

Ensemble AdvancedTCA[®] Application Platform

Serial RapidIO[®] ATCA Application Development and Deployment

- RapidIO connectivity solves high-bandwidth, low-latency problems
- Fully integrated systems reduce development costs
- Flexible modular configurations based on AMC form factor
- Scalable with 2-, 5-, and 14-slot system configurations
- Production ready, fast time-to-market



The Ensemble™ AdvancedTCA[®] Application Platform from Mercury Computer Systems is a standards-based solution built around the power, functionality, and scalability of serial RapidIO[®], AdvancedMC[®] (AMC), and AdvancedTCA[®] (ATCA). The platform supports a variety of I/O sources and heterogeneous processing endpoints, thereby reducing integration costs, improving efficiency, and minimizing risks in design of next-generation applications.

With a large range of chassis and AMCs, Ensemble systems have enormous flexibility to offer the right high-performance system for your density, processing power, and I/O requirements. Our ATCA solutions range from individual processor-based AMCs to systems with 100 FPGAs in a 14-slot chassis. The Ensemble family is a complete ATCA product line: chassis, carrier blades, switch blades, system software, and the widest range of processor AMCs available.

Ensemble systems are deployed across multiple industries to address the toughest applications, such as sophisticated adaptive beamforming for satellite communications, test equipment with multiple processing elements, telecom trials/demo platforms, long-range radar systems, and high-bandwidth low-latency wireless test beds.

Accelerating Application Development

The Ensemble Platform has many advantages that accelerate application development activities:

- The variety of heterogeneous Ensemble AMCs allows developers to customize applications with options to plug in a wide array of processing elements.

- AMCs can be combined with Ensemble carrier blades that provide RapidIO chip-to-chip and across-the-chassis connectivity, enabling seamless scaling from a single-sector system to, for example, multi-sector, multi-antenna, multicarrier base-station implementations.
- Ensemble offers developers the flexibility to easily expand specific processing nodes to address application performance bottlenecks. Additional field-programmable gate array (FPGA) or digital signal processing (DSP) modules can be used to support specific application requirements.
- The homogeneous RapidIO interconnect among processing nodes enables simplified programming for DSPs, communication processors, and FPGAs.

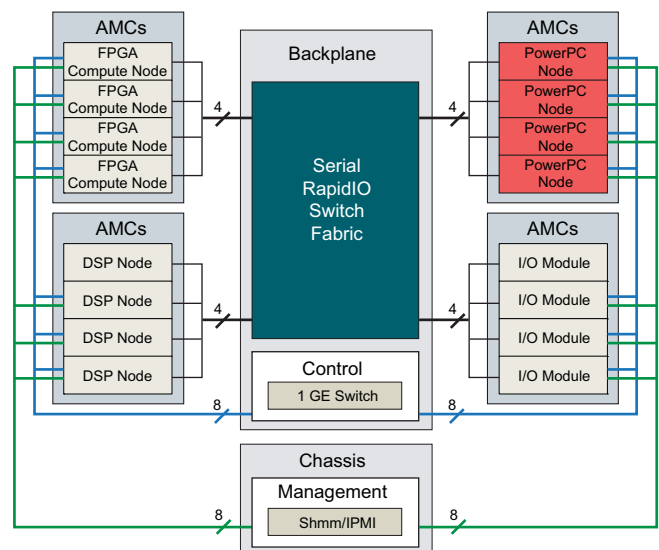


Figure 1. Ensemble ATCA Application Platform architecture

10 Gbps System Performance

Serial RapidIO is a 10-Gbps chip-to-chip and board-to-board interconnect for DSPs, FPGAs, general-purpose processors, and network processors. This high-performance I/O technology minimizes the overhead of processing in the network and provides an efficient inter-processor transport protocol for data-plane applications in telecommunications. At the heart of the Ensemble platform is a RapidIO system hub with 80 Gbps of bisectional capacity and support for inter-chassis and inter-shelf bridging. Serial RapidIO can also be used for chassis-to-chassis interconnect, further enhancing system scalability.

Optimized for Prototyping and Application Development

As communications system developers migrate to commercial off-the-shelf (COTS) alternatives, they need open standards-based system-level solutions with the support of tier one ecosystems. They are increasingly relying on these integrated solutions to make the evaluation of their applications easier over a broad range of technologies. The Ensemble platform is specifically architected to help OEMs leverage the RapidIO standard and its rich ecosystem, allowing them to manipulate and tune the embedded fabric for specific application requirements.

Multiple Chassis Options Fit a Range of Applications

The Ensemble platform offers a range of chassis for your ATCA system. Choose the right one, based on your density, processing power, and I/O needs:

- The Ensemble Application Platform scales to 14-, or even 16-slot configurations with support for hot-swappable AMC modules, delivering 10 Gbps of serial RapidIO capacity to every processing element in the heterogeneous platform.
- The 5-slot mid-size solution is a powerful 5U, 19-inch system with two slots for RapidIO switch blades and three slots for carrier blades, supporting up to 20 processing element AMCs.
- The 2-slot chassis allows you to configure and integrate a small 3U solution with slot-to-slot connections for RapidIO communications, providing a cost-effective development platform for ATCA applications.

Mercury has close working relationships with chassis vendors. We leverage their ATCA packaging expertise to augment our own capabilities to meet your specialized needs.

Support for Heterogeneous Processing

The Ensemble platform has a number of elements that can be categorized based on their function within an integrated system:

- Carrier blades
- Switch blades
- FPGA compute blades
- Control-plane AMC modules
- Data-plane AMC modules

These elements can be flexibly connected, combined, and integrated into high-performance systems that fit the size, complexity, and cost constraints of your unique application needs. Mercury system integration includes I/O driver software, algorithm optimization, and functional testing.

AMC Configurations

AMCs, the latest generation of PICMG® mezzanine modules, have the added advantage of directly connecting I/O to the switch fabric. Each AMC site provides RapidIO connectivity and Gigabit Ethernet through its connector. AMC configurations are supported through the use of a carrier blade (Figure 2). Each AMC carrier blade in an Ensemble system has four AMC sites, with two 10-Gbps RapidIO interfaces for an onboard aggregate bandwidth of 80 Gbps.

Mercury has the widest range of processor AMCs available, including Xilinx® FPGAs, TI® DSPs, PowerQUICC™ and PowerPC® 8641D processors, and Intel® Core™ 2 Duo multicore processors.

A fully configured Ensemble chassis can encompass up to 56 AMC modules per system. This scalability and flexibility is essential to support application benchmarking tasks, with the backplane delivering as much as 150 Gbps of low-latency and efficient data messaging capacity. Multi-chassis support is also available via serial RapidIO fiber mezzanine modules.

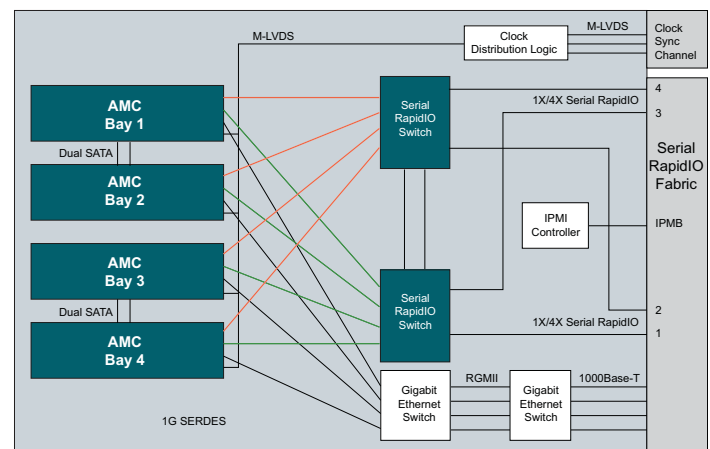


Figure 2. Ensemble BCC-201 Carrier Blade block diagram

Cross-Platform Software

The management and control across the infrastructure of the Ensemble AdvancedTCA Application Platform resides in the cross-platform software suite that supports the system. The software identifies management, control, and data planes for discrete functionality:

- In the management plane, the Shmm/IPMI controls and monitors FRUs, temperature, current, and voltage, and interfaces with the Platform Manager and High Availability Manager software.
- The data plane, using serial Rapid IO or 10 Gigabit Ethernet, supports up to 10 Gbps throughput and 112 ns of latency per switch (RapidIO).
- The control plane, using 1 Gigabit Ethernet, supports up to 1 Gbps bandwidth and latency in the 1 μ s range.

Within the Platform Manager level, the operating system, the communications middleware, and the device driver for RapidIO are managed. This software brings up all hardware and software, including hardware component identification. The System Manager level handles run-time deployment and configuration, including initialization and monitoring, defining, generating and managing alarms, and defining and managing faults. The High Availability Manager software provides the hooks to enable the high availability of the application.

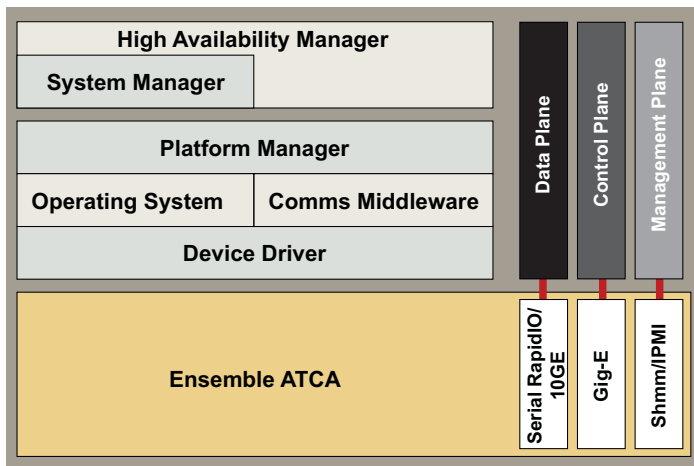


Figure 3. Ensemble ATCA Cross-Platform software stack

Applying a Unique Problem-Solving Approach

Mercury has been solving some of the toughest problems for customers across a range of industries and applications using ATCA solutions. We apply our unique problem-solving approach to all these challenges:

1. In the discovery phase, our technical experts gain a thorough understanding of the complete application environment, taking into consideration current and future needs.
2. In the characterization phase, we evaluate a range of potential technologies, often supporting our research with benchmarking.
3. In the innovation phase, our engineering team designs a balanced system solution that has the right combination of processors, I/O interfaces, interconnects, system software, and algorithms to meet the specific needs of the customer's application within cost and time constraints.
4. In the deployment phase, we complete the statement of work within an ISO environment, complete agreed acceptance procedures, deploy equipment, and provide tiered support packages.

Specifications

14- or 16-Slot ATCA Chassis

Dimensions

14-slot configuration

12U x 444 mm x 385 mm (HxWxD) (approximate)

16-slot configuration

13U x 497 mm x 394 mm (HxWxD) (approximate)

AC to 48V DC power supply converter

(capacity to match the application needs)

Air-cooled, up to 250W per board and 25W per RTM

5-Slot ATCA Chassis

Dimensions

5U x 441.8 mm x 399.3 mm (HxWxD) (approximate)

5 ATCA slots

2 fabric slots

3 node slots

5 rear transition modules (RTM)

1200W Universal 85 to 264VAC power supply

Air-cooled to 200W per board and 15W per RTM

2-Slot ATCA Chassis

Dimensions

3U x 441.8 mm x 416.5 mm (HxWxD) (approximate)

Two ATCA slots

2 node slots

2 rear transition modules (RTM)

800W Universal 85 to 264VAC power supply

Air-cooled to 200W per board and 15W per RTM

External Communication Ports

One or more AMC-based Gigabit Ethernet interfaces
AMC-based fiber interface for Gigabit Ethernet and
4x serial RapidIO

Availability and Serviceability

IPMI management interfaces

Power Input

Dual 48VDC

Software

Management Plane

Shmm/IPMI

Data Plane

RapidIO or 10 Gigabit Ethernet
Up to 10 Gbps throughput
112 ns latency per switch (RapidIO)

Control Plane

1 Gigabit Ethernet
Managed Ethernet SW
1 Gbps throughput

Operating System

Linux® or VxWorks®
DSP BIOS

Communications Middleware

RapidIO system configuration
FPGA bitstreams
DSP application
RapidIO utilities

Device Driver

RapidIO

Environmental

Ruggedization level	Commercial
Temperature	
Operating	0°C to 40°C
Storage	-40°C to +85°C
Humidity	10% to 90% noncondensing

Compliance

PICMG 3.0 Rev. 1.0	
IEEE 1386.1-2001	PCI Local Bus Specification Rev. 2

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