Open Source - Fundamental for Telcos and 5G

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Open source software is code that is designed to be publicly accessible—anyone can see, modify, and distribute the code as they see fit
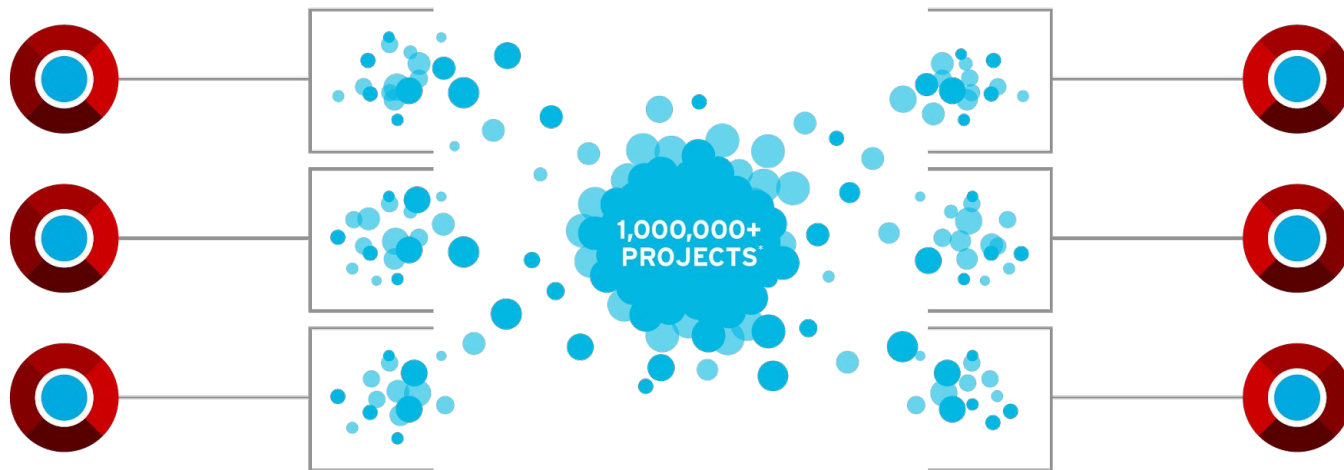

Components

Productize

Product

Get in and Drive

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PRODUCT DEVELOPMENT MODEL

1,000,000+ PROJECTS

PARTICIPATE

We participate in and create community-powered upstream projects.
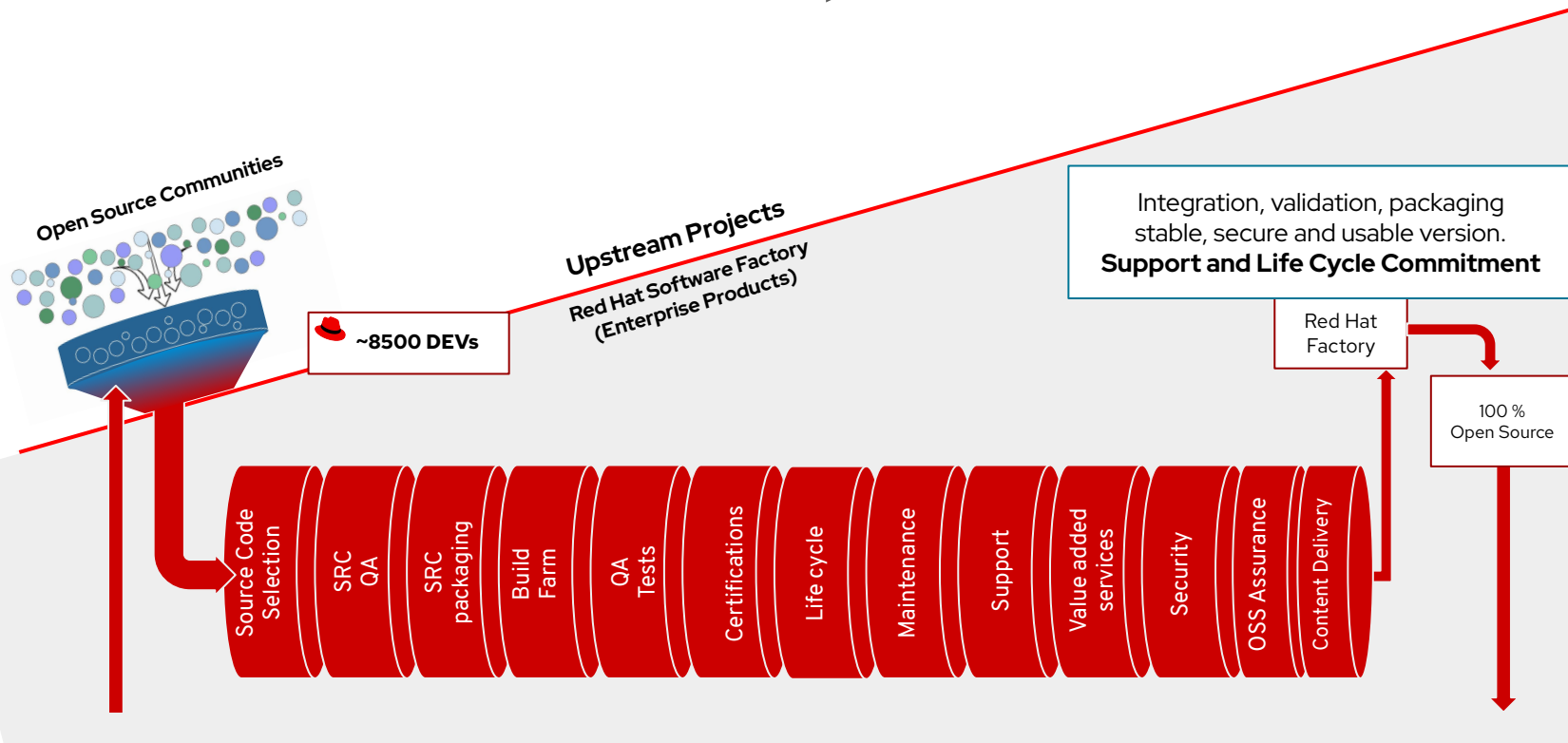
INTEGRATE

We integrate upstream projects, fostering open community platforms.

STABILIZE

We commercialize these platforms together with a rich ecosystem of services and certifications.

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Product Development Model

Open Source Communities

Upstream Projects
Red Hat Software Factory
(Enterprise Products)

~8500 DEVs

Integration, validation, packaging stable, secure and usable version.
Support and Life Cycle Commitment

Red Hat Factory

100 % Open Source

Source Code Selection • SRC QA • SRC packaging • Build Farm • QA Tests • Certifications • Life cycle • Maintenance • Support • Value added services • Security • OSS Assurance • Content Delivery

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CSPs are embracing Open Source

Now Open Source is preferred foundation for development at scales

Now communications service providers **(CSPs) are reconsidering their position on open source** – even if their established suppliers are not eager to follow.

44%
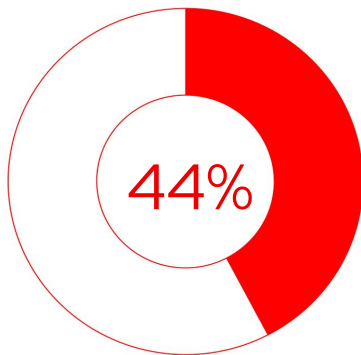
44% of CSPs

Say a **lack of software skills** within the organization is their **biggest challenge** to adopting Agile software development.
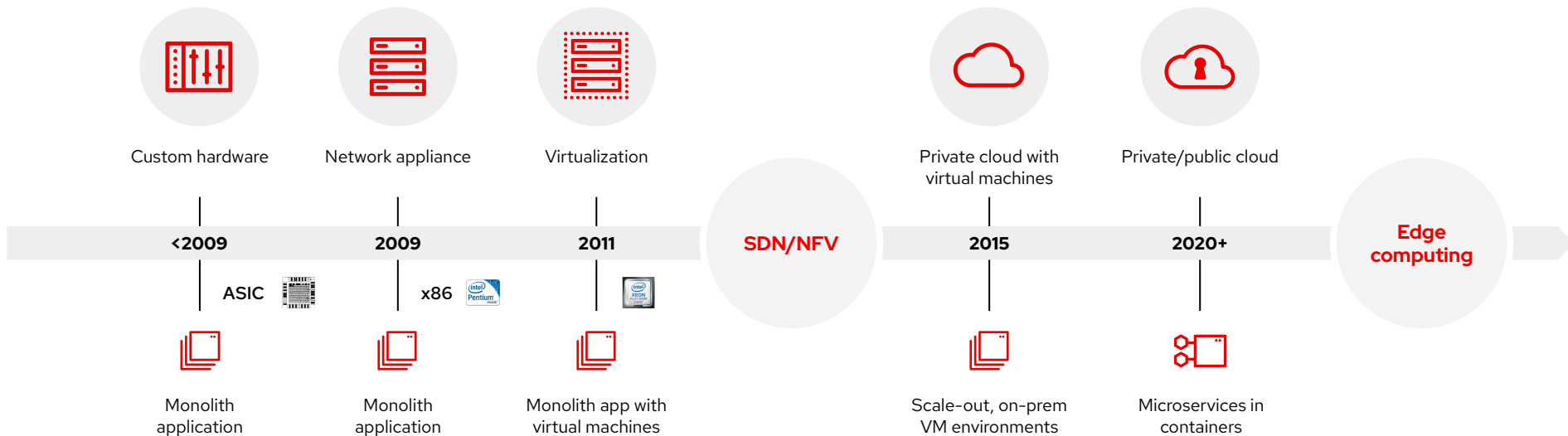
66%
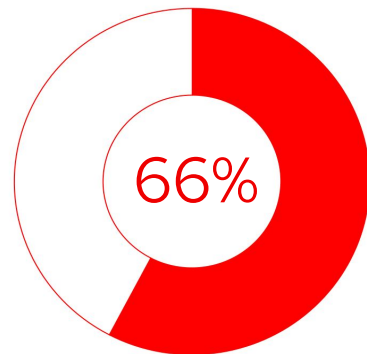
66% of CSPs

Believe s**ignificant cultural change will be required** to meet their future software needs, and **90% overall say "some"** culture change is required.

https://inform.tmforum.org/research-reports/future-oss-towards-an-open-digital-architecture/

V0000000

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Network transformation journey

The real-time aspects of 5G and edge computing will increase the urgency of speeding up "the VNF onboarding process.

Custom hardware	Network appliance	Virtualization		Private cloud with virtual machines	Private/public cloud	Edge computing
<2009	**2009**	**2011**	**SDN/NFV**	**2015**	**2020+**	
ASIC	x86					
Monolith application	Monolith application	Monolith app with virtual machines		Scale-out, on-prem VM environments	Microservices in containers	

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Key Success Factors for open source in Telecoms

Risk Mitigation

Simpler, more effective support contracts.

Customization Dilema

Modularity

Costs goes without saying

Thierry Souche, then Senior Vice President of Orange Labs Products & Services (now CIO at Orange Group), said during his 2013 keynote at the OW2 conference, "No telco will survive without embracing open source."

"Open source is our default option," declared Koen Vermeulen, CIO at Orange France, at the last in-person OW2 conference in 2019. He encouraged all operators to do likewise and make open source their default option when transforming both network and operations"
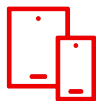
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5G is the latest evolution of wireless mobile technology

Ultra-reliable, immersive experiences for people and objects when and where it matters most

Enhanced mobile broadband (eMBB)

5G enhances data speeds and experiences with new radio capabilities like mmWave frequency spectrum for higher bandwidth allocation and theoretical throughput up to 20Gbps.

Ultra-reliable, low-latency communication (uRLLC)

5G supports vertical industry requirements, including sub-millisecond latency with less than 1 lost packet in 10^5 packets.

Massive machine type communications (mMTC)

5G supports cost-efficient and robust connection for up to 1 million mMTC, NB–IOT*, and LTE–M** devices per square kilometer without network overloading.

* NB-IOT = Narrowband internet of things
** LTE-M = Long Term Evolution Machine Type Communication

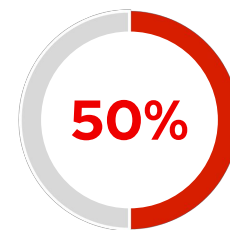# 5G will account for 20% of the global mobile industry by 2025

5G will contribute US$2.2 trillion to the global economy over the next 15 years.

The manufacturing, utilities, and professional and financial services sectors will benefit the most.

20%
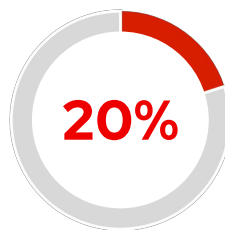
Global connections

By 2025, the number of 5G connections will reach 1.8 billion—20% of the global total.

50%

U.S. connections

5G is forecast to account for 50% of total connections in the U.S. and 30% in China and Europe.

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Industrial opportunities for 5G

Healthcare
Enhanced diagnostic and image analysis, early pandemic detection

Technology, media, & telecommunications
Network maintenance & optimization, self-learning security, neural nets, personalized content

Automotive
Predictive maintenance, autonomous ride sharing, driver assistants

Retail and consumer
Personalized production, delivery, & management, demand prediction and analysis

Financial services
Trading, personal finance planning, fraud detection, customer operations

Energy
Predictive infrastructure maintenance, grid operations and storage, smart metering

Transportation and logistics
Traffic flow management, autonomous trucking and delivery

Manufacturing
Process correction and optimization, on-demand production

Move to Intelligent Infrastructure

5. Support intelligent edge services.

4. Transform OSS to AI-enabled, autonomous.

3. Develop AI/IoT data management and integration platform.

2. Transform services development to agile, Ci/CD, cloud-native.

1. Evolve Network infrastructure thru NFVi toward cloud native: Kubernetes, Operators, etc.
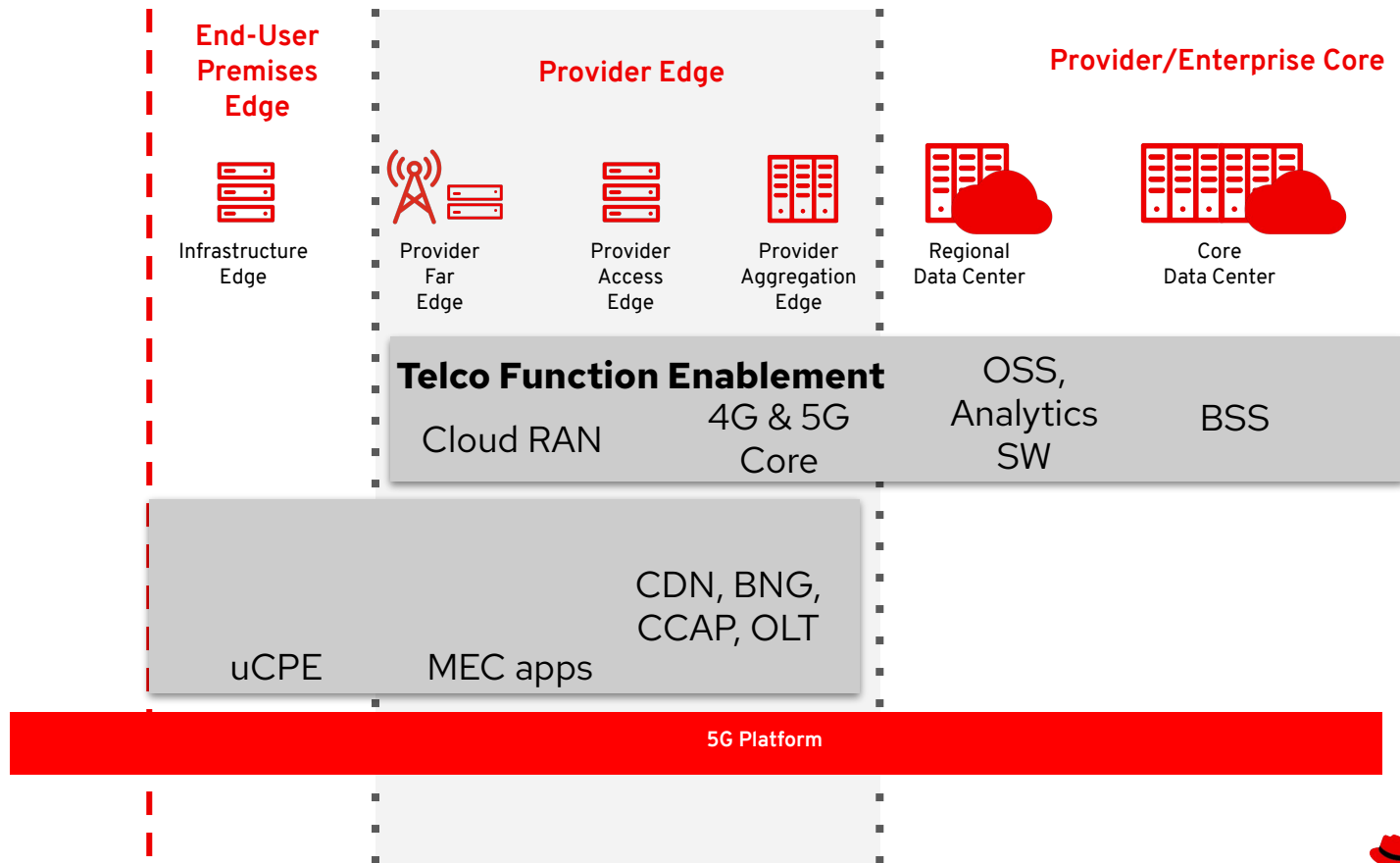
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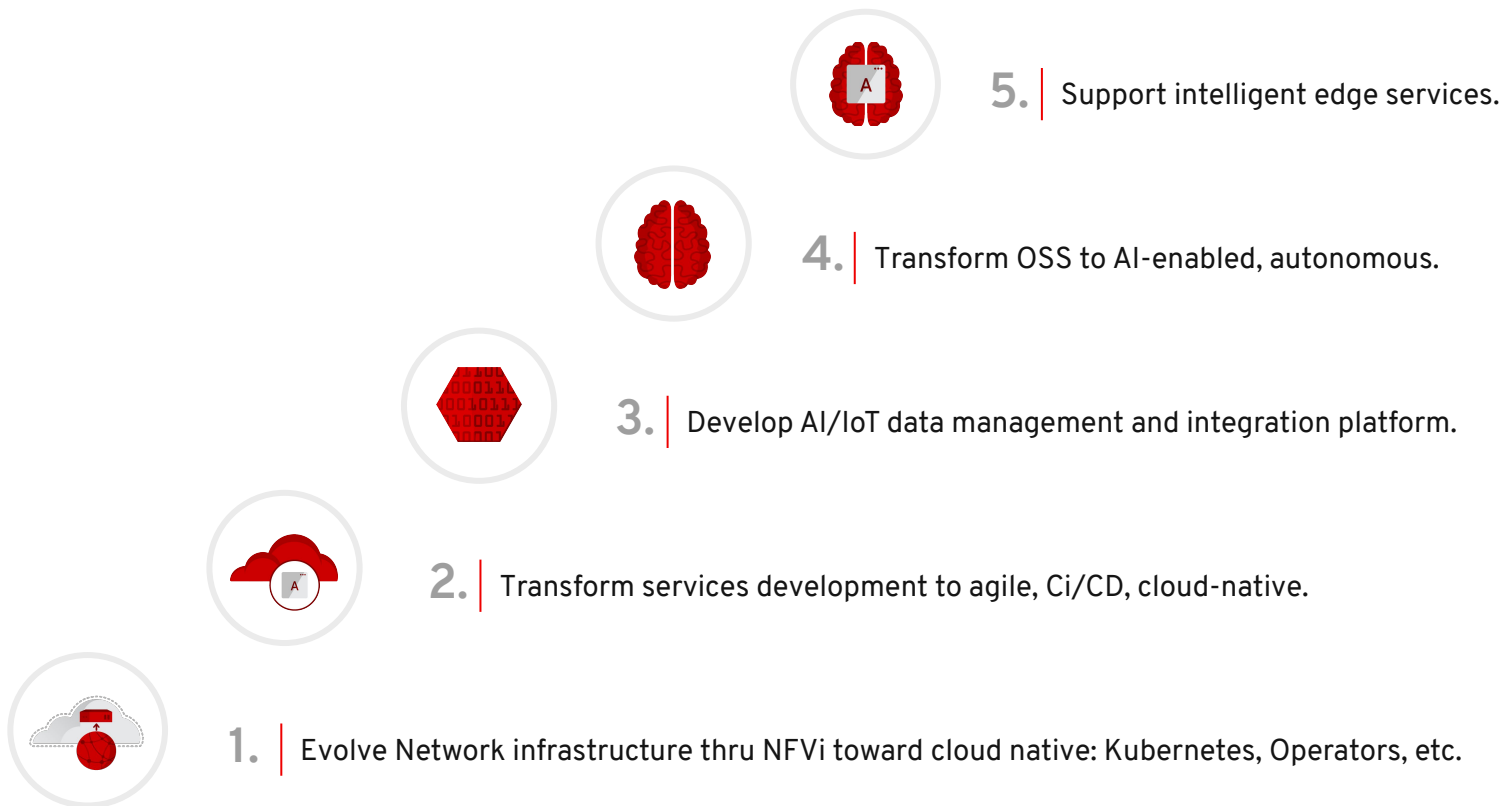
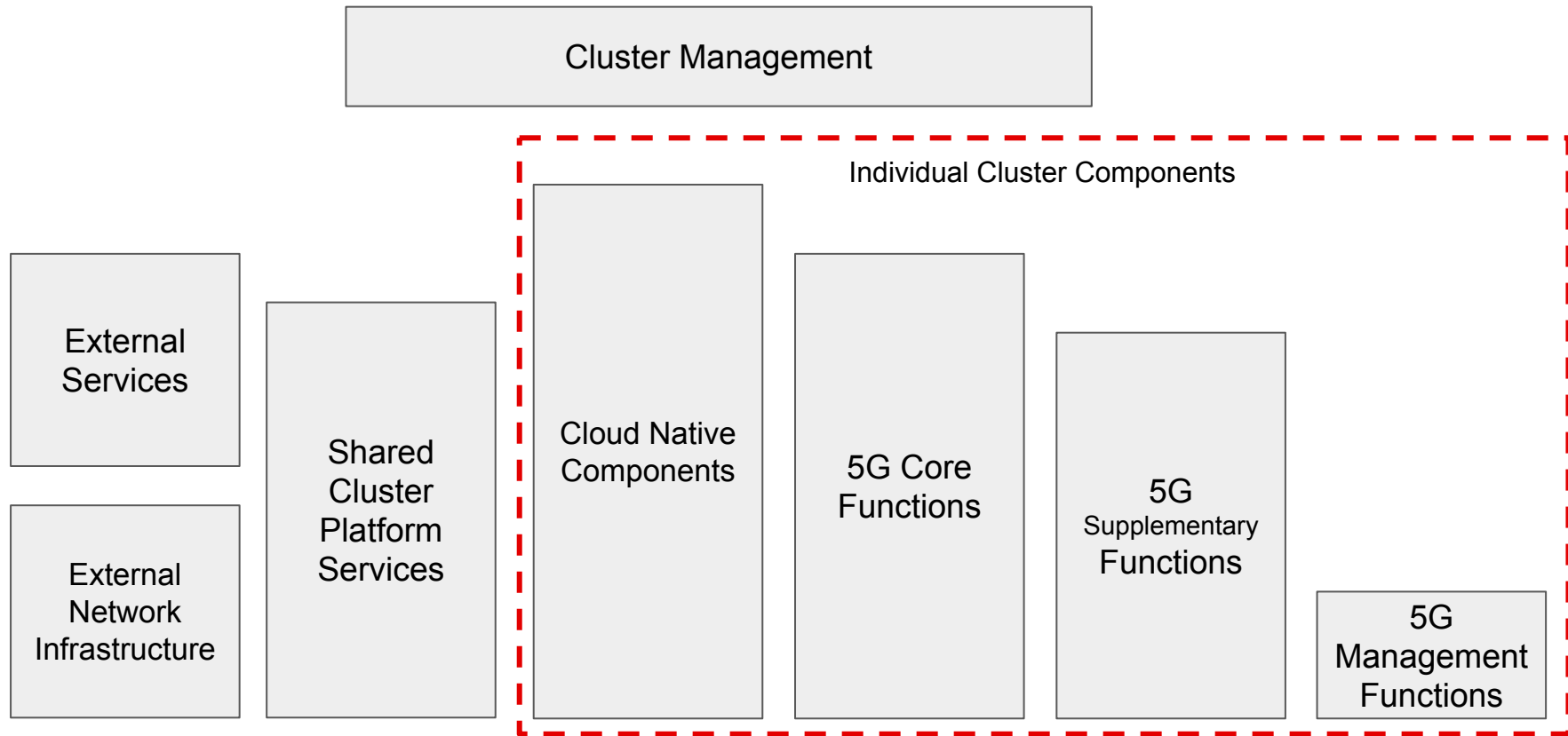# Building an adaptable 5G Core on an open source container platform

"*Platform should be able to support a **wide range of use cases without** adding **operational complexities and cost**. The proposed architecture conceives 5G Core as a set of disaggregated, cloud native applications that communicate internally and externally over well defined standard interfaces*"

"*Each **5GC component** is **implemented as a container-based application** and is referred to as **cloud-native network function (CNF)**. This requires the container platform to support functionalities and operational features like automated deployment, intelligent workload placement, dynamic scaling, hitless upgrades, and self healing*"
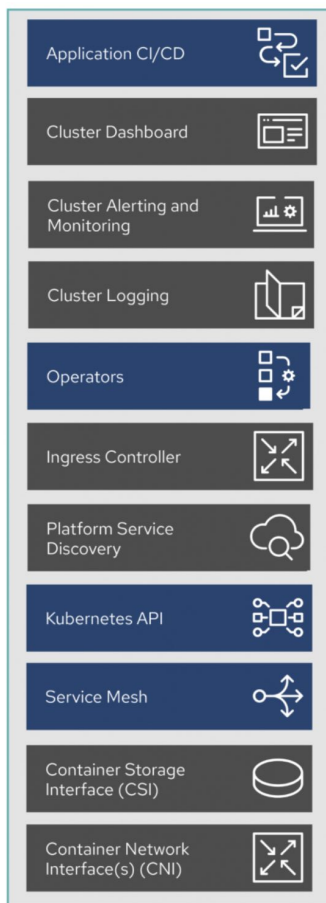
Telco Capabilities

End-User Premises Edge

Provider Edge

Provider/Enterprise Core

Infrastructure Edge

Provider Far Edge

Provider Access Edge

Provider Aggregation Edge

Regional Data Center

Core Data Center

Telco Function Enablement

Cloud RAN

4G & 5G Core

OSS, Analytics SW

BSS

uCPE

MEC apps

CDN, BNG, CCAP, OLT

5G Platform

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5G Solution Stack - Conceptually

Cluster Management

Individual Cluster Components

External
Services

External
Network
Infrastructure

Shared
Cluster
Platform
Services
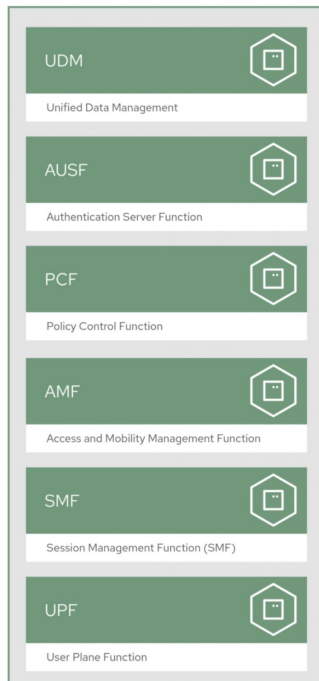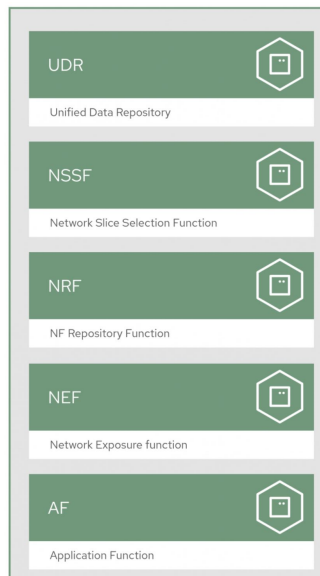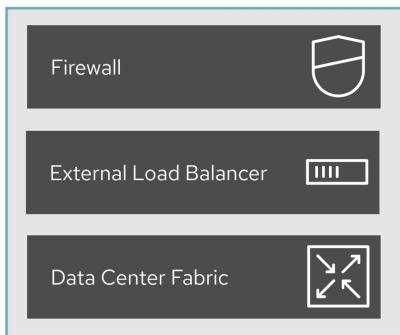
Cloud Native
Components

5G Core
Functions

5G
Supplementary
Functions

5G
Management
Functions

Individual Cluster Components
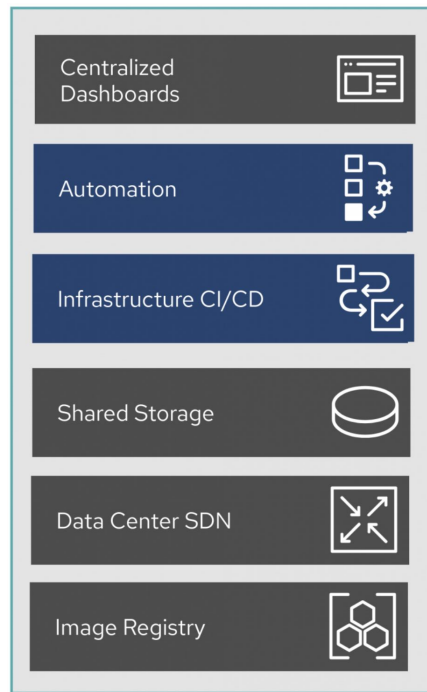
Cloud Native Components

- Application CI/CD
- Cluster Dashboard
- Cluster Alerting and Monitoring
- Cluster Logging
- Operators
- Ingress Controller
- Platform Service Discovery
- Kubernetes API
- Service Mesh
- Container Storage Interface (CSI)
- Container Network Interface(s) (CNI)

5G Core Functions

- UDM — Unified Data Management
- AUSF — Authentication Server Function
- PCF — Policy Control Function
- AMF — Access and Mobility Management Function
- SMF — Session Management Function (SMF)
- UPF — User Plane Function

5G Supplementary Functions

- UDR — Unified Data Repository
- NSSF — Network Slice Selection Function
- NRF — NF Repository Function
- NEF — Network Exposure function
- AF — Application Function

5G Management Functions

- EMS/CNFM — Element Management System/Container Network Function Manager

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External Cluster Components

External Services

DNS

Identity Management

NTP

Shared Cluster Platform Services

Centralized Dashboards

Automation

Infrastructure CI/CD

Shared Storage

Data Center SDN

Image Registry

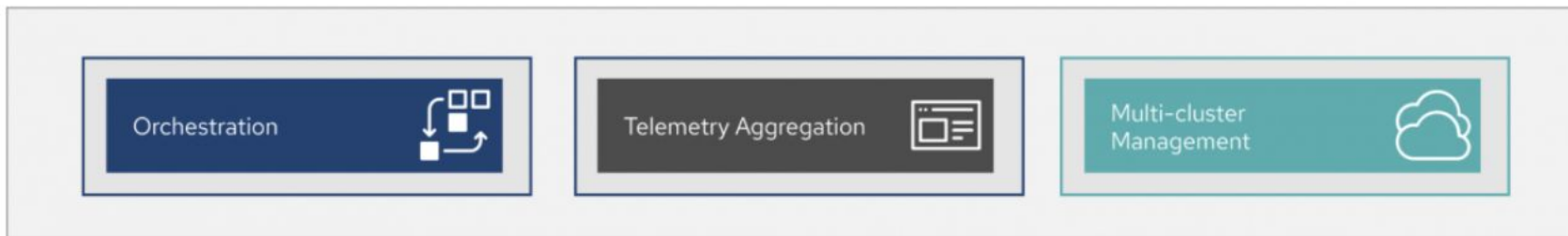### External Network Infrastructure

Firewall

External Load Balancer
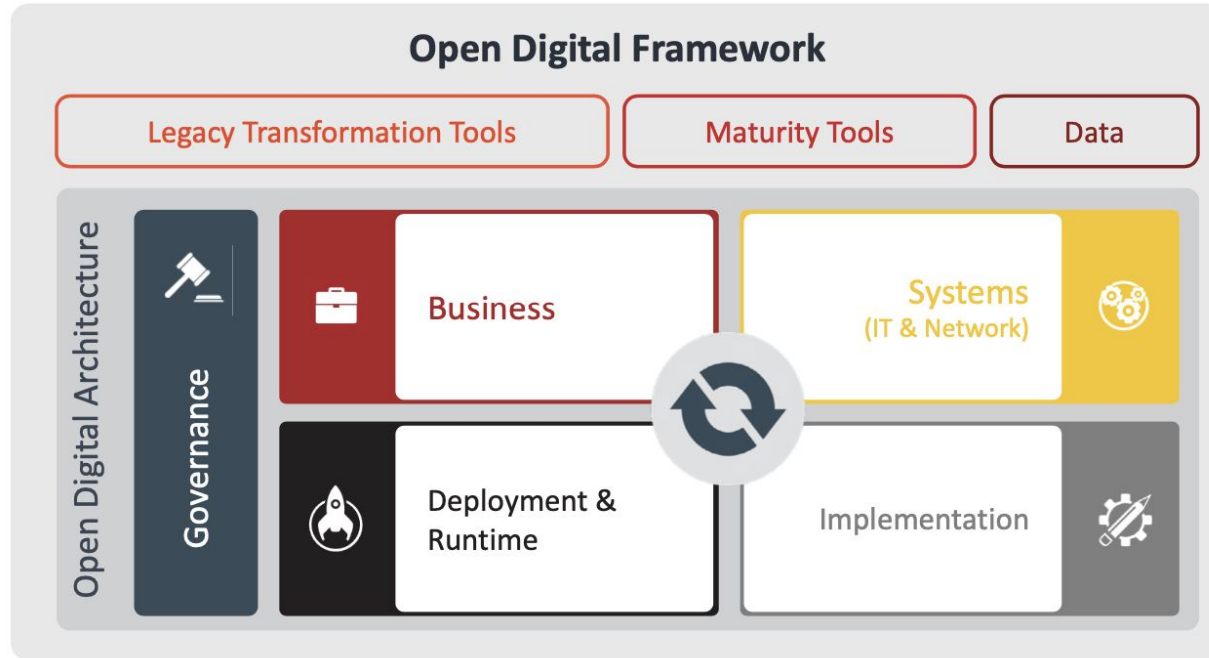
Data Center Fabric

Management

Cluster Management

TM Forum Digital Architecture

Operation and Business Support Systems (OSS/BSS)

CSPs challenges

Multi - vendor interoperability.

Cross-domain service management and orchestration

Cross-domain analytics, data sharing and management

Legacy Transformation

The divide between OSS and BSS

End to end visibility to performance

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Mobile/RAN-related Communities

Standards Development Organizations (SDO's) and Industry Alliances

Red Hat invited to speak in multiple GSMA members-only events regarding Open Source projects and technologies. MWC exhibitor too.

Red Hat is full ETSI member, which is one of 3gpp partner organizations

Red Hat is ETSI &:
- NFV ISG member
- MEC ISG member
- ZSM ISG member

Red Hat monitors specification progress, specifically w.r.t requirements for the NFVI network compatibility (latency, QoS and real-time / synchronization aspects)

Red Hat reviews publications for potential impact. Some specs are being referenced by other orgs such as NFV ISG

Red Hat monitors relevant technical documents published by NGMN

Red Hat monitors specification progress w.r.t impact to infra due to split architecture, synchronization and transport requirements)

Red Hat monitors requirements for infrastructure impacts, and is Involved on "upstream" work e.g. through China Mobile CRAN consortium

Mobile/RAN-related Communities

Open Source Communities

ONAP (OPEN NETWORK AUTOMATION PLATFORM)

Red Hat is Platinum member and is is key contributor to many included upstream projects that are used in or around ONAP (Ansible, Drools, Open Daylight, Kubernetes, OpenStack, OPNFV, Linux)

OPNFV

Red Hat is platinum member, active in multiple projects, board and TSC memberships

Open Source MANO

Red Hat is OSM member, focus limited to integration support / interoperability with Red Hat VIM / NFVI

SUPERFLUIDITY

Red Hat is active member, providing OpenStack datapath improvements, QoS support on compute nodes, Kuryr for container+VM networking

OPEN AIR INTERFACE

Red Hat contributed support for OAI on RHEL+CentOS, and adding OAI support on OpenStack with real-time KVM and OpenShift (containerized vRAN)

TELECOM INFRA PROJECT

Red Hat is TIP &:
- virtual RAN fronthaul project member
- Open RAN project member

O-RAN ALLIANCE

Red Hat is member of ORAN, focus on Cloudification & Orchestration infrastructure support for RAN

Q&A

Red Hat es el proveedor líder mundial de soluciones de software open source para empresas. Sus servicios galardonados de asistencia, training y consultoría lo convierten en un asesor de confianza para las empresas de la lista Fortune 500.

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Thanks

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