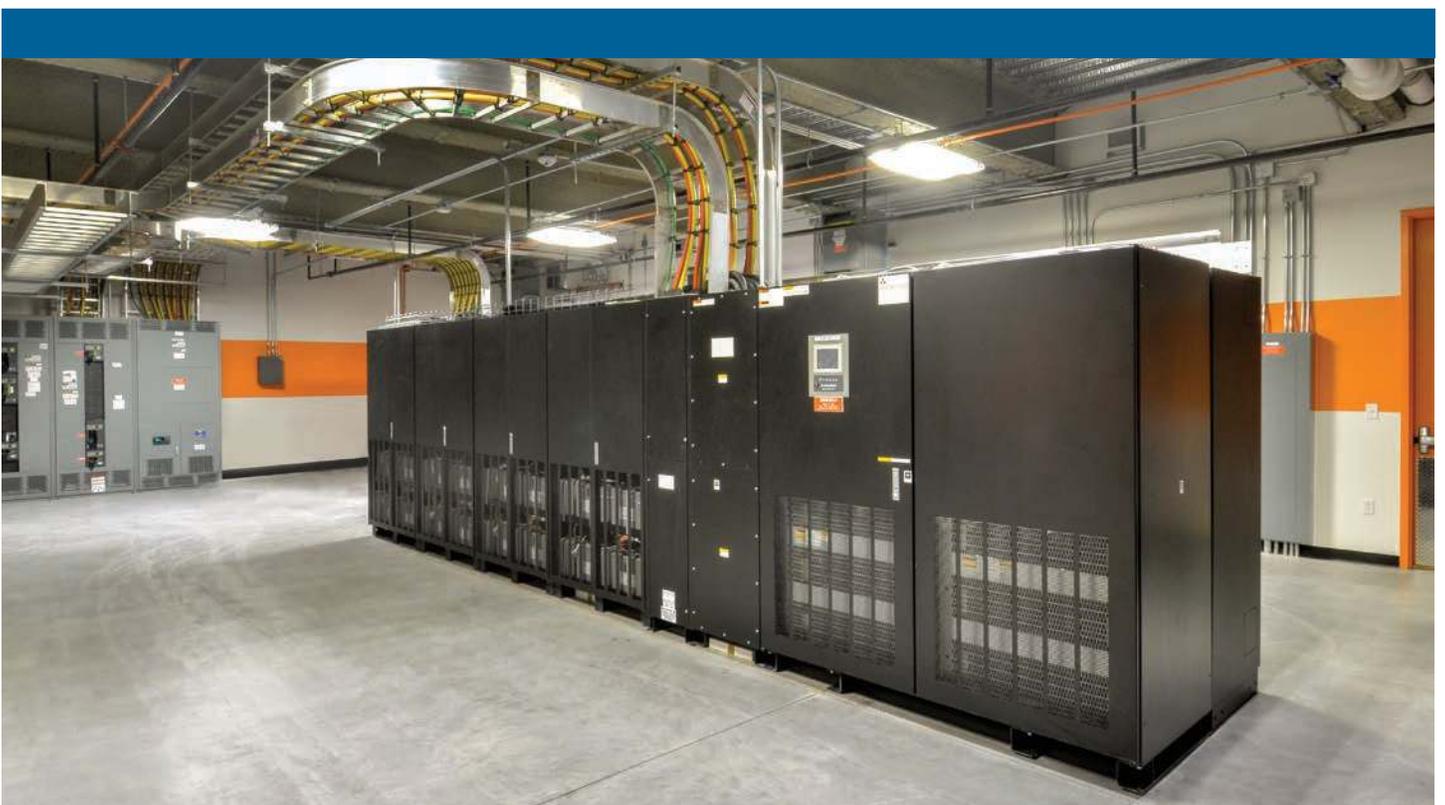CyrusOne

Executive Report

HPC Solutions in High Density Data Centers

How CyrusOne's Houston West data center campus delivers the highest density solutions to customers

With the ever-increasing demand on IT resources, data center infrastructure must continue to evolve to keep pace with the needs of users.

Overview

Many companies, especially those in the Oil and Gas Industry, need high-density deployments of high performance compute (HPC) environments to manage and analyze the extreme levels of computing involved with seismic processing.

CyrusOne's Houston West campus has the largest known concentration of HPC and high-density data center space in the colocation market today.

The data center buildings at this campus are collectively known as the largest data center campus for seismic exploration computing in the oil and gas industry. By continuing to apply its Massively Modular design and build approach and high-density compute expertise, CyrusOne serves the growing number of oil and gas customers, as well as other customers, who are demanding best-in-class, mission-critical, HPC infrastructure.

The company's proven flexibility and scale of its HPC offering enables customers to deploy the ultra-high density compute infrastructure they need to be competitive in their respective business sectors.

The Traditional Data Center Configuration

A standard rack of industry-typical servers requires 30 sq. ft. to be accommodated without supplemental cooling, and a rack that is 60 percent filled could have a power draw as high as 12 kilowatts (kW). Any standard rack of blade servers more than 50 percent full will need to be in a high-density data center or zone.

Traditional data centers built as recently as five years ago were designed to have a uniform energy distribution of around 2 kW to 4 kW per rack. With the increasing use of high-density blade systems, many enterprises are finding that this design envelope is no longer sufficient , even for traditional back office computing.

The High Density Data Center Configuration

A high-density data center is one where the amount of energy needed is more than 10 kW per rack or where the power to the raised floor and the computing equipment exceeds 150 watts per sq. ft. over the entire raised floor. This is the point where traditional all-air data centers begin to have significant limitations.

Rack configuration affects the ability to power, cool, and control the servers n the rack. Air flow, air leakage, power redundancy, power distribution, and cable management all contribute to the solutions needed to successfully run highly dense computing environments.

The rack itself is not the limiting factor in high-density rack configurations. Instead, the maximum heat load for air-cooled racks is determined by the air volume and the air temperature being delivered to the rack. The average maximum load for air-cooled racks is about 10 kW per rack.

The actual maximum load depends on the optimization of variables such as data center design, placement of high-density racks, the use of closely coupled cooling techniques, and of other best practices. When some or all of these techniques are optimized in concert, the actual load can go slightly beyond a 10 kW per rack.

Solutions for High (and Ultra-High) Density Computing

The CyrusOne Houston West data center campus has become the preferred data center destination for the Energy Sector's high (and ultra-high) density deployments of high performance compute equipment. This server equipment is used primarily for the processing of seismic data collected from around the world.

CyrusOne currently offers more than 31 megawatts (MW) of critical power load at Houston West, which enables ultra-high-density infrastructure across more than 24,000 square feet supporting up to 900 watts per square foot. This is the largest known concentration of high-density computer and high-density multi-tenant data center space in the global colocation market.

CyrusOne's proven flexibility and scale of its HPC offering enables customers to deploy the ultra-high density compute infrastructure they need to be competitive in their sector.

This offering enables CyrusOne customers to operate the most complex data analytic systems in the industry. As a result of CyrusOne's engineering capabilities, customers can deploy the latest, cutting-edge high performance technology enabling them to crank through millions and millions of calculations per second. This high speed reduces the amount of time and effort required for customers to determine where the carbon deposits are located, and thus accelerates their ability to deliver oil reserves to market and increase revenue.

As many companies are realizing, being able to speed up data analytics is providing a clear bottom line increase to many companies' results. High density data centers are on the leading edge of helping companies take advantage of the various HPC technologies now available.

Liquid-Cooled Racks Provide Extreme Efficiencies

Liquid-cooled racks embody the concept of "closely coupled" cooling where the cooling mechanism is in close proximity to the servers to be cooled and is aware of the specific requirements of the target servers. Liquid-cooled racks are ideal for high density heat loads.

A large proportion of the high performance compute infrastructure at Houston West is water cooled and powered at 480 volts. The direct water cooling facilitates very efficient heat rejection when compared to traditional air cooling, since heat transferred to water is 800 percent more efficient than heat transfer to air.

By utilizing the power delivery at 480 volts as opposed to the standard 208 volts, there is one less power conversion, which improves efficiency on average by approximately 3 percent. These two attributes of the high-density environment (water cooling and high power delivery) improve the PUE of the deployment by more than 12 percent, which can equate to direct utility savings for CyrusOne's customers

The distributed nature of the high-density compute node infrastructure and the applications that drive them is another unique attribute. This allows for the use of a minimally redundant electrical and mechanical data center infrastructure. The redundancy level of the data center infrastructure is classified as N, meaning there are no redundant components in the electrical and mechanical design.

While the high density, high compute data center is protected from utility interruptions by the use of onsite generators, severe equipment outages could take the N electrical load down. However, the positive for customers is a lower cost to operate since the applications can survive in the event of failure due to number of racks they have installed. This means customers can usually afford the higher risks.

The configuration allows for 100 percent utilization of the data center infrastructure assets, since there is nothing left in reserve for failover. The failover is down virtually in the High Performance Compute hardware and software.
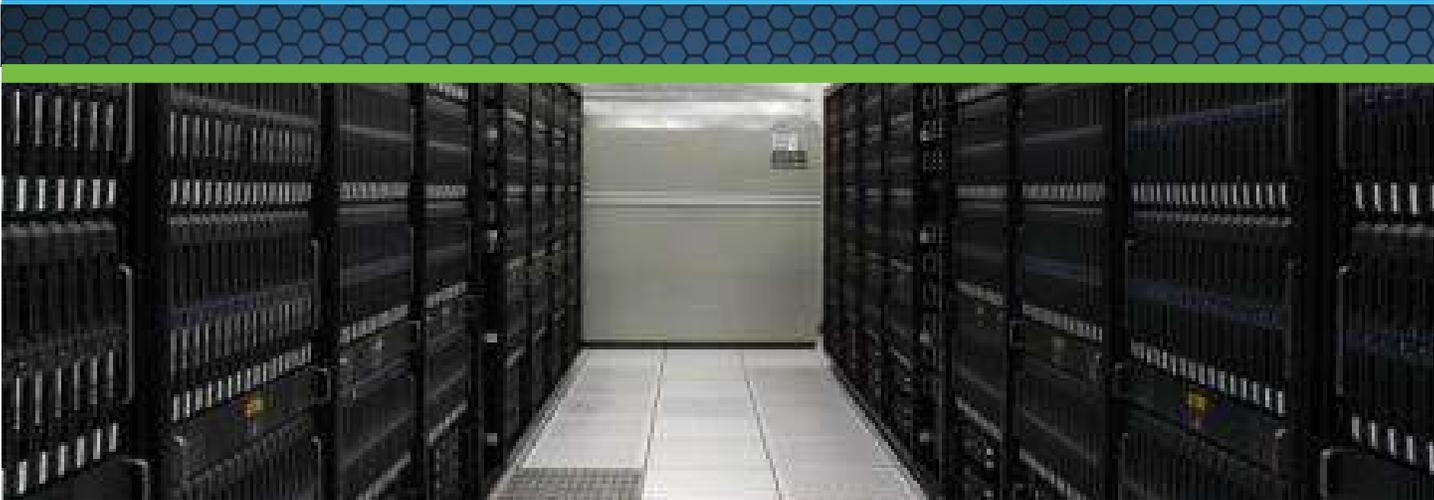
CyrusOne – The Leader in HPC and High Density Data Centers

As the leader in high-density data center deployments in the colocation industry, CyrusOne understands that no data center solution is "one size fits all", especially when it comes to high performance compute and high density deployments. The company's overarching goal is to always say "yes we can" when hosting engineering and implementation meetings with customers.

The company's deep experience with high-density data centers is also assisting customers in other industry sectors realize HPC's benefits. Customers can gain efficiencies by utilizing high density high performance compute solutions when the data center is appropriately engineered to handle higher density levels.

In the future, power consumptions will continue to increase since more transistors and higher clock speeds result in more power consumption. This increased power consumption will, in turn, lead to greater production of heat. Current industry projections forecast power consumption increases by 2X every four years.

Therefore, the demand for HPC to be handled in data centers designed specifically for high density deployments will continue to grow. If your company needs an HPC environment, please contact CyrusOne for a free solutions consultation.

About CyrusOne

CyrusOne specializes in providing highly reliable, flexible and scalable enterprise data center colocation that meets the specific needs of customers across its broad portfolio of carrier-neutral data center facilities in the United States, Europe and Asia. CyrusOne employs its Massively Modular® engineering and design approach to optimize design and construction materials sourcing and enable just-in-time data hall inventory to meet customer demand. The company engineers its facilities with redundant power technology, including an available 2N architecture.

CyrusOne customers can mix and match data centers to create their own production and/or disaster recovery platforms by combining facilities via the low-cost, robust interconnectivity provided by the CyrusOne National Internet Exchange (IX).

About the Author

John Hatem

Executive Vice President, Design, Construction and Operations

John handles the financial management and strategic innovations involved with designing and constructing CyrusOne data centers.

Prior to joining CyrusOne in 2011, he served as the director of design and construction for ConceptCSI Global Data Center Solutions. One of the preeminent construction firms in the industry, it is exclusively dedicated to the design, planning, and construction of mission-critical facilities throughout the world.

With more than 20 years of experience in information technology and data center strategy, John started his career as a network operations engineer, and he has worked with some of the largest financial companies in the world, including JPMorgan Chase & Co. (formerly Bear Stearns & Co. Inc.), Deutsche Bank, and Morgan Stanley. As managing director at Bear Stearns, he was responsible for the strategic design, planning, and control of vital data centers worldwide.

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