
INDUSTRY OVERVIEW

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Introduction to the Data Center Industry

Data Center Services

A data center is a specialized facility designed to house server, storage and networking equipment used to deliver mission-critical business applications, data and content.

Data centers can be owned and operated in-house by the companies that use such infrastructure, or outsourced to professional data center service providers, who typically offer colocation services and managed services.

- Colocation generally refers to a data center configuration where shared or private space in a secure environment with power and cooling is available for use by customers. Such space, power and cooling are used to house and support customers' servers and related IT equipment.
- Managed services generally encompass a wider array of value-added services related to use of colocation facilities, such as business continuity and disaster recovery solutions, management of IT operations, direct private connection to cloud services, and platforms for managing hybrid clouds.

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Benefits of Outsourcing Data Center Services

In the past, outsourced data center facilities were mainly used by enterprises as an alternative to on-premise capacity or for the purpose of IT system redundancy. In recent years, as enterprises increasingly adopt multi-cloud technologies, they are faced with greater technical challenges in hosting their IT infrastructure on their premises. Moreover, cloud service providers have themselves emerged as a major new customer segment for data center services. By aggregating demand from multiple users, including large enterprises, SMEs, internet companies and government, the leading cloud service providers have reached an unprecedented scale in terms of their IT capacity. As compared with traditional enterprise customers, they require larger data centers, with proportionately more power capacity, the ability to expand flexibly, optimum operating efficiency, and multi-market presence. Given the challenges of developing and operating this kind of data center resource, cloud service providers have chosen to outsource a significant part of their requirement to specialist data center companies.

Significant cost saving. Outsourcing data center infrastructure allows companies to avoid the investments associated with building their own facilities, to access higher-quality infrastructure and professional services, and to benefit from economies of scale. Companies that outsource data center infrastructure can concentrate their capital and management resources on core business activities. Specifically, cloud service providers realize cost savings and other operational benefits over the data center life cycle by outsourcing selectively to data center companies.

Continuous supply with flexibility and customizability. Data center service providers can expand flexibly as the capacity requirements of customers increases. Data center service providers plan and implement their capacity expansion based on the requirements of all their customers. Furthermore, data centers can be designed and configured to serve a wide range of customers with different space, power, network and cloud configuration requirements inside the same facility, including those proprietary design and specifications for IT hardware, server racks, and computer rooms required by cloud service providers.

Reliability and efficiency. Data center service providers offer highly secure and reliable environments to house servers and related IT equipment with significant redundancy, which delivers high availability to customers. Outsourced data centers may also have high power density and superior power management, resulting in operational efficiency and reduced carbon footprint.

Key Customer Segments

Major customer verticals include cloud service providers, internet companies, financial institutions, and other large enterprises and public services. Availability, reliability and efficiency are the key value propositions appealing to these customers.

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Cloud service providers. Hyperscale cloud service providers require large data center capacity and the ability to expand flexibly. They operate their IT infrastructure at much higher levels of utilization than most enterprises, which requires data centers with a higher ratio of power to net floor area. They also have their own proprietary design specifications for IT hardware, server racks, and computer rooms. Data center service providers are required to develop their own in-house data center design capability to meet the evolving demand of cloud service providers, which can only be achieved through advanced technical design and execution.

Internet companies. Certain large internet companies are among the leading cloud service providers in China. They use their cloud platforms for their own internal IT, as well as to provide services to their external customers. Other large internet companies have their own private clouds and, in certain cases, also use public cloud services. As such, the data center requirements of large internet companies as a customer segment overlap to a large degree with the requirements of cloud service providers as a customer segment.

Financial institutions. Financial institutions, including banks, insurance companies, and securities firms, are required by the government to house their IT systems in high availability data centers, whether self-built or outsourced, in order to ensure the uptime and security of their applications and data. Outsourced data center service providers must meet stringent design and operational compliance requirements in order to host the IT systems of financial institutions.

Large enterprise and public services. Businesses and government agencies in China are becoming more digitalized. The e-government initiatives by Chinese government increase public sector demand for data center space. Availability and reliable operations of data center services are their primary considerations.

To meet the demands of different customer segments, data center service providers usually operate on two different business models: wholesale and retail. In general, cloud service providers and large internet companies require a large net floor area per facility and a certain level of customization in order to house their own proprietary design of servers and racks. Under the wholesale model, data center service providers typically commit a significant portion or the entirety of a data center to such customers and obtain such commitments while new data centers are still under construction. The contract term can last as long as five to ten years with low churn rate. On the other hand, financial institutions, large enterprise and public services customers, which typically require fewer number of cabinets and no customization, can be satisfied under the retail model which entails multiple customers colocating in the same facility. The contract term for retail customers is typically shorter with higher unit pricing based on cabinets.

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Key Growth Drivers

Digitalization in China

China's economy is increasingly digitalized both in its consumer and business sectors. Demand from the expanding internet user base, which is expected to grow from 881 million in 2019 to 1.1 billion in 2024 according to iResearch, has been driving the digitalization of consumer sectors. Various internet consumer services, including online videos, live streaming, online games and e-commerce, have experienced strong growth and will use increasing amounts of data. Business sectors have embraced digitalization with the support of developed digital infrastructures and favorable government policies.

Total data generation in China is expected to grow at a CAGR of 29.7% from 9.6 zettabytes in 2019 to 35.2 zettabytes in 2024 according to iResearch. To more effectively manage the higher demand for processing, storage, and transmission of data, enterprises and technology companies increasingly outsource some or all of their computing needs to cloud service providers, resulting in strong demand for cloud services and the underlying data center infrastructure.

Application of Emerging Technologies

The maturity and mass adoption of emerging technologies, such as cloud computing, 5G, artificial intelligence ("AI"), big data, machine learning, blockchain, internet of things ("IoT"), augmented reality ("AR") and virtual reality ("VR") is further adding to the demand for data processing, storage and transmission capacity. The increasing popularity of work-from-home and the development of smart cities, telemedicine and online education are accelerating the digitalization of traditional industries and bringing data usage to a new level.

5G has enhanced internet connectivity across China with significantly higher transmission speed and considerable reduction of latency, enabling applications with high data processing and transmission requirements. The shipment of 5G mobile phones in China is expected to grow from 13.8 million in 2019 to 290.4 million in 2024, growing at a CAGR of 84.0%, according to iResearch.

AI requires significant data computing and processing power, and has been adopted across various industries and verticals, such as autonomous driving. Market size in China for AI applications, which includes revenue derived from application of AI in major industries, is expected to increase from RMB57.0 billion in 2019 to RMB262.3 billion in 2024, growing at a CAGR of 35.7%, according to iResearch.

IoT improves the interconnectivity and control of devices, resulting in more devices being connected to the internet and to each other. The number of IoT devices is expected to increase from 4.6 billion in 2019 to 18.4 billion in 2024, growing at a CAGR of 32.1%, according to iResearch. AR and VR devices enabled by IoT also require significant graphics computing power and high-speed, real-time connections to the internet.

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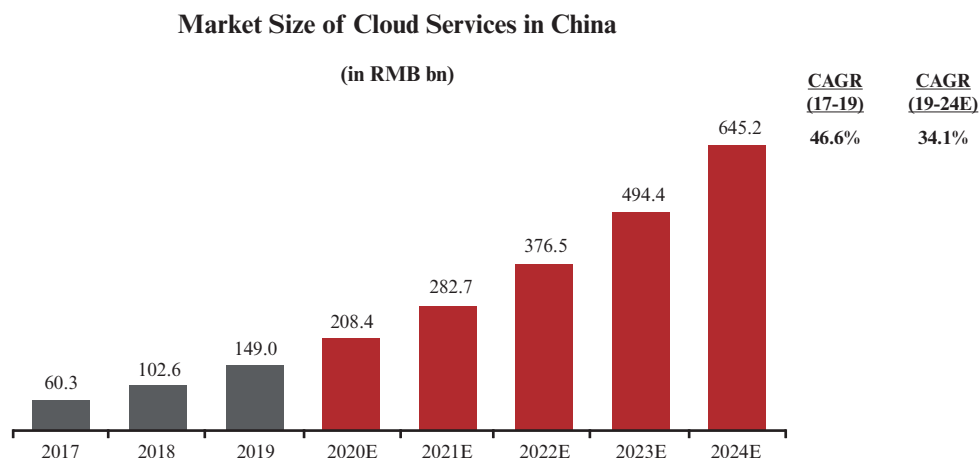
Support from Government Policies

Recently, the PRC government has promoted the concept of “new infrastructure” which includes largescale data centers, artificial intelligence and industrial internet. Such policy orientation is ushering in new waves of investment at all levels of the economy, which will give rise to numerous opportunities benefiting the data center industry.

During the National People’s Congress and Chinese People’s Political Consultative Conference in May 2020, data centers were highlighted as key beneficiaries of the exponential growth of data traffic from 5G and IoT.

Rapid Adoption of Cloud Computing

Digitalization, new technologies and new infrastructure all contribute to the rapid adoption of and increased spending in public, private and hybrid cloud services by enterprises and government agencies in China. According to iResearch, China’s cloud services market in terms of revenue was RMB149.0 billion in 2019, as compared with US\$61.4 billion for the U.S. iResearch expects China’s cloud services market to increase at a CAGR of 34.1% from 2019 to 2024, as compared with a CAGR of 5.5% for the U.S.



The exponential growth of cloud services need to be supported by more and better data center services. Largescale and high-performance data centers are increasingly preferred by the companies that rely on cloud computing services.

Overview of the Data Center Industry in China

China’s data center market can be categorized as (1) carrier-neutral data centers and (2) carrier-operated data centers.

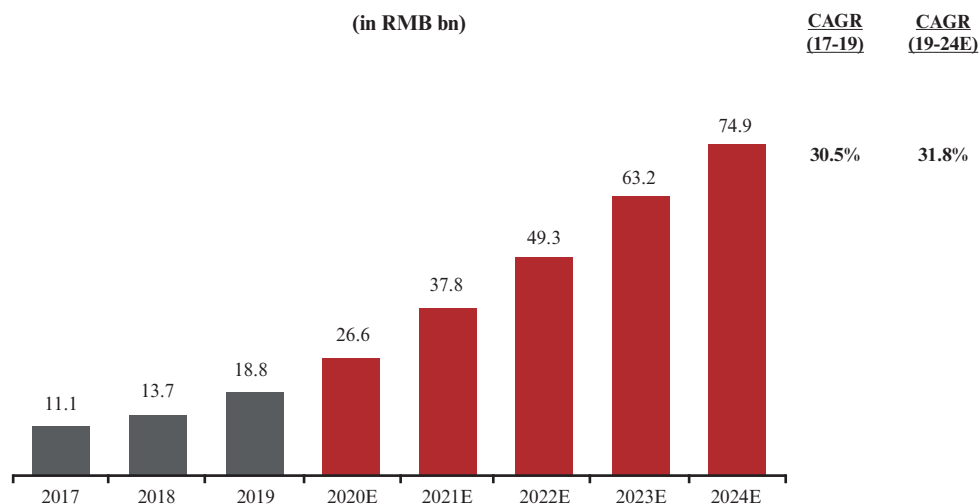
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Carrier-neutral data centers. Carrier-neutral data centers enable customers to connect with all the telecommunications networks present within their facilities. Carrier-neutral data center service providers vary in terms of data center quality, operational track record and differentiated managed service capabilities. Carriers may sometimes partner with carrier-neutral data centers to deliver a complete service package to customers.

Carrier-operated data centers. Telecommunications carriers develop data centers in part to facilitate the sale of related network services. In locations outside of the key economic hubs of China, telecommunications carriers sometimes are the only available providers of data center services.

According to iResearch, the total size of China’s data center services market in terms of revenue⁽¹⁾ was RMB33.4 billion in 2019, of which the carrier-neutral market accounted for RMB18.8 billion, representing 56.3% of the total market. This compares with a total size of the data center market in the U.S. of US\$29.8 billion in 2019. iResearch expects the carrier-neutral market to increase at a CAGR of 31.8% from 2019 to 2024, compared with a CAGR of 9.3% for the U.S. during the same period.

Market Size of Carrier-neutral Data Center Industry in China



Competitive Landscape

Carrier-operated data centers, offered by China’s three major telecommunications carriers, often rely on carriers’ own networks for connectivity and lack flexibility for customers to connect to other carriers’ networks. In contrast, carrier-neutral data centers offer connectivity to multiple telecommunications carriers in their facilities, providing customers the flexibility to choose which carrier to use based on cost and/or network and application requirements. As specialist data center service providers, carrier-neutral data center companies

Note:

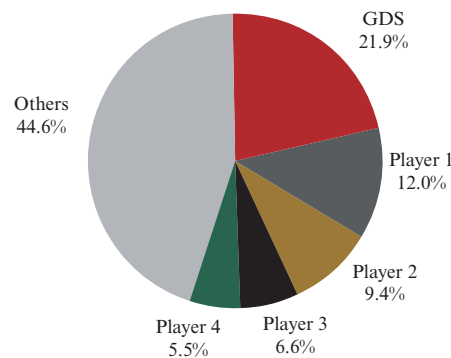
(1) For the purpose of this forecast, data center market revenue is based on data center related colocation and managed services, and excludes any non-data center related revenue.

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also compete based on service standards, data center performance, and responsiveness to customer requirements. As the data center industry further develops, carrier-neutral data centers have grown more rapidly than telecommunications carrier data centers.

The carrier-neutral data center market is fragmented with a few leading service providers with presence across several or all Tier 1 markets competing with different regional companies in each market. According to iResearch, GDS is the leading operator of carrier-neutral data centers in China in terms of revenue with 21.9% market share in 2019.

Market Share* of Carrier-neutral Data Center Players in 2019



High-performance Data Centers

High-performance data centers offer customers a high level of availability, power density and power efficiency. In order to achieve a high level of availability, high-performance data centers are typically equipped with 2N redundant delivery paths for power, cooling and other critical systems that satisfy or exceed the Tier III standard as defined by the Uptime Institute. 2N redundancy refers to a fully redundant, mirrored system with two independent power distribution systems and entails significant additional up-front investment and decreases the yield of net floor area in a building of a given size. According to iResearch, the power density of high-performance data centers is typically over 1.5kW/sqm, as compared to the industry average power density of 1kW/sqm in China, while the PUE level of high-performance data centers need to be lower than 1.5x, as compared to the average PUE level of 1.7x in China in 2019.

Benefits of high-performance data centers include (i) high availability, which satisfies the requirements of customers for housing their mission-critical IT infrastructure, and (ii) high power density and low PUE to allow customers to deploy their IT infrastructure more efficiently with optimal performance. High-performance data centers have become more valuable to customers to ensure continuous uptime for mission-critical IT systems, applications and data.

Notes:

- * The market share of each industry player is presented in terms of its respective data center market revenue. The data center market revenue is based on data center related colocation and managed services, and excludes any non-data center related revenue.

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Regional Markets

According to iResearch, the major Chinese data center markets are primary economic hubs such as the areas in and around Shanghai, Beijing, Shenzhen, Guangzhou, Hong Kong, Chengdu and Chongqing, also known as Tier 1 markets. These locations are also telecommunications network hubs. However, due to scarcity in land supply and power supply permission in Tier 1 markets, data center players have started to develop data centers at the outer edge of Tier 1 markets. Such data centers can fulfill customers' requirements for larger deployments of IT capacity on a single site and to upscale over time, while remaining within acceptable parameters for network latency. According to iResearch, Tier 1 markets, together with the outer edge of Tier 1 markets, accounted for approximately 68% of China's data center market in terms of net floor area in 2019.

In addition to Tier 1 markets, data center players are also penetrating other locations via various models, such as build-to-suit, to accommodate customers' needs to house offline and less critical data and applications in larger capacities and more cost-effectively.

Future Trends

Through aggregation of demand from enterprises adopting emerging technologies with increasing data usage, cloud services providers will continue to be the key customer segment driving demand for data center services. The leading cloud service providers are mainly looking for data center service providers that can meet their specific requirements, including high capacity, high availability and high redundancy in each of availability zone in multiple presences in Tier 1 cities.

With increasing focus on energy consumption and efficiency by the government and enterprises, optimization of operational flows, improvement in power utility efficiency, and use of alternative energy are expected for data center providers to lower operating costs and reduce carbon footprint.

Entry Barriers

Limited supply of suitable sites: Due to constraints in securing suitable land, power supply, and regulatory approvals, it is challenging to develop new data center capacity, particularly in Tier 1 markets where demand is concentrated.

Platform with network effect: Leading players with a nationwide presence in Tier 1 markets have already built a platform of interconnected data centers across the largest Chinese cities that host all of the major public clouds. Such platform is able to deliver a multitude of benefits to customers, including direct and private access to all public cloud platforms, hybrid cloud solutions for large enterprise customers, connectivity across all telecommunications carriers and interconnection to other enterprise companies within and across facilities in China.

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It also enables its cloud service provider customers to expand their presence in the largest Chinese cities, creating a network effect around the enterprises and cloud service providers that reinforces the leading position of data center service providers.

Development and operational know-how: Data center development requires sourcing land and buildings, obtaining the necessary regulatory approvals, accessing adequately redundant power supply and high-quality telecommunications connectivity, carbon emission quotas, and the knowledge and know-how associated with designing, building, fitting out and commissioning high-performance facilities.

Track record: Due to the mission-critical nature of the IT equipment it houses, a data center must maintain continuous operations, monitoring and a high level of security. Operators with a strong operating track record are preferred by customers.

Customer relationships: Once customer equipment is installed in a data center, the relocation cost is high. If customers need additional space, they typically seek to stay in the same data center facility or with the same service provider.

Financial capacity: The development of data center sites and facilities requires significant upfront investment, especially for high-performance data centers.

Impact of COVID-19 on the Data Center and Cloud Services Industries

According to iResearch, the COVID-19 outbreak has had a generally positive impact on the data center and cloud services industries in China.

The increased awareness and implementation of social distancing during the outbreak have resulted in a surge in online activities and consumption of digital content including online video, online games and e-commerce. Businesses in various industries have also accelerated digitalization of their operations and migration to cloud. As a result, there has been increase in data volume and utilization of cloud services, which in turn translates into demand for data center services.

Although the outbreak has gradually been contained in the second quarter of 2020 in China, with work and school activities gradually resuming to pre-outbreak levels, there have been sustainable and structural changes in many industries as well as in consumer behaviors such as the increasing popularity of work-from-home, online education, telemedicine and online grocery shopping. These structural changes further drive long-term demand for cloud services and data center services.

The outbreak did, however, cause minor operational disruptions. There were challenges in achieving scheduled delivery of data center capacity and move-in of certain customers. These challenges were temporary and have gradually been resolved as lock-down restrictions imposed by local governments were lifted.