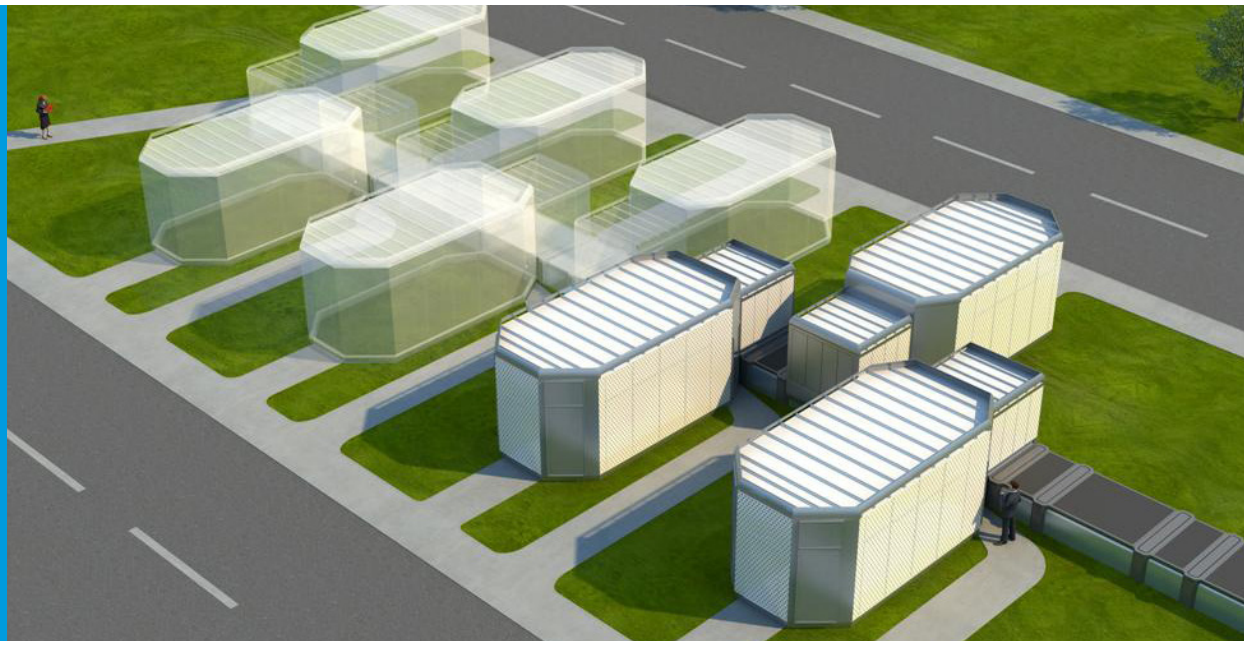
SKANSKA

Integrating data center expansion with IT growth

Lower your cost | Reduce your risk | Enable your business

Modular
Solutions
Whitepaper

May 2012



Creating the dynamic data center of the future, now

The Skanska modular data center solution close-couples physical expansion with IT growth to help organizations achieve optimal computing capacity at the lowest cost.

The issue

Traditional expansion strands capacity and capital

The traditional approach to managing data center growth has relied on a fragmented, linear process to deliver additional capacity.

Traditional process	
Identify need	Driven by IT strategy
Design	Provided by A/E consultants who develop a plan for the expansions
Build out	Managed by a construction firm
Occupy	Migration of systems by the IT department

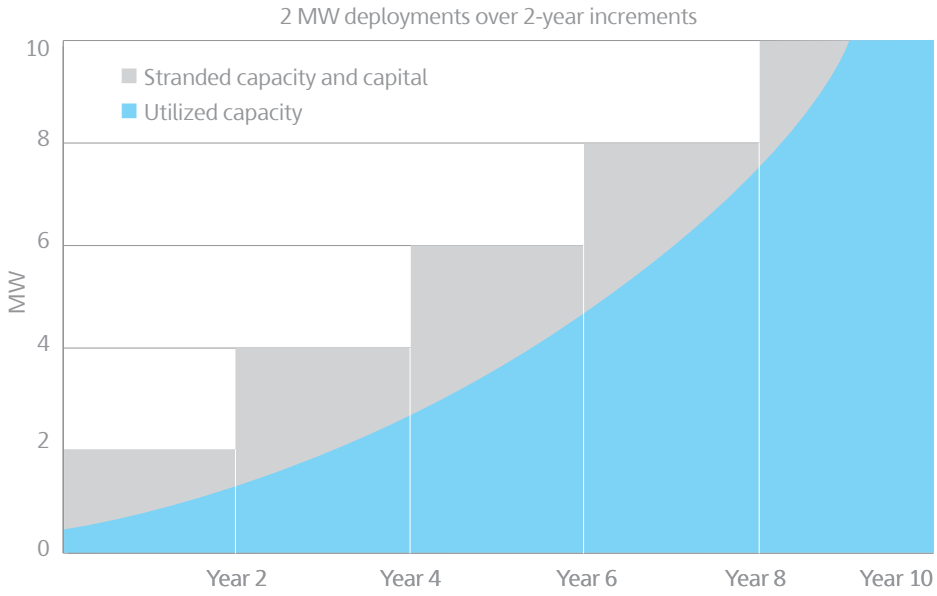
The traditional data center expansion process does not support the technical and infrastructure integration required to lower total-cost-of-ownership (TCO) and foster a dynamic IT environment.

It sounds simple enough. But this approach created unsustainable results: stranding capacity and misappropriating capital. Owners pay to build far more capacity than is needed, and therefore must maintain unused facility space until demand catches up.

Capacity requirements are growing at a rapid rate.[1] As a result, many owners build to stay ahead of demand rather than risk the potentially disastrous impact of a paralyzed IT system. Organizations spend significant capital up-front, constraining their working capital to buy capacity they may not need. This unused capacity also comes with a price tag in the form of energy efficiency penalties in both the electrical and mechanical systems. This results in increased complexity and paying for redundancy that may introduce more risk.

Figure 1: Stranded capacity and capital

Figure 1 illustrates a traditional data center approach leading to stranded capacity and capital.



[1] Storage demand doubles every 18 months (Source: IDC)

For the past several years, the use of modular containers or IT services in a box, has become an acceptable alternative to constructing traditional, raised floor data centers. These modules typically consist of large boxes (e.g., steel shipping containers) housing power, cooling and server systems that can operate as stand-alone units, or provide additional capacity in stages by plugging more boxes into an existing cluster.

Although the containerized approach provides easy scalability, it offers almost no ability to customize the solution to an owner's business needs. This forces the owner to purchase more capacity or pay for higher performance capabilities than needed. Many containerized solutions are also hardware-specific, locking in the owner to a single manufacturer's server components.

Skanska's approach aligns infrastructure expansion and IT load growth with business needs.

The solution

Lower your cost, reduce your risk, enable your business

The Skanska modular solution

Skanska's approach aligns infrastructure expansion and IT load growth with business needs. Our integrated modular solution allows organizations to increase space and IT processing capacity in flexible and customizable phases, guaranteeing optimal utilization at each step. Capital expenditures are matched to actual growth demands through a just-in-time deployment strategy.

Our modular solution incorporates the physical shell, engineering systems (power and cooling) and processing systems (racks and servers) into self-contained units that can be deployed individually or in clusters to only build-out capacity that is needed at the time. This solution combines the most efficient and reliable deployment at the lowest total cost of ownership in the market today.

Figure 2: Capacity and usage growing in parallel

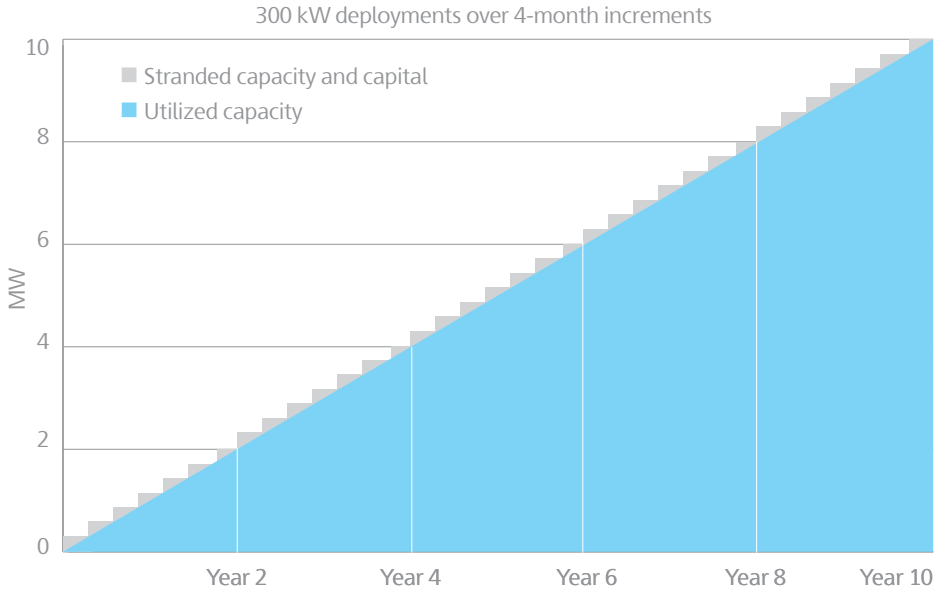


Figure 2 illustrates Skanska's modular deployment where capacity and usage grow in parallel, reducing stranded capacity and capital.

To develop this solution, Skanska brought together the expertise of systems architects and engineers, technical experts in power design and mechanical cooling, controls integrators, operations and maintenance managers, and software developers – all of the interrelated disciplines that play key roles in the design, efficiency and successful operation of a data center.

The Skanska modular solution enables an organization to configure a system to meet their business needs. It seamlessly integrates multiple disciplines: design, mechanics, information technology, engineering, construction and controls.

A key partner in the process is the manufacturing firm INERTECH, LLC. Together, our team developed this patented, innovative and uniquely flexible mechanical solution. This system achieves two significant objectives that help optimize data center operations by:

- Integrating mechanical, electrical and server utilization, and control systems into one view
- Allowing data center managers to configure and optimize the cooling and power storage systems from module to module.

Why our solution is different

To develop its modular solution, Skanska used an iterative process of design, modeling, validating, refining and testing over several years. As a result, the Skanska modular solution now offers an industry-leading level of technological maturity and reliability customers can depend on.

The design is based on a prefabricated mechanical system that allows both the configuration and density of each module to be customized from an eight- to 32-cabinets design. These modules can be combined in clusters to achieve any level of capacity desired. Examples of recent configurations include:

- For TELUS, a large-scale Canadian telecommunications company, we developed a conceptual program that supports a multi-phased build-out over an extended period of time with a total critical IT capacity of 16.2 MW. The phase I build will support 1.35 MW of critical IT load and consist of a mixture of low- (3 – 5 kW per rack), medium- (8 – 10 kW per rack) and high-density (15 kW per rack) modules. Subsequent build outs are planned in 2.7 MW increments, supporting high-density modules of 15 – 30 kW per rack.
- For a confidential U.S. financial company, we are developing a multi-year program with a total critical IT capacity of 14.4MW that will support IT capacity expansion in a modular form factor of 250 kW increments. The IT modules as well as the mechanical and electrical infrastructure supporting the modules are designed for rapid prefabricated modular deployment. The modules (consisting of 16 racks each) will support high-density server racks of up to 20kW per rack.

Photo by: Per-Anders Pettersson

Photo by: Adam Friedberg

Figure 3: Efficiency across utilization

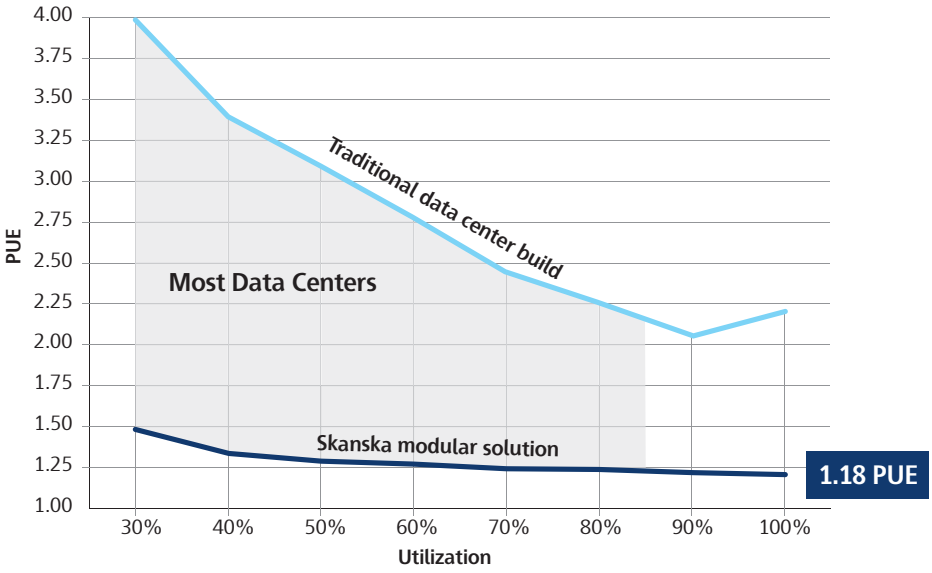


Figure 3 illustrates a traditional data center build compared to Skanska's modular solution. In the typical scenario, a large enterprise data center initially experiences low utilization of its total built capacity. Efficiency increases slowly over time. In contrast, our modular solution provides consistently low energy usage throughout its entire lifespan as capacity and usage grow in tandem.

Breakthrough energy efficiency

Our modular solution provides the most cost-effective way to manage data center expansion and represents a significant leap forward in energy efficiency.

Tested and proven benefits

Our modular solution was reviewed and tested by a renowned team of independent researchers and engineers from the University of Maryland. Dr. Reinhard Radermacher, Director of the Center for Environmental Energy Engineering (CEEE), led the research team. He is an internationally recognized expert in thermal research and simulation. The results of the analysis and testing verifies that our **design will produce an annualized PUE of 1.18 at 90% of full build-out of 4.5 MW load.**

Some of the benefits of the Skanska modular system include:

- **Guaranteed performance –** Skanska will not only guarantee the cost of the project, we also underwrite the energy performance of the data center facilities that we design/build/commission.
- **Ease of installation –** once built, the modules can be delivered to the project site and quickly assembled, minimizing the disruption caused by an extended construction process. Main utility spines promote ease of installation.
- **Lower maintenance cost –** the simplicity of design and built-in control mechanisms mean that Skanska modular requires significantly less maintenance, with little or no operator oversight.

The innovative Skanska modular design guarantees an industry-leading total system PUE* of approximately 1.18.

* Power Usage Effectiveness

The result

Data center owners have lower initial capital outlays, can invest in new, efficient capacity incrementally over time, and are able to rapidly deploy new capacity as needed.

Success story

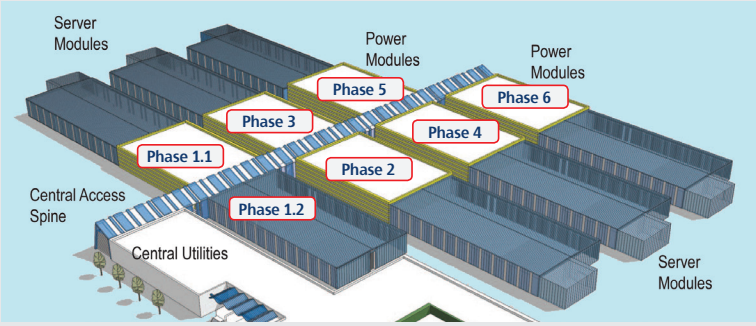
Canadian telecommunications giant TELUS is deploying the Skanska modular solution for its new Super Internet Data Center (SIDC). **This is the world's most efficient data center with the lowest carbon footprint possible.**

TELUS has planned a multi-phase build out to scale with its business growth. By utilizing the Skanska modular solution, TELUS is initially installing the required system components to allow for the non-invasive installation (rigging, setting, and connections) of future modules with minimal or no risk of disruption to existing operations.

Whereas traditional enterprise data center projects consist of over-building in a capitally-intensive manner, TELUS can build just for current capacity in a less invasive and cost-efficient process.

Photo by: Adam Friedberg

eComb™ is one of our customized, energy-efficient modular solutions that marries capital expenditures with IT capacity requirements to allow for timely, non-disruptive expansion on as-needed basis in traditional aisle settings, lowering our client's total cost of ownership.



About Skanska

Skanska's Mission Critical Center of Excellence (COE) offers a radically different delivery method. Our full complement of strategies and tools provides our clients with greater options to plan, design, construct and operate their facilities. Our approach integrates an in-depth focus on business needs and leverages a wide-range of technologies and tools. This approach has proven invaluable in advancing our clients' capacity planning efforts, improving asset utilization and dramatically reducing energy consumption portfolio-wide.

Skanska USA is one of the largest, most financially sound construction networks in the country serving a broad range of industries including healthcare, education, sports, data centers, government, aviation, transportation, and water/wastewater. Headquartered in New York with 36 offices across the country, Skanska USA employs approximately 9,400 people who are committed to sustainable construction and an injury-free workplace.

SKANSKA

Skanska USA Building Inc.
www.skanska.com

350 Fifth Avenue
32nd Floor
New York, NY 10018
P: 917.438.4500

Contact

MissionCritical@Skanska.com

Author

Terry Rennaker
Vice President and Director of Modular Infrastructure

For more information, please check our web site at
www.usa.skanska.com/missioncritical