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

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CG-OpenRack-19 and CORD

Introduction...
What does **OCP APPROVED** and **INSPIRED** status mean to a Service Provider?

- 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

![Diagram showing TEMs Model and DevOps Model](image_url)
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
CG-OpenRack-19 Ecosystem

- 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
Growing CG-OpenRack-19 Ecosystem

- 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).

Reference: OCP Trial Results for Telco Infrastructure, Jungsoo Kim, SKTelecom
CG-OpenRack-19 is the Carrier Grade version of OCP

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<th>Feature</th>
<th>Rackmount Server</th>
<th>OCP Open Rack</th>
<th>OCP CG-OpenRack-19</th>
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<td>Blind Mate Optical Interconnect</td>
<td>N</td>
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<td>Scalable Interconnect</td>
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<td>Rapid FRU Replacement</td>
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<td>Built to meet NEBS</td>
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<td>Based on industry standard 19” footprint</td>
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<tr>
<td>Regulatory/EMC at Rack Level</td>
<td>Y</td>
<td>N</td>
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</tr>
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CG-OpenRack-19 uses best practices from OpenRack, but adds features important to telecom & service providers.
CG-OpenRack-19 and CORD Sled Examples...
CG-OpenRack-19 Skylake Storage Sled

- 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
The server has one on-board boot flash on PCIe and two off-board SSDs on SATA.
Each drive location can support 3.5" or 2.5", SAS or SATA, HDD or SSD.
Two dataplane interfaces at 10Gb, 25Gb, 100Gb, or other speeds per fiber pair.
The number and size of attached SSDs is flexible.
CG-OpenRack-19 Skylake Expansion Sled

- 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
Expansion Sled Add-In Card Examples

• 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
• Up to 4x DSP card

Server board at lower level

Up to 4x DSP cards stacked two at the front and two at the rear
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.
• Up to 2x GPU card
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.
CG-OpenRack-19 and CORD Evolution...
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

Software Stack
vOLT/vOLT-HA, vSG/vCPE, vRouter etc.
On Commodity Hardware
CG-OpenRack-19 and CORD
Radisys System Integration...
Accelerating Open Telecom Innovation

ServiceEngine™
Taking the Pain out of “Open” Integration

Data Center Migration Service for Open Source Platforms, Software and Reference Solutions

Open Source Software Distribution, Support and Life Cycle Management

DevOps Enablement and Agile SW Integration, Customization, Validation and Test

Fastest Data Center turn up
Excellence in Support
Software Defined Broadband Access Services

Global Support → Proof of Concept

Field Deployment

Software Defined Broadband Access

Software Customization

Testing & Automation → Network Design & 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