

Harmonie-Arome on AWS

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Agenda

- Intro
- AWS parallelcluster vs. on-prem
- DR integration and maintenance via CI/CD
- Cost and final remarks

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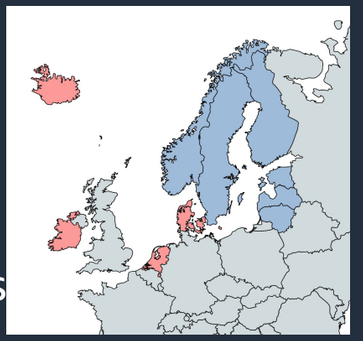
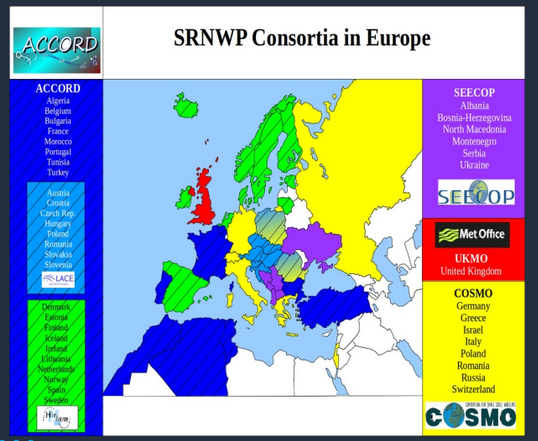
Proof-of-concept collaboration projects



- **Phase 1: Initial (performance) evaluation:**
  - Usage approach: Simple - treat it similar to yet another remote HPC system for weather applications and some might get disappointed
  - AWS blog post with focus on initial performance experiences
  - Published scripts and documentation under Hirlams public github.com repository
  - UWC-W contribution to the ACCORD Newsletter focusing on the initial AWS experience



- **Phase 2: Production aspect – DR cost estimate**
  - Usage approach: Try to adapt to services and integrate on-prem and AWS more properly
  - Initial discussions and break-down into a set of Mandatory Requirements
  - Full production cycle test, porting of the whole script-suite for cycle orchestration via ecflow
  - Full CI/CD pipeline integration and system independent maintenance cycle
  - Input data shall be real cycle input data (LBC, restart and observations) and not processed snapshots for benchmarking

Both projects were conducted under AWS research grants and in close collaboration with AWS.

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AWS parallelcluster 101

Physical cluster design



AWS ParallelCluster json file

```
Region: @REGION@
Os: @AMIOS@
CustomAmi: @AMI@

HeadNode:
    InstanceType: m5.4xlarge
    Networking:
       SubnetId: subnet-@subnetid@
    Ssh: KeyName: @sshkey@

Scheduling:
   Scheduler: slurm
   SlurmQueues:
     - Name: hpc6a
       ComputeSettings:
            LocalStorage:
               RootVolume:
                  Size: 100
            ComputeResources:
               - Name: hpc6a
                    InstanceType: hpc6a.48xlarge
                    Efa:
                       Enabled: true
                    MinCount: 0
                    MaxCount: 50
                    Networking:
                       SubnetIds:
                        - subnet-@SUBNETID@
                       PlacementGroup:
                          Enabled:true

SharedStorage:
   - MountDir: /shared
     Name: myebs
     StorageType: Ebs
     EbsSettings:
        VolumeType: gp3
        Size: 100
   - MountDir: /lustre
     Name: myfsx
     StorageType: FsxLustre
     FsxLustreSettings:
        StorageCapacity: 1200
        DeploymentType: SCRATCH_2
        ImportPath: s3://myhpcbucket
```

Head node

Scheduler Settings

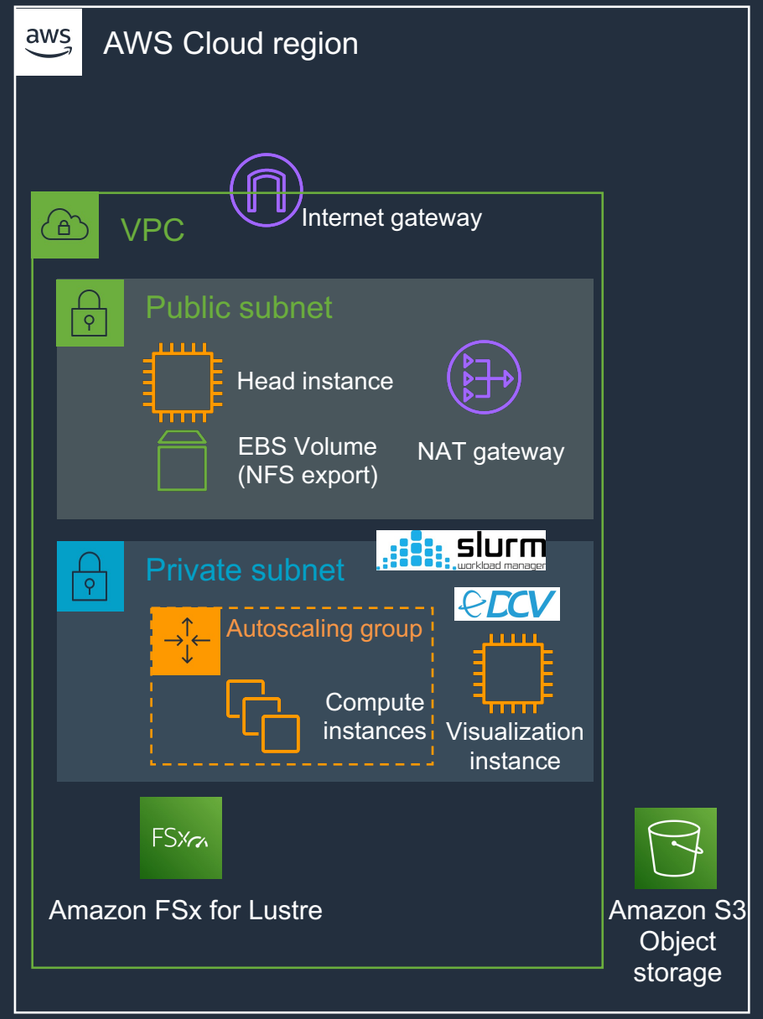
Compute nodes

Network settings

NFS Storage

Lustre storage

Cluster deployed on AWS by AWS ParallelCluster



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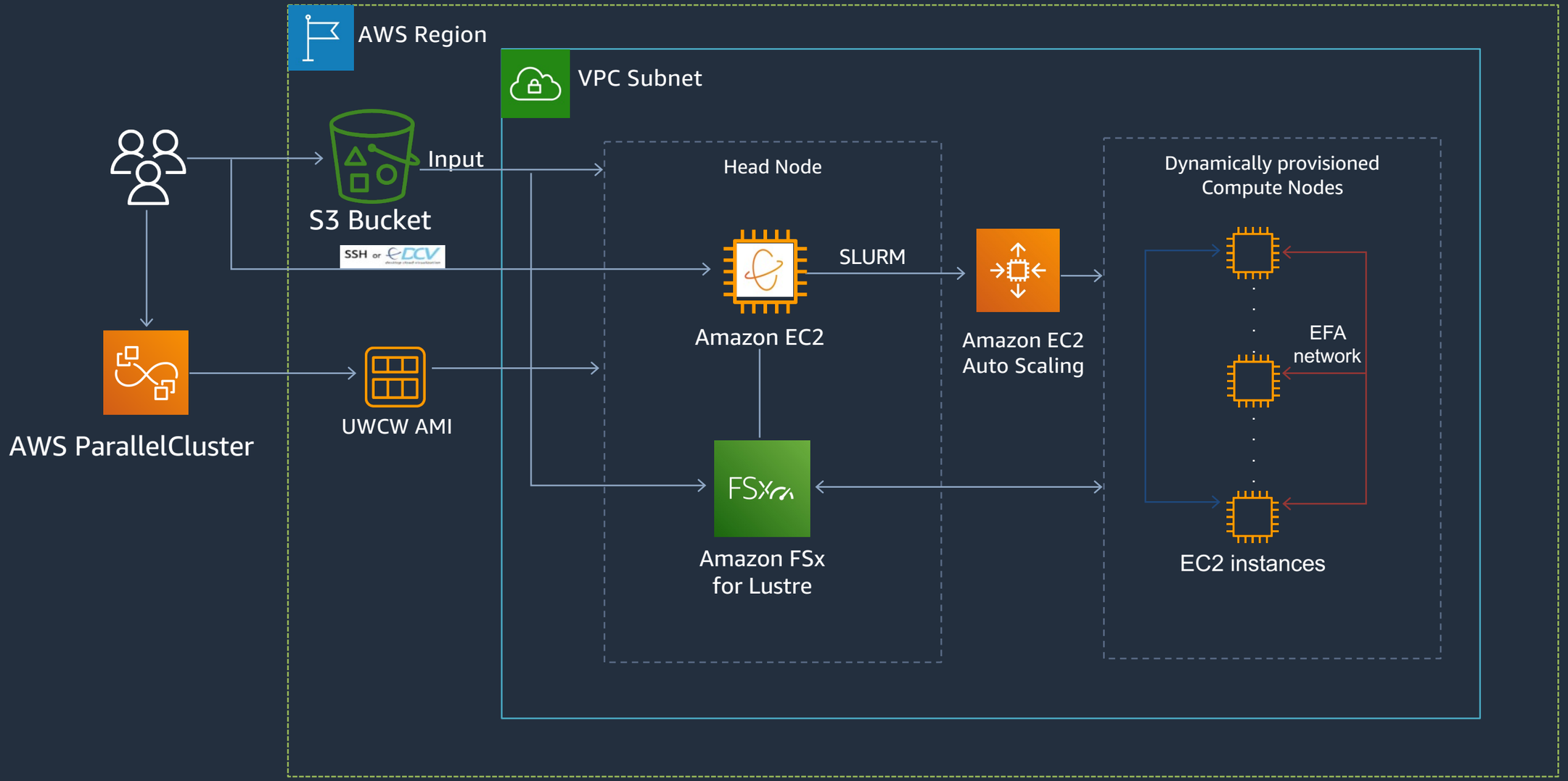
Cluster Architecture



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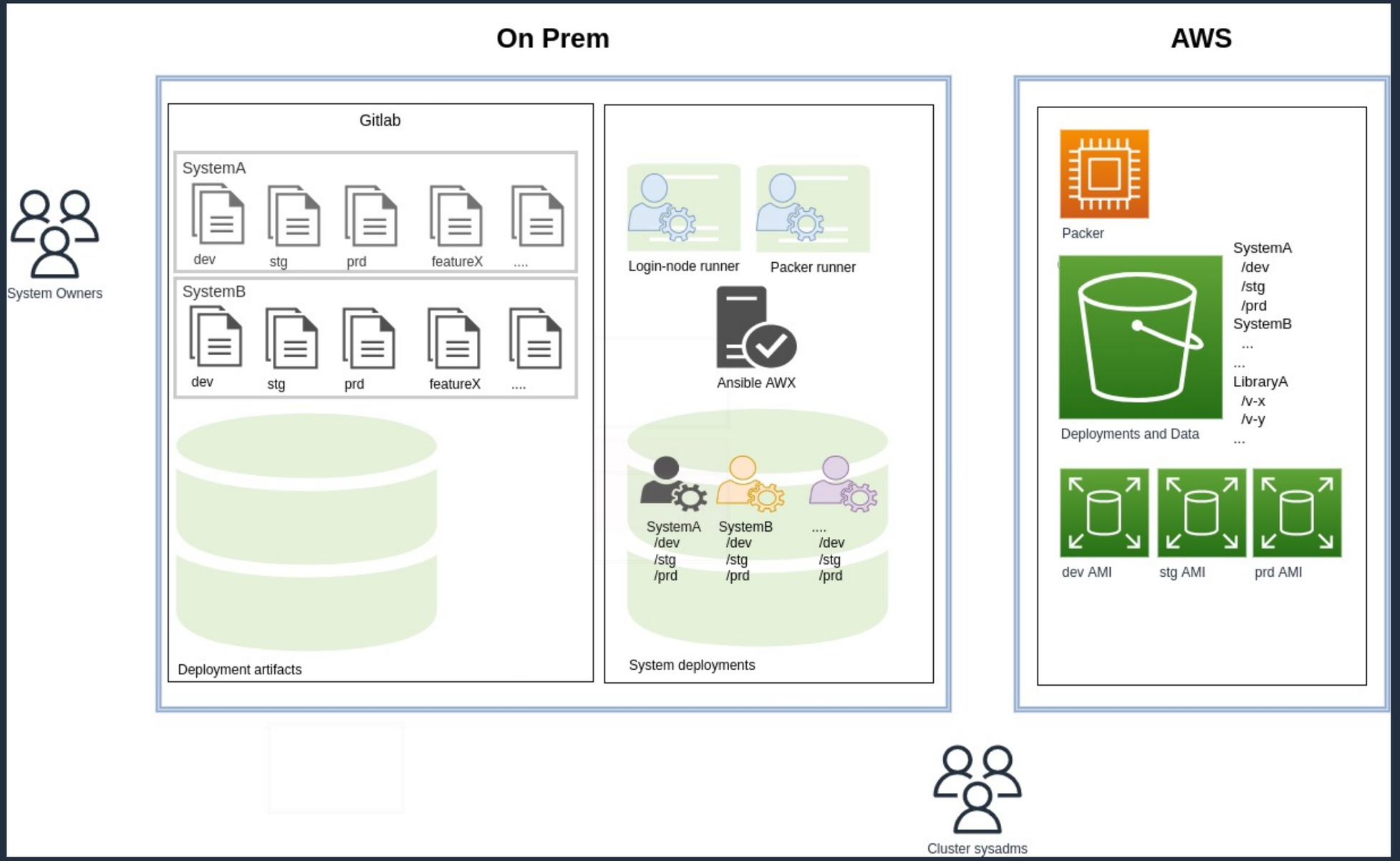
Integrating on-prem with AWS via GIT and CI/CD



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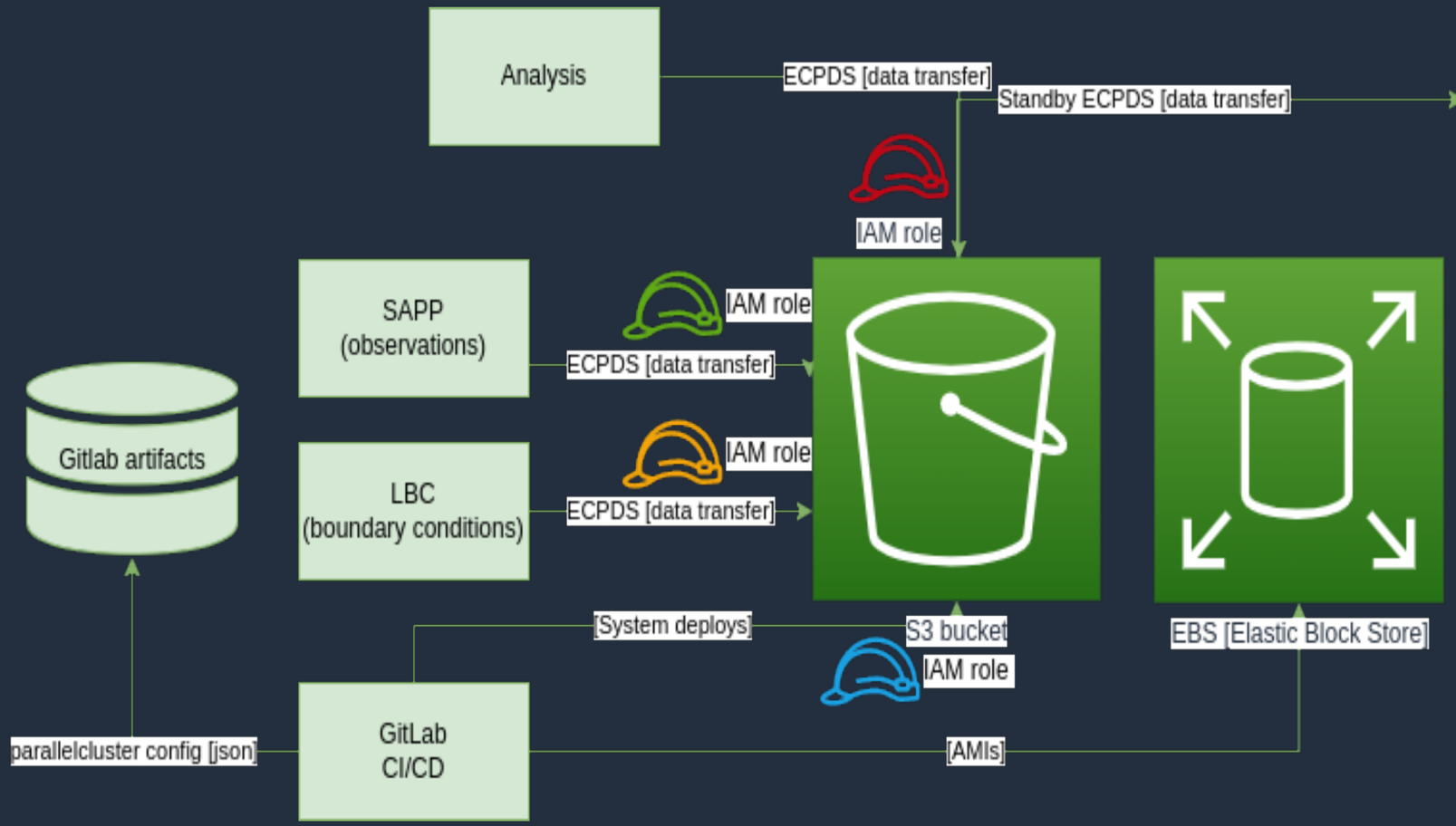
Asynchronous data-flow with individual lifecycle policies



ECPDS config

- Hostname/IP: s3.amazonaws.com
- Login: IAM specific role access_key
- Password: IAM specific role secret
- Transfer Method: generics3a
- Options -> Properties
  - s3a.bucketName = "bucket-uwcw"
  - s3a.prefix = "/lbc/"
  - s3a.region = "region"

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AWS Standby DR Cost estimates

	Default				Optimized		
AMI	Build [H]	# Builds/Y	Total [H]	Cost per Year ($)	#Build w. layers [H]	Total [H]	Cost per Year ($)
Cost to construct AMI [EC2 hours]	4	120	480	$391.68	120*0.1+12*1.3+1*0.8	28.4	$23.17
	Size [GB]	# AMIs	Total [GB]	Cost per Year ($)	# AMIs	Total [GB]	
Cost to store AMI	100	10	1000	$600.00	5	500	$300.00
Data storage	Est. Window [GB]		Total [GB]	Cost per Year ($)	Daily window bz2 [GB]	Total [GB]	
Cost to store Data in S3 (standard tier)	2500		2500	$690.00	185+120	305	$84.00
Verification Cycle [(25xhpc6a.48xlarge]	Cycle [H]	#Cycles/Y	Total [H]				
On-Demand Computex25 [EC2 hours]	1	48	48	$3,712.00			$3,712.00
Storage (FSx - 1.2 TiB SCRATCH)			48	$11.00			$11.00
Data Transfer	~Size [GB]	Frequency	Total [GB]	Cost per Year ($)	Size [GB]		
On-prem to AWS via internet				Free			Free
AWS to on-prem via internet	800	48	38400	$3,456.00	0		$0.00
Total Cost for AWS DR insurance				**$8,836.00**			**$4,129.00**

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aws

Final remarks

- Ability to integrate and to maintain the integration of hosted services is important to us

- UWC-West are now better prepared to integrate with multiple target platforms

- No more limited by reservation constrains which allows for more parallelism

- Pick hardware based on individual applications (tune for performance and/or cost)

- The flexibility is new to us and we still have a lot to learn

- Continuous Cost control is a new important aspect

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