

Future-Ready Data Center Infrastructure

A Guide to High-Density Colocation

High-Density Colocation Overview

High-density colocation is a type of colocation designed to accommodate increasing power requirements, driven mostly by artificial intelligence (AI) and other high-performance workloads. This type of colocation is increasingly important due to the rise of high-performance computing (HPC), big data analytics, and other intensive applications that require more power and cooling per unit of rack space. High-density environments are engineered with advanced cooling systems to dissipate the additional heat generated by densely packed servers running at full capacity.

COMPARISON

Traditional vs. High-Density Colocation

Traditional data centers typically offer a power density of around 2-4 kilowatts (kW) per rack. High-Density data centers leverage cabinet technology enhanced by advanced cooling methods and enable providers to deliver optimal configurations that support rack densities of up to 85kW.

Factors Driving the Need for High-Density Colocation



Increasing Computing Demands

The proliferation of data-intensive applications – like AI, machine learning (ML), and big data analytics – has led to a surge in computing demands. Businesses need to meet those demands with more processing power in a colocation data center space.



Cloud Computing & Virtualization

Cloud and virtualizing adoption have transformed the way businesses manage and deploy IT resources. Cloud providers need a solution that helps them optimize server density, reduce latency, and enhance overall performance.



Power & Space Constraints

Traditional data centers face limitations in terms of available power and physical space. Businesses want to address these constraints by maximizing the utilization of existing data center facilities, reducing the need for significant expansions.



Edge Computing Requirements

The need for low latency and better-performing applications – that require real-time processing- is pushing businesses to explore edge computing capabilities in colocation data centers.



Rapid Technological Advancements

Advancements in hardware, like more powerful processors, contribute to businesses seeking solutions to stay competitive with their peers.



Cost Efficiency

Organizations that need to achieve better economies of scale may consider consolidating computing resources into a smaller physical footprint. This helps reduce overall operating costs related to data center space, power consumption, networking, and cooling.



Energy Efficiency & Sustainability

Energy costs, regulation, and environmental concerns are pushing businesses to find data center solutions with advanced cooling and energy-efficient solutions to minimize environmental impacts and operational costs.



Increased Connectivity Needs

The interconnected nature of modern applications and services requires robust and high-speed connectivity. To meet these requirements, organizations are considering facilities that offer a variety of network providers, improving connectivity and reducing latency.



Flexible Scalability

As customer behavior changes, business needs often change with them. Scalability is crucial for companies experiencing growth or fluctuations in demand for their services. They often seek data center solutions that meet their flexible scaling needs.



Advanced Cooling

New data-intensive applications produce more heat than traditional applications. Organizations need advanced cooling solutions, like liquid cooling, to keep these power-hungry applications running efficiently.



What Benefits Would My Business Get from High-Density Colocation?

In the evolving landscape of digital transformation, high-density colocation emerges as a strategic solution for businesses aiming to optimize their data center operations. This approach not only enhances efficiency but also aligns with the growing demands for intensive computing capabilities. Here's a closer look at the benefits that highdensity colocation offers.



Enhanced Cost Efficiency

By embracing high-density colocation, businesses can significantly improve the utilization of space, power, and cooling resources within a data center. This heightened efficiency translates into tangible cost savings, as it allows for a denser configuration of equipment within a more compact area, effectively lowering the total cost of data center operations.

Seamless Scalability

Tailored to grow in tandem with their business, highdensity colocation facilities offer the flexibility to expand their IT infrastructure effortlessly. This adaptability ensures that as their computational needs escalate, they can augment their setup with additional equipment without necessitating extensive modifications to existing infrastructure.

Superior Network Connectivity

Access to high-speed, dependable internet connections and networking services is a hallmark of high-density colocation facilities. This connectivity advantage bolsters the performance and reliability of online services, providing an enhanced experience for users.

Optimal Resource Utilization

High-density environments are specifically designed to accommodate a greater concentration of computing resources within the same physical space. This capability is especially advantageous for organizations with demanding computing requirements, enabling them to deploy more servers and thus, amplify their computational power without expanding their spatial footprint.

Promoting Energy Efficiency

Data centers catering to high-density colocation are often at the forefront of incorporating advanced cooling solutions and energy-efficient technologies. This commitment to sustainability not only mitigates environmental impact but also yields a cost-efficient model by reducing energy consumption.

Robust Security Measures

Investment in comprehensive security protocols, including advanced access controls and surveillance systems, is a standard practice among colocation providers. This security infrastructure, coupled with adherence to industry regulations, creates a fortified environment for IT assets.

Key Components of High-Density Colocation

High-density colocation represents a pivotal shift in how businesses approach data center infrastructure, catering to the escalating demands for power and cooling necessitated by advanced computing technologies. This model is distinguished by its ability to support intensive computing operations within a compact footprint, a feat achieved through the integration of sophisticated hardware, power, cooling systems, and space optimization strategies. These are the core components of high-density colocation facilities.

Hardware Infrastructure

The foundation of any high-density colocation setup is its hardware infrastructure, designed to accommodate the rigorous demands of modern computing tasks. This includes:

Servers and Blade Systems

High-density colocation facilities house state-of-the-art servers and blade systems, engineered for optimal performance and efficiency. These systems are compact, yet powerful, capable of processing vast amounts of data at high speeds, making them ideal for applications requiring substantial computational power, such as big data analytics and machine l earning algorithms.

Data Storage

Accompanying these powerful computing units are advanced storage solutions. These are not only large, allowing for the storage of petabytes of data, but are also designed for high-speed access and data retrieval. This ensures that the computational power of the servers is not bottlenecked by slow data access times.

Networking Equipment

The glue that holds the hardware infrastructure together is the networking equipment, including high-speed cabling and connectivity options. This ensures seamless communication between servers, storage systems, and the external world, facilitating fast data transfers and minimizing latency for critical applications.

Power and Cooling Systems

The increased computational density in high-density colocation facilities necessitates robust power and cooling systems to ensure uninterrupted operation and longevity of the hardware.

Power Distribution and Redundancy

These facilities are equipped with advanced power distribution units (PDUs) that efficiently manage the delivery of power to the racks. Additionally, redundancy is built into the power infrastructure to ensure that, in the event of a power failure, backup systems can maintain operations without interruption.

Advanced Cooling Technologies

Given the significant heat generated by densely packed, high-performance hardware, high-density colocation facilities leverage advanced cooling technologies. These may include inrow cooling, cold aisle containment, and innovative liquid cooling solutions, including liquid-to-chip systems, are all used to efficiently dissipate heat and ensure hardware operates within optimal temperature ranges.

Space Configuration

Maximizing the use of available space while ensuring efficient operation of the hardware is a critical aspect of high-density colocation.

Rack and Cabinet Design

Racks and cabinets in high-density facilities are designed to accommodate more equipment in less space. This is achieved through innovative designs that allow for vertical stacking and closer placement of hardware, without compromising on cooling efficiency or accessibility for maintenance.

Layout and Floorplanning

The layout of the data center floor is meticulously planned to optimize airflow and cooling efficiency. This includes strategic placement of cooling units, careful routing of power and network cables to avoid obstructions, and the use of containment systems to prevent the mixing of hot and cold air streams.

By integrating these key components, high-density colocation data centers offer a robust, efficient, and scalable environment for businesses to house their critical IT infrastructure. This approach not only supports the highpower demands of modern computing applications but also provides a pathway for sustainable growth and innovation.

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Availability Challenges

- Ensuring Continuous Uptime Implementing robust systems for power and cooling redundancy to guarantee high availability and minimize downtime.
- Service Level Agreements (SLAs) Negotiating comprehensive SLAs with colocation providers that specify uptime guarantees and response times for support and maintenance.
- Disaster Recovery Planning Establishing disaster recovery protocols and backup solutions to maintain operations during unforeseen events.

Heat Dissipation and Cooling Efficiency Challenges

- Advanced Cooling Solutions Implementing in-row cooling, hot/ cold aisle containment, or liquid cooling to manage the excess heat generated by high-density setups.
- Regular Maintenance Scheduling regular maintenance to ensure cooling systems operate at peak efficiency.
- Monitoring and Adjustments Using environmental monitoring tools to continuously assess and adjust cooling requirements in real time.

Scalability Concerns

- Flexible Infrastructure Choosing a colocation provider with modular infrastructure that can scale up or down as needed.
- Space Planning Anticipating future space requirements and ensuring the provider can accommodate additional racks or cabinets without significant delays.
- Contract Flexibility Negotiating contracts that allow for scalability without incurring prohibitive costs or long-term commitments.

Cost Considerations

- Transparent Pricing Models Understanding the pricing structure for power usage, space, cooling, and additional services to avoid unexpected costs.
- ✓ Total Cost of Ownership (TCO) Evaluating the TCO, including indirect costs such as transportation and staff time, when comparing colocation providers.
- Negotiating Contracts Working with the colocation provider to negotiate contracts that align with business's budget and growth projections.

Power Density Challenges

- Adequate Power Supply Ensuring the colocation provider can supply the necessary power per rack to meet the demands of high-density deployments.
- ✓ Future-Proofing Planning for future power needs to accommodate growth without requiring major infrastructure changes.
- Efficient Power Distribution Utilizing advanced PDUs and smart power management systems to optimize power distribution and usage.

Connectivity Option Availability/ Redundancy Challenges

- ✓ High-Bandwidth Requirements Ensuring the colocation provider offers high-bandwidth options to support the increased data transfer needs of high-density environments.
- Redundant Connectivity Establishing redundant network connections to prevent single points of failure and maintain consistent connectivity.
- Carrier Neutrality Selecting a colocation provider that offers carrier neutrality for a wide range of connectivity options and competitive pricing.

Security and Compliance

- Physical Security Measures Verifying that the colocation facility has stringent physical security measures, including biometric access, surveillance, and 24/7 on-site security personnel.
- Cybersecurity Protocols Ensuring the provider has robust cybersecurity measures in place, such as firewalls, intrusion detection systems, and regular security audits.
- Regulatory Compliance Confirming the colocation provider meets industry-specific compliance standards (e.g., HIPAA, SOC 2, PCI DSS) and assists with compliance reporting.



Why TierPoint Stands Out

TierPoint's high-density colocation solutions are meticulously engineered to support the rigorous demands of high-performance computing and artificial intelligence applications. Our offerings are distinguished by state-of-the-art cooling systems, robust power infrastructure, and secure, scalable spaces designed for the most intensive computing environments.

Unmatched Expertise & Rapid Deployment	TierPoint has established itself as a leader in the high-density colocation space, with a track record of successfully meeting the dynamic needs of clients in high-performance computing, including Al applications. Our experience is evidenced by one of the industry's largest ultra-high-density deployments for a single user, showcasing our capability to deliver at scale and speed.
Comprehensive IT Solutions	Integrated Technology Partner: Beyond high-density colocation, TierPoint offers a broad spectrum of IT solutions, including managed services and cloud offerings, positioning us as an all-encompassing technology ally. Our consultative approach differentiates us, allowing for the creation of customized solutions that precisely fit your unique business needs.
Enhanced Cost Efficiency	Our high-density solutions are designed with top-tier cabinets that maximize space efficiency while optimizing power and cooling resources. This approach not only improves energy efficiency but also leads to considerable cost reductions by minimizing the expenses associated with wiring, networking, and cross-connects through strategic consolidation.
Strategic Geographic Presence	TierPoint sets itself apart from competitors with a selection of geographically diverse locations. This flexibility ensures that you can position your infrastructure in proximity to your user base, optimizing performance and reducing latency. Our enterprise-grade facilities are built on a foundation of redundancy, with critical systems duplicated to ensure resilience and backed by a 100% uptime service level agreement (SLA).

USE CASES

What Types of Businesses Benefit from High-Density Colocation?

Technology & IT Services Companies

Businesses in the tech sector, like software development, IT consulting, and other tech-related services, often need to run Artificial Intelligence and High-Perfomance Computing workoads. High-Density colocation allows them to support their infrastructure efficiently.

Gaming & Media Streaming

Companies in the gaming industry and those providing media streaming services require powerful servers to deliver high-quality graphics, low-latency experiences, and seamless streaming. High-density colocation supports the infrastructure needed for these services.

E-Commerce & Online Retailers

E-commerce businesses experience fluctuating demands, especially during peak seasons. High-density colocation helps them manage variable workloads by providing the necessary computing power and scalability to handle increased online traffic.

Cloud Service Providers

Companies offering cloud services, including Infrastructure as a Service (IaaS) and Platform as a Service (PaaS), benefit from high-density colocation to efficiently manage and scale their cloud infrastructure.

Financial Services

Financial institutions, such as banks and investment firms, deal with large volumes of data and require high-performance computing for financial modeling, analytics, and transaction processing. High-density colocation can meet these demanding requirements.

Healthcare & Life Sciences

Healthcare organizations and life sciences companies often deal with large datasets, medical imaging, and complex computational tasks. High-density colocation supports the computing requirements for medical research, genomic analysis, and other data-intensive processes.

Manufacturing & Engineering

Businesses in manufacturing and engineering may require high-performance computing for design simulations, product testing, and process optimization. Highdensity colocation can provide the necessary computational resources.

Government & Defense

Government agencies and defense contractors often have stringent security and reliability requirements. High-density colocation can provide the necessary infrastructure for secure data storage, processing, and communication.



Top Features of our High-Density Colocation Solution

Upgrade your infrastructure with high-density colocation. Let's discuss how we can elevate your high-performance computing and support your AI data center needs. Contact us today.

Unmatched Computing Power

Our racks support densities of up to 85kW with optimal configurations, ideal for AI and GPU-intensive workloads.



Space-Efficient Cabinets

Our state-of-the-art cabinet design maximizes density and integrates cooling and power distribution, accommodating any rack-mountable hardware.



Enhanced Security Measures

Benefit from round-the-clock electronic and physical security, including two-factor and biometric systems, for both facility and cabinet access.



Advanced Liquid Cooling

Our innovative liquid-air cooling technology optimizes temperatures for peak performance, with real-time power and thermal monitoring without expanding their spatial footprint.



Direct Network Connectivity

Enjoy private, low-latency data exchanges between TierPoint data centers, with diverse cabling and redundant network options.



Modernized Facilities

Our data centers feature upgraded, redundant UPS and generators, ensuring reliable power and cooling for highdensity demands across multiple enterprise-class locations.

TierPoint provides CoreWeave with technologically advanced solutions in a cost-effective manner, enabling the company to meet the needs of our customers rapidly and economically.

Michael Intrator CEO and Co-founder of CoreWeave

About TierPoint

TierPoint (tierpoint.com) is a leading provider of secure, connected IT platform solutions that power the digital transformation of thousands of clients, from the public to private sectors, from small businesses to Fortune 500 enterprises. Taking an agnostic approach to helping clients achieve their most pressing business objectives, TierPoint is a champion for untangling the complexity of hybrid, multi-platform approaches to IT infrastructure, drawing on a comprehensive portfolio of services, from public to multitenant and private cloud, from colocation to disaster recovery, security, and more. TierPoint also has one of the largest and most geographically diversified U.S. footprints, with dozens of world-class, cloud-ready data centers in 20 markets, connected by a coast-to-coast network.



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Learn More

Let us help you power your Al workloads with high-density colocation. Call **844.267.3687** or email **sales@tierpoint.com** to connect with one of our advisors. Or visit us at **tierpoint.com** to learn more.