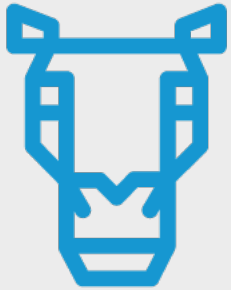

Private 5G as a Managed Cloud Service

*Larry Peterson*
*Open Networking Foundation*
*Princeton University*



# PRONTO

Securing the Internet Using Verifiable Closed-Loop Control

*(A DARPA Research Project at Stanford, Cornell, Princeton, ONF)*

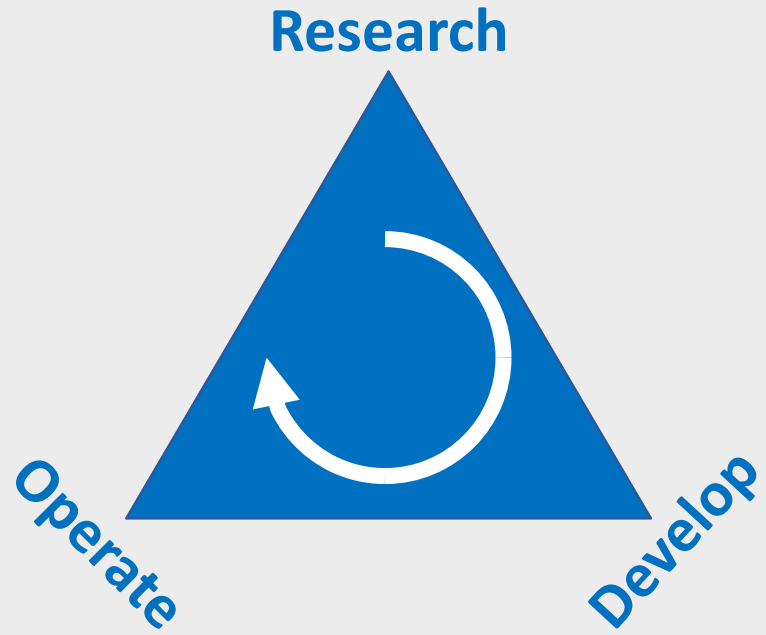
# PRONTO'S OBJECTIVE

*"We will create and deploy the first network—including 5G—under verifiable closed-loop control as an exemplar for others in government, industry, and education to replicate."*

*"Pronto will be an operational network that is deployed in a production environment, carries real traffic, and runs innovative edge services."*

# Pronto's Approach

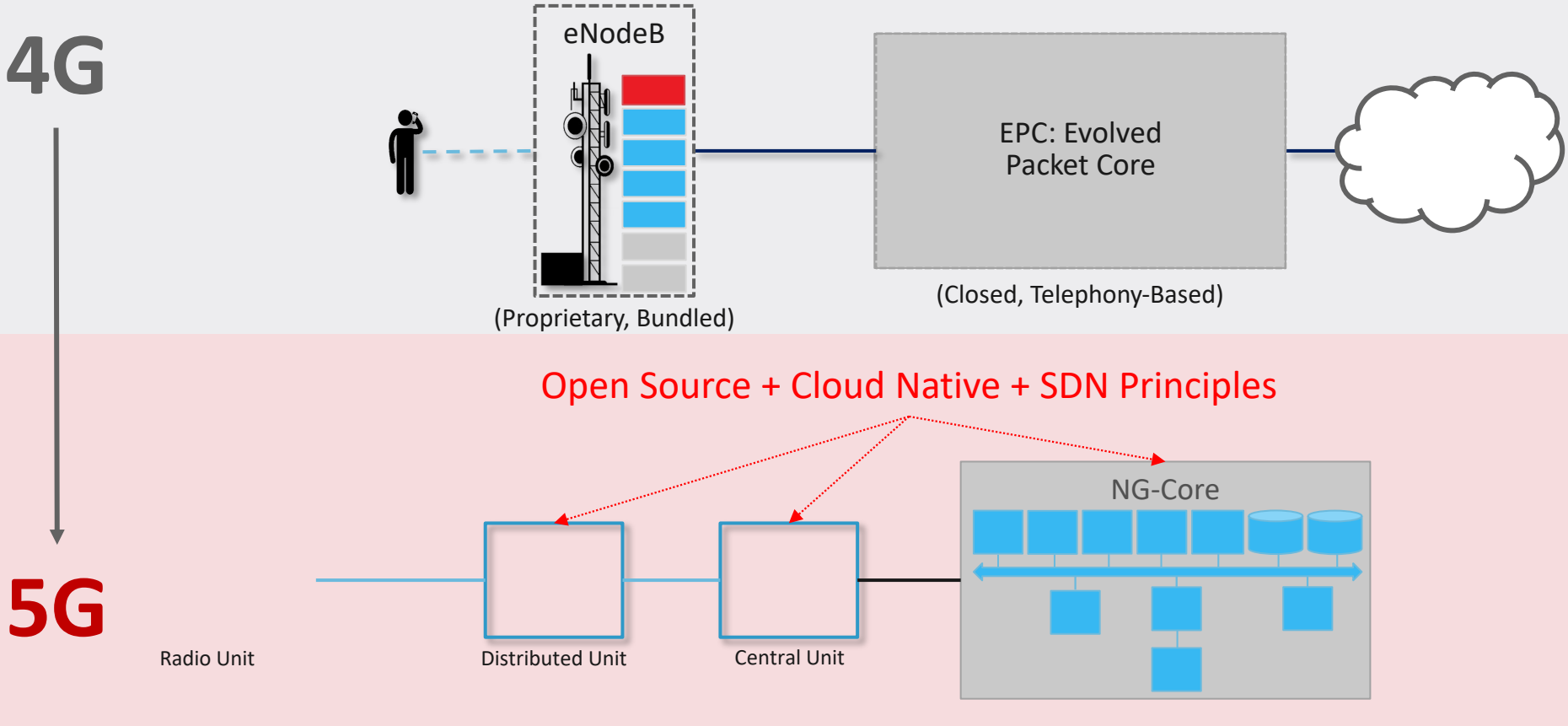
Edge AI using cellular-controlled drones
Real-time closed-loop control (DDoS, hijacking)
Formal verification of programs and packets



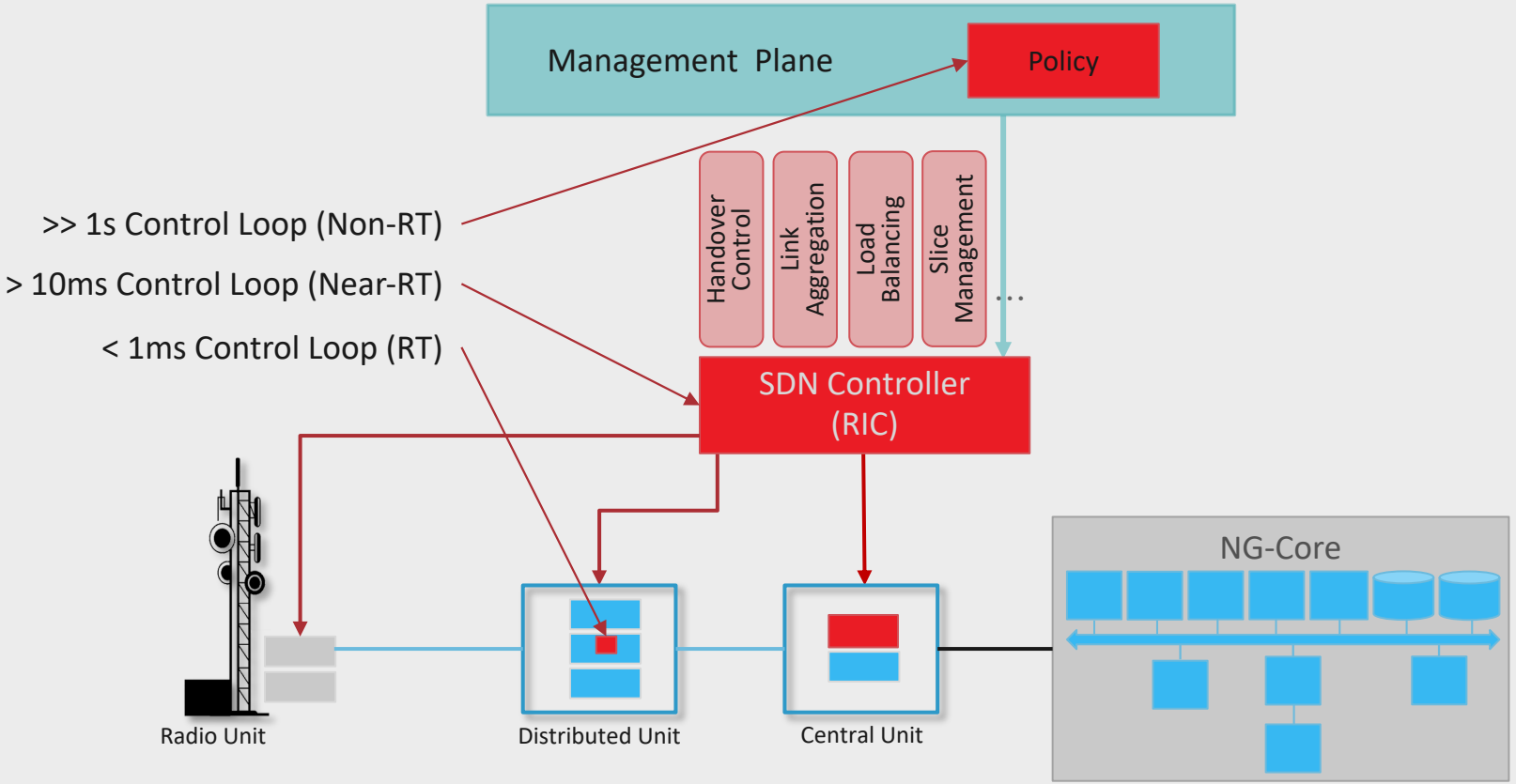

Deploy & operate a Private 5G network at Universities, ONF, Intel, and elsewhere

Aether: Edge cloud with Software-Defined Core, RAN, and Fabric (P4)

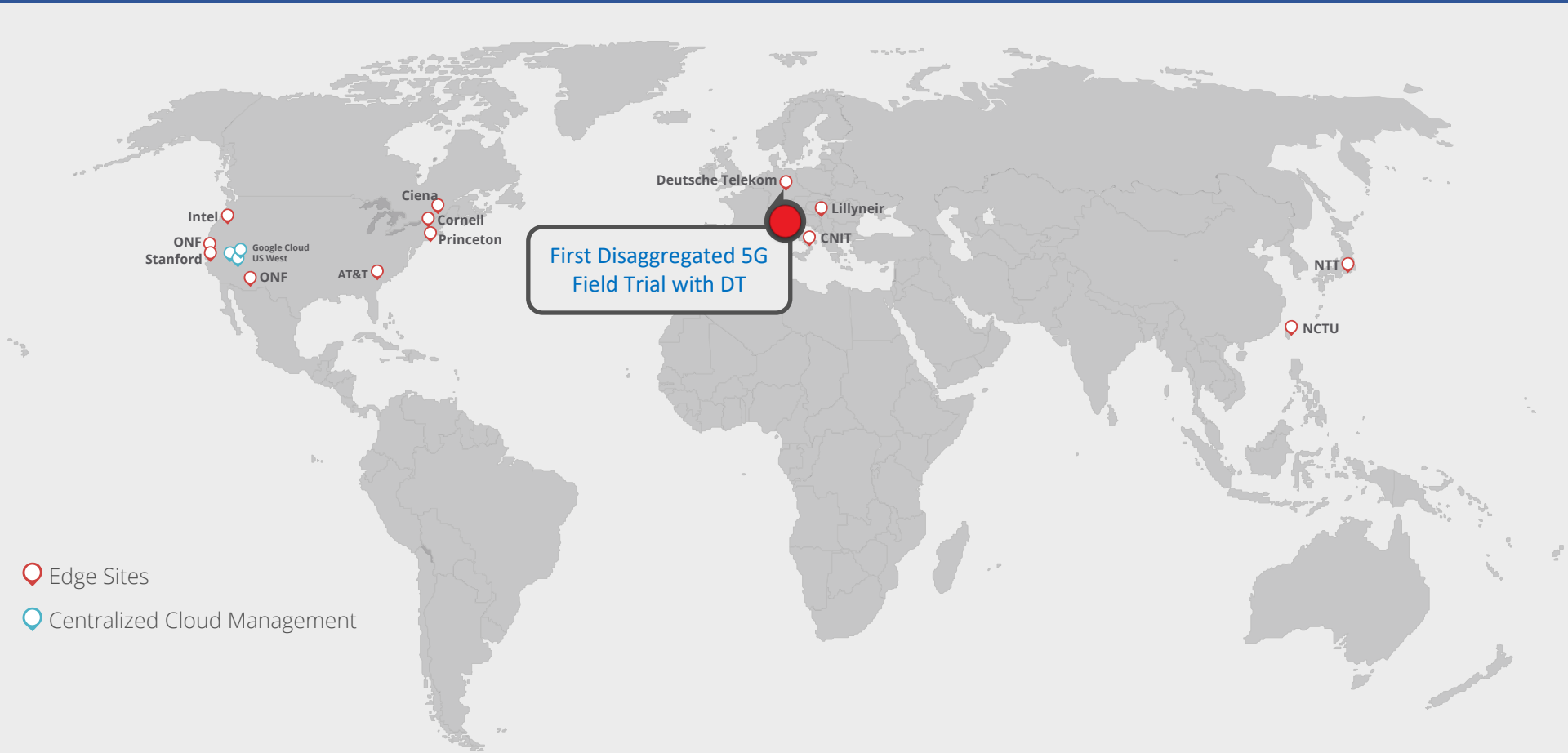
# Pronto's Opportunity



# Programmable End-to-End & Top-to-Bottom

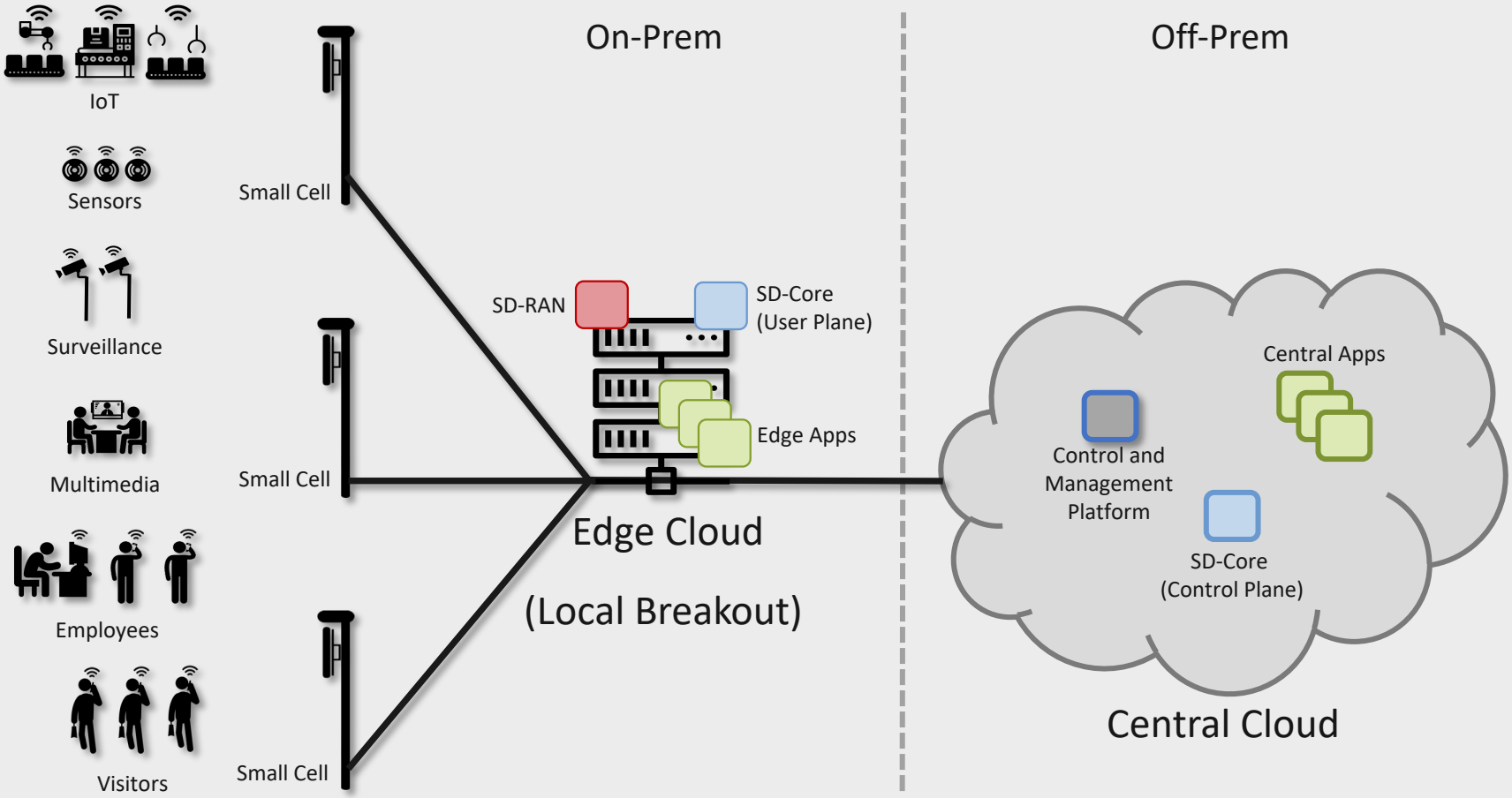


# Operational Deployment Since December ’19

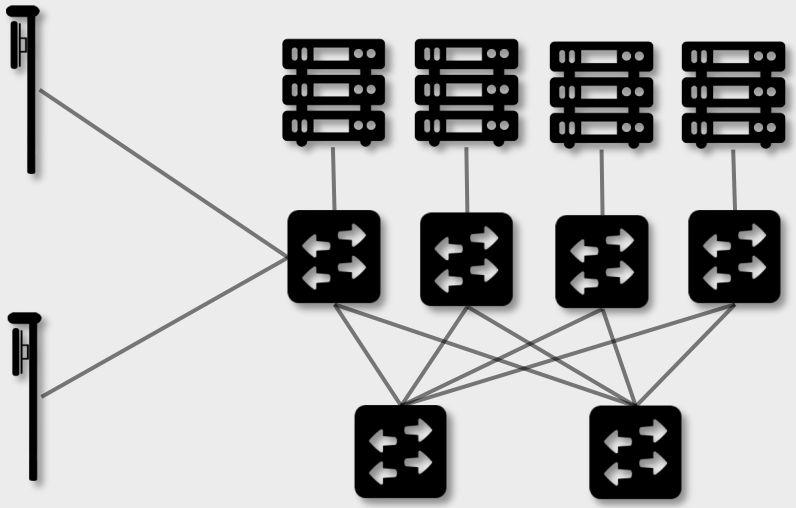



An Open Source Private 5G Platform

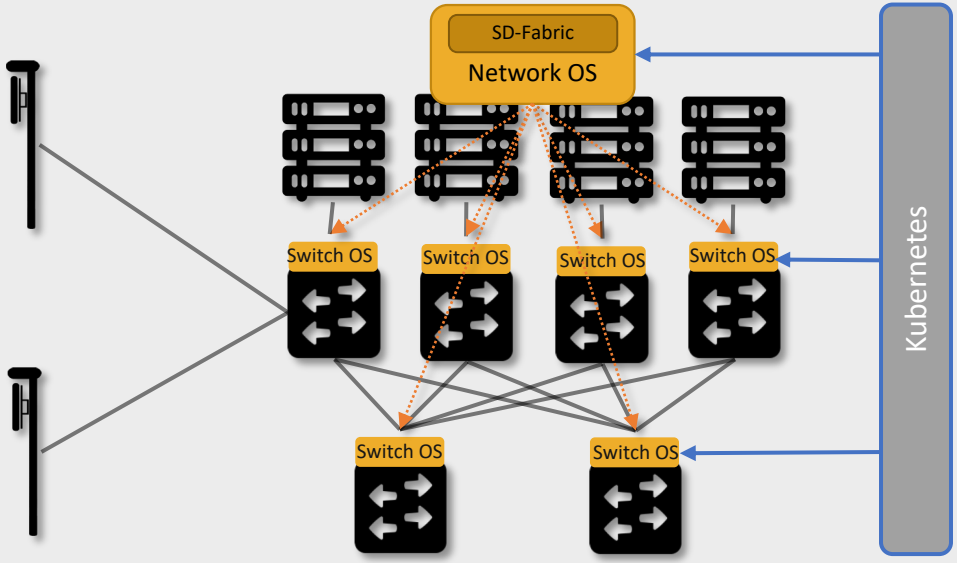
# AETHER OVERVIEW



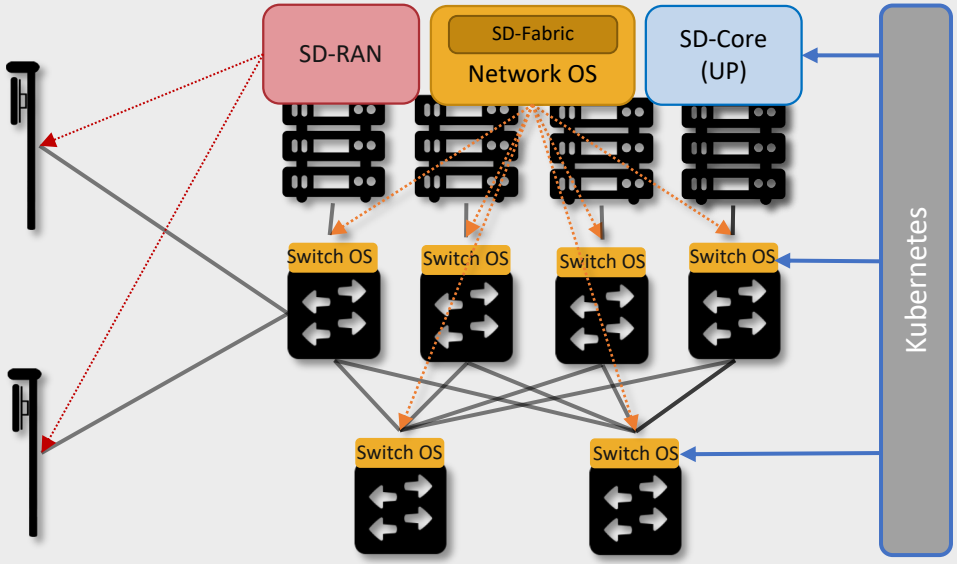
# AETHER HARDWARE



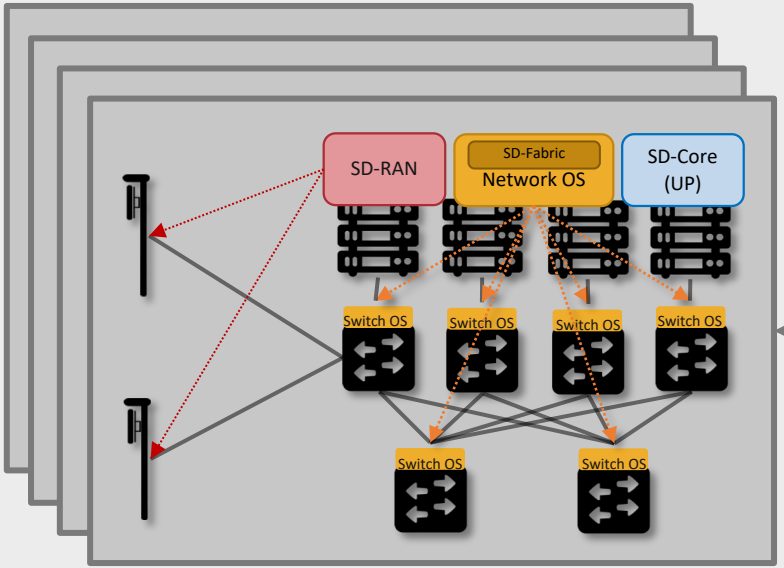
# AETHER PLATFORM



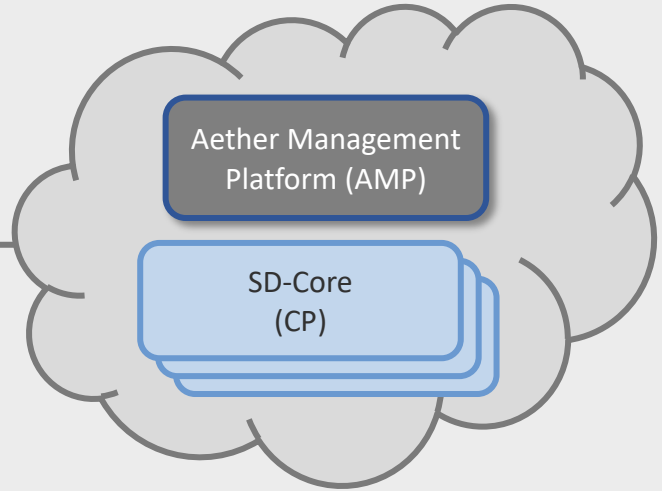
# AETHER CONNECTIVITY SERVICE



# AETHER AS A MANAGED SERVICE

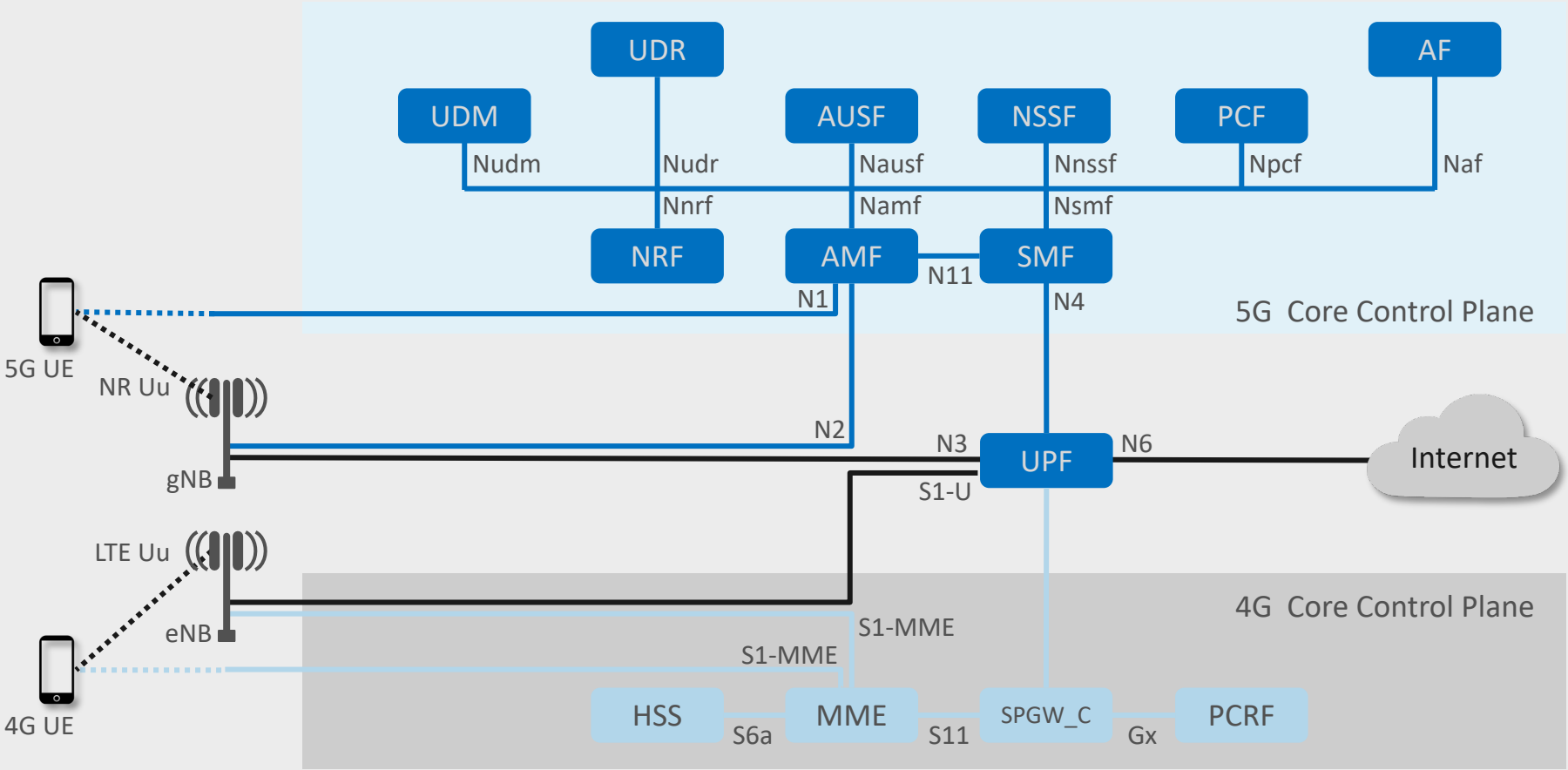



Aether Connected Edge (ACE)

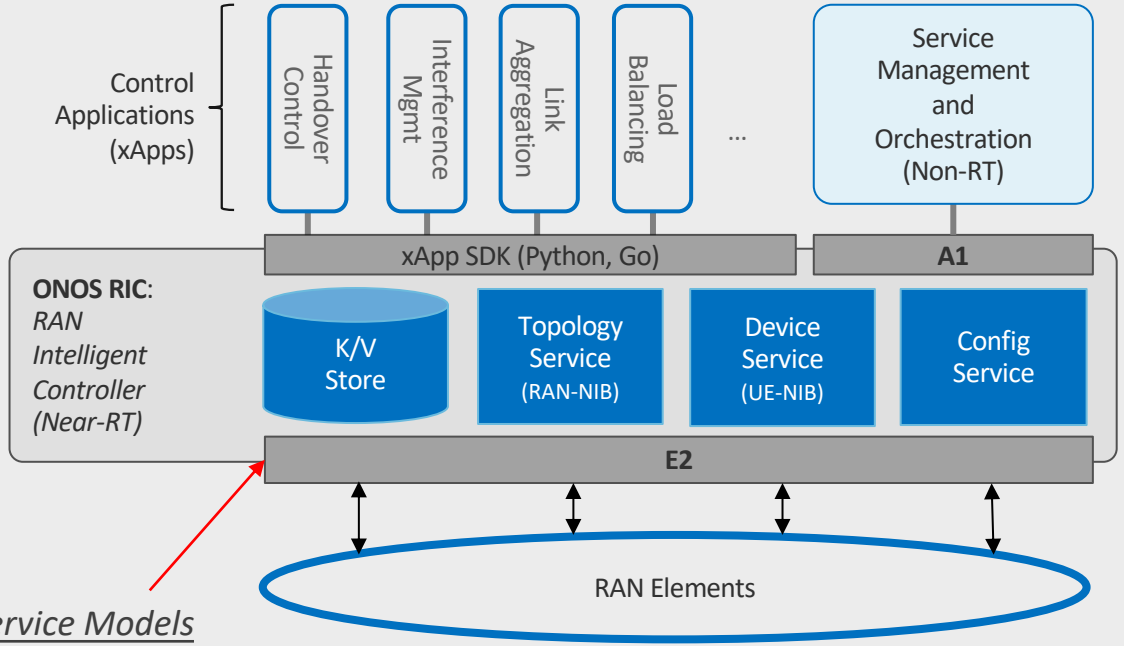



Central Cloud

# SD-Core: Cloud Native Control Plane



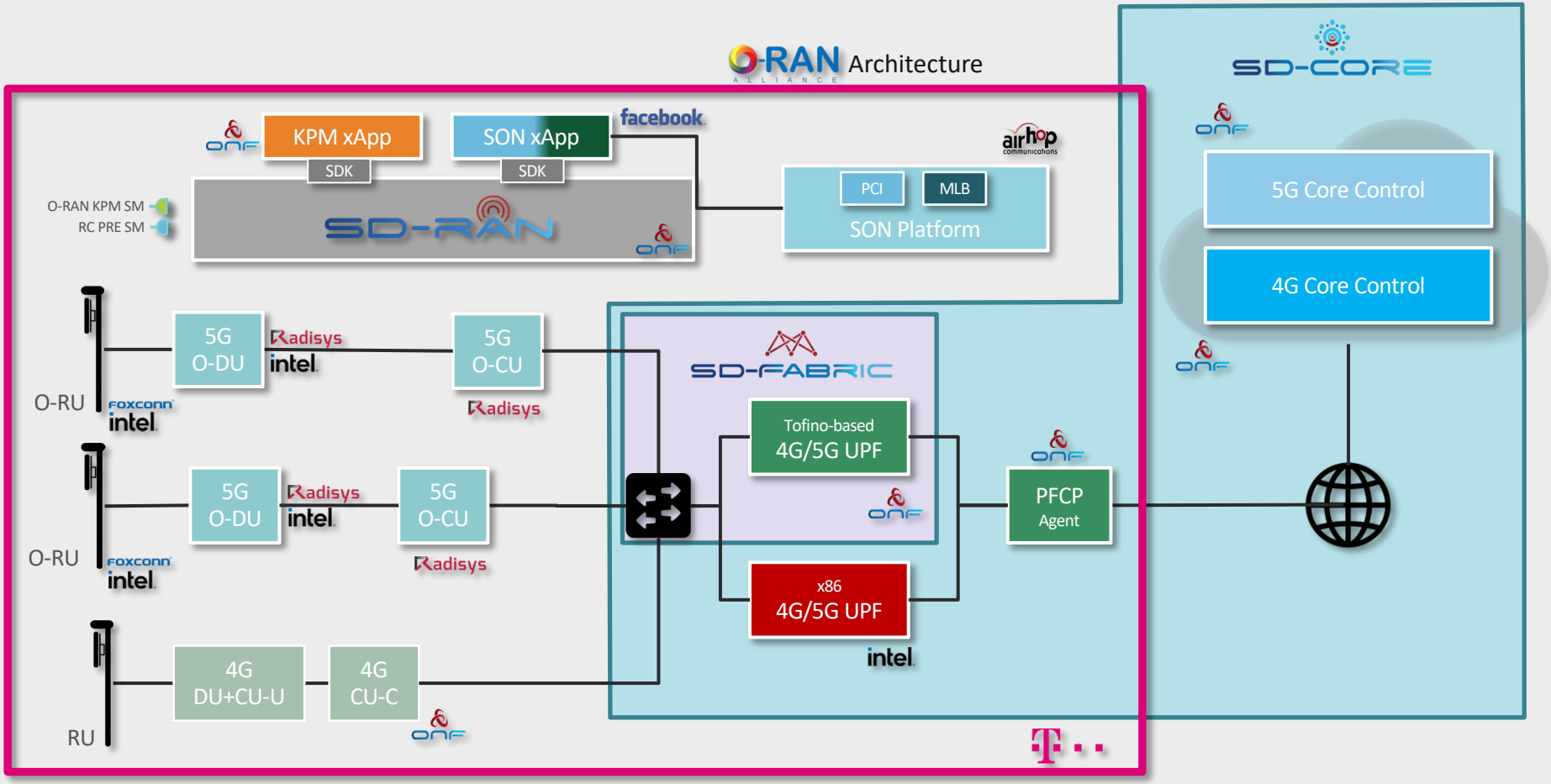
# SD-RAN: SDN-Based RAN Control



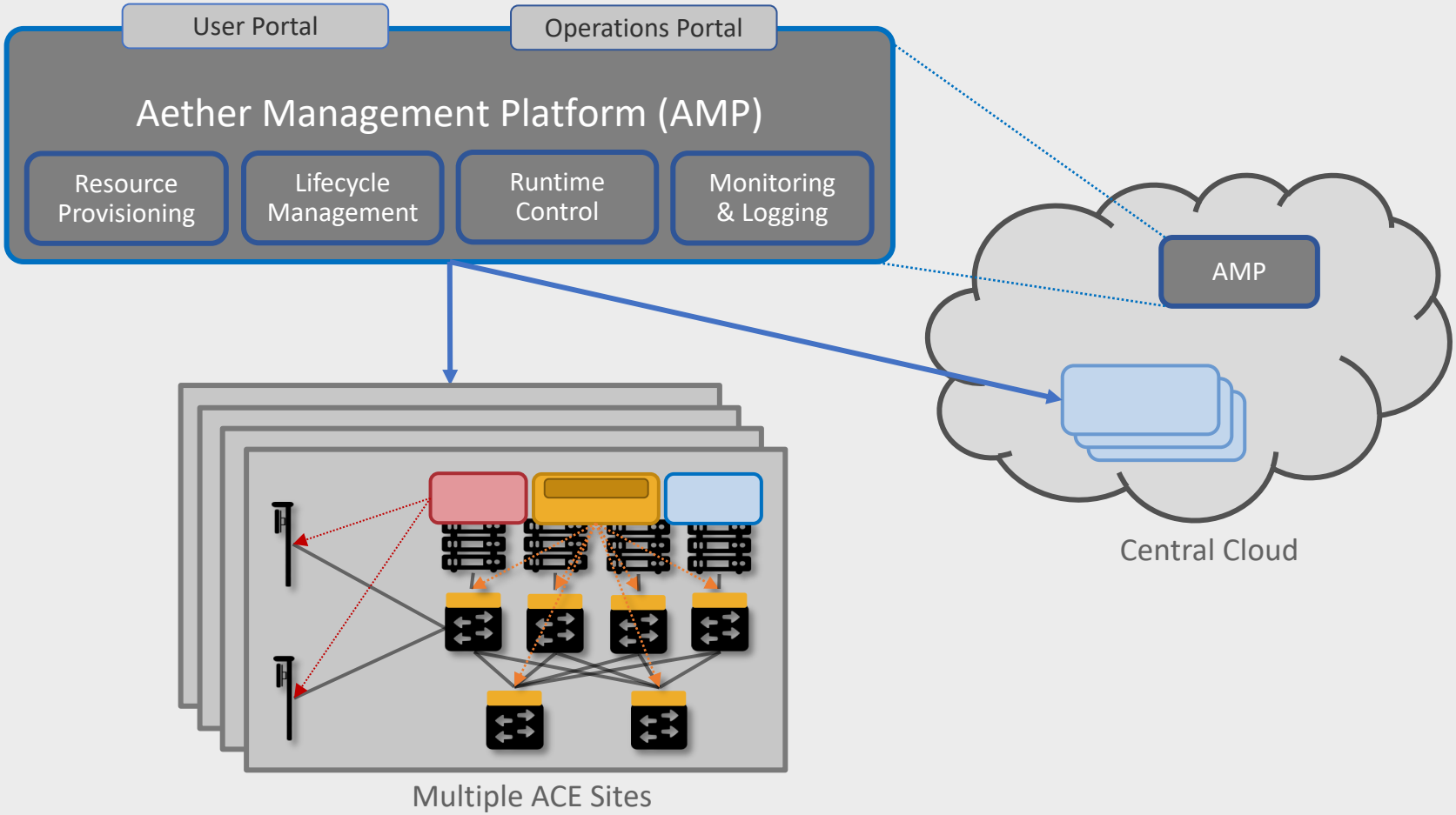

*Supports O-RAN Service Models*

- *E2SM-KPM*
- *E2SM-RC*

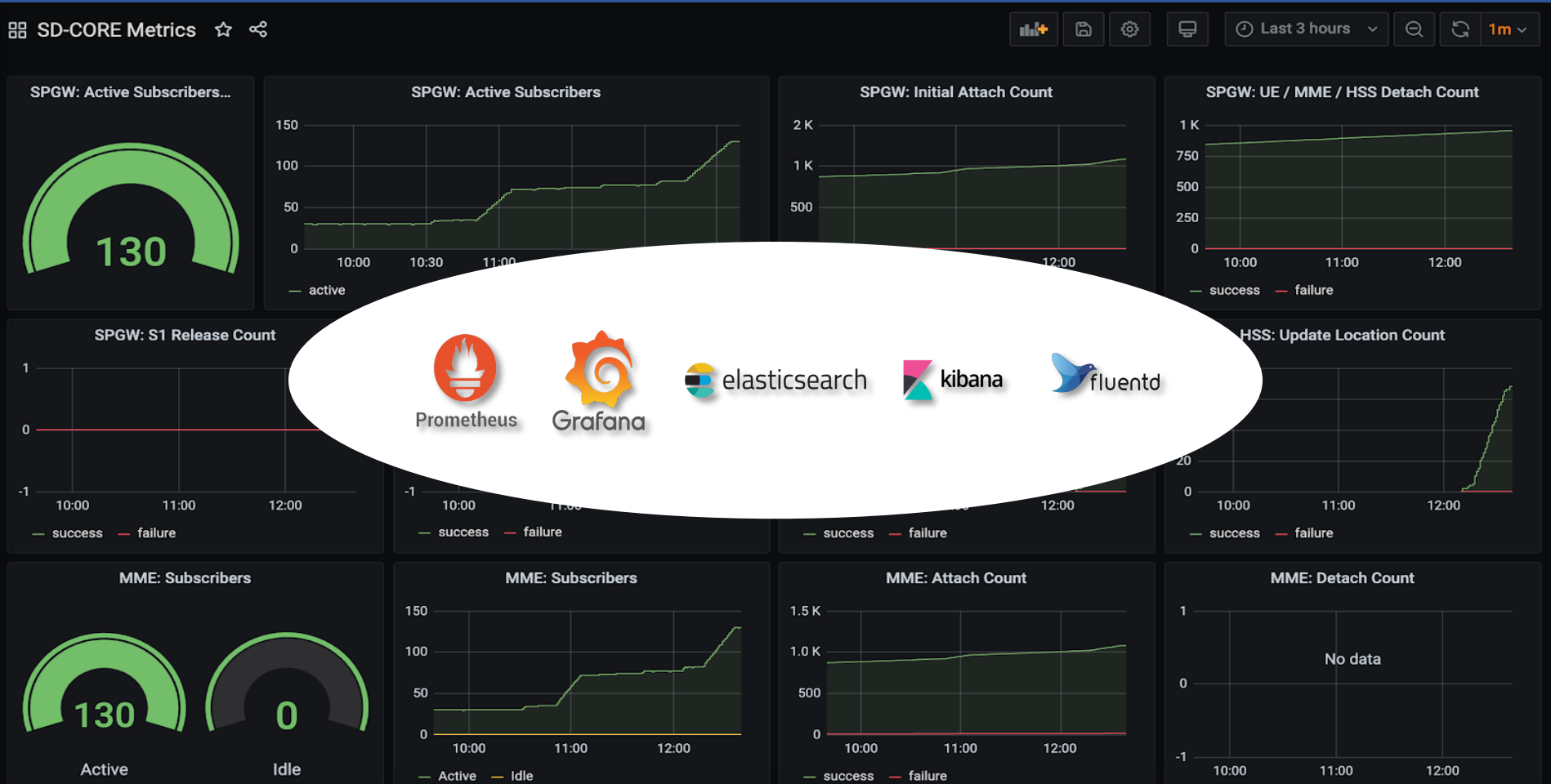
# Berlin Open RAN Field Trial



# Aether Management Platform



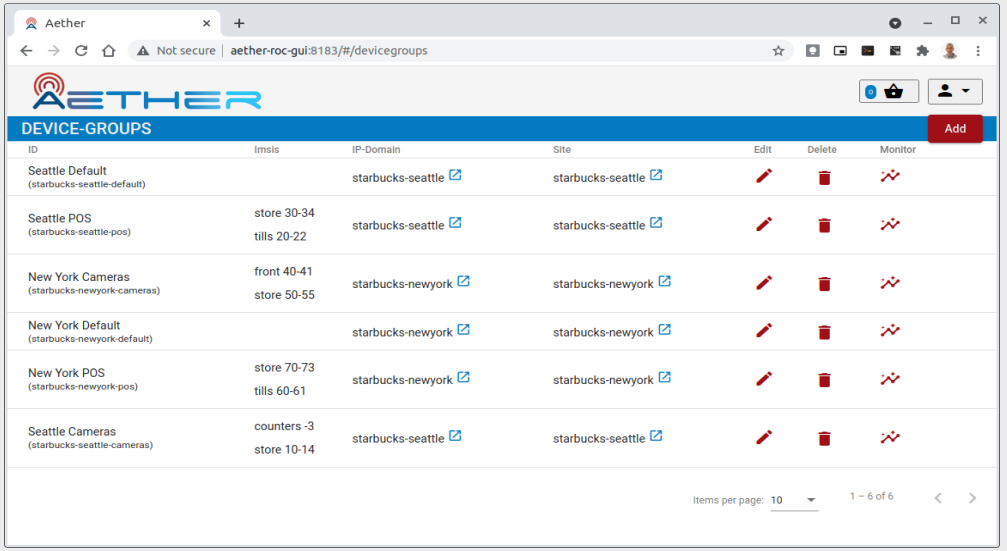
# Monitoring & Logging



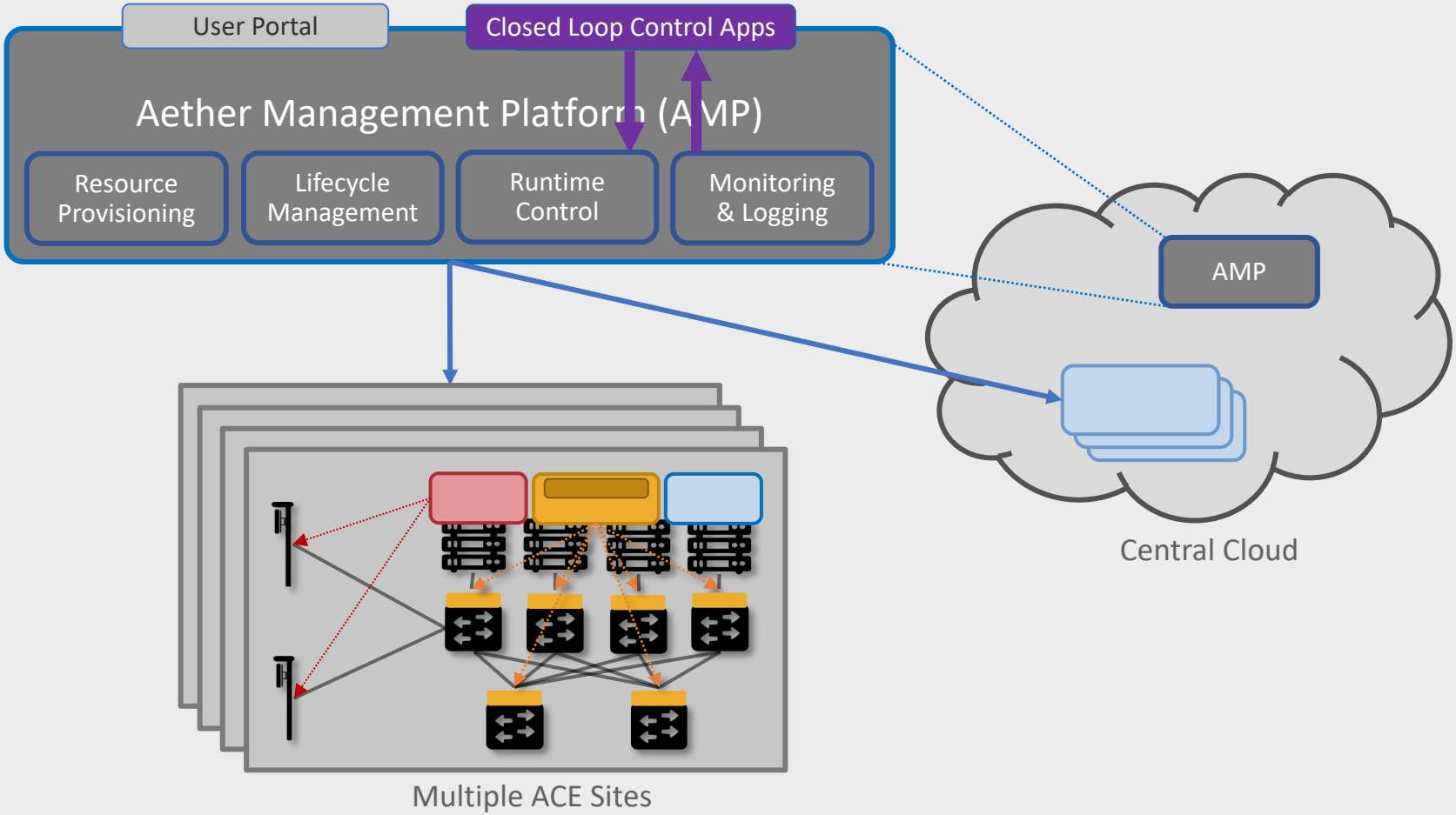
# Runtime Control API

Programmatic API and Enterprise Portal to…

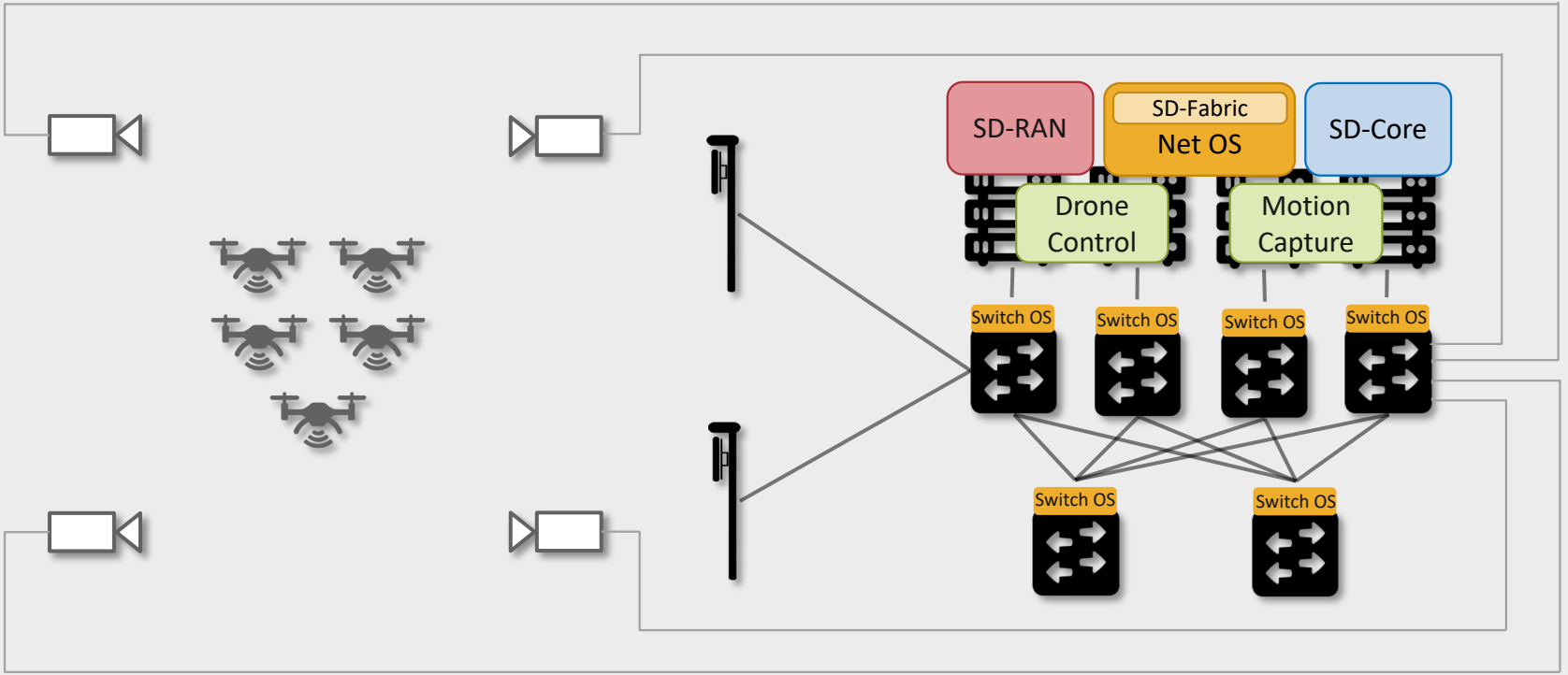
- *Manage Devices and Device Groups*
- *Define Slices to Isolate Traffic*
- *Set QoS Parameters for Slices*
- *Assign Device Groups & Applications to Slices*
- …



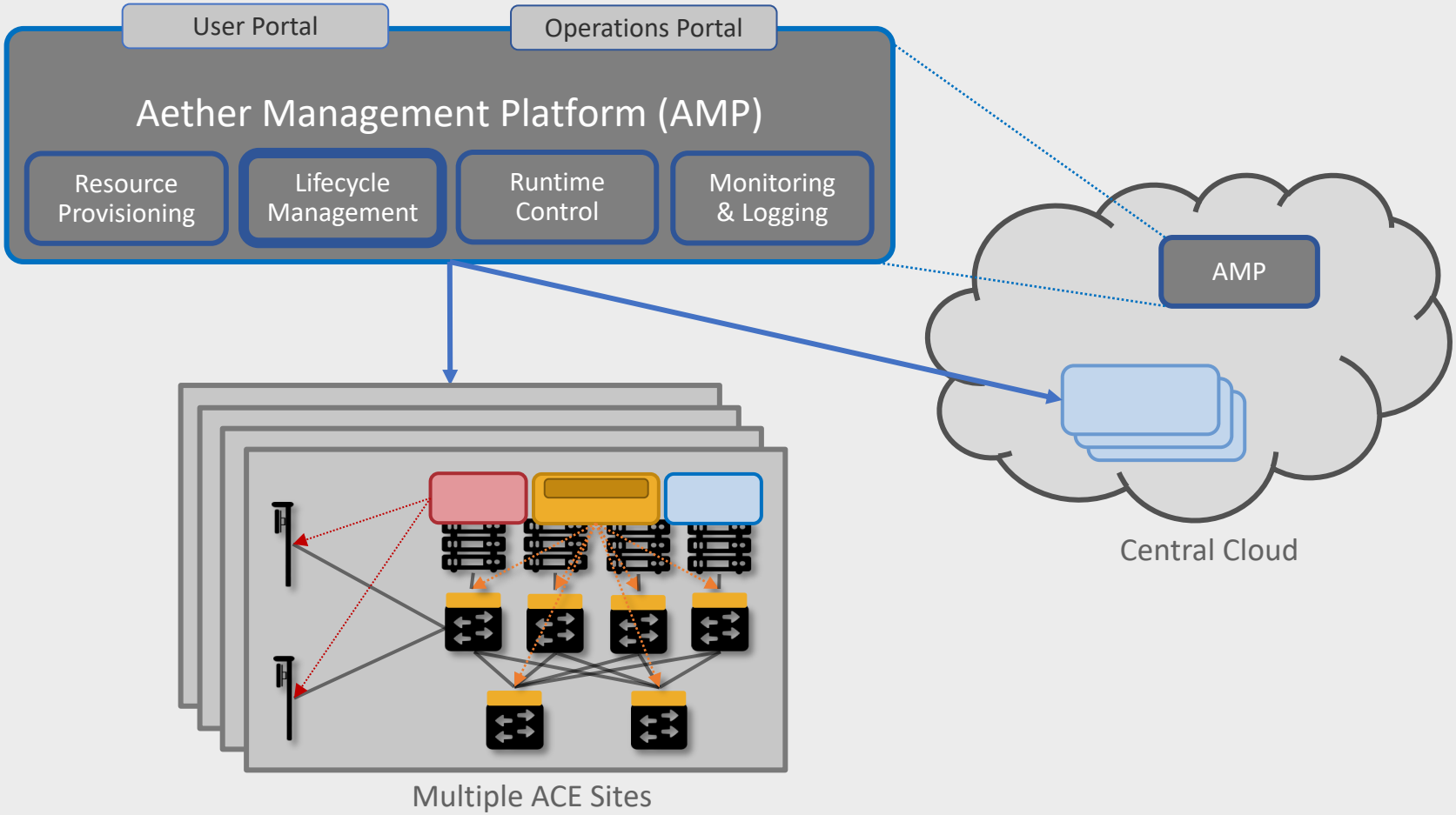
# Closed-Loop Control



# Closed-Loop Control Demo

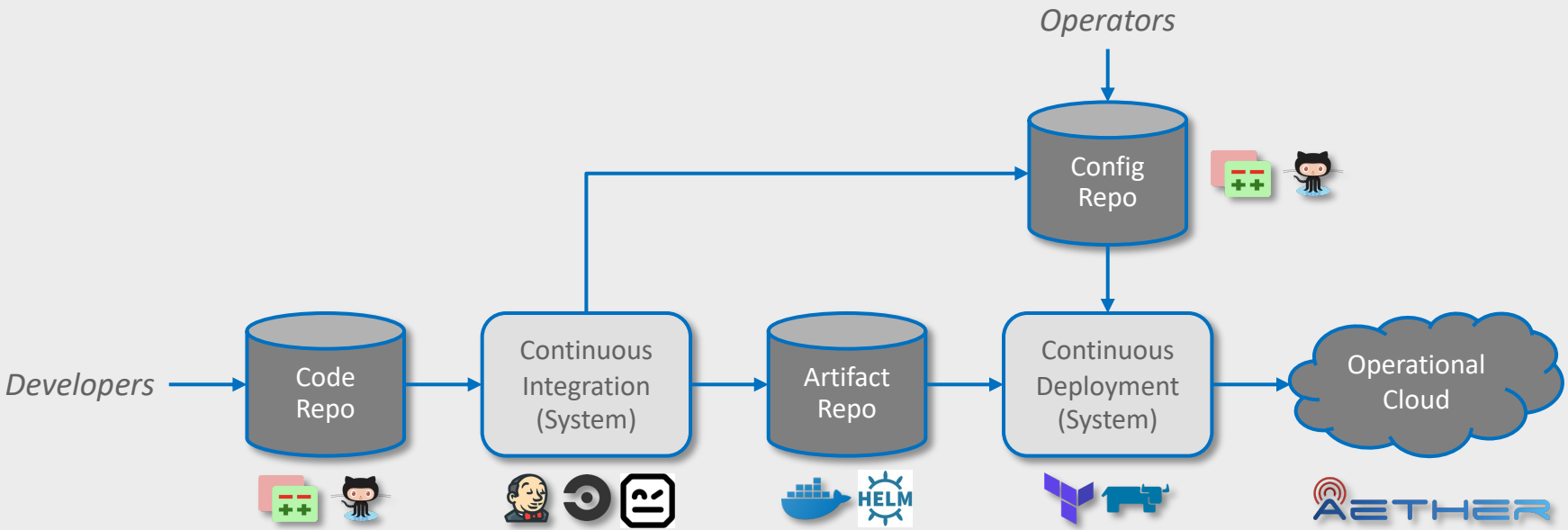


# Aether Management Platform



# LIFECYCLE MANAGEMENT

(Continuous Integration / Continuous Deployment)



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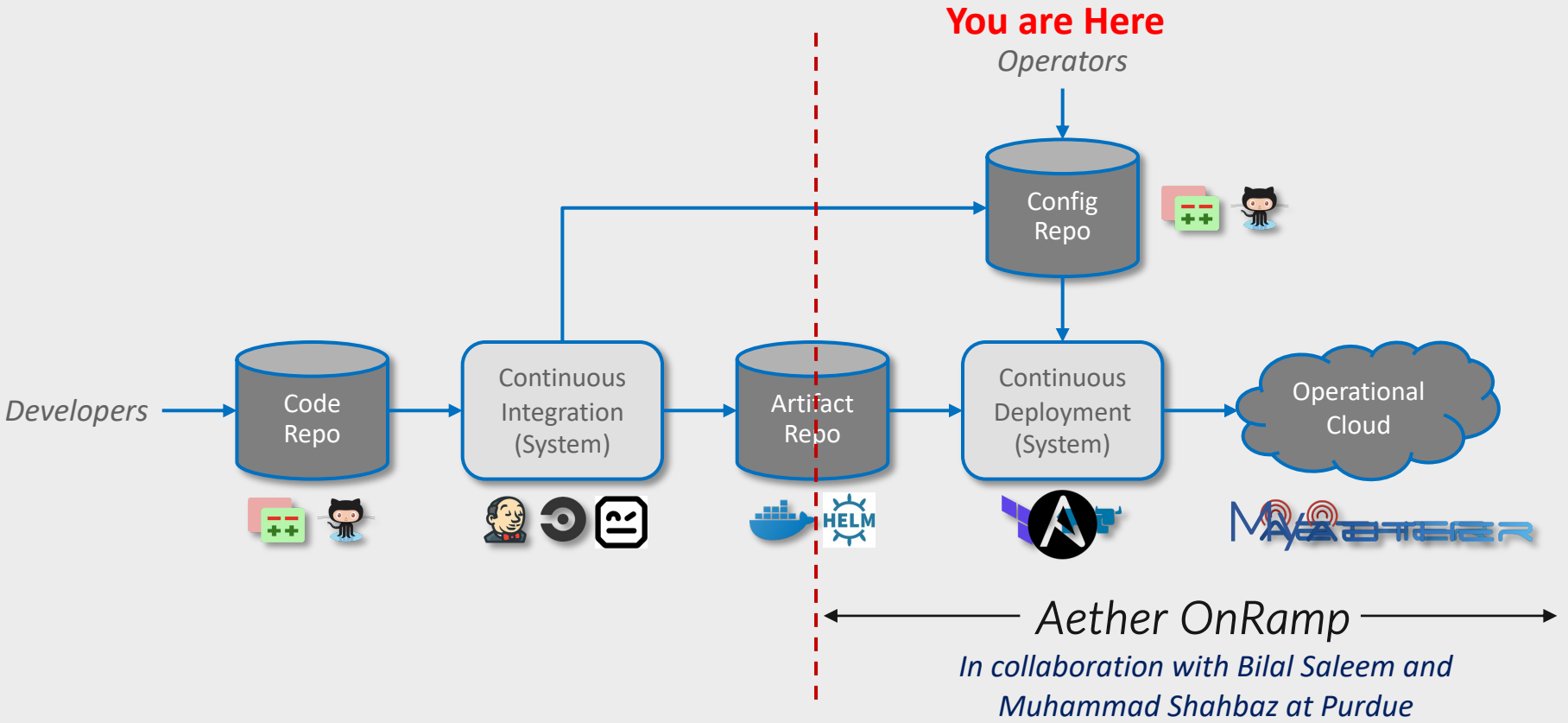


# AETHER ONRAMP

Transitioning Aether: Managed Service → Deployable Platform

- *Includes tooling needed to run as a managed cloud service*
- *Overriding goal is to support users "owning" the configuration*
- *In support of Education, Research, Field Trials, Commercial Deployments*

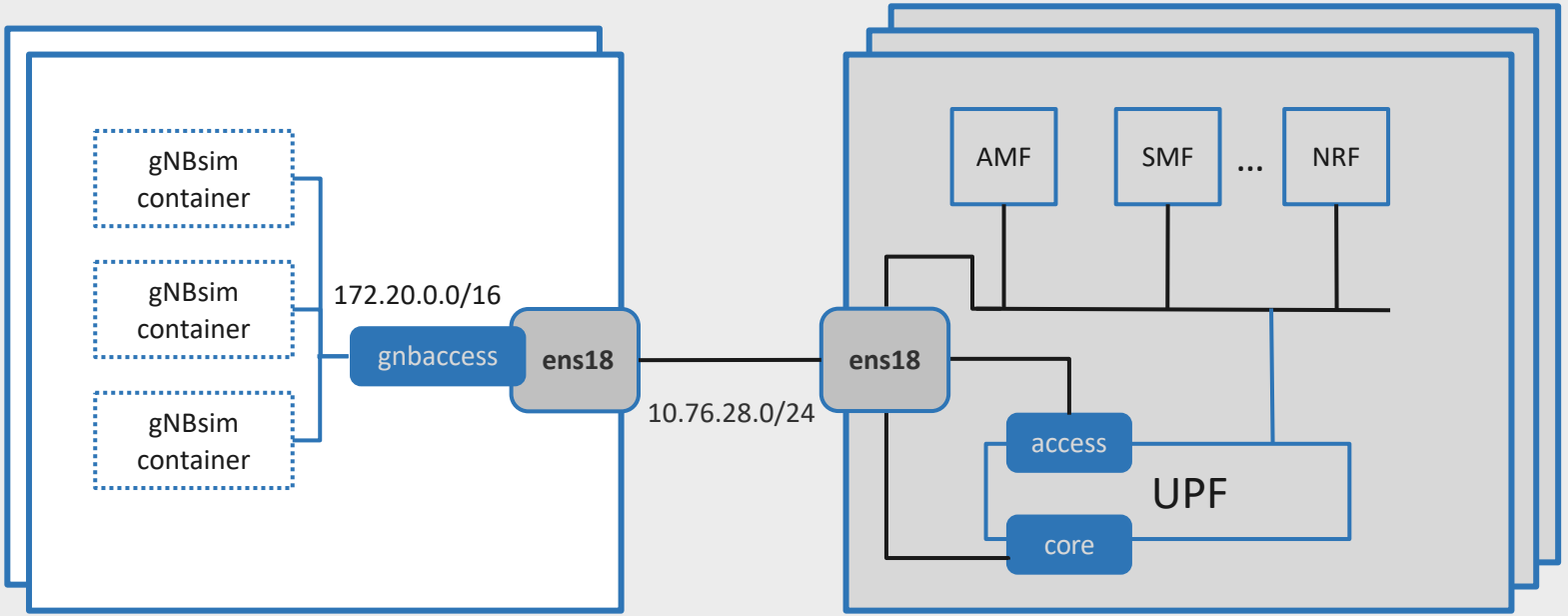
Designed to scale up for different target environments

- *Single Server / Emulated or Physical gNBs*
- *Single Site Cluster / Emulated or Physical gNBs*
- *Multi-Site Hybrid Cloud*

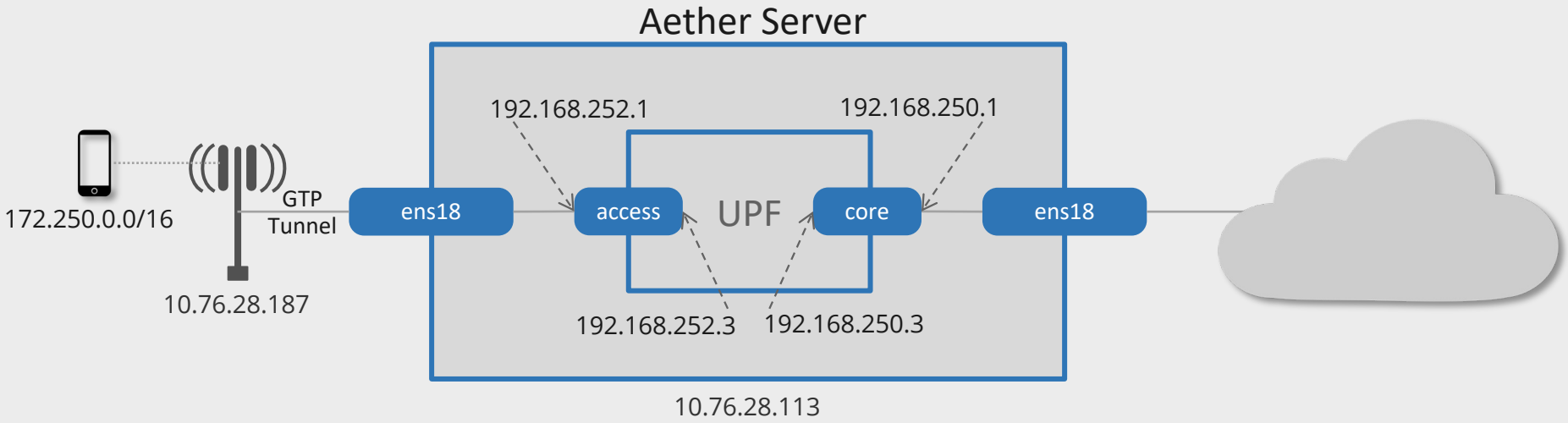
Designed to incrementally support additional features

- *Git Modules: aether-k8s, aether-5gc, aether-gnbsim, aether-amp, aether-sdran*
- *Ansible Roles: 5gc/roles/core, 5gc/roles/route, 5gc/roles/upf*
- *Ansible Vars: main-quickstart.yml, main-gNB.yml, main-eNB.yml, main-gnbsim.yml*
  - *Each defines a "blueprint" for deploying Aether*

# OnRamp: Emulated RAN



# OnRamp: Physical RAN



# ONRAMP: PHYSICAL RAN

AETHER
ONF CONTINUOUSLY CERTIFIED

Aether v2.2.0-dev - September 6, 2023

mosolabs

## MOSO CANOPY 5G INDOOR SMALL CELL

**Model #:** Model SCD5164
**Category:** Small Cell

MosoLabs Canopy Indoor 5G Sub-6GHz radios are designed to improve coverage and capacity, enabling you to build a secure and resilient private network.

# More Information

## Aether OnRamp

- Code: https://github.com/opennetworkinglab/aether-onramp
- Guide: https://docs.aetherproject.org
- Slack: https://onf-community.slack.com #aether-onramp
- Roadmap: https://github.com/opennetworkinglab/aether-onramp/wiki

## Aether Project

- Web Site: https://opennetworking.org/aether
- Wiki: https://wiki.opennetworking.org/display/COM/Aether
- TST Meetings: Tuesdays 10am PT (See Wiki for links)

## Background Reading

- https://5G.systemsapproach.org
- https://SDN.systemsapproach.org
- https://OPs.systemsapproach.org