Hewlett Packard Enterprise

Technical white paper

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MANAGING THE IT ENVIRONMENT USING HPE IT ACCESS AND CONTROL

Next-generation KVM Switches and Serial Console Servers deliver server and device management across all IT environments

CONTENTS

INTRODUCTION

HPE IT Access and Control is good for you. Traditional analog KVM Switches continue to provide direct local access to servers using a local console in the rack environment, while Serial Console Servers deliver remote management access to serially managed devices such as headless servers and network switches. The new generation digital KVM Switches can now provide centralized remote access to servers across the network in addition to supporting advanced functions such as remote media access and others.

KVM CONSOLE SWITCHES

KVM (Keyboard-Video-Mouse) console switches are an essential technology in modern data centers. These switches are used to provide access and control to multiple servers from one or more console stations.

Analog versus IP/Digital KVM Switches

Traditional analog KVM Switches provide direct access and control of servers by routing their KVM signals to the switch and then outputting a selected server's signals to a console directly attached to the switch (Figure 1).

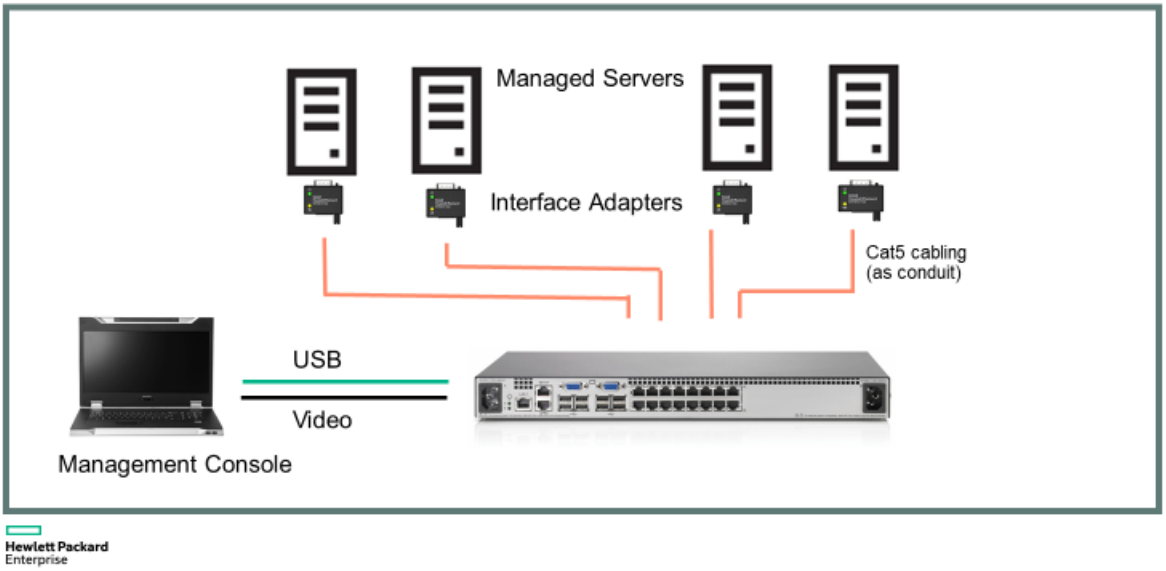

FIGURE 1. Analog KVM Switching

Analog KVM switching typically use interface adapters and Cat5 cables to convey the KVM signals electrically from the server to the switch, however there is no networking involved in the entire analog KVM architecture. For this reason, we often refer to analog KVM control as "out-of-band" since no network connection is involved. Analog KVM allows access to the servers even when the network is down. Today's more advanced Analog KVM Switches can provide controlled access to as many as 32 individual servers with login security for the console in addition to the login security at the server OS level.

Digital (or IP) KVM Switches, deliver additional levels of functionality above and beyond that of analog KVM Switches. Figure 2 shows the architecture for an installation using an IP KVM switch.

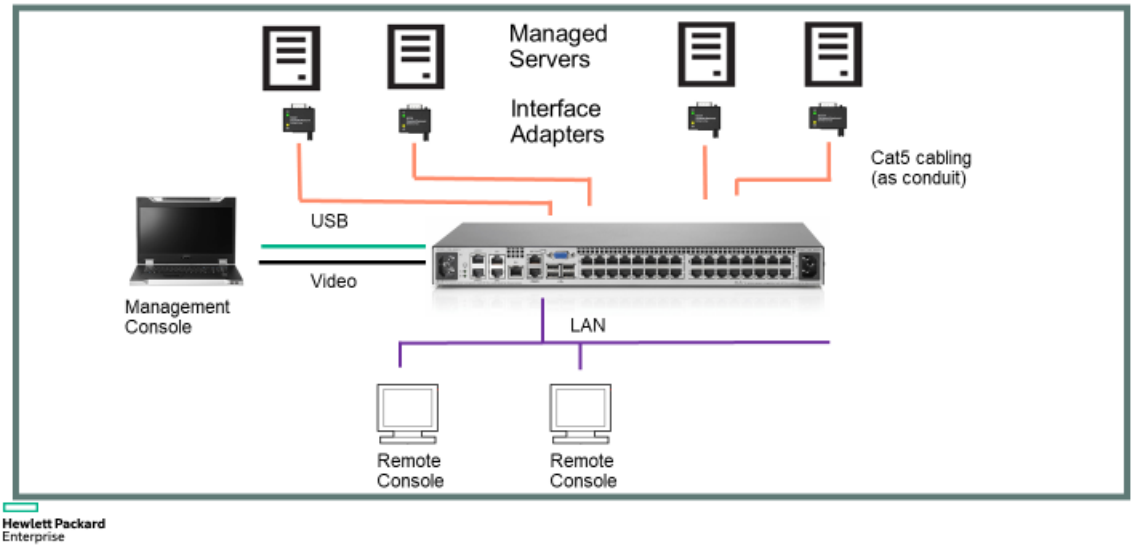

FIGURE 2. Digital (IP) KVM Switching

With IP KVM, the switch can convert the KVM signals from a server into network traffic that is sent across the LAN and accessed by a remote console using a web browser. This allows for truly remote control of the server from anywhere in the production network. It also delivers multiple simultaneous access to the connected servers along with remote support for login security and other advanced features which we will review later.

As Figure 2 also shows, IP KVMs still support local access to servers as well, using a directly connected Management Console.

Tiered KVM Switching

Most HPE KVM Switches (both Analog and IP) allow you to manage and control either 8, 16 or 32 computers from a single Management Console. In larger installations you may need to manage many more systems than this and using separate independent switches to do so creates a separate management point for each switch. Fortunately, more advanced KVM Switches can use a technique known as tiering to create a larger matrix of servers that can be controlled from a single access point.

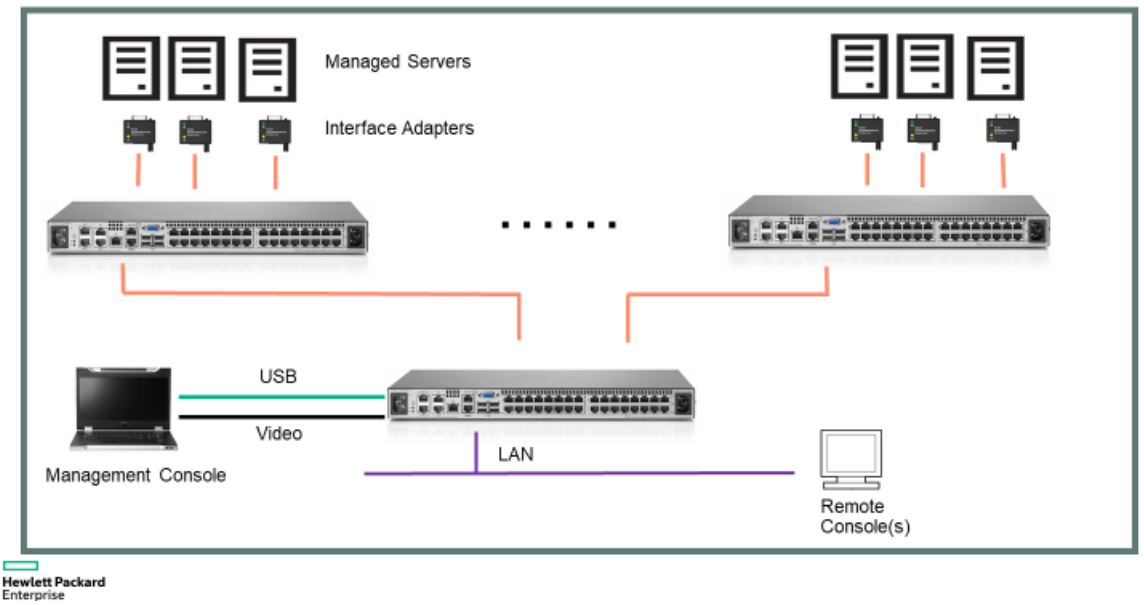

FIGURE 3. Tiered KVM Switching

With tiering (Figure 3), a set of first-level KVM Switches are connected directly to their managed servers, just as in a standard KVM configuration. However, the output from each of these switches is then fed into one of the input ports of a single second-level KVM switch. This creates a single point of access to all servers in this matrix, using either local or remote management consoles. As an example, a tiered configuration using thirty-three 32-port KVM Switches can provide controlled access for up to 1024 (32 x 32) servers. For optimal operation the second-level switch should be an IP KVM. This delivers the additional benefit of providing both local and remote access to all servers in the matrix.

Interface adapters for HPE KVM Switches

Interface adapters physically translate the signals from servers' video, USB and/or serial ports onto Cat5 cables for transmission to the KVM switch. HPE offers six different KVM interface adapters.

- **USB/VGA adapter**—for servers with a VGA video output.
- **USB/DisplayPort adapter**—for servers with a DisplayPort video output.
- **Small Form Factor (SFF) adapter**—compact interface adapter (VGA only).
- **HPE BladeSystem c-Class KVM Interface Adapter**—provides KVM access to HPE BladeSystem BL Servers via the SUV connector on the front of each blade server.
- **USB/VGA adapter with CAC and Virtual Media support**—required to support CAC and Virtual Media for a server.
- **Serial Interface Adapter**—for use with serially managed devices (network switches, etc.).

HPE Enterprise LCD Consoles

HPE Enterprise LCD Consoles provide an optimal solution for a Local Management Console that integrates directly into the rack infrastructure. Each LCD Console provides a high-performance display (up to 1600 x 1200 resolution at 60 to 75 Hz refresh rate) and a keyboard with touch pad. With a 1U rackmount form factor, the console also allows a KVM console switch to be mounted directly behind it.

HPE Enterprise LCD Consoles include two (2) front side USB pass-through ports to deliver Virtual Media CAC support with those KVM Console switches that support these.

Additional HPE KVM Switch features

In addition to basic KVM operation and tiering, HPE KVM Switches—depending on the model—also offer additional functions that increase ease of server management in more advanced IT environments.

Login security

All HPE KVM Switches above the Standard 4 port switch feature login security. Local and Remote Console users must login to the KVM Console from an Access Control List that is maintained on the KVM Switch. This security sits in front of whatever OS-level login security is present on the managed servers. Local Console KVM access provides additional implicit physical security in that it is completely out-of-band, eliminating the possibility of unauthorized access across the network.

Onscreen Display

With Onscreen Display, managers can select which server to manage from the display of the local or remote console. Onscreen Display is featured on all Advanced and Enterprise HPE KVM Switches. Basic KVM Switches may still employ physical pushbuttons on the switch to toggle between managed servers.

Onboard Web Interface

Onboard Web Interface (OBWI) provides a web-based interface for configuring and managing a KVM switch remotely across the network.

Virtual Media Support

Virtual Media Support provides the ability to virtually attach USB-based storage to a managed server either locally at the KVM Switch or remotely over the network through the USB port of a remote console. Virtual Media support requires use of a specific model of Interface Adapter as well as installation of special software on remote consoles for remote operation.

Common Access Card support

Common Access Card (CAC) support allows authentication/login to managed servers using Common Access Cards, either locally at the KVM switch or remotely through a remote console. As with Virtual Media, CAC support requires use of the specific model of Interface Adapter as well as installation of special software on remote consoles for remote operation. CAC can only be used in tiered configurations if all of the KVM Switches are Digital (IP).

Portfolio of HPE KVM Switches

HPE has three classes of KVM Switches—each designed to meet the needs of different IT environments in terms of features, scalability, and redundancy.

HPE Standard KVM Switches

Standard KVM Switches offer a basic KVM switching solution for use in non-critical and Small-to-Medium Business (SMB) environments. HPE offers a single 4-Port Analog KVM switch that designed to meet these needs. This switch features push-button and hot-key switching and works only with a local console.

HPE Advanced KVM Switches

Advanced KVM Switches offer the features needed for data center management and control of servers. In addition to supporting KVM tiering, HPE Advanced KVM Switches also feature the following:

- Onscreen Display for switching between servers.
- Onboard Web Interface for managing and configuring the KVM switch remotely.

HPE Advanced KVM Switches are available in both Analog and Digital (IP) models with either 8 or 16 ports. In addition to remote console capabilities, Advanced IP KVM Switches are capable of supporting server Virtual Media and login with Common Access Cards using the Console USB port.

HPE Enterprise KVM Switches

Enterprise KVM Switches are intended for use in Large Scale Enterprise or mission critical environments, particularly those with high-density rack configurations. Enterprise KVM Switches are available in Analog and Digital (IP) models and deliver additional functionality beyond Advanced switches, including:

- Switch models with up to 32-server ports and remote support for up to 4 users (IP models only).
- Redundant power supplies and dual LAN access ports for increased uptime and reliability.

In addition, HPE Enterprise Analog KVM Switches also support server Virtual Media and login with Common Access Cards in local mode while Enterprise IP KVM Switches support these both locally and remotely.

Comparison of HPE KVM Switches

Table 1 is side-by-side comparison of the KVM Switches in the HPE Portfolio. With KVM Switches, there is a nomenclature shorthand that references the switch's basic capabilities. Thus, a switch may often be referred to as a 1x2x16—meaning simply that the switch supports 1 remote user, 2 local users and up to 16 server connections.

TABLE 1. HPE KVM Switch Portfolio

Series/Model	Ports	Tiering	Virtual Media and CAC	Redundancy	Serial interface support	HPE product number (SKU)
Standard						
ATEN CS1304 G2	4	16	None	None	None	Q1F44A
ATEN CS1308 G2	8	64	None	None	None	Q1F45A
ATEN CS1316 G2	16	256	None	None	None	Q1F46A
Advanced Analog						
HPE 0x1x8 G3 KVM Console Switch	8	128	None	None	Limited	AF651A
HPE 0x2x16 G3 KVM Console Switch	16	256	None	None	Limited	AF652A
Advanced IP						
HPE 1x1x8 G4 KVM IP Console Server	8	256	Both	None	Limited	Q1P54A
HPE 1x2x16 G4 KVM IP Console Server	16	512	Both	None	Limited	Q1P55A
Enterprise Analog						
HPE 0x2x16 KVM Server Console Switch G2 with Virtual Media CAC Software	16	512	Both	Dual Power Supply Dual LAN	All Serial Protocols	AF618A

TABLE 1. HPE KVM Switch Portfolio (continued)

Series/Model	Ports	Tiering	Virtual Media and CAC	Redundancy	Serial interface support	HPE product number (SKU)
HPE 0x2x32 KVM Server Console Switch G2 with Virtual Media CAC Software	32	1024	Both	Dual Power Supply Dual VGA	All Serial Protocols	AF619A
Enterprise IP						
HPE 1x1Ex8 KVM IP Console Switch G2 with Virtual Media CAC Software	8	256	Both	Dual Power Supply Dual LAN	All Serial Protocols	AF620A
HPE 2x1Ex16 KVM IP Console Switch G2 with Virtual Media CAC Software	16	512	Both	Dual Power Supply Dual LAN	All Serial Protocols	AF621A
HPE 4x1Ex32 KVM IP Console Switch G2 with Virtual Media CAC Software	32	1024	Both	Dual Power Supply Dual LAN	All Serial Protocols	AF622A

Transitioning from Analog to IP/Digital KVM Solutions

Analog KVM Switches continue to provide basic local console management of IT resources, however the new generation of digital (or IP) KVM Switches offer significant additional functionality at relatively small premiums. When considering whether to use the newer IP KVM Switches, it is important to understand all the advantages that they deliver.

- **Local and remote access.** IP KVM Switches still provide the same local, out-of-band and hardware-based console access of analog KVM Switches. The addition of remote access capabilities allows access to the servers' consoles over the network as well.
- **Practical tiering support.** Tiering capability delivers the ability to manage and control a large number of servers from a single access point. To minimize latency tiering works best if the top tier switch is an IP KVM. This delivers the additional advantage of providing remote access capabilities to all servers in the tiered matrix, even if the Tier 1 switches are analog KVMs.
- **Support for remote CAC and Virtual Media.** All HPE IP KVM Switches support remote CAC and Virtual Media. Only HPE Enterprise level analog KVM Switches support CAC and Virtual Media, and then only locally.
- **More simultaneous users.** Analog KVM Switches can support at most two local console users at a time, which may prove impractical when managing larger numbers of servers. Depending on the model, IP KVM Switches can support up to four simultaneous remote users while still supporting local console users.

HPE SERIAL CONSOLE SERVERS

While servers typically require a Keyboard/Video/Mouse (KVM) connection for management, other devices in the data center or Rack are managed via serial connections using various terminal-oriented protocols (e.g., Telnet or SSH). These include a variety of IT devices such as UPS systems, network switches and routers, Power Distribution Units (PDUs), storage systems and even headless servers running UNIX®-based Operating Systems.

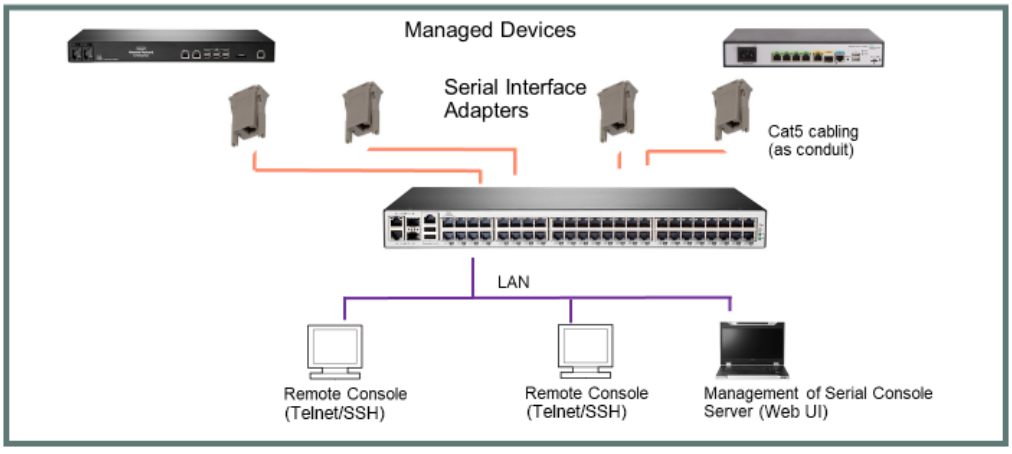

FIGURE 4. Serial Console Servers

HPE Serial Console Servers provide the same aggregated access and control for these serially managed devices that KVM Switches do for traditional servers. As Figure 4 shows, Serial Console Servers use the same general scheme to route serial signals from the managed devices to the Console Server itself. The system uses RJ45 serial ports and Cat5 cables to convey the signals electrically to the Serial Console Server switch. Older managed devices may require serial interface adapters to convert signals for the Cat5 cabling. Because serially managed devices may use one of several different pin-out configurations, Serial Console Servers are able to comprehend these different pin-outs and act appropriately using auto-pinout and speed detection. HPE Serial Console Servers also feature Zero Touch Provisioning, which supports automatic configuration of the Serial Console Server using a configuration file downloaded from a file server location on first boot up. Both of these capabilities save time during installation and configuration, allowing deployment of newly installed Serial Console Servers without intervention.

HPE Serial Console Servers feature their own advanced login security for local users as well as user group administration with both preset and customizable security profiles. HPE Serial Console Servers also support advanced Authentication and Authorization using protocols including LDAP, TACACS+ and RADIUS.

HPE Serial Console Server models

HPE offers two models of Serial Console Servers (Table 2). In addition to providing three times as many ports, the 48-port Serial Console Server delivers enterprise-level redundancy, featuring redundant power supplies and connectivity.

TABLE 2. HPE Serial Console Servers

Series/Model	Ports	Redundancy	Network interfaces	HPE product number (SKU)
HPE 16-port WW Serial Console Server	16	Single Power Supply	Dual NICs	Q1P52A
HPE 48-port WW Serial Console Server	48	Dual Power Supply	Dual NICs Fibre Channel Modem	Q1P53A

Serial Console management using HPE KVM Switches

Some data center IT configurations may utilize a relatively small number of serially managed devices compared to the number of KVM-based servers installed. In these cases, installing full-blown Serial Console Servers may not be the best solution. Fortunately, HPE KVM Switches will allow one or more of their KVM Ports to be used as a serial console port by connecting through a serial interface adapter. Using KVM-based serial console ports can eliminate the need for separate Serial Console Servers when managing a small number of serially managed devices in a rack along with servers.

When considering the use of KVM Switches for serial console management, it is important to understand the limitations of this approach. Each KVM port that you use for a serial console connectivity requires a separately powered serial interface adapter. From a purely practical standpoint, this becomes cumbersome relatively quickly. HPE recommends using no more than 4 ports on a KVM switch for serial console management.

Serial console connections on a KVM switch also do not provide any of the advanced serial functionality available with a Serial Console Server. This includes all the following:

- Auto-pinout detection and speed detection of serial connections
- Event notifications using customized alert strings
- Port data logging

USING IT ACCESS AND CONTROL AS PART OF YOUR IT MANAGEMENT SOLUTION

While management processors—including iLO—provide remote software KVM for servers, HPE Access and Control products can be an ideal solution for several different IT environments and situations, including the following:

- **As a backup to software-based KVM.** For mission critical IT environments, KVM Switches are the ultimate backup to remote management through management processors. Using Local Console access, KVM Switches deliver true Out-of-Band KVM access to the servers in a rack even when the networks are down. If desired, software KVM can still be used for server management access when the networks are working.
- **Consistent management access in heterogeneous server environments.** In IT environments using servers from multiple vendors, KVM Switches provide a single consistent interface and security model for accessing servers both locally and remotely. Software-based KVM solutions from different server vendors will each have a different user interface and different security logins.
- **Management across the IT environment.** KVM Switches and Serial Console Servers provide local and remote access to all the managed IT equipment in the rack—including servers, switches, UPSs, and other serially managed devices.
- **Simplified access to managed IT resources.** IT Access and Control products consolidate remote access to a single IP access point for the all managed IT devices connected to each switch.

HPE IT Access and Control products can provide a complete solution for managing IT infrastructure in the data center. The new generation of IP KVM Switches deliver both local and remote access to traditional server resources while Serial Console Servers deliver consolidated management of serially managed IT devices.

RESOURCES

HPE IT Access and Control products
hpe.com/us/en/product-catalog/servers/it-access-and-control.hits-12.html

HPE Rack and Power Infrastructure main page
hpe.com/us/en/integrated-systems/rack-power-cooling.html

a00072128ENW, March 2021, Rev. 1

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