Hewlett Packard Enterprise

Technical white paper

Installing and running Microsoft Windows Server on HPE Superdome Flex servers

Offering flexibility, performance, and reliability for Microsoft Windows Server critical environments

Contents

Abstract

This paper describes what Hewlett Packard Enterprise supports with its HPE Superdome Flex server running Microsoft Windows Server 2019, Windows Server 2022 and recently released Windows Server 2025. It is intended to help anyone who needs to install either Microsoft Windows Server 2019, Windows Server 2022 or Windows Server 2025 on an HPE Superdome Flex server.

Introduction

With the introduction of second-generation on Intel® Xeon® Scalable processors, Hewlett Packard Enterprise also released the next-generation HPE Superdome Flex servers, leveraging new technologies and capabilities.

HPE Superdome Flex servers based on **Intel Xeon Scalable Gold 62xx and Platinum 82xx (second-generation Intel Xeon Scalable processors)** in addition to those based on Intel Xeon Scalable Gold 61xx and Platinum 81xx (the first-generation Intel Xeon Scalable processors) have been enabled and validated to support Microsoft Windows Server 2019 as well as Windows Server 2022. Also, **Intel Xeon Scalable Gold 62xx and Platinum 82xx (second-generation Intel Xeon Scalable processors) have been enabled and validated to support Windows Server 2025.**

Windows Server 2019, Windows Server 2022 and Windows Server 2025

Microsoft Windows Server 2019 was designed for hybrid cloud environments. With a rich set of features and enabled for the latest technologies, this version can utilize all the components that are part of HPE Superdome Flex servers including persistent memory, to offer an outstanding solution for Windows-based applications that require growing and (or) large amount of resources and mission-critical environments. Leveraging Windows Server 2019 and Windows Server 2022 capabilities, adding enhancements and improvements, for example increased scalability; also incorporating innovations in areas like security, Windows Server 2025 is the latest Microsoft Operating System to be supported with HPE Superdome Flex servers described below.

HPE Superdome Flex

Strengthening the scalability, flexibility, and mission-critical RAS capabilities of its predecessors, HPE Superdome Flex servers utilize a unique modular architecture based on four sockets Intel Xeon Scalable processors chassis (basic building block/unit of a server). These units can be combined together either into a single system image or into HPE hardware partitions (HPE nPars), which allows the system to grow over time according to business needs. HPE nPars start from 4 sockets and can go up to 32 sockets, and provide greater system reliability and licensing optimization. Multiple HPE nPars can be created in a rack. HPE nPar is electrically isolated from the others allowing easier server maintenance while the others continue to run undisturbed.

A base chassis has the following characteristics: Four Intel Xeon Scalable processors (options from 4 to 28 cores), 48 DIMM slots; 12 DIMMs per processor for DDR4 (and Intel® Optane™ Persistent Memory 100 series for HPE Superdome Flex servers with 2nd Generation 62xx and 82xx processors), up to 16 PCIe Gen3 slots, and two HPE Superdome Flex ASICs.

Configurations can start with a base chassis and can be expanded with up to seven chassis to build a large single server with a maximum of eight chassis and 32 sockets (896 cores using 28 cores processors) and 48 TB of memory (using DDR4 128 GB DIMMs). However, as discussed later, for Windows Server 2019, 16 sockets/24 TB RAM is the maximum configuration validated by HPE. **Windows Server 2022 and Windows Server 2025** has been validated and certified for up to **32 sockets** and **48 TB of RAM** enabling support for up to **896 cores** (with 28 cores Intel® Xeon® Platinum processors) and **1,792 logical processors** when Intel® Hyper-Threading is used. It is important to note that Intel Optane Persistent Memory (PMem for short) for HPE with Microsoft Windows Server 2019 and Windows Server 2022 is supported on server configurations comprising up to 16 sockets only (2nd Generation: 62xx and 82xx processors). Intel Optane Persistent Memory is not supported with Windows Server 2025 on HPE Superdome Flex platform.

Complete specifications (HPE QuickSpecs) are available at hpe.com/psnow/doc/a00026242enw?from=app&section=search&isFutureVersion=true.

HPE Superdome Flex processor configuration rules:

- Processor types must not be mixed within the same chassis or HPE nPar. Also mixing different frequencies or different cache sizes are not supported either.
- Processor modules on a chassis must be the same revision, frequency, and cache size.
- It is highly recommended that all processors within all HPE nPars within a complex be identical in order to maximize repartitioning options.

The base I/O includes 4-drive bays, two 1GbE and two 10GbE NIC ports, four USB ports, and a built-in DVD.

Memory recommendations:

- Support for either a full chassis of 48 DIMMs or a half-populated chassis with 24 DIMMs.
- The amount of memory on each chassis within the partition should be the same, and it is recommended to use the same amount of memory on each processor module within a partition.

Intel Optane Persistent Memory for HPE Superdome Flex servers' considerations:

Intel Optane Persistent Memory 100 series for HPE Superdome Flex servers is only supported with Intel Xeon Scalable processor family second-generation (62xx and 82xx).

- Chassis must be half populated with DDR4 DIMMs before Intel Optane Persistent Memory 100 series for HPE Superdome Flex can be added and if so, it is not supported to mix DDR4 DIMM sizes.
- Intel Optane PMem DIMMS must be equally populated across each socket as either 1, 2, or 6 per socket.

Intel Optane PMem quantity and type must be consistent across system complex or partitions; if partitions have different memory configurations, repartitioning is not supported. For detailed information, refer to HPE Superdome Flex persistent memory user guide.

I/O options are part of the **base chassis** for the first chassis or expansion chassis and partition chassis for others. The I/O options are either 16 or 12 PCIe Gen3 slots (Note that there is a **compute node** choice for expansion chassis, which does not provide any PCIe slot) allowing a wide variety of combinations of I/O cards depending on the applications requirements. The list of I/O adapters for each OS is mentioned in the HPE QuickSpecs.

I/O recommendations

- Slots for boot adapters are #5, and slot #3 for alternate boot devices.
- For a better load on the system, HPE recommends spreading adapters across all CPUs:
  CPU 0 = Slots 1, 2, 3, 5; CPU 1 = Slots 4, 6, 7, 8; CPU 2 = Slots 9, 10, 11, 13; CPU 3 = Slots 12, 14, 15, 16
- For optimal performance, PCIe x16 lane adapters should be placed in x16 slots.
- Expansion chassis can be configured as compute-only chassis configuration with no PCIe slots.

HPE Superdome Flex features a comprehensive and differentiated set of Reliability, Availability, and Serviceability (RAS) features discussed in detail in the HPE Superdome Flex server architecture and RAS technical white paper. Noteworthy features include self-healing capabilities and an analysis engine for better diagnostics and mission-critical reliability.

Supported configurations

Platform

Certified for Windows Server 2019 since March 2019, Windows Server 2022 since October 2021 and Windows Server 2025 since November 2024, HPE Superdome Flex server can scale up or scale out Windows Server environments with its 4-socket modular building blocks. Each building block can be customized to match the workload requirements with a choice of memory size and capacity, processor and core count, amount and type of I/O devices.

As mentioned earlier, the HPE Superdome Flex server can be used in a single chassis configuration and can be expanded up to four chassis in total forming a server with 16 sockets (limit certified by HPE with Microsoft Windows Server 2019) and up to eight chassis in total, forming a server with 32 sockets which is now the maximum limit certified by HPE with Microsoft Windows Server 2022 and Microsoft Windows Server 2025. Also, HPE nPar (hardware partition) is fully supported; servers can grow over time up to the maximum validated size with Microsoft supported operating systems, that is, 16 processors and up to 24 TB of RAM with Windows Server 2019 and 32 processors/ 48 TB of RAM for Windows Server 2022 and Windows Server 2025.

All of Windows Server 2019, Windows Server 2022 and Windows Server 2025 **Standard Edition and Datacenter Edition** are supported; the choice depends on applications and business requirements. For a comparison between these editions, which also includes the maximum limits supported, check the Microsoft website at docs.microsoft.com/en-us/windows-server/get-started-19/editions-comparison-19 for Windows Server 2019, docs.microsoft.com/en-us/windows-server/get-started/editions-comparison-windows-server-2022 for Windows Server 2022 and https://learn.microsoft.com/en-us/windows-server/get-started/editions-comparison?pivots=windows-server-2025 for Windows Server 2025.

The installation of the operating system can be done in **server core** or **server with desktop experience**.

The decision has to be made prior to the installation because any change requires a complete reinstallation of the operating system.

Note

Currently, the maximum configuration validated by HPE is 16s and 24 TB RAM with Windows Server 2019 and 32s and 48 TB RAM with Windows Server 2022 and Windows Server 2025.

When persistent memory needs to be added (16s only), the maximum configuration supported comprises 96 DDR4 DIMMs and 96 Intel Optane Persistent Memory 100 series for HPE Superdome Flex modules. HPE has successfully tested a configuration totalizing 30 TB (out of which 24 TB were Intel Optane PMem for HPE Superdome Flex).

HPE I/O options supported with Microsoft Windows Server 2019, 2022 and 2025 are listed in the HPE QuickSpecs.

Firmware revision

HPE Superdome Flex firmware initially required running firmware bundle 3.0.512 (at least) to install Microsoft Windows Server 2019. With the support of Intel Optane Persistent Memory 100 series for HPE, it required firmware bundle 3.20.206 (or above) for the same installation.

To install and run Microsoft Windows Server 2022 on any supported configuration firmware bundle 3.40.106 (or above) is necessary. Lastly, to install and run Microsoft Windows Server 2025 on any supported configuration firmware bundle 4.5.6 (or above) is necessary. HPE recommends running the **latest version of firmware** on its servers. Note that systems come from factory with the latest firmware within date of shipment, but it is advisable to check on the HPE website whether a newer version had been released afterwards and if that is the case, update the server.

The latest firmware recipe bundle for HPE Superdome Flex system is available on the HPE support webpage at support.hpe.com/hpesc/public/home/driverHome?sp4ts.oid=1010323142. On the landing page, by selecting the Operating environment such as "Microsoft Windows Server 2022" (for example), you will get firmware bundle file under the section "Firmware," which can be installed/updated following the installation instructions available reading the download page.

Boot device

HPE Superdome Flex base chassis includes four disk bays that can be filled with a choice of SAS hard disk drives (HDDs) or solid-state drives (SSDs) and SATA SSDs for boot. Boot from storage area network (SAN) devices is supported on all Fibre Channel adapters.

Also, PXE boot is possible with the embedded Ethernet adapter.

Here is the list of adapters supported for boot:

- Embedded Intel RSTe SATA controller: Boot support is available for both physical/HBA mode and RAID mode.
- **Important note:** Intel RSTe SATA controller was not supported with the initial Windows Server 2022 support. Starting with the HPE Superdome Flex I/O Service pack version 2022-03-06-0A, support for Intel RSTe SATA controller (Intel RSTe AHCI RAID Driver) is available.
- HPE 9361-4i RAID controller.
- HPE 3154-8e RAID controller: Boot support for both physical/HBA mode and RAID mode.
- HPE 3162-8i Encryption RAID controller (internal encryption).
- All supported Fibre Channel adapters.
- PXE boot via Intel Corporation Ethernet Connection X722 for 10GBASE-T.

Slots enabled for boot:

1. Boot devices should be in slot 5.
2. Alternate boot devices should be in slot 3.

Secure boot

Secure boot is a security feature which ensures that each component launched during the boot process is digitally signed and that the signature is validated against a set of trusted certificates embedded in the UEFI BIOS. Both HPE Superdome Flex servers and Microsoft Windows Server support Secure boot. When Secure boot is enabled on the HPE Superdome Flex server, the system firmware verifies OS

loader, driver, and UEFI application signatures before running them. By default, Secure boot is disabled. This default applies to systems shipped from the factory, and to newly created HPE Superdome Flex server partitions. Many Secure boot configuration changes require resetting the partition before booting an OS or accessing the UEFI Shell.

For more details on Secure boot (configuration/troubleshooting) check the "HPE Superdome Flex Server User Guide" available at hpe.com/support/superdome-flex-user.

HPE value-added software

- **HPE Superdome Flex I/O Service Pack**

  HPE Superdome Flex I/O Service Pack comes as an ISO image, which contains HPE smart components that allow installing validated drivers and software for various OS versions and I/O firmware. These smart components can be deployed using Smart Update Manager (SUM) after initial OS installation process or for upgrades when a new version gets released.

  Version **2019.04** was the first version supporting Microsoft Windows Server 2019, **2021.10** is the minimum version required for Windows Server 2022 and 2024.11 is the minimum version required for Windows Server 2025 to get tested drivers and software utilities, tools together with the HPE Data Collection Daemon (DCD) for Microsoft Windows Server (part of this bundle) HPE recommends the latest version to be installed. For a complete list of components and information, we highly encourage to read the release notes published with the HPE Superdome Flex I/O Service Pack.

  The **HPE Superdome Flex I/O Service Pack ISO** is available at hpe.com/support/superdome-flex-software (under Drivers and Software and select the "software" button).

  Note: Version 2019.09 was the minimum required for configurations with Intel Optane PMem for HPE.

  HPE Superdome Flex support matrix called HPE Superdome Flex Release Sets should be checked to ensure supported combinations of firmware and HPE Superdome Flex I/O service pack.

- **HPE Data Collection Daemon**

  HPE DCD is an agentless service for HPE Superdome Flex servers. HPE DCD proactively monitors the health of hardware components that are visible to running operating system instance and reports any errors to management firmware running on Rack Management Controller (RMC) of HPE Superdome Flex. The management service running on RMC uses the data within its Redfish service and serves it out of band to client applications like HPE Insight Remote Support (IRS).

  HPE DCD is delivered as signed and certified smart component. It includes the following major features for Windows:

  - HPE DCD collects inventory data for the following listed components:
    - Windows Server host operating system
    - SAS/SATA controller—MegaRAID 9361-4i Controller
    - Physical drives—HPE Superdome base chassis drives (internal only)
    - RAID volumes (logical drives) hosted by MegaRAID 9361-4i Controller, SmartRAID 3162 and 3154 controllers
    - Ethernet devices
  - HPE DCD proactively monitors health of the MegaRAID 9361-4i Controller, SmartRAID 3162-8i /e Controller, SmartRAID 3154-16i Controller, SmartRAID 3154-24i Controller, SmartRAID 3154-8e Controller, attached drives, Ethernet devices and RAID volumes and forwards state change events to RMC.
  - A command line utility "dcdCli" is provided to test the HPE DCD event infrastructure.
  - Logging is supported in HPE DCD to log messages at different logging levels.

All the data is transferred between HPE DCD and RMC through the IPMI Channel.

The HPE DCD product smart component for Windows is part of the HPE Superdome Flex I/O Service Pack; a pointer to the HPE DCD release notes is included in the I/O Service Pack release notes.

Microsoft Windows Server 2019, 2022 and 2025 installation

Prerequisites

This paper assumes that the HPE Superdome Flex server is cabled correctly and accessible from the network (configured and attached to a functional network). For more information, see the HPE Superdome Flex Server User Guide.

If the system is planned to be part of a hard partition using HPE nPars, it should have been already defined. It is often easier and simpler to set up an operating system with a small partition that could be grown after the initial installation. It is also faster to install Windows Server on a system with few logical processors, rather than a large amount (for more details please check the known issues section at the end of this white paper). The HPE Superdome Flex Server Partitioning Guide discusses how to proceed.

Microsoft Windows Server 2019, Windows Server 2022 and Windows Server 2025

Microsoft Windows Server 2019, Windows Server 2022 as well as Windows Server 2025 can be installed manually or in an automated fashion (using PXE boot). Installer must make sure everything is prepared for a successful installation.

- Media should be accessible from the technician system to the deployed server for both interactive (manual) and automated (unattended) installations.
- License should provide support for all cores that will be running the Windows Server OS.
- HPE recommends installing Microsoft Windows Server 2019 Build 17763.379 from March 2019 (or above) to avoid an issue with Fibre Channel boot device and Hyper-V (for more details please check the known issues section at the end of this white paper).
- In the case of Windows Server 2025, Build 26100.2314 from November 2024 (or above) is recommended to avoid an OS installation issue on higher socket configurations.
- As mentioned earlier, HPE recommends doing the initial Windows Server setup on a small server or basic nPar (i.e., one base chassis) whenever possible, to ease installation and avoid some wait time during hardware detection. The server can be expanded afterwards and additional hardware is recognized automatically.

Important note

Please be aware that Microsoft Windows Server (all versions) does not support installations based on HTTP boot, therefore this can't be used to install Windows Server on an HPE Superdome Flex server.

Drivers and HPE software components

Use the **latest HPE Superdome Flex I/O Service Pack** version to install or update drivers, software, and I/O firmware with SUM. The HPE Superdome Flex I/O Service Pack ISO is available at hpe.com/support/superdome-flex-software under "Drivers and Software", selecting the "Software" button. It can be installed or used for updates with instructions available in the download page.

- Installer should download the ISO image and make it available for the installation.
- Special considerations:
  - If the boot disk resides on the embedded **Intel RSTe SATA** controller, the latest HPE Superdome Flex Intel RSTe AHCI RAID Driver must be provided during setup. The driver is included as a smart component in the HPE Superdome Flex I/O Service Pack ISO. Loading this driver during setup process ensures visibility and accessibility of the disks connected to this controller and copies the necessary files.
  - If PXE boot is used, the Intel Corporation Ethernet Connection X722 for 10GBASE-T driver (Intel i40ea Driver for Windows Server 2019) for the embedded network adapter must be added to the WIM images to be able to boot. The driver (i40ea65.sys) is included as a smart component in the HPE Superdome Flex I/O Service Pack ISO.
- If SAN boot is used, the adapter used for SAN boot must have been enabled in **Device manager** of the HPE Superdome Flex BIOS menu, which is activated upon start with the following option "**Press [F2] to enter setup and select boot options**."

Boot device

Configuration of the primary boot adapter is mandatory to install Windows on a bootable device. It is required to define the location and size of the boot disk considering the page file and debugging information in case of a critical event.

The boot device must be clean (no existing partition) to avoid any potential issues when installing Windows Server.

- **Size**

  The boot device size depends on the target configuration requirements and should be able to accommodate regular OS updates, a paging file large enough to handle potential memory dumps should a critical event occur (Note that the memory dump though can be located on a different disk through configuration).

  Microsoft Windows Server 2019, 2022 and 2025 require at least 32 GB (absolute minimum, which is core installation and less than 16 GB of RAM) but then you have to take into account the RAM size, page file, potential kernel dump, and so on.

  For a 12 TB (RAM) server, if the page file is approximately 300 GB and located on the Windows Server OS partition (recommended, avoiding Stop 0x9F), we can target a disk of around 1 TB.

- **Page file (pagefile.sys)**

  The Page file is used for multiple reasons including to extend the amount of memory (extending the commit limit), support system crash dump, and support some Windows applications, which make it necessary.

  On computers with a large amount of memory, it is recommended to set the page file manually using the WMIC.exe command; in this paper, you can find an example of how to do this. For background information, you can check a Microsoft support article available at support.microsoft.com/en-us/help/973423/you-cannot-set-page-files-on-a-partition-that-is-larger-than-2-terabyt.

  The rule of thumb is to set a page file size around **1/32 RAM** size, expressed in MB.

- **Crash dump (memory.dmp by default)**

  In case of critical errors, Windows Server is able to generate a crash dump for debugging purposes. Various options can be set within the operating system in order to help in this situation. The variety of the memory dumps is documented here: docs.microsoft.com/en-us/windows-hardware/drivers/debugger/varieties-of-kernel-mode-dump-files.

  It may take a lot of disk space and time to generate complete memory dumps on servers with large memory footprints. HPE recommends setting the memory dump to "**kernel memory dump**;" in most of the cases, it provides enough information for troubleshooting.

- **Storage area network**

  It is possible to boot from SAN; care must be taken to ensure that the configuration is supported, and often it is advisable to check all the elements in the configuration for compatibility concerns (storage array, SAN switches, HBAs).

  - A logical unit (LUN or logical disk) must be carved from the storage array.
  - Only one LUN should be presented to an HBA on the host, from only one path preferably.

    HPE recommends using zoning and LUN masking techniques to prevent confusion and mistakes during initial Windows setup. In effect, if multiple paths are used, Windows setup will see only one disk online and all the other paths would show the same disk offline. Do not try to get them online. Multiple paths are recommended for availability and redundancy reasons, but this can be set up later after OS installation and initial setup.

    A single path and only one LUN (disk) presented are essential for an easy and successful installation.

    For information on how to configure Fibre Channel adapter to boot from SAN, see the HPE Boot from SAN Configuration Guide.

- **Deployment**

  To perform the OS deployment, you need to connect the HPE Superdome Flex server with a **technician PC**. A technician PC is typically a laptop or any computer that is used during installation.

  It should include the tools necessary for the installation (PuTTY, Java, Windows Server, and HPE Superdome Flex I/O Service Pack media, and such) and have access to HPE Superdome Flex.

  It is possible to connect to the server in one of the following ways:

  - Locally, from the computer: You may use a micro-USB cable to connect the technician PC to the CNSL port on an HPE Superdome Flex server RMC.
  - Remotely from a network connection to the RMC with a recent internet browser: The browser should allow pop-ups.

- **Gather installation materials and information**

  Gather information that will be useful for your Windows Server installation.

  1. Information about the RMC

     IP address for the RMC_____

     Hostname for the RMC_____

     Site gateway IP address_____

     Subnetwork mask_____

     NTP server IP address _____

     Site name server IP address _____

  2. Information about the server to be installed

     Information might be entered during the process either interactively (manual installation) or automatically in an answer file (unattended installation).

     Localization_____

     Windows Server OS key_____

     Boot device _____

     Boot device size _____

     Server hostname _____

     Server fully qualified domain name (FQDN) _____

     Microsoft Active Directory Domain name or workgroup_____

     (If Active Directory, administrator's credentials to join domain)

     _____

     Server IP address(es) _____

     Server subnet mask(s) _____

     Server gateway IP address_____

     Server administrator's password _____

     Site DNS server IP addresses _____

     Site search domain _____

Perform a Windows Server installation

This part of the document walks through a typical manual installation that can serve as an example and learning for a Windows Server 2019 with Desktop experience installation. This assumes the installer has all the information required to perform the installation and enough privileges to complete the steps necessary for the setup.

Summary of the steps

- Choose an installation method (manual or unattended).
- Prepare the technician system to be used for the deployment.
  - Prepare the media for the installation (Microsoft Windows Server, HPE Superdome Flex I/O Service Pack, and others).
  - Make sure you have your licensing information as well as all information gathered for a successful installation.
- Prepare the system at the hardware level.
  - Make sure the firmware is at a level supported for the Microsoft Windows Server version you are using.
  - Set up the boot device (If you are using SAN boot, ensure there is only one LUN presented through only one path [zoning and/or selective presentation]).
- Connect to the RMC of the target HPE Superdome Flex server.
  - Power on the system or the partition.
- Proceed with Windows Server operating system setup.
  - Enable Remote Desktop; configure or disable Windows firewall.
- Apply the latest HPE Superdome Flex I/O Service Pack.
- Join Active Directory domain, if applicable.
- Install Windows roles and features, if applicable (for example, multipath I/O, and others).
- Update Windows Server 2019, Windows Server 2022 or Windows Server 2025 with the latest cumulative updates.
- At this point, if the system is going to be part of a hardware partition with multiple chassis, extend the partition.
- Connect or present other disks and/or LUNs and any additional SAN paths (if applicable).
  - Verify the server sees all the devices and multiple paths are correctly set.
- Customize the Windows environment with optimal settings for the target applications.
  - Page file, memory dump type, power option, and such.
- Install any additional applications.
- Grow the server or hardware partition (nPar) if necessary, and restart.

Step-by-step Windows Server installation example

HPE Superdome Flex servers enabling the second-generation Intel Xeon Scalable processors, provides a new user experience for the remote console connecting via a web interface to the RMC. In this chapter, you will be guided through the Windows Server installation steps using a technician PC that connects to the RMC and starts a virtual (keyboard video media) remote console.

This is what is depicted in the following paragraphs.

Most of the screenshots are Windows Server 2019 related however the installation of Microsoft's latest operating systems (Windows Server 2022 and Windows Server 2025) are very similar, there are minor differences in the screen layouts, which are self explanatory.

Connect to HPE Superdome Flex server

Using the RMC IP address, or FQDN or even the hostname if you can resolve it, and a recent web browser to connect to the system.

Note

It is usually very convenient to have a PuTTY (terminal) session to the RMC to be able to monitor or launch some commands through the command line interface, such as when you need to power on the system. For details, see the HPE Superdome Flex Server Administration Guide.

1. On the technician PC, open a web browser.
2. Enter the **RMC IP address** (or hostname or FQDN).

Select the partition for your target installation (if the system is partitioned).

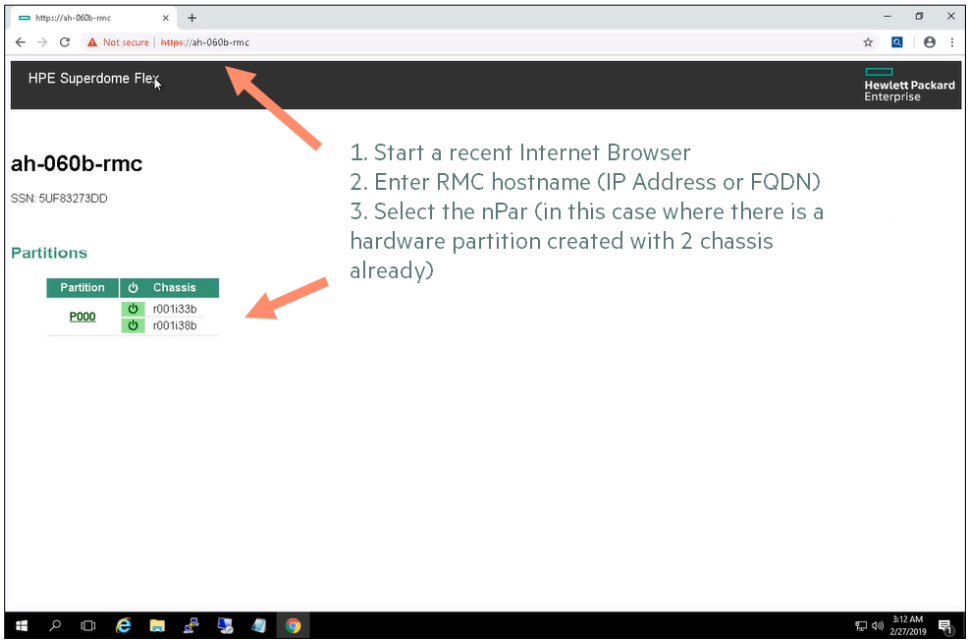

Figure 1. Internet browser—Connection to an RMC

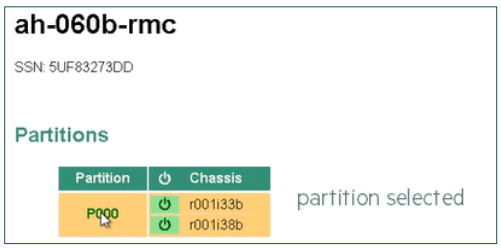

Figure 2. HPE nPar selected

Authenticate with enough privileges; log in to the system using the RMC administrator's credentials. Enter **username** and **password** and click **Sign me in**.

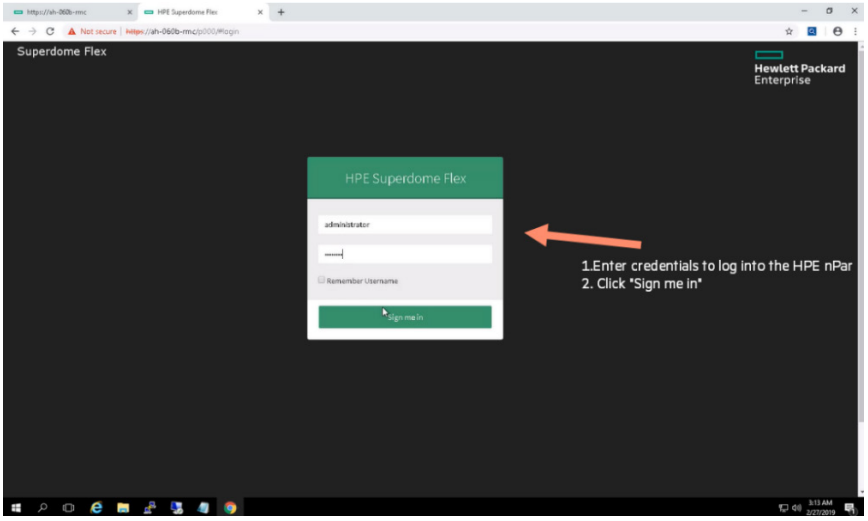

Figure 3. Authenticate to the HPE Superdome Flex hardware partition on the RMC

Power on the system (or HPE nPar) and load Windows Server installation media

At this point, Remote Control (remote KVM) web interface displays. It allows setting up the virtual media to redirect ISO images (which can contain the Microsoft Windows Server 2019 image or HPE Superdome Flex I/O Service Pack image, for example) and launch the KVM interface (virtual console).

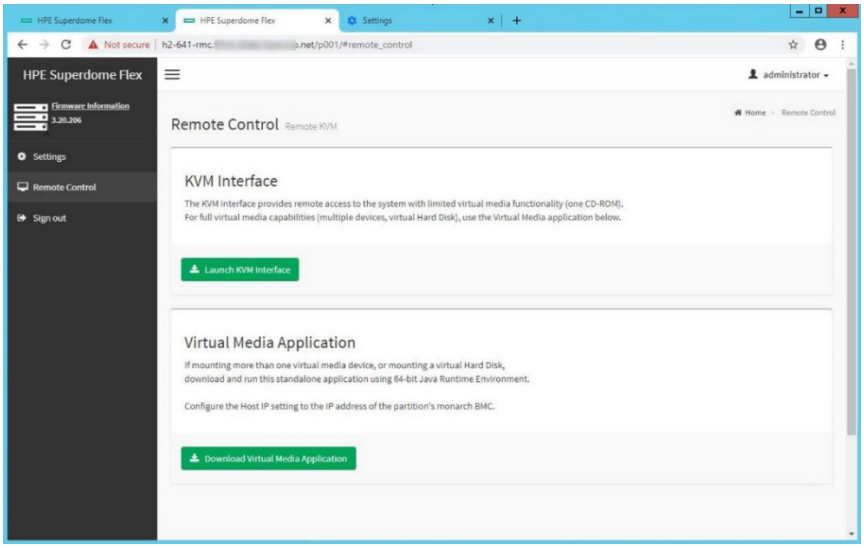

Figure 4. HPE Superdome Flex—Remote Control web interface

Click **Settings** on the left of the window, then **Media Redirection settings, and Media instance settings**. Select **1** from the drop-down menu under **CD/DVD Device instances** and click **Save**.

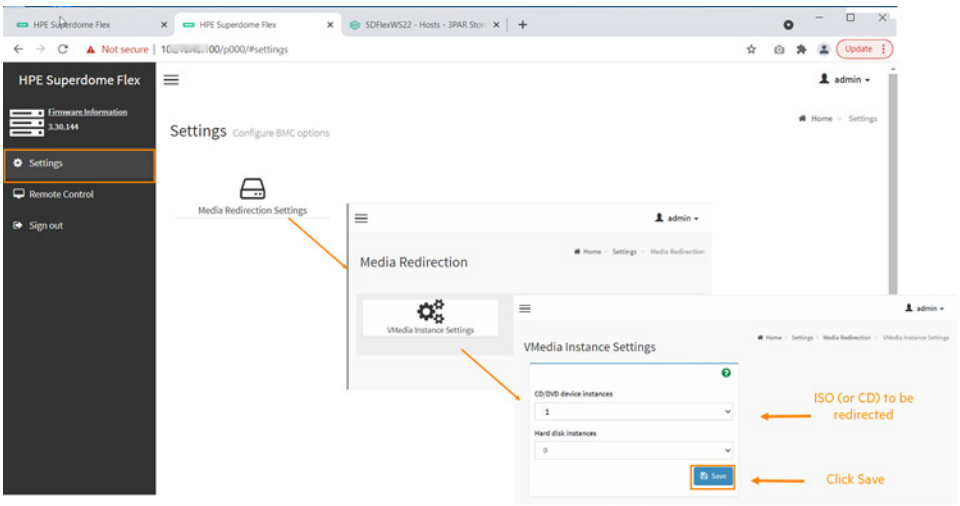

Figure 5. Settings > Media Redirection Settings > Media instance Settings

Go back to the left side of the window and select **Remote Control**, click **Launch KVM interface**. A new window opens.

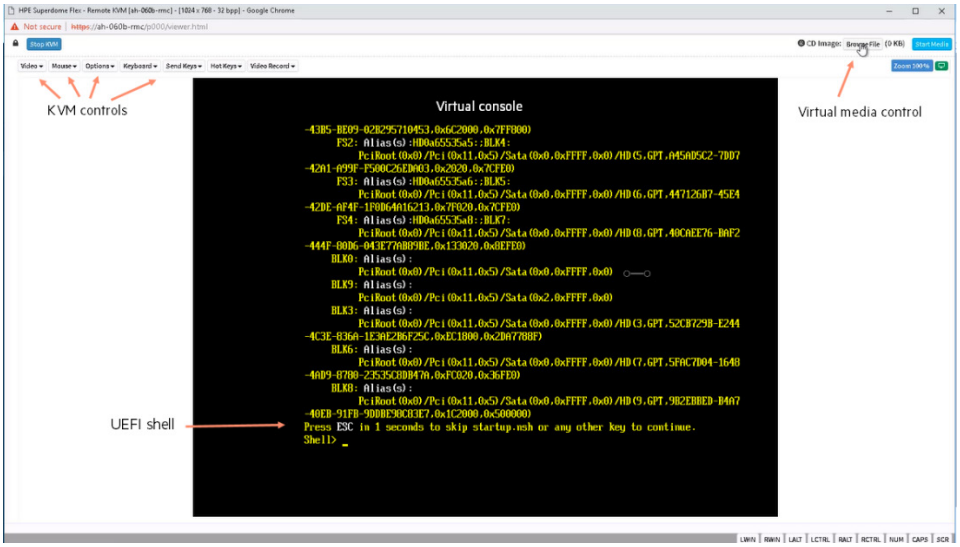

Figure 6. HPE Superdome Flex—Remote KVM

In this scenario, the HPE Superdome Flex and nPar had been powered on. It was left at the UEFI shell.

Note

If it is not powered on, follow the instructions from the HPE Superdome Flex Server User Guide, under the section entitled: Connecting to the HPE Superdome Flex server, verifying the configuration, and booting.

3. Redirect the Windows Server media using the **Browse** File on the top right corner (it assumes that the ISO image is accessible from the technician PC), select Windows Server 2019 media (in Figure 7, an ISO image), click Open, and at the top right corner, click **Start Media**.

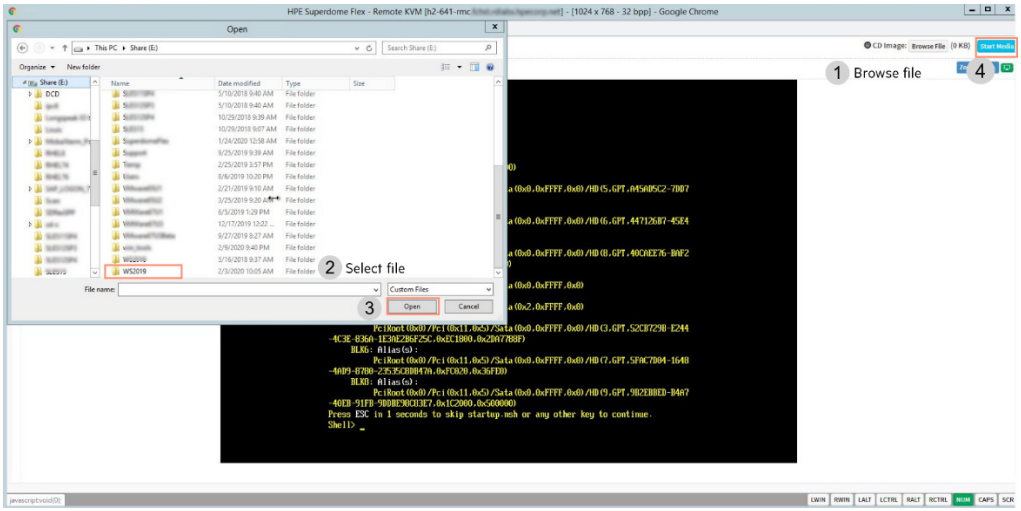

Figure 7. Virtual console—Redirection of an ISO image from a local drive to the remote console

Note

For two simultaneous virtual media connections, an embedded Java application can be launched from the browser. For more information check appendix A.

Initiating the Windows Server installation

4. Boot from the Windows Setup Media. For that, you might need to go to the UEFI Boot Manager Menu to select the corresponding entry and boot.

   In our example, we have redirected a Windows Setup ISO image through the virtual media feature. Figure 7 shows that the system is at the UEFI shell.

   a. From here, you can type **Exit** to go to the UEFI menu; or it is possible to use the **MAP –r** command, and look for a bootable UEFI file system, which corresponds to the bootable partition on the Windows Setup Media. A bootable UEFI file system is formatted FAT32 and shows as FSx: (x is a number in the order of display should there be multiple bootable EFI partitions from multiple devices).

   b. As depicted in Figure 8, at the UEFI Shell, type **Exit (Enter)** and select **"Boot Manager Menu" (Enter)** from the UEFI main menu.

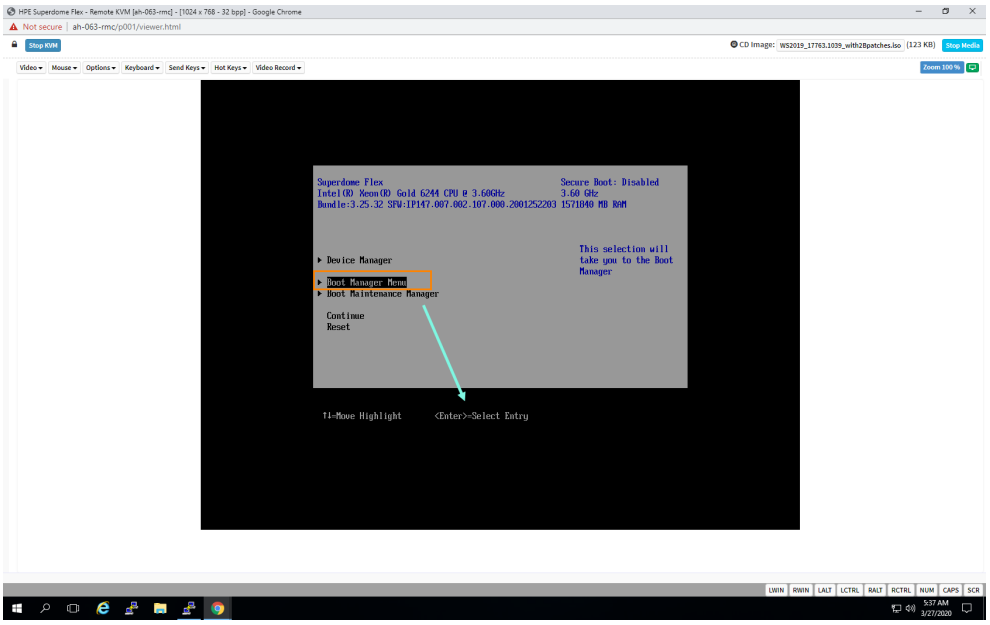

Figure 8. UEFI menu—Boot Manager Menu entry

5. Select the appropriate entry to boot from your Windows Setup Media (Figure 9).

   If you want to do this through the UEFI shell, once MAP –r has returned the list of UEFI file systems (**FSx**:) and block devices (**BLKy**:), you will have to type **FSx**: (Enter), next at the prompt FSx:> type **CD \EFI\Microsoft\Boot (Enter)**, and then from FSx:\EFI\Microsoft\Boot> type **BOOTX64 (Enter)**.

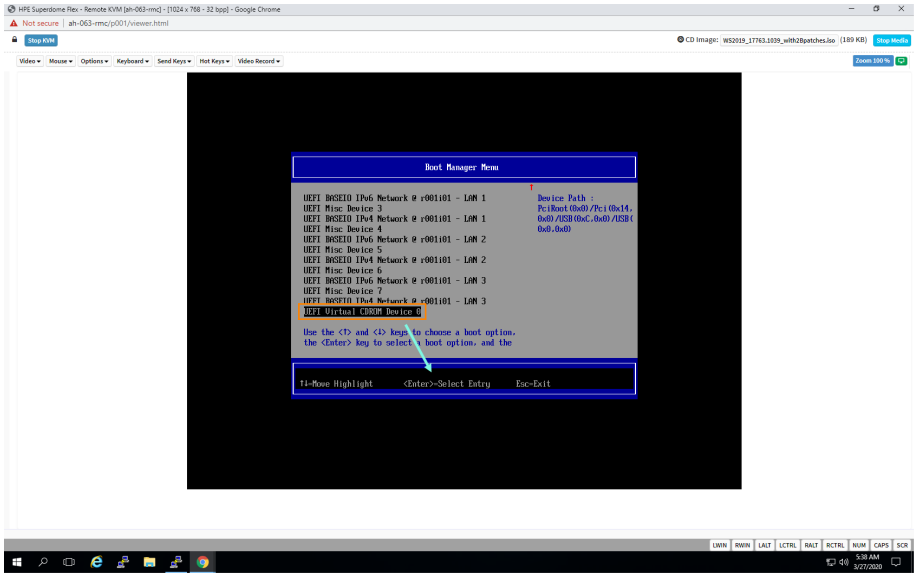

Figure 9. Boot Manager Menu—Virtual media—UEFI Virtual CDROM Device 0

6. On the next screen (as shown in Figure 10), **Press any key to boot** from the Windows Setup image; WinPE is going to load from the DVD (/ISO, /network share) image.

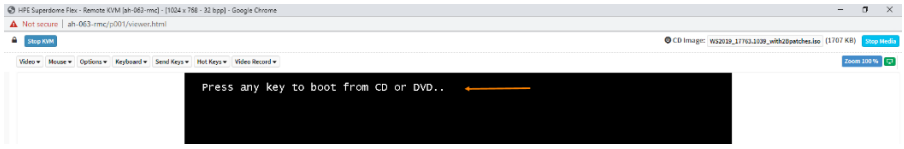

Figure 10. Booting from the Windows Setup Media—Press any key to boot from CD or DVD

7. Next, usual Windows Setup screens display. You would be prompted to enter information if using the interactive mode, and click **Next**.

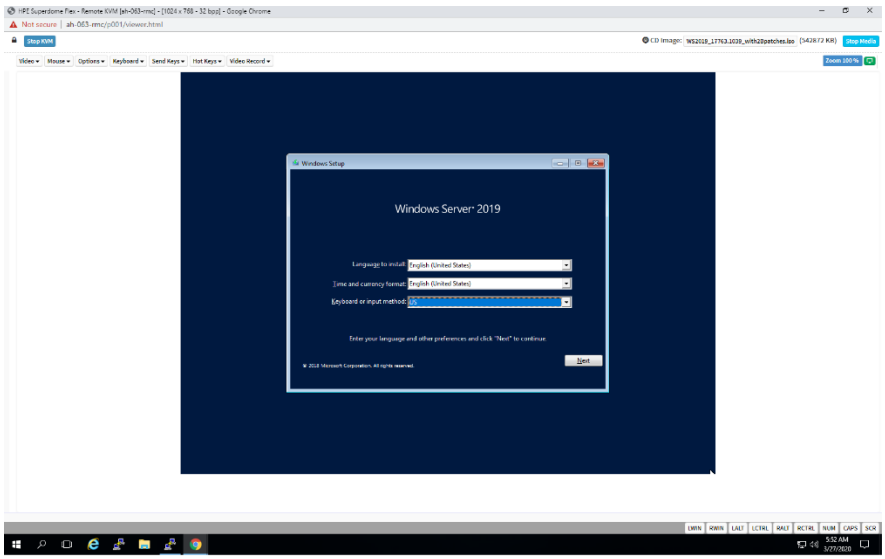

Figure 11. Windows Setup—Enter language/locale information

8. On the next screen, click **Install now**.

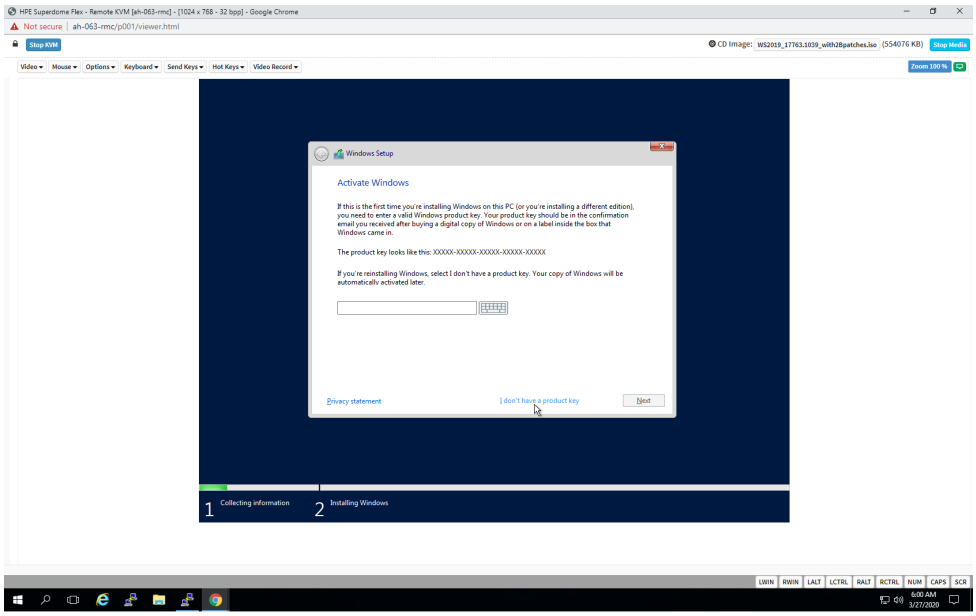

Figure 12. Windows Setup—Install now

9. Enter your license key, or defer it for later (in this case, click **I don't have a product key**), and click **Next**.

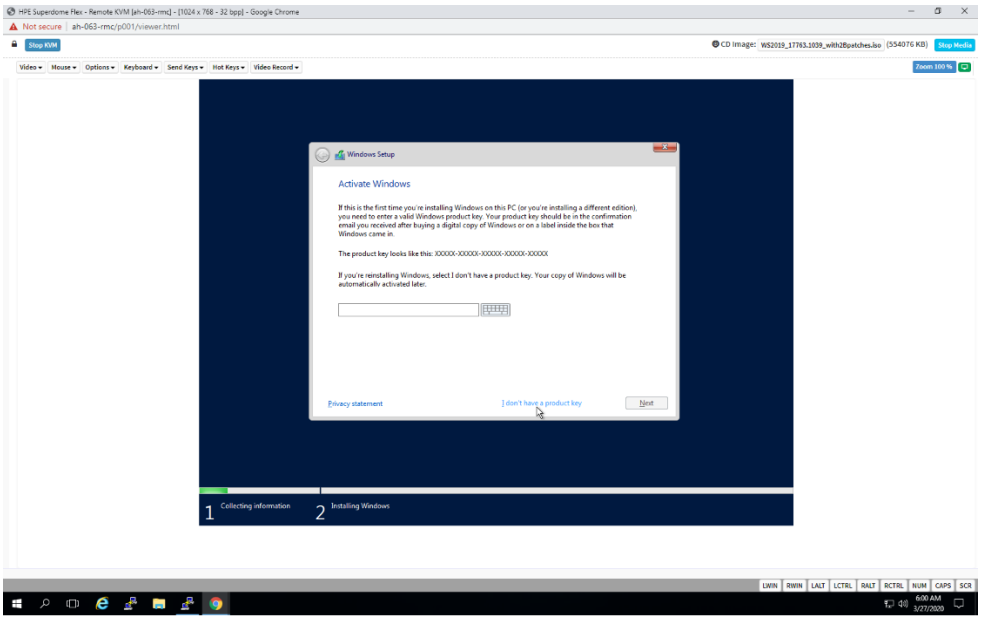

Figure 13. Windows Setup—License key

10. On the next screen, select the type of Windows Server installation, which corresponds to your target environment. In Figure 14, Datacenter Edition (with Desktop Experience) is selected. This is Datacenter with the graphical user interface. Click **Next**.

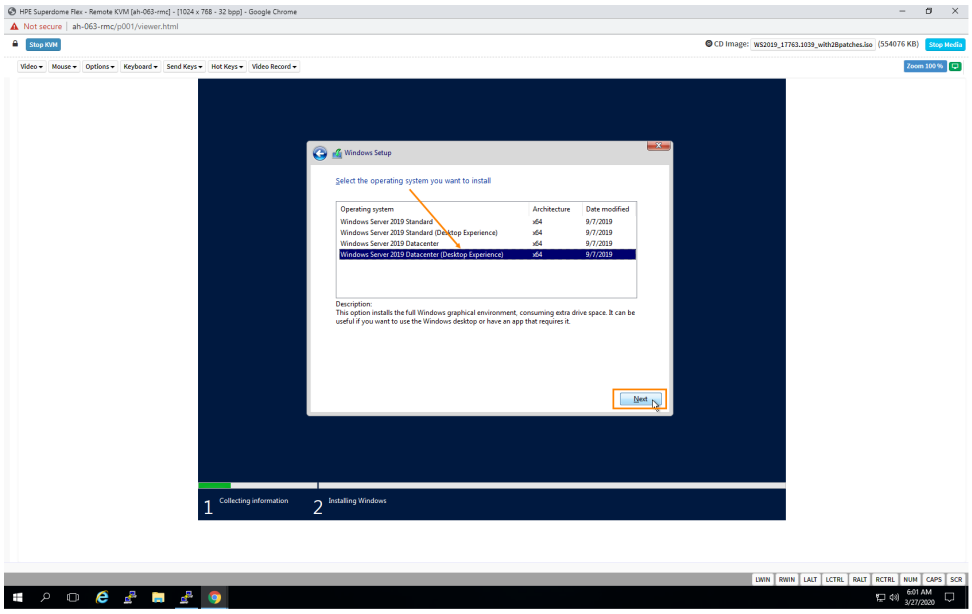

Figure 14. Windows Setup—Operating system choice

11. Read the notices and licensing terms on the next screen and check the "I accept the licensing terms" box, once done. Click **Next**.

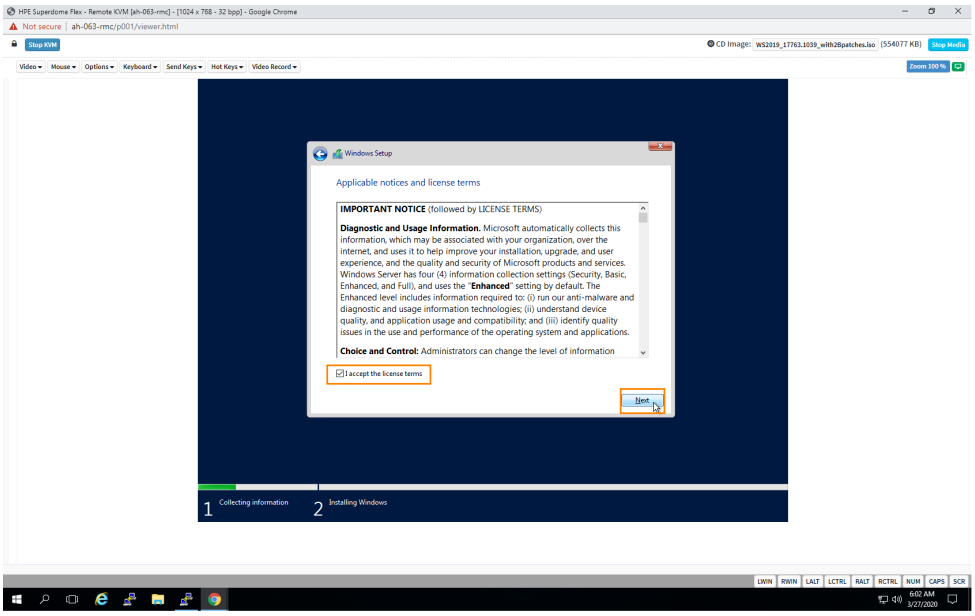

Figure 15. Windows Setup—Applicable notices and license terms

12. Select the installation type to be performed (Upgrade or Custom) as depicted in Figure 16.

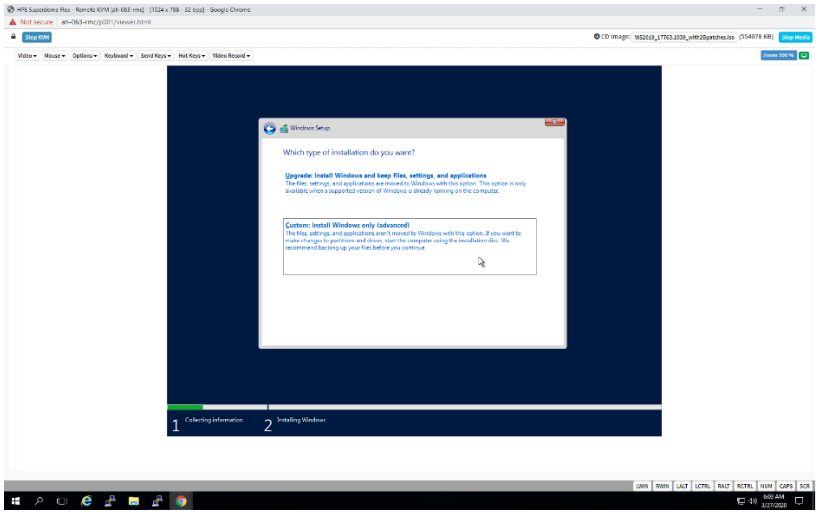

Figure 16. Windows Setup—Installation type

The next section allows selecting the Windows boot disk.

Boot disk selection

With UEFI, the boot disk is being initialized using GUID Partition Table (GPT), which allows large size disks and partitions, many partitions, and other features (described in the Microsoft documentation). It contains the EFI System partition (used for boot), an MSR partition (Microsoft Reserved for backward compatibility), a recovery partition, and the one that stores all Windows files including binaries and registry (configuration).

If the target environment had been prepared and the driver is part of the Windows Setup Media (in box driver), the disk would be visible during the setup process and can be selected. Partitions will be created by default with default size given the size of the disk (or the portion you have specified).

For Windows Server 2019 though (like for Windows Server 2016), the **embedded Intel RSTe SATA controller driver** is not **inbox**; therefore, it is required to load it during setup in order to install Windows on a disk attached to this adapter.

Note

For Windows Server 2022, the embedded Intel RSTe SATA controller driver is inbox from Windows Server 2022 version 21H2. The disks get listed automatically and this procedure need not be followed.

- Procedure to manually load the Embedded Intel RSTe SATA Controller during setup process

When the driver is not part of the Windows Setup Media, there is no disk showed when asked to select the location of the Windows files as depicted in Figure 17.

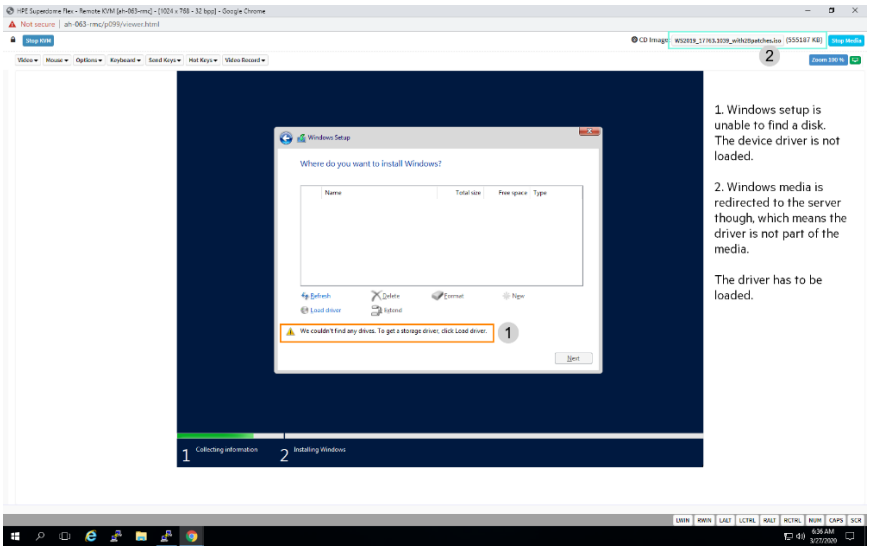

Figure 17. Windows Setup—File location

Note

Drivers are located in the \Packages folder within the HPE Superdome Flex I/O Service Pack ISO image. To get the name of the smart component for a particular driver, read the file called Contents.html, which can be found at the root. Look for the name.

For example, in version 2021.10, the smart component is called cp048878.exe.

Driver - Storage	HPE Superdome Flex Intel RSTe AHCI RAID Driver for Windows Server 2016 and 2019	7.5.0.1990	Recommended	cp048878.exe

Figure 18. Extract of Contents.html at the root of the HPE Superdome Flex I/O Service Pack (2021.10)

In the example from the screenshots presented in this paper, the embedded Intel RSTe AHCI RAID driver included in the HPE Superdome Flex I/O Service Pack had been put in an ISO file located on the technician PC.

In that situation, the Windows Setup Media can be dismounted from the console and replaced with the ISO image containing the Windows Server 2019 driver.

a. From the top right corner of the console, click **Stop Media** to dismount the Windows Server setup media.

b. Then, click **Browse** to select the location of the driver (as mentioned, in this example, an .ISO file was generated from the extract of the smart component entitled cp041192.exe), select the appropriate file, click **Open**, and then click **Start Media**.

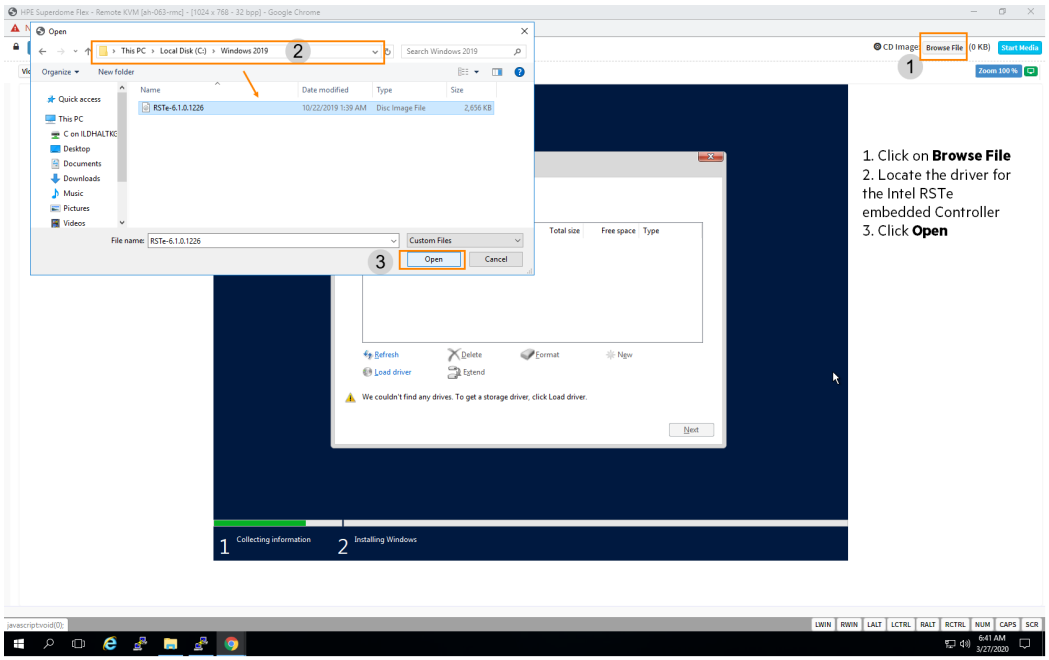

Figure 19. HPE Superdome Flex console—ISO file redirection

c. Then, click **Load driver** as depicted in Figure 20.

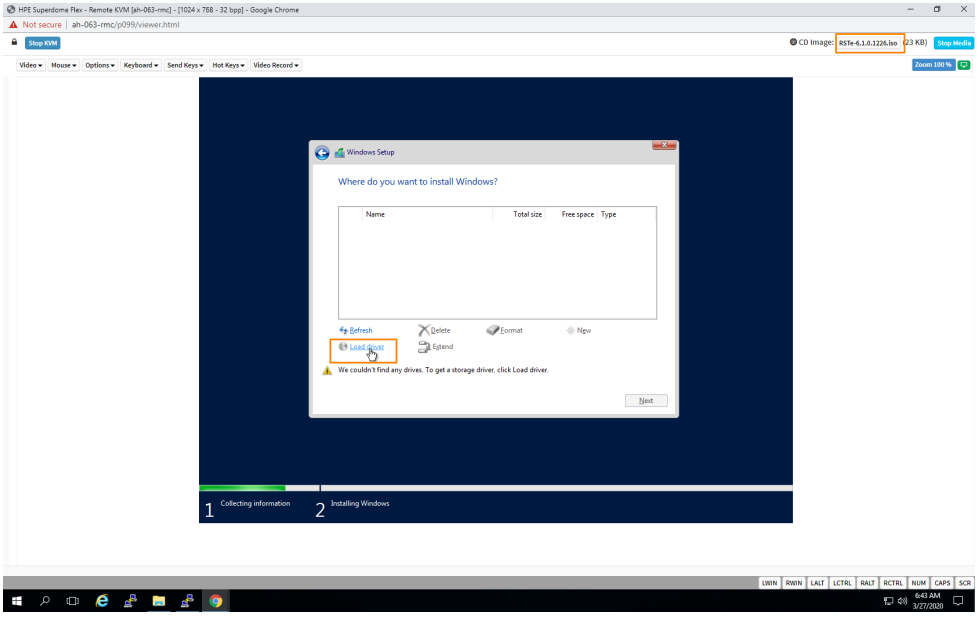

Figure 20. Windows Setup > Where do you want to install Windows?—Load driver

d. Browse to the media that has the driver. Once selected, click **OK**, and then select the **Intel(R) C600+/C220+ series chipset SATA RAID Controller (E:\iaStorE.inf)** driver and click **Next**.

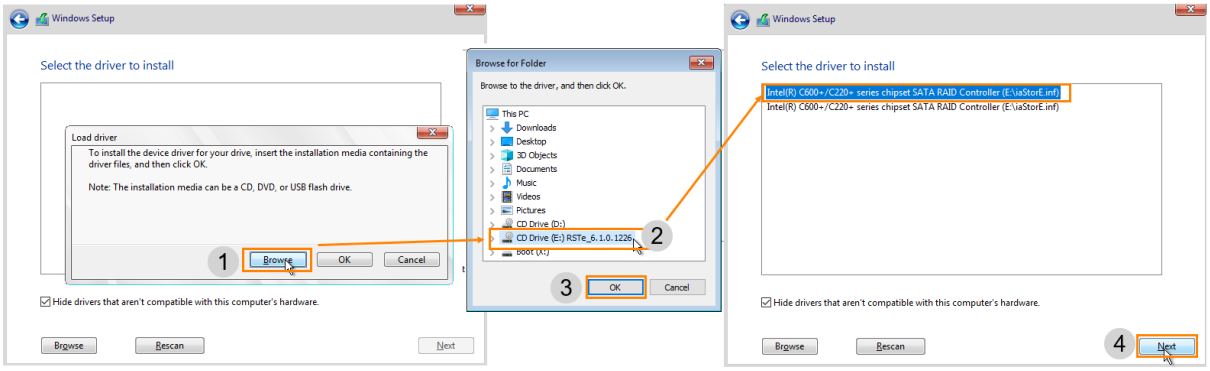

Figure 21. Windows Setup—Select Intel iaStorE driver

e. User needs to stop media for the mounted RSTe ISO, then re-mount the Windows 2019 ISO and then click refresh, then click **Next**.

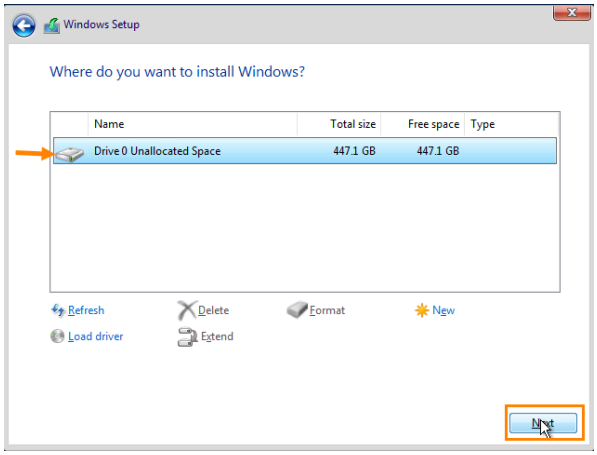

Figure 22. Windows Setup—Select disk

Once the disk is selected, the setup process continues and copies the files, prepares for installation, and proceeds.

13. Several reboots will occur (at least three) until you get the screen asking for entering the administrator's **password** (remember it is case sensitive) and log in.

    There are still few tasks, which can be done at this point. For instance, it may be more convenient to enable Remote Desktop so that by using the IP address of a network adapter on the client network, a system administrator would be able to customize the server environment.

14. To enable Remote Desktop for administrative tasks, use the Start button (at the bottom left corner), and click **Server Manager**.

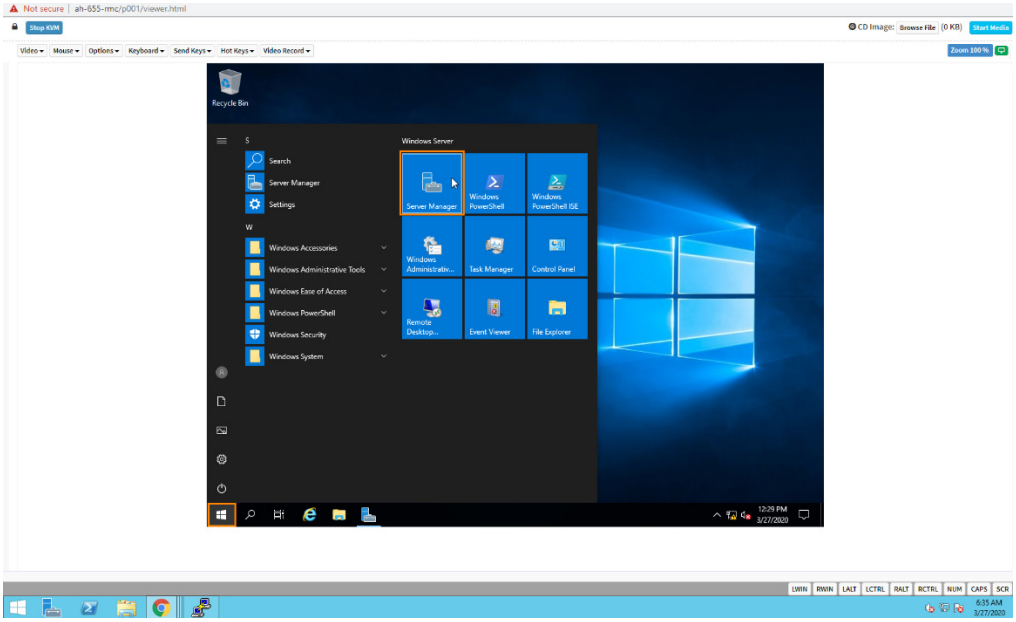

Figure 23. Windows Server 2019 default desktop after logging on

Enable Remote Desktop and allow it to go through the firewall

Select **Local Server** from the left pane, and click Disabled next to Remote Desktop. **System Properties** window opens into the **Remote** tab. From there, select **Allow remote connections to this computer** in the Remote Desktop section. Check the box underneath it (**Allow connections only**) if this is applicable in your environment.

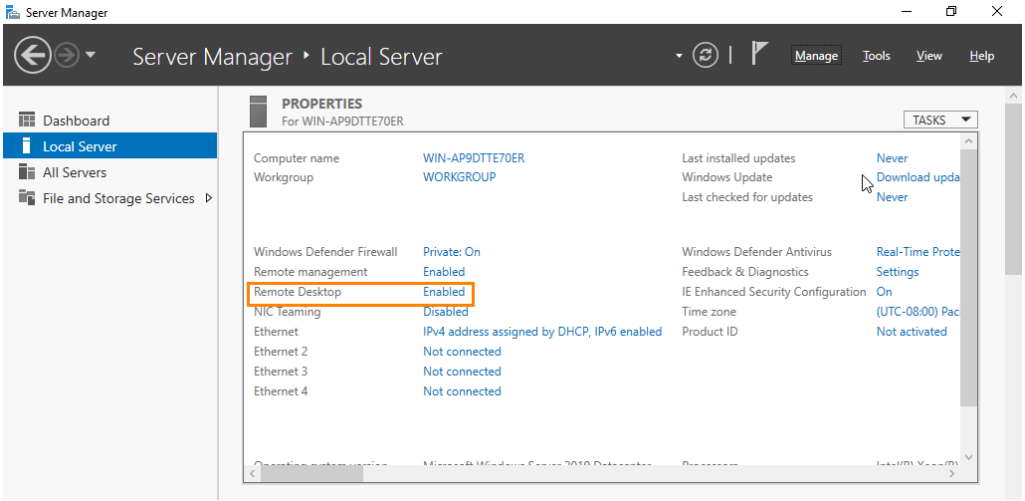

Figure 24. Windows Server 2019 > Server Manager—Remote Desktop (Enabled)

15. Enable firewall for Remote Desktop. Launch **Windows PowerShell**—this application/icon can be started from the Start button, typing in **Power**. When you see **Windows PowerShell desktop application** item, right-click to get the contextual menu. From the menu, select **Start as Administrator**.
16. From a PowerShell command prompt, you can enter the following command:

```
PS C:\Users\Administrator>Enable-NetFirewallRule -DisplayGroup "Remote Desktop" [press Enter]
```

17. To quit PowerShell, **enter Exit** (Enter) at the PowerShell prompt.

```
PS C:\Users\Administrator>Exit [press Enter]
```

You may also want to disable Internet Explorer Enhanced Security during deployment for administrators.

Go back to Server Manager window, make sure the Local Server is selected, and on the right pane select **On** next to **Internet Explorer Enhanced Security**. On the Internet Explorer Enhanced Security Configuration windows, click **Off** radio button under Administrators, and click **OK**.

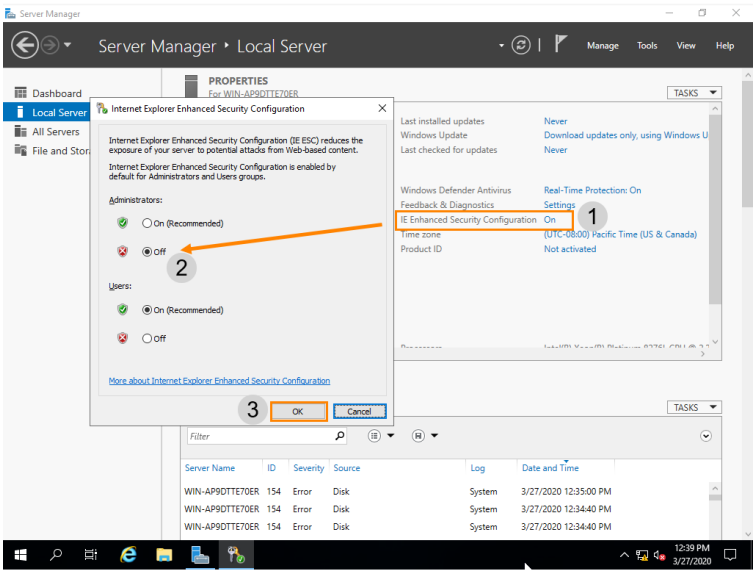

Figure 25. Windows Server 2019 > Server Manager—IE Enhanced Security Configuration

Apply the latest tested drivers and add HPE value-added software from the HPE Superdome Flex I/O Service Pack

HPE recommends running Microsoft Windows Server 2019, 2022 or 2025 on HPE Superdome Flex servers with the latest tested drivers and software. These are part of the HPE Superdome Flex I/O Service Pack media available on the web, in HPE Support Center. The media includes SUM to discover hardware and software on the system and propose appropriate updates. SUM installs missing drivers, driver updates, HPE value-added software in proper order and ensures all dependencies are met before deploying an updated component.

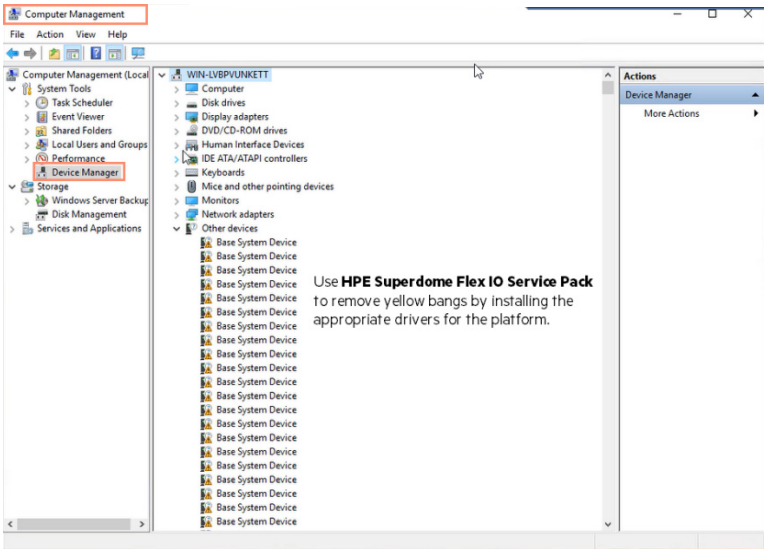

Figure 26. Windows Server 2019 > Computer management > Device Manager—Yellow bangs indicating device problems (drivers not installed)

18. To install HPE drivers and software on the platform, mount the latest **HPE Superdome Flex I/O Service Pack ISO** image as described in the section entitled Procedure to manually load the Embedded Intel RSTe SATA Controller during setup process and illustrated in Figure 19. Once mounted, there should be a new CD/DVD drive displayed in File Explorer.
19. From File Explorer, under the administrator's context (currently logged), there is enough privileges to update drivers and install new software like the HPE DCD, select the drive to browse/locate content (Figure 27—Drive is E:).

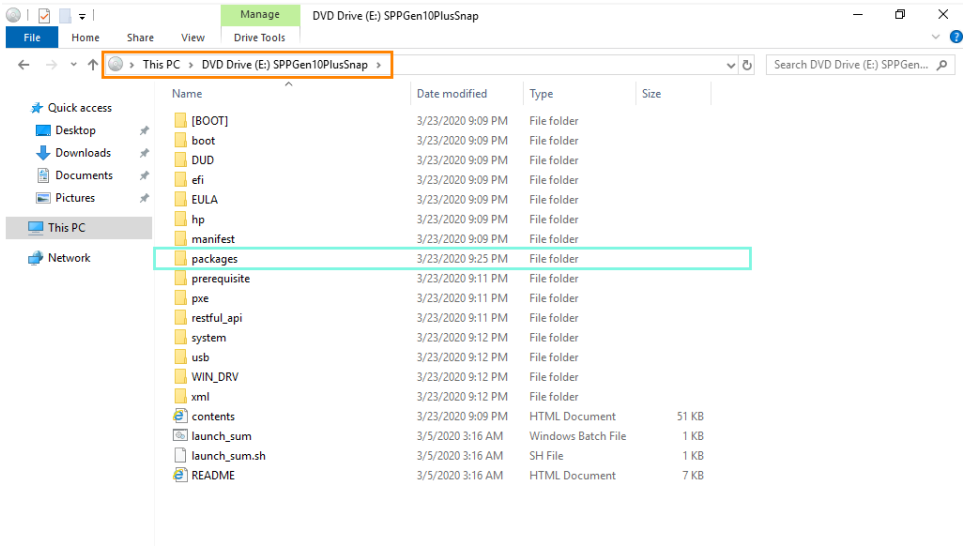

Figure 27. Windows Server 2019 >Taskbar > File Explorer displaying the content of HPE Superdome Flex I/O Service Pack

20. On the HPE download page for the HPE Superdome Flex I/O Service Pack, is an installation tab, which describes the installation process.

    One way to launch the SUM process with the web interface is outlined in the following. Browse to the **packages** folder and look for "**smartupdate**" batch file. Double click "**smartupdate.bat**;" the batch file executes and opens a **command prompt** window and displays the SUM web interface.

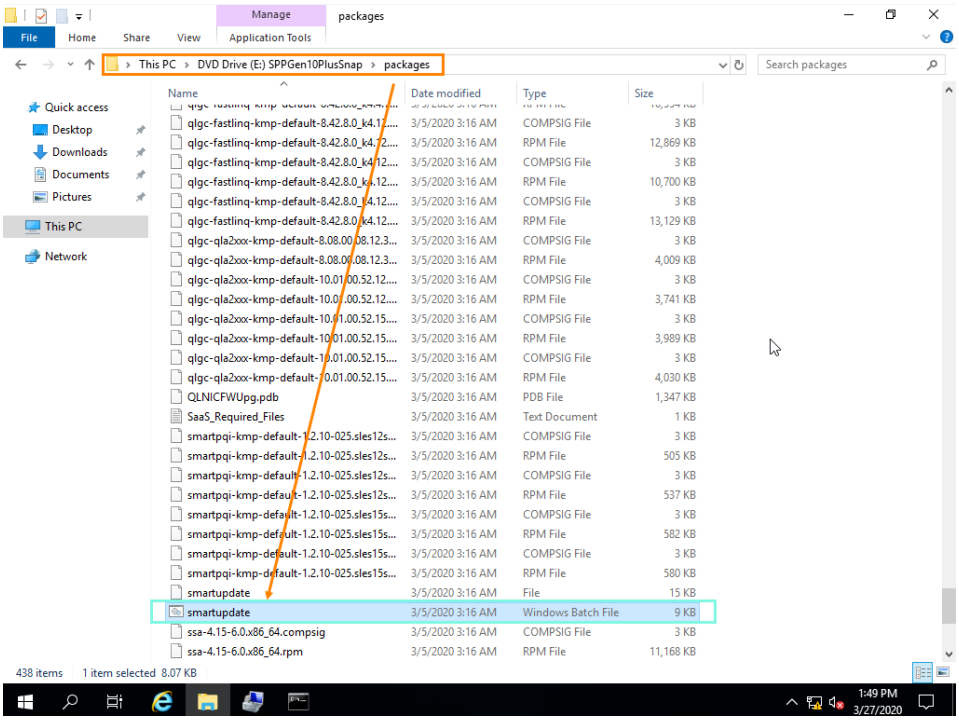

Figure 28. HPE Superdome Flex I/O Service Pack—D:/packages/smartupdate.bat

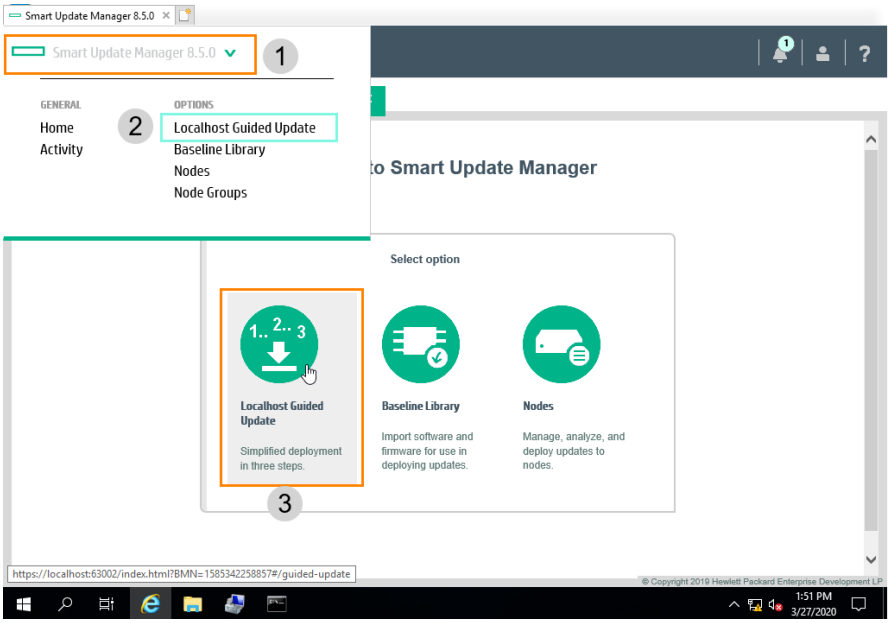

Figure 29. SUM default screen (and main menu)

21. Use the **Localhost Guided Update** and follow the screens. Illustrated is an interactive deployment mode: on the Localhost Guided Update window, select **Interactive** and click **OK**.

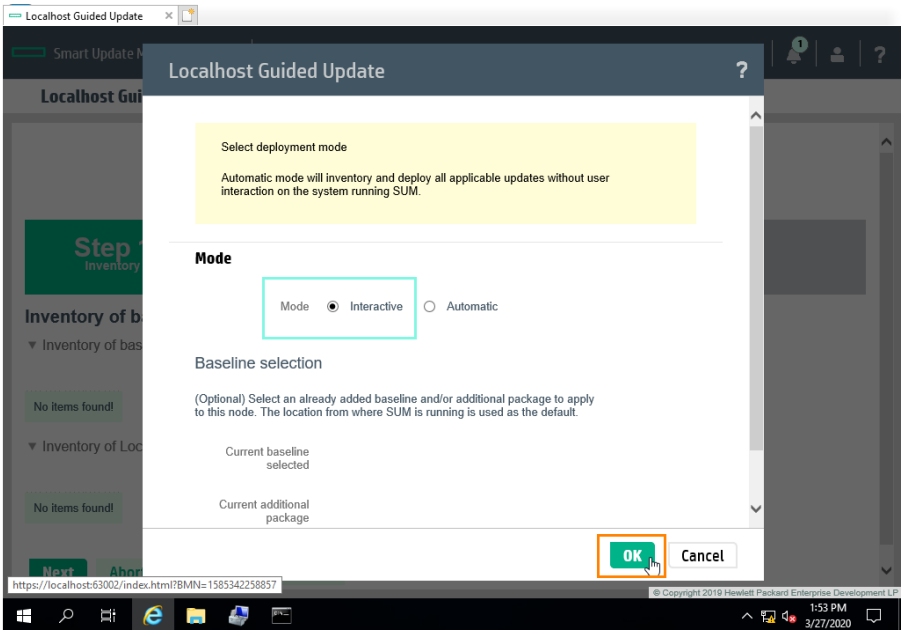

Figure 30. SUM > Localhost Guided Update—Choosing Interactive mode

22. Inventories of both baseline and Localhost happen. A status for the Localhost compared to the baseline, which indicates in Figure 31 that the update is required. Click **Next**.

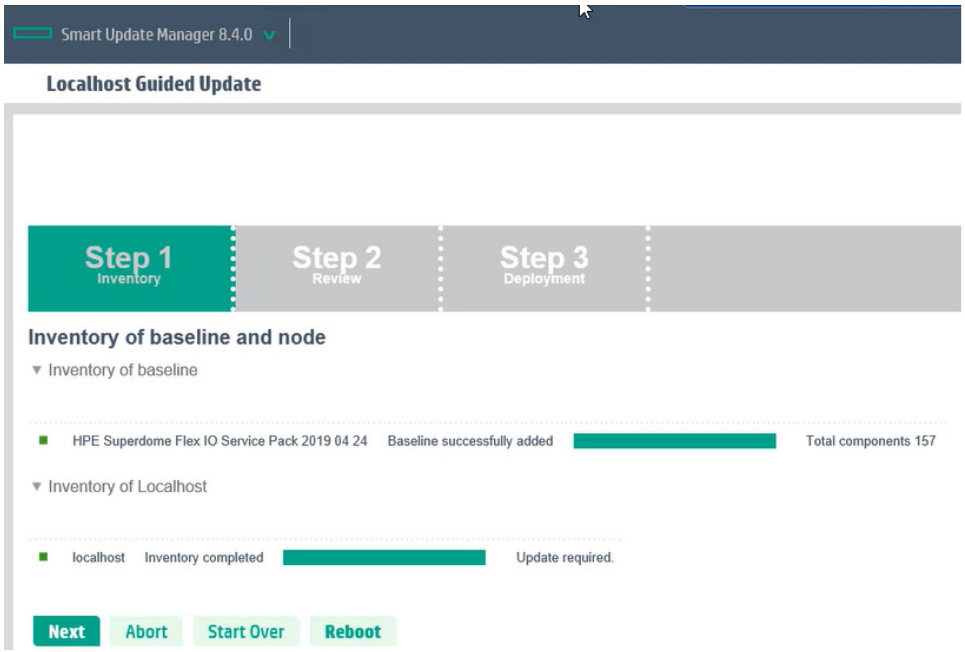

Figure 31. SUM > Localhost Guided Update—Inventories of baseline and Localhost

23. The list of smart components displays with the recommended deployment actions and other information. It is possible to force the selection, removing or adding components from the list if they are (or not) selected. Default selection corresponds to what is required. Click **Deploy**.

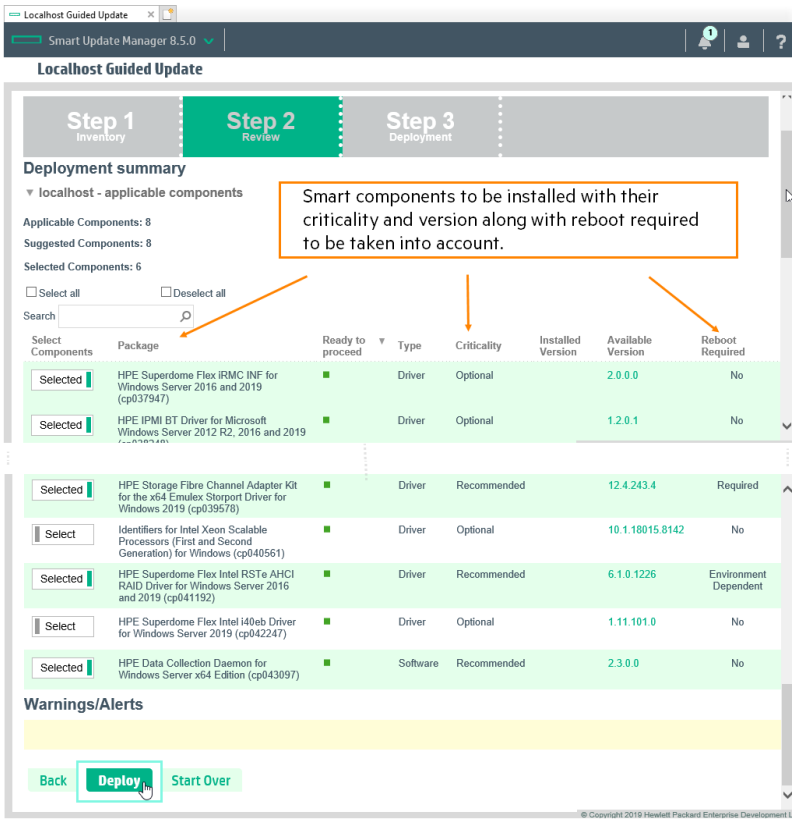

Figure 32. SUM > Localhost Guided Update—Default smart components to be deployed

24. Components are deployed on the system; it might take a while to deploy all components depending on the selection. When the deployment is done, a summary of the status is displayed. It is possible to check more information using **View log**, and in most of the cases, it is preferable to reboot at the end. Click **Reboot**.

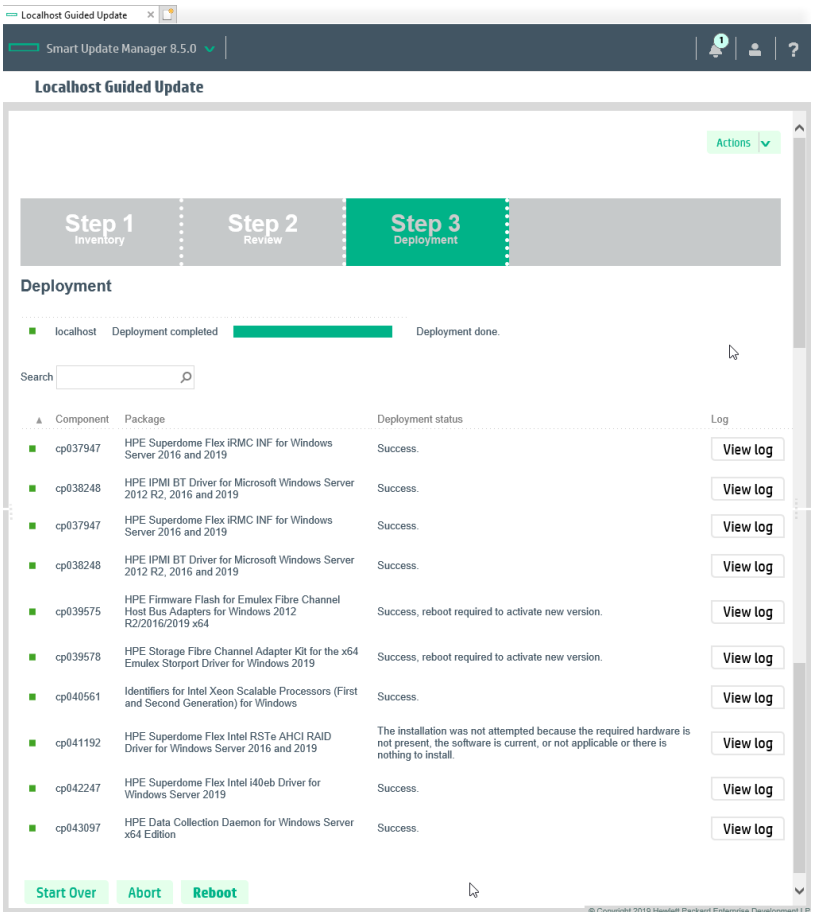

Figure 33. SUM > Localhost Guided Update—Step 3 Deployment

For more information about SUM, check the HPE Support center and look for Smart Update Manager User guide.

Caution

Although the HPE Superdome Flex I/O Service Pack contains smart components, which could be found in the Service Pack for ProLiant (SPP), it is **not supported** to run the Service Pack for ProLiant on HPE Superdome Flex server and can harm the functioning of the server. The bundle included in the version for HPE Superdome Flex contains smart component versions tested and validated for this platform.

Customize environment

Part of the customization includes tasks that help run with optimal settings. Most of them are very similar to the Windows Server 2016 environment, and it may be advisable to set the page file, memory dump type, and other parameters.

- Setting up the page file and kernel dump

  Setting the page file manually avoids it to grow if the size is chosen in adequacy with the application environment. HPE recommends for most of the cases, a size approximately less or equal than 1/32 RAM expressed in MB.

25. Open a **command prompt** window **as administrator** and type the following commands:

```
C:\WINDOWS\system32>wmic computersystem where name="%computername%" set
AutomaticManagedPagefile=False (press Enter)
```

```
C:\WINDOWS\system32>@wmic pagefileset where name="%SystemDrive%\\pagefile.sys" set
InitialSize=375 000,MaximumSize= 375 000 (press Enter)
```

The next command allows creating a kernel dump should a critical error occur. Kernel dumps should contain enough information for debugging, unless another type is requested by support personnel.

```
C:\WINDOWS\system32>@wmic recoveros set DebugInfoType = 2 (press Enter)
```

a. Changing Power Scheme to maximize performance of the applications running on Windows

26. Still within the command prompt window (as administrator), enter the following command:

```
C:\WINDOWS\system32>powercfg -setactive scheme_min (press Enter)
```

a. Install Windows additional roles and features

b. Make sure the system is running with the latest Windows updates

Windows Server 2019 (as well as Windows Server 2022 and 2025) patching is simplified using Microsoft Update Catalog (look for the product **Windows Server 2019, Windows Server 2022 or Windows Server 2025**). By default, Automatic Updates (AUs) is enabled in Windows Server and configured to download updates from the Windows update site but let administrators decide when to install them.

When the server finds updates, they will be downloaded, and you will be notified that there are updates ready to be applied. Updates will not be installed and servers are not rebooted automatically, as avoiding production downtime is critical for a server. You control scheduling a maintenance window and installing the updates when it is best for your business.

c. Grow the HPE Superdome Flex partition if needed. See the instructions in the HPE Superdome Flex Server Partitioning Guide.

Intel Optane PMem for HPE support

Windows Server 2019 implements native support of persistent memory referred often as Storage Class Memory (SCM) devices, also called Persistent Memory (PMem) devices and even is some cases Non-Volatile Memory (NVM); this allows:

- Zero-copy access to persistent memory media
- Most existing user-mode applications to be run without modification
- Sector granular failure modes to preserve application compatibility

Windows Server 2019 and Windows Server 2022 supports both a standard block device interface, in which case devices can be formatted and used like any standard disk without requiring any application changes (using standard APIs) and a byte-addressable memory interface which uses DAX (direct access). DAX is a mechanism that allows applications to directly access SCM device through CPUs using load/store instructions as opposed to going through the entire I/O stack with standard block devices. Applications require code change to take advantage of DAX.

As an example, Microsoft SQL Server implements a "persisted log buffer" capability (starting with version 2016) so that the most recent information of the transactional log file can be written directly to a PMem device, improving performance on heavy loaded OLTP systems.

As mentioned earlier, HPE Superdome Flex servers based on second-generation Intel Xeon Scalable processors, running the most recent firmware (at least 3.20.206) can leverage Intel Optane Persistent Memory for HPE. To find more information about Intel Optane Persistent Memory 100 series for HPE Superdome Flex configuration, check the QuickSpecs and take a look at the HPE Persistent Memory Guide for HPE Superdome Flex server (hpe.com/support/superdome-flex-pmem).

Terminology used with persistent memory

- **Region:** A region defines the physical address space, which can be presented to an operating system. This address space corresponds either to a PMem device (if devices are not interleaved); or if devices are interleaved, this is the sum of all PMem device spaces connected to a CPU (Socket).
- **Namespace:** Namespace are derived from persistent memory regions and define logical devices that can be utilized by an operating system as a block device or a directly access persistent media.

Configuring Intel Optane persistent memory for HPE

There are two operations required for an operating system to be able to use the persistent memory as storage devices. The first one consists in setting a "goal configuration," which determines the regions of volatile memory and persistent memory on Intel Optane PMem modules. And then, creating namespaces on top of the resulting persistent regions. Configuration information is kept on metadata on persistent memory devices.

The first part of the configuration is generally performed using the IPMCTL command from the EFI shell whilst the second part could be done with Microsoft Windows PowerShell cmdlets.

1. IPMCTL

The IPMCTL utility allows managing (and monitoring) persistent memory devices in order to define regions setting goals based upon operating mode and interleaving (or not). As a reminder, on HPE Superdome Flex server supports AppDirect mode only therefore goal definition should set to 100% AppDirect.

This utility runs in the UEFI context primarily (however, it can also be launched in the Windows Server environment; the Windows utility could be obtained from GitHub). In this white paper we focus on the EFI version of the tool, therefore, to be run, the server needs to be powered on, and directed to run the EFI shell, waiting user input at EFI Shell> prompt.

Syntax used to define a goal:

```
Create [-dimm [[DimmIDs]]] -goal [-socket [SocketIDs]][MemoryMode=[0|%]]
[PersistentMemoryType=[AppDirect|AppDirectNotInterleaved]]
```

Warning

Be aware that setting a goal is destructive (any existing persistent memory data is going to be lost).

For example, the command used to clear configuration can be launch at the EFI Shell prompt. Using a terminal emulator like PuTTY, and connecting to the RMC through SSH as an administrator, the server can be powered on, and interrupted during boot to start the EFI shell.

```
EFI > ipmctl create -force -goal MemoryMode=0 Reserved=100
```

```
Shell> ipmctl create -force -goal MemoryMode=0 Reserved=100
 SocketID | DimmID | MemorySize | AppDirect1Size | AppDirect2Size
=============================================================
 0x0000   | 0x0001 | 0 B        | 0 B            | 0 B
 0x0000   | 0x0011 | 0 B        | 0 B            | 0 B
 0x0000   | 0x0021 | 0 B        | 0 B            | 0 B
 0x0000   | 0x0101 | 0 B        | 0 B            | 0 B
 0x0000   | 0x0111 | 0 B        | 0 B            | 0 B
 0x0000   | 0x0121 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1001 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1011 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1021 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1101 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1111 | 0 B        | 0 B            | 0 B
 0x0001   | 0x1121 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2001 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2011 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2021 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2101 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2111 | 0 B        | 0 B            | 0 B
 0x0002   | 0x2121 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3001 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3011 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3021 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3101 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3111 | 0 B        | 0 B            | 0 B
 0x0003   | 0x3121 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4001 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4011 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4021 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4101 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4111 | 0 B        | 0 B            | 0 B
 0x0004   | 0x4121 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5001 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5011 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5021 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5101 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5111 | 0 B        | 0 B            | 0 B
 0x0005   | 0x5121 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6001 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6011 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6021 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6101 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6111 | 0 B        | 0 B            | 0 B
 0x0006   | 0x6121 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7001 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7011 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7021 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7101 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7111 | 0 B        | 0 B            | 0 B
 0x0007   | 0x7121 | 0 B        | 0 B            | 0 B
A reboot is required to process new memory allocation goals.
Shell>
```

Figure 34. EFI Shell> IPMCTL Clear configuration command. A reboot is required

The next step determines the persistent memory regions defining a goal. On an HPE Superdome Flex server under the EFI shell, you can run the following command to create an interleaved PMem region:

```
Shell> ipmctl create -goal memorymode=0 persistentmemorytype=appdirect
```

```
Shell> ipmctl create -goal memorymode=0 persistentmemorytype=appdirect
The following configuration will be applied:
 SocketID | DimmID | MemorySize | AppDirect1Size | AppDirect2Size
==========================================================================
 0x0000   | 0x0001 | 0 B        | 126.0 GiB      | 0 B
 0x0000   | 0x0011 | 0 B        | 126.0 GiB      | 0 B
 0x0000   | 0x0021 | 0 B        | 126.0 GiB      | 0 B
 0x0000   | 0x0101 | 0 B        | 126.0 GiB      | 0 B
 0x0000   | 0x0111 | 0 B        | 126.0 GiB      | 0 B
 0x0000   | 0x0121 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1001 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1011 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1021 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1101 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1111 | 0 B        | 126.0 GiB      | 0 B
 0x0001   | 0x1121 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2001 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2011 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2021 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2101 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2111 | 0 B        | 126.0 GiB      | 0 B
 0x0002   | 0x2121 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3001 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3011 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3021 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3101 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3111 | 0 B        | 126.0 GiB      | 0 B
 0x0003   | 0x3121 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4001 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4011 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4021 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4101 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4111 | 0 B        | 126.0 GiB      | 0 B
 0x0004   | 0x4121 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5001 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5011 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5021 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5101 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5111 | 0 B        | 126.0 GiB      | 0 B
 0x0005   | 0x5121 | 0 B        | 126.0 GiB      | 0 B
 0x0006   | 0x6001 | 0 B        | 126.0 GiB      | 0 B
 0x0006   | 0x6011 | 0 B        | 126.0 GiB      | 0 B
 0x0006   | 0x6021 | 0 B        | 126.0 GiB      | 0 B
 0x0006   | 0x6101 | 0 B        | 126.0 GiB      | 0 B
```

Figure 35. EFI Shell> IPMCTL Configuring persistent memory regions using interleaving (one region per socket regrouping all PMem devices connected to the same processor), a reboot is required

After rebooting the system and launching the EFI Shell again, you can then check how it is configured, using the "show" argument.

```
Shell> ipmctl show -goal
There are no goal configs defined in the system.
Please use 'show -region' to display currently valid persistent memory regions.
Shell> ipmctl show -region
 RegionID| SocketID | PersistentMemoryType | Capacity  | FreeCapacity | HealthSt
ate
==========================================================================
====
 0x0001  | 0x0000   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0002  | 0x0001   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0003  | 0x0002   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0004  | 0x0003   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0005  | 0x0004   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0006  | 0x0005   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0007  | 0x0006   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
 0x0008  | 0x0007   | AppDirect            | 756.0 GiB | 756.0 GiB    | Healthy
Shell> ipmctl show -namespace
No Namespaces defined in the system.
Shell>
```

Figure 36. EFI Shell> IPMCTL show –goal IPMCTL show –region IPMCTL show -namespace

Once the system had been configured with a goal and restarted, the "show –goal" option reports that there is no goals defined, but using the "show region" command displays the regions (RegionID) mapped to a processor (SocketID) PersistentMemoryType (AppDirect) Capacity and HealthState.

It is then possible to define a namespace using the following syntax at EFI shell>

```
Shell> ipmctl create -namespace -region <regid> capacity=<size>
```

IPMCTL can be used to create, but also to delete or sanitize PMM, refer to the HPE Superdome Flex persistent memory user guide to use the appropriate commands.

Note
Using ipmctl.efi is the only way to create multiple namespaces per AppDirect region.

In our white paper, it is assumed that Windows Server 2019 would be started on the server, and namespace configuration is performed under the operating system context (as Administrator). This is required to create volumes to be used by applications.

At this time, if you launch Computer Management > Device Manager, you can see the physical NVDIMM devices.

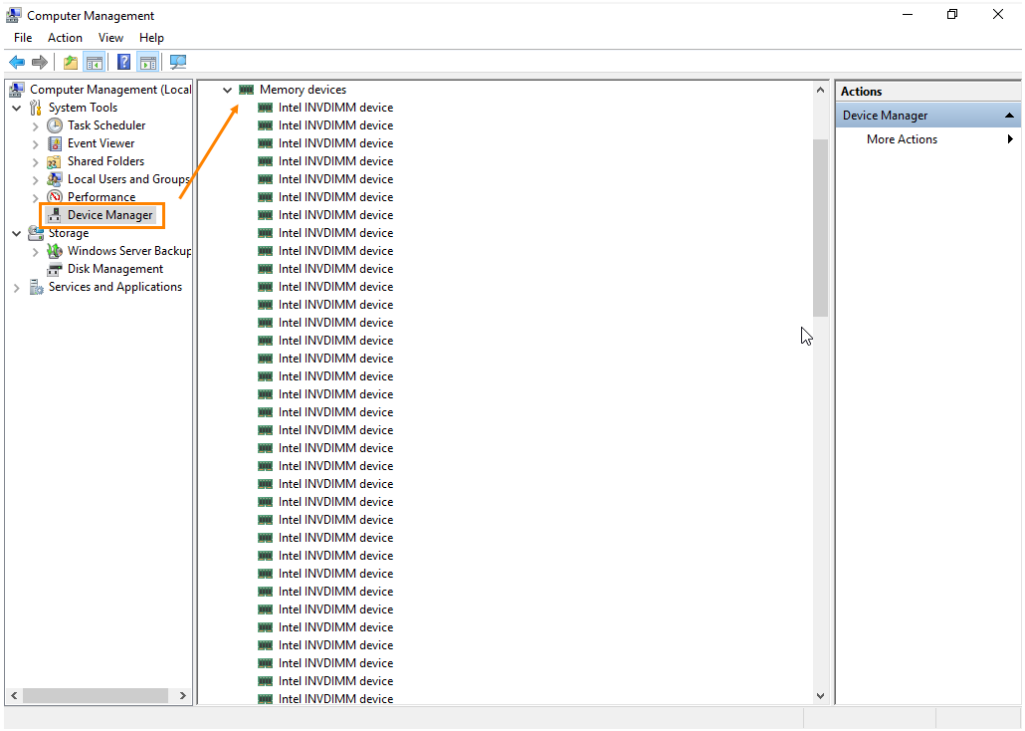

Figure 37. Device Manager > Memory devices

2. Windows Server 2019 and 2022 PMem PowerShell cmdlets.

Windows Server 2019 offers a set of PowerShell cmdlets to configure and monitor PMem devices, we can list the following:

a. `Get-PmemUnusedRegion to display the PMem regions with available space.`
b. `Get-PmemPhysicalDevice to display persistent memory devices information in the system`
c. `New-PmemDisk to configure namespaces;`

For example, you can configure namespaces on all available PMem regions space, running:

a. `Get-PmemUnusedRegion | New-PmemDisk`
b. `Remove-PmemDisk, to delete a specific PMem disk device.`
c. `Init-PmemDisk, to re-initialize the namespace/label metadata on a specific PMem disk.`
d. `Remove-PmemDisk, to delete a specific PMem disk device`

For example, if you want to delete all the existing SCM disks after they have been cleared (with Clear-Disk), use the following command:

```
Get-PmemDisk | Remove-PmemDisk
```

In our example, let's check PMem available regions and PMem device information, open a PowerShell Window under the administrator context, and run:

```
Get-PmemUnusedRegion
```

And

```
Get-PmemPhysicalDevice
```

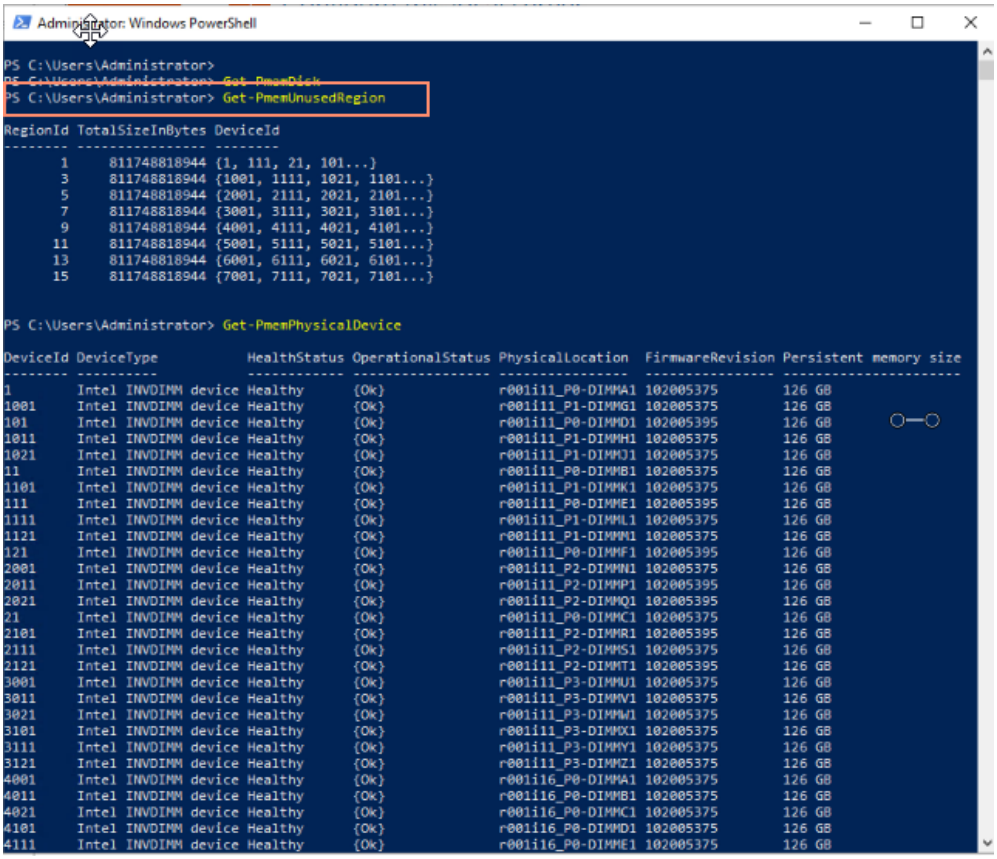

Figure 38. Checking unused regions and PMem physical devices

Now, create the persistent memory disks on top of the unused regions using PowerShell, and enter:

```
Get-PmemUnusedRegion |New-PmemDisk -AtomicityType BlockTranslationTable
```

Once done, you can see the newly created persistent memory disks under Device Manager (see Figure 39):

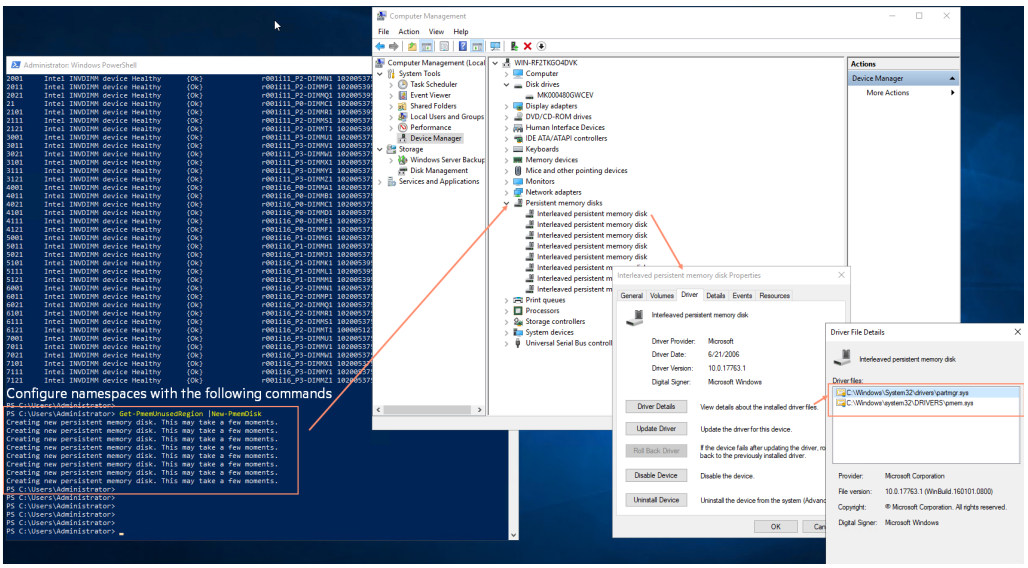

Figure 39. Get-PmemUnusedRegion | New-PmemDisk

Note

To avoid torn-block effects, it is recommended to use `New- PmemDisk -AtomicityType BlockTranslationTable`; for more information, please check support.hpe.com/hpesc/public/docDisplay?docId=emr_na-a00098908en_us

You can then use tools like Disk Manager under computer management to manage disks and format them as standard block devices using both NTFS and ReFS filesystems. If you want a device formatted as a DAX device, you must run a Windows command prompt or PowerShell to use the DAX option (only with **NTFS** though).

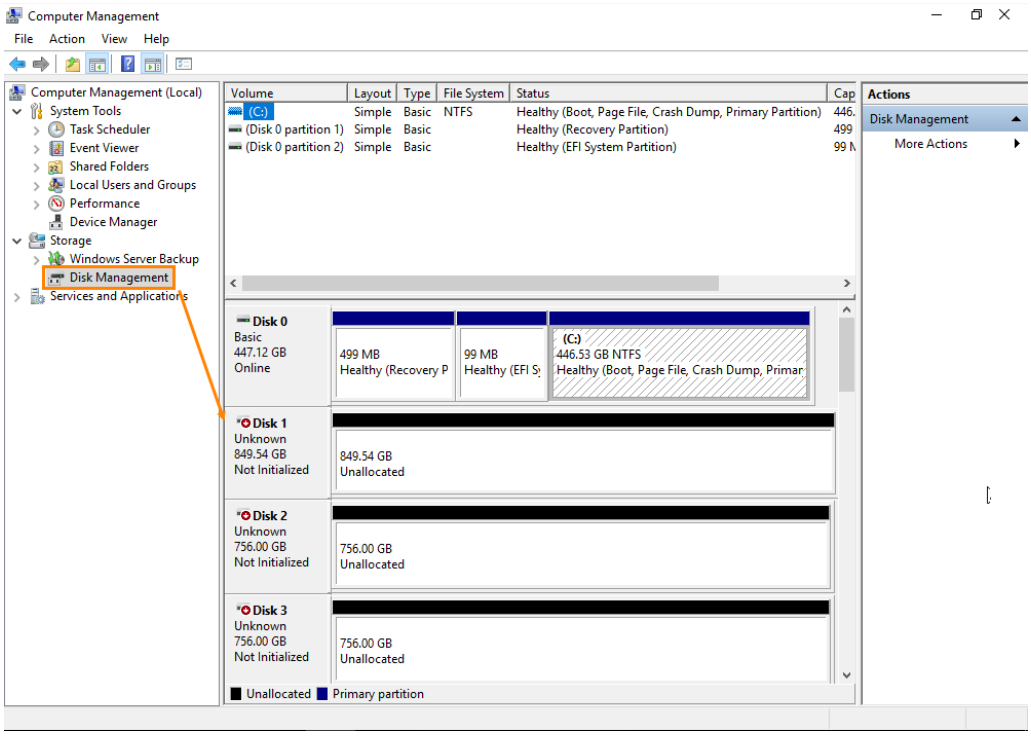

Figure 40. Computer Management—Disk manager

From there, you can then create volumes, partitions, and format with the file system of your choice (NTFS or ReFS).

You could also use Server Manager > Local Server > File and Storage Services > Volumes > Storage pool to enable software RAID through storage spaces. Note that when using software RAID, the DAX format is not supported.

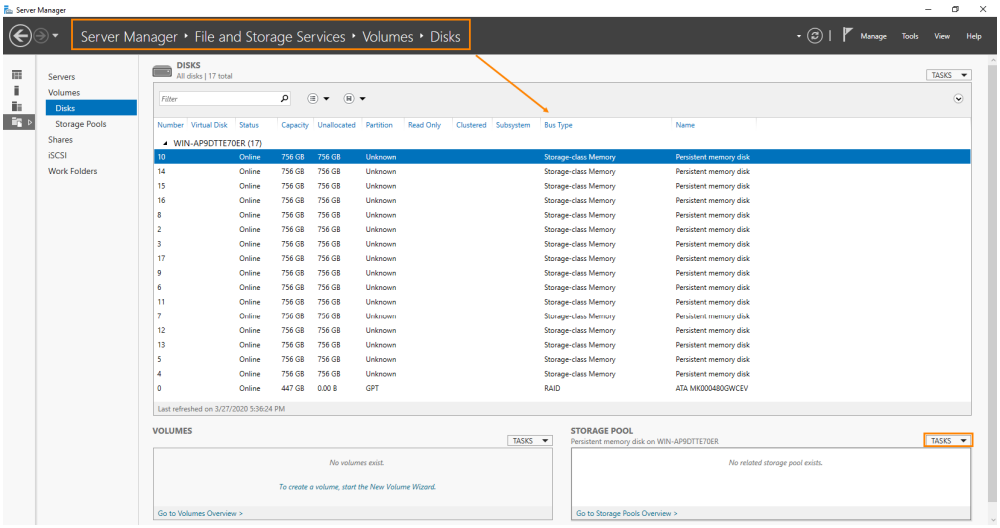

Figure 41. Server Manager—File and Storage Services—Volumes

From there you will have to create one or more storage pool first, then create one or more VDISK (storage space) and create volumes which in turn are formatted in order to be used by applications.

To format volumes once the partition is created, use standard methods such as your preferred GUI interface, or the Windows command prompt or even PowerShell. You must be authenticated as an Administrator.

Standard operations will use the following commands:

```
Get-Disk | Initialize-Disk -Passthru | New-Partition -AssignDriveLetter -UseMaximumSize |
Format-Volume
```

Formatting DAX is only possible with NTFS filesystem. Under the Windows command prompt, use format with the /DAX option; in Windows PowerShell context, use `-IsDax:$true`

For example, in a Windows Command Prompt environment started AS Administrator use the following:

```
C:\Users\Administrator> Format Drive: /FS:NTFS /DAX
```

Or in PowerShell

```
C:\Windows\System32> Format-Volume -IsDax:$true
```

To verify if the volume is formatted with the DAX option, you can use the `FSUTIL fsinfo volumeinfo X:` command or `Get-Partition -DriveLetter X | fl` under PowerShell.

Note
Depending on the operation you want to perform, there are many commands that are not listed in this paper, but in the resources section, you can find pointers to other documents that are covering these commands, for the Windows Server environment, there is an HPE specific document targeting HPE ProLiant servers entitled Deploying HPE Persistent Memory on Microsoft Windows Server 2012 R2, Server 2016 and Server 2019 which contains these commands.

Note
Intel Optane Persistent Memory is not supported with Windows Server 2025 on HPE Superdome Flex platform.

Known issues

Related to Windows Server 2019.

Known issues are written in HPE advisory alerts. For any HPE advisory, check the following URL: support.hpe.com/hpesc/public/home. Enter HPE Superdome Flex in the search area, then documents (gray bar above results), customer advisory (on the left, under document subtype). At this time for Windows Server 2019 these could be found:

Hyper-V installation failure/BSOD on Windows Server 2019
On HPE Superdome Flex servers with Windows 2019 RTM (OS build 17763.107) installed on a Fibre Channel disk, the following issues might be seen with regard to Hyper-V role installation.

1. Installation of Hyper-V roles/features fails
2. After installing Hyper-V, the system requires a reboot and then the OS crashes
3. After Hyper-V installation completes and when the OS reboots, it starts loading the features and it fails during this process with error message "unable to load the features"
4. After installing Hyper-V features, a BSOD happens with error code `WHEA_UNCORRECTABLE_ERROR`

This is due to an issue with the inbox Storport driver with Windows Server 2019 RTM build (17763.107).

Resolution
This issue is fixed with newer Storport drivers embedded in Windows Server 2019 build 17763.379 from March 2019 and above. Facing the above issue should trigger an operating system update to at least build 17763.379.

Persistent memory issues (Windows Server 2019 and 2022)
In the unlikely event that firmware cannot communicate with an Intel Optane PMem for HPE Module or PMM (e.g., channel failure, total DIMM failure), the PMM will be deconfigured. Although rare, the following scenario have been identified where the deconfiguration is not handled well:

Deconfigured PMMs in AppDirect (interleaved mode) prevent Windows Server 2019 from showing logical PMem storage.
An issue prevents Windows Server 2019 or Windows Server 2022 from accessing PMem logical devices when the PMem region is setup in the default AppDirect (interleaved) mode and a PMM becomes deconfigured. This impacts all namespaces. As a result, users won't be able to see any logical PMem devices in device manager, or listed with Windows PowerShell cmdlets Get-PmemDisk, and PMem disk data will not be accessible.

Since the issue is not present in the AppDirect-not-interleaved configuration. Customers will want to weigh the performance difference between higher bandwidth interleaved mode versus the non-interleaved configuration.

Acquitted PMem DIMMs will be marked as Read-Only
In case there were any deconfigured DIMMs on the system being acquitted, the disks and physical devices will be listed as Unhealthy with Windows PowerShell cmdlets Get-PmemPhysicalDevice and Get-PmemDisk and the PMem disk will be marked as Read-Only.

To continue using the disk, run the Reset-PhysicalDisk command to make it writeable again.

Potential blue screen bug check Stop 0x101 CLOCK_WATCHDOG_TIMEOUT when creating or deleting PMem namespaces
A BSOD (Blue Screen of Death) may be intermittently encountered on systems configured with PMM while creating or deleting namespaces using New-PmemDisk or Remove-PmemDisk PowerShell cmdlets.

If this occurs, upon system restart, the same operation should be retried and will work.

HPE is working to fix the issue and the corresponding customer advisory will be updated when the solution will be available.

Installation of Windows Server 2019 on a 16-socket partition may take hours on servers with hundreds of logical processors.
On HPE Superdome Flex servers, installation of Windows Server 2019 on a 16-socket partition may take hours on servers with hundreds of logical processors. For instance, on a 16-socket partition (at 28 cores per processor), installation time observed was significantly higher starting with 700 logical processors and above.

The issue is independent of the type of memory used (DDR4 or Intel Optane PMem for HPE). It is not observed on partitions with less than 16 sockets or on systems with Hyper-Threading disabled.

Resolution
Follow installation steps as described on Page 9 in the section entitled summary of the steps. Either of the following workarounds can be used:

1. Start Windows Server installation with a relatively "small" amount of resources (one chassis or two at the most). After the OS installation is complete, you can enlarge the partition, the OS will take into account all resources upon reboot.
2. Alternatively, disable Intel Hyper-Threading to reduce the amount of logical processors by half and perform the Windows Server installation. After the OS installation is complete, you can enable Hyper-Threading; the OS will take into account all resources upon reboot.

On a 32s/48 TB configuration with 1,792 logical processors (Hyper-threading ON), a BSOD is seen during WS2022 Installation.
A BSOD happens with error code `System Thread Exception Not Handled`; as a result, setup is interrupted during the initial phase of installation.

Resolution
Workaround is to complete OS installation with Hyper-threading OFF and later turn it ON. Alternatively, OS can be installed on a smaller partition and then the partition size can be modified to 32s.

Certain Versions of Intel Microcode May Cause the Server to Fail to Boot or to Stop Responding
HPE published an advisory entitled "Certain Versions of Intel Microcode May Cause the Server to Fail to Boot or to Stop Responding."
It gives information about these Microcodes and how to work around this issue.

Appendix A

Using Java virtual media

If you need to redirect more than one ISO image or CD/DVDs to an HPE Superdome Flex Server, use the Java Virtual Media applet from the HPE Superdome Flex RMC web console. The embedded Java application can be launched from the browser; this requires connecting the additional management LAN port on the monarch BMC (nPar main chassis) to the data center's management network.

In order to do this, from the RMC web console, select "Download Virtual Media Application" as showed in the figure below, and launch "Jviewer-sa.jar" applet and enter the IP address of the BMC (find it out using the SHOW NETWORK command on the HPE Superdome Flex RMC CLI).

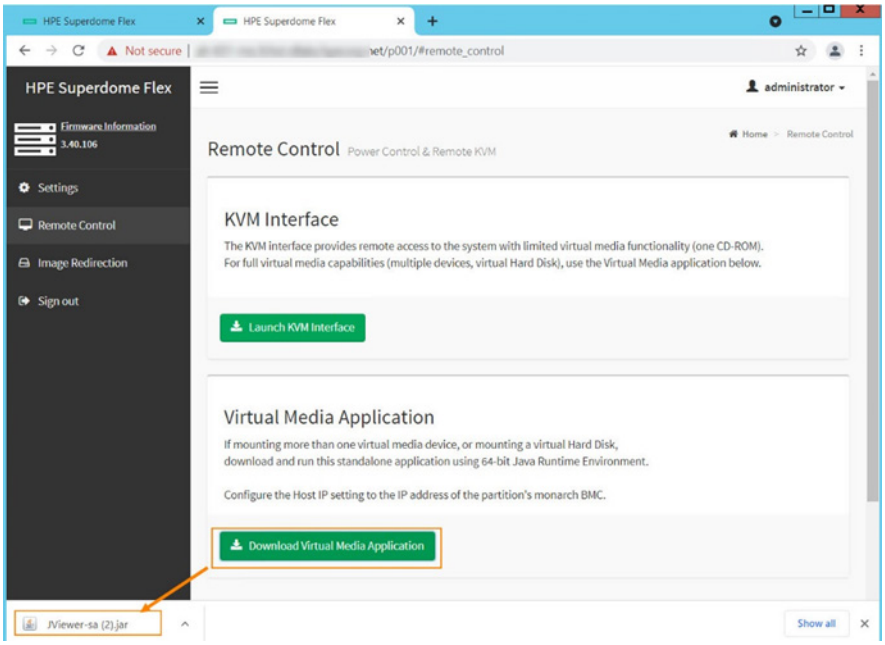

Figure 42. HPE Superdome Flex RMC web console—Jviewer-sa.jar applet

Enter the Base I/O IP address, and credentials, then click Launch.

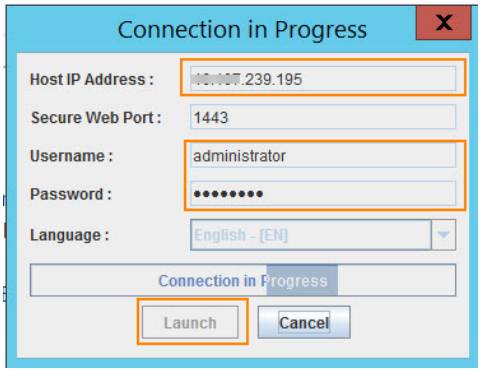

Figure 43. Jviewer connection interface

This will allow redirecting ISO images as depicted below:

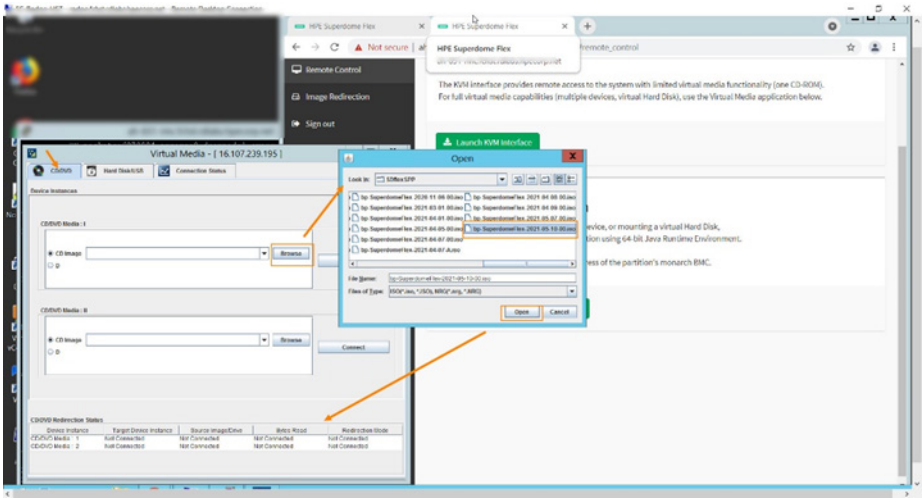

Figure 44. Jviewer—Virtual Media—CD redirection

The media will be exposed to the host (nPar or server), and can be used directly from the OS instance, or UEFI interface if the OS is not yet installed.

Resources

HPE Superdome Flex information

HPE Superdome Flex on the Windows Server Catalog

Customer documentation for HPE Superdome Flex server

Intel Optane Persistent Memory for HPE reference documents:

HPE Persistent Memory Guide for HPE Superdome Flex Server

Deploying HPE Persistent Memory on Microsoft Windows Server 2012 R2, Server 2016, and Server 2019

Guide to configure HPE Persistent Memory for proper use with Microsoft SQL Server to prevent database corruption due to a torn block

Learn more at

HPE.com/Superdome

Visit **HPE.com**

Chat now (sales)

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