powerBridge
Computer




MTCA beyond physics

An overview

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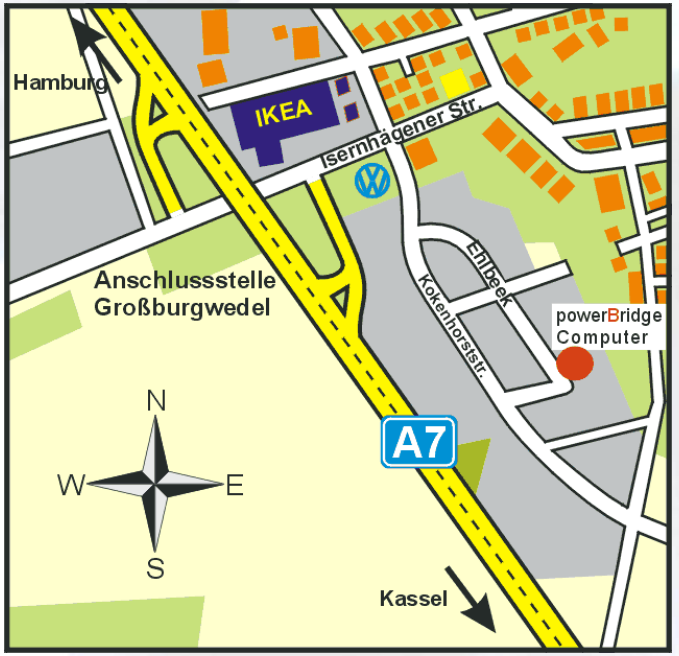
ISO 9001 • ISO 14001
LL-C (Certification)

MicroTCA
TECHNOLOGY LAB
A HELMHOLTZ INNOVATION LAB

100% paperless company

- Over 25 years in the market
- Privately owned
- Over 30 years VME experience
- Own Lab and integration facilities
- powerBridge has delivered over 27.000 VME boards and 5.500 systems
- Active PICMG member
- Member at MTCA Tech Lab (DESY)
- ISO 9001:2008 and 14001:2009 approved



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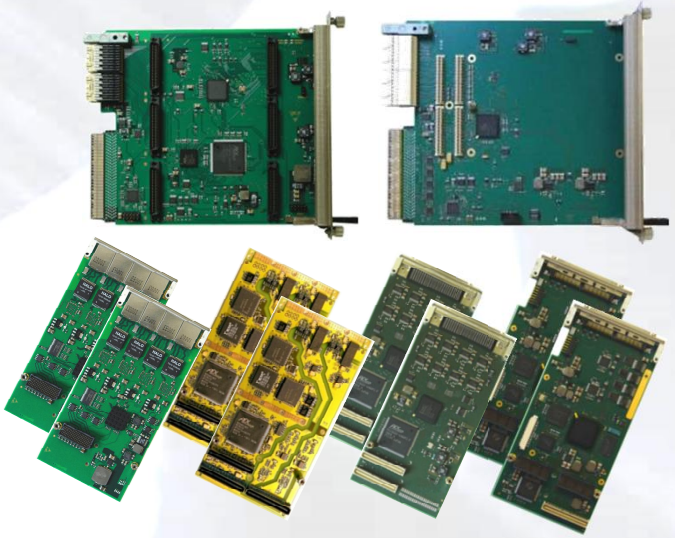
WHY. Take. MicroTCA?

- 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
  - and more to come…



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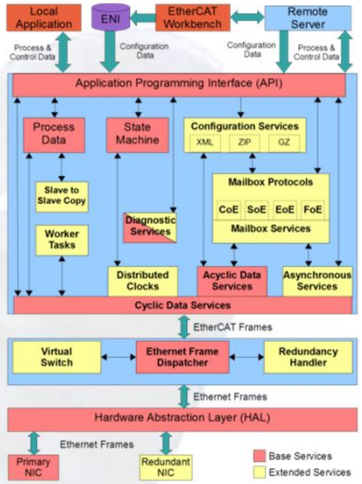
Fieldbus.
EtherCAT. Master.

EtherCAT Master

- Configuration and management of EtherCAT networks
- 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



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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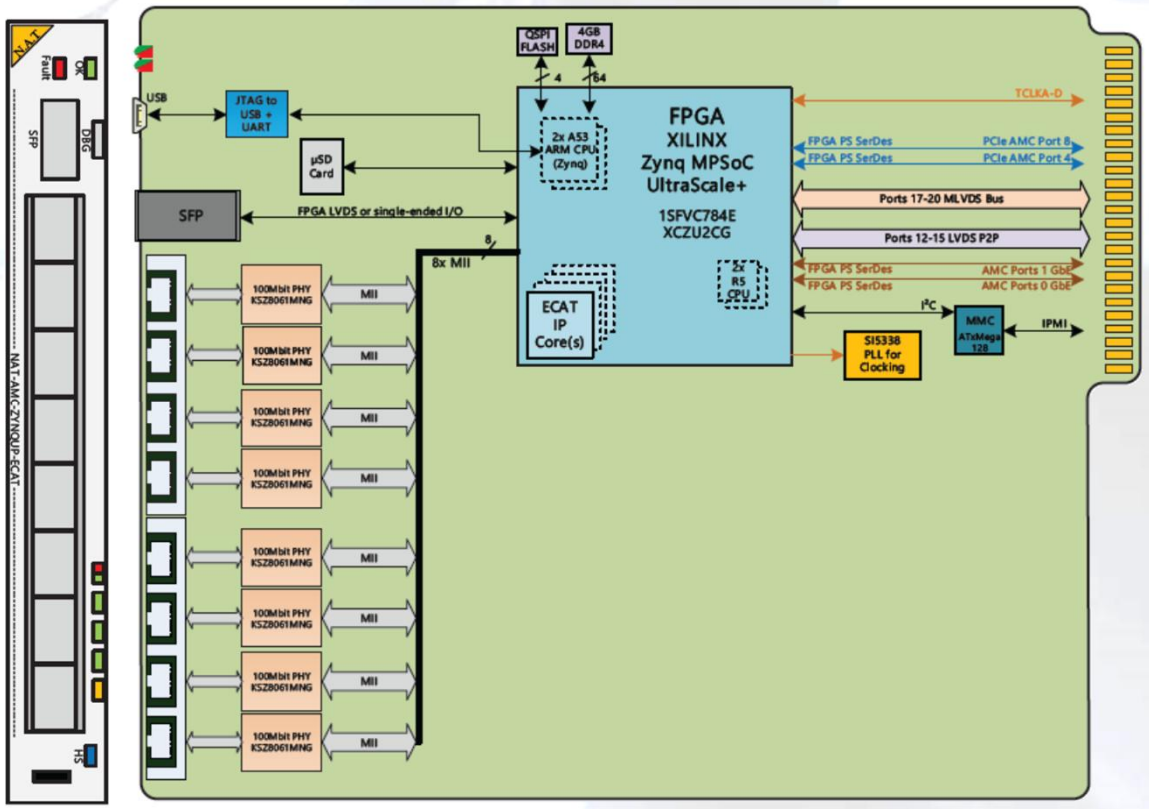
Fieldbus.
EtherCAT. Slave.

NAT-AMC-ZYNQ-ECAT

- Double Mid-size AMC with Zynq Ultrascale+
- 8x Ethernet via RJ45
- 1x SFP
- EtherCat slave module
- Allows different EtherCat subnetworks to be synchronized
- More details in presentations from
  - Herbert Erd, NAT
  - Bruno Fernandes, XFEL



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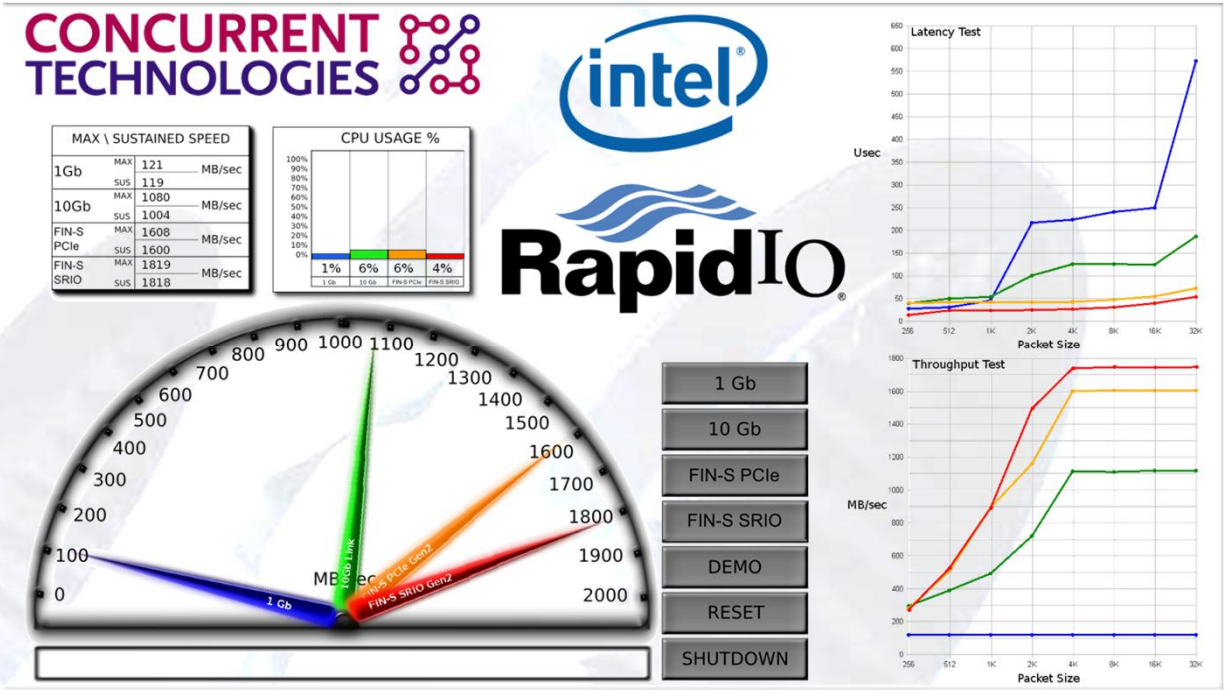
FIN-S.

High Speed Data Transfer.



Fabric Interconnect Networking Software FIN-S

- IP based socket communication
- Direct Inter-Process Communication Interface
- Support for Linux, Windows, VxWorks
- MTCA, AMC, VPX
- High Performance, Low latency comms
- PCI Express, Rapid-IO, 10GbE

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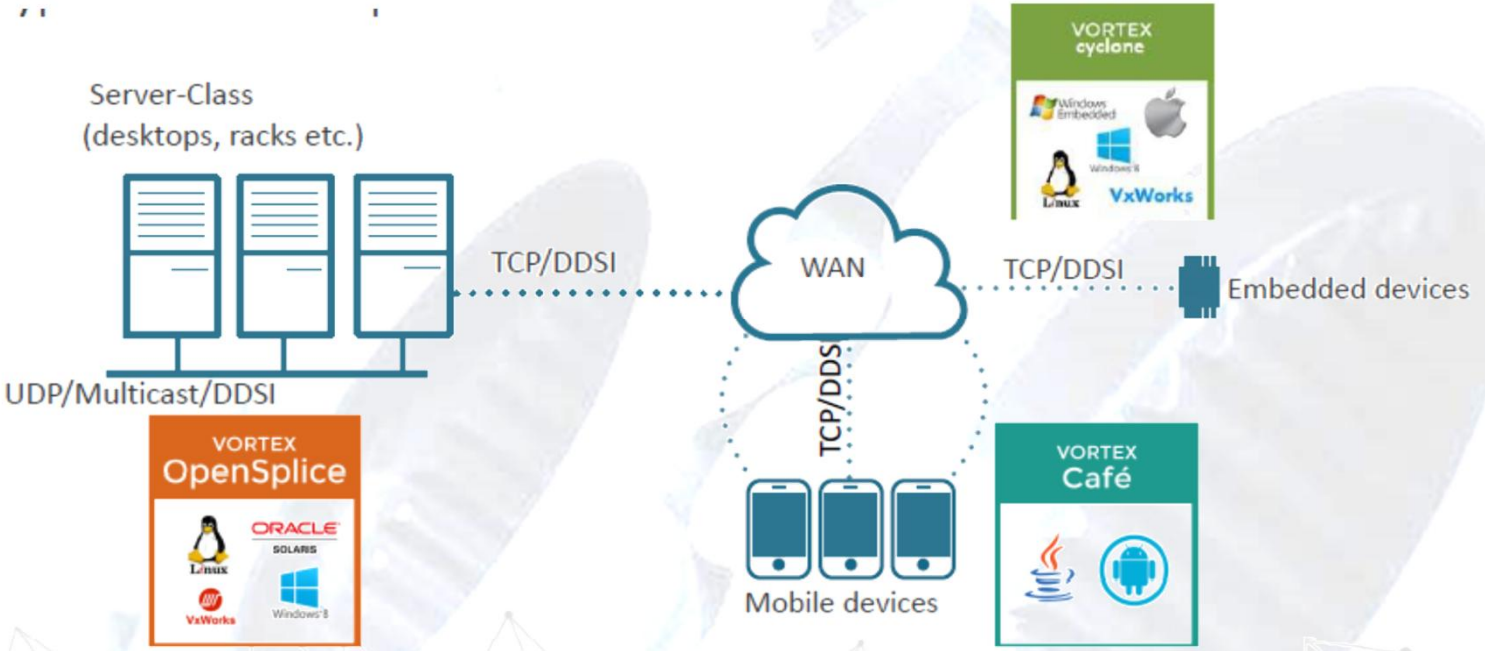
Vortex DDS.

Real Time Data Exchange.



Data Distribution Service for Real-Time Systems

- Data Centric Middleware
- In-memory Real-Time Database for the Network
- designed for business critical applications
- Large scale applications
- Scalable, real-time, high performance
- low latency data exchange between applications

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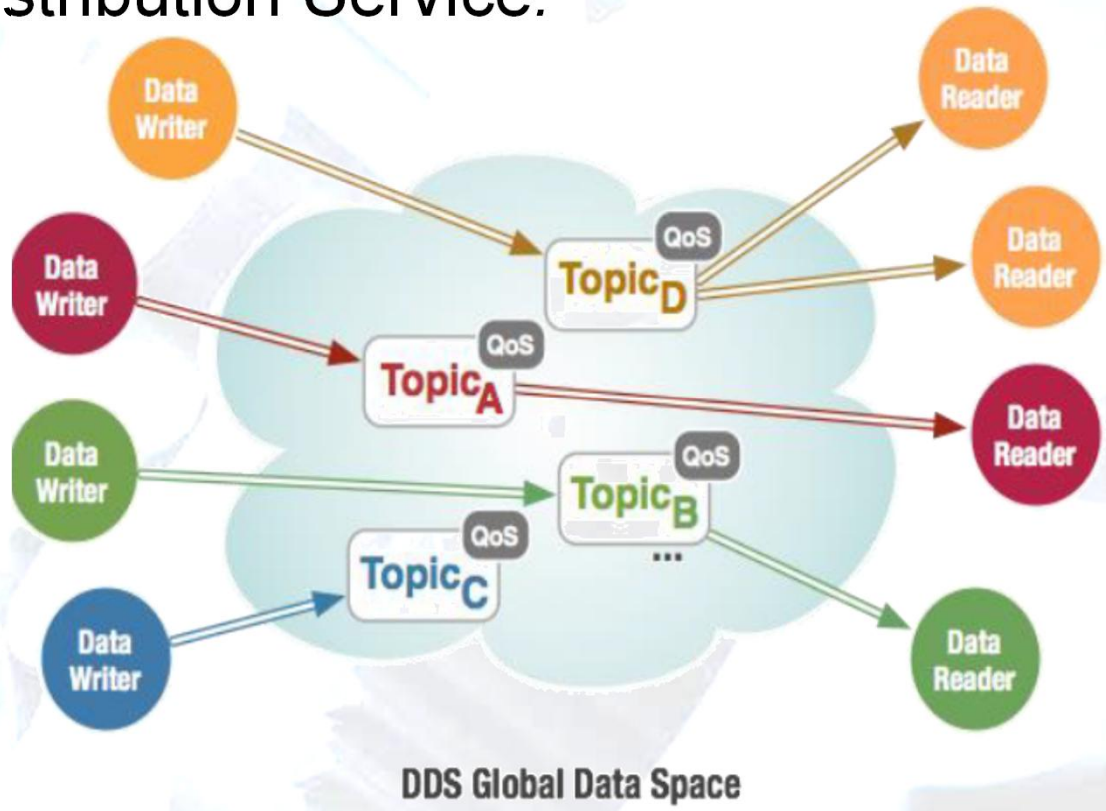
Vortex DDS.

Data Distribution Service.



Data Distribution Service for Real-Time Systems

- Global data space that allow applications to
- Autonomously
- Anynomously
- Asynchronously
- Share data in a secure and efficient way
- Fully distributed, high efficient, scalable

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Vortex DDS.

MathWorks Integration.

Vortex OpenSplice MATLAB and Simulink Integration

- Vortex provides MATLAB API (DDS) language binding for the MATLAB scripting language to allow to exchange data with Vortex OpenSplice DDS domains.
- Vortex OpenSplice also provides support for connecting MathWorks Simulink models to DDS domains.
- The Vortex DDS Block Set enables Simulink users to drop blocks representing key DDS entities into their Simulink models to read and write data to a Vortex OpenSplice domain.

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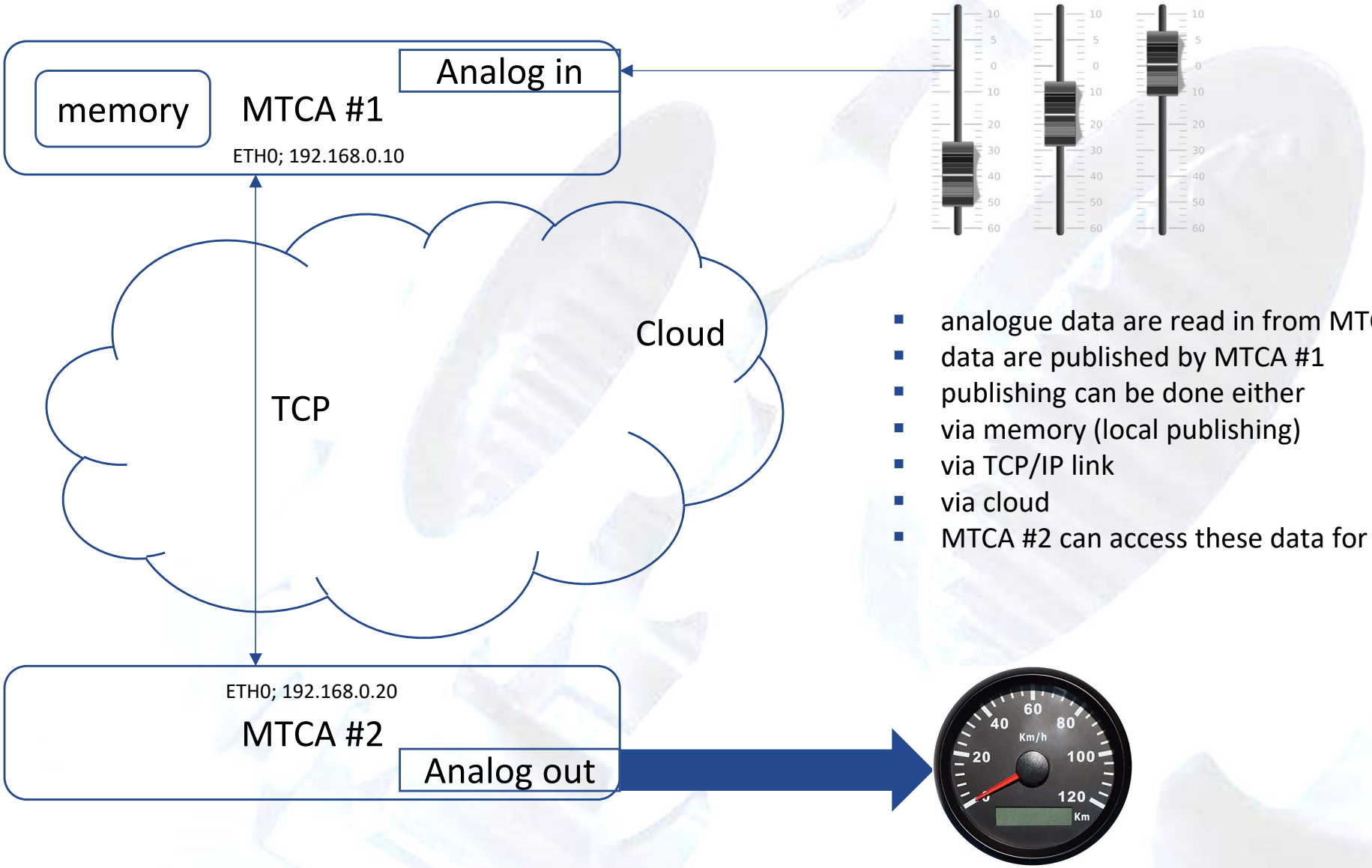
Vortex DDS.

Workshop Demo.



- analogue data are read in from MTCA #1
- data are published by MTCA #1
- publishing can be done either
- via memory (local publishing)
- via TCP/IP link
- via cloud
- MTCA #2 can access these data for further actions

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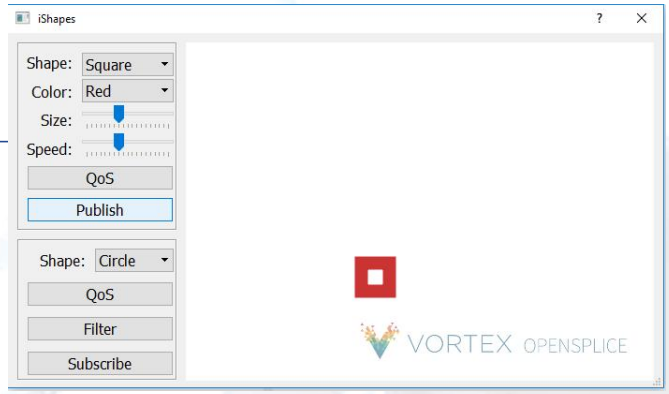
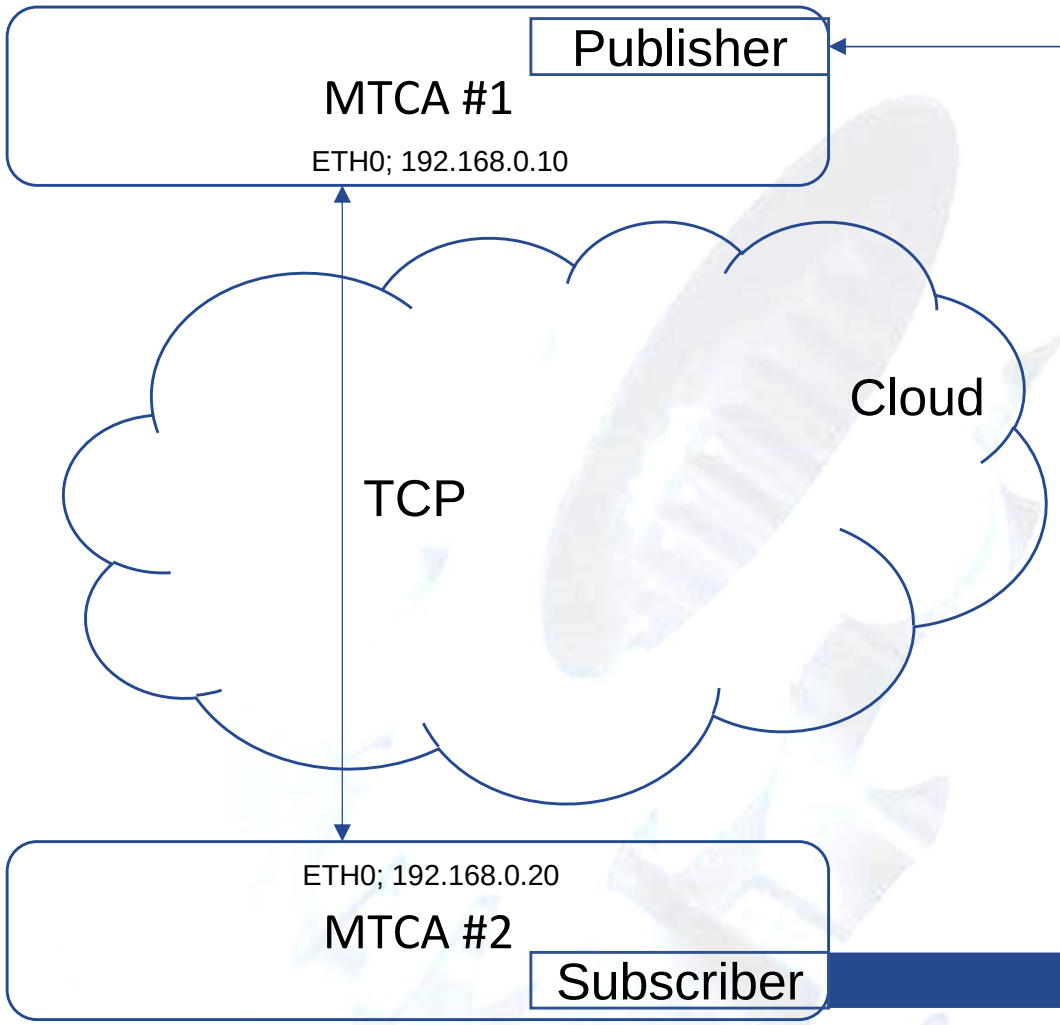
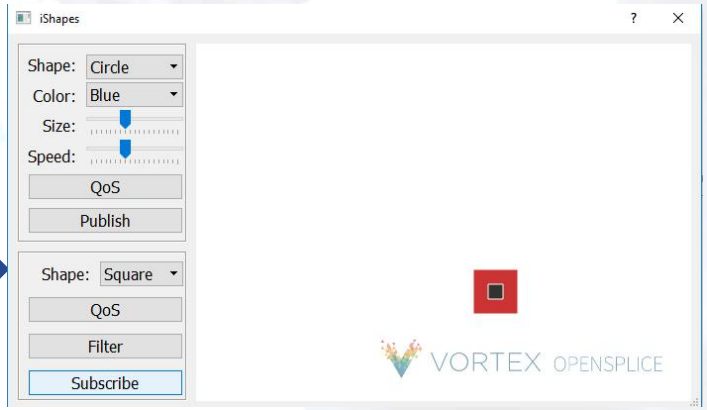
Vortex DDS.

Workshop Demo.





ishapes writes(publishes) different instances of various shapes. As another instance, it can read (subscribe) the different type of shapes.



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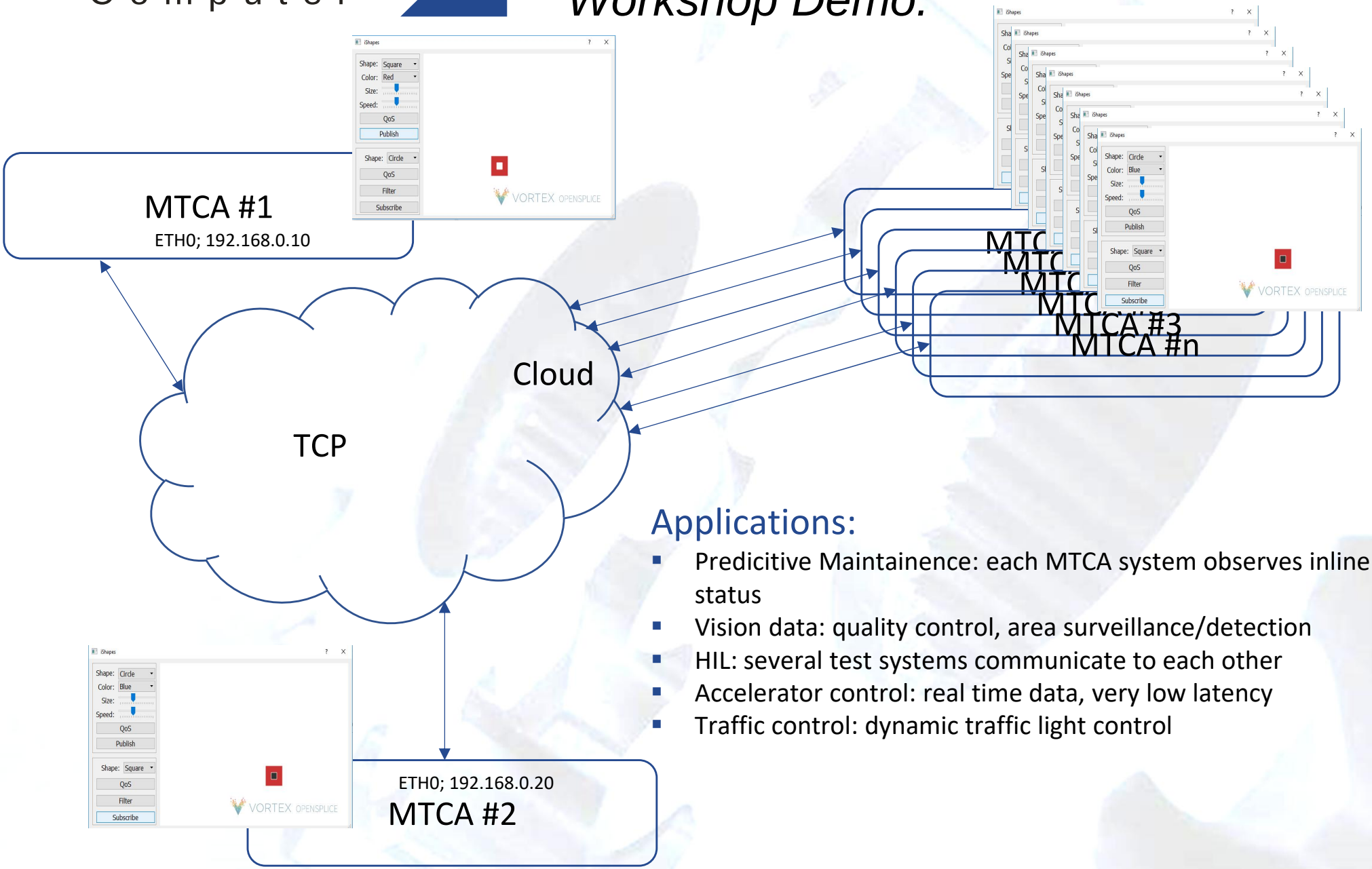
Vortex DDS.

Workshop Demo.



Applications:

- Predicitive Maintainence: each MTCA system observes inline machine status
- Vision data: quality control, area surveillance/detection
- HIL: several test systems communicate to each other
- Accelerator control: real time data, very low latency
- Traffic control: dynamic traffic light control

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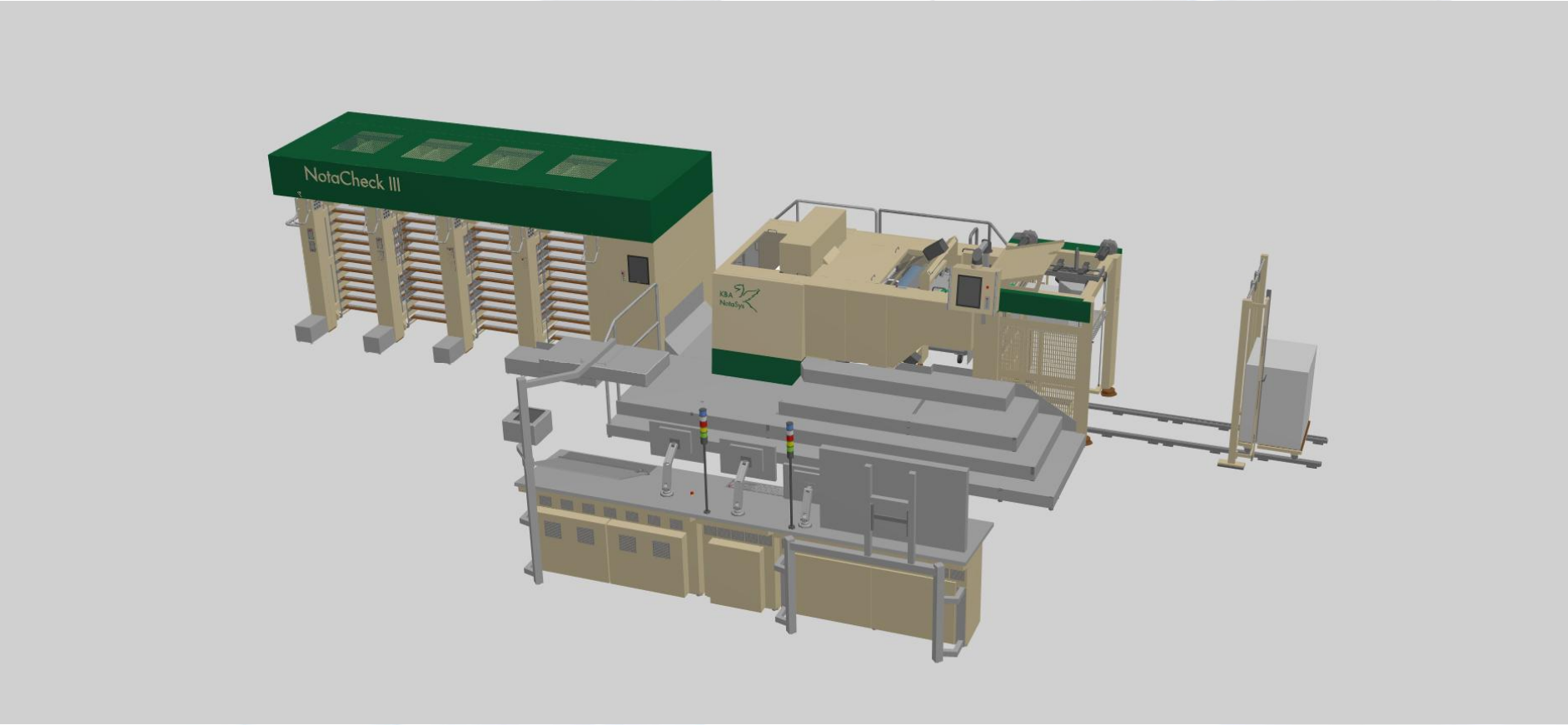
MTCA. Banknote Inspection.

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. 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
- 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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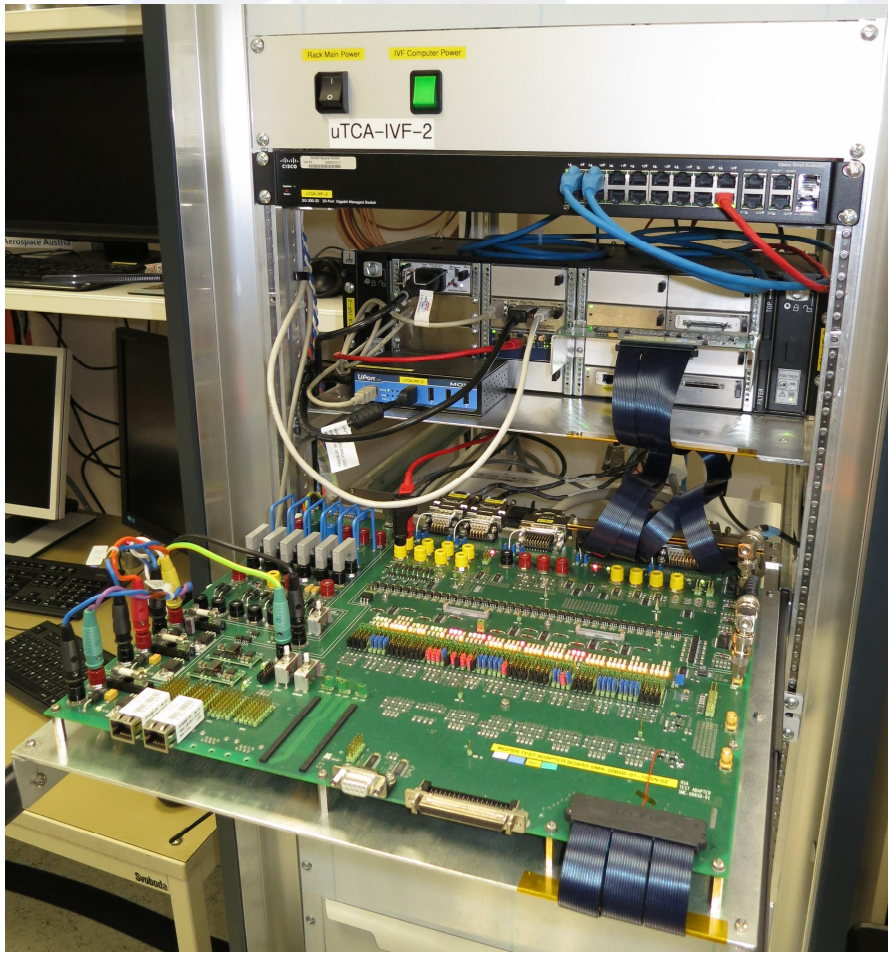
MTCA. SAT Testbed.

High Density. Maximum Flexibility.

- 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 10 and VxWorks)



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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

- Telphony 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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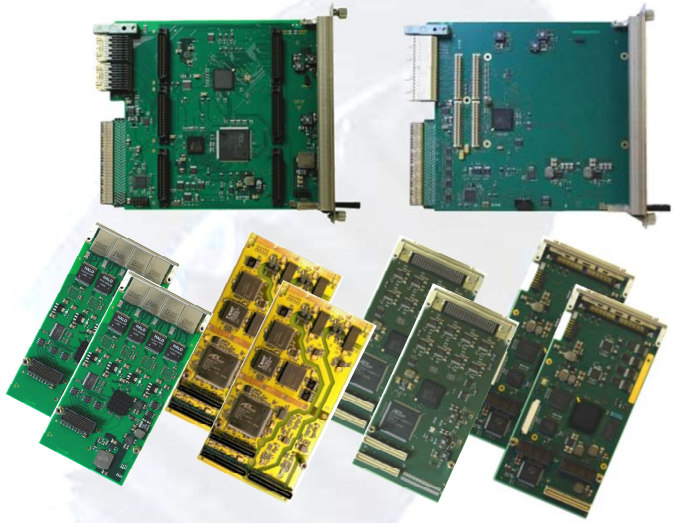
MTCA. Toolbox.

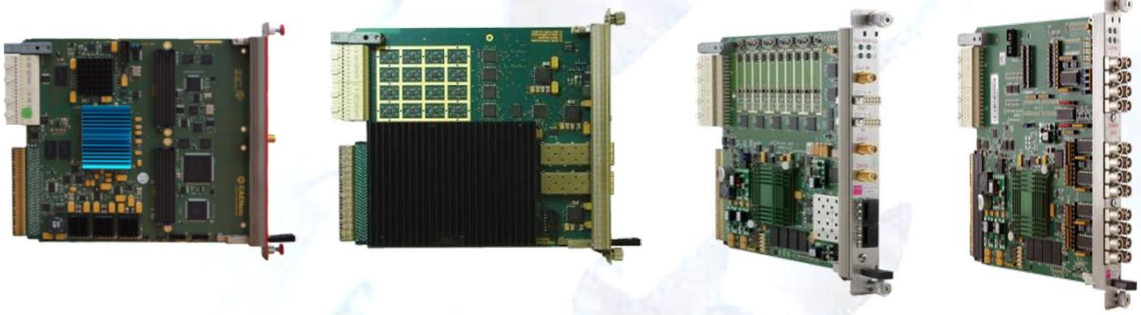
Starterkits and components.

- 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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Contact. Information.

- Friedrich Fix
- Email: friedrich.fix@powerbridge.de
- Tel: +49 5139 998015

- Tobias Naber
- Email: tobias.naber@powerbridge.de
- Tel: +49 5139 998037

- Thomas Holzapfel
- Email: thomas.holzapfel@powerbridge.de
- Tel: +49 5139 998021

powerBridge Computer Vertriebs GmbH

Ehlbeek 15a

30938 Burgwedel, GERMANY

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Industrial. Exhibition.

Meet us at the virtual exhibition on
Tuesday, 12:45 at

https://desy.zoom.us/j/91406424179

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Coffee Time.

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