

Korea Data Centers



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Strong demand on industry restructuring

The market for data centers is expanding due to the surge in data consumption, especially for large and hyperscale domestic data centers.

- Data centers are commonly categorized by occupier type into owner-occupied Enterprise and for-lease Colocation centers.
- The significant rise in data consumption has led to substantial supply volumes of hyperscale centers worldwide.
- While the overall data centers market is showing robust growth globally, the hyperscale data center market in the Asia-Pacific region is most active.
- The Korean market for hyperscale data center possesses high potential for growth based on the nation's well-established IT infrastructure.
- The Seoul Metropolitan Area is currently and will likely remain the most-highly concentrated region on completion of upcoming future developments.

“Investment in hyperscale data centers is emerging as a new global trend and Korea is forecast to expand its market share with an upcoming influx of large-scale supply.”

SAVILLS RESEARCH

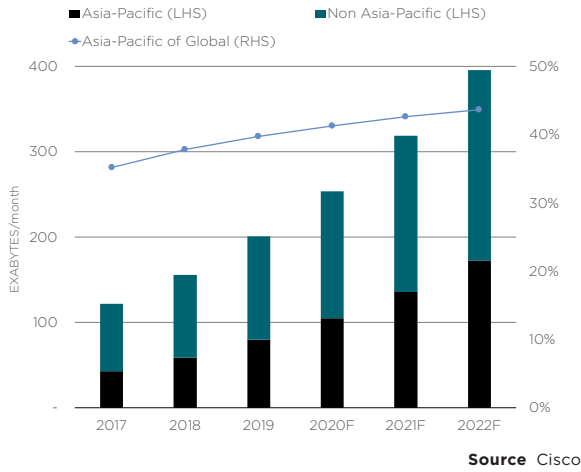
RESEARCH

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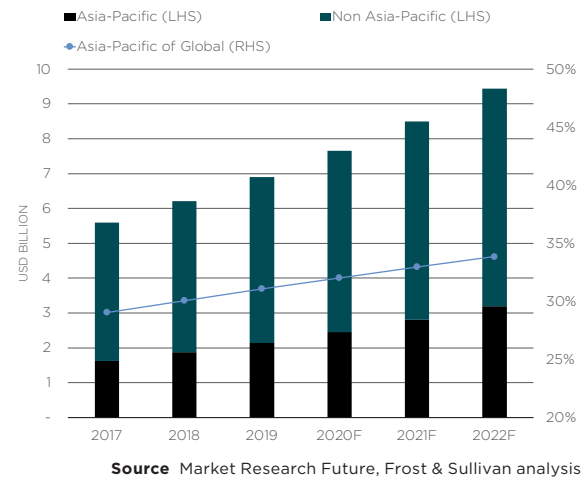
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GRAPH 1: Global and Asia-Pacific IP Traffic, 2017 to 2022(F)



GRAPH 2: Global and Asia-Pacific Data Centers Market Revenue, 2017 to 2022(F)



GLOBAL DATA DEMAND

According to Cisco, global data IP (Internet Protocol) traffic is forecast to increase at an average annual rate of 26% between 2017 and 2022 to reach 396 exabytes per month. Data usage volumes have gained pace alongside the development of ICT technologies such as OTT (Over The Top) services like YouTube, 5G networks, IoT (Internet of Things), and the cloud. The global OTT market size is predicted to grow at an average annual rate of 20% from 2014 to 2020, and the global 5G market at an average annual rate of 84% from 2020 to 2025. Global cloud services revenue will also contribute to the data traffic, growing at an average annual rate of 16% over the 2018-2022 period.

GLOBAL SUPPLY

The global data centers (“DC”) market is likely to record significant growth on rising data traffic volumes at an average rate of 11% from 2017 to 2022. The growth of hyperscale DCs, in particular, has been remarkable. The estimated number of hyperscale DCs in the world has doubled from 338 in 2016 to 628 in 2021, and the proportion of hyperscale DCs among all DC servers has doubled from 27% to 53% over the same period.

ASIA-PACIFIC DATA DEMAND

The uptrend in data consumption in the Asia-Pacific region is also steepening. According to Cisco, IP traffic in the Asia-Pacific region is forecast to rise at an average annual rate of 32% from 2017 to 2022, and its proportion of the worldwide total will continue to rise during the same period. Factors contributing to more data

usage in Asia-Pacific include include high bandwidth connectivity for smartphones and the internet, the adoption of wearable devices and the emergence of autonomous vehicles.

ASIA-PACIFIC SUPPLY

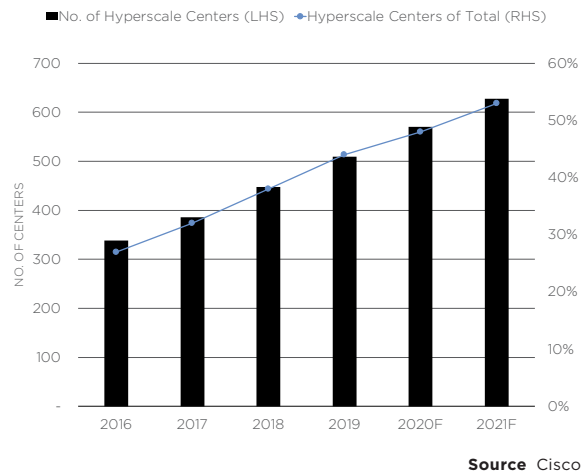
Supported by the uptrend in data consumption, the DC market in the region is also expected to see high growth rates. The number DCs in Asia-Pacific expected to grow at an average annual rate of 14% from 2017 to 2022, and its proportion of total worldwide volumes will also increase during the same period.

While only 30% of the world’s hyperscale DCs were in the Asia-Pacific region as recently as 2016, this figure is forecast to grow to 39% by 2021 to outweigh North America at 35%. At the end of 2018, hyperscale DCs in the Asia-Pacific region were distributed in the following order according to number; China, Japan, Australia, Singapore, India and Hong Kong, while Korea was grouped under Others.

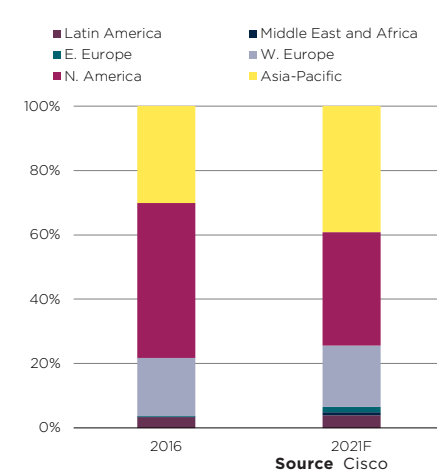
KOREA DATA DEMAND

Korea is globally recognized for its advanced ICT-related technologies, and related infrastructure and industries are fast-growing. As a result, domestic data consumption will experience high growth and domestic IP traffic is to increase about 2.5 times by 2022 compared to 4.6 exabytes per month in 2017. The 5G technology market on active commercial adoption is forecast to expand by 62% annually on average during the next five years to 2025. The domestic OTT market is also expected to grow annually at

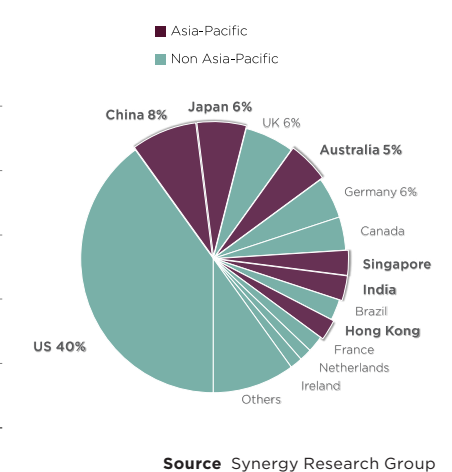
GRAPH 3: Global Hyperscale Data Centers Stock 2016 to 2021(F)



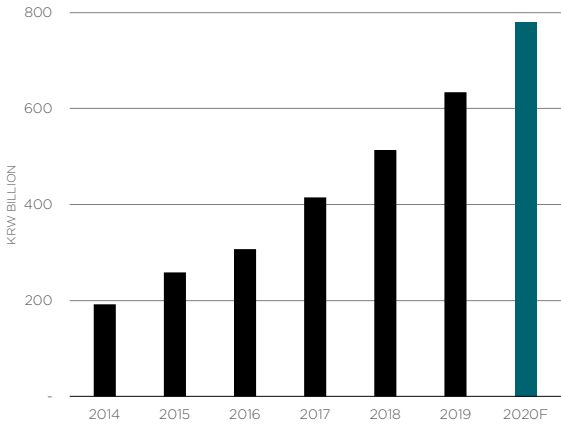
GRAPH 4: No. of Hyperscale Data Centers by Region, 2016 and 2021(F)



GRAPH 5: Hyperscale Data Centers by Country, 2018

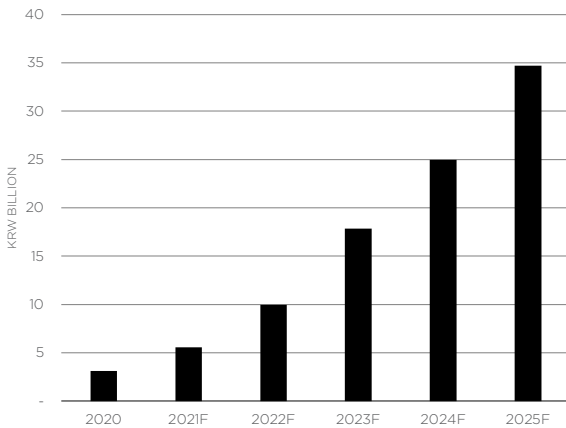


GRAPH 6: Korea OTT Market Revenue, 2014 to 2020(F)



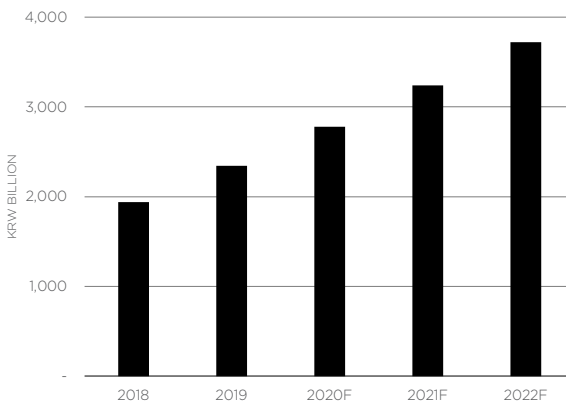
Source Korea Communications Commission

GRAPH 7: Korea 5G Network Market Revenue, 2020 to 2025(F)



Source KT Research Institute, Korea Internet & Security Agency

GRAPH 8: Korea Cloud Services Revenue, 2018 to 2022(F)



Source Gartner

an average rate of 28% from 2014 to 2020. In addition, domestic cloud service spending is forecast to grow at an average annual rate of 18% to 2022 compared to 2018.

KOREA SUPPLY AND MAJOR CENTERS

While data consumption has already been increasing exponentially thanks to active growth of ICT-related infrastructure industries such as OTT, 5G and the cloud, the growth of the domestic DC market has been somewhat delayed. Global operators have recently entered the market, with Google opening a domestic region – a bundle of DCs installed by a cloud operator – at LG Uplus Pyeongchon Mega Center, and Microsoft developing a domestic DC in Busan to expand its domestic cloud services platform.

In line with the global trend among DCs, domestic DCs are also now developing hyperscale DCs. The three developments in 2020, SK C&C Pangyo Data Center and LG Uplus Pyeongchon Mega Center – both currently under expansion – and SK Broadband Gasan Center, are classified as hyperscale DCs with electric power needs of over 154kVA. Notably, LG Uplus Pyeongchon Mega Center at 165MW set the record for the largest power capacity in the Asia-Pacific region. Expected projects including Microsoft Busan Data Center and Naver 2nd Data Center are hyperscale DCs that are currently under development or in review.

Seoul and Gyeonggi came in as the most-highly concentrated regions of DCs with over half of the total, followed by Chungcheong

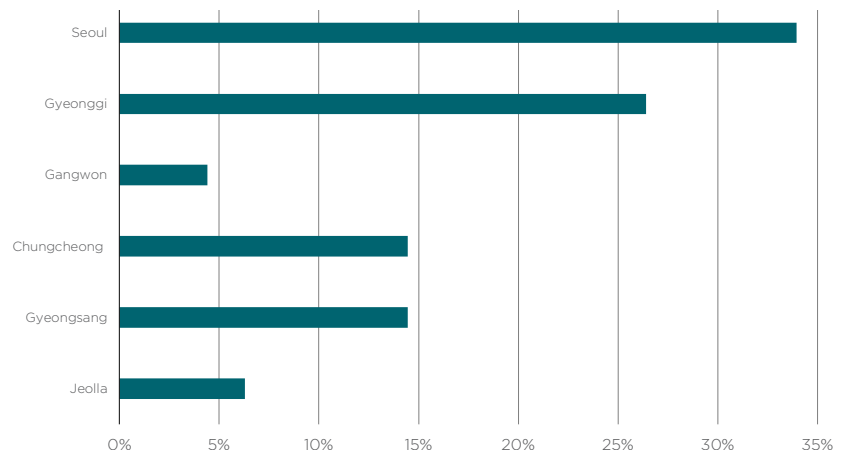
and Gyeongsang. The Seoul and Gyeonggi regions are advantageous for their easy accessibility to companies located in Seoul and the proximity of other power and network infrastructure. Future developments will most likely also be positioned in Seoul and Gyeonggi, especially on the city boundaries. This will allow the sites to secure the large power sources required for hyperscale DCs at comparatively cheaper land prices than the city centre.

Korea is a leader in 5G technology and has a well-developed ICT infrastructure, with the rapid growth of the cloud services market. If large, hyperscale DCs capable of supporting global demand are supplied to the market, growth of the domestic DC market is likely to accelerate further.

DEFINITION OF DATA CENTERS

DCs may be categorized using different criteria, including occupier types which can be divided into Enterprise and Colocation DCs. Enterprise DCs, applicable to most companies, are owner-occupied by corporations that require the use of many servers. In contrast, Colocation DCs are commercially leased by professional operators and can be further divided into Wholesale Colocation and Retail Colocation DCs according to the type of lease contract and operation. Wholesale Colocation refers to leasing the upper floor area to one or a small number of tenants and granting them full responsibility for the installation, management and operation of the facilities, and is the business model for Digital Realty.

GRAPH 9: Korea Data Centers¹ by District, 2019



¹Measured in terms of number of DCs

Source Savills Korea

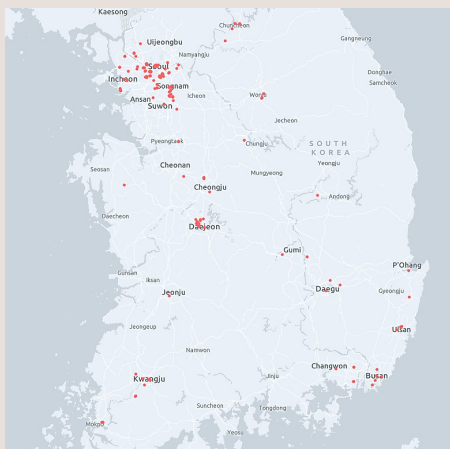
On the contrary, Retail Colocation involves leasing only a portion of the area or rack to a final user and the operator maintains direct authority for the installation, management and operation of the network lines and equipment, and is the business model for companies such as Equinix.

The concept of “hyperscale DC” has been newly introduced given the rapid growth of data traffic and recent advances in ICT technologies. Hyperscale DCs are comprehensive in their size and performance, and although there are no concrete defining criteria, the concept generally refers to a DC with the flexibility to expand the system, memory, network, storage, and other

factors as required and makes use of an organic structure compared to more traditional large scale DCs. In order to define hyperscale DCs, the global market research firm Synergy Research Group uses scale standards of over 100,000 servers and over 2,500 sq m of upper floor area, while Cisco applies performance-related standards, classifying DCs of operators that are grossing a certain figure of Internet Communication Technology (ICT) sales as hyperscale.

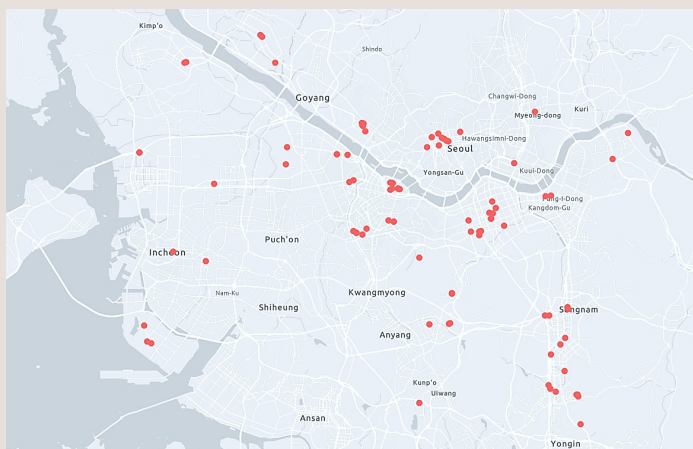
Overview of the Korea Data Centers Market

Total Stock Nationwide



As of December 2019

Total Stock in Seoul Metropolitan Area



Source Savills Korea

※Includes all data centers which adhere to Ministry of Science and ICT requirements which specify that “the computer center floor area in the data center should be of 500 sq m or greater.”