



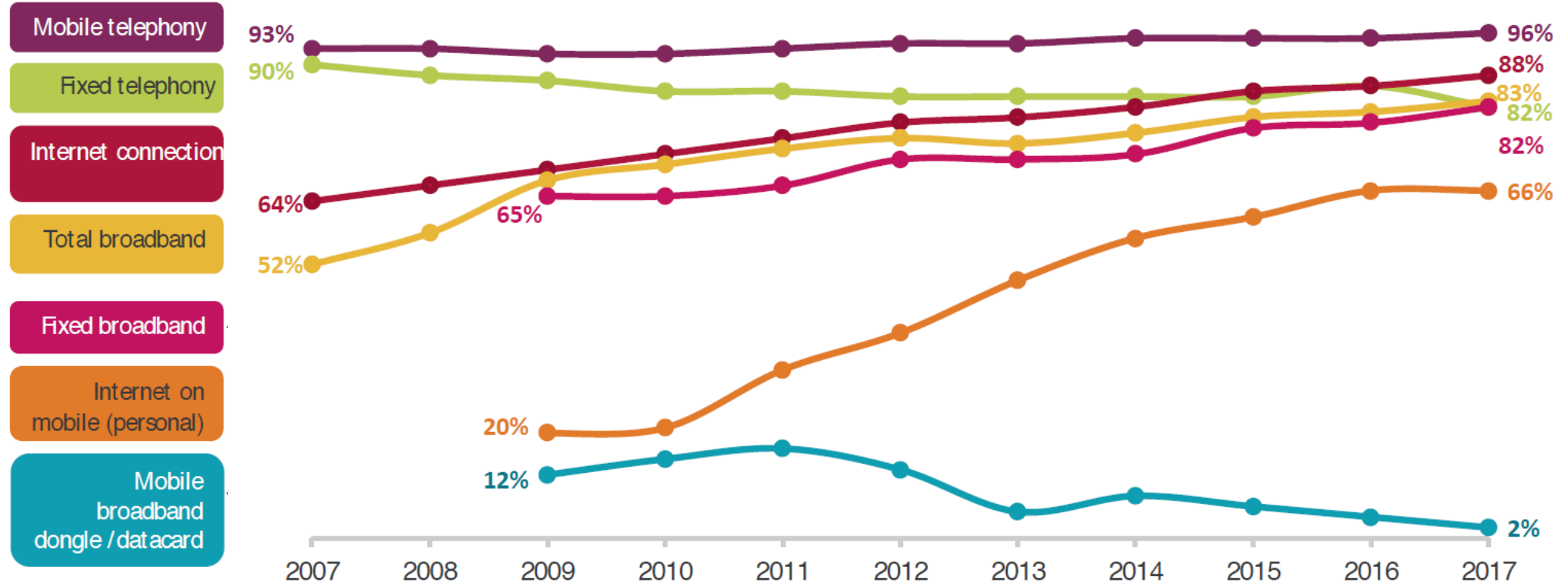
# One Smart Network – Getting ready for the next decade

**Howard Watson**

CTIO BT Group

Barclays CTO Conference  
March 2019

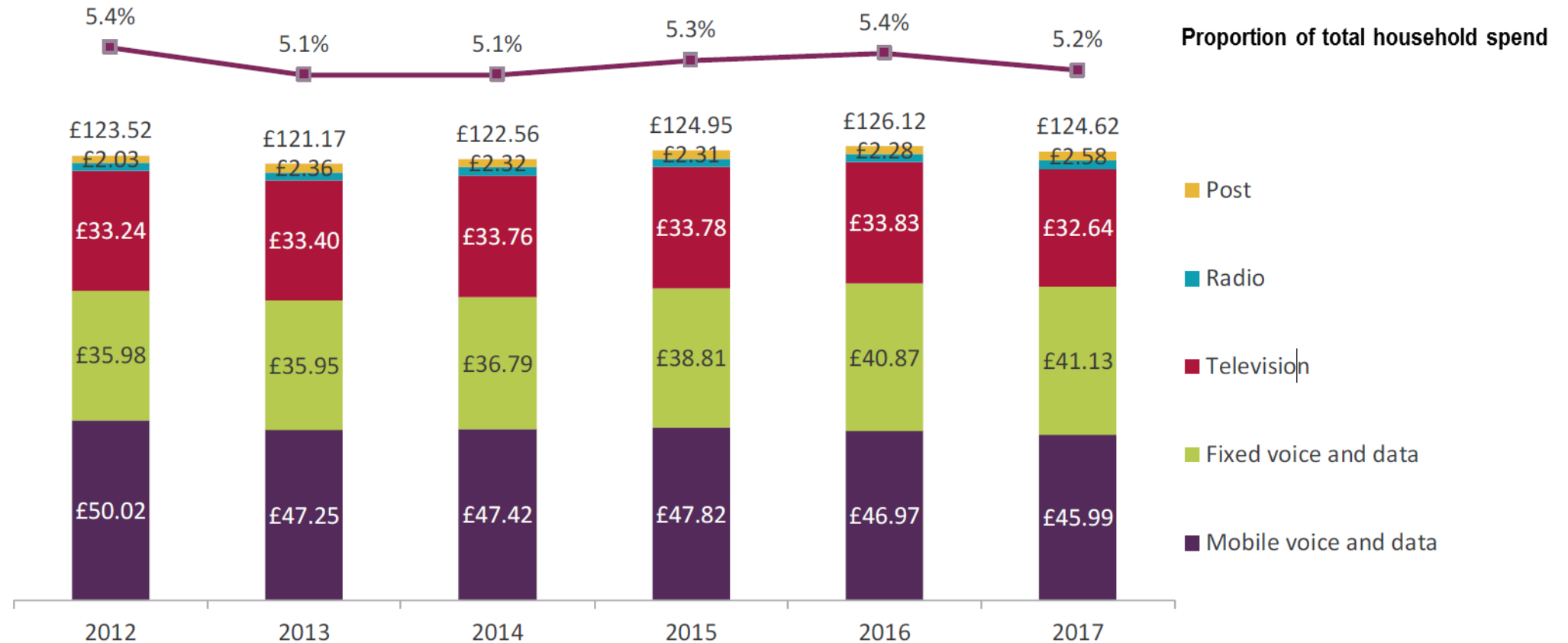
# A look at the communications market



## Take-up of key telecoms technologies (proportion of households / adults)

Source: Ofcom Technology Tracker. Data from Q1 of each year 2007-2014, then H1 2015-2017.

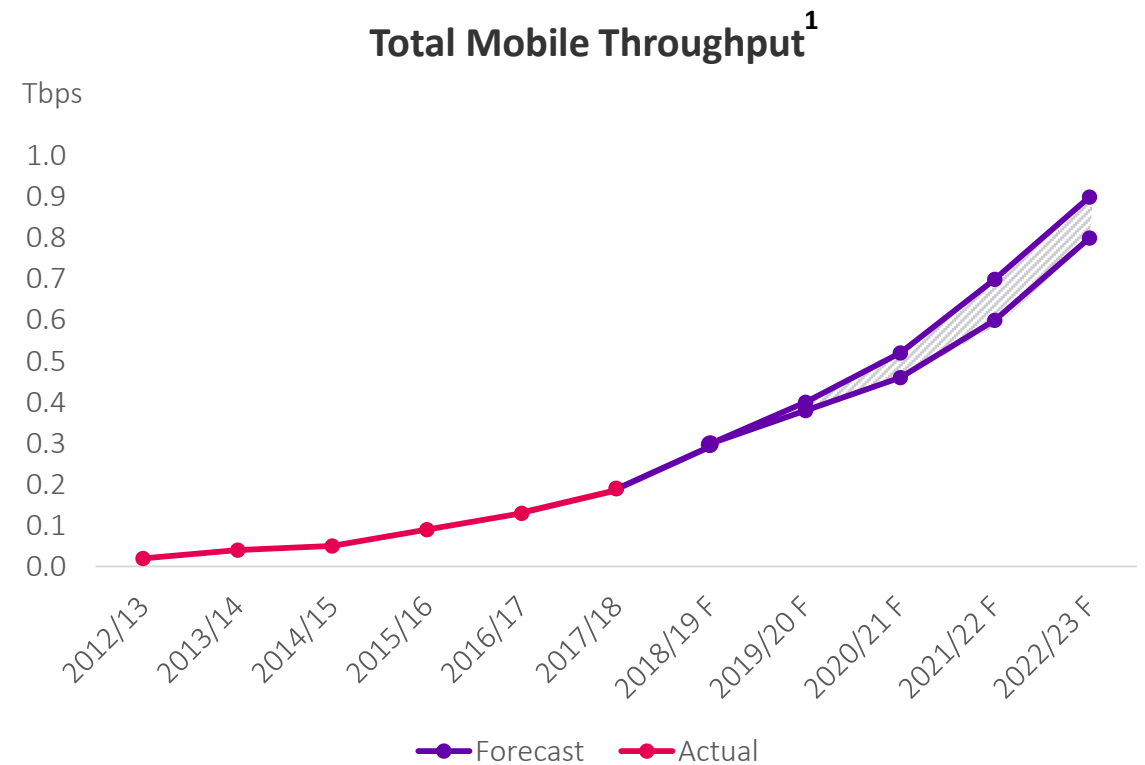
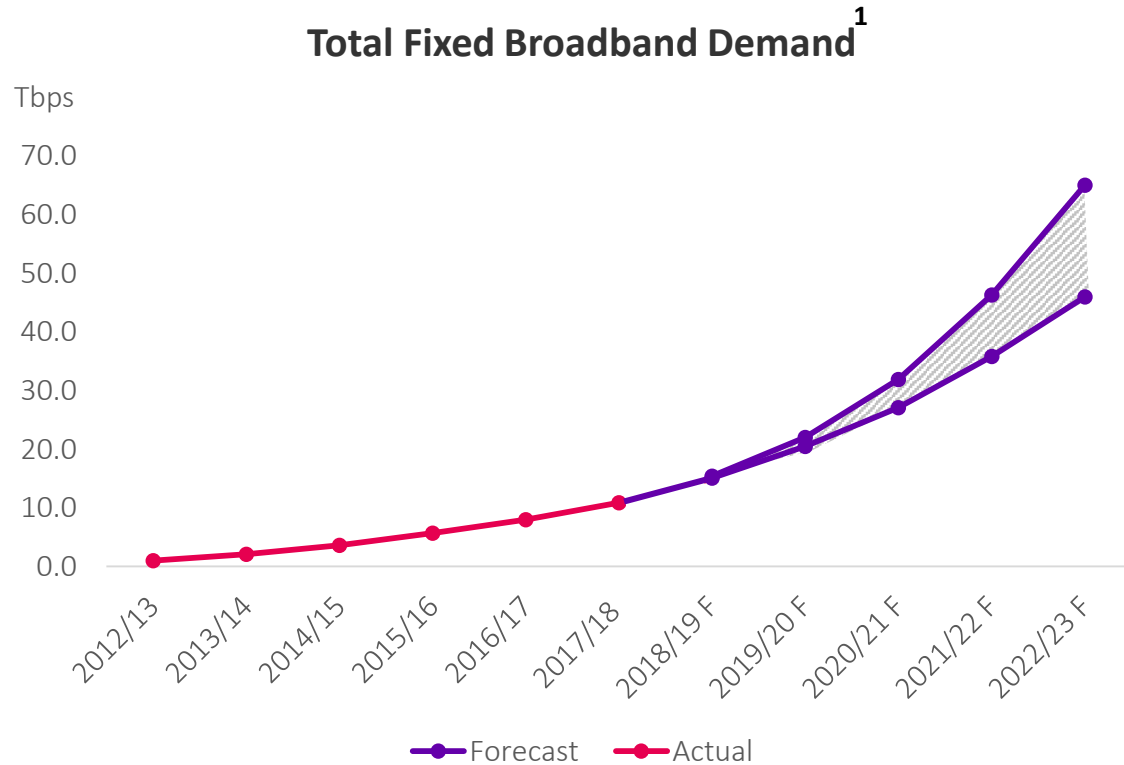
# A look at the communications market



**Average household spend on communications services**

Source: Ofcom / operators / ONS

# Exponential growth in data consumption and network capacity requirements



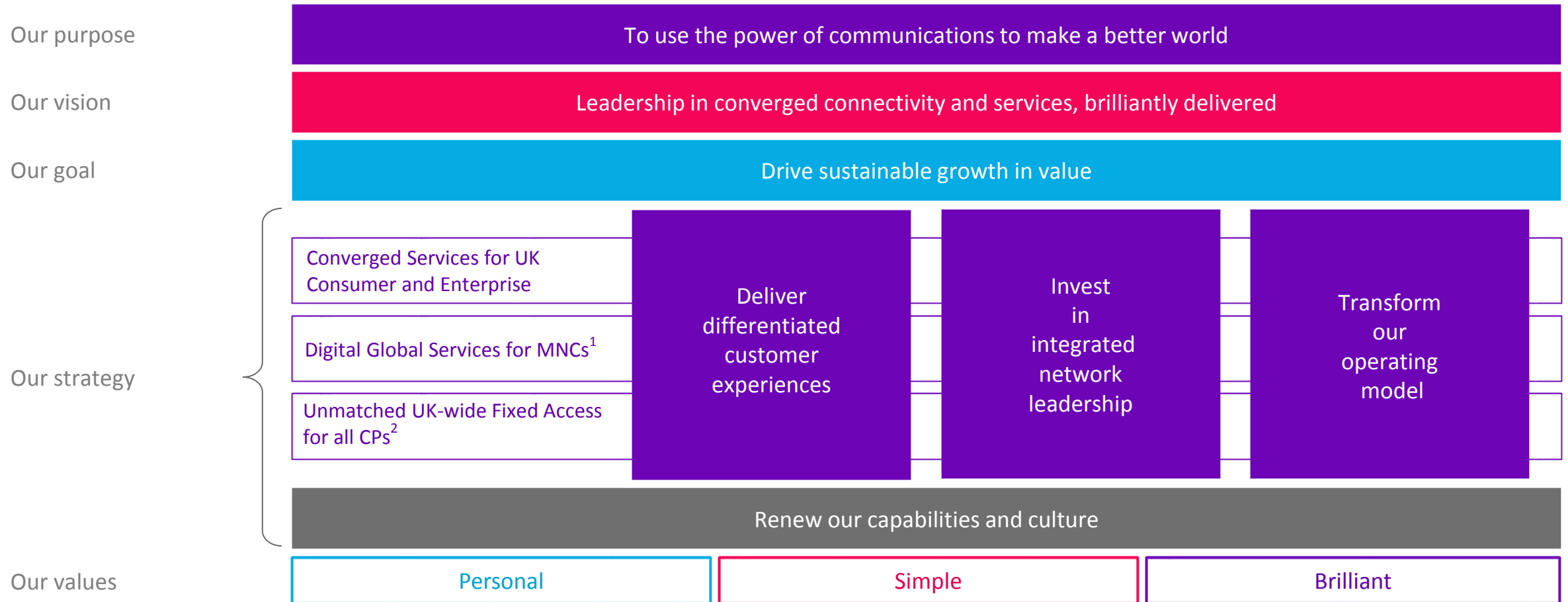
- Government and Ofcom promoting FTTP infrastructure competition
- Multiple ultrafast projects announced across the market

- Mobile data traffic growth continues
- Heavy investments in mobile infrastructure are needed in the mid-term

Source: BT  
<sup>1</sup> actual and forecast growth on BT networks



# We have evolved our strategy to focus on convergence



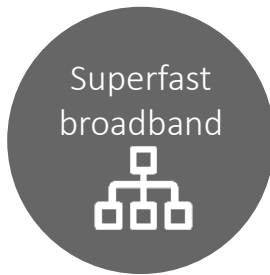
<sup>1</sup>Multi-National Corporations

<sup>2</sup>Communications Providers



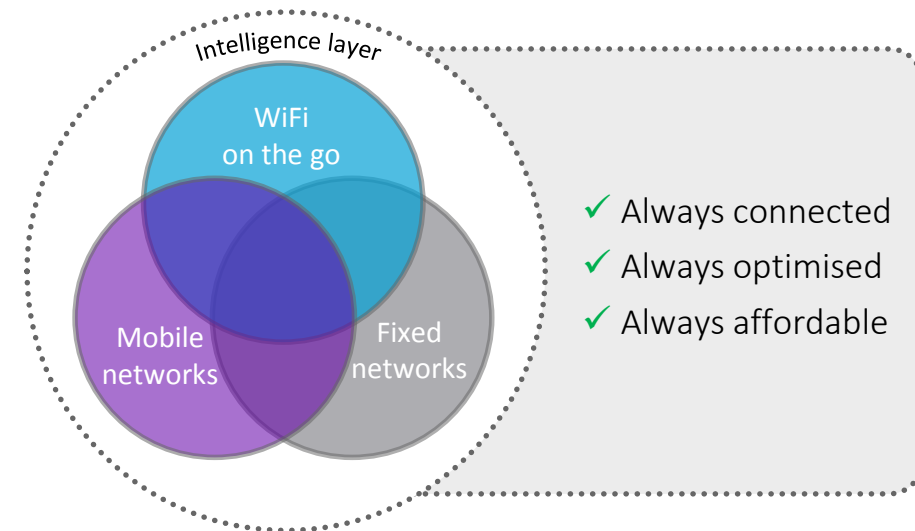
# 'One network to rule them all'

**Today:**  
Three different networks

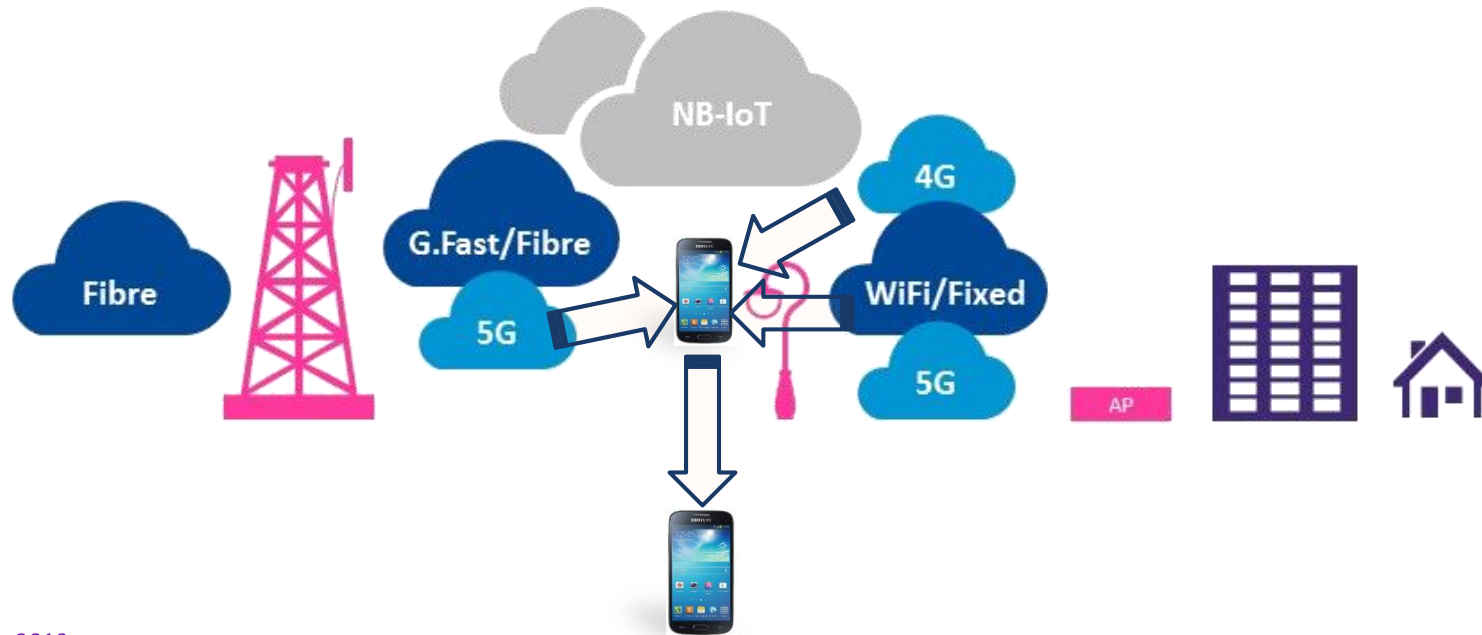
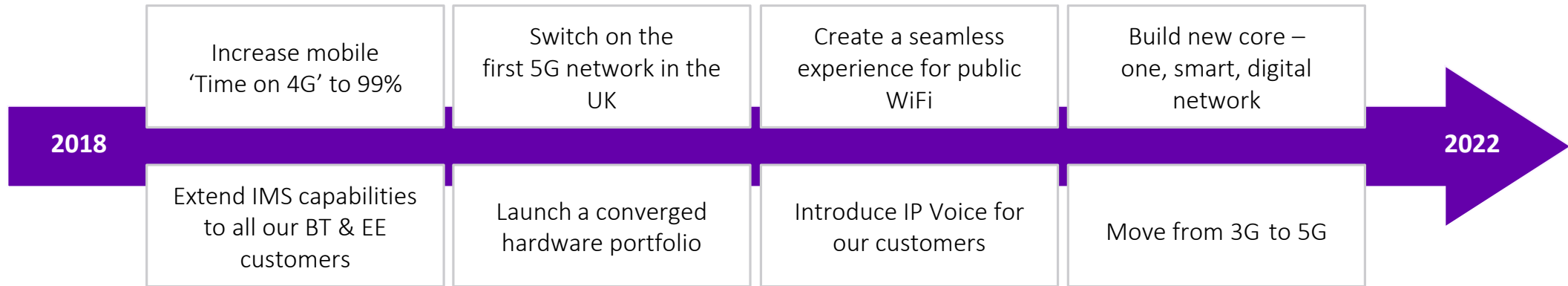


- ✗ Different usage allowances
- ✗ Complex to switch between networks
- ✗ Inconsistent coverage and speed

**Tomorrow:**  
One smart network



# The journey towards one smart network



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News Sport Weather iPlayer Sounds

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**Technology**

# First 5G cities in UK named by EE

© 13 November 2018

5G could also be used as a replacement for fixed home broadband

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# SPEED BOOST EE reveals the 16 launch cities to get 'SUPER-FAST' 5G internet in 2019

Brits are set for a major speed upgrade if they live in one of these cities

By Sean Keach, Digital Technology and Science Editor  
13th November 2018, 12:00 pm | Updated: 13th November 2018, 4:28 pm

**The Telegraph** NEWS

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### EE to roll out 5G in 16 cities next year in 'demand-led' strategy



# BT has ambitious plans for 5G

EE will switch on 5G services in 16 UK cities in 2019, starting in: London, Cardiff, Edinburgh, Belfast, Birmingham and Manchester.

Coverage will then be extended to Glasgow, Newcastle, Liverpool, Leeds, Hull, Sheffield, Nottingham, Leicester, Coventry and Bristol.

• 5G launch locations



*EE's ambitious investment in 5G sites demonstrates that our city is a great place to invest in innovative and future-facing digital connectivity."*

**Sadiq Khan, Mayor of London**

# Benefits of 5G technology

## 4G

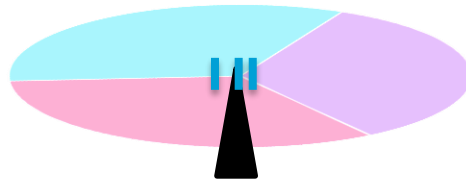
Up to 20MHz blocks



2 or 4 antennas  
(2x2 or 4x4 MIMO)



Typically 3 cells



Typically 1Gbps to 10Gbps, dedicated functions connected to the fixed core

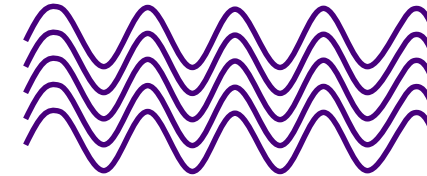
**Larger spectrum blocks**

**More spectrum reuse:  
antennas**

**More spectrum reuse:  
cells**

**More efficient core**

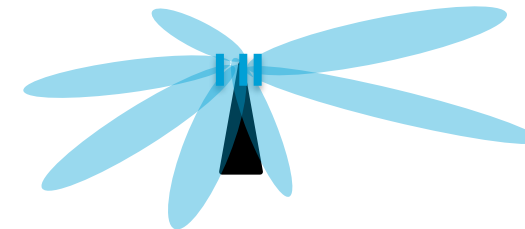
## 5G



Up to 100MHz blocks



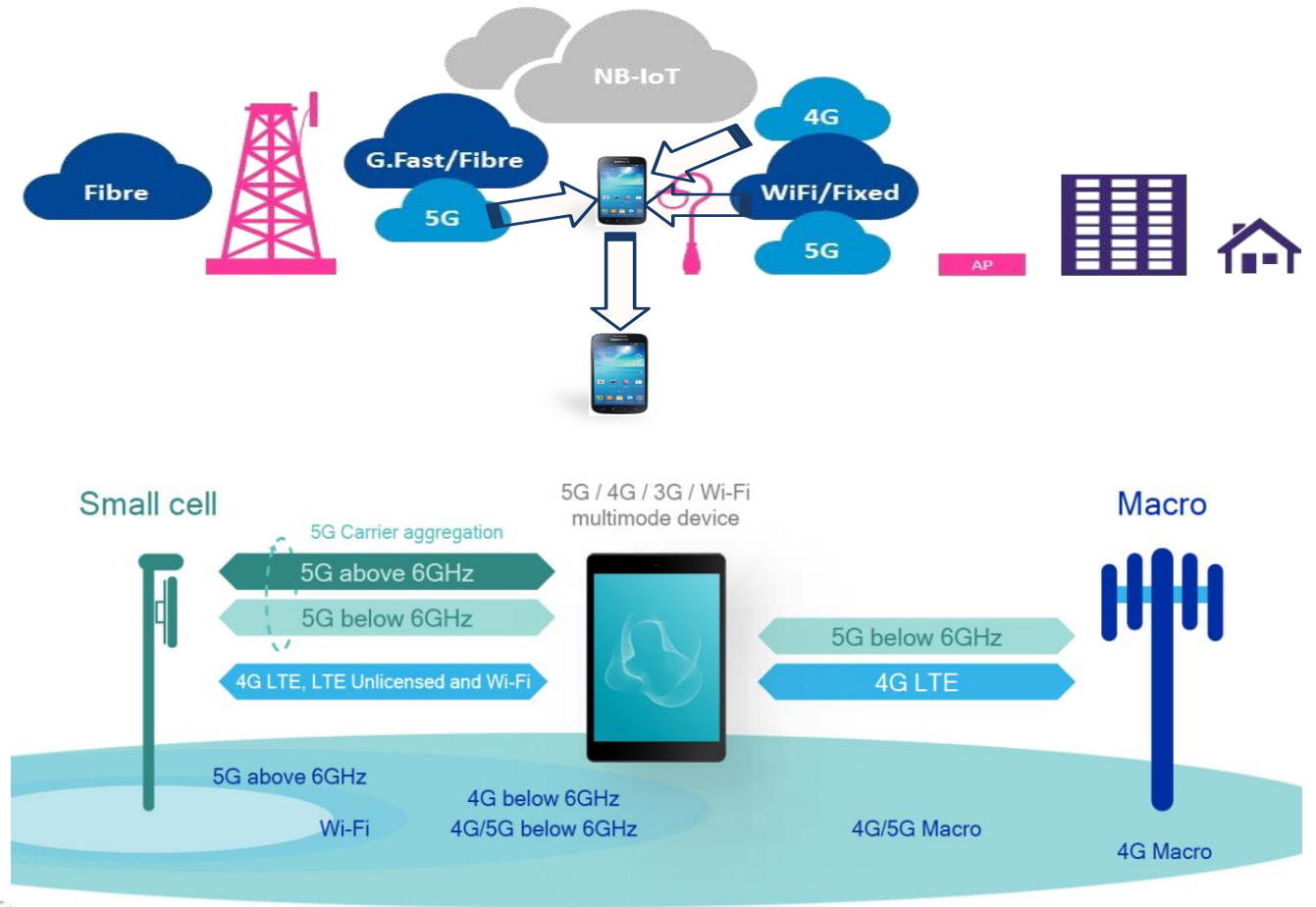
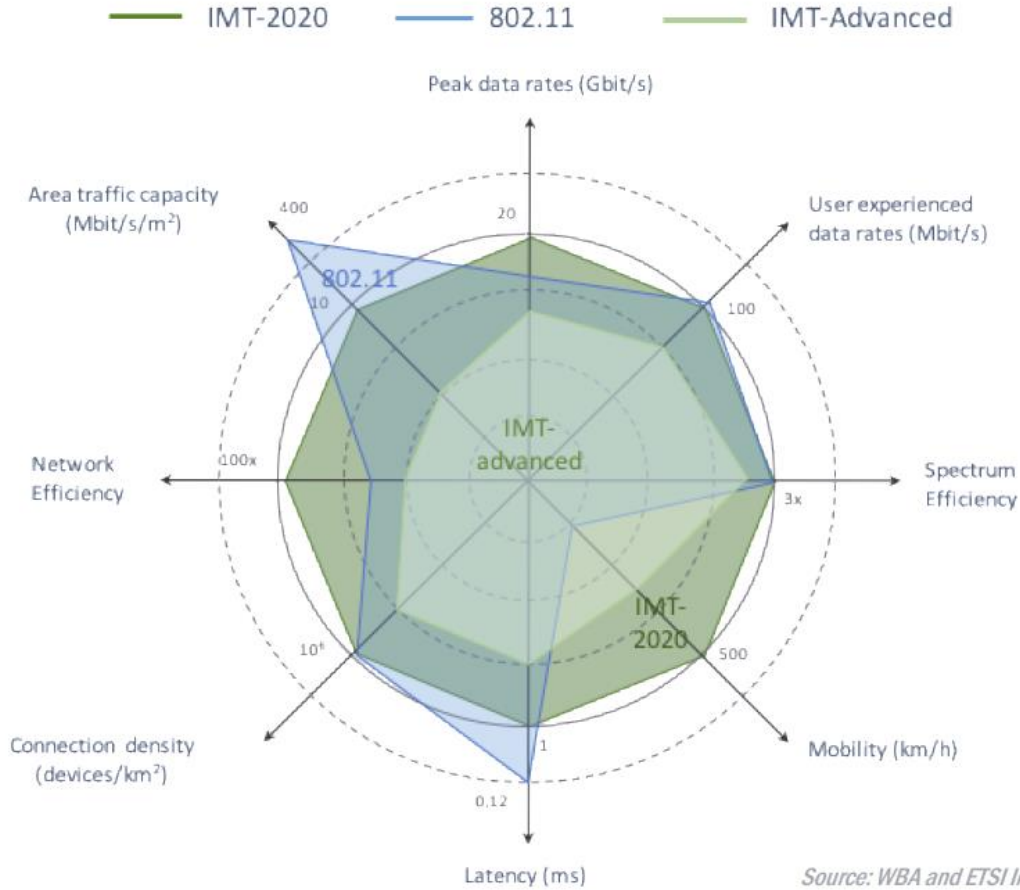
64 or hundreds of  
antennas (Massive  
MIMO)



Beam forming

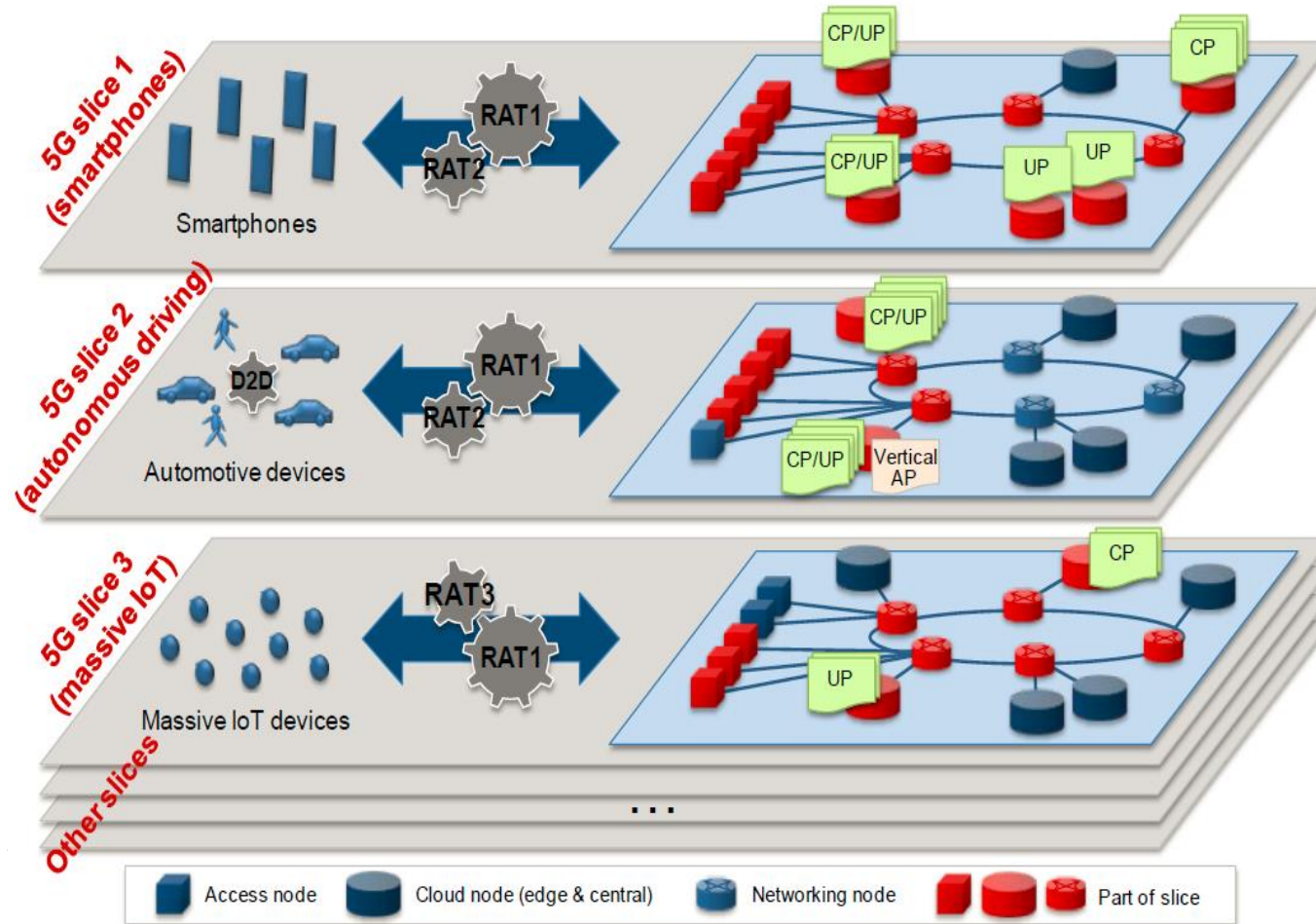
Typically 10Gbps to 100Gbps, embedded in the  
fixed core

# Multi-connectivity for optimal experience



# Network Slicing

Multiple logical networks dedicated to different services/service types



## Rapid deployment of new services

- End goal is fully automated deployment of new network slices with no disruption

## Support for different operational models

- Different SLAs (e.g. security, reliability etc.), require isolation between different slices

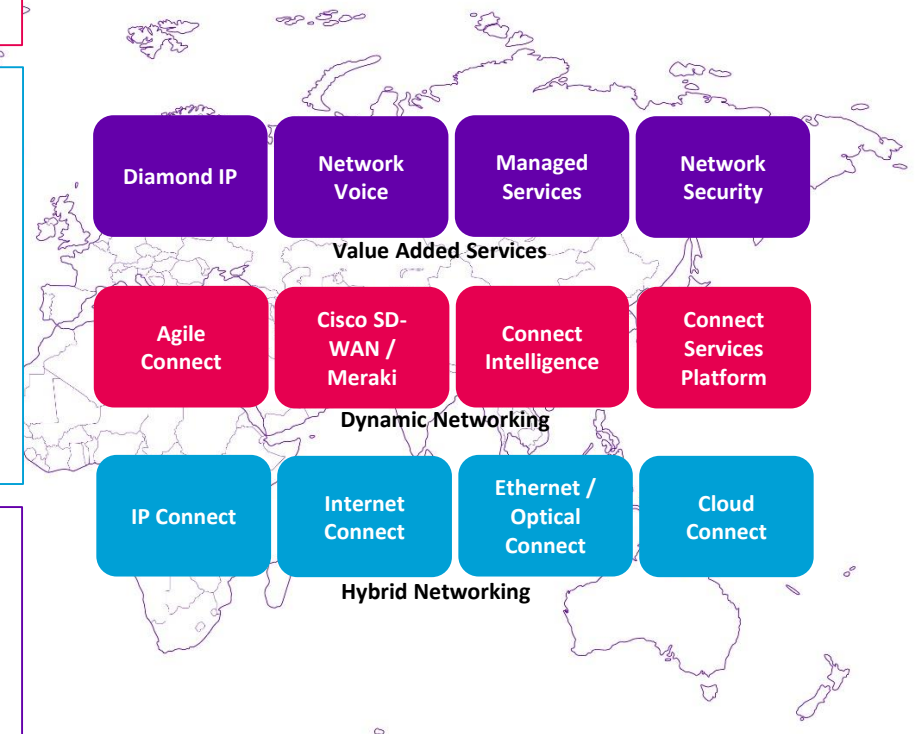
## Conflicting functional requirements

- Optimisation of each slice for the specific functionality, some requirements may be mutually exclusive

# Dynamic Network Services delivered on our Global network

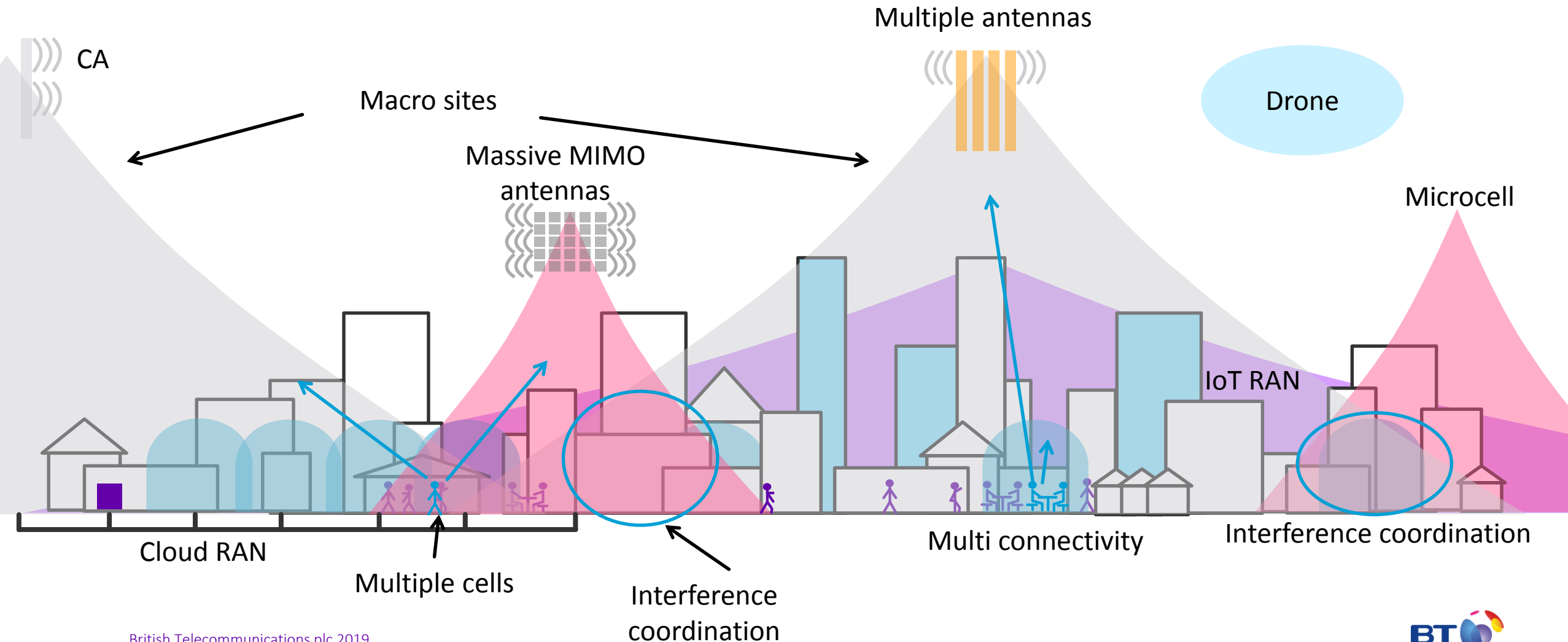
>200 countries      >3,400 customers served      4 global service hubs      >5,200 PoPs

Core SDN	<b>Bandwidth on demand</b>	<p>IPCG (MPLS) – flex port speeds via My Account portal</p> <p>ICG (Internet) – usage based billing</p> <p>On Demand enhancements to Connect Portfolio</p>
Network Virtualisation	<b>Cloud Service Nodes</b>  <b>Connect Services Platform</b>  <b>SNAP</b>	<p>NFV from the cloud: Firewall , Infovista, Riverbed, DDOS protection, Internet Gateway</p> <p>Connect Edge - Cisco ENCS + alternative white box</p> <p>Connect Services Platform - Virtual Network Functions (VNFs) including Cisco SD-WAN, Checkpoint, Fortinet, InfoVista, Riverbed plus own use VNFs</p> <p>Service &amp; Network Automation Platform, fully integrates partner solutions and extend orchestration from the core network to major third-party cloud data centres and LAN/DC-LAN</p>
SD-WAN	<b>Agile Connect</b>  <b>Connect Cisco SD-WAN /Meraki</b>  <b>InfoVista/Riverbed</b>	<p>SD-WAN overlay based on Nokia Nuage solution, integrated into BT's network platform and portal</p> <p>SD-WAN solutions based on Cisco technology (Viptela/Meraki) integrated with BT's platform with additional reporting capability</p> <p>SD-WAN features available from Riverbed/InfoVista solutions, BT first to market with As a Service solutions</p>

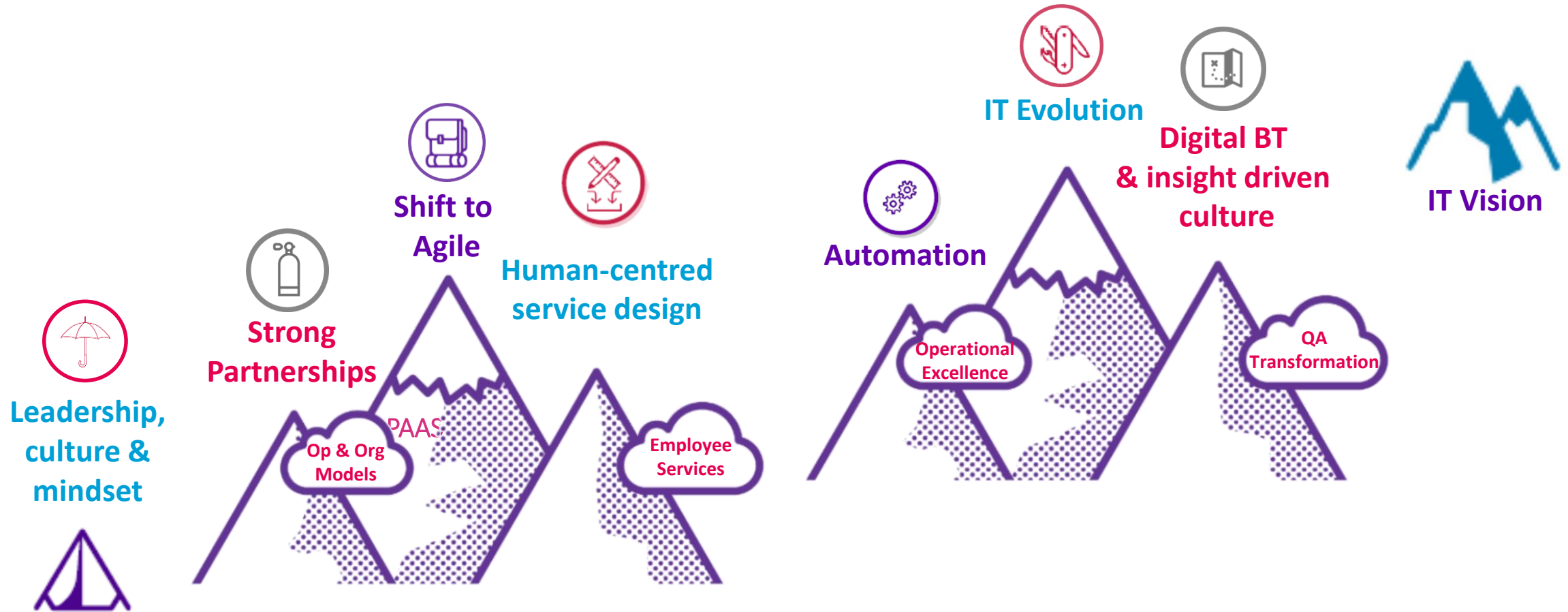


# An exciting journey – but a complex one

Increased technology complexity needs to result in LESS complex customer experiences



# We're transforming our culture, approach and mindset



# Glossary

<b>ONS</b>	Office for National Statistics	<b>RAT</b>	Radio Access Technology
<b>FTTP</b>	Fibre to the Premise	<b>Vertical AP</b>	Vertical Application
<b>5G</b>	The next-generation standard for wireless communications—are scheduled to follow (but not replace) current 4G networks with vastly increased capacity, lower latency, and faster speeds	<b>D2D</b>	Device to Device, communication refers to a radio technology that enables devices to communicate directly with each other
<b>4G</b>	Fourth generation of broadband cellular network technology, succeeding 3G.	<b>SLAs</b>	Service Level Agreements
<b>IMS</b>	IP Multimedia Subsystem or IP Multimedia Core Network Subsystem is an architectural framework for delivering IP multimedia services. Historically, mobile phones have provided voice call services over a circuit-switched-style network, rather than strictly over an IP packet-switched network	<b>IPCG</b>	IP Connect Global network, lets you connect different sites with different needs, locally, nationally and around the world
<b>IP Voice</b>	Technology for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet	<b>MPLS</b>	Multiprotocol Label Switching is a routing technique in telecoms networks that directs data from one node to the next based on short path labels rather than long network addresses
<b>MIMO</b>	Multiple-input and Multiple-output, method for multiplying the capacity of a radio link using multiple transmission and receiving antennas	<b>ICG</b>	Inbound Contact Global, a voice service where you can route your callers all over the world to the most suitable agent or automated solution
<b>G.Fast</b>	Delivers ultrafast broadband speeds of more than 100Mbps	<b>POPs</b>	Point of Presence is the point at which two or more different networks or communication devices build a connection with each other
<b>IMT</b>	International Mobile Telecommunication system	<b>RAN</b>	Radio Access Network is part of a mobile telecommunication system
<b>CP/UP</b>	Control Plane carries signalling traffic User Plane carries network user traffic	<b>IoT</b>	Internet of Things, refers to the concept of extending Internet connectivity beyond conventional computing platforms
		<b>NFV</b>	Network Functions Virtualization is an initiative to virtualize network services



