



Server Room

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Superior Planning Pays Off

While Server Room operational challenges are not getting easier, they can be reduced through superior planning and design.

Information availability is - and will always be - king in government.

So, telling your bosses, colleagues and constituents the data they want to access and the information they need is not available is not an option. They don't care about server utilization or temperature "hot spots".

It is your job to make sure your organization has the computing power to make information available 24/7/365. What's more, you are serving a community increasingly more mobile; one that has come to expect anytime, anywhere access to the knowledge they need.

So your facility and your computing environment are paramount to your success. The facility may be called a Server Room or a Data Center - or both. And while a Server Room usually describes the area used for smaller arrangements of servers, the difference between a Server Room and a Data Center can often be in the "eye of the beholder".

"In government, I've seen Data Centers the size of a closet and Server Rooms that are 200,000 square feet," Brad Nacke Government Business Manager, the Liebert business of Emerson Network Power told 1105 Custom Media. "Often what the facility is called is what the customer chooses."

No matter what term is used, both Server Rooms and Data Centers have come "out of the backroom" and are in the "crosshairs" of government efforts to increase computing power, while at the same time reduce electrical power, heating and cooling costs.

Many of EPA's, DOE's and GSA's current and future Green Government efforts focus on making the IT and facilities that comprise Server Rooms and Data Centers as energy efficient as they can be.

What Research Says

The pace of change within Server Rooms/Data Centers is increasing according to an October 2008 survey of members of the Data Center Users' Group (DCUG).

According to the research, implementation of new technologies, growing management demands for availability and the adoption of the mobile workplace via wireless devices are increasing the criticality of these facilities. In fact, 75% said these facilities are more critical today than in past years.

Further the research states "power densities across the room and within the rack are rising sharply. In doing so,

they're pushing facility capacity to the max - and fast. In the last two years, power density per average rack has risen from 6 kW to 8 kW."

More than 10% said they will be out of capacity by the end of this year and a total of 68% expect to be at capacity within the next three years.

Despite the current tight economic climate, 75% are still planning to upgrade their facilities; that demonstrates even more how important technology is. Many are already turning to virtualization technologies to increase computing power and installing advanced heating and cooling technologies to boost energy efficiency.

The movement is on to integrate system-wide scalable architectures that drive down total cost of ownership through a focus on flexibility and efficiency without compromising availability. In fact, the research shows that IT managers are unwilling to compromise availability for efficiency gains.

IT and Facilities Act As One

In the end the research shows there is no universal driver for efficiency; nor is there a common approach to solving problems. There are multiple strategies that must be addressed by a cohesive team that brings together the IT and facilities communities.

These professionals will be called upon to be flexible and work in an environment where the only constant is change. They will be dealing with an ongoing torrent of new technologies that will spawn new design and implementation challenges. They will be called upon to be responsible for purchasing decisions that must integrate energy savings with rising availability requirements.

Plus, IT managers must be prepared for continued emphasis on lowering expenses and exhibit the skills to effectively manage the inner workings of Server Room/Data Center facilities to ensure that the components perform at prescribed levels and last as long as possible.

So, while the servers, the storage, the cooling and the power are the physical entities that must be managed and maintained, it is the professionals in charge who must possess the management skills and the organizational collaboration to meet the challenge.

Server Room Design Hints

Whether you are planning to re-design your current Server



Room or to design one from scratch, the bottom line is when you are finished your Server Room should operate as a carefully controlled environment. Design should focus on the space required, computing power needed and the related power requirements specifically:

- Plan for an increased requirement for power in the server room. According to experts you may need to install a redundant, scalable Uninterrupted Power Source (UPS) and power distribution systems to provide adequate power.

Architects and planners need to be aware of the “big-picture” server room issues including scalability, flexibility and high availability; not to mention power, heating and cooling considerations.



- Provide sufficient cooling to handle your requirements. Nothing will impact the availability of your Server Room faster than insufficient cooling. Case in point: Smaller servers don't mean less heat.
- Protect your investment by limiting physical access to your facility and taking the appropriate cyber security measures. You must bring together physical and cyber

security professionals to work in tandem to secure your facility from unauthorized entry and cyber attacks.

- Keep a log that records all software and hardware changes (e.g. OS updates configuration changes, hot-fixes, application updates and fixes, and network hardware swap outs and additions). This record provides a log you can use to fix errors.

A Good Plan Pays for Itself

So, who is going to do all this Server Room/Data Center planning? Can you do it yourself? Do you have the necessary skills to design a space and the supporting infrastructure? Do you have the expertise to:

- Provide estimates of project costs as they relate to the overall availability expectation?
- Identify accurately the equipment, space and IT services needed for critical load profiling?
- To bring the plan to fruition yourself?

As always, a good plan is the essential ingredient needed to deliver a successful project. Successful project managers use plans to keep things on track and prevent as many mistakes as possible.

For example, according to Nacke, sometimes equipment is bought without a clear vision of what it is expected to do. At the same time, facility equipment decisions may be based off of current budgets using the normal lifespan of servers and storage, not facility equipment.

Look To The Future

Nacke says the typical Server Room/Data Center buys IT to last 3-5 years. Even though it is tempting to buy facility equipment that lasts the same 3-5 years, in fact good facility equipment can last 15-20 years.

“You need to design for the next tech refresh and pre-plan to take into account upcoming capital investments.” For example, 5 years ago no one planned for Blade servers. But as the size of servers has grown smaller, more heat is generated in the same physical space. You need to plan for the next technology.

The message is to educate yourself and find a “trusted advisor”. It may be a Prime contractor you are working with already, a small niche Systems Integrator or the equipment manufacturers themselves.

Then hire this “trusted advisor” to do a baseline audit of your site and benchmark where you are; that includes your computing, power, heating and cooling needs. “Determine your start point and your end point and work with them to develop a plan that gets you there,” added Nacke. □

The Power To Be Cool

IT managers are turning to scalable and adaptable solutions to effectively power and cool the powerful computing technologies being deployed today.

Think about it. For every \$1 you spend on computing equipment and services, you probably spend another \$1 for the power and cooling to keep that equipment running.

In fact, a 2007 analysis of Data Center costs by Emerson Network Power found that you spend an astonishing 38% of your combined computing equipment and power/cooling dollars on cooling alone.

It's no wonder that in a survey of Data Center User Group members, 83% said power and heat were in their Top 3 concerns (others were availability (52 percent), and space constraints/growth (45 percent).

Obviously, you want that to change.

You know if you have to reconfigure your power and cooling every time there is an advance in computing and networking technology (e.g. blade servers) or every time your mission requirements change, you will never deliver an adequate ROI.

For example, if a UPS module is only compatible with other UPS modules of the exact same size, scalability will occur in rigidly defined increments. A UPS system that is compatible with other UPS modules of varying capacities provides greater flexibility in how growth is managed. UPS modules should also support reconfiguration to add redundancy, or change the type of redundancy being employed, to support higher levels of availability.

You Must Adapt

Virtualization, blade servers, high-density communications switches, business continuity and the convergence of voice and data are all driving change. No matter the size of your Server Room/Data Center, you are faced with the challenge of creating facilities with a 20 year lifespan when technology changes and refreshes every 3-5 years.

You are looking for solutions that are scalable and adaptable to effectively power and cool the high-density blade servers being deployed today. At the same time you must look to the future to the next technology.

So, while you are creating facilities that make the most of current cooling technologies, you can keep one eye on the future by supplementing these systems with adaptive cooling technologies. According to the Uptime Institute's "A Flexible Approach to Protecting IT System Availability" white paper,

the "adaptive, hybrid approach provides a cost-effective, energy-efficient solution to the requirements of today's systems while enabling the flexibility to adapt to whatever the future brings."

Adaptive cooling principles provide new and existing facilities a roadmap for dealing with heat densities that are

Controlling energy consumption and costs are critical as IT pros face the dual challenge of delivering services while eliminating operational bottlenecks in the Server Room environment.

increasing unpredictably and unevenly. Adaptive cooling provides maximum flexibility and scalability with the lowest cost of ownership while maintaining or improving availability. And it provides scalable, reliable and efficient cooling that deal with the issue of density growth.

According to Uptime, "these requirements can be achieved by optimizing cooling infrastructure and carefully selecting the two components of adaptive cooling: traditional under-floor cooling and supplemental cooling."

Smaller Rooms, Big Considerations

Choosing the right cooling infrastructure is greatly influenced by the size of your Server Room/Data Center.

Today water and refrigerants are making a "cooling comeback" to cool server racks directly. Also new modular fully enclosed server systems that frequently use liquid cooling are now on the market.

And when it comes to large Data Centers there are other options including outside air economizers to limit the need for chillers or air conditioning units. According to *Server Watch*, these monitor the internal and external environmental conditions and decide what proportion of outside air can be used to achieve optimum cooling efficiency.

When it comes to cooling smaller Server Rooms, the white paper by J. Kipland Kiger from G. Blackmon & Associates "Application Considerations for Cooling Small Computer and Server Rooms", specifically addresses the issue. Here are a few things to keep in mind according to Kiger:



- Unlike common commercial comfort air conditioning systems, precision air conditioning units are designed to run continually, require little maintenance, and provide precise control of temperature and humidity. Standard air conditioners quickly lose efficiency and break under continual operation.
- Compare the price based on the amount of sensible cooling capacity.
- Compare price based on the same sensible capacity at the same entering conditions and not just “two-ton versus two-ton.” For example lower tonnage precision air conditioning system will probably match the higher tonnage comfort unit for most applications.
- Think about access. Small precision ceiling units, which are designed for one-side only service access and filter replacement, utilize tight room space more efficiently. Multi-side access for service restricts where units can be placed.
- Take into account condensate pump power, drains and

alarms. Does the unit have its own power or require an additional power feed that increases overall installation costs? Does an alarm system detect an overflow or simply let water overflow on to the floor? Can the system be shut down remotely?

According to Kiger, “the fact is precision air conditioning systems are designed specifically to cool electronic equipment. Their high sensible heat ratio and continuous-duty design makes them ideal for small computer rooms and closets. They also include a number of features that simplify and reduce installation cost. Consequently, precision cooling units are almost always a more effective and cost efficient choice.”

These are just a few considerations when thinking about the power needed to be cool. But there are more. Learn more about power and cooling requirements in white papers that delve into the bits and bytes of different power and cooling technologies found at http://www.liebert.com/servicesupport_pages/WhitePapers.aspx . □

The Growing IT and Facilities Management Partnership

If you are charged with planning and running today's Server Room/Data Center, you know that it's imperative you get facilities management involved.

Working with them helps you manage an operation focused on being green and energy-efficient. Essentially, facility management is about power, cooling and fire protection, and also, where Data Centers are concerned, physical access controls - in short the environment where servers operate.

A facility manager has a complete overview of a building and its current and planned future uses - something your IT staff probably lacks. It can be a trusted partner when it comes to dealing with power and cooling considerations. They can help with the planning and layout to help you make the most of your resources.

Facilities management professionals can help IT calculate the amount of power that must be supplied in a Server Room/Data Center and how much cooling capacity is needed to remove the resulting heat. At the same time, it can help IT plan for the how it will impact on people and the office layout throughout a building. Information like this is clearly invaluable for the IT department. Thus it is essential the two departments to communicate regularly.

By forming a partnership with your facilities team when planning the layout of your data center, you will get expertise that can be invaluable in your efforts to ensure the facility will be practical to run, and as green and energy efficient, as possible.





Server Room Skill Sets

No matter how good the equipment, software is or how energy efficient and “green” a Server Room is, how it runs is only as good as the skills of the manager behind it.

If there was one term that captured what it takes to be a successful Server Room manager it is resiliency - the ability to anticipate, adapt and respond in ways that maintains or speeds up performance. There is a direct connection between resiliency and the ability of IT to support key business objectives.

In other words, the best managers don't give up. They look anywhere and everywhere to solve problems – vendors, customer support, their associates, the Internet, whatever it takes to resolve the issue.

When it comes to quantifying Server Room skill sets, there are numerous sources for advice. One expert is Celerity Works Mike Lisagor who is the author of *The Enlightened Manager* and organizer of the annual government *Program Management Summit* produced by the 1105 Government Information Group.

Perhaps the biggest challenge for IT leaders is to differentiate between technologists who can and can't transition into competent Server Room/Data Center managers.

In a recent conversation with 1105 Custom Media, Lisagor stressed the following: “Perhaps the biggest challenge for IT leaders is to differentiate between technologists who can and can't transition into competent business managers. The former will be a management nightmare while the latter can help an agency navigate the rapidly changing IT governance landscape with enlightened management.”

Seven Skills

Increasingly the management skills needed be an effective Server Room manager encompasses much more than technical knowledge according to Lisagor.

Successful managers at any level need intangible skills such as: treating people with respect; being honest as to project status; being a good listener; keeping in sight what the overall mission is and prioritizing technology implementation within budget and cultural realities.

Here is a summary of seven skill sets that will set you apart:

1. Be Stakeholder Savvy

Connect with stakeholders at all levels and departments within your organization including program managers, technical managers, contracting staff and senior executives. This will give you access to the organizational intelligence you will need when you must deploy resources to meet competing goals. Be an active participant and you will develop the business savvy you need to succeed.

Also be willing to work at any hour, IT often means the flexibility to work non-standard hours and be available 24/7.

2. Set Reasonable Expectations

Organizations are looking to IT to deliver solutions. Don't over promise and set expectations properly so that your management and users understand how much the solution will cost, how long it will take to deploy, and exactly what it can and can't do.

3. Be In Charge Of Your Budget

Be ready to discuss topics such as ROI and TCO with program and contracting staff. If you understand and can explain both the upfront and long-term costs of technology solutions, you'll be better able to guide your organization in making technology choices that will positively impact the business. Managing your budget involves looking not only at expenditures, but also at expected returns.

4. Be A Trusted Technology Advisor

Be a realist as to what current and new technologies can do and not do. Say “no” to technologies that won't fulfill the organization's missions - no matter how “cool” they are. Do this and you'll be seen as a credible source for technology advice and heighten your strategic value to the organization.

5. Get Credentials, Gain Practical Experience

Education and certifications such as MCSE, CCNA or CompTIA A+ matter. So do security specific certifications. A mix of Linux and Windows server abilities is extremely desirable.

The talent pool is deep, so you need to be able to compete. In government, you can take advantage of reimbursement programs for training opportunities, but if you must invest in certifications on your own- do it and you'll quickly realize

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On The Road Computing Power

A mobile Server Room brings computing power to wherever it is needed.

First responders and Warfighters know having computing power close at hand can make the difference. That's why Uncle Sam has taken a keen interest in the development of mobile, containerized computing that can house a modular Server Room/Data Center; one that can get close to the action, yet provide all the information processing power Warfighters and First Responders might need.

"Over the last few years tremendous effort and energy has been put into reducing the power consumption of servers," explained Conor Malone, VP of Core Engineering at Rackable Systems in a recent interview with 1105 Custom Media.

"From component levels, chips, to disk drives, everyone is concerned with reducing the amount of power consumed, being green and trying to squeeze out efficiencies at every level."

Malone's company specializes in delivering pre-packaged units beyond the server size; fully wired, ready to go servers in cabinets they just roll in and put on data center floor. But they were looking to develop something larger.

Design Angles and Legos

"We started out from a couple of different design angles," explained Malone. "We began thinking about how to deliver something larger than a cabinet. The next natural size is how to get a 'row' to somebody."

This led Malone's team down the path to a self contained unit. "We looked around and found shipping containers were about the right size for building a row level configuration," said Malone. "We could integrate both the Data Center and server environment."

This allowed them to integrate servers and heating/cooling systems. "The side benefit was we realized we were building a data center building block or Lego, and this can run stand alone, which works for some customers."

Malone says its mobile, modular center (called the "ICE Cube") is good for organizations that are deploying hundreds of thousands of servers such as Internet service providers. "They use this as a building block. Put 50 of them together and you have a pretty good size center."

Proximity Computing

What makes this powerful mobile "Server Room" computing platform so attractive to government is that containers don't need raised floors or specialized environments. The container itself is the computing environment.

So, if the military needs to outfit a facility fast or emer-

gency personnel need computing power where there is no power, officials can simply bring in a container by truck, train or boat. Then they can set up one container or rent a warehouse where they can scale up or scale down as needed.

"Look at disaster recovery," said Malone. "People sleep better knowing they have full complement of gear ready to go."

This mobile computing platform - which comes in a variety of sizes - is giving customers a new, creative tool and provides a customized, turnkey structure that is ready to go when it shows up.



The ICE Cube gives new meaning to proximity computing. It can work in hostile, harsh environments, where officials want to get computing closer to front line. "We have even been asked can we get one on a C-130," added Malone. "It pushes the data crunching closer to where people are collecting the data. It's a tool that lets them do things they can't do with buildings."

This mobile computing platform - which comes in a variety of sizes - is giving customers a new, creative tool and provides a customized, turnkey structure that is ready to go when it shows up. "You plug it in and turn it on," said Malone.

Learn more about the ICE Cube at www.rackable.com. □



Keys For Successful Server Rooms

Energy Logic is a vendor-neutral roadmap for reducing Server Room/Data Center energy consumption based on a holistic analysis.

The relationship between gains in computing power and reductions in the use of electric power is essential if IT professionals are going to have a true understanding of Server Room/Data Center efficiency.

To further the knowledge of the industry the Liebert business of Emerson Network Power produced a white paper – *Energy Logic: Calculating and Prioritizing Your Data Center IT Efficiency Actions* – which provides “a holistic, prioritized roadmap for reducing data center energy consumption”.

While this white paper did not address efficiency directly because there is no universally accepted metric for Server Room/Data Center output, it does show how IT management can use efficiency metrics to address these challenges and provides a prioritized set of actions to gain the greatest improvement in efficiency. The IT industry needs to do more work to develop a universal metric for server and Server Room/Data Center output.

According to Energy Logic, here are four actions you can undertake right now to boost efficiency:

1. Speed up refresh cycle for IT technology

Take advantage of efficiency improvements that have been made at the server level. With the dramatic gains in efficiency that can be realized, more aggressive efforts to replace inefficient server processor and power supply technology with more efficient technologies will pay dividends. In addition to their other benefits, blade servers provide an architecture that facilitates module-level replacement, further increasing their role in enhancing efficiency.

2. Implement server power management policies.

Servers consume a high percentage of peak load power even when the processor is idle. Power management represents an untapped resource that can play a large role in increasing data center efficiency.

3. Virtualize applications

Many government servers are drastically underutilized. Virtualization can increase computing power in the same space and allows managers to monitor data loads.

4. Adopt a high-density architecture.

High density cooling in particular has the largest impact on data center efficiency outside of actions taken at the server level.

Energy Savings Times Ten

According to the white paper, to implement these strategies you will be taking the following ten energy savings actions - each of which will pay for itself over time.

1. *Upgrade to lower power processors*
2. *Install high efficiency power supplies*
3. *Utilize power management features*
4. *Install blade servers*
5. *Virtualize your server operations*
6. *Use higher AC voltage power distribution methods*
7. *Embrace cooling best practices*
8. *Use variable capacity cooling*
9. *Use supplemental cooling technologies*
10. *Invest in monitoring and optimization technologies*

Paying For The Future Through ESPCs

When building or retrofitting your Server Room or Data Center you need to design for the next technology refresh said the Liebert business of Emerson Network Power’s Brad Nacke in an interview with 1105 Custom Media.

Why? Because according to Nacke, while the typical computer center plans for their IT to last 3-5 years, good facility equipment lasts 15-20 years. That planning may take expertise you don't have in-house. That's why Nacke suggests you find a “trusted advisor” to do a baseline on where you stand now; one who can help you design a workable plan.

Energy Logic has been successful in changing the way many organizations view the challenge of Server Room/Data Center consumption and efficiency.

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Once you have a workable plan, you will have to pay for it. One strategy is to use Energy Savings Performance Contracts (ESPCs). What they do is help you with strategies to pay for upgrades with your expense budget rather than your capital budget.

According to EPA, financing large-scale projects can be prohibitively expensive for a federal agency. To help agencies Congress authorized Energy Savings Performance Contracts (ESPCs) “to encourage federal agencies to become more energy-efficient and to reduce their energy costs. ESPCs enable agencies to improve energy efficiency-reducing energy use and costs-through private investments”.

EPA describes an ESPC is an agreement between a federal facility and an Energy Services Company (ESCO). The

ESCO designs a project to increase the energy efficiency at a facility.

The ESCO then purchases and installs the necessary equipment, such as new energy-efficient windows, automated controls, and updated heating, ventilation, and air conditioning equipment. In exchange for not having to pay for the equipment, the federal agency promises to pay the company a share of the savings resulting from the energy efficiency improvements. The ESCO is responsible for maintaining the equipment, as well as measuring the energy consumption and savings.

Learn more about Energy Logic and ESPCs. Visit http://www.liebert.com/servicesupport_pages/WhitePapers.a.spx and <http://www.epa.gov/greeningepa/energy/espc.htm>. □

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the return on this investment in your career.

Getting practical experience can be a “chicken and egg” dilemma. So, don’t be afraid to get down in the trenches. Build a server from scratch, which requires researching component capabilities, analyzing price/performance data, choosing brand or vendor, dealing with power, cooling and other “green” factors, and troubleshooting problems.

6. Be Tactful and Patient

Hone the skills that allow you to navigate smoothly through your organization. Often you will need to explain technology to non-technical staff and talk about the pros and cons in language they can relate to. Being patient is an absolute must. It can make or break your career as issues and problems often take much longer to solve than anticipated.

7. Be Optimistic - Mix management and IT skills

Come to work each day with a positive attitude. This will

take you far. As you move higher up in the organization, the emphasis moves toward a mix of IT, management and other skills. Many of the issues faced have little to do with IT systems directly, such as power and cooling. If you want that senior management position you’ll need knowledge - or at least an understanding - of areas outside of IT, such as facility management, engineering, and probably corporate politics and PR.

“The need for management to communicate with those around them has never been more pressing. The rapid growth of technology has increased work complexity and the need to coordinate with many individuals located in multiple places and organizational units,” Lisagor told 1105 Custom Media.

“Every manager can make a difference, and the more enlightened the manager is, the more enlightened the organization will be.” □