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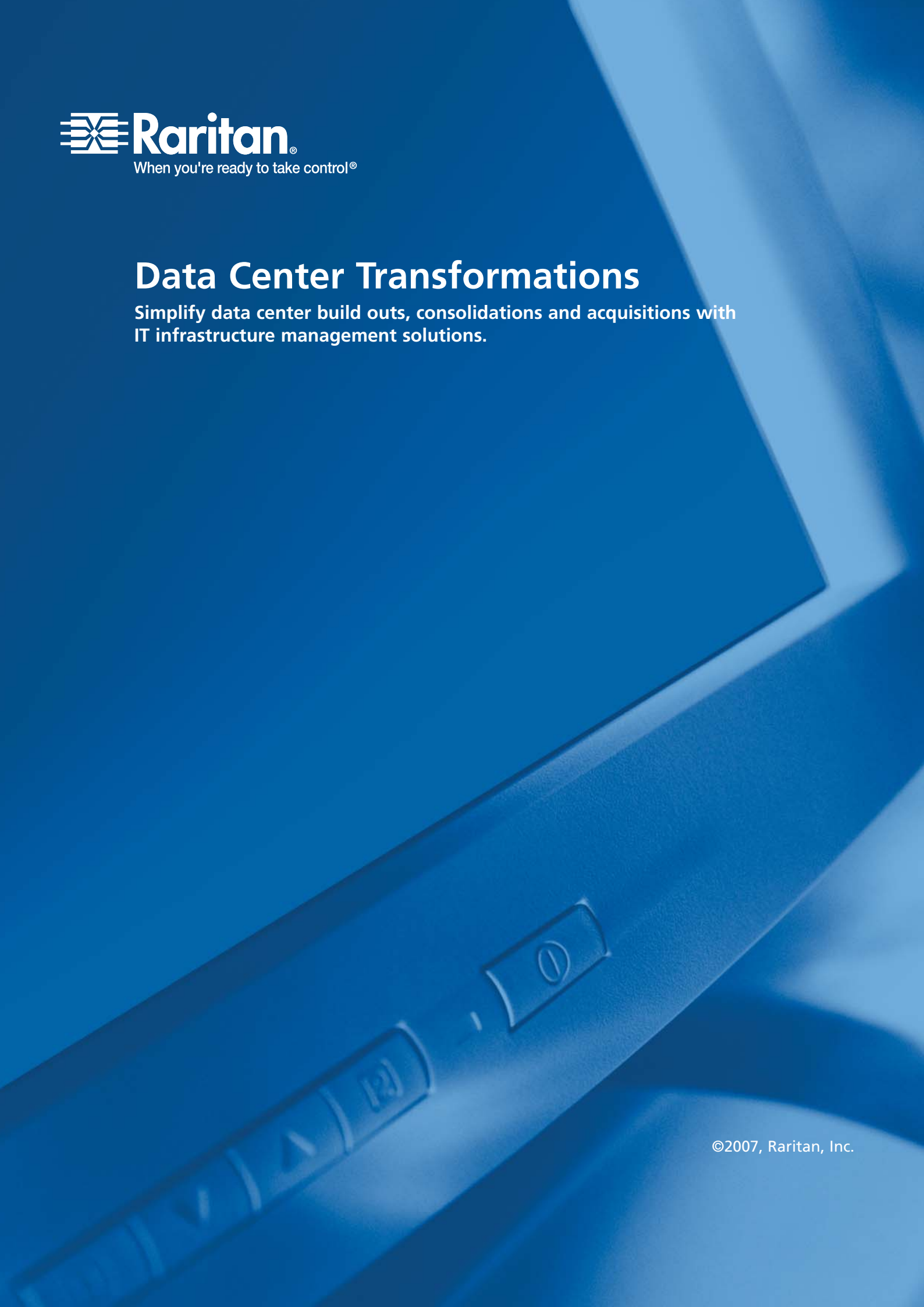
Data Center Transformations

Simplify data center build outs, consolidations and acquisitions with IT infrastructure management solutions.



Abstract

Changes in information technology (IT) can be split into two broad categories. Moves, additions and changes (MAC) are day-to-day IT activities which involve adding and removing end-user personnel, changing end-user locations such as when an employee moves to a different cubicle and upgrades services. Build outs, consolidations and acquisitions (BOCA) are large-scale projects which can be very disruptive and require careful planning and implementation to maintain operations. Key considerations are the complexity and risks such data center transformations bring with them and establishing a process that ensures success. This white paper examines the BOCA process and what is required to meet IT goals and objectives and maintain business continuity.

Implementing an effective BOCA project requires progress through five basic stages: assess, plan, build, stabilize and optimize. This paper will discuss each of the five stages and how the right remote access and IT infrastructure management tools, deployed early and used for monitoring and management throughout the process, will dramatically improve overall efficiency. Furthermore, by minimizing the need to travel and reducing cycle times these tools can play a critical role in successfully implementing a BOCA project in a timely, productive and efficient manner.

Data Center Transformations and the BOCA Process

The IT community, including end users, consultants and installation contractors, is familiar with MAC - Moves, Adds and Changes – to IT network infrastructure. MAC work occurs on a daily basis as end-user personnel are added or removed, change locations or upgrade services. MAC work is handled locally, sometimes informally and, for some sites, almost continuously. This paper considers data center transformations and introduces a new process - BOCA - Build Outs, Consolidations and Acquisitions. Different than MAC, BOCA supports large scale projects - new data center build outs, restacks of existing data centers, major technology upgrades and the integration of data centers as a result of a business acquisition.

The BOCA process supports a data center as it grows in size, complexity and criticality. Once implemented, the BOCA procedures are intended to create an IT infrastructure that will support future growth while minimizing the impact on existing facilities and operations.

Key considerations in a data center transformation are the complexity and risks such transformations bring with them and establishing processes that ensure success. Often data center transformations, and BOCA projects, are triggered by business, not IT, decisions that may not allow sufficient planning or accommodation for either existing IT infrastructure priorities or the opportunity to improve the final outcome using the right IT tools and processes. Key questions to ask include the following:

- Does the senior business management team understand what they are asking of the IT department?
- Does the business realize that IT transformation logistics planning are critical in order to maintain IT services?
- Are key interdependencies identified and rationalized between the business and IT?
- Have the risks been assessed and contingency plans been developed?

Implementing an effective BOCA project progresses through five basic stages: assess, plan, build, stabilize and optimize. This paper will discuss each of the five stages and how the right remote access and IT infrastructure management tools, deployed early and monitored throughout the process, will dramatically improve overall efficiency.

By installing robust out-of-band KVM (Keyboard, Video, Mouse) switches and serial console servers early on, the BOCA team gets the benefits of detailed network information and remote access early in the project. Beyond a traditional IT equipment focus, intelligent power distribution tools that optimize the consumption and distribution of power can dramatically improve the total operational efficiency.

Data Center Transformations

Today, data centers are being transformed for a variety of reasons - the need to support additional capacity, consolidate IT facilities and operations, gain access to more reliable sources of electrical power and many other reasons. Some transformations are the result of an IT operations initiative such as cutting IT costs or implementing a new business continuity/disaster recovery (BCDR) plan. In many cases other departments drive data center changes such as requiring new IT services, incorporating the IT assets of an acquired company or relocating IT infrastructure to a new facility.

Duane Morris, LLP, a Philadelphia law firm, moved its data center across the street but that move provided many important opportunities for the IT department.

"It was an opportunity to implement a whole new data center design," said Michael Carpinella, the Duane Morris technical services director. "It was a chance to improve security; to streamline operations, administration and maintenance; to lower total cost of ownership; and maximize application availability for an international, round-the-clock operation."

Whatever the impetus for the transformation, the IT department is usually the one made responsible for implementing the changes. Unfortunately, these tasks come on top of the IT department's day-to-day duties and involve skills that go well beyond installing a few Windows® patches. Add to this the fact that the IT infrastructure and the applications and services it supports must keep functioning 24/7/365 despite the transformation. The expression "changing the tires while the car is moving" comes to mind.

The BOCA Process - Assess

This stage involves understanding what you have and what you hope to accomplish. To pull off a tire change at 65 miles per hour requires world-class project management skills and the information necessary to make the most of those skills. The nature of such projects will obviously vary. However, to know whether or not the right objectives and goals have been set, and whether or not they are ultimately achieved, requires establishing current-state performance and utilization baselines. You need a detailed inventory of what you have, and some form of availability and performance monitoring to set the baselines for how well the IT system is currently functioning, what service levels need to be maintained, and where changes and improvements should be made.

The BOCA Process - Plan

As described above, planning a BOCA project requires an accurate inventory of all the IT assets and resources and a picture of the network's availability and performance. For the planning stage, you need to determine how you will get from the current state to the end-state goals and objectives.

Schedule slips can have adverse affects including paying penalties, extending contracts with third parties and not being able to utilize the systems and services that were the reasons for the BOCA project in the first place. Secure, remote access can really help to keep a project on schedule by reducing physical travel, promoting collaboration among subject matter experts and by allowing access to the network from anywhere at anytime.

IT operational goals are only one of the criteria by which the project will be judged. Consider the impact of schedule slips on M&A deal consummation deadlines or the cost impacts of extending third-party contracts or the problems caused by consuming greater-than-expected IT staff time. What will happen if a physical move is delayed because IT isn't ready? What if the data center changes, such as additional cooling or power, are not in place by the start of a major new product launch? What contingency plans are in place if final hour testing just prior to a cutover uncovers some serious shortcomings, for example the need to balance power demands across equipment racks? Remote access solutions alone won't solve these problems but they can go a long way to keeping projects on schedule and to efficiently resolving both foreseen and unforeseen issues.

The keys to achieving a good BOCA project are the following:

- **Simplicity**: proliferation of complex systems makes it more important than ever to have a management tool that reduces the number of touch points needed to monitor and respond to network events.
- **Visibility**: gain perspective and understanding of performance, utilization, interdependencies and potential risks. Visibility gives you the ability to be proactive, to plan ahead and develop a clear roadmap.
- **Continuity**: developing robust fault tolerant infrastructure by identifying, prioritizing and managing risks.
- **Partnership**: align the business and IT managers to a common and well-defined outcome.
- **Transparency**: milestone reporting to up-stream managers that flags problems before they become disasters.

An IT department won't make a move until they are confident that real-time availability, security and mean time to repair (MTTR) will not be adversely affected. In fact, one of the planning goals, perhaps even the reason for the move, is likely to be that these areas improve.

The BOCA Process - Build

By minimizing the need to travel and reducing cycle times, remote IT infrastructure tools can play a critical role in successfully implementing a BOCA project in a timely and efficient manner.

The build phase may be as simple as adding a few more servers to an existing rack. Though even this apparently simple build out could involve some significant interface issues. Imagine the potential complexity if the new servers are to be the physical home for several virtual servers providing entirely new IT services. What if there is no more space in the equipment racks, or if the power and cooling required of the data center are already beyond the design limits? Imagine the complexity of dealing with these and other issues when consolidating IT equipment and operations across the globe.

A key consideration is minimizing service disruptions during the transition. Downtime is a key measure of the extent of disruptions but downtime should be considered in the context of end-user "customer" satisfaction. A three hour network outage beginning at 1 a.m. has much less negative impact on customer satisfaction than a 20 minute outage beginning at 10 a.m. Though as companies, even midsize ones, become more global, it is more difficult to find times when the network can be out without adversely affecting customer satisfaction and confidence somewhere in the world.

Often, a physical count of equipment, the linkages between the components, and the necessary support including cabling, power, etc., is left for the end of a project. Gathering such important information this late in the process means the data center managers lack critical information and remote access, both of which can significantly simplify a BOCA build phase and improve efficiency and productivity.

Presumably, facility power requirements have been carefully specified but do you know what each device actually draws? Just looking at specifications won't provide an accurate picture and is likely to lead to underloading equipment racks. This can be an issue during the initial equipment installation and even more so during subsequent additions. Having real-time, device-level current draws helps facilities and IT managers coordinate and optimize their efforts.

Software-only and in-band access solutions won't work if the operating system is hung or the network is down. Under these conditions the only way to remediate a problem server would be directly at the rack or with power cycling supported by an intelligent PDU.

Remote Access Solutions

By installing robust out-of-band KVM (Keyboard, Video, Mouse) switches and serial console servers early on, such as when the racks and network connections are laid out, the BOCA team gets the benefits of detailed network information and remote access early in the process when those benefits can have the most significant impact. A matrix KVM switch allows multiple users, each at a console supported by the KVM switch, to connect to multiple network devices. Secure serial console servers support serial devices, such as networking switches and routers, firewalls and load balancers, through text-based serial interfaces. If the serial console server has modem access, the administrator can establish remote access even before WAN and Internet connectivity is in place.

KVM-over-IP switches have limitations with respect to the number of users that can operate through a single KVM switch at any one time. To overcome such "blocking" limitations, servers that are likely to require frequent access can be spread over multiple KVM-over-IP switches. One of the advantages of KVM-over-IP solutions is that they require only a moderate amount of Cat5 cabling. This makes them a good remote alternative where access or space for cables is limited such as when expanding an existing data center facility. It is important to remember that as more cabling is added to a rack more air flow is restricted leading to additional cooling issues.

Analog KVM, running locally out of band (over its own network), provides the best mouse synchronization and best video quality. Depending on the network traffic and the user-to-switch distance, mouse response through KVM-over-IP switches may have a small lag and some degradation in video quality. Analog KVM connects to servers and consoles over a dedicated, on-site network. Since the information does not travel over the IP network, analog KVM provides the highest level of security but there are distance limitations and remote access is limited to the data center site itself. KVM over IP rides on the IP network. This means the traffic is publicly available but for all but the most security-concerned end users, e.g., Department of Defense, the traffic can be adequately secured with the proper application of encryption, authentication and authorization.

An intelligent power distribution unit (PDU) further supports remote access. With remote monitoring you are able to keep tabs on the actual power consumption at the individual outlets in real time. If a server should malfunction to the point that it needs to be rebooted, an intelligent PDU can remotely cycle power. In the event of a power outage, the most sophisticated intelligent PDUs can both sequence the power as it comes back on to prevent tripping breakers, and will "remember" which outlets were on and which were off before the power outage occurred. Security must also be ensured at the same high level as server access since remotely turning off power to mission critical servers could be just as damaging as gaining access to the servers themselves. Hence, state-of-theart intelligent PDUs offer secure encryption such as 256-bit AES and support industry-standard authentication and authorization such as LDAP-S, Active Directory®, and RADIUS.

Notifying IT staff and end users of upcoming changes and outages includes not just an announcement but in many cases also involves documentation and training at different levels of sophistication depending on who is affected. Remote access can play a key role in the integration of hardware, applications, services and training. Remote access can be critical for undoing mistakes that may have been caused by less knowledgeable IT staff, or when trying to absorb the IT systems of an acquired company or to consolidate globally dispersed and diverse IT operations.

A Window of Opportunity

The build stage of data center transformations offers windows of opportunity to upgrade to better equipment or facilities and to simplify operations. Often the two go hand in hand. A BOCA allows IT and facility managers to standardize on one or a few hardware and software platforms. This makes the data center more manageable and reduces the number of vendors which further simplifies matters. For example, IT managers might opt for a particular model of server and facility managers might opt for a particular model of equipment rack. With the right information, IT and facility managers can coordinate their efforts, for example, ensuring appropriate cooling and power distribution schemes.

A data center transformation is also an opportunity to implement or refine business continuity and disaster recovery (BCDR) plans. Such plans often involve remote locations and multiple systems, cutting across a variety of organizations. Security, a key issue in its own right and in BCDR plans, must be maintained during the transformation and, hopefully, improved as one of the transformation goals. One way this can be accomplished is by creating a lights-out data center limiting physical access to only hardware upgrades and repairs and by restricting access with policy-based KVM over IP for server management and access to intelligent PDUs for power monitoring and control.

Power management has become a major issue for data center managers. As the global price of fossil fuels increase and the per-unit increase in thermal output rises and IT tools become smaller and faster, power management is quickly rising to the top of do-more-with-less issues for the IT industry. Minimizing equipment by implementing virtualization can reduce power demands, though for some applications virtualization drives servers hard so the power savings may not be as great as anticipated. Reducing power consumption reduces the amount of heat and thus the cooling required. Virtualization also conserves scarce rack space. But when multiple services are running on one server it becomes even more critical that IT administrators be able to access and fix problem devices quickly.

The many potential pitfalls in the build stage of a transformation can lead to increased and unnecessary costs from duplication of efforts, duplication of equipment and the costs associated with missing service level agreements (SLAs).

The BOCA Process - Stabilize

Overlapping the build phase is the stabilize phase. During the BOCA process, the IT network must continue to function 24/7/365. Despite adding new equipment, new services, possibly in an entirely new location, the IT network must continue to serve the organization. Implementing the right kind of monitoring can help maintain day-to-day requirements and avoid potentially debilitating outages.

At a high level, stabilizing a data center BOCA means ensuring IT network, process and procedure reliability. Both the IT staff and client/end users must continue to be productive, hopefully with improved efficiency or security or both, as a result of the BOCA effort. Getting all of these factors right, and their interactions, leads to a stabile data center. During the BOCA process there will certainly be some temporary conditions but it is a mistake to wait to the end of the project to deliver on the hoped for improvements or to recognize the underlying interactions.

At the end of the day, a BOCA project must deliver peace of mind. Failure to do so as soon as possible means much greater difficulty establishing not only end-user trust in the network later but IT staff productivity as well. Remote access, control, management and monitoring are critical to minimizing, and hopefully eliminating, events that can adversely affect the level of trust and peace of mind.

Stabilizing Physical Resources

Stabilizing the physical resources involves the proper deployment of power, cooling, cabling and equipment as well as the management of servers and network devices. With respect to power, it is obviously important to distribute adequate power to the various racks of equipment with adequate margins so additional equipment can be added as required. Today however, it is typical for racks to have more power than actually needed, even after allowing headroom for growth.

Heat Removal

Cooling requires careful analysis of the data center as a whole including air flow, vents, air conditioning, the racks and which equipment is in which racks. Sometimes, the interactions of these various factors are not obvious or may even be counterintuitive. For example, adding additional air conditioning might cause some racks to become hotter, not cooler. This can happen if circulation patterns change, e.g., the new air conditioning creates hot air eddy currents instead of allowing hot air to reach return ducts.

A data center is an ecosystem unto itself. Cable and components deployed in the space will have an effect on the overall climate control capabilities of the space. The cables cannot be installed in a random manner; they must be placed with a minimal impact on airflow paths and heated air removal.

Proper selection, configuration and deployment of data center enclosures should be viewed with a keen eye to any effects on room climate control. Enclosures supporting termination and network hardware will have lower heat loads (even for large switches) than those supporting rack mount servers. But with the large number of cables running into termination and network enclosures, care must be taken not to create installations that block air supply and discharge paths. Once in the enclosures, the large volume of cable can act as air dams possibly preventing adequate airflow and circulation.

There are a variety of products for heat removal - passive and active air solutions as well as water cooled cabinets or components. Care must be taken to route cables so as not to interfere with the deployment of these systems. Server enclosures are most likely to be affected but there could also be an impact on network enclosures. Cable bundles cannot be placed in potential airflow paths which can be almost anywhere within the enclosure footprint, but most likely in the rear door for exhaust fans in rack mount server cabinets, base or roof surfaces for chimney air removal systems or front and rear sides for water cooled cabinets. It may not be practical to keep all these spaces clear, but a forward looking program will reduce the impact if and when these systems are deployed.

Enclosures & BOCA

As a continuing part of the BOCA process, enclosure selection and deployment must also be given careful consideration. The enclosures containing passive and active components along with all related connectivity and power cables have an underappreciated yet vital role in the cable management system and BOCA process. For simplicity, data center enclosures can be divided into three basic categories - Termination, Network and Server - each supporting different components and services. As the names imply, the Termination enclosure will support patch panels and related cable management hardware. The Network enclosures support active components, e.g., switches, routers, etc. Server enclosures hold rack mount server and storage components and related ancillary hardware. Each of the three can have different configurations based on the type of cable, e.g., copper or fiber optic, and cable density, types and number of installed components and climate control needs. When selecting enclosures to support these applications, footprint and maximizing the use on internal spaces becomes critical.

In a perfect data center, it would be ideal to have the enclosures identified and deployed according to this scheme – patch panels in termination cabinets supporting network enclosures providing connectivity out to rows of server enclosures (See Figure 1). While many new data centers are laid out along these lines, this is not always achievable for existing data centers with limited floor space and pre-installed infrastructure. But, even these sites can benefit from a properly implemented BOCA process.

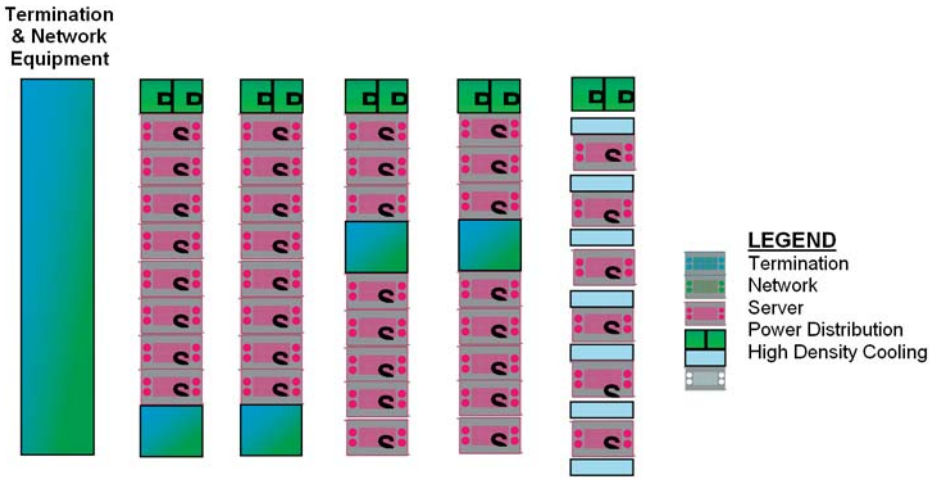


Figure 1 - Data Center Layout

Enclosure Selection

Enclosures supporting termination and network hardware will require sufficient internal volume to accommodate large amounts of station cable and patch cords. Sufficient space must be provided to allow for ease of cable routing, identification, segregation and access for MAC service. Server enclosures may not need to accommodate the same cable density, but still must provide room for patch cords, KVM cables, miscellaneous connections and power cords. The enclosures may need to tie in to cable pathway products, such as ladder racks or cable trays, allowing for seamless routing into and out of enclosures. The same would be true for open racks, but enclosures, with doors and walls, provide a security barrier against unauthorized access to installed hardware.

An additional consideration applies to populating useable rack mount space. Even though most data center enclosures have 42 to 47 rack units (RU) of 19" rail space, it is recommended that only 75 - 80% be populated. These limits may be necessitated by infrastructure limitations - perhaps available power or connectivity. But even with sufficient support structure, the remaining rack space can be set aside to accommodate future component installations and allow for potential product footprint changes. The additional rack space can even provide a buffer space to facilitate components that may be installed as part of BOCA such as KVM switches and serial console servers.

For termination and network enclosures, with their potential for high cable counts, at least one set of vertical 19" mounting rails will be required. A second set may be necessary to support mounting hardware for active components. Enclosure width becomes a critical parameter to ensure enough room outside the installation plane of the 19" rails to route, manage and secure all the cables present. For these installations, widths of 28" to 32" will provide the added room to allow the end user a well-managed and organized cable routing system. This will involve separating cables by service (station, interconnect, SAN, back-up, etc.) as well as by source for redundant installations. Keeping the cables outside the 19" rails and clear of patch panels and switches will provide easier access for MAC work, troubleshooting and service.

Server enclosures do not have to be as wide as the others, but depth is critical. The extra depth is required for deep rack mount server products, some as deep as 34". In addition, rack mount products have all their cables in the back of the units, making it vital to provide enough space in the rear parts of the enclosures to allow for cable routing and power management. While a 24" wide enclosure may be suitable, for high density installations of 1U servers a wider footprint may be beneficial to handle the cables.

Stabilizing Processes and Procedures

Obviously, servers and network devices must be monitored and managed to ensure the ongoing stability of the data center. Remote access allows for timely updates and fixes over the course of the BOCA process. IT infrastructure management tools should be simple to deploy yet provide the information necessary to support critical decisions about the IT environment. IT administrators and directors have lots of complexity with which to deal. The deployment of a stabilization solution to make life easier, more efficient and more reliable ought not to be so complicated that the remedy is worse than the problem.

Stabilizing processes and procedures involves both IT and facilities staff implementing best practices and meeting a variety of regulations. To do this efficiently requires remote monitoring, access and control of the IT infrastructure. Availability and performance monitoring at the beginning of a BOCA project provides a baseline against which the staff can measure the impacts of various actions taken during the project. To maintain efficiencies and productivity the right policies, processes and procedures need to be implemented and followed. They may come from industry best practices such as the Information Technology Infrastructure Library (ITIL), company procedures, or both.

A discussion of ITIL is beyond the scope of this white paper but, as an example, ITIL recommends first recovering from an outage quickly, then later conducting root cause analysis. Such a process places a premium on remote access and control. Also important is implementing governmental regulations such as Sarbanes-Oxley and HIPAA. Failure to do so quickly and completely can have dire consequences.

Stabilization is not a trivial part of the BOCA process. It is a key to establishing a reliable IT infrastructure and creating a productive and efficient IT environment. A stabile, reliable network is important to maintaining security and giving the IT staff and end users peace of mind.

The BOCA Process - Optimize

Closely related to stabilize is optimize. Both touch on issues related to simplified management, efficiency, productivity and security. All of these taken together, if done properly, can lead to peace of mind.

Simplified management of heterogeneous IT infrastructure, including a wide variety of platforms and devices, will increase the productivity and efficiency of IT staff letting them spend less time putting out fires and more time adding value to the business. Key tools are remote access and control and availability and performance monitoring. In addition to the efficient use of people there are issues of efficiently using power, cooling and the available space. Optimizing a BOCA deployment can mean improvements to security such as creating a lights-out data center and implementing policy-based access.

IT administrators are faced with logistical issues including physical distance, staffing, training, configuration, testing and timing to name a few areas that impact BOCA and thus need to be managed and optimized. With the right tools and necessary information the data center manager can cut through the complexity, eliminate physical distance as an obstacle and reduce the amount of time necessary to complete the project.

Once the build phase is complete, the data center needs to be managed with the objective of optimizing the IT infrastructure. This involves monitoring ongoing data center operations while optimizing the new installation to avoid problems, determine if the goals and objectives of the move are being accomplished and, ultimately, delivering clients/end users a high quality of service including any new applications.

A data center transformation not only supports upgrades of equipment and facilities but it also provides data center managers opportunities to update or revise procedures as well. KVM allows remote access to eliminate physical distance as a barrier to better management. Remote at-the-rack-like access reduces response times and supports the application of standard procedures at all locations optimizing operations. Data center managers may also take advantage of a BOCA transformation to better meet compliance requirements for government regulations, to update and implement corporate procedures, to meet new corporate requirements and to plan for future growth and changes.

The Solutions

Secure, remote access is an important feature to consider for any data center but it is particularly relevant for a BOCA project. Since there are different approaches to remote access it is important to choose the right one while the window of opportunity is open.

Software-based remote access products work unless the application becomes corrupted, the operating system hangs or the device itself needs to be power cycled. Better remote access solutions provide enterprise-grade security, BIOS-level (Basic Input/Output System) and console-level access to IT infrastructure and support for remote power cycling and monitoring. Best-in-class solutions support both in-band and out-of-band network management.

The main purpose of a KVM switch is to enable a single KVM console to access and control multiple devices. KVM switches eliminate the need for separate keyboards, video monitors and mice freeing up valuable physical space and reducing demand for electric power and cooling. They also allow out-of-band access, control and management of servers even if the network is down. A KVM switch, integrated with intelligent PDUs for power management, allows a complete system reboot. Remote access via KVM over IP makes possible geographically-distributed lights-out data centers with highly-secure limited physical access.

Remote access has the obvious advantage of reducing travel time and costs and as a result collapses cycle times. The costs of managing servers and other devices in complex networks are now twice the costs of the servers and devices themselves. By virtually bringing together geographically-dispersed subject matter experts cycle times can be further reduced due to the benefits of collaboration. If IT staff can access troubled devices from wherever they are with at-the-rack access then two or more IT subject matter experts can work together solving problems. A further refinement to collaboration is support for limited, policy-based access. For example, a Cisco expert might only be given access to Cisco devices.

By allowing one or more users to access and control multiple servers or other target devices, KVM switches enable businesses of all sizes to realize reduced costs, improved business continuity and more robust security. There are many other advantages too such as less IT staff turnover and improved end-user customer satisfaction.

Raritan solutions include remote out-of-band and in-band access. BIOS-level out-of-band access is provided by the Dominion® KX KVM-over-IP switches and the Dominion SX secure serial console servers. Remote in-band monitoring of an entire network is provided by CommandCenter® NOC. Remote power control is supported by the Raritan Dominion PX intelligent PDU which can be integrated with the other tools to create a complete solution. Policy-based permissions and access to, and consolidation of, all these solutions is provided by the CommandCenter Secure Gateway.

Michael Carpinella, Technical Services Director of the law firm Duane Morris, LLP summed up the offering as follows, "The Raritan solution provided a great way for us to simplify and accelerate many of our data center work processes, as well as to reduce our incident response times." "Software installation, troubleshooting problems, reconfiguring network cards, server installation - all these things are done more quickly now through CommandCenter Secure Gateway. Being able to see every server from one console is the ideal situation."

Conclusion

This white paper presented a disciplined approach to BOCA projects consisting of five phases: assess, plan, build, stabilize, and optimize. Techniques and tools were discussed that can make a BOCA project less complex and less time consuming thereby making it easier for IT administrators to overlay the project on top of their already hectic and stressful day-to-day network management tasks.

IT administrators should take advantage of the window of opportunity a BOCA project offers for improved IT productivity and efficiency while enabling peace of mind for the business because disruption of mission critical process can be managed and avoided. While the chance to upgrade equipment and address environmental issues such as cooling are obvious, the chance to implement new processes and procedures that can lead to better end-user satisfaction and cross-functional teamwork are not so obvious. Choosing the right tools and thinking through the best ways to deploy them is important for the success of the transition and for meeting ongoing goals and objectives of the new, or at least modified, data center. As discussed in this paper, remote IT infrastructure management is a critical tool and can positively impact many aspects of a BOCA project and a data center's operations.

About Raritan

Raritan is a leading provider of management solutions that simplify IT operations. Based on KVM (Keyboard, Video, Mouse) switches, serial console servers, management software, power management and remote connectivity, Raritan's secure solutions drive data center and branch office efficiency and productivity in more than 50,000 locations around the world. Raritan also serves the OEM market by developing advanced, hardware-based, remote-management components based on KVM-over-IP and IPMI technologies. Founded in 1985, Raritan today has 38 offices worldwide, and its products are distributed in 76 countries. For more information, please visit Raritan.com

Herb Villa, Field Technical Manager of Rittal Corporation, contributed to this document.