

# xTCA™ Hardware Platform Management: the Big Picture

Tutorial T1A: Introduction to  
AdvancedTCA/MicroTCA

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World-Class Management Components

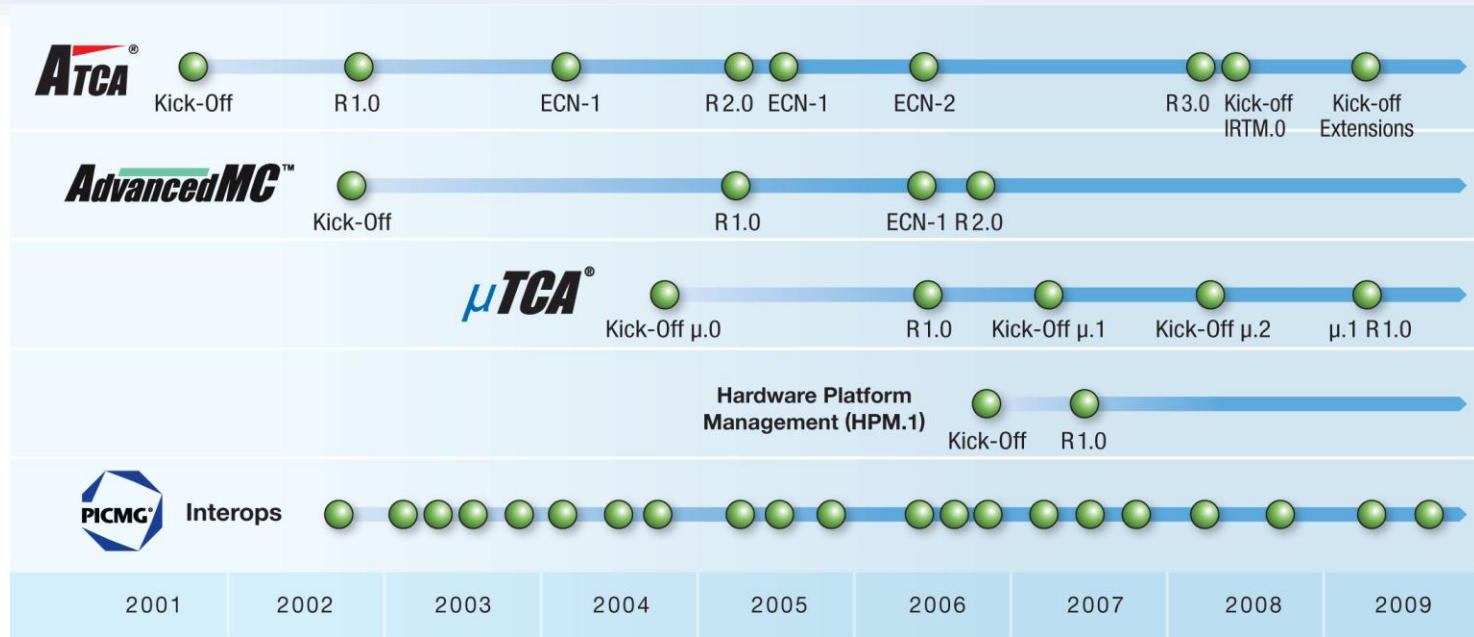
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# Introduction to Pigeon Point Systems



- Providing world-class management components for open modular platforms
  - Focused on delivering outstanding xTCA management controllers and Service Availability Forum interfaces to them
  - Dependable for specification compliance, interoperability and responsive support
  - Proven in dozens of companies and with years of interoperability experience
- Founded in 1997 and headquartered in Scotts Valley, Calif.
- Acquired by Actel Corporation in July 2008
- Visit Booth 306 or [www.pigeonpoint.com](http://www.pigeonpoint.com) for more details
  - See [www.pigeonpoint.com/library.html](http://www.pigeonpoint.com/library.html) for other background material on hardware platform management

# The PICMG xTCA Landscape



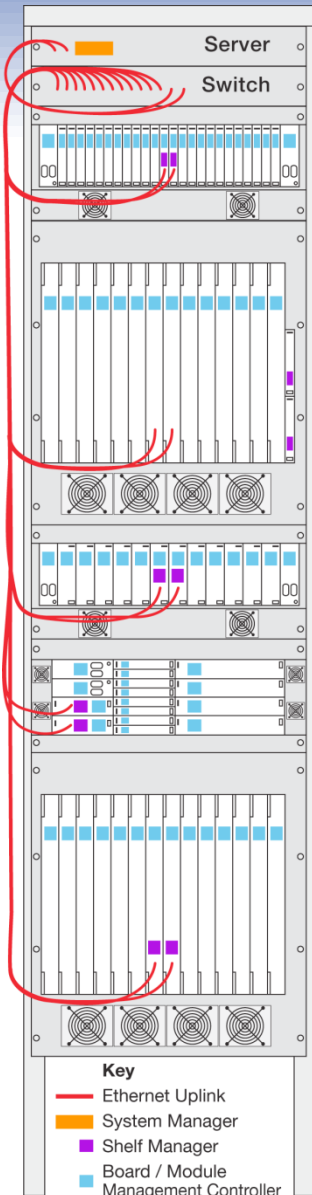
- Eight years of development for 4 major spec families; goal to maximize sharing of platform management facilities
- Specification development complemented and strengthened by regular interoperability testing
- Result: sophisticated, but complex platform management architecture based on IPMI, tuned to PICMG needs

# Related Initiatives of the Service Availability Forum (SAF)

- Hardware Platform Interface (HPI) specification:
  - Defines APIs that provide a generic mechanism to monitor and control highly available systems
  - Primary goal: allow for portability of HPI user code across a variety of hardware platforms
- HPI to xTCA mapping specification
  - Defines a mapping to ATCA shelves via the Shelf Manager
  - New revision adding mapping for MicroTCA, currently in development by SAF, with Pigeon Point leadership
- SAF website ([www.saforum.org](http://www.saforum.org)) has specs, tutorials and more

**SERVICE  
AVAILABILITY™  
FORUM**

# Key Responsibilities of xTCA Hardware Platform Management



- Monitor basic health and control low-level aspects of boards, modules and other field-replaceable units (FRUs) within a  $\mu$ TCA or ATCA shelf
  - Mandatory management controllers at all levels
- Provide accessibility for inventory info and sensor readings, such as temperatures and fan speeds
- Archive (and forward, as needed) event reports and failure notifications from boards, modules and other managed FRUs
- Manage power, cooling and interconnect resources in a shelf
- Enable visibility into a shelf for a logical System Manager function comprising some mix of software and operations staff
  - Optionally, use HPI as hardware-independent foundation for System Manager software

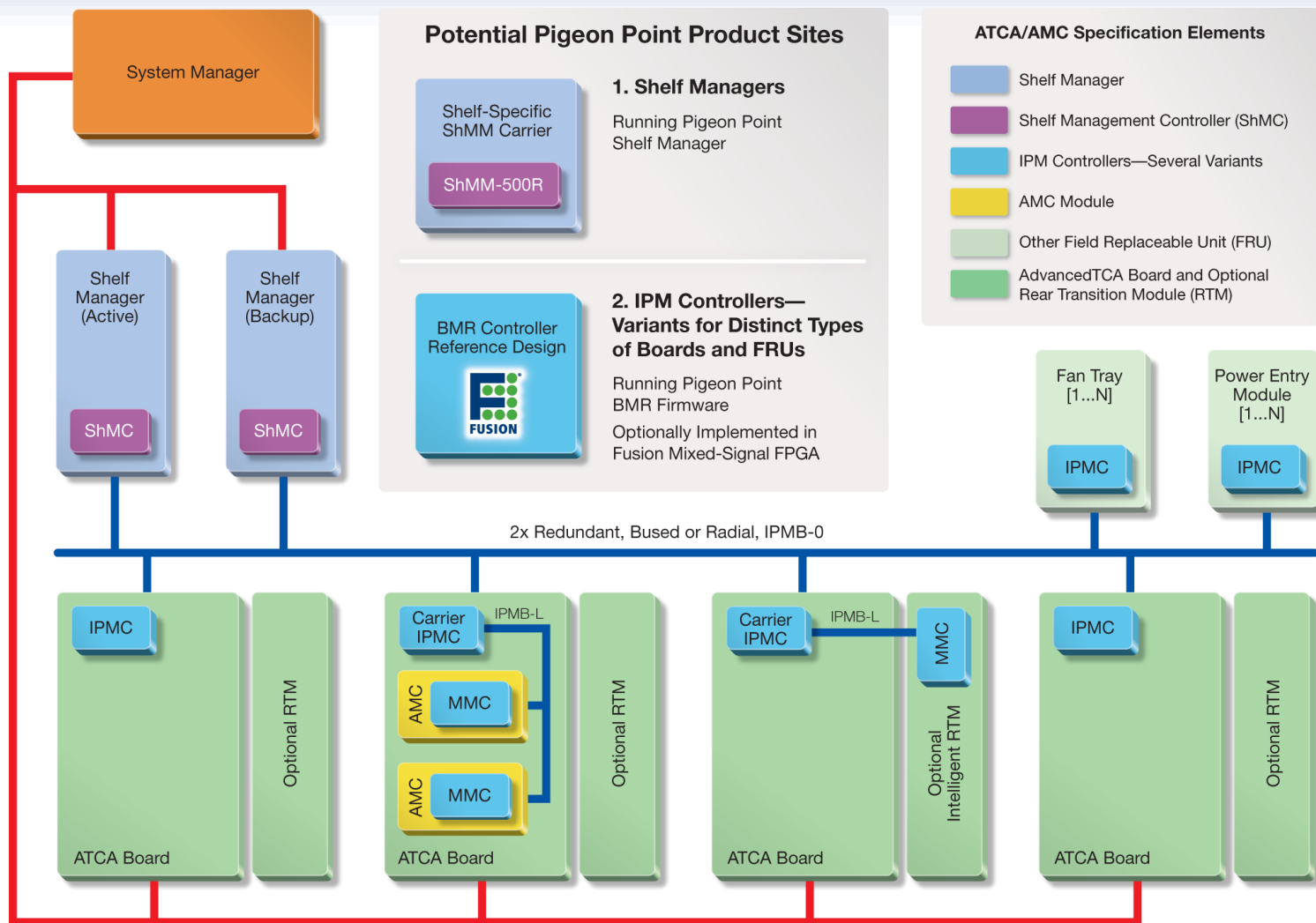
# Overall Approach to xTCA Hardware Platform Management



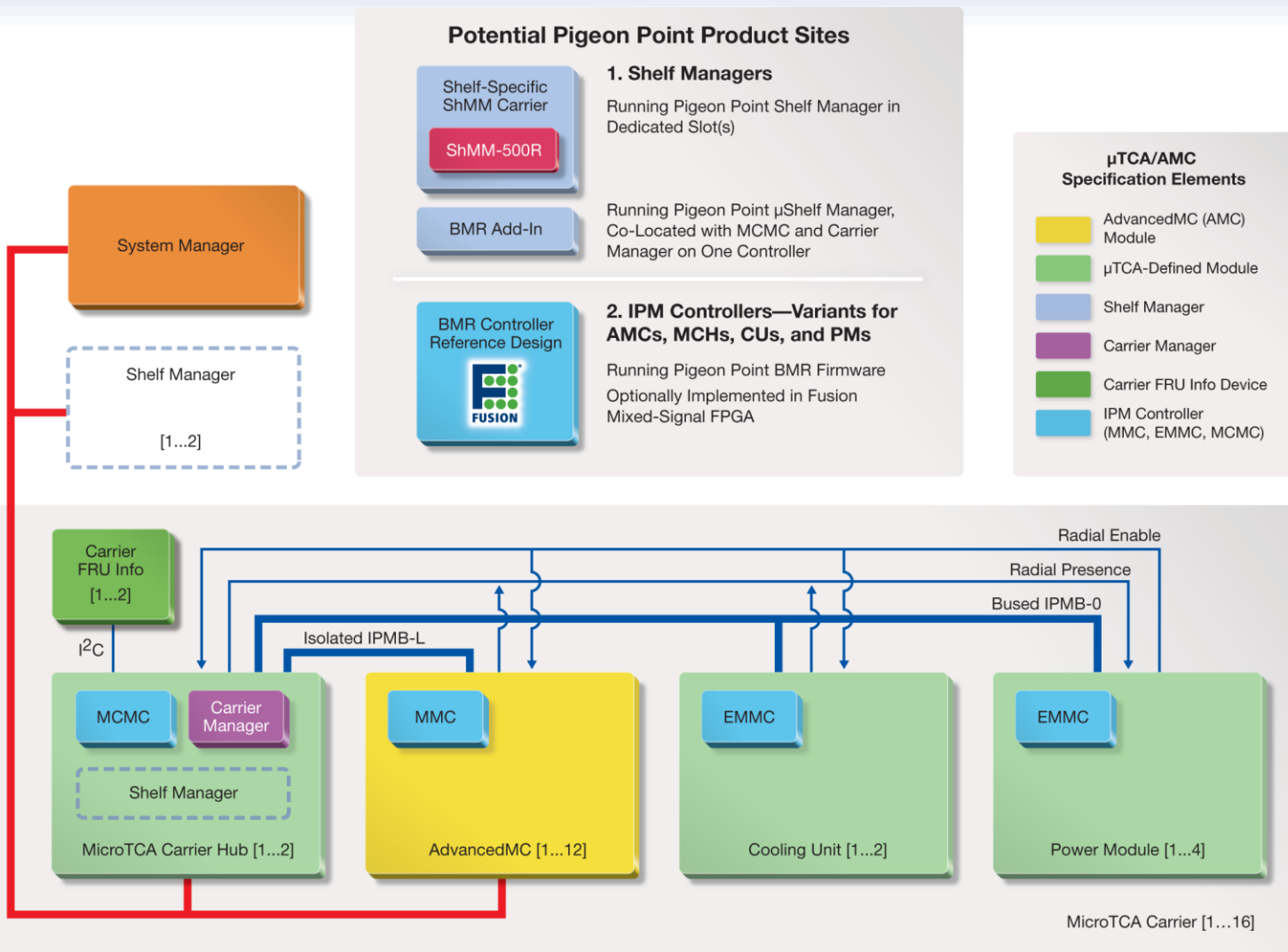
# of IPMI Commands	
IPMI 1.5 Base	107
ATCA	+38
AMC	+4
μTCA	+9
HPM.1	+11

- Adopt Intelligent Platform Management Interface, Version 1.5 as foundation from PC/server world
  - Use IPMI 2.0 for selected features, as needed
  - Add significant collection of PICMG-defined xTCA extension commands
- Emphasize interoperability among independently implemented components
- Encourage and leverage ecosystem of “off-the-shelf” management components
  - Component reuse helps product developers
    - Allowing them to focus on their value adds
    - Ensuring interoperability when mature, compliant components are chosen
  - Pigeon Point components used as examples

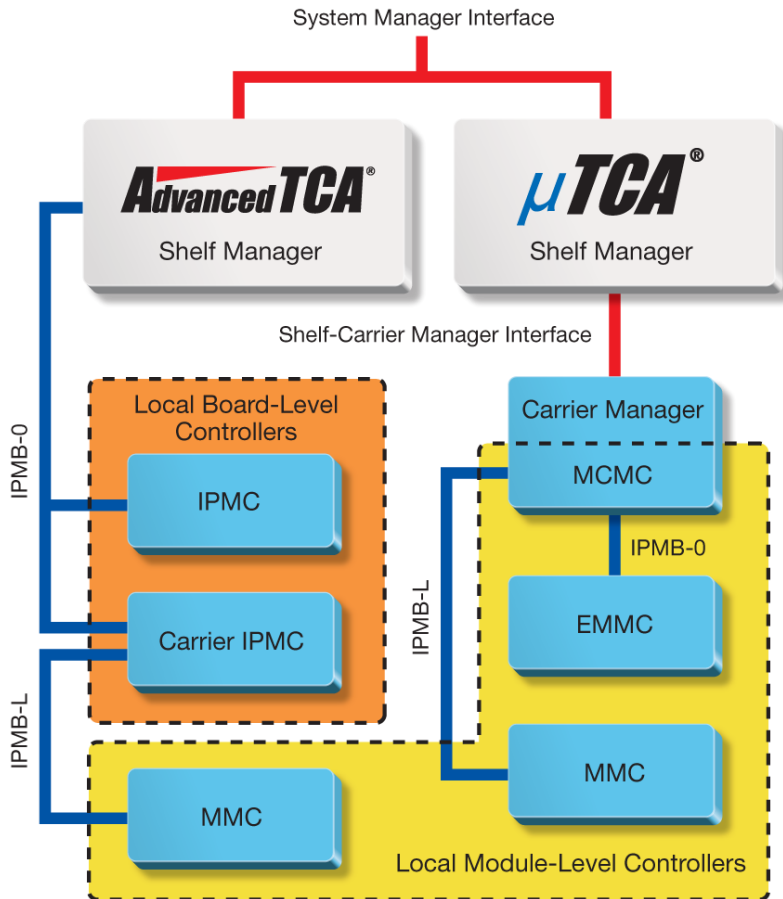
# Hardware Platform Management Elements for ATCA/AMC



# Hardware Platform Management Elements for $\mu$ TCA/AMC

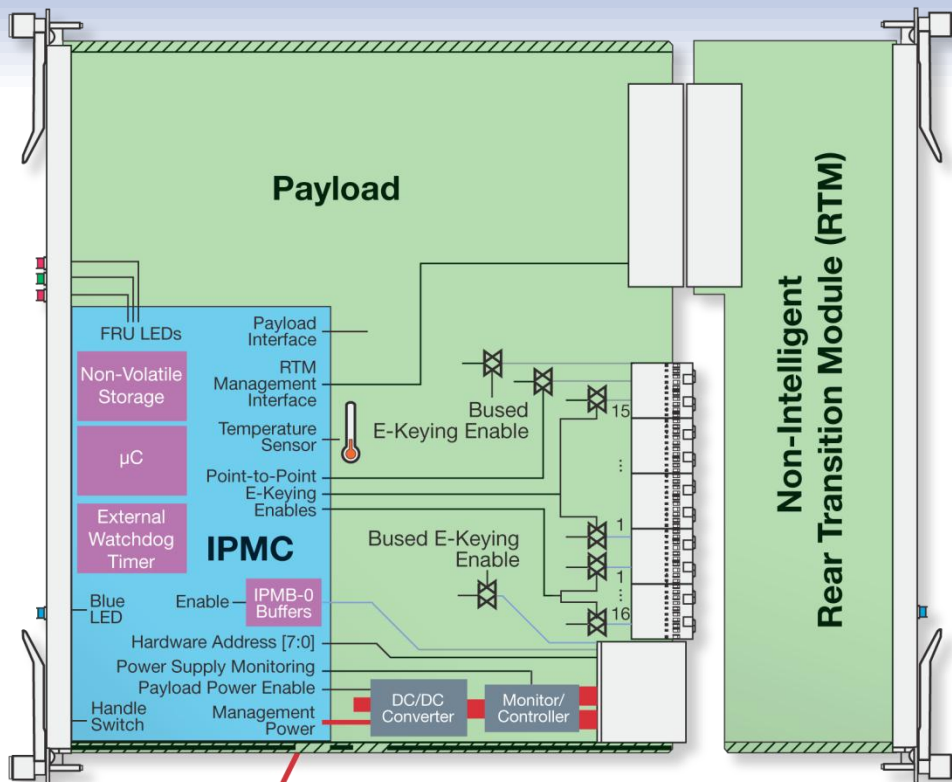


# Management Controller Types in xTCA: Overall Categories and Roles

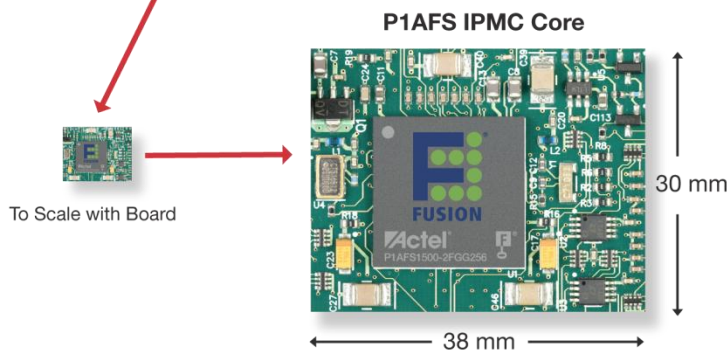


- IPMCs manage ATCA boards and other board-level FRUs, e.g. fan trays
- MMCs use IPMB-L, manage AMCs and intelligent RTMs
- EMMCs use IPMB-0, manage non-AMC μTCA FRUs, e.g. power modules
- MCMCs provide local FRU management for μTCA MCHs
- Board-level controllers are directly visible to Shelf Manager
- Module-level controllers are indirectly visible to Shelf Manager via their carrier
- Local FRU controller manages physical FRU on which it resides

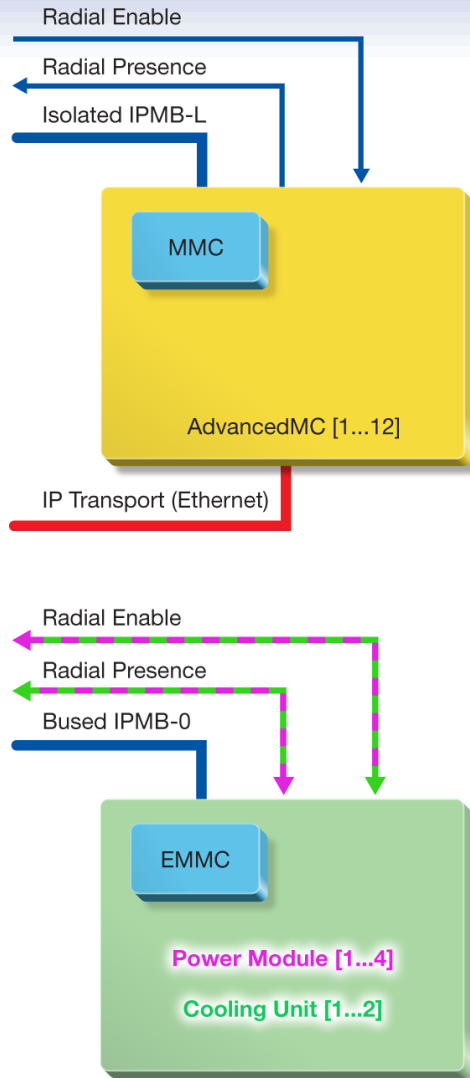
# Example Local FRU Controller: ATCA IPM Controller



- Generic functions of local FRU controllers include
  - Temperature, power, LED, handle switch tracking
  - Inventory data and sensor description storage
  - Payload interface to main CPU(s) on the board
- IPMC-specific functions include
  - E-Keying management
  - RTM management
- Physical IPMC represents tiny fraction of board area, but critical functionality



# MMCs and EMMCs Provide Local Management for AMCs, PMs and CUs

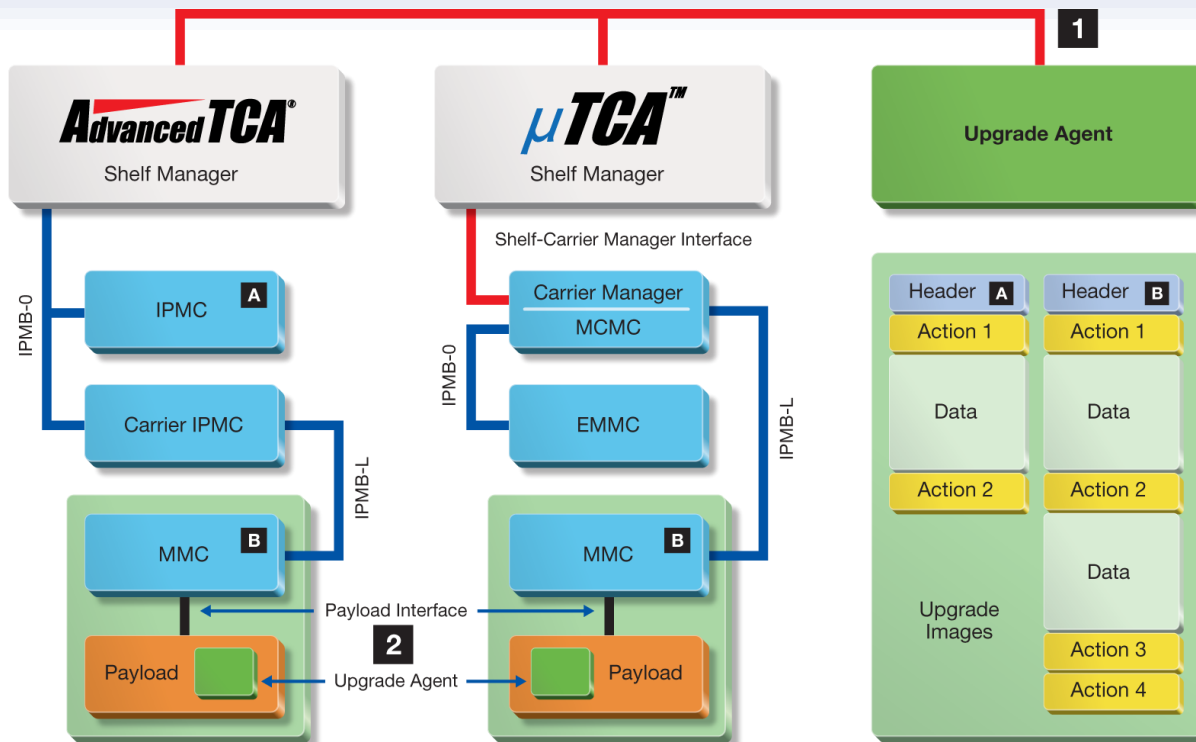


- The Module Management Controller on an AMC sees the same interface on either  $\mu$ TCA or ATCA carrier
  - An isolated IPMB-L, a presence output, an enable input
- The Enhanced MMC (EMMC) on a  $\mu$ TCA Power Module or Cooling Unit uses a bused, dual redundant IPMB-0; also
  - Power Modules provide presence detect inputs and enable control outputs for the carrier
  - Cooling Unit and OEM module provide presence output and enable input

# Key Shelf/Carrier Management Responsibilities: ATCA/ $\mu$ TCA Roles

<b>Key Management Responsibility</b>	<b>Responsible Management Level or Interface</b>	
	<b>ATCA<sup>™</sup></b>	<b><math>\mu</math>TCA<sup>™</sup></b>
Representing shelf to System Manager	Shelf	
Managing cooling	Shelf	
Logging/forwarding events, managing sensor/FRU data repository	Shelf	
Electronic keying of in-shelf fabric and clock interconnects	Shelf and Local Carrier	Local Carrier Only; no Shelf E-Keys
Managing power budget and allocations	Shelf	Carrier
Mandatory in-shelf Shelf Manager access to managed FRUs	IPMB-0	IP or Proprietary

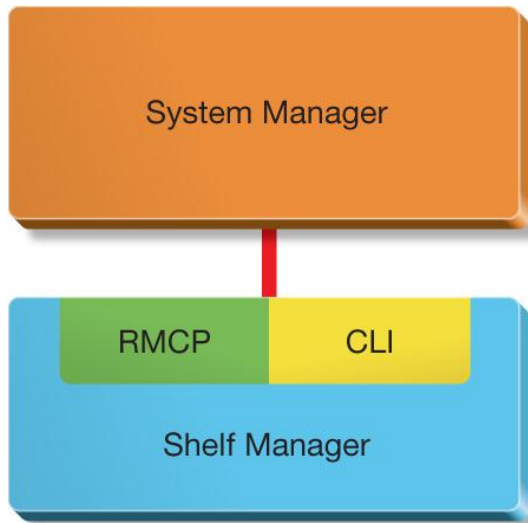
# HPM.1-Based Firmware Upgrades Address Key Need for xTCA



**Upgrade Transfer Options:** **1** RMCP Indirect via Shelf Manager **2** IPMI Direct Over Payload Interface

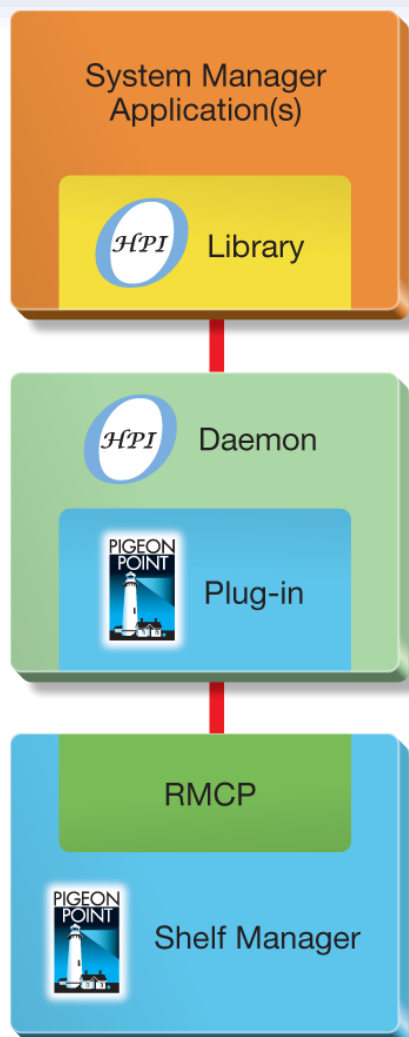
- Defines interfaces for upgrade agents and IPM Controllers
- Defines format for upgrade images with opaque upgrade data
- Allows agent to upgrade firmware in arbitrary controllers

# Selecting a System Manager Interface



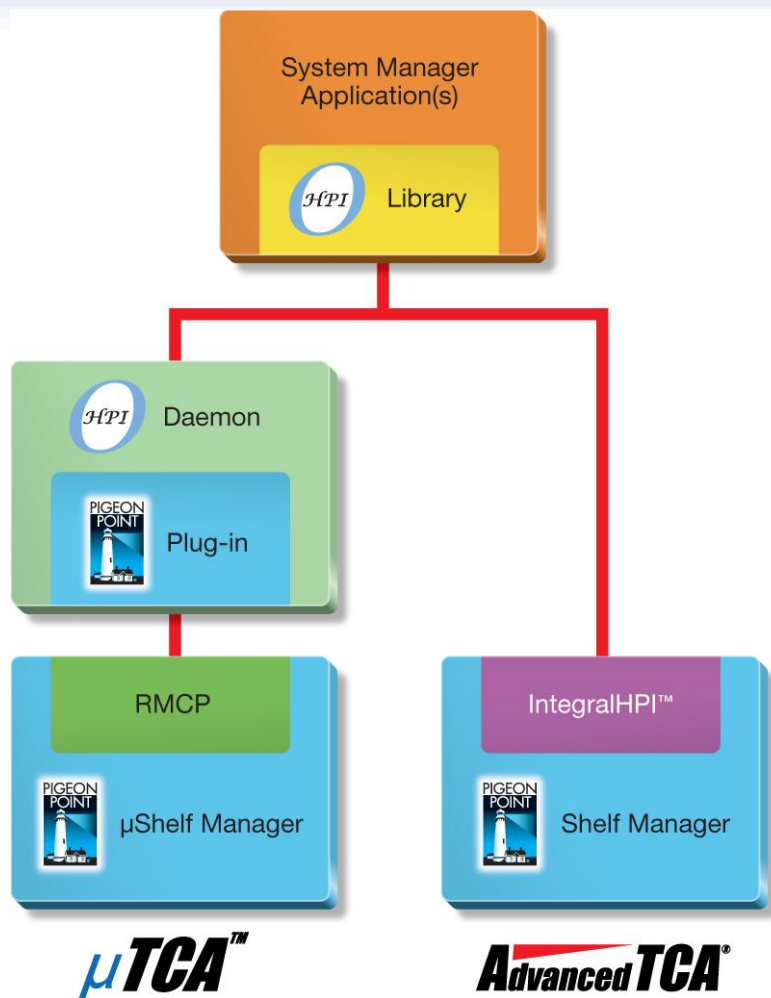
- Most xTCA Shelf Managers support multiple System Manager interfaces
  - IPMI LAN Interface (RMCP) the only xTCA-required interface
  - Others usually supported, such as command line interface (CLI)
- RMCP defines protocol and semantics, allows portable System Manager software
  - RMCP somewhat low level
- Many developers of complex systems prefer a more abstract interface that also supports portability
  - One popular choice: SAF's Hardware Platform Interface (HPI)
  - Can be layered above RMCP

# OpenHPI: an Effective HPI Enabler



- Provides highly adaptable foundation with plug-ins for particular platform types
  - [www.openhpi.org](http://www.openhpi.org) has details & source
  - Supports wide range of platforms
  - Allows HPI clients remote from OpenHPI daemon
- Pigeon Point OpenHPI and plug-in delivers SAF mapping spec compliance with PPS Shelf Manager (either ATCA or  $\mu$ TCA)
  - Current mapping spec covers only ATCA
  - Mapping spec update under way to add  $\mu$ TCA support

# Architectural Flexibility for Managing Systems with HPI



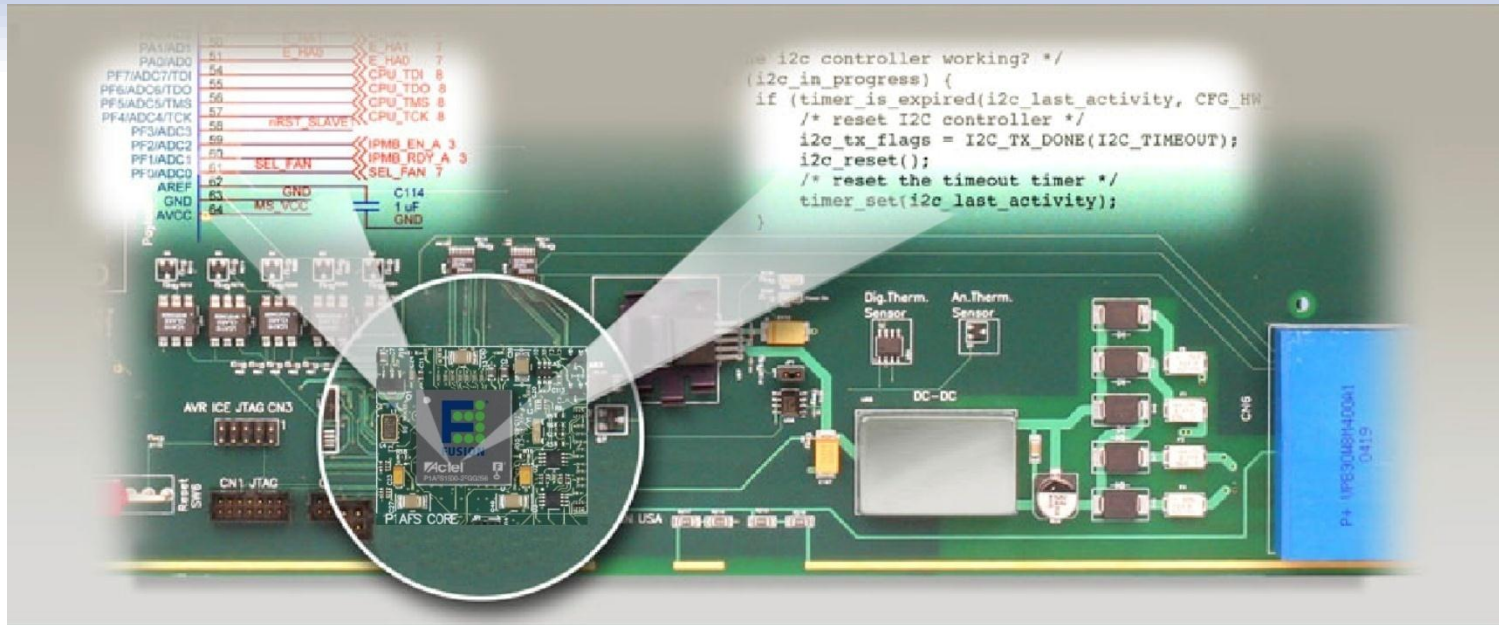
- System Manager with binary OpenHPI library can manage
  - ATCA shelves directly via Pigeon Point IntegralHPI
  - μTCA shelves via OpenHPI daemon
  - Non-xTCA platforms via appropriate OpenHPI plug-ins in daemon
    - Example: bladed servers
- Allows unified HPI-based management of mixed architecture configurations

# One Way to Build Shelf Managers: Use Off-the-Shelf Mezzanine Modules



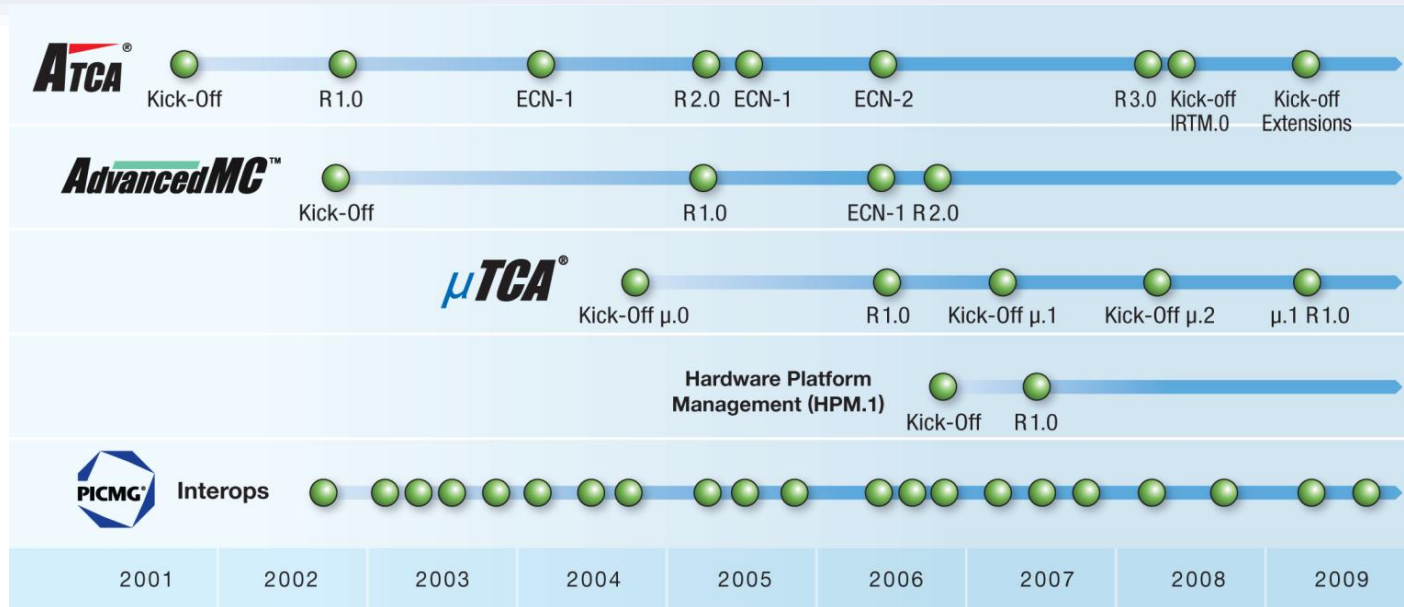
- SO-DIMM-sized Pigeon Point ShMM-500R + shelf-specific carrier yields an ATCA Shelf Manager
  - Avoids massive “from-scratch” development
  - Small size of mezzanine makes for great physical flexibility for Shelf Manager placement in the shelf

# One Way to Build Board/Module Controllers: Use Existing PPS Solutions



- Integration-ready schematics, FPGA designs
- Bench top HW for ramp up
- Actel Fusion<sup>®</sup> mixed-signal FPGA, Renesas H8S, Atmel AVR core silicon
- Firmware source code
- Common firmware base for all controller types
- GNU tool chain
- Designed for easy configuration

# Implementing PICMG Management Controllers Takes Serious Engineering



- Eight years of PICMG h/w platform management spec work has yielded:
  - PICMG 3.0: 222 pages
  - AMC.0: 98 pages
  - MTCA.0: 110 pages
  - HPM.1: 66 pages
- Strongly consider using existing components
- Pick validated, interop-tested components
- Participate in TCA-IWs with your own products

# Conclusion: MicroTCA/AdvancedMC Hardware Platform Management

- Represents a significant PICMG effort to:
  - Define interoperable extensions to IPMI
  - Maintain and enhance these extensions through interoperability testing and further specification work
  - Maintain maximum consistency among different platform architectures such as MicroTCA, AMC and ATCA
- Constitutes a serious engineering project at any of the shelf, board or module levels
  - Even if development starts from existing PICMG 2.9 or conventional IPMI components
- Can significantly benefit from the use of off-the-shelf components that are validated and interoperability-tested

# Thank you!!

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## World-Class Management Components

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Mark Overgaard is the founder and president of Pigeon Point Systems (PPS), which is now an Actel company. Mr. Overgaard is also a leader in the technical subcommittees of PICMG, including the hardware platform management aspects of AdvancedTCA, AdvancedMC and MicroTCA. Prior to founding PPS in 1997, Mr. Overgaard was VP, Engineering at Lynx Real-Time Systems (a Unix-compatible RTOS supplier) and TeleSoft (a major supplier of embedded development solutions for Ada).