01_CVD: UCS Server Prerequisites

This solution takes an existing FlashStack VSI design and extends it to deliver a FlashStack for AI solution with MLOps provided by Red Hat OpenShift AI. See latest FlashStack VSI Cisco Validated Design (CVD) document for more details on the infrastructure design that this solution is based on.

To build the solution using an existing FlashStack VSI design, we start with changes that must be made to the existing design to support AI/ML workloads. For optimal performance using NVIDIA GPUs, the following policies should be in place as outlined below.

- BIOS Policy: **Intel Virtualization Technology for Directed IO (Intel VT-d /IOMMU)** - Enabled
- BIOS Policy: **Single Root I/O Virtualization (SR-IOV)** - Enabled
- **Hyperthreading** - Enabled
- **Power Setting or System Profile** - High Performance
- **CPU Performance** - Enterprise or High Throughput
- **Memory Mapped I/O above 4-GB** - Enabled (if applicable)

A fully loaded UCS system with M7 servers with GPUs and running AI/ML workloads may require adjustments to the default Thermal Chassis policy, specifically the FAN policy.

- Chassis Policy: Thermal Policy > **FAN Policy**

References:

- Latest FlashStack VSI CVD (at the time of this writing) : https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flashstack_m7_vmware_8_ufs_fc.html
- NVIDIA AI Enterprise User Guide: https://docs.nvidia.com/ai-enterprise/4.1/user-guide/index.html
- NVIDIA: Understanding BIOS Configuration for Performance Tuning https://enterprise-support.nvidia.com/s/article/understanding-bios-configuration-for-performance-tuning

- Cisco UCS Server BIOS Tokens in Intersight Managed Mode (IMM): https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/Intersight/IMM_BIOS_Tokens_Guide/b_IMM_Server_BIOS_Tokens_Guide.html
- Performance Tuning Best Practices Guide for Cisco UCS M7 Platforms: https://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/ucs-m7-platforms-wp.html

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Verify UCS Server policies

Per NVAIE User Guide, the following prerequisite policies are recommended for optimal performance:

1.2. Prerequisites for Using NVIDIA AI Enterprise

Before proceeding, ensure that these prerequisites are met:

- You have a system that meets the requirements in ***NVIDIA AI Enterprise Release Notes***.
- One or more supported NVIDIA GPUs are installed in your system.
- If you are using an NVIDIA A100 GPU, the following BIOS settings are enabled on your system:
  - Single Root I/O Virtualization (SR-IOV)
  - VT-d/IOMMU - Enabled

For optimum performance, set options in your server configuration as follows:

- Enable the following options:
  - **Hyperthreading**
  - **Memory Mapped I/O above 4 GB** (if applicable)
- Set the **Power Setting** or **System Profile** option to **High Performance**.
- If applicable, set **CPU Performance** to **Enterprise** or **High Throughput**.

The required policies on a Cisco UCS server can be verified from Cisco Intersight as outlined below.

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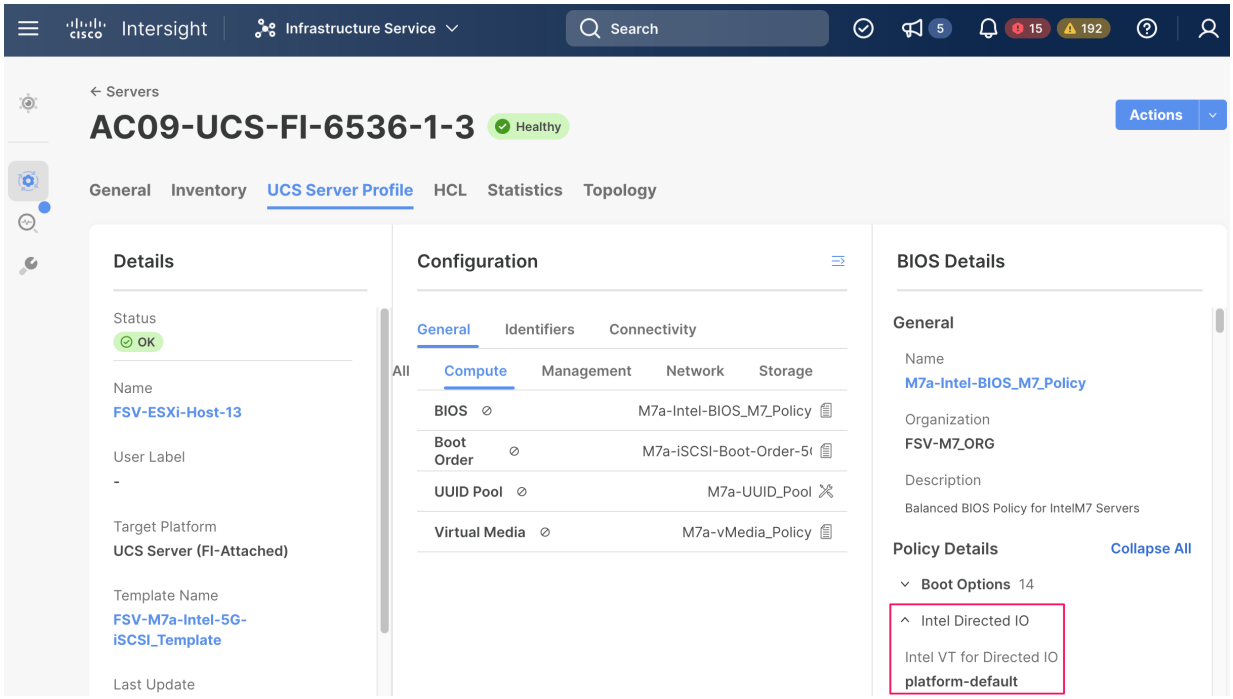
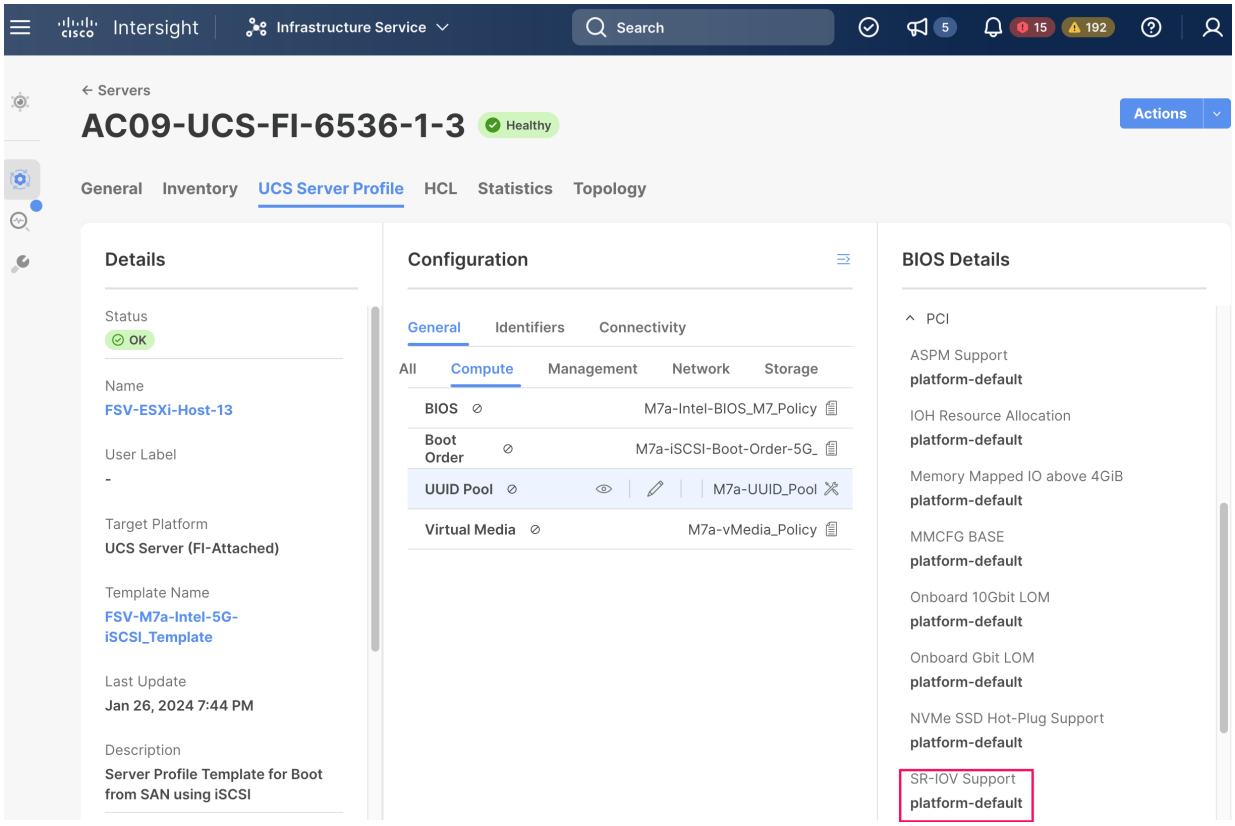
1. Enable BIOS Policy: **Intel VT-d /IOMMU**. Per the Cisco UCS Server BIOS Tokens IMM document, this is enabled by default and can be confirmed from Cisco Intersight as shown below.

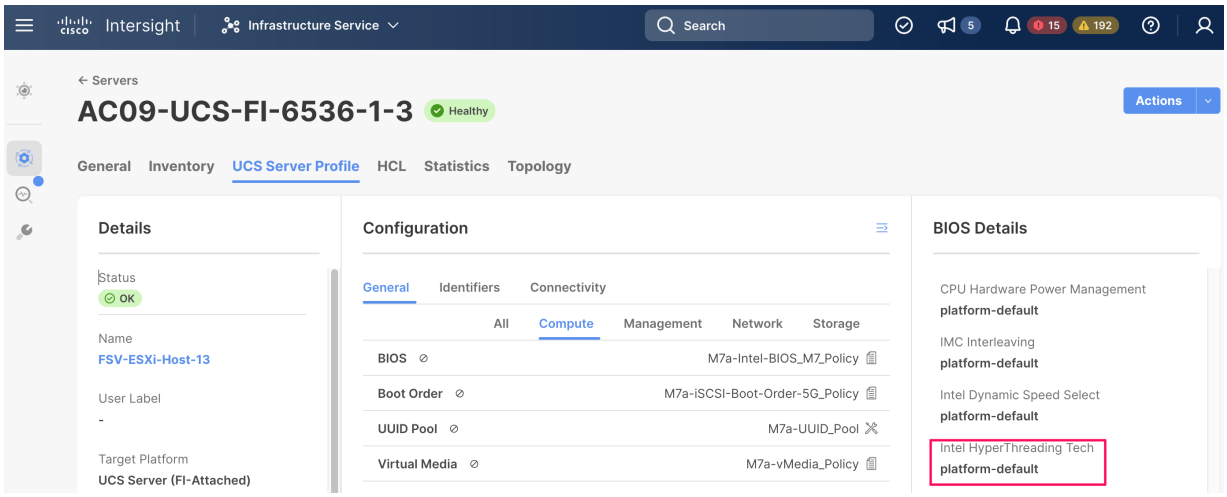


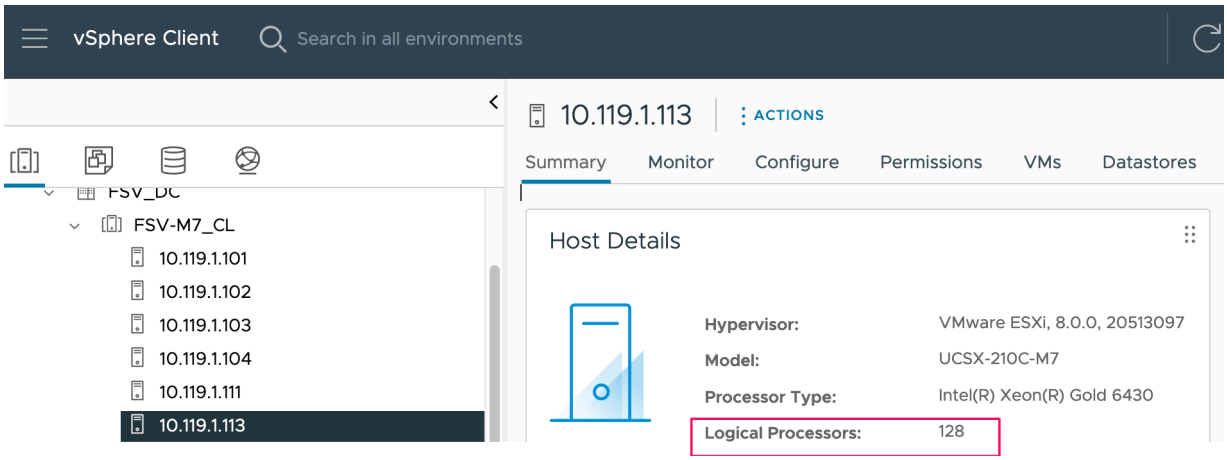
Note: The IOMMU setting under BIOS > Memory is for AMD processors and not applicable to Intel processors.

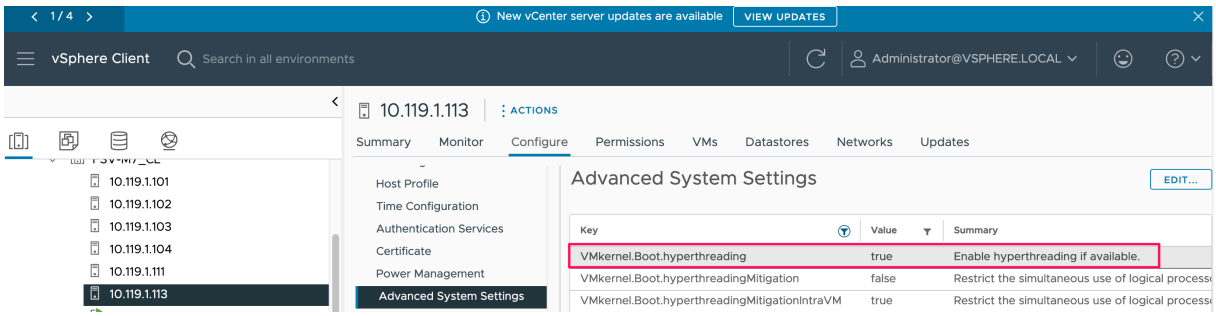
2. Enable BIOS Policy: **Single Root I/O Virtualization (SR-IOV)** . This setting is **not documented** at this time in the Cisco UCS Server BIOS Tokens IMM document but setting can be seen from Cisco Intersight. SR-IOV is enabled and can be verified using one of the following methods:
    - Access Server console and verify BIOS settings
    - `nvidia-smi` from the ESXi host once the NVIDIA GPU is deployed.



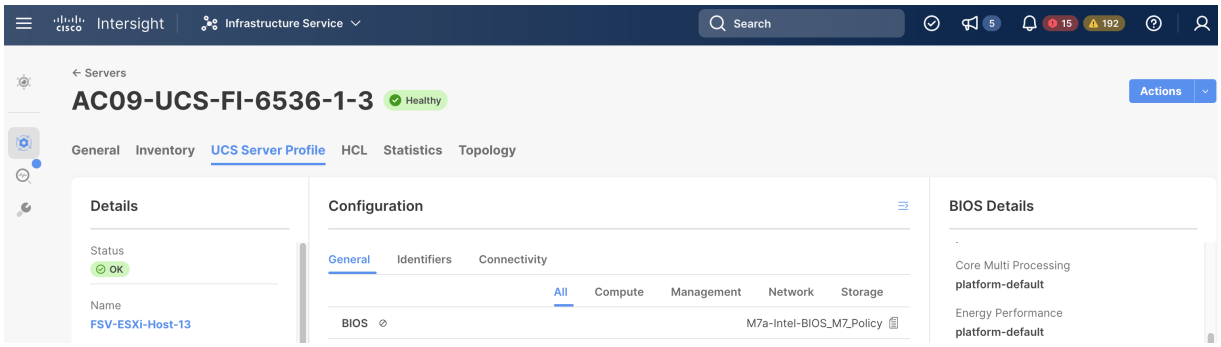
3. Enable **Intel Hyperthreading** technology. It is enabled by default and confirmed from the ESXI host as shown below.



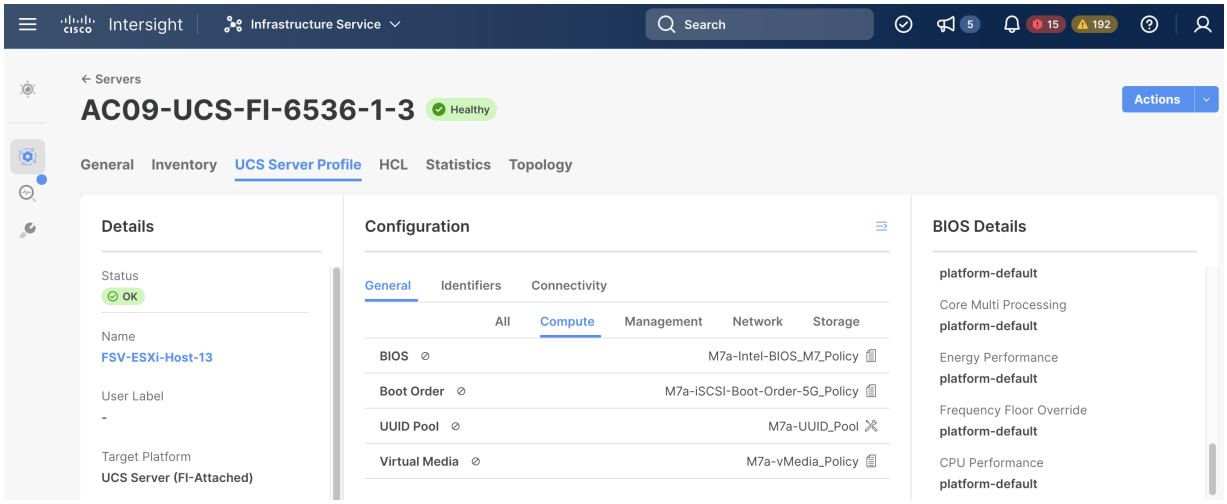




4. **Energy Performance - Performance.**
   Per the Cisco UCS Server BIOS Tokens IMM document, this is enabled by default and can be confirmed from Cisco Intersight as shown below.



5. **CPU Performance**
   This is currently disabled by default.



6. **Memory Mapped I/O above 4-GB** - Enabled (if applicable)
7. When adding GPUs to a system, it is important to ensure that the fan control policy reflects the needs of you environment. For a Cisco UCS-X series, it can be specified using the **Fan Control Policy** under **Chassis Policy** as shown.