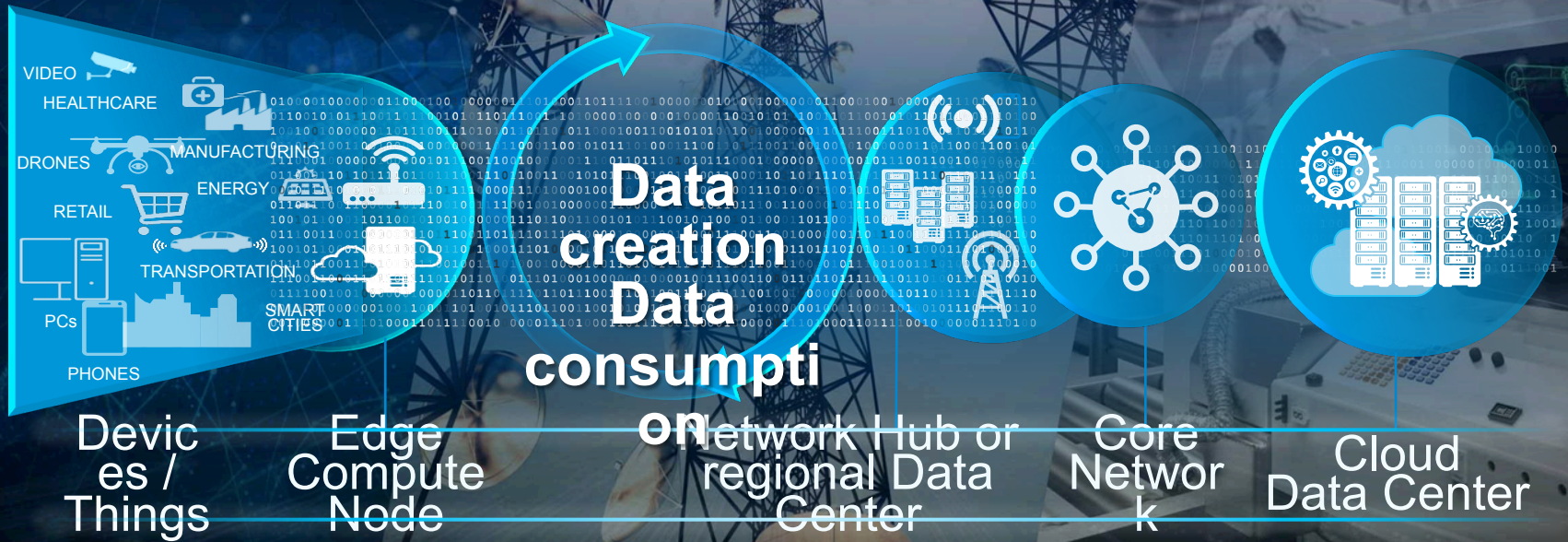
‘opening’ up for the Emerging ‘edge’

Pranav Mehta
Sr. Principal Engineer & Director
Infrastructure Research Lab

December 2018


Reimagining
THE
edge
>$30B
TAM OPPORTUNI
BY 2025
Source: IDC, Market view and Intel judgment

What is the edge?



5G accelerating edge deployments

By 2019, 45% of data will be stored, analyzed, and acted on at the edge

Devices / Things

Edge Compute Node

Network Hub or regional Data Center

Core Network

Cloud Data Center

Visual cloud – most compelling workload

Visual data source

- CONTENT CAPTURE
- CONTENT CREATION
- TRANSCODE

Network

- CORE
- NETWORK EDGE
- ACCESS

Visual data sink

- CONTENT CONSUMPTION

Media Processing & Delivery

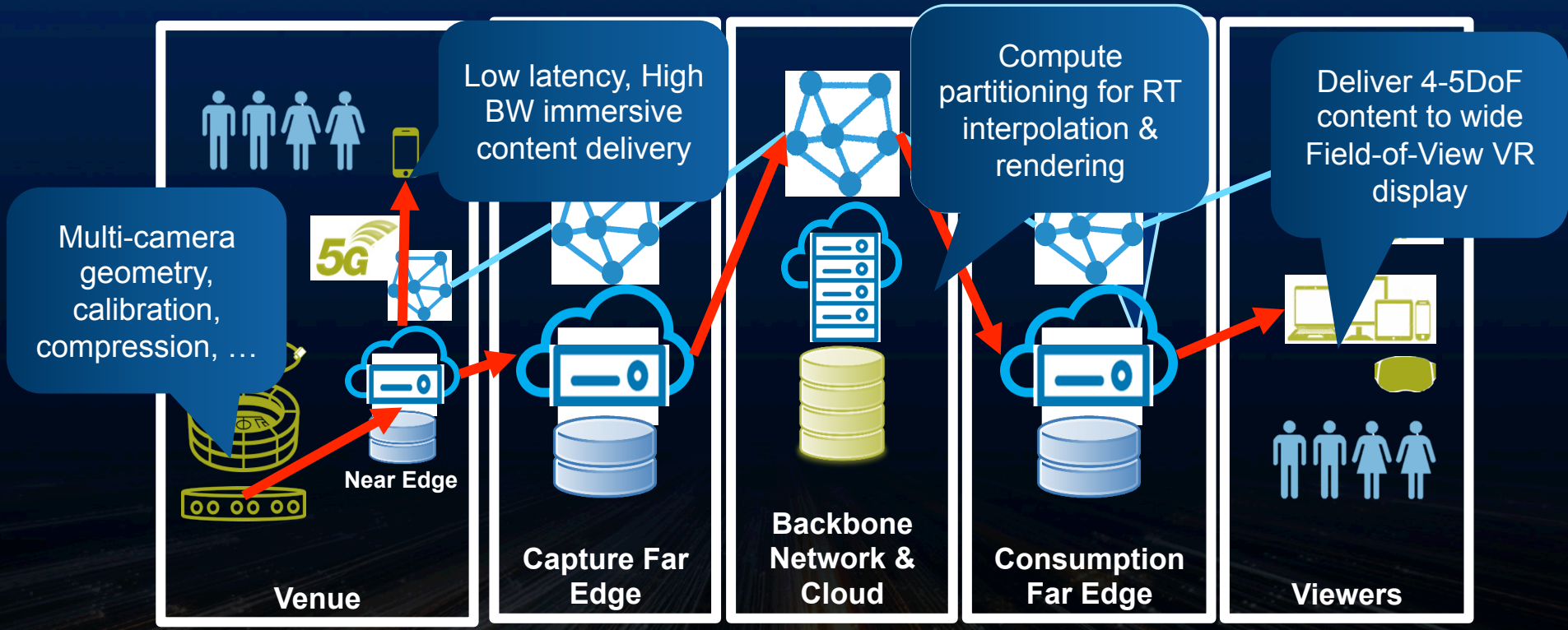
Media Analytics

Immersive Media

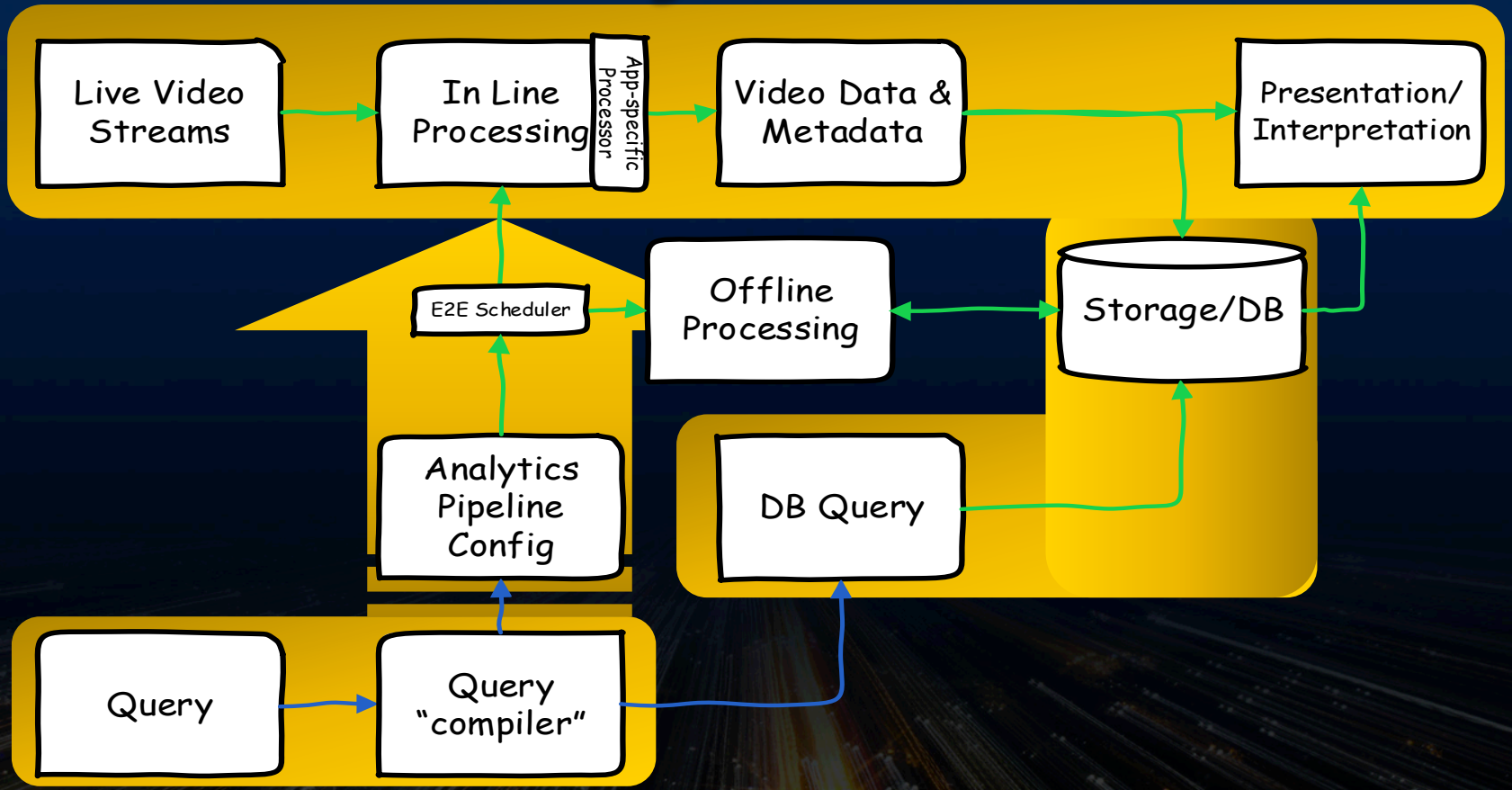
Cloud Graphics

Cloud Gaming

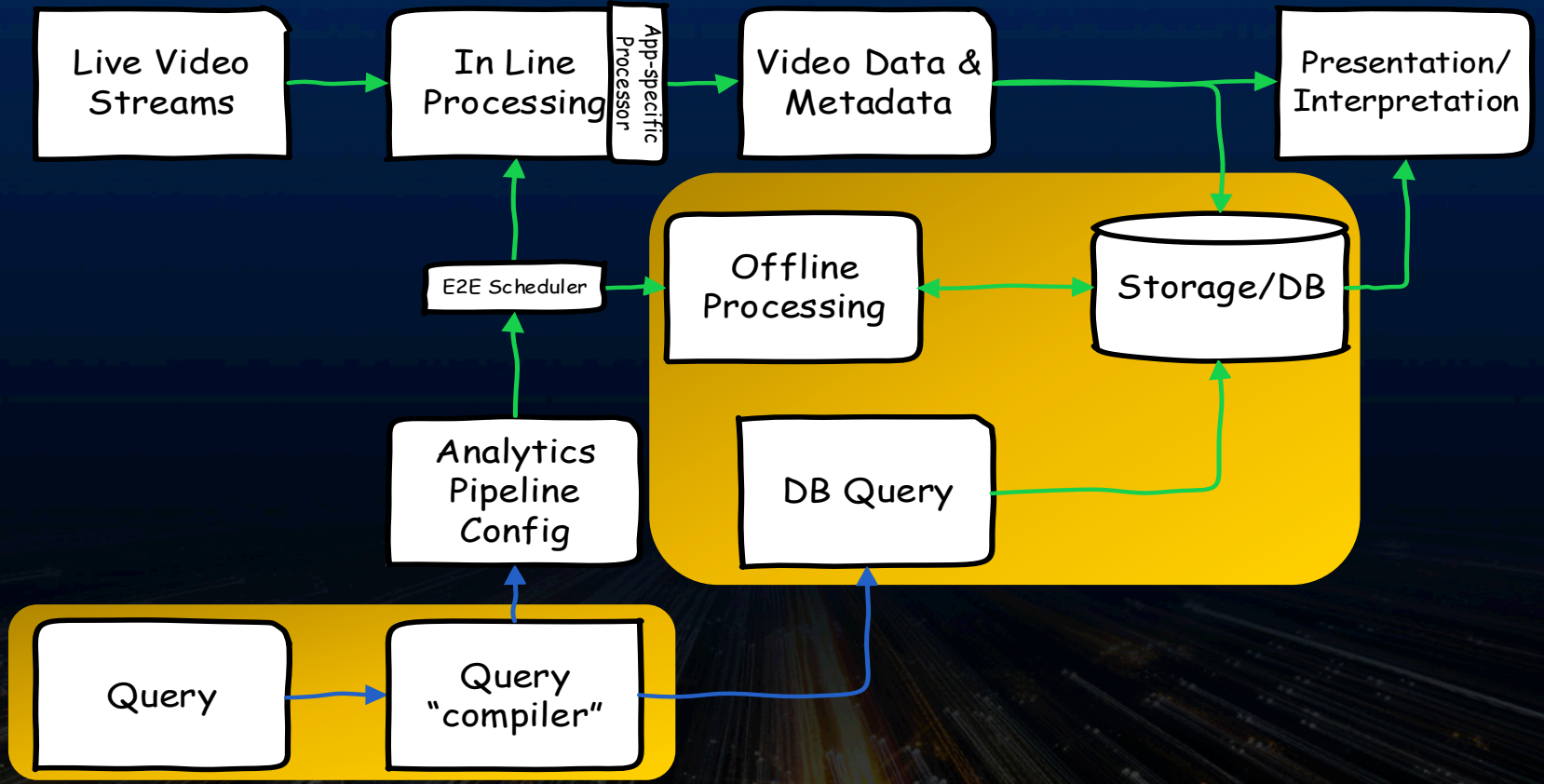
Immersive Media Use Case



Video Analytics Use Case



Video Analytics Use Case



Creating an 'open' end-to-end infrastructure

Edge Common Software Stack

Open source ecosystem

- Developer Environment & Platform
- Cloud Agnostic Edge with Orchestration
- Differentiated Edge Frameworks
- Industry Standard Interfaces with Optimized Perf Libraries

NETWORK FUNCTIONS

Enterprise & CLOUD CPE
(Routing, SD-WAN, Network Security, Application Delivery, Analytics)

Wireless access
(Basestations)

Cable
(vCCAP & PON)

Edge central offices
(vBNG, vEPC, CDN)

SILICON & PLATFORM TECHNOLOGIES

Intel® Xeon® Processor

Intel® Atom™ Processor

Intel® Ethernet Controller

Altera® FPGA

Intel® SSD

Intel 3D XPoint

Intel® QuickAssist

Intel® Quick Sync Video

Intel® Resource Director

summary

- The Evolving ‘Edge’ demands a New Infrastructure paradigm than simply extending the Cloud
- Visual Cloud Workloads offer unique insights for system partitioning challenges
- An ‘open’ End-to-End testbed – a necessity for creating an Agile and Vibrant ecosystem

Mobile & M-CORD

ONF Connect
2018

Where is the Edge for a Mobile Operator?

POP Sites

Backhaul Aggregation

Satellite Sites

(Metro Area Aggregation + Routing)

Regional Sites

DIA

Internet

App

RAN Virtualization

the "Edge"

Reminder - Your Edge CANNOT go past your RAN if you want to be efficient

Edge Drivers

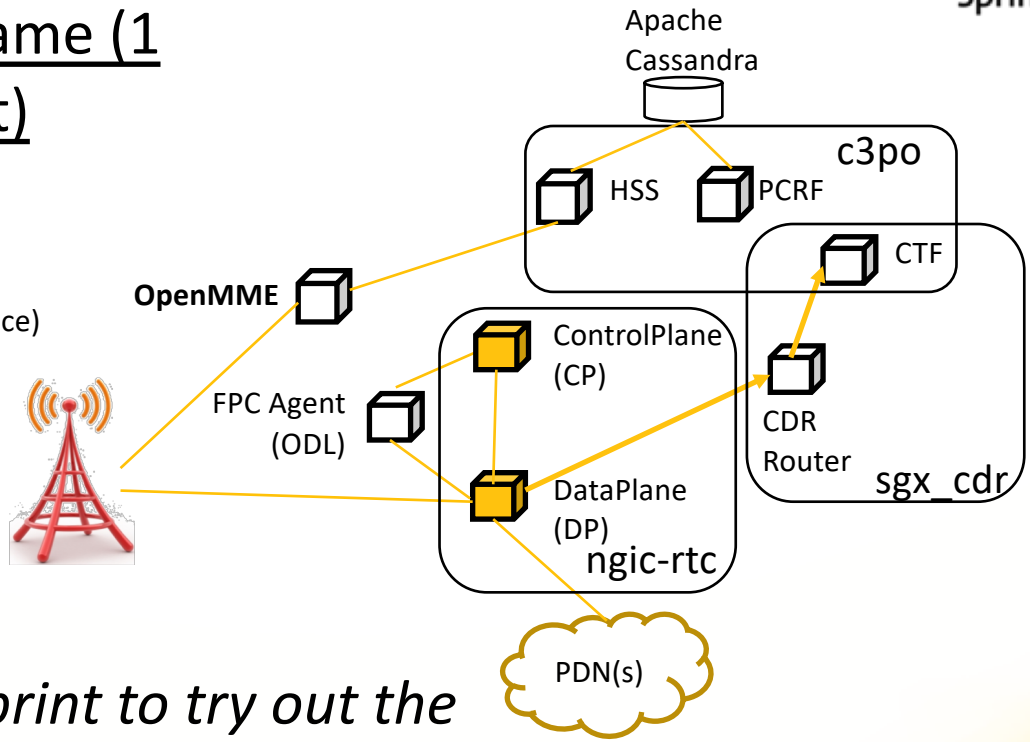
- Application requires it & must move closer
- Sites are too big to fail
- Service/Customer requires it

M-CORD Projects with Sprint/Intel/GS Labs

Recommended “Starter” Frame (1 instance of each component)

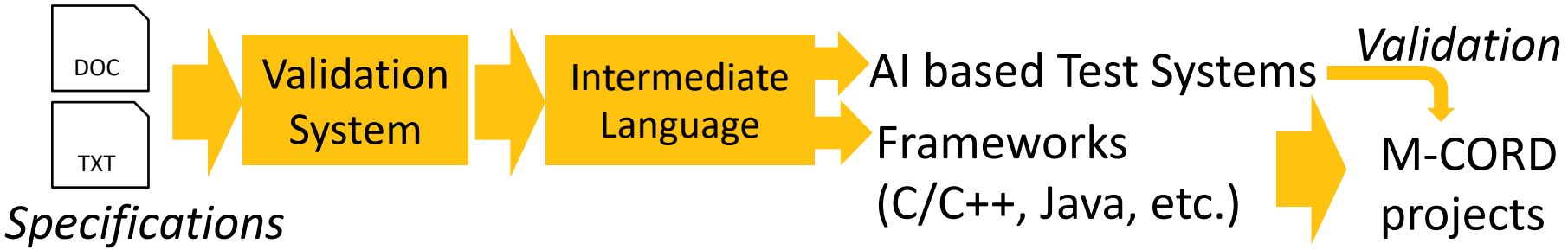
40K Users
1K Control Plane TPS
42-80 CPU Cores

System scale (via Cassandra) is ~1B endpoints (1 key space)
Designs exist for 1*10^18 scale



“frame” - a minimum footprint to try out the solution. Each component can scale higher.

We do more than build functions



To date

- validation code has caught ~4K specification defects/nits
- Spec to code is
  - up to 20 hours of work (dependent upon # of errors)
  - Average is ~90 minutes for documents following existing formats
- *We can rapidly prototype features with scale*

M-CORD and Sprint – The road ahead

Spec 2 Code

- Generation support for GTP, Sx, NAS and Open API
- Automated AI test generation for any protocol

5G

- ngic_rtc support for Sx and possibly N4
- Option 3x for all components

Readiness

- UPF / Control plane readiness for field testing
- License support process (with partners)

Research

- NGC (as specifications are ready)
- 4G scale & feature testing

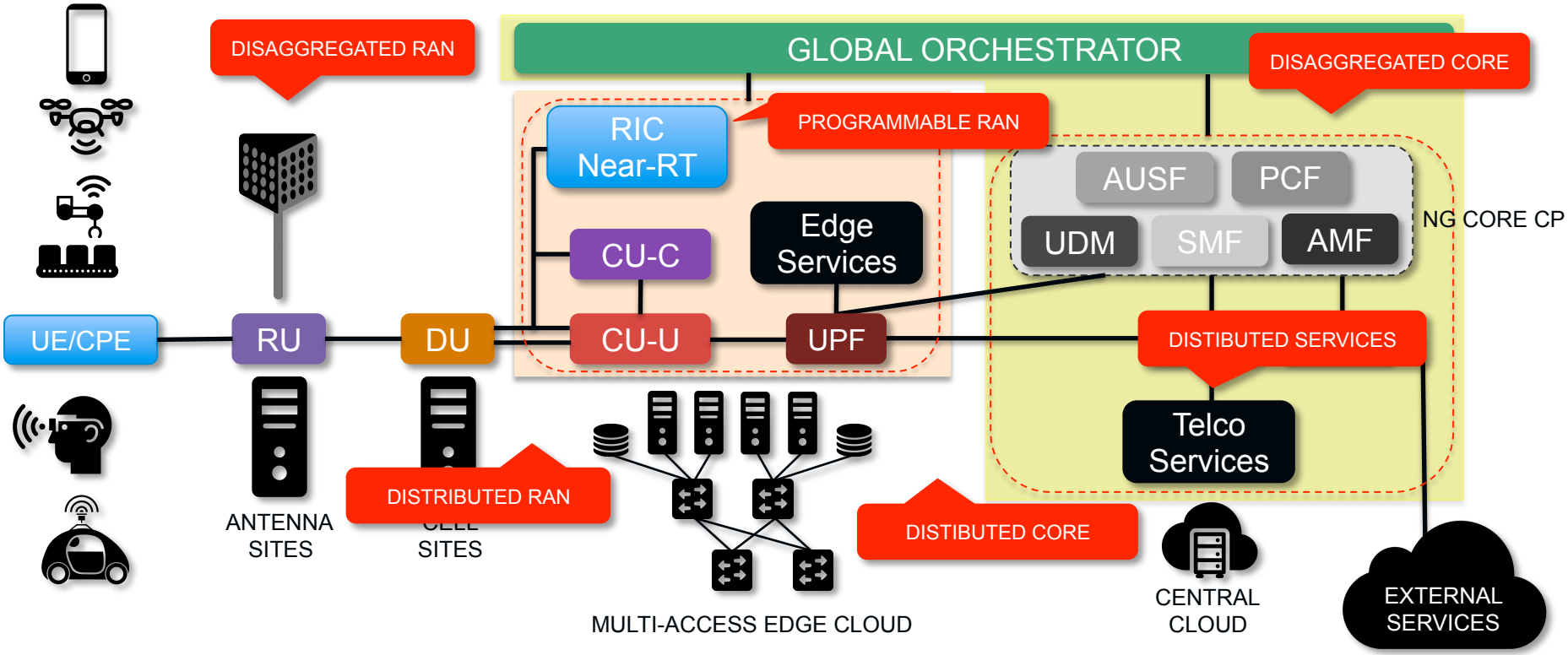
MOBILE EDGE CLOUD

Trailblazing Activities at ONF on Their Paths Towards New RDs

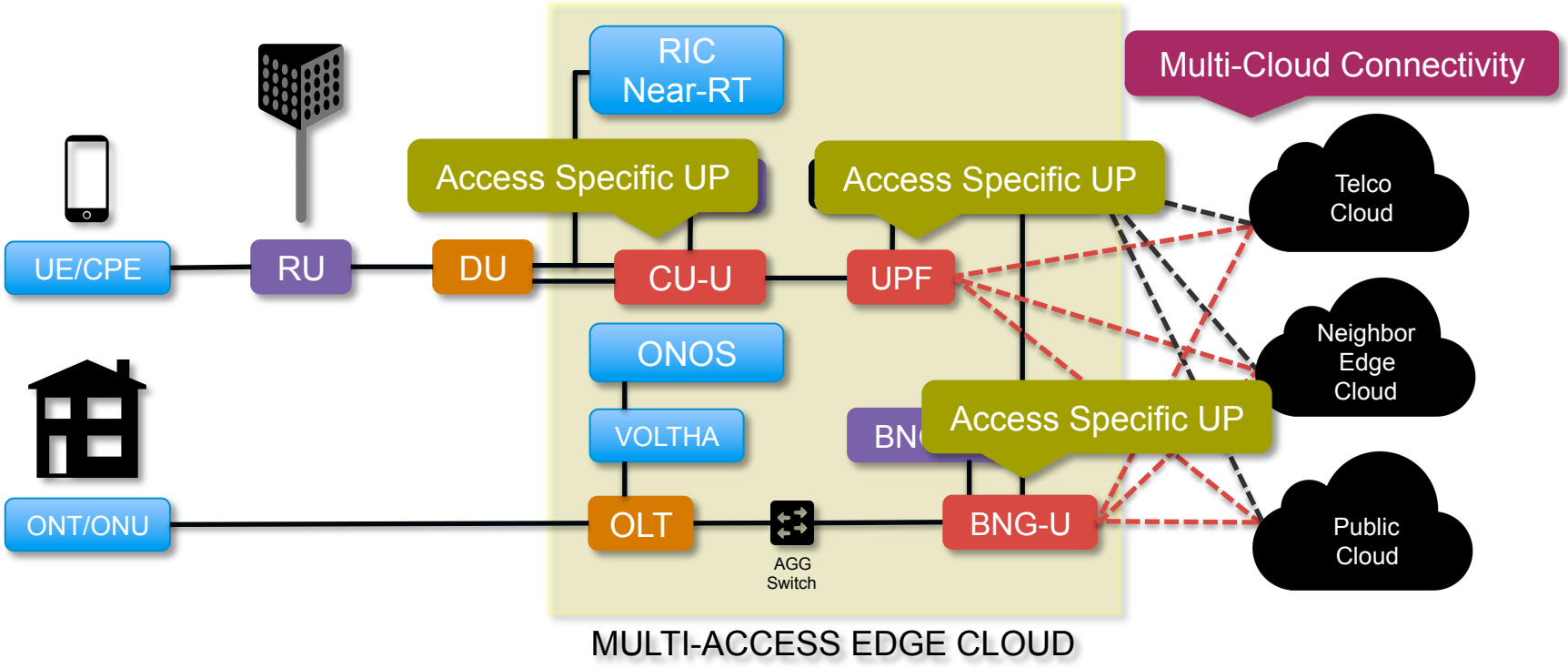
Oğuz Sunay
Chief Architect Mobility
December 6, 2018

5G Needs an Edge Cloud

Enabling Disaggregated, Distributed RAN, Core and End-User Services



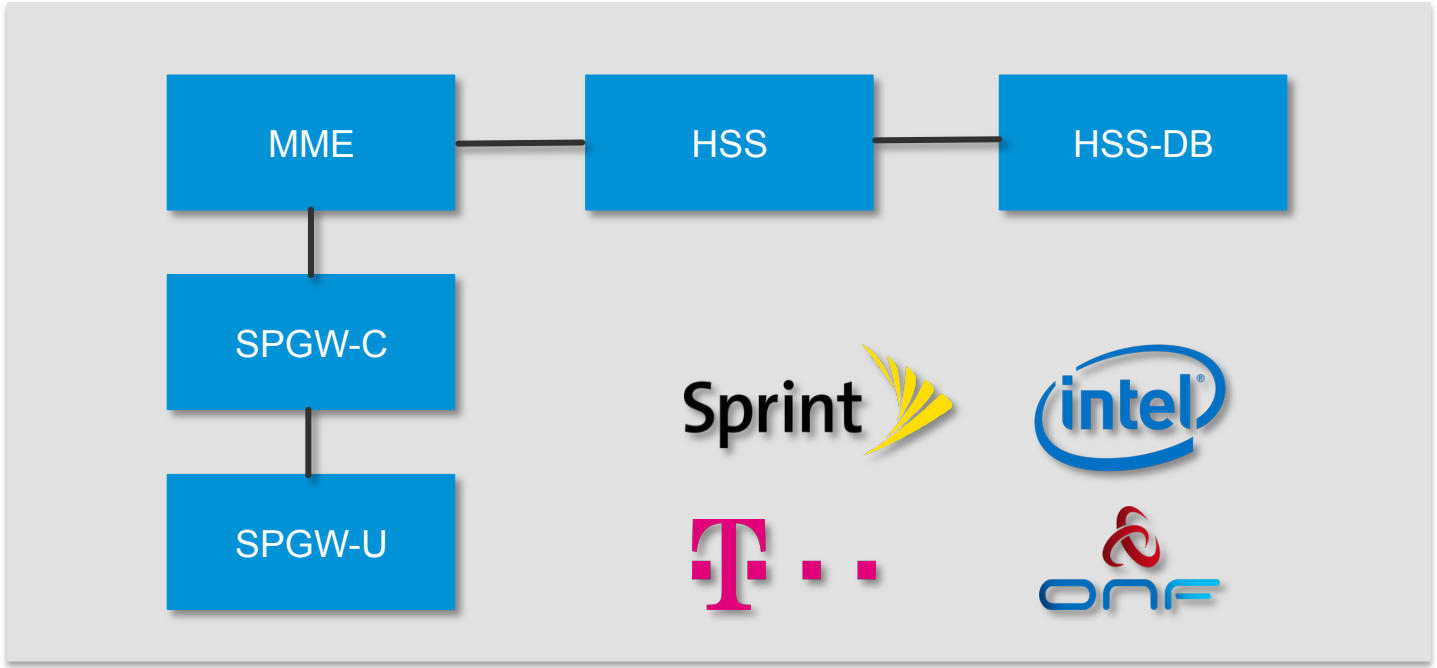
Zooming in on the Edge
Needs to Support Multi-Access



Converged Access and Core

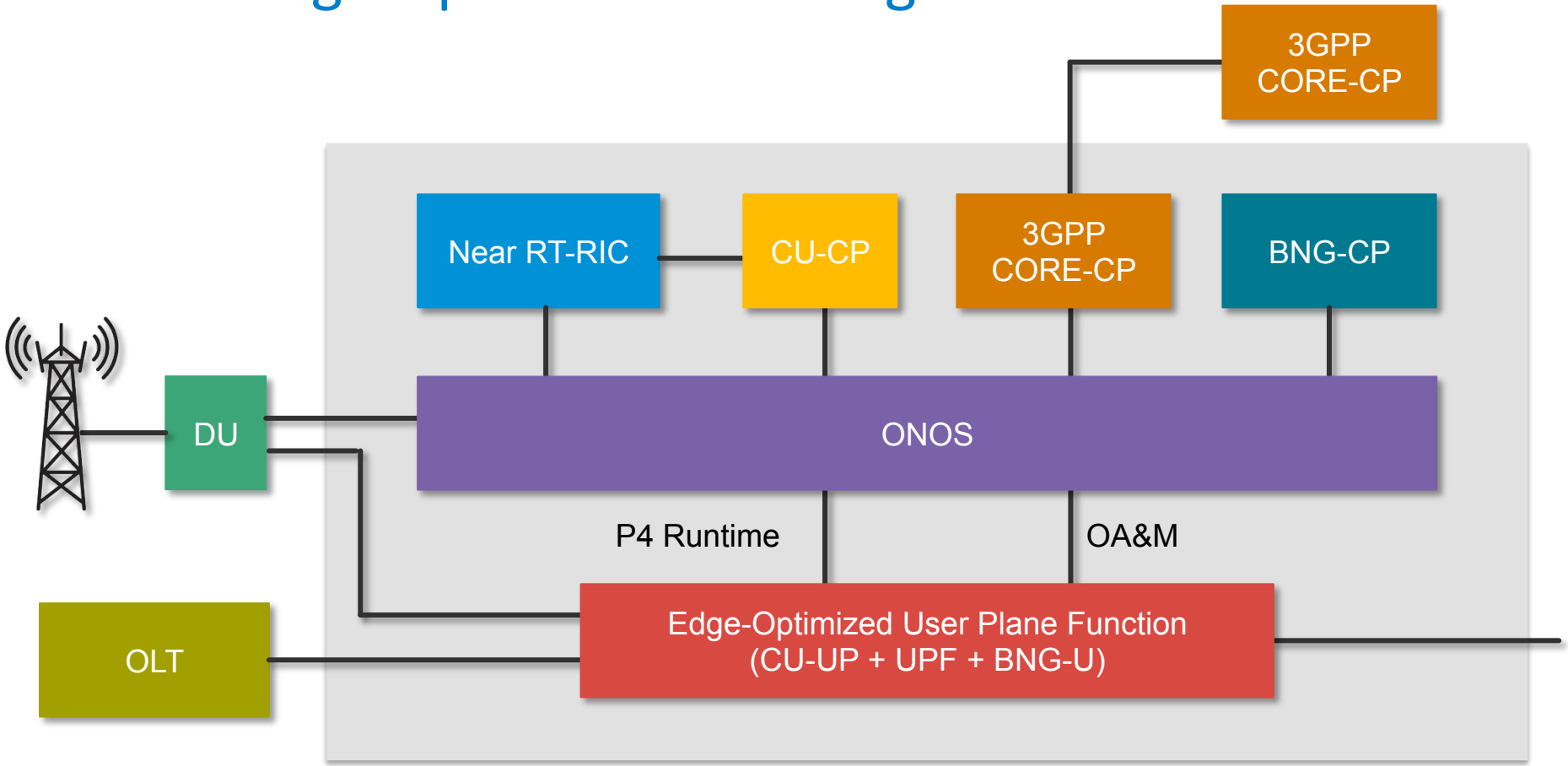
On the Path Towards a New RD

Light-Weight Open Source EPC
Towards Productization with a Tight Timeline

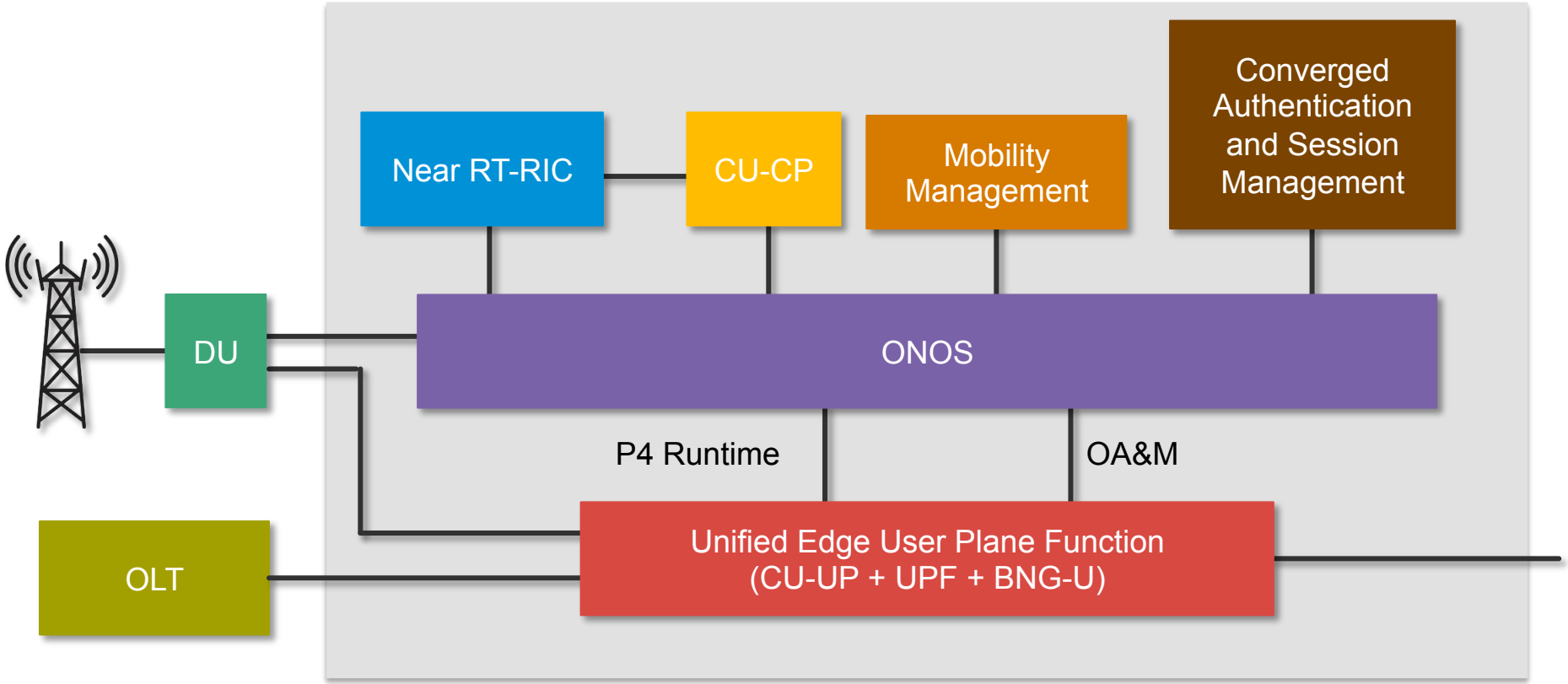


Focus on **Fixed Mobile Substitution** Service
Minimum Viable Product Desired

Edge Optimized Converged User Plane



Edge-Optimized Converged Control Plane

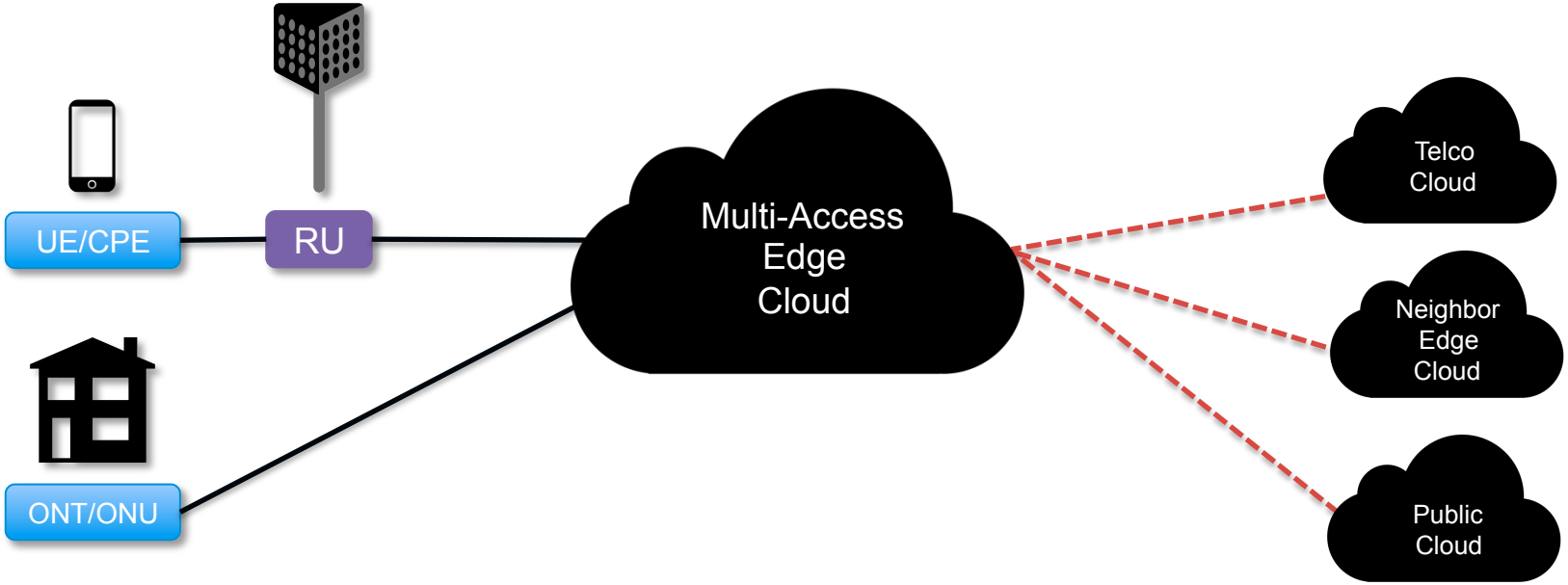


Multi-Access Edge Cloud

On the Path Towards a New RD

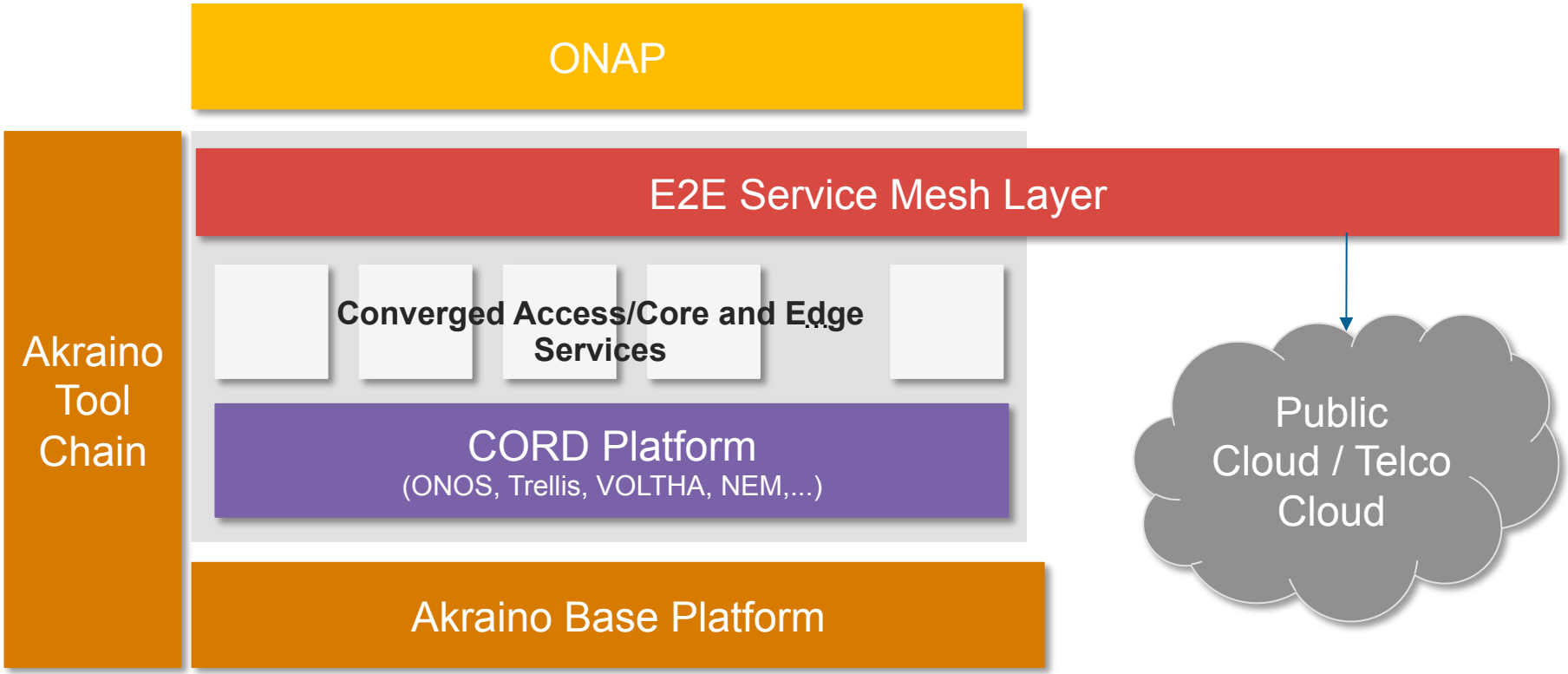
Multi-Access Edge Cloud

Enabling Distributed Services Across Multiple Clouds



Multi-Access Edge Cloud

Integrated Solution Leveraging Complementary Open Source Solutions



Open Call for Active Participation

Let us enable the open source Multi-Access Edge Cloud Towards Converged 5G – Broadband Access Enablement