

*How to select a KVM over IP system
to assist with HIPAA compliance*

Hub and spoke failover architecture, virtual media, exit macros and other security elements you should insist on in a KVM over IP switching system for your healthcare network.

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Table of Contents

- 3 Executive Summary
- 4 The critical role of multi-layered KVM switching in enterprise security
- 4 Leveraging industry-standard security for greater compliance
- 5 How Avocent solutions can help
- 7 An action plan for KVM acquisition



Executive Summary

With the enactment of the Health Insurance Portability and Accountability Act (HIPAA) of 1996 by the U.S. Congress, information security became a top priority for every IT organization and business involved with health care. No company can afford to have its critical systems disrupted for any length of time. No company can afford to have its key medical data or valuable customer information fall into the wrong hands. And no company can afford to ignore the mandate for accurate, reliable and verifiable health care reports.

HIPAA was established to protect patient privacy and allow patients greater access to their medical records. It also requires the establishment of national standards for electronic health care transactions and national identifiers for providers, health insurance plans and employers. A key focus is the security and privacy of health data.

Because data threats come in so many forms — and because it's never wise to rely on a single point-of-protection when guarding against threats — effective security for health care information requires a multi-layered approach. Physical, logical and operational security are therefore all essential ingredients for successful compliance with HIPAA.

KVM switching solutions provide secure remote data center management, but they also should integrate with the existing security infrastructure. KVM over IP switching systems with virtual media capability uniquely enable security managers to control physical access to critical data center resources — as well as power systems, environmental controls, security devices, branch office servers and other distributed IT assets. KVM switching ensures that only authorized personnel can perform critical management operations on servers or network devices.

The KVM platform that any enterprise chooses to implement must itself be extremely secure. It must offer appropriate protection from exploits launched from outside the enterprise. It must have effective controls to prevent unauthorized access by internal users. And it must safeguard critical systems from the dangers that can result from human error.

The Avocent KVM platform featuring virtual media is especially well suited to assist in following HIPAA regulations. The DS Series KVM over IP switching systems provide fieldproven security features and benefits to ensure that KVM functions themselves are not maliciously or inadvertently used to compromise critical enterprise assets. These benefits include standards-based authentication, multiple encryption modes for remote sessions, exit macros, remote boot with virtual media, and the comprehensive event-reporting capabilities that security managers need to properly audit the end-to-end IT environment. In addition to remote boot capability, virtual media gives administrators the ability to remotely perform file transfers, application and OS patches, and diagnostic testing—enhancing physical security of data centers.

When considering the benefits of a KVM over IP system, a health care organization should look closely at the KVM security architecture to ensure integrity of its own critical IT resources. Avocent is the only KVM provider with hub and spoke failover architecture and delivers powerful technology for achieving security, while simultaneously generating significant ROI as a result of performance and productivity gains. This unique combination of optimized security and streamlined IT access and control makes Avocent KVM over IP switching a key support player in meeting the demands of HIPAA compliance.

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The critical role of multi-layered KVM switching in enterprise security

IT organizations within the health care industry face a growing number of security threats to their critical data. These threats continue to evolve in their sophistication. They also represent a greater business risk than ever before, since productivity, revenue and customer relationships depend more than ever on the health and availability of essential IT services.

Fortunately, enterprise defenses are also evolving. New technologies and best practices are helping IT better protect critical services. By implementing the right combination of technologies and practices, health care IT organizations can effectively minimize risk without putting undue strain on their finite medical, financial and human resources.

One particularly important component of any enterprise defense strategy is the implementation of a “layered” security model. Under a layered model, security tools and techniques are applied across multiple tiers of the enterprise architecture. While the specific structure of these models may vary, they generally segment the enterprise architecture into some combination of perimeter, network, host, data and/or application tiers. Perimeter defenses, for example, typically include firewalls and anti-virus email gateways. Network defenses may include network-based intrusion detection systems and access/authentication controls. Datalayer defenses may include encryption and another set of access/authentication controls.

There are several reasons a layered security model is crucial for HIPAA compliance. First, it helps prevent critical health care assets from being put at risk because of the failure of any single security measure. Second, it creates additional protection from destruction, loss, unauthorized alteration or other misuse — by either internal or external sources. Third, it often creates synergies between layers that can effectively thwart exploits that might otherwise be successful. This is the case when an application-level access control tool blacklists the IP address of someone who makes too many password guesses and then forwards that banned IP address to a network-level defense to prevent additional attempts on other systems.

Layered models may also segment security measures into physical, logical and operational components. Again, these multiple layers create redundancies and synergies that help to more effectively protect the enterprise from both the malicious and accidental threats that can originate internally and externally.

KVM technology is a critical component of any such layered security strategy. At the logical/network layer, KVM acts as an internal “firewall” to prevent unauthorized users who have penetrated

perimeter defenses from gaining access to data center resources. At the same time, KVM provides host-layer security from both a physical and logical standpoint. Physically, the technology allows host resources to be placed in a secure environment so that their use can be restricted to those users who are authorized via the KVM system’s remote access mechanisms. Logically, it protects host resources by providing the means by which users are given access to specific systems for specific tasks.

The control of physical access to critical servers is particularly important. For example, a health care data center may have its database servers in the same physical location as its email servers. Allowing email server administrators into the same room as database servers without supervision is likely to be considered a significant security breach. Put simply, it threatens the integrity of the data placed there. With KVM over IP switching, on the other hand, email server administrators can be granted the console-level access they need without compromising those policies.

Combined with associated best practices — such as ensuring that the rights of technicians who leave the company are rescinded in a timely manner — KVM switching provides a uniquely powerful and effective way of ensuring that critical computing resources are not compromised by unauthorized access. As such, it is the ideal complement to the other classic components of a layered security model such as firewalls and admin-level passwords.

Leveraging industry-standard security for greater compliance

Of course, in order to provide such valuable security capabilities, a KVM over IP system must itself be highly secure. Not all IP-based switching systems are created the same. A significant differentiator is the layered security model. Choosing the wrong KVM system that allows appliance-based access could lead to a security breach. Data could be corrupted or stolen. Critical business services could be compromised. And, theoretically, a malicious intruder could use a hijacked KVM system to continue “eavesdropping” on sensitive IT activities over an extended period of time.

Effective security is therefore an essential consideration in assessing, implementing and managing KVM over IP technology. Just as enterprise security as a whole requires a multi-faceted approach, so too does KVM security. The following are the key “facets” to consider when evaluating KVM over IP system security models.

Authentication - HIPAA requires companies to have technical safeguards that control access to computer systems and prevent communications containing Electronic Protected Health Information (EPHI) from being intercepted by anyone other than the intended recipient. KVM authentication mechanisms can help restrict access to authorized users. Ideally, an industry-accepted

authentication method (such as Active Directory, Lightweight Directory Access Protocol (LDAP), NT, TACAS+ and/or Radius) should be used in conjunction with the KVM system's own access control to ensure that the specific user is entitled to access each specific device. You should be able to assign device-level rights based on a user's name so that administrators have access to more devices than, for example, an entry-level technician.

Additional security can be achieved through a key exchange between the KVM appliance and the client access software. Best practice security also requires that a time limit be put on this exchange.

To streamline administration, a centralized engine should be used to manage access rights across all enterprise locations. This eases security-related workloads and ensures that common security policies are implemented for all devices. Many health care organizations will want to leverage their existing LDAP infrastructure so that the administration of their KVM security is fully integrated with their overall enterprise security processes.

Encryption - Data encryption is also essential for HIPAA compliance which calls for encryption to be utilized when EPHI information flows over open networks. This helps eliminate the possibility of critical systems being compromised by the interception of legitimate KVM sessions. The level of encryption that can be used is contingent on the ability of the OS, device and/or browser involved. Best KVM security practices should include 128bit SSL encryption, AES and 3DES encryption – which encrypts, decrypts and re-encrypts data with three separate keys. Ideally, the KVM system will automatically implement the highest level of encryption that the environment can support in order to optimize security.

Failover - In addition to addressing internal and external security threats, HIPAA requires a contingency plan be in place for responding to emergencies, including disaster recovery procedures. Secure KVM systems can help prevent critical business processes from being interrupted due to power failures, fire, severe weather or other types of disasters. If a KVM system can be disrupted by a single point-of-failure, it may expose the business to unacceptable risk. To eliminate this risk, a KVM system should offer mirrored, redundant authentication capabilities with fully automatic failover functionality. In the event that a primary server goes off-line for any reason, the secondary server should fully support KVM access to all target resources with exactly the same sets of rights and privileges in place.

Auditing - Auditing mechanisms are also critical for the maintenance of KVM security. These logs should provide appropriate native reporting and/or be exportable into popular reporting applications

so that anomalies and trends can quickly be detected. In particular, security managers should continually monitor events such as failed authentications and attempts to gain access beyond authorized permissions. Comprehensive audits should also be performed regularly in conjunction with other security best practices.

Virtual media support – Virtual media is defined as simulated media that performs the same function of a mass storage device without being physically connected. This translates into additional remote capabilities. This support should go across all server platforms and not be dependent on a brand name. Virtual media provides the administrator one more reason to stay out of the data center and thus comply with HIPAA provisions designed to protect against inappropriate access to protected data.

How Avocent solutions can help

Avocent KVM over IP solutions offer a fieldproven security architecture used by thousands of customers worldwide in complex IT environments. Avocent continues to enhance its security mechanisms in response to evolving threats and changing approaches to enterprise security management.

Avocent DS Series KVM over IP solutions, including DSView® 3 management software, provide several key advantages for IT organizations seeking to ensure the absolute integrity of critical computing resources while gaining the security and productivity advantages offered by KVM technology.

The Security Rule within HIPAA identifies three categories of standards: administrative, physical and technical. KVM over IP is based in the technical category. HIPAA technical safeguards are outlined in the Code of Federal Regulations, Title 45 – Public Welfare, Part 164 Security and Privacy, Section 312 (45 CFR §164.312). They detail the standards for access control, auditing, user authentication and the other technical measures involved in securing stored and transmitted EPHI. While Avocent solutions are not intended to be portrayed within this paper as a total solution for HIPAA compliance, the following advantages do complement some “Required” and “Addressable” compliance measures.

Reliable failover capability – The ability to enact emergency access procedures for obtaining necessary EPHI during an emergency is considered Required under 45 CFR §164.312. **An emergency constitutes something – such as a fire, natural disaster, vandalism or system failure – that can damage your system containing EPHI. You therefore require the means to enter an emergency mode of operation that enables your enterprise to continue to operate in the event of any such emergency.**

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The Avocent hub and spoke model for IT data center device management plays the role of providing a solid failover system. DSView servers are synchronized in real time; if the “hub” server suffers a problem or shuts down, a “spoke” server then becomes the primary hub without loss of data or transactions. A customer can prepare for disaster recovery or any outage with up to 15 separate, remote spokes. All components are kept in sync ensuring the integrity of the entire system.

Secure credentials and authentication – Unique User Identification is also Required under 45 CFR §164.312. It’s part of Entity authentication where measures are in place to verify that a person or entity seeking access to EPHI is the one claimed. The purpose is to prevent unauthorized access to data that is transmitted over a communications network.

Avocent DSView 3 software provides for implementing user authentication using either the software’s internal database or an external authentication service. DSView 3 software supports RSA SecurID two-factor authentication as well as Active Directory, LDAP, NT, TACAS+ and RADIUS.

After a user is authenticated by the DSView 3 software, they are only presented with a view of the resources for which they have been granted access. When the user clicks on a resource to establish a KVM session, the DSView server first authenticates the user. The DSView server then retrieves the information necessary to establish the KVM session from the targeted resource and forwards that information to the DSView client. Only then can the DSView client connect via the KVM switch to the resource.

This “moderated connection” model is widely accepted for securing communications (as, for example, with H.232 for VoIP). Also, it is important to note that the moderated connection simply establishes communication between the DSView client and the targeted resource. The user must still use secure credentials to actually log on to the resource. Thus, in addition to enabling layered security, Avocent DS Series solutions employ a layered security model.

The Avocent DS15100 IPMI proxy appliance, also managed by DSView 3 software, provides a browser-based, out-of-band interface to securely monitor and control power and system health on IPMI-enabled servers. DSView 3 software allows access to these servers only after user authentication and uses the same interface used for KVM, serial and external-managed power connections.

Secure communications – Integrity Controls are addressed within the Transmission Security safeguards of HIPAA regulations. While not Required, they are considered an Addressable implementation. Integrity Controls are designed to implement

security measures to ensure that electronically transmitted EPHI is not improperly modified without detection until disposed.

Here is a detailed look at how Avocent solutions provide support in a secure communication process. DSView 3 management software is compatible with Windows-based operating systems and can be installed on enterprise Red Hat Linux operating systems. The DSView client communicates with the DSView server using a standard Web browser such as Internet Explorer, Netscape, Firefox and Mozilla. The communication protocol used between the client browser and the DSView server is the HTTPS protocol. The TCP port used is configurable on the DSView server and must be specified in the browser URL. HTML documents are transmitted over this HTTPS link.

When the DSView client first connects, it must authenticate with the DSView server using either a login or client certificate. If the DSView server is configured for external authentication, the login request is redirected to the external authentication service. The protocol used depends upon the type of external authentication server.

The security of authentication using DSView 3 software is strengthened by:

- The use of message timestamps to automatically terminate sessions that are not established in a timely manner
- AES, DES, 3DES or 128bit SSL encryption of session establishment messages
- Use of X.509 certificate-based SSL for all communication between DSView client, DSView server and Avocent appliances

Security and ease-of-administration are enhanced through the use of Single Sign-On (SSO), which allows users and permissions to be added, modified and deleted in a common manner across multiple devices. This eliminates the potential security lapses and additional administrative work created when multiple redundant user databases must be managed separately.

Customers may also leverage their LDAP implementations to support KVM permissions management. This can further streamline security administration and enable KVM access rights to be managed in a common manner with other enterprise systems. Again, this authentication environment ensures that only authorized users gain access to KVM-enabled resources and that those users only access devices for which they have been given specific permissions. It also enables security managers to enforce security policies with minimal manual intervention.

Encryption – The Avocent KVM solution discussed in this section will complement HIPAA compliance implementations you have in place to address Transmission Security.

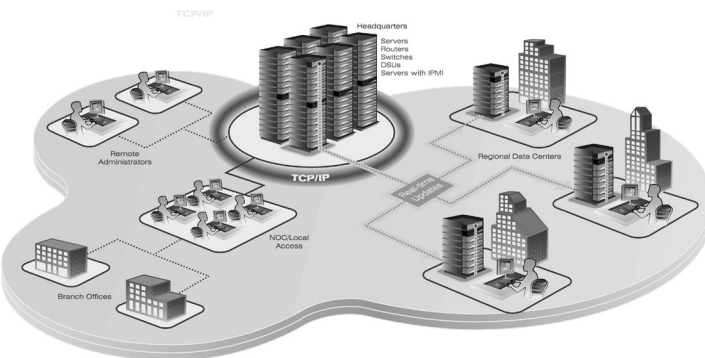
Avocent KVM over IP solutions automatically apply the highest practical level encryption – including AES, DES, 3DES and 128bit SSL technology – to all authentication and operational sessions communications. Authorized security administrators can also set encryption levels manually. Encryption of the video stream is separately configurable.

It is also important to note that in the case of remote KVM sessions taking place across VPNs, the traffic between the user and the resource is already being encrypted. This provides another level of protection for KVM traffic and may affect decisions about whether or not to additionally encrypt that traffic using the encryption functionality of the Avocent platform.

Virtual media – Virtual media, although not directly addressed in HIPAA technical safeguards, can be considered an aid in protecting Transmission Security.

Virtual media enables administrators to achieve increased operational efficiency in remote server management by mapping local removable media or a mass storage device to a remote server. This provides the administrator the ability to perform file transfers, application and OS patches, and diagnostic testing from a CD. The Avocent solution permits this process using DSView® 3 management software. Through the appliance interface, the administrator can plug a USB 2.0 device directly into the appliance in the data center and apply a patch across all the connected servers.

Virtual media accessed by DSView 3 software and DSR® switch appliances centralizes IT staff and provides the tools to leverage IT expertise in distributed IT environments. It also helps control



physical access to data centers and server rooms, and makes for a more efficient workday by keeping IT administrators at their desks.

Auditing capabilities – Audit controls are Required within 45 CFR §164.312 for HIPAA compliance. Avocent solutions serve as a line of support.

DSView 3 management software captures all relevant data about sessions, users and operations across the environment. This data can be used to generate native reports for granular security auditing – or exported in CSV format for use in popular applications such as Microsoft Excel and Crystal Reports. Such reports can be customized and examined to see if anyone using one identity to gain access to the KVM system is using a different identity to log on to specific servers. This would be clear evidence of a potential internal security breach.

In addition to offering IT organizations the most secure architecture for KVM implementation, the Avocent solution also provides a variety of features that make it especially effective for supporting layered enterprise IT security. For example, with DSView 3 software, KVM views can be automatically populated by retrieving the requisite data from remote devices. This supports the implementation of highly secure server rooms that strictly control physical access to servers, while eliminating the labor and potential for error that arise when views are manually populated.

Exit macros – While there is no specific HIPAA requirement for exit macros, it is a part of the Avocent solution that can help reinforce measures addressed within safeguards for workstation security and automatic logoff.

One of the perils of suffering a network failure, client machine lockup or inactivity disconnection is exposure to outside manipulation or attacks. Your servers are still basically “open,” logged in, and highly vulnerable. Most KVM providers are helpless to provide a solution. To further enhance security, Avocent DSView 3 software provides exit macros that send the keystrokes required to log out each user when a session is terminated for any reason. This protects against one user accessing a server under the assumed identity of the person previously on the same server.

Avocent solutions are uniquely secure and powerful to enhance enterprise security and complement safeguards in place to meet HIPAA compliance.

An action plan for KVM acquisition

The compliance challenges presented by HIPAA often fall on the shoulders of the IT departments of health care facilities and organizations to help establish and maintain the security of their protected health information.

Because KVM technology is such a valuable component of enterprise data protection, IT security managers are typically leading business drivers for acquiring a KVM switching system. The three key issues managers face as they pursue acquisition of KVM technology are scope, cost justification and competitive evaluation.

Scope - Before being able to calculate the exact cost of a KVM solution – or which vendor’s solution is most appropriate – it is first necessary to determine the scope of the KVM implementation. Factors affecting scope include the number of devices being managed, the number of distinct locations where those devices are situated, the number of staff members being given KVM access privileges and the diversity of those privileges.

Cost justification - KVM acquisition is usually not cost-justified based on security benefits alone. Instead, it is the operational benefits of KVM that are primarily used in ROI analysis. These operational benefits include reduced labor, reduced travel, and increased uptime. They are almost always sufficient for cost-justifying acquisition of the technology, which means that the additional security benefits provided by KVM are essentially all “gravy.”

For example, one leading not-for-profit health care network was able to remove over 24 monitor/keyboard/mice from their data center and free up valuable real estate to add much needed servers. The KVM purchase also resulted in total server access for IT administrators, limited access to other personnel and no access to the general public, all features that also helped meet HIPAA requirements.

Competitive evaluation - Once the decision has been made to acquire KVM over IP technology, the next question is which KVM over IP vendor offers the best solution to buy. Key considerations in any evaluation of competing KVM solutions are likely to include operational features, ease of implementation, ease of use, scalability and overall value. However, as outlined in this paper, security concerns are also important to consider when selecting an enterprise KVM platform. In particular, decision-makers should

carefully assess and compare the following security-related characteristics of competitive KVM over IP solutions:

- Failover functionality
- Strength of authentication and encryption mechanisms
- Ease and granularity of administration of KVM privileges
- The ability to administer security policies for KVM in a manner common with other IT management systems
- Virtual media capabilities
- Auditing capabilities
- Exit macros

It’s also important to choose a KVM vendor with a proven track record of technical advancement and innovation. As the overall IT landscape evolves, KVM over IP solutions must evolve accordingly. And, with these systems playing an increasingly critical role in IT operations and IT security, the ability of KVM over IP solutions to keep pace with changing requirements should be a primary consideration.

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