



# GSI Roadshow

**MTCA/PXIe in Science and Industry**

March 2024

## At a Glance



ISO 9001 • ISO 14001  
LL-C (Certification)



- Over 25 years in the market
- Privately owned
- Over 25 years VME experience
- Own Lab and integration facilities
- powerBridge has delivered over 30.000 VME boards and 6.000 systems
- PICMG member, actively working on MTCA.4 specification
- ISO 9001:2015 and 14001:2015 approved

**powerBridge Computer and their partners are the backbone of  
VITA & PICMG Technology. We are experts of technologies.**

powerBridge  
Computer



Telecommunication



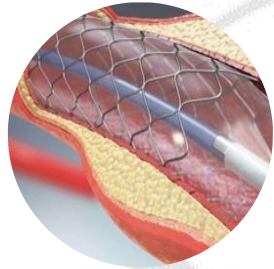
Defense



Aerospace



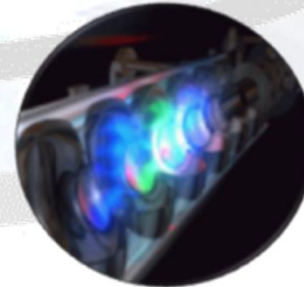
Transportation



Medical Industry



Industria Automation



Scientific

powerBridge  
Computer

powerBridge Computer has the right solution ...  
From building blocks to systems for **any branch**

- **Backplane based Computer systems:**
  - CPCI, CPCI Serial, MTCA, VME, ATCA, VPX
- **Industrial computer**
  - IPCs, Tablet PCs
- **Flexible I/O Boards**
  - Additional I/O Functions with Mezzanines :
  - PMC, XMC, FMC, IP
- **Carrier Boards for Mezzanine Modules**
  - Available for all form factors:
  - CPCI, CPCI Serial, MTCA, VME, ATCA, VPX und PCIe

- CPCI Serial Chassis, Backplanes and power supplies



Optionally with redundancy and replaceable fan unit

- CPCI-S CPU Boards 3U



- some I/O- and carrier Boards



## CPCI-S CPU Boards



- 3U CPCI Serial A3620 CPU
- 6/7 Generation Intel Core i7 CPU
- Up to 32 GB DDR3L ECC memory
- Up to 4 independent displays
- Various front I/O possibilities
- GbE, USB, DP, RS232
- Optional extended temperature range: -40 to +85°C



cPCI-3620 cPCI-3620D cPCI-3620S cPCI-3620T cPCI-3620TR cPCI-3620N

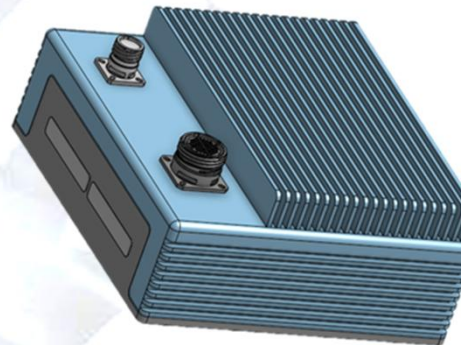
- Interface:
  - 1x PCIe x8
  - 2x PCIe x4
  - 3x PCIe x1
  - 4x SATA 6Gb/s
  - 2x USB 3.0
  - 8x USB 2.0



## Available Form Factors

- ComEx 6
- ComEx 7
- ComEx 10
- Qseven
- Smarc
- Miriac Modules
- Designed by Microsys
- Based on NXP Processors

- VITA 75 cold plate mounting
- Intel® Xeon® Processor E3-1505M v6, quad-core; 16GB DDR4-2400 with ECC soldered down
- Compliant with MIL-STD-810G/461F/704F/1275E
- Quad Gigabit Ethernet and 6x USB ports
- Available GPGPU on PCI Express x16 Gen3



Designed by



# Systemintegration Test and Documentation



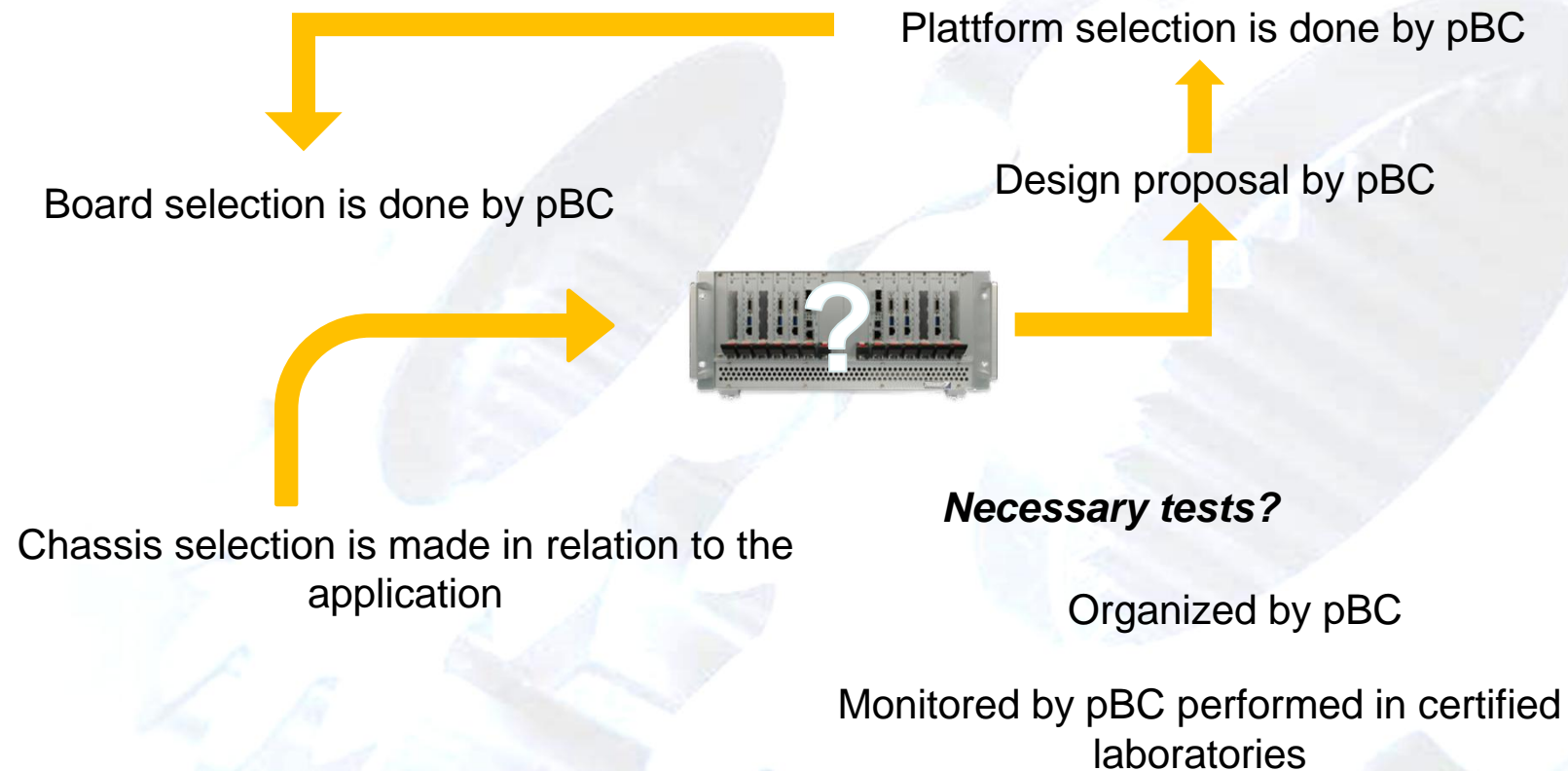


## **ISO Certification:**

- **Prerequisites and measures to achieve the highest and consistent quality in the manufacture of customer-specific computer systems with the aim of minimizing overall costs.**
- **Ensuring component quality.**
- **Importance of system design, manufacturing quality, and manufacturing and testing documentation.**
- **Influence of the Device History Record.**

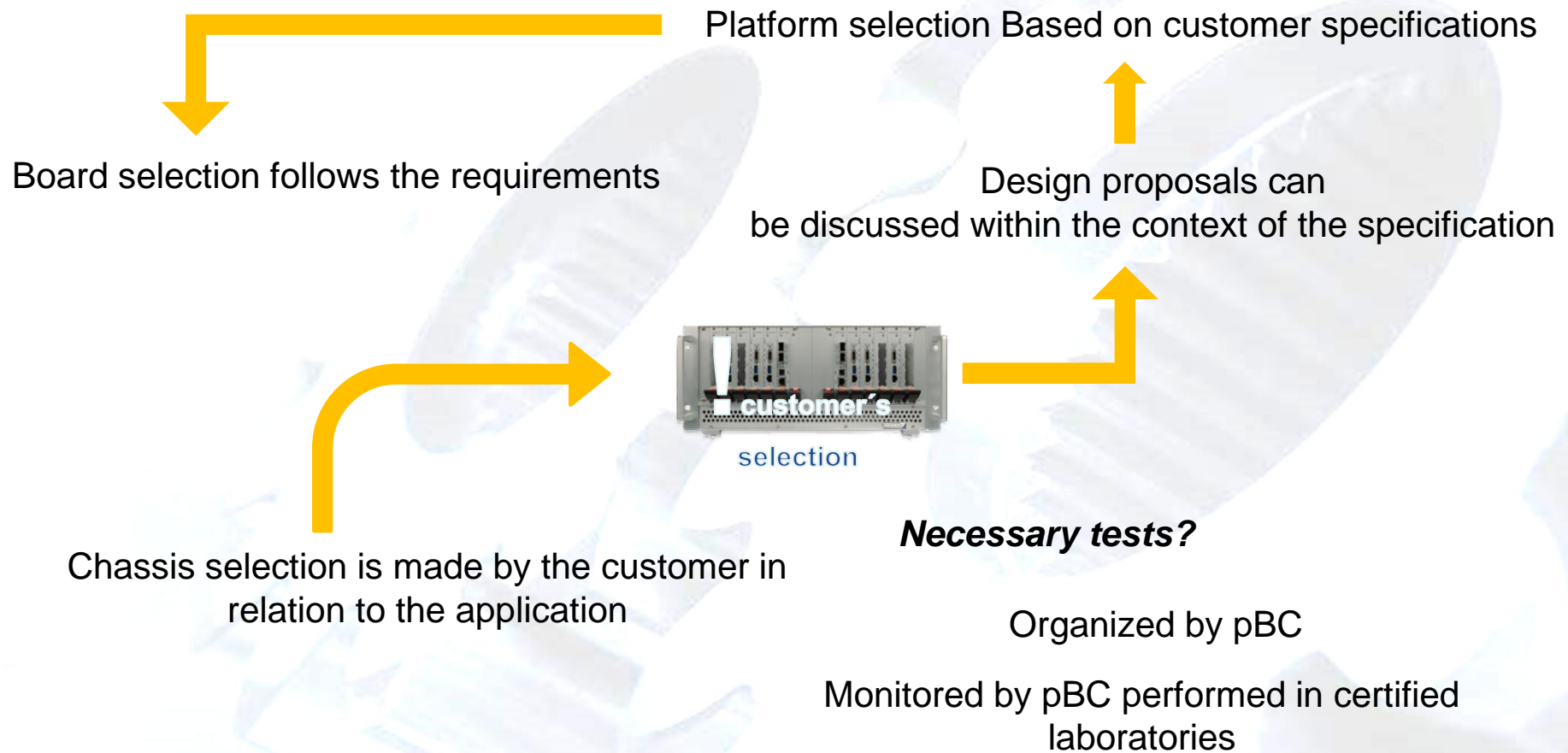
## Systemidentification Version I

Customer's functional specifications, system requirements with regard to the application



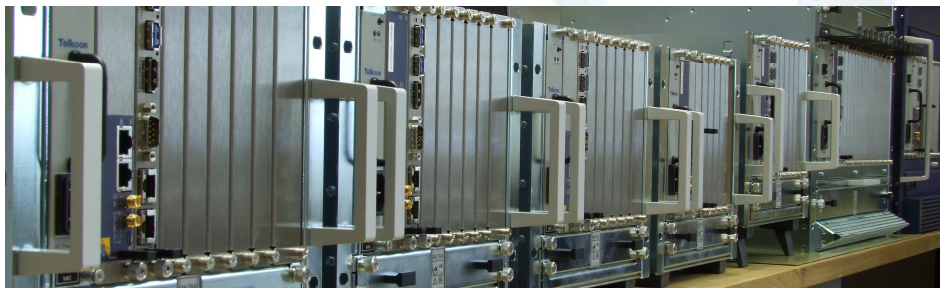
## Systemidentification Version II

Design and platform specifications from the customer, system requirements are fixed



## Requirements for the highest product quality

- quality of the components
- system build
- Quality of manufacturing and manufacturing documentation
- Tests, during production, final test, safety test
- Quality of the test instructions
- Device History Record



Installationshinweise VP717.pdf - Adobe Acrobat

2014-12-02 Mtg- Installationshinweise VP717.doc

VX838/011-74  
Montage- und Installationshinweise Rev.1.2  
Materialnummer: 83220224  
Dokumentnummer: 54.1155.157.02

1. Vorbereitungen

- a) Die Seriennummern von CPU Board und TR Modul in das Prüfprotokoll übertragen.
- b) Die Firmware/Bios Revision (Label Board-Rückseite) mit Angaben auf dem Karton vergleichen.
- c) Im PP die Abruf- Bestell- Nr. und alle Angaben in der Artikeltablette anpassen.
- d) Im Begleitschein ebenfalls die Auftragsnummer anpassen. Dateinamen unten im Begleitschein anpassen. Begleitschein für Kartonbeilage drucken und bereitlegen.
- e) Eine EU Konformitätserklärung 2011/65/EU für jedes Lieferlos beilegen. Datum anpassen!
- f) Ein COC VP717xx von pBC für jedes einzelne Produkt erstellen. SN, AU und Datum anpassen!
- g) Auf dem CPU-Karton das Label "Caution! Lithium Metal Battery" entfernen.
- h) Auf der Karton Stirnseite vom links ein Typenschild „VP717/083-43-K1“ anbringen

VP717/083-43-K1  
SN: M

CONCURRENT TECHNOLOGIES  
VP71708343K1  
Serial Order # 83220224  
Rev. 1.2 / 01.12.14  
www.cocpbc.com  
ITM 9, MOD. 02  
www.cocpbc.com

With ME Firmware Update  
B541A3L1

## Manufacture of computer systems, examples



VME basiertes Control  
system with Dual-Core PPC  
CPU with OS-9

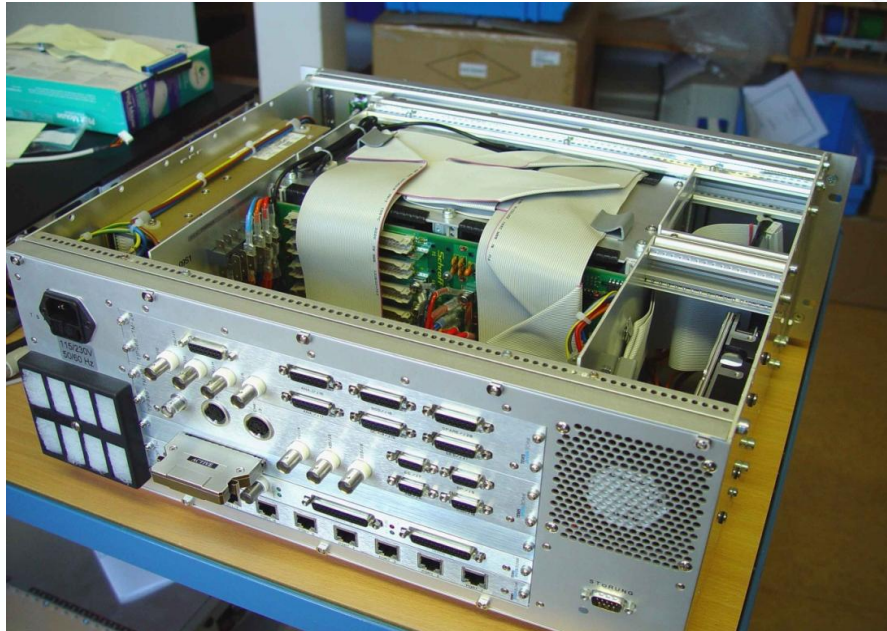


Application:

Medical technology  
automation system for the  
pharmaceutical industry



## Manufacture of computer systems, examples



VME based control  
system with VxWorks

Application: Wafer  
inspection system for  
semiconductor  
manufacturers

## Manufacture of computer systems, examples



customized VME System with  
VME64 Backplane



VME Rack für military  
Application,

Suitable for use in harsh  
environments with shock and  
vibration, low noise, front and  
rear view



## Manufacture of computer systems, examples

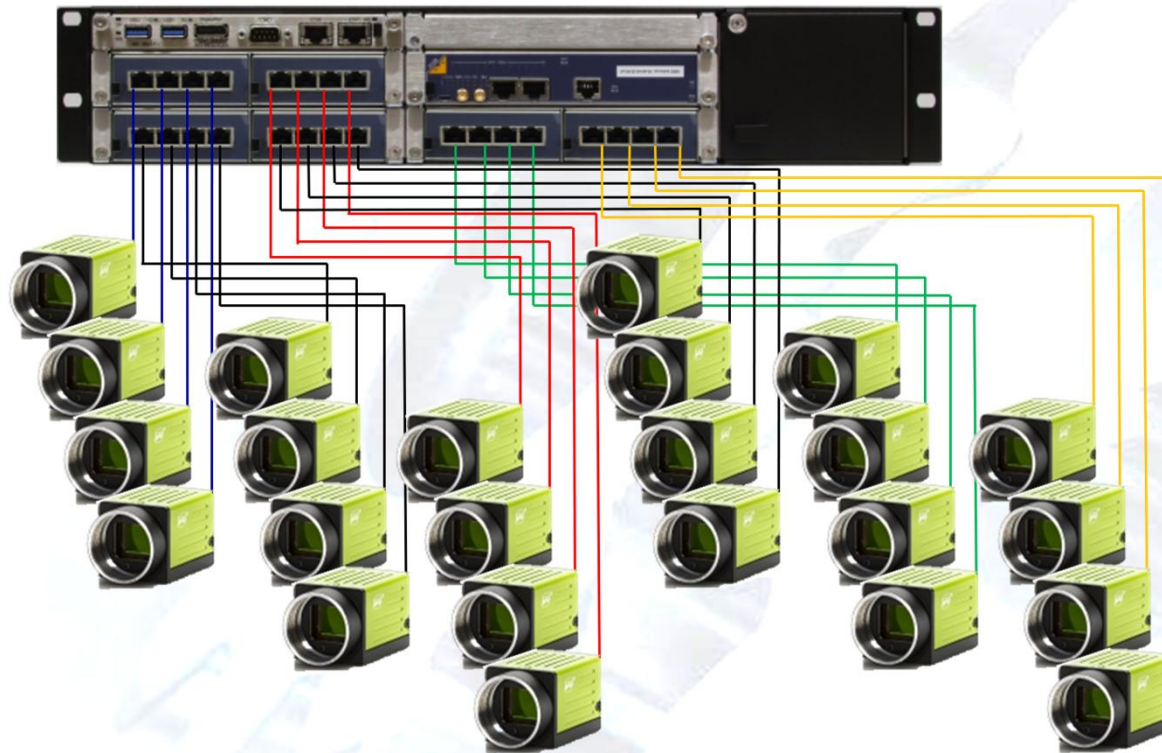


cPCI based system with  
dual core CPUs and  
embedded Linux

Application:

Medical technology,  
detection of dirt or particles  
in ampoules

## Manufacture of computer systems, case study



### 24 cameras in one 2U System

- Error detection, material testing, quality assurance,...
- Each camera can be used for a specific task
- Image matching by software such as Visual Applets
- Data storage on the CPU up to 4TB and accessible via
- 10GbE in the front panel
- Scalable to a maximum of 24 cameras in a 2U system

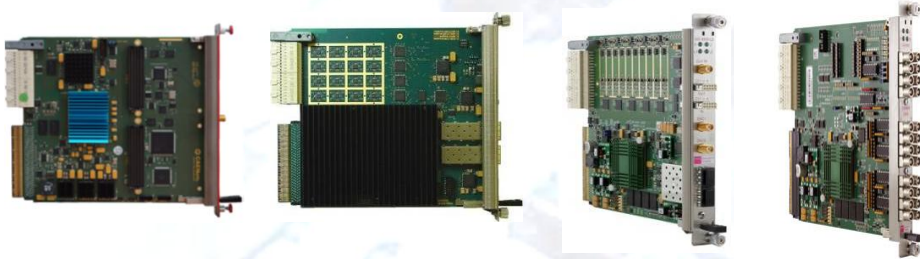


**MTCA**

- MTCA.4 Starter Kits, consists MCH, CPU & PSU

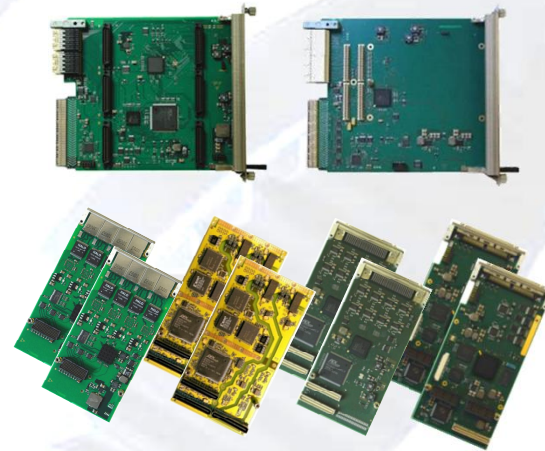


- AMC Modules



- Filler Modules, Adapter cable, Programming and Debugging Tools as well as Test Adapter

- Carriers + Mezzanines (IP, PMC, XMC, FMC)



- SW & FW Support as well as BSP, source code Drivers, sample applications, FPGA framework

## 2U MTCA.4 Crate



Starter Kit Basic configuration:

- CPU >> AMG 6x/msd
- PSU >> NAT-PM-AC1000
- MCH >> NAT- MCH

Other and additional modules are available on request

- 2U 19" MTCA.4 crate, PICMG MTCA.4 R1.0
- 5 double mid-size AMC slots
- 1 double full-size AMC slot
- 5 double mid-size  $\mu$ RTM slots
- Double full-size MCH slot with  $\mu$ RTM Slot
- Double full-size Power module slot
- Exchangeable cooling unit with front to left or right to left air flow
- Dust filter exchangeable



## Two Computer in one single Chassis

### Solution

- One single MTCA Chassis (e.g. 2HE)
- Plug in your required AMCs; e.g. 2x CPU, several I/O



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## Two Computer in one single Chassis

### Solution

- One single MTCA Chassis (e.g. 2HE)
- Plug in your required AMCs; e.g. 2x CPU, several I/O
- Define Root Complex

**CPU 1**  
I/O for CPU 1  
I/O for CPU 1



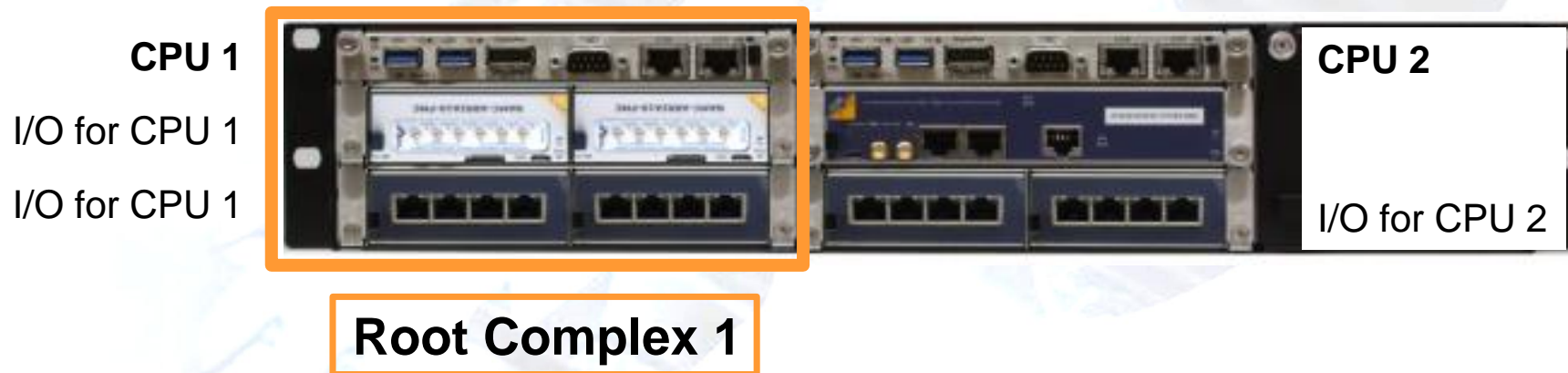
**CPU 2**  
I/O for CPU 2



## Two Computer in one single Chassis

### Solution

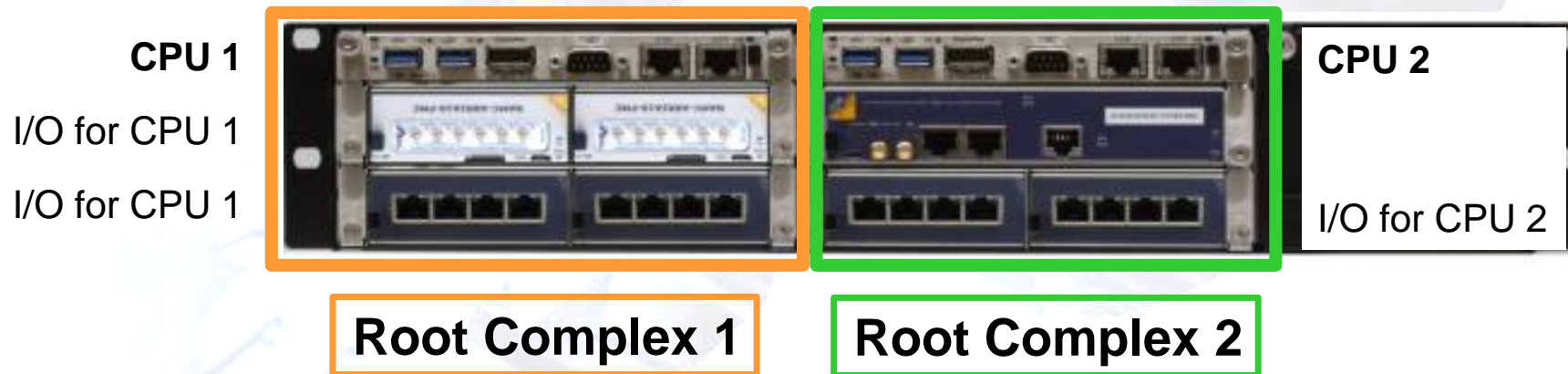
- One single MTCA Chassis (e.g. 2HE)
- Plug in your required AMCs; e.g. 2x CPU, several I/O
- Define Root Complex



## Two Computer in one single Chassis

### Solution

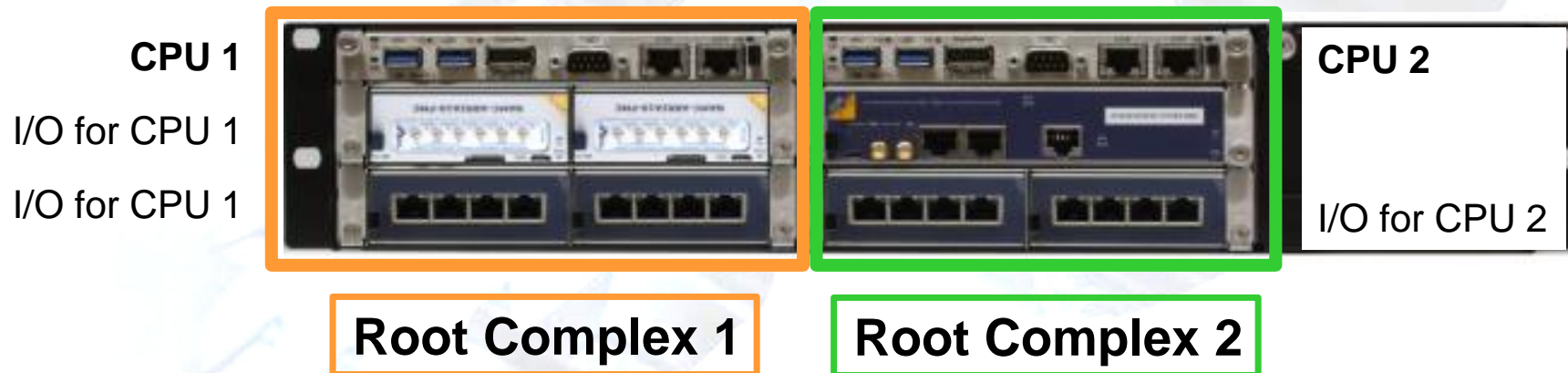
- One single MTCA Chassis (e.g. 2HE)
- Plug in your required AMCs; e.g. 2x CPU, several I/O
- Define Root Complex



## Two Computer in one single Chassis

### Solution

- One single MTCA Chassis (e.g. 2HE)
- Plug in your required AMCs; e.g. 2x CPU, several I/O
- Define Root Complex



... up to six Root Complexes are possible

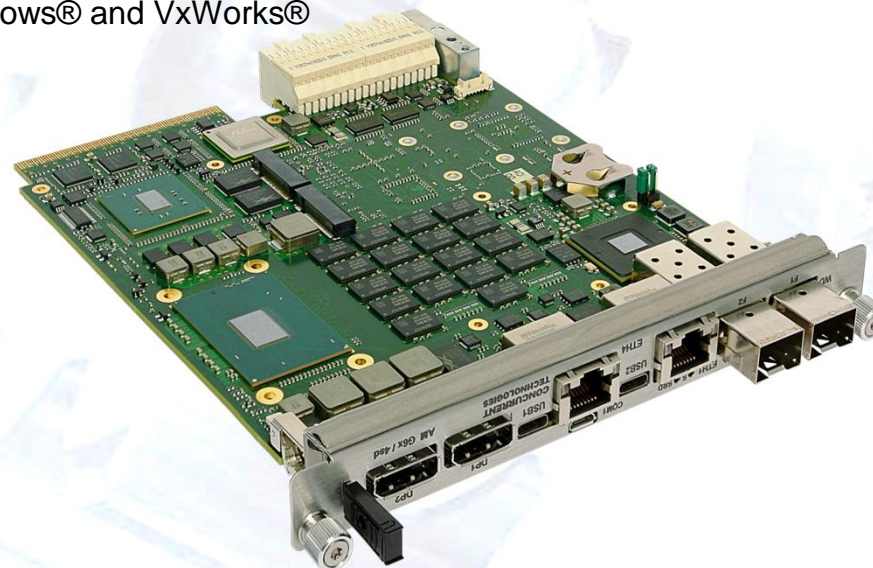
## Processor AMC's

- 4-core Intel® Xeon® processor E3-1505M v6:
- 8 Mbytes Cache, 3.0 GHz
- Intel® HD Graphics P630
- 2-core Intel® Core™ i3-7102E processor:
- 3 Mbytes Cache, 2.1 GHz
- Intel® HD Graphics 6302-core
- Front panel connections including option for 2 x 10 Gigabit
- SFP+ modules for remote connectivity
- Built in SATA microSSD™ for local boot and data storage
- Two M.2 sites for M-key SSD high speed RAID storage
- Optional µRTM
- Optional I/O in extended options region
- Support for Linux®, Windows® and VxWorks®



AM F5x/msd

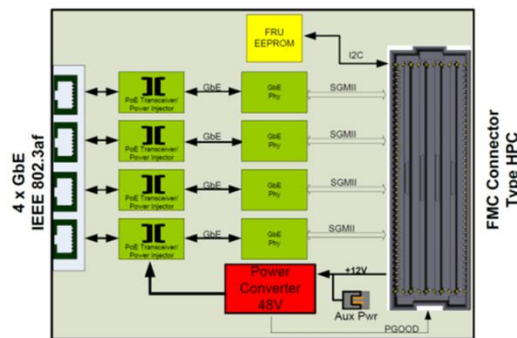
- Intel® 4-core processor variants for CPU or GPU intensive processing loads
- 4-core Intel® Xeon® processor E3-1515M v5:
  - 8 Mbytes Cache, 2.80 GHz
  - Intel Iris™ Pro Graphics P580
- Gen 3 PCI Express® fabric interface options for flexible connection to other payloads
- Front panel connections including:
  - 2 x 10GBASE-T Ethernet for networking
  - 1 x DisplayPort®, USB and Serial for configuration
  - Optional Flash Drive Module for local boot and data storage
  - Optional I/O in extended options region



AM G6x/msd

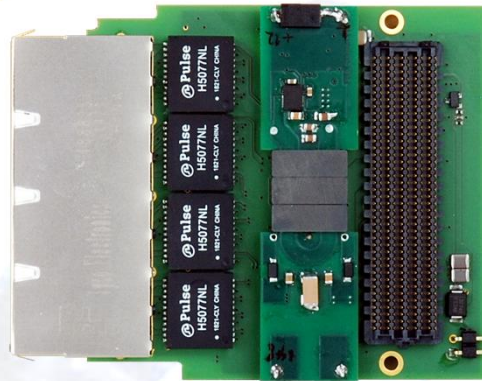
## Image Processing Boards

FMC-GigE-Vision-PoE



### Key Features:

- 4 IEEE 802.3af compatible front ports
- High efficient power converter
- FMC HPC Connector



### FPGA Carrier Boards

The **FMC-GigE-Vision** is dedicated to powerful FPGA based FMC carrier boards like the *NAMC-ARRIA10-FMC* or the *NAMC-ZYNQ-FMC* boards for first level picture or video processing/analysis. Due to their high speed interconnect topology FMC modules are the ideal platforms to aggregate and process high bandwidth data streams as provided i.e. by camera links and video streams.

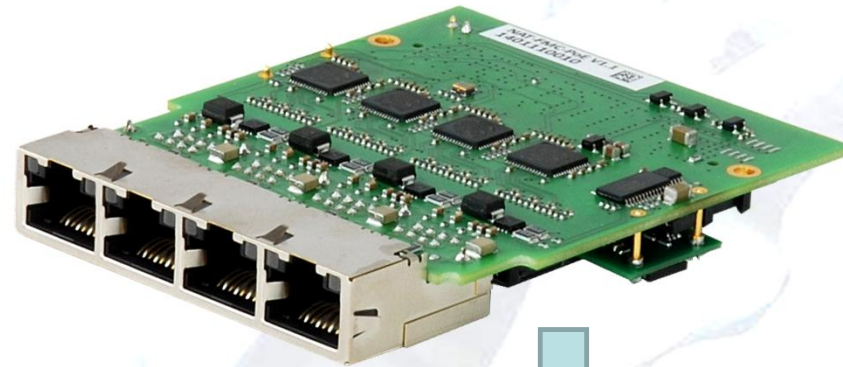
### Ethernet Switching

The four front panel Ethernet connections can be routed/aggregated to the MTCA backplane's. 1GbE ports (0/1) or to the 10GbE fatpipe ports (4-7 or 8-11).

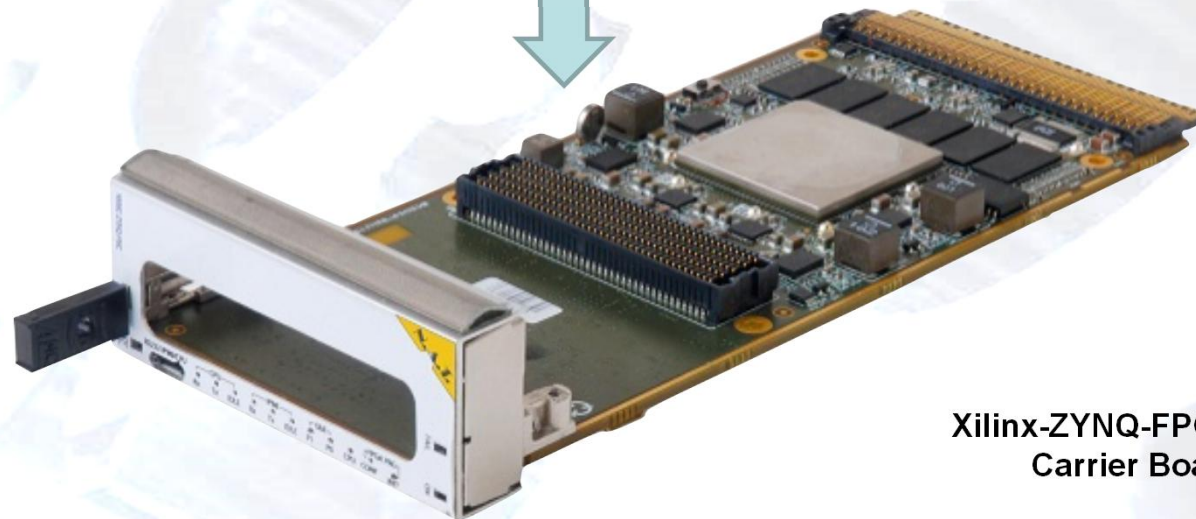
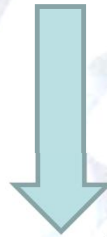
### PoE

The board is capable to drive power to 4 Ethernet links per IEEE802.3 af standard (15.4W per link) or two links per IEEE802.3 af standard (25.5W per link)

# MTCA Image Processing System

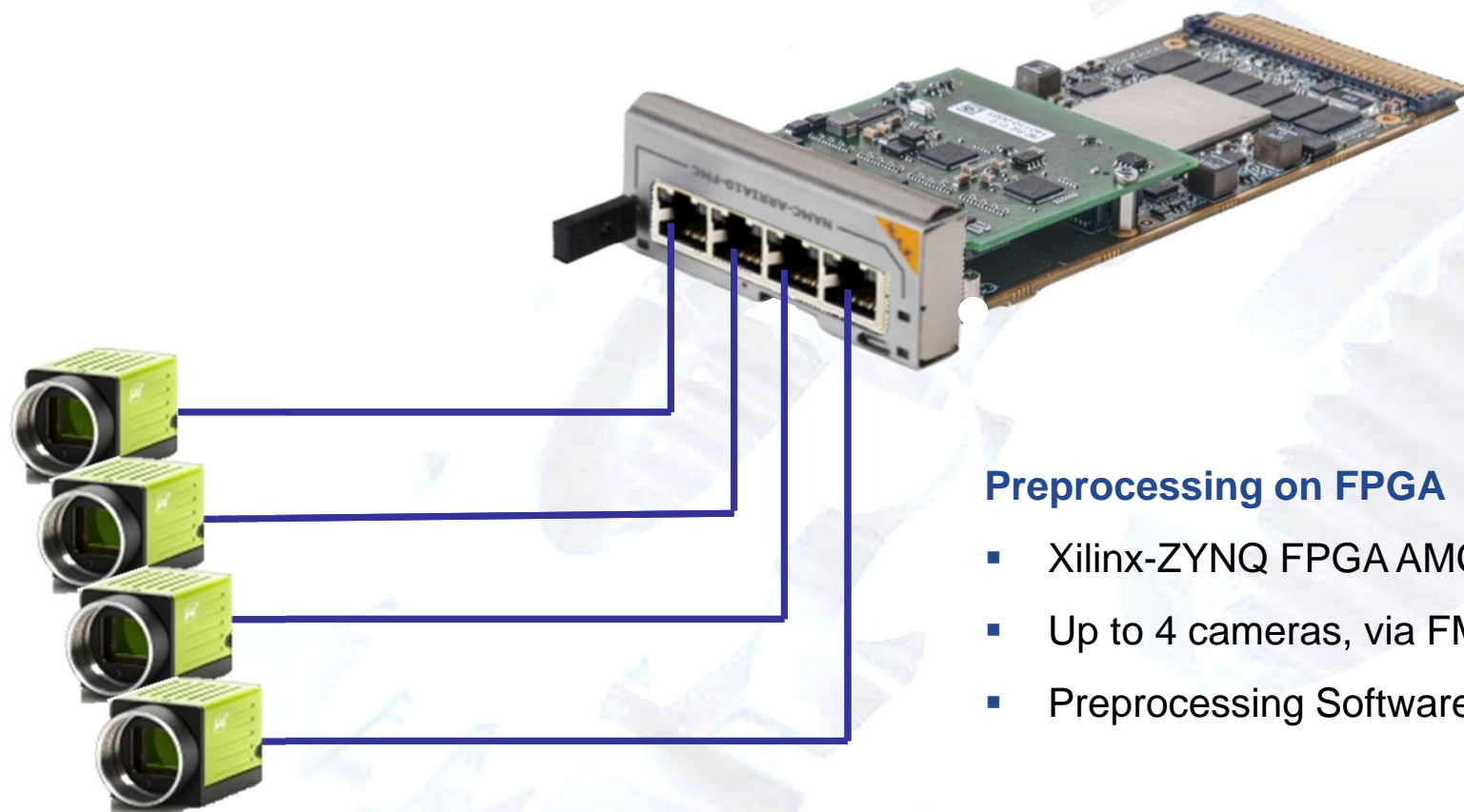


4 port GigE Vision  
PoE FMC



Xilinx-ZYNQ-FPGA FMC  
Carrier Board

# MTCA Image Processing System



## Preprocessing on FPGA

- Xilinx-ZYNQ FPGA AMC Board
- Up to 4 cameras, via FMC connected
- Preprocessing Software on FPGA, f.e. Visual Applets

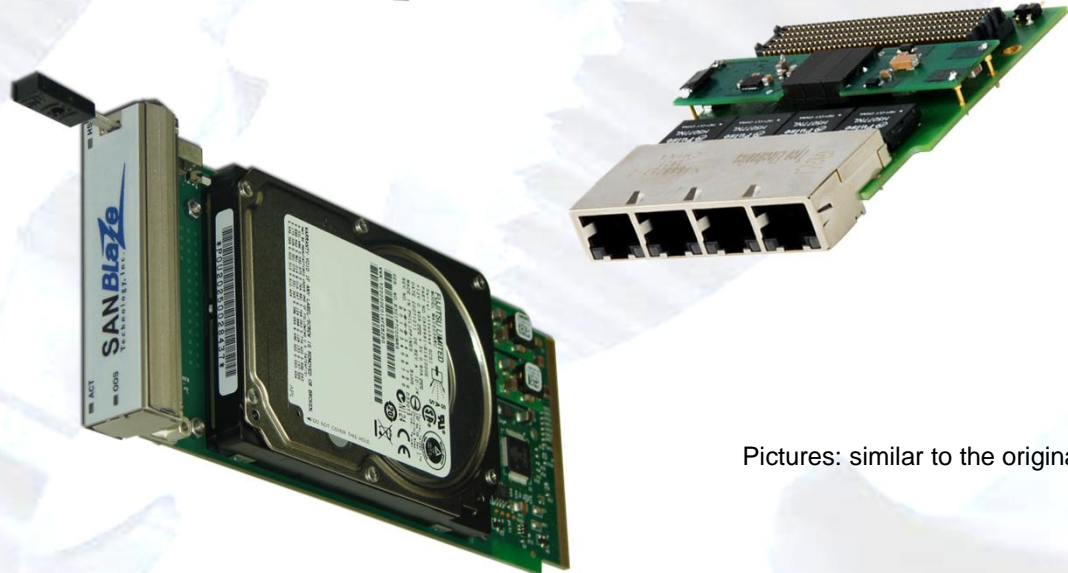
## Image Processing Boards

### ▪ ZYNQ FPGA Board

- Xilinx ZYNQ-7000 XC7Z045 or XC7Z100 FPGA
- High pin-count FMC slot complies with VITA 57.1
- Dual banks of DDR3 memory (1 GB 64-bit, 512MB 32-bit)
- 256 MB NOR quad SPI flash memory
- MicroSD card slot
- AMC.1, AMC.2, AMC.3, AMC.4 and IPMI 2.0 compliant
- JTAG access over backplane
- FMC adapter GbE Vision (see small mezzanine)

### ▪ SanBlaze Storage Board

- One Integrated 2.5" disk drive /SSD
- SAS or SATA protocol and signaling
- Select active Port
- AMC port 3 only
- AMC port 2 only
- Both Ports (SAS only)
- Serial burst data rate 6.0Gb/s
- Capacity options up to 1TB
- Front panel disk activity LED



Pictures: similar to the original boards



## Wireless Boards

### ▪ ZYNQ FPGA Board

- Xilinx ZYNQ-7000 XC7Z045 or XC7Z100 FPGA
- High pin-count FMC slot complies with VITA 57.1
- Dual banks of DDR3 memory (1 GB 64-bit, 512MB 32-bit)
- 256 MB NOR quad SPI flash memory
- MicroSD card slot
- AMC.1, AMC.2, AMC.3, AMC.4 and IPMI 2.0 compliant
- JTAG access over backplane
- FMC adapter GbE Vision (see small mezzanine)

### ▪ Digital Board

- Xilinx Zynq XC7Z045-2FFG900C AP SoC, consisting of an integrated processing system (PS) and programmable logic on a single die
- 1 Gb 32-bit wide DDR3 SDRAM (8X 256 MB x 4 SDRAMs)
- 2X 256 Mbit Quad SPI-Flash for non-volatile storage
- Clock synthesizer, clock jitter attenuator and clock distribution network
- The board provides access to 12 GTX transceivers:
- Eight of the GTX transceivers are wired to the MicroTCA backplane
- Four of the GTX transceivers are wired to the QSFP Module connector (QSFP1)
- 4 x 10 Gbps optical lanes for CPRI and 10 GbE to the front panel via QSFP
- Programmable logic JTAG connector
- 1X SD card slot available, memory extension up to 64 Gbyte, bootable

### ▪ Analog Board

- Up to 4x AD9361 RF agile transceiver devices each supporting two antennas
- Each transceiver can be fully synchronized up to 4 GHz
- Integrated ADCs/DACs
- Tunable carrier frequency between 70 MHz and 6 GHz
- Up to 56 MHz analog bandwidth
- Noise figure < 2.5 dB
- Each receive (RX) subsystem includes independent automatic gain control (AGC), dc offset correction, quadrature correction, and digital filtering.



Pictures: similar to the original boards

## DAC Boards

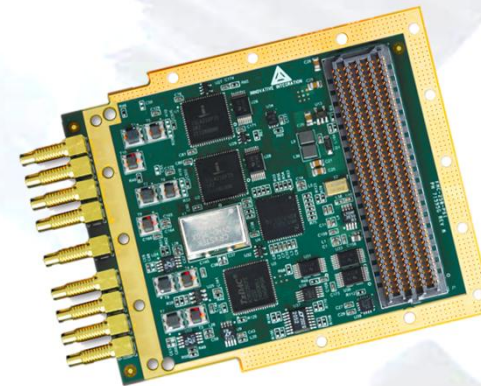
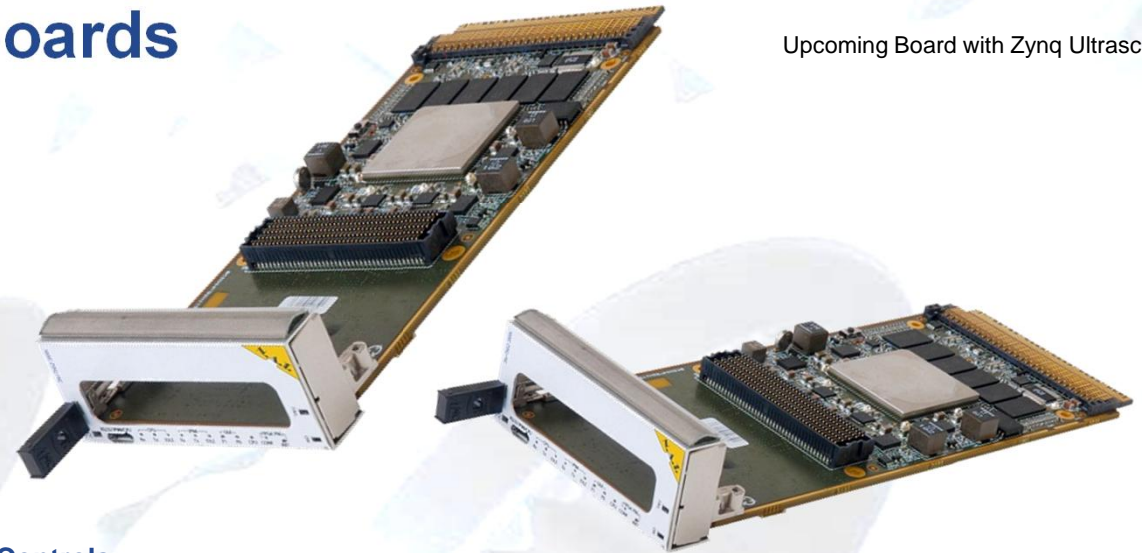
Upcoming Board with Zynq Ultrascale +

### ▪ ZYNQ FPGA Board

- Xilinx ZYNQ-7000 XC7Z045 or XC7Z100 FPGA
- High pin-count FMC slot complies with VITA 57.1
- Dual banks of DDR3 memory (1 GB 64-bit, 512MB 32-bit)
- 256 MB NOR quad SPI flash memory
- MicroSD card slot
- AMC.1, AMC.2, AMC.3, AMC.4 and IPMI 2.0 compliant
- JTAG access over backplane
- FMC adapter GbE Vision (see small mezzanine)

### ▪ FMC Module with 4x 310 MSPS 16-bit A/D with PLL and Timing Controls

- FMC module, VITA 57.1 High Pin Count
- Four A/D Inputs
- 310 MSPS, 16-bit
- AC or DC coupled
- Sample clocks and timing and controls
- Both Front panel and FMC Ref Clock and Trig/Sync inputs
- Front panel Clock/Vref output
- Programmable PLL
- 20 MHz TCXO Ref
- No SERDES required
- 2.5V VADJ
- Power monitor and controls
- 8.8W typical (AC-coupled inputs)
- Conduction Cooling Supported
- Environmental ratings for -40 to 85C
- 9g RMS sine, 0.1g<sup>2</sup>/Hz random vibration



Pictures: similar to the original boards  
Sources: NAT, Innovative Integration

# Onboard video (pre-)processing by FPGA or ARM



Xilinx-ZYNQ-FPGAs



Intel-Altera-ARRIA10-FPGA



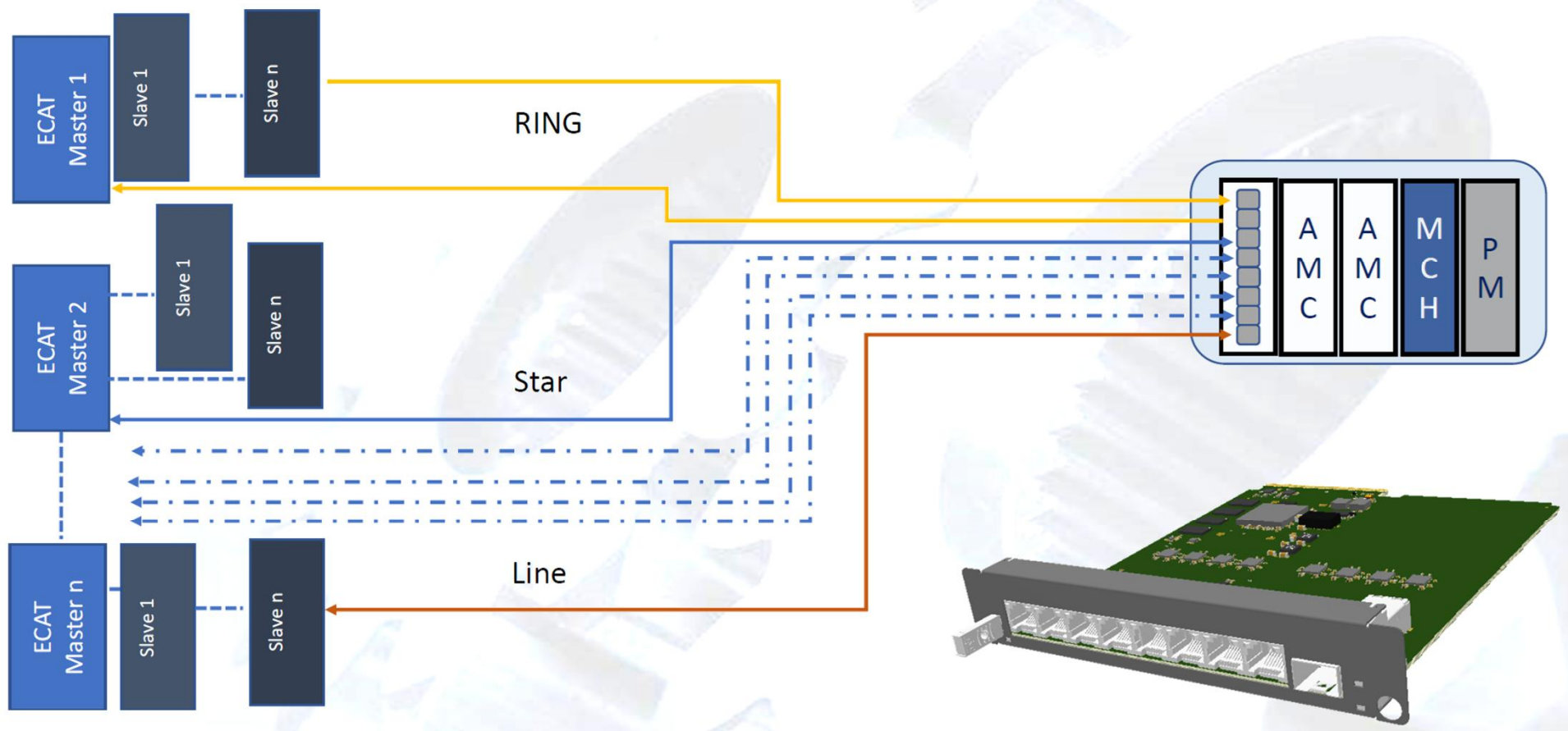
Kintex-7-FPGA



Xilinx-ZYNQUP-FPGAs



# EtherCAT with NAT-AMC-ZYNQUP-ECAT





## EtherCAT Slave modules

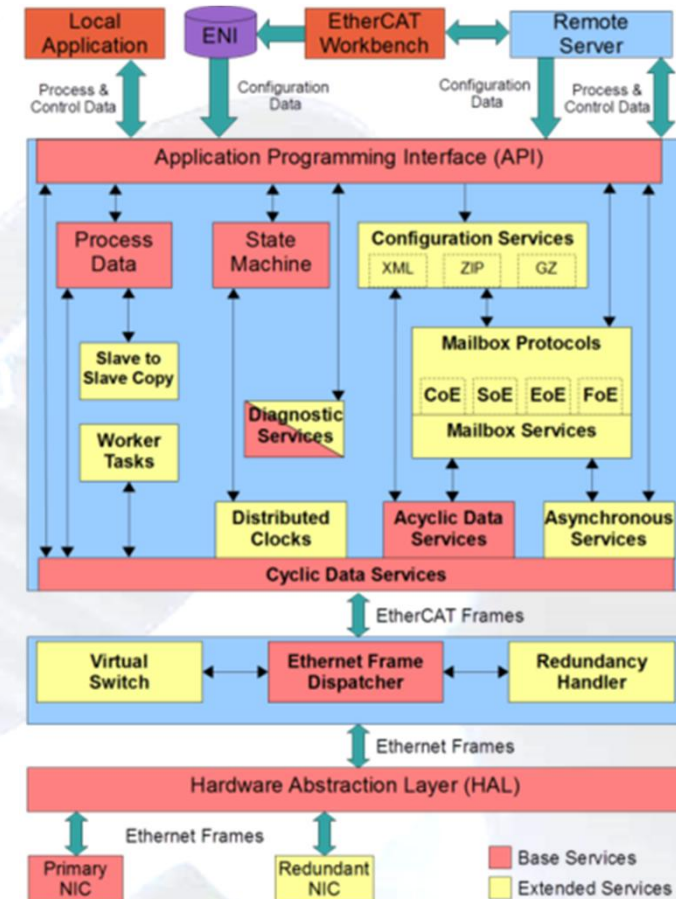
- EPS-9905 6-slot DIN rail mount with EPS-6000 EtherCAT bus coupler
- EPS-1132 digital input 32 channel with SPI interface (sinking type)
- EPS-2032 digital output 32 channel with SPI interface (sourcing type)
- EPS-2308 relay output 8 channel and 8 digital input with SPI interface
- EPS-3032 analogue input 32 channel (+/-10V) with SPI interface
- EPS-3216 analogue input 16 channel (0~20mA) with SPI interface
- EPS-3504 RTD input thermal 4 channel with SPI interface
- EPS-4008 analogue output 8 channel with SPI interface
- EPS-7002 pulse output motion controller 2 channel with SPI interface



## EtherCAT. Master

### MTCA System can act as EtherCAT Master

- Configuration and management of EtherCAT networks
- Cyclic exchange of process data
- Sophisticated API common to all implementations as interface between the application and the EtherCAT master stack
- Mailbox based communication with:
  - CAN application protocol over EtherCAT (CoE)
  - Ethernet over EtherCAT (EoE)
  - File over EtherCAT (FoE)
  - Servo Drive over EtherCAT (SoE)
- Built-in detailed diagnostics and profiling functions
- Written in ANSI-C designed with high performance, small resource usage and scalability in mind
- The core components are operating system (OS) and CPU architecture independent
- Adaption to many prevalent (real-time) operating systems available from stock
- EtherCAT Master Class A according to ETG.1500



## Standalone 2nd FMC, SDR Solution

### Features

- **NAT-FMC-SDR4**
- **FMC mezzanine board with RF front-end**
- 2x Analog Devices ADRV9009 dual RF transmitters, receivers, and observation receivers
- 4x Rx/Tx channels with large bandwidth
- Synchronizable for creating large phased-arrays
- Multiboard synchronization
- VITA 57.1 FMC high pin count (HPC) connector
- Direct access to the inputs via 2nd FMC with HDMI Interfaces.



## Wireless Solutions SDR Systems

### NAT-SDR-FLEX-L

#### 19" 3U rack-mount fully redundant system

- 1x **NATIVE-C3-PTM**
- 2x **NAT-MCH** for system management and switching
- 2x **NAT-PM-AC600**
- 2x **NAT-AMC-ZYNQUP-SDR8** mini-coax-to-SMA adapter cable
- 1x PrAMC (Intel® Xeon® [E3-1500 v5](#))
- 7x spare [AMC](#) slots for further system extension + 2x spare slots each for PTMs and PMs



### NAT-SDR-FLEX-M

#### 19" 1U rack-mount non-redundant system

- 1x **NATIVE-C1**
- 1x **NAT-MCH** for system management and switching
- 1x **NAT-PM-AC600**
- 2x **NAT-AMC-ZYNQUP-SDR8** mini-coax-to-SMA adapter cable
- 1x PrAMC (Intel® Xeon® [E3-1500 v5](#))
- 1x spare [AMC](#) slot for further system extension



### NAT-SDR-FLEX-S

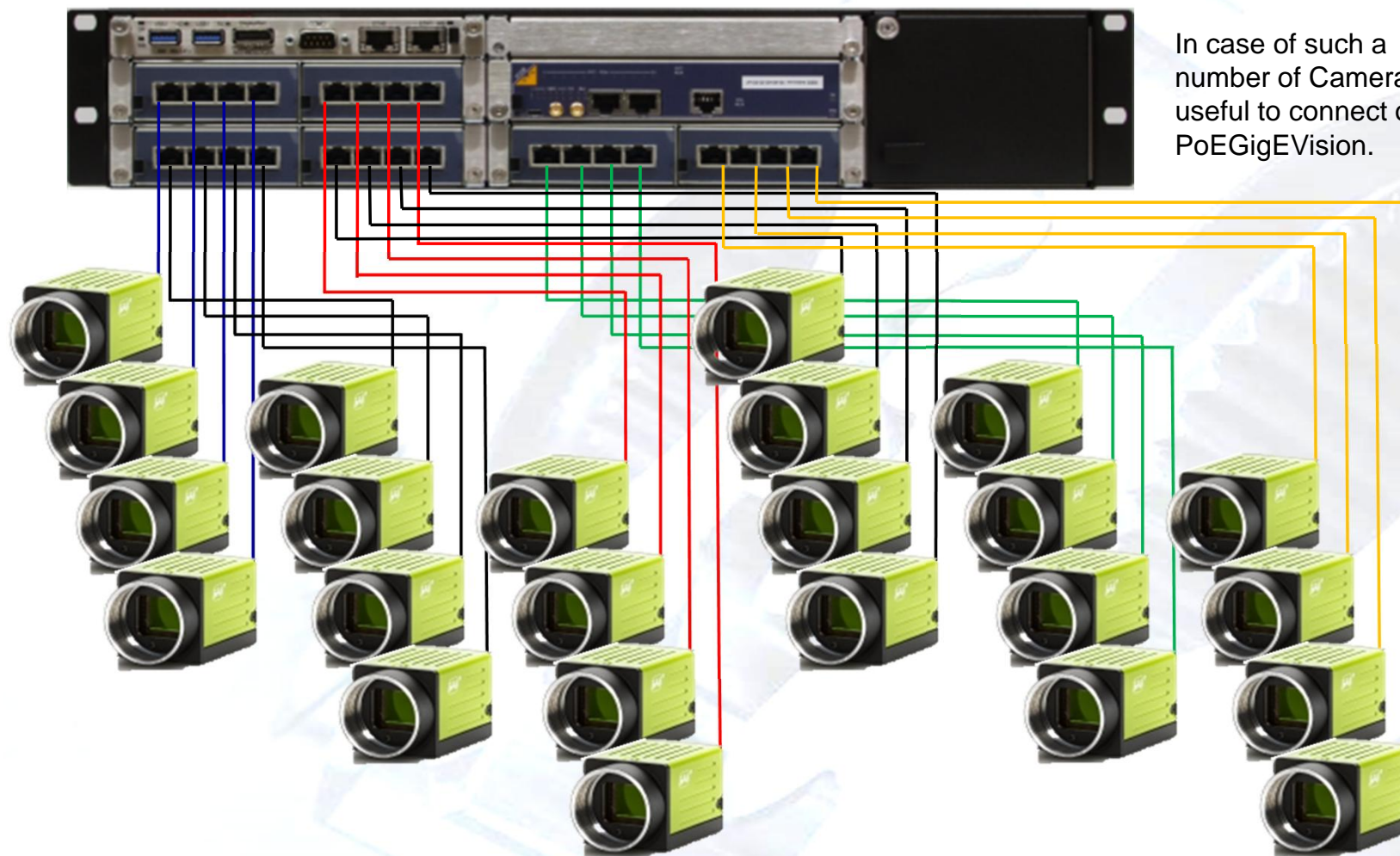
#### 1U table-top/set-top-box system

- 1x **NATIVE-mini** including 150WAC open frame PM and NAT-eMCH
- 1x **NAT-AMC-ZYNQUP-SDR8** mini-coax-to-SMA adapter cable
- 1x PrAMC (Intel® Xeon® [E3-1500 v5](#))



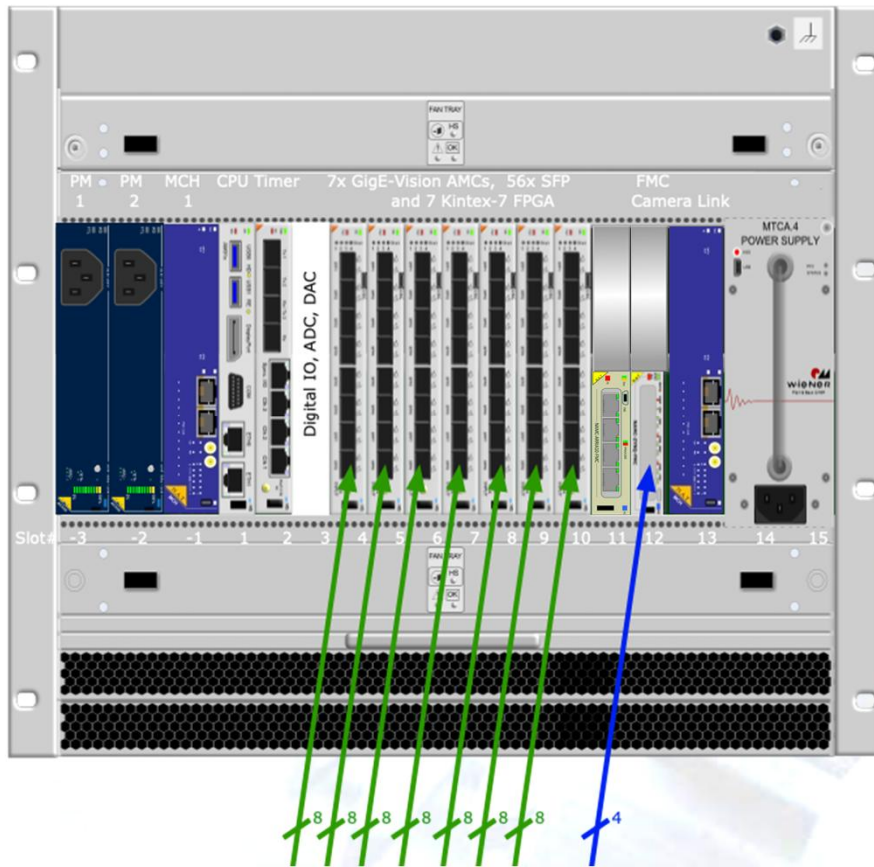


## Image Processing System mid range



In case of such a number of Cameras it's useful to connect over PoEGigEVision.

# PowerVision System Advantage Modularity, Flexibility, Bandwidth

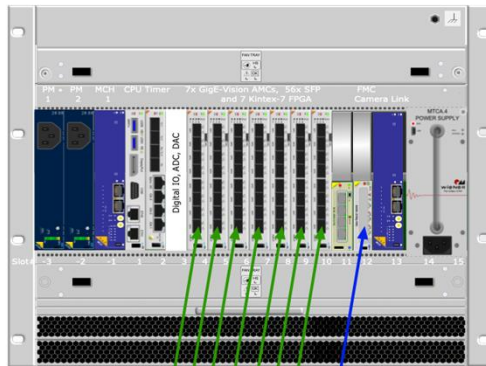


2nd FMC  
with HDMI



# Image Processing System maximized

**9U**  
12x8 GigE-Vision  
= 96 cameras



Qty GigE-Vision  
Cameras = 8

Qty GigE-Vision  
Cameras  
with Power over  
Ethernet  
or  
other Camera  
Interface e.g.  
Camera Link = 4



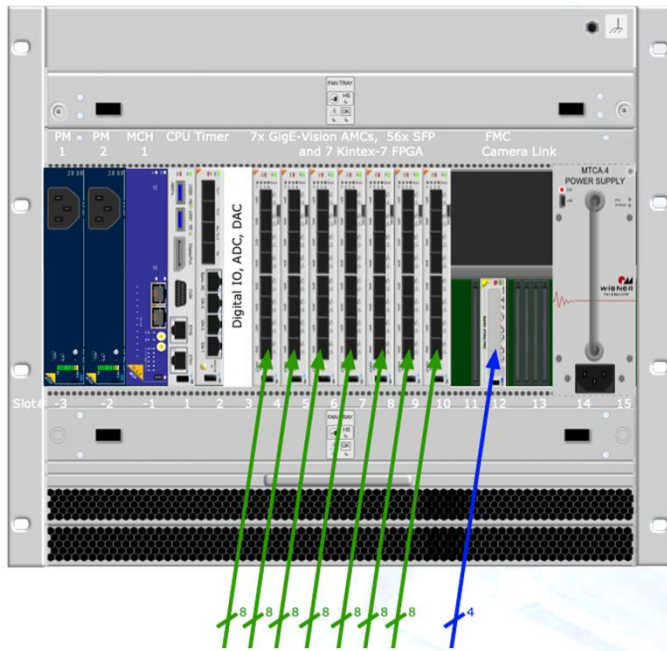
**4 x 2U = 8U**  
4 x 48 GigE-Vision  
192 cameras



**3 x 3U = 9U**  
3 x 4 and 2 x 8 GigE-Vision  
= 72 cameras  
or 6 x 8 GigE-Vision  
= 96 cameras

## 9U MTCA.4 Camera System

- 12x NAMC-TCK7 = 96 GigE-Vision Cameras
- 12x NAMC-FPGA-FMC = 48 Cameras
- Mixture of NAMC-TCK7 & NAMC-FPGA-FMC
- Timing & Triggerbus,**
- Low-Latency P2P Realtime-Fieldbus Master, e.g. EtherCat**



## 2U MTCA.0 DAC System

- 12x NAMC-FPGA-FMC= 48 DAC Channels
- Mixture of NAMC-TCK7 & NAMC-FPGA-FMC optional

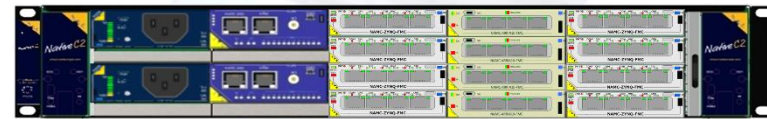
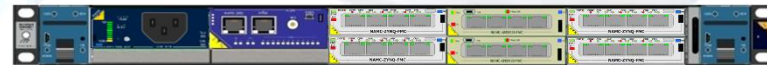


## 2U MTCA.4 multi using system

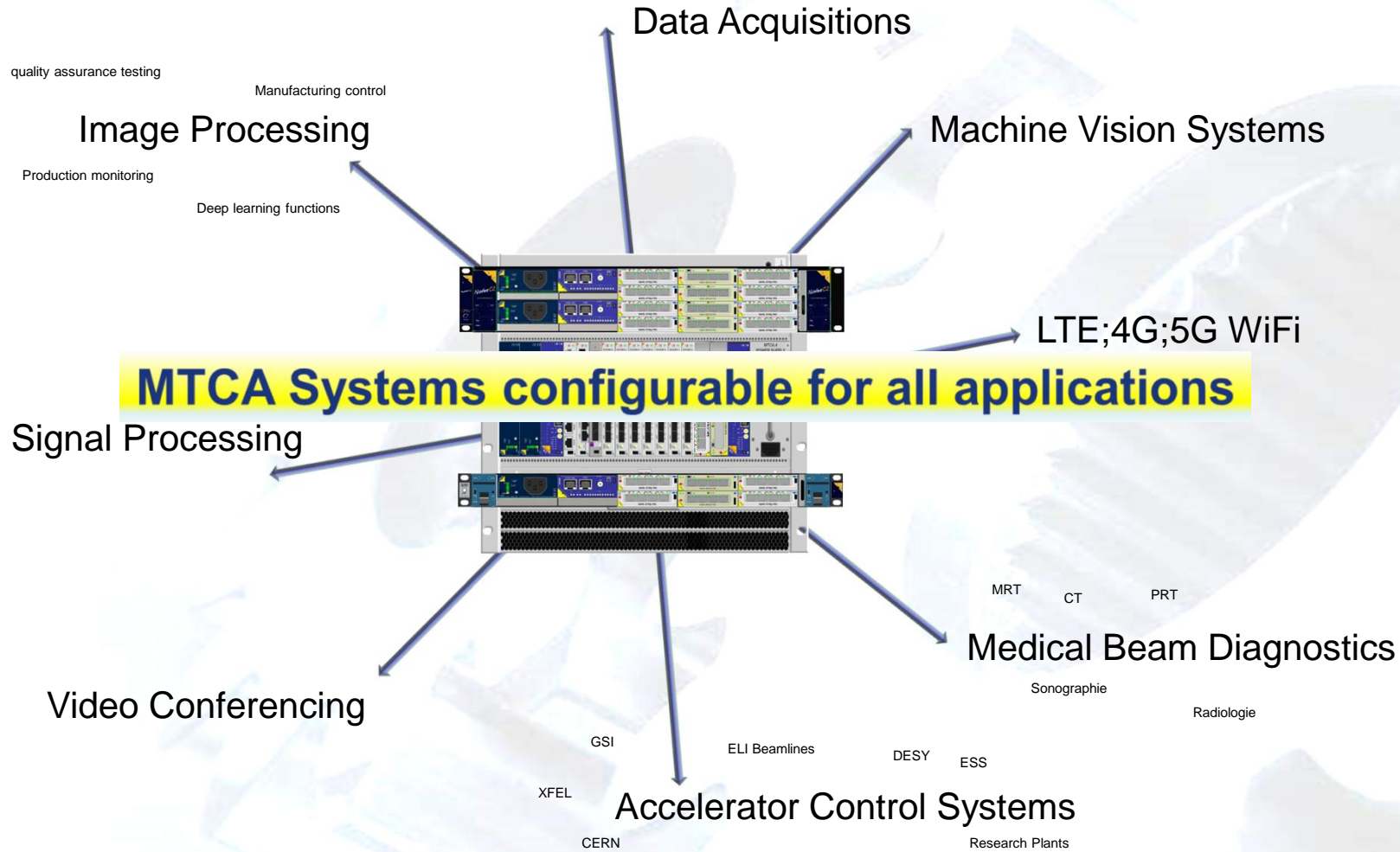
- 6x NAMC-TCK7 = 48 GigE-Vision Cameras
- 6x NAMC-SDR = 72 Wireless User
- Mixture of NAMC-TCK7 & NAMC-FPGA-FMC
- Realtime-Fieldbus Master, e.g. EtherCat
- Timing & Triggerbus, Low-Latency P2P**
- 4 USB-3 Cameras



Universal Data Acquisition Computing System



# powerBridge UDAC Systems



# Design-In Infrastructure

- Starter Kits Hardware & Development
- Starter-Kits
- Infrastructure Components
- Integration Components
- Standalone
- Right Function



turn-key  
user-ready



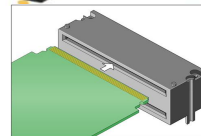
turn-key  
application-ready



19inch



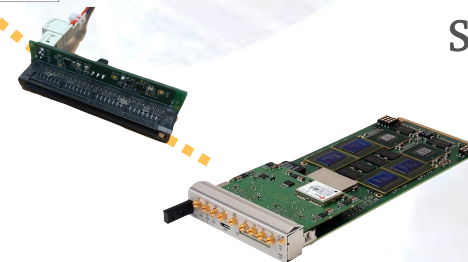
Small Box



Sub-module



Standalone



AMC

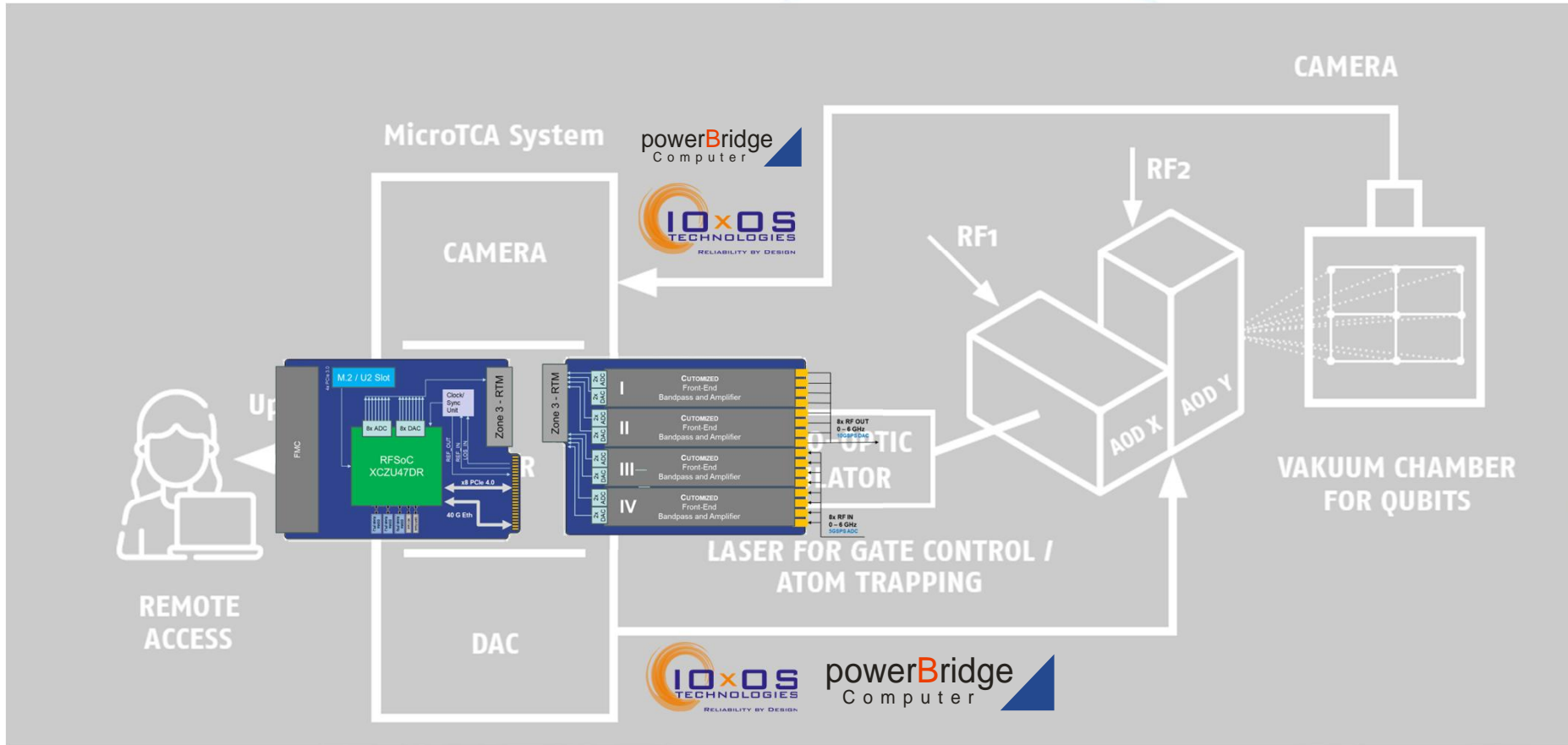


# Vision on CoaXPress 2.0 for MTCA DDS (Direct Digital Synthesizer)

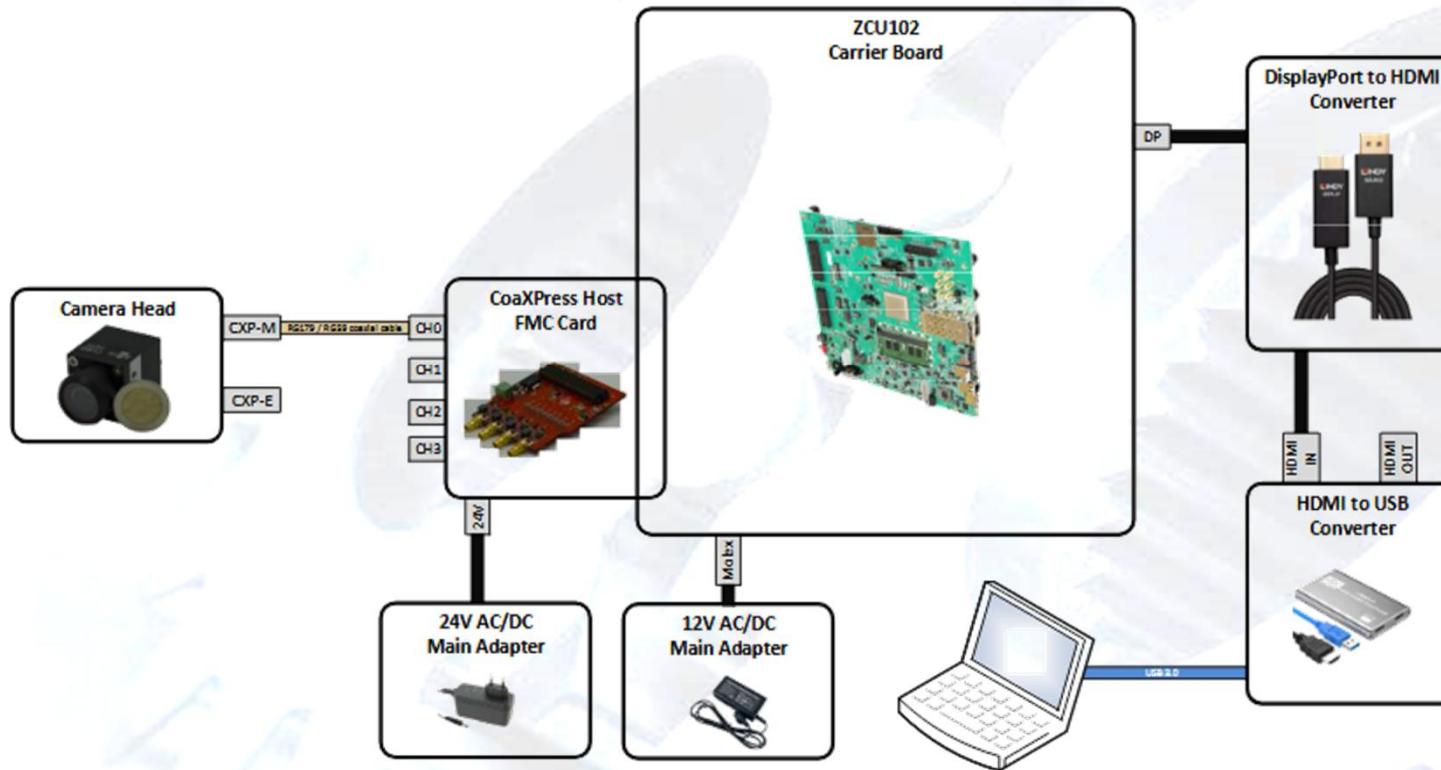
GSI Roadshow 2024



# MTCA for Quantumcomputing

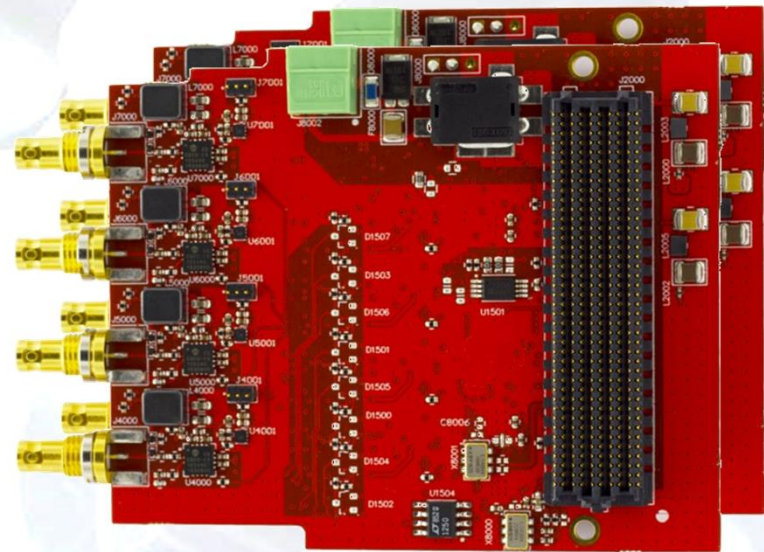


## Existing System / Demo



## Facts

- CoaXPress 2.0 / 1.1.1
- 4-connection, stackable to 8-connection,
- FPGA Mezzanine Card (FMC) standard.
- operating at up to 12.5 Gbps.
- Two boards can be stacked to provide up to 8 ports



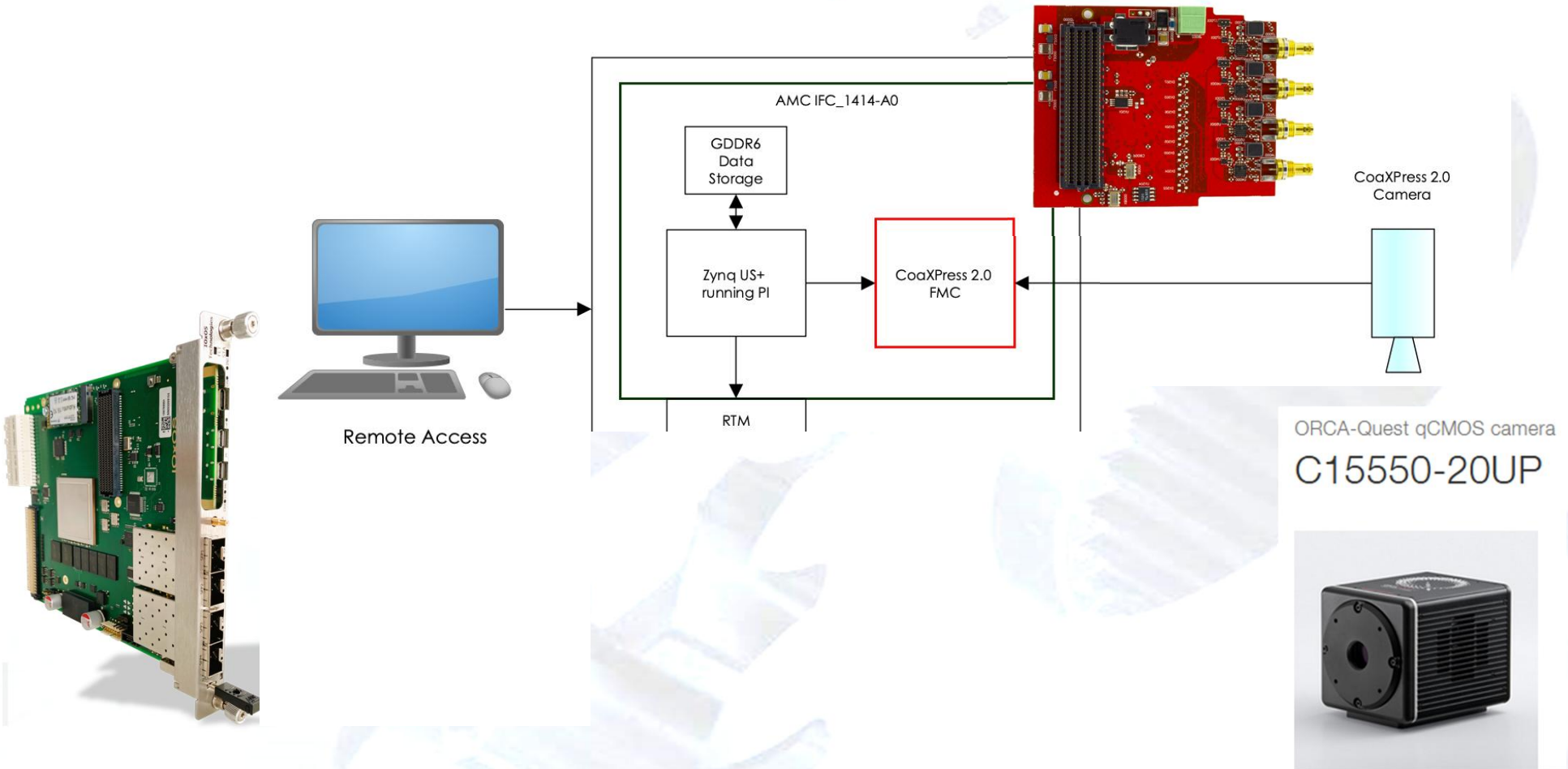
## IFC\_1414 Single Board Computer FMC



### ■ Key Features

- Xilinx Zynq UltraScale+ MPSoC (ZU7EG/ZU11EG)
  - PS: 2 GB DDR4 with ECC
  - PL: 2 GB GDDR6 at 16 GB/s
- Single HPC VITA57.1 FMC Slot
- Fast I/O Interfaces
  - Quad SFP+ (10 Gbps) or
  - Dual SFP+ (10 Gbps) + QSFP+ (40 Gbps)
- Local and remote configuration
- Support for White Rabbit PTP
- DESY D1.2 and D1.3 compliant uRTM interface

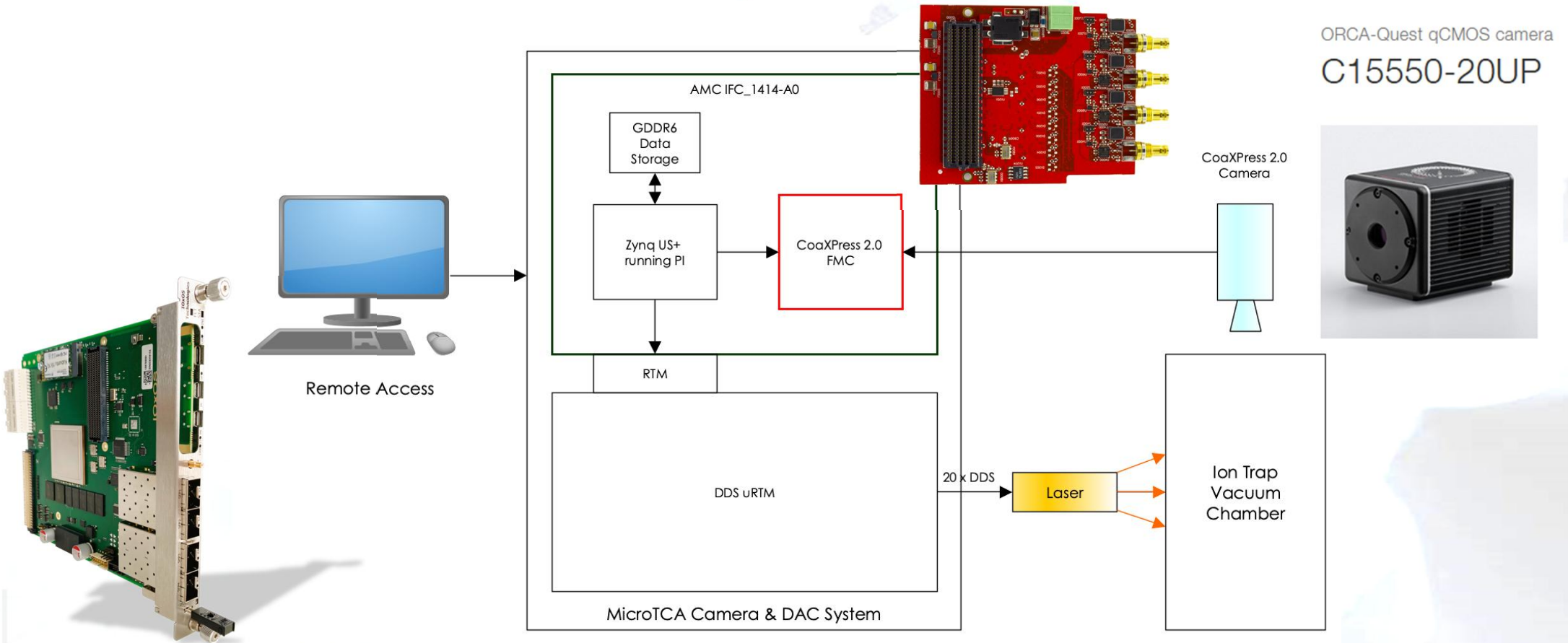
# MTCA Solution for Vision



## **DDS (Direct Digital Synthesizer)**

- **DDS on uRTM form factor**
- **Based on Analog Devices DDS AD99xx solution**
- **Up to 20 channels**
  - DAC resolution ranging from 10 to 14 bits
  - DAC speed ranging from 500 Msps up to 2.5 Gsps

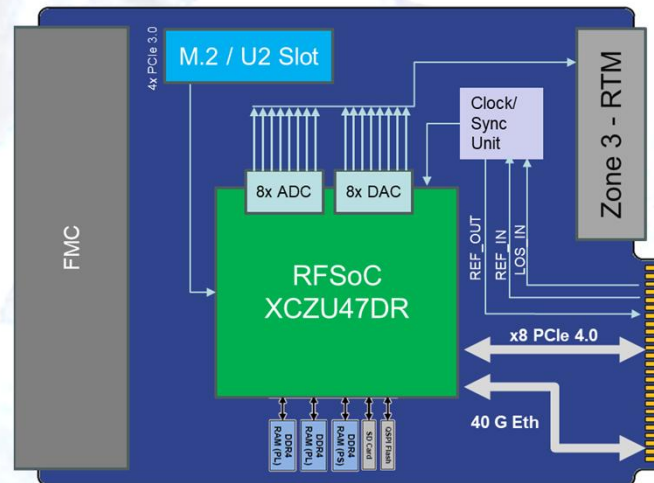
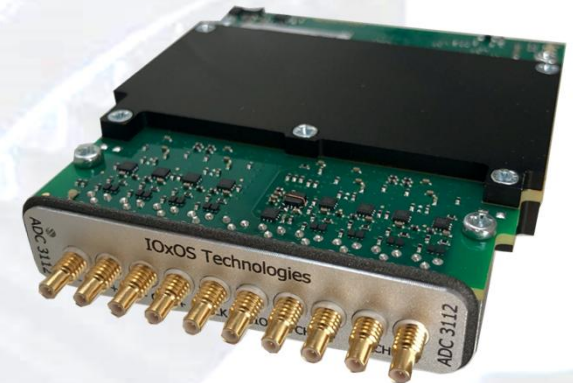
# MTCA Solution





## DDS on FMC

- **DDS on FMC form factor**
- **Based on Analog Devices DDS AD99xx solution**
- **Up to 4-8 channels**
  - DAC resolution ranging from 10 to 14 bits
  - DAC speed ranging from 500 Msps up to 2.5 Gsps





## Cooperation pBC and IOXOS



Development, VHDL programming and integration on the FPGA-Board

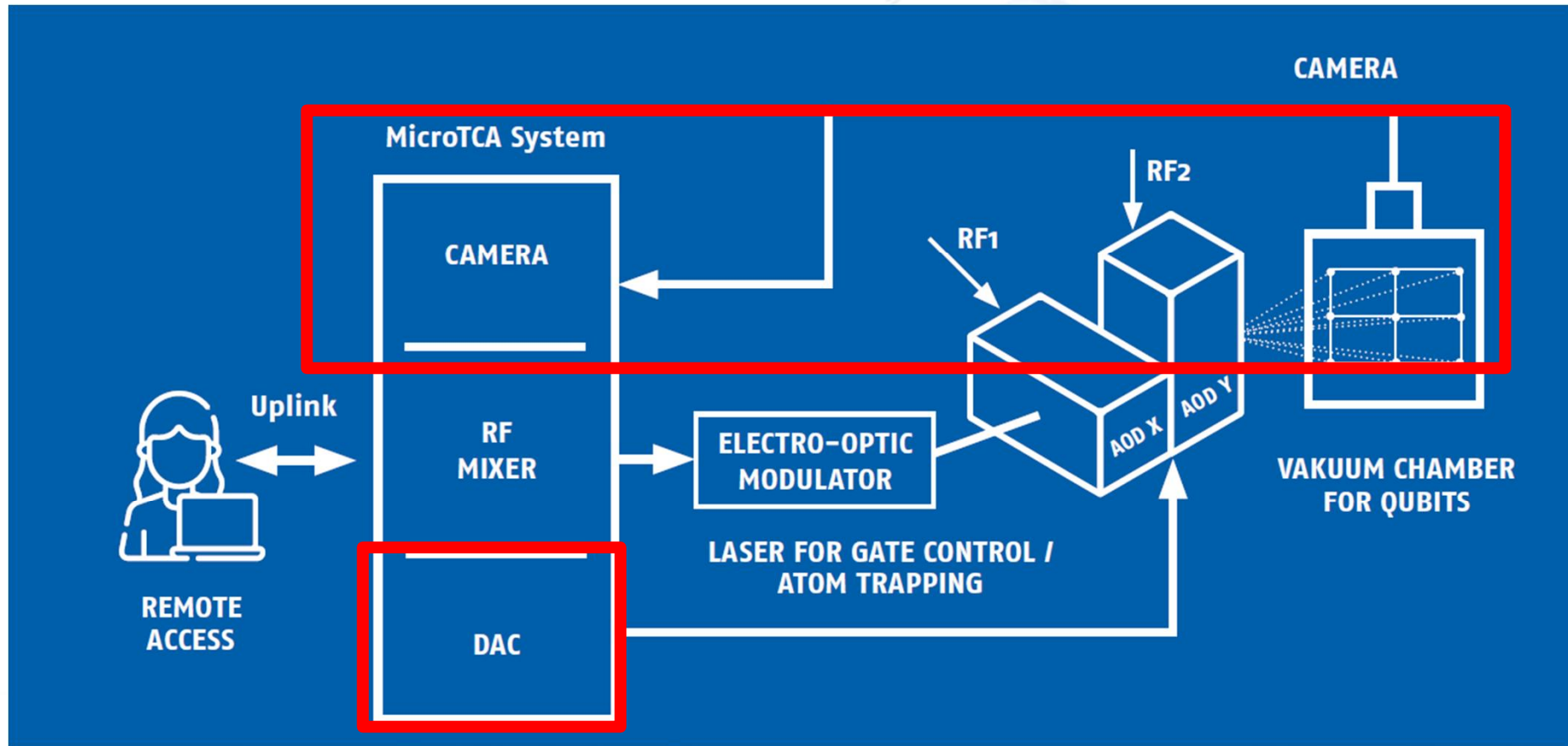


Sales, product management and integration in complete system

## Applications

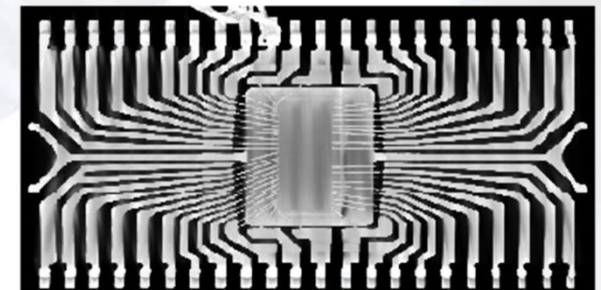


# MTCA for Quantumcomputing



### X-RAY

- X-ray microscopy / micro-computed tomography
- Quality inspection
- Frame Rate: 121 frames/s  
@ 4608x2592 pixel



## **Why another Vision Solution?**



## Current Market Situation

- **Many camera systems on the market**
  - For SPS
  - For IPCs
  - Stand Alone
  - National Instruments
  - Etc.

**→ Why on MTCA platform?**

## Why MTCA

- **MTCA is known for**

- High reliable
- FPGA-Performance
- High Data performance
- No mainstream

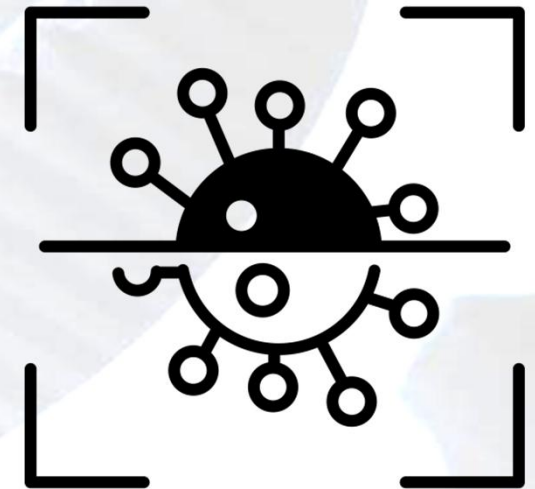
- ➔ MTCA is used, if the customer needs highest performance systems.
- ➔ Probably for about 1-2 % of all Vision-applications





## Conclusion

- **VISION for MTCA is useful,**
  - For max. 2% of all camera applications
  - Direct processing on the FPGA is required
  - High data rates are required



Created by nakals  
from Noun Project

## Overview Data-rates

Date rates	
1 GigVision	1 Gbit/s
10 GigVision	10 Gbit/s
Camera Link Full (64 Bit)	5,4 Gbit/s
PCIe Gen3.0 x1	8 Gbit/s
USB 3.2 Gen 1x1	5 Gbit/s
Coaxpress 2.0 x1	12,5 Gbit/s

→ up to 8x 12.5 Gbit/s = **100 Gbit/s**

## Advantages Coax-press

- **High data rates**
- **For absolute high performance applications**
- **Existing Frame grabber Board available**

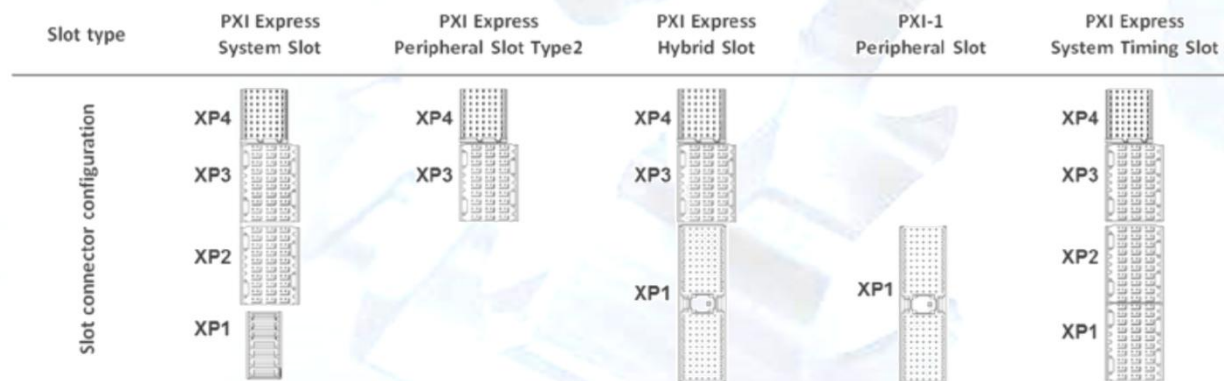




**PXIe**

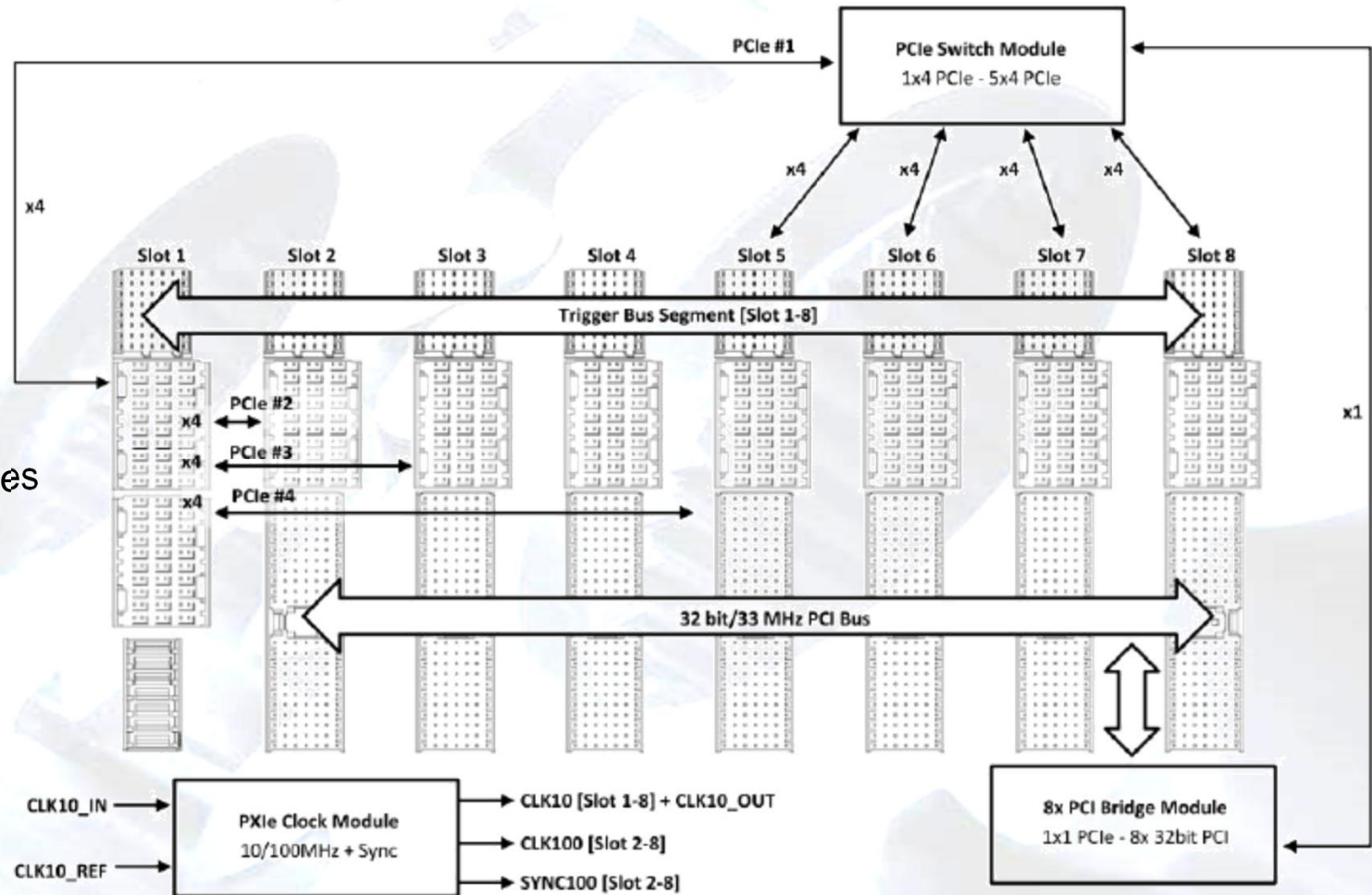
## Based on CPCI Express

- Identical form factor and connectors
- Similar performance parameters
  - PWR Management based on the ATX specification
  - five 3 U / 6 U\* slot types available
  - Fully downwards compatible to 32bit CPCI and PXI-1 modules
  - PXI-1 signals on XP4 (Trigger, daisy chaining, CLK10, star trigger)
  - Enhanced PXIe timing functionality on XP3
  - Highly precise, low jitter clock generation and switching
- Differential clock signals PXIe\_CLK100, PXIe\_SYNC100
- Differential trigger signal DSTAR\_TRIG[A:C]

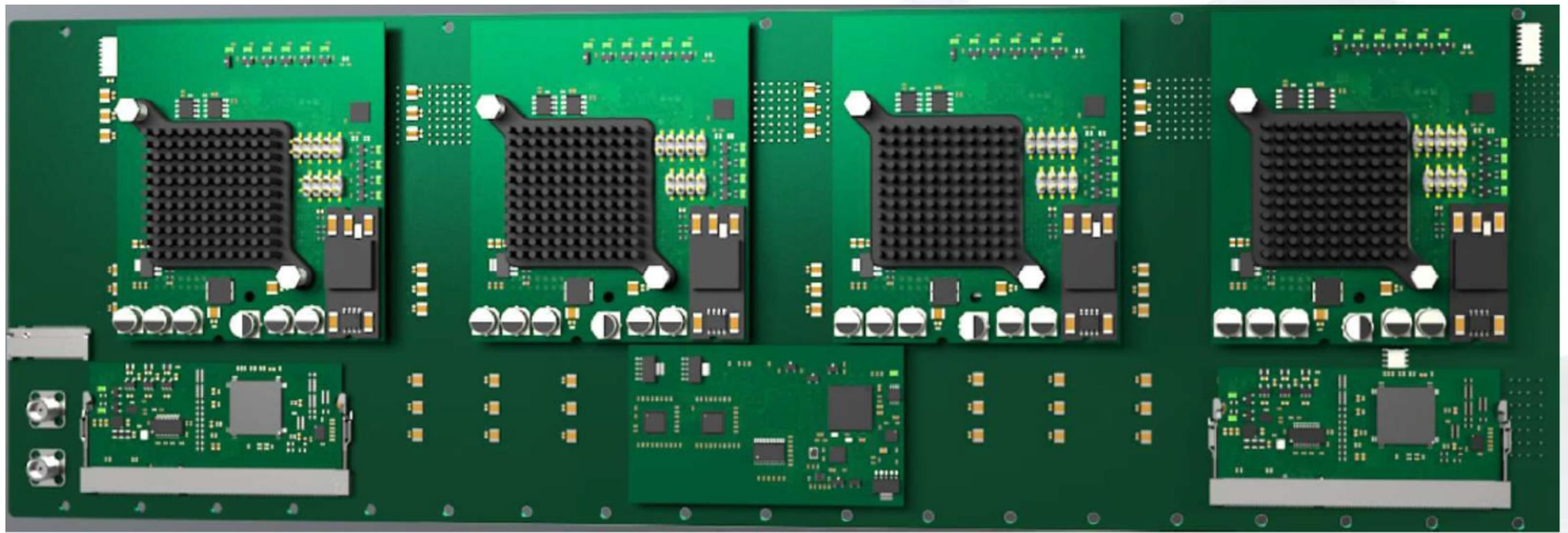


## Defining a PXle Topology

- (1) Number of Slots
- (2) Slot types
- (3) Customer requirement
- (4) Selection of required function modules
- (5) Definition of chassis interfaces



## Backplane (example): 18 Slot full hybrid



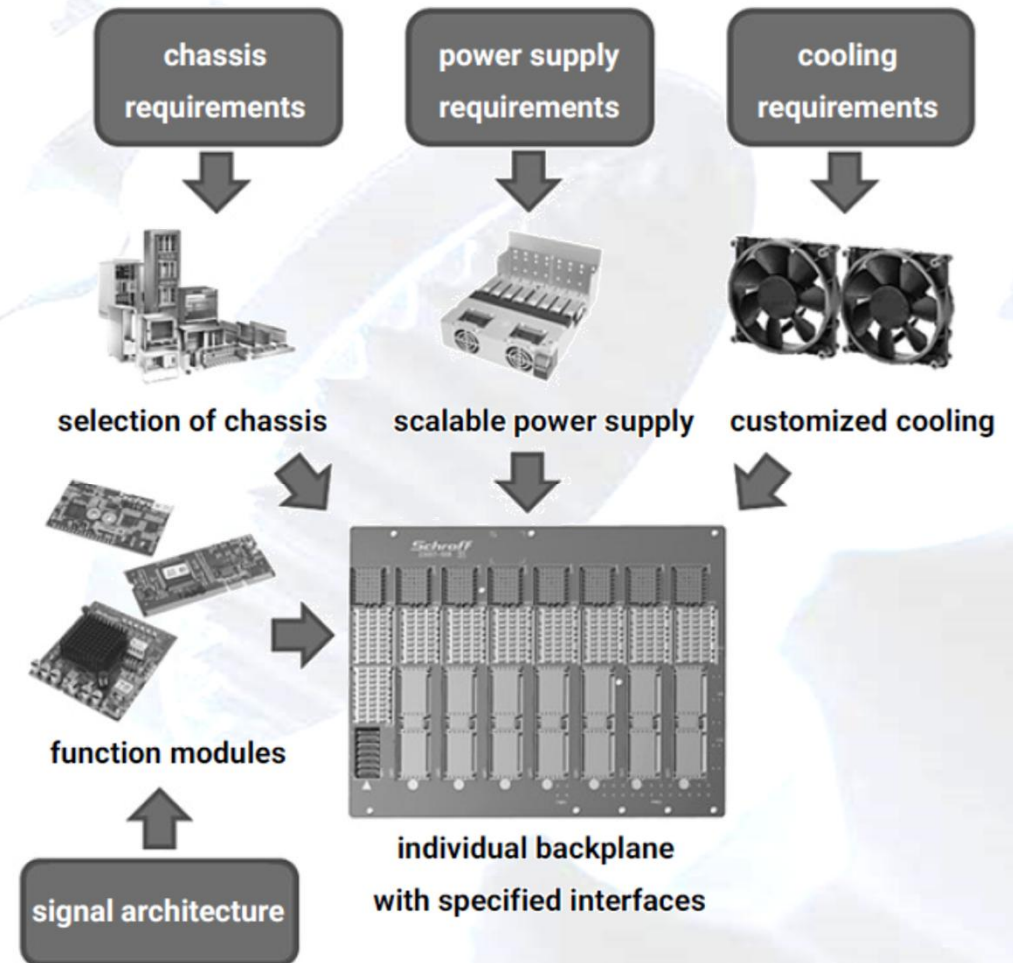
## System scaling and Module requirements

Backplane	PXI Express Clock Module	PCIe Switch Module	PCI Bridge Module	PXI Trigger Bridge
4 Slot Full Hybrid	1	0	1	0
6 Slot Full Hybrid	1	1	1	0
8 Slot Full Hybrid	1	1	1	0
10 Slot Full Hybrid	1	2	2	1
12 Slot Full Hybrid	1	3	2	1
14 Slot Full Hybrid	<b>1 + expansion</b>	3	2	1
16 Slot Full Hybrid	<b>1 + expansion</b>	4	2	1
18 Slot Full Hybrid	<b>1 + expansion</b>	4	2	2



## Benefits through modularity

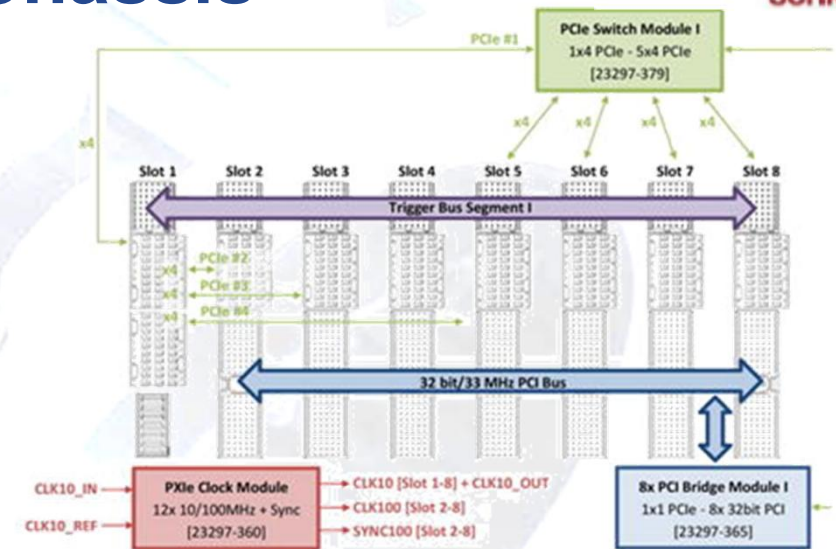
- Quality and properties guaranteed
- by verified standard components
- Customer requirements can be easily implemented
- Reduction of development time & costs
- attractive system costs even for customer-specific projects
- high maintainability and direct technical support



# PXI-Express Chassis

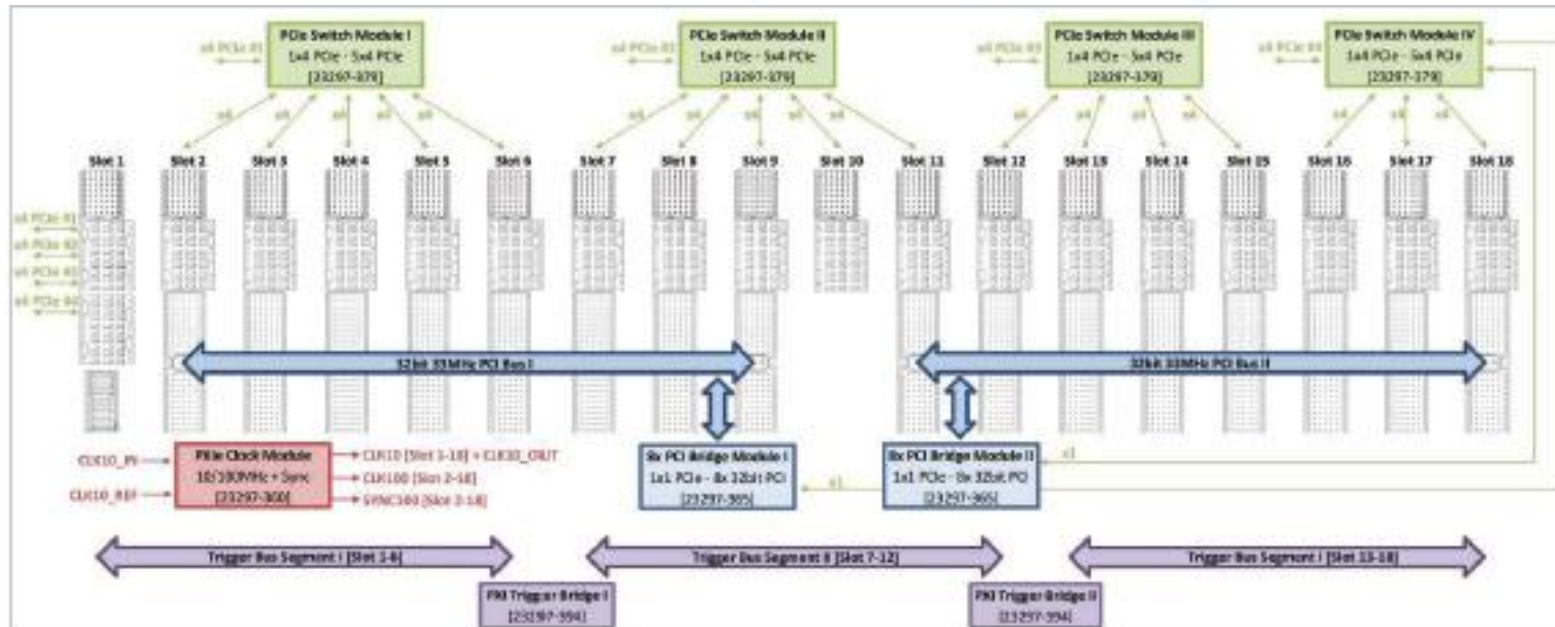
## Specification: PXI Express 4 U, 8 Slot, 44 HP

- Dimension: 19" 4HE
- Slotnumber: 8
- Numbers of Hybrid Slots: 7
- Numbers of PXI Express Slots: 0
- Numbers of PXI Slots: 0
- Max. System Bandwidth GB/s: 16
- Power/ Slot: 50 Watt
- Number of PXI Express Timing Slots: 1



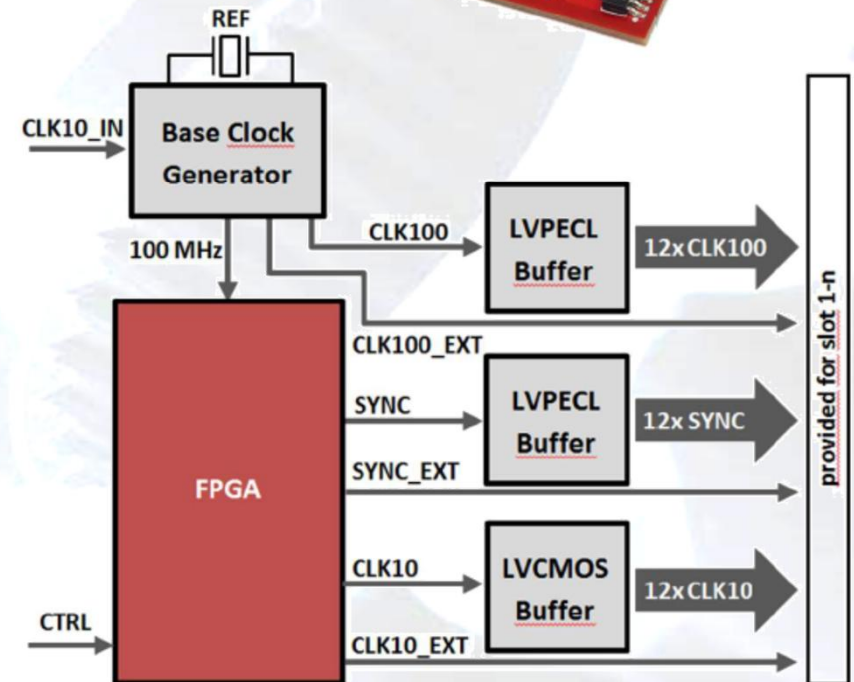
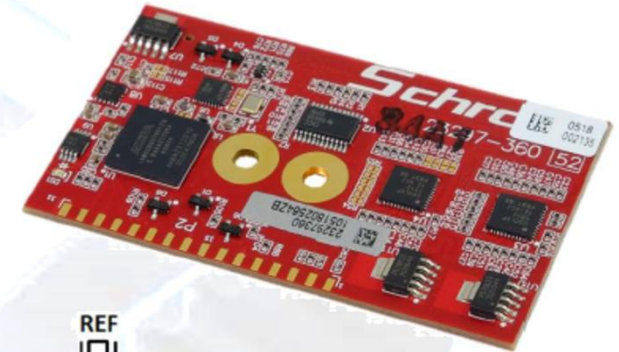
- PXI Express Desktop Chassis, 4 U, 84 HP, with handles and 19" mounting brackets
- 1 PXI Express System Slot with 12 HP width, 1
- PXI Express Timing Slot and 16 Hybrid Slots
- Ultra-high performance Gen 3 PCIe switching with a default four-link (4x4) system slot
- Powerful cooling concept with low fan noise, 50 W per slot 15K temperature increase
- Air flow from bottom to rear with temperature controlled fans;
- Integrated Chassis Monitoring Modul (CMM)
- Wide range AC input with mains switch on the rear side, power push bottom on the front (top) Rear panel
- external 10 MHz clock inputs/outputs

# PXIe Chassis 18 Slot, 4U, 84 HP



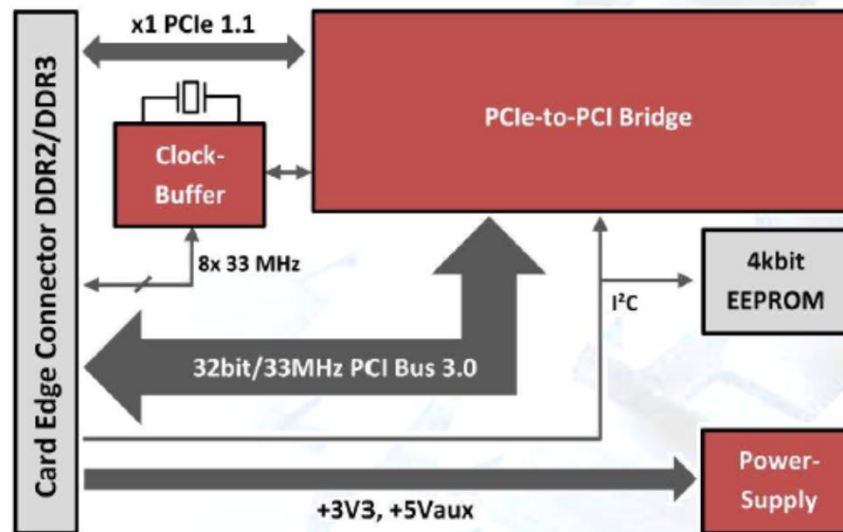
## FEATURES

- Generates PXI-1 & PXI-5 CLKs for up to 24 Slots
- CLK10 [10 MHz single-ended]
- CLK100 [100 MHz differential]
- SYNC [100 MHz differential]
- Switching to external clock sources via BNC jack or to a assembled System Timing Slot
- Ultra low phase noise and high frequency stability [ $<25\text{ppm}$ ]
- Customizable SYNC / CTRL scenarios



## FEATURES

- Downwards compability to PXI-1 and CPCI-Modules [VIO 3V3 and 5V0 supported]
- Translates a PCIe x1 upstream port to a PCI 32bit - 33MHz downstream port
- Supports up to eight PCI-Master simultaneously
- Highly efficient and low power consumption



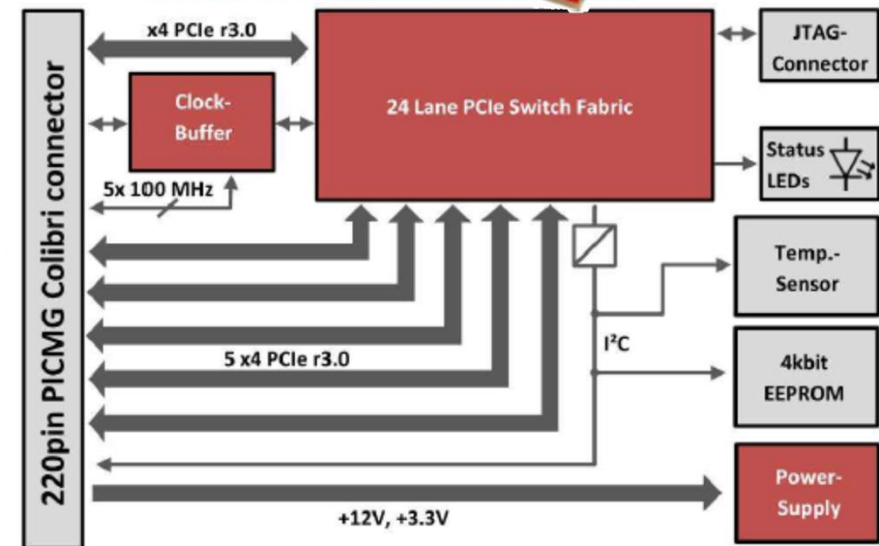
PCIe –PCI Bridge Module	
I/O Controller	Diodes Inc. –PI7C9X112SL
Port Count	Supports up to x8 PCI Masters
Primary Bus	X1 PCI Express Base Specification R1.1 compliant
Secondary Bus	33MHz/32bit PCI Local Bus Specification R3.0 compliant
Module Bandwidth	133MByte/s
Operating Voltage	+3,3V +/-5%      250mA +5V +/-5%      75mA
Interconnection	DDR2/DDR3 card Edge compatible
Power	Typical 700mW      max. 1200mW
Dimensions(LxBxH)	67,6mmx30,0mmx4,5mm
MTBF	>3.500.000 h at 40°C
Environmental	Op. Temp.      -40°C to 85°C Storage      -65°C to 150°C Humidity      20-80% non condensing



## FEATURES

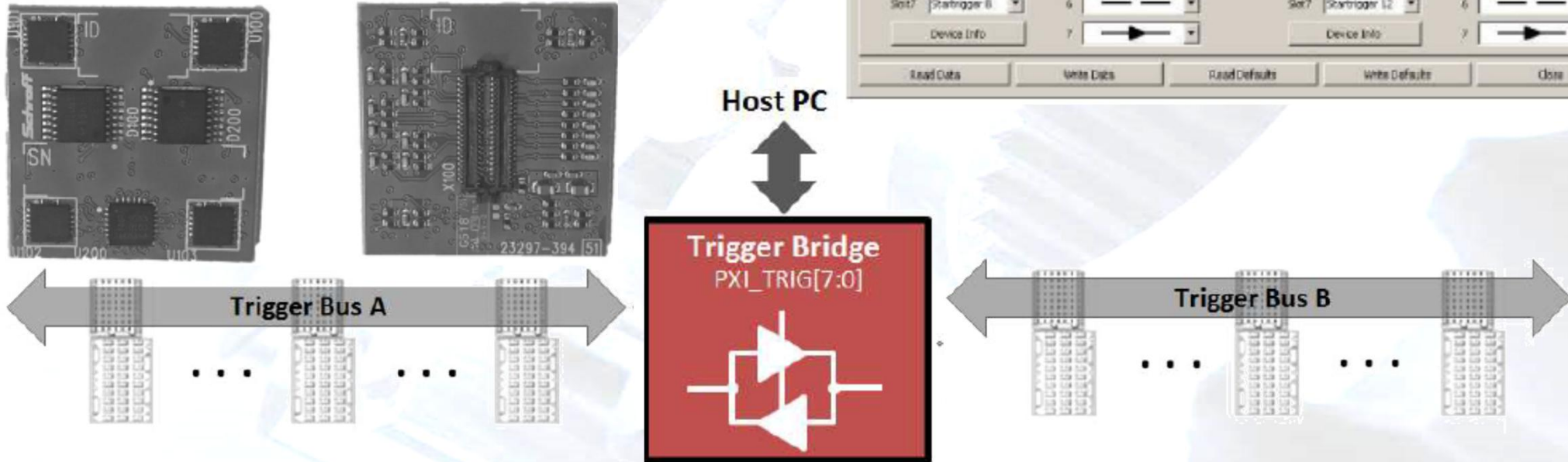
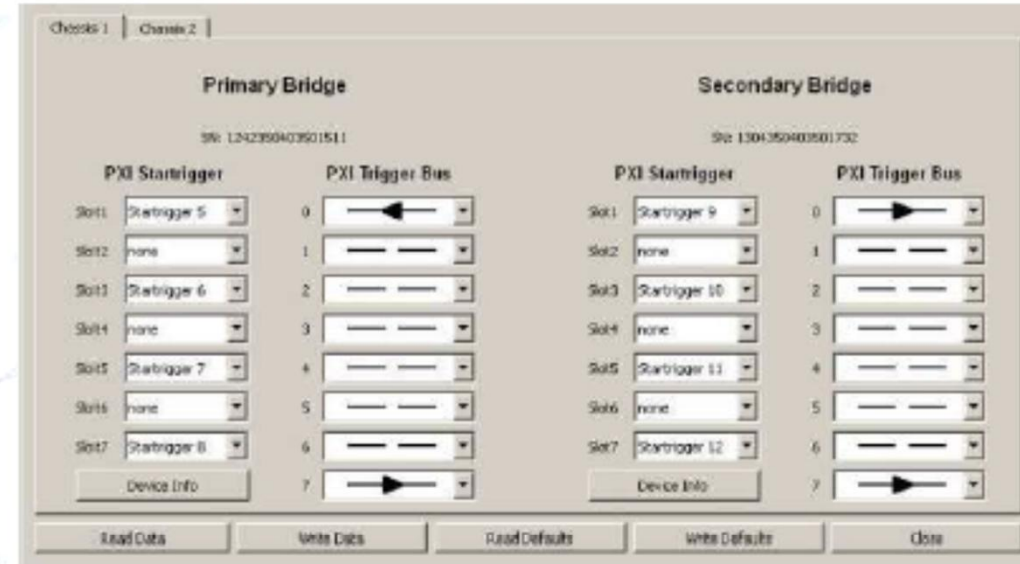
- Extends PCIe port capability up to 400%
- PCI Express Gen3 by default
- High Switching Performance through intelligent Packet-Flow-Control
- Excellent signal integrity and EMV behavior

PCIe 24 Lane Switch Module	
Fabric Switch	Broadcom-PEX8724
Bandwidth	4GB/s- PCIe Gen3
Port Configuration	1 x4 upstream port < - > 5 x4 downstream ports PCIe Base Specification R3.0 PCIe Base Specification R2.0
Combatibility	PCIe Base Specification R1.0a/1.1
Operating Voltage	+12V +/- 5% 1000mA +5V +/- 5% 200mA
Power	Typical 6,3W Max. 13,0W
Interconnection	220pin PICMG Colibri connector
Interfaces	4kbit SPI-EEPROM, JTAG, Local I <sup>2</sup> C, 2x GÜIO, Status LEDs
Dimensions(LxBxH)	80,0mmx70,0mmx20,0mm
MTBF	>3.500.000 h at 40°C
Environmental	Op. Temp. 0°C to 70°C Storage -55°C to 125°C Humidity 20-80% non condensing
Customized Version with 1 x8 >> 2 x8 port configuration up to 8GB/s	



## FEATURES

- Linking of separate system trigger segments, as max. 8 slots per trigger segment are possible according to specification by default
- unipolar connection A\_PXI\_TRIGX to B\_PXI\_TRIGX via software to host PC possible
- PXI compliant termination of trigger lines on trigger bridge
- Runtime-compensated trigger signals





## PXI Express Embedded Controller 3U 4TE

- PXI™-5 PXI Express hardware spec. Rev.2.0 compliant
- Maximum System Throughput 6 GB/s1
- Integrated m.2 NVMe PCIe Gen3 Storage
- 8th Intel® Core™ Generation with Hyper-Threading
- Most compact PXIe Embedded Controller on market
- Customizable BIOS
- 1 Four-Link mode PCIe Gen 3 x2 - x2 - x1 - x1

## PCIe-PCI BRIDGE MODULE

- Enables PCIe compatibility for multiple legacy PCI systems
- Operates in a fully transparent forward bridge mode
- 3.3 V and 5.0 V I/O compatible
- Wide industrial temperature range for various applications
- Very low power consumption at a common small form factor

## PCIe 24 LANE SWITCH MODULE

- Enlarges PCIe usability of PCIe limited host systems
- High Performance Switching Capability through flexible packet flow control
- Full PCI Express Gen3 –Gen1 backward compatibility
- Excellent signal integrity and EMC characteristics
- Very low power consumption at a small form factor



## Benefits

### Max. System bandwidth guaranteed

- PCI Express Gen3 supported by default for PXI Express Chassis
- Signal architecture without bottle necks

### Improved system cooling concept

- Low pressure & highly efficient
- Base-to-Rear-Airflow
- Less installation space required compared to competitors with several air in-/outtakes
- Each PXI Express chassis verified by simulation and post production thermal measurement

### Attractive pricing policy

- Especially for large systems, with non standard form factors or for customized requirements

### Maintainability

- short system downtime in failure event due to modular chassis concept
- easy replacement with functional spare parts

### Smallest PXI Express form factor

- Chassis can be shrunk to 4HP System Slot Module size without a common constructional offset

### Customization

- Fully customizable due to modularization
- Chassis can be customized easily and with low development time & costs

Backplanes and Chassis are designed by

## PXIe-3988

### Key Features

- 9th Gen Intel® Xeon® E processor (codename "Coffee Lake")
- Up to 64GB GB dual channel DDR4 at 2133/2400 MHz (non-ECC)
- Maximum system throughput up to 16 GB/s by PCI Express 3.0 bus
- Supports four links x4 or two links x8 PXI Express link indent to PXI Express chassis
- 2x GbE, 4x USB 2.0, 2x USB 3.0, GPIB (IEEE488) controller
- 2x DisplayPort connectors, 1x RS-232/422/485 DB-9 connector
- Trigger I/O for advanced PXI trigger functions



## PXIe-9834

4CH 16-Bit 80 MS/s PXI Express Digitizer



## PXIe-9852

Dynamic Signal Analyzer



## CPCI-3544

Video Capture Card



# PXI/PXIe Boards, Controller and more



## PXIe-9848

8-CH 14-bit 100 MS/s High-Speed PXI Express Digitizer

Key Features

- PXI Express specification Rev. 1.0 compliant
- Up to 100 MS/s sampling rate & High resolution 14-bit ADC
- Up to 100 MHz bandwidth for analog input
- 512 MB onboard storage memory
- Programmable input voltage range of  $\pm 0.2$  V or  $\pm 2$  V, or  $\pm 100$  V Max
- Scatter-Gather DMA data transfer for high speed data streaming
- One external digital trigger input
- Full auto-calibration

## Dynamic Signal Acquisition & Analysis PXIe-9529

8-CH 24-Bit High-Resolution Dynamic Signal Acquisition Module

Key Features:

- 8 simultaneous sampling analog input
- 24-Bit Sigma-Delta ADC
- $\pm 1$ V, and  $\pm 10$ V input ranges
- AC (0.5Hz) or DC input coupling, software selectable
- 110 dB dynamic range



## PXI/PXIe Boards, uplink Boards

PCIe-8560/PXI-8565

### Key Features

- PCI Express-based control of PXI/CompactPCI
- High-speed PCI Express x1 interface
- Direct control of PXI/CompactPCI systems
- Supports 32-bit/66 MHz PCI™ interface
- Expansion distance of up to 7 meters  
(expansion cables at 1 M, 3 M, and 7 M)
- Comprehensive hardware and software transparency



## Contact Information

Let's discuss your requirements and test our performance!

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