

# FPGA-based compute nodes

- Motivation
  - Panda DAQ/Hades Upgrade(?)
- Compute nodes features
  - 4 FPGA
  - Memory
  - Mezzanine card on ATCA
- Crate System
  - ATCA /Bricolage/ Blade System

# Motivation

- Interaction rates of the order of 10MHz  
typical event sizes 4 to 8 kB.
- raw data rates 40GB/s - 200 GB/s
- high flexibility and selectivity
- continuously sampling data acquisition
- Event selection in programmable processing units
- Connection via high speed networks (10 GBit/s)

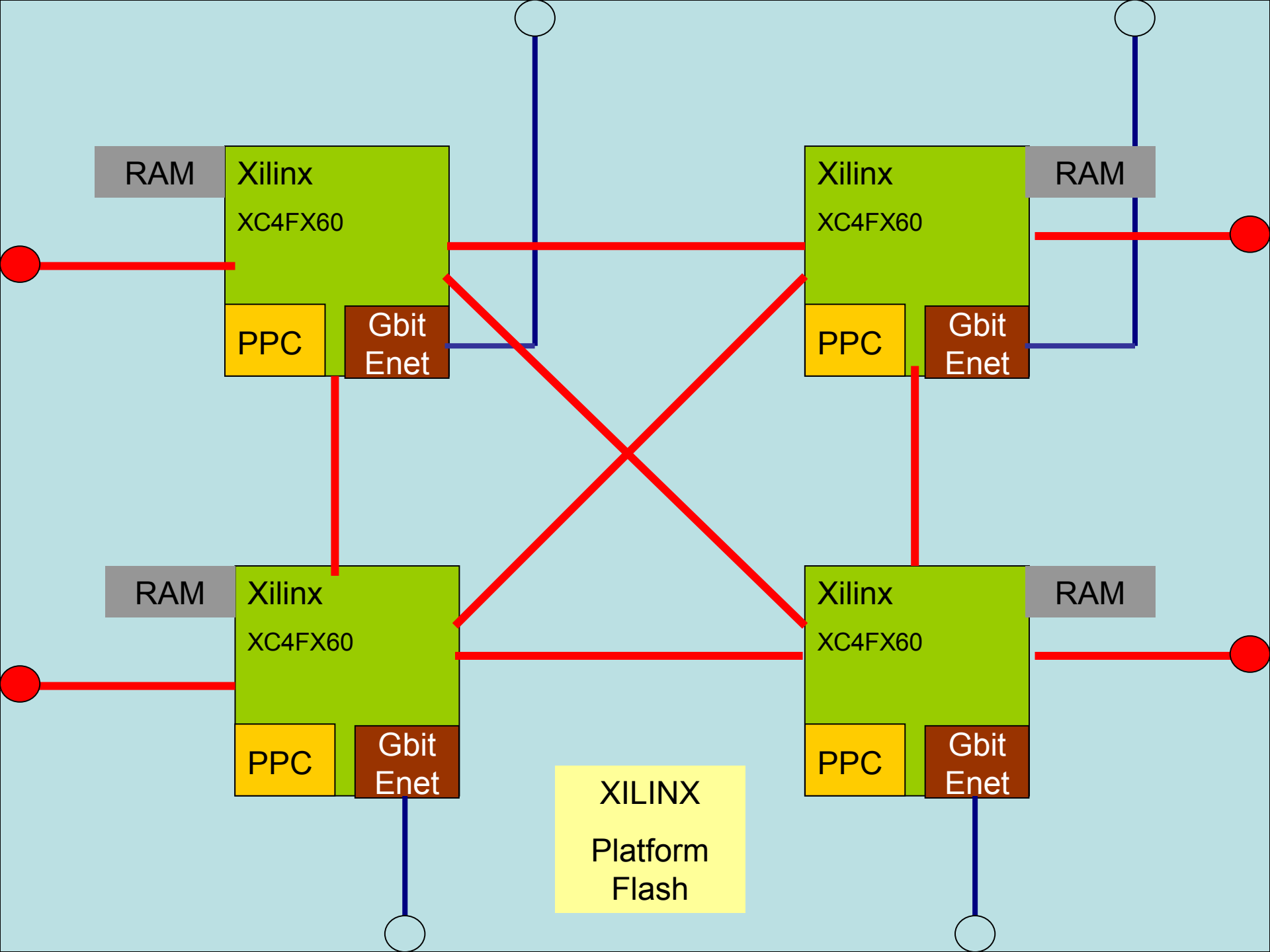
# Compute Nodes

- Prototype under development
- Universal highly configurable and scalable hardware platform for multiple applications
- Resources
  - 4 Virtex 4 FX60 FPGAs with local dram
  - Board level connections between the FPGAs via high speed serial I/O (Rocket-IO)
  - Inter-Board connectivity via 4 Rocket-IO/Optical links as well as via 4 GBit Ethernet ports
  - LINUX operating system running in PPC (part of XC4V60)
  - Large number of logic cells

# Compute Nodes

## Working configuration

- Components:
  - 4x Virtex FX60 (2xPPC, 4xEthernet, 8xRocketIO)
  - 4x 512 Mb DRAM
  - 4x agilent SFF Optical Transceivers
  - 4x Gbit Ethernet (mac embedded in the FPGAs )
- PCB
  - 4U Advance Mezzanine Card – ATCA
- Estimated prize: 3,000€/board

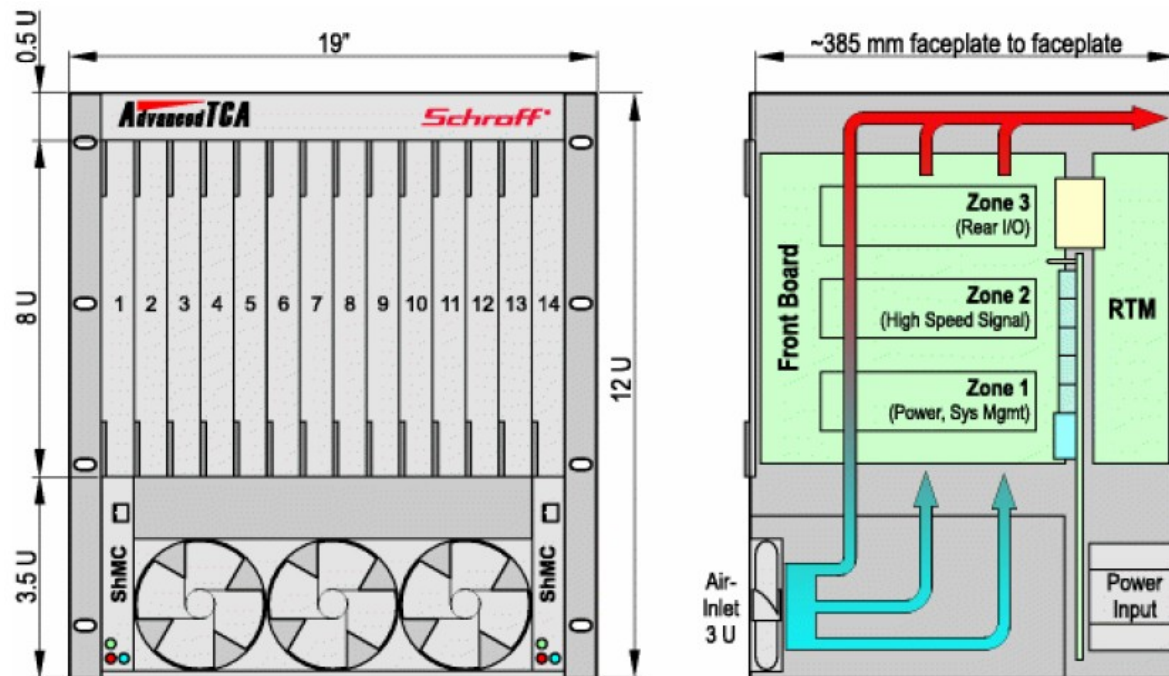


# Crate system: Options

- ATCA
- Bricolage with old PC cases
- IBM Blade System – OpenBlade
- VME
- Lay them on the table/screw them onto detectors...
- ???

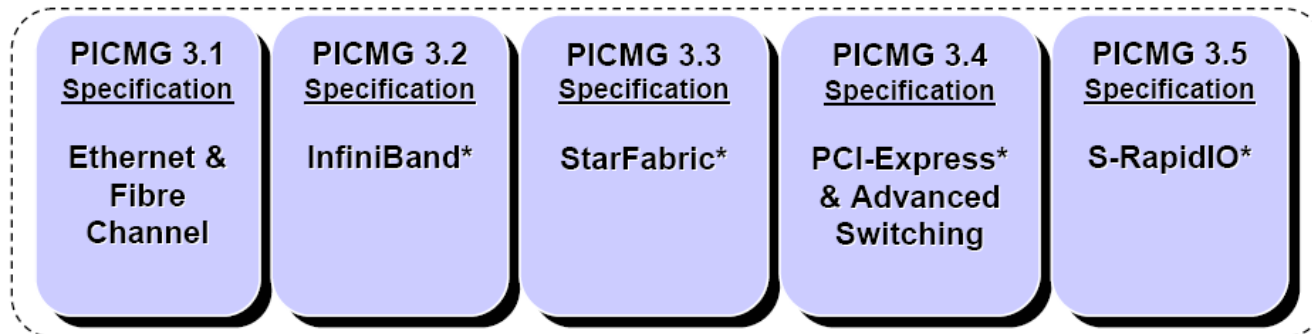
# ATCA

- 19" Rack: 14 slot – 8U
- Cooling: Classic air flow (fans)
- Rough Mechanics, Self management
- Power ~ 200W/slot
- Full mesh backplane



# ATCA

- 19" Rack: 14 slot – 8U
- Cooling: Classic air flow (fans)
- Rough Mechanics, Self management
- Power ~ 200W/slot
- Full mesh backplane → Ethernet supported



## PICMG 3.0 Base Specification

- Power Distribution
- Mechanical Elements
- System Management
- Regulatory Guidelines
- Connector Zones and type
- Fabric Topology
- Thermal Management Guidelines



# ATCA, ?

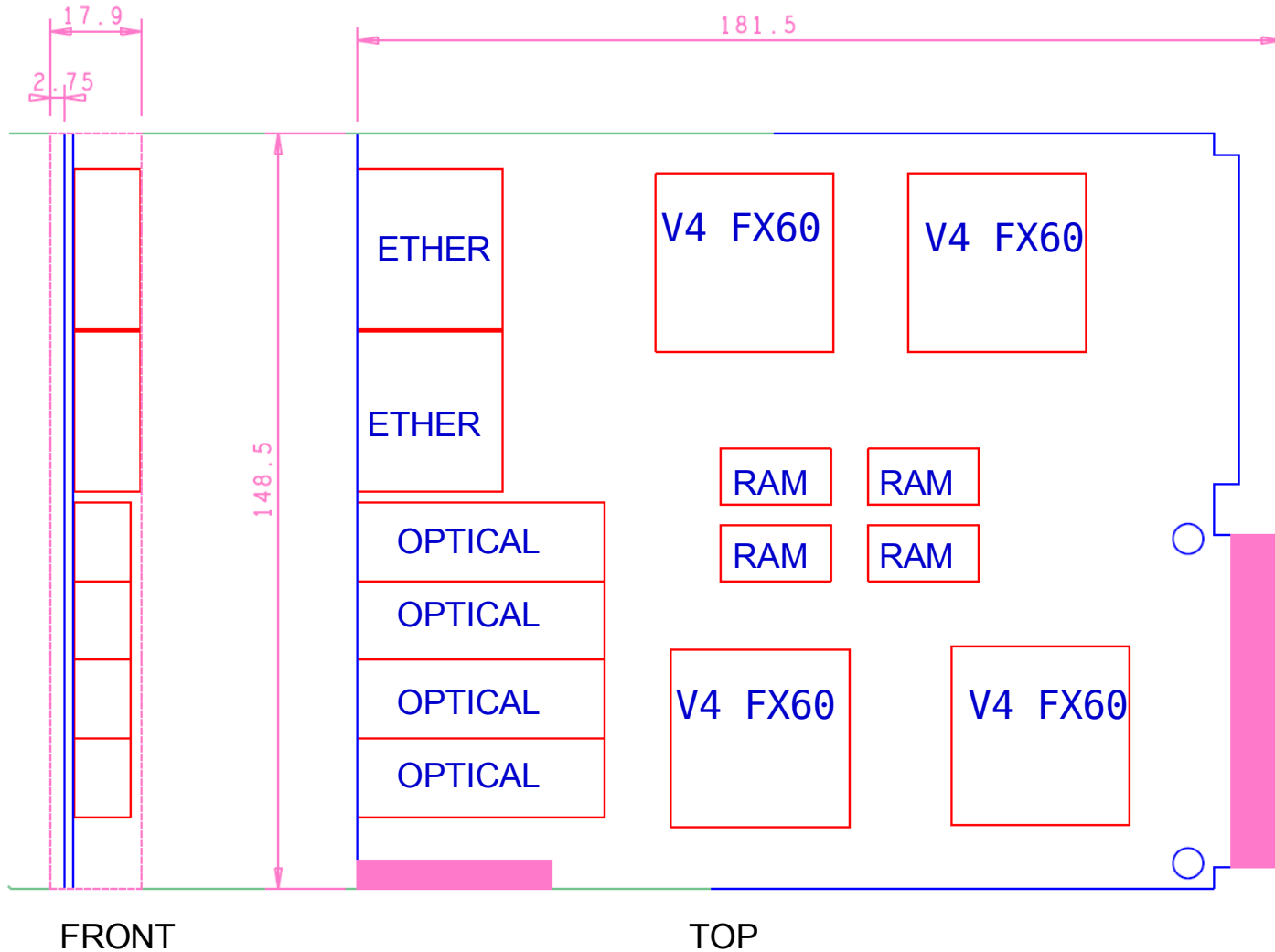
## PROs

- **Industry standard**
- Provides slow control and self management
- Large Power
- Proper cooling
- Nice backplane  
But we don't really need it!
- **Standard all around PANDA**  
**Is it so?**

## CONs

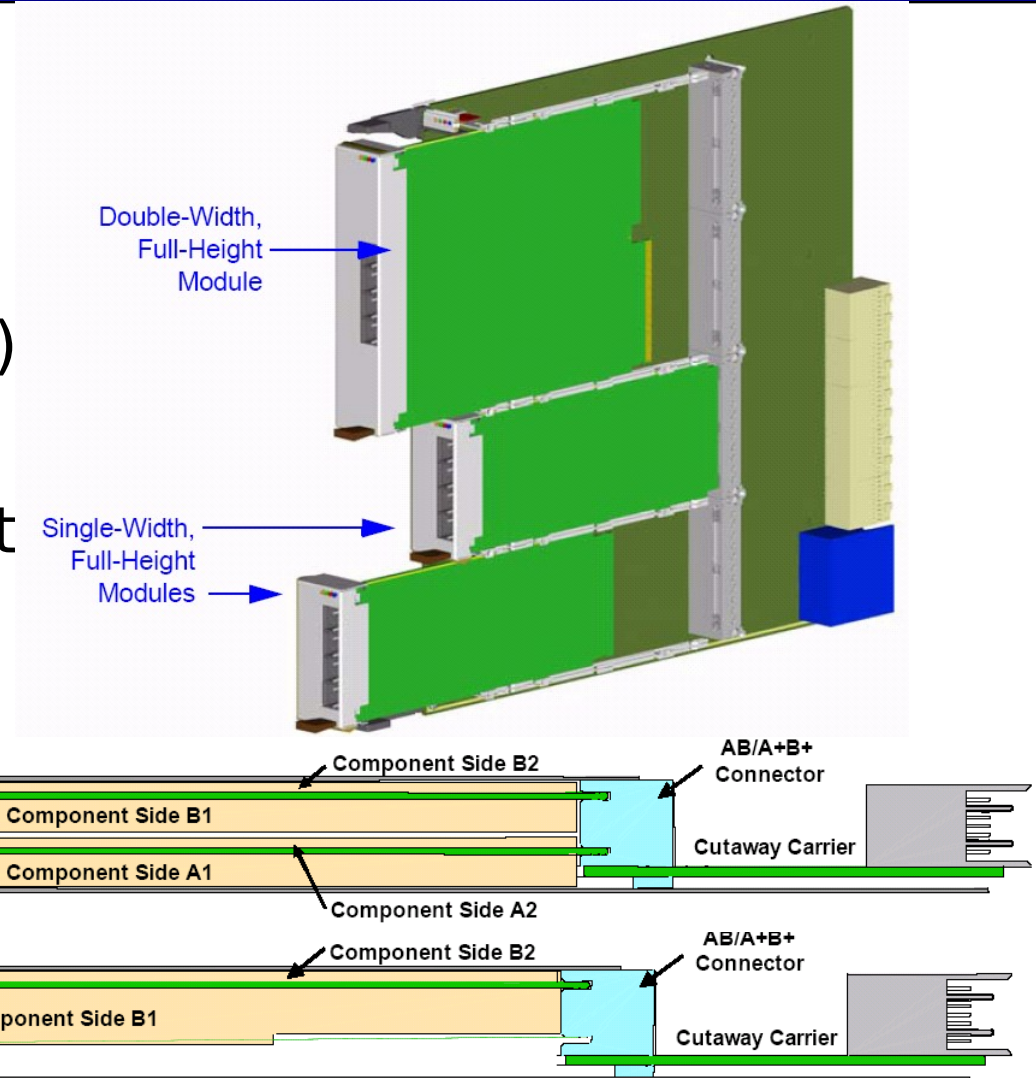
- Overloaded mech.
  - Ugly huge metal crates
  - Earthquake proof!
- Prize
  - Expensive but not really an issue
  - 6000/14\*2 ~ 200€/board
- Maybe:
  - Something better/cheaper

# CN: layout



# CN: mechanics

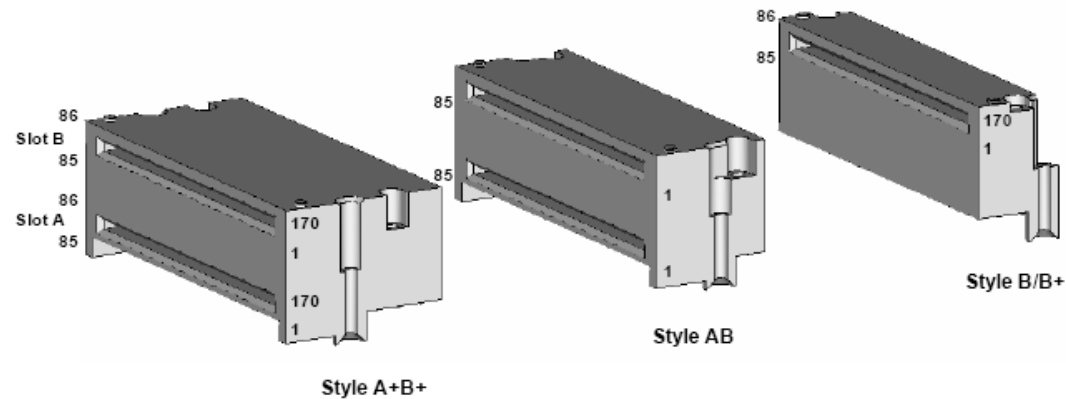
- Advanced Mezzanine Card
  - Double-Width (4U)
  - Full-Height (1 card per 1/2slot)



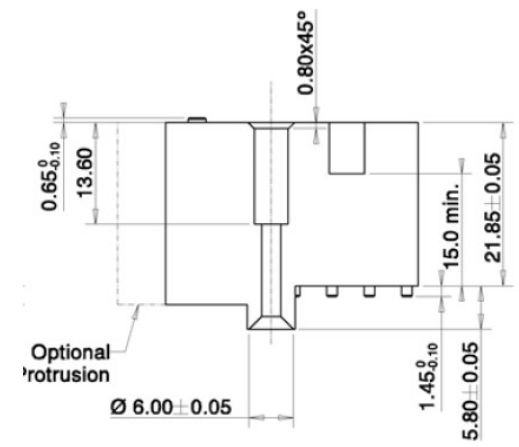
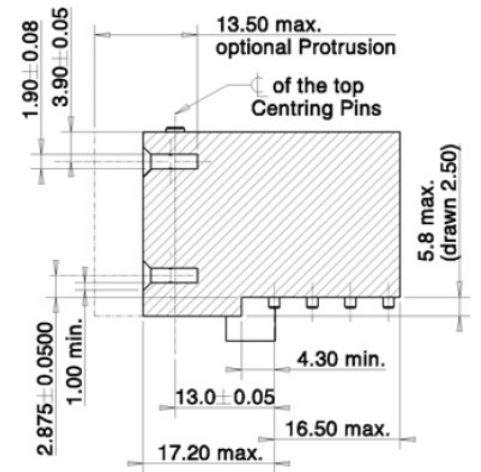
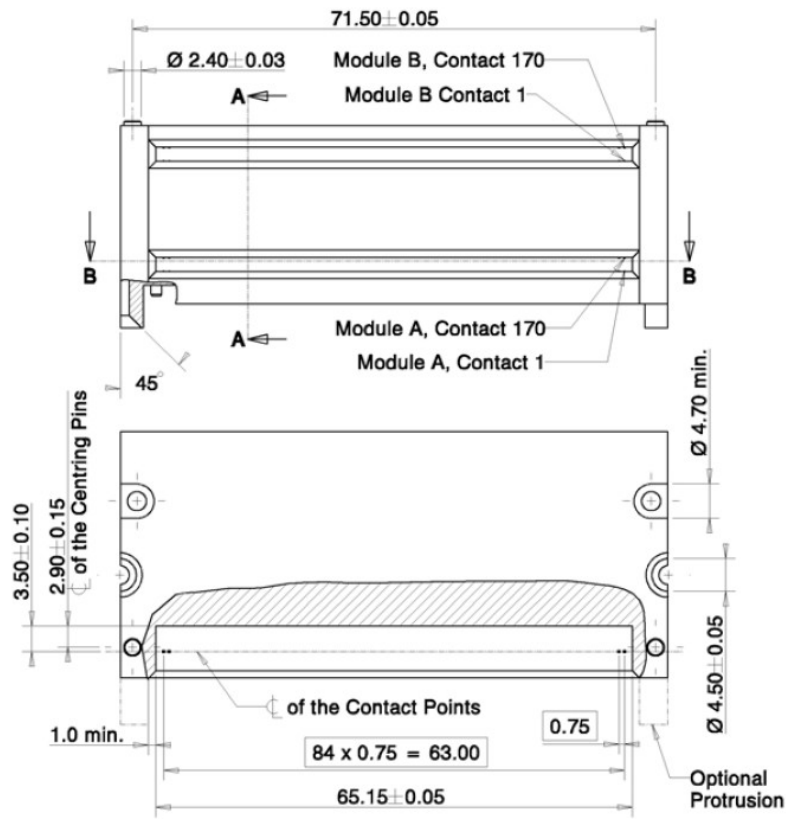
# Mezzanine - Carrier

Connector Style	Interface to AMC Module	Number of Module Slots	Number of contact positions to Carrier	Number of contact rows on Carrier	Differential pairs	General purpose contacts	Power contacts	Ground contacts
B	Basic	1	85	1	19	11	8	28
B+	Extended	1	170	2	45	16	8	56
AB	Basic	2	170	2	38	22	16	56
A+B+	Extended	2	340	4	90	32	16	112

Figure 7-1 Overview of AMC Connector housings



# Mezzanine - Carrier



# Zone 1 connector

