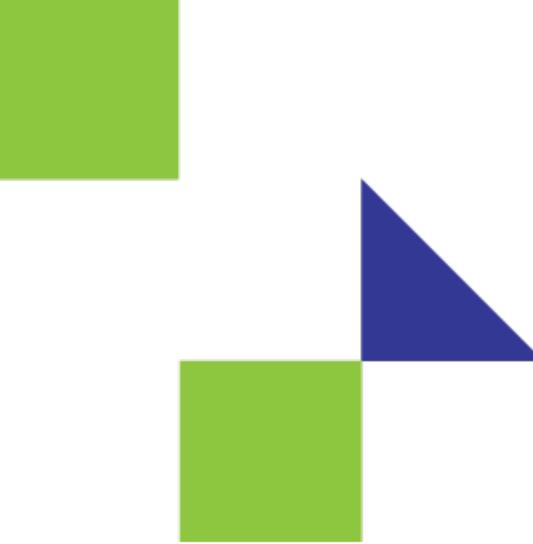




OCP SUMMIT

March 20-21
2018
San Jose, CA

OPEN. FOR BUSINESS.



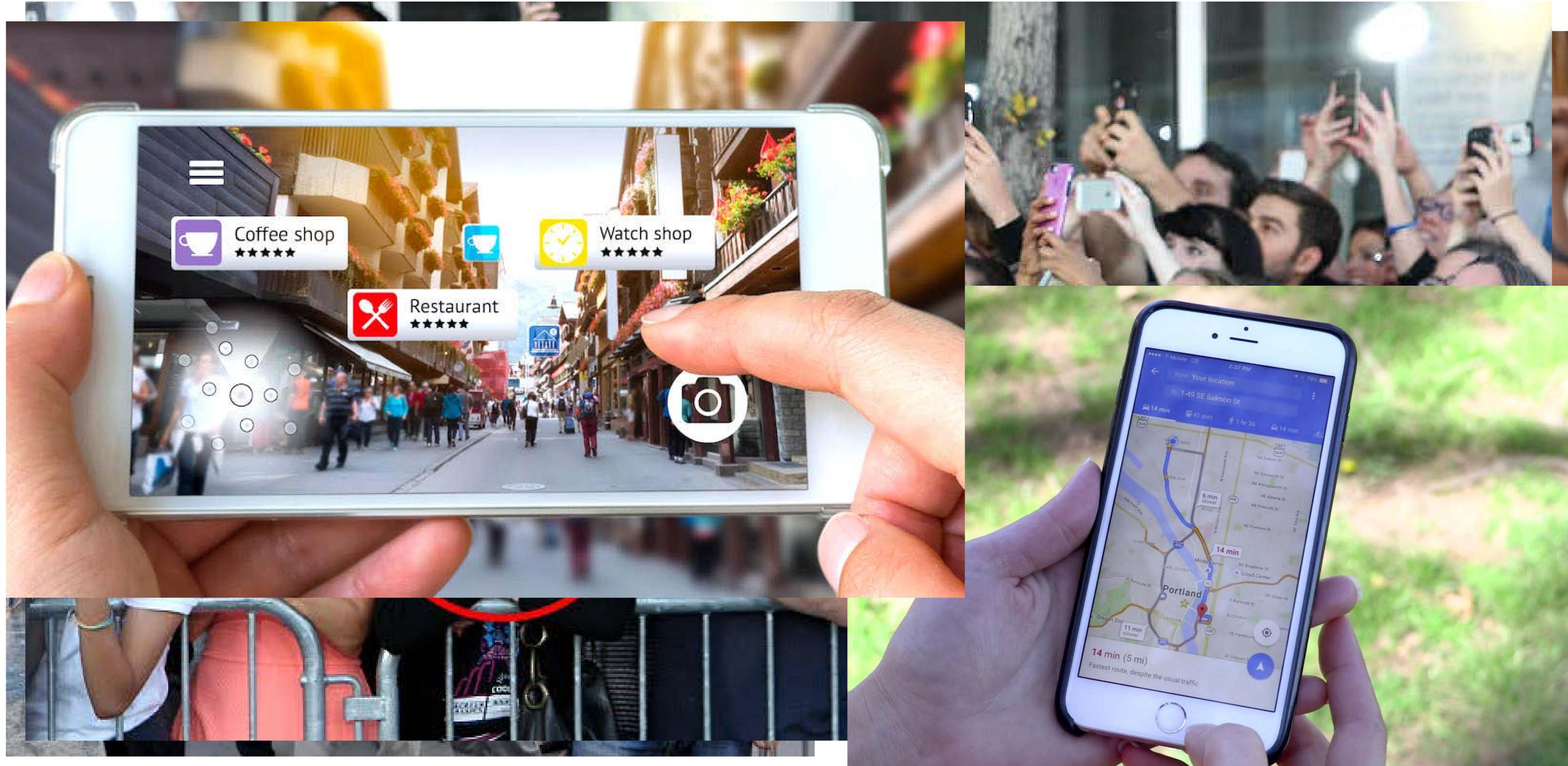
OCP CG OpenRack 19" & Edge Computing

Jeff Sharpe, Director Product Strategy, ADLINK

OPEN. FOR BUSINESS.



How far we've come



Where are we heading?

2018 – 2022 Faster, Smarter & Explosion of devices

10000x more traffic

10-10000x more devices

Capacity

Latency

< 1 millisecond latency

Energy Consumption

10 Years battery for M2M

Cost

M2M Ultra low cost

User data rates

> 10Gbs data rates

100Mbs Low-end data rates

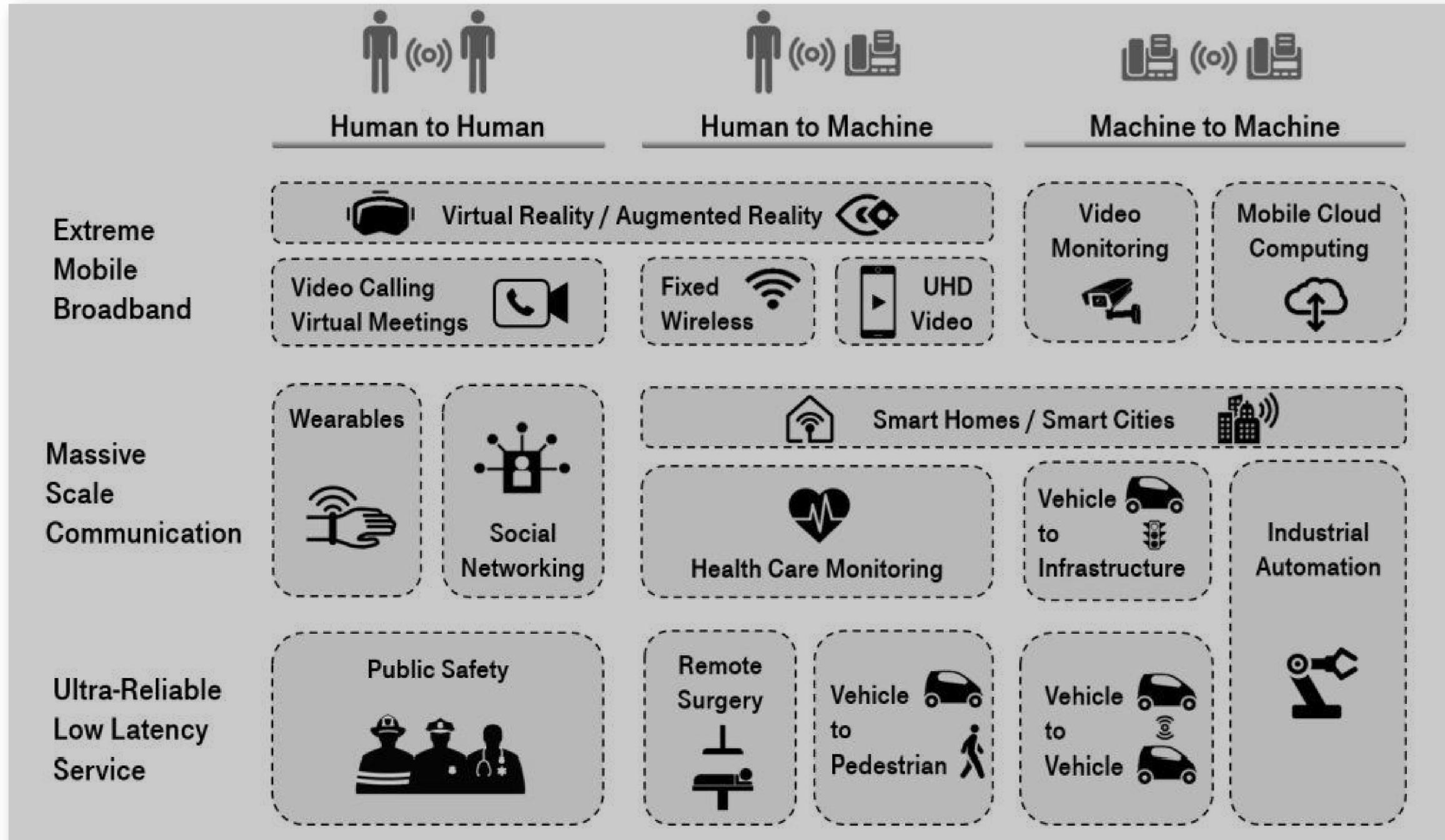
Coverage

No Downtime



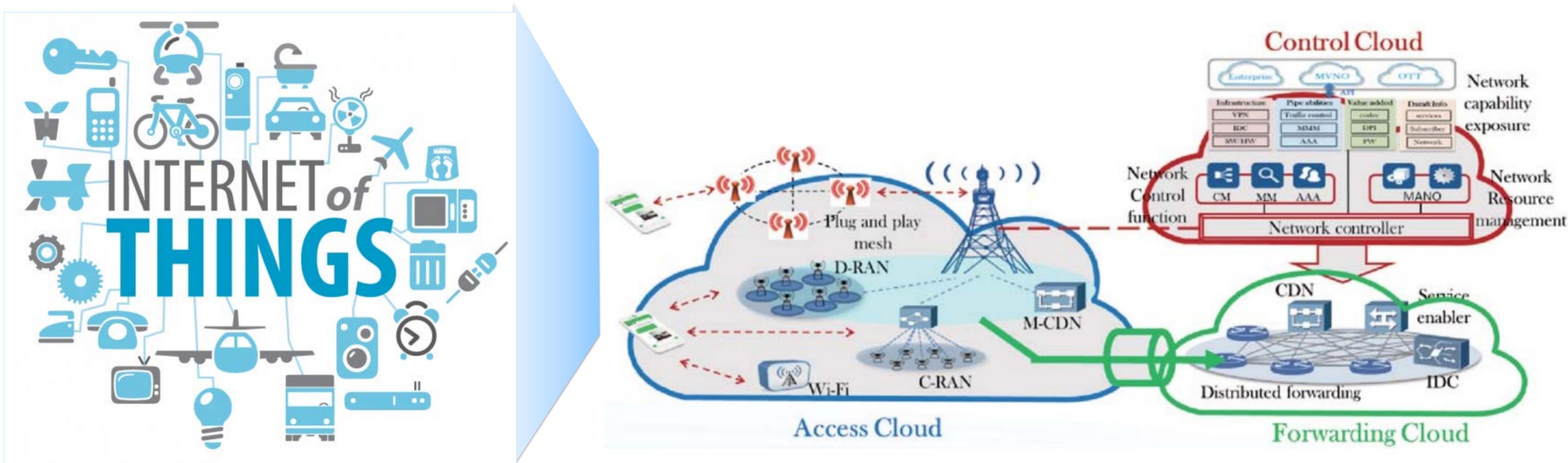
Generation	Device	Specifications	
1G		Year 1991 Standards AMPS, TACS Technology Analog Bandwidth - Data rates -	People
2G		Year 1991 Standards GSM, GPRS, EDGE, CDMA (IS-95) Technology Digital Bandwidth Narrow Band Data rates <80-100 Kbit/s	
3G		Year 2001 Standards UMTS/HSPA, CDMA2000 1X/1xEV-DO Rev. A Technology Digital Bandwidth Broad Band Data rates up to 2 Mbit/s	
4G		Year 2010 Standards LTE, LTE-Advanced Technology Digital Bandwidth Mobile Broad Band Data rates xDSL-like experience 1 hr HD movie in 6 minutes	
5G		Year 2020-2030 Standards - Technology Digital Bandwidth Ubiquitous connectivity Data rates Fiber-like experience 1 hr HD movie in 6 seconds	People & Things

Use Cases based on Range of Performance



- Early 5G Use Cases**
- Enhanced Mobile Broadband
 - Connected Vehicles
 - Enhanced Multi-Media
 - Massive Internet of Things
 - Ultra-Reliable Low Latency Applications
 - Fixed Wireless Access (Early 5G Deployments)

Software Defined Network & Virtual Functions



Operators Value: Expand their presence from Pipe to full Solution Provider

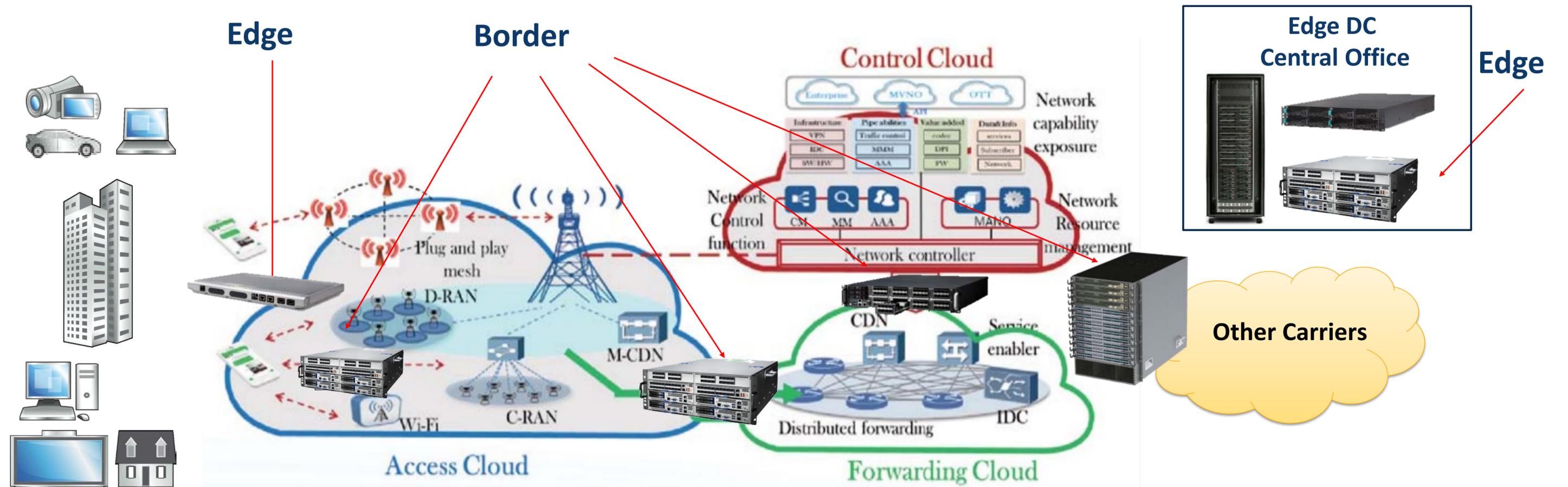
Supplier Value: Open and Flexible, Act as a Partner, Integration enablement, 1 step ahead

Where is the EDGE?

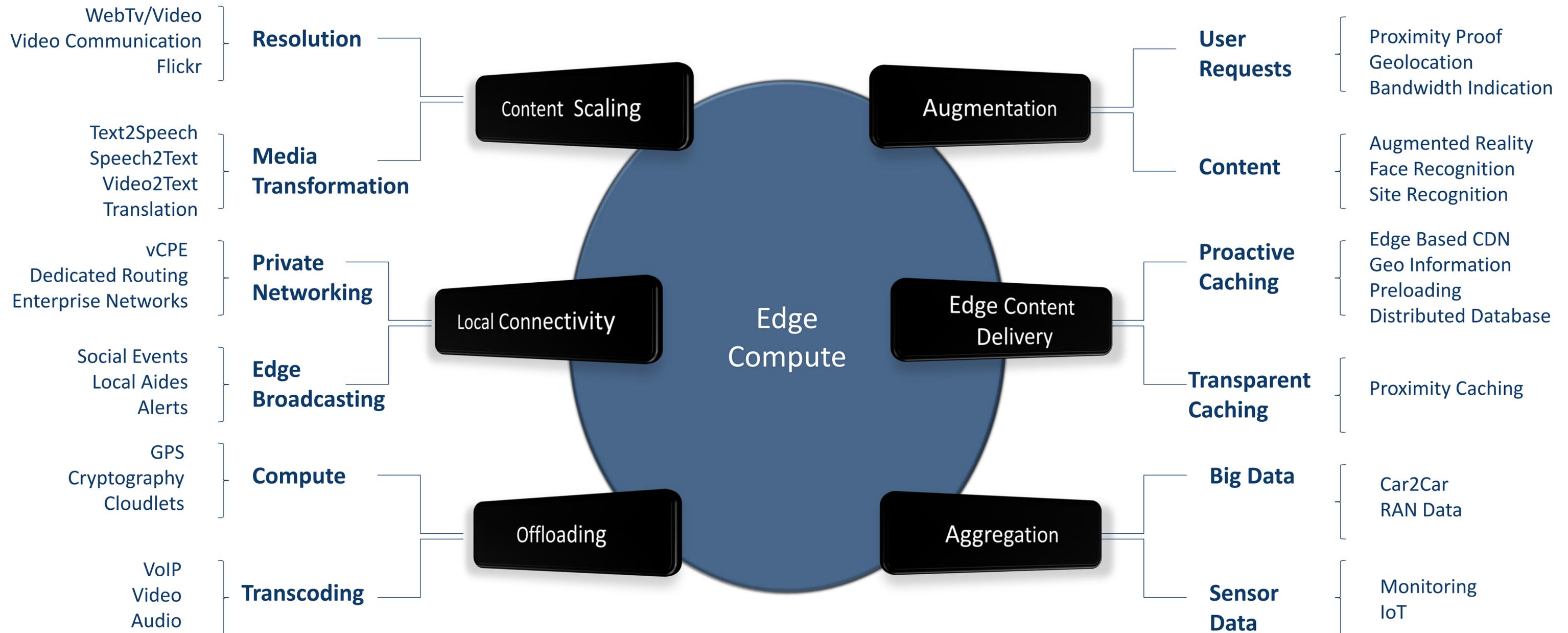
Edge Computing: Local Connectivity, Edge Content Delivery, Offload to Monetize/Optimize Networks

Border: Firewall, IPS/IDS, UTM, DPI, Border Gateway, Session Border Controller to protect the network

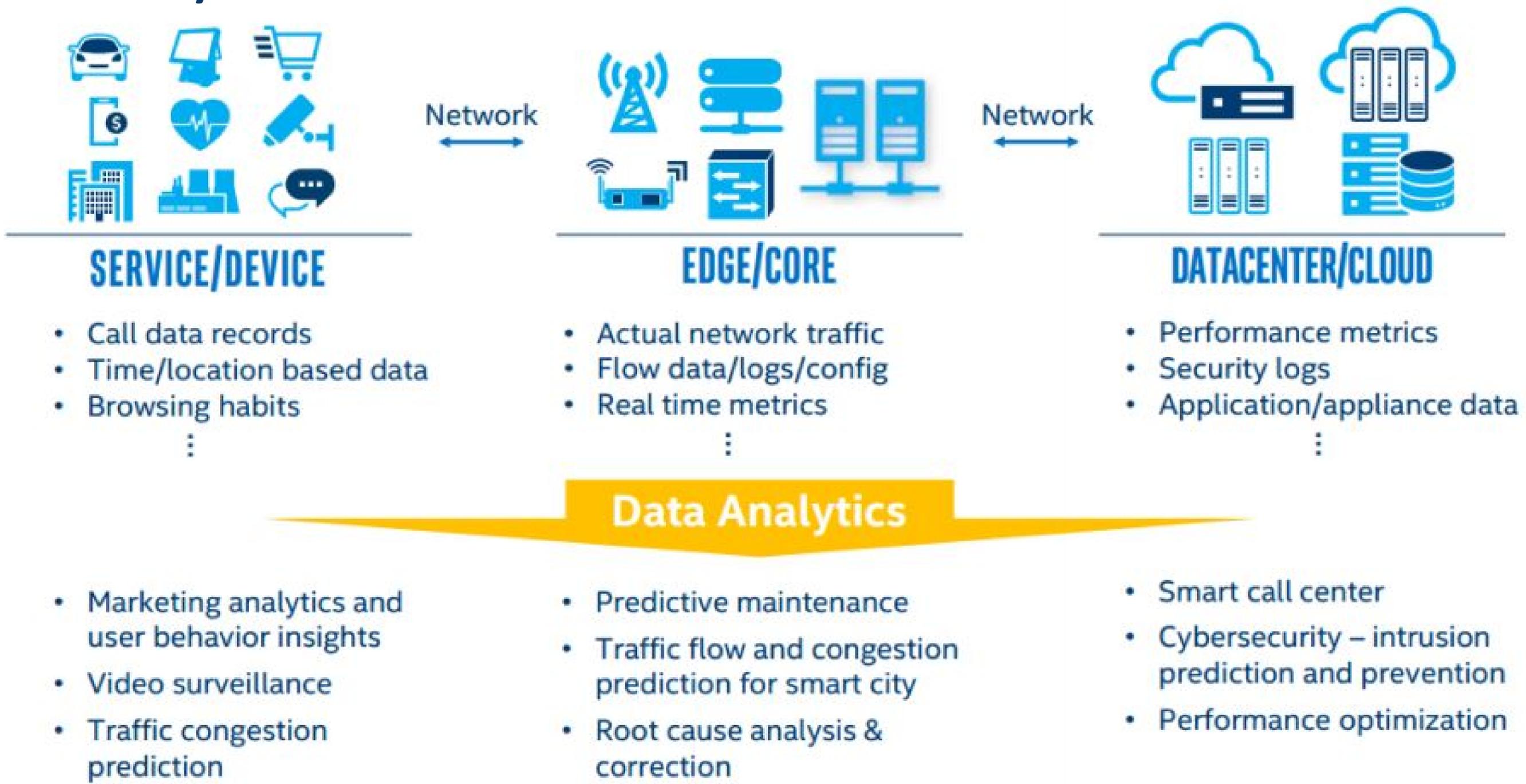
5G Network Architecture



Focus: Monetization/Optimization of Telecom/Mobile Networks

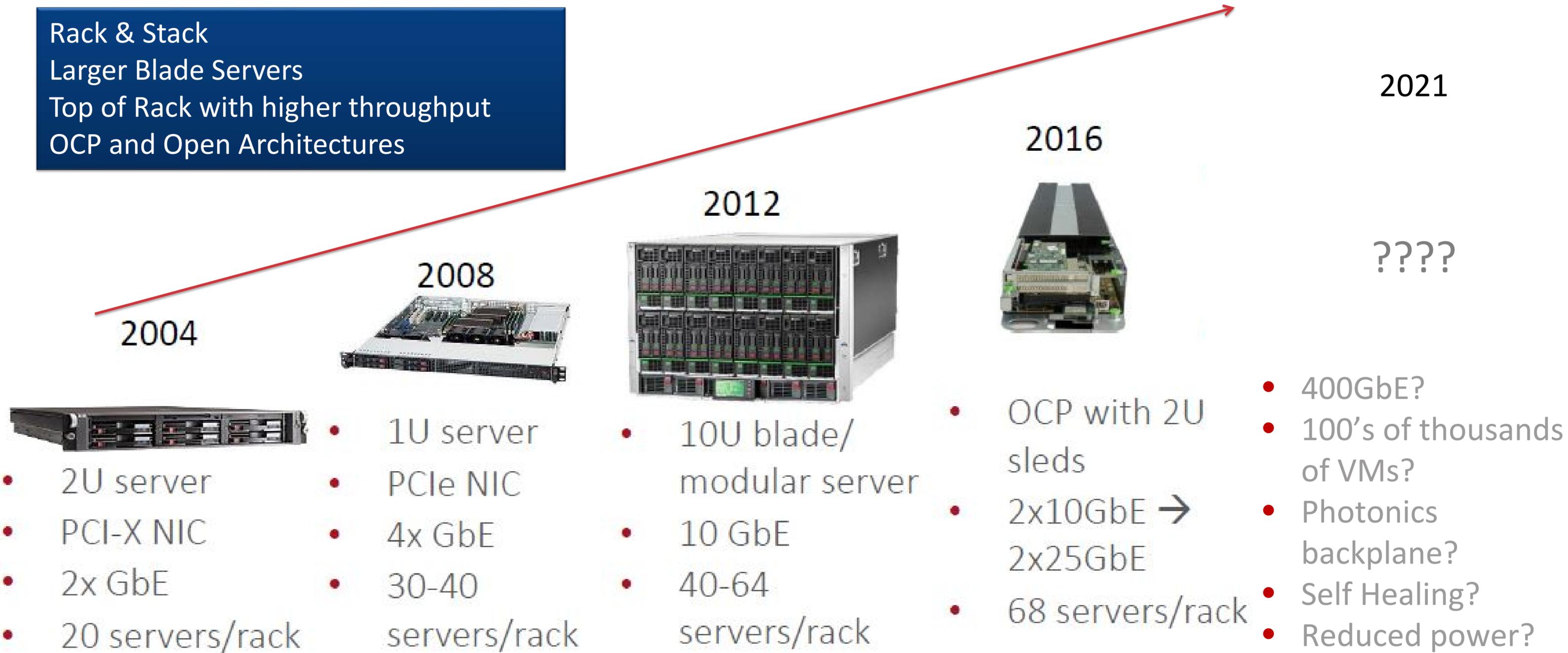


Next Generation Networks – Real-Time AI and Analytics



Looking back – We’ve come a long way

Rack & Stack
Larger Blade Servers
Top of Rack with higher throughput
OCP and Open Architectures



2004



- 2U server
- PCI-X NIC
- 2x GbE
- 20 servers/rack

2008



- 1U server
- PCIe NIC
- 4x GbE
- 30-40 servers/rack

2012



- 10U blade/modular server
- 10 GbE
- 40-64 servers/rack

2016



- OCP with 2U sleds
- 2x10GbE → 2x25GbE
- 68 servers/rack

2021

????

- 400GbE?
- 100's of thousands of VMs?
- Photonics backplane?
- Self Healing?
- Reduced power?

Carrier Grade Platform Evolution

Proprietary -> Open Architectures
Standards driven Platforms (ATCA)
Lower TCO
Large mix of eco-system participants
Utilization of Central Office for Edge
Scale, density and cost effectiveness

OCP-CG Open 19"
Now to future

ATCA / Carrier-Grade Appliances
2001 to Now

Proprietary
1990's to Now



Why OCP-CG – Anatomy of a system



Physical

- Suitable for CO retrofit and new telco data center environments
- 19" rack width and standard "RU" spacing for greatest flexibility
- 1000 to 1200mm cabinet depth, supporting GR-3160 floor spacing dimensions

Content/workload

- Heterogeneous compute and storage servers
- Built for SDN and Virtualized systems for optimal performance/ecosystem
- Eco-system for CPU, GPU, ARM, DSP and switching

Management

- Ethernet based OOB management network connecting all nodes via a TOR management switch
- Optional rack level platform manager

Networking/Interconnect

- One or more Ethernet TOR networking switches for I/O aggregation to nodes
- Fiber cables, hot swappable blind-mate with flexible interconnect mapping.
- Environment, power, seismic & acoustic CO environmental requirements applicable
- Safety and other certification standards also applicable
- NEBS optional (L1/L3)

2017 Evolution of OCP Technology into Telecom

radisys

ADLINK TECHNOLOGY INC.



OCP-CG-OpenRack-19"
Frame Level
Specification



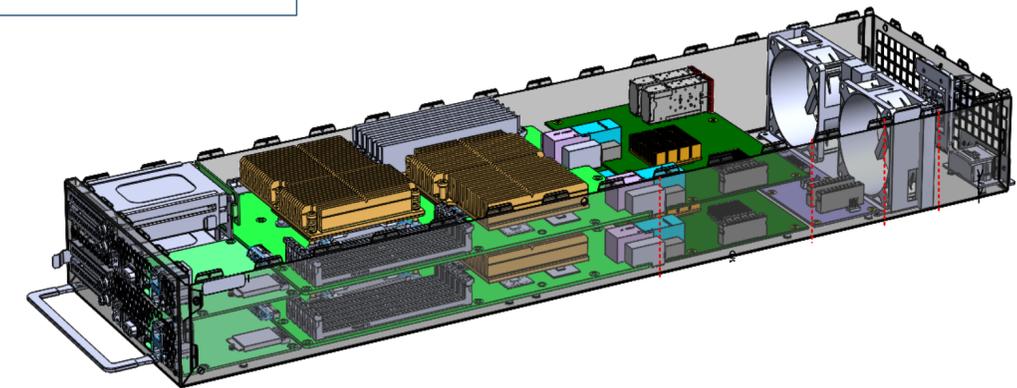
OCP-CG-OpenRack-19"
Open Sled Specification



Half width



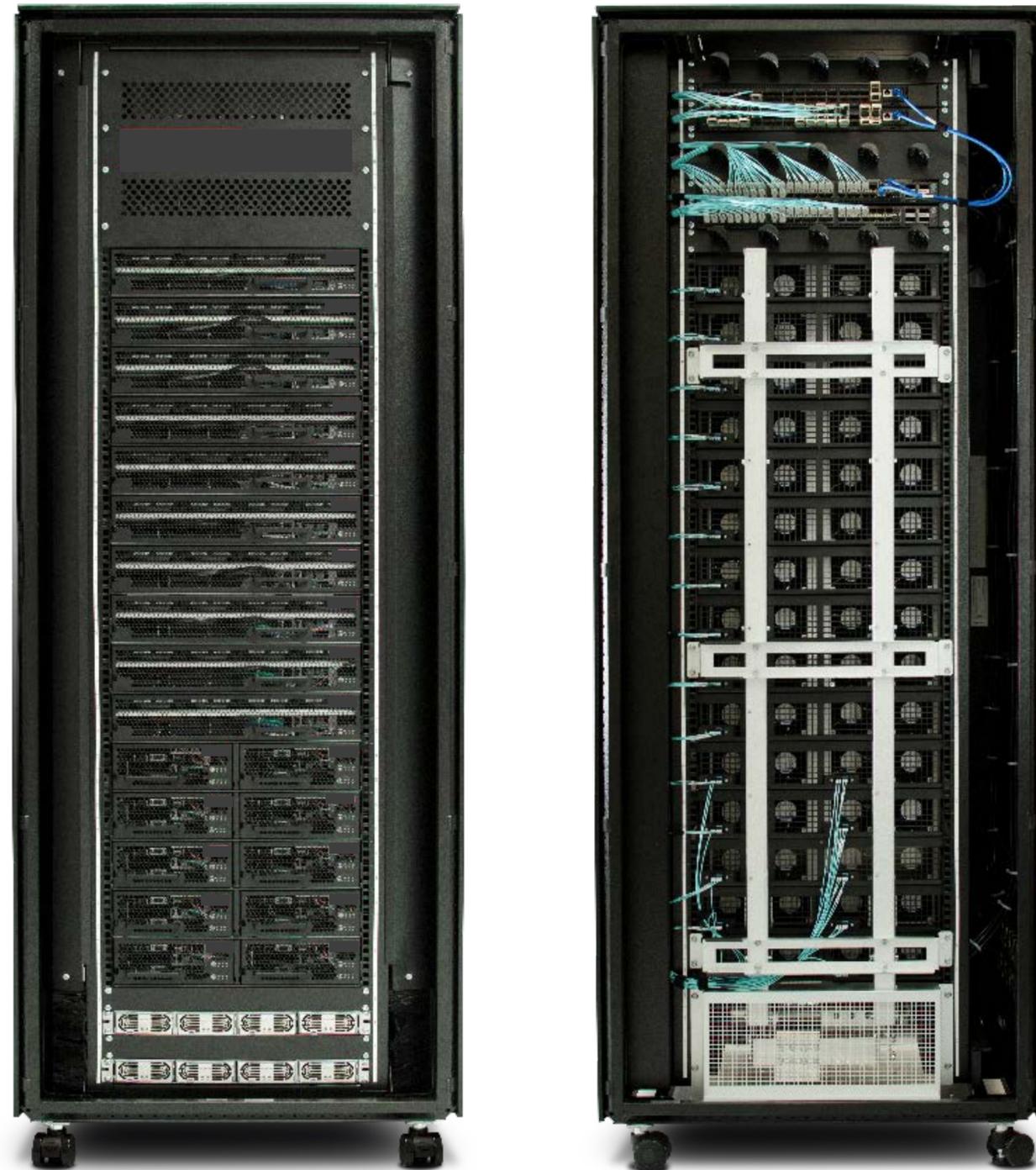
Full width



Sled Definition based on
OCCERA

Enables additional container for sleds, components and partners for OCCERA growth/future

42U OpenRack Configuration



•42U OCP-CG OpenRack 19”

- 600mm & 800mm wide rack options
- Power → 110/208VAC 3ph & 230/400VAC PDU
 - 3 PSU shelves provides 12 x 2500W PSU's
- Management Switches (x2)
 - Switch #1 : Connects 1G to each server BMC
 - Switch #2 : Connects 1G to each server CPU
- Data Switches
 - 1 or 2 switches (up to 3.2 Tbps each)
 - 40G uplinks to spine switch, 10G downlink to each server
 - Option for 100G uplinks & 25G downlinks (v2.3)

•Standard Configurations

- Balanced : 8x Compute (16 sleds) + 8x Storage
- Storage : 17x Storage Shelves
- Same components as 19U frame

Additional 12u frame size at our booth

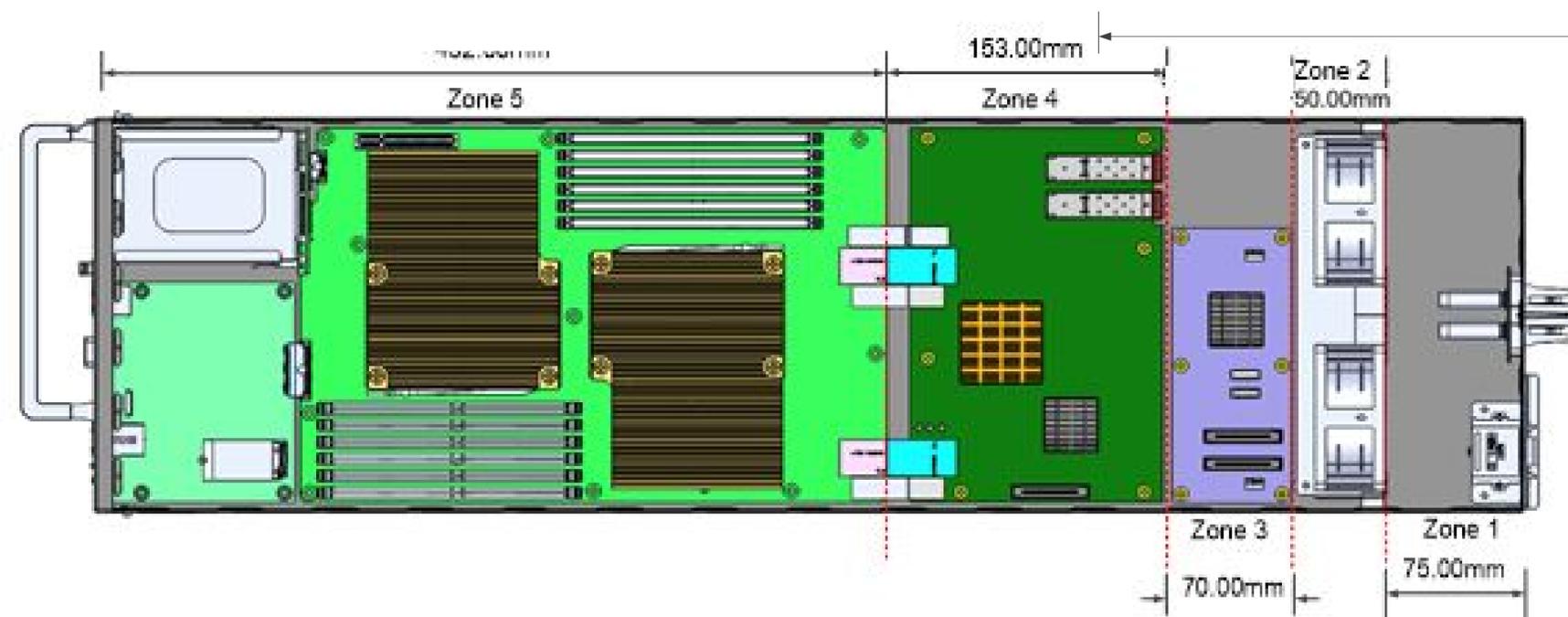
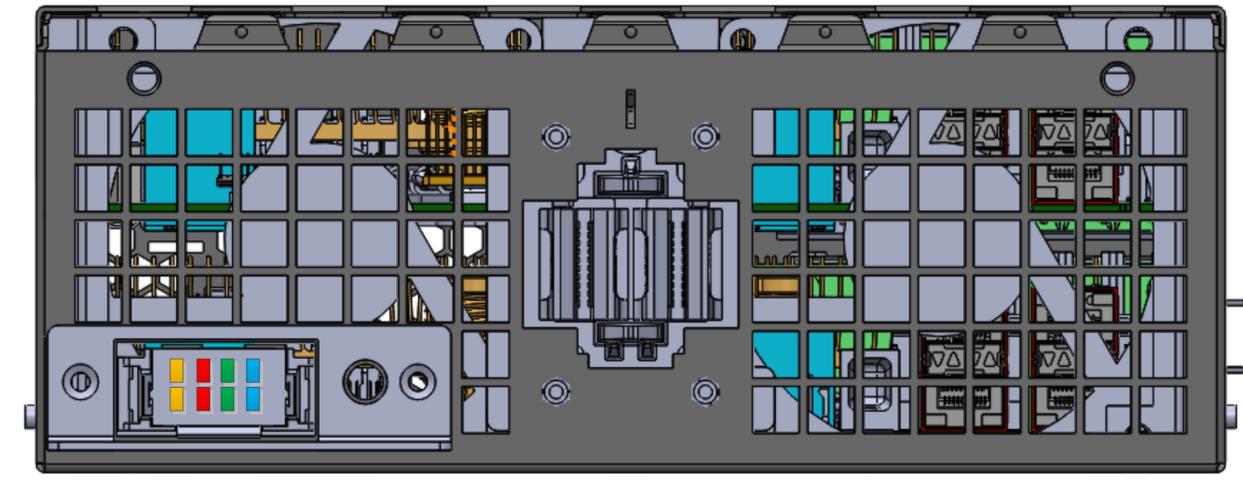


OpenSled Design

Defining the sled based on CG-OpenRack-19 frame spec

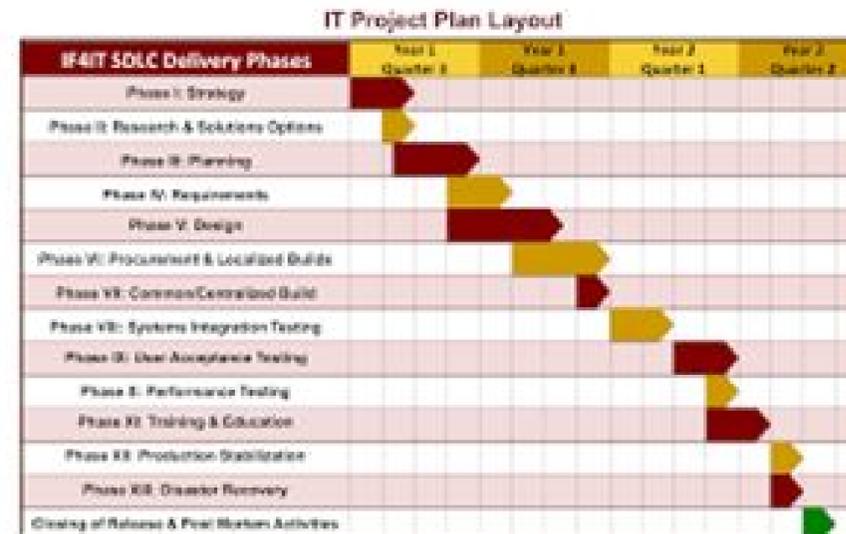
Front view allowing additional/optional connectivity, Hot Swappable Storage access – removable or hinged front panel

Rear panel is defined by Radisys' CG-OpenRack-19" frame spec.

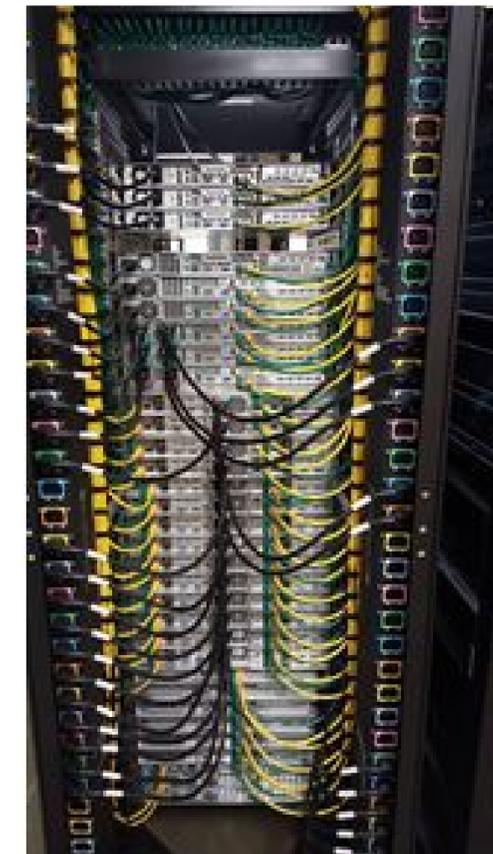


Top view of sled – defines internal components

Typical Rack Commissioning: 1-3 months



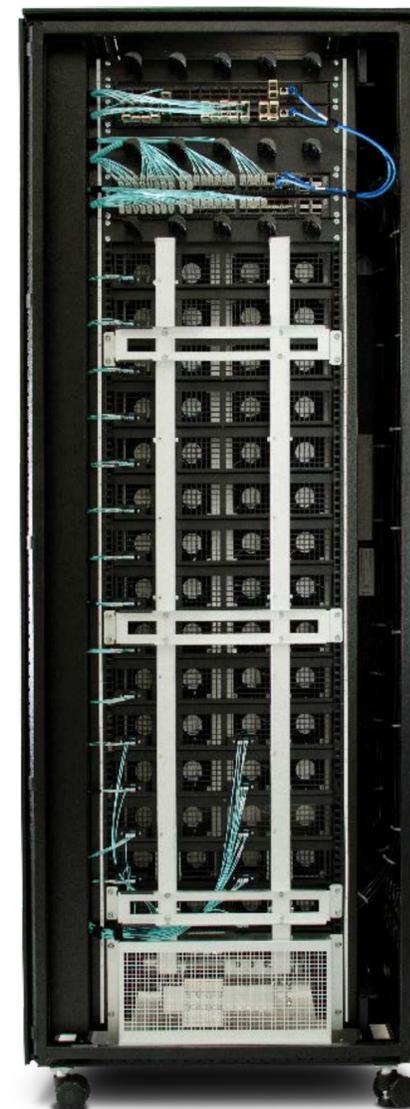
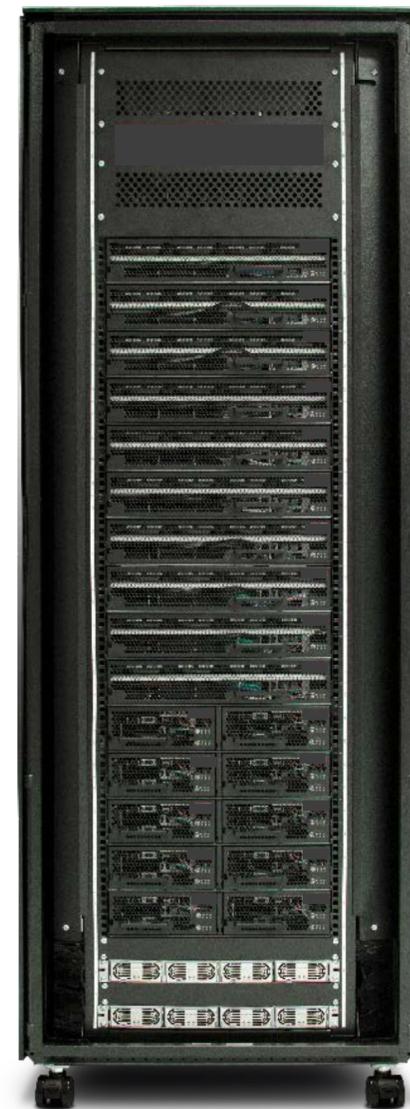
- *Schedule contractors*
- *...Receive components*
- *...Schedule different contractors*
- *...Build rack*
- *...Schedule different contractors*
- *....Install & test*
- ...all gated around scheduled maintenance windows*



With OCP-CG delivery: 3 Days

Telco OCP Derived Platforms

Pre-wired & tested rack core, sleds are FRUs with fully optical interconnect to ToR switches



Plug in Power

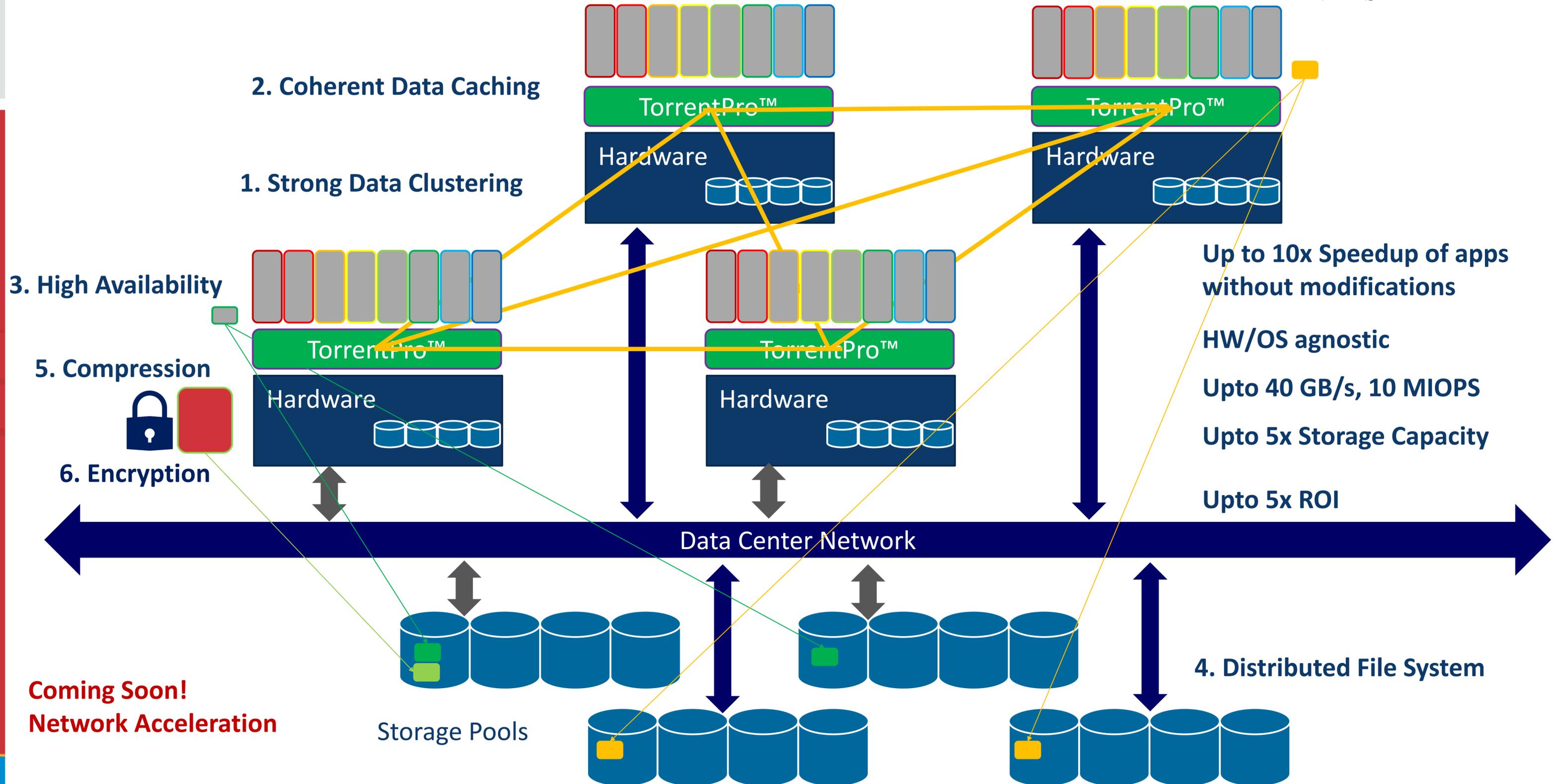


Connect to Spine



*Slide in sleds
...fast install
...easy serviceability*

Dynavisor TorrentPro™



Coming Soon!
Network Acceleration

TorrentPro™ Hyperscale Hyperconvergence



Conventional Data Centers

- Low network bandwidth
- Aggregated storage on network

Hyperconvergence

- More compute power
- Imploded the SAN
- Built-in fast storage
- Immune to network
- Software storage clustering

Dynavisor TorrentPro™

- Hyperconvergence at a data center scale
- Storage throughput at the scale of TB/sec
- Zoning data across continents

Compute + Storage



ADLink CG-OpenRack-19

Powered By

Dynavisor TorrentPro™

- **Single logical compute + storage cluster** across continents
- Illustration:
 - 8 Racks, 144 Compute Sleds, 64 Storage Sleds, 704 CPU, 132 TB RAM, 2 PB SSD, 10 PB HDD
 - Active work set of **~2 PB @ 1-4 TB/sec** storage throughput
- **Upto 10x acceleration of apps** without modification
- **Up to 5x ROI** to data centers
- RAS: High Availability, Parity, Compression, Encryption

Compute + Storage



6.4 Tbps Cluster Network

Zone 1: San Francisco, USA

10 Gbps Internet Link

6.4 Tbps Cluster Network

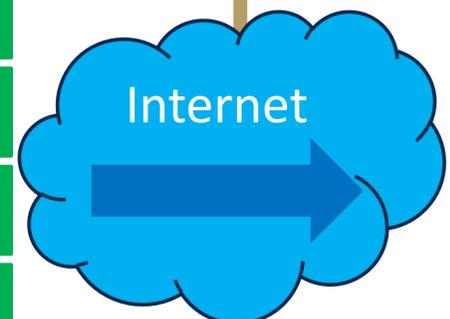
Zone 2: Sydney Australia

TorrentPro™ Backup And Disaster Recovery



Critical Applications (Active)

Critical Applications (Hot Standby)



**Built-in DR
No Apps
Needed!**

**Less Cost
More than
critical apps**

**Better
RPO/RTO for
the same cost**



OCP-CG Openrack 19" 2018/19 PoI

Expanding assets for 5G MEC

- Storage sled with 24 x 2.5" with Purley
- Incorporation of 2u OCP Appliance module w/ multi-host controller and PCI switching for special purpose sleds
- Increased NIC up to 100Gbs
- Broaden System Solutions with ARM and FPGA sleds
- GPGPU Introduction for advanced network AI/Analytics
- Enhancements with OpenBMC, SDN Containers and Integration with ONAP, ONF and CORD
- Cross-pollination into other industry-driven committees
- Integration with Dynvisor & additional software partners

Need active participation with Carriers and Partners



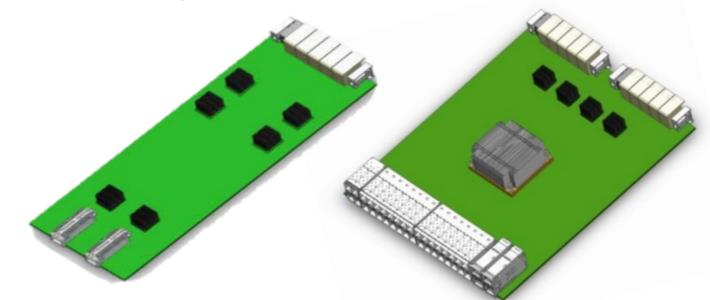
Special Purpose Appliance



NVIDIA V100 w/ NVLink



ARM-based SOC
H/W Accelerators



Conclusion



Collaborate, Define and Deliver - OCP CG OpenRack 19”

- **5G Driving MEC**: Low Latency, High Density and Evolution of Central Office to OCP-CG
- **Collaboration & Open Architectures**: We believe in collaboration, open architectures while working with industry leading eco-system partners/committees
- **On-going dedication to OCP CG OpenRack 19”** – Content rich roadmap for converged markets
- **Extreme Computing**: ADLINK and Dynavisor for efficiency & optimization
 - Incorporates ADLINK’s OCCERA architecture which can fit into many types of systems (HCI, 19” Appliance, Datacenter/MediaCenter, OCP-CG-Openrack-19”)
 - OCP OpenSled is based on deployed technology and integration complete by Q2’17



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