

Open RAN – Comment Perspectives d'un nouveau fournisseur

Mars 2022

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APAC



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billion
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Multicloud Container Development Platforms

Q3 2020



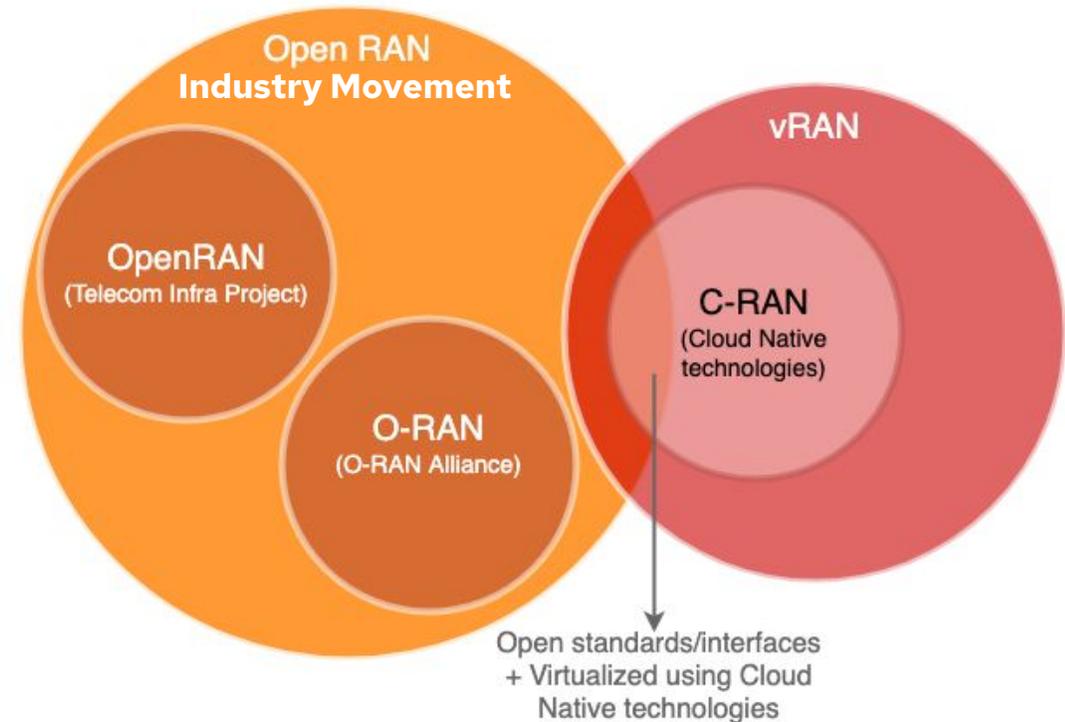
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RAN Evolution: Key Terminology Used

Open RAN, OpenRAN, O-RAN, vRAN, Cloud RAN , ...

1. **Open RAN** is a generic term that refers to **industry movement** and **open RAN architectures** including open interfaces, virtualization / containerization and use of AI/ML, etc.
2. **OpenRAN** is a project initiated by the Telecom Infra Project (TIP). It's an attempt to realize the Open RAN concept on its own part. Its work covers 2G/3G/4G/5G. As inputs, OpenRAN uses 3GPP and O-RAN Alliance specifications.
3. **O-RAN** (ORAN) refers to the O-RAN Alliance or standards created by the O-RAN Alliance, which complements 3GPP specifications by defining interface profiles, new open interfaces and new nodes.
4. **vRAN (Virtualized RAN)**: Whereas Open RAN focuses on openness, vRAN is really about decoupling software from hardware.
5. **Cloud RAN (C-RAN)** is vRAN built on cloud native technologies, such as microservices, containers and CI/CD. Confusingly, C-RAN is also sometimes used to mean Centralized RAN where baseband processing is centralized and relocated out from antenna site to edge data center, but in most cases that is written as CRAN.

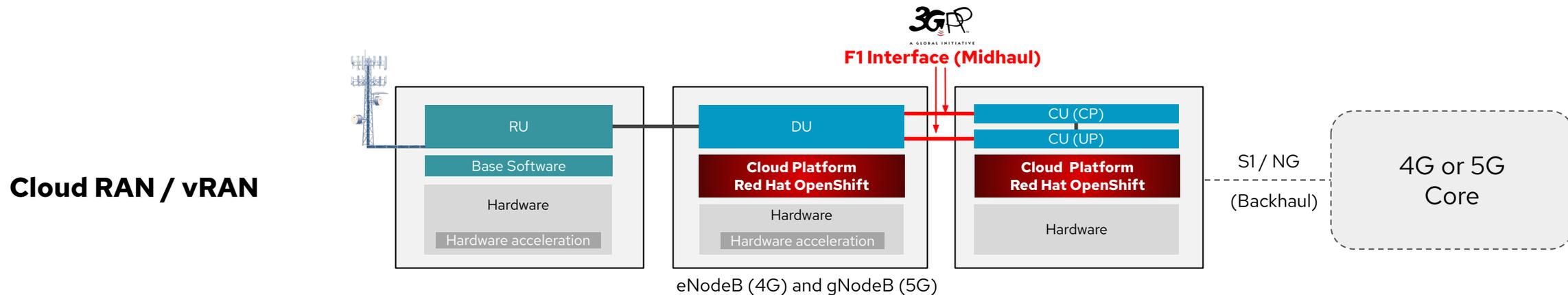


Source: [Devopedia 2021](#).

Open RAN does not have to be virtual
Virtual RAN does not have to be open

Mobile Network Radio Base Station

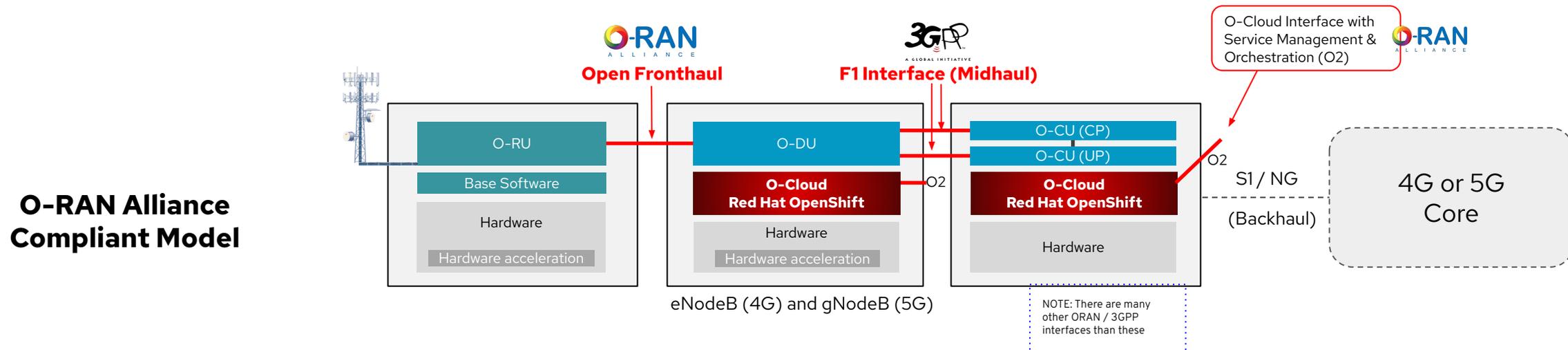
RAN Evolution: Open RAN Model with Containerized RAN Workloads on Container Platform



- Functional Split / Disaggregation per 3GPP Rel 15
- F1 Interface (midhaul) by 3GPP
- Standard interface (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, can be VMs or containers, but increasingly containers
- **Single RAN vendor model**
- **Red Hat OpenShift Container Platform or Red Hat OpenStack Platform as Cloud Platform**

Mobile Network Radio Base Station

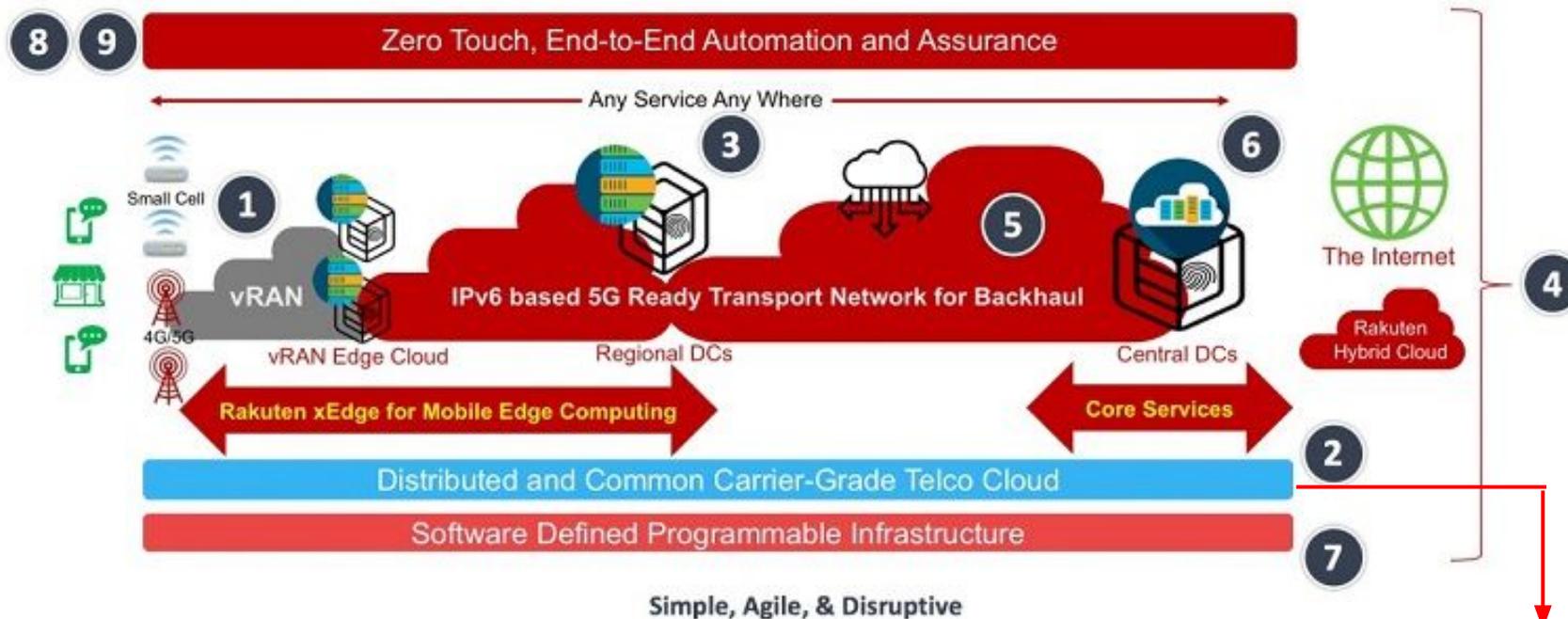
RAN Evolution: Open RAN Model aligned with O-RAN Alliance



- Functional Split / Disaggregation per 3GPP Rel 15
- Open Fronthaul by ORAN Alliance
- F1 Interface (Midhaul) by 3GPP
- Standard interface (Backhaul) towards Core Network(s)
- Three entity model: Radio Unit (RU), Distributed Unit (DU), Centralized Unit (CU, Control and User Planes)
- O-RAN Alliance nomenclature: O-RU, O-DU, O-CU
- **Cloud Platform (O-Cloud)** to host O-DU and O-CU workloads
- **Goal: multi vendor**
- **Red Hat OpenShift Container Platform as O-Cloud**

Overview for Rakuten MNO Architecture

Rakuten Network, World's First Cloud Native Platform



1. Open, Virtualized and Disaggregated RAN
- 2. Fully virtualized with common and distributed Telco Cloud**
- 3. Mobile Edge Computing**
4. 5G systems architecture based design from launch
5. 5G enabled IPv6 transport/Mobile Backhaul Architecture
6. SDN Enabled Centralized and Regional Datacenter Fabrics for 5G
7. Common Hardware SKUs - Standardization and Simplification
8. End-to-End Infrastructure and Service Automation
9. Unified OSS/BSS
10. New Business Models - Opening up new ecosystems

18,000 4G and 1,000 5G base stations in March 2021

 **Red Hat** technologies and services

RAN Evolution Adds New Requirements to Cloud Platforms

These are three of the most important new areas to cover ...

5G NR deployment scenarios
impose new requirements to
the infrastructure layer



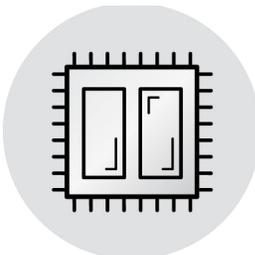
Realtime Kernel (RT)

Workloads stringent low-latency determinism requirements for core kernel features such as interrupt handling and process scheduling in the microsecond (μ s) range.



Precision Time Protocol (PTP)

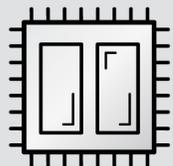
Time synchronization via transport networks will be critical for 5G radios. PTP remains the preferred method to deliver timing across packet-switched networks



Hardware Acceleration

Field Programmable Gate Arrays (FPGA) , SmartNIC, and other hardware acceleration components will be vital for 5G virtualized infrastructure.

RAN Evolution Adds New Requirements to Cloud Platforms



CPU Management

CPU Manager manages groups of CPUs and constrains workloads to specific CPUs. CPU Manager is useful for workloads that have some of these attributes: require as much CPU time as possible or are low-latency network applications.



Topology Management

Topology Manager collects hints from the CPU Manager, Device Manager, and other Hint Providers to align pod resources, such as CPU, SR-IOV VFs, and other device resources, for all Quality of Service (QoS) classes on the same non-uniform memory access (NUMA) node.



Low Latency

A combination of multiple factors that allow the workload the maximum processing capacity and minimizes packet delivery latencies.



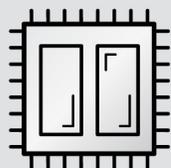
Zero touch provisioning

Provides all the tools required to install, upgrade and maintain the cloud infrastructure for the RAN workload with minimum user interaction in an “appliance” like deployment. Reduced complexity with increased flexibility of options and performance.



Remote Management

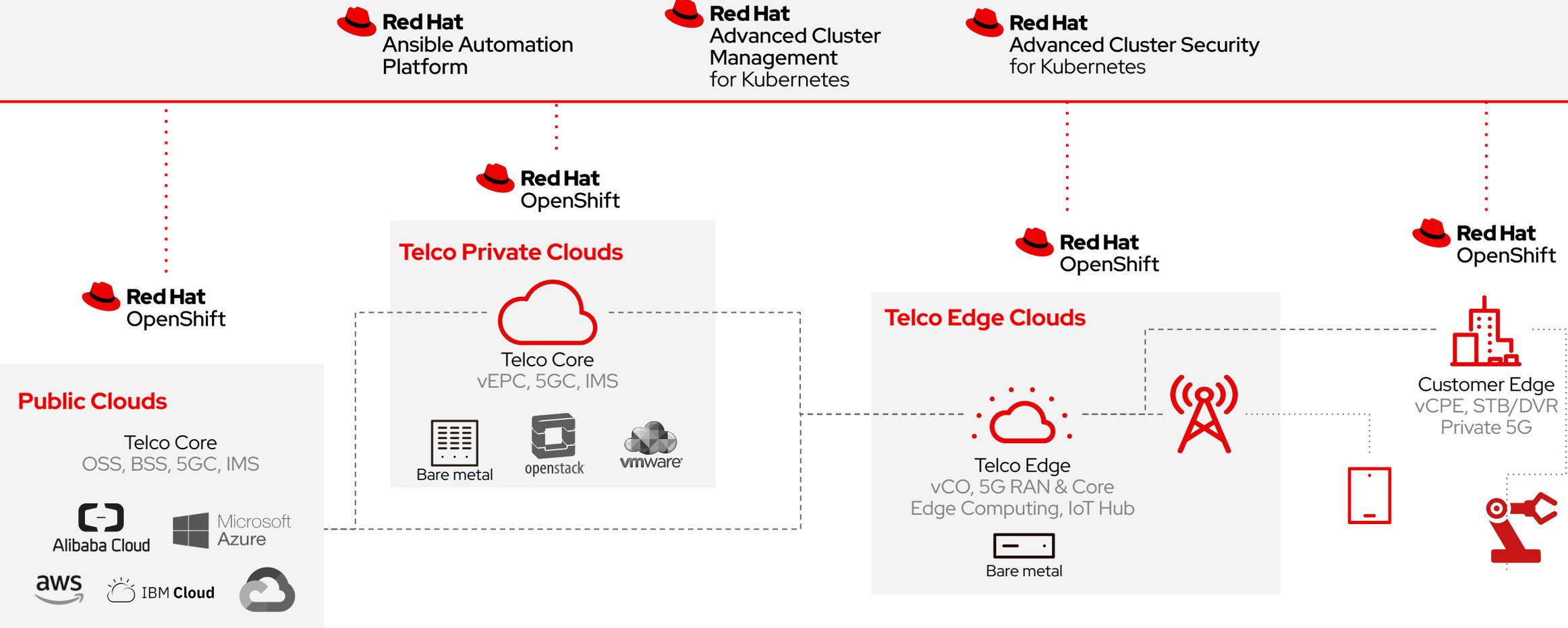
Take full control of edge and RAN operation from a centralized single pane of glass. This includes, OpenShift installation and upgrade, application provisioning and monitoring.



Reduce footprint

Remote Radio sites have limited space and power, therefore edge and RAN clouds would require a small cloud footprint.

Enabling a uniform telco horizontal cloud



A single platform for the edge

Radio Access Network

Centralized Unit (CU)
Distributed Unit (DU)

Mobile Core

4G S/P-GW-U
5G UPF

Edge Computing

CDN, IaaS, CaaS
AI/ML applications
Industry-specific B2B
applications

A single open telco cloud platform for the edge

Optimize scarce resources at the edge (space, power, cooling)
Consistent operations, a single platform to manage instead of three
Innovation and speed to market, re-use platform to pick best of breed workloads

Key requirements for edge platform

Radio Access Network

Centralized Unit (CU)
Distributed Unit (DU)

Support of RAN workloads:
real time Linux, low latency
kernel, PTP, hardware
accelerator...

Ecosystem of RAN network
functions

Mobile Core

4G S/P-GW-U
5G UPF

Support of mobile user plane
NFs: CPU pinning, NUMA
topology, SR-IOV, DPDK,
huge pages...

Ecosystem of mobile core
network functions

Edge Computing

CDN, IaaS, CaaS
AI/ML applications
Industry-specific B2B
applications

Support for cloud computing
services: IaaS, CaaS, block,
object, file storage, vGPU
Developer tools
Ecosystem of IT PaaS and
applications ISVs

Small footprint (minimal amount of servers), management at scale of 100's, 1000's of edge clusters

OpenShift ecosystem for mobile core

Status as of February 2022, more coming soon...

Vendor	CNF
	UnityCloud 5G Core
	Alepo Converged Core Solution
	Axyom™ 5G Multi Access Core
	5G Core with Network Slice Manager and 5GLAN, TSN support functions
	Secure 5G Core

Vendor	CNF
	5G Authentication, Core Charging, Policy Control Data management
	5G Core
	5G Core
	5G Core, Converged Charging
	5G Core CNF
	5G Common Core i5GC

OpenShift ecosystem for RAN

Status as of February 2022, more coming soon...

More than 40 certified CNFs
in Red Hat Ecosystem catalog
(as of February 2022)

Ericsson:

[Open RAN Ecosystem Evolution](#), February 2022 with Eric Parsons, VP, Cloud RAN at Ericsson

Nokia:

[Accelerating cloud RAN technology innovation in the 5G era](#), February 2022, with Jane Rygaard, Head of Dedicated Wireless Networks and Edge Clouds at Nokia

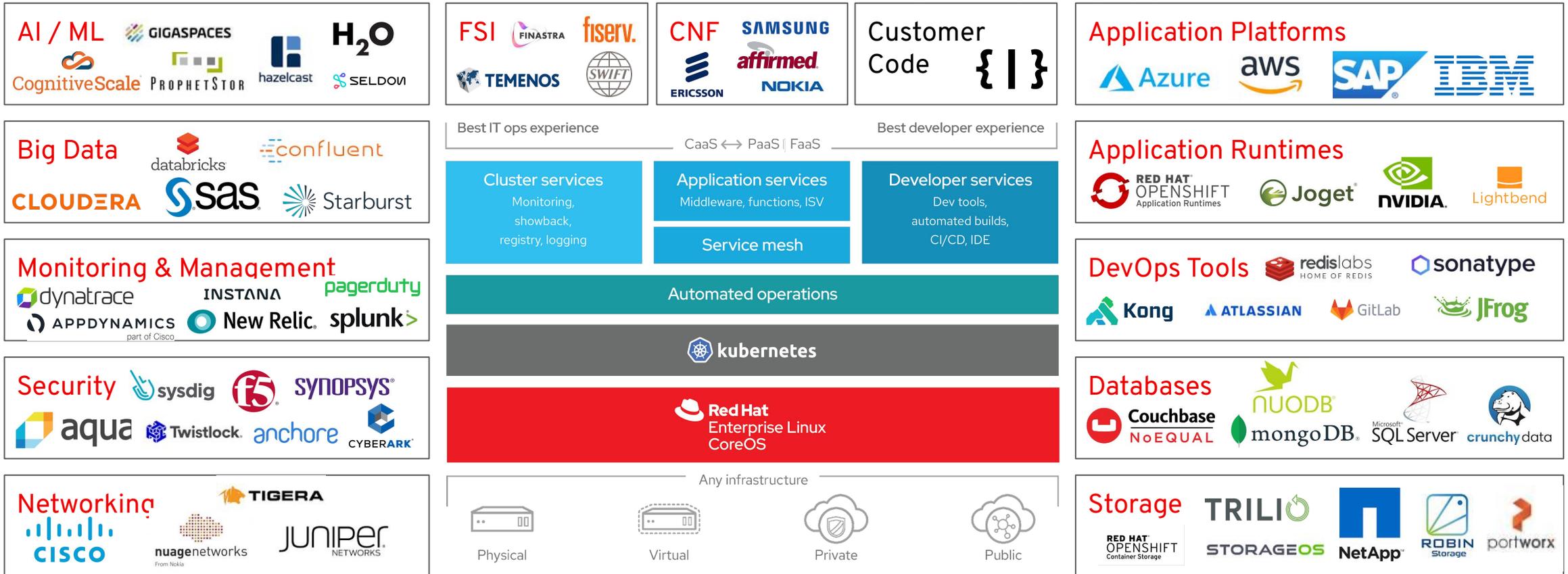
Samsung 5G vRAN:

[Samsung Joins Forces With Industry Leaders To Advance 5G vRAN Ecosystem](#), February 2022

Vendor	CNF
 ALTIOSTAR <i>Leading Network Transformation</i>	4G and 5G Open vRAN
	Aurora Airband RAN
	5G RAN CU
	5G vRAN
	RAN Intelligent Controller (RIC)

OpenShift ecosystem for IT

Most extensive container ecosystem to build edge computing applications



OpenShift ecosystem for IT

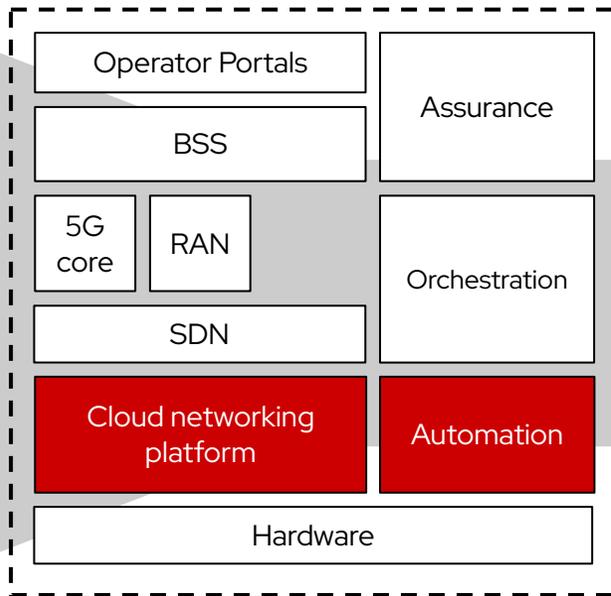
Most extensive container ecosystem to build edge computing applications

AI / ML CognitiveScale GIGASPACE PROPHETSTOR hazelcast H ₂ O SELDOVI	FSI TEMENOS FINASTRA fiserv. SWIFT	CNF ERICSSON SAMSUNG affirmed NOKIA	Customer Code { }	Application Platforms Azure aws SAP IBM
Big Data CLOUDERA sas databricks	<p>5000+ OpenShift certified container images</p> <p>300+ OpenShift certified containerized products</p> <p>200+ OpenShift certified operators</p>			Realtime Joget nvidia Lightbend
Monitoring & Management dynatrace APPDYNAMICS INSTANT New				redislabs HOME OF REDIS sonatype SIAN GitLab JFrog
Security aqua sysdig Twistlock				UODB MongoDB Microsoft SQL Server crunchydata
Networking CISCO nuagenetworks TIGERA JUNIPER NETWORKS				Storage RED HAT OPENSIFT Container Storage TRILIO STORAGEOS NetApp ROBIN Storage portworx
Any infrastructure Physical Virtual Private Public				

End to end system integration

What has been disaggregated needs to be integrated

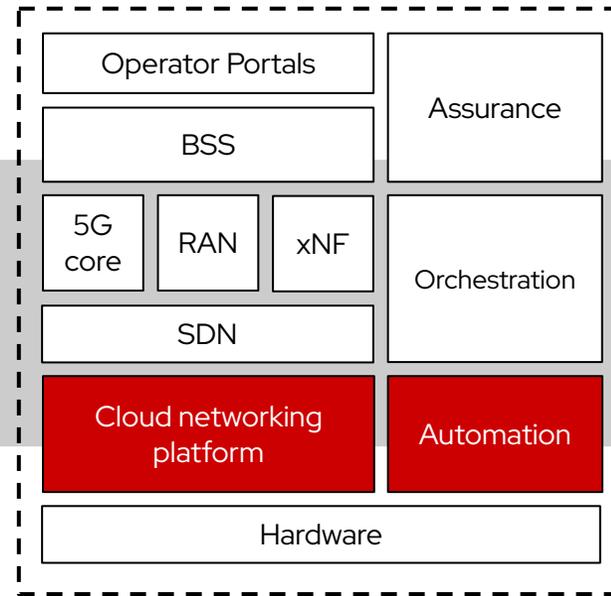
Red Hat Reference Architecture lab



Red Hat owned and managed

- Use case based
- Pre-architected and integrated
- interoperability & performance tested
- 80% re-usable

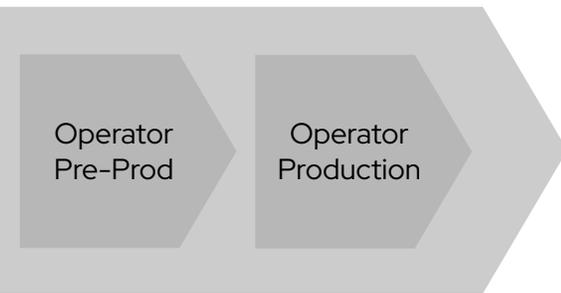
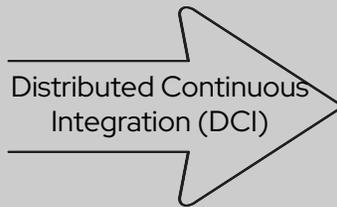
Telco Blueprint lab



Led by telco or system integrator (SI)

Red Hat serviced & supported

- Standardized high-level design (HLD)
- Dedicated life-cycle lab
- Continuous testing
- 20% telco service provider specific



Red Hat platform with certified ecosystem products

National sovereignty

How open source can help with digital sovereignty



Security

More eyes, more security



Secure supply

Code that lasts forever

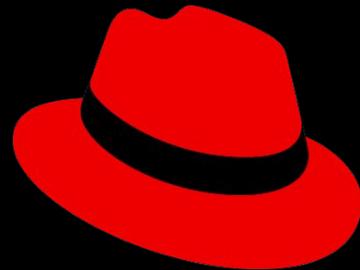


OPERATE FIRST

“Open Source removed the access to software as a limiting factor for businesses and individuals. However, with software proliferating into every aspect of the business – and our world in general – resulting in ever growing complexity of software stacks, **the challenge is now operationalizing software.**”

Our code is

open_



Red Hat

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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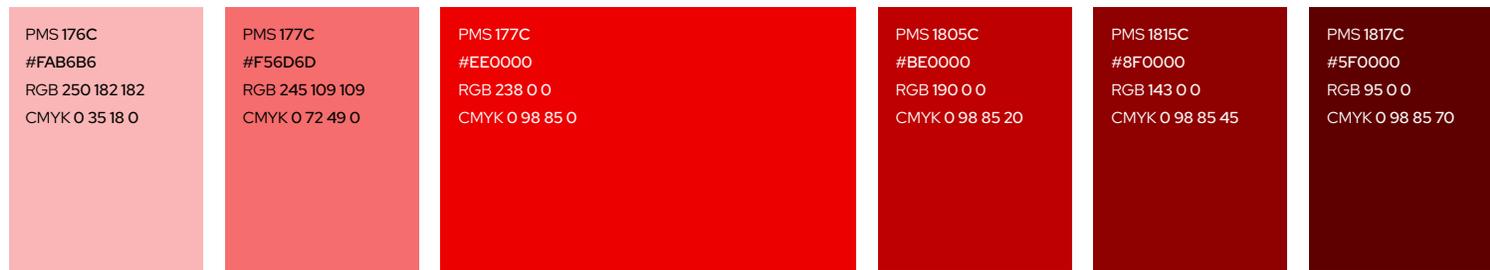


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Using color in presentations



Red tints

Red Hat red

Red shades



Neutrals

Start with our core

Whether distributed internally or externally, presentations should always feel like Red Hat. Use our core colors and adhere to the presentation template.

Using color in presentations



Presentation palette 1



Presentation palette 2



Presentation palette 3



Presentation palette 4

Beyond red

While our core colors should work for most presentations, some slides include graphs, diagrams, and other assets that require additional colors. In these instances, choose one of the presentation palettes to keep your presentation professional and on-brand.