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WATCH

Data Centre

Still a Long Runway for Growth

May 2016

Contents

Executive summary

The growth story of data centres remains intact, if not stronger. The global co-location market continues to experience fast growth, with revenue projected to grow by 25.8% CAGR from 2015 to 2017. Some investors have however expressed concerns over disruptive technology; as with all technologies, disruptors are constantly emerging which could affect data centre demand and supply.

Technology innovation will always seek to increase operational efficiency. The inflection point of concern would be when the rate of miniaturization outpaces data generation, leading to reduced demand for physical data centre space. However, the global data explosion is still at the early part of its exponential curve, with the Internet of Things and big data forming the next wave of digital revolution and paving the way for more data creation, processing and storage. There continues to be developing technologies such as virtual reality and augmented reality that could provide more data growth. Global storage capacity is trying to keep pace with the growth of digital universe. Businesses' goal of keeping capital efficient, coupled with the increasingly complex regulatory and changing IT environment, will continue to encourage outsourcing demand.

While there could be disruptive technology leading to smaller and more efficient hardware requirements, technology adoption takes time. Any new product has to be proven reliable and cost needs to come down before widespread adoption. Nevertheless, operators have to continuously future-proof their data centres to keep them relevant. Speed, connectivity and a secure infrastructure will remain critical for data centres.

Data centre operators continue to build, acquire and redesign data centres, and expand regionally to meet the growing demand. Demand remains strong across the world and is broad-based, supported by requirements of various size and type.

The next wave of digital revolution will continue to shape businesses' operating models, technical and infrastructure needs. Technology innovation will continue to move towards operational efficiency which could reduce space take-up but increase power density per rack. Data storage needs amidst an increasingly complex regulatory and IT environment will continue to provide the impetus for outsourcing demand and there is still a long runway for growth. Operational expertise is key to future-proofing data centres. While competition has increased with a few large players expanding its global presence, the data centre market is expected to remain fragmented and track records remain important in securing and retaining tenants.

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Introduction

Since our last paper on "Data Centres: Fast Growing, Superior Quality and High Yielding Asset Class" in December 2014, the growth story of data centres remains intact, if not stronger. The global co-location market continues to experience fast growth, with revenue projected to grow by 25.8% CAGR from 2015 to 2017[1]. Some investors have however expressed concerns over disruptive technology; as with all technologies, disruptors are constantly emerging which could affect data centre demand and supply. This paper takes a closer look at the potential disruptors, future-proofing and demand dynamics of data centres.

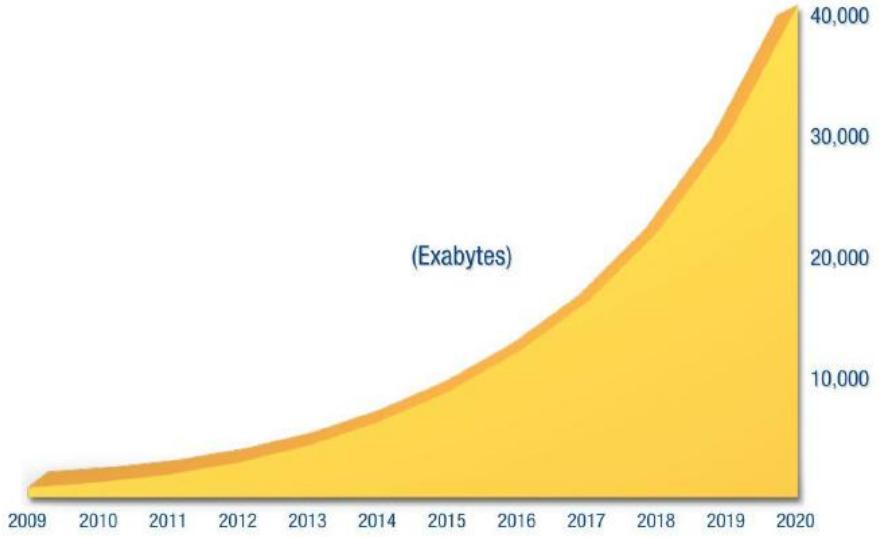
Data explosion

The global data explosion is still at the early part of its exponential curve, with the Internet of Things (IoT) and big data forming the next wave of digital revolution and paving the way for more data creation, processing and storage; and there continues to be developing technologies. Businesses' goal of keeping capital efficient, coupled with the increasingly complex regulatory and changing IT environment, will continue to encourage outsourcing demand.

Still early in the curve

The digital universe – existing digitally-stored data – is projected to grow at an exponential rate to 40,000 exabytes[2] from 2015 to 2020 (Figure 1). Internet adoption, IoT, big data, cloud computing will sustain this growth rate, which is equivalent to a CAGR of 25%, into the next five years. As more data will be processed and analysed in real time, global internet protocol (IP) traffic is projected to grow by 23% CAGR from 2015 to 2019[3]. The progression into 5G wireless network will support all these.

Figure 1: The digital universe into 2020



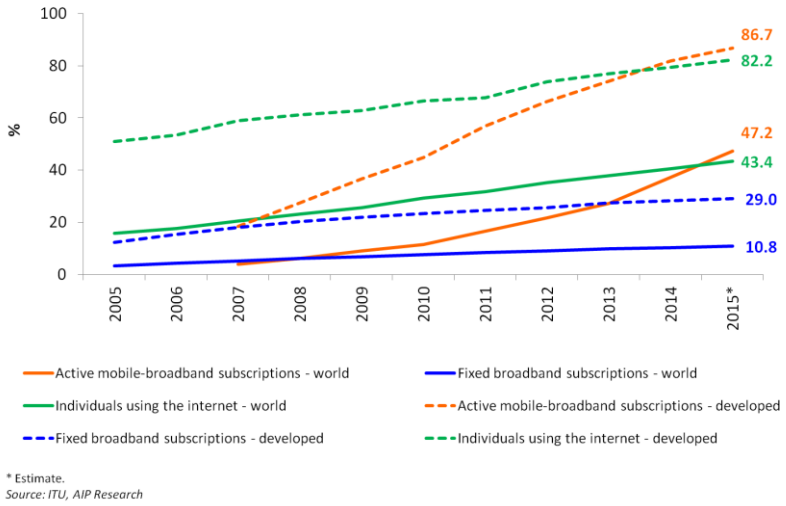
Source: IDC's Digital Universe Study, sponsored by EMC, December 2012

[1] 451 Research
[2] 1 exabyte = 10^18 bytes.
[3] Cisco, "Visual Networking Index 2014-2019", May 2015.

Global storage capacity is trying to keep pace with the growth of digital universe. According to IDC, installed raw capacity is projected to grow by 23% CAGR from 2012 to 2017. Capacity shipped continues to grow, with large-capacity hard disk drives shipped to data centres and cloud storage applications rising by 33%[4] in 2015.

Internet adoption: Despite a rapid growth of 12% CAGR in the number of internet users over the last decade, a substantial percentage of the world's population still does not have broadband subscriptions and there is room to grow. According to International Telegraph Union (ITU)[5], approximately 47.2% of the world's population have active mobile-broadband subscriptions while only 10.8% have fixed broadband subscriptions, compared to developed countries' 86.7% and 29.0% respectively (Figure 2). Falling prices of broadband subscriptions and digital devices should continue to encourage adoption.

Figure 2: Internet penetration rate, 2005-2015



* Estimate.
Source: ITU, AIP Research

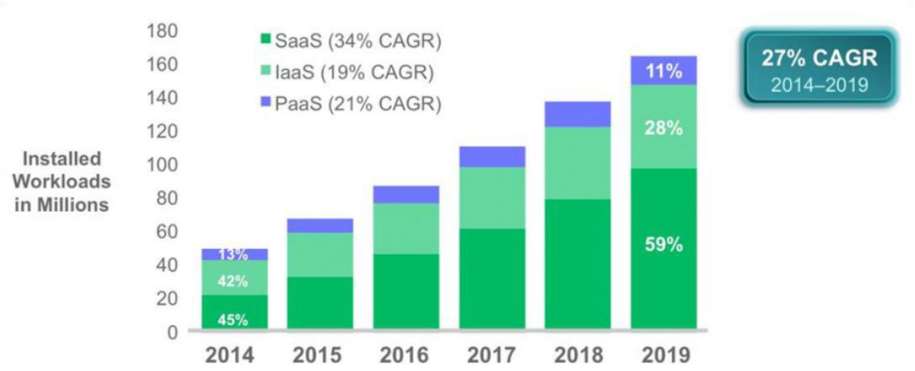
IoT: Smartphones and tablets are the first wave of digital revolution; IoT is next. IoT enables automation when smart objects such as driverless cars, tracking devices in shipping containers and wearable medical devices that capture health data are interconnected. This can be applied in nearly all fields and can be extended to enable smart grids, intelligent transportation, smart homes and smart cities. McKinsey estimated that the average smart home may contain 50 to 100 connected appliances, lights, thermostats, and other devices, each with its own low-power requirements[6]. IT research firm Gartner predicted that connected devices will grow by 34% CAGR to 20.8 billion units from 2016 to 2020[7].

[4] TrendFocus, "HDD Units Fall in 2015 but Storage Capacity Shipped Grows to 538 Exabytes", 23 February 2016. TrendFocus is a global data storage research firm.
[5] ITU is the United Nations specialised agency for information and communication technologies.
[6] McKinsey, "The Internet of Things: Sizing up the Opportunity", December 2014.
[7] Gartner, "Gartner Says 6.4 Billion Connected "Things" Will Be in Use in 2016, Up 30% rom 2015", 10 November 2015.

Big data: As we digitise more information and leave our digital footprints through smart devices and more businesses and governments recognise the value in aggregating and analysing these large data sets to gain fresh insights, big data has the potential to grow. The availability of free open source software such as Hadoop, NoSQL databases and Gephi to help users with big data analytics will encourage adoption. According to IDC, big data technology and services market is projected to grow by 26.4% CAGR to USD 41.5 billion through 2018[8].

Cloud computing: The adoption of cloud computing continues, up from 57% in 2012 to 72% in 2015[9]. As security concerns remain, businesses are putting the less sensitive and less important data in the cloud. Nevertheless, cloud computing remains a cost-effective IT strategy and further adoption will be encouraged by emerging cloud solutions, vertical cloud solutions, integration with big data analytics and cloud aggregators who package multiple cloud computing services into a bundle. As the uses of cloud computing such as online collaboration, e-commerce, digital or cloud-based payments, on-demand entertainment expand, demand for cloud computing services are expected to grow by 27% CAGR from 2014 to 2019[10] (Figure 3).

Figure 3: Global cloud computing services, 2014-2019



Note: Emerging cloud solutions can be aligned within the traditional software-as-a-service (SaaS), platform-as-a-service (PaaS), infrastructure-as-a-service (IaaS).
Source: Cisco Global Cloud Index, 2014-2019

New technologies continue to develop beyond what the world could only imagine before, which means that data growth could be underestimated. Virtual reality (VR) and augmented reality (AR) hardware, while currently having low adoption rates, have the potential to become the next computing platform after personal computers and smartphones. Goldman Sachs projects the VR and AR market to grow to USD 80 billion by 2025[11] while Deloitte predicts a stronger growth to USD 150 billion by 2020[12]. VR and AR technologies have practical applications. In real estate, potential home buyers can view shortlisted homes and obtain transaction details through their AR glasses; in logistics, forklift drivers can read information of containers just by looking at them. All these require data for location

[8] https://www.idc.com/prodserv/4Pillars/bigdata
[9] International Data Group (IDG), "Enterprise Cloud Computing Survey 2015".
[10] Cisco, "Global Cloud Index 2014-2019", 2015.
[11] Bloomberg, "Goldman Sachs Has Four Charts Showing the Huge Potential in Virtual and Augmented Reality", 13 January 2016.
[12] Deloitte University Press, "Tech Trends 2016: Innovating in the Digital Era", February 2016.

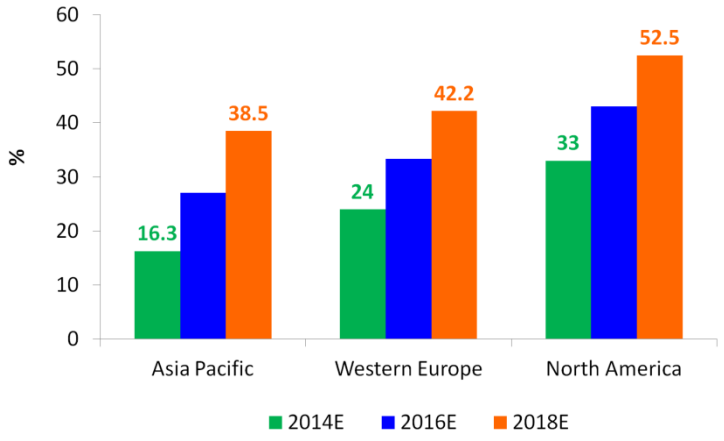
positioning, shared data and information to be retrieved on-demand from the cloud, which will also spur demand for cloud computing.

Outsourcing demand

Businesses continue to outsource their IT and data centre requirements to third-party service providers (Figure 4) to optimise cost, i.e. cut down on capital expenditure and ramp up on operating expenditure when necessary, amid increasing data centre complexities. Data centre management is becoming complex for two reasons: 1) the increasingly data-driven business landscape requires data centres to be more efficient, reliable and agile to support future business growth but many organisations lack the expertise; and 2) the increasingly stringent global regulatory environment continues to demand for greater data protection and security especially as more personal data are captured by IoT, big data, VR and AR.

Data residency regulations, which restrict the residency of certain data to the home country or region, will become more common. An example is Indonesia where financial institutions are required to keep their data within the country, and data centre operators and disaster recovery centres to operate in Indonesia only. The law was recently passed and pending implementation. While some data storage requirements will be shifted back to such countries and drive domestic data centre demand, we do not think the impact on regional data centre hubs will be significant as they will continue to be sought-after to host less sensitive data given their quality of service and performance, not to mention the explosion in data requirements as mentioned in the section above.

Figure 4: Outsourced data centre (% based on sq ft) by region, 2014-2018



Source: Broad Group, AIP Research

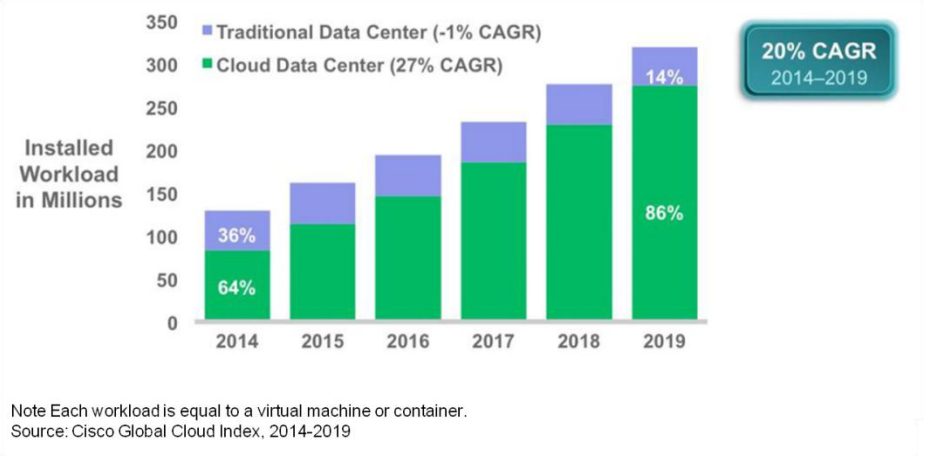
Potential disruptions?

Technology innovation will always seek to increase operational efficiency, hence data centre owners and operators must be aware of potential risks to physical space requirements if hardware miniaturization gathers speed. The inflection point of concern would be when the rate of miniaturization outpaces data generation, leading to reduced demand for physical data centre space. There are two potential threats from cloud computing and flash storage but they are manageable as discussed below.

#1: Cloud computing may reduce physical server space but overall workload to rise

Cloud computing can reduce the number of physical servers required per enterprise with more virtualised servers handling the processing work; but overall workload[13] is still expected to grow, with more workloads moving from traditional data centres to cloud data centres to leverage on public cloud (Figure 5). Global provider of movie and TV series streaming Netflix recently shut its data centre to move its streaming business to the public cloud. Cisco projected installed workloads in cloud data centres to grow by 27% CAGR, with those in the public and private cloud projected to grow by 44% and 16% CAGR respectively from 2014 to 2019.

Figure 5: Global workload distribution, 2014-2019



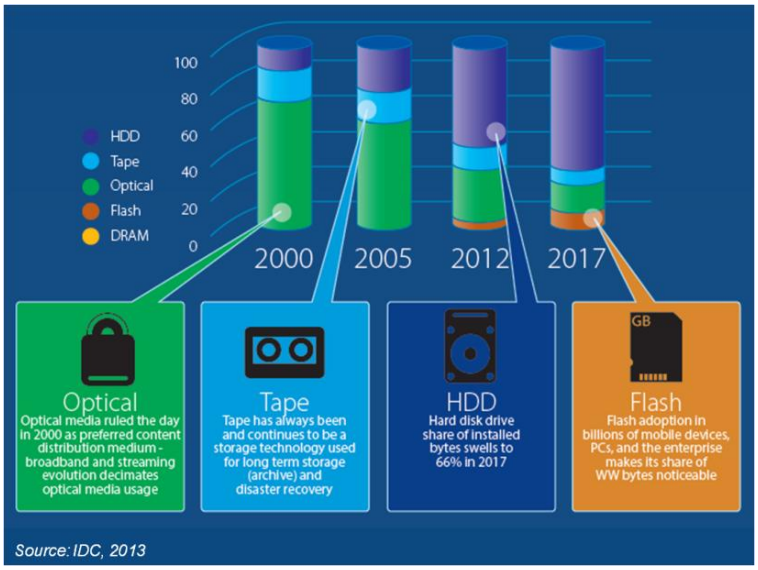
Note Each workload is equal to a virtual machine or container.
Source: Cisco Global Cloud Index, 2014-2019

#2: Flash storage may reduce physical storage space but consumes more power; adoption expected to be gradual

Flash storage, which can provide large amount of fast storage capacity to meet the demands of faster processor speeds, greater network bandwidth and server virtualisation in high-performance software applications and cloud computing, may reduce physical storage space but consumes higher power density i.e. kilowatt per rack or space. Data centres can thus charge on both space take-up and power consumption. Adoption rate is also expected to be gradual as it is only necessary for fast retrieval and cost is still an impediment although prices are falling. IDC expects flash storage to make up less than 20% of installed bytes by 2017 and not all will be in data centres (Figure 6). The availability of more powerful storage will also encourage more data creation and storage.

[13] Defined as a virtual or physical set of computer resources assigned to run a specific application or provide computing services for one or many users.

Figure 6: Worldwide installed bytes by media, 2000-2017



Future-proofing

While there could be disruptive technology leading to smaller and more efficient hardware requirements, technology adoption takes time. Any new product has to be proven reliable and cost needs to come down before widespread adoption. Nevertheless, operators have to continuously future-proof their data centres to keep them relevant. Speed, connectivity and a secure infrastructure will remain critical for data centres.

#1: Capital expenditure refreshment to keep pace with technological advancement

Capital expenditure refreshment for data centres is usually every 5-10 years depending on equipment lifespan. Interviews with data centre consultants suggest that data centres built within the last 10 years have not faced obsolescence yet, with building structure and mechanical and electrical components having gone through little changes. Experienced operators will plan their data centres such that the obsolescence of one component will not affect the rest.

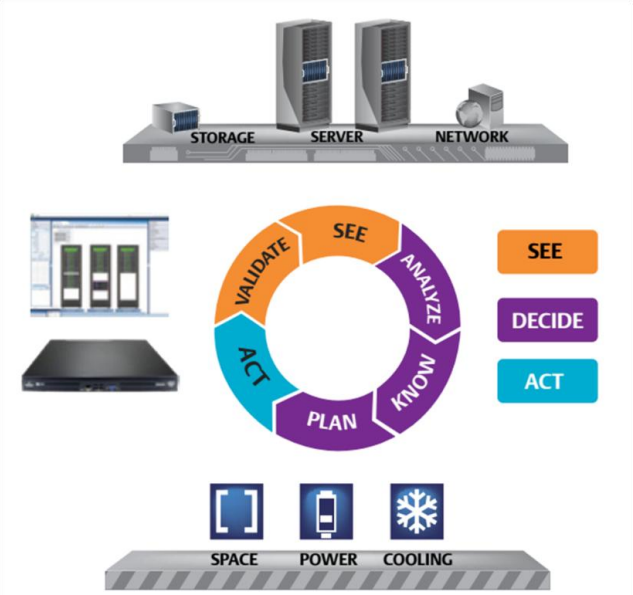
#2: Continuous improvement in speed and connectivity to handle workload demands

As enterprises use more high performance computing to handle large volume of data and real-time events, operators will need to ensure their requirements for processing power and speed are met by their data centres' power density, network capacity and connectivity. Some operators have partnered network carriers that have an extensive network linking to submarine cable landing stations to facilitate interconnects, providing customers with low latency and direct connectivity.

#3: Software-defined data centres to provide flexibility and agility to meet customers' needs and optimise operational efficiency

Data centres are increasingly required to scale up or down on capacity when needed; and the control of data centres is gradually moving towards data centre infrastructure management (DCIM) platforms that allow data centre operators to assess the current situation based on data collected and decide how best to operate their infrastructures (Figure 7). Currently, there are various DCIM platforms that allow operators to monitor power utilisation, temperature, cooling, airflow, humidity, rack power, etc for performance tracking and energy management. In future, DCIM could be fully automated to handle changeable workloads with flexibility and agility; for example, software-defined networking that can automatically increase its bandwidth in response to higher data traffic and automated cooling system that can maintain the appropriate temperature as temperature fluctuates with changeable workloads.

Figure 7: DCIM illustration



Source: Emerson Network Power, 2013

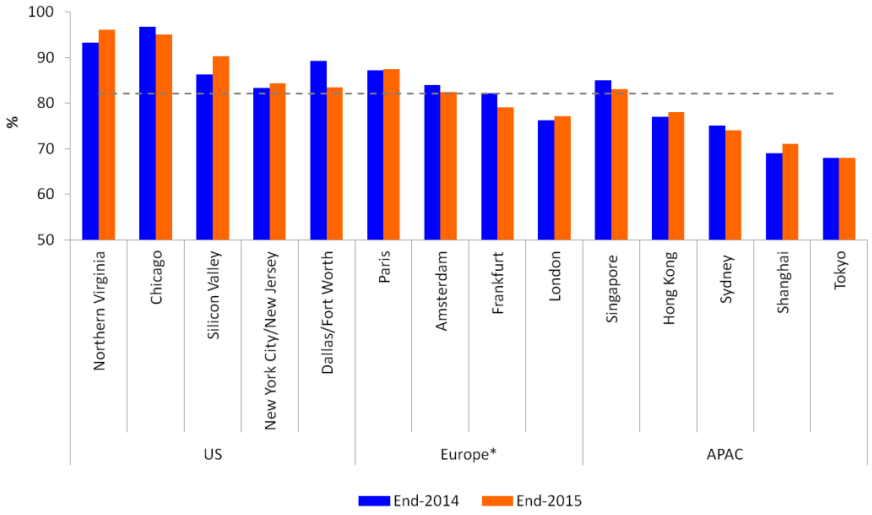
#4: Data centres to be more energy-efficient in the face of climate change regulations

Data centres use huge amount of energy and emit large amounts of carbon and increasing climate change regulations through forums like Conference of the Parties (COP) 21 will continue to affect how data centres operate. Global sustainability research firm Anthesis predicted that by 2020, data centre will consume around 140 billion kilowatt-hours and emit nearly 150 million metric tons of carbon pollution annually. There are talks of putting more data centres in cold climate countries to allow for free cooling. Those in hot climate countries will have to explore new cooling methods and new energy sources such as renewable and nuclear energy. In day-to-day operations, data centre operators can also advise tenants to use more efficient servers that can operate at higher temperatures, build in better airflow, better place the servers to facilitate cooling and leverage on district cooling.

Demand dynamics

Data centre operators continue to build, acquire and redesign data centres, and expand regionally to meet the growing demand. Construction activity tends to be higher in countries with stronger fundamentals. Demand remains robust across the regions and is broad-based, supported by requirements of various size and type. Utilisation rate is still high, averaging 82% across the world's major markets (Figure 8).

Figure 8: Utilisation rates across world's major data centre markets



*Reflects 3Q2015
Source: Broad Group, CBRE, AIP Research

Asia Pacific has a strong growth story. Demand is strong, with huge room for outsourced data centre space to grow (Figure 4).

- **Singapore** will have the largest capacity expansion and is becoming the preferred location to Hong Kong as a jumping-off point for China for this reason. Demand is broad-based, coming from enterprises, financial institutions, content companies and cloud service providers, with utilisation rate projected to increase from 83% in 2015 to 92.1% in 2018[14].

- **Hong Kong** will remain important given its proximity to China yet falling outside of the internet censorship jurisdiction although political concerns may deter some demand.

- In **China**, strong demand from enterprises and cloud service providers with modern data centre requirements will continue to drive outsourcing; only a quarter of data centre infrastructure is outsourced in China[15]. In **Beijing**, growth will be supported by the local government's effort to develop the capital city – which has a large headquarter base and thriving IT sector – into a cloud computing base to serve global business needs. As a financial centre and gateway to China, **Shanghai** has demand coming from foreign financial institutions. As the Shenzhen-Hong Kong stock exchange becomes prominent and requires low latency, **Shenzhen** is increasingly important.

[14] Broad Group, 2015.
[15] DatacenterDynamics, "China Data Center Market Trends 2012-2013".

- **Tokyo**, being the most populous metropolitan area in the world, has a large domestic market driven by companies in the media, gaming and financial industries.

- **South Korea** and **Taiwan** also have a strong domestic technology and telecommunications base respectively driving demand. Earthquake concerns in Japan continue to drive backup strategy in South Korea.

- In **Australia**, demand is driven by cloud service providers and enterprises seeking disaster recovery and business continuity services. Increasingly, more companies are deploying the dual strategy of locating their data centres in both **Sydney** and **Melbourne**, one of them being the backup.

- **Jakarta** is attracting more attention due to Indonesia's new data residency regulation which is driving data centre demand.

Europe sees continued demand from US-based IT infrastructure firms providing cloud services, with expansion mostly in the key internet hubs, i.e. **Amsterdam, Frankfurt** although they are moving towards **London** to deploy their next round of infrastructure. **Paris** sees softer demand as domestic firms particularly the financial institutions reduce their IT requirements amid the economic slowdown. The EU-US Privacy Shield is currently under debate to replace the earlier "Safe Harbour" rules; however if rejected, data may be required to be shifted back to Europe and boost data centre demand. The Safe Harbour rules previously allowed companies to store personal data in the US until the European Court of Justice invalidated it on account of insufficient data protection in October 2015.

Conclusion

The next wave of digital revolution will continue to shape businesses' operating models, technical and infrastructure needs. Technology innovation will continue to move towards operational efficiency which could reduce space take-up but increase power density per rack. Data storage needs amidst an increasingly complex regulatory and IT environment will continue to provide the impetus for outsourcing demand and there is still a long runway for growth. Even with disruptive technology, adoption takes time. Climate change regulations will become stricter but there is still time to invest in new technologies in anticipation of it. Hence, operational expertise is key to future-proofing data centres. While competition has increased with a few large players expanding their global presence, the data centre market is expected to remain fragmented and a strong track record remains important in securing and retaining tenants.

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