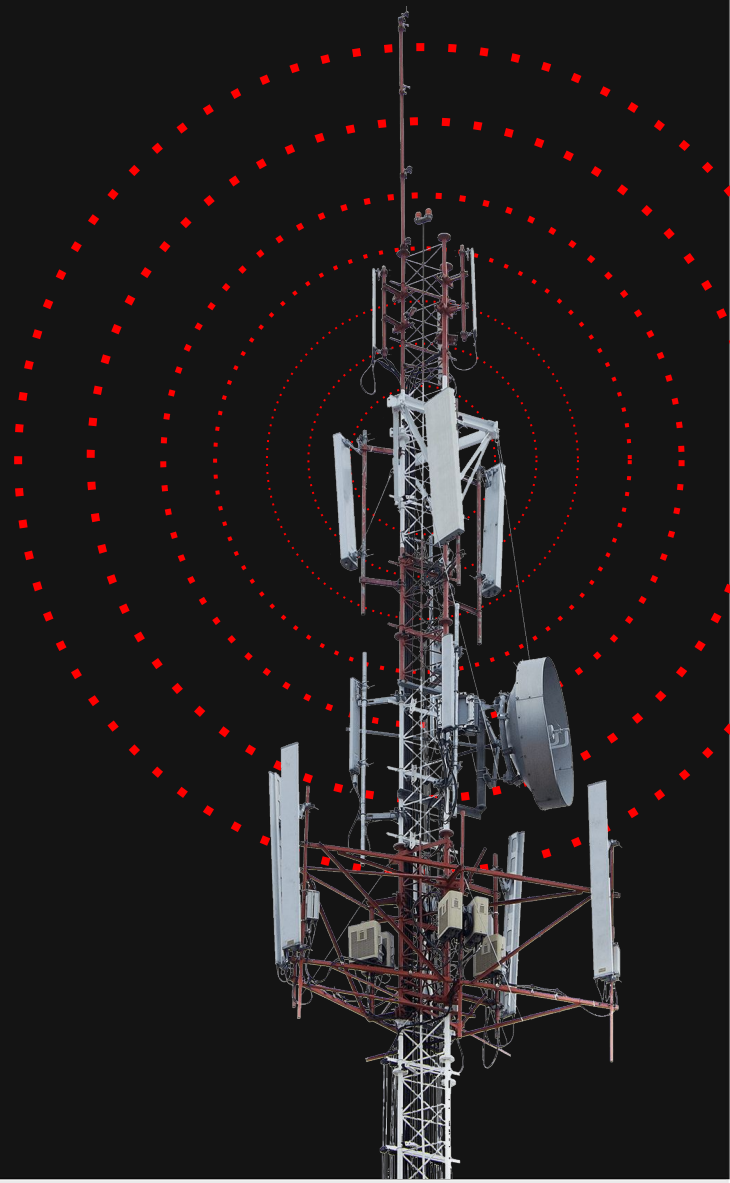
Red Hat OpenShift - platforma kubernetes dla 5G Core i Open RAN



Arkadiusz Sitek, Senior Telco Solutions Architect
Telecom, Media & Entertainment
Red Hat EMEA

October 13th 2022:

Verizon moves commercial traffic onto its 5G SA Core

Verizon 5GC is deployed on Red Hat OpenShift

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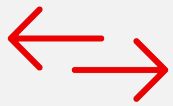
5G is Enabler Technology

Three Main Use Case Categories for 5G

Enhanced mobile broadband (eMBB)

- Prepaid consumer
- Post-paid consumer
- Fixed wireless access for residential
- Fixed wireless access for small businesses
- Consumer mobile virtual network operator (MVNO)



Ultra-reliable, low-latency communication (uRLLC)

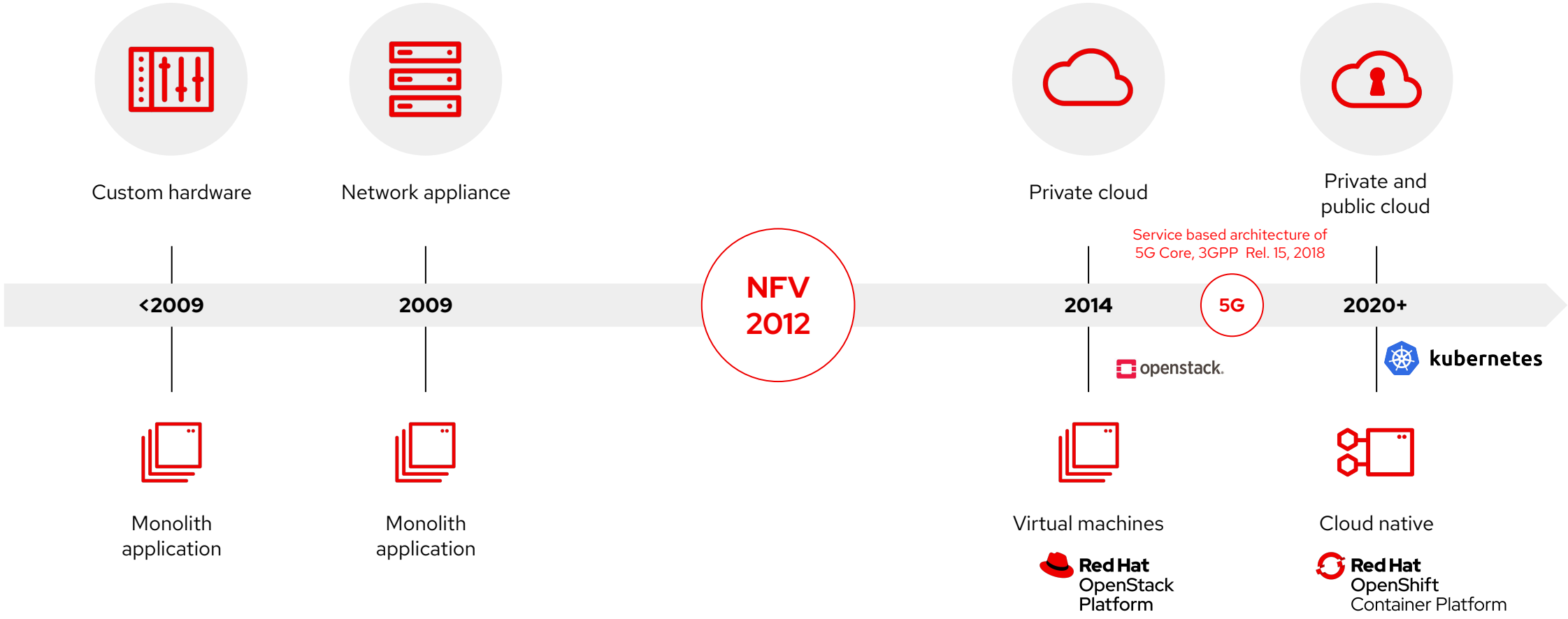
- Federal government devices
- Car manufacturers
- Farm conglomerates
- Mining companies
- Smart cities

Massive machine type communications (mMTC)

- Public safety video surveillance
- Self-driving cars
- Critical applications for health
- Industrial automation
- Augmented reality

Network slicing requires infrastructure agility and stability

NFV Journey - Cloud Native



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OpenShift in 5G Core

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Service Based Architecture (SBA) of 5G SA Core

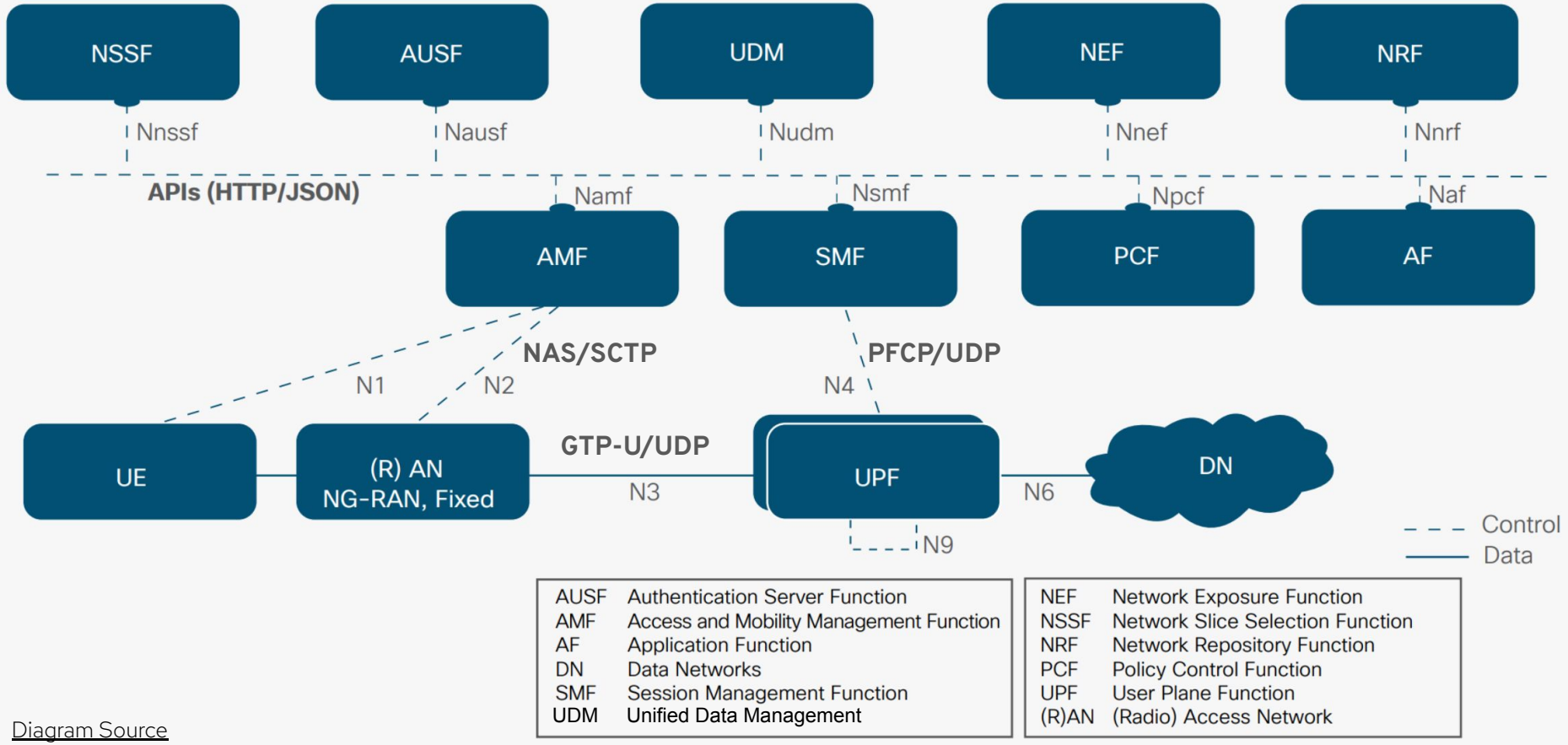

Diagram Source

- Containers
- APIs
- Decoupling

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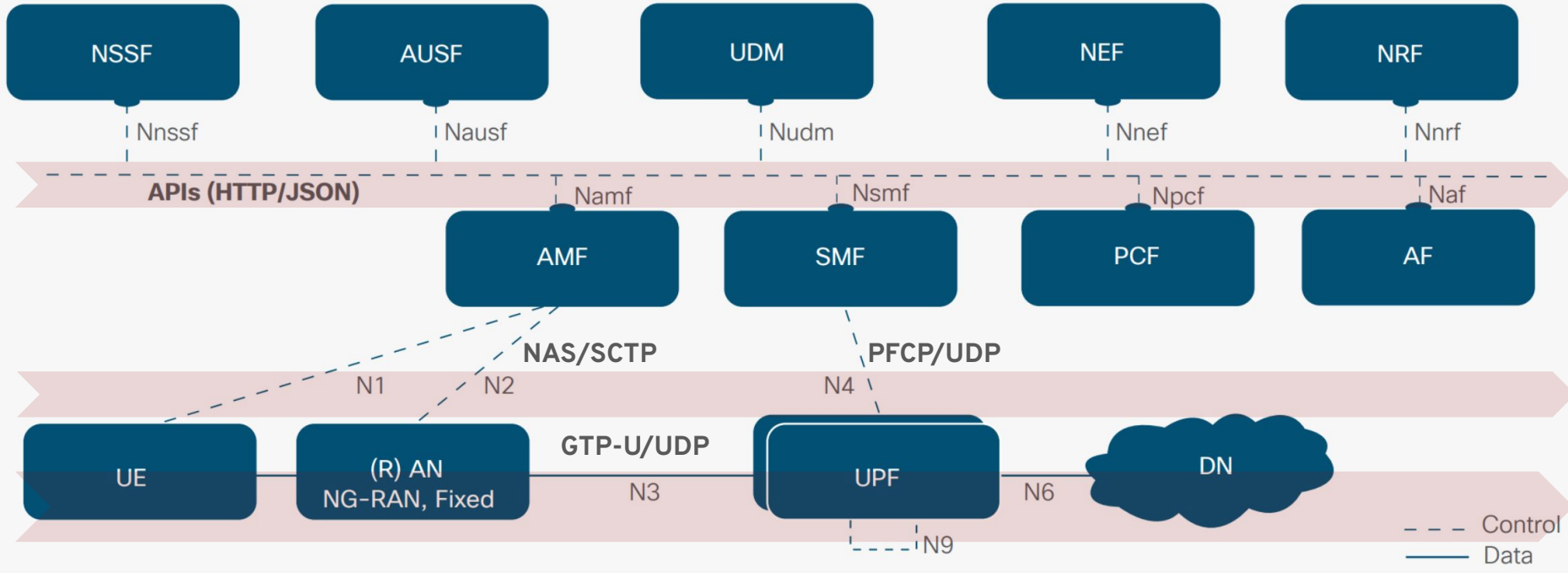
Service Based Architecture (SBA) of 5G Core



AUSF	Authentication Server Function
AMF	Access and Mobility Management Function
AF	Application Function
DN	Data Networks
SMF	Session Management Function
UDM	Unified Data Management

NEF	Network Exposure Function
NSSF	Network Slice Selection Function
NRF	Network Repository Function
PCF	Policy Control Function
UPF	User Plane Function
(R)AN	(Radio) Access Network

Kubernetes networking (REST): OVN-K, metalLB

Control-Plane networking OVN-K, MAC-VLAN, kernel SR-IOV

Dataplane networking: SR-IOV with DPDK (GTP, SCTP, ...)

Diagram Source

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OpenShift for 5G SA Core

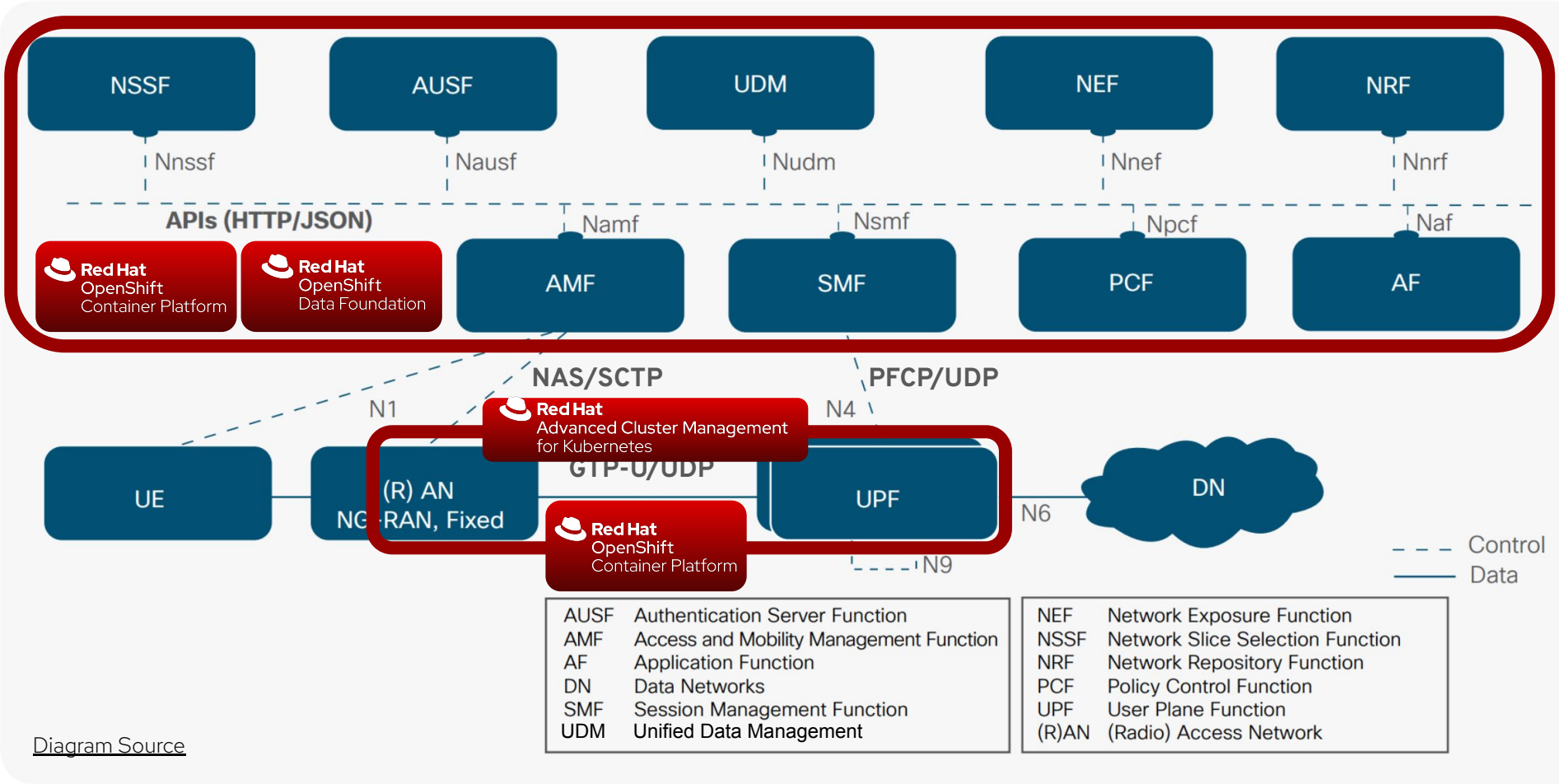

Diagram Source

Telco features

Automation

Security

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OpenShift for 5G SA Core - multi-vendor CNF deployment

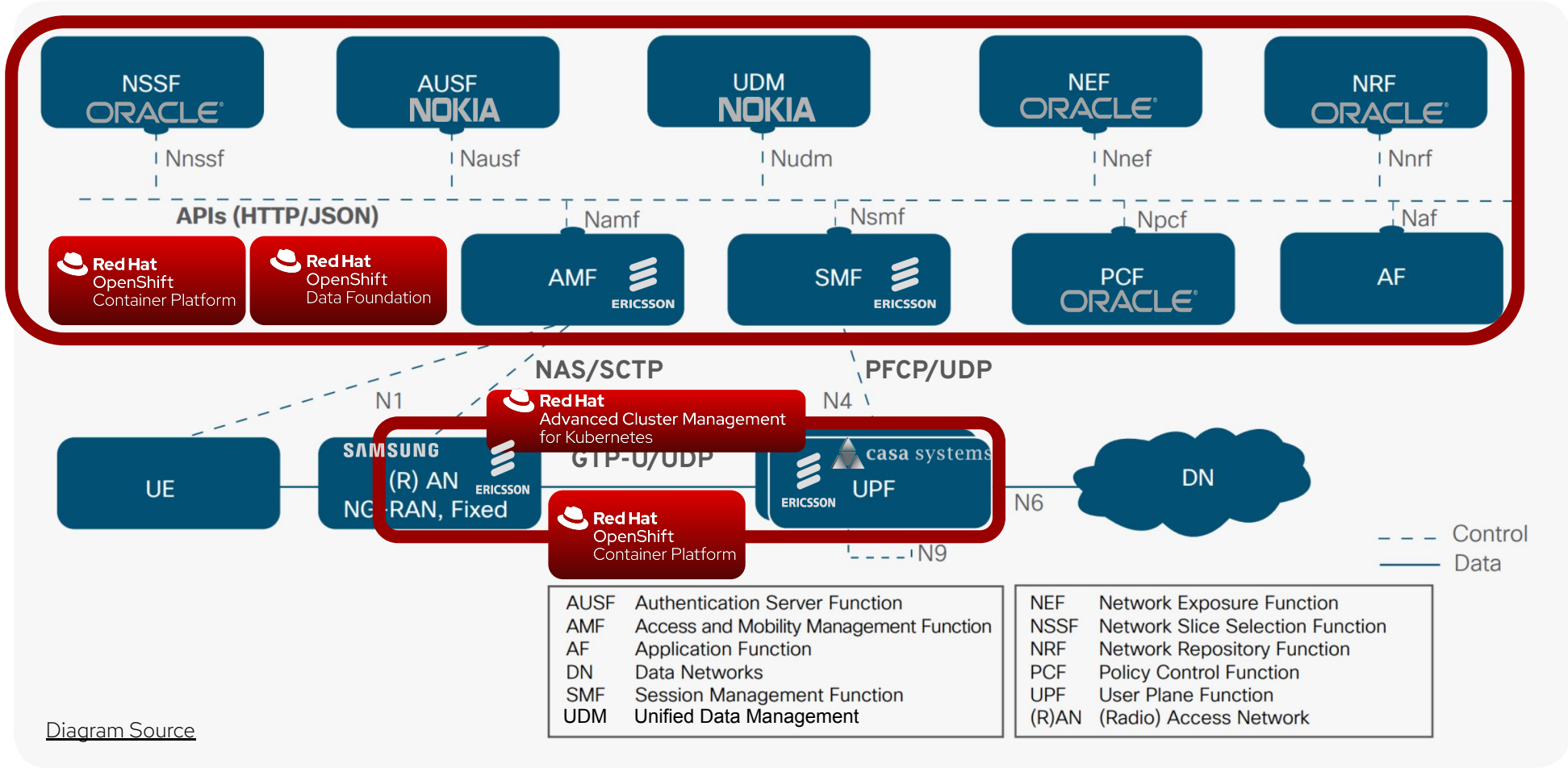

Diagram Source

OpenShift in Open RAN

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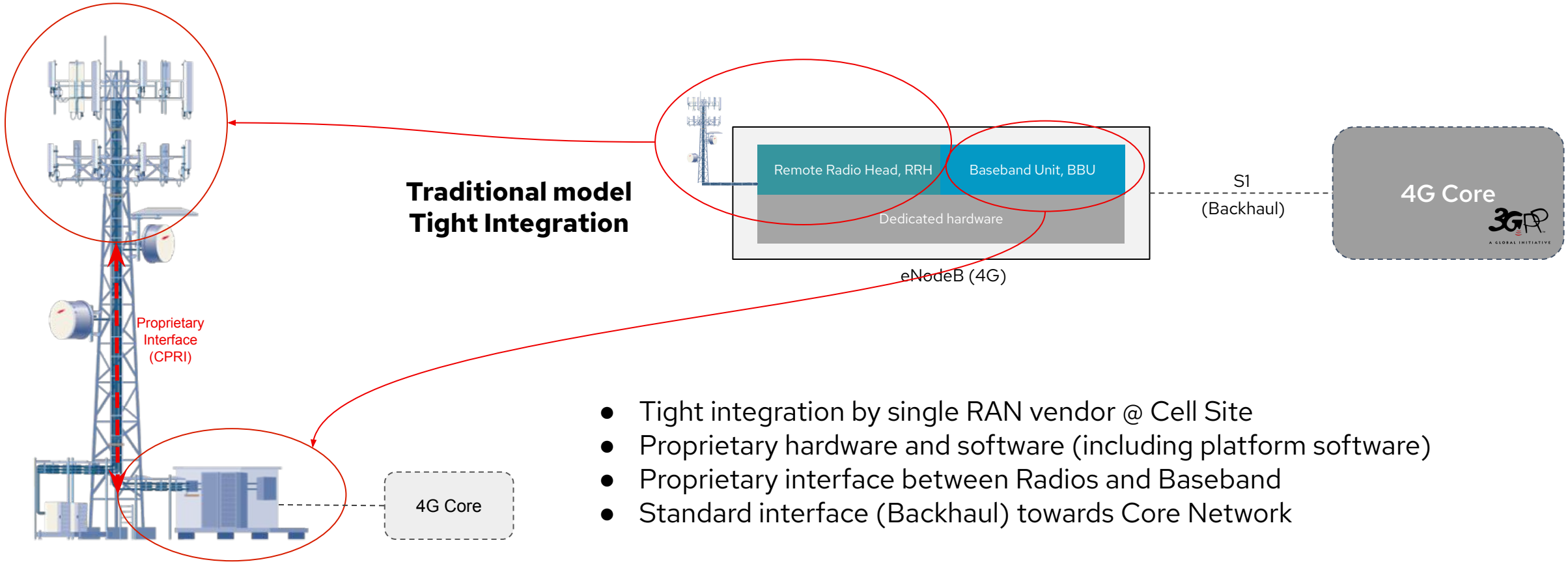
Mobile Network Radio Base Station

RAN Evolution: Traditional Model (2/3/4G)



- Tight integration by single RAN vendor @ Cell Site
- Proprietary hardware and software (including platform software)
- Proprietary interface between Radios and Baseband
- Standard interface (Backhaul) towards Core Network

RRH = Remote radio head
BBU = Baseband unit

RU = Radio unit

DU = Distributed unit
CU = Centralized unit

UP = User plane
CP = Control plane

UPF = User Plane Function

S1 = 4G RAN and EPC interface
NG = Next-generation logical interface

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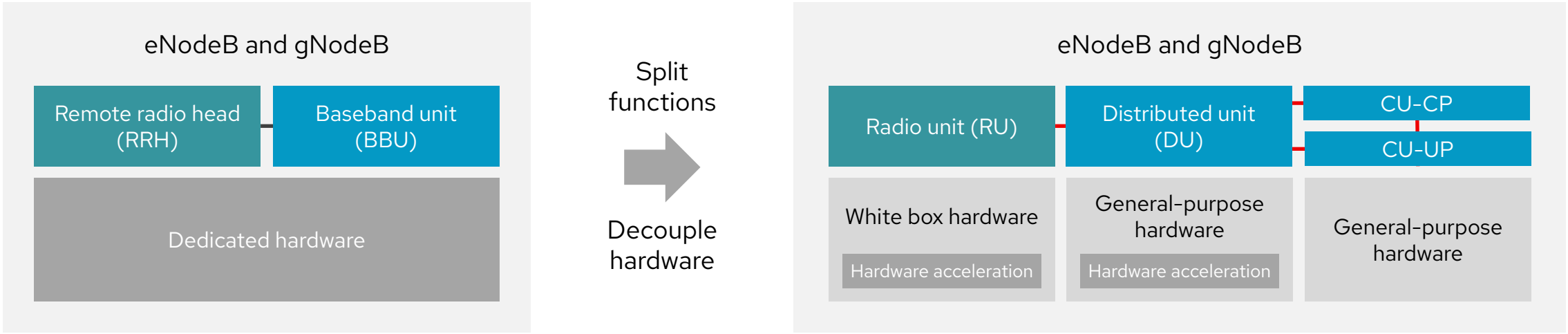
Open RAN Architecture



Key

RRH = Remote radio head
BBU = Baseband unit

O-RU = ORAN Radio unit
O-DU = ORAN Distributed unit

O-CU = ORAN Centralized unit
CP = Control plane

UP = User plane

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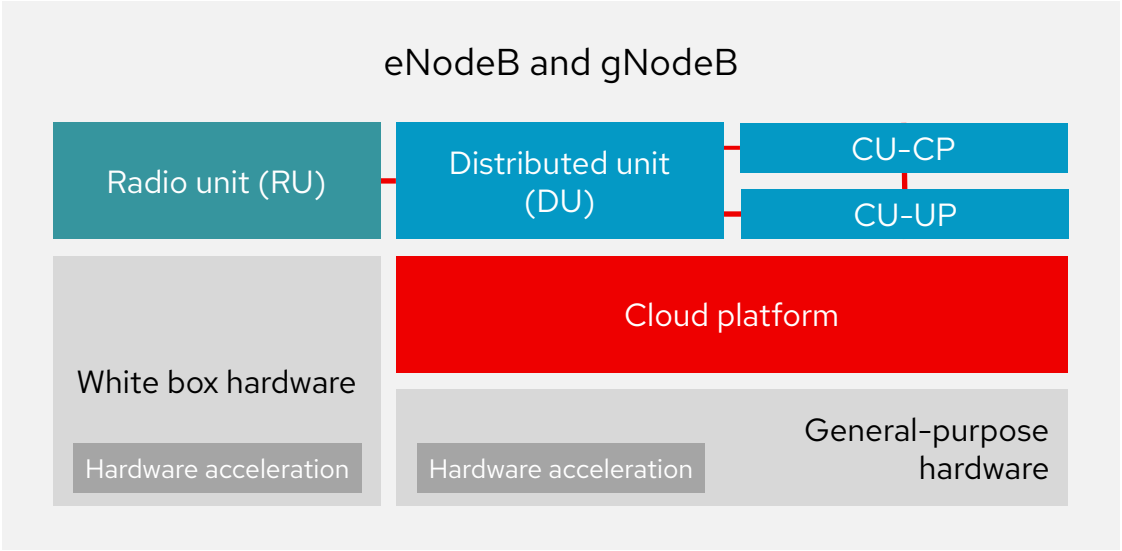
Open RAN cloudification

Cloud platforms bring orchestration and automation to RAN



Key

RU = Radio unit
DU = Distributed unit
CU = Centralized unit
CP = Control plane
UP = User plane

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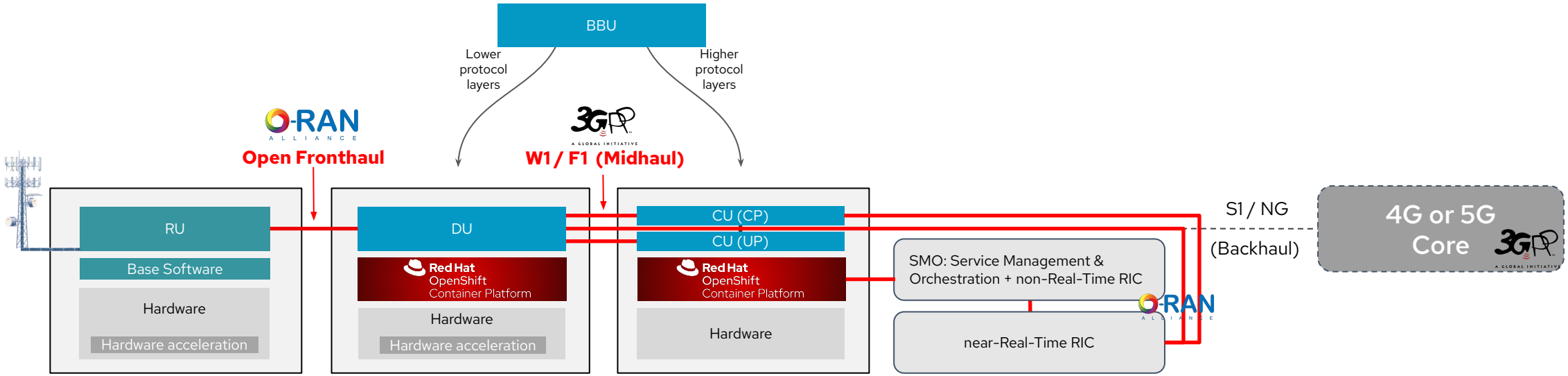
Mobile Network Radio Base Station

RAN Evolution: Open RAN Model with Containerized RAN Workloads on Container Platform



- Midhaul: Functional Split / Disaggregation per 3GPP
- Open Fronthaul by O-RAN Alliance
- Standard interfaces (Backhaul) towards Core Network(s)
- Three entity model: Radio Unit (RU), Distributed Unit (DU), Centralized Unit (CU, Control and User Planes)
- Cloud Platform to host DU and CU workloads
- Potential for multi RAN vendor model

RRH = Remote radio head
BBU = Baseband unit

RU = Radio unit

DU = Distributed unit
CU = Centralized unit

UP = User plane
CP = Control plane

UPF = User Plane Function
RIC = RAN Intelligent Controller

S1 = 4G RAN and EPC interface
NG = Next-generation logical interface

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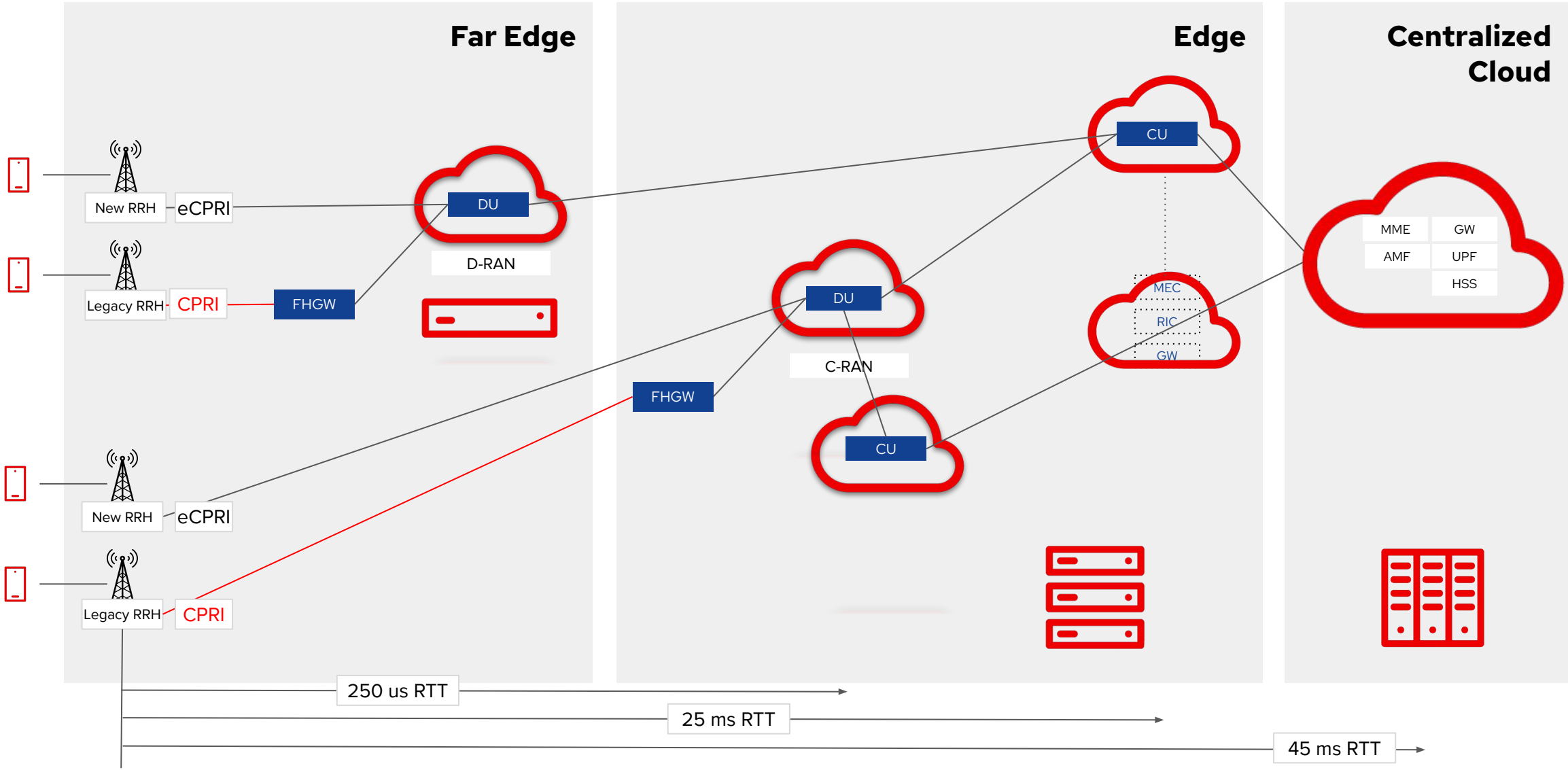
(Open) RAN architectures: D-RAN and C-RAN



D-RAN = Distributed RAN
C-RAN = Centralized RAN

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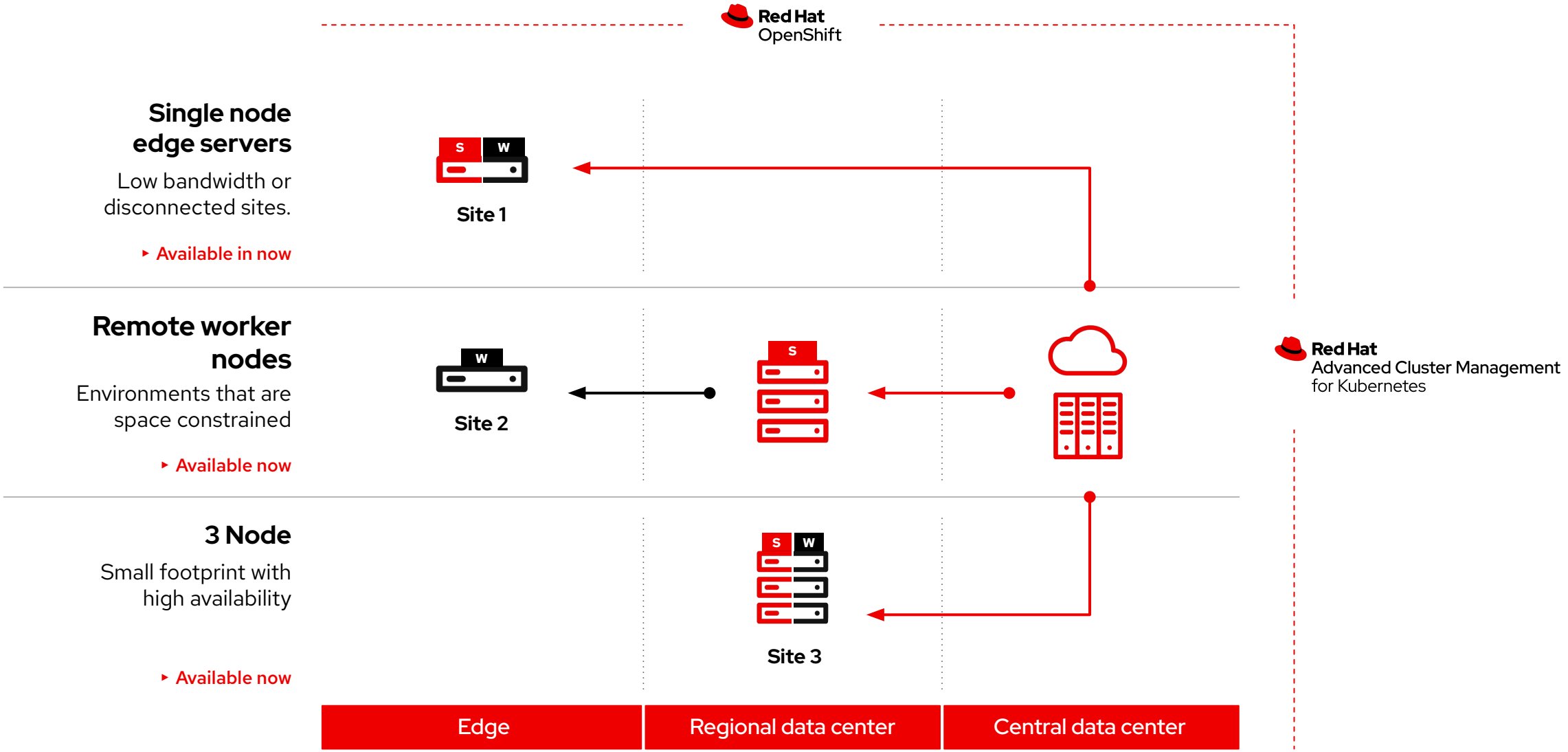

Cluster management and application deployment

Kubernetes node control

Legend:
S: Supervisor/control nodes
W: Worker nodes

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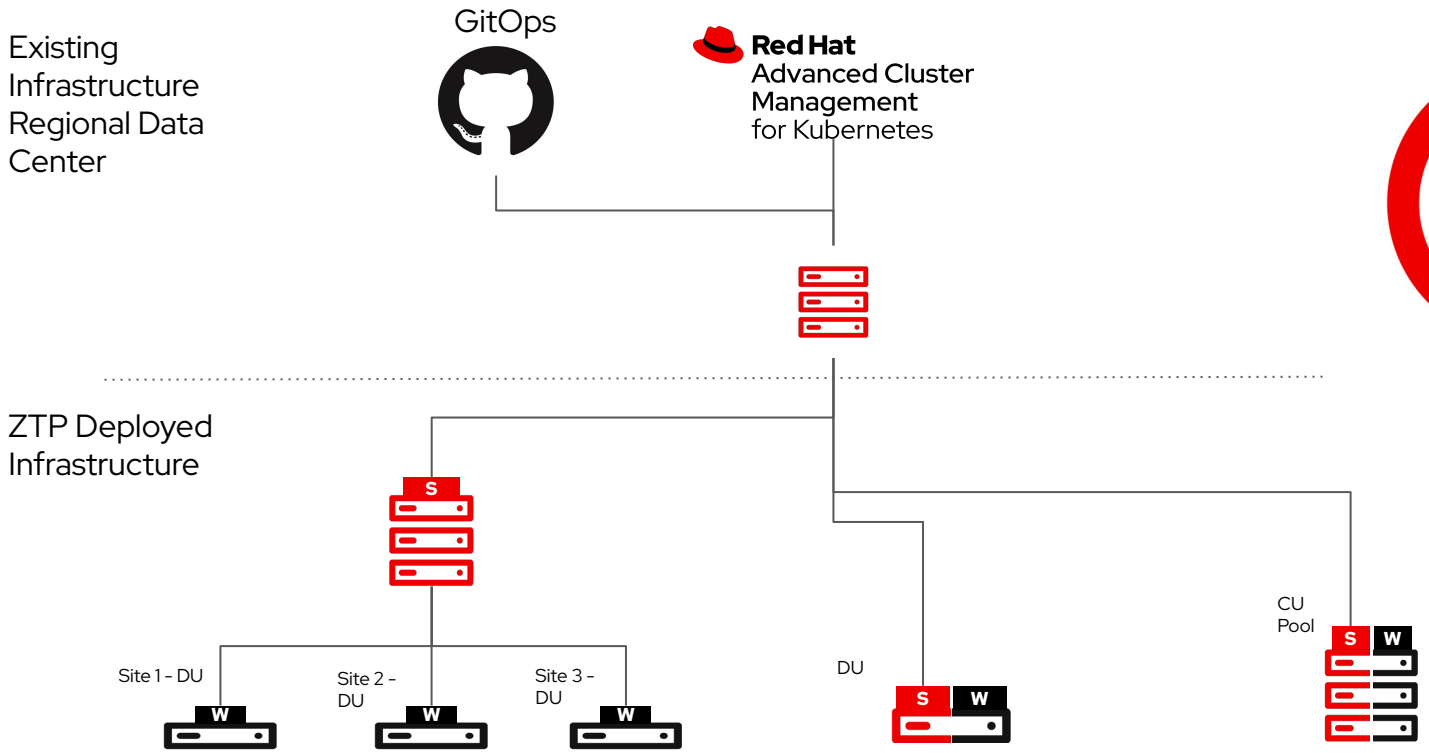
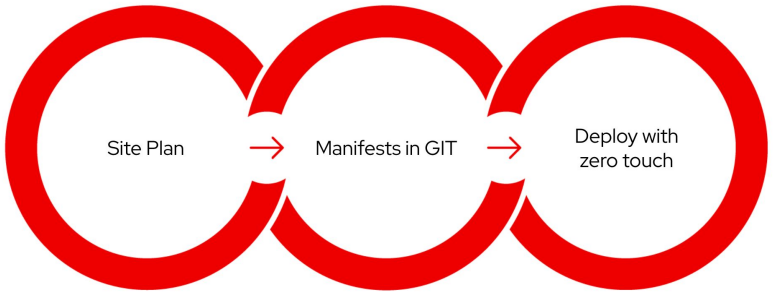
Zero Touch Provisioning

- **Deploy & manage 2000 SNO:** Support DU profile delivery with ACM in IPv6 connected and disconnected scenarios.
- **Export hub collected metrics to external tools:** Operations teams can integrate metrics collected from their Kubernetes clusters with metrics collected from other IT sources for a holistic view in their preferred tooling.





ZTP - Zero Touch Provisioning
DU - Distributed Unit
CU - Central Unit

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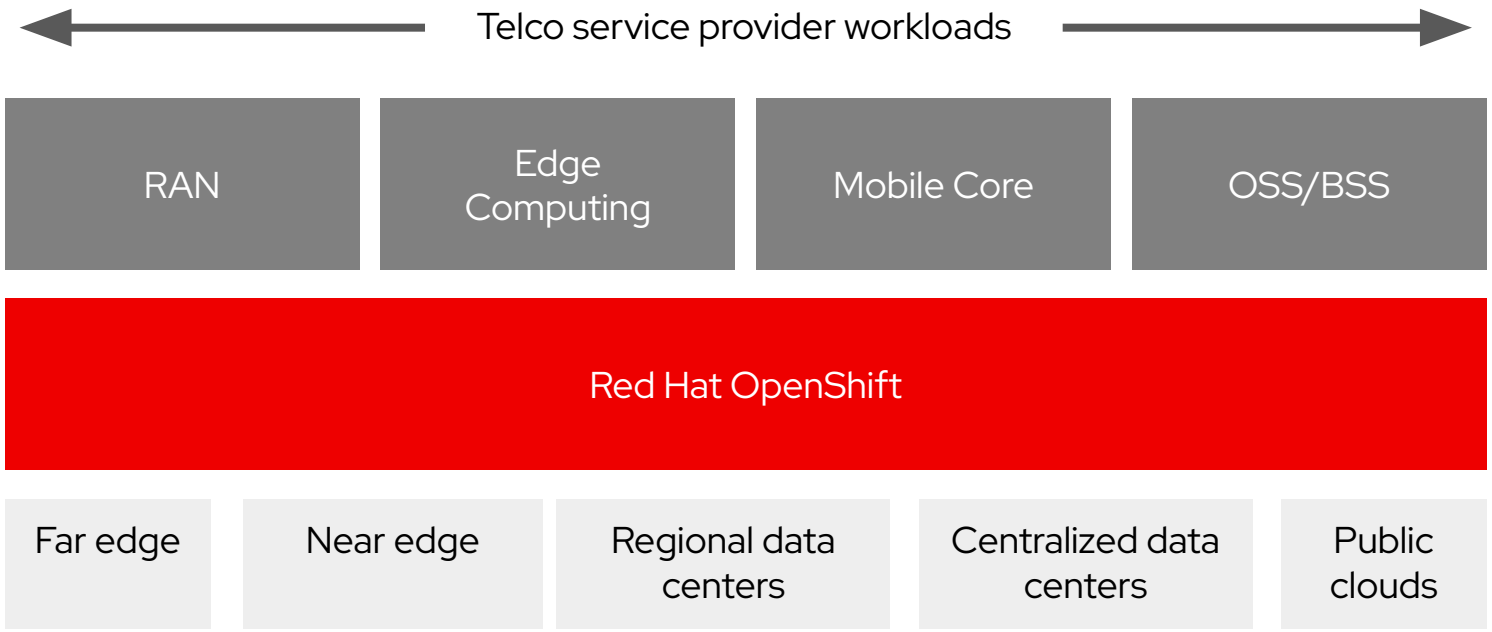
Open horizontal telco cloud - Red Hat OpenShift container platform



Consistent operations

Faster time to market

Increased innovation

Red Hat

Telco Cloud Platform Requirements (RAN and CORE)

Networking

- High Performance Data Plane
- Multiple Networking Interfaces
- High Throughput
- Low Latency
- Load Balancer
- Acceleration Hardware

Deployment & Scale

- Remote Distributed Deployments
- Single node and HA clusters
- Field upgradability
- Zero-touch-provisioning

Real-Time, Latency and Sync

- Time Synchronization
- Real-Time Determinism
- CPU Affinity and Isolation
- Topology Management
- Node Feature Discovery

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Red Hat Telco Ecosystem

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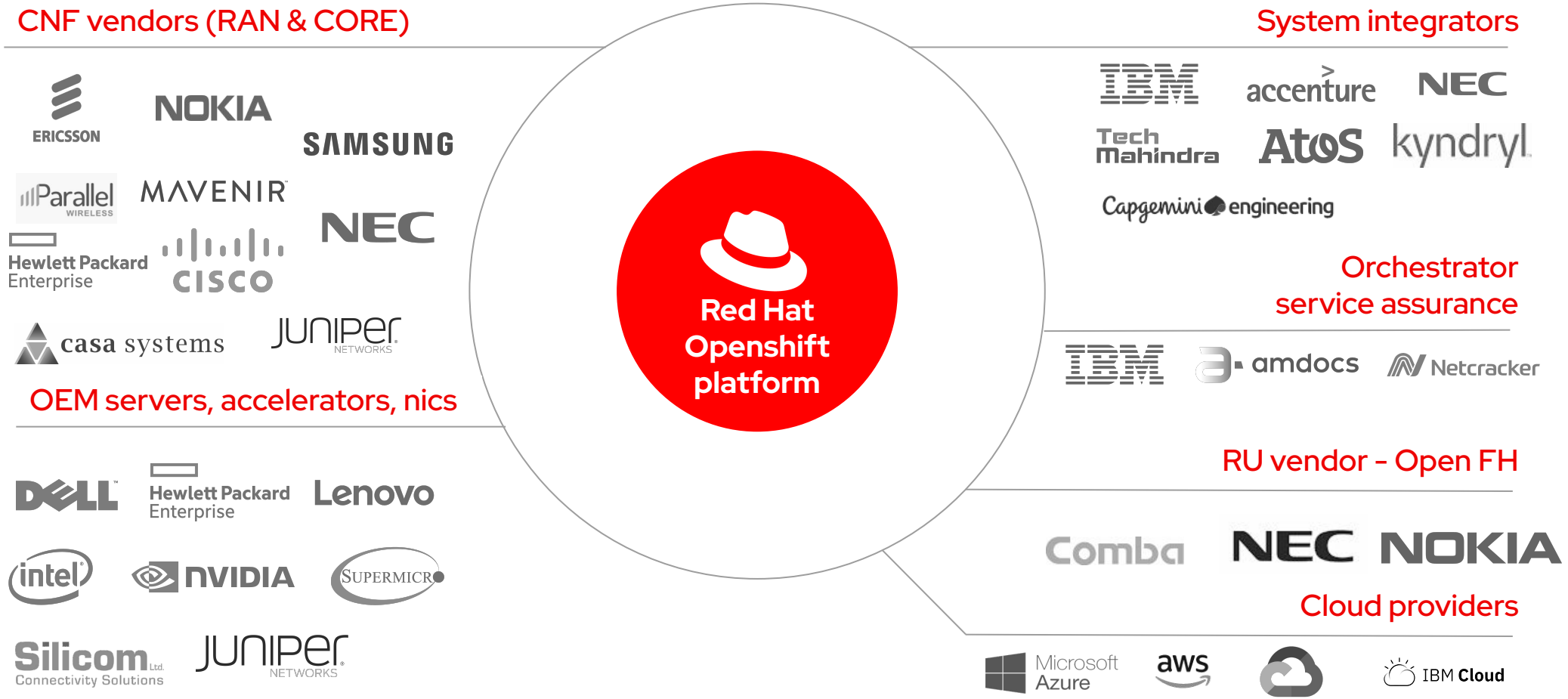
Building Red Hat's Telco ecosystem



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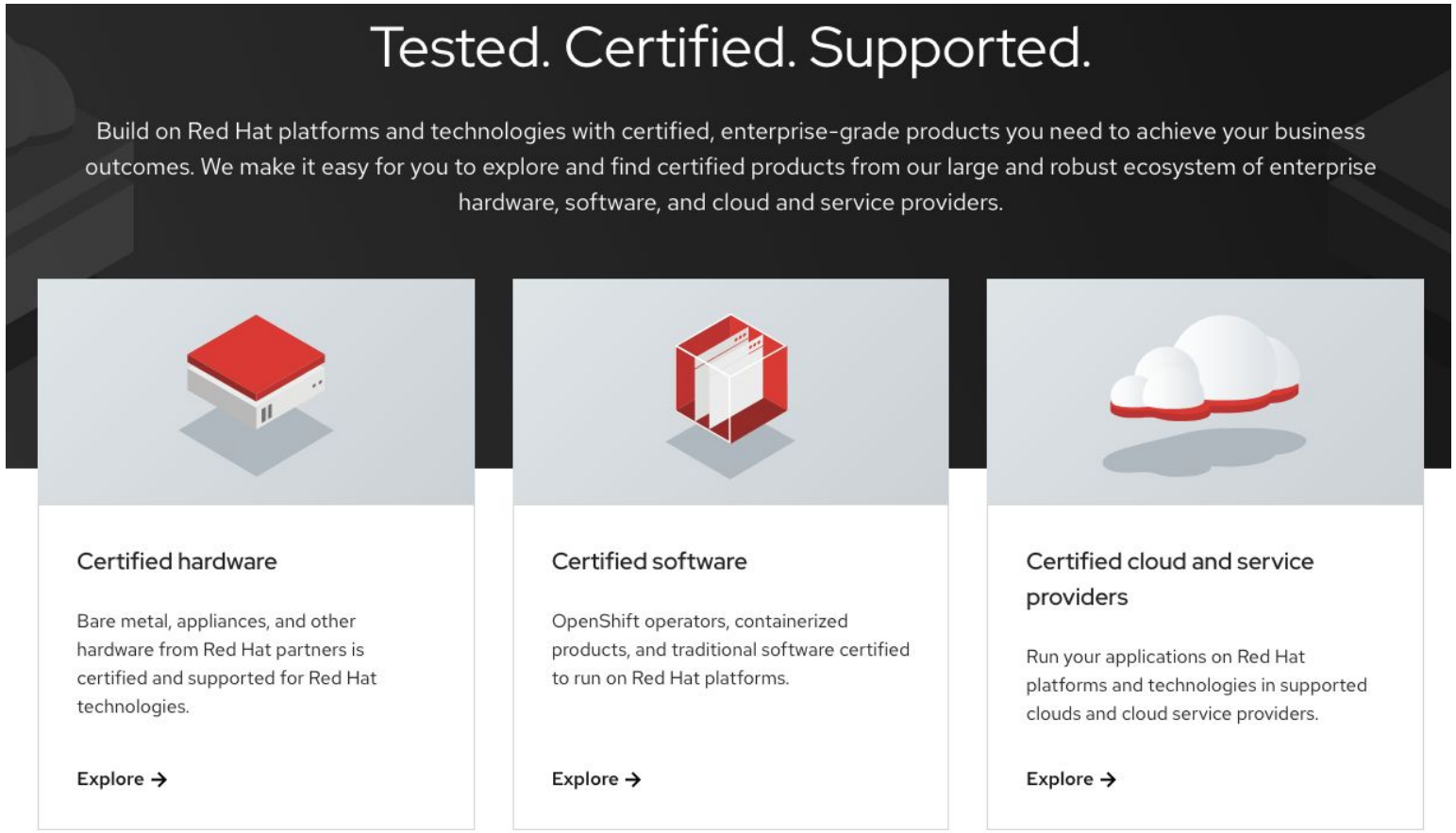

Red Hat Ecosystem Catalog

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Thank you

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