Salesforce DX Developer Guide

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CHAPTER 1 How Salesforce Developer Experience (DX) Tooling Changes the Way You Work

In this chapter ...

- Get Started by Using a Sample Repo
- Get Started by Creating a New DX Project
- Create an Application
- Migrate or Import Existing Source
- Salesforce DX Release Notes

Salesforce DX tooling provides modern experience to manage and develop apps on the platform across their entire lifecycle. It brings together source-driven development, team collaboration with governance, and new levels of agility for custom app development on Salesforce based on modern best practices.

Highlights include:

- Your tools, your way. You use the developer tools you already know.
- The ability to apply best practices to software development. Source code and metadata exist outside of the org and provide more agility to develop Salesforce apps in a team environment. Instead of the org, your version control system is the source of truth.
- A powerful command-line interface (CLI) removes the complexity of working with your Salesforce org for development, continuous integration, and delivery.
- Flexible and configurable scratch orgs that you build for development and automated environments. This new type of org makes it easier to build your apps and packages.
- You can use any IDE or text editor you want with the CLI and externalized source.

Note: Salesforce DX tooling requires the API Enabled system permission, which provides programmatic access to your org's information.

Are You Ready to Begin?

Here's the basic order for doing your work using Salesforce DX. These workflows include the most common CLI commands. For all commands, see the *Salesforce CLI Command Reference*.

- Install Salesforce CLI
- Enable Dev Hub
- Use a Sample Repo to Get Started
- Create an Application
- Migrate or Import Existing Source

Optionally, install:

- Salesforce Extensions for VS Code
- Agentforce Vibes IDE

- DevOps Center

SEE ALSO:

Developer Experience (DX) Developer Center

Salesforce CLI Command Reference

Get Started by Using a Sample Repo

The quickest way to get going with Salesforce DX tooling is to clone the `dreamhouse-lwc` GitHub repo. Use its configuration files and Salesforce application to try some commonly used Salesforce CLI commands. In addition to source code for the application, the repo includes sample data and Apex tests.

This task assumes you have a Dev Hub org. See Select and Enable a Dev Hub Org for more information.

1. If you haven't already, install Salesforce CLI on your computer.
2. Open a terminal or command prompt window, and clone the `dreamhouse-lwc` GitHub sample repo using HTTPS or SSH.
   HTTPS:

   ```
   git clone https://github.com/trailheadapps/dreamhouse-lwc.git
   ```

   SSH:

   ```
   git clone git@github.com:trailheadapps/dreamhouse-lwc.git
   ```

3. Change to the `dreamhouse-lwc` project directory.

   ```
   cd dreamhouse-lwc
   ```

4. Authorize your Dev Hub org by logging into it, set it as your default, and assign it an alias.

   ```
   sf org login web --set-default-dev-hub --alias DevHub
   ```

   Enter your Dev Hub org credentials in the browser that opens. After you log in successfully, you can close the browser.

5. Create a scratch org using the `config/project-scratch-def.json` file, set the org as your default, and assign it an alias.

   ```
   sf org create scratch --definition-file config/project-scratch-def.json --set-default
   --alias my-scratch-org
   ```

   The command uses the default Dev Hub you set with the `sf org login web` command in a previous step.

6. View the orgs that you've either created or logged into.

   ```
   sf org list
   ```

   The table displays the Dev Hub you logged into and the scratch org you created. The right-most column indicates the default scratch org and Dev Hub org; in the real-life output you see cute emojis, but in the output below we use `(S)` and `(D)`, respectively. The Alias column displays the aliases you assigned each org. Here's some sample output.

   ```
      Type    Alias          Username                                Org ID
   Status                Expires
    __  _______ _______________ ____________________________________ ____________________
   ____________________ __________
    (D) DevHub  DevHub         jules@sf.com                           00Daj0AUXXXXXXXXXX
   Connected
      Sandbox                jules@sf.com.jssandtwo                 00D02000EAMXXXXXXX
   Connected
    (S) Scratch my-scratch-org test-loo73bj6givn@example.com          00D7xOjgTEASXXXXXX
   Active                2024-05-16

   Legend:  (D)=DevHub, (S)=Default Org      Use --all to see expired and deleted scratch
    orgs
   ```

7. Deploy the Dreamforce app, whose source is in the `force-app` directory, to the scratch org.

```
sf project deploy start --source-dir force-app
```

8. Assign the `dreamhouse` permission set to the default scratch org user (`test-ibnpzayw@example.com`).

```
sf org assign permset --name dreamhouse
```

9. Import sample data from three objects (Contact, Property, and Broker) into the scratch org using the specified plan definition file.

```
sf data import tree --plan data/sample-data-plan.json
```

10. Run Apex tests.

```
sf apex run test --result-format human --wait 1
```

Apex tests run asynchronously by default. If the tests finish before the `--wait` value, the results are displayed. Otherwise, use the displayed command to get the results using a job ID.

11. Open the scratch org and view the deployed metadata under Most Recently Used.

```
sf org open
```

12. In App Launcher, find and open the Dreamhouse application.

Congrats! You just deployed an application to a new scratch org.

SEE ALSO:

- Sample Repository on GitHub
- Authorization
- Create Scratch Orgs
- Deploy Source From Your Project to the Scratch Org
- Run Apex Tests

Get Started by Creating a New DX Project

Let's say you're a Salesforce developer who creates awesome org customizations using declarative tools and builders, such as Flow and Lightning App Builder. You've heard about source-driven development, and want to move in that direction. You therefore need to extract your customizations from your org and store them in a source control system, such as GitHub, which then becomes your new source of truth. But you're not quite sure how it all works and would like to get some hands on practice using simple use cases. Keep reading!

This tutorial starts completely from scratch and shows you how to create simple artifacts, such as Apex classes and LWC components, and then how to sync them between your org and your local project on your laptop. Another tutorial to help you learn about source-driven development is Get Started by Using a Sample Repo on page 3, which is also hands-on but provides a ready-made application that's already in a GitHub repo. Both tutorials are a lot of fun.

Note: We highly recommend that you use a Developer Edition org to simulate your production org, and scratch orgs for your development work. This tutorial shows you how to get set up. This way, you don't mess up your developer sandbox with artifacts you're just playing with.

Get an Org to Play With and Set It as Your Dev Hub

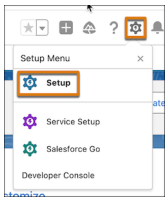
Before you do anything, you need a Salesforce org to play with and designate as your Dev Hub, which is required when working with Salesforce DX. We don't recommend using your production org.

If you don't currently have an org in which you can play in, here are some options:

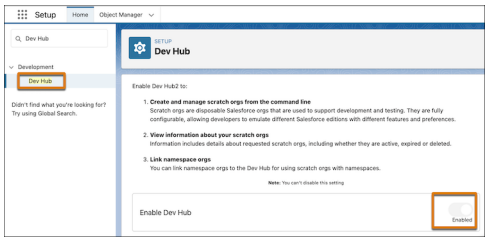
- Sign up for a free Developer Edition org here. Remember your username and password!
- Create a free Trailhead playground (also referred to as a Hands-on Org), which is just a Developer Edition org that's linked to your Trailhead account. Be sure you follow these instructions to get the username and password of your org.

Then follow these steps.

1. Log in to your org from your browser by navigating to login.salesforce.com and enter your username and password.
2. In the top-right corner, click the gear icon and then **Setup**.



3. In the Quick Find box on the left, enter `Dev Hub`, then click **Dev Hub**.
4. Click **Enable Dev Hub**.



Read more about it:

- Select and Enable a Dev Hub Org

Install the Salesforce Platform Development Tools

Now set up your local computer so you can start using the Platform development tools, Salesforce CLI and Salesforce Extensions for Visual Studio Code (VS Code).

If you're not allowed to install tools on your computer, you can use Agentforce Vibes IDE which contains all these tools in a Web browser. In this document we show only Salesforce CLI and VS Code though.

1. Install Salesforce CLI on your computer.
   Windows:
   a. Download the .exe file to your computer.
   b. Open Windows explorer and execute the downloaded `*.exe` file by double-clicking it and answering all the prompts.
   macOS:

a. Download the *.pkg file to your computer.

b. Open Finder and execute the downloaded `*.pkg` file file by double-clicking it and answering all the prompts.

2. Open a command prompt (Windows) or terminal (macOS), and then run this CLI command to make sure Salesforce CLI is installed correctly:

```
sf version
```

You see something like `@salesforce/cli/2.98.6 darwin-arm64 node-v22.17.0.`

3. Install Visual Studio Code on your computer.
4. Install the Salesforce Extensions into VS Code.

Tip: If Node.js is installed on your computer and you prefer using `npm` to install applications, run this command to install Salesforce CLI

```
npm install -g @salesforce/cli
```

Read more about it:

- Agentforce Vibes IDE Overview
- Salesforce CLI: Quick Start
- Salesforce Extensions for Visual Studio Code

Create a Salesforce DX Project

Salesforce DX projects provide a structure for your org's metadata (such as Apex code and org configuration), org templates, sample data, and all your team's tests. To bring consistency to your team's development processes, store project metadata in a source control system (SCS), such as GitHub. Let's create a project and take a brief look at the default new files.

1. In your command prompt (Windows) or terminal (macOS), change to a directory on your computer where you want to create the DX project. For example, on macOS:

```
cd /Users/juliet/sfdx
```

2. Create a Salesforce DX project called `mydxproject` by running this command:

```
sf project generate --name mydxproject
```

3. Change to the directory that was created.

```
cd mydxproject
```

Here's some information about the most interesting files and subdirectories in your new DX project:

- `sfdx-project.json`: Main configuration file for your Salesforce DX project.
- `config/project-scratch-def.json`: Definition file for creating scratch orgs.
- `.forceignore`: File that specifies the source files you want to exclude when synchronizing metadata between your local project and org. If you're familiar with Git, you can see that the file is very similar to the .gitignore file.
- `force-app`: Directory that contains source files that represent metadata from your org. The directory doesn't yet contain any files, but we'll add some later!

Read more about it:

- Create a Salesforce DX Project

- Salesforce DX Project Configuration

Authorize Your Dev Hub and Create a Scratch Org

Remember when you previously created a Dev Edition or Trailhead Playground org to play with and set it as your Dev Hub? You now authorize it locally so you can use it with your Salesforce DX project. And then you can create a scratch org, which you use for development.

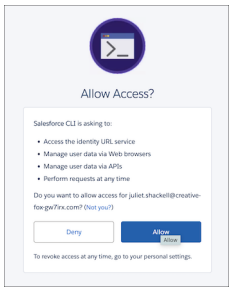
1. From your command prompt or terminal window, run this CLI command:

   ```
   sf org login web --set-default-dev-hub --alias DevHub
   ```

   The `--set-default-dev-hub` and `--alias` flags declare this Dev Hub org as your default Dev Hub org and give it an alias. Later you see how specifying these flags now makes other CLI commands easier to use.

2. Log in to the org using your username and password in the window that pops up, just like you log into any Salesforce org. But wait, didn't you already log into this org? Yes, you did! But this time you're logging into it via the `org login web` CLI command, which authorizes the org to be used by your local DX project. After you're connected, you don't have to keep logging into the org when you run subsequent CLI commands.

3. Click Allow in the browser window that opens and asks if you allow access to the org.

   You can close the browser window because you're all done with it.

   Back in your command prompt or terminal, you should see output like this, which confirms that you successfully authorized the org:

   ```
   Successfully authorized joe@creative-fox-gw7irx.com with org ID 00Daj123457MzBEAU.
   ```

4. In your command prompt or terminal, run this command to see the org you just authorized, along with additional information about it, such as its org ID and Connected status.

   ```
   sf org list
   ```

   The little tree emoji ( ) to the left indicates that it's your default Dev Hub org.

5. Run this command to create a scratch org using the default definition file that was created in the Salesforce DX project:

   ```
   sf org create scratch --definition-file config/project-scratch-def.json --set-default
   --alias myscratch
   ```

   Be sure you run the command from your main DX project directory, which in our example is `/Users/juliet/sfdx/mydxproject`.

   As the command runs, the output tells you what's happening in the background as Salesforce creates the scratch org.

   Similar to when you authorized the Dev Hub org, the `--set-default` and `--alias` flags set the scratch org as your default org and give it an alias. The scratch org creation process requires a Dev Hub, but because you previously set the one you authorized as your default, you don't need to specify it to the org create scratch command. Otherwise you must use the `--target-dev-hub` flag.

You see this message when the scratch org creation is finished:

```
Your scratch org is ready.
```

6. Run this command again to see the new scratch org listed in the list of authorized orgs:

```
sf org list
```

The little leaf emoji ( ) to the left indicates that it's your default org. Run this command to see details about your new org:

```
sf org display
```

Good job! You're now ready to do some development work using your new scratch org.

Read more about it:

- Authorize an Org Using a Browser
- Authorization Information for an Org
- Reference documentation for the "org" CLI commands
- Create Scratch Orgs

Make a Change in Your Scratch Org And Retrieve It to Your Project

If you're a Salesforce admin, you're probably familiar with customizing an org using tools such as Setup and Object Manager. You're now going to use these familiar tools to make a simple change in your new scratch org: add a custom field to the existing Account object. The details don't matter, you simply want to make any change so you can then retrieve its associated metadata into your project.

We're also going to give VS Code a whirl. Most developers prefer using an integrated development environment (IDE) and VS Code is optimized for working on the Salesforce Platform.

We don't go into details about how to use VS Code, which can do all kinds of amazing things. Check out this Trailhead module for more information. But we show you a few basics.

1. From your open command prompt or terminal, run this command to open your scratch org in a browser:

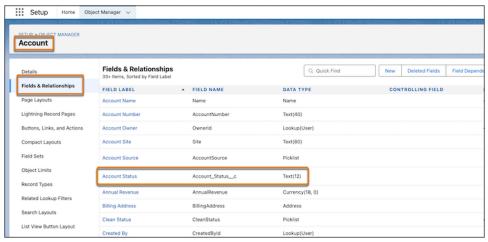
```
sf org open
```

Hold on, how did the CLI command know which org to open? Easy: when you created the scratch org, you specified that it's your default org. If you want to open a different org, or be explicit about the default org, you use the `--target-org` flag and pass it a username or alias. For example:

```
sf org open --target-org myscratch
```

2. In the browser that opens, use Object Manager to create a custom field with label **Account Status** on the Account object. Choose any properties about the field that you want, it doesn't matter for the purposes of this exercise.
Never done this task before? Follow this Trailhead Quick Look for details.

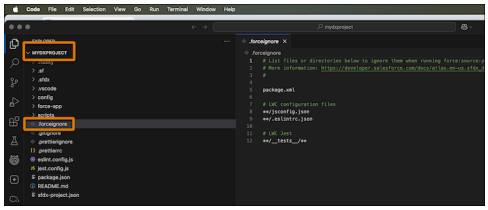
When you're finished, you see something like this:



3. Open VS Code. An easy way is to run this command from your open command prompt or terminal; the application opens right up:

```
code
```

4. Click **File -> Open Folder ...**, navigate to your Salesforce DX project folder (which is `/Users/juliet/sfdx/mydxproject` in our example), and click **Open**.
5. On the left, under **MYDXPROJECT**, click the `.forceignore` file, which is in the root of your Salesforce DX project directory. The contents of the file appears in a tab on the right. You see something like this:



You use the `.forceignore` file to ignore files or directories when you run the CLI commands to deploy or retrieve source.

6. Click inside the `.forceignore` tab and add these two lines at the end of the file after `**/__tests__/**`:

```
# Exclude Profiles
**/profiles/**
```

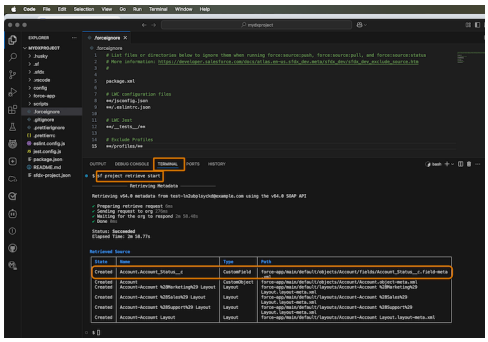
The reason we're excluding Profiles from the source that's deployed and retrieved is that they can be finicky and it's easier for now to just not worry about them. You also get some practice using the `.forceignore` file!

7. Click **File -> Save**.
8. In the VS Code terminal, run this command to retrieve the customization you just made:

```
sf project retrieve start
```

If you don't have a terminal window open in VS Code, click **View -> Terminal**.

The retrieve might take a minute or two. But when it's finished, you see something like this:



Similar to when you previously opened the scratch org, this CLI command knows to retrieve changed or new metadata from the scratch org because you set it as your default org.

The command output shows the metadata that it retrieved. You should see your new Account Status custom field. You probably also see other retrieved metadata, such as Layouts. That's normal.

The Path column shows where the new metadata files are located in your project. Take a look at them if you want!

What you just did was pretty amazing; you used the Object Manager UI to customize the scratch org and then retrieved that customization (as metadata source files) to your DX project as local source files.

Read more about it:

- Develop with Ease with Salesforce Extensions for VS Code
- How to Exclude Source When Syncing
- Retrieve Metadata from Your Scratch Org
- Reference Documentation for the `project` CLI Commands

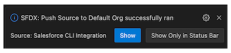
Create an Apex Class and Deploy it To the Scratch Org

But wait, there's more! Let's say you want to create an Apex class in your scratch org. You can use Setup in the Salesforce UI to create Apex classes, but the tool is limited, so let's instead use VS Code, which we introduced in the previous section.

1. From VS Code, click **View -> Command Palette** and run **SFDX:Create Apex Class**.
   Enter `MyApexClass` for the Apex class name and store it in the default local source directory (`force-app/main/default/classes`).

   A new tab opens on the right with initial code for `MyApexClass`, which is stored in a file called `MyApexClass.cls`. The command also created another file: `MyApexClass.cls-meta.xml`.

2. (Optional) If you're familiar with the Apex programming language, add some code to the new class. But you can also leave it empty for now; all we need for this exercise are the metadata files that correspond to the Apex class.
3. Click **File -> Save** to save the new Apex class.
4. From the command palette, run **SFDX: Push Source to Default Org**. (Deploying is sometimes also called pushing.)
   You should see a notification like this when it's complete:

   Also check your output window (click **View -> Output** if you don't see it). You see information about the deploy, including the files that were actually deployed:

```
=== Pushed Source
STATE     FULL NAME     TYPE        PROJECT PATH

_______   ____________  _________
_____________________________________________________________________________
Created   MyApexClass   ApexClass
../mydxproject/force-app/main/default/classes/MyApexClass.cls
Created   MyApexClass   ApexClass
../mydxproject/force-app/main/default/classes/MyApexClass.cls-meta.xml
```

5. Go back to the browser window that's open to your scratch org. If you closed the browser window, you can run this command again from the VS Code terminal:

```
sf org open
```

6. In the Setup Quick Find box, enter *Apex*, then click **Apex Classes**. You should see the `MyApexClass` Apex class you just created, but now it's also in your scratch org. Pretty cool, huh!

7. For fun, let's do one last thing: edit the Apex class in Setup. For example, add this comment to the top of the file:

```
// This is a very exciting Apex class
Be sure to save!
```

8. In VS Code, go to the command palette and run **SFDX: Pull Source from Default Org**.
9. When the retrieve (also sometimes called a pull) finishes, refresh the `MyApexClass` Apex class in VS Code if necessary; you should see the new comment that you made in Setup.

This section gave you just a taste of using VS Code to develop Apex classes.

Read more about it:

- Apex Quick Start
- Develop with Ease with Salesforce Extensions for VS Code

Create a Lightning Web Component and Deploy it to the Scratch Org

Writing an Apex class was fun, so let's use VS Code to create a Lightning Web Component (LWC) in your DX project and then deploy it to your scratch org.

1. From VS Code, click **View -> Command Palette** and run **SFDX:Create Lightning Web Component**.
   Enter *`helloworld`* for the filename and store it in the default directory (`force-app/main/default/lwc`).

   A new tab opens on the right with initial code for the new LWC component, which is stored in a file called `helloworld.js`. The command also creats two other associated files (`helloworld.html` and `helloworld.js-meta.xml`) and a test.

2. (Optional) If you're familiar with creating Lightning Web Components, add some code to any of the `helloworld` files. But you can also leave them empty for now; all we need for this exercise are metadata files associated with the LWC component.
3. Click **File -> Save** to save the new LWC component.
4. From the command palette, run **SFDX: Push Source to Default Org**. Similar to when you deployed the Apex class, you see a notification and information in the Output window.

Optionally run through the same steps described in the Apex section, such as opening your scratch org, viewing your new `helloworld` component in Setup (search for **Lightning Components** in the Quick Find box), making a change, and then retrieving the change back to your project.

Read more about it:

- Get Started with Lightning Web Components
- Develop with Ease with Salesforce Extensions for VS Code

Deploy All Customizations To a Sandbox

You just completed all this development work in a scratch org, but at some point you probably want to deploy everything to a sandbox for further testing, and then eventually deploy to your production org.

Let's simulate some of this process by deploying the changes you made (a new custom field, a new Apex class, and a new LWC component) to your Dev Hub org, which we'll pretend is the sandbox that you use for testing changes. This time we run CLI commands from a command prompt or terminal, rather than use the VS Code commands.

Important: There's a lot more involved in rigorous DevOps. This Getting Started doc simply gives you a taste of what you can do with Salesforce CLI and VS Code extensions around org metadata and scratch orgs.

1. From the command prompt (Windows) or terminal (macOS) that's open in your Salesforce DX project, run this command to deploy your changes to your Dev Hub.

```
sf project deploy start --source-dir force-app --target-org DevHub
```

The `--source-dir` flag specifies exactly what you want to deploy, which is all the metadata that's in the `force-app` package directory.

You see something like this:

```
──────────────── Deploying Metadata ────────────────
 Deploying v64.0 metadata to joe@resilient-fox-4z9oop.com using the v64.0 SOAP API.


  Preparing 205ms
  Waiting for the org to respond - Skipped
  Deploying Metadata 2.88s
    Components: 7/7 (100%)
  Running Tests - Skipped
  Updating Source Tracking - Skipped
  Done 0ms
 Status: Succeeded
 Deploy ID: 0Affj0000017DPlCAM
 Target Org: joe@resilient-fox-4z9oop.com
 Elapsed Time: 3.09s


Deployed Source
┌─────┬──────────────────────────────┬──────────────┬──────────────────────────────────────────────────────────────────────────────────────┐
│ State   │ Name                                 │ Type                       │ Path                                                                                 │
├─────┼──────────────────────────────┼──────────────┼──────────────────────────────────────────────────────────────────────────────────────┤
│ Created │ MyApexClass                          │ ApexClass                  │ force-app/main/default/classes/MyApexClass.cls                                       │
│ Created │ MyApexClass                          │ ApexClass                  │ force-app/main/default/classes/MyApexClass.cls-meta.xml                              │
│ Created │ Account.Account_Status__c            │ CustomField                │ force-app/main/default/objects/Account/fields/Account_Status__c.field-meta.xml       │
│ Changed │ Account-Account %28Marketing%29 Layout │ Layout                   │ force-app/main/default/layouts/Account-Account %28Marketing%29 Layout.layout-meta.xml │
│ Changed │ Account-Account %28Sales%29 Layout   │ Layout                     │ force-app/main/default/layouts/Account-Account %28Sales%29 Layout.layout-meta.xml    │
│ Changed │ Account-Account %28Support%29 Layout │ Layout                     │ force-app/main/default/layouts/Account-Account %28Support%29 Layout.layout-meta.xml  │
│ Changed │ Account-Account Layout               │ Layout                     │ force-app/main/default/layouts/Account-Account Layout.layout-meta.xml                │
│ Created │ helloworld                           │ LightningComponentBundle   │ force-app/main/default/lwc/helloworld/helloworld.html                                │
```

```
| Created | helloworld                              | LightningComponentBundle |
force-app/main/default/lwc/helloworld/helloworld.js
|
| Created | helloworld                              | LightningComponentBundle |
force-app/main/default/lwc/helloworld/helloworld.js-meta.xml
|
└────┴──────────────────┴──────────────┴──────────────────────────────────────┘
```

2. Open the Dev Hub org in a browser window:

```
sf org open --target-org DevHub
```

Use Object Manager and Setup to check that the new custom field (`Account.Account_Status`), Apex class (`MyApexClass`), and LWC component (`helloworld`) exist in the org.

Wow, you just created and moved lots of metadata around! Awesome sauce.

Read more about it:

- Deploy Source From Your Project to the Scratch Org
- Reference Documentation for the `project` CLI Commands

Add Project Files to Your VCS

A typical next step is to add your Salesforce DX project's local files, which represent Salesforce customizations, to a version control system like GitHub. You can then share the DX project, use it to create a scratch org that mirrors your production org's customizations, version your code updates, test updates using a continuous integration (CI) system, and generally adhere to modern development practices.

However, that step is beyond the scope of this topic, but check out the Git and GitHub Basics Trailhead module for more information.

Next Steps

We hope this document gets you started using Salesforce DX. Here are a few more links to help you as you embark on this exciting journey.

- Get Started by Using a Sample Repo
- Salesforce Developers Sample Apps

Create an Application

Follow the basic workflow when you are starting from scratch to create and develop an app that runs on the Lightning Platform.

1. Set up your project.
2. Authorize the Developer Hub org for the project.
3. Configure your local project.
4. Create a scratch org.
5. Push the source from your project to the scratch org.
6. Develop the app.
7. Pull the source to keep your project and scratch org in sync.

8. Run tests.
9. Add, commit, and push changes. Create a pull request.

Deploy your app using one of the following methods:

- Build and release your app with managed packages
- Build and release your app using the Metadata API

Migrate or Import Existing Source

Use the Metadata API to retrieve the code, and then convert your source for use in a Salesforce DX project.

Tip: If your current repo follows the directory structure that is created from a Metadata API retrieve, you can skip the retrieve step and go directly to converting the source.

1. Set up your project.
2. Retrieve your metadata.
3. Convert the metadata formatted source you just retrieved to source format.
4. Authorize the Developer Hub org for the project.
5. Configure your local project.
6. Create a scratch org.
7. Push the source from your project to the scratch org.
8. Develop the app.
9. Pull the source to sync your project and scratch org.
10. Run tests.
11. Add, commit, and push changes. Create a pull request.

Deploy your app using one of the following methods:

- Build and release your app with managed packages.
- Build and release your app using the Metadata API.

Salesforce DX Release Notes

Use the Salesforce Release Notes to learn about the most recent updates and changes to development environments, packaging, platform development tools, and Salesforce APIs.

For the latest changes, visit:

- Salesforce Extensions for Visual Studio Code Release Notes
- Salesforce CLI Release Notes
- Development Environments Release Notes (Includes Developer Edition orgs, sandboxes, and scratch orgs)
- Packaging Release Notes
- New and Changed Items for Developers (Includes Apex, standard objects, Metadata API, and more)

CHAPTER 2 Provide Developers Access to Salesforce DX Tools

In this chapter ...

- Select and Enable a Dev Hub Org
- Enable Source Tracking in Sandboxes
- Add Salesforce DX Users

Prepare your development team with the license, user access, and user permissions they need. Determine which org to use as your Dev Hub org, and enable the Dev Hub setting in that org.

Select and Enable a Dev Hub Org

The Dev Hub lets you create scratch orgs, unlocked packages, and second-generation managed packages. Your Dev Hub is also the designated place to manage all your scratch orgs, packages, and namespaces.

Determine which org to use as your Dev Hub org, then enable the Dev Hub setting in that org. Dev Hub comprises objects with permissions that allow admins to control the level of access available to a user and an org. If you're developing an unlocked package that you intend to deploy to other orgs, enable the Dev Hub setting in one of your active production orgs. This ensures that your package is owned by an active org.

All Salesforce ISV and OEM partners should designate their Partner Business Org (PBO) as their Dev Hub org, see Enable Dev Hub and Second-Generation Managed Packaging for more details.

To enable Dev Hub in an org:

1. Log in as System Administrator to your production, Developer Edition, or trial org.
2. From Setup, enter *Dev Hub* in the Quick Find box and select **Dev Hub**.

   If you don't see Dev Hub in the Setup menu, make sure that your org is one of the supported editions.
3. To enable Dev Hub, click **Enable**.

   After you enable Dev Hub, you can't disable it.

Note: You can't enable Dev Hub in a sandbox.

The Dev Hub org instance determines where scratch orgs are created.

- Scratch orgs created from a Dev Hub org in Government Cloud are created on a Government Cloud instance.
- Scratch orgs created from a Dev Hub org in Hyperforce are created on a Hyperforce instance.

Consider these factors if you select a trial or Developer Edition org as your Dev Hub.

- You can create up to six scratch orgs and package versions per day, with a maximum of three active scratch orgs.
- Trial orgs expire on their expiration date.
- Developer Edition orgs can expire due to inactivity.
- Package versions are associated with your Dev Hub org. When a trial or Developer Edition org expires, you lose access to the package versions.

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Dev Hub available in: **Developer**, **Enterprise**, **Performance**, and **Unlimited** Editions

Scratch orgs available in: **Developer**, **Enterprise**, **Group**, and **Professional** Editions

Enable Unlocked Packaging

Enable packaging in your org so you can develop unlocked packages. You can work with the packages in scratch orgs and sandboxes.

Enable Einstein Chatbot Features in Scratch Orgs

Turn on Einstein Features in your Dev Hub to eliminate the manual steps for enabling the Chatbot feature in scratch orgs. When you accept the Terms of Service for Einstein, a separate acceptance is not required in each scratch org created from this Dev Hub org. If you previously accepted the Terms of Service for Einstein to turn on an Einstein-related feature, this setting is already enabled.

Enable Language Extension Packages (Beta)

Enable Language Extension Packages in Dev Hub to create language extension packages that contain translations of components in other packages. This feature is available in unlocked and first- and second-generation managed packages.

Enable Unlocked Packaging

Enable packaging in your org so you can develop unlocked packages. You can work with the packages in scratch orgs and sandboxes.

Before you begin, enable Dev Hub in your org.

1. Log in to the org where you've enabled Dev Hub.
2. From Setup, enter *Dev Hub* in the Quick Find box and select **Dev Hub**.
3. Select **Enable Unlocked Packages and Second-Generation Managed Packages**.
   After you enable this setting, you can't disable it.

To get started with creating unlocked packages, see Unlocked Packages. For information on second-generation managed packages, see the Second-Generation Managed Packages Developer Guide.

Enable Einstein Chatbot Features in Scratch Orgs

Turn on Einstein Features in your Dev Hub to eliminate the manual steps for enabling the Chatbot feature in scratch orgs. When you accept the Terms of Service for Einstein, a separate acceptance is not required in each scratch org created from this Dev Hub org. If you previously accepted the Terms of Service for Einstein to turn on an Einstein-related feature, this setting is already enabled.

Complete this task before attempting to create a scratch org with the Chatbot feature.

1. Log in to your Dev Hub org.
2. From Setup, enter *Dev Hub* in the Quick Find box and select **Dev Hub**.
3. On the Dev Hub Setup page, turn on **Enable Einstein Features**.

Enable Language Extension Packages (Beta)

Enable Language Extension Packages in Dev Hub to create language extension packages that contain translations of components in other packages. This feature is available in unlocked and first- and second-generation managed packages.

Note: This feature is a Beta Service. Customer may opt to try such Beta Service in its sole discretion. Any use of the Beta Service is subject to the applicable Beta Services Terms provided at Agreements and Terms.

Language extension packages can only contain Translations and CustomObjectTranslations. If a base package includes components that can't be translated, those components aren't included when you create a language extension package.

1. In Dev Hub, from Setup, in the Quick Find box, enter *Dev Hub*, and then select **Dev Hub**.
2. On the Dev Hub Setup page, turn on **Enable Language Extension Packages**.

Enable Source Tracking in Sandboxes

By enabling source tracking in Developer and Developer Pro sandboxes, Salesforce DX tooling can automatically track new, changed, and deleted metadata components. You can then select and determine which changes to move forward in the development cycle and release. For DX tooling that uses a Salesforce DX project or source control repository, source tracking can aid in conflict detection and resolution. And best of all, because source tracking identifies which metadata components changed, you no longer have to manually keep track of changes.

You can enable source tracking in Developer and Developer Pro sandboxes in two ways: in your production org for all sandboxes created from it, or for a specific sandbox. After you turn on source tracking, you can disable it at any time.

- For all Developer and Developer Pro sandboxes—when you enable the feature in your production org, all newly created and refreshed sandboxes use source tracking. Existing sandboxes don't have source tracking enabled until you refresh them.
- For a specific Developer or Developer Pro sandbox—if you don't want to enable source tracking in all sandboxes, or want to enable source tracking without refreshing the sandbox, you can enable it directly in the sandbox from the Sandbox Settings Setup page.

Note: Source tracking isn't supported and can't be enabled for Partial Copy sandboxes, Full sandboxes, or Developer Edition orgs. Source tracking can result in metadata deployments taking longer to complete.

SEE ALSO:

Salesforce Help: Refresh Your Sandbox

Enable Source Tracking for All Developer and Developer Pro Sandboxes

Enable source tracking for all Developer and Developer Pro sandboxes in your production org from the Dev Hub Setup page.

1. Log in to the source (production) org.
2. From Setup, find and select **Dev Hub**.

   If you don't see Dev Hub in the Setup menu, make sure that the source org is one of the supported editions.
3. Select **Enable Source Tracking in Developer and Developer Pro Sandboxes**.
4. Refresh any existing Developer or Developer Pro sandboxes to enable this feature.

   Source tracking is automatically enabled for any newly created or refreshed Developer or Developer Pro sandboxes.

You can disable this feature at any time by clicking the toggle. When the sandbox is refreshed, all source tracking information is deleted.

EDITIONS

Available in: **Enterprise**, **Performance**, and **Unlimited** Editions. For **Professional** and **Database.com** Editions, you can only enable source tracking directly in the sandbox.

USER PERMISSIONS

To view a sandbox:

- View Setup and Configuration AND Customize Applications

To create, refresh, activate, and delete a sandbox:

- Manage Dev Sandboxes (Developer or Developer Pro only) or Manage Sandboxes (all sandbox types)

Enable Source Tracking in a Specific Sandbox

Enable source tracking for a specific Developer or Developer Pro sandbox in its Settings Setup page. If you refresh a sandbox, you must re-enable this feature.

1. Log in to the Developer or Developer Pro sandbox.
2. From Setup, find and select **Sandbox Settings**.
3. Click **Enable Source Tracking in This Sandbox**.

Metadata changes from this point forward are tracked, but existing metadata changes made before you enabled this feature aren't tracked. When the sandbox is refreshed, all source tracking information is deleted. If you haven't enabled source tracking in the production org for all Developer and Developer Pro sandboxes, and you want the refreshed sandbox to use source tracking, you must re-enable the feature in the Sandbox Settings page.

If you disable source tracking, it can take several days to clean up the source tracking records. The process isn't instantaneous. You can re-enable source tracking after the cleanup process is finished.

EDITIONS

Available in: Lightning Experience in Developer and Developer Pro sandboxes

USER PERMISSIONS

To view a sandbox:

- View Setup and Configuration AND Customize Applications

To create, refresh, activate, and delete a sandbox:

- Manage Dev Sandboxes (Developer or Developer Pro only) or Manage Sandboxes (all sandbox types)

Add Salesforce DX Users

System administrators can access the Dev Hub org by default. You can enable more users to access the Dev Hub org so that they can create scratch orgs and use other developer-specific features.

Your developer users can use Salesforce DX with the Salesforce, and Salesforce Platform standard user license, or you can assign them the Developer license, or the Salesforce Limited Access - Free license instead.

If your org has Developer licenses, you can add users with the Developer profile and assign them the provided Developer permission set. Alternatively, you can add users with the Standard User or System Administrator profiles. For a standard user, you must create a permission set with the required Dev Hub permissions. We recommend that you avoid adding users as system administrators unless their work requires that level of authority and not just Dev Hub org access.

Determine Which License to Assign to Dev Hub Users

Which license type you assign to developer users depends on how much access they require in the Dev Hub org. If they require full administrative access, you can assign the Salesforce or Salesforce Platform standard user license. If you want to limit access to only specific features, Salesforce provides two developer license options

Add a System Administrator or Standard User to Your Dev Hub Org

Add system administrator users only if their work requires that level of authority. Otherwise, add standard users and create a permission set with the required Salesforce DX permissions.

Add a Developer User to Your Dev Hub Org

Using a Developer license, add a user with the Developer profile and assign them the Developer permission set.

Add a Limited Access User to Your Dev Hub Org

If your users only require access to the Dev Hub, the Salesforce Limited Access - Free license is a good approach. The Salesforce Limited Access - Free license is available by request. After this license is provisioned add a user with this license and the Limited Access user profile, and then create and assign them a permission set to the required Dev Hub objects.

Create and Assign a Permission Set to Developer Users

To give full access to the Dev Hub org, create and assign a custom permission set that grants access to required Dev Hub objects. Or if you have the Developer license, assign the Developer permission set.

SEE ALSO:

Org Shape Permissions

Determine Which License to Assign to Dev Hub Users

Which license type you assign to developer users depends on how much access they require in the Dev Hub org. If they require full administrative access, you can assign the Salesforce or Salesforce Platform standard user license. If you want to limit access to only specific features, Salesforce provides two developer license options

Salesforce or Salesforce Platform License

The Salesforce license is for users who require full access to standard CRM and AppExchange apps. Users with this user license are entitled to access any standard or custom app.

The Salesforce Platform license is designed for users who need access to custom apps but not to standard CRM functionality. Users with this user license are entitled to use custom apps developed in your organization or installed from AppExchange.

Developer License

The Developer license is designed for users whose role is to build customizations or applications. This license provides access to development tools and environments. It comes with one Developer sandbox, one scratch org, and access to the Dev Hub. In the production org, this license restricts access to standard and custom objects. For example, users can't access the Account object within the Sales app. And because of the restriction to custom objects, users can't be assigned access to custom apps or AppExchange apps.

The development environments provide access to Salesforce features. With a Developer sandbox, you can use all the features that exist in the production org. The org administrator can create the Developer sandbox that was provisioned with the Developer license. A scratch org, which can be configured to your specifications using a scratch org definition file, gives you access to features on a trial basis. For example, you can use a scratch org to work with Financial Services Cloud or to play with Sales Cloud Einstein features. The Developer license provides access to the Dev Hub, enabling users to create scratch orgs on a self-service basis.

Free Limited Access License

The Salesforce Limited Access - Free license provides accounts to non-admin users in your production org, when these users require access to only a specific app, feature, or setting. Standard Salesforce objects such as Accounts, Contacts, and Opportunities aren't accessible with this license. The Salesforce Limited Access - Free license isn't available in Developer Edition orgs.

The edition of the Dev Hub org determines the maximum number of the Limited Access licenses you can request.

- Enterprise Edition orgs can request up to 20 licenses.
- Unlimited Edition orgs can request up to 50 licenses.

To request this license, contact your Salesforce account executive. A Salesforce admin can upgrade a Salesforce Limited Access - Free license to a standard Salesforce license at any time.

The Salesforce Limited Access - Free license doesn't support certain features.

- To provide the ability to create and manage org shapes, assign the Salesforce user license. The Salesforce Limited Access - Free license isn't supported at this time.

- Users with the Salesforce Limited Access - Free license and View All Records permissions can create scratch orgs using an existing org shape.
- Users with the Salesforce Limited Access - Free license and View All Records permissions can view scratch org snapshots created by users other than themselves.
- The Salesforce Limited Access - Free license doesn't provide access to some Salesforce CLI commands, such as `sf limits api display`.
- Contact your Salesforce admin for API limits information.

SEE ALSO:

Add Salesforce DX Users

Permission Set for Salesforce DX Users

Add a System Administrator or Standard User to Your Dev Hub Org

Add system administrator users only if their work requires that level of authority. Otherwise, add standard users and create a permission set with the required Salesforce DX permissions.

1. Create a user in your Dev Hub org, if necessary.
   a. In Setup, enter *Users* in the Quick Find box, then select **Users**.
   b. Click **New User**.
   c. Fill out the form, and assign the System Administrator or Standard User profile.
   d. Click **Save**.

   If you're adding a System Administrator user, you can stop here.
2. If you're adding a Standard User, create a permission set for Salesforce DX users if you don't have one.
   a. From Setup, enter *Permission Sets* in the Quick Find box, then select **Permission Sets**.
   b. Click **New**.
   c. Enter a label, API name, and description. The API name is a unique name used by the API and managed packages.
   d. Select a user license option. If you plan to assign this permission set to multiple users with different licenses, select **None**.
   e. Click **Save**. The permission set overview page appears. From here, you can navigate to the permissions you want to add or change for Salesforce DX. For the required permissions, see Create and Assign a Permission Set to Developer Users.
3. Apply the Salesforce DX permission set to the Standard User.
   a. From Setup, enter *Permission Sets* in the Quick Find box, then select **Permission Sets**.
   b. Select the Salesforce DX permission set.
   c. In the permission set toolbar, click **Manage Assignments**.
   d. Click **Add Assignments**.
   e. Select the user to assign the permission set to.
   f. Click **Assign**.
   g. Click **Done**.

You can limit a user's access by modifying the permissions.

Add a Developer User to Your Dev Hub Org

Using a Developer license, add a user with the Developer profile and assign them the Developer permission set.

The Developer license is a paid license that is designed for users whose role is to build customizations or applications. This license provides access to development tools and environments. It comes with one Developer sandbox, one scratch org, and access to the Dev Hub. In the production org, this license restricts access to standard and custom objects.

1. Create a user in your Dev Hub org.
   a. In Setup, enter `Users` in the Quick Find box, then select **Users**.
   b. Click **New User**.
   c. Fill out the form.
   d. Select **Developer** for User License, and then **Developer** for Profile.
   e. After filling out the remaining information, click **Save**.
2. Assign the built-in Developer permission set to the user.
   a. On the user's detail page, in the Permission Set Assignments related list, click **Edit Assignments**.
   b. In the Available Permission Sets, add the Developer permission set and click **Save**.

The Developer permission set grants access to Dev Hub features and second-generation packages. For details, see Create and Assign a Permission Set to Developer Users.

Add a Limited Access User to Your Dev Hub Org

If your users only require access to the Dev Hub, the Salesforce Limited Access - Free license is a good approach. The Salesforce Limited Access - Free license is available by request. After this license is provisioned add a user with this license and the Limited Access user profile, and then create and assign them a permission set to the required Dev Hub objects.

The Salesforce Limited Access - Free is designed for users whose role is to build customizations or applications. This license provides access to the Dev Hub, development tools, and environments. In the production org, this license restricts access to standard and custom objects.

1. Create a user in your Dev Hub org.
   a. In Setup, enter `Users` in the Quick Find box, then select **Users**.
   b. Click **New User**.
   c. Fill out the form.
   d. Select **Salesforce Limited Access - Free** for User License, and then **Limited Access User** for Profile.
   e. After filling out the remaining information, click **Save**.
2. Create a permission set that provides your developer users with access to the required Dev Hub objects. For details, see Create and Assign a Permission Set for Developer Users or Assign Second-Generation Managed Packaging User Permissions.

Create and Assign a Permission Set to Developer Users

To give full access to the Dev Hub org, create and assign a custom permission set that grants access to required Dev Hub objects. Or if you have the Developer license, assign the Developer permission set.

Standard Developer Permission Set

If you're providing access to the Dev Hub org using the standard Developer license, it also includes a built-in Developer permission set. This permission set provides the required permissions for scratch orgs, and unlocked and second-generation managed packaging. You can use the provided Developer permission set or create your own.

Create a Permission Set

Follow the steps to create a permission set, then add the required scratch org and packaging permissions.

Required Permissions for Scratch Orgs

- Object Settings > Scratch Org Infos > Read, Create, Edit, and Delete
- Object Settings > Active Scratch Orgs > Read, Edit, and Delete

Required Permissions for Unlocked Packaging and Second-Generation Managed Packaging

To work with unlocked or second-generation managed packages in the Dev Hub org, the permission set must contain the scratch org permissions and:

- Object Settings > Namespace Registries > Read
- System Permissions > Create and Update Second-Generation Packages

The system permission provides access to:

Salesforce CLI Command	Tooling API Object (Create and Edit)
`package create`	Package2
`package version create`	Package2VersionCreateRequest
`package version update`	Package2Version

Assign Permission Set to Users

To assign one or more users to a permission set, or to remove a user from a permission set, see Manage Permission Set Assignments in *Salesforce Help*.

CHAPTER 3 Project Setup

In this chapter ...

- Sample Repository on GitHub
- Create a Salesforce DX Project
- Salesforce DX Project Structure and Source Format
- How to Exclude Source When Syncing
- Create a Salesforce DX Project from Existing Source
- Convert Files in Metadata Format to Source Format
- Salesforce DX Usernames and Orgs
- Link a Namespace to a Dev Hub Org
- Salesforce DX Project Configuration
- Multiple Package Directories
- Replace Strings in Code Before Deploying or Packaging

A Salesforce DX project provides a project structure for your org's metadata (code and configuration), org templates, sample data, and all your team's tests. To bring consistency to your team's development processes, store these items in a source control system (SCS). Retrieve the contents of your team's repository when you're ready to develop a new feature.

What makes a project a Salesforce DX project? It includes an `sfdx-project.json` file, which defines the project's configuration. This `.json` file includes connected app information for Salesforce CLI, in which directories project files are located, packaging directory structure for 2GP packages, and which API version you want to use, if not the latest.

You have different options to create a Salesforce DX project depending on how you want to begin. You can use your preferred SCS. Most of our examples use Git.

Use the Sample Repository on GitHub	Explore the features of Salesforce DX using one of our sample repos and your own SCS and toolset.
Create a Salesforce DX Project from Existing Source	Start with an existing Salesforce app to create a Salesforce DX project.
Create a Salesforce DX Project	Create an app on the Salesforce Platform using a Salesforce DX project.

Sample Repository on GitHub

To get started quickly, see the `dreamhouse-lwc` GitHub repo. This standalone application contains an example DX project with multiple Apex classes, Aura components, custom objects, sample data, and Apex tests.

Cloning this repo creates the directory `dreamhouse-lwc`. See the repo's Readme for more information.

Assuming that you've already set up Git, use the `git clone` command to clone the main branch of the repo from the command line.

To use HTTPS:

```
git clone https://github.com/trailheadapps/dreamhouse-lwc
```

To use SSH:

```
git clone git@github.com:trailheadapps/dreamhouse-lwc.git
```

If you don't want to use Git, download a .zip file of the repository's source using Clone, or download on the GitHub website. Unpack the source anywhere on your local file system.

See Get Started by Using a Sample Repo for the next steps.

Tip: Check out more complex examples in the Sample Gallery.

The Sample Gallery contains sample apps that show what you can build on the Salesforce platform. They're continuously updated to incorporate the latest features and best practices.

Create a Salesforce DX Project

A Salesforce DX project has a specific structure and a configuration file that identifies the directory as a Salesforce DX project.

1. Change to the directory where you want the DX project located.
2. Create the DX project.

   ```
   sf project generate --name MyProject
   ```

   If you don't specify an output directory with the `--output-dir` flag, the project directory is created in the current location. You can also use the `--default-package-dir` flag to specify the default package directory to target when syncing source to and from the org. If you don't indicate a default package directory, this command creates a default package directory, `force-app`.

   Use the `--template` flag to specify what your project initially looks like. Each template provides a complete directory structure that takes the guesswork out of where to put your source. If you choose `--template empty`, your project contains these sample configuration files to get you started.

   - `.forceignore`
   - `config/project-scratch-def.json`
   - `sfdx-project.json`
   - `package.json`

   If you choose `--template standard`, your project also contains these files that are especially helpful when using Salesforce Extensions for VS Code. If you don't specify the `--template` flag, the `project generate` command uses the standard template.

   - `.gitignore`: Makes it easier to start using Git for version control.

- `.prettierrc` and `.prettierignore`: Make it easier to start using Prettier to format your Aura components.
- `.vscode/extensions.json`: Causes Visual Studio Code, when launched, to prompt you to install the recommended extensions for your project.
- `.vscode/launch.json`: Configures Replay Debugger, making it more discoverable and easier to use.
- `.vscode/settings.json`: By default, this file has one setting for excluding certain files and folders in searches and quick open. You can change this value or add other settings.

If you choose `--template analytics`, you get all the helpful basic and VS Code files. But the default package directory contains fewer directories, such as for storing Analytics template bundles. `/force-app/main/default/waveTemplates`) and a few other metadata types, such as Apex classes and LWC components.

Example:

```
sf project generate --name mywork --template standard
```

```
sf project generate --name mywork --default-package-dir myapp-source
```

Next steps:

- (Optional) Register the namespace with the Dev Hub org.
- Configure the project (`sfdx-project.json`). If you use a namespace, update this file to include it.
- Create a scratch org definition that produces scratch orgs with the features you need for your project. The `config` directory of your new project contains a sample scratch org definition file (`project-scratch-def.json`).

SEE ALSO:

Create a Salesforce DX Project from Existing Source

Salesforce DX Project Configuration

Link a Namespace to a Dev Hub Org

Build Your Own Scratch Org Definition File

How to Exclude Source When Syncing

VS Code Command: SFDX: Create Project, SFDX: Create Project with Manifest

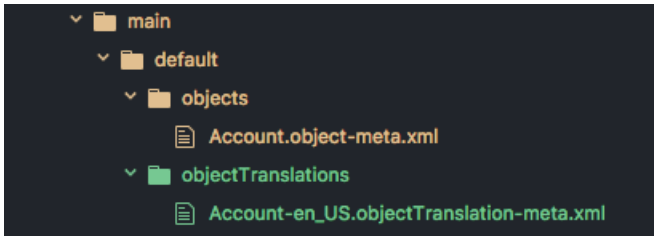
Salesforce DX Project Structure and Source Format

A Salesforce DX project has a specific project structure and source format. Source format uses a different set of files and file extensions from what Metadata API uses. When you retrieve metadata from the org with the `project retrieve start` command, Salesforce CLI stores it in source format in your project. When you deploy metadata, Salesforce CLI converts it into the format that Metadata API requires.

Source Transformation

It's not uncommon for metadata formatted source to be very large, making it difficult to find what you want. If you work on a team with other developers who update the same metadata at the same time, you have to deal with merging multiple updates to the file. If you're thinking that there has to be a better way, you're right.

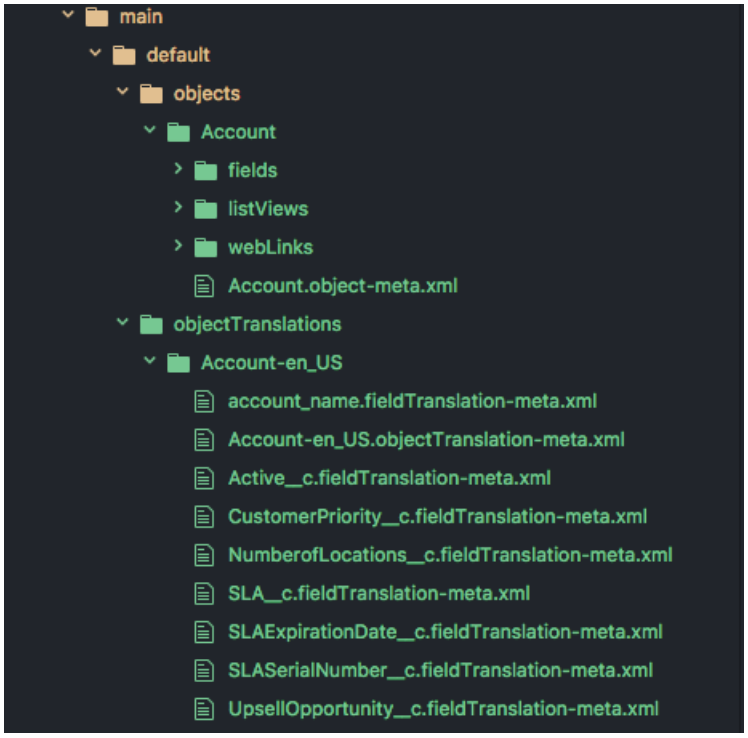
Before, all custom objects and object translations were stored in one large metadata file.



We solve this problem by providing a new source shape that breaks down, or *decomposes*, these large source files to make them more digestible and easier to manage with a version control system. It's called source format. Source format makes it much easier to find what you want to change or update. And you're less likely to overwrite a team member's change if it's decomposed.

A Salesforce DX project decomposes custom objects and custom object translations into intuitive subdirectories by default. If you want, you can also specify that other metadata types, such as permission sets and custom labels, are decomposed.

See Decomposed Metadata Types for details on how we decompose custom objects and custom object translations and how to configure more metadata types to be similarly decomposed.

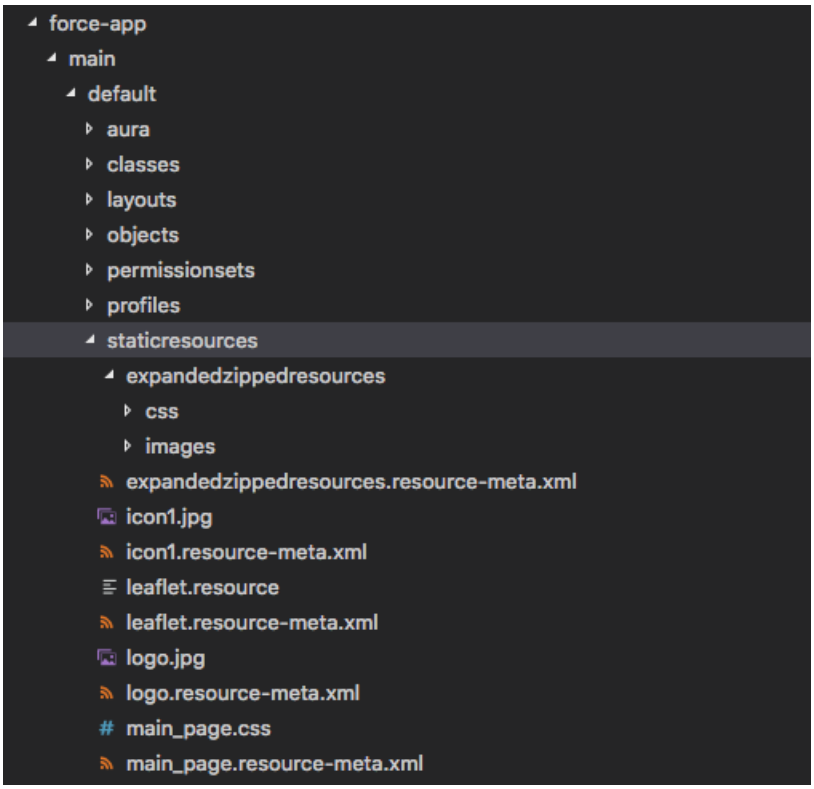


Static Resources

Static resources must reside in the `/main/default/staticresources` directory. The `project deploy` and `project retrieve` commands support auto-expanding or compressing archive MIME types within your project. These behaviors support both the `.zip` and `.jar` MIME types. This way, the source files are more easily integrated in your Salesforce DX project and version control system.

For example, if you upload a static resource archive through the scratch org's Setup UI, the `project retrieve start` command expands it into its directory structure within the project. To mimic this process from the file system, add the directory structure to compress directly into the static resources directory root, then create the associated `.resource-meta.xml` file. If an archive exists as a single file in your project, it's always treated as a single file and not expanded.

This example illustrates how different types of static resources are stored in your local project. You can see an expanded `.zip` archive called `expandedzippedresource` and its related `.resource-meta.xml` file. You also see a couple `.jpg` files being stored with their MIME type, and a single file being stored with the legacy `.resource` extension



See Salefsorce Help: Static Resources for more information.

File Extensions

When you convert existing metadata format to source format, we create an XML file for each bit. All files that contain XML markup now have an `.xml` extension so that your XML editor recognizes them as XML files and you can look at them. To sync your local projects and scratch orgs, Salesforce DX projects use a particular directory structure for custom objects, custom object translations, Lightning web components, Aura components, and documents.

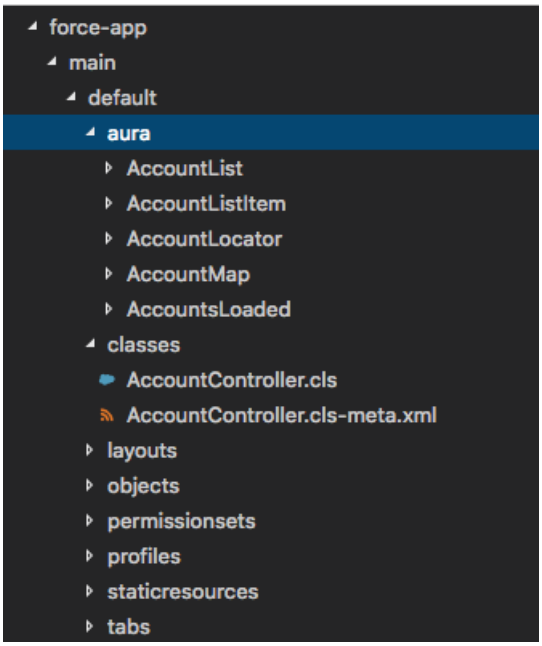
For example, if you had an object called Case, source format provides an XML version called `Case.object-meta.xml`. If you have an app called DreamHouse, we create a file called `DreamHouse.app-meta.xml`. You get the idea.

Traditionally, static resources are stored on the file system as binary objects with a `.resource` extension. Source format handles static resources differently by supporting content MIME types. For example, `.gif` files are stored as a `.gif` instead of `.resource`. By storing files with their MIME extensions, you can manage and edit your files using the associated editor on your system.

You can have a combination of existing static resources with their `.resource` extension, and newly created static resources with their MIME content extensions. Existing static resources with `.resource` extensions keep that extension, but any new static resources show up in your project with their MIME type extensions. We allow `.resource` files to support the transition for existing customers. Although you get this additional flexibility, we recommend storing your files with their MIME extensions.

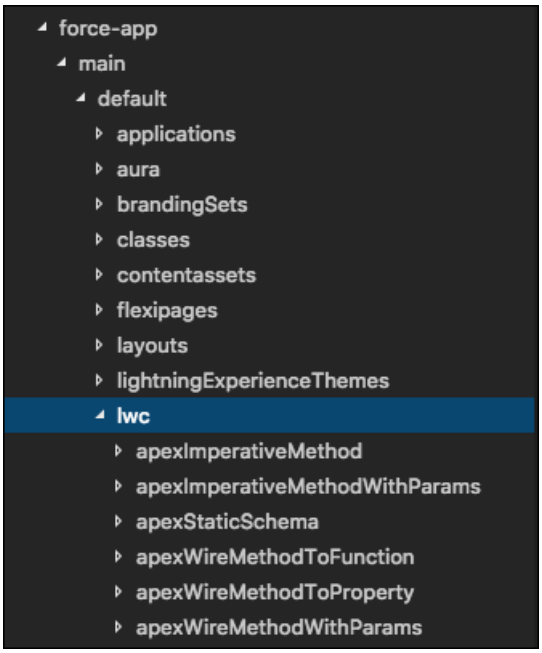
Aura Components

Aura bundles and components must reside in a directory named `aura` under the *`<package directory>`* directory.



Lightning Web Components

Lightning web components must reside in a directory named `lwc` under the *`<package directory>`* directory.



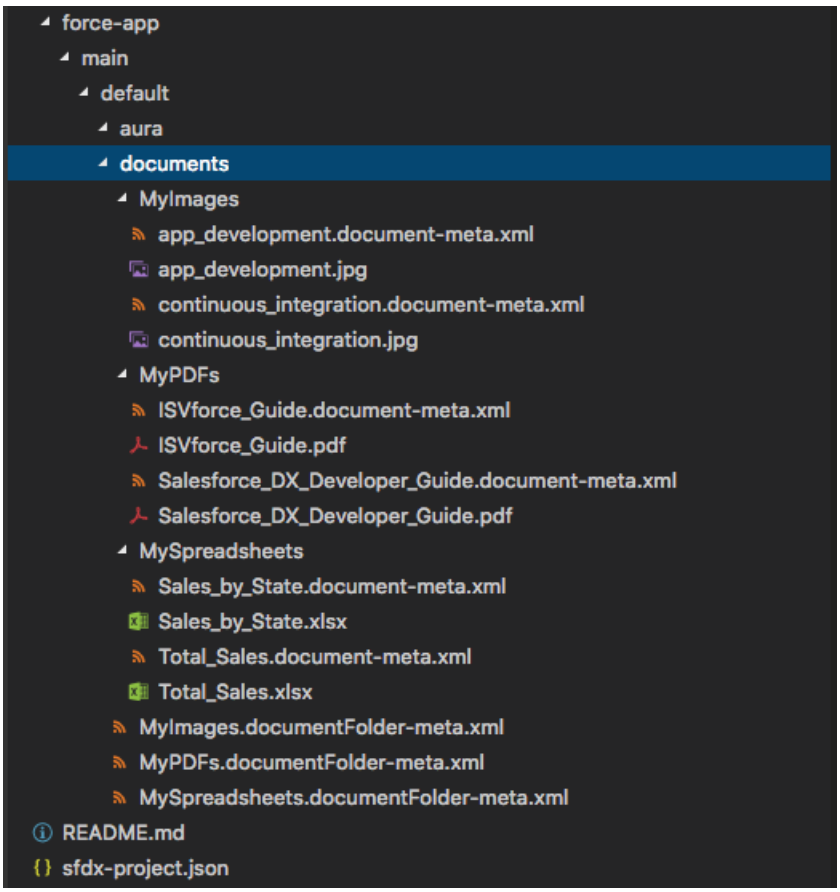
ExperienceBundle and DigitalExperienceBundle for Experience Cloud Sites

The ExperienceBundle metadata type represents an Aura or an LWR site, and must reside in a directory named `experiences` under the *`<package directory>`* directory. The `experiences` directory contains a folder for each Aura or LWR site in your org.

The DigitalExperiencBundle metadata type represents an enhanced LWR site, and must reside in a directory named `digitalExperiences` under the *`<package directory>`* directory. The `digitalExperiences/site` directory contains a folder for each enhanced LWR site in your org.

Documents

Documents must be inside the directories of their parent document folder. The parent document folder must be in a directory called `documents`. Each document has a corresponding metadata XML file that you can view with an XML editor.



Decomposed Metadata Types

Decomposition refers to splitting a single, often large, metadata XML file into smaller XML files based on its subtypes. The result is referred to as source format. By default, a Salesforce DX project always decomposes custom objects and custom object translations. You can also optionally specify that other metadata types, such as permission sets and custom labels, be decomposed.

Start Decomposing the Optional Metadata Types (Beta)

The Salesforce DX project file (`sfdx-project.json`) determines which of the optional metadata types are decomposed. But don't update it manually. Rather, run the `project convert source-behavior` Salesforce CLI command which updates the project file for you, and also breaks up the associated metadata file XML into smaller files.

Note: Decomposition of permission sets, custom labels, sharing rules, and workflows is a pilot or beta service that is subject to the Beta Services Terms at Agreements - Salesforce.com or a written Unified Pilot Agreement if executed by Customer, and applicable terms in the Product Terms Directory. Use of this pilot or beta service is at the Customer's sole discretion.

Before you begin, commit all your DX project source files to your version control system. Committing the files ensures that you can easily see what changed in your project. You can also revert the changes if necessary.

1. Open a terminal or command prompt and change to your Salesforce DX project directory.
2. Optionally execute a dry run of the CLI command to display what it does before it actually changes your DX project. For example, to dry run the decomposition of permission sets, run this command:

   ```
   sf project convert source-behavior --behavior decomposePermissionSetBeta2 --dry-run
   ```

   See this table for the `--behavior` values for the other metadata types you can optionally decompose.
3. When you're ready to update your DX project, run the same command but without the `--dry-run` flag:

   ```
   sf project convert source-behavior --behavior decomposePermissionSetBeta2
   ```

   If your default org is enabled for source tracking, the CLI command returns an error. This error is expected, because decomposing your local metadata causes the source tracking system to get out of sync with the org. Follow the directions in the error message and try again.
4. If you deleted your default org, recreate it and deploy your local source.

When the `project convert source-behavior` command finishes, your `sfdx-project.json` file is updated to always decompose permission sets, or whatever type you specified. The existing source files in your local package directories are converted into the new decomposed format. You can now deploy and retrieve your metadata as usual.

If you change your mind and don't want to decompose the optional types, revert the changes made by the `project convert source-behavior` and recreate your source-tracking orgs.

This table provides the list of metadata types that are decomposed by default, and the types that you can optionally decompose. For optional metadata types, the table also shows the corresponding `--behavior` flag value.

Metadata Type	Value of `--behavior` Flag	Details About the Source Format Structure
CustomObject	Not needed; type is decomposed by default.	Custom Objects
CustomObjectTranslation	Not needed; type is decomposed by default.	Custom Object Translations
CustomLabels	`decomposeCustomLabelsBeta2`	Custom Labels (Beta)
ExternalServiceRegistration	`decomposeExternalServiceRegistrationBeta`	External Service Registrations (Beta)
PermissionSet	`decomposePermissionSetBeta2`	Permission Sets (Beta)
SharingRules	`decomposeSharingRulesBeta`	Sharing Rules (Beta)
Workflow	`decomposeWorkflowBeta`	Workflows (Beta)

Source Format Structure of Decomposed Metadata Types

This section provides details about how the decomposed metadata types are broken down into their local source format structure.

Note: Decomposition of the optional metadata types (custom labels, permission sets, sharing rules, and workflows) is a pilot or beta service that is subject to the Beta Services Terms at Agreements - Salesforce.com or a written Unified Pilot Agreement if executed by Customer, and applicable terms in the Product Terms Directory. Use of this pilot or beta service is at the Customer's sole discretion.

Custom Objects

Custom objects are decomposed by default.

When you convert from metadata format to source format, your custom objects are placed in the `<package-directory>/main/default/objects` directory. Each object has its own subdirectory that reflects the type of custom object. Some parts of the custom objects are extracted into in these subdirectories:

- `businessProcesses`
- `compactLayouts`
- `fields`
- `fieldSets`
- `indexes`
- `listViews`
- `recordTypes`
- `sharingReasons`
- `validationRules`
- `webLinks`

The parts of the custom object that aren't extracted are placed in a `<object-name>.object-meta.xml` file.

Custom Object Translations

Custom object translations are decomposed by default.

Custom object translations reside in the `<package-directory>/main/default/objectTranslations` directory, each in their own subdirectory named after the custom object translation. Custom object translations and field translations are extracted into their own files within the custom object translation's directory.

- For field names, `<field_name>.fieldTranslation-meta.xml`
- For object names, `<object_name>.objectTranslation-meta.xml`

The remaining pieces of the custom object translation that aren't field translations are placed in a file called `<objectTranslation-name>.objectTranslation-meta.xml`.

See Salesforce Help: Translation Workbench for more information.

Custom Labels (Beta)

Custom labels aren't decomposed by default; you must specifically configure your DX project to decompose them. See Start Decomposing the Optional Metadata Types (Beta) for details.

By default, all custom labels for your entire org are contained in a single file called `CustomLabels.labels-meta.xml` that resides in the *<package-directory>*`/labels` directory. Each package directory can have its own `CustomLabels.labels-meta.xml` file.

If you choose to decompose custom labels, individual `CustomLabel` components appear one time in a dedicated `*.label-meta.xml` source file. The name of each `*.label-meta.xml` source file is derived from the `fullName` of the `CustomLabel` component it contains. This example shows four custom label files in the default package directory.

```
sfdx-project
└── force-app
    └── main
        └── default
            └── labels
                ├── Timeout_Warning.label-meta.xml
                ├── Logout_Message.label-meta.xml
                ├── Login_Message.label-meta.xml
                └── Authentication_Error.label-meta.xml
```

You can further organize custom labels in your DX project, as long as you follow these guidelines:

- All `*.label-meta.xml` source files must be contained by a `labels` source directory.
- You can create a `labels` source directory in each of your multiple package directories in your DX project.
- You can create subdirectories of the `labels` source directory to further organize your `*.label-meta.xml` files.

Here are some examples of different ways you can organize custom labels.

```
sfdx-project
├── force-app
└── otherPackageDir
    └── labels
        ├── Authentication_Error.label-meta.xml
        ├── Login_Message.label-meta.xml
        ├── Logout_Message.label-meta.xml
        └── Timeout_Warning.label-meta.xml
```

```
sfdx-project
├── force-app
└── otherPackageDir
    └── labels
        ├── Application
        │   ├── Login_Message.label-meta.xml
        │   └── Logout_Message.label-meta.xml
        ├── Authentication_Error.label-meta.xml
        └── Timeout_Warning.label-meta.xml
```

```
sfdx-project
├── force-app
│   └── main
│       └── default
│           └── labels
│               ├── Login_Message.label-meta.xml
│               └── Logout_Message.label-meta.xml
└── otherPackageDir
    └── labels
        ├── Error
        │   └── Authentication_Error.label-meta.xml
        └── Warning
            └── Timeout_Warning.label-meta.xml
```

External Service Registrations (Beta)

External service registrations aren't decomposed by default; you must specifically configure your DX project to decompose them. See Start Decomposing the Optional Metadata Types (Beta) for details.

By default, an external service registration is contained in a file called `<external-service-registration-name>.externalServiceRegistration-meta.xml` that resides in the `<package directory>/main/default/externalServiceRegistrations` directory.

If you choose to decompose external service registrations, they're still stored in the top-level `<package directory>/main/default/externalServiceRegistrations` directory. But each registration is decomposed into two source files when you retrieve it to your Salesforce DX project. One of the files is in YAML format and contains an OpenAPI spec. When you deploy the registration to your org, the two files are re-converted into the one metadata API XML file.

For example, let's say the name of your external service registration metadata component is `BankService`. The two source files after decomposition are:

- `BankService.yaml` : A YAML file that contains the contents of the `schema` metadata component field. This field contains an OpenAPI 2.0.x or OpenAPI 3.0.x schema in JSON or YAML format. If the field's content is in JSON format in your org, it's always converted to YAML format when retrieved to your DX project.
- `BankService.externalServiceRegistration-meta.xml` : A standard metadata API XML file that contains all the fields *except* `schema`.

Permission Sets (Beta)

Permission sets aren't decomposed by default; you must specifically configure your DX project to decompose them. See Start Decomposing the Optional Metadata Types (Beta) for details.

By default, a permission set is contained in a file called `<permission-set-name>.permissionset-meta.xml` that resides in the `<package-directory>/main/default/permissionsets` directory.

If you choose to decompose permission sets, they're still stored in the top-level `<package-directory>/main/default/permissionsets` directory. This graphic shows how a sample permission set called `MyPermSet` is then decomposed into its smaller XML files.

```
sfdx-project
└── force-app
    └── main
        └── default
            └── permissionsets
                └── MyPermSet
                    ├── objectSettings
                    │   ├── Purchase_Order__c.objectSettings-meta.xml
                    │   ├── PO_Line_Item__c.objectSettings-meta.xml
                    │   └── Account.objectSettings-meta.xml
                    ├── MyPermSet.userPermissions-meta.xml
                    ├── MyPermSet.permissionset-meta.xml
                    ├── MyPermSet.pageAccesses-meta.xml
                    ├── MyPermSet.flowAccesses-meta.xml
                    ├── MyPermSet.externalDataSourceAccesses-meta.xml
                    ├── MyPermSet.externalCredentialPrincipalAccesses-meta.xml
                    ├── MyPermSet.customSettingAccesses-meta.xml
                    ├── MyPermSet.customPermissions-meta.xml
                    ├── MyPermSet.classAccesses-meta.xml
                    └── MyPermSet.applicationVisibilities-meta.xml
```

Here are some highlights about the decomposition:

- The decomposed files for a specific permission set are contained in a subdirectory named the same as the permission set, `MyPermSet` in our example.
- The specific permission set directory contains a single file called `<Name>.permissionset-meta.xml file`, where *`<Name>`* is the directory name. This XML file contains information such as the permission set label, description, and license. In our example, the file is called `MyPermSet.permissionset-meta.xml`.
- The `objectSettings` directory consolidates object-related permissions and settings into a single file for each object, with name *`<ObjectName>`*`.objectSettings-meta.xml`.
- The remaining permissions and settings are in focused files with a category-specific extension, such as `MyPermSet.applicationVisibilities-meta.xml` or `MyPermSet.flowAccesses-meta.xml`.

Sharing Rules (Beta)

Sharing rules aren't decomposed by default; you must specifically configure your DX project to decompose them. See Start Decomposing the Optional Metadata Types (Beta) for details.

By default, all sharing rules for an object are contained in a file called *`<object-name>`*`.sharingRules-meta.xml` that resides in the *`<package directory>`*`/main/default/sharingRules` directory. The *`object-name`* refers to the object to which the sharing rule applies.

If you choose to decompose sharing rules, they're still stored in the top-level *`<package directory>`*`/main/default/sharingRules` directory. But the sharing rules are grouped into subdirectories with the same name as the object that the sharing rule is associated with. Within this object subdirectory, parts of the sharing rule are extracted into these subdirectories.

- `sharingCriteriaRules`
- `sharingGuestRules`
- `sharingOwnerRules`
- `sharingTerritoryRules`

The parts of the sharing rule that aren't extracted are placed in a *`<object-name>`*`.sharingRules-meta.xml` file.

Workflows (Beta)

Workflows aren't decomposed by default; you must specifically configure your DX project to decompose them. See Start Decomposing the Optional Metadata Types (Beta) for details.

By default, all workflows for an object are contained in a file called `<object-name>.workflow-meta.xml` that resides in the `<package directory>/main/default/workflows` directory. The *object-name* refers to the object to which the workflow applies.

If you choose to decompose workflows, they're still stored in the top-level `<package directory>/main/default/workflows` directory. But the workflows are grouped into subdirectories with the same name as the object that the workflow is associated with. Within this object subdirectory, parts of the workflow are extracted into these subdirectories.

- `workflowAlerts`
- `workflowFieldUpdates`
- `workflowKnowledgePublishes`
- `workflowOutboundMessages`
- `workflowRules`
- `workflowSends`
- `workflowTasks`

The parts of the workflow that aren't extracted are placed in a `<object-name>.workflow-meta.xml` file.

How to Exclude Source When Syncing

When syncing metadata between your local file system and a target org, you often have source files you want to exclude. Similarly, you often want to exclude certain files when converting source to Salesforce DX source format. In both cases, you can exclude individual files or all files in a specific directory with a `.forceignore` file.

The `.forceignore` file excludes files when running most of the `project` commands, such as `project deploy start`, `project retrieve start`, `project convert source`, and `project delete source`.

Structure of the `.forceignore` File

The `.forceignore` file structure mimics the `.gitignore` structure. Each line in `.forceignore` specifies a pattern that corresponds to one or more files. The files typically represent metadata components, but can be any files you want to exclude, such as LWC configuration JSON files or tests.

The `project` commands, when parsing the `.forceignore` file, use the same rules and patterns as the `.gitignore` file. A few common examples of these rules and patterns include:

- Always use the forward slash (`/`) as a directory separator, even on operating systems that use back slashes, such as Microsoft Windows.
- An asterisk (`*`) matches anything except a forward slash (`/`).
- Two consecutive asterisks (`**`) in patterns have special meaning, depending on where they're located in the pathname. See for examples.
- For readability, use blank lines as separators in the `.forceignore` file.

There are many more rules and patterns. See the git documentation for details.

Determine the Exact Filename for a Metadata Component

As you build your `.forceignore` file, you sometimes need the exact name of the metadata components that you want to exclude. The easiest way to determine the name of a particular component is to look at the package directory that contains the source files, such as the default `force-app` directory.

For example, profile metadata components live in the `main/default/profiles` directory. Let's say that the directory contains the source file `NotUsedProfile.profile-meta.xml`. To specify that the `project` commands exclude this component, add this entry to your `.forceignore`:

```
**/NotUsedProfile.profile-meta.xml
```

Another way to determine the exact name of a metadata component is to look at the output of the `project` commands if you're also using source tracking. For example, if you have either local or remote changes, run the `project deploy preview` or `project retrieve preview` command to display the full pathname of the changed components. This output displays the filename of the `Dreamhouse` permission set and the `Settings` custom tab in the Path column of the Will Deploy section:

```
sf project deploy preview

Will Deploy [2] files.
 Type          Fullname    Path

 ____________ __________
_____________________________________________________________________________
 PermissionSet dreamhouse
force-app/main/default/permissionsets/dreamhouse.permissionset-meta.xml
 CustomTab     Settings    force-app/main/default/tabs/Settings.tab-meta.xml
```

Other Files That the Source Commands Ignore

The source commands ignore these files even if they aren't included in your `.forceignore` file:

- Any source file or directory that begins with a "dot", such as `.DS_Store` or `.sf`
- Any file that ends in `.dup`
- `package2-descriptor.json`
- `package2-manifest.json`

Exclude Remote Changes Not Yet Synced with Your Local Source

Sometimes, you make a change directly in an org but you don't want to pull that change into your local DX project. To exclude remote metadata changes, add an entry to `.forceignore` that represents the metadata source file that would be created if you *did* retrieve it.

For example, if you have a permission set named `Dreamhouse,` add this entry to `.forceignore`:

```
**/Dreamhouse.permissionset-meta.xml
```

Exclude MetadataWithContent Types

Metadata components that include content, such as ApexClass or EmailTemplate, extend the MetadataWithContent type. These components have two source files: one for the content itself, such as the Apex code or email template, and the accompanying metadata file. For example, the source files for the HelloWorld Apex class are `HelloWorld.cls` and `HelloWorld.cls-meta.xml`.

To exclude a MetadataWithContent component, such as an ApexClass, either list both source files in the `.forceignore` file, or use an asterisk. For example:

```
# Explicilty list the HelloWorld source files to be excluded
helloWorld/main/default/classes/HelloWorld.cls
helloWorld/main/default/classes/HelloWorld.cls-meta.xml

# Exclude the HelloWorld Apex class using an asterisk
helloWorld/main/default/classes/HelloWorld.cls*
```

Exclude Bundles and File Groups

Use two consecutive asterisks (`**`) to ignore files spread across multiple directories with just one `.forceignore` entry.

For example, to exclude all resource files related to a Lightning web component named `myLwcComponent`, add this entry to exclude the entire component bundle:

```
**/lwc/myLwcComponent
```

To exclude all Apex classes:

```
**/classes
```

Metadata with Special Characters

If a metadata name has special characters (such as forward slashes, backslashes, or quotation marks), we encode the file name on the local file system for all operating systems. For example, if you retrieve a custom profile called Custom: Marketing Profile, the colon is encoded in the resulting file name.

```
Custom%3A Marketing Profile.profile-meta.xml
```

If you reference a file name with special characters in `.forceignore`, use the encoded file name.

Where to Put `.forceignore`

Be sure the paths that you specify in `.forceignore` are relative to the directory containing the `.forceignore` file. For the `.forceignore` file to work its magic, you must put it in the proper location, depending on which command you're running.

- Add the `.forceignore` file to the root of your project for the `project` source tracking commands.
- Add the file to the metadata retrieve directory (with `package.xml`) for `project convert mdapi`.

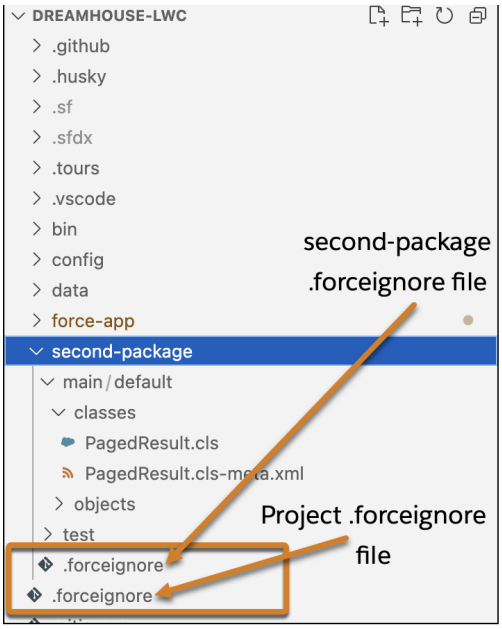
Multiple `.forceignore` Files in a Single Project

You typically have only one `.forceignore` file in your Salesforce DX project, usually in the project's root directory. However, it's possible to have more, so it's important to know which `.forceignore` file the `project` commands use when deploying or retrieving a particular source file.

When the `project` commands are determining whether to exclude a source file, they traverse up the directory tree from where the source file lives, looking for a `.forceignore` file. When they find one, they refer to it to determine whether to exclude the source file, and then stop. They don't continue looking for another `.forceignore` file.

Let's look at an example. Imagine you have a `.forceignore` file in the root directory of your project, and it doesn't exclude any Apex classes. In addition to the standard `force-app` package directory, you've configured a second package directory called

`second-package`, which has its own `.forceignore` file at its root. This `.forceignore` file excludes Apex classes that start with `Paged`. The `second-package` package directory has an Apex class called `PagedResult` in its `main/default/classes` subdirectory. Here's what it looks like in VS Code.



Let's say you run this command in the project to deploy all Apex classes in all package directories.

```
sf project deploy start --metadata ApexClass
```

Because the `PagedResult` Apex class lives in the `second-package` package directory, the deploy command refers to the `.forceignore` in that directory, and excludes the source files associated with the Apex class. The command doesn't refer to the project `.forceignore` file.

Let's now assume that the `force-app` directory contains a `PagedNewResult` Apex class. The deploy command refers to the project `.forceignore` file and thus doesn't exclude the associated source files. Or in other words, the command deploys the files associated with the `PagedNewResult` Apex class.

Sample Syntax

Here are some options for indicating which source to exclude. In this example, all paths are relative to the project root directory.

```
# Specify a relative path to a directory from the project root
helloWorld/main/default/classes

# Specify a wildcard directory - any directory named "classes" is excluded
**classes

# Specify file extensions
**.cls*
**.pdf

# Specify a specific file
helloWorld/main/default/HelloWorld.cls*
```

List the Files and Directories Currently Being Ignored

Use the `project list ignored` command to list the files and directories in your project that the `project` commands are currently ignoring. The `project list ignored` command refers to the `.forceignore` file to determine the list of ignored files.

To list all the files in all package directories that are ignored, run the command without any flags. Use the `--source-dir` flag to limit the check to a specific file or directory. If you specify a directory, the command checks all subdirectories recursively.

This example checks if a particular file is ignored.

```
sf project list ignored --source-dir package.xml
```

This example gets a list of all ignored files in a specific directory.

```
sf project list ignored --source-dir force-app/main/default
```

Sample output if the command finds ignored files:

```
Found the following ignored files:
force-app/main/default/aura/.eslintrc.json
force-app/main/default/lwc/.eslintrc.json
force-app/main/default/lwc/jsconfig.json
```

Sample output if the file isn't ignored:

```
No ignored files found in paths:
README.md
```

SEE ALSO:

Retrieve Changes to Profiles with Source Tracking

Create a Salesforce DX Project from Existing Source

If you're a Salesforce developer, partner, or ISV, you likely have existing source in a managed package in your packaging org or application source in your sandbox or production org. Before you begin using Salesforce DX, retrieve the existing source into a Salesforce DX project.

1. Create a Salesforce DX project.

   ```
   sf project generate --name MyProject
   ```

2. Change to the project directory.

   ```
   cd MyProject
   ```

3. Retrieve your source by running the `project retrieve start` command. The location and format of your current source determine the command flags you must use.

Format and Location of Current Source	Command To Retrieve Your Source
You're a partner who has your source already defined as a managed package in your packaging org.	`sf project retrieve start --package-name <package-name> --target-org <sourceOrg-username-or-alias>` The `--target-org` flag specifies the username or alias for the source org (such as a packaging org) from which you're retrieving the source. The `--package-name` flag specifies the package name; if the name contains a space, enclose it in double quotes. By default, the command creates a package directory, with the same name as your package, in the DX project directory. The command then retrieves the source from your package and organizes it in the new directory using the standard DX source format structure. Use the `--output-dir` to specify a different directory; the command creates the directory if it doesn't exist.
You have a manifest file, typically called `package.xml`, that defines your unpackaged source in a sandbox or production org.	`sf project retrieve start --manifest <manifest-file> --target-org <sourceOrg-username-or-alias>` The `--target-org` flag specifies the username or alias for the org (such as a sandbox or production) from which you're retrieving the source. The `--manifest` flag indicates the path to the manifest file, typically called `package.xml`. By default, the command retrieves the source into the existing `force-app` package directory of your DX project Use the `--output-dir` to specify a different directory; the command creates the directory if it doesn't exist.

Tip: If you already have a repo that follows the directory structure created from a Metadata API retrieve, then your source files in the repo are in metadata format. You can convert these files into source format and include them in your Salesforce DX project. See Convert Files in Metadata Format to Source Format for details.

4. If the retrieve created a package directory in your project, add it to your `sfdx-project.json` file.

Do you have source in a sandbox or production org, but you don't have a manifest file (`package.xml`) for retrieving it to your project? Use the `project generate manifest` CLI command to create one. For example, this command generates a manifest from the metadata components in the org with the alias `prod-org`.

```
sf project generate manifest --from-org prod-org
```

See the command help for more examples and information.

```
sf project generate manifest --help
```

You can also refer to Sample package.xml Manifest Files in the *Metadata API Developer Guide*.

SEE ALSO:

- Create a Salesforce DX Project
- Salesforce DX Project Structure and Source Format
- Salesforce DX Project Configuration
- Convert Files in Metadata Format to Source Format
- *VS Code Command*: SFDX: Create Project, SFDX: Create Project with Manifest

Convert Files in Metadata Format to Source Format

If you already have a repo in which you've retrieved metadata from an org using the Metadata API directly, the files are in metadata format. You can convert these files into source format and add them to your Salesforce DX project. You can then deploy and retrieve them to and from your org using CLI commands and use source tracking to track changes.

The convert command ignores all files that start with a "dot," such as `.DS_Store`. To exclude more files from the convert process, add a `.forceignore` file.

1. Change to your Salesforce DX project directory.
2. Convert the files from metadata format to source format with the `project convert mdapi` command. Let's say your metadata-format files are in a directory called `/Users/testing/mdapi_project`.

   ```
   sf project convert mdapi --root-dir /Users/testing/mdapi_project
   ```

   The `--root-dir` flag is the name of the directory that contains the metadata format files.

   The converted source is stored in the default package directory indicated in the `sfdx-project.json` file, typically named `force-app`. Use the `--output-dir` flag to put the converted files in a different package directory; the command creates the directory if it doesn't exist.
3. If the convert created a package directory in your project, add it to your `sfdx-project.json` file.

SEE ALSO:

- Salesforce DX Project Configuration

Salesforce DX Usernames and Orgs

Many Salesforce CLI commands connect to an org to complete their task. For example, the `org create scratch` command, which creates a scratch org, connects to a Dev Hub org. The `project deploy start` and `project retrieve start` commands synchronize source code between your project and an org. In each case, the CLI command requires a username to determine which org to connect to. Usernames are unique within the entire Salesforce ecosystem and are associated with just one org.

When you create a scratch org, the CLI generates a username. The username looks like an email address, such as test-wvkpnfm5z113@example.com. You don't need a password to connect to or open a scratch org, although you can generate one later with the `org generate password` command.

Salesforce recommends that you set the org that you connect to the most during development as your default org. The easiest way to set it is when you log in to a Dev Hub org or create a scratch org; you can also use the `config` commands. Specify the

`--set-default-dev-hub` or `--set-default` flag, respectively. You can also create an alias to make the org's usernames more readable and intuitive. You can use usernames or their aliases interchangeably for all CLI commands that connect to an org.

These examples set the default org and aliases when you log in and authorize an org, in this case a Dev Hub org, and then when you create a scratch org.

```
sf org login web --set-default-dev-hub --alias my-hub-org
sf org create scratch --definition-file config/project-scratch-def.json --set-default
--alias my-scratch-org
```

To verify whether a CLI command requires an org connection, look at its flag list with the `-h` flag. Commands that have the `--target-dev-hub` flag connect to the Dev Hub org. Similarly, commands that have `--target-org` connect to scratch orgs, sandboxes, and so on. This example displays the flag list and help information about `org create scratch`.

```
sf org create scratch -h
```

When you run a CLI command that requires an org connection and you don't specify a username, the command uses the default. To display all the orgs that you've authorized or created, run `org list`. The default Dev Hub and scratch orgs are marked with an emoji on the left; see the legend at the end of the display for details.

Let's run through a few examples. This example deploys source code to the org that you've set as the default.

```
sf project deploy start
```

To specify an org other than the default, use `--target-org`. For example, let's say you created a scratch org with the alias `my-other-scratch-org`. It's not the default but you still want to deploy source to it.

```
sf project deploy start --target-org my-other-scratch-org
```

This example shows how to use the `--target-dev-hub` flag to specify a non-default Dev Hub org when creating a scratch org.

```
sf org create scratch --target-dev-hub jdoe@mydevhub.com --definition-file my-org-def.json
 --alias yet-another-scratch-org
```

More About Setting Default Orgs

If you've already created a scratch org, you can set it, or any other org, as your default by running the `config set` command from your project directory.

```
sf config set target-org test-wvkpnfm5z113@example.com
```

The command sets the value locally, so it works only for the current project. To use the default org for all projects on your computer, specify the `--global` flag. You can run this command from any directory. Local project defaults override global defaults.

```
sf config set target-org test-wvkpnfm5z113@example.com --global
```

The process is similar to set a default Dev Hub org, except you use the `target-dev-hub` config variable.

```
sf config set target-dev-hub jdoe@mydevhub.com
```

To unset a config variable, run the `config unset` command. Use the `--global` flag to unset it for all your Salesforce DX projects.

```
sf config unset target-org --global
```

To view all the configuration variables you've set, run `config list`; if you run it from a project directory it also lists the local ones.

```
sf config list
```

More About Aliasing

Use the `alias set` command to set an alias for a scratch org you've already created, or any org after you've authorized it. You can create an alias for any org: Dev Hub, scratch org, production, sandbox, and so on. So when you issue a command that requires the org's username, using an easily-remembered alias speeds things up.

```
sf alias set my-scratch-org test-wvkpnfm5z113@example.com
```

An alias also makes it easy to set a default org. The previous example of using `config set` to set `target-org` now becomes much more digestible when you use an alias rather than the actual username.

```
sf config set target-org my-scratch-org
```

Set multiple aliases with a single command by separating the name-value pairs with a space; in this case you must use the equal sign.

```
sf alias set org1=<username> org2=<username>
```

You can associate an alias with only one username at a time. If you set it multiple times, the alias points to the most recent username. For example, if you run the following two commands, the alias my-org is set to test-wvkpnfm5z113@example.com.

```
sf alias set my-org test-blahdiblah@example.com
sf alias set my-org test-wvkpnfm5z113@example.com
```

To view all aliases that you've set, use one of the following commands.

```
sf alias list
sf org list
```

To remove an alias, use the `alias unset` command.

```
sf alias unset my-org
```

List All Your Orgs

Use the `org list` command to display the usernames and aliases for the orgs that you've authorized and the active scratch orgs that you've created.

```
sf org list

    Type    Alias          Username                                        Org ID
   Status                 Expires
 __ _______ _______________ ____________________________________________ ____________________
 ____________________ __________
 D DevHub  JulesDevHub    jules@sf.com                                   00DB0001234c7jiMAA
 Connected
   Sandbox                jules@sf.com.jssandtwo                         00D020012344XTiEAM
 Connected
 O Scratch my-scratch-org test-qjrr9q5d13o8@example.com                  00DMN0012342Gez2AE
 Active                 2023-08-21

Legend:  D=Default DevHub, O=Default Org      Use --all to see expired and deleted scratch
 orgs
```

The output lists the orgs that you've authorized or created, including Dev Hub orgs, production orgs, scratch orgs, and sandboxes. The table displays the usernames that you specified when you authorized the orgs, their aliases, their IDs, and whether the CLI can connect

to it. An emoji on the left points to the default org or Dev Hub; refer to the legend at the bottom for details. Scratch orgs also display their expiration dates.

To view more information, such as the scratch org creation date and associated DevHub org, and instance URL for all orgs, use the `--verbose` flag.

```
sf org list --verbose
```

Use the `--clean` flag to remove non-active scratch orgs from the list. The command prompts you before it does anything.

```
sf org list --clean
```

SEE ALSO:

- Authorization
- Build Your Own Scratch Org Definition File
- Create Scratch Orgs
- Generate or Change a Password for a Scratch Org User
- Deploy Source From Your Project to the Scratch Org

Link a Namespace to a Dev Hub Org

To use a namespace with a scratch org, you must link the Developer Edition org where the namespace is registered to a Dev Hub org.

Complete these tasks before you link a namespace.

- If you don't have an org with a registered namespace, create a Developer Edition org that is separate from the Dev Hub or scratch orgs. If you already have an org with a registered namespace, you're good to go.
- In the Developer Edition org, create and register the namespace.

  Important: Choose namespaces carefully. If you're trying out this feature or need a namespace for testing purposes, choose a disposable namespace. Don't choose a namespace that you want to use in the future for a production org or some other real use case. After you associate a namespace with an org, you can't change it or reuse it.

1. Log in to your Dev Hub org as the System Administrator or as a user with the Salesforce DX Namespace Registry permissions.

   Tip: Make sure your browser allows pop-ups from your Dev Hub org.

   a. From the App Launcher menu, select **Namespace Registries**.

   b. Click **Link Namespace**.

2. In the window that pops up, log in to the Developer Edition org in which your namespace is registered using the org's System Administrator's credentials.

   You can't link orgs without a namespace: sandboxes, scratch orgs, patch orgs, and branch orgs require a namespace to be linked to the Namespace Registry.

To view all the namespaces linked to the Namespace Registry, select the **All Namespace Registries** list view.

SEE ALSO:

- Get a Trial Development Environment for Free
- *Lightning Aura Components Developer Guide*: Create a Namespace in Your Org
- Add Salesforce DX Users
- Salesforce Help: My Domain

Salesforce DX Project Configuration

The project configuration file `sfdx-project.json` indicates that the directory is a Salesforce DX project. The configuration file contains project information and facilitates the authorization of orgs and the creation of second-generation packages. It also tells Salesforce CLI where to put files when syncing between the project and org.

We provide sample `sfdx-project.json` files in the sample repos for creating a project using Salesforce CLI or Salesforce Extensions for VS Code.

Note: Are you planning to create second-generation packages? When you're ready, add packaging-specific configuration options to support package creation. See Project Configuration File for a Second-Generation Managed Package.

We recommend that you check in this file with your source.

```
{
"packageDirectories" : [
    { "path": "force-app", "default": true},
    { "path" : "unpackaged" },
    { "path" : "utils" }
  ],
"namespace": "",
"sfdcLoginUrl" : "https://login.salesforce.com",
"sourceApiVersion": "63.0"
}
```

You can manually edit these parameters.

name (required for Salesforce Functions)

Salesforce DX or Salesforce Functions project name.

namespace (optional)

The global namespace that is used with a package. The namespace must be registered with an org that is associated with your Dev Hub org. This namespace is assigned to scratch orgs created with the `org create scratch` command. If you're creating an unlocked package, you have the option to create a package with no namespace.

Important: Register the namespace with Salesforce and then connect the org with the registered namespace to the Dev Hub org.

oauthLocalPort (optional)

By default, the OAuth port is 1717. Change this port if 1717 is already in use and you plan to create a connected app in your Dev Hub org to support JWT-based authorization. Be sure you also follow the steps in Create a Connected App in Your Org to change the callback URL.

packageAliases (optional)

Aliases for package IDs, which can often be cryptic. See Project Configuration File for a Second-Generation Managed Package for details.

packageDirectories (required)

Package directories indicate which directories to target when syncing source to and from the org. These directories can contain source files from your managed or unmanaged package. They can also contain unpackaged source files produced by, for example, an ant tool or change set. For information on all `packageDirectories` options, see Project Configuration File for a Second-Generation Managed Package.

Keep these things in mind when working with package directories.

- The location of the package directory is relative to the project. Don't specify an absolute path. The following two examples are equivalent.

  ```
  "path": "helloWorld"
  "path" : "./helloWorld"
  ```

- You can have only one default path (package directory). If you have only one path, we assume it's the default, so you don't have to explicitly set the `default` parameter. If you have multiple paths, you must indicate which one is the default.
- Salesforce CLI uses the default package directory as the target directory when retrieving changes from the org to the local project. This default path is also used when creating second-generation packages.
- If you don't specify an output directory, the default package directory is also where files are stored during source conversions. Source conversions are both from metadata format to source format, and from source format to metadata format.

plugins (optional)

To use the custom plugins you've created with your Salesforce DX project, add a `plugins` section to the `sfdx-project.json` file. In this section, add configuration values and settings to change your plugins' behavior.

```
"plugins": {
  "yourPluginName": {
    "timeOutValue": "2"
  },
  "yourOtherPluginName": {
    "yourCustomProperty": true
  }
}
```

Store configuration variables for only those values that you want to check in to source control for the project. These configuration values affect your whole development team.

pushPackageDirectoriesSequentially (optional) (Deprecated)

Note: This property is deprecated and applies only to the deprecated `force:source:push` command. It doesn't affect the behavior of the `project deploy start` command. To deploy packages sequentially, and in a specific order, use separate `project deploy start` commands in the desired order.

Set to `true` to push multiple package directories in the order they're listed in `packageDirectories` when using `force:source:push`. The directories are pushed in separate transactions. The default value of this property is `false`, which means that multiple package directories are deployed in a single transaction without regard to order. Example:

```
"packageDirectories": [
    {
      "path": "es-base-custom",
      "default": true
    },
    {
      "path": "es-base-ext"
    }
  ],
  "pushPackageDirectoriesSequentially": true,
```

replacements (optional)

Automatically replace strings in your metadata source files with specific values right before you deploy the files to an org.

See Replace Strings in Code Before Deploying for details.

sfdcLoginUrl (optional)

The login URL that the `org login` commands use. If not specified, the default is `https://login.salesforce.com`. Override the default value if you want users to authorize to a specific Salesforce instance. For example, if you want to authorize into a sandbox org, set this parameter to `https://test.salesforce.com`.

If you don't specify a default login URL here, or if you run `org login` outside the project, specify the instance URL when authorizing the org with the `--instance-url` flag.

sourceApiVersion (optional)

The API version that the source is compatible with.

The `sourceApiVersion` value determines the fields retrieved for each metadata type during `project deploy`, `project retrieve`, or `project convert`. This field is important if you're using a metadata type that has changed in a recent release. You'd want to specify the version of your metadata source. For example, let's say a new field was added to the CustomTab for API version 63.0. If you retrieve components for version 57.0 or earlier, you see errors when running the `project` commands because the components don't include that field.

Don't confuse this project configuration parameter with the org-api-version CLI configuration variable, which has a similar name. See How API Version and Source API Version Work in Salesforce CLI for more information and the default value.

sourceBehaviorOptions (optional) (Beta)

Specify which metadata types in your Salesforce DX project are decomposed. Custom objects and custom object translations are always decomposed by default. Decomposition refers to splitting a single, often large, metadata XML file into smaller XML files based on its subtypes.

Note: Decomposition of permission sets, custom labels, sharing rules, and workflows is a pilot or beta service that is subject to the Beta Services Terms at Agreements - Salesforce.com or a written Unified Pilot Agreement if executed by Customer, and applicable terms in the Product Terms Directory. Use of this pilot or beta service is at the Customer's sole discretion.

Don't manually update your `sfdx-project.json` file with this option. Rather, run the `project convert source-behavior` Salesforce CLI command which updates the file for you, and also breaks up the associated metadata file XML into smaller files. See Start Decomposing the Optional Metadata Types (Beta) on page 31 for details.

Possible values:

- `decomposeCustomLabelsBeta2`—Decompose the CustomLabels metadata type.
- `decomposeExternalServiceRegistrationBeta`—Decompose the ExternalServiceRegistration metadata type.
- `decomposePermissionSetBeta2`—Decompose the PermissionSet metadata type.
- `decomposeSharingRulesBeta`—Decompose the SharingRules metadata type
- `decomposeWorkflowBeta`—Decompose the WorkFlow metadata type.

Example:

```
"sourceBehaviorOptions": ["decomposePermissionSetBeta2", "decomposeCustomLabelsBeta2"]
```

SEE ALSO:

Link a Namespace to a Dev Hub Org
Authorization
How to Exclude Source When Syncing
Retrieve Source from the Scratch Org to Your Project
Deploy Source From Your Project to the Scratch Org

Multiple Package Directories

When you create your Salesforce DX project, we recommend that you organize your metadata into logical groupings by creating multiple package directories locally. You then define these directories in your `sfdx-project.json` file. You can group similar code and source files for an application or customization to better organize your team's repository. Later, if you decide to use unlocked or second-generation managed packages (2GP), these directories correspond to the actual unlocked or 2GP packages.

Note: For clarity, a package directory refers to the local (client-side) directory that contains decomposed metadata files, that is, metadata in source format. This directory doesn't always result in an unlocked or 2GP package. Package refers to an unlocked or 2GP package.

In your `sfdx-project.json` file, list each package directory separately in the `packageDirectories` section. Each local package directory adheres to the standard Salesforce DX project structure.

The multiple package directory structure is client-side (local) only. When you deploy the source to the org with `project deploy start`, there's no association between its local package directory location and the package in the org. You specify that metadata belongs to a specific unlocked or 2GP package in an org by explicitly installing the package.

All of the `project` commands that deploy, retrieve, and convert metadata support multiple package directories.

How Do I Set It Up?

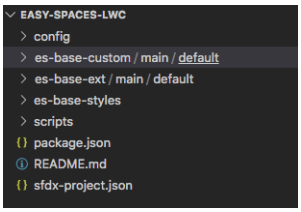
Setting up multiple package directories is easy. How you organize your local source code among these directories takes more thought and planning, and depends on your development environment. Plan how to organize your code before you get started. Keep your source code well organized as your project grows to make it easier and more efficient for your developers to work.

Let's say you put the decomposed metadata files for a custom object MyObject in the default package directory. You can then put files for a new field MyField on MyObject in a different "extension" package directory without having to also include the MyObject files. Although this example is simple, you can organize your code in any number of different ways. These blog posts provide some ideas.

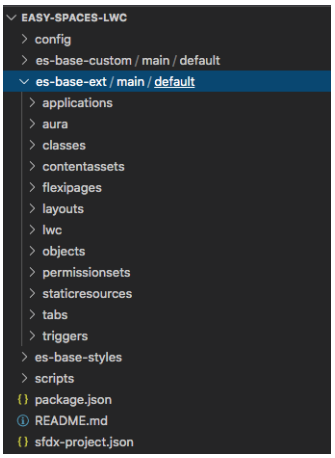
Here's how you set up multiple package directories. Let's first look at a sample `sfdx-project.json` snippet:

```
"packageDirectories": [
    {
      "path": "es-base-custom",
      "default": true
    },
    {
      "path": "es-base-ext"
    },
    {
      "path": "es-base-styles"
    }
  ],
```

The sample `sfdx-project.json` snippet defines three package directories: `es-base-custom` (the default), `es-base-ext`, and `es-base-styles`. Let's say your top-level local project directory is called `easy-spaces-lwc`. The directory hierarchy underneath it looks something like this:



Each `es-base-*` directory adheres to the standard Salesforce DX project structure. For example, the `es-base-ext` directory looks something like this:



Now add the decomposed metadata source to these multiple package directories in the way that best suits your development environment.

How Does It Work?

Let's go through a few examples to see how `project deploy start` and `project retrieve start` work with multiple package directories.

For new orgs, the `default project deploy start` command deploys all the metadata in all multiple package directories listed in your `sfdx-project.json` file. After that, the command deploys only metadata that's new, changed, or marked for delete. By default, the command deploys the metadata in a single transaction, as if you had just one package directory.

```
sf project deploy start --target-org my-org
```

You can also target the metadata you want to deploy. You can deploy specific package directories, specific metadata components, components listed in a manifest file, and more. This example deploys the metadata in the `es-base-custom` package directory:

```
sf project deploy start --source-dir es-base-custom --target-org my-org
```

To deploy more than one package directory, specify the `--source-dir` flag multiple times. This example deploys all the package directories configured in the sample `sfdx-project.json` file shown in the previous section.

```
sf project deploy start --source-dir es-base-custom --source-dir es-base-ext --source-dir
 es-base-styles --target-org my-org
```

This example deploys all Apex classes found in all your multiple package directories:

```
sf project deploy start --metadata ApexClass --target-org my-org
```

When you run `project retrieve start`, the command retrieves all remote changes from the org into your local project. For each retrieved component, the command looks in all package directories for a local match. If it finds a match, the command updates it. If it doesn't find a match, the command copies the local component into the default package directory, which in our example is `es-base-custom`.

```
sf project retrieve start --target-org my-org
```

You can then move the retrieved files into the package directory that makes sense for your project. After you deploy the moved files back to the org with `project deploy start`, Salesforce CLI tracks their new location.

You can also use `project retrieve start` to retrieve targeted metadata from your org. Existing metadata is retrieved into its correct local package directory and new metadata into the default package directory. This example retrieves only the metadata components contained in the local `es-base-custom` package directory:

```
sf project retrieve start --source-dir es-base-custom  --target-org my-org
```

This example retrieves all Apex classes from your org; new classes go into the default package directory and classes that exist locally go into their corresponding package directory.

```
sf project retrieve start --metadata ApexClass --target-org my-org
```

Push Source Sequentially

By default, `project deploy start` deploys metadata to your org in a single transaction, regardless of the order that you list your multiple package directories in `sfdx-project.json`. But sometimes you must specify the exact order that the package directories are pushed. Reasons include:

- The number of recomposed metadata component files in your local project exceeds the Salesforce metadata limit of 10,000 files per retrieve or deploy. One workaround is to split up your metadata into multiple package directories that each contain less than this limit and push each directory sequentially, and thus separately.
- You have dependencies between multiple package directories, which requires that they be pushed in a specific order.
- More than one package directory contains the same metadata component, and you want to specify which one is deployed last so it's not overwritten.

If you need multiple deployments in a specific order, run `project deploy start` several times with the `--source-dir` or `--metadata` flags in the desired order.

SEE ALSO:

Developer Guide: Second-Generation Managed Packages

Developer Guide: Install and Uninstall Second-Generation Managed Packages

Salesforce DX Project Structure and Source Format

Salesforce Developers Blog: Working with Modular Development and Unlocked Packages

Replace Strings in Code Before Deploying or Packaging

Automatically replace strings in your metadata source files with specific values right before you deploy the files to an org or create a package version.

These sample use cases describe scenarios for using string replacement:

- A NamedCredential contains an endpoint that you use for testing. But when you deploy the source to your production org, you want to specify a different endpoint.
- An ExternalDataSource contains a password that you don't want to store in your repository, but you're required to deploy the password along with your metadata.
- You deploy near-identical code to multiple orgs. You want to conditionally swap out some values depending on which org you're deploying to.

For the `project deploy start` command, string replacement occurs when source-formatted files are converted to metadata API format, and then a ZIP file is created and deployed to the org. It also occurs when you run the `package version create` command, which converts source files as part of the package creation process. The changes that result from string replacement are never written to your project source; they apply only to the deployed or packaged files.

Note: For simplicity, the rest of this topic assumes that you're using string replacement before deploying to your org, but the same ideas also apply to creating a package version.

Configure String Replacement

Configure string replacement by adding a `replacements` property to your `sfdx-project.json` file. The property accepts multiple entries that consist of keys that define the:

- Source file or files that contain the string to be replaced.
- The string to be replaced.
- The replacement value.

To see how string replacements work, let's look at an example; see more examples later in this topic.

This sample `sfdx-project.json` specifies that when the file `force-app/main/default/classes/myClass.cls` is deployed, all occurrences of the string `replaceMe` are replaced with the value of the THE_REPLACEMENT environment variable:

```
{
  "packageDirectories": [
     {
       "path": "force-app",
       "default": true
     }
  ],
  "name": "myproj",
  "replacements": [
    {
      "filename": "force-app/main/default/classes/myClass.cls",
      "stringToReplace": "replaceMe",
      "replaceWithEnv": "THE_REPLACEMENT"
    }
  ]
}
```

You can specify these keys in the `replacements` property.

Location of Files

One of the following properties is required:

- `filename`: Single file that contains the string to be replaced.
- `glob`: Collection of files that contain the string to be replaced. Example: `**/classes/*.cls`.

String to be Replaced

One of the following properties is required:

- `stringToReplace`: The string to be replaced.
- `regexToReplace`: A regular expression (regex) that specifies a string pattern to be replaced.

Replacement Value

One of the following properties is required:

- `replaceWithEnv`: Specifies that the string is replaced with the value of the specified environment variable.
- `replaceWithFile`: Specifies that the string is replaced with the contents of the specified file.

Conditional Processing

These properties are optional:

- `replaceWhenEnv`: Specifies that a string replacement occur only when a specific environment variable is set to a specific value. Use the property `env` to specify the environment variable and the property `value` to specify the value that triggers the string replacement.
- `allowUnsetEnvVariable`: Boolean property used with the `replaceWithEnv` property. When set to `true`, specifies that if the `replaceWithEnv` environment variable isn't set, then remove the replacement string from the file before deploying. In other words, replace it with nothing. When set to `false` (the default value), you get an error when the `replaceWithEnv` environment variable isn't set.

Follow these syntax rules:

- Always use forward slashes for directories (`/`), even on Windows.

- Both JSON and regular expressions use the backslash (\) as an escape character. As a result, when you use a regular expression to match a dot, which requires escaping, you must use *two* backslashes for the `regexToReplace` value:

  ```
  "regexToReplace" : "\\."
  ```

  Similarly, to match a single backslash, you must specify three of them.

  ```
  "regexToReplace" : "\\\"
  ```

Examples

This example is similar to the previous example but shows how to configure string replacement for two files:

```
"replacements": [
  {
    "filename": "force-app/main/default/classes/FirstApexClass.cls",
    "stringToReplace": "replaceMe",
    "replaceWithEnv": "THE_REPLACEMENT"
  },
  {
    "filename": "force-app/main/default/classes/SecondApexClass.cls",
    "stringToReplace": "replaceMe",
    "replaceWithEnv": "THE_REPLACEMENT"
  }
]
```

This example shows how to specify that the string replacement occur only if an environment variable called DEPLOY_DESTINATION exists and it has a value of `PROD`.

```
"replacements": [
  {
    "filename": "force-app/main/default/classes/myClass.cls",
    "stringToReplace": "replaceMe",
    "replaceWithEnv": "THE_REPLACEMENT",
    "replaceWhenEnv": [{
      "env": "DEPLOY_DESTINATION",
      "value": "PROD"
    }]
  }
]
```

In this example, if the environment variable SOME_ENV_THAT_CAN_BE_BLANK isn't set, the string `myNS__` in the `myClass.cls` file is removed when the file is deployed. If the environment variable is set to a value, then that value replaces the `myNS__` string.

```
"replacements": [
    {
      "filename": "/force-app/main/default/classes/myClass.cls",
      "stringToReplace": "myNS__",
      "replaceWithEnv": "SOME_ENV_THAT_CAN_BE_BLANK",
      "allowUnsetEnvVariable": true
    }
  ]
```

This example specifies that when the Apex class files in the `force-app/main/default` directory are deployed, all occurrences of the string `replaceMe` are replaced with the contents of the file `replacementFiles/copyright.txt`.

```
"replacements": [
  {
    "glob": "force-app/main/default/classes/*.cls",
    "stringToReplace": "replaceMe",
    "replaceWithFile": "replacementFiles/copyright.txt"
  }
]
```

Use a regular expression to specify a search pattern for text rather than the literal text. For example, Apex class XML files always contain an `<apiVersion>` element that specifies the Salesforce API version, as shown in this snippet.

```
<?xml version="1.0" encoding="UTF-8" ?>
<ApexClass xmlns="http://soap.sforce.com/2006/04/metadata">
    <apiVersion>55.0</apiVersion>
    <status>Active</status>
</ApexClass>
```

Let's say you want to test your Apex classes on a more recent API version before you actually update all your classes. This example shows how to use a regular expression to search for the `<apiVersion>` element. At deploy, the element is replaced with a specific string, such as `<apiVersion>58.0</apiVersion>`, which is contained in the `replacementFiles/latest-api-version.txt` file.

```
"replacements": [
  {
    "glob": "force-app/main/default/classes/*.xml",
    "regexToReplace": "<apiVersion>\\d+\\.0</apiVersion>",
    "replaceWithFile": "replacementFiles/latest-api-version.txt"
  }
]
```

Tips and Tricks

- (macOS or Linux only) When using the `replaceWithEnv` or `replaceWhenEnv` properties, you can specify that the environment variables apply to a single command by prepending the variables before the command execution. For example:

  ```
  THE_REPLACEMENT="some text" DEPLOY_DESTINATION=PROD sf project deploy start
  ```

  Warning: Be careful when setting passwords or secrets this way, because they show up in your terminal history.

- If you've configured many string replacements, and are finding it difficult to manage, check out open-source tools that load the contents of one or more files to your environment, such as dotenv-cli. In this example, environment variables configured in two local `.env` files are loaded before the `project deploy start` command execution:

  ```
  dotenv -e .env1 -e .env2 sf project deploy start
  ```

  Warning: Don't commit passwords or secrets in `.env` files.

- If you specify `--json` for `project deploy start`, the JSON output includes a `replacements` property that lists the affected files and the string that was replaced. If you specify `--json` and `--concise`, the JSON output doesn't include the `replacements` property.

To view string replacement information in the `project deploy start` human-readable output, specify `--verbose`.

- Many of the string replacement use cases and examples in this topic use environment variables. How to set an environment variable to the required value depends on your operating system, and is beyond the scope of this document. But for some hints, see the introduction of the Salesforce CLI Environment Variables topic in the *Salesforce CLI Setup Guide*.

Considerations and Limitations

- If you configure multiple string replacements in multiple files, the performance of the deployment can degrade. Consider using the `filename` key when possible, to ensure that you open only one file. If you must use `glob`, try to limit the number of files that are opened by specifying a single directory or metadata type.

  For example, `"glob": "force-app/main/default/classes/*.cls"` targets Apex class files in a specific directory, which is better than `"glob": "**/classes/**"`, which searches for all Apex metadata files in all package directories.

- Be careful using string replacement in static resources. When not doing string replacement, Salesforce CLI simply zips up all static resources when it first encounters their directory and deploys them as-is. If you configure string replacement for a large static resource directory, the CLI must inspect a lot more files than usual, which can degrade performance.
- You can't use string replacements when deploying in metadata format, such as with the command `project deploy start --metadata-dir`.
- If your deployment times out, or you specify the `--async` flag of `project deploy start`, and then run `project deploy resume` or `project deploy report` to see what happened, the deployed files contain string replacements as usual. However, the output of `project deploy resume` and `project deploy report` don't display the same string replacement information as `project deploy start --verbose` would have.

Test String Replacements

To test string replacement without actually deploying files to the org or creating a package version, follow these steps.

Test String Replacements

To test string replacement without actually deploying files to the org or creating a package version, follow these steps.

1. Set the `SF_APPLY_REPLACEMENTS_ON_CONVERT` environment variable to `true`.
2. Run the `project convert source` command, which converts the source files into metadata API format. For example:

   ```
   sf project convert source --output-dir mdapiOut --source-dir force-app
   ```

3. Inspect the files in the output directory (`mdapiOut` in our example) for the string replacements and what exactly will be deployed to the org or packaged.

Warning: Be careful when writing passwords or secrets to the file system while testing. Also, be sure to reset any environment variables you set during testing so they aren't accidentally applied later.

CHAPTER 4 Authorization

In this chapter ...

- Authorize an Org Using a Browser
- Authorize an Org Using the JWT Flow
- Create a Private Key and Self-Signed Digital Certificate
- Create an External Client App in Your Org
- Create a Connected App in Your Org
- Use the Default Connected App Securely
- Use an Existing Access Token
- Authorize an Org Using Its SFDX Authorization URL
- Authorization Information for an Org
- Log Out of an Org

Authorization refers to logging into an org so you can run commands that require access to the org. Creating an org with a CLI command also automatically authorizes it. For example, you authorize a Dev Hub org to allow you to create, delete, and manage your Salesforce scratch orgs. After you set up your project on your local machine, you authorize the Dev Hub org before you can create a scratch org. When you run the command to create the scratch org, Salesforce CLI automatically authorizes it.

You can also authorize other existing orgs, such as sandboxes or packaging orgs, to provide more flexibility when using CLI commands.

You authorize an org only one time. To switch between orgs during development, specify the username that you used to log into the org with either the `--target-org` or `--target-dev-hub` flag. You can also set a default org or use an alias.

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Dev Hub available in: **Developer**,**Enterprise**, **Performance**, and **Unlimited** Editions

Scratch orgs are available in: **Developer**, **Enterprise**, **Group**, and **Professional** Editions

You have some options when authorizing an org, depending on what you're trying to accomplish.

- The easiest option is to run `org login web`, which opens a browser in which you enter your Salesforce credentials. This option is officially called the *OAuth 2.0 web server flow*.
- For continuous integration (CI) or automated environments, use the `org login jwt` command. This option is officially called the *OAuth 2.0 JSON Web Tokens (JWT) bearer flow*. This flow is ideal for scenarios where you can't interactively log in to a browser, such as from a CI script.

  You can also use the `org login sfdx-url` command in automated environments; this method uses the org's SFDX authorization URL.

  Important: If your org is configured with high assurance (stepped up) authentication, Salesforce prompts the user to verify their identity. This verification process means that you can't use the JWT flow or SFDX authorization URL with Salesforce CLI for headless authentication.

SEE ALSO:

Authorize an Org Using a Browser

Authorize an Org Using the JWT Flow

Salesforce Help: OAuth 2.0 Web Server Flow for Web App Integration

Salesforce Help: OAuth 2.0 JWT Bearer Flow for Server-to-Server Integration

Authorize an Org Using a Browser

Authorize an org with a browser by running a CLI command and entering your credentials in the browser that automatically opens. That's it!

Use this authorization method when multi-factor authentication (MFA) is enabled on your org, either directly with a username and password or via single sign-on (SSO).

Important: You must have the **Approve Uninstalled Connected Apps** user permission to complete this task. Org administrators have the permission by default.

1. Open a terminal (macOS and Linux) or command prompt (Windows).
2. Run the `org login web` CLI command. We recommend using the `--alias` flag to make it easy to refer to the org later.

   ```
   sf org login web --alias my-org
   ```

   Use the `--set-default` flag if you want the org to be the default for commands that accept the `--target-org` flag. If you're authorizing a Dev Hub org, use the `--set-default-dev-hub` flag instead. See the `org login web` command for examples.
3. In the browser window that opens, sign in to your org with your Salesforce login credentials. Click **Allow**, which allows Salesforce CLI to access to your org.
4. Close the browser window. Your org is now authorized!

If the URL that you use to log in to your org isn't the default (`login.salesforce.com`), update your project configuration file (`sfdx-project.json`). Set the `sfdcLoginUrl` option to your My Domain login URL. For example:

```
"sfdcLoginUrl" : "https://MyDomainName.my.salesforce.com"
```

This example is for a sandbox.

```
"sfdcLoginUrl" : "https://MyDomainName--SandboxName.sandbox.my.salesforce.com"
```

Alternatively, you can use the `--instance-url` flag of `org login web` to specify the URL. This value overrides the login URL you specified in the `sfdx-project.json` file. For example:

```
sf org login web --alias my-hub-org --instance-url https://exciting.sandbox.my.salesforce.com
```

Note: We recommend that you use your enhanced My Domain login URL, as it isn't affected by org migrations that change your org's Salesforce instance. Be sure you use the version that ends in `my.salesforce.com` instead of the URL you see in Lightning Experience (`.lightning.force.com`). To verify the valid My Domain URL, from Setup, enter *My Domain* in the Quick Find box, then select **My Domain**.

The orgs you authorize for Salesforce CLI are required to have either an external client app (preferred) or a connected app. We provide a default connected app called `Salesforce CLI`. If you need more security or control, such as setting the refresh token timeout

or specifying IP ranges, create your own external client app or connected app (only if you need to create scratch orgs or sandboxes). You can also configure the default connected app to be more secure.

SEE ALSO:

- *Salesforce CLI Command Reference*: org login web
- Create an External Client App in Your Org
- Create a Connected App in Your Org
- Use the Default Connected App Securely
- Salesforce DX Project Configuration
- *Salesforce Help*: Enhanced Domains
- *VS Code Command*: SFDX: Authorize an Org, SFDX: Authorize a Dev Hub

Authorize an Org Using the JWT Flow

Use the JWT flow to authorize an org in continuous integration (CI) environments, which are fully automated and don't support the human interactivity of logging into a browser.

The JWT flow requires a digital certificate, also called a digital signature, to sign the JWT request. You can use your own certificate or create a self-signed certificate using OpenSSL.

Important: If your org is configured with high assurance (stepped up) authentication, Salesforce prompts the user to verify their identity. This verification process means that you can't use the JWT flow and Salesforce CLI for headless authentication.

1. If you don't have your own private key and digital certificate, you can use OpenSSL to create the key and a self-signed certificate.

   It's assumed in this task that your private key file is named `server.key` and your digital certificate is named `server.crt`.

2. Create an external client app and configure it for Salesforce DX.

   This task includes uploading the `server.crt` digital certificate file. Make note of the consumer key when you finish configuring the external client app because you need it later.

   Important: If you're authoring a Dev Hub org and plan to create scratch orgs or sandboxes with the `org create scratch | sandbox` commands, then you must create a connected app instead of an external client app.

3. Open a terminal (macOS and Linux) or command prompt (Windows).

4. Run the `org login jwt` CLI command. We recommend using the `--alias` flag to make it easy to refer to the org later. Specify the consumer key from your external client app or connected app with the `--client-id` flag, the path to the private JWT key file (`server.key`), and the username for your org. For example:

   ```
   sf org login jwt --client-id 04580y4051234051 --jwt-key-file /Users/jdoe/JWT/server.key
    --username jdoe@myorg.com --alias my-hub-org
   ```

   Use the `--set-default` flag if you want the org to be the default for commands that accept the `--target-org` flag. If you're authorizing a Dev Hub org, use the `--set-default-dev-hub` flag instead. See the `org login jwt` command for examples.

You can authorize a scratch org using the same consumer key and private key file that you used to authorize its associated Dev Hub org. See Authorize a Scratch Org Using the JWT Flow

If the URL that you use to log in to your org isn't the default (`login.salesforce.com`), update your project configuration file (`sfdx-project.json`). Set the `sfdcLoginUrl` option to your enhanced My Domain login URL. For example:

```
"sfdcLoginUrl" : "https://MyDomainName.my.salesforce.com"
```

This example is for a sandbox.

```
"sfdcLoginUrl" : "https://MyDomainName--SandboxName.sandbox.my.salesforce.com"
```

Alternatively, you can use the `--instance-url` flag of the `org login jwt` command to specify the URL. This value overrides the login URL you specified in the `sfdx-project.json` file. For example:

```
sf org login jwt --client-id 04580y4051234051 --jwt-key-file /Users/jdoe/JWT/server.key
--username jdoe@myorg.com --alias my-hub-org --instance-url
https://mydomain--mysandbox.sandbox.my.salesforce.com
```

Note: We recommend that you use your My Domain login URL, because it isn't affected by org migrations that change your org's Salesforce instance. Be sure you use the version that ends in `my.salesforce.com` instead of the URL you see in Lightning Experience (`.lightning.force.com`). To verify the valid My Domain URL, from Setup, enter *My Domain* in the Quick Find box, then select **My Domain**.

SEE ALSO:

Salesforce CLI Command Reference: org login jwt
Create a Private Key and Self-Signed Digital Certificate
Create a Connected App in Your Org
Salesforce DX Project Configuration
Salesforce Help: Enhanced Domains
Salesforce Help: Set Up Multi-Factor Authentication

Authorize a Scratch Org Using the JWT Flow

If you authorized your Dev Hub org using the `org login jwt` command, you can use the same digital certificate and private key to authorize an associated scratch org. This method is useful for continuous integration (CI) systems that must authorize scratch orgs after creating them, but don't have access to the scratch org's access token.

Before you begin, we assume that:

- You previously authorized your Dev Hub org with the `org login jwt` command.
- The private key file you used when authorizing your Dev Hub org is accessible and in `/Users/jdoe/JWT/server.key`.
- You've created a scratch org and have its administration user's username, such as test-wvkpnfm5z113@example.com.
- You know the scratch org's instance URL. If you don't know it, you can query your Dev Hub org. For example:

  ```
  sf data query --target-org my-dev-hub --query "SELECT SignupUsername,LoginUrl FROM
  ScratchOrgInfo WHERE SignupUsername='test-wvkpnfm5z113@example.com'"
  ```

1. Copy the consumer key from the external client app (or connected app) that you created in your Dev Hub org.
   a. Log in to your Dev Hub org.
   b. From Setup, enter *App Manager* in the Quick Find box to get to the Lightning Experience App Manager.
   c. Locate the external client app (or connected app) in the apps list, then click the dropdown menu on the right side, and select **View**.

d. In the API (Enable OAuth Settings) section, click **Manage Consumer Details**

   If prompted, verify your identity by entering the verification code that was automatically sent to your email address.

e. Copy the Consumer Key to your clipboard. The consumer key is a long string of numbers, letters, and characters, such as 3MVG9szVa2Rx_sqBb444p50Yj (example shortened for clarity.)

2. Open a terminal (macOS and Linux) or command prompt (Windows).
3. Run the `org login jwt` CLI command. The `--client-id` and `--jwt-key-file` flag values are the same as when you ran the command to authorize a Dev Hub org. Set `--username` to the scratch org's admin username and set `--instance-url` to the scratch org's instance URL, such as `https://energy-enterprise-2539-dev-ed.scratch.my.salesforce.com`. For example:

```
sf org login jwt --client-id 3MVG9szVa2Rx_sqBb444p50Yj \
--jwt-key-file /Users/jdoe/JWT/server.key --username test-wvkpnfm5z113@example.com \
--instance-url https://energy-enterprise-2539-dev-ed.scratch.my.salesforce.com
```

   If you get an error that the user isn't approved, it means that the scratch org information hasn't yet been replicated. Wait a short time and try again.

Note: If your scratch org is running on Hyperforce and the `--username` value of `org login jwt` is a non-admin scratch org user, you can't use your Dev Hub's digital certificate and private key. To authorize the scratch org in this scenario, follow the standard JWT flow steps.

SEE ALSO:

Authorize an Org Using the JWT Flow

Salesforce Help: Connected Apps

Create Scratch Orgs

Create a Private Key and Self-Signed Digital Certificate

Authorizing an org with the `org login jwt` command requires a digital certificate and the private key used to sign the certificate. We highly recommend that you use your own private key and certificate issued by a certification authority. You can also use OpenSSL to create a key and a self-signed digital certificate, just to get started. Using a private key and certificate is optional when you authorize an org by logging into a browser.

Warning: The steps in this topic are for sample purposes only. You can use the generated key and certificate to get started, but check with your company's security policies before you use either of them in a production environment.

This process produces two files:

- `server.key`—The private key. You specify this file when you authorize an org with the `org login jwt` command.
- `server.crt`—The digital certificate. You upload this file when you create the required external client app or connected app.

1. Open a terminal (macOS and Linux) or command prompt (Windows).
2. If necessary, install OpenSSL on your computer.

   To check whether OpenSSL is installed on your computer, run the `which` command on macOS or Linux or the `where` command on Windows.

```
which openssl
```

3. Create a directory for storing the generated files, and change to the directory.

```
mkdir /Users/jdoe/JWT
```

```
cd /Users/jdoe/JWT
```

4. Generate a private key, and store it in a file called `server.key`.

```
openssl genpkey -aes-256-cbc -algorithm RSA -pass pass:SomePassword -out server.pass.key
 -pkeyopt rsa_keygen_bits:2048
```

```
openssl rsa -passin pass:SomePassword -in server.pass.key -out server.key
```

5. Generate a certificate signing request by using the `server.key` file. Store the certificate signing request in a file called `server.csr`. Enter information about your company when prompted.

```
openssl req -new -key server.key -out server.csr
```

6. Generate a self-signed digital certificate from the `server.key` and `server.csr` files. Store the certificate in a file called `server.crt`.

```
openssl x509 -req -sha256 -days 365 -in server.csr -signkey server.key -out server.crt
```

Now create a external client app and upload the digital certificate to it. If you're authorizing a Dev Hub and you plan to create scratch orgs or sandboxes later with the `org create scratch|sandbox` commands, then you must create a connected app instead.

SEE ALSO:

- OpenSSL: Cryptography and SSL/TLS Tools
- Create a Connected App in Your Org
- Authorize an Org Using the JWT Flow

Create an External Client App in Your Org

Salesforce CLI requires an external client app in the org that you're authorizing. An external client app is a packageable framework that enables a third-party application (Salesforce CLI) to integrate with Salesforce by using APIs and security protocols. We provide a default connected app when you authorize an org with the `org login web` command. For extra security, you can create your own external client app in your org by using Setup and configure it with the settings of your choice. You're required to create an external client app when authorizing the org with the `org login jwt` command.

Important: If you're authoring a Dev Hub org and plan to create scratch orgs or sandboxes with the `org create scratch|sandbox` commands, then you create a connected app instead.

In the next task, the steps marked *(Required for JWT)* are required only if you're creating an external client app to use with the `org login jwt` command. In this case, you also need a file that contains a digital certificate, such as `server.crt`. You can use your own private key and certificate issued by a certification authority. Or you can use OpenSSL to create a key and a self-signed digital certificate. See Create a Private Key and Self-Signed Digital Certificate.

The steps marked *(Required for JWT)* are optional if you're creating an external client app to use with `org login web`.

1. Log in to your org.
2. From the Quick Find box in Setup, enter *App Manager*, then click **App Manager**.

3. Click **New External Client App**.
4. Update the basic information as needed, such as the external client app name and your contact email address.
5. Under **API (Enable OAuth Settings)**, click **Enable OAuth**.
6. Under **App Settings**, in the **Callback URL** box, enter `http://localhost:1717/OauthRedirect`.

   If port 1717 (the default) is already in use on your local machine, specify an available one instead. Then update your `sfdx-project.json` file by setting the `oauthLocalPort` property to the new port. For example, if you set the callback URL to `http://localhost:1919/OauthRedirect`:

   ```
   "oauthLocalPort" : "1919"
   ```

7. In the **OAuth Scopes** section, select these scopes:
   - **Manage user data via APIs (api)**
   - **Manage user data via Web browsers (web)**
   - **Perform requests at any time (refresh_token, offline_access)**
8. *(Required for JWT)* In the **Flow Enablement** section, select **Enable JWT Bearer Flow**.
9. *(Required for JWT)* Click **Upload Files** and upload the file that contains your digital certificate, such as `server.crt`.
10. Click **Create**.

    The basic external client app is created and enabled, and you see the page to manage your new external client app. However, you must further configure the external client app to use it with Salesforce CLI.

11. Click **Edit**.
12. *(Required for JWT, including substeps)* Click the **Policies** tab.
    a. Open **OAuth Policies**.
    b. In the **Plugin Policies** section, set **Permitted Users** to `Admin approved users are pre-authorized`.
    c. Click **OK**.
    d. In the **App Policies** section, select the profiles that are pre-authorized to use this external client app. Similarly, select the permission sets. Create the profiles or permission sets if necessary.
13. If not currently there, click the **Policies** tab.
14. In the **App Authorization** section, under **OAuth Policies**, click **Expire refresh token after a specific time**.
15. In the **Refresh Token Validity Period** box, enter `90`. For **Refresh Token Validity Unit**, select `Day(s)`.

    Setting a maximum of 90 days for the refresh token expiration is a security best practice. To continue running CLI commands against an org whose refresh tokens have expired, reauthorize it with the `org login web` or `org login jwt` command.

16. In the **Session Timeout in Minutes** box, enter `15`.

    Setting a timeout for access tokens is a security best practice. Salesforce CLI automatically handles an expired access token by referring to the refresh token.

17. Click **Save**.

    Your external client app is ready to use.

Get and Use the Consumer Key and Secret

When you're ready to run one of the `org login` commands that uses this external client app, follow these steps to get the consumer key and secret:

1. Log in to your org.
2. From the Quick Find box in Setup, enter *App Manager*, and then click **External Client App Manager**.
3. Click your external client app.
4. Click the **Settings** tab.
5. Open **OAuth Settings** and click **Consumer Key and Secret**.

   The **Verify Your Identiy** web page opens.
6. Check your email for a verification code, and then copy and paste the code in the **Verify Your Identity** web page.
7. Click **Verify**.
8. Click **Copy** next to **Consumer Key**.

   Depending on whether you've specified that it's required, also copy the **Consumer Secret**.

To use the consumer key, use the `--client-id` flag of the `org login` commands. For example, if your consumer key is 04580y4051234051 and you're authorizing a Dev Hub org by logging into it from a browser, run this command in a terminal (macOS and Linux) or command prompt (Windows):

```
sf org login web --client-id 04580y4051234051 --set-default-dev-hub --alias my-hub-org
```

If you specified in the external client app that the Web Server Flow requires a client (consumer) secret, the command prompts you for it. The command then opens the login page for you to add your org credentials.

See the reference for `org login web` and `org login jwt` for more examples.

Create a Connected App in Your Org

Salesforce CLI requires either an external client app (preferred) or connected app in the org that you're authorizing.

Warning: Create a connected app in your org **only** if it's your Dev Hub and you plan to later create scratch orgs or sandboxes with the `org create scratch|sandbox` commands. Otherwise, create an external client app, which is the preferred integration framework.

Connected apps are being deprecated. We plan to provide the information in this topic only until the requirement to use connected apps for sandbox or scratch org creation is removed.

A connected app is a framework that enables an external application, in this case Salesforce CLI, to integrate with Salesforce using APIs and standard protocols, such as OAuth. We provide a default connected app when you authorize an org with the `org login web` command.

Important: You must have the **Approve Uninstalled Connected Apps** user permission to complete this task. Org administrators have the permission by default.

In the task below, the steps marked *Required for JWT* are required only if you're creating a connected app to use with the `org login jwt` command. In this case you also need a file that contains a digital certificate, such as `server.crt`. The steps are optional if you're creating a connected app to use with `org login web`.

1. Contact Salesforce Customer Support to enable the creation of connected apps in your org.

Creating connected apps is now disabled by default, because connected apps are being deprecated. If you need to create a connected app, Salesforce Customer Support must enable an org perm in your org. This is a one-time process per org. See New connected apps can no longer be created in Spring '26.

2. Log in to your org.
3. From Setup, in the Quick Find box, enter *External Client Apps*, and then select **Settings**.
4. Turn on **Allow creation of connected apps** and click **Enable**.
5. Click **New Connected App**.
6. Update the basic information as needed, such as the connected app name and your email address.
7. Select **Enable OAuth Settings**.
8. For the callback URL, enter *http://localhost:1717/OauthRedirect*.

   If port 1717 (the default) is already in use on your local machine, specify an available one instead. Then update your `sfdx-project.json` file by setting the `oauthLocalPort` property to the new port. For example, if you set the callback URL to *http://localhost:1919/OauthRedirect*:

   ```
   "oauthLocalPort" : "1919"
   ```

9. (Required for JWT) Select **Use digital signatures**.
10. (Required for JWT) Click **Choose File** and upload file that contains your digital certificate, such as `server.crt`.
11. Add these OAuth scopes:
    - **Manage user data via APIs (api)**
    - **Manage user data via Web browsers (web)**
    - **Perform requests at any time (refresh_token, offline_access)**
12. Click **Save**, then **Continue**.
13. Click **Manage Consumer Details**.

    If prompted, verify your identity by entering the verification code that was automatically sent to your email address.
14. Click **Copy** next to Consumer Key because you need it later when you run an `org login` command. Depending on whether you specify that it's required, also copy the Consumer Secret.
15. Click **Back to Manage Connected Apps**.
16. Click **Manage**.
17. Click **Edit Policies**.
18. In the OAuth Policies section, for the Refresh Token Policy field, click **Expire refresh token after:** and enter 90 days or less.

    Setting a maximum of 90 days for the refresh token expiration is a security best practice. To continue running CLI commands against an org whose refresh tokens have expired, reauthorize it with the `org login web` or `org login jwt` command.
19. In the Session Policies section, set **Timeout Value** to *15 minutes*.

    Setting a timeout for access tokens is a security best practice. Salesforce CLI automatically handles an expired access token by referring to the refresh token.
20. (Required for JWT) In the OAuth Policies section, select **Admin approved users are pre-authorized** for permitted users, and click **OK**.
21. Click **Save**.

22. (Required for JWT) Click **Manage Profiles**, select the profiles that are pre-authorized to use this connected app, and click **Save**. Similarly, click **Manage Permission Sets** to select the permission sets. Create permission sets if necessary.

To specify the consumer key, use the `--client-id` flag of the `org login` commands. For example, if your consumer key is 04580y4051234051 and you're authorizing a Dev Hub org by logging into it from a browser, run this command in a terminal (macOS and Linux) or command prompt (Windows):

```
sf org login web --client-id 04580y4051234051 --set-default-dev-hub --alias my-hub-org
```

If you specifed in the connected app that the web login flow requires a client (consumer) secret, the command prompts you for it. The command then opens the login page for you to add your org credentials.

See the reference for `org login web` and `org login jwt` for more examples.

SEE ALSO:

- Create a Private Key and Self-Signed Digital Certificate
- *Salesforce Help*: Connected Apps
- Authorization
- *Salesforce Help*: Set Up Multi-Factor Authentication

Use the Default Connected App Securely

If you authorize an org with the `org login web` command, but don't specify the `--client-id` flag, Salesforce CLI creates a default connected app in the org called `Salesforce CLI`. However, its refresh tokens are set to never expire. As a security best practice, Salesforce recommends that refresh tokens in your org expire after 90 days or fewer. Another security best practice is to set an expiration for the access token to 15 minutes. Similar to refresh tokens, the access token in the default connected app is set to never expire. To continue using this default connected app in a secure way, configure its policies.

Important: You must be the org administrator to install the default `Salesforce CLI` connected app, which is one of the steps of this task.

1. Log in to your org.
2. From Setup, enter *`OAuth`* in the Quick Find box, then select **Connected Apps OAuth Usage**.
3. Select the `Salesforce CLI` app and click **Install**. Confirm by clicking **Install** again.
4. Click **Edit Policies**.
5. In the OAuth Policies section, for the Refresh Token Policy field, click **Expire refresh token after:** and enter *`90 Days`* or less.
6. In the Session Policies section, set **Timeout Value** to *`15 minutes`*.
7. Click **Save**.

If you run a CLI command against an org whose refresh token has expired, you get an error. For example:

```
ERROR running org open: Error authenticating with the refresh token due to: expired
access/refresh token
```

The `org list` command also displays expired refresh token information in the CONNECTED STATUS column. To continue using the org, reauthorize it with the `org login web` or `org login jwt` command.

Salesforce CLI automatically handles an expired access token by referring to the refresh token.

SEE ALSO:

Salesforce Help: Connected Apps

Authorize an Org Using a Browser

Authorize an Org Using the JWT Flow

Use an Existing Access Token

When you authorize an org using the `org login` commands, Salesforce CLI takes care of generating and refreshing all tokens, such as the access token. But sometimes you want to run a few CLI commands against an existing org without going through the entire authorization process. In this case, you provide the access token and URL of the Salesforce instance that hosts the org to which you want to connect.

Almost all CLI commands that have the `--target-org | -o` flag accept an access token. The only exception is `org display user`.

1. Open a terminal (macOS and Linux) or command prompt (Windows).
2. To get the instance URL and access token for the org to connect to, run the `org display` command. See the values for the `Access Token` and `Instance Url` keys.

```
sf org display --target-org myorg
=== Org Description

 KEY              VALUE
 ─────────────── ──────────────────────────────────────────────────
 Access Token     00D8H0000007wprAQkAQAlOT5H (truncated for security)
...
 Instance Url     https://creative-impala-20hx3-dev-ed.my.salesforce.com
...
```

3. Use `config set` to set the `org-instance-url` configuration variable. To set it locally, run the command from a Salesforce DX project; to set it globally, use the `--global` flag.

```
sf config set org-instance-url=https://creative-impala-20hx3-dev-ed.my.salesforce.com
--global
```

4. When you run the CLI command, use the org's access token as the value for the `--target-org` flag rather than the org's username. For example:

```
sf project deploy start --source-dir <source-dir> --target-org 00D8H0000007wprAQkAQAlOT5H
```

Tip: If your access token contains a `!` character, you must sometimes escape it with a backslash (`\`). For example, if your access token is `00007wpr!AQkAQA`, specify it this way: `--target-org 00007wpr\!AQkAQA`

Salesforce CLI doesn't store the access token in its internal files. It uses it only for this CLI command run.

SEE ALSO:

- Authorization Information for an Org
- *Salesforce CLI Command Reference*: config set
- *Salesforce CLI Command Reference*: project deploy start

Authorize an Org Using Its SFDX Authorization URL

Use an org's Salesforce DX (SFDX) authorization URL to authorize an org in continuous integration (CI) environments, which are fully automated and don't support the human interactivity of logging into a browser.

1. Open a terminal (macOS and Linux) or command prompt (Windows) on the computer where you've already authorized the org using a Web browser.
2. Get your org's SFDX authorization URL and store it in a file by running this command.

   ```
   sf org display --target-org my-org --verbose --json > authFile.json
   ```

   The JSON output includes a key called `sfdxAuthUrl`, whose value is the org's SFDX authorization URL.
3. In your CI environment, authorize the org by referencing the `authFile.json` file with this command.

   ```
   sf org login sfdx-url --sfdx-url-file authFile.json
   ```

For more information and examples, see the reference about the `org login sfdx-url` command in the Salesforce CLI Command Reference.

Authorization Information for an Org

You can view information for all orgs that you've authorized and the scratch orgs that you've created.

To view authorization information about an org, run this command from a terminal (macOS and Linux) or command prompt (Windows).

```
sf org display --target-org <username-or-alias>
```

If you have set a default org, you don't have to specify the `--target-org` flag. To display the usernames for all the active orgs that you've authorized or created, run `org list`.

If you've set an alias for an org, you can specify it with the `--target-org` flag. This example uses the `my-scratch-org` alias.

```
sf org display --target-org my-scratch-org

Warning: This command will expose sensitive information that allows for subsequent activity
 using your current authenticated session.
Sharing this information is equivalent to logging someone in under the current credential,
 resulting in unintended access and escalation of privilege.
For additional information, please review the authorization section of the
https://developer.salesforce.com/docs/atlas.en-us.sfdx_dev.meta/sfdx_dev/sfdx_dev_auth_web_flow.htm

=== Org Description

 KEY             VALUE
```

```
_______________
_____________________________________________________________________________________

Access Token    <long-string>
Alias           my-scratch-org

Api Version     58.0

Client Id       PlatformCLI

Created By      jdoe@fabdevhub.org

Created Date    2023-06-09T17:59:18.000+0000

Dev Hub Id      jdoe@fabdevhub.org

Edition         Developer

Expiration Date 2023-06-16

Id              00D8H0000007wprU

Instance Url    https://java-connect-41-dev-ed.scratch.my.salesforce.com

Org Name        Your Company

Signup Username test-gm9uud@example.com

Status          Active

Username        test-gm9uud@example.com
```

To get more information, such as the Salesforce DX authentication URL, include the `--verbose` flag. This flag displays the `Sfdx Auth Url` value only if you authorized the org using `org login web` and not `org login jwt`.

Note: To help prevent security breaches, the `org display` output doesn't include the org's client secret or refresh token.

SEE ALSO:

OAuth 2.0 Web Server Authentication Flow

Salesforce DX Usernames and Orgs

Log Out of an Org

For security purposes, you can use the Salesforce CLI to log out of any org you've previously authorized. This practice prevents other users from accessing your orgs if you don't want them to.

Important: The only way to access an org after you log out of it is with a password. By default, new scratch orgs contain one administrator with no password. Therefore, to avoid losing access to a scratch org, set a password for at least one user of a scratch

org if you want to access it again after logging out. If you don't want to access the scratch org again, delete it with `org delete scratch` rather than log out of it.

To log out of an org, run `org logout` from a terminal (macOS and Linux) or command prompt (Windows). This example uses the alias `my-hub-org` to log out.

```
sf org logout --target-org my-hub-org
```

To log out of all your orgs, including scratch orgs, use the `--all` flag.

```
sf org logout --all
```

To access an org again, other than a scratch org, reauthorize it.

When you log out of an org, it no longer shows up in the `org list` output. If you log out of a Dev Hub org, the associated scratch orgs show up only if you specify the `--all` flag.

SEE ALSO:

Salesforce CLI Command Reference: org logout

VS Code Command: SFDX: Log Out from All Authorized Orgs, SFDX: Log Out from Default Org

CHAPTER 5 Metadata Coverage

Launch the Metadata Coverage report to determine supported metadata for scratch org source tracking purposes. The Metadata Coverage report is the ultimate source of truth for metadata coverage across several channels. These channels include Metadata API, scratch org source tracking, unlocked packages, second-generation managed packages, classic managed packages, and more.

View the Metadata Coverage report.

For more information, see Metadata Types in the *Metadata API Developer Guide*.

We've moved the information on Hard-Deleted Components in Unlocked Packages.

SEE ALSO:

Components Available in Managed Packages

CHAPTER 6 Scratch Orgs

In this chapter ...

- Supported Scratch Org Editions and Allocations
- Build Your Own Scratch Org Definition File
- Create a Scratch Org Based on an Org Shape
- Create Scratch Orgs
- Scratch Org Snapshots
- Select the Salesforce Release for a Scratch Org
- Deploy Source From Your Project to the Scratch Org
- Retrieve Source from the Scratch Org to Your Project
- Scratch Org Users
- Manage Scratch Orgs from the Dev Hub Org
- Scratch Org Error Codes

The scratch org is a source-driven and disposable deployment of Salesforce code and metadata. A scratch org is fully configurable, allowing developers to emulate different Salesforce editions with different features and settings. You can share the scratch org configuration file with other team members, so you all have the same basic org in which to do your development. In addition to code and metadata, developers can install packages and deploy synthetic or dummy data for testing. Don't add personal data to scratch orgs.

Scratch orgs drive developer productivity and collaboration during the development process, and facilitate automated testing and continuous integration. You can use Salesforce CLI or an IDE to open your scratch org in a browser without logging in. Spin up a new scratch org when you want to:

- Start a new project.
- Start a new feature branch.
- Test a new feature.
- Start automated testing.
- Perform development tasks directly in an org.
- Start from "scratch" with a fresh new org.

Alternatives to scratch orgs are sandboxes and Developer Edition orgs, which are used as development environments for many Salesforce development use cases. If you're wondering whether to use a sandbox, scratch org, or Developer Edition org as your development environment, you're not alone. To help you better understand which to choose, see the Salesforce Developers Blog: Choose the Right Salesforce Org for the Right Job.

Source Tracking

Source tracking refers to tracking the changes you make to your local source files and the metadata in your org, and keeping both in sync.

Scratch orgs have source tracking enabled by default. You can opt out of source tracking when you create the scratch org by specifying the `--no-track-source` flag of the `org create scratch` command. This flag affects only your local configuration, not the scratch org itself. Salesforce CLI sets a local configuration option `trackSource: false` as part of your authorization information to the org. If you log out of the scratch org and then log back in again, source tracking is enabled again by default.

If you're actively in development mode, we suggest keeping source tracking enabled in your scratch org so you can easily sync the changes between your org and your local project. But source tracking can slow down deployments and retrievals, so it's sometimes better to disable it if it's not needed. Here are some use cases.

- Your continuous integration (CI) script simply creates a scratch org, deploys source, runs Apex and browser tests, and then deletes the scratch org.
- You want to spin up a scratch org for a demo, user acceptance testing, or debugging.
- Your test data has changed and you want to ensure it's correct by importing it into a scratch org. But you haven't changed any metadata or source code.
- You want to install and verify a package your CI built.
- You want to test a pull request by deploying code to a scratch org, but you don't plan to change the code.

Scratch Org Creation Methods

By default, scratch orgs are empty. They don't contain much of the sample metadata that you get when you sign up for an org, such as a Developer Edition org, the traditional way. Some of the things not included in a scratch org are:

- Custom objects, fields, indexes, tabs, and entity definitions
- Sample data
- Sample Chatter feeds
- Dashboards and reports
- Workflows
- Picklists
- Profiles and permission sets
- Apex classes, triggers, and pages

Before creating a scratch org, you must configure it so it has the features, settings, licenses, and limits that mirror a source org, often your production org. The combination of features, settings, edition, licenses, and limits are what we refer to as the org's shape.

We offer these methods for configuring scratch orgs:

- Build Your Own Scratch Org Definition File
- Create a Scratch Org Based on an Org Shape
- Create a Scratch Org Based on a Snapshot

On Which Salesforce Instances Are Scratch Orgs Created?

Scratch orgs are created on sandbox instances. The sandbox instance depends on the country information used when creating the Dev Hub org.

Scratch orgs for Government Cloud and Hyperforce are created in the region where the Dev Hub org is physically located.

- Scratch orgs created from a Dev Hub org in Government Cloud are created in a Government Cloud instance.
- Scratch orgs created from a Dev Hub org in Hyperforce are created on a Hyperforce instance.

If you notice that your scratch orgs aren't located in the expected region, create a Salesforce Support case.

Scratch Org Expiration Policy

A scratch org is temporary and is deleted along with the associated ActiveScratchOrgs records from the Dev Hub after their expiration. This expiration process ensures that teams frequently sync their changes with their version control system and are working with the most recent version of their project.

Scratch orgs have a maximum 30 days lifespan. You can select a duration from 1 through 30 days at the time of creation, with the default set at 7 days. After the scratch org has expired, you can't restore it.

Note: Deleting a scratch org doesn't terminate your scratch org subscription. If your subscription is still active, you can create a new scratch org. Creating a new scratch org counts against your daily and active scratch org limits.

SEE ALSO:

Salesforce Admins Blog: Sandboxes vs. Scratch Orgs and How to Use Them

Supported Scratch Org Editions and Allocations

Your Dev Hub org is often your production org, and you can enable Dev Hub in these editions: Developer, Enterprise, Unlimited, or Performance. Your Dev Hub edition determines how many scratch orgs you can create. You choose one of the supported scratch org editions each time you create a scratch org.

Supported Scratch Org Editions

Possible values for the Salesforce edition of the scratch org are:

- Developer
- Enterprise
- Group
- Professional

Note: Partners can create partner edition scratch orgs: Partner Developer, Partner Enterprise, Partner Group, and Partner Professional. This feature is available only if creating scratch orgs from a Dev Hub in a partner business org. See Supported Scratch Org Editions for Partners in the *First-Generation Managed Packaging Developer Guide* for details.

Scratch orgs have these storage limits:

- 200 MB for data
- 50 MB for files

Entities defined as metadata types aren't counted as part of storage allocations in scratch orgs. For more information about entities that are counted against storage allocations, see *Salesforce Help*: Data and File Storage Allocations.

Supported Dev Hub Editions and Associated Scratch Org Allocations

To ensure optimal performance, your Dev Hub org edition determines your scratch org allocations. These allocations determine how many scratch orgs you can create daily, and how many can be active at a given point.

To try out scratch orgs, sign up for a Developer Edition org on Salesforce Developers, then enable Dev Hub.

Note: If you're a partner or ISV, your scratch org allocations are likely different. See the *First-Generation Managed Packaging Developer Guide* for details.

The *active scratch org allocation* is the maximum number of scratch orgs you can have at any given time based on the edition type. The allocation becomes available if you delete a scratch org or if a scratch org expires. The *daily scratch org allocation* is the maximum number of successful scratch org creations you can initiate in a rolling (sliding) 24-hour window. Allocations are determined based on the number of scratch orgs created in the preceding 24 hours.

Edition	Active Scratch Org Allocation	Daily Scratch Org Allocation
Developer Edition or trial	3	6
Enterprise Edition	40	80
Unlimited Edition	100	200
Performance Edition	100	200

List Active and Daily Scratch Orgs

Note: If your Salesforce admin provided access to the Dev Hub org using the Free Limited Access license and you can't run this command, contact your admin for assistance.

To view your scratch org allocations and how many are remaining, run this command in a terminal or command window against your Dev Hub org. Only relevant limits (`ActiveScratchOrgs` and `DailyScratchOrgs`) are shown.

```
sf limits api display --target-org <Dev Hub username or alias>
```

Look for these two limits in the output:

```
Name                                          Remaining   Max
_____________________________________________ _________   _________
ActiveScratchOrgs                             198         200
DailyScratchOrgs                              400         400
```

View Limits for a Scratch Org

To view limits information for a scratch org:

```
sf limits api display --target-org <scratch org username or alias>
```

Build Your Own Scratch Org Definition File

The scratch org definition file is a blueprint for a scratch org. It mimics the shape of an org that you use in the development lifecycle, such as sandbox, packaging, or production.

The settings and configuration options associated with a scratch org determine its shape, including:

- Edition—The Salesforce edition of the scratch org, such as Developer, Enterprise, Group, or Professional.
- Add-on features—Functionality that isn't included by default in an edition.
- Settings—Org and feature settings used to configure Salesforce products, such as Field Service and Experience Cloud.

Setting up different scratch org definition files allows you to easily create scratch orgs with different shapes for testing. For example, you can turn Field Service on or off in a scratch org by setting the FieldService org preference in the definition file. If you want a scratch org with sample data and metadata like you're used to, add this option: `hasSampleData`.

We recommend that you keep this file in your project and check it in to your version control system. For example, create a team version that you check in for all team members to use. Individual developers could also create their own local version that includes the scratch org definition parameters. Examples of these parameters include email and last name, which identify who is creating the scratch org.

Scratch Org Definition File Name

You indicate the path to the scratch org configuration file when you create a scratch org with the `org create scratch` CLI command.

- If you're using Salesforce CLI on the command line, you can name this file whatever you like and locate it anywhere the CLI can access.
- If you're using Salesforce Extensions for VS Code, make sure that the scratch org definition file is located in the `config` folder of your Salesforce DX project. Its name must also end in `scratch-def.json`.

If you're using a sample repo or creating a Salesforce DX project, the sample scratch org definition files are located in the `config` directory. You can create different configuration files for different org shapes or testing scenarios. For easy identification, name the file something descriptive, such as `devEdition-scratch-def.json` or `packaging-org-scratch-def.json`.

Scratch Org Definition File Options

Here are the options you can specify in the scratch org definition file:

Name	Required?	Default If Not Specified
orgName	No	Company
country	No	Dev Hub's country. If you want to override this value, enter the two-character, upper-case ISO-3166 country code (Alpha-2 code). You can find a full list of these codes at several sites, such as: https://www.iso.org/obp/ui/#search. This value sets the locale of the scratch org.
username	No	test-*`unique_identifier`*@example.com
adminEmail	No	Email address of the Dev Hub user making the scratch org creation request
edition	Yes	None. Valid entries are Developer, Enterprise, Group, or Professional
description	No	None. 2000-character free-form text field. The description is a good way to document the scratch org's purpose. You can view or edit the description in the Dev Hub. From App Launcher, select **Scratch Org Info** or **Active Scratch Orgs**, then click the scratch org number.
hasSampleData	No	Valid values are `true` and `false`. False is the default, which creates an org without sample data.
language	No	Default language for the country. To override the language set by the Dev Hub locale, see Supported Languages for the codes to use in this field.
features	No	None. See Scratch Org Features.
release	No	Same Salesforce release as the Dev Hub org. Options are `preview` or `previous`. You can use this option only during Salesforce release transition periods.
settings	No	None. See Scratch Org Settings for more information.
objectSettings	No	None. Use objectSettings to specify object-level sharing settings and default record types. To successfully install in a scratch org, some packages require that you define object-level sharing settings and default record types. The objectSettings option is a map. Each key is the lowercase name of an object, such as opportunity or account. The definition for each key is also a map with two possible values:

Name	Required?	Default If Not Specified
		• `sharingModel`—Sets a sharing model. Different objects support different sharing models. Possible values of sharing models are: – `private` – `read` – `readWrite` – `readWriteTransfer` – `fullAccess` – `controlledByParent` – `controlledByCampaign` – `controlledByLeadOrContent` • `defaultRecordType`—Creates a record type. This setting is required before installing a package that creates record types. Specify an alphanumeric string that starts with a lowercase letter.
<custom field API name>	No	None. Useful for Dev Ops use cases where you want to track extra information on the ScratchOrgInfo object. First, create the custom field, and then reference it in the scratch org definition by its API name.
snapshot	No	None. Name of a snapshot, which is a point-in-time copy of a scratch org. You create the snapshot using the `org create snapshot` CLI command. Use only if you're using a snapshot to create your scratch org. See Scratch Org Snapshots.
sourceOrg	No	None. 15-character source org ID. Use only if you're using Org Shape for Scratch Orgs to create your scratch org. See Create a Scratch Org Based on an Org Shape.

Sample Scratch Org Definition File

Here's what the scratch org definition JSON file looks like. For more information on features and settings, see Scratch Org Features.

```
{
  "orgName": "Acme",
  "edition": "Enterprise",
  "features": ["Communities", "ServiceCloud", "Chatbot"],
  "settings": {
      "communitiesSettings": {
          "enableNetworksEnabled": true
      },
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
```

```
      },
      "omniChannelSettings": {
          "enableOmniChannel": true
      },
      "caseSettings": {
          "systemUserEmail": "support@acme.com"
      }
  }
}
```

Some features, such as Experience Cloud, can require a combination of a feature and a setting to work correctly for scratch orgs. Experience Cloud uses the term `Communities` in its configuration. This code snippet sets both the feature and associated setting.

```
"features": ["Communities"],
    "settings": {
        "communitiesSettings": {
          "enableNetworksEnabled": true
      },
        ...
```

Create a Custom Field for ScratchOrgInfo

You can add more options to the scratch org definition to manage your Dev Ops process. To do so, create a custom field on the ScratchOrgInfo object. (ScratchOrgInfo tracks scratch org creation and deletion.)

Important: If you're making these changes directly in your production org, proceed with the appropriate level of caution. The ScratchOrgInfo object isn't available in sandboxes or scratch orgs.

In the Dev Hub org, create the custom field.

- From Setup, enter *`Object Manager`* in the Quick Find box, then select **Object Manager**.
- Click **Scratch Org Info**.
- In Fields & Relationships, click **New**.
- Define the custom field, then click **Save**.

After you create the custom field, you can pass it a value in the scratch org definition file by referencing it with its API name. Let's say you create two custom fields called `workitem` and `release`. Add the custom fields and associated values to the scratch org definition, then create the scratch org:

```
{
     "orgName": "MyCompany",
     "edition": "Developer",
     "workitem__c": "W-12345678",
     "release__c": "June 2024 pilot",

     "settings": {
         "omniChannelSettings": {
              "enableOmniChannel": true
     }
           }
}
```

Set Object-Level Sharing Settings and Default Record Types

To install successfully, some packages require that you define object-level sharing settings and default record types before installation. Set the sharing settings and default record types with `objectSettings`. In this sample scratch org definition file, we set a sharing model and a default record type for opportunity, and a default record type for account.

```
{
  "orgName": "MyCompany",
  "edition": "Developer",
  "features": ["Communities", "ServiceCloud", "Chatbot"],
  "settings": {
      "communitiesSettings": {
          "enableNetworksEnabled": true
      }
  }
  "objectSettings": {
     "opportunity": {
        "sharingModel": "private",
        "defaultRecordType": "default"
     },
     "account": {
        "defaultRecordType": "default"
     }
  }
}
```

Scratch Org Features

The scratch org definition file contains the configuration values that determine the shape of the scratch org. You can enable these supported add-on features in a scratch org.

Scratch Org Settings

Scratch org settings are the format for defining org preferences in the scratch org definition. Because you can use all Metadata API settings, they're the most comprehensive way to configure a scratch org. If a setting is supported in Metadata API, it's supported in scratch orgs. Settings provide you with fine-grained control because you can define values for all fields for a setting, rather than just enabling or disabling it.

Scratch Org Features

The scratch org definition file contains the configuration values that determine the shape of the scratch org. You can enable these supported add-on features in a scratch org.

Note: Some scratch org features require a license or permissions in the Dev Hub org. If you can't create the scratch org by just specifying the feature name in the scratch org definition file, see your Salesforce admin for assistance.

Supported Features

Features aren't case-sensitive. You can indicate them as all-caps, or as we define them here for readability. If a feature is followed by <value>, you must specify a value as an incremental allocation or limit.

You can specify multiple feature values in a comma-delimited list in the scratch org definition file.

```
"features": ["ServiceCloud", "API", "AuthorApex"],
```

AccountInspection

Enables the Account Intelligence view. The Account Intelligence view is a consolidated dashboard showing account metrics, activities, and related opportunities and cases.

AccountingSubledgerGrowthEdition

Provides three permission sets that enable access to Accounting Subledger Growth features.

AccountingSubledgerStarterEdition

Provides three permission sets that enable access to Accounting Subledger Starter features.

AccountingSubledgerUser

Enables organization-wide access to Accounting Subledger Growth features when the package is installed.

AddCustomApps:<value>

Increases the maximum number of custom apps allowed in an org. Indicate a value from 1–30.

AddCustomObjects:<value>

Increases the maximum number of custom objects allowed in the org. Indicate a value from 1–30.

AddCustomRelationships:<value>

Increases the maximum number of custom relationships allowed on an object. Indicate a value from 1–10.

AddCustomTabs:<value>

Increases the maximum number of custom tabs allowed in an org. Indicate a value from 1–30.

AddDataComCRMRecordCredit:<value>

Increases record import credits assigned to a user in your scratch org. Indicate a value from 1–30.

AddInsightsQueryLimit:<value>

Increases the size of your CRM Analytics query results. Indicate a value from 1–30 (multiplier is 10). Setting the quantity to 6 increases the query results to 60.

AdditionalFieldHistory:<value>

Increases the number of fields you can track history for beyond the default, which is 20 fields. Indicate a value between 1–40.

AdmissionsConnectUser

Enables the Admissions Connect components. Without this scratch org feature parameter, the custom Admissions Connect components render as blank.

AdvisorLinkFeature

Enables the Student Success Hub components. Without this scratch org feature parameter, the custom Student Success Hub components render as blank.

AdvisorLinkPathwaysFeature

Enables the Pathways components. Without this scratch org feature parameter, the custom Pathways components render as blank.

AIAttribution

Provides access to Einstein Attribution for Marketing Cloud Account Engagement. Einstein Attribution uses AI modeling to dynamically assign attribution percentages to multiple campaign touchpoints.

AllUserIdServiceAccess

Enables all users to access all users' information via the user ID service.

AnalyticsAdminPerms

Enables all permissions required to administer the CRM Analytics platform, including permissions to enable creating CRM Analytics templated apps and CRM Analytics Apps.

AnalyticsAppEmbedded

Provides one CRM Analytics Embedded App license for the CRM Analytics platform.

ApexGuruCodeAnalyzer

Enables ApexGuru's generative AI-powered runtime insights in Salesforce Code Analyzer, which delivers Apex code quality recommendations directly in developer IDEs.

API

Even in the editions (Professional, Group) that don't provide API access, REST API is enabled by default. Use this scratch org feature to access additional APIs (SOAP, Streaming, Bulk, Bulk 2.0).

ArcGraphCommunity

Lets you add Actionable Relationship Center (ARC) components to Experience Cloud pages so your users can view ARC Relationship Graphs.

Assessments

Enables dynamic Assessments features, which enables both Assessment Questions and Assessment Question Sets.

AssetScheduling:<value>

Enables Asset Scheduling license. Asset Scheduling makes it easier to book rooms and equipments. Indicate a value between 1–10.

AssociationEngine

Enables the Association Engine, which automatically associates new accounts with the user's current branch by creating branch unit customer records.

AuthorApex

Enables you to access and modify Apex code in a scratch org. Enabled by default in Enterprise and Developer Editions.

B2BCommerce

Provides the B2B License. B2BCommerce enables business-to-business (B2B) commerce in your org. Create and update B2B stores. Create and manage buyer accounts. Sell products to other businesses.

B2BLoyaltyManagement

Enables the B2B Loyalty Management license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

B2CCommerceGMV

Provides the B2B2C Commerce License. B2B2C Commerce allows you to quickly stand up an ecommerce site to promote brands and sell products into multiple digital channels. You can create and update retail storefronts in your org, and create and manage person accounts.

B2CLoyaltyManagement

Enables the Loyalty Management - Growth license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

B2CLoyaltyManagementPlus

Enables the Loyalty Management - Advanced license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

BatchManagement

Enables the Batch Management license. Batch Management allows you to process a high volume of records in manageable batches.

BenefitManagement

Enables the objects, features, and permissions for managing benefits programs, benefit disbursements, and benefit applicant tracking in Public Sector Solutions.

BigObjectsBulkAPI

Enables the scratch org to use BigObjects in the Bulk API.

BillingAdvanced

Enables access to all the Billing features and objects that are available with the Revenue Cloud Billing license in the scratch org.

Briefcase

Enables the use of Briefcase Builder in a scratch org, which allows you to create offline briefcases that make selected records available for viewing offline.

BudgetManagement

Gives users access to budget management features and objects. To enable budget management, add this feature to your scratch org definition file.

BusinessRulesEngine

Enables Business Rules Engine, which enables both expression sets and lookup tables.

BYOCCaaS

Enables you to set up and test a partner contact center that integrates with supported Contact Center as a Service (CCaaS) providers in your scratch org.

BYOOTT

Enables you to set up and test a Bring Your Own Channel for Messaging channel that integrates with supported Messaging providers in your scratch org.

CacheOnlyKeys

Enables the cache-only keys service. This feature allows you to store your key material outside of Salesforce, and have the Cache-Only Key Service fetch your key on demand from a key service that you control.

CalloutSizeMB:<value>

Increases the maximum size of an Apex callout. Indicate a value between 3–12.

CampaignInfluence2

Provides access to Customizable Campaign Influence for Sales Cloud and Marketing Cloud Account Engagement. Customizable Campaign Influence can auto-associate or allow manual creation of relationships among campaigns and opportunities to track attribution.

CascadeDelete

Provides lookup relationships with the same cascading delete functionality previously only available to master-detail relationships. To prevent records from being accidentally deleted, cascade-delete is disabled by default.

CaseClassification

Enables Einstein Case Classification. Case Classification offers recommendations to your agents so they can select the best value. You can also automatically save the best recommendation and route the case to the right agent.

CaseWrapUp

Enables Einstein Case Wrap-Up. To help agents complete cases quickly, Einstein Case Wrap-Up recommends case field values based on past chat transcripts.

CGAnalytics

Enables the Consumer Goods Analytics org perm in scratch orgs.

ChangeDataCapture

Enables Change Data Capture, if the scratch org edition doesn't automatically enable it.

Chatbot

Enables deployment of Bot metadata into a scratch org, and allows you to create and edit bots.

ChatterEmailFooterLogo

ChatterEmailFooterLogo allows you to use the Document ID of a logo image, which you can use to customize chatter emails.

ChatterEmailFooterText

ChatterEmailFooterText allows you to use footer text in customized Chatter emails.

ChatterEmailSenderName

ChatterEmailSenderName allows you to customize the name that appears as the sender's name in the email notification. For example, your company's name.

CloneApplication

CloneApplication allows you to clone an existing custom Lightning app and make required customizations to the new app. This way, you don't have to start from scratch, especially when you want to create apps with simple variations.

CMSMaxContType

Limits the number of distinct content types you can create within Salesforce CMS to 21.

CMSMaxNodesPerContType

Limits the maximum number of child nodes (fields) you can create for a particular content type to 15.

CMSUnlimitedUse

Enables unlimited content records, content types, and bandwidth usage in Salesforce CMS.

Communities

Allows the org to create an Experience Cloud site. Experience Cloud uses the term Communities in its configuration. To use Communities, you must also include communitiesSettings > enableNetworksEnabled in the settings section of your scratch org definition file.

CompareReportsOrgPerm

Enables the org permission to allow for comparison of Lightning Reports.

ConAppPluginExecuteAsUser

Enables the pluginExecutionUser field in the ConnectedApp Metadata API object.

ConcStreamingClients:<value>

Increases the maximum number of concurrent clients (subscribers) across all channels and for all event types for API version 36.0 and earlier. Indicate a value between 20–4,000.

ConnectedAppCustomNotifSubscription

Enables connected apps to subscribe to custom notification types, which are used to send custom desktop and mobile notifications.

ConnectedAppToolingAPI

Enables the use of connected apps with the Tooling API.

ConsentEventStream

Enables the Consent Event Stream permission for the org.

ConsolePersistenceInterval:<value>

Increases how often console data is saved, in minutes. Indicate a value between 0–500. To disable auto save, set the value to 0.

ContactsToMultipleAccounts

Enables the contacts to multiple accounts feature. This feature lets you relate a contact to two or more accounts.

ContractApprovals

Enables contract approvals, which allow you to track contracts through an approval process.

ContractManagement

Enables the Contract Lifecycle (CLM) Management features in the org.

ContractMgmtInd

Enables the Contract Lifecycle Management (CLM) features for Industries.

CoreCpq

Enables read-write access to Revenue Cloud features and objects. To use Revenue Cloud, you must also include revenueManagementSettings > enableCoreCPQ in the settings section of your scratch org definition file.

CPQ

Enables the licensed features required to install the Salesforce CPQ managed package but doesn't install the package automatically.

CustomerDataPlatform

Enables the CustomerDataPlatform license in scratch orgs.

CustomerDataPlatformLite

Enables the Data Cloud license in scratch orgs. You must also include the CustomerDataPlatform feature and enableCustomerDataPlatform Metadata API setting in your scratch org definition.

CustomerExperienceAnalytics

Enables the Customer Lifecycle Analytics org perm in scratch orgs.

CustomFieldDataTranslation

Enables translation of custom field data for Work Type Group, Service Territory, and Service Resource objects. You can enable data translation for custom fields with Text, Text Area, Text Area (Long), Text Area (Rich), and URL types.

CustomNotificationType

Allows the org to create custom notification types, which are used to send custom desktop and mobile notifications.

DataComDnbAccounts

Provides a license to Data.com account features.

DataComFullClean

Provides a license to Data.com cleaning features, and allows users to turn on auto fill clean settings for jobs.

DataMaskUser

Provides 30 Data Mask permission set licenses. This permission set enables access to an installed Salesforce Data Mask package.

DataProcessingEngine

Enables the Data Processing Engine license. Data Processing Engine helps transform data that's available in your Salesforce org and write back the transformation results as new or updated records.

DebugApex

Enables Apex Interactive Debugger. You can use it to debug Apex code by setting breakpoints and checkpoints, and inspecting your code to find bugs.

DecisionTable

Enables Decision Table license. Decision tables read business rules and decide the outcome for records in your Salesforce org or for the values that you specify.

DefaultWorkflowUser

Sets the scratch org admin as the default workflow user.

DeferSharingCalc

Allows admins to suspend group membership and sharing rule calculations and to resume them later.

DevelopmentWave

Enables CRM Analytics development in a scratch org. It assigns five platform licenses and five CRM Analytics platform licenses to the org, along with assigning the permission set license to the admin user. It also enables the CRM Analytics Templates and Einstein Discovery features.

DeviceTrackingEnabled

Enables Device Tracking.

DevOpsCenter

Enables DevOps Center in scratch orgs so that partners can create second-generation managed packages that extend or enhance the functionality in the DevOps Center application (base) package.

DisableManageIdConfAPI

Limits access to the LoginIP and ClientBrowser API objects to allow view or delete only.

DisclosureFramework

Provides the permission set licenses and permission sets required to configure Disclosure and Compliance Hub.

Division

Turns on the Manage Divisions feature under Company Settings. Divisions let you segment your organization's data into logical sections, making searches, reports, and list views more meaningful to users. Divisions are useful for organizations with extremely large amounts of data.

DocGen

Enables the Document Generation Feature in the Org.

DocGenDesigner

Enables the designers to create and configure document templates.

DocGenInd

Enables the Industry Document Generation features in the org.

DocumentChecklist

Enables Document Tracking and Approval features, and adds the Document Checklist permission set. Document tracking features let you define documents to upload and approve, which supports processes like loan applications or action plans.

DocumentReaderPageLimit

Limits the number of pages sent for data extraction to 5.

DSARPortability

Enables an org to access the DSARPortability feature in Privacy Center. Also, provides one seat each of the PrivacyCenter and PrivacyCenterAddOn licenses.

DurableClassicStreamingAPI

Enables Durable PushTopic Streaming API for API version 37.0 and later.

DurableGenericStreamingAPI

Enables Durable Generic Streaming API for API version 37.0 and later.

DynamicClientCreationLimit

Allows the org to register up to 100 OAuth 2.0 connected apps through the dynamic client registration endpoint.

EAndUDigitalSales

Enables the Energy and Utilities Digital Sales feature in the org.

EAndUSelfServicePortal

Enables the Self Service Portal features for Digital Experience users in the org.

EAOutputConnectors

Enable CRM Analytics Output Connectors.

EASyncOut

Enable CRM Analytics SyncOut.

EdPredictionM3Threshold

Sets the number of records in the payload to 10, after which the Einstein Discovery prediction service uses M3.

EdPredictionTimeout

Sets the maximum duration of a single Einstein Discovery prediction to 100 milliseconds.

EdPredictionTimeoutBulk

Sets the maximum duration of a single Einstein Discovery prediction when it runs in bulk to 10 milliseconds.

EdPredictionTimeoutByomBulk

Sets the maximum duration of a single Bring Your Own Model (BYOM) Einstein Discovery prediction to 100 milliseconds.

EducationCloud: <value>

Enables use of Education Cloud.

Einstein1AIPlatform

Provides access to Einstein generative AI features such as Agentforce, Prompt Builder, Model Builder, and the Models API. To use generative AI features, you must also include einsteinGptSettings > enableEinsteinGptPlatform in the settings section of your scratch org definition file.

EinsteinAnalyticsPlus

Provides one CRM Analytics Plus license for the CRM Analytics platform.

EinsteinArticleRecommendations

Provides licenses for Einstein Article Recommendations. Einstein Article Recommendations uses data from past cases to identify Knowledge articles that are most likely to help your customer service agents address customer inquiries.

EinsteinBuilderFree

Provides a license that allows admins to create one enabled prediction with Einstein Prediction Builder. Einstein Prediction Builder is custom AI for admins

EinsteinDocReader

Provides the license required to enable and use Intelligent Form Reader in a scratch org. Intelligent Form Reader uses optical character recognition to automatically extract data with Amazon Textract.

EinsteinRecommendationBuilder

Provides a license to create recommendations with Einstein Recommendation Builder. Einstein Recommendation Builder lets you build custom AI recommendations.

EinsteinSalesRepFdbk

Enables the Agentforce Sales Coach feature in an org. This scratch org feature also includes a large number of Einstein for Sales Generative AI features.

EinsteinSearch

Provides the license required to use and enable Einstein Search features in a scratch org.

EinsteinVisits

Enables Consumer Goods Cloud. With Consumer Goods cloud, transform the way you collaborate with your retail channel partners. Empower your sales managers to plan visits and analyze your business's health across stores. Also, allow your field reps to track inventory, take orders, and capture visit details using the Retail Execution mobile app.

EinsteinVisitsED

Enables Einstein Discovery, which can be used to get store visit recommendations. With Einstein Visits ED, you can create a visit frequency strategy that allows Einstein to provide optimal store visit recommendations.

EmbeddedLoginForIE

Provides JavaScript files that support Embedded Login in IE11.

EmpPublishRateLimit:<value>

Increases the maximum number of standard-volume platform event notifications published per hour. Indicate a value between 1,000–10,000.

EnablePRM

Enables the partner relationship management permissions for the org.

EnableManageIdConfUI

Enables access to the LoginIP and ClientBrowser API objects to verify a user's identity in the UI.

Enablement

Enables features for creating, taking, and tracking sales programs with Enablement. Business operations experts and sales leaders identify the revenue outcomes they want sales reps to achieve, such as increased average deal sizes or shorter ramp times. Then, they create programs that help sales reps work towards those outcomes as part of their daily work.

EnableSetPasswordInApi

Enables you to use `sf org generate password` to change a password without providing the old password.

EncryptionStatisticsInterval:<value>

Defines the interval (in seconds) between encryption statistics gathering processes. The maximum value is 604,800 seconds (7 days). The default is once per 86,400 seconds (24 hours).

EncryptionSyncInterval:<value>

Defines how frequently (in seconds) the org can synchronize data with the active key material. The default and maximum value is 604,800 seconds (7 days). To synchronize data more frequently, indicate a value, in seconds, equal to or larger than 0.

EnergyAndUtilitiesCloud

Enables the Energy and Utilities Cloud features in the org.

Entitlements

Enables entitlements. Entitlements are units of customer support in Salesforce, such as phone support or web support that represent terms in service agreements.

ERMAnalytics

Enables the ERM Analytics org perm in your scratch org.

EventLogFile

Enables API access to your org's event log files. The event log files contain information about your org's operational events that you can use to analyze usage trends and user behavior.

EntityTranslation

Enables translation of field data for Work Type Group, Service Territory, and Service Resource objects.

ExcludeSAMLSessionIndex

Excludes Session Index in SAML sign-on (SSO) and single logout (SLO) flows.

Explainability

Enables an org to use Decision Explainer features.

ExpressionSetMaxExecPerHour

Enables an org to run a maximum of 500,000 expression sets per hour by using Connect REST API.

ExternalIdentityLogin

Allows the scratch org to use Salesforce Customer Identity features associated with your External Identity license.

FieldAuditTrail

Enables Field Audit Trail for the org and allows a total 60 tracked fields. By default, 20 fields are tracked for all orgs, and 40 more are tracked with Field Audit Trail.

FieldService:<value>

Provides the Field Service license. Indicate a value between 1–25.

FieldServiceAppointmentAssistantUser:<value>

Adds the Field Service Appointment Assistant permission set license. Indicate a value between 1–25.

FieldServiceDispatcherUser:<value>

Adds the Field Service Dispatcher permission set license. Indicate a value between 1–25.

FieldServiceLastMileUser:<value>

Adds the Field Service Last Mile permission set license. Indicate a value between 1–25.

FieldServiceMobileExtension

Adds the Field Service Mobile Extension permission set license.

FieldServiceMobileUser:<value>

Adds the Field Service Mobile permission set license. Indicate a value between 1–25.

FieldServiceSchedulingUser:<value>

Adds the Field Service Scheduling permission set license. Indicate a value between 1–25.

FinanceLogging

Adds Finance Logging objects to a scratch org. This feature is required for Finance Logging.

FinancialServicesCommunityUser:<value>

Adds the Financial Services Insurance Community permission set license, and enables access to Financial Services insurance community components and objects. Indicate a value between 1–10.

FinancialServicesInsuranceUser

Adds the Financial Services Insurance permission set license, and enables access to Financial Services insurance components and objects.

FinancialServicesUser:<value>

Adds the Financial Services Cloud Standard permission set license. This permission set enables access to Lightning components and the standard version of Financial Services Cloud. Also provides access to the standard Salesforce objects and custom Financial Services Cloud objects. Indicate a value between 1–10.

FlowSites

Enables the use of flows in Salesforce Sites and customer portals.

ForceComPlatform

Adds one Salesforce Platform user license.

ForecastEnableCustomField

Enables custom currency and customer number fields for use as measures in forecasts based on opportunities.

FSCAlertFramework

Makes Financial Services Cloud Record Alert entities accessible in the scratch org.

FSCServiceProcess

Enables the Service Process Studio feature of Financial Service Cloud. Provides 10 seats each of the IndustriesServiceExcellenceAddOn and FinancialServicesCloudStardardAddOn licenses. To enable the feature, you must also turn on the StandardServiceProcess setting in Setup and grant users the AccessToServiceProcess permission.

Fundraising

Gives users access to Nonprofit Cloud for Fundraising features and objects in Salesforce.

GenericStreaming

Enables Generic Streaming API for API version 36.0 and earlier.

GenStreamingEventsPerDay:<value>

Increases the maximum number of delivered event notifications within a 24-hour period, shared by all CometD clients, with generic streaming for API version 36.0 and earlier. Indicate a value between 10,000–50,000.

Grantmaking

Gives users access to Grantmaking features and objects in Salesforce and Experience Cloud.

GuidanceHubAllowed

Enables the Guidance Center panel in Lightning Experience. The Guidance Center shows suggested and assigned content in the user's flow of work. Suggested content is related to the app or page where the user is working. Assigned content includes guidance sets for Salesforce admins, links or Trailhead modules assigned to users with Learning Paths, and Enablement programs for sales reps.

HealthCloudAddOn

Enables use of Health Cloud.

HealthCloudEOLOverride

Salesforce retired the Health Cloud CandidatePatient object in Spring '22 to focus on the more robust Lead object. This scratch org feature allows you to override that retirement and access the object.

HealthCloudForCmty

Enables use of Health Cloud for Experience Cloud Sites.

HealthCloudMedicationReconciliation

Allows Medication Management to support Medication Reconciliation.

HealthCloudPNMAddOn

Enables use of Provider Network Management.

HealthCloudUser

This enables the scratch org to use the Health Cloud objects and features equivalent to the Health Cloud permission set license for one user.

HighVelocitySales

Provides Sales Engagement licenses and enables Salesforce Inbox. Sales Engagement optimizes the inside sales process with a high-productivity workspace. Sales managers can create custom sales processes that guide reps through handling different types of prospects. And sales reps can rapidly handle prospects with a prioritized list and other productivity-boosting features. The Sales Engagement feature can be deployed in scratch orgs, but the settings for the feature can't be updated through the scratch org definition file. Instead, configure settings directly in the Sales Engagement app.

HighVolumePlatformEventAddOn

Increases the daily delivery allocation of high-volume platform events or change data capture events by 100,000 events. This scratch org feature simulates the purchase of an add-on. If the org has the `HighVolumePlatformEventAddOn`, the daily allocation is flexible and isn't enforced strictly to allow for usage peaks.

HLSAnalytics

Enables the HLS Analytics org perm in scratch orgs.

HoursBetweenCoverageJob:<value>

The frequency in hours when the sharing inheritance coverage report can be run for an object. Indicate a value between 1–24.

IdentityProvisioningFeatures

Enables use of Salesforce Identity User Provisioning.

IgnoreQueryParamWhitelist

Ignores allowlisting rules for query parameter filter rules. If enabled, you can add any query parameter to the URL.

IndustriesActionPlan

Provides a license for Action Plans. Action Plans allow you to define the tasks or document checklist items for completing a business process.

IndustriesBranchManagement

Branch Management lets branch managers and administrators track the work output of branches, employees, and customer segments in Financial Services Cloud.

IndustriesCompliantDataSharing

Grants users access to participant management and advanced configuration for data sharing to improve compliance with regulations and company policies.

IndustriesMfgAdvncdAccFrcs

Enables Advanced Account Forecasting. With Advanced Account Forecasting, generate comprehensive, multi-horizon forecasts for sales, operations, inventory, service, and other aspects of your business. Tailor your forecasting configurations to your objectives to generate accurate, relevant forecasts.

IndustriesMfgPartnerVisitMgmt

Enables Partner Visit Management. Partner Visit Management helps sales managers in your company schedule visits to partner and distributor locations. Sales managers can use those visits to monitor performance, arrange for periodic check-ins, conduct trainings, upsell and cross-sell products, and follow up on sales agreement renewals and warranty expiration.

IndustriesMfgProgram

Enables Program Based Business. With Program Based Business, program managers can manage the end-to-end lifecycle of a program where they derive forecasts based on their customers' forecasts, transform these forecasts into business opportunities, and convert those opportunities into run-rate business. Program based business is common across multiple industries such as process, aerospace, defense, automotive, engineer-to-order, and make-to-order environments.

IndustriesMfgRebates

Enables Rebate Management. Manage incentive programs, track rebate attainment, automate payouts, and gain insights into sales performance and program effectiveness.

IndustriesMfgTargets

Enables Sales Agreements. With Sales Agreements, you can negotiate purchase and sale of products over a continued period. You can also get insights into products, prices, discounts, and quantities. And you can track your planned and actual quantities and revenues with real-time updates from orders and contracts.

IndustriesManufacturingCmty

Provides the Manufacturing Sales Agreement for the Community permission set license, which is intended for the usage of partner community users. It also provides access to the Manufacturing community template for admins users to create communities.

IndustriesMfgAccountForecast

Enables Account Forecast. With Account Forecast, you can generate forecasts for your accounts based on orders, opportunities, and sales agreements. You can also create formulas to calculate your forecasts per the requirements of your company.

InsightsPlatform

Enables the CRM Analytics Plus license for CRM Analytics.

InsuranceCalculationUser

Enables the calculation feature of Insurance. Provides 10 seats each of the BRERuntimeAddOn and OmniStudioRuntime licenses. Also, provides one seat each of the OmniStudio and BREPlatformAccess licenses.

InsuranceClaimMgmt

Enables claim management features. Provides one seat of the InsuranceClaimMgmtAddOn license.

InsurancePolicyAdmin

Enables policy administration features. Provides one seat of the InsurancePolicyAdministrationAddOn license.

IntelligentDocumentReader

Provides the license required to enable and use Intelligent Document Reader in a scratch org. Intelligent Document Reader uses optical character recognition to automatically extract data with Amazon Textract by using your AWS account.

InvestigativeCaseManagement

Enables the objects, features, and permissions for managing investigative cases, including evidence management and case proceedings, in Public Sector Solutions.

InvoiceManagement

Enables access to all the Billing features and objects that are available with the Revenue Cloud Advanced license in the scratch org.

Interaction

Enables flows. A flow is the part of Salesforce Flow that collects data and performs actions in your Salesforce org or an external system. Salesforce Flow provides two types of flows: screen flows and autolaunched flows.

IoT

Enables IoT so the scratch org can consume platform events to perform business and service workflows using orchestrations and contexts.

JigsawUser

Provides one license to Jigsaw features.

Knowledge

Enables Salesforce Knowledge and gives your website visitors, clients, partners, and service agents the ultimate support tool. Create and manage a knowledge base with your company information, and securely share it when and where it's needed. Build a knowledge base of articles that can include information on process, like how to reset your product to its defaults, or frequently asked questions.

LegacyLiveAgentRouting

Enables legacy Live Agent routing for Chat. Use Live Agent routing to chat in Salesforce Classic. Chats in Lightning Experience must be routed using Omni-Channel.

LightningSalesConsole

Adds one Lighting Sales Console user license.

LightningScheduler

Enables Lightning Scheduler. Lightning Scheduler gives you tools to simplify appointment scheduling in Salesforce. Create a personalized experience by scheduling customer appointments—in person, by phone, or by video—with the right person at the right place and time.

LightningServiceConsole

Assigns the Lightning Service Console License to your scratch org so you can use the Lightning Service Console and access features that help manage cases faster.

LiveAgent

Enables Chat for Service Cloud. Use web-based chat to quickly connect customers to agents for real-time support.

LiveMessage

Enables Messaging for Service Cloud. Use Messaging to quickly support customers using apps such as SMS text messaging and Facebook Messenger.

LongLayoutSectionTitles

Allows page layout section titles to be up to 80 characters.

LoyaltyAnalytics

Enables Analytics for Loyalty license. The Analytics for Loyalty app gives you actionable insights into your loyalty programs.

LoyaltyEngine

Enables Loyalty Management Promotion Setup license. Promotion setup allows loyalty program managers to create loyalty program processes. Loyalty program processes help you decide how incoming and new Accrual and Redemption-type transactions are processed.

LoyaltyManagementStarter

Enables the Loyalty Management - Starter license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

LoyaltyMaximumPartners:<value>

Increases the number of loyalty program partners that can be associated with a loyalty program in an org where the Loyalty Management - Starter license is enabled. The default and maximum value is 1.

LoyaltyMaximumPrograms:<value>

Increases the number of loyalty programs that can be created in an org where the Loyalty Management - Starter license is enabled. The default and maximum value is 1.

LoyaltyMaxOrderLinePerHour:<value>

Increases the number of order lines that can be cumulatively processed per hour by loyalty program processes. Indicate a value between 1–3,500,000.

LoyaltyMaxProcExecPerHour:<value>

Increases the number of transaction journals that can be processed by loyalty program processes per hour. Indicate a value between 1–500,000.

LoyaltyMaxTransactions:<value>

Increases the number of Transaction Journal records that can be processed. Indicate a value between 1–50,000,000.

LoyaltyMaxTrxnJournals:<value>

Increases the number of Transaction Journal records that can be stored in an org that has the Loyalty Management - Start license enabled.

Macros

Enables macros in your scratch org. After enabling macros, add the macro browser to the Lightning Console so you can configure predefined instructions for commonly used actions and apply them to multiple posts at the same time.

MarketingCloud

Provides licenses for Marketing Cloud Growth edition. These licenses provide access to campaigns, flows, emails, forms, landing pages, and consent management features. You can send up to 20 emails per day from a scratch org.

MarketingUser

Provides access to the Campaigns object. Without this setting, Campaigns are read-only.

MaterialityAssessment

Provides the permission set licenses and permission sets required to configure materiality assessment in Net Zero Cloud.

MaxActiveDPEDefs:<value>

Increases the number of Data Processing Engine definitions that can be activated in the org. Indicate a value between 1–50.

MaxApexCodeSize:<value>

Limits the non-test, unmanaged Apex code size (in MB). To use a value greater than the default value of 10, contact Salesforce Customer Support.

MaxAudTypeCriterionPerAud

Limits the number of audience type criteria available per audience. The default value is 10.

MaxCustomLabels:<value>

Limits the number of custom labels (measured in thousands). Setting the limit to 10 enables the scratch org to have 10,000 custom labels. Indicate a value between 1–15.

MaxDatasetLinksPerDT:<value>

Increases the number of dataset links that can be associated with a decision table. Indicate a value between 1–3.

MaxDataSourcesPerDPE:<value>

Increases the number of Source Object nodes a Data Processing Engine definition can contain. Indicate a value between 1–50.

MaxDecisionTableAllowed:<value>

Increases the number of decision tables rules that can be created in the org. Indicate a value between 1–30.

MaxFavoritesAllowed:<value>

Increases the number of Favorites allowed. Favorites allow users to create a shortcut to a Salesforce Page. Users can view their Favorites by clicking the Favorites list dropdown in the header. Indicate a value between 0–200.

MaxFieldsPerNode:<value>

Increases the number of fields a node in a Data Processing Engine definition can contain. Indicate a value between 1–500.

MaxInputColumnsPerDT:<value>

Increases the number of input fields a decision table can contain. Indicate a value between 1–10.

MaxLoyaltyProcessRules:<value>

Increases the number of loyalty program process rules that can be created in the org. Indicate a value between 1–20.

MaxNodesPerDPE:<value>

Increases the number of nodes that a Data Processing Engine definition can contain. Indicate a value between 1–500.

MaxNoOfLexThemesAllowed:<value>

Increases the number of Themes allowed. Themes allow users to configure colors, fonts, images, sizes, and more. Access the list of Themes in Setup, under Themes and Branding. Indicate a value between 0–300.

MaxOutputColumnsPerDT:<value>

Increases the number of output fields a decision table can contain. Indicate a value between 1–5.

MaxSourceObjectPerDSL:<value>

Increases the number of source objects that can be selected in a dataset link of a decision table. Indicate a value between 1–5.

MaxStreamingTopics:<value>

Increases the maximum number of delivered PushTopic event notifications within a 24-hour period, shared by all CometD clients. Indicate a value between 40–100.

MaxUserNavItemsAllowed:<value>

Increases the number of navigation items a user can add to the navigation bar. Indicate a value between 0–500.

MaxUserStreamingChannels:<value>

Increases the maximum number of user-defined channels for generic streaming. Indicate a value between 20–1,000.

MaxWishlistsItemsPerWishlist

Limits the number of wishlist items per wishlist. The default value is 500.

MaxWishlistsPerStoreAccUsr

Limits the number of wishlists allowed per store, account, and user. The default value is 100.

MaxWritebacksPerDPE:<value>

Increases the number of Writeback Object nodes a Data Processing Engine definition can contain. Indicate a value between 1–50.

MedVisDescriptorLimit:<value>

Increases the number of sharing definitions allowed per record for sharing inheritance to be applied to an object. Indicate a value between 150–1,600.

MinKeyRotationInterval

Sets the encryption key material rotation interval at once per 60 seconds. If this feature isn't specified, the rotation interval defaults to once per 604,800 seconds (7 days) for Search Index key material, and once per 86,400 seconds (24 hours) for all other key material.

MobileExtMaxFileSizeMB:<value>

Increases the file size (in megabytes) for Field Service Mobile extensions. Indicate a value between 1–2,000.

MobileSecurity

Enables Enhanced Mobile Security. With Enhanced Mobile Security, you can control a range of policies to create a security solution tailored to your org's needs. You can limit user access based on operating system versions, app versions, and device and network security. You can also specify the severity of a violation.

MobileVoiceAndLLM

Allows mobile apps to download large language models (LLMs) and voice models for offline use from the model store service. Normally, mobile apps have access to the model store service when Einstein is enabled, but the MobileVoiceAndLLM scratch org feature enables offline voice without requiring orgs to fully enable Einstein.

MultiLevelMasterDetail

Allows the creation a special type of parent-child relationship between one object, the child, or detail, and another object, the parent, or master.

MutualAuthentication

Requires client certificates to verify inbound requests for mutual authentication.

MyTrailhead

Enables access to a myTrailhead enablement site in a scratch org.

NonprofitCloudCaseManagementUser

Provides the permission set license required to use and configure the Salesforce.org Nonprofit Cloud Case Management managed package. You can then install the package in the scratch org.

NumPlatformEvents:<value>

Increases the maximum number of platform event definitions that can be created. Indicate a value between 5–20.

ObjectLinking

Create rules to quickly link channel interactions to objects such as contacts, leads, or person accounts for customers (Beta).

OmnistudioMetadata

Enables Omnistudio metadata API. Using this API, customers can deploy and retrieve Omnistudio components programmatically.

OmnistudioRuntime

Enables business users to execute OmniScripts, DataMappers, FlexCards, and so on in the employee facing applications.

OmnistudioDesigner

Enables administrator or developer to create new OmniScripts/ DataMappers / Integration Procedures instances.

OrderManagement

Provides the Salesforce Order Management license. Order Management is your central hub for handling all aspects of the order lifecycle, including order capture, fulfillment, shipping, payment processing, and servicing.

OrderSaveLogicEnabled

Enables scratch org support for New Order Save Behavior. OrderSaveLogicEnabled supports only New Order Save Behavior. If your scratch org needs both Old and New Order Save Behavior, use OrderSaveBehaviorBoth.

OrderSaveBehaviorBoth

Enables scratch org support for both New Order Save Behavior and Old Order Save Behavior.

OutboundMessageHTTPSession

Enables using HTTP endpoint URLs in outbound message definitions that have the Send Session ID option selected.

OutcomeManagement

Gives users access to Outcome Management features and objects in Salesforce and Experience Cloud.

PardotScFeaturesCampaignInfluence

Enables additional campaign influence models, first touch, last touch, and even distribution for Pardot users.

PersonAccounts

Enables person accounts in your scratch org.

PipelineInspection

Enables Pipeline Inspection. Pipeline Inspection is a consolidated pipeline view with metrics, opportunities, and highlights of recent changes.

PlatformCache

Enables Platform Cache and allocates a 3 MB cache. The Lightning Platform Cache layer provides faster performance and better reliability when caching Salesforce session and org data.

PlatformConnect:<value>

Enables Salesforce Connect and allows your users to view, search, and modify data that's stored outside your Salesforce org. Indicate a value from 1–5.

PlatformEncryption

Shield Platform Encryption encrypts data at rest. You can manage key material and encrypt fields, files, and other data.

PlatformEventsPerDay:<value>

Increases the maximum number of delivered standard-volume platform event notifications within a 24-hour period, shared by all CometD clients. Indicate a value between 10,000–50,000.

ProcessBuilder

Enables Process Builder, a Salesforce Flow tool that helps you automate your business processes.

ProductsAndSchedules

Enables product schedules in your scratch org. Enabling this feature lets you create default product schedules on products. Users can also create schedules for individual products on opportunities.

ProductCatalogManagementAddOn

Enables read-write access to Product Catalog Management features and objects.

ProductCatalogManagementViewerAddOn

Enables read access to Product Catalog Management features and objects.

ProductCatalogManagementPCAddOn

Enables read access to Product Catalog Management features and objects for Partner Community Users in scratch orgs.

ProgramManagement

Enables access to all Program Management and Case Management features and objects.

ProviderFreePlatformCache

Provides 3 MB of free Platform Cache capacity for security-reviewed managed packages. This feature is made available through a capacity type called Provider Free capacity and is automatically enabled in Developer Edition orgs. Allocate the Provider Free capacity to a Platform Cache partition and add it to your managed package.

ProviderManagement

Enables the objects, features, and permissions for managing provider networks, care plans, and service delivery in Public Sector Solutions.

PSSAssetManagement

Enables the objects, features, and permissions for managing assets in Public Sector Solutions.

PublicSectorAccess

Enables access to all Public Sector features and objects.

PublicSectorApplicationUsageCreditsAddOn

Enables additional usage of Public Sector applications based on their pricing.

PublicSectorSiteTemplate

Allows Public Sector users access to build an Experience Cloud site from the templates available.

RateManagement

Enables Rate Management that allows you to set, manage, and optimize rates for usage-based products.

RecordTypes

Enables Record Type functionality. Record Types let you offer different business processes, picklist values, and page layouts to different users.

RefreshOnInvalidSession

Enables automatic refreshes of Lightning pages when the user's session is invalid. If, however, the page detects a new token, it tries to set that token and continue without a refresh.

RevSubscriptionManagement

Enables Subscription Management. Subscription Management is an API-first, product-to-cash solution for B2B subscriptions and one-time sales.

S1ClientComponentCacheSize

Allows the org to have up to 5 pages of caching for Lightning Components.

SalesCloudEinstein

Enables Sales Cloud Einstein features and Salesforce Inbox. Sales Cloud Einstein brings AI to every step of the sales process.

SalesforceContentUser

Enables access to Salesforce content features.

SalesforceFeedbackManagementStarter

Provides a license to use the Salesforce Feedback Management - Starter features.

SalesforceHostedMCP

Enables hosted MCP servers on the scratch org. With this scratch org feature parameter, MCP clients can connect to available hosted MCP servers.

SalesforceIdentityForCommunities

Adds Salesforce Identity components, including login and self-registration, to Experience Builder. This feature is required for Aura components.

SalesforcePricing

Enables Salesforce Pricing, which allows you to set, manage, and optimize prices across your entire product portfolio

SalesUser

Provides a license for Sales Cloud features.

SAML20SingleLogout

Enables usage of SAML 2.0 single logout.

SCIMProtocol

Enables access support for the SCIM protocol base API.

ScvMultipartyAndConsult

Enables you to set up and test multiparty calls and consult calls for Service Cloud Voice with Partner Telephony.

SecurityEventEnabled

Enables access to security events in Event Monitoring.

SentimentInsightsFeature

Provides the license required to enable and use Sentiment Insights in a scratch org. Use Sentiment Insights to analyze the sentiment of your customers and get actionable insights to improve it.

ServiceCatalog

Enables Employee Service Catalog so you can create a catalog of products and services for your employees. It can also turn your employees' requests for these products and services into approved and documented orders.

ServiceCloud

Assigns the Service Cloud license to your scratch org, so you can choose how your customers can reach you, such as by email, phone, social media, online communities, chat, and text.

ServiceCloudVoicePartnerTelephony

Assigns the Service Cloud Voice with Partner Telephony add-on license to your scratch org, so you can set up a Service Cloud Voice contact center that integrates with supported telephony providers. Indicate a value from 1–50.

ServiceUser

Adds one Service Cloud User license, and allows access to Service Cloud features.

SessionIdInLogEnabled

Enables Apex debug logs to include session IDs. If disabled, session IDs are replaced with "SESSION_ID_REMOVED" in debug logs.

SFDOInsightsDataIntegrityUser

Provides a license to Salesforce.org Insights Platform Data Integrity managed package. You can then install the package in the scratch org.

SharedActivities

Allow users to relate multiple contacts to tasks and events.

Sites

Enables Salesforce Sites, which allows you to create public websites and applications that are directly integrated with your Salesforce org. Users aren't required to log in with a username and password.

SocialCustomerService

Enables Social Customer Service, sets post defaults, and either activates the Starter Pack or signs into your Social Studio account.

StateAndCountryPicklist

Enables state and country/territory picklists. State and country/territory picklists let users select states and countries from predefined, standardized lists, instead of entering state, country, and territory data into text fields.

StreamingAPI

Enables Streaming API.

StreamingEventsPerDay:<value>

Increases the maximum number of delivered PushTopic event notifications within a 24-hour period, shared by all CometD clients (API version 36.0 and earlier). Indicate a value between 10,000–50,000.

SubPerStreamingChannel:<value>

Increases the maximum number of concurrent clients (subscribers) per generic streaming channel (API version 36.0 and earlier). Indicate a value between 20–4,000.

SubPerStreamingTopic:<value>

Increases the maximum number of concurrent clients (subscribers) per PushTopic streaming channel (API version 36.0 and earlier). Indicate a value between 20–4,000.

SurveyAdvancedFeatures

Enables a license for the features available with the Salesforce Feedback Management - Growth license.

SustainabilityCloud

Provides the permission set licenses and permission sets required to install and configure Sustainability Cloud. To enable or use CRM Analytics and CRM Analytics templates, include the DevelopmentWave scratch org feature.

SustainabilityApp

Provides the permission set licenses and permission sets required to configure Net Zero Cloud. To enable or use Tableau CRM and Tableau CRM templates, include the DevelopmentWave scratch org feature.

TalentRecruitmentManagement

Enables the objects, features, and permissions for managing the talent recruitment and hiring process in Public Sector Solutions.

TCRMforSustainability

Enables all permissions required to manage the Net Zero Analytics app by enabling Tableau CRM. You can create and share the analytics app for your users to bring your environmental accounting in line with your financial accounting.

TimelineConditionsLimit

Limits the number of timeline record display conditions per event type to 3.

TimelineEventLimit

Limits the number of event types displayed on a timeline to 5.

TimelineRecordTypeLimit

Limits the number of related object record types per event type to 3.

TimeSheetTemplateSettings

Time Sheet Templates let you configure settings to create time sheets automatically. For example, you can create a template that sets start and end dates. Assign templates to user profiles so that time sheets are created for the right users.

TransactionFinalizers

Enables you to implement and attach Apex Finalizers to Queueable Apex jobs.

UsageManagement

Enables Usage Management. Using Usage Management, you can setup, track, and manage the consumption of usage-based products.

VolunteerManagement

Gives users access to Volunteer Management features and objects in Salesforce.

WaveMaxCurrency

Increases the maximum number of supported currencies for CRM Analytics. Indicate a value between 1–5.

WavePlatform

Enables the Wave Platform license.

Workflow

Enables Workflow so you can automate standard internal procedures and processes.

WorkflowFlowActionFeature

Allows you to launch a flow from a workflow action.

WorkplaceCommandCenterUser

Enables access to Workplace Command Center features including access to objects such as Employee, Crisis, and EmployeeCrisisAssessment.

WorkThanksPref

Enables the give thanks feature in Chatter.

AccountInspection

Enables the Account Intelligence view. The Account Intelligence view is a consolidated dashboard showing account metrics, activities, and related opportunities and cases.

AccountingSubledgerGrowthEdition

Provides three permission sets that enable access to Accounting Subledger Growth features.

More Information

Requires that you also include the DataProcessingEngine scratch org feature in your scratch org definition file. Requires that you enable Data Pipelines. Requires configuration using the Setup menu in the scratch org. See Accounting Subledger in Salesforce Help.

AccountingSubledgerStarterEdition

Provides three permission sets that enable access to Accounting Subledger Starter features.

More Information

Requires that you also include the DataProcessingEngine scratch org feature in your scratch org definition file. Requires that you enable Data Pipelines. Requires configuration using the Setup menu in the scratch org. See Accounting Subledger in Salesforce Help.

AccountingSubledgerUser

Enables organization-wide access to Accounting Subledger Growth features when the package is installed.

More Information

Requires that you install the Accounting Subledger or Accounting Subledger for Industries managed package. If you install the Accounting Subledger package, also set up the Opportunity object. See Accounting Subledger Legacy Documentation in Salesforce Help.

AddCustomApps:<value>

Increases the maximum number of custom apps allowed in an org. Indicate a value from 1–30.

Supported Quantities

1–30, Multiplier: 1

AddCustomObjects:<value>

Increases the maximum number of custom objects allowed in the org. Indicate a value from 1–30.

Supported Quantities

1–30, Multiplier: 1

AddCustomRelationships:<value>

Increases the maximum number of custom relationships allowed on an object. Indicate a value from 1–10.

Supported Quantities

1–10, Multiplier: 5

AddCustomTabs:<value>

Increases the maximum number of custom tabs allowed in an org. Indicate a value from 1–30.

Supported Quantities

1–30, Multiplier: 1

AddDataComCRMRecordCredit:<value>

Increases record import credits assigned to a user in your scratch org. Indicate a value from 1–30.

Supported Quantities

1–30, Multiplier: 1

AddInsightsQueryLimit:<value>

Increases the size of your CRM Analytics query results. Indicate a value from 1–30 (multiplier is 10). Setting the quantity to 6 increases the query results to 60.

Supported Quantities

1–30, Multiplier: 10

AdditionalFieldHistory:<value>

Increases the number of fields you can track history for beyond the default, which is 20 fields. Indicate a value between 1–40.

Supported Quantities

1–40, Multiplier: 1

More Information

Previous name: AddHistoryFieldsPerEntity.

AdmissionsConnectUser

Enables the Admissions Connect components. Without this scratch org feature parameter, the custom Admissions Connect components render as blank.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "Omega - Dev Org",
  "edition": "Partner Developer",
  "hasSampleData": "true",
  "features": [
    "DevelopmentWave",
    "AdmissionsConnectUser",
    "Communities",
    "OmniStudioDesigner",
    "OmniStudioRuntime"
  ],
  "settings": {
      "lightningExperienceSettings": {
          "enableS1DesktopEnabled": true
      },
      "chatterSettings": {
          "enableChatter": true
      },
      "languageSettings": {
          "enableTranslationWorkbench": true
      },
      "enhancedNotesSettings": {
          "enableEnhancedNotes": true
      },
      "pathAssistantSettings": {
          "pathAssistantEnabled": true
      },
      "securitySettings": {
          "enableAdminLoginAsAnyUser":true
      },
      "userEngagementSettings": {
          "enableOrchestrationInSandbox": true,
          "enableOrgUserAssistEnabled": true,
          "enableShowSalesforceUserAssist": false
      },
      "experienceBundleSettings": {
          "enableExperienceBundleMetadata": true
```

```
      },
      "communitiesSettings": {
          "enableNetworksEnabled": true,
          "enableOotbProfExtUserOpsEnable": true
      },
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": false
      }
  }
}
```

More Information

Next, install the Admissions Connect package in the scratch org. For installation instructions, see Install Admissions Connect in Salesforce Help.

AdvisorLinkFeature

Enables the Student Success Hub components. Without this scratch org feature parameter, the custom Student Success Hub components render as blank.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "edition": "Partner Developer",
  "features": [
    "Communities",
    "FeatureParameterLicensing",
    "AdvisorLinkFeature"
  ],
  "orgName": "SAL - Dev Workspace",
  "hasSampleData": "true",
  "settings": {
    "chatterSettings": {
      "enableChatter": true
    },
    "communitiesSettings": {
      "enableNetworksEnabled": true,
      "enableOotbProfExtUserOpsEnable": true
    },
    "enhancedNotesSettings": {
      "enableEnhancedNotes": true
    },
    "experienceBundleSettings": {
      "enableExperienceBundleMetadata": true
    },
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
```

```
    },
    "languageSettings": {
      "enableTranslationWorkbench": true
    },
    "securitySettings": {
      "enableAdminLoginAsAnyUser": true
    }
  }
}
```

More Information

Next, install the Student Success Hub package in the scratch org. For setup instructions, see Install Student Success Hub in Salesforce Help.

AdvisorLinkPathwaysFeature

Enables the Pathways components. Without this scratch org feature parameter, the custom Pathways components render as blank.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "Pathways - Dev Org",
  "edition": "Partner Developer",
  "features": [
    "Communities",
    "FeatureParameterLicensing",
    "AdvisorLinkFeature",
    "AdvisorLinkPathwaysFeature"
  ],
  "settings": {
    "chatterSettings": {
      "enableChatter": true
    },
    "enhancedNotesSettings": {
      "enableEnhancedNotes": true
    },
    "communitiesSettings": {
      "enableNetworksEnabled": true
    },
    "languageSettings": {
      "enableTranslationWorkbench": true
    },
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
    }
  }
}
```

More Information

Next, install the Pathways package in the scratch org. For setup instructions, see Set Up Pathways in Salesforce Help.

AIAttribution

Provides access to Einstein Attribution for Marketing Cloud Account Engagement. Einstein Attribution uses AI modeling to dynamically assign attribution percentages to multiple campaign touchpoints.

Sample Scratch Org Definition File

Before enabling Einstein Attribution, make sure that `enableAIAttribution` and `enableCampaignInfluence2` are set to `true`.

```
{
  "orgName": "NTOutfitters",
  "edition": "Enterprise",
  "features": ["AIAttribution"],
  "settings": {
    "campaignSettings": {
        "enableAIAttribution": true
        "enableCampaignInfluence2": true

    }
}
```

More Information

This feature is available in Account Engagement Advanced and Premium editions.

Optional configuration steps are accessible in Setup in the scratch org. For more information, see *Salesforce Help*: Einstein Attribution.

AllUserIdServiceAccess

Enables all users to access all users' information via the user ID service.

More Information

The AllUserIdServiceAccess permission is off by default for all new and existing orgs. To turn on this feature, contact Salesforce Customer Support.

AnalyticsAdminPerms

Enables all permissions required to administer the CRM Analytics platform, including permissions to enable creating CRM Analytics templated apps and CRM Analytics Apps.

More Information

See Set Up the CRM Analytics Platform in Salesforce Help for more information.

AnalyticsAppEmbedded

Provides one CRM Analytics Embedded App license for the CRM Analytics platform.

ApexGuruCodeAnalyzer

Enables ApexGuru's generative AI-powered runtime insights in Salesforce Code Analyzer, which delivers Apex code quality recommendations directly in developer IDEs.

More Information

To improve developer accuracy and speed, use ApexGuru in Salesforce Code Analyzer to detect antipatterns using both static analysis and generative AI.

For more information about ApexGuru, see ApexGuru Insights in Salesforce Help.

API

Even in the editions (Professional, Group) that don't provide API access, REST API is enabled by default. Use this scratch org feature to access additional APIs (SOAP, Streaming, Bulk, Bulk 2.0).

More Information

See Salesforce editions with API access for more information.

ArcGraphCommunity

Lets you add Actionable Relationship Center (ARC) components to Experience Cloud pages so your users can view ARC Relationship Graphs.

More Information

Provides 1 seat of the FinancialServicesEALoginAddon add-on license.

Requires that you install Financial Services Cloud. See Customize Experience Cloud Templates using ARC Components in Financial Services Cloud Administrator Guide.

Assessments

Enables dynamic Assessments features, which enables both Assessment Questions and Assessment Question Sets.

More Information

Add these options to your scratch org feature definition file. For "edition," you can indicate any of the supported scratch org feature editions.

```
{
  "orgName": "Sample Org",
  "edition": "Developer",
  "features": ["Assessments"],
  "settings": {
```

```
    "industriesSettings": {
      "enableIndustriesAssessment": true,
      "enableDiscoveryFrameworkMetadata": true
    }
  }
}
```

Add the Assessment to the page layout. See Page Layouts in Salesforce Help for more information.

AssetScheduling:<value>

Enables Asset Scheduling license. Asset Scheduling makes it easier to book rooms and equipments. Indicate a value between 1–10.

Supported Quantities

1–10

More Information

See Enable Asset Scheduling in Salesforce Scheduler in Salesforce Help for more information.

AssociationEngine

Enables the Association Engine, which automatically associates new accounts with the user's current branch by creating branch unit customer records.

More Information

Provides 11 seats of the FSCComprehensivePsl user license and 11 seats of the FSCComprehensiveAddOn add-on license.

Requires that you install Financial Services Cloud. See AssociationEngineSettings in Metadata API Developer Guide.

AuthorApex

Enables you to access and modify Apex code in a scratch org. Enabled by default in Enterprise and Developer Editions.

More Information

For Group and Professional Edition orgs, this feature is disabled by default. Enabling the AuthorApex feature lets you edit and test your Apex classes.

B2BCommerce

Provides the B2B License. B2BCommerce enables business-to-business (B2B) commerce in your org. Create and update B2B stores. Create and manage buyer accounts. Sell products to other businesses.

More Information

Requires that you also include the Communities scratch org feature in your scratch org definition file to create a store using B2B Commerce. Not available in Professional, Partner Professional, Group, or Partner Group Edition orgs.

B2BLoyaltyManagement

Enables the B2B Loyalty Management license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

More Information

See Loyalty Management in Salesforce Help for more information.

B2CCommerceGMV

Provides the B2B2C Commerce License. B2B2C Commerce allows you to quickly stand up an ecommerce site to promote brands and sell products into multiple digital channels. You can create and update retail storefronts in your org, and create and manage person accounts.

More Information

Also requires the Communities feature in your scratch org definition file.

Not available in Professional, Partner Professional, Group, or Partner Group Edition orgs.

For more information, see Salesforce Help at Salesforce B2B Commerce and B2B2C Commerce..

B2CLoyaltyManagement

Enables the Loyalty Management - Growth license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

More Information

See Loyalty Management in Salesforce Help for more information.

B2CLoyaltyManagementPlus

Enables the Loyalty Management - Advanced license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

More Information

See Loyalty Management in Salesforce Help for more information.

BatchManagement

Enables the Batch Management license. Batch Management allows you to process a high volume of records in manageable batches.

More Information

See Batch Management in Salesforce Help for more information.

BenefitManagement

Enables the objects, features, and permissions for managing benefits programs, benefit disbursements, and benefit applicant tracking in Public Sector Solutions.

Sample Scratch Org Definition File

To enable BenefitManagement, add these features and settings to your scratch org definition file.

```
{
    "orgName": "BM Org",
    "edition": "Developer",
    "features": ["BenefitManagement:2"],
    "settings": {
    "lightningExperienceSettings": {
    "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
    "enableS1EncryptedStoragePref2": false
    },
    "IndustriesSettings": {
    "enableIndustriesAssessment": true,
    "enableDiscoveryFrameworkMetadata": true,
    "enableInteractionSummaryPref": true,
    "enableBenefitManagementPreference": true,
    "enableGroupMembershipPref": true,
    "enableCaseReferralPref": true
    },
    "OmniStudioSettings": {
    "enableOmniStudioMetadata": false
    },
    "DocumentChecklistSettings": {
    "deleteDCIWithFiles": true
    }
    }
    }
```

BigObjectsBulkAPI

Enables the scratch org to use BigObjects in the Bulk API.

More Information

See Big Objects Implementation Guide for more information.

BillingAdvanced

Enables access to all the Billing features and objects that are available with the Revenue Cloud Billing license in the scratch org.

More Information

- Available in Enterprise, Unlimited, and Developer Edition scratch orgs.

- Provides 10 seats of BillingAdvancedAddOn add-on licenses.
- Enable Billing in Revenue Cloud and turn on Billing settings.
- Provides permission sets to access Billing features.
- See Manage Billing in Revenue Cloud for more information.

Scratch Org Definition File

To enable BillingAdvanced, add these settings to your scratch org definition file.

```
{
  "orgName": "<Org Name>",
  "adminEmail":"<Admin Email Address>"
  "edition": "<Edition Name>",
  "features": [
    "InvoiceManagement",
    "BillingAdvanced",
    "EnableSetPasswordInApi"
  ],
  "settings": {
    "billingSettings": {
      "enableBillingSetup": true
    },
   "lightningExperienceSettings": {
        "enableS1DesktopEnabled": true
      }
  }
}
```

Briefcase

Enables the use of Briefcase Builder in a scratch org, which allows you to create offline briefcases that make selected records available for viewing offline.

BudgetManagement

Gives users access to budget management features and objects. To enable budget management, add this feature to your scratch org definition file.

More Information

See Budget Management in Salesforce Help for more information.

BusinessRulesEngine

Enables Business Rules Engine, which enables both expression sets and lookup tables.

More Information

Provides 10 Business Rules Engine Designer and 10 Business Rules Engine Runtime licenses. For more information, see Business Rules Engine in Salesforce Help.

BYOCCaaS

Enables you to set up and test a partner contact center that integrates with supported Contact Center as a Service (CCaaS) providers in your scratch org.

More Information

This feature requires that you also include the `ServiceCloud` and `Scrt2Conversation` scratch org features in your scratch org definition file. You must also enable second-generation managed packaging to use this feature in a scratch org. Available in Salesforce Enterprise and Developer Editions.

For setup and configuration steps, see Bring Your Own Channel for CCaaS in Salesforce Help.

Sample Scratch Org Definition File

```
{
  "orgName": "BYO CCaaS Scratch Org",
  "edition": "Developer",
  "features": ["ServiceCloud", "Scrt2Conversation", "BYOCCaaS"
  "settings": {
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
     },
   "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
    }
  }
}
```

BYOOTT

Enables you to set up and test a Bring Your Own Channel for Messaging channel that integrates with supported Messaging providers in your scratch org.

More Information

This feature requires that you also include the `ServiceCloud` and `Scrt2Conversation` scratch org features in your scratch org definition file. You must also enable second-generation managed packaging to use this feature in a scratch org. Available in Salesforce Enterprise and Developer Editions.

For setup and configuration steps, see Bring Your Own Channel in Salesforce Help.

Sample Scratch Org Definition File

```
{
  "orgName": "BYOC Scratch Org",
  "edition": "Developer",
  "features": ["ServiceCloud", "Scrt2Conversation", "BYOOTT"
  "settings": {
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
     },
```

```
    "mobileSettings": {
       "enableS1EncryptedStoragePref2": false
     }
   }
}
```

CacheOnlyKeys

Enables the cache-only keys service. This feature allows you to store your key material outside of Salesforce, and have the Cache-Only Key Service fetch your key on demand from a key service that you control.

More Information

Requires enabling PlatformEncryption and configuration using the Setup menu in the scratch org. See Which User Permissions Does Shield Platform Encryption Require?, Generate a Tenant Secret with Salesforce, and Cache-Only Key Service in Salesforce Help.

CalloutSizeMB:<value>

Increases the maximum size of an Apex callout. Indicate a value between 3–12.

Supported Quantities

3–12, Multiplier: 1

CampaignInfluence2

Provides access to Customizable Campaign Influence for Sales Cloud and Marketing Cloud Account Engagement. Customizable Campaign Influence can auto-associate or allow manual creation of relationships among campaigns and opportunities to track attribution.

Sample Scratch Org Definition File

To enable Customizable Campaign Influence, set `enableCampaignInfluence2` to `true`.

```
{
  "orgName": "NTOutfitters",
  "edition": "Enterprise",
  "features": ["CampaignInfluence2"],
  "settings": {
    "campaignSettings": {
        "enableCampaignInfluence2": true

    }
}
```

More Information

This feature is available in Salesforce Enterprise, Performance, Unlimited, and Developer Editions.

Optional configuration steps are accessible in Setup in the scratch org. For more information, see *Salesforce Help*: Customizable Campaign Influence.

CascadeDelete

Provides lookup relationships with the same cascading delete functionality previously only available to master-detail relationships. To prevent records from being accidentally deleted, cascade-delete is disabled by default.

CaseClassification

Enables Einstein Case Classification. Case Classification offers recommendations to your agents so they can select the best value. You can also automatically save the best recommendation and route the case to the right agent.

CaseWrapUp

Enables Einstein Case Wrap-Up. To help agents complete cases quickly, Einstein Case Wrap-Up recommends case field values based on past chat transcripts.

More Information

Available in Enterprise Edition scratch orgs.

Requires configuration using the Setup menu in the scratch org.

See Set Up Einstein Classification Apps in Salesforce Help for more information.

CGAnalytics

Enables the Consumer Goods Analytics org perm in scratch orgs.

More Information

Provides 1 seat of the CGAnalyticsPlus add-on license.

ChangeDataCapture

Enables Change Data Capture, if the scratch org edition doesn't automatically enable it.

Chatbot

Enables deployment of Bot metadata into a scratch org, and allows you to create and edit bots.

More Information

To use this feature, turn on **Enable Einstein Features** in the Dev Hub org to accept the Terms of Service.

See Einstein Bots in Salesforce Help for more information.

ChatterEmailFooterLogo

ChatterEmailFooterLogo allows you to use the Document ID of a logo image, which you can use to customize chatter emails.

More Information

See Add Your Custom Brand to Email Notifications in Salesforce Help for more information.

ChatterEmailFooterText

ChatterEmailFooterText allows you to use footer text in customized Chatter emails.

More Information

See Add Your Custom Brand to Email Notifications in Salesforce Help for more information.

ChatterEmailSenderName

ChatterEmailSenderName allows you to customize the name that appears as the sender's name in the email notification. For example, your company's name.

More Information

See Chatter Email Settings and Branding in Salesforce Help for more information.

CloneApplication

CloneApplication allows you to clone an existing custom Lightning app and make required customizations to the new app. This way, you don't have to start from scratch, especially when you want to create apps with simple variations.

More Information

See Create Lightning Apps in Salesforce Help for more information.

CMSMaxContType

Limits the number of distinct content types you can create within Salesforce CMS to 21.

CMSMaxNodesPerContType

Limits the maximum number of child nodes (fields) you can create for a particular content type to 15.

CMSUnlimitedUse

Enables unlimited content records, content types, and bandwidth usage in Salesforce CMS.

Communities

Allows the org to create an Experience Cloud site. Experience Cloud uses the term Communities in its configuration. To use Communities, you must also include communitiesSettings > enableNetworksEnabled in the settings section of your scratch org definition file.

More Information

Available in Enterprise and Developer Edition scratch orgs.

CompareReportsOrgPerm

Enables the org permission to allow for comparison of Lightning Reports.

ConAppPluginExecuteAsUser

Enables the pluginExecutionUser field in the ConnectedApp Metadata API object.

ConcStreamingClients:<value>

Increases the maximum number of concurrent clients (subscribers) across all channels and for all event types for API version 36.0 and earlier. Indicate a value between 20–4,000.

Supported Quantities

20–4,000, Multiplier: 1

ConnectedAppCustomNotifSubscription

Enables connected apps to subscribe to custom notification types, which are used to send custom desktop and mobile notifications.

More Information

Sending custom notifications requires both CustomNotificationType to create notification types and ConnectedAppCustomNotifSubscription to subscribe to notification types. See Manage Your Notifications with Notification Builder in Salesforce Help for more information on custom notifications.

ConnectedAppToolingAPI

Enables the use of connected apps with the Tooling API.

ConsentEventStream

Enables the Consent Event Stream permission for the org.

More Information

See Use the Consent Event Stream in Salesforce Help for more information.

ConsolePersistenceInterval:<value>

Increases how often console data is saved, in minutes. Indicate a value between 0–500. To disable auto save, set the value to 0.

Supported Quantities

0–500, Multiplier: 1

ContactsToMultipleAccounts

Enables the contacts to multiple accounts feature. This feature lets you relate a contact to two or more accounts.

ContractApprovals

Enables contract approvals, which allow you to track contracts through an approval process.

ContractManagement

Enables the Contract Lifecycle (CLM) Management features in the org.

ContractMgmtInd

Enables the Contract Lifecycle Management (CLM) features for Industries.

CoreCpq

Enables read-write access to Revenue Cloud features and objects. To use Revenue Cloud, you must also include revenueManagementSettings > enableCoreCPQ in the settings section of your scratch org definition file.

More Information

- Available in Developer and Enterprise scratch org editions.
- Provides 10 RevenueLifecycleManagementAddOn add-on licenses.
- Provides permission sets for Context Service, Business Rules Engine, Document Generation, Omnistudio, Data Processing Engine, Product Catalog Management, Salesforce Pricing, Product Configurator, Transaction Management, Salesforce Contracts, Rate Management, Dynamic Revenue Orchestrator, and Billing.
- Displays the setup pages for Context Service, Business Rules Engine, Document Generation, Omnistudio, Data Processing Engine, Product Catalog Management, Salesforce Pricing, Revenue Settings (Product Configurator and Transaction Management), Contracts, Rate Management, Dynamic Revenue Orchestrator, and Billing.
- Requires configuration using the Setup menu in the scratch org. See Revenue Cloud.

Scratch Org Definition File

Add these options to your scratch org definition file.

```
{
"edition": "Enterprise",
"features": [
"BusinessRulesEngine",
"Communities",
"OrderSaveLogicEnabled",
"OrderManagement",
"OrderSaveBehaviorBoth",
```

```
"PartnerCommunity",
“CustomerCommunityPlus",
"ContextService",
"CoreCpq",
"SalesforcePricing",
"SalesforceConfiguratorEngine",
"UsageManagement",
"BillingAdvanced",
"DocGen",
"EnableSetPasswordInApi",
"ProductCatalogManagementPCAddOn"
],
"settings": {
"communitiesSettings": {
"enableNetworksEnabled": true
},
"customAddressFieldSettings": {
"enableCustomAddressField": true
},
"currencySettings": {
"enableMultiCurrency": true
},
"experienceBundleSettings": {
"enableExperienceBundleMetadata": true
},
"lightningExperienceSettings": {
"enableS1DesktopEnabled": true
},
"industriesContextSettings": {
"enableContextDefinitions": true
},
"opportunitySettings": {
"enableOpportunityTeam": true
},
"revenueManagementSettings": {
"enableCoreCPQ": true
},
"orderManagementSettings": {
"enableOrderManagement": true
},
"orderSettings": {
"enableOrders": true,
"enableEnhancedCommerceOrders": true,
"enableOrderEvents": true,
"enableOptionalPricebook": true,
"enableZeroQuantity": true,
"enableNegativeQuantity": true
},
"quoteSettings": {
"enableQuote": true,
"enableQuotesWithoutOppEnabled": true
},
"industriesPricingSettings": {
"enableSalesforcePricing": true
```

```
},
"industriesRatingSettings": {
"enableRating": true,
"enableRatingWaterfall": true,
"enableRatingWaterfallPersistence": true
},
"DynamicFulfillmentOrchestratorSettings": {
"enableDFOPref": true
}
},
  "orgName": "<your org name>",
  "adminEmail": "<your admin email>"
}
```

CPQ

Enables the licensed features required to install the Salesforce CPQ managed package but doesn't install the package automatically.

More Information

For additional information and configuration steps, see Manage Your Quotes with CPQ in Salesforce Help.

CustomerDataPlatform

Enables the CustomerDataPlatform license in scratch orgs.

Sample Scratch Org Definition File

```
{
  "orgName": "Acme",
  "edition": "Developer",
  "features": ["CustomerDataPlatform", "CustomerDataPlatformLite"],
  "settings": {
    "customerDataPlatformSettings" : {
      "enableCustomerDataPlatform" : true
    }
  }
}
```

More Information

To create scratch orgs that use Data Cloud, you must first log a case with Salesforce Partner Support. This feature can be enabled on your Partner Business Org (PBO) only. After it's enabled, you can create scratch orgs with Data Cloud features. .

See *Salesforce Help*: Feature Availability in Data Cloud and Customer Data Platform for a list of functionality available with the CustomerDataPlatform license.

CustomerDataPlatformLite

Enables the Data Cloud license in scratch orgs. You must also include the CustomerDataPlatform feature and enableCustomerDataPlatform Metadata API setting in your scratch org definition.

Sample Scratch Org Definition File

```
{
  "orgName": "Acme",
  "edition": "Developer",
  "features": ["CustomerDataPlatform", "CustomerDataPlatformLite"],
  "settings": {
    "customerDataPlatformSettings" : {
      "enableCustomerDataPlatform" : true
    }
  }
}
```

More Information

To create scratch orgs that use Data Cloud, you must first log a case with Salesforce Partner Support. This feature can be enabled on your Partner Business Org (PBO) only. After it's enabled, you can create scratch orgs with Data Cloud features.

See *Salesforce Help*: Feature Availability in Data Cloud and Customer Data Platform for a list of functionality available with the Data Cloud license.

CustomerExperienceAnalytics

Enables the Customer Lifecycle Analytics org perm in scratch orgs.

More Information

Provides 1 seat of the CustomerExperienceAnalyticsPlus add-on license.

CustomFieldDataTranslation

Enables translation of custom field data for Work Type Group, Service Territory, and Service Resource objects. You can enable data translation for custom fields with Text, Text Area, Text Area (Long), Text Area (Rich), and URL types.

More Information

Requires that you also include the EntityTranslation scratch org feature in your scratch org definition file. Not available in Professional, Partner Professional, Group, or Partner Group Edition orgs.

CustomNotificationType

Allows the org to create custom notification types, which are used to send custom desktop and mobile notifications.

More Information

Sending custom notifications requires both CustomNotificationType to create notification types and ConnectedAppCustomNotifSubscription to subscribe to notification types. See Manage Your Notifications with Notification Builder in Salesforce Help for more information on custom notifications.

DataComDnbAccounts

Provides a license to Data.com account features.

DataComFullClean

Provides a license to Data.com cleaning features, and allows users to turn on auto fill clean settings for jobs.

DataMaskUser

Provides 30 Data Mask permission set licenses. This permission set enables access to an installed Salesforce Data Mask package.

More Information

For additional installation and configuration steps, see Install the Managed Package in Salesforce Help.

DataProcessingEngine

Enables the Data Processing Engine license. Data Processing Engine helps transform data that's available in your Salesforce org and write back the transformation results as new or updated records.

More Information

See Data Processing Engine in Salesforce Help for more information.

DebugApex

Enables Apex Interactive Debugger. You can use it to debug Apex code by setting breakpoints and checkpoints, and inspecting your code to find bugs.

DecisionTable

Enables Decision Table license. Decision tables read business rules and decide the outcome for records in your Salesforce org or for the values that you specify.

More Information

See Decision Table in Salesforce Help for more information.

DefaultWorkflowUser

Sets the scratch org admin as the default workflow user.

DeferSharingCalc

Allows admins to suspend group membership and sharing rule calculations and to resume them later.

More Information

Requires configuration using the Setup menu in the scratch org. See Defer Sharing Calculations in Salesforce Help.

DevelopmentWave

Enables CRM Analytics development in a scratch org. It assigns five platform licenses and five CRM Analytics platform licenses to the org, along with assigning the permission set license to the admin user. It also enables the CRM Analytics Templates and Einstein Discovery features.

DeviceTrackingEnabled

Enables Device Tracking.

DevOpsCenter

Enables DevOps Center in scratch orgs so that partners can create second-generation managed packages that extend or enhance the functionality in the DevOps Center application (base) package.

Dev Hub Org

Ask a Salesforce admin to enable DevOps Center in the Dev Hub org. From Setup, enter *DevOps Center* in the Quick Find box, then select **DevOps Center**. You can create scratch orgs after the org preference is enabled.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
    "orgName": "Acme",
    "edition": "Enterprise",
    "features": ["DevOpsCenter"],
    "settings": {
        "devHubSettings": {
            "enableDevOpsCenterGA": true
            }
        }
    }
```

Scratch Org Definition File For Scratch Orgs Created from an Org Shape

If you create a scratch org based on an org shape with DevOps Center enabled, we still require that you add the DevOps Center feature and setting to the scratch org definition for legal reasons as part of the DevOps Center terms and conditions.

```
{
    "orgName": "Acme",
    "sourceOrg": "00DB1230400Ifx5",
    "features": ["DevOpsCenter"],
    "settings": {
        "devHubSettings": {
            "enableDevOpsCenterGA": true
            }
```

```
        }
    }
```

More Information

Salesforce Help: Build an Extension Package for DevOps Center

DisableManageIdConfAPI

Limits access to the LoginIP and ClientBrowser API objects to allow view or delete only.

DisclosureFramework

Provides the permission set licenses and permission sets required to configure Disclosure and Compliance Hub.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "dch org",
  "edition": "Developer",
  "features": ["DisclosureFramework"],
  "settings": {
    "industriesSettings":{
      "enableGnrcDisclsFrmwrk": true,
      "enableIndustriesAssessment" : true
    }
  }
}
```

More Information

For configuration steps, see Disclosure and Compliance Hub in the Set Up and Maintain Net Zero Cloud guide in Salesforce Help.

Division

Turns on the Manage Divisions feature under Company Settings. Divisions let you segment your organization's data into logical sections, making searches, reports, and list views more meaningful to users. Divisions are useful for organizations with extremely large amounts of data.

DocGen

Enables the Document Generation Feature in the Org.

DocGenDesigner

Enables the designers to create and configure document templates.

DocGenInd

Enables the Industry Document Generation features in the org.

DocumentChecklist

Enables Document Tracking and Approval features, and adds the Document Checklist permission set. Document tracking features let you define documents to upload and approve, which supports processes like loan applications or action plans.

More Information

See Enable Document Tracking and Approvals in the Financial Services Cloud Administrator Guide for more information.

DocumentReaderPageLimit

Limits the number of pages sent for data extraction to 5.

More Information

See Intelligent Form Reader in Salesforce Help for more information.

DSARPortability

Enables an org to access the DSARPortability feature in Privacy Center. Also, provides one seat each of the PrivacyCenter and PrivacyCenterAddOn licenses.

More Information

See Portability in the Salesforce REST API Developer Guide for more information.

DurableClassicStreamingAPI

Enables Durable PushTopic Streaming API for API version 37.0 and later.

More Information

Available in Enterprise and Developer Edition scratch orgs.

DurableGenericStreamingAPI

Enables Durable Generic Streaming API for API version 37.0 and later.

More Information

Available in Enterprise and Developer Edition scratch orgs.

DynamicClientCreationLimit

Allows the org to register up to 100 OAuth 2.0 connected apps through the dynamic client registration endpoint.

EAndUDigitalSales

Enables the Energy and Utilities Digital Sales feature in the org.

EAndUSelfServicePortal

Enables the Self Service Portal features for Digital Experience users in the org.

EAOutputConnectors

Enable CRM Analytics Output Connectors.

More Information

This scratch org requires the Dev Hub to have the EAOutputConnectors permission. See Salesforce Output Connection in Salesforce Help for more details.

EASyncOut

Enable CRM Analytics SyncOut.

More Information

This scratch org requires the Dev Hub to have the EASyncOut permission. See Sync Out for Snowflake in Salesforce Help for more details.

EdPredictionM3Threshold

Sets the number of records in the payload to 10, after which the Einstein Discovery prediction service uses M3.

EdPredictionTimeout

Sets the maximum duration of a single Einstein Discovery prediction to 100 milliseconds.

EdPredictionTimeoutBulk

Sets the maximum duration of a single Einstein Discovery prediction when it runs in bulk to 10 milliseconds.

EdPredictionTimeoutByomBulk

Sets the maximum duration of a single Bring Your Own Model (BYOM) Einstein Discovery prediction to 100 milliseconds.

EducationCloud: <value>

Enables use of Education Cloud.

Supported Quantities

Maximum: 10; Multiplier: 1

More Information

Standard set up steps are required after enabling this feature. See Set Up Education Cloud in Salesforce Help for more information.

Einstein1AIPlatform

Provides access to Einstein generative AI features such as Agentforce, Prompt Builder, Model Builder, and the Models API. To use generative AI features, you must also include einsteinGptSettings > enableEinsteinGptPlatform in the settings section of your scratch org definition file.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "Agentforce scratch org",
  "edition": "Developer",
  "features": ["Einstein1AIPlatform"],
  "settings": {
      "einsteinGptSettings": {
          "enableEinsteinGptPlatform": true
      }
   }
}
```

Additional Configuration for Prompt Builder

After you generate the scratch org, Prompt Builder isn't available until you assign yourself the Manage Prompts permission in the scratch org.

When packaging a prompt template in second-generation packages, add the `EinsteinGPTPromptTemplateManager` permission set to the `sfdx-project.json` file. See Considerations for Packaging Prompt Templates in Salesforce Help for details.

More Information

Available in Developer and Enterprise Edition scratch orgs.

Requires configuration using the Setup menu in the scratch org. Many generative AI features also require a Data Cloud license.

See Einstein Generative AI in Salesforce Help for more information.

EinsteinAnalyticsPlus

Provides one CRM Analytics Plus license for the CRM Analytics platform.

EinsteinArticleRecommendations

Provides licenses for Einstein Article Recommendations. Einstein Article Recommendations uses data from past cases to identify Knowledge articles that are most likely to help your customer service agents address customer inquiries.

More Information

Available in Enterprise Edition scratch orgs.

Requires configuration using the Setup menu in the scratch org.

See Set Up Einstein Article Recommendations in Salesforce Help for more information.

EinsteinBuilderFree

Provides a license that allows admins to create one enabled prediction with Einstein Prediction Builder. Einstein Prediction Builder is custom AI for admins

More Information

For configuration steps, see Einstein Prediction Builder in Salesforce Help.

EinsteinDocReader

Provides the license required to enable and use Intelligent Form Reader in a scratch org. Intelligent Form Reader uses optical character recognition to automatically extract data with Amazon Textract.

More Information

To use this scratch org feature, the Dev Hub org requires the EinsteinDocReader and SalesforceManagedIFR permissions. For information about Intelligent Form Reader, see Intelligent Form Reader in Salesforce Help.

EinsteinRecommendationBuilder

Provides a license to create recommendations with Einstein Recommendation Builder. Einstein Recommendation Builder lets you build custom AI recommendations.

More Information

Enabled in Developer and Enterprise Editions.

Requires configuration using the Setup menu in the scratch org. You also need the EinsteinRecommendationBuilderMetadata feature to use Einstein Recommendation Builder in scratch org.

EinsteinSalesRepFdbk

Enables the Agentforce Sales Coach feature in an org. This scratch org feature also includes a large number of Einstein for Sales Generative AI features.

More Information

The EinsteinSalesRepFdbk scratch org feature enables Agentforce for Sales standard actions, such as Create Close Plan, Get Product Pricing, Meeting Follow-Up Email, Send Meeting Request, Identify Contact Role, Identify Key Contacts, Find Similar Opportunities, Review My Day, and Find Contact Interactions. It also enables Einstein Generative AI features, such as Sales Call Summaries, Call Explorer, Generative Conversation Insights, and Automatic Contact Enhancement.

EinsteinSearch

Provides the license required to use and enable Einstein Search features in a scratch org.

More Information

Available in Professional and Enterprise Edition scratch orgs.

Requires configuration using the Setup menu in the scratch org.

EinsteinVisits

Enables Consumer Goods Cloud. With Consumer Goods cloud, transform the way you collaborate with your retail channel partners. Empower your sales managers to plan visits and analyze your business's health across stores. Also, allow your field reps to track inventory, take orders, and capture visit details using the Retail Execution mobile app.

EinsteinVisitsED

Enables Einstein Discovery, which can be used to get store visit recommendations. With Einstein Visits ED, you can create a visit frequency strategy that allows Einstein to provide optimal store visit recommendations.

More Information

See Create a Visit Frequency Next Best Action Strategy in Salesforce Help.

EmbeddedLoginForIE

Provides JavaScript files that support Embedded Login in IE11.

EmpPublishRateLimit:<value>

Increases the maximum number of standard-volume platform event notifications published per hour. Indicate a value between 1,000–10,000.

Supported Quantities

1,000–10,000, Multiplier: 1

EnablePRM

Enables the partner relationship management permissions for the org.

EnableManageIdConfUI

Enables access to the LoginIP and ClientBrowser API objects to verify a user's identity in the UI.

Enablement

Enables features for creating, taking, and tracking sales programs with Enablement. Business operations experts and sales leaders identify the revenue outcomes they want sales reps to achieve, such as increased average deal sizes or shorter ramp times. Then, they create programs that help sales reps work towards those outcomes as part of their daily work.

More Information

- Provides 5 Enablement add-on licenses, where each license provides 1 seat of the Enablement permission set license and 1 seat of the Enablement Resources permission set license.
- Provides permission set groups, permission sets, and user permissions for managing and accessing sales programs data.
- Provides access to the Enablement Settings page in Setup, which provides guidance for assigning permissions and includes other optional configuration settings.

See Sales Programs and Partner Tracks with Enablement in Salesforce Help and see the Sales Programs and Partner Tracks with Enablement Developer Guide for more information.

EnableSetPasswordInApi

Enables you to use `sf org generate password` to change a password without providing the old password.

EncryptionStatisticsInterval:<value>

Defines the interval (in seconds) between encryption statistics gathering processes. The maximum value is 604,800 seconds (7 days). The default is once per 86,400 seconds (24 hours).

Supported Quantities

0–60,4800, Multiplier: 1

More Information

Requires enabling PlatformEncryption and some configuration using the Setup menu in the scratch org. See Which User Permissions Does Shield Platform Encryption Require?, and Generate a Tenant Secret with Salesforce in Salesforce Help.

EncryptionSyncInterval:<value>

Defines how frequently (in seconds) the org can synchronize data with the active key material. The default and maximum value is 604,800 seconds (7 days). To synchronize data more frequently, indicate a value, in seconds, equal to or larger than 0.

Supported Quantities

0–604,800, Multiplier: 1

More Information

Requires enabling PlatformEncryption and some configuration using the Setup menu in the scratch org. See Which User Permissions Does Shield Platform Encryption Require?, and Generate a Tenant Secret with Salesforce in Salesforce Help.

EnergyAndUtilitiesCloud

Enables the Energy and Utilities Cloud features in the org.

Entitlements

Enables entitlements. Entitlements are units of customer support in Salesforce, such as phone support or web support that represent terms in service agreements.

ERMAnalytics

Enables the ERM Analytics org perm in your scratch org.

More Information

Provides 1 seat of the ERMAnalyticsPlus add-on license.

EventLogFile

Enables API access to your org's event log files. The event log files contain information about your org's operational events that you can use to analyze usage trends and user behavior.

EntityTranslation

Enables translation of field data for Work Type Group, Service Territory, and Service Resource objects.

More Information

To translate custom field data, also include the CustomFieldDataTranslation scratch org feature in your scratch org definition file. Not available in Professional, Partner Professional, Group, or Partner Group Edition orgs.

ExcludeSAMLSessionIndex

Excludes Session Index in SAML sign-on (SSO) and single logout (SLO) flows.

More Information

The ExcludeSAMLSessionIndex permission is off by default for all new and existing orgs. Enable this permission when Salesforce is the identity provider and you don't want the session index to be sent during SAML SSO. Enable this permission when Salesforce is the service provider and you don't want the session index to be sent during SLO. To turn on this feature, contact Salesforce Customer Support.

Explainability

Enables an org to use Decision Explainer features.

For more information, see Decision Explainer for Expression Set in Salesforce developer documentation.

ExpressionSetMaxExecPerHour

Enables an org to run a maximum of 500,000 expression sets per hour by using Connect REST API.

For more information, see Expression Set in Salesforce developer documentation.

ExternalIdentityLogin

Allows the scratch org to use Salesforce Customer Identity features associated with your External Identity license.

FieldAuditTrail

Enables Field Audit Trail for the org and allows a total 60 tracked fields. By default, 20 fields are tracked for all orgs, and 40 more are tracked with Field Audit Trail.

More Information

Previous name: RetainFieldHistory

FieldService:<value>

Provides the Field Service license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

More Information

Available in Enterprise Edition. Enabled by default in Developer Edition. See Enable Field Service in Salesforce Help for more information.

FieldServiceAppointmentAssistantUser:<value>

Adds the Field Service Appointment Assistant permission set license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

More Information

See Setup Field Service Appointment Assistant and Assign Field Service Permissions in Salesforce Help for more information.

FieldServiceDispatcherUser:<value>

Adds the Field Service Dispatcher permission set license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

More Information

See Assign Field Service Permissions in Salesforce Help for more information.

FieldServiceLastMileUser:<value>

Adds the Field Service Last Mile permission set license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

FieldServiceMobileExtension

Adds the Field Service Mobile Extension permission set license.

FieldServiceMobileUser:<value>

Adds the Field Service Mobile permission set license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

More Information

See Assign Field Service Permissions in Salesforce Help for more information.

FieldServiceSchedulingUser:<value>

Adds the Field Service Scheduling permission set license. Indicate a value between 1–25.

Supported Quantities

1–25, Multiplier: 1

More Information

See Assign Field Service Permissions in Salesforce Help for more information.

FinanceLogging

Adds Finance Logging objects to a scratch org. This feature is required for Finance Logging.

FinancialServicesCommunityUser:<value>

Adds the Financial Services Insurance Community permission set license, and enables access to Financial Services insurance community components and objects. Indicate a value between 1–10.

Supported Quantities

1–10, Multiplier: 1

FinancialServicesInsuranceUser

Adds the Financial Services Insurance permission set license, and enables access to Financial Services insurance components and objects.

More Information

See Get Started with Financial Services Cloud for Insurance in Salesforce Help.

FinancialServicesUser:<value>

Adds the Financial Services Cloud Standard permission set license. This permission set enables access to Lightning components and the standard version of Financial Services Cloud. Also provides access to the standard Salesforce objects and custom Financial Services Cloud objects. Indicate a value between 1–10.

Supported Quantities

1–10, Multiplier: 1

FlowSites

Enables the use of flows in Salesforce Sites and customer portals.

ForceComPlatform

Adds one Salesforce Platform user license.

ForecastEnableCustomField

Enables custom currency and customer number fields for use as measures in forecasts based on opportunities.

More Information

Available in Enterprise Edition and Unlimited Edition scratch orgs, and requires enabling Salesforce Forecasting in Setup. See Salesforce Forecasting in Salesforce Help for more information.

FSCAlertFramework

Makes Financial Services Cloud Record Alert entities accessible in the scratch org.

More Information

Provides 11 seats of the FSCComprehensivePsl user license and 11 seats of the FSCComprehensiveAddOn add-on license.

Requires that you install Financial Services Cloud and OmniStudio. See Record Alerts in Financial Services Cloud Administrator Guide.

FSCServiceProcess

Enables the Service Process Studio feature of Financial Service Cloud. Provides 10 seats each of the IndustriesServiceExcellenceAddOn and FinancialServicesCloudStardardAddOn licenses. To enable the feature, you must also turn on the StandardServiceProcess setting in Setup and grant users the AccessToServiceProcess permission.

Fundraising

Gives users access to Nonprofit Cloud for Fundraising features and objects in Salesforce.

Scratch Org Definition File

See Nonprofit Cloud for Fundraising in Salesforce Help for more information. To enable Fundraising, add these settings to your scratch org definition file.

Note: The Fundraising licenses are assigned when the Fundraising feature is enabled in the scratch org.

```
{
  "orgName": "Fundraising Org",
  "edition": "Enterprise",
  "features": [
    "AccountingSubledgerGrowthEdition",
    "IndustriesActionPlan",
    "AnalyticsQueryService",
    "PublicSectorAccess",
    "Fundraising",
    "IndustriesSalesExcellenceAddOn",
    "IndustriesServiceExcellenceAddOn",
    "MarketingUser",
    "ProgramManagement",
    "OmniStudioDesigner",
    "OmniStudioRuntime",
    "EnableSetPasswordInApi",
    "PersonAccounts"
  ],
  "settings": {
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
    },
    "IndustriesSettings": {
      "enableFundraising": true,
      "enableGiftEntryGrid": true,
      "enableGroupMembershipPref": true
    }
  }
}
```

GenericStreaming

Enables Generic Streaming API for API version 36.0 and earlier.

More Information

Available in Enterprise and Developer Edition scratch orgs.

GenStreamingEventsPerDay:<value>

Increases the maximum number of delivered event notifications within a 24-hour period, shared by all CometD clients, with generic streaming for API version 36.0 and earlier. Indicate a value between 10,000–50,000.

Supported Quantities

10,000–50,000, Multiplier: 1

Grantmaking

Gives users access to Grantmaking features and objects in Salesforce and Experience Cloud.

More Information

See Grantmaking in Salesforce Help for more information. To enable Grantmaking, add these settings to your scratch org definition file.

```
{
  "features": ["Grantmaking"],
  "settings": {
    "IndustriesSettings": {
      "enableGrantmaking": true
    }
  }
}
```

GuidanceHubAllowed

Enables the Guidance Center panel in Lightning Experience. The Guidance Center shows suggested and assigned content in the user's flow of work. Suggested content is related to the app or page where the user is working. Assigned content includes guidance sets for Salesforce admins, links or Trailhead modules assigned to users with Learning Paths, and Enablement programs for sales reps.

More Information

Not available in Group Edition scratch orgs.

To use this scratch org feature, the Dev Hub org requires the GuidanceHubAllowed permission. If this permission isn't enabled in the Dev Hub, contact Salesforce Customer Support.

See Guidance Center in Salesforce Help for more information.

HealthCloudAddOn

Enables use of Health Cloud.

More Information

See Administer Health Cloud in Salesforce Help for more information.

HealthCloudEOLOverride

Salesforce retired the Health Cloud CandidatePatient object in Spring '22 to focus on the more robust Lead object. This scratch org feature allows you to override that retirement and access the object.

More Information

To use this scratch org feature, the Dev Hub org requires the HealthCloudEOLOverride permission. See Candidate Patient Data Entity Retirement in Salesforce Help for more information.

HealthCloudForCmty

Enables use of Health Cloud for Experience Cloud Sites.

More Information

See Experience Cloud Sites in Salesforce Help for more information.

HealthCloudMedicationReconciliation

Allows Medication Management to support Medication Reconciliation.

More Information

See Enable Medication Management to Perform Medication Reconciliation in Salesforce Help for more information.

HealthCloudPNMAddOn

Enables use of Provider Network Management.

More Information

See Provider Network Management in Salesforce Help for more information.

HealthCloudUser

This enables the scratch org to use the Health Cloud objects and features equivalent to the Health Cloud permission set license for one user.

More Information

See Assign Health Cloud Permission Sets and Permission Set Licenses in Salesforce Help for more information.

HighVelocitySales

Provides Sales Engagement licenses and enables Salesforce Inbox. Sales Engagement optimizes the inside sales process with a high-productivity workspace. Sales managers can create custom sales processes that guide reps through handling different types of prospects. And sales reps can rapidly handle prospects with a prioritized list and other productivity-boosting features. The Sales Engagement feature can be deployed in scratch orgs, but the settings for the feature can't be updated through the scratch org definition file. Instead, configure settings directly in the Sales Engagement app.

HighVolumePlatformEventAddOn

Increases the daily delivery allocation of high-volume platform events or change data capture events by 100,000 events. This scratch org feature simulates the purchase of an add-on. If the org has the `HighVolumePlatformEventAddOn`, the daily allocation is flexible and isn't enforced strictly to allow for usage peaks.

More Information

See Platform Event Allocations in the *Platform Events Developer Guide*.

HLSAnalytics

Enables the HLS Analytics org perm in scratch orgs.

More Information

Provides 1 seat of the HealthCareAnalyticsPlus add-on license.

HoursBetweenCoverageJob:<value>

The frequency in hours when the sharing inheritance coverage report can be run for an object. Indicate a value between 1–24.

Supported Quantities

1–24, Multiplier: 1

IdentityProvisioningFeatures

Enables use of Salesforce Identity User Provisioning.

IgnoreQueryParamWhitelist

Ignores allowlisting rules for query parameter filter rules. If enabled, you can add any query parameter to the URL.

Note: Where possible, we changed noninclusive terms to align with our company value of Equality. We maintained certain terms to avoid any effect on customer implementations.

IndustriesActionPlan

Provides a license for Action Plans. Action Plans allow you to define the tasks or document checklist items for completing a business process.

More Information

Previous name: ActionPlan.

For more information and configuration steps, see Enable Actions Plans in Salesforce Help.

IndustriesBranchManagement

Branch Management lets branch managers and administrators track the work output of branches, employees, and customer segments in Financial Services Cloud.

More Information

Provides the Branch Management add-on license and user permissions, plus 11 seats of the FSCComprehensivePsl user license and 11 seats of the FSCComprehensiveAddOn add-on license.

Requires that you install Financial Services Cloud. See Branch Management in Financial Services Cloud Administrator Guide.

IndustriesCompliantDataSharing

Grants users access to participant management and advanced configuration for data sharing to improve compliance with regulations and company policies.

More Information

Provides 1 seat of the FinancialServicesCloudStandardAddOn add-on license.

Requires that you install Financial Services Cloud. See Compliant Data Sharing in *Financial Services Cloud Administrator Guide*.

IndustriesMfgAdvncdAccFrcs

Enables Advanced Account Forecasting. With Advanced Account Forecasting, generate comprehensive, multi-horizon forecasts for sales, operations, inventory, service, and other aspects of your business. Tailor your forecasting configurations to your objectives to generate accurate, relevant forecasts.

More Information

See Create Holistic, Multi-Enterprise Forecasts with Advanced Account Forecasting in Salesforce Help for more information.

IndustriesMfgPartnerVisitMgmt

Enables Partner Visit Management. Partner Visit Management helps sales managers in your company schedule visits to partner and distributor locations. Sales managers can use those visits to monitor performance, arrange for periodic check-ins, conduct trainings, upsell and cross-sell products, and follow up on sales agreement renewals and warranty expiration.

More Information

See Partner Visit Management in Manufacturing Cloud in Salesforce Help for more information.

IndustriesMfgProgram

Enables Program Based Business. With Program Based Business, program managers can manage the end-to-end lifecycle of a program where they derive forecasts based on their customers' forecasts, transform these forecasts into business opportunities, and convert those opportunities into run-rate business. Program based business is common across multiple industries such as process, aerospace, defense, automotive, engineer-to-order, and make-to-order environments.

More Information

See Learn About Program Based Business in Salesforce Help for more information.

IndustriesMfgRebates

Enables Rebate Management. Manage incentive programs, track rebate attainment, automate payouts, and gain insights into sales performance and program effectiveness.

More Information

See Rebate Management in Salesforce Help for more information.

IndustriesMfgTargets

Enables Sales Agreements. With Sales Agreements, you can negotiate purchase and sale of products over a continued period. You can also get insights into products, prices, discounts, and quantities. And you can track your planned and actual quantities and revenues with real-time updates from orders and contracts.

More Information

See Track Sales Compliance with Sales Agreements in Salesforce Help for more information.

IndustriesManufacturingCmty

Provides the Manufacturing Sales Agreement for the Community permission set license, which is intended for the usage of partner community users. It also provides access to the Manufacturing community template for admins users to create communities.

More Information

See Improve Partner Collaboration with Communities in Salesforce Help for more information.

IndustriesMfgAccountForecast

Enables Account Forecast. With Account Forecast, you can generate forecasts for your accounts based on orders, opportunities, and sales agreements. You can also create formulas to calculate your forecasts per the requirements of your company.

More Information

See Create Account Forecasts to Enhance Your Planning in Salesforce Help for more information.

InsightsPlatform

Enables the CRM Analytics Plus license for CRM Analytics.

InsuranceCalculationUser

Enables the calculation feature of Insurance. Provides 10 seats each of the BRERuntimeAddOn and OmniStudioRuntime licenses. Also, provides one seat each of the OmniStudio and BREPlatformAccess licenses.

InsuranceClaimMgmt

Enables claim management features. Provides one seat of the InsuranceClaimMgmtAddOn license.

More Information

See Manage Claims in Salesforce Help for more information.

InsurancePolicyAdmin

Enables policy administration features. Provides one seat of the InsurancePolicyAdministrationAddOn license.

More Information

See Manage Insurance Policies in Salesforce Help for more information.

IntelligentDocumentReader

Provides the license required to enable and use Intelligent Document Reader in a scratch org. Intelligent Document Reader uses optical character recognition to automatically extract data with Amazon Textract by using your AWS account.

More Information

To use this scratch org feature, the Dev Hub org requires the EinsteinDocReader and BYOAForIFR permissions. For information about Intelligent Document Reader, see Intelligent Document Reader in Salesforce Help.

InvestigativeCaseManagement

Enables the objects, features, and permissions for managing investigative cases, including evidence management and case proceedings, in Public Sector Solutions.

Sample Scratch Org Definition File

To enable InvestigativeCaseManagement, add these features and settings to your scratch org definition file.

```
{
    "orgName": "ICM Org",
    "edition": "Developer",
    "features": [
    "InvestigativeCaseManagement:2"
    ],
    "settings": {
    "lightningExperienceSettings": {
    "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
    "enableS1EncryptedStoragePref2": false
    },
    "industriesSettings": {
    "enableCarePlansPreference": true,
    "enableBenefitManagementPreference": true,
```

```
    "enableTimelinePref": true,
    "enableGroupMembershipPref": true,
    "enableIndustriesAssessment": true,
    "enableDiscoveryFrameworkMetadata": true,
    "enableInteractionSummaryPref": true,
    "enableEnhancedUIForISPref": true,
    "enableInteractionCstmSharingPref": true,
    "enableCaseProceedingsPref": true,
    "enableEvidenceManagementPref": true,
    "enableInvestigativeCaseMgmntPrf": true,
    "enableDisbursementPreference": true,
    "enableCaseReferralPref": true
    }
    }
    }
```

InvoiceManagement

Enables access to all the Billing features and objects that are available with the Revenue Cloud Advanced license in the scratch org.

More Information

- Available in Enterprise, Unlimited, and Developer Edition scratch orgs.
- Provides 10 seats of BillingAddOn add-on licenses.
- Enable Billing in Revenue Cloud and turn on the required Billing settings.
- Provides permission sets to access Billing features.
- See Manage Billing in Revenue Cloud for more information.

Scratch Org Definition File

To enable InvoiceManagement, add these settings to your scratch org definition file.

```
{
  "orgName": "<Org Name>",
  "adminEmail":"<Admin Email Address>"
  "edition": "<Edition Name>",
  "features": [
    "InvoiceManagement"
    "EnableSetPasswordInApi"
  ],
  "settings": {
    "billingSettings": {
      "enableBillingSetup": true
    },
   "lightningExperienceSettings": {
        "enableS1DesktopEnabled": true
      }
  }
}
```

Interaction

Enables flows. A flow is the part of Salesforce Flow that collects data and performs actions in your Salesforce org or an external system. Salesforce Flow provides two types of flows: screen flows and autolaunched flows.

More Information

Requires configuration in the Setup menu of the scratch org.

IoT

Enables IoT so the scratch org can consume platform events to perform business and service workflows using orchestrations and contexts.

More Information

Also requires Metadata API Settings in the scratch org definition file.

JigsawUser

Provides one license to Jigsaw features.

Knowledge

Enables Salesforce Knowledge and gives your website visitors, clients, partners, and service agents the ultimate support tool. Create and manage a knowledge base with your company information, and securely share it when and where it's needed. Build a knowledge base of articles that can include information on process, like how to reset your product to its defaults, or frequently asked questions.

More Information

See Salesforce Knowledge in Salesforce Help for more information.

LegacyLiveAgentRouting

Enables legacy Live Agent routing for Chat. Use Live Agent routing to chat in Salesforce Classic. Chats in Lightning Experience must be routed using Omni-Channel.

LightningSalesConsole

Adds one Lighting Sales Console user license.

LightningScheduler

Enables Lightning Scheduler. Lightning Scheduler gives you tools to simplify appointment scheduling in Salesforce. Create a personalized experience by scheduling customer appointments—in person, by phone, or by video—with the right person at the right place and time.

More Information

See Manage Appointments with Lightning Scheduler in Salesforce Help for more information.

LightningServiceConsole

Assigns the Lightning Service Console License to your scratch org so you can use the Lightning Service Console and access features that help manage cases faster.

More Information

See Lightning Service Console in Salesforce Help for more information.

LiveAgent

Enables Chat for Service Cloud. Use web-based chat to quickly connect customers to agents for real-time support.

LiveMessage

Enables Messaging for Service Cloud. Use Messaging to quickly support customers using apps such as SMS text messaging and Facebook Messenger.

LongLayoutSectionTitles

Allows page layout section titles to be up to 80 characters.

More Information

To turn on this feature, contact Salesforce Customer Support.

LoyaltyAnalytics

Enables Analytics for Loyalty license. The Analytics for Loyalty app gives you actionable insights into your loyalty programs.

More Information

See Analytics for Loyalty in Salesforce Help for more information.

LoyaltyEngine

Enables Loyalty Management Promotion Setup license. Promotion setup allows loyalty program managers to create loyalty program processes. Loyalty program processes help you decide how incoming and new Accrual and Redemption-type transactions are processed.

More Information

See Create Processes with Promotion Setup in Salesforce Help for more information.

LoyaltyManagementStarter

Enables the Loyalty Management - Starter license. Create loyalty programs and set up loyalty program-specific processes that allow you to recognize, rewards, and retain customers.

More Information

See Loyalty Management in Salesforce Help for more information.

LoyaltyMaximumPartners:<value>

Increases the number of loyalty program partners that can be associated with a loyalty program in an org where the Loyalty Management - Starter license is enabled. The default and maximum value is 1.

Supported Quantities

0–1, Multiplier: 1

LoyaltyMaximumPrograms:<value>

Increases the number of loyalty programs that can be created in an org where the Loyalty Management - Starter license is enabled. The default and maximum value is 1.

Supported Quantities

0–1, Multiplier: 1

LoyaltyMaxOrderLinePerHour:<value>

Increases the number of order lines that can be cumulatively processed per hour by loyalty program processes. Indicate a value between 1–3,500,000.

Supported Quantities

1–3,500,000, Multiplier: 1

LoyaltyMaxProcExecPerHour:<value>

Increases the number of transaction journals that can be processed by loyalty program processes per hour. Indicate a value between 1–500,000.

Supported Quantities

1–500,000, Multiplier: 1

LoyaltyMaxTransactions:<value>

Increases the number of Transaction Journal records that can be processed. Indicate a value between 1–50,000,000.

Supported Quantities

1–50,000,000, Multiplier: 1

LoyaltyMaxTrxnJournals:<value>

Increases the number of Transaction Journal records that can be stored in an org that has the Loyalty Management - Start license enabled.

Supported Quantities

1–25,000,000, Multiplier: 1

More Information

See Transaction Journal Limits in Salesforce Help for more information.

Macros

Enables macros in your scratch org. After enabling macros, add the macro browser to the Lightning Console so you can configure predefined instructions for commonly used actions and apply them to multiple posts at the same time.

More Information

See Set Up and Use Macros in Salesforce Help for more information.

MarketingCloud

Provides licenses for Marketing Cloud Growth edition. These licenses provide access to campaigns, flows, emails, forms, landing pages, and consent management features. You can send up to 20 emails per day from a scratch org.

Scratch Org Definition File

```
{
   "features": [
      "MarketingCloud",
      "CustomerDataPlatform",
      "CustomerDataPlatformLite",
      "EnableSetPasswordInApi",
   ],
   "settings": {
      "customerDataPlatformSettings": {
         "enableCustomerDataPlatform": true
      },
      "lightningExperienceSettings": {
         "enableS1DesktopEnabled": true
      },
      "mobileSettings": {
         "enableS1EncryptedStoragePref2": false
      }
   }
}
```

More Information

Marketing Cloud Growth edition uses Data Cloud to store engagement events, create segments, personalize messages, process decisions in flows, and generate analytics. Salesforce ISVs that develop applications for Marketing Cloud Growth edition must have the Data Cloud Scratch Org permission enabled in their Partner Business Orgs.

You can enable Data Cloud in your scratch org by creating a case with Salesforce Partner Support. Use this template as a guide when you submit your request, replacing *{your_org_id_here}* with the ID of your Partner Business Org:

- **Subject**: *Enable Data Cloud for scratch orgs in Dev Hub*
- **Description**: *Please enable Data Cloud scratch org permissions on my Partner Business Org. My org ID is {your_org_id_here}*
- **Product and Topic**: *Partner Programs & Benefits (License Request - Trial/Dev Org)*

After Salesforce Partner Support completes your request, add the `CustomerDataPlatform` and `CustomerDataPlatformLite` features to your scratch org definition file.

MarketingUser

Provides access to the Campaigns object. Without this setting, Campaigns are read-only.

MaterialityAssessment

Provides the permission set licenses and permission sets required to configure materiality assessment in Net Zero Cloud.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
    "orgName": "NZC Package Dev",
    "edition": "Enterprise",
    "features": [
      "DisclosureFramework",
      "DocGen",
      "DocGenDesigner",
      "DocGenInd",
      "OmnistudioDesigner",
      "OmnistudioRuntime",
      "SurveyAdvancedFeatures",
      "SustainabilityApp",
      "MaterialityAssessment:1"
    ],
    "settings": {
      "industriesSettings": {
        "enableGnrcDisclsFrmwrk": true,
        "enableIndustriesAssessment": true,
        "enableSustainabilityCloud": true,
        "enableSCCarbonAccounting": true,
        "enableSCSNGManagement": true,
        "enableMaterialityAssessment": true,
        "enableInformationLibrary": true
    }
```

```
    }
}
```

More Information

For configuration steps, see Configure Net Zero Cloud and Enable the Disclosure and Compliance Hub in the Set Up and Maintain Net Zero Cloud guide in Salesforce Help.

MaxActiveDPEDefs:<value>

Increases the number of Data Processing Engine definitions that can be activated in the org. Indicate a value between 1–50.

Supported Quantities

1–50, Multiplier: 1

MaxApexCodeSize:<value>

Limits the non-test, unmanaged Apex code size (in MB). To use a value greater than the default value of 10, contact Salesforce Customer Support.

MaxAudTypeCriterionPerAud

Limits the number of audience type criteria available per audience. The default value is 10.

MaxCustomLabels:<value>

Limits the number of custom labels (measured in thousands). Setting the limit to 10 enables the scratch org to have 10,000 custom labels. Indicate a value between 1–15.

Supported Quantities

1–15, Multiplier: 1,000

MaxDatasetLinksPerDT:<value>

Increases the number of dataset links that can be associated with a decision table. Indicate a value between 1–3.

Supported Quantities

1–3, Multiplier: 1

MaxDataSourcesPerDPE:<value>

Increases the number of Source Object nodes a Data Processing Engine definition can contain. Indicate a value between 1–50.

Supported Quantities

1–50, Multiplier: 1

MaxDecisionTableAllowed:<value>

Increases the number of decision tables rules that can be created in the org. Indicate a value between 1–30.

Supported Quantities

1–30, Multiplier: 1

MaxFavoritesAllowed:<value>

Increases the number of Favorites allowed. Favorites allow users to create a shortcut to a Salesforce Page. Users can view their Favorites by clicking the Favorites list dropdown in the header. Indicate a value between 0–200.

Supported Quantities

0–200, Multiplier: 1

MaxFieldsPerNode:<value>

Increases the number of fields a node in a Data Processing Engine definition can contain. Indicate a value between 1–500.

Supported Quantities

1–500, Multiplier: 1

MaxInputColumnsPerDT:<value>

Increases the number of input fields a decision table can contain. Indicate a value between 1–10.

Supported Quantities

1–10, Multiplier: 1

MaxLoyaltyProcessRules:<value>

Increases the number of loyalty program process rules that can be created in the org. Indicate a value between 1–20.

Supported Quantities

1–20, Multiplier: 1

MaxNodesPerDPE:<value>

Increases the number of nodes that a Data Processing Engine definition can contain. Indicate a value between 1–500.

Supported Quantities

1–500, Multiplier: 1

MaxNoOfLexThemesAllowed:<value>

Increases the number of Themes allowed. Themes allow users to configure colors, fonts, images, sizes, and more. Access the list of Themes in Setup, under Themes and Branding. Indicate a value between 0–300.

Supported Quantities

0–300, Multiplier: 1

MaxOutputColumnsPerDT:<value>

Increases the number of output fields a decision table can contain. Indicate a value between 1–5.

Supported Quantities

1–5, Multiplier: 1

MaxSourceObjectPerDSL:<value>

Increases the number of source objects that can be selected in a dataset link of a decision table. Indicate a value between 1–5.

Supported Quantities

1–5, Multiplier: 1

MaxStreamingTopics:<value>

Increases the maximum number of delivered PushTopic event notifications within a 24-hour period, shared by all CometD clients. Indicate a value between 40–100.

Supported Quantities

40–100, Multiplier: 1

MaxUserNavItemsAllowed:<value>

Increases the number of navigation items a user can add to the navigation bar. Indicate a value between 0–500.

Supported Quantities

0–500, Multiplier: 1

MaxUserStreamingChannels:<value>

Increases the maximum number of user-defined channels for generic streaming. Indicate a value between 20–1,000.

Supported Quantities

20–1,000, Multiplier: 1

MaxWishlistsItemsPerWishlist

Limits the number of wishlist items per wishlist. The default value is 500.

More Information

For more information, see Salesforce Help at Salesforce B2B Commerce and D2C Commerce

MaxWishlistsPerStoreAccUsr

Limits the number of wishlists allowed per store, account, and user. The default value is 100.

For example, if User1 is associated with Store1 and Store2, and has access to Account1 and Account2, then the wishlist limit is the same for the combinations of User1 with Store1 and Account1, User1 with Store2 and Account2, and User1 with Store1 and Account2.

More Information

For more information, see Salesforce Help at Salesforce B2B Commerce and D2C Commerce.

MaxWritebacksPerDPE:<value>

Increases the number of Writeback Object nodes a Data Processing Engine definition can contain. Indicate a value between 1–50.

Supported Quantities

1–10, Multiplier: 1

MedVisDescriptorLimit:<value>

Increases the number of sharing definitions allowed per record for sharing inheritance to be applied to an object. Indicate a value between 150–1,600.

Supported Quantities

150–1,600, Multiplier: 1

MinKeyRotationInterval

Sets the encryption key material rotation interval at once per 60 seconds. If this feature isn't specified, the rotation interval defaults to once per 604,800 seconds (7 days) for Search Index key material, and once per 86,400 seconds (24 hours) for all other key material.

More Information

Requires enabling PlatformEncryption and some configuration using the Setup menu in the scratch org. See Which User Permissions Does Shield Platform Encryption Require? and Generate a Tenant Secret with Salesforce in Salesforce Help.

MobileExtMaxFileSizeMB:<value>

Increases the file size (in megabytes) for Field Service Mobile extensions. Indicate a value between 1–2,000.

Supported Quantities

1–2,000, Multiplier: 1

MobileSecurity

Enables Enhanced Mobile Security. With Enhanced Mobile Security, you can control a range of policies to create a security solution tailored to your org's needs. You can limit user access based on operating system versions, app versions, and device and network security. You can also specify the severity of a violation.

MobileVoiceAndLLM

Allows mobile apps to download large language models (LLMs) and voice models for offline use from the model store service. Normally, mobile apps have access to the model store service when Einstein is enabled, but the MobileVoiceAndLLM scratch org feature enables offline voice without requiring orgs to fully enable Einstein.

Sample Scratch Org Definition File

This sample scratch org definition file enables MobileVoiceAndLLM. Additionally, the sample scratch org definition configures lightningExperienceSettings and mobileSettings.

```
{
  "orgName": "Acme",
  "edition": "Developer",
  "features": ["MobileVoiceAndLLM"],
  "settings": {
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
    }
  }
}
```

MultiLevelMasterDetail

Allows the creation a special type of parent-child relationship between one object, the child, or detail, and another object, the parent, or master.

MutualAuthentication

Requires client certificates to verify inbound requests for mutual authentication.

MyTrailhead

Enables access to a myTrailhead enablement site in a scratch org.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "Acme",
  "edition": "Enterprise",
  "features": ["MyTrailhead"],
  "settings": {
    "trailheadSettings": {
      "enableMyTrailheadPref": true
    }
  }
}
```

More Information

Salesforce Help: Enablement Sites (myTrailhead)

NonprofitCloudCaseManagementUser

Provides the permission set license required to use and configure the Salesforce.org Nonprofit Cloud Case Management managed package. You can then install the package in the scratch org.

More Information

For installation and configuration steps, see Salesforce.org Nonprofit Cloud Case Management.

NumPlatformEvents:<value>

Increases the maximum number of platform event definitions that can be created. Indicate a value between 5–20.

Supported Quantities

5–20, Multiplier: 1

ObjectLinking

Create rules to quickly link channel interactions to objects such as contacts, leads, or person accounts for customers (Beta).

OmnistudioMetadata

Enables Omnistudio metadata API. Using this API, customers can deploy and retrieve Omnistudio components programmatically.

For more information, see Enable OmniStudio Metadata API Support.

OmnistudioRuntime

Enables business users to execute OmniScripts, DataMappers, FlexCards, and so on in the employee facing applications.

OmnistudioDesigner

Enables administrator or developer to create new OmniScripts/ DataMappers / Integration Procedures instances.

OrderManagement

Provides the Salesforce Order Management license. Order Management is your central hub for handling all aspects of the order lifecycle, including order capture, fulfillment, shipping, payment processing, and servicing.

More Information

Available in Enterprise and Developer Edition scratch orgs.

If you want to configure Order Management to use any of these features, enable it in your scratch org:

- MultiCurrency
- PersonAccounts
- ProcessBuilder
- StateAndCountryPicklist

Requires configuration using the Setup menu in the scratch org. For installation and configuration steps, see *Salesforce Help*: Salesforce Order Management.

Note: The implementation process includes turning on several Order and Order Management feature toggles in Setup. In a scratch org, you can turn them on by including metadata settings in your scratch org definition file. For details about these settings, see OrderSettings and OrderManagementSettings in the *Metadata API Developer Guide*.

OrderSaveLogicEnabled

Enables scratch org support for New Order Save Behavior. OrderSaveLogicEnabled supports only New Order Save Behavior. If your scratch org needs both Old and New Order Save Behavior, use OrderSaveBehaviorBoth.

Scratch Org Definition File

To enable OrderSaveLogicEnabled, update your scratch org definitions file.

```
{
  "features": ["OrderSaveLogicEnabled"],
  "settings": {
    "orderSettings": {
      "enableOrders": true
    }
  }
}
```

OrderSaveBehaviorBoth

Enables scratch org support for both New Order Save Behavior and Old Order Save Behavior.

Scratch Org Definition File

To enable OrderSaveLogicEnabled, update your scratch org definitions file.

```
{
  "features": ["OrderSaveBehaviorBoth"],
  "settings": {
    "orderSettings": {
      "enableOrders": true
    }
  }
}
```

OutboundMessageHTTPSession

Enables using HTTP endpoint URLs in outbound message definitions that have the Send Session ID option selected.

OutcomeManagement

Gives users access to Outcome Management features and objects in Salesforce and Experience Cloud.

More Information

See Outcome Management in Salesforce Help for more information. To enable Outcome Management, add these settings to your scratch org definition file.

```
{
  "features": ["OutcomeManagement"],
  "settings": {
    "IndustriesSettings": {
      "enableOutcomes": true
    }
  }
}
```

PardotScFeaturesCampaignInfluence

Enables additional campaign influence models, first touch, last touch, and even distribution for Pardot users.

PersonAccounts

Enables person accounts in your scratch org.

More Information

Available in Enterprise and Developer Edition scratch orgs.

PipelineInspection

Enables Pipeline Inspection. Pipeline Inspection is a consolidated pipeline view with metrics, opportunities, and highlights of recent changes.

More Information

Available in Enterprise Edition scratch orgs. To enable Pipeline Inspection in your scratch org, add this setting in your scratch org definition file.

```
"settings": {
    ...
    "opportunitySettings": {
      "enablePipelineInspectionFlow": true
    },
    ...
  }
```

PlatformCache

Enables Platform Cache and allocates a 3 MB cache. The Lightning Platform Cache layer provides faster performance and better reliability when caching Salesforce session and org data.

More Information

See Platform Cache in the Apex Developer Guide for more information.

PlatformConnect:<value>

Enables Salesforce Connect and allows your users to view, search, and modify data that's stored outside your Salesforce org. Indicate a value from 1–5.

Supported Quantities

1–5, Multiplier: 1

PlatformEncryption

Shield Platform Encryption encrypts data at rest. You can manage key material and encrypt fields, files, and other data.

PlatformEventsPerDay:<value>

Increases the maximum number of delivered standard-volume platform event notifications within a 24-hour period, shared by all CometD clients. Indicate a value between 10,000–50,000.

Supported Quantities

10,000–50,000, Multiplier: 1

ProcessBuilder

Enables Process Builder, a Salesforce Flow tool that helps you automate your business processes.

More Information

Requires configuration in the Setup menu of the scratch org.

See Process Builder in Salesforce Help for more information.

ProductsAndSchedules

Enables product schedules in your scratch org. Enabling this feature lets you create default product schedules on products. Users can also create schedules for individual products on opportunities.

ProductCatalogManagementAddOn

Enables read-write access to Product Catalog Management features and objects.

More Information

Available in Developer and Enterprise scratch org editions. Provides 1 Product Catalog Management add-on license.

ProductCatalogManagementViewerAddOn

Enables read access to Product Catalog Management features and objects.

More Information

Available in Developer and Enterprise scratch org editions. Provides 1 Product Catalog Management Viewer add-on license.

ProductCatalogManagementPCAddOn

Enables read access to Product Catalog Management features and objects for Partner Community Users in scratch orgs.

More Information

- Available in Developer and Enterprise scratch org editions.
- Provides 1 Product Catalog Management add-on license.
- Requires a partner community user to be set up. The partner community user must be granted the Product Catalog Management Partner Community add-on license.

ProgramManagement

Enables access to all Program Management and Case Management features and objects.

More Information

To enable ProgramManagement, add these settings to your scratch org definition file.

```
{
  "orgName": "Sample Org" ,
  "edition": "Enterprise",
  "features": ["ProgramManagement"],
```

```
  "settings": {
    "IndustriesSettings": {
      "enableBenefitManagementPreference": true,
      "enableBenefitAndGoalSharingPref": true,
      "enableCarePlansPreference": true
    }
  }
}
```

Alternatively, enable the settings in the org manually. See Enable Program Management in Salesforce Help.

ProviderFreePlatformCache

Provides 3 MB of free Platform Cache capacity for security-reviewed managed packages. This feature is made available through a capacity type called Provider Free capacity and is automatically enabled in Developer Edition orgs. Allocate the Provider Free capacity to a Platform Cache partition and add it to your managed package.

More Information

See Set Up a Platform Cache Partition with Provider Free Capacity in Salesforce Help for more information.

ProviderManagement

Enables the objects, features, and permissions for managing provider networks, care plans, and service delivery in Public Sector Solutions.

Sample Scratch Org Definition File

To enable ProviderManagement, add these features and settings to your scratch org definition file.

```
{
    "orgName": "Provider Management Org",
    "edition": "Developer",
    "features": ["ProviderManagement:2"],
    "settings": {
    "lightningExperienceSettings": {
    "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
    "enableS1EncryptedStoragePref2": false
    },
    "IndustriesSettings": {
    "enableBenefitAndGoalSharingPref": true,
    "enableBenefitManagementPreference": true,
    "enableCarePlansPreference": true,
    "enableCaseReferralPref": true,
    "enableProviderManagementPref": true,
    "enableProviderMgmtSharingPref": true,
    "enableDisbursementPreference": true
    }
    }
    }
```

PSSAssetManagement

Enables the objects, features, and permissions for managing assets in Public Sector Solutions.

Sample Scratch Org Definition File

To enable PSSAssetManagement, add these features and settings to your scratch org definition file.

```
{
    "orgName": "PSS Asset Management Org",
    "edition": "Enterprise",
    "features": [
    "PSSAssetManagement"
    ],
    "settings": {
    "industriesSettings": {
    "enableIndustriesAssessment": true,
    "enableDiscoveryFrameworkMetadata": true
    }
    }
    }
```

PublicSectorAccess

Enables access to all Public Sector features and objects.

PublicSectorApplicationUsageCreditsAddOn

Enables additional usage of Public Sector applications based on their pricing.

PublicSectorSiteTemplate

Allows Public Sector users access to build an Experience Cloud site from the templates available.

RateManagement

Enables Rate Management that allows you to set, manage, and optimize rates for usage-based products.

More Information

- Provides these set of licenses:
  - 5 RatingEngineAccess platform licenses
  - 5 RatingRunTimeAddOn add-on licenses
  - 5 RatingDesignTimeAddOn add-on licenses
  - 10 FullCRM licenses
- Requires you to enable CoreCpq to access Rate Management.

See Configure Rate Pricing Calculations in Revenue Cloud in Salesforce Help for more information.

RecordTypes

Enables Record Type functionality. Record Types let you offer different business processes, picklist values, and page layouts to different users.

RefreshOnInvalidSession

Enables automatic refreshes of Lightning pages when the user's session is invalid. If, however, the page detects a new token, it tries to set that token and continue without a refresh.

RevSubscriptionManagement

Enables Subscription Management. Subscription Management is an API-first, product-to-cash solution for B2B subscriptions and one-time sales.

More Information

Available in Enterprise and Developer scratch orgs. To enable Subscription Management in your scratch org, add this setting in your scratch org definition file.

```
"settings": {
    ...
    "subscriptionManagementSettings": {
      "enableSubscriptionManagement": true
    },
    ...
  }
```

For more information about Subscription Management, see https://developer.salesforce.com/docs/revenue/subscription-management/overview.

S1ClientComponentCacheSize

Allows the org to have up to 5 pages of caching for Lightning Components.

SalesCloudEinstein

Enables Sales Cloud Einstein features and Salesforce Inbox. Sales Cloud Einstein brings AI to every step of the sales process.

More Information

Available in Enterprise Edition scratch orgs.

See Sales Cloud Einstein in Salesforce Help for more information.

SalesforceContentUser

Enables access to Salesforce content features.

SalesforceFeedbackManagementStarter

Provides a license to use the Salesforce Feedback Management - Starter features.

More Information

Available in Enterprise and Developer edition scratch orgs. To use the Salesforce Feedback Management - Starter features, enable Surveys and assign the Salesforce Advanced Features Starter user permission to the scratch org user. For additional information on how to enable Surveys and configuration steps, see Enable Surveys and Configure Survey Settings and Assign User Permissions in Salesforce Help.

SalesforceHostedMCP

Enables hosted MCP servers on the scratch org. With this scratch org feature parameter, MCP clients can connect to available hosted MCP servers.

More Information

Use of Salesforce hosted MCP servers requires setup of external clients. See Salesforce Hosted MCP Severs in Salesforce Help.

SalesforceIdentityForCommunities

Adds Salesforce Identity components, including login and self-registration, to Experience Builder. This feature is required for Aura components.

SalesforcePricing

Enables Salesforce Pricing, which allows you to set, manage, and optimize prices across your entire product portfolio

More Information

Provides 5 Salesforce Pricing Design Time AddOn, 5 Salesforce Pricing Run Time AddOn licenses. For more information, see Salesforce Pricing in Salesforce Help.

SalesUser

Provides a license for Sales Cloud features.

SAML20SingleLogout

Enables usage of SAML 2.0 single logout.

SCIMProtocol

Enables access support for the SCIM protocol base API.

ScvMultipartyAndConsult

Enables you to set up and test multiparty calls and consult calls for Service Cloud Voice with Partner Telephony.

More Information

This feature requires that you also include the `ServiceCloudVoicePartnerTelephony` scratch org feature in your scratch org definition file. Available in Salesforce Enterprise, Unlimited, and Developer Editions.

For setup and configuration steps, see Manage Multiparty Calls and Consult Calls in the Service Cloud Voice for Partner Telephony Developer Guide.

Sample Scratch Org Definition File

```
{
  "orgName": "MultipartyScratchOrg",
  "edition": "Developer",
  "features": ["ScvMultipartyAndConsult", "ServiceCloudVoicePartnerTelephony"]
  "settings": {
    "lightningExperienceSettings": {
      "enableS1DesktopEnabled": true
     },
   "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
    }
  }
}
```

SecurityEventEnabled

Enables access to security events in Event Monitoring.

SentimentInsightsFeature

Provides the license required to enable and use Sentiment Insights in a scratch org. Use Sentiment Insights to analyze the sentiment of your customers and get actionable insights to improve it.

More Information

To use this scratch org feature, the Dev Hub org requires the IESentimentAnalysis, AwsSentimentAnalysis, BYOAForSentiment, and IESentimentAnalysisEnabled permissions. For information about Sentiment Insights, see Sentiment Insights in Salesforce Help.

ServiceCatalog

Enables Employee Service Catalog so you can create a catalog of products and services for your employees. It can also turn your employees' requests for these products and services into approved and documented orders.

More Information

To use this scratch org feature, the Dev Hub org requires the ServiceCatalog permission. To learn more, see Employee Service Catalog.

ServiceCloud

Assigns the Service Cloud license to your scratch org, so you can choose how your customers can reach you, such as by email, phone, social media, online communities, chat, and text.

ServiceCloudVoicePartnerTelephony

Assigns the Service Cloud Voice with Partner Telephony add-on license to your scratch org, so you can set up a Service Cloud Voice contact center that integrates with supported telephony providers. Indicate a value from 1–50.

Supported Quantities

1–50, Multiplier: 1

More Information

For setup and configuration steps, see Service Cloud Voice with Partner Telephony in Salesforce Help.

ServiceUser

Adds one Service Cloud User license, and allows access to Service Cloud features.

SessionIdInLogEnabled

Enables Apex debug logs to include session IDs. If disabled, session IDs are replaced with "SESSION_ID_REMOVED" in debug logs.

SFDOInsightsDataIntegrityUser

Provides a license to Salesforce.org Insights Platform Data Integrity managed package. You can then install the package in the scratch org.

More Information

For installation and configuration steps, see the Salesforce.org Insights Platform Data Integrity help.

SharedActivities

Allow users to relate multiple contacts to tasks and events.

More Information

For additional installation and configuration steps, see Considerations for Enabling Shared Activities in Salesforce Help.

Sites

Enables Salesforce Sites, which allows you to create public websites and applications that are directly integrated with your Salesforce org. Users aren't required to log in with a username and password.

More Information

You can create sites and communities in a scratch org, but custom domains, such as www.example.com, aren't supported.

SocialCustomerService

Enables Social Customer Service, sets post defaults, and either activates the Starter Pack or signs into your Social Studio account.

StateAndCountryPicklist

Enables state and country/territory picklists. State and country/territory picklists let users select states and countries from predefined, standardized lists, instead of entering state, country, and territory data into text fields.

StreamingAPI

Enables Streaming API.

More Information

Available in Enterprise and Developer Edition scratch orgs.

StreamingEventsPerDay:<value>

Increases the maximum number of delivered PushTopic event notifications within a 24-hour period, shared by all CometD clients (API version 36.0 and earlier). Indicate a value between 10,000–50,000.

Supported Quantities

10,000–50,000, Multiplier: 1

SubPerStreamingChannel:<value>

Increases the maximum number of concurrent clients (subscribers) per generic streaming channel (API version 36.0 and earlier). Indicate a value between 20–4,000.

Supported Quantities

20–4,000, Multiplier: 1

SubPerStreamingTopic:<value>

Increases the maximum number of concurrent clients (subscribers) per PushTopic streaming channel (API version 36.0 and earlier). Indicate a value between 20–4,000.

Supported Quantities

20–4,000, Multiplier: 1

SurveyAdvancedFeatures

Enables a license for the features available with the Salesforce Feedback Management - Growth license.

More Information

Available in Enterprise and Developer edition scratch orgs. To use the Salesforce Feedback Management - Growth features, enable Surveys and assign the Salesforce Surveys Advanced Features user permission to the scratch org user. For additional information on how to enable Surveys and configuration steps, see Enable Surveys and Configure Survey Settings and Assign User Permissions in Salesforce Help.

SustainabilityCloud

Provides the permission set licenses and permission sets required to install and configure Sustainability Cloud. To enable or use CRM Analytics and CRM Analytics templates, include the DevelopmentWave scratch org feature.

More Information

For installation and configuration steps, see Sustainability Cloud Legacy Documentation in the Set Up and Maintain Net Zero Cloud guide in Salesforce Help.

SustainabilityApp

Provides the permission set licenses and permission sets required to configure Net Zero Cloud. To enable or use Tableau CRM and Tableau CRM templates, include the DevelopmentWave scratch org feature.

Scratch Org Definition File

Add these options to your scratch org definition file:

```
{
  "orgName": "net zero scratch org",
  "edition": "Developer",
  "features": ["SustainabilityApp"],
  "settings": {
    "industriesSettings": {
      "enableSustainabilityCloud": true,
      "enableSCCarbonAccounting": true
    }
  }
}
```

More Information

For configuration steps, see Configure Net Zero Cloud in the Set Up and Maintain Net Zero Cloud guide in Salesforce Help.

TalentRecruitmentManagement

Enables the objects, features, and permissions for managing the talent recruitment and hiring process in Public Sector Solutions.

Sample Scratch Org Definition File

To enable TalentRecruitmentManagement, add these features and settings to your scratch org definition file.

```
{
    "orgName": "TRM Org",
    "edition": "Developer",
    "features": [
    "TalentRecruitmentManagement:4"
    ],
    "settings": {
    "lightningExperienceSettings": {
    "enableS1DesktopEnabled": true
    },
    "mobileSettings": {
    "enableS1EncryptedStoragePref2": false
    },
    "IndustriesSettings": {
    "enablePositionRecruitmentPref": true,
    "enableIndustriesAssessment": true,
    "enableDiscoveryFrameworkMetadata": true,
    "enableCriteriaBasedSearchAndFilter": true
    },
    "DocumentChecklistSettings": {
    "deleteDCIWithFiles": true
    }
    }
    }
```

TCRMforSustainability

Enables all permissions required to manage the Net Zero Analytics app by enabling Tableau CRM. You can create and share the analytics app for your users to bring your environmental accounting in line with your financial accounting.

More Information

For more information, see Deploy Net Zero Analytics in the Set Up and Maintain Net Zero Cloud guide in Salesforce Help.

TimelineConditionsLimit

Limits the number of timeline record display conditions per event type to 3.

More Information

See Provide Holistic Patient Care with Enhanced Timeline in Salesforce Help for more information.

TimelineEventLimit

Limits the number of event types displayed on a timeline to 5.

More Information

See Provide Holistic Patient Care with Enhanced Timeline in Salesforce Help for more information.

TimelineRecordTypeLimit

Limits the number of related object record types per event type to 3.

More Information

See Provide Holistic Patient Care with Enhanced Timeline in Salesforce Help for more information.

TimeSheetTemplateSettings

Time Sheet Templates let you configure settings to create time sheets automatically. For example, you can create a template that sets start and end dates. Assign templates to user profiles so that time sheets are created for the right users.

More Information

For configuration steps, see Create Time Sheet Templates in Salesforce Help.

TransactionFinalizers

Enables you to implement and attach Apex Finalizers to Queueable Apex jobs.

More Information

Note: This functionality is currently in open pilot and subject to restrictions.

See the Transaction Finalizers (Pilot) in Apex Developer Guide for more information.

UsageManagement

Enables Usage Management. Using Usage Management, you can setup, track, and manage the consumption of usage-based products.

More Information

- Provides 5 UsageManagementAddOn add-on licenses and 10 FullCRM licenses.

See Usage Management in Salesforce Help for more information.

VolunteerManagement

Gives users access to Volunteer Management features and objects in Salesforce.

Scratch Org Definition File

See Nonprofit Cloud for Volunteer Management in Salesforce Help for more information. To enable Volunteer Management, add these settings to your scratch org definition file.

Note: Volunteer Management licenses are assigned when the Volunteer Management feature is enabled in the scratch org.

```
{
    "orgName": "Volunteer Management Org",
    "edition": "Enterprise",
    "hasSampleData": "false",
    "features": [
        "PersonAccounts",
        "VolunteerManagement"
    ],
    "settings": {
        "lightningExperienceSettings": {
            "enableS1DesktopEnabled": true
        },
        "IndustriesSettings": {
            "enableVolunteerManagement": true
        }
    }
  }
```

WaveMaxCurrency

Increases the maximum number of supported currencies for CRM Analytics. Indicate a value between 1–5.

WavePlatform

Enables the Wave Platform license.

Workflow

Enables Workflow so you can automate standard internal procedures and processes.

More Information

Requires configuration in the Setup menu of the scratch org.

WorkflowFlowActionFeature

Allows you to launch a flow from a workflow action.

More Information

This setting is supported only if you enabled the pilot program in your org for flow trigger workflow actions. If you enabled the pilot, you can continue to create and edit flow trigger workflow actions.

If you didn't enable the pilot, use the Flows action in the ProcessBuilder scratch org feature instead.

WorkplaceCommandCenterUser

Enables access to Workplace Command Center features including access to objects such as Employee, Crisis, and EmployeeCrisisAssessment.

More Information

For additional installation and configuration steps, see Set Up Your Work.com Development Org in the *Workplace Command Center for Work.com Developer Guide*.

WorkThanksPref

Enables the give thanks feature in Chatter.

Scratch Org Settings

Scratch org settings are the format for defining org preferences in the scratch org definition. Because you can use all Metadata API settings, they're the most comprehensive way to configure a scratch org. If a setting is supported in Metadata API, it's supported in scratch orgs. Settings provide you with fine-grained control because you can define values for all fields for a setting, rather than just enabling or disabling it.

For information on Metadata API settings and their supported fields, see Settings in *Metadata API Developer Guide*.

Important: Although the Settings are upper camel case in the *Metadata API Developer Guide*, be sure to indicate them as lower camel case in the scratch org definition.

```
{
  "orgName": "Acme",
  "edition": "Enterprise",
  "features": ["Communities", "ServiceCloud", "Chatbot"],
  "settings": {
      "communitiesSettings": {
          "enableNetworksEnabled": true
      },
      "lightningExperienceSettings": {
          "enableS1DesktopEnabled": true
      },
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
      },
      "omniChannelSettings": {
          "enableOmniChannel": true
      },
      "caseSettings": {
          "systemUserEmail": "support@acme.com"
      }
  }
}
```

Here's an example of how to configure SecuritySettings in your scratch org. In this case, to define session timeout, you nest the field values.

```
{
  "orgName": "Acme",
  "edition": "Enterprise",
  "features": [],
  "settings": {
       "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
```

```
        },
       "securitySettings": {
           "sessionSettings":{
              "sessionTimeout": "TwelveHours"
           }
       }
   }
}
```

This example shows how to use NameSettings to enable middle names and suffixes in your org for these person objects: Contact, Lead, Person Account, and User.

```
{
  "orgName": "Acme",
  "edition": "Enterprise",
  "settings": {
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
       },
       "nameSettings": {
          "enableMiddleName": true,
          "enableNameSuffix": true
       }
   }
}
```

Create a Scratch Org Based on an Org Shape

We know it's not easy to build a scratch org definition that mirrors the features and settings in your production org. With Org Shape for Scratch Orgs, you can leave building the scratch org definition to us. After you capture the org's shape, you can spin up scratch orgs based on it.

Available in: Developer, Group, Professional, Unlimited, and Enterprise editions. The scratch org created from the org shape is the same edition as the source org.

Not available in: Scratch orgs and sandboxes

What's Included in Org Shape?

Features, Metadata API settings, edition, limits, and licenses determine what we refer to as an org's shape. For further clarification, org shape includes:

- Metadata API settings with `boolean` fields.
- Licenses associated with installed packages, but not the packages themselves. To use the associated package, install it in the scratch org created from the org shape.

Note: Some features aren't captured when the org shape is created. However, you can add the features manually to the scratch org definition file. See Troubleshoot Org Shape for details.

What's Not Included in Org Shape?

- Metadata API settings with `integer` or `string` fields. However, you can manually add non-Boolean settings or other settings not included in the source org to your scratch org definition. See Scratch Org Definition for Org Shape for examples.
- Metadata types
- Data

Org Shapes Are Specific to a Release

Scratch org shapes are associated with a specific Salesforce release. Be sure to recreate the org shape after the source org is upgraded to the new Salesforce release. During a Salesforce major release transition, your Dev Hub org and source org can be on different release versions. See Scratch Org Definition for Org Shape for options during the transition period.

Can I See the Org Shape File?

Org shapes are internal system files and aren't viewable.

Enable Org Shape for Scratch Orgs

Enable Org Shape for Scratch Orgs in the org whose shape you want to capture (source org).

Org Shape Permissions

A Salesforce admin for the Dev Hub org must assign permissions to users who plan to create org shapes, or create scratch orgs based on an org shape. If you already have a permission set for Salesforce DX users, you can update it to include access.

Create and Manage Org Shapes

Create an org shape to mimic the baseline setup (features, limits, edition, and Metadata API settings) of a source org without the extraneous data and metadata. If the features, settings, or licenses of that org change, you can capture those updates by recreating the org shape. You can have only one active org shape at a time. Org shapes are internal system files and aren't viewable.

Scratch Org Definition for Org Shape

During org shape creation, we capture the features, settings, edition, licenses, and limits of the specified source org. This way, you don't have to manually include these items in the scratch org definition file. You can create a scratch org based solely on the source org shape. Or you can add more features and settings in the scratch org definition file to include functionality not present in the source org.

Troubleshoot Org Shape

Here are some issues you can encounter when using Org Shape for Scratch Orgs.

SEE ALSO:

Metadata API Developer Guide: Settings

Enable Org Shape for Scratch Orgs

Enable Org Shape for Scratch Orgs in the org whose shape you want to capture (source org).

Available in: Developer, Group, Professional, Unlimited, and Enterprise editions

Not available in: Scratch orgs and sandboxes

Be sure to:

- Enable Org Shape for Scratch Orgs in both the source org and the Dev Hub org, if you want to capture the shape of an org that isn't also your Dev Hub org.
- When entering the org ID, use only the first 15 characters rather than the full 18-character org ID.

You can find the org ID in **Setup > Company Information**.

1. Enable Org Shape for Scratch Orgs in the Dev Hub org that you use to create scratch orgs. Contact a Salesforce admin if you require assistance.
   a. From Setup, enter `Scratch Orgs` in the Quick Find box, then select **Scratch Orgs**.
   b. Click the toggle for **Enable Org Shape for Scratch Orgs**.
   c. In the text box, enter the 15-character org ID for the Dev Hub, then click **Save**.
2. (Optional) If the source org is different from the Dev Hub org, enable Org Shape for Scratch Orgs in the source org.
   a. Log in to the source org.
   b. From Setup, enter `Scratch Orgs` in the Quick Find box, then select **Scratch Orgs**.
   c. Click the toggle for **Enable Org Shape for Scratch Orgs**.
   d. Enter the 15-character Dev Hub org ID that you're using to create scratch orgs.

You can specify up to 50 Dev Hub org IDs to address these common use cases:

- You have multiple production orgs but your development team has access to only one. For the customization they're building, they require the shape of another production org.
- Your developers use their own Dev Hub orgs and don't have access to the production org. However, they want to create scratch orgs based on the shape of the production org.
- You're an ISV who uses your production org to create scratch orgs. You want to capture the shape of your first-generation packaging org so you can build second-generation packages.

Org Shape Permissions

A Salesforce admin for the Dev Hub org must assign permissions to users who plan to create org shapes, or create scratch orgs based on an org shape. If you already have a permission set for Salesforce DX users, you can update it to include access.

Access	Permissions
Create an org shape	Object Settings > Shape Representation > Create, Edit
Delete an org shape	Object Settings > Shape Representation > Delete
Use an org shape to create a scratch org	No additional permissions are required besides the ones for creating scratch orgs.

You don't require the "Modify All Records" permission to delete shapes created by others because there can be only one active shape in the org at a time.

Supported Licenses

In addition to providing users with appropriate permissions, be sure to assign the Salesforce license to Org Shape users. Other user licenses aren't supported at this time.

SEE ALSO:

Add Salesforce DX Users

SOAP API Developer Guide: ShapeRepresentation

Create and Manage Org Shapes

Create an org shape to mimic the baseline setup (features, limits, edition, and Metadata API settings) of a source org without the extraneous data and metadata. If the features, settings, or licenses of that org change, you can capture those updates by recreating the org shape. You can have only one active org shape at a time. Org shapes are internal system files and aren't viewable.

An org shape captures Metadata API settings, not all metadata types. For example, customizations that appear in the org, such as Lightning Experience Themes, aren't included as part of org shape. See Settings in the *Metadata API Guide* for the complete list.

An org shape includes org preference and permissions. It doesn't include data entries such as AddressSettings.

Important: Scratch org shapes are associated with a specific Salesforce release. Be sure to recreate the org shape after the source org is upgraded to the new Salesforce release.

1. Authorize both your Dev Hub org and the source org. Run this command for each org.

```
sf auth web login --alias
```

2. Create the org shape for the source org. This command kicks off an asynchronous process to create the org shape.

```
sf org create shape --target-org <source org username/alias>
Successfully created org shape for 3SRB0000000TXbnOCG.
```

3. Check the status of the `shape:create` command.

```
sf org shape list
```

```
=== Org Shapes
ALIAS  USERNAME  ORG ID              SHAPE STATUS CREATED BY CREATED DATE
_____ _________ __________________ _____________ __________ _____________
SrcOrg me@my.org 00DB1230000Ifx5MAC InProgress   me@my.org  2020-08-06
```

You can use the org shape after the status is `Active`:

```
=== Org Shapes
ALIAS   USERNAME  ORG ID              SHAPE STATUS CREATED BY   CREATED DATE
______ _________ __________________ _____________ ___________ _____________
SrcOrg me@my.org 00DB1230000Ifx5MAC Active       me@my.org    2020-08-06
```

If you run the `sf org create shape` command again for this org, the previous shape is marked inactive and replaced by a new active shape.

If you don't want to create scratch orgs based on this shape, you can delete the org shape. To delete an org shape:

```
sf org delete shape --target-org <username/alias>
```

Scratch Org Definition for Org Shape

During org shape creation, we capture the features, settings, edition, licenses, and limits of the specified source org. This way, you don't have to manually include these items in the scratch org definition file. You can create a scratch org based solely on the source org shape. Or you can add more features and settings in the scratch org definition file to include functionality not present in the source org.

Important: In the scratch org definition, indicate the 15-character `sourceOrg` instead of `edition`. The sourceOrg is the org ID for the org whose shape you created. Use only the first 15 characters rather than the full 18-character org ID.

Simple Scratch Org Definition File

If your Dev Hub org, source org, and org shape are all on the same Salesforce version, you can use the simple scratch org definition.

```
{
  "orgName": "Acme",
  "sourceOrg": "00DB1230400Ifx5"
}
```

Scratch Org Definition File during Salesforce Release Transitions

During the Salesforce major release transition, your Dev Hub org and source org can be on different versions. If your Dev Hub org is on a different version than your source org, add the `release` option to your scratch org definition file to create scratch orgs using the org shape.

```
{
  "orgName": "Acme",
  "sourceOrg": "00DB1230400Ifx5",
  "release": "previous"
}
```

Source Org/Org Shape Version	Dev Hub Version	Supported Scratch Org Version	Release Option to Use in Scratch Org Definition File
Current	Preview	Current version only	`"release": "previous"`
Preview	Current	Preview version only	`"release": "preview"`

Scratch Org Definition File for DevOps Center

If you create a scratch org based on an org shape with DevOps Center enabled, we still require that you add the DevOps Center feature and setting to the scratch org definition. We require that customers explicitly enable it for legal reasons as part of the DevOps Center terms and conditions.

```
{
    "orgName": "Acme",
    "sourceOrg": "00DB1230400Ifx5",
    "features": ["DevOpsCenter"],
    "settings": {
        "devHubSettings": {
            "enableDevOpsCenterGA": true
            }
```

```
        }
    }
```

Scratch Org Definition File with Other Features and Settings

To add features not captured by org shape, or to test features that your source org doesn't have, you can add more scratch org features and Metadata API settings. Settings refer to the Settings metadata type, not all metadata types.

```
{
  "orgName": "Acme",
  "sourceOrg": "00DB1230000Ifx5",
  "features": ["Communities", "ServiceCloud", "Chatbot"],
  "settings": {
      "communitiesSettings": {
          "enableNetworksEnabled": true
      },
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
      },
      "omniChannelSettings": {
          "enableOmniChannel": true
      },
      "caseSettings": {
          "systemUserEmail": "support@acme.com"
      }
  }
}
```

Next: Create a scratch org using the org shape scratch org definition file.

SEE ALSO:

Metadata API Developer Guide: Settings

Troubleshoot Org Shape

Here are some issues you can encounter when using Org Shape for Scratch Orgs.

Some Features Not Captured by Org Shape

Description: Some features and settings aren't enabled in the org shape, in many cases by design due to security or legal reasons.

- Chatbot
- DevOpsCenter
- MultiCurrency
- PersonAccounts

Workaround: Add them to the scratch org definition.

```
{
    "orgName": "Acme",
    "sourceOrg": "00DB1230400Ifx5",
    "features": [”Chatbot”, "MultiCurrency", "DevOpsCenter"],
```

```
    "settings":
      {
       "botSettings":
          "enableBots": true
      }
       "currencySettings":
          "enableMultiCurrency": true
      }
       "devHubSettings": {
          "enableDevOpsCenterGA": true
      }
  }
```

Some Field Service Features Aren't Enabled in Org Shape

Description: Even when the Field Service Enhanced Scheduling and Optimization, and Field Service Integration features are enabled in the source org in which the org shape is created, these features aren't enabled when creating a scratch org based on the org shape.

Workaround: Manually add the missing Field Service Metadata API settings to the scratch org definition depending on which features are enabled in the source org.

Scenario 1: If the org shape included both the Field Service Enhanced Scheduling and Optimization, and Field Service Integration features, manually add the Field Service Enhanced Scheduling and Optimization Metadata API setting, `o2EngineEnabled`, in the scratch org definition file, which enables both features.

```
"settings":
    {
     "fieldServiceSettings":
      {
        "fieldServiceOrgPref": true,
          "o2EngineEnabled": true
      }
    }
```

Scenario 2: If the org shape included only the Field Service Integration feature, manually add the Field Service Enhanced Scheduling and Optimization Metadata API setting `optimizationServiceAccess`, to the scratch org definition file.

```
"settings":
    {
     "fieldServiceSettings":
      {
        "fieldServiceOrgPref": true,
           "optimizationServiceAccess": true
      }
    }
```

DevOps Center Isn't Enabled in a Scratch Org Based on an Org Shape

Description: Although DevOps Center is enabled in the source org, the scratch org created from the source org's shape doesn't have DevOps Center enabled. The DevOps Center org preference is purposely toggled off. We require that customers explicitly enable it by indicating the feature and setting in the scratch org definition file for legal reasons as part of the DevOps Center terms and conditions.

Workaround: Add the DevOps Center feature and setting to the scratch org definition file. See Scratch Org Definition for Org Shape for details.

ERROR running force:org:shape:list

Description: A trial org from which you created the org shape has expired. You could see either of these errors:

```
ERROR running org list shape: Error authenticating with the refresh token due to: inactive
 user
ERROR running org list shape: Error authenticating with the refresh token due to: expired
 access/refresh token
```

Workaround:

- Use `sf org logout` to log out and remove the expired org.
- Run `sf org list shape` again.

Can't create a Digital Experience Cloud Site Using Org Shape

Description: When you try to create a scratch org from an org shape that contains an Experience Cloud Site, you get an error.

```
Required fields are missing: [Welcome Email Template, Change Password Email Template, Lost
 Password Template]
```

Workaround: None.

Error While Creating Scratch Org Using a Shape

Description: You see this error when creating a scratch org using a shape.

```
ERROR running org create scratch: A fatal signup error occurred. Please try again.
If you still see this error, contact Salesforce Support for assistance.
```

Workaround: Generate a new shape using the `org create shape` command, then try again.

Shift Status Picklists Aren't Populated When Using a Shape With Field Service

Description: When you create a scratch org from a shape with Field Service enabled, the Status field picklist for Shifts is empty.

Workaround: Use an org shape with field service disabled, then enable field service in the scratch org definition file settings.

```
{
 "orgName": "Acme",
 "sourceOrg": "00DB1230000Ifx5",
 "settings": {
     "fieldServiceSettings": {
         "fieldServiceOrgPref": true
     }
 }
}
```

Org Shape Feature Accepts Only 15-Character Org IDs

Description: You can use only 15-character org IDs when enabling Org Shape for Scratch Orgs and specifying the source org in the scratch org definition file. Org IDs are usually 18 characters long, which is what the `org list` command displays.

Workaround: Use only the first 15 characters of a standard 18-character org ID when working with the Org Shape feature.

Create Scratch Orgs

Easily spin up a scratch org and open it directly from the command line.

Before you create a scratch org:

- Set up your Salesforce DX project
- Authorize the Dev Hub org
- Create the scratch org definition file (build your own or use an org shape)

You can create scratch orgs for different functions, such as for feature development, for development of packages that contain a namespace, or for user acceptance testing.

Tip: Delete any unneeded or malfunctioning scratch orgs in the Dev Hub org or via the command line so that they don't count against your active scratch org allocations.

Indicate the path to the scratch definition file relative to your current directory. For sample repos and new projects, this file is located in the `config` directory.

Ways to Create Scratch Orgs

Create a scratch org for development using a scratch org definition file, give the scratch org an alias, and indicate that this scratch org is the default. Use the `--target-dev-hub` flag to specify your Dev Hub org's username or alias; if you don't specify this flag, the command uses your default Dev Hub.

```
sf org create scratch --definition-file config/project-scratch-def.json --alias MyScratchOrg
 --set-default --target-dev-hub MyHub
```

You can override many of the options in the user definition file by specifying the corresponding flag at the command line when you run `org create scratch`. This technique allows multiple users or continuous integration jobs to share a base definition file and then customize options when they run the command. This example overrides the adminEmail and edition options.

```
sf org create scratch --definition-file config/project-scratch-def.json --admin-email
me@email.com --edition developer
```

You're not required to specify a definition file when you create a scratch org, as long as you specify the required flag `--edition`.

```
sf org create scratch --edition developer
```

This example creates a scratch org from a snapshot with the specified name.

```
sf org create scratch --snapshot dhsnapshot --wait 10 --target-dev-hub MyHub
```

This example creates a scratch org from an org shape with the specified ID.

```
sf org create scratch --source-org 00DB1230000Ifx5
```

Create a scratch org for user acceptance testing or to test installations of packages. In this case, you don't want to create a scratch org with a namespace. You can use this command to override the namespace value in the scratch org definition file. This example also specifies the scratch org's duration, which indicates when the scratch org expires (in 1-30 days). The default duration is 7 days.

```
sf org create scratch --definition-file config/project-scratch-def.json --no-namespace
--duration-days 30
```

Specify the Salesforce release for the scratch org. During the Salesforce release transition, you can specify the release (preview or previous) when creating a scratch org. See Select the Salesforce Release for a Scratch Org for details.

```
sf org create scratch --edition developer --release preview
```

Request a scratch org, but don't wait for it complete, by specifying the `--async` flag.

```
sf org create scratch --edition developer --async
```

The command displays a job ID that you pass to the `org resume scratch` command. Use this command to also resume a scratch org creation that times out.

```
sf org resume scratch --job-id 2SRB0000CSqdJOAT
```

Create a scratch org with source tracking disabled.

```
sf org create scratch --definition-file config/project-scratch-def.json --no-track-source
```

View Scratch Org Creation Progress

While executing, the `org create scratch` command displays running information about the background processes. When the command completes, it displays two important pieces of information: the org ID and the username.

```
———————————— Creating Scratch Org ————————————

 Prepare Request 11ms
 Send Request 11.73s
 Wait For Org - Skipped
 Available 12ms
 Authenticate 1.51s
 Deploy Settings 2.14s
 Done 0ms

Request Id: 2SRWs000003y7mUOAQ (https://cbdocorg.my.salesforce.com/2SRWs000003y7mUOAQ)
OrgId: 00DE200000DHqsM
Username: test-lvsbbdryeaxn@example.com
Alias: myscratch
Elapsed Time: 15.40s

Your scratch org is ready.
```

Open the Scratch Org

```
sf org open --target-org test-st9thgoyyyq3@example.com
```

If you used the `--alias` flag to set an alias, you can use that value for `--target-org`.

```
sf org open --target-org MyScratchOrg
```

Salesforce Release Transition Periods

Timing is everything during the Salesforce release transition period. During the transition period, you can intend to create a scratch org on the current release but find that the scratch org is unexpectedly created on the preview release. If the instance on which the scratch

is created transitions to the preview release after the creation request is initiated, the scratch org is created on the preview version instead of the current version. During this transition period, there's no way to know when the sandbox (CS) instance will be upgraded.

If you open the scratch org and it isn't on the expected version, you have some options. See "How Release Transitions Can Affect the Scratch Org Version" in Select the Salesforce Release for a Scratch Org.

Troubleshooting Tips

If the create command runs into an error, it's not always clear if the scratch org was created. Issue this command on your Dev Hub org to see if it returns the scratch org ID, which confirms the existence of a scratch org that was created today and owned by you:

```
sf data query --query "SELECT ID, Name, Status FROM ScratchOrgInfo WHERE CreatedBy.Name =
 '<your name>' AND CreatedDate = TODAY" --target-org <Dev Hub org>
```

Use this information to determine if the creation actually worked. For example, let's say your name is Jane Doe, and you created an alias for your Dev Hub org called DevHub:

```
sf data query --query "SELECT ID, Name, Status FROM ScratchOrgInfo WHERE CreatedBy.Name =
 'Jane Doe' AND CreatedDate = TODAY" --target-org DevHub
```

SEE ALSO:

- ScratchOrgInfo sObject API Reference
- Project Setup
- Authorization
- Build Your Own Scratch Org Definition File
- Deploy Source From Your Project to the Scratch Org
- *VS Code Command*: SFDX: Create a Default Scratch Org

Scratch Org Snapshots

Capture the state of a scratch org's configuration so that you can use it to create scratch org replicas. A snapshot is a point-in-time copy of a scratch org that includes installed packages, features, limits, licenses, metadata, and data.

Configuring a scratch org with a project's dependencies can be a manual and time-consuming process. It can require deploying dependent metadata to it, seeding it with sample data, installing one or more packages, and then performing manual tasks directly in the scratch org. And then, poof, the scratch org expires, and you have to start all over again. With scratch org snapshots, you can quickly replicate scratch orgs with the required project dependencies.

How Snapshots Fit in the Development Lifecycle

Because a snapshot is a point-in-time copy of your scratch org, it's static. To update your snapshot, delete it and create another snapshot.

You can create a snapshot from only a scratch org and, conversely, you can create only scratch orgs from a snapshot. Snapshots have the same 200-MB data storage limit as scratch orgs. A snapshot isn't meant to replace source-driven development or a version control system. You continue to follow best development practices by externalizing and modularizing your project source.

Snapshots and scratch orgs don't replace sandboxes for user acceptance testing. A snapshot is intended to contain the static dependencies of a project, and not the entire happy soup of your production org.

Snapshot Allocations and Limits

Snapshots are associated with a Dev Hub org. Therefore, you must use the same Dev Hub org when you create the scratch org from the snapshot.

- The number of snapshots you can create is the same as the active scratch org allocation based on edition type.
- Snapshots expire after 90 days. When a snapshot expires or is deleted, its status is updated automatically and its license becomes immediately available.
- Snapshot data is retained for 100 days. When a snapshot expires, it's associated data is deleted 10 days later. If a snapshot is deleted, its associated data is deleted 100 days after its creation date.

Edition	Snapshot Allocations (Active and Daily)
Developer Edition	3
Enterprise Edition	40
Unlimited Edition	100
Performance Edition	100

To view your snapshot usage with Salesforce CLI, run:

```
sf org list limits -o <Dev Hub username or alias>
```

Look for these values in the output:

```
Name                  Remaining      Max
____________________  _________      _________
ActiveOrgSnapshots    38             40
DailyOrgSnapshots     35             40
```

Unsupported Features

These features aren't copied to the snapshot because they risk exposing sensitive data or authentication secrets.

- Connected apps
- External credentials
- Named credentials

Get Started with Scratch Org Snapshots

Install the required Salesforce DX tools, then enable Dev Hub and Scratch Org Snapshots in an org, usually your production org.

Salesforce CLI Snapshot Commands

You must use Salesforce CLI commands to create and manage your scratch org snapshots.

Create a Scratch Org Snapshot

You can create a snapshot if the source scratch org wasn't created using a snapshot or with a namespace.

Create a Snapshot for Use with Namespaced Scratch Orgs

While you can't use a namespaced scratch org to create a snapshot, you can create a namespaced scratch org from a snapshot. That way, you can deploy namespaced metadata to the scratch org. Snapshots are intended to include only dependent packages, metadata, and test data.

Create a Scratch Org Based on a Snapshot

The snapshot must belong to the Dev Hub that you're using to create the scratch org. We recommend that you create a scratch org definition file that references the snapshot, although you can also reference it directly with the `--snapshot` flag of `org create scratch`. Changing or deleting a scratch org has no effect on a snapshot.

Create a Package Version Based on a Snapshot

If you're a partner or ISV who builds second-generation managed packages that depend on base packages, you can create package versions significantly faster by using scratch org snapshots. Using a snapshot to create a package version is a great choice if your dependent base packages are stable.

Manage and Maintain Your Snapshots

You can check the status of snapshot creation, list all snapshots, and delete a snapshot.

Get Started with Scratch Org Snapshots

Install the required Salesforce DX tools, then enable Dev Hub and Scratch Org Snapshots in an org, usually your production org.

- Install Salesforce CLI.
- Enable Dev Hub in your production org.
- Authorize your Dev Hub org. The Dev Hub org is the org you use to create and manage scratch orgs.
- Enable Scratch Org Snapshots in the Dev Hub org.
- Provide users with permissions to create snapshots.

Enable Scratch Org Snapshots in the Dev Hub Org

A snapshot must belong to the Dev Hub org that you're using to create the scratch orgs.

Assign a License and Permissions to Snapshot Users

Provide all non-admin Scratch Org Snapshots users with a supported license and access to the required scratch org and snapshot objects. Dev Hub (production org) admins can create and manage snapshots by default.

Enable Scratch Org Snapshots in the Dev Hub Org

A snapshot must belong to the Dev Hub org that you're using to create the scratch orgs.

1. Log into your Dev Hub org as the admin user.
2. From Setup, enter *Scratch Orgs* in the Quick Find box, then select **Scratch Orgs**.
3. Click to enable **Enable Scratch Org Snapshots**.

EDITIONS

Available in: **Developer**, **Enterprise**, **Group**, **Professional**, and **Unlimited** editions

Not available in: Scratch orgs and sandboxes

Assign a License and Permissions to Snapshot Users

Provide all non-admin Scratch Org Snapshots users with a supported license and access to the required scratch org and snapshot objects. Dev Hub (production org) admins can create and manage snapshots by default.

1. Log in to your Dev Hub org as the admin user.
2. Assign to each snapshot user a Salesforce, Salesforce Platform, or Salesforce Limited Access license.
3. In Setup, create a permission set or select an existing one.
4. From the permission set's Object Settings, select **Org Snapshots**, then click **Edit**.

   a. Under Object Permissions, select **Read**, **Create**, and **Delete**.
   b. (Optional) Add these object permissions to the permission set.
   - To allow users to see snapshots that other users create, select **View All Records**.
   - To allow users to delete snapshots that other users create, select **Modify All Records** (Salesforce license only).

5. If snapshot users don't already have access to the required scratch org objects (Scratch Org Info and Active Scratch Orgs) through another permission set, include access to them in this permission set.

   See *Required Permissions for Scratch Orgs* in Create and Assign a Permission Set to Developer Users for details.

6. Save your changes.
7. Click **Manage Assignments**, then **Add Assignment**.
8. Select the users, click **Next**, and optionally set an expiration date.
9. Click **Assign**, then **Done**.

Salesforce CLI Snapshot Commands

You must use Salesforce CLI commands to create and manage your scratch org snapshots.

`org create snapshot`
Create a snapshot of a scratch org.

`org delete snapshot`
Delete a scratch org snapshot.

`org get snapshot`
Get details about a scratch org snapshot.

`org list snapshot`
List scratch org snapshots that belong to the specified Dev Hub org.

Get Help in the Terminal for Command Syntax

The `--help` and `-h` flags enable you to get varying levels of help (comprehensive or abbreviated) right in the command window:

Example:

```
sf org create snapshot --help
```

Create a Scratch Org Snapshot

You can create a snapshot if the source scratch org wasn't created using a snapshot or with a namespace.

Before you begin:

- Enable Dev Hub in your production org, or another org you use to create scratch orgs.
- Enable Scratch Org Snapshots in the Dev Hub org.
- Be sure that non-admin users have the proper permissions to use scratch orgs and snapshots. See Assign a License and Permissions to Snapshot Users for details.

A snapshot captures the state of a scratch org at a point in time. To update your snapshot, delete it and create another snapshot. Unlike an org shape, a snapshot includes installed packages, metadata, and data. The time to create a snapshot depends on the size of the source scratch org. To speed up snapshot creation time, include only what's necessary for your project.

Note: If you continue to modify the source scratch org after you run the snapshot command, not all the modifications will be reflected in the snapshot. Instead, complete the configuration of the source scratch org before creating the snapshot.

Command syntax:

```
sf org create snapshot --name <name> --source-org <ID or alias of scratch org> \
--target-dev-hub <username or alias of Dev Hub org> --description <text>
```

A snapshot name can have a maximum length of 15 characters. It can contain only alphanumeric characters (no special characters or spaces, even if the name is surrounded by quotation marks during creation).

Tip: To view the aliases, usernames, and IDs of your authenticated orgs and scratch orgs, run the `org list` command.

Example:

```
sf org create snapshot --name dhsnapshot --source-org dreamhouse-scratch \
--target-dev-hub my-dev-hub --description "Dreamhouse app"
```

Your request is initially InProgress:

```
Name                Value
__________________  ____________________
Id                  0Oo1Q0000004C93SXX
Snapshot Name       dhsnapshot
Description         Dreamhouse app
Status              InProgress
Source Org          00D050000004ipAEXX
Created Date        09/22/2023, 02:07 PM
Last Modified Date  09/22/2023, 02:07 PM
Expiration Date     2023-12-21
```

To check the status of the request, see Manage and Maintain Your Snapshots.

Create a Snapshot for Use with Namespaced Scratch Orgs

While you can't use a namespaced scratch org to create a snapshot, you can create a namespaced scratch org from a snapshot. That way, you can deploy namespaced metadata to the scratch org. Snapshots are intended to include only dependent packages, metadata, and test data.

1. Create and register the namespace in the Dev Hub org and add it to the `sfdx-project.json` file.
2. When you create the scratch org that you plan to use as the source of the snapshot, be sure to indicate the `--no-namespace` flag.
3. Create the scratch org snapshot.
4. Create a scratch org based on the snapshot.

   The resulting scratch org has a namespace, which means that any unpackaged metadata from the snapshot is now namespaced in the resulting scratch org.

SEE ALSO:

Link a Namespace to a Dev Hub Org

Create a Scratch Org Based on a Snapshot

The snapshot must belong to the Dev Hub that you're using to create the scratch org. We recommend that you create a scratch org definition file that references the snapshot, although you can also reference it directly with the `--snapshot` flag of `org create scratch`. Changing or deleting a scratch org has no effect on a snapshot.

Create the Scratch Org Definition File

The scratch org definition file is the blueprint for your scratch org. It's likely that your snapshot includes all the required features and settings to configure the scratch orgs created from it.

Using our Dreamhouse scratch org as an example, let's create a scratch org definition file called `dhsnapshot-scratch-def.json` that contains only two entries: `orgName` and `snapshot`, which is the name you gave the snapshot when you created it.

Important: Be sure you use the `snapshot` option instead of `edition` in the scratch org definition file.

```
{
  "orgName": "Salesforce",
  "snapshot": "dhsnapshot"
}
```

When creating the scratch org definition file, don't include these options:

- edition
- features
- hasSampleData
- release
- sourceOrg

Add Settings to the Scratch Org Definition File to Override Default Snapshot Settings

Some scratch org settings aren't inherited from the org snapshot. In these cases, you can add these settings in the scratch org definition file to achieve the desired scratch org configuration when creating a scratch org from a snapshot.

This example scratch org definition file illustrates adding some scratch org settings, in the event that these settings weren't inherited from the scratch org snapshot.

```
{
  "orgName": "Salesforce",
  "snapshot": "dhsnapshot",
  "settings": {
    "activitiesSettings": {
      "enableCalendarHomeLWC": false
    },
    "omniChannelSettings": {
      "enableOmniSkillRouting": true
      "enableOmniChannel": true
    },
    "experienceBundleSettings": {
      "enableExperienceBundleMetadata": true
    },
    "oauthOidcSettings": {
      "blockOAuthUnPwFlow": true
```

```
    },
    "mobileSettings": {
      "enableS1EncryptedStoragePref2": false
    },
    "securitySettings": {
      "lockerServiceNext": false
    }
  }
}
```

Create the Scratch Org Based On Your Snapshot

It can take Salesforce longer to create a scratch org from a snapshot, so we suggest you increase the `--wait` value so the command doesn't time out. Remember to set the `--target-dev-hub` flag to the same Dev Hub org associated with the snapshot.

For example:

```
sf org create scratch --definition-file config/dhsnapshot-scratch-def.json \
--alias dh-scratch-ci --wait 10 --target-dev-hub my-dev-hub
```

This example shows how to use the `--snapshot` flag to directly reference the snapshot without using a defintion file.

```
sf org create scratch --snapshot dhsnapshot \
--alias dh-scratch-ci --wait 10 --target-dev-hub my-dev-hub
```

You can indicate whether the scratch org you create from the snapshot has a namespace, which is important if you're using scratch orgs for second-generation package development.

- Define a namespace in the `sfdx-project.json` file. The resulting scratch org has a namespace, which means that any unpackaged metadata from the snapshot is now namespaced in the resulting scratch org.
- Use the `--no-namespace` flag to ensure the resulting scratch org doesn't have a namespace, even if you have a namespace specified in the `sfdx-project.json` file.

Success! Development and testing with scratch orgs just got a whole lot easier.

Determine the Release Version for the Resulting Scratch Org

Normally, a scratch org is created on the same release version as the Dev Hub org regardless of how the scratch org was created: using the standard method, an org shape, or a snapshot. However, during Salesforce Preview, a scratch org can be created on a different release version from the Dev Hub org, if the snapshot release version differs from the Dev Hub's release version.

During the Salesforce release transition, release version differences can occur for these scenarios:

- The Dev Hub org is on the current generally available Salesforce release, but the snapshot is created on the preview release version.
- The Dev Hub has upgraded to the preview release, but the snapshot was created on the current release version.

In cases where the Dev Hub org and snapshot release versions differ, the resulting scratch org is created on the same release version as the snapshot, as illustrated in this table.

Dev Hub Release Version	Snapshot Release Version	Resulting Scratch Org Release Version
Current	Current	Current
Current	Preview	Preview

Dev Hub Release Version	Snapshot Release Version	Resulting Scratch Org Release Version
Preview	Current	Current
Preview	Preview	Preview

Snapshot Error Codes

See Scratch Org Error Codes for details.

Create a Package Version Based on a Snapshot

If you're a partner or ISV who builds second-generation managed packages that depend on base packages, you can create package versions significantly faster by using scratch org snapshots. Using a snapshot to create a package version is a great choice if your dependent base packages are stable.

What Are the Benefits of Using a Snapshot When Developing a Package Version?

A snapshot includes all the dependencies and configurations required for your package. When you run the `package version create` CLI command, we create a scratch org behind the scenes. That scratch org serves as a build org where we build your package. In the build org we install the dependent packages you specified, and deploy the package metadata for the package version you're creating.

If you install your dependent packages in the scratch org before you create the snapshot, and specify the snapshot when you create a package version, the package build process bypasses these steps. Meaning, we don't install the dependent packages into the build org, but use the snapshot instead. If you don't use a snapshot, those dependent packages have to be installed each time you create a package version, which can greatly prolong package creation times.

For a more detailed explanation, see Second-Generation Managed Packaging Guide: When to Use Scratch Org Snapshots in Package Development.

Why Can't I Promote a Package Version Based on a Snapshot?

Using snapshots to create package versions speeds up the package development and testing process. However, a scratch org snapshot could contain unpackaged metadata that's not associated with the package. For example, if you're an ISV that created a package version with unpackaged metadata in a snapshot, it's likely that your customers could encounter installation issues when you perform a push upgrade to orgs that don't contain the dependent metadata.

To ensure your package version is ready to release and doesn't contain any unintended dependencies, you must build a package version without a snapshot.

Note: You can promote an unlocked package based on a snapshot. Only managed packages based on snapshots can't be promoted to the released state.

How Do I Create a Package Version Based on Snapshot?

See Second-Generation Managed Packaging Guide: Create a Package Version Based on a Scratch Org Snapshot.

Manage and Maintain Your Snapshots

You can check the status of snapshot creation, list all snapshots, and delete a snapshot.

Check the Status of a Snapshot Creation

Creating a snapshot can take a while. Use the snapshot name or ID to check its creation status.

```
sf org get snapshot --snapshot <name or ID> --target-dev-hub <username or alias>
```

For example:

```
sf org get snapshot --snapshot dhsnapshot --target-dev-hub my-dev-hub
```

After the status changes to `Active`, you can use the snapshot to create scratch orgs.

```
Name                Value
 ──────────────────  ────────────────────
 Id                  0Oo1Q0000004C93SXX
 Snapshot Name       dhsnapshot
 Description         Dreamhouse app
 Status              Active
 Source Org          00D050000004ipAEXX
 Created Date        09/22/2023, 02:07 PM
 Last Modified Date  09/22/2023, 02:14 PM
 Expiration Date     2024-09-21
 Last Cloned Date
 Last Cloned By Id
```

List All Scratch Org Snapshots

You can view all the snapshots in a Dev Hub org that you have access to. If you're an admin, you can see all snapshots associated with the Dev Hub org. If you're a user, you can see only your snapshots, unless a Dev Hub admin gives you View All Records permissions.

```
sf org list snapshot --target-dev-hub <username or alias>
```

Delete a Scratch Org Snapshot

If you don't need a snapshot anymore or run out of active snapshots, you can delete a snapshot. Dev Hub admins can delete any snapshot, while users can delete only their snapshots unless a Dev Hub admin gives the user Modify All Records permissions. Deleting a snapshot frees up a license to create an additional snapshot, but the associated data is retained for 100 days after the snapshot was created.

This example identifies the snapshot for deletion by snapshot name.

```
sf org delete snapshot --snapshot dhsnapshot --target-dev-hub my-dev-hub
```

This example identifies the snapshot for deletion by snapshot ID.

```
sf org delete snapshot --snapshot 0OoWt00000000A1BCD --target-dev-hub my-dev-hub
```

Select the Salesforce Release for a Scratch Org

During the Salesforce release transition, you can specify the release (preview or previous) when creating a scratch org.

What Is Salesforce Preview?

During every major Salesforce release, you can get early access to the upcoming release in your scratch orgs and sandboxes to test new customizations and features before your production org is upgraded. This window is called the Salesforce Preview. Scratch orgs created on the upcoming release are called preview scratch orgs.

Normally, you create scratch orgs that are the same version as the Dev Hub. However, during the major Salesforce release transition that happens three times a year, you can select the Salesforce release version `Preview` or `Previous`, based on the version of your Dev Hub.

To try out new features in an upcoming release, you no longer have to create a trial Dev Hub on the upcoming version to create preview scratch orgs. You can use your existing Dev Hub that includes your existing scratch org active and daily limits.

For example, you can select a version over the next three releases during these release transition dates. Preview start date is when sandbox instances are upgraded. Preview end date is when all instances are on the GA release.

Release Version	Preview Start Date	Preview End Date
Spring '26	January 11, 2026	February 21, 2026
Summer '26	May 10, 2026	June 13, 2026
Winter '27	August 30, 2026	October 10, 2026

Because *previous* and *preview* are relative terms, your Dev Hub org version during the release transition determines their relative significance. Here's what happens when you try to create a scratch org with one of the release values.

Dev Hub Version	Preview	Previous
Dev Hub has upgraded to the latest version	Error (Dev Hub is already on the latest version)	Prior Dev Hub version
Dev Hub is still on the GA version	Version following the Dev Hub version (newly released Salesforce version)	Error (Dev Hub is on the GA version; previous version unavailable)

Note: If you don't specify a release value, the scratch org version is the same version as the Dev Hub org.

Create a Scratch Org for a Specific Release

You can specify the release version in the scratch org definition file or directly on the command line. Any value you set on the command line overrides what you have defined in your scratch definition file.

- Find out which instance your Dev Hub org is on: https://status.salesforce.com.
- Add the release option (lowercase) to your scratch org definition file.

```
{
   "orgName": "Dreamhouse",
   "edition": "Developer",
   "release": "preview",
   "settings": {
      "mobileSettings": {
          "enableS1EncryptedStoragePref2": true
```

```
        }
    }
}
```

Alternatively, you can specify the release value directly on the command line with the `--release` flag. Any value you specify on the command line overrides the value in the scratch org definition.

- Create the scratch org by executing the `org create scratch` command in a terminal (macOS and Linux) or command prompt (Windows).

  In this example, we're creating a scratch org on the preview release.

  ```
  sf org create scratch --definition-file config/project-scratch-def.json --alias PreviewOrg
   --target-dev-hub DevHub --release preview
  ```

Be sure to set the `apiVersion` to match the scratch org version.

To set it globally for all DX projects:

```
sf config set org-api-version 59.0 --global
```

To set it on the command line:

```
SF_ORG_API_VERSION=59.0 sf org create scratch  --definition-file
config/project-scratch-def.json --alias PreviewOrg --target-dev-hub DevHub --release preview
```

Note: Regardless of the release version of your Dev Hub, you can use scratch org features that are available in the release (preview or previous) of the scratch org you create.

How Release Transitions Can Affect the Scratch Org Version

During a Salesforce major release transition, the sandbox (CS) instances on which scratch orgs are created transition to the preview release before your Dev Hub org does. During this transition period, you can intend to create a scratch org on the current generally available release but unexpectedly discover that it was created on the preview release. Sandbox instances begin to transition to the preview release several days before the preview start date. If the instance on which the scratch org is created transitions to the preview release after the creation request is initiated, the scratch org is created on the preview version instead of the current version.

During this transition period, there's no way to know when the sandbox instance will be upgraded. If the scratch org must be on the current release, you can try these options:

- If it's a day or two before the preview start date, recreate the scratch org. If the scratch org is again created on the preview release, contact Salesforce Customer Support and open a case.
- Wait to create the scratch org until after the preview start date, and indicate `previous` as the release value in the scratch org definition file.

What If I Want to Create a Pre-Release Scratch Org?

Pre-release is a very early build of the latest version of Salesforce that's available before Salesforce Preview. It's not built to handle scale and doesn't come with any Salesforce Support service-level agreements (SLAs). For this reason, the only way to create a pre-release scratch org is to sign up for a pre-release trial Dev Hub org (subject to availability).

SEE ALSO:

VS Code Command: SFDX: Create a Default Scratch Org

Deploy Source From Your Project to the Scratch Org

After changing the source, you can sync the changes to your scratch org by deploying the changed source to it with the `project deploy start` command.

Note: Scratch orgs have source tracking enabled by default. But sometimes you don't want source tracking, such as in a continuous integration environment when you want to speed up deployments. You can opt out of source tracking when you create the scratch org by specifying the `--no-track-source` flag.

```
sf org create scratch --definition-file config/project-scratch-def.json --no-track-source
```

See Create Scratch Orgs for more reasons to disable source tracking.

The first time you deploy source to the org, all source in the package directories in the `sfdx-project.json` file is deployed to the scratch org to complete the initial setup. At this point, Salesforce CLI starts source-tracking locally on the file system and remotely in the scratch org to determine which metadata has changed. Let's say you deployed an Apex class to a scratch org and then decide to modify the class in the scratch org instead of your local file system. Salesforce CLI tracks in which local package directory the class was created, so when you retrieve it back to your project, it knows where it belongs.

To run the deploy commands described in the remainder of this topic, first open a terminal (macOS and Linux) or command window (Windows) and then change to your Salesforce DX project directory.

Preview a Deployment

Before you deploy source to an org, you can preview the components that will be deployed, the potential conflicts, and the ignored files by executing `project deploy preview`. For example, this command displays a preview of deploying all the source in your project to a scratch org with alias `MyGroovyScratchOrg`.

```
sf project deploy preview --target-org MyGroovyScratchOrg
```

Use flags to target the source you want to preview, such as only the source listed in a manifest. In this example, `--target-org` points to the scratch org's username.

```
sf project deploy preview --manifest package.xml --target-org test-am6xqkossaq8@example.com
```

Tip: You can create an alias for an org using `alias set`. To display the usernames and aliases of all the scratch orgs you've created, run `org list`.

Deploy Source to a Scratch Org

To deploy changed local source to your default scratch org, run this command.

```
sf project deploy start
```

The command displays what it deployed. This sample output shows a deployment of the `PropertyController` Apex class.

```
Deploying v58.0 metadata to test-am6xqkossaq8@example.com using the v59.0 SOAP API.
Deploy ID: 0Af7e00001WsuoSCAR
Status: Succeeded | ████████████████████████████████████████ | 1/1 Components (Errors:0)
| 0/0 Tests (Errors:0)

Deployed Source
=========================================================================================================
```

```
| State   Name                Type       Path

| ──────── ──────────────────── ──────────
──────────────────────────────────────────────────────────────────────

| Changed PropertyController ApexClass force-app/main/default/classes/PropertyController.cls

| Changed PropertyController ApexClass
force-app/main/default/classes/PropertyController.cls-meta.xml
```

Use flags to target the source you want to deploy, rather than everything that's changed.

- Use the `--metadata` flag to deploy specific metadata components, such as Apex classes.
- Use the `--manifest` flag to deploy components in a manifest file.
- Use `--source-dir` to deploy source in a package directory.

See the reference information about project deploy start for examples and other flags you can specify.

Select Files to Ignore During Deploys

It's likely that you have some files that you don't want to sync between the project and scratch org. Add these files to the `.forceignore` file so they're ignored by the deploy command.

If the Deploy Detects Warnings

If you run `project deploy start`, and warnings occur, Salesforce CLI doesn't deploy the source. Warnings can occur, for example, if your project source is using an outdated version. If you want to ignore these warnings and deploy the source to the scratch org, run:

```
sf project deploy start --ignore-warnings
```

Tip: Although you can successfully deploy using this option, we recommend addressing the issues in the source files. For example, if you see a warning because a Visualforce page is using an outdated version, consider updating your page to the current version of Visualforce. This way, you can take advantage of new features and performance improvements.

If the Deploy Detects File Conflicts

During development, you change files locally in your file system and change the scratch org directly using the builders and editors that Salesforce supplies. Usually, these changes don't cause a conflict and involve unique files. Also, the `project deploy start` command doesn't handle merges. Projects and scratch orgs are meant to be used by one developer.

However, if you run `project deploy start`, and conflicts are detected, Salesforce CLI terminates the operation and doesn't deploy the source. Instead, it displays conflict information, such as this sample output. The PropertyController Apex class has been changed both locally and in the org, but the changes are in conflict.

```
sf project deploy start
 STATE    FULL NAME           TYPE      FILE PATH

 ──────── ──────────────────── ──────────
──────────────────────────────────────────────────────────────────────────────────────────────

 Conflict PropertyController ApexClass
<dir>/force-app/main/default/classes/PropertyController.cls-meta.xml
 Conflict PropertyController ApexClass
```

```
<dir>/force-app/main/default/classes/PropertyController.cls
Error (1): There are changes in the org that conflict with the local changes you're trying
 to deploy.
```

First decide which change you want to keep. To keep the local change, rerun the deploy and specify the `--ignore-conflicts` flag.

```
sf project deploy start --ignore-conflicts
```

To keep the change that's in the org, run the `project retrieve start` command to retrieve the change to your local project, and specify the `--ignore-conflicts` flag.

```
sf project retrieve start --ignore-conflicts
```

SEE ALSO:

- How to Exclude Source When Syncing
- Retrieve Source from the Scratch Org to Your Project
- Track Changes Between Your Project and Org
- *VS Code Command*: SFDX: Deploy Source to Org

Retrieve Source from the Scratch Org to Your Project

After you do an initial deploy, your changes are tracked between your local file system and your scratch org. If you change metadata in your scratch org, retrieve those changes to your local project to keep both in sync.

Note: Scratch orgs have source tracking enabled by default. But sometimes you don't want source tracking, such as in a continuous integration environment when you want to speed up deployments. You can opt out of source tracking when you create the scratch org by specifying the `--no-track-source` flag.

```
sf org create scratch --definition-file config/project-scratch-def.json --no-track-source
```

See Create Scratch Orgs for more reasons to disable source tracking.

To run the retrieve commands described in the remainder of this topic, first open a terminal (macOS and Linux) or command window (Windows) and then change to your Salesforce DX project directory.

Preview a Retrieve

Before you retrieve metadata from an org, you can preview the components that will be retrieved, the potential conflicts, and the ignored files by executing `project retrieve preview`. For example, this command displays a preview of retrieving changed metadata from a scratch org with the alias `MyGroovyScratchOrg` to your local project.

```
sf project retrieve preview --target-org MyGroovyScratchOrg
```

Tip: You can create an alias for an org using `alias set`. To display the usernames and aliases of all the scratch orgs you've created, run `org list`.

Retrieve Metadata from Your Scratch Org

To retrieve changed source from your default scratch org to your project, run this command

```
sf project retrieve start
```

The command displays what it retrieved and where in your local Salesforce DX project it puts it. This sample output shows a retrieve of the `DiscountSpecial` Apex class and `DiscountPermSet` permission set into the `force-app/main/default` directory.

```
Preparing retrieve request... □
Preparing retrieve request... Succeeded

Retrieved Source
═══════════════════════════════════════════════════════════════════════════════════════
| State   Name            Type          Path

| ________ ________________ ______________
_____________________________________________________________________________
| Created DiscountSpecial ApexClass    force-app/main/default/classes/DiscountSpecial.cls

| Created DiscountSpecial ApexClass
force-app/main/default/classes/DiscountSpecial.cls-meta.xml
| Created DiscountPermSet PermissionSet
force-app/main/default/permissionsets/DiscountPermSet.permissionset-meta.xml
```

Use flags to target the source you want to retrieve, rather than everything that's changed.

- Use the `--metadata` flag to retrieve specific metadata components, such as Apex classes.
- Use the `--manifest` flag to retrieve components in a manifest file.
- Use `--source-dir` to retrieve source in a package directory.

See the reference information about project retrieve start for examples and other flags you can specify.

Select Files to Ignore During Retrieves

It's likely that you have some files that you don't want to sync between the project and scratch org. Add these files to the `.forceignore` file so they're ignored by the retrieve command.

If the Retrieve Detects File Conflicts

During development, you change files locally in your file system and change the scratch org using builders and editors. Usually, these changes don't cause a conflict and involve unique files. Also, the `project retrieve start` command doesn't handle merges. Projects and scratch orgs are meant to be used by one developer.

However, if you run `project retrieve start`, and conflicts are detected, Salesforce CLI terminates the operation and doesn't retrieve the source. Instead, it displays conflict information, such as this sample output. The PropertyController Apex class has been changed both locally and in the org, but the changes are in conflict.

```
sf project retrieve start
Preparing retrieve request... □ Sending request to org
 STATE    FULL NAME          TYPE      FILE PATH

 ________ ________________ _________
_____________________________________________________________________
```

```
 Conflict PropertyController ApexClass
<dir>force-app/main/default/classes/PropertyController.cls-meta.xml
Preparing retrieve request... Error
Error (1): There are changes in your local files that conflict with the org changes you're
 trying to retrieve.
```

First decide which change you want to keep. To keep the change that's in the org, rerun the retrieve and specify the `--ignore-conflicts` flag.

```
sf project retrieve start --ignore-conflicts
```

To keep the local change, run the `project deploy start` command to deploy the change to your org, and specify the `--ignore-conflicts` flag.

```
sf project deploy start --ignore-conflicts
```

SEE ALSO:

- Retrieve Source from the Scratch Org to Your Project
- How to Exclude Source When Syncing
- Track Changes Between Your Project and Org
- *VS Code Command*: SFDX: Retrieve Source to Org

Scratch Org Users

A scratch org includes one administrator user by default. The admin user is typically adequate for all your testing needs. But sometimes you need other users to test with different profiles and permission sets.

You can create a user by opening the scratch org in your browser and navigating to the Users page in Setup. You can also use the `org create user` CLI command to easily integrate the task into a continuous integration job.

Scratch Org User Limits, Defaults, and Considerations

- You can run the `org create user` command only for scratch orgs. If you try to create a user for a non-scratch org, the command fails.
- Your scratch org edition determines the number of available user licenses. The number of licenses determines the number of users you can create. For example, a Developer Edition org includes a maximum of two Salesforce user licenses. Therefore, in addition to the default administrator user, you can create one standard user.
- The new user's username must be unique across all Salesforce orgs and in the form of an email address. The `org create user` command provides the `--set-unique-username` flag to ensure uniqueness. The username is active only within the bounds of the associated scratch org.
- You can't delete a user using Salesforce CLI, just like you can't delete a Salesforce user using Setup. The user is deactivated when you delete the scratch org with which the user is associated. Deactivating a user frees up the user license. But you can't reuse usernames, even if the associated user has been deactivated.
- The simplest way to create a user is to let the `org create user` command assign default or generated characteristics to the new user. If you want to customize your new user, create a definition file and specify it with the `--definition-file` (`-f`) flag. In the file, you can include all the User sObject fields and a set of Salesforce DX-specific options, described in User Definition File for Customizing a Scratch Org User. You can also specify these options on the command line.

- If you don't customize your new user, the `org create user` command creates a user with these default characteristics.
  - The username is the existing administrator's username prepended with a timestamp. For example, if the administrator username is test-wvkpnfm5z113@example.com, the new username is something like 1505759162830_test-wvkpnfm5z113@example.com.
  - The user's profile is Standard User.
  - The values of the required fields of the User sObject are the corresponding values of the administrator user. For example, if the administrator's locale (specifically the LocaleSidKey field of User sObject) is en_US, the new user's locale is also en_US.
- After the new user has been created, Salesforce CLI automatically authenticates it to the scratch org so the new user can immediately start using the scratch org. Salesforce CLI uses the same authentication method that was used on the associated Dev Hub org. Due to Hyperforce limitations, if the Dev Hub authentication used the JWT flow and the scratch org is on Hyperforce, then the scratch org user creation fails. For this reason, if you plan to create scratch org users, authenticate to the Dev Hub org with either the `org login web` or `org login sfdx-url` command, and not `org login jwt`.

How Scratch Org Users Can Log In to the Scratch Org

How you log in to a scratch org can depend on if you're the default admin user, or on which infrastructure the scratch org was created. To determine the infrastructure, find the **Instance** on the Company Information Setup page, then go to Find My Instance.

- Regardless of the instance, default admin users can log in using `test.salesforce.com` or the My Domain URL, such as `https://MyDomainName.scratch.my.salesforce.com`.
- If the scratch org is on a Salesforce first-party instance, other users can log in using `test.salesforce.com` or the My Domain URL.
- If the scratch org is on a Hyperforce instance, other users must log in using the My Domain URL.

Create a Scratch Org User

Although scratch orgs were designed to be used by one developer, sometimes you need other users to test with different profiles and permission sets.

User Definition File for Customizing a Scratch Org User

To customize a new scratch org user, rather than use the default and generated values, create a definition file.

Generate or Change a Password for a Scratch Org User

By default, new scratch orgs contain one administrator user with no password. Use the `org generate password` CLI command to generate or change a password for this admin user. After it's set, you can't unset a password, you can only change it.

SEE ALSO:

User sObject API Reference

Create a Scratch Org User

Although scratch orgs were designed to be used by one developer, sometimes you need other users to test with different profiles and permission sets.

Use the `org create user` command to create a user. Specify the `--set-alias` flag to assign a simple name to the user that you can reference in later CLI commands. When the command completes, it outputs the new username and user ID.

```
sf org create user --set-alias qa-user --target-org my-scratch
Successfully created user "1690397809_test-st9thgoyyyq3@example.com" with ID 0058I002inzvQAA
 for org 00D80000PhAkUAK.
```

```
See more details about this user by running "sf org user display -o
1690397809774_test-st9thgoyyyq3@example.com".
```

Users are associated with a specific scratch org. Specify the scratch org username or alias at the command line with the `--target-org` flag if it isn't already set as the default. If you try to create a user for a non-scratch org, the `org create user` command fails.

You can customize the new user by creating a definition file and specifying it with the `--definition-file` flag.

```
sf org create user --set-alias qa-user --definition-file config/user-def.json
```

View the list of users associated with a scratch org with the `org list users` command. The (A) on the left identifies the administrator user that was created when the scratch org was created.

```
sf org list users --target-org my-scratch
=== Users in org 00D80000PhAkUAK

 Default Alias      Username                                      Profile Name         User
 Id
 _______ __________ ____________________________________________ ____________________
_______________
 (A)     my-scratch test-st9thgoyyyq3@example.com                 System Administrator
0058I002inzvQAA
         qa-user    1690397809_test-st9thgoyyyq3@example.com      Standard User
0058I002inzvQAA
```

Display details about a user with the `org display user` command.

```
sf org display user --target-org qa-user
Warning: This command exposes sensitive information <truncated for readability>

=== User Description

 key          label

 ____________
_____________________________________________________________________________________________

 Username     1690397809_test-st9thgoyyyq3@example.com

 Profile Name Standard User

 Id           0058I002inzvQAA

 Org Id       00D80000PhAkUAK

 Access Token 00D8I<truncated>
 Instance Url https://connect-enterprise-1121-dev-ed.scratch.my.salesforce.com

 Login Url    https://connect-enterprise-1121-dev-ed.scratch.my.salesforce.com

 Alias        qa-user
```

User Definition File for Customizing a Scratch Org User

To customize a new scratch org user, rather than use the default and generated values, create a definition file.

The user definition file uses JSON format and can include any Salesforce User sObject field and these Salesforce DX-specific options.

Salesforce DX Option	Description	Default If Not Specified
`permsets`	An array of permission sets assigned to the user. Separate multiple values with commas, and enclose in square brackets. You must have previously deployed the permission sets to the scratch org with `project deploy start`.	None
`generatePassword`	Boolean. Specifies whether to generate a random password for the user. If set to `true`, `org create user` displays the generated password after it completes. You can also view the password using `org display user`.	False
`profileName`	Name of a profile to associate with the user. Similar to the ProfileId field of the User sObject except that you specify the name of the profile and not its ID. Convenient when you know only the name of the profile.	Standard User

The user definition file options are case-insensitive. However, we recommend that you use lower camel case for the Salesforce DX-specific options and upper camel case for the User sObject fields. This format is consistent with other Salesforce DX definition files.

This user definition file includes some User sObject fields and three Salesforce DX options (`profileName`, `permsets`, and `generatePassword`).

```
{
    "Username": "tester1@sfdx.org",
    "LastName": "Hobbs",
    "Email": "tester1@sfdx.org",
    "Alias": "tester1",
    "TimeZoneSidKey": "America/Denver",
    "LocaleSidKey": "en_US",
    "EmailEncodingKey": "UTF-8",
    "LanguageLocaleKey": "en_US",
    "profileName": "Standard Platform User",
    "permsets": ["Dreamhouse", "Cloudhouse"],
    "generatePassword": true
}
```

In the example, the username tester1@sfdx.org must be unique across the entire Salesforce ecosystem; otherwise, the `org create user` command fails. We recommend that you use the `--set-unique-username` flag, which overrides the value in the configuration file and ensures a unique username. The alias in the Alias option is different from the alias you specify with the

`--set-alias` flag of `org create user`. Use the Alias option only with the Salesforce UI. The `--set-alias` flag is local to the computer from which you run the CLI, and you can use it with other CLI commands.

Indicate the path to the user definition file with the `--definition-file` flag. You can name this file whatever you like and store it anywhere the CLI can access.

```
sf org create user --set-alias qa-user --definition-file config/user-def.json --target-org
 my-scratch
```

You can override an option in the user definition file by specifying it as a name-value pair at the command line. This technique allows multiple users or continuous integration jobs to share a base definition file and then customize options when they run the command. This example overrides the username, list of permission sets, and whether to generate a password.

```
sf org create user --set-alias qa-user --definition-file config/user-def.json
permsets="Dreamy,Cloudy" Username=tester345@sfdx.org generatePassword=false --target-org
my-scratch
```

You can also add options at the command line that aren't in the user definition file. This example adds the City option.

```
sf org create user --set-alias qa-user --definition-file config/user-def.json City=Oakland
 --target-org my-scratch
```

SEE ALSO:

User sObject API Reference

Generate or Change a Password for a Scratch Org User

By default, new scratch orgs contain one administrator user with no password. Use the `org generate password` CLI command to generate or change a password for this admin user. After it's set, you can't unset a password, you can only change it.

You can also use the `--on-behalf-of` flag to generate a password for a scratch org user that you've created locally with the `org create user` command. You can't use the `org generate password` command for users that you created in the scratch org with Setup.

1. Generate a password for a scratch org user with this command:

   ```
   sf org generate password --target-org <username-or-alias>
   ```

   You can run this command for scratch org users only. The command outputs the generated password.

   The target org must be the username or alias for the scratch org admin user. Use the `--on-behalf-of` flag to assign passwords to multiple users at once, including admin users, or to users who don't have permissions to do it themselves. Specify multiple locally created users by specifying multiple `--on-behalf-of` flags. For example, let's say the my-scratch alias corresponds to the scratch org's admin user, and you want to generate a password for users with aliases `ci-user` and `qa-user`:

   ```
   sf org generate password --target-org my-scratch --on-behalf-of ci-user --on-behalf-of
    qa-user
   ```

   By default, the command generates a password that's 13 characters in length; the possible characters include all lower and upper case letters, numbers, and symbols. To change the password strength, use the `--length` and `--complexity` flags. The `--complexity` flag is a number from 0 through 5; the higher the value, the more possible characters are used, which strengthens the password. The default value is 5. See the command-line help for a description of each value. This example shows how to generate a password that's 20 characters long:

   ```
   sf org generate password --target-org my-scratch --length 20
   ```

2. View the generated password and other user details:

```
sf org display user --target-org qa-user
Warning: This command exposes sensitive information <truncated for readability>

=== User Description

 key          label

 ____________
_____________________________________________________________________________________

 Username     1690397809_test-st9thgoyyyq3@example.com

 Profile Name Standard User

 Id           0058I002inzvQAA

 Org Id       00D80000PhAkUAK

 Access Token 00D8I<truncated>
 Instance Url https://connect-enterprise-1121-dev-ed.scratch.my.salesforce.com

 Login Url    https://connect-enterprise-1121-dev-ed.scratch.my.salesforce.com

 Alias        qa-user
 Password     ogihymg%lXa
```

3. Log in to the scratch org with the new password:
   a. From the `org display user` output, copy the value of the Instance URL and paste it into your browser. In our example, the instance URL is `https://connect-enterprise-1121-dev-ed.scratch.my.salesforce.com`.
   b. If you've already opened the scratch org with the `org open` command, you're automatically logged in again. To try out the new password, log out and enter the username and password listed in the output of the `org display user` command.
   c. Click **Log In to Sandbox**.

Note: If you change a scratch org user's password using the Salesforce UI, the new password doesn't show up in the `org display user` output.

Manage Scratch Orgs from the Dev Hub Org

You can view and delete your scratch orgs and their associated requests from the Dev Hub org.

In the Dev Hub org, the ActiveScratchOrg standard object represents the scratch orgs that are currently in use. The ScratchOrgInfo standard object represents the requests that were used to create scratch orgs and provides historical context.

1. Log in to the Dev Hub org as the System Administrator or as a user with the Salesforce DX permissions.
2. From the App Launcher, select **Active Scratch Orgs** to see a list of all active scratch orgs.

   To view more details about a scratch org, click the link in the Number column.
3. To delete an active scratch org from the Active Scratch Orgs list view, choose **Delete** from the dropdown.

Deleting an active scratch org doesn't delete the request (ScratchOrgInfo) that created it, but it does free up a scratch org so that it doesn't count against your allocations.

4. To view the requests that created the scratch orgs, select **Scratch Org Infos** from the App Launcher.

   To view more details about a request, click the link in the Number column. The details of a scratch org request include whether it's active, expired, or deleted.

5. To delete the request that was used to create a scratch org, choose **Delete** from the dropdown.

   Deleting the request (ScratchOrgInfo) also deletes the active scratch org.

SEE ALSO:

Add Salesforce DX Users

Scratch Org Error Codes

If scratch org creation fails, the system generates an error code that can help you identify the cause. Some of these errors are generated by the SignupRequest API and apply to all org signups.

Note: These error codes are specific to scratch org signups. Additional error codes for other org signup scenarios are included in the *Object Reference for the Salesforce Platform*: SignupRequest.

Error Code	Description
`C-1007`	Duplicate username.
`C-1015`	Error while establishing the new org's My Domain (subdomain) settings. Contact Salesforce Support for assistance.
`C-1016`	Error while configuring the OAuth connected app for Proxy Signup. Verify that your connected app has a valid consumer key, callback URL, and unexpired certificate (if applicable).
`C-1018`	Invalid subdomain value provided during sign-up.
`C-1019`	Subdomain in use. Choose a new subdomain value.
`C-1020`	Template not found. Either the template doesn't exist or it was deleted.
`C-1033`	Template is the wrong version.
`C-1034`	Can't create the org. Contact Salesforce Customer Support for assistance.
`C-9998`	Not a valid scratch org. Contact Salesforce Customer Support for assistance.
`C-9999`	Generic fatal error. Contact Salesforce Customer Support for assistance.
`S-1017`	Namespace isn't registered. To use a namespace with a scratch org, you must link the Developer Edition org where the namespace is registered to a Dev Hub org. See Salesforce Help: Link a Namespace to a Dev Hub Org.
`S-2006`	Invalid country.
`SH-0001`	Can't create scratch org from org shape. Contact the source org admin to add your Dev Hub org ID. From Setup, in the Quick Find box, enter *`Org Shape`*, and then select **Org Shape**.

Error Code	Description
SH-0002	Can't create scratch org. No org shape exists for the specified `sourceOrg`. Create an org shape and try again.
SH-0003	Can't create scratch org from the org shape because it was created on a previous Salesforce release version and is outdated. Recreate the org shape and try again.
SN-0001	The snapshot has expired. Create another snapshot, then try again.
SN-0002	The snapshot doesn't belong to the specified Dev Hub org. Run the command with the appropriate `--target-dev-hub`.
SH-9999	Can't validate org shape due to fatal error. Contact Salesforce Customer Support for assistance.
VR-0001	Can't create the scratch org. Try again later.
VR-0002	Can't create the scratch org. Check that the release value is valid. If no release value was specified, contact Salesforce Customer Support.
VR-0003	Can't create the scratch org. Check that the release value is valid. If no release value was specified, contact Salesforce Customer Support.

CHAPTER 7 Sandboxes

In this chapter ...

- Authorize Your Production Org
- Create a Sandbox Definition File
- Create, Clone, or Refresh a Sandbox

Sandboxes are copies of your Salesforce org that you can use for development, testing, and training, without compromising the data and applications in your production org.

Salesforce offers sandboxes and a set of deployment tools, so you can:

- Isolate customization and development work from your production environment until you're ready to deploy changes.
- Test changes against copies of your production data and users.
- Provide a training environment.
- Coordinate individual changes into one deployment to production.

USER PERMISSIONS

To view a sandbox:
- View Setup and Configuration

To create, refresh, activate, and delete a sandbox:
- Manage Dev Sandboxes (Developer or Developer Pro only) or Manage Sandboxes (all sandbox types)

Traditionally, you or your admin has created and managed your sandboxes through the Setup UI. But we realize that many developers want the ability to create and manage their developer and testing environments programmatically, and to automate their CI processes. Salesforce CLI enables you to do both.

Alternatives to sandboxes are scratch orgs and Developer Edition orgs, which are used as development environments for many Salesforce development use cases. If you're wondering whether to use a sandbox, scratch org, or Developer Edition org as your development environment, you're not alone. To help you better understand which to choose, see the Salesforce Developers Blog: Choose the Right Salesforce Org for the Right Job.

Authorize Your Production Org

JWT and Web-based flows require a production org with sandbox licenses instead of a Dev Hub. However, it's OK if your production org is also a Dev Hub org.

The examples in Authorize an Org Using the JWT-Based Flow and Authorize an Org Using the Web-Based Flow are geared toward scratch orgs. Follow these tips to successfully authorize your production org.

- Be sure to use `https://login.salesforce.com` for `sfdcLoginUrl` in `sfdx-project.json` file. Alternatively, you can use `org login jwt --instance-url` to specify the URL directly on the command line. This value overrides the login URL you specified in the `sfdx-project.json` file.
- Specify the username for your production org when running the `org login jwt` command. No need to specify a Dev Hub or indicate a default Dev Hub.
- The JWT authorization flow requires that you create a connected app. When you create the connected app, log in to your production org, not a Dev Hub org.

Create a Sandbox Definition File

Before you can create a sandbox using Salesforce CLI, define the configuration for it in a sandbox definition file. The sandbox definition file is a blueprint for the sandbox. You can create different definition files for each sandbox type that you use in the development process.

Sandbox Configuration Values

Option	Required?	Description
activationUserGroupId	No	A reference to the ID of a public group of Salesforce users who can access the sandbox. The user who created the sandbox is added to the group by default. You can specify either `activationUserGroupId` or `activationUserGroupName` but not both.
activationUserGroupName	No	The name of the public group of Salesforce users who can access the sandbox. The user who created the sandbox is added to the group by default. You can specify either `activationUserGroupId` or `activationUserGroupName` but not both.
apexClassId	No	A reference to the ID of an Apex class that runs after each copy of the sandbox. Allows you to perform business logic on the sandbox to prepare it for use. You can specify either `apexClassId` or `apexClassName` but not both.

Option	Required?	Description
apexClassName	No	The name of the Apex class that runs after each copy of the sandbox. Allows you to perform business logic on the sandbox to prepare it for use. You can specify either `apexClassId` or `apexClassName` but not both.
autoActivate	No	If `true`, you can activate a sandbox refresh immediately.
copyArchivedActivities	No	Full sandboxes only. This field is visible if your organization has purchased an option to copy archived activities for sandbox. To obtain this option, contact Salesforce Customer Support.
copyChatter	No	If `true`, archived Chatter data is copied to the sandbox.
description	No	A description of the sandbox (1000 or fewer characters), which helps you distinguish it from other sandboxes.
features	No	The add-on features to apply when creating or refreshing the sandbox. The `features` option is not needed when cloning a sandbox. Currently, there's one valid value: • `['SandboxStorage']`: Increases the data storage available for Developer sandboxes from 200 MB to 400 MB and Developer Pro sandboxes from 1 GB to 2 GB. You can't use this feature with Partial Copy or Full sandboxes.
historyDays	No	Full sandboxes only. Represents the number of days of object history to be copied in the sandbox. Valid values: • -1, which means all available days • 0 (default) • 10 • 20 • 30 • 60 • 90 • 120 • 150 • 180

Option	Required?	Description
licenseType	Yes (for sandbox creation)	Valid values are `Developer`, `Developer_Pro`, `Partial`, and `Full`. You can specify only one of these options: `licenseType`, `sourceSandboxName`, or `sourceId`.
sandboxName	Yes	A unique alphanumeric string (10 or fewer characters) to identify the sandbox. You can't reuse a name while a sandbox is in the process of being deleted.
sourceId	Yes (for sandbox cloning)	A reference to the ID of the sandbox being cloned. You can specify only one of these options: `licenseType`, `sourceSandboxName`, or `sourceId`.
sourceSandboxName	Yes (for sandbox cloning)	Name of the sandbox being cloned. You can specify only one of these options: `licenseType`, `sourceSandboxName`, or `sourceId`.
templateId	Yes (for Partial sandboxes)	Optional for Full sandboxes. Not available for Developer and Developer Pro sandboxes. A reference to the sandbox template as identified by the 15-character ID beginning with `1ps` in the URL when viewing a sandbox template in a browser. A sandbox template lets you select which objects to copy in a sandbox.

Sample Sandbox Definition File

Although you can place the sandbox definition file anywhere, we recommend keeping it in your Salesforce DX project in the `config` directory. When naming the file, we suggest providing a descriptive name that ends in `sandbox-def.json`, for example, `developer-sandbox-def.json`.

Here's a sample definition file for creating a sandbox:

```
{
     "sandboxName": "dev1",
     "licenseType": "Developer"
}
```

Here's a sample definition file for cloning a sandbox:

```
{
     "sandboxName": "dev1clone",
     "sourceSandboxName": "dev1"
}
```

Here's a sample definition file for creating a sandbox with the `features` option:

```
{
      "sandboxName": "dev1",
      "licenseType": "Developer" or "Developer_Pro",
      "features": "['SandboxStorage']"
}
```

SEE ALSO:

Tooling API: SandboxInfo

Salesforce Help: Public and Personal Groups

Create, Clone, or Refresh a Sandbox

Create a sandbox to use for development, testing, or training. Clone a sandbox to copy its data and metadata to another sandbox. Refresh an existing sandbox to get the latest metadata, and sometimes data, from the source org.

Before you create or clone a sandbox:

- Create a Salesforce DX project with a manifest file.
- Authorize to a production org with available sandbox licenses.
- Create the sandbox definition file.

Why We Recommend Using Aliases

When you create or clone a sandbox, the usernames generated in the sandbox are based on the usernames present in the production org or sandbox. The username looks like an email address, such as `username@company.com.dev1`. If the resulting username isn't unique, we prepend some characters and digits to the username. The modified username looks something like `00x7Vqusername@company.com.dev1`.

As you can imagine, remembering these usernames can be challenging, especially if you have several sandboxes you're managing. Aliasing is a powerful way to manage and track your orgs, and we consider it a best practice. So when you issue a command that requires the username, using an alias that you can remember can speed up things.

If you didn't set an alias when you created the sandbox, you can set one later.

```
sf alias set MyDevSandbox username@company.com.dev1
```

Create a Sandbox

Optional: Create a Sandbox Definition File

When you create a sandbox, Salesforce copies the metadata and data (for Partial Copy and Full) from your production org to a sandbox org. Specify the username or alias of your production org with the `--target-org` flag.

```
sf org create sandbox --target-org prodOrg --definition-file config/dev-sandbox-def.json
--alias MyDevSandbox --set-default --wait 30
```

The command asks you to confirm the sandbox configuration and then shows information as the sandbox is being created.

The `--set-default` flag indicates that this sandbox is your default org for all CLI commands. If you're working with several orgs and you don't want this one to be the default, exclude this flag.

To directly define the required sandbox options, or to override the values defined in the sandbox definition file, specify appropriate flags on the command line.

```
sf org create sandbox --name FullSbx --license-type=Full --target-org prodOrg --alias
MyFullSandbox --wait 30
```

Tip: Because the sandbox is processed in a queue, the sandbox creation process can take longer than the default wait time of 6 minutes. We recommend setting a larger value for `--wait`, for example, 30 minutes.

How long the creation process takes depends on the size and complexity of your production org. You see status messages posted to output:

```
Sandbox Create... □ 00:28:00 until timeout. 26%
 Field          Value
 ─────────────  ──────────────────────────
 Id             0GR1Q888800HORuWAO
 SandboxName    dev11
 Status         Processing
 LicenseType    DEVELOPER
 SandboxInfoId  0GQ1Q000009999mWAO
 Created Date   2023-10-17T21:42:49.000+0000
 CopyProgress   26%
 SandboxOrg     00DP0099993zEZj
--------------------
Sandbox Create Stages
□ - Pending
… - Processing
… - Activating
… - Authenticating
```

After the wait period is over, you can run the `org resume sandbox` command to check the status of the sandbox creation process. If the sandbox is created within the wait time, Salesforce CLI automatically authenticates in to the sandbox. And the sandbox appears in the output of the `org list` command. Team members can authenticate to the sandbox by running the `org web login` command and providing their usernames and passwords.

```
sf org web login --instance-url https://test.salesforce.com
```

Clone a Sandbox

You can create a sandbox by cloning an existing sandbox rather than using your production org as your source. You can save time by customizing a sandbox with a set of data and metadata and then replicating it. Use the `--source-sandbox-name` flag to specify the existing sandbox name and the `--name` flag to the name of the new sandbox. You can also use the `--sourceId` flag to specify the existing sandbox by its ID rather than its name. Both sandboxes must be associated with the specified production org that contains the sandbox licenses. (`--target-org` flag).

Sandbox cloning simplifies having multiple concurrent streams of work in your application lifecycle. You can set up a sandbox for each type of work, such as development, testing, and staging. Your colleagues can easily clone individual sandboxes instead of sharing one sandbox and stepping on each other's toes.

```
sf org create sandbox --source-sandbox-name FullSbx --name NewSbx --target-org prodOrg
--alias MyDevSandbox --set-default --wait 30
```

Tip: Because the sandbox is processed in a queue, the sandbox cloning process can take longer than the default wait time of 6 minutes. We recommend setting a larger value for `--wait`, for example, 30 minutes.

After the wait period is over, you can run the `org resume sandbox` command to check the status of the sandbox cloning process. If the sandbox is cloned within the wait time, the CLI automatically authenticates in to the sandbox. And the sandbox appears in the output of the `org list` command. Team members can authenticate to the sandbox by running the `org web login` command and providing their usernames and passwords.

```
sf org web login --instance-url https://test.salesforce.com
```

Check the Sandbox Status

Creating or cloning a sandbox can take several minutes. If the command times out, it displays a job ID that you can pass to the `org resume sandbox` command to report on creation or cloning status. When the sandbox is ready, this command also authenticates to the sandbox.

```
sf org resume sandbox --job-id 0GR1888880000HORuWAO --target-org prodOrg
```

If the `org create sandbox` command times out, the alias isn't set. However, you can set it using the `alias set` command:

```
sf alias set MyDevSandbox username@company.com.dev1
```

Open a Sandbox

After the sandbox is ready, you can open it by specifying its username or alias. However, you don't have to provide its password because the CLI manages the authentication details for you.

```
sf org open --target-org MyDevSandbox
```

Refresh a Sandbox

Refreshing an existing sandbox updates its metadata from the source org. If the sandbox is a clone or if it uses a sandbox template, the refresh process also updates the sandbox org's data.

```
sf org refresh sandbox --name FullSbx --target-org prodOrg
```

Be sure the value of `--name` is the sandbox name, and not its alias. The `--target-org` flag can be either the username or alias of the source org.

To change the configuration of the refreshed sandbox, specify a definition file with the `--definition-file` flag. Then include the configuration options you want to change, such as `licenseType`, `templateID`, or `copyArchivedActivities` (full sandbox only.) You can't, however, change the sandbox name using the `org refresh sandbox` command. To change the sandbox name, first delete it with the `org delete sandbox` command. Then recreate it with the `org create sandbox` command and give it a new name.

Delete a Sandbox

You can delete a sandbox using Salesforce CLI, whether you created it locally with `org create sandbox` or logged into an existing sandbox with a `org login` command. You must also have previously logged into the production org that contains the sandbox license.

```
sf org delete sandbox --target-org MyDevSandbox
```

Next:

- Retrieve metadata from your sandbox to your local DX project.
- Develop directly in your sandbox, then retrieve the changes to your local DX project.
- Deploy local changes to a sandbox.

SEE ALSO:

Salesforce Help: Deploy Enhancements from Sandboxes

Salesforce Help: Create, Clone, or Refresh a Sandbox Using Setup UI

Authorize an Org Using the JWT Flow

Authorize an Org Using a Browser

CHAPTER 8 Track Changes Between Your Project and Org

In this chapter ...

- Manage Source Tracking for Your org
- Preview Changes Identified by Source Tracking
- Deploy and Retrieve Changes Identified by Source Tracking
- Resolve Conflicts Between Your Local Project and Org
- Best Practices
- Performance Considerations of Source Tracking

Use source tracking to track the changes between your local project and a scratch org or sandbox when you create, update, or delete source code.

Source tracking has no direct effect on the org; it affects only your local environment. Specifically, Salesforce CLI checks a local configuration file to determine whether you've enabled source tracking for a particular org. If you have, then source tracking operations are executed when you work with the org, such as using the `project deploy start` command.

The `project deploy|retrieve start` commands without flags deploy or retrieve all changed source between your local project and the target org. For more granular control, use flags to specify specific metadata components, package directories, or manifest files to deploy or retrieve. This example retrieves the `MyFabClass` Apex class:

```
sf project retrieve start --metadata ApexClass:MyFabClass
```

In addition to listing the changes you make, source tracking makes it possible to:

- Automatically track changes to metadata components, saving you from tracking them manually.
- See changes deployed to a sandbox by other developers.
- Deploy or retrieve changed source.
- Identify and resolve conflicts between your local project and scratch org or sandbox before deploying or retrieving source.

To see which metadata components support source tracking, check the Source Tracking column of the Metadata Coverage Report.

Manage Source Tracking for Your org

Source tracking works only if your target org allows it. Don't worry, you can still deploy or retrieve metadata to and from an org without source tracking. But the commands don't check for conflicts, and you must specify exactly what you want to deploy or retrieve using an appropriate flag, such as `--source-dir` or `--metadata`.

Org Editions that Support Source Tracking

- Developer Edition orgs, production orgs, Partial Copy sandboxes, and Full sandboxes—Source tracking isn't supported.
- Developer and Developer Pro sandboxes—Source tracking is supported if their associated production org has been enabled for source tracking.
- Scratch orgs—Source tracking is always supported.

Manage Source Tracking in New Orgs

Scratch Orgs have source tracking enabled by default. For Developer and Developer Pro sandboxes, source tracking is also enabled by default as long as their associated production org has been enabled for source tracking.

You can opt out of source tracking when you create the scratch org or sandbox by specifying the `--no-track-source` flag of the `org create scratch|sandbox` command. This flag affects only your local configuration, not the org itself. Salesforce CLI sets a local configuration option `trackSource: false` as part of your authorization information to the org. If you log out of the org and then log back in again, source tracking is enabled again by default.

Here's how to create a scratch org with source tracking disabled.

```
 sf org create scratch --target-dev-hub=MyHub --definition-file
config/project-scratch-def.json --no-track-source
```

Here's a sandbox example.

```
sf org create sandbox --definition-file config/dev-sandbox-def.json --target-org prodOrg
--no-track-source
```

Manage Source Tracking in Existing Orgs

You can change whether an existing scratch org or sandbox allows source tracking with these two commands:

- `org enable tracking`: Allow Salesforce CLI to track changes in your source files between your project and an org.
- `org disable tracking`: Prevent Salesforce CLI from tracking changes in your source files between your project and an org.

This example shows how to enable source tracking in an org with alias `mySandbox`; the command returns an error if the org doesn't support tracking, such as a Full sandbox.

```
sf org enable tracking --target-org mySandbox
```

Let's say you have a sandbox that you use for integration tests, and you want to deploy source to it but not wait for tracking operations. This example shows how to disable source tracking on an org with alias `mySandbox`:

```
sf org disable tracking --target-org mySandbox
```

SEE ALSO:

VS Code Command: SFDX: Create a Default Scratch Org

Preview Changes Identified by Source Tracking

To see changes between your local project and target org, navigate to the project directory for which you want to see changes. Then run one of the preview commands, which display either the local changes in your project you can deploy to your org, or the org changes that you can retrieve.

1. In a terminal or command window, navigate to the project directory. In this example, the directory is named MyProject.

   ```
   cd /Users/joe/dx-projects/MyProject
   ```

2. To see what's changed between your project and org, run either the `project deploy preview` or `project retrieve preview` command. Include the `--target-org` flag to specify the username or alias of the scratch org or sandbox that you want to compare with your local project. In this example, the command displays the local changes that can be deployed to the sandbox with the alias `DevSandbox`.

   ```
   sf project deploy preview --target-org DevSandbox
   ```

   Similarly, this example displays the remote changes in the sandbox that can be retrieved back into the local project.

   ```
   sf project retrieve preview --target-org DevSandbox
   ```

   The `project deploy preview` command accepts the `--metadata`, `--source-dir`, and `--manifest` flags, which you can use to preview more granular deployments. This example previews a deployment of only `ApexClass` metadata:

   ```
   sf project deploy preview --metadata ApexClass --target-org DevSandbox
   ```

This `project deploy preview` sample output shows that there are local changes to the `WidgetClass` Apex class and WidgetObject__c custom object that can be deployed to the org.

```
sf project deploy preview --target-org DevSandbox

No conflicts found.

No files will be deleted.

Will Deploy [2] files.
 Type          Fullname         Path

 ____________ _______________
_____________________________________________________________________________

 ApexClass     WidgetClass      force-app/main/default/classes/WidgetClass.cls-meta.xml

 CustomObject WidgetObject__c
force-app/main/default/objects/WidgetObject__c/WidgetObject__c.object-meta.xml
```

```
No files were ignored. Update your .forceignore file if you want to ignore certain files.
```

This `project retrieve preview` sample output shows that there are remote changes to the `GizmoClass` Apex class and GizmoObject__c custom object (and its layout) that can be retrieved from the org to the local project. The output also shows that there are no conflicts between the project and org.

```
sf project retrieve preview --target-org DevSandbox

No conflicts found.

No files will be deleted.

Will Retrieve [3] files.
 Type         Fullname                          Path
 ___________  ________________________________  ____

 Layout       GizmoObject__c-GizmoObject Layout
 CustomObject GizmoObject__c
 ApexClass    GizmoClass

Ignored [2] files. These files won't retrieve because they're ignored by your .forceignore
 file.
 Type    Fullname                          Path
 _______ ________________________________  ____

 Profile Admin
 Profile B2B Reordering Portal Buyer Profile
```

The preview commands use tables of change information with three columns: Type, Fullname, and Path. Each row represents one change.

- *Type* is the changed component's metadata type. It describes what the component is, such as an Apex class or a custom object.
- *Fullname* is the API name of the component.
- *Path* is the location of the component in your local project. If it's blank, the component isn't present in your local project. When blank, it usually means that a component is present in the org but not in your local project.

If source tracking doesn't detect any changes, then the preview commands return a statement saying `No results found`.

```
=== Source Status
No results found
```

After previewing the changes in the source in your local project and the org, you're ready to deploy or retrieve and resolve potential conflicts.

Deploy and Retrieve Changes Identified by Source Tracking

When you create a Salesforce app, you typically use both low-code and pro-code techniques. An example of low-code is creating a custom object directly in an org using Setup. An example of pro-code is creating an Apex class in your local project using an IDE, such as VS Code. As you work, source tracking identifies changes so you can keep the remote metadata in the org in sync with the source in your local project.

The process is iterative. First you preview the remote and local changes. If conflicts exist, you resolve them. You must now ensure that these changes exist in both the org and your local project. So you retrieve the remote changes to your local project, then push them to your source control repository, to ensure that the source control system contains all your changes and is the source of historical truth.

You deploy your local changes, such as Apex code, to the org so you can validate and test it. And you keep iterating through this process until you finish developing the Salesforce app.

To see source tracking in action, let's look at some examples.

Say you run `project retrieve preview` and see remote changes.

```
sf project retrieve preview --target-org DevSandbox

No conflicts found.

No files will be deleted.

Will Retrieve [3] files.
 Type         Fullname                          Path
 ____________ ________________________________ ____
 Layout       GizmoObject__c-GizmoObject Layout
 CustomObject GizmoObject__c
 ApexClass    GizmoClass

Ignored [2] files. These files won't retrieve because they're ignored by your .forceignore
 file.
 Type    Fullname                            Path
 _______ ___________________________________ ____
 Profile Admin
 Profile B2B Reordering Portal Buyer Profile
```

Retrieve the changes in your org to your local project with the `project retrieve start` command. Now that the components have been created locally, the Path column has a value and it includes the default package directory.

```
sf project retrieve start --target-org DevSandbox
Preparing retrieve request... □ Sending request to org
Preparing retrieve request... Succeeded

Retrieved Source
=========================================================================================
| State   Name                              Type         Path

| _______ ________________________________ ____________
_____________________________________________________________________________________
| Created GizmoClass                        ApexClass
force-app/main/default/classes/GizmoClass.cls
| Created GizmoClass                        ApexClass
force-app/main/default/classes/GizmoClass.cls-meta.xml
| Created GizmoObject__c                    CustomObject
force-app/main/default/objects/GizmoObject__c/GizmoObject__c.object-meta.xml
| Created GizmoObject__c-GizmoObject Layout Layout
force-app/main/default/layouts/GizmoObject__c-GizmoObject Layout.layout-meta.xml
```

After retrieving the source, run `project retrieve preview` again. Now, source tracking reports that there's nothing to retrieve.

```
sf project retrieve preview

No conflicts found.

No files will be deleted.
```

```
No files will be retrieved.

Ignored [2] files. These files won't retrieve because they're ignored by your .forceignore
 file.
 Type    Fullname                              Path
 ──────  ────────────────────────────────────  ────
 Profile Admin
 Profile B2B Reordering Portal Buyer Profile
```

Let's now look at deploying. To preview your local changes, run `project deploy preview`.

```
sf project deploy preview --target-org DevSandbox

No conflicts found.

No files will be deleted.

Will Deploy [2] files.
 Type          Fullname        Path

 ────────────  ──────────────
──────────────────────────────────────────────────────────────────────────────────
 ApexClass     WidgetClass     force-app/main/default/classes/WidgetClass.cls-meta.xml

 CustomObject WidgetObject__c
force-app/main/default/objects/WidgetObject__c/WidgetObject__c.object-meta.xml

No files were ignored. Update your .forceignore file if you want to ignore certain files.
```

Then deploy your local changes. After deploying to a sandbox, other developers that are using the sandbox can see your changes.

```
sf project deploy start --target-org DevSandbox
Deploying v59.0 metadata to test-ikspctiorkzs@example.com using the v59.0 SOAP API.
Deploy ID: 0Af8D00000pNmKySAK
Status: Succeeded | ████████████████████████████████████ | 2/2 Components (Errors:0)
| 0/0 Tests (Errors:0)

Deployed Source
═══════════════════════════════════════════════════════════════════════════════════
| State   Name            Type         Path

| ──────  ──────────────  ───────────
──────────────────────────────────────────────────────────────────────────────────
| Created WidgetClass     ApexClass    force-app/main/default/classes/WidgetClass.cls

| Created WidgetClass     ApexClass
force-app/main/default/classes/WidgetClass.cls-meta.xml
| Created WidgetObject__c CustomObject
force-app/main/default/objects/WidgetObject__c/WidgetObject__c.object-meta.xml
```

Run `project deploy preview` again.

```
sf project deploy preview

No conflicts found.
```

```
No files will be deleted.

No files will be deployed.

No files were ignored. Update your .forceignore file if you want to ignore certain files.
```

The command reports there's nothing to deploy, indicating that your local project and the org are synchronized.

Retrieve Changes to Profiles with Source Tracking
Retrieving profiles behaves a little differently with source tracking.

SEE ALSO:

VS Code Command: SFDX: Deploy|Retrieve Source to|from Org

Retrieve Changes to Profiles with Source Tracking

Retrieving profiles behaves a little differently with source tracking.

Important: In general, we recommend that you use permission sets instead of profiles. Profiles aren't consistent across orgs, and the source files that are retrieved and deployed depend on the org type, the tracking state, and other metadata in the operation. If you decide to continue using profiles, we recommend that you exclude them when you deploy or retrieve by adding them to the `.forceignore` file.

Without source tracking, retrieving profiles only returns some profile information. Retrieving profiles returns information about profiles that pertains to other items specified in the `package.xml` file.

For example, retrieving profiles with this `package.xml` file returns profile permissions for the MyCustomField__c custom field on the Account object.

```
<?xml version="1.0" encoding="UTF-8"?>
<Package xmlns="http://soap.sforce.com/2006/04/metadata">
 <types>
  <members>Account.MyCustomField__c</members>
  <name>CustomField</name>
 </types>
 <types>
  <members>*</members>
  <name>Profile</name>
 </types>
 <version>50.0</version>
</Package>
```

With source tracking, retrieving profiles returns profile information pertaining to anything else specified in the `package.xml` file plus any components getting tracked by source tracking. That includes any entity for which a change exists between your local project and the org.

For example, say you create a custom field on the Opportunity object called OppCustomField__c in your local environment. Source tracking detects the change and reports it. Now you retrieve profiles using the same `package.xml` file as you did when source tracking was off.

```
<?xml version="1.0" encoding="UTF-8"?>
<Package xmlns="http://soap.sforce.com/2006/04/metadata">
 <types>
  <members>Account.MyCustomField__c</members>
  <name>CustomField</name>
 </types>
 <types>
  <members>*</members>
  <name>Profile</name>
 </types>
 <version>50.0</version>
</Package>
```

Even though the `package.xml` file doesn't reference OppCustomField__c, because source tracking is tracking the new custom field, your retrieve returns profile permissions for both the MyCustomField__c custom field on the Account object and the OppCustomField__c on the Opportunity object.

For more information about retrieving profiles, see the Profile metadata type in the *Metadata API Developer Guide*.

Note: Although source retrieves don't include `package.xml` files, retrieve requests return profile information pertaining to everything reported by source tracking.

SEE ALSO:

Salesforce Help: Permission Sets

How to Exclude Source When Syncing

Resolve Conflicts Between Your Local Project and Org

As a best practice, if conflicts exist for components in your local project or in the org, resolve them before moving forward. You can resolve the conflict manually, or overwrite one version of a component with another. Only overwrite changes if you're certain that the new version is the one you want to use.

Say you run `project deploy preview` and see conflicting changes between your local project and in the org. For example, this command output shows that `WidgetClass` has conflicting changes but `GizmoClass` is ready to be deployed.

```
sf project deploy preview --target-org DevSandbox

Conflicts [1]. Run the command with the --ignore-conflicts flag to override.
 Type      Fullname    Path
 ──────── ─────────── ──────────────────────────────────────────────────────
 ApexClass WidgetClass force-app/main/default/classes/WidgetClass.cls-meta.xml

No files will be deleted.

Will Deploy [1] files.
 Type      Fullname   Path
 ──────── ─────────── ──────────────────────────────────────────────────────
 ApexClass GizmoClass force-app/main/default/classes/GizmoClass.cls-meta.xml
```

```
No files were ignored. Update your .forceignore file if you want to ignore certain files.
```

If you try to actually deploy the source, Salesforce CLI reports the conflict again and stops the operation from completing. You see similar conflict messages when you run `project retrieve preview`. To successfully deploy or retrieve, first resolve the conflicts, and then overwrite either your local project or the org with the resolved file. Let's see how this works.

Overwrite Conflicting Changes

If you decide that the local version is correct, overwrite the conflicting change in the org by including the `--ignore-conflicts` flag when you deploy. In our example, because only `WidgetClass` has conflicting changes, let's first deploy just that component to get rid of the conflicts and then deploy the non-conflicting source later.

```
sf project deploy start --metadata ApexClass:WidgetClass --ignore-conflicts --target-org
DevSandbox
```

The DevSandbox org now has the same version of `WidgetClass` that was in your local project. When you run `project deploy preview` again you see no conflicting changes messages.

If, however, you decide that the version of `WidgetClass` in the org is the correct one, overwrite your local copy by retrieving the DevSandbox org version while ignoring conflicts.

```
sf project retrieve start --metadata ApexClass:WidgetClass --ignore-conflicts --target-org
 DevSandbox
```

Your local project now has the same version of `WidgetClass` that was in your org.

Well done, you resolved the conflict! Now run `project deploy start` without any special flags to finish deploying `GizmoClass` and any other new local source.

```
sf project deploy start --target-org DevSandbox
Deploying v59.0 metadata to test-ikspctiorkzs@example.com using the v59.0 SOAP API.
Deploy ID: 0Af8D00000pNtEUSA0
Status: Succeeded | ████████████████████████████████████████ | 1/1 Components (Errors:0)
| 0/0 Tests (Errors:0)

Deployed Source
=================================================================================
| State   Name       Type      Path
| ─────── ────────── ───────── ───────────────────────────────────────────────────
| Created GizmoClass ApexClass force-app/main/default/classes/GizmoClass.cls
| Created GizmoClass ApexClass force-app/main/default/classes/GizmoClass.cls-meta.xml
```

SEE ALSO:

VS Code Documentation: Detect Conflicts on Deploy

Best Practices

Get the most out of source tracking by following these best practices.

Retrieve changes and resolve conflicts before deploying your changes to a sandbox

This practice helps other developers incorporate your changes and facilitates collaboration.

Review metadata change history with a version control system like Git

With a version control system, you can version your changes, track change history, and review metadata changes before promoting to other environments, such as a sandbox.

Get source tracking files back into sync

If source tracking gets confused and starts reporting inaccuracies, you can use the `project deploy|retrieve start` commands to get back into sync. Which command you use depends on which source you most trust: use `project deploy start` if you trust your local source files and `project retrieve start` if you trust what's in your org. For either command, specify the `--ignore-conflicts` flag. See Resolve Conflicts Between Your Local Project and Org for details and examples.

Performance Considerations of Source Tracking

Source tracking performs extra functions to determine changes to source tracked components, such as running more queries and waiting for the SourceMember Tooling API object to be updated after a deployment. So, some commands can take a little longer to run when working with medium-to-large sized projects. If you're working with small projects, you don't notice any slowdown.

A medium-sized project has 30 or more components or 50 or more tests. A project with 25 components and 51 tests is considered medium.

A large-sized project is 600 or more components or 150 or more tests. A project with 610 components and 140 tests is considered large.

If you experience long-running commands, break up your projects into smaller sets of components, and deploy the smaller sets.

You can also opt out of source tracking when you create a scratch org or sandbox by specifying the `--no-track-source` flag of the `org create scratch|sandbox` command. See Source Tracking for use cases.

If creating a scratch org or sandbox for use as a development environment in DevOps Center, don't disable source tracking.

CHAPTER 9 Work with Data

In this chapter ...

- Work With Small Datasets
- Work With Large Datasets
- Work With Individual Records
- Run a SOQL or SOSL Query
- Upload a File to Your Org

Development environments, such as scratch orgs and developer sandboxes, need a set of stock data for testing.

Sometimes, the stock data in a development environment doesn't meet your development needs. Apex tests generally create their own data. Therefore, if Apex tests are the only tests you're running in a scratch org, you probably don't need to worry about data for the time being. However, other tests, such as UI, API, or user acceptance tests, do need baseline data. Scale and performance testing often requires a very large set of data. Make sure that you use consistent datasets when you run tests of each type.

Scratch orgs come with the same set of data as the edition on which they're based. For example, Developer Edition orgs typically include 10–15 records for key standard objects, such as Account, Contact, and Lead. These records come in handy when you're testing something like a new Apex trigger, flow, or Lightning web component.

The following sections describe the Salesforce CLI commands you can use to populate your orgs and provide basic usage examples. The commands you use depend on your current stage of development.

SEE ALSO:

Salesforce DX Developer Guide: Supported Scratch Org Editions and Allocations

Salesforce Help: Sandbox Licenses and Storage Limits by Type

Salesforce Help: Scalability

Salesforce Help: Secure Your Sandbox Data with Salesforce Data Mask

Work With Small Datasets

Use the `data export|import tree` commands to move small sets of data between orgs, such as fewer than 3,000 records. These commands use JSON files to describe Salesforce records and the relationships between them. Developers can use these commands to quickly and easily create small sets of representative data in a scratch org when developing or testing their code.

The `data export tree` command uses one or more SOQL queries to select the data in an org that it writes to the JSON files. The queries can be for one or more Salesforce objects, using either a multi-level relationship query or multiple individual queries. The JSON files use the sObject tree format, which is a collection of nested parent-child records with a single root record. You then use these JSON files to import data into an org with the `data import tree` command.

When exporting records from two or more Salesforce objects, we recommend using the `--plan` flag. Specifying this flag generates separate JSON files for each object and a plan definition file that aggregates them, thus making imports easier. When using plans, you can export up to five levels of child objects using a relationship query, or export multiple objects that don't necessarily have relationships by specifying multiple queries.

Let's look at a few examples to see the power of these commands.

Data from a Single Salesforce Object

For this example, imagine you created a set of useful Account records while working on your application in a scratch org. Exporting these records allows you to save this data as a JSON file in your version control system. Later, you can use this file to import the same set of Account records into a new scratch org or sandbox as you continue to develop and refine your application.

This example shows how to export Account records from your default org:

```
sf data export tree \
--query "SELECT Name, Industry, TickerSymbol from Account" \
--output-dir test-data
```

The `--query` flag specifies the SOQL query that selects the records you want to export; in this case it's very simple and touches just one object: Account. For simplicity, the example SOQL query includes only a few Account fields, but in real life you include the writable fields that you want to export. Don't include fields that aren't writable, such as formula fields. The `--output-dir` flag specifies the directory in which to write the single JSON file.

The output JSON file is always named after the queried object, in this case `Account.json`. The file is in the sObject Tree format and looks something like this:

```
{
    "records": [
        {
            "attributes": {
                "type": "Account",
                "referenceId": "AccountRef1"
            },
            "Name": "Edge Communications",
            "Industry": "Electronics",
            "TickerSymbol": "EDGE"
        },
        {
            "attributes": {
                "type": "Account",
                "referenceId": "AccountRef2"
            },
```

```
            "Name": "Burlington Textiles Corp of America",
            "Industry": "Apparel",
            "TickerSymbol": "BTXT"
        }
    ]
}
```

For each record, the `type` key specifies its object, such as Account in our example. The `referenceID` key is a stand-in for a record ID; when imported into a new org the record gets a different ID than in the org where it was exported from. These stand-in IDs help preserve relationships, such as lookups, between imported records.

To import these records into a new scratch org, use this CLI command:

```
sf data import tree \
--files test-data/Account.json \
--target-org new-scratch-org
```

You use the `--files` flag to specify the JSON file that has the records, and `--target-org` to specify the org into which you want to import the records.

Data from Salesforce Objects with Parent/Child Relationships

Now imagine you created a useful set of both Account and Contact records while working on your application in a scratch org. To export records from both of these objects, you must use a SOQL relationship query. When combined with the `--plan` flag, the query results in multiple data JSON files and a plan definition file that includes references to preserve the relationships between records from different objects. As a result, your data is correctly imported into a new org.

Here's what your new export command looks like. The SOQL query now has a relationship subquery that includes child Contact records for each Account record found. As before, the SOQL query includes only a few fields, but you can specify any writable fields required by your dataset:

```
sf data export tree \
   --query "SELECT Name, Industry, TickerSymbol, (SELECT FirstName, LastName, Email, Phone
 FROM Contacts) FROM Account"  \
    --output-dir test-data --plan
```

When the command finishes, the output directory contains an `Account.json` file with the Account records, just as before. But it also now contains a `Contact.json` file with Contact records, and a file called `Account-Contact-plan.json` that details the plan for importing all the records. The plan outlines the relationships between the objects that were exported and specifies the order in which to load them when imported. For example, contacts typically have references to accounts, so the Account records must be imported before the Contact records.

Here's the corresponding command to import these records into an org with alias `new-scratch-org`:

```
sf data import tree \
    --plan test-data/Account-Contact-plan.json --target-org new-scratch-org
```

This import uses the `--plan` flag to specify the name of the plan definition file created by the export command. Without a plan you must import each object separately, so using a plan makes imports much easier.

Data from Salesforce Objects with Junction Relationships

A junction object is a Salesforce object with two master-detail relationships that models a many-to-many relationship between two objects. An example of a junction object is AccountContactRelation, which represents a relationship between a contact and one or more accounts.

Let's say you created several many-to-many relationships between your contacts and accounts while working on your application in a scratch org. To export the records from both these objects while preserving the junction object relationships, you must specify multiple queries during the export. To do so, use the `--query` flag multiple times when executing the `data export tree` command. For example, you can combine individual queries against the Account, Contact, and AccountContactRelation objects, ensuring that the references for all exported data match and can then be imported into a new org.

```
sf data export tree \
    --query "SELECT Name, Industry, TickerSymbol FROM Account"  \
    --query "SELECT FirstName, LastName, Email, Phone FROM Contact"  \
    --query "select ID, ContactId, AccountId from AccountContactRelation" \
    --output-dir test-data-junction --plan
```

When executing the `data export tree` with multiple queries, the plan definition file is always named `plan.json`. As always, this file outlines the relationships between the exported objects and specifies the order in which records are loaded during import. The import command itself is similar to previous examples.

```
sf data import tree --plan test-data-junction/plan.json --target-org new-scratch-org
```

Tip: To automatically enable the feature to relate a contact to multiple accounts in a scratch org, specify the ContactsToMultipleAccounts feature in the scratch org definition file. For example:

```
{
  "orgName": "Dreamhouse",
  "edition": "Developer",
  "features": ["Walkthroughs", "EnableSetPasswordInApi", "ContactsToMultipleAccounts"],
…
}
```

SEE ALSO:

Salesforce CLI Command Reference: data Commands

SOQL and SOSL Reference Guide

REST API Developer Guide: sObject Tree

Salesforce Help: Create a Many-to-Many Object Relationship (Junction Objects)

Salesforce Help: Contacts to Multiple Accounts

Object Reference for the Salesforce Platform: AccountContactRelation

Work With Large Datasets

When you're ready to do more real-world testing, you often need large sets of data, such as millions of records. In this case, you use the various `data bulk` CLI commands to move the data around, typically between sandboxes. These commands are also useful when automating data extractions and data loads in production orgs.

Salesforce CLI's `data bulk` commands use the Salesforce Bulk API 2.0, which is optimized for working with large sets of data. You can use these CLI commands to import, export, update, upsert, or delete many records asynchronously; collectively these actions are also known as bulk ingests. The commands work in pairs: first run a command such as `data import bulk` to submit a bulk ingest request, and then later run `data import resume` to view the status and results. Salesforce processes the request in the background.

Here are the bulk commands:

- `data export bulk|resume`
- `data import bulk|resume`

- `data delete bulk|resume`
- `data upsert bulk|resume`
- `data update bulk|resume`
- `data bulk results`

Let's see how these commands work.

Bulk Export and Import

Let's first assume you already have many records in an org that you want to export and store in a file so you can later import them into another org for scale testing. Use a SOQL query to select the records you want to export; you can query only one Salesforce object. This example shows how to export records from the Account object from your default org:

```
sf data export bulk \
    --query "SELECT Name, Phone, Website FROM Account" \
    --output-file accounts.csv --wait 10
```

When the request finishes, the file `accounts.csv` contains the records in comma-separated values (CSV) format. The `--wait` flag specifies that the command waits for 10 minutes to complete before it times out.

Warning: The `data export bulk` command uses Bulk API 2.0, which limits the type of SOQL queries you can run. For example, you can't use clauses such as `GROUP BY` or `LIMIT`, or aggregate functions such as `count()`. For the complete list of limitations, see the *SOQL Considerations* section in the *Bulk API Developer Guide*.

Here are a few other flags you can specify to customize the export.

Flag	Description
`--query-file`	Read the SOQL query from a file rather than at the command line. This flag is useful if your SOQL query is very long.
`--result-format:`	Export into a file that uses JSON format rather than CSV, the default. Note that bulk imports support files in only CSV format, not JSON.
`--all-rows:`	Include rows that have been soft-deleted due to a merge or delete; by default, deleted records are not included.
`--column-delimiter:`	The character used between columns when writing CSV output. Default is COMMA, but you can specify BACKQUOTE, CARET, and more.

This example gets the SOQL query from the `soql-query.txt` file, writes the records to a file in JSON format, and includes soft-deleted records; it also runs on an org with the alias `my-org`:

```
sf data export bulk \
    --query-file soql-query.txt --result-format json --all-rows \
    --output-file accounts-all.json --wait 10 --target-org my-org
```

Bulk exports can take a while, depending on how many records are returned by the SOQL query. In our previous examples, we specified that the command wait for 10 minutes for it to finish. If the command times out, it displays the `data export resume` command you must run to get the status and results of the job. The command then returns control of the terminal, even though the job processing is still happening in the background. The resume command uses a job ID, or you can use the `--use-most-recent` flag to resume the most recently run job.

```
sf data export resume --job-id 750xx00fake00005sAAA
```

To bulk import the records from a file, run the `data import bulk` command. Similar to exporting, you can import records into only one Salesforce object at a time, so the records in the file must be for the same object. Also, bulk import supports only files in CSV format, not JSON.

This example shows how to bulk import records from the `accounts.csv` file into the Account object in the org with the alias `new-scratch-org`. You must specify the column delimiter used in the file, which in this example is the comma.

```
sf data import bulk --file accounts.csv --sobject Account \
   --column-delimiter COMMA --wait 10 --target-org new-scratch-org
```

Important: The format of the CSV file from which you're importing must follow the rules and guidelines imposed by Bulk API 2.0. For example, the first row lists the fields you're importing, and you must include all the object's required fields. For complete documentation about creating these files, see the *Prepare Data to Ingest* section of the *Bulk API Developer Guide*.

The CSV file created by the `data export bulk` command follows the required formatting rules and guidelines.

Similar to the bulk export command, if the import times out, it completes and displays the `data import resume` command you must run to get the status and results of the job. You can also use the `--use-most-recent` flag to resume the most recently run import job.

```
sf data import resume --use-most-recent
```

Bulk Delete

Use the `data delete bulk` command to delete multiple records at once from a single Salesforce object. You must specify a comma-separated values (CSV) file that has only one column (named Id) and then the list of record IDs you want to delete, one ID per line. This sample CSV file snippet is for deleting account records:

```
Id
0017z00000m14R9AAI
0017z00000m5a0nAAA
0017z00000m5a0oAAA
```

This example deletes the accounts listed in the specified CSV file from the default org:

```
sf data delete bulk --sobject Account --file delete-accounts.csv --wait 10
```

As with all the bulk data commands, if the `data delete bulk` command times out, it displays the `data delete resume` command you must run to see the status and results.

By default, the `data delete bulk` command puts the deleted records into the Salesforce Recycle Bin. You can specify that you want the records to be marked for immediate deletion, also known as hard delete, by including the `--hard-delete` flag.

Important: You must have the "Bulk API Hard Delete" system permission to use the `--hard-delete` flag. This system permission is disabled by default and can be enabled only by your Salesforce admin.

Bulk Update and Upsert

The `data update bulk` and `data upsert bulk` commands both read a CSV file that has new field values for a single Salesforce object. The first column in the file must be a record ID. The remaining columns are the fields you want to update. This sample CSV file snippet is for updating the Name field of the Account object:

```
Id,Name
0017z00000m14R9AAI,"New Name One"
```

```
0017z00000m5930AAA,"New Name Two"
0017z00000m5931AAA,"New Name Three"
```

Important: See *Prepare Data to Ingest* in the *Bulk API Developer Guide* for full documentation about the format of the CSV file when bulk updating and upserting.

However, when you run `data update bulk`, you can update only existing records; if the command finds an ID in the CSV file that doesn't currently exist, the command fails. By contrast, if you run `data upsert bulk` on the same CSV file, the command updates existing records and creates a record if necessary.

This example updates records of the Account object of your default org using the `accounts-update.csv` file:

```
sf data update bulk --file accounts-update.csv \
   --sobject Account --wait 10
```

If all the records in `accounts-update.csv` exist, then the command completes successfully and the Account object fields are updated with their new values. To also insert new records, you must use `data upsert bulk`. The command requires the `--external-id` flag, which for this example we set to just the Id field. Then, in the CSV file, rows that contain no value for the Id column are inserted as new records. For example:

```
Id,Name
0017z00000m14R9AAI,"New Name One"
0017z00000m5930AAA,"New Name Two"
0017z00000m5931AAA,"New Name Three"
,"New Account"
```

Here's how to run the upsert command:

```
sf data upsert bulk --file accounts-update.csv \
   --sobject Account --external-id Id --wait 10
```

As with all the bulk data commands, if the `data update|upsert bulk` commands time out, they display the `data update|upsert resume` commands you must run to see the status and results.

Get Detailed Results From Any Bulk Ingest Job

Use the `data bulk results` CLI command to get detailed results from any completed bulk ingest job that you previously ran using any Salesforce tool. Examples of these tools include:

- The bulk Salesforce CLI commands discussed in this topic, such as `data import bulk` and `data upsert bulk`
- Data Loader
- A partner product on AppExchange that uses Bulk API 2.0

The `data bulk results` command requires that the bulk ingest job has completed; the command also needs the job ID. For example, if you're using `data import bulk`, and it's still processing, run `data import resume` first and wait for it to complete. Make note of the outputted job ID.

The `data bulk results` command first shows a summary of the job results. It includes the overall status, the executed operation, the affected Salesforce object, and the number of successful and failed records that were processed. For example:

```
sf data bulk results --job-id 75fake00CZBD1IAP --target-org my-scratch

Status: JobComplete
Operation: insert
Object: Account
```

```
Processed records: 13
Successful records: 13

Saved successful results to 75fake00CZBD1IAP-success-records.csv
```

The command also provides a CSV file that contains details of every successful record that was processed, including the new Salesforce record IDs; in our sample output, the name of the file is `75fake00CZBD1IAP-success-records.csv`. If any errors occurred during the bulk ingest job, the command generates separate CSV files with details about the failures, and if possible, the unprocessed records.

SEE ALSO:

- *Salesforce CLI Command Reference*: data Commands
- *Salesforce Help*: Sandbox Licenses and Storage Limits by Type
- *Bulk API Developer Guide*: Bulk API 2.0
- *Bulk API Developer Guide*: SOQL Considerations
- *Bulk API Developer Guide*: Prepare Data to Ingest
- *Data Loader Guide*
- Salesforce AppExchange

Work With Individual Records

Everyone's process is unique, and you don't always need the same data as your teammates. When you want to create, modify, or delete individual records quickly, use the `data record` commands, such as `data create record`. With these commands you specify field values directly at the command line, so you don't need any CSV or JSON data files. These commands work with both standard and custom Salesforce objects, and Tooling API objects.

Create a Record

This example shows how to create a record in the Account object in your default org:

```
sf data create record --sobject Account \
   --values "Name='Exciting Company' Website=www.example.com NumberOfEmployees=45
Phone='(415) 555-1212'"
```

Use the `--values` flag to specify field values in the form `<fieldName>=<value>`. Be sure to use the object's field API name and not its label. Separate multiple pairs with spaces, and use single quotes for individual values that include spaces. You must specify a value for all required object fields.

Use the `--use-tooling-api` flag to create a Tooling API object record. This example creates a record in the TraceFlag Tooling API object:

```
sf data create record --use-tooling-api --sobject TraceFlag \
   --values "DebugLevelId=7dl170000008U36AAE StartDate=2024-12-15T00:26:04.000+0000 \
   ExpirationDate=2024-12-15T00:56:04.000+0000 LogType=CLASS_TRACING
TracedEntityId=01p17000000R6bLAAS"
```

Get a Record

Use the `data get record` command to retrieve and display a single record of a Salesforce standard or Tooling API object. The command first displays basic information about the record, such as its ID, and then displays all the record's fields, one field per line. Fields with no values are displayed as null.

Identify the record by either its ID (`--record-id` flag) or with a list of field-value pairs (`--where` flag). If your list of fields identifies more than one record, the command fails; the error displays how many records were found.

When using `--where` to identify a record by its field values, be sure to use the object's field API name and not its label. Separate multiple field-value pairs with spaces, and use single quotes for individual values that include spaces.

For example, to display the Account record that we added in the previous section, run this command:

```
sf data get record --sobject Account \
    --where "Name='Exciting Company' Website=www.example.com"
```

If you noted the record ID when you created the record, you can use it to display the record this way:

```
sf data get record --sobject Account --record-id 001Oy0000xyz123
```

Here's the example for Tooling API objects:

```
sf data get record --use-tooling-api  --sobject TraceFlag --record-id 7tf8c00xx
```

Update or Delete a Record

Use the `data update|delete record` commands to change an existing object or Tooling API record.

Identify the record by either its ID (`--record-id` flag) or with a list of field-value pairs (`--where` flag). If your list of fields identifies more than one record, the command fails; the error displays how many records were found.

To update a field, use the `--values` flag to specify the new field value. For both `--values` and `--where`, be sure to use the object's field API name and not its label. Separate multiple field-value pairs with spaces, and use single quotes for individual values that include spaces.

For example, let's say the phone number for the Exciting Company account changed; here's the CLI command to update the record:

```
sf data update record --sobject Account \
  --where "Name='Exciting Company'" --values "Phone='(510) 555-1212'"
```

Here's how you delete the record:

```
sf data delete record --sobject Account --where "Name='Exciting Company'"
```

This example shows how to delete a record of a Tooling API object using its record ID:

```
sf data delete record --use-tooling-api --sobject TraceFlag --record-id 7tf8c00xx
```

SEE ALSO:

Salesforce CLI Command Reference: data Commands

Tooling API: TraceFlag

Run a SOQL or SOSL Query

It's often useful to run a CLI command to quickly query a Salesforce object or search for specific terms across many objects. For example, maybe you want to see all the Account records for the energy industry, or search for contact or lead names that begin with the letters JO. Salesforce provides two robust search languages for just these use cases: SOQL and SOSL.

SOQL

Use Salesforce Object Query Language (SOQL) to search a single Salesforce or Tooling API object for specific information. SOQL is similar to the SELECT statement in the widely used Structured Query Language (SQL) but is designed specifically for Salesforce data.

This example shows how to run a simple SOQL query against the Account object in your default org:

```
sf data query --query "SELECT ID, Name FROM Account WHERE Industry='Energy'"
```

If your query is long, you can store it in a file and specify the file name to the `--file` flag, as shown in this example, which runs against an org with the alias `new-scratch-org`:

```
sf data query --file query.txt --target-org new-scratch-org
```

Tip: If your query returns more than 2,000 records, use the `data export bulk` command instead.

Use the `--all-rows` flag to also return records that have been soft-deleted due to a merge or delete. By default, deleted records aren't returned. To change the format of the output, such as to comma-separated values (CSV) or JSON, use the `--result-format` flag.

```
sf data query --query "SELECT ID, Name FROM Account WHERE Industry='Energy'" --all-rows
--result-format json
```

To query a Tooling API object, include the `--use-tooling-api` flag. This example also shows how to use the `--output-file` to write output to a file in CSV format.

```
sf data query --query "SELECT ID, Name FROM ApexClass" --use-tooling-api --result-format
csv --output-file query-output.csv
```

SOSL

Use Salesforce Object Search Language (SOSL) search fields across multiple objects.

This SOSL query searches the contacts and leads in your default org for names that start with Jo:

```
sf data search
  --query "FIND {Jo*} IN Name FIELDS Returning Contact(Name, Phone), Lead(Name, Phone)"
```

If your SOSL search query is long, you can store it in a file and specify the filename to the `--file` flag, as shown in this example, which runs against an org with the alias `new-scratch-org`:

```
sf data search --file query.txt --target-org new-scratch-org
```

Specify `--result-format csv` to write a comma-separated value (CSV) file to disk:

```
sf data search --file query.txt --result-format csv
```

SEE ALSO:

Salesforce CLI Command Reference: data Commands

SOQL and SOSL Reference Guide

Upload a File to Your Org

Use the `data create file` CLI command to upload a local file to your org. The file is uploaded to the ContentDocument standard object; when the command finishes it outputs the new record ID. In the Salesforce UI, the uploaded file is available from the Files tab. The command always creates a new file in the org; you can't update an existing file. If you create a file with the name of an existing file, a new duplicate record is created.

This simple example shows how to upload the file called `astro.png` to an org with the alias `new-scratch-org`:

```
sf data create file --file astro.png --target-org new-scratch-org
```

By default, the `Title` field of the new ContentDocument record is the same as the name of the file (without the extension). In the example, the title is `astro`. Use the `--title` flag to give it a new title:

```
sf data create file --file astro.png --title "Astro Running" --target-org new-scratch-org
```

By default, the uploaded file isn't attached to a Salesforce record, such as an account or contact. If you know the ID of the record to which you want to attach the uploaded file, specify it with the `--parent-id` flag. This example attaches the file to a contact because the ID starts with `003`:

```
sf data create file --file astro.png --parent-id 003O300000WLdtwIAD --title "Astro Running"
 --target-org new-scratch-org
```

SEE ALSO:

Salesforce CLI Command Reference: data Commands

Object Reference for the Salesforce Platform: ContentDocument

CHAPTER 10 Salesforce DX MCP Server and Tools (Beta)

In this chapter ...

- Quick Start Using the VS Code With Copilot MCP Client (Beta)
- Install and Configure the Salesforce DX MCP Server (Beta)
- Use the Core Salesforce DX MCP Tools (Beta)

Use the Salesforce DX MCP Server and its tools to enter natural language prompts in your IDE to complete standard DX tasks like syncing metadata, running Apex and agent tests, and creating scratch orgs. The DX MCP server includes over 60 MCP tools for various Salesforce features, such as DevOps, LWC development, and code analysis. These tools provide predictable, secure, and structured context to large language models (LLMs), ensuring efficient and accurate results.

Note: Salesforce DX MCP Server is a pilot or beta service that is subject to the Beta Services Terms at Agreements - Salesforce.com or a written Unified Pilot Agreement if executed by Customer, and applicable terms in the Product Terms Directory. Use of this pilot or beta service is at the Customer's sole discretion.

Let's see how this work with an example. Say you enter `Deploy my metadata` in your IDE's agentic chat window. The LLM sees that the DX MCP Server provides a `deploy_metadata` MCP tool, which sounds perfect! The LLM then calls that tool within the context of your local DX project. Success and error messages that result from the metadata deploy are then returned back to the LLM to determine the next steps. In sum, the MCP DX tools guide the LLM to accomplish your goals in the the most accurate, tested, and up-to-date way.

If the LLM didn't have the specific context for your prompt, it would still come up with a suggestion, and eventually even the correct one. But because the LLM might be relying on out-of-date training data, getting to the correct answer often involves inefficiencies, guesswork, and unpredictable behavior. MCP solves this problem.

The Salesforce DX MCP Server is a specialized Model Context Protocol (MCP) implementation designed to facilitate seamless interaction between LLMs and Salesforce orgs. See MCP Solutions for Developers in the *Agentforce Developer Guide* for general MCP information and descriptions of other Salesforce MCP Servers.

Key features of Salesforce DX MCP Server include:

- Direct interaction with Salesforce orgs through LLM-driven tools.
- Secure access using TypeScript libraries (not shelling out to Salesforce CLI).
- Improved security by avoiding the exposure of secrets in plain text.
- Granular access control with org allowlisting.
- Modular tool architecture for easy extensibility.

Salesforce DX MCP Server Security Features

The Salesforce DX MCP Server was designed with security as a top priority.

- Uses TypeScript libraries directly.
  - Greatly decreases the size of the MCP Server.

  - Significantly reduces the risk of remote code execution (RCE).
- No secrets needed in configuration.
  - Eliminates the risk of plain text secret exposure.
  - Accesses pre-existing (encrypted) auth files on the user's machine.
  - Implements allowlisting for auth info key/values to prevent sensitive data exposure.
- No secrets exposed via MCP tools.
  - Prevents other tools from accessing unencrypted tokens.
  - Tools pass usernames around instead of tokens.
- Granular access control.
  - MCP Server can access auth info for only orgs that have been explicitly allowlisted.
  - Users specify allowed orgs when starting the server.

Agentforce Vibes Extension Includes the Salesforce DX MCP Server

Agentforce Vibes is an AI-powered Salesforce developer tool that's available as an easy-to-install Visual Studio Code (VS Code) extension. It includes Agentforce, an intelligent coding partner that provides information and, most importantly, can take action.

The Salesforce DX MCP Server is pre-configured in Agentforce Vibes, so you can start using the DX MCP tools immediately after you install the extension in VS Code.

See Set Up Agentforce Vibes and Build with Agentforce for more information.

Types of MCP Tools Included in Salesforce DX MCP Server

The Salesforce DX MCP Server includes many tools for working with different Salesforce features. To narrow the LLM context, the DX MCP Server groups the tools into toolsets based on functionality. You can then easily enable only those tools you want to use, rather than enable them all and overwhelm the LLM.

These are the high-level types of MCP tools included in the DX MCP Server:

- **Core DX**: Usual DX tools for working with orgs, deploying and retrieving metadata, and so on.
- **DevOps**: Manage work items, resolve merge conflicts, and troubleshoot deployment problems within DevOps Center.
- **Code Analysis**: Run a static analysis of your code using Salesforce Code Analyzer.
- **Mobile**: Help LWC developers create Lightning web components that integrate with device-native features and adhere to Mobile Offline design patterns.
- **Lightning Web Components (LWC) and Aura**: Help you design, build, test, and optimize LWC code and facilitate Aura migration to LWC.

- **Lightning Types**: Create and enhance custom Lightning types to define complex data structures and build custom user interfaces for Agentforce, Prompt Builder, and other Salesforce applications. See the Lightning Types MCP Tool documentation.

MCP Terminology

Here are the MCP-specific terms we use in this document.

- **MCP Server** - An MCP server lets users interact with a system (such as Salesforce) using an LLM and natural language instead of an API. MCP servers provide the LLM with tools, prompts, and resources that the LLM can use to perform specific tasks.
- **MCP Tools** - Executable functions that the LLM can call to perform actions.
- **MCP Toolsets** - Logical groups of MCP tools based on their functionality. For example, the Salesforce DX MCP Server has `metadata` and `orgs` toolsets.
- **MCP Client** - The interface (such as Agentforce) or IDE (such as Cursor) that can host an MCP server and act as an interface to the LLM. Also called MCP Host, although this document uses the term MCP client.

Quick Start Using the VS Code With Copilot MCP Client (Beta)

Get started with the Salesforce DX MCP Server using Visual Studio Code (VS Code) as the MCP client. After you configure it with the Salesforce DX MCP Server, you then use GitHub Copilot and natural language to easily execute typical Salesforce DX development tasks, such as creating scratch orgs, deploying or retrieving metadata, and viewing org records.

For the best getting-started experience, make sure that you have a standard Salesforce DX environment set up on your computer. In particular:

- Install Node.js on your computer. We recommend you use the Active LTS version.
- Install Salesforce CLI on your computer.
- Install VS Code on your computer.
- Create a Salesforce DX project and open it in VS Code. You can also clone an example repo, such as dreamhouse-lwc, which is a ready-to-use DX project that contains a simple Salesforce application, with metadata and test data.
- Authorize at least one development Salesforce org to use with your DX project, such as a Trailhead playground, sandbox, scratch org, or Developer Edition org, and set it as your default org.

  If you want to create a scratch org using MCP, then you must also authorize a Dev Hub org.

You also need a GitHub account.

Okay, let's do it!

1. Create a `.vscode/mcp.json` file at the root of your DX project and add this JSON:

```
{
 "servers": {
   "Salesforce DX": {
     "command": "npx",
     "args": ["-y", "@salesforce/mcp@latest",
              "--orgs", "DEFAULT_TARGET_ORG",
              "--toolsets", "orgs,metadata,data,users,testing"]
   }
  }
}
```

   You can also configure the DX MCP Server globally by editing the VS Code settings.json file and adding a similar JSON snippet but contained in an `mcp:servers` section.

   The `--orgs` flag is required and specifies the authorized orgs you're allowing the DX MCP Server to access. The `--toolsets` flag specifies the toolsets it should consult when determining the specific tool to run. See Configure the Salesforce DX MCP Server for Your Environment (Beta) for the available values for the two flags.

2. Open VS Code, go to **View -> Command Palette** and find and click **MCP: List Servers**.

   Tip: You can also get to the command palette by pressing Ctrl+Shift+P (Windows or Linux) or Command-Shift-P (macOS).

3. Click **Salesforce DX**, then **Start Server**.
   Click **Yes** if you're asked if the DX MCP Server is trustworthy.

   Check the **Output** tab for the server status and errors. The output also shows information such as the MCP tools and toolsets that were registered, and which MCP tool registration was skipped because they're not generally available (NON-GA).

   When the DX MCP Server is ready, you see a message like this (your server version might be different):

```
Salesforce MCP Server v0.21.2 running on stdio
```

4. **Run Chat: Open Chat (Agent)** from the command palette to start a new GitHub Copilot chat session. If necessary, you're asked to log in to GitHub and authorize VS Code to access it.
   Be sure your GitHub Copilot chat window is in Agent mode; if you're in Ask or Edit mode, use the little drop-down to switch.
5. In the GitHub Copilot chat window, use natural language to explain what you want to do. The DX MCP Server determines which configured tool to use, and then shows it to you along with other information. Review the chosen tool and parameters, then click **Continue** to run the tool and see the results of your request.
   Try out these sample prompts:
   - *Do I have any active scratch orgs? What about inactive scratch orgs?*
   - *Show me all the available information about all my orgs.*
   - *Show me all the accounts in the org with the alias* `my-org`.
   - *Deploy the Apex classes in my DX project to the org with the alias* `my-org`.
   - *Retrieve all agents from my org.*
6. To stop, restart, or view the DX MCP Server configuration, run the **MCP: List Servers** command, click **Salesforce DX**, then click the appropriate option.

Install and Configure the Salesforce DX MCP Server (Beta)

Install the Salesforce DX MCP Server in your MCP client to start using the tools.

Follow these steps:

1. Install Node.js on your computer. We recommend you use the Active LTS version.
2. Add the Salesforce DX MCP Server to Your MCP Client (Beta).
3. Configure the Salesforce DX MCP Server for Your Environment (Beta).

Add the Salesforce DX MCP Server to Your MCP Client (Beta)

The Salesforce DX MCP Server is an `npm` package called `@salesforce/mcp`. Adding the DX MCP Server to an MCP client typically involves updating a JSON file that tells the MCP client how to run the `@salesforce/mcp` package using npx and specifying the `args` option to configure the DX MCP Server. We recommend that you also use the `@latest` tag (`@salesforce/mcp@latest`) so you always get the latest version of the DX MCP Server.

While each MCP client has different JSON files, the format of the `args` option is always the same. Here are instructions for some popular MCP clients.

Agentforce Vibes

The Salesforce DX MCP Server is pre-configured in Agentforce Vibes. See Agentforce Vibes Extension Includes the Salesforce DX MCP Server.

VS Code with Copilot

See the Quick Start Using the VS Code With Copilot MCP Client (Beta), which uses VS Code with GitHub Copilot as the example. The topic includes details about which JSON file to update and an example JSON snippet.

Cursor

To configure Cursor to work with Salesforce DX MCP Server, add this snippet to your Cursor `mcp.json` file:

```
{
  "mcpServers": {
    "Salesforce DX": {
      "command": "npx",
      "args": ["-y", "@salesforce/mcp@latest",
               "--orgs", "DEFAULT_TARGET_ORG",
               "--toolsets", "orgs,metadata,data,users,testing"]
    }
  }
}
```

Cline

To configure Cline, add this snippet to your Cline `cline_mcp_settings.json` file:

```
{
  "mcpServers": {
    "Salesforce DX": {
      "command": "npx",
      "args": ["-y", "@salesforce/mcp@latest",
               "--orgs", "DEFAULT_TARGET_ORG",
               "--toolsets", "orgs,metadata,data,users,testing"]
    }
  }
}
```

Other MCP Clients

For these other clients, refer to their documentation for adding MCP servers and follow the same pattern as in the preceding VS Code and Cursor JSON snippets:

- Claude Code
- Windsurf
- Zed
- Trae

Configure the Salesforce DX MCP Server for Your Environment (Beta)

After you've added the basic Salesforce DX MCP Server to your MCP client, configure the server for your specific environment by updating the `args` option with new flags or new values to the flags.

Surround the flag name and its value each in double quotes, and separate all flags and values with commas. Boolean flags don't take a value.

Let's just run through some examples so you get the idea. Then see later sections for the full list of values you can specify for the `args` option and its flags.

This basic example (for the VS Code with Copilot MCP client) configures the DX MCP Server to access your default org and enables the core DX toolsets.

```
{
  "servers": {
    "Salesforce DX": {
      "command": "npx",
      "args": ["-y", "@salesforce/mcp@latest",
               "--orgs", "DEFAULT_TARGET_ORG",
               "--toolsets", "orgs,metadata,data,users,testing"]
    }
  }
}
```

The `"-y", "@salesforce/mcp@latest"` part tells the `npx` command to automatically install the latest version of the `@salesforce/mcp` npm package instead of asking permission. Don't change this.

From now on we'll show examples of just the `args` option, which is the key configuration option for the Salesforce DX MCP Server.

This example shows how to enable just the `data`, `orgs`, and `metadata` toolsets and allow access to two orgs: your default Dev Hub org and an org with username `test-org@example.com`.

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "DEFAULT_TARGET_DEV_HUB,test-org@example.com",
         "--toolsets", "data,orgs,metadata"]
```

This example shows how to configure access to two orgs for which you specified aliases when you authorized them (`my-scratch-org` and `my-dev-hub`).

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "my-scratch-org,my-dev-hub",
         "--toolsets", "data,orgs,metadata"]
```

This example allows the MCP Server to access all your authorized orgs, all toolsets, and tools that are not yet generally available. In other words, this enables everything! Only do this if you truly need everything.

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "ALLOW_ALL_ORGS",
         "--toolsets", "all",
         "--allow-non-ga-tools"]
```

This example enables five tool sets (`data`, `orgs`, `metadata`, `lwc-experts`, and `code-analysis`) and a specific tool (`run_apex_test`) from a different toolset.

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "DEFAULT_TARGET_ORG",
         "--toolsets", "data,orgs,metadata,lwc-experts,code-analysis",
         "--tools", "run_apex_test",
         "--allow-non-ga-tools"]
```

This example allows access to both your default org and default Dev Hub org. It also enables three specific MCP tools rather than using toolsets. The `core` toolset is always enabled, even if you don't specify it in the server configuration.

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "DEFAULT_TARGET_ORG,DEFAULT_TARGET_DEV_HUB",
         "--tools", "list_all_orgs,deploy_metadata,run_apex_test"]
```

This example enables the `orgs` toolset and the specific tool `deploy_metadata`.

```
"args": ["-y", "@salesforce/mcp@latest",
         "--orgs", "DEFAULT_TARGET_ORG",
         "--toolsets", "orgs",
         "--tools", "deploy_metadata"]
```

Valid Values for the `args` Option

These are the flags that you can pass to the `args` option.

Table 1: Valid values for the args option

Flag Name	Required?	Description
`--orgs`	Yes	One or more orgs that you've locally authorized and are allowing the MCP Server to use. You must specify at least one org. See Valid Values for the --orgs Flag.
`--toolsets`	You must specify at least one of these flags: `--toolsets`, `--tools`, `--dynamic-tools`.	Groups of MCP tools based on functionality. Allows you to run the DX MCP Server with only the tools you require, which in turn reduces the LLM context. See Valid Values for the --toolsets Flag.
`--tools`	You must specify at least one of these flags: `--toolsets`, `--tools`, `--dynamic-tools`.	Specific MCP tools you want to enable. See Valid Values for the --tools Flag.
`--no-telemetry`	No	Boolean flag to disable telemetry, which is the automatic collection of data for monitoring and analysis. Telemetry is enabled by default, so specify this flag to disable it.
`--debug`	No	Boolean flag that requests that the DX MCP Server print debug logs. Debug mode is disabled by default. Not all MCP clients expose MCP logs, so this flag might not work in your environment.
`--allow-non-ga-tools`	No	Boolean flag to allow the DX MCP Server to use both the generally available (GA) and NON-GA tools that are in the toolset you specify. By default, the DX MCP Server uses only the tools marked GA.

Flag Name	Required?	Description
`--dynamic-tools`	You must specify at least one of these flags: `--toolsets`, `--tools`, `--dynamic-tools`.	(experimental) Boolean flag that enables dynamic tool discovery and loading. When specified, the DX MCP Server starts with a minimal set of core tools and loads new tools as needed. This flag is useful for reducing the initial context size and improving LLM performance. Dynamic tool discovery is disabled by default. This feature works in VS Code and Cline but may not work in other MCP clients.

Valid Values for the --orgs Flag

The Salesforce MCP tools require an org, and so you must include the required `--orgs` flag and specify at least one authorized org. Separate multiple values with commas.

We recommend that, for security reasons, you don't automatically specify all the orgs you've authorized but instead only the orgs you want the DX MCP Server to access.

Tip: If you're limiting the MCP tools to those that don't typically require a Salesforce org (such as Salesforce Code Analyzer tools in the `code-analysis` toolset), you must still set the `--orgs` flag, such as `--orgs DEFAULT_TARGET_ORG`. You don't get an error on server start, even if you haven't set a default org.

You must explicitly authorize the orgs on your computer before the MCP server can access them. Use the `org login web` Salesforce CLI command or the **VS Code SFDX: Authorize an Org** command from the command palette.

These are the available values for the `--orgs` flag.

Table 2: Valid values for the --orgs Flag

Flag Value	Description
`DEFAULT_TARGET_ORG`	Allow access to your default org. If you've set a local default org in your DX project, the DX MCP Server uses it. If not, the server uses a globally-set default org.
`DEFAULT_TARGET_DEV_HUB`	Allow access to your default Dev Hub org. If you've set a local default Dev Hub org in your DX project, the DX MCP Server uses it. If not, the server uses a globally-set default Dev Hub org.
`ALLOW_ALL_ORGS`	Allow access to all authorized orgs. Use caution with this value!
`<username or alias>`	Allow access to a specific org by specifying its username or alias, such as `my-org` (alias) or `test@example.com` (username).

Valid Values for the `--toolsets` Flag

The Salesforce DX MCP Server uses toolsets to logically group MCP tools based on functionality; use the `--toolsets` flag to specify the ones you want to enable for your environment. Separate multiple toolsets commas.

Tip: If you enable an MCP tool with the `--toolsets` flag, you can then disable it in your MCP client, which takes precedence.

These are the available toolsets. For some of these toolsets, the complete list of included tools is documented in separate documentation, as indicated.

Table 3: Valid values for the --toolsets Flag

Toolset Name	Description
`all`	Enables all available tools from all toolsets. We recommend that you configure only the toolsets you're going to use, rather than all of them with this value. The DX MCP Server includes over 60 MCP tools, so enabling them all in your MCP client can overwhelm the LLM context.
`core`	Core set of DX MCP tools. This toolset is always enabled. See Core DX MCP Tools Reference for the included tools.
`orgs`	Tools to manage your authorized orgs. See Core DX MCP Tools Reference for the included tools.
`data`	Tools to manage the data in your org, such as listing all accounts. See Core DX MCP Tools Reference for the included tools.
`users`	Tools to manage org users, such as assigning a permission set. See Core DX MCP Tools Reference for the included tools.
`metadata`	Tools to deploy and retrieve metadata between your org and DX project. See Core DX MCP Tools Reference for the included tools.
`testing`	Tools to test Salesforce features, such as Apex classes and Agentforce agents. See Core DX MCP Tools Reference for the included tools.
`code-analysis`	Tools to run a static analysis of your code using Salesforce Code Analyzer. See the Code Analyzer MCP Tools documentation.
`devops`	Tools to manage work items, resolve merge conflicts, and troubleshoot deployment problems within DevOps Center. See the DevOps MCP Tools documentation.

Toolset Name	Description
`lwc-experts`	Tools to help you design, build, test, and optimize LWC code. See the LWC MCP Tools documentation.
`aura-experts`	Tools to help you migrate Aura applications to LWC. See the LWC MCP Tools documentation.
`mobile-core`	Core (minimal) set of tools to help LWC developers create Lightning web components that integrate with device-native features and adhere to Mobile Offline design patterns. See the Mobile MCP Tools documentation.
`mobile`	All the tools to help LWC developers create Lightning web components that integrate with device-native features and adhere to Mobile Offline design patterns. See the Mobile MCP Tools documentation.

Valid Values for the `--tools` Flag

You can use the `--tools` flag to enable specific tools. Use the `--toolsets` and `--tools` flags in combination to enable, for example, all the tools in the `orgs` toolset and just one tool (`run_apex_test`) in the testing toolset. Separate multiple tools with commas.

Tip: If you enable an MCP tool with the `--tools` or `--toolsets` flag, you can then disable it in your MCP client, which takes precedence.

The easiest way to find the name of a specific MCP tool is using your MCP client. For example, in VS Code with GitHub Copilot, click the **Configure Tools** button in the bottom-right of the chat window to see all the available tools, including the Salesforce DX ones.

You can also refer to the documentation for the different types of MCP tools:

- Core Salesforce DX MCP Tools Documentation on page 241
- DevOps Center MCP Tools Documentation
- Code Analyzer MCP Tools Documentation
- Mobile MCP Tools Documentation
- LWC MCP Tools Documentation

Manage the Salesforce DX MCP Server (Beta)

The exact steps to manage the Salesforce DX MCP Server depends on your MCP client.

But most clients allow you to:

- Stop and restart the server. If a new version of the DX MCP Server `npm` package (`@salesforce/mcp`) was released, then it's automatically updated.
- Set the LLM models that the DX MCP Server can use.

Check your MCP client documentation for details.

Use the Core Salesforce DX MCP Tools (Beta)

Use the core Salesforce DX MCP tools to run classic DX tasks, such as work with orgs, retrieve and deploy metadata, run Apex tests, and more.

The core DX tools are grouped into these toolsets:

- `orgs`
- `metadata`
- `data`
- `users`
- `testing`

See the toolset topic for information about the other available toolsets, such as DevOps and LWC, and links to documentation about how to effectively use them.

Prerequisites for Using the Core DX MCP Tools

To work with the core DX MCP tools, you need the standard Salesforce DX environment set up on your computer. In particular:

- Install and configure the Salesforce DX MCP Server in your MCP client.
- Install Salesforce CLI on your computer.
- Install VS Code on your computer.
- Create a Salesforce DX project and open it in VS Code. You can also clone an example repo, such as dreamhouse-lwc, which is a ready-to-use DX project that contains a simple Salesforce application, with metadata and test data.
- Authorize at least one development Salesforce org to use with your DX project, such as a Trailhead playground, sandbox, scratch org, or Developer Edition org, and set it as your default org.

  If you want to create a scratch org using MCP, then you must also authorize a Dev Hub org.

Sample Prompts that Invoke the Core DX MCP Tools

Here are some sample prompts to get you started using the core DX MCP tools. You never call a specific MCP tool directly; as always in this exciting new AI world, you use natural language to tell the LLM what you want to accomplish, and it then figures out what tools to call to complete the task.

You can configure your MCP client to automatically run MCP tools that just provide information, but to ask for your explicit confirmation before it runs a tool that makes a real change in your local DX project or in your org. We think this behavior is a good idea.

Get information about the orgs that the DX MCP Server knows about:

- *List all my orgs and provide all the details you know about them.*
- *Fully describe the org with the alias my-org.*

Tips:

- If the MCP client doesn't list the authorized orgs that you want to use, update the `--orgs` flag in your DX MCP Server configuration and either add the org's alias or username or specify `ALLOW_ALL_ORGS`.
- In general, if the LLM seems to be getting confused, start a new chat session which clears the context. This tip applies to pretty much all LLM usage.

Open your org in a browser:

- *Open my org in a browser.*
- *Open the Resort Manager agent in Agent Builder.*
- *Open the Get Experiences flow in its associated builder.*
- *Open the file I'm currently working on (in my IDE) in my org.*

Tips:

- To open an agent or flow in its associated org builder, you must have the metadata files in your Salesforce DX project. Try retrieving them if they're in your org, but not in your DX project.

Work with scratch orgs and snapshots:

- *Do I have any active scratch orgs? What about inactive scratch orgs?*
- *Create a scratch org, give it the alias my-scratch, and make it my default org.*
- *Create a snapshot from the scratch org you just created.*
- *Create a scratch org from the snapshot you just created.*
- *Delete the scratch org with the alias my-scratch.*

Tips:

- If you successfully create a scratch org using a prompt, but it doesn't show up when you ask to list your orgs, update the `--orgs` flag in your DX MCP Server configuration and either add the new scratch org alias or username or specify `ALLOW_ALL_ORGS`.

Get information about your org:

- *Show me all the accounts in my org.*
- *What are all the fields of the account object?*
- *Show me all the accounts in my org; include the name, billing address, web site, and phone fields.*
- *How many system administrators do I have in my org? What are their usernames?*

Deploy and retrieve metadata:

- *Deploy all local Apex classes to my org.*
- *Deploy everything in my DX project to my org.*
- *Retrieve all agents from my org.*

Run tests:

- *Run all local Apex tests and diagnose any failures.*
- *Run all agent tests.*

Core DX MCP Tools Reference

The core Salesforce DX MCP Server provides these tools for working with orgs, metadata, and so on. We provide this reference information so you understand what kinds of tasks these tools can accomplish; you don't call these tools directly, but rather the LLM does.

The tools marked NON-GA are not yet generally available, specify the `--allow-non-ga-tools` flag in your DX MCP Server configuration to use them. See Configure the Salesforce DX MCP Server for Your Environment.

Table 4: Core DX MCP Tools

Tool name	Toolset	GA?	Description
`get_username`	`core` Always available	GA	Determines the appropriate username or alias for Salesforce operations, handling both default orgs and Dev Hubs.
`resume_tool_operation`	`core` Always available	GA	Resumes a long-running operation that wasn't completed by another tool.
`list_all_orgs`	`orgs`	GA	Lists all configured Salesforce orgs.
`create_org_snapshot`	`orgs`	NON-GA	Creates a scratch org snapshot.
`create_scratch_org`	`orgs`	NON-GA	Creates a scratch org.
`delete_org`	`orgs`	NON-GA	Deletes a locally-authorized Salesforce scratch org or sandbox.
`org_open`	`orgs`	NON-GA	Opens a Salesforce org in a browser.
`run_soql_query`	`data`	GA	Runs a SOQL query against a Salesforce org.
`assign_permission_set`	`users`	GA	Assigns a permission set to the user or on behalf of another user.
`deploy_metadata`	`metadata`	GA	Deploys metadata from your Salesforce DX project to an authorized org.
`retrieve_metadata`	`metadata`	GA	Retrieves metadata from an authorized org to your Salesforce DX project.
`run_agent_test`	`testing`	GA	Executes Agentforce agent tests in your authorized org.
`run_apex_test`	`testing`	GA	Executes Apex tests in your authorized org.

CHAPTER 11 Development

In this chapter ...

- Develop Against Any Org
- Assign a Permission Set
- Create Lightning Apps and Aura Components
- Create Lightning Web Components
- Create an Apex Class
- Create an Apex Trigger
- Create a Custom Object
- Execute Anonymous Apex
- Run Apex Tests

After you import some test data, you've completed the process of setting up your project. Now, you're ready to start the development process.

Create Source Files from the CLI

To add source files from the CLI, make sure that you're working in an appropriate directory. For example, if your package directory is called `force-app`, create Apex classes in `force-app/main/default/classes`. You can organize your source as you want underneath each package directory except for documents, custom objects, and custom object translations.

As of API version 45.0, you can build Lightning components using two programming models: Lightning Web Components and Aura Components. To organize your components' source files, your Aura components must be in the `aura` directory. Your Lightning web components must be in the `lwc` directory.

Execute one of these commands.

- `apex generate class`
- `apex generate trigger`
- `cmdt generate object`
- `cmdt generate field`
- `cmdt generate record`
- `cmdt generate records`
- `cmdt generate fromorg`
- `lightning generate app`
- `lightning generate component`
- `lightning generate event`
- `lightning generate interface`
- `lightning generate test`
- `schema generate sobject`
- `schema generate field`
- `schema generate platformevent`
- `schema generate tab`
- `static-resource generate`
- `visualforce generate component`
- `visualforce generate page`

Many of the commands have these two helpful optional flags:

Flag	Description
`-d`, `--output-dir`	The directory for saving the created files. If you don't indicate a directory, your source is added to the current folder. To add the source to an existing directory, indicate the absolute or relative path. If you don't indicate an absolute or a relative path and the directory doesn't exist, Salesforce CLI attempts to create it for you.
`-t`, `--template`	Template used for the file creation.

Tip: If you want to know more information about a command, run it with the `--help` flag. For example, `sf apex generate class --help`.

Edit Source Files

Use your favorite code editor to edit Apex classes, Visualforce pages and components, Lightning web components, and Aura components in your project. You can also make edits in the Setup UI of your org and then use `project retrieve start` to retrieve those changes to your project. For Lightning pages (FlexiPage files) that are already in your org, use the shortcut to open Lightning App Builder in a scratch org from your default browser. Lightning Pages are stored in the `flexipages` directory.

To edit a FlexiPage in your default browser—for example, to edit the Property_Record_Page source—execute this command from the `flexipages` directory.

```
sf org open --source-file Property_Record_Page.flexipage-meta.xml
```

If you want to generate a URL that loads the `.flexipage-meta.xml` file in Lightning App Builder but doesn't launch your browser, use the `--url-only | -r` flag.

```
sf org open --source-file Property_Record_Page.flexipage-meta.xml
--url-only
```

SEE ALSO:

Salesforce CLI Command Reference

Develop Against Any Org

After developing against scratch or sandbox orgs that have source tracking enabled, you eventually test and validate your changes in a non-source-tracked org.

You can use Salesforce CLI to retrieve and deploy metadata (in metadata format) to non-source-tracked orgs with the same ease as retrieving and deploying source (in source format) to and from scratch orgs. If you're new to Salesforce CLI, Salesforce DX Project Structure and Source File Format explains the difference between source format and metadata format.

Using `project retrieve start`, you can retrieve the metadata you need in source format to your local file system (DX project). When your changes are ready for testing or production, you can use `project deploy start` to deploy your local files directly to a non-source-tracked org.

Not sure what metadata types are supported or which metadata types support wild cards in `package.xml`? See Metadata Types in the *Metadata API Developer Guide*.

Before You Begin

Before you begin, don't forget to:

- Create a Salesforce DX project that includes a manifest (package.xml). Run `project generate --name mywork MyProject --manifest`.
- Authorize your non-source-tracked org. If connecting to a sandbox, edit your `sfdx-project.json` file to set `sfdcLoginUrl` to `https://test.salesforce.com` before you authorize the org. Don't forget to create aliases for your non-source-tracked orgs.

Metadata Names That Require Encoding on the Command Line

When retrieving or deploying metadata using the `--metadata` option, commas in metadata names require encoding to work properly.

Don't: `sf project deploy start --metadata "Profile:Standard User" --metadata "Layout:Page,Console"`

Do: `sf project deploy start --metadata "Profile:Standard User" --metadata "Layout:Page%2CConsole"`

Retrieve Source from a Non-Source-Tracked Org

Use the `project retrieve start` command to retrieve source from orgs that don't have source tracking, such as a sandbox or your production org. If you already have the source code and metadata in a VCS, you might be able to skip this step. If you're starting anew, you retrieve the metadata associated with the feature, project, or customization you're working on.

You can retrieve metadata in source format using one of these methods:

- Specify a `package.xml` that lists the components to retrieve.
- Specify a comma-separated list of metadata component names.
- Specify a comma-separated list of source file paths to retrieve. You can use the source path option when source exists locally, for example, after you've done an initial retrieve.
- Specify a comma-separated list of package names.

If the comma-separated list you're supplying contains spaces, enclose the entire comma-separated list in one set of double quotes.

To Retrieve:	Command Example
All metadata components listed in a manifest	`sf project retrieve start --manifest path/to/package.xml`
Source files in a directory	`sf project retrieve --source-dir path/to/source`
A specific Apex class and the objects whose source is in a directory	`sf project retrieve --source-dir path/to/apex/classes/MyClass.cls --source-dir path/to/source/objects`
Metadata that contains spaces	`sf project retrieve start --metadata "Profile:Standard User"`
All Apex classes	`sf project retrieve --metadata ApexClass`
A specific Apex class	`sf project retrieve --metadata ApexClass:MyApexClass`
A layout name that contains a comma (Layout: Page, Console)	`sf project retrieve --metadata "Layout:Page%2C Console"`
All the metadata related to a specific package or packages	`sf project retrieve --metadata --package-name DreamHouse`

You can specify only one scoping parameter when retrieving metadata: `--metadata`, `--source-dir`, or `--manifest`. If you indicate `--package-name`, you can include one additional scoping parameter.

```
sf project retrieve start --package-name DreamHouse --manifest manifest/package.xml
```

Deploy Source to a Non-Source-Tracked Org

Use the `project deploy start` command to deploy source to orgs that don't have source tracking, such as a sandbox or production org.

You can deploy metadata in source format using these methods:

- Specify a `package.xml` that lists the components to deploy
- Specify a comma-separated list of metadata component names
- Specify a comma-separated list of source file paths to deploy

If the comma-separated list you're supplying contains spaces, enclose the entire comma-separated list in one set of double quotes.

To Deploy:	Command Example
All components listed in a manifest	`sf project deploy start --manifest path/to/package.xml`
Source files in a directory	`sf project deploy start --source-dir path/to/source`
A specific Apex class and the objects whose source is in a directory	`sf project deploy start --source-dir path/to/apex/classes/MyClass.cls --source-dir path/to/source/objects`
All Apex classes	`sf project deploy start --metadata ApexClass`

To Deploy:	Command Example
A specific Apex class	`sf project deploy start --metadata ApexClass:MyApexClass`
All custom objects and Apex classes	`sf project deploy start --metadata CustomObject --metadata ApexClass`
All Apex classes and a profile that has a space in its name	`sf project deploy start --metadata ApexClass --metadata "Profile:Content Experience Profile"`
A recently validated set of components without running Apex tests (often referred to as a quick deploy)	`sf project deploy quick --job-id JOBID` You can run this option after you have run tests, passed code coverage requirements, and performed a check-only deployment using the `project deploy validate` command, which returns the job ID.
Even if the deployment contains warnings	`sf project deploy start --ignore-warnings`
Regardless of whether the deployment contains errors (not recommended if deploying to a production org)	`sf project deploy start --ignore-errors`

Delete Non-Tracked Source

Use the `project delete source` command to delete components from orgs that don't have source tracking, such as sandboxes.

If the source exists locally in a DX project, you can delete metadata by specifying the path to the source or by listing individual metadata components. If the comma-separated list you're supplying contains spaces, enclose the entire comma-separated list in one set of double quotes.

To Delete:	Command Example
Source files in a directory	`sf project delete source --source-dir path/to/source`
A specific component, such as a FlexiPage	`sf project delete source --metadata FlexiPage:Broker_Record_Page`
A specific component that includes a space	`sf project delete source --metadata "Profile:Content Experience Profile"`

Do You Want to Retain the Generated Metadata?

Normally, when you run some CLI commands, a temporary directory with all the metadata is created then deleted upon successful completion of the command. However, retaining these files can be useful for several reasons. You can debug problems that occur during command execution. You can use the generated `package.xml` when running subsequent commands, or as a starting point for creating a manifest that includes all the metadata you care about.

To retain all the metadata in a specified directory path when you run these commands, set the SF_MDAPI_TEMP_DIR environment variable:

- `project deploy start`
- `project retrieve start`

- `project delete source`
- `project convert mdapi|source`
- `org create scratch` (if your scratch org definition contains scratch org settings, not org preferences)

Example:

```
SF_MDAPI_TEMP_DIR=/users/myName/myDXProject/metadata
```

SEE ALSO:

VS Code Command: SFDX: Deploy|Retrieve|Delete Source From Org

Assign a Permission Set

After creating your scratch org and deploying the source, you must sometimes give your users access to your application, especially if your app contains custom objects.

1. If needed, create the permission set in the scratch org.
   a. Open the scratch org in your browser.

      ```
      sf org open --target-org <scratch org username/alias>
      ```

   b. From Setup, enter *Perm* in the Quick Find box, then select **Permission Sets**.
   c. Click **New**.
   d. Enter a descriptive label for the permission set, then click **Save**.
   e. Under Apps, click **Assigned Apps** > **Edit**.
   f. Under Available Apps, select your app, then click **Add** to move it to Enabled Apps.
   g. Click **Save**.
2. Retrieve the permission set from the scratch org to your project.

   ```
   sf project retrieve start --target-org <scratch org username/alias>
   ```

3. Assign the permission set to one or more users of the org that contains the app:

   ```
   sf org assign permset --name <permset_name> --target-org <username/alias>
   ```

   The target username must have permission to assign a permission set. Use the `--on-behalf-of` flag to assign a permission set to non-administrator users.

   ```
   sf org assign permset --name <permset_name> --target-org <admin-user> --on-behalf-of
   <non-admin-user>
   ```

You can also assign permission set licenses to users using the `org assign permsetlicense` command. It works similarly to the `org assign permset` command.

SEE ALSO:

Salesforce Help: Permission Sets

Salesforce Help: Permission Set Licenses

Create Lightning Apps and Aura Components

You can use Salesforce CLI to create Lightning apps and Aura components in your local Salesforce DX project. The generated files live in an `aura` directory in a package directory of your project.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.
2. Create the `aura` directory in the location you want to generate the Lightning app and Aura components. For example, if you want to generate them in the default package directory, create the `force-app/main/default/aura` directory if it doesn't exist.
3. Create a Lightning app or an Aura component; specify the app or component name with the `--name` flag and the `aura` directory with the `--output-dir` flag.

```
sf lightning generate app --name myApp --output-dir force-app/main/default/aura
```

```
sf lightning generate component --type aura --name myAuraComponent --output-dir
force-app/main/default/aura
```

Use the `project deploy start` command to deploy the new Lightning app and Aura component to your org.

```
sf project deploy start --metadata AuraDefinitionBundle:myApp --metadata
AuraDefinitionBundle:myAuraComponent
```

SEE ALSO:

VS Code Command: SFDX: Create Aura App|Component|Event|Interface

Create Lightning Web Components

Create Lightning Web Components

You can use Salesforce CLI to create Lightning web components in your local Salesforce DX project. The generated files live in a `lwc` directory in a package directory of your project.

Note: Want to develop your Lightning web components in a real-time preview of your Lightning app or Experience Cloud site? Try the new Local Dev experience, which lets you iterate faster on your components without deploying code or manually refreshing the preview.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.
2. Create the `lwc` directory in the location you want to generate the Lightning app and Aura components. For example, if you want to generate them in the default package directory, create the `force-app/main/default/aura` directory if it doesn't exist.
3. Create the Lightning web component; specify the component name with the `--name` flag and the `lwc` directory with the `--output-dir` flag.

```
sf lightning generate component --type lwc --name myLightningWebComponent --output-dir
 force-app/main/default/lwc
```

Use the `project deploy start` command to deploy your new Lightning web component to your org.

```
sf project deploy start --metadata LightningComponentBundle:myLightningWebComponent
```

SEE ALSO:

- Create Lightning Apps and Aura Components
- *Lightning Web Components Dev Guide*: Introducing Lightning Web Components
- *VS Code Command*: SFDX: Create Lightning Web Component | Test

Create an Apex Class

You can use Salesforce CLI to create Apex classes in your local Salesforce DX project. The generated class files live in a `classes` directory in a package directory of your project.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.
2. Create the `classes` directory in the location you want to generate the Apex class. For example, if you want to generate it in the default package directory, create the `force-app/main/default/classes` directory if it doesn't exist.
3. Create the Apex class; specify the class name with the `--name` flag and the `classes` directory with the `--output-dir` flag.

   ```
   sf apex generate class --name myClass --output-dir force-app/main/default/classes
   ```

The command generates two files:

- `myClass.cls-meta.xml`—metadata file
- `myClass.cls`—Apex source file

By default, the command creates an empty Apex class. However, you can select different templates, depending on what you're creating, by specifying the `--template` flag.

Template	Description	More Information in Apex Developer Guide
DefaultApexClass (default)	Standard Apex class.	Classes
ApexException	Use Apex built-in exceptions or create custom exceptions. All exceptions have common methods.	Exception Class and Built-in Exceptions
ApexUnitTest	Use the `@isTest` annotation to define classes and methods that only contain code used for testing your application.	isTest Annotation
InboundEmailService	Use email services to process the contents, headers, and attachments of inbound email.	Apex Email Service

This example selects the `ApexException` template.

```
sf apex generate class --name myException --template ApexException --output-dir
force-app/main/default/classes
```

Use the `project deploy start` command to deploy the new Apex class to your org.

```
sf project deploy start --metadata ApexClass:myClass
```

SEE ALSO:

Apex Developer Guide

VS Code Command: SFDX: Create Apex Class

Create an Apex Trigger

Use Apex triggers to perform custom actions before or after a change to a Salesforce record, such as an insertion, update, or deletion. You can use Salesforce CLI to create Apex triggers in your local Salesforce DX project. The generated files live in a `triggers` directory in a package directory of your project.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.
2. Create the `triggers` directory in the location you want to generate the Apex trigger. For example, if you want to generate it in the default package directory, create the `force-app/main/default/triggers` directory if it doesn't exist.
3. Generate the Apex trigger; specify the trigger name with the `--name` flag and the `triggers` directory with the `--output-dir` flag.

   ```
   sf apex generate trigger --name myTrigger --output-dir force-app/main/default/triggers
   ```

   By default, the generated trigger is for `before insert` events on the generic sObject. Use the `--event` and `--sobject` flags to change these default values. This example generates a trigger that fires before and after an insert into the Account object.

   ```
   sf apex generate trigger --name myTrigger --event 'before insert,after insert' --sobject
    Account --output-dir force-app/main/default/triggers
   ```

The command generates two files.

- `myTrigger.trigger-meta.xml`—metadata file
- `myTrigger.trigger`—Apex trigger source file

Use the `project deploy start` command to deploy the new Apex trigger to your org.

```
sf project deploy start --metadata ApexTrigger:myTrigger --target-org myscratch
```

SEE ALSO:

Apex Developer Guide: Triggers

Trailhead: Apex Triggers

VS Code Command: SFDX: Create Apex Trigger

Create a Custom Object

You can use Salesforce CLI to generate the metadata files for new custom objects in your local Salesforce DX project.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.

2. Run the interactive `schema generate sobject` command. You must specify a label for your new custom object with the `--label` flag. The command uses this label to provide intelligent suggestions for other object properties, such as its API name and plural label.

   ```
   sf schema generate sobject --label "New Object"
   ```

   Answer all the questions about your new object, such as the location of the generated files in your Salesforce DX project and whether to enable various object properties.

After you create your custom object:

- Create a custom field on your new object with the interactive `schema generate field` command, which generates the necessary metadata files in your project. You can also use the command to create a custom field on a standard object, such as Account.
- Create a custom tab for your new object with the `schema generate tab` command.

Then deploy your new custom object to your org.

```
sf project deploy start --metadata CustomObject:NewObject__c --target-org myscratch
```

The first time you deploy your new custom object to a source-tracking org, the org creates additional properties and sets new defaults on it. For this reason, we recommend that you immediately retrieve the custom object so your local source files are updated with this new information.

SEE ALSO:

Salesforce Help: Fields Required for Creating Custom Objects

Salesforce Help: Custom Field Types

Salesforce Help: Custom Field Attributes

Execute Anonymous Apex

You can execute an anonymous block of Apex code in an org with the `apex run` Salesforce CLI command.

1. Open a terminal (macOS and Linux) or command prompt Windows and change to your Salesforce DX project directory.
2. Run the `apex run` command with no flags to open an interactive shell. At the prompt, enter all your Apex code; press CTRL-D when you're finished. Your code is then executed in a single execute anonymous request in the specified org, or the default org if you don't specify one.

   ```
   sf apex run --target-org myscratch
   ```

   This output shows an example of executing the Apex code `system.debug ('Hello world!');`

   ```
   Start typing Apex code. Press the Enter key after each line, then press CTRL+D when
   finished.
   system.debug ('Hello world!');
   Compiled successfully.
   Executed successfully.

   58.0 APEX_CODE,DEBUG;APEX_PROFILING,INFO
   Execute Anonymous: system.debug ('Hello world!');
   14:23:06.174
   (174742273)|USER_INFO|[EXTERNAL]|0058H000005QWcE|test-ux9lpg9jyyqt@example.com|(GMT-07:00)
    Pacific Daylight Time (America/Los_Angeles)|GMT-07:00
   ```

```
14:23:06.174 (174785450)|EXECUTION_STARTED
14:23:06.174 (174792639)|CODE_UNIT_STARTED|[EXTERNAL]|execute_anonymous_apex
14:23:06.174 (175417814)|USER_DEBUG|[1]|DEBUG|Hello world!
14:23:06.175 (175529797)|CUMULATIVE_LIMIT_USAGE
14:23:06.175 (175529797)|LIMIT_USAGE_FOR_NS|(default)|
  Number of SOQL queries: 0 out of 100
  Number of query rows: 0 out of 50000
  Number of SOSL queries: 0 out of 20
  Number of DML statements: 0 out of 150
  Number of Publish Immediate DML: 0 out of 150
  Number of DML rows: 0 out of 10000
  Maximum CPU time: 0 out of 10000
  Maximum heap size: 0 out of 6000000
  Number of callouts: 0 out of 100
  Number of Email Invocations: 0 out of 10
  Number of future calls: 0 out of 50
  Number of queueable jobs added to the queue: 0 out of 50
  Number of Mobile Apex push calls: 0 out of 10

14:23:06.175 (175529797)|CUMULATIVE_LIMIT_USAGE_END

14:23:06.174 (175598235)|CODE_UNIT_FINISHED|execute_anonymous_apex
14:23:06.174 (175617689)|EXECUTION_FINISHED
```

Use the `--file` flag to execute Apex code in a file rather than interactively.

```
sf apex run --file ~/test.apex
```

SEE ALSO:

Apex Developer Guide: Anonymous Blocks

VS Code Command: SFDX: Execute Anonymous Apex with Currently Selected Text | Editor Contents

Run Apex Tests

When you're ready to test changes to your source code, you can run Apex tests in an org using Salesforce CLI on the command line. You can also run Apex tests from Salesforce Extensions for VS Code or from within third-party continuous integration tools, such as Jenkins or CircleCI.

Minimum User Permissions and Settings Required

The user running Apex tests must have these user permissions in the org:

- View Setup and Configuration
- API Enabled

Also ensure that the Enable Streaming API setting is enabled in the org's user interface. The setting is enabled by default.

See User Permissions and Configure User Interface Settings for details.

Run All Apex Tests and View Results

This command runs all Apex tests in the specified org asynchronously, which is the default behavior.

```
sf apex run test --target-org myscratch
```

The command outputs the `apex get test` command with a job ID that you can then run to view the full results. For example:

```
sf apex get test --test-run-id 7078HzRMVV --target-org myscratch
```

For more examples, see the help for the commands by running `sf apex run test --help` and `sf apex get test --help` CLI commands, or read the Salesforce CLI Reference, which contains the same information as the help output.

Determine Code Coverage in Orgs With Large Volumes of Apex Code

Before deploying Apex classes and triggers to your production org, or including them in an AppExchange managed package, you must write unit tests that cover 75% of the total Apex code in your org. You can retrieve information about your current code coverage percentage using one of these tools:

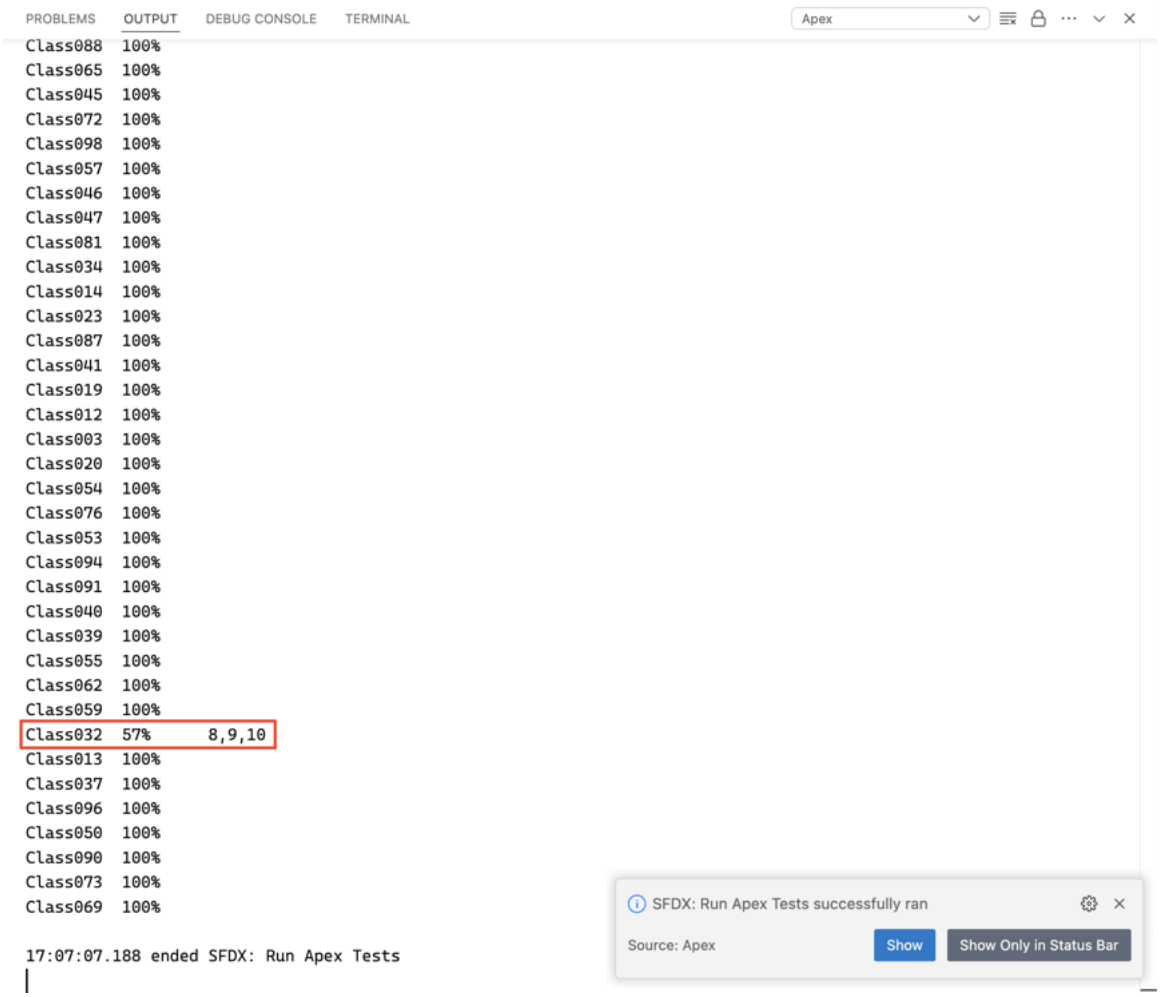
- Salesforce CLI: Specify the --code-coverage flag of the apex run test command. Or
- VS Code: Check the `retrieve-test-code-coverage` setting.

Both methods produce a report with detailed information about the code coverage of all Apex classes in your org.

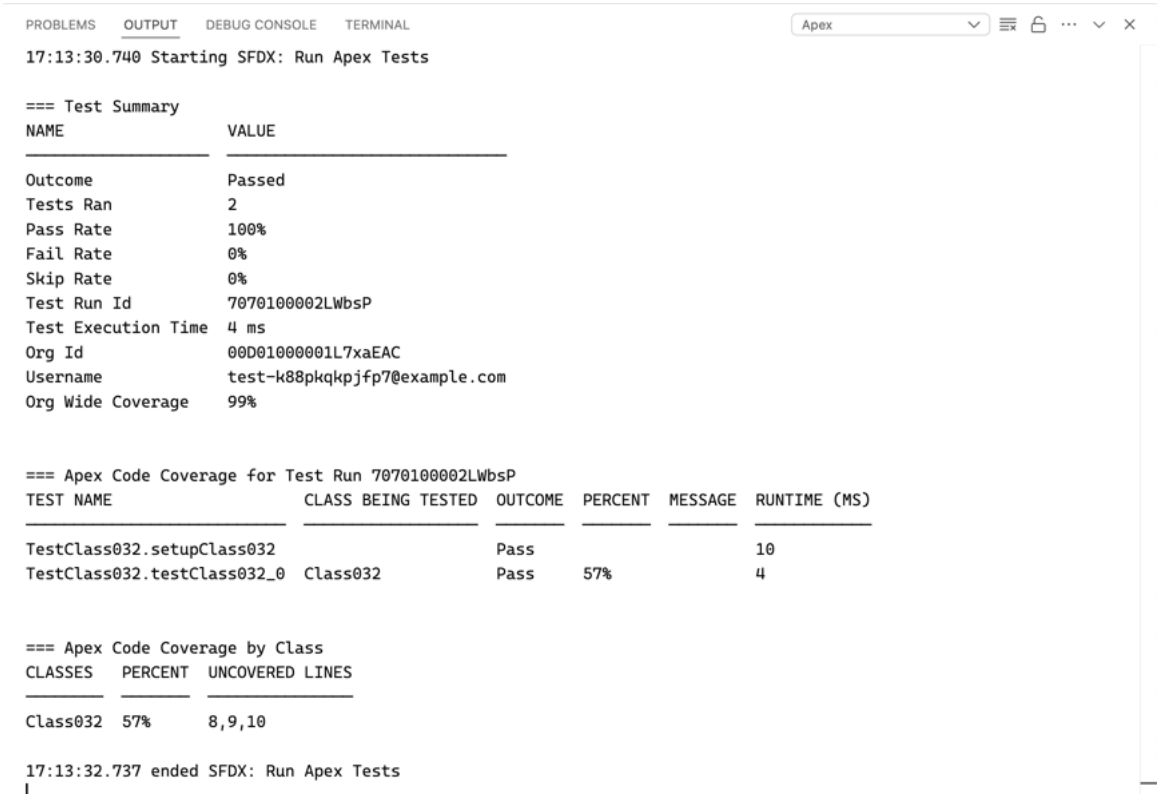
To improve the performance for large test runs, check the **Store Only Aggregate Code Coverage** setting in your org from **Setup** > **Apex Test Execution** > **Options...**. This setting improves the performance of gathering code coverage information for large orgs with many Apex classes by turning off per-class code coverage. When the setting is checked, the Apex Code Coverage by Class table in the Apex test results contains all Apex classes and triggers listed in `ApexCodeCoverageAggregate`, including classes that aren't covered by the tests in the current Apex test run. You can drill down and check which classes aren't covered, and then adjust your unit tests to reach the required code coverage.

To minimize scrolling while viewing your code coverage information when you run only a handful of Apex tests, we recommend unchecking the **Store Only Aggregate Code Coverage** setting. The Apex Code Coverage by Class table then shows only the Apex classes and triggers covered by the current Apex test run. The calculation of per-class code coverage filters the entries in this table to include only classes that were directly touched by the test methods in the run.

Here's an example of how you can use the **Store Only Aggregate Code Coverage** setting to investigate and resolve code coverage issues. A nightly build with the setting checked shows that the `Class032` has only 57% code coverage.



Uncheck the setting and run the test on `Class032` to get code coverage information for just that class. Use this information to write more unit tests for the class with low coverage. As you keep checking the new code coverage percentage of `Class032`, you no longer have to scroll through the long results of all your Apex tests.



Debug Apex

If you use Salesforce Extensions for Visual Studio Code (VS Code) for your development tasks, you have a choice of Apex Debugger extensions. Whichever debugger you chose, you set breakpoints in your Apex classes and step through their execution to inspect your code in real time to find bugs. You can run Apex tests in VS Code or on the command line.

Generate and View Apex Debug Logs

Apex debug logs can record database operations, system processes, and errors that occur when executing a transaction or running unit tests in any authenticated org. Enable the Debug Log in Salesforce Extensions for VS Code, then view the logs with VS Code or Salesforce CLI.

SEE ALSO:

Apex Developer Guide : Debugging, Testing, and Deploying Apex

Salesforce CLI Command Reference : Apex Commands

Test Anything Protocol (TAP)

VS Code Command: SFDX: Run Apex Tests | Test Suite

Debug Apex

If you use Salesforce Extensions for Visual Studio Code (VS Code) for your development tasks, you have a choice of Apex Debugger extensions. Whichever debugger you chose, you set breakpoints in your Apex classes and step through their execution to inspect your code in real time to find bugs. You can run Apex tests in VS Code or on the command line.

Apex Replay Debugger

Apex Replay Debugger is available for use without any additional licenses. To configure and use it, see Apex Replay Debugger.

Apex Interactive Debugger

You must have at least one available Apex Debugger session in your Dev Hub org. To purchase more sessions for an org, contact your System Admin to open a case.

- Performance Edition and Unlimited Edition orgs include one Apex Debugger session.
- Apex Debuggers sessions aren't available in Trial and Developer Edition orgs.
- You can purchase Apex Debugger sessions for Enterprise Edition orgs.

Enable the Apex Debugger in your scratch orgs by adding the `DebugApex` feature to your scratch org definition file:

```
"features": "DebugApex"
```

To configure and use it, see Apex Interactive Debugger.

ISV Customer Debugger (Salesforce Extensions for VS Code Only)

ISV Customer Debugger is part of the Apex Interactive Debugger (`salesforcedx-vscode-apex-debugger`) extension, so you don't have to install anything other than the Salesforce Extension Pack and its prerequisites. You can debug only sandbox orgs.

See ISV Customer Debugger in Salesforce Extensions for VS Code for details.

SEE ALSO:

Visual Studio Marketplace: Apex Replay Debugger extension

Visual Studio Marketplace: Apex Interactive Debugger extension

Generate and View Apex Debug Logs

Apex debug logs can record database operations, system processes, and errors that occur when executing a transaction or running unit tests in any authenticated org. Enable the Debug Log in Salesforce Extensions for VS Code, then view the logs with VS Code or Salesforce CLI.

1. In Salesforce Extensions for VS Code, prepare the org to generate logs and configure the debugger.
   a. Log in to the org.
   b. For Replay Debugger, run **SFDX: Turn on Apex Debug Log for Replay Debugger**.
   c. Create a launch configuration file for Replay Debugger or Interactive Debugger.
2. After you run the tests, get a list of the debug logs.

```
sf apex list log --target-org myscratch

APPLICATION DURATION (MS) ID       LOCATION  SIZE (B) LOG USER  OPERATION       REQUEST
 START TIME   STATUS
___________ ______________ _______  _________ ________ _________ _______________ _______
 ___________  _______
Unknown     1143          07L9Axx  SystemLog 23900    User User ApexTestHandler Api
  2017-09-05x  Success
```

3. View a debug log by passing its ID to the `apex get log` command.

```
sf apex get log --log-id 07L9A000000aBYGUA2

38.0
APEX_CODE,FINEST;APEX_PROFILING,INFO;CALLOUT,INFO;DB,INFO;SYSTEM,DEBUG;VALIDATION,INFO;VISUALFORCE,INFO;WAVE,INFO;WORKFLOW,INFO
15:58:57.3
(3717091)|USER_INFO|[EXTERNAL]|0059A000000TwPM|test-ktjauhgzinnp@example.com|Pacific
Standard Time|GMT-07:00
15:58:57.3 (3888677)|EXECUTION_STARTED
15:58:57.3
(3924515)|CODE_UNIT_STARTED|[EXTERNAL]|01p9A000000FmMN|RejectDuplicateFavoriteTest.acceptNonDuplicate()
15:58:57.3 (5372873)|HEAP_ALLOCATE|[72]|Bytes:3
...
```

SEE ALSO:

Apex Developer Guide: Debug Log

CHAPTER 12 Build and Release Your App

In this chapter ...

- Build and Release Your App with Metadata API

When you finish writing your code, the next step is to deploy it. We offer different deployment options based on your role and needs as a customer, system integrator, or independent software vendor (ISV) partner.

To learn about the benefits of the different development models, review these Trailhead modules:

- Org Development Model
- Package Development Model
- Quick Start: Unlocked Packages
- Unlocked Packages for Customers

You have several tooling options, based on how you decide to build and release yours apps.

Customers and Non-ISV Partners

- Agentforce Vibes IDE – A web-based integrated development environment that has all the power and flexibility of Visual Studio Code, Salesforce Extensions for VS Code, and Salesforce CLI in your web browser.
- Salesforce Extensions for VS Code – A set of extensions that come with rich tools for developing on the Salesforce platform.
- Salesforce CLI – A command-line interface that simplifies development and build automation when working with your Salesforce org
- Metadata API – An API for deploying, retrieving, creating, updatinge, or deleting customizations.
- DevOps Center – Change and release management for declarative and pro-code developers.
- Unlocked Packages – For customers who want to organize metadata into a package and deploy the metadata (via packages) to different orgs.

ISV Partners

- Second-Generation Managed Packages

  If you're an ISV that develops apps and lists them on AppExchange, Salesforce recommends managed packages.

  Second-generation managed packaging (managed 2GP) ushers in a new way for AppExchange partners to develop, distribute, and manage their apps and metadata. You can use managed 2GP to organize your source, build small modular packages, integrate with your version control system, and better utilize your custom Apex code. You can execute all packaging operations via Salesforce CLI, or automate them using scripts.

For more information on managed 2GP packages, see the Second-Generation Managed Packaging Developer Guide.

- First-Generation Managed Packages

  Similar to managed 2GP, managed 1GP packages are used by ISVs to distribute their business apps to customers via AppExchange.

  If you're familiar with first-generation managed packages and want to learn more about how 1GP differs from 2GP, see Comparison of First- and Second-Generation Managed Packages.

  For more information on managed 1GP packages, see Create a First-Generation Managed Package using Salesforce DX.

Build and Release Your App with Metadata API

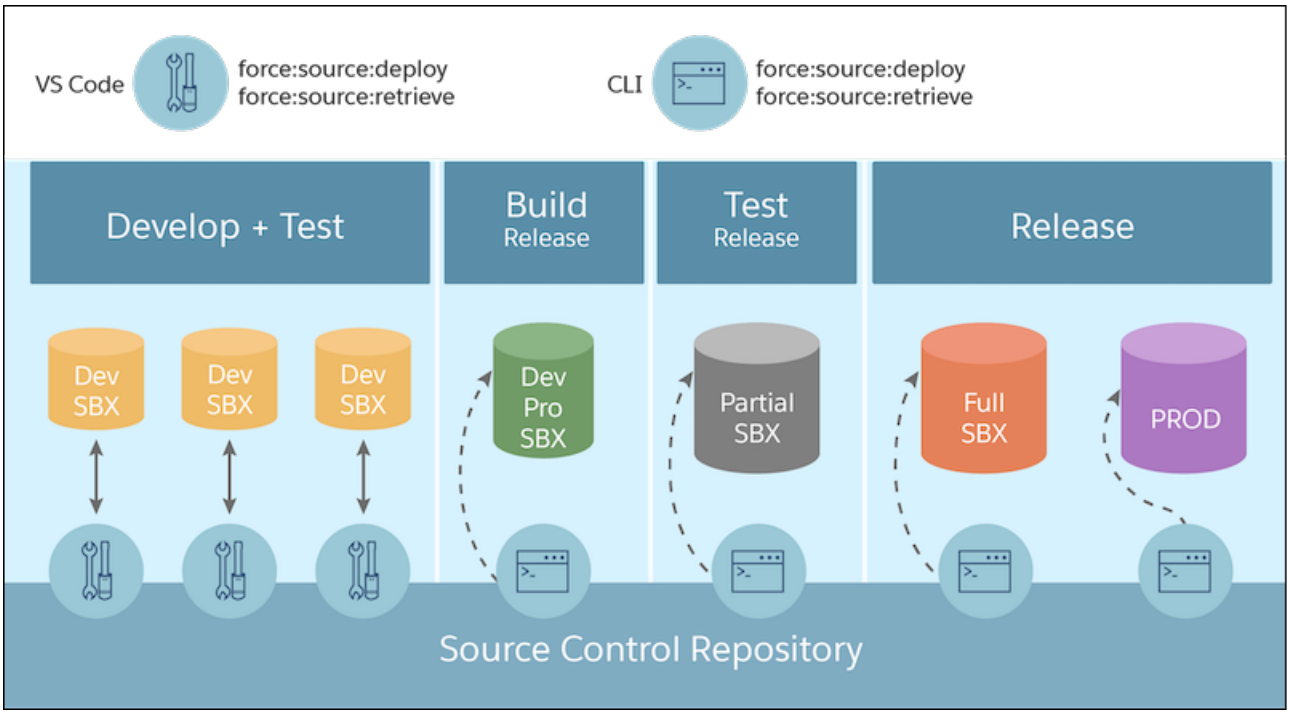
Develop and test your app in your sandboxes. Use Salesforce CLI or Salesforce Extensions for VS Code to retrieve and deploy your source. This development work flow is called the org development model.

Develop and Test in a Sandbox Using the Org Development Model

Similar to change sets, the release artifact is a set of changed metadata to update in the production org. You can develop, test, and deploy your changes using the `project deploy` commands. If you want to know more about this development model, see the Org Development Model module in Trailhead.

Development and Release Environments

1. **Develop and test:** Each team member has their own Developer sandbox to create their assigned customization. Developer sandboxes contain no production data.
2. **Build release:** Team members each migrate their customizations from their respective developer sandboxes to a shared Developer Pro sandbox for integration. Developer Pro sandboxes don't contain production data, but you can seed them with testing data.
3. **Test release:** For user-acceptance testing, the team uses a Partial sandbox to create a complete replica of production.
4. **Release:** After the release is in production, the team can use the Full sandbox to train users without the risk of altering production data. A Full sandbox includes a copy of production data.



What Tools Do I Need?

Tool	Description
Salesforce DX project	The Salesforce DX project contains the metadata and source files that comprise your changes. A DX project has a specific project structure and source format. In addition to source files, the project contains a configuration file, `sfdx-project.json`. This file contains project information and enables you to leverage Salesforce DX tools for many of your development tasks.
Deployment artifact	After testing the changes, you create the deployment artifact, a `.zip` file that contains changed files to deploy. Deploy the release artifact to the full (staging) sandbox first, and then finally to production. You can think of the deployment artifact as the inbound change set. The changes don't take effect until they are deployed.
Source control system	All changes are merged and stored in a source control system, which contains the Salesforce DX project.
Salesforce CLI	You can use Salesforce CLI for every phase of the org development life cycle. It improves productivity by providing a single interface for all your development, testing, and automation use cases.
Salesforce Extensions for VS Code	Salesforce Extensions for VS Code is built on top of Salesforce CLI and Visual Studio Code. Together, they are an integrated development environment for custom development on Lightning Platform. You can run Salesforce CLI commands directly from the command palette or terminal.
Change management mechanisms	It's still important to capture your changes externally using formal change-tracking tools, such as a change list, a deployment run list, and other project management tools.

Considerations for Deploying Apex Code

To deploy Apex to production, unit tests of your Apex code must meet coverage requirements. Code coverage indicates how many executable lines of code in your classes and triggers are covered by your test methods. Write test methods to test your triggers and classes, and then run those tests to generate code coverage information.

If you don't specify a test level when initiating a deployment, the default test execution behavior depends on the contents of your deployment package.

- If your deployment package contains Apex classes or triggers, when you deploy to production, all tests are executed, except tests that originate from a managed package.
- If your package doesn't contain Apex code, no tests are run by default.

You can run tests for a deployment of non-Apex components. You can override the default test execution behavior by setting the test level in your deployment options. Test levels are enforced regardless of the types of components present in your deployment package.

We recommend that you run all local tests in your development environment, such as a sandbox, before deploying to production. Running tests in your development environment reduces the number of tests required in a production deployment.

Develop and Test Changes Locally
Develop changes in source format, deploying to and retrieving from your Developer sandbox.

Build and Test the Release Artifact
After your team has finished its development tasks, transition to the build release phase to integrate your changes in a Developer Pro sandbox. Then build the release artifact.

Test the Release Artifact in a Staging Environment
Stage the changes and run regression tests in a Full sandbox.

Release Your App to Production
Now that all your tests have passed in the Full sandbox, you're ready to deploy to production.

Cancel a Metadata Deployment
You can cancel a metadata deployment from Salesforce CLI and specify a wait time for the command to complete.

Develop and Test Changes Locally

Develop changes in source format, deploying to and retrieving from your Developer sandbox.

These steps provide the high-level work flow.

1. Create a DX project.

   A DX project has a specific structure and configuration files that Salesforce DX tooling requires. See Create a Salesforce DX Project.

2. Create a source control repository or use an existing one.

   If you're using an existing repo, be sure it has the required DX configuration files. See Salesforce DX Project Structure and Source Format.

3. Authorize the Developer sandbox.

   See Authorize an Org Using a Browser.

4. Perform development tasks in your developer sandbox.
5. Retrieve the changes from the developer sandbox.

   If your sandbox is source tracked, changes are automatically identified. To retrieve just the changed metadata:

   ```
   sf project retrieve start
   ```

   If your sandbox isn't source tracked, or want to retrieve metadata that hasn't changed, or you want to retrieve many changes, you can use a manifest (`package.xml`).

   ```
   sf project retrieve start --manifest path/to/package.xml
   ```

   Run `sf project retrieve start --help` for all command options with examples.

6. Commit the changes to the source control repository.

Next: Deploy all changes the team has made to the first testing environment to test those changes. See Salesforce CLI Reference: deploy Commands.

Build and Test the Release Artifact

After your team has finished its development tasks, transition to the build release phase to integrate your changes in a Developer Pro sandbox. Then build the release artifact.

Here are the high-level steps in the work flow to create the release artifact.

1. Pull the changes from the repo so your local project contains all the changes your team has made.
2. Authorize the Developer Pro sandbox.
3. Run the deploy command that mimics what you'll deploy to production, for example:

```
sf project source deploy --manifest manifest/package.xml --target-org dev-pro-sandbox
\
--test-level RunSpecifiedTests --tests TestMyCode
```

4. Open the sandbox.
5. Perform testing.
6. If the testing passes, continue to the test release phase where you deploy the release artifact to the partial sandbox. Then perform user-acceptance testing.

After the testing passes, move to the release phase and perform regression tests in the Full sandbox.

Test the Release Artifact in a Staging Environment

Stage the changes and run regression tests in a Full sandbox.

After you have made all your changes based on the integration testing, the next step is to stage the changes in a Full sandbox. The process of deploying changes to the Full sandbox is similar to the process you used to deploy changes to your Developer Pro sandbox. This phase includes regression testing and mimics how you release the changes to production.

These steps provide the high-level work flow.

1. Authorize the Full sandbox.
2. (Optional) If you made any changes based on your testing in the Developer Pro sandbox, create a release artifact (`.zip`). If not, use the existing release artifact.
3. To validate the deployment without saving the components in the target org, run all local (regression) tests. A validation enables you to verify the results of tests that would be executed during a deployment, but doesn't commit any changes.

```
sf project deploy validate --manifest manifest/package.xml --target-org full-sandbox
--test-level RunLocalTests
```

4. Test the actual production deployment steps in the staging sandbox. Set up the same quick deploy that you plan to execute against the production org.

```
sf project deploy validate --manifest manifest/package.xml --target-org full-sandbox
--test-level RunSpecifiedTests
```

   This command returns a job ID that you reference in the quick deploy.

5. Next, test the quick deploy using the job ID returned in the previous step.

```
sf project deploy quick --target-org full-sandbox --job-id jobID
```

After you validate a deployment, you have 10 days to perform the quick deployment to production.

Release Your App to Production

Now that all your tests have passed in the Full sandbox, you're ready to deploy to production.

1. In your deployment run list, complete any pre-deployment tasks.
2. Authorize your production org.
3. Set up the quick deploy by validating the deployment.

   ```
   sf project deploy validate --source-dir force-app --target-org prod-org --test-level
   RunLocalTests
   ```

   This command returns a job ID that you reference in the quick deploy.
4. After the tests are run, verify that all the Apex tests have passed. Be sure that the tests cover at least 75% of the code being deployed.
5. Run the quick deploy:

   ```
   sf project deploy quick --target-org prod-org --job-id jobID
   ```
6. Open the production org, then perform any post-deployment tasks listed in the deployment run list.

Cancel a Metadata Deployment

You can cancel a metadata deployment from Salesforce CLI and specify a wait time for the command to complete.

To cancel your most recent deployment, run `project deploy cancel --use-most-recent`. You can cancel earlier deployments by using the `--job-id <JOBID>` flag to specify the deployment that you want to cancel.

```
sf project deploy cancel --job-id <jobid>
```

The default wait time for the cancel command to complete and display its results in the terminal window is 33 minutes. If the command isn't completed by the end of the wait period, the CLI returns control of the terminal window to you. You can adjust the wait time as needed by specifying the number of minutes in the `--wait` flag, as shown in the following example:

```
sf project deploy cancel --wait 20 --use-most-recent
```

Curious about the status of a canceled deployment? Run a deployment report.

```
sf project deploy report --use-most-recent
```

CHAPTER 13 Unlocked Packages

In this chapter ...

- What's an Unlocked Package?
- Package-Based Development Model
- Before You Create Unlocked Packages
- Know Your Orgs
- Create Org-Dependent Unlocked Packages
- Workflow for Unlocked Packages
- Configure Unlocked Packages
- How We Handle Profile Settings in Unlocked Packages
- Develop Unlocked Packages
- Push a Package Upgrade for Unlocked Packages
- Install an Unlocked Package
- Migrate Deprecated Metadata from Unlocked Packages
- Uninstall an Unlocked Package
- Transfer an Unlocked Package to a Different Dev Hub

Salesforce offers different types of packages, and unlocked packages are especially suited for internal business apps. Unless you plan to distribute an app on AppExchange, an unlocked package is the right package type for most use cases. You can use unlocked packages to organize your existing metadata, package an app, extend an app that you've purchased from AppExchange, or package new metadata.

Unlocked packages follow a source-driven development model. The source of truth of the metadata contained in the package is your version control system, not what's in an org. This model brings with it all the benefits of modern source-driven development models.

Note: If you're an AppExchange partner that plans to distribute your app to customers via AppExchange, use second-generation managed packaging. See Second-Generation Managed Packages for more information.

What's an Unlocked Package?

If you're new to packaging, think of a package as a container that you fill with metadata. It contains a set of related features, customizations, and schema. Unlocked packages help you add, edit, and remove metadata in your org in a trackable way. You can apply your metadata to multiple orgs, and upgrade your Salesforce apps easier and faster. Unlocked packages are especially suited for internal business apps.

Unlocked packages differ from managed packages, which have manageability rules that determine the behavior of each metadata component in the package. With an unlocked package, you have a lot of flexibility. Your admins can make changes directly in production in response to emergency change requests because metadata in unlocked packages can be modified in a production org.

At the same time, this flexibility comes with responsibility. Ensure that you have the proper governance in place to prevent cases where package updates overwrite changes that admins make directly in production. You can avoid this issue by ensuring that your admins communicate with your development team whenever they edit any packaged metadata directly in the production org.

Each unlocked package has a distinct lifecycle. When you add metadata to an existing unlocked package, you create a new package version. While the package is continually evolving, each package version is an immutable artifact that never changes.

A package version contains the specific metadata and features associated with the package version at the time it was created. As you iterate on your package, and add, remove, or change the packaged metadata, you create many package versions.

You can install a package version in a scratch, sandbox, trial, Developer Edition, or production org. Installing a package version is similar to deploying metadata. Each package version has a version number, and subscribers can install a new package version into their org through a package upgrade.

Note: Because package versions are immutable, they can also be used as artifacts for Continuous Integration (CI) and Continuous Delivery (CD) processes.

You can repeat the package development cycle any number of times. You can change metadata, create a package version, test the package version, and finally install the package to a production org. This distinct app development lifecycle lets you control exactly what, when and how your metadata is rolled out. In the installed org, you can inspect which metadata came from which package and the set of all metadata associated with a specific package.

Package-Based Development Model

To demonstrate the power of unlocked packages, here's how packaging works in the traditional development model. For most production orgs, metadata traditionally is contained in two buckets: a set of managed packages installed from AppExchange, and unpackaged metadata.

Customers often invest in Salesforce customizations to support business processes and extend the power of the Salesforce platform. In the development model, your Salesforce org's monolith of unpackaged metadata contains all the metadata that belongs to a custom app or extension. Because that metadata isn't isolated or organized, it can be difficult to understand, upgrade, and maintain.

In the package development model, you can organize your unpackaged metadata in your production org into well-defined packages. And you can use Salesforce DX projects to organize your source into package directories with everything managed in a version control system of your choice. Your end goal is to create packages using those directories that are versionable, easy to maintain, update, install, and upgrade.

Unlocked packages allow you to declare multi-level dependencies on one or many managed and unlocked packages, which keeps your packages small and modular. You can use the command line to execute unlocked packaging operations, or you can include packaging-specific Salesforce CLI commands in a script and automate your package development.

Before You Create Unlocked Packages

When you use unlocked packaging, to be sure that you set it up correctly, verify the following.

Did you?

- Enable Dev Hub in Your Org
- Enable Second-Generation Managed Packaging
- Install Salesforce CLI

Note: Unlocked packaging is available with these licenses: Salesforce or Salesforce Limited Access - Free (partners only).

Developers who work with unlocked packages need the correct permission set in the Dev Hub org. Developers need either the System Administrator profile or the Create and Update Second-Generation Packages permission. For more information, see Add Salesforce DX Users.

The maximum number of unlocked package versions that you can create from a Dev Hub per day is the same as your daily scratch org allocation. To request a limit increase, contact Salesforce Customer Support.

Scratch orgs and packages count separately, so creating an unlocked package doesn't count against your daily scratch org limit. To view your scratch org limits, use the CLI:

```
sf limits api display
```

For more information on scratch org limits, see Scratch Orgs.

Know Your Orgs

Some of the orgs that you use with unlocked packaging have a unique purpose.

Choose Your Dev Hub Org

Use the Dev Hub org for these purposes.

When you create an unlocked package using Salesforce CLI, you associate the package with a specific Dev Hub org. When you're ready to define and create a package for production use, be sure to create the package using the Dev Hub in one of your production orgs.

The Dev Hub org is the owner of all unlocked packages you create, and is used:

- To link your namespaces if you want to create namespaced unlocked packages
- To authorize and run your `sf package` commands

If an unlocked package is associated with a non-production Dev Hub org, and that org expires or becomes inactive, the installed package can't be updated, and new attempts to install the package may fail.

Namespace Org

If you are using a namespace, you must create an org for the sole purpose of specifying the namespace for your package. We refer to this org as your namespace org.. If you want to use the namespace strictly for testing, choose a disposable namespace.

After you create a namespace org and use it to specify your namespace, open your Dev Hub org and link the namespace org to your Dev Hub org.

Other Orgs

When you work with packages, you also use these orgs:

- You can create scratch orgs on the fly to use while testing your packages.
- The target or installation org is where you install the package.

Create Org-Dependent Unlocked Packages

Org-dependent unlocked packages are a variation of unlocked packages that allow you to create packages that depend on unpackaged metadata in the org where you plan to install the package (installation org).

Untangling your production org metadata can be a daunting project. But now you have a solution that enables you to package metadata without completely accounting for all metadata dependencies: org-dependent unlocked packages. When you use org-dependent unlocked packages, metadata validation occurs during package installation, instead of during package version creation.

USER PERMISSIONS

To create packages:
- Create and Update Second-Generation Packages

Longstanding and large production orgs often accumulate large amounts of metadata that are difficult to modularize when adopting a package-based Application Lifecycle Management (ALM) approach. Instead, you can package metadata that depends on unpackaged metadata in the installation org.

Note: Org-dependent unlocked packages are a variation of unlocked packages, and not a separate package type. They follow the same package development steps, and use the same supported metadata types as unlocked packages.

To create an org-dependent unlocked package, specify the `orgdependent` CLI parameter on the `sf package create` CLI command.

```
sf package create -t Unlocked -r force-app -n MyPackage --org-dependent
```

Scenario	Unlocked Packages	Org Dependent Unlocked Packages
Build once, install anywhere	Yes	No. These packages are designed for specific production and sandbox orgs. You can install them only in orgs that contain the metadata that the package depends on.
Dependency validation	Occurs during package version creation	Occurs during package installation
Can depend on other packages	Yes	No
Requires dependencies to be resolved to create the package	Yes	No
Supported metadata types	See the unlocked packaging channel of the Metadata Coverage Report.	See the unlocked packaging channel of the Metadata Coverage Report.
Recommended development and testing environment	Use scratch orgs to develop and test your unlocked packages.	Use a sandbox that contains the dependent metadata. Consider enabling Source Tracking in Sandboxes to develop your org-dependent unlocked package. Then, test the package in a sandbox org before installing it in your production org.

Scenario	Unlocked Packages	Org Dependent Unlocked Packages
Code coverage requirement	Before you can promote and release an unlocked package, the Apex code must meet a minimum 75% code coverage requirement.	We don't calculate code coverage, but we recommend that you ensure the Apex code in your package is well tested.

To review which of your packages are org-dependent unlocked packages, use `sf package list --verbose`.

Workflow for Unlocked Packages

You can create and install an unlocked package directly from the Salesforce command line.

Review and complete the steps in Before You Create Unlocked Packages before starting this workflow.

The basic workflow includes these steps. See specific topics for details about each step.

1. Create a DX project.

   ```
   sf project generate --output-dir expense-manager-workspace --name expenser-app
   ```

2. Authorize the Dev Hub org, and create a scratch org.

   ```
   sf org login web --set-default-dev-hub --alias MyDevHub
   ```

   When you perform this step, include the `--set-default-dev-hub` option. You can then omit the Dev Hub username when running subsequent Salesforce CLI commands.

   Tip: If you define an alias for each org you work with, it's easy to switch between different orgs from the command line. You can authorize different orgs as you iterate through the package development cycle.

3. Create a scratch org and develop the package. You can use VS Code and the Setup UI in the scratch org to build and retrieve the pieces you want to include in your package. Navigate to the expenser-app directory, and then run this command.

   ```
   sf org create scratch --definition-file config/project-scratch-def.json --alias MyTestOrg1
    --duration-days 30
   ```

4. Verify that all package components are in the project directory where you want to create a package.
5. From the Salesforce DX project directory, create the package.

   ```
   sf package create --name "Expense Manager" --path force-app
   --package-type Unlocked
   ```

6. Review your `sfdx-project.json` file. The CLI automatically updates the project file to include the package directory and creates an alias based on the package name.

   ```
   {
      "packageDirectories": [
         {
            "path": "force-app",
            "default": true,
            "package": "Expense Manager",
            "versionName": "ver 0.1",
   ```

```
            "versionNumber": "0.1.0.NEXT"
        }
    ],
    "namespace": "",
    "sfdcLoginUrl": "https://login.salesforce.com",
    "sourceApiVersion": "59.0",
    "packageAliases": {
        "Expense Manager": "0Hoxxx"
    }
}
```

Notice the placeholder values for `versionName` and `versionNumber`.

Specify the features and org settings required for the metadata in your package using an external `.json` file, such as the scratch org definition file. You can specify using the `--definition-file` flag with the `sf package version create` command, or list the definition file in your `sfdx-project.json` file. See: Project Configuration File for Unlocked Packages

7. Create a package version. This example assumes the package metadata is in the `force-app` directory.

```
sf package version create --package "Expense Manager" --installation-key test1234 --wait
 10
```

8. Install and test the package version in a scratch org. Use a different scratch org from the one you used in step three.

```
sf package install --package "Expense Manager@0.1.0-1" --target-org MyTestOrg1
--installation-key test1234 --wait 10 --publish-wait 10
```

9. After the package is installed, open the scratch org to view the package.

```
sf org open --target-org MyTestOrg1
```

Package versions are beta until you promote them to a managed-released state. See: Release an Unlocked Package.

Configure Unlocked Packages

You include an entry in the `sfdx-project.json` file for each package to specify its alias, version details, dependencies, features, and org settings. From the command line, you can also set or change options, such as specifying an installation key, update the package name, or add a description.

Project Configuration File for Unlocked Packages

The project configuration file is a blueprint for your project. The settings in the file create an outline of your package and determine the package attributes and package contents.

Unlocked Packaging Keywords

A keyword is a variable that you can use to specify a package version number.

Package Installation Key

To ensure the security of the metadata in your package, you must specify an installation key when creating a package version. Package creators provide the key to authorized subscribers so they can install the package. Package installers provide the key during installation, whether installing the package from the CLI or from a browser. An installation key is the first step during installation. The key ensures that no package information, such as the name or components, is disclosed until the correct installation key is supplied.

Extract Dependency Information from Unlocked Packages

For an installed unlocked package, you can now run a simple SOQL query to extract its dependency information. You can also create a script to automate the installation of unlocked packages with dependencies.

Understanding Namespaces

A namespace is a 1-15 character alphanumeric identifier that distinguishes your package and its contents from other packages in your org.

Share Release Notes and Post-Install Instructions

Share details about what's new and changed in a released unlocked package with your users.

Specify Unpackaged Metadata or Apex Access for Apex Tests (Unlocked Packages)

Best Practices for Unlocked Packages

We suggest that you follow these best practices when working with unlocked packages.

Package IDs and Aliases for Unlocked Packages

During the package lifecycle, packages and package versions are identified by an ID or package alias. When you create a package or package version, Salesforce CLI creates a package alias based on the package name, and stores that name in the `sfdx-project.json` file. When you run CLI commands or write scripts to automate packaging workflows, it's often easier to reference the package alias, instead of the package ID or package version ID.

Frequently Used Unlocked Packaging Operations

Project Configuration File for Unlocked Packages

The project configuration file is a blueprint for your project. The settings in the file create an outline of your package and determine the package attributes and package contents.

Here are the parameters you can specify in the project configuration file.

Name	Required?	Default if Not Specified
apexTestAccess	No	None. Assign permission sets and permission set licenses to the user in context when your Apex tests run at package version creation. `"apexTestAccess": { "permissionSets": [ "Permission_Set_1", "Permission_Set_2" ], "permissionSetLicenses": [ "SalesConsoleUser" ] }` See Specify Unpackaged Metadata or Apex Access for Apex Tests (Unlocked Packages)

Name	Required?	Default if Not Specified

branch	No	None. If your package has an associated branch, but your package dependency is associated with a different branch, use this format.
		`"dependencies": [ { "package": "pkgB", "versionNumber": "1.3.0.LATEST", "branch": "featureC" } ]`
		If your package has an associated branch, but your package dependency doesn't have an associated branch, use this format.
		`"dependencies": [ { "package": "pkgB", "versionNumber": "1.3.0.LATEST", "branch": "" } ]`
		See Use Branches in Unlocked Packaging

calculateTransitiveDependencies	No	False. Enables the calculation of the package's indirect dependencies. A package can have multilevel dependencies where pkgC depends on pkgB, and pkgB depends on pkgA. By default, you list all of a package's dependencies, including indirect (transitive) dependencies. When `calculateTransitiveDependencies` is set to *`true`*, you specify a package's direct dependencies only, and the indirect dependencies are calculated for you. See the `dependencies` parameter's description for example configurations in the `sfdx-project.json` file. `calculateTransitiveDependencies` also enables you to generate a hierarchical graph of a package version's dependencies. To generate the dependencies graph, run the `package version displaydependencies` CLI command. See package version displaydependencies in the *Salesforce CLI Command Reference*.
default	Yes, if you've specified more than one package directory	true Indicates the default package directory. Use the `sf project retrieve` command to copy metadata from your scratch org to your default package directory.

Name	Required?	Default if Not Specified
		There can be only one package directory in which the default is set to true.
definitionFile	No	None. A reference to an external `.json` file used to specify the features and org settings required for the metadata of your package, such as the scratch org definition. Example: `"definitionFile": "config/project-scratch-def.json",`

dependencies	No	None. Specify the dependencies on other packages.
		To specify dependencies for unlocked packages within the same Dev Hub, use either the package version alias or a combination of the package name and the version number.
		`"dependencies": [ { "package": "MyPackageName@0.1.0.1" } ]`
		`"dependencies": [ { "package": "MyPackageName", "versionNumber": "0.1.0.LATEST" } ]`
		To specify dependencies for unlocked packages outside of the Dev Hub use:
		`"dependencies": [ { "package": "OtherOrgPackage@1.2.0" } ]`
		Note: You can use the LATEST keyword for the version number to set the dependency.
		To denote dependencies with package IDs instead of package aliases, use:
		• The `0Ho` ID if you specify the package ID along with the version number
		• The `04t` ID if you specify only the package version ID
		If the package has more than one dependency, provide a comma-separated list of packages in the order of installation. For example, if a package depends on the package Expense Manager

Name	Required?	Default if Not Specified

		- Util, which in turn depends on the package External Apex Library, the package dependencies are:
		`"dependencies": [ { "package" : "External Apex Library - 1.0.0.4" }, { "package": "Expense Manager - Util", "versionNumber": "4.7.0.LATEST" } ]`
		If you set the `calculateTransitiveDependencies` parameter to *`true`*, you specify the package's direct dependencies only, and the indirect (transitive) dependencies are calculated for you.
		For example, if `calculateTransitiveDependencies` is enabled and the package depends on the package Expense Manager - Util, which in turn depends on the package External Apex Library, the package dependency is:
		`"dependencies": [ { "package": "Expense Manager - Util", "versionNumber": "4.7.0.LATEST" } ]`
		See: Extract Dependency Information from Unlocked Packages and Considerations for Promoting Packages with Dependencies

includeProfileUserLicenses	No	False. Setting this parameter to `true` ensures that user licenses associated with profiles in unlocked packages are retained during package version creation. By default, unlocked packages remove profile information not pertinent to the packaged metadata. `"packageDirectories": [ { "package": "PackageA", "path": "common", "versionName": "ver 0.1", "versionNumber": "0.1.0.NEXT", "default": false, "includeProfileUserLicenses": true }`

Name	Required?	Default if Not Specified
		]
namespace	no	None. A 1–15 character alphanumeric identifier that distinguishes your package and its contents from packages of other developers.
package	Yes	The package name specified in the project json file.
packageAliases	Yes	Salesforce CLI updates the project file with aliases when you create a package or package version. You can also manually update this section for existing packages or package versions. You can use the alias instead of the cryptic package ID when running CLI `sf package` commands.
path	Yes	If you don't specify a path, Salesforce CLI uses a placeholder when you create a package.
postInstallUrl	No	None. A URL to post-install instructions for subscribers.
releaseNotesUrl	No	None. A URL to release notes.
seedMetadata	No	None. Specify the path to your seedMetadata directory. Seed metadata is available to standard value sets only. If your package depends on standard value sets, you can specify a seed metadata directory that contains the value sets. Example: `"packageDirectories": [ { "seedMetadata": { "path": "my-unpackaged-seed-directory" } }, ]`
unpackagedMetadata	No	None. See Specify Unpackaged Metadata or Apex Access for Apex Tests (Unlocked Packages)
versionDescription	No	None.
versionName	No	If not specified, the CLI uses `versionNumber` as the version name.
versionNumber	Yes	The versionNumber field sets the version number that is assigned the next time you create a new version. Version numbers are formatted as MAJOR.MINOR.PATCH.BUILD. For example, 1.2.1.8. To avoid creating multiple package versions with the same

Name	Required?	Default if Not Specified
		MAJOR.MINOR.PATCH.BUILD number, you must increment the versionNumber before creating a new package version. To automatically increment the build number to the next available build for the package, use the keyword NEXT (1.2.1.NEXT). Alternatively, when you create a new package version, you can set the version number using the `--versionNumber` flag in the CLI. For more details, see Guidance for Version Numbering.

When you specify a parameter using Salesforce CLI, it overrides the value listed in the project definition file.

The Salesforce DX project definition file is a JSON file located in the root directory of your project. Use the `sf project generate` CLI command to generate a project file that you can build upon. Here's how the parameters in `packageDirectories` appear.

```
{
   "namespace": "",
   "sfdcLoginUrl": "https://login.salesforce.com",
   "sourceApiVersion": "61.0",
   "packageDirectories": [
      {
         "path": "util",
         "default": true,
         "package": "Expense Manager - Util",
         "versionName": "Summer '24",
         "versionDescription": "Welcome to Summer 2024 Release of Expense Manager Util
Package",
         "versionNumber": "4.7.0.NEXT",
         "definitionFile": "config/scratch-org-def.json"
      },
      {
         "path": "exp-core",
         "default": false,
         "package": "Expense Manager",
         "versionName": "v 3.2",
         "versionDescription": "Summer 2024 Release",
         "versionNumber": "3.2.0.NEXT",
         "postInstallUrl": "https://expenser.com/post-install-instructions.html",
         "releaseNotesUrl": "https://expenser.com/summer-2024-release-notes.html",
         "definitionFile": "config/scratch-org-def.json",
         "dependencies": [
            {
               "package": "Expense Manager - Util",
               "versionNumber": "4.7.0.LATEST"

            },
            {
               "package" : "External Apex Library - 1.0.0.4"
            }
         ]
```

```
        }
    ],
    "packageAliases": {
        "Expense Manager - Util": "0HoB00000004CFpKAM",
        "External Apex Library@1.0.0.4": "04tB0000000IB1EIAW",
        "Expense Manager": "0HoB00000004CFuKAM"}
}
```

What If I Don't Want My Salesforce DX Project Automatically Updated?

In some circumstances, you don't want to have automatic updates to the `sfdx-project.json` file. When you require more control, use these environment variables to suppress automatic updates to the project file.

For This Command	Set This Environment Variable to True
sf package create	SFDX_PROJECT_AUTOUPDATE_DISABLE_FOR_PACKAGE_CREATE
sf package version create	SFDX_PROJECT_AUTOUPDATE_DISABLE_FOR_PACKAGE_VERSION_CREATE

Unlocked Packaging Keywords

A keyword is a variable that you can use to specify a package version number.

You can use keywords to automatically increment the value of the package build numbers, ancestor version numbers, set the package dependency to the latest version, or the latest released and promoted version.

Use the Keyword	Example
LATEST to specify the latest version of the package dependency when you create a package version.	`"dependencies": [ { "package": "MyPackageName", "versionNumber": "0.1.0.LATEST" } ]`
NEXT to increment the build number to the next available for the package version. If you don't use `NEXT`, and you also forget to update the version number in your `sfdx-project.json` file, the new package version uses the same number as the previous package version. Although we don't enforce uniqueness on package version numbers, every package version is assigned a unique subscriber package version ID (starts with 04t).	`"versionNumber": "1.2.0.NEXT"`
RELEASED to specify the latest promoted and released version of the package dependency when you create a package version.	`"dependencies": [ { "package": "pkgB", "versionNumber": "2.1.0.RELEASED"`

Use the Keyword	Example
	}]
HIGHEST to automatically set the package ancestor to the highest promoted and released package version number. Use only with ancestor version or ancestor ID.	"packageDirectories": [{ "path": "util", "package": "Expense Manager - Util", "versionNumber": "4.7.0.NEXT", "ancestorVersion": "HIGHEST" },
NONE in the ancestor version or ancestor ID field. Ancestry defines package upgrade paths. If the package ancestor is set to NONE, an existing customer can't upgrade to that package version.	"packageDirectories": [{ "path": "util", "package": "Expense Manager - Util", "versionNumber": "4.7.0.NEXT", "ancestorVersion": "NONE" },

Package Installation Key

To ensure the security of the metadata in your package, you must specify an installation key when creating a package version. Package creators provide the key to authorized subscribers so they can install the package. Package installers provide the key during installation, whether installing the package from the CLI or from a browser. An installation key is the first step during installation. The key ensures that no package information, such as the name or components, is disclosed until the correct installation key is supplied.

To set the installation key, add the `--installation-key` parameter to the command when you create the package version. This command creates a package and protects it with the installation key.

```
sf package version create --package "Expense Manager" --installation-key "JSB7s8vXU93fI"
```

Supply the installation key when you install the package version in the target org.

```
sf package install --package "Expense Manager" --installation-key "JSB7s8vXU93fI”
```

Change the Installation Key for an Existing Package Version

You can change the installation key for an existing package version with the `sf package version update` command.

```
sf package version update --package "Expense Manager@1.2.0-4" --installation-key
“HIF83kS8kS7C”
```

Create a Package Version Without an Installation Key

If you don't require security measures to protect your package metadata, you can create a package version without an installation key.

```
sf package version create --package "Expense Manager" --directory common \
--tag 'Release 1.0.0' --installation-key-bypass
```

Check Whether a Package Version Requires an Installation Key

To determine whether a package version requires an installation key, use either the `sf package version list` or `sf package version report` CLI command.

Extract Dependency Information from Unlocked Packages

For an installed unlocked package, you can now run a simple SOQL query to extract its dependency information. You can also create a script to automate the installation of unlocked packages with dependencies.

The SubscriberPackageVersion Tooling API object now provides dependency information. Using a SOQL query on SubscriberPackageVersion, you can identify the packages on which your unlocked package has a dependency. You can get the (04t) IDs and the correct install order for those packages.

Example: Package B has a dependency on package A. Package D depends on packages B and C. Here's a sample `sfdx-project.json` that you would have specified while creating a package version. Package D dependencies are noted as packages A, B, and C.

```
{
    "packageDirectories": [
        {
            "path": "pkg-a-workspace",
            "package": "pkgA",
            "versionName": "ver 4.9",
            "versionNumber": "4.9.0.NEXT",
            "default": true
        },
        {
            "path": "pkg-b-workspace",
            "package": "pkgB",
            "versionName": "ver 3.17",
            "versionNumber": "3.17.0.NEXT",
            "default": false,
            "dependencies": [
                {
                    "package": "pkgA",
                    "versionNumber": "3.3.0.LATEST"
                }
            ]
        },
        {
            "path": "pkg-c-workspace",
            "package": "pkgC",
            "versionName": "ver 2.1",
            "versionNumber": "2.1.0.NEXT",
            "default": false
        },
        {
            "path": "pkg-d-workspace",
            "package": "pkgD",
            "versionName": "ver 1.1",
            "versionNumber": "1.1.0.NEXT",
            "default": false,
            "dependencies": [
```

```
                {
                    "package": "pkgA",
                    "versionNumber": "3.3.0.LATEST"
                },
                {
                    "package": "pkgB",
                    "versionNumber": "3.12.0.LATEST"
                },
                {
                    "package": "pkgC",
                    "versionNumber": "2.1.0.LATEST"
                }
            ]
        }
    ],
    "namespace": "",
    "sfdcLoginUrl": "https://login.salesforce.com",
    "sourceApiVersion": "44.0",
    "packageAliases": {
        "pkgA": "0HoB00000008Oq6KAE",
        "pkgB": "0HoB00000008OqBKAU",
        "pkgC": "0HoB00000008OqGKAU",
        "pkgD": "0HoB00000008OqGKAQ"
    }
}
```

Before installing pkgD (with ID=04txx000000082hAAA), use this SOQL query to determine its dependencies. The username is typically the target subscriber org where the unlocked package is to be installed.

```
sf data query -u {USERNAME} -t
   -q "SELECT Dependencies FROM SubscriberPackageVersion
       WHERE Id='04txx000000082hAAA'" --json
```

You see this output when you run the query, with the (04t) IDs for pkgA, pkgB, and pkgC in that order.

```
"Dependencies":{"Ids":[
   {"subscriberPackageVersionId":"04txx000000080vAAA"},
   {"subscriberPackageVersionId":"04txx000000082XAAQ"},
   {"subscriberPackageVersionId":"04txx0000000AiGAAU"}]}
```

Understanding Namespaces

A namespace is a 1-15 character alphanumeric identifier that distinguishes your package and its contents from other packages in your org.

When you specify a package namespace, every component added to a package has the namespace prefixed to the component API name. Let's say you have a custom object called Insurance_Agent with the API name, `Insurance_Agent__c`. If you add this component to a package associated with the Acme namespace, the API name becomes `Acme__Insurance_Agent__c`.

You can choose to create unlocked packages with or without a specific namespace. A namespace is assigned to a package at the time that it's created and can't be changed.

Use No-Namespace Packages If	Use Namespace Packages If
You want to migrate metadata from your org's monolith of unpackaged metadata to unlocked packages. Creating a no-namespace package gives you more control over how you organize and distribute parts of an application.	You're new to packaging and you're adopting packages in several stages. Using a namespace prefix such as Acme__ can help you identify what's packaged and what's still unpackaged metadata in your production orgs
You want to retain the API name of previously unpackaged metadata elements.	You have more than one development team. A namespace can ensure your API names don't collide with another team. In general, working with a single namespace is easier, and you can easily share code across packages that share a namespace.

Important: When creating a namespace, use something that's useful and informative to users. However, don't name a namespace after a person (for example, by using a person's name, nickname, or private information).

When you work with namespaces, keep these considerations in mind.

- You can develop more than one unlocked package with the same namespace but you can associate each package with only a single namespace.
- If you work with more than one namespace, we recommend that you set up one project for each namespace.
- If you have unlocked packages and managed packages in the same namespace, make sure to enable debug logging at the namespace level so that you can capture logs from Apex classes across packages.

Create and Register Your Namespace
With unlocked packages, you can share a single namespace with multiple packages. Since sharing of code is much easier if your package shares the same namespace, we recommend that if use namepaces, you use a single namespace for your namespaced unlocked packages.

Avoid Namespace Collisions
Namespaces impact the combination of package types you can install in an org.

Namespace-Based Visibility for Apex Classes in Unlocked Packages
The `@namespaceAccessible` makes public Apex in a package available to other packages that use the same namespace. Without this annotation, Apex classes, methods, interfaces, and properties defined in an unlocked package aren't accessible to the other packages with which they share a namespace. Apex that is declared global is always available across all namespaces, and needs no annotation.

Create and Register Your Namespace

With unlocked packages, you can share a single namespace with multiple packages. Since sharing of code is much easier if your package shares the same namespace, we recommend that if use namepaces, you use a single namespace for your namespaced unlocked packages.

To create a namespace:

1. Sign up for a new Developer Edition org.
2. In Setup, enter *Package Manager* in the Quick Find box, and select **Package Manager**.
3. In Namespace Settings, click **Edit**.
4. Enter a namespace and select **Check Availability**.
5. (Optional) Select a package to associate with this namespace , or select **None**, then click **Review**.

6. Review your selections, and then click **Save**.

To register a namespace:

1. To link the namespace that you created with your Dev Hub, use Namespace Registry. See Link a Namespace to a Dev Hub for details.
2. In the `sfdx-project.json` file, specify your namespace using the namespace attribute. When you create a new unlocked package, the package is associated with the namespace specified in the `sfdx-project.json` file.

Avoid Namespace Collisions

Namespaces impact the combination of package types you can install in an org.

To understand how namespaces affect the types of packages you can install in a namespaced or no-namespace org, review this table.

Installation Org	No-namespace Unlocked Package	Namespaced Unlocked Package	Second-generation Managed Package (2GP)	First-generation Managed Package (1GP)
Org with a namespace For example, a 1GP packaging org, 1GP patch org, Developer Edition org with namespace, or a scratch org with namespace	Fail. You can't install a no-namespace unlocked package in an org with a namespace.	Pass. If the namespace of the unlocked package is different from the namespace of the org, you can install one or many packages.	Pass (scratch orgs) If the namespace of the 2GP is different from the namespace of the scratch org, you can install one or many packages. Fail (1GP packaging and patch orgs). To prevent 1GP packages from depending on 2GP packages, we block the installation of 2GP packages in a 1GP packaging or patch org. We also block the installation of 2GP packages in Developer Edition (DE) orgs that have an associated namespace, unless it's a DE scratch org.	Pass. If the namespace of the 1GP is different from the namespace of the org, you can install one or many packages. Fail. If the namespace of the 1GP is the same as the namespace of the org, you can't install the 1GP into the org.
Org without a namespace	Pass. Can install one or many no-namespace unlocked packages.	Pass. Can install one or many namespaced unlocked packages.	Pass. Can install one or many 2GP packages.	Pass. Can install one or many 1GP packages.

To understand how namespaces affect the combination of packages that can be installed into one org, review this table.

Namespace and Package Type	Unlocked Package with Namespace Y	Second-generation Managed Package (2GP) with Namespace Y	First-generation Managed Package (1GP) with Namespace Y
First-generation Managed Package (1GP) with namespace X	Pass. If the 1GP and unlocked package use unique namespaces, you can install them in the same org.	Pass. If the 1GP and 2GP use a unique namespace, you can install them in the same org.	Pass. If each 1GP uses a unique namespace, you can install multiple 1GP packages in the same org.
First-generation Managed Package (1GP) with namespace Y	Fail. If the 1GP and unlocked package share a namespace, you can't install them in the same org.	Fail. If the 1GP and 2GP share a namespace, you can't install them in the same org.	Fail. If the 1GP packages share a namespace, you can't install them in the same org.
Second-generation Managed Package (2GP) with namespace X	Pass. You can install a 2GP and a namespaced unlocked package in the same org. The packages can share a namespace or use unique namespaces.	Pass. You can install multiple 2GP packages with unique namespaces, or the same namespace.	Pass. If the 1GP packages use unique namespaces, you can install multiple 1GP packages in the same org.
Second-generation Managed Package (2GP) with namespace Y	Pass. You can install a 2GP and a namespaced unlocked package in the same org. The packages can share a namespace or use unique namespaces.	Pass. You can install multiple 2GP packages with the same namespace in the same org.	Fail. If the 1GP and 2GP share a namespace, you can't install them in the same org.

Namespaces and Package Dependencies

A namespaced unlocked package can't depend on an unlocked package without a namespace.

Namespace-Based Visibility for Apex Classes in Unlocked Packages

The `@namespaceAccessible` makes public Apex in a package available to other packages that use the same namespace. Without this annotation, Apex classes, methods, interfaces, and properties defined in an unlocked package aren't accessible to the other packages with which they share a namespace. Apex that is declared global is always available across all namespaces, and needs no annotation.

Considerations for Apex Accessibility Across Packages

- A Lightning component outside the package can access a public Apex method installed from a no-namespace unlocked package. The component can be installed from another package or created in the org. For accessing Apex methods, a no-namespace unlocked package is treated the same as an unmanaged package.
- You can't use the `@namespaceAccessible` annotation for an `@AuraEnabled` Apex method.
- You can add or remove the `@namespaceAccessible` annotation at any time, even on managed and released Apex code. Make sure that you don't have dependent packages relying on the functionality of the annotation before adding or removing it.

- When adding or removing `@namespaceAccessible` Apex from a package, consider the impact to users with installed versions of other packages that reference this package's annotation. Before pushing a package upgrade, ensure that no user is running a package version that would fail to fully compile when the upgrade is pushed.

This example shows an Apex class marked with the `@namespaceAccessible` annotation. The class is accessible to other packages within the same namespace. The first constructor is also visible within the namespace, but the second constructor isn't.

```
// A namespace-visible Apex class
@namespaceAccessible
public class MyClass {
    private Boolean bypassFLS;

    // A namespace-visible constructor that only allows secure use
    @namespaceAccessible
    public MyClass() {
        bypassFLS = false;
    }

    // A package private constructor that allows use in trusted contexts,
    // but only internal to the package
    public MyClass (Boolean bypassFLS) {
        this.bypassFLS = bypassFLS;
    }
    @namespaceAccessible
    protected Boolean getBypassFLS() {
       return bypassFLS;
    }
}
```

Share Release Notes and Post-Install Instructions

Share details about what's new and changed in a released unlocked package with your users.

Share details about what's new and changed in an unlocked package with your users. You can specify a release notes URL to display on the package detail page in the user's org. And you can share instructions about using your package by specifying a post install URL. The release notes and post install URLs display on the Installed Packages page in Setup, after a successful package installation. For users who install packages using an installation URL, the package installer page displays a link to release notes. And users are redirected to your post install URL following a successful package installation or upgrade.

Specify the `postInstallUrl` and `releaseNotesUrl` attributes in the `packageDirectories` section for the package.

```
   "packageDirectories": [
      {
         "path": "expenser-schema",
         "default": true,
         "package": "Expense Schema",
         "versionName": ""ver 0.3.2"",
         "versionNumber": "0.3.2.NEXT",
         "postInstallUrl": "https://expenser.com/post-install-instructions.html",
         "releaseNotesUrl": "https://expenser.com/winter-2020-release-notes.html"
        },
        ],
       {
         "namespace": "",
         "sfdcLoginUrl": "https://login.salesforce.com",
```

```
        "sourceApiVersion": "47.0",
        "packageAliases": {
            "Expenser Schema": "0HoB00000004CzHKAU",
            "Expenser Schema@0.1.0-1": "04tB0000000719qIAA"
    }
}
```

You can also use the `--post-install-url` and the `--release-notes-url` Salesforce CLI parameters with the `sf package version create` command. The CLI parameters override the URLs specified in the `sfdx-project.json` file.

Specify Unpackaged Metadata or Apex Access for Apex Tests (Unlocked Packages)

Specify Unpackaged Metadata for Package Version Creation Tests

Specify the path to the unpackaged metadata in your `sfdx-project.json` file.

In this example, metadata in the `my-unpackaged-directory` is available for test runs during the package version creation of the TV_unl package.

```
"packageDirectories": [
    {
        "path": "force-app",
        "package": "TV_unl",
        "versionName": "ver 0.1",
        "versionNumber": "0.1.0.NEXT",
        "default": true,
        "unpackagedMetadata": {
            "path": "my-unpackaged-directory"
        }
    },
]
```

The `unpackagedMetadata` attribute is intended for metadata that isn't part of your package. You can't include the same metadata in both an unpackaged directory and a packaged directory.

Manage Apex Access for Package Version Creation Tests

Sometimes the Apex tests that you write require a user to have certain permission sets or permission set licenses. Use the `apexTestAccess` setting to assign permission sets and permission set licenses to the user in whose context your Apex tests get run at package version creation.

```
"packageDirectories": [
    {
        "path": "force-app",
        "package": "TV_unl",
        "versionName": "ver 0.1",
        "versionNumber": "0.1.0.NEXT",
        "default": true,
        "unpackagedMetadata": {
            "path": "my-unpackaged-directory"
        },
```

```
        "apexTestAccess": {
                "permissionSets": [
                    "Permission_Set_1",
                    "Permission_Set_2"
                ],
                "permissionSetLicenses": [
                    "SalesConsoleUser"
                ]
            }

    },
]
```

Note: To assign user licenses, use the runAs Method. User licenses can't be assigned in the `sfdx-project.json` file.

Best Practices for Unlocked Packages

We suggest that you follow these best practices when working with unlocked packages.

- We recommend that you work with only one Dev Hub, and enable Dev Hub in a production org.
- The Dev Hub org against which you run the `sf package create` command becomes the owner of the package. If the Dev Hub org associated with a package expires or is deleted, its packages no longer work.
- Use care in deciding how to utilize namespaces. For most customers, we recommend working with no namespace or a single namespace to avoid unnecessary complexity in managing components. If you're test-driving unlocked packages, use a test namespace.

  Use real namespaces only when you're ready to embark on a development path headed for release in a production org.

  Note: You can't install a no-namespace, unlocked package into any org with a namespace (for example, a scratch org with a namespace).

- Include the `--tag` option when you use the `sf package version create` and `sf package version update` commands. This option helps you keep your version control system tags in sync with specific package versions.
- Create user-friendly aliases for packaging IDs, and include those aliases in your Salesforce DX project file and when running CLI packaging commands. See: Package IDs and Aliases for Unlocked Packages.

Package IDs and Aliases for Unlocked Packages

During the package lifecycle, packages and package versions are identified by an ID or package alias. When you create a package or package version, Salesforce CLI creates a package alias based on the package name, and stores that name in the `sfdx-project.json` file. When you run CLI commands or write scripts to automate packaging workflows, it's often easier to reference the package alias, instead of the package ID or package version ID.

Package aliases are stored in the `sfdx-project.json` file as name-value pairs, in which the name is the alias and the value is the ID. You can modify package aliases for existing packages and package versions in the project file.

At the command line, you also see IDs for things like package members (a component in a package) and requests (like a `sf package version create` request).

Note: As a shortcut, the documentation sometimes refers to an ID by its three-character prefix. For example, a package version ID always starts with `04t`.

Here are the most commonly used IDs.

ID Example	Short ID Name	Description
033J0000dAb27uxVRE	Subscriber Package ID	Use this ID when contacting Salesforce for packaging or security review support. To locate this ID for your package, run `sf package list --verbose` against the Dev Hub that owns the package.
04t6A0000004eytQAA	Subscriber Package Version ID	Use this ID to install a package version. Returned by `sf package version create`.
0Hoxx00000000CqCAI	Package ID	Use this ID on the command line to create a package version. Or enter it into the `sfdx-project.json` file and use the directory name. Generated by `sf package create`.
08cxx00000000BEAAY	Version Creation Request ID	Use this ID to view the status and monitor progress for a specific request to create a package version such as `sf package version create report`

Frequently Used Unlocked Packaging Operations

For a complete list of Salesforce CLI packaging commands, see: Salesforce Command Line Reference Guide.

Salesforce CLI command	What it Does
`sf package create`	Creates a package. When you create a package, you specify its package type and name, among other things.
`sf package version create`	Creates a package version.
`sf package install`	Installs a package version in a scratch, sandbox, or production org.
`sf package uninstall`	Removes a package that has been installed in an org. This process deletes the metadata and data associated with the package.
`sf package version promote`	Changes the state of the package version from beta to the managed-released state.
`sf org create scratch`	Creates a scratch org.
`sf org open`	Opens an org in the browser.

How We Handle Profile Settings in Unlocked Packages

During package version creation for unlocked or second-generation managed packages, the build system inspects the contents of all profiles in the DX project directory, not just the directory specified in the path, and preserves only the profile settings that are directly related to the metadata in the package. The profile itself, and any profile settings unrelated to the package's metadata are discarded from the package.

During package installation, the preserved profile settings are applied only to existing profiles in the subscriber org. The profile itself isn't installed in the subscriber org.

To control which profile settings are included, use the `scopeProfiles` parameter in the project configuration file.

Note: Packages that contain only profiles and no additional metadata aren't allowed and fail during package version creation.

When you select…	The packaged profile settings are applied to…	This installation option is available via…
Install for Admins Only	The System Administrator profile in the subscriber org. CRUD access to custom objects is granted automatically to the System Administration profile.	• The package installer page • Salesforce CLI `sf package install` command The default behavior for CLI-based package installs is to install for admins only.
Install for All Users	The System Administrator profile and all cloned profiles in the subscriber org. CRUD access to custom objects is granted automatically to the System Administration profile, and all cloned profiles. Standard profiles can't be modified.	• The package installer page • Salesforce CLI `sf package install` command To install for all users via the CLI, include the security type parameter. `sf package install --security-type AllUsers`
Install for Specific Profiles	Specific profiles in the subscriber org. This selection lets the person installing your package determine how to map the profile settings you packaged to specific profiles in their org.	• The package installer page Not available for CLI-based package installations.

To test the behavior of your packaged profile, install your package in a scratch org.

1. From Setup, enter *`Profile`* in the Quick Find box, and then locate and inspect the profiles you selected during package installation.
2. Check whether your profile settings have been applied to that profile.

   Repeat this step for any other profile you expect to contain your profile settings. Don't look for the profile name you created; we apply profile settings to existing profiles in the subscriber org.

Whenever possible, use package permission sets instead of profile settings. Subscribers who install your package can easily assign your permission set to their users.

Note: During a push upgrade, some profile settings related to Apex classes and field-level security aren't automatically assigned to the System Admin profile. To ensure that user access is set up correctly after a push upgrade, communicate with your customer. Make sure they review and update their profile settings after a push upgrade.

Retain License Settings in Unlocked Packages

By default, license settings in profiles are removed during package creation. To retain these settings, specify the `includeProfileUserLicenses` parameter in your `sfdx-project.json` file. In this scenario, the license settings are retained and applied to the profiles in the subscriber org that are selected during package installation.

```
"packageDirectories": [
    {
        "package": "PackageA",
        "path": "common",
       "versionName": "ver 0.1",
       "versionNumber": "0.1.0.NEXT",
       "default": false,
       includeProfileUserLicenses: true
    }
]
```

Develop Unlocked Packages

A package is a top-level container that holds important details about the app or package: the package name, description, and associated namespace.

You supply the package details in the package descriptor section of your `sfdx-project.json` project configuration file.

Create and Update an Unlocked Package

When you're ready to test or share your package, use the `sf package create` command to create a package.

Create New Versions of an Unlocked Package

A package version is a fixed snapshot of the package contents and related metadata. The package version lets you manage changes and track what's different each time you release or deploy a specific set of changes.

Guidance for Package Version Numbering

Use package versions to evolve your managed package, and release subsequent package versions without breaking existing package users. Every package version is a fixed snapshot of the package contents and related metadata.

Code Coverage for Unlocked Packages

Before you can promote and release an unlocked package, the Apex code must meet a minimum 75% code coverage requirement. You can install package versions that don't meet code coverage requirements only in scratch orgs and sandboxes.

Considerations for Promoting Packages with Dependencies

If your company is developing a package that has a package dependency, ask yourself these questions before promoting (releasing) a new package version.

Release an Unlocked Package

Each new package version is marked as beta when its created. As you develop your package, you may create several package versions before you create a version that is ready to be released and installed in production orgs.

Update an Unlocked Package Version

You can update most properties of a package version from the command line. For example, you can change the package version name or description. One important exception is that you can't change the release status.

Hard-Deleted Components in Unlocked Packages

When these components are removed from an unlocked package, they're hard deleted from the target install org during the package upgrade.

Delete an Unlocked Package or Package Version

Use the `sf package version delete` and `sf package delete` to delete packages and package versions that you no longer need.

View Package Details

View the details of previously created packages and package versions from the command line.

Create and Update an Unlocked Package

When you're ready to test or share your package, use the `sf package create` command to create a package.

If you are using a namespace, specify the package namespace in the `sfdx-project.json` file. To learn more, see Understanding Namespaces.

To create the package, change to the project directory. The name becomes the package alias, which is automatically added to the project file. You can choose to designate an active Dev Hub org user to receive email notifications for Apex gacks, and install, upgrade, or uninstall failures associated with your packages.

```
sf package create --name "Expenser App" --package-type Unlocked --path  \
"expenser-main" --target-dev-hub my-hub --error-notification-username me@devhub.org
```

The output is similar to this example.

```
sfdx-project.json has been updated.
Successfully created a package. 0HoB00000004CzHKAU
=== Ids
NAME         VALUE
___________  __________________
Package Id   0HoB00000004CzHKAU
```

Metadata Limits in Unlocked Packages

Metadata in package	Limit
Number of Metadata Files	10,000 files
Total Metadata File Size	600 MB

Update the Package

To update the name, description, or the user to receive error notifications of an existing package, use this command.

```
sf package update --package "Expense App" --name "Expense Manager App" \
--description "New Description" --error-notification-username me2@devhub.org
```

Note: You can't change the package namespace or package type after you create the package.

Create New Versions of an Unlocked Package

A package version is a fixed snapshot of the package contents and related metadata. The package version lets you manage changes and track what's different each time you release or deploy a specific set of changes.

Before you create a package version, first verify package details, such as the package name, dependencies, and update the versionNumber parameter in the `sfdx-project.json` file. Verify that the metadata you want to change or add in the new package version is in the package's main directory.

When you create a package version, you have three options regarding how package validations are handled.

- (Default) Complete all validations of dependencies, package ancestors, and metadata before the package version is returned.
- Perform validations asynchronously.
- Skip validation on the package version.

Create an Unlocked Package Version (Default Option)

Create the package version with this command. Specify the package alias or ID (0Ho). You can also include a scratch definition file that contains a list of features and setting that the metadata of the package version depends on.

```
sf package version create --package "Expenser App" --installation-key "HIF83kS8kS7C" \
--definitionfile config/project-scratch-def.json --code-coverage --wait 10
```

Note: When creating a package version, specify a `--wait` time to run the command. If the package version is created within that time, the `sfdx-project.json` file is automatically updated with the package version information. If not, you must manually edit the project file.

It can be a long-running process to create a package version, depending on the package size and other variables. You can easily view the status and monitor progress.

```
sf package version create report --package-create-request-id 08cxx00000000YDAAY
```

The output shows details about the request.

```
=== Package Version Create Request
NAME                            VALUE
──────────────────────────────  ────────────────────
Version Create Request Id       08cB00000004CBxIAM
Status                          InProgress
Package Id                      0HoB00000004C9hKAE
Package Version Id              05iB0000000CaaNIAS
Subscriber Package Version Id   04tB0000000NOimIAG
Tag                             git commit id 08dcfsdf
Branch
CreatedDate                     2024-05-08 09:48
Installation URL
https://login.salesforce.com/packaging/installPackage.apexp?p0=04tB0000000NOimIAG
```

You can find the request ID (08c) in the initial output of `sf package version create`.

Depending on the size of the package and other variables, the create request can take several minutes. When you have more than one pending request to create package versions, you can view a list of all requests with this command.

```
sf package version create list --created-last-days 0
```

Details for each request display as shown here (IDs and labels truncated).

```
=== Package Version Create Requests [3]
ID     STATUS  PACKAGE2 ID PKG2 VERSION ID SUB PKG2 VER ID TAG BRANCH CREATED DATE ===
08c... Error   0Ho...
08c... Success 0Ho... 05i... 04t...                                  2024-06-22 12:07
08c... Success 0Ho... 05i... 04t...                                  2024-06-23 14:55
```

Async Validation

Async validation creates a new package version before completing package validations. If your development team is using continuous integration (CI) scripts, you can leverage async validation to get an installable artifact sooner so you can start post-package creation steps.

To specify async validation, include the `--async-validation` parameter.

```
sf package version create --async-validation <rest of command syntax>
```

Sample Command-Line Output

```
Version create.... Create version status: PerformingValidations
The validations for this package version are in progress, but you can now begin testing
this package version.
To determine whether all package validations complete successfully, run "sf package version
 create report --package-create-request-id  08cxx", and review the Status.
Async validated package versions can be promoted only if all validations complete
successfully.
Successfully created the package version [08cxx. Subscriber Package Version Id: 04txx
Package Installation URL:
https://login.salesforce.com/packaging/installPackage.apexp?p0=04txx
As an alternative, you can use the "sf package:install" command.
```

The command-line output provides you a package creation request ID that starts with 08c. To confirm whether all package validations complete successfully, use the 08cxx ID when and run `sf package version create report --package-create-request-id 08cxx`. Then validate that the `Status` is listed as `Success`. Async validated package versions can be promoted only if all validations complete successfully.

Skip Validation

Skips validation of dependencies, package ancestors, and metadata during package version creation. Skipping validation significantly reduces the time it takes to create a new package version, but package versions created using skip validation can't be promoted to the released state.

```
sf package version create --skip-validation <rest of command syntax>
```

Note: You can't specify both skip validation and code coverage, because code coverage is calculated during validation.

You also can't specify both skip validation and async validation at the same time.

Use Keyword NEXT to Ensure Package Version Numbers Are Unique

To ensure your version number is unique, use the keyword `NEXT` when you set the version number in your `sfdx-project.json` file.

For example, `"versionNumber": "1.2.0.NEXT"`.

If you don't use `NEXT`, and you also forget to update the version number in your `sfdx-project.json` file, the new package version uses the same number as the previous package version. Although we don't enforce uniqueness on package version numbers, every package version is assigned a unique subscriber package version ID (starts with 04t).

How Many Package Versions Can I Create Per Day?

Run this command to see how many package versions you can create per day and how many you have remaining.

```
sf limits api display
```

Look for the `Package2VersionCreates` entry.

```
NAME                                    REMAINING  MAXIMUM
──────────────────────────────────────  ─────────  ─────────
Package2VersionCreates                   23         50
```

Simplify Unlocked Package Development by Creating and Specifying an Org Shape

If your package's metadata depends on a complex set of features, settings, or licenses, it can be difficult to declaratively specify these dependencies in a scratch org definition file. Instead, create an org shape of your production org, or another development org, and specify that source org's ID in your scratch org definition file. During package creation, we mimic the source org's environment when we build and validate your package's metadata.

Use Branches in Unlocked Packaging

Development teams who use branches in their source control system (SCS), often build package versions based on the metadata in a particular branch of code.

Target a Specific Release for Your Unlocked Packages During Salesforce Release Transitions

During major Salesforce release transitions, you can specify `preview` or `previous` when creating a package version. Specifying the release version for a package allows you to test upcoming features, run regression tests, and support customers regardless of which Salesforce release their org is on. Previously, you could only create package versions that matched the Salesforce release your Dev Hub org was on.

Simplify Unlocked Package Development by Creating and Specifying an Org Shape

If your package's metadata depends on a complex set of features, settings, or licenses, it can be difficult to declaratively specify these dependencies in a scratch org definition file. Instead, create an org shape of your production org, or another development org, and specify that source org's ID in your scratch org definition file. During package creation, we mimic the source org's environment when we build and validate your package's metadata.

Before using this feature, get familiar with how Org Shape for Scratch Orgs works.

Then enable the scratch org setting in your source org, generate the org shape, and edit your scratch org definition file to include the org name and 15-character source org ID.

```
{
  "orgName": "Acme",
```

```
  "sourceOrg": "00DB1230400Ifx5"
}
```

Use Branches in Unlocked Packaging

Development teams who use branches in their source control system (SCS), often build package versions based on the metadata in a particular branch of code.

To identify which branch in your SCS a package version is based on, tag your package version with a branch name using `--branch` attribute in this Salesforce CLI command.

```
sf package version create --branch featureA
```

You can specify any alphanumeric value up to 240 characters as the branch name.

You can also specify the branch name in the package directories section of the `sfdx-project.json` file.

```
"packageDirectories": [
     {
        "path": "util",
        "default": true,
        "package": "pkgA",
        "versionName": "Spring '21",
        "versionNumber": "4.7.0.NEXT",
        "branch": "featureA"
     }]
```

When you specify a branch, the package alias for that package version is automatically appended with the branch name. You can view the package alias in the `sfdx.project.json` file.

```
"packageAliases": {
    "pkgA@1.0.0.4-featureA":"04tB0000000IB1EIAW"}
```

Keep in mind that version numbers increment within each branch, and not across branches. For example, you could have two or more beta package versions with the version number 1.3.0.1.

Branch Name	Package Version Alias
featureA	pkgA@1.3.0-1-featureA
featureB	pkgA@1.3.0-1-featureB
Not specified	pkgA@1.3.0-1

Although more than one beta package version can have the same version number, there can be only one promoted and released package version for a given major.minor.patch package version.

Package Dependencies and Branches

By default, your package can have dependencies on other packages in the same branch. For package dependencies based on packages in other branches, explicitly set the branch attribute in the `sfdx.project.json` file.

To specify a package dependency	Use this format
Using the branch attribute	`"dependencies": [ { "package": "pkgB", "versionNumber": "1.3.0.LATEST", "branch": "featureC" }]`
Using the most recent promoted and released version of package	`"dependencies": [ { "package": "pkgB", "versionNumber": "2.1.0.RELEASED" }]`
If your package has an associated branch, but the dependent package doesn't have a branch	`"dependencies": [ { "package": "pkgB", "versionNumber": "1.3.0.LATEST", "branch": "" }]`
Using the package alias	`"dependencies": [ { "package": "pkgB@2.1.0-1-featureC" }]`

Target a Specific Release for Your Unlocked Packages During Salesforce Release Transitions

During major Salesforce release transitions, you can specify `preview` or `previous` when creating a package version. Specifying the release version for a package allows you to test upcoming features, run regression tests, and support customers regardless of which Salesforce release their org is on. Previously, you could only create package versions that matched the Salesforce release your Dev Hub org was on.

To create a package version based on a preview or previous Salesforce release version, create a scratch org definition file that includes either:

```
{
    "release": "previous"
}
```

or

```
{
    "release": "preview"
}
```

In the `sfdx-project.json` file, set the `sourceApiVersion` to correspond with the release version of the package version you're creating. If you are targeting a previous release, any `sourceApiVersion` value below the current release is accepted.

Then when you create your package version, specify the scratch org definition file.

```
sf package version create --package pkgA --definition-file config/project-scratch-def.json
```

Preview start date is when sandbox instances are upgraded. Preview end date is when all instances are on the GA release.

Release Version	Preview Start Date	Preview End Date
Spring '26	January 11, 2026	February 21, 2026
Summer '26	May 10, 2026	June 13, 2026
Winter '27	August 30, 2026	October 10, 2026

Guidance for Package Version Numbering

Use package versions to evolve your managed package, and release subsequent package versions without breaking existing package users. Every package version is a fixed snapshot of the package contents and related metadata.

While the format for package version number is predetermined, how you determine a version number, and whether you enforce uniqueness on package version numbers is left to package developers. The format for package version numbers is MAJOR.MINOR.PATCH.BUILD. Every package version has both a version number that you determine (for example, 2.2.0.1), and a unique subscriber package version ID (starts with 04t) that is auto-assigned when you create the package version.

Before you promote a particular MAJOR.MINOR.PATCH package version, it's possible to create multiple package versions that have unique 04t IDs, but all share the same version number, for example 2.2.0.1. There are a few approaches you can take to ensure each package version number is unique. Keep reading to learn more, but let's start by learning how to specify a package version number.

How Do I Specify the Package Version Number?

The `versionNumber` attribute in your `sfdx-project.json` project configuration file determines the version number that is assigned the next time you create a managed 2GP version. Before creating a new package version, you must manually increment this attribute in the project file. If you don't increment the versionNumber, then you can wind up with multiple package versions with the same version number, but unique subscriber package version IDs (starts with 04t).

```
{
   "namespace": "exp-mgr",
   "sfdcLoginUrl": "https://login.salesforce.com",
   "sourceApiVersion": "61.0",
   "packageDirectories": [
      {
         "path": "util",
         "default": true,
         "package": "Expense Manager - Util",
         "versionName": "Summer '24",
         "versionDescription": "Summer 2024 Expense Manager Util Package",
         "versionNumber": "2.2.0.1",
         "definitionFile": "config/scratch-org-def.json"
      },
```

Use the Keyword NEXT to Enforce Unique Build Numbers

As best practice, don't create multiple package versions that have the same MAJOR.MINOR.PATCH.BUILD version number. An easy way to ensure the build portion of your version number is unique is to use the keyword `NEXT` when you set the version number in your `sfdx-project.json` file. This way, you don't have to manually increment the version number when you want to create a new package version.

```
{
   "namespace": "exp-mgr",
   "sfdcLoginUrl": "https://login.salesforce.com",
   "sourceApiVersion": "61.0",
   "packageDirectories": [
      {
         "path": "util",
         "default": true,
         "package": "Expense Manager - Util",
         "versionName": "Summer `24",
         "versionDescription": "Summer 2024 Expense Manager Util Package",
         "versionNumber": "2.2.0.NEXT",
         "definitionFile": "config/scratch-org-def.json"
      },
```

Use the CLI Flag to Override a Package Version Number

You can also override the version number listed in your project file, by using the `--version-number` flag when you create a new package version.

```
sf package version create -p "my2gp" --version-number 2.2.0.NEXT <rest of command syntax>
```

By using the keyword NEXT with the `--version-number` flag in the CLI, you ensure the build portion of the version number is unique.

Note: Keep in mind, the `--version-number` flag doesn't update your `sfdx-project.json`. To keep the VersionNumber in the project file current, update it manually.

What Happens to Version Numbering After You Promote a Package Version?

After you promote a package version with a specific MAJOR.MINOR.PATCH version you can't continue to create package versions that use that same MAJOR.MINOR.PATCH version number. If you attempt to do so, you receive an error message.

How Do I Determine Whether to Use a New Major, Minor, or Patch Version?

While there are restrictions on what changes are allowed in a patch version, determining what qualifies as a major or minor change is largely up to you. When introducing major changes, increase the major version number, and increase the minor version number when making smaller improvements.

Code Coverage for Unlocked Packages

Before you can promote and release an unlocked package, the Apex code must meet a minimum 75% code coverage requirement. You can install package versions that don't meet code coverage requirements only in scratch orgs and sandboxes.

Important: Unlocked package versions that were promoted to the released state before Winter '21 aren't subject to code coverage requirements.

To compute code coverage using Salesforce CLI, use the `--code-coverage` parameter when you run the `sf package version create` command.

Package version creation can take longer to complete when code coverage is being computed, so consider when in the development cycle to include the code coverage parameter. You can choose to skip code coverage, and you can skip all validation by specifying the `--skip-validation` parameter. You can promote package versions only if they're validated and meet code coverage requirements.

View code coverage information for a package version using `sf package version list` with the `--verbose` parameter, or the `sf package version report` command in Salesforce CLI.

We don't calculate code coverage for org-dependent unlocked packages.

Considerations for Promoting Packages with Dependencies

If your company is developing a package that has a package dependency, ask yourself these questions before promoting (releasing) a new package version.

Are you:

- Developing the base and extension package in parallel?
- Specifying skip validation when creating new package versions?
- Using the keywords `LATEST` or `RELEASED` when specifying the package dependency?

If you answered no to all these questions, your package doesn't have any tricky dependency scenarios and you can promote it when it's ready. If you answered yes to any of these questions, keep reading.

Specifying Skip Validation

When you create a package version and specify skip validation, the version is created without validating dependencies, package ancestors, or metadata.

If you develop your base package using skip validation, test your extension package using either a stable and previously promoted version of the base package, or a non-skip validated base package version.

Most importantly, if you're developing a version of your base package and extension package in parallel, ensure that you:

- First promote the base package version.
- Then specify the promoted package version in the dependency section of your extension package using the keyword `RELEASED`.
- Finally, create the extension package version.

After testing the extension package version, you then promote it. This process ensures that the extension package version that you promote to the released state has as its dependency the promoted base package version.

Using the Keyword LATEST or RELEASED

A keyword is a variable that you can use to specify a package version number. The keyword `LATEST` maps to the most recently created package version, which might not be the same as the promoted and released package version.

The keyword `RELEASED` maps to the promoted and released package version.

For example: If you create versions 1.0.0.1, 1.0.0.2, and 1.0.0.3, and promote version 1.0.0.2, then 1.0.0.RELEASED = 1.0.0.2, but 1.0.0.LATEST = 1.0.0.3.

Example

Your company created a base package called PkgBase, and an extension package called PkgExtn.

PkgBase is under active development, and the development team is creating versions that specify `--skip-validation`.

PkgExtn version 2.3 is under active development and references its dependency on PkgBase by using the following definition in the `sfdx-project.json`.

```
  {
        "path": "pkg-extension",
        "default": false,
        "package": "PkgExtn",
        "versionName": "v 2.3",
        "versionDescription": "Winter 2025",
        "versionNumber": "2.3.0.NEXT",
        "dependencies": [
           {
              "package": "PkgBase",
              "versionNumber": "1.1.0.LATEST"

           },
```

Before promoting version 2.3 of PkgExtn, you must test it using the promoted version 1.1.0 of PkgBase. Update the PkgExtn dependency section of your `sfdx-project.json` and change the dependency from 1.1.0.LATEST to 1.1.0.RELEASED. If the tests succeed, then create a new version of PkgExtn and ensure it works as expected with the promoted base package version.

Release an Unlocked Package

Each new package version is marked as beta when its created. As you develop your package, you may create several package versions before you create a version that is ready to be released and installed in production orgs.

Before you promote the package version, ensure that the user permission, **Promote a package version to released**, is enabled in the Dev Hub org associated with the package. Consider creating a permission set with this user permission, and then assign the permission set to the appropriate user profiles.

When you're ready to release, use `sf package version promote`.

```
sf package version promote --package "Expense Manager@1.3.0-7"
```

If the command is successful, a confirmation message appears.

```
Successfully promoted the package version, ID: 04tB0000000719qIAA to released.
```

After the update succeeds, view the package details.

```
sf package version report --package "Expense Manager@1.3.0.7"
```

Confirm that the value of the Released property is `true`.

```
=== Package Version
NAME                            VALUE
──────────────────────────────  ────────────────────
Name                            ver 1.0
Alias                           Expense Manager-1.0.0.5
Package Version Id              05iB0000000CaahIAC
Package Id                      0HoB0000000CabmKAC
```

```
Subscriber Package Version Id   04tB0000000NPbBIAW
Version                         1.0.0.5
Description                     update version
Branch
Tag                             git commit id 08dcfsdf
Released                        true
Created Date                    2018-05-08 09:48
Installation URL
https://login.salesforce.com/packaging/installPackage.apexp?p0=04tB0000000NPbBIAW
```

You can promote and release only once for each package version number, and you can't undo this change.

Update an Unlocked Package Version

You can update most properties of a package version from the command line. For example, you can change the package version name or description. One important exception is that you can't change the release status.

If the most recent package version has been released, increment either the major, minor, or patch version number for the next package version you create.

Package version numbers use the format major.minor.patch.build. For example, if you released package 1.0.0.2, you could use 1.1.0.0, 2.0.0.0, or 1.0.1.0 for the next package version.

Example:

```
sf package version update --package "Your Package Alias"
```

Hard-Deleted Components in Unlocked Packages

When these components are removed from an unlocked package, they're hard deleted from the target install org during the package upgrade.

- AccountForecastSettings
- AcctMgrTargetSettings
- ActionableListDefinition
- ActionPlanTemplate
- AccountingFieldMapping
- AccountingModelConfig
- AdvAccountForecastSet
- AdvAcctForecastDimSource
- AdvAcctForecastPeriodGroup
- AIApplicationConfig
- AIUsecaseDefinition
- AnalyticSnapshot
- ApexClass
- ApexComponent
- ApexPage
- ApexTrigger
- ApplicationRecordTypeConfig

- ApplicationSubtypeDefinition
- AppointmentAssignmentPolicy
- AssessmentQuestion
- AssessmentQuestionSet
- AssistantContextItem
- AssistantSkillQuickAction
- AssistantSkillSobjectAction
- AssistantVersion
- AuraDefinitionBundle
- BatchCalcJobDefinition
- BatchProcessJobDefinition
- BenefitAction
- BldgEnrgyIntensityCnfg
- BrandingSet
- BriefcaseDefinition
- BusinessProcessGroup
- BusinessProcessTypeDefinition
- CareBenefitVerifySettings
- CareLimitType
- CareProviderSearchConfig
- CareRequestConfiguration
- ChannelObjectLinkingRule
- ClaimFinancialSettings
- ClauseCatgConfiguration
- CompactLayout
- ContractType
- ConversationVendorInfo
- CustomApplication
- CustomPageWebLink
- CustomPermission
- CustomTab
- Dashboard
- DecisionMatrixDefinition
- DecisionMatrixDefinitionVersion
- DecisionTable
- DecisionTableDatasetLink
- DisclosureDefinition
- DisclosureDefinitionVersion
- DisclosureType
- DiscoveryAIModel

- DiscoveryGoal
- Document
- DocumentGenerationSetting
- DocumentType
- EmailServicesFunction
- EmailTemplate
- EmbeddedServiceBranding
- EmbeddedServiceConfig
- EmbeddedServiceLiveAgent
- EmbeddedServiceMenuSettings
- ESignatureConfig
- ESignatureEnvelopeConfig
- ExplainabilityActionDefinition
- ExplainabilityActionVersion
- ExplainabilityMsgTemplate
- ExpressionSetDefinition
- ExpressionSetDefinitionVersion
- ExpressionSetObjectAlias
- ExternalAIModel
- ExternalClientApplication
- ExtlClntAppMobileSettings
- ExtlClntAppOauthSettings
- ExternalDataSrcDescriptor
- ExternalServiceRegistration
- FeatureParameterBoolean
- FeatureParameterDate
- FeatureParameterInteger
- FieldRestrictionRule
- FieldServiceMobileExtension
- FlexiPage
- Flow
- FuelType
- FuelTypeSustnUom
- GatewayProviderPaymentMethodType
- HomePageComponent
- HomePageLayout
- IdentityVerificationProcDef
- InstalledPackage
- IntegrationHubSettings
- IntegrationHubSettingsType

- IntegrationProviderDef
- Layout
- Letterhead
- LicenseDefinition
- LightningComponentBundle
- LightningExperienceTheme
- LightningMessageChannel
- LightningOnboardingConfig
- ListView
- LiveChatAgentConfig
- LiveChatButton
- LiveChatSensitiveDataRule
- LocationUse
- LoyaltyProgramSetup
- MarketingAppExtActivity
- MarketingAppExtension
- MatchingRule
- MfgProgramTemplate
- MLDataDefinition
- MLPredictionDefinition
- NamedCredential
- NetworkBranding
- ObjectHierarchyRelationship
- OcrSampleDocument
- OcrTemplate
- OmniDataTransform
- OmniIntegrationProcedure
- OmniScript
- OmniUiCard
- PaymentGatewayProvider
- PermissionSet
- PermissionSetGroup
- PermissionSetLicense
- PipelineInspMetricConfig
- PlatformEventSubscriberConfig
- ProductAttributeSet
- ProductSpecificationTypeDefinition
- Profile
- QuickAction
- RecordAlertCategory

- RecordAlertDataSource
- RegisteredExternalService
- RelatedRecordAssocCriteria
- RelationshipGraphDefinition
- RemoteSiteSetting
- Report
- ReportType
- RestrictionRule
- SalesAgreementSettings
- SchedulingRule
- SchedulingObjective
- ScoreCategory
- ServiceAISetupDefinition
- ServiceAISetupField
- ServiceProcess
- SharingReason
- SharingRecalculation
- SlackApp
- StaticResource
- StnryAssetEnvSrcCnfg
- SustainabilityUom
- SustnUomConversion
- SvcCatalogCategory
- SvcCatalogFulfillmentFlow
- SvcCatalogItemDef
- TimelineObjectDefinition
- UIObjectRelationConfig
- UserAccessPolicy
- UserLicense
- UserProfileSearchScope
- ValidationRule
- VehicleAssetEmssnSrcCnfg
- ViewDefinition
- VirtualVisitConfig
- WaveApplication
- WaveComponent
- WaveDashboard
- WaveDataflow
- WaveDataset
- WaveLens

- WaveRecipe
- WaveTemplateBundle
- WaveXmd
- WebLink
- WebStoreTemplate
- WorkflowAlert
- WorkflowFieldUpdate
- WorkflowFlowAction
- WorkflowOutboundMessage
- WorkflowRule
- WorkflowTask

All other components are marked as deprecated when removed from an unlocked package. An admin can choose to remove deprecated components. If the package is uninstalled, all components, including the deprecated components previously associated with the package, are deleted from the org.

Delete an Unlocked Package or Package Version

Use the `sf package version delete` and `sf package delete` to delete packages and package versions that you no longer need.

To delete a package or package version, users need the Delete Second-Generation Packages user permission. Before you delete a package, first delete all associated package versions.

Package Type	Can I delete beta packages and package versions?	Can I delete released packages and package versions?
Second-Generation Managed Packages	Yes	No
Unlocked Packages	Yes	Yes

Considerations for Deleting a Package or Package Version

- Deletion is permanent.
- Attempts to install a deleted package version will fail.
- Before deleting, ensure that the package or package version isn't referenced as a dependency.

Examples:

```
$ sf package delete -p "Your Package Alias"
```

```
$ sf package delete -p 0Ho...
```

```
$ sf package version delete -p "Your Package Version Alias"
```

```
$ sf package version delete -p 04t...
```

These CLI commands can't be used with first-generation managed packages or package versions. To delete a first-generation managed package, see View Package Details in the *First-Generation Managed Packaging Developer Guide*.

View Package Details

View the details of previously created packages and package versions from the command line.

To display a list of all packages in the Dev Hub org, use this command.

```
sf package list --target-dev-hub my-hub
```

You can view the namespace, package name, ID, and other details in the output.

```
Name              Id                  Alias           Description  Type
________________  __________________  ______________  ___________  __________  _______
Expenser App      0HoB00000004CzRKAU  Expenser App                 Unlocked
Expenser Logic    0HoB00000004CzMKAU  Expenser Logic               Unlocked
Expenser Schema   0HoB00000004CzHKAU  Expenser Schema              Unlocked
```

Include optional parameters to filter the list results based on the modification date, creation date, and to order by specific fields or package IDs. To limit the details, use `--concise`. To show expanded details, use `--verbose`.

To display a list of all package versions in the Dev Hub org, use this command.

```
sf package version list --target-dev-hub my-hub
```

You can view the namespace, version name, and other details in the output.

```
Package Name      Namespace  Version  Sub Pkg Ver Id       Alias
Installation Key  Released
________________  _________  _______  __________________  ________________________
__________________  ________
Expenser Schema             0.1.0.1  04tB0000000719qIAA   Expenser Schema@0.1.0-1   false
            true
Expenser Schema             0.2.0.1  04tB000000071AjIAI   Expenser Schema@0.2.0-1   false
            true
Expenser Schema             0.3.0.1  04tB000000071AtIAI   Expenser Schema@0.3.0-1   false
            false
Expenser Schema             0.3.0.2  04tB000000071AyIAI   Expenser Schema@0.3.0-2   false
            true
Expenser Schema             0.3.1.1  04tB0000000KGU6IAO   Expenser Schema@0.3.1-1   false
            false
Expenser Schema             0.3.1.2  04tB0000000KGUBIA4   Expenser Schema@0.3.1-2   false
            true
Expenser Schema             0.3.2.1  04tB0000000KGUQIA4   Expenser Schema@0.3.2-1   false
            true
Expenser Logic              0.1.0.1  04tB0000000719vIAA   Expenser Logic@0.1.0-1    false
            true
Expenser App                0.1.0.1  04tB000000071A0IAI   Expenser App@0.1.0-1      false
            true
```

Push a Package Upgrade for Unlocked Packages

Push upgrades enable you to upgrade packages installed in orgs, without asking org admins to install the upgrade themselves. You can choose which orgs receive a push upgrade, what version the package is upgraded to, and when you want the upgrade to occur. Push upgrades are particularly helpful if you need to push a change for a hot bug fix.

Use Salesforce CLI or SOAP API to initiate the push upgrade, track the status of each job, and review error messages if any push upgrades fail.

The CLI push upgrade commands are available to second-generation managed packages and unlocked packages. For unlocked packages, push upgrades are enabled by default.

Table 5: Package Types and Push Upgrade Options

Package Type	Push Upgrade using CLI?	Push Upgrade using API?	Push Upgrade using UI?
2GP	Yes	Yes	No
1GP	No	Yes	Yes
Unlocked	Yes	Yes	No

Push Upgrade Considerations for Unlocked Packages

- You can include new and changed features, or remove features during a push upgrade.
- When a push upgrade is installed, the Apex in the package is compiled.
- You can use push upgrades even if the package version requires a password.

Schedule a Push Upgrade Using CLI
Use Salesforce CLI commands to schedule, abort, or view details about your push upgrade requests. Push upgrades let you upgrade second-generation managed packages installed in subscriber orgs, without asking customers to install the upgrade themselves.

Schedule a Push Upgrade Using CLI

Use Salesforce CLI commands to schedule, abort, or view details about your push upgrade requests. Push upgrades let you upgrade second-generation managed packages installed in subscriber orgs, without asking customers to install the upgrade themselves.

The push upgrade feature is available to unlocked packages and second-generation managed packages only. To push a package upgrade for a second-generation managed package, that package must have already passed the AppExchange security review.

Push upgrades for unlocked packages are enabled by default. To enable push upgrades for your second-generation managed package, log a case with Salesforce Partner Support.

To initiate a push upgrade for an unlocked or second-generation managed package, the Create and Update Second-Generation Packages user permission is required.

There are several aspects to scheduling a push upgrade for a package. At a high-level these include:

- Identifying the subscriber orgs and the org IDs that you want to upgrade
- Scheduling the push upgrade
- Tracking the progress and completion of the push upgrade

In some scenarios you may also need to abort a scheduled push upgrade, or analyze errors that occurred. Let's review each of these steps in more detail.

Determine the Orgs to Be Upgraded

There isn't a dedicated `push-upgrade` CLI command for this action, instead let's look at how to use the CLI `data query` command.

Push upgrades must be done in the context of the Dev Hub org that owns the package. To confirm the set of packages owned by a specific Dev Hub org, run the `package list` command.

Then authorize to the Dev Hub org that is the owner of the package are upgrading.

```
sf org login web --set-default-dev-hub
```

If you're preparing to push a package upgrade, we assume your development environment is set up, if you aren't certain, review Set Up Your Development Environment.

Here are three example queries you can use to retrieve a list of subscriber orgs that are eligible for a package upgrade. To review the possible fields that can be queried, see PackageSubscriber in the *Object Reference for the Salesforce Platform*.

Each query requires either a subscriber package ID (starts with 033), or a subscriber package version ID (starts with 04t). To retrieve the subsciber package ID, use the package list command and specify the `--verbose` flag. To retrieve the subscriber package version ID, use the package version list command.

Query Example 1:

Compile a list of all orgs that have a specific package installed. This query requires the subscriber package ID (starts with 033).

```
sf data query --target-org myDevHub --query "SELECT OrgKey, OrgName, OrgType, InstanceName,
 MetadataPackageId, MetadataPackageVersionId FROM PackageSubscriber WHERE MetadataPackageId
 = '033xxxxxxxxxxxxx'" --result-format json
```

If you copy and paste this query, update the target org and the subscriber package ID, before running the command. The target org is the Dev Hub org that owns the package. Specify either the username or alias for the Dev Hub org.

Query Example 2:

Compile a list of orgs that have a specific package version installed, and pipe that output to a CSV file.

```
sf data query --target-org myDevHub --query "SELECT OrgKey, OrgName, OrgType FROM
PackageSubscriber WHERE MetadataPackageVersionId = '04t…'" --result-format csv
```

If you copy and paste this query, update the target org and the subscriber package version ID, before running the command. The target org is the Dev Hub org that owns the package. Specify either the username or alias for the Dev Hub org.

This query returns as CSV file that you can use when scheduling the push upgrade. Before specifying the file in the `package push-upgrade schedule` command, remove the first line of the CSV file. The CSV file can contain one org ID per line only.

Query Example 3:

Compile a list of all orgs that have a package version lower than version 2.7 installed. This query requires two separate steps.

> **Note:** A single package has both a package ID (starts with 0Ho) and a subscriber package ID (starts with 033). For part one of this two-part query, you must specify the 0Ho ID. If you run the `package list` command with the `--verbose` flag, you can determine both the 033 and 0Ho ID for a package. For more details on package IDs, see Package IDs and Aliases for Second-Generation Managed Packages.

First, query the Package2Version object to find all versions of your package that are numerically lower than the specified version (2.7).

```
sf data query --target-org admin@packaging.com --use-tooling-api --query "SELECT
SubscriberPackageVersionId FROM Package2Version WHERE Package2Id = '0HoPACKAGEIDxxxx' AND
 (MajorVersion < 2 OR (MajorVersion = 2 AND MinorVersion < 7))"
```

If you copy and paste this query, update the target org, the Package ID (starts with 0Ho), and the major and minor version before running the command. The target org is the Dev Hub org that owns the package. Specify either the username or alias for the Dev Hub org.

Note the `SubscriberPackageVersionId` values (starts with 04t) returned by this query.

Next, query the PackageSubscriber object using the subscriber package version IDs (starts with 04t) from the previous step.

```
sf data query --target-org myDevHub --query "SELECT OrgKey FROM PackageSubscriber WHERE
MetadataPackageVersionId IN ('04tID1', '04tID2', '04tID_etc')" --result-format csv >out.txt
```

If you copy and paste this query, update the target org and the subscriber package version IDs (starts with 04t) before running the command. The target org is the Dev Hub org that owns the package. Specify either the username or alias for the Dev Hub org.

If you created a CSV file in this step and plan to use the file to schedule your push upgrade, you must remove the first line of the file so that it contains a list of org IDs only.

Schedule a Package Push Upgrade

After you have the org IDs for the subscribers you're upgrading, you can schedule the push upgrade. Review these examples of the flags you might include with the `package push-upgrade schedule` command. For more details on this command, see the Salesforce CLI Command Reference.

When scheduling a push upgrade you have a choice about how to specify the orgs you want upgraded. You can use either flag:

- `--org-file` and provide a CSV file of all the orgs to be upgraded, or
- `--org-list` and specify a comma-separated list of org IDs in the command line when you run the push upgrade CLI command

If using a org file, it must contain one org ID per line only.

Examples for package push-upgrade schedule

Schedule a push upgrade that initiates at a specified time with a list of org IDs:

```
sf package push-upgrade schedule --package 04txyz --start-time "2024-12-06T21:00:00"
--org-list 00DAxx, 00DBx
```

Schedule a push upgrade that initiates as soon as possible using a list of orgs in a CSV file:

```
sf package push-upgrade schedule --package 04txyz --org-file upgrade-orgs.csv
```

Note: If you don't specify the `--start-time` flag, the push upgrade begins as soon as resources are available. When specfiying a start time, schedule during off peak hours. Specify start time in UTC.

Retrieve Details about Scheduled Package Push Upgrades

Use the `package push-upgrade list` or `package push-upgrade report` commands to retrieve details about push upgrades that have been scheduled or completed for a package.

Examples for `package push-upgrade list`:

List all package push upgrade requests for a specified package:

```
sf package push-upgrade list --package 033xyz --target-dev-hub myDevHub
```

List all package push upgrade requests for a specified package scheduled in the last 30 days:

```
sf package push-upgrade list --package 033xyz --scheduled-last-days 30 --target-dev-hub
myDevHub
```

List all package push upgrade requests with a status of Failed. This status occurs if the push upgrade fails for one or more orgs.

```
sf package push-upgrade list --package 033xyz --status Failed
```

List all package push upgrade requests with a status of Succeeded:

```
sf package push-upgrade list --package 033xyz --status Succeeded
```

Generate a report about a specific push upgrade request:

```
sf package push-upgrade report --push-request-id 0DVxyz --target-dev-hub myDevHub
```

The `package push-upgrade list` command displays these fields: push request ID, package version ID, package version number, status of the push upgrade request, push upgrade request scheduled start date and time, the number of orgs scheduled for push upgrade, the number of orgs that were successfully upgraded, the number of orgs that failed to be upgraded, and push upgrade request created date and time.

The `package push-upgrade report` command provides additional information, including error details.

Cancel a Pending Package Push Upgrade Request

If your push upgrade request has a status of either `Created` or `Pending` you can cancel the push upgrade by running the `package push-upgrade abort` command. To retrieve the status of your push upgrade request, run either `package push-upgrade list` or `package push-upgrade report`.

To cancel a specified push upgrade request:

```
sf package push-upgrade abort --push-request-id 0DVxyz
```

Retrieve Error Messages for a Package Push Upgrade

There isn't a dedicated push upgrade CLI command for this retrieving error message, instead let's look at how to use the CLI `data query` command. Use this example query to retrieve error messages stored in the PackagePushError object.

Example:

```
sf data query --query "SELECT Id, PackagePushJobId, PackagePushJob.SubscriberOrganizationKey,
 ErrorDetails, ErrorMessage, ErrorSeverity, ErrorTitle, ErrorType FROM PackagePushError
WHERE PackagePushJob.PackagePushRequestId='$PUSH_REQUEST_ID'" --target-org myDevHub
```

Install an Unlocked Package

Install unlocked packages using the CLI or the browser. You can install package versions in a scratch org, sandbox org, DE org, or production org.

Install Packages with the CLI

If you're working with the Salesforce CLI, you can use the `sf package install` command to install packages in a scratch org or target subscriber org.

Install Unlocked Packages from a URL

Install unlocked packages from the CLI or from a browser, similar to how you install managed packages.

Upgrade a Version of an Unlocked Package

A package upgrade occurs when you install a new package version into an org that has a previous version of that package installed.

Sample Script for Installing Unlocked Packages with Dependencies

Use this sample script as a basis to create your own script to install packages with dependencies. This script contains a query that finds dependent packages and installs them in the correct dependency order.

Install Packages with the CLI

If you're working with the Salesforce CLI, you can use the `sf package install` command to install packages in a scratch org or target subscriber org.

Before you install a package to a scratch org, run this command to list all the packages and locate the ID or package alias.

```
sf package version list
```

Identify the version you want to install. Enter this command, supplying the package alias or package ID (starts with 04t).

```
sf package install --package "Expense Manager@1.2.0-12" --target-org jdoe@example.com
```

By default, the package install command provides admins access to the installed package. To provide access to all users, specify `--security-type AllUsers` when you run the package install command.

If you've already set the scratch org with a default username, enter just the package version ID.

```
sf package install --package "Expense Manager@1.2.0-12"
```

Note: If you've defined an alias (with the `-a` parameter), you can specify the alias instead of the username for `--target-org`.

The CLI displays status messages regarding the installation.

```
Waiting for the subscriber package version install request to get processed. Status =
InProgress Successfully installed the subscriber package version: 04txx0000000FIuAAM.
```

Control Package Installation Timeouts

When you issue a `sf package install` command, it takes a few minutes for a package version to become available in the target org and for installation to complete. To allow sufficient time for a successful install, use these parameters that represent mutually exclusive timers.

- `--publish-wait` defines the maximum number of minutes that the command waits for the package version to be available in the target org. The default is 0. If the package is not available in the target org in this time frame, the install is terminated.

  Setting `--publish-wait` is useful when you create a new package version and then immediately try to install it to target orgs.

  Note: If `--publish-wait` is set to 0, the package installation immediately fails, unless the package version is already available in the target org.

- `--wait` defines the maximum number of minutes that the command waits for the installation to complete after the package is available. The default is 0. When the `--wait`interval ends, the install command completes, but the installation continues until it either fails or succeeds. You can poll the status of the installation using `sf package install report`.

  Note: The `--wait` timer takes effect after the time specified by `--publish-wait` has elapsed. If the `--publish-wait` interval times out before the package is available in the target org, the `--wait` interval never starts.

For example, consider a package called Expense Manager that takes five minutes to become available on the target org, and 11 minutes to install. The following command has `publish-wait` set to three minutes and `wait` set to 10 minutes. Because Expense Manager requires more time than the set `publish-wait` interval, the installation is aborted at the end of the three-minute `publish-wait` interval.

```
sf package install --package "Expense Manager@1.2.0-12" --publish-wait 3 --wait 10
```

The following command has `publish-wait` set to six minutes and `wait` set to 10 minutes. If not already available, Expense Manager takes five minutes to become available on the target org. The clock then starts ticking for the 10-minute `wait` time. At the

end of 10 minutes, the command completes because the `wait` time interval has elapsed, although the installation is not yet complete. At this point, `sf package install report` indicates that the installation is in progress. After one more minute, the installation completes and `sf package install report` indicates a successful installation.

```
sf package install --package "Expense Manager@1.2.0-12" --publish-wait 6 --wait 10
```

SEE ALSO:

Salesforce CLI Command Reference package install

Salesforce Help: Determine Which Users Can Access a Package

Install Unlocked Packages from a URL

Install unlocked packages from the CLI or from a browser, similar to how you install managed packages.

If you create packages from the CLI, you can derive an installation URL for the package by adding the subscriber package ID to your Dev Hub URL. You can use this URL to test different deployment or installation scenarios.

For example, if the package version has the subscriber package ID, 04tB00000009oZ3JBI, add the ID as the value of apvId.

`https://MyDomainName.lightning.force.com/packagingSetupUI/ipLanding.app?apvId=04tB00000009oZ3JBI`

Anyone with the URL and a valid login to a Salesforce org can install the package.

To install the package:

1. In a browser, enter the installation URL.
2. Enter your username and password for the Salesforce org in which you want to install the package, and then click **Login**.
3. If the package is protected by an installation key, enter the installation key.
4. For a default installation, click **Install**.

   A message describes the progress. You receive a confirmation message when the installation is complete.

SEE ALSO:

Salesforce Help: Determine Which Users Can Access a Package

Upgrade a Version of an Unlocked Package

A package upgrade occurs when you install a new package version into an org that has a previous version of that package installed.

To upgrade a package, use the package install CLI command

```
sf package install --package 04t... --target-org me@example.com
```

For more examples and details about this command, see package install in the *Salesforce CLI Command Reference*.

When you perform a package upgrade, here's what to expect for metadata changes.

When you upgrade to a new unlocked package version, you choose whether to require successful compilation of all Apex in the org and package (`--apex-compile all`), or only the Apex in the package (`--apex-compile package`).

- Metadata introduced in the new version is installed as part of the upgrade.
- If an upgraded component has the same API name as a component already in the target org, the component is overwritten with the changes.
- If a component in the upgrade was deleted from the target org, the component is re-created during the upgrade.

- Metadata that was removed in the new package version is also removed from the target org as part of the upgrade. Removed metadata is metadata not included in the current package version install, but present in the previous package version installed in the target org. If metadata is removed before the upgrade occurs, the upgrade proceeds normally. Some examples where metadata is deprecated and not deleted are:
  - User-entered data in custom objects and fields are deprecated and not deleted. Admins can export such data if necessary.
  - An object such as an Apex class is deprecated and not deleted if it's referenced in a Lightning component that is part of the package.
- In API version 45.0 and later (Salesforce CLI version 45.0.9 or later), you can specify what happens to removed metadata during package upgrade. Use the `sf package install` command's `-t | --upgrade-type` parameter, specifying one of these values:
  - `Delete` specifies to delete all removed components, except for custom objects and custom fields, that don't have dependencies.
  - `DeprecateOnly` specifies that all removed components must be marked deprecated. The removed metadata exists in the target org after package upgrade, but is shown in the UI as deprecated from the package. This option is useful when migrating metadata from one package to another.
  - `Mixed` (the default) specifies that some removed components are deleted, and other components are marked deprecated. For more information on hard-deleted components, see Hard-Deleted Components in Unlocked Packages.

It's possible to install a lower package version on top of a higher package version, but seriously consider this scenario before attempting it. This is not the same as a rollback, which isn't possible.

Note: For package installs into production orgs, or any org that has Apex Compile on Deploy enabled, the platform compiles all Apex in the org after the package install or upgrade operation completes. This approach assures that package installs and upgrades don't impact the performance of an org, and is done even if `--apex-compile package` is specified.

Sample Script for Installing Unlocked Packages with Dependencies

Use this sample script as a basis to create your own script to install packages with dependencies. This script contains a query that finds dependent packages and installs them in the correct dependency order.

Sample Script

Note: Be sure to replace the package version ID and scratch org user name with your own specific details.

```
#!/bin/bash


# The execution of this script stops if a command or pipeline has an error.

# For example, failure to install a dependent package will cause the script

# to stop execution.

set -e


# Specify a package version id (starts with 04t)

# If you know the package alias but not the id, use sf package version list to find it.
```

```
PACKAGE=04tB0000000NmnHIAS


# Specify the user name of the subscriber org.

USER_NAME=test-bvdfz3m9tqdf@example.com


# Specify the timeout in minutes for package installation.

WAIT_TIME=15


echo "Retrieving dependencies for package Id: "$PACKAGE


# Execute soql query to retrieve package dependencies in json format.

RESULT_JSON=`sf data query -u $USER_NAME -t -q "SELECT Dependencies FROM
SubscriberPackageVersion WHERE Id='$PACKAGE'" --json`


# Parse the json string using python to test whether the result json contains a list of
ids or not.

DEPENDENCIES=`echo $RESULT_JSON | python -c 'import sys, json; print
json.load(sys.stdin)["result"]["records"][0]["Dependencies"]'`


# If the parsed dependencies is None, the package has no dependencies. Otherwise, parse
the result into a list of ids.

# Then loop through the ids to install each of the dependent packages.

if [[ "$DEPENDENCIES" != 'None' ]]; then


    DEPENDENCIES=`echo $RESULT_JSON | python -c '

import sys, json

ids = json.load(sys.stdin)["result"]["records"][0]["Dependencies"]["ids"]

dependencies = []

for id in ids:

    dependencies.append(id["subscriberPackageVersionId"])

print " ".join(dependencies)

'`
```

```
    echo "The package you are installing depends on these packages (in correct dependency
 order): "$DEPENDENCIES

    for id in $DEPENDENCIES

    do

        echo "Installing dependent package: "$id

        sf package install --package $id -u $USER_NAME -w $WAIT_TIME --publish-wait 10

    done


else

    echo "The package has no dependencies"


fi


# After processing the dependencies, proceed to install the specified package.

echo "Installing package: "$PACKAGE

sf package install --package $PACKAGE -u $USER_NAME -w $WAIT_TIME --publish-wait 10


exit 0;
```

Migrate Deprecated Metadata from Unlocked Packages

You can deprecate metadata in an unlocked package, move that metadata to a new package, and then install the new package in your production org.

As you create more unlocked packages, you can refactor your package and move metadata from one unlocked package to another unlocked package if necessary.

To move production metadata from package A to package B, follow these steps.

1. Identify the metadata to be moved from package A to package B.
2. Remove the metadata from package A, create a version, and release the package.
3. Add the metadata to package B, create a version, and release the package.
4. In your production org, upgrade package A.
5. In your production org, install package B.

Your metadata is now a part of package B in your production org.

Uninstall an Unlocked Package

You can uninstall a package from an org using Salesforce CLI or from the Setup UI. When you uninstall unlocked packages, all components in the package, as well as any deprecated components previously associated with the package, are deleted from the org.

To use the CLI to uninstall a package from the target org, authorize the Dev Hub org and run this command.

```
sf package uninstall --package "Expense Manager@2.3.0-5"
```

You can also uninstall a package from the web browser. Open the Salesforce org where you installed the package.

```
sf org open -u me@my.org
```

Then uninstall the package.

1. From Setup, enter *Installed Packages* in the Quick Find box, then select **Installed Packages**.
2. Click **Uninstall** next to the package that you want to remove.
3. Determine whether to save and export a copy of the package's data, and then select the corresponding radio button.
4. Select **Yes, I want to uninstall** and click **Uninstall**.

Considerations on Uninstalling Packages

- If you're uninstalling a package that includes a custom object, all components on that custom object are also deleted. Deleted items include custom fields, validation rules, custom buttons, and links, workflow rules, and approval processes.
- You can't uninstall a package whenever a component not included in the uninstall references any component in the package. For example:
  - When an installed package includes any component on a standard object that another component references, Salesforce prevents you from uninstalling the package. An example is a package that includes a custom user field with a workflow rule that gets triggered when the value of that field is a specific value. Uninstalling the package would prevent your workflow from working.
  - When you've installed two unrelated packages that each include a custom object and one custom object component references a component in the other, you can't uninstall the package. An example is if you install an expense report app that includes a custom user field and create a validation rule on another installed custom object that references that custom user field. However, uninstalling the expense report app prevents the validation rule from working.
  - When an installed folder contains components you added after installation, Salesforce prevents you from uninstalling the package.
  - When an installed letterhead is used for an email template you added after installation, Salesforce prevents you from uninstalling the package.
  - When an installed package includes a custom field that's referenced by Einstein Prediction Builder or Case Classification, Salesforce prevents you from uninstalling the package. Before uninstalling the package, edit the prediction in Prediction Builder or Case Classification so that it no longer references the custom field.
- You can't uninstall a package that removes all active business and person account record types. Activate at least one other business or person account record type, and try again.
- You can't uninstall a package if a background job is updating a field added by the package, such as an update to a roll-up summary field. Wait until the background job finishes, and try again.

Transfer an Unlocked Package to a Different Dev Hub

You can transfer the ownership of an unlocked package from one Dev Hub org to another.

Note: This package transfer feature is available only to unlocked packages and second-generation managed packages. Dev Hub orgs aren't used with first-generation managed packages or unmanaged packages, so this feature doesn't apply to those package types.

Request a Package Transfer to a Different Dev Hub

Start by logging a case with Salesforce Customer Support, and provide the following details:

`Subject:` Unlocked Package Transfer to a different Dev Hub

`Description:`

In the description, list:

- Subscriber package ID of the package you're transferring. This ID starts with 033.

  To verify the 033 ID of your package, run the `sf package list` command with the `--verbose` flag on the source Dev Hub org.

- Dev Hub org ID for the source org.
- Dev Hub org ID for the destination org. The destination Dev Hub org can't be a Developer Edition org or a trial org.
- (Optional) Namespace of the package being transferred. If the package is a no-namespace unlocked package, skip this step.
- Acknowledge that you've reviewed and completed the steps listed in the `Prepare to Transfer Your Package` section, including linking your namespace to the destination Dev Hub, and clearing your Apex Error Notification User.

If you're transferring more than one package, file a separate case for each package.

After your case has been reviewed and approved, someone from Salesforce Customer Support will contact you to arrange a time to initiate the package transfer.

Note: For security reasons, package transfers between a Dev Hub located in Government Cloud and a Dev Hub located outside Government Cloud aren't permitted.

Prepare to Transfer Your Package

Here's how you can help ensure a smooth package transfer.

- If the package you're transferring has a namespace, keep the namespace linked to the source Dev Hub. Before the package transfer, the namespace must be linked to both the source and destination Dev Hub orgs.
- Before the package transfer process is initiated, ensure all push upgrades or package version creation processes have completed.
- Delete package versions that are no longer needed.
- If specified, clear the package's Error Notification User using the `sf package update --error-notification-username=` command. If you're transferring the package to a Dev Hub org you own, you can set the Error Notification User to a user in the destination Dev Hub after the package transfer is complete. Note: Specifying `--error-notification-username=` with no value after the equals sign clears any previously set username.

During the Package Transfer Process

All push upgrades or package version creation processes must be complete before the package transfer process is initiated. Salesforce Customer Support will alert you about the date the package transfer will occur.

After the Package Transfer Is Complete

Run `sf package list` and verify that the package is no longer associated with your Dev Hub.

Impact of Package Transfers on Package IDs

ID Type	ID starts with	After package transfer is complete ...
Subscriber Package ID	033	This ID remains the same.
Subscriber Package Version ID	04t	This ID remains the same.
Package ID	0Ho	The transferred package receives a new and unique package ID.

Update Your Package Project File

Before you create new packages or package versions on your Dev Hub, update your `sfdx-project.json` file and remove all references to the transferred package from the package directory and package alias sections.

If you have packages in your Dev Hub that depend on the package that you're transferring, update the package dependency section in your `sfdx-project.json` file to explicitly specify the 04t ID of the transferred package that you depend on.

For example, if you transferred pkgA to a different Dev Hub, and your `sfdx-project.json` file lists the package dependency like this.

```
"dependencies": [
   {
      "package": "pkgA"
      "versionNumber": "2.0.0.LATEST"
   }
]
```

Update the dependency to either specify the 04t ID of pkgA.

```
"dependencies": [
   {
      "package": "04tB0000000UzH5IAK"
   }
]
```

Or specify the dependency using a package alias.

```
"dependencies": [
   {
      "package": "pkgA2.0.0-1"
   }
"packageAliases": {
     "pkgA2.0.0-1": "04tB0000000UzH5IAK"
}
]
```

What Package History Is Transferred?

When a package is transferred, all package versions, and all lines of ancestry are transferred. Upgrade paths aren't affected.

Regardless of whether the package transfer occurred between two Dev Hub orgs you own, or the package was transferred externally to a Dev Hub you don't own, we transfer the package version history.

We transfer:

- Package name, namespace, type, and IDs. One exception is that the transferred package gets a new 0Ho ID.
- Package version info. This includes all the info that is typically displayed when you run the `sf package version list` or `sf package version report` command.

We don't transfer:

- Push upgrade history.
- Package version create requests.
- The username of the Dev Hub user who received Apex and other types of error notifications. This optional user is set using `--error-notification-username`.
- Deleted package versions.

Take Ownership of an Unlocked Package Transferred from a Different Dev Hub
You can take ownership of an unlocked package that is transferred from another Dev Hug org.

Take Ownership of an Unlocked Package Transferred from a Different Dev Hub

You can take ownership of an unlocked package that is transferred from another Dev Hug org.

To initiate a package transfer from your Dev Hub org, see Transfer an Unlocked Package to a Different Dev Hub.

Note: For security reasons, package transfers between a Dev Hub located in Government Cloud and a Dev Hub located outside Government Cloud aren't permitted.

Receive a Package Transfer

Link the namespace of the package you're receiving to your Dev Hub org. See Link a Namespace to a Dev Hub Org in the *Salesforce DX Developer Guide*. If the package isn't associated with a namespace, skip this step.

After the Package Transfer Is Complete

After the package transfer is complete, you'll be notified by Salesforce Customer Support.

To verify that the transferred package is associated with your Dev Hub, run `sf package list`.

Impact of Package Transfers on Package IDs

ID Type	ID starts with	After package transfer is complete …
Subscriber Package ID	033	This ID remains the same.

ID Type	ID starts with	After package transfer is complete …
Subscriber Package Version ID	04t	This ID remains the same.
Package ID	0Ho	The transferred package receives a new and unique package ID.

Update Your Package Project File

Open and review the contents of the `sfdx-project.json` file associated with the transferred package.

Open and review the contents of any scratch org definition files associated with the transferred package. Definition files help in setting up your scratch orgs during development. Use the `–definition-file` parameter to specify a definition file when you create a new package version.

If the package directories section lists additional packages that weren't transferred to you, remove those references from the `sfdx-project.json` file.

Next, review the package alias section of the `sfdx-project.json` file, and remove any references to package aliases that aren't associated with the package that was transferred.

Update the package alias of the transferred package to specify its 0Ho package ID.

Before You Create a New Package Version

Similar to how you go about creating new package versions, you must update the `sfdx-project.json` file, and update the version number.

To designate a Dev Hub user to receive email notifications for unhandled Apex exceptions, and install, upgrade, or uninstall failures associated with your package, run the `sf package update` command, and use the `--error-notification-username` parameter.

What Package History Is Transferred?

We transfer:

- Package name, namespace, type, and IDs. One exception is that the transferred package gets a new 0Ho ID.
- Package version info. This includes all the info that is typically displayed when you run the `sf package version list` or `sf package version report` command.

We don't transfer:

- Push upgrade history.
- Package version create requests.
- The username of the Dev Hub user who received Apex and other types of error notifications.
- Deleted package versions.

CHAPTER 14 Continuous Integration

In this chapter ...

- Continuous Integration Using CircleCI
- Continuous Integration Using Jenkins
- Continuous Integration with Travis CI
- Sample CI Repos for Org Development Model
- Sample CI Repos for Package Development Model

Continuous integration (CI) is a software development practice in which developers regularly integrate their code changes into a source code repository. To ensure that the new code does not introduce bugs, automated builds and tests run before or after developers check in their changes.

Many third-party CI tools are available for you to choose from. Salesforce DX easily integrates into these tools so that you can set up continuous integration for your Salesforce applications.

SEE ALSO:

Salesforce Help: Install and Configure DevOps Center

Salesforce Help: Manage and Release Changes Easily and Collaboratively with DevOps Center

Continuous Integration Using CircleCI

CircleCI is a commonly used integration tool that integrates with your existing version control system to push incremental updates to the environments you specify. CircleCI can be used as a cloud-based or on-premise tool. These instructions demonstrate how to use GitHub, CircleCI, and your Dev Hub org for continuous integration.

Configure Your Environment for CircleCI
Before integrating your existing CircleCI framework, configure your Dev Hub org and CircleCI project.

Connect CircleCI to Your DevHub
Authorize CircleCI to push content to your Dev Hub org via a connected app.

SEE ALSO:

CircleCI

The sfdx-circleci-package Github Repo

The sfdx-circleci-org Github Repo

Configure Your Environment for CircleCI

Before integrating your existing CircleCI framework, configure your Dev Hub org and CircleCI project.

1. Set up your GitHub repository with CircleCI. You can follow the sign-up steps on the CircleCI website to access your code on GitHub.
2. Install the Salesforce CLI, if you haven't already.
3. Follow Authorize an Org Using the JWT Flow for your Dev Hub org, if you haven't already.
4. Encrypt your server key.
   a. First, generate a key and initialization vector (iv) to encrypt your `server.key` file locally. CircleCI uses the key and iv to decrypt your server key in the build environment.

      Run the following command in the directory containing your `server.key` file. For the *<passphrase>* value, enter a word of your own choosing to create a unique key.

      ```
      openssl enc -aes-256-cbc -k <passphrase> -P -md sha1 -nosalt
      ```

      The key and iv value display in the output.

      ```
      key=****24B2
      iv =****DA58
      ```

   b. Note the key and iv values, you need them later.

   c. Encrypt the `server.key` file using the newly generated key and iv values. Run the following command in the directory containing your `server.key` file, replacing *<key>* and *<iv>* with the values from the previous step.

      ```
      openssl enc -nosalt -aes-256-cbc -in server.key -out server.key.enc -base64 -K <key>
       -iv <iv>
      ```

      Note: Use the key and iv values only once, and don't use them to encrypt more than the `server.key`. While you can reuse this pair to encrypt other things, it is considered a security violation to do so.

You generate a new key and iv value every time you run the command in step a. In other words, you can't regenerate the same pair. If you lose these values you must generate new ones and encrypt again.

Next, you'll store the key, iv, and contents of `server.key.enc` as protected environment variables in the CircleCI UI. These values are considered secret, so take the appropriate precautions to protect them.

Connect CircleCI to Your DevHub

Authorize CircleCI to push content to your Dev Hub org via a connected app.

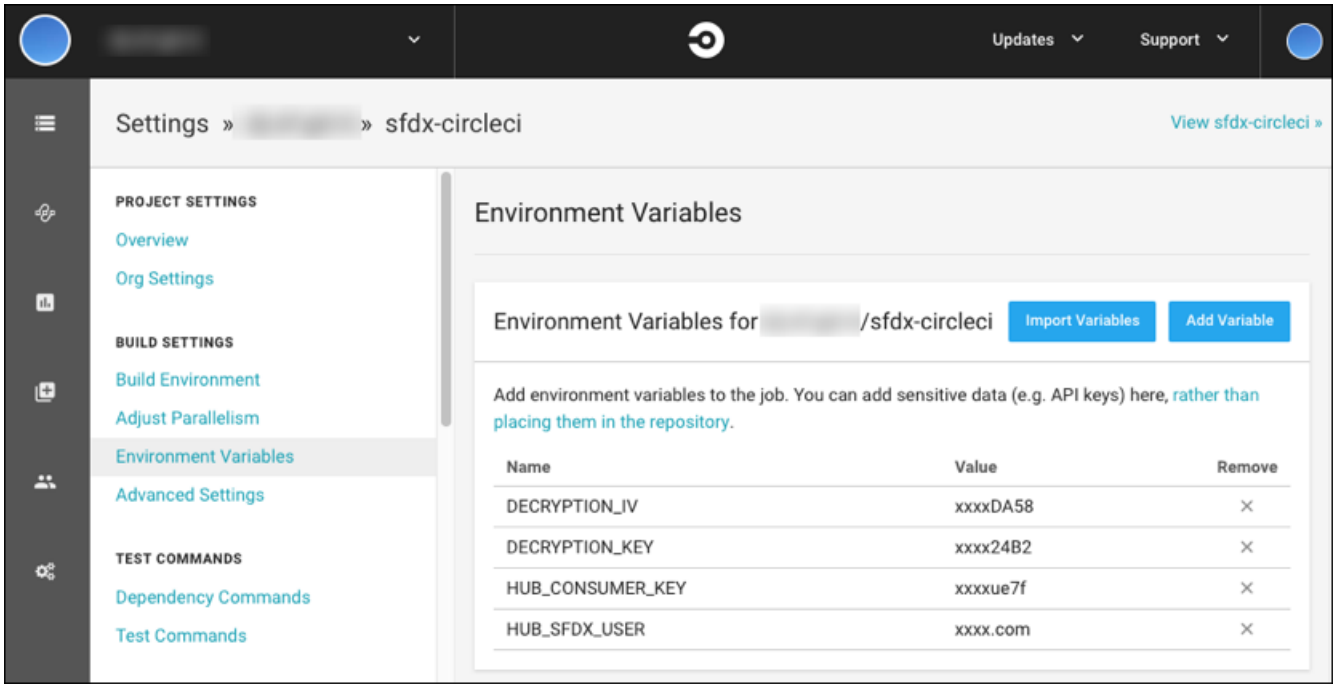
1. Make sure that you have Salesforce CLI installed. Check by running `sf version` and confirm that you see version information. If you don't have it installed, see Install Salesforce CLI.
2. Confirm you can perform a JWT-based authorization from the directory containing your `server.key` file. Run the following command from the directory containing your `server.key` (replace *<your_consumer_key>* and *<your_username>* values where indicated).

   ```
   sf org login jwt --client-id <your_consumer_key> --jwt-key-file server.key --username
    <your_username> --set-default-dev-hub
   ```

3. Fork the sfdx-circleci repo into your GitHub account using the **Fork** link at the top of the page.
4. Create a local directory for this project and clone your forked repo locally into the new directory. Replace *<git_username>* with your own GitHub username.

   ```
   git clone https://github.com/<git_username>/sfdx-circleci.git
   ```

5. Retrieve the generated consumer key from your JWT-Based Authorization connected app. From Setup, in the Quick Find box, enter *App*, and then select **App Manager**. Select **View** in the row-menu next to the connected app.
6. In the CircleCI UI, you see a project named sfdx-circleci. In the project settings, store the consumer key in a CircleCI environment variable named `HUB_CONSUMER_KEY`. For more information, see the CircleCI documentation Setting an Environment Variable in a Project.
7. Store the username that you use to access your Dev Hub in a CircleCI environment variable named `HUB_SFDX_USER` using the CircleCI UI.
8. Store the key and iv values from Encrypt Your Server Key in CircleCI environment variables named `DECRYPTION_KEY`and `DECRYPTION_IV`, respectively. When you finish setting the environment variables, your project screen looks like the following image.



Note: In the directory containing your `server.key` file, use the command `rm server.key` to remove the `server.key`. Never store keys or certificates in a public place.

You're ready to go! Now when you commit and push a change, your change kicks off a CircleCI build.

- Contribute to the repository – If you find any issues or opportunities for improving this repository, fix them! Feel free to contribute to this project, fork this repository, and then change the content. After you make your changes, share them with the community by sending a pull request. See How to send pull requests for more information about contributing to GitHub projects.
- Report issues – If you find any issues with this demo that you can't fix, feel free to report them in the issues section of this repository.

Continuous Integration Using Jenkins

Jenkins is an open-source, extensible automation server for implementing continuous integration and continuous delivery. You can easily integrate Salesforce DX into the Jenkins framework to automate testing of Salesforce applications against scratch orgs.

To integrate Jenkins, we assume:

- You are familiar with how Jenkins works. You can configure and use Jenkins in many ways. We focus on integrating Salesforce DX into Jenkins multibranch pipelines.
- The computer on which the Jenkins server is running has access to your version control system and to the repository that contains your Salesforce application.

Configure Your Environment for Jenkins

Before integrating your Dev Hub and scratch orgs into your existing Jenkins framework, configure your Jenkins environment. Our example assumes that you're working in a package development model.

Jenkinsfile Walkthrough

The sample Jenkinsfile shows how to integrate your Dev Hub and scratch orgs into a Jenkins job. The sample uses Jenkins Multibranch Pipelines. Every Jenkins setup is different. This walkthrough describes one of the ways to automate testing of your Salesforce applications. The walkthrough highlights Salesforce CLI commands to create a scratch org, upload your code, and run your tests.

Sample Jenkinsfile

A `Jenkinsfile` is a text file that contains the definition of a Jenkins Pipeline. This `Jenkinsfile` shows how to integrate Salesforce CLI commands to automate testing of your Salesforce applications using scratch orgs.

SEE ALSO:

Jenkins

Pipeline-as-code with Multibranch Workflows in Jenkins

Configure Your Environment for Jenkins

Before integrating your Dev Hub and scratch orgs into your existing Jenkins framework, configure your Jenkins environment. Our example assumes that you're working in a package development model.

1. In your Dev Hub org, create a connected app as described by the JWT-based authorization flow. This step includes obtaining or creating a private key and digital certificate.

   Make note of your consumer key (sometimes called a client ID) when you save the connected app. You need the consumer key to set up your Jenkins environment. Also have available the private key file used to sign the digital certificate.

2. On the computer that's running the Jenkins server, do the following.

   a. Download and install Salesforce CLI.

   b. Store the private key file as a Jenkins Secret File using the Jenkins Admin Credentials interface. Make note of the new entry's ID.

   You later reference this Credentials entry in your `Jenkinsfile`.

   c. Set the following variables in your Jenkins environment.

   - SF_USERNAME—The username for the Dev Hub org, such as juliet.capulet@myenvhub.com.
   - SF_INSTANCE_URL—The login URL of the Salesforce instance that hosts the Dev Hub org. The default is https://login.salesforce.com. We recommend that you update this value to the My Domain login URL for the Dev Hub org. You can find an org's My Domain login URL on the My Domain page in Setup.
   - SF_CONSUMER_KEY—The consumer key that was returned after you created a connected app in your Dev Hub org.
   - SERVER_KEY_CREDENTALS_ID—The credentials ID for the private key file that you stored in the Jenkins Admin Credentials interface.
   - PACKAGE_NAME-The name of your package, such as My Package.
   - PACKAGE_VERSION-The version of your package, which starts with 04t.
   - TEST_LEVEL-The test level for your package, such as RunLocalTests.

   The names for these environment variables are just suggestions. You can use any name as long as you specify it in the `Jenkinsfile`.

   You can also optionally set the SF_AUTOUPDATE_DISABLE variable to `true` to disable auto-update of Salesforce CLI. CLI auto-update can interfere with the execution of a Jenkins job.

3. Set up your Salesforce DX project so that you can create a scratch org.

4. (Optional) Install the Custom Tools Plugin into your Jenkins console, and create a custom tool that references Salesforce CLI. The Jenkins walkthrough assumes that you created a custom tool named toolbelt in the `/usr/local/bin` directory, which is the directory in which Salesforce CLI is installed.

SEE ALSO:

Authorize an Org Using the JWT Flow

Salesforce CLI Setup Guide

Jenkins: Credentials Binding Plugin

Project Setup

Jenkinsfile Walkthrough

The sample Jenkinsfile shows how to integrate your Dev Hub and scratch orgs into a Jenkins job. The sample uses Jenkins Multibranch Pipelines. Every Jenkins setup is different. This walkthrough describes one of the ways to automate testing of your Salesforce applications. The walkthrough highlights Salesforce CLI commands to create a scratch org, upload your code, and run your tests.

This walkthrough relies on the sfdx-jenkins-package Jenkinsfile. We assume that you're familiar with the structure of the Jenkinsfile, Jenkins Pipeline DSL, and the Groovy programming language. This walkthrough demonstrates implementing a Jenkins pipeline using Salesforce CLI and scratch orgs. See the CLI Command Reference regarding the commands used.

This workflow most closely corresponds to `Jenkinsfile` stages.

- Define Variables
- Check Out the Source Code
- Wrap All Stages in a withCredentials Command
- Wrap All Stages in a withEnv Command
- Authorize Your Dev Hub Org and Create a Scratch Org
- Push Source and Assign a Permission Set
- Run Apex Tests
- Delete the Scratch Org
- Create a Package
- Create a Scratch Org and Display Info
- Install Package, Run Unit Tests, and Delete Scratch Org

Define Variables

Use the `def` keyword to define the variables required by Salesforce CLI commands. Assign each variable the corresponding environment variable that you previously set in your Jenkins environment.

```
def SF_CONSUMER_KEY=env.SF_CONSUMER_KEY
def SERVER_KEY_CREDENTALS_ID=env.SERVER_KEY_CREDENTALS_ID
def TEST_LEVEL='RunLocalTests'
def PACKAGE_NAME='0Ho1U000000CaUzSAK'
def PACKAGE_VERSION
def SF_INSTANCE_URL = env.SF_INSTANCE_URL ?: "https://MyDomainName.my.salesforce.com"
```

Define the `SF_USERNAME` variable, but don't set its value. You do that later.

```
def SF_USERNAME
```

Although not required, we assume that you used the Jenkins Global Tool Configuration to create the `toolbelt` custom tool that points to the CLI installation directory. In your `Jenkinsfile`, use the tool command to set the value of the `toolbelt` variable to this custom tool.

```
def toolbelt = tool 'toolbelt'
```

You can now reference the Salesforce CLI executable in the `Jenkinsfile` using `${toolbelt}/sf`.

Check Out the Source Code

Before testing your code, get the appropriate version or branch from your version control system (VCS) repository. In this example, we use the `checkout scm` Jenkins command. We assume that the Jenkins administrator has already configured the environment to access the correct VCS repository and check out the correct branch.

```
stage('checkout source') {
        // when running in multi-branch job, one must issue this command
        checkout scm
  }
```

Wrap All Stages in a withCredentials Command

You previously stored the JWT private key file as a Jenkins Secret File using the Credentials interface. Therefore, you must use the `withCredentials` command in the body of the `Jenkinsfile` to access the secret file. The `withCredentials` command lets you name a credential entry, which is then extracted from the credential store and provided to the enclosed code through a variable. When using `withCredentials`, put all stages within its code block.

This example stores the credential ID for the JWT key file in the variable `SERVER_KEY_CREDENTALS_ID`. You defined the `SERVER_KEY_CREDENTALS_ID` earlier and set it to its corresponding environment variable. The `withCredentials` command fetches the contents of the secret file from the credential store and places the contents in a temporary location. The location is stored in the variable `server_key_file`. You use the `server_key_file` variable with the `org login jwt` command to specify the private key securely.

```
withCredentials([file(credentialsId: SERVER_KEY_CREDENTALS_ID, variable: 'server_key_file')])

   # all stages will go here
}
```

Wrap All Stages in a `withEnv` Command

When running Jenkins jobs, it's helpful to understand where files are being stored. There are two main directories to be mindful of: the workspace directory and the home directory. The workspace directory is unique to each job while the home directory is the same for all jobs.

The `withCredentials` command stores the JWT key file in the Jenkins workspace during the job. However, Salesforce CLI `auth` commands store authentication files in the home directory; these authentication files persist outside of the duration of the job.

This setup isn't a problem when you run a single job but can cause problems when you run multiple jobs. So, what happens if you run multiple jobs using the same Dev Hub or other Salesforce user? When the CLI tries to connect to the Dev Hub as the user you authenticated, it fails to refresh the token. Why? The CLI tries to use a JWT key file that no longer exists in the other workspace, regardless of the `withCredentials` for the current job.

If you set the home directory to match the workspace directory using `withEnv`, the authentication files are unique for each job. Creating unique auth files per job is also more secure because each job has access only to the auth files it creates.

When using `withEnv`, put all stages within its code block,

```
withEnv(["HOME=${env.WORKSPACE}"]) {
   # all stages will go here
}
```

Note: If you don't use a pipeline or you run commands outside of a pipeline stage, add a home environment specification to your script: `export HOME=$WORKSPACE`.

Authorize Your Dev Hub Org and Create a Scratch Org

This `sfdx-jenkins-package` example uses two stages: one stage to authorize the Dev Hub org and another stage to create a scratch org.

```
// ------------------------------------------------------------------------
// Authorize the Dev Hub org with JWT key and give it an alias.
// ------------------------------------------------------------------------

stage('Authorize DevHub') {
    rc = command "${toolbelt}/sf org login jwt --instance-url ${SF_INSTANCE_URL} --client-id
 ${SF_CONSUMER_KEY} --username ${SF_USERNAME} --jwt-key-file ${server_key_file}
--set-default-dev-hub --alias HubOrg"
    if (rc != 0) {
        error 'Salesforce dev hub org authorization failed.'
    }
}


// ------------------------------------------------------------------------
// Create new scratch org to test your code.
// ------------------------------------------------------------------------

stage('Create Test Scratch Org') {
    rc = command "${toolbelt}/sf org create scratch --target-dev-hub HubOrg --set-default
 --definition-file config/project-scratch-def.json --alias ciorg --wait 10 --duration-days
 1"
    if (rc != 0) {
        error 'Salesforce test scratch org creation failed.'
    }
}
```

Use `org login jwt` to authorize your Dev Hub org.

You're required to run this step only one time, but we suggest you add it to your `Jenkinsfile` and authorize each time you run the Jenkins job. This way you're always sure that the Jenkins job isn't aborted due to lack of authorization. There's typically little harm in authorizing multiple times, but keep in mind that the API call limit for your scratch org's edition still applies.

Use the flags of the `org login jwt` command to provide information about the Dev Hub org that you're authorizing. The values for the `--client-id`, `--username`, and `--instance-url` flags are the SF_CONSUMER_KEY, HubOrg, and SF_INSTANCE_URL environment variables you previously defined, respectively. The value of the `--jwt-key-file` flag is the `server_key_file` variable that you set in the previous section using the `withCredentials` command. The `--set-default-dev-hub` flag specifies that this HubOrg is the default Dev Hub org for creating scratch orgs.

Note: It's a best practice to have a unique authentication file for each Jenkins job using the `withEnv` wrapper. But it's possible to authorize a Dev Hub on your Jenkins machine instead. The advantage is that your authentication is set centrally on your machine

for any Jenkins job you run. The disadvantage is security: Every job has access to all authenticated users whether you want them to or not.

If you do want to auth to your Dev Hub on your Jenkins machine, follow these steps:

- On the Jenkins machine as the Jenkins user, authorize to your Dev Hub using any of the `org login` commands.
- In your Jenkinsfile, remove the `withCredentials`, `withEnv`, and `org login jwt` statements.

Use the `org create scratch` CLI command to create a scratch org. In the example, the CLI command uses the `config/project-scratch-def.json` file (relative to the project directory) to create the scratch org. The `--json` flag specifies the output as JSON format. The `--set-default` flag sets the new scratch org as the default.

The Groovy code that parses the JSON output of the `org create scratch` command extracts the username that was auto-generated as part of the org creation. This username, stored in the SF_USERNAME variable, is used with the CLI commands that push source, assign a permission set, and so on.

Push Source and Assign a Permission Set

Let's populate your new scratch org with metadata. This example uses the `project deploy start` command to deploy your source to the org. The source includes all the pieces that make up your Salesforce application: Apex classes and test classes, permission sets, layouts, triggers, custom objects, and so on.

```
// -----------------------------------------------------------------------
// Push source to test scratch org.
// -----------------------------------------------------------------------

stage('Push To Test Scratch Org') {
    rc = command "${toolbelt}/sf project deploy start --target-org ciorg"
    if (rc != 0) {
        error 'Salesforce push to test scratch org failed.'
    }
}
```

Recall the SF_USERNAME variable that contains the auto-generated username that was output by the `org create scratch` command in an earlier stage. The code uses this variable as the argument to the `--target-org` flag to specify the username for the new scratch org.

The `project deploy start` command deploys all the Salesforce-related files that it finds in your project. Add a `.forceignore` file to your repository to list the files that you don't want pushed to the org.

Run Apex Tests

Now that your source code and test source are pushed to the scratch org, run the `apex run test` command to run Apex tests.

```
// -----------------------------------------------------------------------
// Run unit tests in test scratch org.
// -----------------------------------------------------------------------

stage('Run Tests In Test Scratch Org') {
    rc = command "${toolbelt}/sf apex run test --target-org ciorg --wait 10 --result-format
 tap --code-coverage --test-level ${TEST_LEVEL}"
    if (rc != 0) {
        error 'Salesforce unit test run in test scratch org failed.'
```

```
    }
}
```

You can specify various flags to the `apex run test` CLI command. In the example:

- The `--test-level ${TEST_LEVEL}` flag runs all tests in the scratch org, except tests that originate from installed managed packages. You can also specify `RunLocalTests` to run only local tests, `RunSpecifiedTests` to run only certain Apex tests or suites or `RunAllTestsInOrg` to run all tests in the org.
- The `--result-format tap` flag specifies that the command output is in Test Anything Protocol (TAP) format. The test results that are written to a file are still in JUnit and JSON formats.
- The `--target-org ciorg` flag specifies the username for accessing the scratch org (the value in SF_USERNAME).

The `apex run test` command writes its test results in JUnit format.

Delete the Scratch Org

Salesforce reserves the right to delete a scratch org a specified number of days after it was created. You can also create a stage in your pipeline that uses `org delete scratch` to explicitly delete your scratch org when the tests complete. This cleanup ensures better management of your resources.

```
// -------------------------------------------------------------------------
// Delete package install scratch org.
// -------------------------------------------------------------------------

stage('Delete Package Install Scratch Org') {
    rc = command "${toolbelt}/sf org delete scratch --target-org installorg --no-prompt"
    if (rc != 0) {
        error 'Salesforce package install scratch org deletion failed.'
    }
}
```

Create a Package

Now, let's create a package. If you're new to packaging, you can think about a package as a container that you fill with metadata. It contains a set of related features, customizations, and schema. You use packages to move metadata from one Salesforce org to another. After you create a package, add metadata and create a new package version.

```
// -------------------------------------------------------------------------
// Create package version.
// -------------------------------------------------------------------------

stage('Create Package Version') {
    if (isUnix()) {
        output = sh returnStdout: true, script: "${toolbelt}/sf package version create
--package ${PACKAGE_NAME} --installation-key-bypass --wait 10 --json --target-dev-hub
HubOrg"
    } else {
        output = bat(returnStdout: true, script: "${toolbelt}/sf package version create
--package ${PACKAGE_NAME} --installation-key-bypass --wait 10 --json --target-dev-hub
HubOrg").trim()
        output = output.readLines().drop(1).join(" ")
}
```

```
    // Wait 5 minutes for package replication.
    sleep 300

    def jsonSlurper = new JsonSlurperClassic()
    def response = jsonSlurper.parseText(output)

    PACKAGE_VERSION = response.result.SubscriberPackageVersionId

    response = null

    echo ${PACKAGE_VERSION}
}
```

Create a Scratch Org and Display Info

Remember when you created a scratch org earlier? Now let's create a scratch org to install your package into, and display info about that scratch org.

```
// ------------------------------------------------------------------------
// Create new scratch org to install package to.
// ------------------------------------------------------------------------

stage('Create Package Install Scratch Org') {
    rc = command "${toolbelt}/sf org create scratch --target-dev-hub HubOrg --set-default
 --definition-file config/project-scratch-def.json --alias installorg --wait 10
--duration-days 1"
    if (rc != 0) {
        error 'Salesforce package install scratch org creation failed.'
    }
}


// ------------------------------------------------------------------------
// Display install scratch org info.
// ------------------------------------------------------------------------

stage('Display Install Scratch Org') {
    rc = command "${toolbelt}/sf org display --target-org installorg"
    if (rc != 0) {
        error 'Salesforce install scratch org display failed.'
    }
}
```

Install Package, Run Unit Tests, and Delete Scratch Org

To finish up, install your package in your scratch org, run unit tests, then delete the scratch org. That's it!

```
// ------------------------------------------------------------------------
// Install package in scratch org.
// ------------------------------------------------------------------------

stage('Install Package In Scratch Org') {
```

```
    rc = command "${toolbelt}/sf package install --package ${PACKAGE_VERSION} --target-org
 installorg --wait 10"
    if (rc != 0) {
        error 'Salesforce package install failed.'
    }
}


// ------------------------------------------------------------------------
// Run unit tests in package install scratch org.
// ------------------------------------------------------------------------

stage('Run Tests In Package Install Scratch Org') {
    rc = command "${toolbelt}/sf apex run test --target-org installorg --result-format tap
 --code-coverage --test-level ${TEST_LEVEL} --wait 10"
    if (rc != 0) {
        error 'Salesforce unit test run in pacakge install scratch org failed.'
    }
}


// ------------------------------------------------------------------------
// Delete package install scratch org.
// ------------------------------------------------------------------------

stage('Delete Package Install Scratch Org') {
    rc = command "${toolbelt}/sf org delete scratch --target-org installorg --no-prompt"
    if (rc != 0) {
        error 'Salesforce package install scratch org deletion failed.'
    }
}
```

SEE ALSO:

- Sample Jenkinsfile
- Pipeline-as-code with Multibranch Workflows in Jenkins
- TAP: Test Anything Protocol
- Configure Your Environment for Jenkins
- *Salesforce CLI Command Reference*

Sample `Jenkinsfile`

A `Jenkinsfile` is a text file that contains the definition of a Jenkins Pipeline. This `Jenkinsfile` shows how to integrate Salesforce CLI commands to automate testing of your Salesforce applications using scratch orgs.

The Jenkinsfile Walkthrough topic uses this sfdx-jenkins-package `Jenkinsfile` as an example.

```
#!groovy

import groovy.json.JsonSlurperClassic

node {
```

```
    def SF_CONSUMER_KEY=env.SF_CONSUMER_KEY
    def SF_USERNAME=env.SF_USERNAME
    def SERVER_KEY_CREDENTALS_ID=env.SERVER_KEY_CREDENTALS_ID
    def TEST_LEVEL='RunLocalTests'
    def PACKAGE_NAME='0Ho1U000000CaUzSAK'
    def PACKAGE_VERSION
    def SF_INSTANCE_URL = env.SF_INSTANCE_URL ?: "https://login.salesforce.com"

    def toolbelt = tool 'toolbelt'


    // -------------------------------------------------------------------------
    // Check out code from source control.
    // -------------------------------------------------------------------------

    stage('checkout source') {
        checkout scm
    }


    // -------------------------------------------------------------------------
    // Run all the enclosed stages with access to the Salesforce
    // JWT key credentials.
    // -------------------------------------------------------------------------

    withEnv(["HOME=${env.WORKSPACE}"]) {

        withCredentials([file(credentialsId: SERVER_KEY_CREDENTALS_ID, variable:
'server_key_file')]) {

            // -----------------------------------------------------------------------
            // Authorize the Dev Hub org with JWT key and give it an alias.
            // -----------------------------------------------------------------------

            stage('Authorize DevHub') {
              rc = command "${toolbelt}/sf org login jwt --instance-url ${SF_INSTANCE_URL}
 --client-id ${SF_CONSUMER_KEY} --username ${SF_USERNAME} --jwt-key-file ${server_key_file}
 --set-default-dev-hub --alias HubOrg"
                if (rc != 0) {
                    error 'Salesforce dev hub org authorization failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Create new scratch org to test your code.
            // -----------------------------------------------------------------------

            stage('Create Test Scratch Org') {
                rc = command "${toolbelt}/sf org create scratch --target-dev-hub HubOrg
--set-default --definition-file config/project-scratch-def.json --alias ciorg --wait 10
--duration-days 1"
                if (rc != 0) {
```

```
                    error 'Salesforce test scratch org creation failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Display test scratch org info.
            // -----------------------------------------------------------------------

            stage('Display Test Scratch Org') {
                rc = command "${toolbelt}/sf org display --target-org ciorg"
                if (rc != 0) {
                    error 'Salesforce test scratch org display failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Push source to test scratch org.
            // -----------------------------------------------------------------------

            stage('Push To Test Scratch Org') {
                rc = command "${toolbelt}/sf project deploy start --target-org ciorg"
                if (rc != 0) {
                    error 'Salesforce push to test scratch org failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Run unit tests in test scratch org.
            // -----------------------------------------------------------------------

            stage('Run Tests In Test Scratch Org') {
                rc = command "${toolbelt}/sf apex run test --target-org ciorg --wait 10
--result-format tap --code-coverage --test-level ${TEST_LEVEL}"
                if (rc != 0) {
                    error 'Salesforce unit test run in test scratch org failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Delete test scratch org.
            // -----------------------------------------------------------------------

            stage('Delete Test Scratch Org') {
                rc = command "${toolbelt}/sf org delete scratch --target-org installorg
--no-prompt"
                if (rc != 0) {
                    error 'Salesforce test scratch org deletion failed.'
                }
            }
```

```
            // -------------------------------------------------------------------------
            // Create package version.
            // -------------------------------------------------------------------------

            stage('Create Package Version') {
                if (isUnix()) {
                   output = sh returnStdout: true, script: "${toolbelt}/sf package version
 create --package ${PACKAGE_NAME} --installation-key-bypass --wait 10 --json --target-dev-hub
 HubOrg"
                } else {
                  output = bat(returnStdout: true, script: "${toolbelt}/sf package version
 create --package ${PACKAGE_NAME} --installation-key-bypass --wait 10 --json --target-dev-hub
 HubOrg").trim()
                    output = output.readLines().drop(1).join(" ")
                }

                // Wait 5 minutes for package replication.
                sleep 300

                def jsonSlurper = new JsonSlurperClassic()
                def response = jsonSlurper.parseText(output)

                PACKAGE_VERSION = response.result.SubscriberPackageVersionId

                response = null

                echo ${PACKAGE_VERSION}
            }


            // -------------------------------------------------------------------------
            // Create new scratch org to install package to.
            // -------------------------------------------------------------------------

            stage('Create Package Install Scratch Org') {
                rc = command "${toolbelt}/sf org create scratch --target-dev-hub HubOrg
--set-default --definition-file config/project-scratch-def.json --alias installorg --wait
 10 --duration-days 1"
                if (rc != 0) {
                    error 'Salesforce package install scratch org creation failed.'
                }
            }


            // -------------------------------------------------------------------------
            // Display install scratch org info.
            // -------------------------------------------------------------------------

            stage('Display Install Scratch Org') {
                rc = command "${toolbelt}/sf org display --target-org installorg"
                if (rc != 0) {
                    error 'Salesforce install scratch org display failed.'
                }
```

```
            }


            // -----------------------------------------------------------------------
            // Install package in scratch org.
            // -----------------------------------------------------------------------

            stage('Install Package In Scratch Org') {
                rc = command "${toolbelt}/sf package install --package ${PACKAGE_VERSION}
 --target-org installorg --wait 10"
                if (rc != 0) {
                    error 'Salesforce package install failed.'
                }
            }


            // -----------------------------------------------------------------------
            // Run unit tests in package install scratch org.
            // -----------------------------------------------------------------------

            stage('Run Tests In Package Install Scratch Org') {
                rc = command "${toolbelt}/sf apex run test --target-org installorg
--result-format tap --code-coverage --test-level ${TEST_LEVEL} --wait 10"
                if (rc != 0) {
                   error 'Salesforce unit test run in pacakge install scratch org failed.'

                }
            }


            // -----------------------------------------------------------------------
            // Delete package install scratch org.
            // -----------------------------------------------------------------------

            stage('Delete Package Install Scratch Org') {
                rc = command "${toolbelt}/sf org delete scratch --target-org installorg
--no-prompt"
                if (rc != 0) {
                    error 'Salesforce package install scratch org deletion failed.'
                }
            }
        }
    }
}

def command(script) {
    if (isUnix()) {
        return sh(returnStatus: true, script: script);
    } else {
        return bat(returnStatus: true, script: script);
```

```
        }
}
```

SEE ALSO:

Jenkinsfile Walkthrough

Continuous Integration with Travis CI

Travis CI is a cloud-based continuous integration (CI) service for building and testing software projects hosted on GitHub.

For help with setting up Travis CI, see:

- Sample Travis CI repo for Org Development model
- Sample Travis CI repo for Package Development model

SEE ALSO:

sfdx-travisci Sample GitHub Repo

Travis CI

Sample CI Repos for Org Development Model

Get started quickly with CI by cloning a sample repository from your vendor of choice. Each repo has a sample configuration file and a comprehensive `README.md` with step-by-step information.

These sample repositories support the org development model. This model uses Salesforce CLI, a source control system, and sandboxes during the application life cycle. To determine if this model is right for you, head over and earn your badge by completing the Org Development Model module.

Vendor	Link to GitHub Repository
AppVeyor	https://github.com/forcedotcom/sfdx-appveyor-org
Bamboo	https://github.com/forcedotcom/sfdx-bamboo-org
Bitbucket	https://github.com/forcedotcom/sfdx-bitbucket-org
CircleCI	https://github.com/forcedotcom/sfdx-circleci-org
GitLab	https://github.com/forcedotcom/sfdx-gitlab-org
Jenkins	https://github.com/forcedotcom/sfdx-jenkins-org
TravisCI	https://github.com/forcedotcom/sfdx-travisci-org

Sample CI Repos for Package Development Model

Get started quickly with CI by cloning a sample repository from your vendor of choice. Each repo has a sample configuration file and a comprehensive `README.md` with step-by-step information.

These sample repositories support the package development model. This model uses Salesforce CLI, a source control system, scratch orgs for development, and sandboxes for testing and staging. To determine if this model is right for you, head over and earn your badge by completing the Package Development Model module.

Vendor	Link to GitHub Repository
AppVeyor	https://github.com/forcedotcom/sfdx-appveyor-package
Bamboo	https://github.com/forcedotcom/sfdx-bamboo-package
Bitbucket	https://github.com/forcedotcom/sfdx-bitbucket-package
CircleCI	https://github.com/forcedotcom/sfdx-circleci-package
GitLab	https://github.com/forcedotcom/sfdx-gitlab-package CI/CD template for Salesforce/Apex apps: https://gitlab.com/sfdx/sfdx-cicd-template
Jenkins	https://github.com/forcedotcom/sfdx-jenkins-package
TravisCI	https://github.com/forcedotcom/sfdx-travisci-package

CHAPTER 15 Troubleshoot Salesforce DX

In this chapter ...

- Resolve Common Authorization Errors
- Error: No default dev hub found
- Unable to Work After Failed Org Authorization
- Error: The consumer key is already taken
- CLI Version Information

Here are some tips to help you troubleshoot issues.

SEE ALSO:

Salesforce Trailblazer Community

Resolve Common Authorization Errors

Errors sometimes occur when you run either `org login web` or `org login jwt` to log into and authorize an org. Here are some of the more common errors, what they mean, and what you can do to try to fix them.

Before you begin, update to the most recent version of Salesforce CLI and check if you still see the issue. Salesforce releases a new CLI version every week.

If you installed Salesforce CLI using the installers, run this command.

```
sf update
```

If you installed using npm, run this command.

```
npm install --global @salesforce/cli
```

For each error, we provide this information:

- **Error text**: Literal text of the error.
- **Error name**: The name of the error, which is also displayed in the error message.
- **What it likely means**: While it's often difficult to determine precisely what happened in your environment, we make a best guess about what it could be.
- **Recommended fixes**: One or more things you can try to fix the problem, with the one most likely to work listed first.
- **NOT RECOMMENDED**: Actions you should never take.

`org login web` Errors

These errors can occur when you run `org login web` to authorize an org by logging into it using a web browser.

Error: authentication failure

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: invalid_grant::authentication failure`
- **Error name**: `AuthCodeExchangeError`
- **What it likely means**: You don't have permission to access the org. The problem can stem from an issue with the connected app, settings, org settings, or with a customization, such as a guest flow that must run before authorization.
- **Recommended fixes**:
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Make sure that the org is configured to allow API access, and that you specifically have API access to the org. Both settings are required to run any CLI command that involves an org.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Check that your connected app settings are correct, especially if you created your own rather than use the default Salesforce CLI connected app. See Create a Connected App in Your Org.

Error: unable to get local issuer certificate

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: request to https://test.salesforce.com//services/oauth2/token failed, reason: unable to get local issuer certificate`
- **Error name**: `AuthCodeExchangeError` or `AuthCodeUsernameRetrievalError`
- **What it likely means**: Node.js can't find the certificate that it uses for HTTPS traffic in the certificate store on the local computer. The problem can be related to a proxy, firewall, or VPN that's between the client and server. For example, the proxy could be configured for "deep inspection" in which the proxy swaps the SSL certificate with its own certificate to allow it to inspect traffic, and the proxy certificate is causing the error.
- **Recommended fixes**:
  - Set the `NODE_EXTRA_CA_CERTS` environment variable to include expected certificates.
  - If using a proxy, make sure that the `HTTPS_PROXY` and `HTTP_PROXY` environment variables are set properly.
  - Check the proxy settings for specific certificate behavior.
- **NOT RECOMMENDED**:
  - Don't set `NODE_TLS_REJECT_UNAUTHORIZED=0`, which disables certificate verification for Salesforce CLI requests and allows man-in-the-middle attacks.
  - Don't set the `strict-ssl=false` npm configuration setting. This setting allows npm to use HTTP rather than HTTPS and allows unencrypted traffic and man-in-the-middle attacks.

Error: grant type not supported

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: unsupported_grant_type::grant type not supported`
- **Error name**: `AuthCodeExchangeError`
- **What it likely means**: The OAuth 2.0 endpoint doesn't support the grant_type value passed to it. If you're using the default Salesforce CLI connected app, this error usually means that you're using the wrong instance URL to log in. If you're using a different connected app, check to see if it's configured correctly for the grant types used by the CLI.
- **Recommended fixes**:
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Don't use a Lightning URL for your instance URL. For example, use `https://MyDomainName.my.salesforce.com` and not `https://MyDomainName.lightning.force.com`.
  - Make sure you always use `https`, and not `http`, for all URLs.
  - Make sure that the org is configured to allow API access, and that you specifically have API access to the org. Both settings are required to run any CLI command that involves an org.
  - Check that the clock on your local computer is accurate. If too much time (over 3 minutes) passes between the auth code generation and the request for an access token, an error like this can occur.
  - If you're using a custom connected app rather than the default Salesforce CLI one, check that the settings are correct. See Create a Connected App in Your Org.

Error: ECONNRESET

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: request to https://test.salesforce.com//services/oauth2/token failed, reason: read ECONNRESET`
- **Error name**: `AuthCodeExchangeError`
- **What it likely means**: Your org reset the connection.
- **Recommended fixes**:
  - Rerun the `org login web` command. This error is sometimes temporary and simply reauthorizing the org fixes it.
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.

Error: ETIMEDOUT

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: request to https://test.salesforce.com//services/oauth2/token failed, reason: connect ETIMEDOUT`
- **Error name**: `AuthCodeExchangeError`
- **What it likely means**: The connection to your org timed out.
- **Recommended fixes**:
  - Rerun the `org login web` command. This error is sometimes temporary and simply reauthorizing the org fixes it.
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.

Error: self-signed certificate in certificate chain

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: request to https://login.salesforce.com//services/oauth2/token failed, reason: self-signed certificate in certificate chain`
- **Error name**: `AuthCodeExchangeError` or `AuthCodeUsernameRetrievalError`
- **What it likely means**: During certificate verification, Node.js encountered a certificate that can't be chained to a root certificate in the local trust store, or the root certificate is not locally trusted. The problem can be related to a proxy, firewall, or VPN that's between the client and server. For example, the proxy could be configured for "deep inspection" in which the proxy swaps the SSL certificate with its own certificate to allow it to inspect traffic, and the proxy certificate is causing the error.
- **Recommended fixes**:
  - Don't trust any unknown certificates.
  - Make sure all certificates are properly created.
  - Make sure that the certificates you're using are trusted within the trust store or added to the `NODE_EXTRA_CA_CERTS` environment variable.

  - If using a proxy, make sure that the `HTTPS_PROXY` and `HTTP_PROXY` environment variables are set properly.
  - Check the proxy settings for specific certificate behavior.
- **NOT RECOMMENDED**:
  - Don't set `NODE_TLS_REJECT_UNAUTHORIZED=0`, which disables certificate verification for Salesforce CLI requests and allows man-in-the-middle attacks.
  - Don't set the `strict-ssl=false` npm configuration setting. This setting allows npm to use HTTP rather than HTTPS and allows unencrypted traffic and man-in-the-middle attacks.

Error: IP restricted

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: ip restricted`
- **Error name**: `AuthCodeExchangeError`
- **What it likely means**: The org has IP restrictions enabled. If Salesforce CLI attempts to log in and authorize an org from an IP address that isn't allowed, then this error is thrown.
- **Recommended fix**: If the IP address that Salesforce CLI uses is known and allowed, update your org's Trusted IP Ranges.

Error: ENOTFOUND

- **Error text**: `Invalid client credentials. Verify the OAuth client secret and ID. Error authenticating with auth code due to: request to https://login.salesforce.com/services/oauth2/token failed, reason: getaddrinfo ENOTFOUND login.salesforce.com`
- **Error name**: `AuthCodeExchangeError` or `AuthCodeUsernameRetrievalError`
- **What it likely means**: The domain name couldn't be resolved within the time limit. The error could be caused by an incorrect instance URL, a DNS issue, or a proxy issue.
- **Recommended fixes**:
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Don't use a Lightning URL for your instance URL. For example, use `https://MyDomainName.my.salesforce.com` and not `https://MyDomainName.lightning.force.com`.
  - Make sure you can use a command-line tool, such as `nslookup`, to resolve the domain manually from the same computer from which you're running the `org login web` command.
  - If using a proxy, make sure that the `HTTPS_PROXY` and `HTTP_PROXY` environment variables are set properly.

`org login jwt` Errors

These errors can occur when you run `org login jwt` to authorize an org by logging into it with the JWT flow.

Error: user hasn't approved this consumer

- **Error text**: `We encountered a JSON web token error, which is likely not an issue with Salesforce CLI. Here's the error: Error authenticating with JWT. Errors encountered: user hasn't approved this consumer`
- **Error name**: `JwtGrantError`
- **What it likely means**: Your connected app settings aren't configured correctly or a new connected app hasn't finished replicating.
- **Recommended fixes**:
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - If you recently created the connected app, wait a few minutes for it to finish replicating and then try to authorize again.
  - Check that your connected app settings are correct, especially if you created your own rather than used the default Salesforce CLI connected app. See Create a Connected App in Your Org. In particular, on the main page where you manage the connected app:
    - Set **Permitted Users** to `Admin approved users are pre-authorized`.
    - Add the profile of the user you want to authorize by clicking **Manage Profiles**.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. You can specify the instance URL either with the `--instance-url` command flag or the `SF_AUDIENCE_URL` environment variable, although `SF_AUDIENCE_URL` isn't usually needed for production environments. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Don't use a Lightning URL for your instance URL. For example, use `https://MyDomainName.my.salesforce.com` and not `https://MyDomainName.lightning.force.com`.

Error: client identifier invalid

- **Error text**: `We encountered a JSON web token error, which is likely not an issue with Salesforce CLI. Here's the error: Error authenticating with JWT. Errors encountered: client identifier invalid`
- **Error name**: `JwtGrantError`
- **What it likely means**: The OAuth client ID (also called consumer key) that you passed to the command's `--client-id` flag doesn't match the one specified in the connected app.
- **Recommended fixes**:
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Make sure that the client ID and client secret that are configured in your connected app settings match the values you passed to the `org login jwt` command.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. You can specify the instance URL either with the `--instance-url` command flag or the `SF_AUDIENCE_URL` environment variable, although `SF_AUDIENCE_URL` isn't usually needed for production environments. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Don't use a Lightning URL for your instance URL. For example, use `https://MyDomainName.my.salesforce.com` and not `https://MyDomainName.lightning.force.com`.

Error: ENOENT

- **Error text**: `We encountered a JSON web token error, which is likely not an issue with Salesforce CLI. Here's the error: ENOENT: no such file or directory, open '/workspace/my-repository/server.key'`
- **Error name**: `JwtGrantError`
- **What it likely means**: The private JWT key file that you specified with the `--jwt-key-file` flag of the `org login jwt` either doesn't exist or it's in a different location. This issue typically occurs in CI (continuous integration) environments where the private JWT key file is accessible for only specific actions.
- **Recommended fix**: Make sure that the private JWT key file exists in the specified location and is accessible by all Salesforce CLI commands that interact with an org, because these commands must authenticate before they can send API requests.

Error: HTML response

- **Error text**: `Data Not Available webpage. "The data you were trying to access could not be found. It may be due to another user deleting the data or a system error. If you know the data is not deleted but cannot access it, please look at our support page"`
- **Error name**: `JwtGrantError`
- **What it likely means**: The org is temporarily down for maintenance or isn't yet ready for API requests.
- **Recommended fixes**: This error is probably temporary. Wait a few minutes and retry. If this error happens regularly, contact Salesforce Customer Support.

Error: audience is invalid

- **Error text**: `We encountered a JSON web token error, which is likely not an issue with Salesforce CLI. Here's the error: Error authenticating with JWT. Errors encountered: audience is invalid [audience=https://login.salesforce.com login=https://test.salesforce.com/]`
- **Error name**: `JwtGrantError`
- **What it likely means**: This error usually occurs with other errors such as `user hasn't approved this consumer`. This error can also indicate that you used the incorrect instance URL with the command.
- **Recommended fixes**:
  - Use the most recent version of Salesforce CLI and its core plugins. To verify, run the `doctor` command.
  - Use the correct instance URL when logging in to the org, and make sure that it's in the correct enhanced My Domain format. You can specify the instance URL either with the `--instance-url` command flag or the `SF_AUDIENCE_URL` environment variable, although `SF_AUDIENCE_URL` isn't usually needed for production environments. To find your org's instance URL, log into it, go to the Setup > Company Settings > My Domain page, and see **Current My Domain URL**. See My Domain Login and Application URL Formats with Enhanced Domains.
  - Don't use a Lightning URL for your instance URL. For example, use `https://MyDomainName.my.salesforce.com` and not `https://MyDomainName.lightning.force.com`.
  - If using a proxy, make sure that the `HTTPS_PROXY` and `HTTP_PROXY` environment variables are set properly.

- If you see additional errors, check this topic for troubleshooting information about those errors.

SEE ALSO:

Authorize an Org Using a Browser

Authorize an Org Using the JWT Flow

Salesforce Help: OAuth 2.0 Web Server Flow for Web App Integration

Salesforce Help: Set Trusted IP Ranges for Your Organization

Error: No default dev hub found

You see this error when you try to create a scratch org due to an authorization issue.

Let's say you successfully authorize a Dev Hub org using the `--set-default-dev-hub` flag. The username associated with the org is your default Dev Hub username. You then successfully create a scratch org without using the `--target-dev-hub` flag. But when you try to create a scratch org another time using the same CLI command, you get this error:

```
Error (1): No default dev hub found. Use -v or --target-dev-hub to specify an environment.
```

What happened?

Answer: You're no longer in the directory where you ran the authorization command. The directory from which you use the `--set-default-dev-hub` flag matters.

If you run the authorization command from the root of your project directory, the `target-dev-hub` config variable is set locally. The value applies only when you run the command from the same project directory. If you change to a different directory and run `org create scratch`, the local setting of the default Dev Hub org no longer applies and you get an error.

Solve the problem by doing one of the following.

- Set `target-dev-hub` globally so that you can run `org create scratch` from any directory.

  ```
  sf config set target-dev-hub=<devhubusername> --global
  ```

- Run `org create scratch` from the same project directory where you authorized your Dev Hub org.
- Use the `--target-dev-hub` flag with `org create scratch` to run it from any directory.

  ```
  sf target-dev-hub --definition-file <file> --target-dev-hub <devhubusername> --alias
  my-scratch-org
  ```

- To check whether you've set configuration values globally or locally, use this command and check the Location column.

  ```
  sf config list
  ```

SEE ALSO:

How Salesforce Developer Experience (DX) Tooling Changes the Way You Work

Unable to Work After Failed Org Authorization

Sometimes you try to authorize a Dev Hub org or a scratch org using the Salesforce CLI or an IDE, but you don't successfully log in to the org. The port remains open for the stray authorization process, and you can't use the CLI or IDE. To proceed, end the process manually.

macOS or Linux

To recover from a failed org authorization on macOS or Linux, use a terminal to kill the process running on port 1717.

1. From a terminal, run:

```
lsof -i tcp:1717
```

2. In the results, find the ID for the process that's using the port.
3. Run:

```
kill -9 <the process ID>
```

Windows

To recover from a failed org authorization on Windows, use the Task Manager to end the Node process.

1. Press Ctrl+Alt+Delete, then click **Task Manager**.
2. Select the **Process** tab.
3. Find the process named `Node`.

   Note: If you're a Node.js developer, you can have several running processes with this name.

4. Select the process that you want to end, and then click **End Process**.

Error: The consumer key is already taken

Let's say you run `project retrieve start` on an org in which you've created a connected app. When you try to deploy the retrieved source to a different org, the deploy fails with the error `The consumer key is already taken`. What happened?

Connected apps include a consumer key that a website or app uses to identify itself to Salesforce. Consumer keys must be unique across the entire Salesforce ecosystem. When you try to deploy the retrieved (and unchanged) source file associated with the connected app to a new org, the deploy fails due to duplicate consumer keys.

You have a few options to work around this problem.

- Remove the connected app source file from your project before you deploy your source to the new org. As a result, the connected app isn't created. The connected app source file is named something like `force-app/main/default/connectedApps/MyConnApp.connectedApp-meta.xml`.
- Update the file for the connected app and change the value of the `<consumerKey>` element to a unique value. Here's a snippet of a sample connected app file that shows the `<consumerKey>` element.

```
<?xml version="1.0" encoding="UTF-8"?>
<ConnectedApp xmlns="http://soap.sforce.com/2006/04/metadata">
    <contactEmail>john@doecompany.com</contactEmail>
    <contactPhone>5556789</contactPhone>
    <label>MyConnApp</label>
    <oauthConfig>
        <callbackUrl>http://localhost:1717/OauthRedirect</callbackUrl>
        <consumerKey>3MVG9PG9sFc71i9n55UWbx2</consumerKey>
```

```
        <isAdminApproved>false</isAdminApproved>
...
```

SEE ALSO:

Salesforce Help: Connected Apps

CLI Version Information

Use these commands to view version information about Salesforce CLI.

```
sf plugins --core      // Version of the CLI and all installed plug-ins
sf --version     // CLI version
```

CHAPTER 16 Limitations for Salesforce DX

Here are some known issues you could run into while using Salesforce DX.

For the latest known issues, visit the Trailblazer Community's Known Issues page and the issues tab in the Salesforce CLI's main GitHub repo.

Salesforce CLI

Can't Import Record Types Using Salesforce CLI

Description: We don't support RecordType when running the `data tree import` command.

Workaround: None.

Limited Support for Shell Environments on Windows

Description: Salesforce CLI is tested on the Command Prompt (`cmd.exe`) and Powershell. There are known issues in the Cygwin and Min-GW environments, and with Windows Subsystem for Linux (WSL). Until these environments are tested and supported in a future release, we recommend that you use a supported shell.

Workaround: None.

Dev Hub and Scratch Orgs

Salesforce CLI Sometimes Doesn't Recognize Scratch Orgs with Communities

Description: Sometimes, but not in all cases, the Salesforce CLI doesn't acknowledge the creation of scratch orgs with the Communities feature. You can't open the scratch org using the CLI, even though the scratch org is listed in Dev Hub.

Workaround: You can try this workaround, although it doesn't fix the issue in all cases. Delete the scratch org in Dev Hub, then create a new scratch org using the CLI. Deleting and recreating scratch orgs counts against your daily scratch org limits.

Error Occurs If You Pull a Community and Deploy It

Description: The error occurs because the scratch org doesn't have the required guest license.

Workaround: In your scratch org definition file, if you specify the Communities feature, also specify the Sites feature.

Source Management

ERROR: Entity of type 'RecordType' named 'Account.PersonAccount' cannot be found

Description: Although you can turn on Person Accounts in your scratch org by adding the feature to your scratch org definition, running `project deploy start` or `project deploy retrieve` results in an error.

Workaround: None.

`project convert source` Doesn't Add Post-Install Scripts to `package.xml`

Description: If you run `project convert source`, `package.xml` doesn't include the post install script.

Workaround: To fix this issue, choose one of these methods:

- Manually add the `<postInstallClass>` element to the `package.xml` in the metadata directory that `project convert source` produces.
- Manually add the element to the package in the release org or org to which you are deploying the package.

Must Manually Enable Feed Tracking in an Object's Metadata File

Description: If you enable feed tracking on a standard or custom object, then run `project retrieve start`, feed tracking doesn't get enabled.

Workaround: In your Salesforce DX project, manually enable feed tracking on the standard or custom object in its metadata file (`-meta.xml`) by adding `<enableFeeds>true</enableFeeds>`.

Unable to Push Lookup Filters to a Scratch Org

Description: When you execute the `project deploy start` command to deploy the source of a relationship field that has a lookup filter, you sometimes get this error:

```
duplicate value found: <unknown> duplicates value on record with id: <unknown> at line num, col num.
```

Workaround: None.

Deployment

Compile on Deploy Can Increase Deployment Times in Scratch Orgs

Description: If your deployment times for Apex code are slow, your scratch org might have the `enableCompileOnDeploy` setting set to `true`.

Workaround: To turn it off, set it to `false` (the default) or delete the setting from the scratch org definition.

```
{
  "orgName": "My Company",
  "edition": "Developer",
  "features": [],
  "settings": {
    "lightningExperienceSettings": {
          "enableS1DesktopEnabled": true
      },
      "apexSettings": {
```

```
            "enableCompileOnDeploy": false
        }
    }
}
```

Managed First-Generation Packages

When You Install a Package in a Scratch Org, No Tests Are Performed

Description: If you include tests as part of your continuous integration process, those tests don't run when you install a package in a scratch org.

Workaround: You can manually execute tests after the package is installed.

New Terminology in CLI for Managed Package Password

Description: When you use the CLI to add an installation key to a package version or to install a key-protected package version, the flag name of the key is `--installationkey`. When you view a managed package version in the Salesforce user interface, the same package attribute is called "Password". In the API, the corresponding field name, "password", is unchanged.

Workaround: None.

Managed Second-Generation Packages

Protected Custom Metadata and Custom Settings are Visible to Developers in a Scratch Org If Installed Packages Share a Namespace

Description: Use caution when you store secrets in your second-generation packages using protected custom metadata or protected custom settings. You can create multiple second-generation packages with the same namespace. However, when you install these packages in a scratch org, these secrets are visible to any of your developers that are working in a scratch org with a shared namespace. In the future, we might add a "package-protected" keyword to prevent access to package secrets in these situations.

Workaround: None.

Unlocked Packages

Protected Custom Metadata and Custom Settings are Visible to Developers in a Scratch Org If Installed Packages Share a Namespace

Description: Use caution when you store secrets in your unlocked packages using protected custom metadata or protected custom settings. You can create multiple unlocked packages with the same namespace. However, when you install these packages in a scratch org, these secrets are visible to any of your developers that are working in a scratch org with a shared namespace. In the future, we might add a "package-protected" keyword to prevent access to package secrets in these situations.

Workaround: None.