CICRA
CHANNEL ISLANDS COMPETITION & REGULATORY AUTHORITIES

WELCOME

Michael O’Higgins

Tim Ringsdore

DIRECTOR CICRA

Agenda

08.45 Coffee/Croissants - Networking

09.15 Introduction – Michael O'Higgins Chairman CICRA

09.30 McKinsey – Nemanja Vucevic - Key Note Speaker

10.15 Ofcom – Cliff Mason & Laura Iglesias

10.45 States of Jersey Policies - Stephanie Peat

11.15 Break

11.30 States of Guernsey Policies – Colin Vaudin

12.00 JT Global

12.30 Airtel

13.00 Chairman Closes Session - Lunch

Agenda

14.15 Chairman opens afternoon session

14.20 Sure

14.50 Guernsey Development & Planning Authority – Jim Rowles & Jersey Department of the Environment – Andy Scate

15.20 Break

15.30 Q&A Session

16.15 CICRA Next Steps Tim Ringsdore

16.25 Summary – Chairman Michael O'Higgins

16.40 Close

Networking drinks

Nemanja Vucevic

ASSOCIATE PARTNER - MCKINSEY

McKinsey&Company

Road to 5G

WORKSHOP DOCUMENT | JULY 5TH 2018

Questions that many of our clients are struggling with on 5G

What is the 5G business case and incremental **revenue potential**?

Is 5G a technological **evolution or a revolution**?

Which **spectrum bands** will be required for 5G?

How will 5G affect my **investment level and budgets**?

What else than piloting 5G should I be doing?

The importance of the “second derivative” discussions on 5G

First order core beliefs

Global excitement and value creation but diminishing share to connectivity

Traffic growth and capacity investments will be key

Natural migration strategy based on reframing spectrum and upgrade to 4.XG

Short term business case is based on cost avoidance more than incremental revenue potential

Standardization and handset support will make this a 2020 topic although all operators will do pilots in 2018-20

Post 2020 traffic density in urban will trigger densifications

Infrastructure investments will have to be squeezed into capex to revenue ratio of <18%

Second derivative questions?

What is the right industry structure?

Which capabilities will I be needing?

What is the role of regulation?

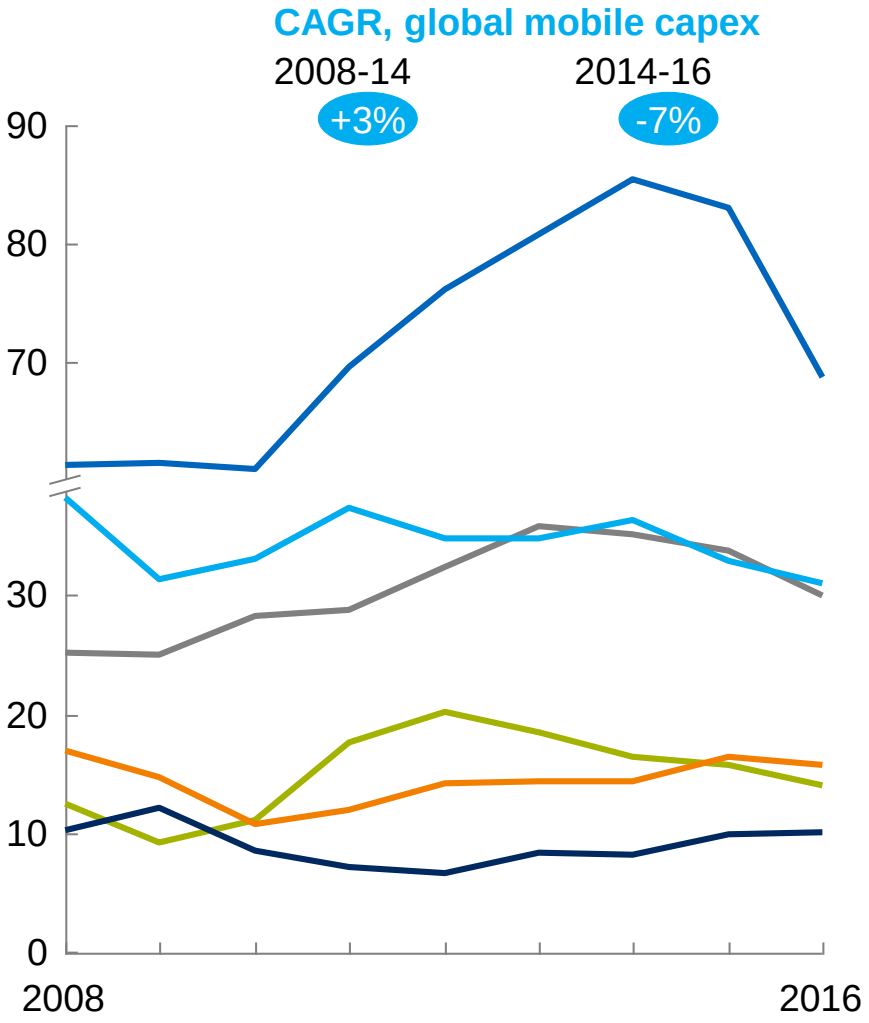
Is 5G a natural monopoly?

What is the outcome of a 5G “war game” … collective destruction?

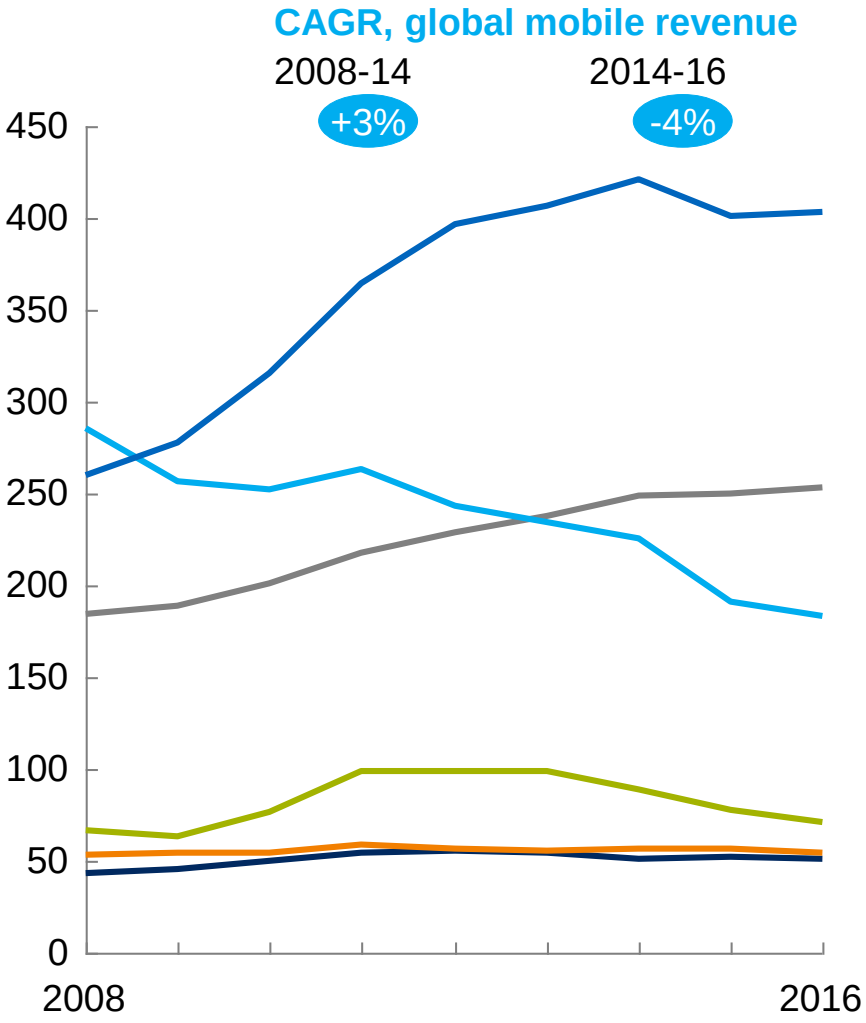
Industry is coming out of 4G investment cycle without having seen incremental monetization

USD trillions

Mobile capex

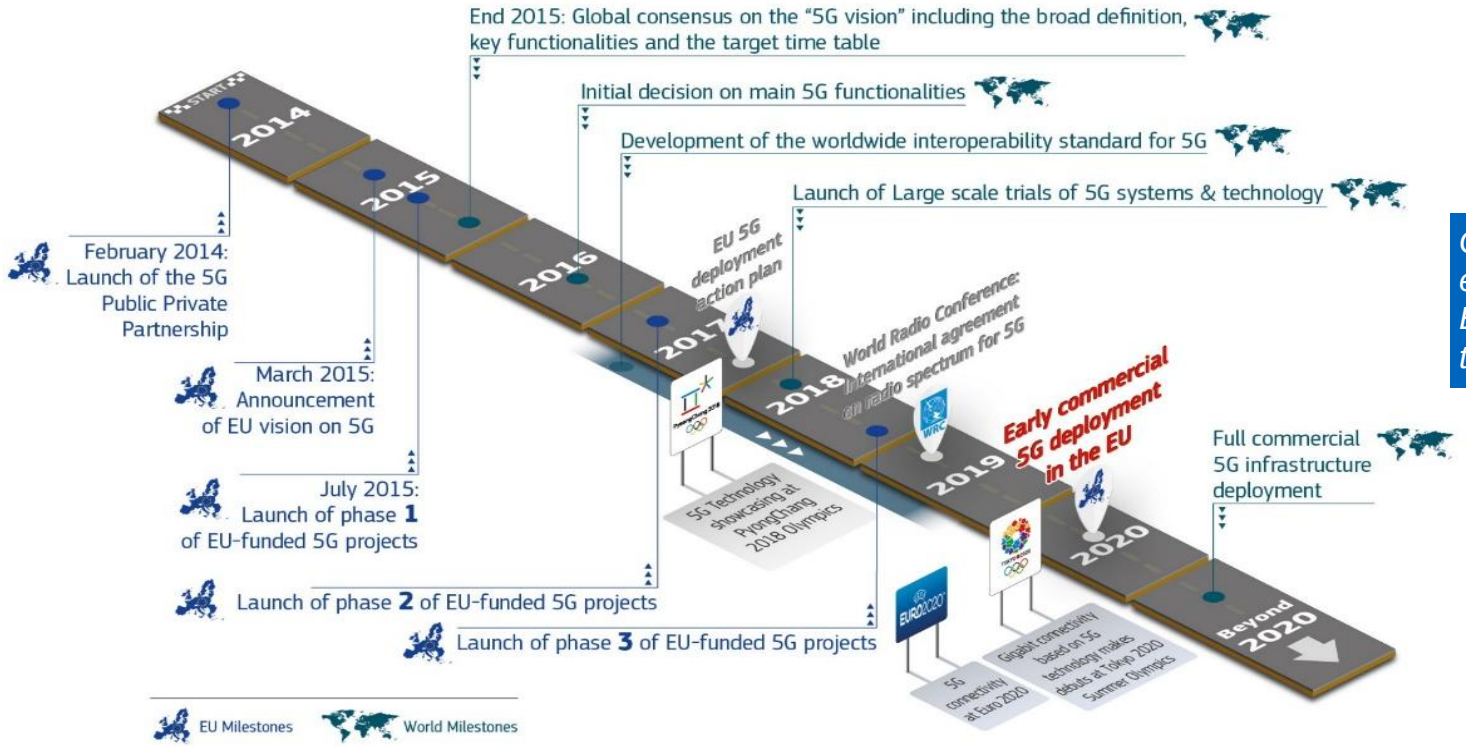


Mobile revenue



SOURCE: Ovum

The roadmap for 5G commercial deployment by 2020 is firmly described in the EU agenda



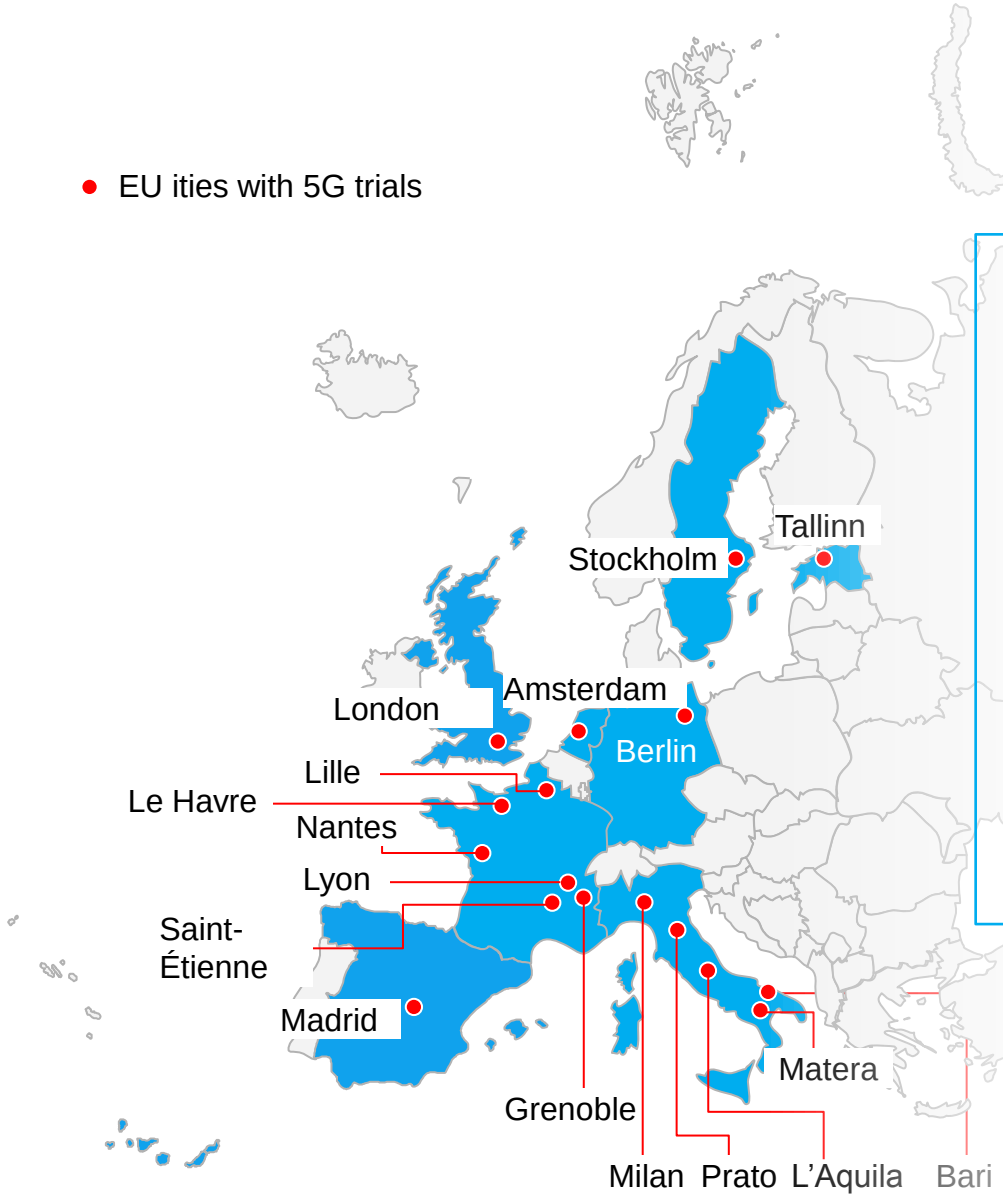
Governments are expected to support EU 5G agenda and try to lead in 5G

Key upcoming milestones in EU

2018	2020	2025
Launch of 5G trials in **at least one city** per Member State	Commercial 5G services in at least one city per member state	All urban areas and major terrestrial transport paths have **uninterrupted 5G coverage** Target of at least **100 Mbps download speeds for all households**, both rural and urban

SOURCE: EU Commission, Towards a European gigabit society Connectivity targets and 5G, 5G action plan

No one wants to be left behind - 5G trials are running across the world



Globally operators and vendors have started exploring 5G in different vertical industries

Types of 5G trials	Countries
Connected cars	
Manufacturing	
Smart city	
UHD video	
Fixed wireless access	

"**5G has the potential to transform our economies** and our societies profoundly"
- *Prime Minister upon signing a joint declaration on 5G deployment in EU*

SOURCE: Policy Tracker, Team analysis, Press search

OEMs are cooperating with operators to develop 5G technology

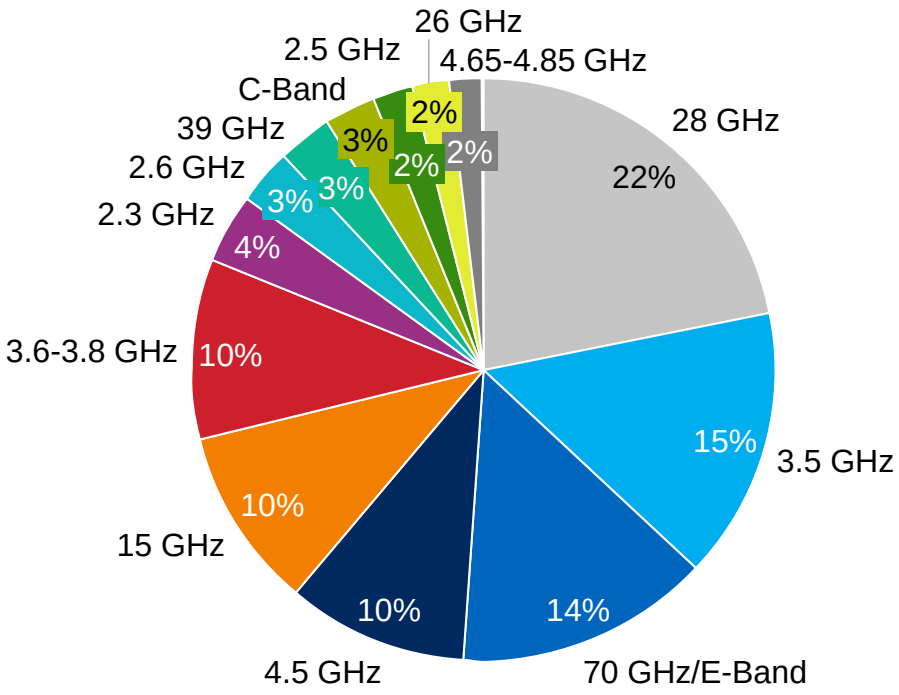
✓ OEM-Telco trial collaboration

Top 10 Global Telco's	HUAWEI	NOKIA	ERICSSON	ZTE
中国移动 China Mobile	✓	✓	✓	✓
verizon		✓	✓	
at&t		✓	✓	
vodafone	✓	✓	✓	✓
NTT	✓	✓	✓	
SoftBank Group	✓		✓	✓
Deutsche Telekom	✓	✓	✓	
Telefónica	✓	✓	✓	✓
américa móvil			✓	
中国电信 CHINA TELECOM	✓	✓	✓	✓

SOURCE: Company website; Ovum

Upcoming spectrum auctions put urgency on 5G plans

Global trials; percent



- *Global 5G trials predominantly focus on 28GHz and 3.4-3.8 GHz bands, from GSA report*
- *US leading initiatives in mix of licensed and unlicensed layers empowered by the technology companies (e.g., CBRS[1] and PAL[2])*

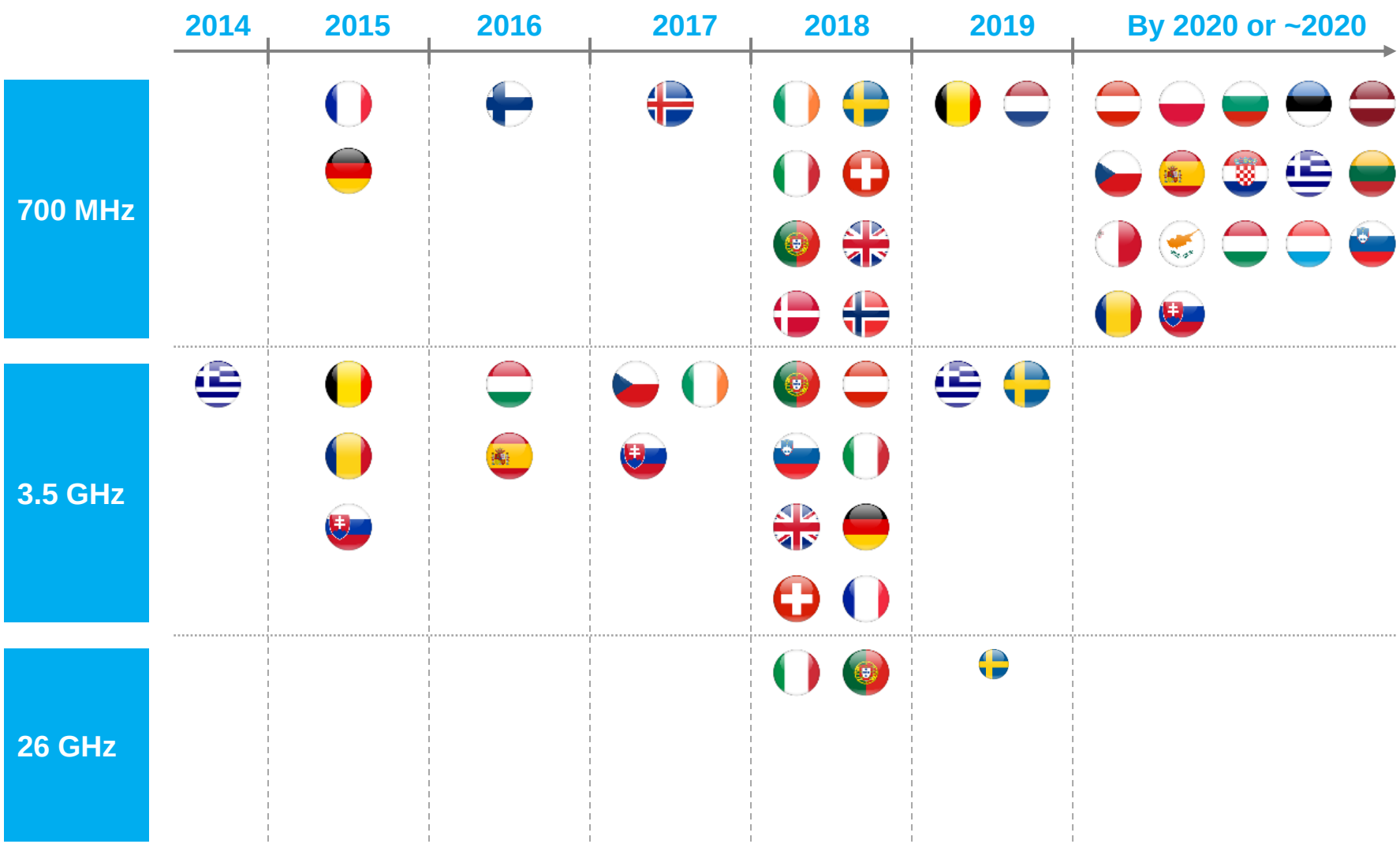
European Union initiatives

- **License harmonization**: EU Commission focused on harmonization of licenses and 5G interoperability, e.g., harmonization of frequency bands (700, 3.5.), license conditions, allocation period
- **Licensed spectrum access at ~3.5 GHz** band (3.4-3.8 GHz), Europe looking to licensed spectrum access, auctions in band 42 and 43 (3.4-3.8 GHz) already started in some countries[3] and in discussions in other
- **mmWave bands focus to 26 GHz**
  - 28GHz not yet officially supported in Europe[4]
  - Europe's Radio Spectrum Policy Group (RSPG), recommends 26 GHz should be the first European "5G" mm-wave band, with 32 GHz and 40 GHz to be studied
  - Operators in UK already hold some 28GHz band[5]
- **Sub 3GHz bands:** Current 5G focus and trials are mostly in higher (>3GHz band) due to current spectrum occupancy. Lower frequencies can be freed up in the future and used for 5G

1 Citizen's Broadband Radio Service
2 Priority Access Licenses
3 In plan: Italy, Slovenia, Belgium, Germany , the UK and Finland; Already auctioned some spectrum in Hungary, Ireland, Romania and the Czech Republic
4 Trials in US, Canada, Korea, Japan
5 Arquiva, O2, Vodafone, Three

SOURCE: GSA report; policy tracker; expert interviews

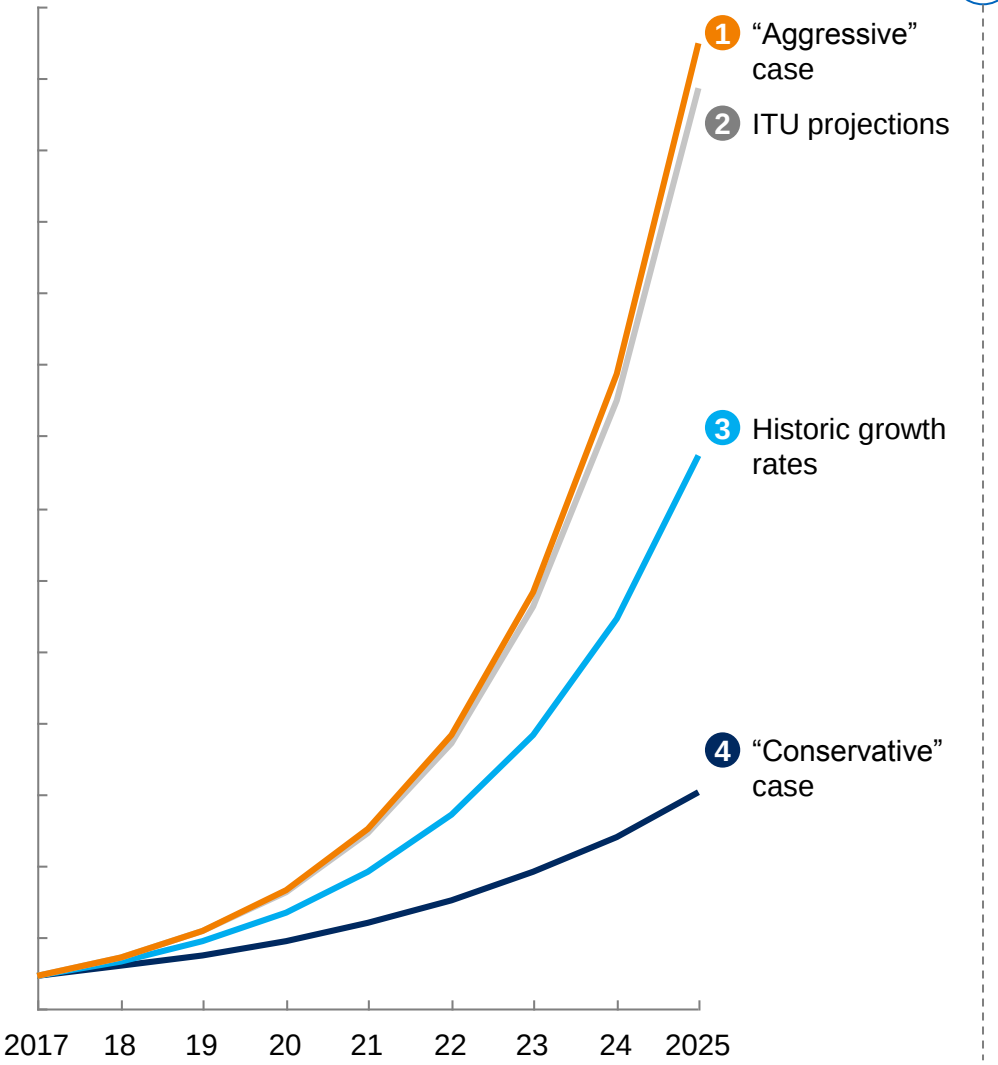
5G spectrum is already auctioned in Europe



SOURCE: Ovum, 5G spectrum tracker

Traffic is forecasted to grow at 30-40+ % p.a. in most European countries

Annual data consumption,
Petabytes

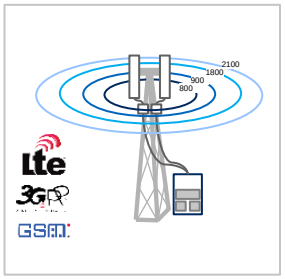
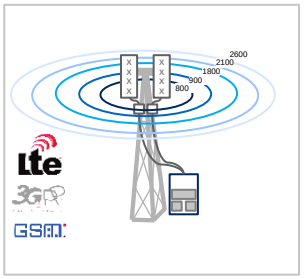
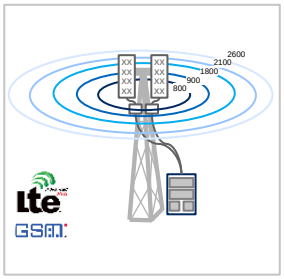
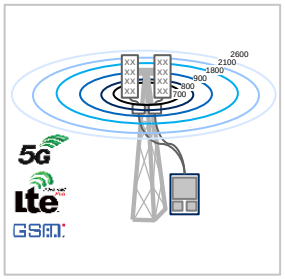
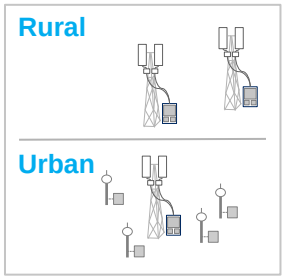


Scenaria overview

	CAGR	Scenario description
1 "Aggressive" case	~50%	▪ Strong (~10% total) usage of **autonomous vehicles** and corporate drones massively driving up M2M demand
2 ITU projections	~49%	▪ **ITU** 2015 "The State of Broadband" report
3 Historic growth rates	~35-40%	▪ **Analysis Mason** estimating ~36-38% annual growth rate for France / Germany
4 "Conservative" case	~24%	▪ **Bernstein estimates:** – Personal usage of MBB primarily due to video at ~15 GB / month / user – IoT limited primarily to e-volved today's use cases (~1-2 GB/month/person)

SOURCE: ITU; Analysys Mason; Bernstein

Most operators will start by upgrading existing networks to meet increasing capacity demand

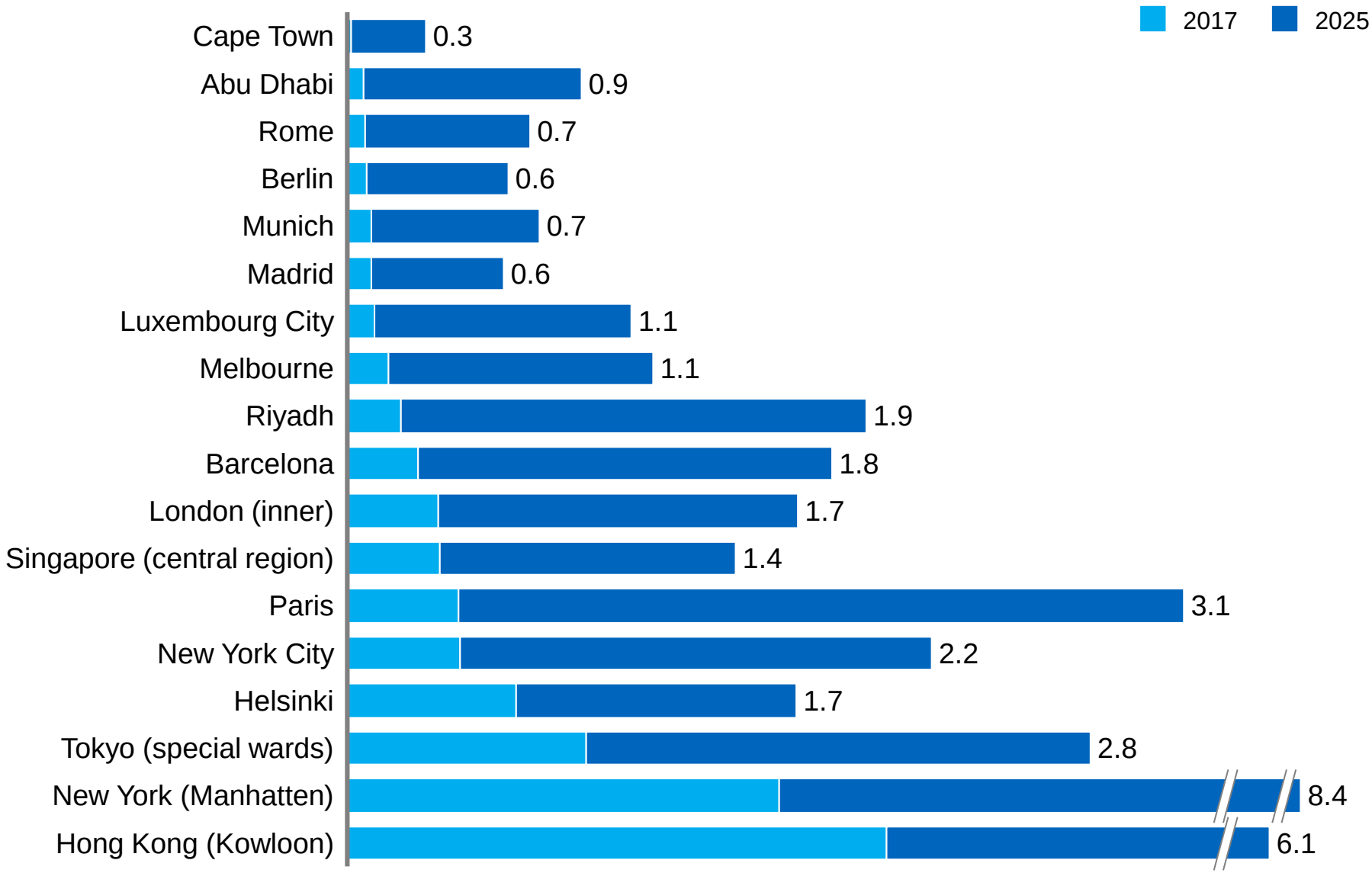
	Site configuration **as-is**	**Upgrade 1:** adding L26 + refarming u21	**Upgrade 2:** 4x4 MIMO rollout	**Upgrade 3:** 5G 700 MHz layer	**Capacity densification**
					
Description and technology configuration (excludes 2G)	"Typical" Macro site today ▪ L8: 10 MHz ▪ L18: 20 MHz ▪ U21: 10 MHz	All sites 2x2 MIMO-enabled New band addition; 3G band refarmed to 4G after 2020 ▪ L8: 10 MHz ▪ L18: 25 MHz ▪ U21/L21:15 MHz ▪ L26: 20 MHz	High-frequency bands (18, 21, 26) upgraded to 4x4 MIMO ▪ L8: 10 MHz ▪ L18: 25 MHz ▪ L21:15 MHz ▪ L26: 20 MHz	Addition of 700 MHz 5G band ▪ 5G7: 10MHz ▪ L8: 10 MHz ▪ L18: 25 MHz ▪ L21:15 MHz ▪ L26: 20 MHz	**Rural**[2] sites: addition of further "Upgrade 3" new sites as needed **Urban**[2] sites: addition of new small cells; each @ 2 sectors of 50MHz 3500-band 5G
Cell-average spectral efficiency bps/Hz	▪ 1.20 (HSPA+) ▪ 1.41 (LTE-A)	▪ 1.20 (HSPA+) ▪ 1.70 (LTE-A 2x2 MIMO)	▪ 2.40 (LTE-A 4x4 MIMO)	▪ 2.40 (LTE-A 4x4 MIMO) ▪ 2.13 (5G 2x2 with NOMA[3])	▪ 2.40 (LTE-A 4x4) ▪ 2.13 (5G 2x2 with NOMA[3]) ▪ 3.00 (5G 4x4, NOMA[3])
Busy hour capacity Mbps[1]	**~160 Mbps**	**~320 Mbps** (3G/4G) **~330 Mbps** (4G only)	**~480Mbps**	**~530 Mbps**	**~300 Mbps** (small cell)

1 Estimated cell-average spectral efficiency-derived peak capacity for 3-sector macro site for as-is and upgrades 1-3; 2-sector small cell
2 Sites defined as Urban / Rural depending on site traffic density (BH throughput / coverage area)
3 1.25x spectral efficiency gain expected with 5G due to NOMA; ho higher (e.g. MMIMO) configurations considered for 5G 3.5 GHz

SOURCE: NTT Docomo Technical Journal; Operator inputs

Growing traffic density in urban areas will drive investments in small cells

Average traffic density across different cities[1] is growing with data traffic; PB per sqkm

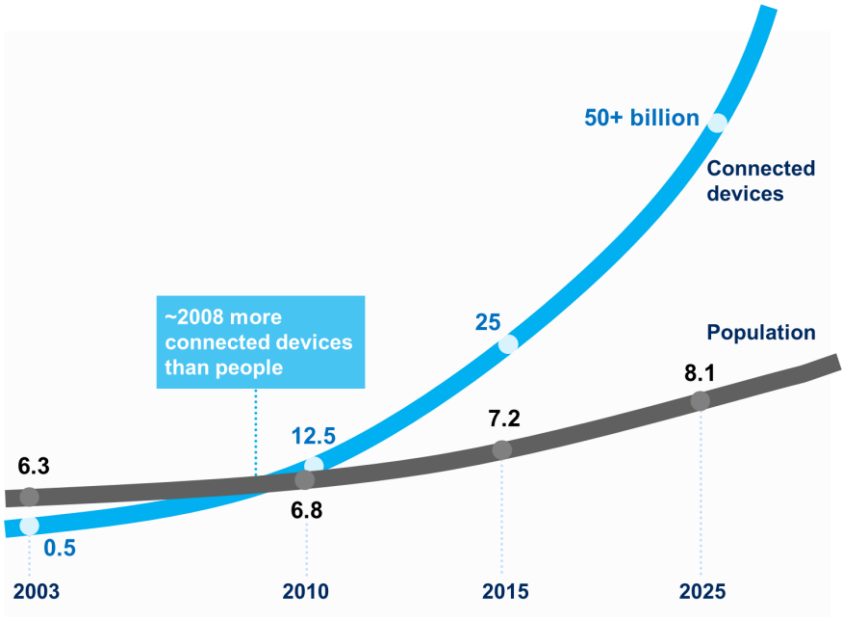


1 Unless specified, excluded areas outside the smallest definition of 'city', i.e.. exclude areas outside 'city' in 'metropolitan' / 'urban'

SOURCE: Eurostat; Analysys Mason; country census

Next wave of connectivity is for IoT

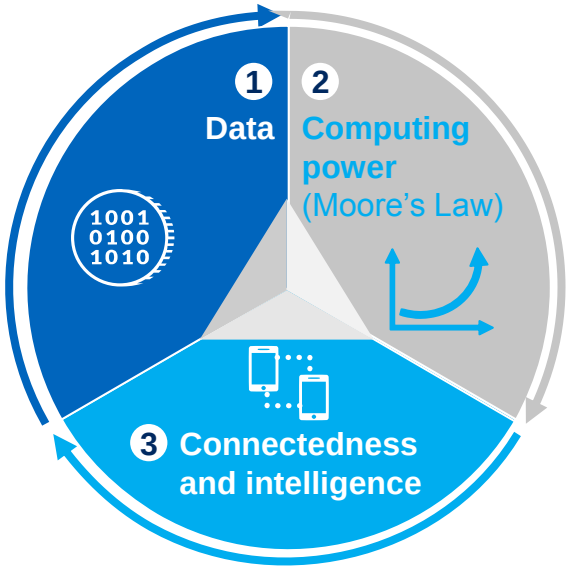
Connected devices surpass individuals



Due to three critical enablers

sensors shipped in manufacturing increased from 4.2B in 2012 to 23.6B in 2014

1,000 fold increase in computing power/mm^2 in last 10 years



Machine intelligence predicted to match that of humans by 2029

SOURCE: Statistisches Bundesamt; Deutsche Bundesbank; Prognos; Thomas Nipperdey; McKinsey

5G will enable significant value creation but connectivity is diminishing in terms overall value capture

IoT market outlook 2020 by vertical; EUR billions

Market size, 2020

- USD 0-0.5 billion
- USD 0.5-1 billion
- USD 1-2 billion
- > USD 2 billion

		Con-nected car	Industry 4.0	Smart utilities	Retail	Public safety	Smart city	IT	Smart home	E-health	Total
Software	Services/ applications	90.0	70.0	14.1	12.9	13.0	7.2	6.1	1.7	2.9	218.0
	Enablement platform	6.5	2.4	4.2	0.5	0.4	1.7	0.3	0.6	0.5	17.1
	Cloud infrastructure	1.4	0.3	0.5	0.1	0.0	0.1	0.0	0.1	0.1	2.6
	Connectivity	2.6	0.0	0.0	0.4	0.6	0.5	0.0	0.0	0.1	4.2
	Connectivity hardware	1.6	2.0	1.1	0.2	0.1	0.3	0.5	1.8	0.5	8.2
	Total	102.1	74.7	19.8	14.2	14.1	9.8	6.9	4.2	4.0	249.9

- **Almost 75%** of total 2020 revenue will be in just three verticals: **connected car, smart utilities and industry 4.0**
- **Over 90%** of the total value lies in **services and the enablement** platform
- **Connectivity** revenues will be **small, making up < 2%** of total IoT market

SOURCE: Machina; MGI

5G demand will be driven by four groups of use cases

2. Massive internet of things
Efficient, low cost communications with deep coverage

>100-1000x scale

Smart homes/ buildings/ cities

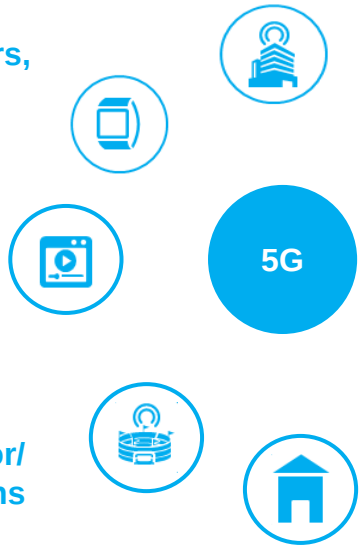
1. Enhanced mobile broadband
Faster, more uniform user experiences

>10x speed

New form factors,
e.g., wearables and sensors

Extreme mobile broadband,
e.g., UHD virtual reality

Demanding indoor/ outdoor conditions
e.g., venues



Critical infrastructure protection and control ,
e.g., smart Grid

Autonomous vehicles, object tracking

Remote control and process automation ,
e.g., aviation, robotics

3. Mission-critical control
Ultra-low latency and high reliability

~10-15x lower latency

4. Fixed wireless access
Fixed BB substitution

SOURCE: Qualcomm, NGMN; expert interviews

First 5G use cases are expected to mature ~2020

NOT EXHAUSTIVE

Short term, ~2020 | 2020-2025 | 2025+

Key 5G use cases	Example applications	5G requirement	Market maturity horizon
Fixed wire-less access	▪ Fixed wireless access as a substitute for fixed broadband connectivity	▪ **Fiber-like speeds** to multiple 10s of houses from one eNB	●
5G hot spots EMBB boost	▪ Smart helmets ▪ Cloud gaming ▪ Streaming and live broadcasting HD video[1] ▪ Cloud office /storage	▪ Can potentially **replace WiFi** for "pop up" locations ▪ Increased **capacity (10 Gbps DL)** ▪ Lower **latency for gaming, helmets, AR/ VR**	● ● ● ●
Virtual & Augmented Reality	▪ Cloud AR/VR ▪ Interactive AR/VR gaming	▪ **Ultra-low-latency and reliability for extreme safety / security** ▪ Increased **capacity (10 Gbps UL)**	● ●
Autonomous vehicles	▪ Aided driving ▪ Platooning ▪ Autonomous driving	▪ **Ultra-low-latency and reliability** for extreme safety / security	● ● ●
In vehicle infotainment	▪ HD streaming ▪ Video conferencing ▪ Gaming	▪ **Ultra-low-latency and reliability** for extreme safety / security ▪ Increased **capacity (10 Gbps UL)**	● ● ●
Drone Applications	▪ Field mission, e.g., agriculture, industry outdoor ▪ Safety & emergency interventions ▪ Logistics (delivery)	▪ **Ultra-low-latency and reliability for extreme safety / security** ▪ Increased **capacity (10 Gbps UL)**	● ● ●
Tactile internet	▪ Remote surgery ▪ Security / natural disaster interventions	▪ **Ultra-reliable low E2E latency** communication (5-25 ms) ▪ Increase **Uplink Capacity**	● ●
Industry 4.0 applications	▪ Cloud based wireless robot control in manufacturing	▪ **Ultra-low-latency and reliability** for extreme precision and safety	●

1 e.g., panoramic cameras, 8k

SOURCE: McKinsey

Enabling all 5G use cases will trigger investment across all network domains

Network evolution due to 5G use cases

Spectrum

1 New spectrum

New <800 MHz bands, e.g. new coverage bands for IoT

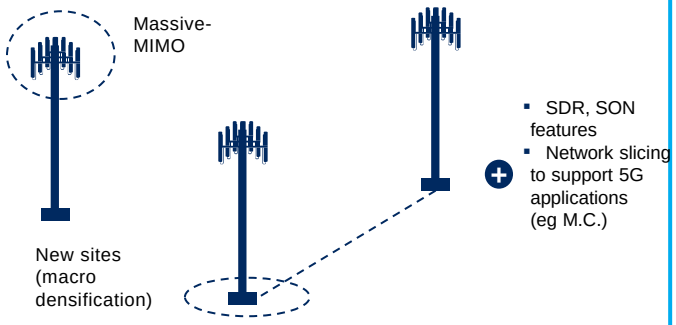
New >3GHz bands, e.g. for small cell deployment in urban

\+

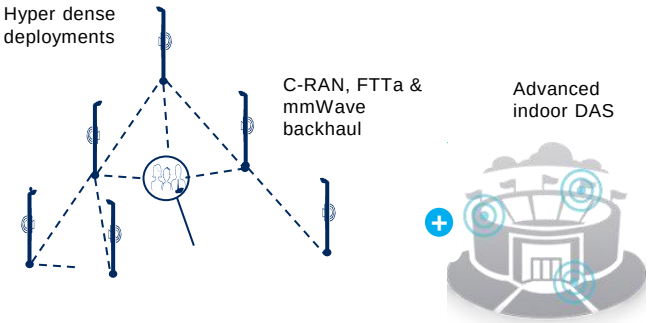
Unlicensed or secondary license access

RAN infrastructure (key trends)

2a Macro network densification and layer upgrades *(legacy network evolution)*



2b Small cell (outdoor) & indoor densification



Transmission

3 Increased fiberization

80-100% backhaul fiberization

New technologies
FTT-Site
FTT-Antenna (Cloud-Ran)
mmWave backhaul

Key drivers

Mission-critical

Large scale IoT

Enhanced mobile broadband

4 Core & features

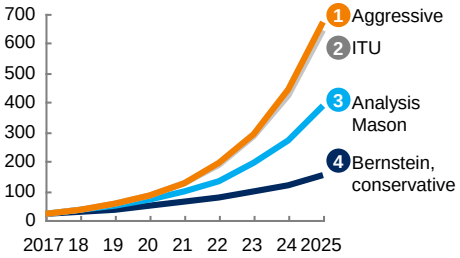
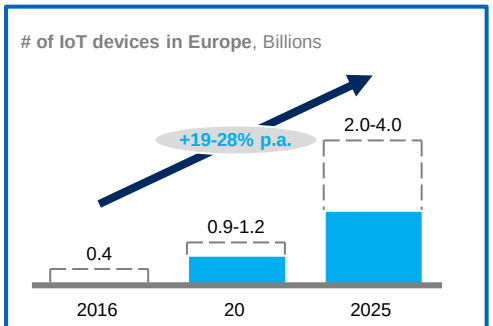
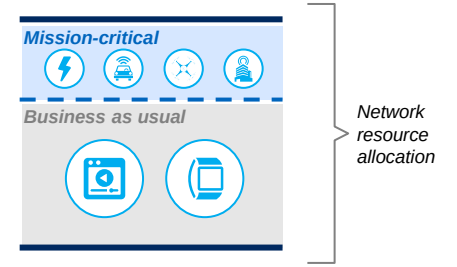
"SAAx", NFV, ultra SON, analytics

Separation of C-plane vs. U-plane

Network slicing

SOURCE: Expert interviews; McKinsey

Key challenge of future 5G RAN will be to cope with the scale-up required from data growth while minimizing constraints new use cases introduce

	Key challenges	Description	Network infrastructure requirements
Enhanced Mobile Broadband		▪ User- and machine-generated data is **expected to increase ~25-50% p.a.** by 2025, overall growing **5-25x** vs. today's volumes	▪ **Upgrading** of sites (e.g. add'l bands, MIMO…) to cater for traffic needs ▪ **Rollout** of new sites (Macro, Small Cell) where upgrades are not sufficient
Massive Internet of Things		▪ IoT devices are expected to increase **5-10x** vs. today ▪ With heterogeneous requirements countrywide	▪ Rolling out **narrow-band technologies** (e.g. NB-IoT) to cater for low-power / wide-area needs ▪ Assigning **network layers / bands** and **slices** to IoT
Mission-Critical Control		▪ Mission-critical applications to require **dedicated resources**, **small latency**, and **high resiliency / reliability**	▪ Deployment of **country-wide low-band 5G** layer for universal coverage ▪ Increasing **fiber** adoption to **~100%** ▪ Dedicating **e2e slices** for critical applications

Massive network scale-up

Network resource constraints

SOURCE: Analysis Mason; Bernstein Research; other industry and vendor / telco reports; McKinsey

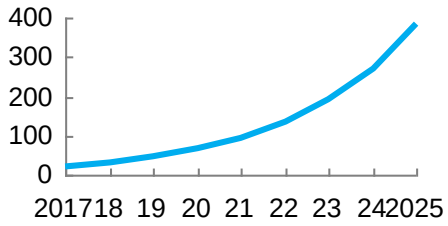
Simulation for a European country show that RAN TCO will double before 2025 TCO for access network[2] (opex + capex)

35% PA TRAFFIC GROWTH ASSUMED

5G use case requirements will drive demand for network resources …

Enhanced mobile broadband

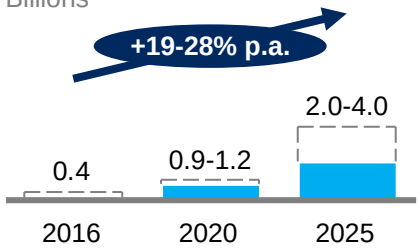
Annual country-wide data usage, PB



- Data **to increase ~35% p.a.** by 2025, overall growing **~11x** vs. today

Massive internet of things

# of IoT devices in Europe
Billions



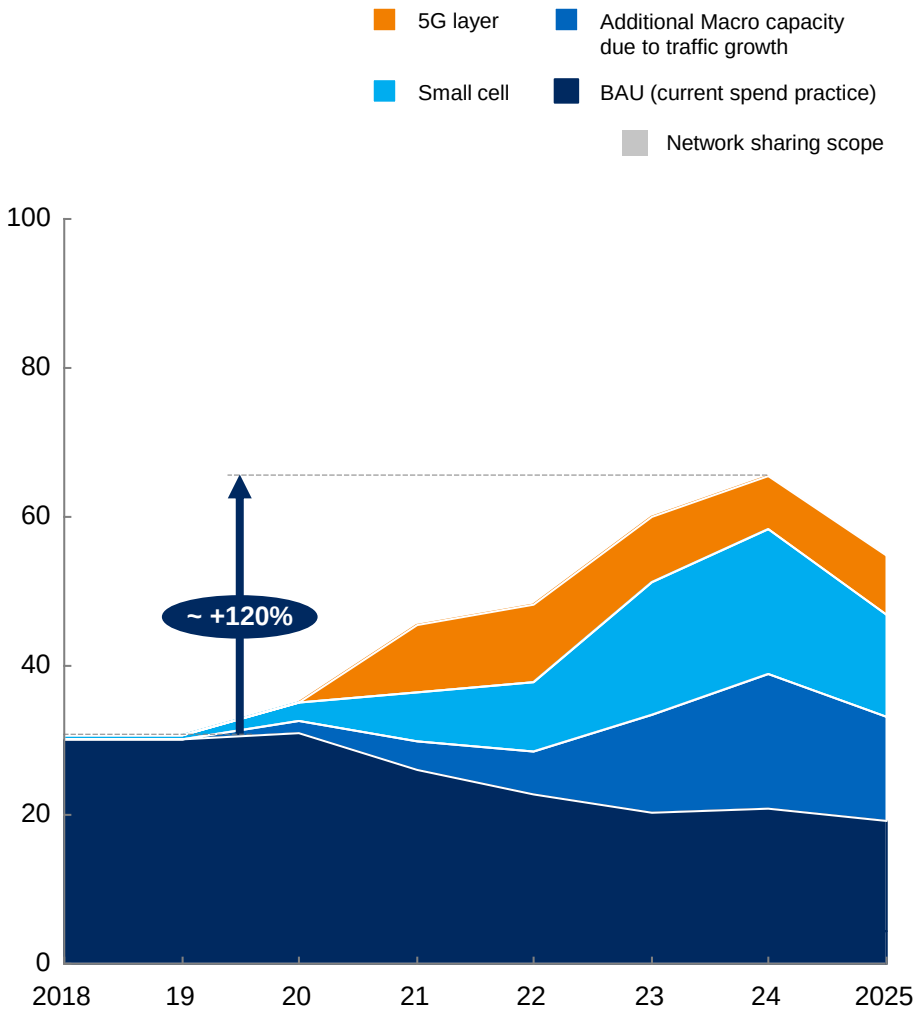
- IoT devices to increase **5-10x** vs. today; with heterogeneous requirements; countrywide

Mission-critical control

Network resource allocation

- Need for **dedicated resources, small latency,** and **high resiliency and reliability**

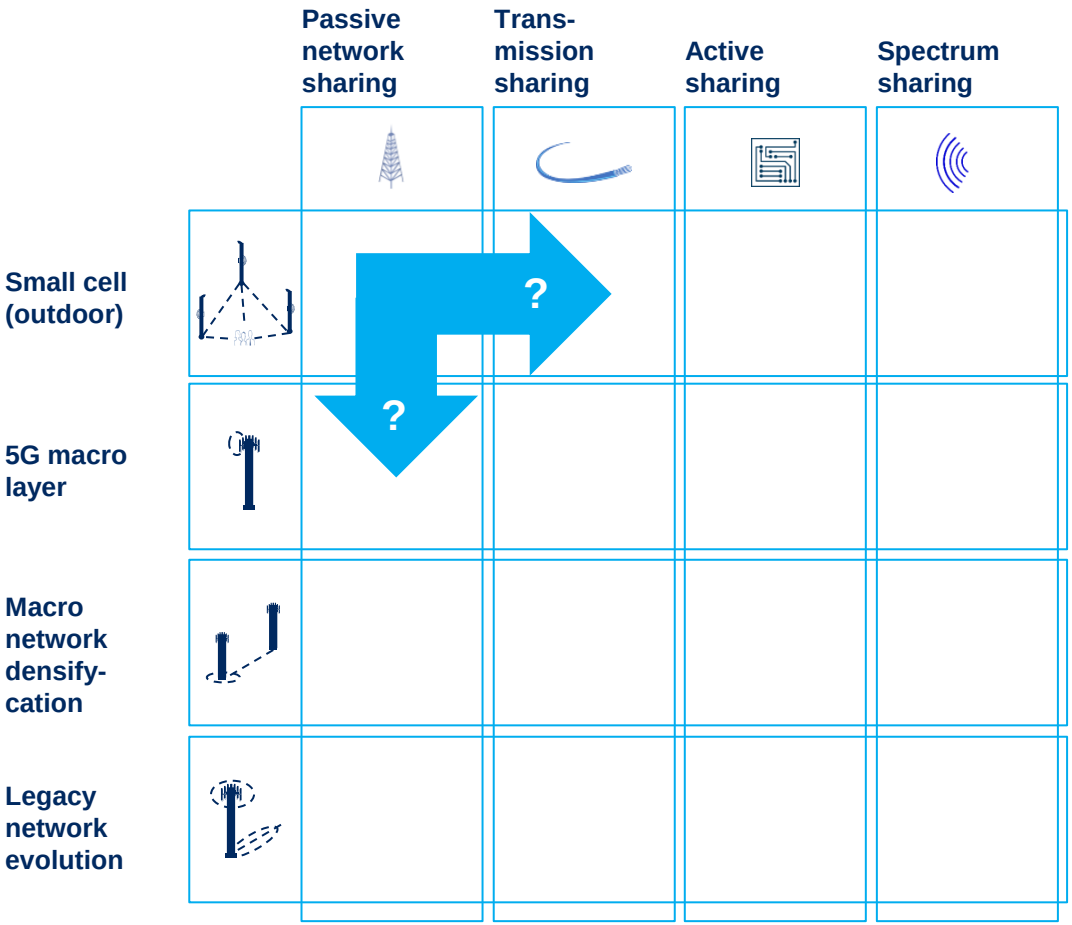
… resulting in >100% increase in TCO if all operators build as-is



1 Simulation for all 3 operators in a European country based on actual network capacity simulation
2 RAN + transmission

SOURCE: McKinsey

The industry will have to decide if onboarding to 5G will be a join or separate effort by the operators



- Should operators consider 5G network sharing from the beginning?
- Is this the moment to consider wider network sharing?
- Is there any sharing & wholesale models that would be acceptable by all 3 operators?

Short term most operators will pilot 5G without strong financial case

Pilots
2018-19

- All operators pilot and market 5G without demand or financial feasibility
- Upgrade of capacity using 4.X evolution and refarming of spectrum
- Spectrum auctions will put financial constraint on operators esp. in light of uncertainty

Widespread deployment
2020-25

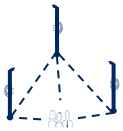
- Small cell deployment to cope with based on traffic density in urban
- Deployment in new IoT layer dependent spectrum allocation
- Consolidation of infrastructure, eg. network sharing

Next technology cycle
2025+

- Widespread adoption and move towards new technology standards

Channel islads will have to work on several enablers on the way to 5G

FOR DISCUSSION

	Examples	Stakeholders
Spectrum 	▪ New frequency bands, 700, 3.5G, mmWave ▪ Spectrum access policies, e.g., sharing, secondary spectrum access, use-it or lease-it ▪ Rollout obligations	Ofcom, CICRA
Network densification 	▪ Access to urban furniture ▪ Access to government property and land	CICRA
Backhauling / Fiber 	▪ Fiber connectivity and new fiber rollout ▪ Fiber access policies	JT, sure., Newtel, CICRA
Capacity evolution 	▪ Building permits process speedup ▪ Equipment upgrades & swaps	CICRA, NOKIA, ERICSSON, HUAWEI, ZTE
Other enablers and limitations 	▪ Network sharing and wholesale policies ▪ EMF management ▪ Funding, government and industry-led venture funds	CICRA

EXTRA BACK-UP SLIDES FROM NEMANJA

Nemanja Vucevic is an Associate Partner at McKinsey & Company where he serves clients on a broad range of technology strategy topics.

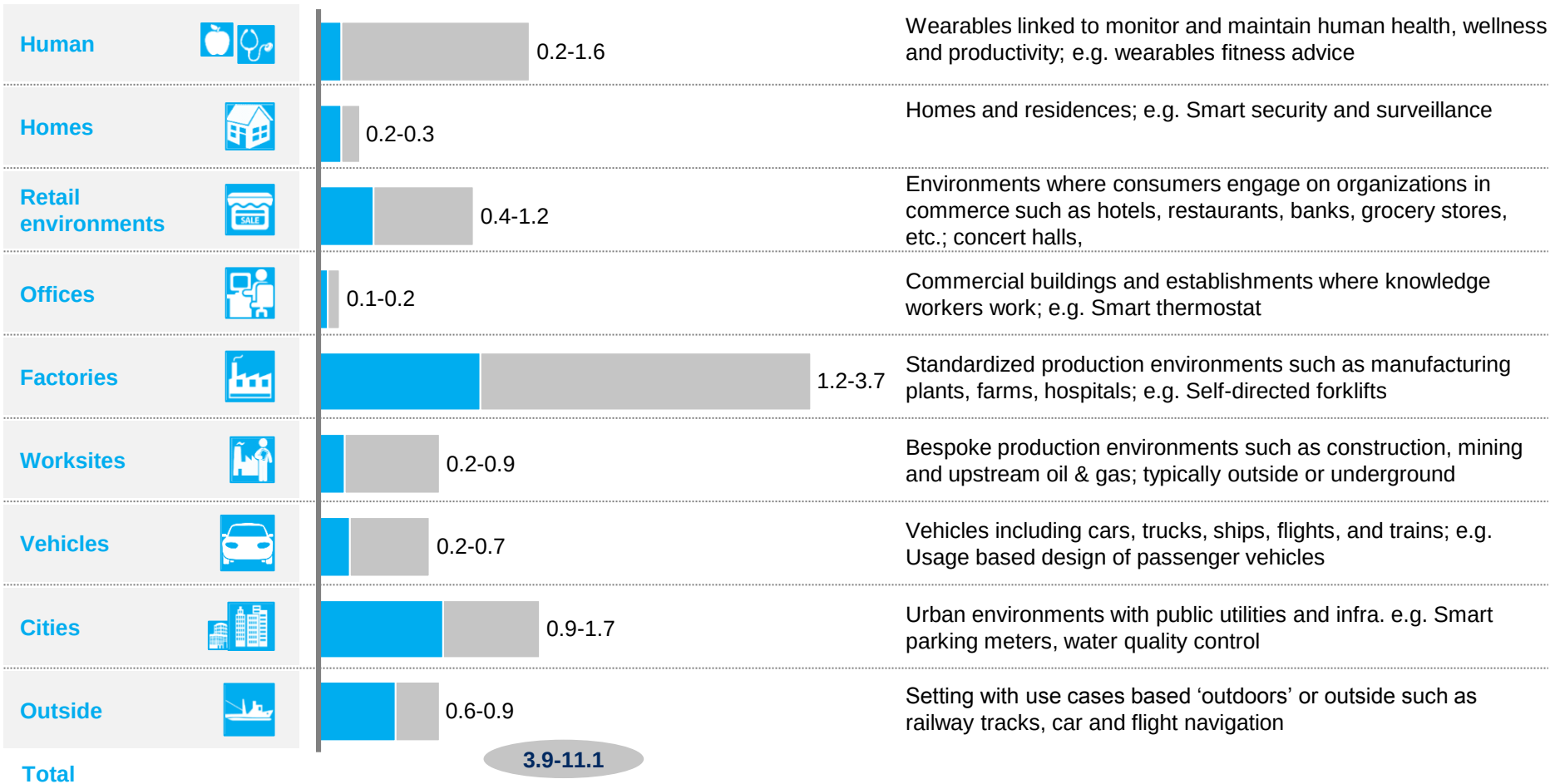
Nemanja joined McKinsey in 2012, where he specializes in Telecom. He's focus is on telecom infrastructure, spectrum and 5G. He is a co-leader of McKinsey's global network sharing service line. Within McKinsey, Nemanja has supported over 20 telecom operators globally.

Before joining McKinsey, Nemanja worked at Research at UPC (Spain), GaTech (USA) and IC-ETF (Serbia). He holds a Ph.D. in Telecom Engineering from the Technical University of Catalonia (Barcelona Tech.), as well as a M.Sc./Dipl-Ing. degree in Electrical Engineering from the University of Belgrade (ETF).

Potential economic impact of IoT in 2025 including consumer surplus is $4-11 Trillion

PRELIMINARY

USD Trillions adjusted to 2015 dollars

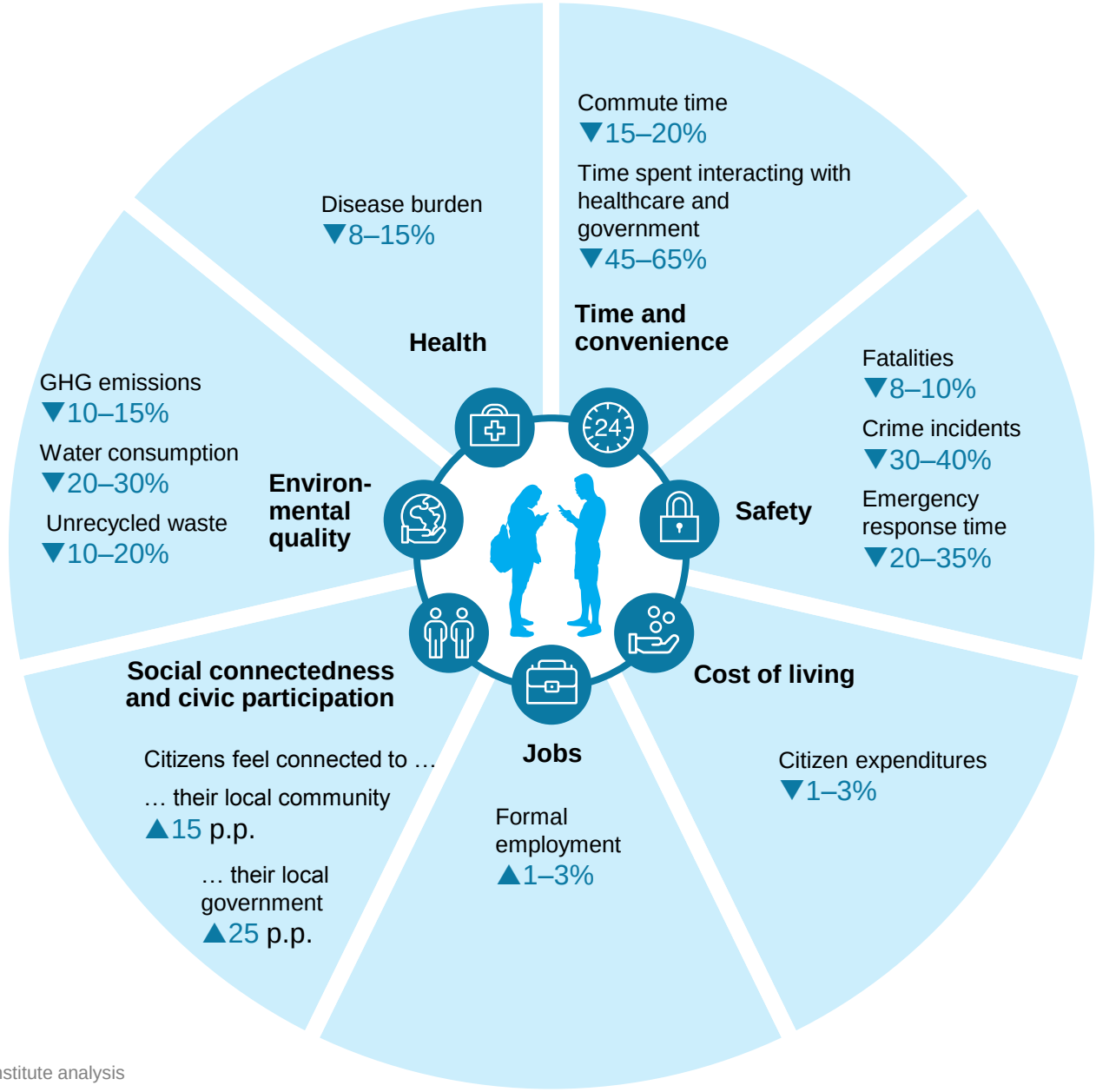


1 Includes sized applications only; includes consumer surplus

SOURCE: McKinsey Global Institute analysis

Smart city applications can improve key quality-of-life indicators by 10-30 %

Potential improvement through current generation of smart city applications

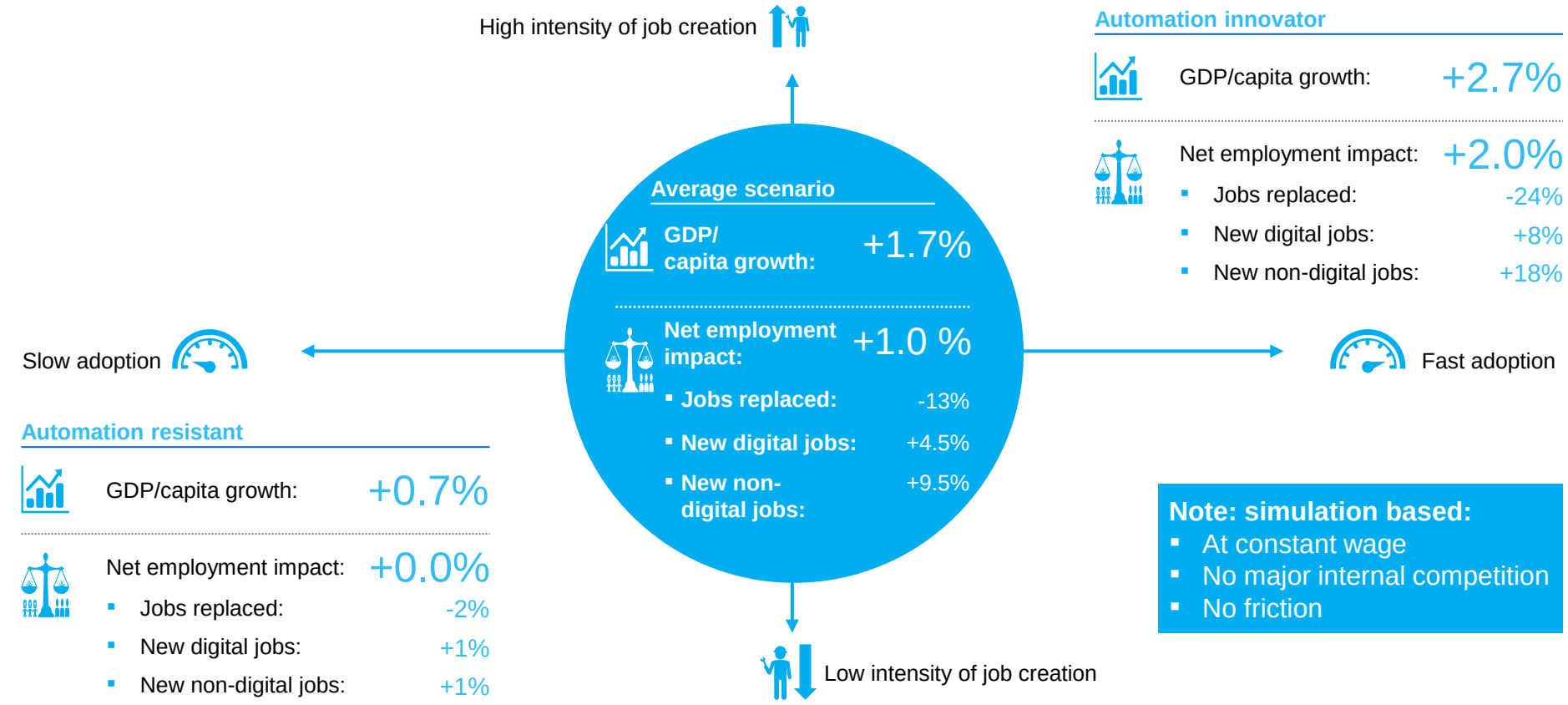


SOURCE: McKinsey Global Institute analysis

Automation has the potential to reinforce a major growth path within a resilient labor market

Estimated, 2016-2030

EXAMPLE

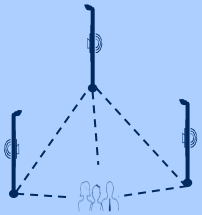


Note: simulation based:
- At constant wage
- No major internal competition
- No friction

SOURCE: Eurostat, McKinsey analysis

Benefits of common 5G network go beyond financial value creation

Small cell active



- **More efficient use of spectrum** with less overall spectrum assigned to operators (e.g., operators can share 150-200 MHz vs. splitting it)
- **Easier access to urban furniture,** negotiation with key stakeholders to access and “modify” urban furniture
- More efficient **EMF emissions management** due to joint operation and coordination
- **Potential for more extensive rollout** given savings generated

5G macro layer active

- **Better country-wide coverage** due to the possibility to cherry-picking the best towers / locations available
- **More efficient use of “reserved” capacity**, especially during the first years of 5G adoption

SOURCE: Past Network Sharing studies

Future winners will adapt their operations to smarter networks

From	To
Blanket coverage deployment of technology based on ROI at a regional level	**Granular planning** and deployment based on ROI at a micro-market level
Supply dimensioned to address aggregated demand based on **tech dimensions**	**Customer and site profitability** actively monitored and used for network dimensioning
Measuring network quality based on internal KPIs that **network is delivering**	Measuring network quality based on perceived **customer experience**
Customer data journeys measured on an average **static basis**	**Optimization of individual customer journeys** and perceived quality
Commercial success dependent on **size of CAPEX budget**	**TCO optimization** through commercial differentiation of network quality and capacity
Focus on infrastructure competition resulting in "**race to the bottom**"	**New model for industry structure** with higher degree of sharing and wholesale of infrastructure

Cliff Mason & Laura Iglesias

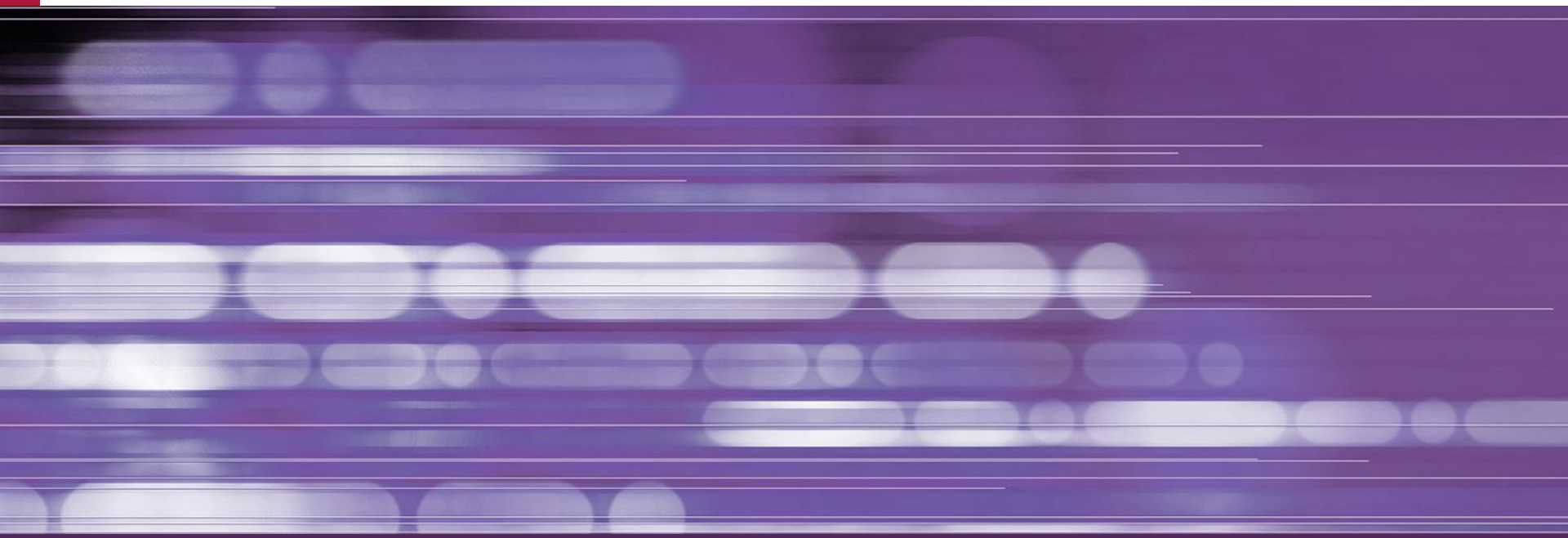
OFCOM

Ofcom
making communications work for everyone

Spectrum and 5G for the Channel Islands

Cliff Mason & Laura Mejuto Iglesias

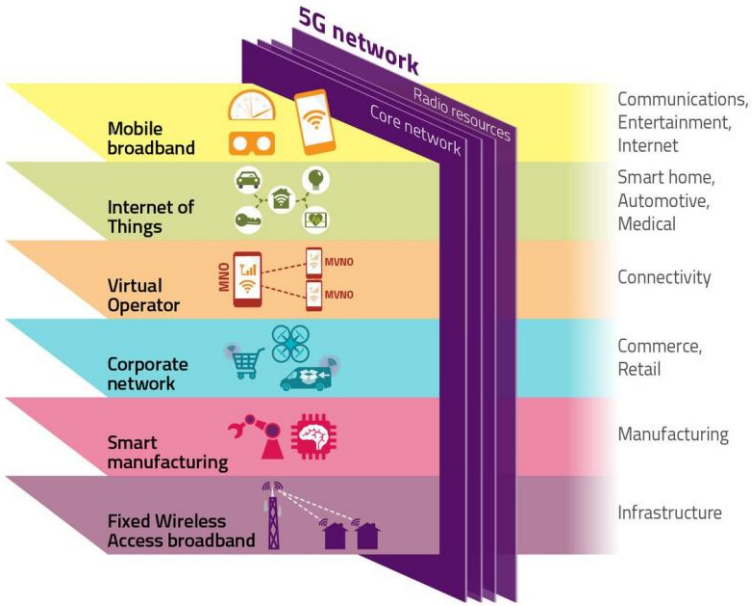
05 July 2018

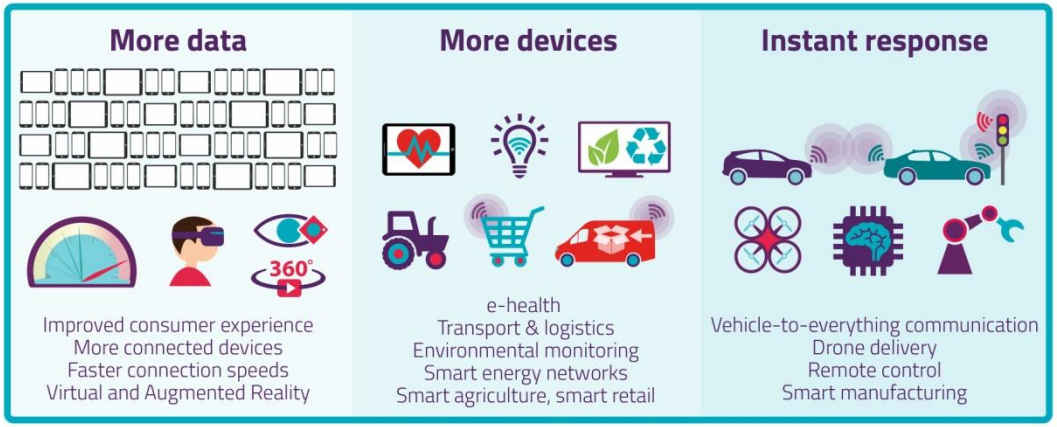


5G what is it and what could it offer

What is 5G?

5G is the next generation of mobile technology. It is expected to deliver faster and better mobile broadband, and to enable more revolutionary uses in sectors such as manufacturing, transport and healthcare.

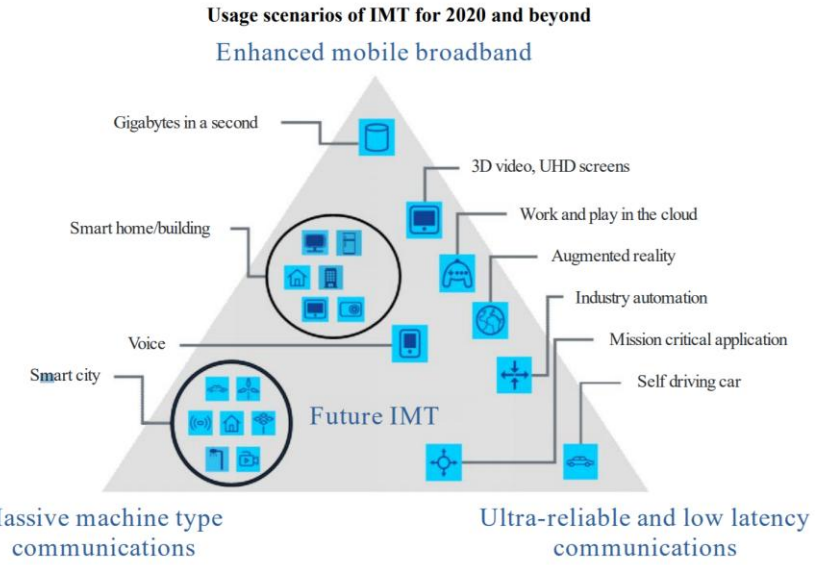


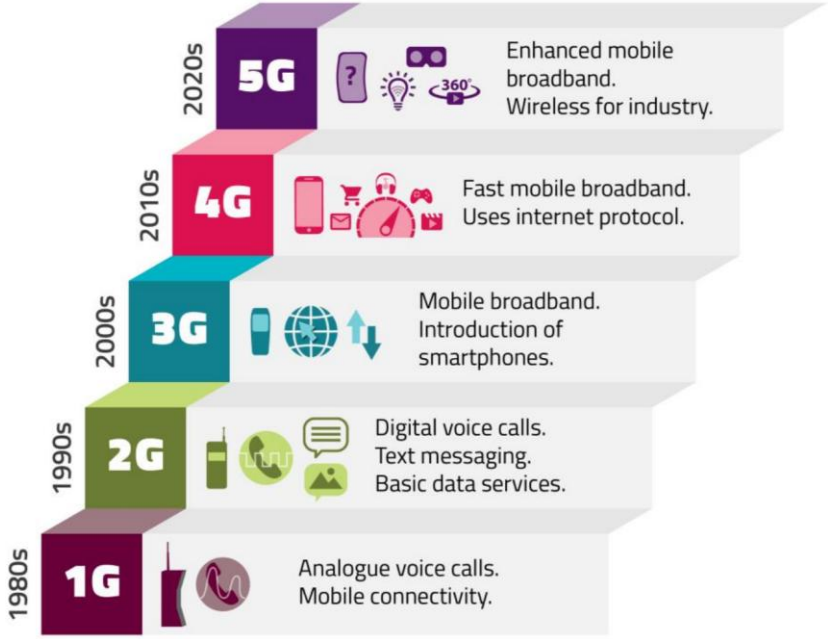


What is 5G?

5G presents a radically different view of mobile technology, as it is built upon enabling widely different services.

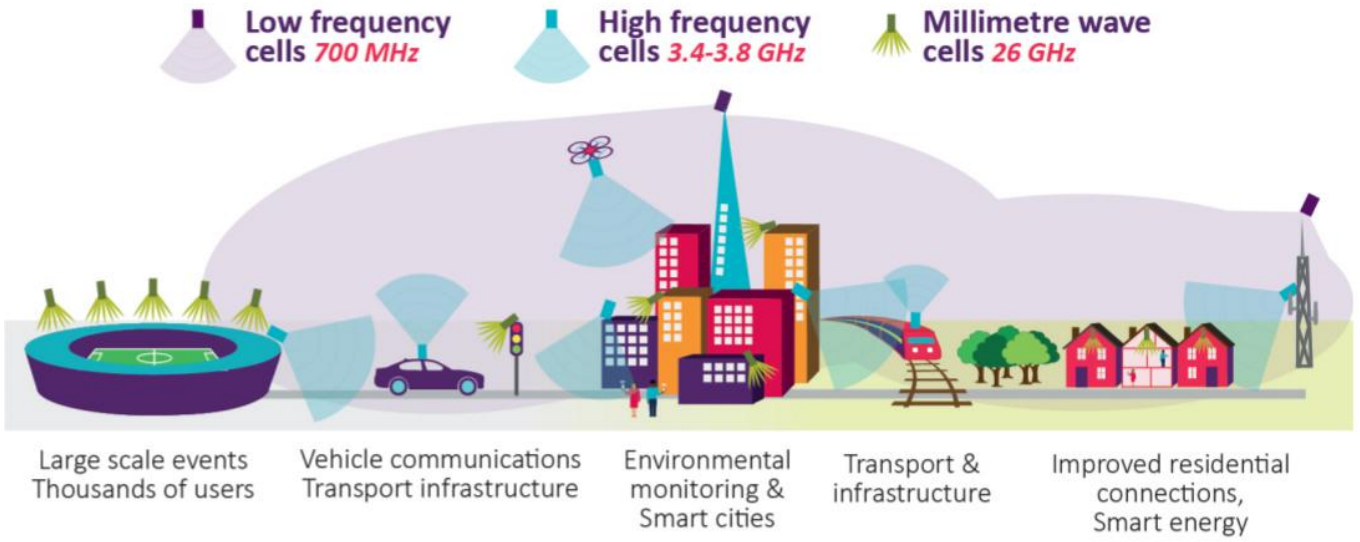
Until now, mobile technology has focused on delivering broadband, including other services as “add-ons”.





Spectrum needs of 5G

Different 5G uses will have different spectrum needs



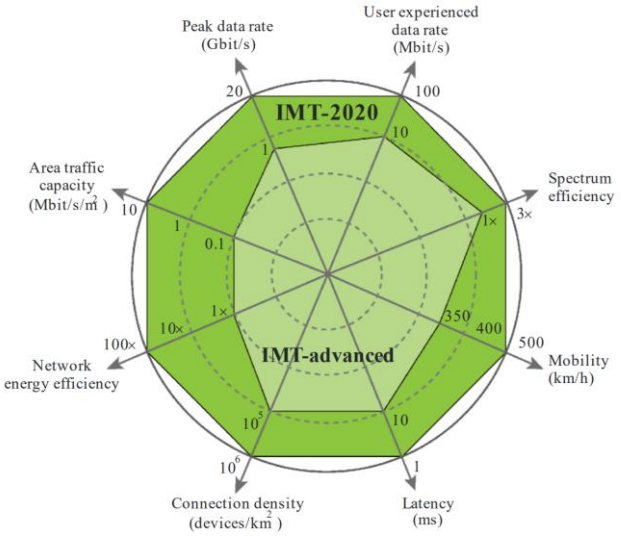
- **Low-frequency** spectrum to support improved coverage and user experience and M2M
- **Mid-frequency** spectrum to meet the increasing capacity demand for mobile services including 5G. The 3.4-3.8 GHz band has been identified as a primary band for 5G in Europe.
- **High-frequency** (mmWave) spectrum which, to date, has not been used to deliver mobile services, is likely to be used to support new 5G applications, in particular those that require high capacity and very low latency by both MNOs and other players.

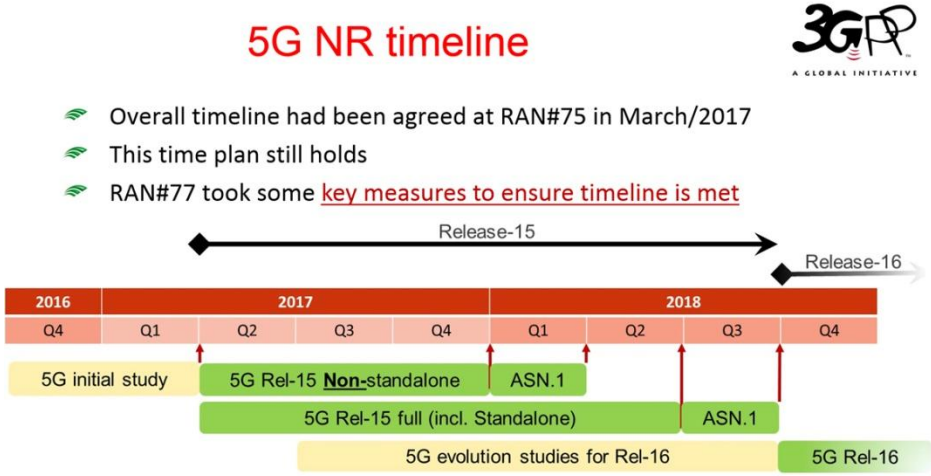
5G technical requirements and Standarization

The development of 5G remains in its early stages but is gaining momentum.

The initial phase of the first set of global 5G standards has been finalised, with further iterations likely later this year.

The first 5G-enabled handsets are likely to follow soon afterwards, probably becoming available from 2019. 5G is being developed with tests and pre-commercial trials underway all over the world.





Paths to 5G

3GPP Release 15 Non Standalone: Finalized in December 2017, contains the first set of 5G standards. The focus is on joining LTE and 5G (New Radio), so 4G (LTE) infrastructure can be used and therefore enabling the 5G early cases.

3GPP Release 15 Standalone: Finalized in June 2018, this group of Standards presents the first set of rules for “full 5G” networks and devices. A 4G CORE or RAN is no longer needed.

3GPP Release 16: Expected to be finalized in 2019, will contain enhancements for use cases included in Release 15 and rules for others not contemplated like URLLC.

5G progress to date

EE 5G in the UK

EE is the UK leader in 4G, so it's reasonable to expect strong performance from the network in our 5G future too.

But more than just expecting it, there's plenty of evidence that this will be the case, as EE has announced plans to launch 5G in around August 2019, which likely means it would have a 5G network before any rival.

And ahead of that, EE is working hard to develop and trial 5G tech, with a live 5G trial network planned to be launched in London's Tech City later in 2018. If that weren't enough, the network has also secured a decent amount of 5G-capable spectrum at Ofcom's recent auction.

Below you'll find full details of all this and more, along with information on what EE has planned beyond its 5G launch.

Vodafone UK first to test new 5G spectrum across a live network

12th April 2018

Vodafone UK's Jade Knight, Head of Network Deployment for the South, and Peter Rodriquez, Head of 5G Delivery, conducting the UK's first test of new 5G spectrum*

Vodafone UK today completed the first test of new 5G spectrum across an existing live network between Manchester and the company's headquarters in Newbury, Berkshire.

O2 The Blue / O2 to launch 5G test bed at The O2

Linkedin Facebook Twitter +

Published: 22/02/2018 | by O2

O2 to launch 5G test bed at The O2

Test network will be available for visitors to enjoy at least two years ahead of expected 5G rollout in Britain

O2 today unveiled plans to launch a 5G test bed at The O2 in North Greenwich later this year, bringing a 5G experience to the world's most popular entertainment venue. Installation of the network will begin in March, with visitors able to enjoy the technology from the second half of 2018. The move will see O2 leading the way in putting the next generation network technology into the hands of the British public.

The network will initially roll-out across select locations at The O2, including the exclusive O2 blueroom and the O2 store at the venue, with plans to extend coverage across the venue by the end of 2020. It will initially allow O2 customers to experience ground-breaking technology via a variety of customer demonstrations. Demonstrations being assessed for showcasing include virtual reality, augmented reality and live streaming.

What is Ofcom doing to enable 5G

Ofcom's UK work on 5G

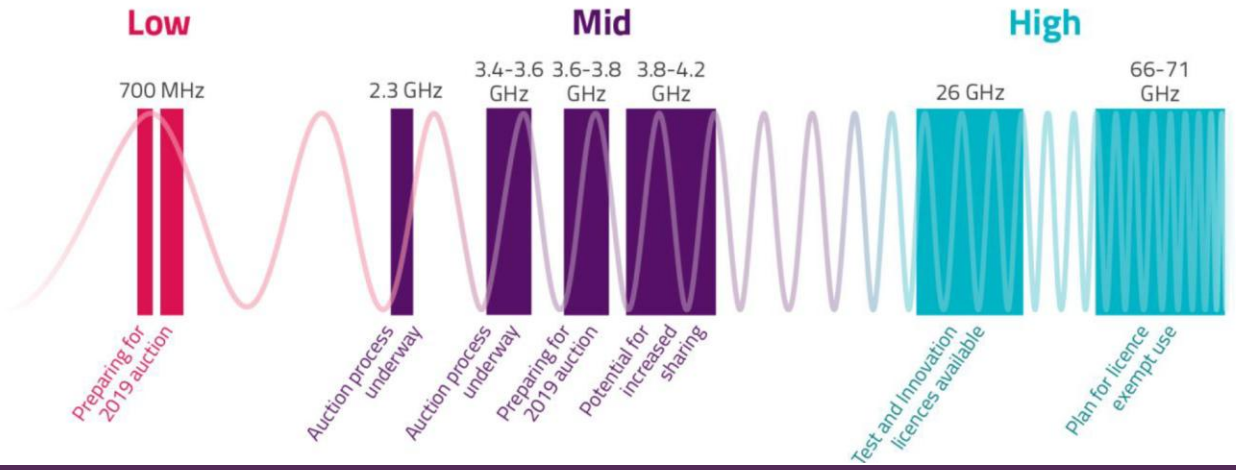
What has Ofcom done so far?

- In 2017 made available an additional 125 MHz spectrum for WiFi in the 5 GHz band.
- In April 2018 awarded the spectrum bands:
  - 2.3 GHz (2350 – 2390 MHz) and
  - 3.4 - 3.6 GHz (3410 – 3480 & 3500 – 3580 MHz) bands.
- 2018, have begun the process to award the 700 MHz and 3.6 – 3.8 GHz bands.
- March 2018 published a document: Enabling 5G in the UK in which we advised that we plan to:
  - release different types of spectrum bands for 5G as soon as practicable and encourage trials at 26 GHz (the 5G mmWave pioneer band).
  - further consider the possibility of increased sharing in the 3.8 - 4.2 GHz spectrum for innovative new uses, while taking into account existing users. The band may be suitable for broadband wireless systems and/or low power indoor industrial uses, such as connected factories and industrial Internet of Things.
- Refreshed our 'Innovation and Trials' licensing portal and documentation.

Ofcom's planned work on 5G

Making more spectrum available for 5G

- Currently consulting on allowing 5G devices to use the 66 - 71 GHz band on a licence-exempt basis. If it is decided to proceed, regulations should be in place by the end of the year.
- Next UK awards planned for the 700 MHz and 3.6 - 3.8 GHz bands in 2H/2019. Consultation on proposals for the award expected later this year.
- Investigating the possible options for further sharing in the 3.8 – 4.2 GHz band. Aiming to consult on proposal at the end of 2018.
- Leading international work on making the 26 GHz band available for 5G services.



Spectrum availability in the Channel Islands

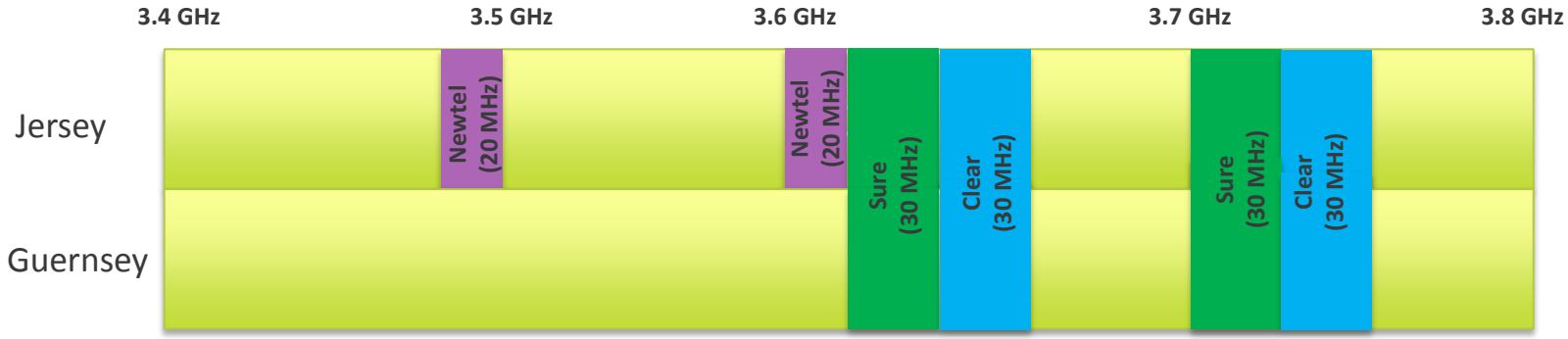
Spectrum availability in Channel Islands

Status of spectrum allocations in the Channel Islands

- Spectrum identified as pioneer for 5G services:
  - 700 MHz currently being cleared.
  - 2.3 GHz unallocated.
  - 3.4 – 3.8 GHz partially allocated.
  - 3.8 – 4.2 GHz (sharing?).
  - 26 GHz technical work ongoing.
  - 66 – 71 GHz – Statement on (UK) consultation due for publication shortly. Islands will be advised on the outcome and invited for inclusion in any measures adopted.

Issues to consider

1. Current allocation of spectrum in the 3.4 – 3.8 GHz band



Channel Island Allocations

Frequency Downlink	Uplink	J	G	Bandwidth MHz	Jersey JT (J)	Airtel (J)	Sure (J)	Marathon	Newtel	Clear (J)	Bandwidth MHz	Guernsey JT (G)	Airtel (G)	Sure (G)	Clear(G)
3.480 - 3.500	3.580 - 3.600			2 x 20					Newtel (J)		2 x 20				
3.600 - 3.630	3.700 - 3.730			2 x 30			Sure(J)				2 x 30			Sure(G)	
3.630 - 3.660	3.730 - 3.760			2 x 30						Clear (J)	2 x 30				Clear (G)
3.660 - 3.700	3.760 - 3.800			2 x 40							2 x 40				

2. 700 MHz
   - currently undergoing clearance of terrestrial TV
   - timescales for licensing in the islands
   - Discussion with Ofcom (broadcasting/award team) about interference mitigation measures and how to address the islands' requirements

Access to spectrum for innovation, testing and trials

Innovation and trial licensing

- In order to support 5G research and development Ofcom provides access to spectrum via Innovation and Trials licences, these allow:
  - Access to any frequency band (subject to coordination and availability).
  - Quick, inexpensive access to radio spectrum for wireless tests, with licences costing from £50.
  - The ability to run trial scenarios involving consumers, to help build an understanding of how 5G services could be used.
- The licences cover activities such as:
  - the development of innovative wireless telegraphy (radio) equipment;
  - Scientific / academic research and experimentation; and
  - trials and test demonstrations of radio apparatus, applications and technologies.
- However, they do not allow the deployment of commercial or operational networks or systems and are not appropriate for applicants seeking to acquire a licence for long term access.

What licences are available?

Two types of non-operational, non-commercial licences are available on the terms of:

- Non-protected / non-interference with regard to other authorised spectrum users.
- Covers the use of non-RED approved equipment.
- No guarantee of access to the spectrum after the licence period has ended, whether for continuation of testing/ research work or for operational use.

Innovation and Research Licence

- For the development / research of innovative spectrum systems, applications or services.
- May involve collaboration with third party companies but not the provision of services to third party end users.
- Time-limited duration up to 12* months
- Licence fee: £50 for each location.

Demonstration and Trial Licence

- To test, trial or demonstrate a new system, application or service (that does not fit within current licence categories).
- Third party trial users may be permitted but must be made aware of the limits of the authorisation under this licence.
- Time-limited duration up to 6* months
- Licence fee: £50 per month for each location.

* Available period of licensing may be shorter, depending on the spectrum requested and the requirements of incumbent authorised users

How do I apply or get more information?

Come and speak to Ofcom

- Innovation and trial licence may not be needed if:
  - using certain frequencies under 960 MHz and transmissions are carried out under suppressed radiation conditions;
  - equipment complies with the conditions of our licence exemption regulations; or
  - the equipment fully complies with the conditions in your existing licence.
- For more information visit Ofcom's Innovation Licensing Portal where further guidance and application forms can be found.
- If you have any questions you can email the team at innovation.licensing@Ofcom.org.uk
- As stated these licences are granted for use on a non-operational non-commercial basis. For those companies interesting in potentially rolling out a commercial / operational subsequently, we advise early discussion with CICRA regarding competition, telecommunications & licensing issues.

Thank you.

Questions?

- Cliff Mason cliff.mason@ofcom.org.uk
- Laura Mejuto Iglesias laura.Iglesias@ofcom.org.uk

- Reference Information: Mobile and wireless broadband

Stephanie Peat

DIRECTOR OF DIGITAL AND TELECOMS POLICY

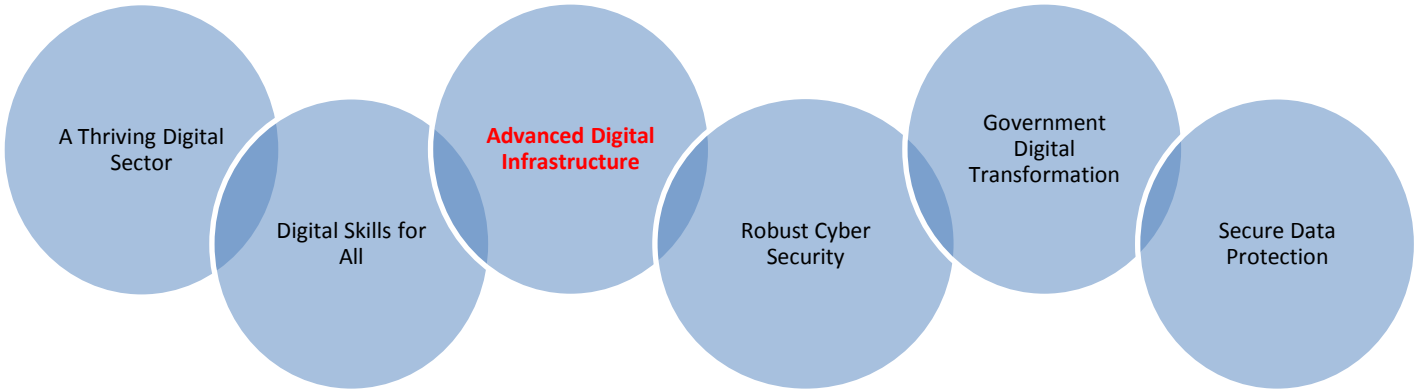
States of Jersey

5G Pre-Summit Meeting

Stephanie Peat
Director of Digital and Telecoms Policy

5th July 2018

Jersey's Digital Policy Framework sets out high-level policy objectives



http://digitalpolicy.gov.je/

Including the need to maintain an ‘Advanced Digital Infrastructure’ …

Support projects that improve the digital infrastructure

Encourage affordable services with appropriate choice for homes and businesses

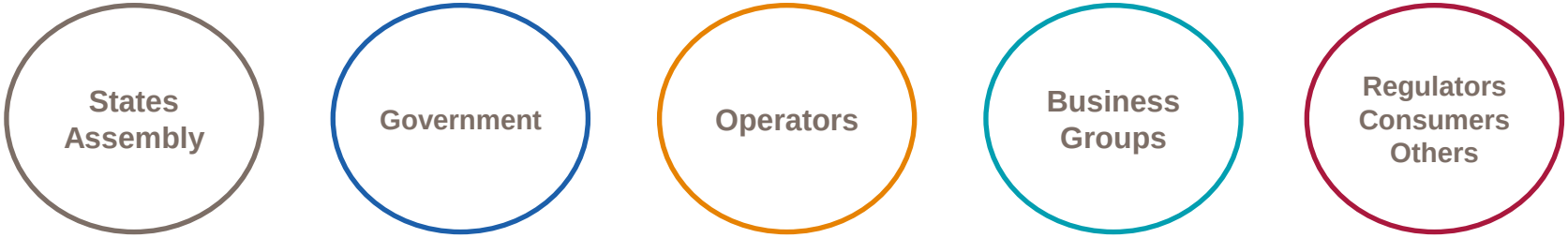
Maintain resilience and capacity of Jersey’s digital infrastructure

Promote innovation in the delivery of next-generation networks and services

…and for an overarching Telecoms Strategy for Jersey

- Consistent with wider policy aims
- Support the development of an advanced digital infrastructure
- Bolster businesses in all sectors that rely on connectivity & enable productivity led growth
- Deliver consumer and citizen benefits from connectivity
- Encourage affordable services with appropriate choice for homes and businesses
- Promote innovation in and remove any necessary barriers to delivery of next generation networks and services
- Maintain a level of resilience and capacity

Developed with key stakeholders



- States Members
- Economic Affairs Scrutiny Panel (EASP)

- Chief Minister's Dept.
- Treasury & Resources Dept.
- eGov
- Comm. & Const. Affairs Dept.
- Environment Dept.
- Infrastructure Dept.
- Social Security Dept.
- Locate Jersey

- Jersey Telecom
- Sure
- Airtel
- NewTel

- Digital Jersey and its members
- Chamber of Commerce
- Institute of Directors
- Jersey Finance
- Jersey Business

- Trading Standards
- Consumer Council
- Citizens Advice
- CICRA (and its Chairman)
- Ports of Jersey

The Strategy sets out five principles

- **Promote the path to next generation connectivity** building on the current advanced digital infrastructure already in place
- **Promote retail competition** (not network competition) as the most effective way of delivering the benefits of next generation connectivity to consumers and businesses
- **Set out clearly any universal service obligations** and deliver social policies from the telecoms sector only when it is efficient to do so and the cost/funding are transparent
- **Ensure resilience of off-island connectivity**
- **Measure outcomes** using appropriate key performance indicators (KPI's) developed in consultation with the industry

…and guides our approach to the next generation of connectivity

- Be a fast adopter of next generation technologies
- Maximise the advantage of the Gigabit rollout
- Adopt policies to incentivise mobile network sharing and rollout of mobile next generation technologies across relevant Government departments and CICRA
- Continue spectrum management via Ofcom, with CICRA ensuring better coordination and communication with Ofcom
- Coordinate with the UK, Guernsey and other European jurisdictions on using new technologies to deliver specialised services (e.g. TETRA)

What does this mean for our approach to 5G?

Government and the regulator should consider the following levers to incentivise mobile network sharing & the roll out of 5G:

- Ensure through regulation:
  - efficient and effective access to spectrum; and
  - access to high-capacity Gigabit fibre backhaul
- Reduce any barriers that prevent building new mobile sites & ensure that planning process is efficient & timely
- Work with Ofcom to release spectrum in a timely manner
- Introduce spectrum innovation licences in Jersey
- Encourage network sharing through spectrum award rules, planning rules and modernising telecoms licences
- Ensure the cost of accessing buildings, infrastructure and land for telecoms network deployment is not a barrier

Next Steps

This strategy will be implemented by central coordination from the Chief Minister's Department, working closely with other Departments, the regulator and operators.

Using the strategy recommendations, Government will focus on four key objectives:

- Promoting the rollout of next-generation networks in Jersey
- Maximising the benefits of the fibre network
- Keeping the Island safe from threats to its connectivity
- Maintaining transparent and clear policy and regulation

States of Jersey

Thank you

Questions

CUSTOMER FOCUS

CONSTANTLY IMPROVING

WE DELIVER

BETTER TOGETHER

ALWAYS RESPECTFUL

Coffee Break

Colin Vaudin

GOVERNMENT CHIEF INFORMATION OFFICER
STATES OF GUERNSEY

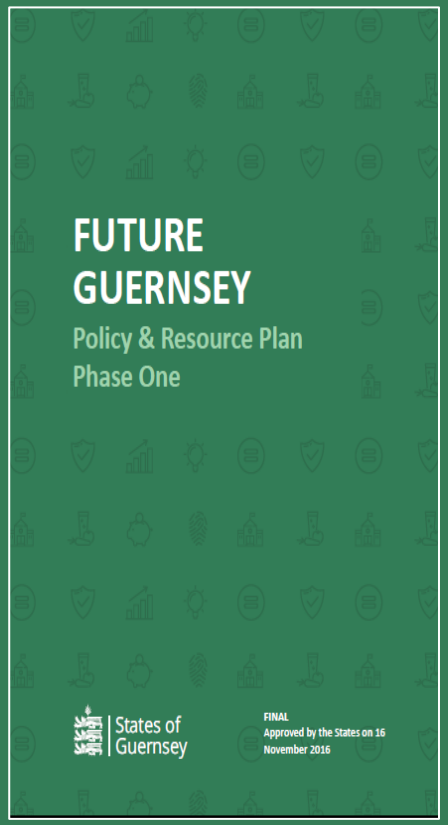
5G Conference

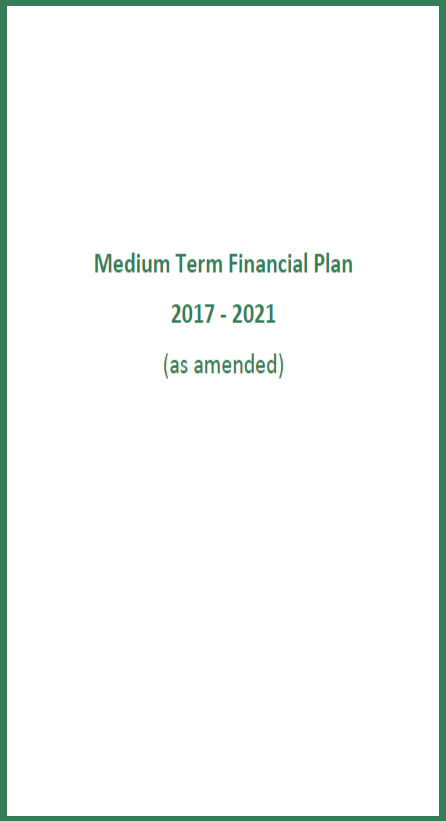
Colin Vaudin – SoG CIO

States of Guernsey

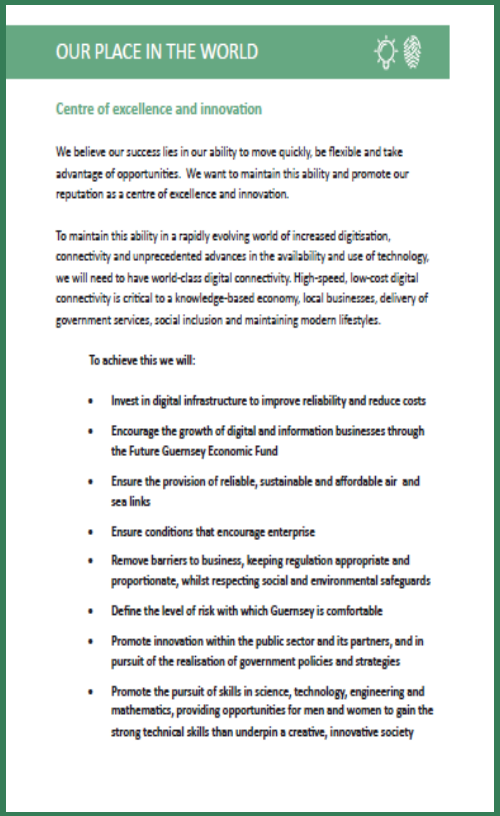
5th July 2018

Key Policy Documents





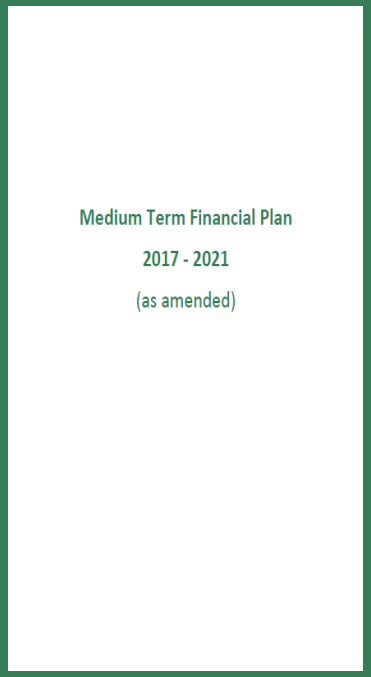
Policy and Resources Plan



Policy and Resources Plan
Approved by the States on 16 November 2017

States of Guernsey

Medium Term Financial Plan


Medium Term Financial Plan

2017 - 2021

(as amended)

Table 27: Portfolio Projects in the Grow Category

GROW CATEGORY		
Small	1	Cyber Information
Medium	2	Castle Cornet Refurbishment
Large	3	Digital Infrastructure
	4	Strategic Air and Sea Links Infrastructure (Pipeline)
	5	St Peter Port Harbour Action Area Development (Pipeline)

MTFP

Approved by the States on 16 November 2017 as part of the Budget Debate

States of Guernsey

Future of Telecoms

Published 19
June 2018

- Published by Committee for Economic Development
- Consultants – RedSky
  - Ian Campbell – Ex CEO Airtel Vodafone
  - David Fowler – Ex CTO SURE
- Consulted with:
  - SURE, JT, Airtel Vodafone
  - CICRA
  - OFCOM
  - SoG CIO, CfED, CfHSC, CfESC, CfHA, Planning and Development Authority
  - IoD and CoC
- Supporting Documentation
  - Analysis Mason Review 2016
  - CfED Digital Sector Strategic Framework

States of Guernsey

Future of Telecoms

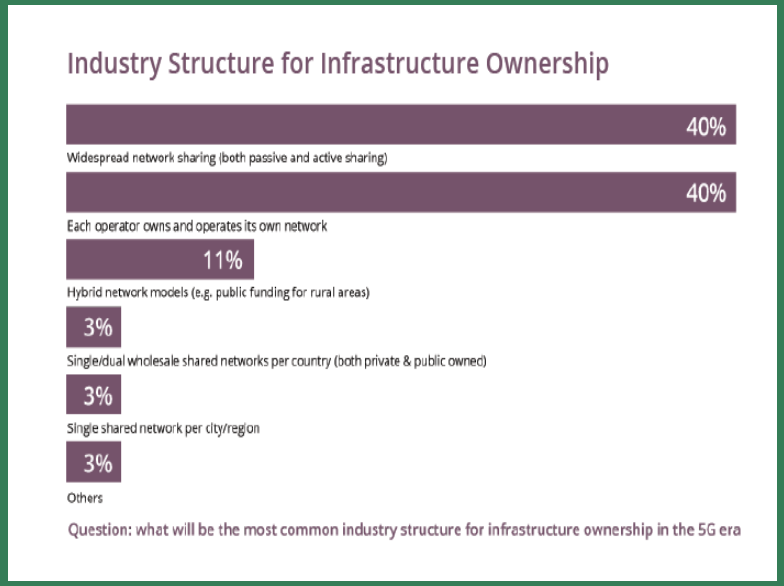
Published 19
June 2018

States of
Guernsey

The key recommendations in this Telecommunications Sector Policy Statement are:

1. The current competitive telecommunications market will deliver fibre to all business districts with 2-3 years and no Government intervention is required.
2. The current competitive telecommunications market is likely to deliver up to 100Mbps high quality superfast broadband to around 85% of the population with 2-3 years. Government support will be required to roll-out superfast broadband to the remaining 15%.
3. CICRA will develop the regulations to enable Government direct support where the commercial business case is uneconomic, and the telecommunications companies have made all reasonable steps to meet the 85%.
4. Government will support a 5G testbed and will, subject to business cases from telecommunications companies, work with CICRA to release spectrum on a temporary basis for 5G testing.
5. Next generation mobile will challenge the traditional investment models and Government will work with CICRA and the Telecommunications companies to develop the most effective network sharing architecture.
6. Government will develop a range of support for the early development of the most effective 5G networks sharing model through a range of measures from planning policy, availability of spectrum through to commercial use of States assets and capital investment.

Future of Telecoms – 5G



Published 19 June 2018

States of Guernsey

Future of Telecoms – 5G

1 5G Network

A single, resilient 5G network that provides boundless connectivity can meet the needs of the Island. A far greater level of network sharing, a new single 5G network or a RAN sharing would meet this requirement. Government will support the regulator in developing the model for the delivery of the most cost effective 5G network that builds competition at all levels, not just the network level, to the advantage of the consumer. CICRA will advise on what legislative and regulatory action is required.

2 5G Backhaul

CICRA to consider the regulation of the interconnect cost of fibre backhaul to 5G sites as sites and backhaul transmission are shared. In this way no operator can enjoy a commercial advantage when it comes to rolling out 5G to areas where fibre is scarce.

3 5G Spectrum

Spectrum to enable 4G was free. The States of Guernsey and CICRA to consider the availability and cost of spectrum with the obligation to develop the most effective 5G network and to ensure sufficient spectrum is available.

4 Planning Policy

Planning policy will be used to encourage the rapid rollout and densification of the 5G network in support of the delivery of the most effective shared 5G network in accordance with the States environmental and planning

5 SoG Infrastructure and Funding

The States of Guernsey may wish to take a role in the commercial aspects of the future 5G network. The States of Guernsey, primarily through its trading entities, owns a range of transmitter sites, street furniture, buildings, underground ducts and off-island cables. In addition to direct funding, as identified in the Medium Term Financial Plan, these physical assets may be made available at

Published 19 June 2018

States of Guernsey

Questions

Colin Vaudin – SoG CIO

States of Guernsey

5th July 2018

JT
JOIN TOGETHER

Daragh McDermott

DIRECTOR CORPORATE AFFAIRS

The path to 5G in the Channel Islands: JT perspective

5th July 2018

5G – key points

- The move from 3G to 4G resolved a significant demand from customers in terms of coverage and data speeds. As of today, such a new demand does not yet exist.
- 4G will continue to be developed and deployed by JT to support data growth.
- The market predictions of significant future volumes of data comes mainly from Connected Cars. It is not yet clear whether Connected Cars will require such a service or how this would pay for a significant build of mobile infrastructure.
- Mobile Operators are likely to take a phased approach using existing sites, with minimal environmental impact.
- 5G is not seen as being viable to provide fixed broadband services.

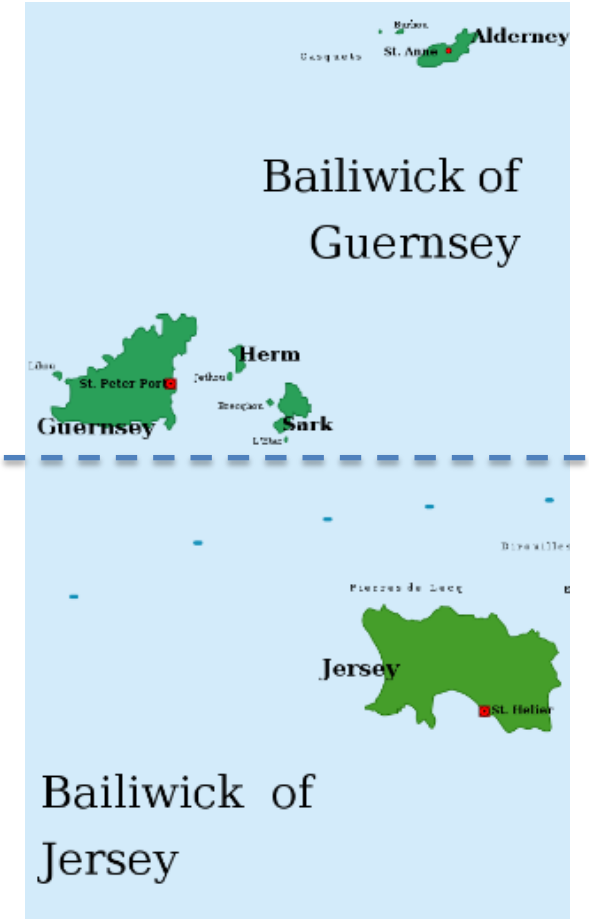
Expected timelines for JT mobile network deployment

- Deployment of all fibre infrastructure to support existing and possible future cell sites- essential to support 5G: Completed in Jersey

- Deployment of 4.5G (including 256 QAM and 4x4 MIMO): Now available in St Helier

- 5G expected to be rolled out in three phases:
    1. 700MHz on existing Macro sites - viewed as straightforward and with no environmental impact, most installed antennas already support 700MHz. This will provide 5G coverage across most of the Channel Islands.
    2. Massive MIMO antennas using 3.5GHz deployed on selected urban areas to provide additional traffic capacity, as required.
    3. Microcell network in urban areas using >6GHz, but only if supported by business Case / traffic volumes.

CICRA role per telecom policies / statutory obligations



1) Run process to satisfy Ofcom spectrum award obligations / Gsy legal requirements
2) Confirm with SoG the extent of minimum rollout obligations (if any)
3) Provision of test licences
4) Biannual site surveys

1) Run process to satisfy Ofcom spectrum award obligations / Jsy legal requirements
2) Confirm with SoJ the extent of minimum rollout obligations (if any)
3) Provision of test licences
4) Biannual site surveys

CICRA .GG .JE

Siddharth Ahlawat

CEO

Contents

- Why 5G?
- What will 5G bring?
- 5G use cases
- Spectrum and standards
- Channel Island challenges
- Questions

Our Partners –

Tried, Tested and Trusted

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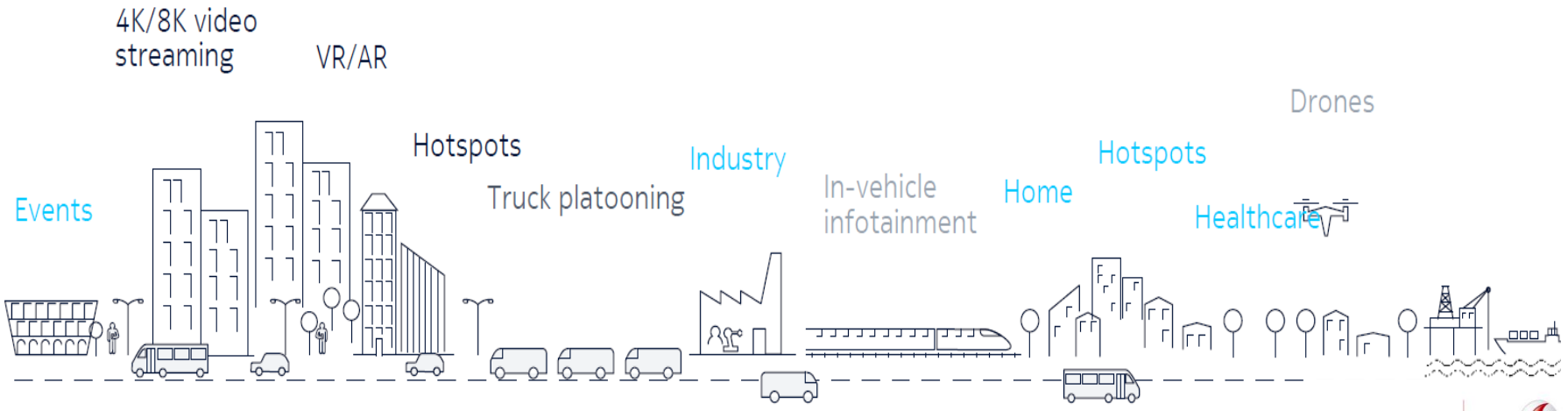
Why 5G?

Consumption - Mobile data consumption x 45 growth (2014 -2020)

ARPU - Stagnating in mature markets

Connectivity – 5O Billion things connected to Internet by 2025

The aim of 5G is to create a more 'hyper connected' society by more comprehensively, and intelligently, integrating LTE , Wi-Fi and cellular IoT technologies, together with at least one new 5G radio interface - source GSMA Nov-2016

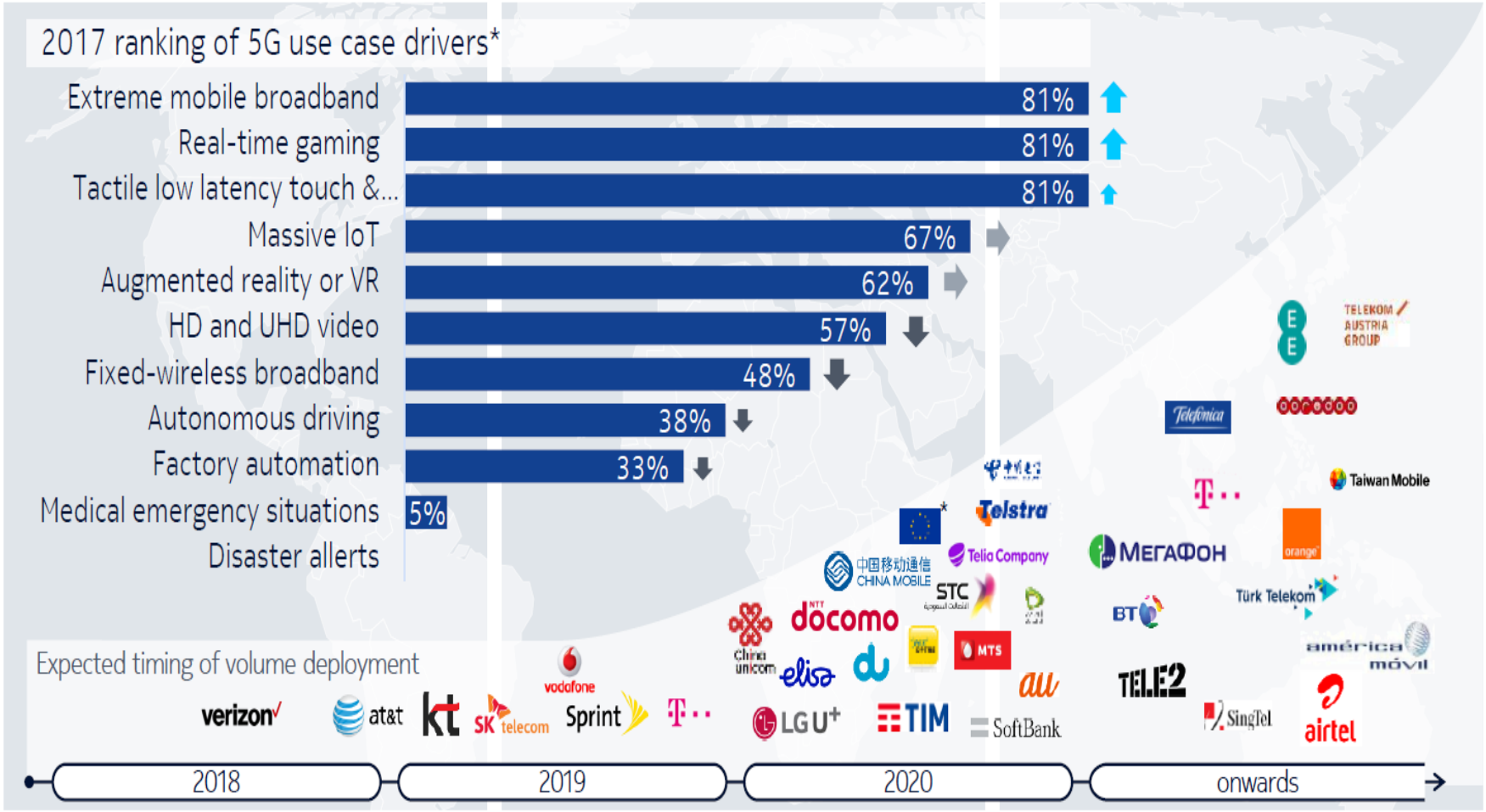


Nokia 2018,

What will 5G bring?

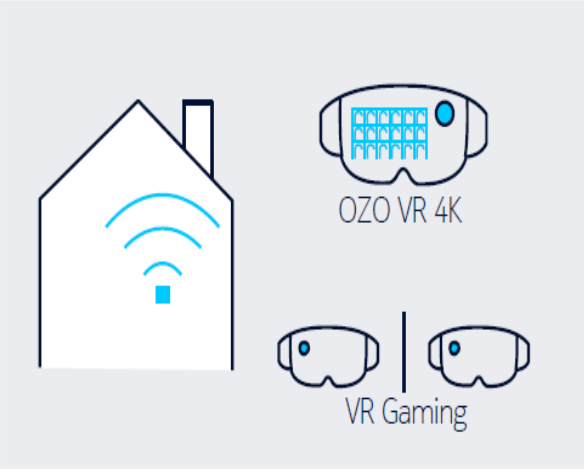
- **Enhanced mobile broadband** – Fibre speeds without cables >1Gbps
  - HD video, virtual reality
  - AR on the go – Enterprise and Consumer
  - Gaming
- **Mission critical services** – ultra reliable low latency connection
  - Order fulfilment in warehouses, wireless production lines
- **Massive IoT communication – NB IoT**
  - E-health
  - Transport and logistics
  - Smart City

Use case driver perception



*) Source: IHS 5G Strategies Global Service provider Survey 2017; n=21; % of ranking important/very important

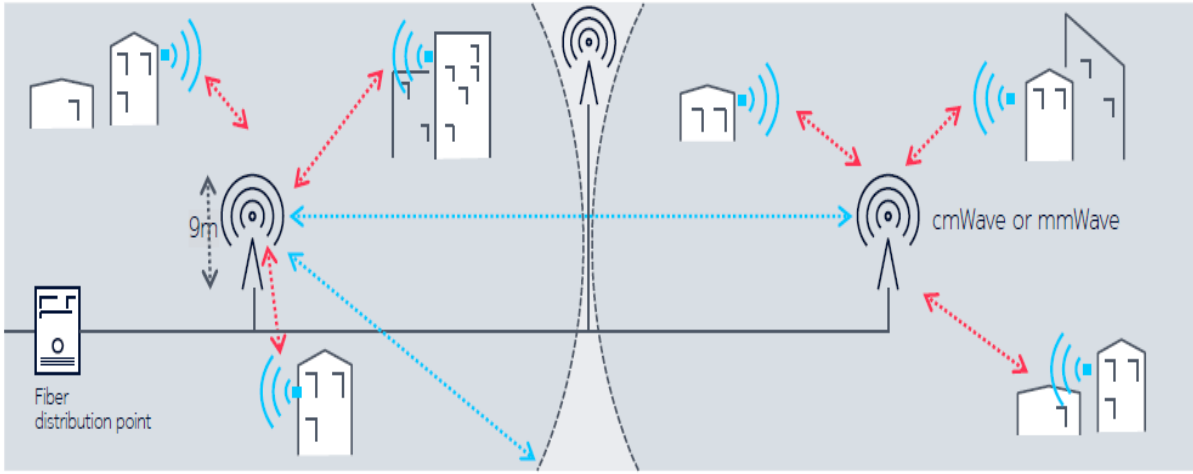
5G home experience – Fibre speeds without cables



Fiber like speeds
to multiple 10s of houses from single BTS

<5ms latency
to avoid motion sickness for VR services

5G Advantage



Accelerate Gbps roll out
compared to FTTP/GPON

Overcome uncertainty
of FTTH adoption impact

Infrastructure build up
to mobile 5G is minimized

Benefits

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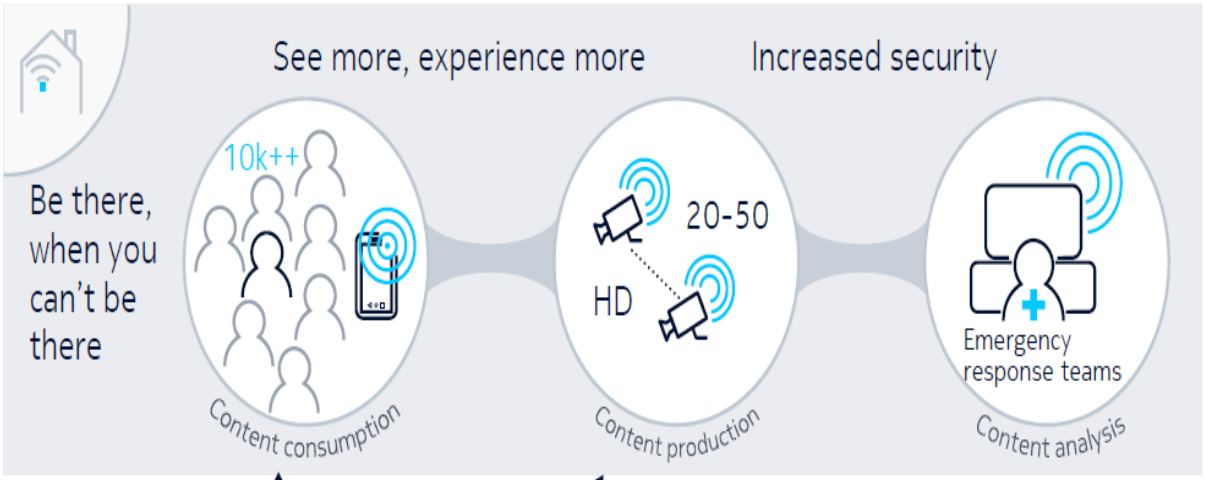
5G event experience - get closer to the action

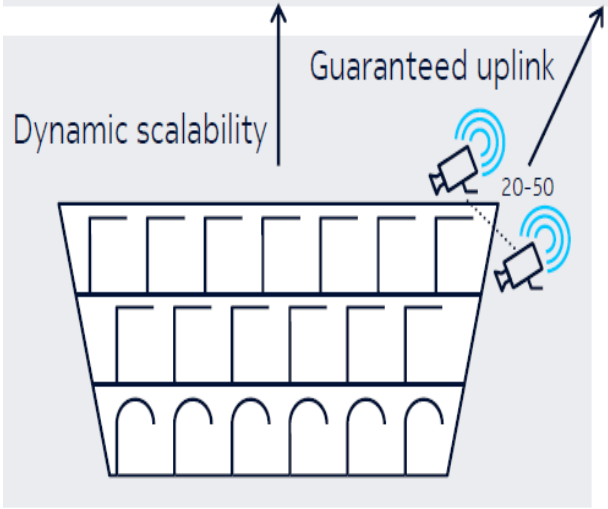


5G Advantage

20 x lower delivery cost
of HD multi-feed video

40 x more capacity
in a stadium

30% take-rate
compared to 2% by 4.5G



Benefits

Ticket upsell
with video and VR services

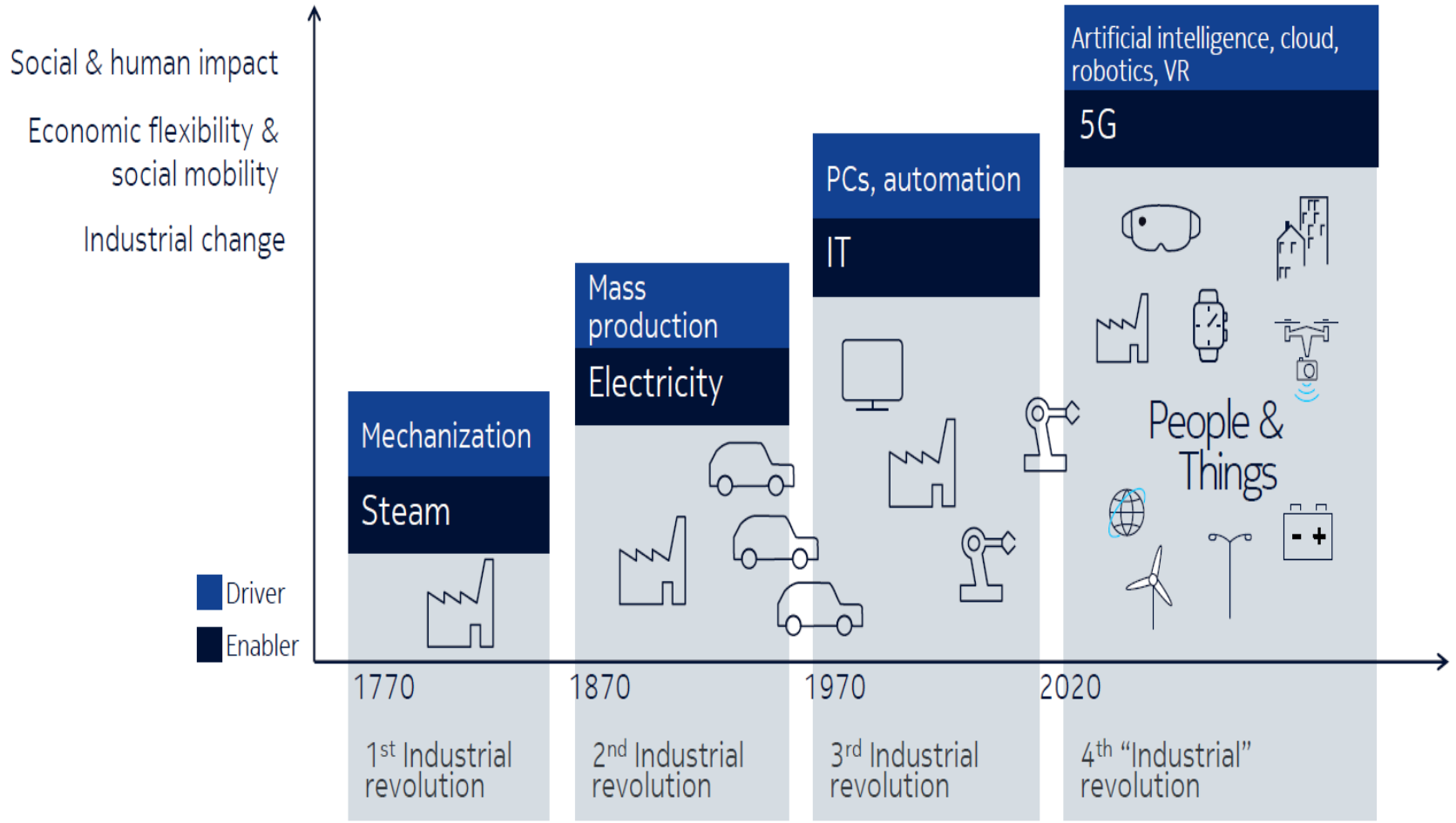
Strategic positioning amongst sport enthusiasts

VR/AR devices channel

Focused advertisement

$8M

4th industrial revolution powered by 5G



Channel Island use cases

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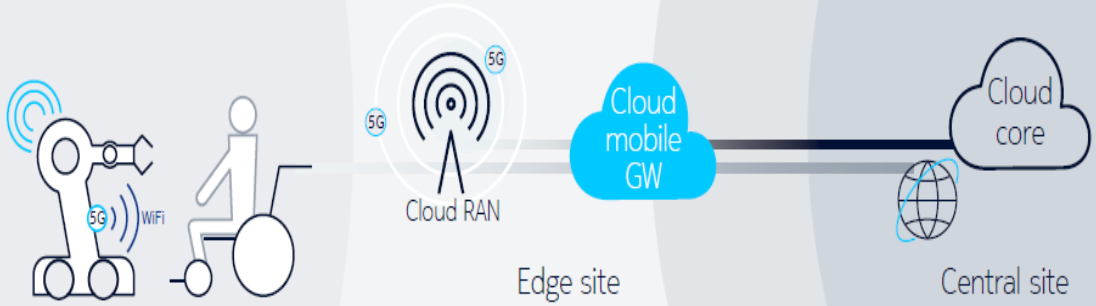
5G for connected healthcare

Remote care
Immediate situational robot control



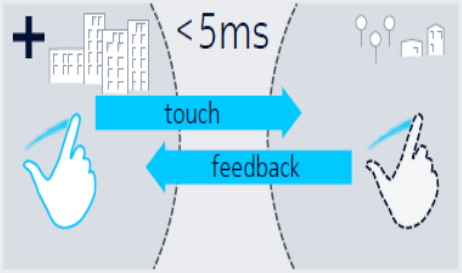
Direct haptic feedback
<5ms;

Haptics & vision in sync
99.999% reliability

Situational robot control
AI* at edge computing centers for self-moving care robots

5G Advantage

Remote examination and surgery
Immediate sensory feedback



Same sense of touch

Haptics & vision in sync

Reduced care costs
while improving quality of life

Remote surgery, a niche but high margin business

Remote care meets aging population trend

Benefits

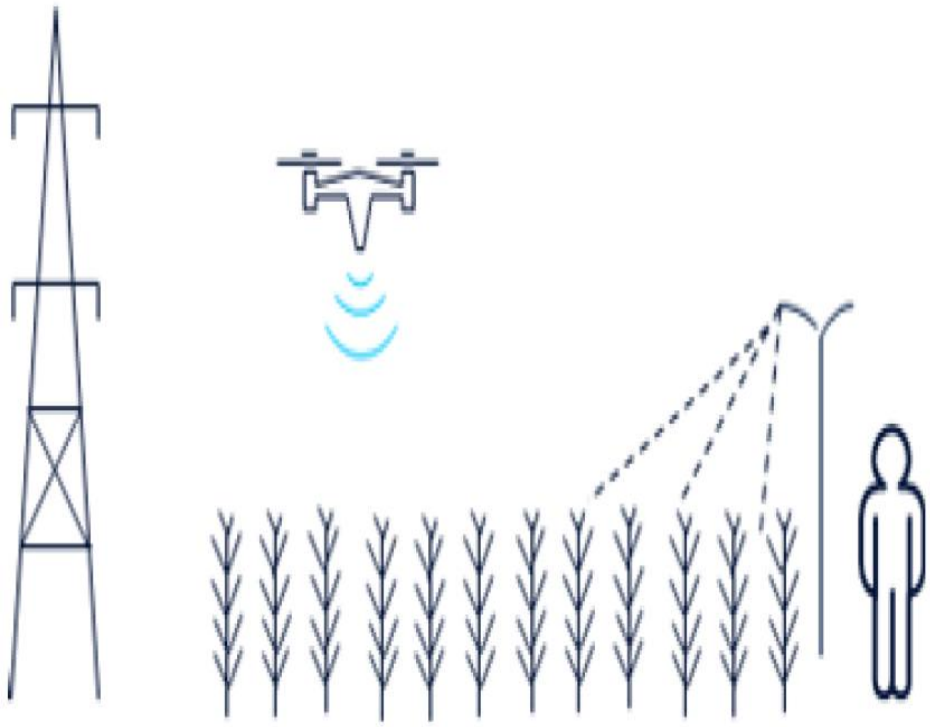
Smart crop management – Lab to Land

Smart irrigation, pesticide control , proactive info sharing framework on crops and weather

Drones instead of traditional crop sensors

It will help to:

- Reduce risk of over and under fertilization
- Reduce spraying by avoiding overlap
- Deliver water and nutrients precisely



Additional use cases

Financial services	Secure communications, FinTech: blockchain. Mobile trading, video conferencing
Utilities	Smart energy management, remote operations, hazard and maintenance sensing, real-time automation
Education & Entertainment	Guaranteed video broadcasting, AR on the go, AR gaming. Smart classrooms and smart labs
Building & Integrated Transport	Centralised building controls, traffic assist using street sensors, drone delivery, smart parking, smart waste
Automotive	Platooning, remote vehicle steering, adaptive cruise control

Spectrum and Standards

5G Myths v Reality

Myths

- 5G mainly for speed and capacity
- 5G will replace 4G
- 5G = Radio evolution
- 5G commercial a long way

Reality

- New applications drive 5G, low cost and energy for sensors, low latency for critical control
- 5G is about integration – LTE will evolve
- Programmable, software driven and holistically managed network architecture
- Standardization started end 2015
  Pre-standardization trials 2018 onwards
  Commercial networks 2019 – mass from 2020

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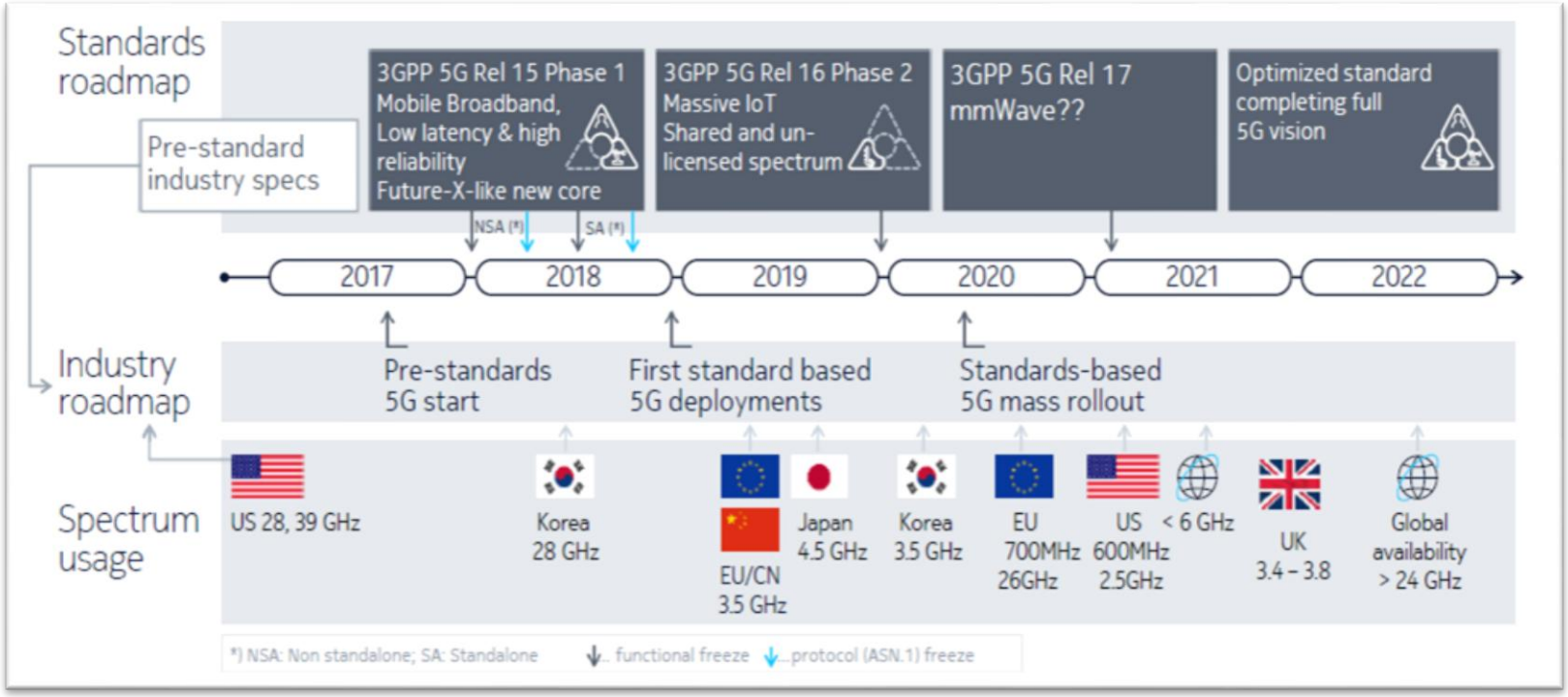
Spectrum and Standardization

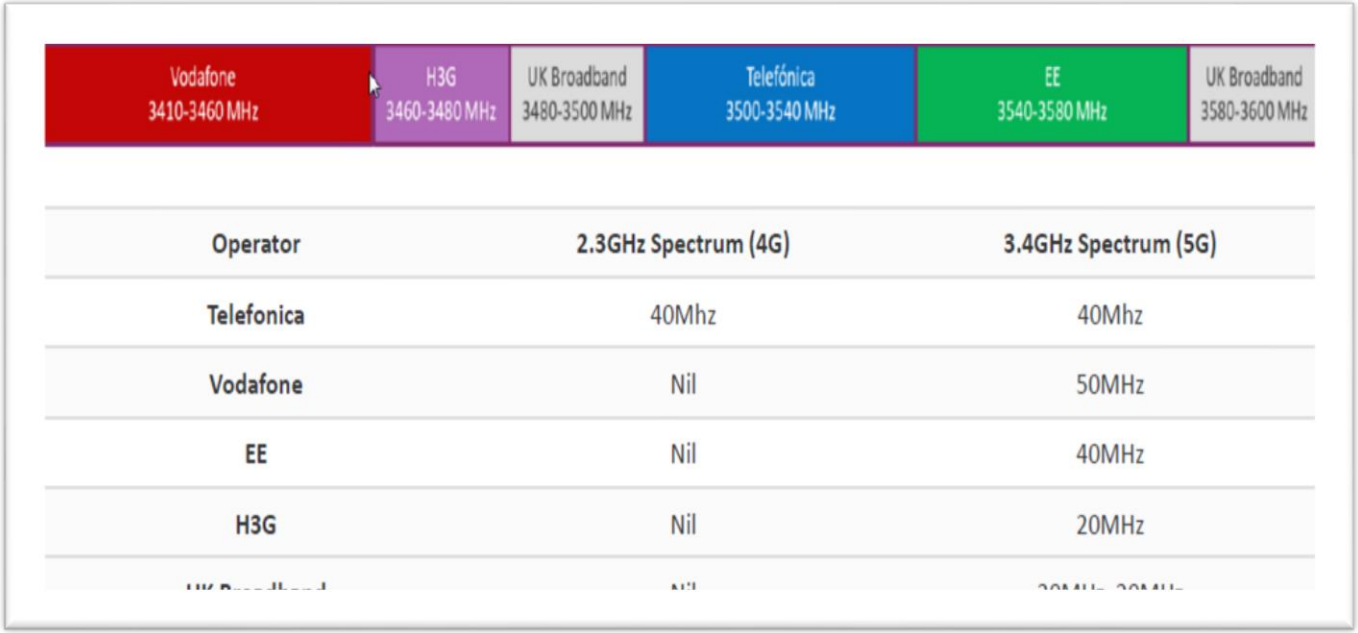
5G needs spectrum within three key frequency ranges to deliver widespread coverage and support all use cases:

Sub-1 GHz, 1-6 GHz and above 6 GHz.



Spectrum above 6 GHz (>24GHz) is needed for ultrahigh speed mobile broadband. Without this, 5G won't be able to deliver significantly faster data speeds or support projected extensive mobile traffic growth – source GSMA Nov-2016

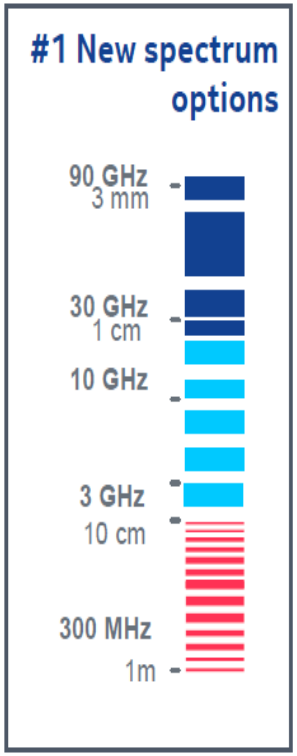
UK 5G spectrum (so far)

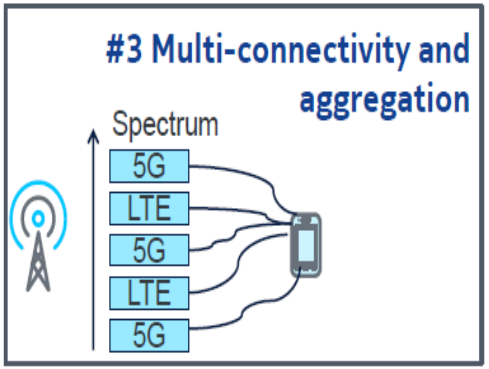


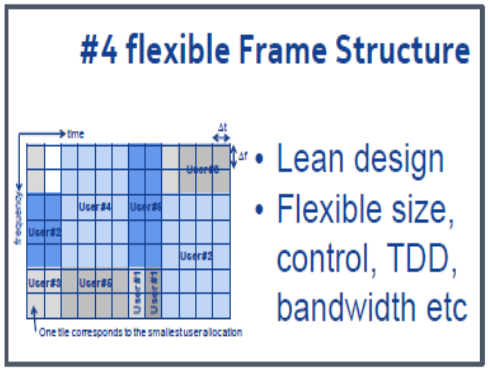
Operator	2.3GHz Spectrum (4G)	3.4GHz Spectrum (5G)
Telefonica	40Mhz	40Mhz
Vodafone	Nil	50MHz
EE	Nil	40MHz
H3G	Nil	20MHz

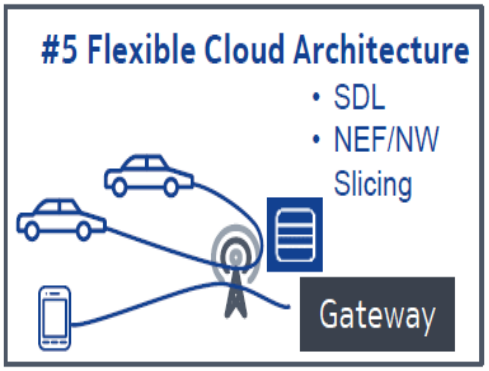
But this is clearly not enough to deliver on the promise

Five Key Technology Components of 5G









Ofcom has identified 24.25-27.5 GHz as the “pioneer band".

The Transport Challenge going from 4G to 5G

E2E Mobile Transport Transformation	
Throughput	From 150Mbps to 1-20 Gbps
Site Density	From 20 to 450 sites/km²
Routing Architecture	From hub & spoke to service aware
Latency	From 20 ms down to 1 ms
Synchronization	From SyncE to 1588v2 for Phase & Time

Microwave no longer the viable option
Dark Fibre will be needed

The Channel Island Challenges

- H&S and environmental impact
- How will 5G fit within the existing 2/3/4G infrastructure
- Options for network roll out for the CI
  - what is our ideal solution,
  - the differences between the Islands
  - challenges a joint approach would create.
- Ideal milestones for innovation and full roll out of 5G spectrum and licenses

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Questions?

Lunch

Alistair Beak

CHIEF MARKETING OFFICER

Sure Group

5G

July 5th 2018

sure.

An overview of 5G: benefits and drivers

a) **Enabler to significant economic activity – true for all countries**

b) **Drivers**
   a) All industry sectors
   b) Increasing data demands
   c) Smart networking / IOT
   d) Complement Fixed

c) **Natural extension of 4G+**
   a) More capacity
   b) Faster / latency
   c) Broader set of applications

2016, US $ BILLIONS

Industry	Enhanced Mobile Broadband	Massive Internet of Things	Mission Critical Services	5G-Enabled Output (2016 $,M)	Percent of Industry Output
Ag., Forestry, and Fishing	●	●	●	$510	6.4%
Arts and Entertainment	●	○	●	65	3.5%
Construction	●	●	●	742	4.7%
Education	●	○	○	277	3.5%
Financial and Insurance	●	●	●	676	4.6%
Health and Social Work	●	●	●	119	2.3%
Hospitality	●	●	○	562	4.8%
Info. and Communications	●	●	●	1,421	11.5%
Manufacturing	●	●	●	3,364	4.2%
Mining and Quarrying	●	●	●	249	4.1%
Professional Services	●	○	○	623	3.7%
Public Service	●	●	●	1,066	6.5%
Real Estate Activities	●	●	●	400	2.4%
Transport. and Storage	●	●	●	659	5.6%
Utilities	●	●	●	273	4.5%
Wholesale and Retail	●	●	●	1,295	3.4%
All Industry Sectors	$4,400	$3,600	$4,300	$12,300	Average: 4.6%

NO IMPACT ○ ● ● ● ● ● HIGH IMPACT

5G-Enabled Output by Industry [Source: IHS Economics]
5G could enable $12 trillion of global economic activity in 2035

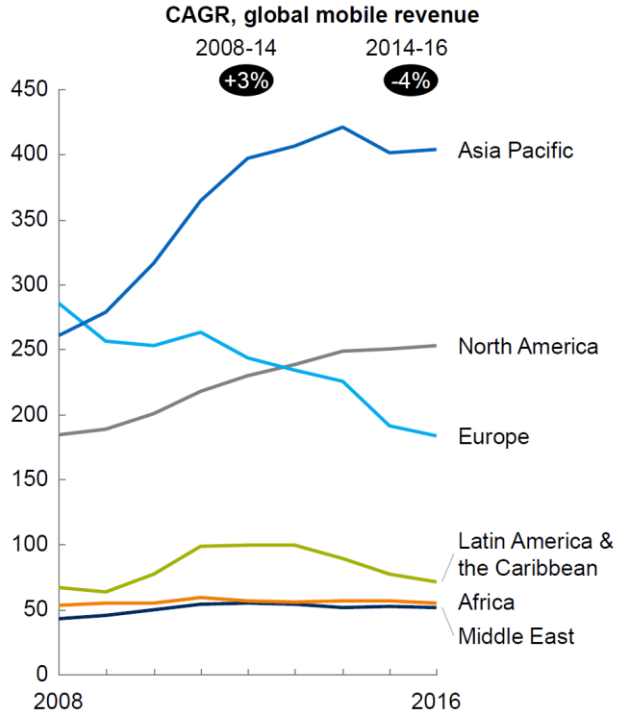
5G is fundamental to Sure. 5G promise is big for society economical outputs and therefore for Channel Islands.

5G has a number of challenges

a) **Increase in number of sites**
   a) Access to public physical infrastructure
   b) Planning
   c) H&S concerns

b) **Spectrum planning & licence planning**

c) **Business case is not yet clear:**
   a) Shortening lifecycle of capex investment
   b) Costs not yet clear
   c) Device roadmap
   d) Mobile usage difference in CIs

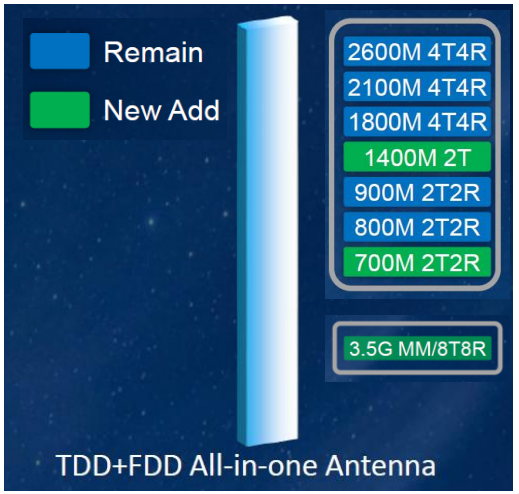


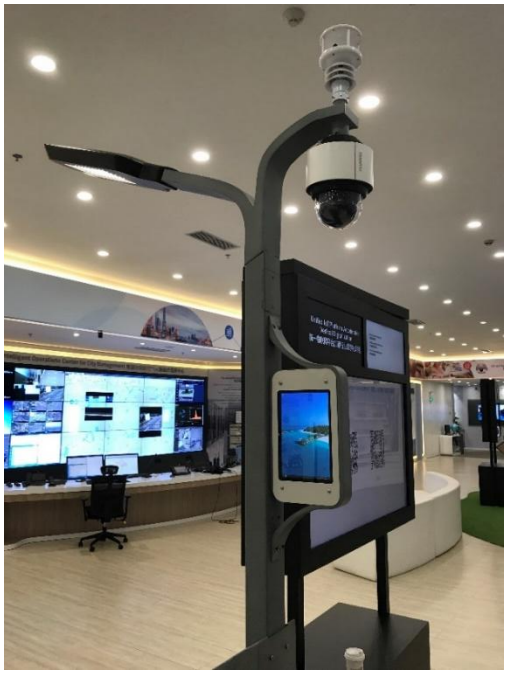
[SOURCE: Ovum]

Current business case is unclear - requires close collaboration with Governments and CICRA to define best approach

How to allay fears: H&S / environment

- **CICRA/Gov't key role as independent to get message across re H&S**
  - difficult space for Operators to prove safety
- **Good potential to use smaller sites & modify urban furniture**
  - Next generation antenna – smaller / more efficient
- **Some form of network sharing could bring benefits:**
  - Fewer sites
  - Lower EMF emissions
  - Efficient use of spectrum





LampSite

We will work with CICRA and health department and conform to EMF limits

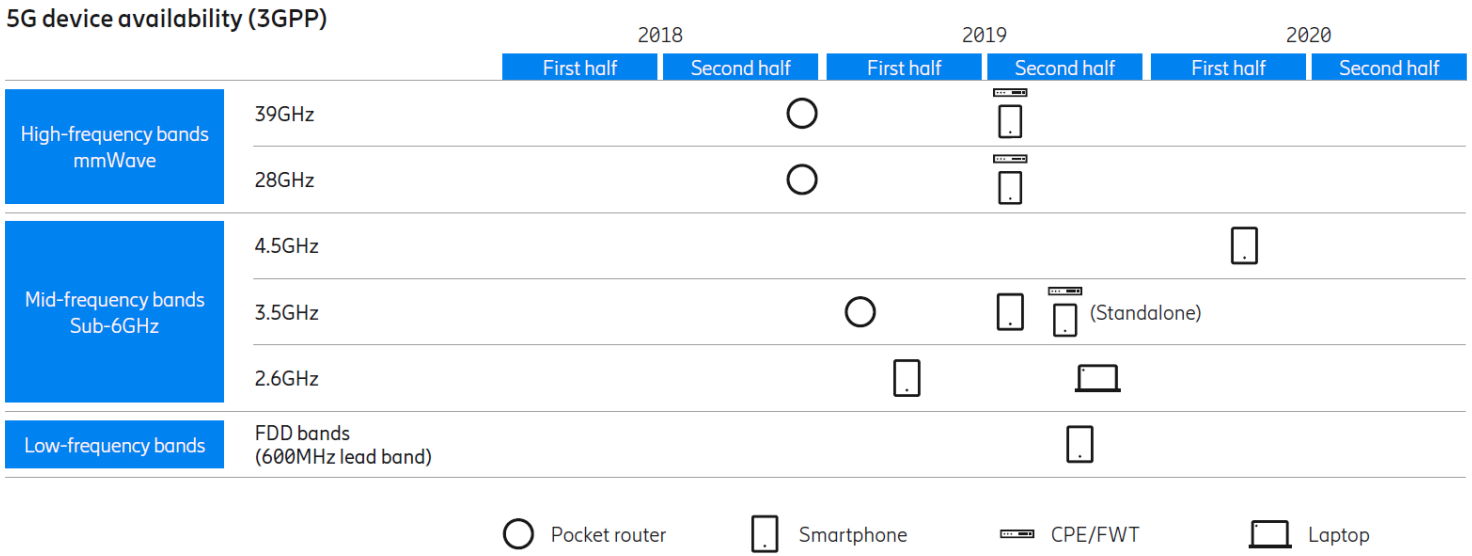
Suppliers: timescales, availability of 5G & standards

Network

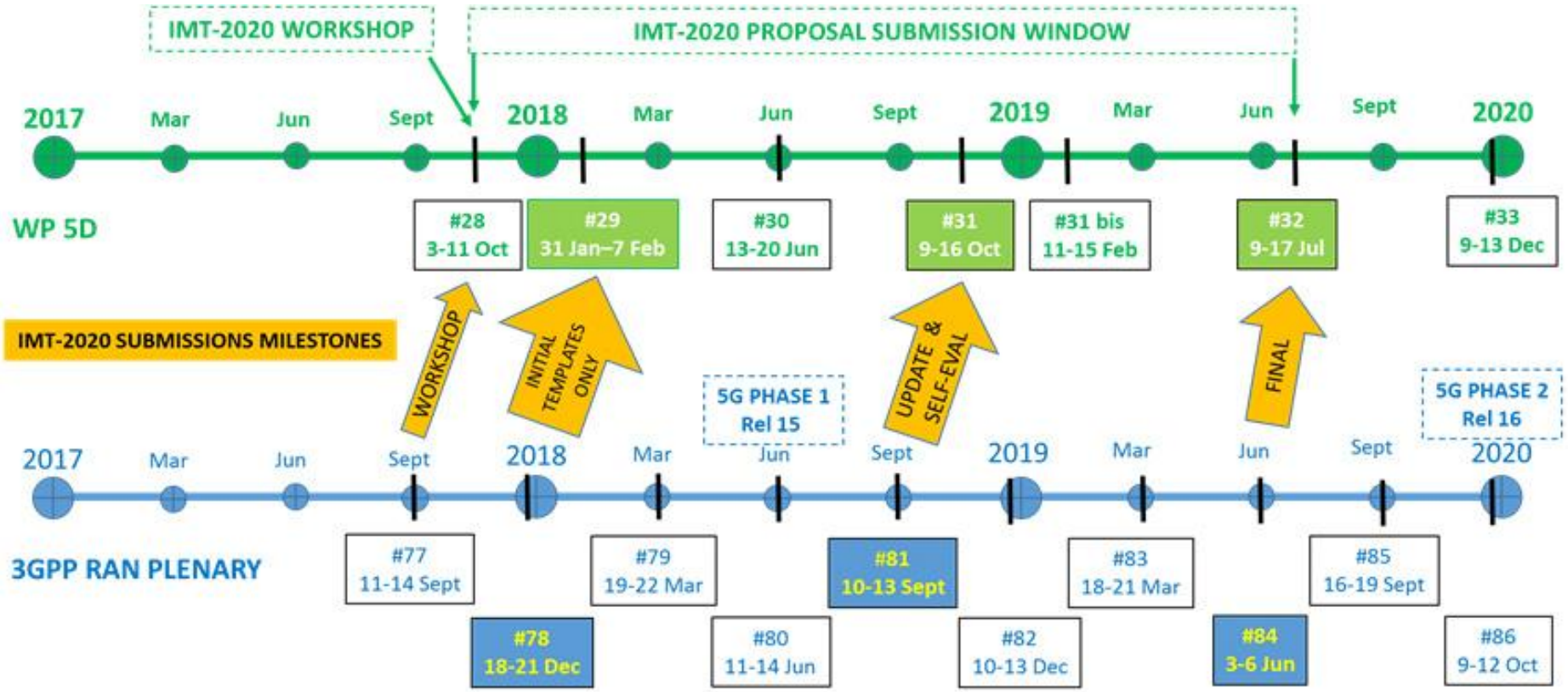
- Potential to trial in 2019
- Available for full commercial launch 2020 earliest

Devices

- Routers becoming available
- Smartphones expected 2019 – however: Apple / Android unclear
- Expect similar take up to UK: 50% penetration by mid 2020s



Complete 5G specification to take more time

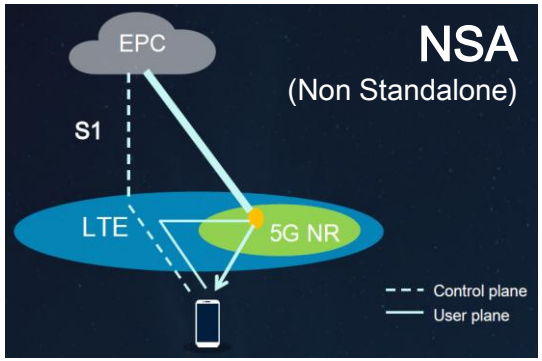


5G will evolve alongside 2G/3G/4G

1Gbps 4.5G Network
Adding spectrum
(900, 2100, 2600)

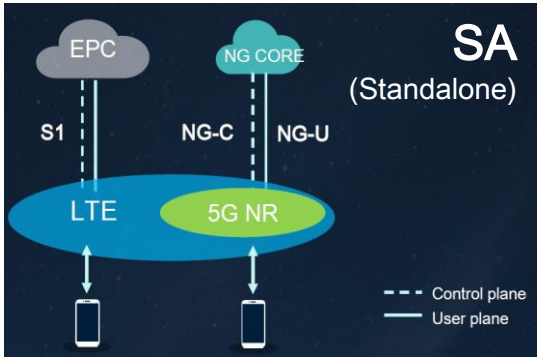
- CA (Carrier Aggregation)
- Massive MIMO
- Cell / sector split

5G NSA @ 3.5Ghz
+
UL & DL Decoupling
Extends C-Band Coverage



- Focus on eMBB
- LTE as anchor, reuse current EPC
- Less requirement for 5G NR coverage

Refarm LTE bands to 5G SA



- eMBB/uRLLC/mMTC and network slicing
- New core required (high complexity)
- High requirement for 5G NR coverage

Establishing a test environment: timing, requirements

DIGITAL GREENHOUSE GUERNSEY

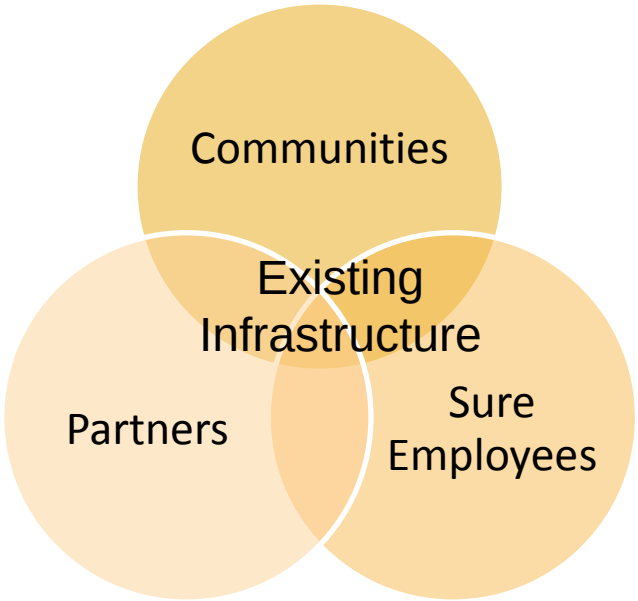
DIGITAL JERSEY

Guernsey Chamber OF COMMERCE

CHAMBER OF COMMERCE JERSEY

HUAWEI

SAMSUNG



Issue temporary / trial 5G licence in 2019

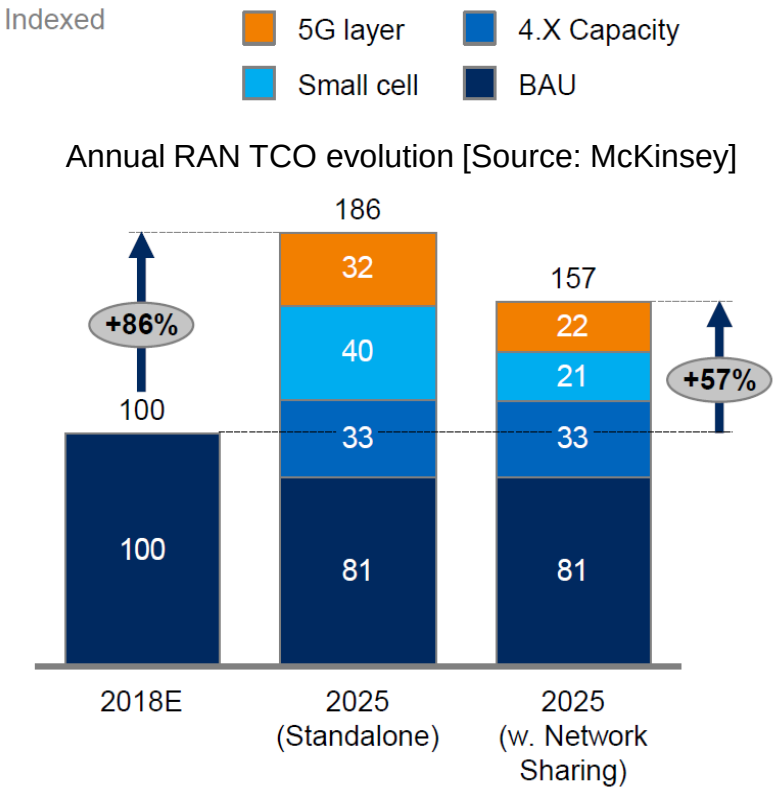
sure.

Options for network roll out

1. **Continue as today**
    1. Does business case work with 3 separate networks?
    2. Environmental impact issue

2. **Joint RAN / full site sharing**
    1. Lower TCO Eg can reduce TCO by 30%
    2. Fewer sites / lowered environmental impact
    3. Potential conflicting operator objectives

3. **One 5G network on each Bailiwick**
    1. Could be efficient economically & environmentally
    2. Complexity of aligning stakeholders and fundamental change to business models
    3. Network homogeneity
    4. Licensing issues



Backhaul requirements

- **Fibre to all/most sites** (phase 1). Need unconditional access and wholesale arrangements when required

- Wide bandwidths of spectrum available at higher bands open up not only the potential to utilise the spectrum for mobile broadband access in small cells, **but also as microwave backhaul to simplify small cell deployments**

- mmWave technologies will bring new opportunities for **integrated access and backhaul**

5G Spectrum & Licences – ideal milestones

2019 Trial spectrum – 3.4-3.6 Ghz

2020 Commercial Licence

- Traditional licence obligations not necessarily apply
- Frequency to be used to be cleared
- Planning consent / access to public infrastructure process in place

mmWavebands focus to 26 GHz

2021 Sub 3GHz bands – 700 Mhz

Trial spectrum required for 2019

Summary

5G is a clear long term economic enabler

Many unknowns

- Investment, Site / coverage, Devices

Requires support from Governments and Regulator

- Planning, Licensing, Spectrum allocation

Different options should be explored in depth

- Maintain status quo, RAN sharing, single 5G

Sure is committed to:

- Work with all parties to explore options
- Invest and build on strong 4G foundation
- Channel Islands competitiveness

Sure is committed to 5G and working with all parties

Thank you

Andy Scate

CHIEF OFFICER
DEPARTMENT OF THE ENVIRONMENT

Jim Rowles

DIRECTOR OF PLANNING

5G Pre-Summit Meeting – Jersey

Guernsey's Planning Perspective

Development & Planning Authority

States of Jersey

Growth, Housing and Environment

5th July 2018

Current Policies - Guernsey

- Strategic Land Use Plan, 2011
  - Infrastructure objectives
- Island Development Plan, 2016
  - Policy S5, BPEO
- Planning Law and Exemptions

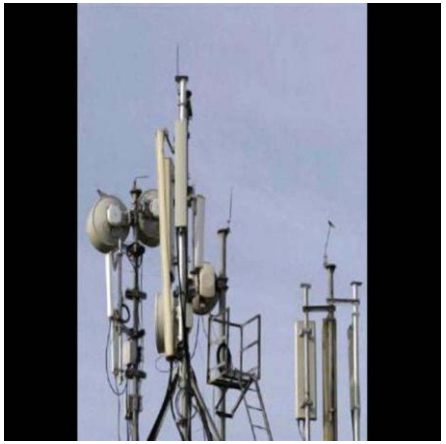
Current Policies – Jersey

- Revised Island Plan 2011
  - Natural Resources and Utilities
  - Policy NR10 – Telecoms Masts
  - Policy NR11 – Communication Antennae
- Planning and Building (General Development Order) 2011
  - Street furniture

Risks and challenges

- Not yet an industry standard
- Extent and scope of requirements
- Uncoordinated, inefficient development
- Health issues?

The fight against Street Clutter - Environmental impact and visual intrusion



Benefits and opportunities

- Extensive use of 5G – supports growth and development
- Building the Network:
  - Use of existing infrastructure
  - Sharing
  - Consolidation
  - New development where required

A shared network solution

- Envisaged by planning policy
- Most efficient way of balancing economic, social and environmental objectives
- Greater public and political acceptance
- Pays dividends in time and expense
- Robust and timely decision making

The Permitting process - Collaboration and support

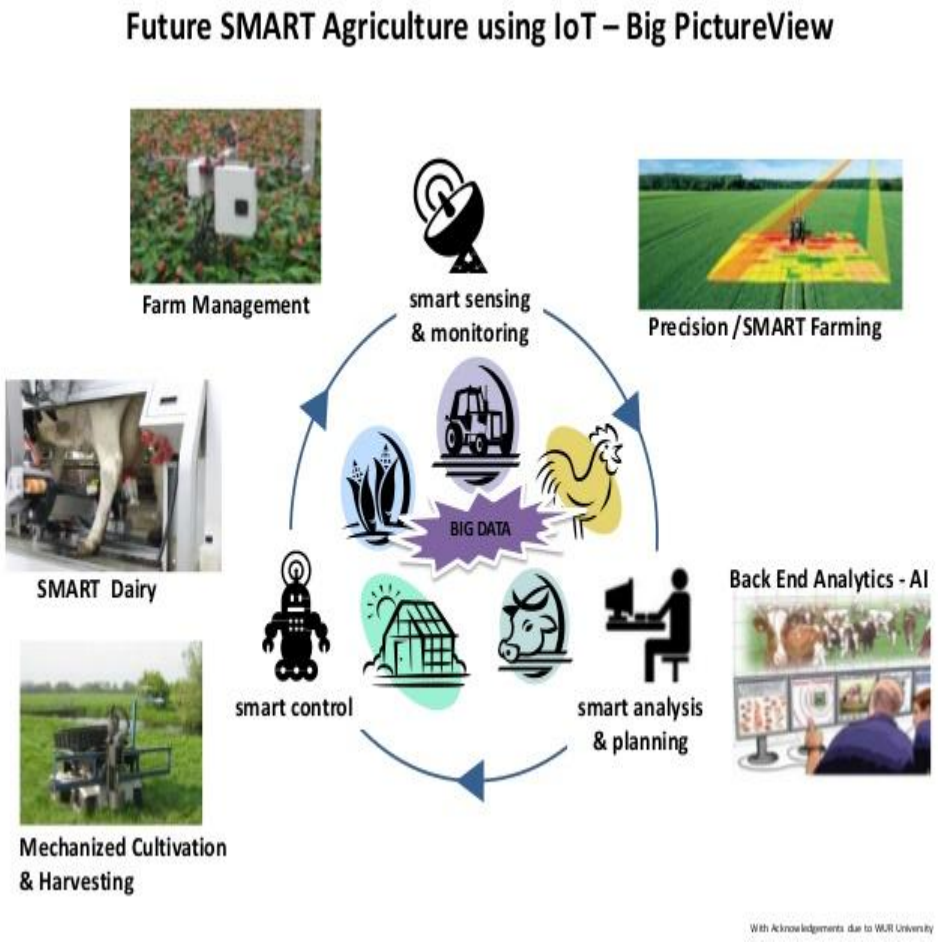
- Working with operators
- Aligning planning policy and procedures
- Pragmatic and practical approach
- Stakeholders all ‘on the same page’
- Monitoring and review
- Scope for refinement

5G – Challenges and opportunities for Public Service Delivery

Opportunities for Service delivery using 5G/data platforms

- Field force data use
- Data collection
- Decision making
- Health monitoring
- Asset allocation and cc
- Wildlife tracking
- Temperature and heat
- Air quality
- Water quality and supply
- Energy use

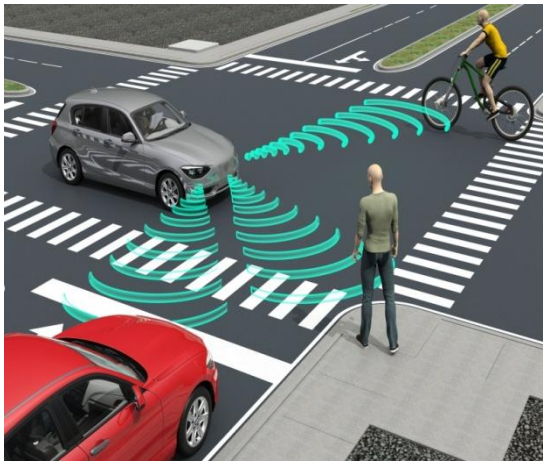
Agriculture and Environment



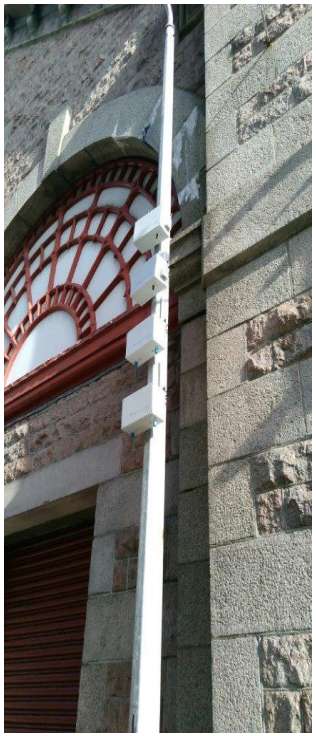
Field force and Decision making

Traffic management, travel and safety

- Impact on road safety
- Road design
- Parking needs?
- Vehicle ownership
- Less clutter?
- Autonomous vehicles and landuse



Environmental monitoring and benefits



Public Service challenges

- 24 hour access
- Mobile and digital access to services
- Staff vs Automation
- Decision making timescales
- Crowd pressure
- Digital investment vs service savings?
- More data means more Public Self responsibility
- Response times and relevance

Tea

Q&A

Session

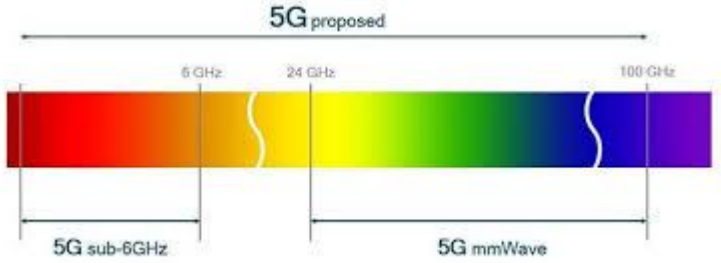
Tim Ringsdore

Next Steps

Current Situation

Licenses

Spectrum



Steering Group

SUMMIT

Guernsey 8 October 2018

Attendees

8 October 2018	Operators
	CICRA/Board
	Ofcom
	McKinsey – Key Note speaker
	Key CI government departments, planning, Strategy, Digital Sector, Schools
	Politicians/civil servants
	Technical companies
	Media

Agenda

- Coffee/Croissants - Networking
- Introduction – Chairman
- CICRA – Tim Ringsdore & Michael Byrne
- McKinsey Key Note Speaker
- Ofcom – Cliff Mason
- States of Jersey Policies - Stephanie Peat
- Break
- States of Guernsey Policies – Colin Vaudin
- Sure
- Lunch

Agenda

Airtel Vodafone

JT

Jersey Planning and environment – Andy Scate

Guernsey Planning and environment – Jim Rowles

Schools presentations

Digital sector presentation

Chairman – Q&A panel regarding the key points from presenters

CICRA next steps – Tim Ringsdore

Chairman - Summary

Key Outputs

8 October 2018	Network roll out options update
	Clear understanding regarding CI policies and support from government, incentives, planning etc
	Update on Spectrum allocation and timescales
	Innovation/test spectrum update
	Drivers and address any H&S concerns
	Risks, challenges and opportunities
	Managing consumer expectations
	Positive media coverage

School Brief

Schools presentation brief

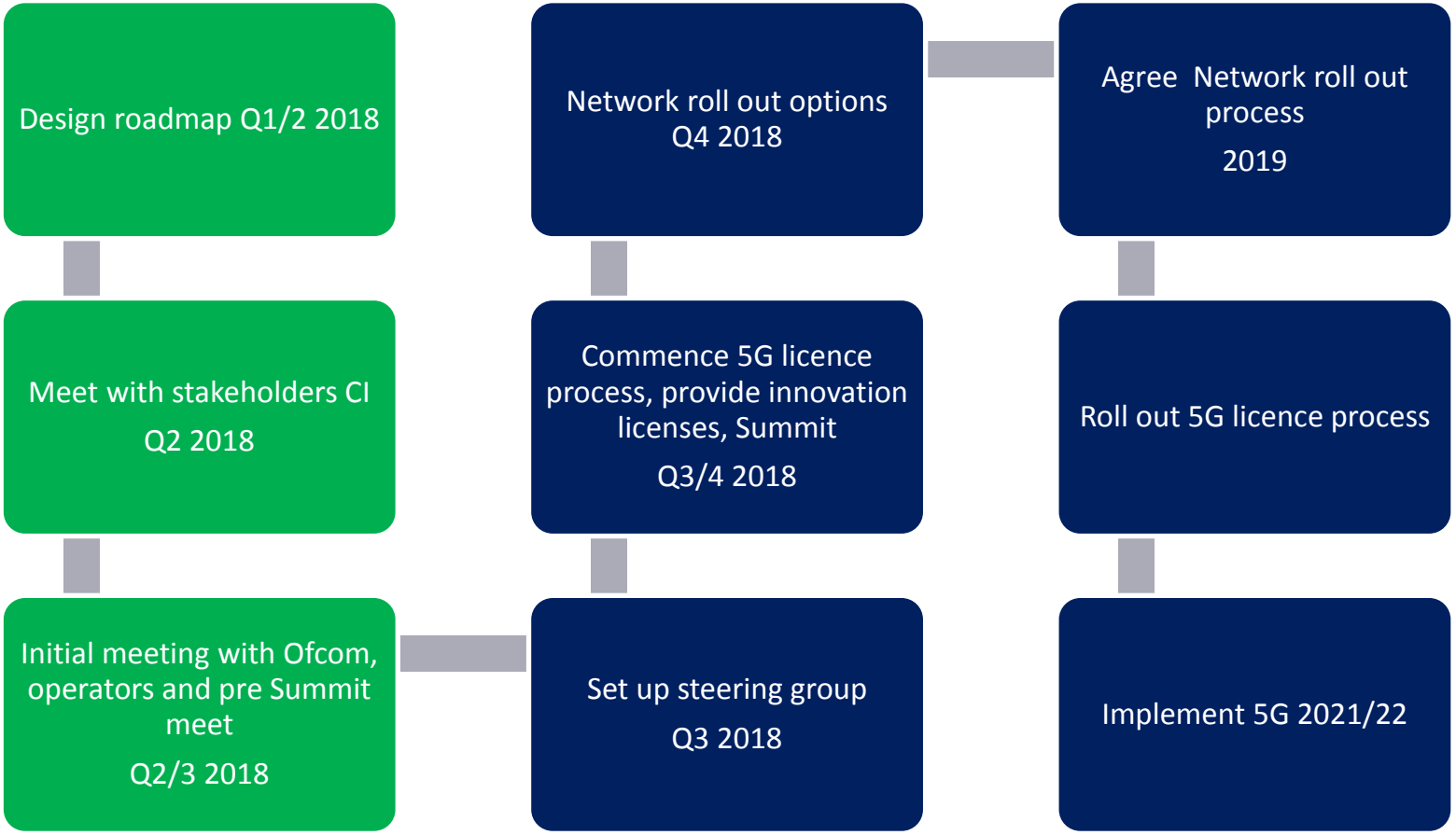
1. What benefits and challenges do you think 5G could present ? Think about jobs, tourism, the finance sector, digital sector, education and health.

2. How do you think services that you use today will change in the future? How will you be using technology in 5 – 10 years time? What about even further ahead? How might your children be using technology in the future? Give us some examples.

3. What social and environmental factors should we take into account? Think about those who can't access technology and the physical environment.

4. How could 5G makes our day to day lives on Jersey better? What new applications should be developed?

CICRA Next Steps



Tim Ringsdore

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Michael O’Higgins

CHAIRMAN

THANK YOU