

# No Fiber No Five G



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# Fiber can take it all

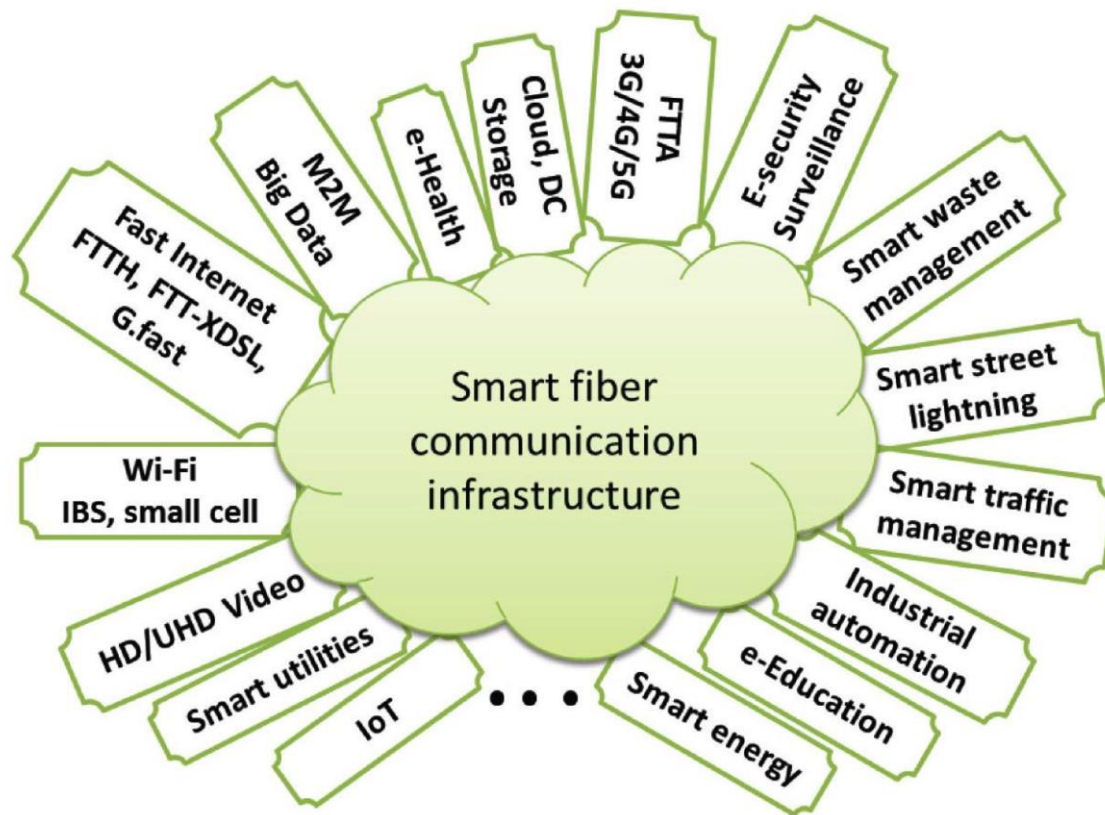


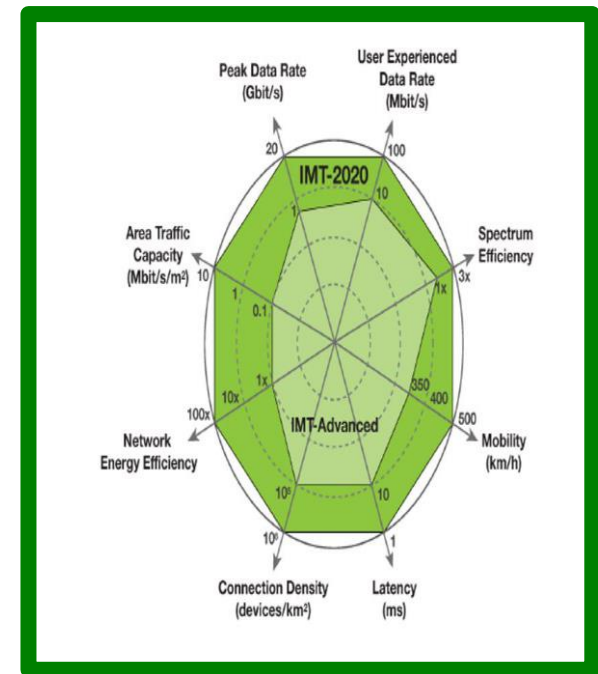
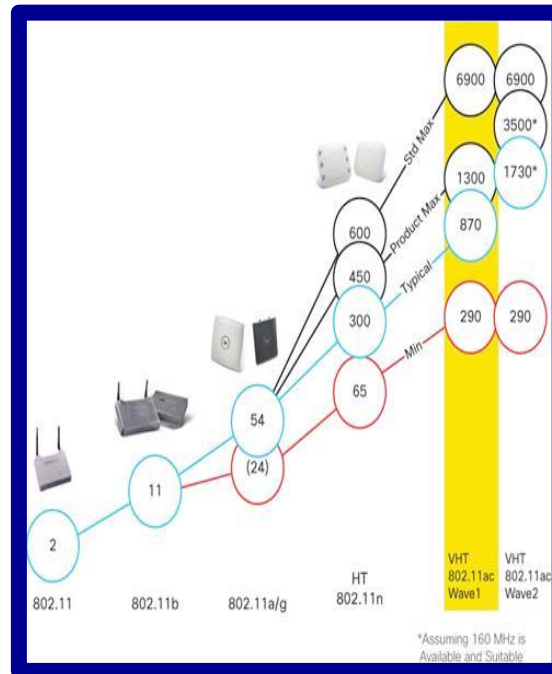
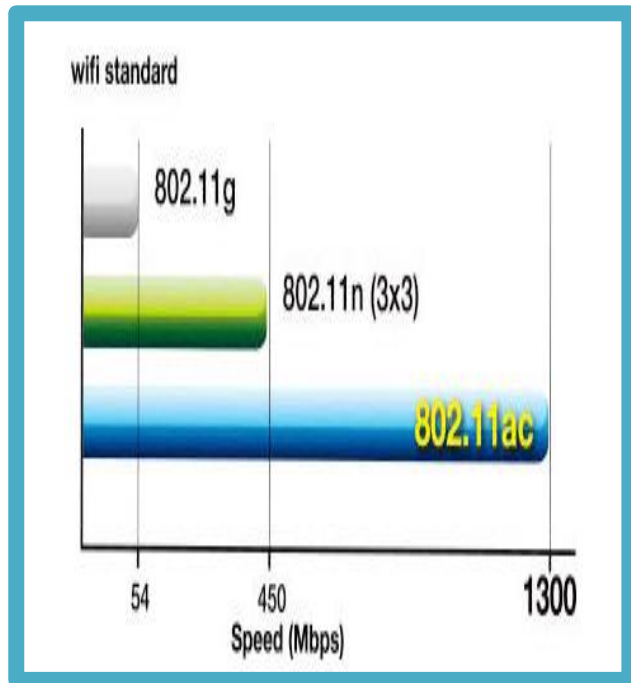
Figure 1: Smart integrated fiber communication infrastructure

# Standards are important

What role do the standards perform?

- Standards provide technology alignment/interoperability
- Network interconnections between smart communities
- Open standards for applications and content providers
- Reduced cost of provisioning - design & build Common design standards

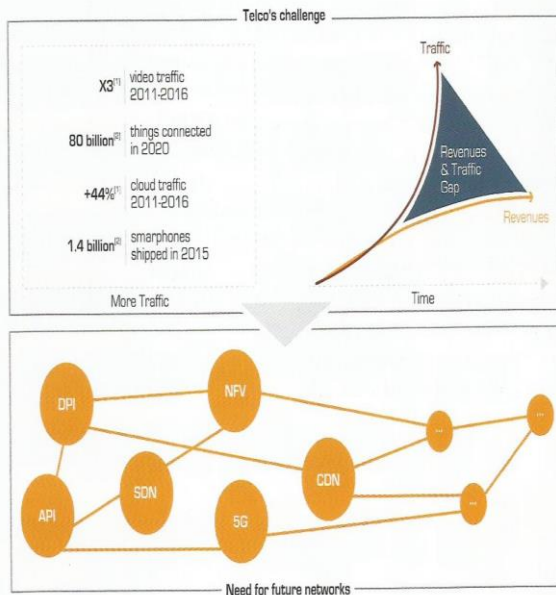
# Access is getting ready



# New Networks and new public application are welcoming IOT

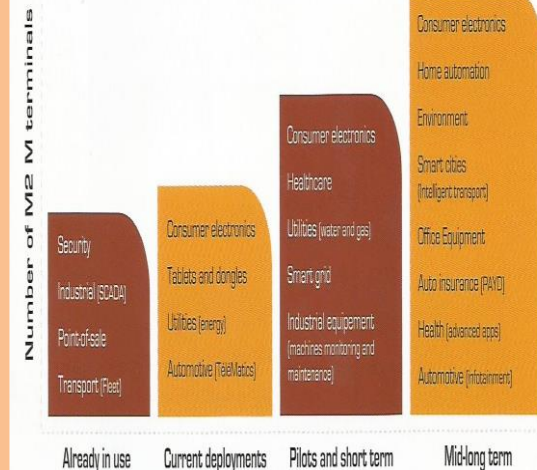
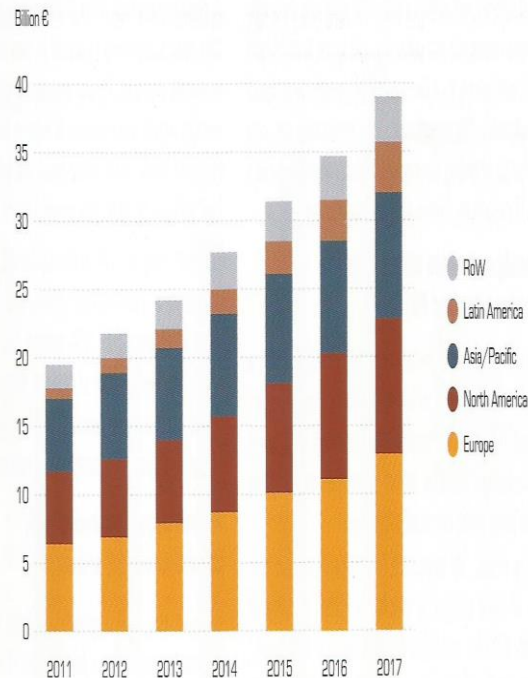
## Telcos redesigning their networks to meet a series of technological and economic challenges

### Future network architecture: drivers and key technologies



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Source: I.D.A.T.E





# Smart Solutions

## E-Governance and Citizen Services



- 1 Public Information, Grievance Redressal
- 2 Electronic Service Delivery
- 3 Citizen Engagement
- 4 Citizens - City's Eyes and Ears
- 5 Video Crime Monitoring

## Waste Management



- 6 Waste to Energy & fuel
- 7 Waste to Compost
- 8 Waste Water to be Treated
- 9 Recycling and Reduction of C&D Waste

## Water Management



- 10 Smart Meters & Management
- 11 Leakage Identification, Preventive Maint.
- 12 Water Quality Monitoring



## Energy Management



- 13 Smart Meters & Management
- 14 Renewable Sources of Energy
- 15 Energy Efficient & Green Buildings

## Urban Mobility



- 16 Smart Parking
- 17 Intelligent Traffic Management
- 18 Integrated Multi-Modal Transport

## Others



- 19 Tele-Medicine & Tele Education
- 20 Incubation/Trade Facilitation Centers
- 21 Skill Development Centers

# Brief overview of various PON types

PON Type	ITU Ref.	BW (DS/US in Gbps)	Split Ratio	Wavelength (DS/US) in nm	Power Saving Strategy	Coexistence
GPON	G.984	2.5/1.25	128	1490/1310	-	Any two out of GPON, XGPON1 and XGS-PON can coexist
XGPON1	G.987	10/2.5	128	1270/1580	Various ONT power saving techniques supported like ONT dozing, sleeping etc.	
XGS- PON	G.9807	10/10	256	1490/1310 OR 1270/1580		
NG-PON2	G.989	40/40	256	1534/1599		NG-PON2 can coexist with above

## Note:

- XGS-PON can support XGPON1 ONTs (10G/2.5G) also.
- NG-PON2 BW can be extended up-to 80G/80G using 8 wavelengths.
- Split Ratio mentioned above is from the perspective of software support and not what is achievable from physical layer perspective
- NGPON2 should support legacy PON and in new deployments use of Wavelength multiplexers and demultiplexers is permitted.
- XGS-PON wavelength will be either that of GPON (if only XGPON1 is running on the PON) or of XGPON1 (if GPON is already running on PON with or without XGPON1 – in the latter case XGS-PON will support existing XGPON1 ONTs)
- NG-PON2 will have multiple wavelengths around the wavelength mentioned above – both in downstream and upstream directions

# ITU Advocacy for broadband

**Advocacy Target 1: Making broadband policy universal – all countries should have a National Broadband Plan or strategy or include broadband in Universal Service/Access definitions**

**Advocacy Target 2: Making broadband affordable – entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces**

**Advocacy Target 3: Connecting homes to broadband – 40% of households in developing countries should have Internet access (fixed or mobile)**

**Advocacy Target 4: Getting people online – Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in LDCs**

**Advocacy Target 5: Achieving gender equality in access to broadband by 2020**



# DDoS attacks Increasing frequency, Size and Vectors

## DDoS attacks, Q1 2016 vs. Q1 2015

125.36% increase in total DDoS attacks

142.14% increase in infrastructure layer

(layers 3 & 4) attacks

34.98% decrease in the average attack duration:

16.14 vs. 24.82 hours

137.5% increase in attacks > 100 Gbps: 19 vs. 8

## DDoS attacks, Q1 2016 vs. Q4 2015

22.47% increase in total DDoS attacks

23.17% increase in infrastructure layer

(layers 3 & 4) attacks

7.96% increase in the average attack duration:

16.14 vs. 14.95 hours

280% increase in attacks > 100 Gbps: 19 vs. 5

## Web application attacks, Q1 2016 vs. Q4 2015

25.52% increase in total web application attacks

1.77% decrease in web application attacks over HTTP

235.99% increase in web application

attacks over HTTPS

87.32% increase in SQLi attacks

## Multi-Vector DDoS Attacks, Q1 2016

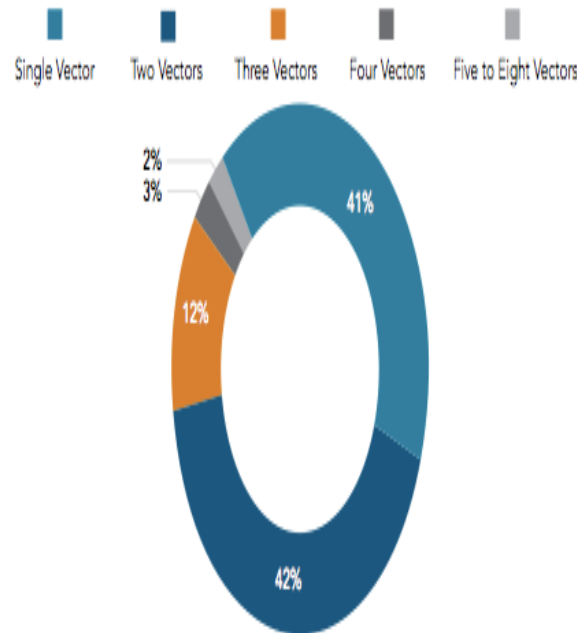


Figure 2-3: Multi-vector attacks accounted for 59% of DDoS activity in Q1 2016, reflecting a slight increase compared with last quarter (56%)

70% of DDoS attack used reflection DNS, Chargen and NTP service

Source

akamai's [state of the internet] / security / Q1 2016

## Top 5 Source Countries for DDoS Attacks, Q1 2015–Q1 2016

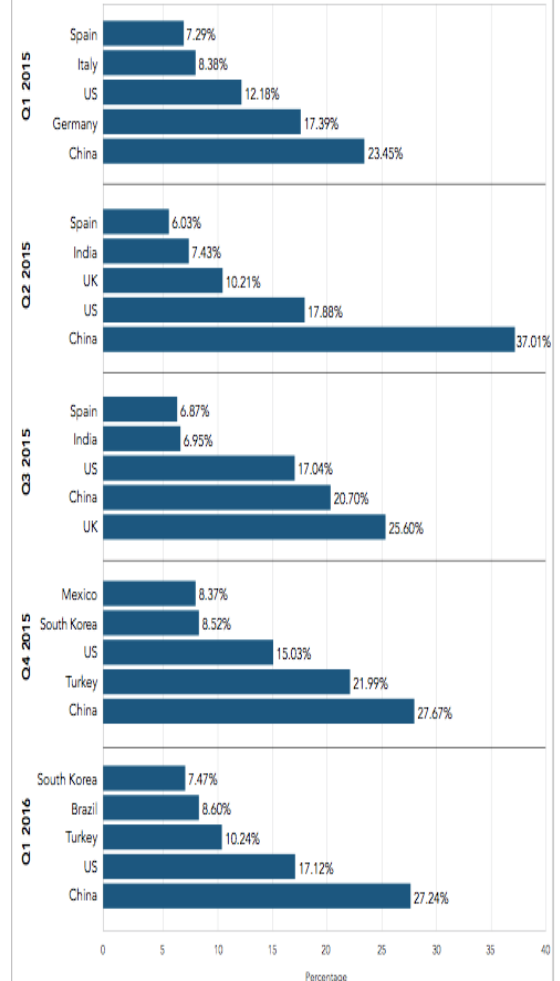
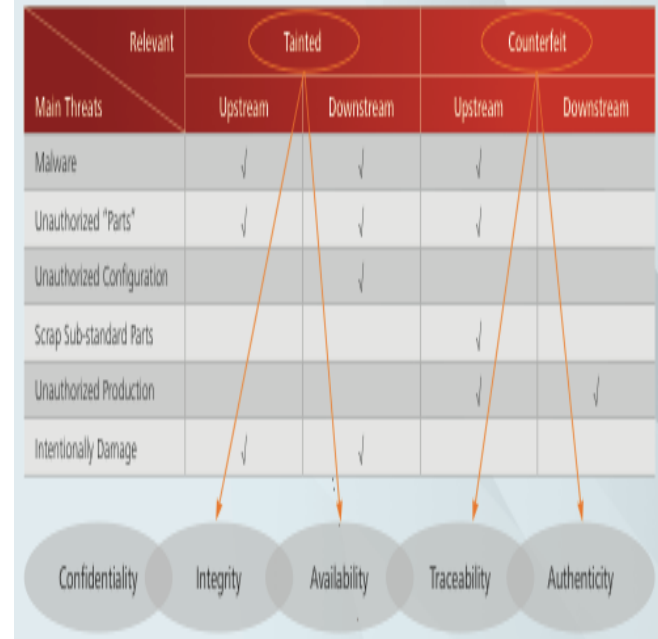


Figure 2-8: China has been the top source country for DDoS attacks since Q1 2015, with the exception of Q3 2015, when the UK took the top spot

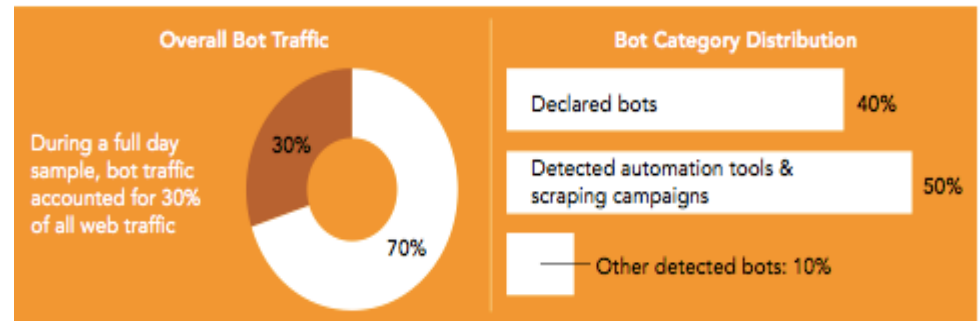
# Security will Emerge as Bigger Concern

- Data security
- Identity and access management
- Cloud access security
- Next gen commerce focus
- Security will become basic function rather than add on
- Strategic concerns will force sophistication of security

Supply Chain Threats and Relevant Parties—The Open Group



Source Global cyber security report -Huawei



# G.Fast progression for using copper for last 300 Meters

The countries where offline populations are concentrated are surprisingly few. The top 20 countries with the largest offline populations (which include the United States at number #15) account for around 75% of the total global offline population. The top three countries alone (India, China and Indonesia) account for 46%, while adding in Pakistan, Bangladesh and Nigeria to create the top six countries accounts for 55%.

## ITU'S G.FAST – TRANSFORMING BROADBAND

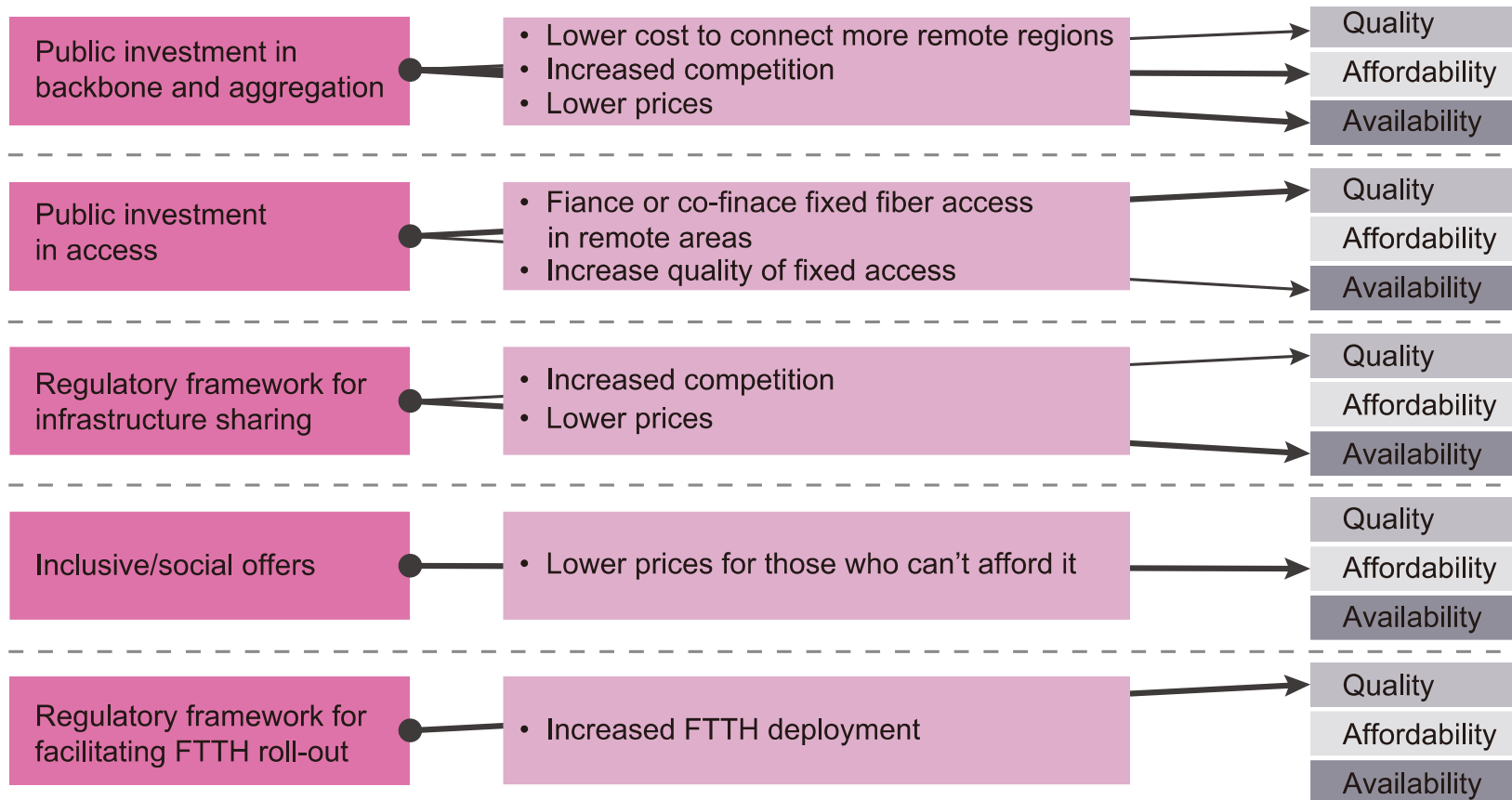
An important development in the area of fixed broadband has been the progress made in the deployment of networks built using ITU's G.fast broadband standard.

G.fast is a new technique to achieve fibre-equivalent speeds of up to 1Gbps reusing traditional copper telephone lines in the 'last mile'. The standards for G.fast were approved by ITU-T Study Group 15 in 2014 and 2015. There are now major G.fast trials underway in many diverse countries, including Australia, Brazil, Croatia, the Republic of Korea, Norway, Panama, Switzerland, the UK and the US.

G.fast can be also used in combination with coaxial cable to give symmetrical maximum speeds of 750/750 Mbps. In Switzerland, Swisscom is trialling the new G.fast data transmission standard, and will extend G.fast deployments to all its fibre-to-the-building (FTTB) and fibre-to-the-street (FTTS) connections from mid-2016 onwards, to give speeds of up to 500 Mbps<sup>1</sup>.

1 Light Reading, issue 5 May 2015.

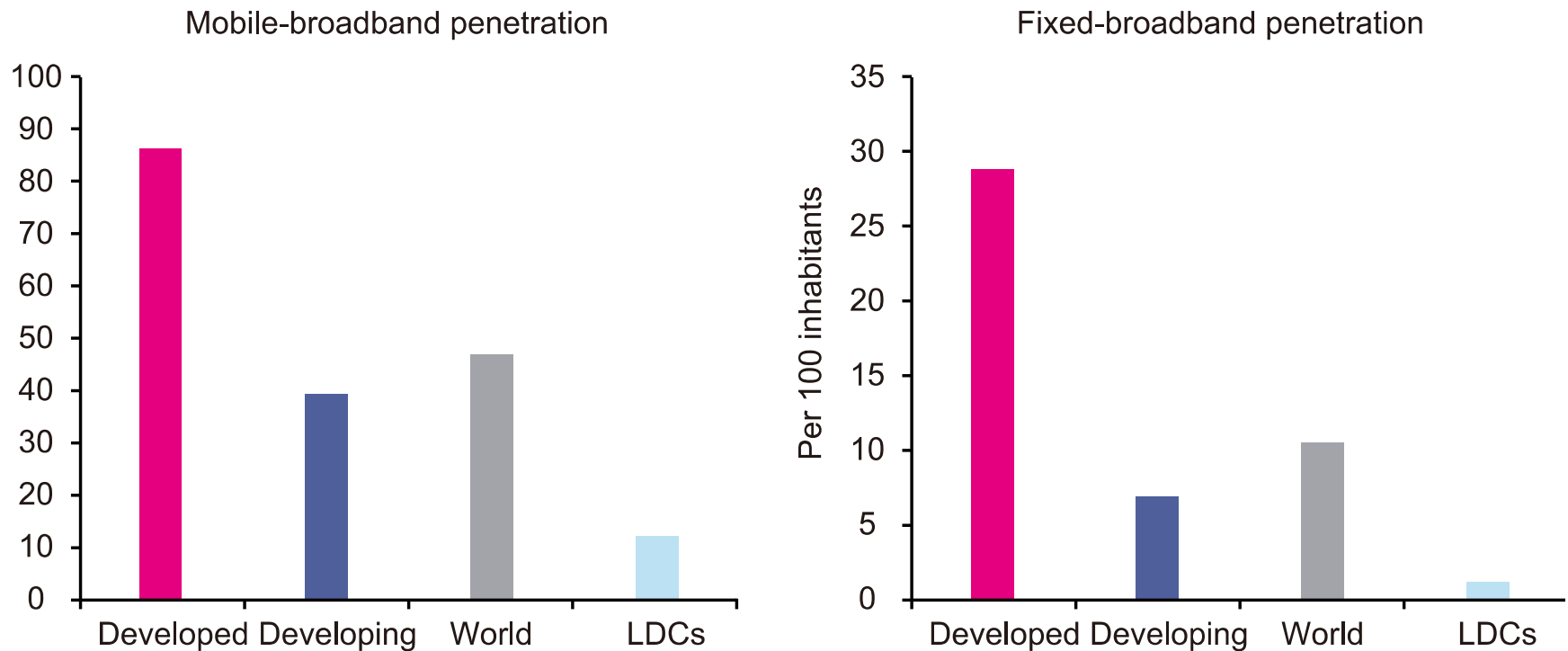
# Strategy for broadband



Source: Nokia/Diffraction Analysis, 2016

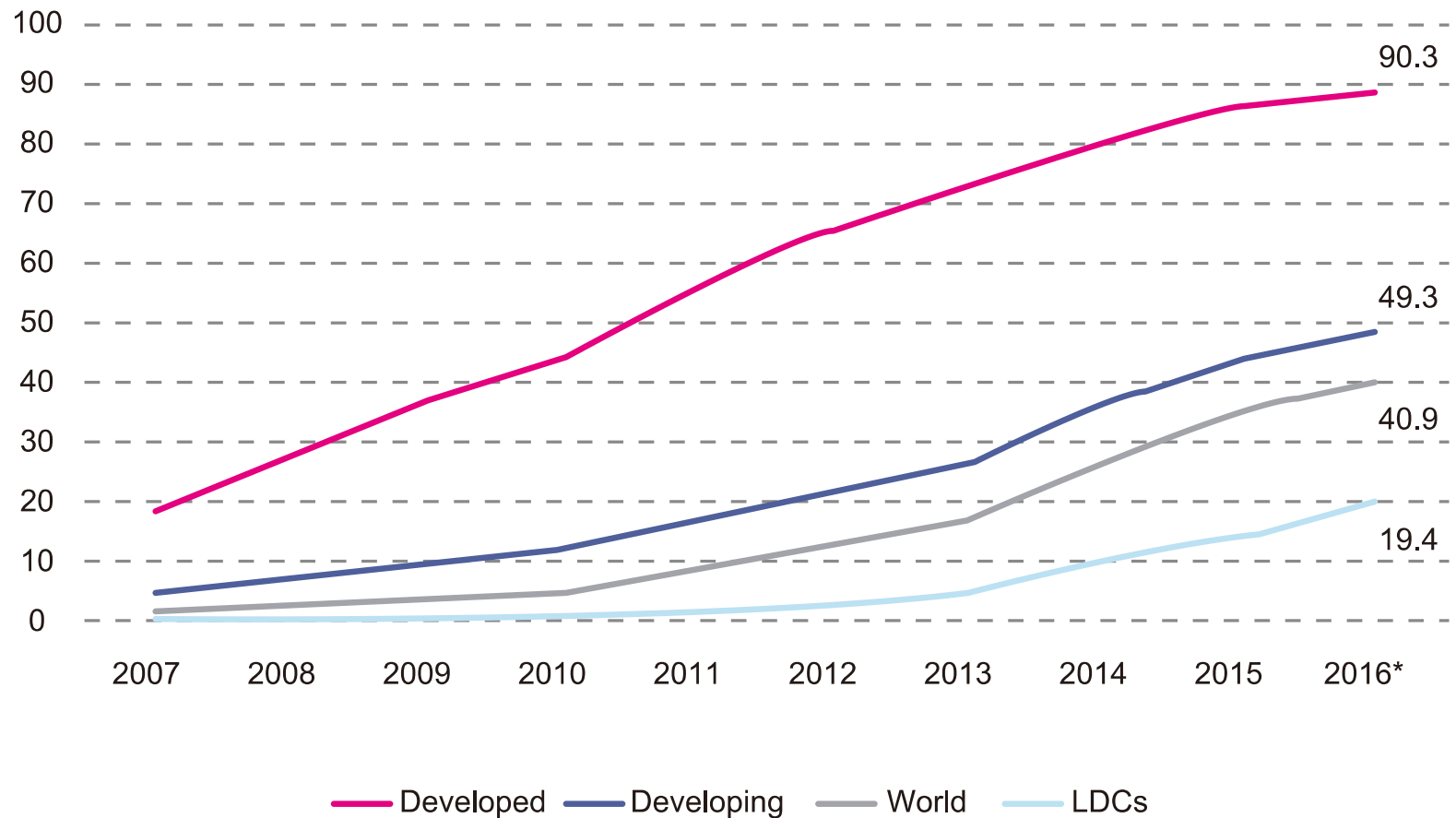
# India has developed and developing world living together

Figure 10: Estimates of mobile-broadband and fixed-broadband penetration, 2015



Source: ITU, Measuring the Information Society Report 2015

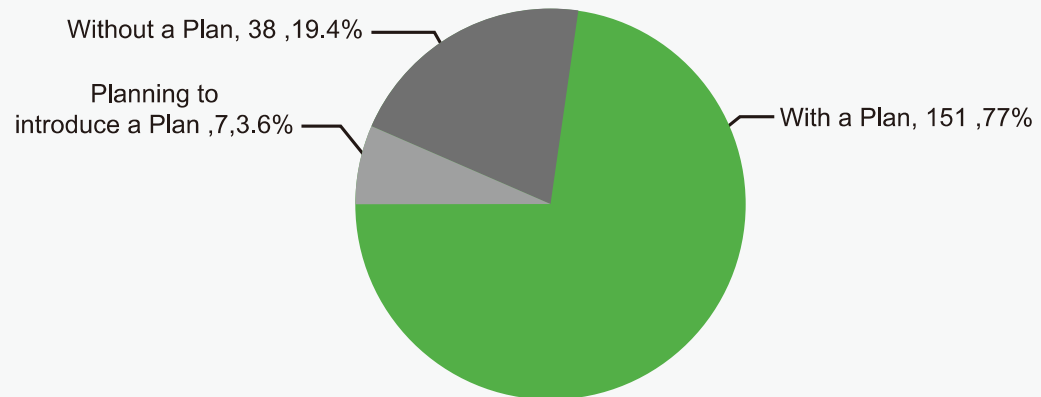
# India Voice penetration is in line





# Entire world has broadband plan

*Exhibit 12:  
Policy Leadership in National  
Broadband Plans, 2006-2016*



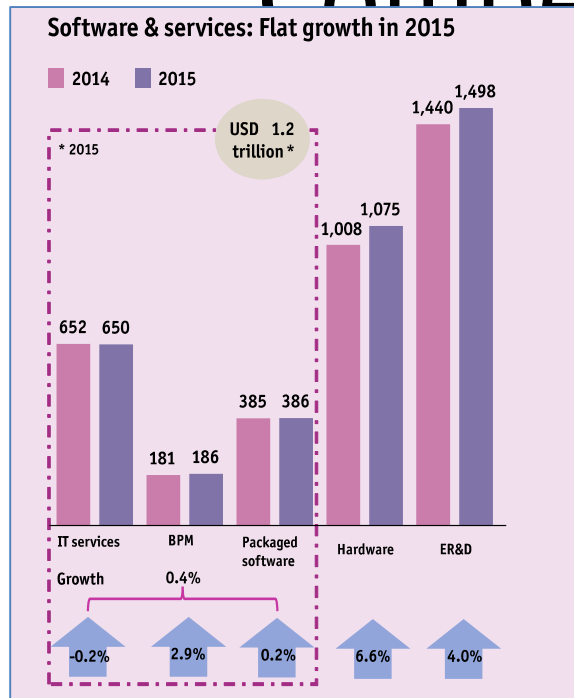
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22. [www.broadbandcommission.org/Documents/Broadband\\_Challenge.pdf](http://www.broadbandcommission.org/Documents/Broadband_Challenge.pdf) accessed 22/10/2016

23. Broadband Commission, *State of Broadband 2016*, page 32

## R&D Industry

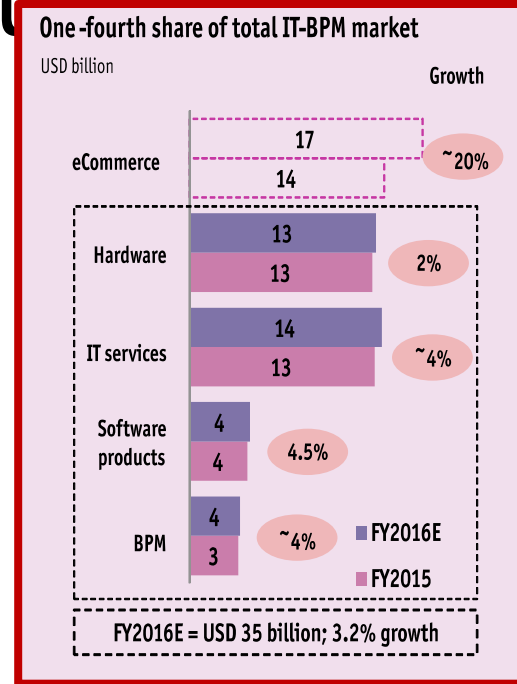
### Competency of India



Global IT-BPM industry

Globally, the cumulative capital investment in technology is estimated to have reached USD 6 trillion in 2014.

Global ER&D spend reached ~USD 1.5 trillion,

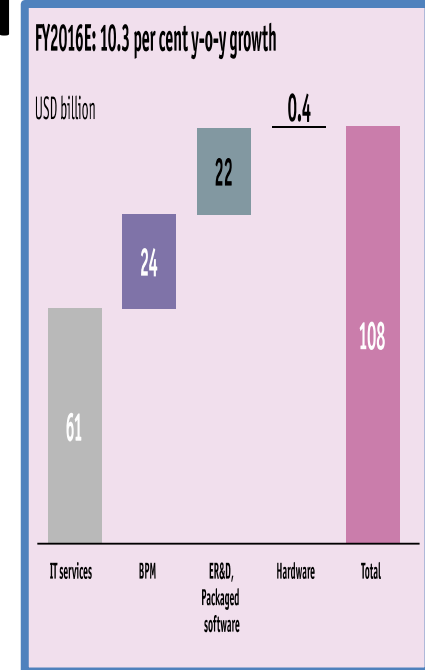


Indian IT-BPM domestic

**Highest volume of diverse, employable talent:** India currently has over 6 million graduates; its IT-BPM employee base for FY2016 is estimated at 3.7 million people, the largest private sector employer

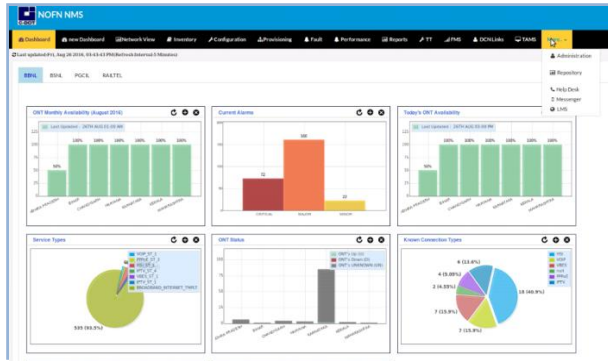
**Digital at the core of innovation:**

- Product innovation: 3rd largest base globally; >4,200 start ups; 1,200 start ups in 2015; ~250% growth in funding in B2B space over last year
- Business innovation: New business models, differentiated pricing strategy; shift from size to business agility

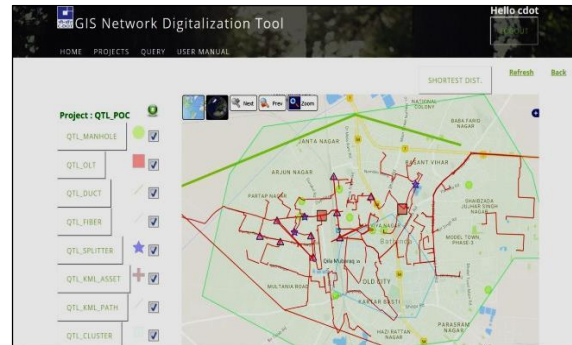


Indian IT-BPM exports

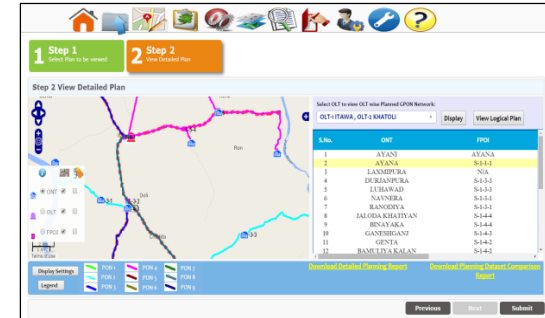
for planning, management & Service Delivery



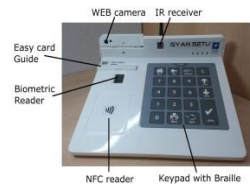
**CNMS**



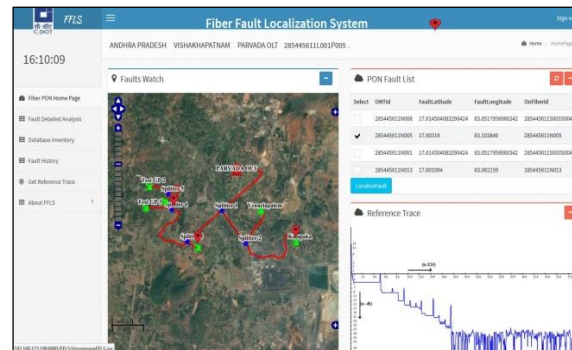
# Network Digitalization Tool



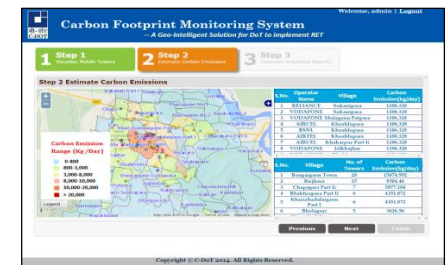
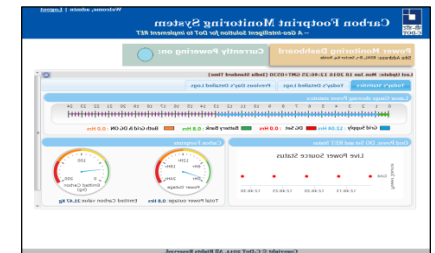
## TeleplanNet - The Telecom Network Planner



## Gyansetu



## Fiber Fault Localization tool

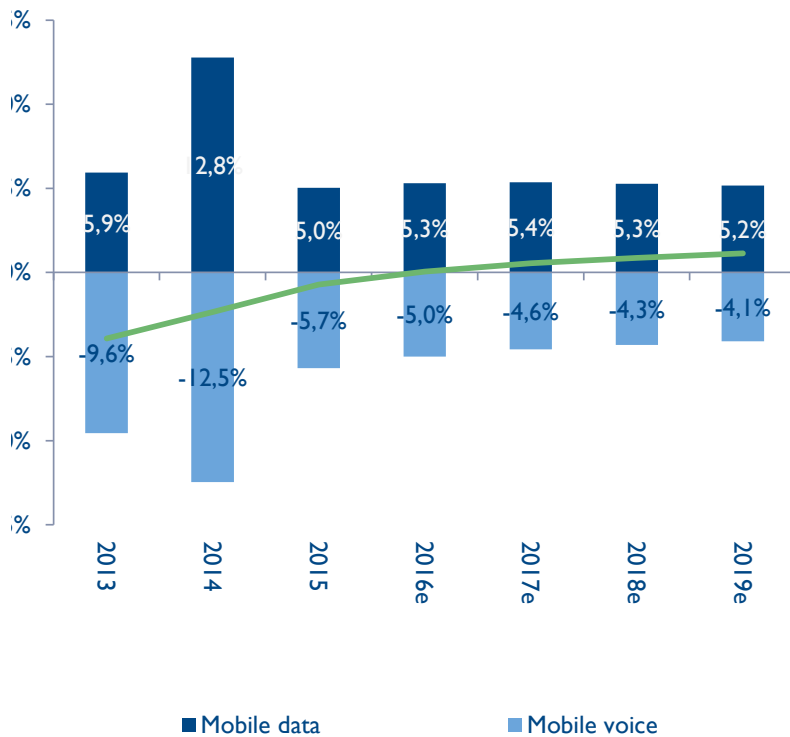


## Carbon Footprint Monitoring solution (*OneM2M compliant*)

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# Declining voice revenue

## European mobile service revenue trends

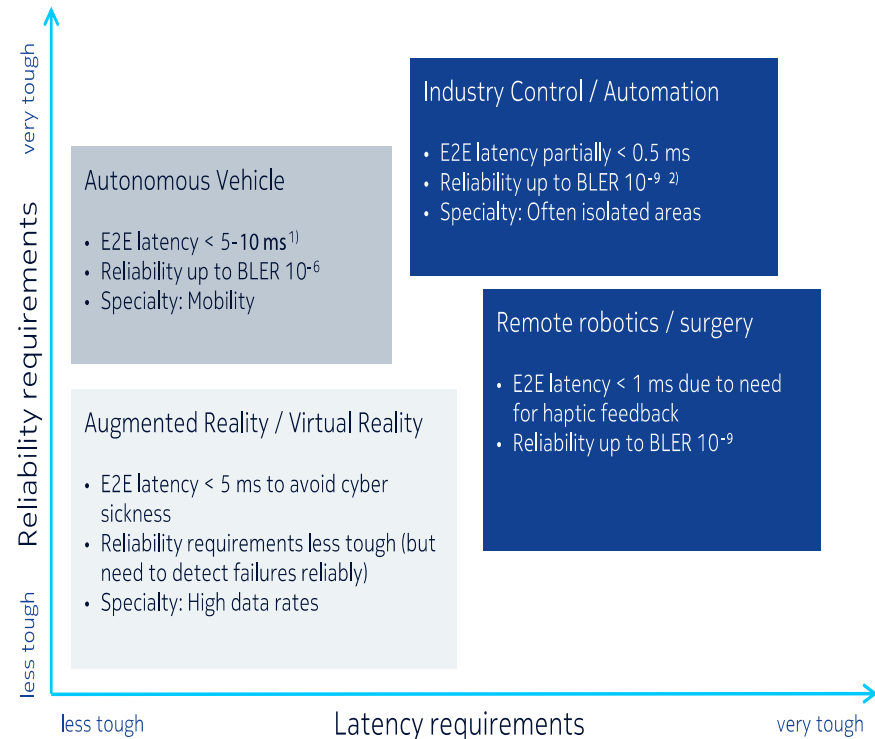
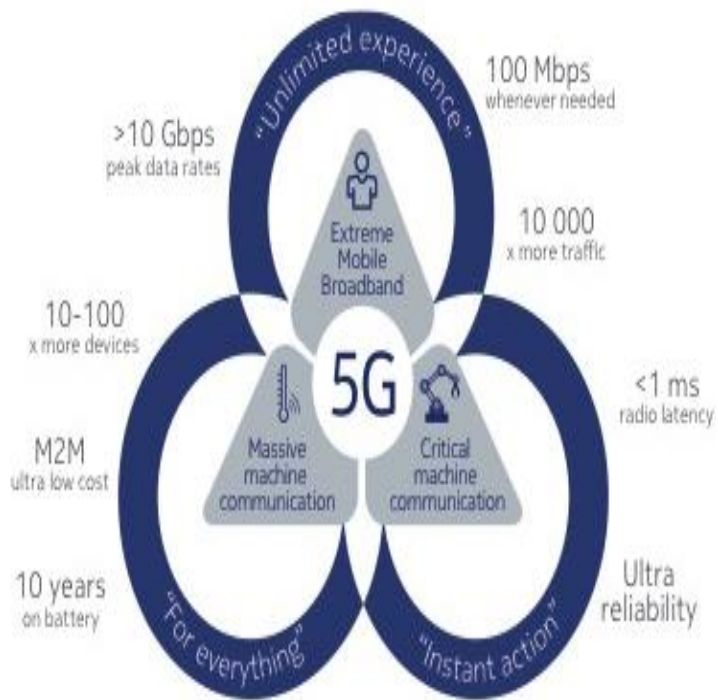


Source: Arthur D. Little analysis, Exane BNP Paribas 2012

## Rethinking TelCo business

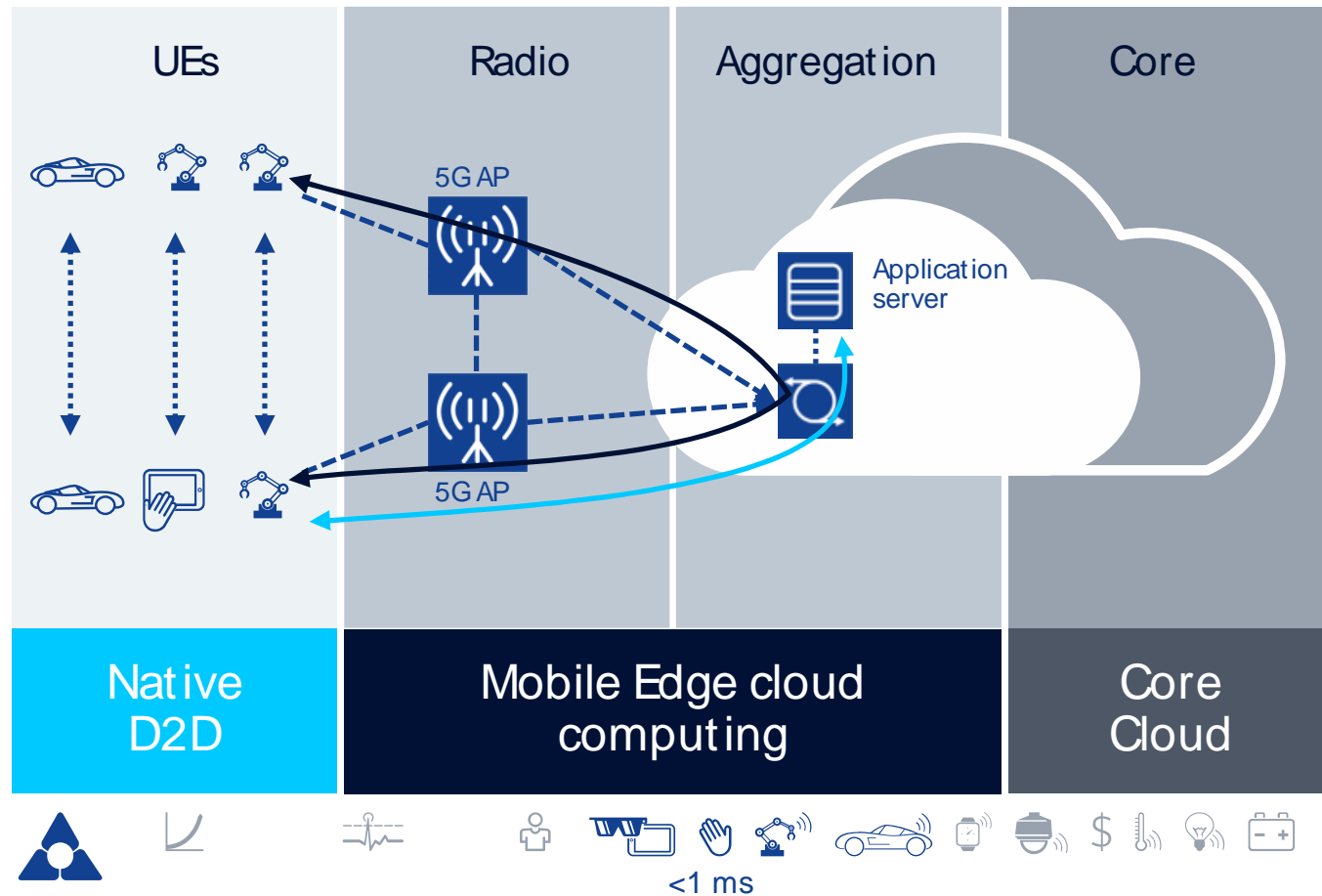
- Core business **revenues in decline**
- **TelCos rethink** their business scope and structure both on
  - top lines e.g. services extension / diversification and ...
  - bottom lines e.g. **cost base redesign**
- Significant **locked-up capital** in existing access infrastructure
- Core business demands **further significant investments** into higher speed access
- Required **investments are hard to monetize** hence access co-operations on the rise
- Mobile access infrastructure is tangible business opportunity – **many TowerCo business options**

# Applications and challenges



Source: NOKIA white paper

# End to end Latency less the 1 ms



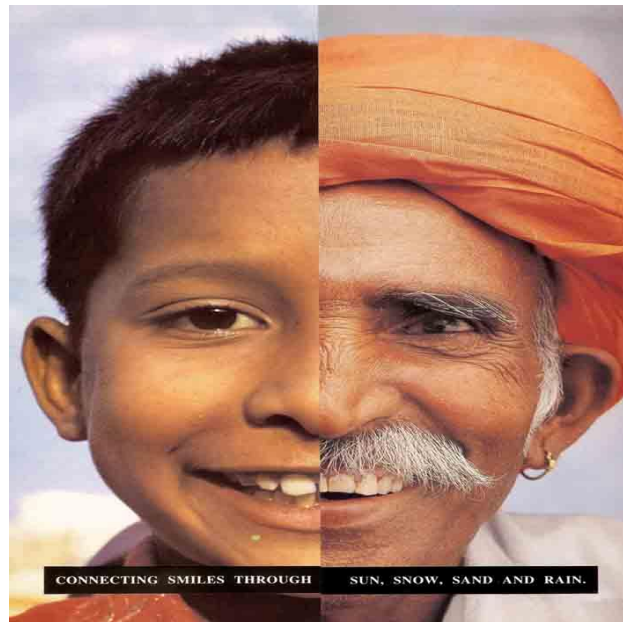


# No Fiber no 5 G

- Latency of the order of ns per Km
- Distance 60 to 80 Kms without intermediate power
- Multiple wavelength as super highway
- More the 16 Tbps per fiber commercially available systems
- Evolution of SDN and NFV will require control plan on fiber
- Best protection schemes for reliability

# Fiber is lower cost without cost of laying

- Home fiber Networks
- 5G for public
- Wi-fi will grow to 5G without mobility
- Permitting offload on your networks



# THANK YOU

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