

Modular data centers provide an agile response to change.

Pay as you grow, optimize lifecycle costs, flexibly support new technology and rapidly deploy data center capacity



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- Introduction
- The CIO is the catalyst for change
- Data centers drive the growth of the enterprise
- A modular approach enables change by aligning data center capacity to business demand
- IBM has superior solutions to address a range of data center design needs
- Change means opportunity—IBM can help

Introduction

The enterprise of the future will be characterized by accelerating, wide-ranging and uncertain change. More than 80 percent of CEOs recently surveyed by IBM expect substantial change in their organizations and business environments.¹ Three out of four CEOs said they plan to enter new market segments. And nearly as many said they plan to use mergers and acquisitions as part of their global integration strategies.² Sixty-nine percent of CEOs believe rising customer expectations of corporate social responsibility—especially regarding energy efficiency and other environmental initiatives—will positively affect their business.³ Many may worry about their ability to keep up.

But rather than resisting this change, leading CEOs are already embracing it.⁴ They see that change brings opportunity. The opportunity to differentiate their business to meet the demands of informed and socially aware customers. The opportunity to adapt their business models to take advantage of stronger collaboration, partnering and global integration. Moreover, change is an opportunity to take a hard look at the old ways of doing things and try new ways to rapidly and cost-effectively grow the business.

The CIO is the catalyst for change


Given the growing importance of IT in the modern enterprise, many CEOs are increasingly turning to their CIOs to help them implement innovative solutions to seize the opportunities presented by change. IT can be the catalyst that enables the CEO's vision.

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To step up to this opportunity, CIOs will need to remake their IT infrastructures into more agile and automated environments that can support change while managing the associated risks. All while under continuing pressure to do more, faster and better—with less. And the decisions they make in designing and building data centers lie at the heart of this change.

Data centers drive the growth of the enterprise

Data centers are often the engine that drives the growth of the enterprise. CIOs have enabled growth by expanding IT capacity with new equipment that helps them meet the unrelenting capacity demands of a growing business. But what about the data center that supports all this gear? Several converging drivers affect why data center design must also change.



“[There] are a great number of facilities that likely weren’t built with high-density server equipment in mind. As a consequence, many of these data centers are likely creating patchwork solutions to grapple with the power, cooling and space issues that have come to the forefront during the past few years. These centers increasingly are unable to support the latest generations of high-density equipment.”⁷ —Gartner

First is the increased demand for computing capacity to support business growth. To satisfy this demand, IT executives are increasing the number and the physical density of servers and storage devices. IBM and consultant studies project that the server installed base will multiply by a factor of six between 2000 and 2010, while storage is expected to grow by a factor of 69.⁵

At the same time, data center energy consumption and cost are increasing. In a recent study, Gartner reported, “The average power consumption per server quadrupled from 2001 to 2006, while the average number of servers doubled and is expected to grow another 50% by 2010. This rapid growth has resulted in data centers typically consuming up to 100 times more energy per square foot than a typical office building.”⁶

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Finally, the pace of data center obsolescence is also increasing. Data center investment has lagged behind investment in servers and other IT equipment. A Gartner study found that “36 percent of respondents indicated that their organizations’ *newest* data centers are seven or more years old, and that nearly four out of five (78%) reported that their oldest data center was at least seven years old.”⁸


But we’ve seen the power density of the IT servers in those data centers grow by a factor of 20 in the past decade. And the type of equipment that must be supported tends to place greater demands on the data center than originally planned.

Organizations are responding with plans to build data centers. A recent survey of Fortune 2000 companies by Digital Realty Trust found that 86 percent of respondents were definitely or probably going to expand their number of data centers in the next 12 months.⁹ Another survey found that 67 percent of senior decision makers in European markets said they were planning to do so within the next 24 months.¹⁰ This provides an ideal opportunity to consider new design options.

A modular approach enables change by aligning data center capacity to business demand

Because demands for IT capacity are unrelenting and often unpredictable, CIOs have found it difficult to design an optimum data center to meet future needs. How can you design a large, capital-intensive data center to last 30 years when the technology it supports changes every two or three years?

Moving from large, monolithic designs to modular data center designs can deliver significant benefits that help CIOs fuel business growth to adapt to change, to provide flexibility to match short-term capacity requirements with long-term growth, and to do so in a cost-effective manner—and more quickly.



“... the manner in which new data centers need to be financed, designed, built and managed is significantly different from what has generally been accepted during the past 30 or more years.”¹¹ —Gartner

Modular data centers provide an agile response to change.**Align business and IT requirements—pay as you grow**


Modular data center design is not about containerization but about using smaller increments of standardized components to enable you to match your business requirements to your IT requirements and add data center capacity when needed. They reduce the need to predict requirements over a 20- to 30-year life span or to build “one big room” to cover all contingencies over a long period of time.

By building in smaller increments—or modules—you pay to build only what you need when you need it. This allows you to defer up-front capital expenditures by as much as 40 percent.¹² This can also enable you to defer your operational expenses by as much as 50 percent.¹³ And you can scale as needed to deliver more capacity to meet business demand, as required. Closely matching capital and operating costs to changing business needs helps provide a virtually unheard-of level of fiscal precision in data center planning, one that will likely be appreciated by the CFO.

Help optimize lifecycle costs around energy—the new IT operational metric

With the increased use and cost of energy in data centers, energy efficiency has become an excellent metric to measure IT operational efficiency. Designing to optimize around the total space in the data center is no longer appropriate as the cost of the physical “shell” only makes up 10 percent of the total capital costs.¹⁴ By contrast, up to 60 percent of the capital costs to build a new data center and 50 percent of the operational costs are energy related.¹⁵

Building a new data center is a significant capital expense—for large or small data centers. Approving initial capital costs means you may also be approving up to five times that amount in operational costs over the 20-year expected life of a new data center. Because cumulative energy costs over this time period can represent up to 75 percent of operational costs, designing to a more energy-efficient level can help you find the business value in your organization’s environmental initiatives.



Approving initial capital costs for a new data center could mean committing up to five times that amount in operational costs over the next 20 years.

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Data center infrastructure efficiency (DCiE) is a metric promoted by the Green Grid to help organizations look at data center efficiencies.¹⁶ Based on this metric, we estimate that changing the design point from the current average DCiE of 43 percent to a DCiE of 66 percent can lower lifetime energy costs by up to 50 percent.

Support new technology adoption—flexibility to adapt to new power densities


In the past decade, the equipment inside data centers has changed dramatically. The average enterprise class data center—a center greater than 5,000 square feet (approximately 500 square meters)—no longer houses only mainframe servers but has more than 75 percent x86 servers and 20 percent UNIX® servers.¹⁷

Because we've seen the power density of x86 servers increase by a factor of 20 in this decade, organizations will need to anticipate and build ahead for a doubling or tripling of power density. This allows them to support the new applications on these servers while also supporting vertical growth. We estimate that clients can get three times the power density growth at one-third the cost to retrofit an existing data center space—in each module.

As you expand your space to add modules, you add horizontal growth as well. You can adapt, deploy and use new generations of technology faster by designing in the flexibility *before* you need it so it is ready *when* you need it.

Accelerate time to market through faster deployment

Business change is accelerating along with increasing demand for IT services. Traditional approaches to data center design and build, based on custom designs and requiring 18 to 24 months—or longer—to complete, may not be able to keep pace. Modular solutions are designed to provide a faster way to get the job done.

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“IDC believes that the datacenter of the future will increasingly default to a standardized design and that a datacenter ‘blueprint’ will become a requirement for most companies to optimize the economics of the datacenter.”¹⁸ —IDC

Modular data center designs based on standardized components, including vendor neutrality to support virtually any IT equipment, help provide for more rapid deployment of IT equipment and applications—often up to 25 percent faster than traditional data center design. In the case of smaller data centers and remote or temporary data centers, the deployment time is often only 8 to 14 weeks, not months or years.

IBM has superior solutions to address a range of data center design needs

IBM Data Center Family™ solutions are among the most comprehensive in the marketplace, offering solutions to suit small and midsize businesses as well as large enterprises. We offer breadth and depth of experience in designing, installing, and building customized or standardized data centers based on your business needs.

Small deployments—scalable modular data center

Modular data centers are excellent choices for midsize clients with growing businesses and that are facing the need to replace or consolidate server rooms or modernize aging infrastructures. IBM IT Facilities Assessment, Design and Construction Services – scalable modular data center has inherent scalability and flexibility to help cut up-front costs by as much as 20 percent by using standardized modules, is designed to be 15 to 30 percent more energy efficient, and can deploy in just 8 to 12 weeks. At 500 to 2,500 square feet (approximately 50 to 250 square meters), it is targeted for midsize clients.

Modular data centers provide an agile response to change. **Scalable modular data center**

A rapidly deployable, cost-effective, energy-efficient data center for small and midsize clients

IBM has delivered to clients more than 50 installations of our scalable modular data center in the first year after introducing it—from Boston to Bangalore. A growing university's old IT infrastructure—sprawled across three server rooms—could no longer keep pace with the change needed to support increasing growth in the student population. The university implemented a centralized, 500-square-foot scalable modular data center solution that helped the university reduce up-front capital costs to less than 20 percent of the cost of a standard raised-floor data center. The university was able to support new technology and consolidate 75 servers down to 40. And the smaller footprint, coupled with energy-efficient components, significantly reduced the university's energy costs—contributing to a 40 percent reduction in overhead costs.¹⁹

Existing data centers with hot spots—high density zone

IDC forecasts “that blades will account for ... 25.8% of server shipments in 2011.”²⁰ These high-density servers tend to consume the most energy, generate the most heat, and place great demands on existing data centers to support them. Because one-third of data center managers expect data centers to last 30 years,²¹ they may have a tough time adapting to this new technology.

The IBM IT Facilities Assessment, Design and Construction Services – high density zone solution can help meet this change by enabling older data centers to support blade servers. It supports plug-and-play capacity growth to provide support for new technology in existing data centers at up to 35 percent less cost than retrofitting the entire data center—without disrupting ongoing IT operations.²²

Modular data centers provide an agile response to change. **High density zone**

Plug-and-play infrastructure to support high-density technology in existing data centers at less cost and without disruption to implement

IBM helped a large commercial banking client support its rapid application growth in its stock trading applications by implementing more than 6,000 new blade servers in the bank's existing data center. The bank needed to quickly deploy high-density servers, but the data center had insufficient perimeter cooling to accommodate the new IT hardware. The bank was able to set up high density zones to hold a dozen equipment racks with in-row cooling. The bank expects to save 20 to 30 percent in its energy costs and extend the life of its data center while meeting business application growth.²³

Large enterprises—enterprise modular data center

Your organization may be among the majority of those large companies that are expanding their data centers in the next two years. IBM IT Facilities Assessment, Design and Construction Services – enterprise modular data center can help you align your IT investment with the growth of your business. You only need to invest in data center capability as you grow by expanding in smaller increments as required. Start as small as a 5,000-square-foot module of raised-floor space and grow to a full 20,000-square-foot (approximately 1,850-square-meter) data center.

 **Enterprise modular data center**

Standardized design in 5,000-square-foot modules of raised-floor space up to 20,000 square feet to add capacity—as you need it—by aligning your capital and operating costs to changing business needs

By expanding horizontally in increments of 5,000 square feet of raised-floor modules, this solution is designed to give you the ability to quadruple your growth as you need it, allowing you to defer up to 40 percent of the capital and up to 50 percent of the operational costs until you actually need the capacity.

Further, by anticipating the increased power densities of new technology and building support for them into your design, you can potentially support up to three times the power and cooling density *within* each module. Taken together, horizontal and vertical scalability help provide up to a 12 times increase in growth capacity. The enterprise modular data center provides a flexible and cost-effective way to support new technology adoption.

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In addition, it has been designed to an attractive energy-efficient DCiE of 66 percent or better—which may reduce up to 50 percent of its lifetime operational costs. By using standardized components, the enterprise modular data center can be designed and built as much as 25 percent faster than a custom design, allowing you a faster time to deployment.

Temporary or remote locations—portable modular data center

In a global economy, organizations often need remote or temporary data centers that can be quickly installed in many locations around the world to be closer to clients, manufacturing sites or remote operations. And many organizations are turning to temporary solutions to provide capacity while they take 18 to 24 months to build a traditional data center.


Portable modular data center

A fully functional data center that is cost-effective and rapid to deploy to increase capacity for remote or temporary data centers

IBM IT Facilities Assessment, Design and Construction Services – portable modular data center is an efficient and compact modular data center that can be shipped in a container for temporary or remote implementations. It provides a fully functional data center that supports multiple vendor technologies in industry-standard racks. It is designed to be rapidly deployed in as little as 12 to 14 weeks and to provide high availability. At a design DCiE of 66 to 77 percent, it can provide improved energy savings to reduce operational costs.

Change means opportunity—IBM can help

Modular data centers—with their flexibility and scalability—provide the core opportunity for CIOs to adapt to change, adopt new technologies, cost-effectively align capacity to business needs and begin to factor in energy efficiency as a key IT operating metric. These innovative approaches to data center design and build

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“This [modular data center] announcement clearly outlines IBM’s vision for the future datacenter that is geared toward **delivering on customer needs for reducing time to market, improving availability, lowering risk as well as optimizing for energy consumption.**”²⁴ —IDC

enable CIOs to play a pivotal role in supporting the CEO’s business objectives by helping to respond faster to change, by improving their companies’ capital and operational costs, by aligning their business and IT growth as required, and by building a “green” image.

IBM can help you seize this opportunity. We own or manage more than 8 million square feet (more than 740,000 square meters) of data center space and have designed and built more than 30 million square feet (nearly 2.8 million square meters) for clients in more than 40 countries. We take an open approach to working with leading data center suppliers to bring you some of the best and most innovative solutions for your particular needs.

We have seen the need for change in data center design and build, for new ways to manage capacity growth to better match business growth, and to adopt new information technology. The modular data center designs that we have successfully implemented—for our own company and our clients—enable continued IT capacity growth, cut operating costs *and* help minimize environmental impact. IBM is helping to build the enterprise of the future by enabling your IT and data center infrastructure to dynamically respond to change.

For more information

To learn more about IBM Data Center Family solutions, please contact your IBM marketing representative or IBM Business Partner, or visit the following Web site:

ibm.com/services/siteandfacilities





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Armonk, NY 10504
U.S.A.

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November 2008
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GTW03022-USEN-00