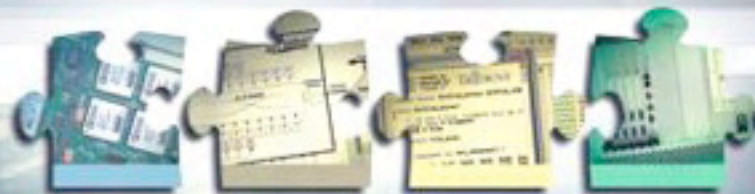




Reconfigurable FPGA Boards in MicroTCA Applications

Ron Huizen
BittWare

Essential building blocks...
Innovative solutions.



Overview

- Reconfigurable AMCs – what are they?
- Adding a mezzanine to AMC
- Example reconfigurable AMCs
- Using them to extend MicroTCA's flexibility
- Example applications



Reconfigurable AMCs

– What are They?

- **Configurable switch fabric interfaces**
 - Support standard switch fabrics and protocols
 - SRIO, PCIe, 10 GigE, CPRI, OBSAI, ...
 - Multiple port connections
- **Configurable AMC clocking**
 - Support system synchronization and clocking options
- **Configurable processing**
 - Support pre, post, and co-processing
- **Implementation leverages the flexibility of FPGAs**
 - Reconfigurable in system via control plane
 - Fully connected AMC clocks
 - Fully connected AMC ports



But wait, there's more!

- Adding FMC (VITA 57) to AMC

- AMCs are not just expansion mezzanines anymore, but are the primary module in MicroTCA
- AMCs are fairly complex & difficult to respin
 - Multi-GHz signals
 - Multiple power/ground planes
 - IPMI/MMC
- Adding a modular front-panel expansion mezzanine allows rapid customization of existing, stable AMCs
 - Rather than inventing a new one, leverage existing one...

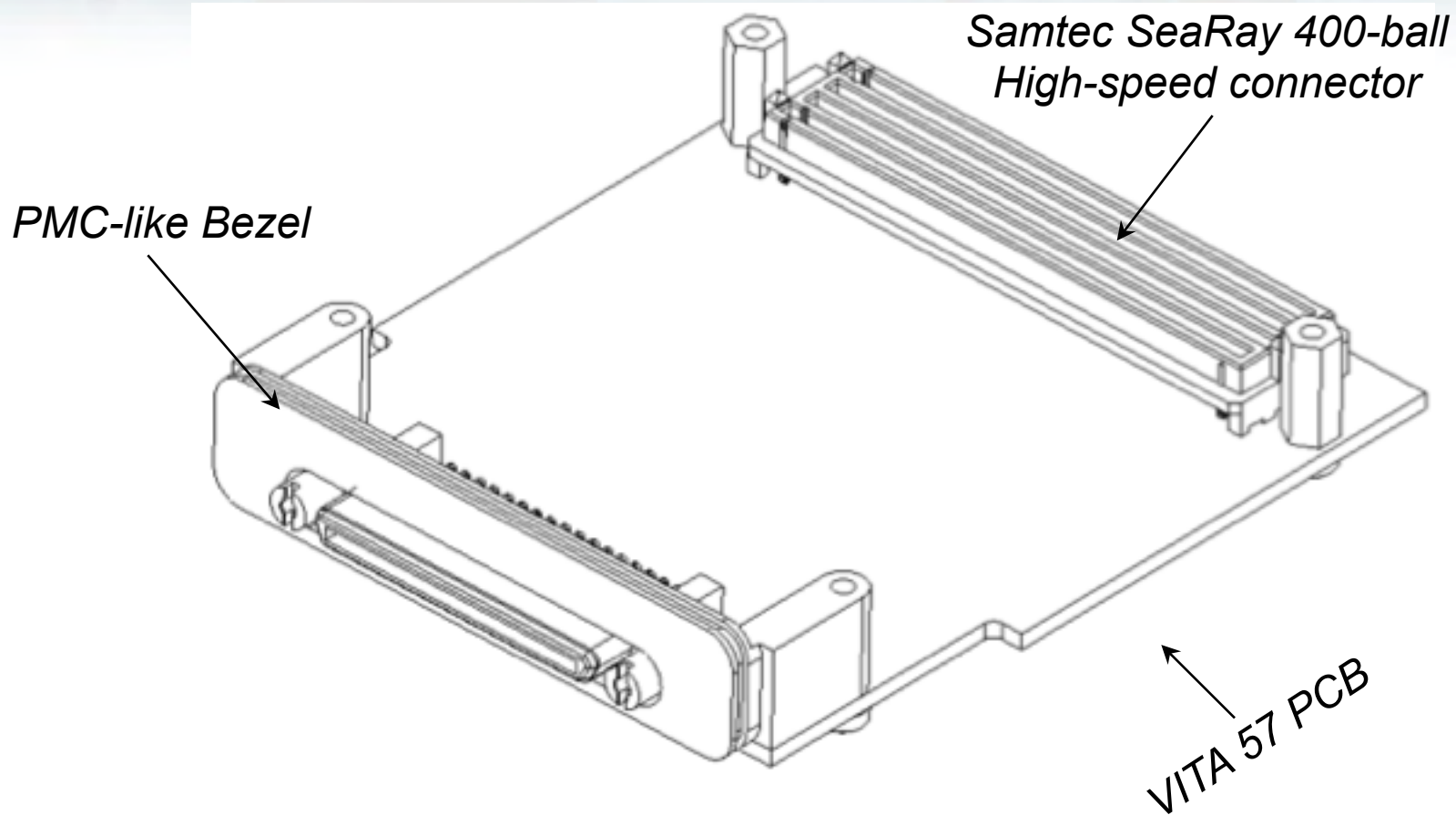


VITA57 (FMC) Spec Overview

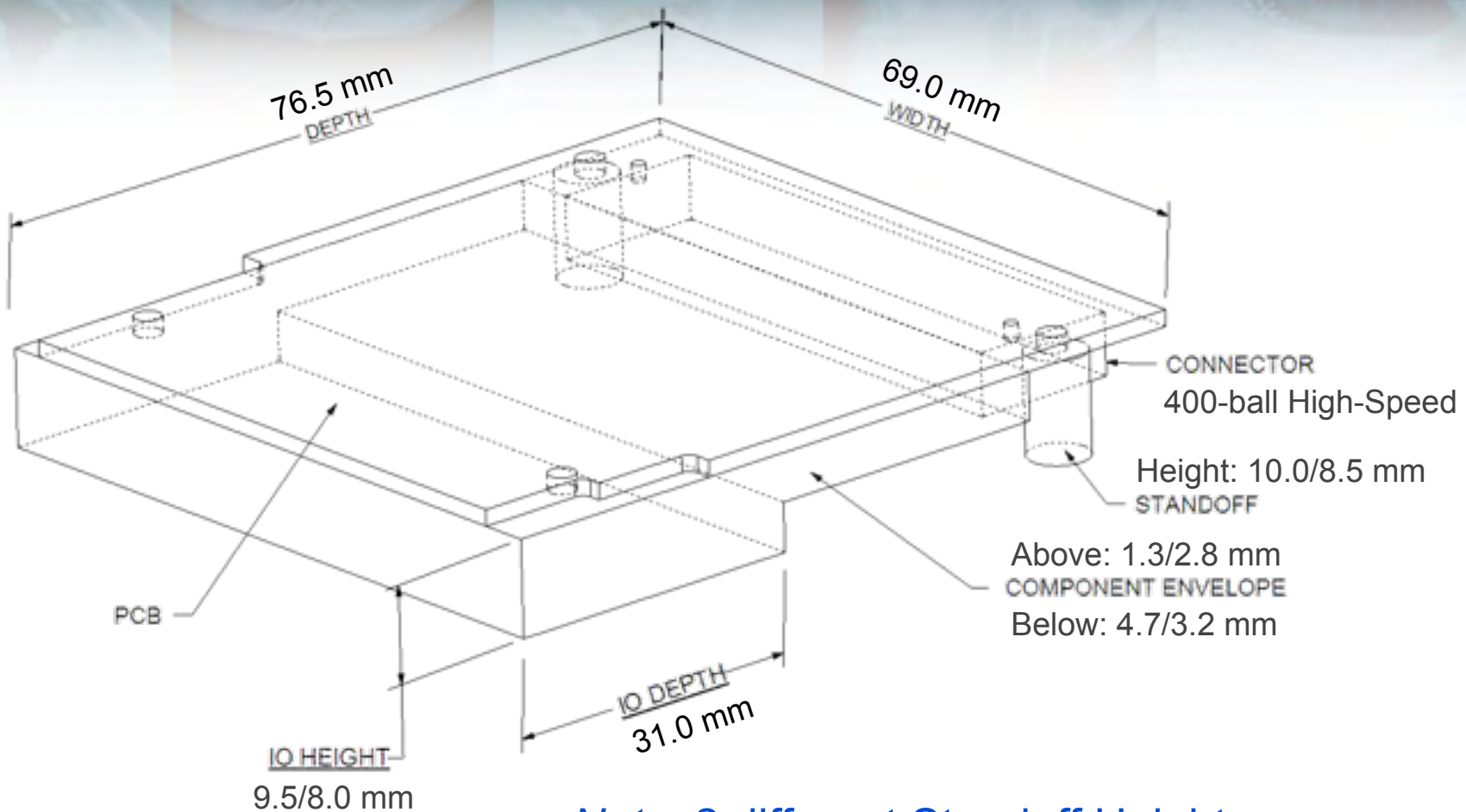
- **ANSI/VITA57.1-2008 FPGA Mezzanine Card**
 - Developed by VITA/VSO; approved July 2008
 - Intended for use on VME, VPX, cPCI, & AMC (Mid-size)
 - Air-cooled & Conduction-cooled variants
- **Original intent was for I/O customization**
 - But can also be used for processing/memory expansion
- **Wide variety of I/O using 400-ball High-speed Connector**
 - Up to 80 Diff.Pairs at up to 2 Gbps, or 160 SE Signals
 - Up to 10X SerDes (4x + 4x + 2:1X) at up to 10 Gbps
 - Reference Clocks
 - JTAG, I2C, & IPMI
 - Low pin-count option also supported
- **Sophisticated Power Supply support**



VITA57 Mechanical Overview



VITA57 Air-Cooled Mechanical Details

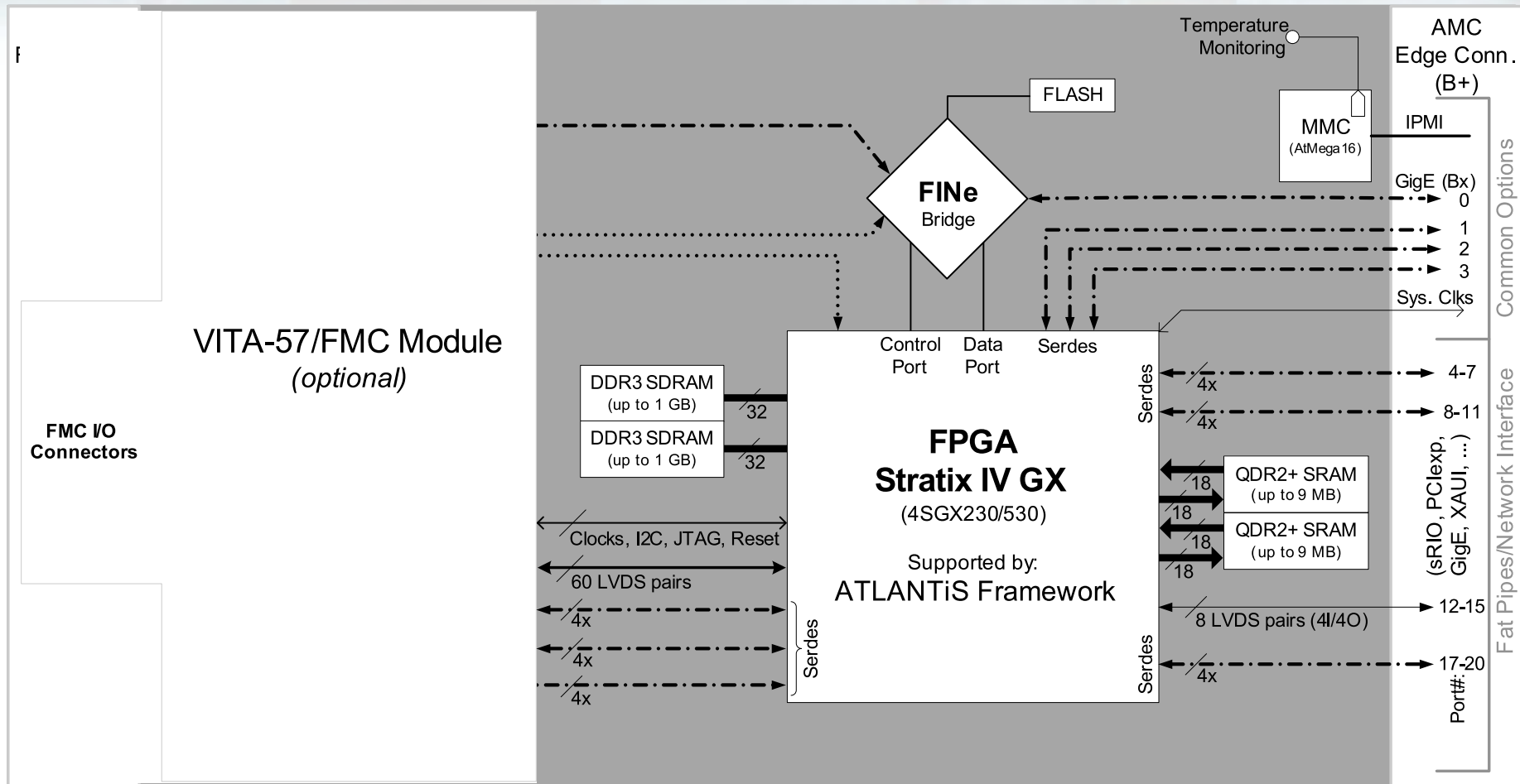


Note: 2 different Standoff Heights



Example Reconfigurable AMC

- BittWare S4-AMC with FMC Site



Example Reconfigurable AMCs

- Adding FMCs to S4-AMC

- **SP/S4-AMC**
 - Quad SFP optical transceivers + Stratix IV FPGA
- **S4/S4-AMC**
 - Dual Altera Stratix IV FPGA
- **T2/S4-AMC**
 - Dual TigerSHARC DSP + Stratix IV FPGA
- High Speed ADCs
- High Speed DACs
- Customer specific I/O



Using Reconfigurable AMCs

- External Interfacing

- **Interface to external devices**
 - Bring legacy systems into MicroTCA
 - Interface to non-switch fabric based systems
- **Front panel**
 - Physical interface on FMC for adaptability
 - e.g. SFPs, analog, ...
 - Available space dictated by AMC size
- **Rear panel**
 - Make use of available AMC ports
 - Physical interface on rear transition module



Using Reconfigurable AMCs

- Bridging

- **Bridging switch fabrics**
 - SRIO, 10 GigE, PCI Express, ...
 - Multiple fabrics and interfaces
- **Bridging protocols**
 - CPRI, OBSAI, SPI-4, ...
 - Aurora, Serial Lite, ...
- **Bridging protocols to switch fabrics**
 - CPRI, OBSAI, SPI-4 to SRIO, 10 GigE, PCIe



Using Reconfigurable AMCs - Configurable Processing

- Use FPGA as a configurable processor
 - Signal processing, Compression, Coding
- Pre, post, and co-processing
- Data flows through the module
- Configure bandwidths as needed
- Front panel module allows additional processing
 - Add another FPGA or DSP



Example Applications

- **Interfacing a CPRI radio to SRIO based MicroTCA**
 - CPRI optical interface on front panel SFPs
 - Pre and post processing of radio data
 - Serial Rapid IO to backplane
 - *Flexibility gained*
 - *adapt to evolving standards*
 - *interface to other radios (OBSAI, custom)*
 - *interface to other switch fabrics (PCI Express, 10 GigE)*
- **Split Signal Processing/Network Infrastructure System**
 - Serial RapidIO for DSPs
 - 10GigE for network processors
 - Bridge SRIO to 10 GigE on reconfigurable AMC
 - *Flexibility gained*
 - *Use incompatible fixed AMCs in the same system*
 - *adapt to different fabrics to support future boards*



Summary

- Reconfigurable FPGA based AMC's can greatly extend your system's flexibility
- Adding a modular expansion mezzanine significantly increases adaptability & reuse of FPGA based AMC's
- Combining a reconfigurable FPGA based AMC with an industry standard front panel mezzanine makes for an extremely adaptable reconfigurable AMC

... must buy BittWare boards ... must buy BittWare boards ...

