How to implement WIF for Gitlab Pipeline with GCP

What is WIF?

WIF is short for Workload Identity Federation for GCP.

Traditionally, applications running outside Google Cloud can use service account keys to access Google Cloud resources.
However, service account keys are powerful credentials, and can present a security risk if they are not managed correctly.

Workload Identity Federation eliminates the maintenance and security burden associated with service account keys.

Visit the link below for detail explanation.
https://cloud.google.com/iam/docs/workload-identity-federation

Why do I need to use WIF to integrate Gitlab Pipeline with GCP?

Implementing WIF will avoid exposing the GSA's keys, which is a security burden.

This helps to reduce the following:

- manual effort to rotate the GSA keys annually.
- risk of the GSA keys being used for non-authorization purposes.

What do I need to take note of when I am using WIF for my pipeline?

The implementation of the WIF is intended with certain security measures:

- The access from Gitlab will be restricted to the repository's path and branches.
  Any moving of the gitlab repository to another project's location will require the access to be defined in the GCP.

Who is responsible for the implementation of WIF for my project's pipeline?

The team for WIF implemenation are defined as the following:

- Pipeline and CI/CD configuration within the Gitlab's repository:
  - The application team who is responsible for the pipeline within the repository. (Responsible)
- The script template that the application team can refer to:
  - This wiki page (Refer to "Script template to be used within the Gitlab's pipeline" section).
- The GCP project's configuration to enable WIF:
  - For **Landing Zone** GCP projects:
    - **CloudOps**. (Refer to the "Request Template for Cloudops" section to be requested with Service One)
  - For **non-Landing Zone** GCP projects:
    - the team with Owner/Editor permission (primary)
    - If no one, CloudOps.
    - You can find in this page the guide on how to configure on the GCP.

Script template to be used within the Gitlab's pipeline

The code below here is a reusable YAML Anchors and Aliases for majority of the pipeline.
The code is simply to perform the following:

1. Obtain the JWT token for the Gitlab instance.
2. Exchange JWT token with GCP project to obtain the impersonated GCP credential.

3. Login to the GCP with the impersonated GCP credential.

Authentication with Gitlab

```
.gcloud_auth: &gcloud_auth
  # Replace the GCP service account name that needs to perform the deployment.
  - export GCP_SERVICE_ACCOUNT=<GSA email>@${PROJECT_ID}.iam.gserviceaccount.com
  - echo ${GCP_TOKEN} > .ci_job_jwt_file
  - gcloud iam workload-identity-pools create-cred-config ${GCP_WORKLOAD_IDENTITY_PROVIDER}
    --service-account=${GCP_SERVICE_ACCOUNT}
    --output-file=.gcp_temp_cred.json
    --credential-source-file=.ci_job_jwt_file
  - gcloud auth login --cred-file=`pwd`/.gcp_temp_cred.json
  - gcloud config set project ${PROJECT_ID}
  - export GOOGLE_APPLICATION_CREDENTIALS=`pwd`/.gcp_temp_cred.json
```

To use the Anchor defined above, define the **PROJECT_ID** and **GCP_WORKLOAD_IDENTITY_PROVIDER** by getting the values from the Gitlab project's CI/CD variables.

1. PROJECT_ID - the ID of the GCP project ID that the pipeline is interacting with.
2. GCP_WORKLOAD_IDENTITY_PROVIDER - the value of the GCP Workload Identity Provider.
   The format is usually like this:
   projects/<project id>/locations/global/workloadIdentityPools/<ID pool name>/providers/<provider name>

Within the deploy step, include the id_tokens declaration and set the aud to https://gitlab.syensqo.com.

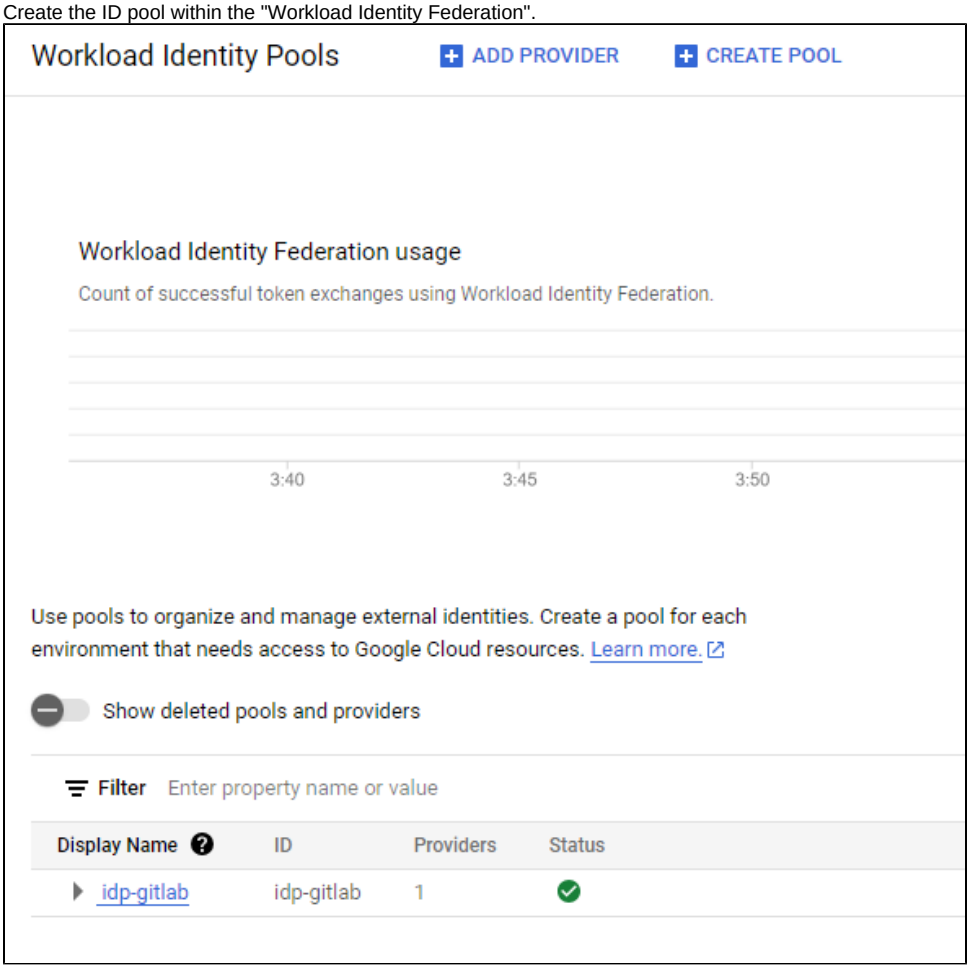
Usage of the Authentication

```
deploy-test:
  stage: deploy
  only:
    - develop
  id_tokens:
    GCP_TOKEN:
      aud: https://gitlab.syensqo.com
  script:
    - export PROJECT_ID=$GCLOUD_TARGET_PROJECT_TEST
    - export GCP_WORKLOAD_IDENTITY_PROVIDER=$GCP_WORKLOAD_IDENTITY_PROVIDER_TEST
    - *gcloud_auth
    - mvn package appengine:deploy -DskipTests
```

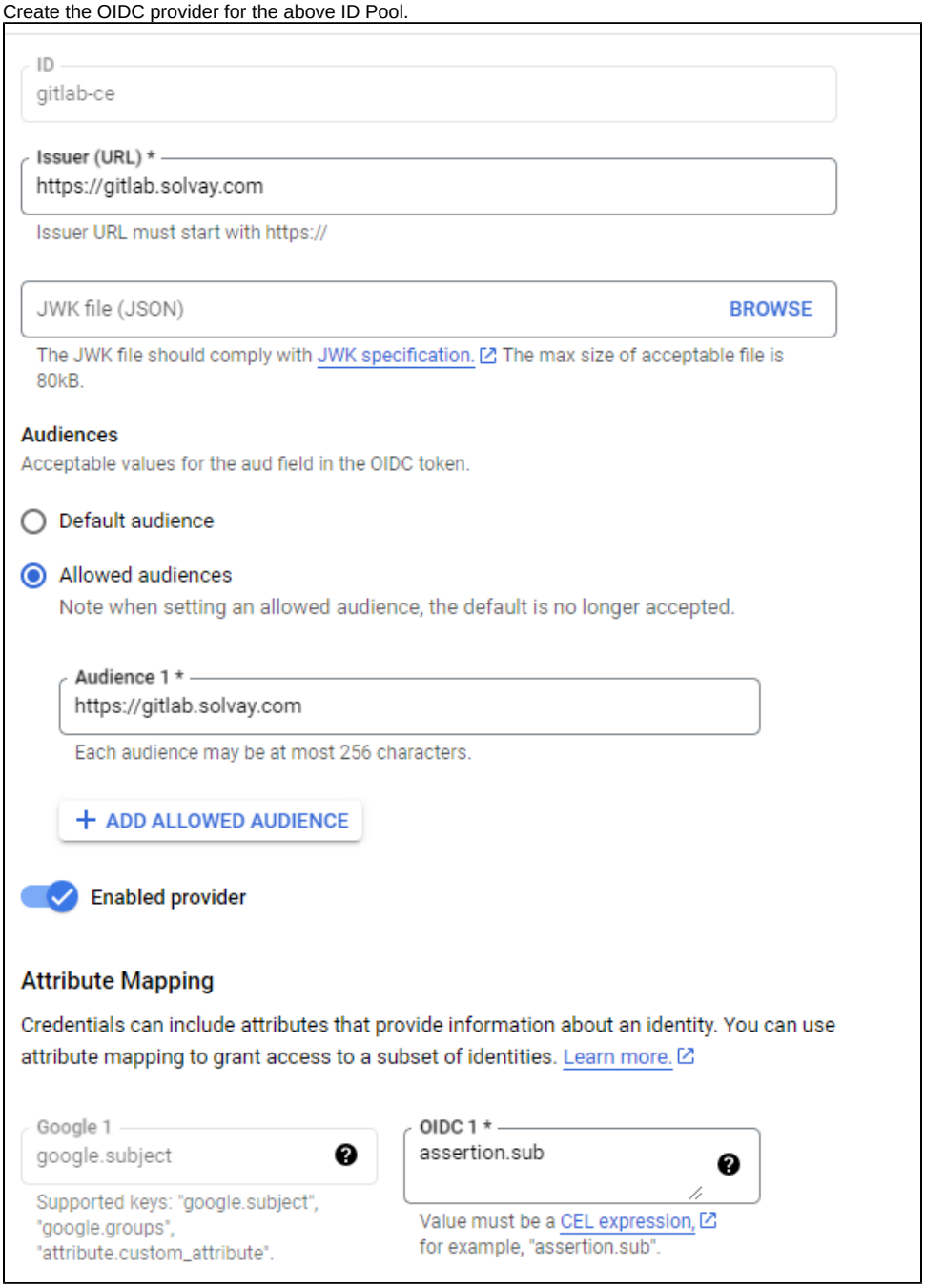
What is the required to be done on the GCP project ?

The following will be required to be configured within the targeted GCP Project:

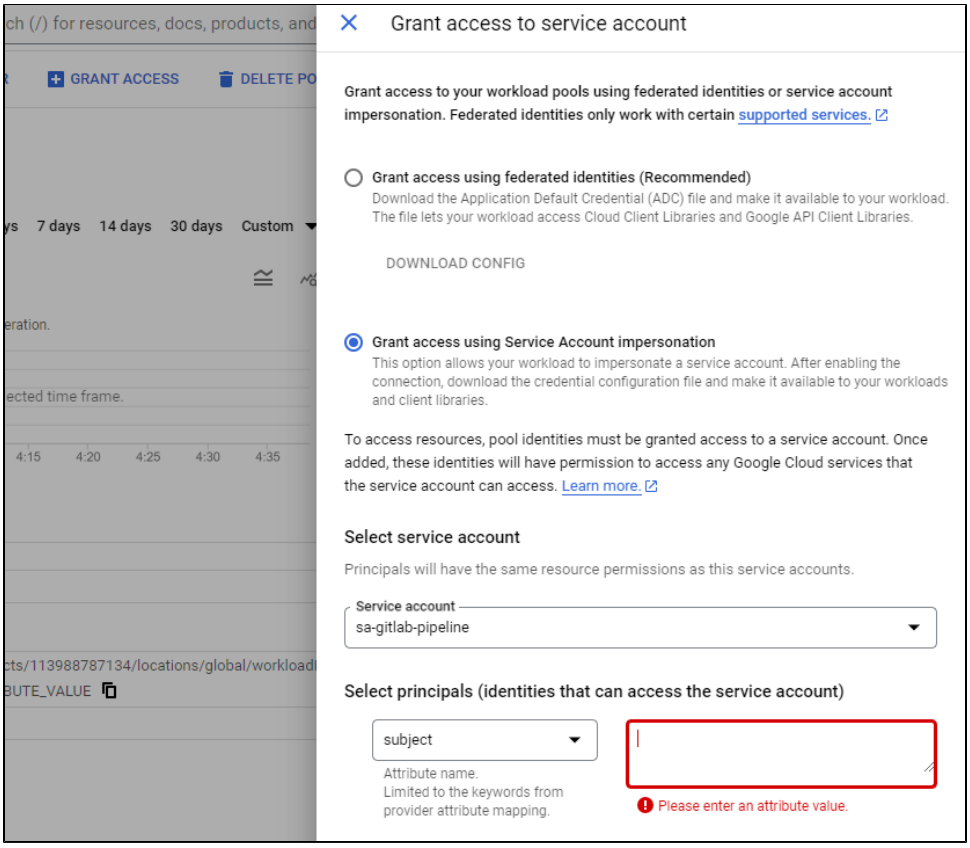
1. Create the ID pool within the "Workload Identity Federation".



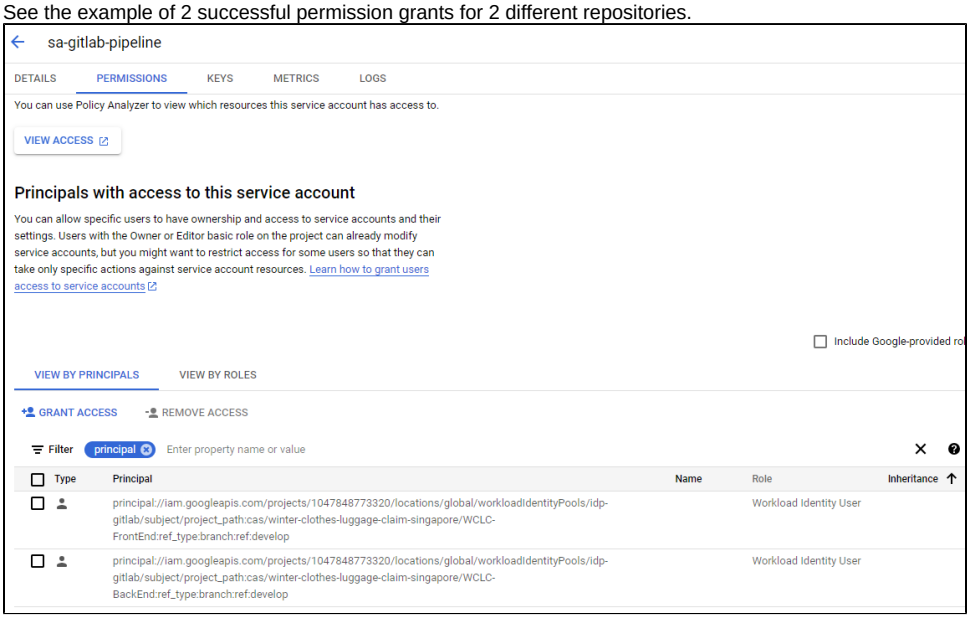
2. Create the OIDC provider for the above ID Pool.



3. Grant Access for the impersonated GSA and define the subject value to be "project_path:<repository path>:ref_type:branch:ref:<name of the branch: develop|master>".
Actual example: "project_path:cas/winter-clothes-luggage-claim-singapore/WCLC-FrontEnd:ref_type:branch:ref:develop"
In doing so, you are only granting permission to repository with the repository's path and only for the develop branch to access this GCP project.



4. You can verify if the grant is successful by checking the permission of the GSA.
   See the example of 2 successful permission grants for 2 different repositories.



Request Template for Cloudops

Request Title: Implement WIF for <gcp project name>

Within description, use the text below and replace with the value required.

Target GCP project: <GCP project ID>
Impersonation GSA: <Service account name used by the gitlab pipeline to perform deployment>
Provider: <https://gitlab.syensqo.com >
Repository Path: <example path url of the repository: cas/sinequa/bigquery-connector>
Branch name for Dev: <develop | other name | NA>

Branch name for Test: <develop | other name | NA>
Branch name for Pre-prod: <develop | other name | NA>
Branch name for Prod: master

Troubleshooting - If pipeline is failing with WIF

If the pipeline is failing, please check on the following:

1. Check on Gitlab's pipeline (.gitlab-ci.yaml) for the following:
    a. Make sure the "id_tokens" is defined.
    b. Make sure the "GCP_SERVICE_ACCOUNT" is using the correct GSA's email.
    c. Make sure the "GCP_WORKLOAD_IDENTITY_PROVIDER" and "PROJECT_ID" is using the correct values.
    d. Make sure the "&gcloud_auth" is referring to the ${GCP_TOKEN} variable.

    ```
    echo ${GCP_TOKEN} > .ci_job_jwt_file
    ```

2. Check on the GCP for the following:
    a. Make sure the WIF's subject is using the correct "project_path".

List of Google APIs required for the GCP Projects

Here is a list of Google APIs required for WIF:

1. Identity and Access Management (IAM) API
2. IAM Service Account Credentials API