

# Lab: Optimizing Pipeline Efficiency

## Overview

This lab will guide you through:

1. Using **conditional job execution** to optimize pipeline performance (e.g., only running jobs when specific files are modified).
2. **Best practices** for pipeline optimization.
3. A **demo** showing how to set up a pipeline job that triggers based on file changes in a merge request.

By the end of this guide, you'll know how to optimize GitLab pipelines for faster, more efficient performance by minimizing unnecessary job executions.

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## Prerequisites

1. Basic understanding of GitLab CI/CD and YAML syntax.
  2. A GitLab repository to work with.
  3. Access to GitLab CI/CD runners.
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## Part 1: Using Conditional Job Execution to Optimize Pipelines

### 1.1 What is Conditional Job Execution?

Conditional job execution allows certain jobs to run only when specific conditions are met. This is useful for avoiding redundant job executions, which can save time and resources.

### 1.2 Using `only` and `except` in GitLab CI/CD

GitLab provides the `only` and `except` keywords to control when jobs run based on branch names, file changes, or merge request events.

#### Example Syntax

```
example_job:
  script:
    - echo "This job only runs on changes in specific files."
  only:
    changes:
      - src/*.py
      - config/*.yaml
```

- **Explanation:** The job only runs if files in `src` or `config` directories change. The `only` keyword here restricts the job to trigger only on file changes.

### 1.3 Lab Setup

We'll create a pipeline where jobs only run if specific files change.

#### Step-by-Step Guide

1. **Define Conditional Job Execution** in `.gitlab-ci.yml`:

```
stages:
  - test
```

```

- deploy

test_job:
  stage: test
  script:
    - echo "Running tests only if Python files in src/ are modified."
  only:
    changes:
      - src/**/*.py

deploy_job:
  stage: deploy
  script:
    - echo "Deploying only if config files in config/ are modified."
  only:
    changes:
      - config/**/*.yaml

```

## 2. Creating the Trigger Files in GitLab UI:

- Go to your GitLab repository.
- Create a new folder named `src` with a file `main.py` in it, containing any basic Python code, e.g.,  
`print("Hello, World!")`.
- Create another folder `config` with a file `config.yml` in it, containing sample YAML content, e.g.,  
`setting: true`.

## 3. Explanation:

- `test_job` only runs if any `.py` file in the `src` directory is modified.
- `deploy_job` only runs if any `.yaml` file in the `config` directory is modified.

## 4. Push and Test:

- Edit `main.py` or `config.yml` through the GitLab UI and commit the changes to trigger the pipeline.
- Verify that only relevant jobs run based on the modified files.

1

1

Q Search or go to...

Project

D

Devtest

Pinned

Issues

Merge requests

Manage

Plan

Code

Merge requests

Repository

Branches

Commits

Tags

Repository graph

Compare revisions

Snippets

Build

Secure

Deploy

Operate

Monitor

Analyze

Help

New file

main

src/main.py

1

print("Hello, World!")

Commit message

Add new file

Target Branch

main

Commit changes

Cancel

devgroup2922244 / Devtest / Jobs / #8216348598

## test\_job

Passed Started just now by Ather Tahir

Search visible log output

1

Running with gitlab-runner 17.5.2 (c6eee8d7)

2

on 4d7fedea6cb9 t2\_rssRuh, system ID: r\_jBM3mcUYRCJf

3

Preparing the "docker" executor

4

Using Docker executor with image ruby:2.7 ...

5

Pulling docker image ruby:2.7 ...

6

Using docker image sha256:3cb84b8c626861ba5167462228a0035db6b2deae893f3e8fafcf256d9d3abddaa for ruby:2.7 with digest ruby@sha256:2347de892e419c7168fc21dec721d5952736989f8c3fbb7f84cb4a87aaf9ce7d ...

7

Preparing environment

8

Running on runner-t2rssruh-project-63857443-concurrent-0 via fb12a11b9706...

9

Getting source from Git repository

10

Fetching changes with git depth set to 20...

11

Reinitialized existing Git repository in /builds/devgroup2922244/devtest/.git/

12

Checking out 656e5c48 as detached HEAD (ref is main)...

13

Skipping Git submodules setup

14

Executing "step\_script" stage of the job script

15

Using docker image sha256:3cb84b8c626861ba5167462228a0035db6b2deae893f3e8fafcf256d9d3abddaa for ruby:2.7 with digest ruby@sha256:2347de892e419c7168fc21dec721d5952736989f8c3fbb7f84cb4a87aaf9ce7d ...

16

\$ echo "Running tests only if Python files in src/ are modified."

17

Running tests only if Python files in src/ are modified.

18

Cleaning up project directory and file based variables

19

Job succeeded

00:03

00:01

00:02

00:01

00:01

## Part 2: Best Practices for Pipeline Optimization

### 2.1 Limit Pipeline Stages and Jobs

Reducing unnecessary stages and jobs can enhance efficiency. Try to keep only essential stages and avoid redundant job duplications.

### 2.2 Use Caching for Dependencies

Utilize GitLab caching to save dependencies between job executions. For example, caching `node_modules` or `pip` packages can save time on repeated installations.

### Example Caching Setup

```
cache:
  paths:
    - node_modules/
```

✓ Pipeline syntax is correct. [Learn more](#)

Edit Visualize Validate **NEW** Full configuration

CI/CD Catalog Help

```
1  cache:
2    | paths:
3    |   - node_modules/
4
5  stages:
6    | - test
7    | - deploy
8
9  test_job:
10 | stage: test
11 | script:
12 |   - echo "Running tests only if Python files in src/ are modified."
13 | only:
14 |   changes:
15 |     - src/**/*.py
16
17 deploy_job:
18 | stage: deploy
19 | script:
20 |   - echo "Deploying only if config files in config/ are modified."
21 | only:
22 |   changes:
23 |     - config/**/*.yaml
```

## 2.3 Avoid Unnecessary Triggers

Set jobs to run only on specific branches or events. Use `only` and `except` keywords effectively.

## Part 3: Demo – Triggering Jobs Based on File Changes in a Merge Request

### 3.1 Scenario

In this demo, we will set up a job that triggers only if there are changes in a specific directory when a merge request is created.

### 3.2 Lab Setup

#### 1. Define Stages and Jobs:

- Create jobs that only trigger on specific changes in merge requests.

## 2. Create `.gitlab-ci.yml` Configuration:

```
stages:
  - build

build_job:
  stage: build
  script:
    - echo "Building project due to changes in src/"
  only:
    - merge_requests
  changes:
    - src/**/*
```

### 3. Explanation:

- The `build_job` triggers if a merge request contains changes in the `src` directory.

### 4. Creating the Trigger Files in GitLab UI:

- Open a new branch in GitLab, create a file in the `src` directory, and commit it.
- Open a merge request for this branch.

### 5. Run the Pipeline:

- Verify that `build_job` runs when the merge request is created with changes in the `src` directory.

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## Summary

This lab covers:

1. Using conditional job execution to run jobs based on file changes.
2. Best practices for optimizing pipelines, including limiting stages, caching dependencies, and avoiding unnecessary triggers.
3. A demo with a pipeline job that triggers only when specific files are modified in a merge request.

Following these practices will help ensure efficient and effective CI/CD workflows in GitLab.