The Diversified O-RAN Showcase: Unifying Open Source Communities

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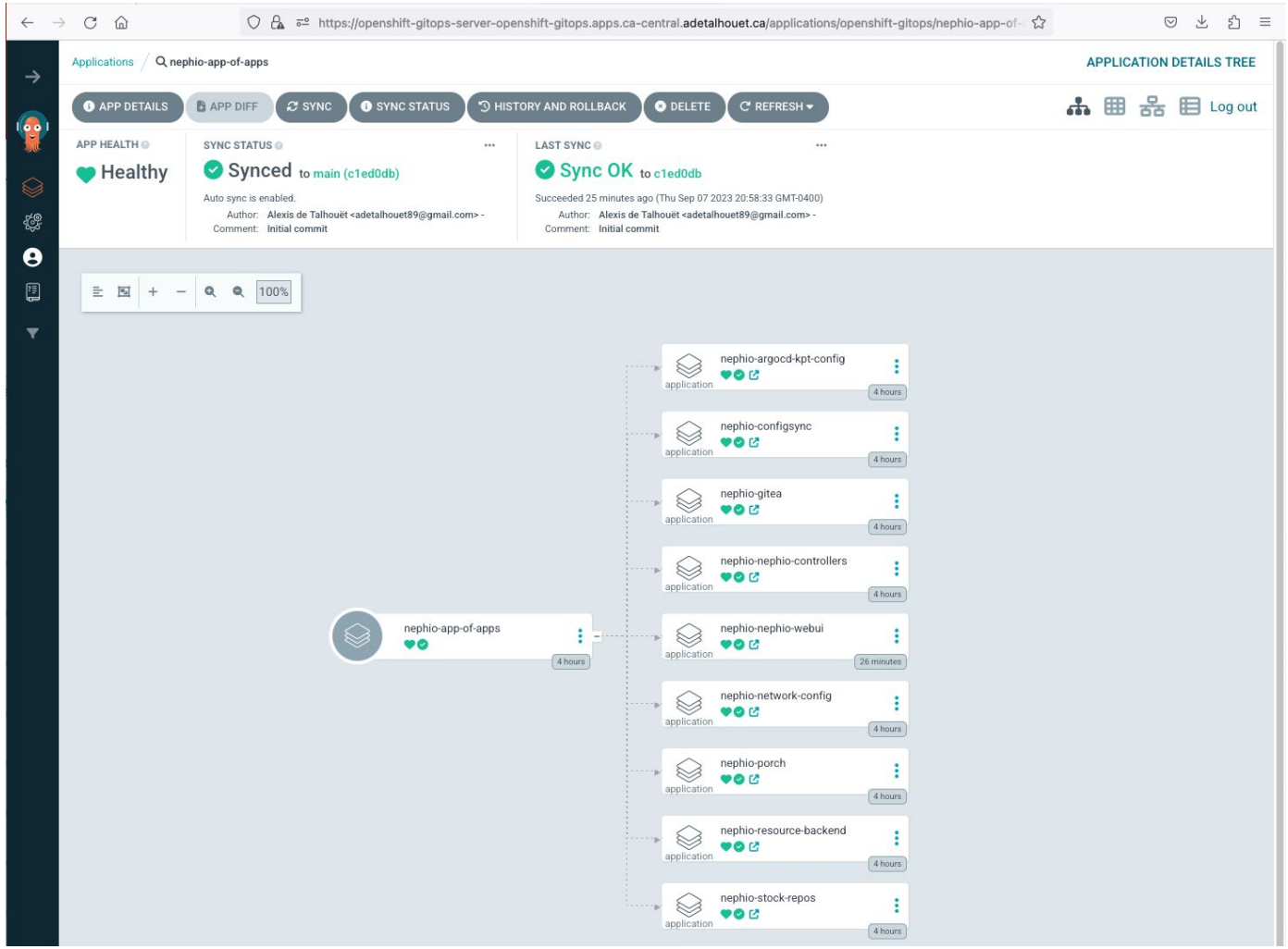
Presentation Outline

- **CaaS Platform**
  - Nephio deployment
  - Single Node Clusters
- **O-RAN Network Functions**
  - Intent based deployment
  - Operators overview
- **CaaS Configuration**
  - Demo
  - Solution Architecture

CaaS Platform

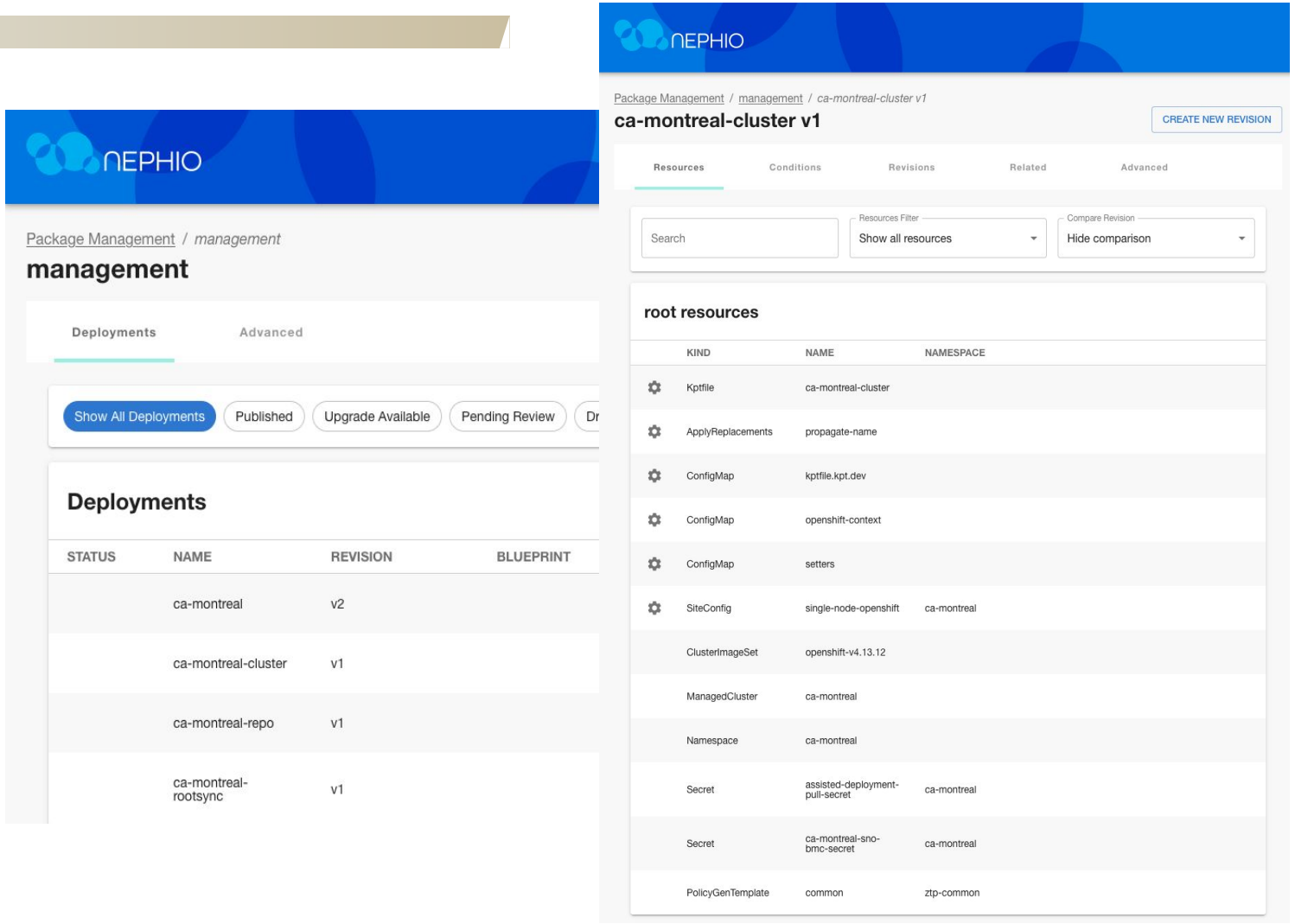
Blueprint for Nephio deployment on OpenShift

- Provide packages for all the required components to deploy Nephio R2 release
- Introduce an ArgoCD Configuration Management Plugin (CMP) to render kpt package pipeline properly
- Generate an ArgoCD Application for each individual components, and apply some OpenShift specific configuration



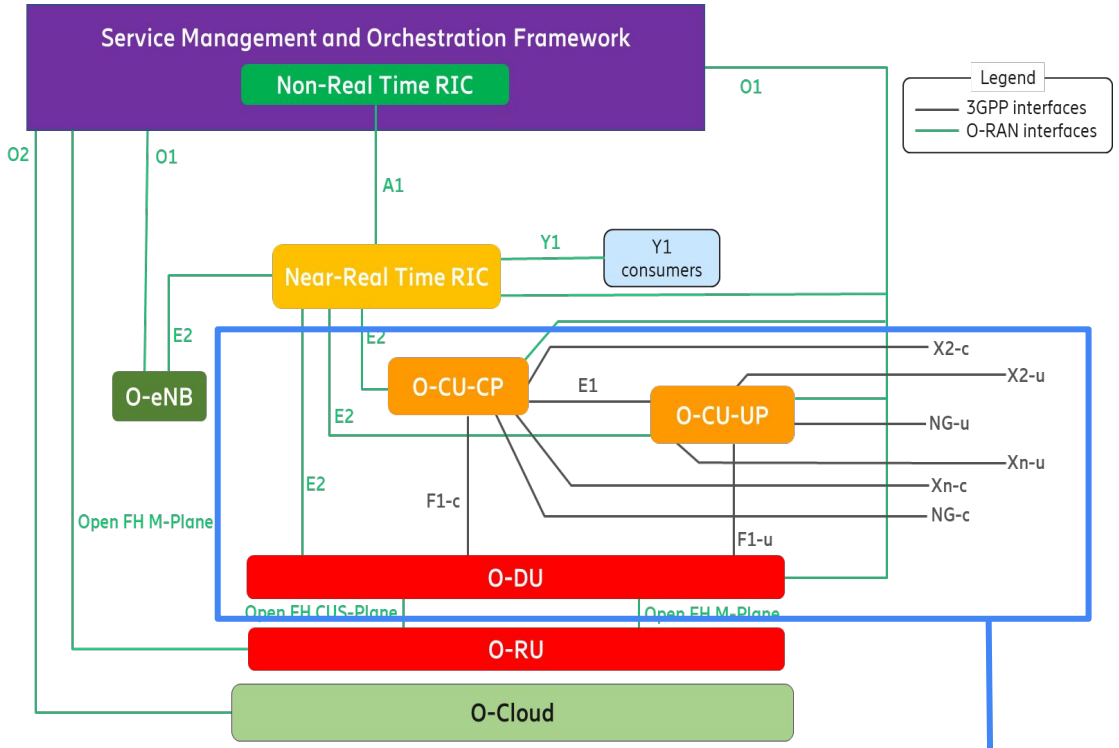
Blueprint for Single Node OpenShift deployment with Nephio

- Provide packages to create a Single Node OpenShift workload cluster
- Introduce two OpenShift-specific kpt functions
  - policy-gen-fn
  - siteconfig-gen-fn

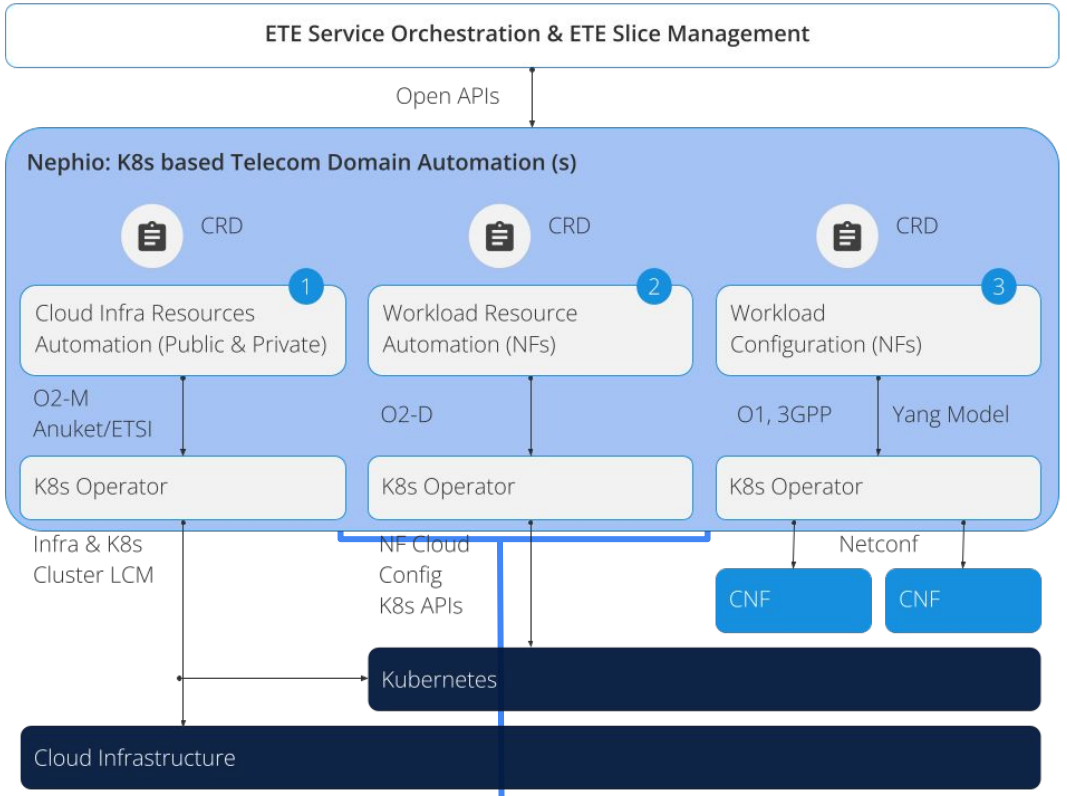


O-RAN Network Functions

Architecture Mapping



Source: O-RAN Alliance (O-RAN.WG1.OAD-R003-v10.00)



Source: Nephio Website

CNFs Provided by OpenAirInterface

Simplified Operators for deploying OAI NFs (not O-RAN 02)

Intent Based Deployment

Intent: Network function requirements

Realization: Nephio KRM functions

Example KRM functions pipeline

```
ne:
mutators:
  - image:
/kpt-fn/apply-replacements:v0.1.1
    configPath: apply-replacements-owner.yaml
  - image:
/kpt-fn/apply-replacements:v0.1.1
    configPath:
replacements-namespace.yaml
  - image: gcr.io/kpt-fn/set-namespace:v0.4.1
    configPath: cm-namespace.yaml
  - image: docker.io/nephio/nf-deploy-fn:v2.0.0
  - image: docker.io/nephio/interface-fn:v2.0.0
  - image: docker.io/nephio/nad-fn:v2.0.0
  - image: docker.io/nephio/interface-fn:v2.0.0
  - image: docker.io/nephio/nf-deploy-fn:v2.0.0
```

OAI DU Deployment NF Deployment (CR)

```
apiVersion:
workload.nephio.org/v1alpha1
kind: NFDeployment
metadata:
  name: du-example
  namespace: example
spec:
  provider: du.openairinterface.org
  parametersRefs:
  - name: oai-du-config
    apiVersion:
workload.nephio.org/v1alpha1
    kind: NFConfig
```

OAI DU NF Config (CR) [Meta CR]

```
apiVersion: workload.nephio.org/v1a
kind: NFConfig
metadata:
  name: oai-du-config
  namespace: example
spec:
  configRefs:
    - apiVersion:
workload.nephio.org/v1alpha1
      kind: RANConfig
      metadata:
        name: ranconfig
      spec:
        gNBID: 12
        rfSimulated: false
        nrCellId: 1 ...
```

KRM functions are generic and not RAN or Core specific

OpenAirInterface K8s Operators

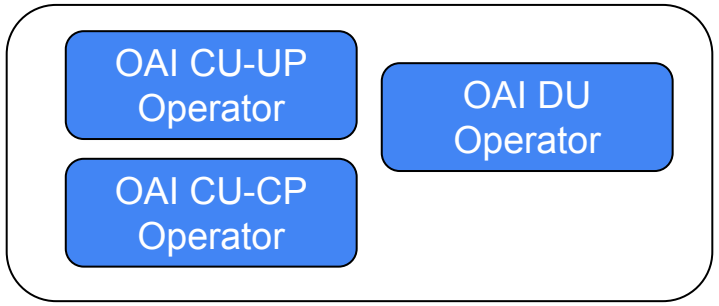
Design Considerations

- One Operator per NF
- Operators supports
  - OAI specific CRs
  - Nephio CRs
    - NFDeployment, NFConfig

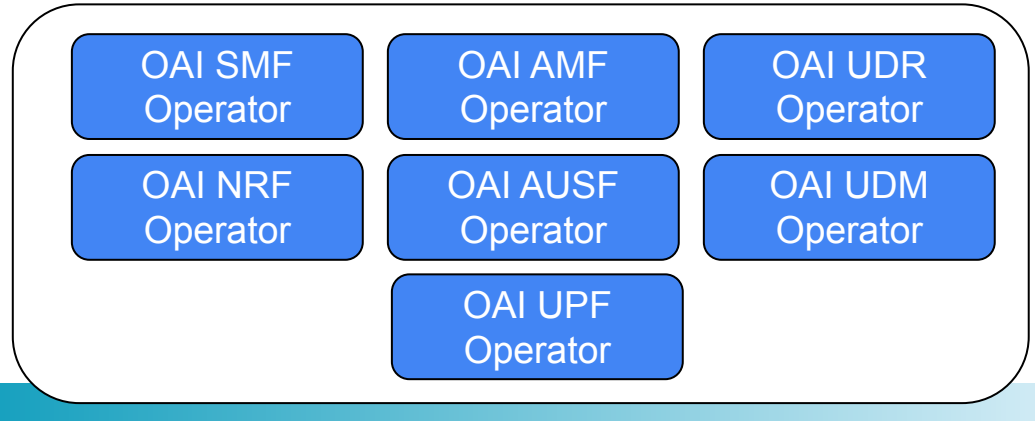
Interesting facts

- The RAN operator developed in Nephio R2 using Helm SDK was designed to orchestrate only Simulated DU
- RAN and Core network function operators developed in python using the KOPF.

OAI RAN Network Function Operators

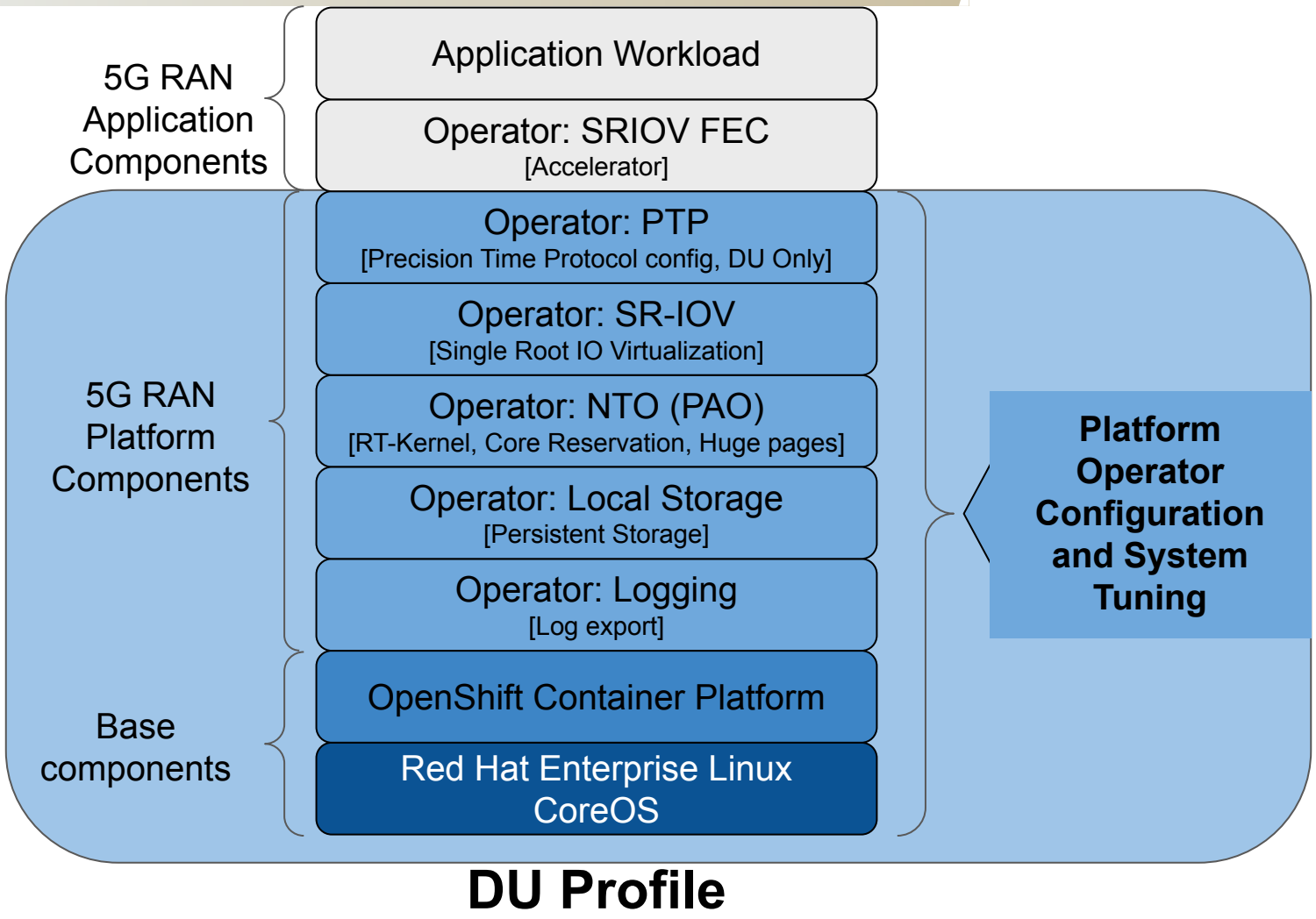


OAI Core Network Function Operators



Link to Github

CaaS Configuration for DU workload



DU Profile

Requirements for OAI DU

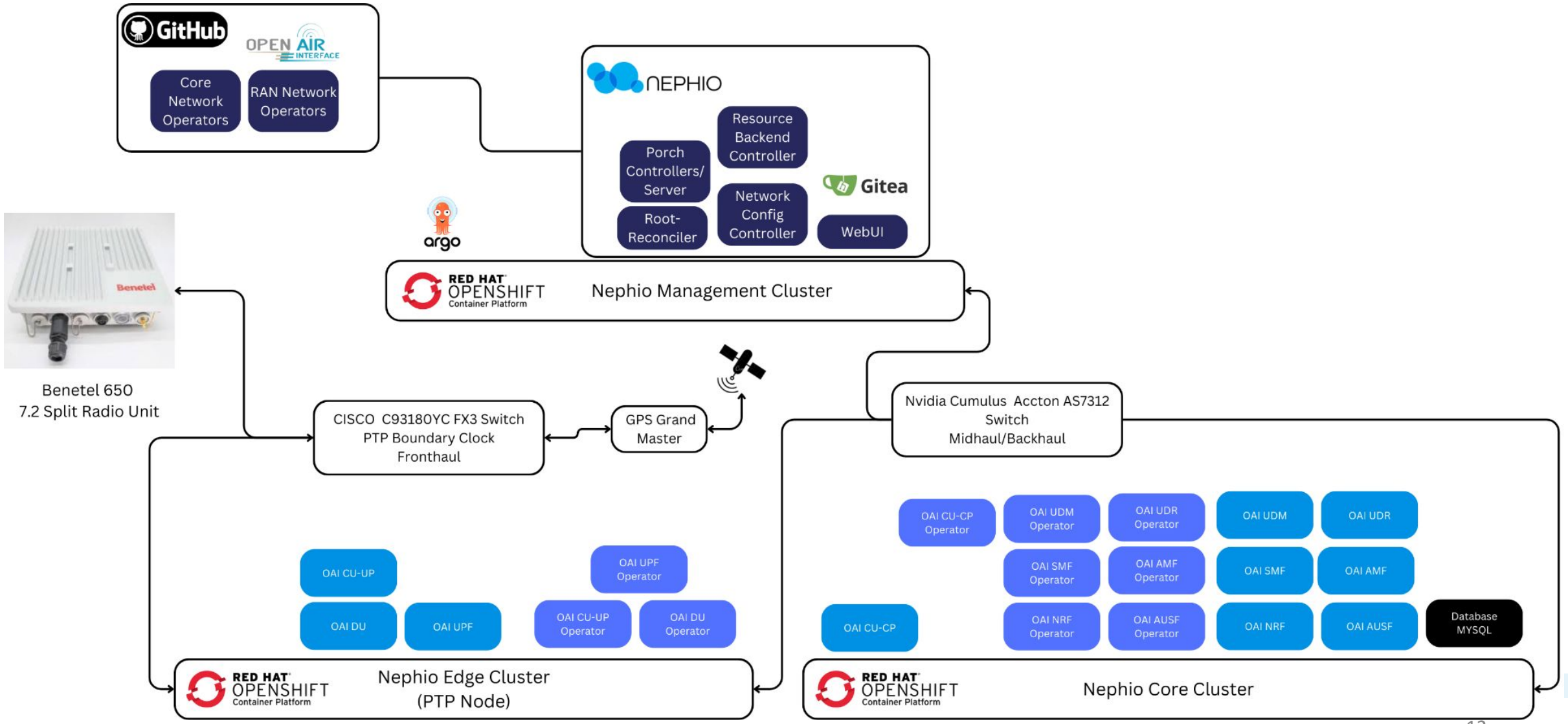
Tested Hardware

- Minimum Intel 3rd generation gold servers or AMD 4th generation (Genova)
- Intel XX710, X710 and E-810 are the only NICs we have tested

Recommended resources

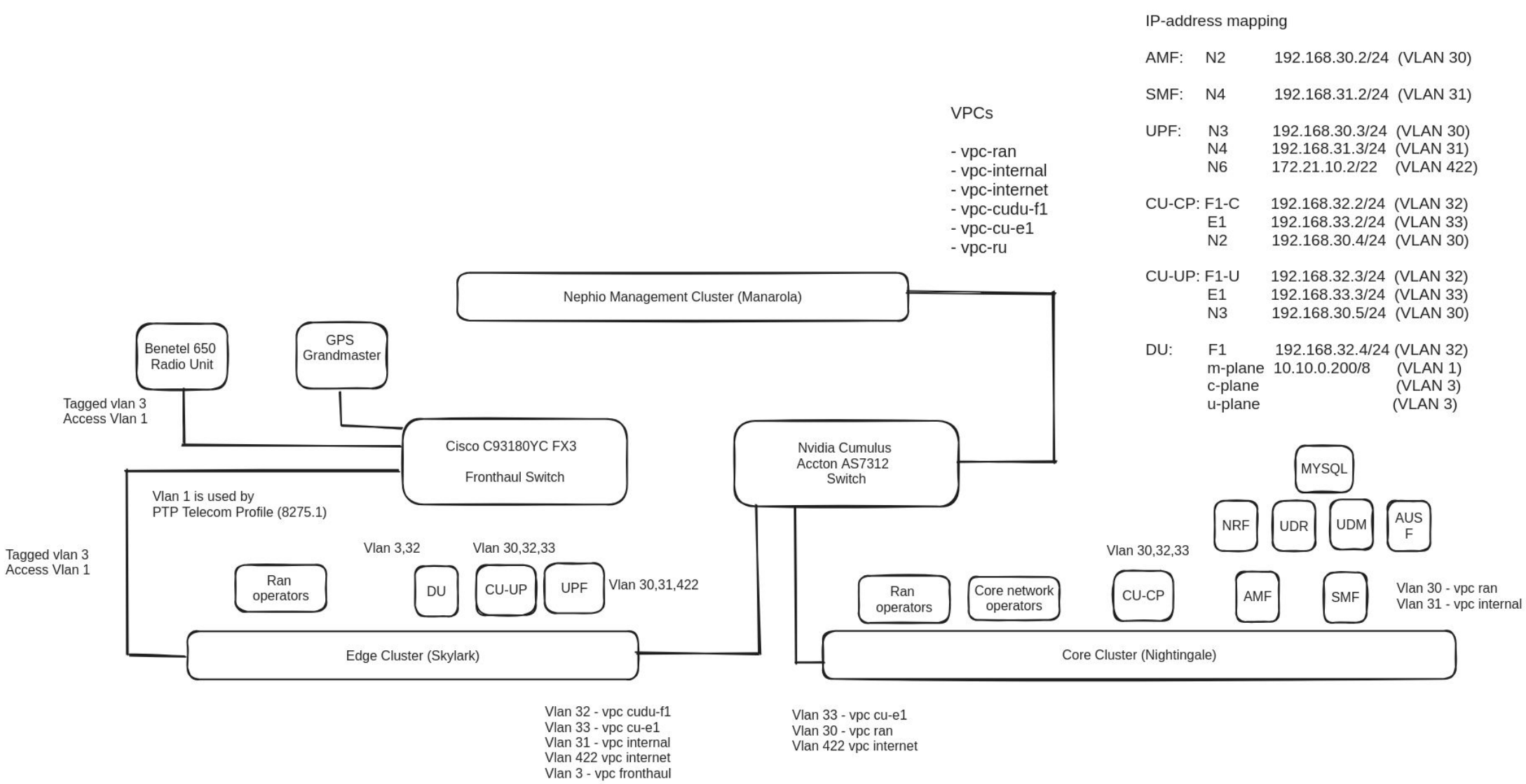
- 8 CPU,
- 4G RAM
- 10Gi Hugepages of size 1Gi

Demo Architecture



Demo Video

Demo Architecture



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- Orchestration of OAI O-RAN NFs and OAI Core NFs via Nephio on single node openshift cluster
- Benetel 650 (Outdoor O-RU)
- LLS-C3 architecture for O-RU and O-DU
- Nephio components deployed and managed by ArgoCD on Openshift
- Single Node Openshift clusters created and managed by Nephio
- OAI RAN and Core NF operators are written using Kubernetes Operators Framework (KOPF)
- Part 2: developer environment with T2

Benetel 650
7.2 Split Radio Unit