SUPERMICRO EXPANDS ITS OPEN SOLUTION PORTFOLIO WITH OCP TOTAL RACK SCALE OFFERINGS, SIMPLIFYING DATA CENTER BUILDOUT AND EXPANSION WHILE REDUCING TIME TO DEPLOYMENT

Industry Standard Rack and Server Designs Reduce Complexity While Increasing Choice and Enabling Scalability

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Executive Summary

As data centers continue to expand and look to optimize their rack scale investments, industry standards are now available, which can reduce costs and allow for a more efficient data center. The Open Compute Project (OCP) has developed a number of system and rack level standards, which results in lower costs for data center operators and enhance AI data centers of the future.

Efficiency: OCP racks are designed to be efficient in terms of power and cooling. They minimize wasted space and materials and use innovative power distribution systems that reduce energy consumption. This can lead to significant cost savings for data center operators.

Scalability: OCP racks are designed to be easily scalable. They can be quickly and easily configured to meet the changing needs of a data center. This is important for businesses that are constantly growing and evolving.

Cost-effective: OCP racks are often less expensive than traditional server racks. The future-proof design choices within these racks are based on open industry standards that prioritize compatibility and reusability. Additionally, OCP racks are modular, which means that data center operators only need to replace malfunctioned components rather than the entire rack.

Future Proof: These design choices ensure that future generations of servers are compatible with industry-standard rack designs and that compatibility and reusability are prioritized.

Openness: OCP embraces open standards, allowing greater flexibility and vendor choice for data centers. These racks include highly customizable hardware and firmware to meet the growing intricacies of customer requirements. This open framework can lead to more innovation and lower costs as industry standards are adopted.

Critical Components

The Supermicro Total Rack Solutions support both air and liquid cooling and are based on OCP and Open-Source Principles and Technologies. The components of a complete OCP solution can include the following:

- **ORV3 Racks:** The OCP has developed two designs for the mechanical specifications of the Open Rack Frame. The design is for the internal dimensions, while the external dimensions may vary. Each design can accommodate rack units (vertical spacing of servers) of either 44.45mm or 48mm. More details can be found at: https://www.opencompute.org/documents/open-rack-base-specification-version-3-pdf

- **Liquid Cooling Options:** Supermicro, with its worldwide manufacturing capacity of almost 1,500 liquid-cooled racks/month, designs entire rack solutions, including cold plates, coolant distribution units (CDUs), coolant distribution manifolds(CDMs), piping, and a cooling tower. The entire solution is available from Supermicro.

- **OCP Rack Server Power:** Power is delivered to the OCP Rack as AC. The power goes to the OCP **Power Shelf** (48V), where the conversion to DC occurs. The DC power is sent through what is referred to as a Busbar, which runs along the entire rack vertically. Each of the OCP ORV3 servers connects to the Busbar through a blind mate connector. This method of delivering power to the server results in:

  - No loss during the AC to DC conversion at each server – The conversion from data center power is only done once per rack.

  - No PSU in each server – Reduces cost as the PSU is not needed in each server. This also lowers cooling requirements.

  - No power cords – A blind mate connector is used, a type of electrical connector with a mating action that happens when sliding or snapping the plugs. These connectors have self-aligning features that allow for small misalignments when mating.
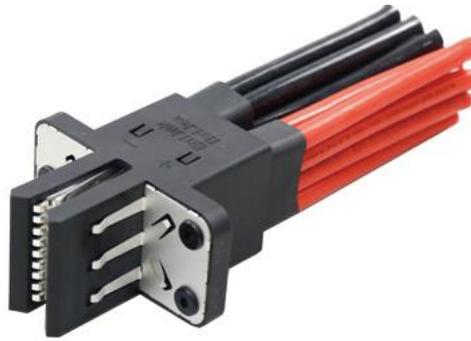
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Figure 1 - OCP Open Rack V3 Power Output Connector

- **Industry Standards:** Supermicro is committed to supporting open industry standards, including EDSFF E1.S and E3.S storage drives, Data Center Modular Hardware System (DC-MHS) architectures, OCP 3.0-compliant Advanced IO module (AIOM) cards for up to 400 Gbps bandwidth based on PCIe 5.0, OCP Open Accelerator Module Universal Base Board Designs for the GPU complex, Open ORV3-compliant DC-powered rack bus bar, and Open BMC. OCP DC-MHS systems provide interoperability between key data center, edge, and enterprise infrastructure elements by providing consistent interfaces and form factors among modular building blocks. Air and liquid cooling is available for the Supermicro CloudDC (DC-MHS based), Supermicro MGX servers, and other planned server product families. The new servers are designed for AI inferencing, enterprise and cloud scale-out workloads.
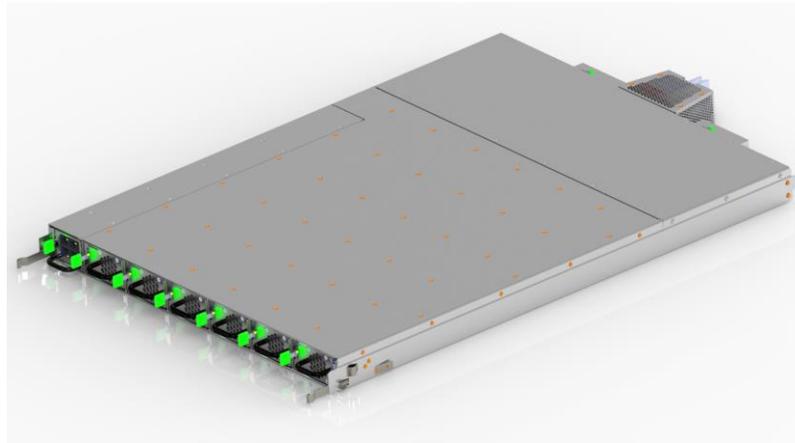

Figure 2 - Power Shelf

- **OCP Server Summary:** Supermicro designs a range of servers optimized for different applications. Servers that will meet the ORV3 specifications include:

  - CloudDC (DC-MHS) Servers – Single or dual Intel Xeon 6 processors or single AMD EPYC processor, which are coming soon.

  - Supermicro MGX Servers – NVIDIA Grace Hopper Superchip processors

  - Supermicro MegaDC ARS Servers with the Ampere CPU

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- o Petascale (DC-MHS) Storage Servers– These new systems will use dual Intel Xeon 6 processors and EDSFF E1.S and E3.S storage, and support CXL as well.

- **Supermicro AIOM Networking:** AOCs are a superset of OCP 3.0 specification and provide a range of networking connectivity.

- **Redfish Profile Support w/SuperCloud Composer:** Intelligent agents within SuperCloud Composer harvest rich metadata, parsing redfish endpoints and preparing this rich metadata for display within SCC's unified dashboard.

- **Networking Option:** The Cloud and AI Rack Solutions can be built with Supermicro Sonic Networking Solutions with 400Gbps Ethernet (QSFP-DD), SONiC Networking Operating System, Fully shared packet buffering, Redundant hot-pluggable power supplies, and regular and reverse airflow models.

- **OpenBMC:** The OpenBMC project is a Linux Foundation collaborative open-source project that produces an open-source implementation of the baseboard management controllers (BMC) firmware stack. OpenBMC is a Linux distribution for BMCs that works across heterogeneous systems, including enterprise, high-performance computing (HPC), telecommunications, and cloud-scale data centers.

- **Open System Firmware:** Supermicro servers support the Open System firmware, allowing for a common interface to the lower level firmware.

Supermicro OCP Compliant Server Details (Based on DC-MHS and DC-SCM modules)

- The upcoming Supermicro X14 CloudDC (DC-MHS) exemplifies Supermicro's commitment to creating OCP compliant servers that adhere to the latest consistent interface and form factor standards for modular building block solutions. These servers enhance interoperability due to highly customizable components and firmware that can be tailored for compatibility across other systems to further meet customer specifications. X14 CloudDC will include modular hardware such as Full Width HPM (Host Processor Module) (M-FLW) and Scalable DeNsity Optimized (M-SDNO), Common Redundant Power Supply (M-CRPS), Peripheral Sideband Tunnelling Interface (M-PESTI), and other features.

- The CloudDC (DC-MHS) servers will also feature a Datacenter-ready Secure Control Module (DC-SCM) that simplifies server security management by unifying management across servers with a singular firmware image and I/O. Credentials and settings saved to the DC-SCM are isolated from the main board, allowing end users to preserve the module in case of an HPM malfunction. These modules, along with their peripherals, are designed to be externally accessible for shared infrastructure enclosures, improving ease of serviceability and longevity. Customers can anticipate faster maintenance and deployment while lowering long-term overhead costs with these forward-looking design choices.

What is DC-MHS?

DC-MHS stands for Data Center Modular Hardware System. This design specification is part of a larger initiative by the Open Compute Project (OCP) to standardize components used in data centers, at the edge, and in enterprise deployments https://www.opencompute.org/index.php/projects/dc-mhs. The goal is to create interchangeable building blocks for more

flexibility and efficiency in data center design. This modularity is achieved through consistent interfaces and form factors for things like server chassis and power supplies. Some essential aspects of DC-MHS include:

Standardized components: DC-MHS defines specifications for core components like Host Processor Modules (HPMs), essentially motherboards. This standardization allows for compatibility between different manufacturers' equipment.

Multiple form factors: The specifications cater to different space requirements with options for full-width and density-optimized HPMs.

Focus on interoperability: A key emphasis with OCP standards is ensuring various vendors' components can work together seamlessly within a data center.

The DC-MHS project page can be found at: https://www.opencompute.org/index.php/projects/dc-mhs

Complete ORV3 Rack Solution From Supermicro

Supermicro has designed and created a prototype OCP ORV3 rack solution based on the NVIDIA GH200 Superchip for AI Training. As part of this rack design, specific servers were selected.

Scalable Unit Specification

As described below, Supermicro has developed a 256 Node Scalable Unit with 256 Supermicro MGX nodes.

256-Node Scalable Unit	SRS-MGX256-SU-001
Overview	Fully integrated 256-node cluster with 256 Hopper GPUs and Grace CPUs
Compute Fabric Leaf	8x SSE-MQM9700-NS2F, 64-port InfiniBand 400G NDR, 32 OSFP ports switch
Compute Fabric Spine	4x SSE-MQM9700-NS2F, 64-port InfiniBand 400G NDR, 32 OSFP ports switch
In-band Management Switch	4x SSE-MSN4600-CS2FC 64-port 100GbE QSFP28, 2U switch
Out-of-band Management Switch	8x SSE-G3748R-SMIS, 48-port 1Gbps Ethernet ToR management switch
Rack	9x 48U 750mm x 1200mm
PDU	34x 208V 60A 3Ph

*Recommended configuration, other network switch options and rack layouts are available.
*Login node may be required. NVIDIA Unified Fabric Manager (UFM) node optional
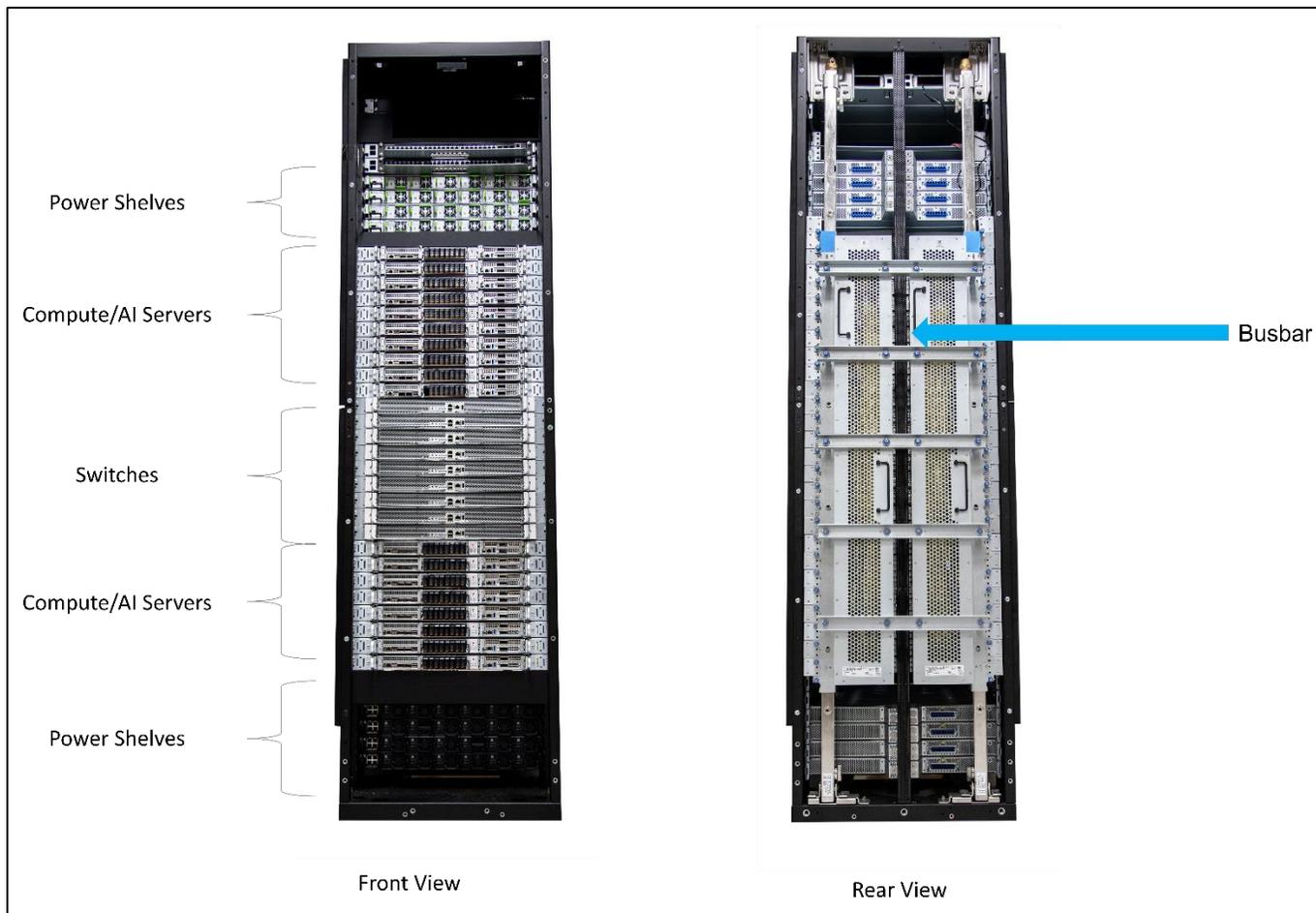
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Figure 3 - Prototype ORV3 Rack with Supermicro AI Servers

Summary

The Open Compute Project is creating efficient designs for data center computing through collaboration. Standards for rack level computing can increase innovation and lead to more efficient designs from multiple vendors. Supermicro creates rack level solutions that adhere to these standards and have complete AI or enterprise designs. These rack level designs include power distribution, servers, and networking, all designed to work efficiently with the defined standards.

Further Information

Supermicro OCP Information: https://www.supermicro.com/en/solutions/ocp

DC-MHS project page https://www.opencompute.org/index.php/projects/dc-mhs

ORV3 Rack Specification: https://www.opencompute.org/documents/open-rack-base-specification-version-3-pdf

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