PRODUCT BRIEF

Pigeon Point BMR-A2F-AMCc Reference Design

Board Management Reference Design
Add-on for Carrier IPMCs

Within AdvancedMC™ Carrier and Custom Derivative Architectures

May 16, 2018

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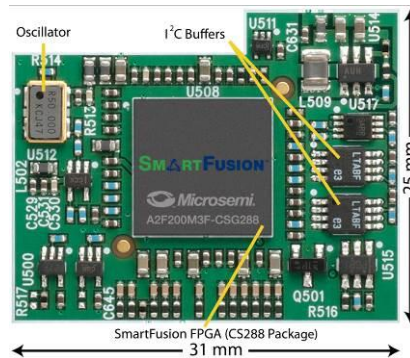
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The BMR-A2F-AMCc design is one of a series of Pigeon Point Board Management Reference (BMR) designs. This member of the series augments the BMR-A2F IPMC to enable it to manage and represent Advanced Mezzanine Cards (AdvancedMCs or AMCs) installed on an ATCA-based AMC carrier. This design can also be used to augment a custom derivative of the BMR-A2F IPMC to support management-equipped on-board modules. This reference design is based on the SmartFusion intelligent mixed-signal FPGA from Microsemi Corporation and requires that the foundation BMR-A2F IPMC be licensed separately.

This reference design is delivered in a Pigeon Point Board Management Starter Kit Add-on (which is detailed in a separate Product Brief). The kit includes:
- An augmented FPGA design that includes the Carrier IPMC additions. This design is ready to be adapted to your carrier for AMCs or custom modules.
- Schematics for the Carrier IPMC additions, ready for integration into the schematics of your carrier, with adaptation as necessary
- Firmware for the Carrier IPMC, delivered in source form and ready for simple and quick adaptation to the specific requirements of your product
- One-stop support for hardware, firmware and software used in developing and delivering your Pigeon Point BMR-based Carrier IPMC, with complementary support from Microsemi for the FPGA design
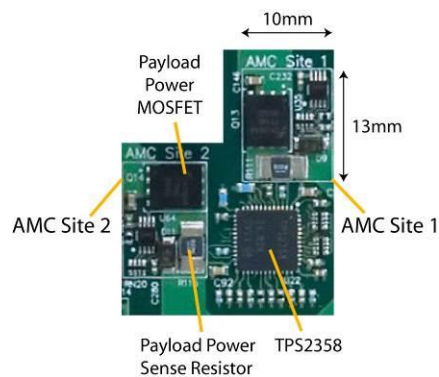
The following photo shows the core of the A2F-based Carrier IPMC, essentially the same as an A2F-based ATCA IPMC. The active components are:
- The A2F200 intelligent mixed-signal FPGA.
- Dual IPMB buffers to isolate the IPMC from the dual redundant IPMB-0 implemented on the backplane.
- An external oscillator to provide the operating frequency.

SmartFusion FPGA (CS288 Package)

The next photo shows a reference implementation of two instances of the carrier-based logic that hosts a module site. Each site or pair of sites is managed by a special module hot swap controller from the Texas Instruments TPS235x or TPS245x families. With the combined facilities of the SmartFusion FPGA and the TPS235x or TPS245x, only two additional active components are required for each module site:
- A MOSFET payload power switch
- An IPMB-L isolation switch to isolate IPMB-L from an unpowered MMC

Specification compliant and interoperability tested
- AMC.0 R2.0, the AdvancedMC base specification
- PICMG 3.0 R3.0 as amended by ECN 3.0-3.0-001, the AdvancedTCA base specification (which is the underlying foundation for AMC.0), plus HPM.1, the IPM Controller Firmware Upgrade specification
- HPM.2 and HPM.3, the LAN-attached IPM Controller and DHCP-assigned Platform Management Parameters specifications (revisions R1.1 and R2.0, respectively)

- IPMI v1.5, document revision 1.1 and the relevant subset of IPMI v2.0, document revision 1.0, plus relevant errata
- PICMG 3.0, HPM.2/3 and IPMI 2.0 compliance includes support for Internet Protocol version 6 (IPv6)
- Thoroughly tested with other management components at PICMG TCA-IWs (Interoperability Workshops)
- Compliance tested with Polaris Networks' ATCA and AMC Testers

Highly adaptable, including for custom, derivative management architectures
- Usable for carrier blades in bladed systems or for carrier-capable main system boards in non-bladed systems, such as appliances
- Independent of number, size and physical form factors of carrier boards and modules
- Board and module hot swap support available, but need not be used
- Allows integration of standards-based carrier boards with proprietary architecture carrier boards within a single bladed system, if desired

Full support for core hardware requirements of a module carrier
- Supports A2F200/500 variants, including CS288, FG256 and FG484 packages
- AMC or custom module payload and management power control / monitoring for each particular site, including payload power current measurement
- Tight compliance with specification constraints on power control, including fast trip circuits for payload and management power to quickly respond to serious fault conditions, disabling power within 300 ns
- Control of fabric E-Keying governed interfaces, for AMCs and custom modules, as well as for on-carrier switches terminating module communication links.
- Control of clock E-Keying governed interfaces, for AMCs and custom modules, as well as for on-carrier clock-related devices
- Optional persistence of above controls across Carrier IPMC resets
- Management of on-carrier IPMB-L, the primary management communication path

with the Module Management Controllers (MMCs) of installed AMCs or custom modules
- Optionally, configuration of a separate logical IPMB-L segment for each module site, so that IPMB-L activity or problems on one leg do not affect the other legs
- Optional inclusion of additional module carrier-oriented hardware, such as a Base Interface Ethernet switch, in extended power domain, with resulting coverage by extended inactive state management

Small footprint
- Carrier IPMC core can fit in the following package-dependent footprints: 25mm x 31mm (CS288), 29.5mm x 34mm (FG256) or 34mm x 44mm (FG484)
- Module site-specific logic for a pair of sites can fit in about $380mm^2$, including a TPS2359 supporting both sites

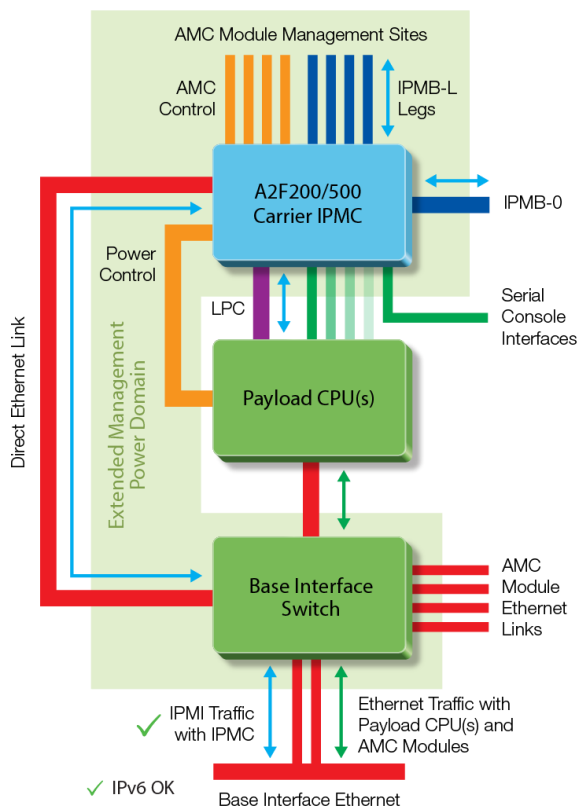**Adaptable and extendable FPGA design**
- Initial FPGA design provided in several variants (e.g. for different package sizes), can be used directly or modified
- Potential modifications include adding or removing Microsemi IP blocks, adding custom logic and/or IP blocks, changing device pin assignments, if necessary

Comprehensive, readily adaptable firmware additions for carrier responsibilities
- All mandatory and many optional IPMI/ATCA/AMC commands supported over IPMB-L
- Carrier IPMC manages installed AMCs and represents them to the Shelf Manager as defined by AMC.0, with similar representation extended to the carrier payload
- Supplementary Pigeon Point extension commands, primarily used over the payload and serial debug interfaces
- Simple—but highly flexible—configuration of firmware features

Augmented optional support for HPM.2 LAN attach facilities

- Optionally, extends HPM.2 LAN attach facilities for module carrier context, enabling, for example:
  - Extended management power for Base Interface Ethernet switch serving modules and augmented management power for modules, themselves
    - Likely crucial to supporting LAN attach access for those modules
  - IPMI message trace collection for IPMB-L, which can be an important complement for IPMB-0 traces
  - Explicit and implicit LAN bridging of IPMI traffic to managed modules
- Overall, enables valuable diagnostic visibility for modules installed on carriers

Simple, but powerful, firmware configuration mechanisms

- Additional configuration variables in a single config.h source file parameterize and determine inclusion/exclusion of carrier-

related subsystems during firmware image build

- Configuration data for programmable analog created in MSS Configurator, imported into BMR build
- Binary configuration files for FRU Information and Sensor Data Records (SDR), with carrier-related additions, merged into firmware image
- FRU Information and SDR files produced from textual representations by special compilers included with underlying BMR-A2F IPMC Starter Kit

Comprehensive Cortex-M3 development environment

- Already provided in underlying BMR-A2F IPMC Starter Kit, ready for use with the Carrier IPMC firmware

Enhancements to BMR-A2F IPMC functionality

- Implicit bridging of IPMI/PICMG/SIPL commands referencing module resources, along with corresponding command replies
- Explicit bridging via IPMI Send Message commands, each containing an embedded command destined for a module, with appropriate forwarding of corresponding command replies
- Common sensor management framework for all sensors on the carrier, including those in installed modules
- Tracking the state of modules and notifying higher level entities (e.g., the Shelf Manager) of state changes
- Managing the hardware resources of the carrier, including power budget and E-Keying governed resources (including both fabric and clock E-Keying)
- Managing non-modules equipped with MMCs, such as Rear Transition Modules

Additional Pigeon Point extension commands for AMC modules and sites

- Get Module State
- Enable AMC Site
- Disable AMC Site

Reference Implementation

The bench top implementation of this reference design is the same A2F-based bench top used with the BMR-A2F IPMC reference design. This board already includes the needed Carrier IPMC functionality supporting two AMC sites: one a physical AMC slot and the other an MMC emulating the management aspects of a second AMC site. In addition to the core facilities of those reference designs, the board includes example implementations of the optional controller features and numerous LEDs, switches and headers to allow lab experimentation with the behavior of the controllers, including pre-supported options and any desired firmware customizations. Following the photo is a high level block diagram of the Carrier IPMC additions supporting two module sites.