

SEE
THE **FUTURE.**
CREATE YOUR OWN.

Serial RapidIO AdvancedTCA DSP Development Platform



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Developing and Deploying DSP Applications for Infrastructure



- ◆ Based on the new modular computing architectures from PICMG
 - AdvancedTCA
 - AdvancedMC
- ◆ Flat, efficient software/hardware architecture
 - Serial RapidIO
 - Common IPC
- ◆ Scalable to 16 slots ~ 100s of DSPs
 - Support for multi-chassis applications scaling

Agenda

- ◆ **Overview**
 - **Mercury Computer Systems**
 - **AdvancedTCA & AdvancedMC**
 - **Serial RapidIO**
- ◆ **Ensemble2**
 - **Architecture**
 - **Hardware Modules**
 - **Software Modules**
- ◆ **Summary**

Company Overview

- ◆ **Mercury was founded in 1981**
- ◆ **Leading provider of innovative, engineered computing solutions**
- ◆ **Locations in U.S., Europe and Asia**
 - **R&D centers in U.S., France, and Germany**
 - **665 employees worldwide**
- ◆ **FY04 Revenue \$186 million**
- ◆ **Constantly investing in knowledge of the customer applications**

Pioneer in Embedded Fabrics



product available 1994

- 1.2 Gbps
- Circuit-switched



product available 2000

- 2.1 Gbps
- Circuit-switched



shipping product since early 2003

- Co-inventor
- Up to 10 Gbps full duplex
- Packet-switched

Business Unit Focuses

- ◆ **OEM Solutions**
 - Telecommunications
 - Semiconductors: mask generation, wafer inspection
- ◆ **Imaging & Visualization Solutions**
 - Life sciences: medical imaging, biotechnology
 - Geosciences: oil and gas exploration
- ◆ **Defense Electronics**
 - Radar
 - Data exploitation, imagery and sonar
- ◆ **Momentum Computer**

What is AdvancedTCA?

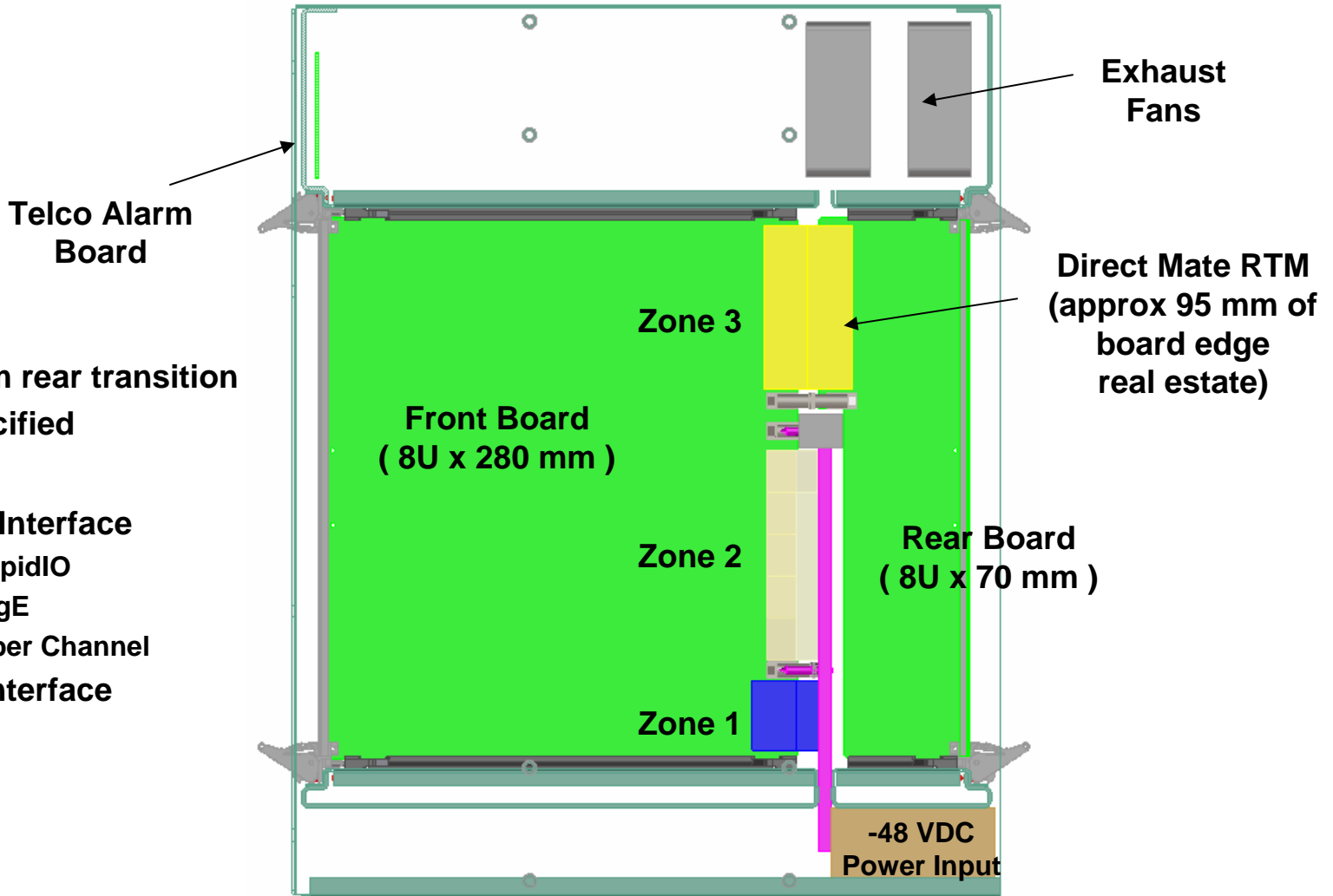
- ◆ **PICMG's new standard for modular computing in communications**
 - **Advanced Telecommunications Computing Architecture (ATCA, PICMG 3.x)**
 - **Tailored for infrastructure**
- ◆ **Defines a set of specifications covering**
 - **Mechanicals and Electricals**
 - **Shelf management**
 - **Data transport (subsidiary specifications)**

Mechanical Specification

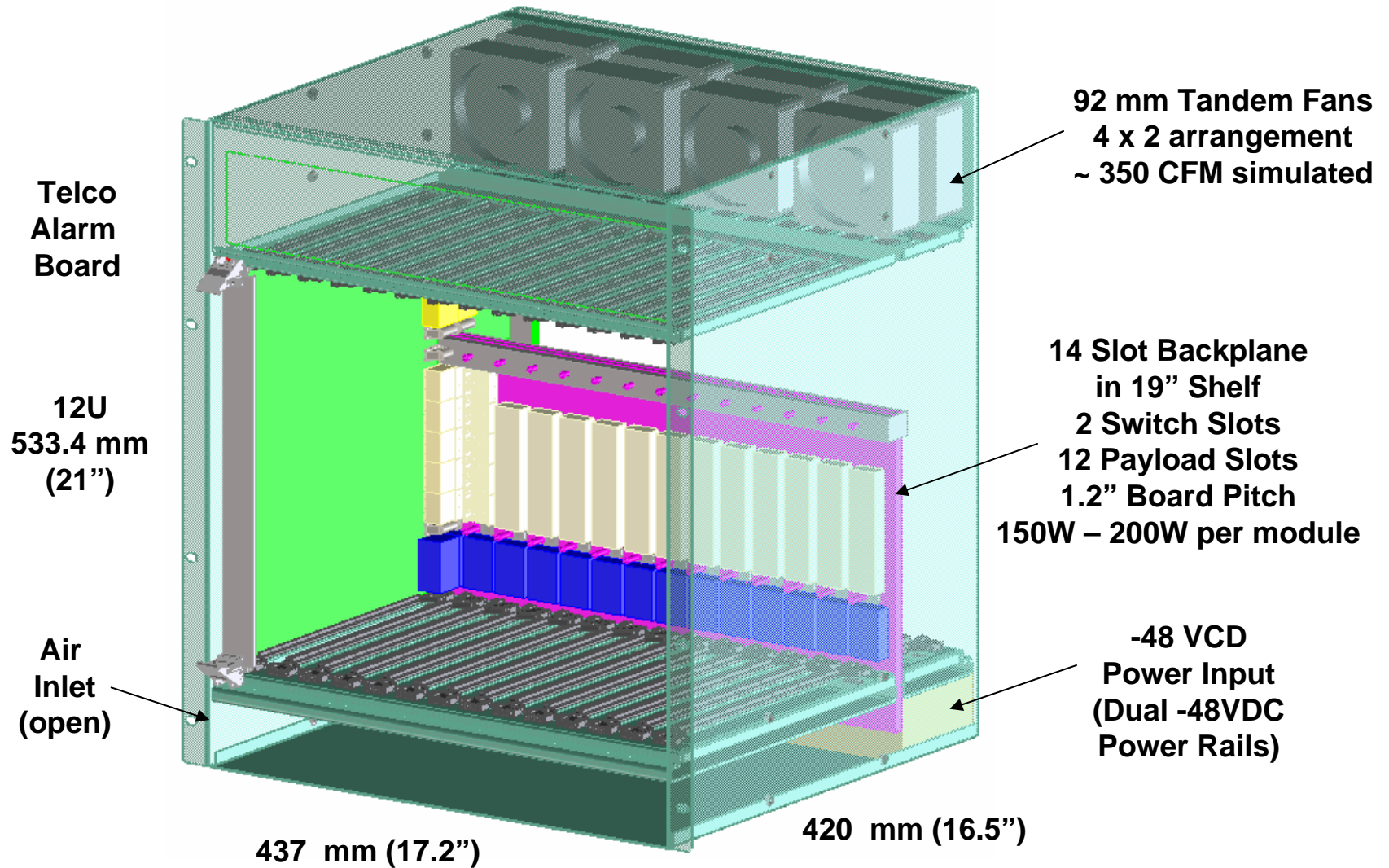
- ◆ **Targeted for 16 slot shelves in 600 mm ETSI cabinets**
 - Room for front and rear cable bend radius
 - 14 slots will fit in an EIA 19" cabinet
 - 23" telecom cabinets also supported
- ◆ **Cooling for 200 W per board**
- ◆ **Reliable mechanics**
 - Serviceability
 - Shock and vibration

Board Mechanics

- ◆ **Zone 3**
 - Custom rear transition
 - Unspecified
- ◆ **Zone 2**
 - Fabric Interface
 - RapidIO
 - GigE
 - Fiber Channel
 - Base Interface
- ◆ **Zone 1**
 - IPMI
 - Power



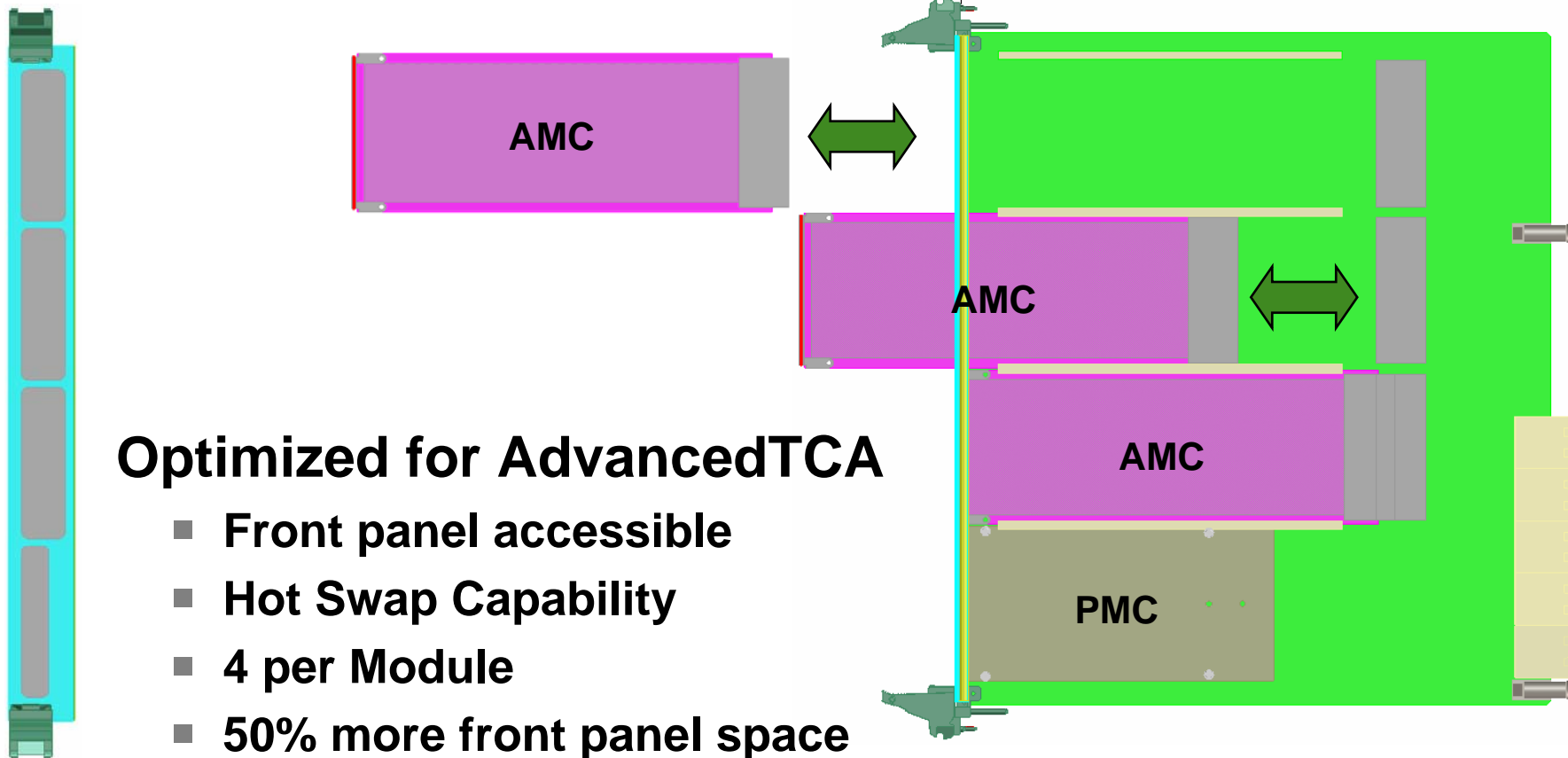
Chassis Mechanics



Subsidiary Specifications

- ◆ **PICMG 3.1 GigE and FiberChannel**
- ◆ **PICMG 3.2 Infiniband**
- ◆ **PICMG 3.3 StarFabric**
- ◆ **PICMG 3.4 PCIExpress and AS**
- ◆ **PICMG 3.5 RapidIO**

What is AdvancedMC?



Optimized for AdvancedTCA

- Front panel accessible
- Hot Swap Capability
- 4 per Module
- 50% more front panel space
- 100% more power

Subsidiary Specifications

- ◆ **AMC.1 PCI Express and AS**
- ◆ **AMC.2 Ethernet**
- ◆ **AMC.3 Storage**
- ◆ **AMC.4 RapidIO**

Why RapidIO?

- ◆ **Standard technology focused on embedded infrastructure**
 - Latency, reliability, and throughput
 - DSPs, communication processors such as the PowerQUICC, NPs and FPGAs
- ◆ **Common, interoperable and focused on**
 - Scalability – multi-chassis subsystem
 - DSPs, communication processors such as the PowerQUICC, NPs and FPGAs

Layered Architecture

- ◆ **Your Application**
- ◆ **Logical Layer**
 - Logical transactions such as
 - Read, write, message, atomic
- ◆ **Transport Layer**
 - Transport logical transactions
 - Handled as requests and responses
- ◆ **Physical Layer**
 - Provide the physical layer control for packets
 - Example - acknowledge, retry, end of packet

Logical Layer Transactions

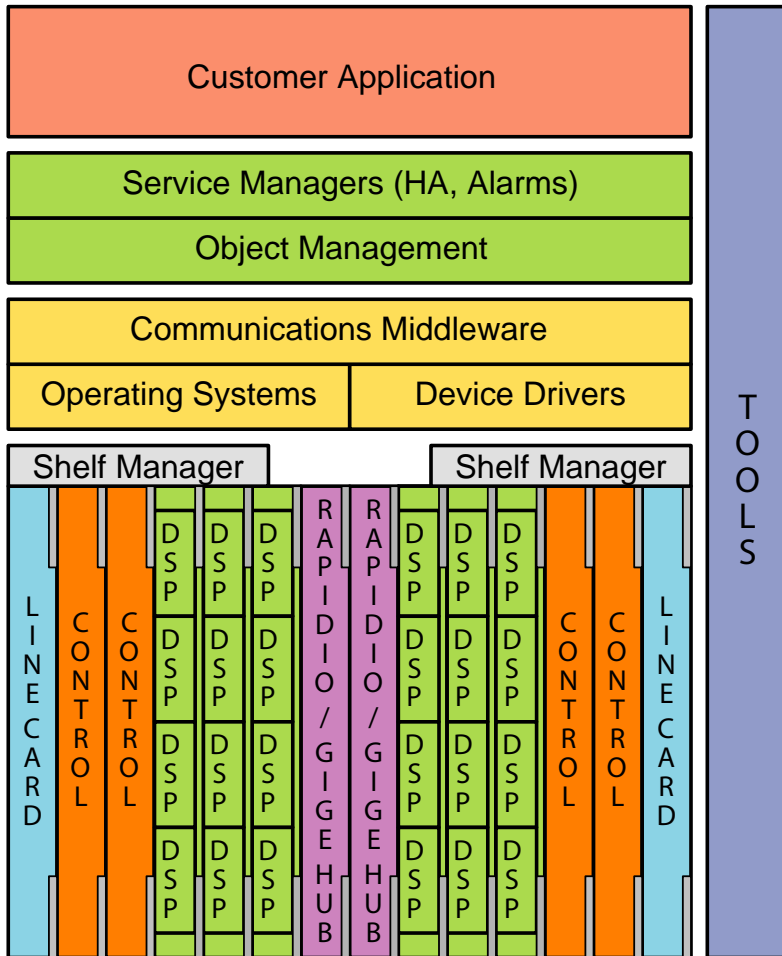
- ◆ **Non-coherent I/O**
 - **Atomics**
 - **NREAD, NWRITE, NWRITE_R, SWRITE**
 - **Maintenance**
- ◆ **Coherent I/O**
 - **Invalidate TLB Entry, IRead_Home, etc.**
 - **Castout, Flush**
- ◆ **Messaging**
 - **Message**
 - **Doorbell**
- ◆ **Data Streaming**
 - **Encapsulation**
 - **Traffic management**
- ◆ **Flow Control**
 - **XON**
 - **XOFF**

Introducing Ensemble²

- ◆ **Modular platform for developing and deploying network applications with TI DSPs**
- ◆ **Built on standard technologies tailored to communications infrastructure**
 - **RapidIO for chip-to-chip, board-to-board, and box-to-box**
 - **DSPs, Communications Processors, and Network Processors**
 - **10 Gbps per link**
 - **ATCA form factor**
 - **AMC modules for compute**
- ◆ **Scalable to 100s of DSPs in single and multi-chassis configurations**



Communications Computer



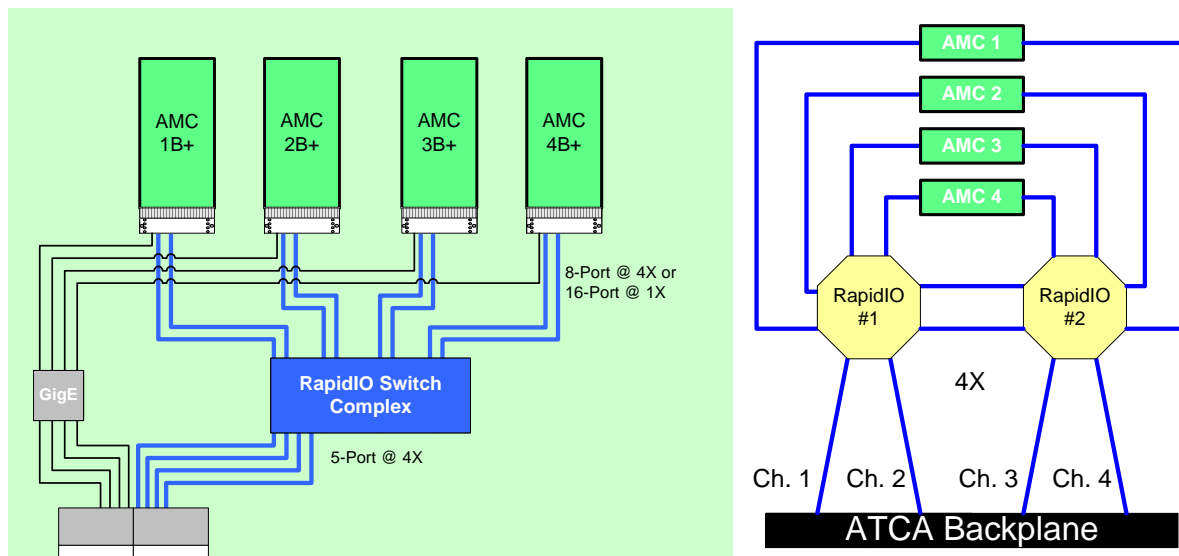
◆ Hardware Modules

- Universal AMC Carrier / Mesh Board
- AMC TI DSP Farm
- AMC inter-chassis bridge
- RapidIO / GigE Hub Board
- Line Card (planning)

◆ Software Modules

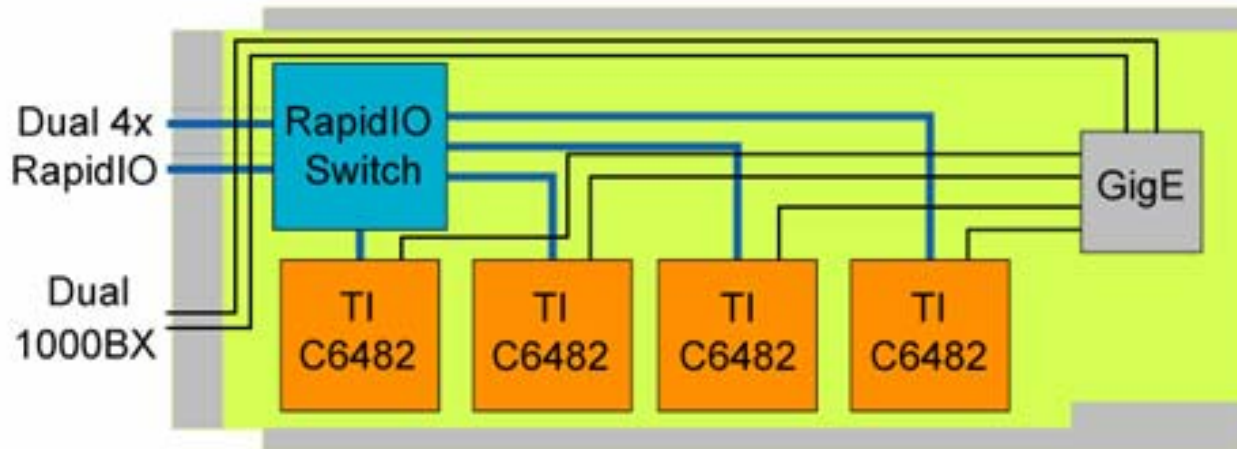
- Communications middleware
- Operating systems (Linux, OSE, DSP Bios)

Universal AMC Carrier / Mesh



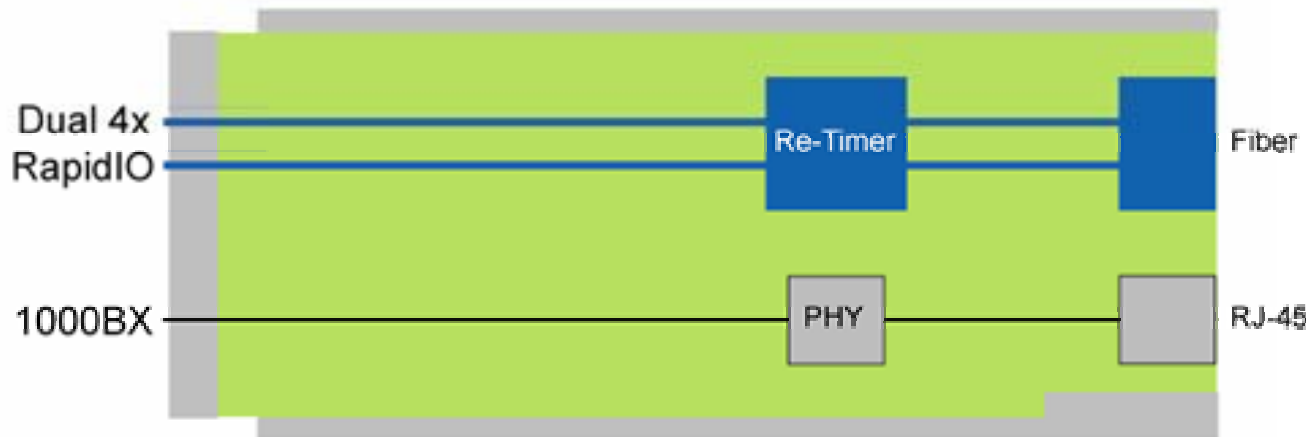
- ◆ 8 Serial RapidIO links @ 4x to 4 AMCs (AMC. 4)
- ◆ 4 Serial RapidIO links @ 4x to the backplane
- ◆ 4 GigE interfaces to 4 AMCs (AMC.2)
- ◆ 4 GigE interfaces to the backplane
- ◆ IPMI for power, switch, and AMC management

TI DSP Farm AMC



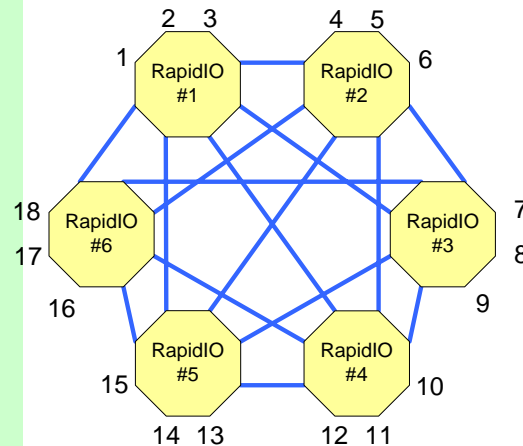
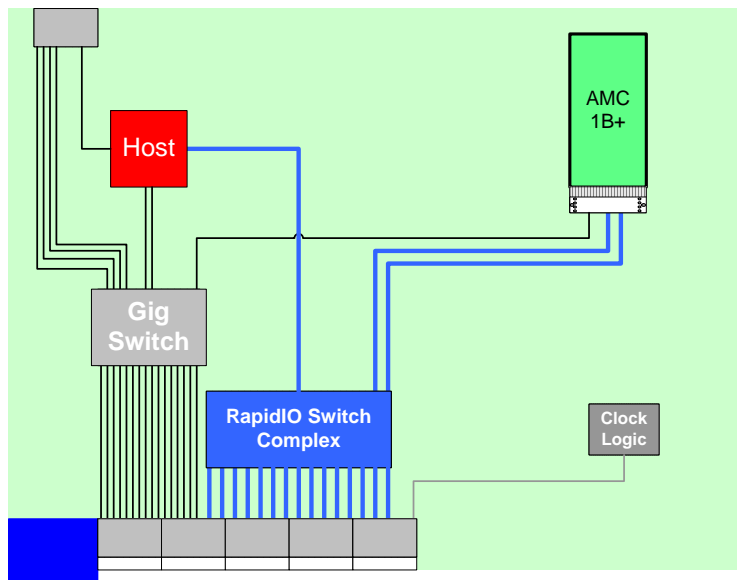
- ◆ **Four TMS320TCI6482s with embedded RapidIO @ 4x**
- ◆ **On-board switch with 20 Gbps of carrier capacity**
 - Support for 3.125, 2.5, and 1.25 Gbauds
 - Support for Dual 1x or 4x per link
- ◆ **64 MB DDR2 DRAM per DSP**
- ◆ **JTAG infrastructure for debug**
- ◆ **IPMI for power, switch, and DSP management**

Inter-chassis I/O AMC



- ◆ Convert XAUI-based RapidIO to LC Fiber Optic
- ◆ Convert 1000BX to 1000BASE-T
- ◆ IPMI for power and port management

RapidIO / GigE Hub



- ◆ **Mesh-based switch complex**
 - 4x internal links @ 3.125 GHz
 - 15 off-board connections
 - 1 host connection
 - Dual 4x AMC slot
- ◆ **160 Gbps of peak duplex capacity**

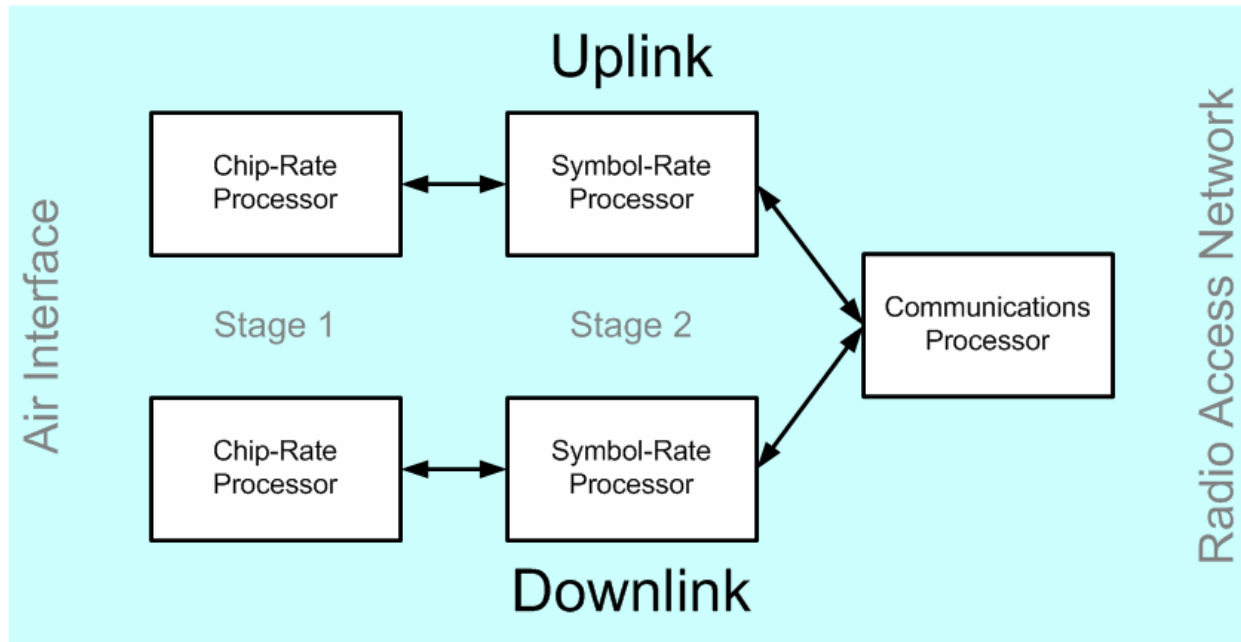
Communications Middleware

- ◆ **Processor and OS agnostic**
 - DSP, FPGAs, PowerPC, Pentium, etc.
 - DSP Bios, OSE, VxWorks, Linux, QNX, etc.
- ◆ **Fast and efficient**
 - Connectionless control
 - Connection-based data plane
 - Scalable to 1000 or more nodes
 - Logical addressing with distributed name server

Ensemble2 Use Cases

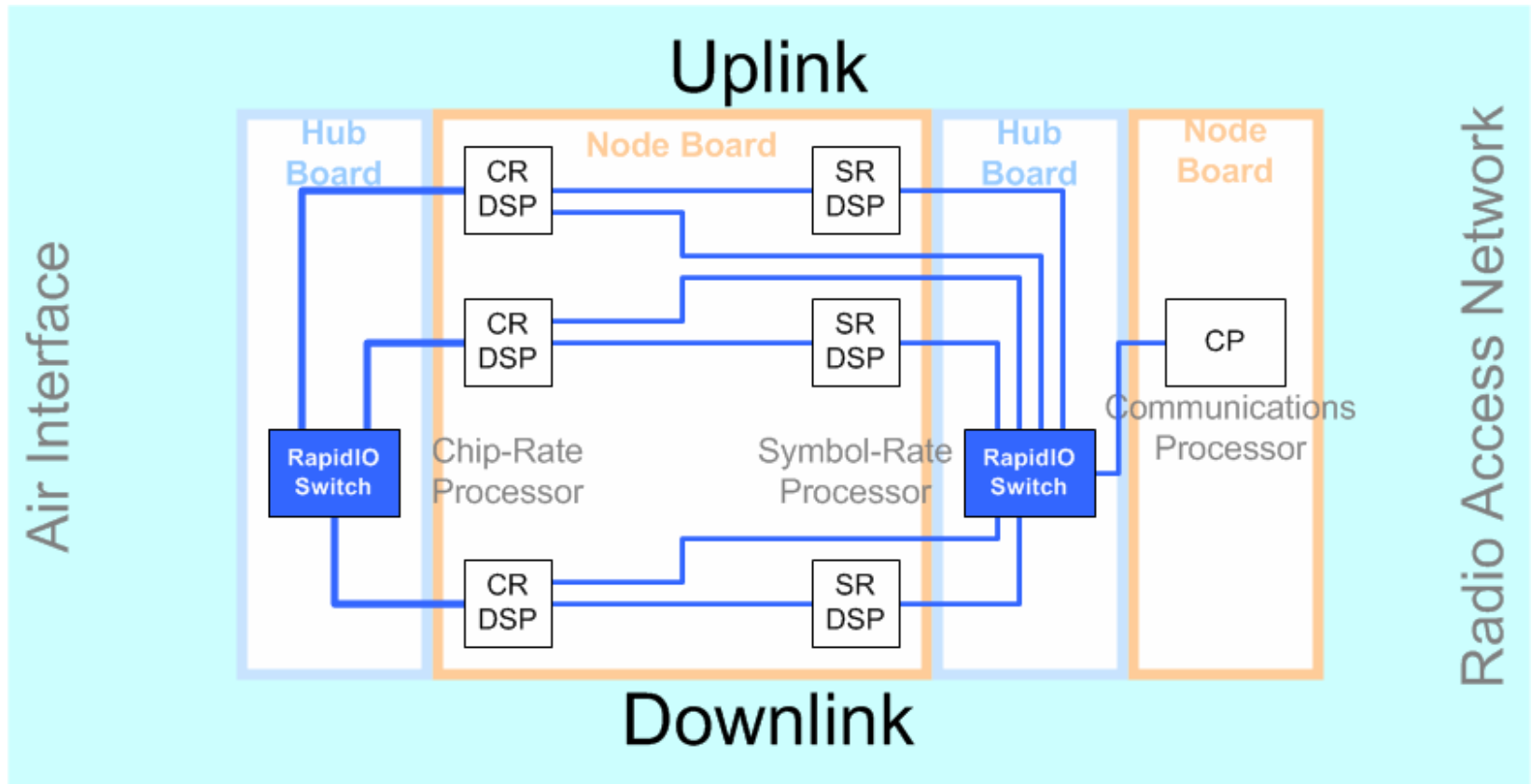
- ◆ **Base station transceiver**
 - UMTS channel card
 - lab development and prototyping
 - Common, high bandwidth interconnect for
 - Digital I/F distribution
 - Inter- and intra-pipeline processing
 - OC-3 and GigE network interfaces
- ◆ **Media gateway**
 - Trunking media gateway
 - Common, efficient interconnect for processing in the network

UMTS Channel Card

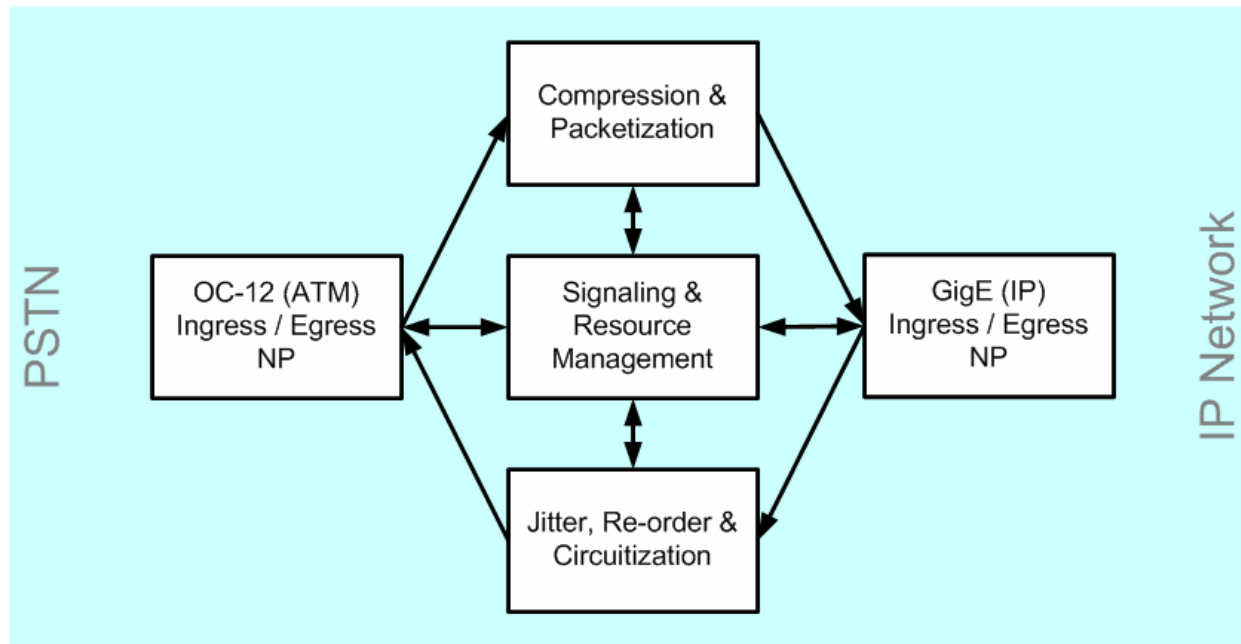


- ◆ **Converts multi-user signal data into separate user streams**
 - Multiple logical channels per user
 - Suitable for transmission over a network
- ◆ **Described as a pipeline of functional stages**
 - Stage 1: Combine / separate users' signals
 - Stage 2: Encode / decode data stream into symbols

RapidIO Channel Card

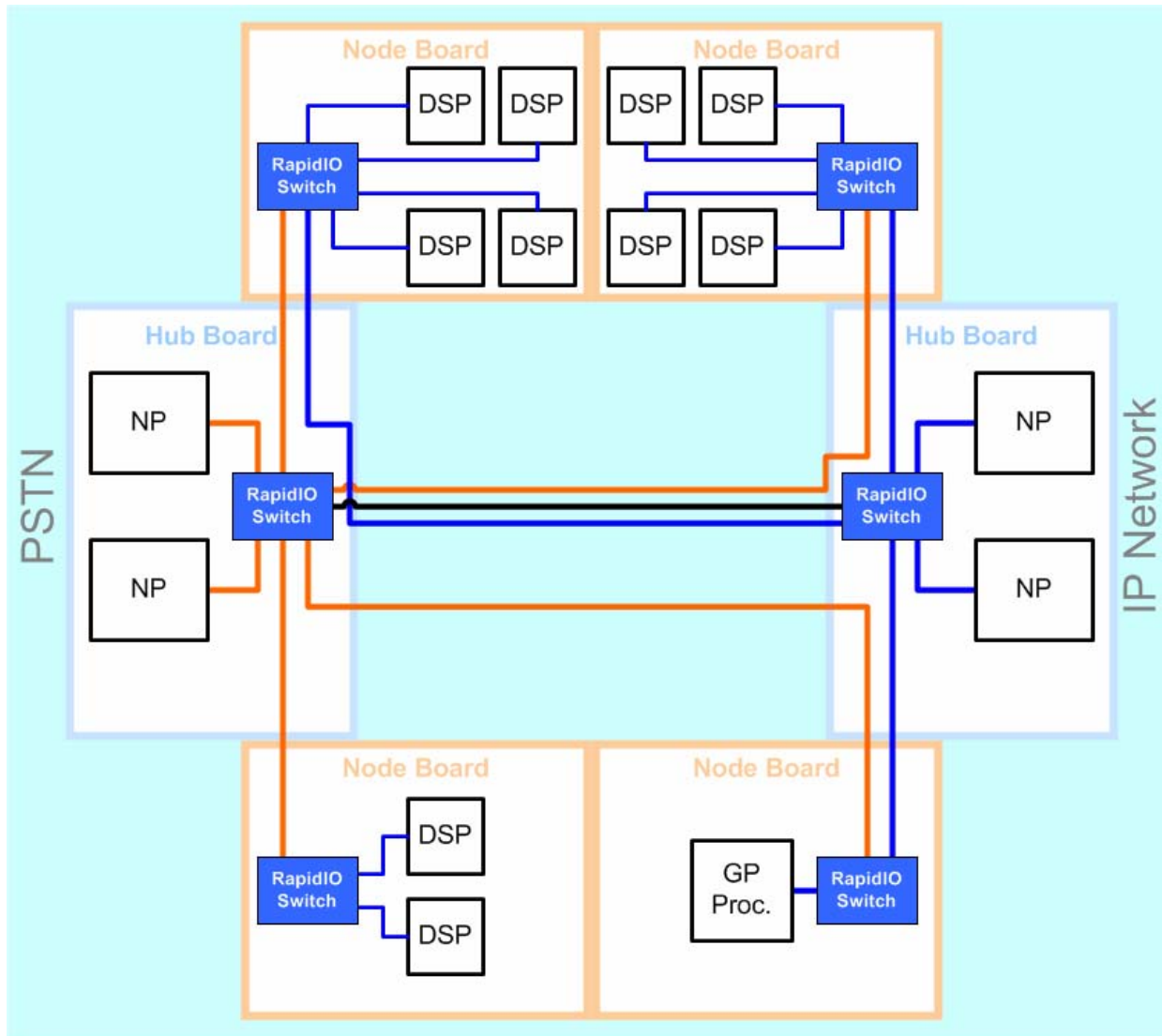


Trunking Media Gateway



- ◆ **Bridges traditional telephone and VoIP networks**
 - **Compression and Packetization**
 - **Jitter, Re-ordering, and Circuitization**

RapidIO Media Gateway



Summary

- ◆ Built around TI's new RapidIO-enabled TMS320TCI6482 DSP
- ◆ Ensemble² is ready to meet the prototyping and production challenges of infrastructure

Get the Most Out of TIDC

NOTE TO PRESENTER:

- ◆ **Talk to track owner about other activities, resource, etc to incorporate on this slide.**
- ◆ **Other activities at TIDC?**
- ◆ **Future TI or company or industry events related to your pres?**
- ◆ **Web Resources**
- ◆ **Point people to do something next.....**
- ◆ **Birds of a Feather, Ask the Expert (in your track), etc.**
- ◆ **Other things?**

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Get to market faster
with TI products,
support and partners.



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