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2025

DevOps With SAS[®] Viya[®] and GitLab

Tutorial

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DevOps With SAS® Viya® and GitLab

Agenda

- Introduction to DevOps
- Configuration
- Collaborative Development
- Pipelines
- Gitlab Executors
- Gitlab Runners
- SAS Specific CI/CD Jobs

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Introduction to DevOps

DevOps With SAS® Viya® and GitLab

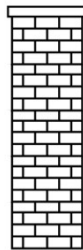
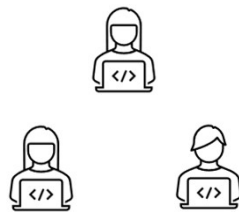
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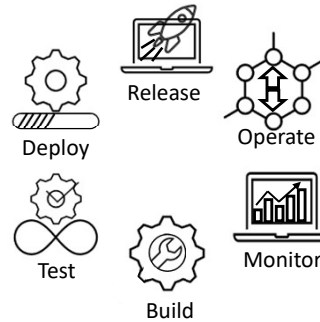
What is DevOps?



Development



Operations



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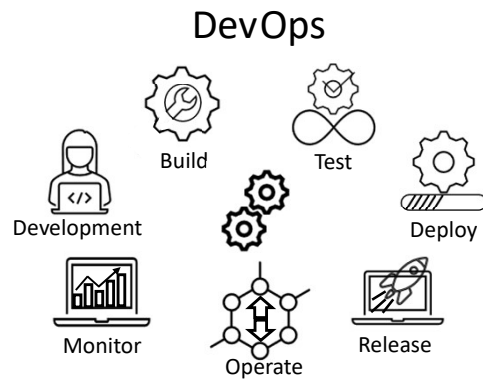
Development and Operations are separated.

Developers throw their work over the wall.

The developers don't know what the operations people need. The operations people don't know what the developers need.

The process is timely and inefficient.

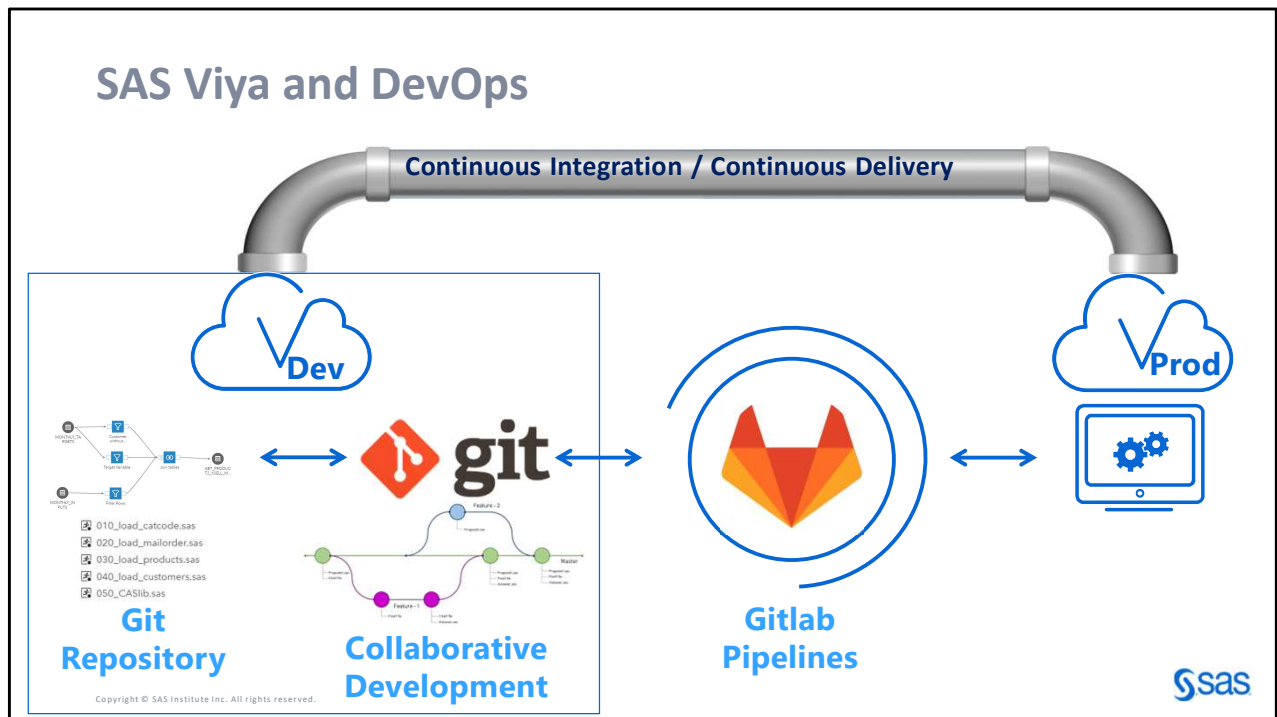
What is DevOps?



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DevOps aims to bring development and operations together in a single process.
DevOps adds automation to increase productivity and reduce the time to release.



By dissociating development from execution,
managing files with version control,
automating repetitive tasks,
conducting tests at every step,
capturing failures early through automated testing,
you transition development and data management into the DevOps realm.

The benefits become quickly evident: process time is reduced, quality is enhanced,
and resources are liberated to pursue new goals.

Components

-  Gitlab: Web-based DevOps Lifecycle Tool
 - Git Repository Manager
 - Git Version Control Platform
 - DevOps Automation tool
- SAS Viya:
 - SAS content
 - SAS Programs
 - Visual Analytics Reports
 - Job Flows
 - ...

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Configuration

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Configuration

Master Branch
- ProgramX.sas
- FlowY.flw



Developer A

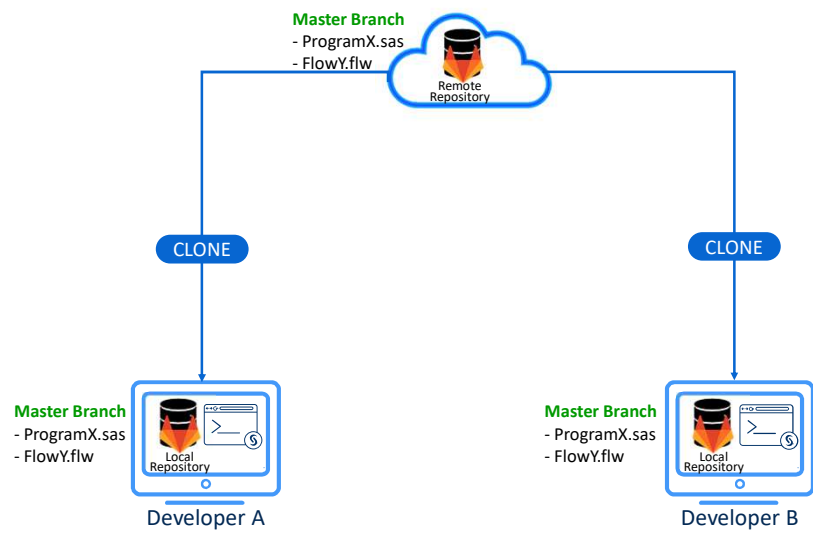


Developer B

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Configuration



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Demo

Configuration



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Collaborative Development

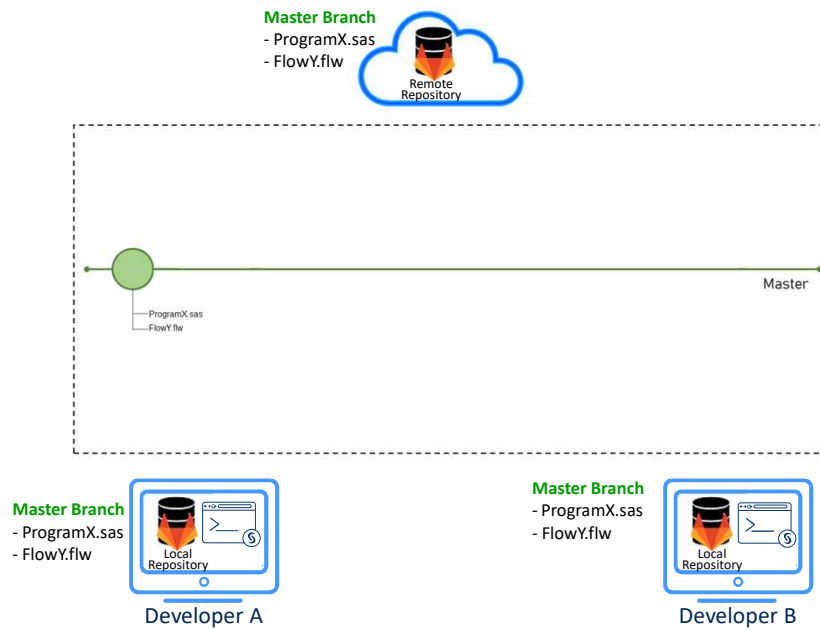
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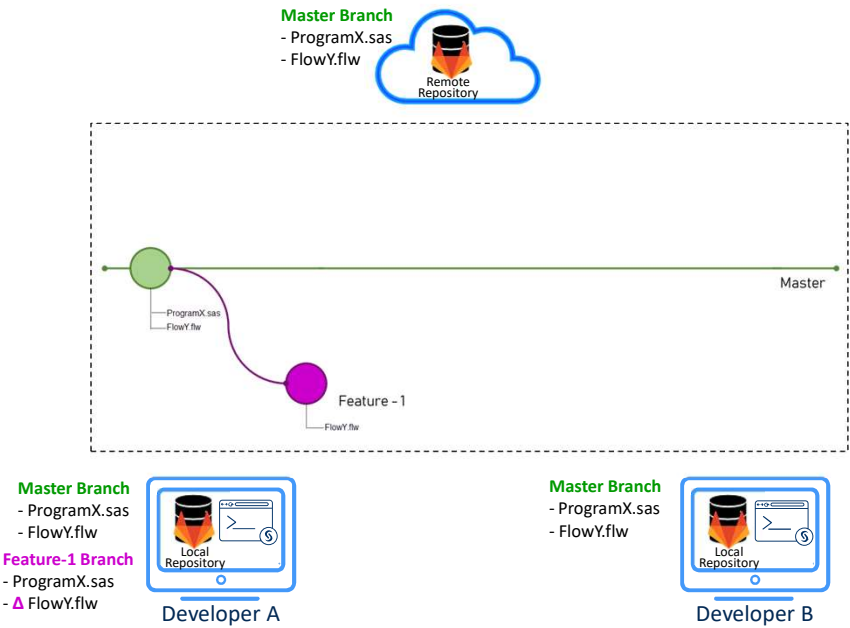
Collaborative Development

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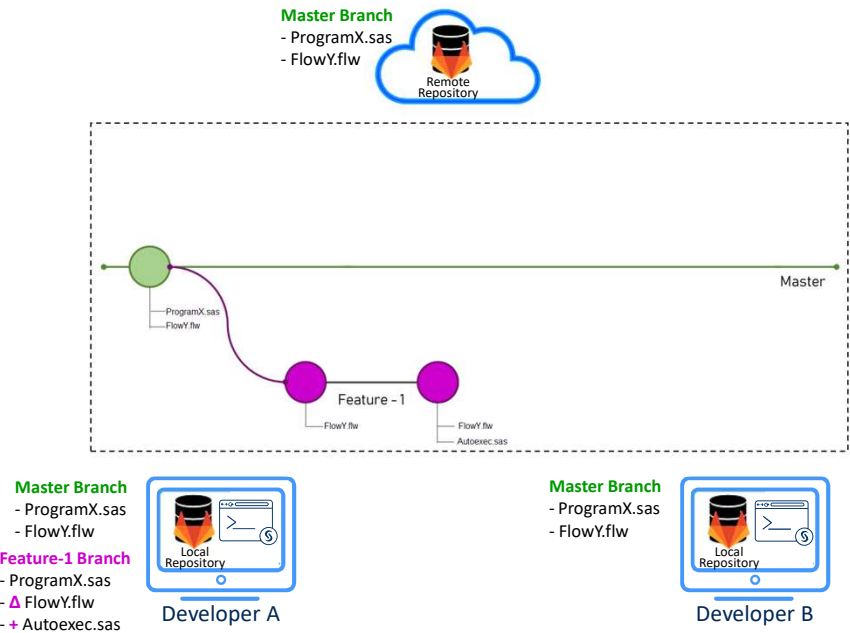
Collaborative Development

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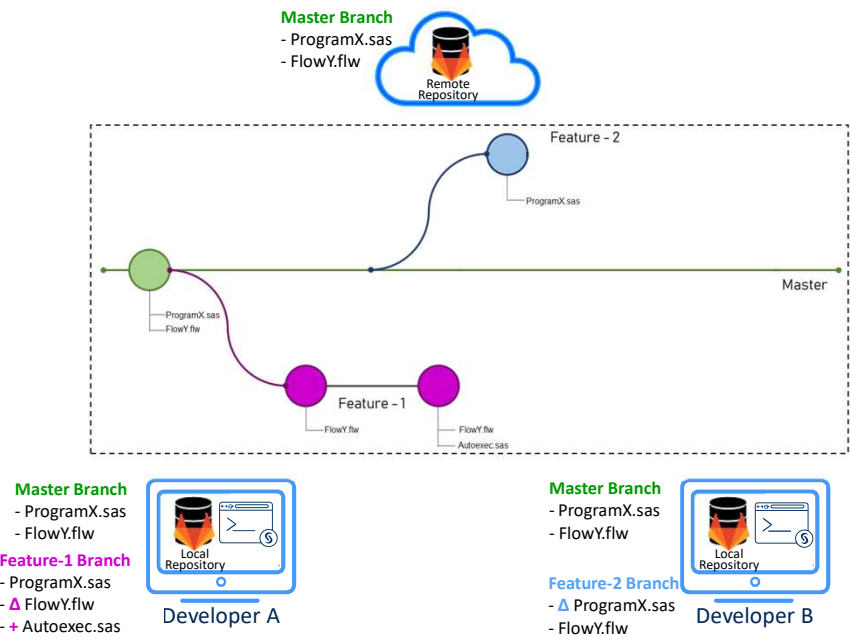
Collaborative Development

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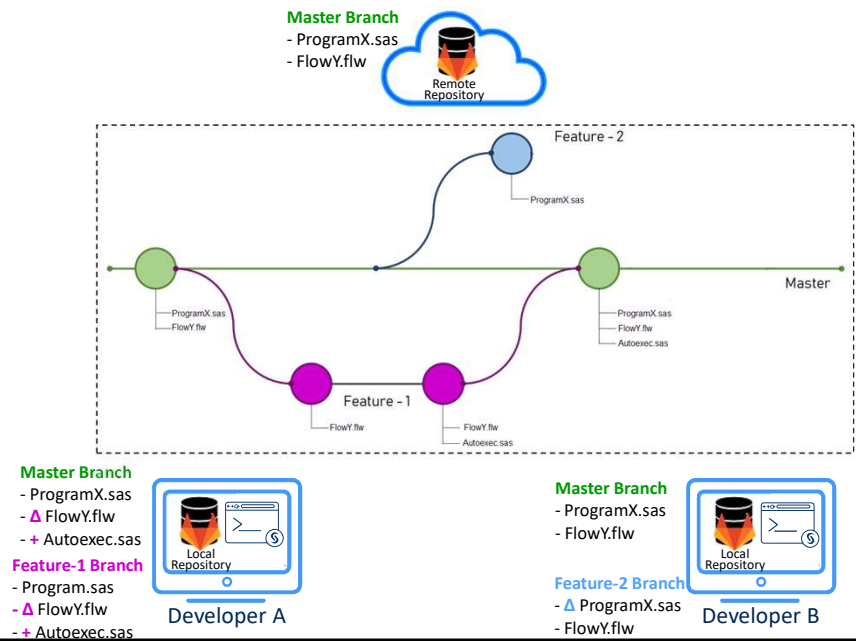
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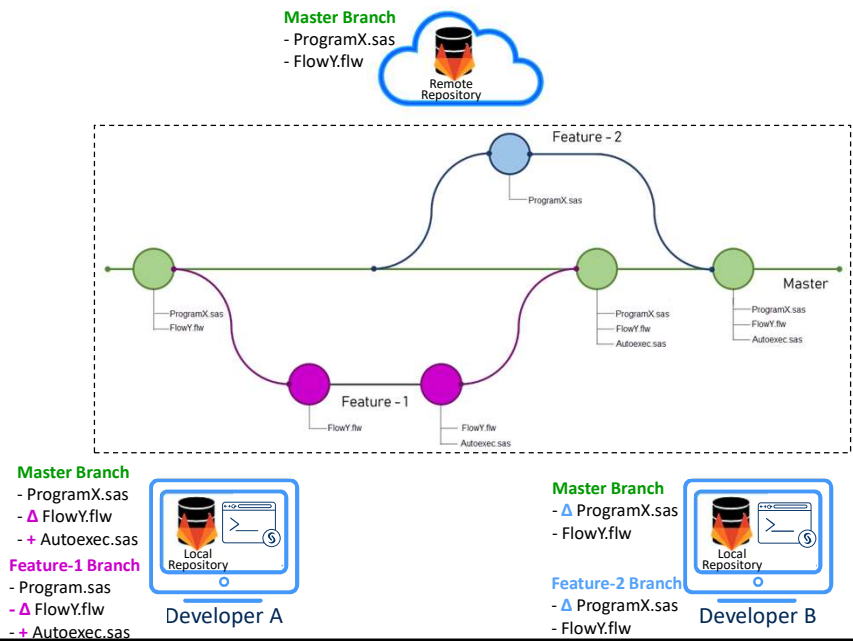
Collaborative Development

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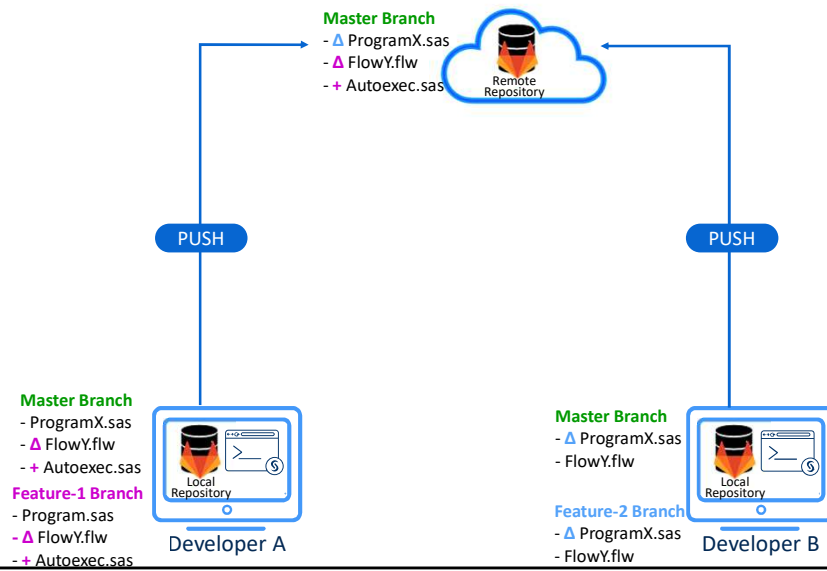


Collaborative Development

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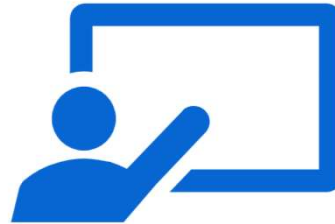


Collaborative Development



Demo

Collaborative Development



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Pipelines

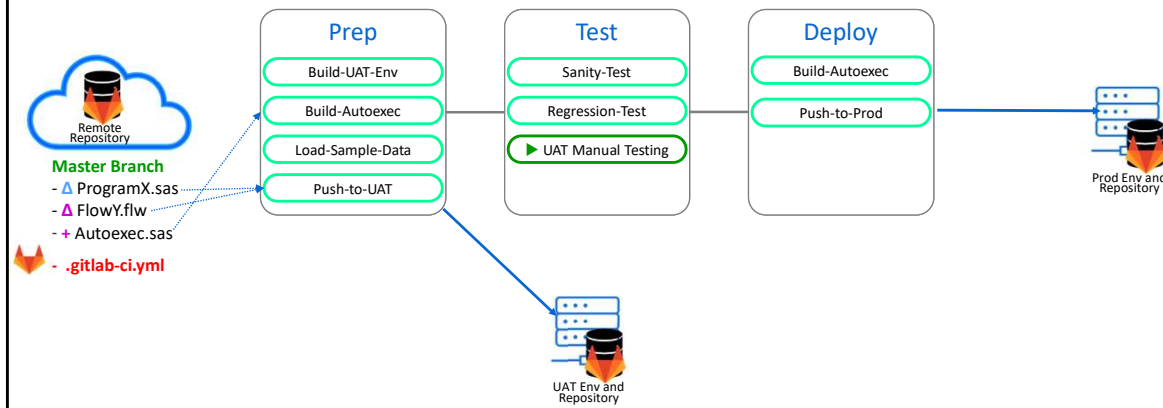
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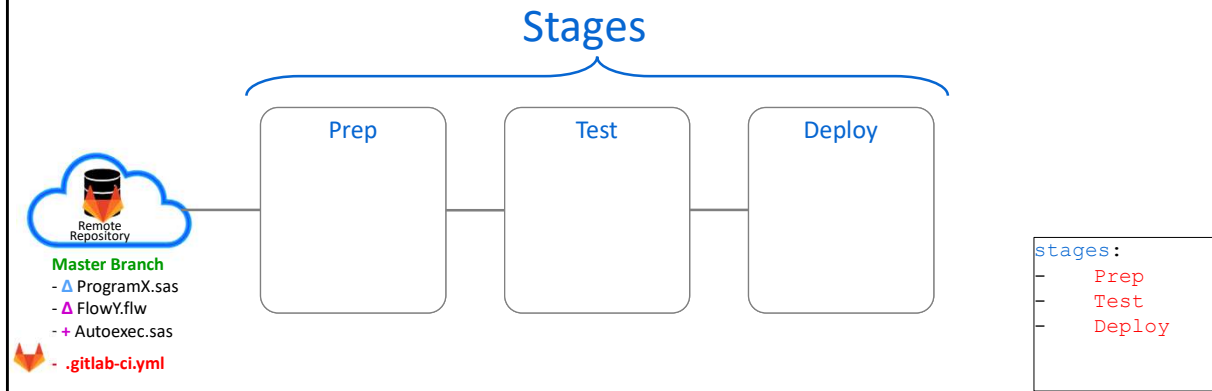
Pipelines

Overview



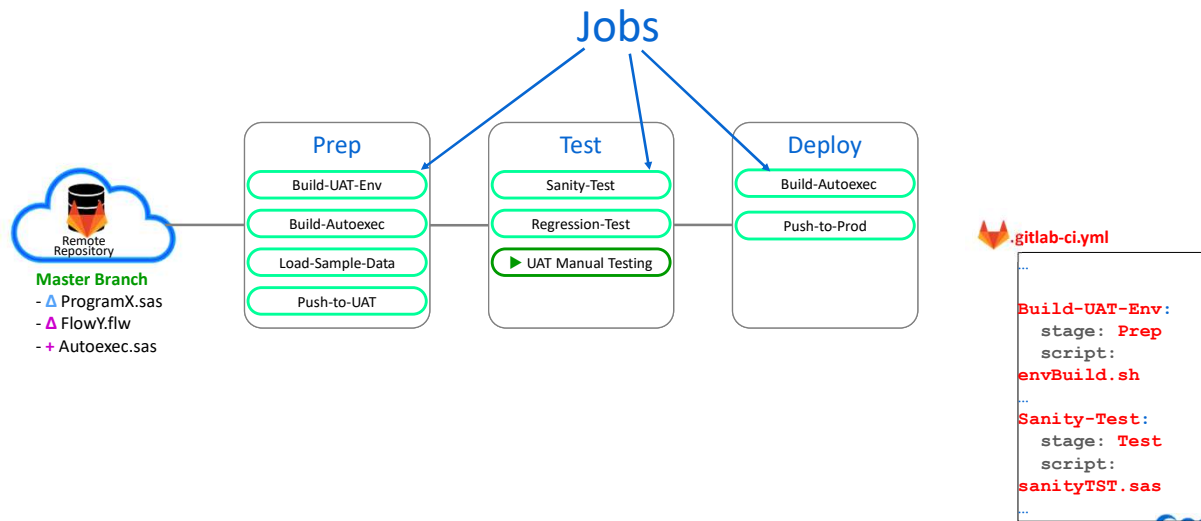
Pipelines

Stages

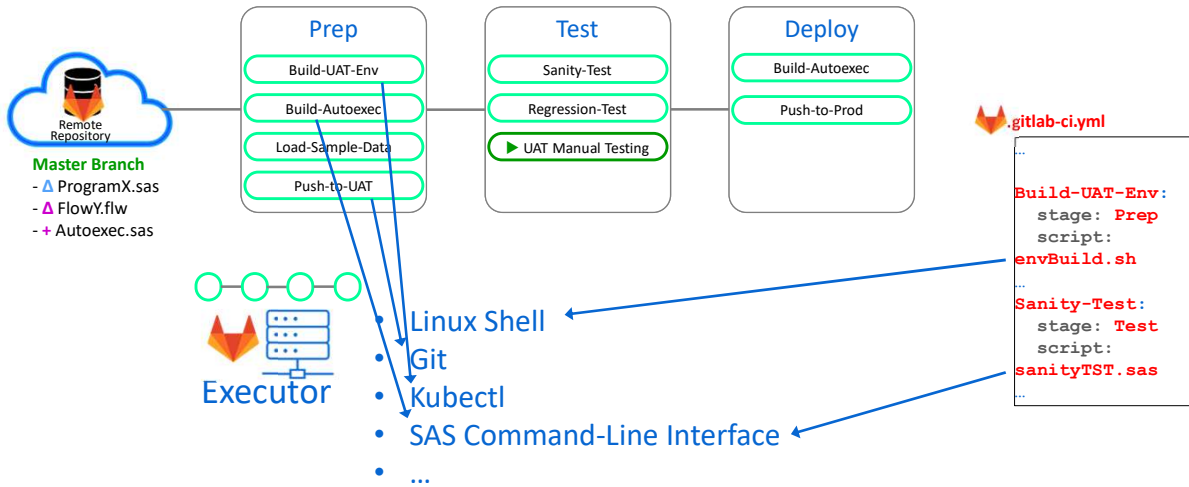


Pipelines

Jobs



Gitlab Executors



Demo

Pipelines



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Gitlab Executors

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Gitlab Executors



- “Servers” to run the individual CI/CD jobs
- Various platforms available:
 - Shell
 - Kubernetes
 - **Docker**
 - among others

Gitlab Executors



Executor

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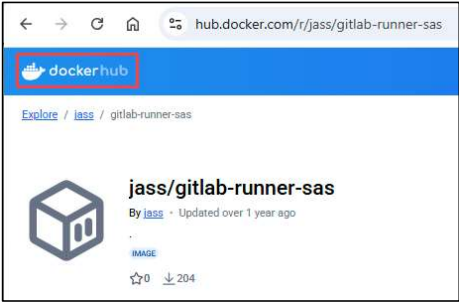
Building the Executor Docker Image

```

GITLAB_REG=registry.gitlab.com/sasedu2/sasgitlabdevelops

# Build from Dockerfile
docker build -t ${GITLAB_REG}/jass/gitlab-runner-sas:0.07

# Push to GitLab container registry docker
push ${GITLAB_REG}/jass/gitlab-runner-sas:0.07
        
```



Dockerfile

```

FROM centos:8
...
RUN sed -i 's/mirrorlist/#mirrorlist/g' /etc/yum.repos.d/CentOS-*
...
ADD files/sas-viya-cli-1.21.30-linux-amd64.tgz /usr/local/bin

WORKDIR /usr/local/bin
COPY ./gelenv_trustedcerts.pem .

RUN sas-viya plugins install --repo SAS audit \
    && sas-viya plugins install --repo SAS authorization \
    && sas-viya plugins install --repo SAS batch \
#    && sas-viya plugins install --repo SAS cas \
#    && sas-viya plugins install --repo SAS compute \
    && sas-viya plugins install --repo SAS configuration \
#    && sas-viya plugins install --repo SAS dcmtransfer \
...
#    && sas-viya plugins install --repo SAS identities \
    && sas-viya plugins install --repo SAS job \
#    && sas-viya plugins install --repo SAS launcher \
...
#    && sas-viya plugins install --repo SAS sid-functions \
    && sas-viya plugins install --repo SAS transfer \
#    && sas-viya plugins install --repo SAS workload-orchestrator \
    && sas-viya plugins list
...
        
```

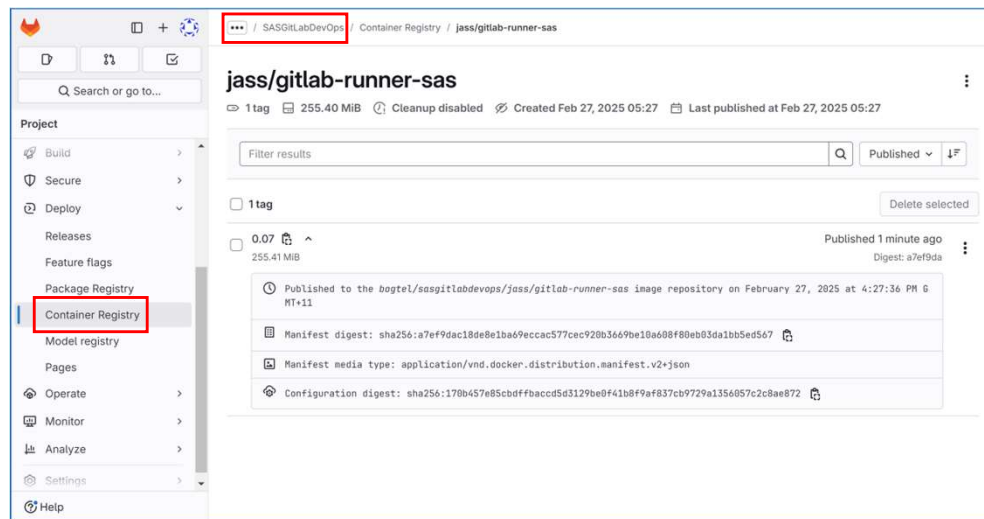
You can use the executor image from docker hub directly by specifying “image: jass/gitlab-runner-sas:1.21.6” in the .gitlab-ci.yml file.

It authenticates to Viya without TLS.

To use TLS security, deploy your own executor with a dockerfile and the docker build command, and push it to your private container registry.

image: registry.gitlab.com/sasedu2/sasgitlabdevops/jass/gitlab-runner-sas:0.07
Do not store TLS credentials in a public container registry.

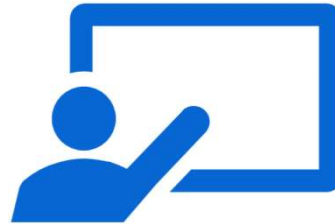
Gitlab Executors



- Should probably be named “executor,” not runner.
- It’s really an image from which executors will be spun up.
- Segways nicely into the topic of runners.

Demo

Gitlab Executors



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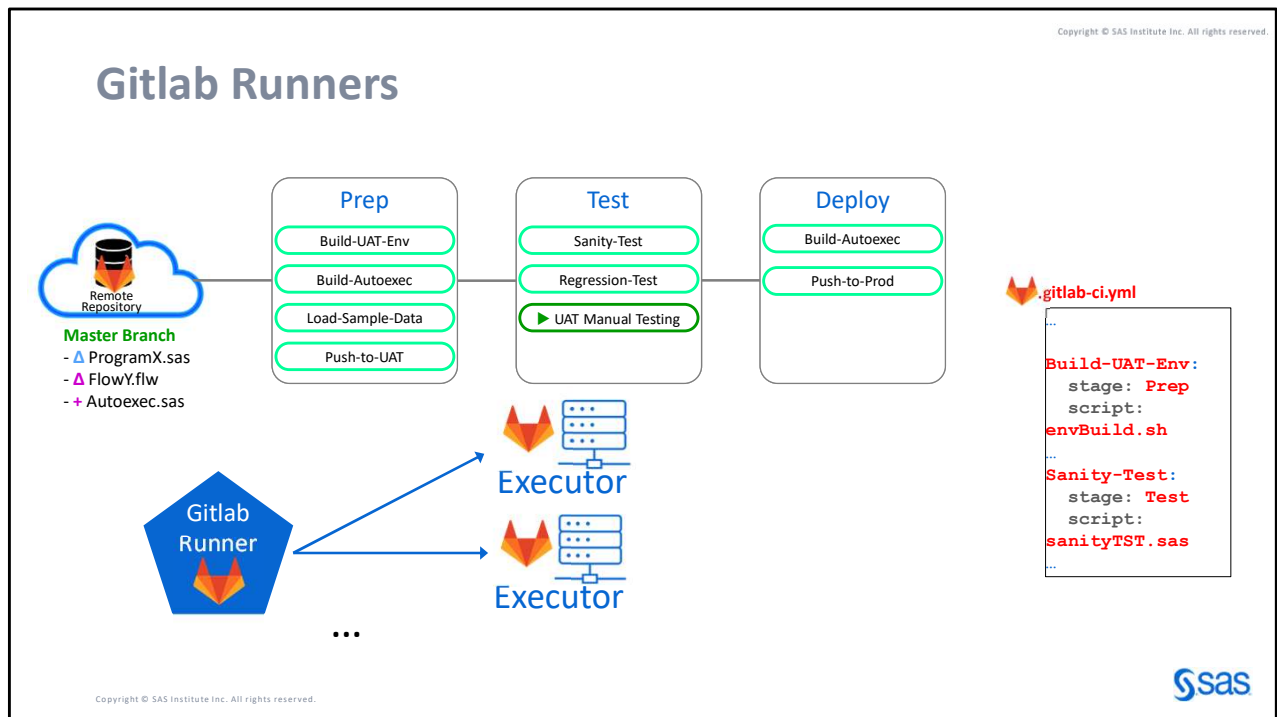


Gitlab Runners

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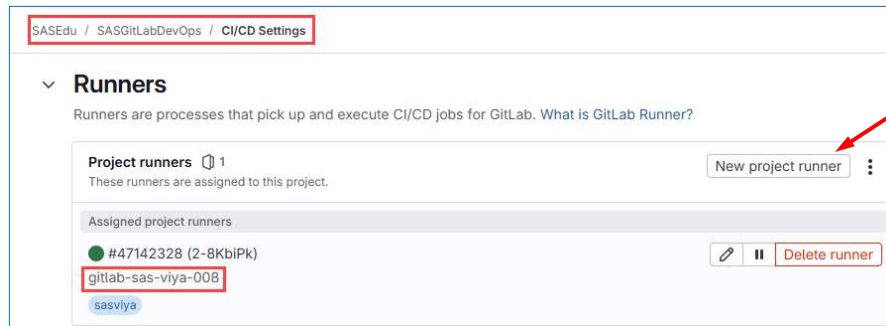




A Gitlab runner reads the pipeline instructions, `.gitlab-ci.yml`.
Runs the instructions (jobs) within using executors as the execution hosts.

Gitlab Runners

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```
[cloud-user@pdcesx03049 docker_gitlab]$  
[cloud-user@pdcesx03049 docker_gitlab]$ kubectl -n gitlab get pods  
NAME                                READY   STATUS    RESTARTS   AGE  
gitlab-sasviya-008-gitlab-runner-775bfcdfcf-lg4vg  1/1     Running   0           6d21h  
gitlab-sasviya-008-gitlab-runner-775bfcdfcf-s4wxw  1/1     Running   0           6d21h  
[cloud-user@pdcesx03049 docker_gitlab]$
```

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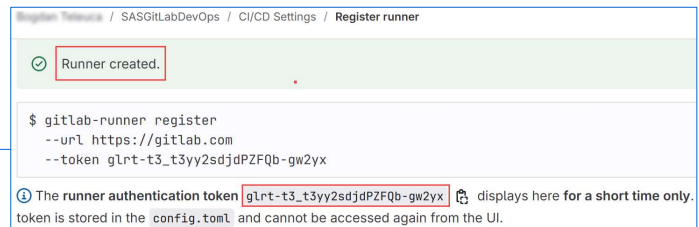
A Gitlab runner reads the pipeline instructions, .gitlab-ci.yml.
Runs the instructions (jobs) within using executors as the execution hosts.

Gitlab Runners

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Deploying the Runner with Helm

```
kubectl create namespace gitlab
helm repo add gitlab https://charts.gitlab.io
helm install \
  -f values.yaml \
  --namespace gitlab gitlab-sasviya-008 \
  --set gitlabUrl=https://gitlab.com/,runnerRegistrationToken=$GITLABTOKEN \
  --set rbac.create=true \
  --set runners.privileged=true \
  --set checkInterval=5 \
  --set nodeSelector."kubernetes.io/role"=agent \
  gitlab/gitlab-runner
```



values.yaml

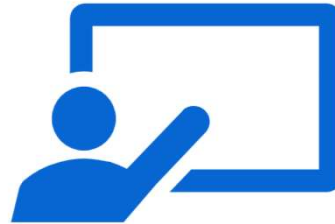
```
resources:
limits:
  memory: 1024Mi
  cpu: 750m
requests:
  memory: 512Mi
  cpu: 500m
## How many runner pods to launch
replicas: 2
```



A Gitlab runner reads the pipeline instructions, .gitlab-ci.yml.
Runs the instructions (jobs) within using executors as the execution hosts.

Demo

Gitlab Runners



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SAS Specific CI/CD Jobs

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SAS CLI Considerations

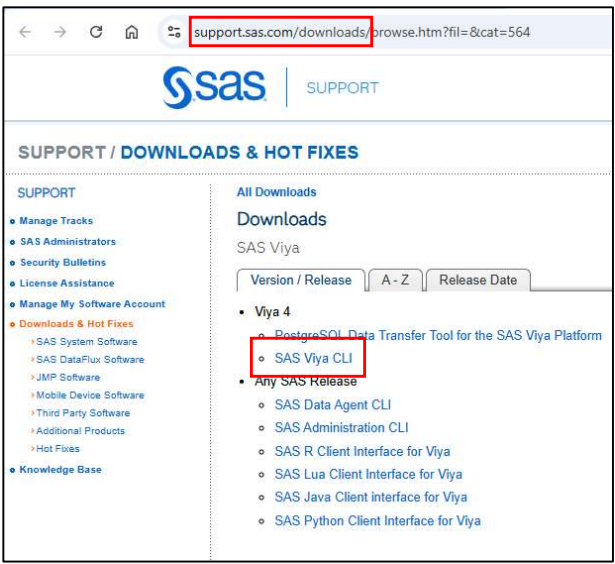
SAS Specific CI/CD Jobs

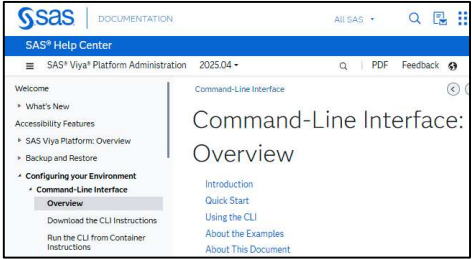
Authentication

```
export SSL_CERT_FILE=~/.certs/gelenv_trustedcerts.pem
sas-viya --profile dev auth login -user geldmui@gelenable.sas.com -password ${AZUPW}
```

Validate the Local CLI Repository

```
sas-viya plugins list-repo-plugins
```





For secure authentication, use a TLS certificate (PEM file).

Authentication creates a token stored in the user's home directory, valid for 10 hours by default.

The -k option allows insecure authentication without a TLS certificate. Avoid this method in production environments.

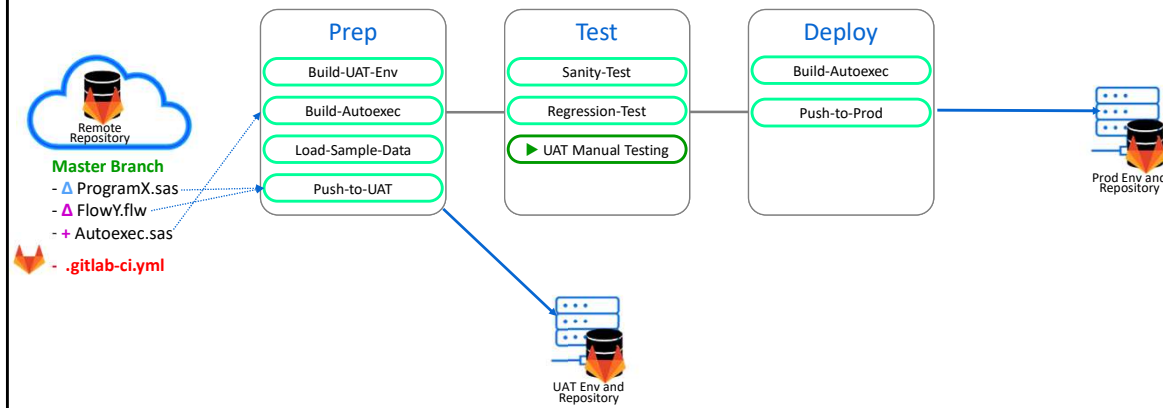
List-rep-plugins:

The output lists all available plugins in the repository and their local status. Indicators in the output signify:

- * : Plugin is installed locally, and the version matches the repository version.
- ^ : Plugin is installed locally, but the repository has a newer version.
- No indicator: Plugin is available in the repository but not installed locally

SAS Specific CI/CD Jobs

Overview



Viya Configuration

SAS Specific CI/CD Jobs

autoexec.sas

```
/* Workshop libraries */
libname SASDM "/azuredm/data/$env" ;

options NOFMTERR ;
```

Build-Autoexec

.gitlab-ci.yml

```
run-sas-program:
  stage: build
  script:
    - export env=test # Set the Environment to test
    - envsubst < autoexec.sas > /var/tmp/compute_autoexec_frmst.sas # Resolve the env variable
    - sed 's/$/\n/:s/"/"/g' /var/tmp/compute_autoexec_frmst.sas > /var/tmp/compute_autoexec_formatted.sas # Format text
    - COMPUTE_AUTOEXEC=$(cat /var/tmp/compute_autoexec_formatted.sas)
    - COMPUTE_AUTOEXEC="${COMPUTE_AUTOEXEC//$'\n'/ }" # Add line feeds
    # Create the config json for updating the autoexec
    - |
      tee /var/tmp/compute_autoexec.json > /dev/null << EOF
      {"items": [{"version": 1,"metadata": {"isDefault": false,"services": ["compute"]},
        "mediaType": "application/vnd.sas.configuration.config.sas.compute.server+json;version=1"},
        "name": "autoexec_code","contents": "${COMPUTE_AUTOEXEC}"},"version": 2}]
      EOF
    - sas-viya -k --profile uat profile set-endpoint $uat_url
    - sas-viya -k --profile uat auth login -user $dev_user -password $dev_passwd
    ...
    # Apply the config
    - sas-viya --profile dev configuration configurations update --file /var/tmp/compute_autoexec.json
```

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Demo

SAS Specific CI/CD Jobs – Viya Configuration

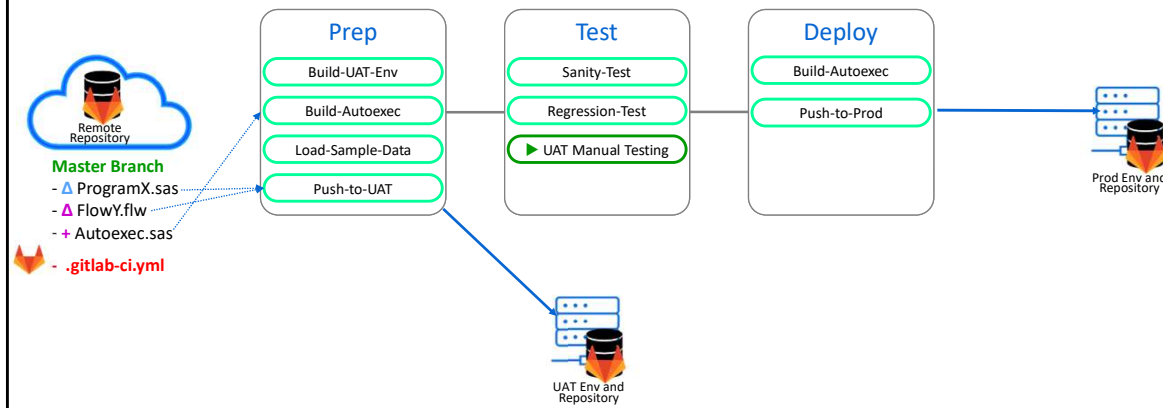


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SAS Specific CI/CD Jobs

Overview



Execute SAS Batch Jobs

SAS Specific CI/CD Jobs

Load-Sample-Data

```
Add-Libnames:
Default:
  image: jass/gitlab-runner-sas:1.21.6
Add-Libnames:
  stage: Prep
  script:
    - sas-viya -k --profile uat profile set-endpoint $uat_url
    - sas-viya -k --profile uat auth login -user $dev_user -password $dev_passwd
    - sas-viya -k --profile uat batch jobs submit-pgm --pgm-path loadSampData.sas
```

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Execute SAS Batch Jobs

SAS Specific CI/CD Jobs

```
sas-viya -k --profile uat batch jobs submit-pgm
```

- The batch API uses the **SAS Batch Service**

The screenshot shows the 'SAS Environment Manager - Manage Environment' interface. On the left, a sidebar contains various icons, with the 'Configuration' icon highlighted. The main panel is titled 'Configuration' and shows a search bar with 'batch' entered. Below the search bar, 'SAS Batch Service' is listed and highlighted with a red box. To the right, a section titled 'The following configuration instances are used to configure the service "SAS Batch Service":' shows a search bar with 'autoexec' entered. Below this, a configuration instance is listed with a red box around the key 'sas.batch.server: autoexec_code'. The 'GUID' is 'c7591b44-#24-4d2d-bc69-1988e5e59e25'. The 'Services' section lists 'SAS Batch Service'. The 'contents' section shows a red box around the SAS code:

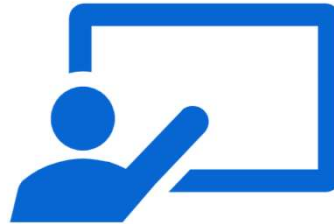
```
/* Workshop libraries */  
libname SASDM "/azuredm/data/test" ;  
/* Source library */  
libname orion "/azuredm/OrionSource";
```

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Demo

SAS Specific CI/CD Jobs – SAS Batch Jobs



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Import a SAS Package

SAS Specific CI/CD Jobs

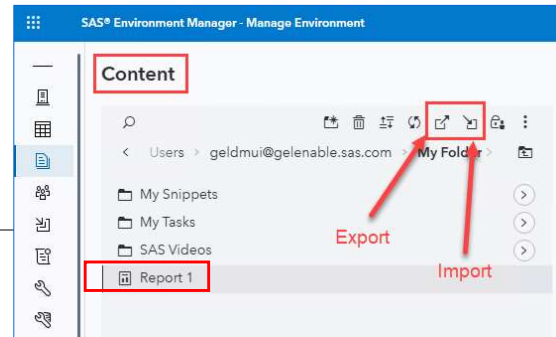
.gitlab-ci.yml

```
run-import-package:
  stage: build
  script:
    ...
    - export GITFOLDER=$(pwd)

    # Upload the .json file from the content folder (Git clone) to SAS Viya
    - sas-viya --profile dev transfer upload --file $SAS_PACKAGE > ${UPLOAD_REPORT}
    - echo View the upload report
    - cat $UPLOAD_REPORT

    # Read the package id from the JSON file into a variable
    - fileid=$(cat $UPLOAD_REPORT | jq -r '.id')

    # Import the package with the id from the variable
    - sas-viya --profile dev transfer import --id $fileid
```



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Run a SAS Studio Flow / “Jobs and Flows” Job

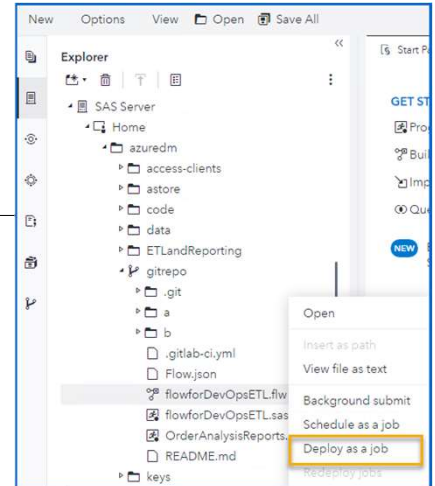
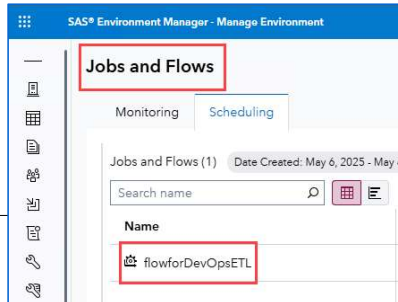
SAS Specific CI/CD Jobs

.gitlab-ci.yml

```
run-studio-flow:
  stage: build
  script:
    ...
    # Parse out the SAS Object id
    - jid=$(sas-viya --profile dev --output json job requests list
      --filter 'eq(name,'$SAS_JOB')' | jq -r '.items[0].id')

    # Execute the Job Request
    - sas-viya --profile dev job requests execute --id $jid

    # Print the Job Request History
    - sas-viya --profile dev job requests list-history --id $jid
```

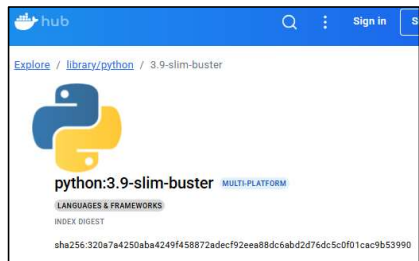


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Run a Python Job

SAS Specific CI/CD Jobs



.gitlab-ci.yml

```
run-python-program:
  stage: build
  image: python:3.9-slim-buster
  script:
    # Run a Python program stored in Git
    - pip install pandas
    - python3 simplePythonProgram.py
```

```
simplePythonProgram.py 118 B
1 import pandas as pd
2
3 data = {'col1': [1, 2, 3], 'col2': ['a', 'b', 'c']}
4 df = pd.DataFrame(data)
5
6 print(df.describe())
```

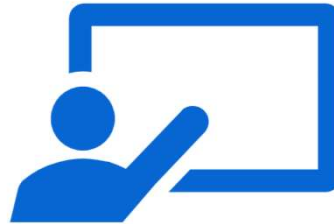
```
56 $ python3 simplePythonProgram.py
57      col1
58 count   3.0
59 mean    2.0
60 std     1.0
61 min     1.0
62 25%     1.5
63 50%     2.0
64 75%     2.5
65 max     3.0
66 Cleaning up project directory and file based variables
67 Job succeeded
```

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Demo

SAS Specific CI/CD Jobs – Run a Python Job



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