
ONE TECHNOLOGY MULTIPLE SOLUTIONS
High Bandwidth
Data Acquisition (HBDQ)
MTCA.4.1 Platform
N.A.T.
MTCA
Let Your Application benefit
www.nateurope.com

About N.A.T.

Network and Automation Technology

- Founded in 1990, privately owned
- Hard- and Software design and manufacturing
- Focus on innovation in communication
- international and worldwide operations
- Headquarters

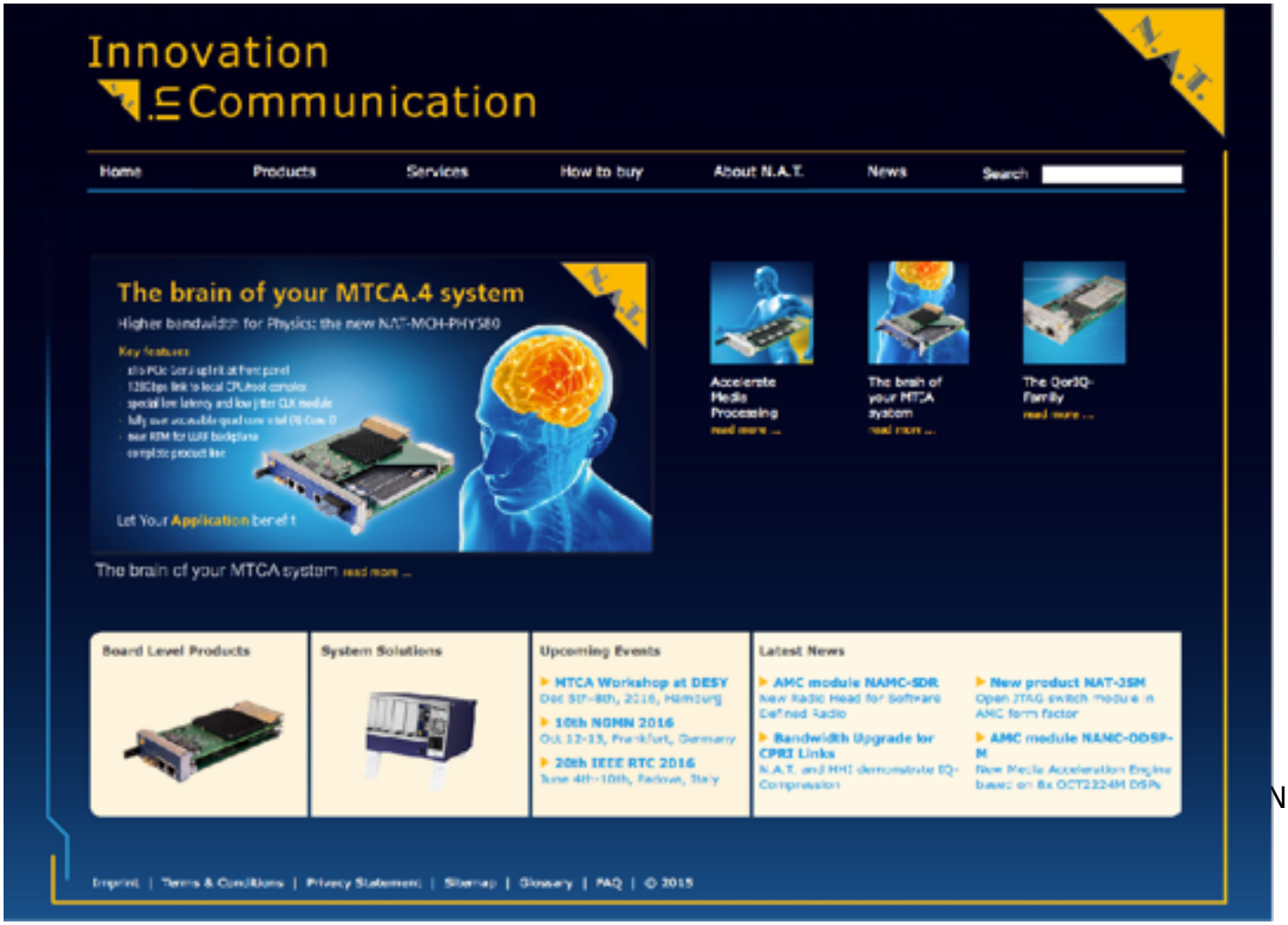
  Konrad-Zuse-Platz 9

  53227 Bonn

  Germany

- MTCA.4 Instructors:
  - Dipl. Ing. Vollrath Dirksen, vollrath@nateurope.com
  - Dipl. Phys. Heiko Körte, heiko@nateurope.com

About N.A.T.
Core competences and capabilities



NX on request

Agenda

- Motivation
- Building Blocks: Chassis, MCH, Power, Timing
- HBDQ: High Bandwidth Data Acquisition Platform based on MTCA.4.1 standard
- JTAG debugging multiple FPGAs
- Summary

1U, 2 single, mid/full-size Slots or 1 double, mid/full-size Slot

Motivation for
High Bandwidth Data Acquisition Platform

- IO move from PCIe-Gen1 to -Gen2 to nowadays -**Gen3**
  - SIS8300-KU: new ADC/DAC using Ultrascale FPGAs, 4 lanes PCIe-Gen3
- AMC CPU become bottleneck
  - already offer 8 PCIe lanes, but can only **use 4 lanes** in standard MTCA.4 crates
- Technology Evolution
  - AMC-CPUs do not follow **Intel-CPU technology quick enough** (Intel Gen1, Gen3, Gen6)
  - Upcoming request for using beside FPGAs oder **GP-GPU** (general purpose graphic processing units) -> AMC-GPU or NVIDIA-PCIe cards
  - Latest COMexpress modules require **more than 30 Watts**
- Latest requirements (FAIR, ESS, ...)
  - less slots but distributed IO, 10G Ethernet too long latency
  - Redundancy on crate level, not board level

- **Goal**
  - Take MTCA.4 systems to the next level of performance taking advantage of the upcoming MTCA.4.1 standard -> HBDQ Platform

About N.A.T.
Markets and Applications

- Automation
- Communication
- Defense & Aerospace
- Energy
- Industrial Control
- Infotainment
- Medical
- Test & Measurement
- Transportation

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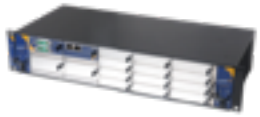
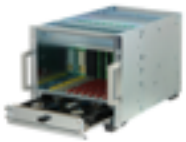
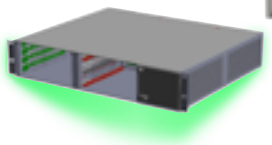
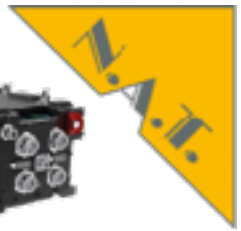
NATIVE
Overview



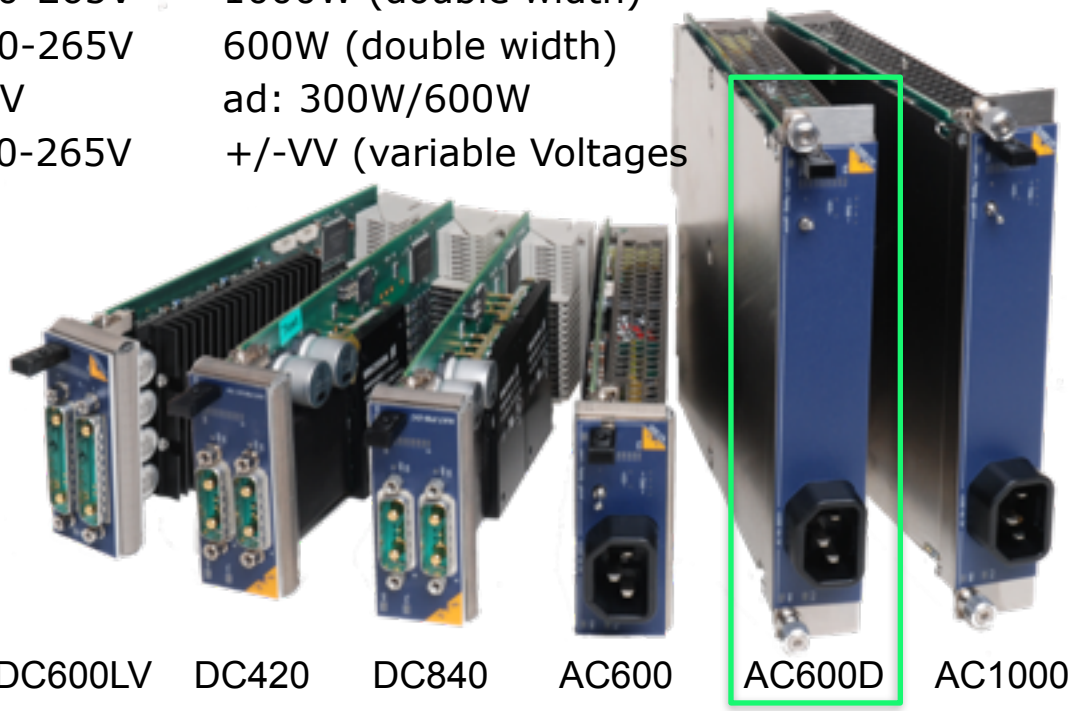



Standard	Name	Size	AMC Slots	µRTM Slots	MCH Slots	Cooling Unit Slots	Power module Slots	JSM	Fat-Pipe Size Comment	Dust filter
	NATIVE-mini	1U	2 sm or 2 sf or 1 df	-	-	-	-	-	**x8** eMCH, Cooling unit, power module	1
MTCA.0	NATIVE-C1	19", 1U	6 sm or 3 sf or 2sm+4dm	-	1 sf	2	1 sf	soon	**x8**	1
	NATIVE-C2	19", 2U	12 sm or 6 sf or 4sm+4dm or ...	-	2 sf	2	2 sf	soon	redundant x4	1
	NATIVE-C5	5U	6 dm +1 df or 7 dm or single/double mix	-	1 df	1	1 df	no	x4	1
MTCA.1	NATIVE-SX	3U	3 sm + 2 sf	-	1 sf	-	-	-	x4 Cooling Unit, Power Module	no
	NATIVE-IPC	19", 4U	12 sm (pluggable from Rear)	-	2 sf	1	2 sdf	-	redundant x4 direct replacement for IPC	1
MTCA.4	NATIVE-R2	**2U**	5 dm + 1 df	4 dm + 1 dm(if no JSM)	1 df + **RTM**	1	1 df	**yes**	**x8**	1
	NATIVE-R5	5U	6 dm +1 df or 7 dm or single/double mix	6 dm + 1 df or 7 dm	1 df + RTM	1	1 df	no	x4	1
	NATIVE-R9	19", 9U	12 dm or 6 df or single/double mix	12 dm or 6 df or combination	2 df + 2RTM	2	4 df or 2 ddf	yes	redundant x4	1
MTCA.2 MTCA.3	on request									

sm single width, mid-size
sf single width, full-size
dm double width, mid-size
df double width, full-size
ddf double width, double-full-size

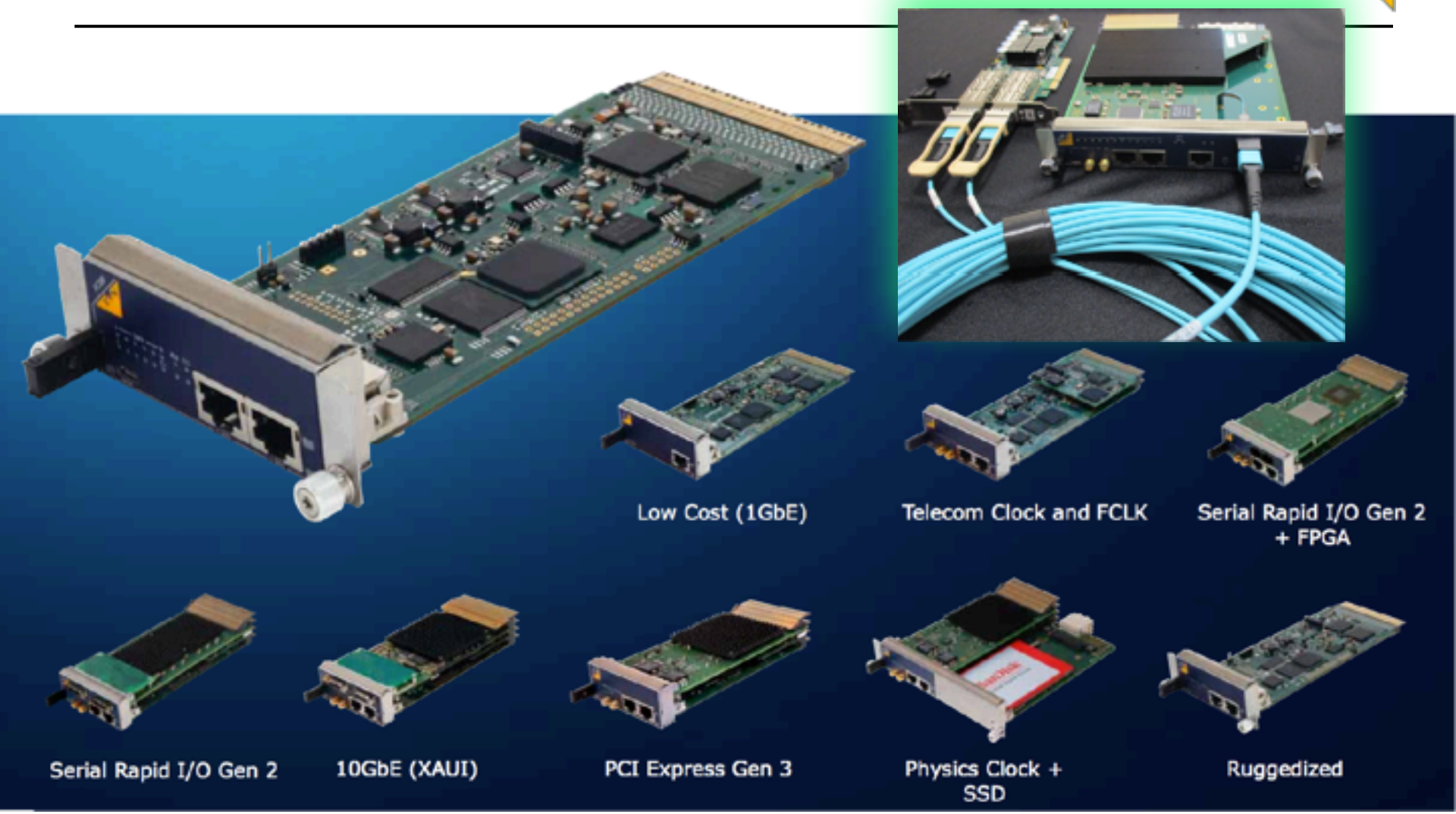
Power Modules for MTCA.0 and MTCA.4

	INPUT	PAYLOAD
• NAT-PM-DC420	DC -48V	420W
• NAT-PM-DC840	DC -48V	840W
• NAT-PM-AC600	AC 110-265	600W
• NAT-PM-AC600D	AC 110-265V	600W (double width)
• NAT-PM-AC1000	AC 110-265V	1000W (double width)
• NAT-RPM-PSC	AC 110-265V	600W (double width)
• NAT-PM-DC600LV	DC 24V	ad: 300W/600W
• NAT-RPM-PSC	AC 110-265V	+/-VV (variable Voltages



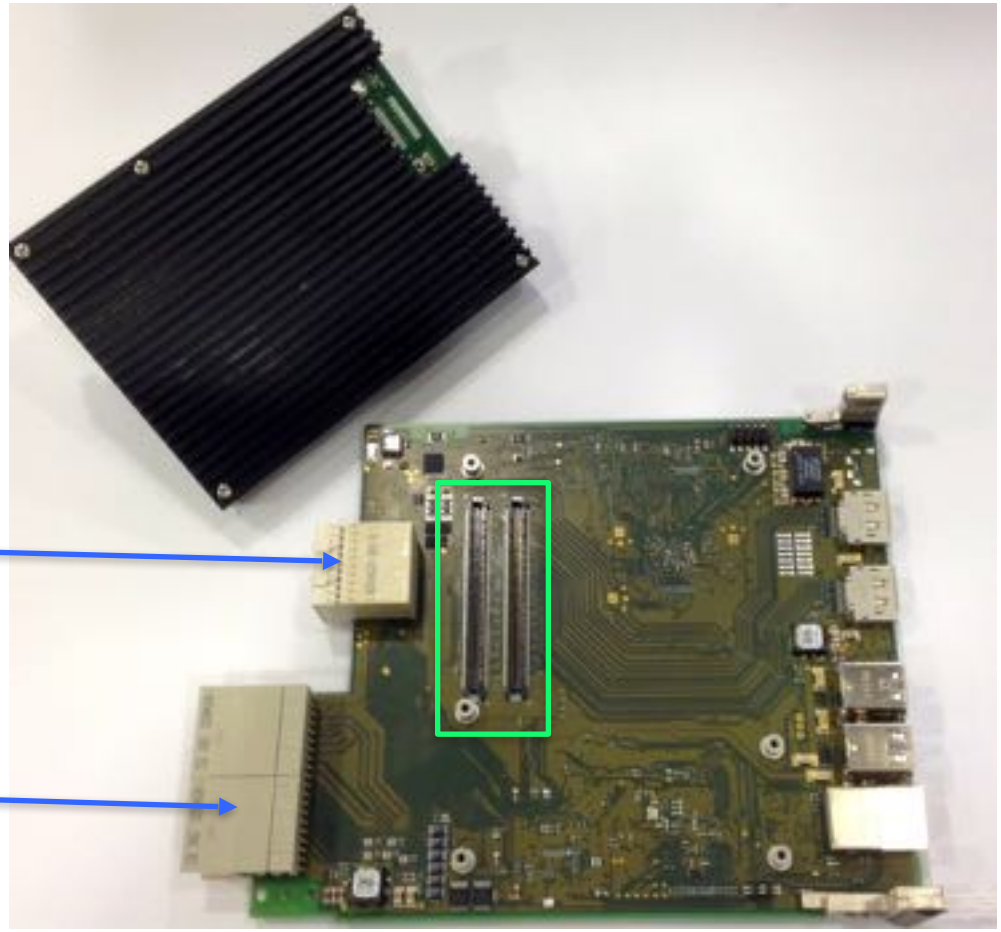
DC600LV DC420 DC840 AC600 AC600D AC1000

NAT-MCH-PHYS80



New MCH-RTM
NAT-MCH-RTM-BM-FPGA: Front Side

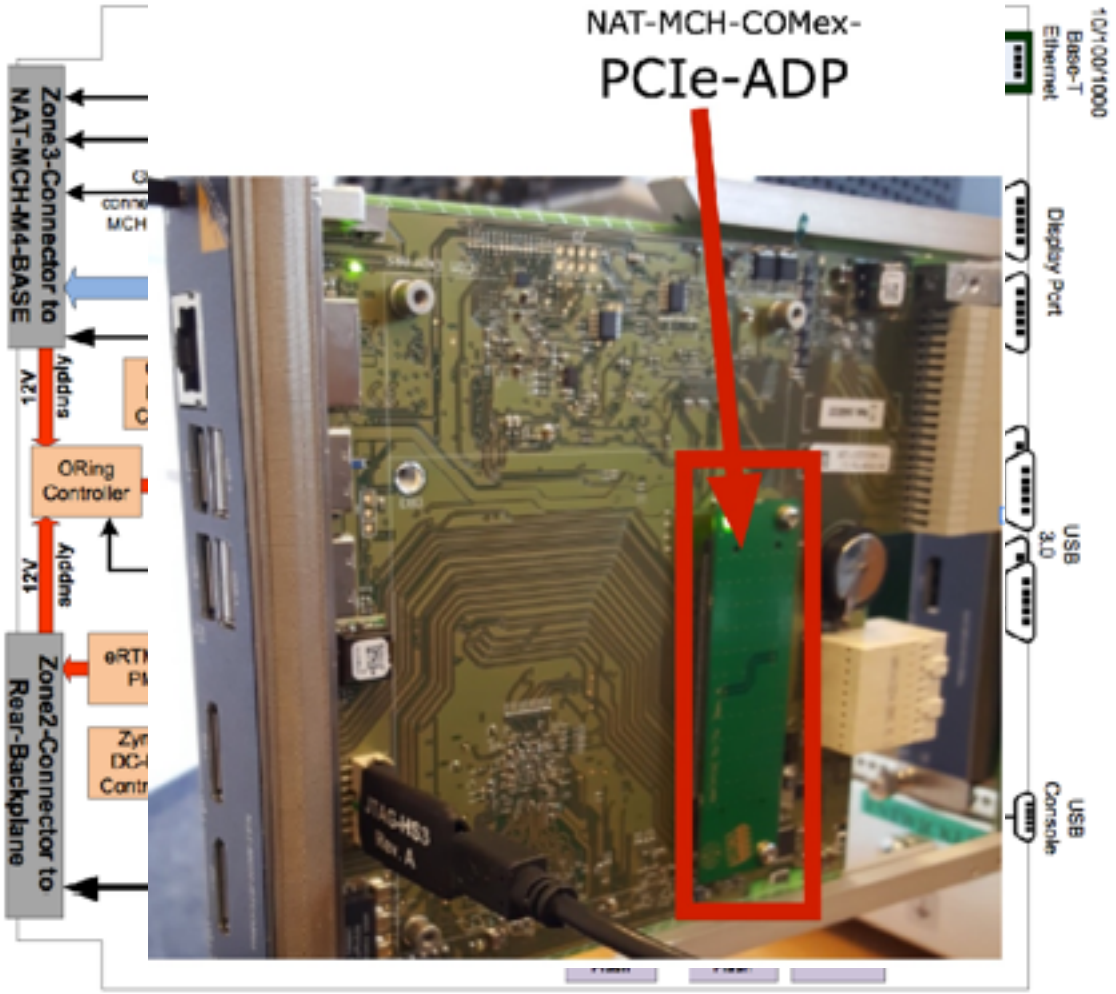
Multiple
COMexpress-CPU-Modules

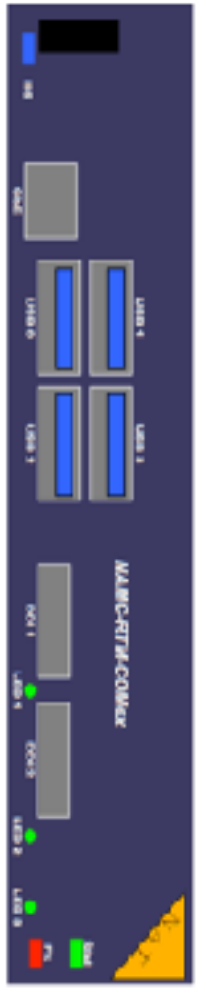


RTM Power connector
RTM Control&Data connector

Second Zone3 connector

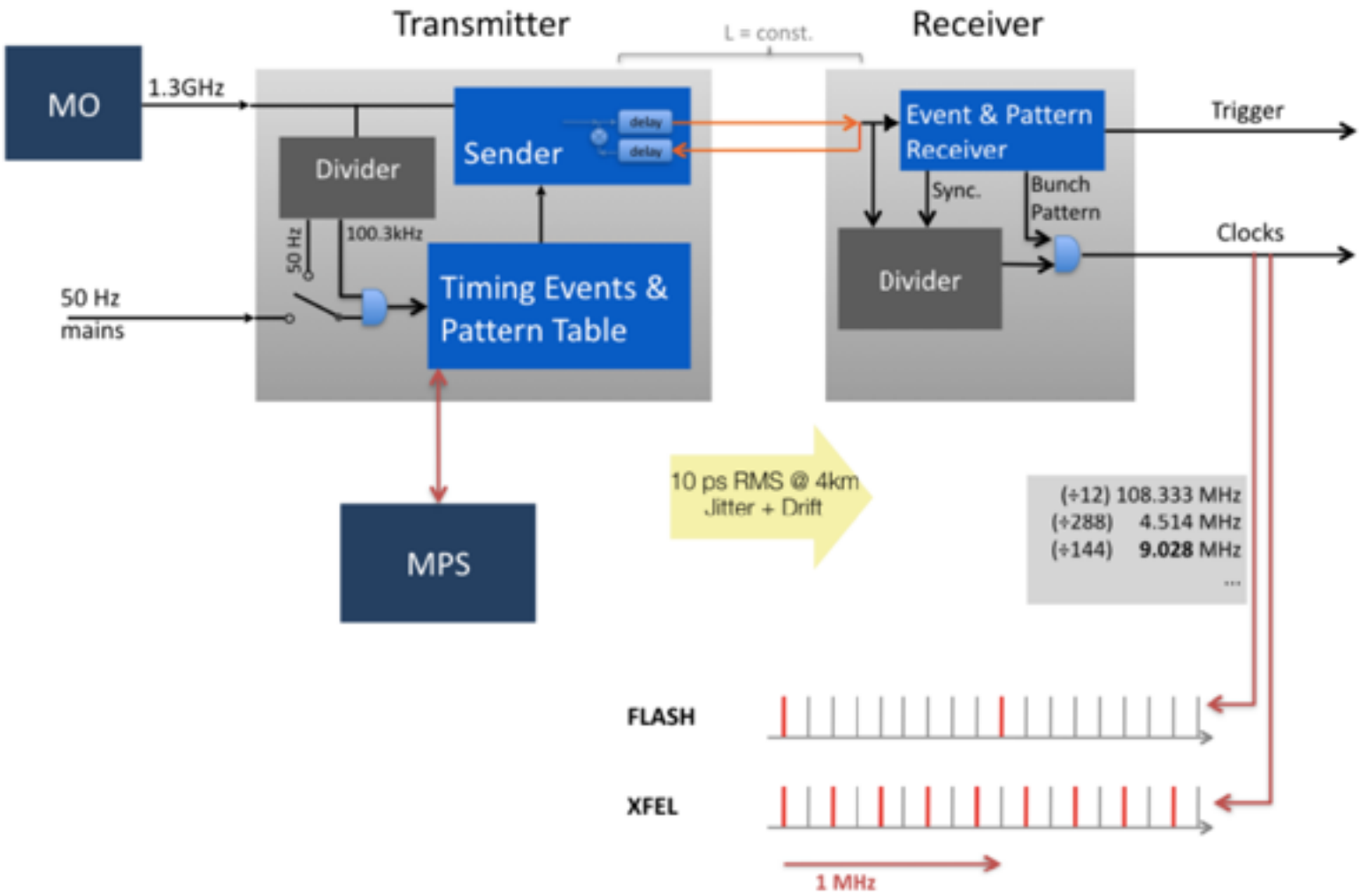
New MCH-RTM
NAT-MCH-RTM-BM-FPGA: Block Diagram





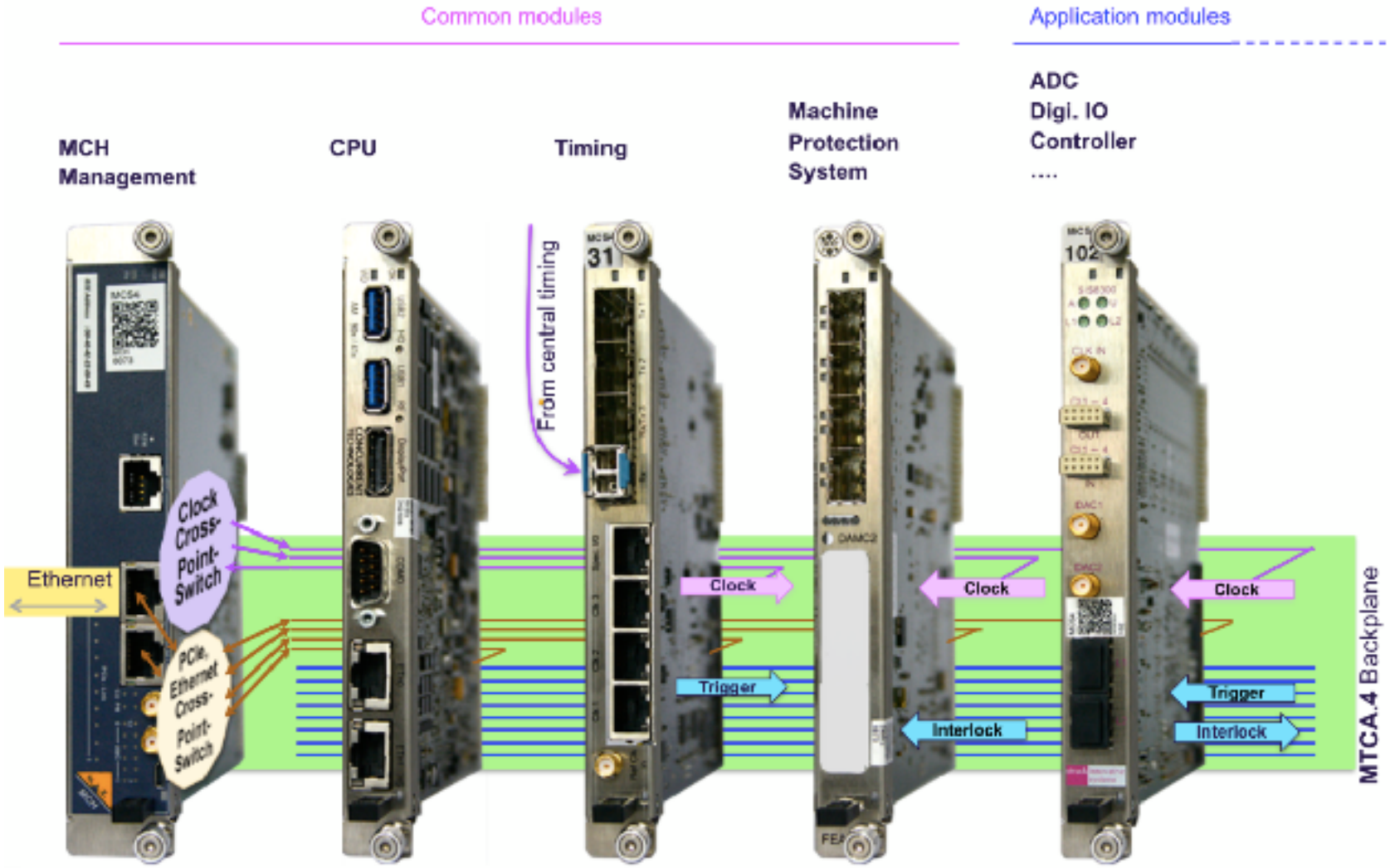
NAMC-psTimer

Synchronisation simplified



Need of Timing/Triggering Hardware

Installation Example XFEL



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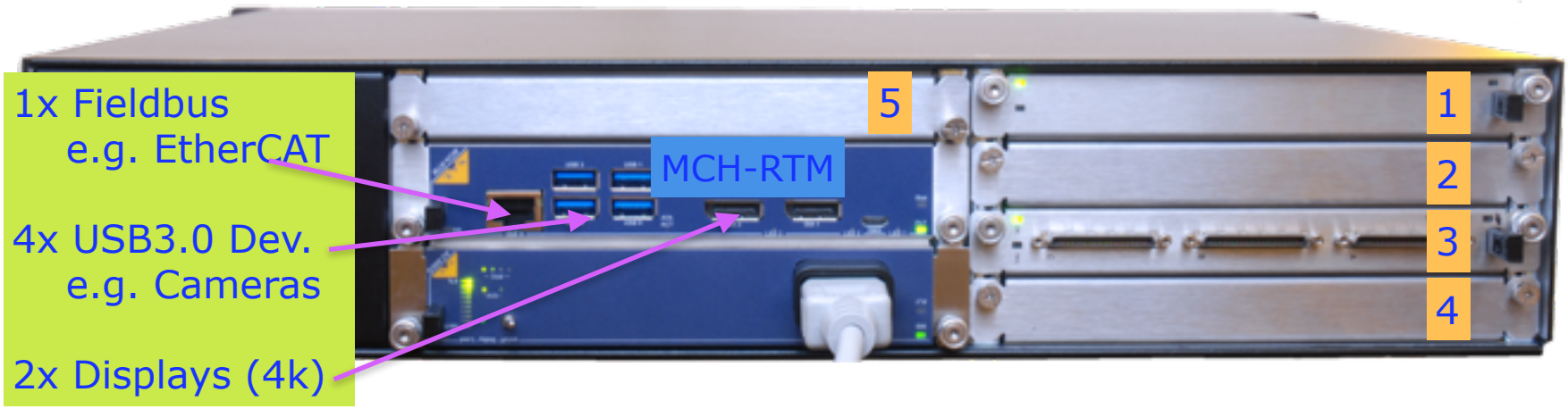
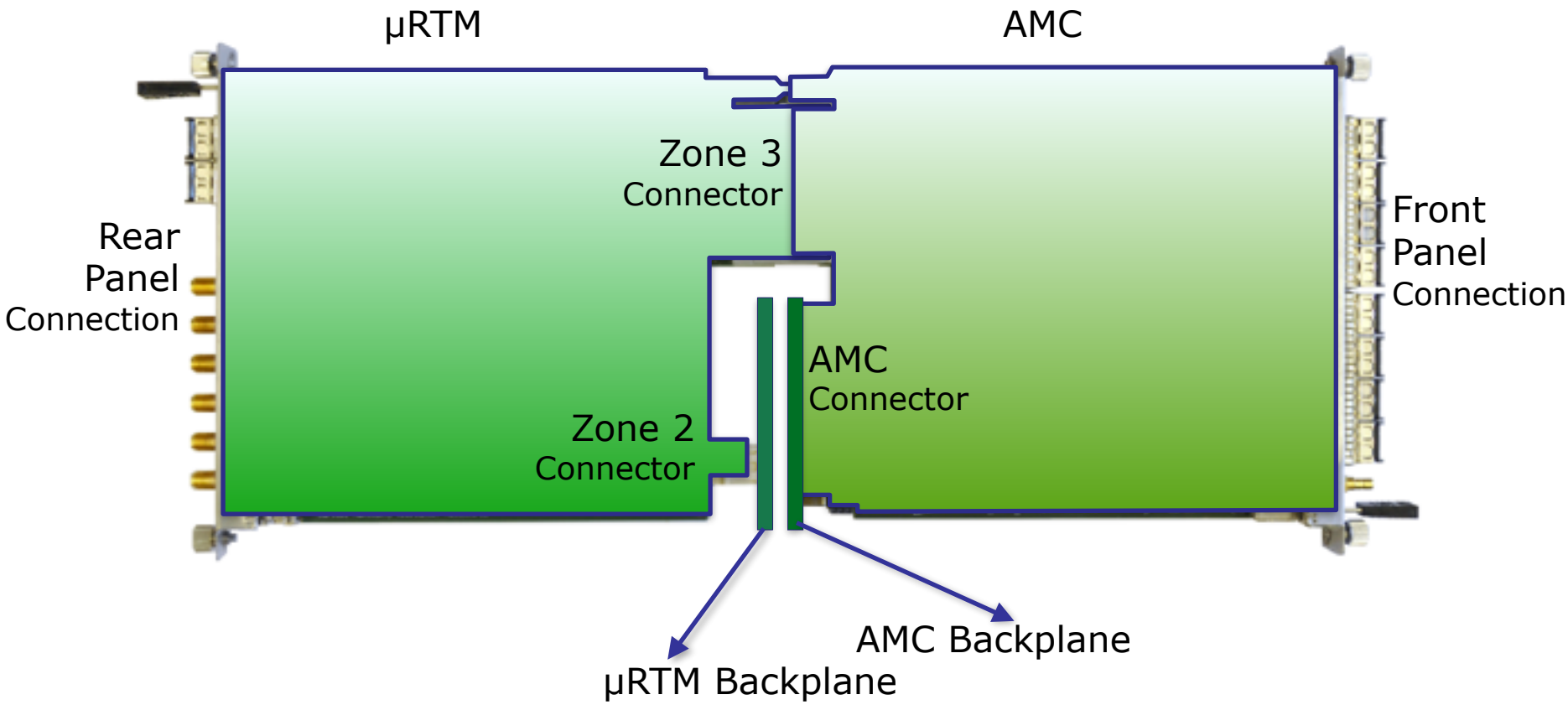
Put things into NATIVE-R2
6 AMCs, 5 µRTMs, PM, JSM, MCH, MCH-RTM

- 2U MTCA.4 chassis for AMCs and µRTMs and JTAG Switch Module



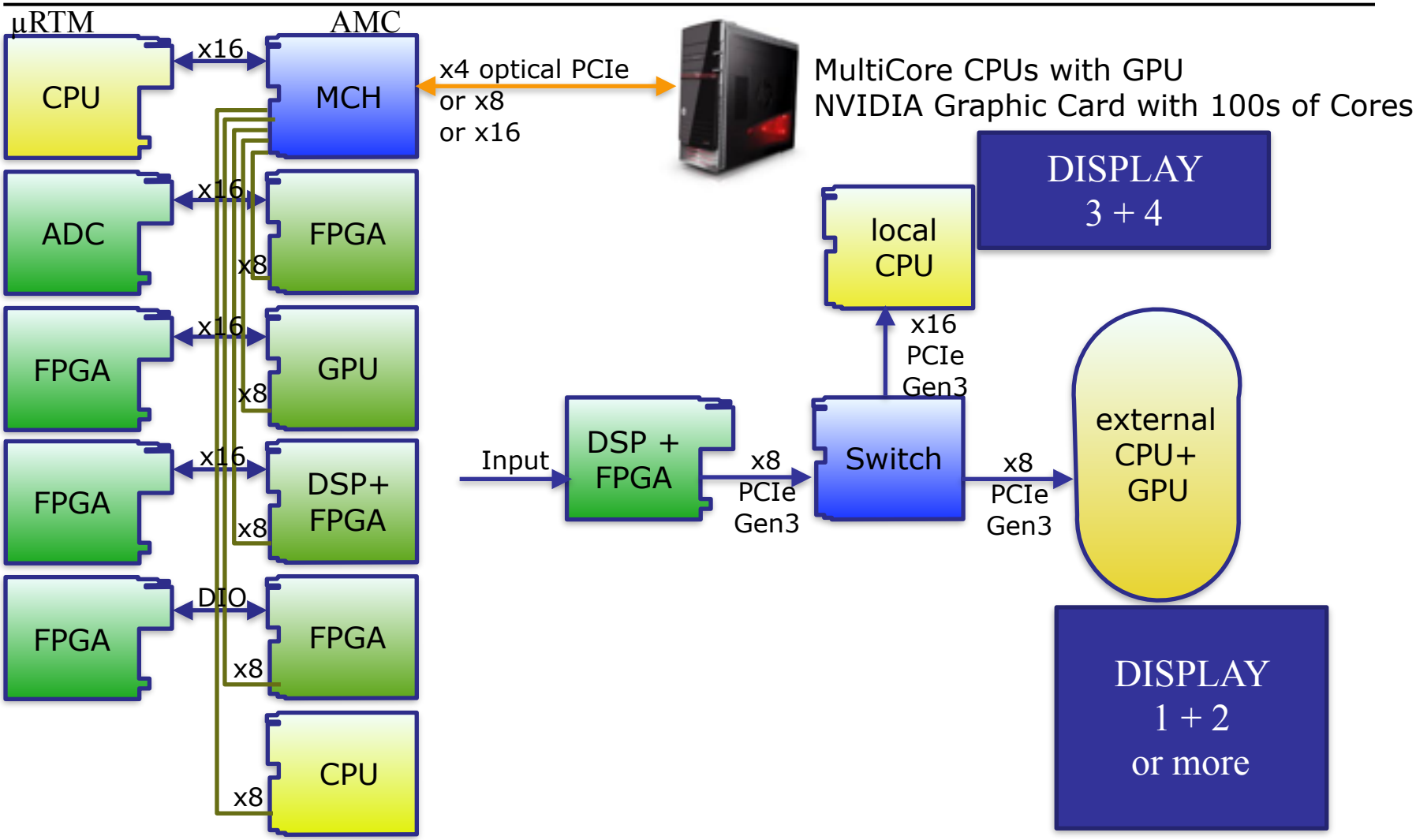
MTCA.4.1 Defines

µRTM Backplane, Zone-2 Connector, Zone-3 Classes
RPM, eRTMs, MCH-RTM, x16 Fat-Pipe



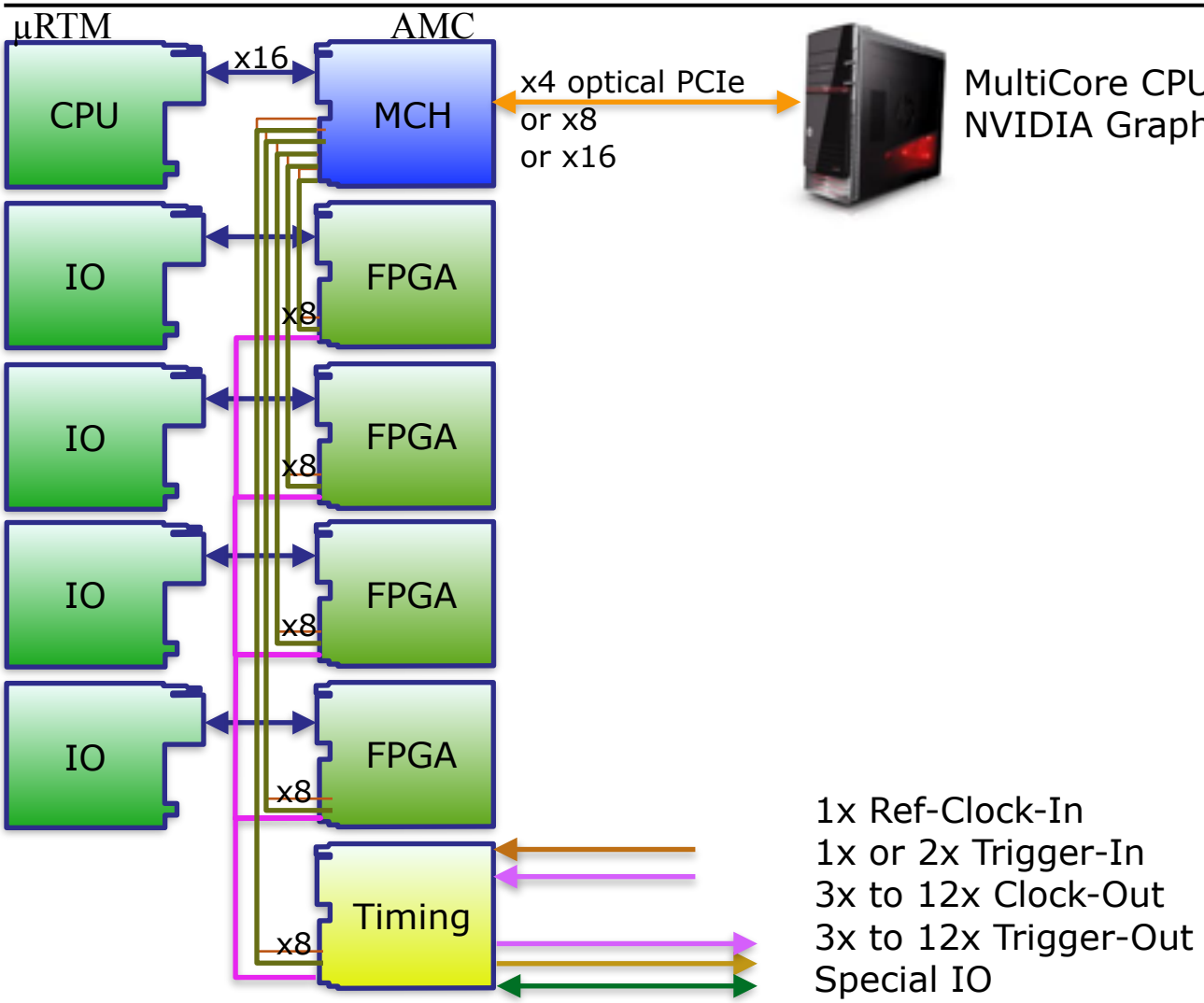
NATIVE-R2

Data stream from DSP/FPGA or FPGA/GPU to Displays



NATIVE-R2

Trigger and Clocks combined with High Bandwidth

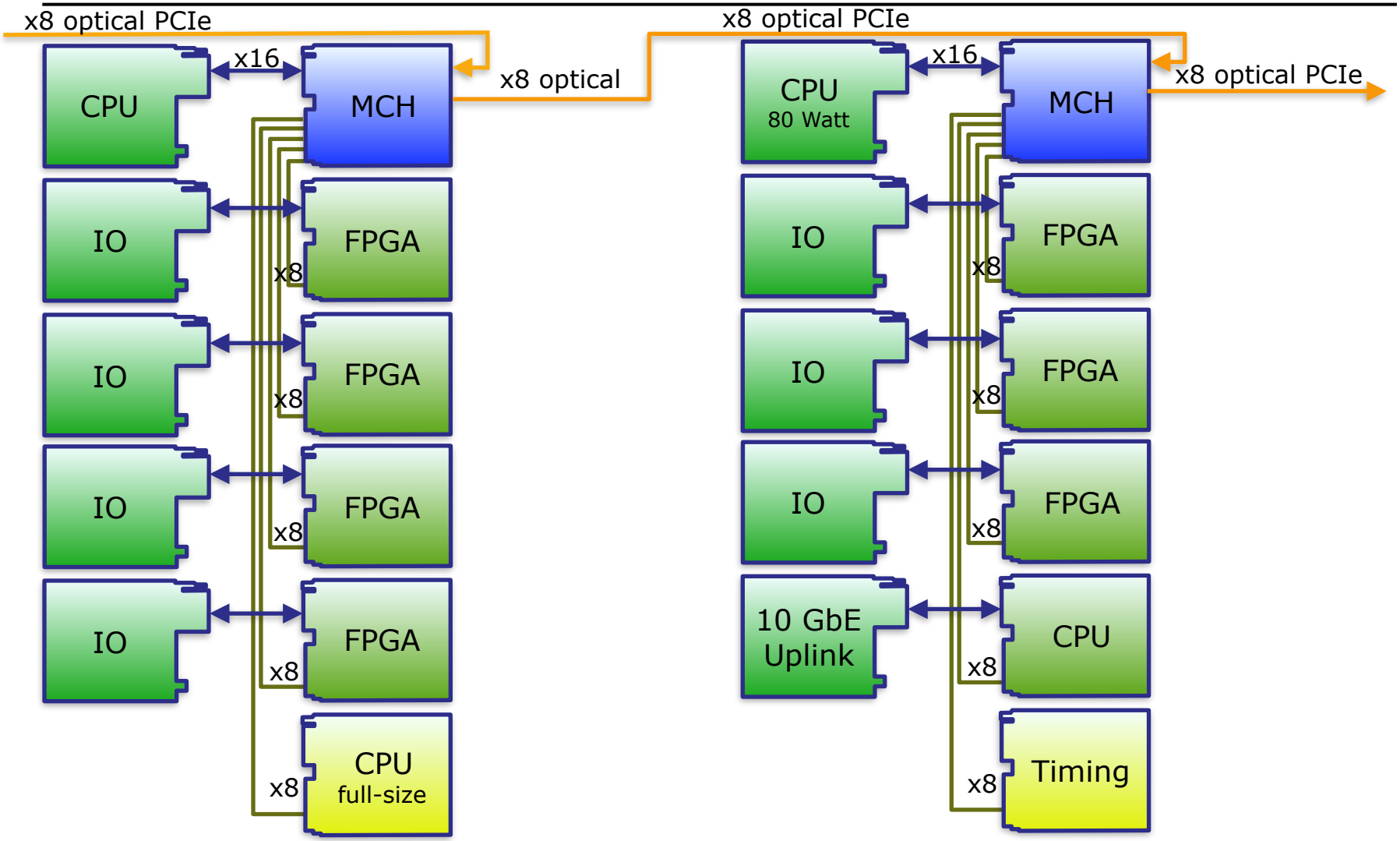


MultiCore CPUs with GPU
NVIDIA Graphic Card with 100s of Cores

1x Ref-Clock-In
1x or 2x Trigger-In
3x to 12x Clock-Out
3x to 12x Trigger-Out
Special IO

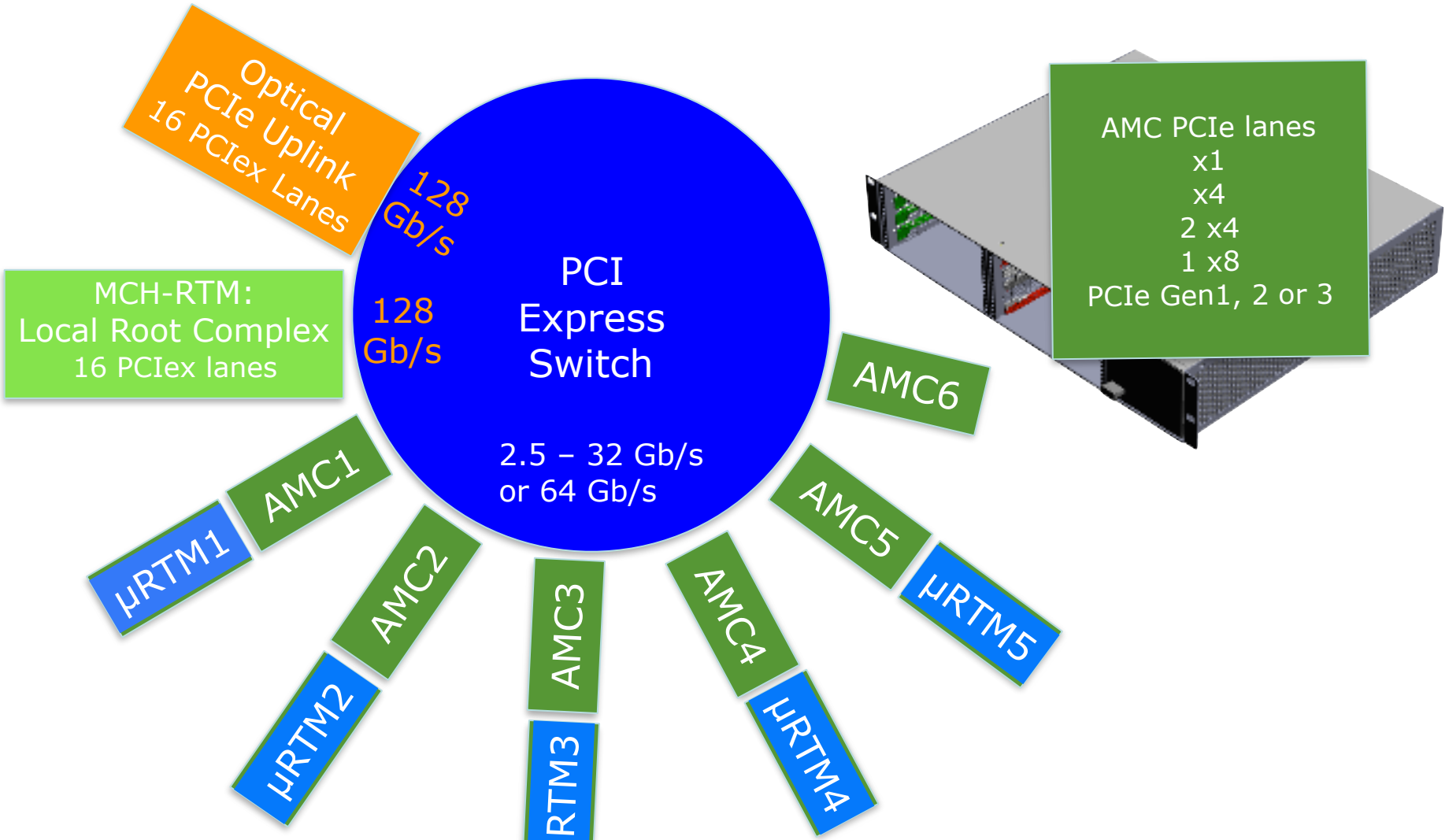
NATIVE-R2

Low Latency Cascading of Systems



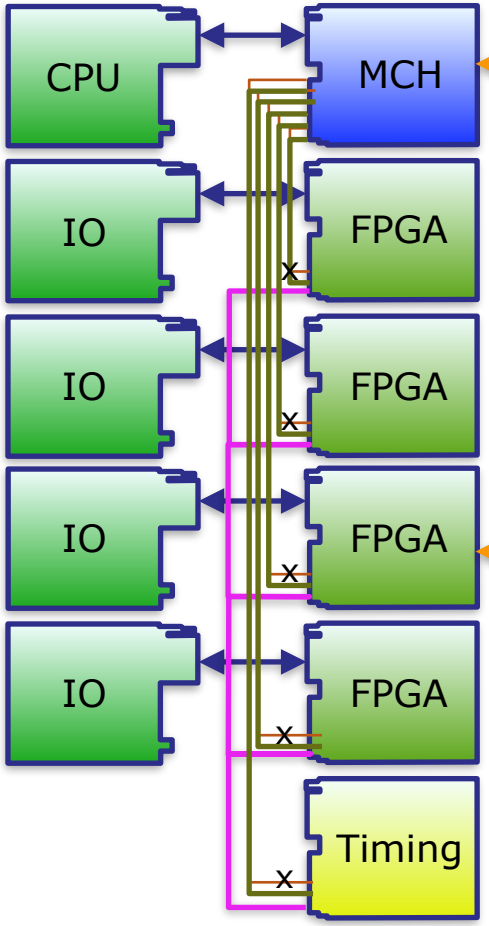
NATIVE-R2

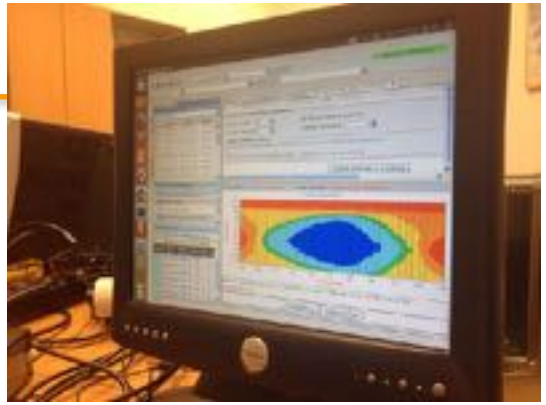
Clustering, Uplink, Cascading of systems

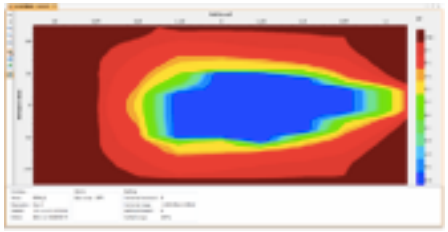


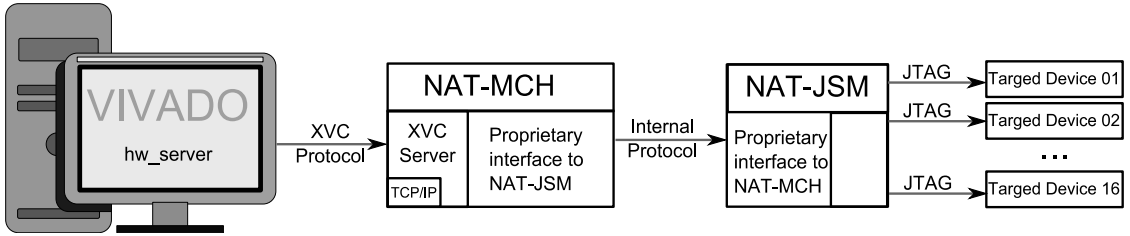
JTAG Switch Module by N.A.T.

NAT-JSM: compact, versatile, flexible









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