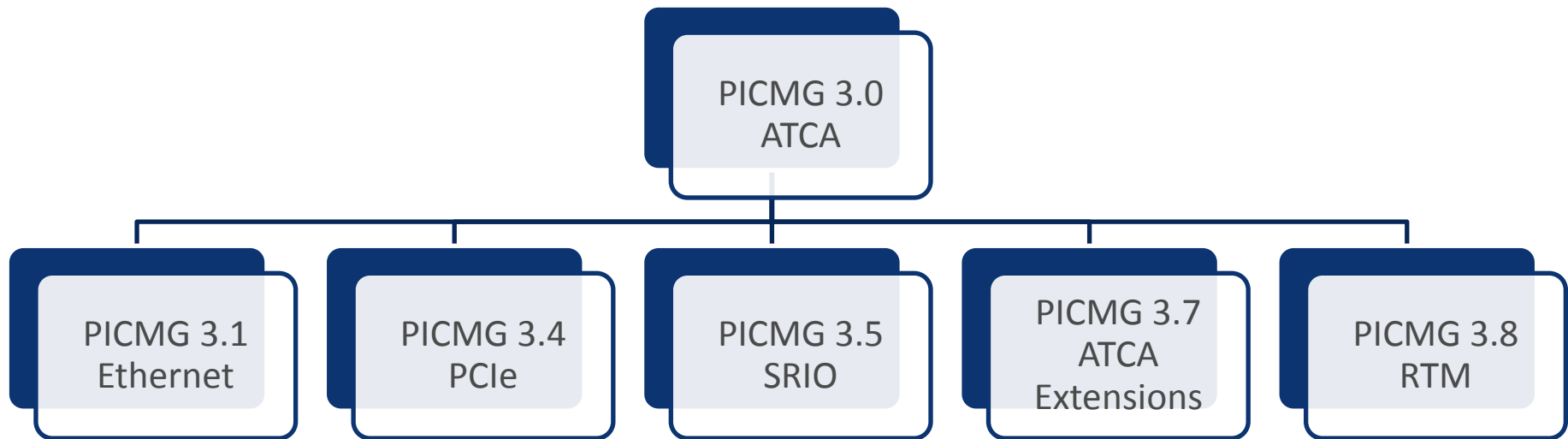


An Introduction to PICMG 3.7 ATCA Base Extensions

PICMG SPECIFICATION HIERARCHY



PICMG 3.0 AdvancedTCA

PICMG 3.0 THE ORIGINAL ATCA IMPLEMENTATION

- Introduced in 2002 by the PCI Industrial Computer Manufacturers Group
- Initially targeted to the Telco Industry, so -48VDC powered
- System Availability target of 99.999% (~6 minutes/year of down time)
- Physical Infrastructure Management and Environmental Monitoring
- 200W/slot in a Telco environment
- Hot-Swap of FRUs and blades supported
- RTMs to simplify cable routing and repair



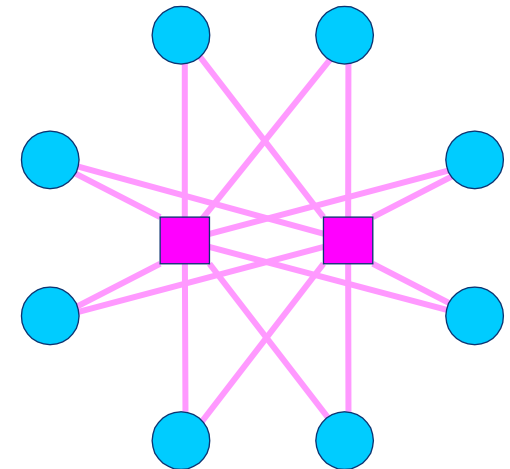
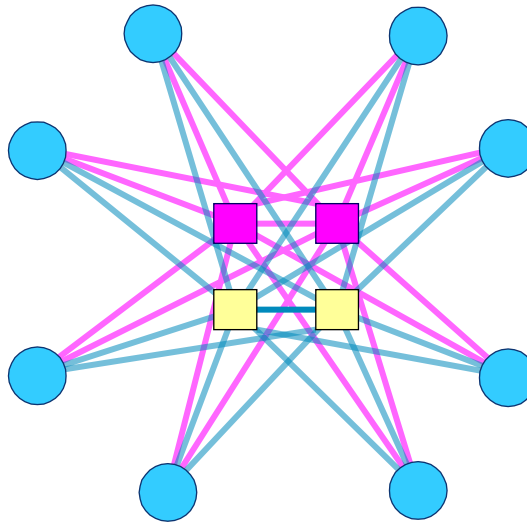
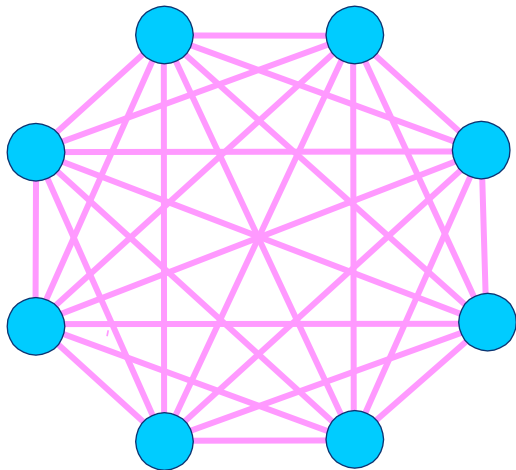
PICMG 3.0 THE ORIGINAL ATCA IMPLEMENTATION

10/100/1000 MB Ethernet Base Interface for out of band management

A protocol agnostic Fabric interconnect for moving data

Dual-Star, Dual-Dual-Star, Full-Mesh, and Replicated Mesh Fabric architectures

A Fabric data rate up to 40Gb/s (4 x 10Gb/s) was planned



PICMG 3.0 THE ORIGINAL ATCA IMPLEMENTATION

The Blades are typically XEON based, but DSPs and Packet Processors are available

Storage blades available

Many version of switch blades

Interoperability Workshops insure that everything works together



PICMG 3.0R1, R2, AND R3 ATCA UPDATES

The ATCA specification is continually updated to meet market requirements

- 200W -> 400W per blade
- Advanced Differential Fabric connector added to support faster Fabrics
- 40G Ethernet added in PICMG 3.1R2
- 1700+ proposed CRs reviewed, mostly clarifications
- Current shelves support 450W+ cooling

PICMG 3.1 ETHERNET & FIBRE CHANNEL

PICMG 3.1

Ethernet/Fibre Channel Over PICMG 3.0

PICMG 3.1 ETHERNET FABRIC

1G (1000Base-KX) Fabric for the first products, 240Gb/s (Full-Mesh)

10G (10GBASE-BX4) Fabric was demonstrated in 2004, 2.4Tb/s (Full-Mesh)

In 2012, PICMG 3.1R2.0 added 40G (40GBASE-KR4) Fabric based on IEEE 802.3ba. It was demonstrated in ATCA systems the same year, 9.6Tb/s (Full-Mesh)

The IEEE 802.3bj standard was recently completed and includes 100GBASE-KP4 and 100GBASE-KR4 for backplane use. The SERDES manufacturers are only showing interest in 100GBASE-KR4 which will make the backplane a challenge to design.

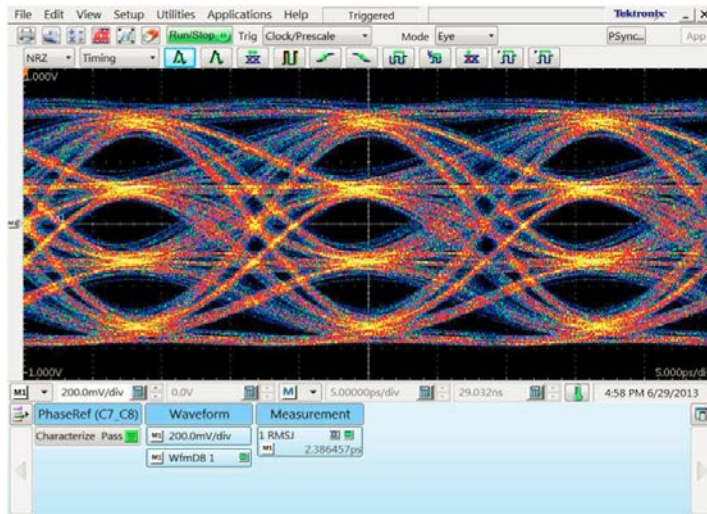
PICMG 3.1R3.0 *could* add:

100G (100GBASE-KR4) Fabric, 24.0Tb/s (Full-Mesh)

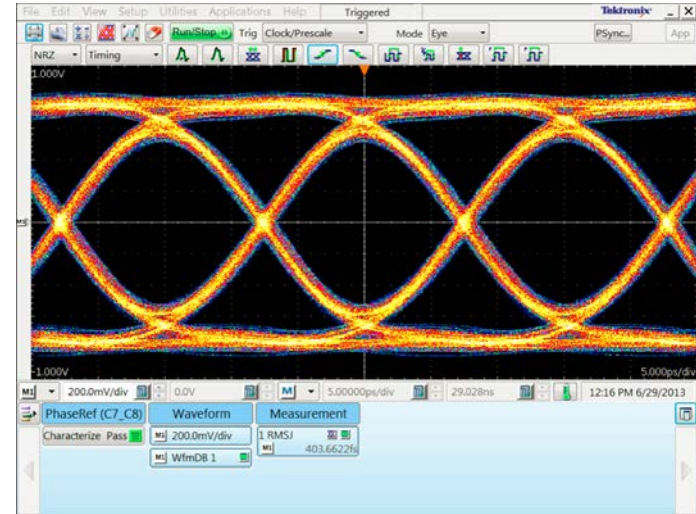


PICMG 3.1 ETHERNET FABRIC

100GBASE-KP4



100GBASE-KR4



KP4 signals run about ½ the frequency of KR4 signals for the same data rate

**IEEE
802**

Images courtesy of Globaltek

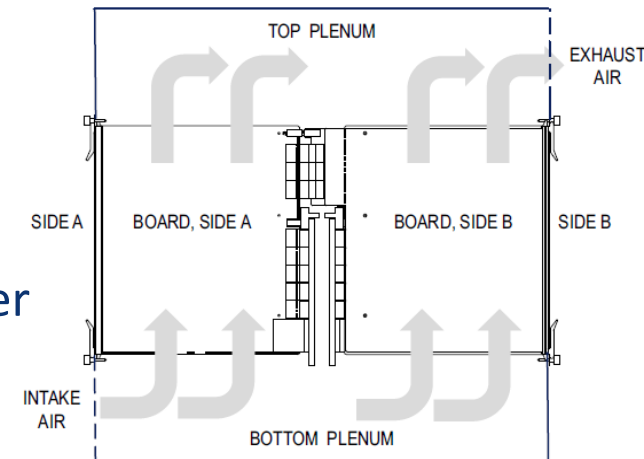
PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

PICMG 3.7

AdvancedTCA Base Extensions

PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

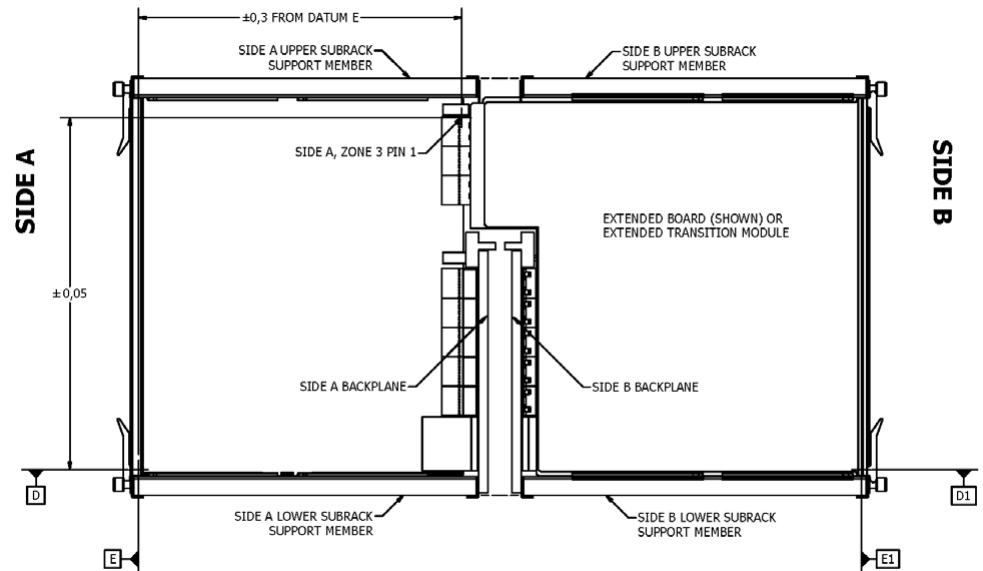
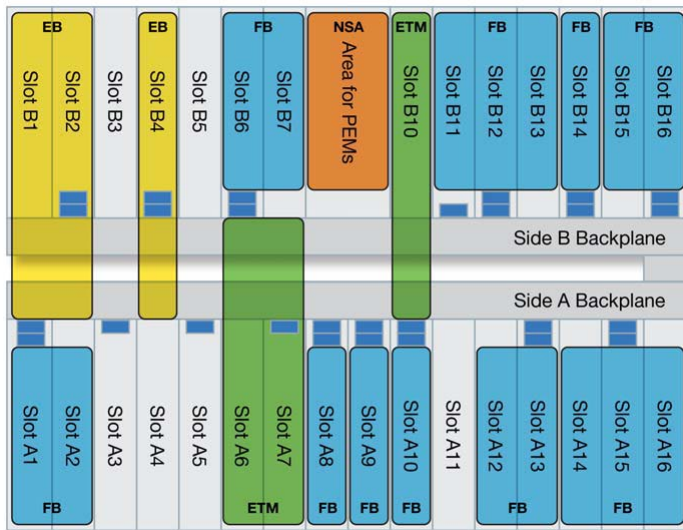
- Backward compatible with existing ATCA boards
- Up to 32 slots, 16 in the front (Side A) and 16 in the back (Side B)
- New Extended Boards and Extended Transition Modules (ETM)
- Power increased to 600W for a single-slot blade, 800W for wider blades
- Support for -60VDC input not required
- Enhanced Hardware Platform Management
- Double Wide boards explicitly supported
- Relaxed temperature profiles for use in a Data Center
- 10GBASE-T supported on the Base Interface



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Up to 32 slots, 16 in the front (Side A) and 16 in the back (Side B)

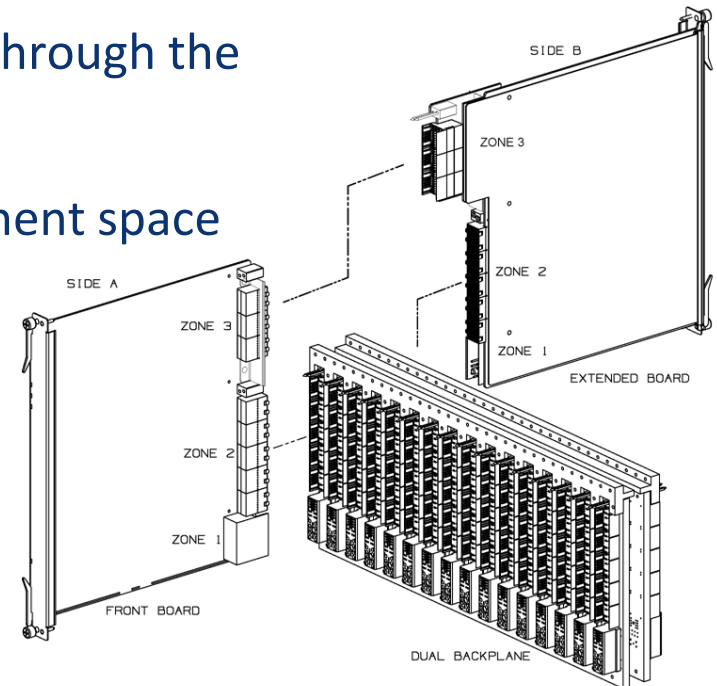
- Can have a single serpentine backplane, or two back-to-back backplanes
- The single serpentine backplane does not support ETMs
- Boards can be installed in Side A or Side B



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Extended Boards (EB) and Extended Transition Modules (ETM)

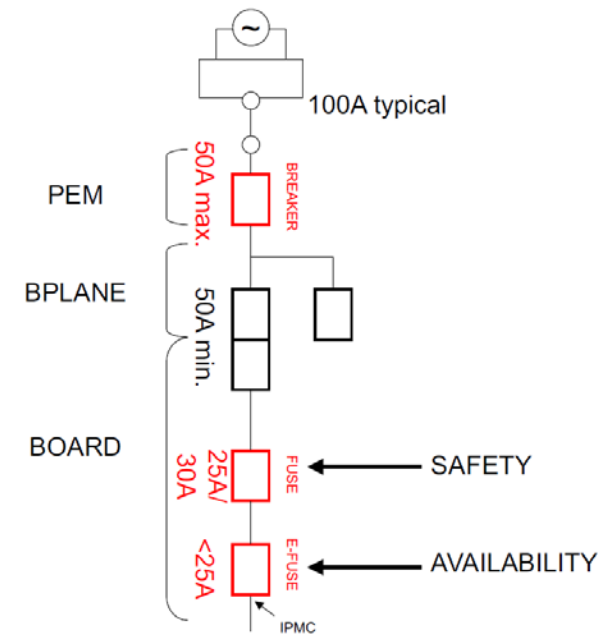
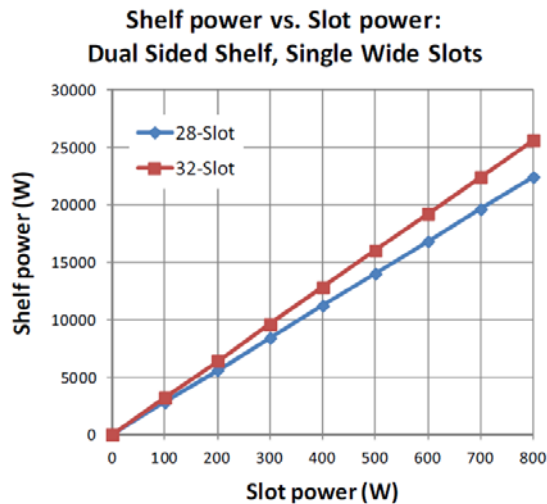
- EBs connect to the Base Interface and Fabric on the backplane
- EBs can get additional power from the backplane
- Both EBs and ETMs connect to the Front Board through the Zone 3 connectors
- Both EBs and ETMs double the available component space
- Both can be installed in Side A or Side B
- ETMs are just big RTMs



PICMG 3.7 ADVANCED TCA BASE EXTENSIONS

Much higher power dissipation for blades and EBs

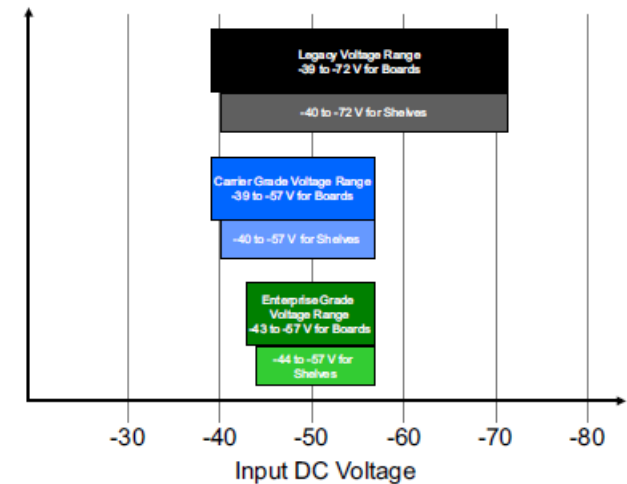
- The power connector rating was increased from 16A to 25A with a more realistic test that includes cooling through the PCBs
- Slot power limit increased from 400W to 800W
- 400W+ Boards require electronic fuses



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Support for -60VDC input not required

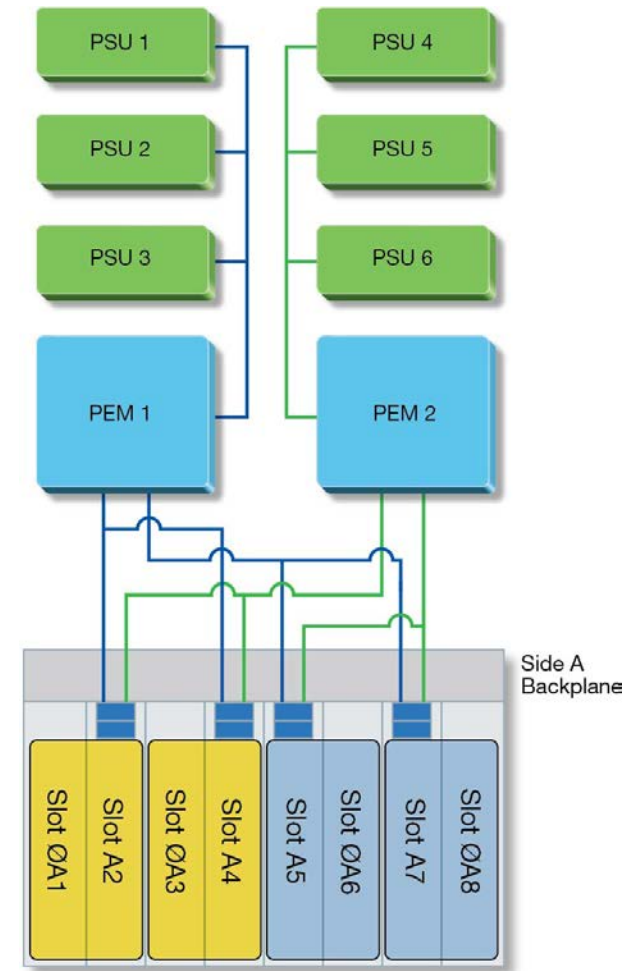
- Legacy, Carrier Grade, and Enterprise Grade voltage ranges defined
 - Legacy includes support for -40 to -72 VDC input, including the nominal -60V
 - Carrier Grade supports only -40 to -57 VDC input , including the nominal -48V
 - Enterprise Grade supports only -44 to -57 VDC input
- Dropping support for -60V makes the shelf and blades SELV and can reduce cost.
- Enterprise Grade blades can use lower Cost DC-DC converters that have a smaller input voltage range



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Hardware Platform Management Enhanced

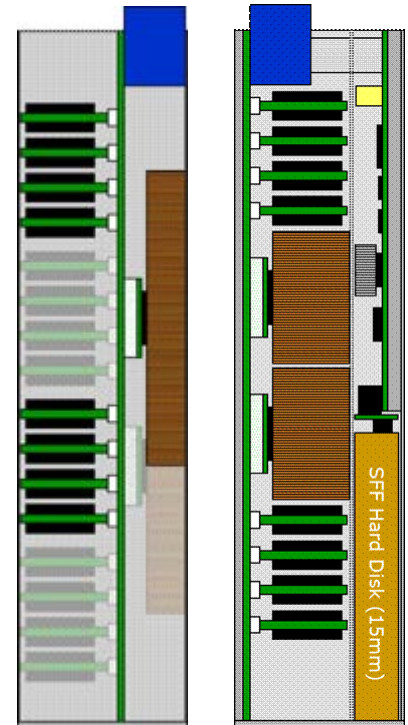
- Support for Extended Boards and ETMs
- Support for up to 32 Boards
- More detail on Power Entry Module feeds
- Can determine which AC Power Supply feeds a FRU
- A board can say what input voltage it supports
- A shelf can say what voltage it will provide
- Boards can report Power and Energy usage
- High accuracy sensors, more than 8-bit raw values



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Double Wide Boards explicitly supported

- Double Wide Boards were allowed in PICMG 3.0 ATCA, but not well described
- PICMG 3.7 has a thorough description of Double Wide Boards
- Double Wide Centered Board
 - PCB in the center, DIMMS on the left, CPUs on the right
- Double Wide Left Aligned Board
 - PCB on the left, everything on the right
- Boards can be more than Double Wide



PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

Relaxed temperature profiles for use in a Data Center

- The original ATCA specification was targeted towards TELCO customers with a 55C maximum ambient temperature
- A Data Center climatic class was added with a 45C maximum ambient temperature
- The Data Center climatic class allows approximately 1.5 times higher Board power to be used as compared with a design for the Central Office climatic class.
- A shelf that can cool 400W boards in a Central Office should be able to cool 600W boards in a Data Center
- The cooling performance classes introduced by CP-TA are included and extended to higher levels

PICMG 3.7 ADVANCEDTCA BASE EXTENSIONS

10GBASE-T supported on the Base Interface

- Increases the speed of the Base Interface from 1G to 10G
- Running the Base Interface at 10G instead of 1G
 - Reduces management message latency
 - Allows for faster firmware upgrades

