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**

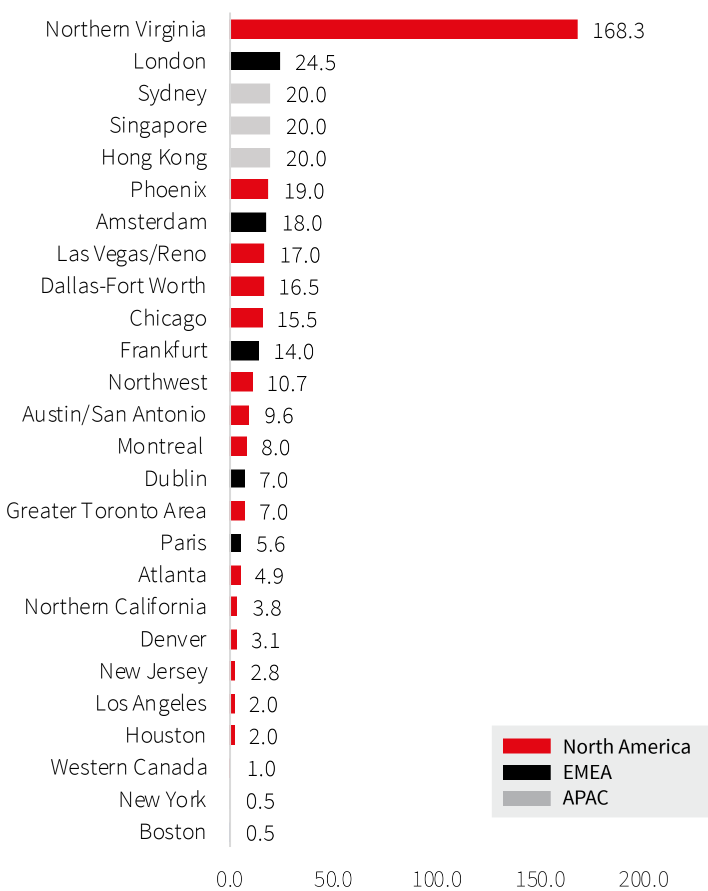
Source: Data-Economy

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.

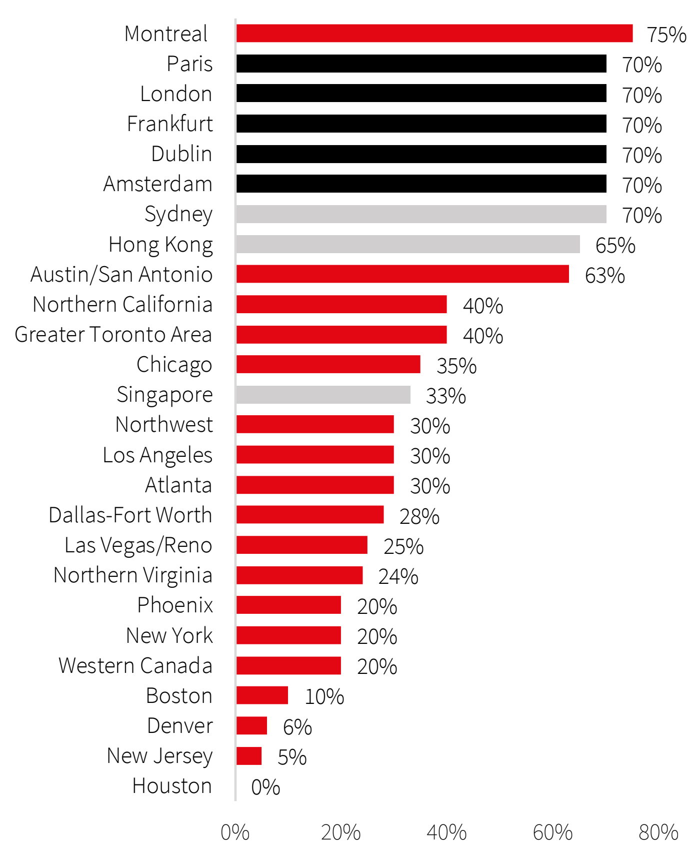
As per the past years, cloud activity continues to be a dominant absorption leader, with many markets exhibiting sizable uptake by the "Big 3" cloud providers. Cloud activity has also expanded beyond the core data center markets and has started to target the midtier cities for expansion. EMEA recorded 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

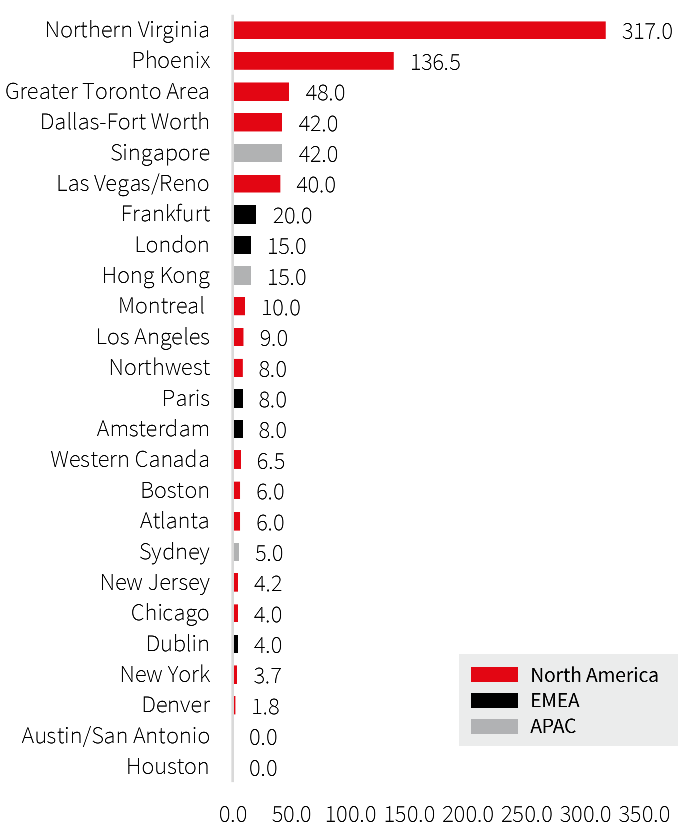
Cloud as percentage of absorption



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.

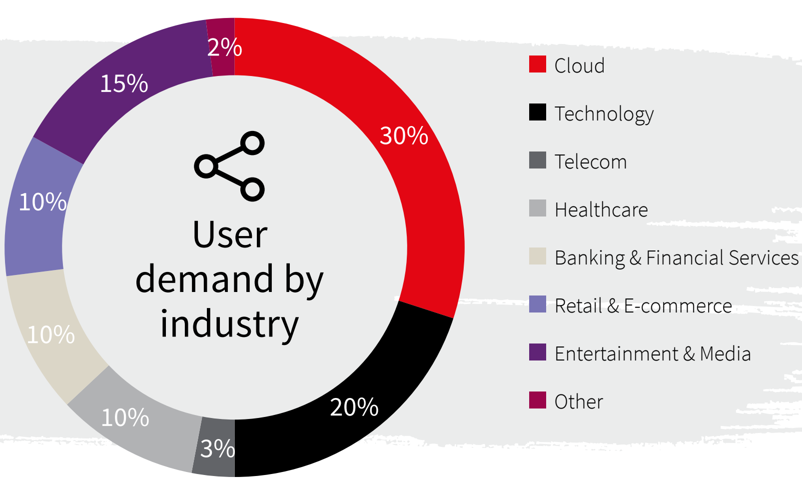
Outlook

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

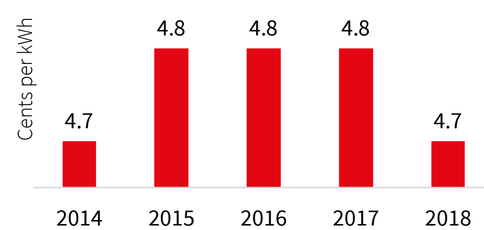


Supply	s.f.	MW
Total inventory:	1,797,000	215.0
Total vacant:	154,000	26.0
Under Construction:	40,000	6.0
Planned:	105,000	23.0

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**

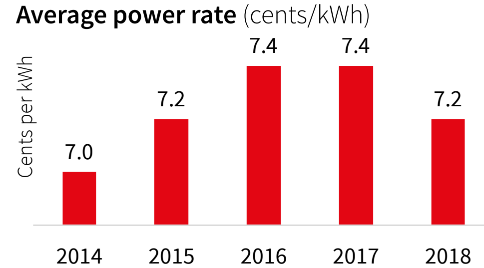
- Providing tight delivery timeliness for future capacity will be important
- Providing strong connectivity in state will be attractive to Users
- Cloud exchanges to regional hubs will help diversify product offering

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)

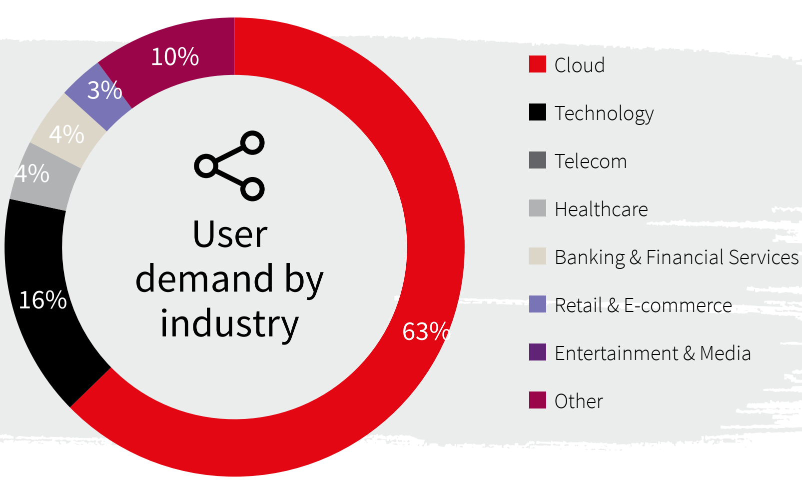
Average power rate (cents/kWh)



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.

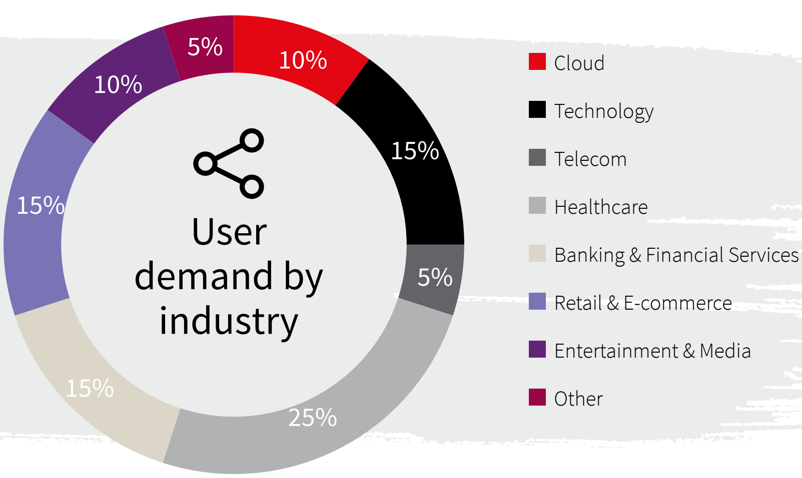
Outlook

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

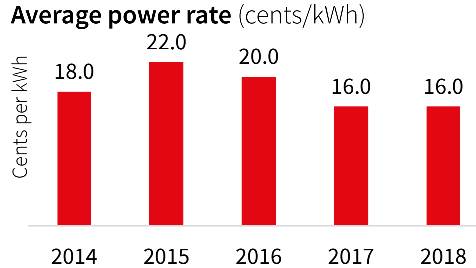


Supply	s.f.	MW
Total inventory:	1,200,000	160.0
Total vacant:	200,000	26.0
Under Construction:	25,000	6.0
Planned:	450,000	90.0

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.

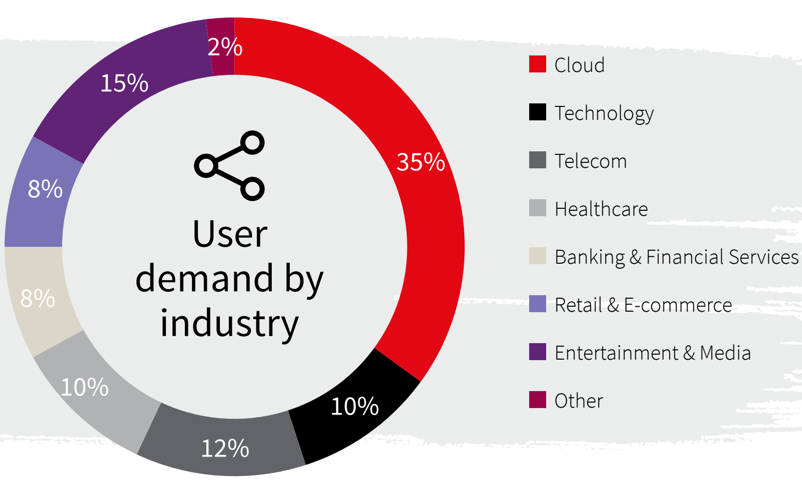
Outlook

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

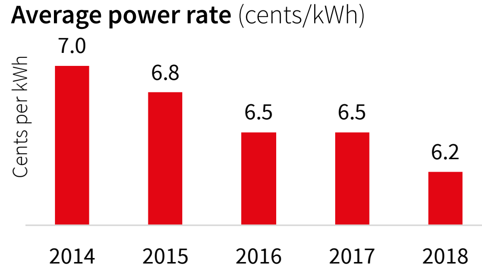


Supply	s.f.	MW
Total inventory:	4,299,000	546.0
Total vacant:	324,789	44.0
Under Construction:	53,333	4.0
Planned:	604,000	75.0

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.

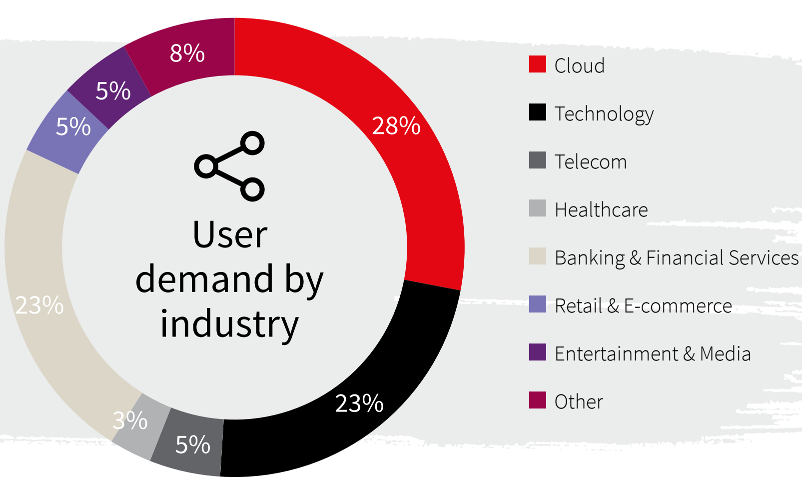
Outlook

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

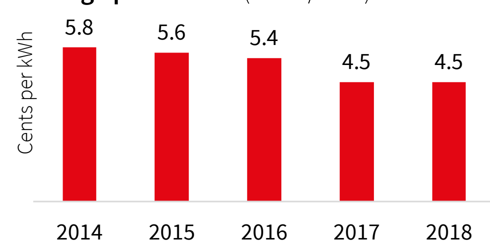


Supply	s.f.	MW
Total inventory:	3,729,690	505.4
Total vacant:	518,862	70.9
Under Construction:	226,595	42.0
Planned:	972,500	173.3

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.

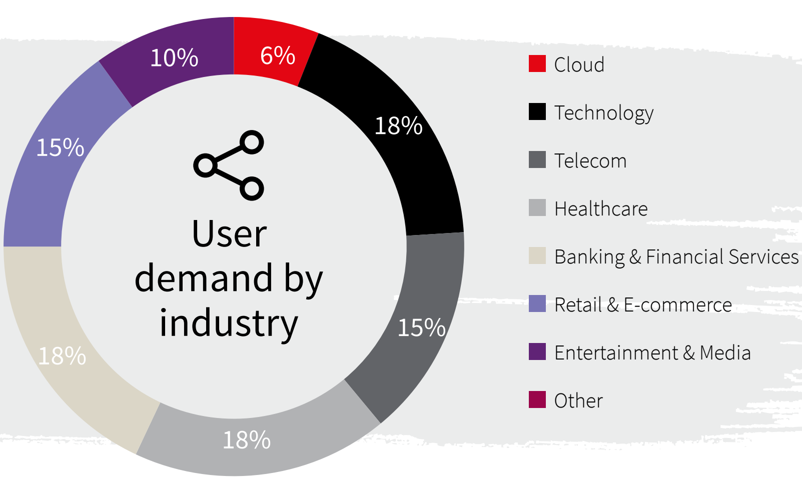
Outlook

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

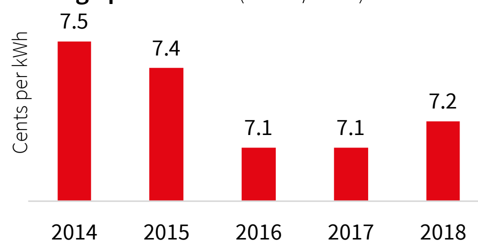


Supply	s.f.	MW
Total inventory:	863,511	130.1
Total vacant:	277,988	39.1
Under Construction:	4,140	1.8
Planned:	153,000	18.3

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.

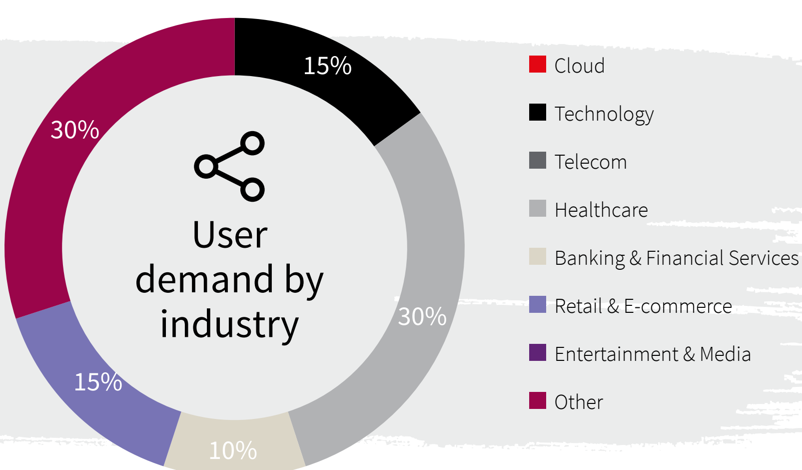
Outlook

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

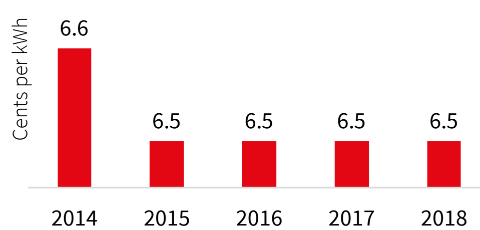


Supply	s.f.	MW
Total inventory:	1,049,266	119.4
Total vacant:	149,239	17.7
Under Construction:	-	0.0
Planned:	579,734	88.3

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.

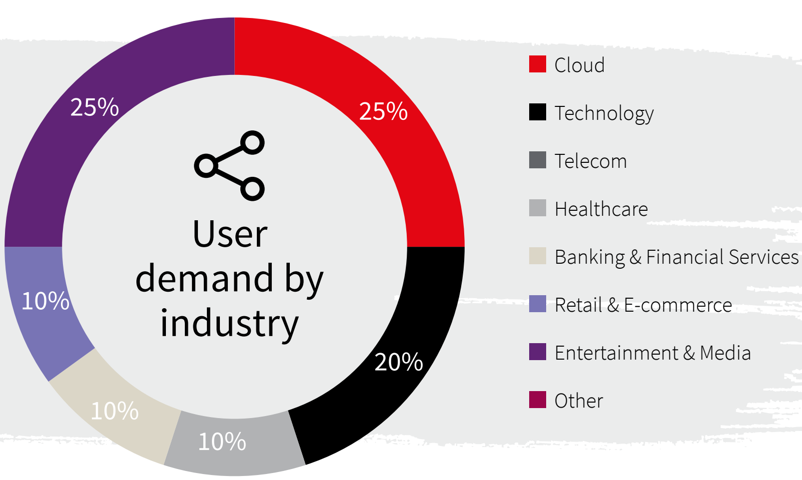
Outlook

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

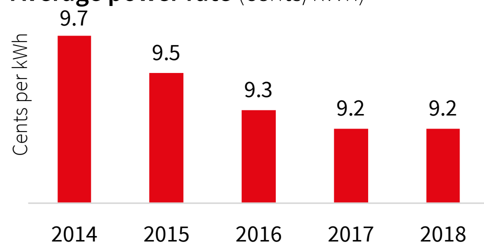


Supply	s.f.	MW
Total inventory:	3,580,471	416.0
Total vacant:	39,772	3.0
Under Construction:	381,881	40.0
Planned:	5,524,322	520.0

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.

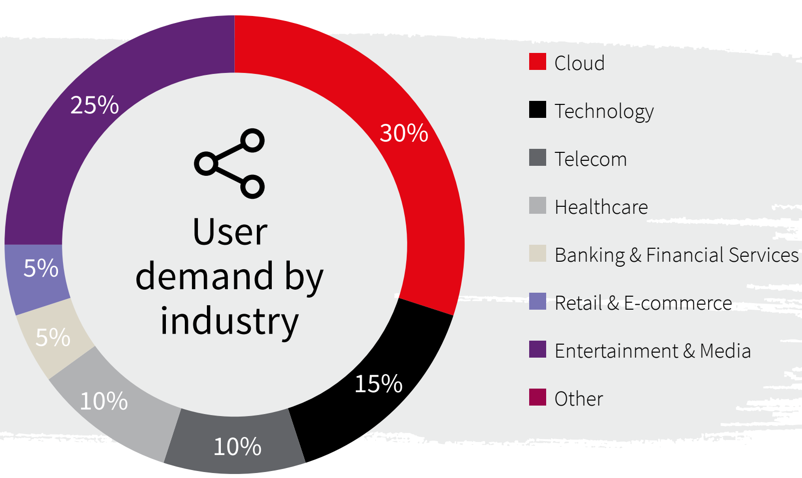
Outlook

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

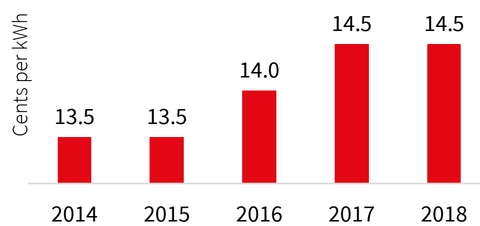


Supply	s.f.	MW
Total inventory:	2,300,000	210.0
Total vacant:	320,000	12.0
Under Construction:	100,000	9.0
Planned:	120,000	6.0

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.

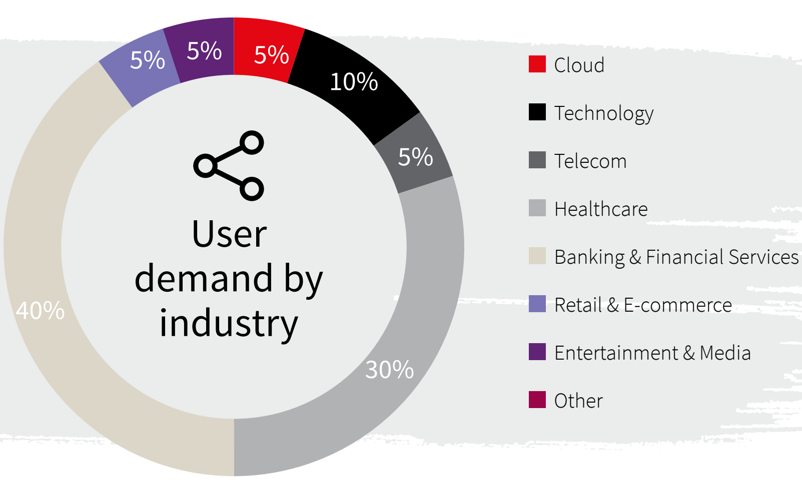
Outlook

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

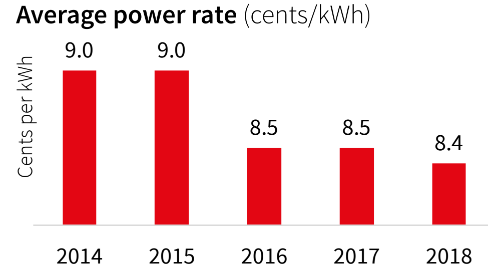


Supply	s.f.	MW
Total inventory:	3,400,000	342.0
Total vacant:	240,000	25.0
Under Construction:	38,000	4.2
Planned:	825,000	110.0

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.

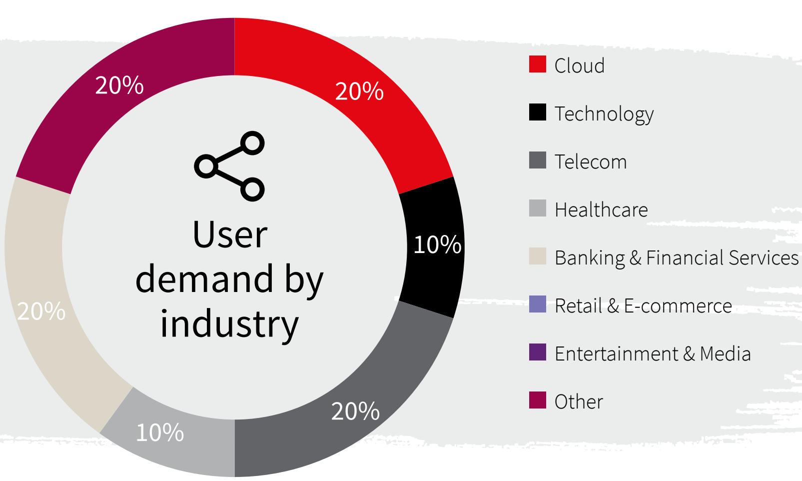
Outlook

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

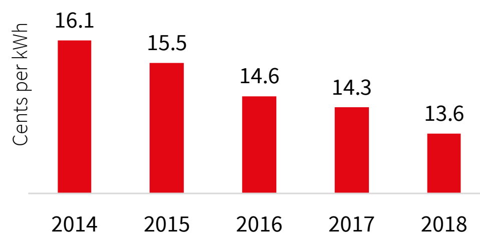


Supply	s.f.	MW
Total inventory:	1,020,000	152.0
Total vacant:	115,000	16.0
Under Construction:	37,000	3.7
Planned:	285,000	37.0

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.

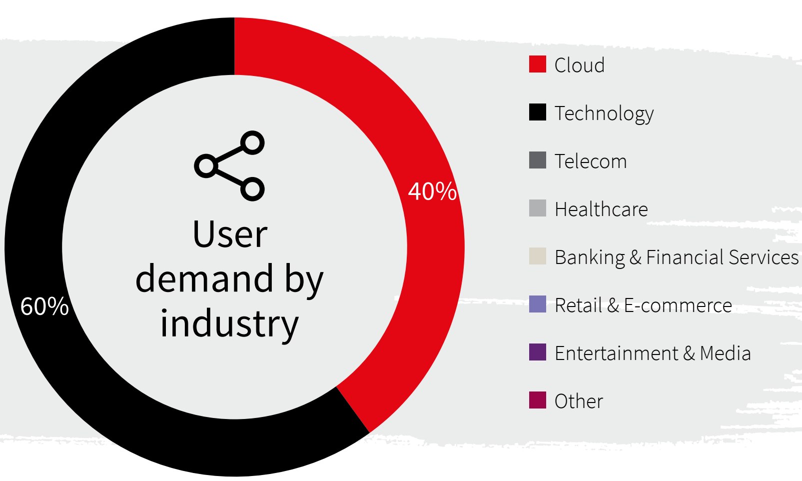
Outlook

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

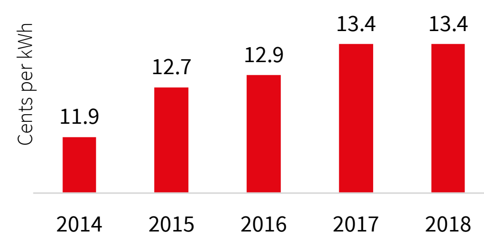


Supply	s.f.	MW
Total inventory:	3,876,000	581.0
Total vacant:	177,000	42.0
Under Construction:	-	-
Planned:	337,000	6.0

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).

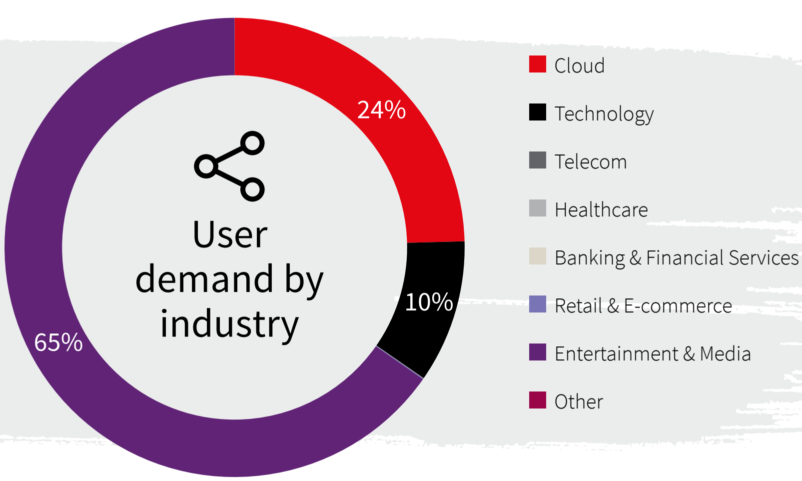
Outlook

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.

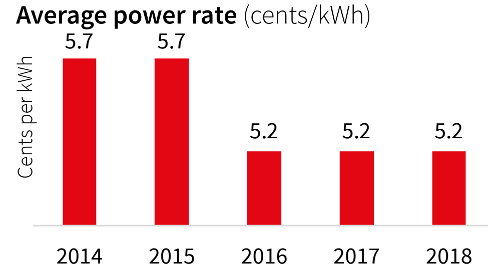


Supply	s.f.	MW
Total inventory:	5,578,085	920.2
Total vacant:	340,080	49.8
Under Construction:	1,653,004	317.0
Planned:	1,638,800	328.3

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.

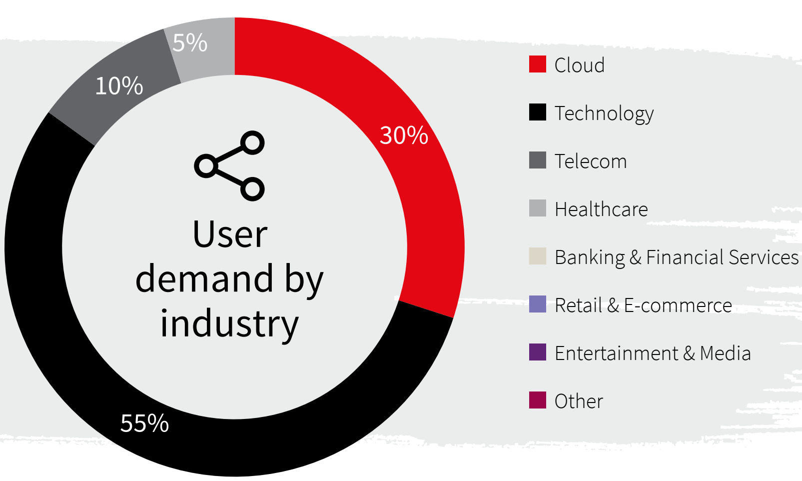
Outlook

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

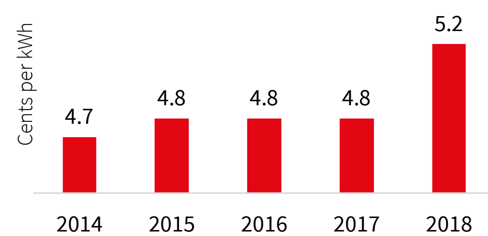


Supply	s.f.	MW
Total inventory:	1,500,000	197.3
Total vacant:	245,161	34.8
Under Construction:	52,048	8
Planned:	387,455	54.3

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.

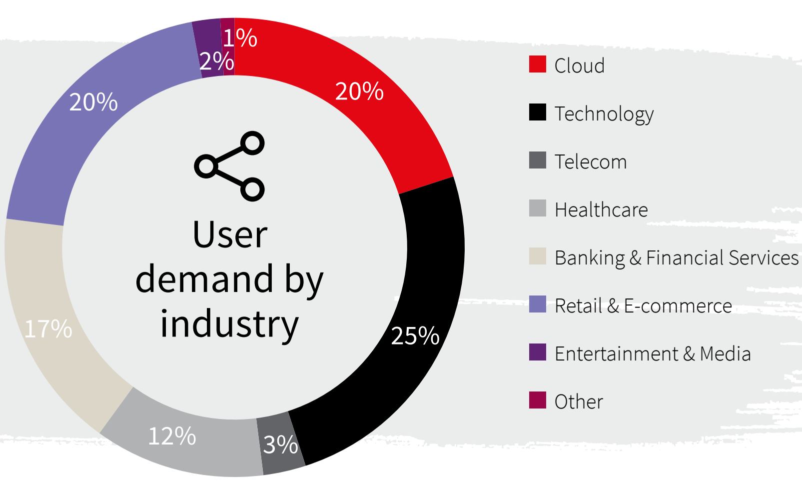
Outlook

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

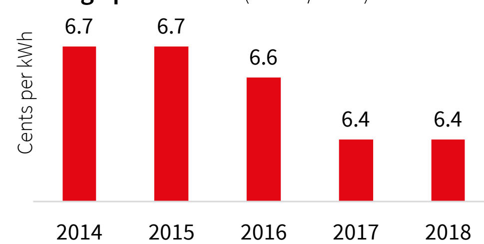


Supply	s.f.	MW
Total inventory:	1,746,013	244.9
Total vacant:	206,871	29.1
Under Construction:	551,630	136.5
Planned:	260,300	44.2

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

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
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.

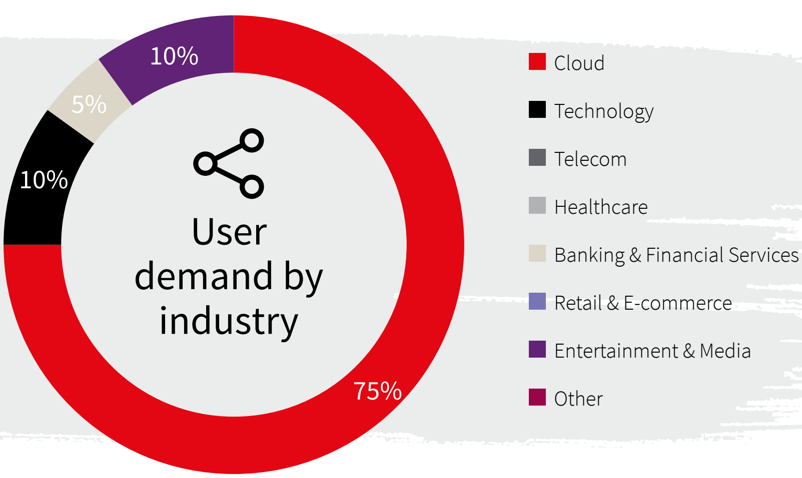
Outlook

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

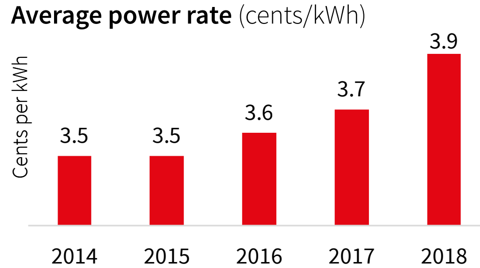


Supply	s.f.	MW
Total inventory:	617,333	127.0
Total vacant:	69,000	10.2
Under Construction:	69,000	10.0
Planned:	323,333	52.0

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.

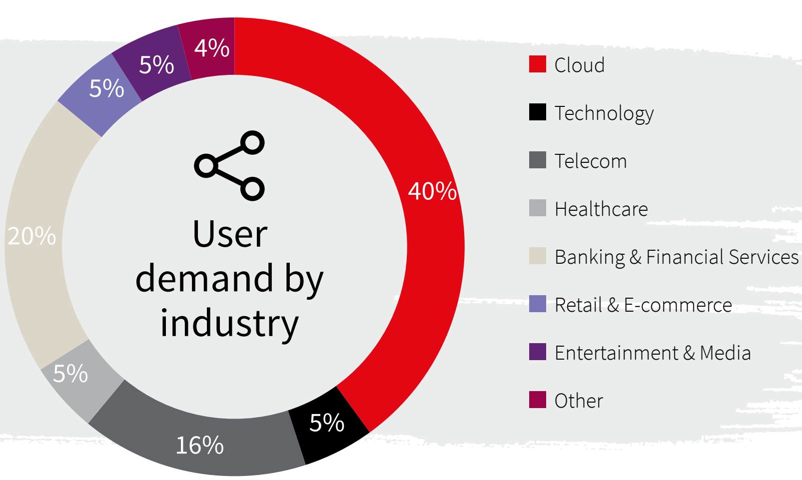
Outlook

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

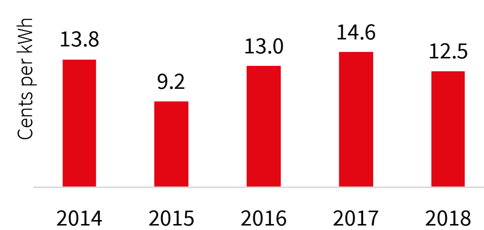


Supply	s.f.	MW
Total inventory:	1,540,000	225.0
Total vacant:	365,000	79.0
Under Construction:	231,000	48.0
Planned:	583,000	141.0

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.

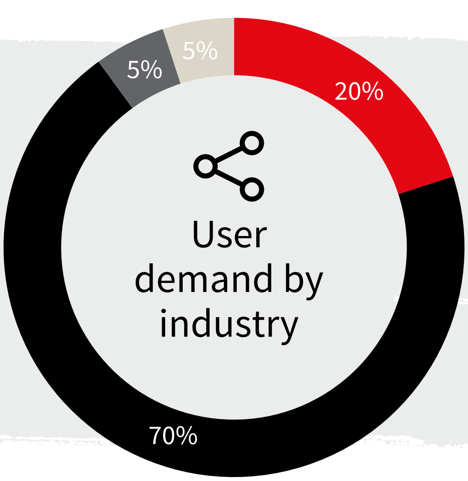
Outlook

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



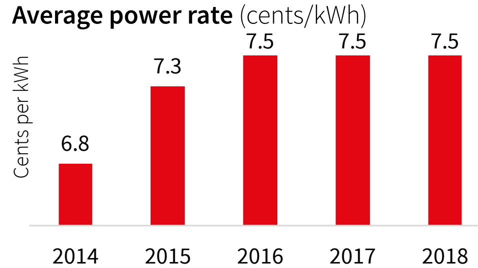
- Cloud
- Technology
- Telecom
- Healthcare
- Banking & Financial Services
- Retail & E-commerce
- Entertainment & Media
- Other

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.

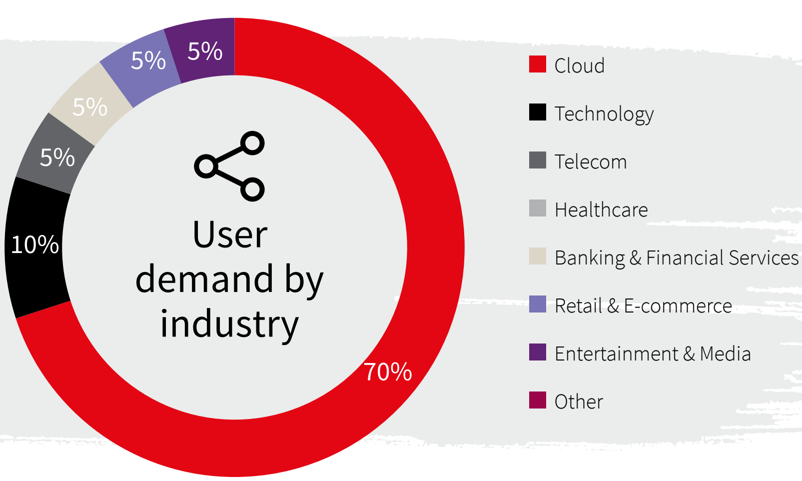
Outlook

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

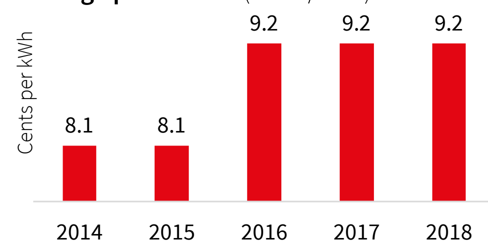


Supply	s.f.	MW
Total inventory:	17,300,000	292.0
Total vacant:	125,400	15.0
Under Construction:	40,000	8.0
Planned:	40,000	8.0

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

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.

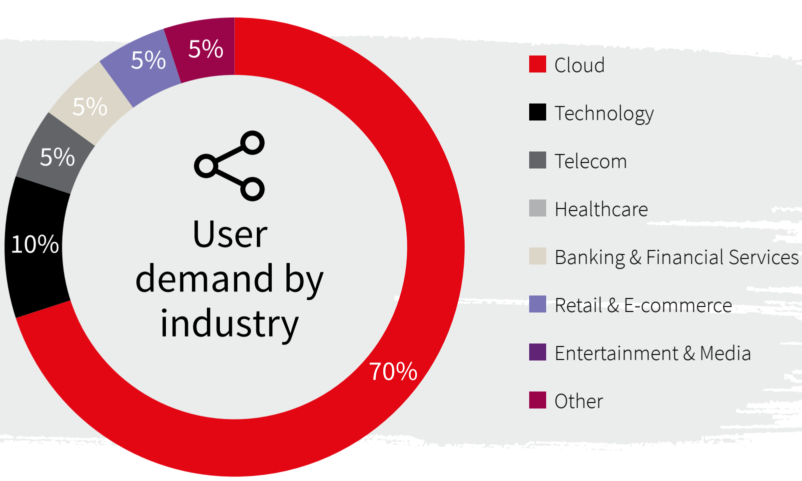
Outlook

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

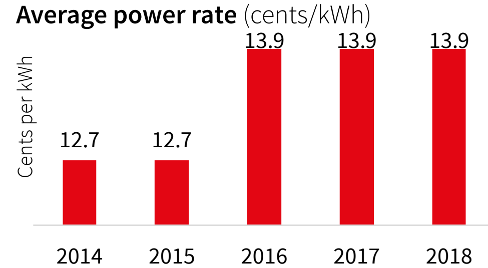


Supply	s.f.	MW
Total inventory:	573,091	100.0
Total vacant:	45,780	6.0
Under Construction:	20,000	4.0
Planned:	30,000	6.0

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

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**

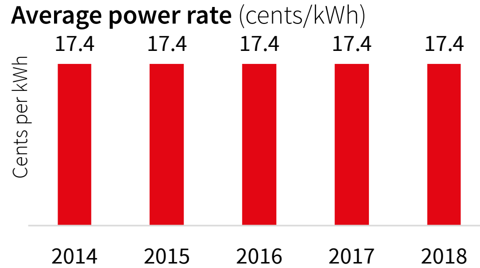
- Frankfurt remains the most competitive European location
- Power remains restricted in much of the city for new facilities
- Need for scale pushes new developments further out of town

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)



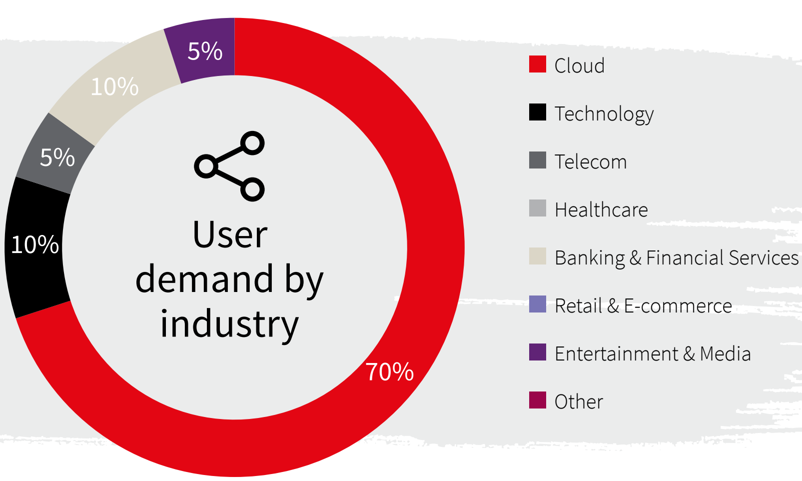
Data Center leverage

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.

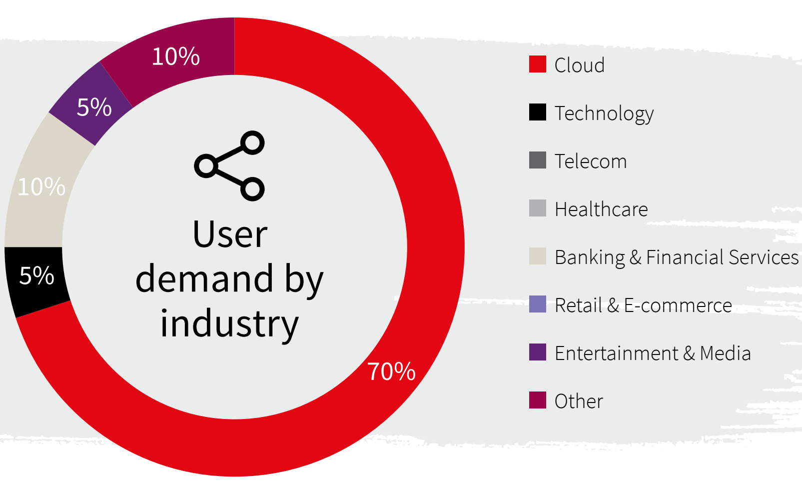
Outlook

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

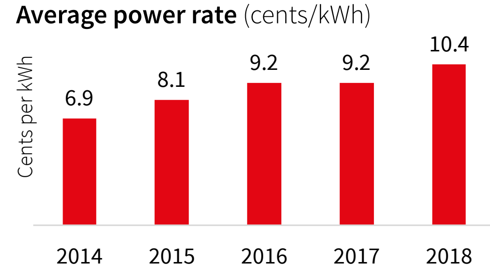


Supply	s.f.	MW
Total inventory:	4,250,000	516.0
Total vacant:	192,400	25.0
Under Construction:	80,000	15.0
Planned:	200,000	40.0

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

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	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.

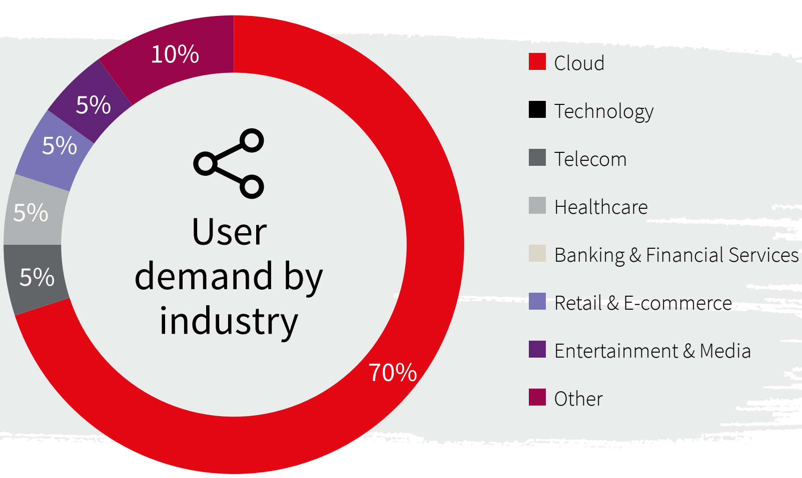
Outlook

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

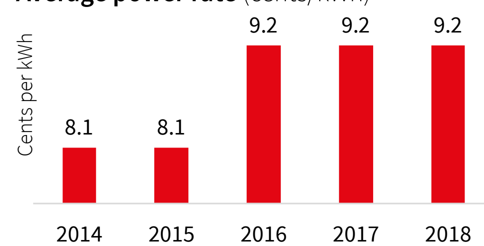


Supply	s.f.	MW
Total inventory:	1,640,000	180.0
Total vacant:	161,100	20.0
Under Construction:	40,000	8.0
Planned:	50,000	10.0

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.

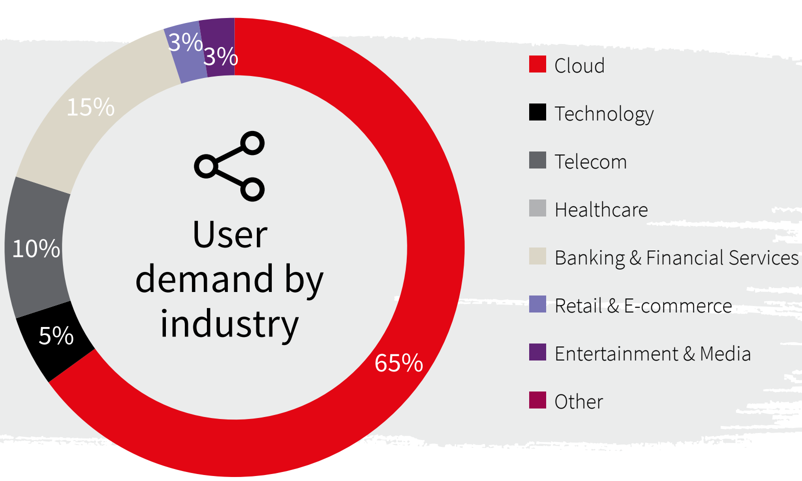
Outlook

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

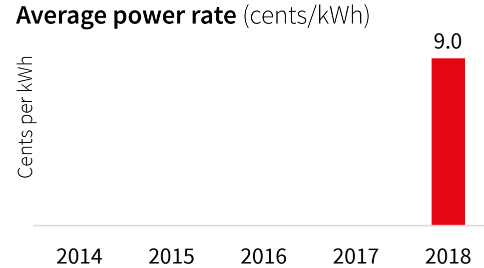


Supply	s.f.	MW
Total inventory:	5,383,333	285.0
Total vacant:	765,000	85.0
Under Construction:	210,000	15.0
Planned:	250,000	20.0

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.

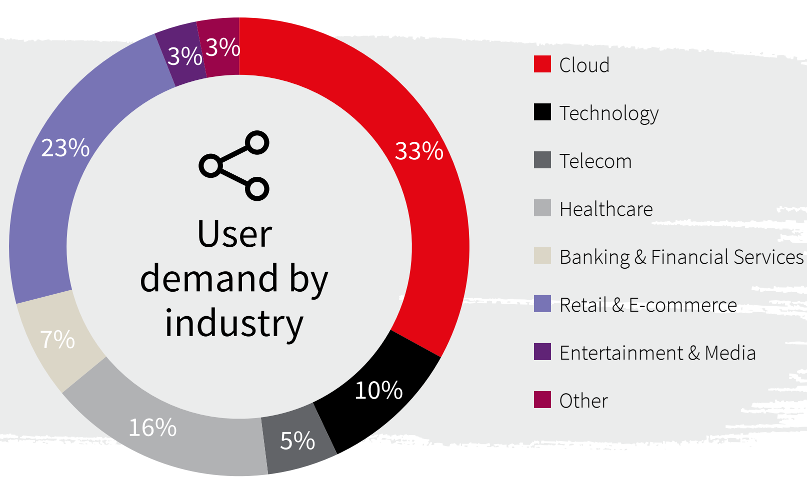
Outlook

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

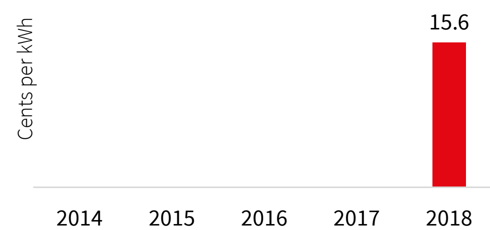


Supply	s.f.	MW
Total inventory:	4,200,000	330.0
Total vacant:	720,000	80.0
Under Construction:	660,000	42.0
Planned:	700,000	90.0

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.

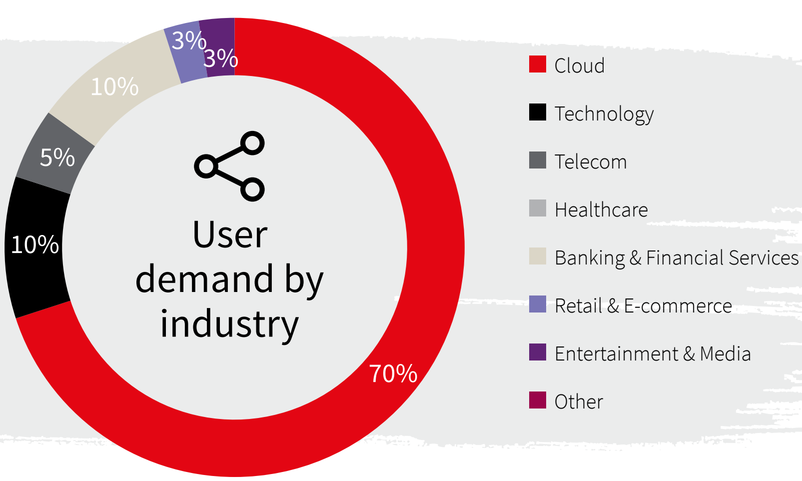
Outlook

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

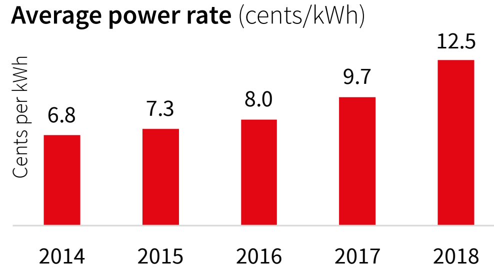


Supply	s.f.	MW
Total inventory:	1,555,000	200.0
Total vacant:	280,000	40.0
Under Construction:	65,459	5.0
Planned:	600,000	80.0

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

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

Contacts

Local U.S. markets

Atlanta
Mike Dolan
+1 404 995 2432
mike.dolan@am.jll.com

Ryan Fetz
+1 404 995 2132
ryan.fetz@am.jll.com

Leigh Martin
+1 404 995 2122
leigh.martin@am.jll.com

Wendy McArthur
+1 404 995 7429
wendy.mcarthur@am.jll.com

Austin & San Antonio
Bo Bond
+1 214 438 6238
bo.bond@am.jll.com

Ali Greenwood
+1 214 438 6237
ali.greenwood@am.jll.com

Curt Holcomb
+1 214 438 6240
curt.holcomb@am.jll.com

Boston
Gabe Cole
+1 617 531 4245
gabe.cole@am.jll.com

Chicago
Matt Carolan
+1 312 228 2513
matt.carolan@am.jll.com

Andy Cvengros
+1 312 228 3202
andy.cvengros@am.jll.com

Sean Reynolds
+1 312 228 3091
sean.reynolds@am.jll.com

Dallas / Fort Worth
Bo Bond
+1 214 438 6238
bo.bond@am.jll.com

Ali Greenwood
+1 214 438 6237
ali.greenwood@am.jll.com

Curt Holcomb
+1 214 438 6240
curt.holcomb@am.jll.com

Denver & Colorado Springs
Mark Bauer
+1 602 282 6259
mark.bauer@am.jll.com

Houston
Bo Bond
+1 214 438 6238
bo.bond@am.jll.com

Ali Greenwood
+1 214 438 6237
ali.greenwood@am.jll.com

Curt Holcomb
+1 214 438 6240
curt.holcomb@am.jll.com

Las Vegas / Reno
Mark Bauer
+1 602 282 6259
mark.bauer@am.jll.com

Los Angeles
Darren Eades
+1 213 239 6061
darren.eades@am.jll.com

New Jersey
Thomas Reilly
+1 973 404 1476
thomas.reilly@am.jll.com

New York City
Jason Bell
+1 212 812 6539
jason.bell@am.jll.com

James Quinn
+1 212 812 5952
james.quinn@am.jll.com

Gary Youm
+1 212 812 5943
gary.youm@am.jll.com

Northern California
Raul Saavedra
+1 415 354 6914
raul.saavedra@am.jll.com

Northern Virginia
Jeff Groh
+1 703 485 8833
jeff.groh@am.jll.com

Kelly McBride
+1 703 891 8382
kellya.mcbride@am.jll.com

Allen Tucker
+1 703 891 8396
allen.tucker@am.jll.com

Pacific Northwest
Conan Lee
+1 206 607 1723
conan.lee@am.jll.com

Phoenix
Mark Bauer
+1 602 282 6259
mark.bauer@am.jll.com

Local Canada markets

Greater Montréal Area
Conan Lee
+1 206 607 1723
conan.lee@am.jll.com

Greater Toronto Area
Stu Cox
+1 416 525 4132
stuart.cox@am.jll.com

Western Canada
Conan Lee
+1 206 607 1723
conan.lee@am.jll.com

Asia Pacific (APAC)
Jordan Berryman
+612 9220 8566
jordan.berryman@ap.jll.com

Bob Tan
+65 9760 8905
bob.tan@ap.jll.com

Europe (EMEA)
Martin Carroll
+44 0 203 147 1545
martin.carroll@eu.jll.com

Alex Tilley
+44 0 203 147 1544
alex.tilley@eu.jll.com

Research

David Barett
Senior Research Analyst
Americas Research
+1 949 296 3614
david.barnett@am.jll.com

Contributors

Bo Bond
Managing Director
Data Center Practice Co-Lead
+1 214 438 6238
bo.bond@am.jll.com

Mark Bauer
Managing Director
Data Center Practice Co-Lead
+1 602 282 6259
mark.bauer@am.jll.com

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