Building absorptive capacity as part of the National Broadband Plan
Looking for the right technology mix

Guillaume Mascot
September, 2015

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WE LIVE IN AN ULTRA-CONNECTED SOCIETY THAT IS CREATING UNPRECENDENTED OPPORTUNITIES...

990%
5-Year growth in M2M Devices

346%
5-Year growth in public wi-fi hotspots

134%
5-Year growth in smartphone sales

140%
5-Year growth in Telco Cloud revenue*

879%
5-Year growth in mobile video
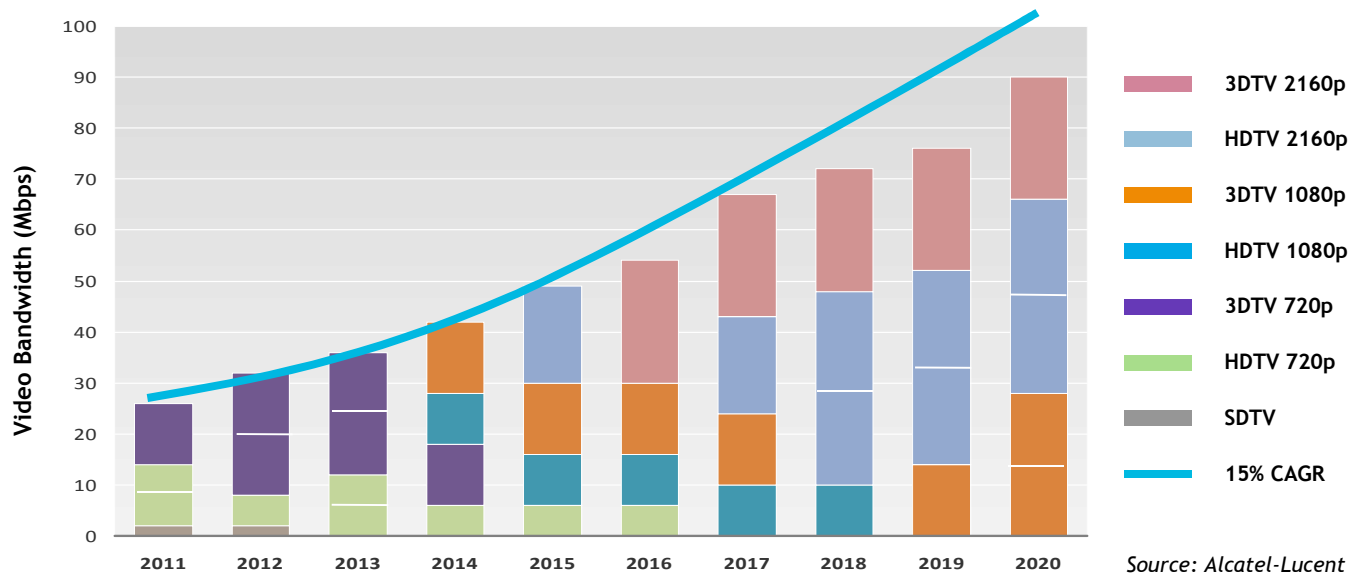
*IAAS, PAAS, SAAS

THE OPPORTUNITIES ARE LIMITLESS:

E-health

E-learning

E-government

Smart Grids

Smart Cities

Communications

Video

Gaming

Entertainment

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HOW MUCH BANDWIDTH DO YOU *NEED*?
100 MBPS COVERS HIGH-END USER DEMAND BY 2020

Video Bandwidth (Mbps) — chart with years 2011–2020

Legend:
- 3DTV 2160p
- HDTV 2160p
- 3DTV 1080p
- HDTV 1080p
- 3DTV 720p
- HDTV 720p
- SDTV
- 15% CAGR

Source: Alcatel-Lucent

70% of Internet traffic is **VIDEO**
Video is the key driver

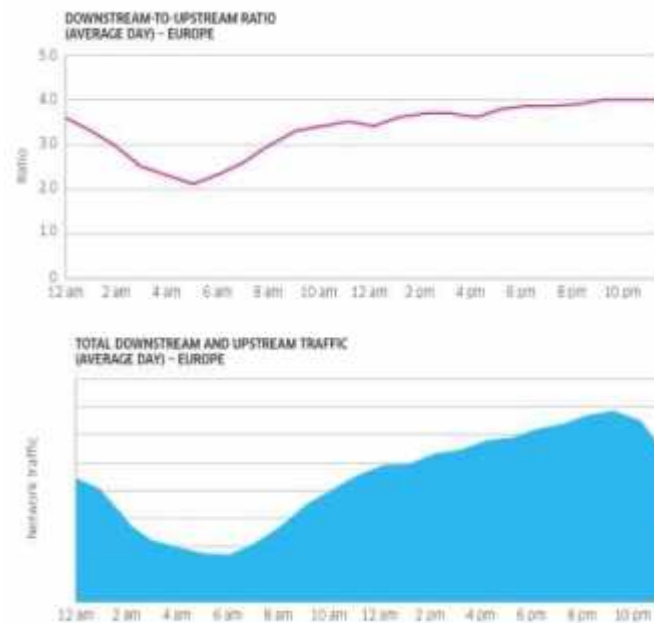**85%** of today's tablets have only **WiFi**
Wi-Fi users are **fixed customers**

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SYMMETRICAL BANDWIDTH: MITH OR MUST?

TRAFFIC IS BECOMING MORE UNICAST

High Unicast - IPTV & OTT - vieweing

Labels within chart: Linear Basic, Linear Premium, Recorded Local, Recorded/Catch up Net, VoD - instant %, Total OTT Time, 20%, 80%

...AND MORE ASSYMETRIC

DOWNSTREAM-TO-UPSTREAM RATIO (AVERAGE DAY) – EUROPE

TOTAL DOWNSTREAM AND UPSTREAM TRAFFIC (AVERAGE DAY) – EUROPE

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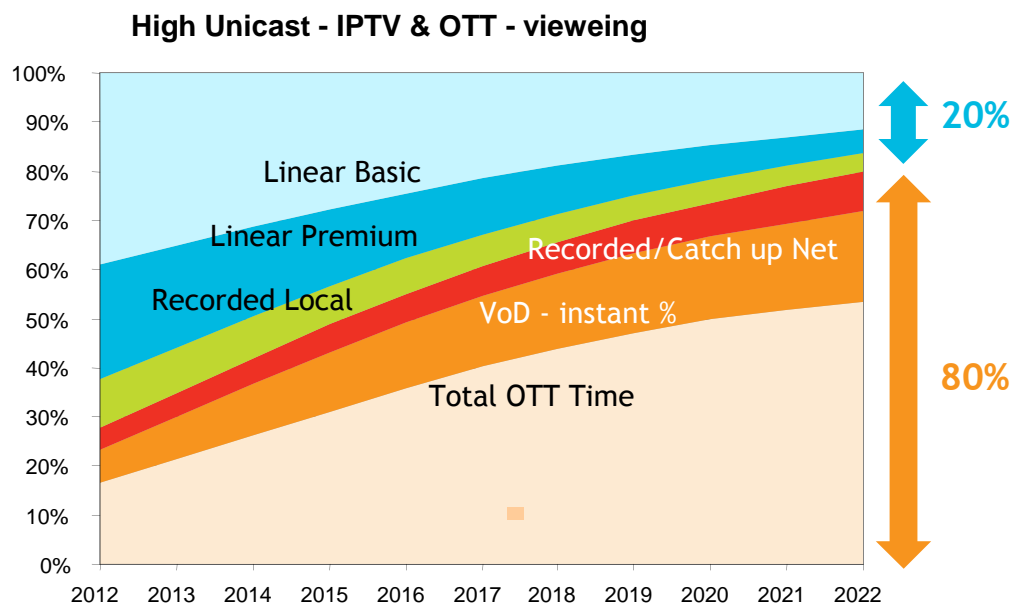
THE ULTRA-BROADBAND CHALLENGE

ITU-T, fixed BB subs per 100 inhabitants

0 40

EU DIGITAL AGENDA

30Mbps to all,
100Mbps to 50% by 2020

BB CHINA STRATEGIC PLAN

50Mbps-1Gbps to all urban and
12Mbps to all rural by 2020

CONNECTING AMERICA

100Mbps to 100M
households by 2020

INDIA NATIONAL BB PLAN

2-100Mbps for 600M
households by 2020

AUSTRALIA NBN

Ultra-fast broadband (25-100
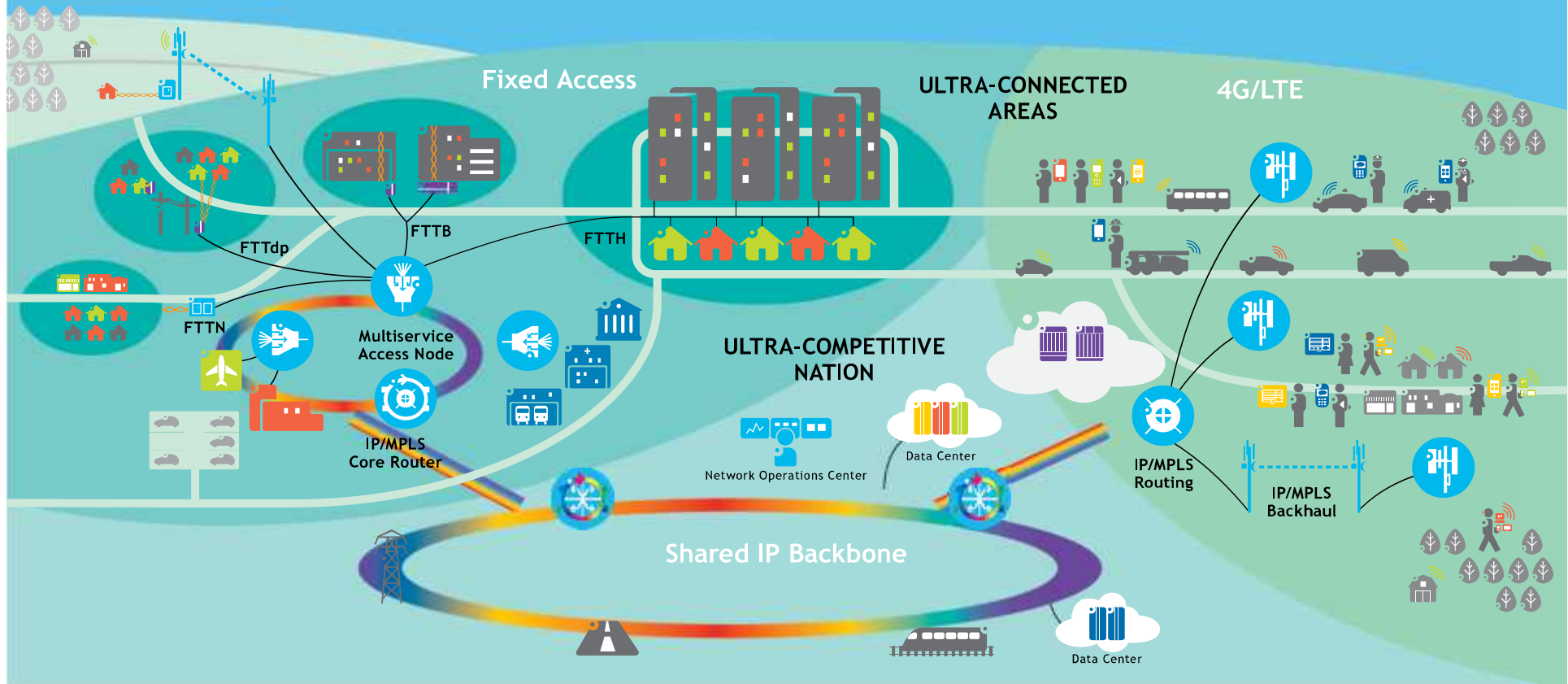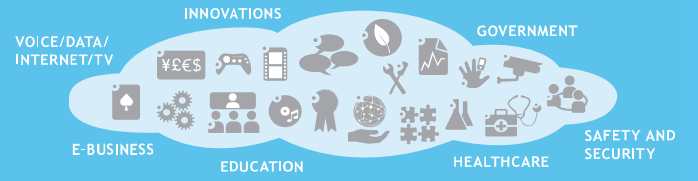Mbps) to all households by 2019

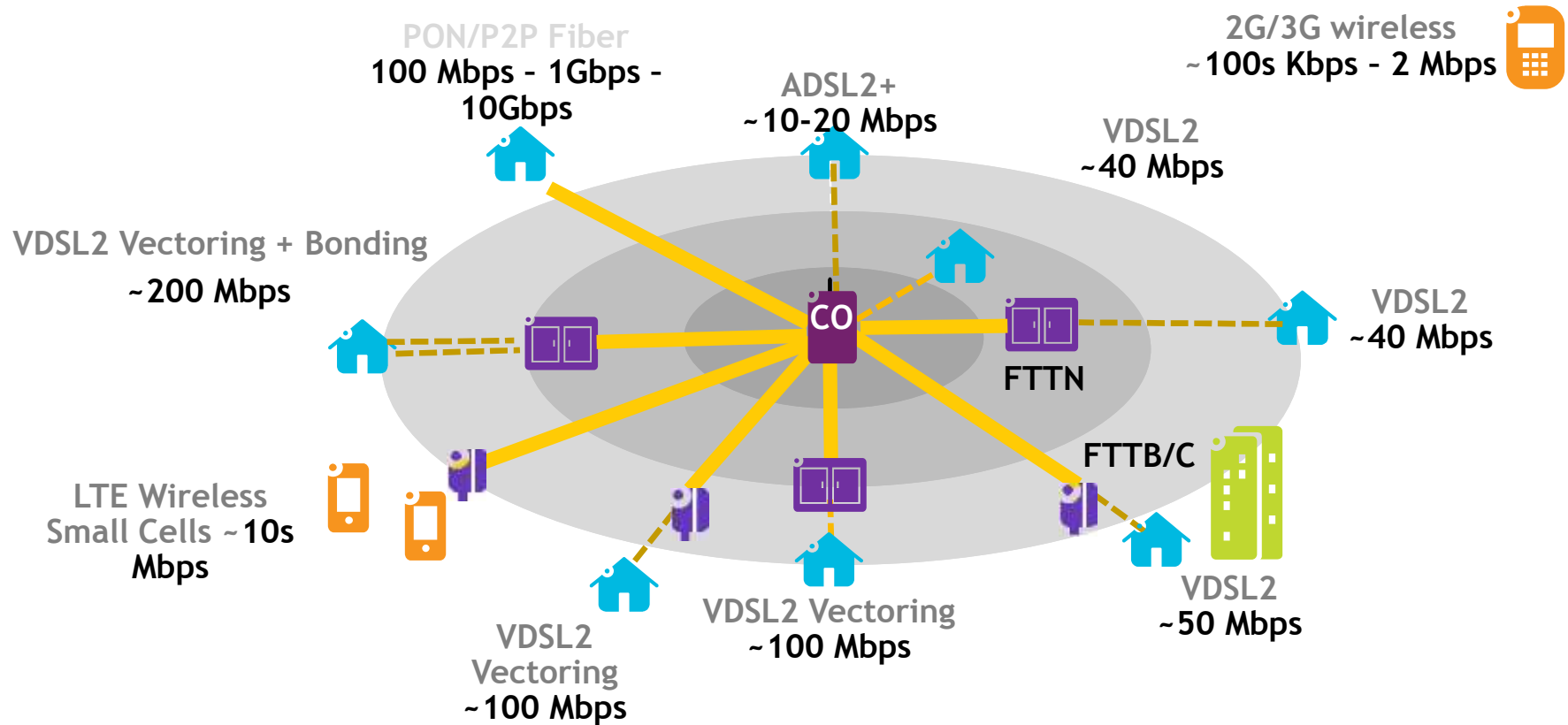**BRASIL PLANO NACIONAL**

160M broadband connections
by 2018

NEW ZEALAND UFB/RBI

Ultra-fast (50-100Mbps) BB to 75%
by 2019, BB for 86% of rural

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DELIVER ULTRA-BROADBAND TO ANY USER QUICKLY AND COST-EFFECTIVELY

VOICE/DATA/INTERNET/TV

INNOVATIONS

GOVERNMENT

E-BUSINESS

EDUCATION

HEALTHCARE

SAFETY AND SECURITY

Fixed Access

ULTRA-CONNECTED AREAS

4G/LTE

FTTdp

FTTB

FTTH

FTTN

Multiservice Access Node

ULTRA-COMPETITIVE NATION

IP/MPLS Core Router

Network Operations Center

Data Center

IP/MPLS Routing

IP/MPLS Backhaul

Shared IP Backbone

Data Center

SOLVING THE BANDWIDTH EQUATION (1/2)

PON/P2P Fiber
100 Mbps – 1Gbps – 10Gbps

ADSL2+
~10-20 Mbps

2G/3G wireless
~100s Kbps – 2 Mbps

VDSL2
~40 Mbps

VDSL2 Vectoring + Bonding
~200 Mbps

VDSL2
~40 Mbps

CO

FTTN

FTTB/C

LTE Wireless Small Cells ~**10s Mbps**

VDSL2
~50 Mbps

VDSL2 Vectoring
~100 Mbps

VDSL2 Vectoring
~100 Mbps

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SOLVING THE BITRATE EQUATION

1 INVESTMENT
- From FTTN (4x) to FTTH (15x)
- The closer to the subscriber, the closer the cost to FTTH

2 TIME TO MARKET
- Deploying FTTH is time consuming
- Re-using existing copper can speed up deployment

3 BANDWIDTH
- FTTH: 1G and more
- FTTx: 100M (VDSL2 Vectoring today), G.fast evolution to 100s

4 OTHER FACTORS
- (-) Aerial fiber, existing ducts
- (+) difficulty to enter the home

FTTx COST COMPARISON, CAPEX + INSTALLATION

Legend:
- Other Factors
- Home Connection & Installation
- Home Equipment
- Civil Works & Cables
- Cabinets or POPs
- Splitters
- Equipment

Categories: ADSL/CO | FTTN 250 subs | FTTCurb 48 subs | FTTB 32 subs | FTTPole 16 subs | FTTWall 1 sub | FTTH

G.FAST/FTTdp

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SOLVING THE BANDWITH EQUATION
BITSTREAM AND VECTORING Vs. SUB-LOOP UNBUNDLING

	SLU	Remedy
Austria	Available where vectoring is not implemented or planned (market demand is negligible)	L2 Bitstream (virtual unbundling)
Belgium	Removed (no market demand)	L2 Bitstream + Belgacom's white label IPTV service
Denmark	Available (no market demand)	L2 Bitstream (virtual unbundling) foreseen
Germany	Available (little market demand) even where vectoring is being deployed except that the second mover will not be allowed to use frequencies >2.2 MHz from the street cabinet	L3 Bitstream until L2 Bitstream (specified by the NGA forum) is available in the second half of 2015
Ireland	Available (no market demand) where vectoring is not implemented or planned	L2 Bitstream
Italy	Available (market demand for 20% coverage)	
Netherlands	Available (no market demand)	
United Kingdom	Available (very limited market demand)	L2 Bitstream (virtual unbundling) foreseen

Several countries have set best practices for VDSL2 Vectoring deployment: (1) first mover deploys, (2) rules to protect the investments of the first mover; all other operators rely on bitstream products instead, (3) all operators benefit from full vectoring gain (speed and predictability).

L2 & L3 Bitstream are now considered as alternatives to infrastructural competition, flexible enough to foster investment, allow deployment take-off and address customers' choice for digital services (including cloud and high-quality video ones)
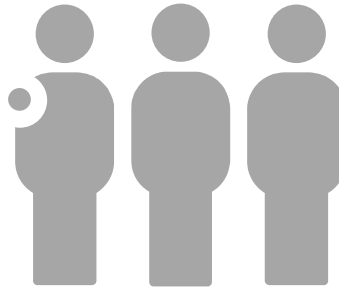
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ENTERING THE HOME
IMPACTS THE BUSINESS CASE

Building owners know there are government broadband targets, and have started to charge money to enter buildings

Operator in APAC

*To connect 7,000 house-holds, we needed **30,000 phone calls in 40 languages** just to schedule home visits*

Operator in Western Europe

***30% of FTTH subscribers change their mind** when the engineer asks where he can drill holes in the wall for the fiber*
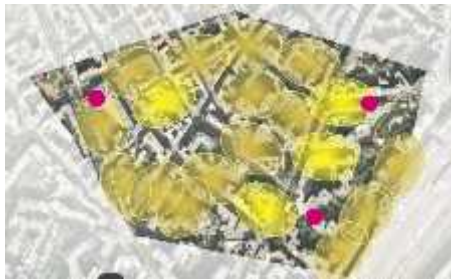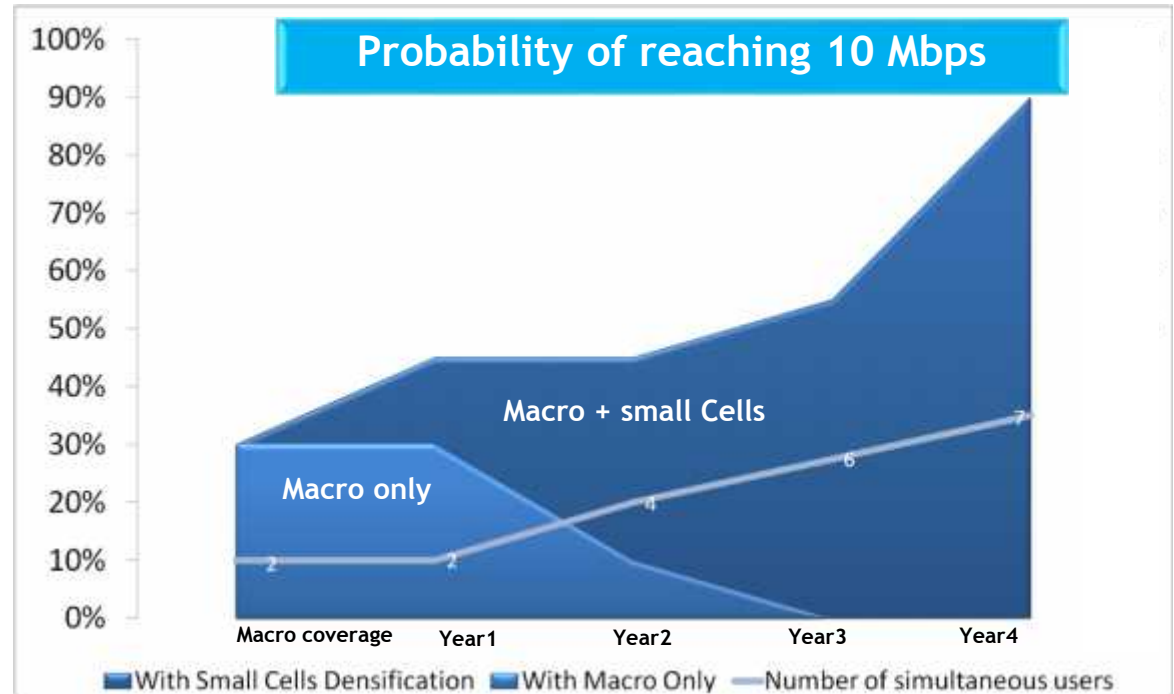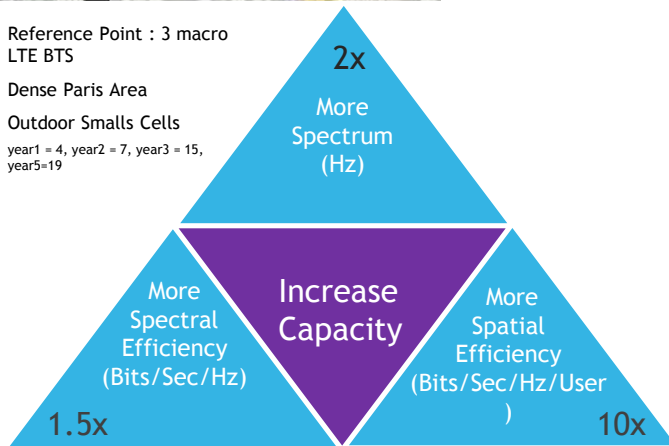
Operator in Europe

*Engineers are not allowed to enter the home if the husband is not at home, and need to **reschedule the appointment***

Operator in the Middle East

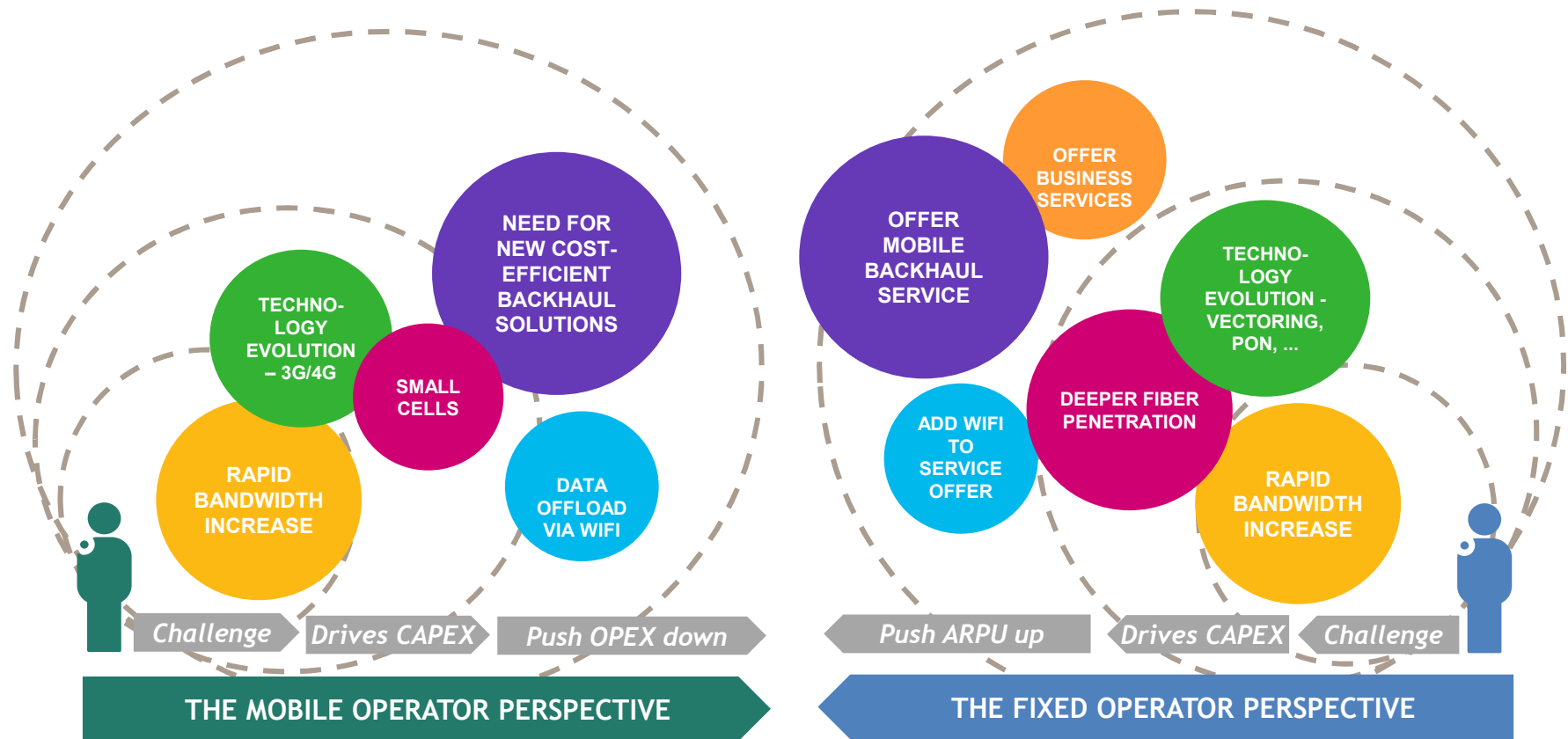Every success has its network

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LONG-TERM SOLUTION FOR MEETING USER DEMANDS

Reference Point : 3 macro LTE BTS

Dense Paris Area

Outdoor Smalls Cells

year1 = 4, year2 = 7, year3 = 15, year5=19

2x
More Spectrum (Hz)

Increase Capacity

1.5x
More Spectral Efficiency (Bits/Sec/Hz)

More Spatial Efficiency (Bits/Sec/Hz/User)
10x

Probability of reaching 10 Mbps

Macro + small Cells

Macro only

| | Macro coverage | Year1 | Year2 | Year3 | Year4 |

With Small Cells Densification | With Macro Only | Number of simultaneous users

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WHERE WIRELESS AND WIRELINE MEET …

THE MOBILE OPERATOR PERSPECTIVE

- TECHNOLOGY EVOLUTION – 3G/4G
- NEED FOR NEW COST-EFFICIENT BACKHAUL SOLUTIONS
- SMALL CELLS
- RAPID BANDWIDTH INCREASE
- DATA OFFLOAD VIA WIFI

Challenge | Drives CAPEX | Push OPEX down

THE FIXED OPERATOR PERSPECTIVE

- OFFER MOBILE BACKHAUL SERVICE
- OFFER BUSINESS SERVICES
- TECHNOLOGY EVOLUTION - VECTORING, PON, ...
- ADD WIFI TO SERVICE OFFER
- DEEPER FIBER PENETRATION
- RAPID BANDWIDTH INCREASE

Push ARPU up | Drives CAPEX | Challenge

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THE FUTURE OF WIRELESS IS WIRED

Monthly cost per Mbps by technology

Copper E1/DS3	>300 USD
Wireless	~200 USD
Ethernet fiber/copper	~100 USD

Leased backhaul revenues in APAC

In 2013: **5B $**

In 2017: **6B $**

LOWER OPEX	MBH WHOLESALE

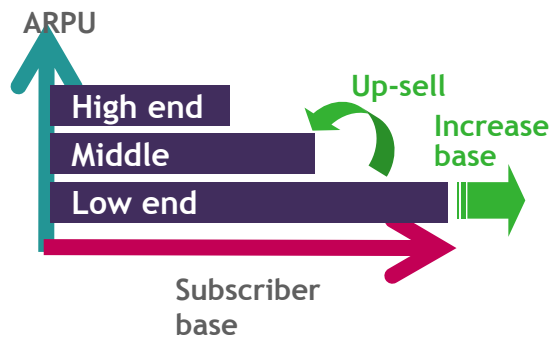| POWERING	CLOCK SYNC	BANDWIDTH

PON	P2P	VDSL	BONDING

RESIDENTIAL ULTRA-BB IS UBIQUITOUSLY AVAILABLE

FIXED NETWORKS FOR MBH LEADS TO FASTER NETWORK MONETIZATION

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EXPLORING NEW BUSINESS MODELS WITH ULTRA FAST BROADBAND

TIERED PRICING

ENTRY-LEVEL TO INCREASE ADOPTION ... AND UPSELL LATER

FLEXIBLE WHOLESALE
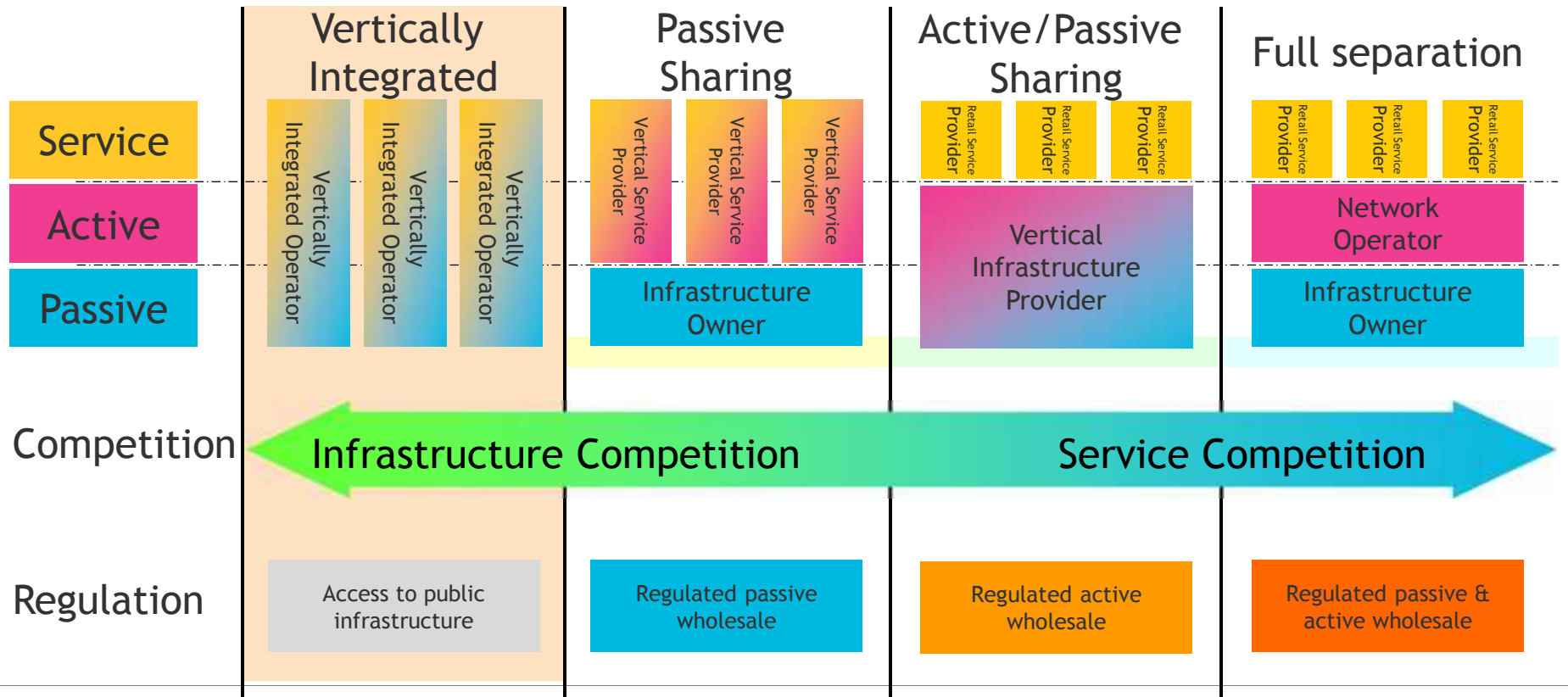

COMPETITION ON QoS LEVEL AND FAIRNESS

PREMIUM VIDEO SERVICE DELIVERY

MANAGED OR OTT

FULL CONTROL OVER BANDWIDTH CONSUMPTION TO ENSURE DIVERSITY, QoS , FAIRNESS AND RESOURCES

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CHOSING THE RIGHT BUSINESS AND ENGAGEMENT MODELS

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