# MicroTCA.4 Communication Links

Kay Rehlich, DESY MicroTCA Technology Lab

Backplane MTCA.0 & MTCA.4
Ethernet, PCIe, SATA
Clocks, Triggers, interlocks
Point-to-point

HELMHOLTZ GEMEINSCHAFT

MICROTCA TECHNOLOGY LAB
A HELMHOLTZ INNOVATION LAB

DESY

# MicroTCA Crate Backplane Communication

## Common modules

## Application modules

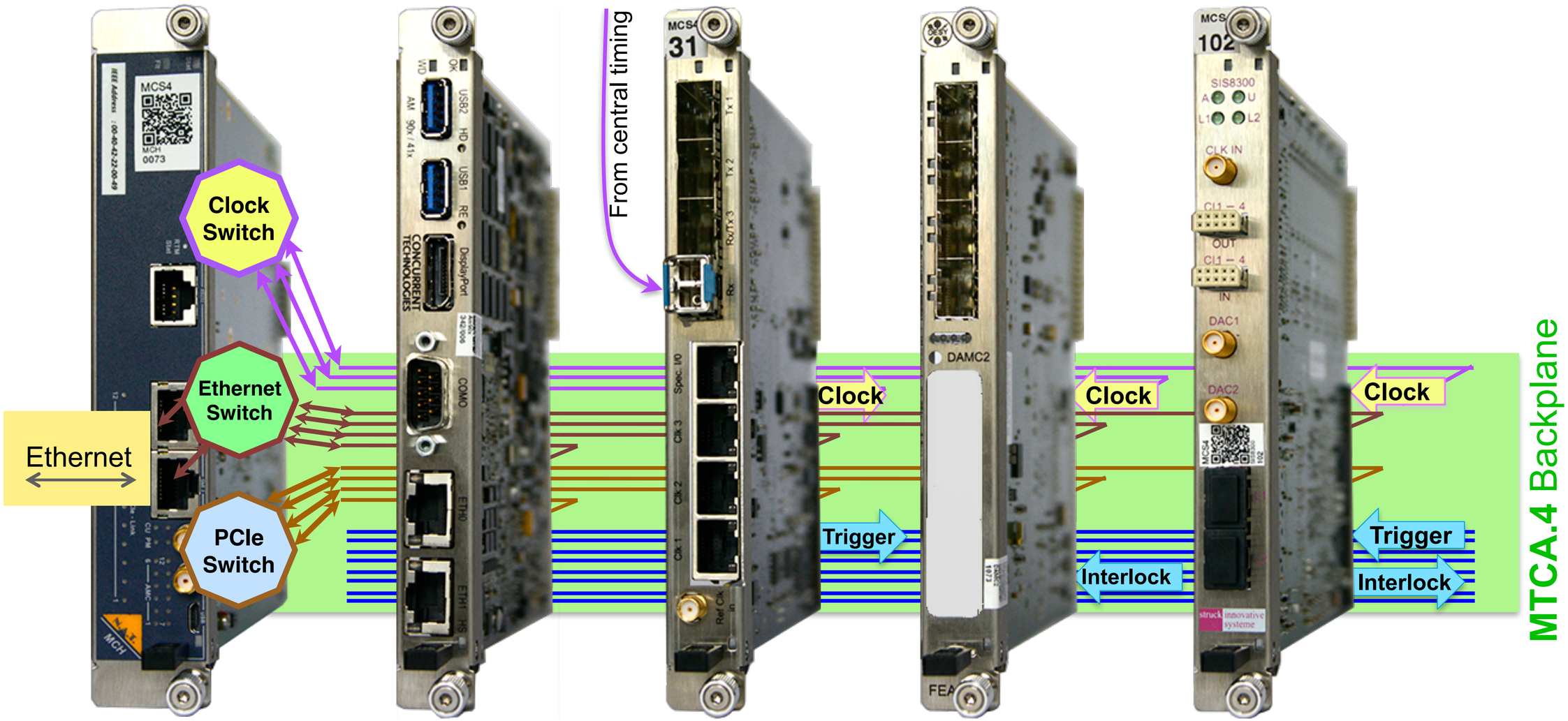
**MCH**

**CPU**

**Timing**

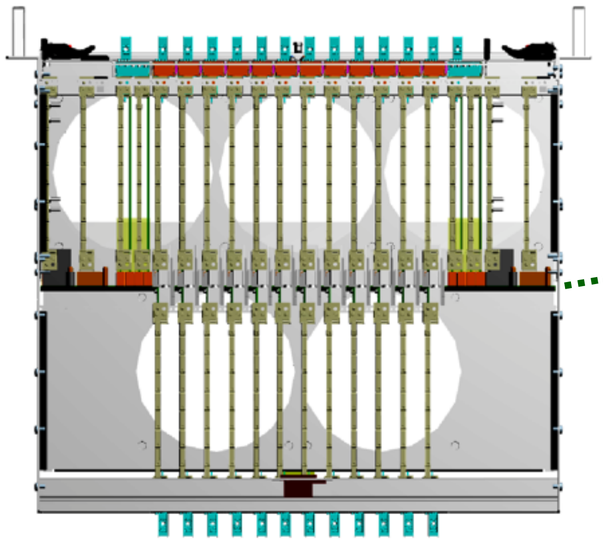
**Machine Protection System**

**ADC Digi. IO Controller ….**

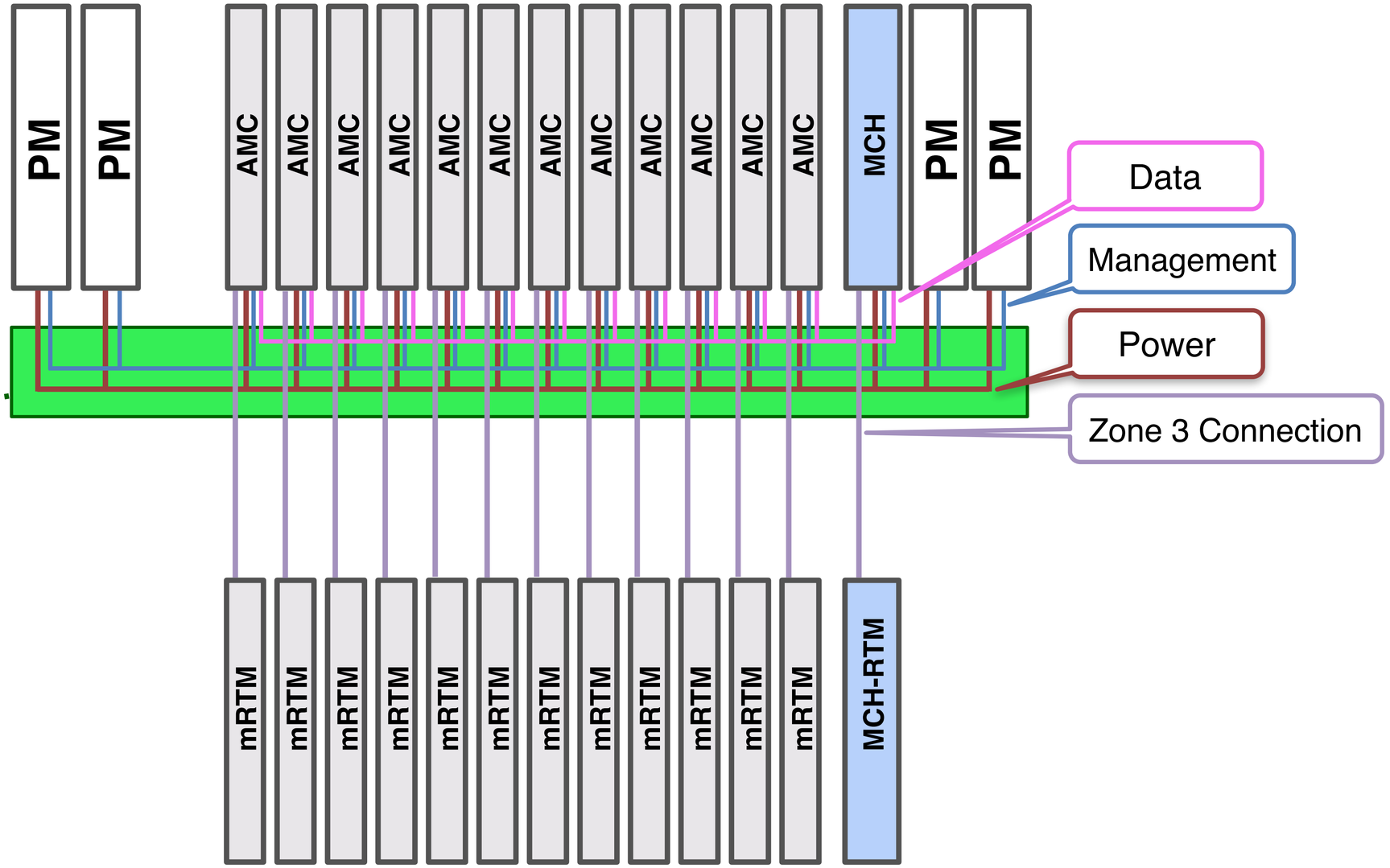


# MTCA.4 Backplane

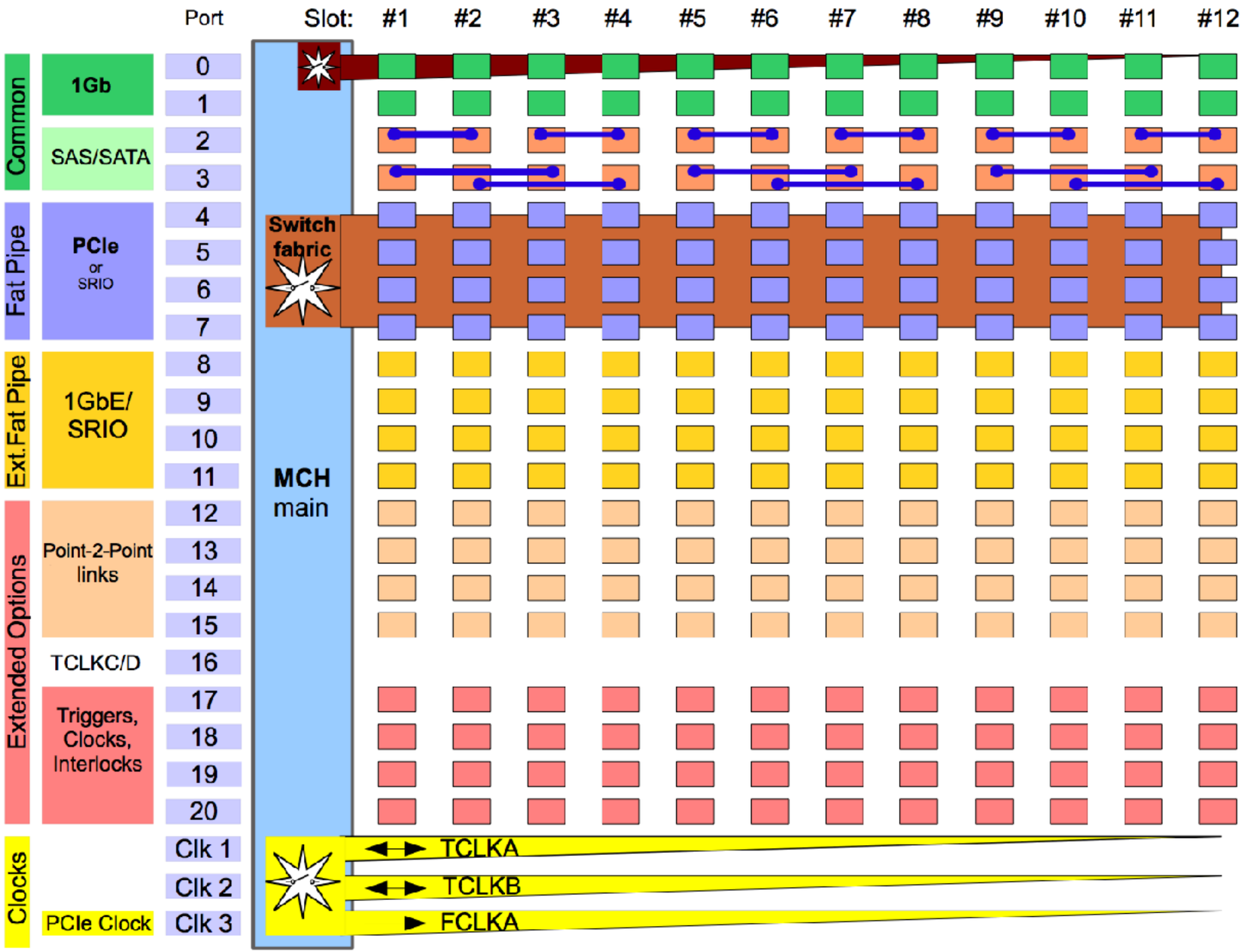
Front Side



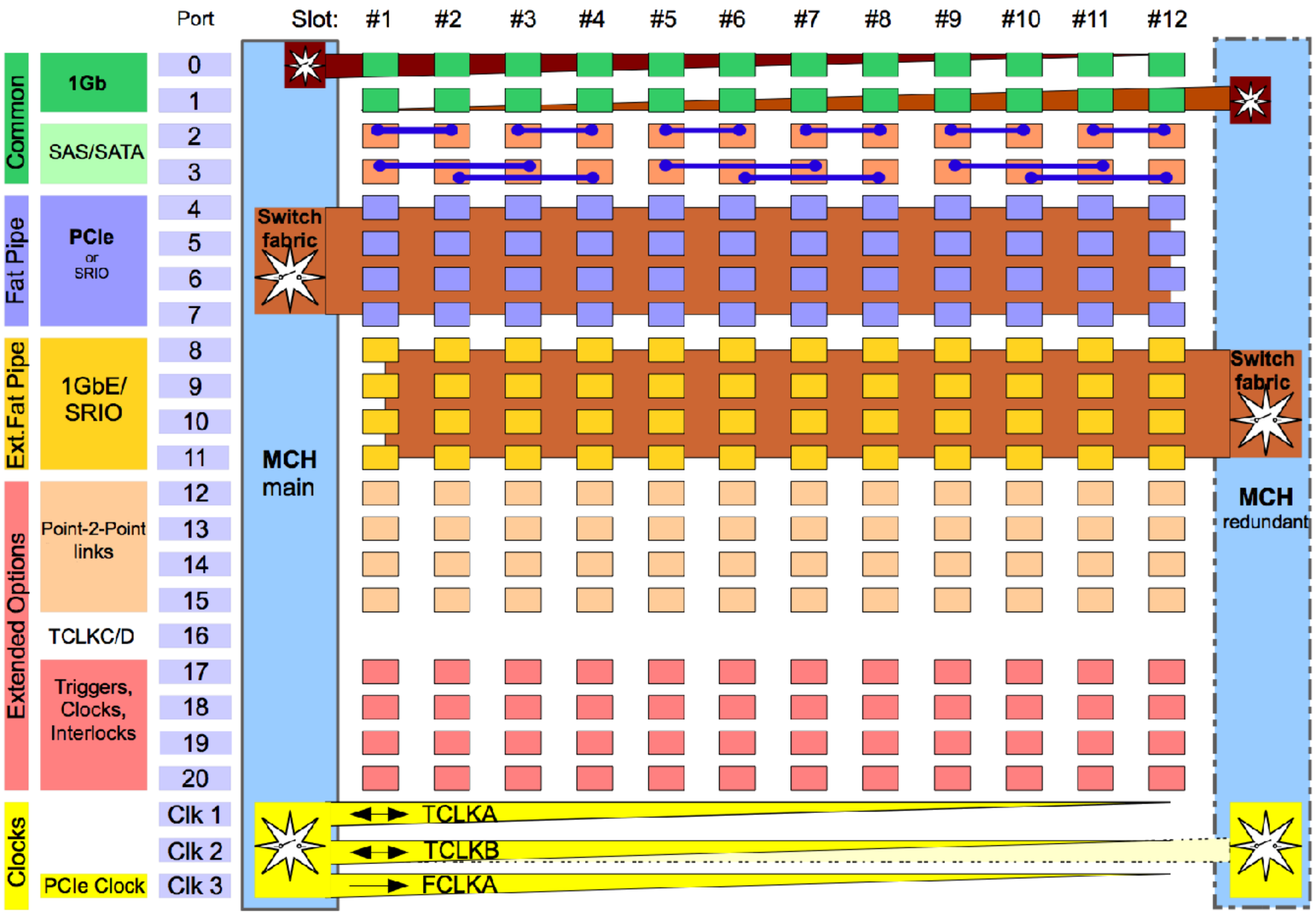
Rear Side



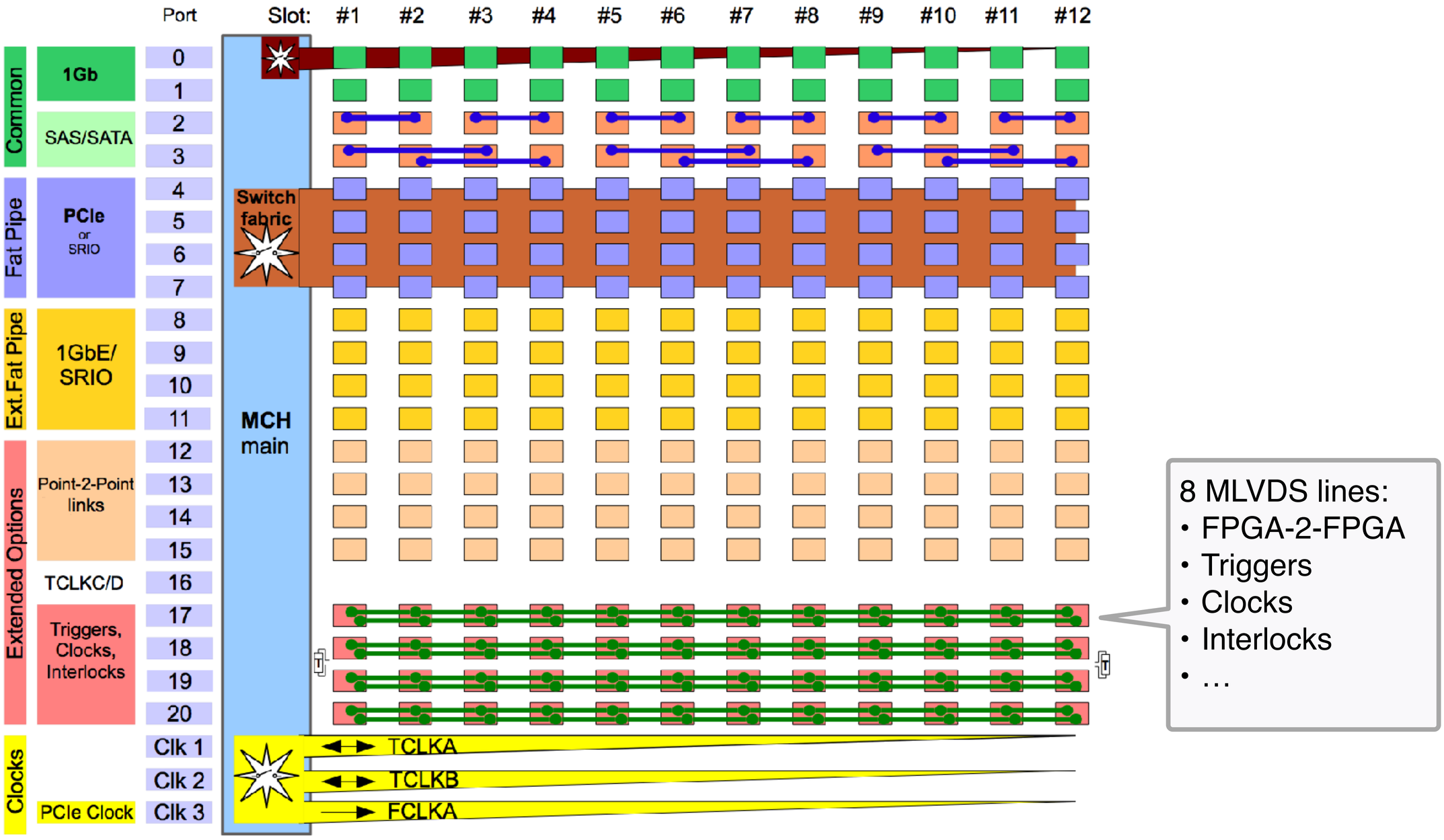
# Basic MTCA.0


Port
Slot: #1 #2 #3 #4 #5 #6 #7 #8 #9 #10 #11 #12
Common
1Gb
SAS/SATA
Fat Pipe
PCIe
or
SRIO
Ext.Fat Pipe
1GbE/
SRIO
Extended Options
Point-2-Point
links
TCLKC/D
Triggers,
Clocks,
Interlocks
Clocks
PCIe Clock
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Clk 1
Clk 2
Clk 3
Switch
fabric
MCH
main
TCLKA
TCLKB
FCLKA

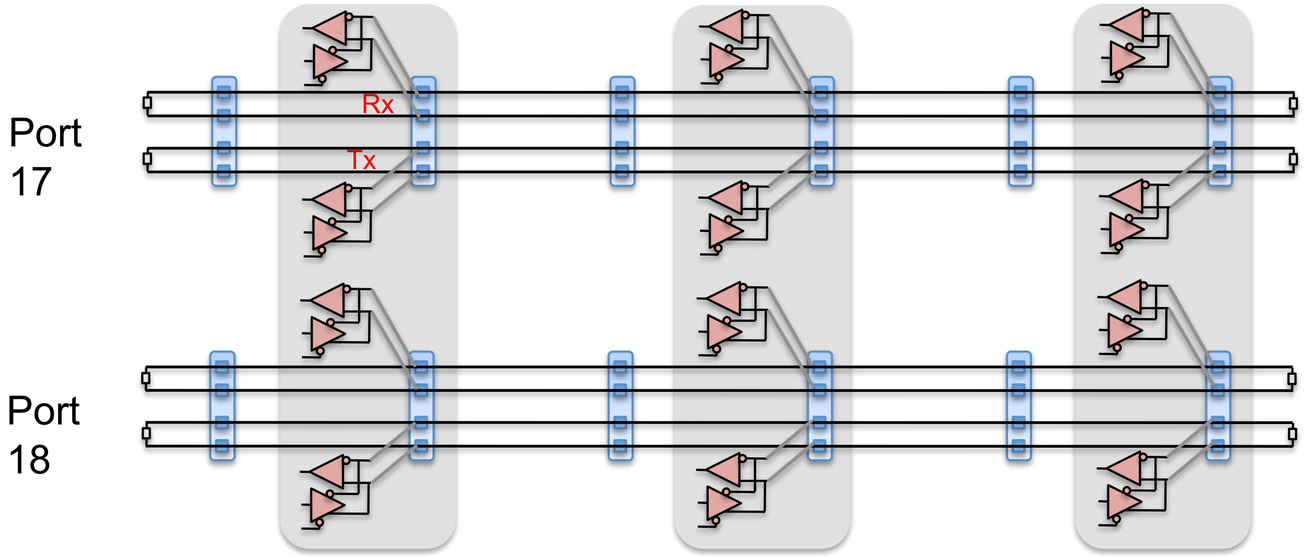
# MTCA.0 with Redundancy



# MTCA.4: MLVDS Bus



# Port 17 … 20 Used as Wired-OR for Interlocks




**M-LVDS** Type-2 receivers (SN65MLVD082) implement a failsafe by using an offset threshold. In addition, the driver rise and fall times are between 1 and 2.0 ns to provide operation at 250 Mbps while also accommodating stubs on the bus.
Outputs are slew rate controlled to reduce EMI and crosstalk effects associated with large current surges.

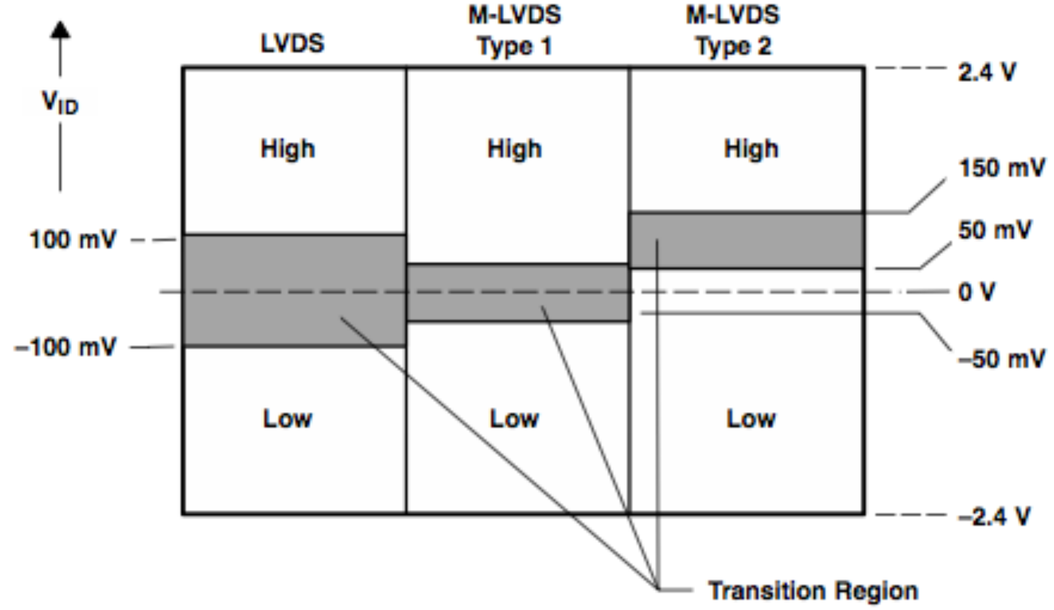
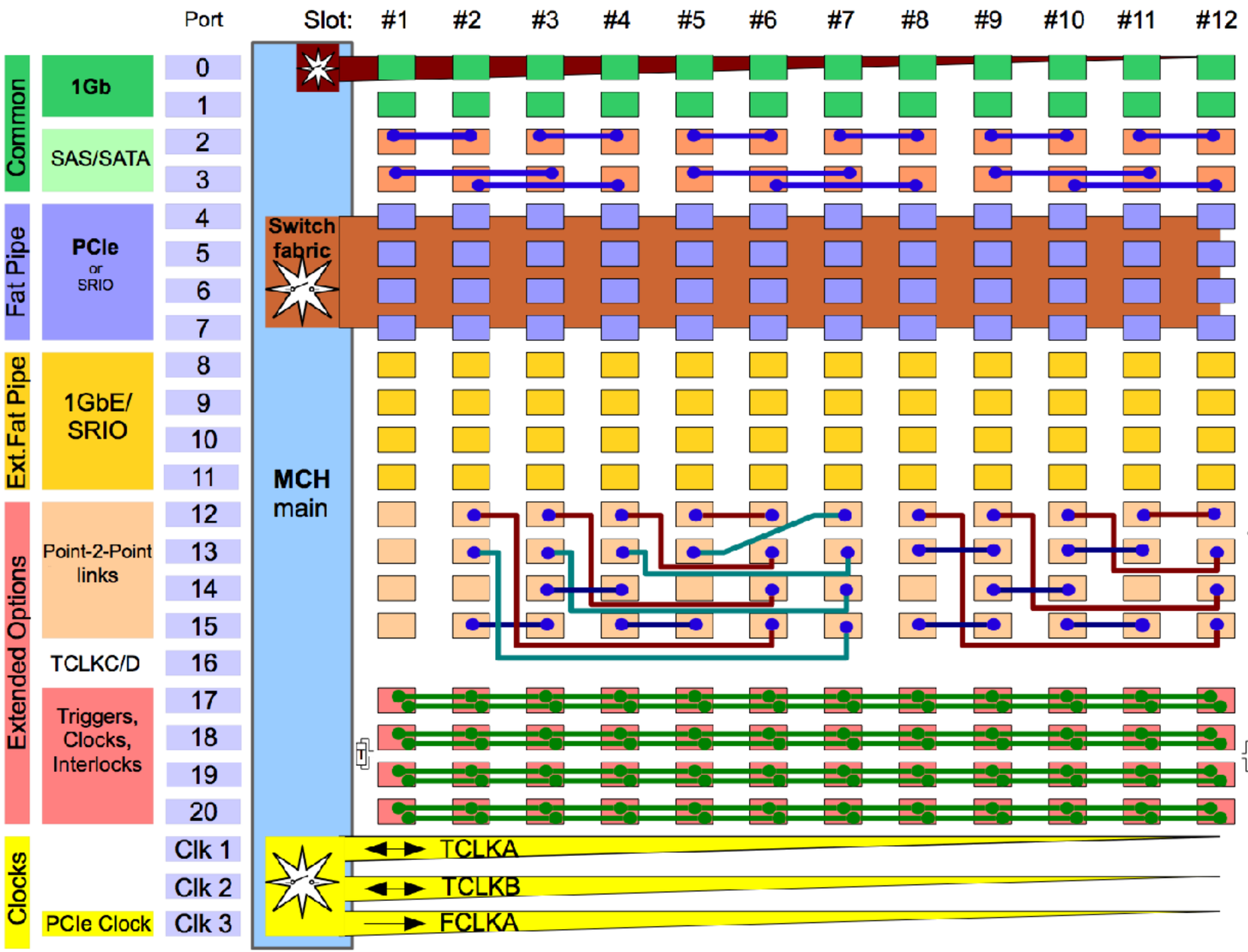



**Figure 2–3. LVDS and M-LVDS Differential Input Voltage Thresholds**

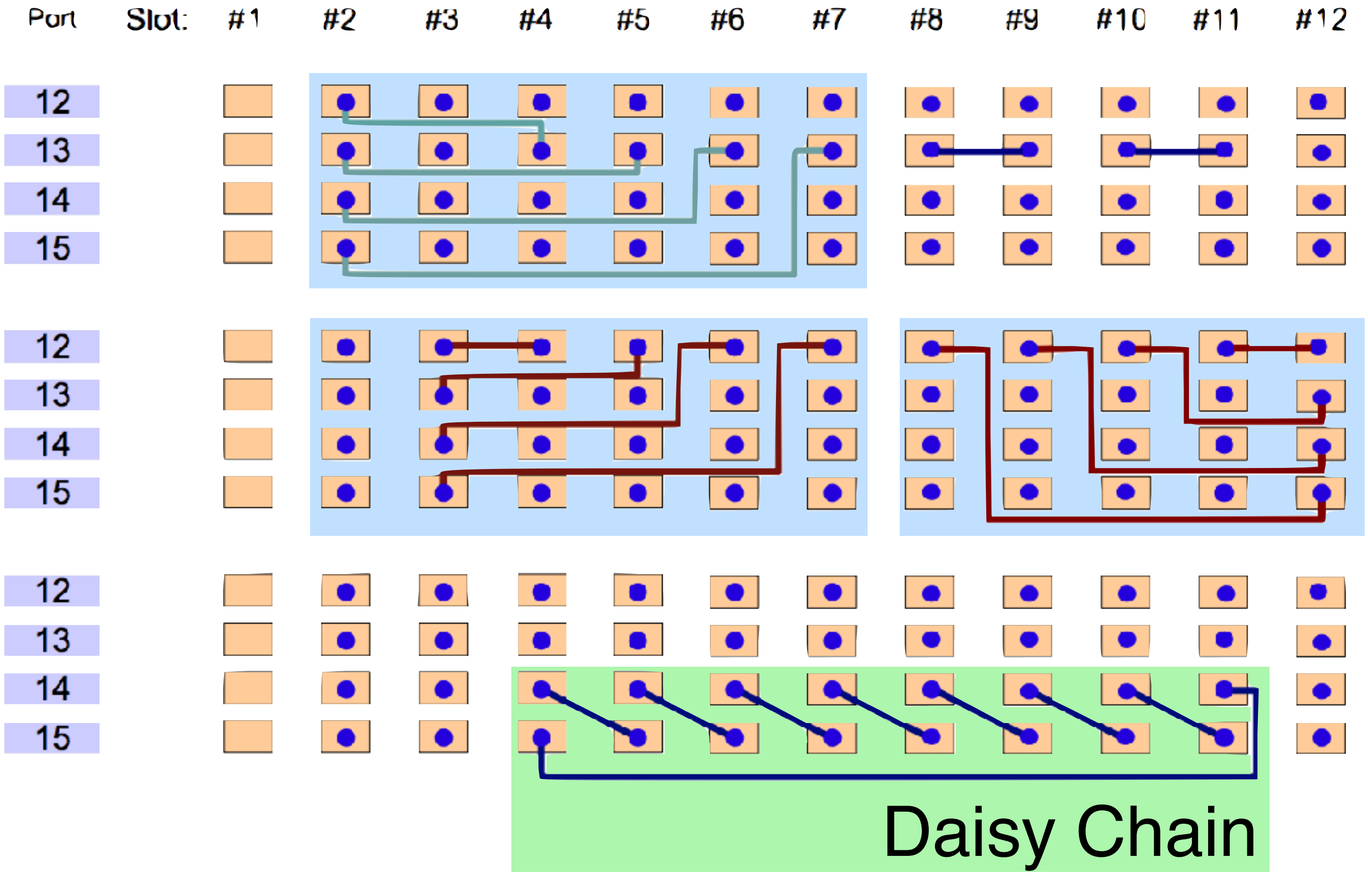
# MTCA.4 with Point-2-Point Links

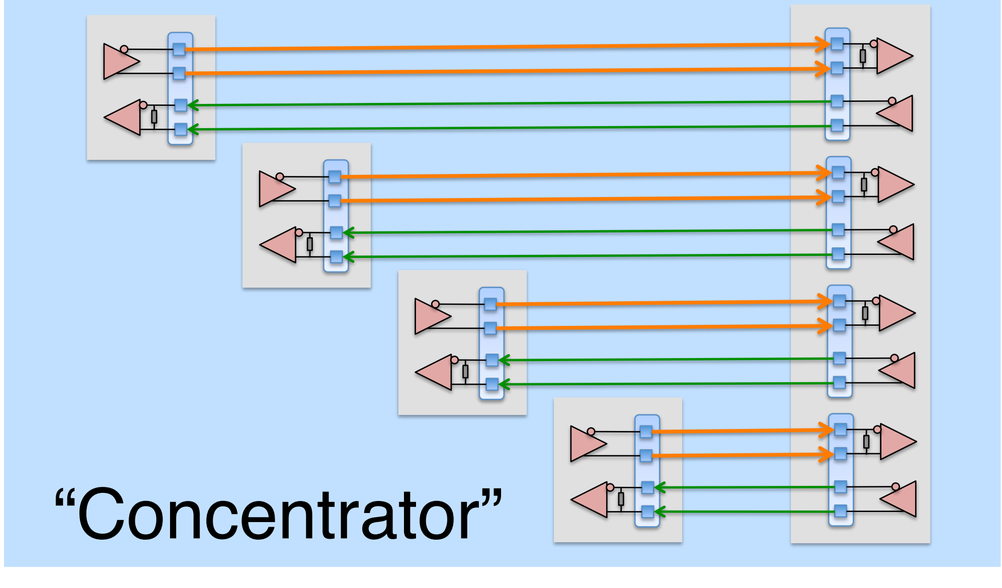


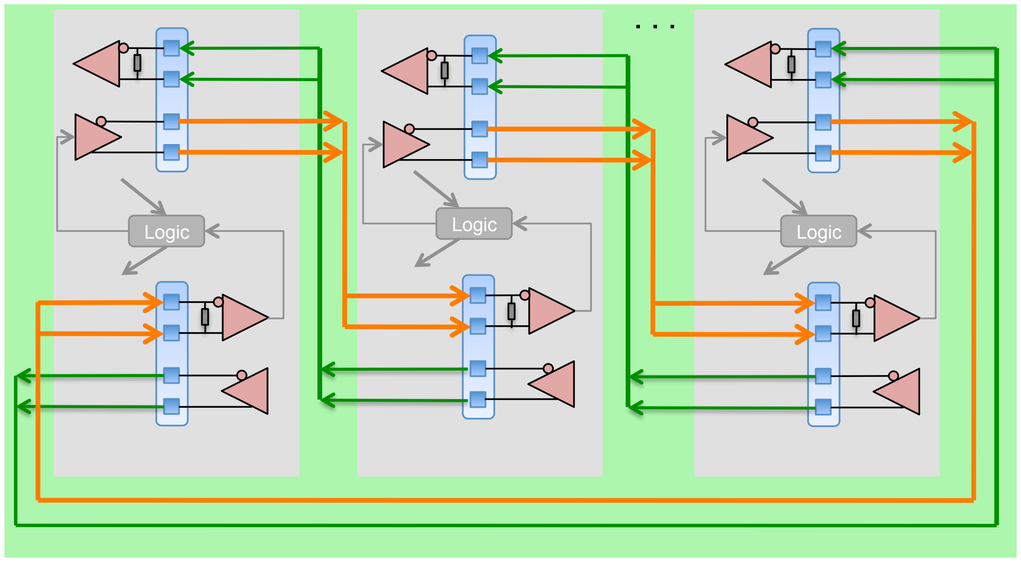

4 bi-directional LVDS lines:

FPGA-2-FPGA communication

# Point-2-Point Topologies

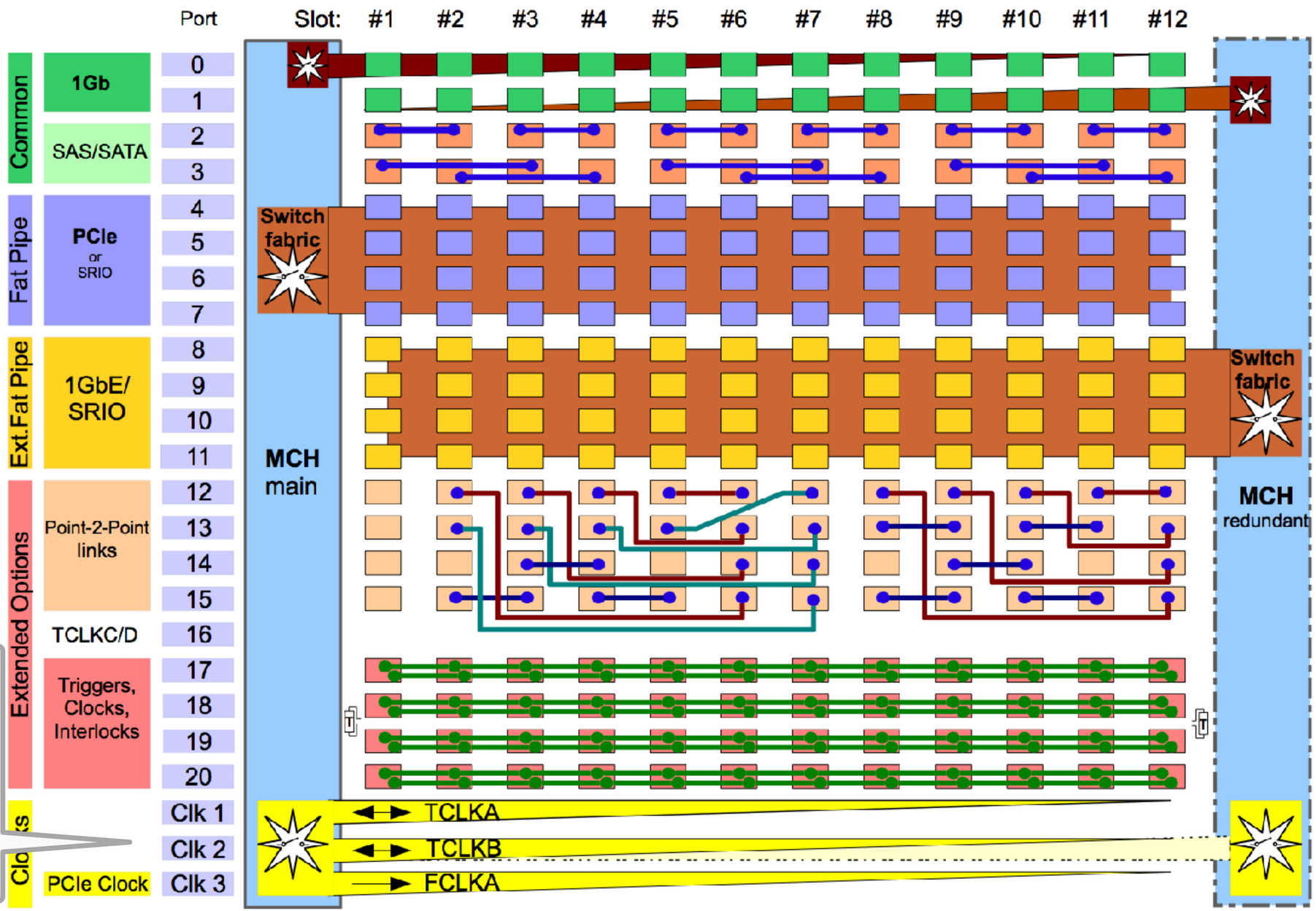


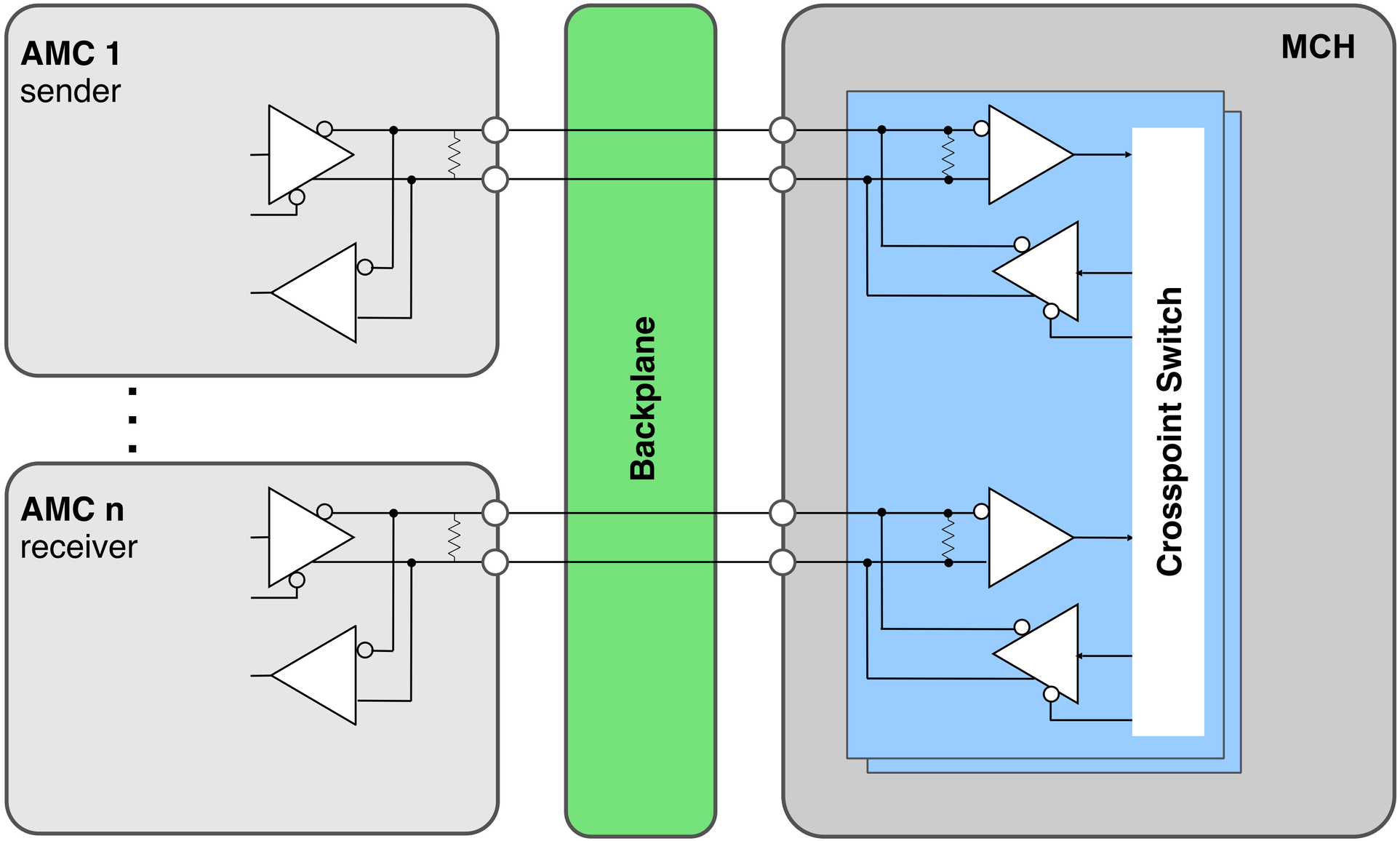

**Other topologies are possible by modifying the backplane**

# MTCA.4 Clocks: MTCA.0 Compatible

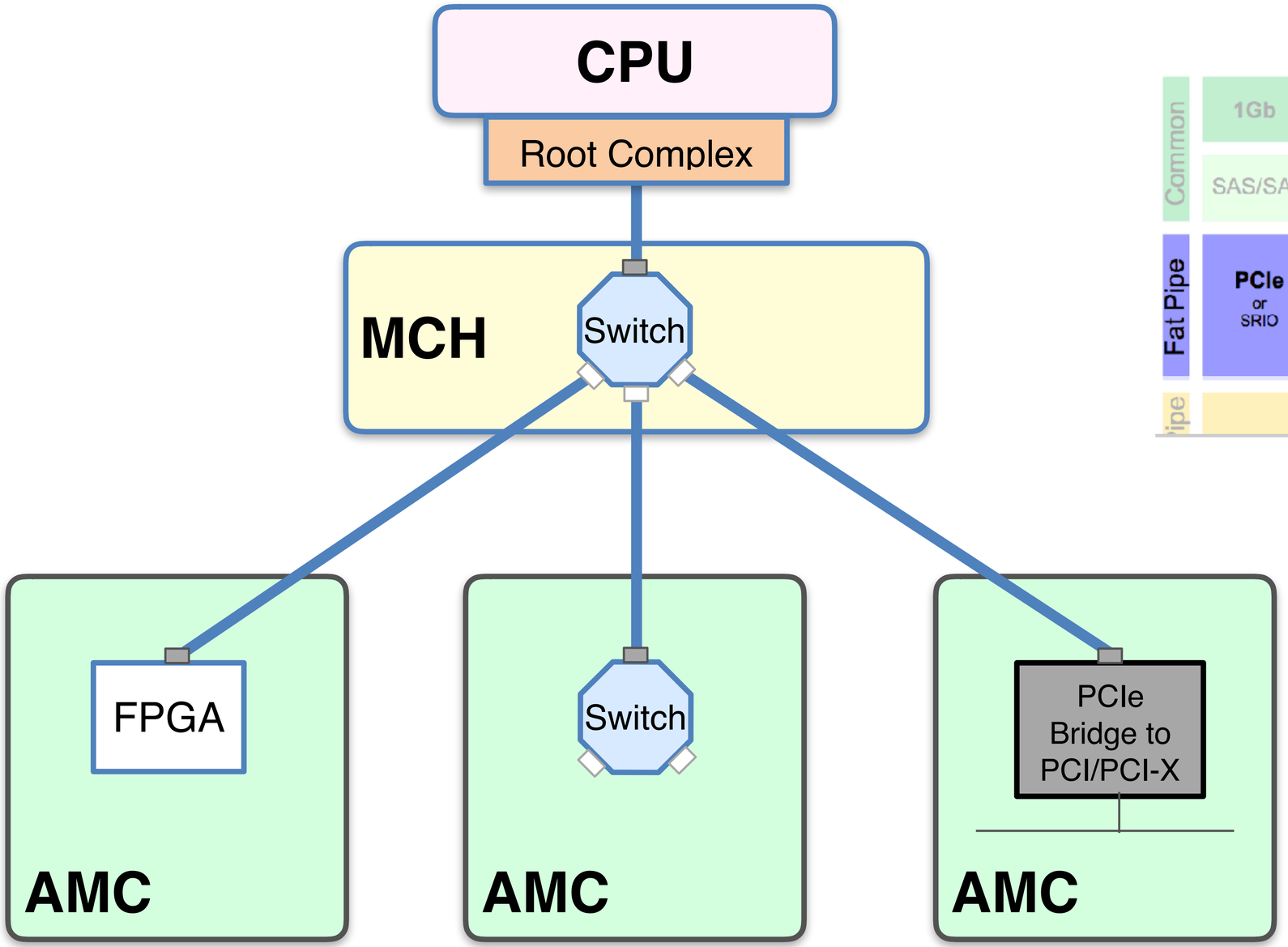


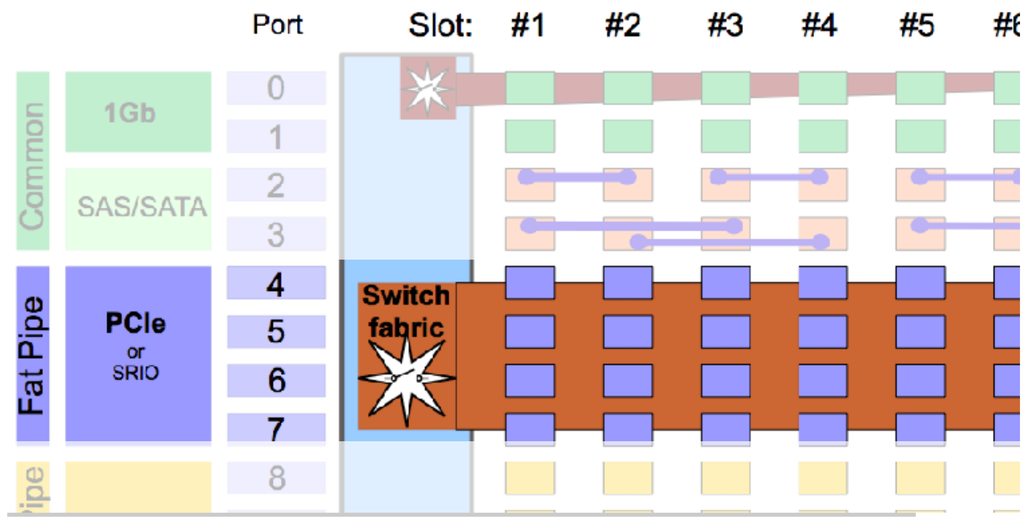

Point-2-Point Clocks:
- Low jitter
- Flexible configuration

# Low Jitter Clock Distribution: Bi-directional LVDS

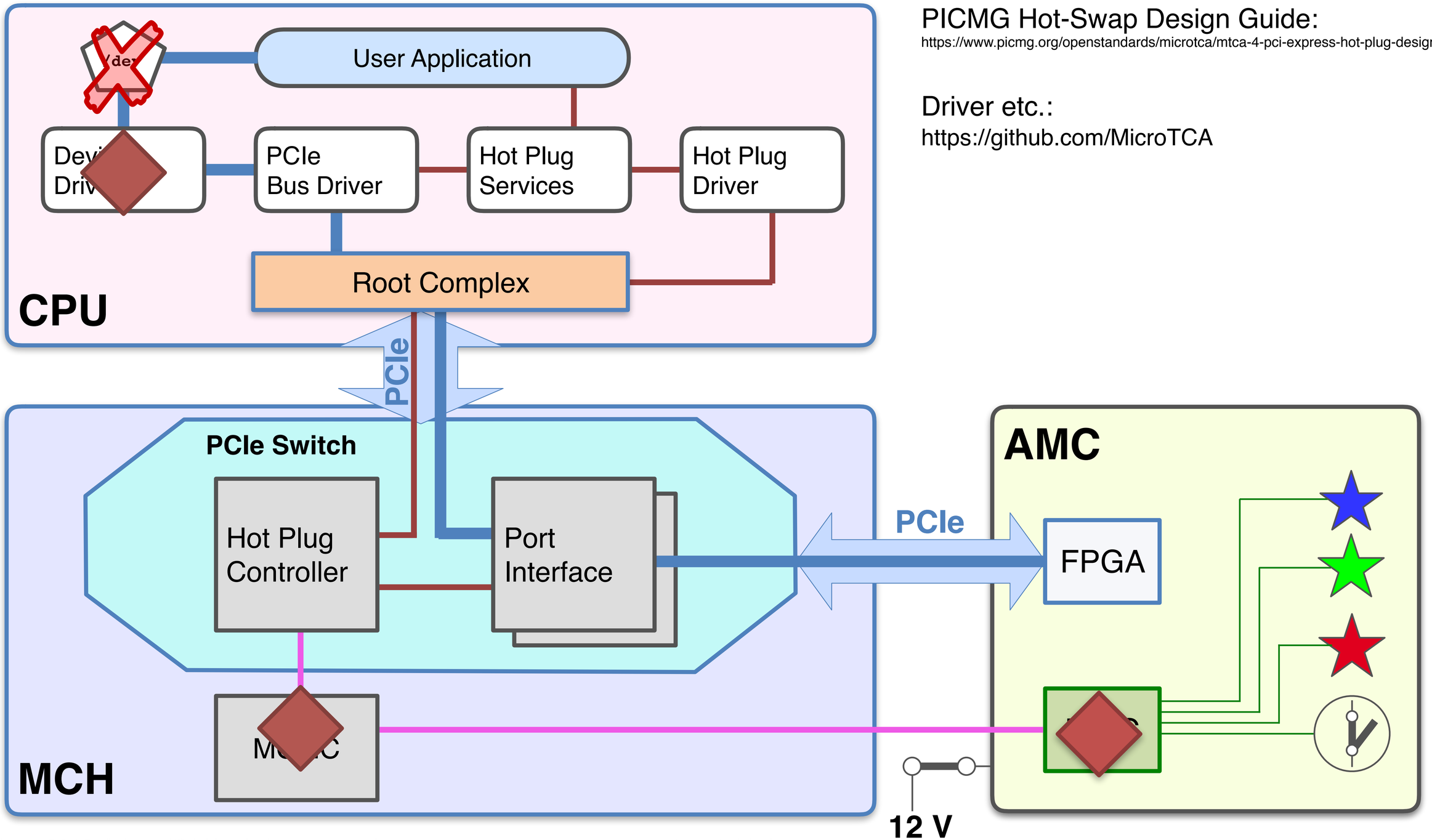


# PCIe Topology



# Architecture : PCIe with Hot-Swap




PICMG Hot-Swap Design Guide:
https://www.picmg.org/openstandards/microtca/mtca-4-pci-express-hot-plug-design-guide/

Driver etc.:
https://github.com/MicroTCA

# MicroTCA.4 Communication Links