

Advanced TCA[®] Technology and Building Blocks

Product Marketing Manager
Rissen Lee



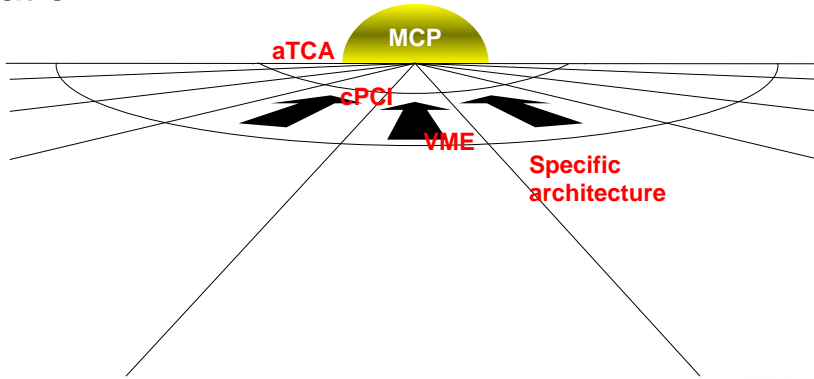
Agenda

- ◆ **Modular Trend**
- ◆ aTCA Technology & Building Block
- ◆ aTCA Application
- ◆ Q&A

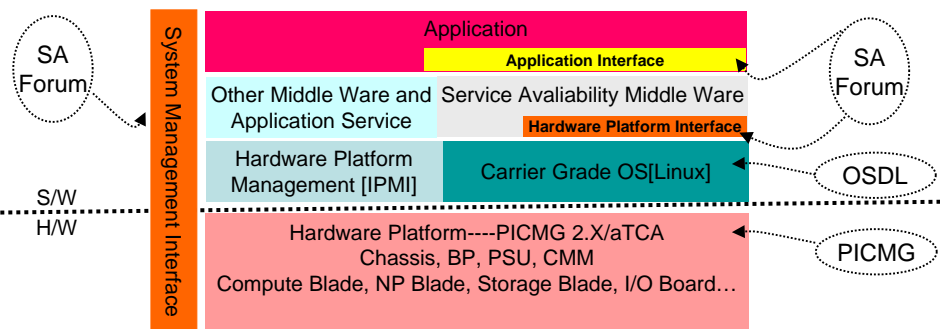


Modular Trend

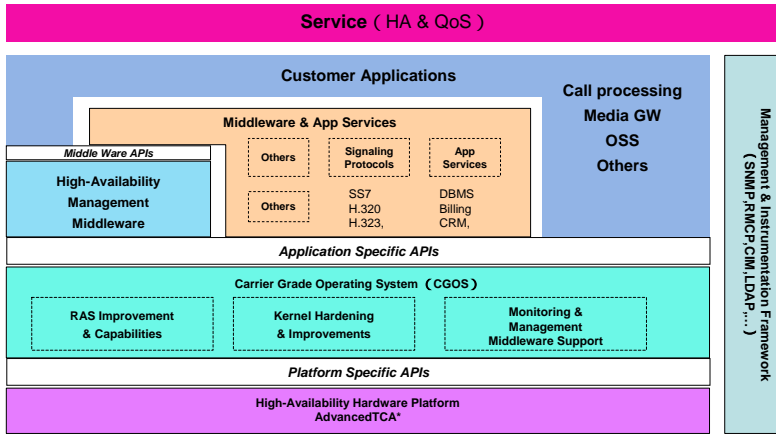
- ◆ Industrialization on Telecom & Network H/W Platform



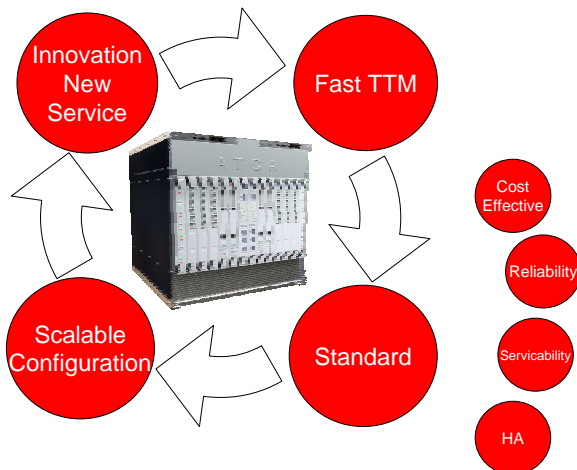
Typical MCP Architecture



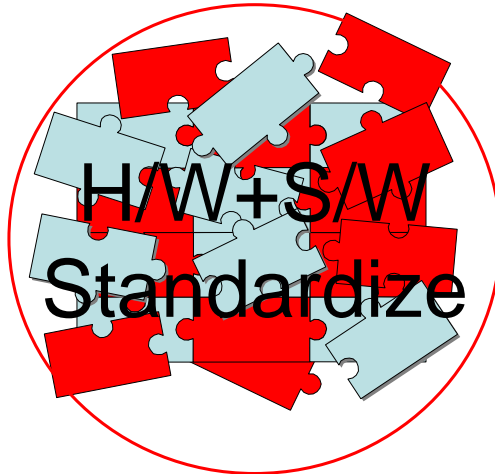
Typical MCP for Telecom & Network Application



Advantages of aTCA



How to realize MCP



Standardizing the Hardware Platform

Advanced Telecom Computing Architecture

Software:

Standardize →

- ◆ Hardware Platform Management I/F
- ◆ Carrier Grade OS
- ◆ Hardware Platform I/F
- ◆ Application I/F

aTCA
S/W

Target:

CG Communication &
Computing Equipment

Hardware:

Standardize →

- ◆ High Speed Interconnect
- ◆ Next Generation Processors
- ◆ Reliability, Manageability, Serviceability

aTCA
H/W

Target:

CG Communication &
Computing Equipment



Agenda

- ◆ Modular Trend
- ◆ **aTCA Technology & Building Block**
- ◆ aTCA Application
- ◆ Q&A

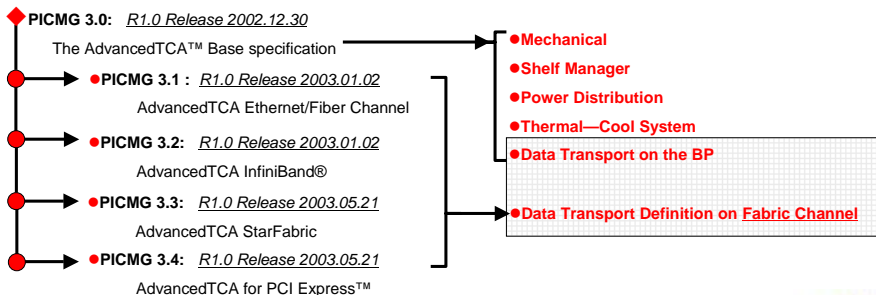


What's the aTCA

aTCA: the PICMG 3.X family, is a new series of PICMG specifications, targeted to requirements for the next generation of carrier grade communications equipment. This series of specifications incorporates the latest trends in high speed interconnect technologies, next generation processors and improved reliability, manageability and serviceability

PICMG 3.x Family

---from www.picmg.com



PICMG 2.X--cPCI & PICMG 3.X--aTCA

- ◆ **2.X: CompactPCI**
 - PICMG 2.0 Core CompactPCI Spec Rev. 2.1 vs Rev. 3.0
 - PICMG 2.1 Hot Swap Spec
 - PICMG 2.3 PMC I/O
 - PICMG 2.4 IP I/O
 - PICMG 2.5 H.110 CT Bus
 - PICMG 2.7 6U Dual System Slot
 - PICMG 2.8 PXI-Instrumentation
 - PICMG 2.9 System Management
 - PICMG 2.10 Keying
 - PICMG 2.11 Power Interface
 - PICMG 2.13 Redundant System Slot
 - PICMG 2.14 MultiComputing Spec
 - PICMG 2.15 PTMC (PCI Telecom Mezzanine Carrier/Card)
 - PICMG 2.16 PSB (Packet Switching Backplane)
 - PICMG 2.17 StarFabric
 - PICMG 2.20 Full Mesh
- ◆ **3.X: ATCA :**
 - PICMG 3.0 Base Specification
 - PICMG 3.1 Ethernet/Fibre Channel Fabric
 - PICMG 3.2 InfiniBand Fabric
 - PICMG 3.3 StarGen Advanced Switching Fabric
 - PICMG 3.4 PCI-Express Advanced Switching Fabric

6U x 160mm
0.8" pitch
57 in²
35-50 Watt
OC-12/OC48

8U x 280mm
1.2" pitch
140 in²
150-200 Watts
OC192/OC768



PICMG 2.X--cPCI & PICMG 3.X--aTCA

PICMG 2.0 family

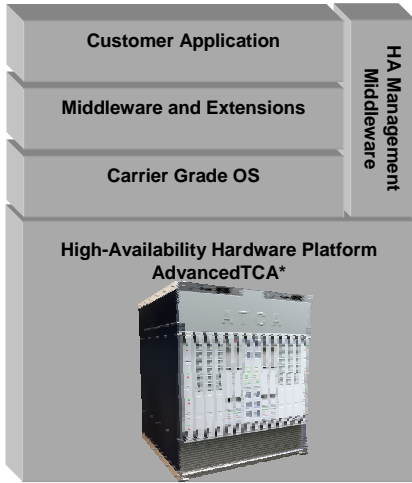
- ◆ The PICMG® 2.0 family of specifications describes a platform suitable for a variety of uses. The first specifications in the family defined a subrack and module packaging option for board level computers and peripherals interconnected by the PCI bus with the following characteristics:
 - 3U and 6U by 160 mm Eurocard packaging
 - 4 HP slot pitch
 - Logic level power distribution at 5 and 3.3 volts
 - Requirement for AC or DC power conditioning
 - Board level hot swap supported by PCI accessible mechanisms
 - User IO pinouts for mezzanines
- ◆ Specifications were added to the family defining auxiliary interconnects such as H.110, an optional IPMI based management infrastructure, and subrack mounted power supplies. Hardware and software refinements were made to the hot-swap architecture and a scheme for backplane networking was also defined.

PICMG 3.0 family

- ◆ The PICMG® 3.0 family of specifications draws heavily on the PICMG® 2.0 experience by adopting the serial interconnect philosophy that has evolved there while making changes where they are indicated by that experience:
 - **8U high by 280 mm deep, with 6 HP Slot pitch, to support higher levels of integration at the Front Board level.**
 - **Bulk -48 VDC distribution with Front Board level power conditioning to better support the evolution of silicon technology**
 - **Elimination of the PCI legacy and reallocation of connectivity to serial interconnects**
 - **Flexible user IO**
 - **Mandatory use of IPMI management**
 - **Power and thermal management guidelines enforced by the management infrastructure**



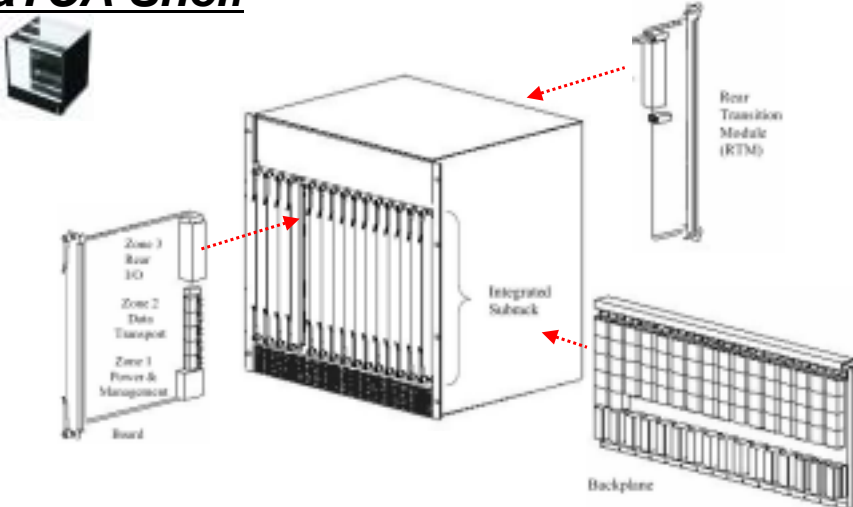
aTCA Building Block



- ◆ Shelf
 - Chassis
 - Power Distribution System
 - Thermal-Cooling System
- ◆ Backplane
- ◆ aTCA Board
 - Fabric Board
 - Node Board
 - I/O Board
- ◆ Shelf Manager

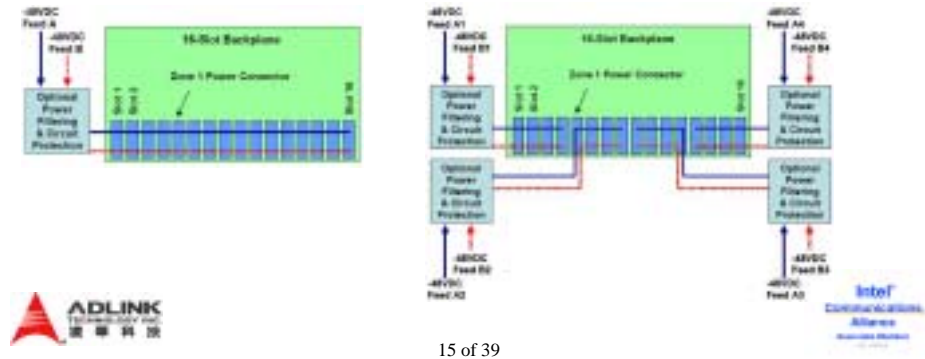


aTCA Shelf

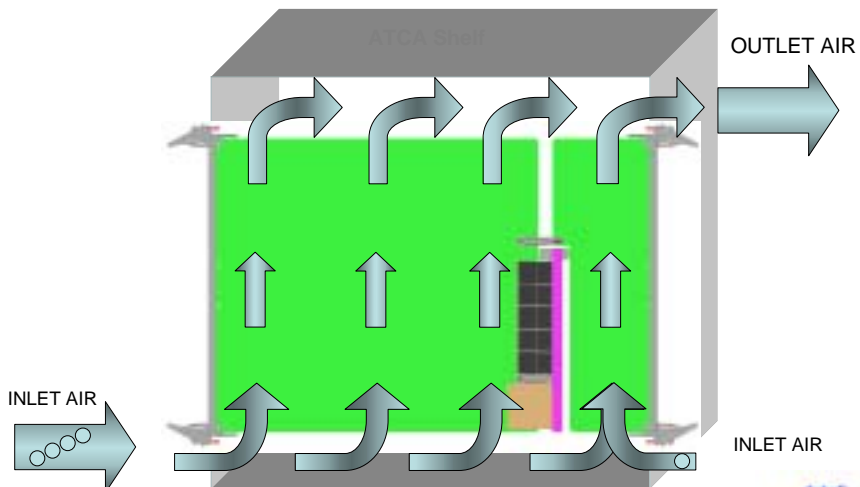


aTCA Power Distribution System

- ◆ -48/-60 VDC power input----40.5 to -57 VDC, -50 to -72 VDC
- ◆ Redundant power inputs
- ◆ Distribution of ringing voltages
- ◆ Capacity of over 3,200 Watts per shelf
- ◆ Local power conversion---DC-DC converters on each board
- ◆ Positronic Power connector with sequenced pins
- ◆ Can be configured with other power distribution architectures

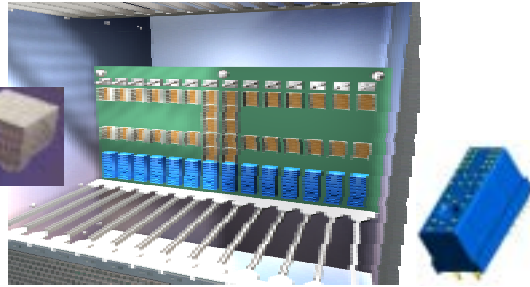


aTCA Thermal-Cooling System

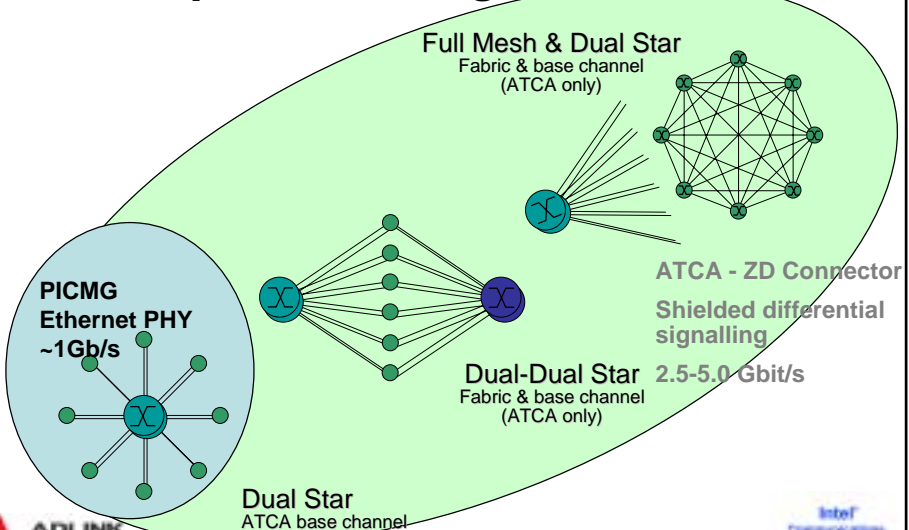


aTCA Backplane

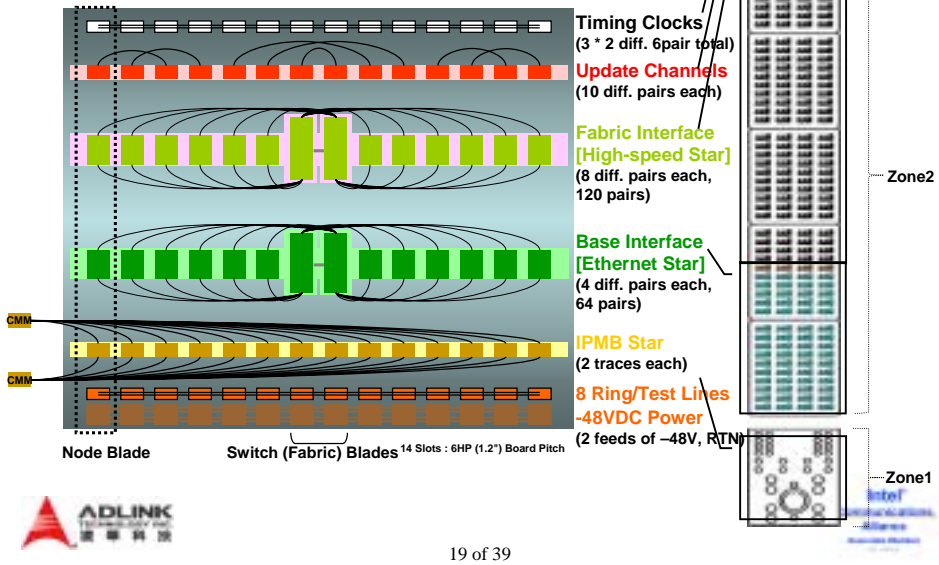
- ◆ 3-8mm Thickness
- ◆ 2-16 Slots
- ◆ ZD Connectors
 - Z1,Z2[P20-P24]
- ◆ Fabric
 - Telecom Clock
 - Update Channel
 - Base Channel
 - 10/100/1000 BaseT Ethernet (dual) Star interconnect interconnect (Supports IP Layer 3 - if boards implement)
 - Fabric Channel
 - PICMG 3.1 – Ethernet Fabric
 - PICMG 3.2 – InfiniBand* Fabric (Dual Star or Mesh)
 - PICMG 3.3 – StarFabric
 - PICMG 3.4 – PCI-Express* (Dual Star or Mesh)



Data transportation Legacy in aTCA

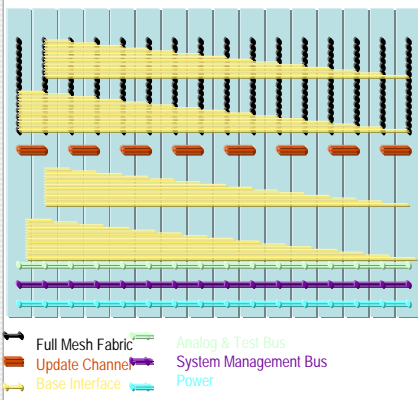


Channels in aTCA Backplane

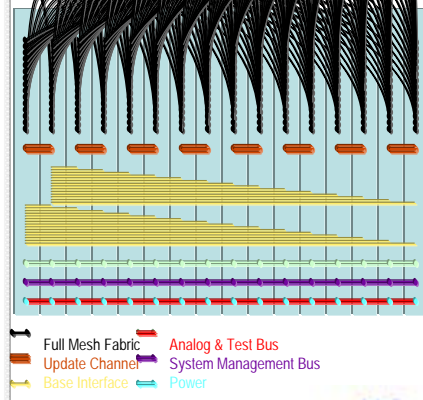


Typical Data Transportation Topology

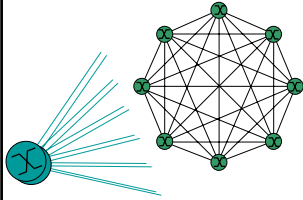
Dual-Dual Star



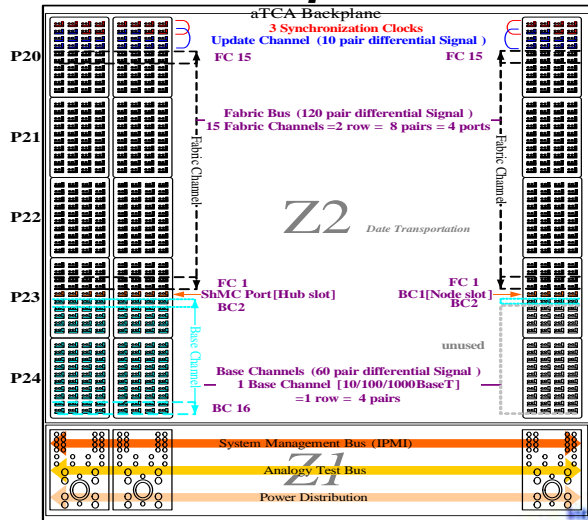
Mesh Topology Realization



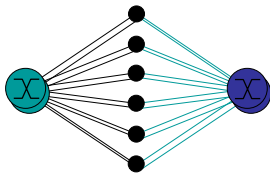
aTCA Mesh Fabric in Backplane



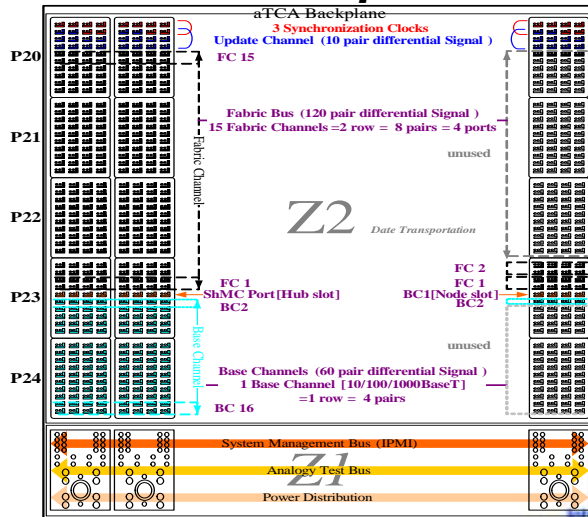
Full Mesh & Dual Star
Fabric & base channel
(ATCA only)



aTCA Dual-Dual Star in Backplane



Dual-Dual Star
Fabric & base channel
(ATCA only)



Data Transport in aTCA

Channel Type	Function	Mode	Configuration		Location	
			Hub	Node	Hub	Node
Telecom Clock	Telecom Clock Signal Transport		6 pairs	6 pairs	P20	P20
Update Channel	HA Redundancy High Speed Data Transport	TBD	10 pairs	10 pairs	P20	P20
Fabric Channel	High Speed Data Transport	PICMG 3.1/3.2/3.3/3.4	120 pairs	16/120pairs	P20-P23	P20-P23
Base Channel	Data Transport over dual Star 1000BaseT Ethernet	Ethernet 1000BaseT	64 pairs[4 pairs for ShMC]	8 pairs	P23-P24	P23
IPMB	HA Redundancy Intelligent Platform Management Bus	I2C	2 pairs	2 pairs	P10	P10

Note:

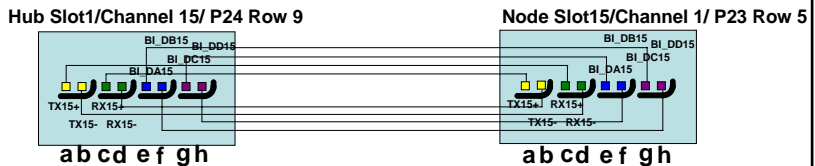
1) Fabric Channel in node slots can be configured with Dual Star, Mesh or Replicate Mesh Topology



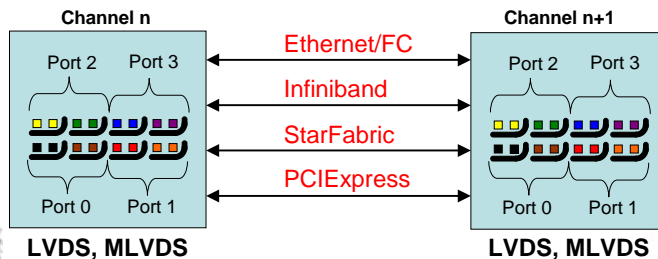
Data Transport in Base/Fabric Channel

Data Transport on the LVDS

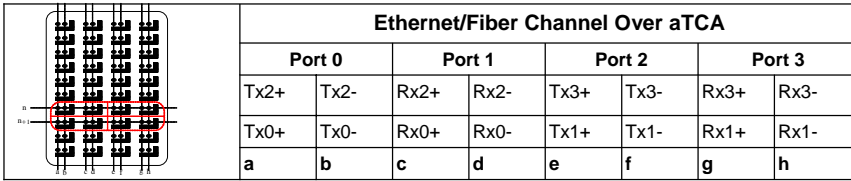
◆ Base Channel Interface : 10/100/1000BaseT [802.3ad-2000]



◆ Fabric Channel Interface: PICMG3.1,3.2,3.3,3.4:

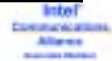


aTCA Fabric Configuration: PICMG 3.1 R1.0 Release 2003.01.02

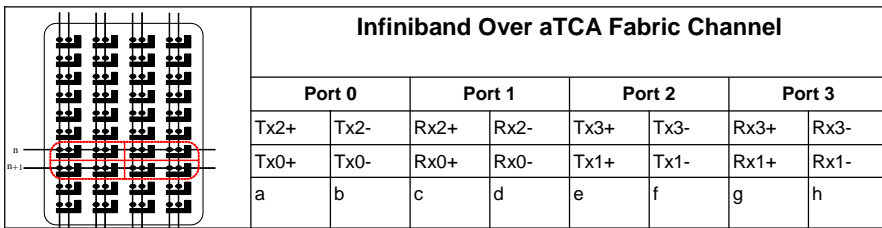


Option	Port0	Port1	Port2	Port3	Description	Data Bit Rate
1	GbE				One 1000BASE-BX	1G/s
2	GbE	GbE			Two 1000BASE-BX	2G/s
3	GbE	GbE	GbE		Four 1000BASE-BX	4G/s
4	GbE			FC-PI	One 1000BASE-BX / One Fiber Channel	1G/s or 2G/s
5	GbE	GbE		FC-PI	Two 1000BASE-BX / One Fiber Channel	1G/s or 2G/s
6	GbE	GbE	FC-PI	FC-PI	Two 1000BASE-BX / Two Fiber Channel	2G/s or 4G/s
7				FC-PI	One Fiber Channel	2G/s
8			FC-PI	FC-PI	Two Fiber Channel	4G/s
	XAU1	XAU1	XAU1	XAU1	One 10GBASE-BX4	10G/s

Notes : FC-PI (Fiber Channel Physical Interface) may support 1 or 2 Gigabits/second w/auto negotiation. The Table assumes 2 Gigabits/second; XAU1:10 Gigabit Attached Unit Interface



aTCA Fabric Configuration: PICMG 3.2 R1.0 Release 2003.01.02



Option	Interface	Port 0	Port 1	Port 2	Port 3	Base Bit Rate
1	Infiniband	Yes	No	No	No	2.5Gb/s
2	Infiniband	Yes	Yes	No	No	5Gb/s
3	Infiniband	Yes	Yes	Yes	No	7.25Gb/s
4	Infiniband	Yes	Yes	Yes	Yes	10Gb/s

10*16*15=2.4Tb/s



aTCA Fabric Configuration: PICMG 3.3 R1.0 Release 2003.05.21

		StarFabric Over aTCA Fabric Channel							
		Port 0		Port 1		Port 2		Port 3	
		Tx2+	Tx2-	Rx2+	Rx2-	Tx3+	Tx3-	Rx3+	Rx3-
		Tx0+	Tx0-	Rx0+	Rx0-	Tx1+	Tx1-	Rx1+	Rx1-
		a	b	c	d	e	f	g	h
Option	Interface	Port 0	Port 1	Port 2	Port 3	Base Bit Rate	Data Bit Rate		
1	StarFabric	Yes	No	No	No	622Mb/s	450Mb/s		
2	StarFabric	Yes	Yes	No	No	1.25Gb/s	0.9Gb/s		
3	StarFabric	Yes	Yes	Yes	Yes	2.5Gb/s	1.8Gb/s		

2.5*16*15=600Gb/s



aTCA Fabric Configuration: PICMG 3.4 R1.0 Release 2003.05.21

		PCI-Express Over aTCA Fabric Channel							
		Port 0		Port 1		Port 2		Port 3	
		Tx2+	Tx2-	Rx2+	Rx2-	Tx3+	Tx3-	Rx3+	Rx3-
		Tx0+	Tx0-	Rx0+	Rx0-	Tx1+	Tx1-	Rx1+	Rx1-
		a	b	c	d	e	f	g	h
Option	Interface	Port 0	Port 1	Port 2	Port 3	Maximum Bit Rate			
1	PCI Express	Yes	No	No	No	2.5Gb/s			
2	PCI Express	Yes	Yes	No	No	5Gb/s			
3	PCI Express	Yes	Yes	Yes	Yes	10Gb/s			

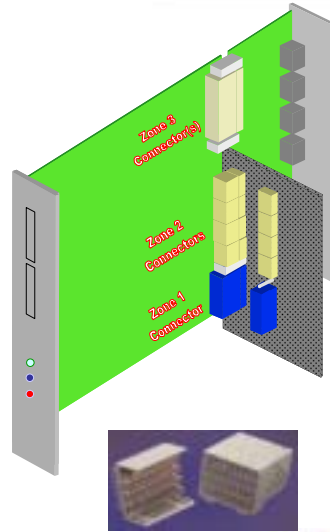
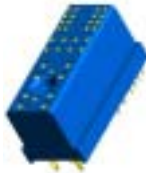
The PICMG 3.4 specification supports the Dual Star, Dual-Dual Star, and Mesh topologies. PICMG 3.4 Boards shall support single (x1), dual (x2), or quad (x4) Port Channel configurations defined in the PCI Express Base Specification. Other Port Channel configurations are not compliant configurations. Table 2 shows the pin assignments for each Channel configuration for one Fabric Channel. The Board shall support the Port to which the pin assignments shall be present across the Rx signal pair on the Board.

10*16*15=2.4Tb/s

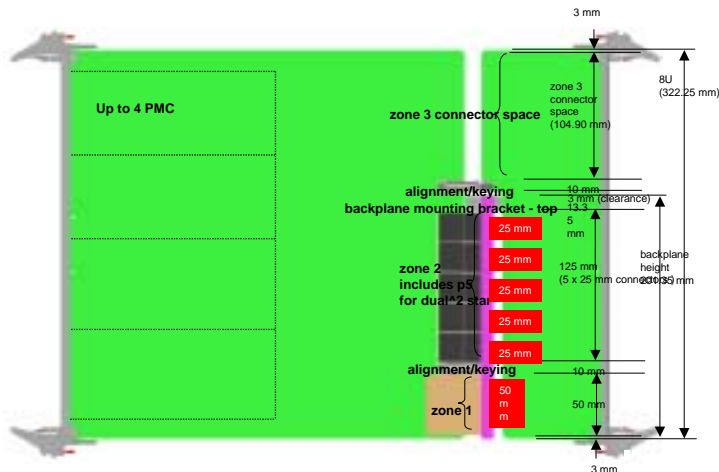


aTCA Board

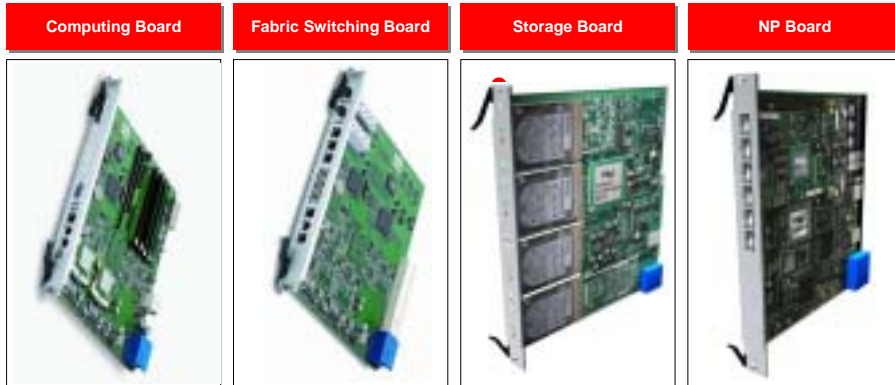
- ◆ **Front Board + RTM Feature:**
 - Front board size 8U x 280 mm
 - Rear board size 8U x 70 mm
 - Board width 6HP (1.2")
 - PCB thickness: 1.6mm - 2.4 mm allowed
 - Simplified Telecom Packaging
 - Provisions for 4 PMCs
 - Alignment/Key pins
 - Z1,Z2,Z3 Connector Zone
 - Z1: Power, IPMI, Ring Test (Postronic Connector)
 - Z2: Data Transport (ZD Connector)
 - Z3: Rear I/O (User Define)
 - 150W---200W
 - Type
 - Universal Computing Board
 - NP Board
 - Storage Board
 - Fabric Switch Board



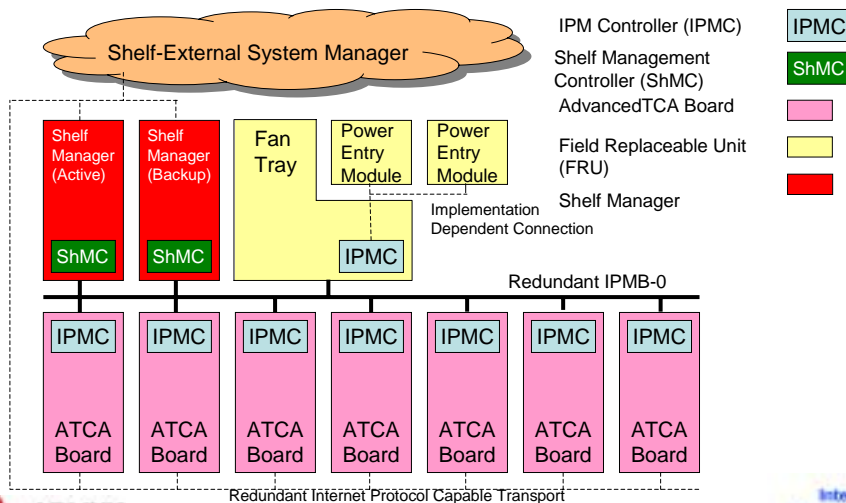
aTCA Board Mechanical



aTCA Board Type



aTCA Management Topology



aTCA Management Features

- ◆ **Architecture**
 - **Dual redundant Shelf (Chassis) Management Controllers (ShMCs)**
 - ShMC is extended version of IPMI Baseboard Management Controller (BMC)
 - No attempt to specify inter-ShMC interactions; only shelf level results
 - **Dual redundant "IPMB-0", implementable either on bused or radial basis**
 - Some overlapping extensions in IPMI 2.0
- ◆ **Compatible extension of IPMI**
 - From static management controller (MC) population assumed in IPMI
 - To dynamic MC population in hot swappable modular platforms
 - Includes approach to management record repositories and hot swap state sensors for FRUs
- ◆ **"E-Keying" facility**
 - Complements ATCA's fabric-agnostic SERDES-based multi-GB/s fabric architecture
 - "Shelf FRU Info" describes backplane links
 - LIB for Application
 - Enables/disables backplane connections
 - Based on protocol compatibility of the end points of each backplane link
 - Future-proof for new fabric protocols
 - Supports OEM protocols (without requiring central registration authority) via GUIDs

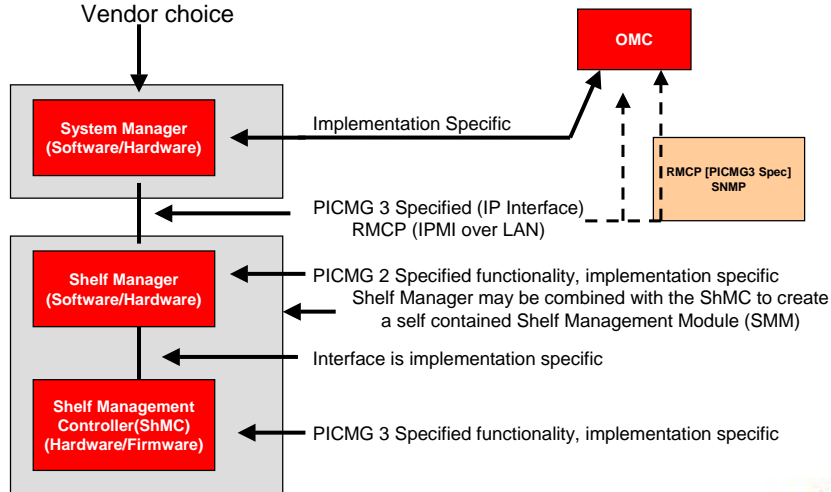


aTCA Management Interface

- ◆ **Hardware I/F**
 - **SMM (Shelf Management Module)**
- ◆ **Software I/F**
 - **RMCP**
 - CLI (via COM or Ethernet)
 - LIB for Application
 - **SNMP**
 - MIB



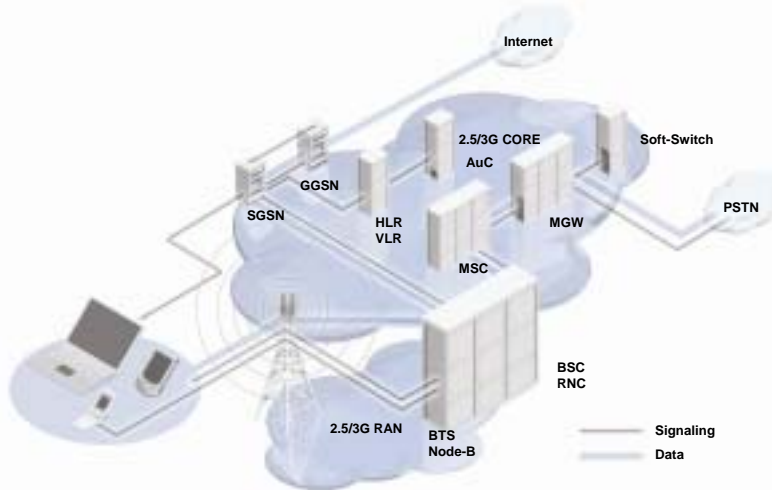
aTCA Management Elements



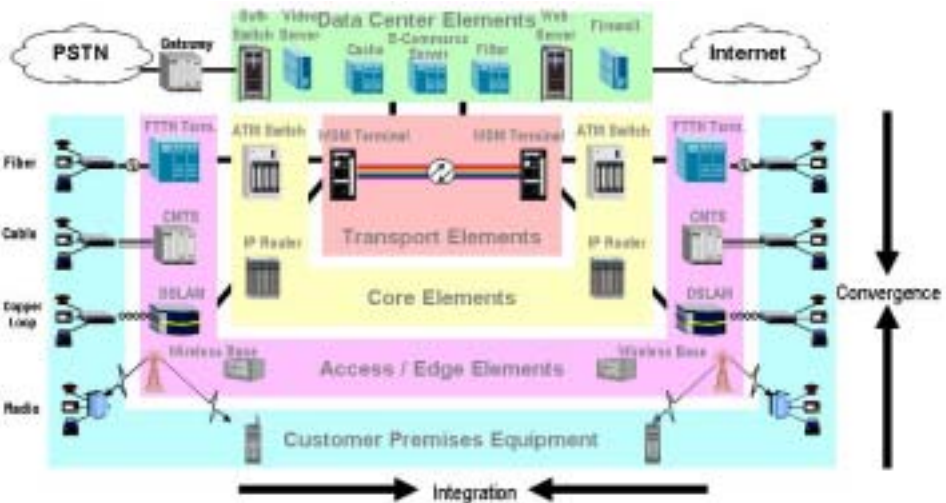
Agenda

- ◆ Modular Trend
- ◆ aTCA Technology & Building Block
- ◆ **aTCA Application**
- ◆ Q&A

aTCA Application-Wireless Core Network



aTCA Application---Telecom Server &GW



Thanks

Q & A

