

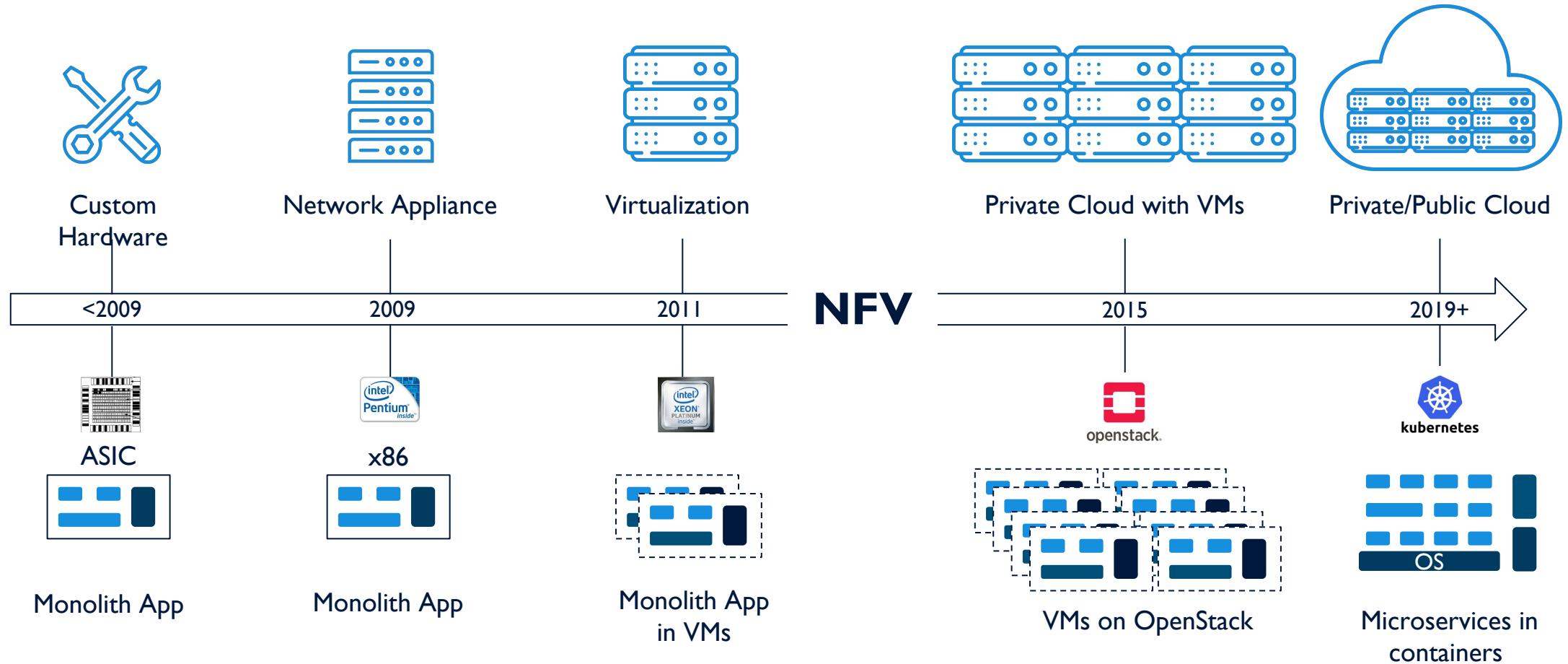
E2E 5G Cloud Native Network

Heather Kirksey, VP, Community & Ecosystem, *Linux Foundation*

Azhar Sayeed, Chief Architect, *Red Hat*

Fu Qiao, Technical Lead, *China Mobile*

NFV Cloud Journey



LF Networking Leads Modern Networking Innovation



70% of the world's mobile subscribers represented by LFN membership



Ecosystem Partners

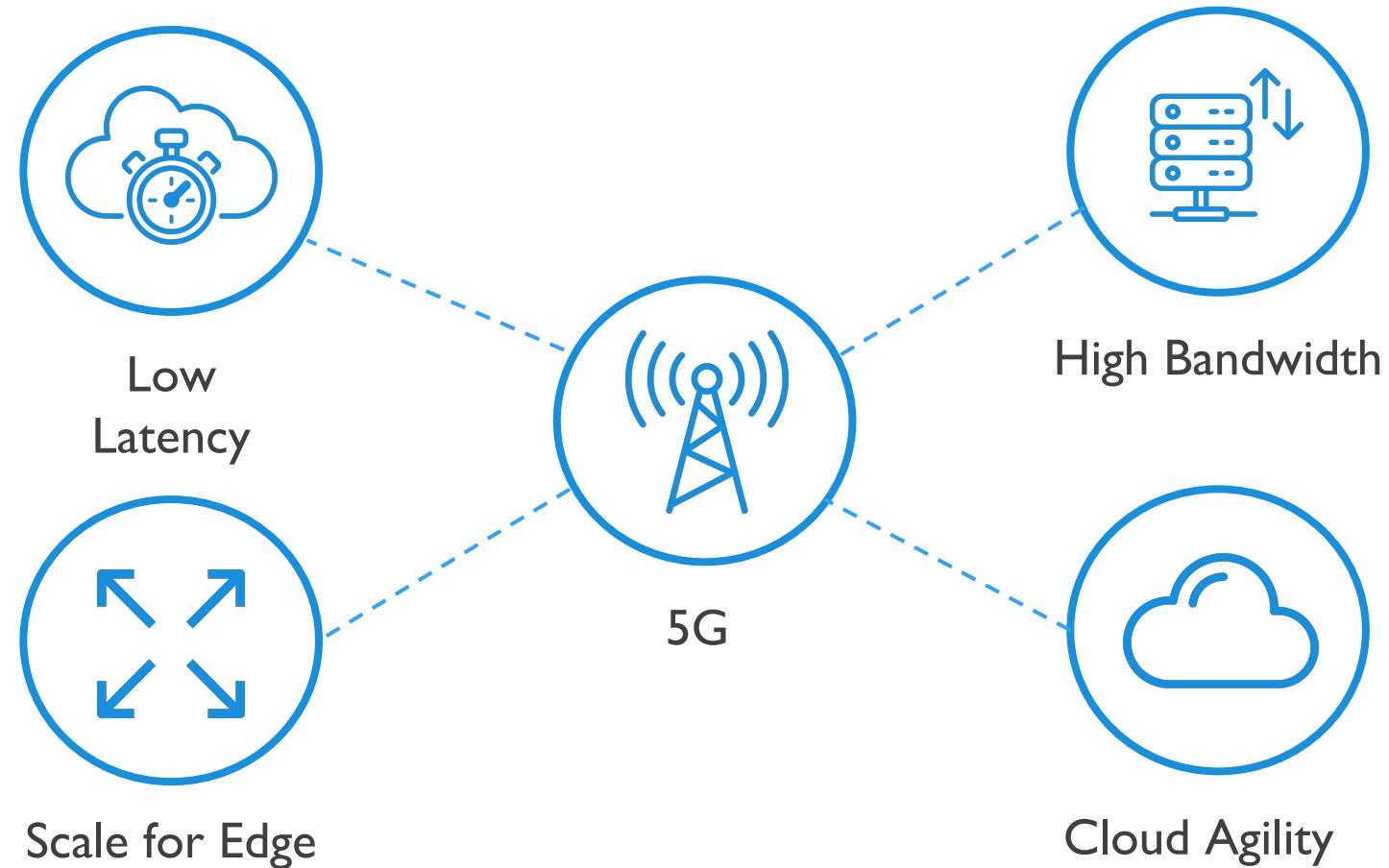


What is 5G?

- › 50 5G commercial networks in 27 countries*
- › Global market for 5G technology will reach \$667.90 billion by 2026**

*5G - 50 5G Commercial Networks – November Snapshot, GSA)

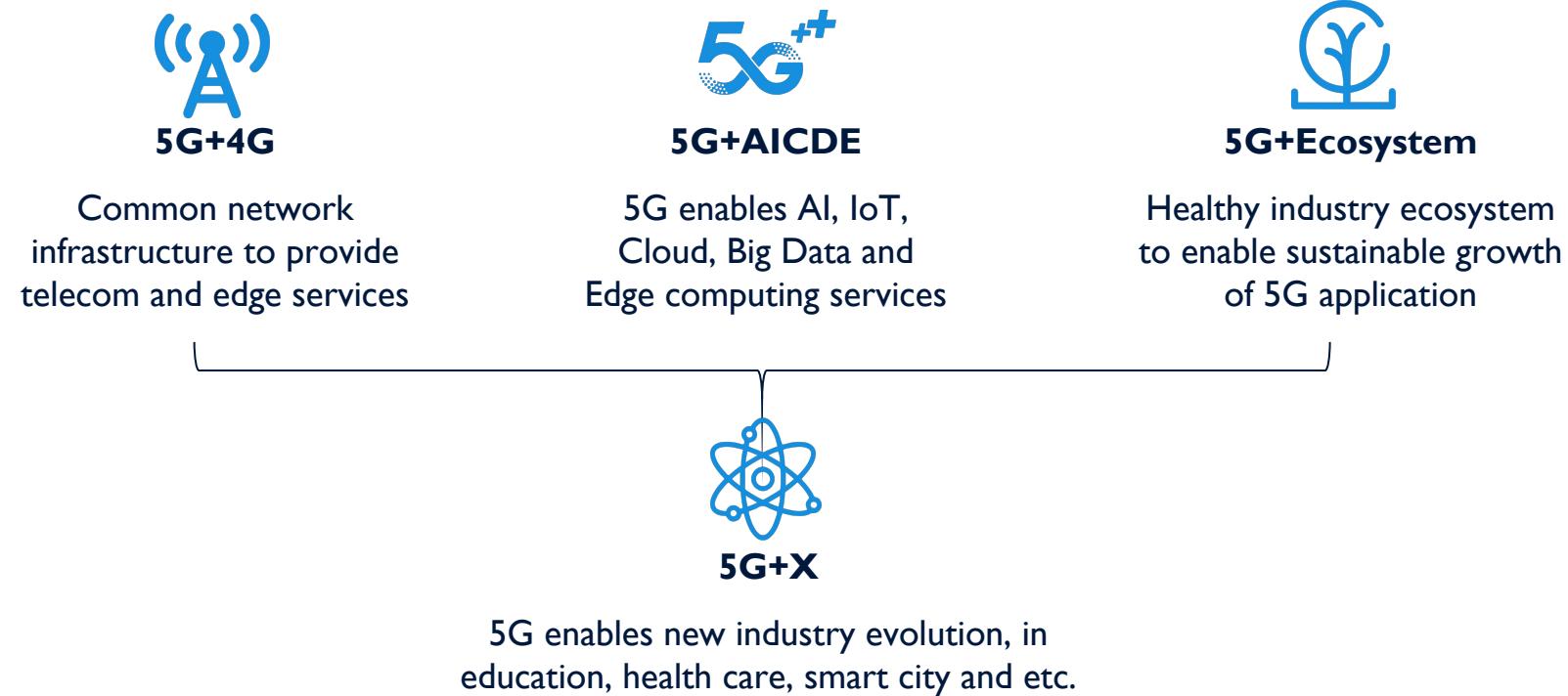
**Big Market Research



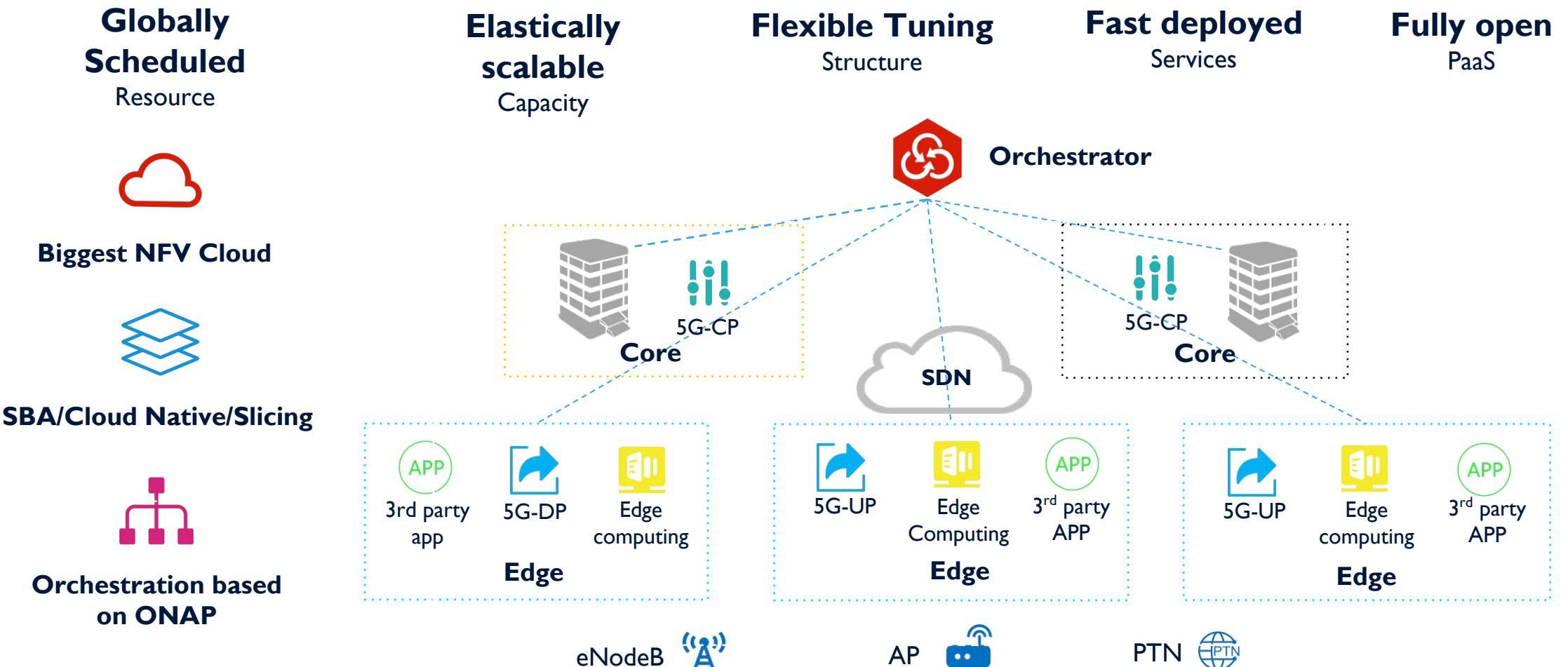
Use Case: 5G and Cloud in China Mobile

China Mobile began 5G commercial service on Oct. 31 in 50 cities

5G is not only a new generation of communication, but also innovation and transformation of Telco technology



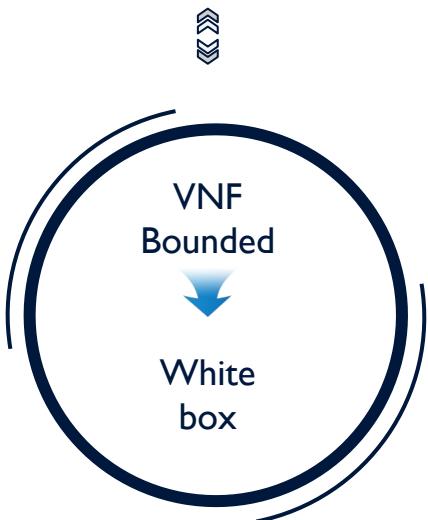
5G Architecture Based on Cloud Native



Major Challenges for 5G

Insufficient Decoupling

New soft 'silo' for
Vendors



Infrastructure

Insufficient SBA

Lack of common service at
the PaaS level



Service

Insufficient Operation

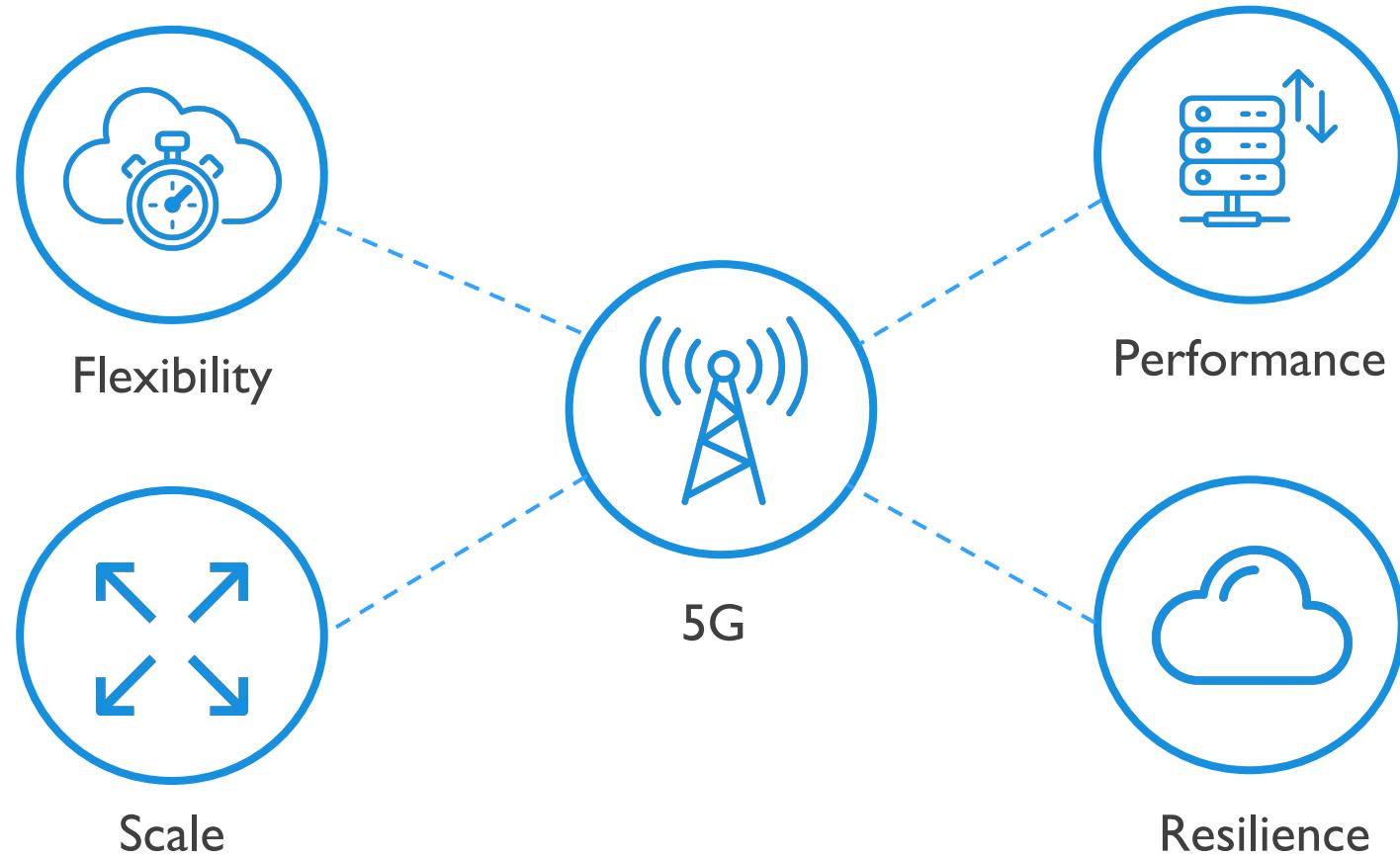
Lack of automatic and intelligent
operation with the increase of
complexity of network



Capability

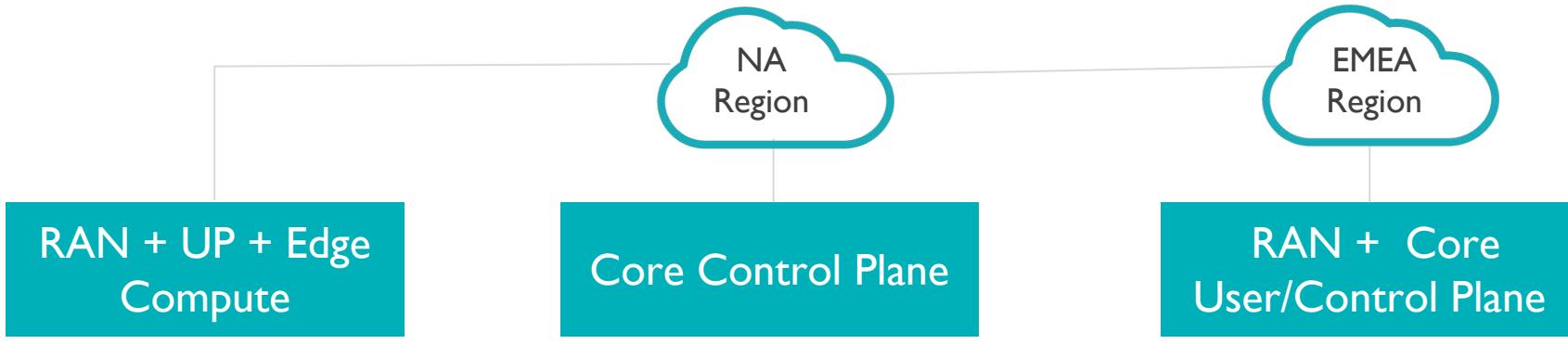
Why Cloud Native for 5G?

- › Common Infrastructure for applications and the network
- › Lifecycle management and cloud operational models
- › Ecosystem of applications and vendors for new services

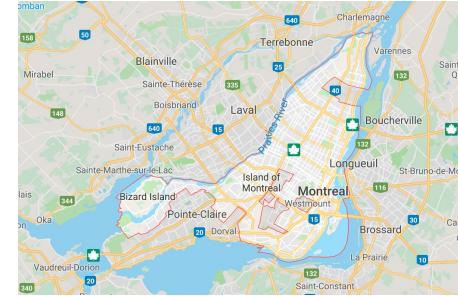


High Level POC Network

End to End Setup



5G PoP
KubeCon San Diego, USA

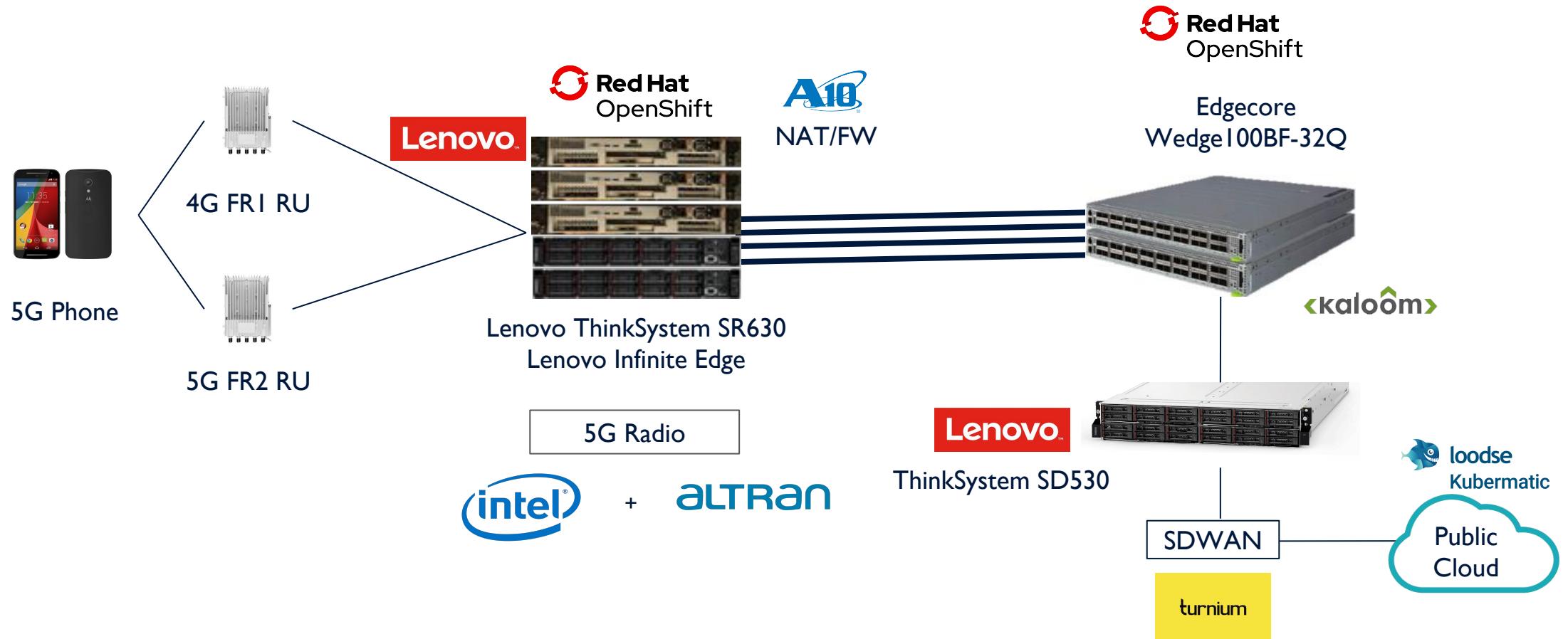


5G Lab
Kaloom Montreal, Canada

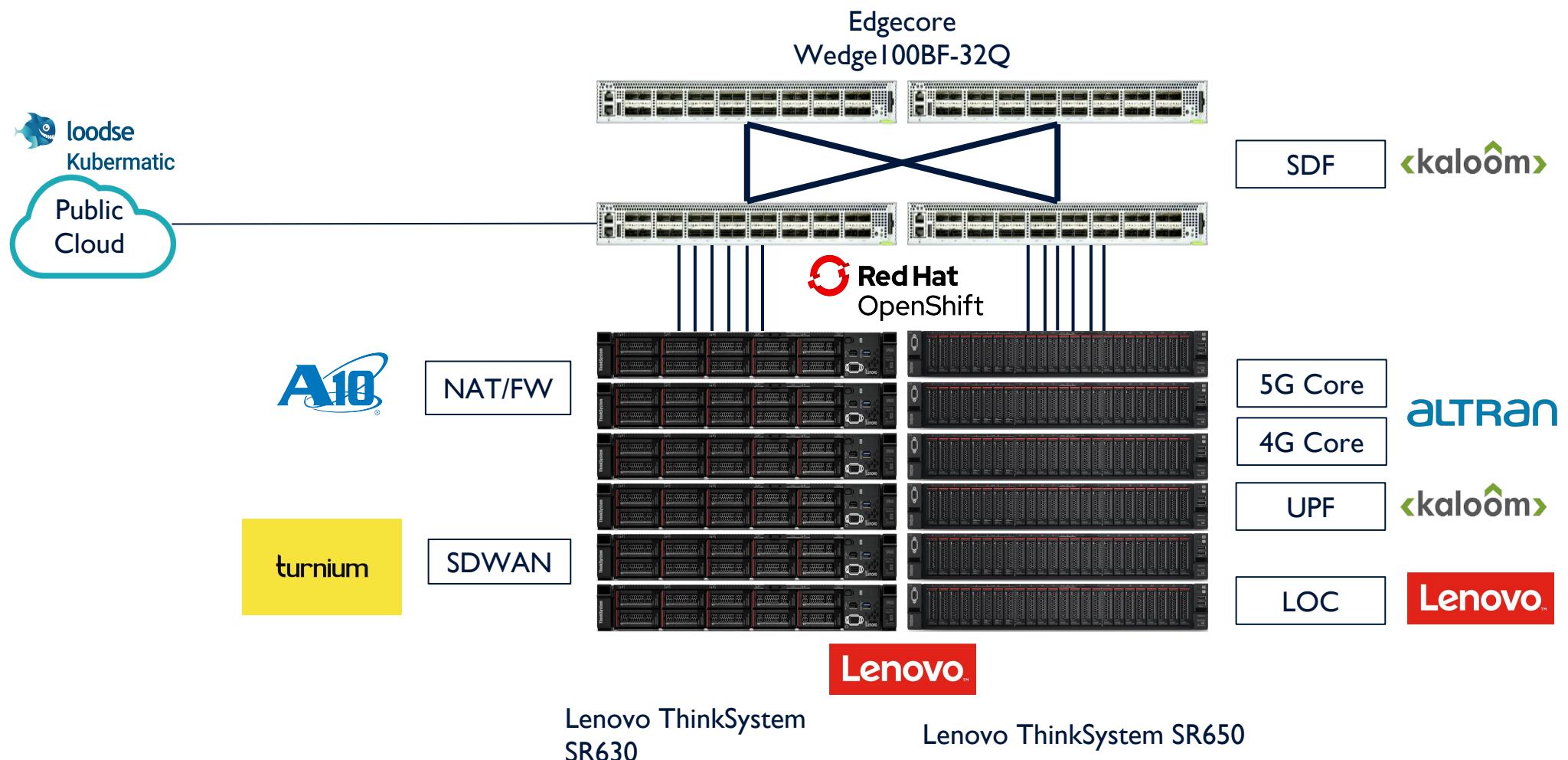


Eurecom
Sophia Antipolis, France

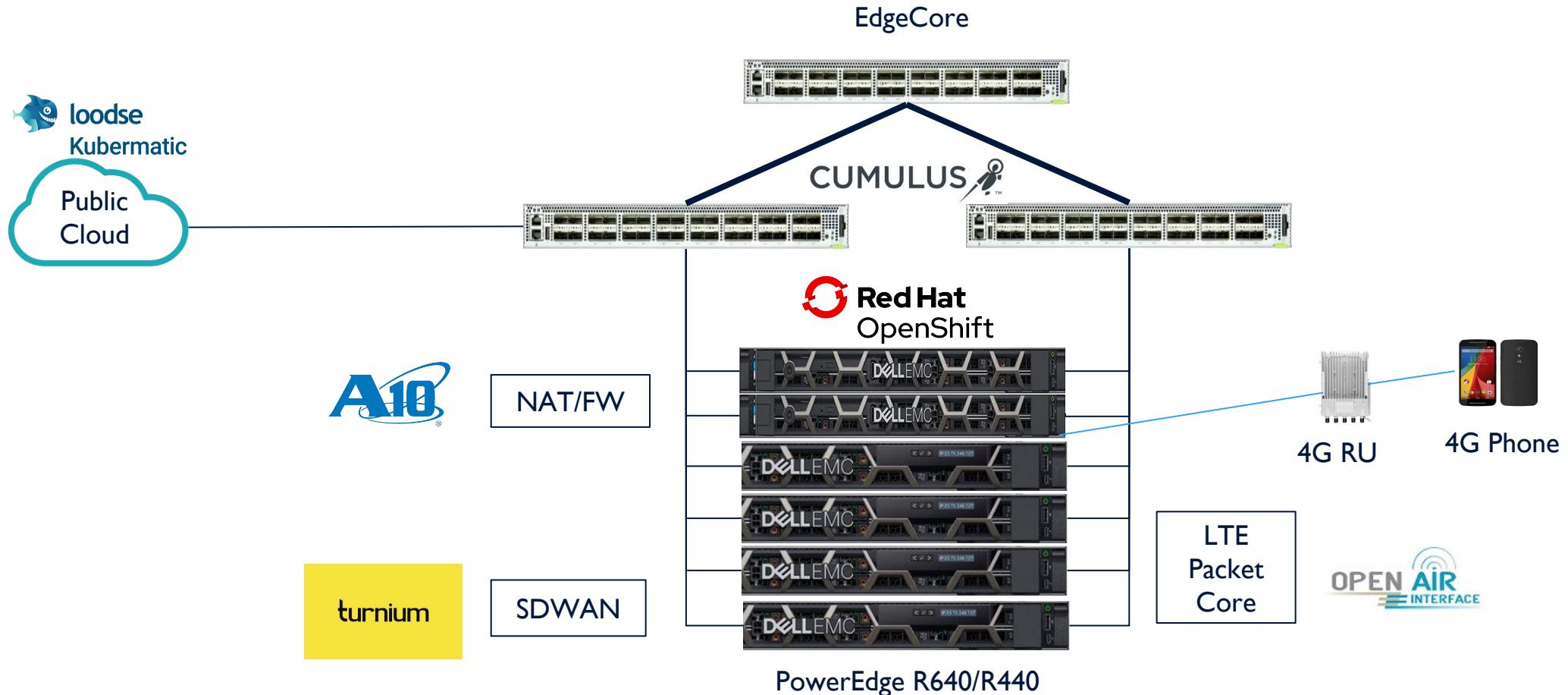
5G RAN + Edge Compute - San Diego



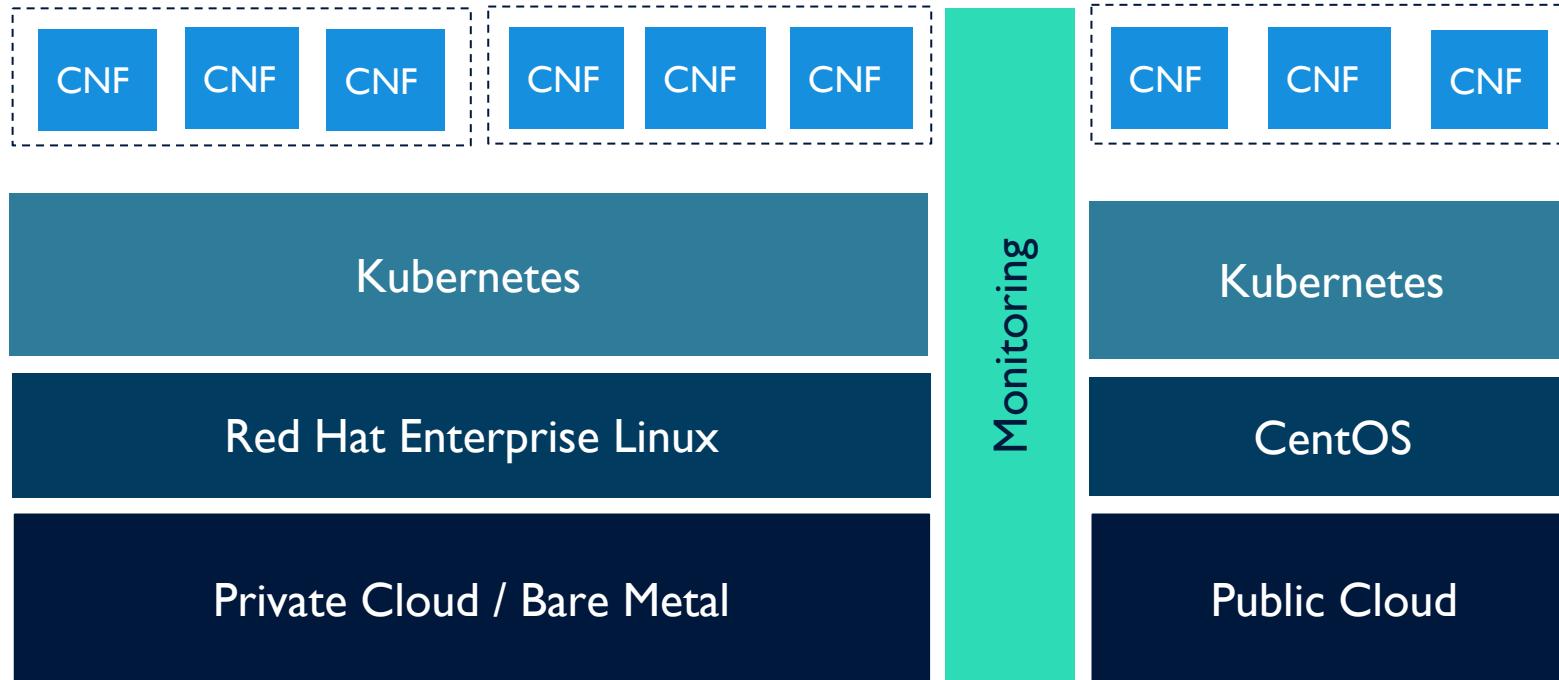
5G Core - NSA - Montreal



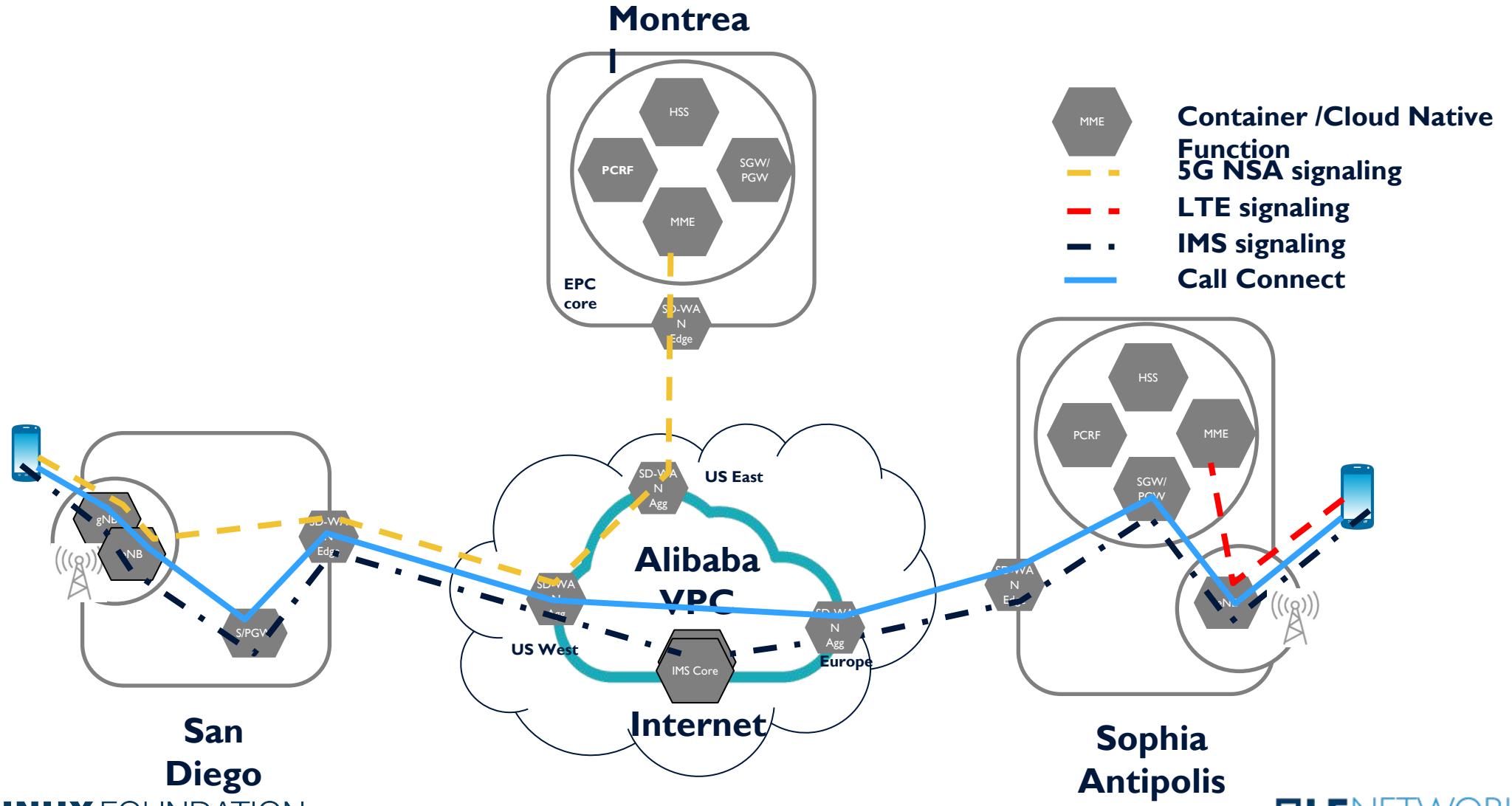
5G RAN & EPC - NSA - Sophia Antipolis, France



Software Stack



Cloud Native Mobile Network



Lessons Learned & Gaps

- › **Kubernetes and Cloud Native 5G Components**

- › Standard Interfaces: CNF Descriptors
- › HW performance and acceleration: exposing FPGA, GPU and other capabilities
- › Networking IPv6 for everything
- › Networking: Protocol support for SCTP, PTP, sub-us-time synchronization
- › Networking: Exposing secondary network interfaces
- › k8s Operators: Best practices and Lifecycle Management
- › CNF Design: Network Function refactoring guidelines with regard to state management

- › **Operations**

- › Radiating frequencies
- › Special configurations
- › Multi Cloud Managers

- › **Technology Readiness for Cloud Native 5G**

- › Handsets
- › Radio Technology - Frequency Bands

- › **5G Code Maturity**

- › 5G RAN
- › 5G Core implementations

LFN & Cloud Native 5G

- › OPNFV and CNTT
 - › Testing and integration project “the place to collaborate and test new initiatives”
 - › Compliance and Verification Programs for Infra and applications
 - › Barometer project providing platform metrics (telemetry)
 - › **Next Phase: Cloud Native Reference Architecture**
 - › **Next Phase: CNF Compliance Testing**
- › ONAP
 - › ONAP 5G use case blueprint shows how to automate 5G, and the ONAP4K8s profile shows how to use ONAP with CNFs/Kubernetes
 - › **Next Phase: Full 5G automation with network slicing anticipated and full CNF/Kubernetes support**
- › ORAN
 - › WG6 and WG8 - Cloud Native Reference Implementations in ORAN-SC
- › FD.io
 - › **Next Phase: 5G UPF implementation**
- › LFN + CNCF TUG Collaboration
 - › CNF Testbed
 - › CI/CD and tooling automation

How to Get Involved

- › Participate in LFN projects to advance cloud native capabilities: <https://wiki.lfnetworking.org/>
- › Join the CNTT Cloud Native Reference Architecture Work:
<https://wiki.lfnetworking.org/display/LN/Common+NFVI+Telco+Task+Force+-+CNTT>
- › Define CNF Compliance and Verification Testing:
<https://wiki.lfnetworking.org/pages/viewpage.action?pageId=25362538>
- › Engage with telecom networking requirements in k8s and CNCF networking projects
- › Drive future networking proofs of concept:
<https://wiki.opnfv.org/display/OSDD/OPNFV+VCO+Demo+Discussion+Home>
- › Attend LF Networking Developer & Testing Forum:
<https://events19.linuxfoundation.org/events/lf-networking-ddf-plugfest-2020/>

Learn More at KubeCon + CloudNativeCon NA

- › On the floor - Visit participant booths:
 - › A10 (S69)
 - › Red Hat (D1)
 - › Intel (D2)
 - › Lenovo (S100)
 - › Loodse (SE27)
- › Attend session about OAI open source RAN/core implementation:
 - › “Build Your Own Private 5G Network on Kubernetes”, Frank Zdarsky, Red Hat & Raymond Knopp, Eurecom, Wednesday, November 20 • 11:50am - 12:25pm,
<https://sched.co/UaWZ>
- › Visit the E2E 5G Cloud Native Network Meeting Space (Sponsored by Red Hat)
 - › The Westin San Diego Gaslamp Quarter, Plaza Meeting Room, 2nd floor
 - › Today and tomorrow: 10:00 - 12:00 AM & 2:00 - 4:00 PM
 - › Email: hgarciag@redhat.com
- › Attend Common NFVI Telecom Taskforce (CNTT) Telecom User Group Meeting
 - › Today: 4:00-6:00 PM Meeting Room 2, Upper Level

Proof Of Concept Partners



Red Hat

turnium

Community Volunteers

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Saeid Hashemi, *Bell Canada*

Dan Bernier, *Bell Canada*

Fu Qiao, *China Mobile*

Sebastian Scheele, *Looose*

Haresh Kheskani, *Looose*

Tobias Hintze, *Looose*

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Geoff Hultin, *Turnium*

Sandeep Panesar, *Turnium*

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Dana Nehama, *Intel*

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Xuan Min, *Alibaba*

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Nilanjan Samajdar, *Altran*

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Jean-Christophe Delaye, *EURECOM*

Raphael Defosseux, *OAI*

Rohan Kharade, *EURECOM*

Kai Xe, *Foxconn*

Heather Kirksey, *Linux Foundation*

Brandon Wick, *Linux Foundation*

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THANK YOU

 THE **LINUX** FOUNDATION