



# Dell Open Server Manager built on OpenBMC for security, lifecycle management, and expert support

## A Principled Technologies research report based on publicly available information

The data center of the future will likely be vendor agnostic. Operating and administration capabilities that are seamless, regardless of the underlying hardware, will allow companies to streamline deployment and maintenance and avoid being locked in with any one vendor.<sup>1</sup> An important factor in this evolution is open standards, which the International Telecommunication Union defines as those that are “available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven process.”<sup>2</sup>

Open standards offer advantages in interoperability, vendor neutrality, the efficient use of existing resources, and greater use of automation, to name a few.<sup>3</sup> According to a 2023 report by the Linux Foundation, organizations in tech consider open standards to help them be more innovative, more competitive, and better at delivering increasing value compared to other standards.<sup>4</sup> Companies rely on open standards to ensure compatibility across hardware and software. Open standards emerge naturally alongside technological innovation; fitting new products into existing ecosystems requires standardization, and open standards make this easier. Examples of major worldwide organizations adopting open standards include the World Health Organization (WHO) supporting interoperability in health technology,<sup>5</sup> RISC-V International committing to keeping its compute standard open,<sup>6</sup> and animation giants Pixar, Adobe, Apple, Autodesk, and NVIDIA forming the Alliance for OpenUSD.<sup>7</sup>

Open standards are valuable to any large technical operation. A typical hyperscaler's data center contains systems from multiple vendors across multiple locations. In these mixed-vendor environments, administrators must often contend with multiple management technologies. To help administrators tackle this challenge, Dell™ PowerEdge™ HS5620 and HS5610 cloud scale servers offer the option to use Dell Open Server Manager built on OpenBMC™. Dell Open Server Manager enables the PowerEdge HS5620 and HS5610 cloud scale servers to offer OpenBMC management for those environments, simplifying system management. This lets administrators slot Dell PowerEdge cloud scale servers in alongside servers from any other vendors that are also running OpenBMC and manage them together using a consistent interface. When you choose PowerEdge cloud scale servers running Open Server Manager can help ensure that your management interface is secure, easy to update, consistent with the standard, and supported by experts at Dell.

At Principled Technologies, we researched publicly available white papers, user manuals, and product demonstrations to learn how the Dell PowerEdge HS5620 and HS5610 servers designed with Intel® Xeon® processors employ Dell Open Server Manager to simplify management across multiple vendors at hyperscale to scale large infrastructures. We learned that Dell Open Server Manager offered on PowerEdge HS5620 and PowerEdge HS5610 cloud scale servers delivers root-of-trust security, easy lifecycle management, and Dell support for open-source OpenBMC. This is on top of the extensive feature list of OpenBMC, which allows administrators to manage servers from different vendors using a single interface.

Using a single management interface lets administrators focus on writing code for one standard instead of maintaining multiple codesets. It can reduce both the number of niche management silos and training time, freeing employees to carry out more innovative work. By decreasing the burden on management, companies can enjoy lower total cost of ownership (TCO).

### A hypothetical scenario

Imagine the following: Your company is growing and buying new servers every year to meet expanding needs. Your infrastructure team has a litany of scripts, tools, and workflows to administrate all the different types of servers in the data center. Admins are getting bogged down with the number of interfaces, and management costs are skyrocketing. They have begun training on Redfish API, investing time and money now to simplify their management approach and save on costs down the road. How can you help protect this investment? By embracing open standards, your company can help pave the way to a more streamlined management ecosystem and avoid vendor lock-in.

## Dell PowerEdge cloud scale servers

Both the 2U PowerEdge HS5620 and the 1U PowerEdge HS5610 feature 4<sup>th</sup> Gen Intel Xeon Scalable processors and are purpose-built for cloud providers.<sup>8</sup> They offer up to 2 TB of DDR5 memory, NVMe®, SAS, and SATA storage, and front I/O configurations for cold aisle serviceability. The Dell PowerEdge HS5620 and PowerEdge HS5610 cloud scale servers are intended for, and compatible with, mixed-vendor data center environments thanks to offering the option of Dell Open Server Manager. They also come with the Dell ProDeploy Infrastructure Suite, putting pre-configured servers to work faster.

The Hyperscale Next program helps cloud service providers (CSPs) scale their server infrastructure by working closely with Dell. This program offers benefits to CSPs by providing early access to technologies, Intel and Dell collaboration on performance tuning, Dell ProDeploy Infrastructure Suite, and helpdesk APIs for support requests.<sup>9</sup> The program also includes Dell Factory Configuration Services and Rack Integration Services, where Dell technicians configure servers and racks to customers' needs at the factory, for fast deployments with much of the groundwork done ahead of time. Hyperscale Next services make it easy to order and slot Dell PowerEdge cloud scale servers into an existing environment, combining with Dell Open Server Manager to provide an attractive solution for cloud providers that wish to add more servers in mixed-vendor data centers.

## What is Dell Open Server Manager?

Available only on Dell PowerEdge cloud scale servers, Dell Open Server Manager is software wrapping around the OpenBMC baseboard management controller (BMC). BMCs are microchips on server motherboards that allow admins to connect to and perform operations on a server when it is powered off. BMCs can provide a virtual console, power the server on and off, and show sensor information and other health indicators, among other functions. While most high-end servers include BMCs, they often use vendor-specific proprietary technology.

OpenBMC is an open-source BMC firmware stack that is a project of the Linux Foundation. IBM, Google, Meta, Intel, Microsoft, and Arm guide the project.<sup>10</sup> OpenBMC allows administrators to use a single BMC management interface across a mixed-vendor environment with servers of widely varying vendors and types. OpenBMC includes a web user interface, IPMI, Redfish, SSH, and serial-over-LAN (SoL) interfaces for a variety of ways to connect and communicate with the BMC.<sup>11</sup>

Dell Open Server Manager, available on the Dell PowerEdge HS5620 and HS5610 cloud scale servers, adds several key capabilities to OpenBMC to make it more useful for production deployments. Figure 1 shows the Dell Open Server Manager user interface.

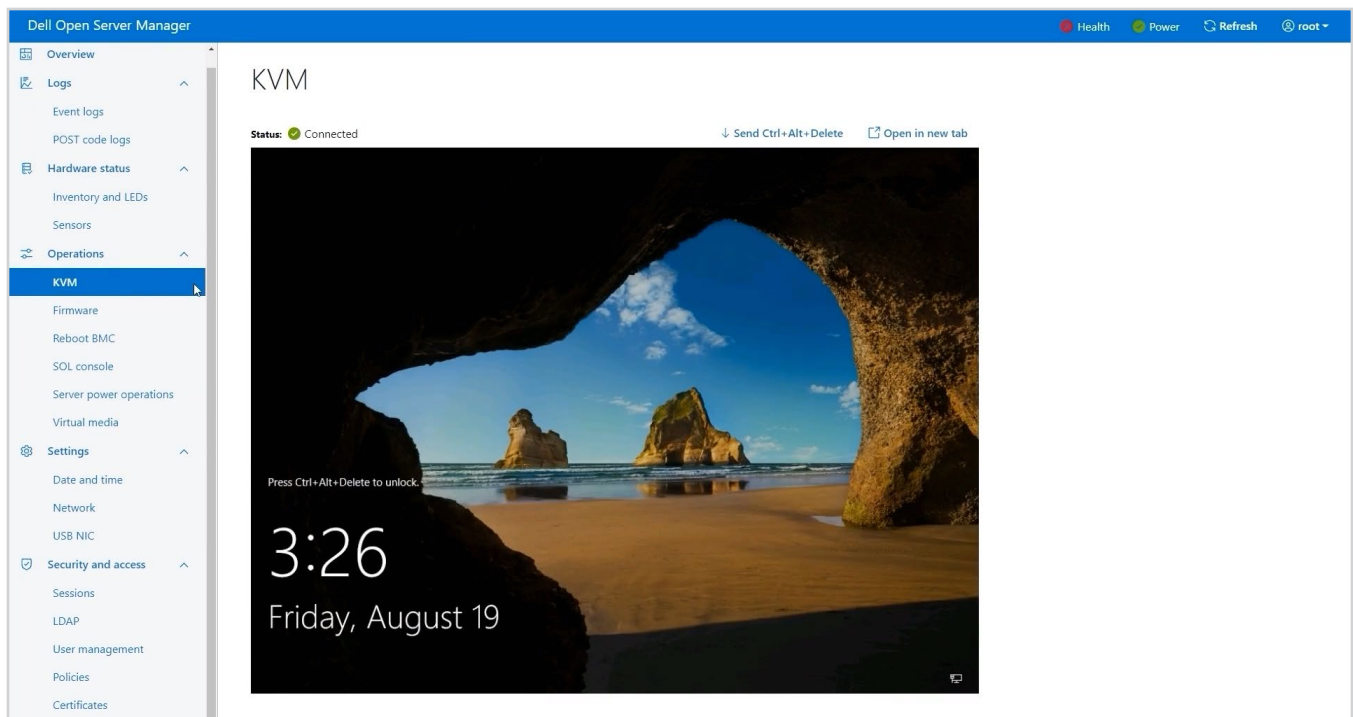


Figure 1: Screenshot of the KVM console in Dell Open Server Manager. Source: <https://infohub.delltechnologies.com/l/videos-118/open-server-manager-built-on-openbmc-demo/>.

## Silicon-based root of trust

Open Server Manager uses silicon-based root of trust to ensure that only authentic software installed from the factory can run on the BMC. Dell installs Open Server Manager at the factory using Dell-signed firmware.<sup>12</sup> This prevents anyone from inadvertently or maliciously installing other versions of the OpenBMC firmware in its place. Dell installs the firmware onto the same silicon used for Dell iDRAC, the flagship Dell BMC technology appropriate for homogeneous environments. (Administrators can install iDRAC to replace Open Server Manager but can revert the server to Open Server Manager only if Dell configured the server with the Open Server Manager software at the factory.<sup>13</sup>)

## Lifecycle management

Dell Open Server Manager makes it possible to use OpenBMC to export and import BIOS profiles and install Dell Update Packages (DUPs), greatly simplifying firmware updates.<sup>14</sup> BIOS profiles allow admins to change BIOS settings at once with a single configuration file. Open Server Manager enables this via the Redfish API, a systems management interface standard. DUPs provide Dell-validated packages for BMC, BIOS, complex programmable logic device (CPLD), power supplies, and backplane firmware.<sup>15</sup> These features can simplify provisioning and updating servers at hyperscale.

## Dell expert support

Dell Open Server Manager takes the logs that OpenBMC creates and automatically converts them into the same format used by iDRAC.<sup>16</sup> This allows Dell support to view the logs using existing support tools and offer the same standard support and warranties with no need for an administrator to act as an intermediary between Dell support and OpenBMC. Thus, administrators can more easily diagnose and solve problems quickly. Administrators generate a SupportAssist collection known as a Technical Support Report (TSR) and can set the logs to various levels of verbosity.

## Technical features of Dell Open Server Manager

In addition to the improved admin and user experience created by the features we have discussed, Dell Open Server Manager has all the powerful features of OpenBMC. Critically, OpenBMC features are available on any servers running the OpenBMC firmware stack, meaning they function across systems in mixed-vendor OpenBMC-enabled environments.<sup>17</sup>

## Interfaces

The more interfaces a BMC supports, the more potential overlap with servers running other types of BMCs. As we mention above, Dell Open Server Manager has all the standard interfaces covered: IPMI, Redfish API, web GUI, SSH, and SoL.<sup>18</sup>

### IPMI

Intelligent Platform Management Interface is a BMC-specific interface specification. IPMI provides out-of-band (OOB) management capability. OOB management is a way for administrators to manage servers outside of the production network, even if the server is turned off or lacking an operating system. As such, OOB capability is vital to any large-scale data center.<sup>19</sup>

Started in 1998, IPMI is supported by a large array of vendors.<sup>20</sup> Because it is such a long-standing and popular standard, IPMI supports a wide variety of servers in a mixed-vendor environment. The promoters of IPMI (Dell, HPE, NEC, and Intel) have issued a statement that they have no plans to make further updates to the specification, and encourage vendors to adopt more modern interfaces such as Redfish.<sup>21</sup>

Administrators can use IPMI to gather sensor information, clear or list events from the system log, manage users, generate inventory data, and perform server power operations.

## Redfish API

The Redfish standard has existed since 2015<sup>22</sup> and provides a RESTful API interface for OOB management.<sup>23</sup> A RESTful API extends the capabilities of IPMI by allowing for management messages to be sent and received via JSON, HTML, XLT, Python, PHP, or plain text. Major vendors' BMCs support Redfish.<sup>24</sup>

Dell Open Server Manager can use Redfish to export and import server BIOS configuration profiles and generate Dell SupportAssist logs,<sup>25</sup> potentially simplifying provisioning and support for hyperscale deployments.

Redfish can also perform most IPMI functions. For a list of all supported Redfish URLs, see the Dell Open Server Manager User Guide at <https://dl.dell.com/content/manual43190679-dell-open-server-manager-built-on-openbmc-2-2-0-user-s-guide.pdf?language=en-us>.

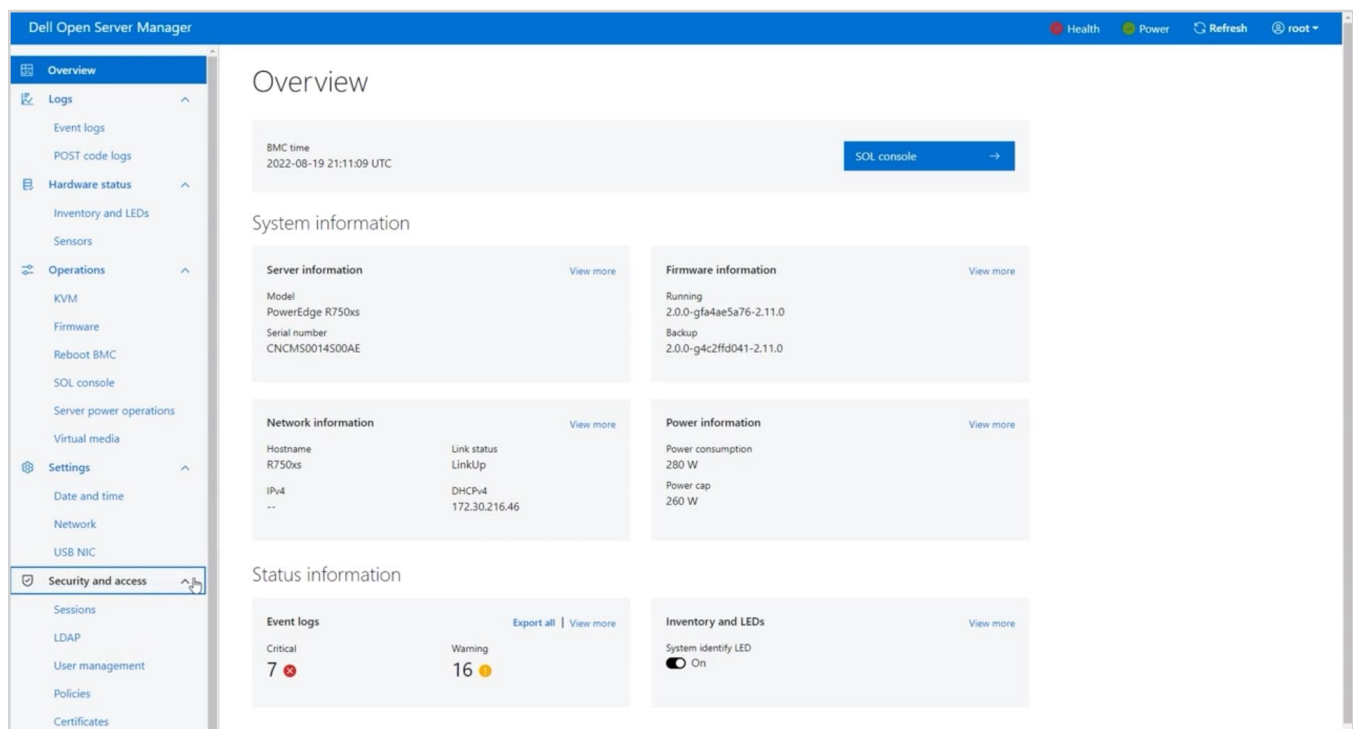


Figure 2: The Dell Open Server Manager user interface. (Source: <https://infohub.delltechnologies.com/l/videos-118/open-server-manager-built-on-openbmc-demo/>)

## Web GUI

A web GUI allows for user-friendly management from a simple HTTP interface for a single or small number of servers. The simplicity of a web GUI is a powerful fallback option for instances when hyperscale automation tools would cast too wide a net. Dell Open Server Manager provides a simple, no-frills GUI that shows relevant information in a clean and easy-to-read interface.<sup>26</sup> Figure 2 shows the Dell Open Server Manager user interface.

## Secure shell (SSH)

Most BMCs allow for SSH access, meaning that administrators can send commands as part of a script. However, in a mixed-vendor environment, different vendors likely have different commands, and it will be necessary to create a new script for each vendor subset.

## Serial over LAN

SoL redirects the serial port to the local network. Admins can then send serial inputs and outputs via Internet Protocol (IP), providing for serial access from anywhere with a network connection

## Host management

BMCs, at their core, provide control over and insight into the server hardware. The ability to manage a host without going through an OS defines OOB management.<sup>27</sup> BMCs can issue power commands to the server and view information such as internal temperatures and hardware inventory, regardless of server power state.

### Power

Rebooting the server or powering the server on or off is an essential function of any BMC. You can do this through IPMI, Redfish, web GUI, and SSH.<sup>28</sup>

### Cooling

All Dell Open Server Manager interfaces can query temperature sensors. Regular queries can provide a live view of internal server temperatures across a mixed-vendor data center, allowing administrators to identify servers that aren't cooling properly so they can remediate the issue.<sup>29</sup>

### LEDs

You can turn server identification LEDs on and off via all Dell Open Server Manager interfaces. This allows admins in the data center to physically locate servers that a monitoring team has identified remotely.<sup>30</sup>

### Inventory

You can query hardware inventory for status via all Dell Open Server Manager interfaces. This includes statuses for the system, BMC, chassis, memory, processors, fans, and power supplies.<sup>31</sup>

### Events

You can view events for the aforementioned hardware via all Dell Open Server Manager interfaces. You can download POST code logs via the same interfaces. Setting up regular queries of hardware events can provide automatic hardware event monitoring and alert on failures across a variety of vendor hardware.<sup>32</sup>



## Virtual KVM and media

A feature that has become common on modern BMCs, the virtual keyboard, video, and mouse (KVM) is a way for admins to see the video output (or console) of a server from a remote location. Virtual media allows an admin to attach a disk image from a remote location. Both features are invaluable for remote operation of servers, especially in the case of provisioning: You can install operating systems from anywhere and view server consoles without an installed video viewer. For example, an admin can watch the console output during POST to check for errors, install drivers, or perform other maintenance that would normally interrupt a video connection. Dell Open Server Manager also allows administrators to use ISO and IMG files as virtual media.<sup>34</sup>

## User management

Dell Open Server Manager provides four user roles: Administrator, Operator, ReadOnly, and NoAccess. Table 1 shows the privileges for each role.<sup>35</sup>

Table 1: The roles and their privileges that Dell Open Server Manager provides.

Privilege	Administrator	Operator	ReadOnly	NoAccess
Log in	✓	✓	✓	✗
Configure	✓	✓	✗	✗
Configure users	✓	✗	✗	✗
Logs	✓	✗	✗	✗
System control	✓	✓	✗	✗
Access virtual console	✓	✓	✗	✗
Access virtual media	✓	✓	✗	✗
System operations	✓	✓	✗	✗
Debug	✓	✓	✗	✗

Having a variety of roles allows different teams to access only the data they need. For very large deployments, it will likely be necessary to pare down the ReadOnly role because, for example, one team might need only temperature data and not data on the hardware in each server. Nonetheless, this feature makes it possible to safely silo administrative, operative, and monitoring duties.

## Dell and Intel commitment to open standards

Much of the pain in managing hyperscale deployments lies in the variety of interfaces, standards, protocols, and generational technologies across disparate vendors. Many of these differences are due to proprietary technologies that were not designed to work with other vendors. Open standards such as OpenBMC let products from different vendors exist side by side and enable cloud providers to reduce the hassle of managing large-scale mixed-vendor environments.

Dell and Intel are both long standing Platinum members of the Open Compute Project (OCP). OCP works to share standards in datacenter products across its large number of members, with the goal of arriving at technologies that work for a wide variety of vendors.<sup>36</sup>

## Conclusion

With OpenBMC, it is possible to deploy BMC software that can work across a variety of vendors. Admins can create or purchase tools that use IPMI, Redfish, or SSH to perform industry-standard operations on hundreds or thousands of servers at once.

Dell Open Server Manager adds critical features to the OpenBMC firmware stack. The software provides the safety of silicon-based root of trust, Dell lifecycle updates for easy firmware and BIOS management, and SupportAssist log bundles for expert Dell support.

Dell offers several Intel Xeon processor-powered server platforms with Open Server Manager capability, with a variety of configuration options to fit the needs of CSPs at any scale. The Dell PowerEdge HS5620 and PowerEdge HS5610 cloud scale servers build on the Dell and Intel commitment to working with other vendors to foster open standards.

Open Server Manager is a strong step towards allowing CSPs to manage hyperscale environments with products from many different vendors, especially as the adoption of OpenBMC and other open standards increases.

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This project was commissioned by Dell Technologies.



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