

Data Center Best Practices

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Data Center

Your IT environment must operate at its peak performance in order to keep your business running optimally—and your data center is at its heart.



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A well-maintained data center operates at peak efficiency, maintaining optimal balances between server and storage technologies, space, power usage, heat produced, and the cooling necessary to prevent overheating. Automation techniques make it possible for data centers to perform a wide range of procedures on their own—simplifying maintenance and freeing the IT department to focus more on business-driven initiatives. In fact, a data center that is operating correctly does little to raise attention. Data centers in need of help, however, have many ways of getting your attention. For example, “If you walk into your data center and you see cables everywhere, different types of servers in and out of racks—all cooled by a bunch of fans and portable air conditioners, you know you have issues,” says Bob Mobach, Logicalis Managing Consultant, Infrastructure Consulting Group.

As the head of a team of data center specialists for Logicalis, Mobach sees data centers with issues in organizations large and small, across a wide range of industries around the country.

He has seen data centers crowded with stray desks, cleaning supplies, and boxes of stuff that no one ever uses, left behind by employees that no one remembers. He has been called in to rescue data centers filled with blade servers that have automatically shut down because the temperature exceeded tolerable limits. Another data center had UPSes that hadn’t worked reliably since the pipes broke in the bathroom a floor above.

The image Mobach paints of a surprising number of data centers recalls the old public health ad campaign slogan: “This is your brain on drugs.”

Meanwhile, pressures are mounting. Mergers and acquisitions are jamming more technology into tighter spaces. Increasing computational demands create crowded equipment racks. Staggering power and cooling requirements cripple budgets. In general, a high percentage of data centers are reaching the end of their life cycles and becoming increasingly expensive to maintain.

Technical Advances

In addition to the risks organizations are taking in terms of interruptions of service and outright failure, they are also missing opportunities to leverage significant technical advances. Much has been written, for example, about the savings in dollars and energy that can be the direct outcome of a comprehensive strategy of server and storage virtualization and consolidation. But those savings cannot be fully realized unless corresponding changes are implemented in the data center.

Companies that confront their data center issues instead of avoiding them are finding significant opportunities to rationalize, consolidate, and optimize data centers that better serve their needs.

The so-called greening of data centers, for example, is a good case study about the benefits of enlightened self-interest. Cooling accounts for as much as 40 percent of the cost of powering a typical data center for a midsize data center (around 2,500 square feet); it can cost up to \$200,000 a year just to maintain an acceptable temperature. Logicalis has been able to trim more than 30 percent off a client's bill by installing updated HVAC systems—including computer room air conditioning (CRAC) and in-row cooling technologies, as well as consolidating devices, rationalizing floor space, and taking other measures.

In the case of one recent marketing services customer that needed to consolidate two data centers (one of which had been outsourced) after a major acquisition, more comprehensive upgrades resulted in a net savings of \$1 million per month.

Multiple Points of View

Several forces restrain organizations from dealing with their data centers. The life cycle of a data center project is long and involved, requiring a diverse set of skills to achieve success. In fact, one of the biggest challenges that Mobach says clients face when evaluating data center options is getting all of the different points of view involved to converge into one coherent strategy.

Different departments view data centers in different ways. The IT department looks at them in terms of the servers, storage devices, and switches humming away inside. The facilities department, on the other hand, sees them as physical structures with structural, mechanical, electrical, and plumbing challenges. Meanwhile, CFOs see them in terms of capital expenditures, ROI, and budgetary constraints.

Engineering Orientation

Although it obviously involves information technology, developing a data center strategy requires an engineering orientation that few IT departments or traditional systems integrators have the skills to provide.

Diverse Skill Set

Data center development requires a wide range of skills:

- Data center design and full-service planning
- Data center relocation
 - Site selection and preparation
 - Asset inventory, tagging, and move planning
 - Asset moving and installation
 - Disaster recovery/redundant site setup
- Project management
- System and data migration
- System/server consolidation
- Cabling, power, and physical infrastructure services
- Post-migration maintenance and support

“You have to take a holistic approach,” Mobach says. That means bringing together a number of specialists who don't typically interact with each other. Mobach, for example, is a Registered Communications Distribution Designer with a specialty in Network Transport Systems (RCDD-NTS). He is trained in the design, integration, and implementation of telecommunications systems and their related infrastructure components.

Other members of Mobach's team include Professional Engineers (PEs), Cisco Certified Internetwork Experts (CCIEs), Certified Information Systems Security Professionals (CISSPs), and Certified Project Management Professionals (CPMPs).

And that's just on his team. Mobach also knows how to talk architecture, plumbing, HVAC, structural, electrical and mechanical engineering, and, of course, finance.

The challenge in developing a data center strategy is not just having access to all of the specialists but making sure they communicate their needs to each other at appropriate times.

Phased Approach

Logicalis recommends a phased approach beginning with a period of discovery and assessment that consists of a review of the existing and planned data center space requirements and overall IT infrastructure.

(See page 5, Data Center Best Practices.)

Technical requirements that need to be detailed include the following:

- Power and cooling densities, as well as loads by equipment type and areas
- Space requirements
- Physical parameters (reliability, power, HVAC, fire protection)
- Disaster recovery, backup strategies and equipment
- Telecommunications and connectivity requirements
- Networking infrastructure
- Security (physical and network)
- Operations and staffing space
- Equipment inventory (server and storage)

Organizations that set off on their own to develop a data center plan often go first to a firm that specializes in mechanical, electrical, and plumbing—where they are met by a perfectly capable electrical or mechanical engineer who knows very little about IT. “Those guys just want numbers,” Mobach says. “They want you to give them estimated load and power requirements so they can do their calculations.” Meanwhile, the IT department is scrambling to dig up name plates with power usage off the back of the equipment lying around in the current data center.

In addition to the fact that the numbers on the name plates are often inaccurate, the resulting load and power estimates that get used to design data centers are too often out of context and fail to accommodate all of the variables. The result is a facility that doesn't quite fit IT—not unlike what happens when an application is developed without the participation of the users in the process. “People tend to just do what they know,” Mobach says.

Mobach and his team know how to provide the larger context for all of the specialties that go into data center development. “We create space plans that lay out cabinets, UPSes, and mechanicals, so we can tell designers, ‘This is what we are going to need, and this is where it's going to sit.’ That kind of information speeds up the process and alleviates coordination issues.”

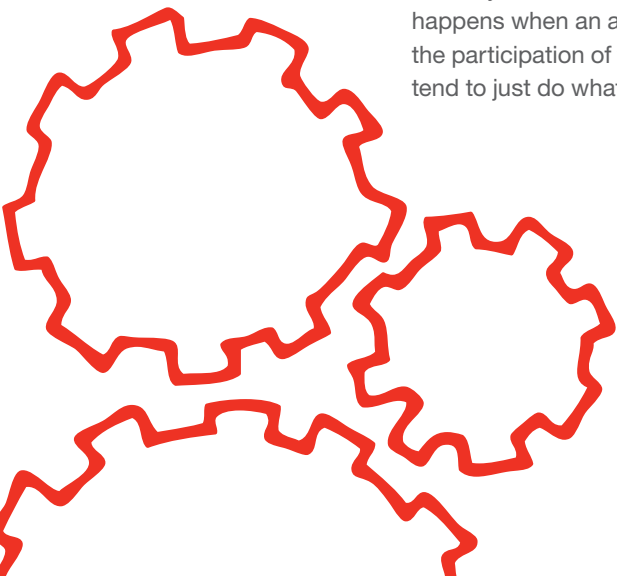
Once all of the appropriate information has been collected and prioritized by stakeholders, there are three basic options for data centers: in-house private build, co-located, and outsourced.

In-house

Traditionally, large corporations have built and maintained their own data center facilities on a corporate campus or in a corporate facility. In-house data centers require a large up-front capital commitment, but the money is spent with the idea that the facility will be used long-term—for 10 to 15 years, allowing the expenditures to be written off over time. In-house data centers also provide a level of flexibility and security not found in vendor-supplied co-location facilities. Historically, in-house data centers were also needed because of bandwidth requirements for the LAN-based user base sitting nearby. For many companies, having a data center anywhere other than in a corporate facility was not an option. It is today.

Co-located

Co-location, or co-lo, in the IT industry can refer to a number of levels of service. But it generally means that some or all of a company's server and storage infrastructure is housed off-site at a vendor-hosted location rather than on the premises of the corporate facility. The co-lo vendor owns the facility, while the organization owns the IT equipment. The vendor provides the physical infrastructure required to properly house and run the servers, including the structure, power, HVAC, UPS, and generator backup. Other requirements, such as network connectivity and server maintenance, are negotiated on a case-by-case basis. In some situations, the vendor also provides either skilled personnel to manage and maintain the company's hosted infrastructure or an alternative office space to house the company's personnel who need direct access to the equipment.



10 Data Center Best Practices

Collaborate

Bring together all of the stakeholders early in the process. Developing and implementing a successful data center strategy depend on collaboration between IT and the facilities department, as well as the CFO's office.

Coordinate

Understand that specialists can do only what they know. Don't ask your IT team about cooling systems or expect an MEP (mechanical, engineer, plumbing) firm to understand IT-specific needs.

Calibrate

Measure the power demands of different types of components in your data center and establish benchmarks and measurable standards to aid in ongoing power management. Before you can manage power use effectively, you have to know all the variables.

Go Green

Advances in cooling design concepts, such as high-density cooling and heat rejection cooling, can save you a significant expense and reduce your carbon footprint at the same time. If you live in a cool climate, take advantage of ambient air systems and let Mother Nature help your data center stay cool in the winter.

Rationalize

Decide what requirements the data center needs to meet and choose a small number of technologies and vendors to meet those needs. Lower technical complexity translates into lower operational overhead. Keep it simple.

Virtualize

Virtualization makes it possible to reduce the number of physical servers you need by an average of 15 to 1 and ensures that all of your servers are running at appropriate load levels. Run smart.

Optimize

Make sure all of your data center systems are performing at their best. New applications and communications architectures, such as software as a service (SaaS) and unified communications, require that everything in your data center not only works well by itself but also works well together with everything else.

Comply

Read and internalize EIA/TIA 942, the compilation of guidelines for everything about data centers. The more standardized you make your data center, the easier it will be to maintain and upgrade so you can avoid having to retrofit later.

Automate

Automating routine processes can reduce operational cost, free up valuable human resources, and standardize procedures. Take advantage of the Information Technology Information Library (ITIL) change management guidelines.

Align

The data center, like the data contained within it, is a corporate asset. Designing, implementing, maintaining, and paying for it should all be done in line with the overall corporate strategy. The data center doesn't belong to the IT department or facilities department. It belongs to the corporation at large.

Key Data Center Opportunities

- Advances in cooling technologies save you money and reduce energy consumption.
- Rationalized IT systems make it easier to respond to changing demands.
- Reclaimed floor space and lower energy bills help you realize the full benefits of IT consolidation efforts.
- Reduced complexity facilitates maintenance and allows you to be more flexible.
- Energy-efficient, optimized data centers prepare your organization for the data requirements of tomorrow.

equipment, facility, and operating staff. The outsourcing agreement may include the transfer of IT employees and IT assets to ensure that quality of service is attained and measured. The outsourcer may also license software and/or hire the people to perform the services. A company may outsource the entire IT department function or choose to outsource “parts” of the IT function, such as running the data center or help desk, developing software, providing telecommunications, or maintaining desktop computers.

Capex Preferences

Each of the three alternatives has pros and cons that need to be evaluated in order to determine the best data center option or combination of options. Mobach says financial policy often has more to do with choosing a data center option than technology considerations.

“It all depends on how an organization likes to handle capital expenditures,” Mobach says. “Organizations that like capex on their books and are looking for an ROI of between 5 and 10 years tend to favor building their own data centers.”

Conversely, organizations that don’t like capex on their books and want to see ROI in three years or less should consider co-location. “There is less capex with co-lo, but after about three years the monthly operating costs overtake the cost of a private build-out,” Mobach says. “The larger the organization, the harder it is to make the economics of co-location work.”

Similarly, Mobach says the economics of outsourcing make it a better option for small or midsize companies with standard platforms. The cost of outsourcing escalates rapidly with size and complexity, and Mobach notes, “It can be very expensive to take back control from the outsourcer.”

Mobach is careful to draw a distinction between outsourcing and managed services. “Managed services is not outsourcing. It’s more like co-managing and can co-exist with either an in-house or co-lo data center. Our managed services offering, for example, can take on all or some of the management of a client’s IT, so they get some of the features of outsourcing but for a much better price. And the customer always stays in control,” he adds.

Concurrent Maintainability

One of the most potentially contentious discussions that must take place in the development of a data center strategy has to do with determining acceptable levels of redundancy. There are four tiers of redundancy—the highest of which is called Tier 4.

Tier 4 redundancy ensures “concurrent maintainability,” which essentially means that everything works all of the time and that any piece of supporting equipment can be taken offline without affecting the data center. It sounds great, but it involves having two of everything in the data center in case one of anything goes down. All organizations want that until they see the price. Deciding which systems need full redundancy versus which can tolerate downtime depends on risk management parameters that vary with different subsystems and need to be negotiated internally. Regulations can add an extra dimension of complexity to redundancy negotiations in industries such as healthcare. Most organizations start out wanting Tier 4 but end up acknowledging that some downtime, for at least some systems, is acceptable.

Tier 4 is impressive. Logicalis has worked on Tier 4 facilities in various scenarios. For example, a remote location for one client called for a 1.6-megawatt UPS plant with individual switchable risers and power grids, as well as four 1.5-megawatt diesel generators for backup, with two separate electric utility substations dedicated to each site. The data center also came with its own water well, diesel and kerosene storage, helicopter-landing pad, and fully redundant cooling towers. It is zone-4 earthquake-compliant and capable of withstanding 150-mile-per-hour winds. Fortunately, not everyone needs that kind of redundancy.

Needless to say, appropriate tiering levels need to be accommodated in the design of a data center as well as any plans for off-site disaster recovery locations. Having to retrofit critical subsystems for redundancy is one of the reasons that many existing data centers have become so crowded.

Moving Day

Migrating your systems to a new or refurbished data center has the potential for as much high drama as a brain transplant. Project management skills are critical. “It’s not like moving a desk,” Mobach quips. Every employee in an organization is affected during the migration. Redundant equipment needs to be functioning for those systems that cannot be interrupted. Mobach recommends a new network infrastructure to ensure optimal connectivity.

The actual migration of devices needs to be planned in stages, and the plan needs to allow for some potentially unpleasant surprises. “When you shut down servers that have been running for years, things happen,” Mobach says. “You have to write that into your script.”

Mobach recommends trial runs in which select systems are shut down before they are moved so you know ahead of time where you are going to have issues. “Otherwise, besides having to mount all the equipment and get it back up and connected, you end up sitting around troubleshooting. It can be one box—one stupid little thing that was forgotten,” he says knowingly. “A power supply for an old server that runs some very important software fails, and there you are on a Saturday afternoon trying to find a part that isn’t made anymore while the migration grinds to a halt around you.” Because he has experience, Mobach develops comprehensive statements of work that are supported by extremely detailed project management plans. The goal of an uneventful migration is accomplished only by anticipating anything that could go wrong and then making sure it doesn’t.

Developing and implementing a data center strategy is an admittedly long and involved process, which for large complex data centers can take two years to complete. The end result, however, is a data center that can serve the organization for its next 15 years.

The best data centers are much more than just facilities with a bunch of technology in them. They are dynamic systems that can evolve as data demands change.

In addition to producing a state-of-the-art data center, the discipline of having identified all aspects of what it takes to keep your data flowing smoothly results in a beneficial degree of awareness and the establishment of lines of communication. It can take data center management to a new level and ensure that your organization gets the most from its most valuable asset for years to come.

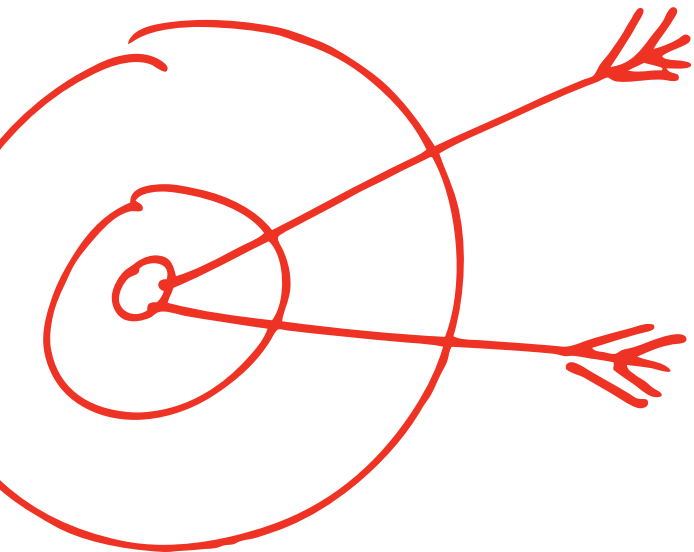
Data Center Industry Guidelines

The list of trade organizations that publish data center guidelines reflects the range of skills involved.

- ANSI – American National Standards Institute
- ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers (TC9.9 Thermal Guidelines for Data Environments)
- BICSI - Building Industry Consulting Service International
- EIA - Electronic Industries Alliance
- IEEE - Institute of Electrical and Electronics Engineers
- ITIL - Information Technology Infrastructure Library
- NEC - National Electrical Code
- NEMA - National Electrical Manufacturers Association
- NFPA - National Fire Protection Association
- TIA - Telecommunications Industry Association
- Uptime Institute

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