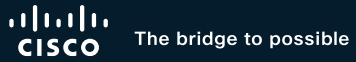

CI/CD pipelines for infrastructure automation

Adrian Iliesiu, Senior Developer Advocate
@aidevnet

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Questions?

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with the speaker after the session

How

1. Find this session in the Cisco Live Mobile App
2. Click “Join the Discussion”
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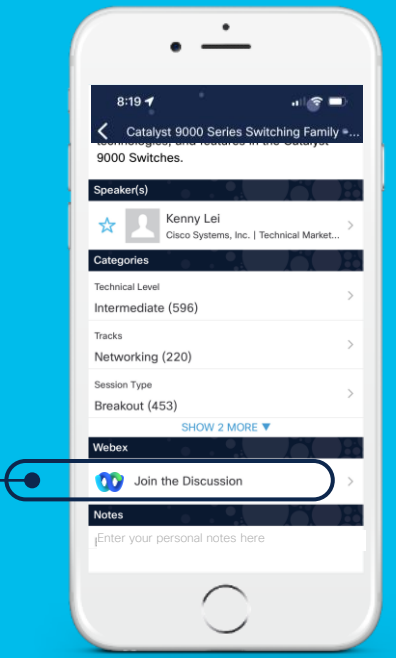
4. Enter messages/questions in the Webex space

Webex spaces will be moderated until February 24, 2023.



Agenda

- CI/CD overview
- GitLab
- Example of a CI/CD pipeline workflow
- Demo
- Resources

CI/CD overview

CI/CD Pipelines

Continuous Integration – Software

- Practice of integrating **code** that developers are producing
- Code is developed in separate **branches**
  - Multiple developers
  - Multiple features
- When code is **merged** into a branch
  - Testing validates changes
  - Flush out potential bugs
  - Ensure quality and no **integration** issues

CI/CD Pipelines

Continuous Delivery – Software

- Releases can be created and delivered at any time
- Changes have met integration requirements?
  - Push to a “stage” environment
  - Run additional tests and checks
- All tasks are automated

CI/CD Pipelines

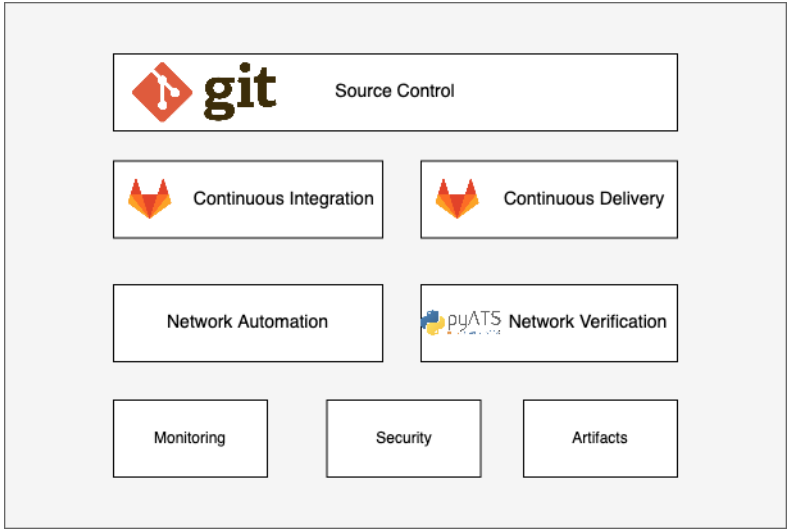
Continuous Deployment – Software

- Takes delivery a step further
- Deploys changes to a production environment
  - Many different deployment strategies available
  - Blue/Green, Canary, Rolling

CI/CD Pipelines

Infrastructure Automation

- Network as Code and Configuration Management strategies
- Continuous Delivery approach to network changes
- Continuous health and improvement approach to monitoring

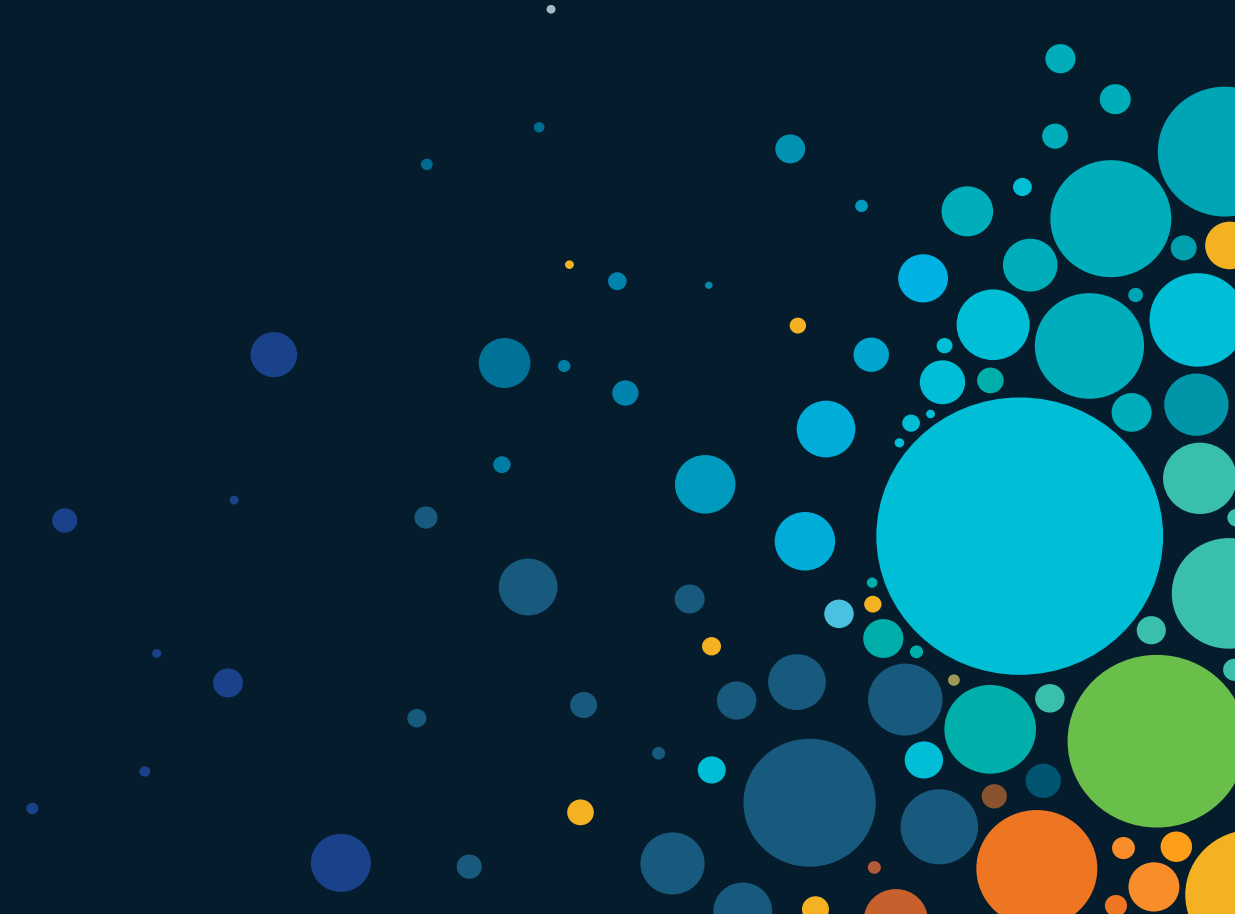


CI/CD Pipelines

Infrastructure Automation

- Configuration changes are done through automation
- Historical insight into changes made to the network
- Validate changes prior to configuring the network
- If an issue is introduced into the network, those changes can be rolled back to a known good state
- Integration with change and ticketing systems for true Continuous Deployment

GitLab



GitLab

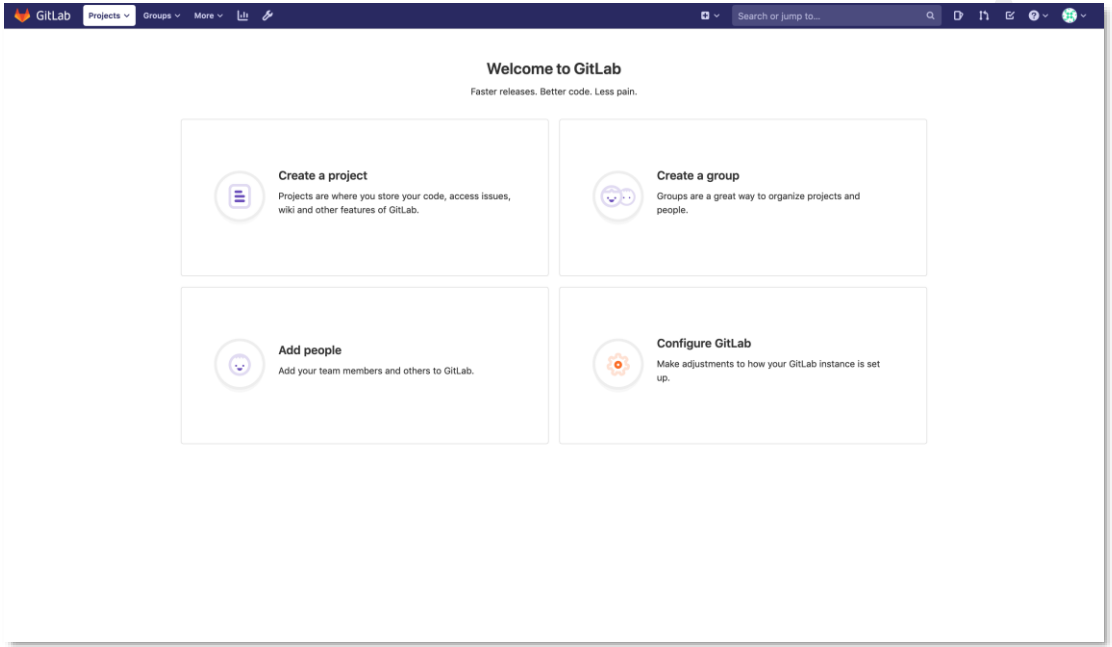
Overview

- Complete DevOps platform
- Project Management
- Hosted Git repositories
- Built-in CI/CD

GitLab

Projects

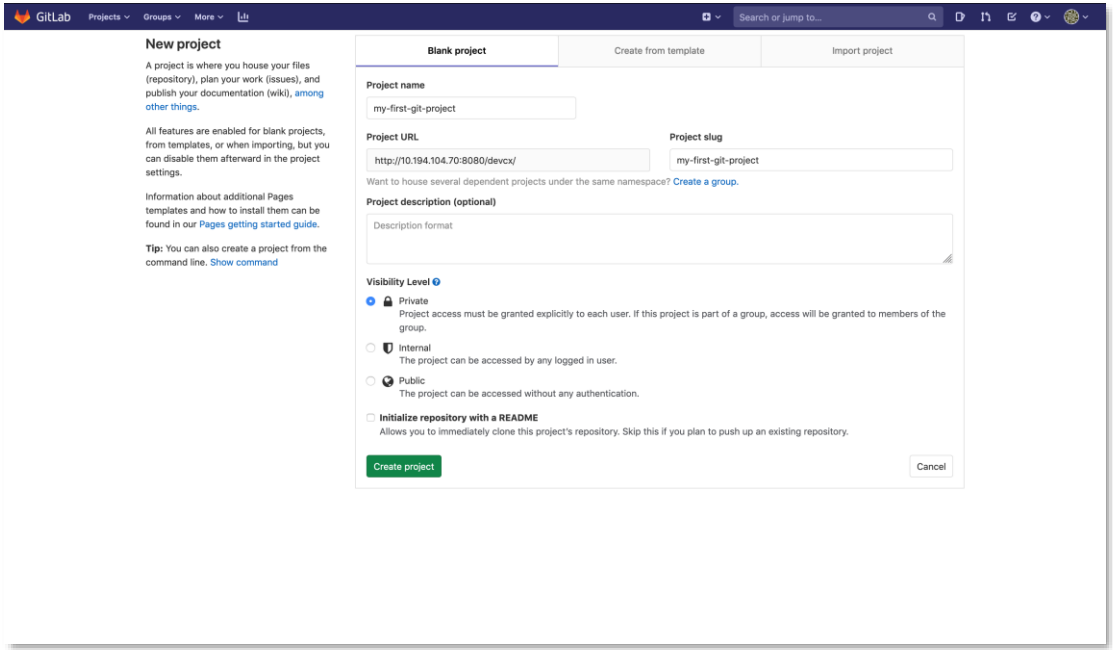
- Code, issues, wikis, etc. are organized into projects



GitLab

- Projects

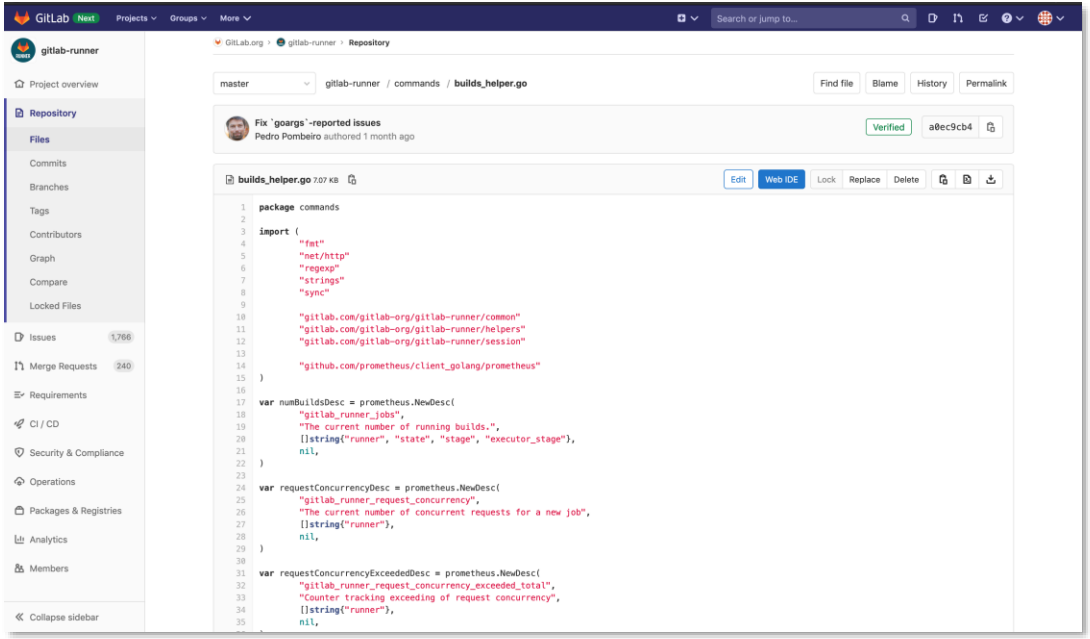
- Create new projects from scratch, use a template, or import an existing project
- Configurable visibility levels: private, internal, public



GitLab

Files

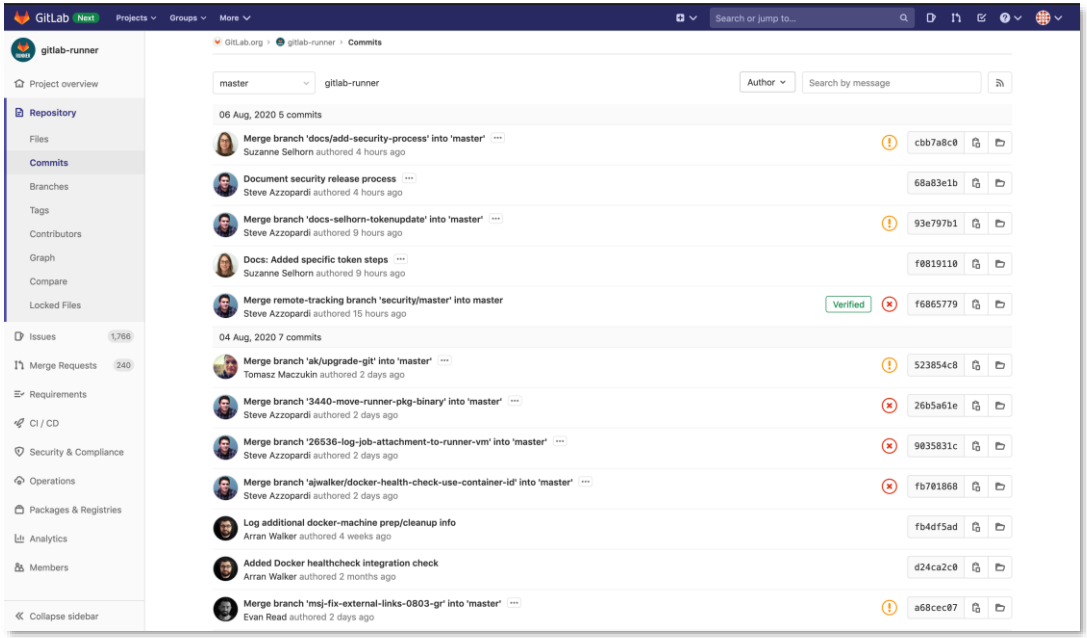
- View, edit, create files under or in your project (repository)



GitLab

Commits

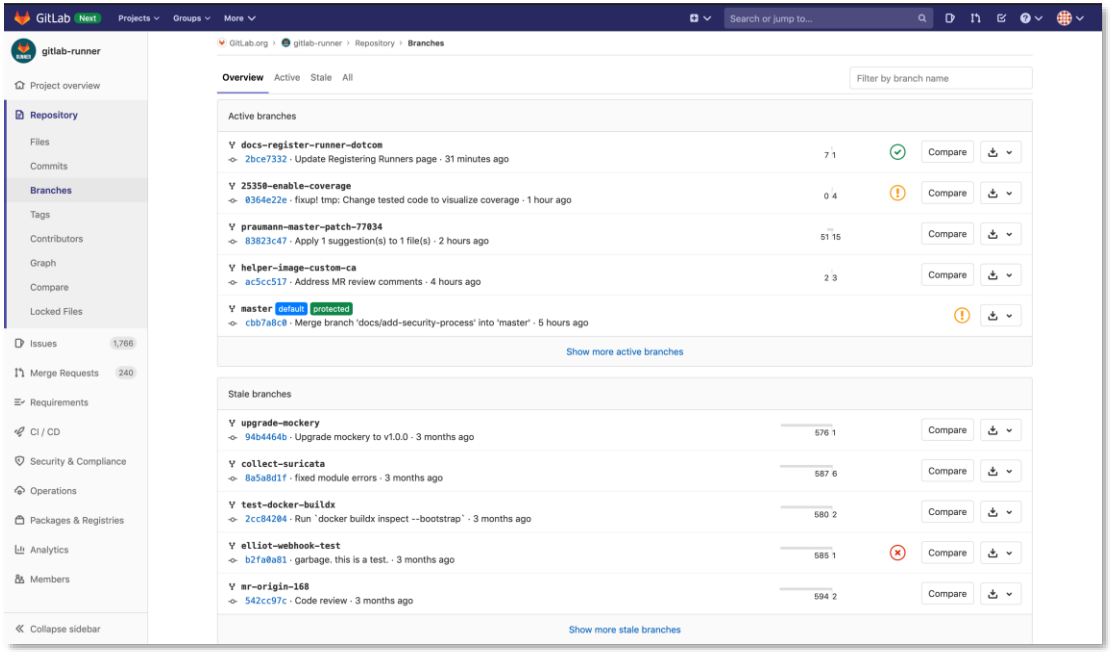
- View and manage commits within your project



GitLab

Branches

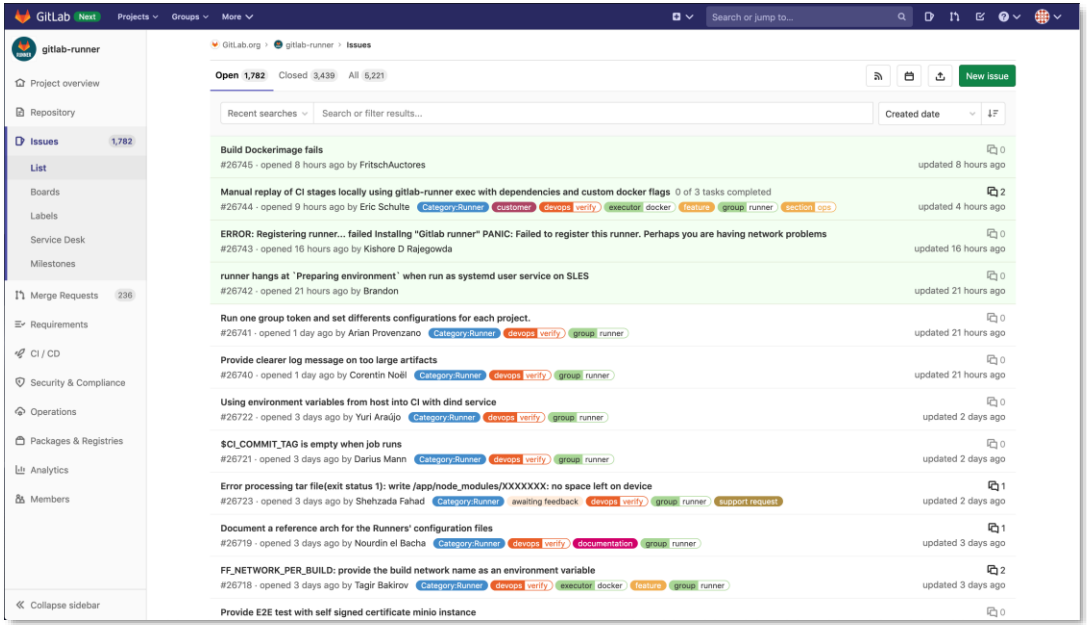
- A version of a project's working tree
- Create merge requests
- Perform inline code review



GitLab

Issues

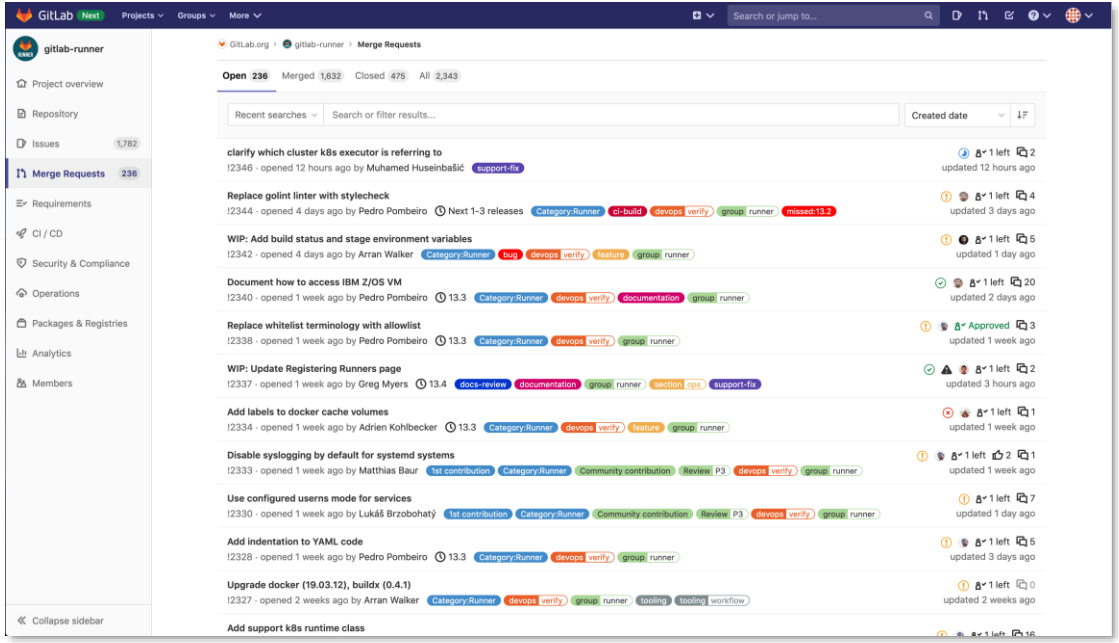
- Used for collaborating on ideas and planning work
- Enable sharing and discussion of ideas/proposals
- Track status of work and tasks



GitLab

Merge Requests

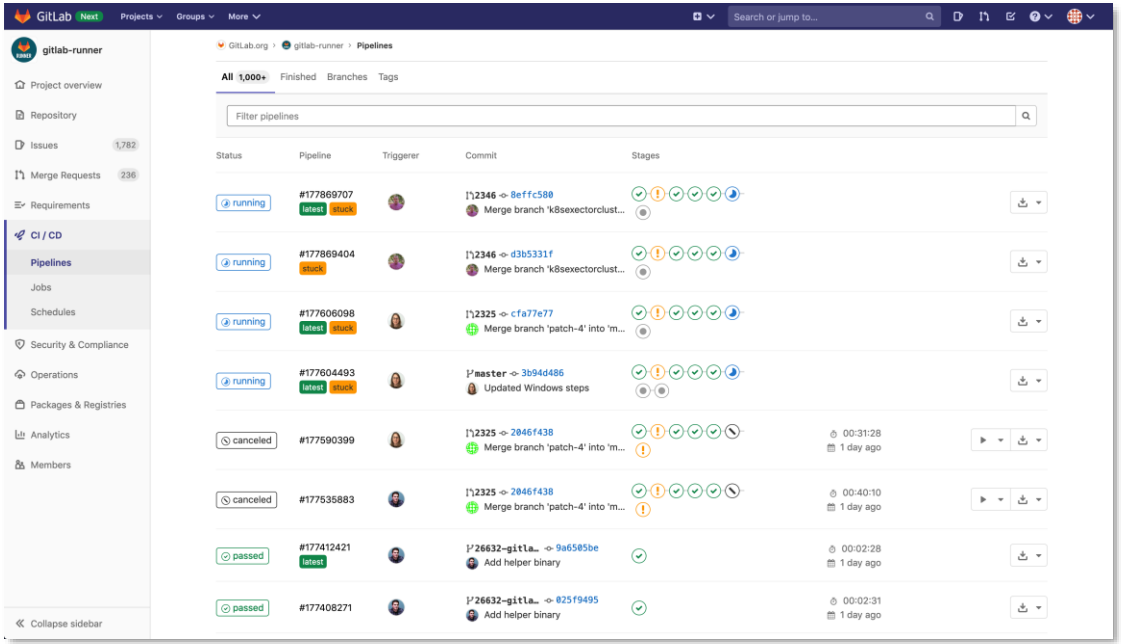
- Request to merge one branch into another



GitLab

Pipelines

- Fundamental building blocks for CI/CD



GitLab

Pipelines

- Composed of:
  - Jobs – What to do
  - Stages - When to run jobs
- A typical pipeline would contain four stages
  - Build (compile)
  - Test (unit-tests)
  - Staging (deploy-to-stage, integration-tests)
  - Production (deploy-to-prod)

GitLab

Runners

- Used to run the jobs and send results back to GitLab
- When a pipeline is triggered, a Runner will `git clone` the repo and then execute the instructions inside of `.gitlab-ci.yml`
- Implements a variety of executors
  - Jobs can run in different scenarios
  - SSH, Shell, Parallels, VirtualBox, Docker, Kubernetes, Custom

GitLab

.gitlab-ci.yml

```yaml
stages:
  - build
  - test
  - deploy

image: alpine

compile_a:
  stage: build
  script:
    - echo "This job builds something."

compile_b:
  stage: build
  script:
    - echo "This job builds something else."

unit_test_a:
  stage: test
  script:
    - echo "This job tests something. It will only run when all jobs in the"
    - echo "build stage are complete."

unit_test_b:
  stage: test
  script:
    - echo "This job tests something else. It will only run when all jobs in the"
    - echo "build stage are complete too. It will start at about the same time as test_a."

deploy_a:
  stage: deploy
  script:
    - echo "This job deploys something. It will only run when all jobs in the"
    - echo "test stage complete."

deploy_b:
  stage: deploy
  script:
    - echo "This job deploys something else. It will only run when all jobs in the"
    - echo "test stage complete. It will start at about the same time as deploy_a."
```

GitLab
Schedules

- Pipelines normally run when conditions are met
  - When a branch is pushed to a repository
- Schedules enable pipeline runs at specific intervals
  - Once every day
  - Every Friday
  - Any schedule as needed

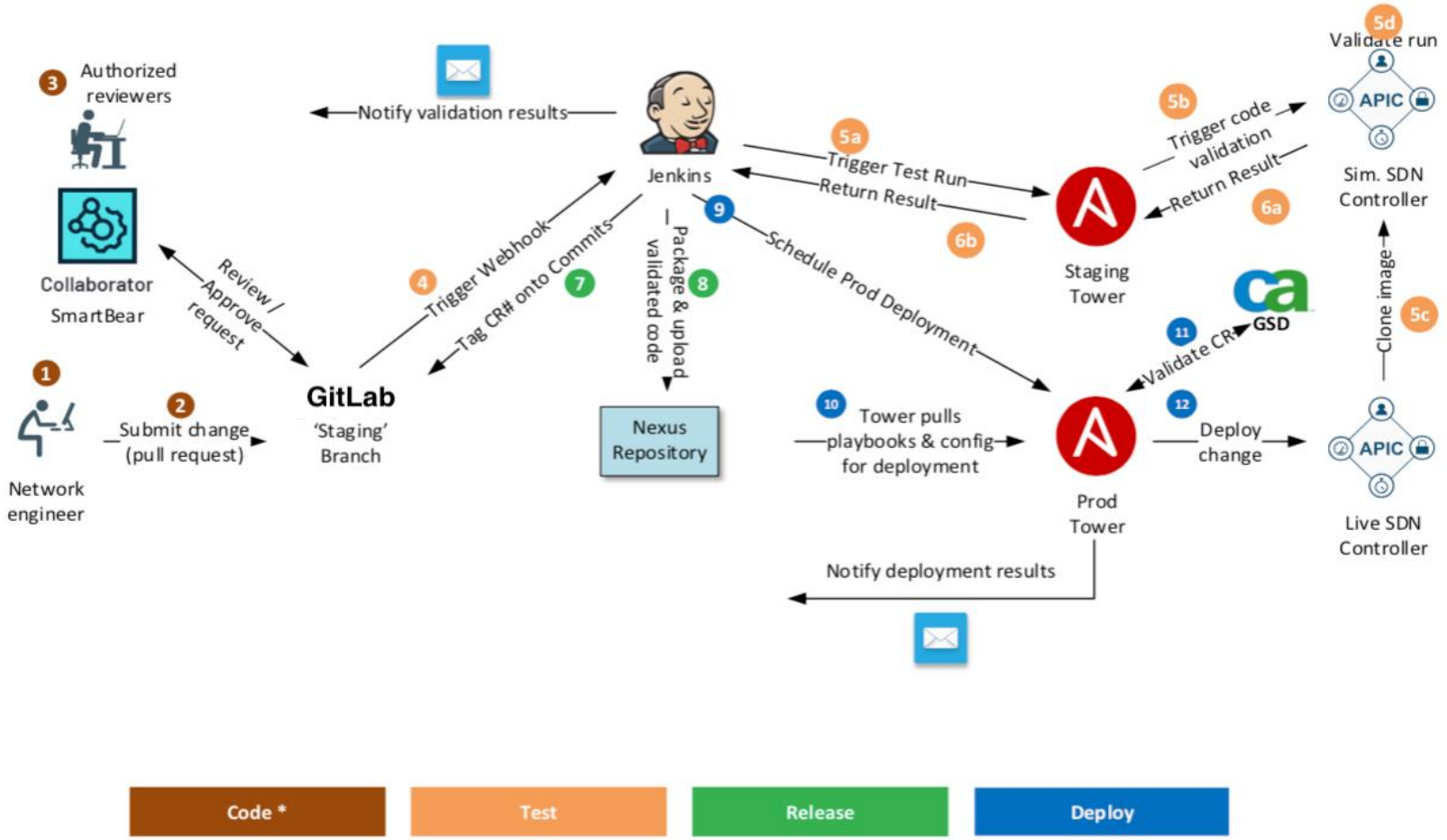
GitLab

Environment Variables

- Useful for customizing your jobs

```
export CI_JOB_ID="50"
export CI_COMMIT_SHA="1ecfd275763eff1d6b4844ea3168962458c9f27a"
export CI_COMMIT_SHORT_SHA="1ecfd275"
export CI_COMMIT_REF_NAME="master"
export CI_REPOSITORY_URL="https://gitlab-ci-token:abcde-1234ABCD5678ef@example.com/gitlab-org/gitlab-foss.g
export CI_COMMIT_TAG="1.0.0"
export CI_JOB_NAME="spec:other"
export CI_JOB_STAGE="test"
export CI_JOB_MANUAL="true"
export CI_JOB_TRIGGERED="true"
export CI_JOB_TOKEN="abcde-1234ABCD5678ef"
export CI_PIPELINE_ID="1000"
export CI_PIPELINE_IID="10"
export CI_PAGES_DOMAIN="gitlab.io"
export CI_PAGES_URL="https://gitlab-org.gitlab.io/gitlab-foss"
export CI_PROJECT_ID="34"
export CI_PROJECT_DIR="/builds/gitlab-org/gitlab-foss"
export CI_PROJECT_NAME="gitlab-foss"
export CI_PROJECT_TITLE="GitLab FOSS"
export CI_PROJECT_NAMESPACE="gitlab-org"
export CI_PROJECT_ROOT_NAMESPACE="gitlab-org"
export CI_PROJECT_PATH="gitlab-org/gitlab-foss"
export CI_PROJECT_URL="https://example.com/gitlab-org/gitlab-foss"
export CI_REGISTRY="registry.example.com"
export CI_REGISTRY_IMAGE="registry.example.com/gitlab-org/gitlab-foss"
export CI_REGISTRY_USER="gitlab-ci-token"
export CI_REGISTRY_PASSWORD="longalfanumstring"
export CI_RUNNER_ID="10"
export CI_RUNNER_DESCRIPTION="my runner"
export CI_RUNNER_TAGS="docker, linux"
export CI_SERVER="yes"
export CI_SERVER_URL="https://example.com"
export CI_SERVER_HOST="example.com"
export CI_SERVER_PORT="443"
export CI_SERVER_PROTOCOL="https"
export CI_SERVER_NAME="GitLab"
export CI_SERVER_REVISION="70606bf"
export CI_SERVER_VERSION="8.9.0"
export CI_SERVER_VERSION_MAJOR="8"
export CI_SERVER_VERSION_MINOR="9"
export CI_SERVER_VERSION_PATCH="0"
export GITLAB_USER_EMAIL="user@example.com"
export GITLAB_USER_ID="42"
```

Example of a CI/CD Pipeline Workflow

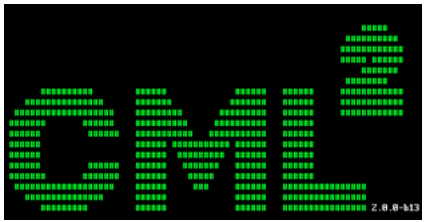


Demo

Test environment

Dev Workstation

Hosting Server



Network Simulation

Infrastructure as Code

Source Control

Testing Framework

Camtasia 2022 File Edit Modify Text View Export Window Help

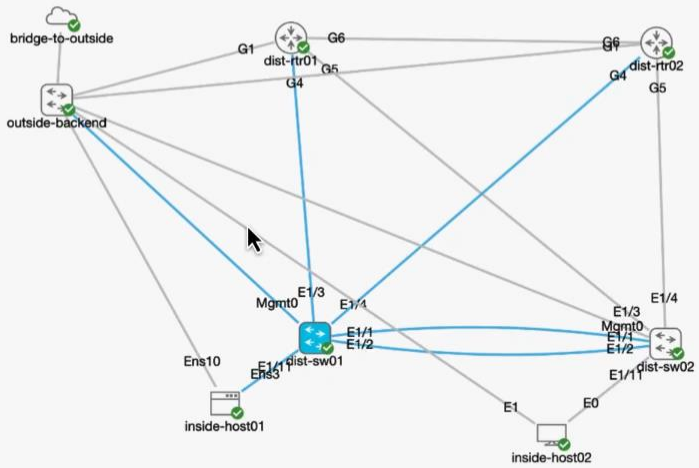
Files · main · developer develop | NXOS/IOSXE Network :: CML²

https://10.10.10.33/lab/8e1463b8-2d5b-4596-92a4-7c8e5af4b2e9

110%

Cisco Modeling Labs Workbench NXOS/IOSXE Network

DASHBOARD TOOLS ADMIN



ADD NODES

NODE INFO SIMULATE CONNECTIVITY CONSOLE VNC EDIT CONFIG INTERFACES

CLONE NODE DELETE NODE

NX-OS 9000

Node Name:
dist-sw01

CPU 28.56% MEMORY 18.82% DISK 8.38% Notifications 0 Status OK

Resources

- https://blogs.cisco.com/author/adrianiliesiu
- https://github.com/CiscoDevNet

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