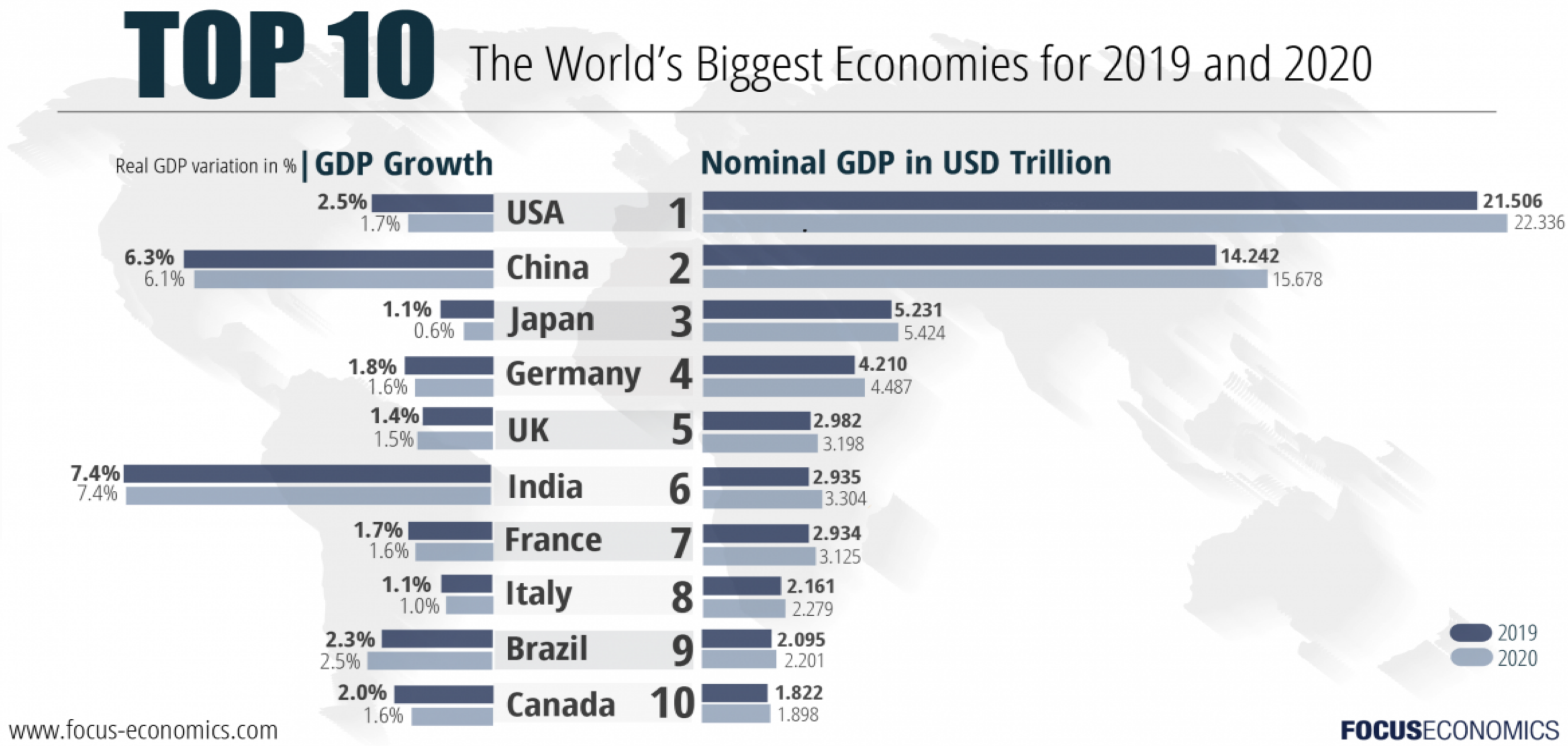
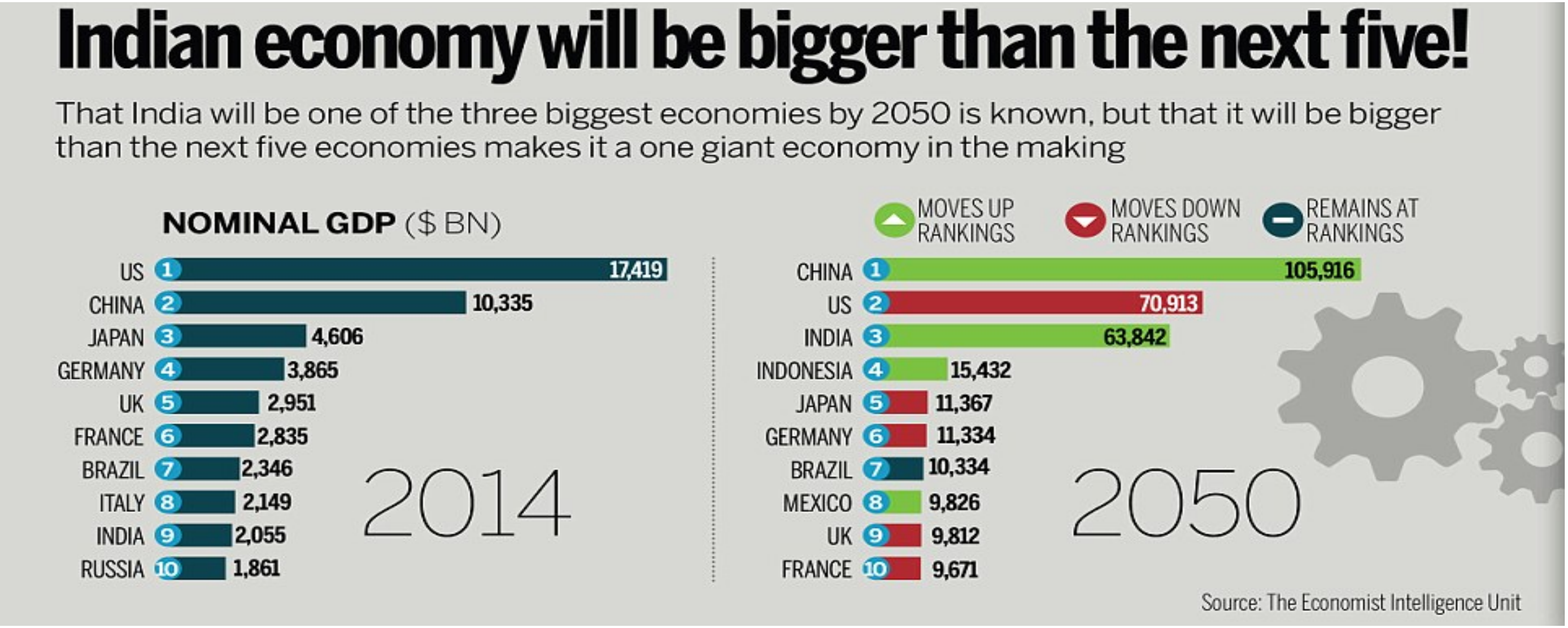

SANOG 34
KEYNOTE
Dave Nishball

AGENDA

INDIA RISING



INDIA RISING – 2050 OUTLOOK



INDIA RISING – KEY DRIVERS

Robust Demand

Competitive Skills

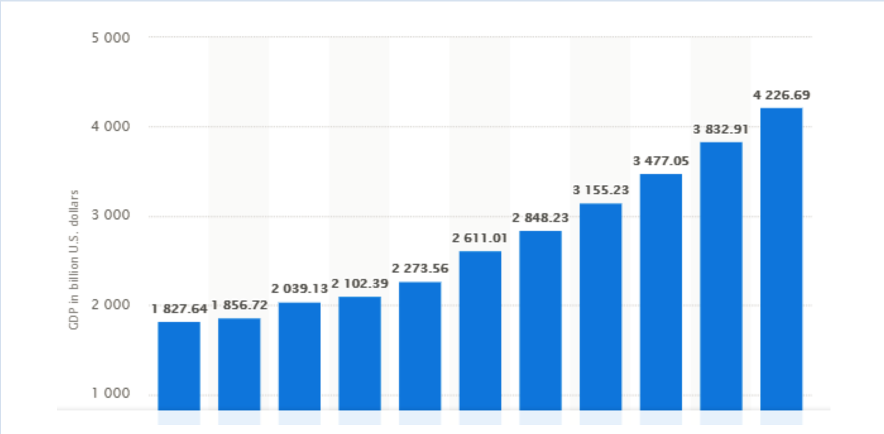
Supportive Policies

Foreign Investments

Emerging Startup Ecosystem

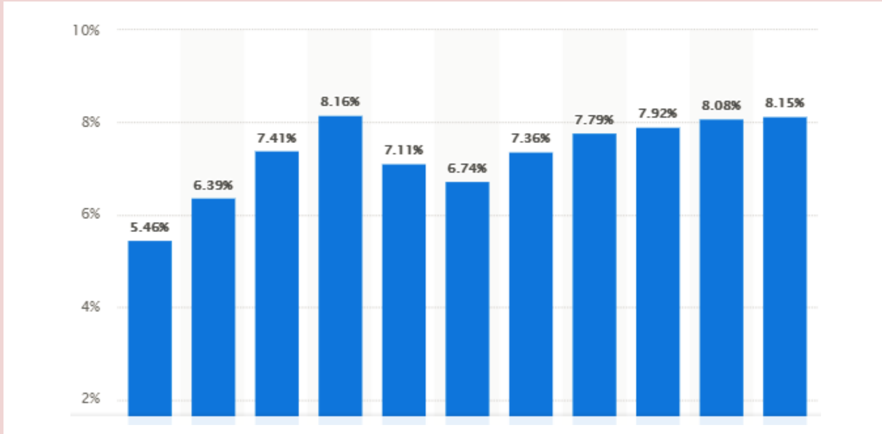
INDIA RISING – ROBUST DEMAND

In Billion USD



- Sixth largest economy in the world
- Third in terms of purchasing power parity at $9.49 Tr.
- In FY 2018 India's economy became the world's fastest growing major economy, surpassing China

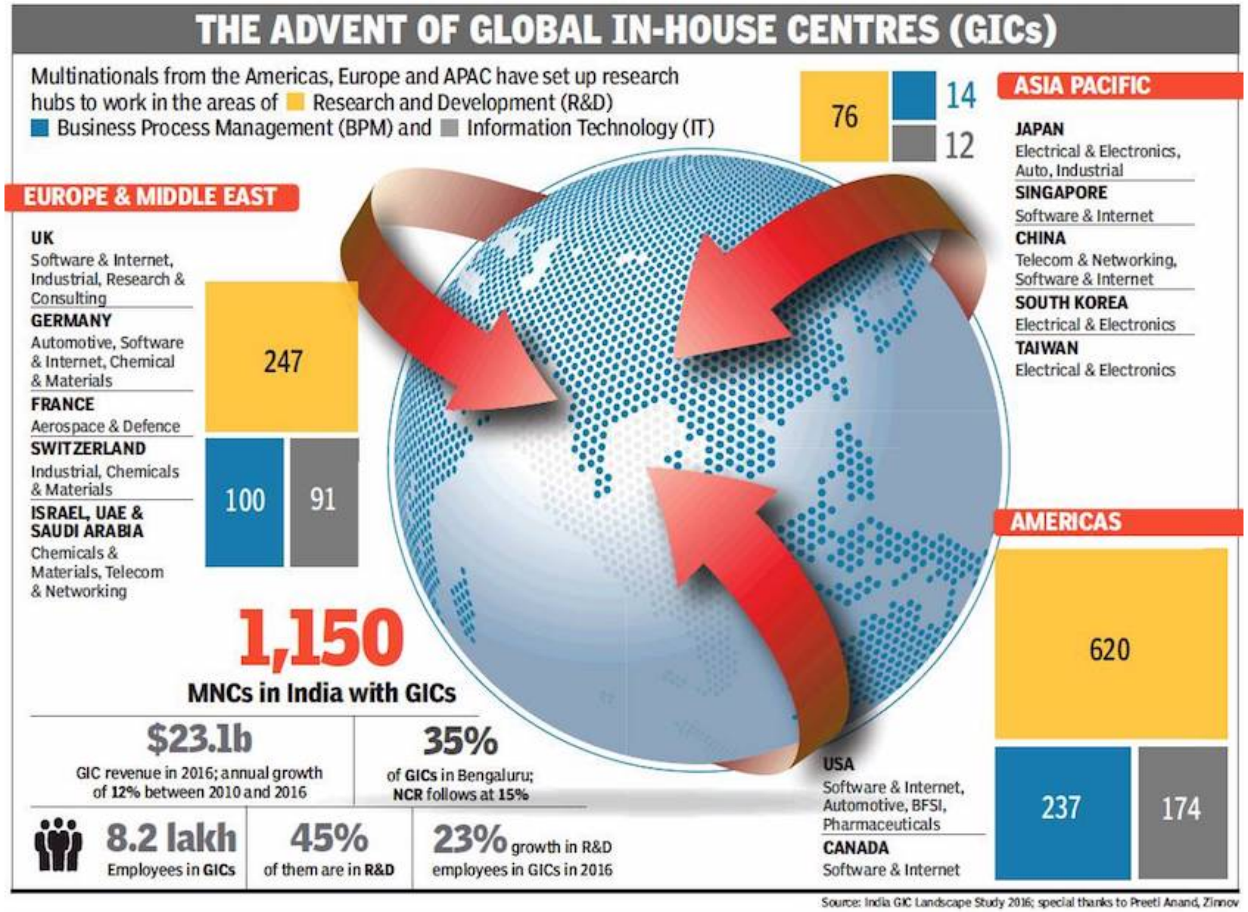
% growth rate
(compared to the previous year)



- Fastest growing service sectors in the world - annual growth rate above 9% since 2001
- To expand at CAGR of 7.4% to $6.84 trillion by 2030*
- Forecast that India will surpass Germany by 2030**

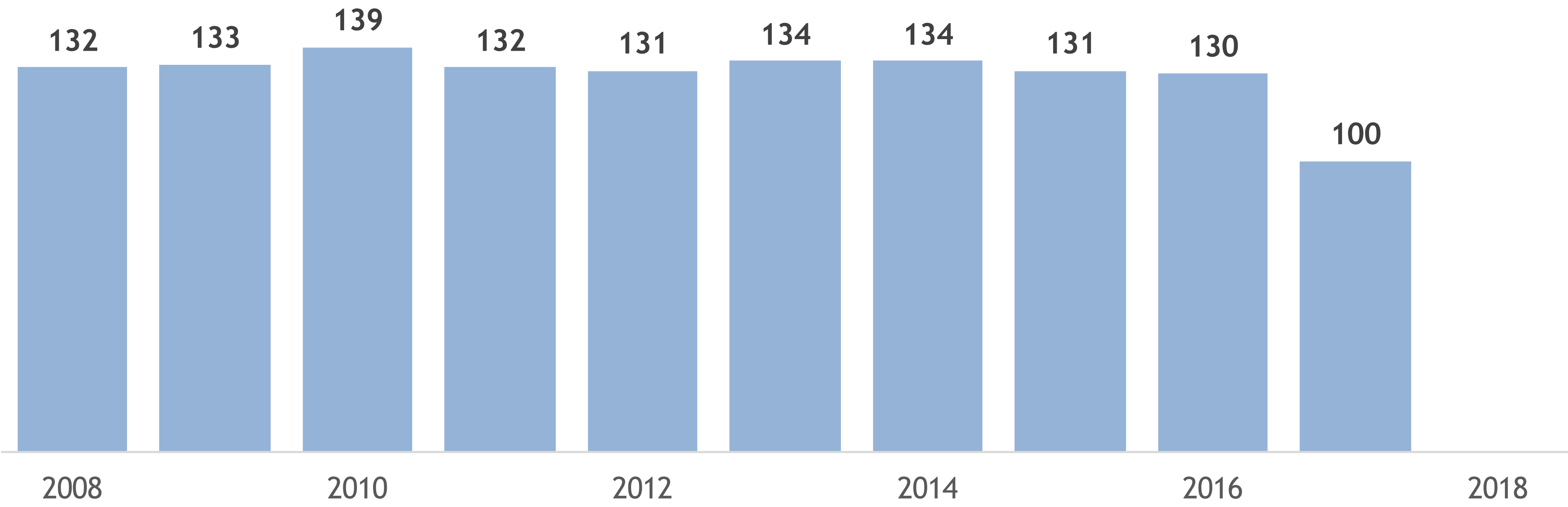
*United States Department for Agriculture Economic Research Service (USDA) ** International Monetary Fund's Managing Director Christine Lagarde

INDIA RISING – COMPETITIVE SKILLS



INDIA RISING – POLICY SUPPORT

India has moved into the
TOP 100 rankings in the World Bank's
'Doing Business 2018'



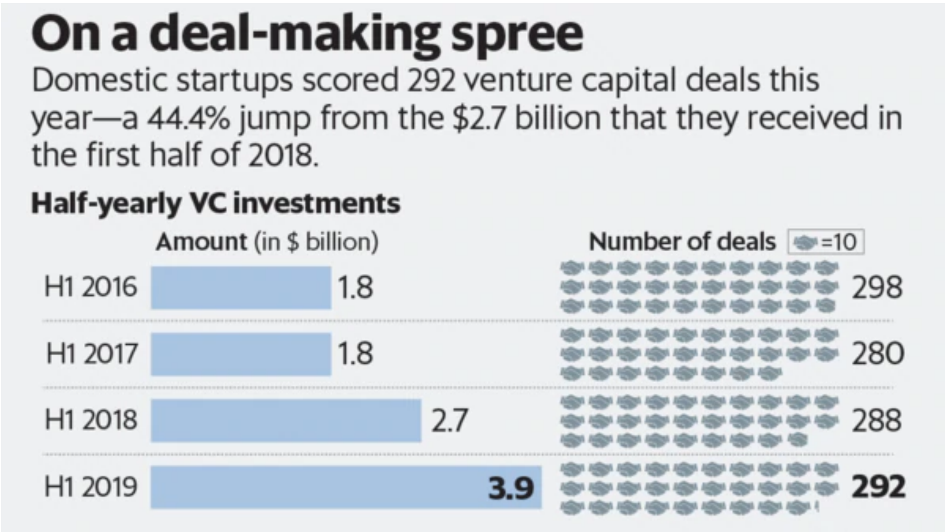
INDIA RISING – FOREIGN DIRECT INVESTMENTS

- India has become the most attractive emerging market for global investment for the next 12 months*
- Annual FDI inflows in the country are expected to rise to US$ 75 billion over the next five years**
- Private investments expected to grow by 8.8% in FY 2018-19, overtaking private consumption growth***

*Emerging Market Private Equity Association (EMPEA) ** UBS Report
*** The World Bank report on emerging markets

INDIA RISING – START-UP ECOSYSTEM

India is now the 3rd largest start-up ecosystem in the world



Source: Livemint.com

	USA	China	India	UK	Germany
Total number of Unicorns	126	77	18	15	6
Unicorns in 2018	25	20	8	2	4

Unicorns in 2018

udaan, OYO, freshworks, zomato, SWIGGY, Paytm mall, policybazaar, BYJU'S The Learning App

Source: Zinnov Research & Analysis (Note: Unicorn data based on CB Insights database)

AGENDA

THE GLOBAL "DIGITAL WAVE"

CONNECTED WORLD

By 2020, smart phone users are expected to reach **2.87 Bn**

DIGITAL BUSINESS

60% of global FMCG sales are driven by online channels

E-COMMERCE

Global online spend is expected to reach **$4.48 Tn** by 2020

SMART CITIES

Global smart city spend is expected to reach **$34.35 Bn** by 2020

E - LEARNING

Global online education to reach **$275 Bn** by 2021

DIGITAL INDIA - A "DIGITAL TSUNAMI"

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CONNECTED WORLD

By 2020, smart phone users are expected to reach **2.87 Bn**

IN INDIA:

330 Mn connected smart phone users in 2017, **500 Mn** by 2020

DIGITAL BUSINESS

60% of global FMCG sales are driven by online channels

IN INDIA:

10-15% of FMCG sales are online in 2016, **40%** of sales by 2020

E-COMMERCE

Global online spend is expected to reach **$4.48 Tn** by 2020

IN INDIA:

Online spend to grow **2.5X** to **$100 Bn** by 2020

SMART CITIES

Global smart city spend is expected to reach **$34.35 Bn** by 2020

IN INDIA:

$1482 Mn has been allocated for the smart city project

E - LEARNING

Global online education to reach **$275 Bn** by 2021

IN INDIA:

Online education will grow by **8X** to **$2 Bn** by 2021

The India digital economy is expected to reach $1 Trillion by 2025

DIGITAL INDIA – A "PERFECT STORM"

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FOREIGN DIRECT DIGITAL INVESTMENT

$5 billion
committed to invest in India

amazon

Alibaba.com

$1.7 billion
Invested in Indian startups

Digital India
Power To Empower

GOVERNMENT INITIATIVES

JAN DHAN YOJNA

200+ Mn Beneficiaries at rural/ semi urban center bank branches

GOVERNMENT E-MARKETPLACE

318,595
Products

120,667
Sellers & Service Providers

AADHAR (UIAI)

89% Of population assigned the biometric unique identifier card (mid-Feb)

CONSUMER RESPONSE

www.

370+ Million
India has the 2nd largest number of internet users

India becomes world's fastest growing market for Apps

1 Trillion
Mobile wallet Transactions by 2018

730+ Mn
Mobile phones

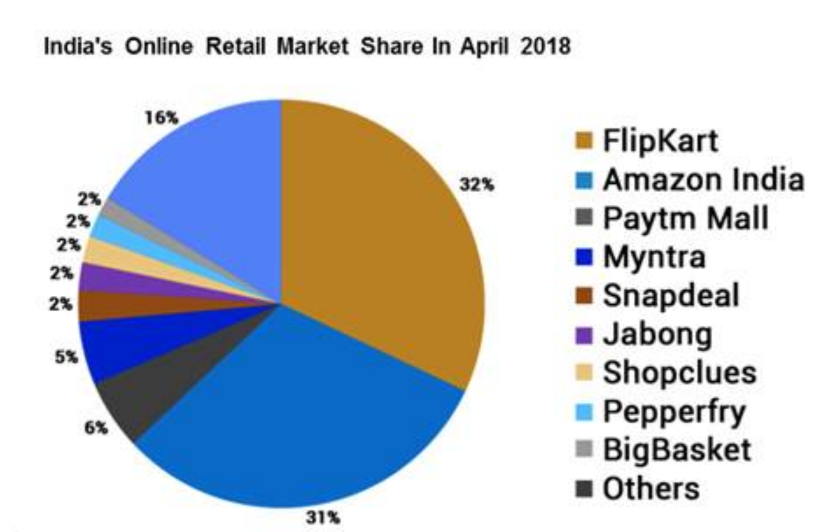
1+ Mn
Smart meters installed

15 Mn
to be installed by 2020

DIGITAL INDIA – EXAMPLE: E-COMMERCE

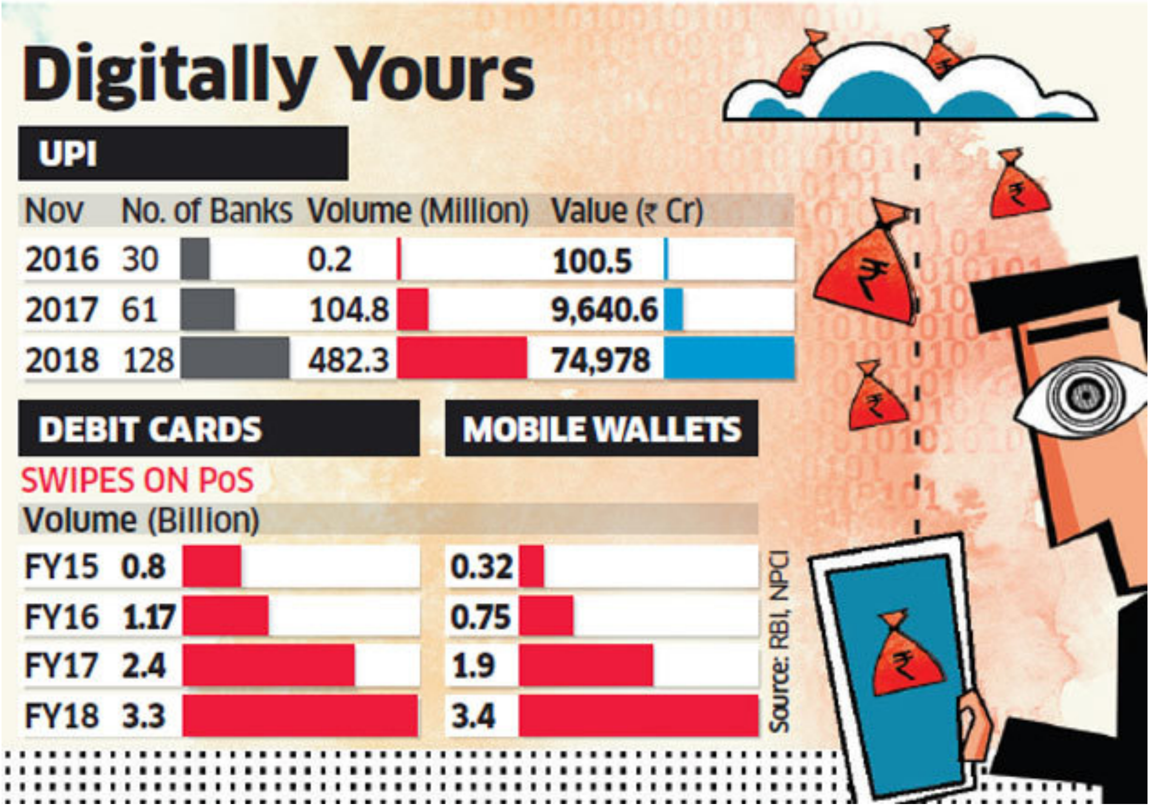
Source: The Economic Times

Source: The Economic Times



Source: Bloomberg Quint

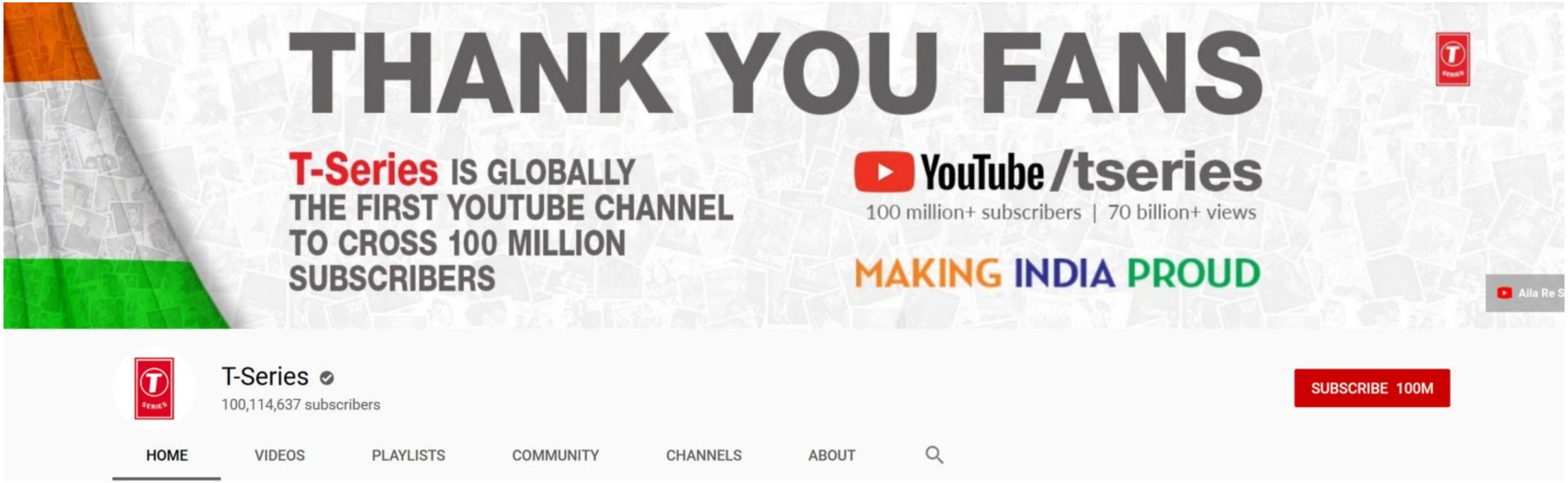
DIGITAL INDIA – EXAMPLE: DIGITAL PAYMENTS



Source: Bankedge.in
Illustration: Anirban Bora

Source: National Bureau of Economic Research, Feb. 2019

DIGITAL INDIA – EXAMPLE: DIGITAL ENTERTAINMENT



Currently, there are 16 Indian YouTube channels with more than 20 million subscribers

Source: Social Blade

DIGITAL INDIA – HEADROOM FOR GROWTH

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Total Number of Wireless Subscribers is flattening, but…

- + 40M per year <u>active</u> internet subscribers
- + 157% growth in mobile data usage (Q2 2017 vs Q2 2018)
- Searches in non-metros growing faster than metros
- Retail e-commerce penetration only 2.9% vs. 29.1% in China
- 400 Million of the World's 2 Billion "Unbanked" are in India
- Cash:GDP ratio is ~11.3%, one of the highest in the world
- IT productivity investment still at an early stage in India

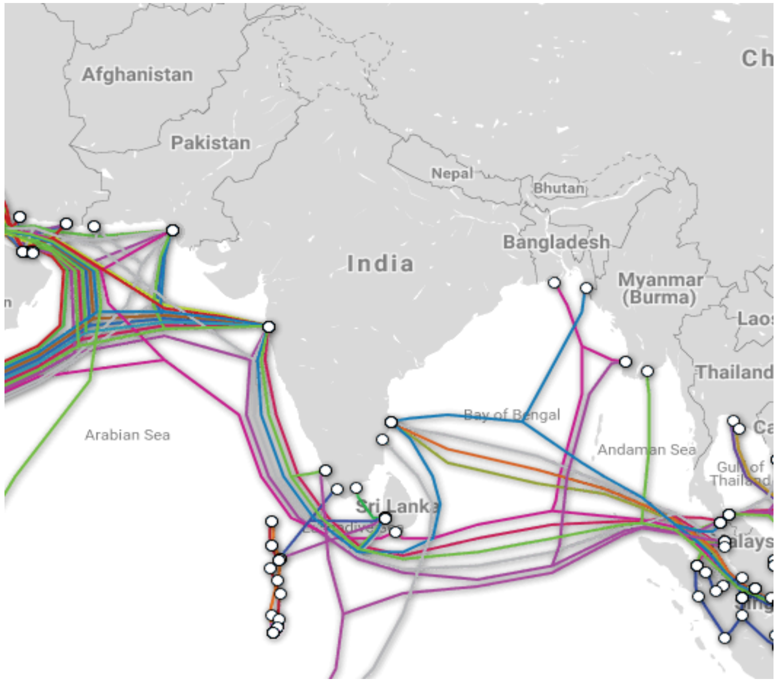
Sources: Google "Year in Search"; TRAI reports; eMarketer 2019;
World Economic Forum; Nomura Global Research

AGENDA

DIGITAL INDIA INFRASTRUCTURE – HISTORICAL CONTEXT

1999-2007	2007-2016	2016-2020
Dial Up/Fixed Line	Mobile Internet Transition	Mobile data consumption spikes with 3G/4G & Jio
Highly regulated telecom market; few players	Access market opens up; sub capacity highly controlled	Network costs start moving toward international levels
Little or no local content	OTT's / Content Players start setting up network nodes	Cloud nodes announced in India – AWS/Azure/Alibaba
Network PoP's double up as Data Center	Telco centric Colo	Carrier Neutral Colo

DIGITAL INDIA INFRASTRUCTURE – NETWORK ARCHITECTURE

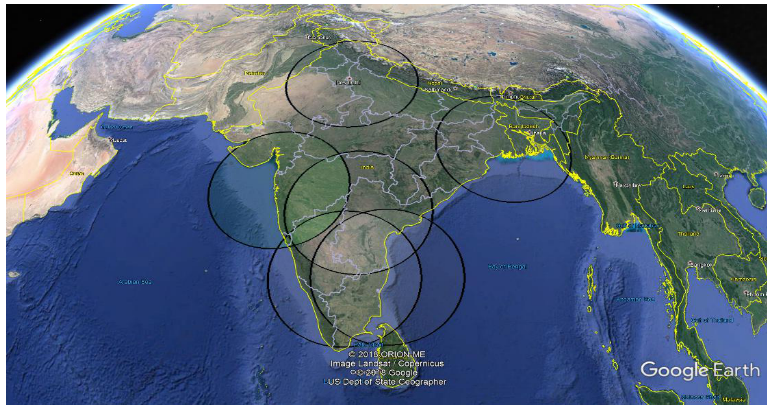


All gateway IP routers for SP's & OTT's are collocated in Chennai/Mumbai, so carrier and IP traffic density is highest there

- Submarine capacities largely land in Mumbai (70%) and Chennai (30%)
- IP Transit from India connects into Europe (Eastbound) and Singapore (Westbound)
- Domestic Long haul carries traffic to other key markets – Delhi, Hyderabad, Bangalore, and Kolkata

DIGITAL INDIA INFRASTRUCTURE – 6 CITIES DOMINATE

- Proximity to Users
- Network Availability
- Proximity to GDP
- Data Center Density



Mumbai	Chennai	Delhi/NCR	Bangalore	Hyderabad	Kolkata
358 million eyeballs	283 million eyeballs	370 million eyeballs	330 Million eyeballs	370 million eyeballs	241 million eyeballs
37% of GDP	28% of GDP	24% of GDP	39% of GDP	41% of GDP	21% of GDP
16 DC’s/CLS sites	9 DC’s/ CLS	7 DC’s	8 DC’s	3 DC’s	2 DC’s

Eyeballs and GDP – approximate eyeballs in a 750 km (20 ms) radius; total over 100% due to overlaps

DIGITAL INDIA INFRASTRUCTURE – DATA CENTER EVOLUTION

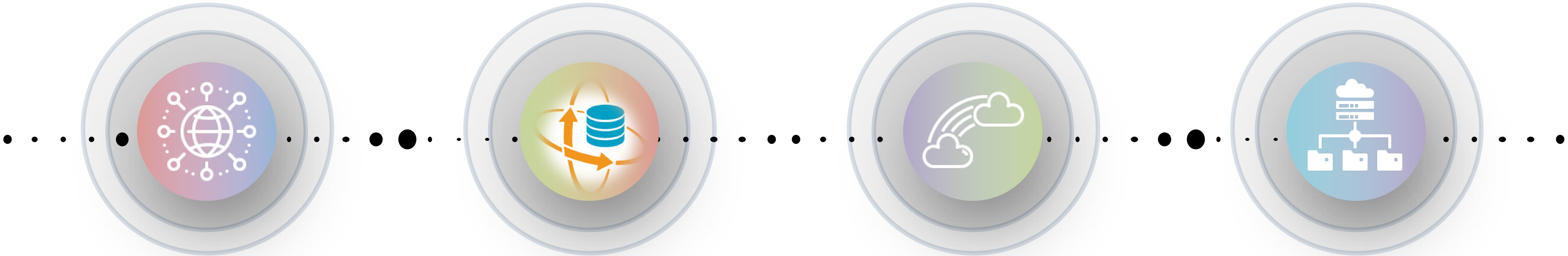
- ~1 MW
- India Enterprise
- < 3KW/rack
- Multi-tenant
- Telco-owned
- Ad-hoc design

- 3 - 5 MW
- India/Global Enterprise
- 3 – 6 KW/rack
- Multi-tenant/Dedicated
- Telco and Carrier Neutral
- Global-influenced design

- 5 - 10 MW
- Enterprise & OTT/Cloud
- 5 – 10 KW/rack
- Dedicated Build
- Mostly Carrier Neutral
- Global design standards

- 10 – 50 MW
- Hyperscale-Ready
- 10+ KW/rack
- Dedicated Campus
- Carrier Neutral
- Next-gen global specs

DIGITAL INDIA INFRASTRUCTURE – PEERING EVOLUTION



- Local Peering almost non-existent
- US-centric peering
- IP Transit is default

- Public peering available
- Participation limited to licensed operators
- Relatively limited traffic vs. IP transit

- OTT Investment in Network
- Private Peering to enable access to Eyeballs in Key Telcos
- More affordable Metro Network access @10G

- Both Public and Private Peering options
- Traffic rapidly scaling
- Multiple neutral IX's, including multi-site IX
- 100G Metro access

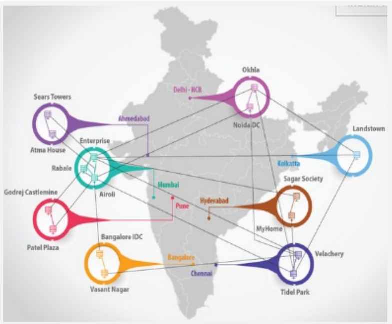
DIGITAL INDIA INFRASTRUCTURE – POWER CHALLENGES

- Power still is a critical DC site decision
  - But 2nd Order vs. Network
  - Address-level vs. City-Level issue
- India Challenge is Distribution, not Generation
  - Investment in Grid has lagged growth
  - Customers must be ready to co-invest
- Reliability is largely an issue for lower voltage
  - Industrial feeders subject to load shedding
  - HV feeders are largely uninterrupted
- Power today is a very solvable issue, and getting better over time

AGENDA

DIGITAL INDIA INFRASTRUCTURE – WHAT'S NEXT?

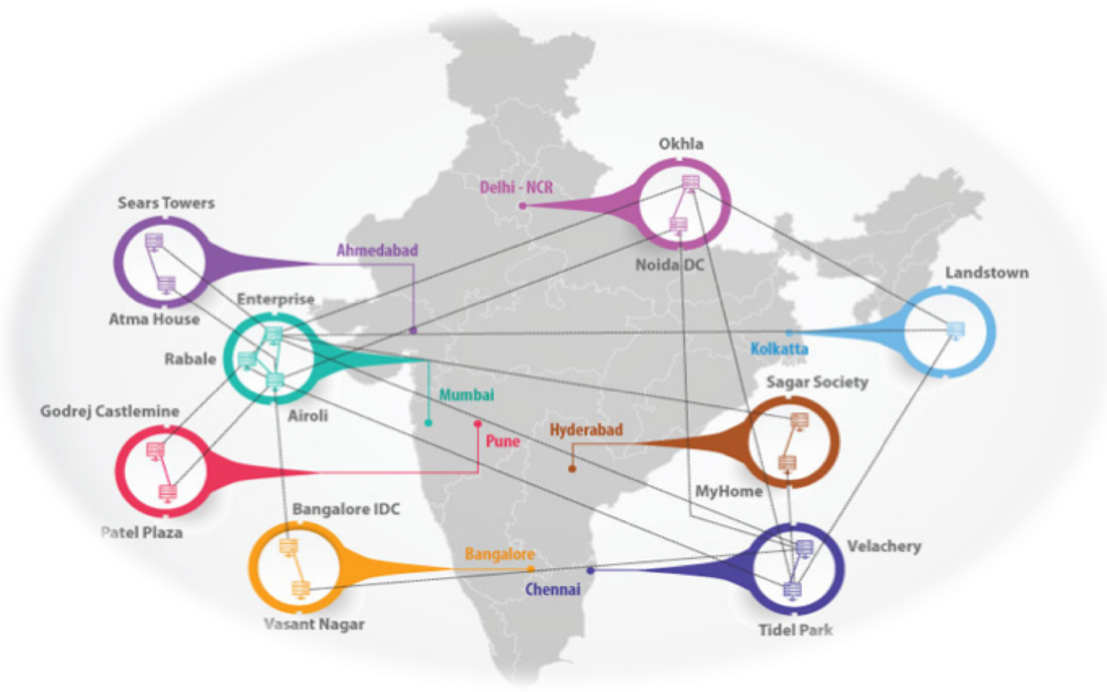
Data Centers



Networks & Peering

The Edge

DIGITAL INDIA INFRASTRUCTURE – FUTURE OF NETWORKS



- Submarine Capacity
  - Massive Capacity
  - Fiber Pair/Open Landing
- Metros (Top 6+)
  - High Capacities DC to DC
  - On-Demand via SDN
- National Long Distance
  - Limited Inter-City Express Routes
  - Cost Differentials (Gateway/Metro/ROI)
- Peering
  - Exponential Growth
  - De-Facto Hubs Emerging

DIGITAL INDIA INFRASTRUCTURE – FUTURE OF DATA CENTERS

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- Investment Scale-up
  - Operators
  - OTT's
- Target Market Stratification
  - Hyperscale
  - Enterprise
  - Network Hub
  - Network Edge
- Campus Development
  - Expansion
  - Interconnection
- Collocation for Hybrid Cloud

DIGITAL INDIA INFRASTRUCTURE – FUTURE OF THE EDGE

- Frontier Continues to Move…
  - 2 Cities
  - 6 Cities
  - 20+ Cities
- Edge Nodes Emerge
  - Latency
  - Cost
  - ISP Consolidation
- Shared Infrastructure Solutions
  - Mini-IX
  - Content Hosting
- Edge expands beyond India

DIGITAL INDIA INFRASTRUCTURE – THE FUTURE REQUIRES COLLABORATION

- Collaboration as the Norm, Not the Exception

- Growth is Centered on Collaborative Business Models
  - Carrier-Neutral DCs
  - IX's

- Sanog / Community Impact
  - Customers Demand Collaboration
  - Industry will respond

- The Pie will grow much faster than each of our shares!

Thank you