LIP COMPUTING INFRASTRUCTURE AND SERVICES

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LIP COMPUTING

EuroHPC Joint Undertaking

fct

LIP

Outline

Introduction:

- Computing Group
- CNCA / INCD

LIP IT infrastructure

- LIP Computing farm
- Tier 2
- Ohers: Cloud

LIP Computing support services

- Challenges using the infrastructure and managing the projects
- Gitlab instance from CNCA/INCD
  - Platform for project management and software development
  - Simplify the access to the infrastructure
  - Future work

Future LIP and CNCA Computing support services

LIP. COMPUTING

LIP Computing Group

The computing infrastructure is developed, maintained and operated by the:

- Distributed Computing and Digital Infrastructures group
- The group provides IT services to LIP and also to external users via CNCA
- Most of the team members also participate in EU innovation projects

CNCA (ex INCD)

- CNCA - Centro Nacional de Computação Avançada
  - No profit private company that originated from a merge of INCD, Deucalion and some FCCN services (data, housing)
  - New statuses and currently accepting new members
  - FCT will be an associated member with control with majority of votes
- LIP will continue to be a member
  - The Tiers-2 and other services will operate under the scope of the CNCA
  - No expected major changes on the current services delivered to LIP users

LIP IT INFRASTRUCTURE

@ LIP

Login | Mail | Web | AAI | other

- LIP Storage (NFS)
  HOMES and GROUP
- Group Servers
  (privacy sensitive data)
- Administrative Services
  (secretariat, accounting)
- Desktops, Laptops
- Printers, Multimedia

@ CNCA

Login **Pauli / Curie**	Grid Services **ARC-CE, webdav, XRootD, StoRM, etc**	Other Services **Virtual / Physical**
Computing Farm (Slurm) CNCA + LIP worker nodes		Cloud (Openstack) CNCA
Tier-2 storage (Lustre) CNCA + LIP		Block Storage (Ceph) CNCA
Homes and Group storage (Lustre) LIP		Object Storage (Ceph+MinIO) CNCA
Software File System (CVMFS) CNCA		Containers (Kubernetes) CNCA
Some group machines LIP		

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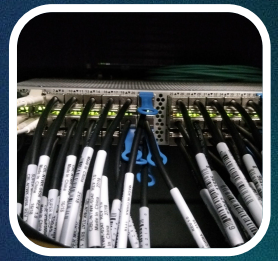
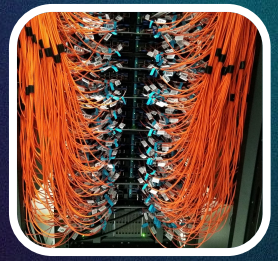


NGC @ LNEC

Sala-Grid Datacenter
New CNCA equipment
LIP specific equipment

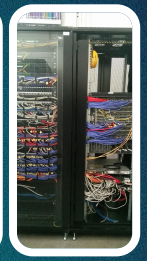
- LIP users
- LIP Tier-2
- CNCA users



U. COIMBRA

Old Datacenter
Physics Dep.
Small LIP facility
Point-of-Presence


LIP @ 3LS

Tape library
Local network + services

U. LISBOA @ REITORIA

Mail, web, VMs
Home directories

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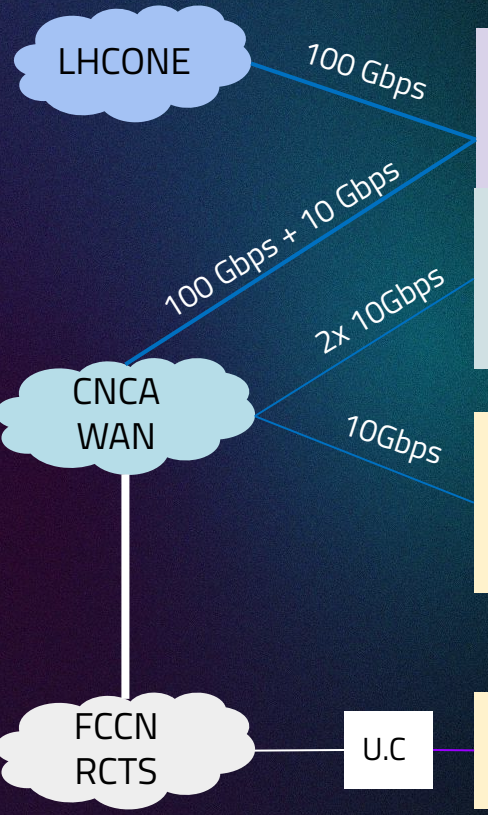
ULisboa datacenter @ Reitoria UL Lisboa
- Web, DNS, LDAP, IdP, Radius, mail, login, homes, group data, nextcloud, Indico, Wikis, web applications, accounting, etc



CNCA datacenter sala-grid @ FCCN Lisbon
- ncg.ingrid.pt / incd.pt
- LIP farm, LIP storage, Tier-2, Tier-3

UTAD datacenter @ Vila Real
- Computing cluster
- Mostly for FCT / CPCA projects
- Opportunistic capacity

LIP Dep Physics UC datacenter @ Coimbra
- CNCA tape libraries
- LIP Coimbra servers should be moved here

LIP Lisbon Datacenter @ 3Is / TTC in Lisbon
- Data backups, backup services, Privacy sensitive data

LIP Coimbra facilities @ Coimbra
- Mail, DNS, LDAP, Radius, VMs, etc

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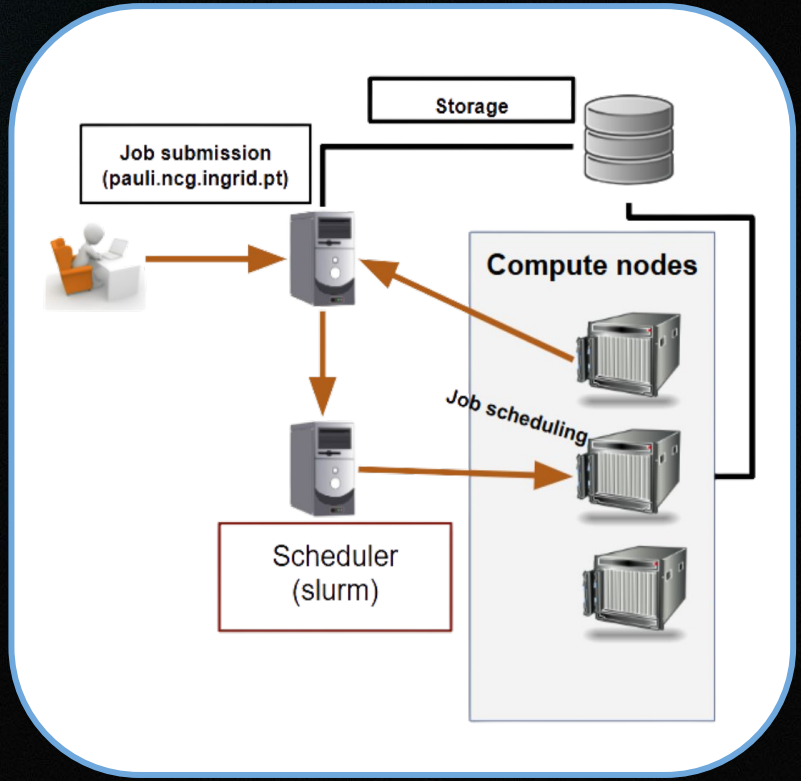
COMPUTING FARM

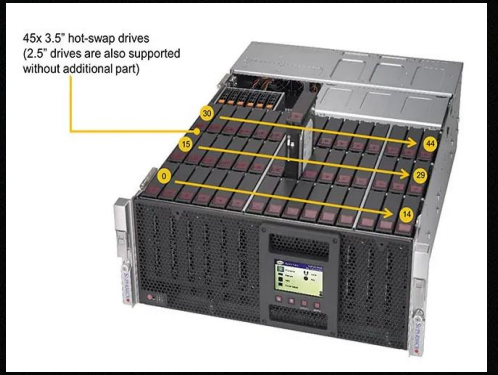
APPLICATIONS RUN IN A COMPUTE NOTE:

- Linux
  - Pauli Centos 7
  - Curie AlmaLinux 9
- You do not have any direct access to the compute nodes
- Access through scheduler (Slurm)
- Storage accessible in both submission and compute nodes



LIP Computing farm at CNCA

Used @ INCD	Hours/year	~ CPU cores
Computing farm T2	14.800.000	2.000
Computing farm LIP	6.936.000	800
Cloud	3.700.000	430
Total	~ 25.500.000	~ 3.000



Upgrade of the LIP farm capacity in 2023

- **ATLAS trigger farm offered equipment and deployed at CNCA**

LIP Storage farm at CNCA

Allocated usable @ INCD	Terabytes (df -H)
T2 + T3 (CNCA used by LIP)	1.514
LSTORE (CNCA used by LIP)	245
SHARE (LIP for group disks)	521
CMS (group acquired)	85
Pheno (group acquired)	254
Titan (group acquired)	176
CERN-cloud (group acquired)	87
HOMES (LIP)	44
Cloud computing (CNCA)	40
Others (CNCA and LIP)	30
Total	~ 3.000

/user LIP **personal home** only accessible to user

- Improved by LIP with server purchased in 2023
- User default quota of 200MB
- Can be increased on request

/shared (read write to GROUP)

- Purchased in 2023 without disks
- Groups can buy disks (still some slots available)

/lstore group acquired equipment servers + disks (read write to GROUP)

/cvmfs software distribution (read only)

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CNCA COMPUTING INFRASTRUCTURE

CNCA Services

Provide **computing** and **data services** for the research community
Computing services:

- Cloud
- HTC
- Online Storage
- Data services
  - Polen data Repository https://repositorio.polen.fccn.pt/

LIP TECHNICAL COORDINATION

CNCA Services

Can LIP access CNCA services?

Yes, CNCA provides computing resources to all academia in Portugal.

How can I have access to CNCA services?

Trough National Computing Calls or best effort access; ALL FCT approved projects can apply to fast track access.

What services can CNCA provide that I don’t already have at LIP?

Extra computing power trough HPC or GPU (Deucalion over 130 A100).

DOCUMENTATION AND HELPDESK

DOCUMENTATION

- LIP WIKI: http://wiki-lip.lip.pt
  - Configure email
  - Eduroam access
  - LIP internal groups documentation
  - LIP computing FARM access and commands

- MORE GENERIC FARM (CNCA): https://wiki.incd.pt

TRAINING

LIP provides 6 training sessions per year under the EuroHPC project

EuroCC Calendar: https://eurocc.fccn.pt/calendariopt/

LIP dedicated slots:

APRIL, SEPTEMBER & OCTOBER
Introduction to HPC - hands-on tutorial
Advanced Job Submission in HPC – hands-on tutorial
Using Containers in HPC - hands-on tutorial
Advanced Use of Containers in HPC - hands-on tutorial

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Gitlab:
explore collaboration enhancements

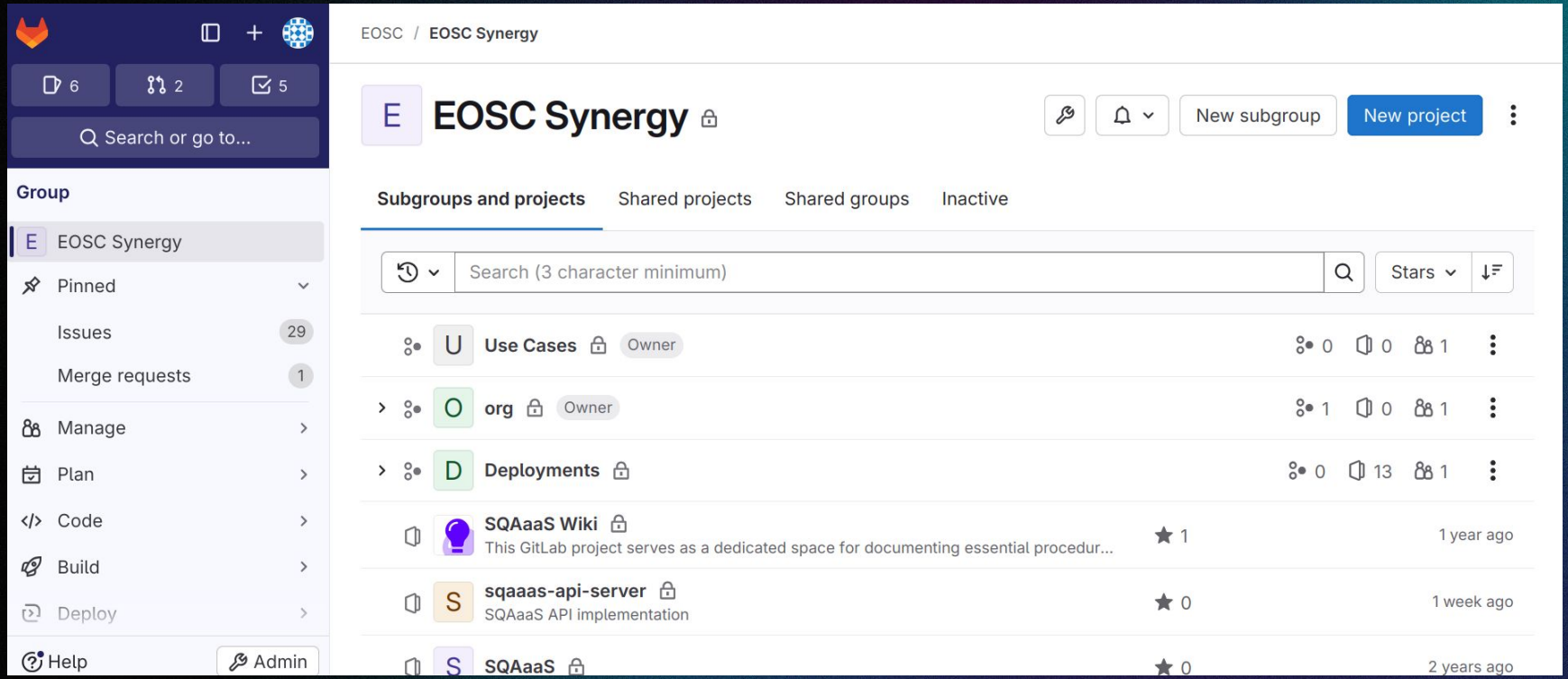
Common issues:

- Project contributions spread along multiple user workspaces
  - PCs
  - Private storage spaces (like CernBox or user home dir)
- Difficulty to review or recover previous work
  - Backups spread
  - Contact the authors
  - Know who are responsible for the contributions

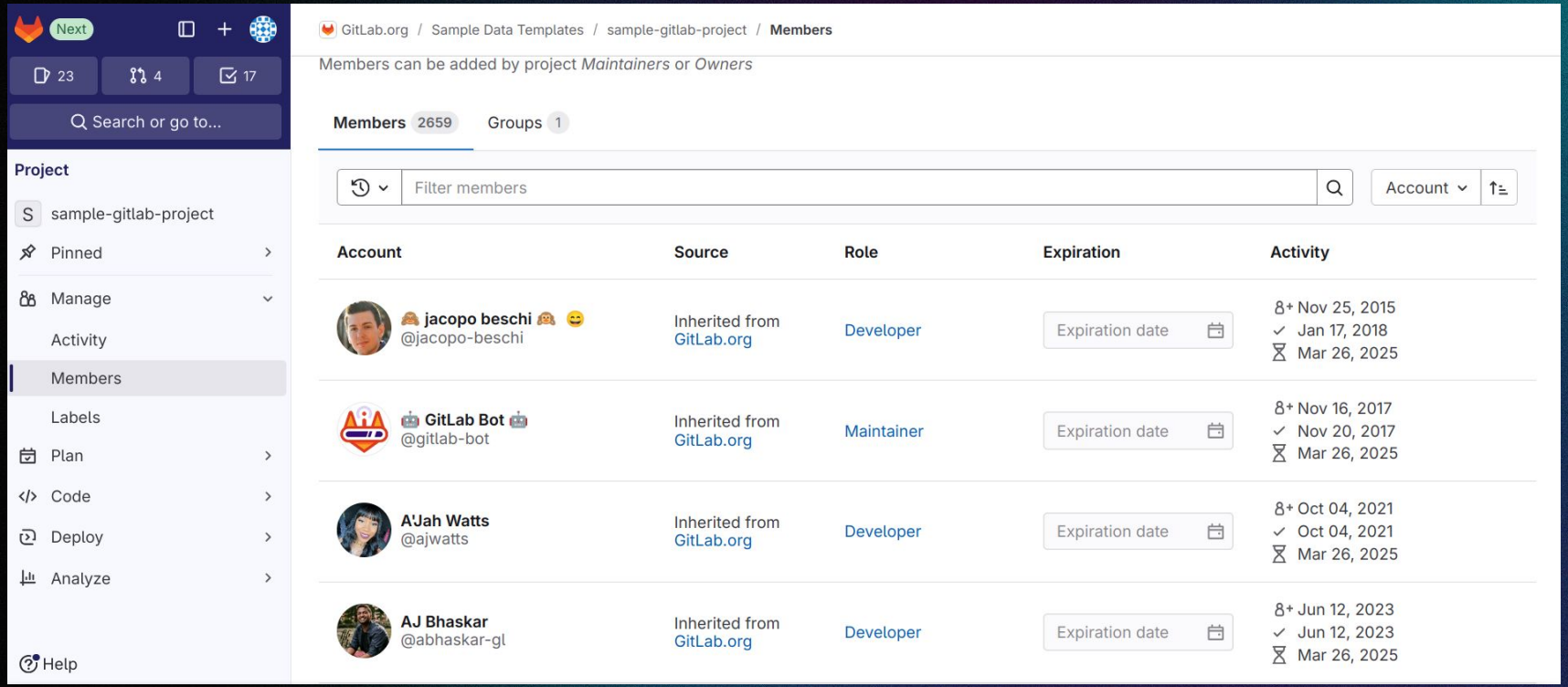
Move on to a new approach:

- Share the work with your team
  - Work left on personal computer or private storages
  - Access anywhere
  - Control the access and avoid leaks
- Keep teams together
  - Share knowledge
  - Get reviews more often
  - Do smaller steps with feedback

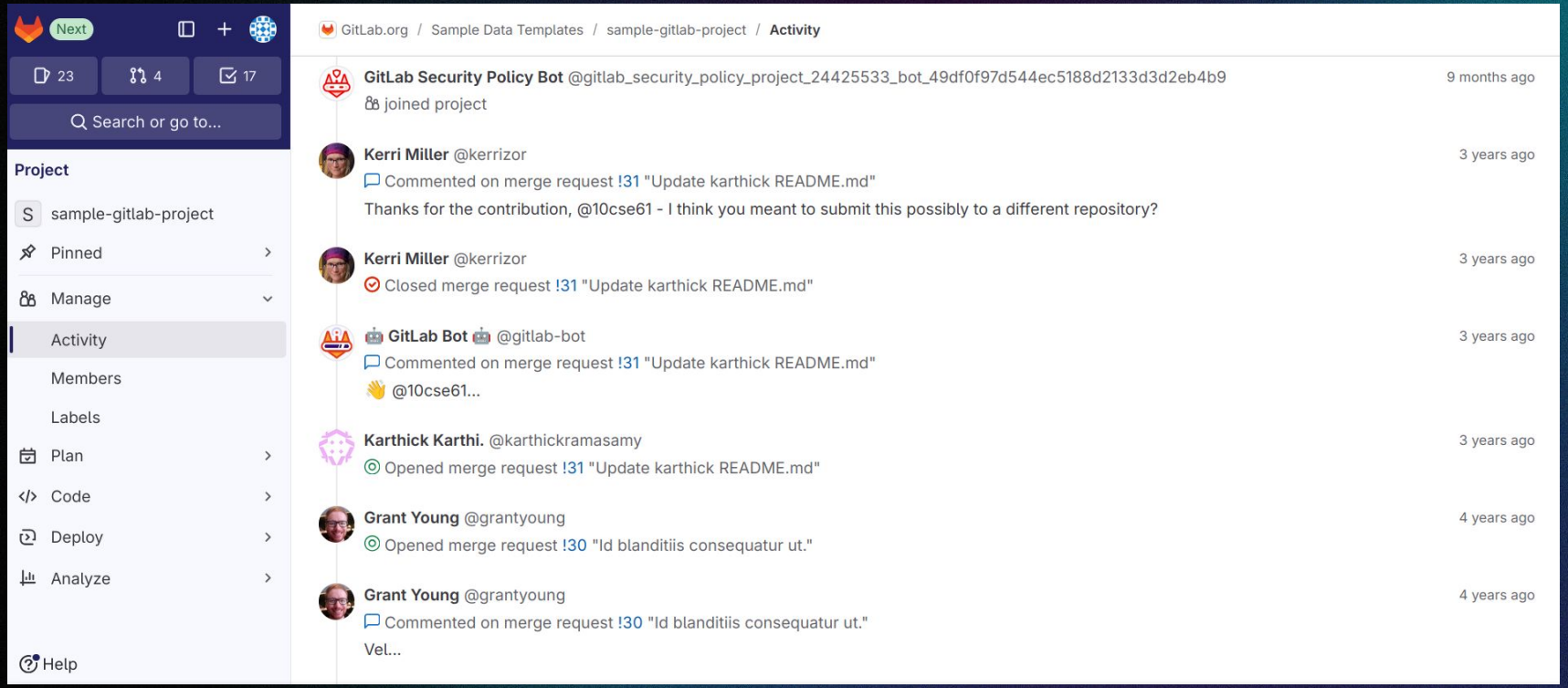
Gitlab groups and projects



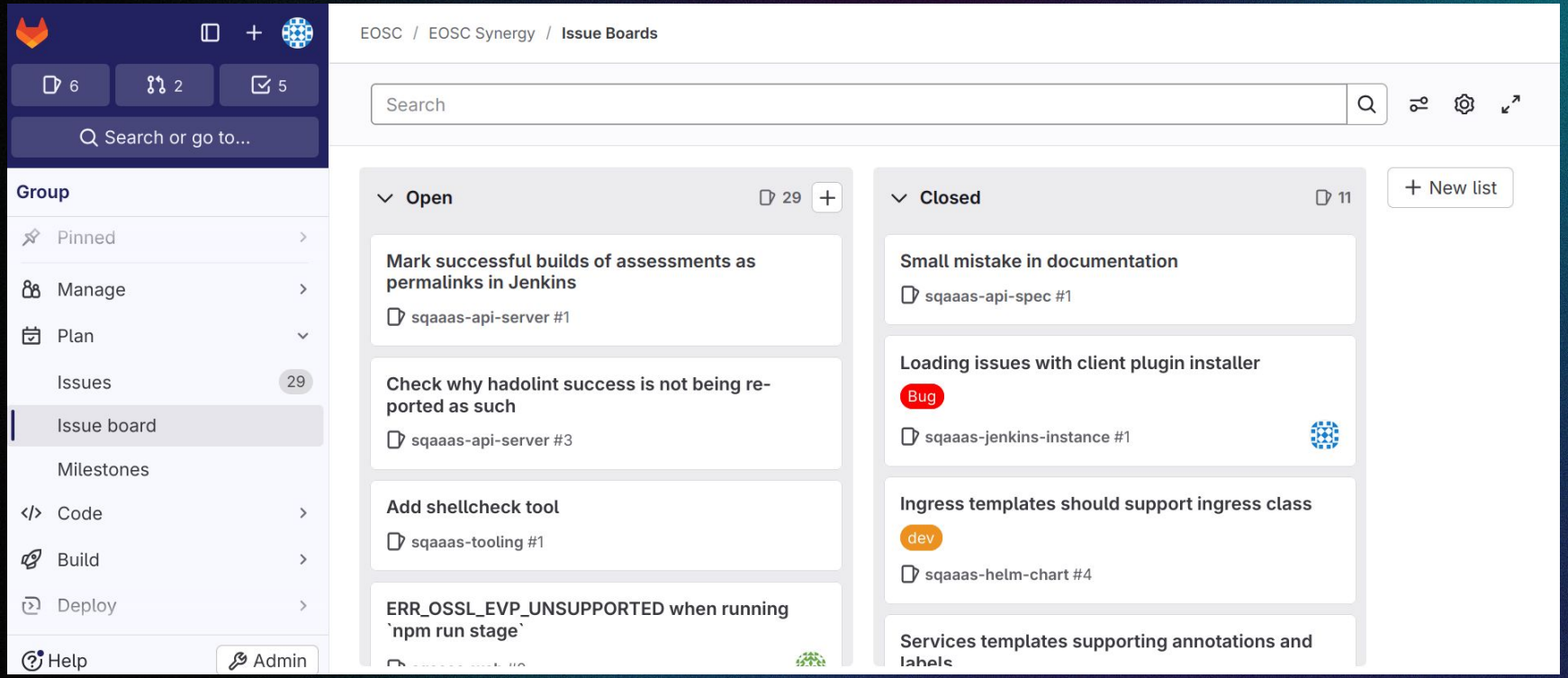
Manage members and roles



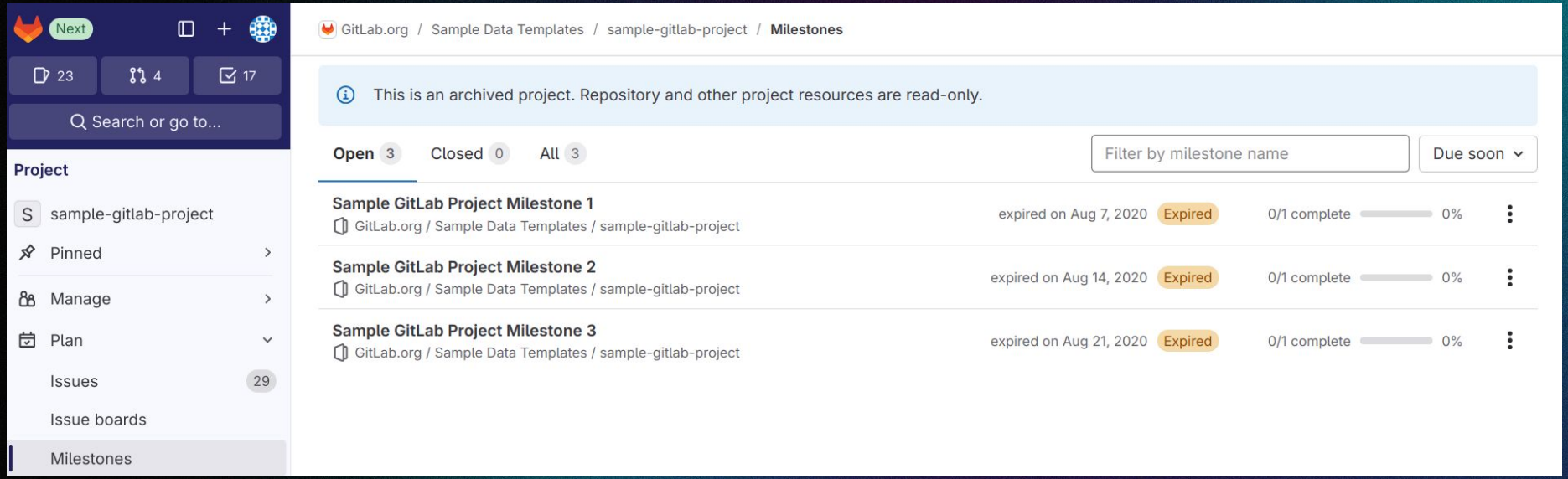
Activity overview



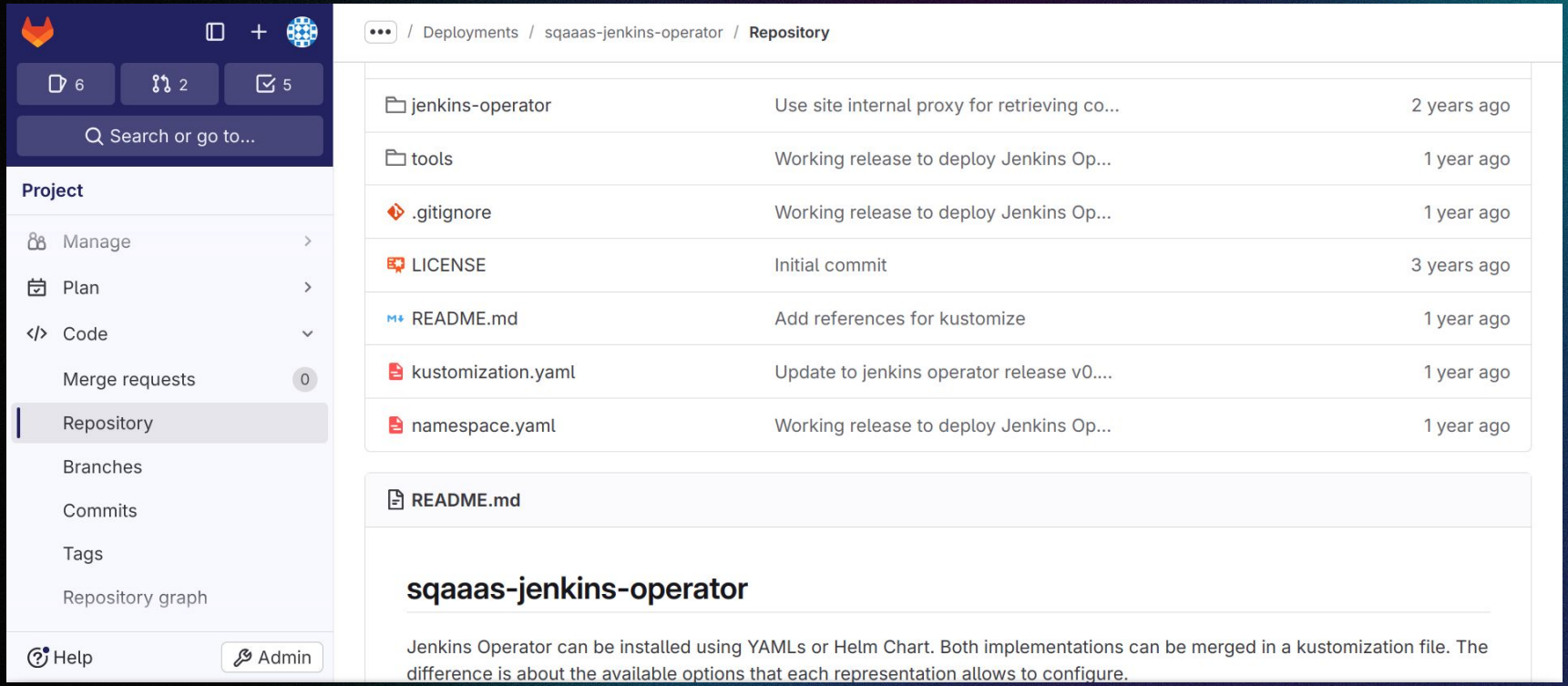
Manage issues for all projects in the group



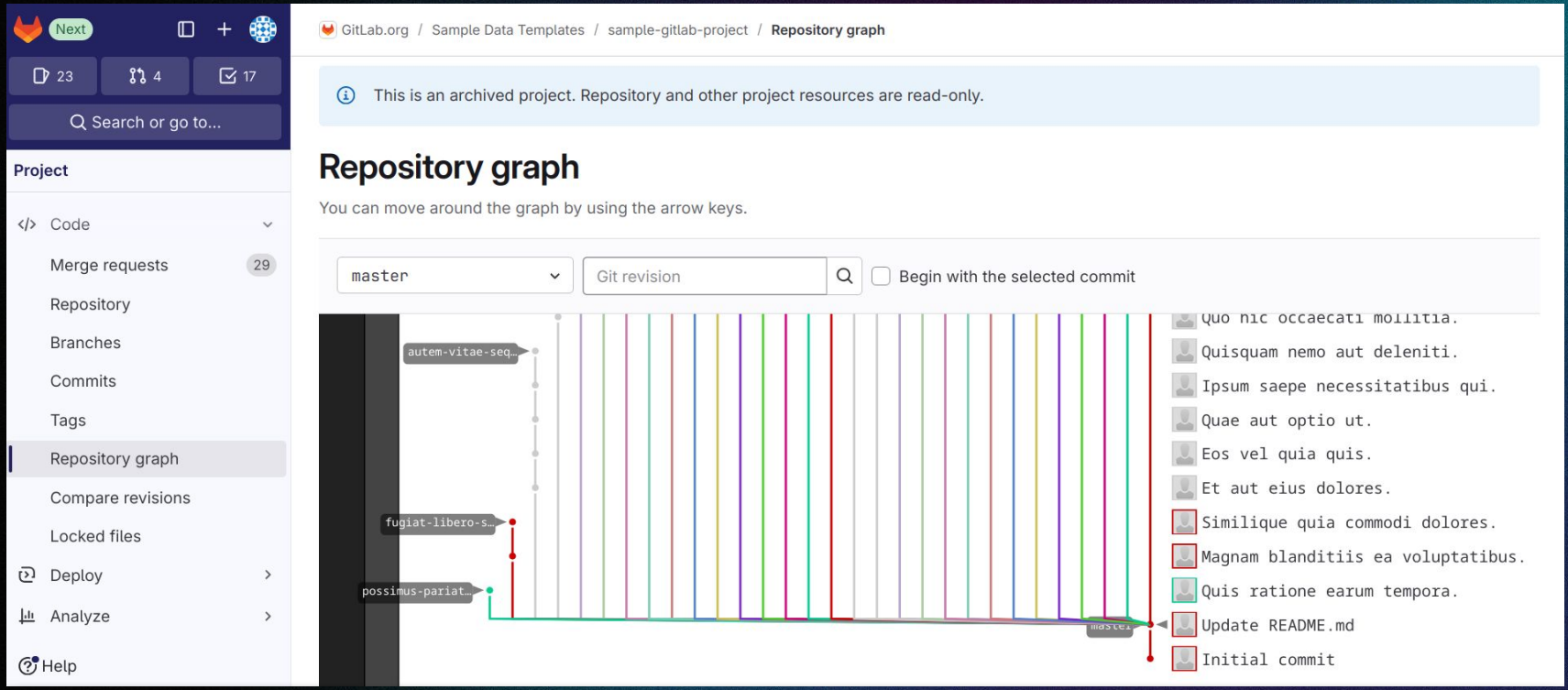
Define milestones and set deadlines



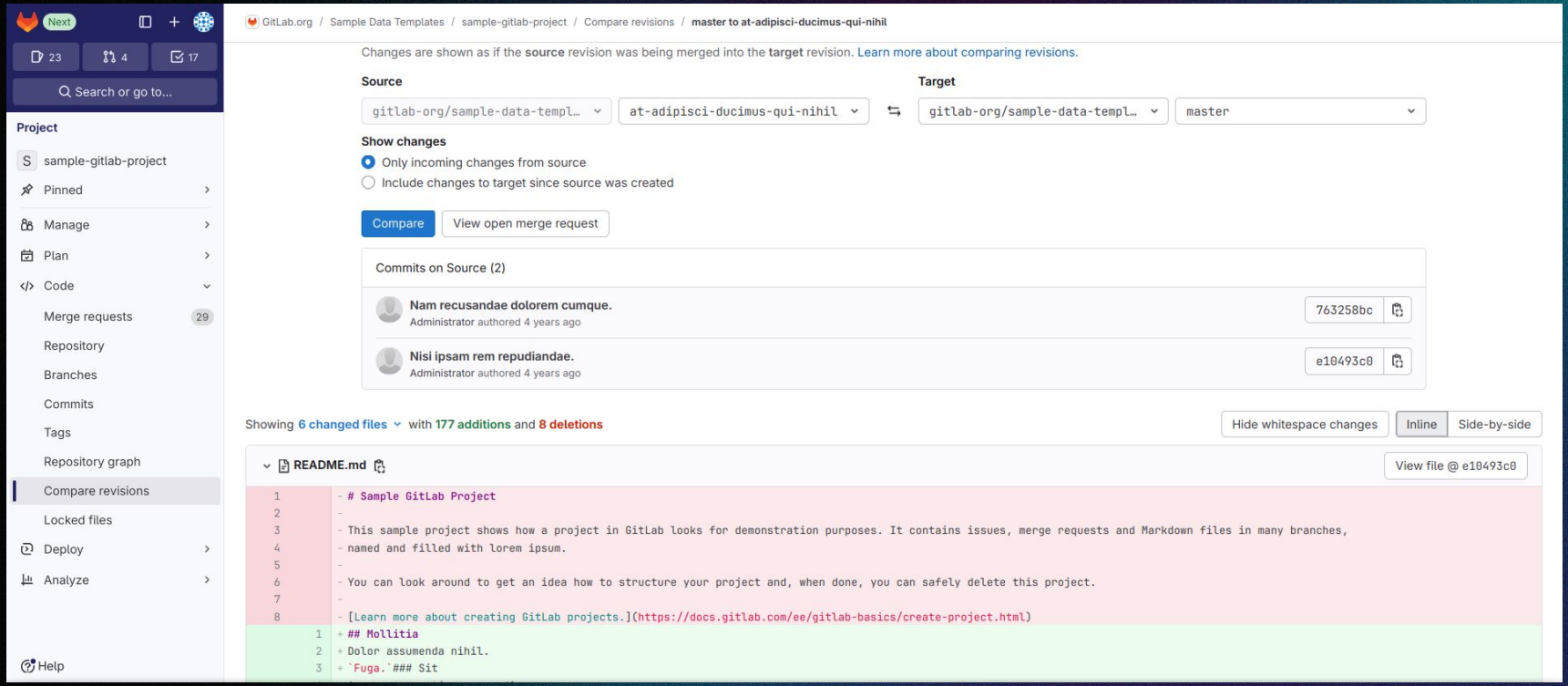
Store code and data along documentation



Review the contributions history



Compare your work revisions



Gitlab:
maximize productivity

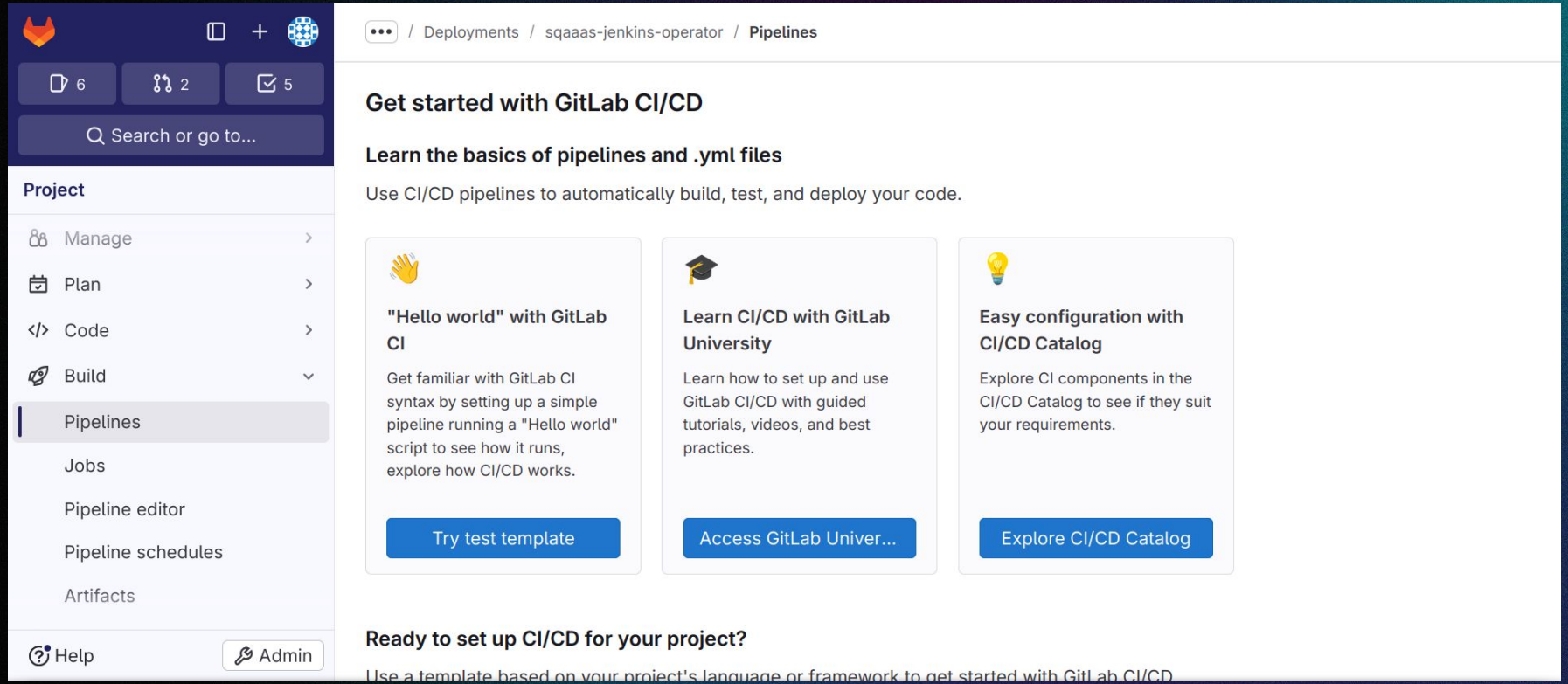
Common issues:

- Infrastructure learning curve
  - Learn how to use specific tools to access the computing cluster
  - Understand the procedures for using existing resources
- Data and code issues
  - Get the results along the code release
  - Losing output in the computing workspace
  - Memory leaks
  - Low performance

Adopt new practices:

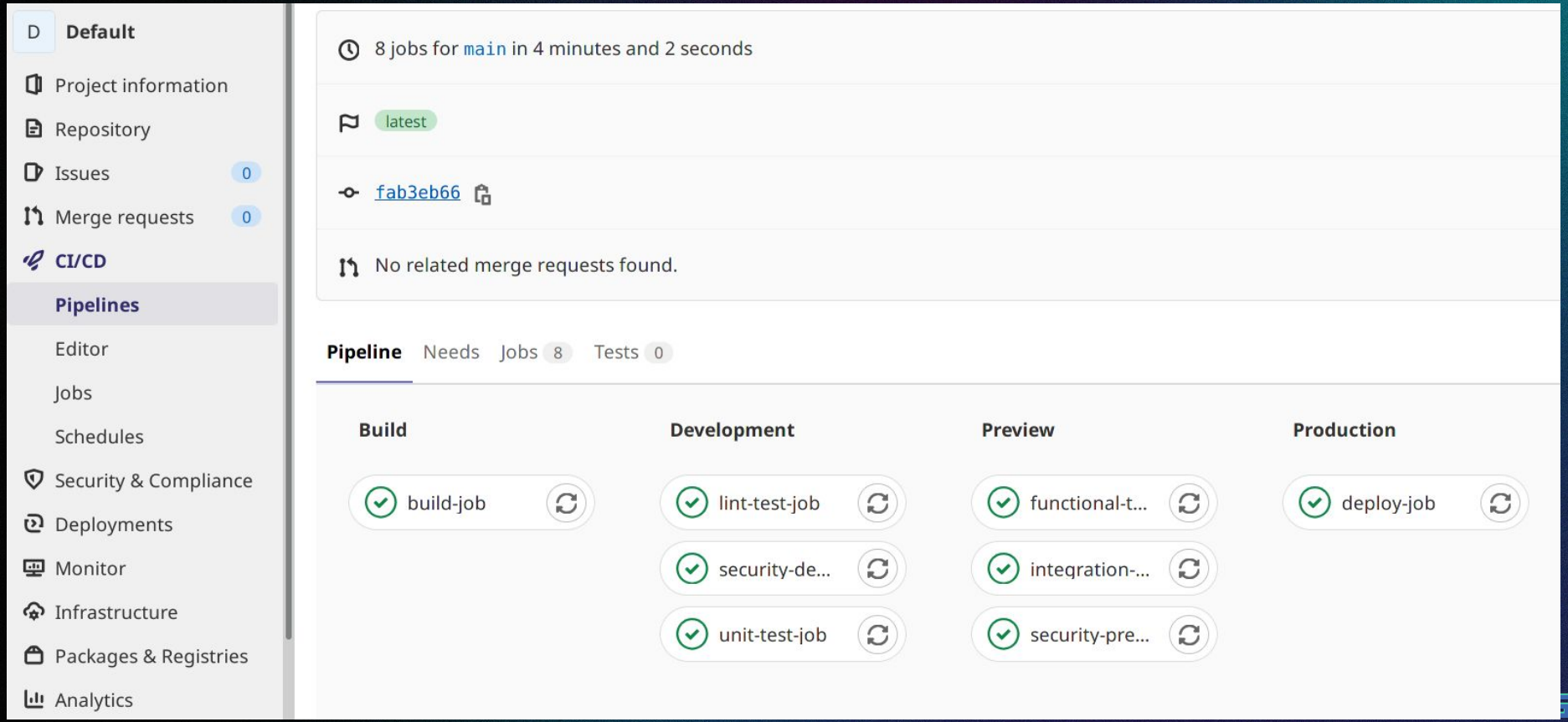
- Create pipelines to run your computations
  - Run your code automatically or manually when there is an update to your project repository
  - Job output directly in the Gitlab interface along your code updates
- Continuous development within your pipelines
  - Check code quality before submitting the computing jobs
  - Only merge the code after results validation

Create pipelines for your computations

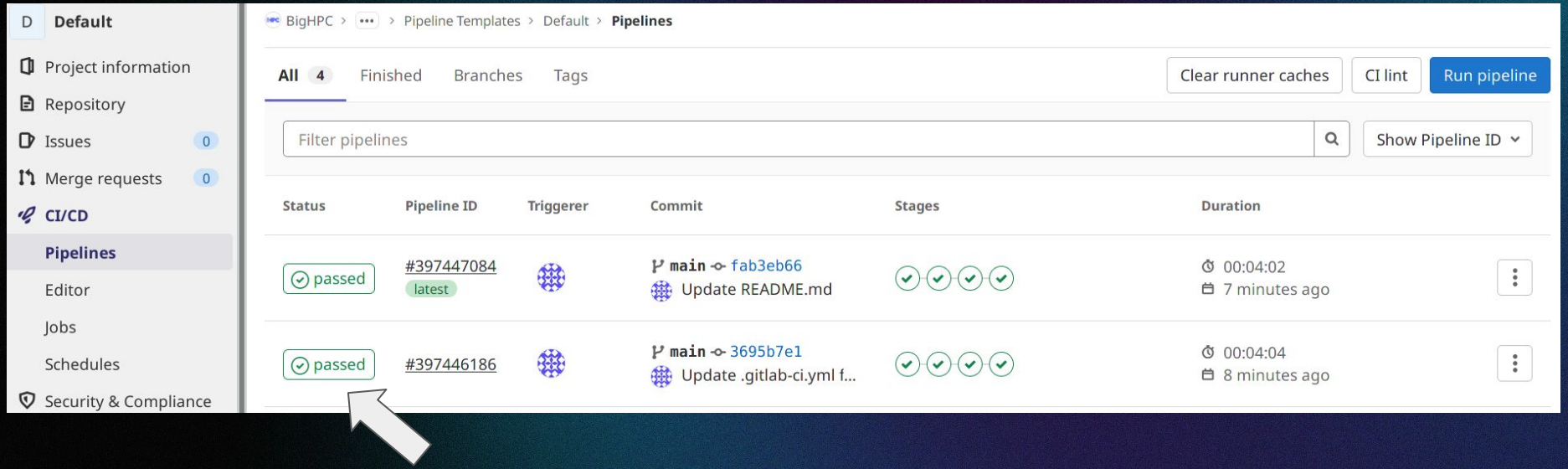


Pipeline composed by stages and jobs

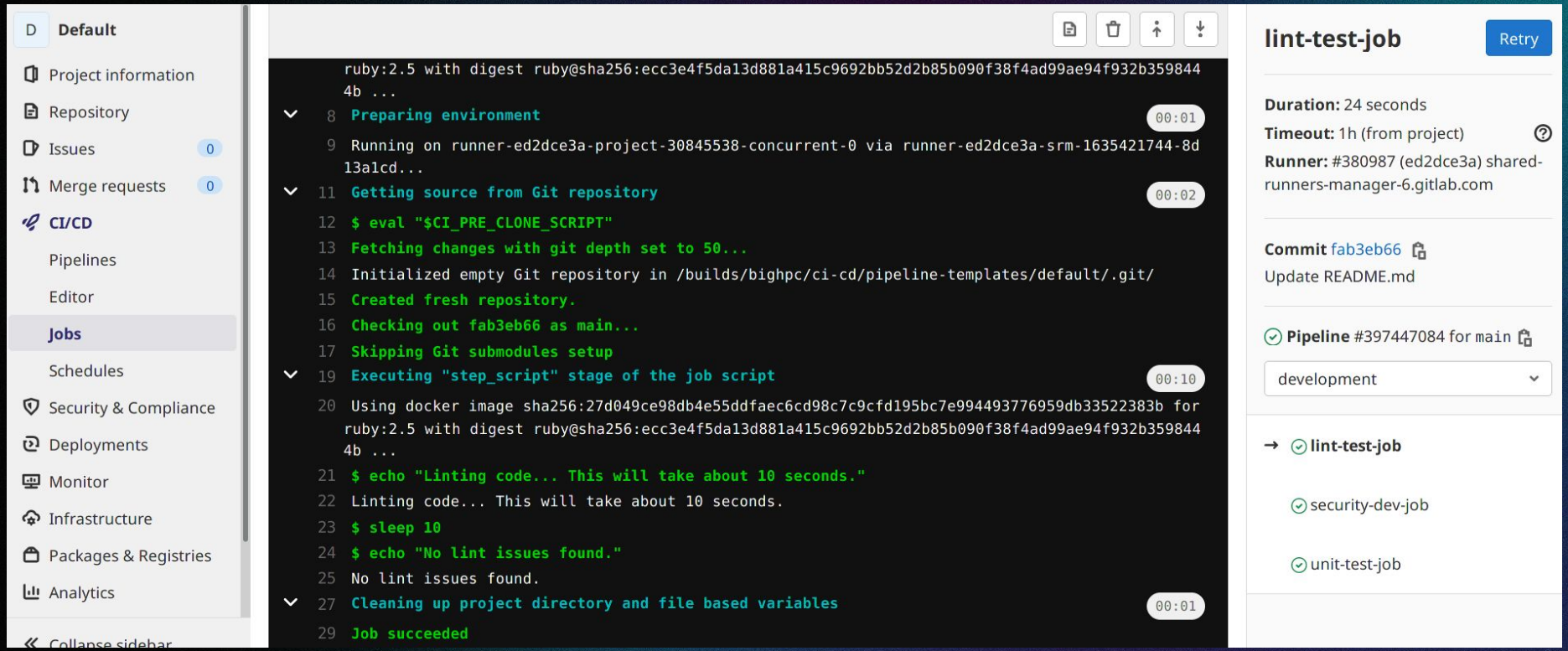
Look into pipeline stages



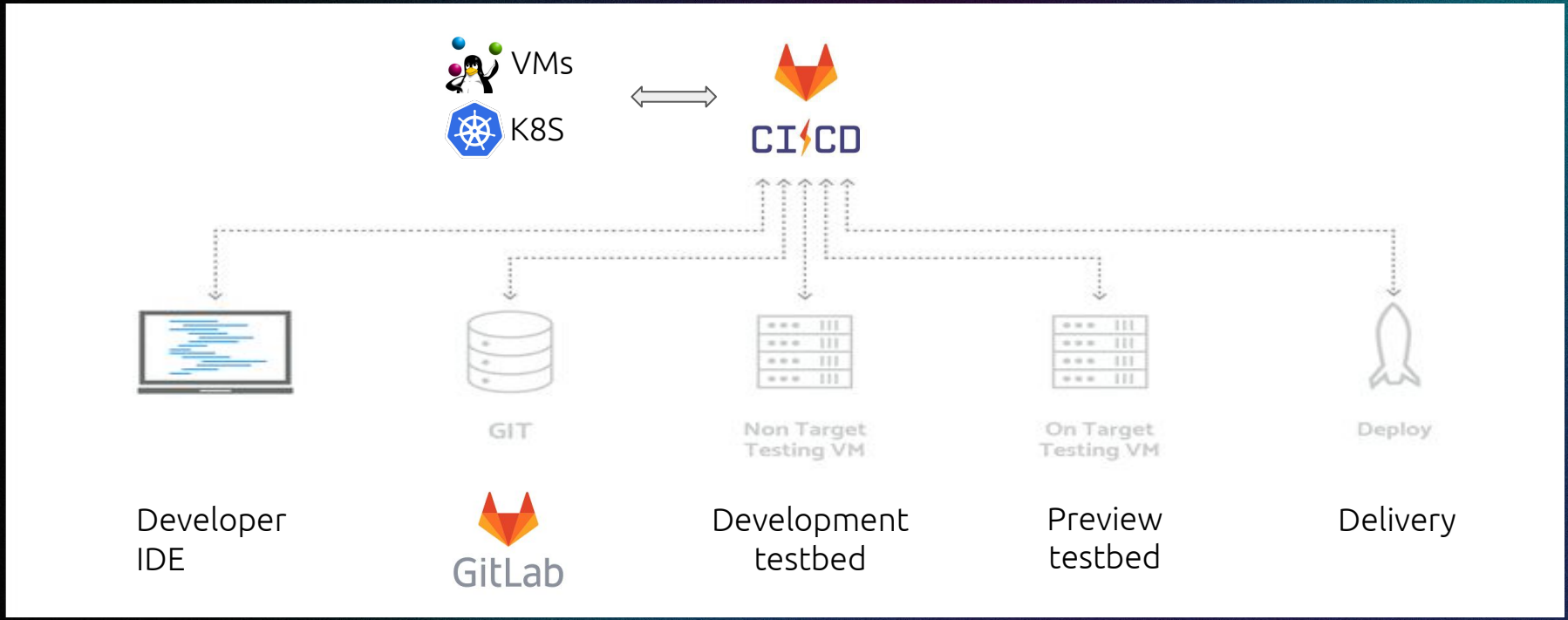
Click over status of pipeline after passing the tests



Job output in the Gitlab interface



Continuous development within your pipelines



Current pilot use cases at LIP:

- Electronics Lab
  - Keep all code, blueprints and data at Gitlab
  - Tasks management
- DGT project
  - All collaborators keep their contributions at Gitlab
  - Continuous development practices adoption
  - Pipelines to check code quality
  - Jobs and deployments automation

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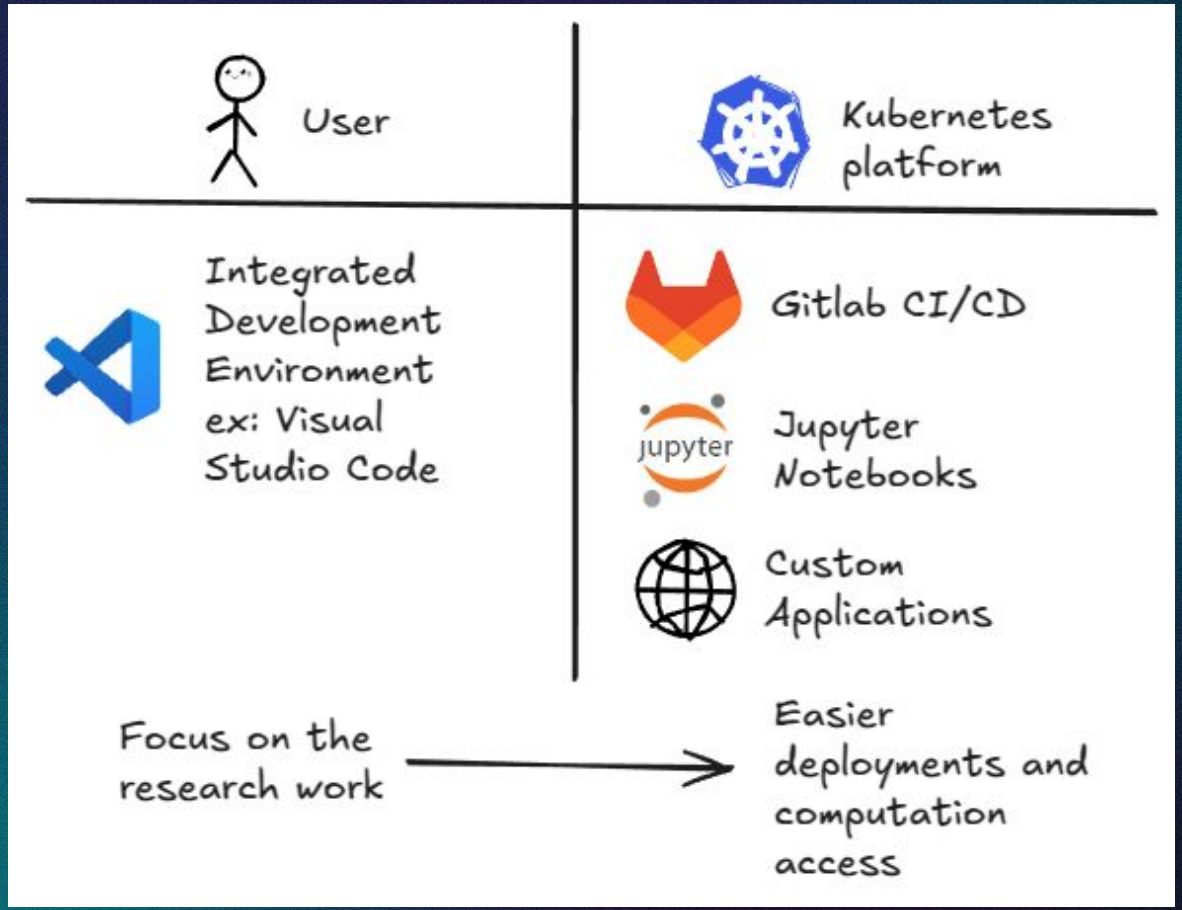
Future CNCA computing services



Kubernetes:

- Industry leading open source container orchestration technology
- Works like a Job scheduler with autoscaling
- More portability with less chance of vendor lock-in

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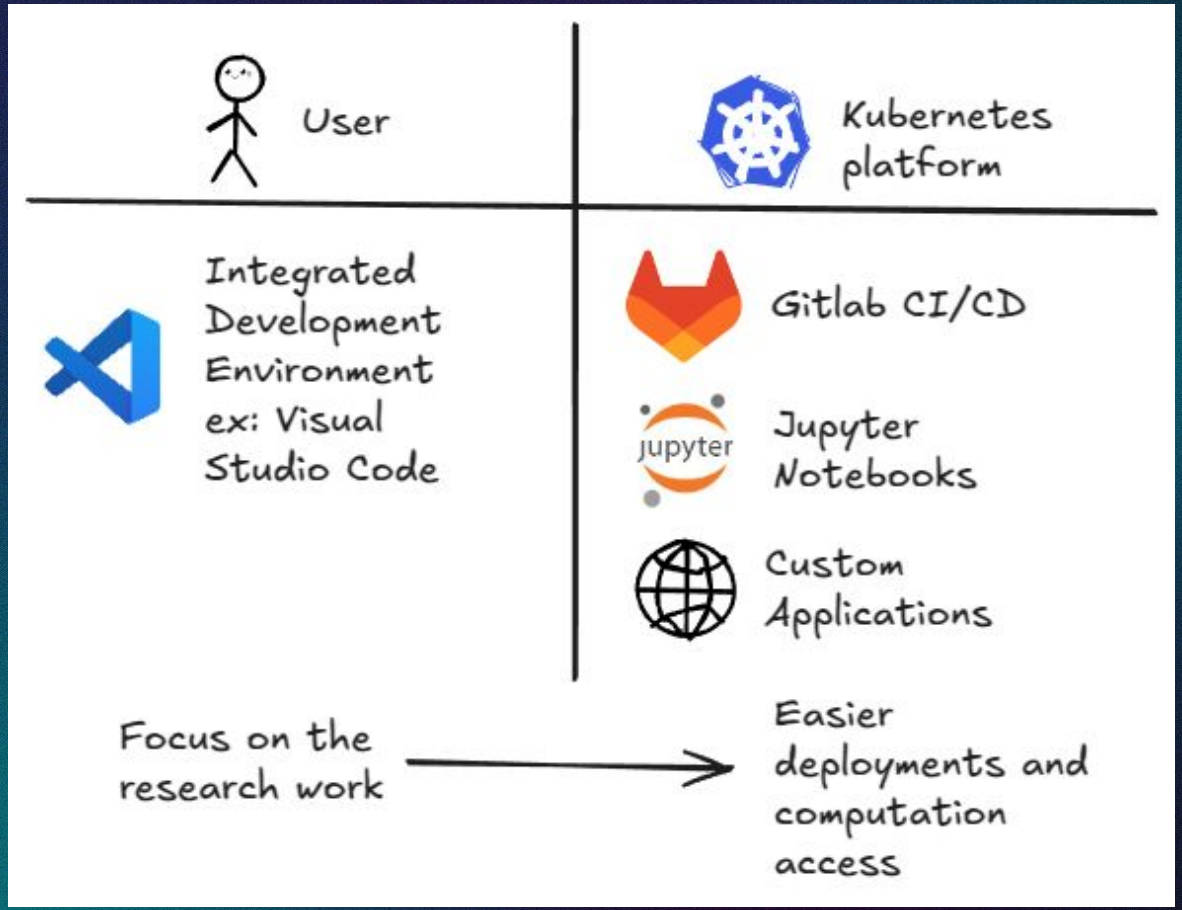

Kubernetes:

- Automation of deployment and scalability
- Increased DevOps efficiency applying methodologies, such as, GitOps
- App stability and availability
- Enhanced flexibility and extensibility to adopt new features and functionalities

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NEXT STEPS

- Gather LIP groups interest to the proposed practices
- Improve work methodologies
- Adopt novel practices
- Place LIP research into a bright future

Let’s work together !

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OBRIGADO

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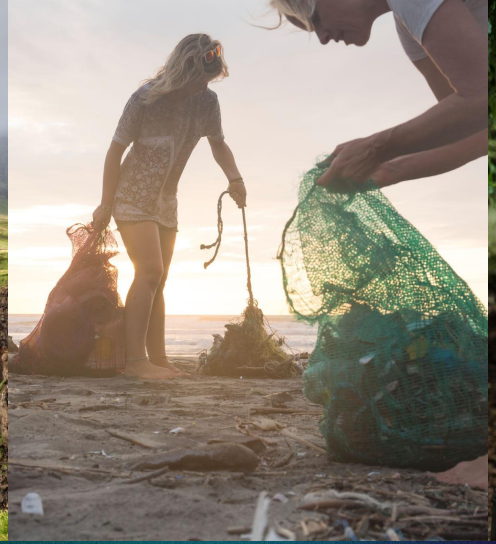

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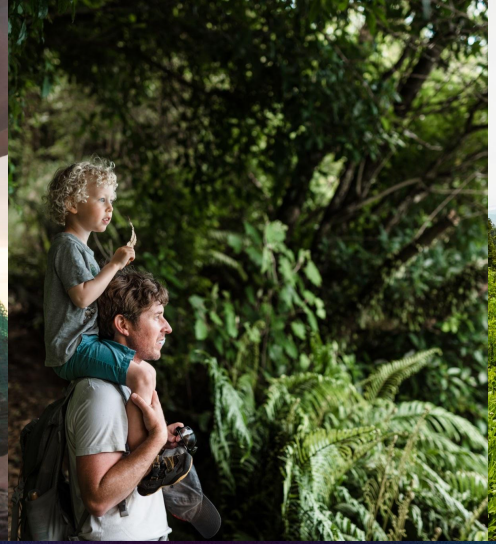

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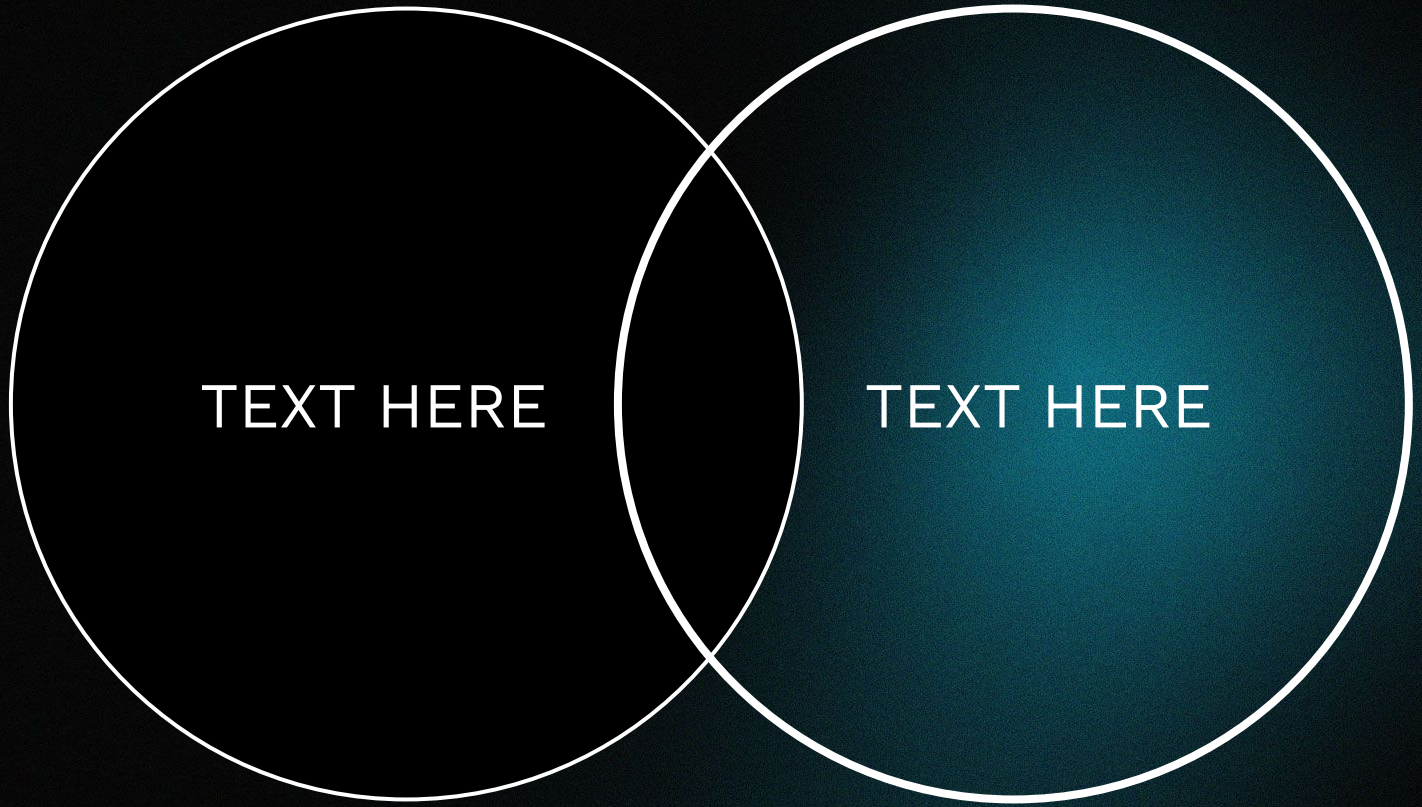

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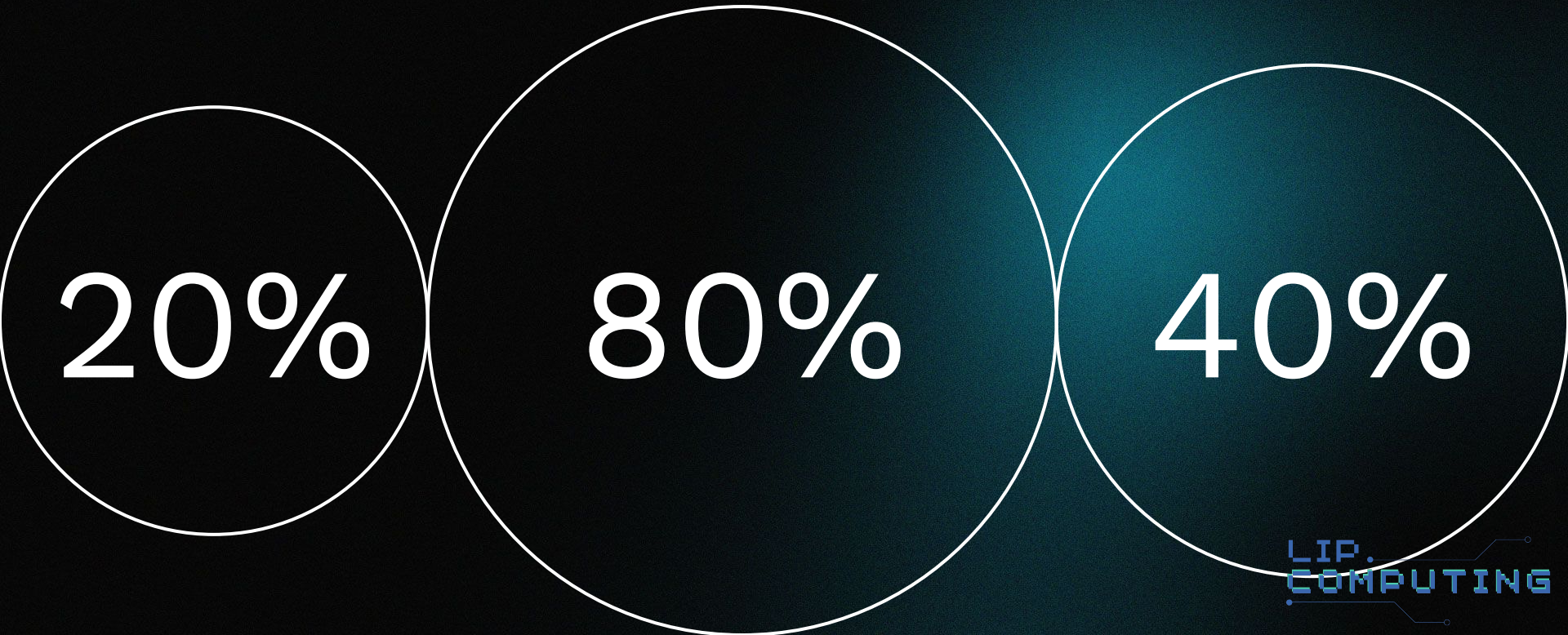

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