PIGEON POINT SYSTEMS

AdvancedTCA® and AdvancedMC™
Hardware Platform Management

AdvancedTCA Summit

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World-Class Management Components
FOCUSED. DEPENDABLE. PROVEN.
The PICMG “TCA” Landscape

- Five years of development for 3 major spec families; goal to maximize sharing of platform management facilities
- Specification development complemented and strengthened by regular interop testing
- Result: sophisticated, but complex, platform management architecture based on IPMI, tuned to PICMG needs
Overall Purpose of PICMG Hardware Platform Management

- Monitor & control low-level aspects of boards, modules and other Field Replaceable Units within a shelf
- Watch over basic health of the shelf and its constituent FRUs, report anomalies, take corrective action when needed
- Provide accessibility for inventory information & sensor readings
- Archive (and forward, as appropriate) event reports and failure notifications from boards, modules and other intelligent FRUs
- Manage power, cooling & interconnect resources in the shelf
- Enable visibility into a shelf for a logical System Manager—some mix of software + “swivel chair folk”
Overall Approach to PICMG Hardware Platform Management

• Focus on low level h/w management
  – Mandatory facilities on all boards, modules and shelves
• Adopt Intelligent Platform Management Interface (IPMI) 1.5 Revision 1.1 as foundation
  – IPMI widely used in PC and Server industry
• Emphasize interoperability among independently implemented components
• Encourage and leverage ecosystem of “off-the-shelf” management components
  – Re-using such components can be a win for product developers
    • Allowing them to focus on their value adds
    • Ensuring excellent interoperability when mature, compliant components are chosen
  – Pigeon Point components used as examples in this presentation
Example ATCA/AMC Shelf, with Dedicated Shelf Management Controllers (ShMCs)
AdvancedTCA Shelf Manager: Key Services

- Provide access to inventory information for all FRUs
- Manage power consumption and backplane interconnects
  - Using self-describing requirements in FRU info
- Implement simple framework for cooling management: responding to FRU-configured temperature threshold events
- Manage distributed collection of sensors
  - Self describing in Sensor Data Records (SDRs)
- Collect events in a persistent store and optionally perform configurable actions in response; IPMI facilities include:
  - Non-volatile System Event Log that stores N event records intended for interpretation via SDRs
  - Platform Event Filtering (PEF) that provides mechanism for configurable actions on events (such as pages or SNMP traps)
- Provide visibility to System Manager on all the above as desired
AdvancedTCA Shelf Manager: Key Services (Cont.)

- System Manager Interface: logical connection to shelf-external management
  - Specification-required for interoperability:
    - IPMI LAN Interface, including Remote Management Control Protocol (RMCP)
    - Likely Shelf Manager-specific additions: command line & SNMP interfaces
- Optional dual redundant Shelf Manager
  - Assumed from same vendor; coordination protocols not covered in specs
- Specification allows broad implementation freedom for logical Shelf Manager function
One Way to Build Dedicated ShMCs: Use Off-the-shelf Mezzanine Modules

- SO-DIMM-sized Pigeon Point ShMM-500R + shelf-specific carrier yields dedicated ShMC
  - Avoids massive “from-scratch” development
  - Small size of mezzanine makes for great physical flexibility for dedicated ShMC placement in the shelf
ShMC Redundancy and Full Connectivity to System Manager

- Spec provides for dual ShMC redundancy w/ auto failover of ShMC IP addresses
  - Details of coordination are left to implementation
  - ShMM-500R details shown
- R2.0 ECN-001 (ShMC cross-connects) allows both ShMCs to be connected with both hubs for better robustness
  - ECN-001 adopted 6/2005
  - ECN development led by Pigeon Point
System Manager Interface

- Multiple Sys Man interfaces on most ATCA Shelf Managers
  - IPMI LAN Interface (RMCP) the only ATCA-required interface
  - Typical ShMCs have at least SNMP & command line, also

- Problem: only RMCP has spec-defined framework and semantics
  - RMCP is quite low level
  - SNMP widely interesting, but MIB necessarily Shelf-Manager-specific
SA Forum’s Hardware Platform Interface (HPI) Provides a Solution

- HPI, layered above RMCP, can provide specification-defined:
  - HW Management API
  - SNMP MIB implementation
- Portable System Manager uses RMCP or either HPI interface
  - Preserves System Manager investments
- SAF’s HPI-to-ATCA Mapping specification provides further compatibility assurance
AdvancedTCA IPM Controller (IPMC): Key Facilities

- IPMI-1.5-specified commands and FRU Information
- Key AdvancedTCA extensions:
  - Dual redundant IPMB-0 connection to Shelf Manager
  - Hot swap state management for FRUs (including represented FRUs)
  - Electronic keying (commands + FRU Info) for point-to-point & bused backplane interconnects
  - LED management, including color, lamp test
  - Fan control for interoperable fan trays
  - Payload power control & negotiation w/ shelf
IPM Controller Interfaces and Physical Size
Overall Approach to Layering AdvancedMC Facilities Above ATCA

• Fit smoothly into established PICMG 3.0 conventions
• Avoid impacting PICMG 3.0 R1.0 Shelf Managers w/ AMC.0
• Reduce requirements on Module Management Controller (MMC) to limit its cost and footprint; example:
  • Require Carrier IPM Controller (IPMC) to represent MMC as a full-fledged ATCA FRU to ShMC; Carrier IPMC:
    – Does power negotiation on AMC’s behalf
    – Does AMC E-Keying similarly to ATCA, but without involvement of Shelf Manager
    – Makes Module SDRs visible to Shelf Manager
• Preserve IPMI foundation in MMC; example:
  – Full IPMI sensor infrastructure is optionally available for MMC sensors
Build Option: Acquire an Existing Mature IPMC Solution (Pigeon Point Example Here)

- Integration-ready schematics
- Bench top HW for ramp up
- Renesas H8S/2168 and Atmel AVR variants
- Minimal board footprint

- Firmware source code
- Common firmware base for H8S and AVR
- GNU tool chain supplied
- Designed for easy configuration
Key Extensions to IPMI FRU Information

- Shelf FRU information
  - Address Table: FRU types and IPMB addresses
  - Shelf Power Distribution: Internal/external current capacities, “feed to FRU” maps
  - Shelf Activation and Power Management: FRU site power capacity and activation controls
  - Shelf Manager IP Connection
  - Backplane Point-to-Point Connectivity

- Board FRU info: Board Point-to-Point Connectivity for use in Electronic Keying
New Developments with ATCA/AMC

- ATCA R2.0 ECN-002, adopted in May, 2006, supports
  - More capable and portable System Managers
  - Finer grain thermal management
  - Generalized self-describing topologies for radial IPMB-0 implementations
  - Many other improvements
- Next up for ATCA; now under way:
  - Editing so that all requirements are individually numbered for precise reference and management
- AMC.0 R1.0 ECR-002 nearing adoption ballot at this writing includes:
  - Many clarifications and other improvements for hardware platform management
  - New clock E-Keying facility
ATCA ECN-002 Example Extensions: Finer Grain Thermal Management

- Self-describing “fan geography” defines the mapping between fans and cooled FRUs
  - E.g. Cooling zone 2 has slots 6-10
  - Included in Shelf FRU Info
- When a temperature exception occurs, just 1 zone needs faster fans
- Results include: better ability to meet acoustic noise constraints
ATCA ECN-002 Example Extensions: More General Radial IPMB-0 Topologies

- Redundant dual star IPMB-0 architecture
  - Covered in original spec
  - Supports dual IPMB-0 even with 1 Shelf Manager
- Non-redundant dual star IPMB-0 architecture
  - Covered only after ECN-002
  - Shelf Managers in distinct unconnected fault zones
Coming Attraction for PICMG Platforms: Unified Firmware Upgrade Facility

- Defines interfaces for Upgrade Agents and IPM Controllers
- Allows an agent to upgrade firmware in arbitrary compliant IPM Controllers
- Spec developed over the last year; now ready to enter formal finalization
PICMG Interoperability Workshops
Vital to Spec and Product Validation

• 13 workshops, 12 involving management testing
  – ~15-25 participating companies in each event
• ~40 test plans for different functional areas
  – Developed by participants; PPS provided major subset
• Management testing paradigm for shelf manager <-> board interactions:
  – Systematically pair each shelf manager type with each of the board types available in a given workshop
  – Work through the relevant test plans for each pairing
  – Participants take responsibility for acting on any issues uncovered in their implementations
• Similar paradigm for shelf manager <-> carrier <-> AMC interactions
• New Communications Platform Trade Association (CP-TA) aims to augment PICMG Interops with formal testing
Implementing PICMG Management Controllers Takes Serious Engineering

- Five years of PICMG h/w platform management spec work has yielded:
  - PICMG 3.0: 187 pages
  - AMC.0: 98 pages
  - MicroTCA.0: 110 pages

- Strongly consider using existing components
- Pick validated, interop-tested components
- Participate in AIWs with your own products
Summary: AdvancedTCA/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 ATCA, AMC and µTCA
- 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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Speaker Background

Mark Overgaard founded Pigeon Point Systems in 1997 to focus on products and services supporting the adoption of open modular platforms to replace proprietary architectures in the telecommunications market. He is a leader in the technical subcommittees of PICMG, including the management aspects of AdvancedTCA, AdvancedMC and MicroTCA. The Pigeon Point platform management components provide the first “off-the-shelf” solutions for shelf, board and module level hardware platform management for all three of the major PICMG platform architectures. Previously Mark was VP, Engineering at Lynx Real-Time Systems (a Unix-compatible RTOS supplier) and TeleSoft (a major supplier of embedded development solutions for Ada).

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