CompactPCI® Serial

How to build multi-cluster systems and super computers based on COTS SBC and switch components

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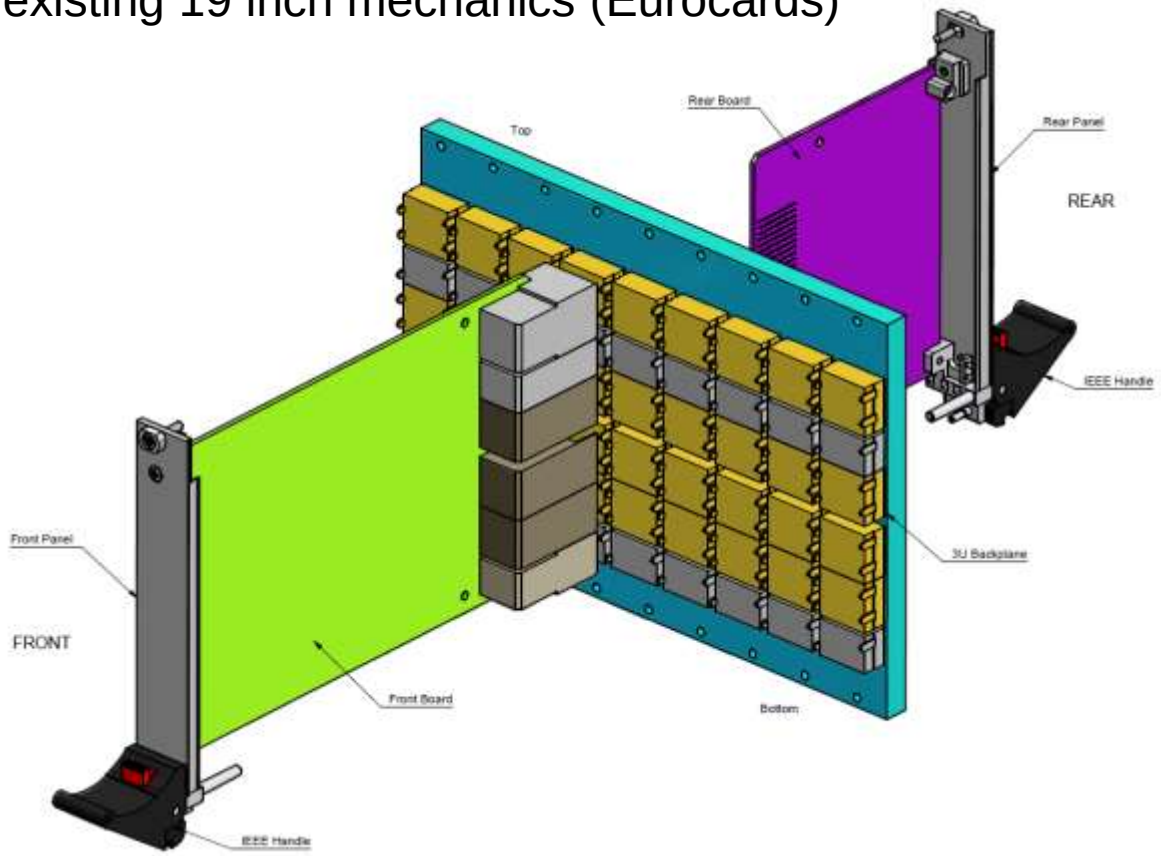
Extension of CompactPCI

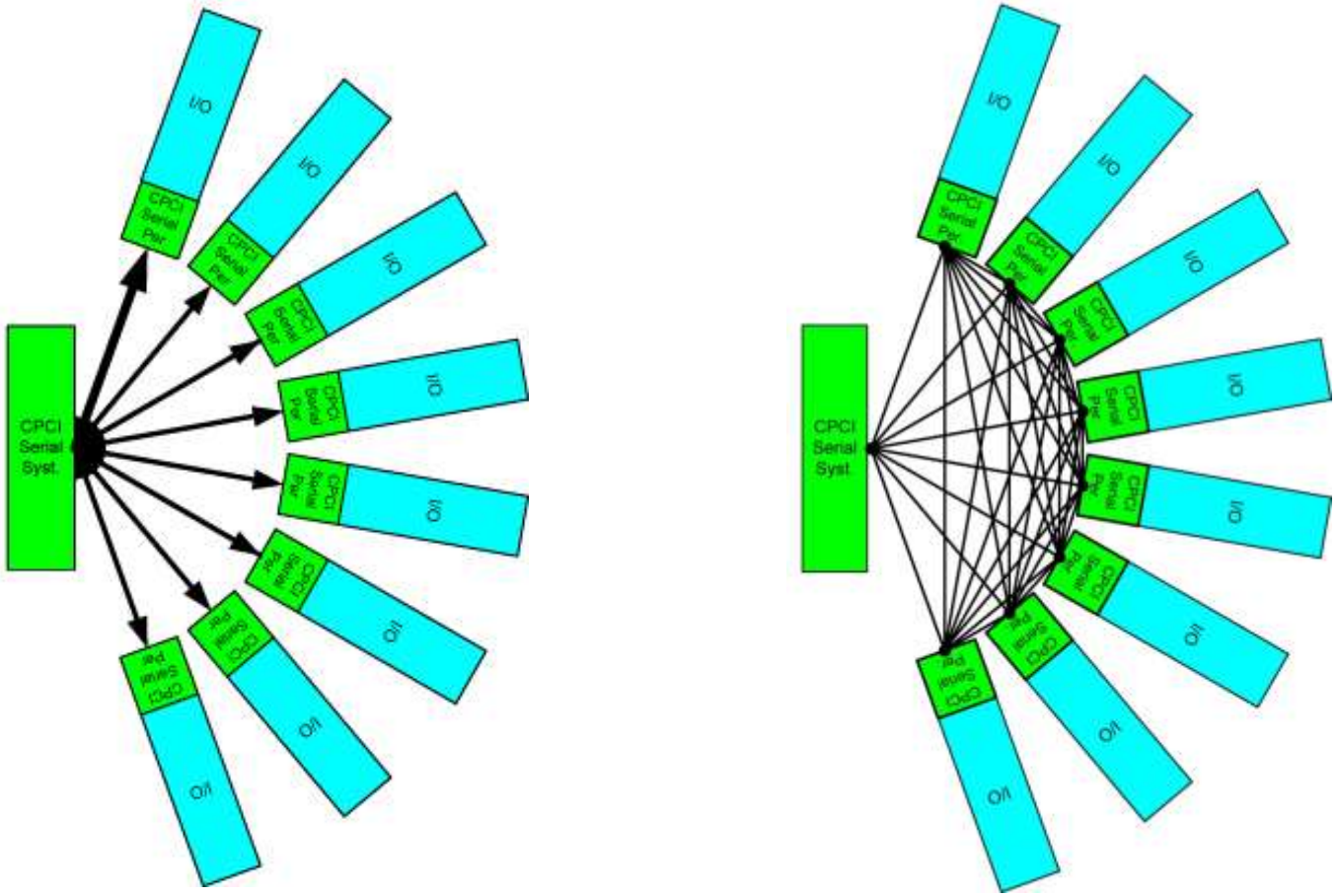
Extension of the well established CompactPCI® standard

- Overcomes the I/O speed limitations of the parallel CompactPCI bus interface
- Uses exclusively high-speed serial bus communications, available concurrently, across the midplane
- Uses existing 19 inch mechanics (Eurocards)



The CompactPCI Serial Architecture

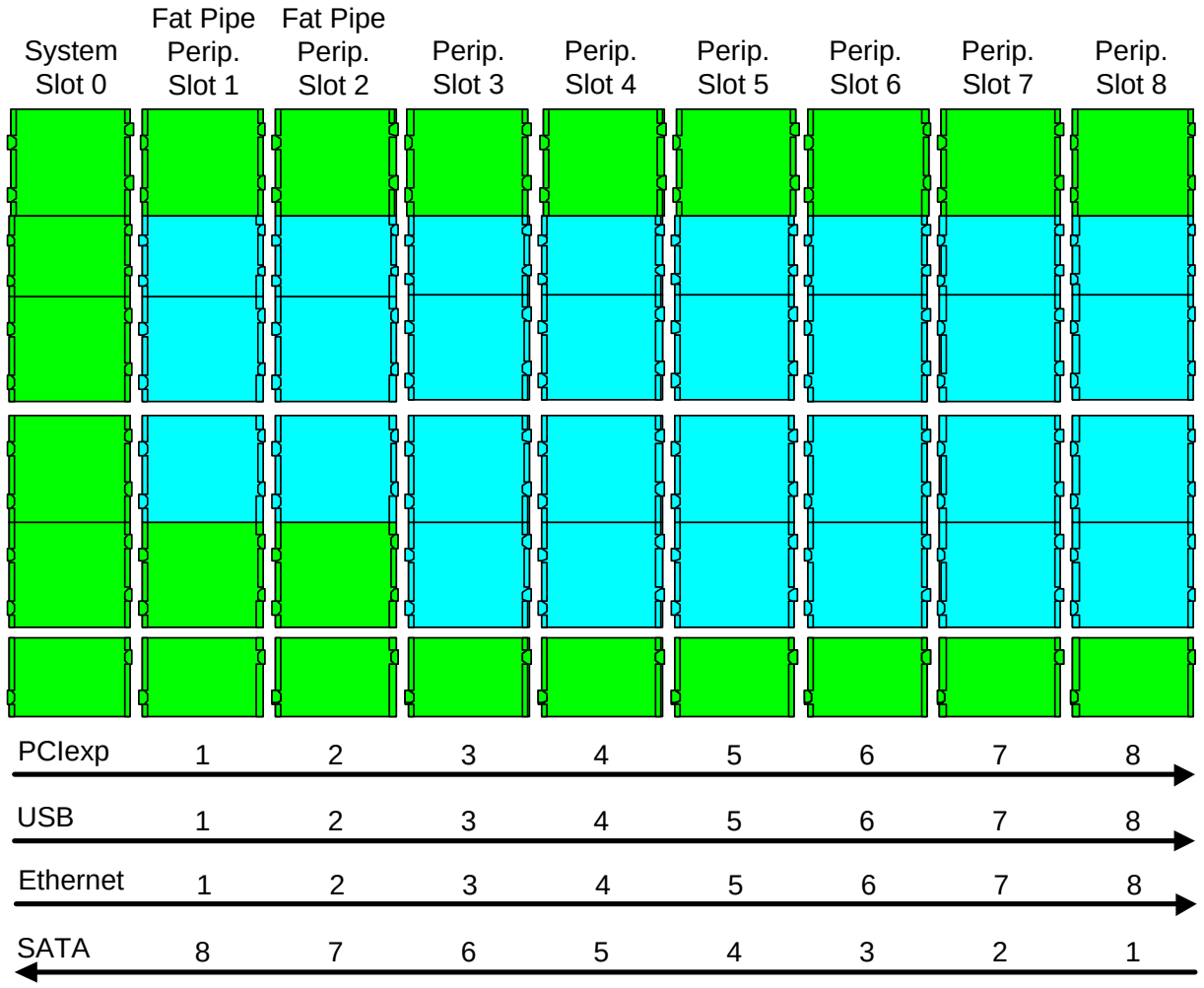
- *Simple star for PCI Express, SATA and USB*
- *Combined with a complete mesh for Ethernet*



Functions without switches and bridges

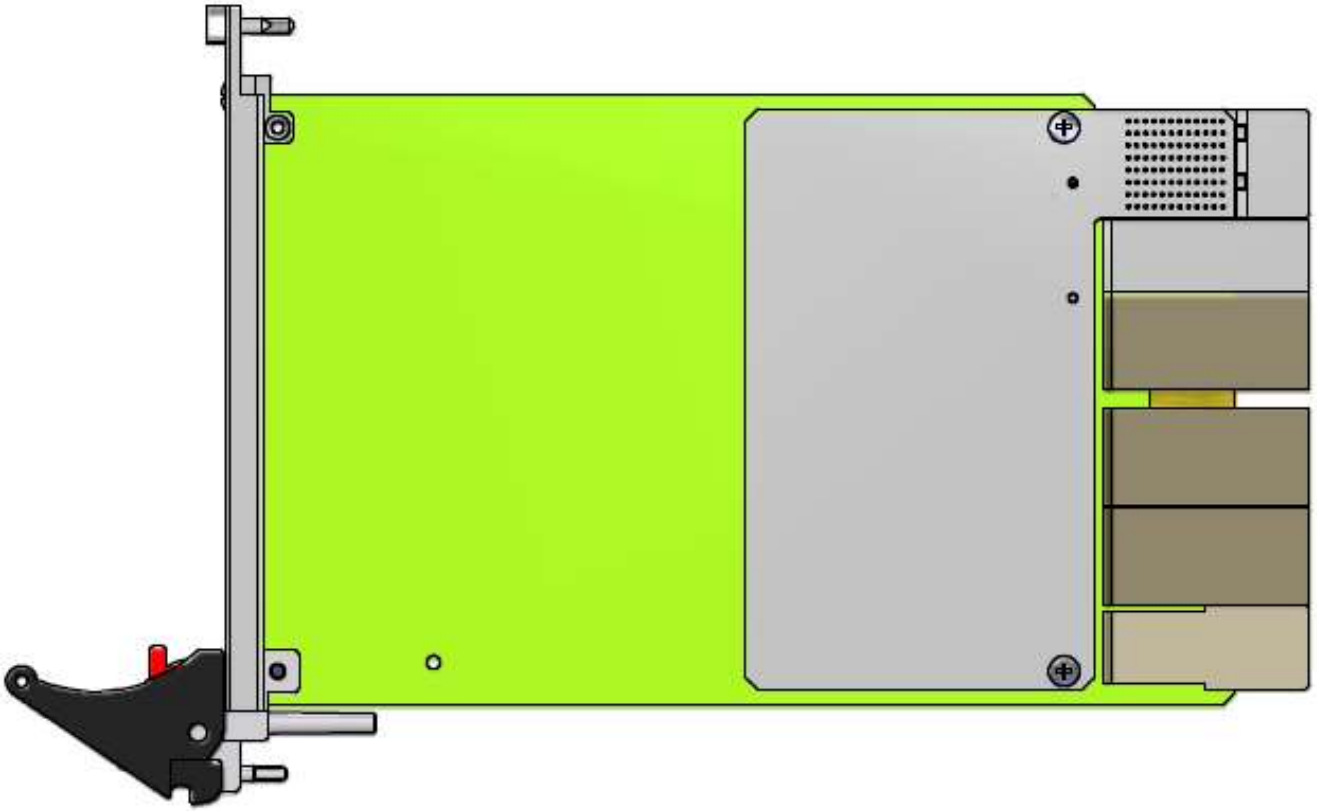
CompactPCI System and Peripheral Slots

Defines one system slot and up to 8 peripheral slots on a standard backplane.



Integration of Mezzanine Cards

CompactPCI Serial permits the connection of mezzanine cards directly to the backplane



Using Ethernet: Star Architecture

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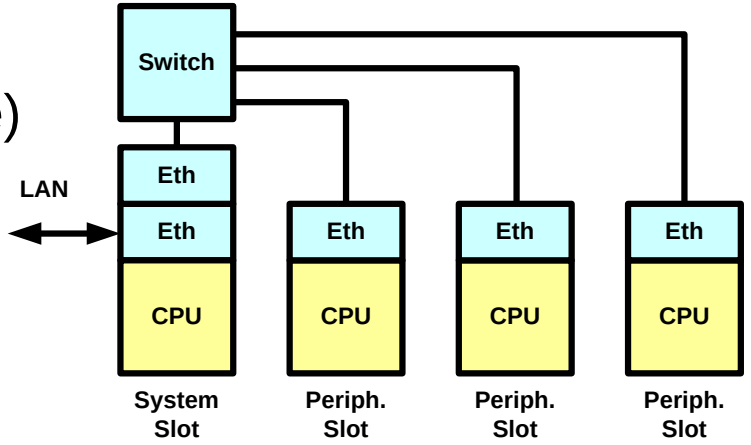
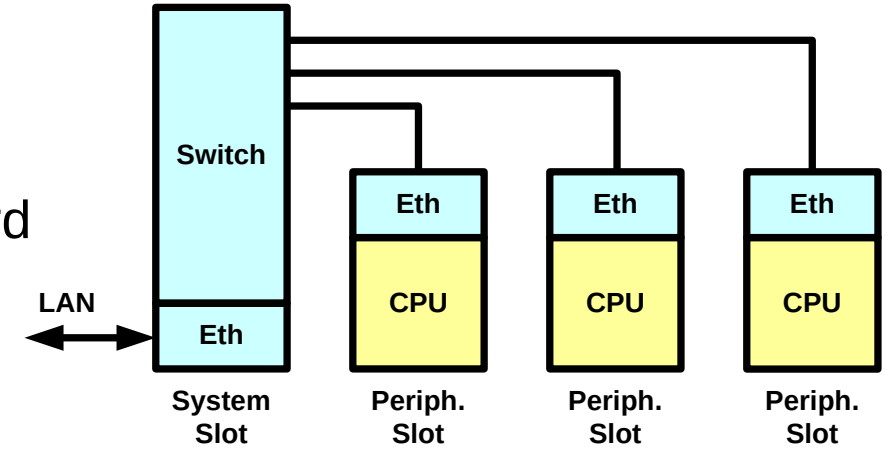
Star configuration examples

- Switch on the system slot (mezzanine)
- Ethernet on standard backplane
- e.g. 4x same processor board



- No CPU in system slot
- Switch as hub of the system
- e.g. 3x same processor board



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Using Ethernet: Mesh and Ring Architecture

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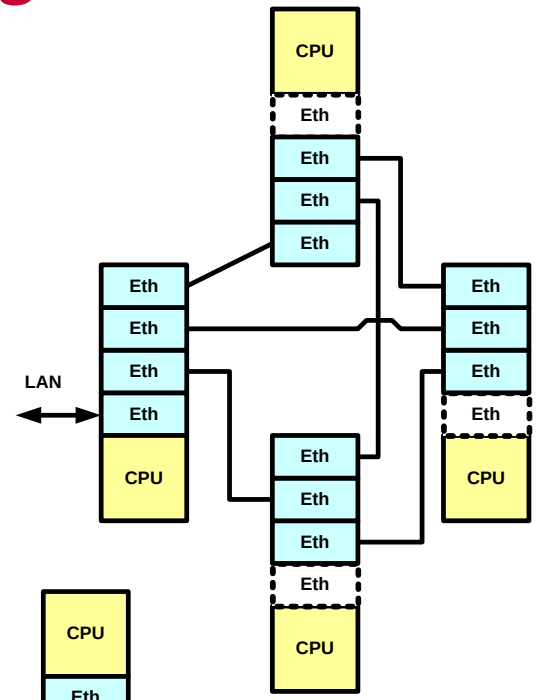
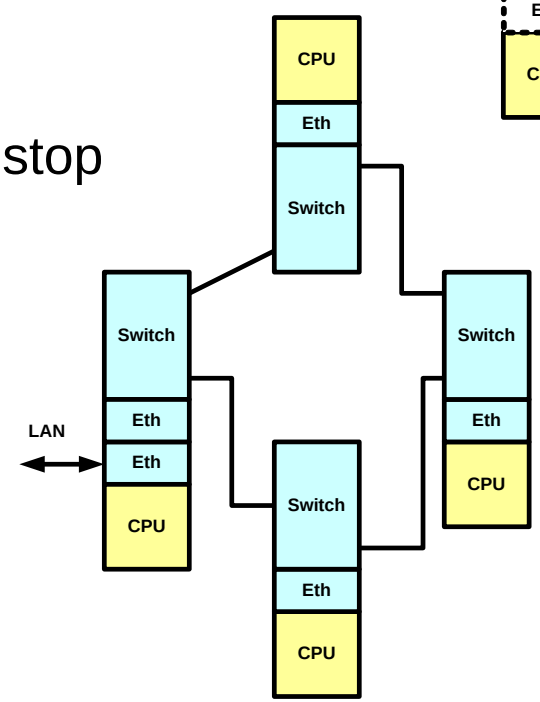
Full mesh configuration

- Symmetrical multi-processing
- All boards connected by Ethernet
- Good scalability
- Very high availability



Ring configuration

- Failure of one board does not stop the system
- Same processor boards
- Standard backplane



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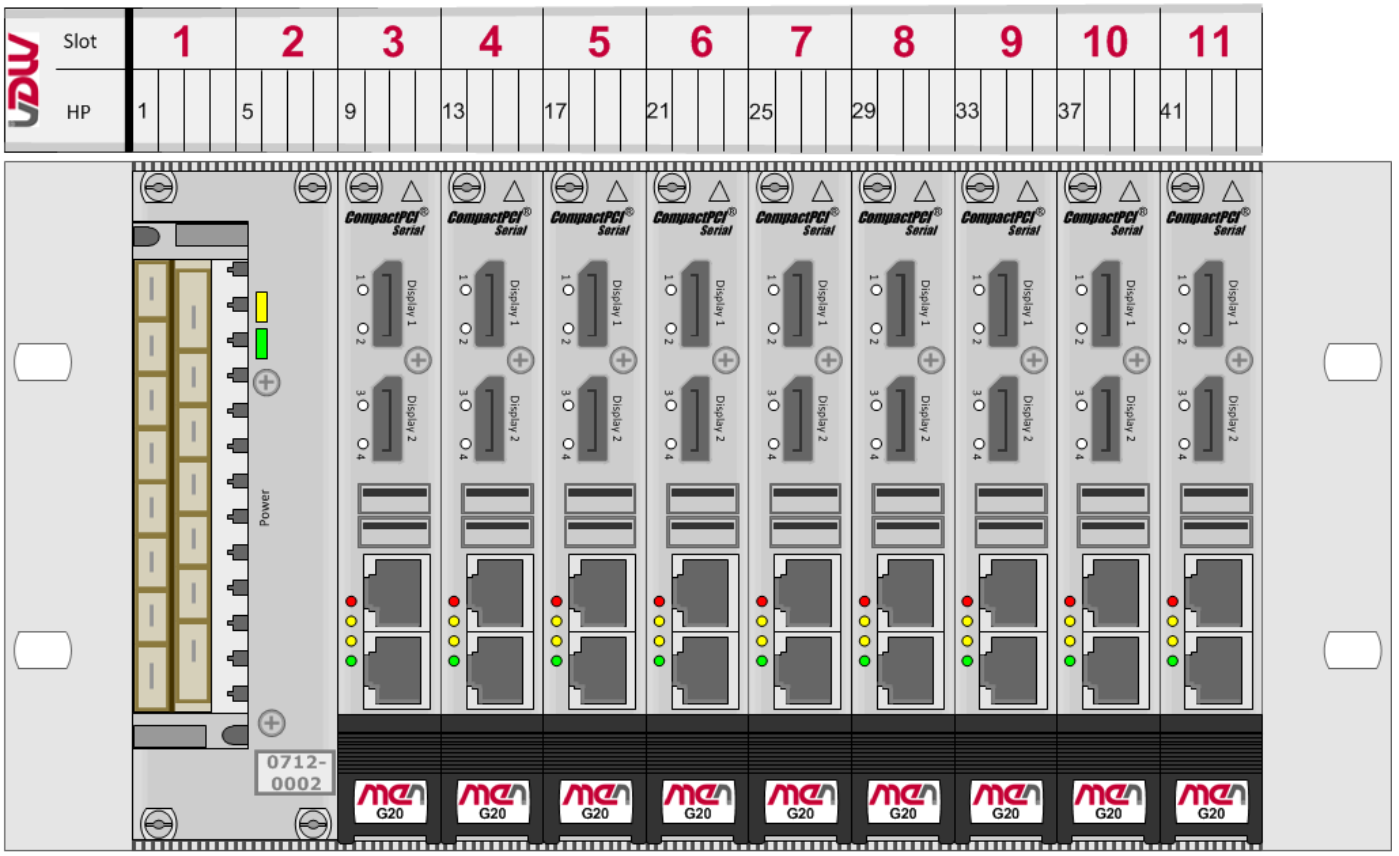
Multiprocessing Cluster System

- All peripheral slots are identical
- Each CPU board can be plugged on every peripheral slot
- Standard software, standard backplane



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High Performance Embedded Computing Cluster

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Sub cluster

- 9 CPU boards per 3U backplane
- Main CPU connects via 1 Gb/s full mesh Ethernet to sub CPUs
- 72 cores with Intel quad-core i7 + HT (8 GB memory, each)

Total cluster

- Ethernet connection of 8 sub clusters
- Controlled by one central storage system
- 576 cores plus management units

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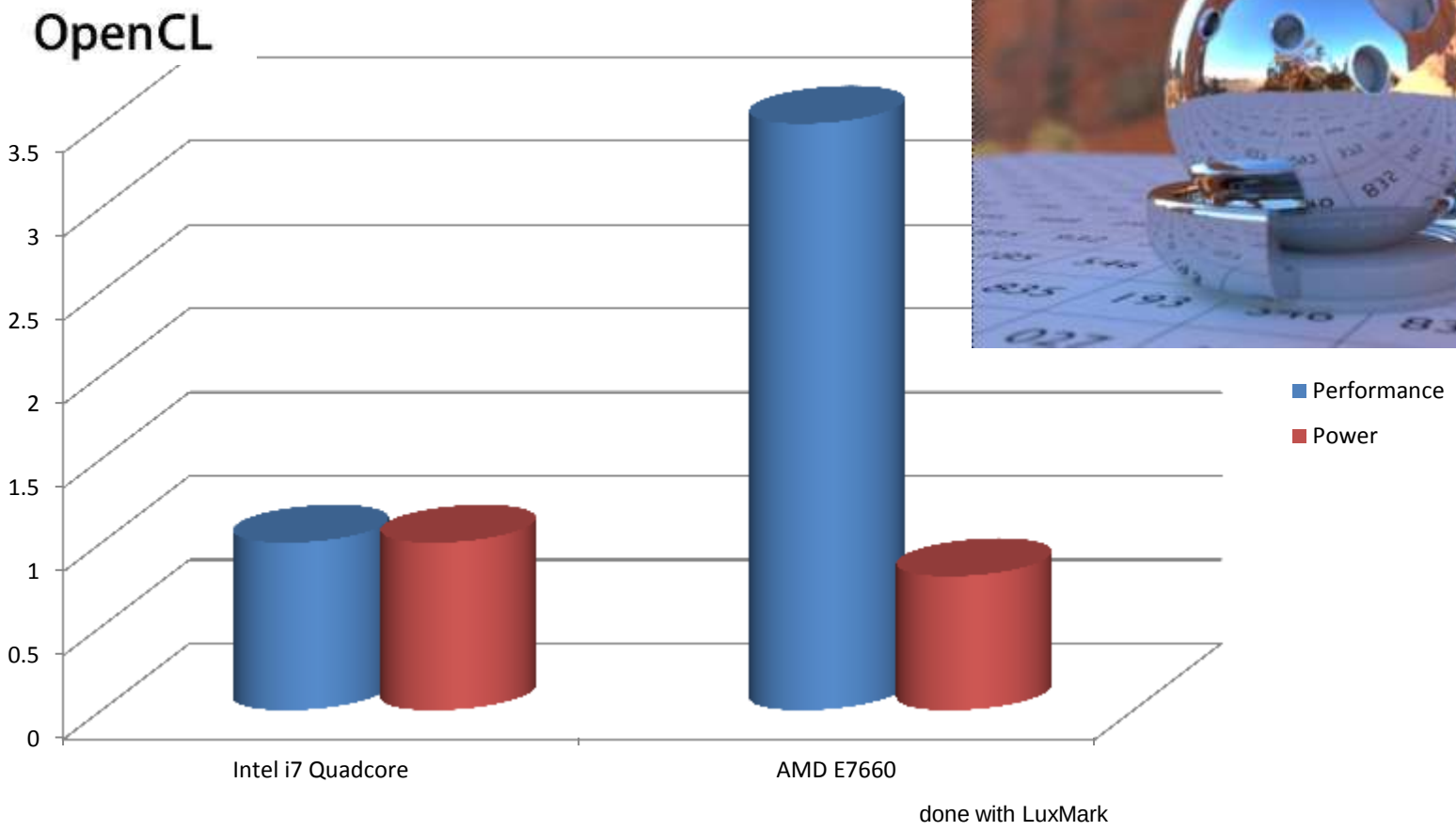
CPU vs. GPGPU – computing performance



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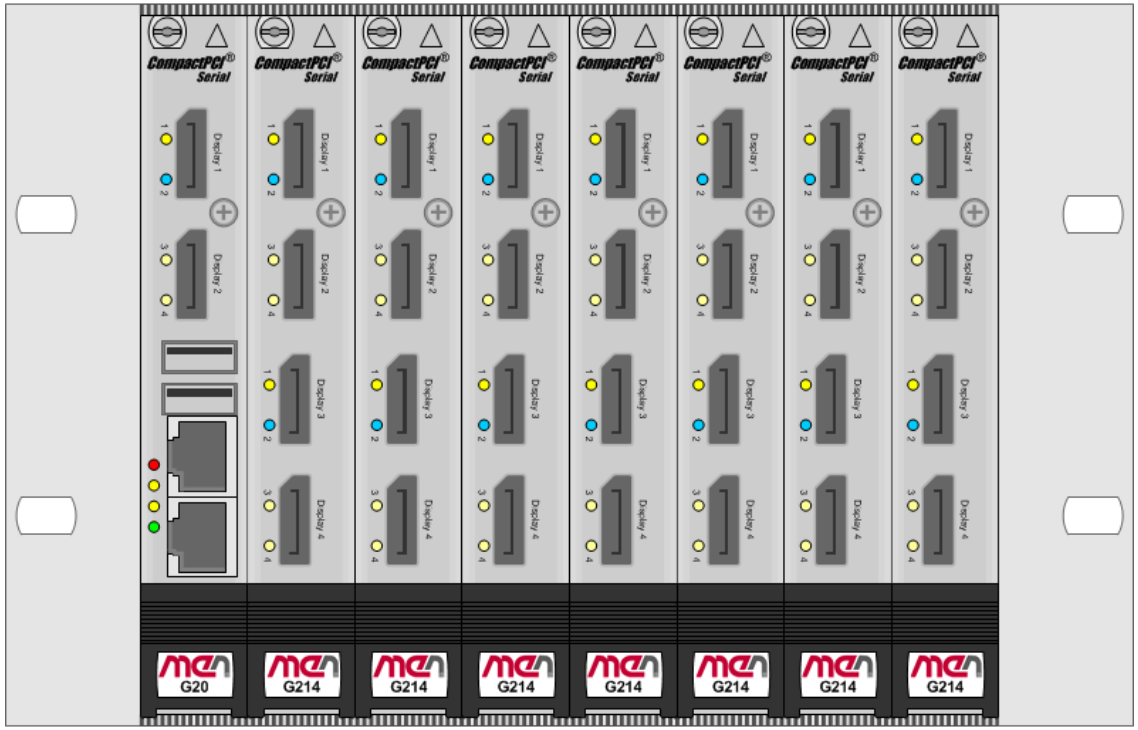
HPEC powered by GPGPU

- One Intel quad-core CPU
- Up to 7 GPGPU boards directly controlled by one system slot CPU via PCIe x8 / PCIe x1
- Provides 3360 computing core (shaders)
- Standard software, standard backplane



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Using Ethernet: Safe Computer Systems

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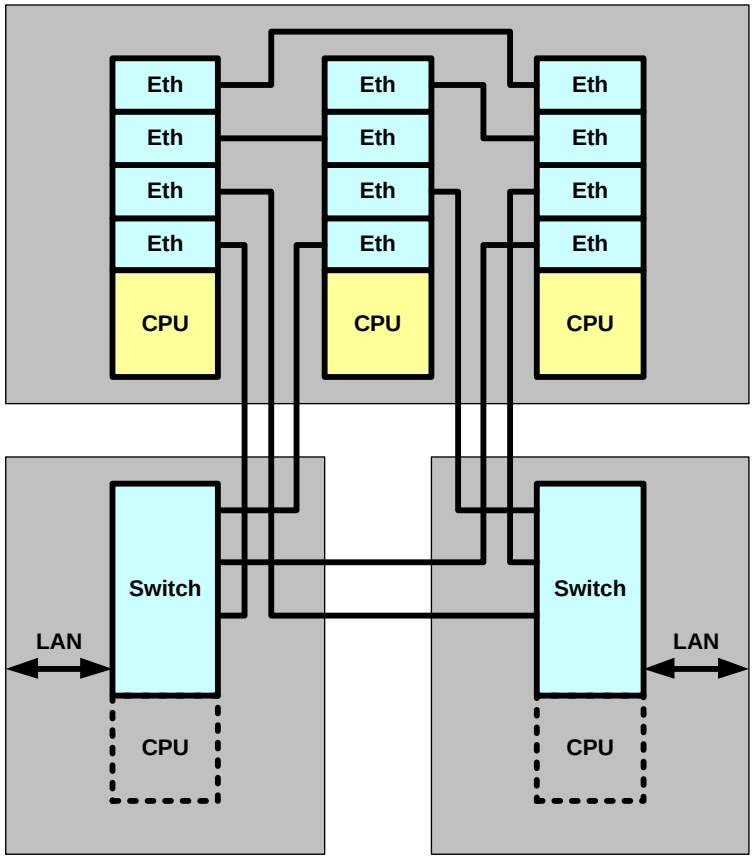
Example 2oo3 system

- Full mesh architecture for wiring 2-out-of-3 systems
- Redundancy to detect errors and raise availability
- 3 identical CPU cards on standard backplane
- Independent redundant switch cards on standard backplane
- Ethernet to compare and align results of the sub units



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Thank you for your attention!

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