



Red Hat Telco at the Edge RAN Cloudification

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Red Hat Open Source Day
#RHOSD #RHForum



Our Approach

COLLECTS AND FOCUSES THE BEST IDEAS

BUSINESS REQUIREMENTS DRIVE THE NEED FOR INNOVATION

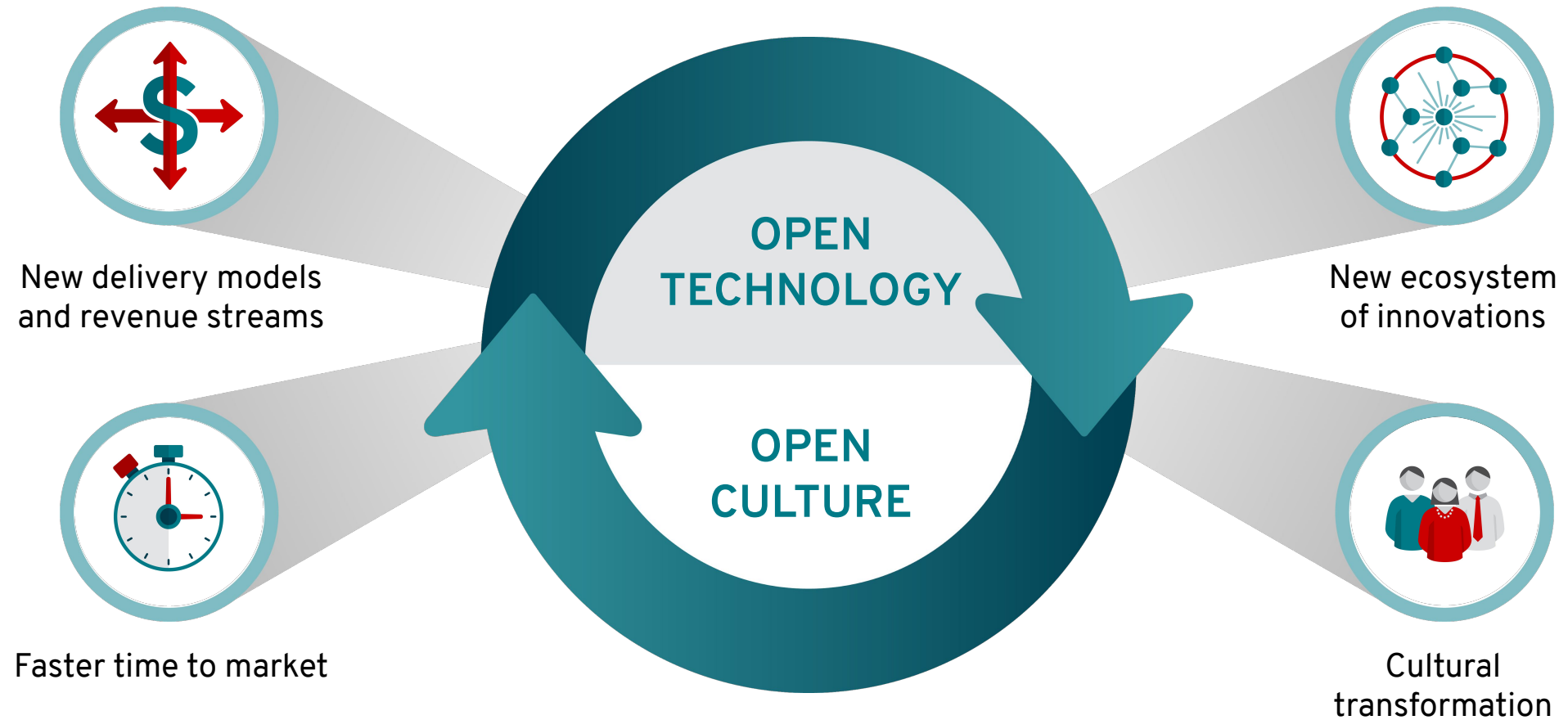
OPEN SOURCE ENABLES INNOVATION

COMMUNITIES ARE THE CATALYST FOR INNOVATION

RED HAT IS A LEADER IN OPEN SOURCE INNOVATION

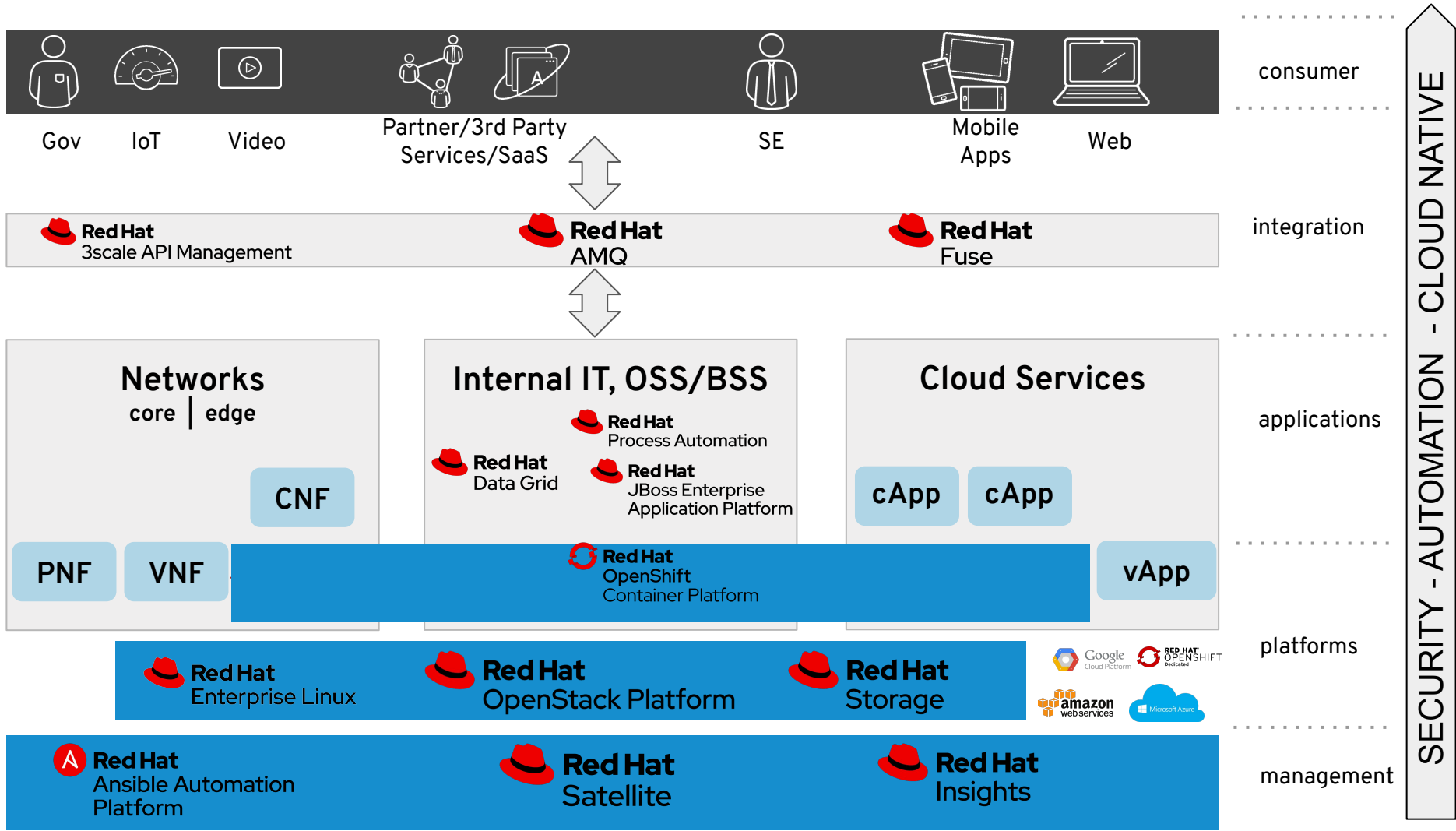
COMMUNITY-POWERED INNOVATION

Open Organizations Create Sustained Competitive Advantage



COLLABORATION | TRANSPARENCY | INCLUSIVITY | ADAPTABILITY | COMMUNITY

Red Hat Portfolio in Telco



Red Hat on ETSI ISG Reference Diagram

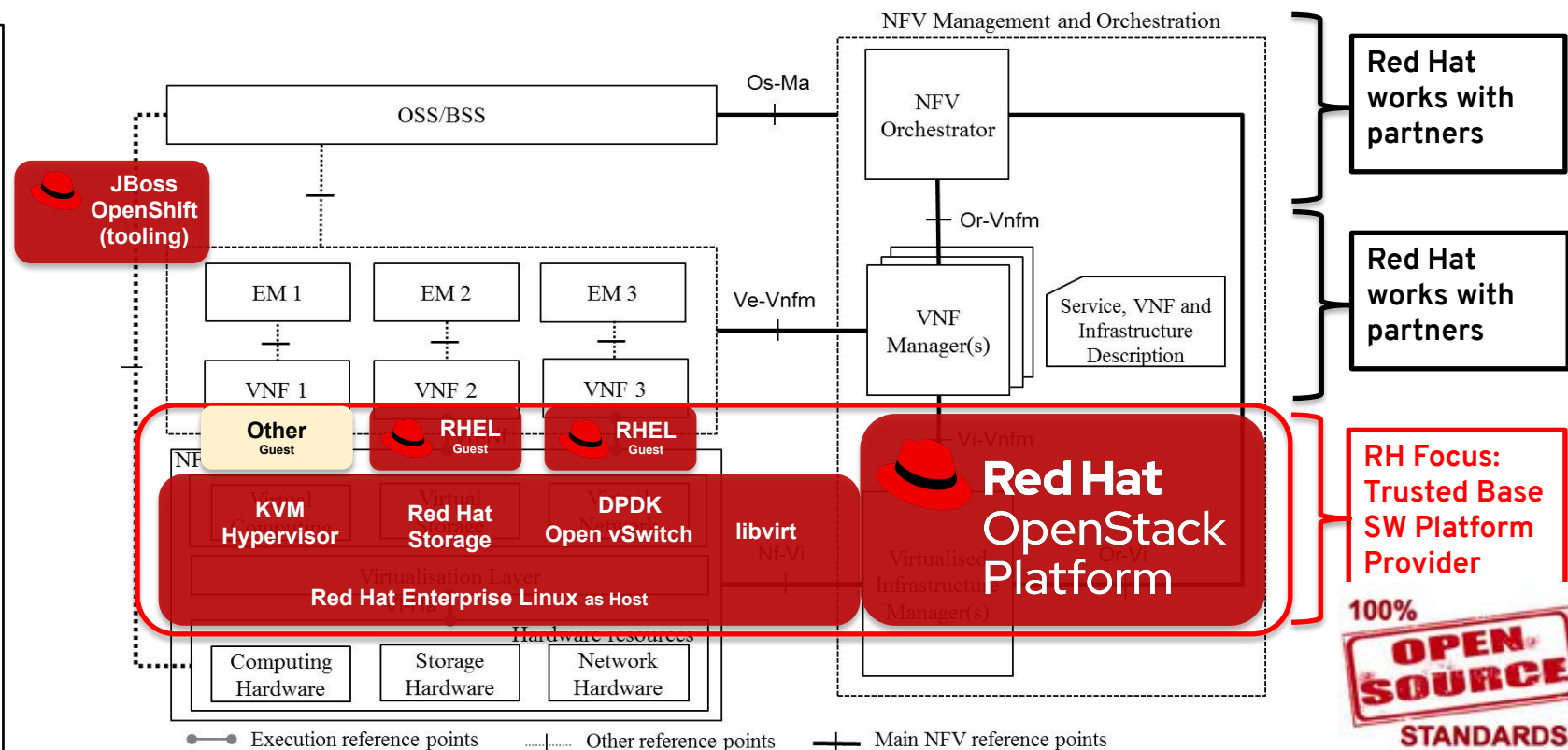
Open & Agile

Open, Flexible, Modular,
Programmable

Single Platform for multiple use
cases beyond NFV

Carrier Class Architecture

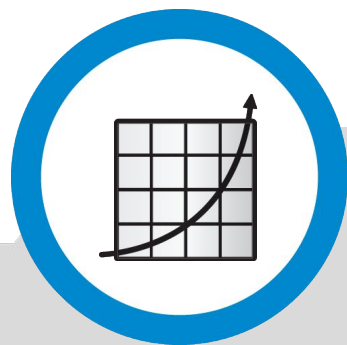
Performance, Throughput,
Scale, Optimised for NFV
High Availability & Security



ETSI Network Functions Virtualization (NFV)

To Make **OPENSTACK** NFV Ready

Development During Last Years



PERFORMANCE

Enhanced Platform Awareness (EPA) SR-IOV, OVS/DPDK, vCPU pinning, Huge pages, RT-KVM ...



AVAILABILITY

High Availability
Fault Tolerant Design
Enterprise Hardened Code
Instance Availability



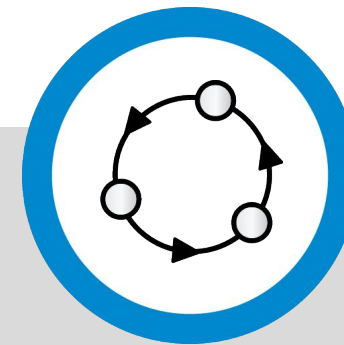
SECURITY

End-to-End
SELinux sVirt
Neutron Security Groups
Block Encryption
SSL/TLS on APIs



MANAGEABILITY

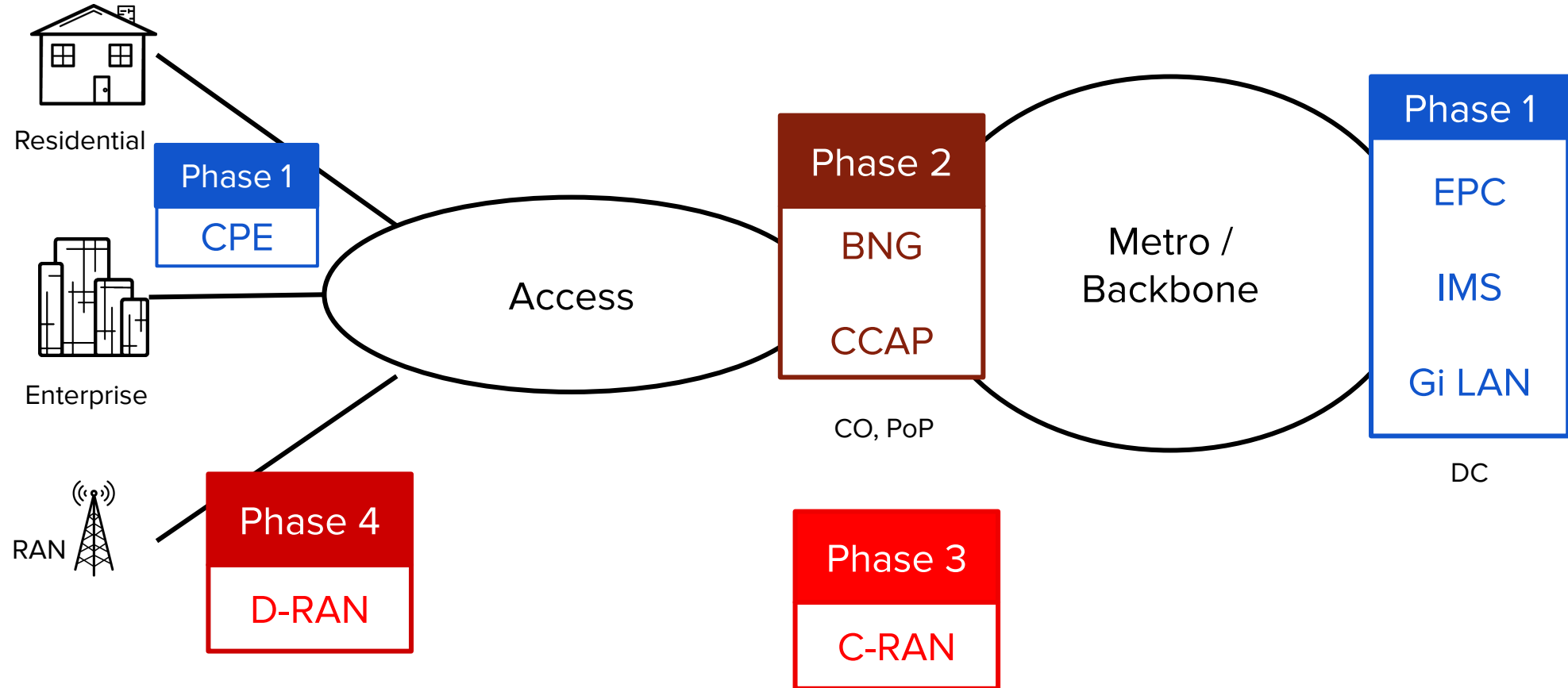
Logging
Performance Monitoring
Operational Visibility
Policy and Compliance



LIFECYCLE

OpenStack Lifecycle
Updates/Patches

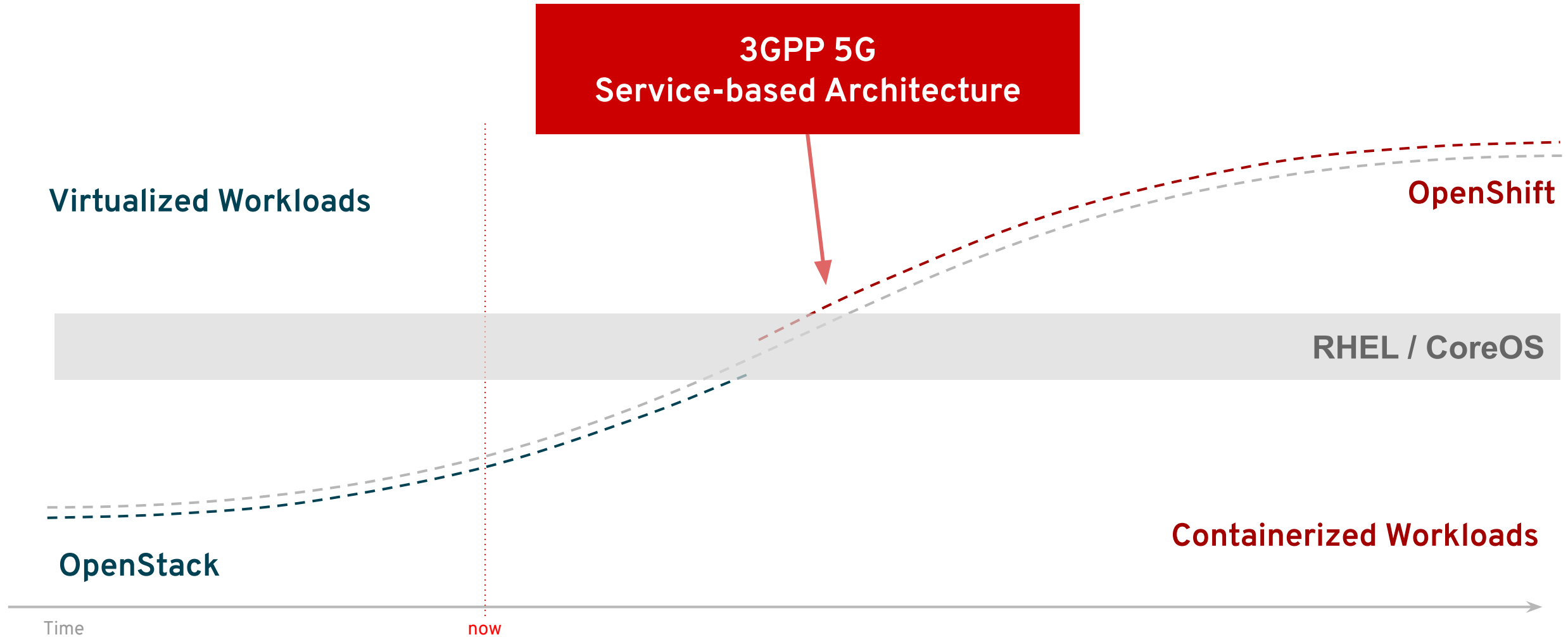
Virtualization Phases in Telco Networks



Some of our public NFV customers

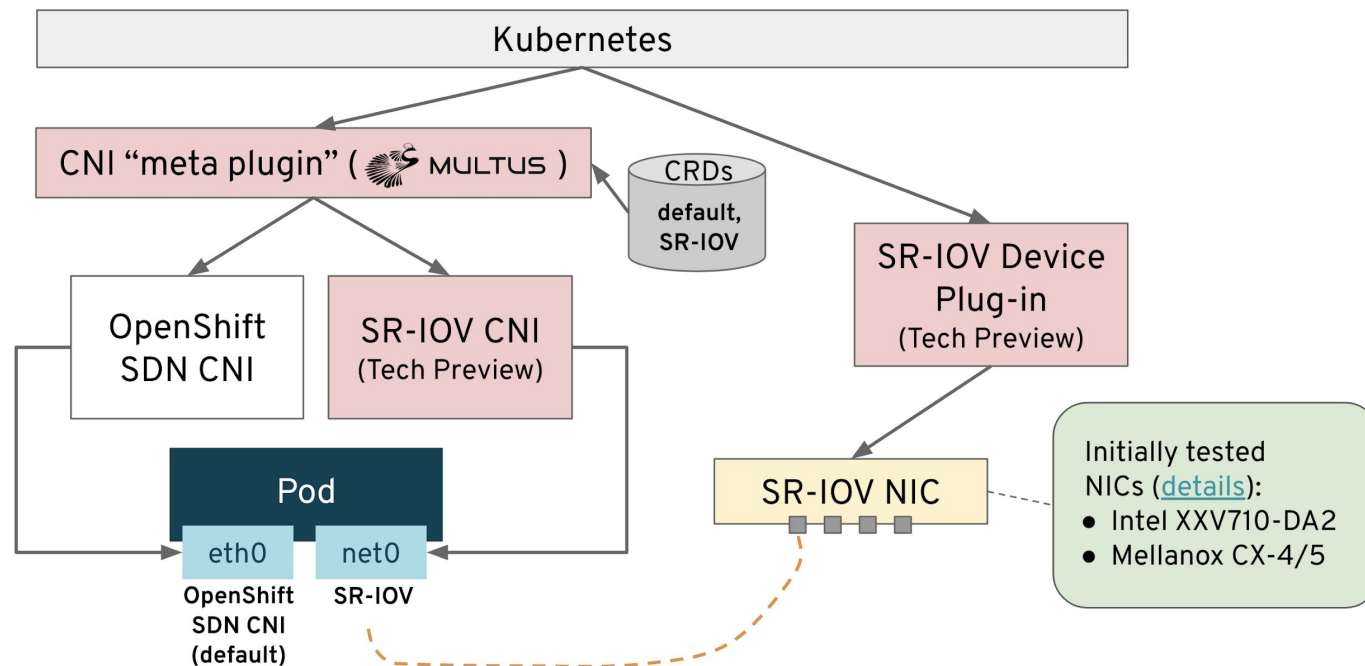


5G and NFV Evolution to Cloud Native



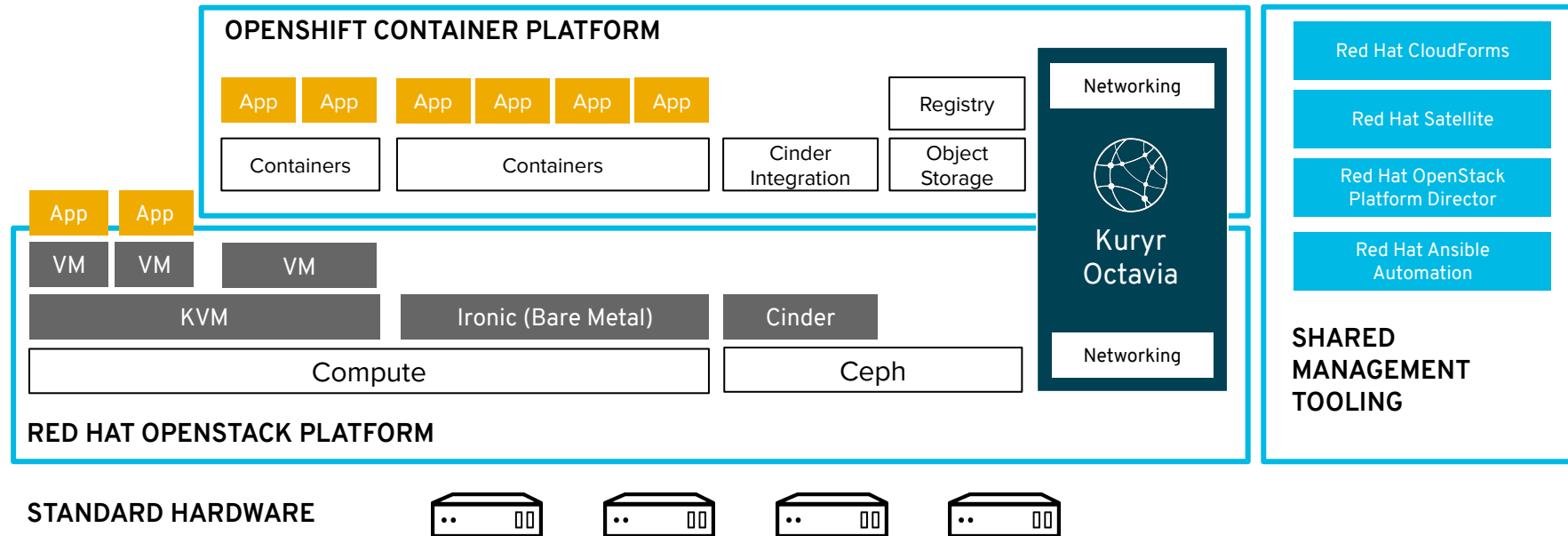
Developments to make OpenShift NFV-Ready

- Hugepages
- CPU pinning
- Multus Multi-Network
- SR-IOV support
- NUMA Awareness
- ...



Seamless Transition to Containers

with continued support of Virtual Machines

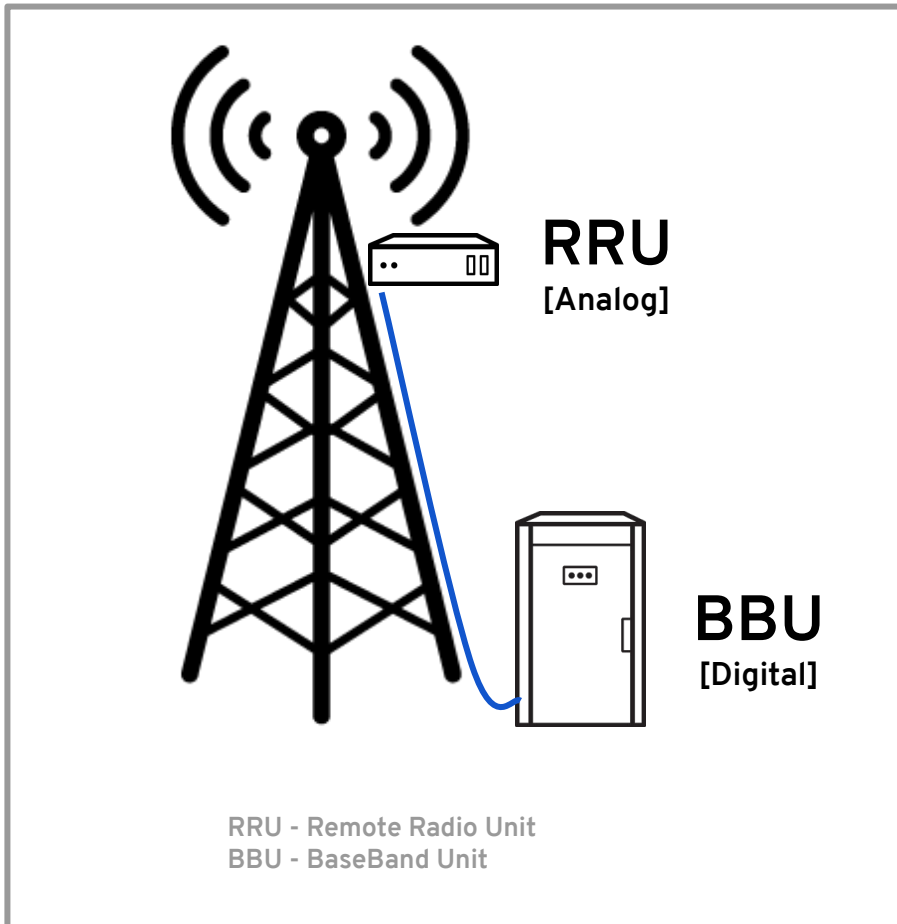




RAN Cloudification

Radio Access Network (RAN) Cell Site

BTS / NodeB / eNodeB / gNodeB



Red Hat Community Involvement



Red Hat is:

- ORAN Member since opened to vendors (Dec 2018)
- Focus on WG6 (Cloudification & Virtualization) WG
- Was previously member of CMCC's CRAN consortium which was merged with xRAN.org to form O-RAN

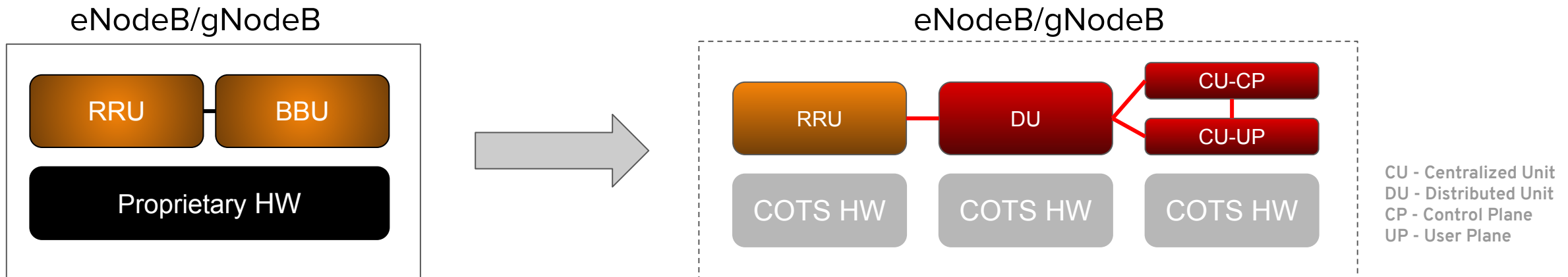


Red Hat is:

- Virtual RAN fronthaul project member
- Open RAN project member
- Edge Computing project member

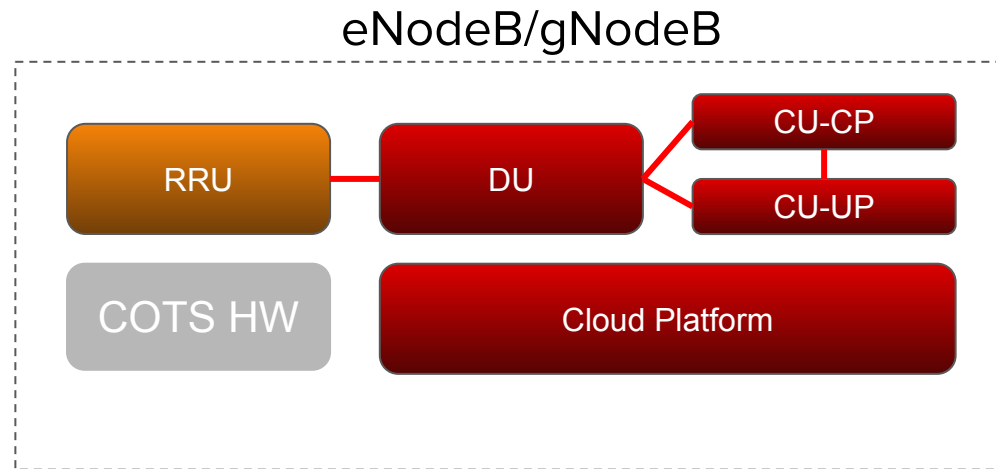
RAN Disaggregation

- Different functional **splits** (CU-CP, CU-UP, DU) with open interfaces
⇒ Deployment flexibility/agility from fully distributed to fully centralized
- HW/SW **decoupling**
⇒ Standardize on COTS HW (reduce cost of spare part management)
⇒ Mitigate vendor lock-in



RAN Cloudification

- Using a cloud platform brings orchestration and automation to the RAN
 - e.g. enables end-to-end automation of network slicing
- Capacity adjustments realised as software scale-in/out

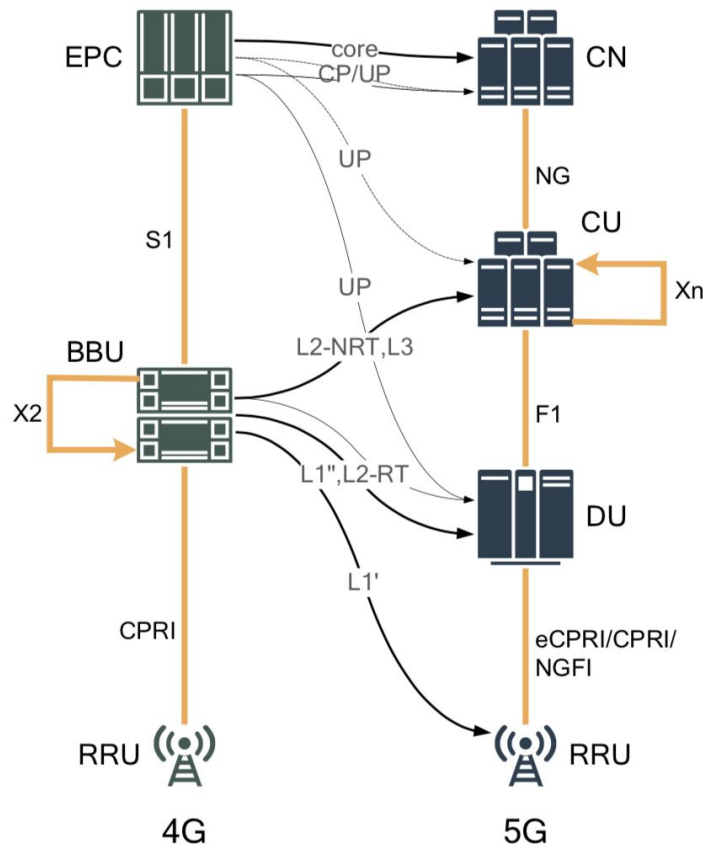


RAN Cloudification -> vBBU (4G), vDU/vCU (5G)

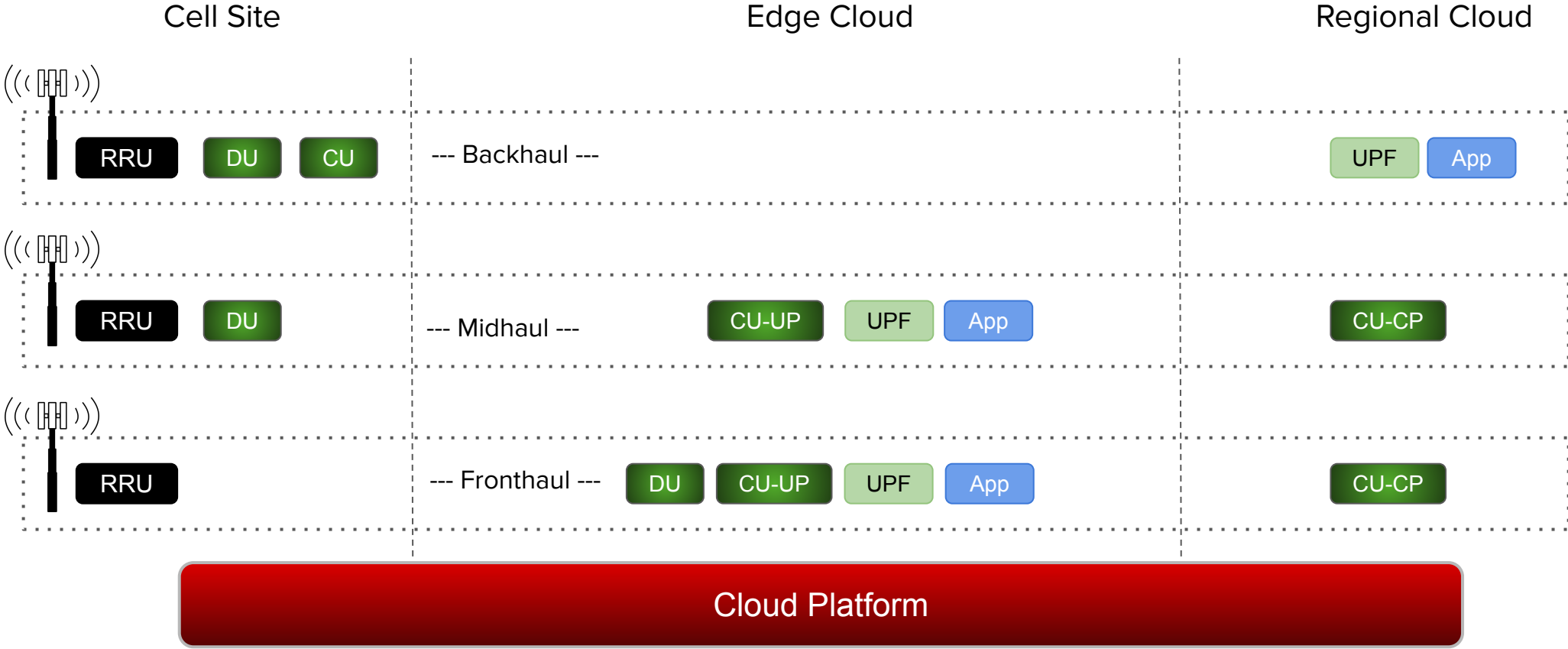
RAN Requirements on Telco Cloud

vCU vBBU	Distributed Cloud (Edge), Low Footprint
vDU	Realtime, PTP, HW Acceleration (FPGA, Smart NICs)

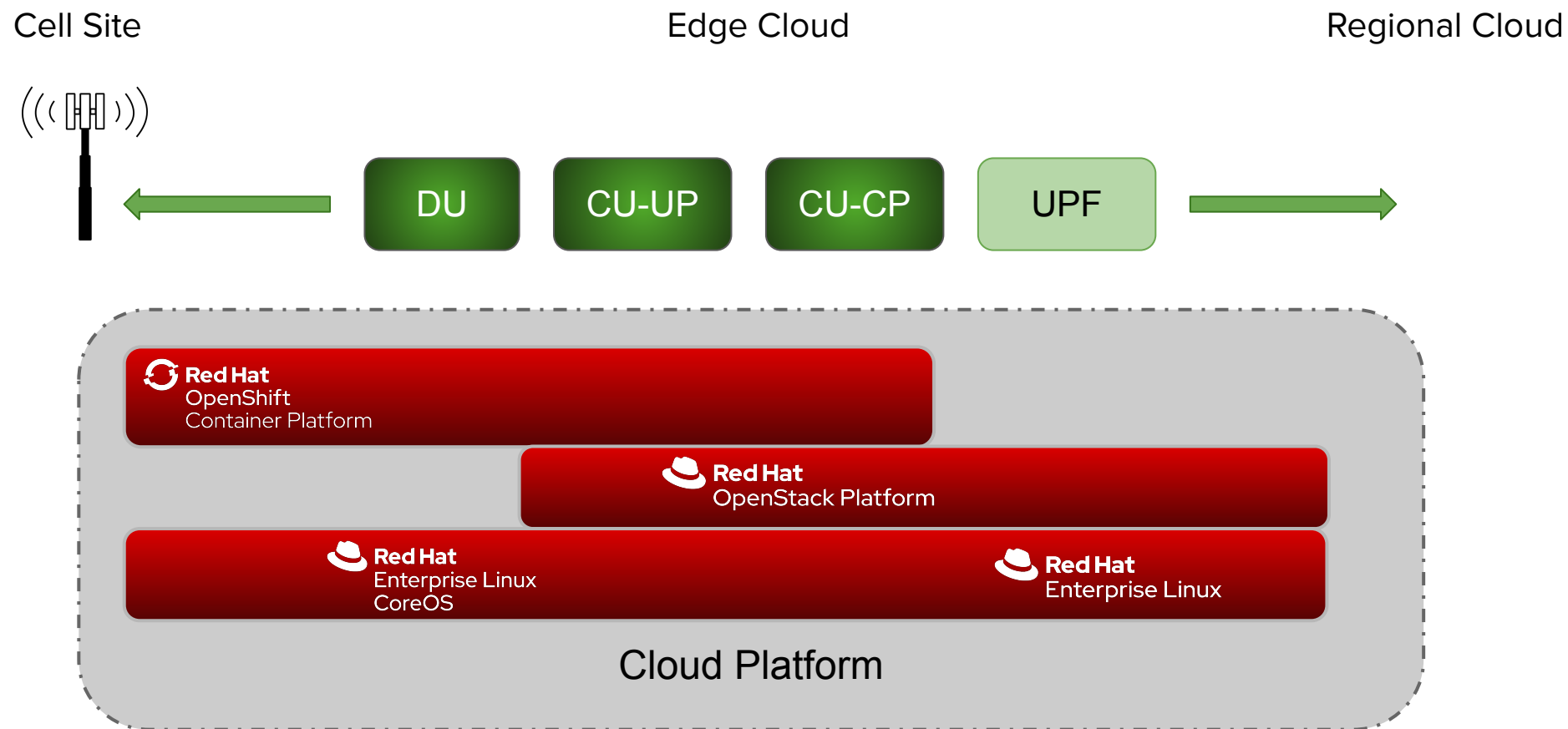
RAN scheduler works on very tight time budget
⇒ **Lower parts of BBU (DU) cannot be centralized too far (geographically)!**



Deployment Scenarios Examples (not exhaustive)

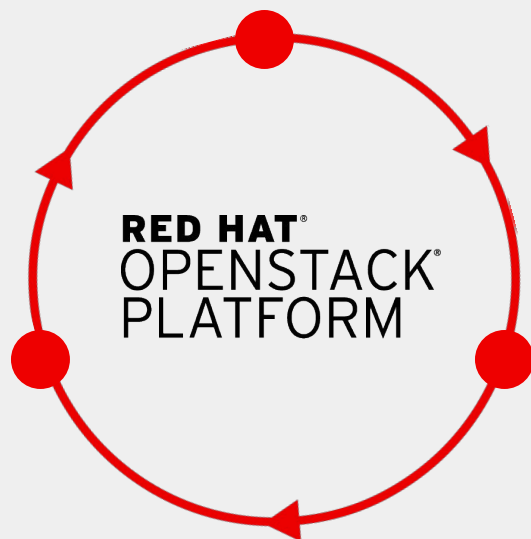


Red Hat Cloud Platform



OpenStack Distributed Compute Nodes (DCN)

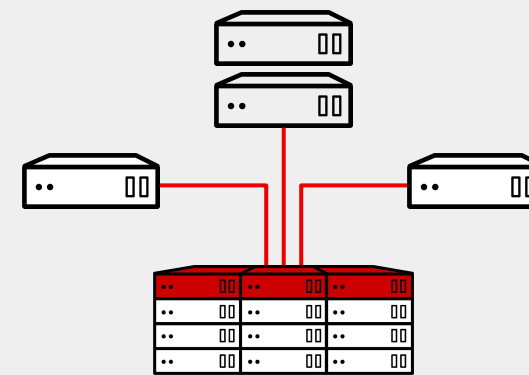
Bringing compute power to the edge



Scale while minimizing operational complexity
with centrally managed edge sites

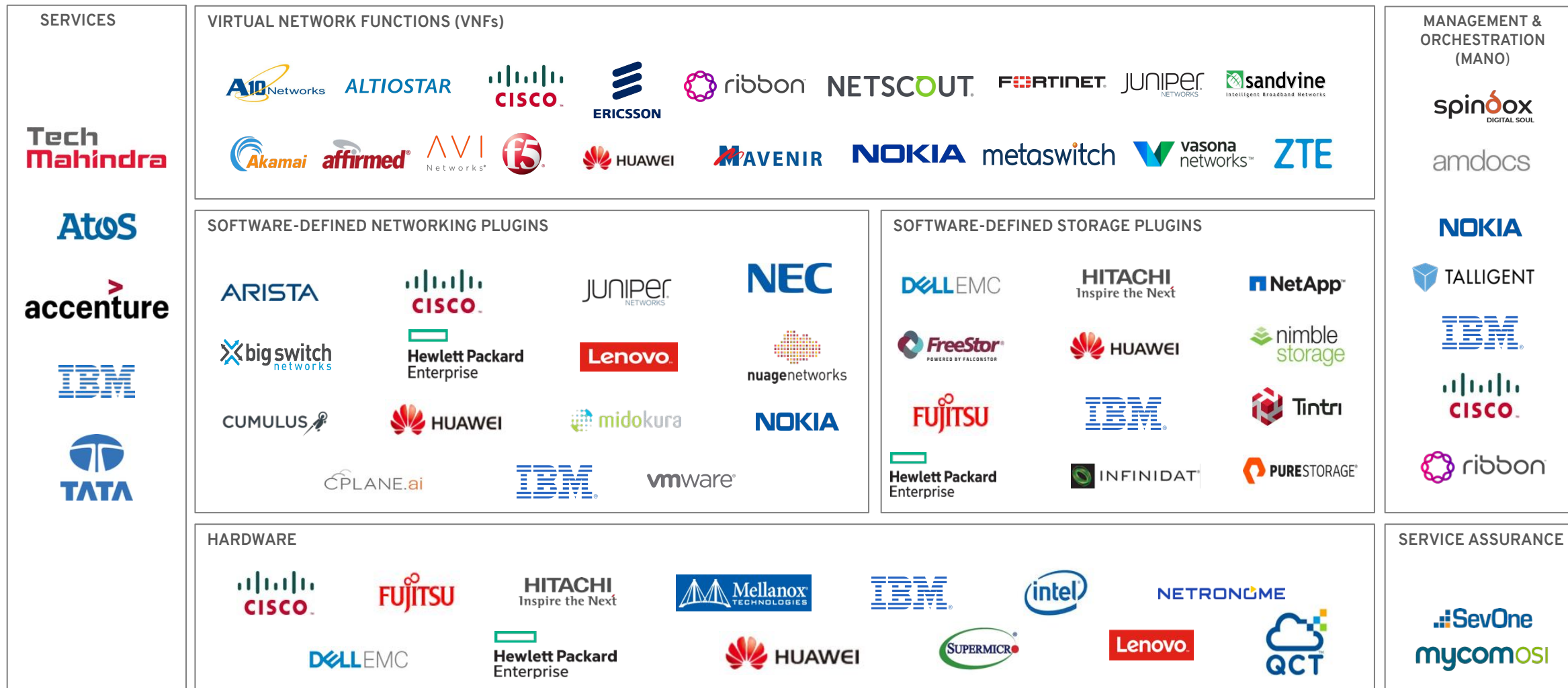
Reduce hardware footprint
and cost at the edge.

Process, analyze, and distribute
important data close to real time.



Distributed Compute Nodes

Red Hat NFV/SDN Partner Ecosystem



Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.



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