



# The GRNET Cloud and the GRNET approach to Hybrid

**CS3 2024**  
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**GRNET**

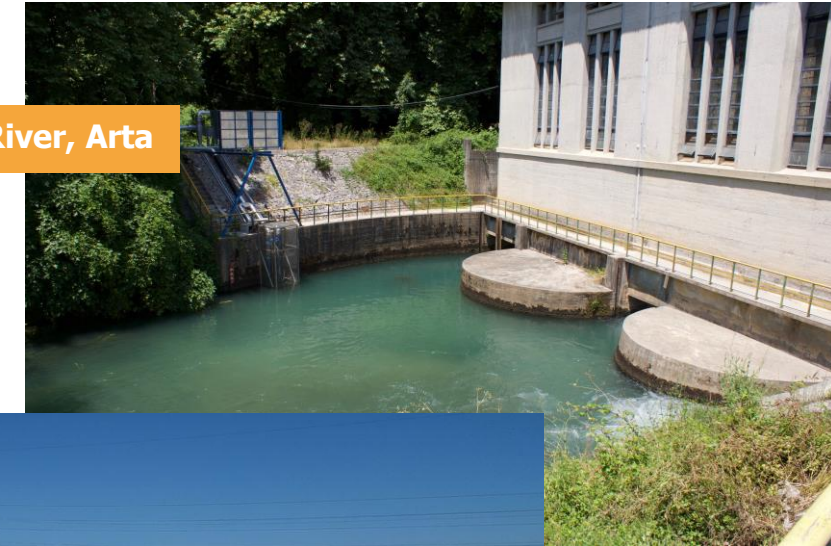
## GRNET in numbers

- > **150** universities, research centers, hospitals, cultural centers
- > **15.000** schools
- Nx**10 Gbps** dark fiber backbone
- Access **1 || 10 Gbps** per institution
- International connectivity through GÉANT network multiple **10 Gbps**
- **535 TFlops** HPC Tier-1 centre, member of PRACE
- **6** DataCenters (EKT, Ypepth-Marousi, Louros Arta, Heraklio Crete), hosting:
  - **134** racks,
  - **2000+** servers,
  - **11.500** Virtual Machines,
  - **3 PB** disk storage,
  - **5 PB** tape



# Computing Infrastructures

- **33.101** ~okeanos cloud users
- **6** data centers in 3 geographic locations
- **2.000** servers
- **11.500** active VMs
- **5.200** datacenter network ports in total
- **10.000** active cloud users
- An optical network of a maximum capacity of **1 Tbps** for the datacenters



Louros River, Arta



Heraklion, Crete



Ministry of Education, Marousi



# National HPC Infrastructure

## ARIS - HPC

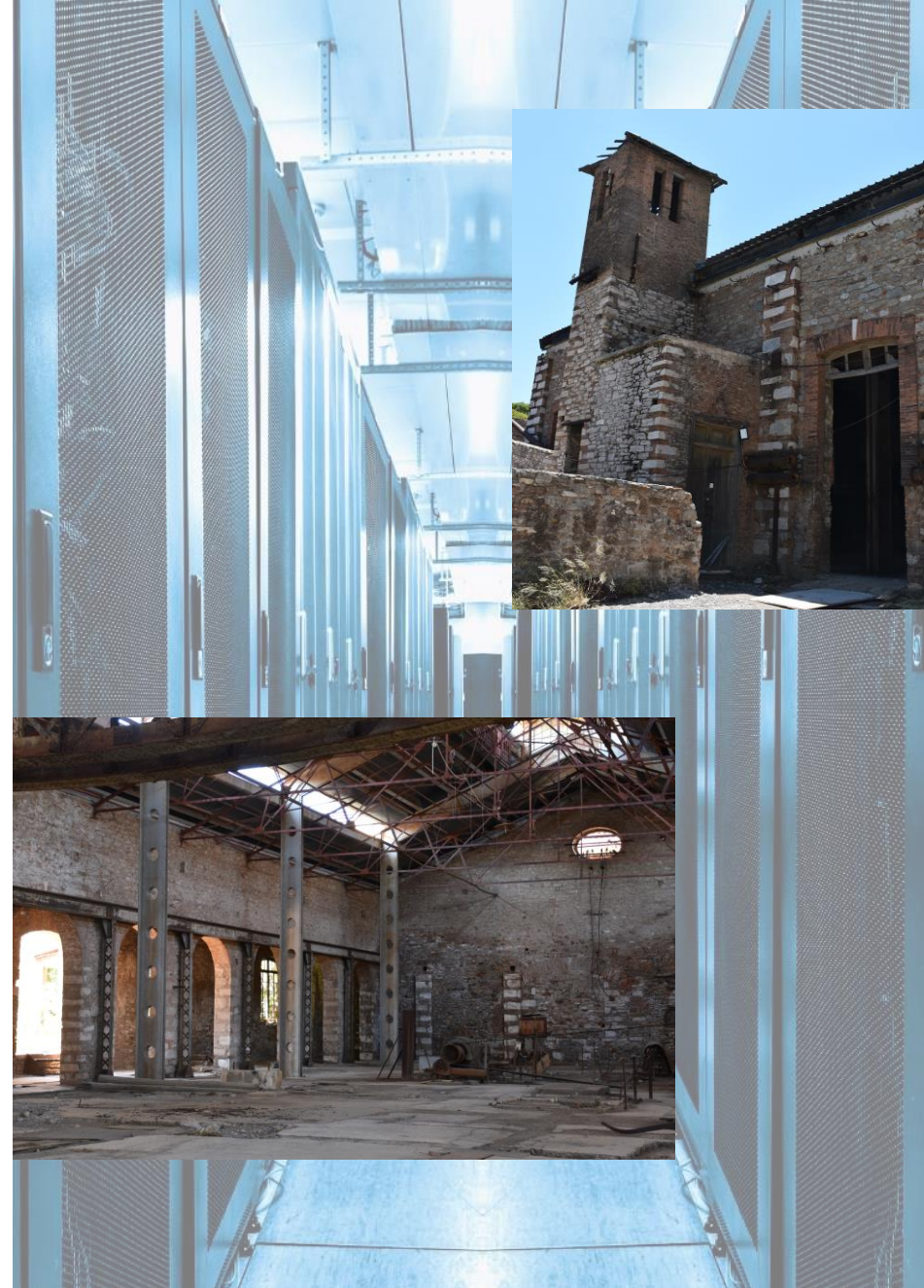
- **5** computational islands, **535** compute nodes
- **2 PB** of storage space
- **535 TFlops** HPC Tier - 1 centre
- **1.100** HPC projects
- **58.200** core Years (510 million core Hours) during the last **7** years
- GRNET is a PRACE Training Center



# New National Supercomputer

## DAEDALUS

- **2024** installation at the Lavrion Technological and Cultural Park
- **33M euros** Build Cost (30% EuroHPC, 70% «Greece 2.0»)
- **30** Petaflops power
- Low energy cost of operation (powered by renewable energy sources and cooled by environmental friendly technology)
- Support of scientific research and innovative SMEs/industry with high computational capacity



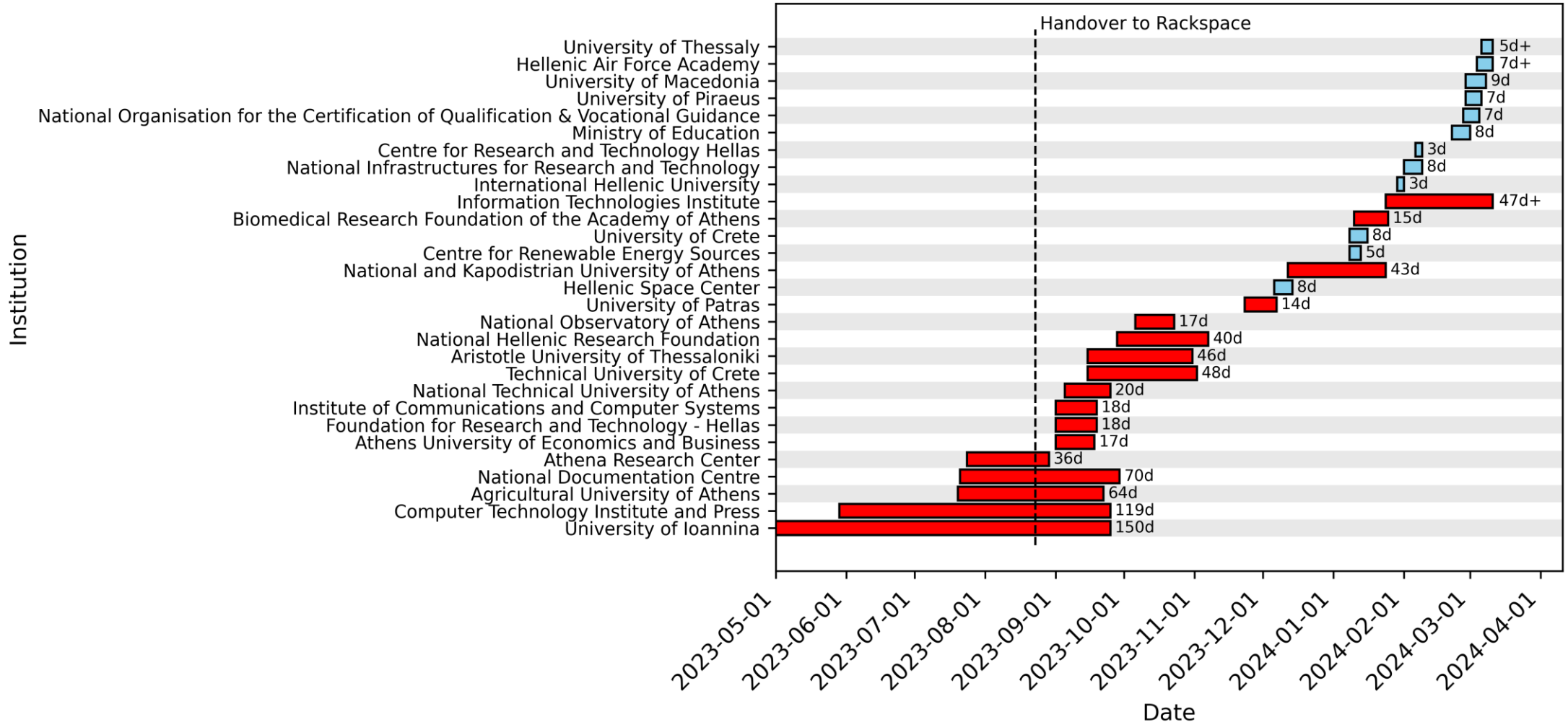
# Hybrid

- Public sector has access to public cloud services (Microsoft Azure)
- Lots of universities, research labs, etc. already using public cloud services (AWS, Google):
  - Existing know-how
  - Existing budget earmarked in EU projects etc.
- Explosion in use of ML / AI, which require special hardware for non-toy uses.
- 11/2022: GRNET signed agreement in OCRE with AWS / Rackspace
- Currently €5M of resources available to users.
- Plan to offer additional resources of about €30M in two tranches (providers) in the next 2–3 years.
- Working for the creation of solution to:
  - Monitor approved budget + consumption per project
  - Aggregate approved budget + consumption per institution
  - Enforcing budgetary limits on projects + dashboard for the cloud delivery team



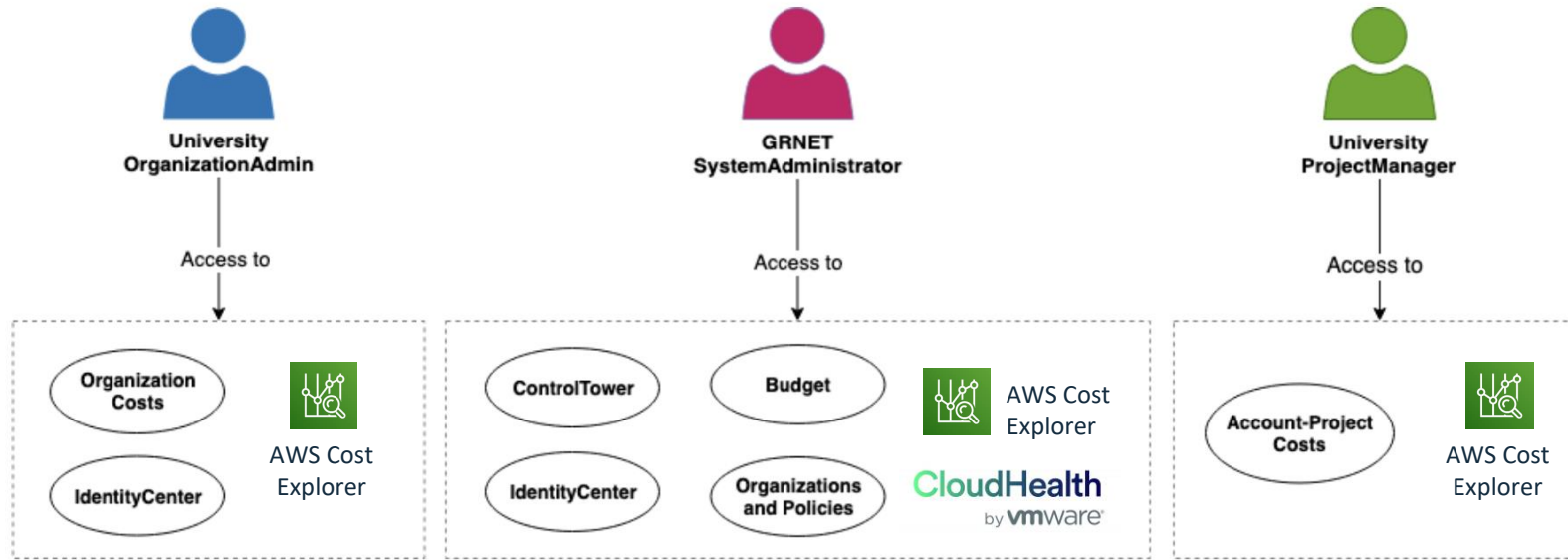
# Onboarding

Onboarding Completion Times





# Actors

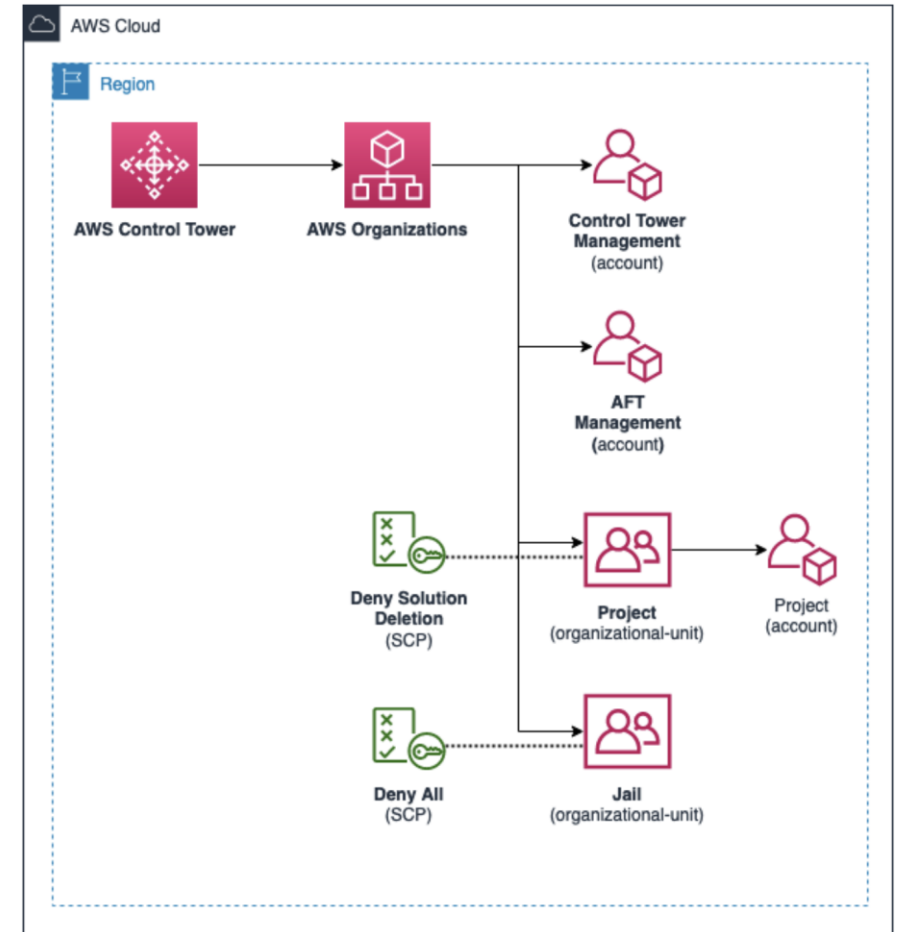


- **Organization Administrator** (University): Manages cloud SSO resources, assesses institution's total spending, allocates resources efficiently through SSO access configuration.
- **System Administrator** (GRNET): Deploys and manages infrastructure for university onboarding, creates Landing Zone on AWS, manages user accounts and permissions, generates reports.
- **Project Manager** (University): Oversees specific projects' onboarding, provides contact for cost threshold alerts, monitors project costs for budget compliance, makes resource allocation decisions.

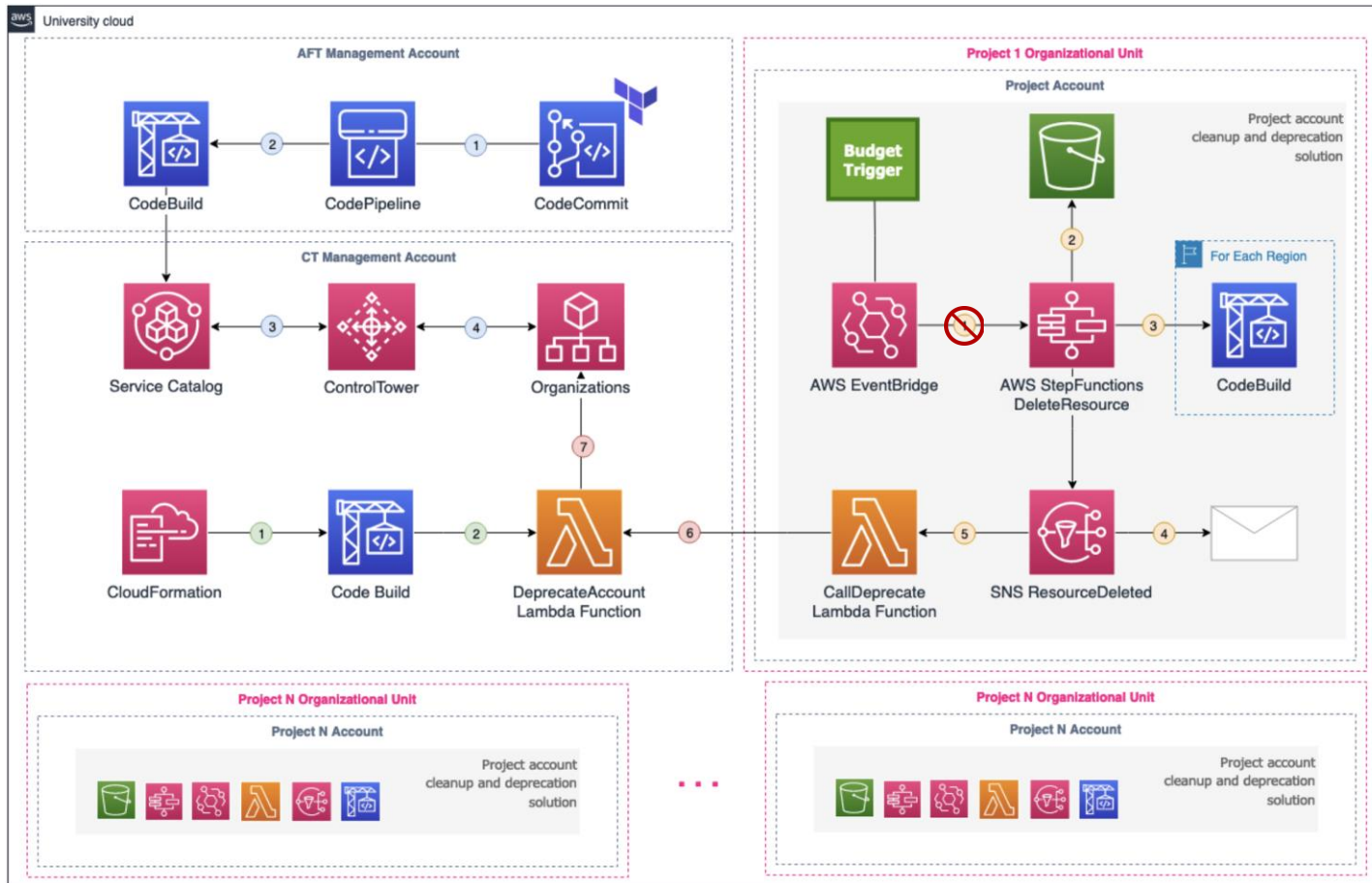


# Organization Architecture

- AWS Control Tower and AWS Organizations form the foundation of the university's organizational structure in the AWS Cloud environment.
- Core management accounts include Control Tower Management and AFT Management, overseeing the overall structure.
- Project-specific organizational units (OUs) are associated with Service Control Policies (SCPs) for resource preservation, while the "JAIL" OU restricts actions in deprecated accounts for enhanced budget control and resource protection.



# Services Architecture



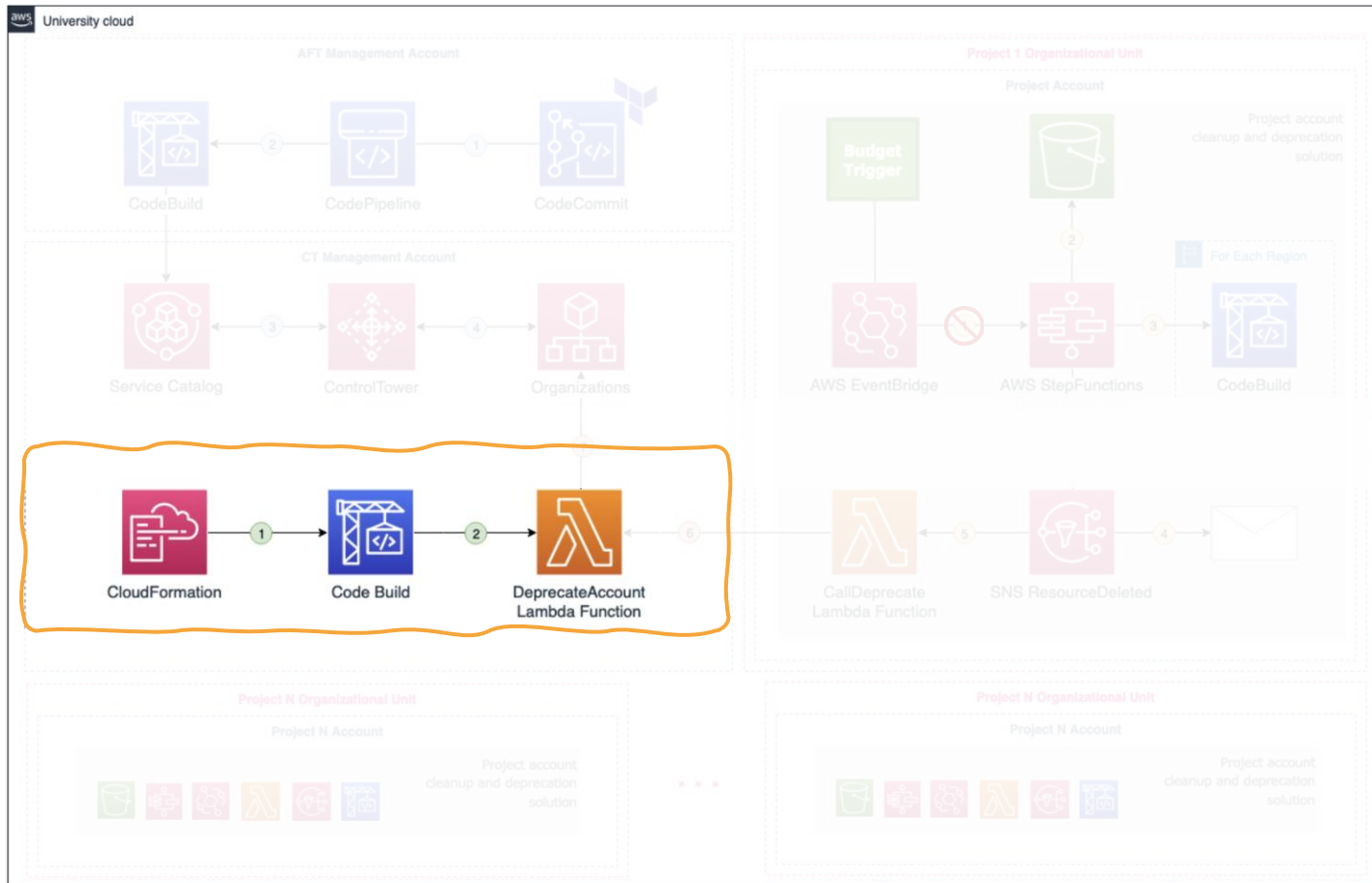
Account creation is orchestrated via the Account Factory Terraform (AFT) framework, utilizing a GitOps model for AWS Control Tower account provisioning automation.

Three principal accounts:

- **AFT Account**
- **CT Management Account**
- **Project Account**

Four main workflows.

# Operational Workflows

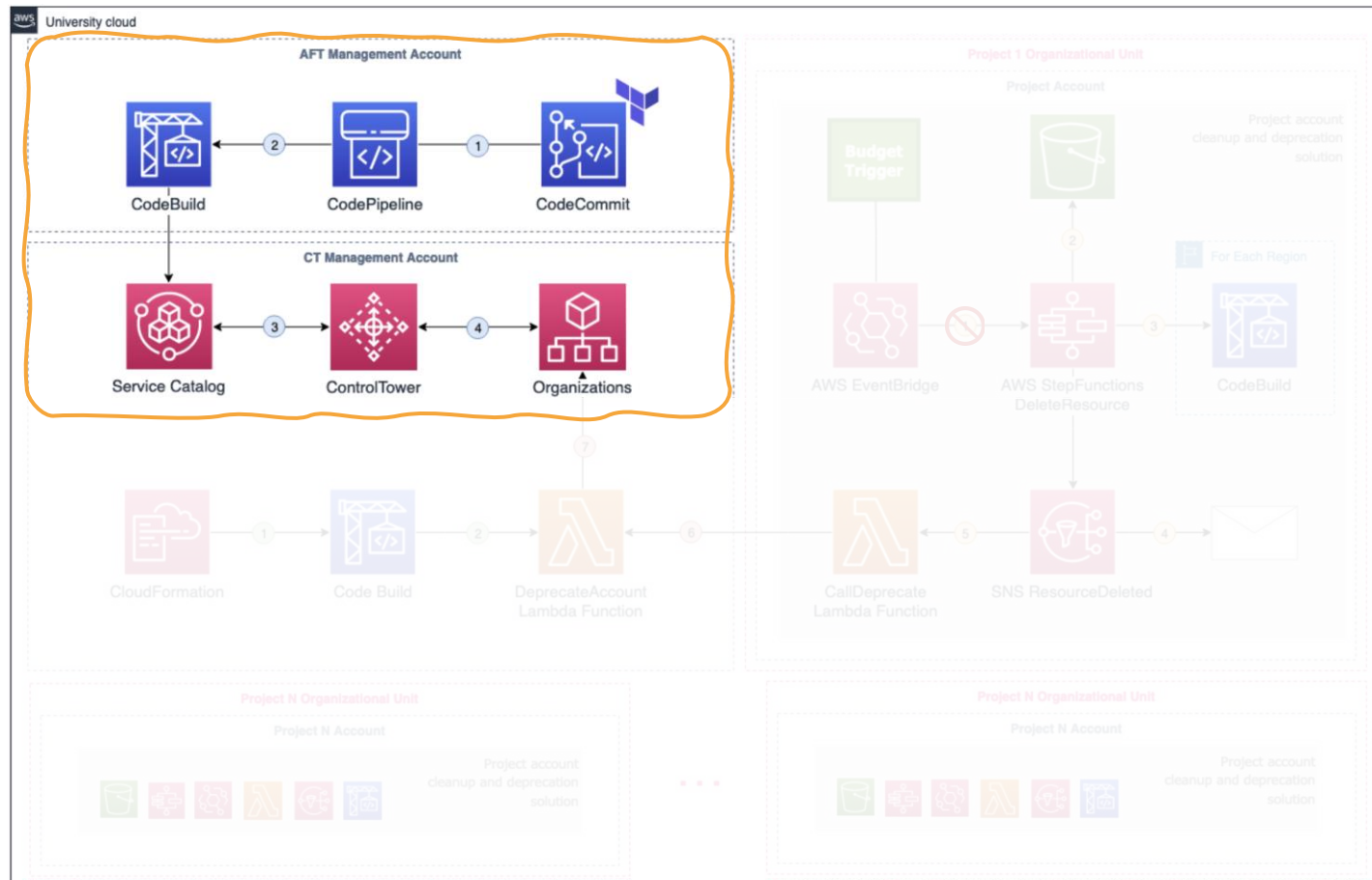


## AFT & Deprecation Resources Creation

- Located in **CT Management Account**.
- Utilizes CloudFormation and CodeBuild for AFT resource creation.
- Creates Lambda function for project account deprecation.



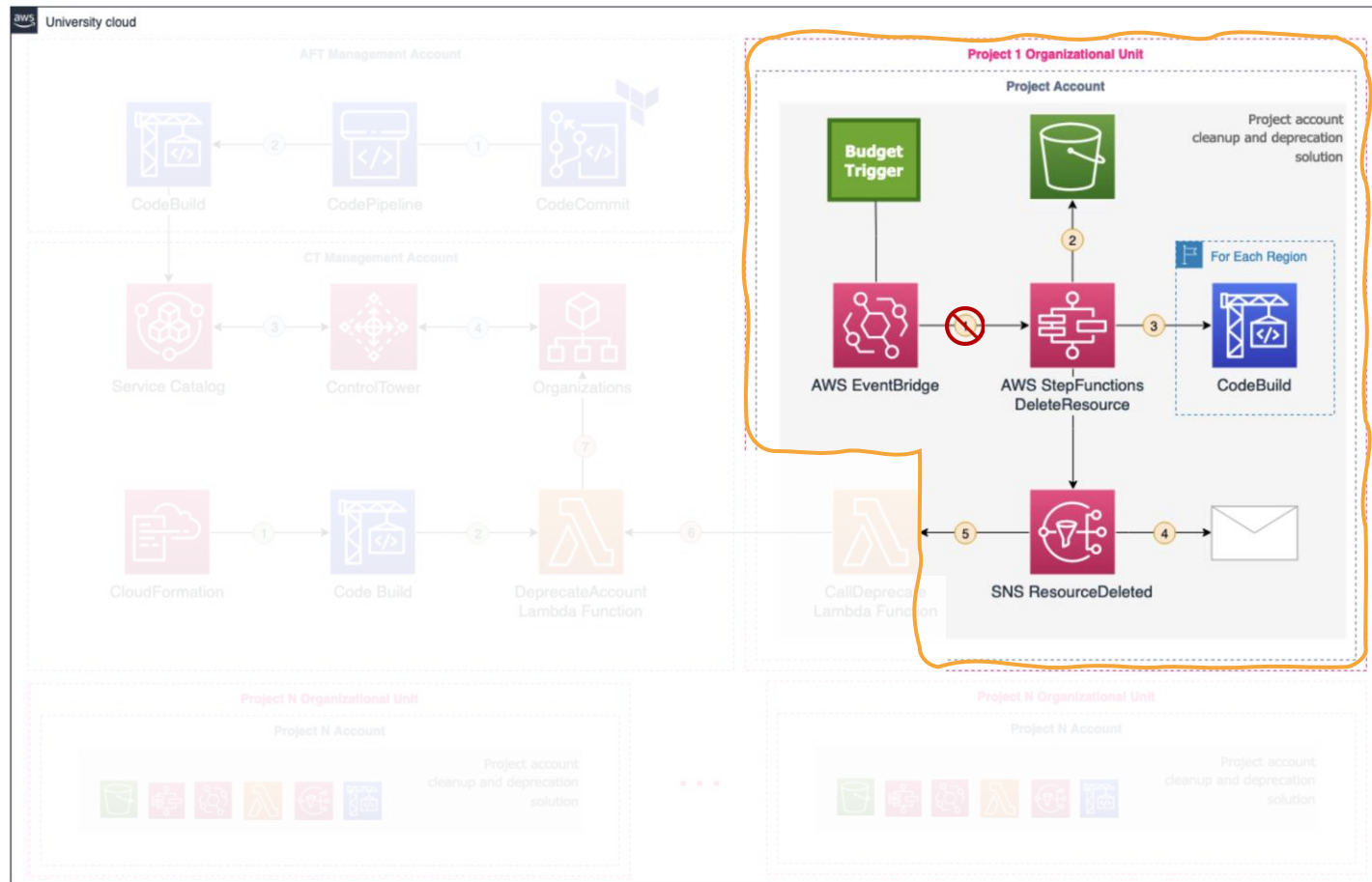
# Operational Workflows



## Creation of New Project Account

- Spans **AFT Account** and **CT Management Accounts**.
- CodeCommit initiates in AFT for "account-requests.tf" file.
- CodePipeline orchestrates CodeBuild for new account request in Service Catalog.

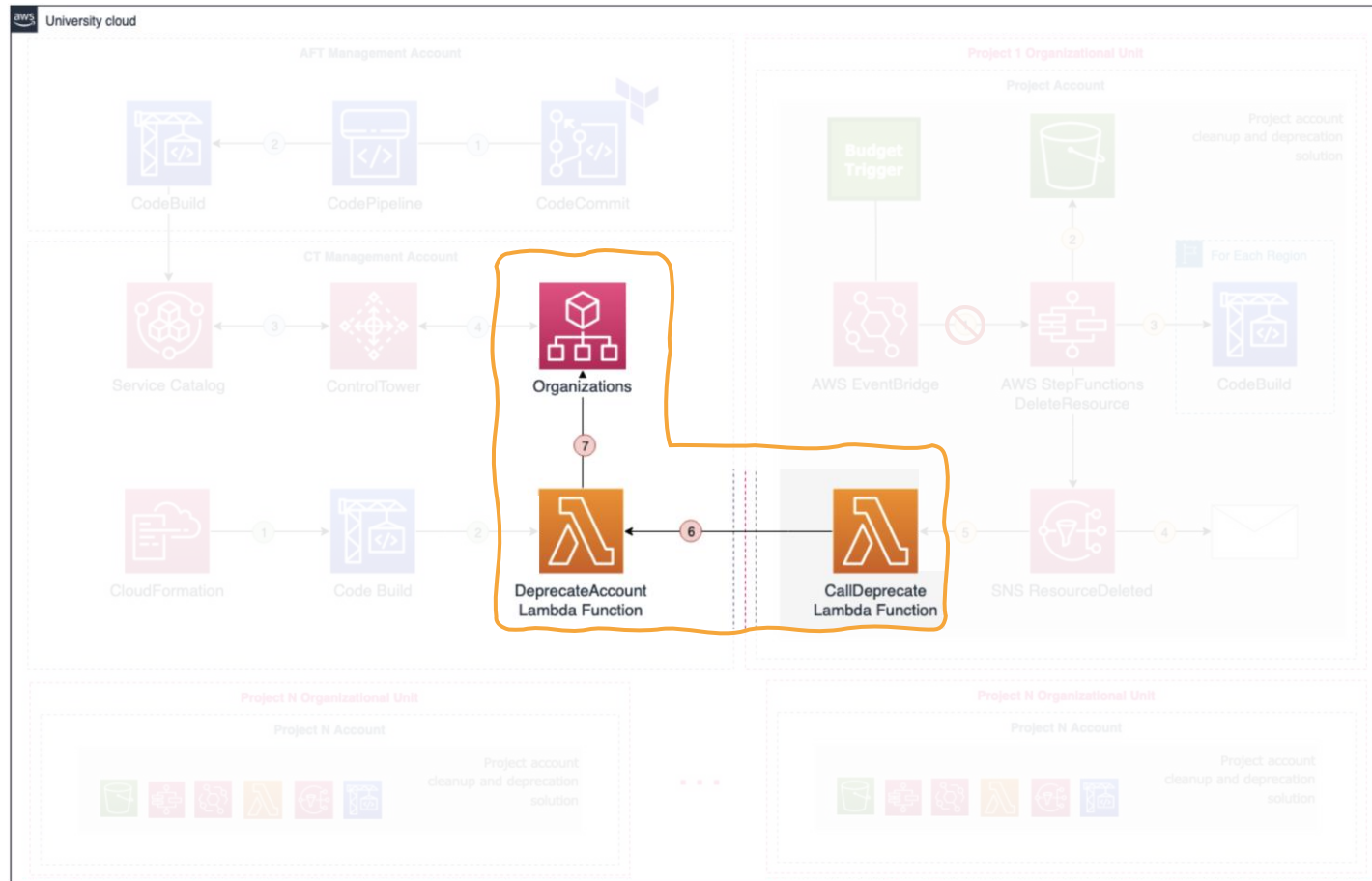
# Operational Workflows



## Account Cleanup

- Resides in **Project Account**.
- Triggered by EventBridge budget trigger (optional).
- Step Functions parallelize CodeBuild projects for resource scanning/deletion.
- SNS notification sent upon successful cleanup, triggering Lambda for deprecation.

# Operational Workflows

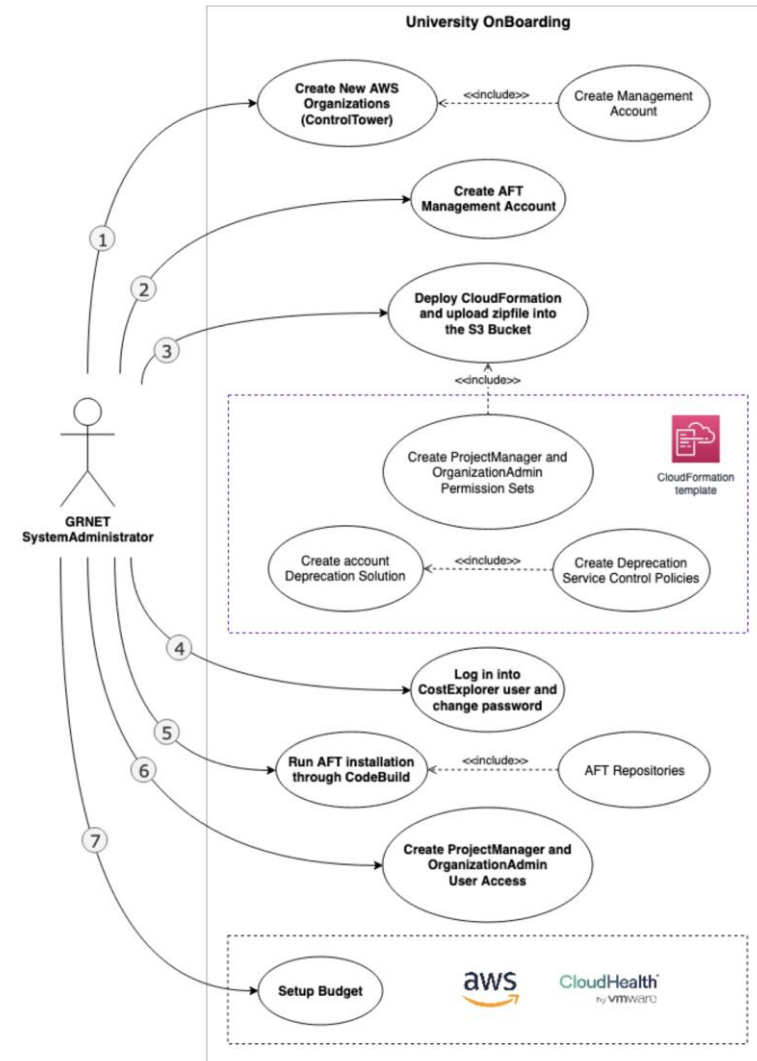
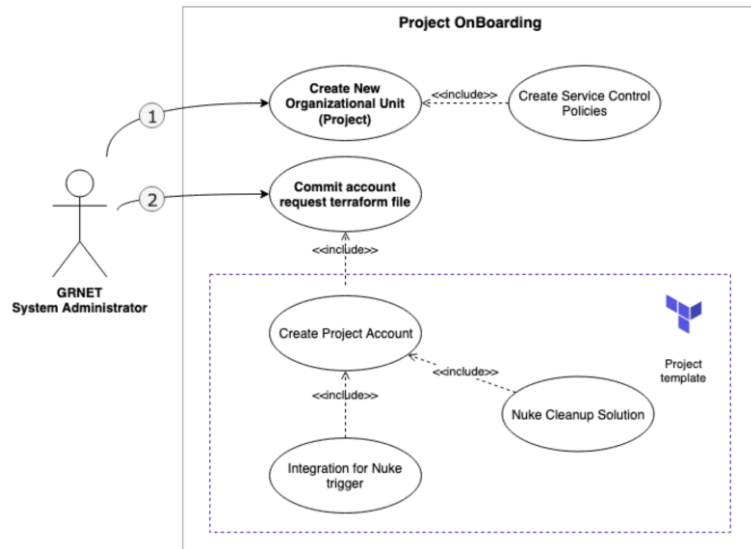


## Deprecation

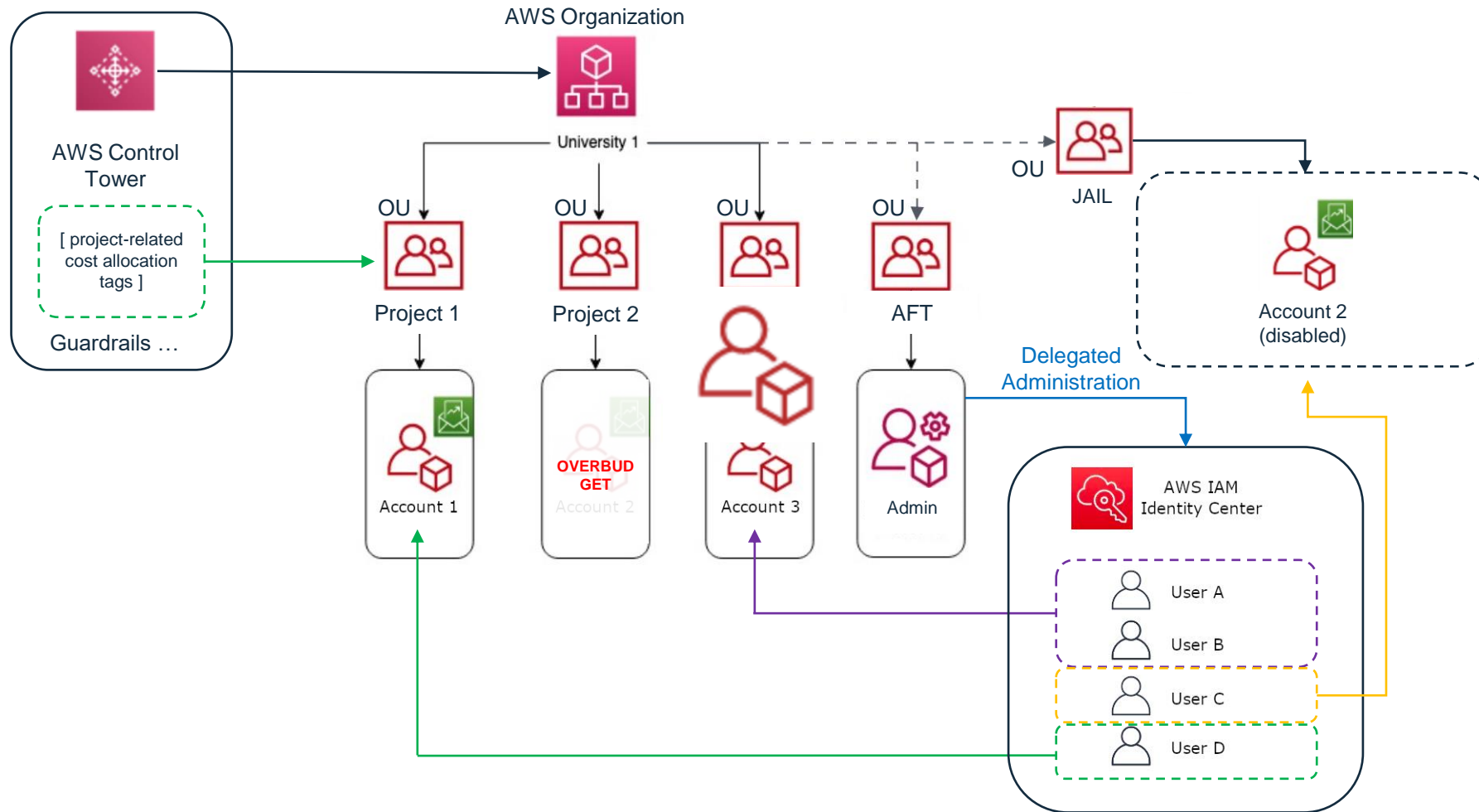
- Combines Lambda functions in **Project Account** and **CT Management Account**.
- Utilizes AWS Organizations for deprecation execution.



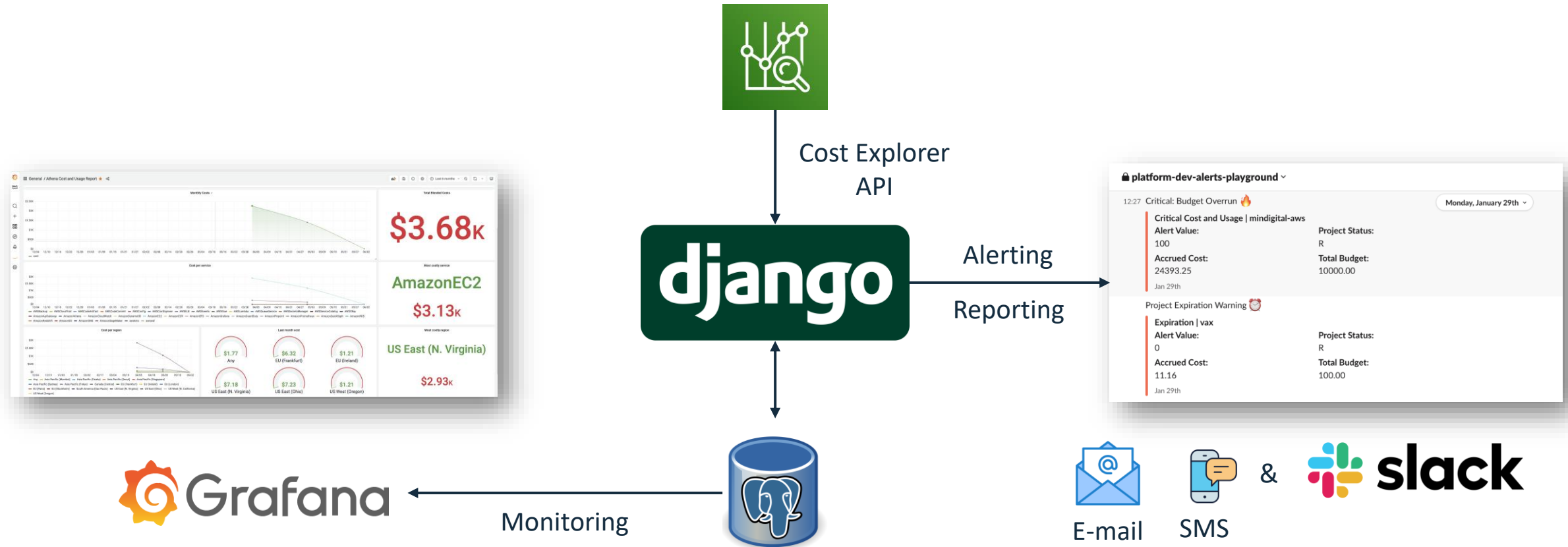
# Onboarding Operations



# Operational Architecture



# ProCloud: Monitoring & Alerting





# ProCloud: Reporting

Institution: [ATHENA] Athena Research Center  
Projects: 4

Start Date: 2023-09-01  
End Date: 2024-03-01

\$ projects: 45221.72 of 64000.00 [71.2%]  
\$ ops: 1879.34

Grand Total: 47101.06

account	name	email	project	total	budget	%	start_date	end_date
110596379725	GreekLLM	user1@athenarc.gr	LLM on custom Greek corpora	31953.40	14000.00	228.2%	2023-09-01	2023-11-01
527077996883	Arcadia	user2@athenarc.gr	Arcadia	12068.23	17000.00	71.0%	2023-09-01	2023-11-01
283840542173	DataBriX	user3@athenarc.gr	DataBri-X	1198.14	18000.00	6.7%	2023-09-01	2025-09-01
767398139343	DeWiNT	user4@athenarc.gr	DeWiNT	1.95	15000.00	0.0%	2024-03-01	2024-09-01

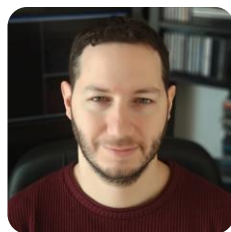
# GRNET Development & Cloud Operations Team



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