



Data Center
Facilities
Design for IT
E-book



CHAPTER 1

IT PROS ARE FROM VENUS, FACILITIES PROS ARE FROM MARS

Effective communication
strategies for data center designs

BY STEPHEN J. BIGELOW

- + Untangle communication lines
- + Promote growth and competition
- + Speak the same language
- + Don't rely on server virtualization

Mending the rift between IT and facilities

UNTANGLE
COMMUNICATION
LINES

PROMOTE
GROWTH AND
COMPETITION

SPEAK THE
SAME LANGUAGE

DON'T RELY
ON SERVER
VIRTUALIZATION

IT'S NO SECRET that there is discord between IT staff and facilities managers in organizations with large data centers. You've heard the stories: An IT manager buys a new SAN without consulting the facilities team first, and the equipment sits on the loading dock for eight months because it's too heavy for the raised floor. Or an IT department budgets \$4 million for a new application with a blade server system, only to spend \$40 million to build a new facility that houses high-density equipment.

Today, IT resources can be provisioned quickly and cheaply—some would say too quickly and cheaply. But those IT resources rely on brick and mortar as well as megawatts, which are abstracted from the IT department.

In our 2009 Data Center Purchasing Intentions Survey of 900 IT managers, nearly all respondents said that reducing IT energy consumption was a priority for their organizations.

This isn't surprising given the economic downturn and high energy costs. However, nearly 30% of survey respondents didn't know how much energy their data centers used.

In recent years, data center facilities managers have sounded the

alarm on rising IT energy consumption and are leading much of the momentum in the energy-efficient data center movement.

IT departments have lagged behind but can no longer ignore the problems facing their organizations. Data center owners and operators cannot plan IT growth effectively, nor can they budget IT projects without communication between IT and facilities groups. Data center facilities and IT integration issues are on the agenda at nearly every data center industry conference. It's becoming even more important as the cost of data center real estate soars. Companies can't afford planning errors with data center projects topping \$100 million, and problems arise when IT and facilities teams don't speak the same language.

This e-book serves as a guide for IT pros looking for information to ensure that their physical infrastructures support the data center. It also provides insight into some of the challenges facing data center facilities teams. ■

Matt Stansberry

Executive Editor, SearchDataCenter.com

REVISED: DATA CENTER FACILITIES IT HANDBOOK, 2009.

viridity.com/power

How much **power** are
your servers using?

Stop guessing...

Start knowing



IT pros are from Venus, facilities pros are from Mars

Communication is the linchpin to successful data center designs.

Contention and miscommunication among organizational groups is nothing new. Even the most open and progressive corporations can identify areas of dysfunction that negatively affect operations and ultimately the bottom line. This dichotomy becomes even more apparent in corporate IT and facilities groups. Most IT groups retreat to their silos of terabytes and gigabits, while facilities pros take refuge in the land of kilowatts and BTUs—

neither making the time or effort to communicate productively.

Unfortunately, this paradigm doesn't work anymore, and long-time communication failures in both camps are costing companies enormous amounts of money in lost revenue. They also create unanticipated infrastructure (e.g., power and cooling) projects for both groups.

It's no surprise that IT and facilities groups are often alienated from one another. Facilities professionals are responsible for a wide scope of "building engineering" activities that

include electrical power distribution, telecommunication and network cabling infrastructure, lighting, heating, ventilation, cooling and any element pertaining to the building superstructure. In contrast, IT is concerned primarily with

implementing and supporting the company's computing resources.

In the days of mainframes, IT would select a system while the mainframe vendor acted as an intermediary—communicating resource requirements to the facilities group that would engineer the necessary infrastructure. IT didn't need to know the "language" that their facilities group used.

As corporate computing models shifted to distributed client/server computing, the IT staff began specifying resource requirements for facil-

ities. IT frequently related power details marked on equipment to facilities groups, but this often led to wildly overstated power and cooling requests.

“Now IT reads the nameplates or looks at the manufacturer’s literature, which is equally as bad in most cases,” said Robert E. McFarlane, principal with Shen Milsom & Wilke, a global technology consulting and design firm headquartered in New York City. IT would then hand over that information to engineers as their requirements. “No engineer with any experience is going to believe [the specifications], so IT is immediately discounted,” he said.

The facilities group then plans changes based on its interpretation of IT’s request. Even though older IT deployments may have taxed facilities’ resources, the power and cooling demands of older equipment impose less cost on the organization compared to modern equipment.

UNTANGLE COMMUNICATION LINES

The lack of communication between IT and facilities (and its potentially devastating implications) can also find root in traditional corporate management. Both groups normally follow very different chains of command. IT departments often report to a CIO or CTO, while the facilities staff reports to a COO. The only common convergence point for these two groups is at the CEO level—where tactical issues become

difficult to address effectively.

The pace at which change happens exacerbates communication problems. Facilities groups tend to operate from a long-term perspective, but IT and its needs are constantly changing. For example, an air conditioning system may provide a working life of 20 years or more, but a server installed today may have a three-year life span.

“IT became the bullet train of change,” McFarlane said. “Facilities never had a reason to operate that way.”

Add to this the fact that corporate computing is shifting back to the centralized data ideal (often resembling mainframes), and the communication problem grows perilous. Powerful servers have proliferated in the modern enterprise, with each cabinet using as much as 40 kW.

Facilities have strained under the spiraling needs of IT, yet power and cooling are often omitted from the ROI calculation.

“IT is often unaware of the total cost of IT,” said Kenneth G. Brill, founder of [Uptime Institute Inc.](#), Inc., in Santa Fe, N.M., providers of educational and consulting services for facilities and IT organizations.

Brill cites a case in which an enterprise spent \$22 million on blade servers, expecting good payback on the anticipated project. However, while working as a consultant, Brill discovered that the new servers required another \$54 million in power distribution and cooling,

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which incurred another \$30 million in operational costs for three years. This pushed the total project cost to well over \$100M—decimating the ROI. This is a disturbingly common scenario that could have been mitigated by getting facilities involved in IT's planning from day one.

PROMOTE GROWTH AND COMPETITION

When the relationship between IT and facilities breaks down, there can be profound cost implications. Resulting business issues, however, are even deeper and more extensive.

IT is constantly adding new servers and equipment to run more applications, accommodate a greater number of end users and support a broader range of business activities. Ultimately, this saves money and allows the company to grow.

In today's tough economic climate, businesses rely on IT to automate critical activities that maintain operations without interruption, even after staff is trimmed. If infrastructure resources are exhausted, IT cannot implement those plans, which prevents the company from automating, growing, effectively

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→ FACILITIES FUNDING: A CAUTIONARY TALE

INEFFICIENT POWER AND cooling systems are always a challenge, but these factors can be insurmountable when business needs collide with empty coffers, which is the reality facing many municipalities.

Bill Kleyman, director of technology at World Wide Fittings Inc., a manufacturer of steel hydraulic tubes and fittings headquartered in Niles, Ill., recounts his experience as a consultant for a city-run data center.

"We were downstairs in one of their core server rooms, and I can't begin to tell you how hot it was in there," Kleyman said. The company was using a \$15 white fan as its server room cooling system. "The room contained mission-critical servers for municipal operations and [supported] thousands of city employees," he said. "But a new cooling system was out of the question because there was no money."

Situations like this underscore the reality that there often are no easy answers for some organizations. This experience gave Kleyman a new appreciation for adequately funded facilities. "As far as I know, the problem has only recently improved," Kleyman said. "It was an eye-opening moment for me." ■

integrating business acquisitions and even remaining competitive.

At the end of the day, companies must also consider the fact that people are often to blame for mistakes. Oversights are embarrassing to expose, and it can be intimidating to reveal problems to other groups.

“Any time a server goes down due to overheating, that is an oversight,” said Bill Kleyman, director of technology at World Wide Fittings Inc., a manufacturer of steel hydraulic tubes and fittings headquartered in Niles, Ill.

Kleyman pointed out a server failure in his own organization that was caused by excessive heating, which facilities personnel who visited the room frequently failed to report. The failure wasn’t critical, but it did trigger an unbudgeted retrofit of the existing cooling system. Kleyman wondered why no one told him earlier—before they had to go into emergency mode. But the event was not without benefit. It sparked direct changes in how both groups communicated and should prevent similar issues in the future.

SPEAK THE SAME LANGUAGE

Experts like Kleyman agree that communication and interaction between IT and facilities groups needs a complete overhaul. The change must start with IT, which needs to do a better job of recognizing what facilities staff members need from their data centers. This

is a change for many data center professionals, and it’s a crucial step to close the communication gap.

Facilities engineers need to know that IT’s requirements are realistic. Otherwise, the requirements may be ignored. “If you can’t talk the language, you have no concept of what a ton of air conditioning is or what kilowatts really means,” said McFarlane. This puts IT at the mercy of facilities groups and what they think IT needs.

Businesses can realize productive changes without adjusting roles or responsibilities. In many cases, improvement starts by simply opening and maintaining a regular dialog.

Kleyman notes the importance of exchanging ideas and listening to concerns. “The [first] conversation [with our facilities group] ended with us agreeing to update each other on any changes or if they have contractors do any lighting, cooling or electrical work,” Kleyman said.

Today, Kleyman says that IT has brief contact almost daily with the building’s facilities manager. Other improvements can occur by including facilities personnel in IT conferences or tradeshow and giving IT better insight into the implications of hardware choices earlier in an acquisition or upgrade process.

Still, other businesses take a more aggressive stance with IT and facilities personnel. One approach is to permanently assign one or more facilities personnel to the IT department, creating a full-time group

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liaison.

Brill goes a step further: “One recommendation is that facilities needs to be moved over to—or under—IT.”

He notes that the escalation in facilities costs adversely affects the

value of IT. “For IT-intensive companies, facilities costs are 8% of IT’s budget,” Brill said. “This is growing at 20% annually.”

Integrated groups may be more capable of performing long-term

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→ IMPROVING INTERACTION IN FIVE EASY STEPS

- 1 **LEARN THE LINGO.** IT's responsibility is to understand volts, amps, kilowatts, BTUs, “tons” of air conditioning and other facilities-related concepts. It may seem a little one-sided, but a knowledgeable facilities engineer can easily tutor IT personnel on infrastructure essentials.
- 2 **DEDICATE RESOURCES.** Make sure the facilities staff sets aside critical resources for the data center, such as electrical circuits, chiller systems, water lines and so on. Facilities must recognize that those resources are essential for IT and prevent other groups from tapping them. You don't want a contractor to connect a new welding machine to the same electrical service that's feeding the server room.
- 3 **GET EVERYONE INVOLVED.** Facilities must be at the table for any significant IT planning. They should also inform IT of any scheduled inspections, outages, upgrades or outside contractor work in or around the premises. IT can use that advanced notice to alter backup schedules or take other actions to guard against business disruptions. Both IT and facilities groups should routinely inspect data center facilities. Tour the area together at regular intervals and identify areas of concern.
- 4 **SPEAK UP.** Don't be afraid to express concerns. If there's a warning light on an uninterruptible power supply or the server room seems too hot, it's worth a discussion—even if the underlying cause may not be critical.
- 5 **DISCUSS NEW TECHNOLOGIES.** Regular interactions are also great opportunities for IT and facilities groups to discuss new power and cooling technologies. Short, casual conversations about applications and technical differences can go a long way in maintaining ongoing dialog between groups. ■

resource planning that combines business goals. IT needs to meet those business goals and the facilities group needs to provide the infrastructure that supports IT. Of course, such radical changes are difficult and often painful, but organizations that have embarked on this type of reorganization have experienced benefits over the long term, Brill said.

Better communication or group restructuring isn't always enough. Sometimes there are no easy answers available, and both sides reach an impasse. Ironically, this happens more frequently in technologically savvy organizations where IT has taken every step to curb power usage, but the facilities department has no more power or cooling capabilities, and the capital needed to redesign or retrofit for planned projects simply isn't there. It's the perennial "rock and a hard place" dilemma.

Consultants called in to mediate often assume the role of marriage counselor. "I appreciate the problems that the facilities guy has. He has no more power to give, no more cooling and no more [available] space," said Peter Sacco, president of PTS Data Center Solutions Inc., a data center and computer room consulting services firm and solutions provider headquartered in Franklin Lakes, N.J.

But it's not always bad. Sacco recounted being approached by a facilities manager to consult with IT

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20%

The rate at which facilities costs are growing annually, according to Kenneth Brill, founder of Uptime Institute, Inc.

about power-saving technologies. "It was the first time I had a [facilities] manager that was so sophisticated," he said. "He wanted to put the onus on IT to use every watt efficiently."

DON'T RELY ON SERVER VIRTUALIZATION

IT groups can leverage some technologies to help contain power and cooling requirements. [Server virtualization](#) has become a viable and cost-effective consolidation technology. This method uses a software abstraction layer to host numerous [virtual machines](#) (VMs) on a single physical server. This can potentially reduce the physical server count, save space in the data center, and lower server power and cooling requirements.

Yet, experts point out that virtualization has been used for data center compression, not savings. "Virtualization has been a Band-Aid on a bullet wound," Sacco said, noting

that many businesses virtualize to save power, only to then add more equipment and put more systems at risk.

Poor management practices have actually exacerbated facilities problems through an uncontrolled proliferation of virtual machines (VM sprawl) that simply drives a need for more physical hardware and corresponding facilities.

IT groups can also examine their environmental requirements with a fresh perspective and see if it makes sense to run servers at higher temperatures. It's a concept that's even attracting attention from large organizations like Google. For every degree higher that the servers operate (without an increase in failures), it reduces the power needed to run cooling systems.

"Maybe it doesn't need to be 68 to 72 degrees," Sacco said, noting that PTS is engaged in testing the relationship between elevated working temperatures and failure rates in the data center. "For computer rooms with a substantially newer IT infrastructure [under five years old], inlet temperature can be upwards of 80° without compromise," he said. "PTS' internal network has been running this way for over three years without incident."

While it may seem that IT is being asked to do all the changing, facilities departments must be willing to take an active role in IT planning and help predict electrical and cooling use trends.

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80°F

The inlet temperature that can be reached for computer rooms with a substantially newer IT infrastructure.

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Facilities personnel must embrace alternative or point-cooling technologies such as flexible row cooling (e.g., hot row/cold row). They should also understand the benefits of using water chillers and water distribution systems for chilled cabinet cooling and stay abreast of current raised floor standards. Facilities should also recognize the rapid changes and pressures that IT must endure and make an effort to respond to those demands.

"There's no way you can ask an IT manager to make a 10-year forecast on what IT will be like," Sacco said. "Facilities [groups] have to be more flexible and adaptable."

THE FUTURE OF IT AND FACILITIES RELATIONS

The idea of improving integration between IT groups and facilities staff is taking hold. More businesses are involving facilities in IT planning. In larger enterprises, a separate facilities team is being assigned

to permanently reside within the IT group.

McFarlane, who teaches a data

center facilities course, said that in the past, 2% to 10% of participants reported intergroup cooperation.

→ WHEN TO CALL IN THE EXPERTS

THE ABILITY TO communicate, understand and cooperate is strained when parties involved cannot adopt new standards.

“One company needed to build a new computer room,” said Peter Sacco, president of PTS Data Center Solutions Inc., a data center and computer room consulting engineering services firm and solutions provider headquartered in Franklin Lakes, N.J. Contractors were in the midst of facility expansions and building a new parking garage. The last thing the company’s management wanted to deal with was a new 1,500-square-foot computer room that IT needed for continued operation, he said.

Sacco was hired as a design consultant for the new computer room, but the company decided to have the existing facilities staff manage the construction.

“The same guy who was building the parking deck was going to manage the construction of the computer room,” he said. Sacco added that while this would be cost-effective elsewhere on campus, it’s best to have an experienced general contractor handle data center construction, or use construction management consultants to oversee the project.

The company’s management took Sacco to task regarding price differences between his conceptual designs and budget and facilities’ proposed design and budget. Sacco pointed out oversights in the facilities’ plan, including insufficient power distribution and inadequate cooling infrastructure.

“They would have built [the data center], delivered it, turned everything on and then wondered why—a month after spending \$2 million—they can’t cool the space,” he said. The company conceded and engaged additional engineering services to address design requirements of the new space.

The company’s management team decided to forego the expense of using an outside general contractor or construction management consultant. Instead, it handled the actual construction using the existing facilities staff, which proved problematic. Weekly inspections revealed that piping was routed and hung incorrectly, unspecified cable trays were filled with piping, and power cabling was placed together. As construction progressed, the company and contractor were regularly at odds and change order costs rose. “It turned out to be a real war of wills.” ■

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Now, his participants regularly report far greater levels of interaction (or permanent integration) between the groups.

"We may be up to 50% to 60%, but we're not yet anywhere near 100%, which is what is going to ultimately be necessary to meet the needs of modern computing," he said. This trend should continue or even accelerate as organizations respond to challenging economic times.

"The only time we get everything [IT and facilities] together is when something drastic is at hand," Sacco said. "I think we're in that climate."

Brill, on the other hand, is more pessimistic. He sees cooperation between IT and facilities as more of a civil war than a marriage of necessity for some organizations.

"Executive management is going to have to intervene, and there's going to be a very bloody period," he said. "Based on what I've seen, that period will be several years long before things settle down." ■

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