



EQUINIX

CHICAGO'S FINANCIAL HUB

EQUINIX ECOSYSTEM REPORT



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EXECUTIVE SUMMARY

Chicago is home to multiple major equities, options and futures exchanges, including the Chicago Stock Exchange (CHX), the Chicago Board Options Exchange (CBOE), the Chicago Mercantile Exchange (CME), the ICE Futures Exchange, NYSE Liffe, a major NYSE SFTI hub, as well as hundreds of global and domestic players.



The Equinix CH1, CH2 and CH4 International Business Exchange™ (IBX®) data centers are located at 350 East Cermak Road in Chicago. Positioned on the South Loop of the city's central business district, the location is ideal for firms trading in commodities, options, futures, FX and other asset classes, as well as for firms venturing into multi-asset and cross-asset trading.

As one of the largest colocation centers in the country, this building is the focal point for Chicago's financial markets. The facility is ideally located to provide connectivity to more than half-a-dozen exchanges as well as hundreds of broker-dealers, crossing and other network providers, market data distributors, liquidity providers, and application providers all in the same building or nearby in downtown Chicago.

In addition to the three data centers at 350 East Cermak Road, Equinix also has the CH3 data center, located in Elk Grove Village, IL. CH3 is 25 miles from East Cermak Road and 22 miles from downtown Chicago.

This report delves into the unique building construction and features that make it a world-class data center; the financial ecosystem present inside the building; the network density and options available for Equinix customers in this facility there; and deployment considerations when interconnecting your financial cities.

The report is appropriate for technical and strategic decision-makers focused on data center management, connectivity, latency monitoring and trading technology.

FACILITY OVERVIEW

The Equinix CH1, CH2 and CH4 IBX data centers are located within one of the largest mission-critical data center and interconnection facilities in downtown Chicago. The building is a 1.1 million square foot facility owned by Digital Realty Trust. A historical landmark, the building originally housed the printing presses for phone books and catalogs before being redesigned as a data center facility. Today, it is one of the world's largest colocation complexes and the nerve center for Chicago's commodity markets. Inside, hundreds of financial firms interconnect with one another.

The eight-story building has 14-foot ceilings. Originally designed to support huge newsprint reams and heavy printing presses, each floor was built to support 250 pounds per square foot. This is perfect for supporting heavy equipment like transformers on the upper floors. The high ceilings allow for more than 12-foot clearance even with 30-inch raised floors.

The CH3 data center in Elk Grove Village provides an additional 133,987 square feet of colocation.

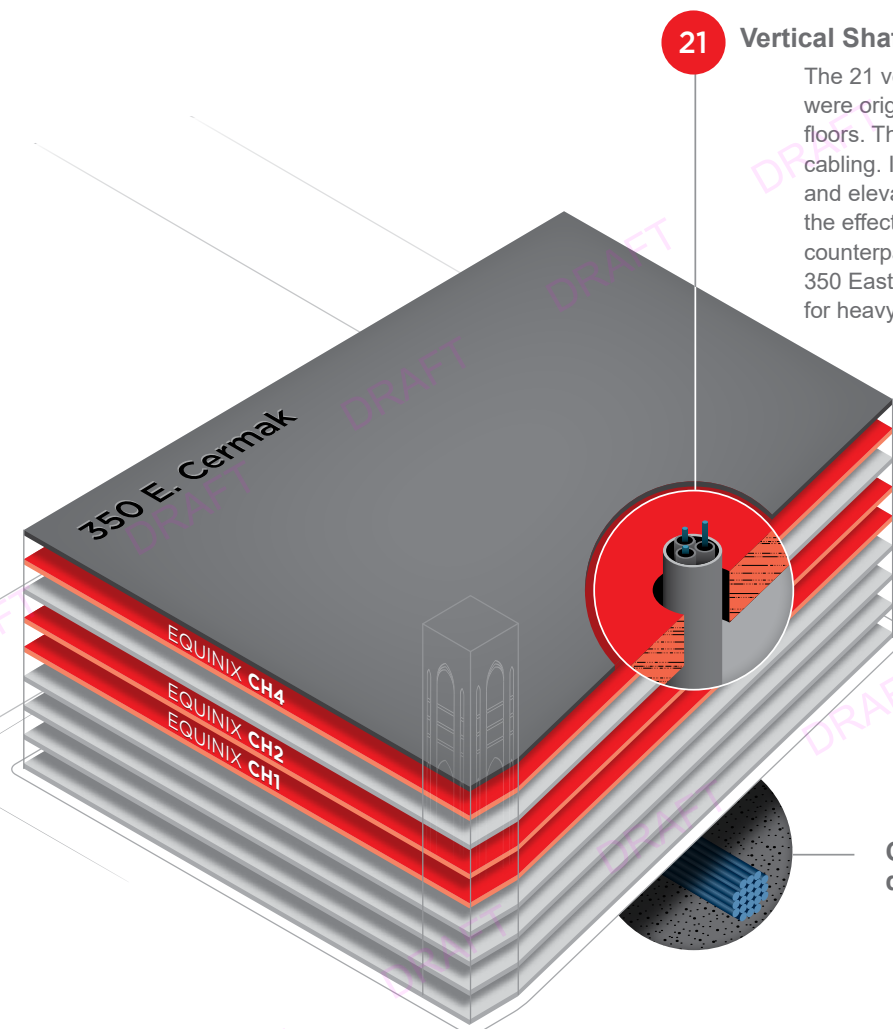
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Vertical Shafts Mean Shorter Cable Lengths

The 21 vertical shafts in the 350 East Cermak building were originally used to lower reams of paper between floors. Those shafts now house fiber and power cabling. In addition, cabling is run through stairwells and elevator shafts. This distributed approach has the effect of shortening the physical distance between counterparties located on separate floors. In short, 350 East Cermak is well connected and ideally suited for heavy power density and top security.

CH1, CH2 and CH4 contain a high concentration of high-value financial exchange customers and carriers

Carrier fiber interconnects directly to CH1, CH2 and CH4





Dense and Reliable Power

The 350 East Cermak facility has four separate electric power feeds from two separate vaults, providing more than 100 megawatts of power. This dual electrical grid provides redundancy: if a power failure affects one grid, the other picks up immediately. The building is also the second-largest power consumer in the Chicago metro area, behind only the Chicago O'Hare airport.

All power is fed into a bank of batteries that convert the AC power to DC. These batteries also provide an uninterruptible power supply (UPS). For backup power, more than 50 generators are distributed throughout the building. In the event that power to the building is lost, the batteries provide power while the generators start up, which then recharge the batteries and provide uninterrupted power to the tenants.

All Equinix facilities are equipped with DC power and with the ability to bring the needed DC power to anywhere within the colocation area. This gives customers the ability to deploy a wide variety of equipment as needed to support their specific operations. The Equinix CH4 IBX data center has been specially designed for higher power densities to accommodate new equipment and technology. The robust design will allow the site to scale with the needs of our customers.

Equinix technicians are trained to handle and maintain the specialized power plants to ensure the operational excellence and uptime customers have come to expect from Equinix IBX data centers.



Integrated, Redundant Cooling

The 350 East Cermak building is supported by an 8.5 million-gallon tank of a refrigerated brine-like liquid. This facility chills liquid to 32 degrees Fahrenheit and pumps it to the building's air handlers to deliver chilled air to the data centers housed in the building. The Equinix HVAC systems are integrated into the building system and provide appropriate airflow, temperature and humidity for optimum equipment operation conditions and to minimize downtime due to overheating equipment. The system is fully redundant and designed to continue operating even in the event of a power failure.



Built Fireproof

The building was originally designed to be completely fireproof, and the roof even has a rubber cover to contain possible fuel spills in the event of a disaster. Manned by a Notifier Fire System, the building utilizes 1,000-gallon-per-minute electrical fire pumps and more than 12,000 sprinklers. In addition, dry or gel systems have been installed according to equipment specifications. All Equinix IBX data centers are built with robust fire detection, suppression and preventative systems designed to minimize equipment damage and prevent disruption to client operations in the event of a fire.



Security

The physical security of the IBX data centers is one of Equinix's highest operational priorities. Each data center utilizes an array of security equipment, techniques and procedures to control, monitor and record access to the facility, including customer cage areas. All areas of the center are monitored and recorded using CCTV, and all access points are controlled. Every IBX data center is staffed with 24-hour security officers to augment physical security features, providing best-in-class protection for your operations. Visitors are screened upon entry to verify identity, and in shared situations, escorted to appropriate locations. Access history is recorded for audit by customers, as needed.

EQUINIX DATA CENTERS

Equinix occupies more than 500,000 square feet of space in these two buildings and is home to the largest public peering exchange in the Chicago area. In addition, we house a platform that allows large banks and trading organizations to link directly to exchanges and other execution venues supporting multiple asset classes as well as to brokers/dealers, clearing members, data feed suppliers and proprietary software vendors.

Financial Ecosystem

The benefits delivered by the emergence of network-neutral data centers are widespread, bringing new opportunities and efficiencies to each member of the financial community. Customers enjoy better access to counterparties, shorter time to market for product launches, and lower costs; the data center operator takes care of significant capital outlays and infrastructure overhead.

The Equinix CH1, CH2, CH3 and CH4 data centers are home to more than 200 buy-sides, sell-sides, prime brokers, clearing members and networks providing access to every asset class. These data centers also house trading systems for numerous liquidity providers and market makers, hedge funds and proprietary trading groups—all who seek extremely low-latency connections to the markets.

In addition, the facilities house matching engines and access nodes for multiple exchanges and trading platforms supporting trading in equities, equity derivatives, commodities, futures, FX and options.

All of these players interconnect with internal market participants and with hundreds of external counterparties.

Benefits to the Buy-Side

By colocating in Equinix, buy-side firms gain inexpensive access to a broad range of counterparties and cloud on-ramps. Because Chicago is home to a broad range of asset classes, buy-sides can find low-latency connectivity to trading counterparties and execution venues to support portfolio management and trading needs in multiple assets.

Benefits to the Sell-Side

Sell-side firms have access to a widening range of instruments and asset classes, expanding the basket of products and services they can offer their clients. Access to a broad selection of networks and financial extranets makes it simpler and less expensive to connect to clients and trading counterparties whether they're located inside or outside the Equinix facility.

For the sell-side and for vendors, the connected global community comprises a significant opportunity to offer services and attract new partners and customers in a nearly frictionless digital marketplace.



The Equinix Financial Ecosystem in Chicago

Brokers, Dealers and Clearing Members

In the CH1, CH2, CH3 and CH4 data centers, customers can directly cross connect with more than 200 broker/dealers, buy-sides, hedge funds, primes and clearing members. Customers in these data centers typically have 10 to 50 cross connections with counterparties in the building and 80 to 200 or more connections to external parties.

Data Providers

The data center houses dozens of market data providers that offer real-time market data from more than 50 exchanges, execution venues and consolidated feeds from around the world.

Trading and Risk Application Providers

In addition to market data, the Equinix Chicago data centers are home to a wide range of best-of-breed trading. These are risk and analytics application and service providers that offer algorithmic trading platforms, order and execution management in multiple asset classes, routing and connectivity to local and global market centers, pre- and post-trade risk management, and settlement and compliance systems.

CHICAGO NETWORKS AND CONNECTIVITY

Connectivity is a key driver for selecting a data center. Our Chicago data center campus boasts multiple different networks, microwave antenna, dark fiber providers and extranets. This diversity creates opportunity for Equinix clients to design networks and select carriers based on their specific business drivers such as high bandwidth, low latency, global connectivity, cost control or a mix of these priorities.

Network providers in Equinix Chicago metro data centers connect to all the major financial centers in EMEA, North America, Asia-Pacific and Latin America.

Chicago network provider examples

Anova
Apcela
AT&T
BT Group
Cogent Communications
Colt
Comcast
Deutsche Telekom
GTT
Hudson Fiber
Hurricane Electric
Level 3 Communications
Masergy Communications
NexGen
Nexgen Networks

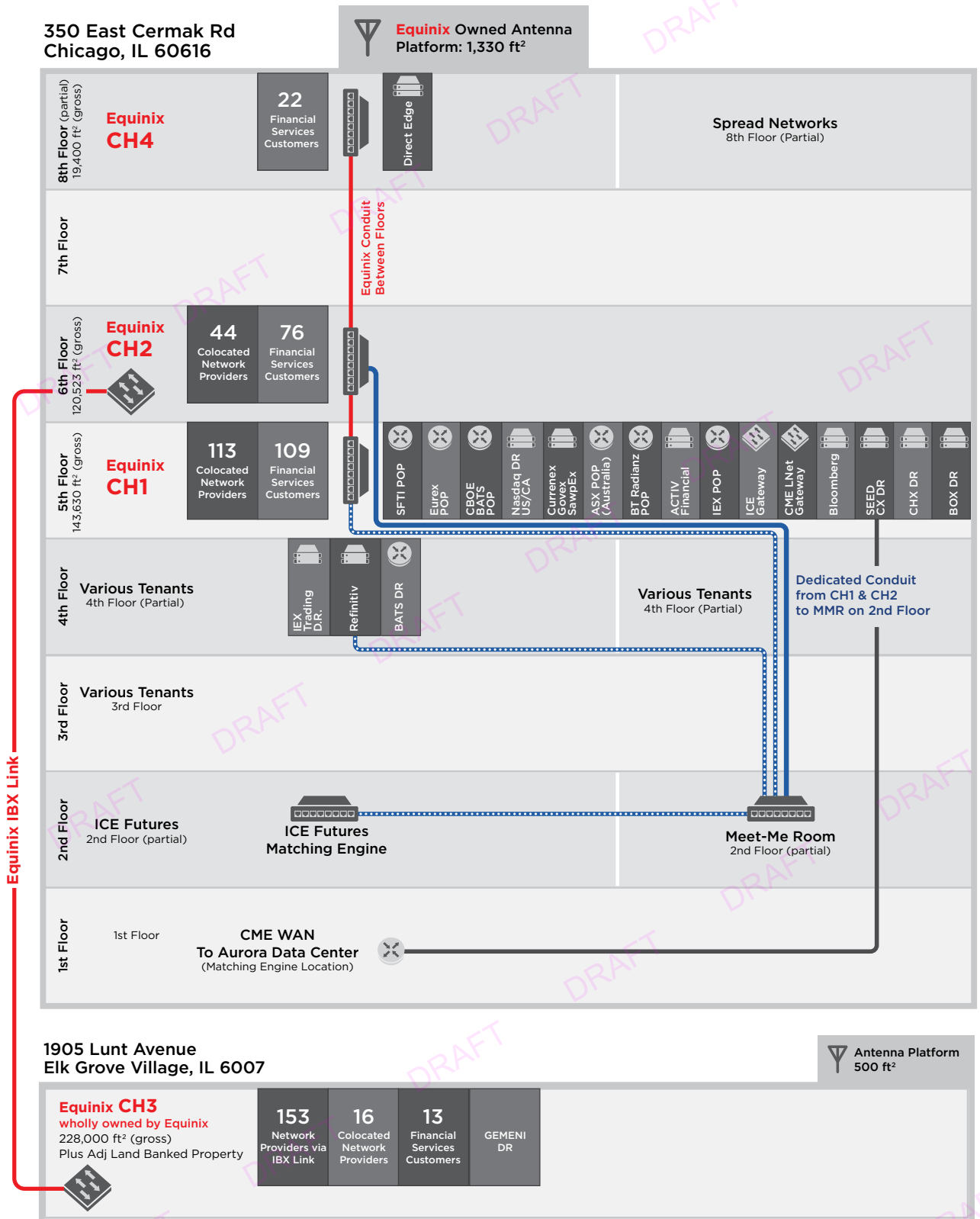
Nippon Telegraph
ORANGE
PCCW
RCN
Reliance Communications
Singtel
SoftBank Group
Sprint
Tata Communications
Telstra
TELUS
TMX Atrium
Verizon
ZAYO GROUP

Chicago extranet provider examples

Apcela
BT Group
IPC
NYSE Technologies
Optimum Lightpath
Options
Pico
Atrium
VFN-Verizon Financial Network

Full directory listings of all available network, technology and service providers located inside Equinix global data centers can be found on Equinix Marketplace. Marketplace.Equinix.com

CHICAGO FINANCIAL ECOSYSTEM



CONNECTIVITY CHOICE

Connect to Multiple Exchanges in a Single Data Center

Chicago is home to multiple major equities, options and futures exchanges, including the Chicago Stock Exchange (CSX), the Chicago Mercantile Exchange (CME), the Australian Securities Exchange (ASX), the Intercontinental Exchange (ICE), Futures Exchange, NYSE Liffe, and a major Chicago Board Options Exchange (CBOE) SFTI hub providing access to New York financial markets. Most of these exchanges colocate matching engines or access nodes in Equinix data centers. This dramatically reduces connectivity costs for participants needing to access these exchanges, especially for companies that trade with more than one exchange or counterparty.

While exchange-specific systems may be placed inside exchange-operated data centers, the density and diversity of upstream data sources, downstream consumers and network providers inside Equinix CH1, CH2, CH3 and CH4 make these facilities the ideal central location for multiexchange trading operations.

Indeed, hundreds of trading firms use the Equinix Chicago data centers as a hub to house their smart order routers, algorithmic trading and execution management systems, market data distribution platforms, and other latency-sensitive, high-performance computing applications, as well as secondary/disaster recovery deployment. These firms are also only a connection away.

The Chicago Mercantile Exchange (CME) houses an LNet access node within Equinix, enabling Ethernet connectivity to the CME Market Data Platform, CME iLink, CME Clearing Systems and CME EOS Trader. LNet connectivity is offered only in the 350 East Cermak building.

CH1, CH2 and CH4 Equinix data center customers can connect via cross connections to the LNet access node and other exchanges including NYSE Liffe, ICE and SFTI. CH3 customers can connect to these exchanges via Equinix Metro Connect®.

Equinix Interconnection

Equinix has the highest number of carriers, networks, media and financial firms of any provider inside Cermak. You can connect with all these firms using the Equinix suite of interconnection products and services including cross connects, metro connects and ECX Fabric connections across CH1, 2, 3 & 4. When developing your connectivity strategy, it is important to distinguish between a direct cross connect and interbuilding cross connects (IBCCs) offered by other providers. The provision time for IBCCs can be drawn out, and there is no guarantee of interconnecting one provider to another.

Through our product suite, Equinix helps connect these firms directly and dynamically to anyone on our global platform:

Equinix Cloud Exchange Fabric® (ECX Fabric®)

Distributed infrastructure and digital ecosystems connected globally on Platform Equinix® via software-defined interconnection.

Equinix Connect

A comprehensive internet access service within Equinix IBX data centers that satisfies a variety of bandwidth requirements.

Equinix Cross Connects

Ensure high-performance, network reliability, redundancy, and low-latency for any business.

Equinix Internet Exchange™

Aggregates thousands of peering sessions onto the shared fabric, connecting peers at 22 Internet Exchange Point (IXP) locations in 25+ global metro areas.

Equinix Metro Connect®

Provides network connectivity across multiple IBX data centers in a metropolitan area, giving you direct access to thousands of networks and companies.

Fiber Connect

Provides dark fiber connections between IBX data centers within a metropolitan area, giving customers ultimate control and flexibility to own and manage data transit to ecosystem partners.

True Low Latency

As mentioned earlier, the 350 East Cermak building contains a series of 21 vertical shafts, which shorten the physical distance between counterparties located on separate floors. The shortened physical distance means that latency on cross connections to the various trading venues and financial ecosystem is extremely low. Equinix ran extensive latency tests in the building to determine latency in the Equinix Financial ecosystem. The test evaluated latency at an average distance and for the longest distance between cages in CH4 and CH1/CH2:

Average Distance:

Inter IBX footage — 630 ft

Intra IBX footage — 700 ft

10GigE — 3.94 microseconds for packets up to 9600 bytes

GigE — 4.32 microseconds for packets up to 1518 bytes

Longest Distance:

Inter IBX footage — 900 ft

Intra IBX footage — 635 ft

10GigE — 4.59 microseconds for packets up to 9600 bytes

GigE — 4.99 microseconds for packets up to 1518 bytes

Configuration:

GigE — Based on multi-mode fiber 62.5 micron cross connect, media converted to overcome distance limitation; tested to 1518 byte packet size. Intermediate and demarcation panels have been included in the link.

10GigE — Based on single-mode fiber 8 micron cross connect, no media conversion; tested to 9000 byte packet size. Intermediate and demarcation panels have been included in the link.

- CFMFF to CFMFF, 1000M, Multi-mode to SM to SM to Multi-mode.
- In absence of 10G Media Converter cards, 10G across Inter-IBX SMF.

NETWORK NEUTRALITY



At Equinix, we find that 80% of our financial customers' cross connects go to network providers or carriers for off-premises connectivity.

Increasingly, the financial services industry has been evolving and rethinking its technology infrastructure. As architecture strategies mature, demand for reliability, low latency, and high throughput becomes increasingly more important. At the same time, the number of high-speed, high-bandwidth connection points required to effectively conduct business is growing exponentially. This drives up costs to the point where the cost of connectivity dramatically overshadows the price of data center space and power.

Firms that were once content to operate their own data centers or colocate infrastructure with a carrier or financial extranet are now evaluating their ability to maintain a competitive position while managing total cost of ownership.

Bringing together a broad range of network providers along with buy-sides, sell-sides, exchanges, alternative trading platforms, market data and analytics providers into a single location can dramatically lower the complexity and cost of connectivity. A network-rich data center helps manage overall costs, improve throughput and drive down latency.

80% of Connections Are for Off-Premises Connectivity

At Equinix, we find that 80% of our financial customers' cross connects go to network providers or carriers for off-premises connectivity. This means that broad choice in carriers and connectivity options is a key factor in selecting a data center. Because Equinix is carrier neutral, our global locations are used by nearly 600 carriers as key interconnection hubs.

Our downtown Chicago IBX data center is no exception. From this location, you can enjoy access to more than 100 different carriers offering a range of services. This breadth of options promotes aggressive competition, enabling our customers to access the best pricing and connectivity options, whether you need long-haul dark fiber to Tokyo or a private line connecting you to the CBOE.

Low-Latency Routes to the Global Financial Markets

As the premier colocation facility in Chicago 350 East Cermak is the primary location for carriers offering the lowest-latency fiber routes from Chicago to New York, Washington, Toronto, London, Frankfurt, Tokyo, Singapore and other major global financial centers. In addition, carriers provide local access to counterparties located around the Chicago metropolitan area.

Even as data centers are developed in the suburbs of Chicago, the building will still remain a central hub for connectivity. Traffic from those suburban data centers to other financial centers will be routed through this building regardless of the carrier selected.

DEPLOYMENT CONSIDERATIONS

There are a range of considerations that affect your ability to scale and adapt to continuing market evolution efficiently, both now and in the future. The following stepped process will help you make more informed decisions regarding the total cost and benefit of your critical trading infrastructure deployment.

1 Determine Trading Targets

- Transaction/execution venues: Include all asset classes.
- Actionable data sources.

2 Establish Providers of the “Spokes”

- List all metro or regional providers for each feed or service.
- Highlight providers that can link multiple endpoints (to reduce the number of vendors).
- Research messaging bandwidth and associated peaks for each feed (the SIIA's FISD Internationally or FIF is a good source for U.S. capacity projections).

3 Identify Backbone Providers Between Cities

- Establish candidate providers between regions or markets.
- Check route diversity between redundant providers of long-haul services (remember recent submarine cable cuts).
- Look for offerings that match technical and budgetary requirements.
- Be sure to check latency (measured versus SLA) for each vendor and offering.

4 Determine Adjacency Requirements

- Critical vendor list is often determined by:
 - Most latency-sensitive.
 - Execution speed of the venue.
 - Outbound bandwidth and protocol.
- Remember vendors that are on your critical path:
 - Inbound aggregate feed providers.
 - Outbound real-time or pre-trade risk analytics.
- There will be multiple critical vendors in each city (at multiple locations).

5 Hubs or Data Centers

- Tally the spoke and backbone connectivity providers and look for the greatest overlap within the data center (not just the building).
 - Look to consolidate vendors to achieve economies of scale and scope.
- Hubs will act as pivot points for present and future connectivity requirements.
- Remember that 80% of cross connects will link to networks providing off-premises connectivity.
- Your data center selection will determine your network expense trajectory or cost to scale.

GUIDE Planning Tool

Equinix maintains a proprietary database of data centers, network and connectivity providers, trading venues, service providers and other important endpoints in an easy-to-use online planning tool. GUIDE can save hours in the deployment assessment and planning process.

Contact Equinix for a demonstration and to request a login.



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About Equinix

Equinix, Inc. (Nasdaq: EQIX) connects the world's leading businesses to their customers, employees and partners inside the most-interconnected data centers. On this global platform for digital

business, companies come together across more than 55 markets on five continents to reach everywhere, interconnect everyone and integrate everything they need to create their digital futures.