Out-of-band (OOB) Management of Storage Software through Baseboard Management Controller

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Agenda

- Data Center Manageability Landscape
- OOB Storage Management
- Key Takeaways
Data Center Manageability Landscape

- Big Four Storage Manageability Use Cases
- Two Types of Management
- Why OOB Management?
- Cloud vs. Enterprise OOB Management
- End to end OOB Management
Big four Manageability Use Cases

- Configuration (e.g., create a RAID volume)
- Health Monitoring (e.g., drive temperature)
- Inventory (e.g., drive vital product data)
- Updates (e.g., drive firmware update)
Two Types of Management

- In-band Management (e.g., using ssh or VNC)
  - Works only after OS has booted
  - Simpler to implement, familiar tools
- Out-of-band (OOB) Management
  - Works without OS
  - A separate secure management channel
Why OOB Management?

- Remote Storage, Network, Resource Management
- OS provisioning
- A dedicated channel to debug OS crashes or when a server fails to boot
- Secure channel
- Isolated channel for infrastructure management for Cloud hosting
Cloud vs. Enterprise OOB Management

- OpenBMC vs. BMC
End-to-end OOB Management Path

- Standard transport for BMC to any on-server component is MCTP over PCIe*
- Transport for outside into the BMC is Redfish/Swordfish over a dedicated LAN

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OOB Storage Management

- Problem Statement
- Emerging Use Cases
- Solution Details
OOB Storage Management — Problem Statement

- There are more and more software defined storage solutions that need secure OOB management
Emerging Use Cases

- Management channel for multiple storage solutions (RAID, cache and others) running in OS kernel space or in user space (e.g., Storage Performance Development Kit)
  - Running on bare metal
  - Running on VMs
The current state of the art

- Hardware RAID cards
  - OOB management exists through MCTP over SMBUS/PCIe*
- Software RAID solutions
  - No OOB management, only inband

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Goals for OOB for SW solutions

- Time to market
- RAID cards uses the same method
- Secure private storage channel management
Two ways

- BMC to host directly (generic one) – e.g. IPMI, Redfish/Swordfish
- Hardware assisted software hub for storage management solutions
Software storage oriented OOB management

- Components
  - Open BMC module
  - Transport protocol BMC-host - SSI protocol
  - Host software module
  - Mailbox (e.g. Intel® Volume Management Device (Intel® VMD) register space, private channel)
Solution details

- BMC/Open BMC module/library
- MCTP based transport protocol BMC ↔ ME
- ME side MCTP Endpoint logic
Solution details

- ME side PECI driver
- PECI based IPSP protocol
- Intel® Volume Management Device device
- PCIe* registers
- Host side software OOB daemon

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Why We Need PCIe* Registers In Intel® Volume Management Device (Intel® VMD)?

- Versatile solution, applicable for
  - OS bare metal use cases
  - Virtualization use cases – Intel® VMD can be assigned to VM with VT-d – OOB management comes with storage capacity
  - UEFI

- No dependencies on OEM specific IPMI solutions

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Layered data model

- **Application layer protocol**
- **Session protocol**
  - Multiple sessions to handle multiple applications at a time
- **Security**
- **Transport layer**
- **Physical layer**

- Storage service protocol (e.g. SSI to manage RAID)
- Session protocol (SSL based)
- IPSP protocol (optimized for frame size x)
- IPSP protocol (optimized for frame size y)
- MCTP over PCIe*
- PECI

BMC | ME | Host

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Solution summary

- Fast time to market to introduce management for new service
- Management of many parallel services running in:
  - PreOS UEFI environment
  - Bare metal OS or in VM
  - In User space or in kernel space
- Built in security in layered data model

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Key Takeways

- Versatile OOB management solutions can facilitate introducing modern storage services for Cloud environments.
- Main goals for OOB management solutions are: configuration, health monitoring, inventory and updates.