

SETTING UP YOUR JAVA DEVELOPER ENVIRONMENT

Summary

Configure your local dev environment for integrating with Salesforce using Java. This tipsheet describes how to set up your local environment so that you can start using Salesforce APIs, such as SOAP API or REST API.

Note: If you're setting up a local environment to develop Salesforce applications using Apex and custom Metadata API components, take a look at the Force.com IDE.

This tipsheet focuses on tools and configurations you'll need to set up your local development system. It assumes you already have a working Salesforce organization with the "API Enabled" permission. API is enabled by default on Developer Edition, Enterprise Edition, Unlimited Edition, and Performance Edition organizations.

If you are not already a member of the Force.com developer community, go to

developer.salesforce.com/signup and follow the instructions for signing up for a Developer Edition organization. Even if you already have Enterprise Edition, Unlimited Edition, or Performance Edition, use Developer Edition for developing, staging, and testing your solutions against sample data to protect your organization's live data. This is especially true for applications that insert, update, or delete data (as opposed to simply reading data).

If you have a Salesforce organization you can use for development but need to set up a sandbox for development and testing, see Developer Environments in the *Application Lifecycle Guide* for instructions on creating a developer sandbox.

Installing Java

You'll need the Java Developer Kit (JDK) version 5.0 or better to use Salesforce APIs. Java is a robust, cross-platform, widely used language that integrates well with Salesforce.

To install the JDK, you'll need a Windows, Mac OS X or Linux system that has internet access. Depending on your system, you might also need administrator level access to install the JDK.

Note: If you think you might already have the JDK installed, use the steps listed in Verifying your JDK install to verify your version of Java. Most versions of Mac OS X and Linux come pre-installed with a version of the JDK.

The JDK is a development kit required to build Java applications. The JDK includes the Java Runtime Environment (JRE) which is required to run Java applications.

- 1. Navigate to http://www.oracle.com/technetwork/java/javase/downloads/index.html in your browser on your local system. Download the latest version of the JDK for your operating system. Make sure you are downloading the JDK, and not the JRE.
- 2. On Windows, double-click the installer executable and follow the steps to install the JDK and the included JRE to your local machine. On Mac OS X, open the .dmg file and double-click on the installer package. On Linux, if you downloaded an .rpm file, in a command prompt window type rpm -ivh jdk install rpm file. If you downloaded a .tar file, extract the files from the tar archive and copy to a location of your choice.
- 3. Add the JDK executables to your path.

a. On Windows, click Start > Control Panel > System and Security > System > Advanced system settings. Click Environment Variables and find the PATH variable in System variables. Add the location of the bin folder of the JDK installation path to the end of your path value. Your path might look something like:

%SystemRoot%\system32;%SystemRoot%;C:\Program
Files\Java\jdk1.7.0 15\bin.Click Ok to apply the changes.

b. On Mac OS X or Linux, you'll need to update your \$PATH environment variable. On Mac OS X you can also use the java home command to set your Java paths.

Verifying your JDK install

To verify your JDK install, in a command prompt window type java -version. You should see something like:

```
java version "1.7.0_15"
Java(TM) SE Runtime Environment (build 1.7.0_15-b03)
Java HotSpot(TM) 64-Bit Server VM (build 23.7-b01, mixed mode)
```

You can also verify the Java compiler was properly installed by typing javac -version in a command prompt window. The output should look something like:

javac 1.7.0_15

If you get an error indicating that either java or javac is an unknown executable, your installation might have failed, or you might not have set your path environment as described in Step 3.

Installing Eclipse

Eclipse is an integrated development environment (IDE) for Java development.

Eclipse requires a Java runtime environment to run.

While Eclipse is not required to develop integration applications for Salesforce, install Eclipse if you want an easy to use IDE that works with Salesforce.

- 1. Navigate to http://www.eclipse.org/downloads in your browser. Download "Eclipse IDE for Java Developers." Choose either the 32–bit version or the 64–bit version, depending on the version of the JDK you have installed.
- 2. Un-archive the downloaded file to a location of your choice. Eclipse does not have a special installation application.
- 3. Launch the Eclipse executable in the eclipse folder you just un-archived. On Windows, this is eclipse.exe, on Mac OS X, this is Eclipse.app, and on Linux this is eclipse. Eclipse will ask for the location of a new eclipse workspace. Click **Ok** to accept the default workspace location.
- **4.** Dismiss the welcome page by closing the welcome page window. You are now in the Eclipse workbench, ready to create a new Java-based Salesforce integration project.

Picking a Path Based on Which API You Use

The next steps for setting up your development environment depend on which Salesforce API you want to use.

To use SOAP API or CRUD-based Metadata API, or any other WSDL-based Salesforce API, complete the steps in the following tasks.

- Installing the Web Services Connector (WSDL-Based APIs) on page 3
- Download Developer WSDL Files (WSDL-Based APIs) on page 3
- Generating Java Stub Files (WSDL-Based APIs) on page 4
- Verify the WSDL Environment (WSDL-Based APIs) on page 4

To use REST API, Bulk API, Chatter API, or any other REST-based Salesforce API, complete the steps in the following tasks.

- Installing HttpClient and JSON Frameworks (REST-Based APIs) on page 6
- Setting Up Connected App Access (REST-Based APIs) on page 6
- Verify the REST Environment (REST-Based APIs) on page 9

Tooling API provides both SOAP and REST-based interfaces, so depending on your needs, you can set up your environment by using one of the paths above.

Streaming API requires installing additional Java frameworks for supporting push technology. See Example: Subscribe to and Replay Events Using a Java Client in the Force.com Streaming API Developer's Guide.

Installing the Web Services Connector (WSDL-Based APIs)

The Force.com Web Services Connector (WSC) is a high-performance runtime framework that makes using WSDL-based Salesforce APIs easier.

To use the WSC framework you'll need a working install of the Java JDK.

- Navigate to http://mvnrepository.com/artifact/com.force.api/force-wsc in your browser and download the WSC pre-built .jar file that matches the API version of Salesforce you're using. If you can't find a pre-built version of WSC that works with the API version you're using, you can build the .jar file from source. Navigate to https://github.com/forcedotcom/wsc and follow the instructions on "Building WSC."
- 2. Save the WSC .jar file in a known location. You'll use it to generate stub files with the WSDLs from your Salesforce organization.
- **3.** Depending on the version of WSC you are using, you may need to also download additional frameworks. Download the following frameworks and extract and copy the framework .jar files to a location you'll remember.
 - Rhino JavaScript framework, available at https://developer.mozilla.org/en-US/docs/Rhino/Download_Rhino
 - StringTemplate engine framework, available at http://www.stringtemplate.org/download.html

Download Developer WSDL Files (WSDL-Based APIs)

Salesforce Web Services Definition Language (WSDL) files provide API details that you use in your developer environment to make API calls.

To download WSDL files directly from your Salesforce organization:

- 1. Log in to your Salesforce developer organization in your browser.
- 2. From Setup, enter API in the Quick Find box, then select API.
- 3. Download the appropriate WSDL files for the API you want to use.

- **a.** If you want to use SOAP API you'll need either the Enterprise or Partner WSDL. See Choosing a WSDL in the SOAP API Developer's Guide to determine which WSDL to download.
- **b.** If you want to use Metadata API you'll need the Metadata WSDL. To login and authenticate with Salesforce you'll also need either the Enterprise or Partner WSDL.
- **c.** If you want to use Tooling API you'll need the Tooling WSDL. To login and authenticate with Salesforce you'll also need either the Enterprise or Partner WSDL.

Generating Java Stub Files (WSDL-Based APIs)

To use WSDL-based Salesforce APIs with Java, you need to generate .jar stub files that you can use in your Java projects.

You'll need the WSC .jar file to generate stub files. You'll also need the appropriate WSDL files for the API you plan to use.

- 1. Open a command prompt window and navigate to the location where your WSDL and WSC .jar files are.
- 2. Generate the Java stub for the WSDL by using the following command in a command prompt window: java -classpath path to WSC jar/WSC jar filename com.sforce.ws.tools.wsdlc path to WSDL/WSDL filename path to output stub jar and filename. You might need to also include additional jar files that WSC needs, such as Rhino or StringTemplate, in the classpath list, separated by semi-colons (on Windows) or colons (on Mac/Linux). See Installing the Web Services Connector (WSDL-Based APIs) for more information on Rhino and StringTemplate.

An example Windows command for generating the stub .jar file "enterprise_stub.jar" using the API version 29.0 WSC and the Enterprise WSDL might look something like this:

```
java -classpath \testWorkspace\wsc\force-wsc-29.0.0.jar;
\testWorkspace\rhino1_7R4\js.jar;
\testWorkspace\stringTemplate\ST-4.0.7.jar;
\jdk\jdk1.7.0_17\lib\tools.jar
com.sforce.ws.tools.wsdlc
\testWorkspace\wsdl\enterprise.wsdl
\testWorkspace\stub\enterprise_stub.jar
```

Note that this example includes the Rhino and StringTemplate dependent .jar files in the classpath.

Verify the WSDL Environment (WSDL-Based APIs)

You can verify your developer environment with a simple Java test application in Eclipse.

You should have the JDK, Eclipse, and WSC installed, and have generated the Java stub .jar files for the WSDL files that you need to use. You'll need the stub .jar file for either the Enterprise or Partner WSDL to follow the verification steps.

- 1. Run Eclipse. Click File > New > Java Project and name the project SF-WSC-Test.
- 2. Add the WSC and stub .jar files to your project. Click **Project** > **Properties** > **Java Build Path** > **Libraries**, click **Add External JARs**, select the WSC, and stub .jar files, and click **OK**.
- 3. Add a new folder to the src folder by right-clicking src, then select New > Folder and use wsc as the folder name.

4. Create a new class by right-clicking wsc and selecting New > Class. Name the class Main.

5. Replace the code Eclipse generates for Main.java as described in the following section.

Use the following simple login example code for your Main.java class. Replace YOUR DEVORG USERNAME with your developer organization username, and replace YOUR DEVORG PASSWORD AND SECURITY TOKEN with your developer organization password appended with your security token. If you did not set a security token in your organization, just provide your password. A GitHub Gist of this code is available here: https://gist.github.com/anonymous/78864d2c4ccfe4e983ef.

```
package wsc;
import com.sforce.soap.enterprise.Connector;
import com.sforce.soap.enterprise.EnterpriseConnection;
import com.sforce.ws.ConnectionException;
import com.sforce.ws.ConnectorConfig;
public class Main {
   static final String USERNAME = "YOUR DEVORG USERNAME";
   static final String PASSWORD = "YOUR DEVORG PASSWORD AND SECURITY
TOKEN";
   static EnterpriseConnection connection;
    public static void main(String[] args) {
        ConnectorConfig config = new ConnectorConfig();
        config.setUsername(USERNAME);
        config.setPassword(PASSWORD);
        try {
            connection = Connector.newConnection(config);
            // display some current settings
            System.out.println("Auth EndPoint:
"+config.getAuthEndpoint());
            System.out.println("Service EndPoint:
"+config.getServiceEndpoint());
            System.out.println("Username: "+config.getUsername());
            System.out.println("SessionId: "+config.getSessionId());
        } catch (ConnectionException e1) {
            e1.printStackTrace();
        }
    }
}
```

The following example output shows a typical successful run of this code.

```
Auth EndPoint: https://login.salesforce.com/services/Soap/c/27.0
Service EndPoint:
https://yourInstance.salesforce.com/services/Soap/c/27.0/00DU0000000L5f0
Username: testuser@testorg.com
SessionId: 00DU000000025f0!ARoAQDjpkH.NReBp vBLZ124aDbgYM v7so9ciUu
```

If the verification Java project runs and displays output that matches your organization, your developer environment is set up and you can start developing Java applications that integrate with Salesforce.

Installing HttpClient and JSON Frameworks (REST-Based APIs)

To access REST resources, you'll need to install HttpClient and JSON frameworks. HttpClient lets you access HTTP resources. The JSON framework lets you generate and parse JSON request and response data.

You'll need to have the JDK installed on your local system to use the HttpClient and JSON frameworks.

- 1. Navigate to http://hc.apache.org/downloads.cgi in your browser and download the binary archive of the latest "GA" version of HttpClient. Un-archive the downloaded file and move the directory to a location you'll remember.
- 2. Navigate to http://mvnrepository.com/artifact/org.json/json in your browser and download the latest binary .jar file. Copy this .jar file to a location you'll remember.

Setting Up Connected App Access (REST-Based APIs)

Because Salesforce REST APIs use OAuth authentication, you'll need to create a connected app to integrate your application with Salesforce.

A connected app integrates an application with Salesforce using APIs. Connected apps use standard SAML and OAuth protocols to authenticate, provide single sign-on, and provide tokens for use with Salesforce APIs. In addition to standard OAuth capabilities, connected apps allow Salesforce admins to set various security policies and have explicit control over who can use the corresponding apps.

The New Connected App wizard walks you through creating a connected app.

- In Lightning Experience, you use the App Manager to create connected apps. From Setup, enter App in the Quick Find box, then select App Manager (1). Click New Connected App (2).
- In Salesforce Classic, from Setup, enter Apps in the Quick Find box, then select Apps (under Build > Create). Under Connected Apps, click New.

Next, specify basic information about your app.

1. Enter the connected app's name. This name is displayed in the App Manager and on its App Launcher tile.

Note: The connected app name must be unique for the connected apps in your org. You can reuse the name of a deleted connected app if the connected app was created using the Spring '14 release or later.

- 2. Enter the API name used when referring to your app from a program. It defaults to a version of the name without spaces. Only letters, numbers, and underscores are allowed, so if the original app name contains any other characters, edit the default name.
- **3.** Enter the contact email for Salesforce to use when contacting you or your support team. This address isn't given to Salesforce admins who install the app.
- **4.** Enter the contact phone for Salesforce to use in case we want contact you. This number isn't given to Salesforce admins who install the app.
- 5. Enter a logo image URL to display your logo on the App Launcher tile. It also appears on the consent page that users see when authenticating. The URL must use HTTPS. Use a GIF, JPG, or PNG file and a

file size that's preferably under 20 KB, but at most 100 KB. We resize the image to 128 pixels by 128 pixels, so be sure that you like how it looks. If you don't supply a logo, Salesforce generates one for you using the app's initials.

- You can upload your own logo image by clicking Upload logo image. Select an image from your local file system that meets the size requirements for the logo. When your upload is successful, the URL to the logo appears in the Logo Image URL field. Otherwise, make sure that the logo meets the size requirements.
- You can also select a logo from the Salesforce samples by clicking **Choose one of our sample logos**. The logos include ones for Salesforce apps, third-party apps, and standards bodies. Click the logo you want, and then copy and paste the URL into the Logo Image URL field.
- You can use a logo hosted publicly on Salesforce servers by uploading an image as a document from the Documents tab. View the image to get the URL, and then enter the URL into the Logo Image URL field.
- 6. If you have a web page with more information about your app, provide an info URL.
- **7.** Enter a description up to 256 characters to display on the connected app's App Launcher tile. If you don't supply a description, just the name appears on the tile.

Next, provide OAuth settings by selecting Enable OAuth Settings and providing the following information.

- 1. If you're setting up OAuth for applications on devices with limited input or display capabilities, such as TVs, appliances, or command-line applications, select **Enable for Device Flow**.
 - Note: When enabled, the value for the callback URL defaults to a placeholder, unless you specify your own URL. You can specify your own callback URL as needed, such as when this same consumer is being used for a different flow. A callback URL isn't used in the device authentication flow.
- 2. Enter the callback URL (endpoint) that Salesforce calls back to your application during OAuth. It's the OAuth redirect URI.

Depending on which OAuth flow you use, the URL is typically the one that a user's browser is redirected to after successful authentication. Because this URL is used for some OAuth flows to pass an access token, the URL must use secure HTTPS or a custom URI scheme. If you enter multiple callback URLs, at run time Salesforce matches the callback URL value specified by the app with one of the values in Callback URL. It must match one of the values to pass validation.

- 3. If you're using the JWT OAuth flow, select **Use Digital Signatures**. If the app uses a certificate, click **Choose File** and browse your system for the certificate.
- **4.** Under Selected OAuth Scopes, add all supported OAuth scopes to. These scopes refer to permissions the user gives to the connected app while it's running. The OAuth token name is in parentheses.

Access and manage your Chatter feed (chatter_api)

Allows access to Chatter REST API resources only.

Access and manage your data (api)

Allows access to the logged-in user's account using APIs, such as REST API and Bulk API. This value also includes chatter api, which allows access to Chatter REST API resources.

Access your basic information (id, profile, email, address, phone)

Allows access to the Identity URL service.

Access custom permissions (custom_permissions)

Allows access to the custom permissions in an org associated with the connected app. It shows whether the current user has each permission enabled.

Allow access to your unique identifier (openid)

Allows access to the logged-in user's unique identifier for OpenID Connect apps.

Full access (full)

Allows access to the logged-in user's data, and encompasses all other scopes. Full doesn't return a refresh token. You must explicitly request the refresh_token scope to get one.

Perform requests on your behalf at any time (refresh_token, offline_access)

Allows a refresh token to be returned if the app is eligible to receive one. This scope lets the app interact with the user's data while the user is offline. The refresh_token scope is synonymous with offline_access.

Provide access to custom applications (visualforce)

Allows access to Visualforce pages.

Provide access to your data via the Web (web)

Allows use of the access_token on the web. It includes Visualforce, which allows access to Visualforce pages.

- 5. If you're setting up OAuth for a client app that can't keep the client secret confidential and must use the web server flow because it can't use the user-agent flow, deselect **Require Secret for Web Server Flow**. We still generate a client secret for your app but this setting instructs the web server flow to not require the client_secret parameter in the access token request. If your app can use the user-agent flow, we recommend user-agent as a more secure option than web server flow without the secret.
- 6. To control how the OAuth request handles the ID token, select **Include the ID token**. If the OAuth request includes the **Allow access to your unique identifier (openid)** scope, the returned token can include the ID token.
 - The ID token is always included in access token responses.
 - With the primary ID token setting enabled, configure the secondary settings that control the ID token contents in both access and refresh token responses. Select at least one of these settings.

Include Standard Claims

Include the standard claims that contain information about the user, such as the user's name, profile, phone_number, and address. The OpenID Connect specifications define a set of standard claims to be returned in the ID token.

Include Custom Attributes

If your app has specified custom attributes, include them in the ID token.

Include Custom Permissions

If your app has specified custom permissions, include them in the ID token.

- 7. To allow users to be automatically logged out of the connected app service provider when they log out of Salesforce as an identity provider, select **Enable Single Logout**.
- 8. If you selected **Enable Single Logout**, enter a single logout URL, which is where Salesforce sends logout requests when users log out of Salesforce. The single logout URL must be an absolute URL starting with https://.

- **9.** To configure asset token settings if you're setting up your app to issue asset tokens for connected devices, select **Enable Asset Tokens**.
 - Specify these settings.

Token Valid for

The length of time that the asset token is valid after it's issued.

Asset Signing Certificate

The self-signed certificate that you've already created for signing asset tokens.

Asset Audiences

The intended consumers of the asset token. For example, the backend service for your connected device, such as https://your_device_backend.com.

Include Custom Attributes

If your app has specified custom attributes, include them in the asset token.

Include Custom Permissions

If your app has specified custom permissions, include them in the asset token.

• Specify the callback URL (endpoint). For example,

https://your_device_backend.com/callback.

- Make sure that you select these OAuth scopes, which are required for asset tokens.
 - Access and manage your data (api)
 - Allow access to your unique identifier (openid)

When you're finished entering the information, click **Save**. You can now publish your app, make further edits, or delete it. If you're using OAuth, saving your app gives you two new values that the app uses to communicate with Salesforce.

- Consumer Key: A value used by the consumer to identify itself to Salesforce. Referred to as client_id in OAuth 2.0.
- Consumer Secret: A secret used by the consumer to establish ownership of the consumer key. Referred to as client secret in OAuth 2.0.

See Create a Connected App in the Salesforce online help for more for more information on connected apps.

Verify the REST Environment (REST-Based APIs)

You can verify your developer environment with a simple Java test application in Eclipse.

You should have the JDK, Eclipse, and the HttpClient and JSON frameworks installed.

- 1. Run Eclipse. Click File > New > Java Project and name the project "SF-REST-Test."
- 2. Click Project > Properties > Java Build Path > Libraries and click Add External JARs. Add the HttpClient.jar files: httpclient, httpcore, commons-codec, and commons-logging (the .jar files will have version information in the filenames). Add the JSON .jar file, which might also have a version number in the .jar filename.
- 3. Add a new folder to the src folder by right-clicking src, then select New > Folder and use sfdc rest as the folder name.
- 4. Create a new class by right-clicking sfdc_rest and selecting New > Class. Name the class Main.

5. Replace the code Eclipse generates for Main.java as described in the following section.

Use the following simple login example code for your Main.java class. Replace YOUR DEVORG USERNAME with your developer organization username, and replace YOUR DEVORG PASSWORD + SECURITY TOKEN with your developer organization password appended with your security token. If you did not set a security token in your organization, just provide your password. Replace YOUR OAUTH CONSUMER KEY with the consumer key from your development organization's connected app. Replace YOUR OAUTH CONSUMER SECRET with the consumer secret from your development organization's connected app. A GitHub Gist of this code is available here:

https://gist.github.com/anonymous/fcb1bc36ef50c0efbeb5. package sfdc rest; import java.io.IOException; import org.apache.http.client.methods.HttpPost; import org.apache.http.impl.client.DefaultHttpClient; import org.apache.http.HttpResponse; import org.apache.http.HttpStatus; import org.apache.http.util.EntityUtils; import org.apache.http.client.ClientProtocolException; import org.json.JSONObject; import org.json.JSONTokener; import org.json.JSONException; public class Main { static final String USERNAME = "YOUR DEVORG USERNAME"; static final String PASSWORD = "YOUR DEVORG PASSWORD + SECURITY TOKEN"; static final String LOGINURL = "https://login.salesforce.com"; static final String GRANTSERVICE = "/services/oauth2/token?grant type=password"; static final String CLIENTID = "YOUR OAUTH CONSUMER KEY"; static final String CLIENTSECRET = "YOUR OAUTH CONSUMER SECRET"; public static void main(String[] args) { DefaultHttpClient httpclient = new DefaultHttpClient(); // Assemble the login request URL String loginURL = LOGINURL + GRANTSERVICE + "&client_id=" + CLIENTID + "&client secret=" + CLIENTSECRET + "&username=" + USERNAME + "&password=" + PASSWORD; // Login requests must be POSTs HttpPost httpPost = new HttpPost(loginURL); HttpResponse response = null;

```
try {
            // Execute the login POST request
           response = httpclient.execute(httpPost);
        } catch (ClientProtocolException cpException) {
            // Handle protocol exception
        } catch (IOException ioException) {
            // Handle system IO exception
        }
        // verify response is HTTP OK
       final int statusCode =
response.getStatusLine().getStatusCode();
       if (statusCode != HttpStatus.SC OK) {
            System.out.println("Error authenticating to Force.com:
"+statusCode);
           // Error is in EntityUtils.toString(response.getEntity())
           return;
        }
        String getResult = null;
        try {
            getResult = EntityUtils.toString(response.getEntity());
        } catch (IOException ioException) {
            // Handle system IO exception
        }
        JSONObject jsonObject = null;
        String loginAccessToken = null;
        String loginInstanceUrl = null;
        trv {
            jsonObject = (JSONObject) new
JSONTokener(getResult).nextValue();
            loginAccessToken = jsonObject.getString("access token");
            loginInstanceUrl = jsonObject.getString("instance url");
        } catch (JSONException jsonException) {
           // Handle JSON exception
        }
        System.out.println(response.getStatusLine());
        System.out.println("Successful login");
        System.out.println(" instance URL: "+loginInstanceUrl);
        System.out.println(" access token/session ID:
"+loginAccessToken);
        // release connection
       httpPost.releaseConnection();
    }
}
```

The following example output shows a typical successful run of this code.

```
HTTP/1.1 200 OK
Successful login
instance URL: https://yourInstance.salesforce.com
access token/session ID:
00DU0000000L5SPxa1XFi0rwB16YCQ.Xyv2nKiCT8iIN9_nkKQJ3UUf
```

If the verification Java project runs and displays output that matches your organization, your developer environment is now set up and you can start developing Java applications that integrate with Salesforce REST APIs.