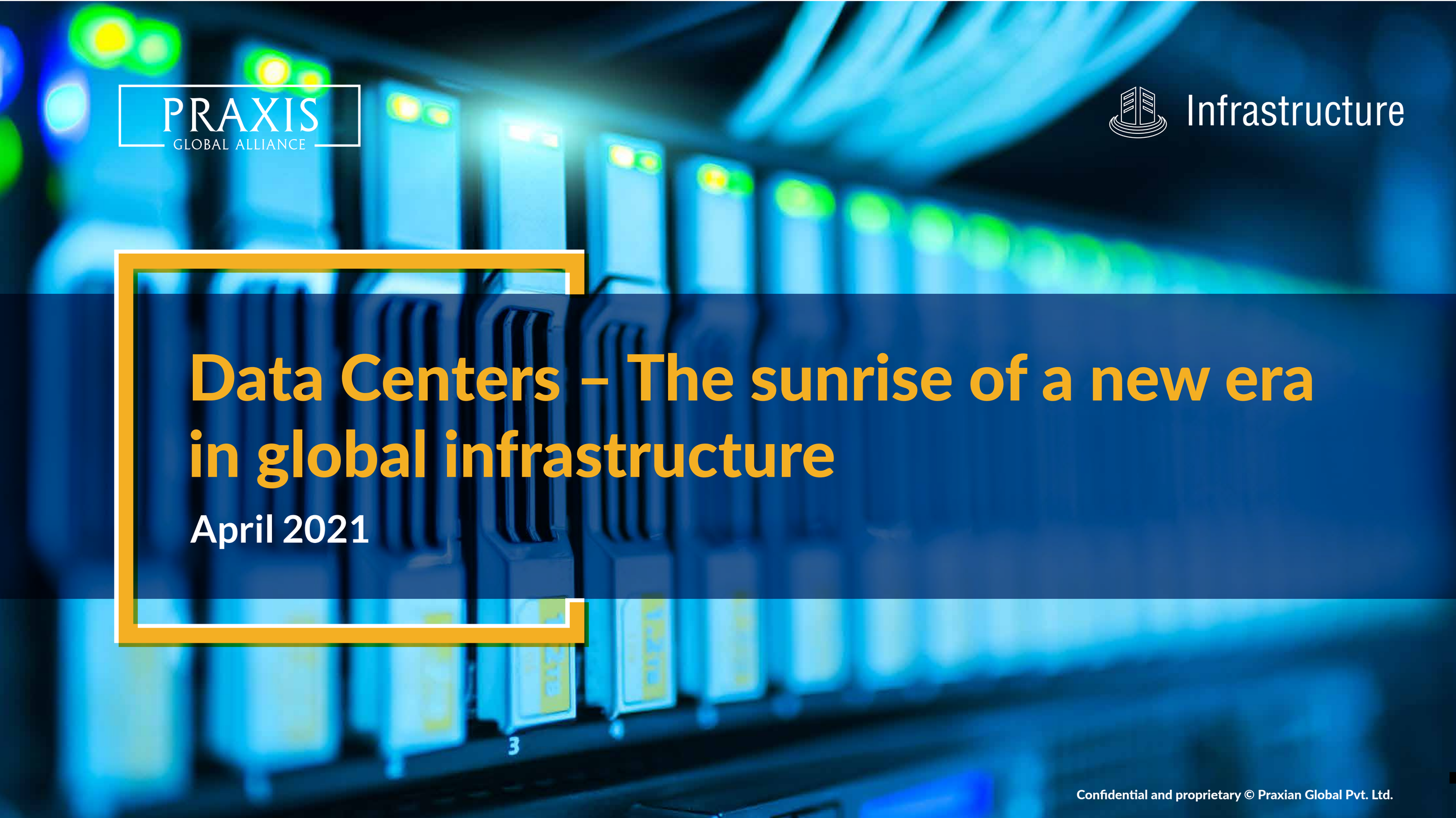


PRAXIS
GLOBAL ALLIANCE

Infrastructure

Data Centers – The sunrise of a new era in global infrastructure

April 2021

Foreword

Data consumption in India primarily revolves around BFSI, Ecommerce, Social Media which together contribute to 75-80% of the total data consumption. The growth of smartphones in India over the last decade or so has also supplemented this growth in data consumption. However, data consumption in India on per capita basis is far lower than its Asian and Western Counterparts.

Data Center growth in India has been significant over the last 4-5 years with major investments from real estate players as well as from PE funds to set up various categories – Co-locations, hyperscale, managed services to Edge Data Centers etc.

In the report, we have discussed growth of Data Centers over the last few years along with type of Data Centers business models that have evolved over these years. We look at Colocation, managed services, hyperscale and Edge Data Centers and their key parameters. We also discuss where the key challenges and opportunities posed in the Data Center business.

Further we discuss the potential growth expected over the next few years in terms of revenue growth and IT power capacity growth, we also focus on the key parameters needed to selecting the location for Data Centers.

Lastly, we discuss about the key players in India and globally, their focus in the top 7 cities in India, their financial positions and margins seen in this business along with break up of cost structures and average monthly charges. We also touch upon policy and regulatory initiatives and key technological trends expected in the next 5 years including a global trend outlook.

The situation is evolving rapidly, and some of the expected scenarios might have slight variations. This report reflects our perspectives as of end of 2020.

Contact us for latest updates.

Madhur Singhal
Managing Partner & CEO

Aryaman Tandon
Managing Partner & Co-Founder

Key takeaways

- Data Centers growth in terms of IT power load capacity has witnessed a robust 18% CAGR between 2007 to 2020P, reaching about 430MW; in terms of real estate capacity, it has witnessed 13% CAGR growth during the same period.
- Going ahead, Data Center revenues are expected to clock about US$ 4B by 2024E; while the IT power load capacity is expected to continue growing at a CAGR of almost 16% during the same period.
- Top 8 Data Center players account for above US$ 6M sq. ft; while Mumbai currently accounts for about 50% of all Data Center building space in India.
- Demand for hyperscale Data Centers are growing rapidly and Captive Data Centers are moving towards 3rd party Co-Location (Colo) type Data Center business models.
- Domestic players are witnessing a CAGR growth of about 20%; Margin profiles becoming better with scale.
- Going ahead, key end use segments such as autonomous vehicles, Ecommerce, social media, connected devices etc., would drive the growth for Data Centers.

Data Center demand is primarily from large customers across industries such as IT, BFSI, social media and Ecommerce which require huge storage of customer data

IT/ITeS/Software
Require storage of large amount of confidential customer data of clients

Banking, Financial Services and Insurance (BFSI)
Require storage of sensitive information such as account details, transaction history etc.

Social media
Require storage of customer data, messages, photos, videos and other information such as transaction history

Ecommerce
Require storage of customer-related data such as product views, card details, transaction history etc.

Government
Require data storage capacity to store information of citizens for providing various services

Telecom
Require data storage space for providing internet services to their customers and for storing required customer information

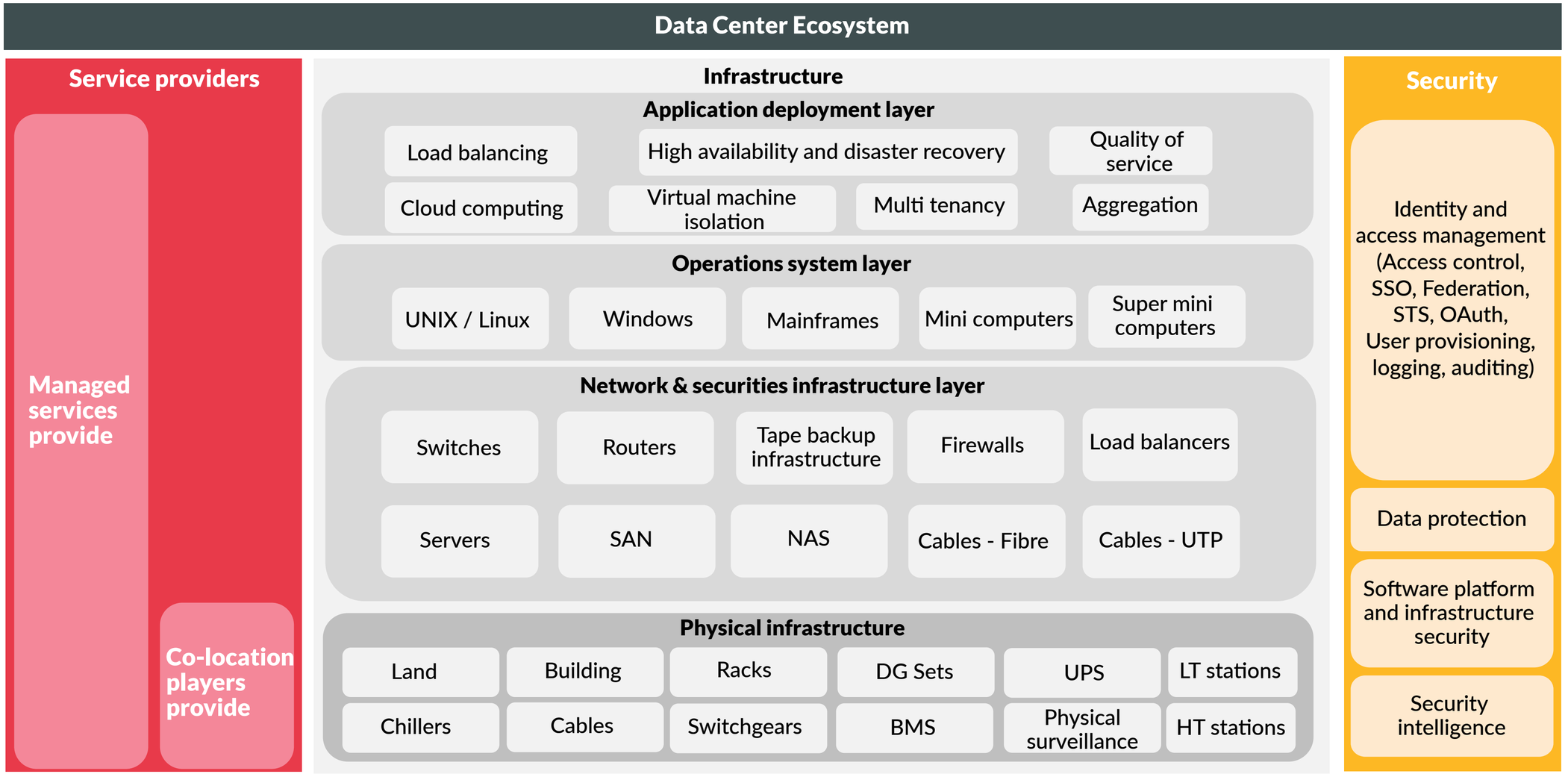
Manufacturing
Require storage of data related to equipment performance for predictive maintenance and for inventory management

Logistics
Require storage of data regarding product movement across the supply chain for effective tracking and pilferage reduction

Healthcare
Require storage of patient medical records and other clinical data for security and regulatory purposes

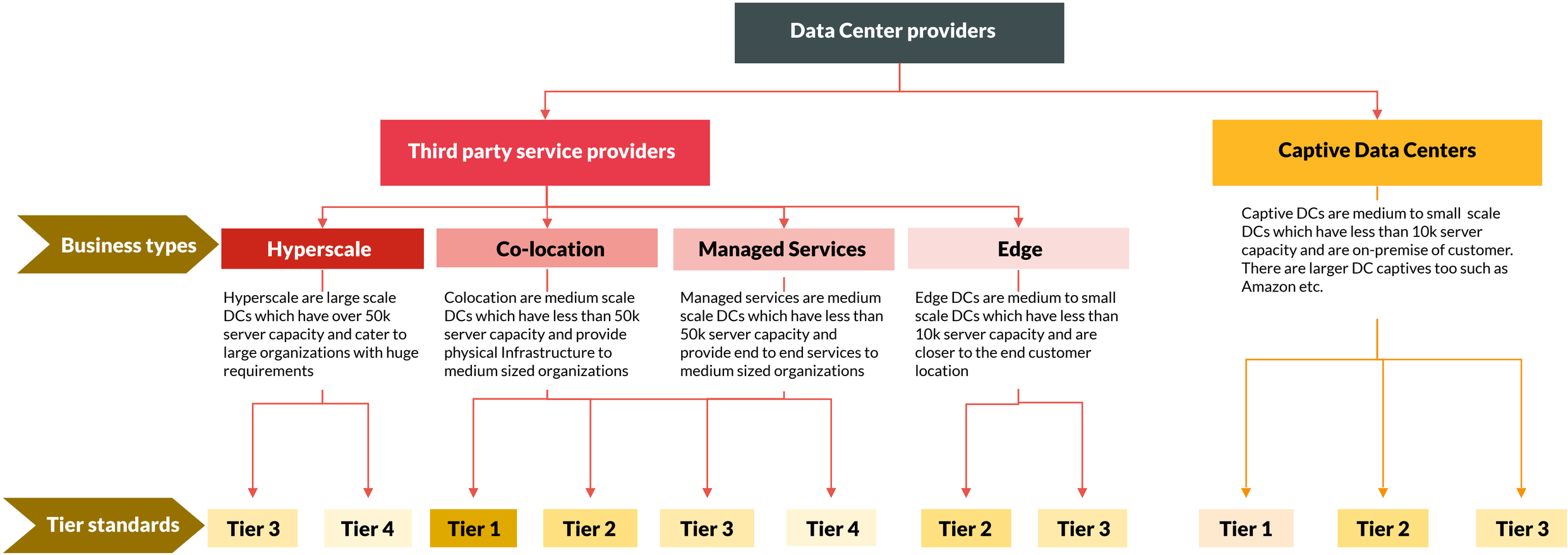
Sources: Secondary research, Praxis analysis

Data Center ecosystem technology stack



Notes: SAN – Storage attached Network; NAS: Network attached Storage; Schematic is representative and DC players can provide other services over and above these services

Third party Data Center service providers form a key share for business types with tier 3 and 4 being the key service standards



- Tier 1 standard category provides basic services to end customer and non-redundant capacity
- Tier 2 standard category provides redundant capacity to the end customer to avoid failure
- Tier 3 standard category provides concurrently maintainable capacity to reduce failure and faults considerably
- Tier 4 standard category provides fault tolerant capacity to eliminate failure and faults.

Sources: Secondary research, Praxis analysis

Based on planning and design parameters, Data Centers can be classified to hyperscale, colocation, managed services and Edge Data Centers

	Third party service providers				Captive
	Hyperscale	Colocation	Managed Services	Edge	
Planning					
Location	• Well-planned and located in hubs on outskirts where land is cheaper	• Well-planned and located in hubs on outskirts where land is cheaper		• Located within cities near business hubs which are the customers of Data Centers	• Location at the clients' premises
Building type	• Well-planned and located in hubs on outskirts where land is cheaper	• Dedicated buildings with Physical infrastructure with Plug and play	• Dedicated buildings with fully-integrated support including servers etc.	• Smaller buildings or parts of a building co-located with other offices, Data Centers etc.	• Smaller buildings compared to co-located and managed services
Proximity to end users	• Located on outskirts of cities, usually far from the business areas	• Located on outskirts of cities, usually far from the business areas		• Located very close to end-users	• On-premises
Latency	• Low to medium latency based upon distance from the end-user	• Low to medium latency based upon distance from the end-user		• Very low latency	• Low latency
Server Design					
Visibility	• High visibility for end-users on critical Data Center parameters	• High visibility for end-users on critical Data Center parameters such as peak server load, power consumption etc.		• Low visibility for end-users on critical Data Center parameters	• High visibility for clients
Size	• At least 50K servers	• Less than 50K servers		• Less than 10K servers	• Less than 10K servers, however some large captive Data Centers exist
Customer types	• Large organizations with heavy data storage requirements	• Medium-to-large scale organizations bringing their own servers	• Medium-to-large scale organizations with end to end requirements	• Organizations with very high requirement for lowest-possible latency.	• Organizations with less requirement but low latency

Notes: 1 Rack contains 40-80 servers
Sources: Secondary research, Praxis analysis

Offerings of a Data Center (DC) range from completely Data Center owned infrastructure model to managing customer in-house Data Center

		Data Center owned and maintained	Customer-owned server infrastructure Data Center hosting (Colocation)		Customer in-house (managed service)
			DC-maintained	Customer-maintained	
Definition		• DC provides infrastructure, management & shared / dedicated servers	• Customers own the servers but outsource management & infrastructure	• Customers own the servers and maintain them but rent infrastructure (power, space, connectivity)	• Customer's servers & applications are managed at customer's physical space
Key customer segments		• Cloud Service users (Small Organizations)	• Small to Medium Scale Organizations	• Small to Medium Scale Organizations	• Major IT firms, Large Scale Organizations
Management (People)					
Assets (Hardware, servers)					
Location (Physical space)					
Enablers	Electrical setup/cooling				
	Physical security				
	Logical security				
	Service desk				
	Monitoring				
	Network/connectivity				

Provided by DC | Optional / partial | Not provided by DC

Sources: Secondary research, Praxis analysis

Data Centers are further classified into 4 standard tiers categories according to their service levels. Players are now focusing on tier 4 fault tolerant DCs

Parameters	Tier 1	Tier 2	Tier 3	Tier 4
Category	Non-Redundant Capacity	Redundant Capacity	Concurrently Maintainable	Fault Tolerant
Uptime per annum (Downtime per annum)	99.67% (28.8 hours Per annum)	99.74% (22 hours Per annum)	99.98% (1.6 hour per annum)	99.995% (0.4 hour per annum)
Capacity components to support the IT Load	N	N+1	N+1	2N+1
Power Outage Protection	-	-	72 hour protection	96 hour protection
Cooling	Single cooling path	Single cooling path	Multiple cooling paths	Multiple cooling paths (Continuous cooling)
Months to implement	3	3-6	15-20	18-24
Target customer	Small Business	Small Enterprise	Large Enterprise	Very Large Org/MNC
Key players in India	Small Scale Data Centers	Small Scale Data Centers	RELIANCE Communications, ST Telemedia Global Data Centres, netmagic, NTT, nxtra data	YOTTA

Notes: Downtime- Time when the system stops, Uptime- Time when the system is working, N: Amount of capacity required to power or cool the Data Center facility at full IT load
Sources: Secondary research, Praxis analysis

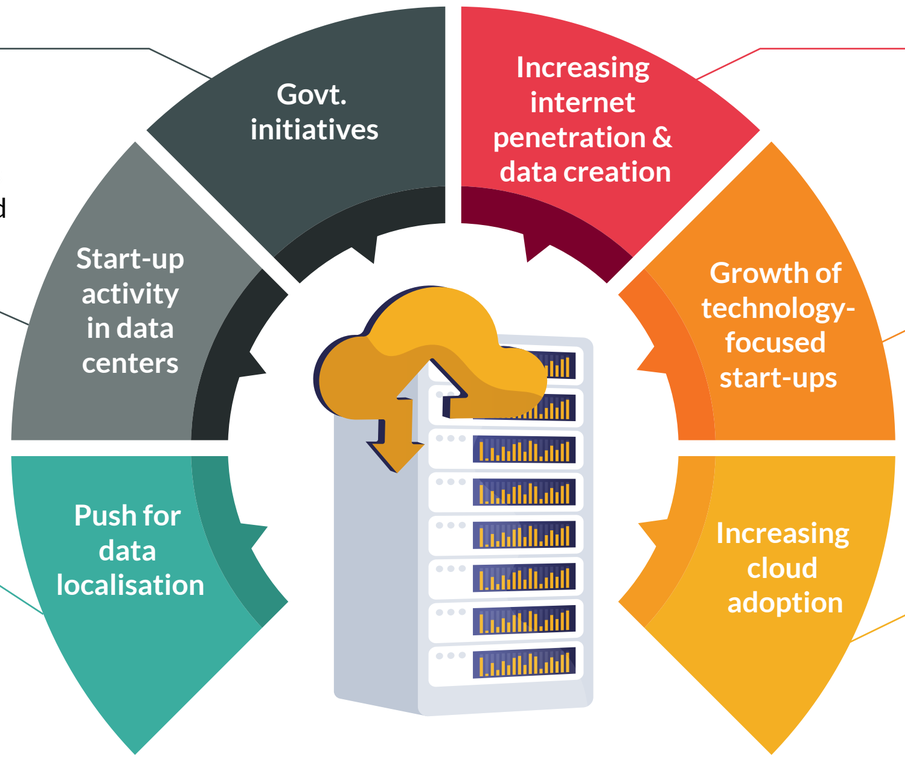
Increasing data requirement and data creation due to internet penetration pushing growth for Data Centers

Tailwinds for Data Centers growth in India

Government's policy push for Data Center infrastructure development through MeitY's Data Center Policy 2020 to further attract investment in the sector. Other states such as Telangana and Uttar Pradesh have also unveiled their Data Center policies

With strong push by government, start-ups such as RackBank have set up hyperscale Data Centers and providing services to small and fast-growing customers

Future initiatives by Govt to ensure data of India consumers stored on Indian servers by companies would drive the Data Center demand considerably



Projected growth in internet and smartphone penetration, BFSI, E-Commerce and Social media in India are currently driving the data consumption and increasing in Data Center requirement

Rapid growth in tech-focused start-ups conducting research in advanced areas such as IoT, autonomous vehicles, Digital transformation etc. is expected to drive future Data Center growth

Increasing number of small and medium-sized firms opting for cloud storage as compared to in-house servers increasing 3rd party Data Center demand

Sources: Secondary research, Praxis analysis

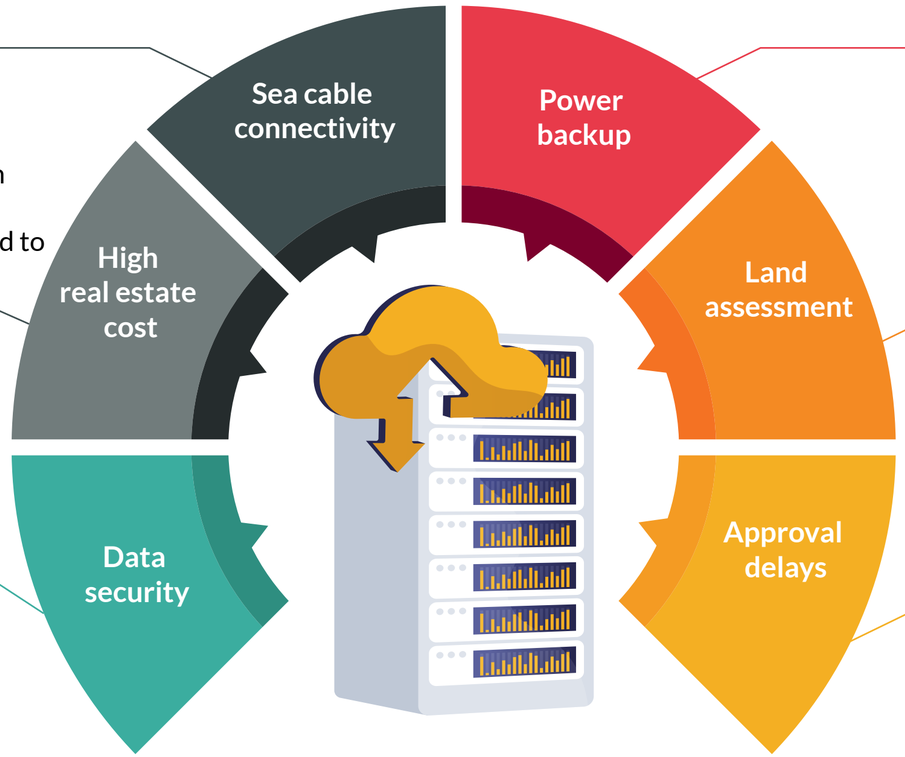
Land assessment, power-related issues and approval delays are key challenges for Data Centers

Headwinds facing Data Centers in India

Sea cable fiber connectivity has not yet penetrated the hinterland where Tier 2 cities are located, thereby restricting Data Centers to the top 7-8 cities / metros in India

Data Centers in India are currently concentrated in areas like Mumbai, Chennai and Bangalore, which have substantially high real estate cost as compared to Tier 2 cities

Co-location & managed service Data Centers in India store, manage and process massive chunks of data, making Data Center facilities vulnerable to security risks.



Power availability and quality continue to be erratic in some parts of the country, which requires Data Centers to always maintain a power backup source to ensure uninterrupted operations

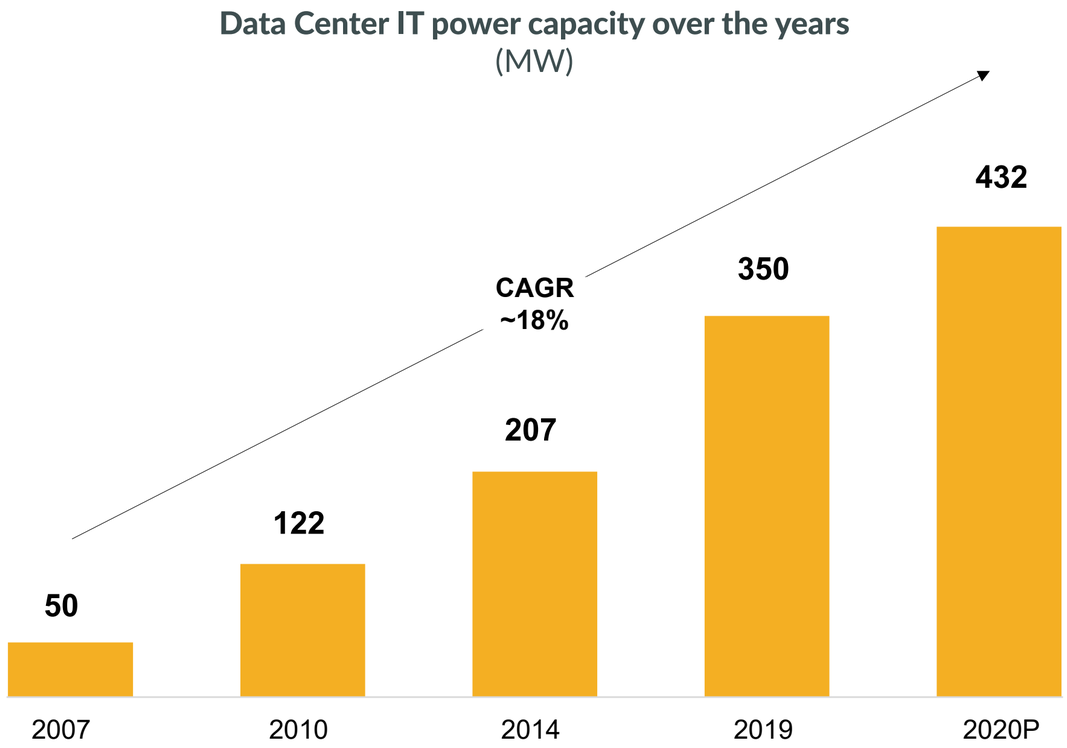
Requirement of large tract of land with good availability of power, water and fiber cable connectivity, and without any presence of industries in the vicinity which can cause vibrations or have potential for disaster

High number of approvals required for a Data Center to go live, leads to higher time requirement for players to start their operations

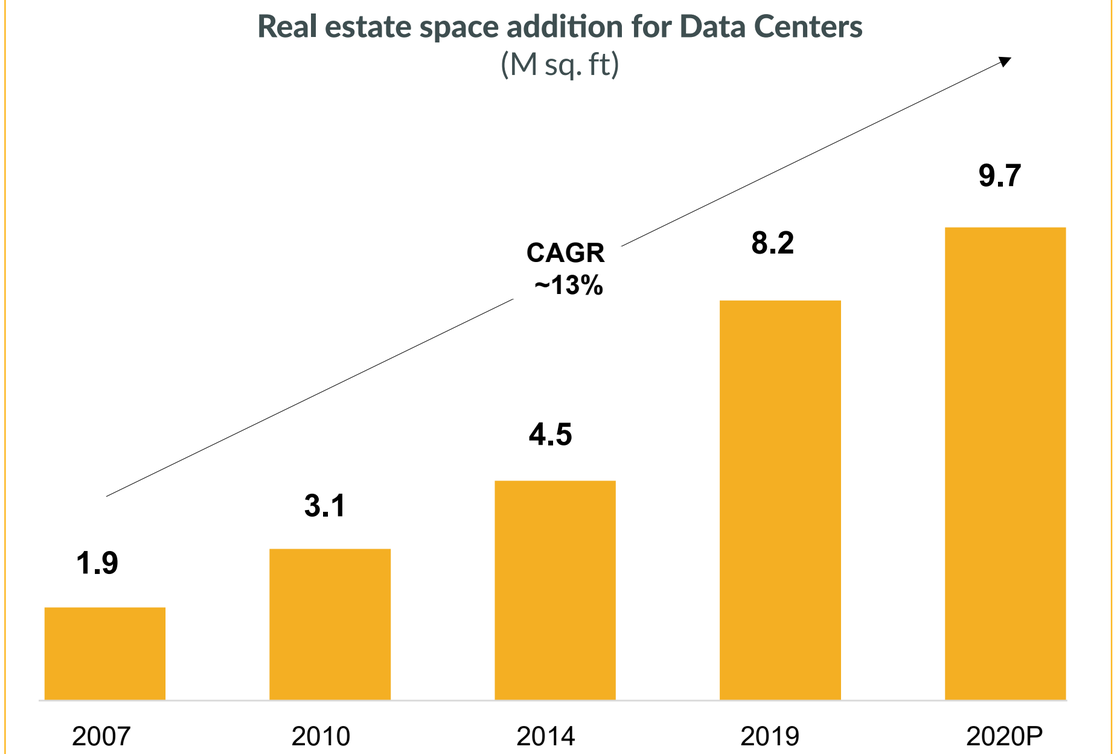
Sources: Secondary research, Praxis analysis

Data Center capacity has grown significantly over the last decade

Data Center IT power capacity is expected to increase from 50MW in 2007 to 432MW in 2020P



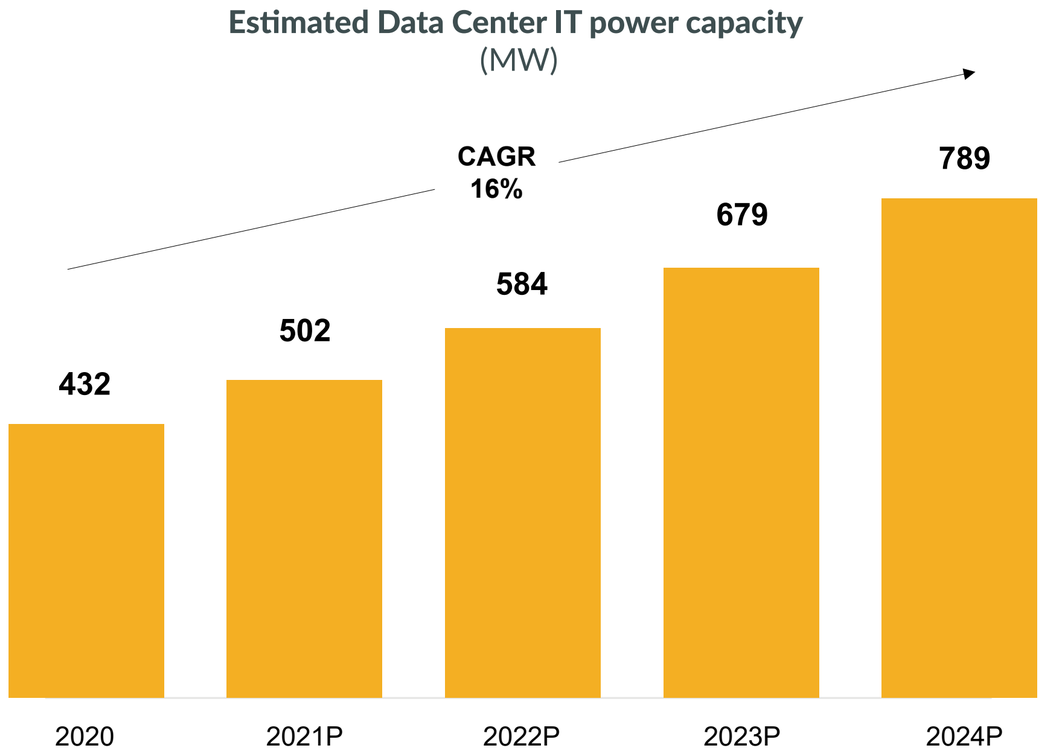
Real estate space under Data Center is expected to increase from 1.9M sq. ft in 2007 to 9.7M sq.ft in 2020P



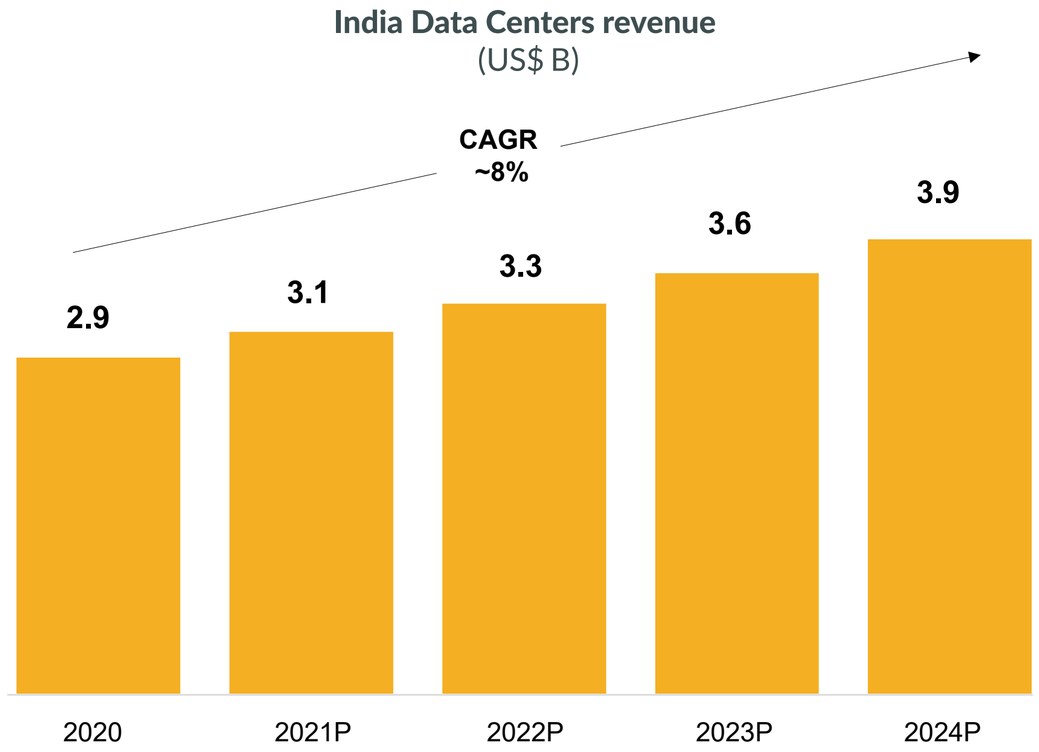
Notes: Real estate space for 2020 is estimated at an IT power capacity to mn sqft ratio
Sources: JLL report, Secondary research, Praxis analysis

In India, Data Center IT power capacity is expected to reach about 800MW by 2024; while revenues are expected to reach about US$ 4B by 2024

Data Center IT power capacity is expected to reach ~800MW by 2024



Data Center revenue is projected to grow at CAGR 8% during 2020-24 and reach US$ 3.9B by 2024



Notes: Revenue growth projections are projected based on past performance of few players;
Sources: Arizton, JLL, Praxis analysis

Land availability parameters for Data Centers

No Vibrations and low potential for disaster

Regions where there are less vibrations or potential for fire / destruction due to heavy construction / industries nearby.

Low flooding potential

Regions that are near sea-coast but are not threatened by flooding

Stable power supply

Regions with abundant supply of high-quality power

Cheaper land

Regions with availability of vast tracts of land available at cheaper prices

Access to fibre cable connectivity

Regions with access to high-speed sea/optic fibre cables for unrestricted connectivity

Disaster avoidance

Regions which do not fall in high seismic zone and high velocity winds

Transport accessibility

Regions with good connectivity for easier access for operations and maintenance staff

Climate conditions

Regions with moderate climate ensuring lower temperatures for effective data center operations

Socio-economic and Government criteria

Availability of construction & sustaining workforce, taxation and incentives

Sources: Secondary research, Praxis analysis

Data Center ecosystem (India + Global)

Data hosting centers

Co-location / Hyperscale / Edge

netmagic | NTT | Web Werks | sify | Reliance Communications | STTelemedia Global Data Centres | Aride Ocean | EQUINIX WHERE OPPORTUNITY CONNECTS | nxtra data SMART. SECURE. RELIABLE | CtrlS | YOTTA | DATA FIRST

Managed data hosting

NxtGen Infinite Datacenter | FUJITSU | Reliance Communications | VERNE GLOBAL | CRAY a Hewlett Packard Enterprise company | HOSTMUD™ | E2E Networks | Rack Bank | TELEHOUSE

Captive

Infosys Navigate your next | amazon | BSNL Connecting India | ITC Enduring Value | Cognizant | TATA CONSULTANCY SERVICES | ICICI Bank | wipro

Data critical infrastructure providers

CISCO | ARISTA | Reliance Communications | IBM | Atos | BROADCOM connecting everything | HUAWEI | Hewlett Packard Enterprise | DELL Technologies

Cloud service providers

Alibaba Cloud | Harbour1 | cyfuture | Google Cloud | aws | NetApp | UNITAS GLOBAL | TATA COMMUNICATIONS | PENGUIN COMPUTING | esds | Microsoft Azure

Support infrastructure providers

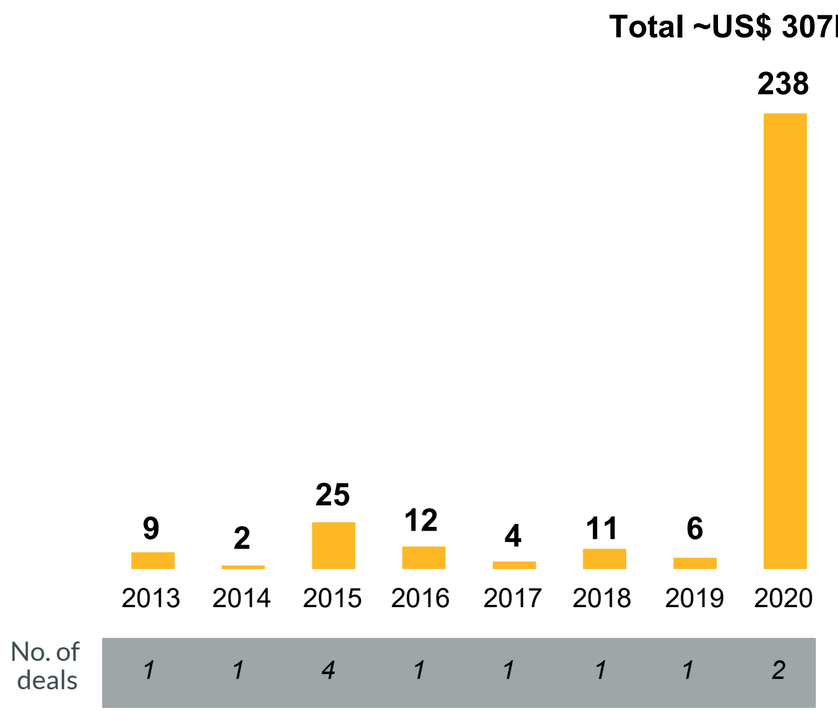
NETRACK ENCLOSURES STORE | SECURE | STREAMLINE | SYSTEMISE | STERLING & WILSON | STULZ CLIMATE. CUSTOMIZED. | ABB | Cummins | ROLLS ROYCE | MITSUBISHI ELECTRIC | Schneider Electric | Kirloskar

Notes: Most companies under data hosting centers classes (colocation, managed data hosting cloud) are active in multiples classes
Sources: Tracxn, Secondary research, Praxis analysis

PE investments in the Data Centers in India witnessed a large spike in 2020

Maximum investment accounted in 2020 in the DC industry

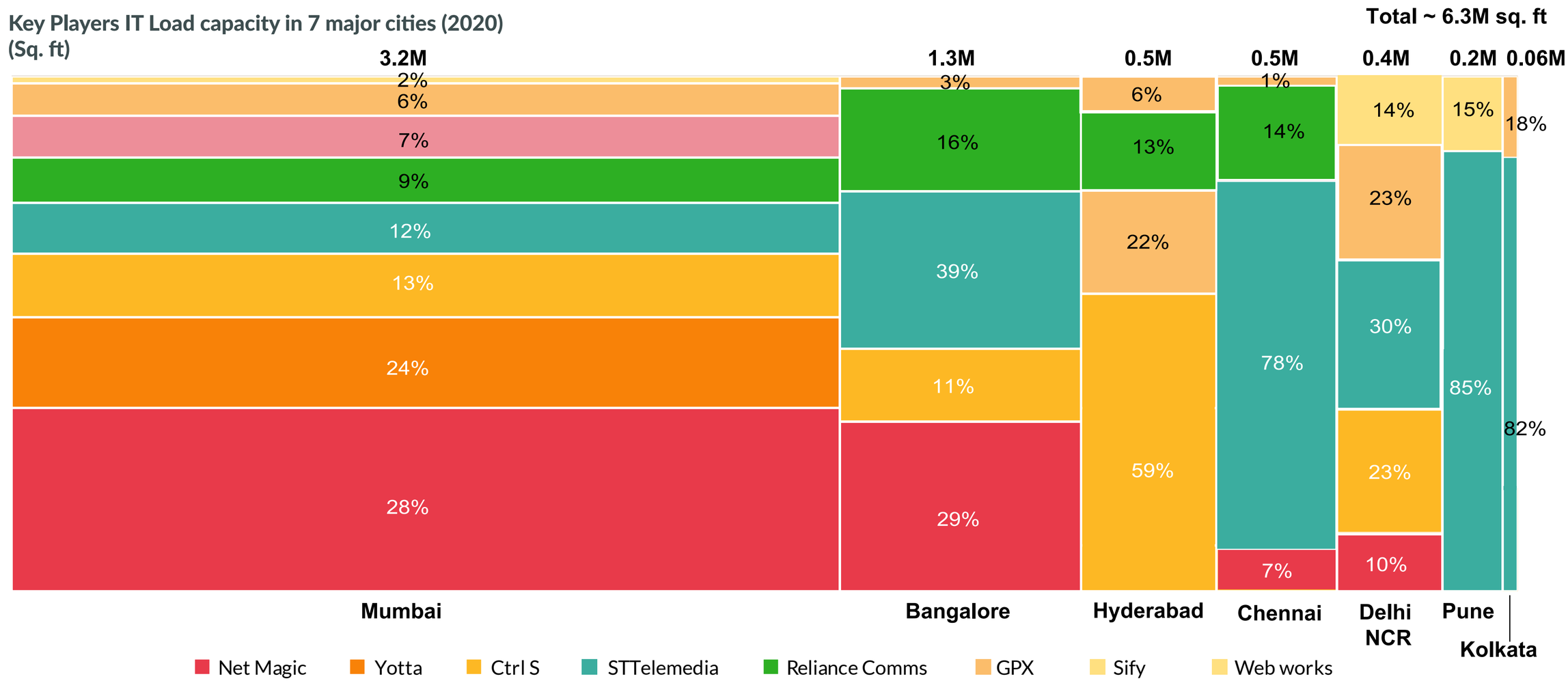
PE investments in colocation and managed service providers
(US$ M)



Data Center Company	Year	Investment (US$)	Type of investment (Funding Round)	Key Investor	Acquisition
nxtra data	2020	235M	Series D	The Carlyle Group	-
GPX	2020	161M	Acquisition	-	Equinix
CtrlS	2008	50M	PE	Och-Ziff Capital Management Group	-
netmagic	2010	15.7M	Series B	nexus venture partners, Cisco investments, 8th Eight Roads	-
NxtGen Infinite Datacenter	2015	13.5M	Series B	Altira	-
esds	2015	4M	Series A	GEF Capital Partners, Canbank VC	-
Pi	2016	11.8M	Series A	Epsilon Venture Partners	-
cyfuture	2016	219K	Seed	RVCF Rajasthan Venture Capital Fund	-

Notes: Ctrl S, esds have also taken up conventional debt
Sources: Tracxn, Secondary research, Praxis analysis

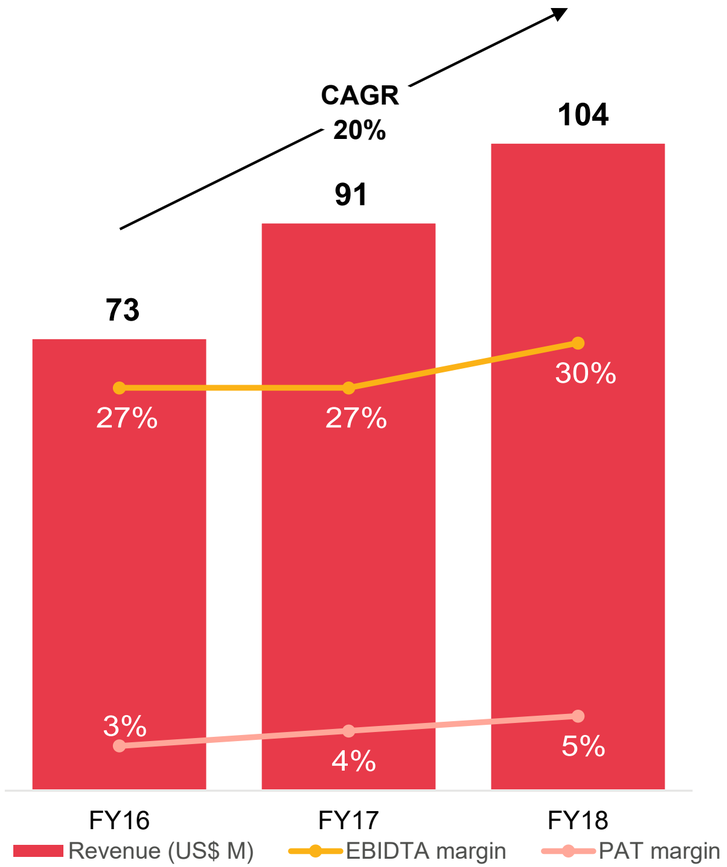
Top 8 Data Center players account for the bulk share of Data Center space in India; Mumbai accounts for about 50% of the total Data Center space



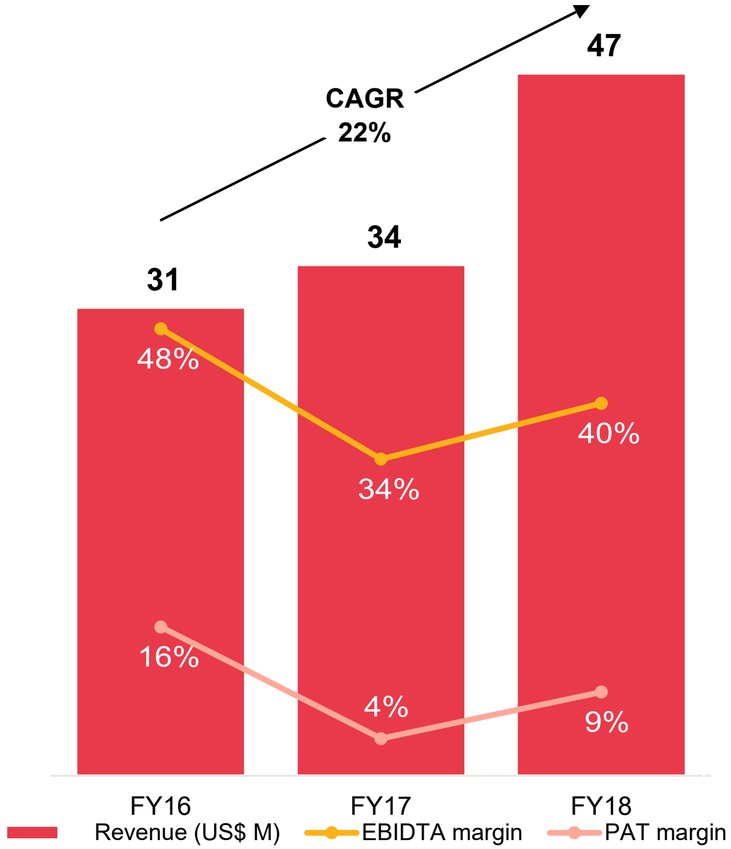
Notes: Total area is estimated for top 8 key players across these 7 major cities,
Sources: Secondary research, Praxis analysis

Domestic players have been growing at higher CAGR of about 20%; Margin profiles becoming better with scale

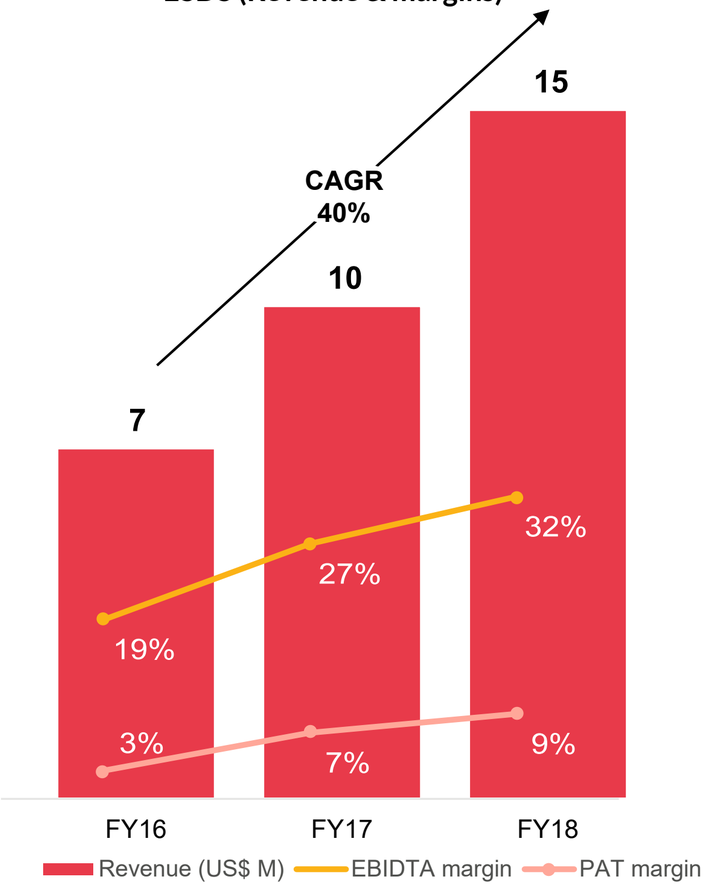
Net Magic (Revenue & margins)



CTRLS (Revenue & margins)



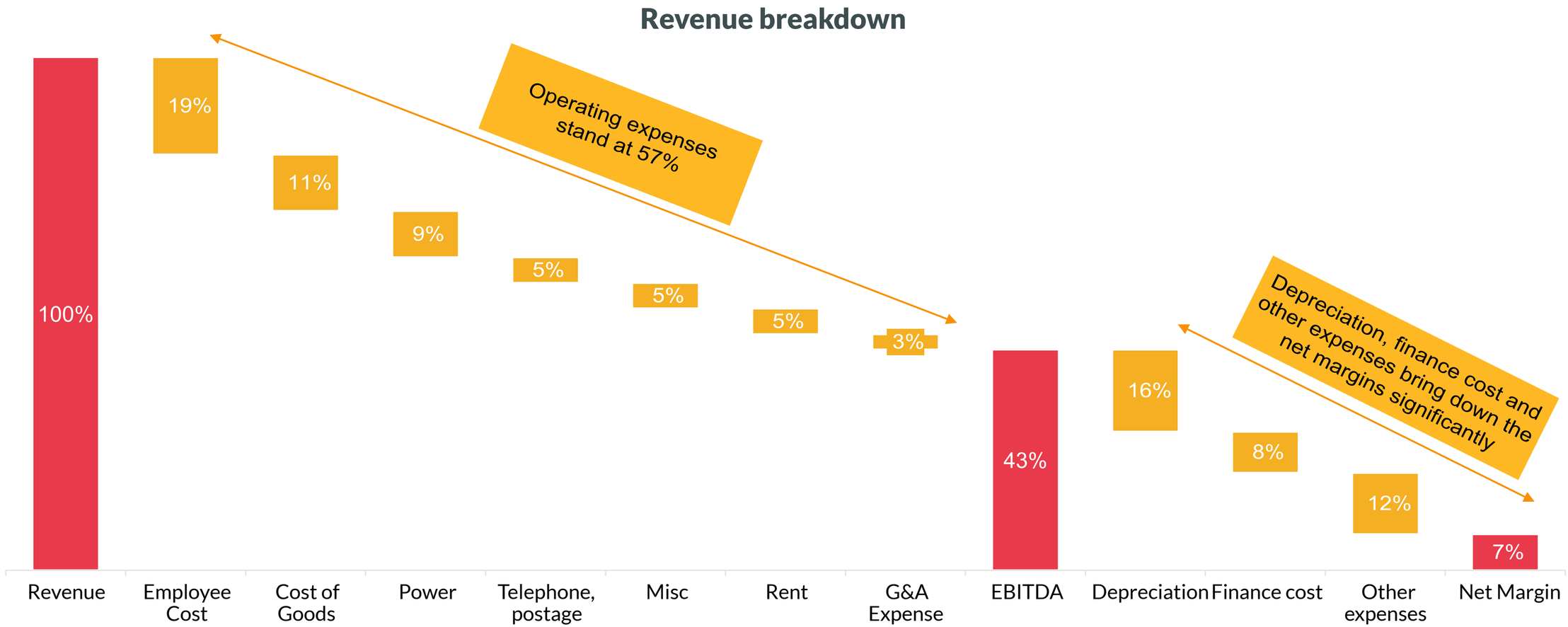
ESDS (Revenue & margins)



Sources: Tracxn, Praxis analysis

Typical cost structure: Operating expenses constitutes ~57% of the revenue; High depreciation cost due to capex heavy nature of the business

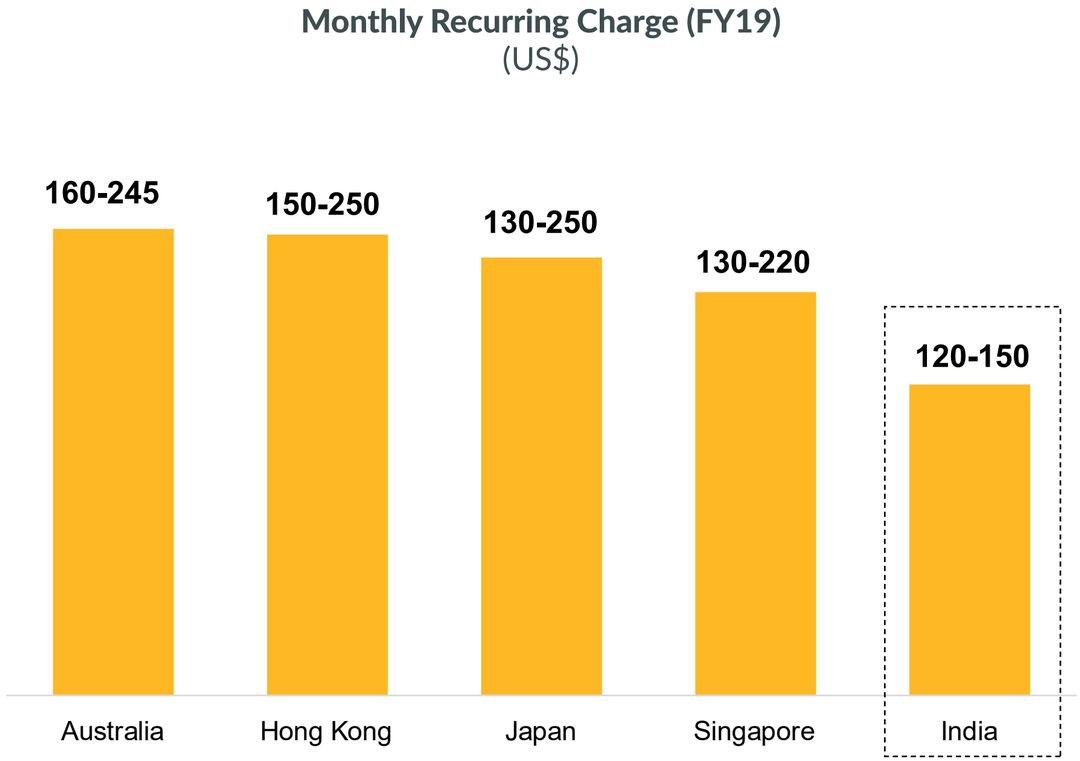
People and Power costs make up ~50% of operating expenses



Notes: Estimated basis FY18 and FY19 financials of few companies
Sources: Tracxn, Praxis analysis

India has lower average monthly charges than other developed countries due to lower cost and increasing demand

Monthly server usage charges in India are significantly lower than developed countries in APAC region



Reasons for India's competitive advantage

Real estate cost: Commercial real estate prices in India are lower than prices in developed countries

Skilled and lower manpower cost: Lower cost of manpower for setting up and managing server infrastructure

High demand growth: Significant increase in data consumption driven by lower data cost and increasing internet penetration in the country

Ability to act as a hub for the region: India's position in South Asian region and availability of sea cable connectivity in key cities enabling it to act as a Data Center hub for the region

Notes: Monthly charges are for <500 kW per month power utilisation
Sources: JLL Report, Secondary research, Praxis analysis

India's draft Data Center policy aims at creating a sustainable ecosystem for data center players with supporting infrastructure and skilled manpower availability

Theme	Reform	Description
Enabling Ease of Doing Business	Infrastructure status for Data Centers	• Infrastructure status in line with sectors like Railways, Power etc. would enable Data Center players to avail long-term credit from lenders at easier terms
	Single window clearance	• Single window clearance for interested players to enable time-bound approvals
	Data Center parks	• Promote pre-provisioned Data Center parks to enable plug and play model for Data Center providers, and ensure access to land parcel, power at low rates, high-capacity network, and pre-approved clearances
	Data Center Incentivization Scheme	• Fiscal and non-fiscal incentives for Data Center players on usage of domestic IT hardware and other non-IT equipment
Ecosystem for data center operations	High quality power availability	• Uninterrupted power supply availability at reasonable rates • Facilitate RE generation within the premises of Data Centers • Facilitate open access for Data Centers to directly procure electricity from RE plants
	Robust connectivity	• Facilitate establishment of captive fiber networks for connecting Data Centers, and ensuring lower bandwidth cost for Data Centers
Data Center Economic Zones	Data Center ecosystem creation	• Government to set up at least 4 specialized Data Center Economic Zones with conducive IT and non-IT infrastructure, connectivity, power and regulatory ecosystem • Would lead to having hyperscale Data Centers, cloud service providers, R&D firms and IT firms at a single place
Technology and research	Indigenous manufacturing	• Fiscal incentives for Indian players to manufacture Data Center related IT and non-IT hardware and software products • Incentivizing global manufacturers to set up manufacturing units in India
	Capacity building	• Skill development and upgradation initiatives to create a trained workforce for Data Center operations and maintenance

Sources: Data Center Policy 2020 by MeitY, Secondary research, Praxis analysis

Upcoming technologies related to IoT, AI/ML, predictive maintenance and big data would increase the demand for Data Centers

End-use	Description	Drivers of growth
Autonomous vehicles	• Autonomous vehicle requires continuous generation of data that needs to be processed for the vehicles to navigate safely on the roads • Average self-driving private car would generate 1-15 TB/ day whereas shared mobility vehicles will generate up to 450 TB/ day	• Improved comfort of driving and potential to reduce accidents related to human error
Automated warehouses	• Automated warehouses that require lesser manpower and offer higher efficiency will require generation and processing of data on a continuous basis	• Improved efficiency of operations
Big data	• Use of more data to understand customer behavior and trends for organizations to take decisions would lead to higher requirement of data storage space	• Ability to generate improved insights on consumers
Connected devices	• IoT-enabled connected devices require huge amount of data to be screened and analyzed where it is generated • Smart homes are one of the fastest growing segments which has the potential to generate huge amount of data	• Higher control over equipment and improved comfort of remote management
Predictive maintenance	• Regular storage of data regarding operational parameters of equipment and devices to ensure identification of potential defects • Companies with complex manufacturing/production equipment that have higher downtime-related costs would invest more in predictive maintenance technology	• Ability of predictive maintenance to reduce potential downtime for the equipment
Smart cities	• Smart cities would have multiple data collection devices across the city which would collect and process huge amount of data to provide the required services to the citizens	• Policy measures by government
Social media	• Increase in smartphone and internet penetration will lead to higher usage of social media platforms requiring higher data storage requirements	• Increase in internet and smartphone penetration
Ecommerce	• Increase in smartphone and internet penetration will lead to higher penetration of Ecommerce in the overall purchases made by the people	• Increase in internet and smartphone penetration

Sources: Data Center Policy 2020 by MeitY, Secondary research, Praxis analysis

Key global trends to monitor in this segment

		Drivers	Outcome
1	**Demand for hyperscale Data Centers**	• Increasing requirement of hyperscale Data Centers due to increased computing power requirement and need for scalable solutions	• 500+ hyperscale Data Centers in existence • 100 of them have come up in past 2 years
2	**Move towards cloud**	• 80% of enterprises are expected to eliminate traditional Data Centers by 2025 as compared to ~10% in 2019	• Companies switching to cloud services and abandoning in-house physical servers
3	**Growth of 5G and Edge DCs**	• Data Centers moving closer to consumers due to increasing requirement of lower latency for higher customer satisfaction • Growth of 5G to further increase data speed and internet penetration	• Emergence of decentralized, smaller-scale Data Centers within cities near customers at the edge of network to reduce latency
4	**Emergence of Green Data Centers**	• Cooling makes up 30-40% of energy consumption of Data Centers • Climate change issues & increasing energy consumption leading to emergence of energy-efficient Data Centers	• AI/ML driven dynamic regulation of temperature • Direct to chip & full immersion liquid cooling solutions • On-site RE power generation to reduce dependence on DGs
5	**Use of solid state drives for data storage**	• Lower space requirement and lower power consumption by solid state drives as compared to hard disk drives • Decreasing cost of solid state drives	• Increasing adoption of solid state drives across Data Centers globally
6	**Remote monitoring & management of Data Centers**	• Covid-19 pandemic had resulted in shortage of manpower for physical monitoring and management for Data Centers.	• RIM (Remote Infrastructure Management) is gaining traction whereby the IT infrastructure of a company can be managed either entirely or in parts via a remote location.

Sources: Data Age 2025 by IDC, Press reviews, secondary research, Praxis analysis

Specific practitioner expertise

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Customer Insight & Brand Loyalty
Measuring and driving improvement in NPS scores and customer loyalty through detailed customer insights and proven frameworks

Cost Transformation
Identifying sustainable opportunities for profit improvement by focusing on strategic cost management

Growth and Scale Up
Growing fast and scaling up by optimizing client offerings, pricing, promotion, and distribution to the right target

Profitability and unit economics
Developing unit economics for any new product / market launch and driving profitability by operational efficiency

Process Re-engineering
Designing and implementing processes based on the principles of design thinking to enhance customer experience

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