REST API in APEX

Architectural constraints/Characteristics

Stateless

Each request from client to server must contain all the information necessary to understand the request, and not use any stored context on the server.

Caching behavior

Responses are labeled as cacheable or non-cacheable.

Uniform interface

All resources are accessed with a generic interface over HTTP.

Named resources

All resources are named using a base URI that follows your Lightning Platform URI.

Layered components

allows for the existence of such intermediaries as proxy servers and gateways to exist between the client and the resources.

Authentication

Uses Oath2.0.

Support for JSON and XML

JSON is the default. You can use the `HTTP ACCEPT` header to select either JSON or XML, or append `json` or `xml` to the URI

Compression

The REST API allows the use of compression on the request and the response, using the standards defined by the HTTP 1.1 specification. Compression is automatically supported by some clients, and can be manually added to others. For better performance.

Request compression: Add **`Accept-Encoding: gzip`** or **`Accept-Encoding: deflate`** in a request Header.

Response compression : in response header **`Content-Encoding: gzip/Content-Encoding: deflate`**

Authorization Through Connected Apps and OAuth 2.0

A connected app requests access to REST API resources on behalf of the client application.

OAuth 2.0 is an open protocol that authorizes secure data sharing between applications through the exchange of tokens.
OAuth authorization flows grant a client app restricted access to REST API resources on a resource server. Each OAuth flow offers a different process for approving access to a client app, but in general the flows consist of three main steps.

1. a connected app, on behalf of a client app, requests access to a REST API resource.
2. In response, an authorizing server grants access tokens to the connected app.
3. A resource server validates these access tokens and approves access to the protected REST API resource.

Perform Cross-Origin Requests from Web Browsers

Suppose a user visits http://www.example.com and the page attempts a cross-origin request to fetch the user's data from http://service.example.com. A CORS-compatible browser will attempt to make a cross-origin request to service.example.com.

In Salesforce, add the origin serving the code to a CORS allowlist.

1. enter `CORS` in the `Quick Find` box, then select **CORS**
2. **New**
3. Enter a URL Pattern

   You can add (*) wildcard at 2nd level domain, Example : `https://*.example.com` .

If a browser that supports CORS makes a request to an origin in the allowlist, Salesforce returns the origin in the **Access-Control-Allow-Origin** HTTP header along with any additional CORS HTTP headers. If the origin isn't included in the allowlist, Salesforce returns HTTP status code 403.

Connected App and OAuth Terminology

https://help.salesforce.com/articleView?id=sf.remoteaccess_terminology.htm&type=5

Access Token: Instead of using the user's Salesforce credentials, a consumer (connected app) can use an access token to gain access to protected resources on behalf of the user. For OAuth 2.0, the access token is a session ID and can be used directly.

Authorization Code: In Oath 2.0, The authorization code is used to obtain an access token and a refresh token. It expires after 15 minutes.

Authorization Server: server that authorizes a resource owner, and upon successful authorization, issues access tokens to the requesting consumer.

Callback URL: A callback URL is the URL that is invoked after OAuth authorization for the consume.

OAuth Endpoint: OAuth endpoints are the URLs that you use to make OAuth authorization requests to Salesforce.

Consumer : A consumer is the website or app that uses OAuth to authorize both the Salesforce user and itself on the user's behalf. Referred to as client in OAuth 2.0.

Consumer Key :A consumer uses a key to identify itself to Salesforce. Referred to as client_id in OAuth 2.0.

Consumer Secret : A consumer uses a secret to establish ownership of the consumer key. Referred to as client_secret in OAuth 2.0.

Refresh Token : Only used in OAuth 2.0, a consumer can use a refresh token to obtain a new access token, without having the end user approve the access again.

Resource Owner: The resource owner is the entity (usually the end user) that grants access to a protected resource.

Resource Server : The resource server is the server that hosts the protected resource. Your Salesforce org is the resource server that protects your data.

Token Secret : A consumer uses this secret to establish ownership of a given token, both for request tokens and access tokens.

Connected Apps

A connected app is a framework that enables an external application to integrate with Salesforce using APIs and standard protocols, such as Security Assertion Markup Language (SAML), OAuth, and OpenID Connect. Connected apps use these protocols to authorize, authenticate, and provide single sign-on (SSO) for external apps.

Developers create and configure authorization flows for connected apps, and admins set policies and permissions to control connected app usage.

1. **Access Data with API Integration**: web-based or mobile applications that need to pull data from your Salesforce org, you can use connected apps as the clients to request this data. Use OAuth 2.0 **Security**.
   a. Web Server integration – Web -> connected app -> Salesforce
   b. Mobile integration -> mobile to salesforce/ can use mobile SDK instead of connected app.
   c. Server to Server integration -> no need to be real time, can do authorization and authentication in advance by sending JSON WEB TOKEN or JWT
   d. IOT integration -> for devices like TV , having limited input capabilities.

2. **Integrate Service Providers with Salesforce**: SSO
   a. You want your users to be able to log in to their app with their Salesforce credentials. Using SAML 2.0 for user **authentication**.
   b. OpenID Connect is a protocol that enables SSO between two services, like SAML2.0. It adds an authentication layer on top of OAuth 2.0 to enable secure exchange of ID tokens that contain user information alongside OAuth access tokens.

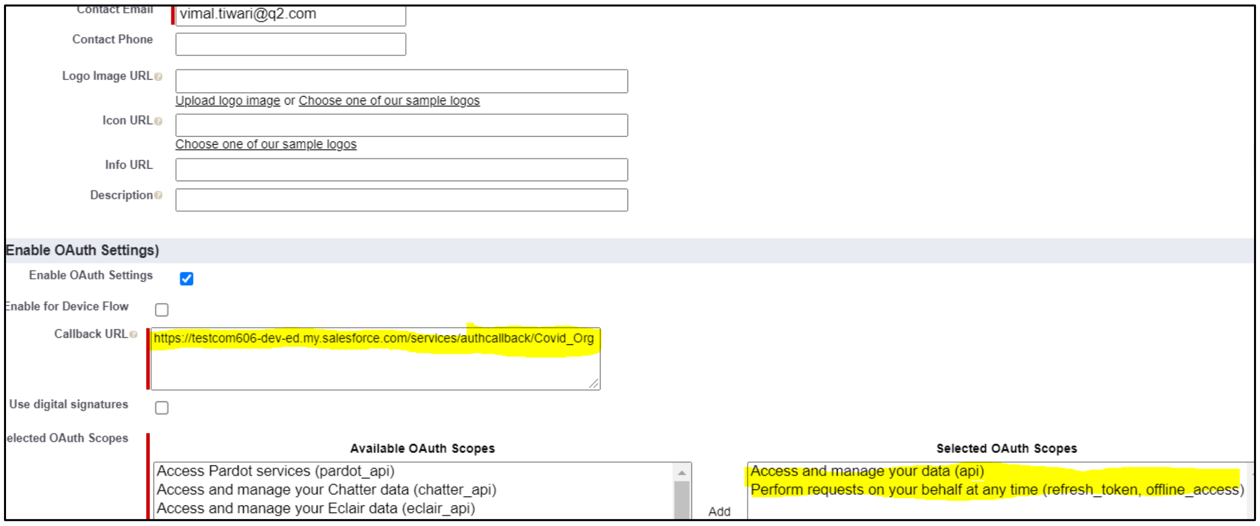
3. **Provide Authorization for External API Gateways:** Using OpenID Connect dynamic client registration, resource servers can dynamically create client apps as connected apps in Salesforce, by sending request to authorization server. The authorization server

verifies the resource server's request and creates the connected app, giving it a unique client ID and client secret.

Basic Rest Based data movement Demo using Connected App and OAuth2.0

Steps for Org 1 acting as Server.

1. In response Server i.e. your org providing service, create Apex class for Account Rest Services
2. Create a connected App there.



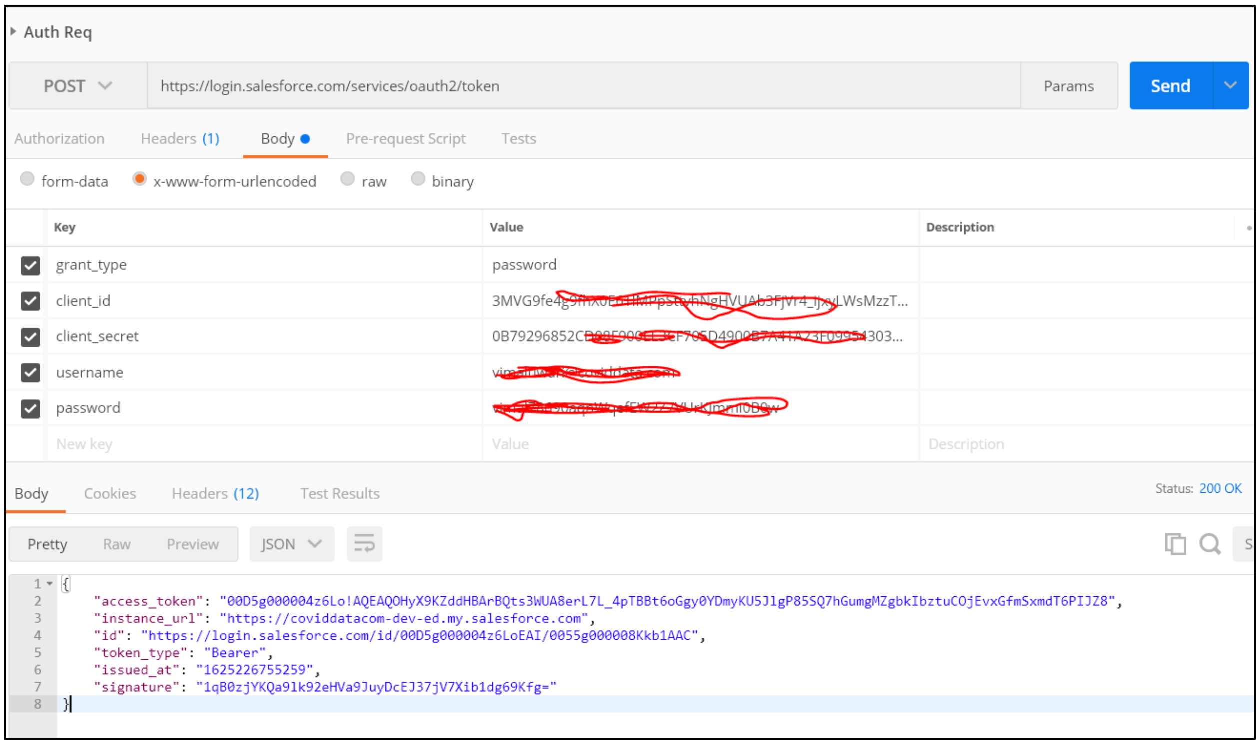
Contact Email: vimal.tiwari@q2.com
Contact Phone:
Logo Image URL:
Upload logo image or Choose one of our sample logos
Icon URL:
Choose one of our sample logos
Info URL:
Description:

Enable OAuth Settings)
Enable OAuth Settings: ✓
Enable for Device Flow: ☐
Callback URL: https://testcom606-dev-ed.my.salesforce.com/services/authcallback/Covid_Org
Use digital signatures: ☐
Selected OAuth Scopes:

Available OAuth Scopes		Selected OAuth Scopes
Access Pardot services (pardot_api)		Access and manage your data (api)
Access and manage your Chatter data (chatter_api)	Add	Perform requests on your behalf at any time (refresh_token, offline_access)
Access and manage your Eclair data (eclair_api)		

3. Use Basic Tutorial of Rest API with Oauth2.0 for creation and testing Rest Services.

Auth :



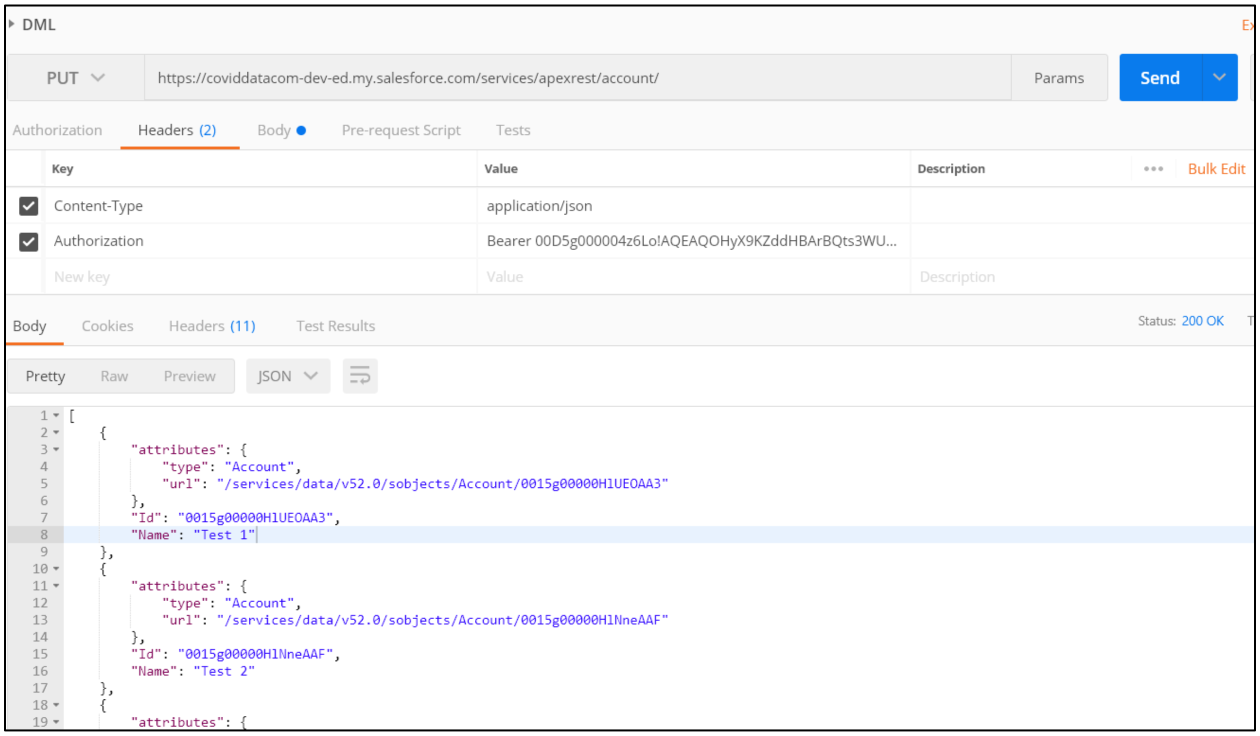
https://login.salesforce.com/services/oauth2/token

Key	Value	Description
✓ grant_type	password	
✓ client_id	3MVG9fe4g[redacted]LWsMzzT...	
✓ client_secret	0B79296852C[redacted]303...	
✓ username	[redacted]	
✓ password	[redacted]	
New key	Value	Description

```
{
    "access_token": "00D5g000004z6Lo!AQEAQOHyX9KZddHBArBQts3WUA8erL7L_4pTBBt6oGgy0YDmyKU5J1gP85SQ7hGumgMZgbkIbztuCOjEvxGfmSxmdT6PIJZ8",
    "instance_url": "https://coviddatacom-dev-ed.my.salesforce.com",
    "id": "https://login.salesforce.com/id/00D5g000004z6LoEAI/0055g000008Kkb1AAC",
    "token_type": "Bearer",
    "issued_at": "1625226755259",
    "signature": "1qB0zjYKQa91k92eHVa9JuyDcEJ37jV7Xib1dg69Kfg="
}
```

Rest Testing

In authorization : Bearer <access-token>// bearer is a prefix



https://coviddatacom-dev-ed.my.salesforce.com/services/apexrest/account/

Key	Value	Description
✓ Content-Type	application/json	
✓ Authorization	Bearer 00D5g000004z6Lo!AQEAQOHyX9KZddHBArBQts3WU...	
New key	Value	Description

```
[
    {
        "attributes": {
            "type": "Account",
            "url": "/services/data/v52.0/sobjects/Account/0015g00000H1UEOAA3"
        },
        "Id": "0015g00000H1UEOAA3",
        "Name": "Test 1"
    },
    {
        "attributes": {
            "type": "Account",
            "url": "/services/data/v52.0/sobjects/Account/0015g00000H1NneAAF"
        },
        "Id": "0015g00000H1NneAAF",
        "Name": "Test 2"
    },
    {
        "attributes": {
```

Steps for Org 2 acting as Client

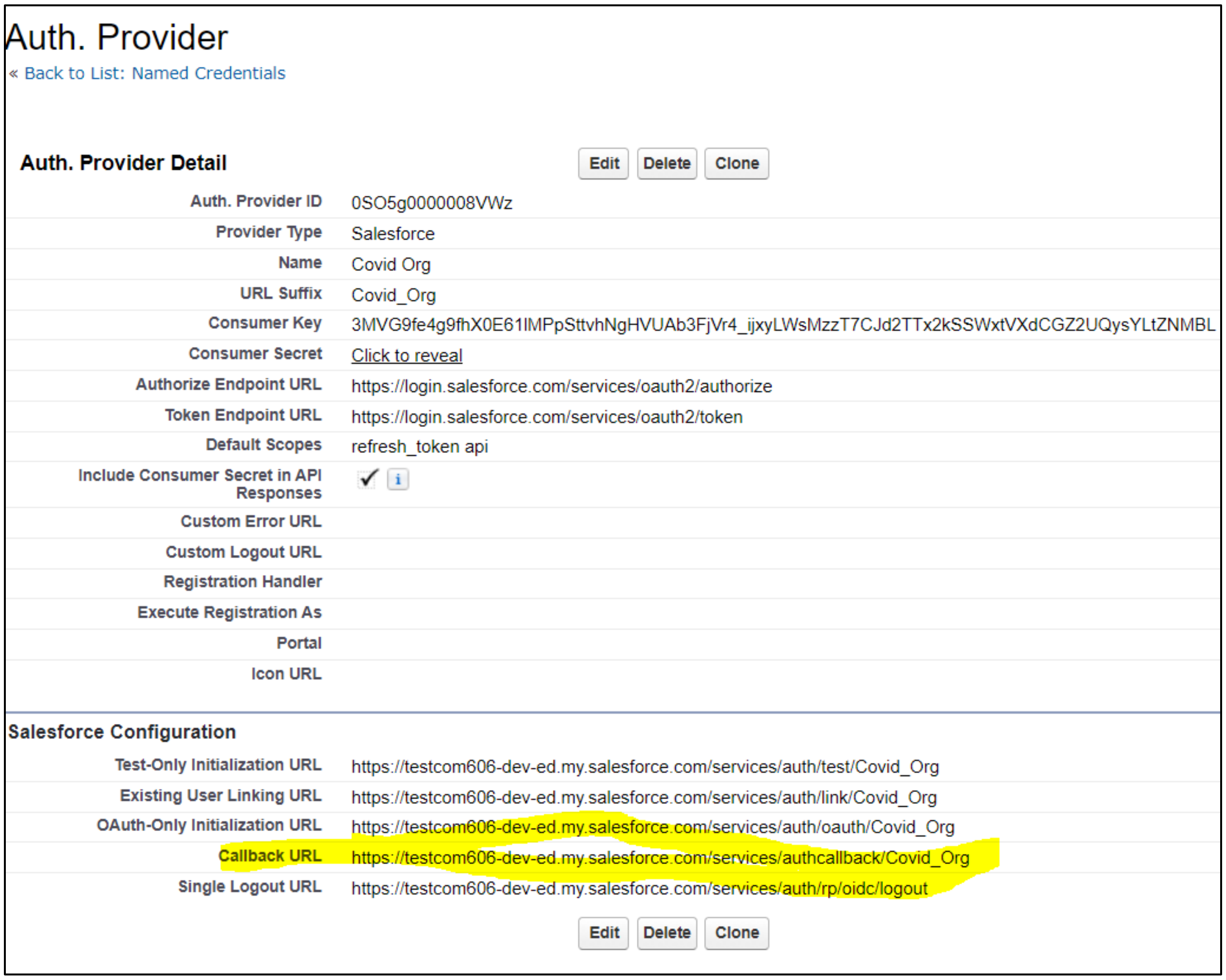
1. Create Authorization Provider – req. in Named Credentials
    a. Setup -> Auth. Provider
    b. Default scope – **refresh_token full**

refresh_token means – It will get updated token each time the existing token expires for authentication.

full means – full access,

Api – Api access.

Call back url – Need to be updated in call back field of connected app in org1.



Auth. Provider

« Back to List: Named Credentials

Auth. Provider Detail

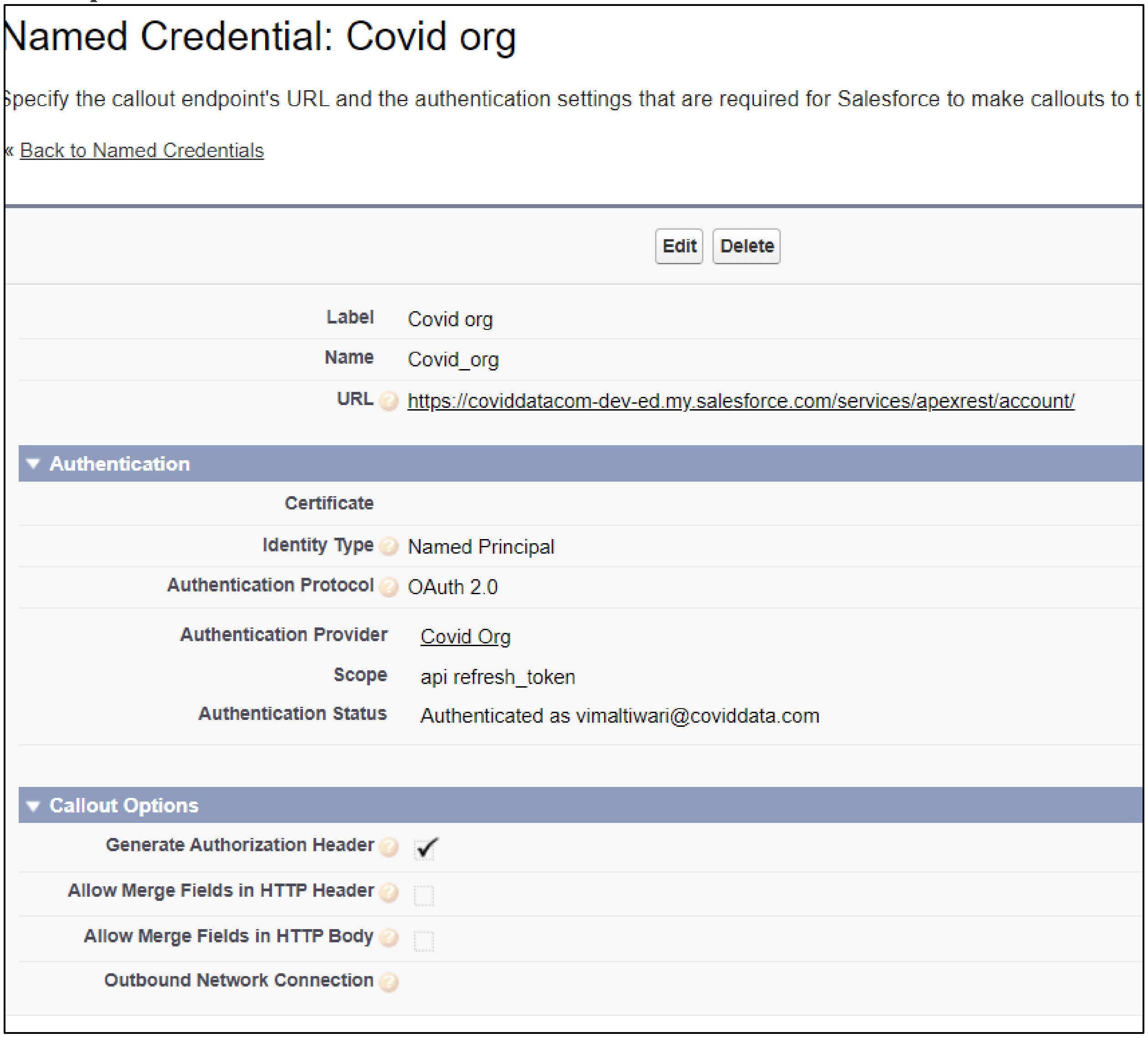
Auth. Provider ID	0SO5g0000008VWz
Provider Type	Salesforce
Name	Covid Org
URL Suffix	Covid_Org
Consumer Key	3MVG9fe4g9fhX0E61lMPpSttvhNgHVUAb3FjVr4_ijxyLWsMzzT7CJd2TTx2kSSWxtVXdCGZ2UQysYLtZNMBL
Consumer Secret	Click to reveal
Authorize Endpoint URL	https://login.salesforce.com/services/oauth2/authorize
Token Endpoint URL	https://login.salesforce.com/services/oauth2/token
Default Scopes	refresh_token api
Include Consumer Secret in API Responses	✓
Custom Error URL	
Custom Logout URL	
Registration Handler	
Execute Registration As	
Portal	
Icon URL	

Salesforce Configuration

Test-Only Initialization URL	https://testcom606-dev-ed.my.salesforce.com/services/auth/test/Covid_Org
Existing User Linking URL	https://testcom606-dev-ed.my.salesforce.com/services/auth/link/Covid_Org
OAuth-Only Initialization URL	https://testcom606-dev-ed.my.salesforce.com/services/auth/oauth/Covid_Org
Callback URL	https://testcom606-dev-ed.my.salesforce.com/services/authcallback/Covid_Org
Single Logout URL	https://testcom606-dev-ed.my.salesforce.com/services/auth/rp/oidc/logout

2. Create **Named Credentials**

a. Provide Auth. Provider for Oauth 2.0
b. Identity type –
    i. Per user – Api callout based on calling user's context
    ii. Named Principal – One user will be used for all callouts, might be the owner.
c. URL : the base url.
d. Authentication protocol – **if it is selected, that means system will take care of authentication. No need to do callout for authentication explicitly**.
e. Authentication status should not be pending. If it is there, setup is not complete.
f. **Generate authorization header** need to be checked, **if any Authentication protocol is selected.**


Named Credential: Covid org

Specify the callout endpoint's URL and the authentication settings that are required for Salesforce to make callouts to t

« Back to Named Credentials

Label	Covid org
Name	Covid_org
URL	https://coviddatacom-dev-ed.my.salesforce.com/services/apexrest/account/

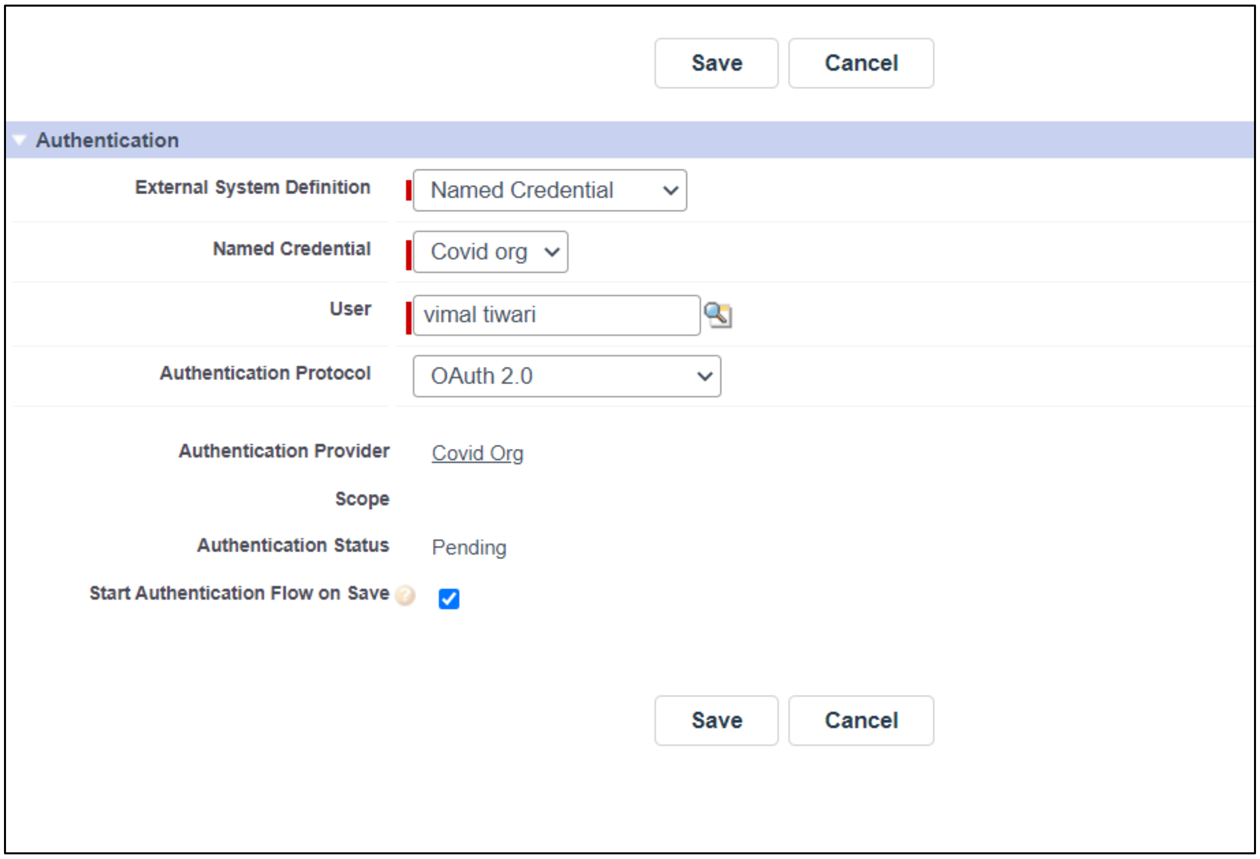
Authentication

Certificate	
Identity Type	Named Principal
Authentication Protocol	OAuth 2.0
Authentication Provider	Covid Org
Scope	api refresh_token
Authentication Status	Authenticated as vimaltiwari@coviddata.com

Callout Options

Generate Authorization Header	✓
Allow Merge Fields in HTTP Header	☐
Allow Merge Fields in HTTP Body	☐
Outbound Network Connection	

3. Give Access of Named Credential to Users – Need in case of **Per user** setting. I have used Permission set.
4. Authentication Settings for External Systems – **Needed in Per user setting**.
    a. Go to my settings -> personal -> Authentication Settings for External Systems
    b. Click new , add NC as external system definition.



External System Definition	Named Credential
Named Credential	Covid org
User	vimal tiwari
Authentication Protocol	OAuth 2.0
Authentication Provider	Covid Org
Scope	
Authentication Status	Pending
Start Authentication Flow on Save	✓

5. It's time to write some apex code and do some fun.
    Create new class **AccountRestClientWithOAuth2** and use its methods to get and put data.

For custom Authorization and callouts:

1. Create remote site setting for base URL.
2. AccountRestClient
    a. Call setAccessToken to get access token and set it in **platform cache and set time to live.** It is a field in seconds which can save the token expire time, based on server's details. Ex. 10 min, 5 min etc.
    b. For each callout, check if token is there, then go for other methods

   c. Else refresh -> call the setAccessToken again and get new token, save it again in cache.

Reference :

https://www.jitendrazaa.com/blog/salesforce/login-to-salesforce-from-salesforce-using-authentication-provider/#more-4516

https://developer.salesforce.com/docs/atlas.en-us.apexcode.meta/apexcode/apex_callouts_named_credentials.htm

https://salesforce.stackexchange.com/questions/102484/use-of-named-credentials-seem-to-be-tied-to-external-data-source

Integration Framework

Overview: Since from UI, we can do real time callouts, because we can prevent user actions, for process based callouts, can't do it real time. It can be near real time. The framework takes callout request from any context and saves it. Then there will be some process which takes the request Queue and process it.

Classes Skeleton

```
global class ResponseWrapper{
        global List<SubResponseWrapper> jsonResponses; // bulk Responses
        global String returnCode;
}

global class RequestWrapper{
        global String endpoint;
        global List< SubRequestWrapper > bodies;//bulk Request
}

global abstract class AbstractHTTPServiceClass{
        global abstract ResponseWrapper process(String httpType, RequestWrapper rw);
}

public class SampleHTTPServiceClass extends AbstractHTTPServiceClass {
        public override  ResponseWrapper process (String methodNam, RequestWrapper rw){
                if(methodName == 'getRecord'){
                        return getRecord(rw);
                }else if .....
        }
        @httpGet
        public ResponseWrapper getRecord(RequestWrapper rw){
                Http h =new Http();
                HttpRequest req = new HttpRequest();
                req.setEndpoint(rw.endpoint);
                HttpResponse res = h.send(req);
                return new ResponseWrapper(res.getBody());
        }
}
```

Data model

1. **Integration Log** – to save the details of an integration callout that is to be called.
    a. Service config – Unique name of corresponding service meta data record.
        i. Can create String like "Service.ClassName.Method" etc
    b. Log Status – New, In Progress, Success, Failed.
    c. Retry count.
    d. Status code
    e. Child records - Notes and Attachment
        i. Save Request as file – Request in Json converted in file
        ii. Save Response as file - Response in Json converted in file

2. **Service Configuration** – Custom Meta data to save callout information.
    a. Callout Service Class Name
    b. Callout method name – Method name
    c. END-POINT – Named credential name.
    d. Relative URL – service URL that gets added after End point.
    e. Max Retry count
    f. Request Wrapper class
    g. Response Wrapper class

3. **Exception log**– log exception per callout
    a. Error
    b. Error type
    c. Callout Id – Integration log id

Execution

1. **Add in Queue - From the Context, where Callout needs to be made**,
    a. Create Integration log by putting required Values.
        i. Provide the meta data records' unique name to it.
        ii. From the meta data,
            1. get the request Wrapper class Name,
            2. create JSON from wrapper.
            3. attach it on integration log as file.
        iii. Mark status as In-Progress. As we cannot update it before Callout In same context.

2. **Process Queue** – Some process which takes the set of requests and process them one by one. For example, **Batch**, **Queueable** etc
    a. Get the set of Logs which are not successful yet.
    b. For each Integration log – that is in In-Progress.

        Try{

        i. Take the meta data record from Pre-queried Meta data list.
        ii. If retry count on log < Max retry in Meta data
            1. Get the service class name.
            2. Get the instance of Service class using Reflection. (Type.forName)
            3. Call the Service Class ***process*** method
                a. pass the method type from Meta data record.
                b. get the Request Json from Attachment file, create a RequestWrappper and pass it.
            4. The method will do **Callout**, and returns a response.
            5. If the return code is 200,
                a. update records status to Success.
                b. Get the Response Wrapper as response, Convert into JSON and save it on log's attachment.
            6. Else
                a. increase the retry count.
                b. Change status of log to FAIL.
            7. Save the return code on Log record.

    }catch(Exception e){

        Use platform event to Create exception log record. And publish it.

    }

    c. Once the loop gets over. We can again go for retrying the failed logs. For this, don't do step 6b . Let the log be in IN-Progress, and again trigger the same process.
    d. For some response codes, we don't want to do anything such as 404, 403. In those cases, remove them from iterating list based on status codes.

Bulk Request – Sending more than 1 log in single callout.

(Request + Response) size can be 6 MB(sync) and 12MB(Async)

In case of bulk Requests, the RequestWrapper will contain request for multiple records, and receives responses corresponding to each record in a single ResponseWrapper. Based on the responses, update individual logs.

If the endpoint takes time to process i.e., possibility of Time out (time more than 120 sec), and response is not gonna be realtime.

a. The Endpoint should some response to notify that, the process will take time.
b. We will expose an endpoint from our system. That Endpoint will be hit by the other system once it finishes the processing.
c. We will update the required records.

Named Credentials

It specifies the URL of a callout endpoint and its required authentication parameters in one definition. It handles the authentication by itself, which is not possible in case of Remote site settings.

Fields

1. **URL**: Root/ BASE_URL of endpoint.

2. **Certificate**: used for digital signature at the time of request.

3. **Identity Type**: Determines whether you're using one set or multiple sets of credentials to access the external system.
    a. **Anonymous**: No identity and therefore no authentication.
    b. **Per User**: Use separate credentials for each user who accesses the external system via callouts. Select this option if the external system restricts access on a per-user basis. After you **grant user access through permission sets or profiles in Salesforce**, users can manage their own authentication settings for external systems in their personal settings. Also set **Authentication Settings for External Systems,** in my settings of that user for External Data source/NC.
    c. **Named Principal**: Use the same set of credentials for all users who access the external system from your org. Select this option if you designate one user account on the external system for all your Salesforce org users.

4. **Authentication protocol**: secure communication between the two systems.
    a. **Password Authentication**: Username and password

    b. **OAuth2.**0
        i. **Authentication Provider**
        ii. **Scope :** provide the scope for access token. Some common scopes are
            1. **"api" – allow current current logged in users account using API.**
            2. **"full" –** Allows access to all data accessible by the logged-in user. **full** doesn't return a refresh token. You must explicitly request the **refresh_token** scope to get a refresh token.
            3. **"refresh_token":** Allows a refresh token to be returned when the requesting client is eligible to receive one.

4. "**refresh_token, offline_access** ": With a refresh token, the app can interact with the user's data while the user is offline. This token is synonymous with requesting `offline_access`

iii. **Start Authentication Flow on Save :** To authenticate to the external system and obtain an OAuth token.

c. **JWT/ JWT Token Exchange**

   i. **Issuer:** who issued the JWT
   ii. **Scope:** Used in JWT token Exchange
   iii. **Token End point:** Used in JWT Token Exchange, JSON Web Token requests are sent to the provider in exchange for access tokens.
   iv. **Per User Subject**: In case per user selected, Per user identity like user Id.
   v. **Named Principal Subject**: In case named Principal selected. Provide some string specifies subject.
   vi. **Audiences:** External service or other allowed recipients for the JWT.
   vii. **Token Valid For:** Time for which token is valid, in Seconds, min, hours, days.
   viii. **JWT Signing Certificate:** Certificate verifying the JWT's authenticity to external system.

d. **AWS Signature Version 4 -** A protocol to authenticate callouts to resources in Amazon Web Services over HTTP. **The identity type must be named principal.**

   i. **AWS Access Key ID**
   ii. **AWS Secret Access Key**
   iii. **AWS Region :** AWS region name for NC endpoint.
   iv. **AWS service :** AWS utility to access.

5. **Custom Headers and Bodies of Apex Callouts**

   a. **Generate Authorization Header:** By default, Salesforce generates an authorization header and applies it to each callout that references the named credential.

   b. **Allow Merge Fields in HTTP Header** : `HTMLENCODE` can't be used on merge fields in HTTP headers.

   // non-standard authentication
   req.setHeader('X-Username', '{!$Credential.UserName}');
   req.setHeader('X-Password', '{!$Credential.Password}');

   // The external system expects "OAuth" as
   // the prefix for the access token.

req.setHeader('Authorization', 'OAuth {!$Credential.OAuthToken}');

c. **Allow Merge Fields in HTTP Body :** HTTP request bodies of callouts, you can apply the `HTMLENCODE` formula function to escape special characters.
req.setBody('UserName:{!HTMLENCODE($Credential.Username)}')
req.setBody('Password:{!HTMLENCODE($Credential.Password)}')

Authentication Providers: They authenticate users for SSO and authorize Salesforce to access protected third-party data.

Setup

Setup | Administer | Security Controls | Auth. Providers | Create New

1. “Consumer Key” and “Consumer Secret”.
2. “Default Scope“, it should have value as “refresh_token full”. “refresh_token” and “full” should be separated by space.
3. Authorize Endpoint URL should be something like: https://AuthenticationProviderinstance/services/oauth2/authorize
4. Token Endpoint URL: https://AuthenticationProviderinstance/services/oauth2/token
5. Once you save “Auth. Provider” in previous step, it will provide you list of URL **Copy Callback URL and edit Connected App we created in service provider Salesforce instance and paste link in callback URL field**.

Streaming API

Streaming API lets you push a stream of notifications from Salesforce to client apps based on criteria that you define.

1. Use Change data capture
2. Platform events
3. PushTopics and subscribe using Bayeus client.

A **PushTopic** is an sObject that contains the criteria of events you want to listen. PushTopic queries support all custom objects and some of the popular standard objects, such as Account, Contact, and Opportunity.

```
PushTopic pushTopic = new PushTopic();
pushTopic.Name = 'AccountUpdates';
//The SELECT statement’s field list must include Id.
//aggregate queries or semi-joins aren’t supported.
pushTopic.Query = 'SELECT Id, Name, Phone FROM Account WHERE BillingCity=\'USA\'';
pushTopic.ApiVersion = 37.0;
//operation preferences, default all are true
pushTopic.NotifyForOperationCreate = true;
pushTopic.NotifyForOperationUpdate = true;
pushTopic.NotifyForOperationUndelete = true;
pushTopic.NotifyForOperationDelete = true;
//field preferences
pushTopic.NotifyForFields = ‘Referenced’;
insert pushTopic;
```

NotifyForFields	Description
All	Notifications are generated for all record field changes.
Referenced (default)	Changes to fields referenced in the SELECT and WHERE clauses are evaluated.
Select	Changes to fields referenced in the SELECT clause are evaluated.
Where	Changes to fields referenced in the WHERE clause are evaluated.

Soap API

Web Services Description Language (WSDL) contains the bindings, protocols, and objects to make API calls. Salesforce provides two SOAP API WSDLs for two different use cases.

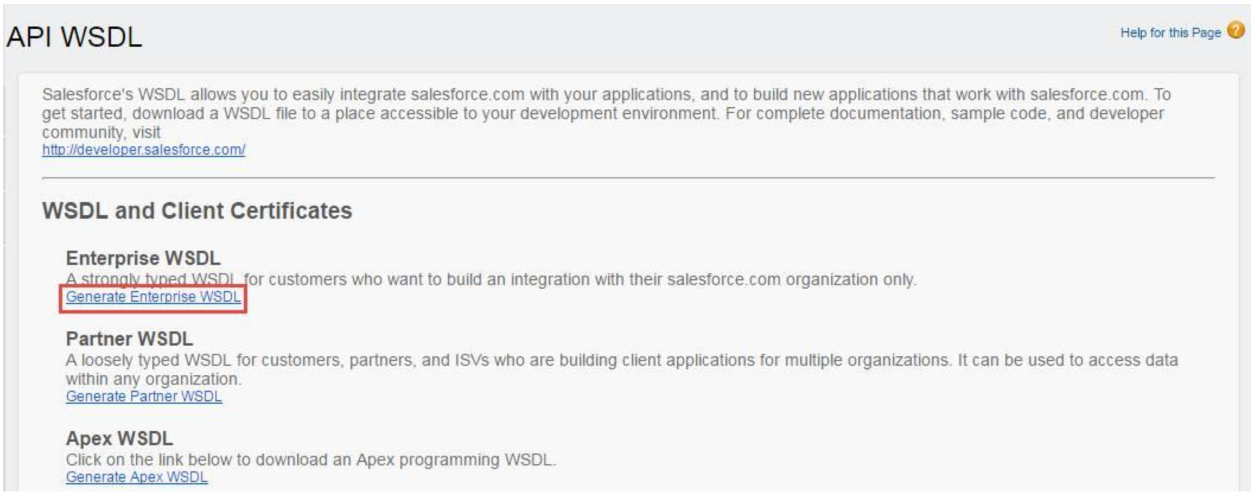
The enterprise WSDL - integration for single org

1. It is optimized for a single Salesforce org.
2. It’s strongly typed, and it reflects your org’s specific configuration.

The partner WSDL - integration for multiple org

1. is optimized for use with many Salesforce orgs.
2. It’s loosely typed, and it doesn’t change based on an org’s specific configuration.

Setup-> quick find -> api



API WSDL

Help for this Page

Salesforce's WSDL allows you to easily integrate salesforce.com with your applications, and to build new applications that work with salesforce.com. To get started, download a WSDL file to a place accessible to your development environment. For complete documentation, sample code, and developer community, visit
http://developer.salesforce.com/

WSDL and Client Certificates

Enterprise WSDL
A strongly typed WSDL for customers who want to build an integration with their salesforce.com organization only.
Generate Enterprise WSDL

Partner WSDL
A loosely typed WSDL for customers, partners, and ISVs who are building client applications for multiple organizations. It can be used to access data within any organization.
Generate Partner WSDL

Apex WSDL
Click on the link below to download an Apex programming WSDL.
Generate Apex WSDL

Demo using Soap Client:
https://trailhead.salesforce.com/en/content/learn/modules/api_basics/api_basics_soap

1. Install the soap client.
2. New soap project and upload WSDL. Once it is successful, it shows all the request that can be made to WSDL org.
3. Login-> request 1-> Provide username and password+Security Token
4. Once login is successful, you get Session ID and instance url.

5. For any other request, for example create, Use session Id in SessionHeader.
6. Hit Instance url, with the requests.

<u>Apex Callout using SOAP web Service</u>

1. Get the WSDL file, from resource server.
2. Convert wsdl to apex using WSDL2Apex. **The size of any WSDL document can be at most 1MB.**
3. The Apex classes construct the SOAP XML, transmit the data, and parse the response XML into Apex objects. Instead of developing the logic to construct and parse the XML of the web service messages, let the Apex classes generated by WSDL2Apex internally handle all that overhead.

<u>Expose a Class as a SOAP web Service</u>

Source System.

1. **Define your class as global**.
2. Add the **webservice** keyword and the **static** definition modifier to each method you want to expose.
3. **The webservice keyword provides global access to the method it is added to.**

```
global with sharing class MySOAPWebService {
   webservice static Account getRecord(String id) {
      // Add your code
   }
}
```

4. Generate this WSDL for your class and send it to target developers.
5. For Authentication, external applications must use either the Enterprise WSDL or the Partner WSDL for login functionality.

Target System:

1. Go to Apex Classes an Click button "Generate from WSDL" using WSDL .
2. Genersate class from Webservice WSDL. It will generate 2 classes. One for Sync and other for Async calling, i.e. future based.
3. Generate another Class with Enerprise/partner WSDL. It will have all standard meta data methods, like describe() calls, login, logout, create, insert etc

4. Develop a class in Target system where you generated apex class to use **Login** method of Enterprise/ partner WSDL using credentials from Source.
5. Then call the SOAP method developed.

   classGeneratedByWSDL. MySOAPWebService instance = new classGeneratedByWSDL. MySOAPWebService();

   instance.getRecord(id);

<u>when should you use REST vs SOAP?</u>

1. **If developing public APIs**, in which you don't have to control over whats going on with he consumer.
2. **APIs that require, a lot of back-and-forth messaging**, with SOAP being stateful the same type of service would require more initialization and state code. Because REST is stateless, the client context is not stored on the server between requests, giving REST services the ability to be retried independently of one another.
3. **Services, that do not need connection all the time** - SOAP services require maintaining an open stateful connection with the client. REST, in contrast, enables requests that are completely independent of each other.
4. **Json response is easy to parse and lightweight. So, response will be quick**.

Which API Do I Use?

API Name	Protocol	Data Format	Communication	When to Use
REST API	REST	JSON, XML	Synchronous	
SOAP API	SOAP (WSDL)	XML	Synchronous	SOAP API to create, retrieve, update, or delete records. You can also use SOAP API to perform searches and much more.
Chatter REST API	REST	JSON, XML	Synchronous (photos are processed asynchronously)	For chatter based use cases.
User Interface API	REST	JSON	Synchronous	Build Salesforce UI for native mobile apps and custom web.
Analytics REST API	REST	JSON, XML	Synchronous	For gathering datasets from Analytics Platform
Bulk API	REST	CSV, JSON, XML	Asynchronous	Submits a batch for use cases,
Metadata API	SOAP (WSDL)	XML	Asynchronous	migrate customization changes
Streaming API	Bayeux	JSON	Asynchronous (stream of data)	For near-real-time streams of data that are based on changes in Salesforce records or custom payloads.
Apex REST API	REST	JSON, XML, Custom	Synchronous	
Apex SOAP API	SOAP (WSDL)	XML	Synchronous	
Tooling API	REST or SOAP (WSDL)	JSON, XML, Custom	Synchronous	fetch the metadata such as Apex classes, Apex triggers, custom objects, custom fields, etc. If we need to get the list of Custom Objects or Custom fields

Platform cache

1. Using cached data improves the performance of your app and is faster than performing SOQL queries repetitively, making multiple API calls, or computing complex calculations.
2. Use the cache to store static data or data that does not change often.
3. Salesforce evicts cached data based on a least recently used (LRU) algorithm

Types Of Cache

1. **Org cache** stores org-wide data that anyone in the org can use.
    a. *time-to-live – Max 48 hours, default is 24 hours*.
2. **Session cache** stores data for an individual user and is tied to that user's session. The maximum life of a session is 8 hours.

Partitions: Caching data to designated partitions ensures that the cache space is not overwritten by other apps or by less critical data.

```
Cache.Org.put('namespace.partition.key', 0);
```

Among all partitions, **there can be only one default partition**. In Default partition, we don't have to use the fully qualify the key name with the namespace and partition name when adding a key-value pair.

```
Cache.Org.put('key', 0);
```

`Namespace.Partition.Key` is the cache key Name format.

1. Namespace – org namespace. Can use "local" too.
2. Partition – partition name.
3. Key – the key which needs to be put.

Store and Retrieve Data in Org Cache

```
// Get partition
Cache.OrgPartition orgPart = Cache.Org.getPartition('local.CurrencyCache');
// Add cache value to the partition. Usually, the value is obtained from a
// callout, but hardcoding it in this example for simplicity.
orgPart.put('DollarToEuroRate', '0.91');
// Retrieve cache value from the partition
String cachedRate = (String)orgPart.get('DollarToEuroRate');
if (cachedRate != null) {
   // Display this exchange rate
} else {
   // We have a cache miss, so fetch the value from the source.
   // Call an API to get the exchange rate.
}
```

Store and Retrieve Data in Session Cache

```
// Get partition
Cache.SessionPartition sessionPart = Cache.Session.getPartition('local.CurrencyCache');
// Add cache value to the partition
sessionPart.put('FavoriteCurrency', 'JPY');
// Retrieve cache value from the partition
String cachedRate = (String)sessionPart.get('FavoriteCurrency');
```

`remove() :- to delete an item from cache.`

`MAX_TTL_SECS:` A constant in Org and Session class represents maximum amount of time, in seconds, to keep the cached value in the session cache.

Access cached values stored in the platform cache from a Visualforce page by using the **$Cache.Session** or **$Cache.Org** global variables.

$Cache.Session.namespace.partition.key

$cache.org. namespace.partition.key

Encryption-Decryption - Classic encryption

1. **EncodingUtil**

- String base64Decode(String inputString)
- String base64Encode(Blob inputBlob)
- Blob convertFromHex(String inputString)
- String convertToHex(Blog inputBlob)
- String urlDecode(String inputString, String encodingScheme)
- String urlEncode(String inputString, String encodingScheme)
  Note: for URL encode and decode second parameter will be encoding scheme i.e., UTF-8. All methods are static so you can call by class name.

2. **Crypto**

Provides methods for creating digests, message authentication codes, and signatures, as well as encrypting and decrypting information. These functions are using AES algorithm to generate the private key and these functions are using AES128, AES256, AES192 algorithms to encrypt and decrypt information. The AES algorithm requires initialization vector to encrypt and decrypt data. **AES stands for Advanced Encryption Standard algorithm**

```
// Security key must be 16 characters string
          public static key=Crypto.generateAesKey(128);

          public static String encodeString(String encodingString){
                    Blob blobData = Crypto.encryptWithManagedIV('AES128', key,
                    Blob.valueOf(encodingString));
                    return EncodingUtil.base64Encode(blobData);
          }

          public static String decodeString(String str){
                    Blob blobData = EncodingUtil.base64Decode(str);
                    Blob decryptedBlob = Crypto.decryptWithManagedIV('AES128', key,
                    encodedEncryptedBlob);
                    return decryptedBlob.toString();
          }
```

Platform encryption - Shield Platform Encryption

Classic encryption uses 128-bit (AES) keys. Shield Encryption uses a stronger 256-bit AES key.

tenant secrets are used to derive your encryption keys. They work with the Salesforce-generated master secret, but your tenant secret is specific to your org.

Setup

1. Provide access to **Manage Encryption Keys** (System permission) to user.
2. Go to **Key Management** and **Generate Tenant Secret**. Export it.
3. Go to **Encryption Policy,** choose **Encrypt fields** and select required ones.
4. Destroy the key. Data will be encrypted now.
5. Upload the key to see the data again.

Outbound messaging In workflows

Outbound messaging allows you to specify that changes to fields within Salesforce can cause messages with field values to be sent to designated external servers.

It Uses SOAP API.

<u>Authorization vs Authentication</u>

Authorization means, the user is allowed to access the data.
Authentication means, who the user is.

Authentication Techniques

1. **Basic Auth** – Username & Password
2. **Bearer / Token based**
   a. **OAuth 1.0** – get access token by using client key and client secret. Use it for further requests. IT is only for web apps.
   b. **OAuth 2.** – same work as OAuth 1.0.
      i. Added delegation of security to Transport layer. So only necessary data is transfers to TL. Also, supports multiple client mode, not only web.
      ii. OAuth2 also introduced the use of refresh tokens that allow authentications to expire, unless “refreshed” on a periodic basis.
      iii. ***The password grant is one of the simplest OAuth grants and involves only one step.***
3. ***SAML*** - Security Assertion Markup Language (**SAML**) is an open standard that allows identity providers (IdP) to pass authorization credentials to service providers (SP). Generally used for SSO.

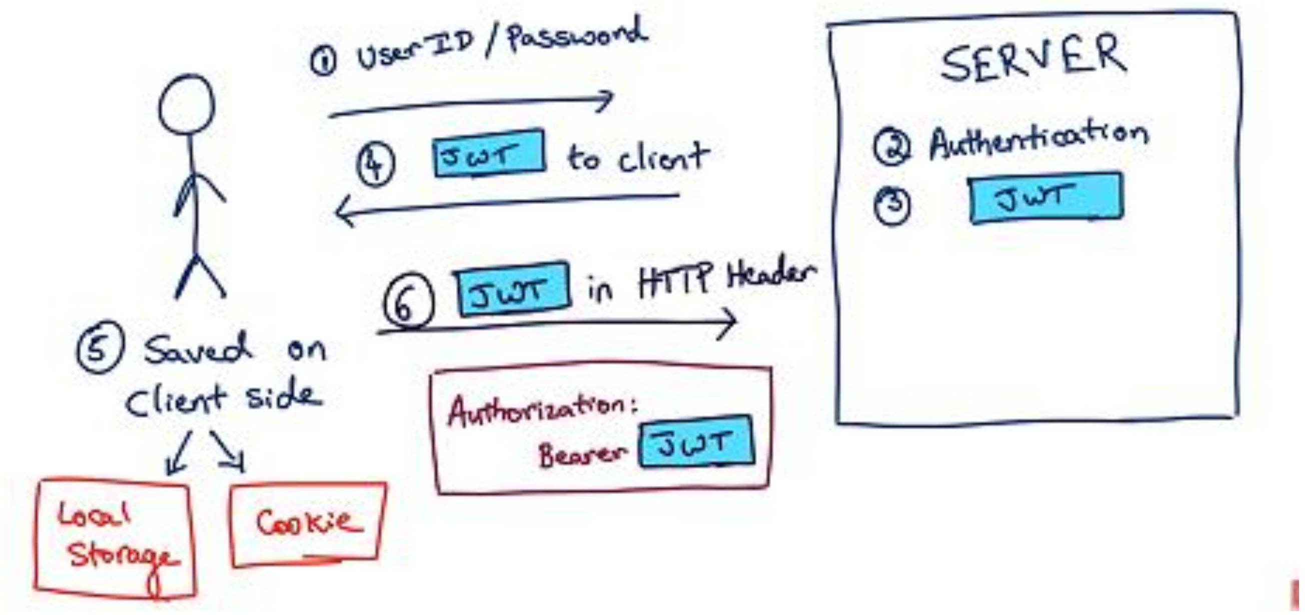
Authorization Techniques.

1. **API-keys** – using a unique key in header for each service.
2. **Basic Auth** – verify Credentials and decide.
3. **HMAC (Hash-based message authorization code**) – Server and client have a secret key. Sender creates a message , encrypt by key and convert into hash by secure hasing algo. The it is sent to Receiver. Receiver will decodes the value using SHA and secret key, and verify the message.

4. **OAuth 2.0**
5. **JWT**

JWT - JSON WEB TOKEN – For Authorization NOT Authentication

The JWT Bearer Flow is an OAuth flow in which an external app (also called client or consumer app) sends a signed JSON string to Salesforce called JWT to obtain an access token. The access token can then be used by the external app to read & write data in Salesforce.



Why JWT?

For authorization, we can use Session Ids. By the problem with the session ids are

1. *The server needs to cache the session Ids to identify the user.*
2. *If there are multiple servers, we need a shared cache which saves session Ids.*
3. *If cache failed, user needs to authenticate again.*

With JWT, Server doesn't need to save any kind of data, for any user. At the time of authentication. Servers gives User a signed JWT with a private key and creates a signature., which the users need to use every time while requesting. In each request, the JWT comes, and server verifies the signature and authorizes the user.

Unlike some other OAuth Flows, the JWT flow does not require end-user interaction to operate. The external app sends the JWT and authenticates itself without manual intervention.

Steps

1. Generate a private Key and a digital Certificate.
2. Create connected app and upload digital certificate. **We need to pre-authenticate it once**, because JWT is for authorization not for authentication .
    a. Hit below URL.
    https://<yourinstance>.salesforce.com/services/oauth2/authorize?response_type=token&client_id=<consumer key>&redirect_uri=sfdc://oauth/jwt/success
        i. Either by Web server
        ii. User-Agent OAuth Flow

3. Create JWT.
    a. Header – Algo and type
    ```
    {
    "alg": "RS256",
    "typ": "JWT"
    }
    ```
    b. JWT Claim –
        i. Issuer – consumer key
        ii. Subject – username
        iii. Audience – login.salesforce.com
        iv. Expiration – now + time
    ```
    {
    "iss": "Consumer key",
    "sub": "Username",
    "aud": "https://<login or test>.salesforce.com",
    "exp": "now + 2 minutes in Unix timestamp"
    }
    ```
    c. Base64 URL encode the Header and the Claims.
    ```
    jwt_part1 = Base64URLencode(JWT Header);
    jwt_part2 = Base64URLencode(JWT Claims);
    ```
    d. Using the private key sign the encoded header and claims separated by a dot using SHA256 with RSA

```
jwt_signature = sign_sha256_RSA( jwt_part1+"."+jwt_part2, "private key")
```

4. Build the final JWT assertion – header + claim + signature.

```
jwt_assertion = jwt_part1+"."+jwt_part2+"."+jwt_signature
```

5. Create a post request.

```
POST https://login.salesforce.com/services/oauth2/token

Header:
Content-Type: application/x-www-form-urlencoded

Body
grant_type=urn:ietf:params:oauth:grant-type:jwt-bearer
assertion=<put the jwt assertion here>
OR
Authorization= Bearer <JWT assertion >
```

6. Response will be having **access_token,** which can be used in subsequent requests to perform allowed operations in Salesforce.

Reference : https://medium.com/@salesforce.notes/salesforce-oauth-jwt-bearer-flow-cc70bfc626c2

https://medium.com/swlh/how-json-web-tokens-work-211ce7b705f7

Service Protocols

Protocols – HTTP, UDP, XMPP, TCP, web sockets

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https://developer.salesforce.com/docs/atlas.en-us.224.0.integration_patterns_and_practices.meta/integration_patterns_and_practices/integ_pat_intro_overview.htm