



OCP
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Building the Foundation: How to Deploy
CORD Architectures with OCP-based
Hardware

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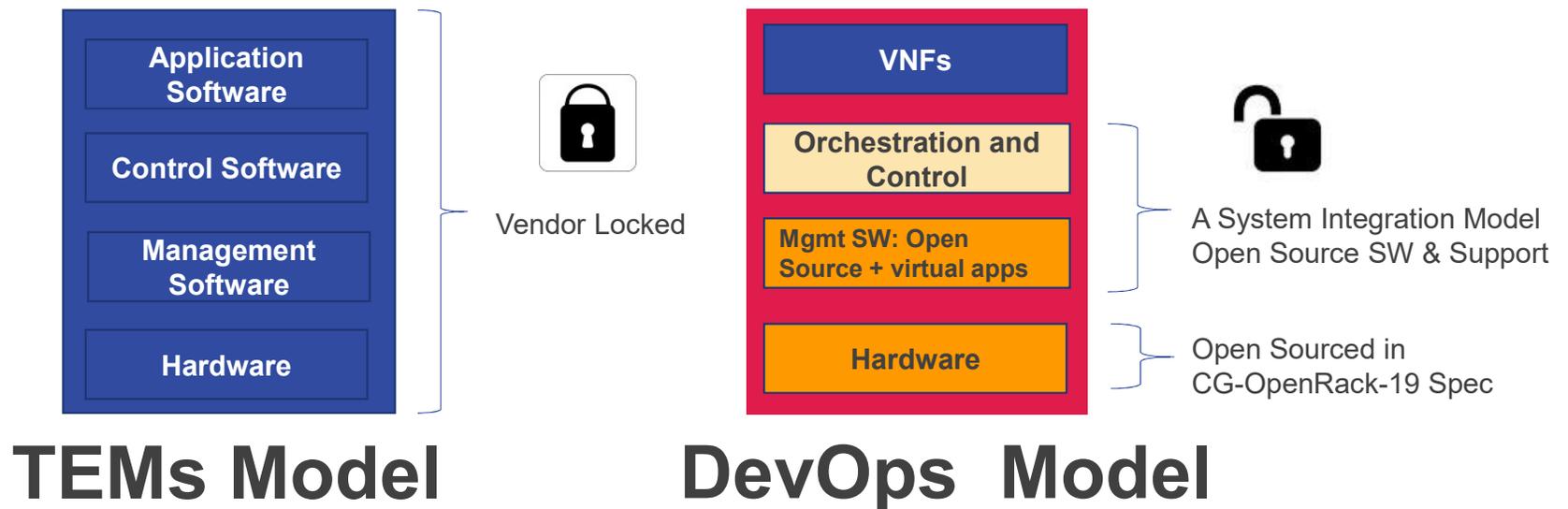


The background of the slide is a photograph of a starry night sky. In the foreground, a large, dark rock formation with a natural archway is visible. Through the archway, a range of snow-capped mountains is seen under a dark, star-filled sky. The Milky Way galaxy is visible in the upper right portion of the sky.

CG-OpenRack-19 and CORD

Introduction...

- Breaks Open the Black Box of Proprietary Infrastructure
- Gains Control and Choice, Lowers costs and DevOps flexibility for new features
- Makes Solutions More Efficient, Flexible and Scalable with better OPS efficiency



CG-OpenRack-19 Achieves OCP Approval



OPEN
Compute Project

+

Radisys

=

Radisys

OCP-INSPIRED™

CG-OpenRack-19
Specification

CG-OpenRack-19
Specification

A collaborative community focused on redesigning hardware to efficiently support the growing demands of compute infrastructure.

Radisys contributed the Carrier Grade Open Rack concept to OCP in the form of a Rack + Sled interop specification

It is real and deployed in 6 data centers with a few hundred racks

Released commercial product families based on this specification are available. Specs are available on the OCP marketplace (www.opencompute.org/products).



- *CG-OPENRACK-19 'Approved' as a Carrier Grade Telecom specification*
 - Multiple new sled offerings delivering incremental features and functions
 - Modularity leverages the ability to re-use OCP racks with new sleds
- Specifications readily available from OCP website ([CG-OpenRack-19 v1.1](#))
- Supplier eco-system developing enabling deployment and early lab evaluations

Figure 2. Sled Vertical Height (front view)

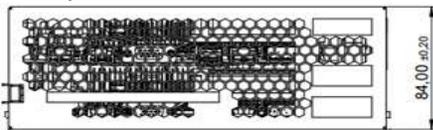


Figure 9. Half-width sled horizontal width (front view)

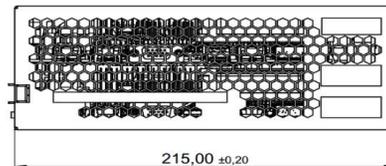


Figure 11. Full-width sled horizontal width (front view)

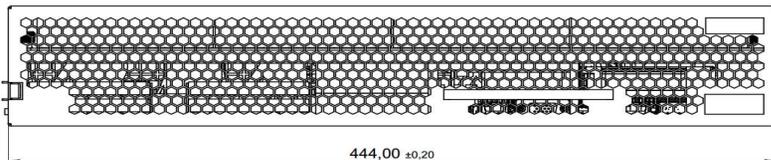
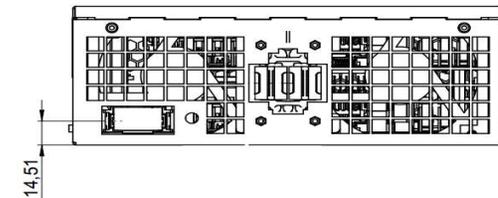


Figure 7. Sled optical connector vertical position (rear view)





- Racks in 600mm and 800mm widths
- Depths from 1000mm to 1200mm
- Heights from 16U to 42U
- Finished in black or white
- Single-phase, 3-phase, or DC power
- Single or redundant feeds
- Any combination of half- and full-width shelves



- Sleds in half-width or full-width
- One or two dual-socket servers per sled
- Broadwell, Skylake, or ARM CPU
- LFF storage (3.5") up to 24 SAS HDDs (288TB), SFF storage (2.5") up to 18 SAS/SATA drives
- Added support for up to 4x full-length, full-height PCIe cards, up to 2x double-width cards
- Dataplane network of 10Gb, 40Gb, 25Gb, 100Gb

- CG-OPENRACK-19 specification created & approved by OCP
 - Covers sled interoperability, mechanicals & connectivity to support new racks and sleds
- Partners involved with CG-OPENRACK-19



RadisyS

- Broad product line, released and commercially available
- Compute sleds, SSD storage sleds, high-cap HDD storage sleds, GPU sleds, etc.



Artesyn GPU sled

- Half-width dual Skylake and dual GPU sleds
- Have been tested with other CG-OpenRack-19 sleds and racks



ADLINK compute sled spec has been approved by OCP

- Half-width dual Skylake-based sled with local storage
- Has been productized and tested with other CG-OpenRack-19 sleds and racks



Pentair racks and sleds

- Scalable racks including power conversion, switching, and interconnects
- Standard half-width and full-width and custom sled options

A key tenant is efficient design.

- Combined rack-level power conversion reduces overall conversion losses, combines redundancy components, and isolates source power changes to a single location.
- Localized cooling (per-sled thermal management) allows cooling only where and how much it is needed.
- Airflow impedance of one sled does not affect another, so there is no minimum impedance per sled, reducing the overall power consumed for cooling.
- Architecture allows customers to meet specific agency requirements, environments, and fit existing site layout. Supports heterogeneous racks.
- These include RF emissions, acoustic noise, NEBS, seismic, and test suites such as NEBS
- Fan aggregation over multiple servers improves efficiency and airflow while reducing acoustic noise and frequency.
- Rack-based blind-mate power and optical interconnects make sled replacement almost instant (< 1 minute)
- Predefined server-to-port associations drastically reduce system setup time, operator costs, and are not affected by sled replacement/upgrade (no risk to system configuration and connectivity).

POWER EFFICIENCIES BRING COST SAVINGS



Power Consumption Comparison

- Compared power consumption of OCP and Legacy system under different room temperature and workload
- As the inlet temperature rises, the efficiency also rises



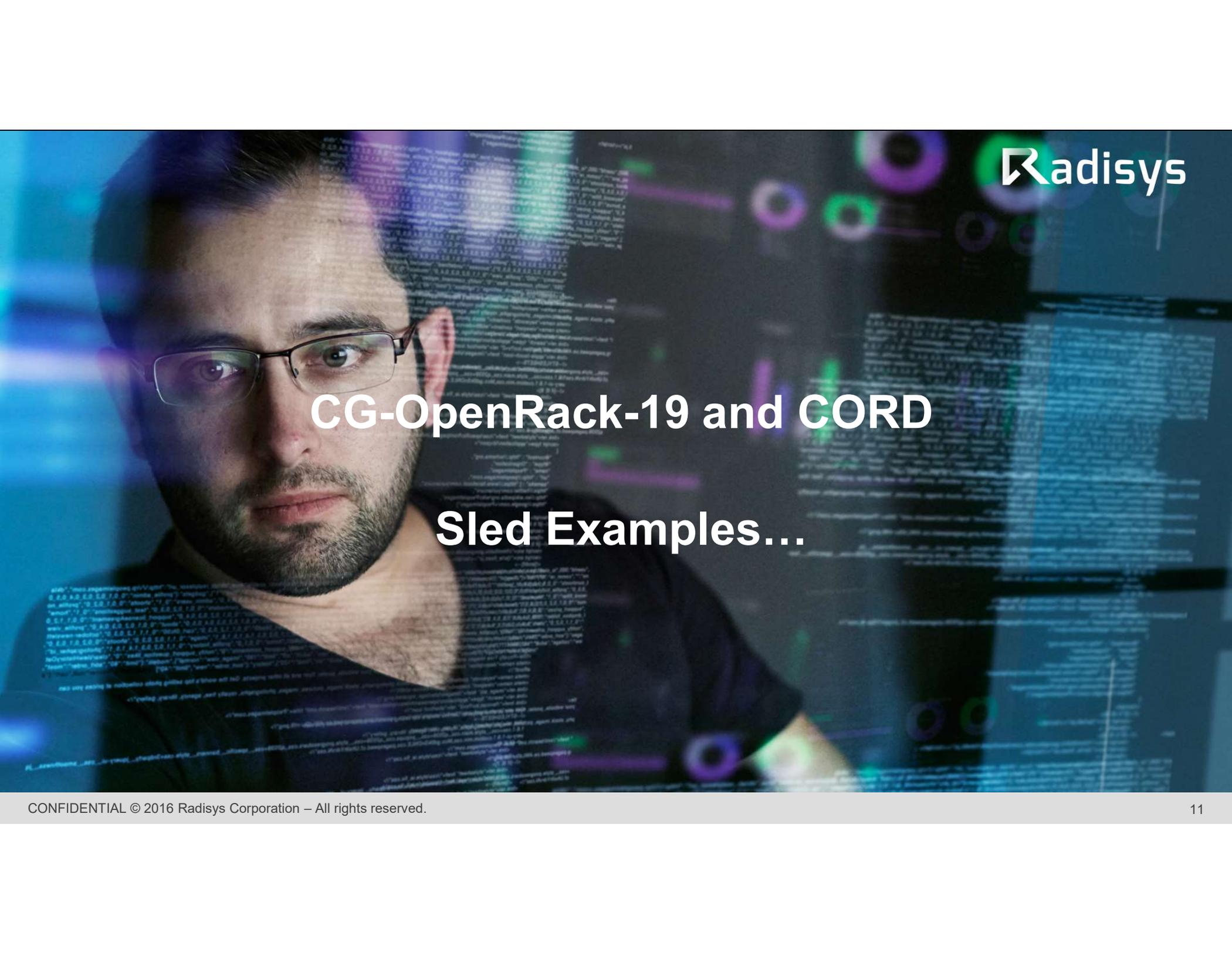
Reference: OCP Trial Results for Telco Infrastructure, Jungsoo Kim, SKTelecom

CG-Open Rack-19 vs Rackmount vs Blade Server vs Vanilla OCP

CG-OpenRack-19 is the Carrier Grade version of OCP

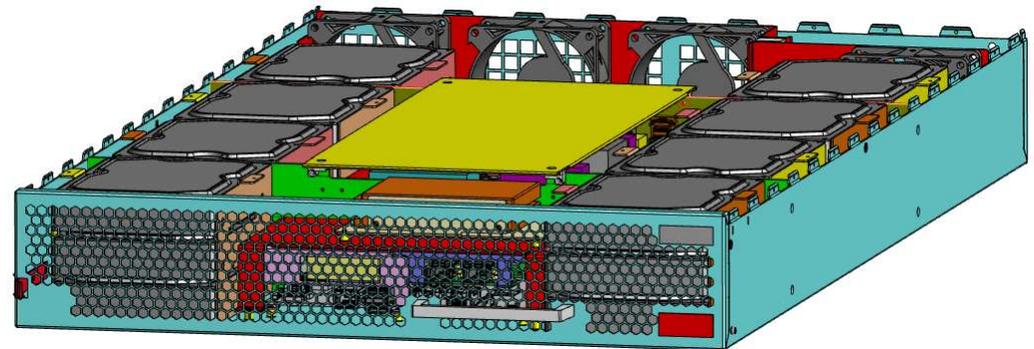
Feature	Rackmount Server	OCP Open Rack	OCP CG-OpenRack-19
Blind Mate Optical Interconnect	N	N	Y
Scalable Interconnect	N	N	Y
Rapid FRU Replacement	N	Y	Y
Open Specification	N	Y	Y
Cross-Vendor Consistency	N	Y	Y
Power Footprint for Carrier Datacenter	Y	N	Y
Built to meet NEBS	Y	N	Y
Based on industry standard 19" footprint	Y	N	Y
Regulatory/EMC at Rack Level	Y	N	Y

CG-OpenRack-19 uses best practices from OpenRack, but adds features important to telecom & service providers

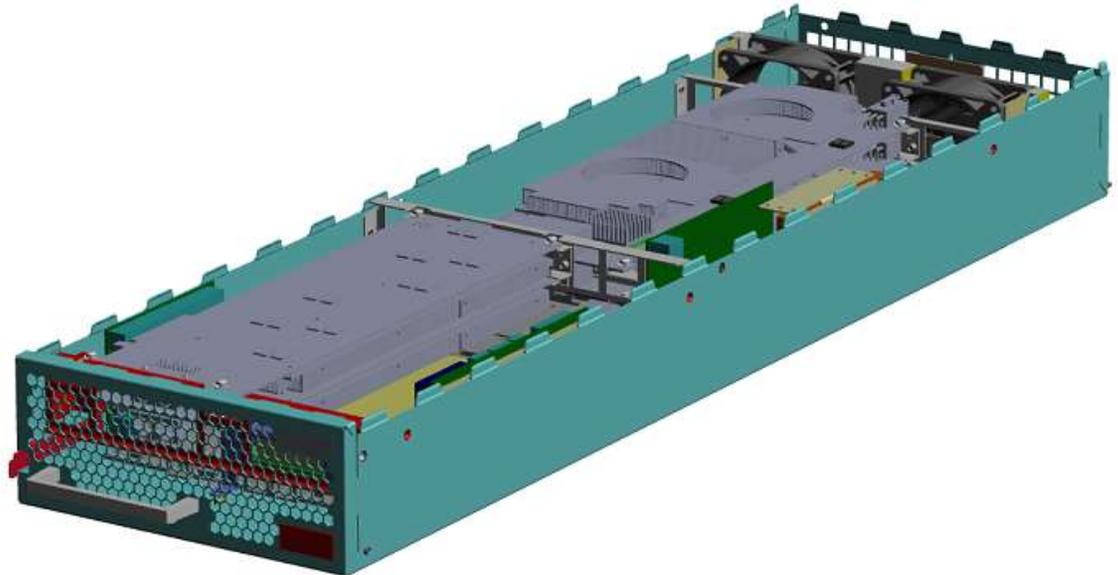


CG-OpenRack-19 and CORD Sled Examples...

- Full width storage-centric sled
 - Dual socket Skylake server boards
 - Redfish/IPMI server management
 - 16 DIMMs per server (16GB or 32GB)
 - M.2 NVMe boot flash
 - Additional 2.5" SATA or NVMe SSDs
 - 10G, n x 10G & 25G NIC options
- Modular high-capacity storage
 - 8 clips of 3x 3.5" SAS/SATA drives
 - Up to 12Gbps SAS
 - Up to 12TB per drive, 288TB total
 - Support for encrypted drives



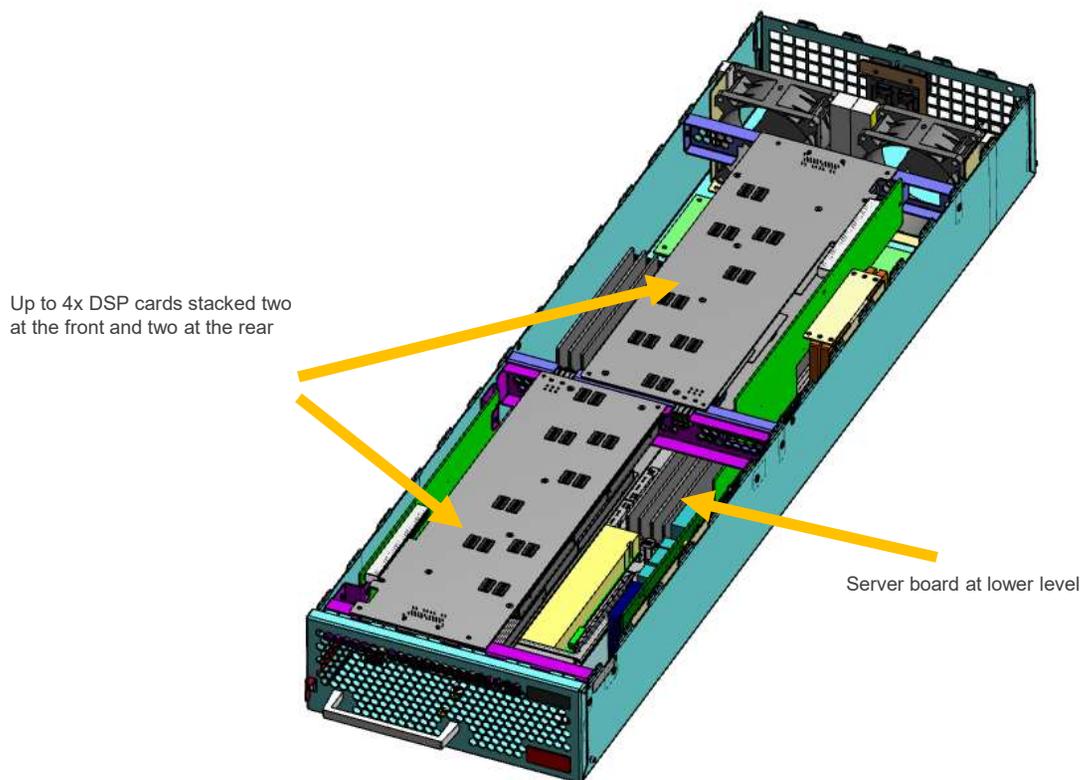
- Half width compute sled
 - Dual socket Skylake server board
 - 2 x Skylake CPUs per server
 - 16 DIMMs per server (16GB or 32GB)
 - M.2 NVMe boot flash
 - 2 x 2.5" SATA SSD per server
 - 10G, n x 10G, 25G, 100G NIC options
- Risers provide 1 or 2 PCIe slots
 - Full length / half length
 - Single or double wide
 - DSP / Transcoding
 - GPU
 - Security accelerators



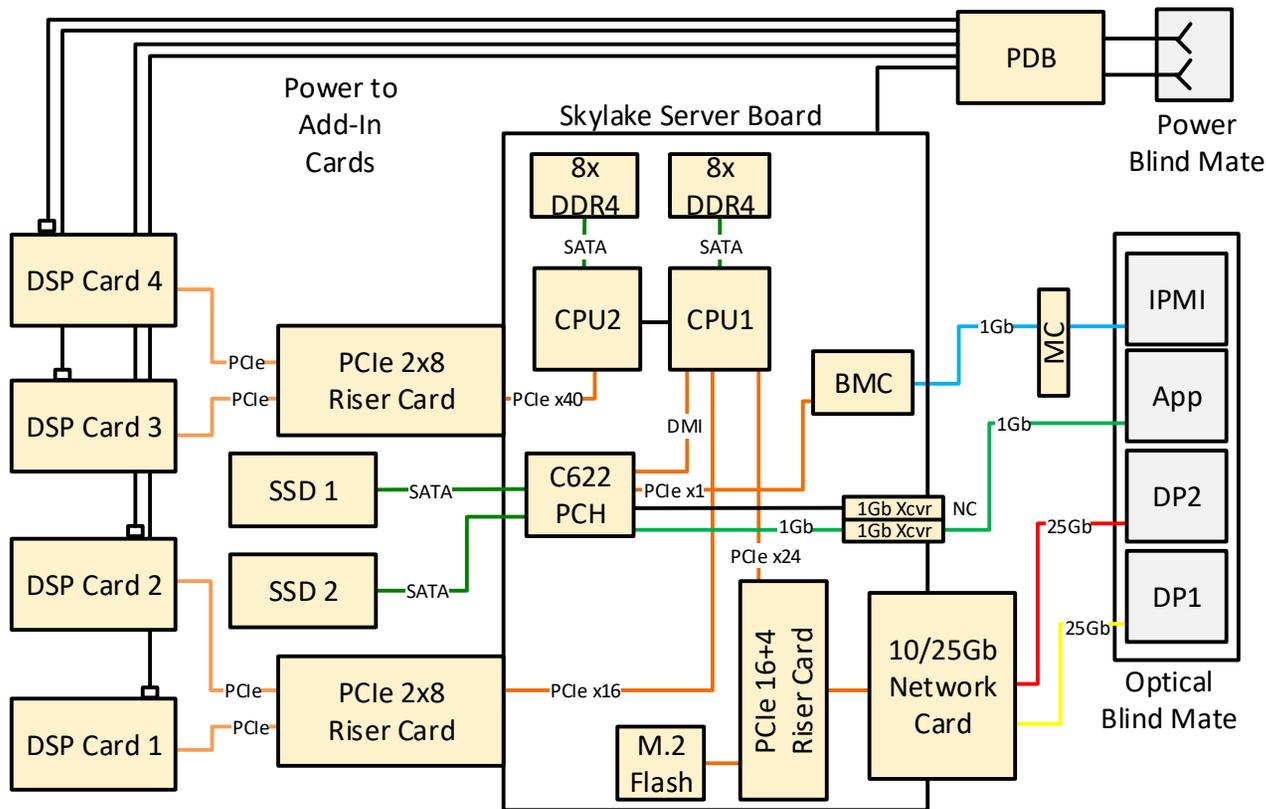
- Single-Width Add-In Card, Advantech, DSP-8682
 - Full-Length, Full-Height, Single-Width Card
 - Based on TI TMS320C6678, Up to 8x DSP per card, SRIO mesh
- Double-Width Add-In Card, nVidia Tesla GPU
 - Full-Length, Full-Height, Double-Width Card
 - Based on Volta GV100 (V100) or Pascal (P100) GPU
- Double-Width Add-In Card, Intel VCA1585LMV “VCA2 “
 - Full-Length, Full-Height, Double-Width Card
 - Based on Xeon E5-2600 v4, 3x GPU per PCIe card

DSP Expansion Sled with 4x DSP Add-In Cards

- Up to 4x DSP card



DSP Expansion Sled Block Diagram

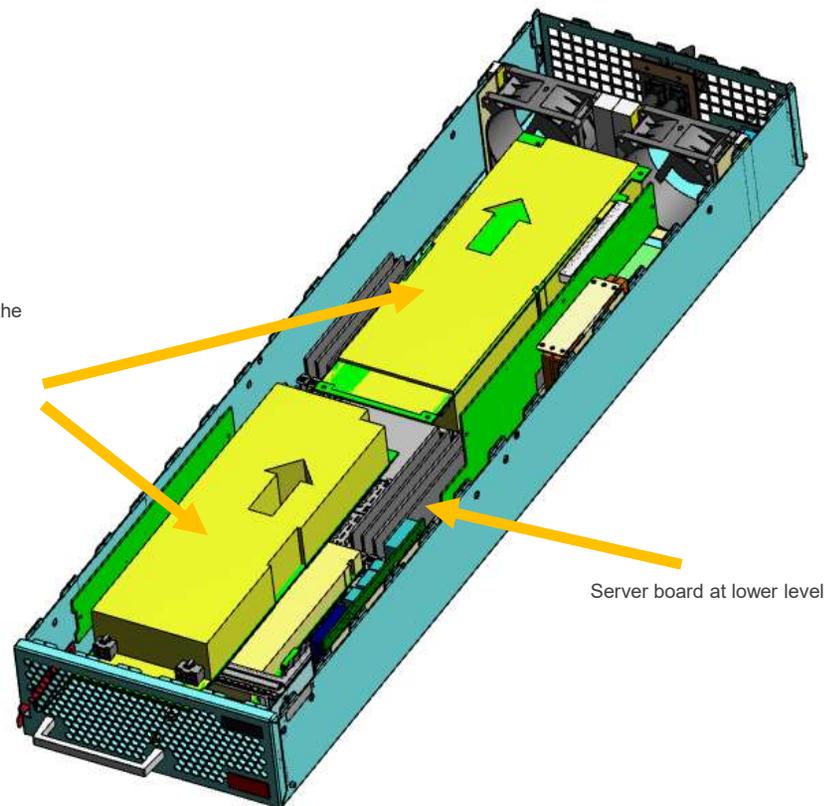


- The server has one on-board boot flash on SATA and two off-board SSDs on SATA
- Each PCIe riser card can support up to two standard x8 full-size PCIe plug-in cards
- Dataplane interfaces can be 10Gb, 25Gb, 100Gb or other speeds per fiber pair
- The number and size of attached SSDs is selectable

GPU Expansion Sled with 2x GPU Add-In Cards

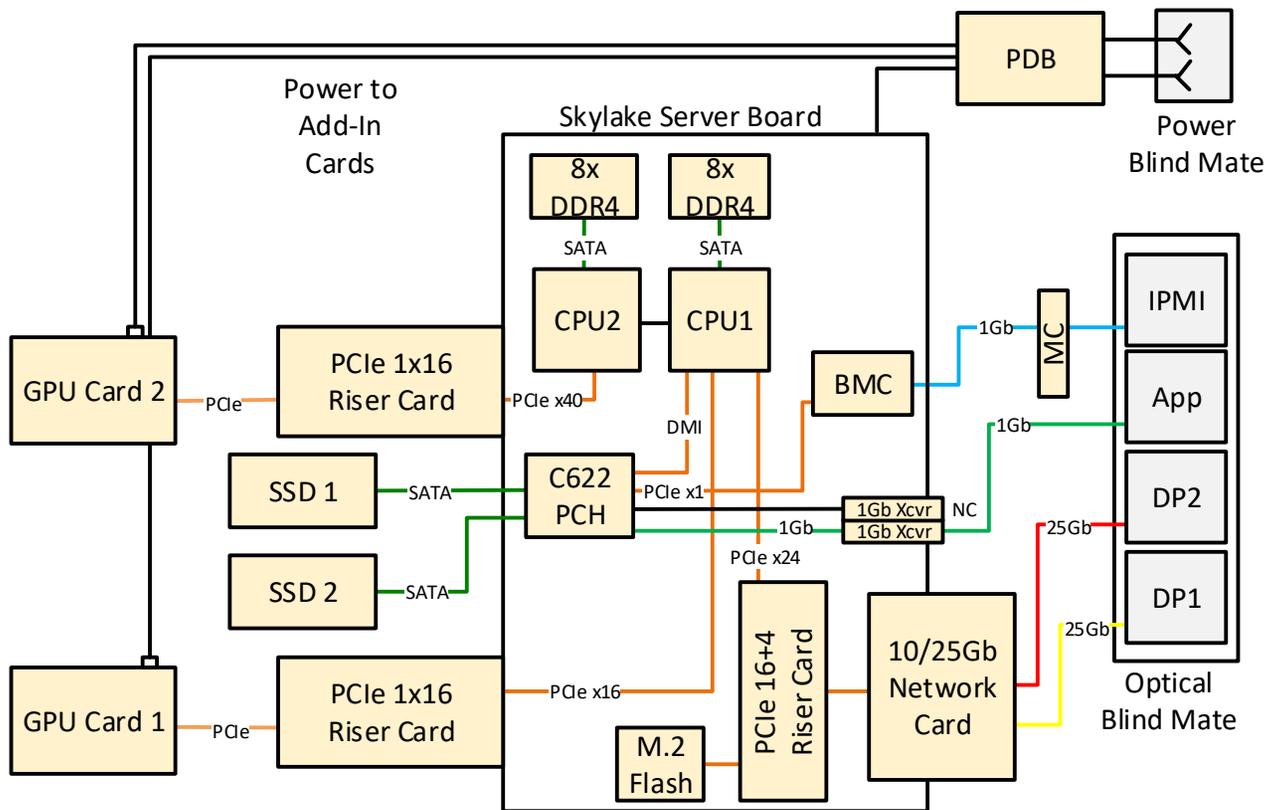
- Up to 2x GPU card

Up to 2x GPU cards one at the front and one at the rear



Server board at lower level

GPU Expansion Sled Block Diagram



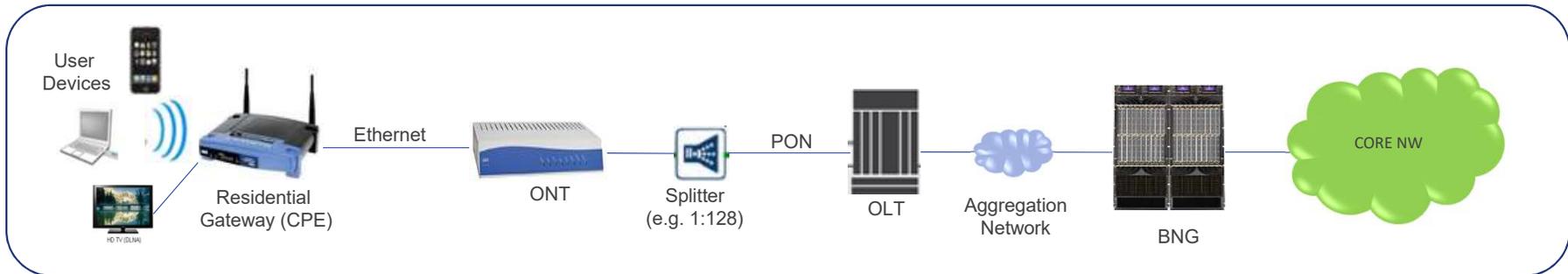
- The server has one on-board boot flash on SATA and two off-board SSDs on SATA
- Each PCIe riser card can support one standard x16 full-size single/double width PCIe plug-in card
- Dataplane interfaces can be 10Gb, 25Gb, 100Gb or other speeds per fiber pair
- The number and size of attached SSDs is selectable

The background of the slide features a man with glasses and a beard, looking directly at the camera. He is wearing a dark t-shirt. The background is a dark, blurred image of computer code and data visualizations, including colorful circles and lines, suggesting a technical or data-driven environment.

CG-OpenRack-19 and CORD Evolution...

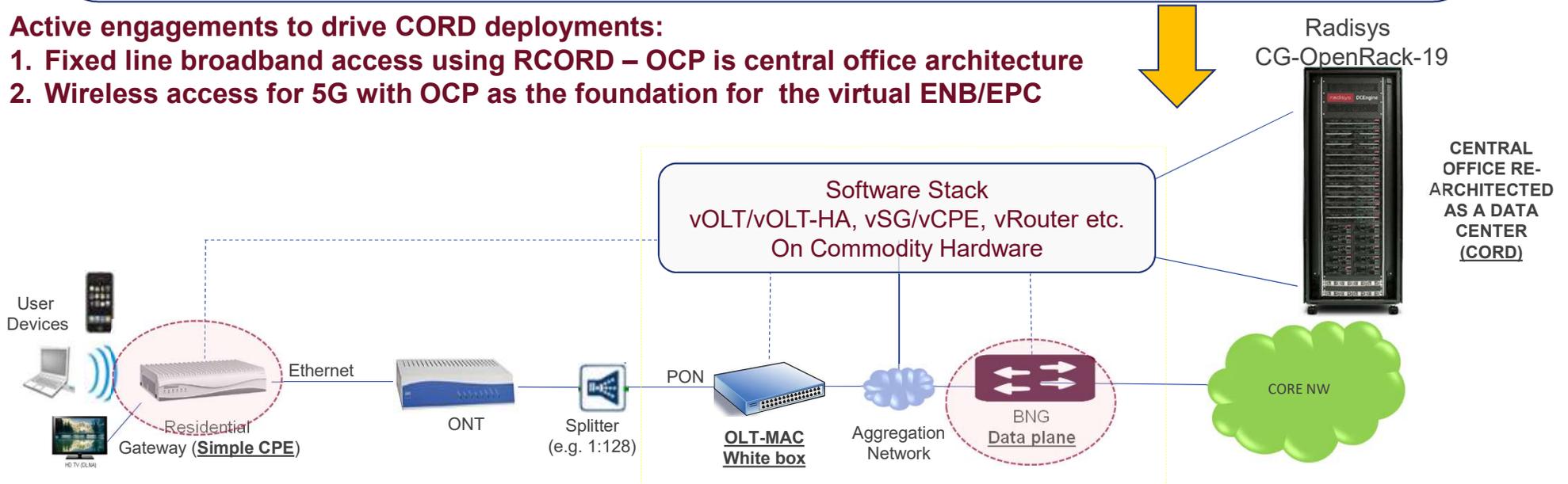
Transformation to SW Defined Broadband Access

Traditional Design



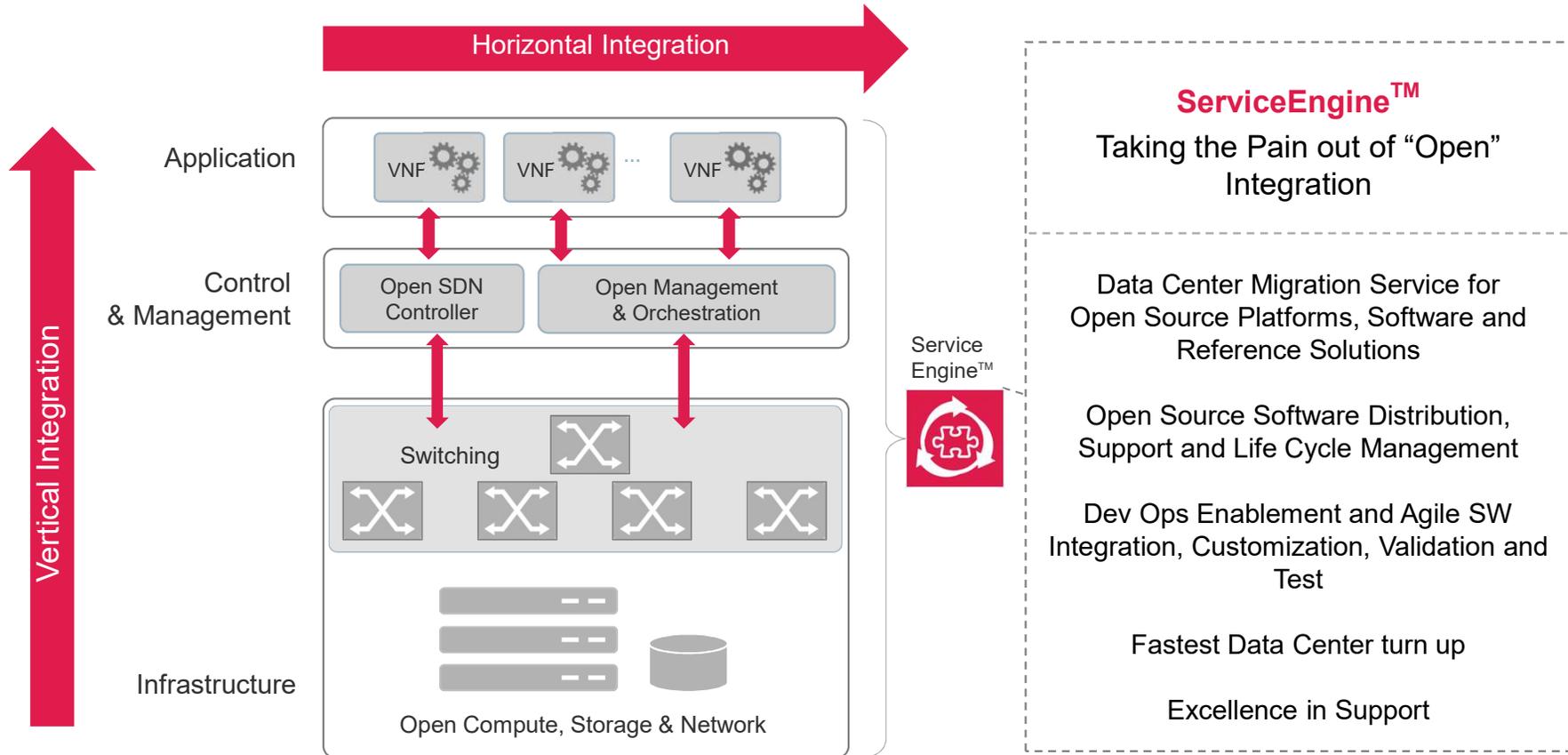
Active engagements to drive CORD deployments:

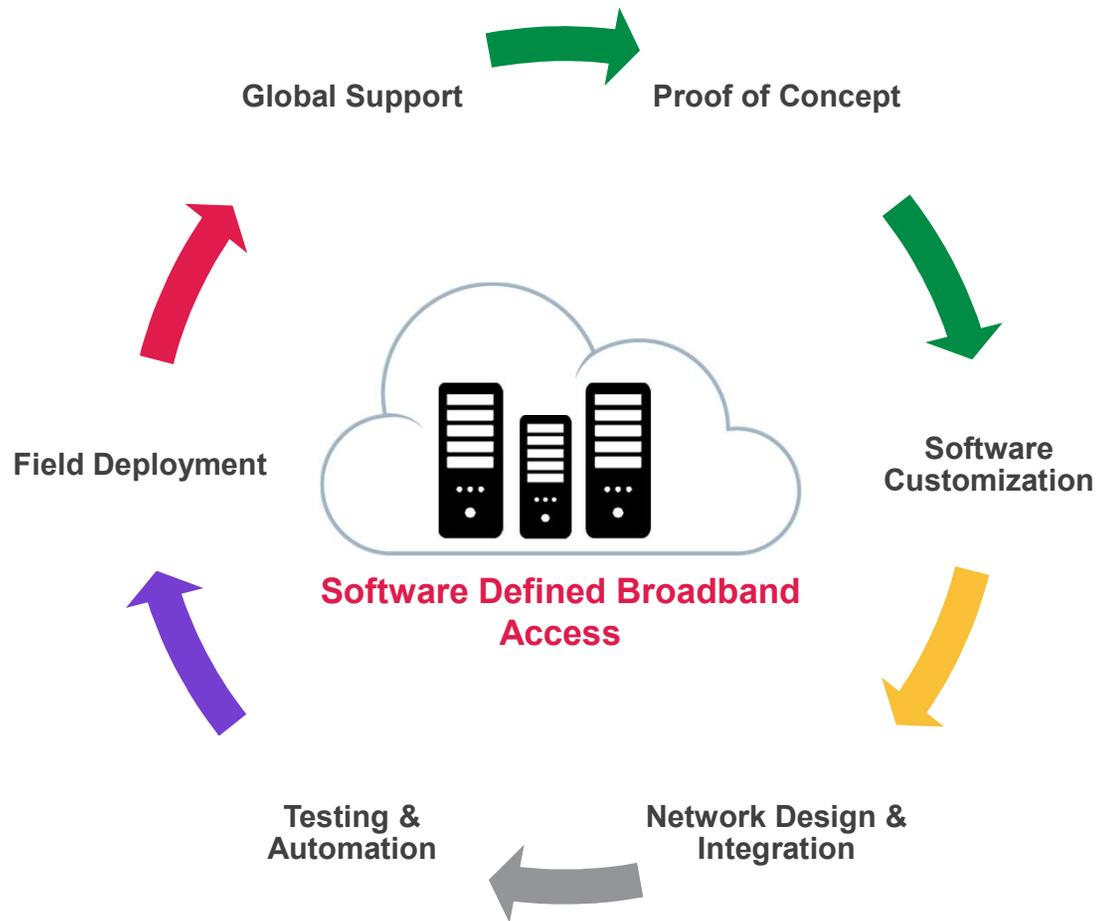
1. Fixed line broadband access using RCORD – OCP is central office architecture
2. Wireless access for 5G with OCP as the foundation for the virtual ENB/EPC



The background of the slide is a photograph of a natural rock arch. The arch is dark and silhouetted against a vibrant, starry night sky. The sky transitions from a deep blue on the left to a purple and magenta on the right, with the Milky Way galaxy visible. Through the opening of the arch, a range of snow-capped mountains is visible under a lighter, cloudy sky.

CG-OpenRack-19 and CORD RadisyS System Integration...





- CORD System Integration Expertise
- DevOps Collaboration Model
- Multi-Vendor Integration
- Open Source Platform Hardening
- API Integration

- The multiple stages required to enable full deployment
 - Service Provider or an external 3rd party to deliver
 - Proof of Concept
 - Development for rapid prototypes
 - Evaluation for Open Source SW and OCP building blocks
 - Define integration points with OSS/BSS systems
 - Business case with secured funding
 - Devops model to drive SW and HW frameworks
 - Integration for Open Source SW and HW building blocks
 - SW customization to complete gaps identified in CORD and other Open Source building blocks
 - Rapid prototypes with increasing features/functions validated by all functional groups
 - Business team, operations, senior management, etc.

- Network Design and Integration
 - All features/functions complete – ready for integration to the network infrastructure
 - API development and ongoing rapid prototypes to integrate with OSS/BSS
 - Procedures for installation of new OCP solution and decommissioning of legacy
- Testing and automation
 - Hardening of the solution & enabling automation for faster SW deployments
 - Agile development process to validate all conditions
- Field Deployment
 - First Office Application and pilot run
 - Production ramp
- Global Support
 - Infrastructure to support security updates, patches, new feature development
 - Infrastructure to support Advance Replacement, Extended Warranty, SLA performance

CG-OpenRack-19 and CORD

Thank You