![Vertiv logo]

Prefabricated Data Center

Rapid Deployment of Unified Infrastructure for Greater Efficiency

The Scenario:

IT anytime, Anywhere

Businesses are faced with the need for IT anytime, anywhere. Speed of deployment then becomes critical as they strive to bring IT even to far-flung areas of the world. Businesses are looking to swiftly deploy IT resources at a large scale and quickly expand them as the need arises.

Traditional "brick-and-mortar" data centers are the usual go-to choice by several businesses. However, the way many businesses plan, design and build their data centers is essentially the same as it was three or four decades ago - when relatively little capacity was needed and IT needs were very different. In the end, traditional data centers may not be a sustainable solution for a rapidly growing data center. Aside from higher costs, traditional data centers take time to build.

The bottom line is this : scalability, availability, efficiency and speed of deployment have become the critical considerations for the modern IT environment.

The Solution:

Rapidly Deployable Solution For Greater Efficiency

Prefabricated modular solutions are a viable solution for changing capacity demands of the data center. Unlike traditional data centers, prefabricated modular data centers are built and assembled off-site.

The resulting facility can accommodate power, thermal management, and other solutions as needed, all of which are pre-integrated and factory tested off-site, significantly reducing on-site work.

Modularity also allows for scalability and flexibility to handle increasing capacity demand. This next-generation solution provides numerous benefits that traditional data centers can't.
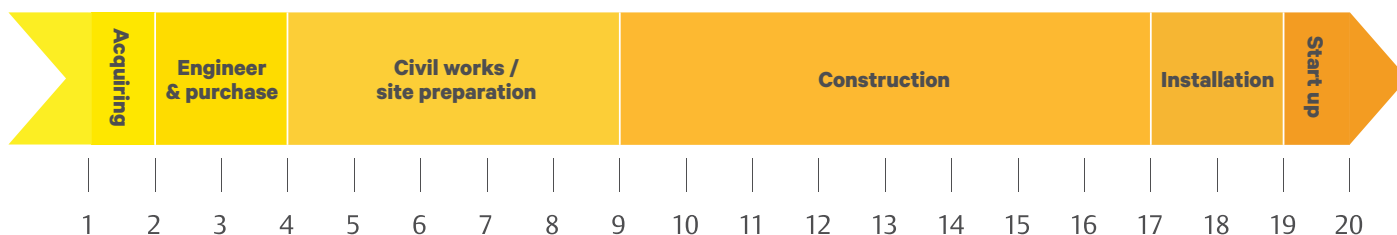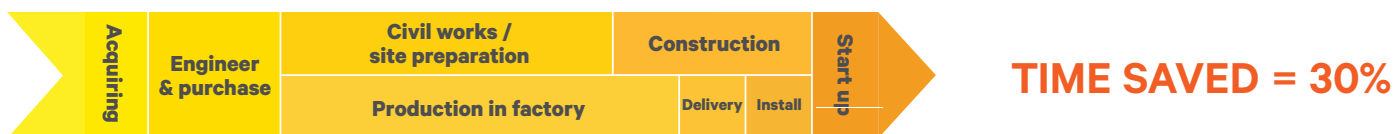
Rapid deployment

Our customers can gain a strategic advantage through prefabricated modular solutions. Rapid deployment can impact positively in both revenue and cost in building a data center. Vertiv's unified infrastructure and design approach provides manufacturing and construction efficiencies leading to time savings of up to 30%

- All sub-systems are pre-assembled, fully integrated, and factory-tested with proven quality assurance processes

- Fabrication and transportation occurs in parallel with site selection, preparation, civil works, and construction

- Global manufacturing and configuration footprint enables implementation across the globe

New Build

| Acquiring | Engineer & purchase | Civil works / site preparation | Construction | Installation | Start up |

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Containerized Solution

| Acquiring | Engineer & purchase | Civil works / site preparation | Construction | Start up |
| Production in factory | Delivery | Install |

TIME SAVED = 30%

Right Sized Infrastructure

The modularity features allows critical power and thermal management needs to be right sized to meet specific IT load requirements. With a redundant and standardized design, capacity can be added or temporarily adjusted to meet the changing needs of the data center. Capacity planning is simplified and our operators can attain a leaner cost structure through better utilization of energy and scalability.

Industry leading energy efficient solutions such as chillers, HVDC, high density racks, third party equipment integration, monitoring software allows greater savings in operating expenditures.
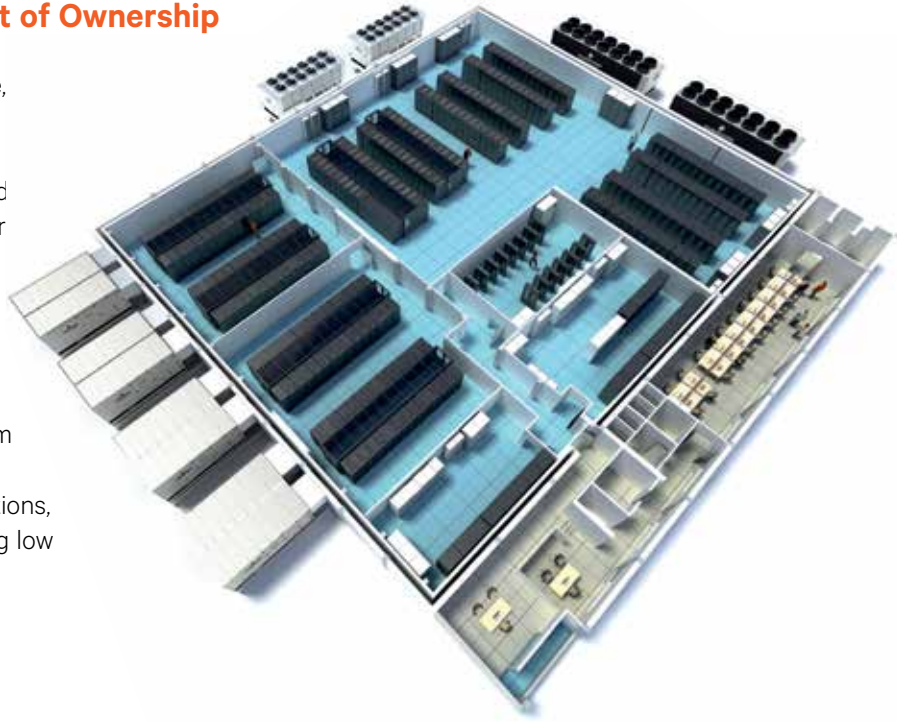
Prefabricated Data Center

Reduce Complexities through Single Point of Ownership

With hundreds of modular solutions deployed worldwide, Vertiv's solution architecture competency from sales to project services to engineering reduces complexities of building your data centers. We work closely with you and your in-house experts, ensuring your Integrated Modular Solution is built according to your specifications.

Our wide range of product portfolio and proven project services capabilities enables us to offer turnkey data center solutions.

Vertiv has the widest portfolio of solutions available, from power protection, thermal management, infrastructure management and monitoring, racks and integrated solutions, and services that optimize your business while delivering low total cost of ownership.

Modules

Flat Pack Module

The Flat Pack Module provides for faster deployment to remote areas, significantly cutting down build time and cost.

Advantages:

Ease of transportation (delivered in open truck or 40' containers), can be sea transport in ISO containers

Two -day erection per module

Lower capacity truck crane 8-ton required

Incorporated a pitched roof, no need for secondary roof

Infrastructure equipment installed at site

Each module can accommodate 26 equipment racks

Module size 12.2m (L) × 4.4m (W) × 4.0 (H)

Factory Build Module

In the Factory Build model, Vertiv solutions are pre-installed and factory tested before deployment, ensuring maximum efficiency of all products upon delivery.

Advantages:

Rapid site deployment

Incorporated a pitched roof, no need for secondary roof

Infrastructure equipment installed at site or factory

Each module can accommodate 26 equipment racks

Module size 12.2m (L) × 4.4m (W) × 4.0 (H)

ISO Containers

ISO Containers are standardized steel shipping enclosures that provide for secure storage and faster transport of materials for installation on-site.

Advantages:

Ease of transportation

Rapid site deployment

Infrastructure equipment installed at site or factory

Each module can accommodate 13 equipment racks

Container size 12.2m (L) × 2.4m (W) × 2.9 (H)

Each module can accommodate 26 equipment racks

Module size 12.2m (L) × 4.4m (W) × 4.0 (H)

Vertiv Owns the Core Datacenter Technologies for Designing "Pay as Grow " Infrastructure

Vertiv's modular solutions approach simplifies the complex environment of data centers by bringing together the most comprehensive power, precision cooling, monitoring and management technologies. It has pioneered some of industry-best practices to deliver "Pay as you grow" infrastructures that overcome challenges in capital inefficiencies and uncertain IT capacity demands.

Efficient

- Enhance business, space, energy efficiency
- Rapid deployment, easy servicing

Economical

- Reduce time and cost of deployment
- Standalone construction without burdening existing infrastructure

Simplified

- Simple and flexible design and implementation
- Systems that work together

Controllable

- Optimized planning, monitoring & management
- Control of your environment

Designed for modular installation and scalable for future growth

Airflow

- Hot / Cold aisle configuration
- Aisle containment separates hot and cold air

Power

- Scalable, high efficiency and high availability row based UPS
- 94% efficient, fewer battery replacements

Efficient Cooling

- Variable Capacity Cooling: Match cooling system capacity to IT needs
- Intelligent controls: Teamwork & Monitoring/Control

Density

- Bring cooling closer to the load
- Higher density IT environment reduces footprint

Modularity

- Faster installation and expansion
- Easier manageability across IT enterprise

Monitoring

- Sensors, Unit Controls & Software
- Provides real-time visibility & efficient infrastructure management

Best Industry Design practices for Optimization and Efficiencies

Integrated Modular Solutions: Typical System Elements

Thermal Management

Make possible the efficient, reliable and cost effective thermal management of mission critical facility through unparalleled expertise and the industry's most advanced service, software, and equipment technology. Energy efficient cold aisle containment can be used with or without conventional raised floor cooling.

DC Power

Vertiv's DC Power technology delivers the most rigorous network-power applications, with an unparalleled breadth of intelligently engineered DC power, distribution, control and monitoring systems.

AC Power

Sustain critical operations that simply can't go down with best-in-class uninterruptible power supplies (UPS) and power distribution units (PDU) that keep data center infrastructure up and running.

Vertiv™ Environet™ Alert

Monitoring Software for Data Center Hardware

Vertiv™ Environet™ Alert provides industry companies with critical facility monitoring software that is affordable and easy to use. This solution delivers superior monitoring, alerting, trending and data organization capabilities for companies in such verticals as healthcare, financial services, government and more, helping them protect and grow their business. Customers get monitoring, alerting and trending at a price that's right for their business.

Automatic Transfer Switches/ Load Banks

Reliably transfer business-critical loads to emergency sources with our industry leading automatic transfer switches and non-automatic transfer switches.

Racks & Integrated Solutions

Vertiv delivers Data Center Racks, Server Racks, Network Racks and Enclosure Solutions for Computer Rooms of all sizes, to Rack Enclosures that contain Thermal Management, Uninterruptible Power, Rack PDUs, and Cable Management in a sturdy, lockable cabinet.

Vertiv has the expertise, knowledge and processes to provide high quality service, original manufactured parts, guaranteed repairs and easy access to product information.
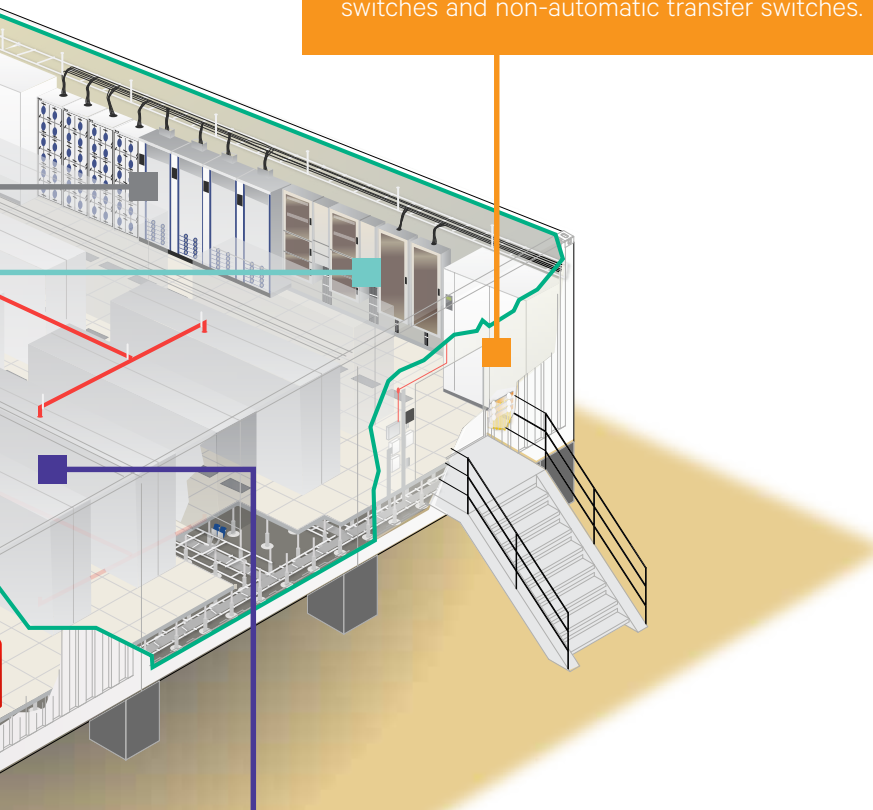
Components of Integrated Modular Solutions

From power supply, backup power, climate control, surge protection, and monitoring, we ensure efficient project management, optimized system integration, and on-time delivery and commissioning. Vertiv offers unmatched visibility and control of critical infrastructure both off-site and on-site – maximizing efficiency while reducing total cost.

Unlike other providers that put together various solutions for each project, Vertiv uses its own in-house solutions to coordinate the entire project, delivering integrated modular solutions efficiently and cost effectively.

Prefabricated Data Center

End to End Project Management

With Vertiv's strong service organization and geographic reach, it is well positioned to serve as the lead Project Manager for large phased and modular infrastructure projects .

Vertiv's technology expertise can help guide design for optimized and standardized solutions. Customers can utilize and leverage on Vertiv's facilities and resources to support fabrication, training, and service to manage on-site assembly, startup and commissioning.

Project Management

Pre- Sales	Project Engineering	Manufacturing + Supply Chain	Start-Up Services	Lifecycle Services

Engineering Services

Project Execution

Testing & Commissioning

After Market Services

The horizontal and vertical integration of Products and Services brings the benefit of ease of operations, training and life cycle maintenance services to the customer.

Project Services	Engineering Services	Installation & Commissioning Services
Project Management	Electrical Design (Tier II–Tier IV)	Vertiv Product Installation
Design Management	Mechanical Design (Thermal Management)	Vertiv Product Commissioning
Risk Management	Infrastructure Management Design	Electrical Commissioning
Contract Administration	Site Planning - Floor Plans - Cable Management	Mechanical Commissioning
Finance Management	Modular Containerized Design	Acceptance Test Plans
Quality Management	Drafting	Practical Completion Certificates
Quality Surveyors		As Built Documentation
Schedulers		
Procurement		
Documentation		
Logistics		

Indoor Infrastructure Products	Outdoor Infrastructure Products	Architecture Services
Fire Suppression System	Sub Stations	Site Drawings
Fire Detection System	Cable Vaults	Building Design
Cable Management System	Generators & Fuel System	Development Approval
Switchboards	Security Bollards, Fencing, CCTV	Building Certificates
Office Fitout		Permits
		Utility Application Services (Electrical, Water, Gas)

Engineering Services	Site Construction Services	Site Management Services
Civil	Foundation	Safety
Hydraulic	Buildings	Schedule
Mechanical	Ground Works	Security
Electrical	Utility Works	Industrial Relations
Fire		Risk
Acoustic		Quality
Structural		Procurement
Environmental		Change Management
Security		Contract Management
Landscape		
Access		

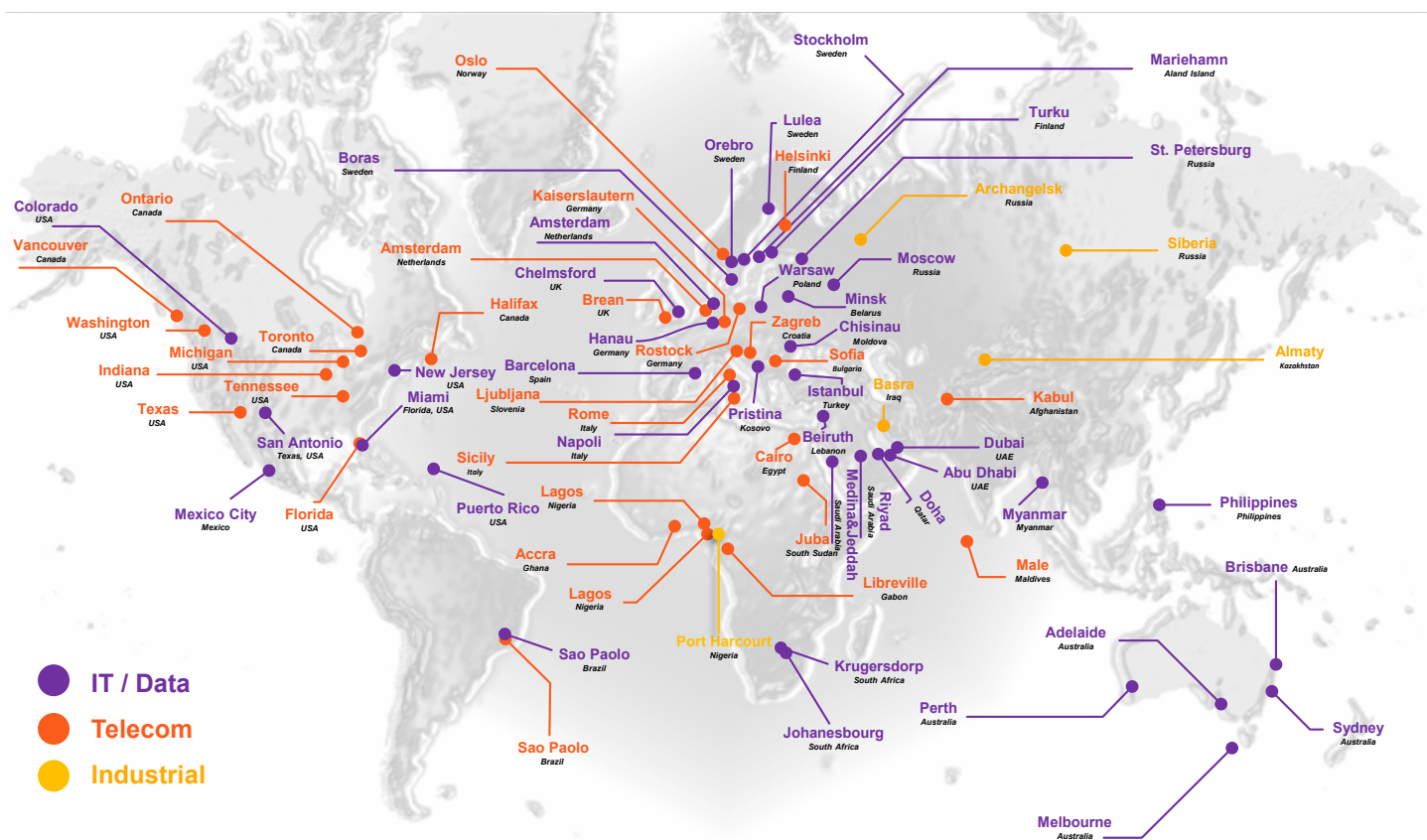*Vertiv Integrates Vertiv Product Technologies and Services with Third Party Product and Services*

Global Resource Knowledge with Proven worldwide Deployments in IT/Data, Telecom and Industrial Application

Prefabricated modular solutions have been deployed worldwide for diverse applications in industries such as oil & gas, mining, military, optical networks, telecommunications, signaling, and data networks. These are configured to site needs and built into different types of structures factoring concerns over environment, logistics, and transportation. Customers for these applications can leverage the worldwide established infrastructure expertise of Vertiv.

- Small Node
  - Base Station (telecom mobile)
  - Transmission (telecom, gas & oil)
  - Analyzer (gas & oil)
- Remote Units
  - BSC (telecom mobile)
  - Repeater, distribution (telecom-optical)
  - Remote Instrumentation (gas & oil)

- Switching & Control Centers
  - MSC, Optical Main Node (telecom)
  - Control Center (gas & oil)
  - Automatic Switchgears (gas, oil & mining)
- Energy Center
  - Power Conversion & Backup (telecom, IT)
- Data Center
  - Bank, Telecom, IT, Gas & Oil, Insurance…

Vertiv's engineering expertise and project management capabilities make remote site planning easy. We have the resources to deliver our Integrated Modular Solutions anywhere. We are available 24/7/365 to support your current and future site needs.

Vertiv Selected Deployments in Recent Years

Case Study: National Broadband Network Co. Ltd.

Products and Services

- Integrated Modular Containerized Solution

- Solution engineering for all aggregation node infrastructure including modular housing systems, energy systems and data centres

- Prefabricated, fully integrated and factory tested modular housing systems

- AC Power - Chloride Trinergy UPS, ASCO 7000 Series make-before-break power management ATS system

- Thermal Management- Liebert precision cooling for optimal efficiency, SmartAisle Cold Aisle Containment System

- Optimization - Liebert SiteScan Monitoring Web

- End-to-end program management

- Global supply chain and logistics

- Site civil works via partnerships

- After Market: Global Services

NBN turned to Vertiv to design, supply, install and commission 10 network hubs that served as the foundation for the continent-spanning network. Vertiv was selected because it offers a unique combination of best-in-class technologies, broad service capabilities, deep industry experience and project management expertise that enabled this unprecedented network build to proceed even faster and more efficiently than initially expected.

NBN looked to Vertiv expertise to customize proven technologies to match their specific needs, manage all elements of design and deployment, and deliver within firm deadlines.

Vertiv designed a fully integrated, modular and containerized infrastructure solution for NBN's aggregation nodes that incorporated best-in-class AC and DC power, thermal management, racks, and infrastructure management and monitoring solutions, as well as supporting services. Vertiv's innovative modular and containerized approach allowed NBN and Vertiv to simultaneously plan, fabricate, fit out, integrate and test all 10 of the network nodes in a central location, rather than build them sequentially at each site location, which was more expensive and more prone to risk of delays.

The benefits for NBN Co. were: dramatically reduced deployment time, reduced cost, and greater flexibility to optimize the total project deployment. To meet NBN Co.'s need for "efficiency without compromise," Vertiv's power and cooling solutions were designed to deliver power usage effectiveness measures that far exceeded industry averages, putting the NBN at the forefront of efficiency. At the same time, Vertiv power and cooling solutions supported NBN Co's need for high server density to support very large traffic demands, as well as the ultra-high availability required for the network backbone carrying the country's online traffic.

Vertiv's leading data center infrastructure solutions supported the initial production roll-outs of the NBN and enabled rapid growth of the network in the years to come. Deployment of the containerized solution for the network hubs enabled this infrastructure to be put in service up to 50 percent faster than purpose-built sites. Additionally, the Vertiv solutions delivered energy-efficiency gains of up to 30 percent over traditional power and cooling solutions. With Vertiv's technologies, Australia's National Broadband Network has built a strong foundation and was well on its way to deliver a modern telecommunications system that connected its cities and towns for the benefit of all its citizens.

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