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Microsoft's Project Olympus in OpenRack

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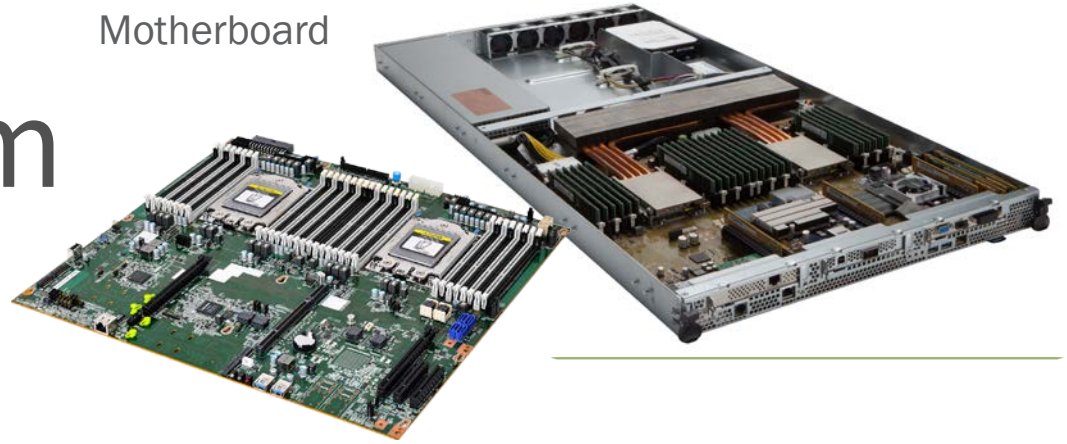
Olympus + OpenRack: Project Olympus Platform

- Provided functionality and modularity in a high availability cloud-based platform.
- Design Versatility
  - Several CPU architectures
  - Two storage platforms
  - New infrastructure solutions, server variations and building blocks continue to be developed

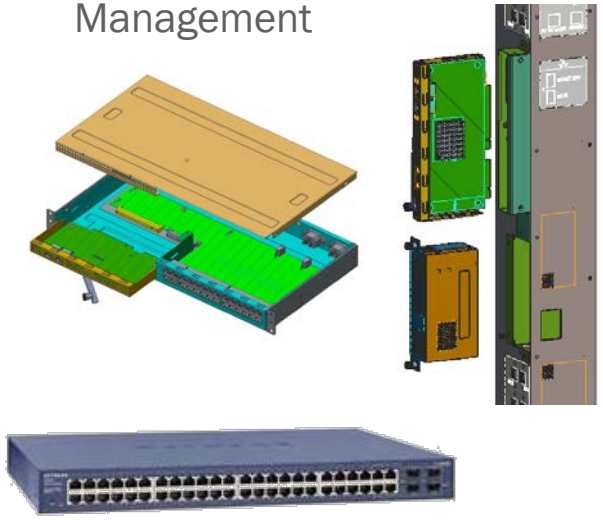
But there is always room for improvement…

Server Chassis and Motherboard



Universal Power Cord

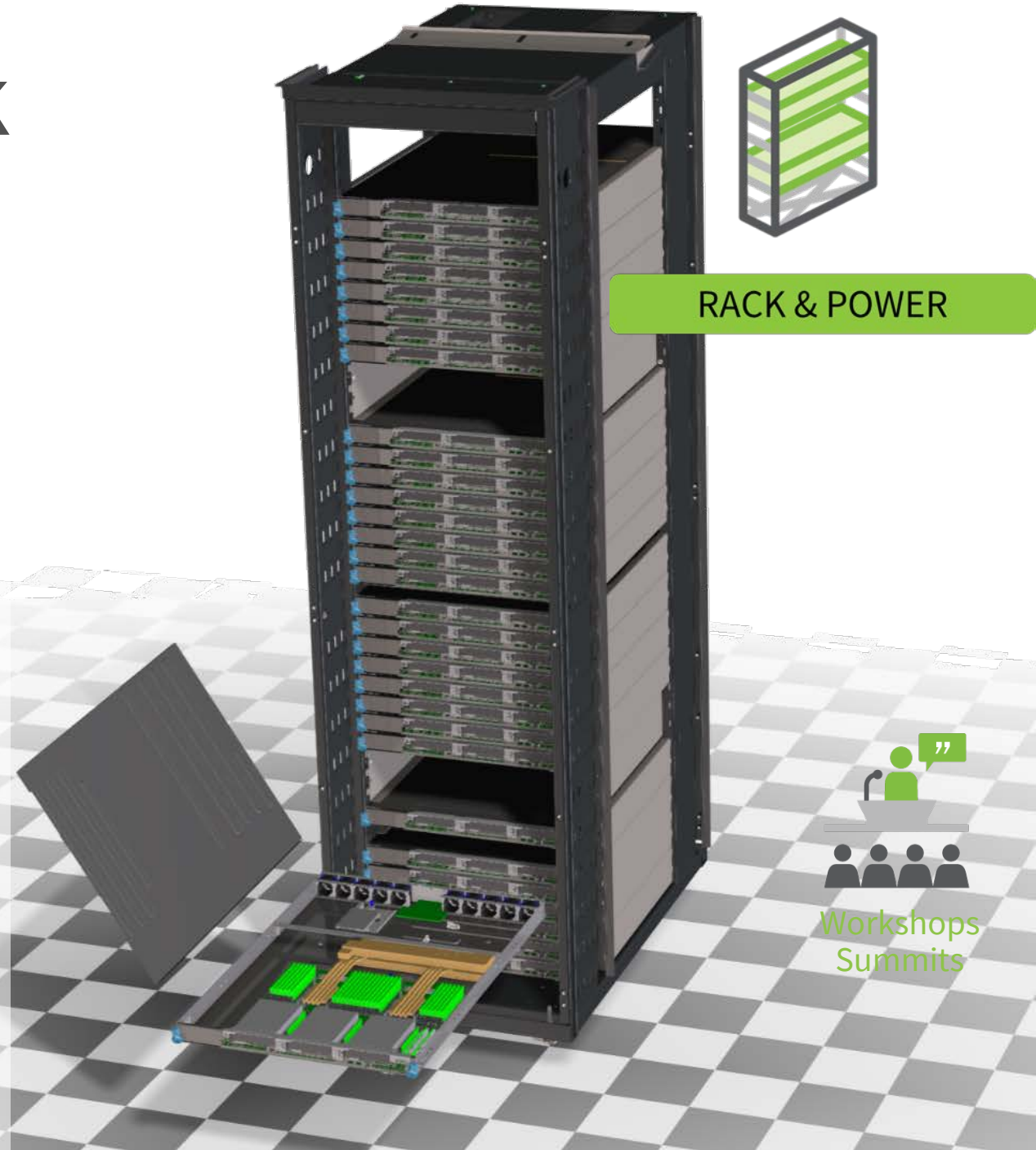
Management



Power Distribution and Rack

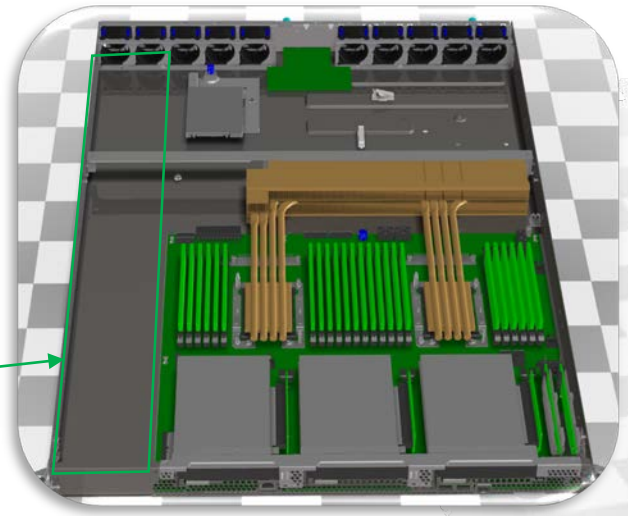
Olympus + OpenRack

- The Investigation Goal
  - Expand Olympus building block portfolio and share innovation on the OpenRack platform
- OpenRack infrastructure becomes another Olympus building block
- Opens many OpenRack building blocks to Olympus platform users.
  - Power infrastructure
  - New form factor rack
- Hardware Convergence
  - Greater cross pollination of innovations.
    - Networking, IO, liquid cooling
- Drive cost through added volume.



Olympus + OpenRack: Olympus Gains

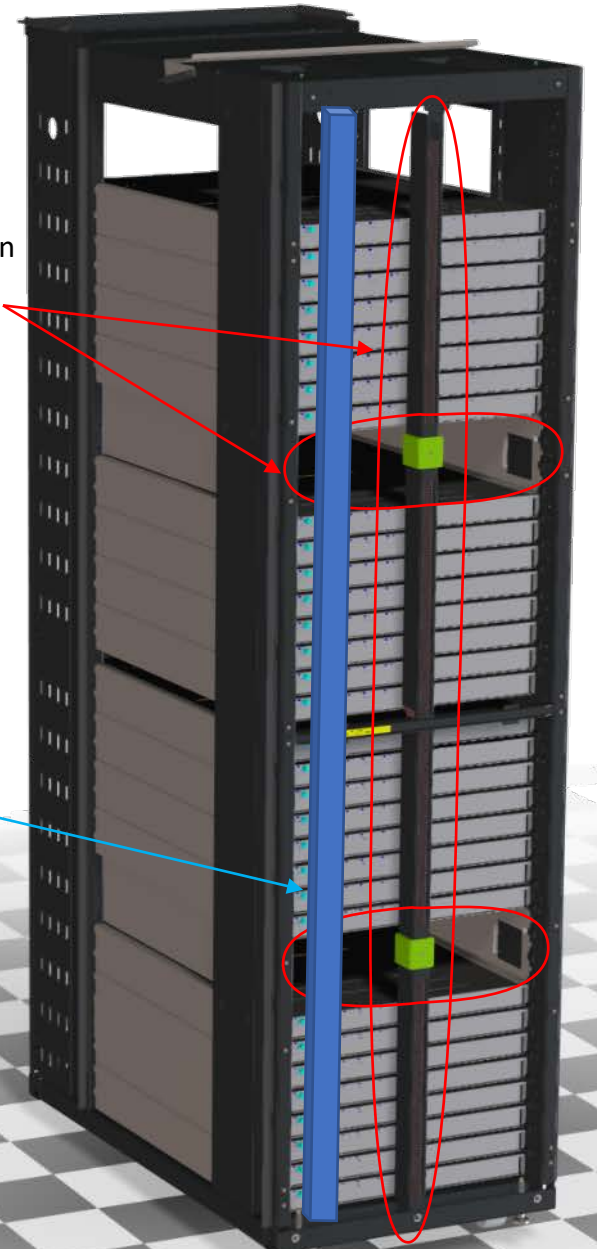
- Flexibility in power distribution
  - Pooled power reduces PSU SKUs, a PSU for a desired rack power
  - Reduced server weight
  - Simplified high power server management
- Faceplate width for increased IO or expansion bay potential
- Potential common liquid cooling solution
- Hardware convergence.
  - Shared/leveraged rack and infrastructure block qualification, dev costs



Additional 100mm width adds potential expansion bay for IO, storage, on board battery

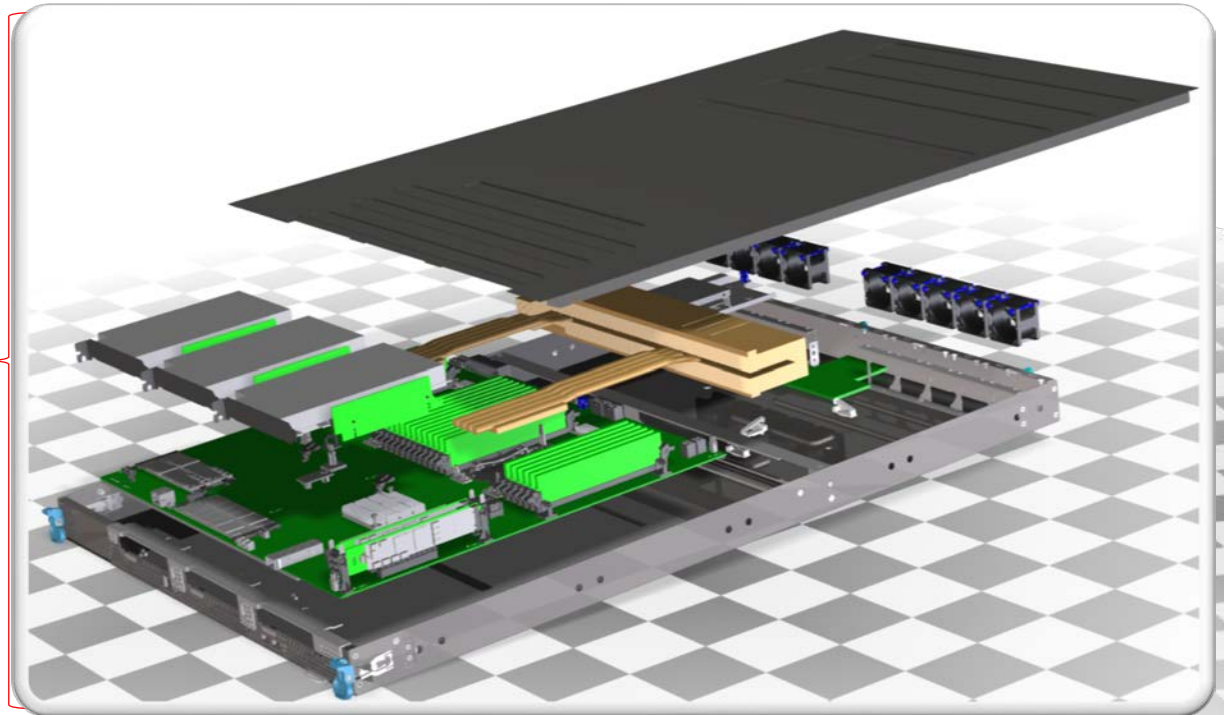
Power Shelf and Busbar Power Provide Options in A/C Input Power Levels and DC Voltage Output Distribution to the Servers

Integrated Cooling Infrastructure on OpenRack Used on Olympus as Well



Olympus + OpenRack: Olympus Retains

- Olympus motherboard, expansion cards, other basic building blocks
- Olympus management infrastructure
  - Power management, health monitoring
- RU on OpenRack



Olympus Building Blocks
- Motherboard
- Riser Cards
- Heat Sink
- Chassis
- SSD Attach

RACK & POWER

Blind Mate Management Infrastructure

Olympus + OpenRack: Power and Voltage

RACK & POWER

Objectives:

Efficiency, Low Cost, High Reliability, Enable common fungible platform infrastructure.

Simple question:

What is the best versatile rack power distribution platform?

Workshops
Summits

Olympus + OpenRack

RACK & POWER

World wide legislation defining efficiency requirement

Lot 9 – Europe is on path to be the first region enforcing a law (Link) banning Servers and Storage equipment with low energy efficiency from being put into service. Regulation is set to become mandatory in **March 2020**. Requirements target Idle Energy, Active Power, Power Supply efficiency along with other material restrictions and requirements to promote re-use of equipment (circular economy). Idle Energy and Active Power requirements are centered around SERT.

China Server Energy Efficiency – CNIS (China National Institute of Standardization) is set to publish draft server efficiency standard this spring. Regulation will be enforced at customs, preventing non-certified serves from being imported. CNIS have yet to select the tool to assess efficiency (SERT vs SEEB which is a Chinese developed metric). Energy limits and other requirements unknown at this time.

Other upcoming regulations:

Japan METI (Ministry of Economy, Trade and Industry) notified WTO (Link) of updated requirements for Server Energy Efficiency. Regulation is expected to be published in spring 2019 and become mandatory for Servers starting 4/1/21. Expected to follow European Lot 9 requirements and adoption of SERT.

Europe GPP – European Commission published Energy/Environmental criteria proposals for procurement of Data Centers and Cloud services. Link to GPP Documentation Potential impact to Microsoft Cloud service offering in Europe. US Department of Energy is also participating in the GPP working group. GPP award criteria target 3 areas: (1) Data Center system as a whole (2) Cooling and power distribution systems (3) IT and Networking equipment.

USA Data Center Optimization Initiative appear to have limited scope and no impact to Microsoft.

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GEC (Green Electronic Council) it's a US based NGO administering the EPEAT program for the DOE. GEC has been working for years to enter the Server and Cloud business by pushing standardization (Server standard published in 2018, Networking under development) and setting EPEAT for Server (active since August 2018). GEC is also active in drafting Green Procurement guidelines. Requirements mostly affect hardware sold to federal and government agencies with no impact to Microsoft at this time. Efforts to extend the scope were unsuccessful so far. AWS, Google and Microsoft intentionally avoided direct engagement with GEC.

ISO/IEC standardization efforts – Draft ISO/IEC DIS 21836 was just published. This standard provides a server energy effectiveness metric (SEEM) to measure and report the energy effectiveness of specific server designs and configurations. It is meant to be leveraged by governments and regulators to establish compliance and/or reporting programs. It adopts SERT but also provides requirements for servers where SERT is not applicable, with the implementation of an alternate server energy effectiveness metrics.

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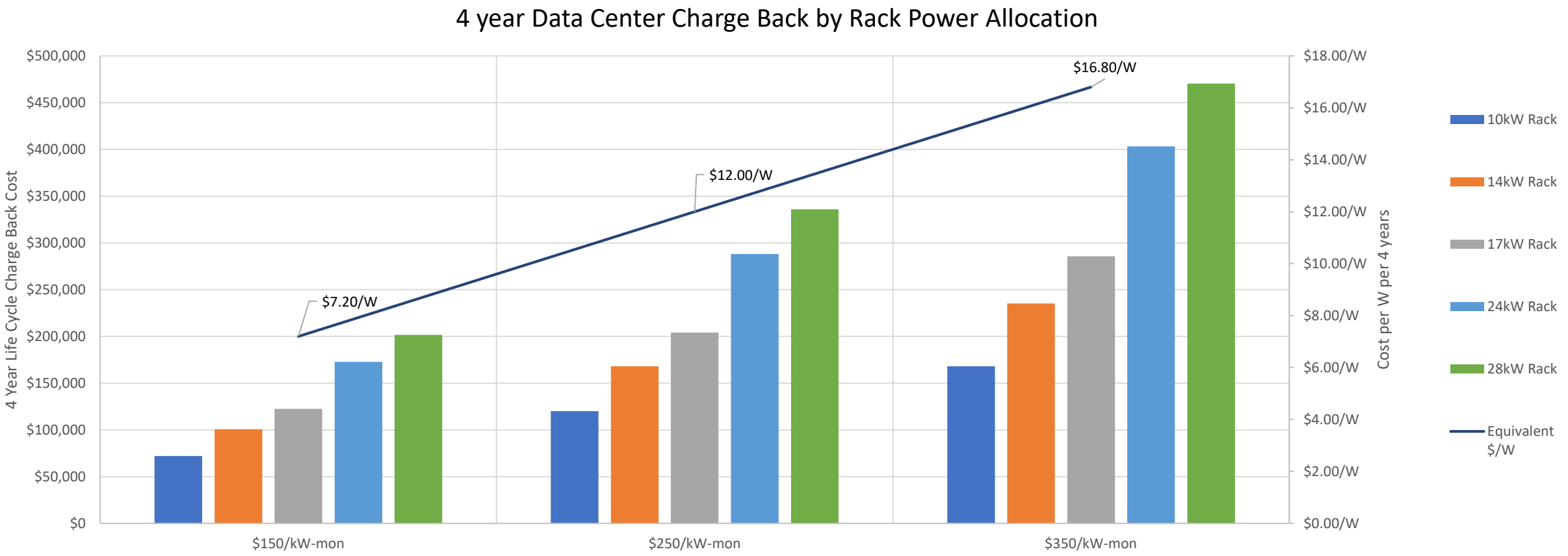
Conversion and distribution efficiency is important



Data Center Charge Back determined by Capex, Opex, and Operator Profit

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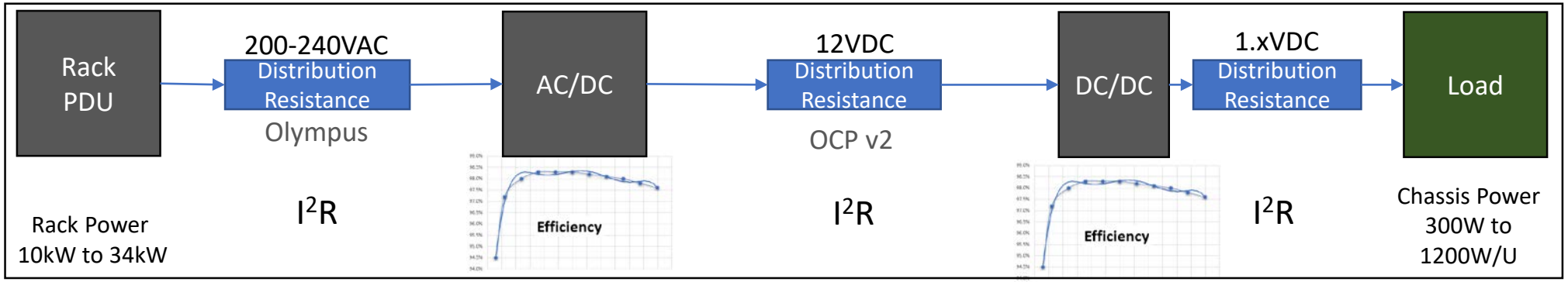
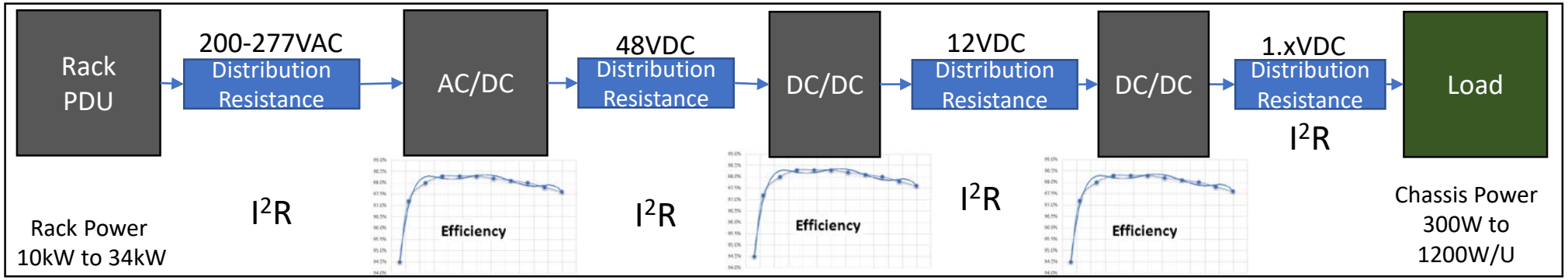
240VAC or 12VDC Distribution Across 48U

240VAC or 12VDC distribution at 48U



240VAC or 48VDC Distribution Across 48U

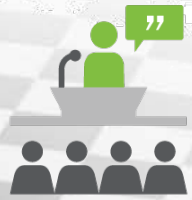
240VAC or 48VDC distribution at 48U



Olympus + OpenRack: Development

- Expanding to OpenRack
  - *Not* discontinuing development on the EIA/PMDU rack
- Mechanical proof of concept is on display at OCP in partner booth and a server blade is displayed at the Microsoft booth
- OpenRack V3 Specification
  - Coordination and collaboration with Facebook for support of the needed features of both OCP and Project Olympus

RACK & POWER



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