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Path to 5G
From the Core to the Edge
Optimizing and Unlocking Full Potential
范欽輝

5G: more than the next generation of wireless communications

Data-heavy, immersive mobile applications	Everybody and everything gets connected	Emergence of mission-critical Telco Edge-to-Cloud use cases
480% Video streaming data consumption growth by 2024[1]	**29B** Devices are expected to be connected worldwide by 2022[2]	**1TB** vehicle and sensor data per month to the cloud by 2025[3]

5G network capabilities

Exponential bandwidth	Massive device density	Ultra-reliable low latency

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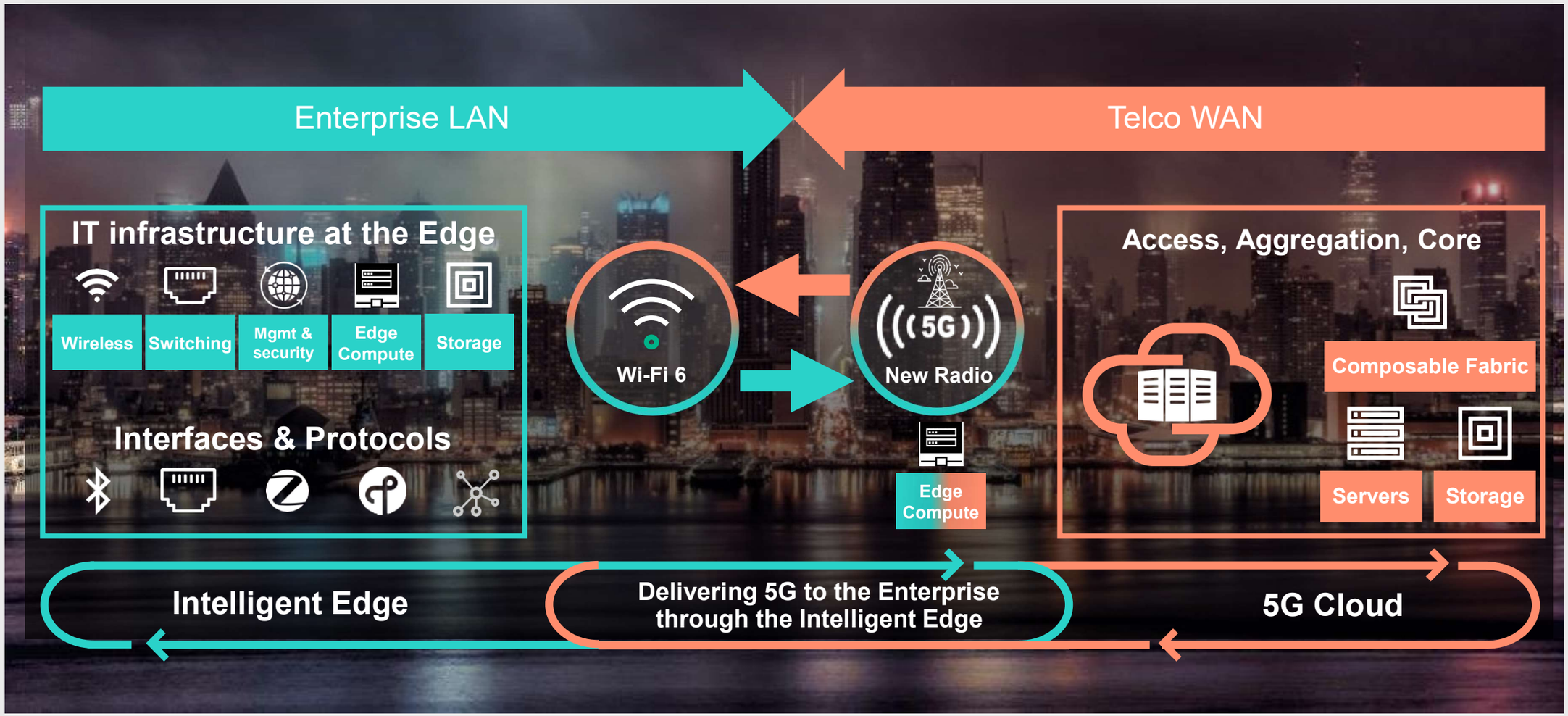
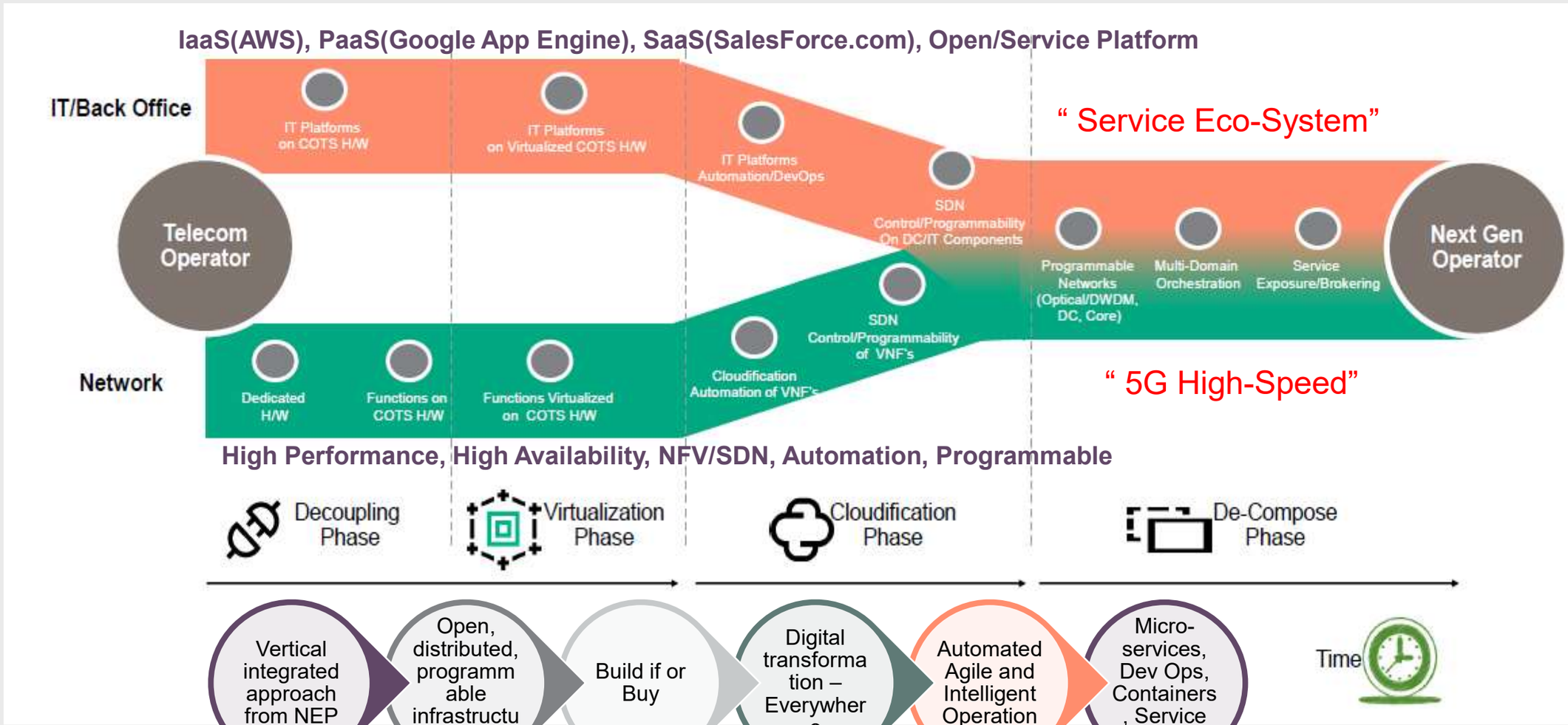
Intelligent Edge: enabler and complement to 5G



5G will enable IT & Network Convergence to be Digital Operator



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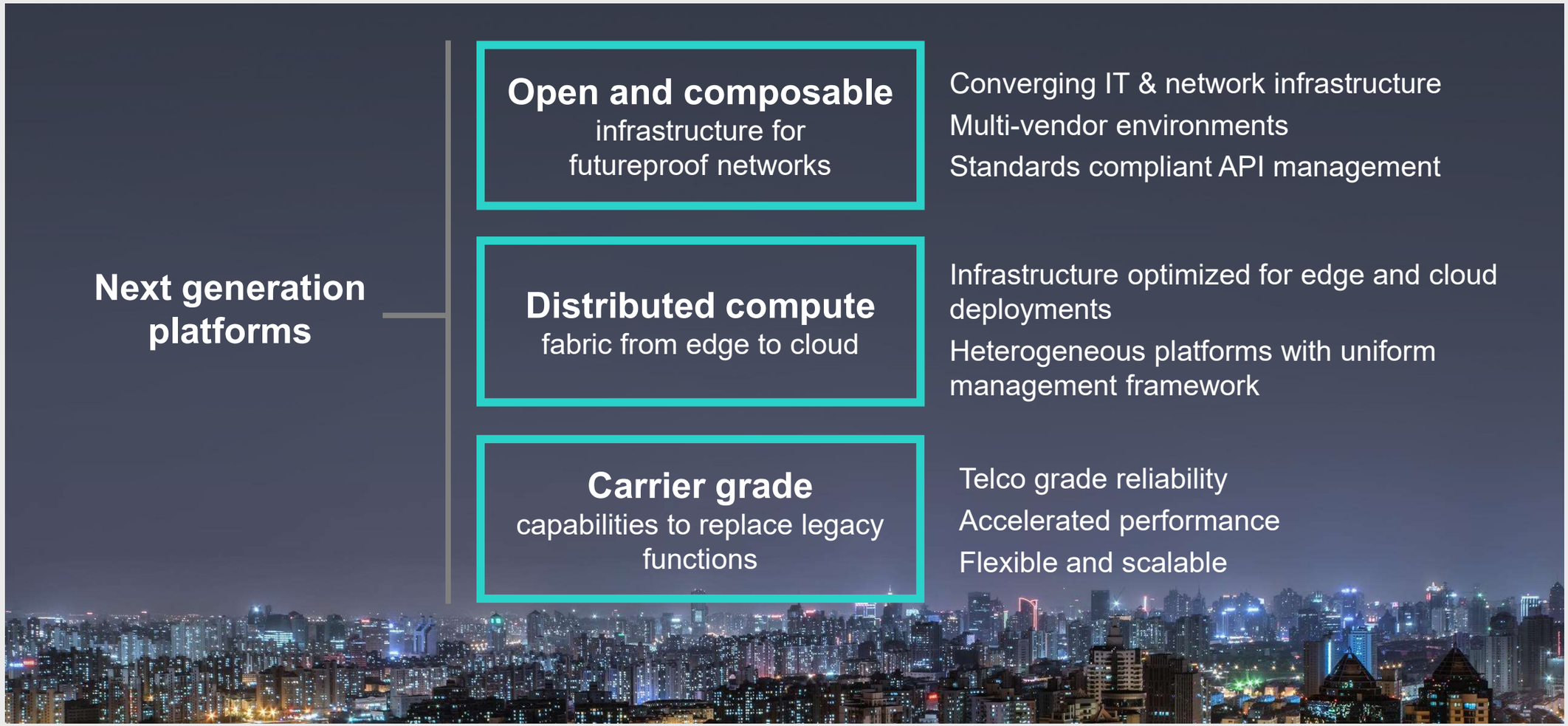
Telco infrastructure is not an IT scale out cloud



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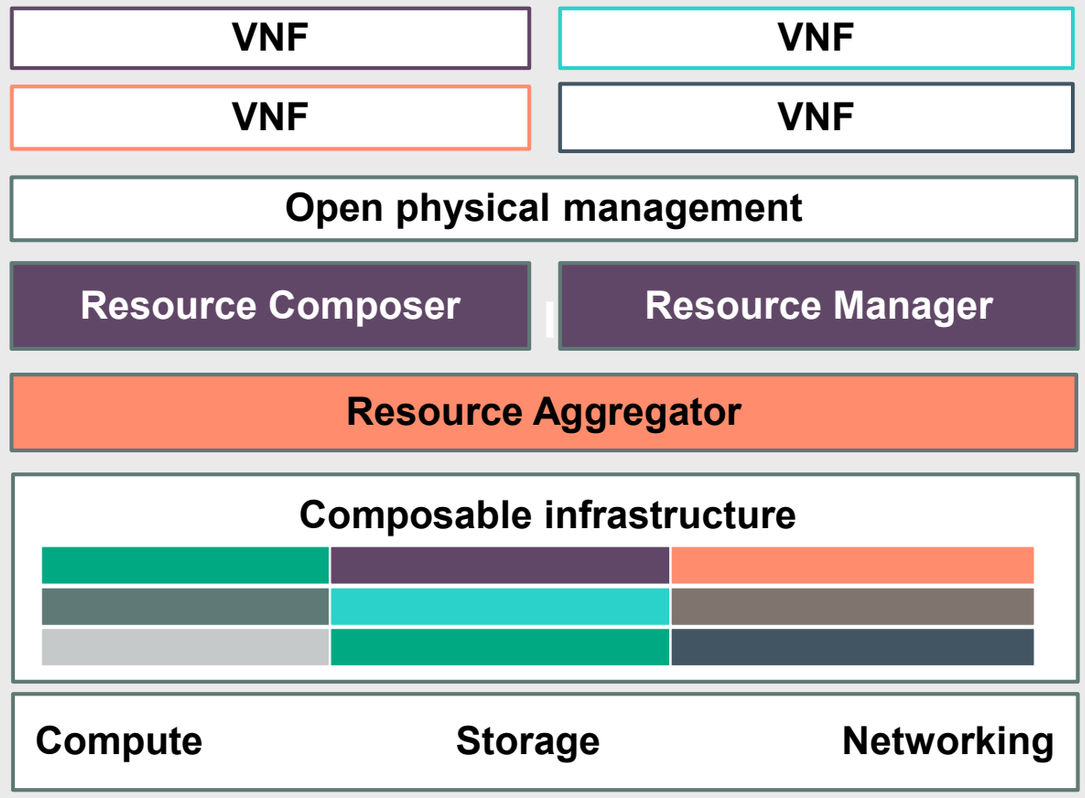
A framework for software-defined infrastructure management

Open Distributed Composable infrastructure management automation required to integrate and scale heterogeneous Telco solution stacks

Resource Composer Layer dynamically identifies available resources and enables SDI through standards-based API's

Resource Aggregator Layer provides infrastructure visibility through standards-based APIs (DMTF/Redfish)



Open Distributed Composable Infrastructure

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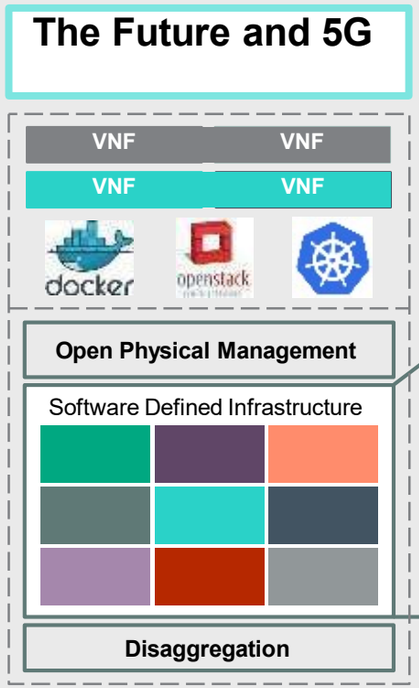
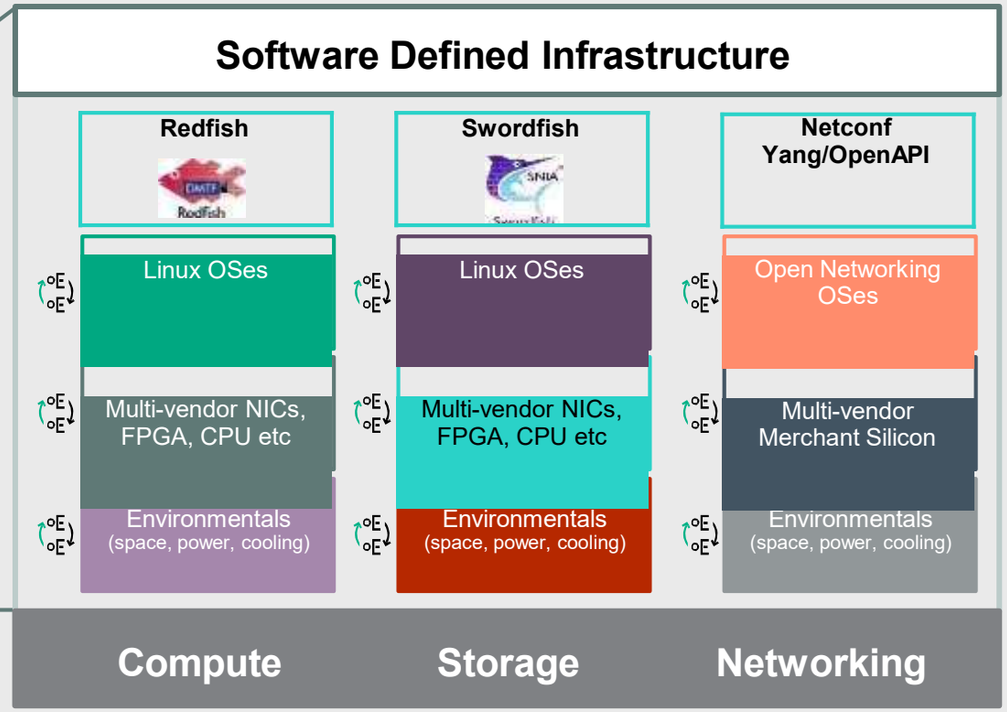
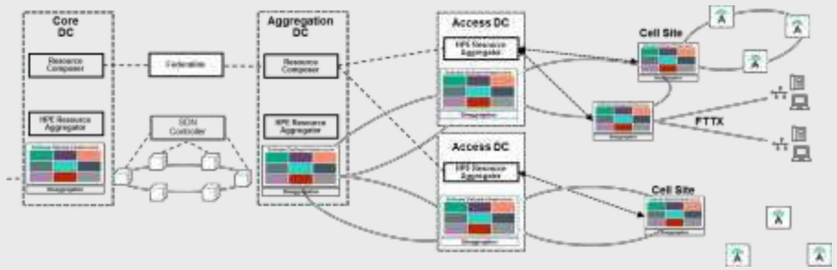
Distributed Software Defined Infrastructure
Open and Programmable







- Hierarchical Management
- Multi-Vendor
- Federation
- Telco Scale

- RFC 2544 Testing
- NEBS L3, ETSI
- NIC acceleration characterization

DPDK

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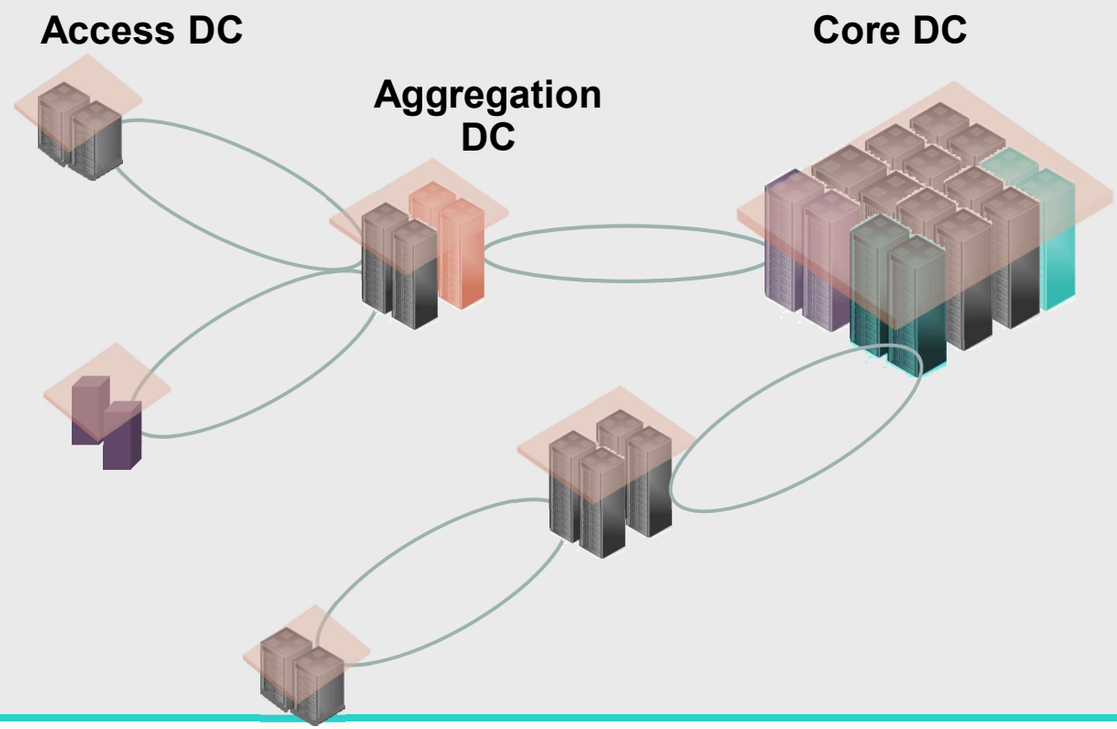
Extending manageability across heterogeneous data centres

Manageability Aggregator

- Industry standard composition service interface supporting hetergenous components
- Event aggregation at telco scale
- DevOps processes



Creating a secure manageability fabric across distributed infrastructure

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USE CASES

EDGE COMPUTING

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Localized Game Streaming - Fast paced Game titles

Improved Gaming experience over Cloud game

Wave 1 : Consoles

- High Resolution
- Latency Intolerant
- High cost overhead

Game App Providers

Wave 2 : Cloud Gaming

- Low Resolution
- Latency tolerant
- Moderate cost overhead

Apple TV | Chromecast

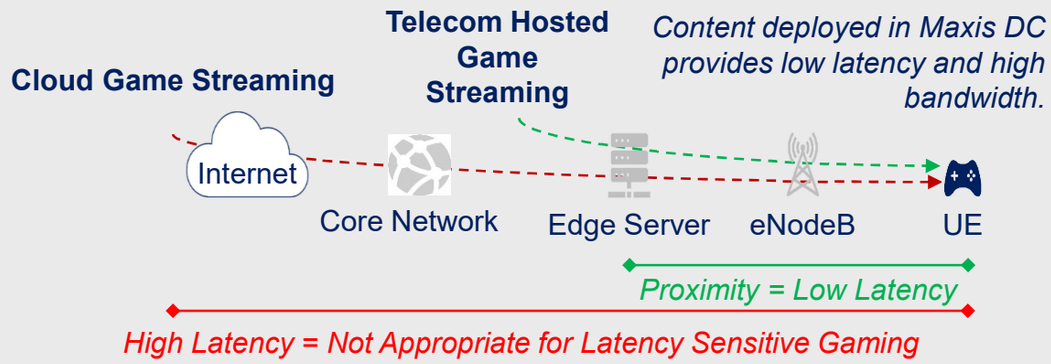
Samsung Gear | Oculus

Open Source Console

Wave 3 : Edge Cloud Gaming

- Bypass Console costs
- Minimize cross-platform R&D burden
- Align costs to consumption and revenues
- Requires a low latency edge

Characteristics look ever closer to consoles: Small screen but high res – latency only issue



Extended offering with Broadband Internet and – Beyond Mobile Wireless

Leverage Customer Behavior and Data Insights – Additional services

Foundation of Edge Cloud – Extend to offer Additional Content Streaming Services

Expanded Partnership – Game Provider and Device Manufacturer

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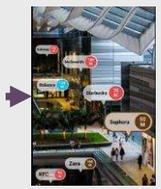
Connected Smart Shopper

Informed Reality with Edge content accelerator

Targeted Advertisement using
Facial Analytics – Age, Gender



turn-by-turn navigation
with blue dot and
notifications based on
real-time position

AR Cache Object

Central AR Cache

Core Network

MEC

Content
Server

Internet

Subscriber Purchase Experience
- Seamless authentication for Operator Post-paid
- Double Consent Purchase confirmation
- Add purchase Amount to Subscriber Bill

Location-based
and personalized
content

Interactive : AR & NLP
- Recommendation
- Price Comparison
- Product Details

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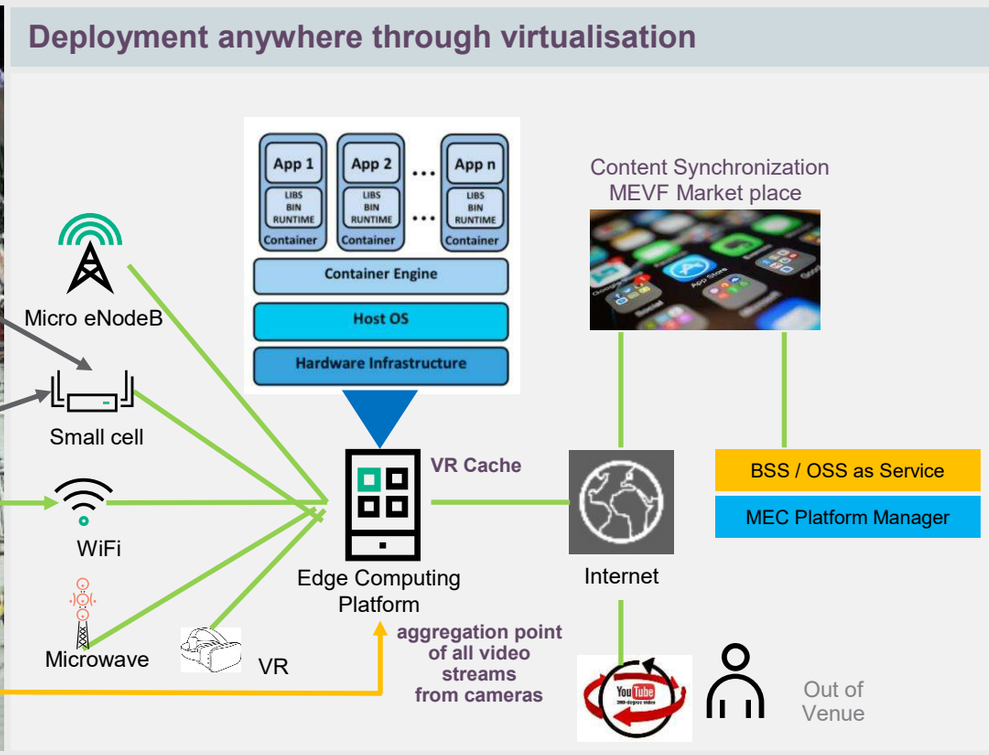
Video Orchestration- In-venue & Out-of-venue VR/360 Live Streaming

Unique immersive second screen for events

Deployment anywhere through virtualisation



USE CASE

- Live camera signals are locally ingested and played out to visitors in real-time
- Visitors can select among many cameras, which are presented in HD and SD
- Distribution over unicast and multi-cast

BENEFITS

- Very dynamic service for event visitors, providing an immersive real-time experience (sub 1sec camera to device and fast replay, zoom in/out)
- Video traffic does not put any burden on the backhaul
- Advertisements can be superimposed on the video feed

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What is HPE's role?

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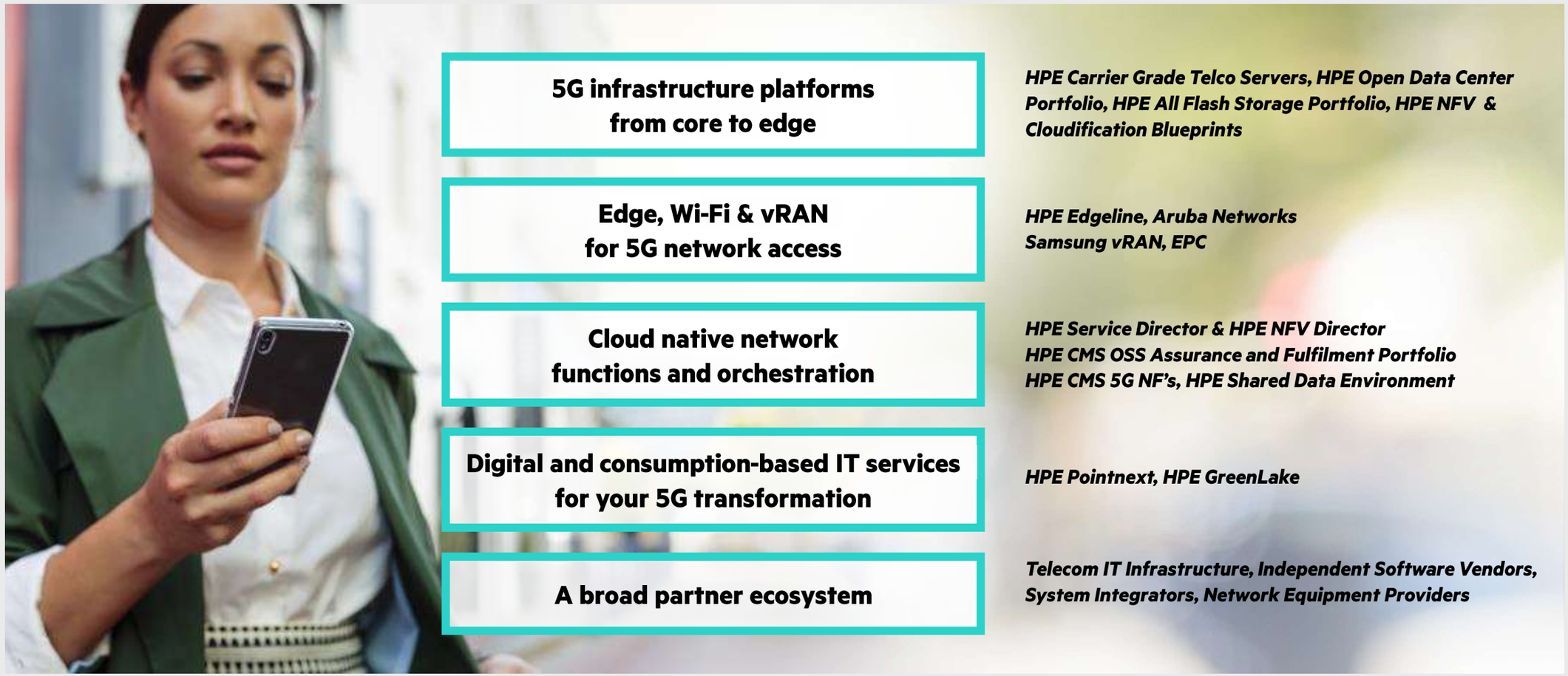
HPE 5G transformation portfolio

Multi-vendor ecosystem delivers best of breed choice for 5G



5G infrastructure platforms from core to edge	***HPE Carrier Grade Telco Servers, HPE Open Data Center Portfolio, HPE All Flash Storage Portfolio, HPE NFV & Cloudification Blueprints***
Edge, Wi-Fi & vRAN for 5G network access	***HPE Edgeline, Aruba Networks Samsung vRAN, EPC***
Cloud native network functions and orchestration	***HPE Service Director & HPE NFV Director HPE CMS OSS Assurance and Fulfilment Portfolio HPE CMS 5G NF's, HPE Shared Data Environment***
Digital and consumption-based IT services for your 5G transformation	***HPE Pointnext, HPE GreenLake***
A broad partner ecosystem	***Telecom IT Infrastructure, Independent Software Vendors, System Integrators, Network Equipment Providers***

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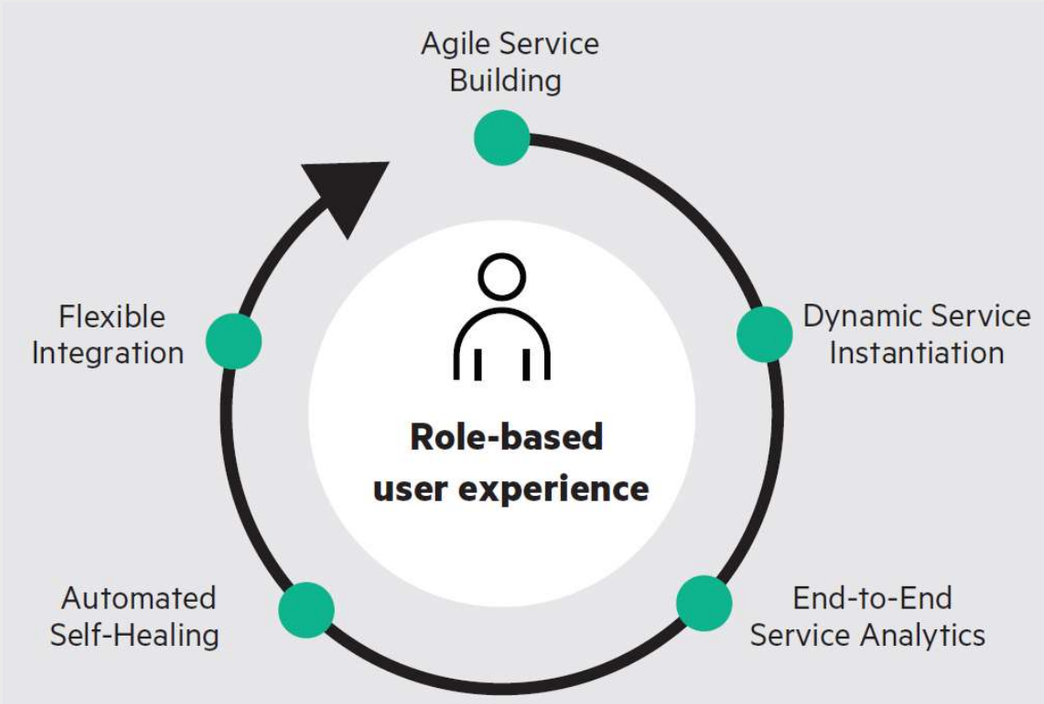
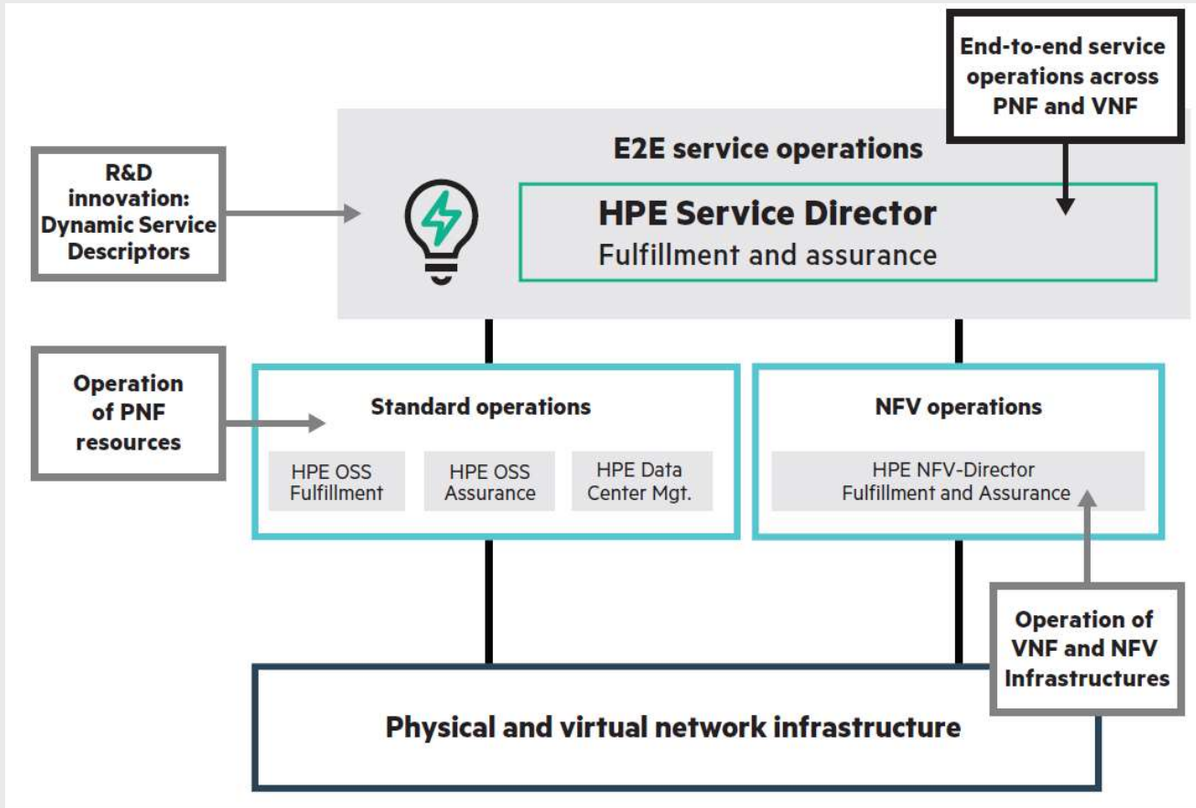
Agile service management on a hybrid infrastructure





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HPE and Samsung

Feb 19th, 2019

HPE 5G core network function (NF) software products:

- **UDSF** - Unstructured Data Storage Function
- **UDR** - Unified Data Repository
- **AUSF** - Authentication Server Function
- **EIR** - Equipment Identity Registry
- **UDM** - Unified Data Management
- **NEF** - Network Exposure Function

SDE - Shared Data Environment

SbA - Service-based architecture

5G transition and co-existence with **4G** and **3G**.

"Through close collaboration with HPE and leveraging Samsung's extensive knowledge, experience, and advanced technologies like core and RAN, both companies will work towards the universal goal of enabling the vision of creating a robust 5G ecosystem. Offering the most optimized 5G products to provide the highest quality in service to operators, Samsung will continue to solidify its stance as an industry leader, ultimately enhancing user experience and boosting competitiveness."

Paul Kyungwhoon Cheun,
Executive Vice President and Head of Networks Business,
Samsung Electronics

Media Advisory

HPE and Samsung Join Forces to Accelerate 5G Adoption

Partners to deliver virtual radio access network and 5G core solutions to advance telecommunications networks' 5G readiness

PALO ALTO, Calif, February 19, 2019 – Hewlett Packard Enterprise (HPE) and Samsung Electronics Co., Ltd. (Samsung) today announced a collaboration to jointly provide solutions that help communications service providers (CSPs) accelerate 5G deployment. Offerings will include solutions for virtual radio access networks (vRAN) and for 5G core networks, enabling CSPs to capitalize on the demand for data-intensive, low-latency services.

Fully leveraging the potential of 5G requires a transformation of telecommunications networks towards an open-standards based architecture, including the replacement of the current proprietary edge appliances with virtual radio access networks (vRAN) running on standard-IT systems. With this collaboration, HPE and Samsung will combine their respective strengths in edge-to-core infrastructure, data management and radio networks to provide end-to-end solutions that enable a fast and smooth 5G transition.

"5G enables a new world of inter-connectivity and will transform every sector in society, from automotive to healthcare," said Phil Davis, President Hybrid IT, Chief Sales Officer, HPE. "HPE is proud to join forces with Samsung to support communications service providers as they evolve their infrastructures to effectively deliver new 5G services to consumers and businesses."

As part of the collaboration agreement, a 5G vRAN solution will be made commercially available through Samsung, leveraging Samsung's vRAN software solutions and system integration services and the new HPE Edgeline EL8000 Converged Edge System which delivers high performance and low latency in a compact and ruggedized form factor, equipped with edge-optimized serviceability and remote systems management. This vRAN solution will enable CSPs to decouple network functions from the edge infrastructure to deliver flexible, agile and cost-effective offerings for customers.

HPE and Samsung will also deliver joint 5G core solutions. The initial offering will consist of Samsung Packet Core software products and selected HPE 5G core network function (NF) software products [1] utilizing the HPE Shared Data Environment (SDE) and service-based architecture (SbA), to streamline the transition to 5G and address periods of overlap of 5G with 4G and 3G.

AT&T Multi-Access Edge Computing

"AT&T's software-defined network, including our 5G network, combined with HPE's intelligent edge infrastructure can give businesses a flexible tool to better analyze data and process low-latency, high-bandwidth applications,"
Mo Katibeh, Chief Marketing Officer, AT&T Business

"HPE believes that the enterprise of the future will need to be edge-centric, cloud-enabled and data-driven to turn all of its data into action and value,"
Jim Jackson, Chief Marketing Officer, HPE

Whatever the right mix of IT, HPE can help

Digital Transformation

Design your own digital transformation journey, define the use cases that better address your pain points and achieve your goals

Connect & Protect

Connect Wi-Fi and IoT devices that are native to other protocols; protect and secure devices, people and data with AI-driven security analytics and policy enforcement

Manage & Orchestrate

Manage and orchestrate IT infrastructure from the Edge to the Cloud, enabling the coexistence and collaboration of Wi-Fi and 5G

Compute at the edge

Host applications and process data right where it is generated, at the edge, for insights in real time

Grow as you need

Build out their IT infrastructure on premise or in the cloud with flexibility and as the business requires

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Technology

Let’s accelerate your transformation

People

Economics