BMC Installation Guide

Lenovo ThinkStation

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Overview

A Baseboard Management Controller (BMC) is a dedicated hardware controller for monitoring and controlling remotely located hardware. Although BMC began as a way for systems administrators to effectively run servers in remote datacenters, it has proven a useful tool for any computer system that may not be easily accessible in day to day use. As more workstations, powerful desktops, and even densely populated mini computers are moved into server rack locations and datacenters, BMC continues to prove invaluable for monitoring and upkeep of any remotely located systems.

Remote Monitoring and Management: A BMC allows admins to keep an eye on important hardware parameters such as temperature, voltage, fan speed, and power consumption. This allows the ability to spot potential issues early and start troubleshooting before there is a system failure.

Out-of-Band Access: Users can access systems remotely via a BMC, even if the system's operating system is offline or unresponsive. This means administrators can view logs and sensors and control some of the system hardware components from anywhere, reducing both time to troubleshoot problems and overall downtime.

Intelligent Sensors and Alerts: A BMC has smart sensors that interact with and gather data from various hardware components. It can send real-time alerts and notifications, helping administrators address issues quickly, prevent system failures, and maintain optimal system performance.

Remote Console Access: A BMC provides a remote console virtual interface that lets administrators access and control the server as if they were physically present. This makes maintenance and troubleshooting easier and even allows for the remote installation of most operating systems.

In essence, a BMC allows users to interact with computer systems anywhere in the world as if the computer is in front of them, allowing administrators to manage, monitor, and troubleshoot systems from anywhere, at any time.

This document covers installation and basic setup of the Lenovo ThinkStation BMC card in supported ThinkStation platforms.

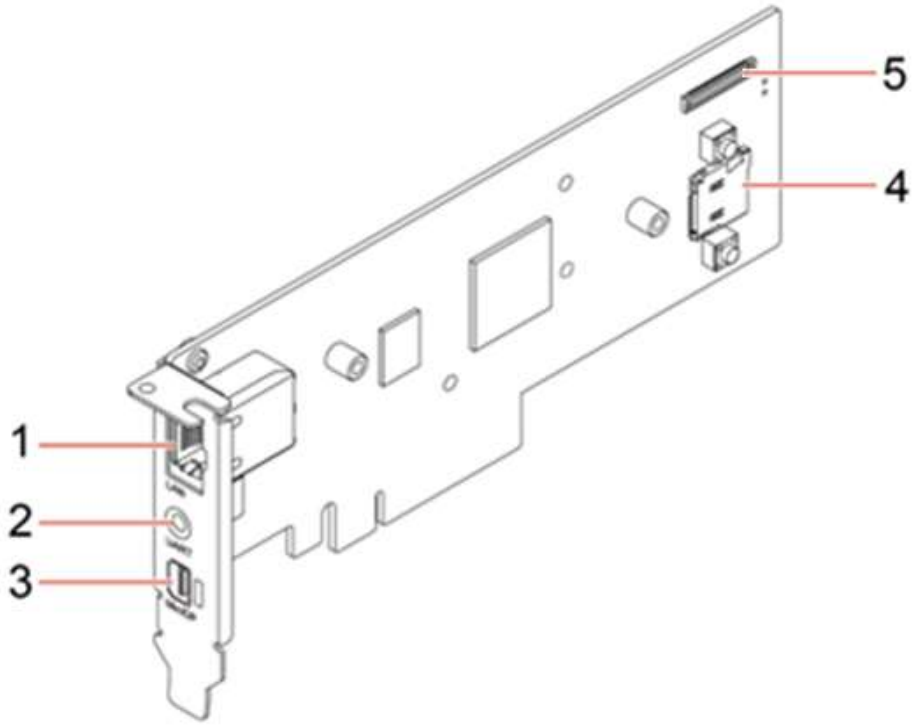
At the time of writing the following ThinkStation platforms support BMC:

- P3 Ultra SFF
- P5
- P7
- P8
- PX

Section 1 – BMC PCIe AIC Components

Below is an image of the BMC PCIe card and the components.

Figure 1, BMC card with identified components



1	Ethernet/LAN connector
2	UART connector (non-functional)
3	Mini DisplayPort out connector
4	MicroSD slot
5	BMC Sideband Cable Port

NOTE: Image is shown with the Low Profile PCIe bracket specific to the P3 Ultra SFF version.

The Ethernet/LAN connector is the connection to allow access to the remote interface of the host system. The P3 Ultra SFF has a compatible 1GbE port on it that can alternatively be used as a shared port, allowing the system to access the network as well as the remote interface to the BMC through one network connection.

The UART connector is a 3.5mm serial port that, at the time of writing, is non-functional.

The Mini DisplayPort (mDP) out connector allows local users to view the computer display output normally even while remote users may have access and are controlling the system. If a standard system GPU, onboard or discrete, is being utilized simultaneously with the remote control of the system, users may experience issues with remote display output of the host system.

The MicroSD slot can be used for BMC firmware recovery or for storage of ISO images for remote OS installation.

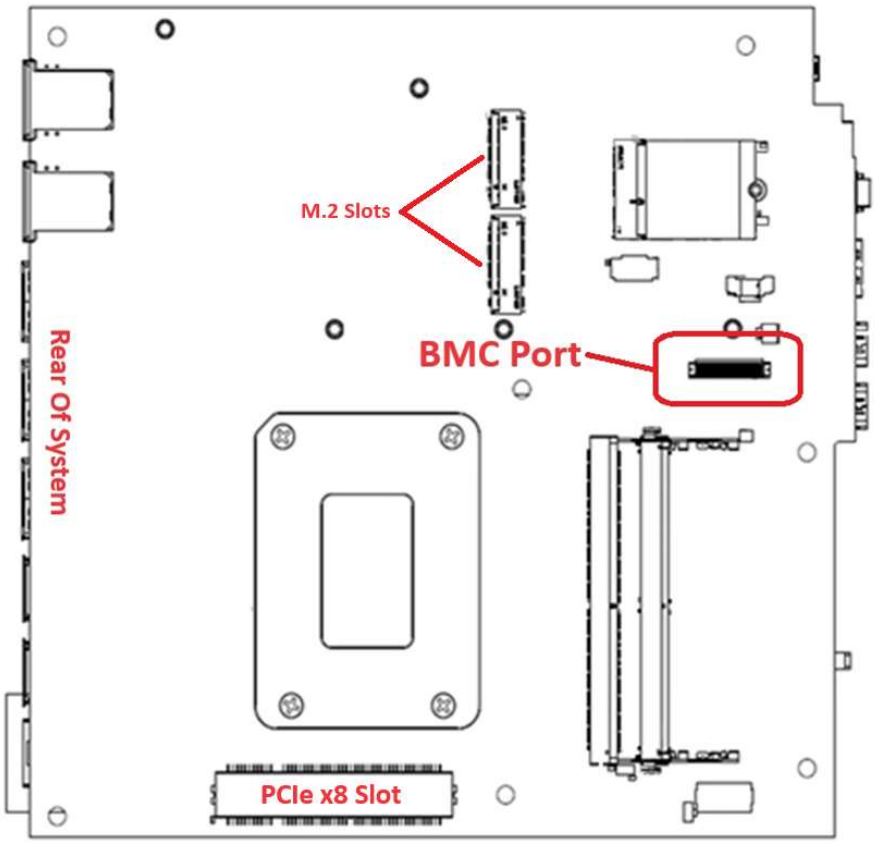
The BMC Sideband Cable Port is the secondary method of connecting the BMC card to the system board, in addition to the connection through the PCIe slot. Details on the connection of this cable are provided in Section 2.

Section 2 – P3 Ultra SFF BMC Card Installation

Installation of the BMC card in the P3 Ultra SFF must be installed in the PCIe x8 slot adjacent to the M.2 location. The BMC card can only be used in this PCIe slot due to the BMC sideband port location on motherboard near this slot. The Lenovo BMC card with a low profile PCIe bracket and the associated P3 Ultra SFF BMC sideband cable are necessary to complete the installation.

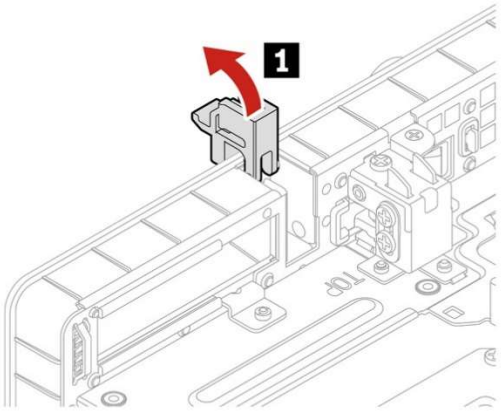
To begin installation of the BMC card, power down the system, remove any connected devices and the power from the system. Then remove the cover and leave the system with the M.2 side facing up. See Figure 2 below for the location of the BMC port on the P3 Ultra SFF motherboard.

Figure 2, P3 Ultra SFF Motherboard BMC Port Location (M.2 SSD side)



On the rear of the system, lift the PCIe bracket retention flipper up out of the way (1) and remove the PCIe slot cover if it is still in place.

Figure 3, PCIe bracket retention flipper (M.2 SSD side)



Lower the BMC card into the system with the PCIe bracket tab extending into the space left open from the flipper. Then slide the BMC card sideways inserting it into the PCIe slot (2). Once the card is properly inserted and seated, lower the flipper down (3) locking the card into place.

Figure 4, BMC card insertion

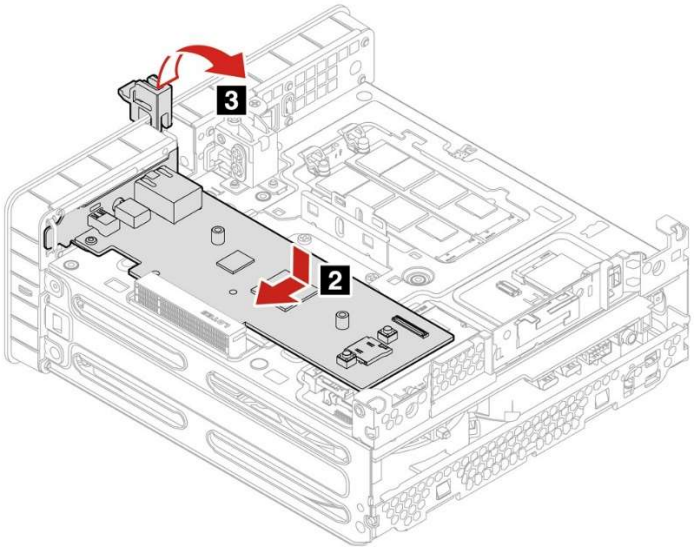
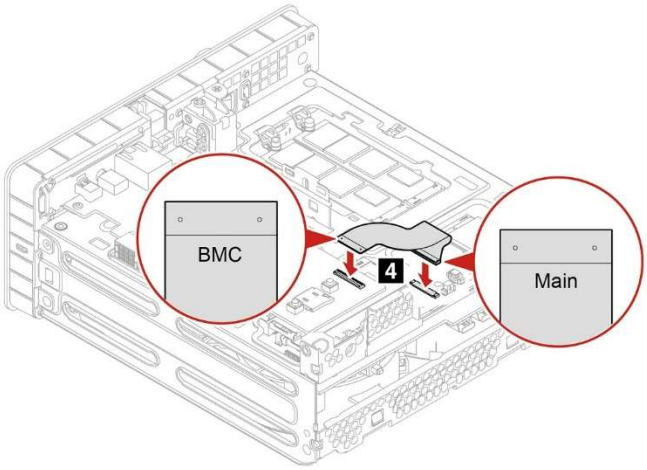


Figure 5, BMC card sideband cable installation



The sideband cable is labeled “Main” for the end that attaches to the motherboard and “BMC” for the end that attaches to the BMC card. To facilitate the installation of the BMC card, it is recommended to connect the “Main” end of the cable to the motherboard port first, install the BMC card into the PCIe slot, and then complete the cable installation by connecting the “BMC” end of the cable to the card.

To complete the installation, reassemble the system, connecting all of the peripherals, cables, and the monitor(s), and finally reattach power. It is recommended to add a network connection to either the BMC card Ethernet port or the onboard 1GbE port to facilitate remote access and configuration of the BMC card. For remote access, the selected Ethernet port must be connected to a network that is also accessible by any potential remote system. The system will need approximately 3 minutes for the BMC to initialize before it is able to power on and start the boot process.

NOTE: If the power button is pushed before the system has finished the BMC initialization, the white LED in the center of the power button will continue to flash 3 times then pause to indicate that BMC is still initializing. Once the process has completed the system will then proceed to boot.

NOTE: Every time the system power is removed and reattached, this initialization process will need to rerun and requires several minutes to complete.

Section 3 – P5/P7/P8/PX BMC Card Installation

Installation of the BMC card into the P5, P7, P8 and PX tower systems is very similar, with the location of the BMC port on the motherboard in roughly the same locations at the bottom center of the board. All four systems require both a BMC card and the associated BMC sideband cable and they each utilize the same BMC card and cable part number. The P5 requires the BMC to be installed to PCIe Slot 5, the P7 requires slot 6, the P8 requires slot 7, and the PX requires slot 8. Figures 6, 7, 8, and 9 below show each system motherboard, the location of the BMC ports, and the locations of the PCIe slot reserved for the BMC card listed in red.

Figure 6, P5 Motherboard BMC Port Location and BMC designated PCIe Slot 5

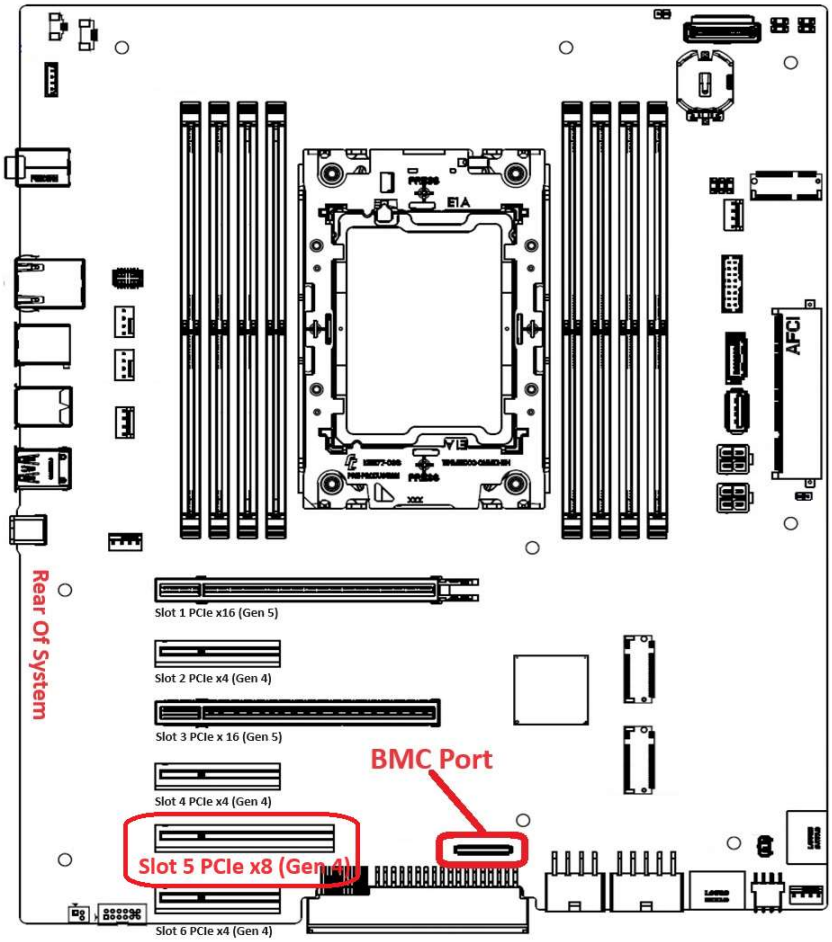


Figure 7, P7 Motherboard BMC Port Location and BMC designated PCIe Slot 6

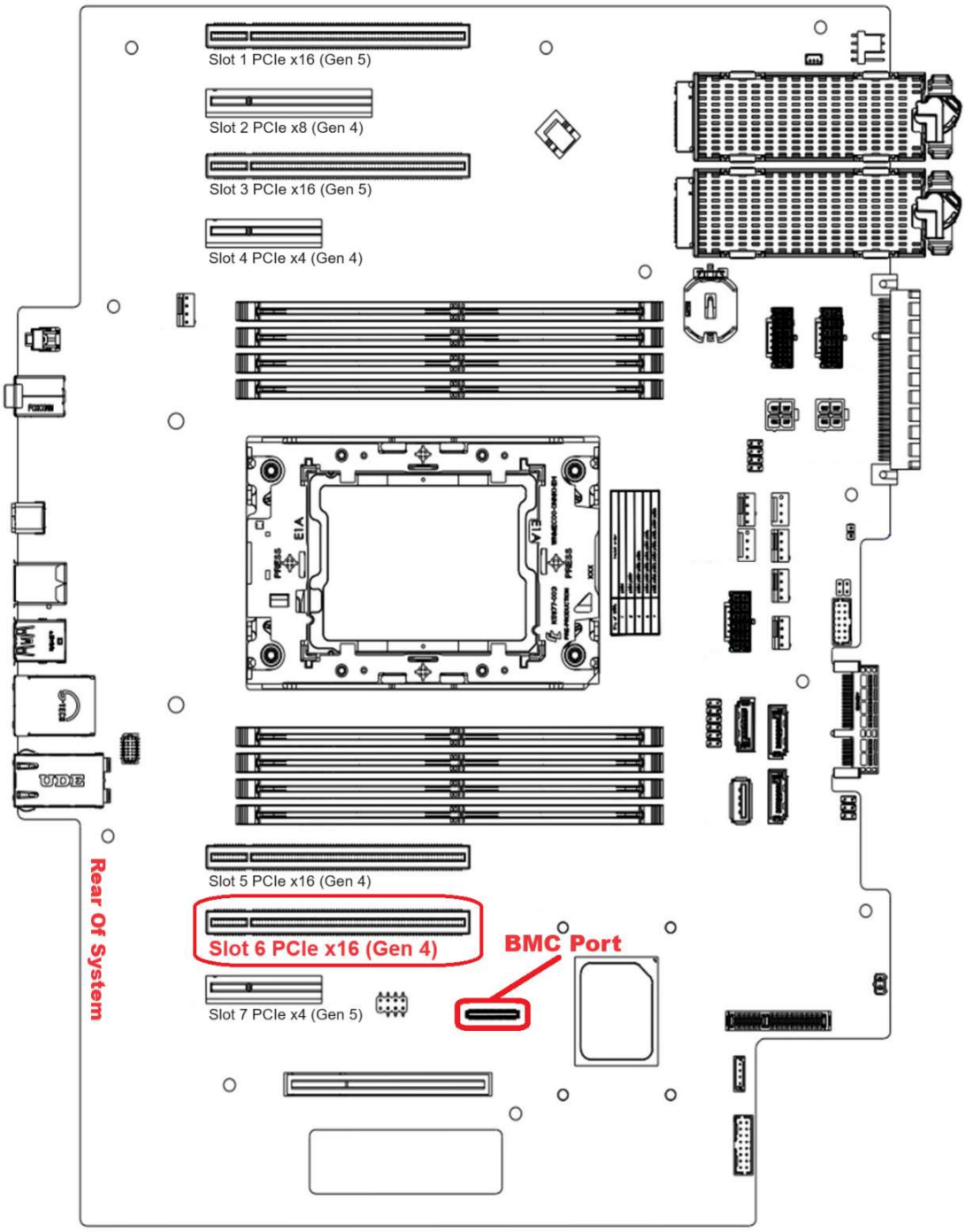


Figure 8, P8 Motherboard BMC Port Location and BMC designated PCIe Slot 7

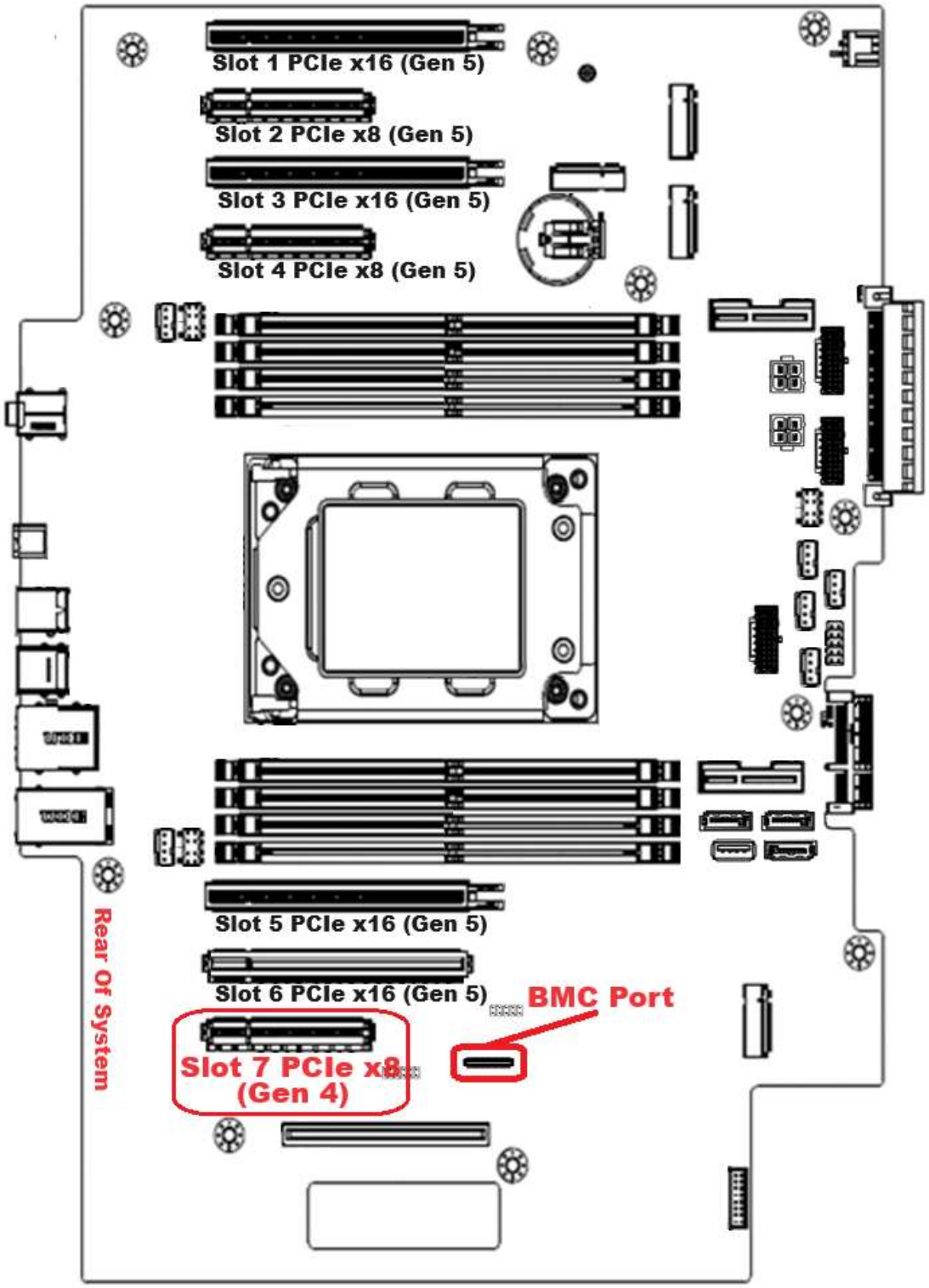
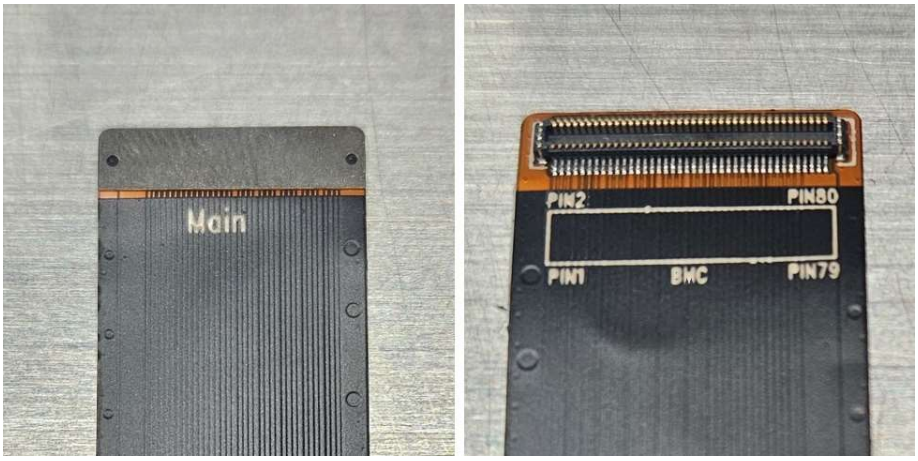


Figure 9, PX Motherboard BMC Port Location and BMC designated PCIe Slot 5

To begin the installation of the BMC card, first power down the system, remove any connected devices and the power from the system, and then remove the cover. The following images demonstrate the installation of the BMC card into a P5 workstation but using the identified ports and slots from the previous images as a reference, the installation is virtually the same unless otherwise noted. Certain system components have been removed to better show the BMC card and sideband cable installation.

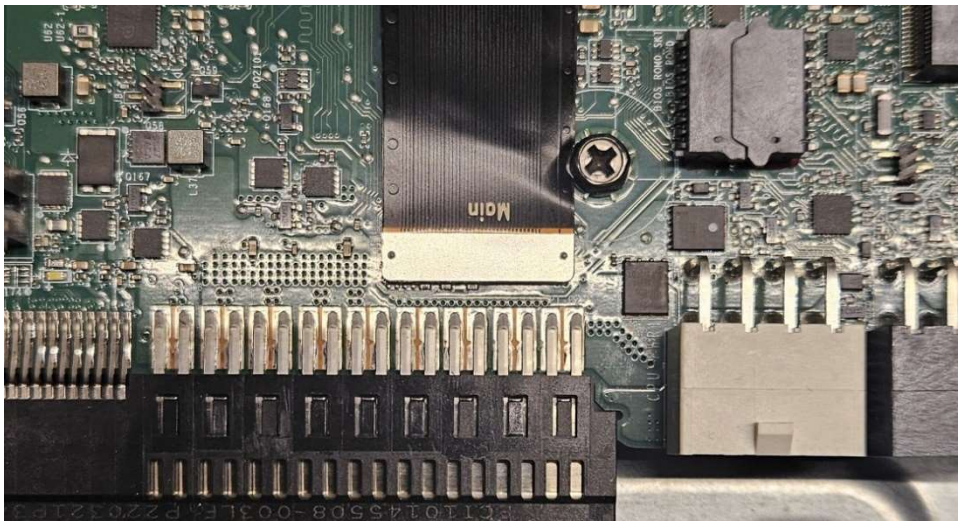
The sideband cable is labeled “Main” for the end that attaches to the motherboard and “BMC” for the end that attaches to the BMC card.

Figure 10, Sideband Cable identification



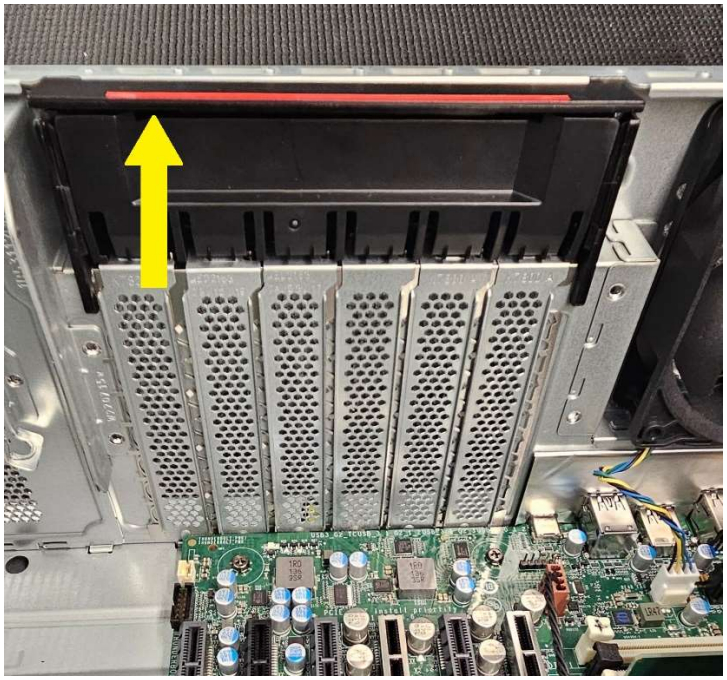
Locate the BMC port on the motherboard and plug the “Main” end of the cable into the motherboard and let the cable lie loose.

Figure 11, Sideband Cable plugged into the motherboard



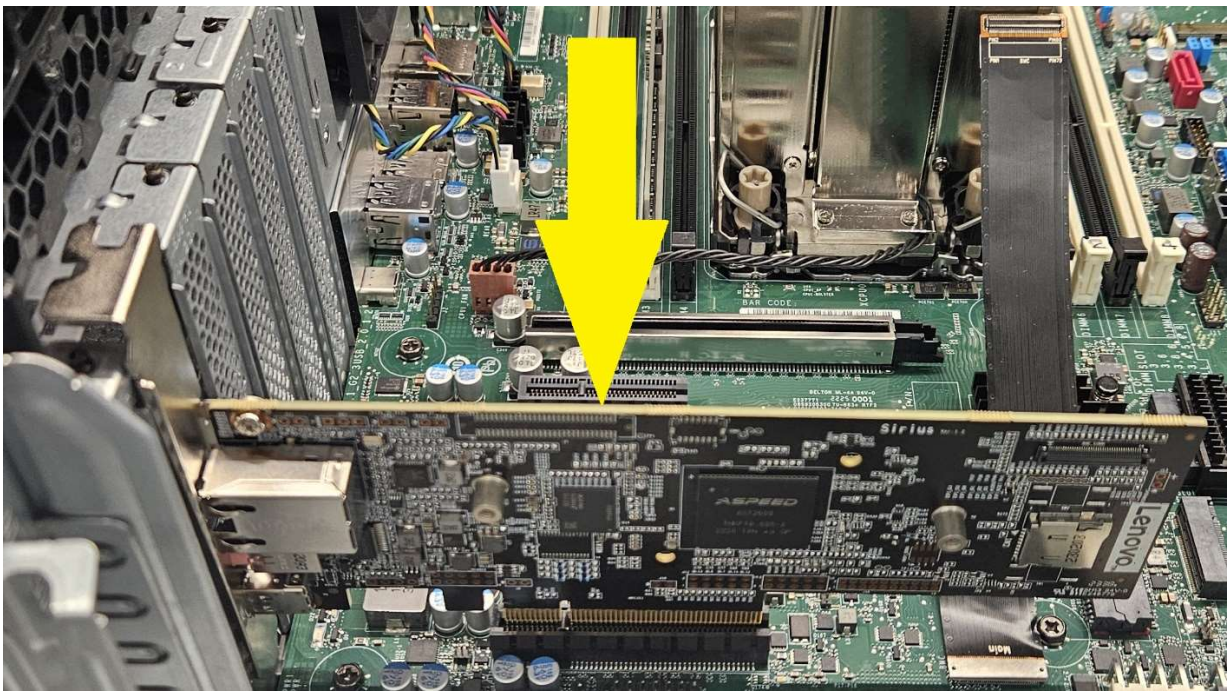
On the rear of the system, lift and turn the PCIe bracket retention handle up out of the way and remove the proper PCIe slot cover if it is still in place.

Figure 12, PCIE bracket retention handle



Insert the BMC card into the appropriate slot for the system in use.

Figure 13, BMC card insertion



Lower the PCIe retention handle back into place to lock the BMC card into the slot. For the P5, P7, and P8 systems, gently curl the BMC Sideband cable over the top of the BMC card and plug the end into the Sideband cable port as shown below.

Figure 14, Sideband cable into the BMC card port in the P5, P7, and P8

For the PX system, the Sideband cable will rise straight up and curl over forwards to plug into the top of the BMC card as shown below.

Figure 15, Sideband cable into the BMC card port in the PX

To complete the installation, reassemble the system, connecting all of the peripherals, cables, and the monitor(s), and finally reattach power. It is recommended to add a network connection to the BMC card Ethernet port. For remote access, the BMC card Ethernet port must be connected to a network that is also accessible by any potential remote system. The system will need approximately 3 minutes for the BMC to initialize before it is able to power on and start the boot process. Normally the process will complete without issue or notification. If the power button is pushed at any time before the BMC card has completed initialization, the power button LED light will light up and the mini diagnostic display on the front of the system will show the progress of the initialization as seen in the Figure below. Once the process has completed the system will then proceed to boot.

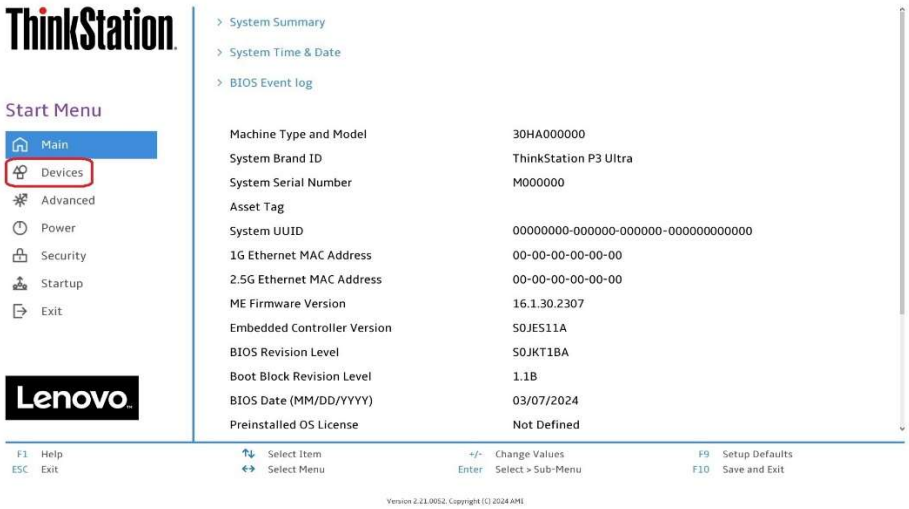
NOTE: Every time the system power is removed and reattached, this initialization process will need to rerun and requires several minutes to complete.

Figure 16, Diagnostic display

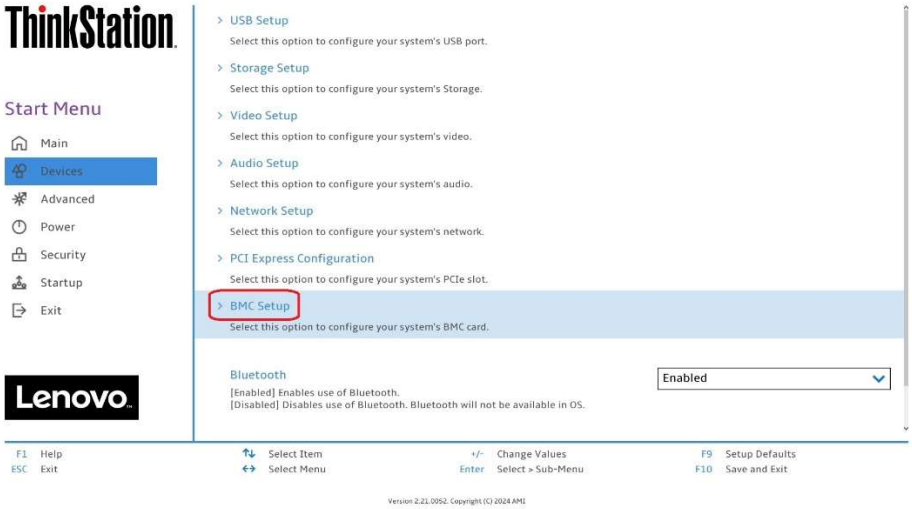
Section 4 – BMC card Setup

To configure the BMC settings, it is necessary to connect to the card remotely. This is typically done through a web GUI, but most settings can also be changed through other 3d party tools. All methods require the host and client systems to be connected to networks that are accessible to one another. This section will cover how to connect to the BMC card through the web GUI as well as how to then connect to the host system through the BMC remote control tool.

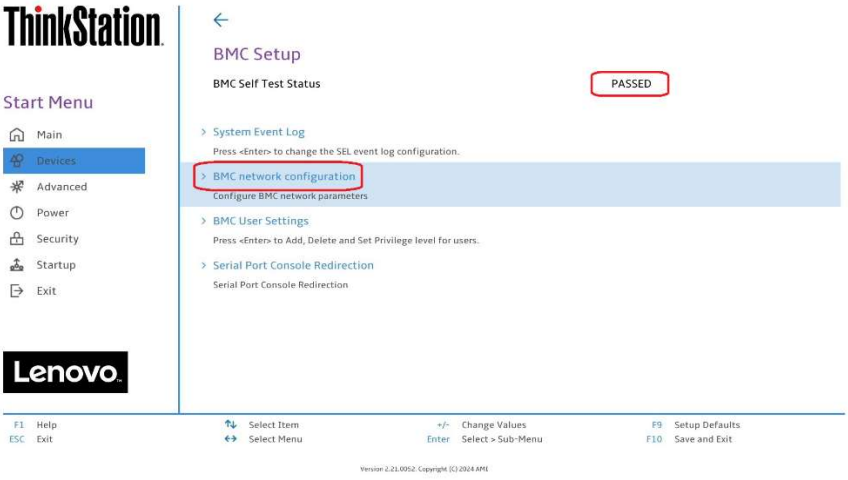
Once the BMC card has been installed and has initialized fully, the system is ready to boot. Verify that an active network cable has been plugged into the Ethernet port on the BMC card. Boot the system and press F1 when the POST screen is displayed to enter the BIOS setup. From the BIOS landing page click on “Devices”.



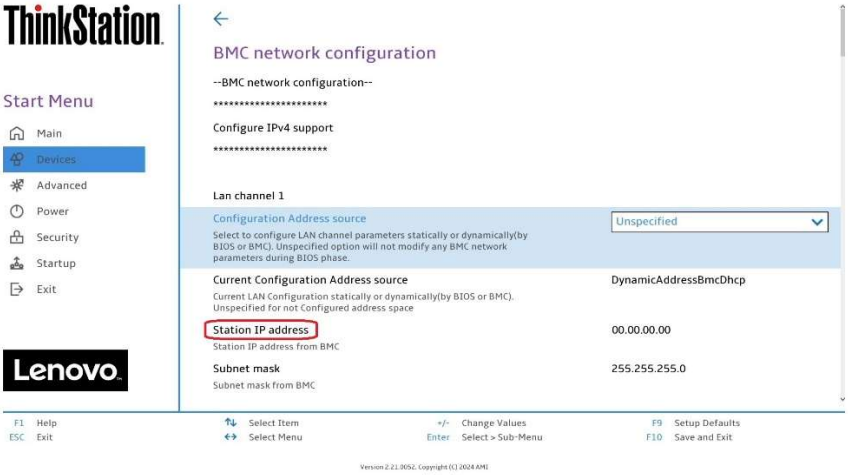
From the “Devices” page click on “BMC Setup”.



On the “BMC Setup” page, verify the “BMC Self Test Status” shows as “PASSED” and click on the “BMC network configuration” option. If the BMC card shows “FAILED” it is recommended to power down the system and remove and reinstall the card and cable to verify all components are installed and seated properly.



In the “BMC network configuration” section note the “Station IP address”.



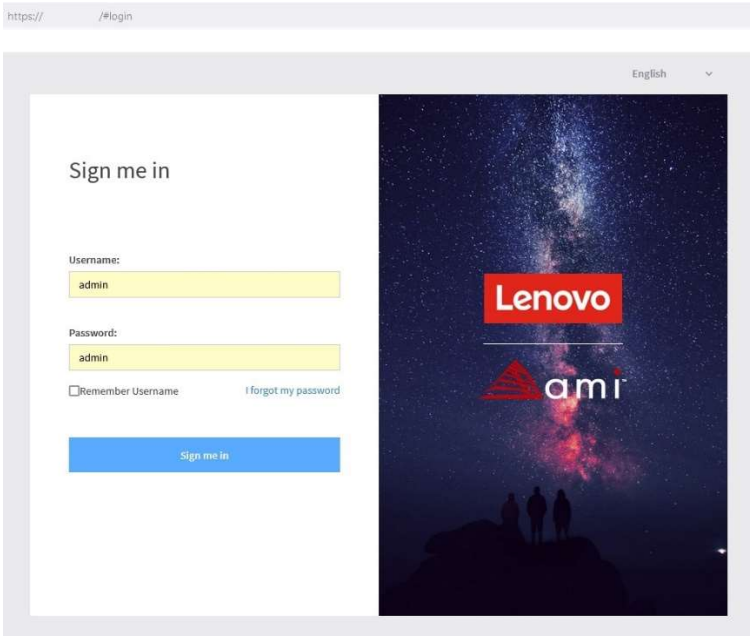
Accessing the Web GUI:

In a remote system, that has access to the same network of the host system, open a browser and type in the “Station IP address” in the following format:

https://xxx.xxx.xxx.xxx

Accept any warnings that appear until reaching the following login screen and log in with the Username “admin” and Password “admin”.

Figure 17, BMC login screen



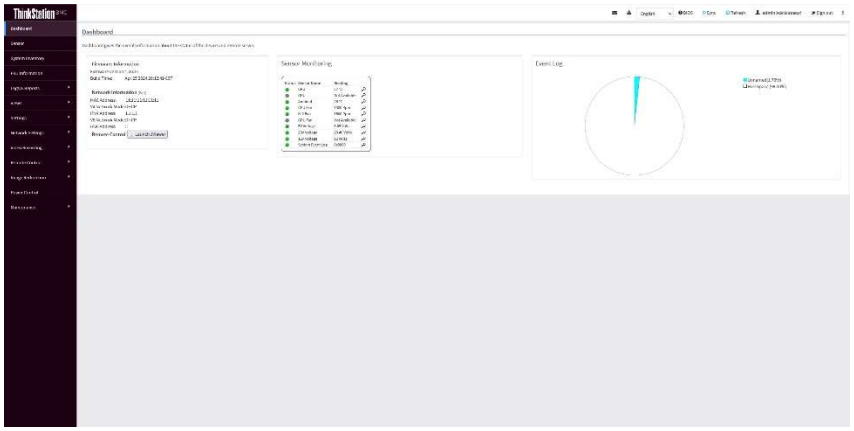
NOTE: Characters entered into the Password field are masked.

When clicking the “Sign me in” button, first time logins will be required to change the Password. Passwords must be 10-20 characters in length and contain characters from three of the following four categories:

- English uppercase characters A-Z
- English lowercase characters a-z
- Numerical digits 0-9
- Special characters (!, $, #, %, etc.)

When the password has successfully been changed, users will need to log in again with the new password. After a successful login users will be presented with the BMC Dashboard as seen in the Figure below.

Figure 18, BMC dashboard



From the landing page users have access to all of the settings, sensors, and features of the BMC card.

Setting up the KVM/Remote Control:

One of the primary features of any BMC, is the ability for users to control the system remotely. The two easiest and most common methods for this with the Lenovo BMC card are using the Remote KVM available through either the HTML 5 interface (H5Viewer) or through the Java application (JViewer).

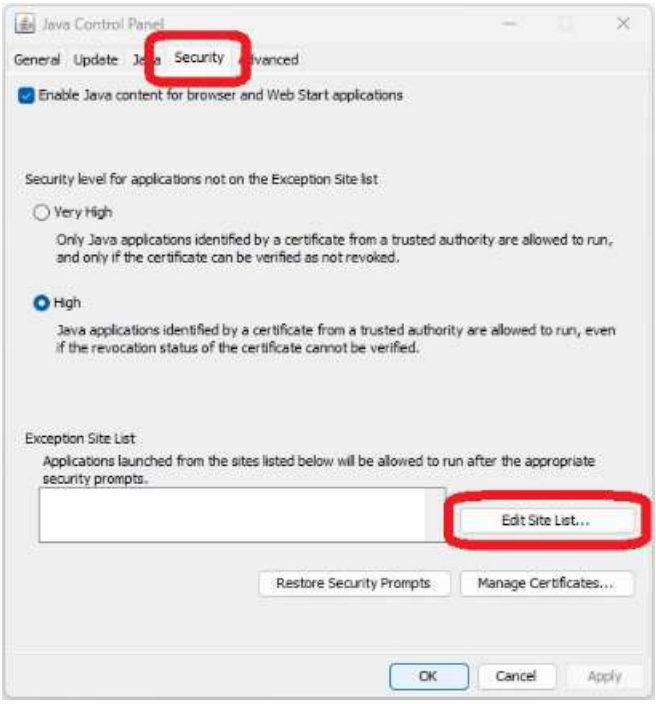
H5Viewer simply requires an HTML 5 capable browser to remotely control a host system:

- Navigate from the Dashboard to “Remote Control” on the left hand side
- From there open the “Remote Control” subsection
- Click on “Launch H5Viewer” and a separate window should open to start the remote control function

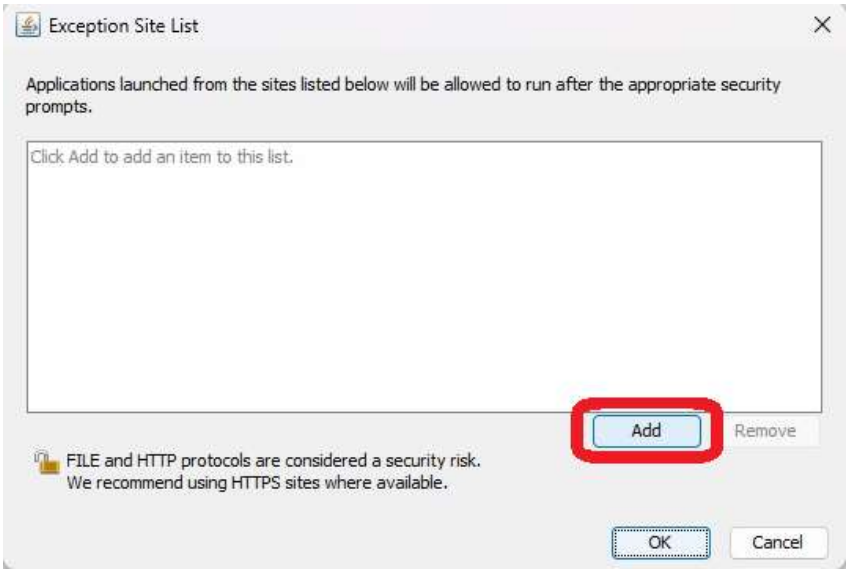
If a new window does not automatically open, check for any browser notifications of blocked windows, grant access to the BMC site to allow it to open new windows as needed, and click on “Launch H5Viewer” again to open the remote control session.

JViewer requires the latest Java from Oracle to be installed on the remote system and some security configuration within the Java applet. For the sake of simplicity, Java for Windows will be used as an example.

- After installing or updating to the latest version of Java, browse to the Java directory and click on “Configure Java” to open the application
- Click on the “Security” tab and click on the “Edit Site List…” button



- In the “Exception Site List” window click on the “Add” button



- Type in the BMC card IP address for the system that is to be accessed remotely in the following format and then click “OK”

  https://xxx.xxx.xxx.xxx

- Verify that the IP address entered now shows up in the “Exception Site List” window in the Security tab and click “OK”
- From the BMC Dashboard select to open “Remote Control” on the left-hand side and from there open the “Remote Control” subsection
- Click on “Launch JViewer” and a file will be downloaded
- Browse to the download location and click on the most recent “jviewer.jnlp” file

  NOTE: When running multiple instances of “JViewer”, from the same or different host systems, users may end up with multiple jviewer.jnlp files where every new instance gets appended with (x) where “x’ is the next progressing number.

- After double clicking on the correct “jviewer(x).jnlp” file a new window will open and, depending on the browser, there may be some security warnings that need to be accepted.

Although the H5Viewer and JViewer differ in appearance, they share many of the same settings and functions. Some examples of remote functionality are keystroke commands that can be sent to the host system, users can change resolution settings, and the host system can be reset, powered on, or powered off remotely. While using the remote control, users have access to the system at all times, from the boot process through the interactions with the OS. User experiences will differ based on the speed of the connection.

Refer to the Lenovo BMC User Guide for additional Remote Control information and a complete list of BMC settings and functionality. The user guide can be found at https://support.lenovo.com/.

Access and changes to the BMC settings can also be made by additional third-party tools such as the various command line based Intelligent Platform Management Interface (IPMI) tools and the more recent HTTP based Redfish platform. As with those and any other third-party tools Lenovo does not recommend any one over another or offer support for them.

Section 5 – Considerations

- Discrete GPUs are unavailable in the P3 Ultra SFF when using a BMC card with a 125W CPU.

- In certain configurations using the Remote Control function, while simultaneously using onboard and or discrete GPU output, users may experience unsatisfactory display output while in the Remote KVM window. This may range from limitations in screen resolution to an extended desktop rather than a duplicate desktop. If only the BMC card mDP is used for a local display, this configuration can always be successfully used in conjunction with the Remote Control functionality.

- When installed into a system running Linux, the BMC card utilizes a video driver that cannot be unloaded. When updating the Nvidia driver within Linux all video drivers are required to be unloaded. If users have a hardware configuration which includes an Nvidia GPU and a BMC card in a Linux environment, they will be unable to update the Nvidia drivers while the BMC card is installed. It is necessary to properly remove the BMC card from the system before rebooting to the OS to update the GPU drivers. After successfully updating the GPU drivers the BMC card will need to be reinstalled.

- The BMC card supports installation of operating systems via image files. No other image file installations, such as peripheral firmware or BIOS updates, are currently supported.

Revision History

Version	Date	Author	Changes/Updates
1.0	6/28/24	S Crowe	Initial launch release
1.1	7/24/24	S Crowe	Add info for P8 and PX