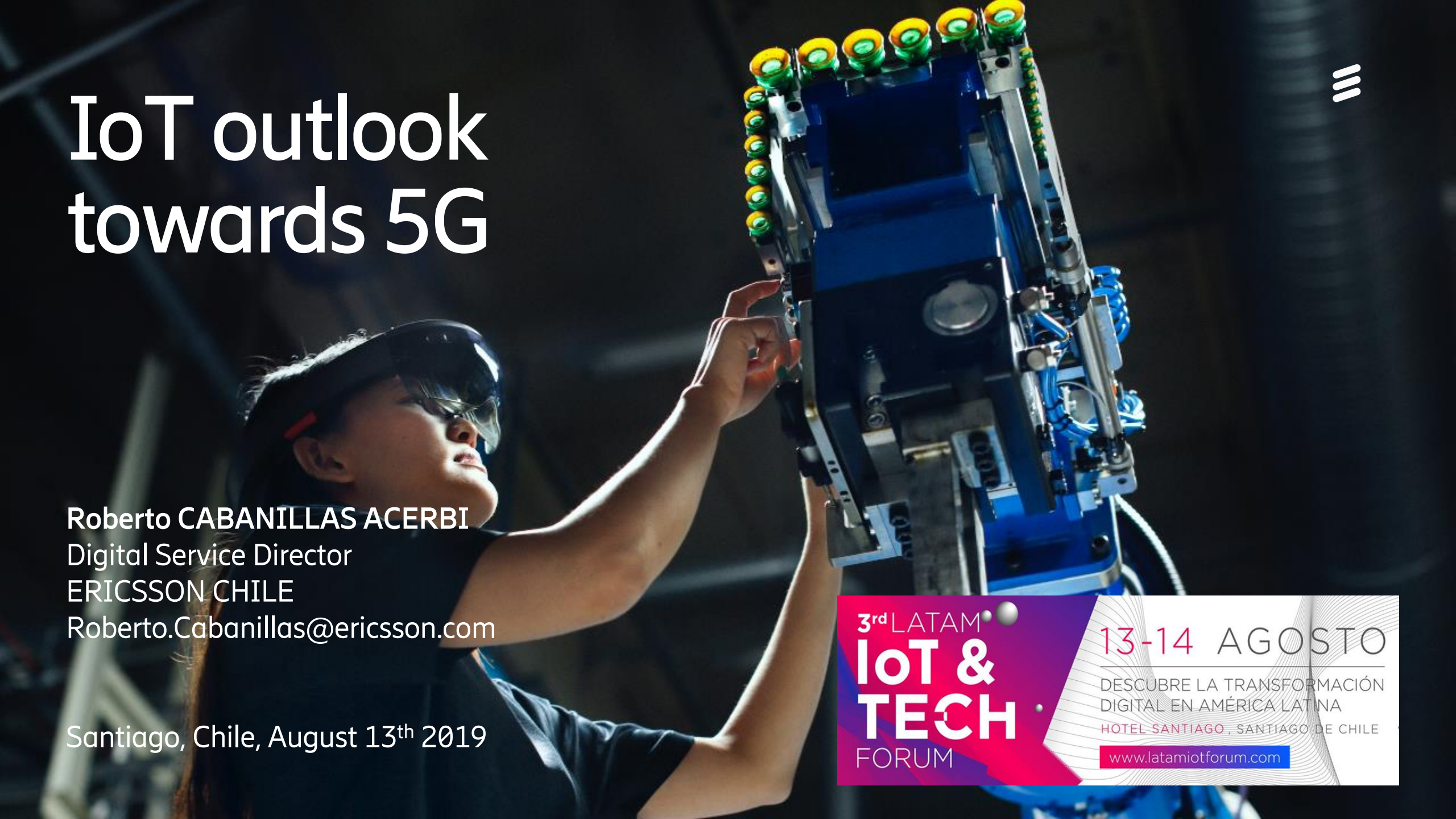


IoT outlook towards 5G

Roberto CABANILLAS ACERBI
Digital Service Director
ERICSSON CHILE
Roberto.Cabanillas@ericsson.com

Santiago, Chile, August 13th 2019



**3rd LATAM
IoT &
TECH
FORUM**

13-14 AGOSTO
DESCUBRE LA TRANSFORMACIÓN
DIGITAL EN AMÉRICA LATINA
HOTEL SANTIAGO, SANTIAGO DE CHILE
www.latamiotforum.com

Ericsson at a glance



Empowering an intelligent, sustainable and connected world

64%

20%

12%

4%

Networks

Telecoms infrastructure

Digital Services

Billing, charging & operation systems for Telecoms

Managed Services

Managing telecom networks on behalf of customers

Technology & New Business

Emerging business opportunities



140+

Years enabling communications addressing world challenges

24b.
usd revenues

5b.
usd in R&D

180+
countries

97500
employees

45000
patents

70+

Years in Chile enabling communications

Ericsson in Chile



1946

Ericsson starts operations in Chile

1995

First Mobile Network Chile

2007

First mobile broadband network (3G) in Chile and Latam

100%

Of mobile calls are running through Ericsson equipment

2/3

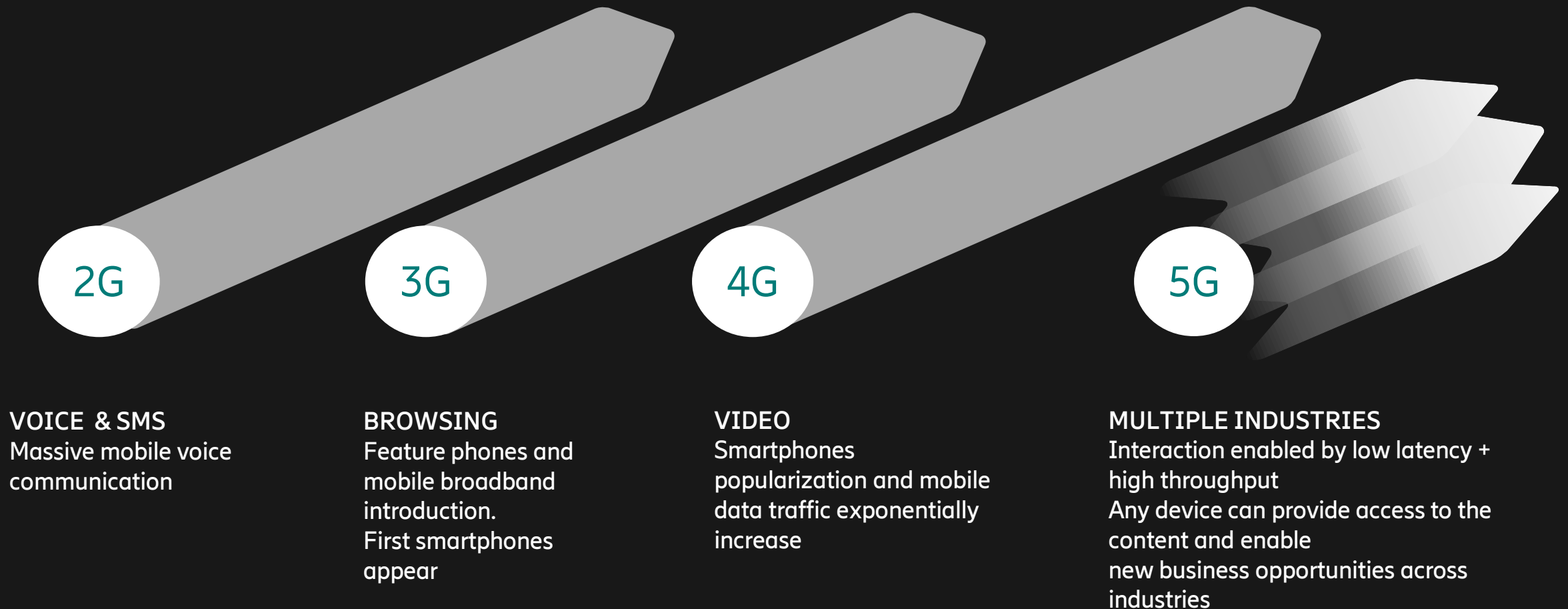
Of our sales are Software and Services

Ericsson in the Quest for Easy towards 5G



YouTube

The evolution from voice to interactivity



Drivers for Growth



MORE
USAGE



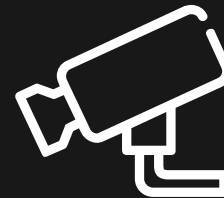
8x mobile data
traffic by 2023

MORE
PEOPLE



8.9 billion subscribers
by 2023

MORE
THINGS



31 billion IoT devices
by 2023

MORE
BUSINESS

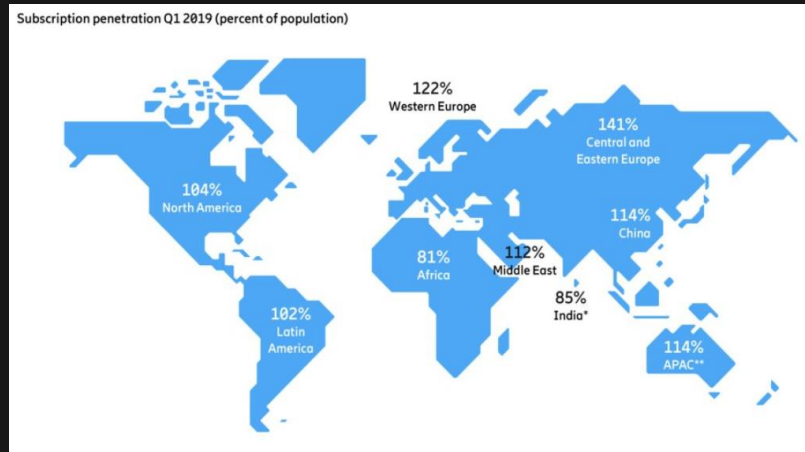


Fixed Wireless Access,
Smart Cities, factories etc.

Ericsson Mobility Report, June 2019 update



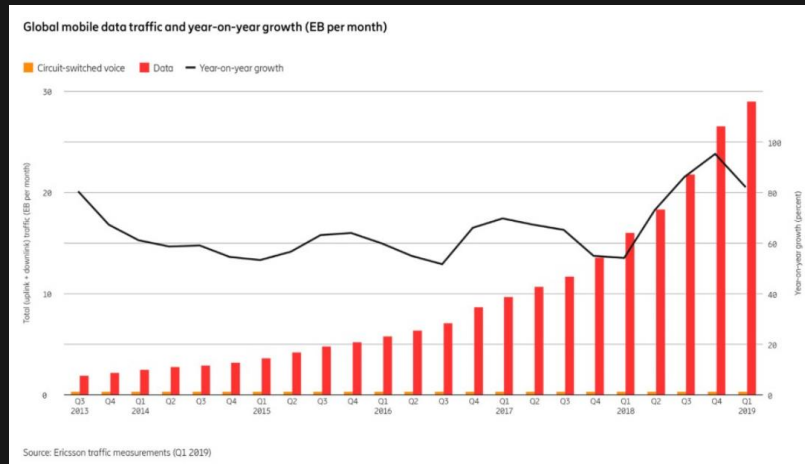
Global subscription penetration is at 104%



Traffic growth is driven both by the rising number of smartphone subscriptions and increasing average data volume per subscription, fueled primarily by more viewing of video content.

7.9bn

Total number of mobile subscriptions in Q1 2019.



82%

Mobile data traffic grew close to 82% between Q1 2018 and Q1 2019

6bn

There are now 6 billion mobile broadband subscriptions.

Broadband relation with socio-economic impact



+1000 Connections



80 new jobs

+10% Penetration



~1% GDP

+1% Penetration



3.8% new ventures

Double speed



0,3% GDP growth

Challenge #: Coverage Everywhere with 4G & 4,5G



Micro Cells with Ruggedized Enclosure



mRRUS Radio Dot

Underground Mining
Indoor IoT for Office
Industrial IoT
Smart Parking
Smart Building

Invisible Site



Smart Transport
Smart Lighting
Smart Parking
Fleet Management
Connected Cars
Connected Fleet Mgmt.
Wearables

Small Cells Hanged

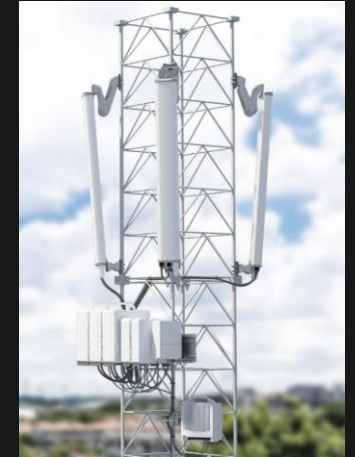


Open Pit Mining
Connected Ports
Smart Farming
Smart Parking

Micro Sites



Macro Sites



Industrial IoT
Connected Building
Connected Hospitals
E-Health wearables
Connected Ports
Smart Cities
Fleet Management
Smart Metering
Smart Farming
Connected Cars

Challenge#: Capacity to fulfill massive IoT



Meeting diversity of use case requirements

		 Bandwidth Spectrum Carrier	 Coverage	 Battery life	 Capacity	 Peak Throughput	 Mobility	 Voice
IoT on LTE	Cat-M1 Wide range of applications	1.4 MHz	160dB (+15dB)	10+ Year	1M+/cell	0.8/1 Mbps (300/375 kbps)	Connected & idle mode mobility	Supported
	NB-IoT Ultra low-bitrate applications	200 kHz	164dB (+20dB)	10+ Year	200K/cell	227/250 kbps (21/63 kbps)	Idle mode mobility	Not Supported

Ericsson supports all IoT technologies based on the 3GPP interoperability standards

Massive IoT coverage with 4,5G



Massive IoT connected devices in a city scenario



Extending LTE coverage for IoT



Percentage of devices reached in the massive IoT city scenario

	800 MHz band			2.6 GHz band		
	4G LTE MBB (144 dB)	4,5G Cat-M1 (160 dB) 	4,5G NB-IoT (164 dB) 	4G LTE MBB (144 dB)	4,5G Cat-M1 (160 dB) 	4,5G NB-IoT (164 dB) ¹ 
Outdoors	100	100	100	100	100	100
Indoors – apartment	100	100	100	97	100	100
Indoors – basement partly underground	99	100	100	83	99	99
Deep indoors – basement fully underground	77	99	99	32	86	92

¹ Radio Frequency (RF) requirements for NB-IoT have not yet been formally defined for the 2.6 GHz band

Coverage is enhanced for low data rate IoT devices by reducing the data rate

Challenge #: Low latency with Cloud/Edge Computing

\$\$\$\$
<1ms



\$\$\$
10ms



\$\$
50ms



\$
100ms



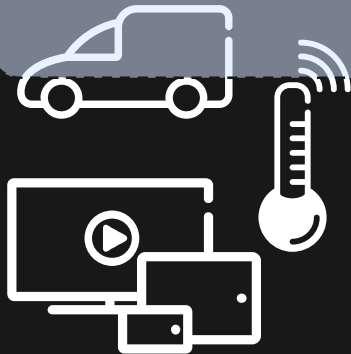
Scale across
with Orchestration

Scale out

Scale up

Application / VNFs

Public
Cloud



Terminal or
Mine Local Processing



Access Point
Small Sizing of HDS



Regional DC
Central Office
HDS Medium sizing

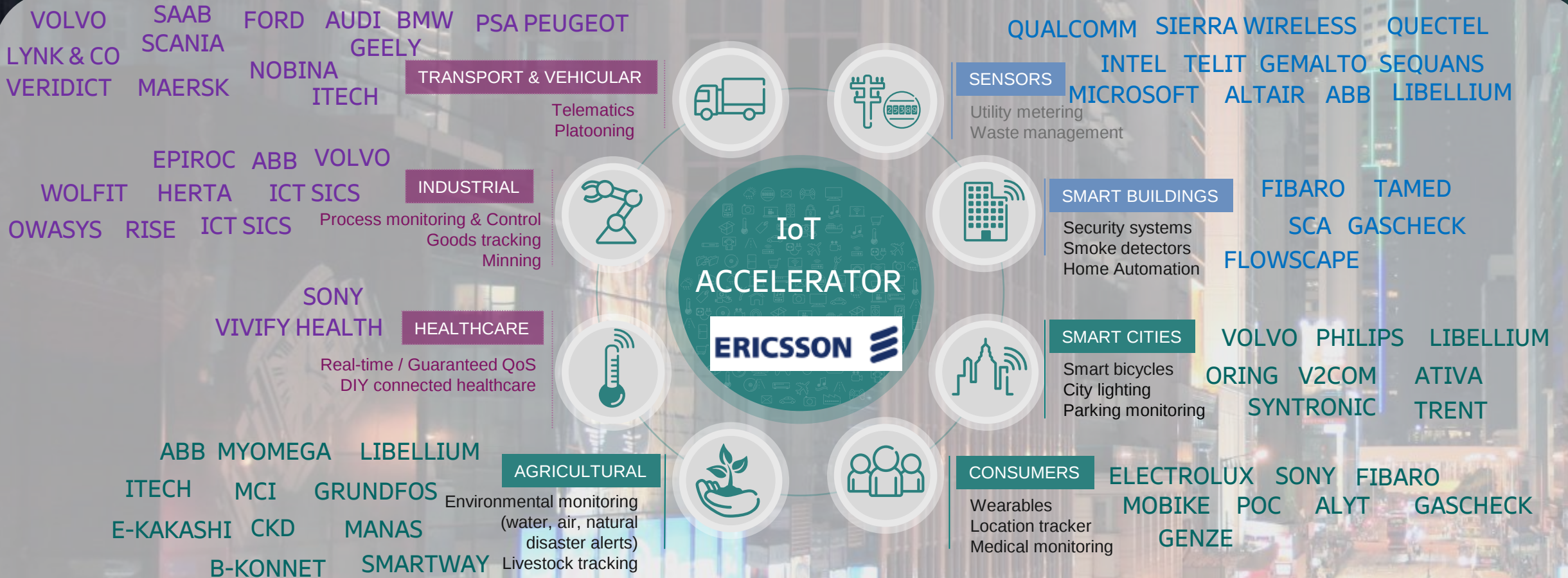
Data Center,
Private Cloud
Hyperscale Data Center(HDS)



Less distributed

- IoT Massive Metering
- Applications with global visibility
- Heavy data processing / machine learning
- Large & cold storage

Challenge#: IoT Ecosystem in evolution ... every week



Ericsson Mission-Critical PTT Device eco system



- Examples of +50 supported handset different brands
 - Andromeda, Atexphone, Bittium, Blackview, CAT, Crosscall, Cyrus, Enjoy, Google, Huawei, Kyocera, Motorola, Oukitel, Oysta, Oinguo, RugGear, Rugtel, Samsung, Sonim, Sony, Vodafone, Zebra



First 5G phones as-of-now

Motorola MOTO X



April 2019
5G: High bands, U.S.



May 2019
5G: mid-band 3.5 GHz



April 2019
5G: mid-band 3.5 GHz
and high-band 28 GHz
depending on markets

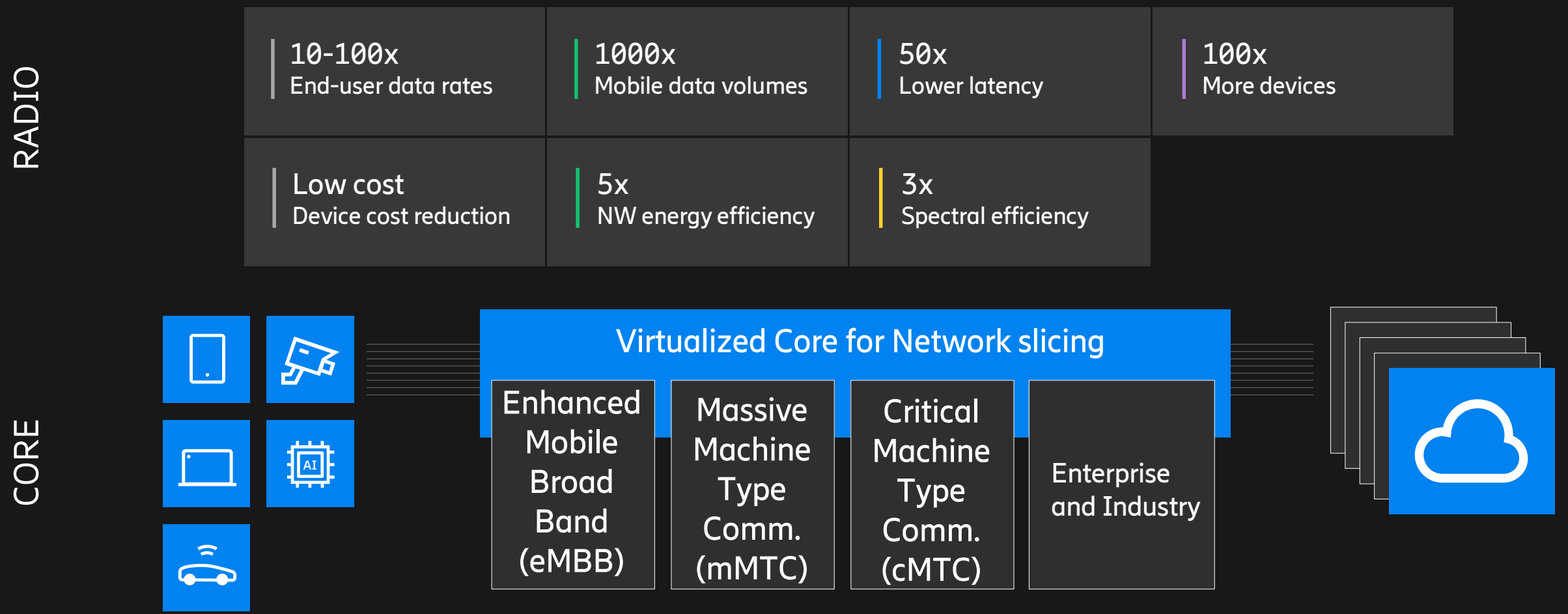


May 2019
5G: mid-band 3.5 GHz

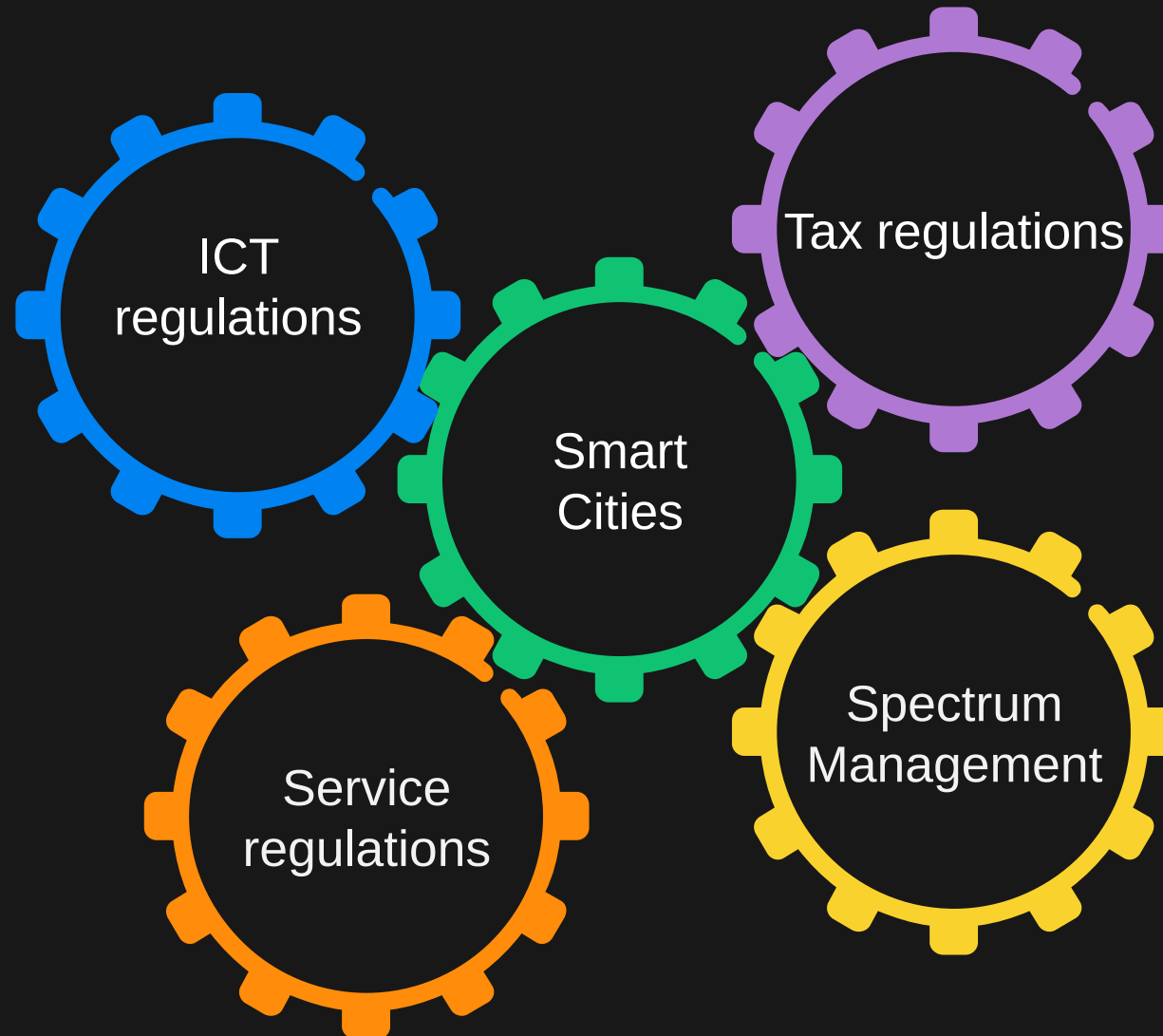


May 2019
5G: mid-band 3.5 GHz

Challenge #6: Interoperability with one network for multiple industries



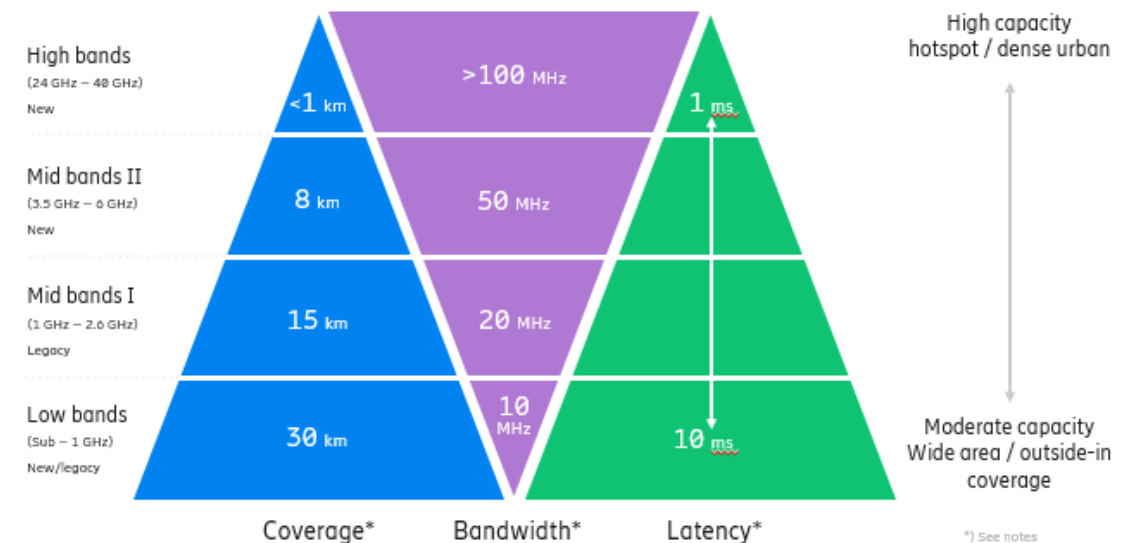
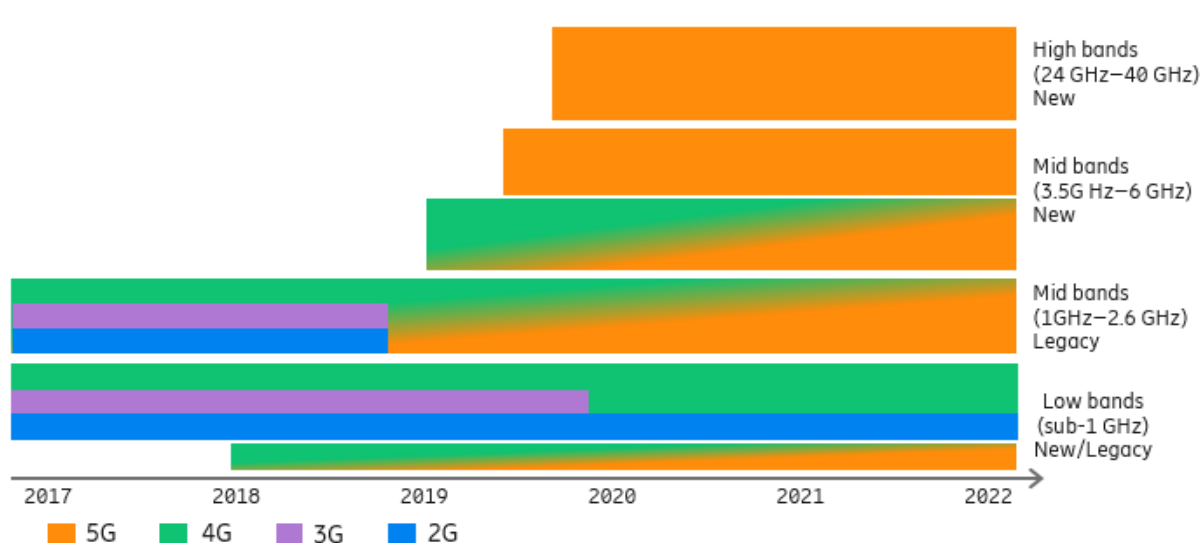
Challenge#: Regulation of Spectrum



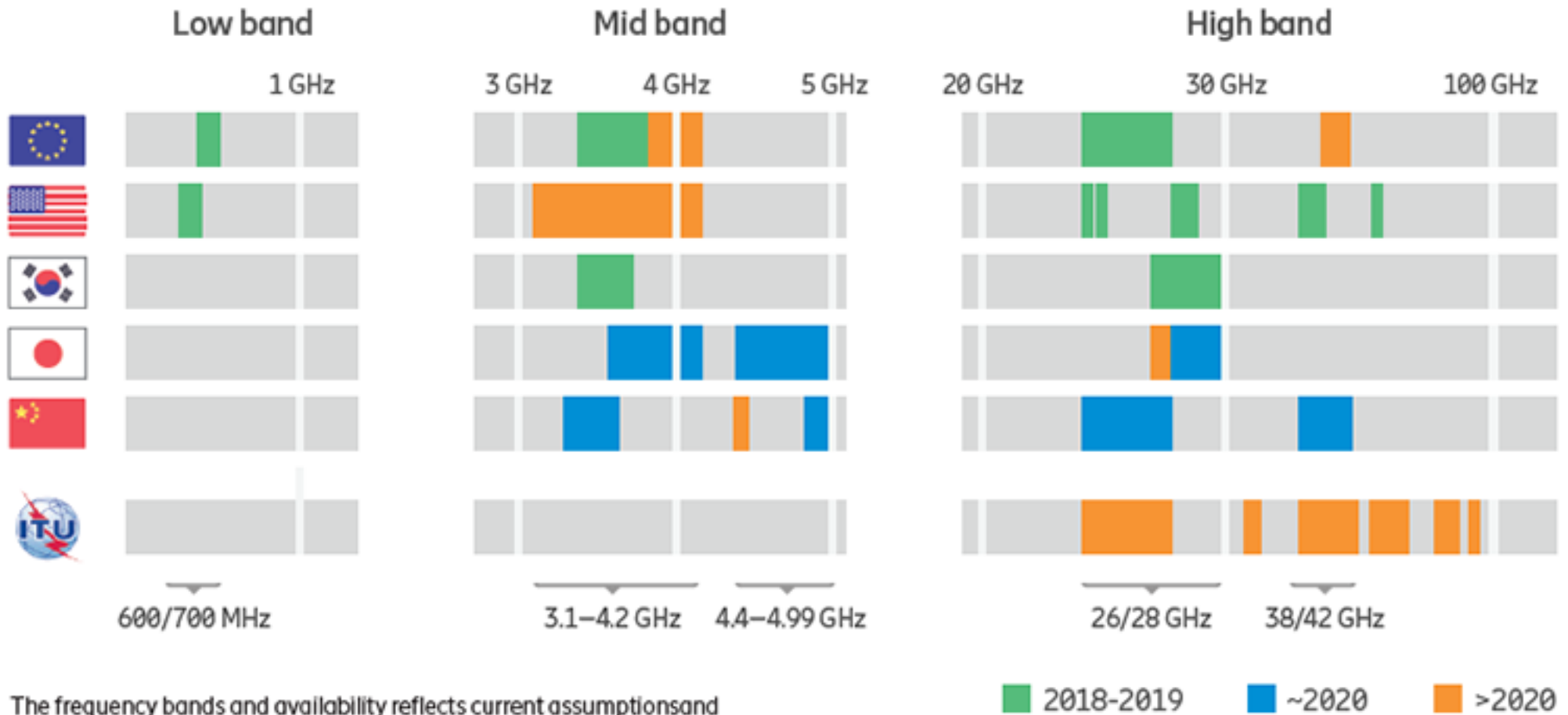
Spectrum Availability & Trade-off



- Initial 5G deployments likely to be non-standalone configurations in mid bands
- Combination of 4G and 5G is expected as traffic increases and new use cases mature
- Standalone 5G deployment will gradually get access to 4G spectrum in mid and low bands



5G spectrum band deployed



The frequency bands and availability reflects current assumptions and are based indications from different countries/regions

Initial 5G-NR focus per region

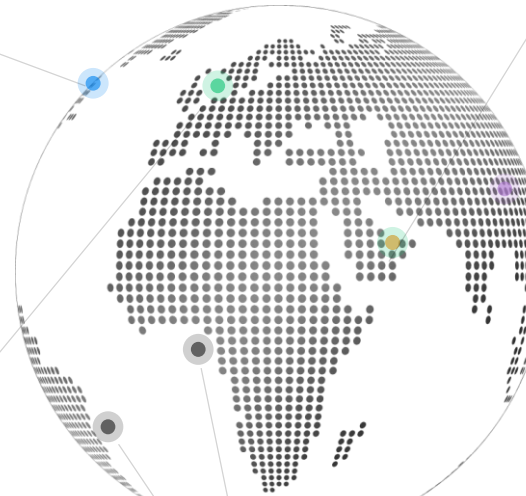


North America

- 2018 launches on mmW
- Low-band FDD NR during 2019
- Mobile broadband and FWA

Middle East

- 2019 launches on midband, with mmWave as second wave
- Mobile broadband and FWA



South America
and Africa later

Europe

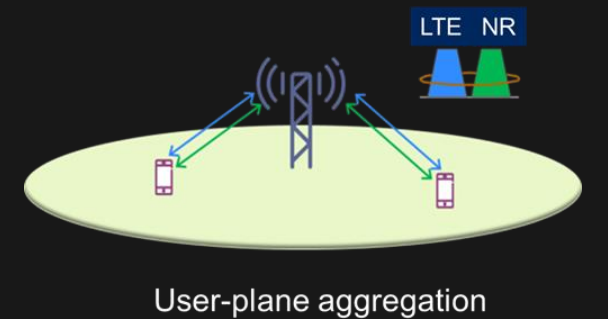
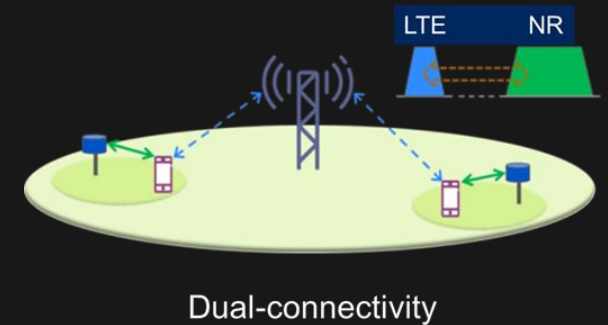
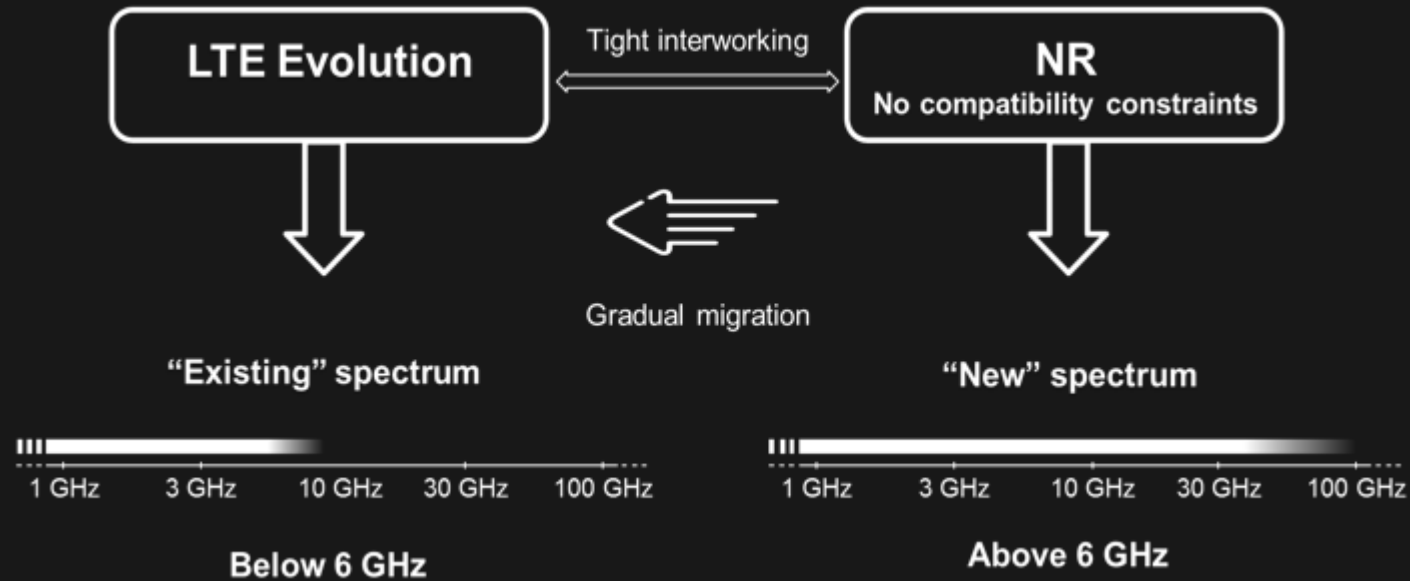
- Initial focus on mid-band
- Focus on industry use-cases
- Low-band NR for coverage
- High-band as capacity booster

Asia

- Initial focus on mid-band, with high-band as second wave
- China and Japan driving volumes in 2020 with large scale rollouts
- Focus in Mobile Broadband

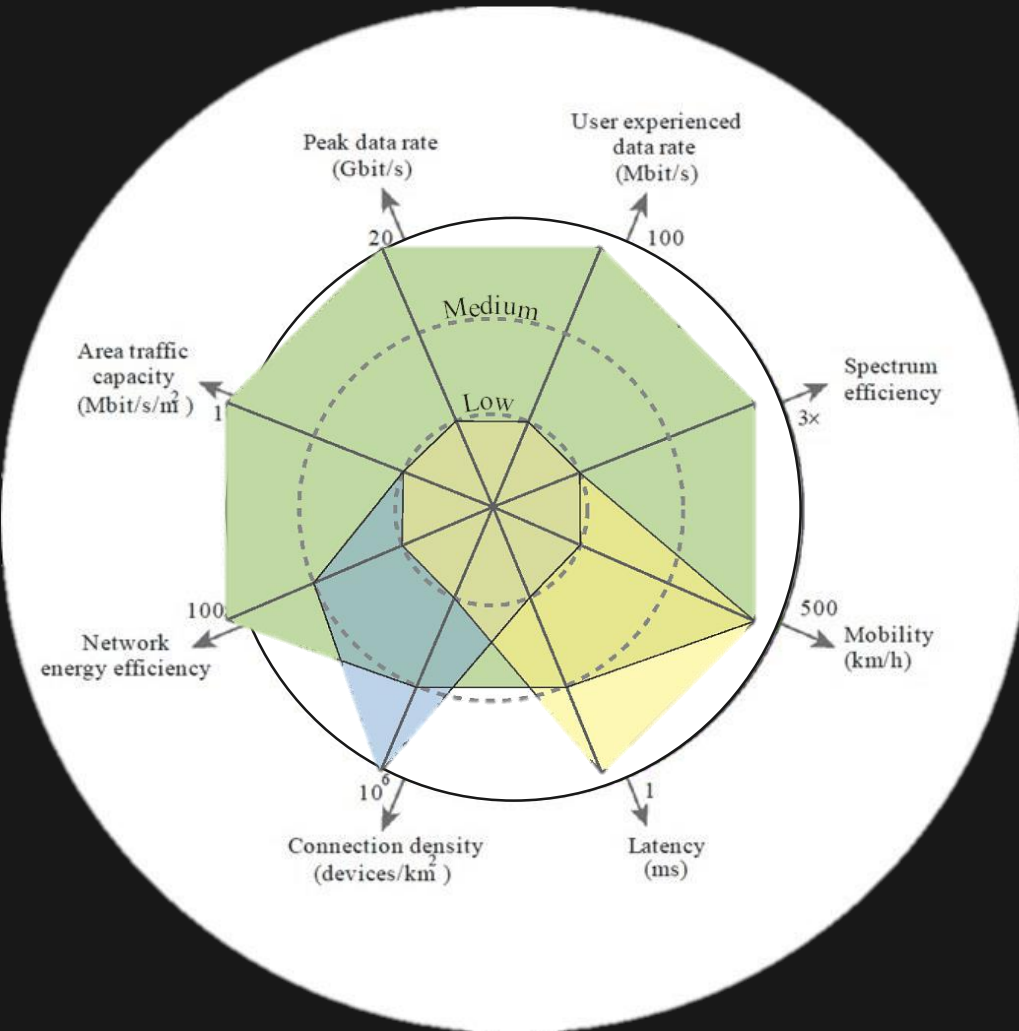
5G = Radio Access + Virtualized Core

New radio Access technology + Evolution of Cloud technology



ITU Technical Expectations of 5G vs. 4G

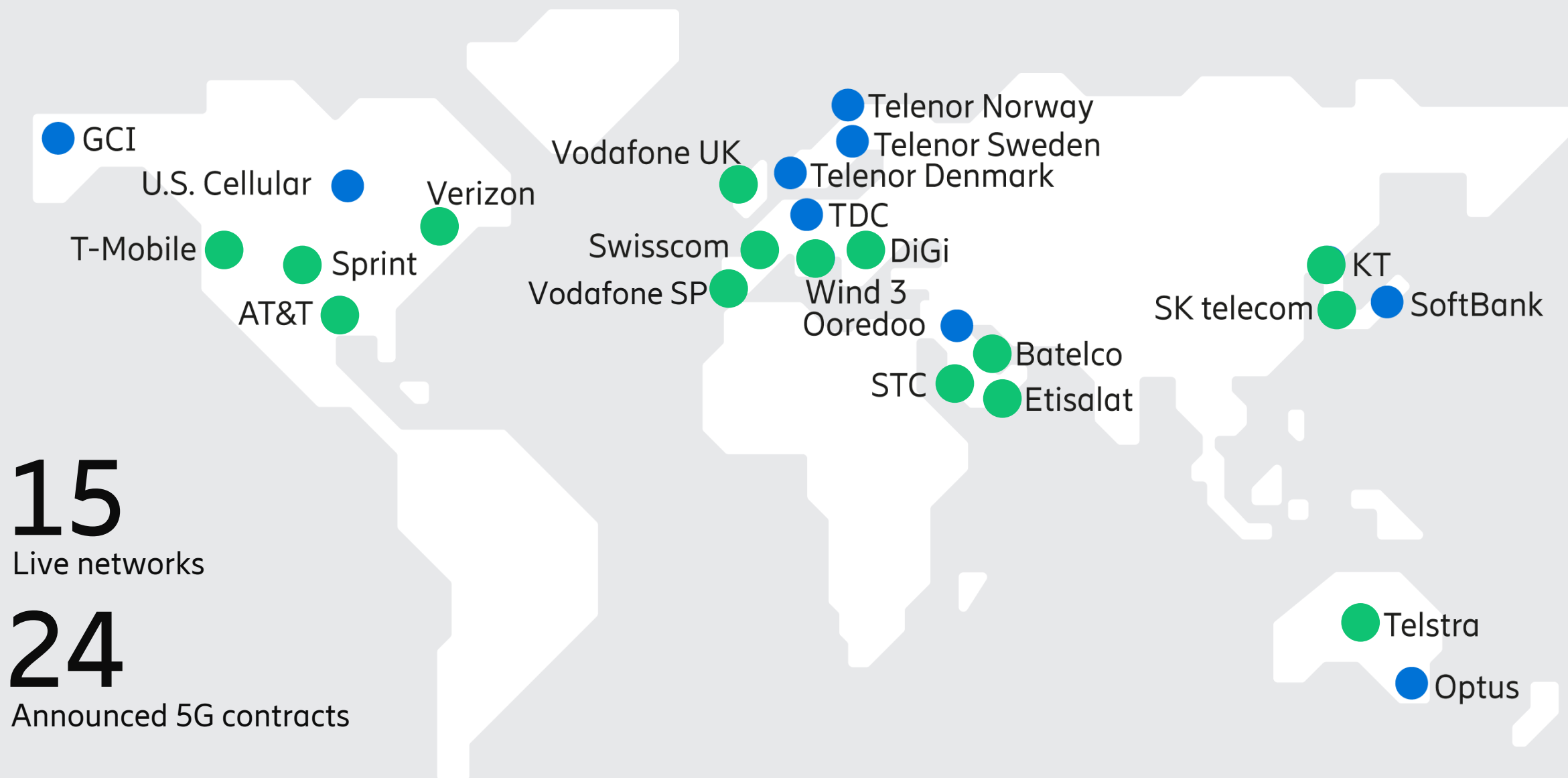
IMT-2020 vs. IMT-Advanced



	Peak Data Rate	20 / 1 Gbps		Connection Density	1 M / 100 k devices / km ²
	User Experienced Data Rate	100 / 10 Mbps		Network Energy Efficiency	Up to ×100
	Spectral Efficiency	30 / 10 bps/Hz		Latency	1 / 10 ms
	Area Traffic Capacity	10 / 0.1 Mbps / m ²		Mobility	500 / 350 km/h
	Reliability & Availability	99.999%		Position accuracy	< 1 / 10 m

Enhanced MBB Massive MTC Critical MTC

5G commercialization



5G is use case driven



Massive Machine Type Communication



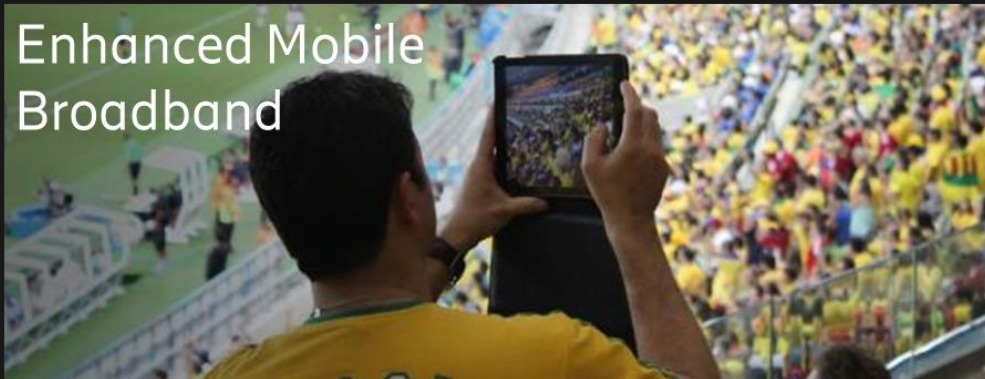
Low cost, low energy, small data volumes, massive numbers

Critical Machine Type Communication



Ultra reliable, ultra low latency
Very high availability

Enhanced Mobile Broadband

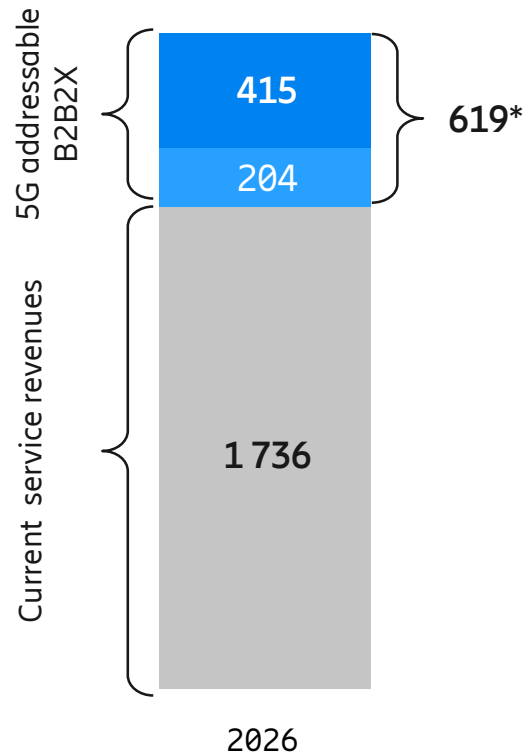


Fixed Wireless Access



5G revenue potential for operators addressing industry digitalization

USDbn, 2026

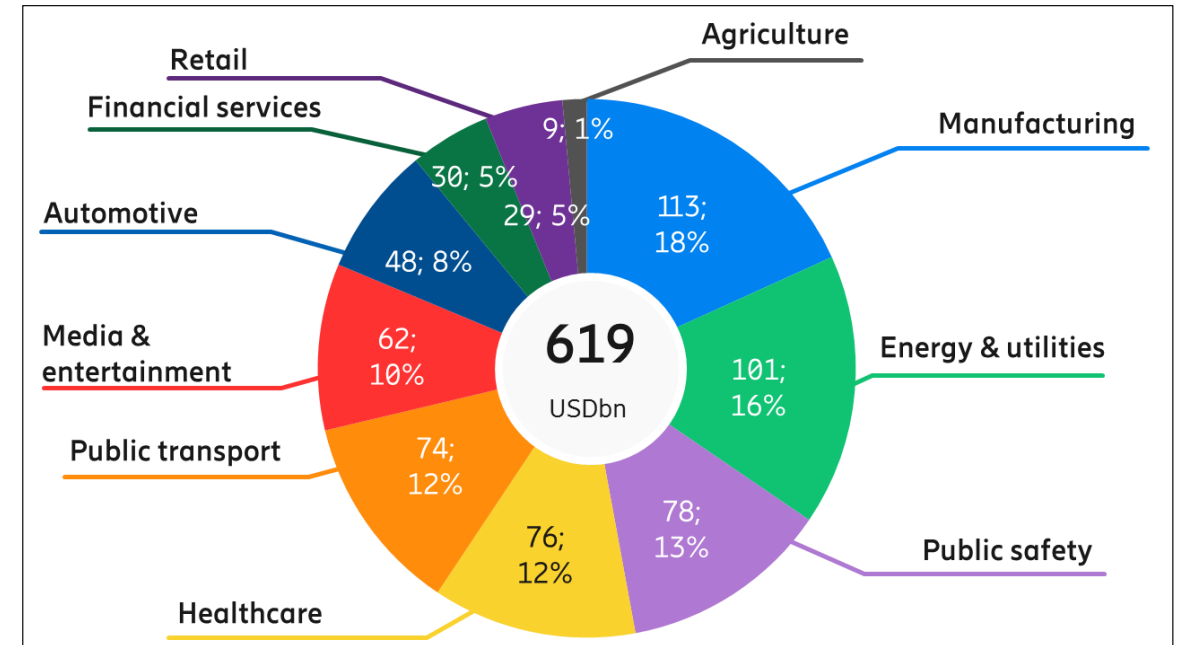


Adding an addressable

36%

revenue growth potential

- Service enabler and service creator revenue potential
- Network developer revenue potential



*Total addressable as Service creator operator role

5G-IoT use case clusters



+200 use cases in 10 industries

Automotive	Media & Entertainment	Public transport	Healthcare	Financial services
Agriculture	Retail	Energy and utilities	Public safety	Manufacturing

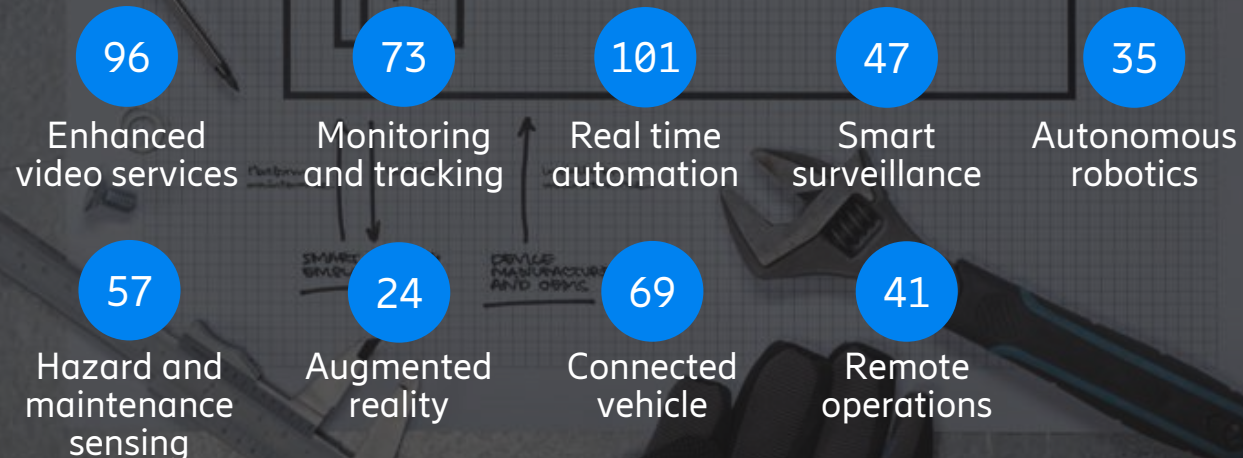
Application based cluster methodology

Go-to-market challenges

- Business and monetization model
- Value chain positioning
- Role in ecosystem
- Partnership development

Deployment challenges

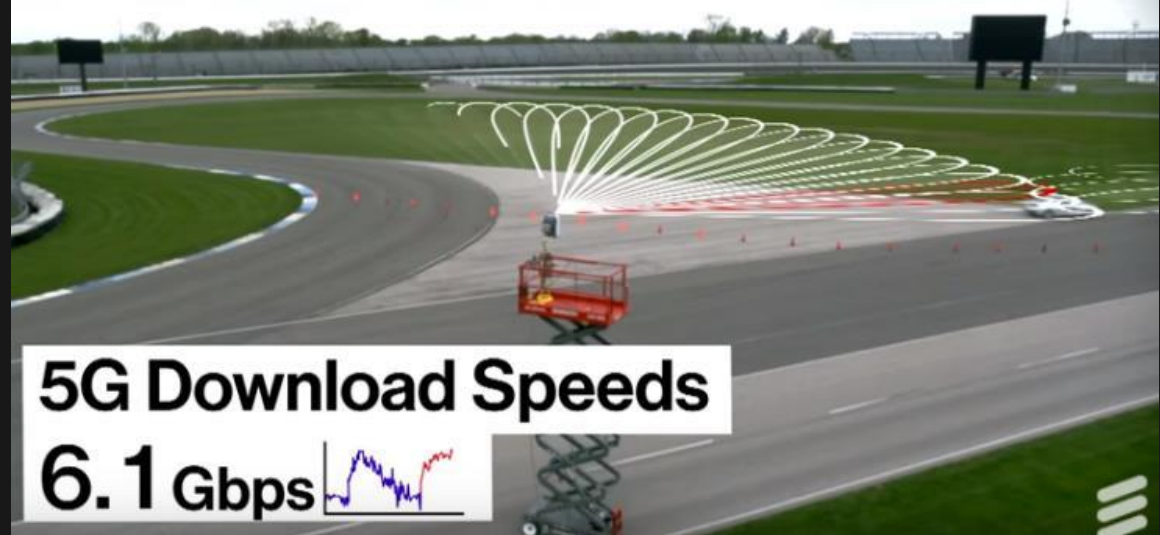
- Technical performance criteria
- Enterprise networks/Indoor
- Device, network, computing and service enablers



To grow with up to 36% operators can address 9 use case clusters



5g remote driving in USA with VERIZON



Artificial Intelligence with 5G in UK jointly with King's College



1ST 5G DEPLOYED NETWORK TESTBED IN LONDON
IN JANUARY 2018 – COMMERCIAL IN 2019

Bringing Ideas to Life



How 5G will transform the way we learn new skills

Master Musician records music movements
in the Cloud Other Musicians can
contribute



A children student can download Music movements
to accelerate learning





VIVO
CNN
CHILE

DEMOSTRACIÓN DE TELEMEDICINA EN RED 5G
Prueba se realizó en un consultorio de la comuna de La Granja

CNN EE.UU. sumó mil militares a sus tropas instaladas en Medio Oriente **12:42**

Ericsson Internal | 2018-02-21

Primer demostración 5G en Industria 4.0 & Minería con Red Comercial de Chile con tecnologías de ABB, ENTEL, ERICSSON

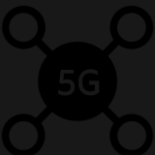


Santiago, Miércoles 31 de Julio 2019



Bandas LTE ENTEL
700Mhz / 1900Mhz / 2600

New Radio NR5G ERICSSON
Bandas 5G de 3,5Ghz



5G Non Stand Alone (NSA)
Mobile Broadband +
Baja Latencia +
Alto Throughput+

Variador de Potencia de Cintas
Transportadoras de Minerales

ABB University - calle Vicuña Mckenna 1602- Ñuñoa



Evento ABB Casa Piedra Sala Manquehue

Data Center **entel**



5G Core de Telecomunicaciones
Ericsson Evolved Packet Core 5G & 4G
VEPC en ENTEL CDIV

18kms

Brazo Robótico

INACAP Universidad - Santiago Sur



Router 5G Wistron WNC
Chipset Qualcomm

5G Router + Notebook para
manipular y contrlora
Variador Minero y Robot





AR
windshield



5G in car
entertainment



See through
cars with 5G



VR cinema



Best seat
experience



Diorama



augmented
events



VR cloud
gaming



AR maps



AR/VR
learning



Gigabytes in
seconds



5G hot zones



Home sensor
service



Connected
robot



5G TV



Personalized
5G
entertainment



Virtual
shopping



Drone
delivery

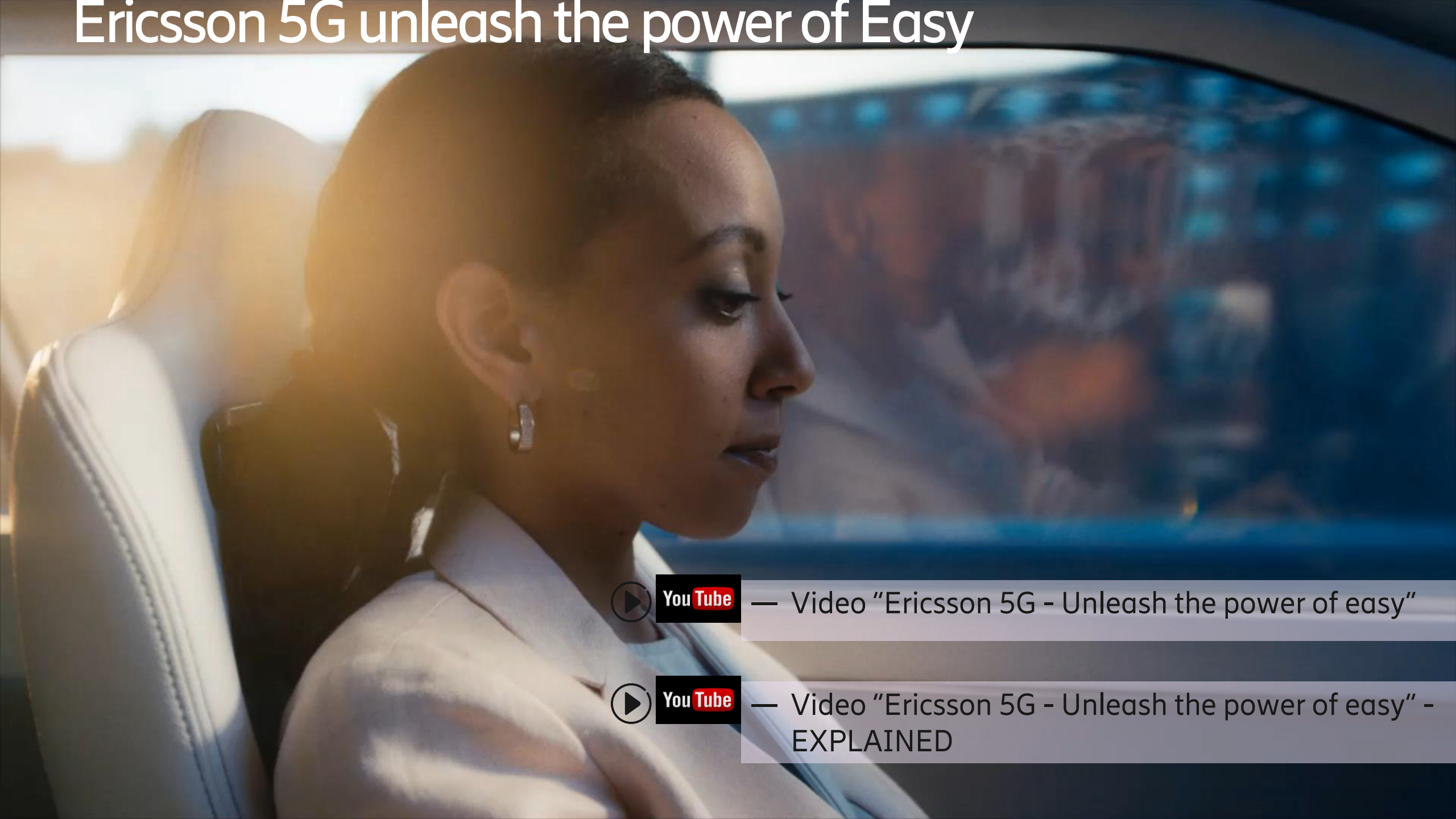


Real time
translations



3D hologram
calling

Ericsson 5G unleash the power of Easy



You Tube

— Video "Ericsson 5G - Unleash the power of easy"



You Tube

— Video "Ericsson 5G - Unleash the power of easy" -
EXPLAINED



5G evolving the way we interact with Things

Examples of use case evolution and supporting network technologies

	Current services	On the road to 5G	5G experiences
 Enhanced mobile broadband	Browsing, social media, music, video	Fixed Wireless Access, interactive live concerts and sport events	4K/8K videos, mobile AR/VR gaming, immersive media
 Automotive	Wi-Fi hotspots, on-demand GPS map data	Predictive vehicle maintenance, capturing real-time sensor data for different services	Autonomous vehicle control, cooperative collision avoidance, vulnerable road user discovery
 Manufacturing	Connected goods, intra-inter enterprise communication	Process automation and flow management, remote supervision and control of machines and materials	Remote control of robots, augmented reality support in training, maintenance, construction, repair
 Energy and utilities	Smart metering, dynamic and bidirectional grid	Distributed energy resource management, distribution automation	Control of edge-of-grid generation, virtual power plant, real-time load balancing
 Healthcare	Remote patient monitoring, connected ambulance, electronic health records	Telesurgery, augmented reality aiding medical treatment	Precision medicine, remote robotic surgery
 Network technologies	> Multi-standard network > Cat-M1/NB-IoT > Cloud optimized network functions > VNF orchestration	> Gigabit LTE > Massive MIMO > Network slicing > Dynamic service orchestration > Predictive analytics	> New Radio (NR) > Virtualized RAN > Federated network slicing > Distributed cloud > Real-time machine learning/AI

Source: Ericsson Mobility Report November 2016

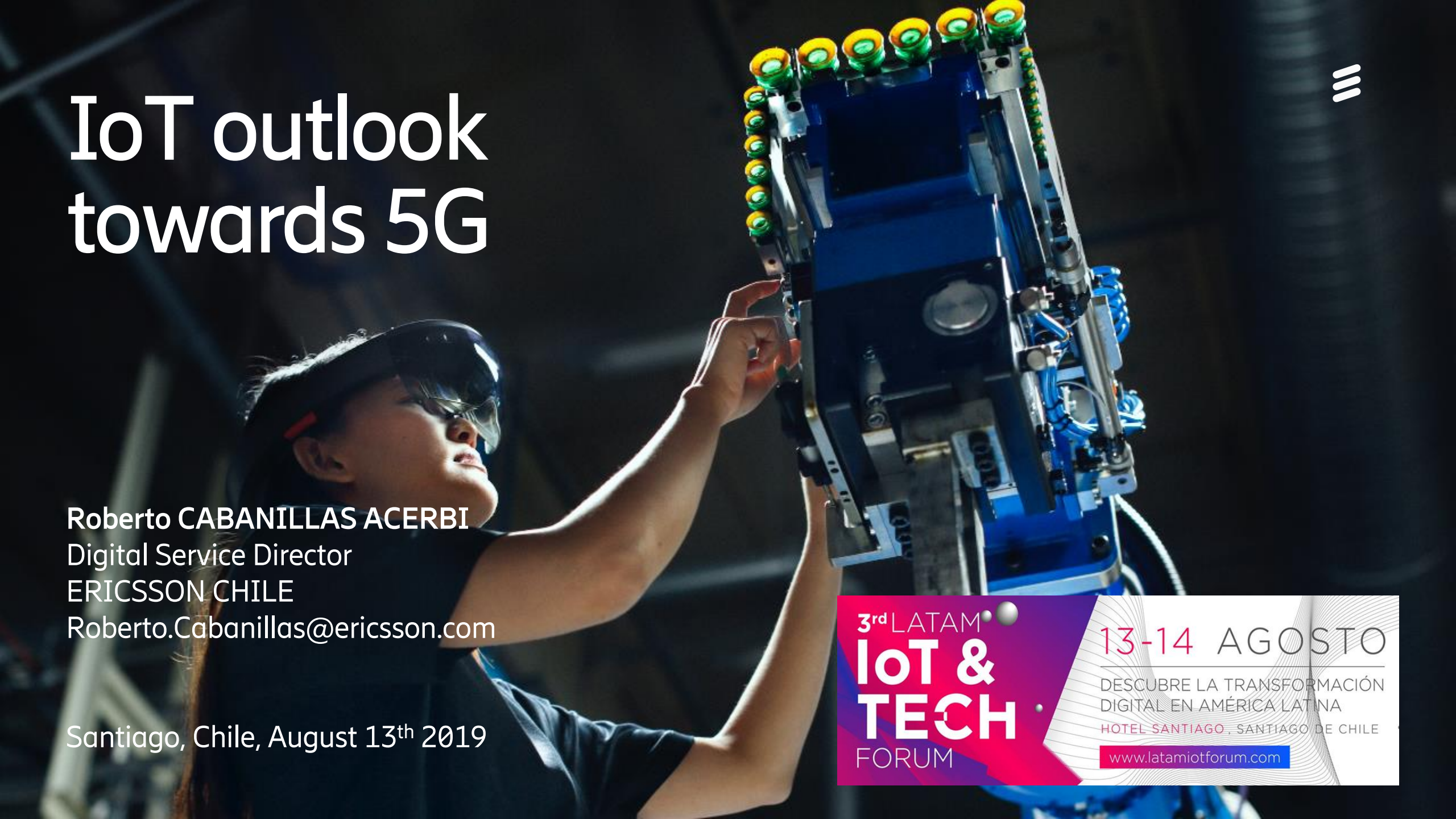
IoE- Internet of Everything

Things+People+Process to Monetize for a Better Society

IoT outlook towards 5G

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