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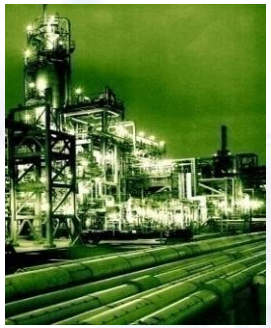
Computer






MTCA Ecosystem…

and real world applications.

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- Over 20 years in the market
- Privately owned
- Over 25 years VME experience
- Own Lab and integration facilities
- powerBridge has delivered over 27.000 VME boards and 5.500 systems
- Active PICMG member
- ISO 9001:2008 and 14001:2009 approved

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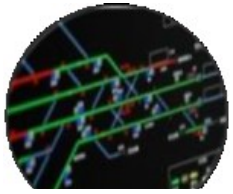
Medical. Transportation.
Communication. Automation.


Transportation


Communications Network


Command & Control


Medical Processing Equipment


Process Control

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Scientific


Rugged Computers


Intelligence, Surveillance & Reconnaissance


Unmanned Vehicles


Training & Simulation

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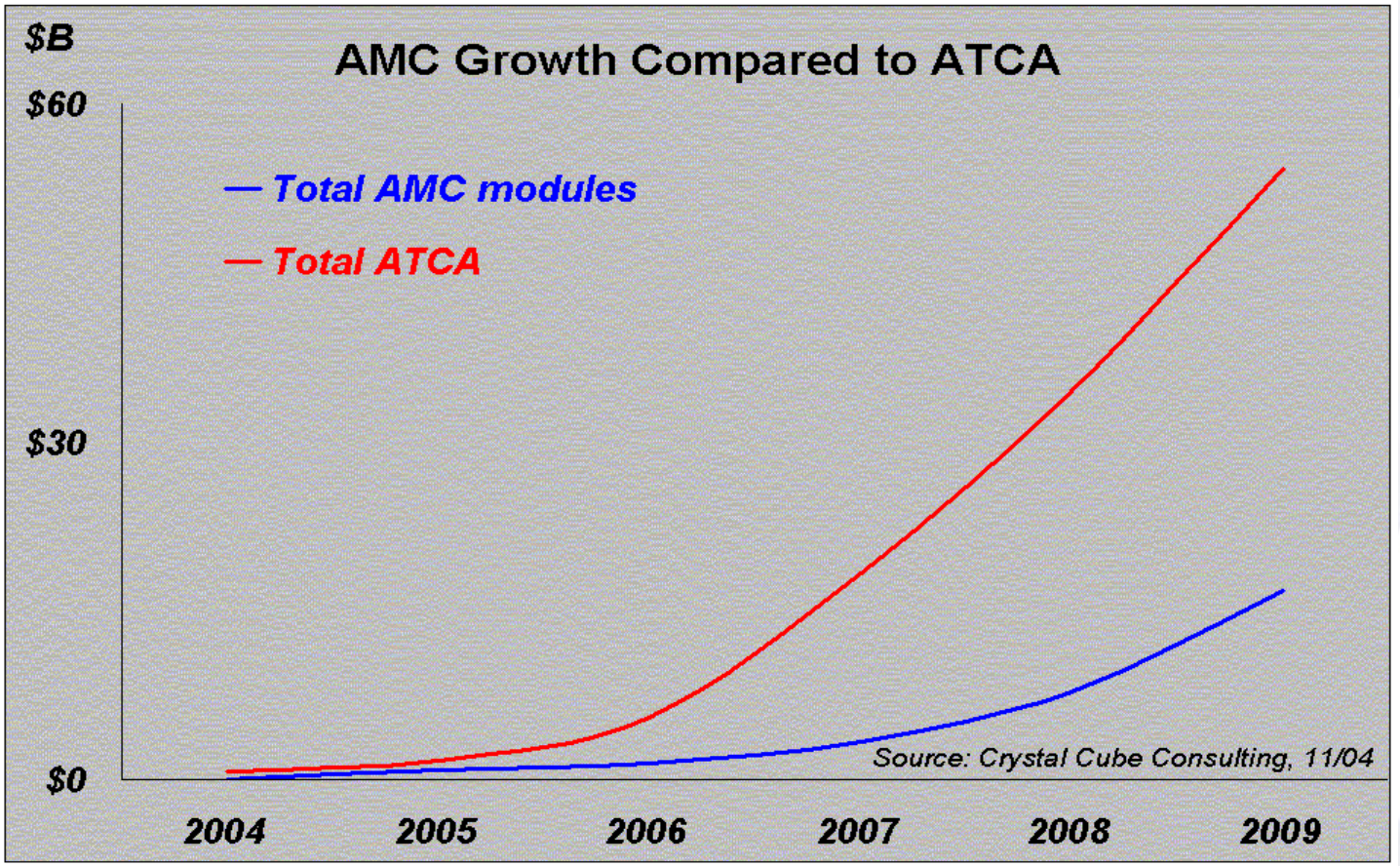
Growth. Prognosis.

ATCA and AMC modules.



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PICMGs. View.
Today.

Markets

Our diverse membership allows PICMG to develop compelling specifications in multiple markets. PICMG technologies are widely used in a broad swath of industries including industrial automation, military/aerospace, transportation, communications, test/measurement, physics/research, energy, medical, and more!

	COM Express	AdvancedTCA	CompactPCI	CompactPCI Serial	HPM	MicroTCA / AMC	SHB
Industrial Automation	X		X	X		X	X
Gaming	X						
Telecommunications	X	X			X	X	
Aerospace	X		X	X	X	X	
Defense	X	X	X	X	X	X	X
Railway	X		X	X	X	X	
Energy	X		X	X	X	X	X
Medical	X		X	X	X	X	
Test / Measurement	X	X	X	X	X	X	
Physics		X			X	X	X
Drones / UAV	X		X	X	X	X	

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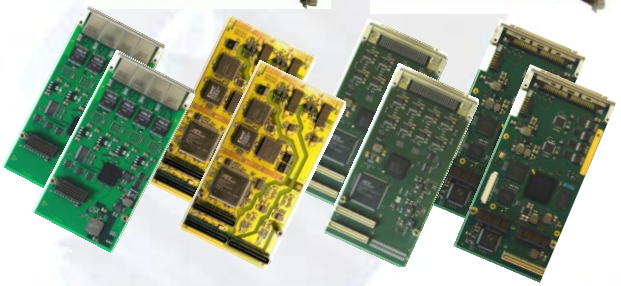
MTCA. New products.
Chassis and AMC.







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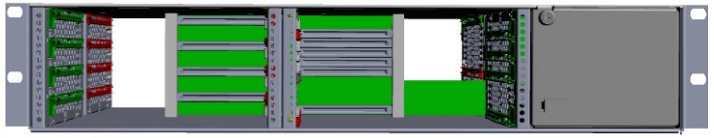
RackPak/M5-1.

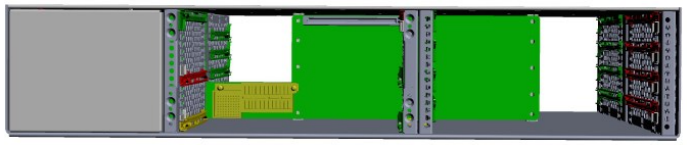
Smart, dense MTCA.4.

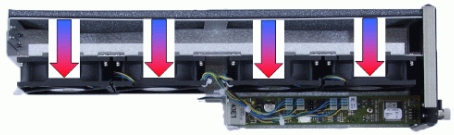
Joint Development together with N.A.T. and Pentair

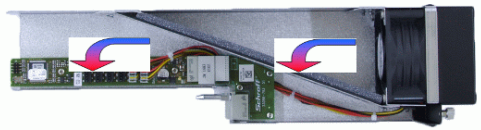
Front view



Rear view







- 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 µRTM slots
- Double full-size MCH slot with µRTM Slot
- Double full-size Power module slot
- Exchangeable cooling unit with front to left or right to left air flow
- Dust filter exchangeable
- Order codes:
  RackPak/M5-1R (right-to-left cooling)
  RackPak/M5-1RS (right-to-left cooling)
  or
  RackPak/M5-1F (front-to-left cooling)

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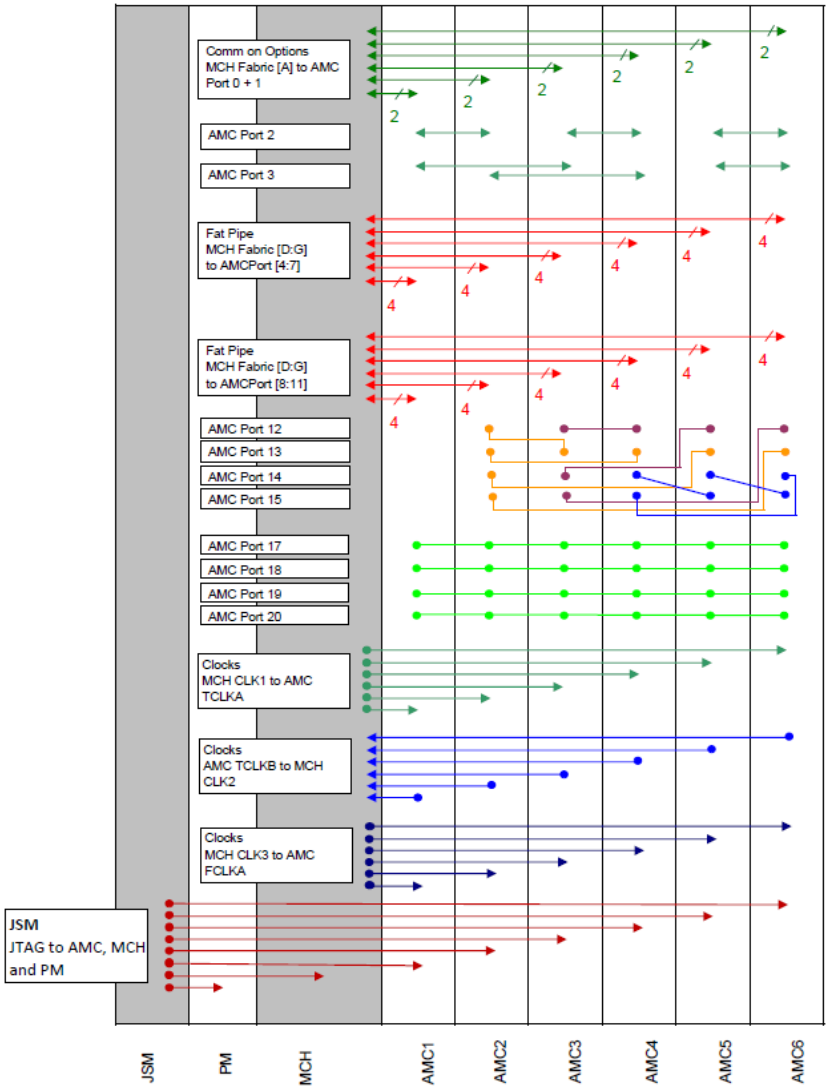
RackPak/M5-1.

Smart, dense MTCA.4.

- Backplane Topology



- **Dual** Ethernet Link (Port 0+1) to every AMC
- Dedicated SATA Links on Ports 2&3
- **PCIe x8** support on Ports 4-11
- Point to Point connections on Ports 12-15
- Daisy Chain on Ports 17-20
- TCLKA, TCLKB and FCLKA Clocks
- **JTAG Switch Module (JSM)** Slot
- Optional White Rabbit Support

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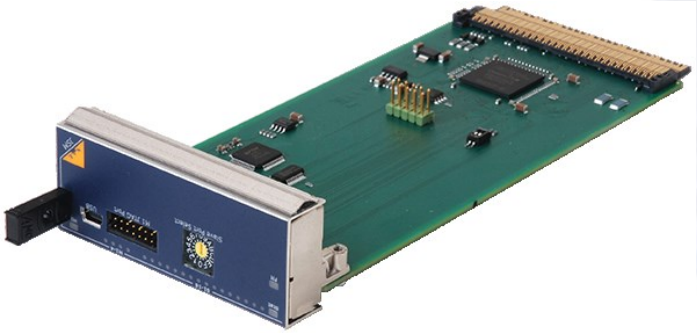
JTAG adapter.

Ease of programming.



- JTAG Switch Module (JSM) in single mid/full size AMC form factor with onboard FPGA to adapt to any JSM pin-out at AMC type backplane connector (default N.A.T. pin out, others on request)
- JTAG download via MCH through Ethernet
- JTAG programming connector at front panel
- Automatic arbitration between JTAG Masters
- Target selection through JTAG information
- Overrule of automatic operation and dedicated selection of JTAG target by front panel elements
- Multiple JSM pinout configurations via FPGA

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AMC extender.

Ease of development.

- AMC extender are passive extenders
- Front AMC extender module
- Rear µRTM extender module
- Enables access to AMC modules and signals
- Supports all fabric connectors
- available with additional power supply for development

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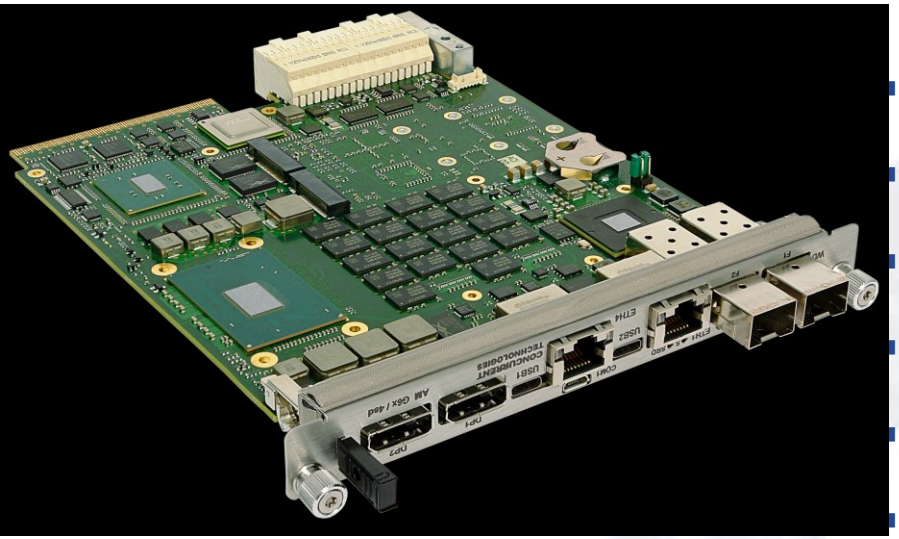
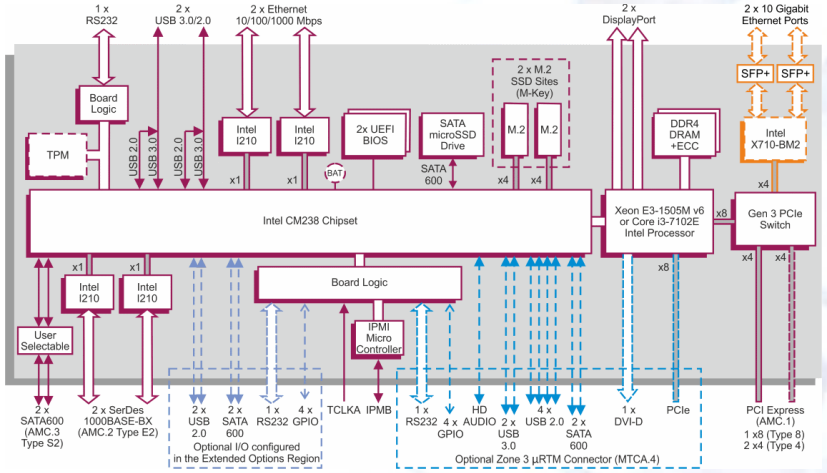
AM G6x/msd.

Raw computing power.



- Intel Xeon E3-1505M v6 or Intel Core i3-7102E
- Up to 32GB ECC memory
- Intel HD Graphics P630
- 2x PCIe x4 or 1x PCIe x8 to fabric
- Wide range of frontpanel connections
- Build in SATA microSSD
- Two M.2 sites for high speed storage
- Support for serial-over-LAN and IPMI-over-LAN



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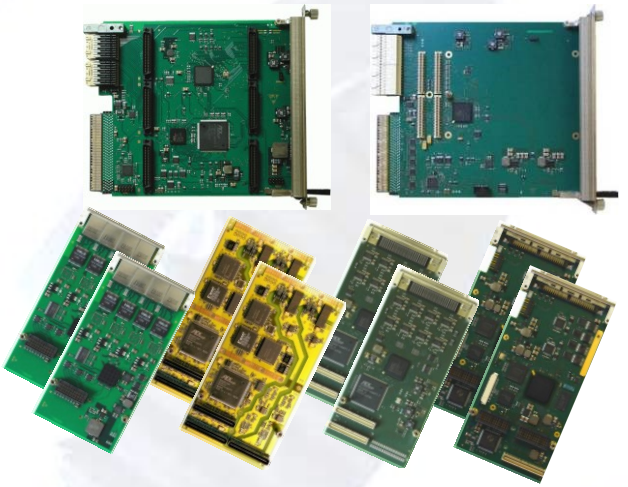
MTCA Toolbox.

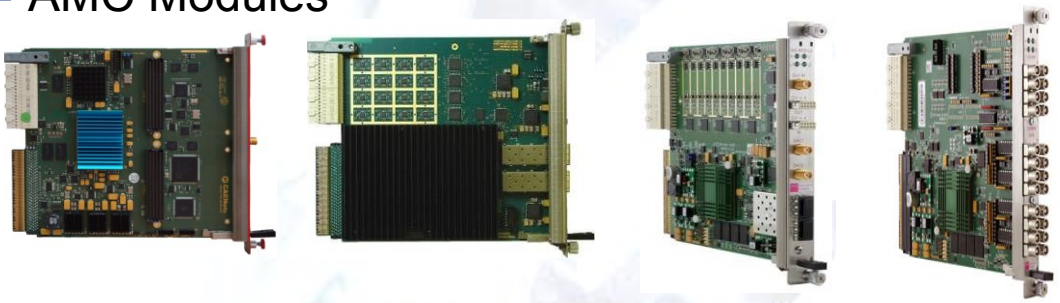
Starterkits and components.

- MTCA.4 Starter Kits, including MCH, CPU & PM

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



- AMC Modules



- SW & FW Support including BSP, source code drivers, sample applications, FPGA framework

- Spare parts, like filler modules, adapter cables, program and debug tools, test adapter

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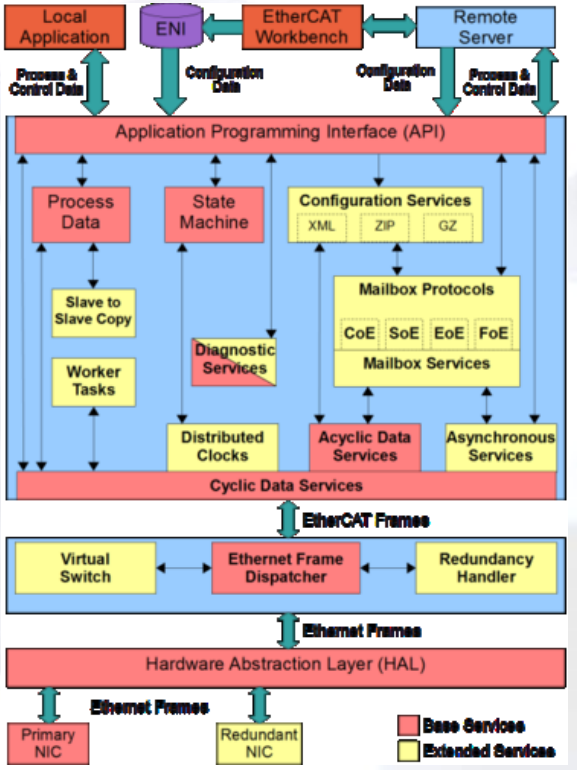
Fieldbus.
EtherCAT. Master.

- 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



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Fieldbus.
EtherCAT. Slaves.

EtherCAT Slave modules

- 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

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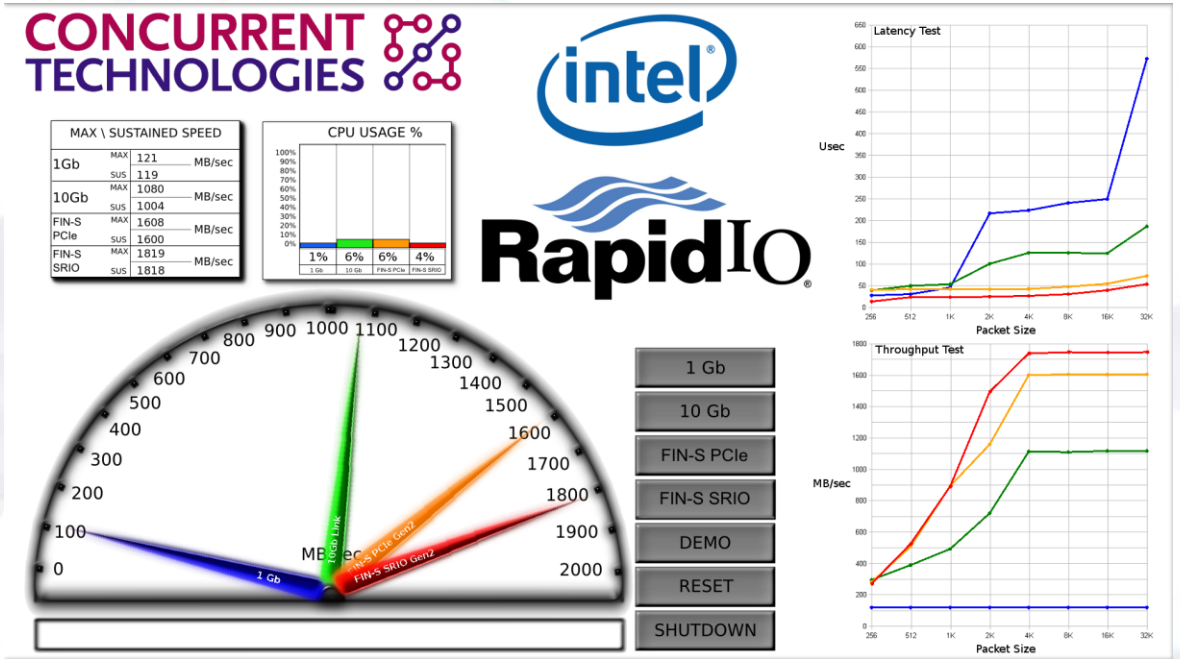
FIN-S.

High Speed Data Transfer.



Fabric Interconnect Networking Software FIN-S

- IP based socket communication
- Direct Inter-Process Communication Interface
- Support for Linux, Windows, VxWorks
- available on AMC, VPX, VXS
- High Performance, Low latency comms
- support of PCI Express, Serial Rapid-IO, 10GbE fabric

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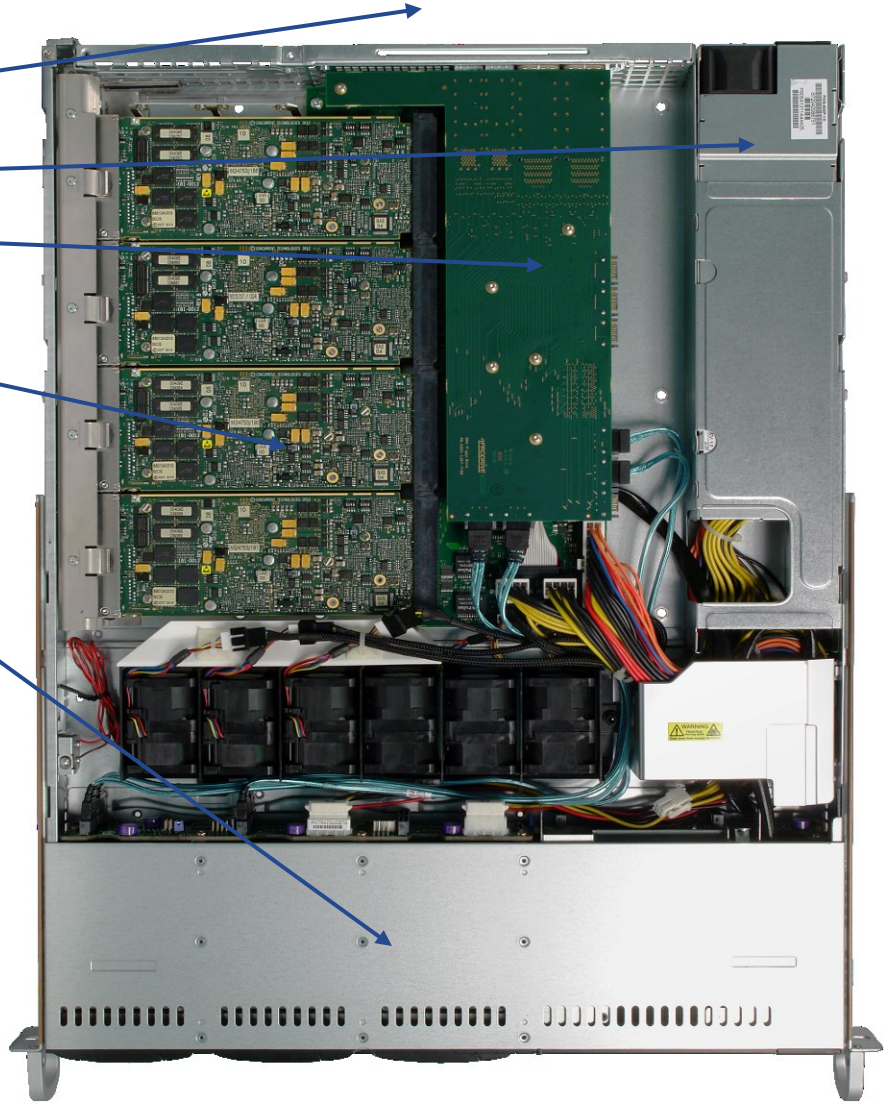
DCCN. Open HPC.

System look.

- Data Center Compute and Network
- 3rd Party 19” 1U rack
  - 10G Ethernet connectivity
  - PSU
  - Fabric switch board
- 4 AMC Module sites
  - Fitted with any combination of CPU/GPU
- Up to 8 spaces for 2.5” removable drives
  - 2 SATA connections to each Module
- Open HPC (high performance compute) Platform
  - Blade server concept based upon AMC



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MTCA. HPC Traffic control.

High Density. Maximum Flexibility.

- COTS components
- Small system footprint
- Fully redundancy for system!
- No NRE or additional development costs

- NATIVE C-2 Chassis
- NAT-MCH Systemcontroller, LAN infrastructure 1/10GbE
- 12 CPU cards per system: NAMC-2041 Quad-Core QorIQ P2014, IEEE-754 Double precision, e500mc Core ->MPC603 compliant, Encryption and secure boot

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MTCA. Telecoms.

High Density. Maximum Flexibility.

- Application-Ready-Platform
- Latest DSP technology (TI or OCTASIC)
- Latest audio and video codecs supported
  - Includes HD audio and video codecs (OPUS, SILK, WebRTC,…)
- Legacy interfaces supported (E1/T1/J1)

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MTCA. SAT Testbed.

High Density. Maximum Flexibility.

- Former Test-Equipment concept and architecture
  - standard PC or IPC systems and Microsoft Windows only
  - Legacy hardware based Device-Under-Test (DUT) interface implementation (e.g. SpaceWire, UART, Mil1553, proprietary Multi-Wire Communication- link, …)
  - Legacy hardware driven SW functions to operate these interfaces, no universal approach
- Consequence and Short-Comings
  - High effort to handle and maintain multiple Interface-Device Vendors, their Libraries and drivers
  - High development effort to realize an appropriate Test-Equipment capable of meeting DUT Verification requirements
  - Limitations in performance and reliability

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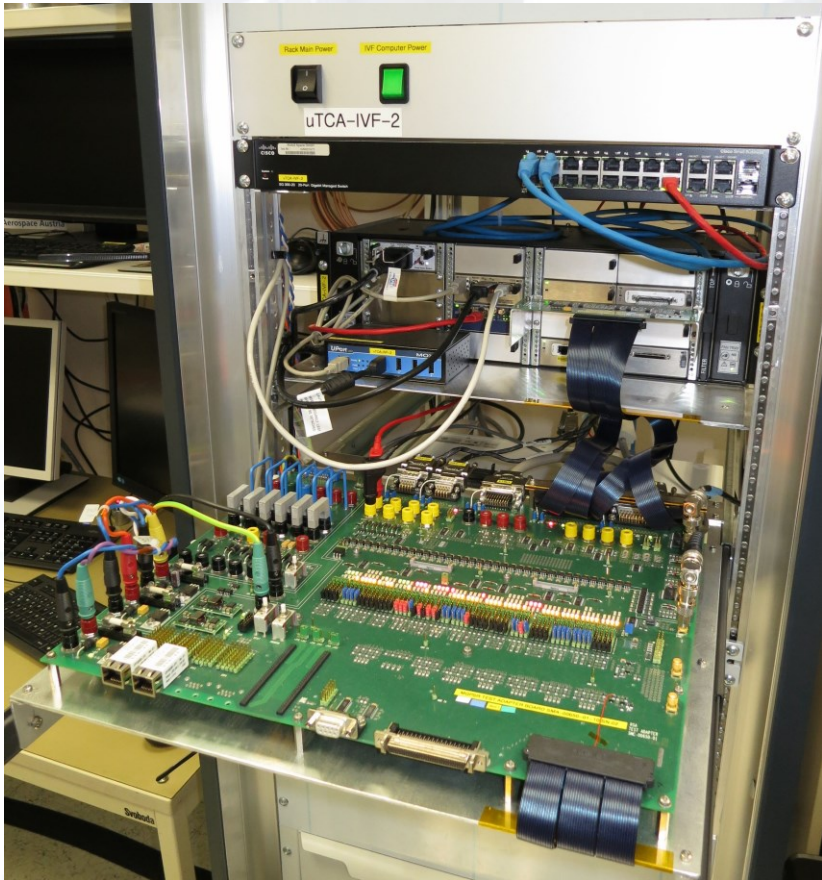
MTCA. SAT Testbed.

High Density. Maximum Flexibility.

- Decision for MTCA due to:
  - Open industry standard
  - Matured Ecosystem
  - Fast datapaths available (SATA 3, PCIe (Gen.2) and GbE)
  - Scaleable architecture
  - Independant PCIe Root complexes
  - Legacy IO could be re-used
  - SW support (Windows 7 and VxWorks)



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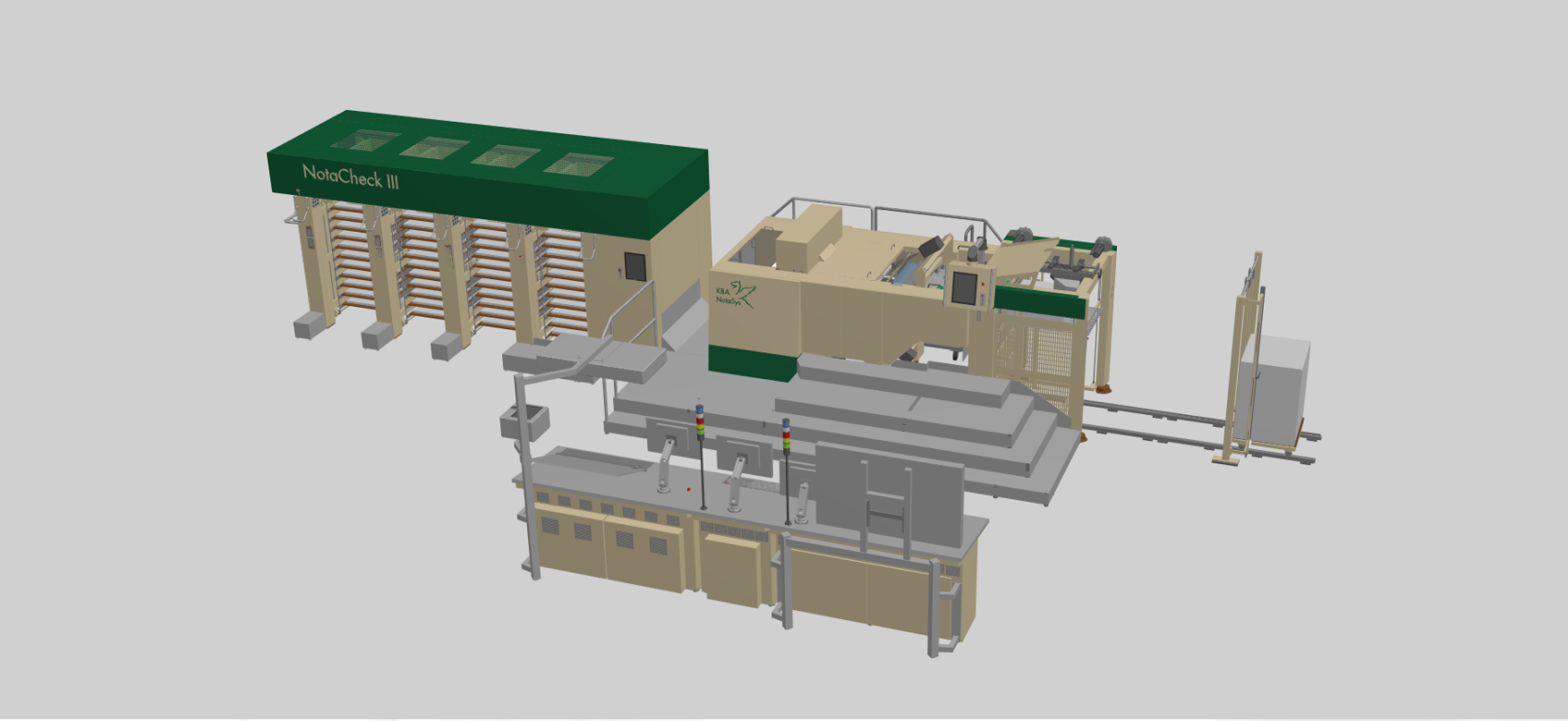
MTCA. Banknote Inspection.

High Density. High Speed.

- Inspection and sorting
- Inline inspection of all sheets
- 12.000 sheets per hour



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MTCA. Banknote Inspection.

High Density. High Speed.

- Up to 18 slots, active backplane
- High bandwidth, PCIe links

Only 1 board per inspection pipeline

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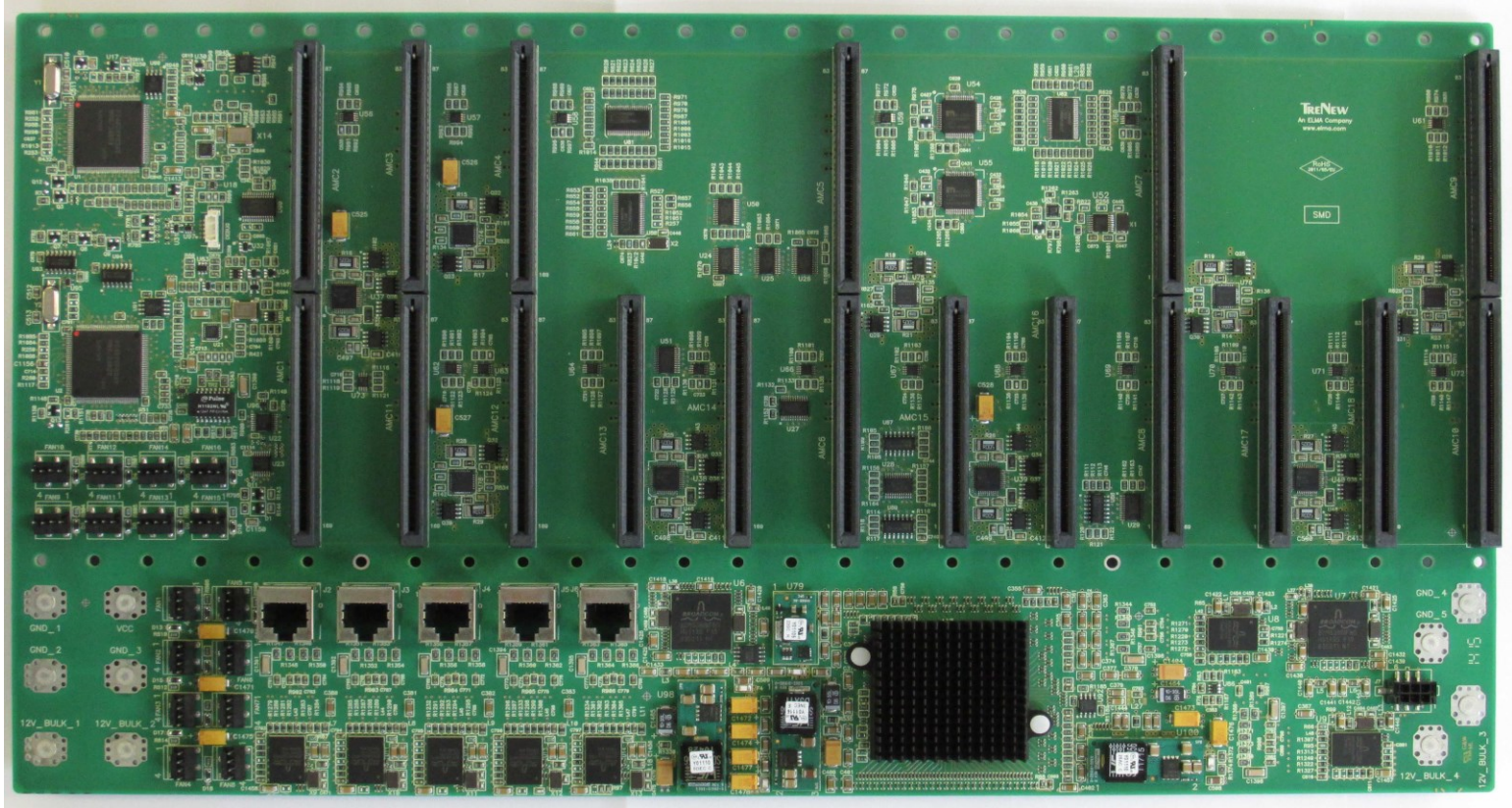
MTCA. Banknote Inspection.

High Density. High Speed.

- Custom backplane with integrated MCHx2, PCIe switch and GbE switch
- Heterogeneous computing approach
- Up to 7 CPUs
- Split configuration: 2 virtual systems!!!
- Custom port configurations between AMC slots (local connections)



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MTCA.
Real Market Applications.

test and measurement

- testbeds for avionics
- high speed visual inspection
- Non destructive Testing (NDT)
- spectral analysis
- Hardware-in-the-loop (HIL)

communication

- PABX
- gateways
- 5G/LTE basestation (CPRI, OBSAI) Testsystems
- conferencing platforms
- Software defined radio (SDR)

medical has adopted MTCA for

- high speed data aquisition
- image processing

others

- Broadcast
- homeland security and defence

And many, many more....

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WHY. Take. MicroTCA?

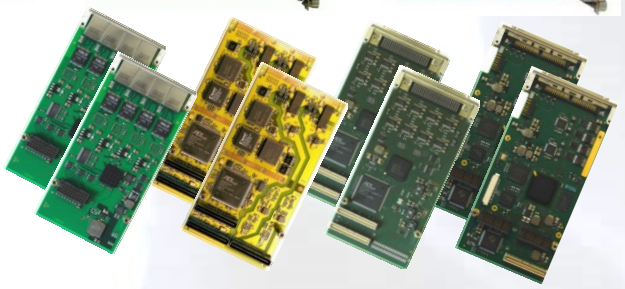
- It is an open, matured, robust Standard
- It is extremely scaleable
- The Ecosystem is intact
- Big variety of different processor boards
  - X86, Freescale, ARM
  - GPGPU, FPGA, DSP
- Big variety of I/O-functions available
  - Either as dedicated AMC module

  Or
  - Via carrier cards (IP, PMC, XMC, FMC)
- Variety of chassis
  - From small to big
- Highspeed interfaces
  - Up to PCIe x8, Gen.3
  - Ethernet 1,10,40GbE
  - SRIO Gen.2
  - 2018 upcoming SRIO Gen.3 and PCIe Gen.4









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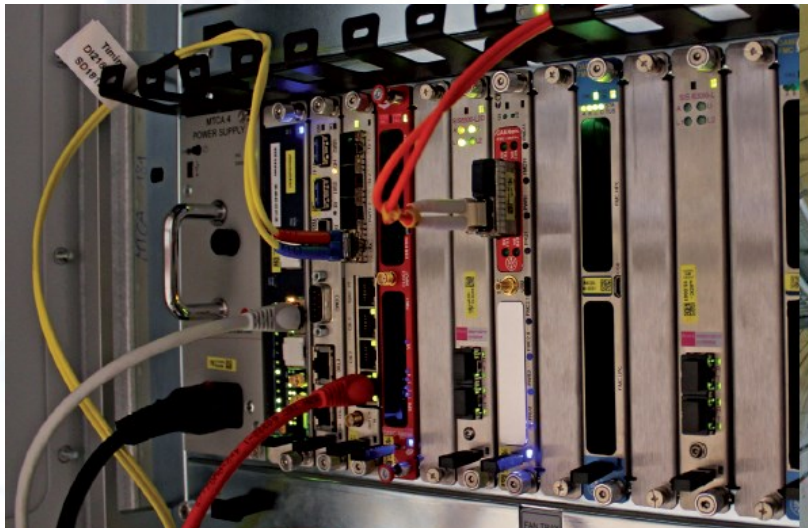
MTCA. Technology. Lab.

Organisational. Framework.

- Powerbridge is a member of the MicroTCA Technology Lab
- Hub for research, development and testing
- Advanced measurements and compliancy testing
- MicroTCA Trainings
- Loaner pool of pre-configured MicroTCA systems
- Custom MicroTCA development
- Licensing of MTCA DESY designs

MICROTCA TECHNOLOGY LAB

A HELMHOLTZ INNOVATION LAB



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Contact Information.

Let´s discuss your requirements and test our performance!

- Thomas Holzapfel
- Email: thomas.holzapfel@powerbridge.de
- Tel: +49-5139-9980-21

powerBridge Computer Vertriebs GmbH,
Ehlbeek 15a, 30938 Burgwedel, Germany
www.powerbridge.de