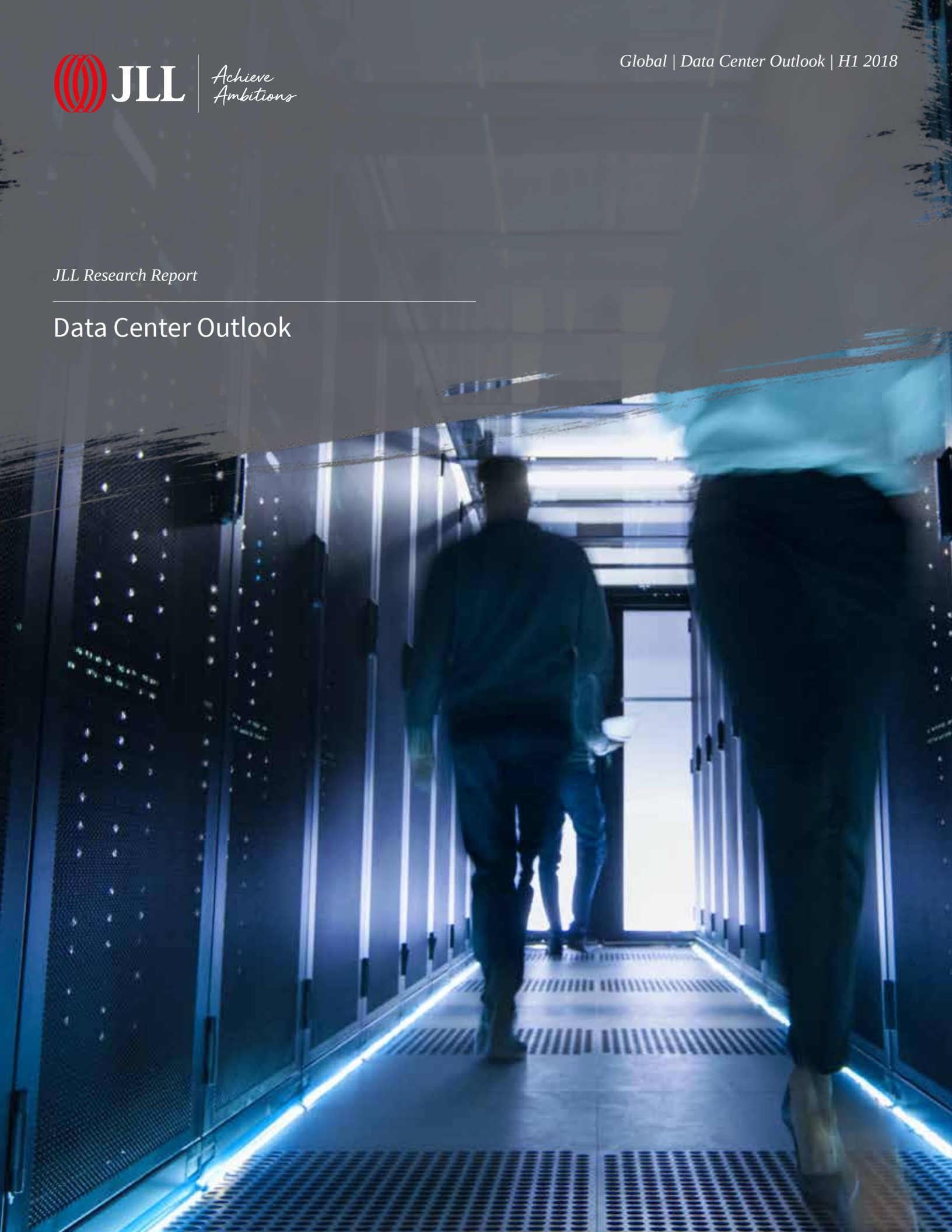
JLL Achieve Ambitions

JLL Research Report

Data Center Outlook



JLL's global Data Center Solutions team has delivered customized data center services and solutions to many of the world's largest corporations. With the expertise of having managed thousands of megawatts of critical facilities transactions, our team assists companies with total site selection (from greenfield to colocation to cloud) utilizing best-in-class due diligence, in-depth TCO analysis, risk and infrastructure assessments, project management services, migration consulting, contract and SLA negotiations, and budget consultation. Our Capital Markets group has deep experience in the data center industry from investment property sales to debt financing ,and our critical facilities management team manages hundreds of millions of square feet of critical environments. We understand the technical elements that are crucial to your facility in terms of power, cooling, connectivity, latency, utilities, redundancy, taxes, construction, public incentives and security. JLL's Data Center Solutions team will help you determine the best cloud, service and data center strategy to meet your business objectives.

Contents

Top 5 trends to watch in the data center industry

1.

Data center REITs, on the road to recovery

After a rough few months to start off 2018, the stock prices of Equinix, CoreSite, CyrusOne, Digital Realty and other data center REITs have begun their trek back, with all either past or near 2018 stock starts. Based on H1 2018 stock activity and general industry growth due to accelerated demand by cloud users, data centers are poised for a strong second half of 2018 and long-term growth.

2.

NAREIT in review

NAREIT's June Investor Forum in New York remained positive in the face of larger concerns about the economy and overall geopolitical spectrum. Steady leasing momentum through the first half of the year delivered confidence for the group. In addition, continued interest in data centers for investment has boosted confidence. Compounded with robust demand across the globe, the sector will continue to outperform.

3.

SD-WAN redefining data center connectivity

SD-WAN, or software-defined wide area network, is redefining connectivity by substituting the hardware-driven approach with a software-driven approach. SD-WAN improves efficiency and performance using its centralized management. This open cloud-based solution offers more flexibility without the installation of expensive equipment and hardware, which is attractive for companies reducing their operating costs. SD-WAN's market share is expected to increase over the next five years as cloud technology expands.

Moving forward, clients are making networks more flexible and less expensive. Because of its cost-effectiveness, SD-WAN is broadly changing existing networks set up today in the data center. There will be investments and significant savings achieved, driving better communications and switching. As a result, this will potentially change the entire network landscape.

4.

Blockchain continues to be more than just hype

As the popularity and general acceptance of blockchain continues to grow, more data and bigger data is being processed, driving continued demand for data center capacity. New companies that are popping up to service the blockchain industry are also driving increased demand across the U.S. While there is still some uncertainty surrounding its applicability, new demand shows that companies are attracted to its security and processing. In addition to processing data, the technology has the potential to provide additional storage capacity through peer-to-peer distribution. The technology behind blockchain is attractive to many different verticals and has the potential to significantly change how transactions and data are shared and organized.

5.

Data center contracts modernizing, driven by changing user needs

Large lease deals from 5 to 10 years ago are starting to roll. The data center industry of today is different; applications have been virtualized, the cloud is an enterprise strategy, and flexibility and access to capacity has changed. Expect renewals, new leases and new service agreements to continually evolve and restructure to better fit how players today do business.

State of the *industry*

Steady absorption & leasing volume was widespread

In the first half of 2018 steady absorption and leasing volume were widespread across data center markets and setting a strong basis for the remaining six months of the year. While economic and geopolitical uncertainties ranging from trade wars to predicted recessions were prevalent in the last several months, users' insatiable need for data center capacity continued to drive strength throughout the sector—with both tenured and emerging markets demonstrating strong fundamentals.

So far in 2018, we've seen an incredible amount of traction in the data center industry, even amid shifting fundamentals of the business. Blockchain continues to gain both global and business adoption as industries from healthcare and finance to real estate and automotive begin to experiment with the powerful platform. As a growing number of companies leverage blockchain, data centers will also continue to see growing demand from the technology as more and more data is being ground by more and more users. Additionally, the "standard lease" for data center capacity is morphing and modernizing with users' shifting needs. Today, we're seeing many long-term 5- to 10-year contracts begin to roll—and the conversation of large-scale restructures surfacing. Today's users' needs have shifted significantly from where the industry stood five-plus years ago, and new dynamic contracts are a signpost of that directional change. Multifaceted flexible leases are a requirement for today's modern data center user. Users are no longer having a "space and power" conversation, but need to build in flexibility for the next 2, 5, even 10 years as technology continues to evolve at a rapidly growing pace. Providers are encouraging the change as they push into emerging markets and structure contracts to have "portability" among different geographies, but more importantly, among different service and product lines.

M&A activity H1 2018

Mega mergers and acquisitions started strong in H1 2018, while still behind the activity recorded last year. The top five M&As to start off the year totaled $4.7 billion. Buyers are vying for new and larger facilities in emerging markets to increase their revenue.

1. GTT bought Interoute for **$2.3 billion, the largest deal YTD**
2. Equinix purchased Informat Dallas for **$800 million**
3. Metronode was bought by Equinix for **$791 million**
4. Zenium sold to CyrusOne for **$442 million**
5. Ensono adds Wipro's data centers to its portfolio for **$405 million**

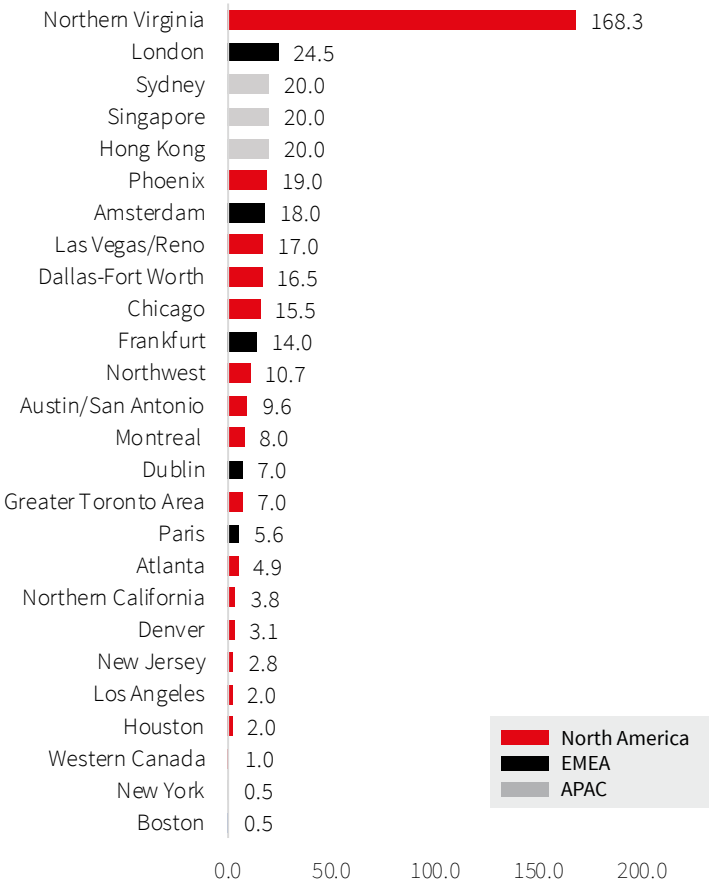
Source: Data-Economy

Absorption for U.S., Canadian, European (EMEA) and Asia Pacific (APAC) markets totaled 421.2 megawatts in the first six months of 2018, a steady increase over past periods. The United States and Canada carried an outsized weight of global net absorption, clocking in at 292.1 MW, up 31.9 percent over H1 2017. EMEA and APAC closed out on similarly solid ground, with EMEA hitting 69.1 MW of net and APAC demonstrating 60.0 MW for the first half of the year. All things considered, 2018's strong data center activity presents confidence heading into the rest of the year and beyond.

Cloud providers are driving the robust growth in Northern Virginia. Developers are focusing their facilities to suit the big cloud providers, as social media giants are taking just under 100 MW. This demand is being met with competitive provider offerings and concessions, which will benefit users throughout 2018. In EMEA, cloud users are driving 70 percent of the 24.5 MW in net absorption recorded in London.

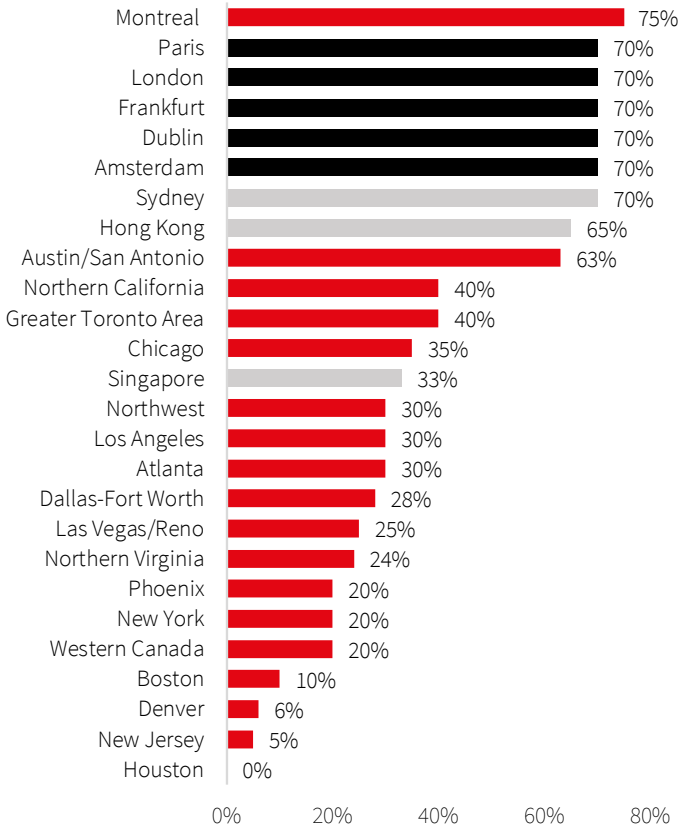
As per the past years, cloud activity continues to be a dominant absorption leader, with many markets exhibiting sizable uptake by the "Big 3" cloud providers. Cloud activity has also expanded beyond the core data center markets and has started to target the midtier cities for expansion. EMEA recorded strong cloud activity to start 2018. Four large cloud provider transactions exceeded 13.5 MW in EMEA alone. In the U.S., Austin/San Antonio (63 percent) and Northern California (40 percent) saw the most cloud activity by percentage of total absorption, driven by cloud providers' need to be closer to both the enterprise and consumer end users. The strength of Austin and San Antonio is bolstered by its value as a disaster recovery location. In terms of total volume, Northern Virginia still stands out as a leader in demand, notably in cloud activity.

Absorption (MW) by market, H1 2018



Cloud users record strong activity across the globe in H1 2018

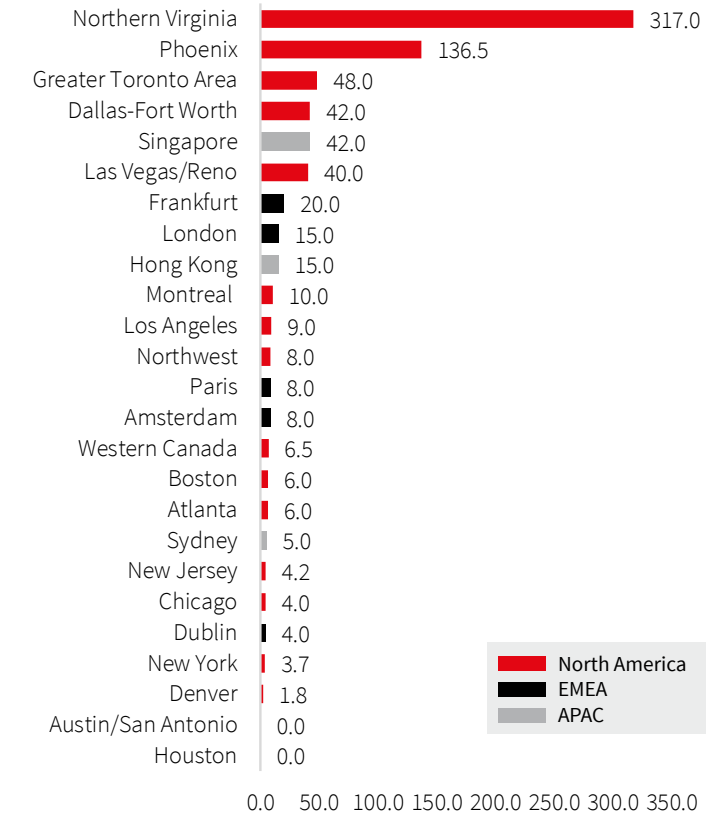
Cloud as percentage of absorption



Considerable absorption across the U.S. over the past 12 to 18 months has continued to drive a need for new inventory. Not surprisingly, we've seen under-construction pipelines increase in nearly every market as providers race to bring the newest and freshest product online. Today, 759.7 MW is under construction across the North American, EMEA and APAC markets, with North America representing 76.1 percent of the total pipeline. Northern Virginia (317.0 MW), Phoenix (136.5 MW) and Greater Toronto Area (48.0 MW) markets lead the charge with the most future inventory in the works.

Strong demand for new facilities spurs new construction in Phoenix and Northern Virginia. Demand from cloud providers continues to be a driver in new supply.

Under Construction (MW) by Market, H1 2018



Definitions

Total inventory represents total amount of multi-tenant data center square footage and power that's either leased (Absorption), shell space planned for future development (Planned), turnkey/conditioned available today (Vacant), or currently being developed into turnkey/conditioned (Under Construction) all under roof.

Planned represents remaining square footage and power under roof to be developed in the future into turnkey or conditioned data center space.

Total vacant represents turnkey/fully conditioned data center space available for lease.

Under construction represents data center space under roof that is actively being developed/constructed as turnkey/conditioned space.

Absorption (Net) represents the amount of new multi-tenant data center square footage and power leased less the total amount of square footage and power no longer occupied between the current and last measurement periods.

United States

Atlanta

Atlanta's colocation expansion continues

Market overview

Supply

Colocation providers continue their expansions with zColo delivering new space and power; DataBank and EdgeConneX are well under way with the construction of new facilities. Switch is "on deck" to introduce more space and power as it prepares its suburban site to start construction. Enterprise data centers continue to trade allowing investors/operators a path into the market.

Demand

The Atlanta data center market remains active in 2018. Technology, healthcare, fintech, entertainment and media continue to drive the market with sizable kW needs. Some colocation demand is also being generated by enterprises that are downsizing their owned data center footprint.

Market trends

Atlanta is hitting its stride as colocation operators and users continue to break into the largest city in the Southeast. Fewer building conversions as providers opt for either building ground-up or securing underutilized facilities. Industrial developers are competing for land sites with data center providers and in some cases are becoming data center developers.

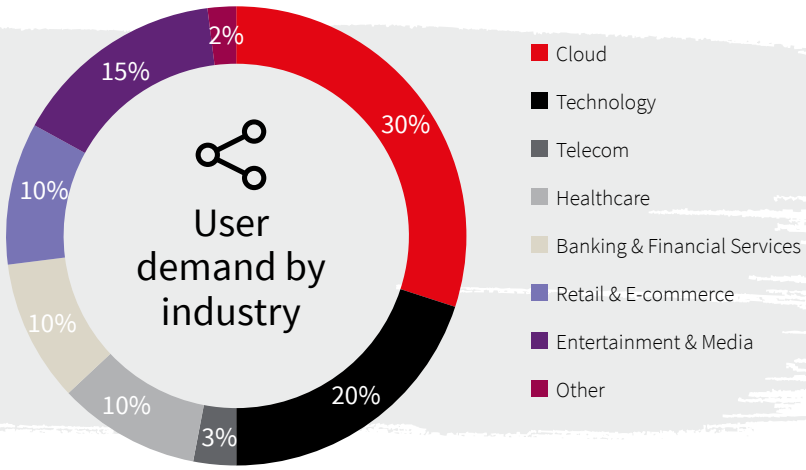
Outlook

for **Users**

- New blocks of space have opened up options for users
- Low power rates are drivers for decision makers
- Look for new colocation product offerings late 2018 early 2019

for **Providers**

- New economic incentives introduced
- More new entrants as providers establish footprints in the SE
- Supply of good data center land sites is diminishing



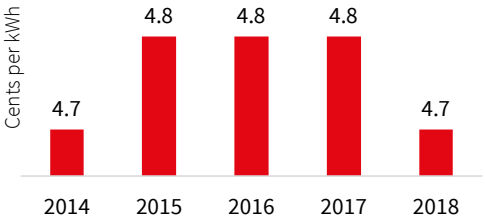
Supply	s.f.	MW
Total inventory:	1,797,000	215.0
Total vacant:	154,000	26.0
Under Construction:	40,000	6.0
Planned:	105,000	23.0

Demand	MW
Net absorption:	4.9

Rental rates

<250kW:	$225 - $325/kW(all in)
>250kW:	$130 - $155/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
SAS Provider	zColo	500 kW
Large Transportation Co	QTS Metro	500 kW
Global Analytics Company	Flexential	100 kW

Austin & San Antonio

Hurricane Harvey drives users to take a closer look at Austin and San Antonio

Market overview

Supply

Supply in the Austin market is stable. DataFoundry has current capacity in the market, as well as vXchnge (which renovated the Sungard facility). Supply in the San Antonio market is very tight and generally limited to Stream Data Centers at this time.

Demand

Demand has picked up in the Austin market. Users based in other markets in Texas continue to see great value in Austin as a disaster recovery location. San Antonio saw another transaction by Microsoft to support its growing business, as it expands in the area.

Market trends

The Austin market has seen a slight up-tick over previous years, we believe partially in response to Hurricane Harvey in Houston. It also continues to appeal to the West Coast technology companies. San Antonio continues to be the Texas market of choice for hypersale due to Microsoft's larger corporate footprint there.

Outlook

for **Users**

- Opportunities for large scale deployment in these regions might require lead times
- A multi-site Texas strategy could yield strong leverage in negotiations
- Cloud exchange particularly in the San Antonio market will be available

for **Providers**

- Providing tight delivery timeliness for future capacity will be important
- Providing strong connectivity in state will be attractive to Users
- Cloud exchanges to regional hubs will help diversify product offering

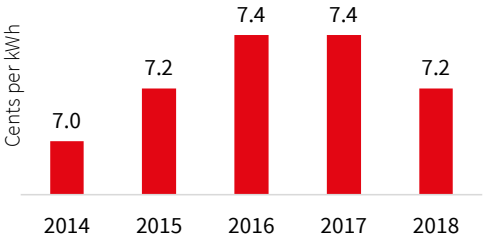
Supply	s.f.	MW
Total inventory:	735,664	144.0
Total vacant:	72,272	13.0
Under Construction:	-	0.0
Planned:	110,000	19.5

Demand	MW
Net absorption:	9.55

Rental rates

<250kW:	$220 - $290/kW(all in)
>250kW:	$110 - $130/kW (+E)

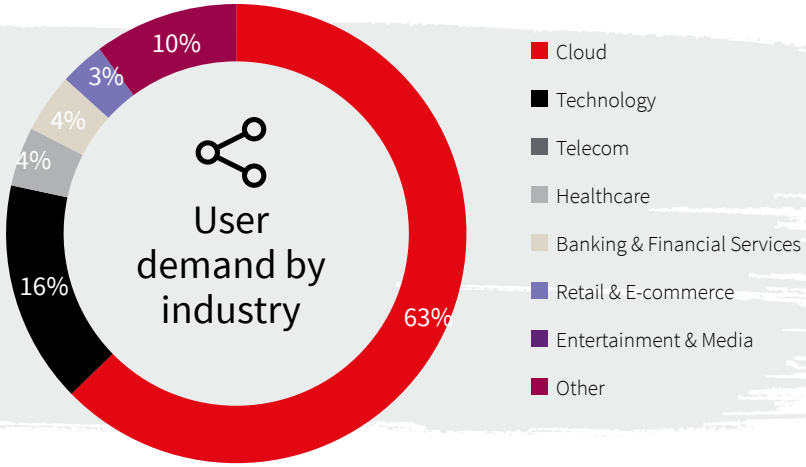
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



2018 significant data center transactions

Tenant	Provider	Size
Microsoft	CyrusOne (San Antonio)	6 MW
Healthcare Provider	DataFoundry	400 kW
Energy Company	CyrusOne	100kW

Boston

Boston off to a very slow start in 2018 as major owners ponder what to do with vacancies

Market overview

Supply

Markley Group and a new entrant, Induspad, are awaiting the arrival of the hyperscale providers with large developments in Lowell and Lawrence respectively. Each have some renewable power and alternate generation stories, but not enough currently to achieve competitive power rates. Berkeley Investments continuing with its 6MW+ development in Malden.

Demand

Demand in Boston has dropped considerably as companies continue to look elsewhere for colocation due to power costs, or increasingly move workloads to the cloud. Although expected, Edge Demand continues to be slow to develop.

Market trends

Although New England represents a population of nearly 15M, the data center market continues to be much weaker than other comparable sized markets, primarily due to the high cost of electricity, as well as the lack of interconnection alternatives to Markley Group controlled One Summer.

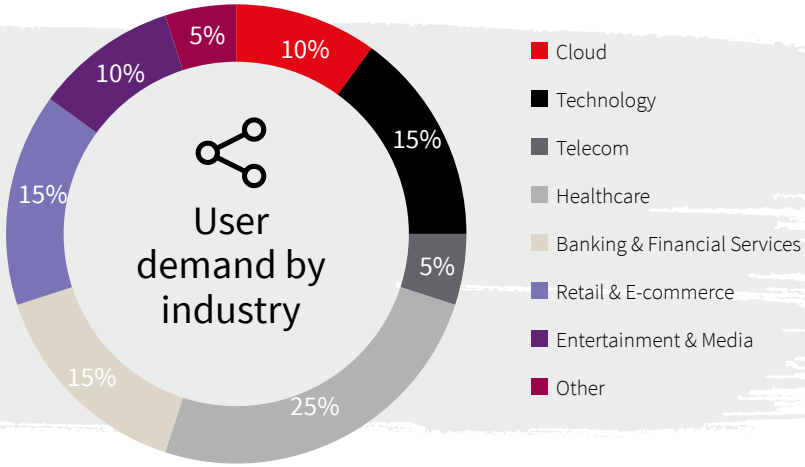
Outlook

for **Users**

- Continued price decline
- Development of alternative products (Data Center Light, Tech Lab, etc.)
- Continued expansion of offerings from regional MSPs such as Tierpoint

for **Providers**

- Anticipated zero demand in >250 kW segment
- Larger customers will continue to churn out of market
- Limited growth of service providers after 3 years of refresh



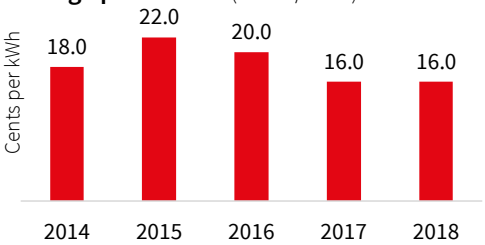
Supply	s.f.	MW
Total inventory:	1,200,000	160.0
Total vacant:	200,000	26.0
Under Construction:	25,000	6.0
Planned:	450,000	90.0

Demand	MW
Net absorption:	0.5

Rental rates

<250kW:	$125 - $350/kW(all in)
>250kW:	$95 - $160/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Healthcare	Markley	100 kW
Financial Services	CoreSite	250 kW
Technology	Markley	150 kW

Chicago

Chicago absorption slows in the first half of 2018 as cloud expansions are delayed

Market overview

Supply

2018 has seen several new entrants within the local market, many with the objective of landing large cloud requirements pending. RagingWire, Stream Data Centers, Coresite and Digital Realty announced new projects with 3 others actively acquiring sites. Other existing operators including T5, CyrusOne and Equinix are actively underway with expansion projects.

Demand

2018 has started slower than previous years as most of the existing cloud nodes were completed in 2016 and 2017. Enterprise demand started very strong however growth is tempered for the second half of 2018 in favor for managed service or cloud migration efforts.

Market trends

2018 looks to be a slower year in Chicago with limited cloud activity. Major cloud providers have chosen to grow in alternative, more tax friendly markets. Enterprise tenants continue to push colocation. However, transactions are smaller in size and shorter in term given an overall move to the cloud. Sale-leaseback efforts continue to be of focus for larger enterprise users.

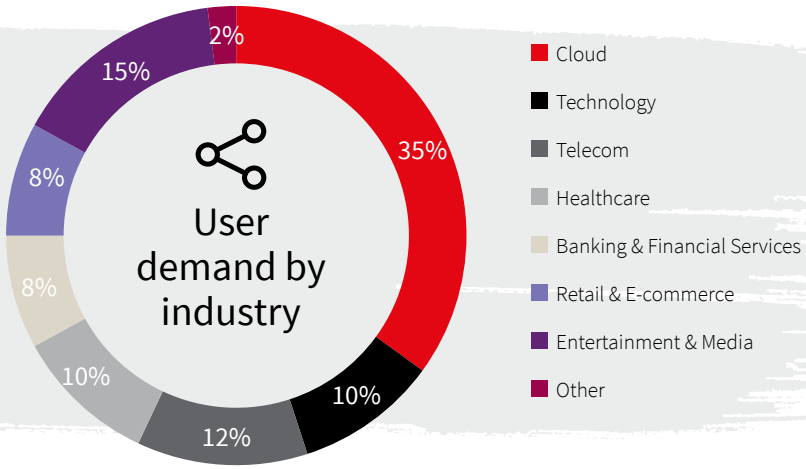
Outlook

for **Users**

- Tenants will have strong leverage due to new inventory
- Sale-leaseback efforts continue to be the topic for larger users
- Cloud on-ramps are becoming key in site selection efforts

for **Providers**

- Limited cloud activity but for a few cloud transactions
- Extremely limited land and powered shell acquisition opportunities
- Several efforts underway to pursue tax incentives



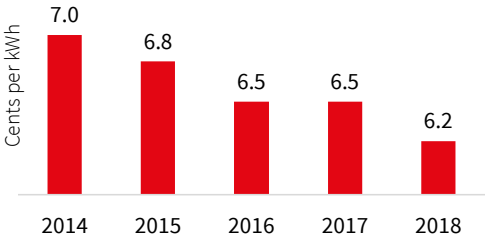
Supply	s.f.	MW
Total inventory:	4,299,000	546.0
Total vacant:	324,789	44.0
Under Construction:	53,333	4.0
Planned:	604,000	75.0

Demand	MW
Net absorption:	15.5

Rental rates

<250kW:	$190 - $400/kW(all in)
>250kW:	$140 - $155/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Managed Service Provider	Digital Realty Trust	1.8 MW
Healthcare Provider	2 confidential sites	500 kW
Bitcoin Miner	New Continuum	900 kW

Dallas/Fort Worth

DFW sees dominant enterprise market activity with increasing cloud interest

Market overview

Supply

Supply in Dallas/Ft. Worth ("DFW") is growing as many providers have just delivered new buildings to the market in response to healthy absorption at other facilities in past years. CyrusOne and QTS are both delivering net new builds. Equinix (INFOMART), Skybox, Stream and Edgecore have land positions and are in the design phase.

Demand

Demand is made up of primarily enterprise transactions averaging 250 kW -2.5 MW's each. Larger user projects (not included in our MTDC numbers) include blockchain (Skybox 150K SF -55 MW's capacity - sold in early '18), Facebook's near completion of their Ft. Worth data center (1.5M SF), and an undisclosed data center project in South Dallas (cloud company ~300 acres).

Market trends

DFW (as a mature data center market) is seeing many data center agreements coming up for expiration, and or needs for modification to meet current market climates. Users should revisit older agreements and discuss options to re-structure to fit their evolving needs. Additionally, access to cloud exchanges is becoming increasingly important in future proofing strategies.

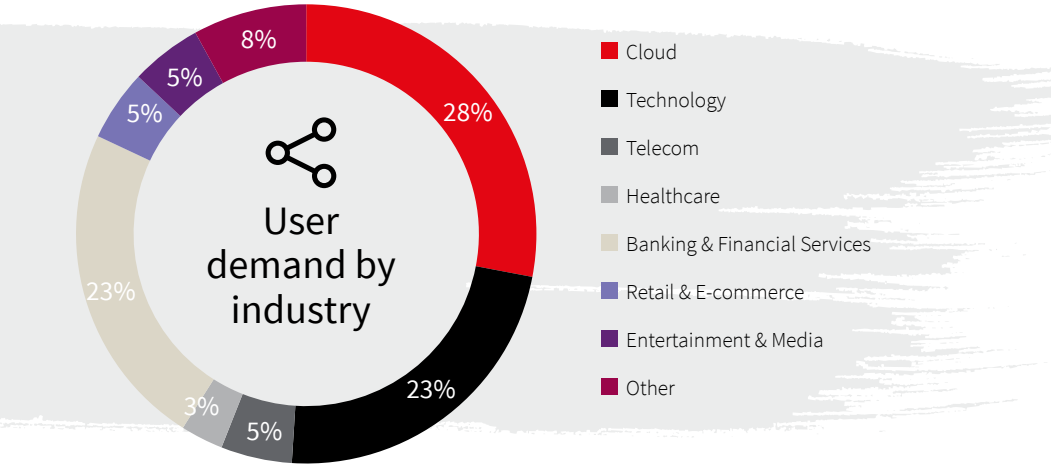
Outlook

for **Users**

- Aggressive rental rates available with strong supply
- Revenue and geographic portability available from providers
- Options for expansion more flexible on terms than in the past

for **Providers**

- Dedication to additional service offerings for tenants key in winning business
- Providing low cost flexible expansion options key ask for commitments
- Connectivity to INFOMART to access cloud exchanges key



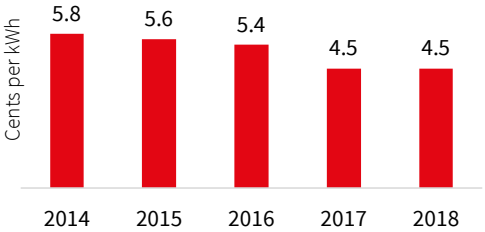
Supply	s.f.	MW
Total inventory:	3,729,690	505.4
Total vacant:	518,862	70.9
Under Construction:	226,595	42.0
Planned:	972,500	173.3

Demand	MW
Net absorption:	16.45

Rental rates

<250kW:	$190 - $300/kW(all in)
>250kW:	$115 - $130/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Hyperscale	QTS	2 MW
Transportation	Aligned	500 kW
Technology	CyrusOne	1 MW

Denver

In Denver, managed service requirements still drive demand with hyperscale and public cloud to follow

Market overview

Supply

H5 Data Centers and Flexential offer the most available turnkey space while Cyxtera, Iron Mountain, Sungard and EdgeConneX all have plans to expand.

Demand

Demand is being driven by Denver HQ companies and those who want secondary/disaster recovery sites centrally located in low disaster zones. Cloud deployments have been slow to enter the Denver area, as they focus on establishing strong presence in other critical markets. These requirements are expected to enter the market to meet the needs of population growth/consumer demand.

Market trends

Many end users are continuing to look for hybrid architectures with local cloud, or extensions to hyperscale providers. With strong current and future demand, providers will continue to benefit by staying ahead of the curve with turnkey space and power availabilities for existing tenant expansions and new tenants entering the market.

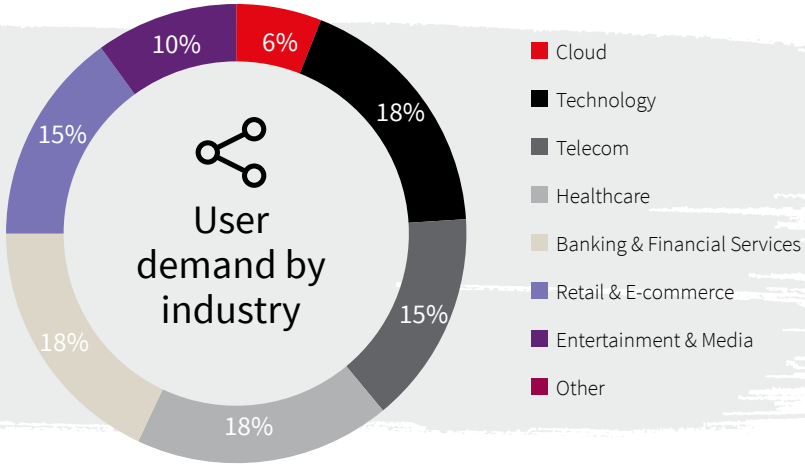
Outlook

for **Users**

- New blocks of space will open up options for users to consider
- Denver continues to show favorably to end users
- Several national operators not yet located in Denver may enter the market

for **Providers**

- Although a slow start, current and future demand still looks strong in Denver
- Staying ahead of the curve will be key for tenant expansions and new entrants
- Not many sizable transactions; smaller requirements will continue to drive market



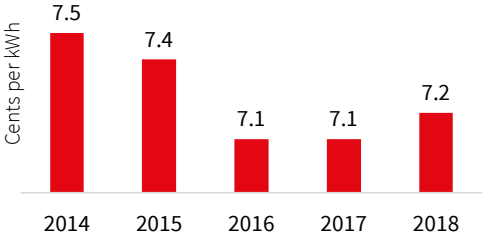
Supply	s.f.	MW
Total inventory:	863,511	130.1
Total vacant:	277,988	39.1
Under Construction:	4,140	1.8
Planned:	153,000	18.3

Demand	MW
Net absorption:	3.1

Rental rates

<250kW:	$260 - $350/kW(all in)
>250kW:	$118 - $160/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Media Company	H5 Data Centers	700 kW
Healthcare	Flexential	300 kW
Undisclosed Client	Iron Mountain	500 kW

Houston

Houston recovery is near with an up-tick in rack and cabinet deployments

Market overview

Supply

Supply has remained fairly stable in the marketplace, with no significant new builds by providers in the marketplace. Quality supply exists in the market and is absorbing the current and recovering demand at a manageable pace.

Demand

Demand in the Houston market has picked back up now that the energy market has recovered. Generally, the demand has diversified however to include a large up-tick from the healthcare industry outsourcing their data center requirements.

Market trends

Overall, the market has continued to recover from the energy market sector fallout by diversifying the product and service offerings available from the providers in the marketplace. Most requirements are in the form of rack and cabinet deployments as this year.

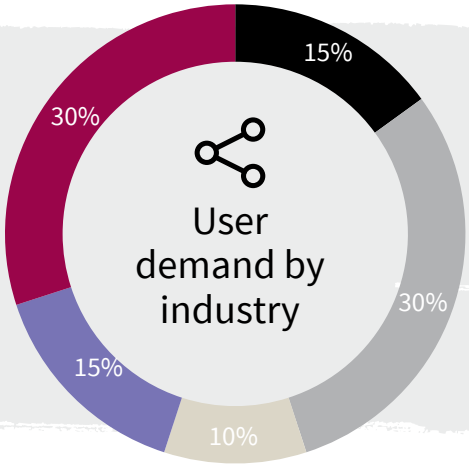
Outlook

for **Users**

- Rental rates remain very low for the market as recovery continues
- Flexibility around footprint, redundancy, and term is available
- In response to Hurricane Harvey, resiliency and uptime should be a key consideration

for **Providers**

- Providing on-ramps to cloud exchanges will be a key to all sectors going forward
- Out of region facilities can be key options for users looking for a D.R. option
- Response to Hurricane Harvey should be highlighted



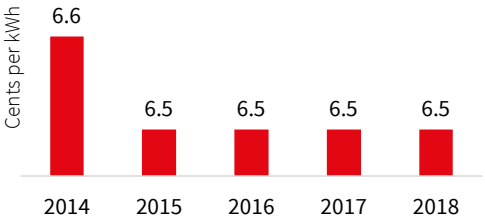
Supply	s.f.	MW
Total inventory:	1,049,266	119.4
Total vacant:	149,239	17.7
Under Construction:	-	0.0
Planned:	579,734	88.3

Demand	MW
Net absorption:	2.00

Rental rates

<250kW:	$220 - $290/kW(all in)
>250kW:	$95 - $130/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Healthcare Provider	DataFoundry	600 kW
Oil & Gas	CyrusOne	200 kW
Fortune 500 Oil & Gas	Skybox	160 kW

Las Vegas/Reno

Las Vegas/Reno continues to be dominated by Switch with consistent available supply

Market overview

Supply

As Switch continues to build out their Vegas/Reno facilities, supply will continue to grow within this market.

Demand

Because of the renewable energy options, hyper scalability, economies of scale, and available capacity, demand has stayed strong within these markets. Ultimately, these markets have offered very competitive total cost of occupancy. Streaming/media companies continue to dominate demand within these markets, with cloud following closely behind it.

Market trends

Demonstrate a continued interest by retail clients looking for usage-based pricing models. Of its client base, Switch reports that nearly 40% are interested in small deployments that come with common retail services.

Outlook

for **Users**

- New multi-megawatt blocks of space have opened up expansion options for users
- Tax incentive and special utility pricing appeals to large scale deployments
- Will continue to be a major network hub appealing to media and entertainment industry

for **Providers**

- A consistent rate of absorption promises regularity in demand
- With only two major providers, Switch will continue to dominate in Vegas & Reno

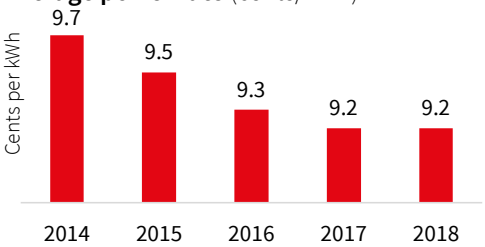
Supply	s.f.	MW
Total inventory:	3,580,471	416.0
Total vacant:	39,772	3.0
Under Construction:	381,881	40.0
Planned:	5,524,322	520.0

Demand	MW
Net absorption:	17

Rental rates

<250kW:	$250 - $350/kW(all in)
>250kW:	$110 - $165/kW (+E)

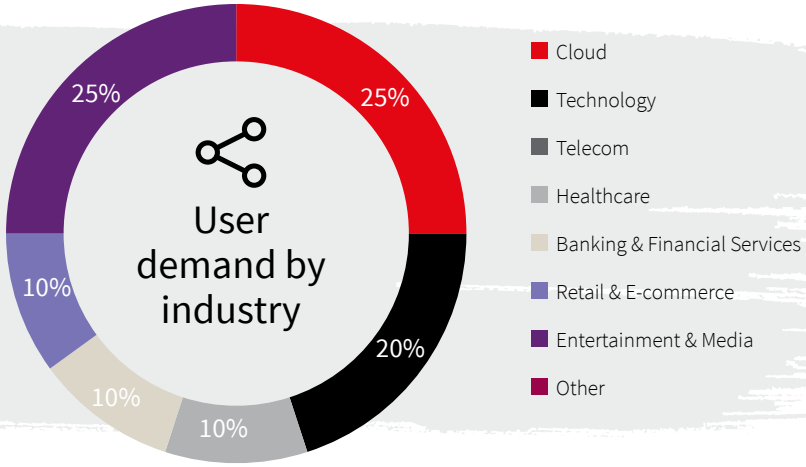
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



2018 significant data center transactions

Tenant	Provider	Size
International Streaming Media Corporation	Switch	15 MW
Existing Customer Expansions	Flexential	600 kW

Los Angeles

Los Angeles providers consolidate and compete for user demand

Market overview

Supply

Supply is being driven by consolidation and rate compression, which continues to be key in the market as providers drastically reduce rates and increase service offerings to be competitive. Larger blocks of space and power are still lacking, but operators have plenty of small pockets to keep up with market demand.

Demand

Demand from Chinese internet/telecom providers continue to drive the market for the larger blocks of space. Smaller users are still the backbone of the market as there is constant demand for small rack deployments.

Market trends

Market trends remain consistent with the general California market, where technology companies and Asia-Pacific entities proximity plays continue to drive market demand. Latency and connectivity still remains high on list for LA users.

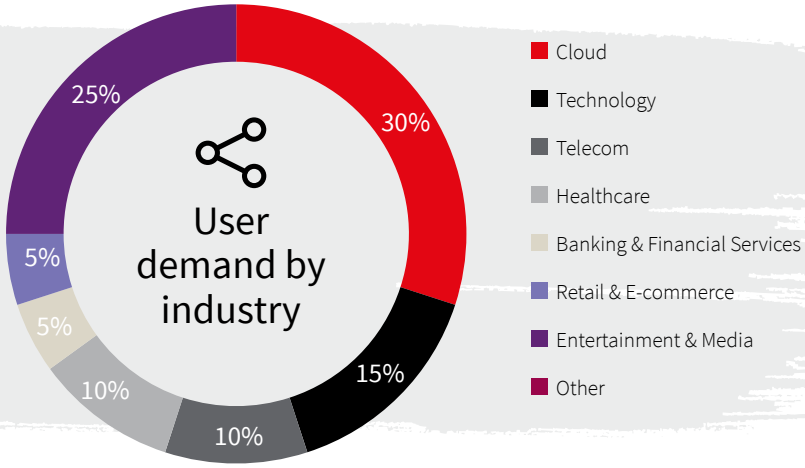
Outlook

for **Users**

- Google's expansion in LA will spur additional interest in the market
- Entertainment, media, and technology continue to be driving forces
- Several new large transactions have limited viable space options

for **Providers**

- Industry rate compression is the driving theme
- Providers are continuing to aggressively compete for customers
- Providers are increasing their service offerings and using as incentives to win deals



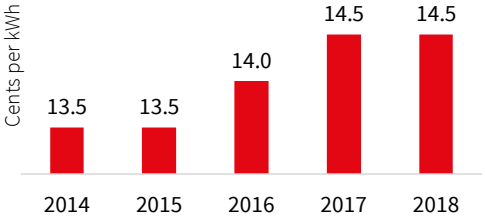
Supply	s.f.	MW
Total inventory:	2,300,000	210.0
Total vacant:	320,000	12.0
Under Construction:	100,000	9.0
Planned:	120,000	6.0

Demand	MW
Net absorption:	2

Rental rates

<250kW:	$190 - $250/kW(all in)
>250kW:	$90 - $120/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Google	Coresite	4 MW
Zayo	One Wilshire	2.5 MW
Evocative	Garland Center	1.2 MW

New Jersey

New Jersey attempts to attract hyperscalers, while financial services companies represent the largest user demand

Market overview

Supply

Supply continues to be a hybrid of turnkey space and shell space. The NJ market can meet both the enterprise and hyperscale needs with sufficient supply of turnkey and powered shell available. Operators are being creative with flexible solutions and cloud enablement to drive more demand out of the Tri-State region.

Demand

Financial services companies are headlining the first half of the year with wholesale deployments being in proximity to NY operations. With all of the network abundance, cost efficient power and tax incentives in Northern Virginia, there has not been any movement by the Hyperscalers to this market.

Market trends

The financial services and healthcare pipeline for the second half of the year will drive absorption rates higher in 2018. Tenants are being savvy and requiring flexible contracts, technologies to move hybrid cloud workloads, renewable energy and power reservation options.

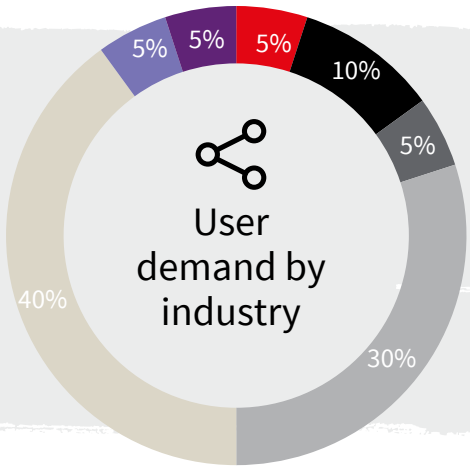
Outlook

for **Users**

- Hyperconverged services continue to enter the market that allow cloud flexibility
- Energy Sustainability is rising: Tenants are requiring 100% renewable energy options
- New reservation and back up capacity solutions are available for growth and DR needs

for **Providers**

- Continued lease flexibility and aggressive agreements offered to tenants
- Providers are continuing to aggressively compete for tenants
- Wholesale users leverage trends to negotiate ramp terms and expansion options



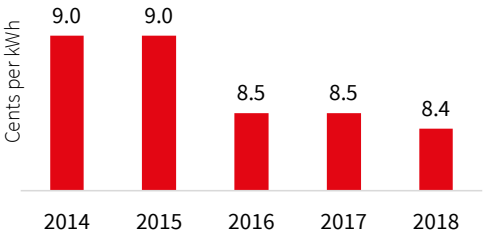
Supply	s.f.	MW
Total inventory:	3,400,000	342.0
Total vacant:	240,000	25.0
Under Construction:	38,000	4.2
Planned:	825,000	110.0

Demand	MW
Net absorption:	2.8

Rental rates

<250kW:	$225 - $575/kW(all in)
>250kW:	$115 - $350/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Financial services	QTS	600 kW
Financial services	Digital Realty	1,000 kW
Financial services	Infomart	300 kW

New York

NY suburbs experience wholesale, shell and disaster recovery interest

Market overview

Supply

NYC operators continue to offer single rack services and promote cloud access. The Suburban Market is positioning 1+ MW of wholesale and custom built shell options, rich in incentives to attract Hyperscalers. Upstate is seeing the Blockchain segment absorb large capacity, powered industrial shells.

Demand

Demand is driven mostly by retail, typically less than 10 racks and 100 kW in size. Demand is from NYC city agencies, followed by healthcare, network and technology supporting fiber and wireless demand in NYC.

Market trends

Network/5G/IoT will drive more small rack deployments in NYC. Suburbs have a pipeline of wholesale in the second half of 2018, as outside counties are offering tax incentives and cheaper power. There has been continued investment in low-cost hydro power upstate by the Blockchain sector.

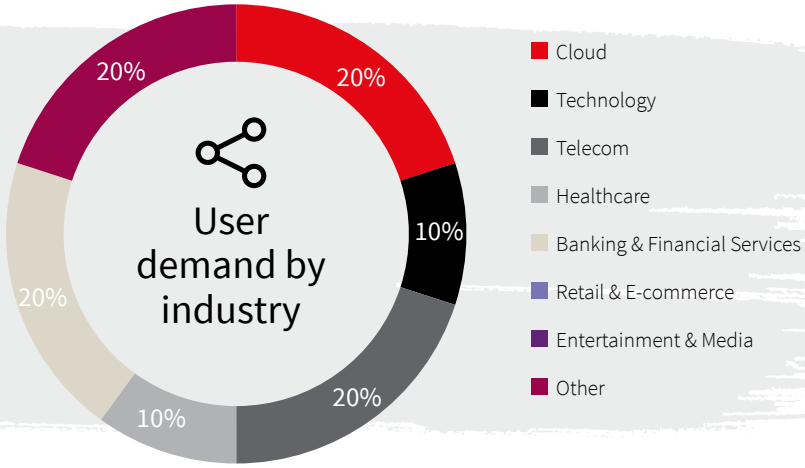
Outlook

for **Users**

- Carrier Hotels continue to see the highest demand due to robust interconnectivity
- Suburbs offer wholesale, shell and robust DR options with tax incentives
- Sublease options continue to grow outside the Carrier Hotel footprint

for **Providers**

- With light demand in NYC, providers are offering flexible contracts
- Wholesale rates are trending down slightly as vacancies increase in nearby markets
- Wholesale users leverage trends to negotiate ramp terms and expansion options

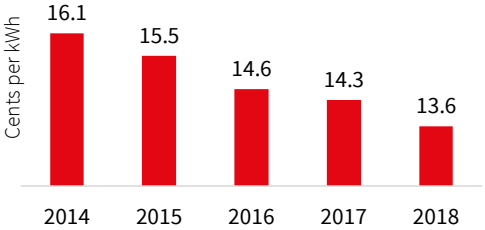


Supply	s.f.	MW
Total inventory:	1,020,000	152.0
Total vacant:	115,000	16.0
Under Construction:	37,000	3.7
Planned:	285,000	37.0

Demand	MW
Net absorption:	0.5

Rental rates	
<250kW:	$275 - $600/kW(all in)
>250kW:	$225 - $500/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
System Integrator-NYC Agency	Telehouse	70 kW
Financial Services	Digital Realty	100 kW
Cloud Provider	Coresite	200 kW

Northern California

NorCal marks up-tick in absorption, but future supply may create imbalance

Market overview

Supply

Digital Realty, Equinix and Vantage delivered new product to Santa Clara with leasing success. Digital Realty leased the entire 6MW it brought online at 3205 Alfred. Vantage and Informart's recapitalizations allows them to build more turnkey product and compete with Digital Realty, CoreSite and Equinix. Few larger deployment footprints are available.

Demand

Nearly all of H1 demand was existing customer expansions that prefer to expand with existing landlords, a trend over the past few quarters. Most of the absorption was new product and was tied to deals in other markets. Gross absorption is up but the fact that it was in new product that came online in the same period nets out the absorption.

Market trends

Tech continues to drive demand. The recent leasing success of new product and the limited supply for larger deployments is driving the delivery of more supply by Digital Realty, CoreSite and others. While there appears to be more year over year demand, it's unclear if there will be enough future demand to meet the significant supply coming online in the next 24 months.

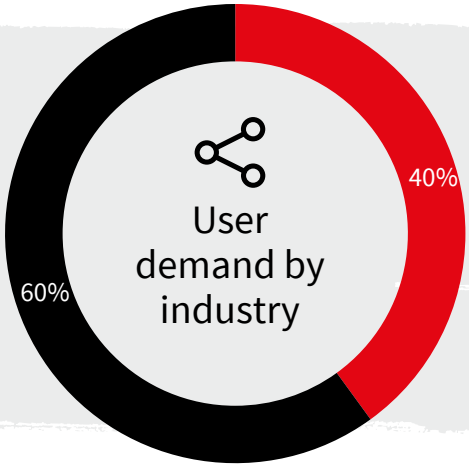
Outlook

for **Users**

- Scarce options for larger deployment means less concessions
- Fair number of options for colocation footprints
- More supply coming online which will shift leverage to Users

for **Providers**

- Need to be mindful of competitive supply coming online
- Need to determine how much supply to bring online and why
- Larger providers with an existing customer base better positioned



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

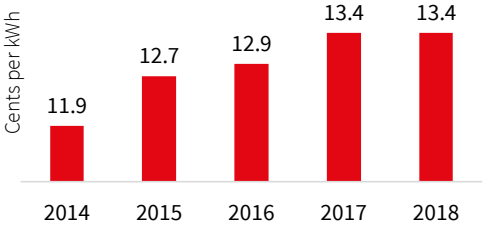
Supply	s.f.	MW
Total inventory:	3,876,000	581.0
Total vacant:	177,000	42.0
Under Construction:	-	-
Planned:	337,000	6.0

Demand	MW
Net absorption:	3.8

Rental rates

<250kW:	$200 - $350/kW(all in)
>250kW:	$125 - $160/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Chinese Telecom	DLR	6 MW
Financial Services	Equinix	300 kW
Unknown	Vantage	600 kW

Northern Virginia

Northern Virginia hits throttle to lead all global markets

Market overview

Supply

CoreSite, CyrusOne, Digital Realty, Equinix, Infomart, Iron Mountain, QTS, Sabey, Vantage currently have new significant deliveries available and online in 1Q19 to meet demand. Also, many providers have closed on land positions outside of Ashburn in neighboring communities, such as Reston and Manassas.

Demand

Cloud, hyperscalers, and enterprises acquire data center space from cabinets to 72+MWs deployments, which benefit from NoVA's global Network Access. This drives historic annual demand absorption of B2B, B2C, SaaS, PaaS, IaaS, cloud computing, new technology, and financial services deployments. Enterprises continue to eliminate on-premises data centers to lower TCO.

Market trends

Multiple cloud service providers, social media and large tech companies acquire or seek new campuses in NoVA. Enterprises with expiring and upcoming MSA renewals can benefit from available and aggressive competitive pricing, concessions and low cost connectivity solutions (SDN).

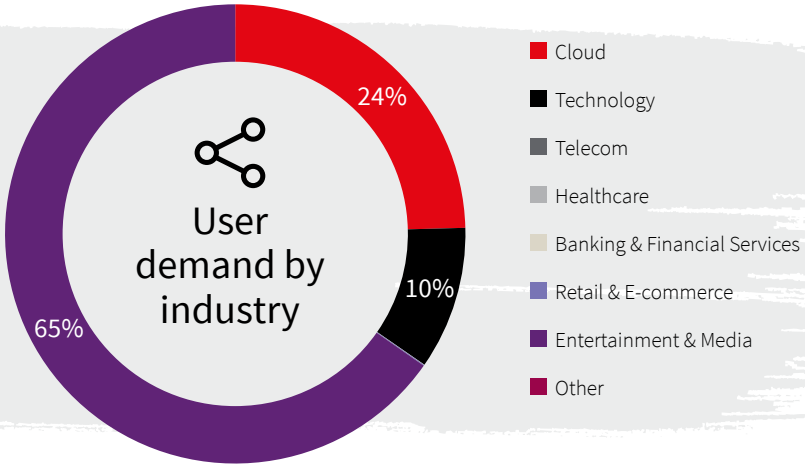
Outlook

for **Users**

- Users require greater network access exchanges, low latency and diversity to support new deployments.
- Broad selection leading to aggressive provider offerings and concessions.
- Highly proprietary servers with greater rack densities will continually need more power.

for **Providers**

- Increased server computer and server density are dramatically evolving.
- New providers continue to evaluate market to participate in broad market demand acceleration.
- New investments meeting returns faster (IRR) than ever before with minimal downtime.



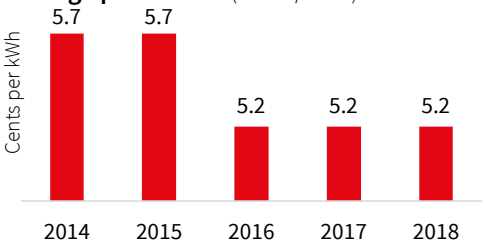
Supply	s.f.	MW
Total inventory:	5,578,085	920.2
Total vacant:	340,080	49.8
Under Construction:	1,653,004	317.0
Planned:	1,638,800	328.3

Demand	MW
Net absorption:	168.25

Rental rates

<250kW:	$180 - $280/kW(all in)
>250kW:	$90 - $130/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Social Media	CloudHQ	72 MW
Cloud	CyrusOne	20 MW
Social Media	Digital Realty	16 MW

Northwest

Hillsboro scores again, Seattle sees some sunshine, and Central Washington ramps up

Market overview

Supply

There are a number of new entries to the market with product currently under construction such as OVH. Additionally, major existing operators, including Flexential, are expanding on a speculative basis in 1 to 3 MW intervals. Recorded vacancy is at 13%, which is a downward trend.

Demand

Demand early on was sluggish but quickly picked up. The typical transaction size of contracts recently negotiated has been historically high, with multiple 1 MW plus commitments. Significant, large-scale inexpensive blockchain, etc. developments are under construction or expansion--creating a new product type.

Market trends

Demand profiles remain consistent. Hyperscale operators, western U.S. technology tenants, and large scale Asian based firms. What has changed is that the Chinese entities have taken footprints in response to the recent cable consortium builds.

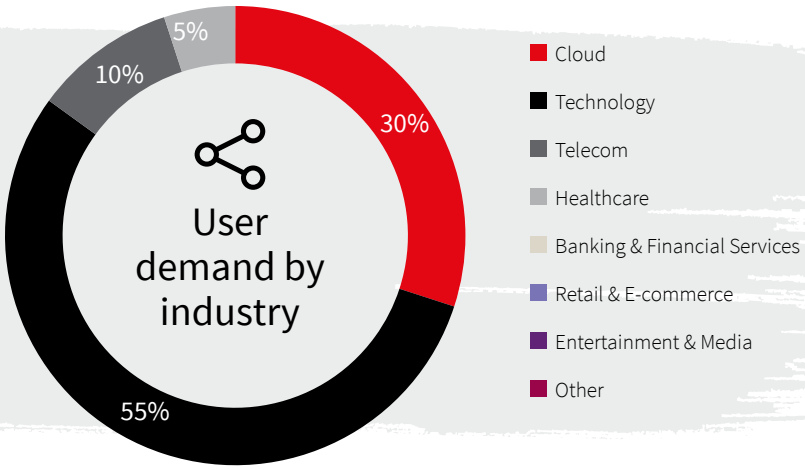
Outlook

for **Users**

- Rates have continued to decrease as M&A continues
- Options that can support 1 MW or greater are diminishing
- Large scale developments have not started with new supply unlikely to deliver until 2020

for **Providers**

- Additional competition will help leasing, the region is under-resourced
- Expect continued requirement to differentiate
- Rental rates may recover temporarily as vacancy decreases



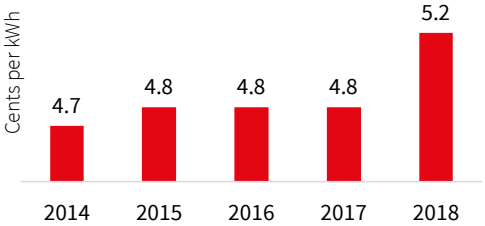
Supply	s.f.	MW
Total inventory:	1,500,000	197.3
Total vacant:	245,161	34.8
Under Construction:	52,048	8
Planned:	387,455	54.3

Demand	MW
Net absorption:	10.68

Rental rates

<250kW:	$220 - $345/kW(all in)
>250kW:	$120 - $135/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Major technology company	Infomart	3 MW
Sea cable consortium	Flexential	250 kW
Major technology company	Internap	1 MW

Phoenix

Hyperscale, cloud providers, and new entrants driving demand in the market

Market overview

Supply

CyrusOne started shell construction on its sixth building. Aligned has 50 MW of expansion space under construction. Iron Mountain broke ground on a building south of their Phoenix DC: 225,000 s.f. and 24 MW of capacity by June 2019 for Phase 1. Lincoln Rackhouse closed on the Bank of America data center, consisting of 54,000SF and roughly 21.6 MWs.

Demand

Well in excess of 100 MWs of demand primarily through hyperscale and cloud provider expansion and new entries into the market.

Market trends

There are several existing data center operators in the market that are expanding and acquiring new data center development sites to accommodate the growing demand for hyperscale, public cloud, and global enterprise companies.

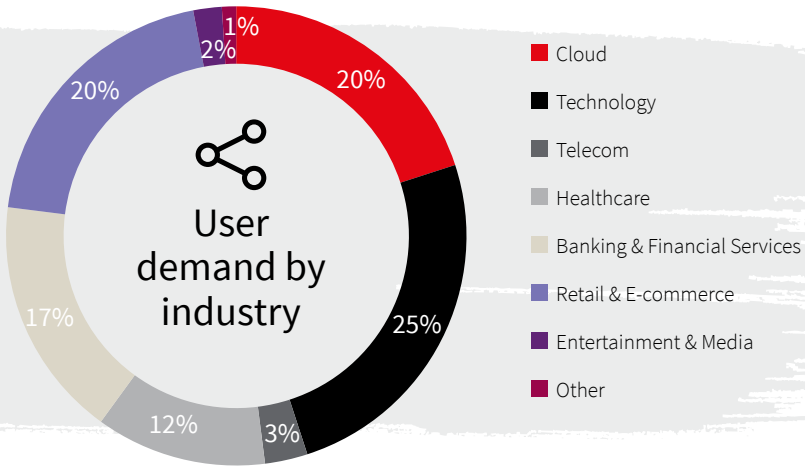
Outlook

for **Users**

- New blocks of space with density and tier options will be delivered to the market
- Attractive terms, conditions, and options to flex up/down will be the norm
- Although Providers dominate the market, leverage will become neutral by year end

for **Providers**

- Providers race to construct and commission space to capture cloud demand
- Working with current customers to continue to expand and renew early is still key
- Competition will grow as new providers start to enter into the market

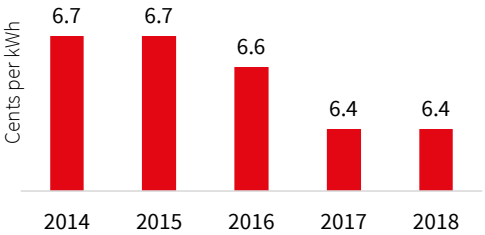


Supply	s.f.	MW
Total inventory:	1,746,013	244.9
Total vacant:	206,871	29.1
Under Construction:	551,630	136.5
Planned:	260,300	44.2

Demand	MW
Net absorption:	19

Rental rates	
<250kW:	$175 - $300/kW(all in)
>250kW:	$110 - $145/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Transportation Network Company	Aligned Energy	11 MW
Confidential Client Expansion	CyrusOne	5 MW
3 Existing Tenant Expansions	Iron Mountain	1 MW

Canada

Montréal

Fast growing Montréal holds title as the jewel of Canada

Market overview

Supply

There is modest supply currently available as U.S. tenants and cryptocurrency/blockchain entities consumed the majority of product last year. However, there is nearly 50 MW of expansion projects underway to deliver N+1 product.

Demand

The demand in Montreal remains the highest in Canada from a number of application types such as U.S. cloud/content providers, visual effects studios, gaming, and software as a service providers both Canadian and from the U.S.

Market trends

Mid-year absorption is due largely to existing U.S. cloud providers who are currently undergoing expansions. The moratorium set on cryptocurrency has created a disruption and that demand has diminished as a result.

Outlook

for **Users**

- Multiple options to compete for users searching for less than 1 MW
- Expect significant supply to come online in 2019
- Anticipate better telecommunications connectivity as telecoms enhance offerings

for **Providers**

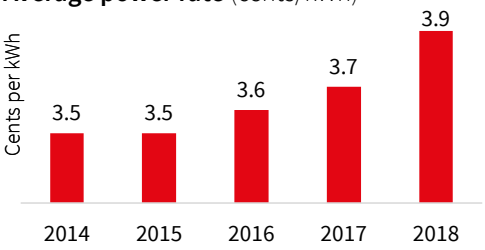
- The new surge of U.S. colocation operator interest will in effect drive business there
- Expect M&A activity in this market very soon
- Rental rates will remain steady

Supply	s.f.	MW
Total inventory:	617,333	127.0
Total vacant:	69,000	10.2
Under Construction:	69,000	10.0
Planned:	323,333	52.0

Demand	MW
Net absorption:	8.0

Rental rates	
<250kW:	$200 - $280/kW(all in)
>250kW:	$150 - $170/kW (+E)

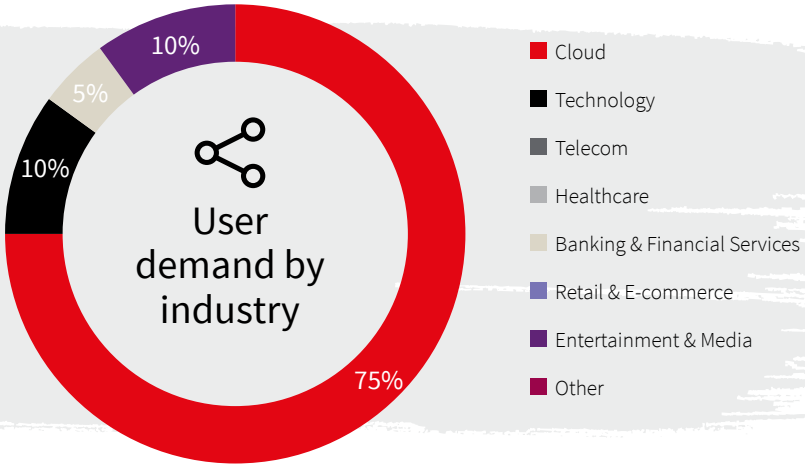
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



2018 significant data center transactions

Tenant	Provider	Size
Blockchain company	EstruXture	2 MW
U.S. Hyperscale expansion	Conf operator	3 MW
U.S. Hyperscale expansion	Conf operator	1 MW

Greater Toronto Area

Market remains slow coupled with significant supply

Market overview

Supply

New supply to the market offers prospective requirements and great opportunities for users in the market. Lagging deal volume over the last twelve months has increased pressure on providers looking to transact on existing vacancy.

Demand

Demand has been lagging for the last twelve months with many retail users assessing transitions to hybrid cloud / cloud solutions. Wholesale requirements have been limited with some requirements assessing out-of-province options driven largely by utility pricing.

Market trends

Cloud and financial services requirements continue to dominate the local market. Some Crypto deals are being entertained in the GTA which seems to be an implication of the Quebec Hydro bidding process for large crypto requirements. Over time crypto requirements may progressively mature and through that maturation, deals outside of Quebec may become more cost neutral.

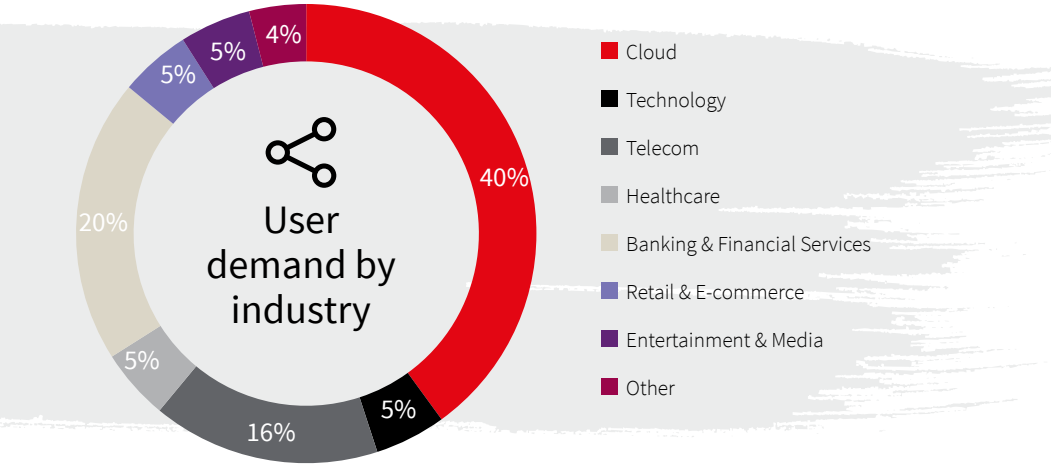
Outlook

for **Users**

- Sluggish market offers larger requirements possible leverage on deal terms
- New construction options offer large requirements improved opportunities

for **Providers**

- Demand beyond 2019 is expected to improve
- Demand may improve with Hydro Quebec's bidding process on large utility requirements



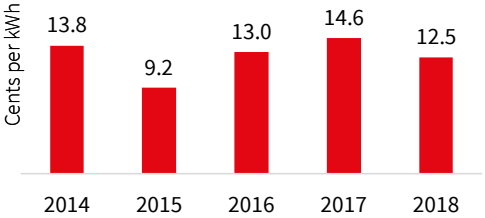
Supply	s.f.	MW
Total inventory:	1,540,000	225.0
Total vacant:	365,000	79.0
Under Construction:	231,000	48.0
Planned:	583,000	141.0

Demand	MW
Net absorption:	7

Rental rates

<250kW:	$225 - $500/kW(all in)
>250kW:	$150 - $190/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Cloud Provider	DLR	3 MW
Cloud Provider	Edge Connex	1.5 MW

Western Canada

All is not quiet on the Western front

Market overview

Supply

Supply has been historically low in the Vancouver and surrounding region, but operators are beginning to expand by acquisition such as EstruXture or by construction such as the Cologix largest new build in the region. Calgary continues to push unleased inventory while Edmonton joins the watched markets as Rogers and others increase their offerings in the north.

Demand

Demand in Western CA has increased, driven by telecom, hyperscale, and U.S. entertainment and film industry users. The market has seen a few large new transactions executed by operators such as Q9. Net absorption remains low as current end users migrate to the cloud or managed hosting, freeing up cage space.

Market trends

Demand has increased significantly in Western Canada, the acquisition of Allstream by Zayo, as well as some new planned long-haul routes, have increased CA offerings and better connect U.S. based operations to their respective U.S. data center.

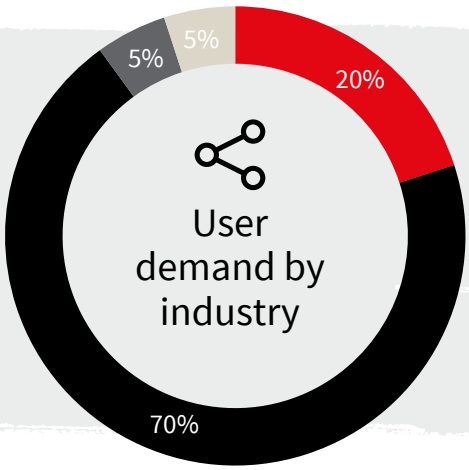
Outlook

for **Users**

- Ample product in Calgary to consider
- No significant size options in Vancouver region until 2019
- In-row water cooled racks are becoming the norm in Vancouver

for **Providers**

- New inventory delivered in 2019 will not have negative impact on rental rates
- Very little planned product means additional delivery not likely until 2020
- Rental rates vary market-to-market, expect continued downward pressure in Calgary



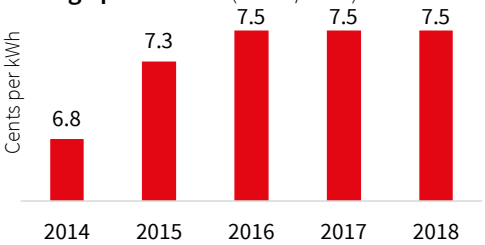
- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

Supply	s.f.	MW
Total inventory:	692,256	96.8
Total vacant:	117,214	15.5
Under Construction:	43,571	6.5
Planned:	3,571	0.5

Demand	MW
Net absorption:	1

Rental rates	
<250kW:	$350 - $450/kW(all in)
>250kW:	$180 - $212/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Film Rendering company	Backbone	115 kW
EMEA software company	Q9	1 MW
U.S. Hyperscale	CONF Calgary	100 kW

Europe

Amsterdam

Amsterdam competes with Frankfurt to be largest mainland European market

Market overview

Supply

Increased steady fit-out in the city keeps vacancy rates suppressed while supply comes to market.

Demand

Demand remains strong in Amsterdam largely driven by the continued draw-down of space and power by the hyperscaler community.

Market trends

More and more, Amsterdam is attracting self-build hyperscaler data centers in addition to the strong colocation demand.

Outlook

for **Users**

- New entrant Iron Mountain takes over Evoswitch
- More space from Digital Realty enters market
- Pricing remains stable with good choice of providers

for **Providers**

- Amsterdam becomes the largest hyperscaler self-build hub after Dublin
- Power remains constrained in Schiphol area
- Expect to see larger campus style facilities being developed

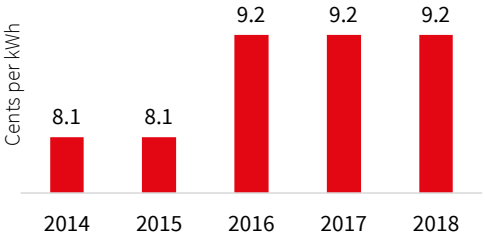
Supply	s.f.	MW
Total inventory:	17,300,000	292.0
Total vacant:	125,400	15.0
Under Construction:	40,000	8.0
Planned:	40,000	8.0

Demand	MW
Net absorption:	18

Rental rates

<250kW:	$160 - $270/kW(all in)
>250kW:	$125 - $200/kW (+E)

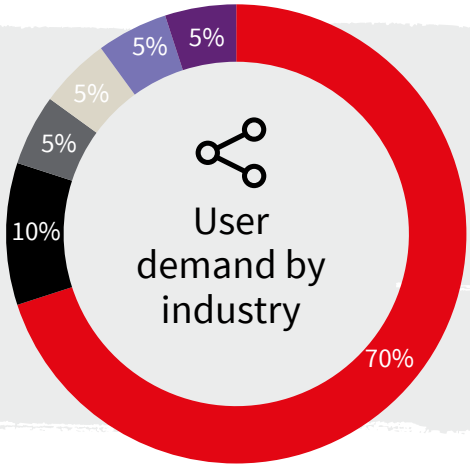
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

2018 significant data center transactions

Tenant	Provider	Size
Cloud Provider	Confidential	3 MW
Financial Institution	Confidential	500 kW
Technology Co	Confidential	250 kW

Dublin

Dublin remains the hyperscaler self build capitol of Europe with a growing colocation market

Market overview

Supply

New supply remains small compared to larger European hub markets though plans for growth slowly come available.

Demand

Cloud providers lead the colocation market demand with 30% of absorption sourced in traditional enterprise.

Market trends

New colocation plans from Edgeconnex, Digital Realty and Cyrus One continue to build scale and importance of the Dublin market.

Outlook

for **Users**

- New building coming to market from Digital Realty
- Continued new supply from Equinix and Interxion dominate the city
- Growing technology hub market for peering

for **Providers**

- Continued self-build by hyperscaler in the city outstrips colocation facilities
- Power restriction compels new facilities to turn to gas turbine generation
- Steady pricing as vacancy rates remain low

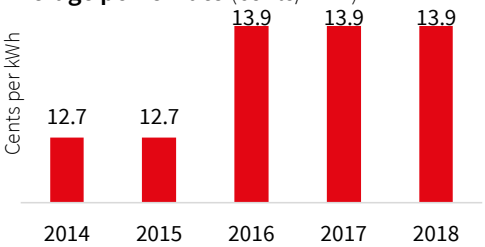
Supply	s.f.	MW
Total inventory:	573,091	100.0
Total vacant:	45,780	6.0
Under Construction:	20,000	4.0
Planned:	30,000	6.0

Demand	MW
Net absorption:	7

Rental rates

<250kW:	$220 - $300/kW(all in)
>250kW:	$130 - $175/kW (+E)

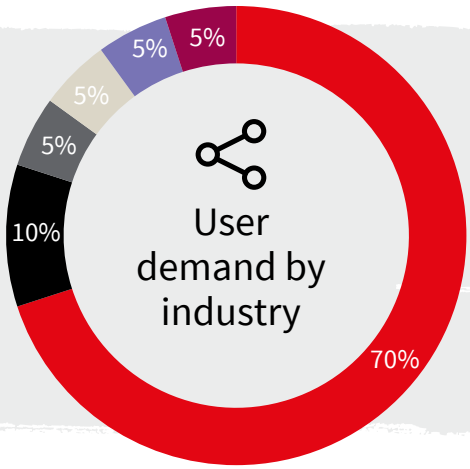
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

2018 significant data center transactions

Tenant	Provider	Size
Technology	Confidential	150 kW
Telecom	Confidential	300 kW
Technology	Confidential	2 MW

Frankfurt

Frankfurt vies for dominance in Europe with significant pipeline of new product

Market overview

Supply

Current vacancy rates remain low while new supply continues to come to Frankfurt through projects like Global Switch's expansion adjacent to its current site that will deliver 11,000 square feet and 14 MW of utility power in 2019 and Zenium's plans for a third building after nearly filling the newly constructed Frankfurt Two.

Demand

Demand remains strong in Frankfurt both from domestic and international users.

Market trends

Expect to see continued strong demand in the city over the next 24-36 months powered by the strength of the German economy and its pivtal position in Europe.

Outlook

for **Users**

- Strong demand keeps pricing stable to rising
- New pipeline of product in market but much is pre-leased
- Excellent choice for new entrants to market from world class providers

for **Providers**

- Frankfurt remains the most competitive European location
- Power remains restricted in much of the city for new facilities
- Need for scale pushes new developments further out of town

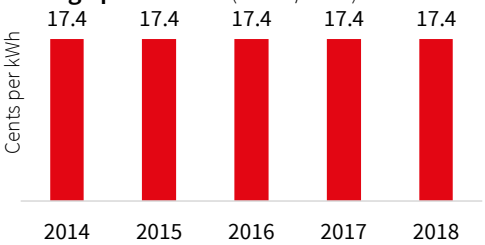
Supply	s.f.	MW
Total inventory:	2,640,000	290.0
Total vacant:	248,628	30.0
Under Construction:	100,000	20.0
Planned:	200,000	40.0

Demand	MW
Net absorption:	14

Rental rates

<250kW:	$200 - $300/kW(all in)
>250kW:	$160 - $200/kW (+E)

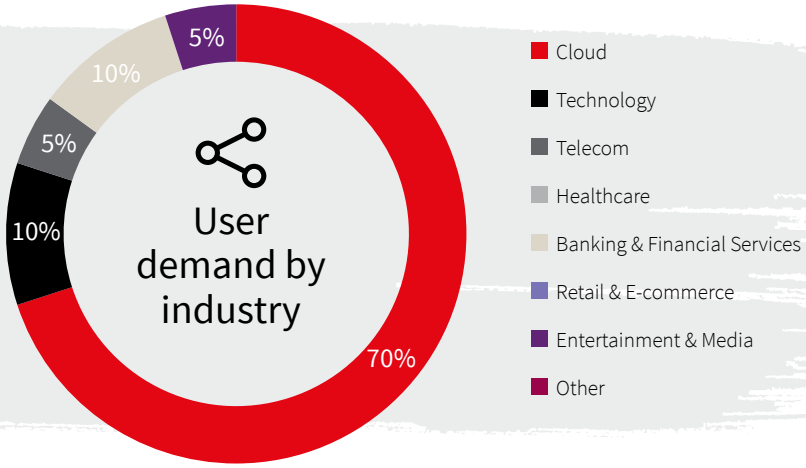
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



2018 significant data center transactions

Tenant	Provider	Size
Cloud Provider	Confidential	1.5 MW
Technology	Confidential	3 MW
Cloud Provider	Confidential	6 MW

London

London dominates the European data center market

Market overview

Supply

London continues to bring new supply to market though vacancy rates remain the lowest in Europe at 4.5%.

Demand

Demand in the city remains the strongest in Europe during the first half of 2018 with nearly 25 MW of absorption to date.

Market trends

Hyperscaler demand for space and power remains the main market driver for the industry.

Outlook

for **Users**

- Significant new supply coming to market
- New entrants include Cyrus One, Server Farm Realty & Iron Mountain
- Pricing remains firm due to the pre-leasing of space ahead of completion

for **Providers**

- London remains the most competitive colocation market in Europe
- New providers keep pressure on existing client relationships
- Power constraints see new facilities in the East of London gain traction

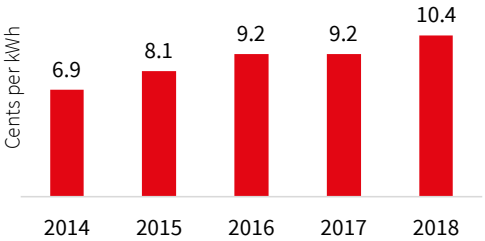
Supply	s.f.	MW
Total inventory:	4,250,000	516.0
Total vacant:	192,400	25.0
Under Construction:	80,000	15.0
Planned:	200,000	40.0

Demand	MW
Net absorption:	24.5

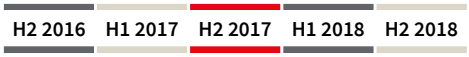
Rental rates

<250kW:	$180 - $280/kW(all in)
>250kW:	$130 - $170/kW (+E)

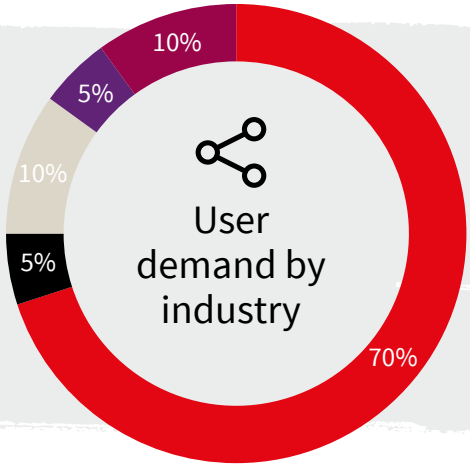
Average power rate (cents/kWh)



Data Center leverage



User favorable market
Neutral market
Provider favorable market



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

2018 significant data center transactions

Tenant	Provider	Size
Cloud Provider	Confidential	3 MW
Technology	Confidential	2.5 MW
Financial Institution	Confidential	400 kW

Paris

Paris take up remains muted in comparison to other mainland European cities

Market overview

Supply

Paris has a small amount of new supply continuing to come to market from the incumbent providers in the market. Vacancy rates remain at a healthy 9.8%.

Demand

Demand has remained sluggish in comparison to other European cities which have benefited from larger hyperscaler take up.

Market trends

Expect to see hyperscaler take up of new space and draw down on existing contracts accelerate in the second half of the year.

Outlook

for **Users**

- Vacancy remains across a number of facilities in the city providing choice for users
- Pricing remains competitive compared to other more constrained markets
- Power cost remains highly competitive compared to other European cities

for **Providers**

- Market take up remains muted
- Reinvigorated interest from hyperscalers driving new entrant interest
- Expect H2 to see significant uplift in take up from hyperscalers

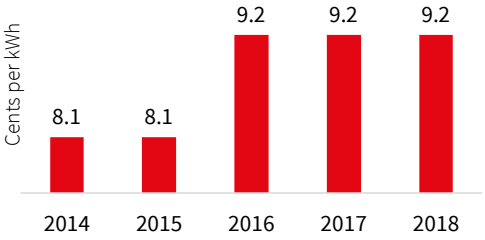
Supply	s.f.	MW
Total inventory:	1,640,000	180.0
Total vacant:	161,100	20.0
Under Construction:	40,000	8.0
Planned:	50,000	10.0

Demand	MW
Net absorption:	5.6

Rental rates

<250kW:	$140 - $250/kW(all in)
>250kW:	$120 - $165/kW (+E)

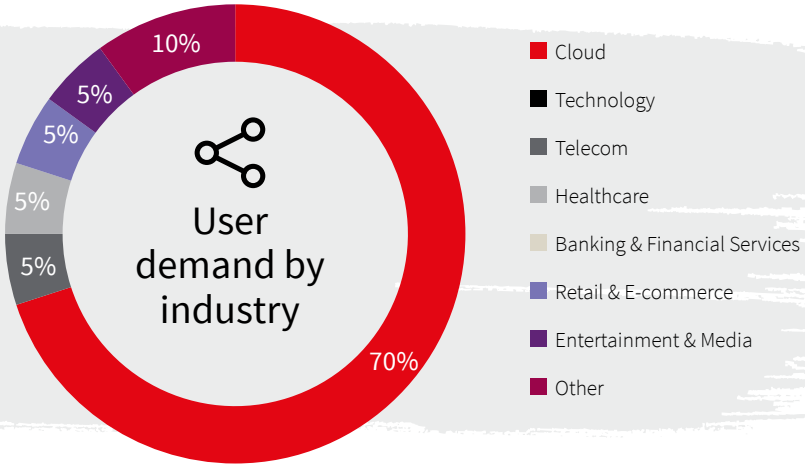
Average power rate (cents/kWh)



Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market



2018 significant data center transactions

Tenant	Provider	Size
Financial Institution	Confidential	300 kW
Technology	Confidential	500 kW
Retail	Confidential	150 kW

Asia Pacific

Hong Kong

Hong Kong's new supply continues to come online as it faces land scarcity issues in the medium to long term

Market overview

Supply

One Asia, an IT services and solutions company has opened its six story, 128,000 s.f. data center facility in Kowloon Bay in Hong Kong. It will be able to host 2,000 racks and it will be the fourth data center in the Kowloon Bay area.

Demand

There has been continued demand in Hong Kong from the cloud service providers and mainland Chinese tech firms along with the normal banking and financial companies. Hyperscalers are desperately trying to seek space however are restricted by the shortage of land availability.

Market trends

The market is experiencing rapid absorption as new supply comes online. Demand continues to be driven by mainland Chinese tech firms and the major cloud service providers. External investors and providers still have a strong interest in the Hong Kong data center market and the government will need to address the land scarcity issues to be able to sustain long term growth.

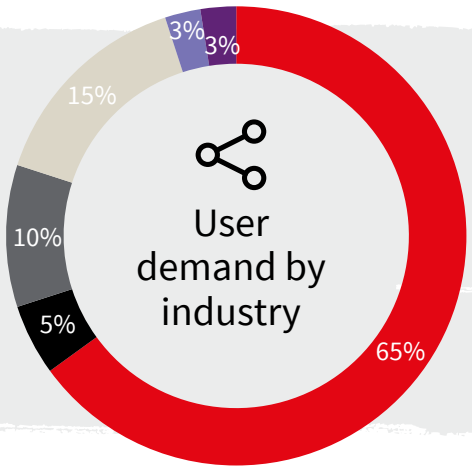
Outlook

for **Users**

- Enterprise, financial tech, and technology continue to be driving forces
- New supply is bringing better than market PUE and connectivity
- Increased market activity is making for more competitive pricing

for **Providers**

- Pressure on supply due to the available inventory is swiftly taken
- A lot of interest from new DC suppliers despite land scarcity issues
- Government needs to address the land availability for DC providers



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

Supply	s.f.	MW
Total inventory:	5,383,333	285.0
Total vacant:	765,000	85.0
Under Construction:	210,000	15.0
Planned:	250,000	20.0

Demand	MW
Net absorption:	20

Rental rates

<250kW:	$280 - $400/kW(all in)
>250kW:	$165 - $260/kW (+E)

Average power rate (cents/kWh)

Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Cloud Service Provider	iAdvantage	3 MW
Cloud Service Provider	Confidential	5 MW
Telecom Company	Confidential	10 MW

Singapore

Singapore activity starts to pick up with new supply due by year end

Market overview

Supply

While there has been no new launch for the first half of 2018, a flurry of completion is expected towards the end of 2018. STT Defu 2, Global Switch in Woodlands, and Mapletree build in the West of Singapore are due to complete in 2H2018.

Demand

Cloud providers continue to anchor demand for colocation space as they progress on their long term build strategies. We have also witness meaningful activities from traditional banking and finance sector.

Market trends

Singapore continues to attract interest across the spectrum of operators, end-users, and investors. Going forward, some of the hyperscale requirements currently under discussion will come to fruition. At the same time, governments across the region are progressing with data protection measures and policies. This may have an impact on the ultimate deployment strategies.

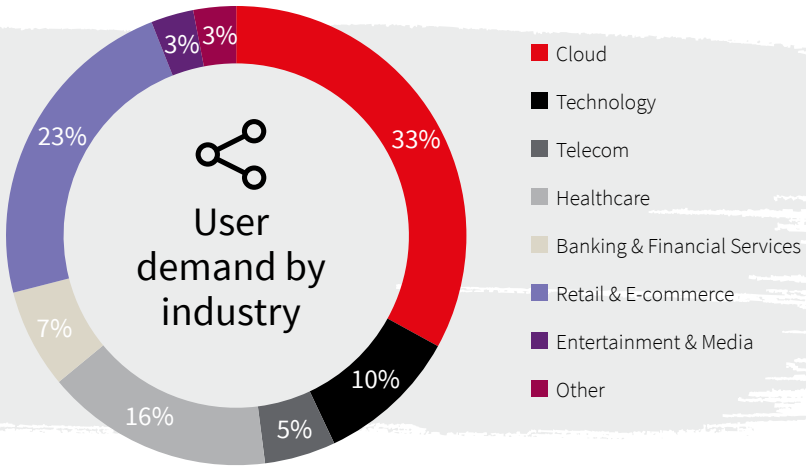
Outlook

for **Users**

- Window of opportunity to explore consolidations, renewals, and take-ups
- High quality facilities and better PUEs may translate to further savings on utilities

for **Providers**

- JTC led initiatives in the Jurong and Loyang parks have attracted strong interest
- Providers looking to acquire greenfield land may have to explore other alternatives



Supply	s.f.	MW
Total inventory:	4,200,000	330.0
Total vacant:	720,000	80.0
Under Construction:	660,000	42.0
Planned:	700,000	90.0

Demand	MW
Net absorption:	20

Rental rates

<250kW:	$225 - $400/kW(all in)
>250kW:	$130 - $220/kW (+E)

Average power rate (cents/kWh)

Data Center leverage

H2 2016	H1 2017	H2 2017	H1 2018	H2 2018

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Keppel DC REIT (Buyer)	Kingsland Data Centre (Vendor)	c. 23,000 sqm

Australia

Australia connects to the global Google Cloud Platform as demand is driven by cloud service providers

Market overview

Supply

Airtrunk opened its new hyperscale data centere in Q3 2017 located in Western Sydney. Phase one has been completed with a cloud service provider as an anchor tenant. Once the facility is completed it will offer over 50 MW IT power to the site. Digital Realty, Global Switch and Equinix all are expanding their current data centres to meet the high demand in the market.

Demand

Sydney demand is being driven by cloud service providers this is due to not only the private but also the public sector embracing the advantages of cloud services. NextDC introduced two Google Cloud interconnects allowing Australia to be connected to the global Google Cloud Platform.

Market trends

High demand in Sydney continues which has been driven by the cloud services, telecos, tech firms and the financial institutions. The top data center providers are meeting this demand by expanding their existing facilities with precommitments. Over the course of 2018/19 the remaining of the new supply will be swiftly consumed having minimum effect on market pricing.

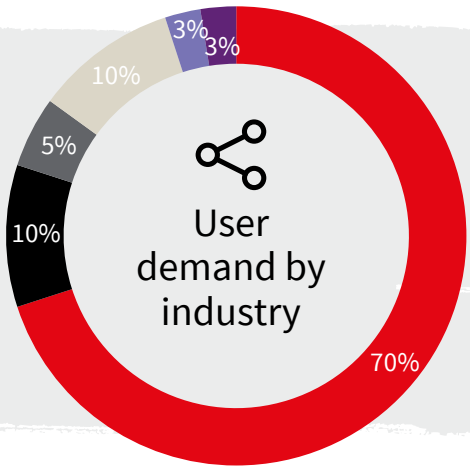
Outlook

for **Users**

- Expansion of Cloud Services creating low latency levels and connectivity speed
- Demand from financial institutions, cloud services and telecoms

for **Providers**

- Over the course of 2018/19 new supply will enter the market
- Likely more hyperscale facilities being built in the medium to long term



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

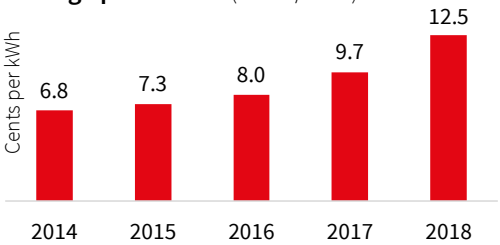
Supply	s.f.	MW
Total inventory:	1,555,000	200.0
Total vacant:	280,000	40.0
Under Construction:	65,459	5.0
Planned:	600,000	80.0

Demand	MW
Net absorption:	20

Rental rates

<250kW:	$250 - $350/kW(all in)
>250kW:	$160 - $245/kW (+E)

Average power rate (cents/kWh)



Data Center leverage

User favorable market
Neutral market
Provider favorable market

2018 significant data center transactions

Tenant	Provider	Size
Cloud Services Provider	Confidential	5 MW
Cloud Services Provider	Confidential	5 MW
Technology	Confidential	3 MW

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Global | Year-End 2017

JLL Research Report

Data Center Outlook

Closing out a dynamic year, data center industry remains strong.

Contents

5 trends

to watch for in 2018

Industry M&A is here to stay

48 deals totaling nearly $20 B happened in 2017 — nearly exceeding the total 2015 and 2016 volumes combined. The trend will remain for the next several years as players continue to expand scale, services and expertise.

Foreign interest in the U.S. will pick up speed

Heading into 2018, foreign data center companies' interest and action in entering the U.S. data center market will accelerate as **international enterprises and providers look to build a footprint for U.S. customers.**

"Gateway to the cloud" and the rise of add-on services

As the data center industry continues to mature, **enterprises will consistently seek out add-on services and outsource data center expertise** as hybrid models become the norm in 2018 and beyond.

Growth of "edge" markets

Enterprises' growing need to be near end-users will drive an uptick in growth in smaller satellite markets. The increasing importance of "edge" markets will begin to play a larger role in data center strategies.

The growing complexity, users, data center solutions and facilities.

Data centers have become exponentially more complex in recent years, that's no surprise. Yet this applies to every facet of the business: facilities, hardware, user requirements and solutions. Expect a jump in the industry's need for remote monitoring, cloud-based management and customized deliverables.

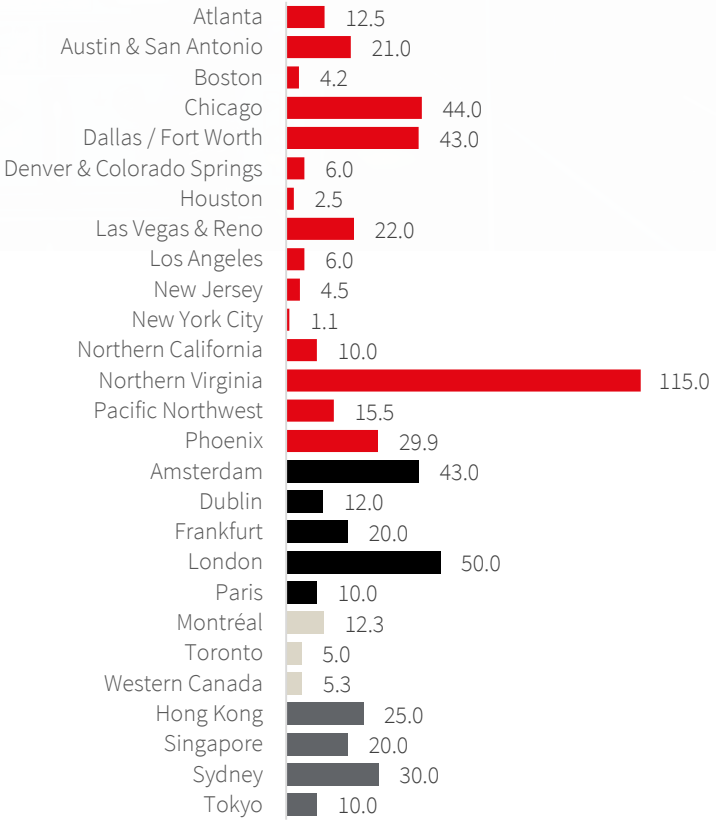
State of the *industry*

Finishing up the year, data center markets in the United States and abroad closed out another strong 12 months with **583.5 MW of absorption across top U.S., Canadian, European (EMEA) and Asia Pacific regions (APAC)** through 2017. The United States and Canada boasted 363.5 MW of positive net absorption, while EMEA hit 135.0 MW and APAC closed out 85.0 MW of absorption in the calendar year. U.S. and Canadian absorption was down 8.6 percent over a record-shattering 2016 (compared to +2.4 percent globally). This all paints an important picture for the industry, as absorption stayed steady amid key shifts and industry shakeups playing out through 2017.

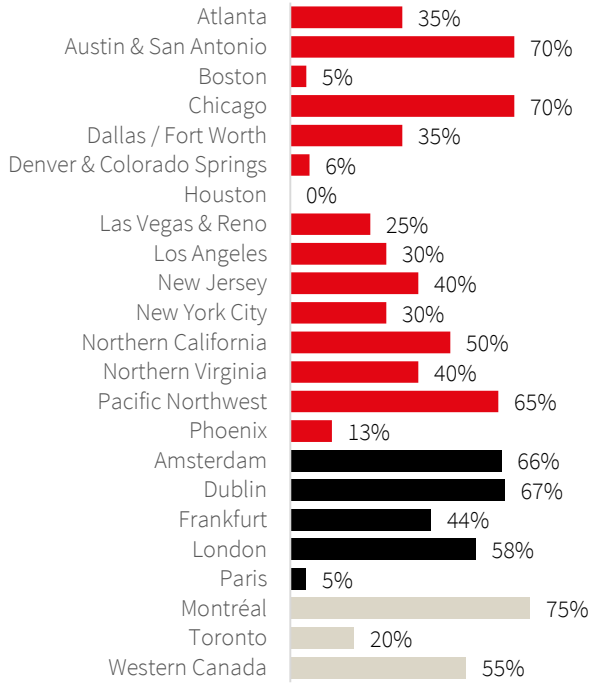
Key year-end 2017 leasing takeaways:

- Cloud leasing continued to reign supreme in the majority of markets—with many cities reporting upward of 25 percent leasing driven by cloud operators.
- "Edge" markets began to see sizeable upticks in absorption in the second half of 2017 as key players looked to fill out their geographic network—as seen in Atlanta, LA, Phoenix and other "edge" cities.
- Overall 2017 absorption continued on the path of normalization post-2016 cloud leasing frenzy, yet pent-up demand still remains in many key markets.

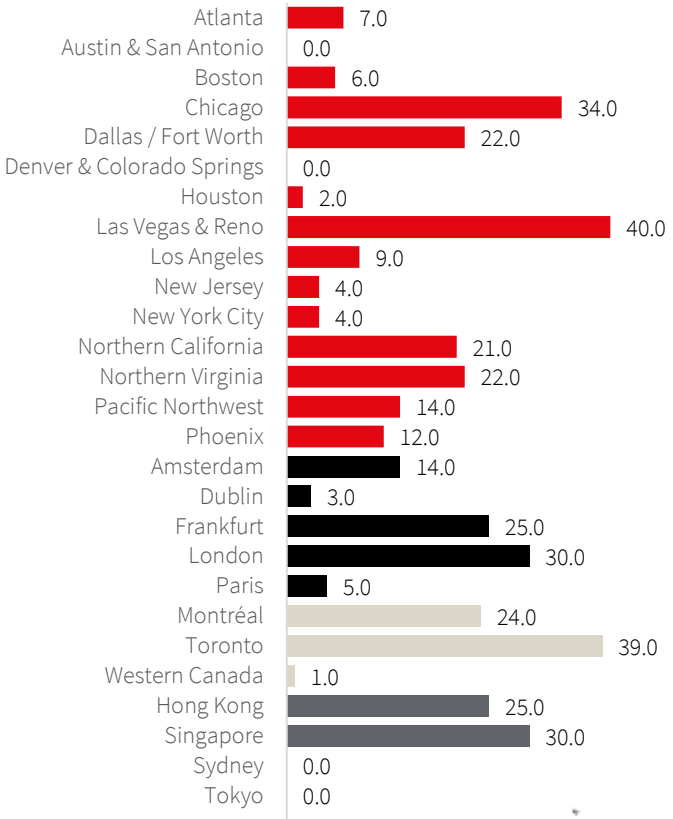
Global net absorption, *year-end 2017 (Units=MW)*



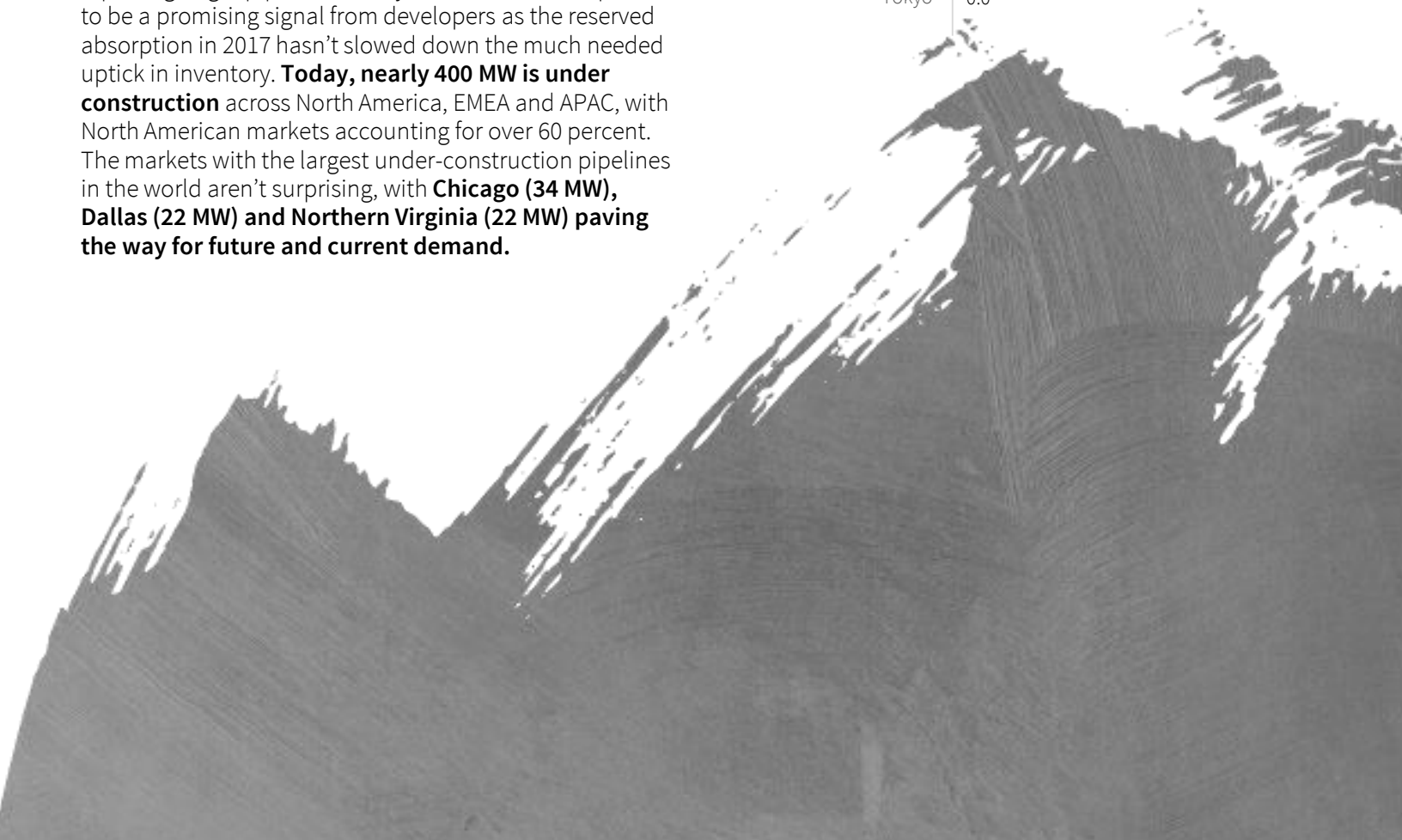
Cloud service providers continued to drive demand in 2017
(Cloud as percentage of absorption in markets)



Current under-construction inventory
(Units=MW)



Under-construction inventory in the data center sector saw a steady uptick over the last 12 months, with many markets reporting larger pipelines than year-end 2016. This proves to be a promising signal from developers as the reserved absorption in 2017 hasn't slowed down the much needed uptick in inventory. **Today, nearly 400 MW is under construction** across North America, EMEA and APAC, with North American markets accounting for over 60 percent. The markets with the largest under-construction pipelines in the world aren't surprising, with **Chicago (34 MW), Dallas (22 MW) and Northern Virginia (22 MW) paving the way for future and current demand.**



2017 M&A round-up

Mergers, acquisitions and inter-industry consolidation continued to define 2017, with an estimated $20 B+ changing hands across nearly 50 deals (larger than 2015 and 2016 combined), as players continued to expand their client base, product coverage, new services and overall expertise. According to the latest report from Synergy Research Group, enterprises are **continually focusing M&As on improving IT capabilities and technologies above all else,** and less on the physical ownership of data center assets. Through 2017, Digital Realty and Equinix continued to be the predominant players in the corporate buyout space—with Equinix buying companies across every global region, while Digital has been primarily focused in North America and Europe. While acquisition activity has been robust over the last 24 months, we can expect to see a similar level and magnitude of transactions for the next several years.

This incredible M&A activity is also both leading and causing the significant uptick in data center facility and network complexities that we're seeing today—creating new growth opportunities for the industry. As no surprise to those in the data center business, physical assets continue to grow in both size and technical intricacy as operators look to drive both cost efficiency and usage optimization in facilities, as well as connect (and quickly) to the continually growing web of the internet. **Through 2018 and well into 2019 and beyond, we can expect to see significant resources, from both the operator and occupier sides, to be dedicated to innovations** ranging from efficient cooling systems and servers up to optimized IT functionality and load adjustment. This uptick in IT and hardware innovation spend will play out across the global M&A stage for the next several years to come, as key players continually strive to be ahead of the game.

Top 2017 M&A:

1. Digital Realty acquired DuPont Fabros — *$7.6 B*
2. Equinix purchased Verizon's mega data center portfolio — *$3.3 B*
3. Cyxtera acquired CenturyLink's data centers — *$2.2 B*
4. Peak10 acquired ViaWest — *$1.7 B*
5. Digital Bridge acquired Vantage — *$1.0 B*
6. Carter Validus sold portfolio to Mapletree Investments — *$750 M*

2018 M&A pipeline already growing:

1. Iron Mountain to buy IO's North America business — *$1.3 B*
2. Equinix agrees to buy Metronode — *$800 M*
3. CyrusOne to buy Zenium — *$442 M*
4. Infomart Data Centers up for sale — *$?? B*

The year of *foreign interest*

2016 was the year of the cloud—with record-breaking amounts of capacity being taking down by any and all cloud providers, impacting nearly every major and secondary data center market in the U.S.

2017 was the year of international exploration—with companies and operators expanding beyond U.S. borders into major international markets, as evidenced by incredible upticks in absorption in London, Amsterdam, Sydney and others.

2018 will be the year of foreign interest—with international occupiers flocking to the U.S. to build a footprint catering to North American consumers and data center users. Expect a jump in interest and activity in both primary and secondary U.S. and Canadian data center markets as international corporations aim to reach the masses.

Keep an eye on China, the most populous country in the world with 1.3 billion citizens and a key player in the global data center industry. The country is expected to have a burgeoning data center business over the next four years, growing at an incredible 13 percent compound annual growth rate, according to Technavio. While industry heavy hitters in the country like Alibaba, Tencent, Baidu and GDS have all grown significantly within the country's borders—competing with the likes of U.S. powerhouses Microsoft, Google and AWS—we fully expect that growth to go international in the near future.

These, and many other rapidly expanding players from Japan, Australia, United Kingdom and others around the globe, are diversifying on product and pricing of existing U.S. companies today, albeit on a significantly smaller scale and playing field – for now. However the tightening regulation over online data in the world's second-largest economy gives local players a leg up and a protectionist environment where they can excel.

Several U.S. data center firms have already started getting ahead of the international trend curve, striking key partnerships for future opportunities and paving roads for potential acquisitions. CyrusOne + GDS. Equinix + Metronode. Apple + GCBD. Amazon + Beijing Sinnet Technology. Keep an eye out in 2018 for continued progress and dynamic changes on the international front.

Data Center REITS *in review*

Our glimpse into Data Center REITs' performance and real estate strategy

Over the past several years, the data center industry has grown rapidly and proven to be incredibly dynamic as our need for data and its uses across many spectrums have multiplied exponentially. Alongside that growth, data center focused real estate investment trusts (REITs) have become major players in the field, facilitating the physical growth of the industry and reaping the rewards that come from being a frontrunner in innovation. Earlier this year we released our 2018 Global Data Center Outlook, looking at the state of the data center industry through 2017, 2018 and beyond. This piece serves as an addendum to the full report where we dissect and understand the interworkings and real estate strategies of the five key publically traded data center REIT players – CyrusOne, Coresite, Digital Realty, QTS and Equinix.

Annual stock price changes in property specific REITs

	2015	2016	2017
Data Centers	1.4%	22.8%	25.2%
Industrial	-1.3%	26.1%	17.0%
Residential	13.6 %	2.4%	3.4%
Office	-2.6%	9.7%	2.2%
Retail	0.9%	-2.7%	-9.1%

Source: NAREIT

Data centers have entered the limelight in recent years on both the stock investment and physical real estate fronts. What's lesser known is that real estate investment trusts (REITs) have been a leader in the data center industry at large.

Why did data center operators and developers *become REITs?*

The short answer, very low cost of capital. The data center industry is a very capital intensive business, which is the highest barrier to entry, and therefore low cost of capital is an extreme advantage. Functioning as a REIT, operators must distribute at least 90% of their taxable income to shareholders in the form of dividends, and the REIT is therefore able to deduct dividends paid to shareholders from its taxable income, which is a massive benefit. These core data center REITs are high yield, and generally secured by stable rents from long-term leases, further compounding the benefits of operating as a REIT versus a standalone developer.

Why do companies choose data center REITs?

Data center REITs can attribute much of their success to the economies of scale, expandability, and geographic reach they provide, factors that smaller local or regional players can't match. For mid to large sized companies, who would need over a year to bring new data center builds online, the ability to outsource capacity to REITs is highly attractive. Using REITs allows companies to adapt their operations with the flick of a switch, and receive a highly redundant product, in a short time-frame, at an unmatched cost.

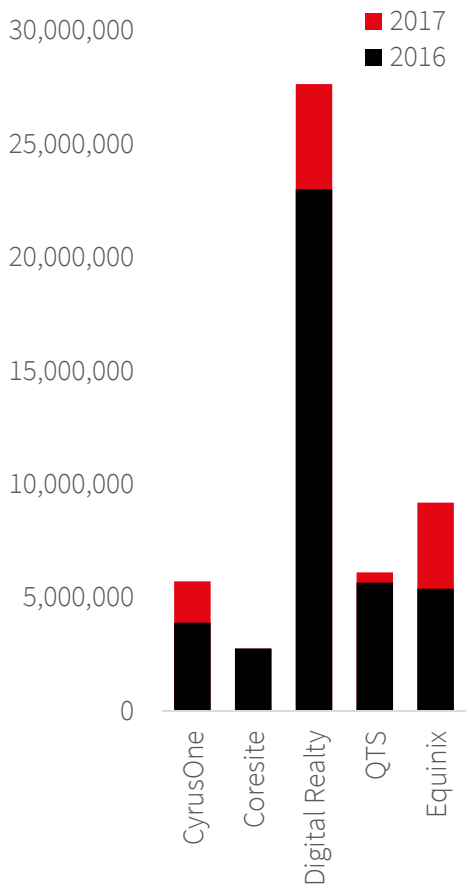
What can we expect from the data centers in coming years?

The need for data centers is here to stay for the foreseeable future. Data creation, demand for content, and internet traffic is expected to increase by 20 percent or more per year for the next four years, according to Cisco – directly fueling exceptional growth for servers, networks, the cloud and data center facilities.

How do non-REIT operators fit in?

The multi-tenant data center industry remains highly fragmented (with nearly 1,500 MTDC vendors globally, per Credit Suisse), creating an interesting dynamic for the entire field. The five REITs maintain just over 35% of global market share, successfully offering economies of scale and ease of expandability for clients. These same players have seen that market share grow rapidly in the past ten years, ramping up from 53 owned and operated data center facilities in 2006, to 230 facilities ten years later, per NAREIT data. Yet many smaller players (each holding 2% of market or less) make up nearly 46% of global market share, and offer competitive options for a variety of users and needs.

Global Gross Leaseable Area
(2016 vs. 2017)



**A note about Switch (SWCH): Switch, the freshest publically traded data center player, not a REIT, entered the public markets in October 2017 so historic and annual data is not available for the company at this time.*

REIT fundamentals

Many financial data points and indicators can be evaluated for data center REITs, to provide a high level comparison we've selected only the essential fundamentals. Here, we present and compare stock prices, real estate holdings, total income and market valuations for the top data center REITs.

Stock fundamentals	CyrusOne (CONE)	Coresite (CORE)	Digital Realty (DLR)	QTS (QTS)	Equinix (EQIX)
Stock price (as of March 31, 2018)	$51.21	$100.26	$105.38	$36.22	$418.14
1 Year Change	0.3%	12.9%	-0.1%	-25.1%	5.3%
3 Year Change	57.6%	104.9%	57.8%	-1.6%	79.6%
Real Estate fundamentals					
2017 Global gross leasable area (m.s.f.)	5.7	2.8	27.7	6.1	9.2
1 Year % Change	46.4%	0.1%	20.2%	8.1%	70.4%
Lease expirations (by % of revenues)					
2017	20.7%	34.3%	14.9%	35.8%	*
2018	13.0%	20.1%	18.0%	21.1%	*
2019	10.0%	16.6%	13.0%	14.2%	*
2020+	56.2%	29.0%	54.1%	29.0%	*
U.S. portfolio breakdown (by % of revenues)					
Northeast	13.0%	14.4%	14.4%	6.3%	14.4%
Southeast	14.0%	20.3%	31.6%	59.5%	20.3%
South Central	43.0%	0.0%	12.4%	12.0%	0.0%
Southwest	12.0%	27.1%	8.6%	3.0%	27.1%
Northwest	0.0%	30.9%	16.4%	5.3%	30.9%
Central	17.0%	7.3%	16.5%	2.2%	7.3%
Other	1.0%			11.7%**	
Income fundamentals					
Funds from operations (FFO) ($M)	$202.9	$224.3	$ 1,011.3	$125.0	$992.4
FFO per Share	$2.10	$4.67	$4.92	$2.45	$12.53
Net asset value (per share)	$55	$109	$109	$51	$407
Premium / discount to NAV (%)	-6.09%	-7.98%	-3.32%	-29.51%	2.65%

Source: JLL Research, Public Filings, S&P Global Market Intelligence
**Equinix (EQIX) does not publish lease expiration dates for their portfolio.*
***QTS does not geographically break out 11.7% of their geographic revenues, assets in the 'other' pool are located throughout the U.S.*

Key*highlights*

1.

REITs continue to grow their real estate footprints by leaps and bounds

- REIT owned gross leasable area (GLA) totaled 51.5 million square feet in 2017, an increase of 26% in 12 months. Equinix grew the most (+70%) via their acquisition of Verizon's data center portfolio, while CoreSite's square footage remained unchanged (+0.1%).

2.

Data center REITs saw sky high stock growth in 2015 and 2016 (significantly outperforming the overall stock market), but the upswing drastically slowed in 2017

- Data center stocks grew by 68% over the last 3 years (nearly three times the 27% growth of the S&P 500), but only +2.5% over the last 12 months. CoreSite was the front runner on both 1 Year (+12.9%) and 3 Year (+104.9%) gains.

3.

Digital Realty (DLR) and DuPont Fabros (DFT) 2017 merger creates an industry behemoth

- Digital Realty's 27.7 m.s.f. footprint is three times the size of Equinix's 9.2 m.s.f. holdings, but only generates 1.9% more funds from operations (FFO).

4.

QTS fundamentals depict painful last few months after 5 month stock slide, and 1 day, 22.7% drop in February 2018

- Funds from Operations (FFO) per share ($2.45/share) remains low compared to the field, and other fundamentals such as 29.5% discount to NAV and FFO per share price (6.8%) appear boosted due to significant stock price drop.

5.

While data center industry growth continues at a steady clip, REITs' stock prices remain discounted based on total value of held assets

- Net Asset Values for the 5 data center REITs, totaling $68 billion in holdings, are at a 2.1% discount based on stock prices today – depicting an underdog image for the industry.

REITs and their real estate *moves*

Let's take a step back from the financials and look at how the REITs are making moves on the ground. Here are the top trends affecting the physical footprints of the top data center players today.

Going on a land buying spree, planning for future growth

Data center REITs are continuing to snap up land across the globe, building land banks in national and international markets. REITs are targeting areas where they aim to expand, as well where they already have an existing presence, positioning themselves for hyperscale demand.

Doubling down on hyperscale

All of the big 5 data center REITs have made it clear that hyperscale is a top priority. With CyrusOne leading the hyperscale race, other REITs have made large strategic moves to keep in the game. Digital Realty's acquisition of Dupont Fabros and QTS dropping their cloud product offering in favor of cloud hosting are both clear examples.

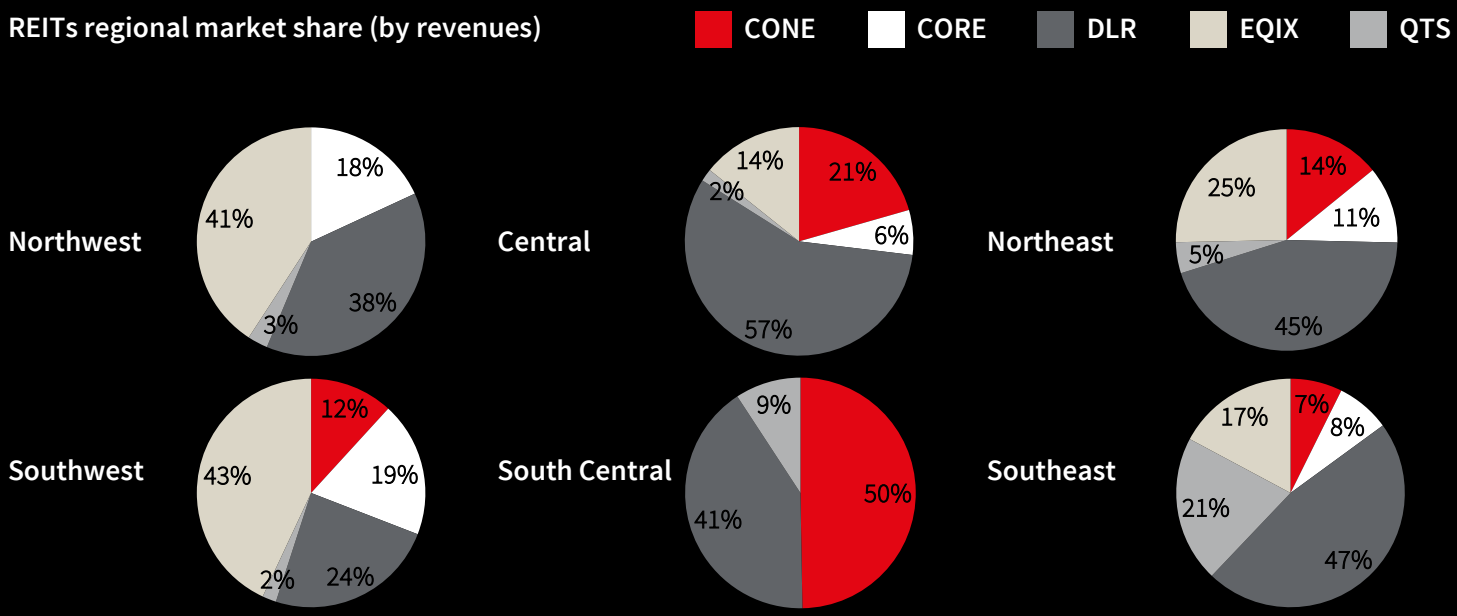
Setting their sights overseas

In an aim to cater to their increasingly globalizing client bases, REITs are dedicating significant cash to growing internationally. Prime avenues include the purchase of existing assets, strategic acquisitions, and leasing of large swaths of capacity. Equinix and Digital Realty lead the international pack, followed closely by Cyrus One, with CoreSite and QTS well behind.

2017 all over again, growth via acquisition

The top REIT players continue to favor acquisitions as prime vehicles of expansion. Equinix has the most funds at play, currently with $1.05B of pending purchases, all international. CyrusOne and Digital Realty, are tied for second place, leveraging both acquisitions and international partnerships. CoreSite and QTS lag behind, but there's still plenty of time in 2018 to catch up.

REITs regional market share (by revenues)



Close-up on

local markets

In this 2017 year-in-review report, we share glimpses into the story of each local market within the U.S., Canada, Europe and Asia Pacific. For full local market year-end updates including key market drivers, absorption and inventory statistics, 2018 outlook and expectations, and more, please reach out to our relevant local market by clicking the email link or via our list of experts at the end of this report.

2017

Year-end local profiles include:

Supply drivers and statistics
Key supply drivers, inventory, vacancy and under-construction statistics.

Demand drivers and statistics
Leasing demand by industry, net absorption, rental and power rates, and significant local data center transactions.

Hyper-localized 2018 outlook and expectations
2018 expectations for both users and providers, as well as local user/provider leverage.

United States

Atlanta

12.5 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Atlanta has attracted several colocation operators throughout 2017, who entered the market via enterprise data center acquisitions. • Existing operators continued expansion in 2H17 fueling the downtown market. • Demand in the Atlanta market remained active throughout 2H17, continuing to be driven by large users, financial tech and other technology firms.	• New operators will continue to scout the Atlanta marketplace for entry opportunities. • Large-enterprise data center owners further consider options to monetize assets. • Several new colocation options will come to market over the next 24 months.

Austin & San Antonio

21.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Demand in the Austin market remains moderate, as it continues to be an attractive disaster recovery market to support other Texas locations and West Coast tech companies. • San Antonio saw in H1 incredible demand from continued expansion by Microsoft, both self-performed and in take-down of wholesale colocation space. • Supply in Austin is relatively stable and being steadily absorbed.	• Rental rates remain attractive in the market heading into 2018, to compete with other Texas and national markets. • Austin and San Antonio will continue to offer an easy cloud exchange platform for customers as access to cloud service providers in the area becomes easier with Microsoft's increased footprint.

Boston

4.2 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• "Edge" services kept Boston market stable through 2017, while the market continues to see steady growth from major content and service providers. • Demand in the Boston market remained relatively flat due to high power and space costs, although the market did see a substantial power cost reduction over the last 24 months.	• In 2018, local companies and connectivity will drive growth of colocation while demanding increased cloud access. • Continuation of "edge" services growth will drive demand for Boston for next several quarters. • Second-generation space coming back on market from Digital Realty and Cyxtera will likely drive down pricing.

Chicago

44.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Robust leasing activity continues in Chicago with new colocation developments expected. • 2017 saw massive cloud demand due to large Apple and Google deployments across the market. Leasing has seen the strongest activity to date—overall deal counts nearly doubling. • Supply in Chicago has become increasingly tight, with readily available capacity for 1 MW+ deployments being limited.	• Chicago will see a surge of inventory in the market to fill gaps of availability over the next 24 months at existing providers. Forecasted demand continues to be strong. • Cloud, enterprise and technology continue to be driving forces, as lower power rates continue to provide attractive options.

United States

local markets

Dallas / Fort Worth

43.0 MW *2017 year-end absorption*

2017 Happenings

- New supply in Dallas / Fort Worth experienced healthy absorption in 2017, as the market continued to ramp up in reaction to Q4 '16 and Q1 '17 demand.
- Dallas / Fort Worth had strong demand in 2017 from enterprise end-users associating their requirements with tech refreshes.
- Additionally, many providers expanded their offerings to include connectivity solutions to public and private cloud products, servicing the evolving needs and flexibility of enterprise users.

2018 Expectations

- New hybrid IT solutions will continue to grow in the market, and continued low power rates (4 cents/kWh) will provide attractive options for users considering the Dallas / Fort Worth market.
- A healthy uptick in supply in the market will continue to create a competitive pricing environment through 2018 and beyond.

Denver & Colorado Springs

6.0 MW *2017 year-end absorption*

2017 Happenings

- In 2017, Denver & Colorado Springs saw nearly double 2016 absorption—with Denver HQs looking for secondary and disaster-recovery sites.
- Additionally, over half of Denver's total data center presence changed hands in 2017 due to local, national and international M&As.
- Cloud deployments have been slow to enter the area, but 2017 was a year that was highly favorable to end users.

2018 Expectations

- Cloud deployments are expected to enter Denver in 2018 as cloud providers expand their geographic coverage and begin to cater to Denver's growing population and consumer demand.
- Many end users will continue to look for hybrid architectures with local cloud or extensions to hyperscale providers.

Houston

2.5 MW *2017 year-end absorption*

2017 Happenings

- 2017 absorption slowed over 2016 stats in Houston as the struggling oil and gas industry becomes a reality. However, an uptick in healthcare activity has given the market a light boost.
- Demand in the Houston market has diversified slightly from the previously dominant energy sector to include larger stakes of healthcare, telecom and technology services industries.
- Amid Hurricane Harvey, all data center facilities proved resilient in the hurricane and weathered the storm as designed, with no direct impact.

2018 Expectations

- All-time-low rental rates continue into the new year as the market recovers from the storms and energy sector drawback.
- Heading into 2018, revenue and capacity portability will become a more robust offering and additional flexibility will be available in contracts.

Las Vegas & Reno

22.0 MW *2017 year-end absorption*

2017 Happenings

- Growing supply made waves in the Vegas & Reno market in 2017. Switch, a Vegas-based firm which went to IPO in 2017, and Peak 10 are large contributors to the nearly 40 MW currently under construction.
- The growing supply enticed large-volume users to the market in 2017, spurred by renewable energy options, hyperscalability and economies of scale.

2018 Expectations

- The uptick in new supply in the market will continue to impact absorption in a positive light and will draw more large-scale deployments and expansions into the market as capacity grows.
- Interest in retail pricing models will continue to remain strong into 2018.
- Las Vegas will continue to be a major network hub appealing to the media and entertainment industry.

United States

Los Angeles

6.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Strong year for LA as recent large transactions narrowed available options in the market. • Cloud users continued to expand their presence in the market to keep up with the demand.	• Blue-chip companies, proximity plays and cloud providers will continue to drive demand in market to solve local market latency and connectivity needs. • Providers are continuing to aggressively compete for customers and are increasing their service offerings to win deals.

New Jersey

4.5 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• The New Jersey market saw a small uptick in demand in 2017 as local tri-state enterprises adopted hybrid cloud models—driven by operational and cost efficiency and close proximity to HQ operations. • New supply remained relatively flat through the year, as large operators increasingly leased-out turnkey supply. • Crypto-currency users have surfaced but remain minimal.	• Enterprises in the New Jersey market will continue to look for additional services and migration support for public cloud migrations, as the overall market trends toward the enterprise-to-hybrid-cloud model. • New Jersey's abundant supply of shell space positions the market well for hyperscalers and large users entering the market. • Large M&A activity will have a continued direct impact on the market.

New York City

1.1 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• NYC saw small increments of growth from buildings, wireless, smart city and IoT initiatives. • Supply in NYC has been retail focused, supporting tech- and network-centric industries aiming to be near carrier hotels and cloud access points. • Demand in market was showing small increments of growth, with retail colocation emerging in Long Island and Orangeburg, NY.	• Expect continued market interest from carrier, social media, content and media industries, with minimal wholesale deals in the near future. • User demand below three-year average; expect supply to be no longer added speculatively. • Sublease options will emerge as long-term tenants continue to consolidate.

Northern California

10.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Northern California indicators remained steady through 2017 as the stable market became increasingly more established heading into 2018. • Demand in the Northern California market remained tepid due to high power costs, higher rents and low vacancy relative to out-of-state markets. • While there was some new absorption in the latter half of 2017, expansion by existing customers drove the majority of market changes.	• 2018 slated to be another steady year for the Northern California market as tech and cloud companies continue to drive absorption and existing customers expand with the overall national trends. • New wholesale data center construction and delivery will increase in the new year due to landlords' belief that decreasing demand is partially a function of limited new product.

local markets

United States

Northern Virginia

115.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Northern Virginia hit a fourth consecutive year of historic demand and absorption, with 115 MW of net absorption in 2017. • Demand continued at a blistering pace across all industry sectors and kW spectrums. • National and international industry M&A expanded product service offerings, and existing colocation providers continue to expand local footprints with robust competitive offerings.	• Competition within the Northern Virginia market will intensify as new connectivity and power options, as well as colo providers' expanding footprints, take hold in the market through 2018. • Extension of network connectivity and available power infrastructure will continue to create comprehensive market opportunities for data center operators and CSPs to serve global enterprise requirements (SaaS, PaaS, Mobility, AI).

Phoenix

29.9 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Phoenix absorption hits an all-time high, up over 80 percent over 2016 levels, with no sign of slowing. • Strong 2017 demand was driven by an increase in cloud computing and software-as-a-service (SaaS) companies, organic growth for existing tenants and enterprise migrations. • Current supply significantly improved as Aligned Data Centers, CyrusOne and Digital Realty all completed large-scale builds.	• With the expected 2018 growth of cloud computing and the large-scale requirements that the cloud operators will inevitably provide, Phoenix is positioned well to appeal to this user group. • New blocks of space with density and tier options will be delivered to the market, as providers race to construct and commission space to capture cloud demand.

Pacific Northwest

19.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Demand bounced back significantly in the second half of 2017, as the Northwest settled from the impact of large-scale industry M&A. • Currently, all major markets in the Northwest have spec construction under way as higher vacancy rates, currently at 13 percent, are diminishing. • Large requirements were executed in multiple submarkets as major data center landlords underwent expansive mergers.	• Expect strong demand in wide power consumption ranges in 2018, with demand in Central Washington increasing as supply is delivered by operators. • Seattle will continue to quickly grow as the "Cloud City," with cloud departments nearby continuing to increase headcount.

Canada local markets

Toronto

5.0 MW *2017 year-end absorption*

2017 Happenings

- Demand in the Toronto market was in transition through 2017 as many of the retail requirements found solutions in the cloud and new supply continued to ramp.
- Enterprise users in the market continued to assess hybrid solutions with both retail and cloud-based solutions, across a rich variety of industries.
- Wholesale and enterprise requirements saw a reduction in deal activity, which has added pressure on many providers to adjust pricing.

2018 Expectations

- Significant supply is currently under construction in Toronto (64.0 MW). Expect supply deliveries to define 2018 fundamentals including leverage, pricing and deal terms.
- A few large financial services and telco requirements are expected to be finalized in 2018, which should serve to absorb some of the new supply coming online throughout the year and into 2019.

Western Canada

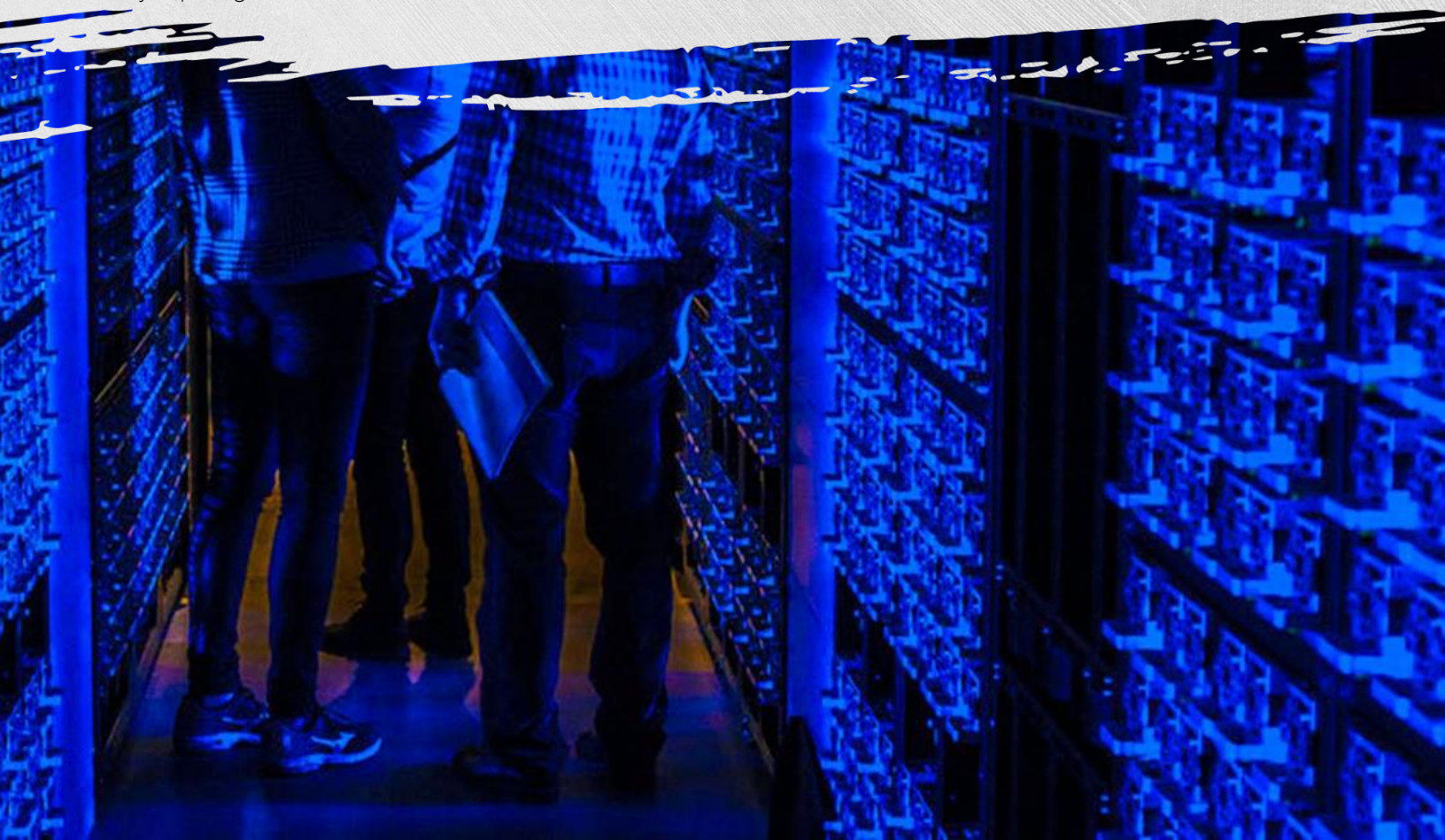
4.8 MW *2017 year-end absorption*

2017 Happenings

- Through 2017, vacancy rates remained in a low, healthy state in the Vancouver region, with net absorption and general growth remaining extremely low, as renewals and expansions were the primary transaction vehicles.
- On the other hand, several key transactions in Calgary during the year were a major contributor to both the market and Western Canada absorption.
- Supply in the market remained extremely limited with little new product considered for build.

2018 Expectations

- Western Canada remains an underserved market. Heading into 2018, Edmonton will continue to increase in both supply and demand. Expect interest to stay consistent until significant rent reductions and other concessions emerge. Also, expect expansions of existing hyperscale footprints.



Europe local markets

Amsterdam

43.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• 2017 presented a record year of takeup for Amsterdam, hitting 43 MW of absorption, bumping the market to the second largest in Europe, driven by hyperscalers drawing down on existing contracts in market. • Supply and demand in Amsterdam grew faster than other mainland European markets in 2017 as existing suppliers and new entrants continued expanding. Vacancy rates remained relatively low at 8.4 percent for the year.	• Heading into 2018, new providers will continue to enter the market as Amsterdam remains a popular first destination in Europe for international users, driving the market to second in size after London. • Expect enterprise, fintech and technology to continue being driving forces. New provider entrants will allow more choice and drive competition for users in 2018.

Dublin

10.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Demand in Dublin in 2017 was largely dominated by hyperscale demand, with 12+ MW of takeup at year-end. Dublin has surpassed Paris in terms of takeup for the first time, underlining the importance and growth of the market. • While Dublin remained the smallest of the European markets with 97 MW IT load, its rapid growth and large supply of self-built facilities by major technology companies make this an important European hub.	• As we enter 2018, demand from retail and smaller requirements remains relatively small. Expect to see further takeup in the city from tech companies over the coming 12 months. • The market will rapidly grow in size into 2019, as Amsterdam pivots from a traditionally tech self-built hub to an increasingly important center among its European peers.

Frankfurt

20.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Activity in Frankfurt during 2017 remained in line with long-term averages, with 20 MW of takeup occurring throughout the year. Unlike London or Amsterdam, the takeup was less dominated by hyperscale activity this year. • Supply in Frankfurt increased throughout the year, with most of the existing suppliers bringing new stock to market either in the form of further fit out of existing facilities or new buildings. Frankfurt continued to be a competitive market given the strength of the German economy and Frankfurt as a global financial hub.	• New space will continue to come to market in 2018, by both new entrants and existing providers—expect an increase in competition to follow suit. As this new supply continues we expect the existing vacancy rate of 6.6 percent to increase, easing supply constraints and allowing users more choice in the market. • Expect new providers to continue to evaluate methods to enter and expand within the Frankfurt market.

London

50.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• 2017 was a record year for absorption in London, hitting 50 MW (up from 45 MW in 2016), keeping vacancy rates at a low 4.8 percent. Demand in the market continued to be driven by hyperscale expansion and signing of new space, while smaller users continue to fuel organic growth. • In 2017, supply in the London market increased by approximately 38 MW, now with a total of 498 MW of total supply. Vacancy rates remained low with new schemes being provisioned to market, but space is often leased prior to completion of build.	• London will remain the most dominant of the European markets, currently with 38 percent market share. With two record years of takeup, the market has low availability rates, which are fueling higher pricing and placing pressure on new schemes to come to market. Expect this trend to play out into 2018 as continued demand drives a competitive market.

Europe local markets

Paris

10.0 MW *2017 year-end absorption*

2017 Happenings

- Through 2017, demand in the Paris market was weak in comparison to other European markets, with approximately 10 MW of absorption being recorded for the year.
- Paris experienced a relatively slow year in terms of new supply, with 16 MW of new stock coming to market, most of which was expansion to existing facilities. Vacancy rates remained reserved through the year, standing at 9.8 percent, showing a healthy balance between supply and demand in the market.

2018 Expectations

- The Paris market has yet to benefit from the wave of new hyperscale signings in Europe as many competing markets have seen during 2017, expect this to be rectified in 2018.
- Relatively low vacancy rates have kept pricing stable, though a wave of new absorption in 2018 could easily push vacancy rates low and force pricing up.
- Through 2018, Paris will continue to remain a competitive European choice, with low power rates and balanced vacancy providing attractive options for users.

Asia Pacific

local markets

Hong Kong

25.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Hong Kong has always seen strong demand from traditional colo and enterprise methods. However, the cloud era has begun to expose the Hong Kong market to a change in dynamic. Demand in Hong Kong in 2017 has been dominated by the large cloud and OTT providers. U.S. giants Google, AWS and Microsoft have all taken space in the city, with Chinese powerhouses Alibaba, Tencent and Baidu also strengthening their position.	• In 2018, the cloud will continue to grow in presence in Hong Kong. The market will increasingly need to cater to and create a balance of planned and available inventory as pressure comes at pace for capacity. • The enterprise market has been steady and will continue to be, and the emergence of fintech, banking, finance, insurance and other sectors will continue to drive steady demand alongside cloud products.

Singapore

20.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Demand took more of a traditional route in 2017 for the market, with the enterprise activity remaining steady and constant. Cloud and technology players remained active; however, transaction levels were below 2016 records. • Supply in Singapore has paused to take a breath in 2017, with only Keppel launching a new 18 MW facility. After the exploits of the previous 18 months, many of the major players in the market stabilized recently built sites before they venture into the next wave of supply.	• Microsoft and Google continue to develop self-owned product; however, expect some change in dynamics and more points of consolidation from the wider wholesale user market as the rest of Southeast Asia begins to spring to life. • The recent emergence of the Malaysian and Indonesian cloud markets could drive connectivity and changes in capacity needs in the city, so expect competitive commercial trends to remain intact as the competition for large deals continues.

Sydney

30.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Through 2017, Sydney and Melbourne saw steady cloud and technology activity responsible for the majority of the market activity. Enterprise demand through local SME activity and government outsourcing continued to grow the market. National broadband and other government-led initiatives have led to a greater need for digital transformation and connectivity than ever before. M&A activity and new provider entrances into the market continued to greatly impact the key players and their strategies.	• Heading into 2018, providers and users will need to adapt to a rapidly changing market, particularly in the wholesale environment. Unlocking new supply in key Sydney locations will be a priority for providers. • Enterprise, fintech and general technology will continue to be driving forces for the market. Key priorities will be focused around connectivity to the greater Australian continent as well as the growth of availability of hybrid environments.

Tokyo

10.0 MW *2017 year-end absorption*

2017 Happenings	2018 Expectations
• Demand from cloud and OTT players continued to drive activity and change the dynamics of the Tokyo market. The need for greater build sizes and more capacity drove operators and providers to balance the takeup of space with the availability of power. • With power and land constraints within the 23 Wards, operators were being pushed outward to areas such as Inzai to accommodate the hyperscale needs of the cloud and OTT giants. The mega joint venture between Digital Realty and Mitsubishi underlines this concept.	• Due to its heightened risk profile and relative isolation, the Tokyo market will always differ from its Hong Kong and Singapore neighbors for MNC corporate occupiers. A focus on improved build styles that can accommodate both retail and larger wholesale requirements will become commonplace through 2018. • Differing build types encouraging larger capacities means far higher densities can be achieved more regularly.

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About JLL Data Center Solutions

JLL's global Data Center Solutions team has delivered customized data center services and solutions to many of the world's largest corporations. With the expertise of having managed thousands of megawatts of critical facilities transactions, our team assists companies with total site selection (from greenfield to colocation to cloud) utilizing best in class due diligence, in-depth TCO analysis, risk and infrastructure assessments, project management services, migration consulting, contract and SLA negotiations, and budget consultation. Our Capital Markets group has deep experience in the data center industry from investment property sales to debt financing and our critical facilities management team manages hundreds of million square feet of critical environments. We understand the technical elements that are crucial to your facility in terms of power, cooling, connectivity, latency, utilities, redundancy, taxes, construction, public incentives and security. JLL's Data Center Solutions team will help you determine the best cloud, service and data center strategy to meet your business objectives.

About JLL Research

JLL's research team delivers intelligence, analysis and insight through market-leading reports and services that illuminate today's commercial real estate dynamics and identify tomorrow's challenges and opportunities. Our more than 400 global research professionals track and analyze economic and property trends and forecast future conditions in over 60 countries, producing unrivalled local and global perspectives. Our research and expertise, fueled by real-time information and innovative thinking around the world, creates a competitive advantage for our clients and drives successful strategies and optimal real estate decisions.

JLL

Data Center

North America | H1 2017

Shifting clouds, surging M&A

JLL Research

Contents

Trends

1 The cloud – now headed to global markets.

2016 saw incredible absorption **driven by cloud demand** – today large scale cloud providers are looking overseas to fill out their global footprint.

2 M&A heavy hitters continue… to the tune of $10 billion.

Several massive acquisitions and buyouts were announced within the industry in 2017 – setting pace for a record breaking year. We're halfway through and **already passing $10B**.

3 Absorption of data center capacity is normalizing – for now.

Coming off a wild year for leasing, the **first half of 2017 depicted reserved absorption** as users continued to work through capacity they picked up in 2016.

4 Data center users crave more power, deploy AI and go global.

Our panel of data center industry heavyweights sound off – telling us about their **growing need for data security** and artificial intelligence, and how it will affect their business going forward.

An insider's *scoop*

To get an insider's perspective on many of the hot topics in the data center market, we interviewed 3 data center user heavyweights to see how changes in the industry are affecting their company and what they expect to see in coming quarters.

Below are the 3 types of users we interviewed:

Technology and big data company with global reach

Worldwide online payment & transaction company

International online retailer and marketplace

Cyber security

How is cyber security affecting your data center strategy and implementation?

Tech & Big Data Company

"From a data center and security viewpoint, we've been deploying extra racks for all the new security appliances that continue to grow the network footprint. The additional security measures have been adding to build times for bringing new systems online. Capacity upgrades and planning have become even more challenging as the wait time now includes security devices in addition to circuit upgrades."

Transaction & Payment Company

"Security is a growing concern and top priority. When looking to expand our presence, we need to ensure business, regulatory and compliance needs are met. We are focused on having a consistent and standardized security posture across all data center locations, as well as proactive framework-level security controls and automated security operations (e.g. patching, vulnerability scanning, product/app testing). We also continue to conduct regular physical and logical vulnerabilities and penetration testing."

Online Retailer

"Changes in cyber security haven't had a major effect on our business yet. Security has always been a top focus and must be ubiquitous no matter the location or infrastructure sourcing."

Cloud

How are you using the cloud today (public vs. private) and will you increase, decrease, or maintain similar usage over the next 24 months?

Tech & Big Data Company

"We use public cloud for locations where we do not have direct managed data centers. In circumstances where applications need to be closer by region to the customer, cloud solutions are great – but for our large processing systems we are moving them to high performance computing (HPC) to reduce cost well below what cloud can offer."

Transaction & Payment Company

"We're using both public and private cloud applications today, but we will see an increase in approved use cases going to public cloud over the next 24 months. However, we anticipate a hybrid model being the sustained strategy over time."

Online Retailer

"We anticipate level cloud usage going forward into the next 24 months for our business. The primary focus will be on private cloud deployments with adaptability for public usage as needed."

Investment

Where are you spending and focusing your IT budget, today and how do you see that changing over the next 24 months?

Tech & Big Data Company

"Our investment is focused on HPC, data centers, automation, and security. Our next step will be to start to focus on moving virtual machines to non-SAN (storage area network) products. We will still have SAN arrays for databasing but it no longer is required for VM environments."

Transaction & Payment Company

"Our current IT budget today is focused on commodity based computing hardware. We believe that focus will continue as we work to standardize our hardware, and continually drive higher performance and reduce costs."

Online Retailer

"IT spending for us will be focused on a few core segments; primarily availability of deployments, security of data and infrastructure, focus on technical debt, and growth in our automation capabilities."

Predictions

What do you believe will be the most impactful changes in technology, relevant to your business, taking place over the next 24 months?

Tech & Big Data Company

"Major heat changes from newer processors will drive us to shutdown data centers that are not at least 200 watts per square foot."

Transaction & Payment Company

"The most impactful technology changes will come about from larger investments in artificial intelligence (AI). AI will help us reduce human intervention and significantly cut time to restore operations due to failures. Plus, AI will allow us to leverage a greater use of predictive analytics."

Online Retailer

"The changes in tech that will have the largest impact will be focused around AI, processor technologies and automation."

Halfway through 2017 – what *progress* has been made?

Absorption returned to normal levels after record leasing in 2016, M&A heavy hitters came in strong, cloud users remained a tour de force, and construction volumes heated up across the U.S.

Absorption statistics calmed down to sustainable levels in 2017 as cloud users took a breather on leasing and continued to work through the massive amounts of capacity they took on in 2016. U.S. markets absorbed a total of 182.1 MW from January through June this year, compared to 249.1 MW across the same timeframe in 2016. Canadian markets on the other hand, captured 34.7 MW of absorption in H1 2017, nearly 10 MW more than H1 2016, carried by sizeable upticks in Toronto and Montreal.

This also comes at a time where national cloud providers brought significant inventory online within the first half of the year, compared to absorbing availabilities in the market, putting a mild damper on absorption. On the other hand, pent up data center demand from Fortune 1000 companies and enterprise users who previously were unable to grab capacity due to low availability, are expected to lease up moderate to large chunks – driving additional absorption through the year. While the first half of 2017 may have been a bit more reserved than last year, we expect greater H1 to H2 consistency in terms of leasing in 2017 compared to 2016 which was heavily front loaded.

Across the board, revenue and growth is up for data center companies in a big way, both in the United States and globally. Data center stocks and REITs have continued to surge since January, gaining an average of 23.2% in price over the course of 2017, yet only 10.2% over the last 52 weeks, a bit of a slowdown from their upswing of nearly 50% in the first half of 2016. In 2016, however, data center REITs saw a sizeable 'correction' after Q2 earnings were released, losing nearly half of that 50% growth due to fear of overvaluation. 2017's Q2 earnings season is expected to be significantly more sensible due to the sustainable growth evident in prices within the first six months of 2017, compared to the rampant escalations in 2016. On the REIT front in H2 2017, expect continued market movement in response to breaking news stories surrounding additional acquisitions of assets and targets playing out amongst the Big 5 Data Center REITs (activity is nearly guaranteed), as well as continued news as we get closer to the Digital Realty and DuPont Fabros closing.

Under construction inventory in the data center sector increased, with the majority of markets depicting larger pipelines than the same time last year. Today, over 506 MW is under construction across North America, compared to just 353 MW a year ago – large pipeline increases in Northern Virginia (+57 MW YoY), Toronto (+41 MW YoY), and Dallas / Fort Worth (+31 MW YoY) depict booming markets looking to catch up to demand.

Biggest market surprises?

	Market	H1 2017 Absorption (MW)	H1 2016 Absorption (MW)	% Change
Primary				
	Northern Virginia	41	55	-25.5%
	Dallas / Fort Worth	27	18	+50.0%
	Northern California	3	58	-94.8%
Secondary				
	Atlanta	8	4	+100%
	Montréal	17	8	+116.3%

Northern Virginia:
Supply and demand fundamentals continue to drive Northern Virginia absorption heading through mid-year 2017. A shortage of available big block spaces has limited some hyperscale leasing options early in the year, but **new deliveries will begin to present fresh hyperscale options**. Providers continue to scramble to bring new inventory online as quickly as possible to capitalize on the low vacancy and pent up user demand in the market.

Dallas / Fort Worth:
While much of the U.S. saw significant movement on the cloud front in 2016, minimal cloud action played out in Dallas - until 2017. H1 2017 brought changes for the market, with **cloud providers officially setting up shop, spurring a 50% bump in absorption**. This added activity brought in by the cloud was on top of growing enterprise and industry verticals in the market – signaling meaningful growth across the first two quarters.

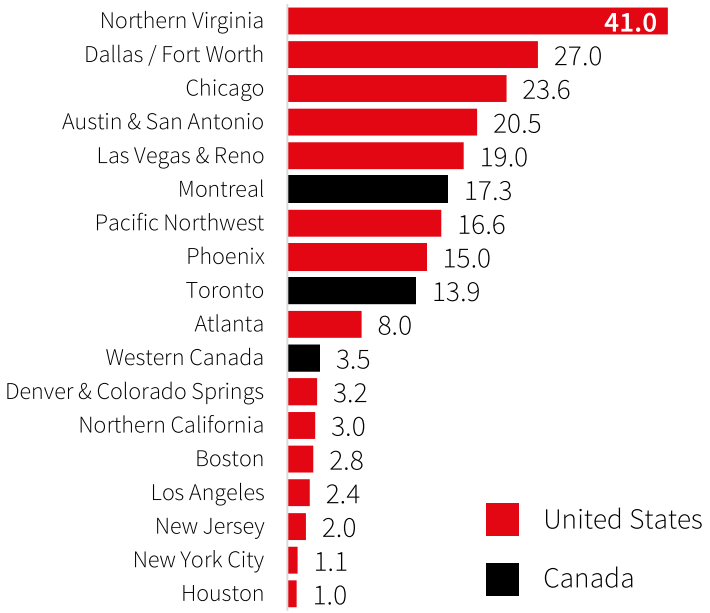
Northern California:
Northern California regressed to traditional market levels in the first half of 2017 after hyperscale providers drove incredible absorption in the region throughout 2016. **Barriers to entry remain high due to costs and land availability** in the mature market, which is just now seeing new inventory come online to ease single digit vacancy.

Atlanta:
Strong growth in Atlanta over the course of 2016 through 2017 was driven not just **by the continued success of tenured operators**, **but also by newer operators entering the market** and hitting their stride. Atlanta has historically been an underserved data center market, but operators and users are turning their sights toward the city to anchor their presence in the Southeast.

Montréal:

Following the raging storm of cloud activity in the U.S. in 2016, **the big name cloud providers swooped in to Montréal in the first half of 2017**, driven by optimal pricing, timing, and power rates in the Canadian market. Cloud activity on top of typical market deals drove absorption up significantly, more than twice H1 2016 levels.

North American net absorption
First Half (H1) 2017, Units = MW



The cloud is *shifting* to global markets

Building off incredible momentum from past quarters, cloud adoption continues to lead industry activity sucking up large swathes of available space in nearly every North American market, but has it hit its peak? Of the 18 major data center markets that we analyze in the U.S. and Canada, 11 of them are showing **30% or more of their user demand coming from the cloud**. At the top end, cloud users in Northern Virginia, Austin / San Antonio, and Chicago are pushing towards nearly three quarters of demand in the markets. Yet when we compare absorption stats from H1 and H2 2016 to today, some questions arise.

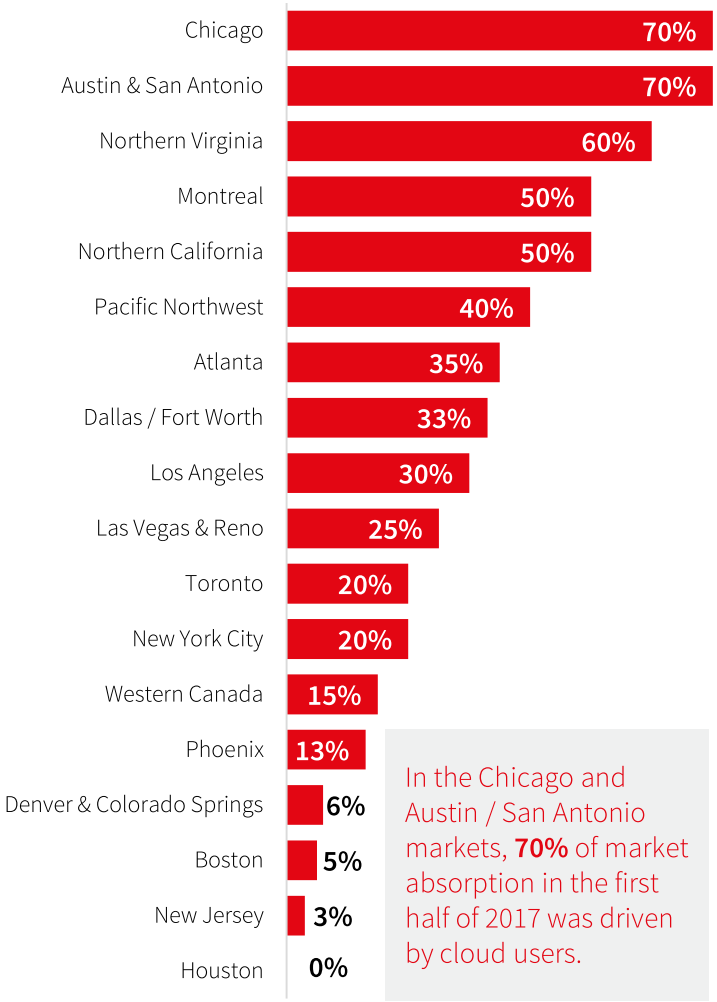
In 2016, the overwhelmingly predominate absorption driver in the data center sector was cloud focused – by a long shot. Microsoft Azure, Amazon Web Services (AWS), Oracle, SoftLayer, Google and others captured massive chunks of space across the country, leading to one of the hottest leasing years on record. 2016 racked up over 350 MW of absorption in the U.S. and 46 MW in Canada, setting high expectations for 2017.

Cloud providers continued to be the leading demand generator in the first half of 2017 – the activity they brought was noticeably lighter than 2016, depicted in cloud heavy markets like Northern Virginia and Chicago. This is by no means an omen, as businesses and users continue to flock towards cloud based products, but rather a sign that AWS and Microsoft Azure are still attempting to power through capacity they picked up in the 'Great Absorption of 2016'.

While cloud movement may have evened out in the first half of 2017 within the U.S., **international data center markets have seen a noticeable uptick in cloud leasing and activity as large cloud services set their sights on international soil**. This intercontinental movement is being spurred by two things; a continued increase in data sovereignty and data privacy policies, and large scale providers pushing towards a worldwide reach to better serve client demand. Data sovereignty remains a hot button topic for many international providers, as more and more government organizations continue to demand user data be stored within international borders, which is having profound impacts on not just Fortune 1000 companies, but also their go-to cloud services group, providers, and operators. Demand from enterprise and hybrid adopters of cloud capabilities are also spurring movement within AWS, Azure and others, **as the big players look to globalize their data center solutions**. International facilities also caught the eye of many medium and large scale colocation providers looking to keep up with the data center industry. Expect acquisitions of facilities and businesses in international Tier 1 markets to pick up in the second half of 2017 as industry leaders become increasingly more comfortable with foreign deals.

Cloud users demonstrate incredible activity in H1 2017

(Cloud as percentage of absorption in markets)



In the Chicago and Austin / San Antonio markets, **70%** of market absorption in the first half of 2017 was driven by cloud users.

M&A heavy hitters continue… to the tune of $10 billion

2016 was a strong year for acquisitions and mergers in the data center industry, with nearly $2 billion trading hands by year end. 2017 however, is on pace to top the charts in a massive way as providers continue to spend the big bucks. We're already set for a wild year, with over $10 billion spoken for in the last 6 months. This M&A activity comes at a time when the industry is headed towards larger, more efficient facilities which offer comprehensive and flexible product to users looking for a consistent global vendor.

Advanced facilities are offering:

- Bigger buildings and rooms providing flexibility for users
- Cutting edge technologies in cooling and energy efficiency
- Larger selection of services and amenities, catering to enterprises

M&A in H1 2017 also continued to highlight data center firms' aim to differentiate their offerings and services from competitors. Digital Realty is acquiring DuPont Fabros to expand their geographic service area. Manny Medina formed Cyxtera Technologies to capture security minded users. Both, prime examples of the providers becoming creative in the face of rising competition.

Mega mergers and acquisitions of H1 2017:

Digital Realty acquires DuPont Fabros

$7.6B

Cyxtera Technologies formed via BC Partners, Medina Capital, and CenturyLink assets

$2.8B

Peak 10 acquires ViaWest

$1.7B

Digital Bridge acquires Vantage

$1.0B

M&As have already made a large splash to kick off 2017, but don't let that fool you, the second half of the year promises to be just as vibrant. Consolidation is the name of the game within any industry, and even more so with data centers.

Expect large scale providers to continue on acquisition sprees as they look to broaden services they offer, enter new markets and move towards offering comprehensive, yet specialized products. Tenured large scale providers will move towards capacity plays, expanding their footprints through real estate based purchases. Also expect to see inspired M&As in the coming months driven by companies looking to compete (on a smaller scale) with AWS and Azure via acquisitions.

U.S. markets

Atlanta

New colocation operators land in the Atlanta market – making waves with acquisitions.

Market overview

Supply in Atlanta is increasing with two colocation operators, Ascent and Lincoln Rackhouse, entering the market. The firms acquired robust enterprise data centers further enhancing wholesale offerings. Digital Realty has also expanded their data center operations to 250 Williams Street solidifying their commitment to the downtown market. Meanwhile, QTS expanded its operations at Jefferson Street and has acquired the adjacent site for additional expansion. DataSite continues to expand power and cooling in their Marietta location.

Demand in the Atlanta market is active—strength primarily being driven by large kW enterprise users seeking a cloud options and range of services. Smaller users continue to fuel organic growth in the market as they decide to outsource their data center needs.

Market trends - Atlanta has historically been an underserved market, but operators and users are turning their sights toward the city to anchor their presence in the Southeast, and will continue to break into the marketplace through acquisition and new builds.

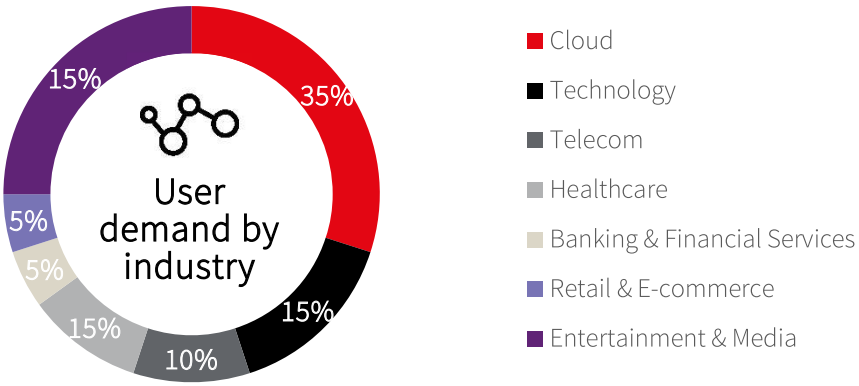
Outlook

for **Users**

- Enterprise, financial tech, and technology continue to be driving forces.
- Low power rates continue to provide attractive options for users
- Several new blocks of space have opened up options for users.

for **Providers**

- 10 MW+ has been delivered to the wholesale market in the first half of 2017.
- New providers are continuing to evaluate ways to enter the Atlanta market.
- Enterprise data centers continue to trade in the marketplace.



Supply

Total inventory: 1.73 m.s.f. / 207 MW
Total vacant: 209,000 s.f. / 33 MW
Under construction: 20,000 s.f. / 3 MW
Planned: 100,000 s.f. / 12 MW

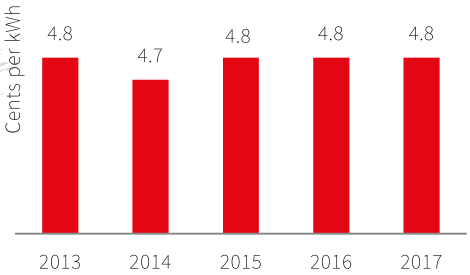
Demand

Net absorption: 8 MW

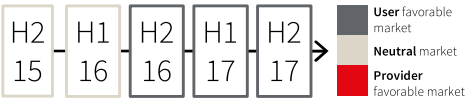
Rental rates

< 250 kW: $225 - $325/kW (all in)
> 250 kW: $130 - $155/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Transport-ation Tenant
T5
1.5 MW

Technology
zColo
1 MW

Digital Realty (Lease)
250 Williams St.
3 MW

Austin & San Antonio

Austin & San Antonio see hopeful enterprise growth stemming from cloud concentration

Market overview

Supply in Austin remains reasonably stable. DataFoundry continues to build TX2, and Vxchnge is under construction on a 2 MW expansion of the former Sungard facility. CyrusOne, Digital Realty, DataFoundry and Vxchnge all have available turn-key inventory to support the market. Stream and CyrusOne both have turn-key product available in San Antonio.

Demand in the Austin market has remained steady, despite higher electricity costs compared to other Texas markets even as West coast technology companies continue to show an interest in the market. San Antonio has seen incredible demand from continued expansion by Microsoft, both self-developed and in take-down of colocation space. Generally, San Antonio providers service the market through rack and cabinet solutions.

Market trends are pointing to a potential increase in demand as Microsoft continues to grow its presence in the San Antonio marketplace. Quick local access to the cloud service providers (CSP) will drive data center providers to the area to support Microsoft.

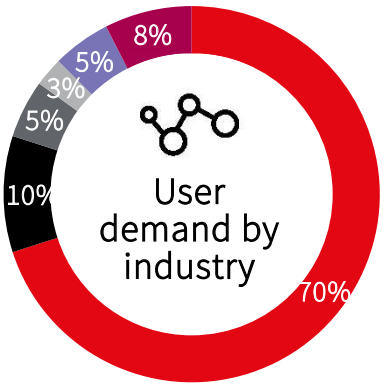
Outlook

for **Users**

- Low rental rates will be available due to market conditions and speculative supply
- Access to CSP's in the area has been, and will continue to become easier
- New offerings will come to market as new product is brought on-line

for **Providers**

- Will continue to provide an easy cloud exchange platform for customers
- Flexible lease terms for service providers can be expected
- Incentives will be provided to offset high electricity costs



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Government

Supply

Total inventory: 526,000 .s.f. / 94.5 MW
Total vacant: 56,000 s.f. / 9.7 MW
Under construction: 7,000 s.f. / 2 MW
Planned: 416,000 s.f. / 53 MW

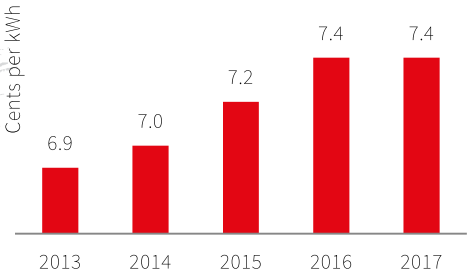
Demand

Net absorption YTD: 20.5 MW

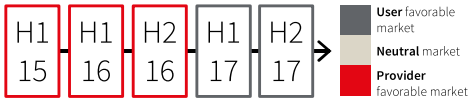
Rental rates

< 250 kW: $220 - $290/kW (all in)
> 250 kW: $110 - $130/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Microsoft
CyrusOne
San Antonio
18 MW

Tech Company
CyrusOne
Austin
1.2 MW

Tech Company
Digital Realty
Austin
943 kW

Boston

Connectivity continues to drive demand in Boston

Market overview

Supply continues to be driven by Markley Group, Digital Realty, Coresite, Cyxtera and, increasingly, Tierpoint. Markley brought new product on line both at One Summer and their newer location in Lowell. Coresite continues to expand 70 Innerbelt for several existing customers. Supply balance was helped by Digital Realty's decision to turn down 200 Quannapowitt, and SunGard's exit as a colo provider from 109 Brookline Avenue.

Demand in the Boston market remains relatively flat due to high power and space costs, although we did see a substantial power cost reduction over the last 24 months. We also continue to see steady growth from major content and service providers aiming to enhance their edge services.

Market trends are fairly consistent with other second tier markets with local companies and connectivity driving growth of colocation while demanding increased cloud access.

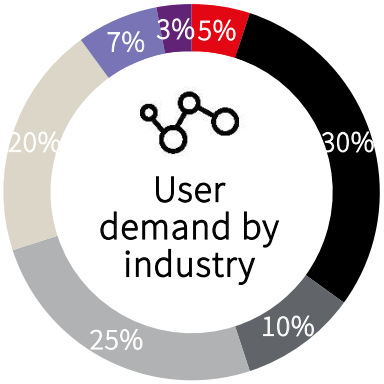
Outlook

for **Users**

- Variety new blocks of space available at Markley, and Tierpoint, as well as expected space at Coresite and Cyxtera.
- Power pricing will continue to decline, with largest impact on high efficiency facilities.
- Mass-IX and others developing robust cloud connectivity solutions.

for **Providers**

- Energy savings programs providing substantial incentives from utility providers.
- High barriers of entry for competitors/new development.
- Strong institutional investor interest in Telecom properties in Boston.



- Cloud
- Technology
- Telecom
- Healthcare & Life Sciences
- Banking & Financial Services
- Education
- Entertainment & Media

Supply

Total inventory: 1.2 m.s.f. / 160 MW
Total vacant: 140,000 s.f. / 16 MW
Under construction: 60,000 s.f. / 6 MW
Planned: 60,000 s.f. / 8 MW

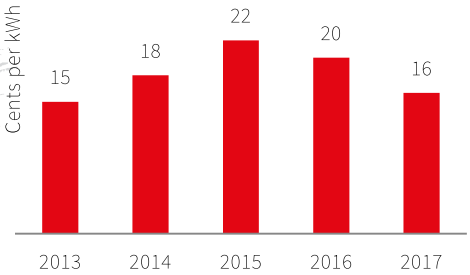
Demand

Net absorption: 2.8 MW

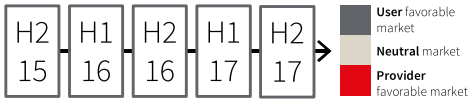
Rental rates

< 250 kW: $275 - $775/kW (all in)
> 250 kW: $115 - $200/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Service Provider
109 Brookline Ave.
2 MW

Hospital
Markley
250 kW

Service Provider
Markley
150 kW

Chicago

Hyperscale demand drives explosive growth in Chicago

Market overview

Supply is being developed at a rapid pace due to high hyperscale demand in the market. Digital Realty Trust, QTS, DuPont Fabros and CyrusOne are collectively driving the demand, building 44 MW of spec product, of which 17 MW is already leased. Several providers are also actively looking at new developments and long-term campus opportunities.

Demand in the Chicago market has never been stronger. To date, 27 MW has already been leased. Hyperscale deployments by Apple and Oracle is a large factor, however enterprise leasing is at its highest point in the past 5 years due to users taking action on outsourcing, cloud and colocation strategies.

Market trends We will see sustained cloud development in the market, as well as colocation providers fighting to accommodate enterprise users who will continue to outsource data center capabilities.

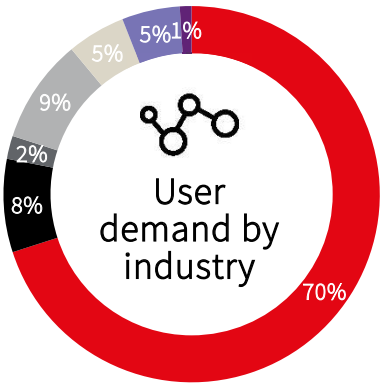
Outlook

for **Users**

- Several new blocks of space have opened up options for users, but planned cloud expansions and deployments will take down those blocks quickly.
- Cloud, financial, healthcare and F1000 continue to push the need for growth.
- Continued aggressive pricing, flexibility and options will benefit users.

for **Providers**

- Several providers looking at starting new developments or major expansions.
- Competitive pricing in the downtown and suburban markets.
- New contractual options emerging, including cloud portability and others.



- Cloud
- Financial
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 3.8 m.s.f. / 840 MW
Total vacant: 216,000 s.f. / 30 MW
Under construction: 20,000 s.f. / 56 MW
Planned: 400,000 s.f. / 45 MW

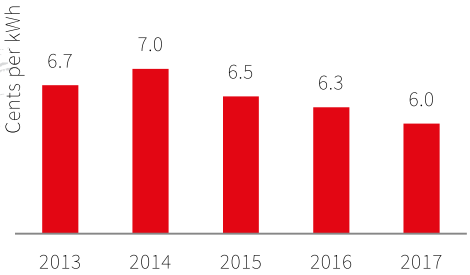
Demand

Net absorption: 23.6 MW

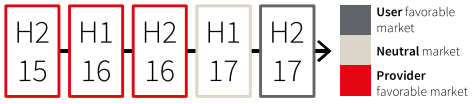
Rental rates

< 250 kW: $230 - $325/kW (all in)
> 250 kW: $135 - $145/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Two Sigma
Confidential location
2.2 MW

ICE
Digital Realty CH1
1.2 MW

Apple
DuPont CH3
14.5 MW

Dallas / Fort Worth

Significant cloud forms in Dallas / Fort Worth, while enterprise users shine through

Market overview

Supply in D/FW is growing to keep pace with demand, as new purpose built ground-up buildings are being delivered by providers such as RagingWire and Digital Realty. Additionally, QTS, Ascent, and CyrusOne have expansion plans underway in the area, as first half 2017 absorption has outpaced previous years.

Demand in the D/FW market has come from several industry verticals. Technology refreshes among Fortune 500 companies are driving an uptick in net new absorption in wholesale providers. Additionally, locally based IBM/Softlayer continues to take down large amounts of capacity to support their growing cloud platform. Buzz about multiple hyperscale cloud providers circling the market seem to be coming to fruition.

Market trends are pointing to higher density environments with technology refreshes. The constant job creation in North Texas has also fueled new requirements. Additionally, power costs in D/FW continue to be one of the lowest in top national markets.

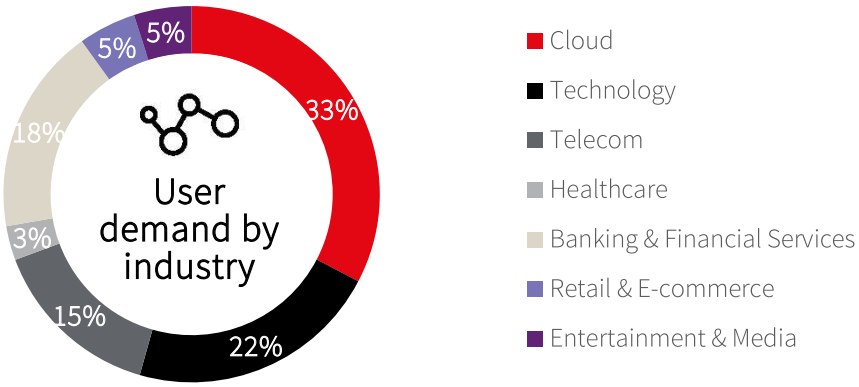
Outlook

for **Users**

- Low power costs will continue to be a game changer for the market.
- Revenue and capacity portability becoming an offering.
- Providers now offering cloud products with public cloud connectivity.

for **Providers**

- Offsetting migration costs is a key incentive for many users.
- Flexibility in terms of portability and cloud access is increasingly important.
- Offering an array of services has becoming critical to customers.
- Land prices have continued to increase in the market.



Supply

Total inventory: 3.42 m.s.f. / 458 MW
Total vacant: 396,000 s.f. / 56 MW
Under construction: 296,000 s.f. / 48 MW
Planned: 500,000 s.f. / 76 MW

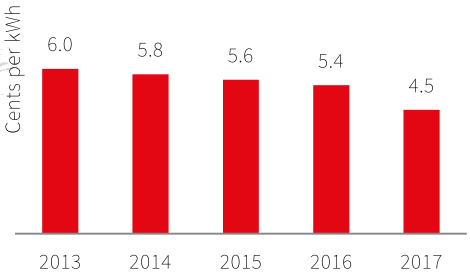
Demand

Net absorption YTD: 27 MW

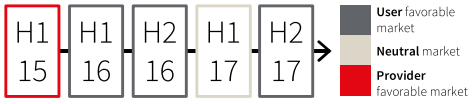
Rental rates

< 250 kW: $225 - $300/kW (all in)
> 250 kW: $115 - $130/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Travel Tech Company
Aligned D.C.
1 MW

Technology Company
RagingWire
1 MW

IBM/Softlayer
Digital Realty
4 MW

Denver & Colorado Springs

Edge technology strategies spur interest in Colorado

Market overview

Supply ViaWest Compark facility in Inglewood completed and commissioned 50,000 s.f. and 12 MW. EdgeConneX, known for content delivery solutions and applications, is expanding with a new facility to be delivered by year end. In Colorado Springs, Progressive Data Centers is marketing excess capacity to colocation customers.

Demand is being driven by Denver HQ companies and those who want secondary sites centrally located in low disaster zones. Industries such as technology solutions, data management and storage, software, education and healthcare, continue to represent the majority of demand in the market, coming from both local and national companies.

Market trends. We are seeing an increase in clients looking at hybrid architectures with local cloud, or extensions to hyperscale providers. Peak10's recent announcement of its acquisition of ViaWest will ensure continued expansion in the market.

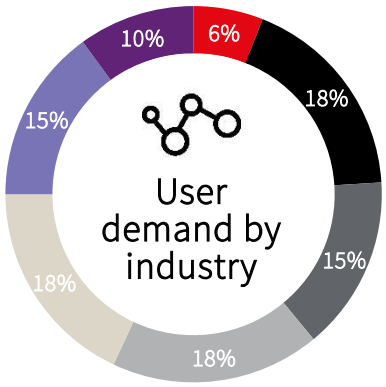
Outlook

for **Users**

- New blocks of space will continue to open up options for users to consider.
- Midway through 2017 continues to show favorably to end users.
- Several national operators not located in Denver, potentially expanding in to market.

for **Providers**

- With current and future demand strong, providers will continue to benefit by staying ahead of the curve with turnkey space and power availabilities for existing tenant expansions and new tenants entering the market.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Insurance
- Entertainment & Media

Supply

Total inventory: 750,001 s.f. / 128 MW
Total vacant: 213,979 s.f. / 28 MW
Under construction: 24,000 s.f. / 3 MW
Planned: 170,000 s.f. / 27 MW

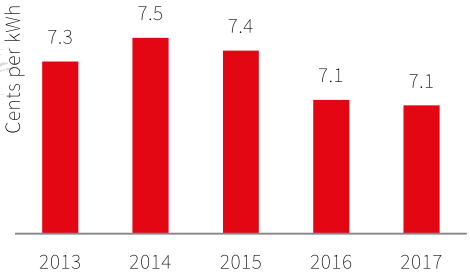
Demand

Net absorption: 3.2 MW

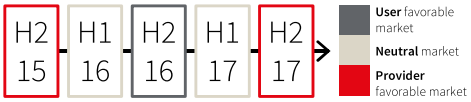
Rental rates

< 250 kW: $180-$250/kW
> 250 kW: $135-$160/kW

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Healthcare
ViaWest – Compark
600 kW

Technology
H5
350 kW

Advertising/ Media
FORTRUST
600 kW

Houston

Energy sector in Houston is looking for some fuel

Market overview

Supply in Houston has stalled along with the struggling oil and gas industry, and providers have paused on speculatively investing in and bringing new product on-line . The major providers have adequate capacity for current demand, with CyrusOne, Skybox, DataFoundry, Digital Realty, and many others having available turn-key inventory to support the market.

Demand in the Houston market has remained very low due to the oil and gas industry pulling back on budgets and capital intensive projects such as data center migrations and new technology investments. Healthcare has continued to increase outsourcing to wholesale colocation providers and we expect growth in to the foreseeable future.

Market trends are pointing to major industry verticals continuing to seek savings on current contracts. Flexibility in future contracts has become increasingly more critical in order to get budgeting approved for data center related projects.

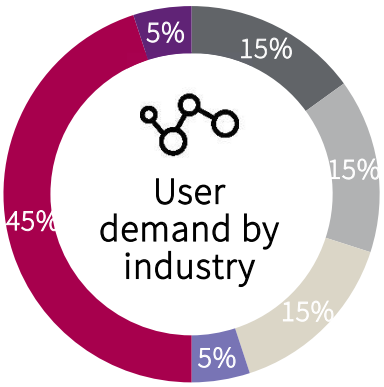
Outlook

for **Users**

- All-time low rental rates available due to market conditions and speculative supply.
- Revenue and capacity portability becoming an offering.
- More flexibility available in contracts, encouraging users.

for **Providers**

- Offsetting migration costs is a key incentive for many users.
- Immediate rent mitigation or cash savings is key.
- Flexibility in infrastructure design still critical to customers.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Energy
- Insurance

Supply

Total inventory: 935,000 .s.f. / 120 MW
Total vacant: 150,000 s.f. / 17.9 MW
Under construction: 9,000 s.f. / 1.5 MW
Planned: 634,000 s.f. / 78 MW

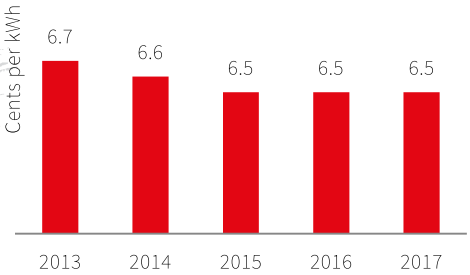
Demand

Net absorption YTD: 1 MW

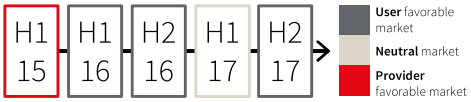
Rental rates

< 250 kW: $220 - $290/kW (all in)
> 250 kW: $95 - $120/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Oil & Gas
CyrusOne
300 kW

Retail
DataFoundry
20 kW

Investment Co
Digital Realty
400 kW

Las Vegas & Reno

Supply in Las Vegas & Reno surges, under construction pipeline grows

Market overview

Supply has surged in Las Vegas with the opening of Switch's Las Vegas 10 data center in May which added 340,000 s.f. and 40 MW of space. Switch will continue to grow and plans to deliver Las Vegas 11 by Q2 2018. ViaWest, to be acquired by Peak 10, continues to offer space in Las Vegas at its Lone Mountain data center. In Reno, supply consists of Switch's first building of 1.2 m.s.f. feet on its Citadel Campus which will eventually deliver roughly 7.2 m.s.f. of data center space.

Demand remains driven by California companies leaving the high costs and risk areas. However, drivers in demand also include volume users seeking to leverage economies of scale, competitive power pricing, and hybrid cloud architecture.

Market trends demonstrate a continued interest by retail clients looking for usage-based pricing models. Of its client base, Switch reports that nearly 40% are interested in small deployments that come with common retail services.

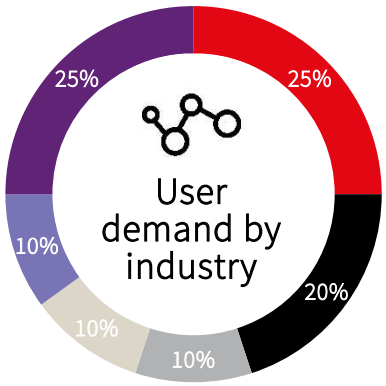
Outlook

for **Users**

- New multi-megawatt blocks of space have opened up expansion options for users.
- Tax incentive opportunity and special utility pricing for volume users can appeal to the large scale deployments.
- Market will continue to be a major hub for the media and entertainment industries.

for **Providers**

- A consistent rate of absorption promises regularity in demand.
- With only two major providers, Switch will continue to dominate the market.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 2.1 m.s.f. / 157 MW
Total vacant: 442,000 s.f. / 56 MW
Under construction: 340,000 s.f. / 40 MW
Planned: 300,000 s.f. / 40 MW

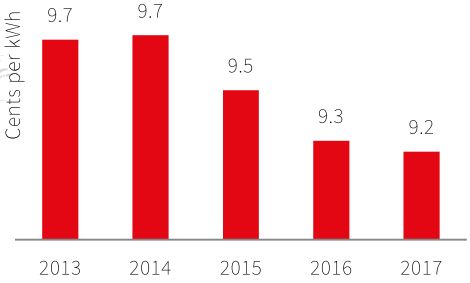
Demand

Net absorption: 19 MW

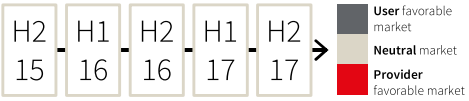
Rental rates

< 250 kW: $250 - $350/kW (+E, Retail)
> 250 kW: $135 - $180/kW (+E, Wholesale)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

National Retailer
ViaWest
Lone Mountain
250 kW

Healthcare
ViaWest
Lone Mountain
700 kW

E-Commerce
Switch
Las Vegas
1 MW

Los Angeles

Demand for faster and more reliable content delivery has sparked new interest in the LA market

Market overview

Supply is still primarily controlled by CoreSite, Digital Realty, Rising Realty, and Equinix. CoreSite has been the most active in the market at its 900 N. Alameda location, while One Wilshire remains well leased. The recent announcement of the 25,000 s.f., 2.5 MW Zayo deal polished off their vacancy. One Wilshire is adding power and cooling to keep up with the demand to be in the location for connectivity.

Demand in the LA market has begun to pick up as providers see the need to be closer to clients, we continue to see activity from small users and organic growth. Moreover, Chinese telecommunications companies and cloud users are beginning to expand their presence in the market.

Market trends are fairly consistent with the general California market, where blue-chip companies and proximity plays will continue to drive demand—as will cloud companies looking to solve local market latency and connectivity needs.

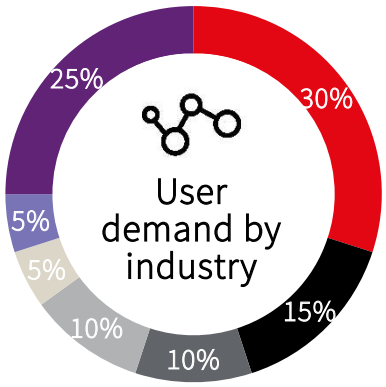
Outlook

for **Users**

- Several new large transactions have limited viable space options.
- Entertainment, media, and technology continue to be driving forces.
- Google's expansion in LA should spur interest in the market.

for **Providers**

- Providers are continuing to aggressively compete for tenants.
- Competitive pricing structures still exist for credit tenants.
- Providers are offering more services, upgrades and amenities to remain competitive.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 2.3 m.s.f. / 210 MW
Total vacant: 190,000 s.f. / 18 MW
Under construction: 20,000 s.f. / 15 MW
Planned: 30,000 s.f. / 6 MW

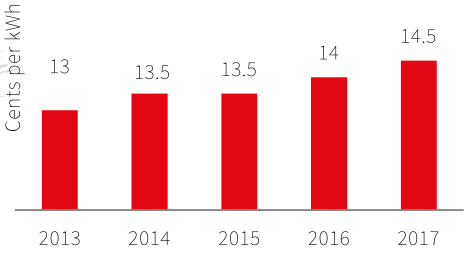
Demand

Net absorption: 2.4 MW

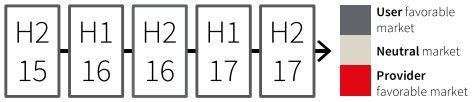
Rental rates

< 250 kW: $250 - $300/kW (all in)
> 250 kW: $90 - $130/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Google
CoreSite
1.5 MW

Zayo
One Wilshire
2.5 MW

Telcom
900 N Alameda
400 kW

New Jersey

New Jersey's data center activity – flat as the bottom of a cumulus cloud

Market overview

Supply remains limited in the market, based on today's current absorption rates, the addition of new supply has been reserved through the first half of 2017. Most owners, if not all, will only start new deployments of space (turnkey supply) when they are within a few megawatts of remaining capacity. The M&A activity continues to re-shape the competitive landscape.

Demand remains flat, and is still being led by the financial services industry. Most of the requirements are in the 100 kW – 500 kW range which has been relatively consistent for the past 24 months. Interestingly, the resurgence of business continuity or disaster recovery requirements have resurfaced in the market after what feels like a 10 year hiatus. Facilities with "seat space" combined with data space should prevail.

Market trends Electrical rates have been hovering at historic lows for New Jersey averaging approximately 8.5 cents per kWh, which isn't quite low enough to attract the hyper-cloud providers. 2017 is shaping up to be another year of consolidations among the major providers in the market, as we saw with CyrusOne's purchase of Sentinel – eliminating another competitor.

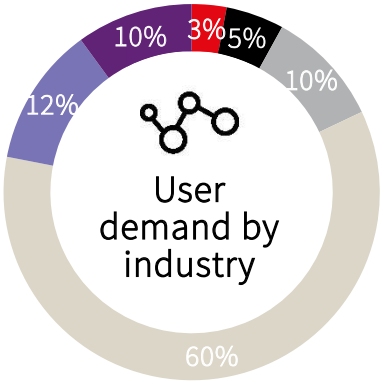
Outlook

for **Users**

- Consolidations will soon reduce the diversity of offerings.
- MW pricing has likely bottomed based on the lack of new providers.
- The cloud will continue to be a disrupter for tenants deciding their needs.

for **Providers**

- Providers are continuing to aggressively compete for tenants.
- Extremely aggressive pricing structures still exist for credit tenants.
- Still view this market as motive with a density of many world class companies.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 3.1 m.s.f. / 327 MW
Total vacant: 247,000 s.f. / 30 MW
Under construction: 20,000 s.f. / 3 MW
Planned: 826,000 s.f. / 116 MW

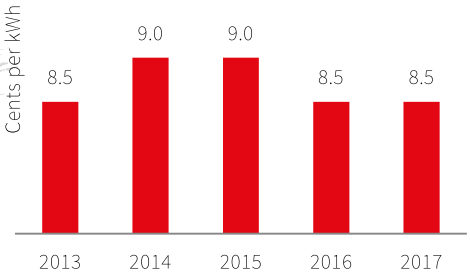
Demand

YTD Net absorption: 2.0 MW

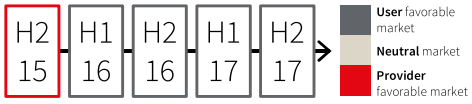
Rental rates

< 250 kW: $250 - $300/kW (all in)
> 250 kW: $125 - $250/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Financial Services
Equinix, Secaucus
300 kW

Confidential
800 Cottontail, Somerset
500 kW

Broadridge Telx / DLR
Clifton
640 kW

New York City

NYC's demand for smart buildings will drive carrier and colocation growth in the five boroughs

Market overview

Supply in NYC has been primarily retail focused to support the technology and network industries that aim to be near the carrier hotels and cloud access points. Retail supply interest sits with the national and global providers: CoreSite, Digital Realty, Telehouse, and Equinix. Hybrid providers such as Sabey, Datagryd and 1547 are positioned to capture portions of the retail and wholesale supply. Smaller local operators like Cologuard, NYI, Neutrality Properties and Vxchnge round out the supply outside of the core carrier hotel providers.

Demand in the market remains flat due to high power costs but there is continued retail activity from carrier, social media, content and media enterprises. Wholesale demand, on the other hand, has declined to a handful of strategic media and network deployments.

Market trends. Due to tepid demand, smaller and local players are feeling the pressure of developing excess shell space into office space. New Jersey having strong supply is contributing to the sub-average enterprise demand levels in NYC. NYC's demand for fiber to more buildings, IoT, and smart building initiatives will continue the carrier demand and growth for carrier hotel colocation in the five boroughs.

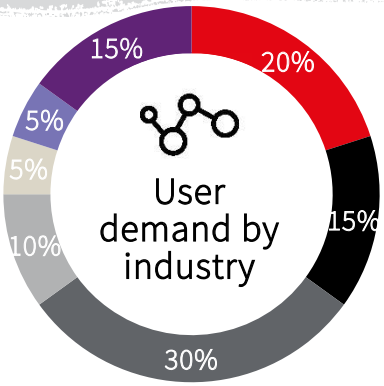
Outlook

for **Users**

- Demand is below the yearly average, with users preferring conditions in nearby markets.
- Supply will no longer be added speculatively.
- Pay-as-you go models will increase in popularity within the market.

for **Providers**

- Supply has leveled out and retail rental rates will continue to be stable.
- Wholesale rates are trending down slightly with open vacancies.
- Wholesale users can leverage these trends to negotiate favorable ramp terms and flexible expansion options.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 1.17 m.s.f. / 164 MW
Total vacant: 145,000 s.f. / 19 MW
Under construction: 42, 000 s.f. / 4 MW
Planned: 290,000 s.f. / 38 MW

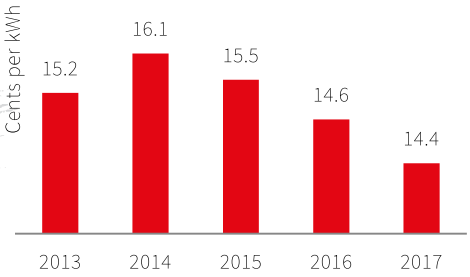
Demand

Net absorption: 1.1 MW

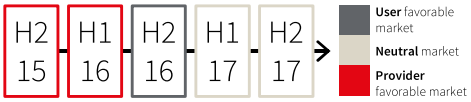
Rental rates

< 250 kW: $300 - $700/kW (+E)
> 250 kW: $250 - $500/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Technology
Digital Realty
1 MW

Social Media
Digital Realty
200 kW

Financial Services
32 Ave. of Americas
125 kW

Northern California

Northern California market continues to mature as fundamentals remain steady

Market overview

Supply is being driven primarily by large providers like CoreSite, Digital Realty and Equinix, with smaller providers rounding out the market. CoreSite has been the most active via its Santa Clara campus. Vantage, recently acquired by DigitalBridge, is aggressively expanding with 24 MW of development being delivered by end of 2018.

Demand in the market is aligned with historical absorption due to high power costs, higher rents, and lower vacancy relative to nearby markets. Chinese telecom companies and cloud users are searching for lease and acquisition opportunities and we expect this to increase as additional supply opens up, driving larger deals to finish out 2017.

Market trends. Northern California continues to maintain strong fundamentals as the market matures past other secondary and tertiary markets. Longstanding tech tenants and entrenched cloud providers continue to sustain the market. Retail providers also continue to leave the market due to the growing market share of nearby cloud operators.

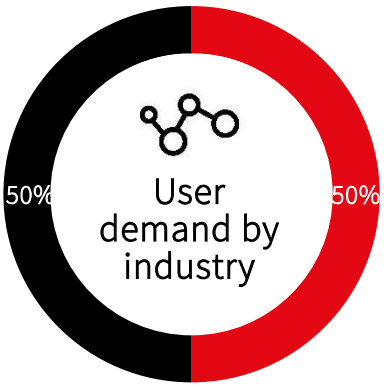
Outlook

for **Users**

- New blocks of space have opened up options for users as vacancy evens out.
- Technology continues to be a driving force.
- Cloud adoption relative to retail colocation will remain a viable alternative.

for **Providers**

- REIT Operators less willing to provide concessions due to lower vacancy.
- Construction and occupancy costs will continue to be driven down.
- Further consolidation and M&A will be pursued.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 4.6 m.s.f. / 424 MW
Total vacant: 167,000 s.f. / 23 MW
Under construction: 125,000 s.f. / 30 MW
Planned: 200,000 s.f. / 46 MW

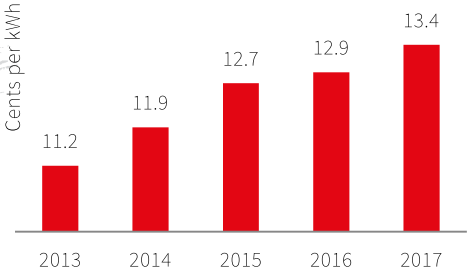
Demand

Net absorption: 3 MW

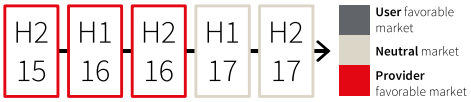
Rental rates

< 250 kW: $150 - $200/kW (+E)
> 250 kW: $125 - $150/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Digital Realty Acquires DuPont Fabros
San Francisco

Digital Bridge Acquires Vantage
Silicon Valley

Northern Virginia

Demand in Northern Virginia driving supply to keep pace with pent up demand from historic 2016

Market overview

Supply in Northern Virginia (NoVa) continues to grow at a historic clip, driven by its top tier status in the industry. With all six major data center REITs and the top five cloud providers actively developing in the market, and with 190 MW under construction, NoVa demand continues to drive supply. Providers are continuing to deliver larger and more flexible data centers for users, driving efficiency through scalability, speed, and cost.

Demand continues to be driven by new, tenured users and innovative developing technologies that desire to be in the market. Northern Virginia's diverse offerings, access to global markets, and fierce competition has created user favorable conditions. Cloud providers, social media, enterprise and tech users remain main demand drivers in NoVa.

Market trends Providers are continuing to be challenged to deliver more on-site services as a key differentiator beyond IaaS. Providers are also seeking cloud hosting to allow for more hybrid colo to cloud solutions to accommodate enterprise workloads.

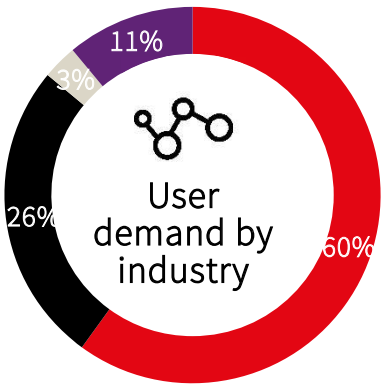
Outlook

for **Users**

- Cloud providers and hyperscale tech enterprises driving demand, offering greater benefits to enterprise users as competition escalates among providers.
- New provider options to extend services and intra-region marketplace.
- Further investment in AI, mobility, autonomous tech, healthcare, and M2M.

for **Providers**

- Expect dynamic pricing structures for diverse users and rapid IT deployments.
- Providers will attempt to capture market demand and continue to grow market share through rapid white space deployments and new quality land holdings.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Social Media

Supply

Total inventory: 12.6 m.s.f. / 853 MW
Total vacant: 492,696 s.f. / 91MW
Under construction: 862,157s.f. / 190 MW
Planned: 1.25 m.s.f. / 172 MW

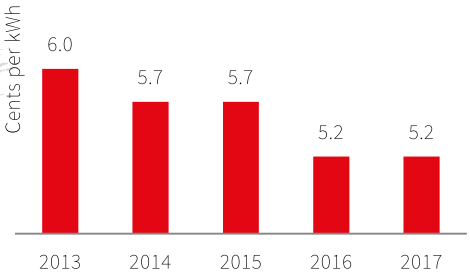
Demand

Net absorption: 41 MW

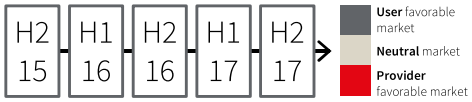
Rental rates

< 250 kW: $140 - $160/kW (+E)
> 250 kW: $100 - $130/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Cloud Firm
CyrusOne
10 MW

Technology Company
Digital Realty
4.8 MW

Cloud Firm
DuPont – ACC9
7.2 MW

Pacific Northwest

Large-scale national and global operators hedge their bets and enter key Northwest markets

Market overview

Supply in the Pacific Northwest remains steady but is expected to increase as Dupont (now Digital Realty) and OVH expand in Hillsboro. CyrusOne is also expanding in Quincy along with proposed expansions in Central Washington from Sabey and Digital Bridge.

Demand is solid in the market, though some of the large scale transactions of 2016 remain to be seen in 2017. In addition to West Coast based end users, the market is seeing Asian end user demand — primarily CDNs and web-retailers.

Market trends. We see increased M&A activity in the market, further changing the landscape considerably, as well as new players with committed resources now in the Northwest increasing demand. Major owner/user expansions in play with the hyperscale operators have also had a profound impact, and will continue to do so.

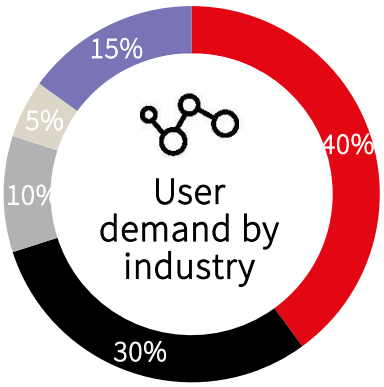
Outlook

for **Users**

- Continued new product coming online in 15 months.
- Ample existing opportunities to competitively analyze.
- Multiple new 'meet me rooms' underway, further enhancing telecom infrastructure.

for **Providers**

- End user demand from California is increasing.
- There will be continued interest from Asia as well as continued expansion from the hyperscale operators in the form of shorter term colocation contracts.
- New competitors will be delivering product by Q4 2018.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 3.9 m.s.f. / 350 MW
Total vacant: 530,000 s.f. / 54 MW
Under construction: 20,000 s.f. / 3 MW
Planned: 723,000 s.f. / 54 MW

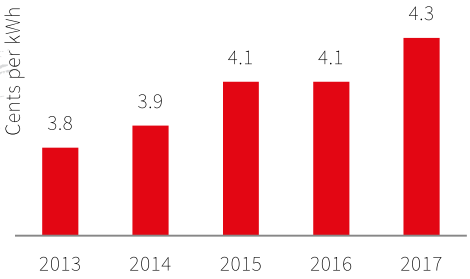
Demand

Net absorption: 16.6 MW

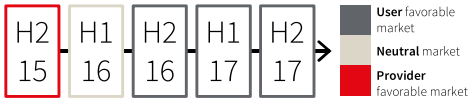
Rental rates

< 250 kW: $135 - $150/kW (+E)
> 250 kW: $115 - $145/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Cogent
32275 32nd Ave
Federal Way, WA
2.5 MW

Cloud Operator
Sabey Data Centers
750 kW

Submarine & Cable Tenant
ViaWest
180 kW

Phoenix

Interest heats up as cloud players enter Phoenix

Market overview

Supply shows signs of improvement as Aligned Data Centers commissioned space in its Phase I facility. CyrusOne also started construction on three more buildings at its Chandler campus. IO announced it will add 2 MW within its Phoenix location in 2017, and 3 MW of space will be available at Digital Realty's E Technology Circle in Q4 2017.

Demand has been driven by increase in cloud computing and software-as-a-service (SaaS) companies, organic growth for existing tenants and enterprise migrations transitioning infrastructure and software needs to private and public clouds.

Market trends With the continued growth of cloud computing and the large scale requirements that the cloud operators will inevitably provide, Phoenix is positioned well to appeal to this user group.

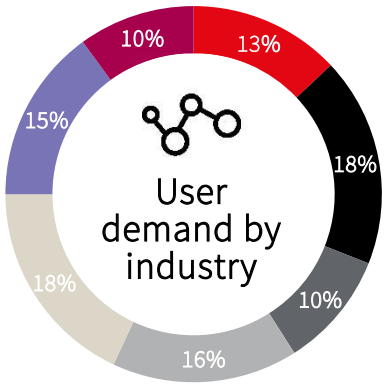
Outlook

for **Users**

- New blocks of space have opened up options for users.
- New construction and operators entering the market promise more solutions.
- Appealing pricing structures exist for credit tenants.

for **Providers**

- Providers are racing to construct and commission space to capture incoming cloud companies.
- Providers are getting creative, working with their current customers to expand and renew.



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Insurance

Supply

Total inventory: 1.15 m.s.f. / 145 MW
Total vacant: 40,300 s.f. / 10 MW
Under construction: 363,000 s.f. / 38 MW
Planned: 312,900 s.f. / 46 MW

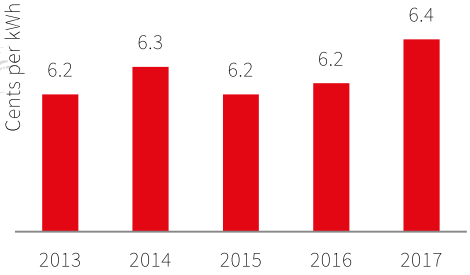
Demand

Net absorption: 15.0 MW

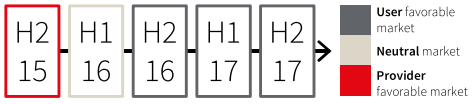
Rental rates

< 250 kW: $260 - $350/kW (all in, Retail)
> 250 kW: $120 - $160/kW (+E, Wholesale)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Healthcare
Aligned
250 kW

Oracle
IO
1.3 MW

Financial Services
Aligned
1.1 MW

Canada markets

Montréal

Unprecedented demand from cloud service providers drives absorption in Montréal

Market overview

Supply is being driven by a few key companies. ROOT Data Centers in Baie D'Urfé, COLO-D in Longueuil and Drummondville, Urbacon in downtown Montréal and CogecoPEER1 in Kirkland. Smaller providers such as METRO OPTIC also have capacity available in the downtown core.

Demand in the Montréal market remains extremely robust due to low power costs and cloud service providers demand. The demand shows no signs of slowing down and absorption rates remain extremely brisk.

Market trends. Cloud companies continuing to expand rapidly. Government Shared Services RFP is indicative of large organizations moving to the cloud. Renewable energy coupled with competitive power pricing from Hydro Québec make the Greater Montréal an attractive market. Large investment funds are putting money to work through data centre development and acquisitions.

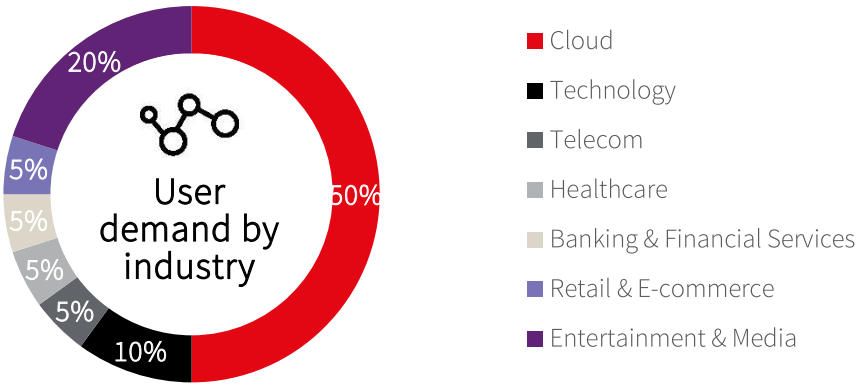
Outlook

for **Users**

- Cloud service providers continue to dominate the market.
- Some users find latency challenges from the Carrier Hotel in Montréal to 151 Front Street West in Toronto.

for **Providers**

- Wholesale Colocation providers continue to aggressively compete for larger tenants.
- Aggressive pricing structures exist for credit tenants with retail colocation providers.
- Providers must be flexible addressing tenants expansion needs as well as their design, space and power utilization requirements.



Supply

Total inventory: 3.8 m.s.f. / 131 MW
Total vacant: 101,300 s.f. / 44 MW
Under construction: 149,000 s.f. / 30 MW
Planned: 458,000 s.f. / 150 MW

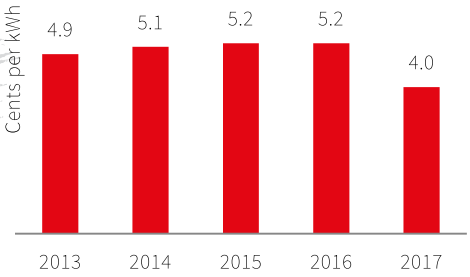
Demand

Net absorption: 17.3 MW

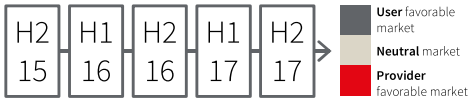
Rental rates

< 250 kW: $250 - $460/kW (all in)
> 250 kW: $140 - $220/kW (+E)

Average power rate *(cents/kWh)*

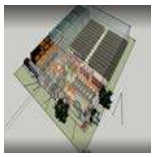


Data Center leverage



2017 significant data center transactions

Cloud Provider
COLO-D
12 MW



Cloud Provider
ROOT DATA CENTERS
5 MW

eStruxture
Acquisition of Netelligent
5.5 MW

Toronto

Wholesale colocation inventory expanding in Toronto, driving market competition

Market overview

Supply is being driven by a few key companies—primarily DuPont Fabros (DFT) and Urbacon. DFT's TOR1 facility (former Toronto Star printing press) will add new wholesale colocation space in Q4 2017. Urbacon has recently announced the addition of 10 MW in Richmond Hill. I.C.E. DATA CENTERS is also bringing new inventory to the market. Further, Ascent purchased the BlackBerry facility in Cambridge, adding another 4.8 MW to supply.

Demand in the Toronto market remains buoyant with traditional financial services and high technology businesses absorbing both space and power. Toronto's place as the centre of business in Canada continues to provide a safe haven for mission critical infrastructure; however, the demand and supply economics certainly favour end-users.

Market trends find cloud companies looking to solve local market latency and connectivity needs. Financial services remain at the centre of the Greater Toronto Area (GTA) market.

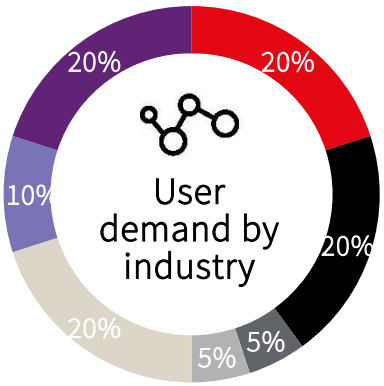
Outlook

for **Users**

- Financial services, entertainment, media, and tech continue to be driving forces
- Tenants are enjoying a competitive marketplace, resulting in some price compression
- Users flock to GTA for low latency, high connectivity and access to market

for **Providers**

- Due to strong competition, providers need to be flexible in offerings and approach
- Price compression being felt due to new inventory and pressures from other markets
- New wholesale colocation options represent large, experienced U.S players with deep pockets causing further price compression even amongst the retail colocation



- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media

Supply

Total inventory: 1.3 m.s.f. / 193 MW
Total vacant: 332,060 s.f. / 70 MW
Under construction: 321,000 s.f. / 62 MW
Planned: 296,100 s.f. / 156 MW

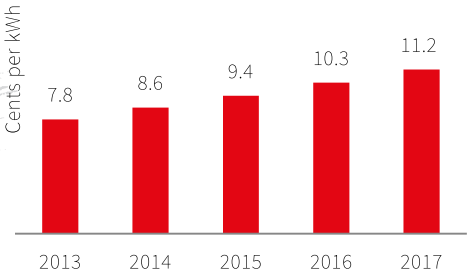
Demand

Net absorption: 14.3 MW

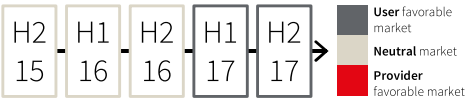
Rental rates

< 250 kW: $200 - $700/kW (all in)
> 250 kW: $150 - $190/kW (+E)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

DFT TOR1
Property Acquisition
46 MW

Ascent TOR1
Property Acquisition (x2)
4.8 MW

Cloud Service Provider
Urbacon
5 MW

Western Canada

Activity from U.S. and Chinese hyperscale operators circle Western Canada

Market overview

Supply is high in Calgary, yet low in Vancouver. Calgary is facing a struggling local economy as well as minimal incentives being offered to users – no new projects are expected as operators work to fill vacancies within existing portfolios. Conversely, supply is low in Vancouver with every operator at or near capacity. Yet, in a market performing extremely well, only one expansion is anticipated due to the high costs of building.

Demand for both Calgary and Vancouver is slower than 2016 for multiple reasons but expected to pick up as the big six cloud operators and international colocation operators investigate Western Canada. Also, Calgary is seeing typical transaction sizes significantly lower than in 2016, with the requirements in the market consisting of 60 kW or below.

Market trends. Expect interest to stay consistent until significant rent reductions and other concessions emerge. Initial POPs into Western Canada with primarily US based hyperscale operators will continue to trickle in to satisfy Canadian customers.

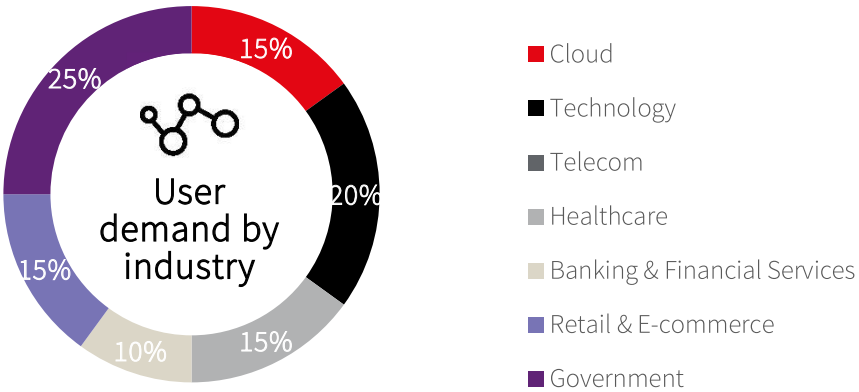
Outlook

for **Users**

- Still no significant downward pressure in rents
- Minimal opportunities to consider over 250 kW

for **Providers**

- Few large deployment requirements will emerge thru the remainder of 2016
- New provider entrants to the market via M&A may shake up the notoriously high pricing in Western Canada (if they enter the Canadian markets at all)
- New telecom requirements will emerge as the grid for Canada is enhanced.



Supply

Total inventory: 84 MW 1,050,000
Total vacant: 120,000 s.f. /10.65 MW
Under construction: 20,000 s.f. / 3 MW
Planned: 65,000 s.f. / 4 MW

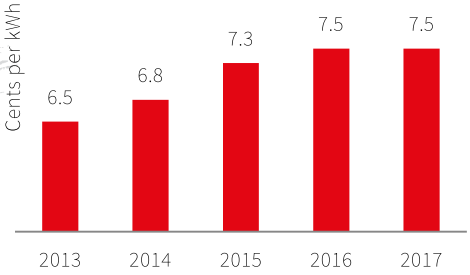
Demand

Net absorption: 3.5 MW

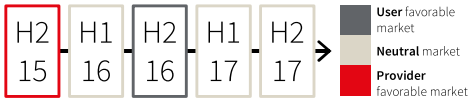
Rental rates

< 250 kW: $400 - 500/kW (all-in)
> 250 kW: $380 - 400/kW (all-in)

Average power rate *(cents/kWh)*



Data Center leverage



2017 significant data center transactions

Confidential Tenant
Rogers
Airdrie
100 kW

Confidential Tenant
Q9
Calgary
110 kW

Financial Tenant
Shaw
Calgary
170 kW

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About JLL Data Center Solutions

JLL's global Data Center Solutions team has delivered customized data center services and strategies to many of the world's largest corporations. JLL understands the technical elements that are crucial to facilities and helps companies determine the best IT and data center strategy for their business objectives. For more information, visit our site.

With the expertise of having managed 1110 megawatts of critical facilities transactions, our team assists companies with total site selection (from greenfield to colocation to cloud) utilizing best in class due diligence, in-depth TCO analysis and comparisons, risk and infrastructure assessments, project development services, migration consulting, contract and SLA negotiations, and budget preparations. Our Capital Markets group has deep experience in the data center industry from investment property sales to debt financing and our critical facilities management team oversees 92 million square feet of critical environments. We understand the technical elements that are crucial to your facility in terms of power, cooling, fiber, latency, utilities, redundancy, taxes, construction, public incentives and security. JLL's Data Center Solutions team will help you determine the best IT and data center strategy to meet your business objectives.

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JLL's research team delivers intelligence, analysis and insight through market-leading reports and services that illuminate today's commercial real estate dynamics and identify tomorrow's challenges and opportunities. Our more than 400 global research professionals track and analyze economic and property trends and forecast future conditions in over 60 countries, producing unrivalled local and global perspectives. Our research and expertise, fueled by real-time information and innovative thinking around the world, creates a competitive advantage for our clients and drives successful strategies and optimal real estate decisions.

Data Center Outlook

A wave of global momentum

North America | 2017

Changing political, economic and technological landscapes fuel stronger and smarter data center growth around the world

TABLE OF CONTENTS

TOP 5 DATA CENTER TRENDS TO WATCH IN 2017

In 2016 the data center market saw big deals from major players, new economic and regulatory policy, and the wild card that is strategic cloud adoption. These factors are changing the rules of the game, from data center pricing models to location selection tactics—and everything in between. Over the next 12 months, we expect to see user demand for smart data center solutions continue to heat up, while operators will feel the heat to deliver more data facilities, faster and more flexibly than ever.

1. Bold M&A will disrupt the playing field—while raising barriers to entry for newcomers to join the game. Mergers and acquisitions (M&A) in the data center sector surged in 2016, a trend that is on pace to continue through the new year. As the experienced players become bigger, expect less room on the bench for new recruits.

2. Shifting global policy and economic trends will spark important new questions about sovereignty and taxation. The U.S. data center climate will evolve over the next two years, with influence from the new presidential administration and federal mandates for data center optimization. Industry game-changers abroad include the unknown impact of Brexit and operator tax breaks, as well as a continuing push for data sovereignty.

3. Data still needs a home—but cloud adoption is shifting which data centers host it, and where. We expect to see even swifter movement to the cloud in the industry's hub markets, from Silicon Valley and Northern Virginia (NoVa) to London and Tokyo. Already, some major cloud providers are anticipating they will need to triple infrastructure by 2020.

4. Retail pricing may be on the way out in 2017 and beyond, as wholesale pricing becomes ubiquitous. Wholesale pricing has traditionally been the domain of large-scale projects, but now with the rise of hyperscale sites, we're seeing bulk pricing trend downward, too.

5. Investors will continue to clamor for data center REITs, for good reason. Data center REITs are boasting return on investment typically in the 10-15% range—impressive, compared with other types of funds that are performing more in the single digits. With demand going nowhere, these firm yields signal another year of bottom-line growth.

An industry on the move, globally

Industry overview

Game-changing M&A. Geopolitical affairs impacting data sovereignty. Hunger for the cloud, measured with scalability concerns. The data center industry is on the verge of a period of great momentum—but smart maneuvering will be necessary for users and operators alike to flourish in the coming months.

HOW DO WE KNOW CHANGE IS ON THE WAY?

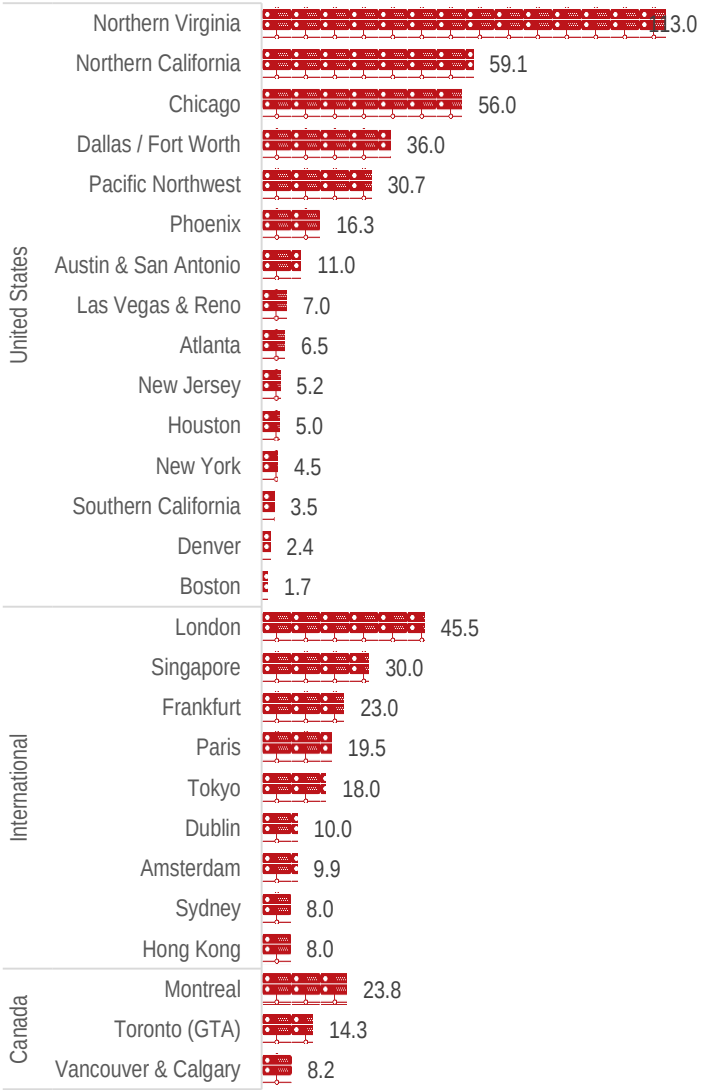
A few key signals:

- High-stakes M&As are now trending across North America. As well-known providers increasingly set their bidding sights on well-known colocation companies, the race is beginning to tighten to a few key players, such as Equinix and Digital Realty.
- U.S. energy costs and regulations for industry are expected to be reduced across the board. For the energy-intensive data center industry, this reduction in cost and oversight could potentially help alleviate the costs of delivering more capacity through the still-dawning era of the Internet of Things (IoT).
- Corporate thirst for the IoT is accelerating data volume and therefore data center demand. With enterprises preparing to increase their investments in smart office devices by 33 percent over the next 12 months, 71 percent are already reporting that they are actively gathering data for IoT initiatives.
- The race to more centralized cloud solutions continues—as does the pressure to provide strong services to the many users who live, work and play outside hub markets. As five-year leases are expiring, demand is surging toward hyperscale and hybrid cloud solutions in hub markets. Some smaller U.S. markets may risk oversupply, yet demand for space at the "Edge" of the network, in lower tier yet still highly populated markets, will still remain active, offering access to key bases of consumers outside the traditional core markets.

Economic picture

In broad strokes, one thing has not changed: the data center industry continues to thrive, and we expect that to continue regardless of the pace of macroeconomic growth. For example, absorption rates have reached record highs, with 357.85 MW in the top U.S. markets and 46.3 in the top Canadian markets, highlighting the still-rampant momentum. The thirst for data will continue even if the broader economy slows.

2016 Year-End – MWs absorption



Major influencing factors, however, are shaping the provider landscape, where even amid growth, there will be those who benefit—and those who don't—from current market shifts.

The promising new technologies that we are seeing from the big three cloud providers (AWS, Microsoft and Oracle), together with the expansion of the IoT, are nudging more business leaders to the cloud. This year, negotiations following most pending lease expirations will be far more complicated than the simple renewal negotiations of yesteryear—data center footprints are being reconfigured across the map, with each lease renewal representing an opportunity for data center users to capitalize on hybrid cloud technology, as well as optimizing their colocation footprint. On the other side of the table, providers are also preparing for an even greater uptick in demand, with several major cloud providers anticipating they will need to triple infrastructure by 2020.

As anticipated in previous JLL data center reports, major colocation companies such as Verizon and CenturyLink are sold off their own sites—often in win-win deals, considering the high-value bids pouring in from other big data center providers, which in turn are seeking to grow their market share or expand their footprint in a strategic area. Equinix, for example, has agreed to acquire 24 of Verizon's data center sites, gaining strongholds in urban consumer hotspots like Virginia and Miami (the N.A.P. of the Americas) in a bold $3.6 billion cash bet. Other colocation companies are up for sale now, too, with firms such as Cologix and Vantage generating huge interest.

Barriers to entry on the rise

This M&A activity is creating an interesting twist in the industry's usual top players: these industry leaders will be far better positioned for future success than new or emerging players. This is in part because what's old is becoming new again. Organizations like Global Innovation Partners, which sat on the sidelines for years because of noncompete terms after its sale to Digital Realty, is now re-emerging in the market as a force to reckon with. At the same time, as interest in hyperscale sites goes up alongside the need for faster, better technology, users are becoming less likely to trust newcomers to the providers' scene.

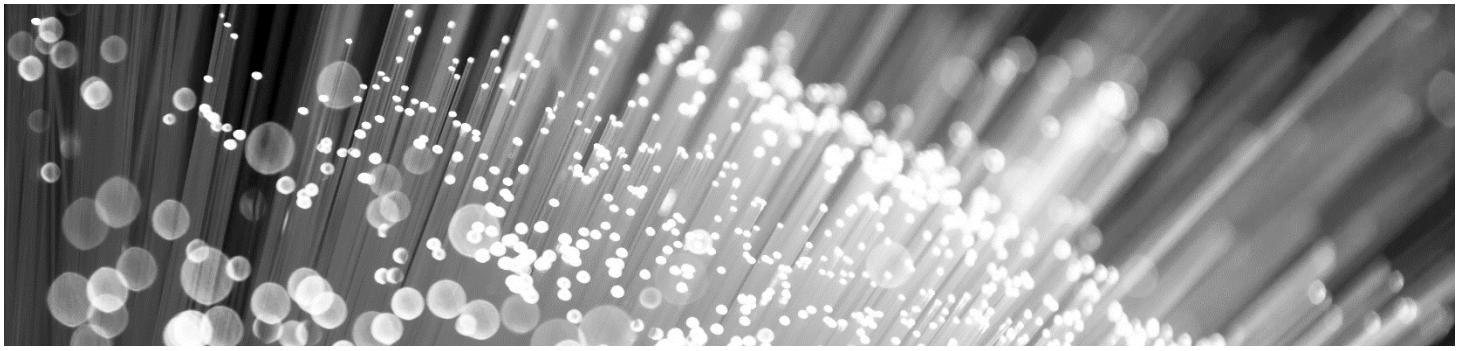
Providers must also confront new geopolitical questions in 2017. In the U.S., data center leaders are asking how the new presidential administration could affect the industry, particularly regarding energy prices. They are actively investigating the potential impact of new federal mandates for data center optimization, including energy metering and power usage effectiveness requirements that must be met by the end of 2018. Any cost-saving and efficiency measure can be meaningful for the industry, which consumed roughly 70 billion kilowatt-hours of electricity in 2014 alone.

At the same time, some analysts are speculating that the industry could currently be at its peak, with power constraints, lagging IT investment and the prospects of an economic downturn poised to emerge as new industry pressures.

In Canada, data sovereignty laws are also raising questions about how much U.S.-delivered AWS and Microsoft data will be moved to the Canadian cloud. This could really swing the pendulum, considering that Canadian companies with Canadian data must reside on Canadian soil. There is also some concern about privacy with the new U.S. administration, which could trigger movement to Canada as a kind of safe haven.

Across the Atlantic, European data centers continue to grapple with the still-unknown impact of Brexit, which will not fully be known until London's data center industry is formally removed from the European Union in 2019. The French presidential election is also delaying some decisions, as data center leaders and the investor community wait to learn the outcome in April 2017 before placing their bets. And while some countries like Sweden are offering new electricity tax breaks to attract more data center operators, others, like Russia, are tightening data sovereignty law. The mandate for personal data submitted by Russian citizens to be stored in data centers within the country is creating complexities for companies such as LinkedIn, whose site has been blocked.

Globally, the friendly investment market is expected to persist through 2017, with data center REITs currently outperforming other types of funds, which have been averaging single-digit multiples. Despite the slight decline we saw directly after the U.S. election, investor confidence has resumed, lured once again by data center REITs' promise of dividend income at reasonable rates.



Market insight

As organizations flock to the cloud for its promise of low capital output and high business value, we are seeing a seismic shift in pricing and contract terms. There is a current significant downward pressure on wholesale pricing, which is no longer the sole domain of bigger-scale projects. Today, bulk pricing is reaching smaller projects, too, with projects as small as 75KW, or 10 racks, now getting bulk pricing, compared with days past where they would have received retail type pricing. Data center users are also finding they have more leverage in flexibility and scalability at the negotiation table.

This year's big breakout markets will be familiar by now, as hub market activity remains sky high.

U.S. breakout markets

- *NoVa:* In Northern Virginia, 2017 should be another well-balanced year, with five years of supply matching, not outpacing, demand. Hyperscale is king here in terms of new supply, in part thanks to new power capacity coming online. Providers are investing in major new electrical design updates, too, which will create more flexibility for enterprise deployments.
- *Northern California:* Land prices in Santa Clara, the data center capital of the region, serve as testament to the market's strength, currently moving past a whopping $100 per square foot. The pending sale of Vantage Data Centers could create an opportunity to fill demand for space, since its portfolio includes two land sites where up to 60 MW of capacity could be developed. At the same time, more tenants are expected to give up space as they take advantage of the cloud, which will keep prices flat – or possibly lead to a decline.
- *Chicago Area:* Land prices in key submarkets are shooting up, as industrial demand surges in the suburban corridors of Chicago. Demand here is sophisticated, too, with hyperscale cloud deployments comprise 86 percent of total leasing in the last 24 months. Campus-style deployments in the suburbs will pull users from legacy data centers thanks to their greater cost-efficiency.

International breakout markets

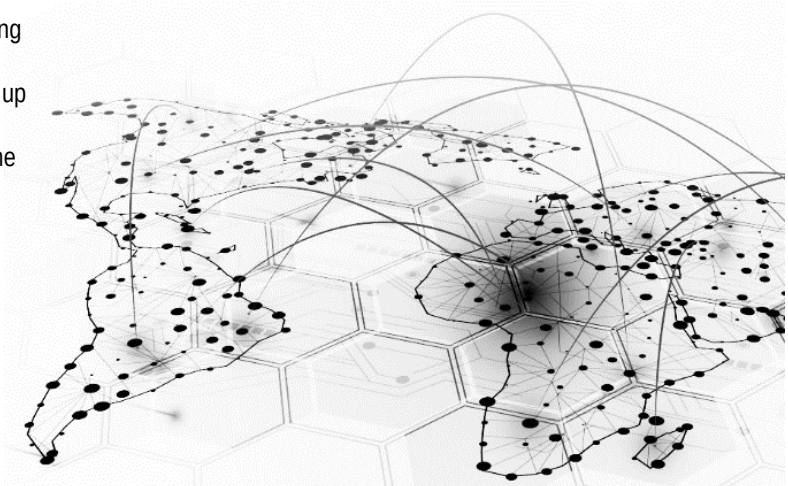
- *Dublin:* The Irish capital will continue to be the fastest growing EMEA market, with total supply likely to hit 100 MW in 2017. Growing data protection concerns are expected to keep demand high through the year, even as new supply comes online and pricing remains firm.
- *Montréal:* Two major real estate investment funds have been created to develop data centers in Montréal. Meanwhile, cloud services providers such as Amazon Web Services and Microsoft launched in Quebec and are creating vast opportunities for cloud growth largely due to the power pricing spread between Quebec and Ontario.
- *Tokyo:* Cloud usage reigns supreme here, with Microsoft, AWS and Google all continuing to expand through 2017. Last year, the market grew by roughly 25 percent, and with today's high absorption and steady pricing, growth should continue into the new year and beyond.

Potential risks in 2017

As we enter 2017, optimism in the data center market is high, with strong demand for data center solutions expected to continue for the foreseeable future. While planning for growth, companies should also monitor three key areas of risk as they move forward in the new year:

- The U.S. dollar strengthened in Q4 2016 following the U.S. presidential election. While this was good news for many investors, for data center operators with significant international exposure, the foreign exchange movements could impact top-line growth.
- The looming prospect of rising interest rates in the U.S. presents another financial risk to data center operators. As of the first week in January 2017, Chicago Federal Reserve president Charles Evans was forecasting two interest rate hikes for the year ahead, with the prospect of a third.
- An active M&A market is driving industry consolidation. With large acquisitions in play, the threat looms that newly combined companies may not absorb all the space they have leased, and there is the possibility for shadow space to come on the market and possibly negatively impact pricing.

Companies who can successfully manage these risks will be poised for growth as the world's insatiable thirst for data continues to expand.



"The marketplace is very fluid at this time, but a few things are certain. Soaring cloud adoption is real and technology innovation will not slow down. In the data center market specifically, equipment is being refreshed at a record pace, portfolios are consolidating and rack densities are climbing rapidly. To stay ahead, companies need to start their strategic planning yesterday!"

—Bo Bond, Mark Bauer, and Jon Meisel
JLL Data Center Solutions Leadership Team

Data Center markets | *United States*

Local Data Center market profiles

ATLANTA

2016 Happenings	2017 Expectations
• Equinix acquired a major portfolio of Verizon's colocation data centers including sites in Atlanta and Norcross. • Telx announced it will add capacity in the Atlanta market at 250 Williams Street. • Construction began on the new CODA building at Georgia Tech's Technology Square.	• Significant wholesale absorption is expected in the first quarter. • Shadow data activity will increase in the market. • New-to-market providers will continue to consider expanding into Atlanta.

AUSTIN/SAN ANTONIO

2016 Happenings	2017 Expectations
• Microsoft took a large position in an area colocation facility for cloud application. • Absorption in the market has been slow due to a lack of new supply and moderate demand. • The market saw multiple business continuity and disaster recovery requirements.	• Phase one of Data Foundry's "Texas 2" data center is expected to reach completion. • Government service industries may pull back on their data center absorption. • New supply to the market could drive an increase in demand to the area, since Austin usually has high interest from the West Coast.

BOSTON

2016 Happenings	2017 Expectations
• Several significant tenants including Carbonite and Pfizer elected to exit the market and move to regions with lower power costs. • Berkeley Investments began development of a multi-use property in Malden that will include up to 100,000 square feet of data center space. • Digital Realty and Sungard both decided to turn down data centers in the market. For Digital Realty, this means converting 200 Quannapowitt Parkway back to office space, while the future of the Sungard facility is currently uncertain.	• The Boston market will likely be heavily impacted by CenturyLink's data center divestiture, as well as its recent purchase of Level 3 Communications. This should improve market presence for both companies, making them more active for new business than in recent years. • Digital Realty is working to reintroduce 128 First Avenue in Needham as a colocation data center, and plans to enable additional connectivity. • Mass-IX, a local interexchange provider, will continue to expand service offerings to enable both network and cloud access at multiple data centers throughout the region.

CHICAGO

2016 Happenings	2017 Expectations
• Land prices in key submarkets including Franklin Park and Elk Grove increased rapidly due to record industrial demand in the Chicagoland area. • Hyperscale cloud deployments represented 86 percent of the overall leasing over the past 24 months, reaching 63 MW. • Leasing has predominantly focused on the suburban corridors, whereas downtown deployments have been smaller but more location-specific.	• Tightening availability of quality land and power in key submarkets will force data center location leaders to consider sites they may not have previously deliberated. • The lure of greater cost-efficiency and better product will pull users from legacy data centers to newer, campus-style deployments in the suburbs. • Some users will experience "cloud paralysis" as they try to decide what to put into the cloud versus colocation.

Local Data Center market profiles

DALLAS/FORT WORTH

2016 Happenings

- RagingWire, T5 and Digital Realty are building new facilities that should be completed in 2017.
- Digital Realty quietly closed on 40 acres in Garland.
- Skybox and Stream are developing powered shells in Legacy (Plano).
- Facebook closed on an additional 50 acres to continue development on its $1 billion data center campus.
- Softlayer, an IBM company, continues to rapidly expand in the Dallas/Fort Worth area.

2017 Expectations

- QTS, Equinix and CyrusOne are contemplating major new market expansion projects for 2017.
- New substation construction will be delivered in the eastern and northern portions of the metro area. Meanwhile, expect data center land prices to rise as quality supply dwindles.
- Hyperscale cloud providers will seek positions in the market, while users will consider more efficient ways to evaluate cloud virtualization as the cloud providers increase local presence.

DENVER

2016 Happenings

- Much of the 2016 demand stemmed from industries such as technology solutions, data management and storage, software, education and healthcare.
- Denver recognized more absorption in retail colocation but has positioned itself well to satisfy more wholesale deals with new inventory under construction.

2017 Expectations

- Wholesale and retail pricing will continue to be favorable for end users going into 2017, due to the higher-than-average vacancy percentage compared to other markets, as well as the healthy competitive landscape between existing and new providers.
- Providers will continue to benefit from "edge" requirements seeking a solution to enable distribution of content at the edge of the Internet.
- The Internet of Things, video-streaming technology, and newly proposed data center legislation will most likely enable one of the major cloud operators to land in Denver.

HOUSTON

2016 Happenings

- DataFoundry continued construction and delivery of new product in the market.
- The energy sector pulled back on data center spends as the price of oil dropped, affecting annual absorption.
- Local providers displayed resiliency and maintained uptime during April's rain and flash flooding.

2017 Expectations

- Stream will begin construction on its third data hall in its facility in The Woodlands.
- The healthcare industry will continue to evaluate outsourcing data center requirements.
- The energy sector will cautiously ramp up its data center space.

LAS VEGAS & RENO

2016 Happenings

- Apple announced that it will double its space at the Reno Technology Park, with the fully built mixed-use campus set to reach approximately 1 million square feet, with a 50 MW substation onsite.
- Switch delivered the first phase of its initial data center building in Reno, consisting of 1.2 million square feet under-roof. The total site is expected to deliver roughly 6.2 million square feet of data center space.
- A confidential Fortune 100 company, headquartered in the Bay Area, is under contract on approximately 2,500 acres within the Tahoe-Reno Industrial Park.

2017 Expectations

- Reno and Vegas are expected to continue to be an attractive option for data center developments due to their competitive power costs, proximity to the Bay Area and tax incentive program.
- Other data center developers are expected to join Apple, Switch, Rackspace and others in development parks east of the city.
- As the only permitted colocation provider in the Tahoe-Reno Industrial Park, Switch will attract other Bay Area Fortune 1000 companies into its Reno campus.

Local Data Center market profiles

NEW JERSEY

2016 Happenings

- Merger and acquisition activity was key in the market, with deals such as Telx/DLR, Cologix/NetAccess and QTS's purchase of DuPont Fabros Technology's data center campus.
- Financial services led the way in colocation leasing activity, with healthcare and life sciences quietly filling in some of the vacancy gaps.
- Many of the large enterprise data centers strongly considered the question of owning compared to leasing.

2017 Expectations

- Construction of additional speculative space may be on the horizon. Turnkey inventory has been whittled down considerably through 2016, and margins could tighten after a few prospective deals come to fruition.
- New national and global providers will enter the market due to the proximity to New York City and the financial markets.
- The state's gubernatorial election could inspire legislators to revisit incentives packages for attracting and retaining corporate tenants, which could potentially include more coverage for data center users.

NEW YORK

2016 Happenings

- DataGryd was the only provider positioned for wholesale in New York City, with Sabey, Digital Realty, NYI, Telehouse, Equinix and NTT all positioned to pick up the remaining retail demand.
- Carriers continued to exit Google's 111 Eighth Avenue location, relocating to other New York City and New Jersey facilities.
- Retail demand was led by carrier and content providers and was driven by proximity to carrier hotels (111 Eighth Avenue, 60 Hudson and 32 Avenue of the Americas). Hedge funds and other financial services companies took small footprints, while main colocation deployments located outside city limits.

2017 Expectations

- The New York market will continue to see less new supply added to the market and will see further retail consolidation inside the New York City carrier hotels as major telecoms remain active in M&A.
- Cloud and infrastructure-as-a-service (IaaS) providers will emerge in the Brooklyn market as tech startups locate within the Digital DUMBO ("Down Under the Manhattan Bridge Overpass") neighborhood.
- Expect AWS, Google and Microsoft to make deployments in the market to serve the public cloud needs.

NORTHERN CALIFORNIA

2016 Happenings

- Microsoft, SoftLayer and Amazon drove the majority of the market's leasing absorption, primarily in the first two quarters of 2016, with some additional activity in the third quarter. Lack of activity from the big players in the fourth quarter led to a leasing slowdown.
- Land prices continued to increase significantly, moving past $100 per square foot.
- Product pricing remained relatively unchanged through the year, even as vacancy in the market remained in the single digits.

2017 Expectations

- The Vantage portfolio sale will drive market conditions and expectations in 2017— the buyer will have the opportunity to deliver 60 MW in a market with single-digit vacancy, and 9 MW of that 60 MW can be delivered as soon as 2017.
- Private equity firms will play a larger role in the industry as they continue looking into data center investments and spaces.
- Landlords will likely overbuild in the long run, while not taking into consideration lease roll or a lack of deal pipeline.
- Chinese telecom companies will expand in the market, driving value and providing offerings to Chinese companies looking to locate within the U.S.

NORTHERN VIRGINIA

2016 Happenings

- Dominion Virginia Power continued to deliver new power substations and lower rates.
- Hyperscale cloud requirements dominated market demand.
- AWS, whose demand is equal to or greater than that of the entire multitenant data center demand in the market, continued rapid deployments throughout NoVa, with no signs of slowing expansion.

2017 Expectations

- One or two large-scale enterprise, single-tenant data centers will be built to suit.
- Multifaceted electrical design (N to 2N) within the data center room will offer flexibility (price and functionality) to enterprise deployments.
- Anticipate the fifth straight year of virtual market equilibrium as demand closely matches new supply coming online.

Local Data Center market profiles

PACIFIC NORTHWEST

2016 Happenings

- Growth was strong through the year as all of the hyperscale operators, including Amazon and Microsoft, invested billions in local data center expansions to support total capacities in excess of 200 MW.
- Transaction sizes were smaller than in previous years, but market activity outpaced previous years.
- Significant activity occurred in the debt and equity markets, with data center sales in high demand and yielding low cap rates.

2017 Expectations

- Multiple major operators, though new entrants to the Northwest data center market, will be developing product, such as DuPont Fabros.
- Very few existing company acquisition opportunities will be available in this market, as the playing field is shrinking to global industry leaders.
- Central Washington and Hillsboro, Oregon, will see the most growth. Central Washington expected to offer competitive total cost of occupancy (TOC) rates, while Hillsboro's submarine cable landing stations will continue to generate demand from across the Pacific.
- Metropolitan regions such as Seattle will continue to see telecom demand grow as content delivery needs expand.

PHOENIX

2016 Happenings

- CyrusOne continued to expand space on its campus in Chandler, with construction under way on a fully preleased fourth building, consisting of approximately 102,000 square feet and 9 MW.
- Phoenix recognized an increased absorption by cloud and software-as-a-service (SaaS) companies.
- Aligned Data Centers delivered its first 21,000-square-foot facility, with 3 MW of expandable space, and is under construction on an additional 21,000 square feet. The company's leasing structure is expected to drive tenant demand.

2017 Expectations

- Due to the current low vacancy rate, new multitenant data center providers will continue to actively seek new entry into the Phoenix market to meet the consistent demand.
- Major cloud providers are expected to take up large chunks of space in Phoenix.
- More than 70 MW are still in demand, so expect approximately 35 MW of absorption to be taken up by cloud providers, existing tenant expansions and added transition by enterprises out of self-operated data centers.

SOUTHERN CALIFORNIA

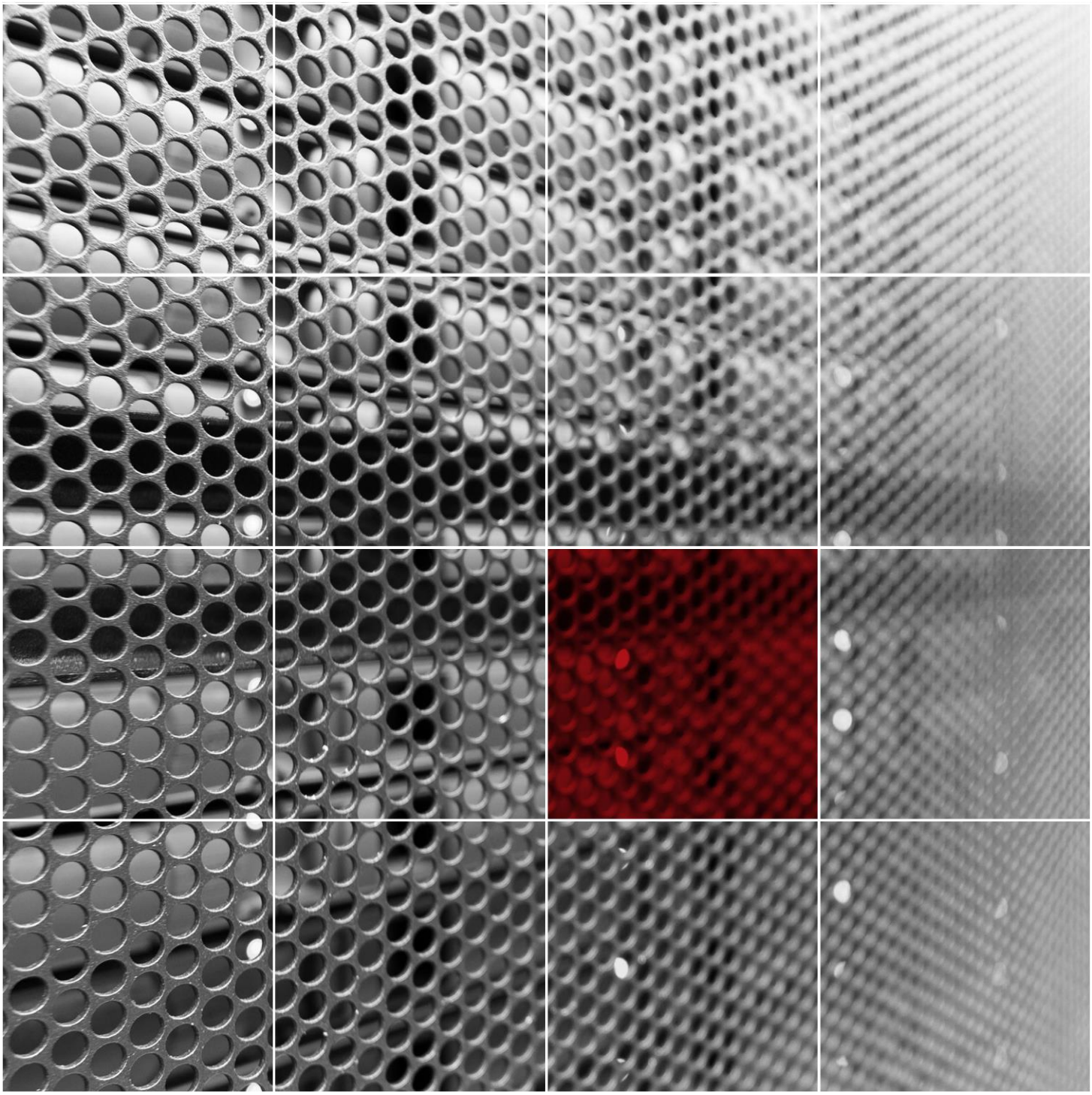
2016 Happenings

- Rising Realty purchased the Garland Center, putting it back on the map as a top data center location for consideration.
- Many tenants began considering relocation options due to a growing spread in building quality.
- Cloud providers have been looking to expand their footprint.

2017 Expectations

- Several buildings on the market could create a musical-chairs effect among tenants.
- Expect increased activity and demand across the market due to client demand to access EMEA.
- Asian companies continue to expand their LA presence.

Data Center markets | *International*



Data Center market profiles from around the globe

In today's interconnected world, events in London and Tokyo can have a major impact on North American markets. Below is a selection of international markets JLL has chosen to provide a glimpse of local trends affecting the global community in 2017.

AMSTERDAM

2017 Expectations

- Major players will continue to bring new space to market, though vacancy rates will remain below 15 percent. Expect a return to long-term average take-up of 15 MW per IT load.
- Continued economic recovery will survive first-quarter elections, after which multinational demand and M&A interest will pick up.
- Pricing will remain firm with 5 percent price increases forecasts for the year.

DUBLIN

2017 Expectations

- Dublin will continue to grow in status as a main EMEA colocation market hub.
- New schemes from all main Dublin colocation companies will deliver staged space into the market during 2017.
- Colocation pricing will remain firm in 2017 even with new sites coming to market, as supply remains constrained against take-up.
- Data protection concerns will help drive demand to the market, though in limited quantity.

FRANKFURT

2017 Expectations

- Maincubes, Digital Realty, Zenium and e-shelter will continue to dominate the market, while Equinix and Interxion continue expansion.
- Return to the long-term average take-up of 19 MW is forecast into 2018.
- Competition for larger 1 MW-plus requirements will remain fierce between competitors.
- Expect new scheme announcements in 2017, with limited new supply being quickly absorbed by existing technology users.

HONG KONG

2017 Expectations

- Global Switch will open its first Hong Kong data center, with a 30 MW site in Tseung Kwan O (TKO) due for completion in the third quarter. Also in TKO, Mega Plus, the latest iAdvantage site, will open in the third quarter with a pre-commitment of 4 MW and plans to reach 22 MW.
- The Hong Kong government will release a greenfield block in TKO, which will yield around 25 MW and 400,000 square feet.
- Pricing will still continue to trend downward, with around 90 MW of supply scheduled in the 2017 calendar year.

LONDON

2017 Expectations

- Fully fitted vacancy rates will remain below 10 percent. Colocation pricing will remain firm with 5 percent price rises forecast as supply remains limited.
- Indirect air will continue to win more requirements against chilled water solutions due to the lower total cost of ownership.
- Limited new supply will reach the market in 2017, but expect new announcements for 2018.
- M&A activity will continue across the sector as global companies seek to consolidate their market position.

MONTRÉAL

2017 Expectations

- AWS, which opened its first Canadian site in 2016 and plans to expand further into the Montréal market due to the low-cost hydro-power.
- Expect continued growth from current cloud providers in-market as well as new cloud providers entering the Canadian market via Montréal.
- With major cloud providers expanding within Montréal, the oversupply situation may quickly turn into a capacity drought.
- Roughly 12 MW of demand is anticipated for 2017.

Data Center market profiles from around the globe

PARIS

2017 Expectations

- New space is being delivered from Equinix, Interxion and Data 4, which will command most of the attention in the market.
- Continued international demand will see a new entrant likely to announce its first Paris scheme—the first new entrant to the market for over 10 years.
- Colocation pricing will continue to firm up, with 5 percent growth forecast.
- Limited new supply will reach the market in 2017 as providers will keep just enough capacity to service moderate demand.
- EMEA-wide M&A activity will deeply affect the Paris market, given the smaller number of competitors here that could drive pricing higher.
- Look for renewed demand from financial institutions decamping from London back to Paris.

SINGAPORE

2017 Expectations

- Expect continuing momentum from the Data Centre Parks, as well as more greenfield design and build-to-suit consolidations.
- Further expansion of the cloud market is also on the horizon, with Google, Microsoft, AWS and Alicloud all to grow their Singapore footprint in 2017.

SYDNEY

2017 Expectations

- Look for further market growth, as Equinix, Global Switch and Airtrunk are all set to expand here.
- Pricing should trend downward as large wholesale requirements become more prevalent to support cloud growth in Sydney.
- Supply will tighten as land availability in suitable areas declines.

TOKYO

2017 Expectations

- Following a year of market growth of around 25 percent in 2016, Tokyo will retain its position as a true global powerhouse.
- OTP and cloud usage are huge users of space in the city. This is set to continue in 2017, with Microsoft, Amazon and Google all continuing to expand here.

TORONTO

2017 Expectations

- Price reductions should continue, especially due to DFT's entrance into Toronto's wholesale market. DFT's purchase of the *Toronto Star* printing factory for $54 million CSD in 2016 is expected to bring a potential capacity of 46 MW to the market.
- There is potential for new market entrants, with CyrusOne, zColo and others looking at Toronto as a growth market.
- An additional 15 MW of demand is anticipated in 2017.

VANCOUVER/CALGARY

2017 Expectations

- Expect more demand in Vancouver from the U.S. film industry and large content delivery requirements. Otherwise, data sovereignty requirements may limit broader demand from the States.
- Rental rates in the Calgary region will depress, increasing the amount of transactions.
- New activity could occur in periphery markets such as Kamloops.

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JLL's global Data Center Solutions team has delivered customized data center services and strategies to many of the world's largest corporations. With the expertise of having managed 1110 megawatts of critical facilities transactions, our team assists companies with total site selection (from greenfield to colocation to cloud) utilizing best in class due diligence, in-depth TCO analysis and comparisons, risk and infrastructure assessments, project development services, migration consulting, contract and SLA negotiations, and budget preparations. Our Capital Markets group has deep experience in the data center industry from investment property sales to debt financing and our critical facilities management team oversees 92 million square feet of critical environments. We understand the technical elements that are crucial to your facility in terms of power, cooling, fiber, latency, utilities, redundancy, taxes, construction, public incentives and security. JLL's Data Center Solutions team will help you determine the best IT and data center strategy to meet your business objectives.

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JLL's research team delivers intelligence, analysis and insight through market-leading reports and services that illuminate today's commercial real estate dynamics and identify tomorrow's challenges and opportunities. Our more than 400 global research professionals track and analyze economic and property trends and forecast future conditions in over 60 countries, producing unrivalled local and global perspectives. Our research and expertise, fueled by real-time information and innovative thinking around the world, creates a competitive advantage for our clients and drives successful strategies and optimal real estate decisions.

Data Center Outlook

Strong Demand, Smart Growth

North America | 2016

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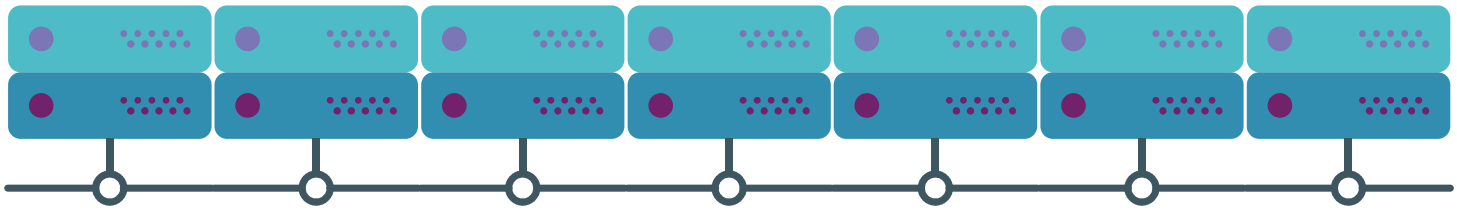


TOP 2016 DATA CENTER TRENDS

From cloud adoption to data sovereignty, the data center industry is experiencing a host of new change drivers, all while it continues to explode with vigorous growth. We're observing companies getting smarter about their data center and data usage strategies, thriving amidst these winds of change.

Cloud adoption acceleration will double the size of the data center industry over the next five years.

Cloud adoption is racing ahead at an accelerated clip, with the cloud-managed service market expected to double by 2021.

Data center users are spreading out across locations, bringing data closer for greater reliability and speed, at the same time as demanding flexibility.

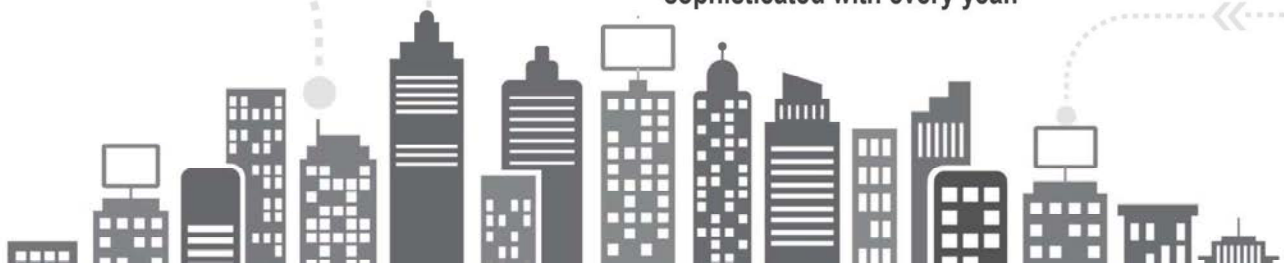
Data center providers and users alike are getting smarter about location planning, and pursuing shorter, more flexible lease structures.

Data sovereignty laws are redrawing the global data center location map.

From Brazil to Russia, the industry's biggest players are expanding internationally faster than ever to meet growing demand and help users stay compliant with regulations designed to keep data inside a nation's borders.

Climate change is shaping data center legislation and technology.

The realities of global climate change have spurred increasingly effective energy efficiency solutions, from refrigerant-based cooling systems to the continuing rise of data center microgrids—all becoming more sophisticated with every year.



CLOSE-UP
ON NORTH AMERICA'S DATA CENTER MARKETS

Economic picture

Stratospheric momentum towards the cloud. A seismic global political shift toward data sovereignty. New regulations supporting a more sustainable future. Today's data center landscape is changing fast, as leading providers and users strive to stay competitive amidst rapid regulatory, technological, and environmental change.

WHERE IS THE RISING DEMAND ORIGINATING? CONSIDER THE FOLLOWING EMERGING GAME-CHANGERS:

- **Demand for cloud technology** is growing fast, and data center providers are working quickly to meet the need.
- **Rapidly evolving data sovereignty laws** are redrawing the map, creating and expanding new markets both in North America and overseas.
- The industry's **biggest players are upping their game**, as users and providers alike grow more sophisticated in server use and resource planning.

Across the board, revenue and growth is up—both in the U.S. and globally. Data center stocks surged in the first half of 2016, gaining an average of 19 percent in the first quarter, then an average of 50 percent in the second quarter.

Globally, the multi-tenant data center (MTDC) market is expected to rise at a compound annual growth rate (CAGR) of 12.1 percent between 2015 and 2018. As the most mature market, North America remains most competitive, representing approximately 44 percent of the global data center market. Here, each of the top 10 metro markets is home to more than 20 MTDC providers each.[1]

By itself, the cloud managed services market size is predicted to grow at a CAGR of 16.6 percent from now through 2021, from $35.54 billion in 2016 to $76.73 billion.[2] Meanwhile, top cloud providers are expected to pull in a collective $120 billion by 2020, representing a CAGR of 61.3 percent from the $11.2 billion these seven mega-providers generated on Infrastructure-as-a-Service (IaaS) in 2015. [3]

Together, this spells continuing promise for large wholesale data center service providers that can keep up with the demand.

Industry insight

Of course, this new opportunity won't be satisfied by stale tactics. Today's data center users and operators are bringing creative approaches that support smarter strategies into the market. For example, large data center operators are offering large campuses to accommodate the intense demand for server space to support cloud and digital content-driven demand. Users are deploying sophisticated predictive analytics to understand their true need, and invest in the servers they need, without over-investing for extensive back-up as in years past. With so much rapid evolution, this means everyone in the market is taking a fresh look at location decisions, rising to the challenge of a changing climate and leveraging new technologies to better capture the market opportunity.

Another curveball the market is offering this year: Rapidly evolving data sovereignty laws. These laws, designed to require that data be housed within the same country from which it is accessed, are influencing data center location decisions, and acting as market-makers in certain countries. It's a smart move for these nations, which can achieve a double-benefit of helping protect data as well as essentially requiring new investment in their economies. However, it also makes conditions more complex for users of data center space. As a result of new and coming data sovereignty laws from France to Brazil to Russia, more data center development activity is taking place outside the U.S. and Canada than ever before.

Additionally complicating international data law is the potential impact of Brexit (the United Kingdom's decision to leave the European Union). Some analysis shows that more than three quarters of British IT leaders have said their data centers are housed elsewhere in Europe. The outcome is still unclear, but many speculate the impact could be profound on data residency issues within the island nation, and well beyond. However, the UK will continue to be held to GDPR (General Data Protection Regulation), a regulation by the European Commission on data handling for all EU citizens, which comes into effect in April 2018.

Meanwhile, **climate change is also becoming a clear influence on strategy**, as the data center industry increasingly looks to improve its triple bottom line (people, planet, and profit). The triple bottom line is an accounting framework used by many organizations to evaluate performance from a socially responsible, environmental, and financial perspective; new technologies and regulations now allow data center facilities to more fully participate in sustainability and corporate responsibility programs.

The U.S. data center industry has significantly improved its electricity savings in the last few years. Despite expectations that energy use would catapult as quickly as the demand for real-time data, energy use has actually remained stable since 2010. And although the total server installed base is expected to grow by 40 percent from 2010 to 2020, the industry is on pace to save energy use by another 10-40 percent in 2020.[4]

There are a few key reasons for this improved efficiency.

- **Cooling and powering strategies** have improved dramatically—especially meaningful in drought- and heat-stricken areas in the Western U.S. Advanced cooling strategies have emerged to make the cooling process less resource-intensive. California recently made headlines by relaxing state law on how refrigerants are used in cooling systems to pave the way for more use of refrigerant-based cooling systems over water cooling, which can save millions of gallons of replenishment of water per day.

- **"Power proportionality" methods** are enabling more data centers to scale back electricity use when they are not processing at full throttle. The resulting economic and environmental benefits of getting smarter about energy use extends to providers, as well as end users.

- The idea of **data center microgrids** is also catching on, from active development in some areas, to more earnest consideration in others. Consider for example Arizona's largest utility's 63-MW development now underway, or Colorado's massive 300-MW microgrid park development. Meanwhile in Manhattan, microgrids are becoming a topic of greater interest within data center leadership circles. The pairing of data centers and microgrids is a natural evolution, considering the industry's dependence on quality, reliable power that can endure even when the central grid is unavailable or simply congested.

Demand drivers

Today's data center IT decision-makers are using increasingly sophisticated criteria when they shop for space and power. Overall, we are seeing a trend toward more informed usage. New supply is being added that is more in tune with demand than in the past. Thanks to predictive analytics, there is less guesswork.

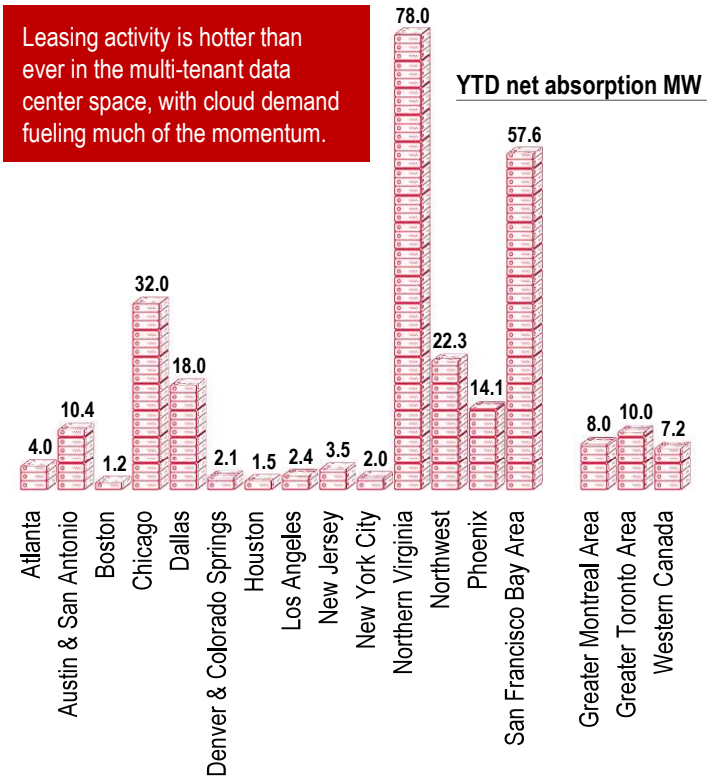
- The '**Big Six' providers have continued on their development binge** domestically, which, amongst other outcomes, means more overall space is available. The industry's most prominent publically traded data center REITs, which include Equinix, Digital Realty, DuPont Fabros Technology, CoreSite Realty, CyrusOne, and QTS have been making some surprising new investments. For example, Digital Realty recently acquired eight data centers in Europe from Equinix, which had committed to spinning off the assets for regulatory approval of its own acquisition of Telecity in 2015.

- Meanwhile, smaller multi-tenant data center players are also making some notable 2016 acquisitions, including Boulder-based Zayo's acquisition of Dallas-based Clearview and St. Louis-based TierPoint's acquisition of Cosentry.

- Big providers are becoming **more efficient in how they are building out space**, and that keeps data center costs in line. Gone are the days of overbuilding a facility that customers might consider nice-to-have—but not mission-critical. Now, they are creating more flexible space so that as new, more diverse users come in, they can offer the resiliency and capacity for what 80 percent of the customers need, as opposed to simply catering to the higher-end specifications of a 20 percent niche market. Design and build has become better geared toward return on investment, and supply chains are also becoming more efficient.

- Data center developers are **no longer building for massive redundancies** as they become more confident in their own forecasting of needs for space and power. And as more sophisticated analytics tools improve usage planning, data center users are becoming less likely to overinvest on more data server space than they need—affecting deals.

These new tactics are pushing demand for space through the roof in many North American markets, causing demand to spread out across primary as well as secondary markets.



Global expansion is another key trend influencing demand. The Big Six data center provider companies are expanding internationally more rapidly than in the past, to locations with needs driven by data sovereignty laws such as France and Brazil, as well as emerging markets. According to data from one of the Big Six, cross-border data center traffic was minimal 15 years ago, but has since grown 45 times, and is expected to grow another nine times in the next 15 years.[5]

In fact, the regions with the fastest expected multi-tenant data center market growth are in Latin America, where 451 Research forecasts CAGR of 19.7 percent from 2015 to 2018, and Asia-Pacific, with a forecasted CAGR of 16.3 percent over the same period.[6] One recent example of this trend comes from Amazon Web Services, which recently announced it is building its next big data center farm in Mumbai, India.

Supply drivers

The industry is flourishing, and yet the pace of new development for colocation firms is actually slowing. Why the apparent disconnect? Capacity is not shrinking—it's simply taking new form as Big Six providers like Digital Realty and CyrusOne shift gears toward building out fewer but larger campuses in order to spread infrastructure and ultimately lower the cost of delivery.

The following new forces are already profoundly shaping new supply:

- **The cloud is driving demand**, as technology continues to advance, and demand accelerates. The hottest markets are those adopting cloud technology and/or absorbing cloud space at a strong clip. And unlike the market surge in 2013, the cloud is expected to bring more staying power to demand. For example, cloud spending is expected to reach $204 billion globally in 2016, with 71 percent of enterprises adopting hybrid cloud services in some way.[7] Indeed, many of the biggest data center providers are scouting for cloud-driven, multi-megawatt wholesale deals, and winning at an unprecedented rate.

- **Leases are expiring—and exposing new opportunities to evolve**. Another key game-changer is that the first wave of multi-tenant data center buildings are now seeing their 10-year leases rolling. Now, as more users begin to renegotiate their terms, an uptick in right-sizing server and resiliency is likely. At the same time, traditional 10-year leases are becoming less common. Today's average is more like 5-7 years, with new opportunity for flexibility and lower rent rates. How will this affect the larger economic outlook? Data center stocks remain up, but little consideration has been given yet to the blend-and-extend nature of current usage agreements. We anticipate some offset to all this absorption.

- **Brexit is stirring up a ripple effect of uncertainty.** How will Britain's decision to leave the EU affect the data center market? The long-term outlook is unclear, but immediate effects included a temporary dip in stock value for a few of the big players. Ultimately, the vote raises questions for international players that cannot yet be answered. For example, what will the change mean for compliance—and related costs? What kinds of citizenship issues will emerge for EU employees in the UK, and vice versa? Will the island nation's prominence as a hub for global technology and financial services continue or falter? We will continue to closely monitor this developing situation.

  It is important to recognize, too, the ways in which this vote could have direct impact on the U.S. market. Financial and currency market volatility across North America could have some negative consequences for consumer and business confidence, however, the potential impact for now is expected to be very minimal. At the same time, lower yields together with uncertainty could push interest in commercial real estate acquisitions, which could theoretically work out favorably for U.S. data centers.

Real estate insight

Hyper-connectivity, flexible capacity, and a solid supply of relatively inexpensive yet reliable power are helping keep the top markets ahead. While some of the hottest markets are not new to the winners' circle, they are keeping their place by staying relevant for companies in rapid cloud-adoption mode, and other current demand drivers. Smaller markets are also emerging as surprising areas of opportunity. Here are a few highlights from our in-depth local North American analyses that round out this report:

Market highlights

- **Northern Virginia retains its star power** with social media and cloud providers like Microsoft, AWS, Google, Facebook, LinkedIn and Oracle's recent feast of space, together signing up for about 55 MW of capacity in the second quarter; that is on top of third-party data center absorption of 78 MW in the first half of the year. New allure is also coming to this connectivity hub thanks to new subsea fiber cables that will link the market to Europe, Africa, and South America.

- **Data centers go north…to Canada:** Montréal's supply is soaring—and with it, growing demand from cloud providers. The Toronto area is also seeing significant potential for inventory growth, and growing hunger for wholesale space. And looking west, extremely limited supply coupled with swelling demand from content delivery networks is heating up the Vancouver market.

- **Chicago rapidly adds to supply**: Explosive cloud growth here will outpace supply, while providers compete for large cloud tenants. Several data center REITs have development projects underway in the Windy City, however, it will likely take a few years for all this new supply to be delivered.

- **The Northwest grows with the tech industry:** Growth is rampant here, thanks to the region's bustling tech and e-commerce industry, together with the emerging trend for Asian corporations to establish data and routing equipment in the area. Supply is growing, with several large expansions now underway, and large and midsize colocation operators alike are scouting the area, too.

Outlook

Rapidly evolving trends mean demand drivers also change quickly. Look for the following trends to increase in industry influence over the next year:

- **Cloud-driven data center usage is an increasingly important "food group."** To some, it already is a key driver from Northern Virginia to Northern California to Chicago. How will the clamor for the cloud affect managed services firms (MSF), and what changes might they make to adapt? Some MSFs report they are being forced already to change their ways, while others say they see it as an opportunity to potentially generate interconnected revenue. We will continue to monitor this game-changing dynamic.

  Cloud adoption has also spurred a massive takedown of multi-tenant data center space from the likes of Microsoft Azure, Oracle, AWS, and Google—a trend that we expect to continue in the coming months.

  Meanwhile, the cloud-driven land grab in many markets is creating a lack of inventory for large-scale deployments, so we expect the pipeline of build-to-suits to expand, too.

- **American consumers have an insatiable thirst for digital content.** And that means so is the thirst for data center server usage. Content providers like Comcast, CNN, ESPN, and many others need more data center capacity, as demand for ubiquitous digital content skyrockets. Consider the following demand drivers:
  - *Our culture has a love affair with binge-watching*: 70 percent of Americans say they will watch consecutive TV episodes in rapid succession now.
  - *Demand for streaming media is exploding*: Close to half of U.S. consumers subscribe to streaming services, more than ever.
  - *Many of us depend on social media*: Two-thirds of millennials say that social media interactions with friends are as valuable as in-person time.[8]

    The digital content frenzy extends well beyond entertainment content, too. For example, a recent banking survey showed that 4 in 10 Americans hadn't visited a branch in the last six months, signaling more people are doing their banking online, on phones or ATMs than in previous years—and mandating that banks expand their digital capability to stay competitive. Banks are also exploring mobile technology for use in their own branches, such as video tellers for self-serve kiosks that would also drive their need for additional data center space.[9]

- **Data center REITs soared in the first half of 2016, but the future is uncertain.** Investor expectations were sky-high in the first half of 2016, with record leasing results spurring data center REITs up by 19 percent during the first quarter of 2016, and by another 50 percent through the second quarter. Looking ahead, however, uncertainty around Brexit and the upcoming U.S. presidential election could trigger a curtail in spending in the second half of the year. Stay alert for potential change in this space.

1 451 Research
2 Markets and Markets
3 Structure Research
4 Lawrence Berkeley National Lab report
5 Equinix
6 451 Research
7 Equinix
8 Deloitte
9 US News

DATA CENTER MARKETS

ATLANTA

Supply

Total inventory: 1.65 m.s.f. / 194 MW
Total commissioned vacant: 120,000 s.f. / 20 MW
Under construction: 90,000 s.f. / 14 MW
Planned: 100,000 s.f. / 13 MW

Demand

Net absorption: 4 MW YTD

Rental rates

< 250 kW: $225 - $325/kW (all in)
> 250 kW: $130 - $155/kW (+E)

Data center overview

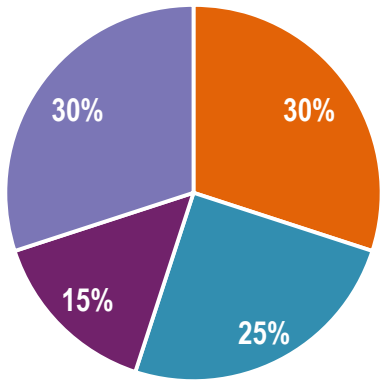
Supply has been steady—but that is likely to change later this year and into 2017 as more space and power becomes positioned to come online. Three providers are scheduled to deliver planned expansion space, a newcomer to the market has recently delivered newly acquired space, and at least two other providers are also actively negotiating to secure new space to bring to the market. Meanwhile, Portman Holdings and Georgia Tech have also officially announced the kick-off of the prominent Coda Tech Square development, a mix of office, retail, and high performance computing space.

Demand is coming from a combination of enterprise server rooms that are migrating out of non-colocation facilities, and new operators from outside Atlanta that are now entering the market.

Market trends we are actively tracking include notable demand-driven expansion by existing colocation providers. We also see potential for new user and operator activity, with Southern Company (the fourth largest utility in the U.S.) actively enhancing the region's utility infrastructure and diversification with recently announced acquisitions and venture agreements with PowerSecure, AGL Resources, and Kinder Morgan.

Corporate headquarter relocation, such as NCR and WorldPay, and some regional office expansions, are also contributing to absorption of office and data center space.

User demand by industry



Outlook

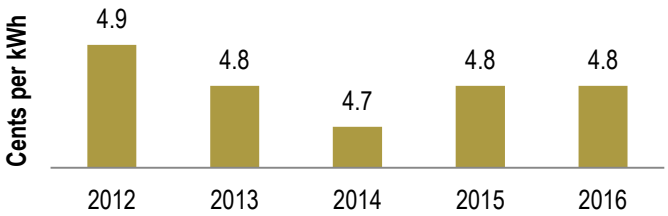
for **Users**

- Users are looking for the maximum flexibility with regards to the type of facility and services offered.
- Enterprise colocation requirements and the entertainment, media, and technology sectors continue to be the driving forces of the market.
- The cloud continues to act as a disrupter for decision-making.

for **Providers**

- Providers are challenged with trying to solve for the optimum hybrid solution for their prospects and customers.
- Testing alternative types of pricing is on the rise for retail space.

Average power rate *(cents/kWh)*



2016 significant data center transactions

New retail offering
T5 Atlanta
1 MW

Confidential tenants
zColo
1.5 MW

New data center offering
vCitadel
2.5 MW

AUSTIN & SAN ANTONIO

Supply

Total inventory: 2.86 m.s.f. / 403 MW
Total commissioned vacant: 98,073 s.f. / 11.36 MW
Under construction: 43,834 s.f. / 9 MW
Planned: 121,000 s.f. / 26.1 MW

Demand

Net absorption: 10.4 MW YTD

Rental rates

< 250 kW: $260 - $360/kW (all in)
> 250 kW: $140 - $160/kW (+E)

Data center overview

Supply, we anticipate, will remain stable in the Austin market as CyrusOne, Digital Realty, and OnRamp all have healthy supply for this market based on current demand. In contrast, supply in San Antonio is tight now that CyrusOne—which until recently had an entire powered shell building available for build-out—has leased nearly 100 percent of this space to a technology tenant.

Demand continues to come primarily from the government and technology sectors, with a significant uptick from West Coast technology firms. Overall, with the exception of one very large transaction, the two markets remain stable and demand remains similar to previous years.

Market trends are being driven by managed services and cloud growth, which will continue to be key in this market as large cloud providers become tenants in massive colocation facilities, and/or continue to increase their owned footprint in these markets. Providers should continue to market these new service options broadly.

Meanwhile, utility rates in Austin continue to rise as subsidies have dropped off, with rates now hovering around $.07/kWh.

Outlook

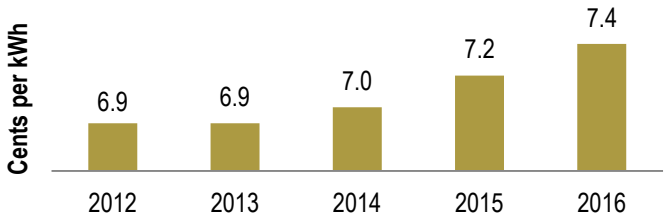
for **Users**

- Utility pricing continues to increase as government subsidies burn off.
- While there are few providers in the marketplace, quality Tier III product is available in the market from best-in-class providers.
- These providers' facilities are demonstrating an increase in managed services and cloud-provider options.

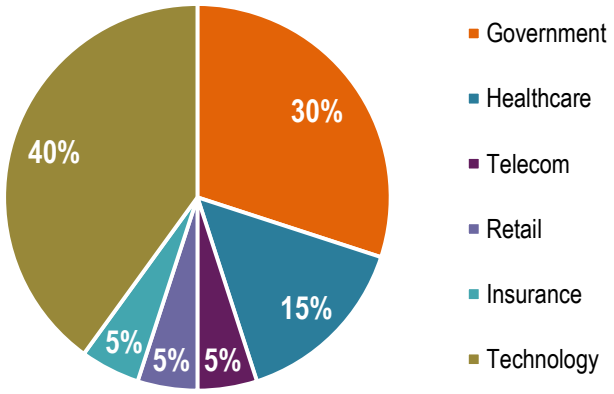
for **Providers**

- Cloud and technology companies are showing continued interest.
- Promotion of additional services is key to attracting new customers.
- A focus on efficiency is meaningful here, as utility costs outpace other Texas markets that may also appeal to technology firms.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

Technology firm
CyrusOne
San Antonio, TX
9 MW

Fortune 100 technology
Stream
San Antonio, TX
200 kW

Energy firm
CyrusOne
Austin, TX
200 kW

BOSTON

Supply

Total inventory: 1.4 m.s.f. / 135 MW
Total commissioned vacant: 165,000 s.f. / 20 MW
Under construction: 10,000 s.f. / 1.5 MW
Planned: 65,000 s.f. / 8 MW

Demand

Net absorption: 1.2 MW YTD

Rental rates

< 250 kW: $300 - $850/kW (all in)
> 250 kW: $115 - $200/kW (+E)

Data center overview

Supply remains fairly static in Boston, with new construction limited to the TierPoint expansion in Marlborough, and the second Markley facility soon to enter the market in Lowell.

Demand is largely coming from local companies and institutions, particularly those focused on life sciences, universities, technology, or financial services.

Market trends are being influenced by a range of new and continuing factors. For one, although we have seen some decline, Boston's utility rates generally remain amongst the highest in the country—a trend that should continue considering the undersupply of generating resources, and more facilities now scheduled to close. Even the most favorable power purchasing contracts today result in all-in rates of $.15-$.20 per kWh. Overall, we are seeing these high rates inspiring strong emphasis on energy conservation for new projects and retrofits.

At the same time, employment growth, GE's relocation to Boston, and continued strength in tech and life sciences are all boosting the economy, and ultimately benefiting data center space providers.

We expect users to maintain leverage in the market for the foreseeable future, with the possible exception of the most highly connected buildings in the market, including One Summer, 230 Congress, and the Bent Street area in Cambridge.

Outlook

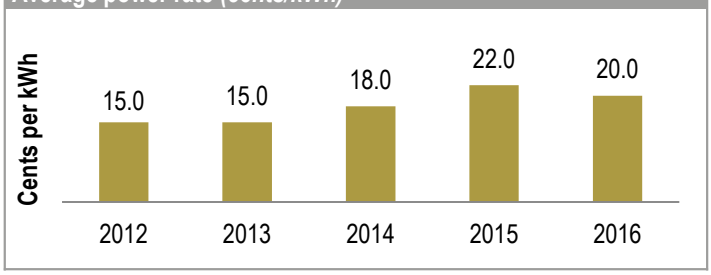
for **Users**

- There is significant availability in both retail and wholesale segments.
- Aggressive pricing has eased and rate declines have subsided for most providers.
- Many providers in the market offer customers the option to convert from colocation to managed services in the future.

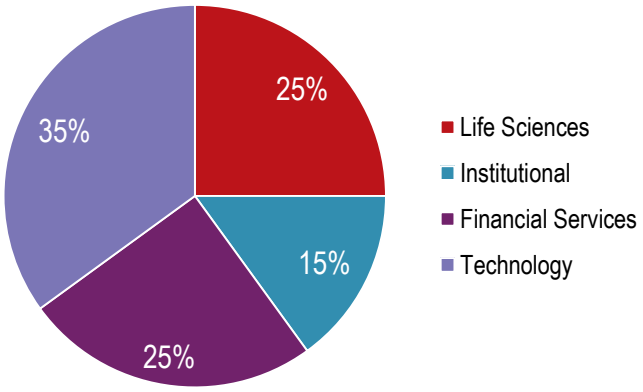
for **Providers**

- The data center investment climate remains strong and assets should continue to trade hands at attractive cap rates of 7.5% or less.
- New entrants and existing providers have active expansion plans across the market.

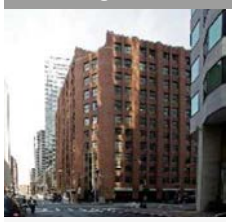
Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions



Capital markets sale
230 Congress
4.5 MW

Capital markets sale
34 St. Martin
8 MW

Tech company
105 Cabot St.
250 kW

CHICAGO

Supply

Total inventory: 3.9 m.s.f. / 502 MW
Total commissioned vacant: 266,947 s.f. / 25 MW
Under construction: 255 s.f. / 27 MW
Planned: 503,000 s.f. / 49 MW

Demand

Net absorption: 32 MW YTD

Rental rates

< 250 kW: $210 - $325/kW (all in)
> 250 kW: $145 - $165/kW (+E)

Data center overview

Supply of wholesale data center space in the Chicagoland area has become scarce due to significant leasing by cloud users and power constraints in key submarkets. All major providers are in the process of next-phase speculative builds due to "just-in-time" cloud requirements.

Demand for the most part continues to come from cloud providers and edge/content expansions into the market. Banking and financial services interest has also grown moderately, due to market fluctuation. Meanwhile, enterprise leasing has slowed with rampant adoption of cloud strategies.

Market trends of note include Chicago's utility rates, which remain very attractive and have been in the $.059 - $.064 per kWh range. The forecast calls for stable, competitive rates in the future, too, in part owing to ComEd's active work to expand several critical substations in order to meet growing demand from data centers. This should be key, considering Elk Grove and Franklin Park substations are at capacity.

Looking ahead, we expect cloud demand to continue to outpace supply. There will be limited product until the first quarter of 2017, but by late 2017, new vacancy should give end users the leverage to negotiate lower rates.

Outlook

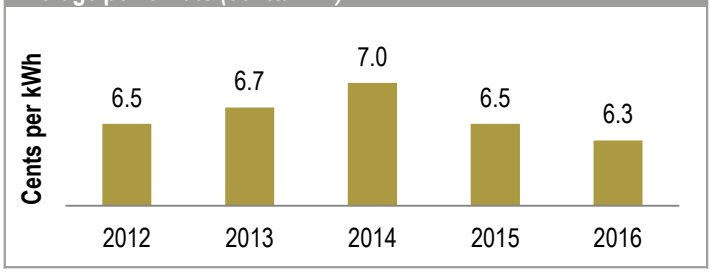
for **Users**

- Users are focused on "just-in-time" compute to accommodate explosive cloud growth.
- Cloud, edge, and financials lead the way as driving forces for the market.

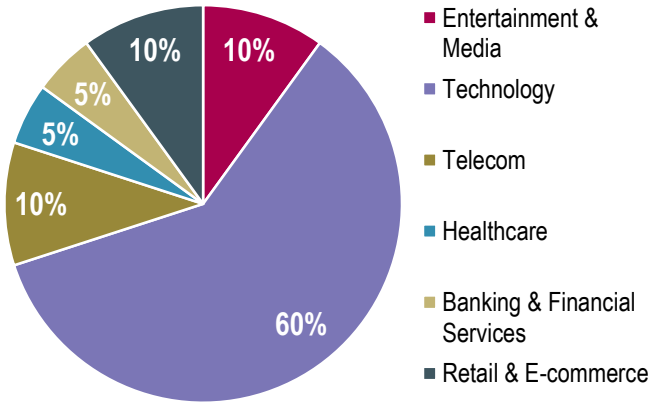
for **Providers**

- Providers continue to compete for large cloud tenants.
- Aggressive pricing structures still exist for credit tenants.
- Many new providers are looking hard at the market—however, they have limited site options to consider.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

SalesForce
Dupont Fabros CH2
2.8 MW

Comcast
Ascent CH2
2.4 MW

Apple
Dupont Fabros CH2
6 MW

DALLAS

Supply

Total inventory: 2.912 m.s.f. / 403 MW
Total commissioned vacant: 228,864 s.f. / 35.33 MW
Under construction: 182,000 s.f. / 17 MW
Planned: 681,875 s.f. / 91 MW

Demand

Net absorption: 18 MW YTD

Rental rates

< 250 kW: $250 - $350/kW (all in)
> 250 kW: $125 - $140/kW (+E)

Data center overview

Supply is currently constrained, with only a handful of wholesale providers offering blocks of available supply. However, some key transactions are underway that could soon help turn the tide: RagingWire, Digital Realty, and ViaWest all have buildings under construction now in the Dallas-Forth Worth area, and will be delivering between the third quarter of 2016 and first quarter of 2017. Additionally, Skybox and Stream are in the midst of delivering powered shell product in the Plano market, a new offering in the area.

Demand continues to come most robustly from financial services, insurance, healthcare, and, increasingly technology—in addition to other sectors in this diversified market. Continued headquarter relocations and regional expansions are also driving demand.

Market trends include ongoing interest in DFW's low utility rates, which remain attractive in the $.045 - $.053 per kWh range. Oncor continues to invest in adding power, while interest in wind energy is spurring increased wind farm development. Other local utilities are also rapidly increasing their infrastructure deployment in the area.

We anticipate that users will have significant leverage towards the end of 2016, when new supply nears completion and providers more actively seek anchor tenants for their new projects.

Outlook

for **Users**

- There will be a small supply deficit window between Q3 and Q4,
- Aggressive pricing and ramp structures will be available for Q1 2017 go-live projects.
- New options for powered shell facilities are coming to the market early next year.

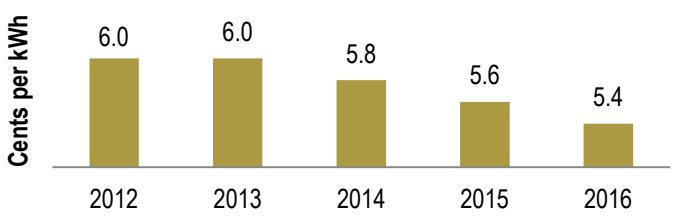
for **Providers**

- A race is underway to get inventory to market Q1 2017 and beyond.
- Users will expect aggressive anchor tenant deals for new 2017 projects.
- Pricing will remain stable through Q3, and then potentially compress by 3-5 percent as new supply comes online.

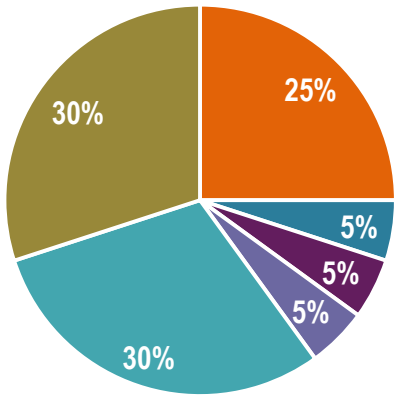
Q2 16 > Q3 16 > Q4 16 > Q1 17 > Q2 17

User favorable market
Neutral market
Provider favorable market

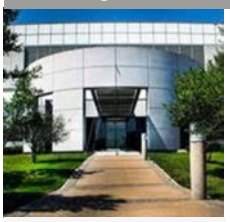
Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions



Technology firm
QTS
6 MW

Caterpillar
Equinix @ Plano
1 MW

Technology services
2020 Live Oak
100 kW

DENVER & COLORADO SPRINGS

Supply

Total inventory: 660,778 s.f. / 113.8 MW
Total commissioned vacant: 195,755 s.f. / 22 MW
Under construction: 0 s.f. / 0 MW
Planned: 205,000 s.f. / 24 MW

Demand

Net absorption: 2.1 MW YTD

Rental rates

< 250 kW: $255 - $325/kW (all in)
> 250 kW: $130 - $160/kW (+E)

Data center overview

Demand is driven predominately by end users with retail colocation requirements and those looking to meet disaster recovery needs. Companies are attracted to the Denver market for workforce technical talent and because of its central U.S. location which supports low-latency specifications and interconnectivity to communications networks serving Chicago and San Francisco metropolitan areas.

Supply is being driven by significant activity from providers, including ViaWest, which is currently in the design and implementation phase of building out the remaining capacity at its Compark facility in Southeast Denver. Construction is scheduled for fourth quarter of this year, and consists of 90,000 square feet delivered in powered shell condition and configured in 1.5 MW blocks. At full build-out, the Compark facility will consist of 140,000 square feet and 18 MW of critical IT load. Meanwhile in Colorado Springs, T5 executed a purchase agreement with a multi-national software company as the first occupant of the T5@Colorado Campus.

Market trends show Colorado Springs remains among the popular enterprise data center markets, having gained a large multi-national software company that purchased approximately 9 acres within the T5@Colorado campus. This enterprise data center is scheduled to break ground in 2017.

Outlook

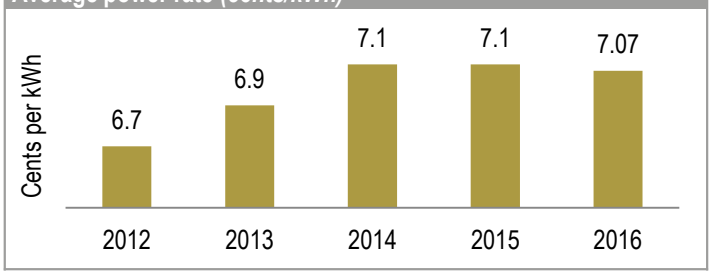
for **Users**

- As providers compete, users benefit from low and stable pricing, expansion flexibility, and a wide array of managed service options.
- The Greater Denver area continues to be an in-demand market thanks to its connectivity for enterprises on both East and West Coasts.

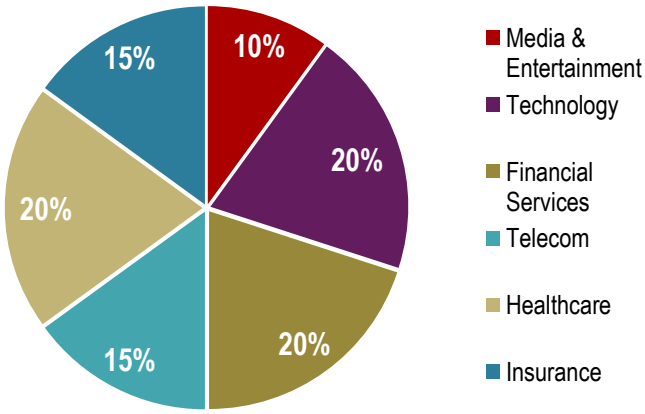
for **Providers**

- Managed service requirements and retail colocation consistently represent the demand.
- Hybrid cloud deployments sought by large enterprises will continue to motivate market growth.

Average power rate *(cents/kWh)*



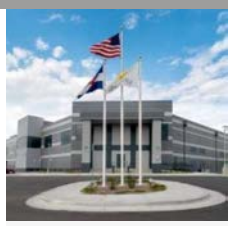
User demand by industry



2016 significant data center transactions

Multinational software company
T5 Data Centers
Colorado Springs, CO
9-acre land purchase

Multinational software company
ViaWest Compark
Denver, CO
250 kW



Hitachi Data Systems
ViaWest Compark
Denver, CO
1.2 MW

HOUSTON

Supply

Total inventory: 762,300 s.f. / 119 MW
Total commissioned vacant: 97,000 s.f. / 12.712 MW
Under construction: 10,000 s.f. / 1 MW
Planned: 393,984 s.f. / 68.2 MW

Demand

Net absorption: 1.45 MW YTD

Rental rates

< 250 kW: $260 - $360/kW (all in)
> 250 kW: $140 - $160/kW (+E)

Data center overview

Supply has been absorbed at a slower rate in the first half of 2016, which is not a surprise, given the drop in the price of oil and its cascading effect on the energy sector over the last 12 months. Recent new supply has been added by a few key players, including Skybox, which delivered its second data center to the market and has additional shell space for a third. CyrusOne also delivered additional space to keep up with demand, and has more options to deliver capacity as needed. Other new supply has come from DataFoundry's 250,000-square-foot building, which saw early leasing success, and Digital Realty's 1.7 MW now available at its Greenspoint campus.

Demand is primarily still coming out of the energy sector, even under current economic conditions, as technology and data-intensive applications support drilling and exploration efforts dramatically. Interest is also growing in the healthcare sector. We have also observed that much of the year-to-date activity is sparked by renewals that consider moving to another provider, but ultimately renew.

Market trends here are deeply connected to the struggling oil and gas sector. Job growth that previously grew at 3-5 percent annually has dropped to .5 percent. As a result, we are seeing some delays in technology spending. Still, overall, the data compute power required for the large companies to drill more efficiently is helping keep the data center market stable.

Outlook

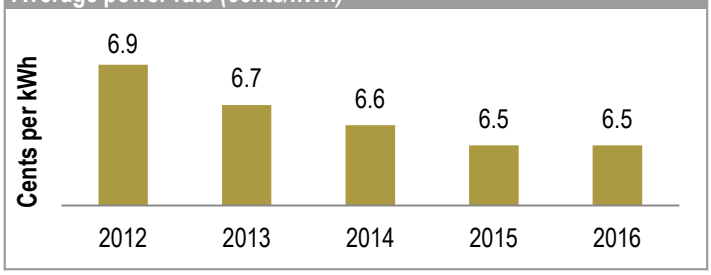
for **Users**

- Users are looking more at powered shell opportunities as quality built-out options are minimal.
- Despite reduced overall spending, the energy sector is still driving the market, while healthcare is a growing presence.

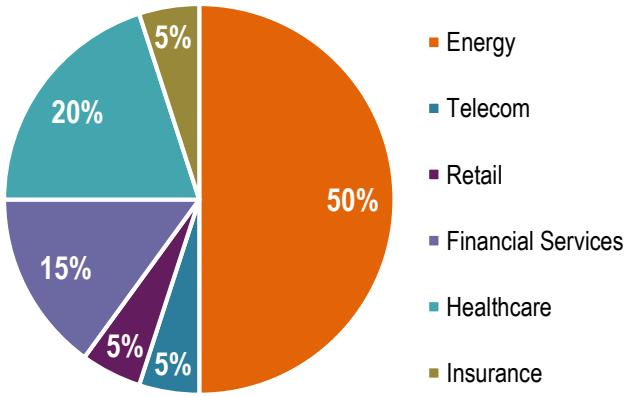
for **Providers**

- Providers are continuing to compete for tenants.
- Aggressive pricing structures still exist for credit tenants.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

Energy firm
Stream
450 kW

Technology cloud firm
Stream
500 kW

Energy firm
CyrusOne
250 kW

LOS ANGELES

Supply

Total inventory: 2.3 m.s.f. / 210 MW
Total commissioned vacant: 190,000 s.f. / 18 MW
Under construction: 20,000 s.f. / 3 MW
Planned: 30,000 s.f. / 3 MW

Demand

Net absorption: 2.4 MW

Rental rates

< 250 kW: $250 - $300/kW (all in)
> 250 kW: $125 - $250/kW (+E)

Data center overview

Supply is being driven by a few key companies—primarily CoreSite, Digital Realty, and Equinix. CoreSite has been the most active in the market at its 900 N. Alameda location, and One Wilshire also remains well leased. G1 Partners, owners at One Wilshire, have added cooling and power in order to lease directly to other users, who can then connect to the Meet-me room without needing to use CoreSite as the primary operator. Additional supply changes in the market include Telecom Center at 530 W. 6th, which came off the market to upgrade infrastructure, and Garland Center, which closed in June to Rising Realty and is being repositioned as a more core market offering with upgrades to power and cooling infrastructure planned for late 2016 to early 2017.

Demand in the LA market remains flat due to high power costs—and yet, we continue to see activity from small users and organic growth. Moreover, Chinese telecommunications companies and cloud users are beginning to enter the market in search of space.

Market trends are fairly consistent with the general California market, where blue-chip companies and proximity plays will continue to drive demand—as will cloud companies looking to solve local market latency and connectivity needs. Large users with high MW needs will continue to source in markets with cheaper power and lower taxes.

Outlook

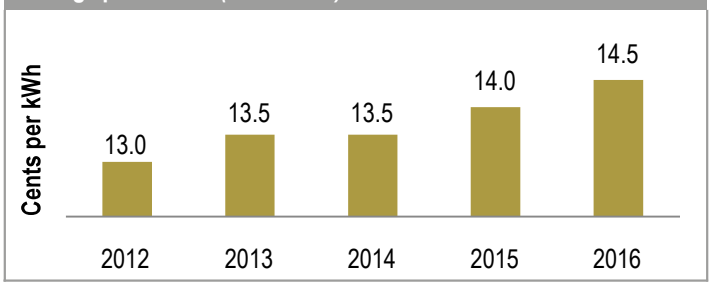
for **Users**

- Several new blocks of direct and sublease space have opened up options for users.
- Entertainment, media, and technology continue to be the driving forces in the market.
- Some providers have offered 2016 promotions to drive new business.

for **Providers**

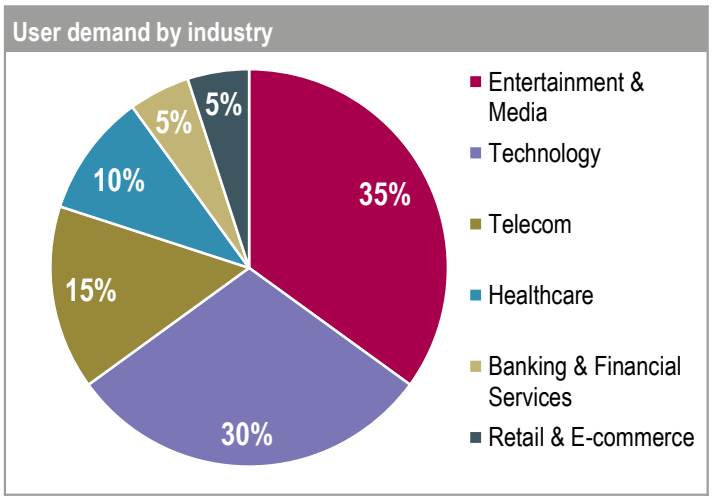
- Providers are continuing to aggressively compete for tenants.
- Extremely aggressive pricing structures still exist for credit tenants.

Average power rate *(cents/kWh)*



** Burbank and SoCal Edison are approximately 9.5 cents*

User demand by industry



2016 significant data center transactions

Alchemy
1200 W. 7th St.
500 kW

Quantil
CoreSite
400 kW

Confidential tech firm
CoreSite
1.5 MW

NEW JERSEY

Supply

Total inventory: 3.1 m.s.f. / 327 MW
Total commissioned vacant: 260,000 s.f. / 33 MW
Under construction: 0 s.f. / 0 MW
Planned: 796,000 s.f. / 115 MW

Demand

Net absorption: 3.5 MW YTD

Rental rates

< 250 kW: $175 - $350/kW (all in)
> 250 kW: $125 - $170/kW (+E)

Data center overview

Supply is somewhat ahead of demand; as a result, we have observed that supply is being added very judiciously. In fact, in most facilities around New Jersey, it is rare to see a Performance Optimized Data Center being built unless the majority of those built out previously have tenant commitments.

Demand within the tristate area continues to be dominated by the financial services industry. However, we have tracked social media, healthcare, and technology as becoming part of a healthier, more diversified tenant base.

Market trends include a short-term dip in utility rates. Operators that did not lock in stable long-term rates (typically averaging $.09 - $.10 per kWh) have recently been able to secure shorter term rates at $.065 - $.08 for a year or two—still leaving the future in question.

We anticipate that users will maintain significant leverage until existing supply is absorbed, or there is increased absorption. Pressure on rates will remain in place, and providers with superior connectivity locally and via long haul seem to have the upper hand. The QTS purchase of DuPont Fabros' facility for $125 million was an impactful event for this market.

Outlook

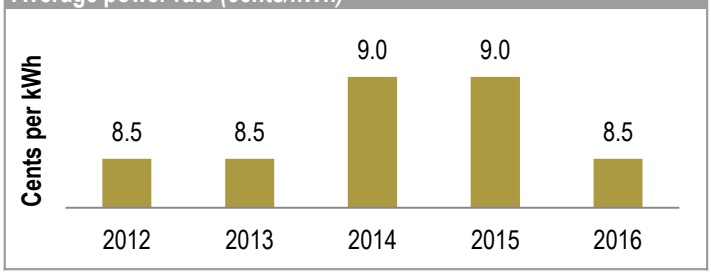
for **Users**

- Users in the New Jersey market are still driven by latency.
- Deployments in this market seem to be smaller than other major markets in the U.S.

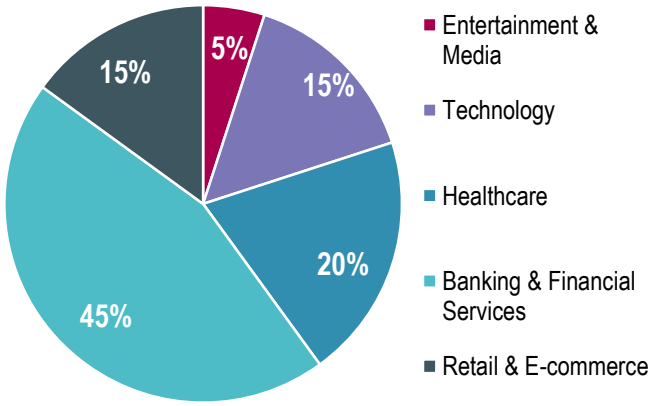
for **Providers**

- Providers continue to compete for tenants.
- Aggressive pricing structures still exist for credit tenants.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

Millennium Parties
Sentinel Data Center
1 MW

QTS purchase
DuPont Fabros
18 MW

Technology firm
Digital Realty Trust
130 kW

NEW YORK CITY

Supply

Total inventory: 1.21 m.s.f. / 166 MW
Total commissioned vacant: 156,000 s.f. / 21 MW
Under construction: 45,000 s.f. / 4.8 MW
Planned: 307,000 s.f./ 40 MW

Demand

Net absorption: 2 MW YTD

Rental rates

< 250 kW: $300 - $700/kW (all in)
> 250 kW: $250 - $500/kW (+E)

Data center overview

Supply in New York state and the New York City metropolitan area has stabilized, and no new providers have entered the market in the last 24 months. In both places, we have observed that third-party colocation providers are taking a "just-in-time" approach to wholesale market demand by increasing supply with a committed lease in hand rather than as forecasted supply. Wholesale market supply generally comes in the form of shell space easily convertible into turnkey space on a six-month average. In the city, Digital Realty, Sabey, and DataGryd are the only competitors, while 1547 in Orangeburg is the only wholesale option outside Manhattan. Overall, retail colocation providers continue to see good absorption and price stabilization, as there is a limited supply of quality space.

Demand has recently been flat. One notable factor is significant vacancy at Sabey's 375 Pearl, which has been pushing down starting rates throughout the market.

Market trends are being driven by factors like commercial utility rates, which in the state of New York are $.134/kWh. This may be down $.026/kWh year-over-year, but it is also 24.2 percent higher than the national average of $.1015/kWh. Additionally, overall employment growth has been up 2.9 percent year-over-year, a sign of economic vitality that is in turn of value to data center providers.

Outlook

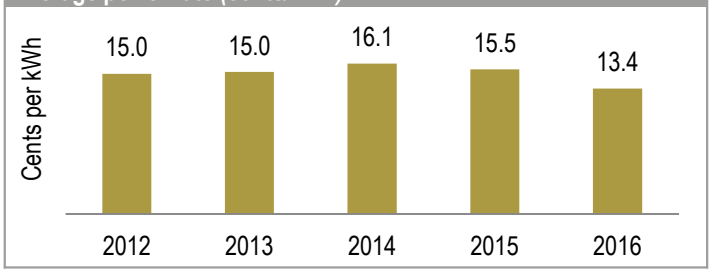
for **Users**

- Supply has leveled out and retail rental rates have stabilized.
- Wholesale rates are trending down slightly with open vacancies.
- Wholesale users can leverage these trends to negotiate favorable ramp terms and flexible expansion options.
- Cloud Interconnect and managed infrastructure solutions are readily available.

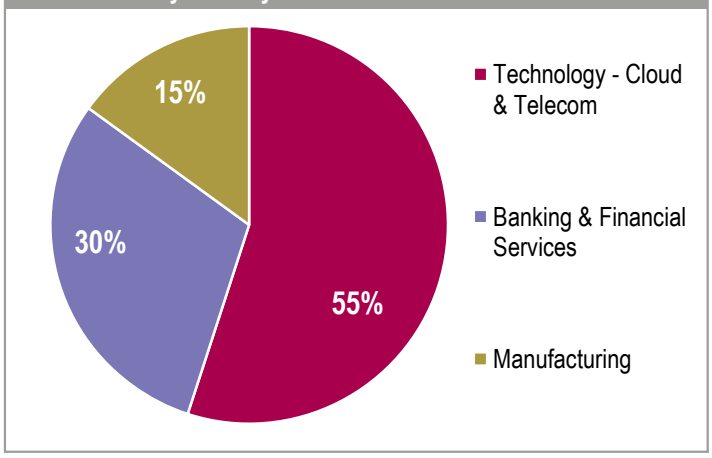
for **Providers**

- User demand is below the three-year average, with users preferring more favorable conditions in Northern Virginia and healthy supply in New Jersey.
- Supply will no longer be added speculatively.
- Pay as you go models will increase in usage.

Average power rate *(cents/kWh)*

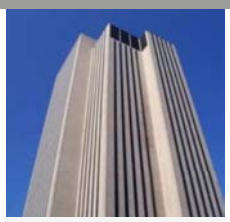


User demand by industry



2016 significant data center transactions

Confidential
60 Hudson
17,801 s.f.



Transit Wireless
375 Pearl
11,000 s.f.

Confidential
111 8th Ave.
6,396 s.f.

NORTHERN VIRGINIA

Supply

Total inventory: 11.2 m.s.f. / 77.6 MW
Total commissioned vacant: 258,615 s.f. / 41.0 MW
Under construction: 1.13 m.s.f. / 103.1 MW
Planned: 2.67 m.s.f. / 290.8 MW

Demand

Net absorption: 78 MW YTD

Rental rates

< 250 kW: $225 - $350/kW (all in)
> 250 kW: $120 - $130/kW (+E)

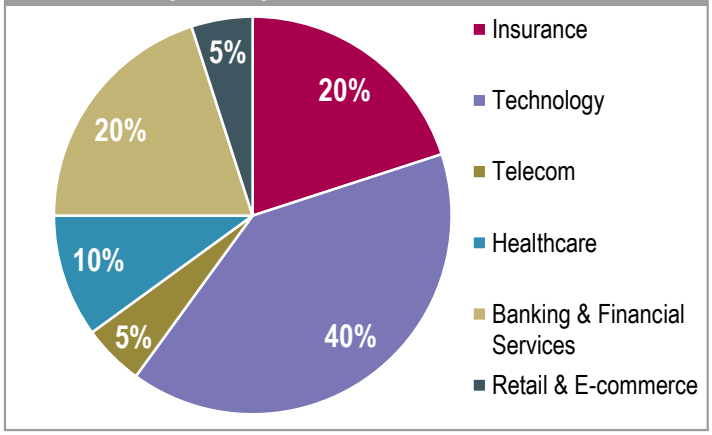
Data center overview

Supply in Northern Virginia (NOVA) is experiencing historic annual market demand, making this one of the most active and vibrant data center markets globally. With more than 103 MW of new supply under construction, an abundance of annual demand ensures the new space will be filled rapidly upon completion.

Demand is being driven by a confluence of salient factors making NOVA a dominant expansion market for both new and existing third-party data center providers, as well as cloud providers with their own facilities, thanks to historic absorption and quality enterprise users.

Market trends show providers and enterprise users alike are drawn to NOVA's rich fiber optic networks, low latency, and access to all cloud providers. Three new major TransAtlantic subsea cables (MAREA, BRUSA, and SAEx) will deliver direct connections to Europe, Brazil, and South Africa, significantly reducing dependency on New Jersey or New York—while also providing greater connectivity. Cloud computing, Dot-com 2.0, and new SaaS users also continue to dominate market growth, AWS Direct Connect and Microsoft Azure ExpressRoute are also experiencing rapid growth in NOVA. Absorption is further enhanced by enterprise users and cloud providers that are turning to third-party providers because they can't build their own facilities fast enough to keep up with internal demand. Additionally, NOVA offers an abundance of available power at competitive rates ($.052/kWh), and proximity to federal government facilities and their burgeoning data center optimization initiatives.

User demand by industry



Outlook

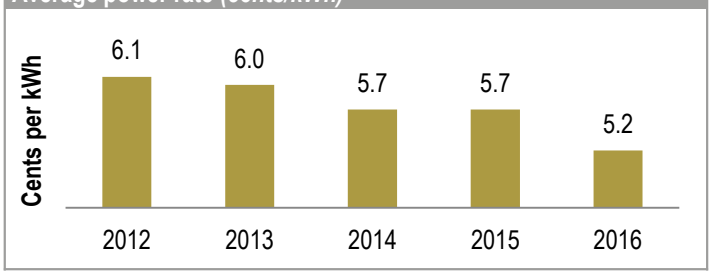
for **Users**

- Historic rent and concessions will continue into 2018.
- Retail colocation pricing will compete aggressively with wholesale.
- Power costs are at record lows and will be predictable for many years.
- Managed services and cloud offering are a significant consideration.

for **Providers**

- Rent compression will continue into 2018 as providers aggressively compete for users, market share, and participation in market velocity.
- The breadth of competition continues to expand as new providers enter NOVA and attempt to differentiate their service offerings.

Average power rate *(cents/kWh)*



2016 significant data center transactions

Microsoft
CyrusOne
35 MW

Apple
DuPont Fabros-ACC7
8 MW

New spec project
Sabey
70+ MW

NORTHWEST

Greater Seattle Area / Central Washington / Hillsboro, Oregon

Supply

Total inventory: 3.725 m.s.f. / 343 MW
Total commissioned vacant: 485,500 s.f. / 53.15 MW
Under construction: 185,000 s.f. / 19 MW
Planned: 431,073 s.f. / 45 MW

Demand

Net absorption: 22.25 MW YTD

Rental rates

< 250 kW: $250 - $350/kW (all in)
> 250 kW: $130 - $140/kW (+E)

Data center overview

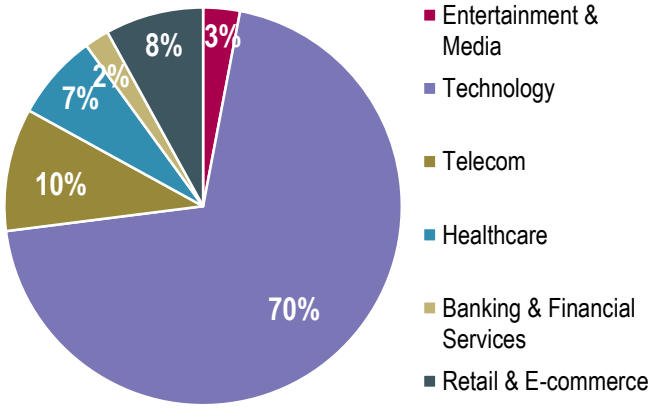
Supply is increasing in the Pacific Northwest due to large expansions by Sabey in Central and Eastern Washington as well as INFOMART in Hillsboro, Oregon. We have also documented interest from multiple large and mid-scale colocation operators looking to break into the Northwest.

Demand is still dominated by the technology industry. While 2015 experienced a few massive MW transactions, 2016 is more in line with standard demand metrics, with many transactions in the 200 kW-2 MW range. We are seeing a new influx of Asian corporations (primarily content delivery networks, e-commerce, and Internet service providers) beginning to establish data centers and routing equipment in the Northwest, while at the same time, aggressive data center expansions by colocation operators and managed hosting providers continues.

Market trends show the region is benefiting from sustainable power, with 80 percent of power estimated to be derived from hydropower. Inexpensive power and tax abatements help total cost of ownership here remain considerably lower than the national average.

Connectivity also plays a major role, with major telecommunications grids being enhanced to service Seattle's robust e-commerce platforms, and resulting in increased demand. New cables are continuing to land, with AWS, Microsoft, and Google all having vested interests in Pacific Submarine cables in Oregon.

User demand by industry



Outlook

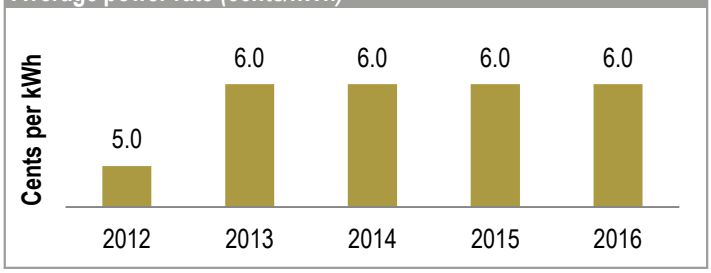
for Users

- Users can expect new options to be offered for consideration in the next 24 months in Hillsboro, Oregon, and Central Washington.
- Rental rates will remain competitive as the fight for establishment in Hillsboro continues.
- Seattle and Hillsboro are becoming major telecommunications routing hubs; expect more telco transactions.

for Providers

- New competitors are expected to enter the market.
- Nearly every existing operator is expanding in the Northwest, which indicates that while supply and competition are increasing, so is demand.

Average power rate *(cents/kWh)*



2016 significant data center transactions

EMC
INFOMART
Hillsboro, OR
1 MW

Healthcare insurance provider
Sabey
Quincy, WA
250 kW

City of Seattle
TierPoint
Liberty Lake, WA
380 kW

PHOENIX

Supply

Total inventory: 1.1 m.s.f. / 143 MW
Total commissioned vacant: 45,200 s.f. / 11 MW
Under construction: 60,500 s.f. / 13 MW
Planned: 386,300 s.f. / 66 MW

Demand

Net absorption: 14.1 MW YTD

Rental rates

< 250 kW: $250 - $325/kW (all in)
> 250 kW: $120 - $160/kW (+E)

Data center overview

Supply continues to increase due to advances by CyrusOne, currently in production to deliver its fourth building at its Chandler campus, and Aligned Data Centers, which is delivering the first phase of its 550,000 square-foot data center later this year. Local provider PhoenixNAP recently brought online additional turnkey space and power. From an enterprise data center perspective, Apple is in the midst of a $2 billion transformation of the partially solar-powered global command center.

Demand is predominately driven by West Coast-based companies attracted by the healthy amount of wholesale product available in the greater market. These companies view Phoenix as viable consideration for data center requirements because of the short latency to California while decreasing power and tax costs. With providers racing to deliver new space, demand from end users with regional requirements is expected.

Market trends demonstrate an increased absorption by cloud and Software-as–a-Service (SaaS) companies. This trend has been a result of the migration by enterprises away from traditional data center build-outs as they transition their infrastructure and software needs toward a public or private cloud environment.

Outlook

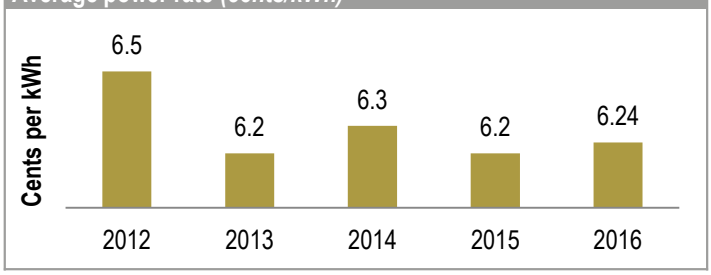
for **Users**

- Phoenix is a user-favorable market and provides competitive pricing and flexibility as new supply is delivered.
- New contiguous space will be available when Aligned Data Centers delivers a new product in the fourth quarter.

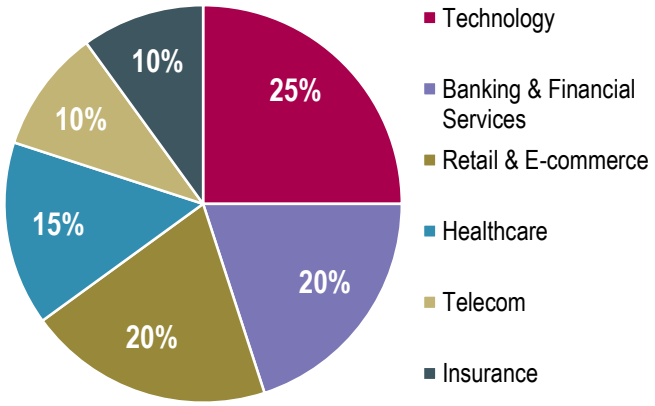
for **Providers**

- Providers will continue to compete for tenants, as long as turnkey space is available.
- Tenants are beginning to prioritize flexibility for expansion or reduction in square footage and power density.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

Financial services firm
CyrusOne
2.25 MW

Colocation provider
Aligned Data Centers
600 kW

Online travel firm
Digital Realty Trust
1.875 MW

SAN FRANCISCO BAY AREA

Supply

Total inventory: 4.6 m.s.f. / 424 MW
Total commissioned vacant: 105,000 s.f. / 17 MW
Under construction: 200,000 s.f. / 18 MW (leased)
Planned: 380,000 s.f. / 43 MW

Demand

Net absorption: 57.6 MW YTD

Rental rates

< 250 kW: $300 - $425/kW (all in)
> 250 kW: $145 - $175/kW (+E)

Data center overview

Supply remains at historically low levels for turnkey product in the Bay Area, and although several projects are planned, most planned inventory has been leased prior to construction. Absorption in the first and second quarters of 2016 was above the prior year's average, with multiple MW deals signed by cloud providers and software companies. We are also seeing a slight increase in rates and a turn towards a more landlord-driven market, with continued demand for new product—and scarce potential development space. In downtown San Francisco, the market is mostly made up of three buildings: 365 Main Street (mostly retail space with no available capacity), 200 Paul Street (60,000 square feet availability but only 4 MW power), and 400 Paul (200,000 square feet coming online in the first quarter of 2017).

Demand has been robust in 2016, with increased activity over 2015. Low inventory levels and a lack of construction suggest pricing will climb on wholesale and colocation leasing rates. Meanwhile, local technology companies, mobile apps, and cloud requirements also continue to drive growth.

Market trends show power rates are a driving factor in the area, with Santa Clara garnering interest for having some of the lowest power rates in California.

Outlook

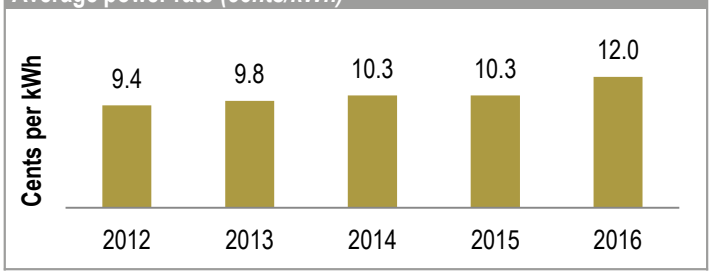
for **Users**

- Expect supply to remain constrained and inventory to become very tight.
- Pricing will remain stable in the short term, then trend upward later in the year.
- Available contiguous space will be priced at a premium.

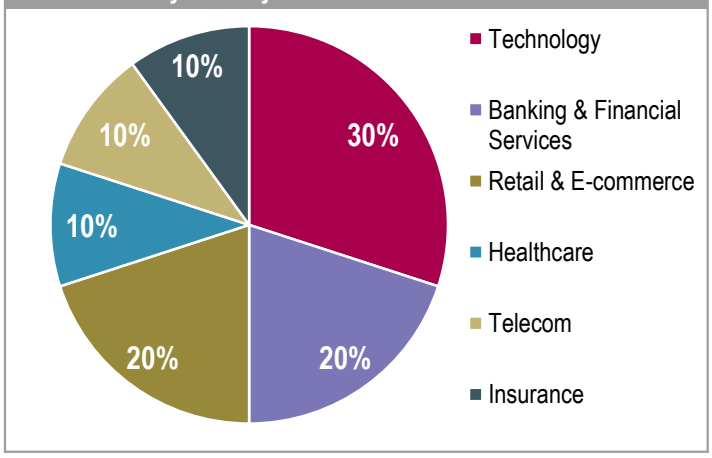
for **Providers**

- CoreSite, Vantage, DuPont, and Digital Realty will need to find new locations to build new product.
- Users will be looking for flexibility of N and N+1 redundancy.
- Inventory will be key to ensuring the continued organic growth of users.

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions

SoftLayer
InfoMart
San Jose, CA
2.6 MW

AWS
CoreSite
Santa Clara, CA
20 MW

Microsoft
Vantage
Santa Clara, CA
9 MW

GREATER MONTRÉAL AREA

Supply

Total inventory: 344,000 s.f. / 114 MW
Total commissioned vacant: 82,700 s.f. / 12 MW
Under construction: 324,000 s.f. / 80 MW
Planned: 393,000 s.f. / 115 MW

Demand

Net absorption: 8 MW YTD

Rental rates

< 250 kW: $280 - $460/kW (all in)
> 250 kW: $160 - $220/kW (+E)

Data centre overview

Supply has been increasing dramatically across Montréal—a trend that we anticipate continuing. New data center facilities completed include locations from COLO-D, Hypertec, Metro Optic, ROOT, Urbacon, and Videotron; CogecoPEER1 also recently launched its newest facility. We expect users to maintain significant leverage until existing supply and new construction is absorbed, most likely by mid-to-late 2017. By late 2017, lower vacancy should give providers the leverage to raise rates and scale back on incentives.

Demand is predominantly coming from cloud providers and technology firms, with additional activity from the gaming, insurance, financial, technology, hospitality, and healthcare sectors. New data sovereignty laws and the low cost of electricity are two of the main drivers of this diverse demand.

Market trends show cloud-based demand has risen dramatically in the Montréal market, with significant transactions now complete with AWS and Microsoft absorbing large amounts of capacity.

Utility rates here remain the lowest in Canada, at approximately CAD$.052 per kWh, and are expected to remain stable, thanks in part to the area's ample hydroelectric supply. Our expectation is that the market will become stronger in the near future, despite slow growth over previous years.

Outlook

for **Users**

- Users are increasingly looking more at powered shell wholesale colocation opportunities, since high quality built out options are minimal.
- Pricing should become more competitive as more supply comes to market.
- Tax incentives are available for users tapping more than 5 MW.

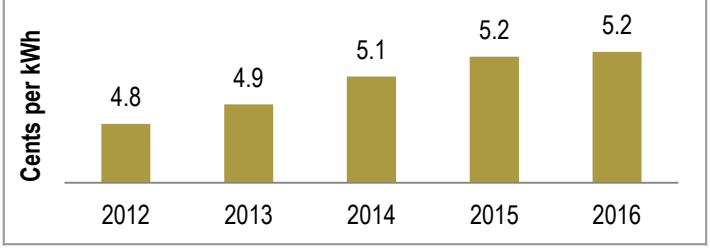
for **Providers**

- The significant amount of planned developments may have an impact on future pricing (downward pricing).
- Demand seems to be shifting from retail to cloud, and wholesale colocation with future cloud growth expected.

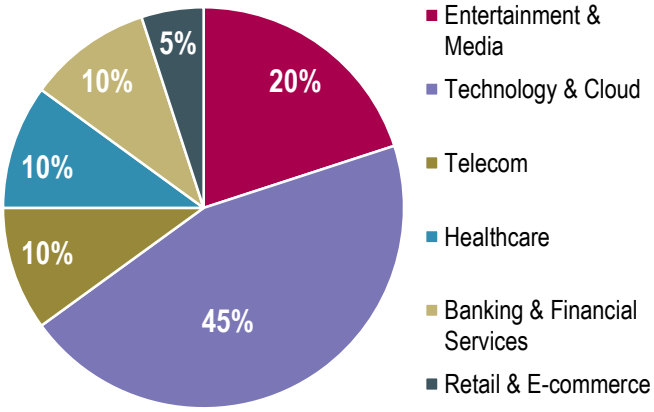
Q2 16 > Q3 16 > Q4 16 > Q1 17 > Q2 17

User favorable market
Neutral market
Provider favorable market

Average power rate *(cents/kWh)*



User demand by industry



2016 significant data centre transactions

Technology firm
Videotron
2 MW

IBM/SoftLayer
Banque Nationale
COLO-D
4 MW

Cloud firm
ROOT
800 kW

GREATER TORONTO AREA

Including Barrie & Kitchener/Waterloo Region

Supply

Total inventory: 1.14 m.s.f. / 174 MW
Total commissioned vacant: 229,000 s.f. / 46 MW
Under construction: 155,000 s.f. / 21 MW
Planned: 224,000 s.f. / 42 MW

Demand

Net absorption: 10 MW YTD

Rental rates

< 250 kW: $225 - $700/kW (all in)
> 250 kW: $150 - $190/kW (+E)

Data center overview

Supply is stable at the moment—but we see the potential for a market shift when two significant developments planned by DuPont Fabros and SuperNap come online. While both developments have been rumored for months, definitive plans have yet to be released. ICE Datacenters' purchase of the former HP enterprise data center will also add roughly 4 MW of new supply to the market in 2017. Interest in data center space continues to grow amongst both wholesale providers and enterprise users outside the financial core, and the rarity of second-generation facilities is translating into additional lag time for new supply to enter the market.

Demand is moving from a moderately balanced appetite between retail and wholesale from previous years, toward a heavier focus on the wholesale market. Several wholesale deals are now pending that should significantly absorb existing vacant space—and in turn reinforce decisions for new wholesale developments in the area.

Market trends show growing momentum for the cloud, with many cloud-based providers rapidly expanding within the market—seemingly undeterred by the fact that utility rates are still rising.

Outlook

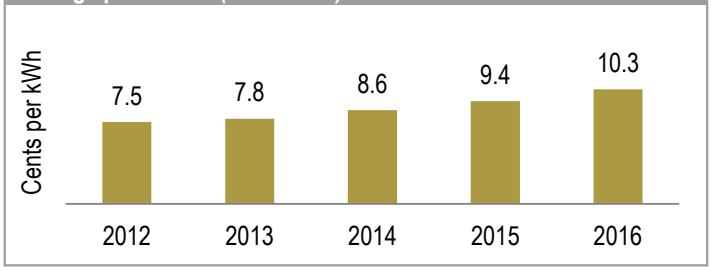
for **Users**

- Rents have not changed dramatically over the past 24 months, however, we expect marginal price softening in 2017.
- We recommend a full review of the market when considering a renewal or new deployment, as some providers are willing to stretch below the perceived market floor on pricing.

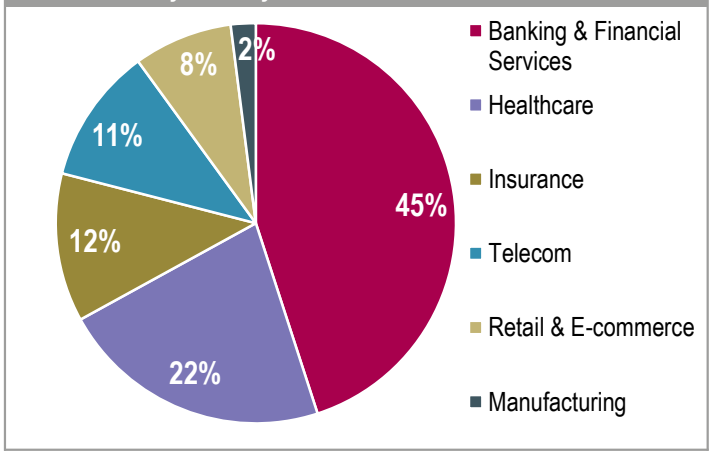
for **Providers**

- Retail demand seems to be softening, with a shift to a growing wholesale market.
- Planned new developments may have future pricing impact for existing providers with available space.

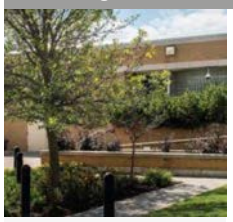
Average power rate *(cents/kWh)*



User demand by industry



2016 significant data center transactions



ICE Data Centers
Former HP Data Center
4 MW

Technology firm
Q9 Networks
1 MW

Technology firm
Rogers Markham
950 kW

WESTERN CANADA

Vancouver BC / Calgary AB

Supply

Total inventory: 900,000 s.f. / 174 MW
Total commissioned vacant: 132,000 s.f. / 46 MW
Under construction: 20,000 s.f. / 2 MW
Planned: 112,000 s.f. / 10 MW

Demand

Net absorption: 7.2 MW YTD

Rental rates

< 250 kW: $300 - $400/kW (all in)
> 250 kW: $200 - $250/kW (+E)

Data center overview

Supply in Calgary is holding steady, owing to the fact that there have been no significant builds since expansions by Shaw and Rogers. Some developments that had been planned for the area have since been postponed due to oil market volatility.

In Vancouver, supply is extremely limited, which is putting upward pressure on pricing. As a result, a few established operators such as Cologix are evaluating expansion opportunities in the area.

Demand is continuing in Calgary, despite low oil prices, due to its strategic telecommunications grid and low risk environment. Demand in Vancouver is also on the rise, with content delivery networks and e-commerce entities establishing data centers locally to tap into the affluent community and sufficiently robust telecommunications grid.

Smaller markets, including Edmonton and Kamloops/Kelowna offer extremely limited options, and are not likely to grow this cycle.

Outlook

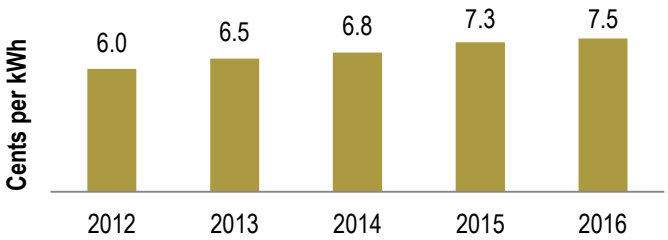
for **Users**

- The Calgary area has a limited amount of options to consider, unless the geographic search parameters are widened.
- Vancouver is expected to receive additional supply in the next 18 months, which may stabilize pricing.

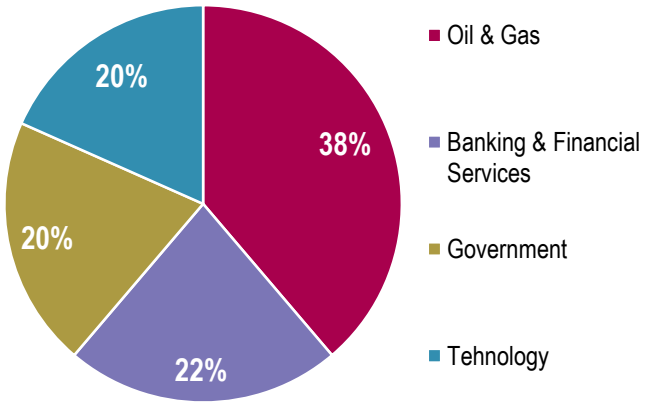
for **Providers**

- Calgary is expected to continue solid growth as it better connects with the data center community in Toronto.
- Vancouver has limited options suitable for data center conversion, so providers would do well to look for off-market opportunities only.

Average power rate *(cents/kWh)*



User demand by industry



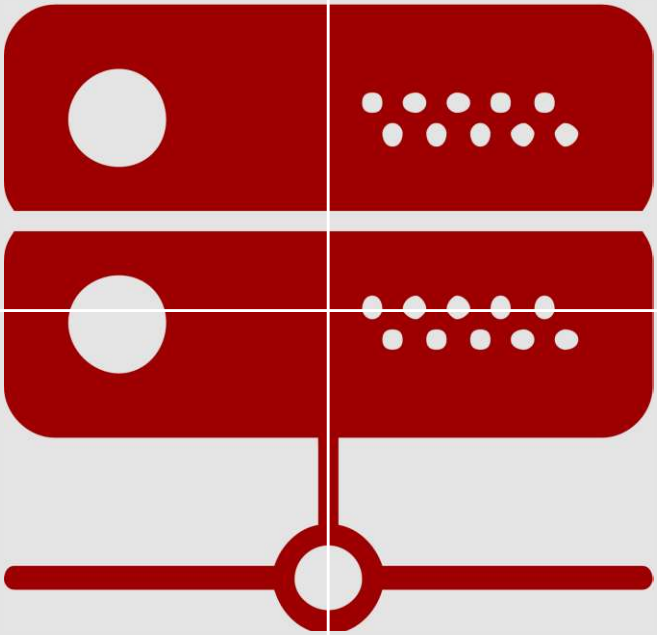
2016 significant data center transactions

Centrilogic
Confidential location
Vancouver, BC
250 kW

Oil/gas firm
Rogers
Calgary, AB
250 kW

Tech firm
Q9
Calgary, AB
~300 kW

LOCAL MARKET CONTACTS



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