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

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**Intel**

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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

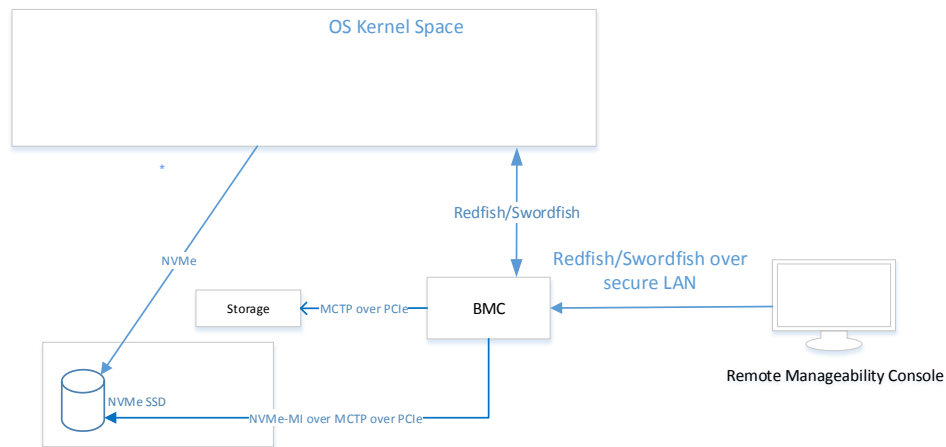
# Cloud vs. Enterprise OOB Management

- 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

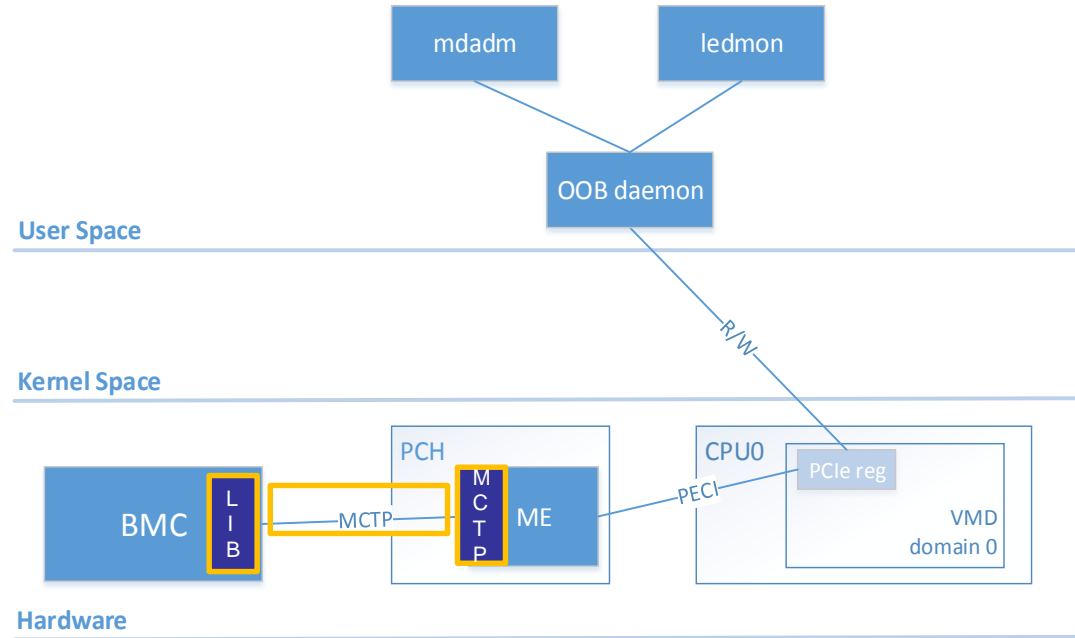


# Software storage oriented OOB management

- ❑ 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

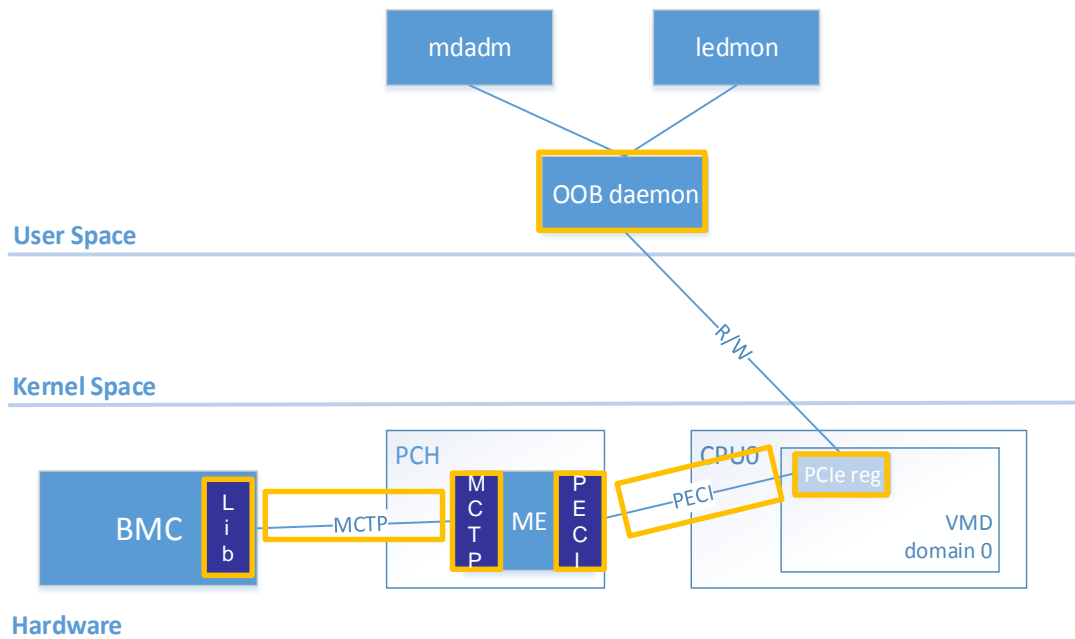
# Solution details

- ❑ BMC/Open BMC module/library
- ❑ MCTP based transport protocol  
BMC  $\leftrightarrow$  ME
- ❑ ME side MCTP Endpoint logic



# Solution details

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



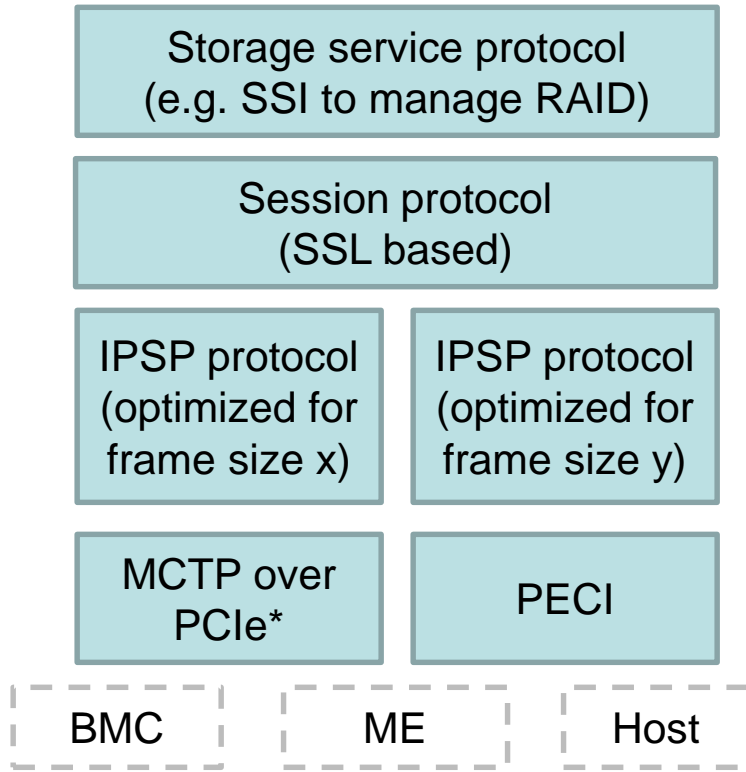
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# Why We Need PCIe\* Registers In Intel® Volume Management Device (Intel® VMD)?

- ❑ 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

\*Other names and brands may be claimed as the property of others.

# 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 Takeaways

- ❑ 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