



Reclaiming Data Center Real Estate Using KVM and Remote Management Technologies

Many large companies do not realize the great pains that network administrators go through to maximize real estate in an enterprise-class data center. Space is costly and network administrators continually rely upon devices that help them do more with less. One such tool to aid in this effort is the KVM (keyboard/video/mouse) switch that enables IT pros to easily and effectively manage servers and other network devices – within the data center or from remote locations. Data centers are continuing to expand. Some are bursting to capacity as new devices are added, security measurements taken and infrastructures swelling to keep pace with the need for more complex applications and technologies. To better control these devices, the KVM switch has evolved into a truly empowering tool for network administrators.

Chicago-based Society of Critical Care Medicine (SCCM) is the largest multi-professional organization dedicated to ensuring excellence and consistency in the practice of critical care. Given the small size of its data center and the need to expand the number of servers, the Society researched KVM solutions to eliminate the clutter and cost involved with purchasing and connecting a keyboard and monitor to each server.

This white paper will discuss how organizations of all sizes can optimize their data centers using KVM and remote technology to set new standards of excellence in reclaiming precious rack space. The paper will also offer information on achieving that excellence and use real-life examples of dynamic organizations with the vision to understand the inherent benefits of this approach.

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Why it is Critical to Optimize Data Center Real Estate

Network administrators are bombarded on so many fronts to keep an organization's information infrastructure operating 24/7 with the least amount of issues. These IT pros are faced with the dual pressures of keeping the lights on while keeping "cost per U" down in the rack in an ever-expanding data center.

According to a recent report by Gartner, data center facilities rarely meet the operational and capacity requirements of their initial design. The combination of new technologies, such as blade servers, which require substantial incremental power and cooling capacity; pressures to consolidate multiple data centers into fewer locations; the need for incremental space; changes in operational procedures; and potential changes in safety and security regulations converge to impose constant facilities changes in the modern data center. Thus, the overarching rule in data center facilities is to design for flexibility and scalability. (Source: Gartner, April 22, 2005, Use Best Practices to Design Data Center Facilities).

For example, a typical server room requires climate control, special flooring and ceiling for cables to pass through, and pulling of those networking cables to all the nodes – this can add up to a cost of \$500 per square foot to construct the data center. It is not uncommon for larger enterprises to spend even seven figures on construction of the server room by the time that materials, contractors, environmental set up, security, and other unforeseen issues are factored into the equation.

Rack size is also another cost factor. Servers can reach depths of 30" which requires a rack that is 24" x 36". With the added 36" at the front and 24" at the back, this will need about 5' x 5' or 25 square feet. Therefore, it would cost \$12,500 (\$500 x 25) for the area. Network administrators must also consider the rack itself. Usually, a server closet with racks and a glass door costs between \$2,000 and \$3,000. However, with servers being pushed to maximum capacity, there is much heat emitted which requires more expensive racks with advanced cooling, power strip, and cooling fans. This drives rack cost up another \$2,000. Plus, each rack should come with UPS power protection at another \$2,000. Under this setup, a gigabit network switch is needed on each rack -- \$2,000 more. The picture is pretty clear now with the costs in this example nearing \$17,000. In an average size data center, a typical rack has about 42 RU (1.5" per Rack Unit) with 35U of actual usable space since UPS and batteries are normally placed at the base of the rack. With that in mind, when the \$17,000 is divided by 35U, the cost per U equals approximately \$485 per U. This does not take into consideration the energy bill to power a data center.

Beyond these data center costs outlined in the previous example, the escalation in "cost per U" can also be attributed to the rising demand for high bandwidth that is forcing organizations to quickly upgrade their infrastructure to accommodate more data. This process includes upgrading all the cabling from regular CAT5e to CAT6 or fiber to accommodate the multi-Gigabit Ethernet. In addition, this upgrade to the server rack must also account for environmental control since most high end servers and blade servers generate extensive amounts of heat. Environmental control is critical in maintaining optimal temperatures under certain levels to allow servers to function normally.

The following examples reinforce that fact that more complex network infrastructures demand more control within the data center and remotely. One such tool to aid in this effort is the KVM (keyboard/video/mouse) switch that enables IT pros to easily and effectively manage servers and other network devices – within the data center or from remote locations.

Complementing KVM technology, remote management tools have also emerged as an effective weapon in the network administrator’s arsenal to reclaim data center space. Remote management products provide customers a hub-and-spoke management model that offers an ideal solution for any data center or server room. These products facilitate the reduction of downtime, while maximizing profits typically lost as operating expenditures. Remote KVM access solutions provide IT administrators with the ability to diagnose, control and repair server-based problems from any location in real time. Before taking these steps, it is imperative to have a comprehensive battle plan or blueprint to optimize data center real estate.

Data Center Real Estate Optimization

Selecting the Right Solution

Critical to the success of optimizing data center real estate hinges on the selection of the right KVM or remote management solution. It is paramount to select a vendor with expertise that goes beyond the solution but understands the pains associated with data center space. This includes assessing the best solution for an organization, evaluating if use is restricted more within walls versus remote access.

VDC, a technology market research and strategy firm that tracks the KVM and remote management space very closely, provides the following KVM switch characteristics to consider: (Source: VDC, April 2005, KVM and Console Switch Solutions):

- Scalability – The switch’s ability to accommodate more devices as an organization grows.
- Flexibility – As IT infrastructure grows in size and different components are introduced, it is increasingly important that KVM Switches have the ability to handle multiple platforms and devices.
- Simplicity – KVM Switch solutions should be deployed with at little ease as possible working “right out of the box.”
- IP Connectivity – IP Connectivity provides remote access to servers, is easily scalable, and is hardware independent.
- High Availability – Network outages are more costly than ever – users demand reliability features that can minimize downtime.

In addition, the emergence of LCD KVM solutions has opened up a multitude of possibilities to reclaim data center space. One model from ATEN Technology, Inc. offers a dual-rail design that allows the console to slide back while the LCD panel remains in plain sight – even with the server rack door closed – to monitor and troubleshoot servers. This provides data center administrators with powerful server access coupled with the convenience of viewing the LCD monitor while the keyboard and touchpad are tucked away neatly in the rack. This offers network administrators a space-saving and cost-effective KVM solution that counteracts cable and hardware clutter.

Cable Management is Key

In addition to the actual KVM solution, it is equally important to practice optimal cable management. There are two schools of thought on this KVM cabling issue – cascading and daisy chaining – each with its own merits, but one being more efficient than the other.

Cascading KVM switches is a method of adding capacity to a KVM installation. It involves using a CPU port of the Parent KVM switch and connecting to a Child KVM switch. With numerous Child switches linked down from the Parent, the effect is reminiscent of the way water cascades down over a waterfall. Cascading can significantly increase the number of computers on an installation. However, the Parent switch loses one CPU port for each cascaded KVM switch that is added.

Daisy Chaining is a method of expanding the capacity of a KVM switch installation. The first Daisy Chained KVM switch is called the Primary unit and each subsequent unit on the chain is referred to as Secondary. In a typical daisy chained installation, KVM switches are strung together similar to how one makes chains of daisy flowers by tying the head of one daisy to another.

However, Daisy Chaining has several advantages over Cascading. Cascading loses one port every time you perform it. Plus, Cascading gives network administrators cabling headaches with a messy cabling configuration since each Child switch is connected to one port on the Parent switch -- the more you cascade, the worse cable management.

Network administrators should practice the following when Daisy Chaining a KVM switch:

1. Use cables that have been certified or approved by the manufacturer for use with the particular KVM switch
2. Ensure that all KVM switches have the most updated firmware installed
3. Follow good cabling practice -- NO sharp angles or creases in the cable
4. Follow the system labeling in the OSD (on screen display) to help identify each system for easy navigation
5. Try using the shortest cables possible to prevent signal loss

Beyond Daisy Chaining, the key to efficient cable management really comes down to the type of cable used in the data center. Thinner KVM cables provide more flexibility and space utilization as network administrators are faced with connecting more devices to the KVM switch. Thicker KVM cables tend to add more unnecessary clutter.

The Data Center Environment – The Importance of Climate Control

Data center space reclamation also is contingent upon optimal environmental conditions prompting KVM vendors to develop enterprise-class remote environment monitoring and management device geared to large enterprise data centers. The demand for IT remote environmental monitoring solutions continues to grow rapidly, especially if an organization's mission-critical information could be compromised by changes to the environment. This has been especially prevalent in dealing with such disasters as Hurricane Katrina and other natural climate disturbances. These devices enable network administrators to access and control server environment settings (temperature, humidity, voltage and current) to eliminate any irregularities that could potentially bring a network down. Through daisy chaining of additional units, thousands of servers can be environmentally controlled.

Data Center Real Estate Reclamation in Action

Organizations that have thrived with their data center real estate reclamation initiatives have built their success on selecting the right solutions that optimize space and reduce costs. The following is an example of data center real estate reclamation in action.

With nearly 13,000 members worldwide, the Society of Critical Care Medicine (SCCM) is the largest multi-professional organization dedicated to ensuring excellence and consistency in the practice of critical care. SCCM is a highly tech savvy organization as evidenced by its deployment of CRM, use of IP telephony services that enable employees and volunteers to work from home or on the road, and operation of a variety of online discussion forums. Plus, SCCM was one of the first organizations of its kind to offer a range of information via RSS and audio/video podcasts. SCCM currently houses 26 Dell, Compaq and Intel servers running on Windows 2003 with Microsoft SQL powered by a 5-person IT staff that backs up all data on the servers – just under 1 terabyte (TB) – each day.

Given the small size of its data center and the need to expand the number of servers, the Society researched KVM solutions to eliminate the clutter involved with connecting a keyboard and monitor to each server. Without KVM, SCCM could not manage a large number of servers from a single device and it would be impossible to fit 20-plus monitors in an already compact server room.” The Society needed KVM solutions that would not consume precious rack space yet also provided reliability when faced with adverse situations.

SCCM's KVM solutions were recently put to the test during the 2005 Hurricane Katrina disaster. The Society worked closely with the Federal Emergency Management Agency (FEMA) and National Institute of Health (NIH) for volunteer relief efforts. The SCCM received a request from NIH to collect and provide names of volunteers who could make a two-week commitment for relief efforts -- the organization immediately solicited volunteers on its web site. Soon after, SCCM servers were hit hard by large numbers of prospective volunteers accessing its site. On-site staff members used KVM units to monitor and troubleshoot the servers for error messages and problems, eliminating any network downtime. Ultimately, 250 volunteers met the criteria and were successfully deployed at the Astrodome in Houston to set up field hospitals and tend to the medical needs of survivors. Without KVM solutions installed, it would have been a nightmare for SCCM to diagnose its servers for errors.

Data Center Real Estate Reclamation in Action

For prospective KVM users, SCCM recommends staying away from non-emulating units and mouse trackballs -- consider only KVMs that take up no more than 1U of vertical space and make sure that the sliding KVM unit has stationary cable connections. SCCM has plans to move to a new building in 2008 since they have outgrown its current location. A new data center will be built and with KVM units prominent for each and every rack.

Recommendations

- Understand the critical need to optimize data center real estate in a climate of complex network infrastructures
- Select the right solution from a vendor with a depth and breadth of relevant expertise that goes beyond the solution but understands the pains associated with data center space
- Practice proper cable management to optimize rack space
- Create a data center environment with the appropriate temperature controls for server optimization
- Contact other organizations that have successfully practiced data center real estate reclamation

Summary

Data center real estate reclamation will continue to play a pivotal role in the success of a data center. The key to optimizing data center real estate is contingent upon network administrators with the foresight to use all the tools outlined to do more with less, especially when the information infrastructure is at stake.

Adhering to these principles will allow organizations to keep pace with technology, adding new applications and technologies without impacting their data centers, and ultimately maintaining cost efficiencies.

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