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#CiscoLive

The bridge to possible

CI/CD pipelines for infrastructure automation

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@aidevnet
DEVNET-2117

#CiscoLive

Agenda

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

Cisco Webex App

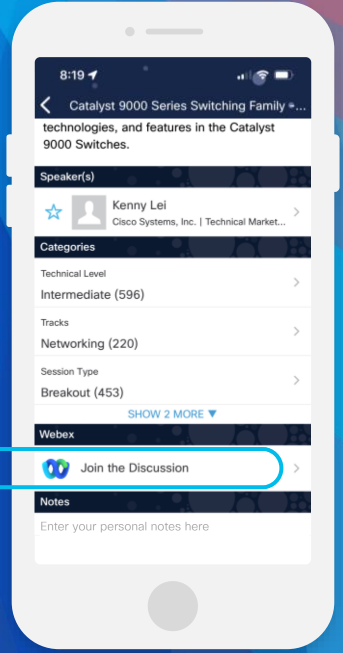
Questions?

Use Cisco Webex App to chat
with the speaker after the session

How

1. Find this session in the Cisco Live Mobile App
2. Click "Join the Discussion"
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated
by the speaker until June 9, 2023.



8:19

Catalyst 9000 Series Switching Family •...

technologies, and features in the Catalyst 9000 Switches.

Speaker(s)

☆ Kenny Lei
Cisco Systems, Inc. | Technical Market...

Categories

Technical Level
Intermediate (596)

Tracks
Networking (220)

Session Type
Breakout (453)

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Webex

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Notes

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https://ciscolive.ciscoevents.com/ciscolivebot/#DEVNET-2117

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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
- Have changes 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

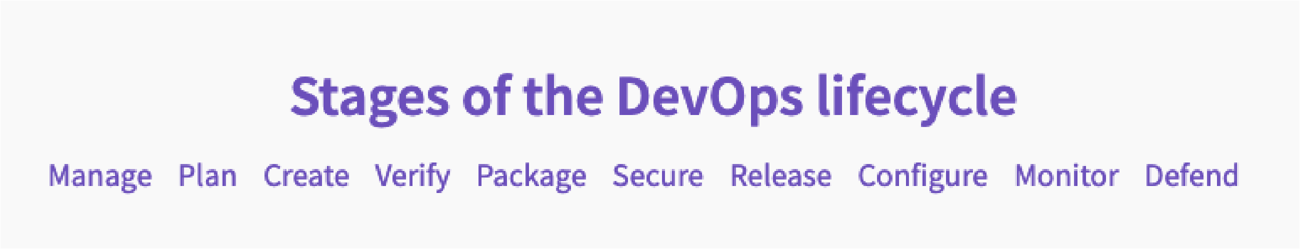
- Configuration changes are done through automation
- Historical insight into changes made to the network
- Validate changes prior to configuring the network
- If an issue is introduced into the network, those changes can be rolled back to a known good state
- Integration with change and ticketing systems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

GitLab

GitLab

Overview

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



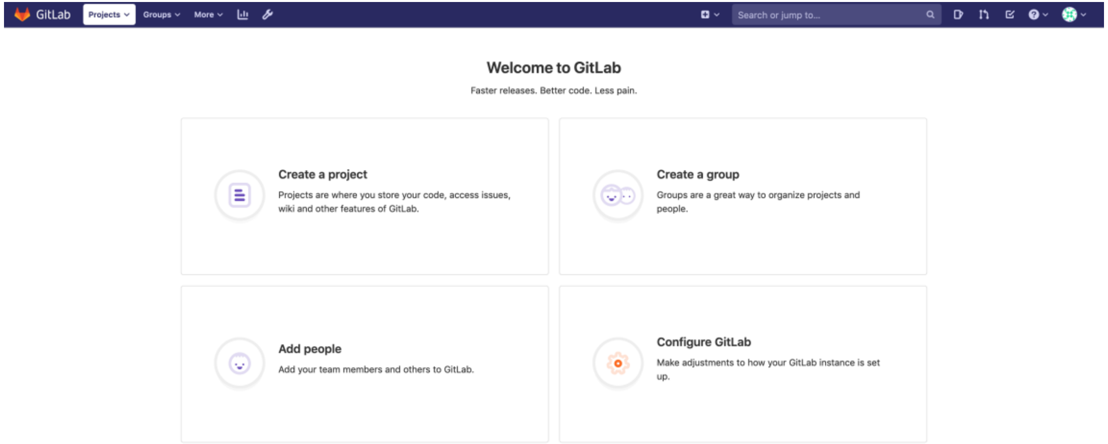
Stages of the DevOps lifecycle

Manage Plan Create Verify Package Secure Release Configure Monitor Defend

GitLab

Projects

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



Welcome to GitLab

Faster releases. Better code. Less pain.

Create a project

Projects are where you store your code, access issues, wiki and other features of GitLab.

Create a group

Groups are a great way to organize projects and people.

Add people

Add your team members and others to GitLab.

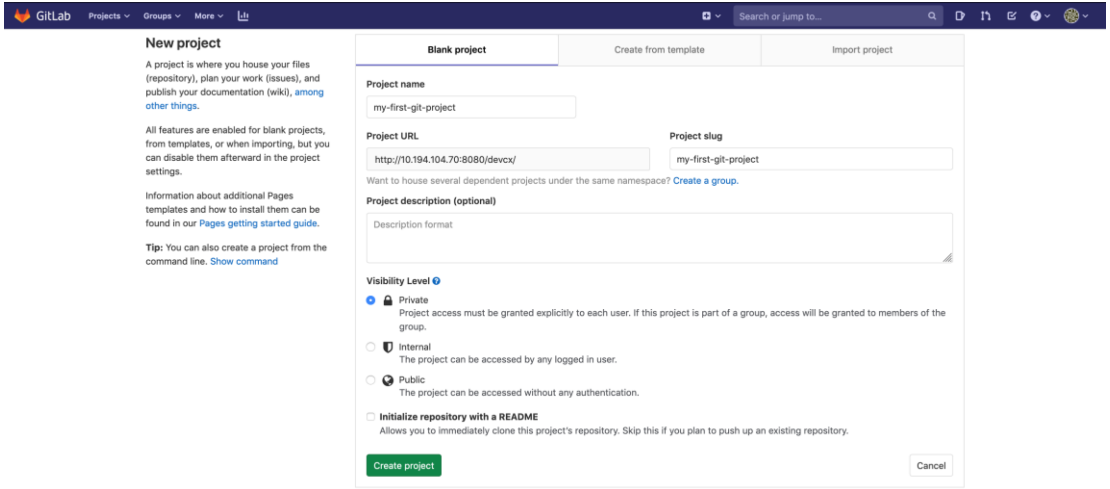
Configure GitLab

Make adjustments to how your GitLab instance is set up.

GitLab

Projects

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



New project

A project is where you house your files (repository), plan your work (issues), and publish your documentation (wiki), among other things.

All features are enabled for blank projects, from templates, or when importing, but you can disable them afterward in the project settings.

Information about additional Pages templates and how to install them can be found in our Pages getting started guide.

Tip: You can also create a project from the command line. Show command

Project name

my-first-git-project

Project URL

http://10.194.104.70:8080/devcx/

Project slug

my-first-git-project

Want to house several dependent projects under the same namespace? Create a group.

Project description (optional)

Description format

Visibility Level

● Private
Project access must be granted explicitly to each user. If this project is part of a group, access will be granted to members of the group.

○ Internal
The project can be accessed by any logged in user.

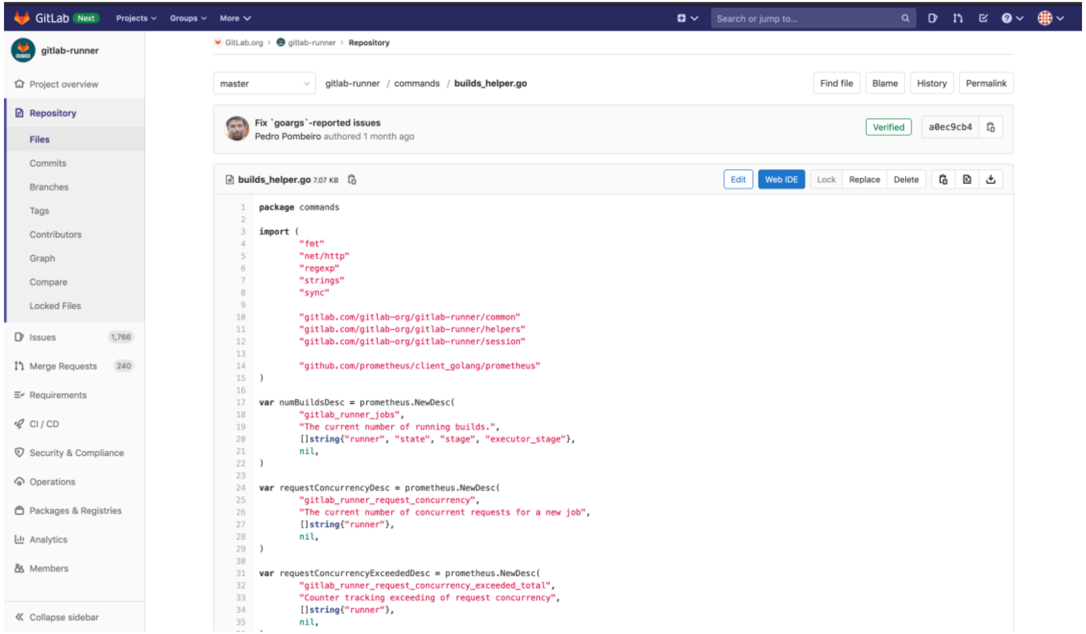
○ Public
The project can be accessed without any authentication.

□ **Initialize repository with a README**
Allows you to immediately clone this project's repository. Skip this if you plan to push up an existing repository.

GitLab

Files

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



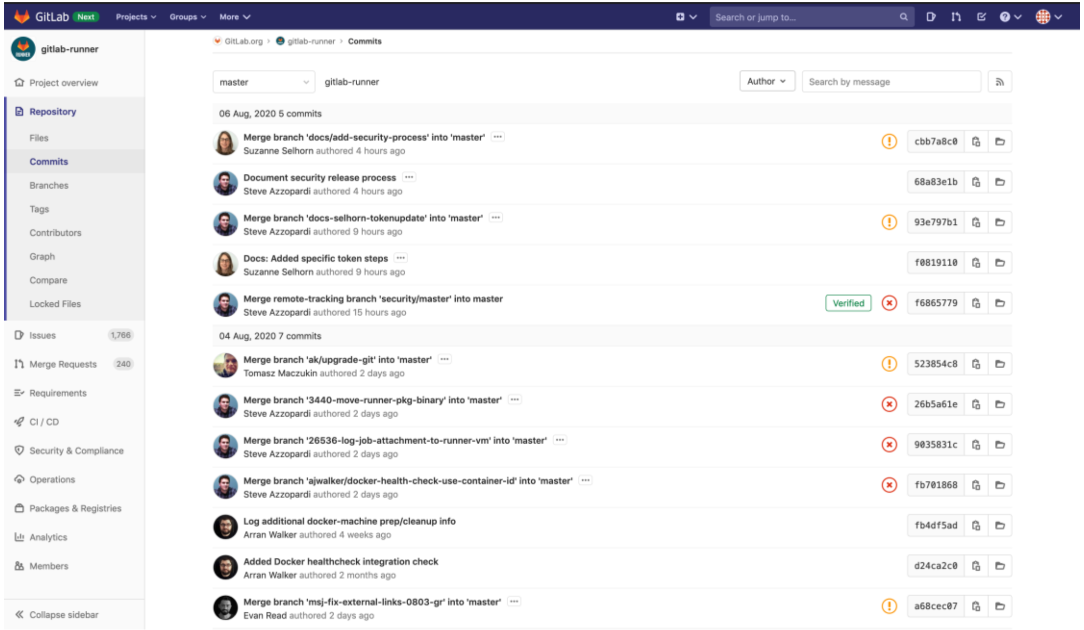
Fix `goargs`-reported issues
Pedro Pombeiro authored 1 month ago

```go
package commands

import (
	"fmt"
	"net/http"
	"regexp"
	"strings"
	"sync"

	"gitlab.com/gitlab-org/gitlab-runner/common"
	"gitlab.com/gitlab-org/gitlab-runner/helpers"
	"gitlab.com/gitlab-org/gitlab-runner/session"

	"github.com/prometheus/client_golang/prometheus"
)

var numBuildsDesc = prometheus.NewDesc(
	"gitlab_runner_jobs",
	"The current number of running builds.",
	[]string{"runner", "state", "stage", "executor_stage"},
	nil,
)

var requestConcurrencyDesc = prometheus.NewDesc(
	"gitlab_runner_request_concurrency",
	"The current number of concurrent requests for a new job",
	[]string{"runner"},
	nil,
)

var requestConcurrencyExceededDesc = prometheus.NewDesc(
	"gitlab_runner_request_concurrency_exceeded_total",
	"Counter tracking exceeding of request concurrency",
	[]string{"runner"},
	nil,
```

GitLab

Commits

- View and manage commits within your project



06 Aug, 2020 5 commits

Merge branch 'docs/add-security-process' into 'master'
Suzanne Selhorn authored 4 hours ago — cbb7a8c0

Document security release process
Steve Azzopardi authored 4 hours ago — 68a83e1b

Merge branch 'docs-selhorn-tokenupdate' into 'master'
Steve Azzopardi authored 9 hours ago — 93e797b1

Docs: Added specific token steps
Suzanne Selhorn authored 9 hours ago — f0819110

Merge remote-tracking branch 'security/master' into master
Steve Azzopardi authored 15 hours ago — Verified — f6865779

04 Aug, 2020 7 commits

Merge branch 'ak/upgrade-git' into 'master'
Tomasz Maczukin authored 2 days ago — 523854c8

Merge branch '3440-move-runner-pkg-binary' into 'master'
Steve Azzopardi authored 2 days ago — 26b5a61e

Merge branch '26536-log-job-attachment-to-runner-vm' into 'master'
Steve Azzopardi authored 2 days ago — 9035831c

Merge branch 'ajwalker/docker-health-check-use-container-id' into 'master'
Steve Azzopardi authored 2 days ago — fb701868

Log additional docker-machine prep/cleanup info
Arran Walker authored 4 weeks ago — fb4df5ad

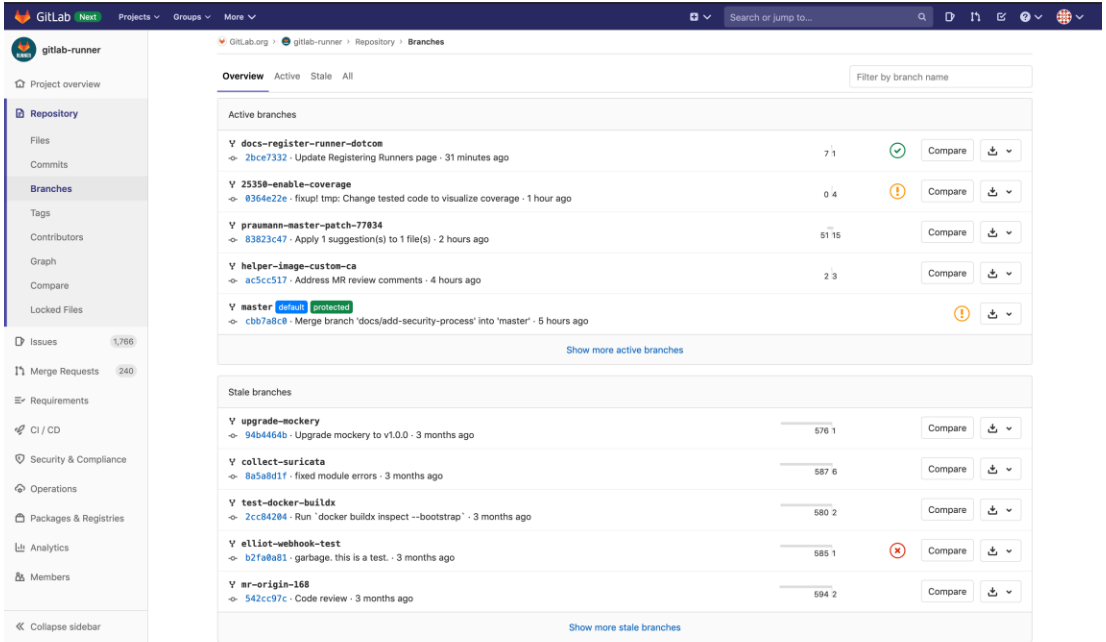
Added Docker healthcheck integration check
Arran Walker authored 2 months ago — d24ca2c0

Merge branch 'msj-fix-external-links-0803-gr' into 'master'
Evan Read authored 2 days ago — a68cec07

GitLab

Branches

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



Active branches

docs-register-runner-dotcom
2bce7332 · Update Registering Runners page · 31 minutes ago — 7 1

25350-enable-coverage
0364e22e · fixup! tmp: Change tested code to visualize coverage · 1 hour ago — 0 4

praumann-master-patch-77034
83823c47 · Apply 1 suggestion(s) to 1 file(s) · 2 hours ago — 51 15

helper-image-custom-ca
ac5cc517 · Address MR review comments · 4 hours ago — 2 3

master default protected
cbb7a8c0 · Merge branch 'docs/add-security-process' into 'master' · 5 hours ago

Show more active branches

Stale branches

upgrade-mockery
94b4464b · Upgrade mockery to v1.0.0 · 3 months ago — 576 1

collect-suricata
8a5a8d1f · fixed module errors · 3 months ago — 587 6

test-docker-buildx
2cc84204 · Run `docker buildx inspect --bootstrap` · 3 months ago — 580 2

elliot-webhook-test
b2fa0a81 · garbage. this is a test. · 3 months ago — 585 1

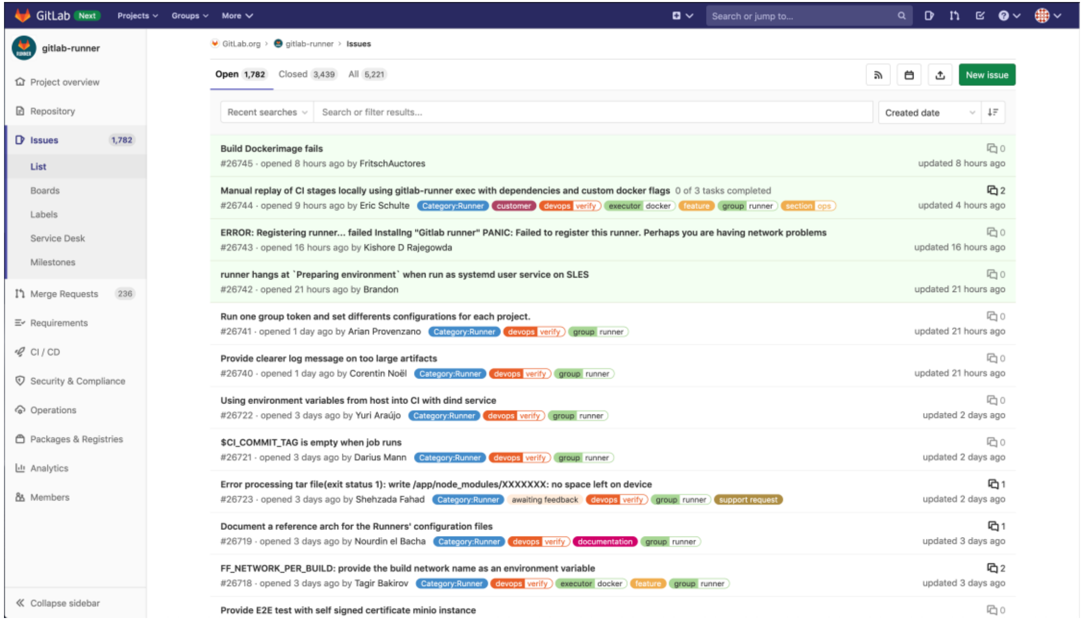
mr-origin-168
542cc97c · Code review · 3 months ago — 594 2

Show more stale branches

GitLab

Issues

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



Build Dockerimage fails — 0
#26745 · opened 8 hours ago by FritschAuctores — updated 8 hours ago

Manual replay of CI stages locally using gitlab-runner exec with dependencies and custom docker flags 0 of 3 tasks completed — 2
#26744 · opened 9 hours ago by Eric Schulte Category:Runner customer devops verify executor docker feature group runner section ops — updated 4 hours ago

ERROR: Registering runner... failed Installng "Gitlab runner" PANIC: Failed to register this runner. Perhaps you are having network problems — 0
#26743 · opened 16 hours ago by Kishore D Rajegowda — updated 16 hours ago

runner hangs at `Preparing environment` when run as systemd user service on SLES — 0
#26742 · opened 21 hours ago by Brandon — updated 21 hours ago

Run one group token and set differents configurations for each project. — 0
#26741 · opened 1 day ago by Arian Provenzano Category:Runner devops verify group runner — updated 21 hours ago

Provide clearer log message on too large artifacts — 0
#26740 · opened 1 day ago by Corentin Noël Category:Runner devops verify group runner — updated 21 hours ago

Using environment variables from host into CI with dind service — 0
#26722 · opened 3 days ago by Yuri Araújo Category:Runner devops verify group runner — updated 2 days ago

$CI_COMMIT_TAG is empty when job runs — 0
#26721 · opened 3 days ago by Darius Mann Category:Runner devops verify group runner — updated 2 days ago

Error processing tar file(exit status 1): write /app/node_modules/XXXXXXX: no space left on device — 1
#26723 · opened 3 days ago by Shehzada Fahad Category:Runner awaiting feedback devops verify group runner support request — updated 2 days ago

Document a reference arch for the Runners' configuration files — 1
#26719 · opened 3 days ago by Nourdin el Bacha Category:Runner devops verify documentation group runner — updated 3 days ago

FF_NETWORK_PER_BUILD: provide the build network name as an environment variable — 2
#26718 · opened 3 days ago by Tagir Bakirov Category:Runner devops verify executor docker feature group runner — updated 3 days ago

Provide E2E test with self signed certificate minio instance — 0

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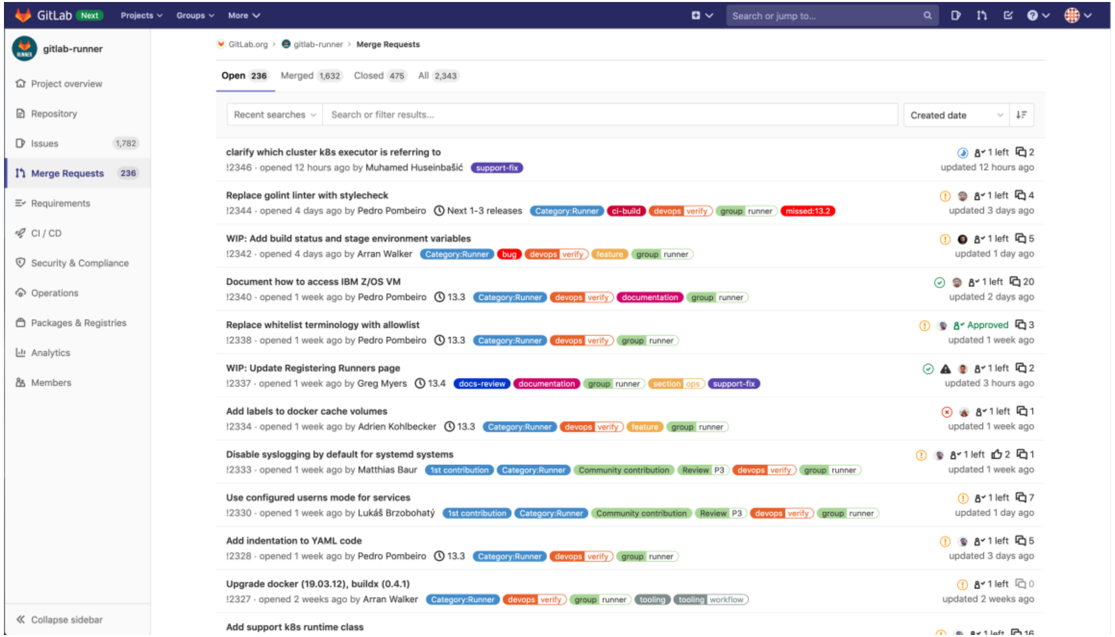
Merge Requests

- Request to merge one branch into another



clarify which cluster k8s executor is referring to
!2346 · opened 12 hours ago by Muhamed Huseinbašić support-fix
1 left 2
updated 12 hours ago

Replace golint linter with stylecheck
!2344 · opened 4 days ago by Pedro Pombeiro Next 1-3 releases Category:Runner ci-build devops verify group runner missed:13.2
1 left 4
updated 3 days ago

WIP: Add build status and stage environment variables
!2342 · opened 4 days ago by Arran Walker Category:Runner bug devops verify feature group runner
1 left 5
updated 1 day ago

Document how to access IBM Z/OS VM
!2340 · opened 1 week ago by Pedro Pombeiro 13.3 Category:Runner devops verify documentation group runner
1 left 20
updated 2 days ago

Replace whitelist terminology with allowlist
!2338 · opened 1 week ago by Pedro Pombeiro 13.3 Category:Runner devops verify group runner
Approved 3
updated 1 week ago

WIP: Update Registering Runners page
!2337 · opened 1 week ago by Greg Myers 13.4 docs-review documentation group runner section ops support-fix
1 left 2
updated 3 hours ago

Add labels to docker cache volumes
!2334 · opened 1 week ago by Adrien Kohlbecker 13.3 Category:Runner devops verify feature group runner
1 left 1
updated 1 week ago

Disable syslogging by default for systemd systems
!2333 · opened 1 week ago by Matthias Baur 1st contribution Category:Runner Community contribution Review P3 devops verify group runner
1 left 2 1
updated 1 week ago

Use configured userns mode for services
!2330 · opened 1 week ago by Lukáš Brzobohatý 1st contribution Category:Runner Community contribution Review P3 devops verify group runner
1 left 7
updated 1 day ago

Add indentation to YAML code
!2328 · opened 1 week ago by Pedro Pombeiro 13.3 Category:Runner devops verify group runner
1 left 5
updated 3 days ago

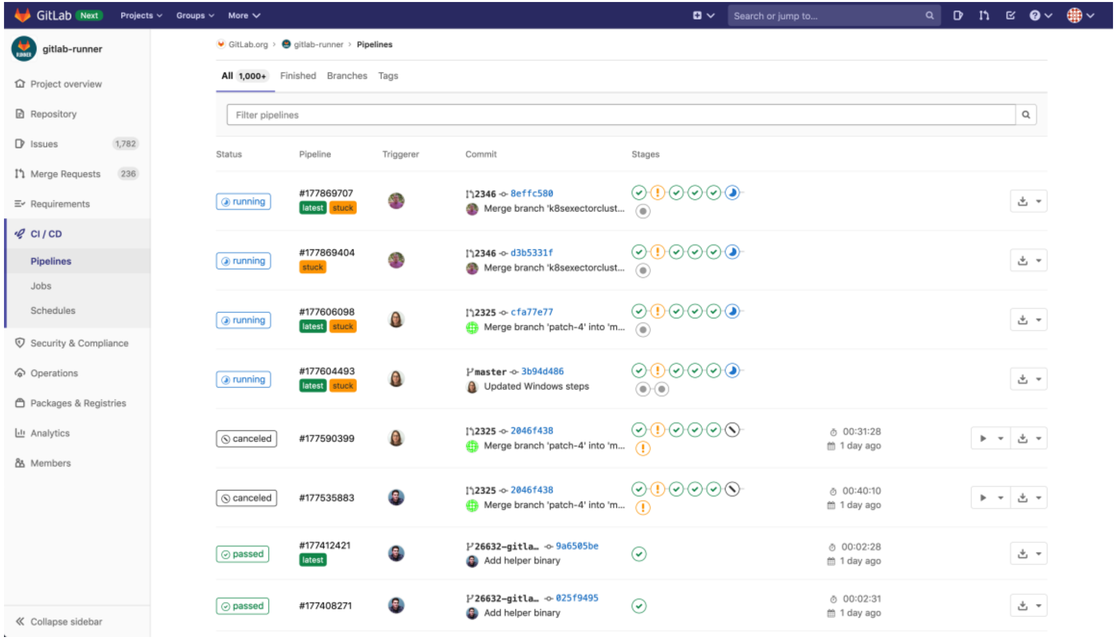
Upgrade docker (19.03.12), buildx (0.4.1)
!2327 · opened 2 weeks ago by Arran Walker Category:Runner devops verify group runner tooling tooling workflow
1 left 0
updated 2 weeks ago

Add support k8s runtime class
1 left 16

GitLab

Pipelines

- Fundamental building blocks for CI/CD



Status	Pipeline	Triggerer	Commit	Stages		
running	#177869707 latest stuck		2346 -o- 8effc580 Merge branch 'k8sexectorclust...	✓ ! ✓ ✓ ✓ ◔ ●		
running	#177869404 stuck		2346 -o- d3b5331f Merge branch 'k8sexectorclust...	✓ ! ✓ ✓ ✓ ◔ ●		
running	#177606098 latest stuck		2325 -o- cfa77e77 Merge branch 'patch-4' into 'm...	✓ ! ✓ ✓ ✓ ◔ ●		
running	#177604493 latest stuck		master -o- 3b94d486 Updated Windows steps	✓ ! ✓ ✓ ✓ ◔ ● ●		
canceled	#177590399		2325 -o- 2046f438 Merge branch 'patch-4' into 'm...	✓ ! ✓ ✓ ✓ ⊘ !	00:31:28 1 day ago	
canceled	#177535883		2325 -o- 2046f438 Merge branch 'patch-4' into 'm...	✓ ! ✓ ✓ ✓ ⊘ !	00:40:10 1 day ago	
passed	#177412421 latest		26632-gitla... -o- 9a6505be Add helper binary	✓	00:02:28 1 day ago	
passed	#177408271		26632-gitla... -o- 025f9495 Add helper binary	✓	00:02:31 1 day ago	

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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)

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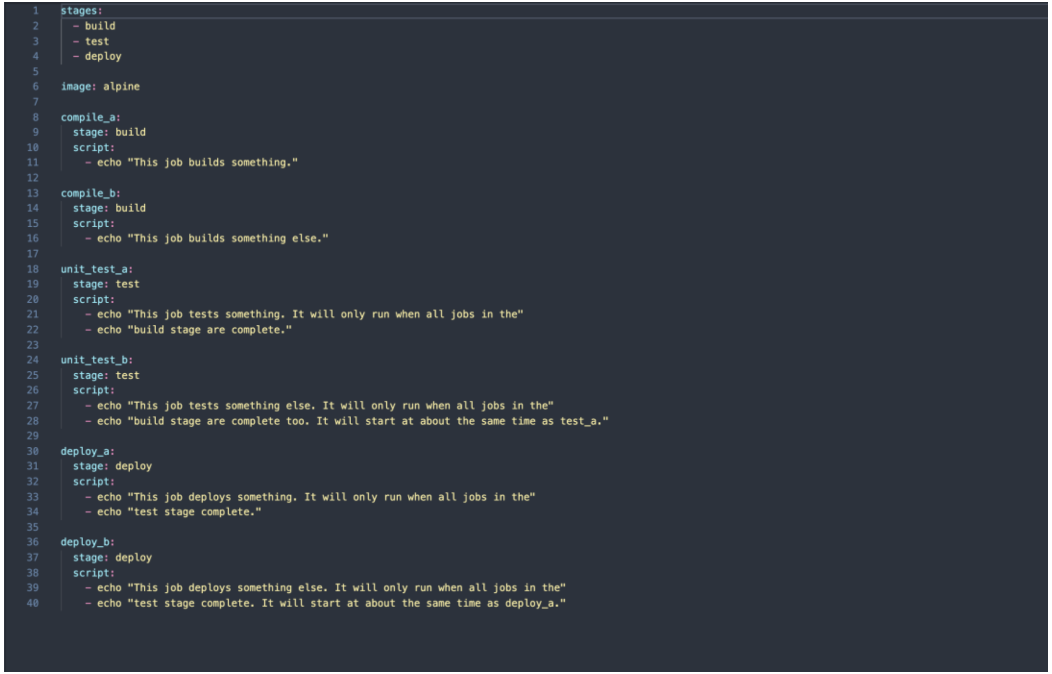
Runners

- 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

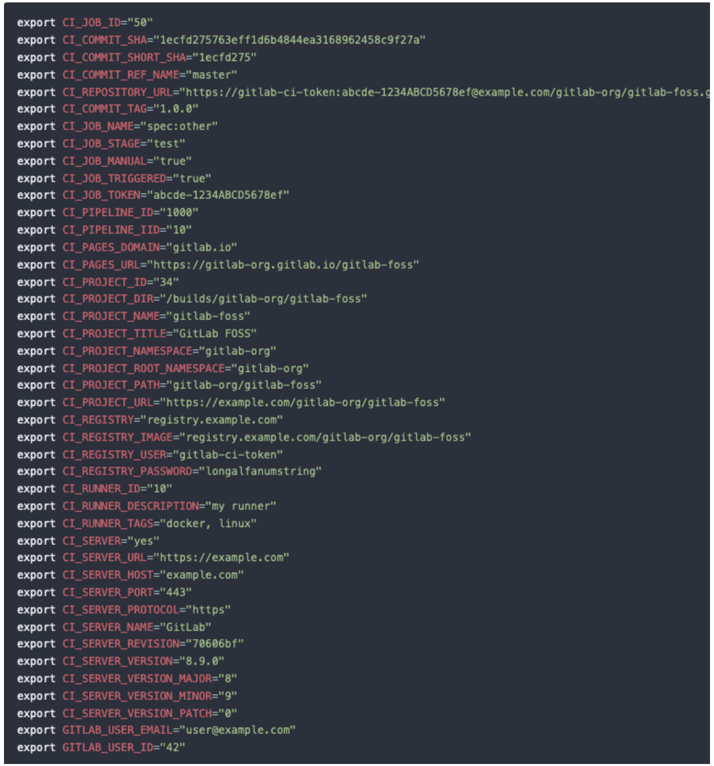
Schedules

- 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

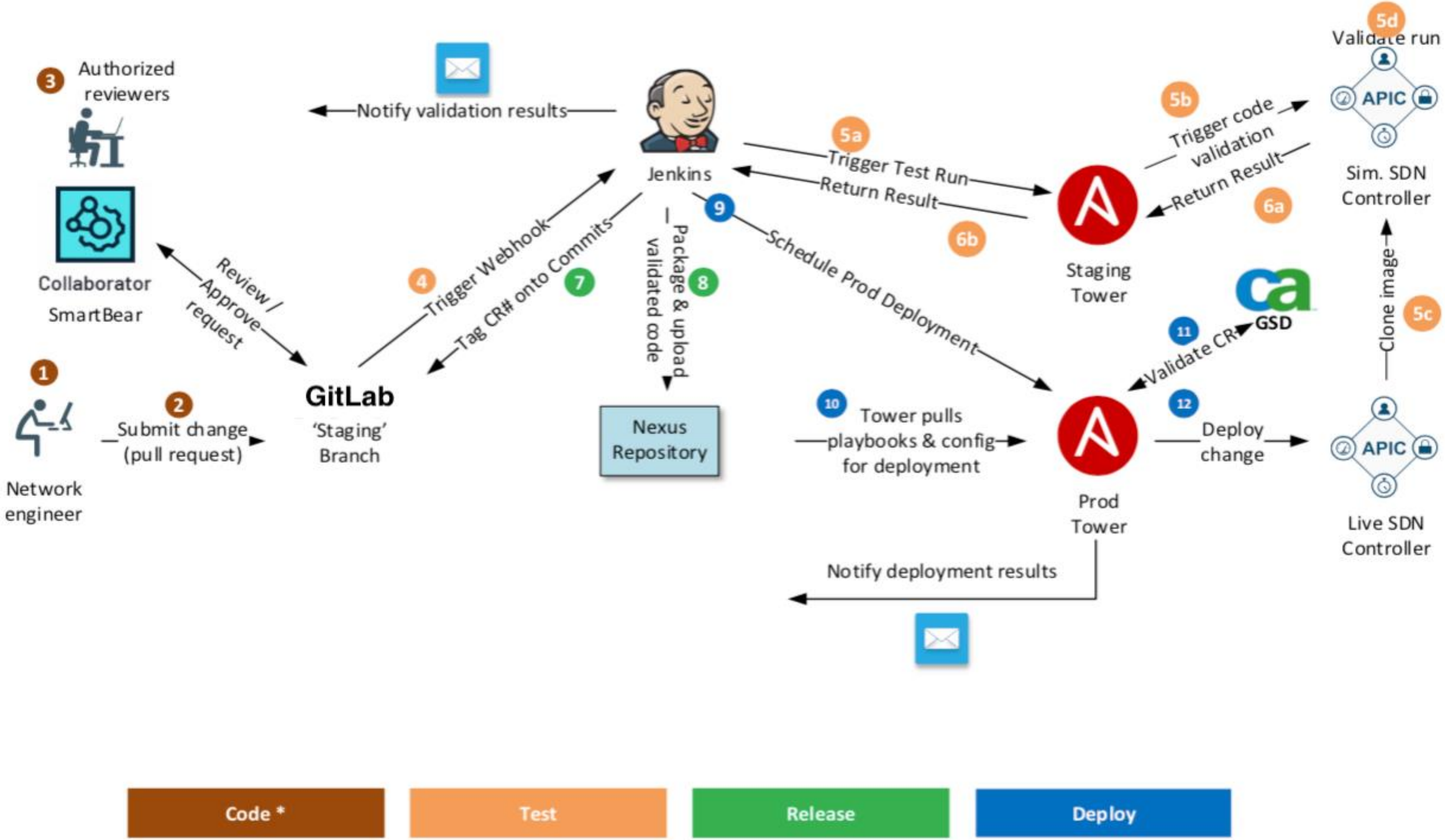
Environment Variables

- 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


3 Authorized reviewers
Collaborator SmartBear
Notify validation results
Jenkins
5a Trigger Test Run
6b Return Result
5b Trigger code validation
6a Return Result
5d Validate run
APIC
Sim. SDN Controller
Staging Tower
Review / Approve request
4 Trigger Webhook
7 Tag CR# onto Commits
8 Package & upload validated code
9 Schedule Prod Deployment
5c Clone image
ca GSD
11 Validate CR
1 Network engineer
2 Submit change (pull request)
GitLab 'Staging' Branch
Nexus Repository
10 Tower pulls playbooks & config for deployment
Prod Tower
12 Deploy change
APIC
Live SDN Controller
Notify deployment results
Code *
Test
Release
Deploy

Demo

Test environment

Dev Workstation

CentOS

Hosting Server

CML 2.0.0-b13

Network Simulation

Infrastructure as Code

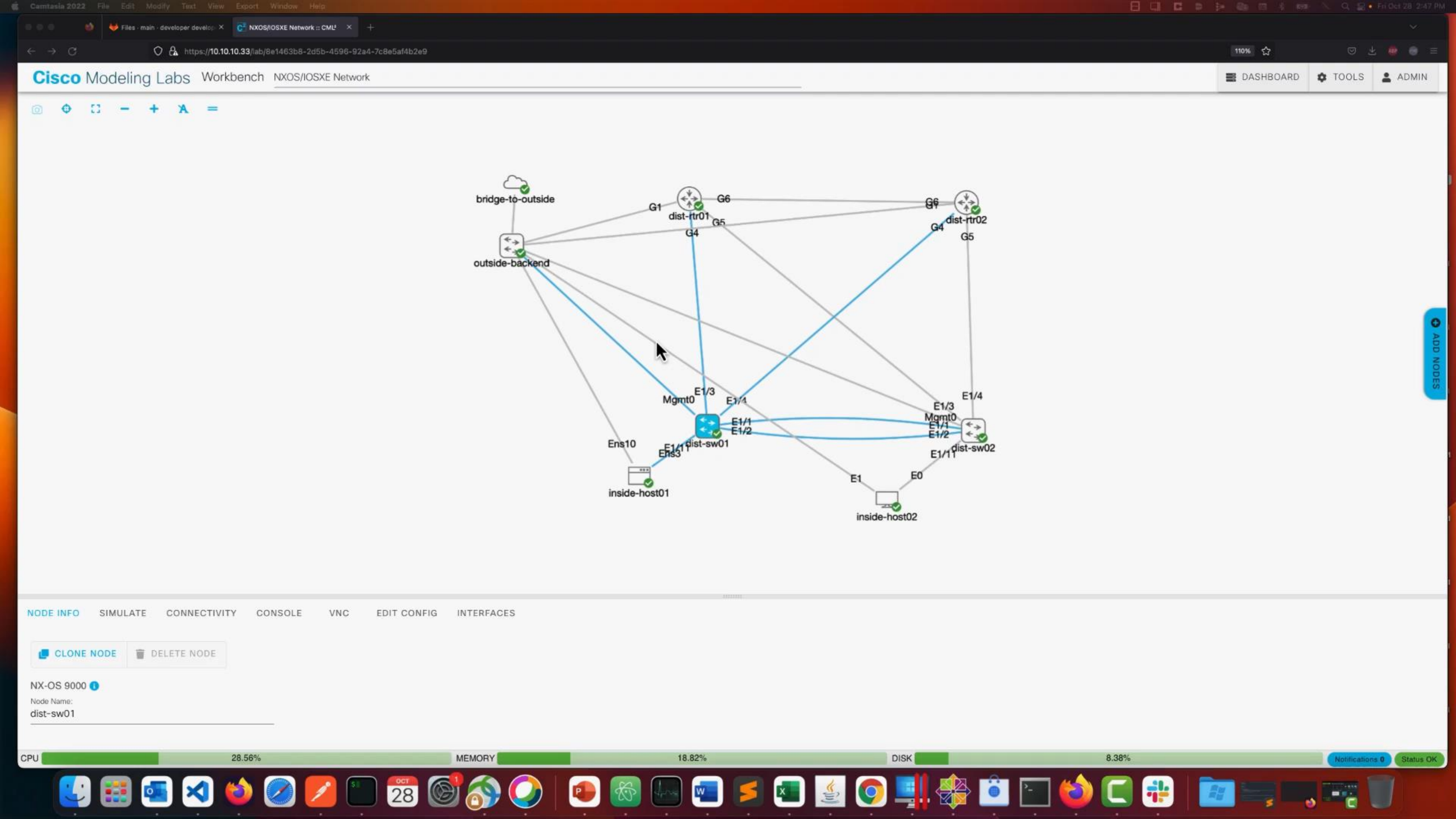
GitLab

Source Control

pyATS

print(network.profile)

Testing Framework



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

NXOS/IOSXE Network

NX-OS 9000

Node Name:
dist-sw01

CPU 28.56%

MEMORY 18.82%

DISK 8.38%

Resources

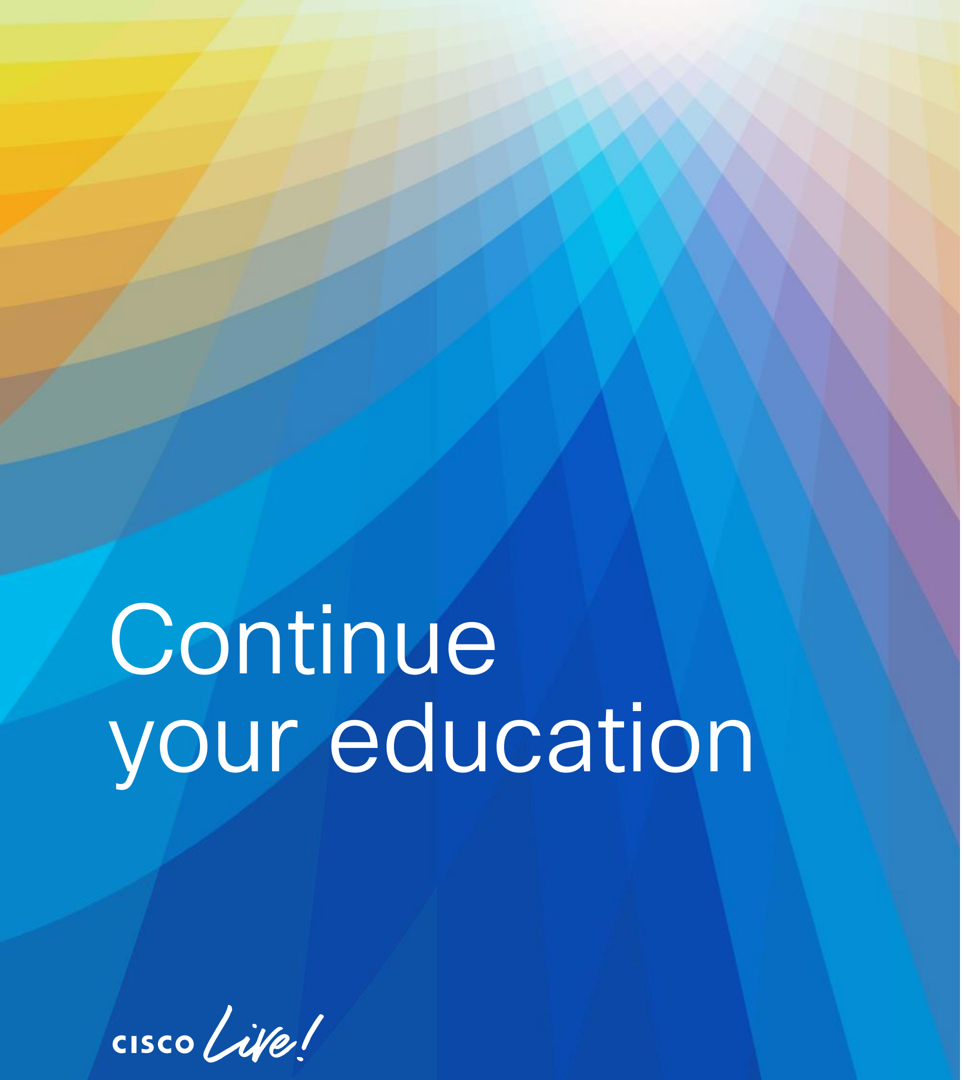
- https://blogs.cisco.com/author/adrianiliesiu
- https://github.com/CiscoDevNet
- https://www.twitch.com/CiscoDevNet

Fill out your session surveys!

Attendees who fill out a minimum of four session surveys and the overall event survey will get **Cisco Live-branded socks** (while supplies last)!

Attendees will also earn 100 points in the **Cisco Live Challenge** for every survey completed.

These points help you get on the leaderboard and increase your chances of winning daily and grand prizes



Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

The bridge to possible

Thank you

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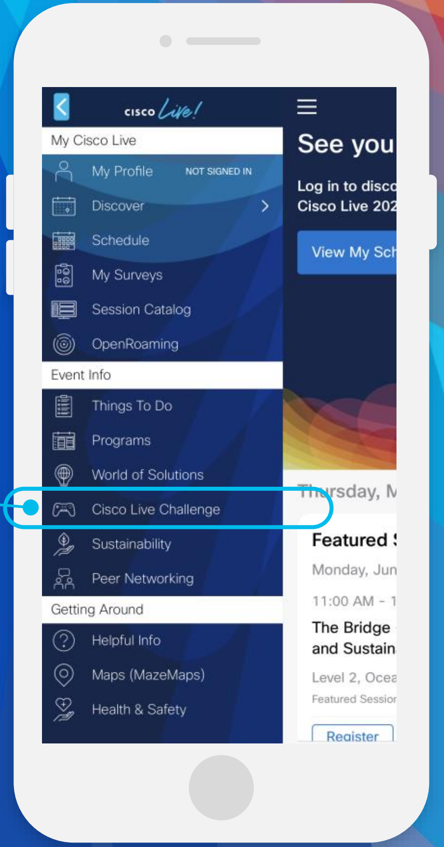
Cisco Live **Challenge**

Gamify your Cisco Live experience!

Get points for attending this session!

How:

1. Open the Cisco Events App.
2. Click on 'Cisco Live Challenge' in the side menu.
3. Click on View Your Badges at the top.
4. Click the + at the bottom of the screen and scan the QR code:



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