XVI MEĐUNARODNA KONFERENCIJA
„Regulatorna djelatnost u sektoru elektronskih komunikacija“
„RAZVOJ REGULATORNOG OKVIRA ZA DIGITALNU BUDUĆNOST“

5G for the future economy: Opportunities and Challenges

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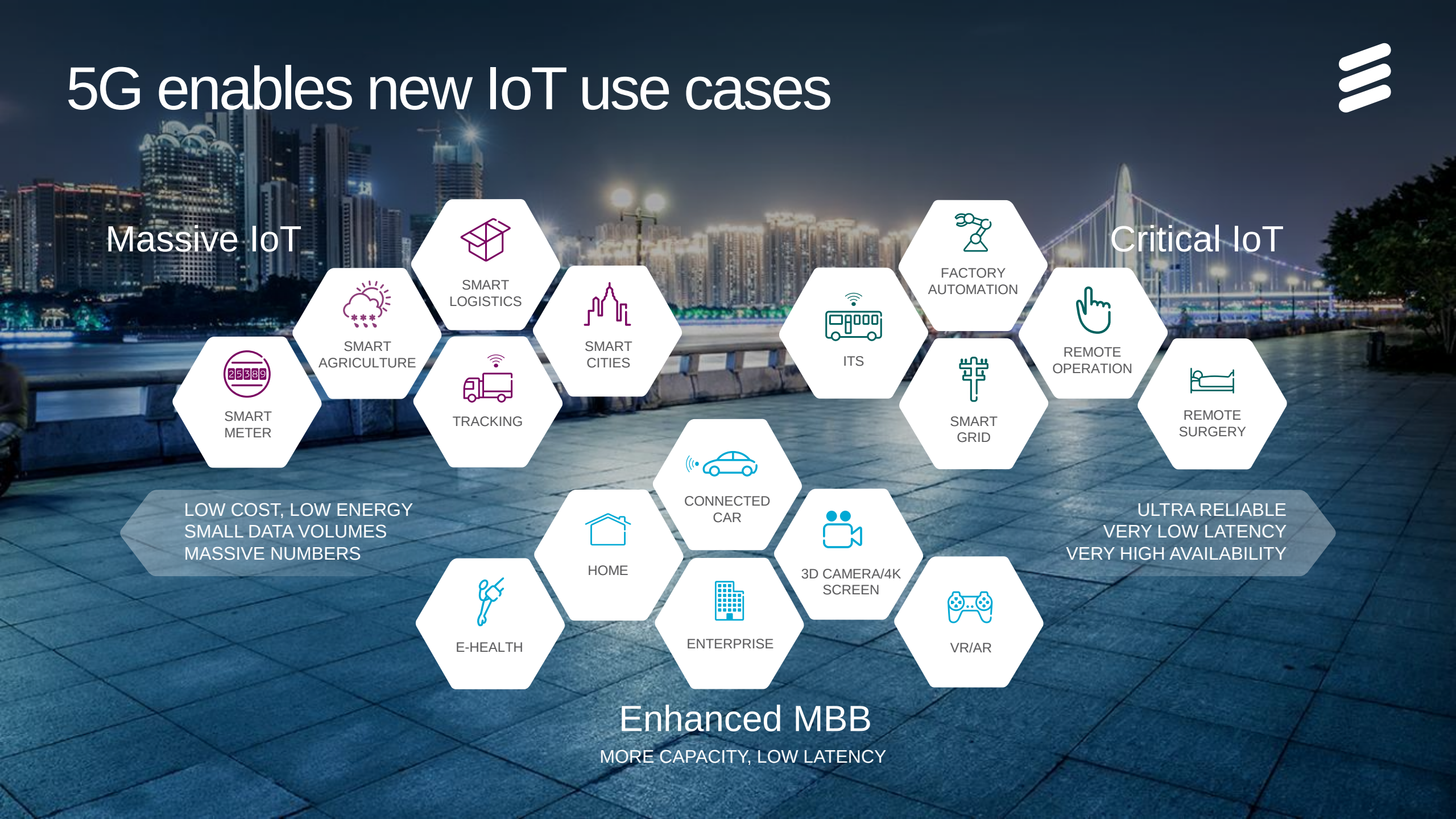
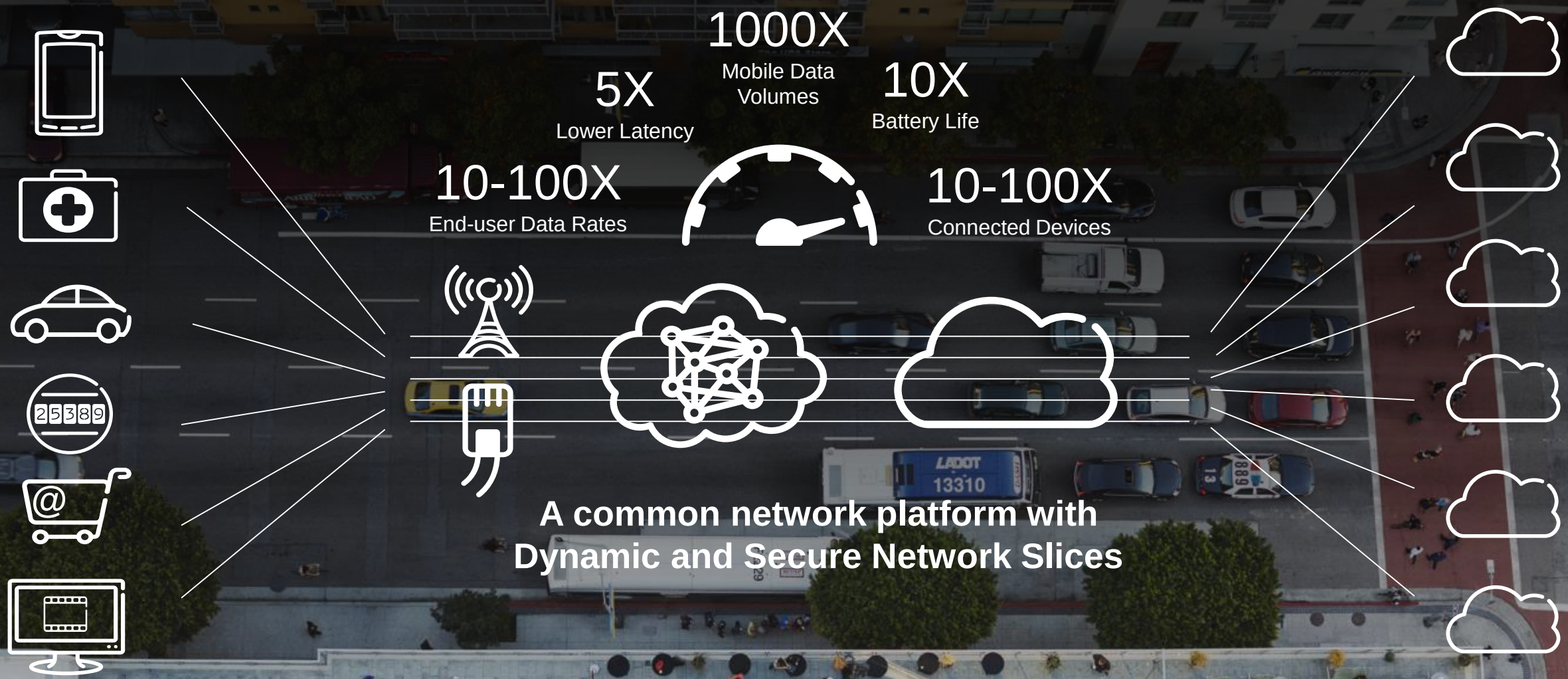
5G enables new IoT use cases

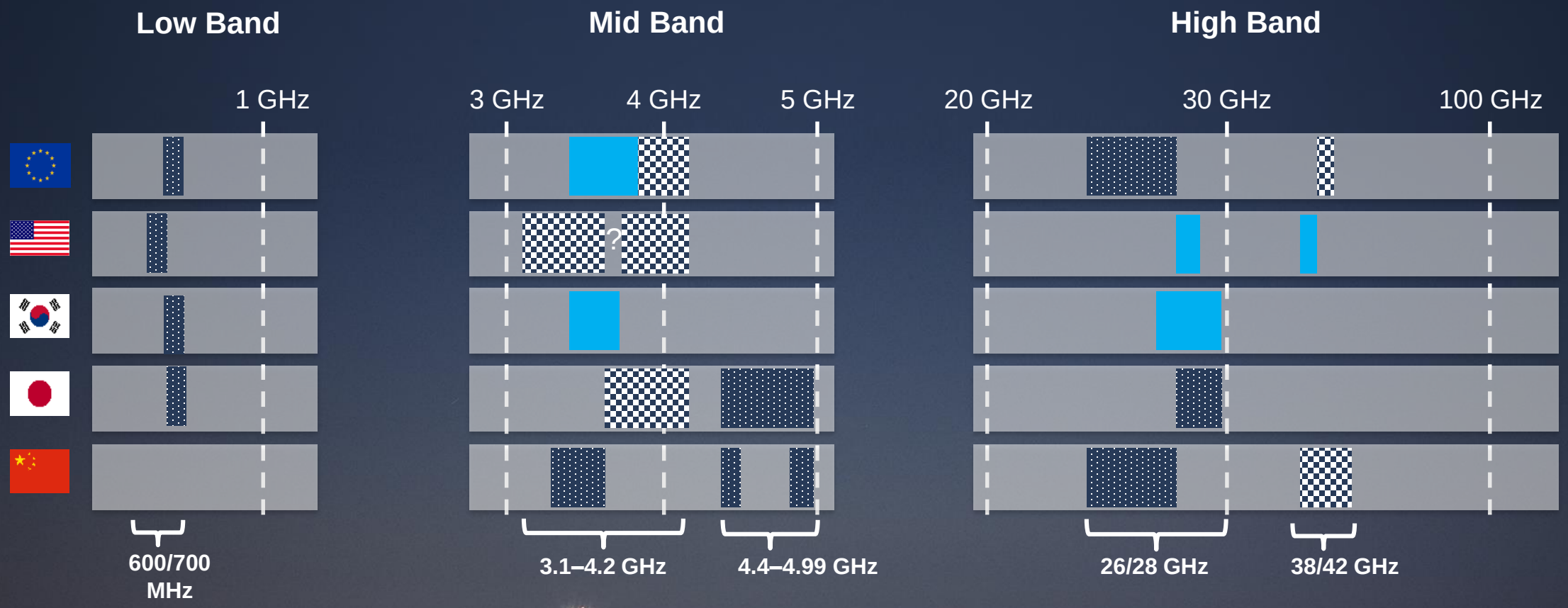


One Network, Multiple Industries



A common network platform with Dynamic and Secure Network Slices

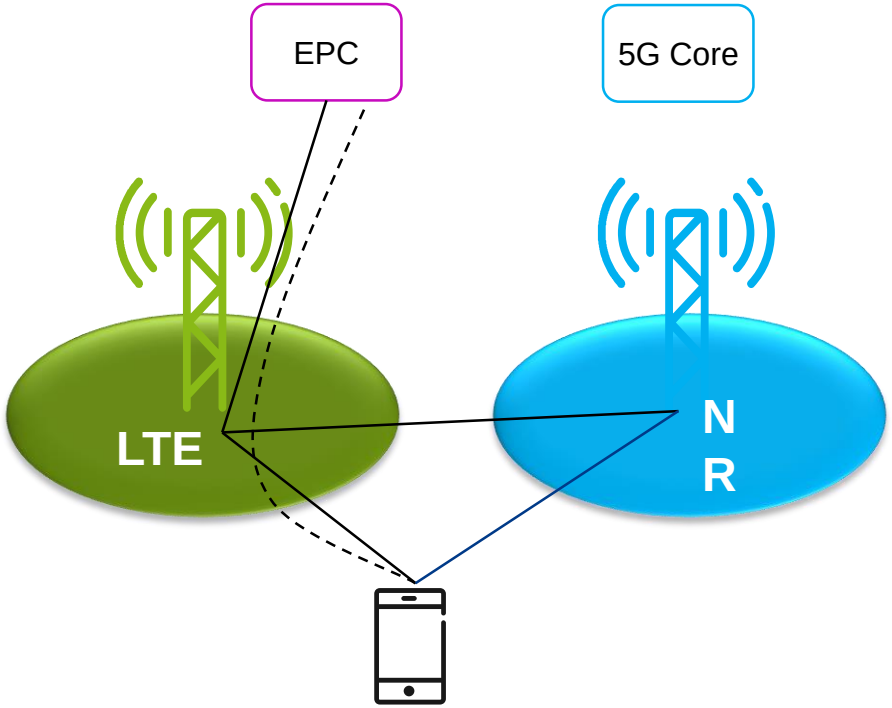
Global 5G Spectrum Situation



3GPP 5G Standards

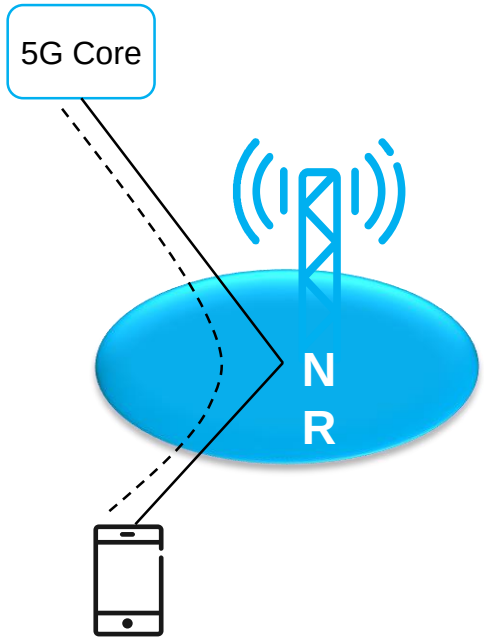
Non-standalone NR

- MBB & low latency & high reliability
- Connected to Evolved Packet Core
- Standardization completed : December 2017



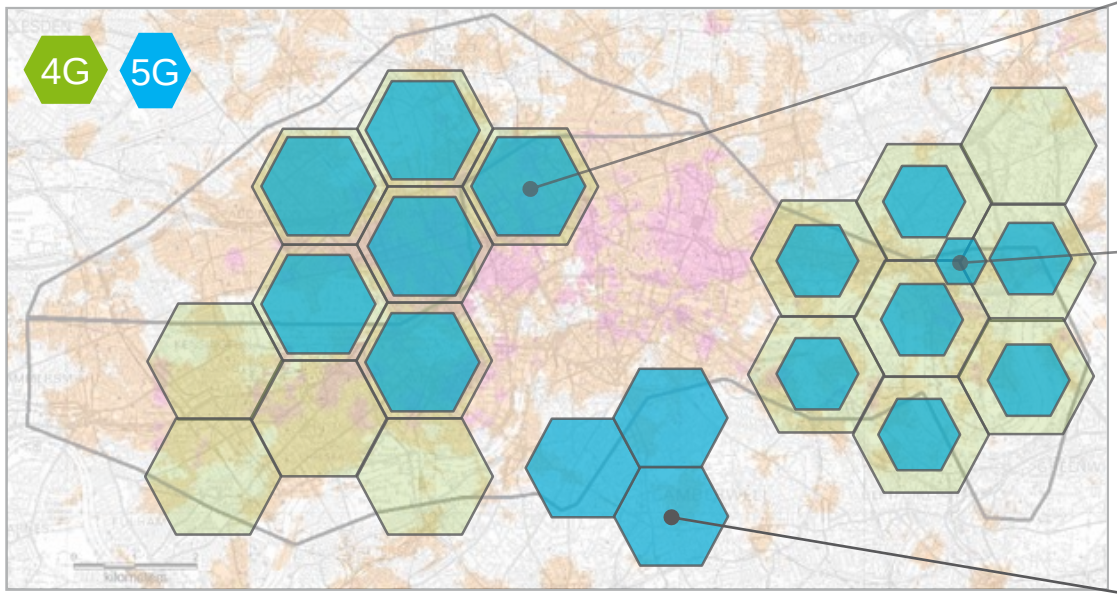
Standalone NR

- MBB & low latency & ultra reliability
- Connected to 5G Core Network
- Standardization completed : June 2018



Deployment scenarios for 5G

5G is expected to be deployed along the existing network infrastructure as well as standalone deployments based on different use cases. Illustration of how different frequencies and technologies can determine site deployment characteristics.



Non-Standalone 5G

4G and 5G in mid-low bands, same coverage area
Both technologies share the same radio site, connected to the existing Core network
Example of use cases: eMBB, FWA in wide areas

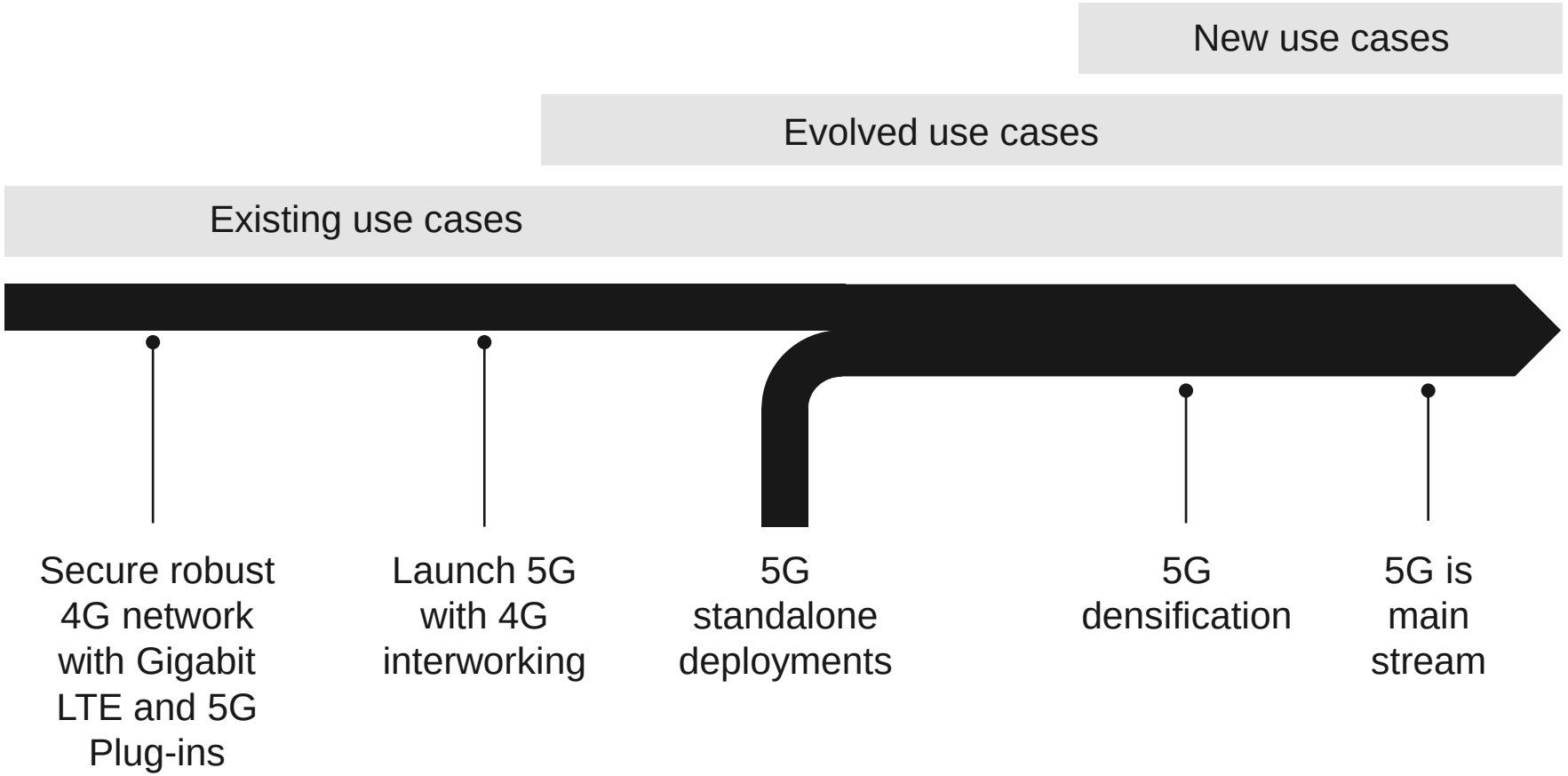
Non-Standalone 5G

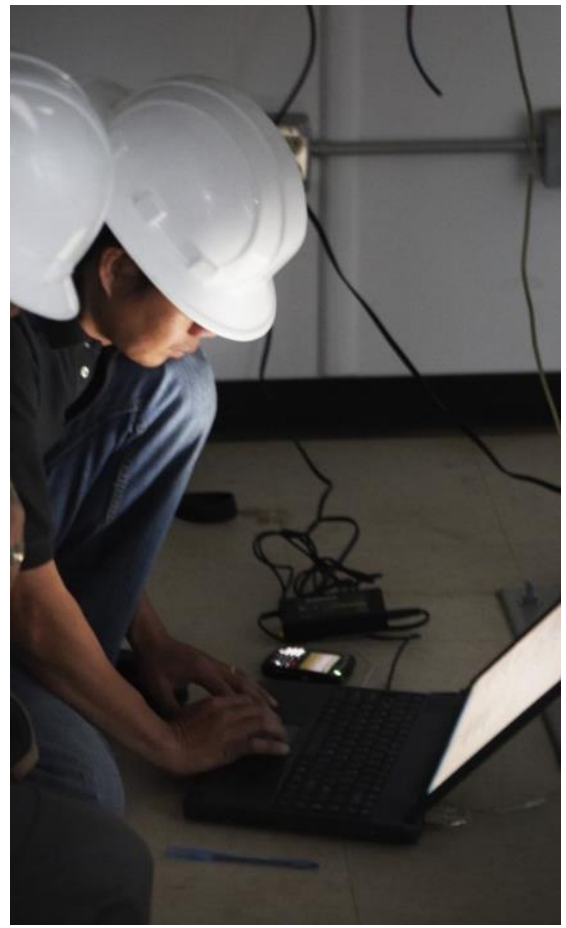
4G in low bands and 5G in high-bands, different coverage areas
5G radios may be deployed in new site as needed, both technologies are connected to the existing Core network
Example of use cases: eMBB, FWA in selected areas

Standalone 5G

Initial 5G deployments in low bands, benefit from larger coverage areas
New 5G radio sites, connected to the new 5G Core
Example of use cases: eMBB, FWA, private network, Industrial IoT

5G Journey


New use cases
Evolved use cases
Existing use cases
Secure robust 4G network with Gigabit LTE and 5G Plug-ins
Launch 5G with 4G interworking
5G standalone deployments
5G densification
5G is main stream



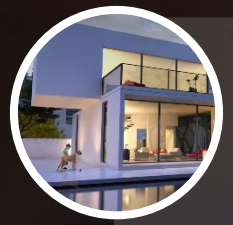
Technical expectations of 5G

Peak Data Rate	1 - 20 Gbps
User Experienced Data Rate	10 - 100 Mbps
Spectral Efficiency	×1 - ×3
Mobility	350 - 500 km/h
Latency	1 - 10 ms
Connection Density	10k - 1m devices / km^2
Network Energy Efficiency	×1 - ×100
Area Traffic Capacity	0.1 - 10 Mbps / m^2
Availability	99.999% (of time)
Battery life	10 years*
Reliability	99.999% (of packets)
Position accuracy	10m - <1m
Security	Strong subscriber authentication, user privacy and network security

*For low power IoT devices

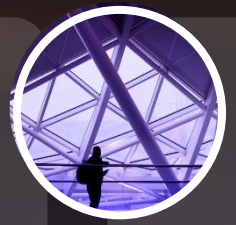
Source: ITU-R, NGMN, 3GPP

Potential use cases



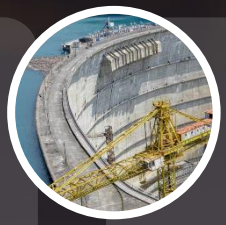
SMART HOME

- Building Automation & Security
  - Alarm Monitoring
  - Lighting/Heating Control



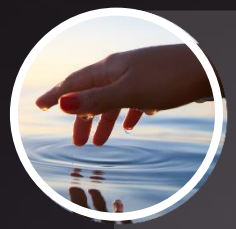
SMART BUILDING

- Building Automation & Security
  - Security/Fire Alarms
  - Lighting/HAVC Control
  - Connected Elevators



INDUSTRY

- Smart Agriculture
- Connected Supply Chain
- Construction Equipment Monitoring
- Manufacture & Processing

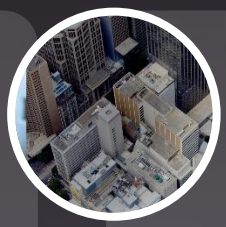


CONNECTED HEALTH

- Assisted Living
- Clinical Remote Monitoring

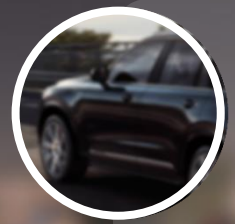
ENERGY & UTILITIES

- Smart Metering
- Connected Microgeneration



SMART CITY

- Connected Public Services
- Road Traffic Management
- Environmental Monitoring



CONNECTED CAR

- Stolen Vehicle Recovery
- Usage Based Insurance

CONSUMER ELECTRONICS

- Pet/Child/Asset Tracking

Source: Machina 2017

It is all about use case evolution with supporting technologies

	Current	On the road to 5G	5G experience
Enhanced mobile broadband	Screens everywhere	New tools	Immersive experience
Automotive	On demand information	Real-time information vehicle to vehicle	Autonomous control
Manufacturing	Process automation	Flow management and remote supervision	Cloud robotics and remote control
Energy & utilities	Metering and smart grid	Resource management and automation	Machine intelligence and real-time control
Healthcare	Connected doctors and patients	Monitoring and medication e-care	Remote operations
Technologies	Multi-standard network Cat-M1/NB-IoT Cloud optimized functions VNF orchestration	Gigabit LTE (TDD, FDD, LAA) Massive MIMO Network slicing Dynamic service orchestration Predictive analytics	5G NR Virtualized RAN Federated network Distributed cloud Real-time machine learning/AI

A new Ericsson survey on 5G

Primary Research

Based on phone interviews with C-Level and other executives during October and November 2017

10 Key industries

Energy & Utilities, Manufacturing, Public Safety, Healthcare, Public Transport, Media & Entertainment, Automotive, Financial, Retail & Agriculture.

Global Coverage

A global representation of respondents covering North America; Latin America; Asia Pacific; Europe; Middle East and Africa

Large companies

Approximately 100 interviews for each of the 10 industries covered, representing large companies with a minimum of 1 000 employees

Global business insights, Industry adoption of 5G by 10 industries

¾

expect their industry and own company to leverage 5G to improve offerings AND cost

73%

have a strategy to leverage first mover advantages.

70%

expect their first 5G use case to be in production by 2021

5

5G capabilities carrying tied to premium values across industries

>50%

Expect to be in trials for their first use case in 2019

Insights

The industry impact of 5G, January 2018

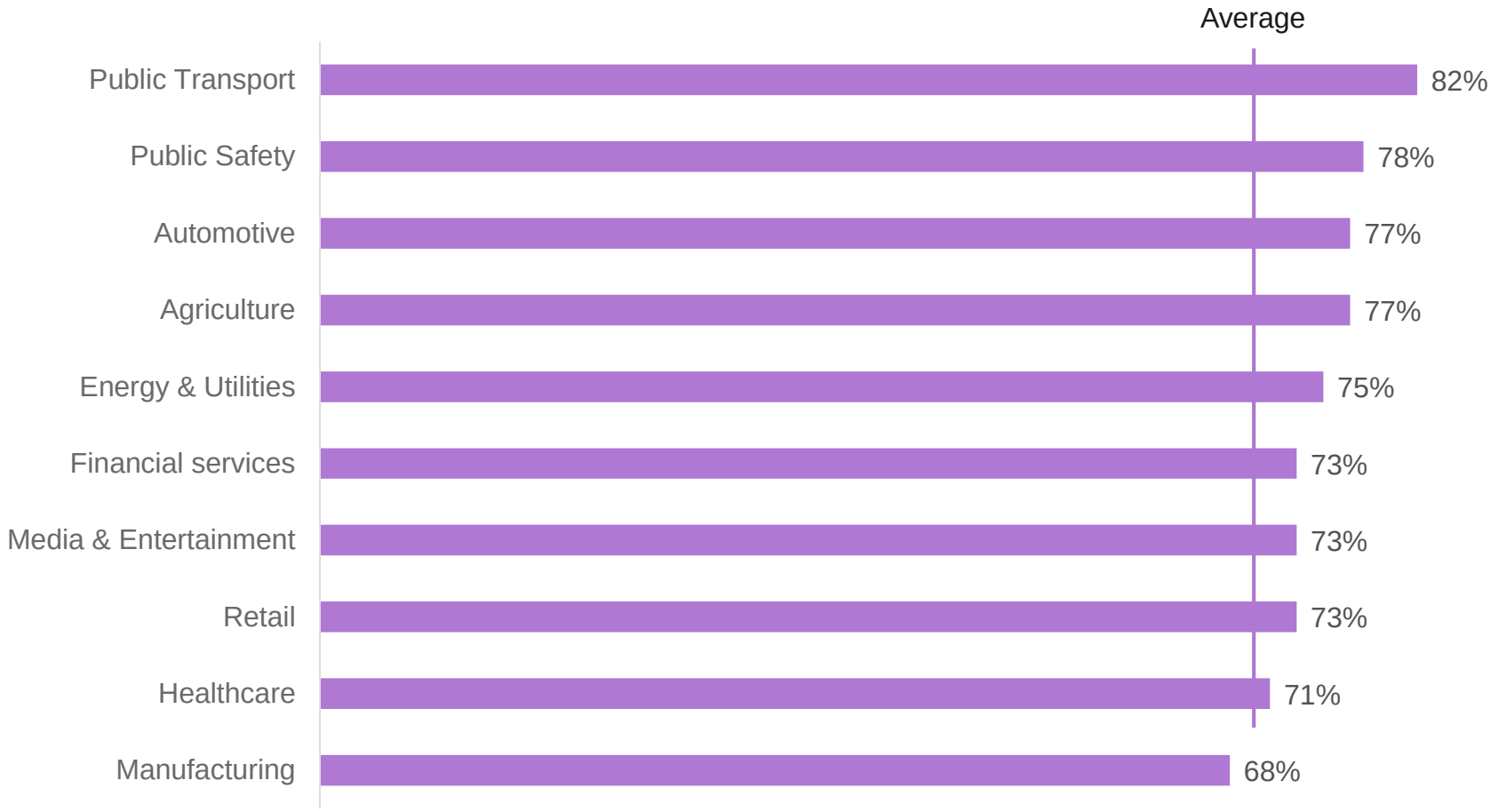
Operator implications

— Large pent-up demand from industries eager to leverage 5G trials already in 2019

— First mover advantage ambitions will make TTM critical

— 5G price premium for crucial attributes

Top-4 use cases in production by 2021, by industry sector



On average, over

70%

of companies aim to have use cases in production by 2021

Source: The industry impact of 5G - Insights from 10 sectors into the role of 5G, Ericsson, January 2018

6 major findings in our survey

Capability driven focus

Industry reasons to move

Known adoption barriers

Top-4 Use cases

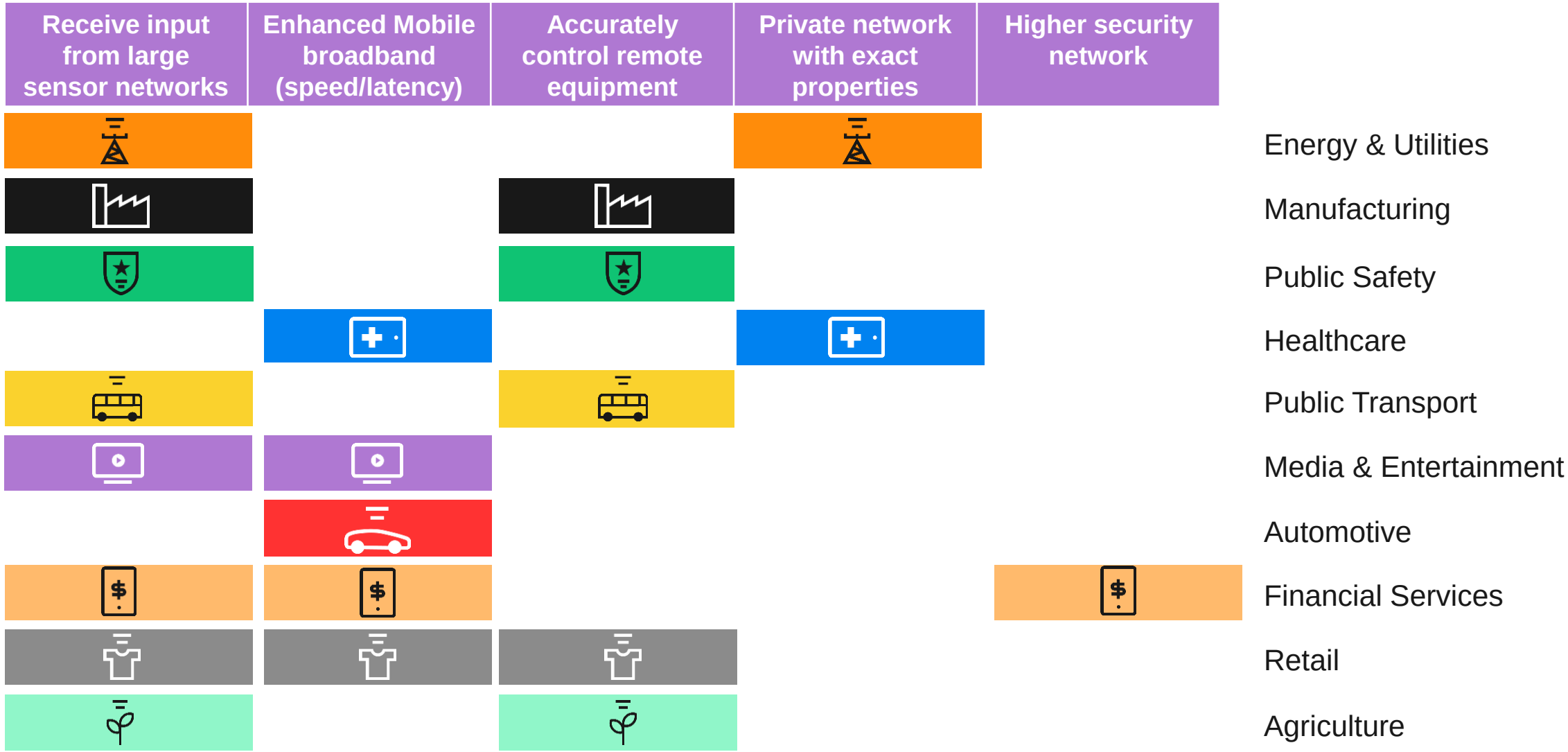
Identified for each industry, together with main pain points and timing for trials and production services

Trial & production timing

Customer value & Efficiency

Premium price potential

5 network capabilities in focus



Source: The industry impact of 5G - Insights from 10 sectors into the role of 5G, Ericsson, January 2018

Reasons for taking next step to 5G, strategic point of view

Major strategies

1. Create a first mover advantage
2. Position yourself as an industry innovator
3. Leverage digital disruption enablers
4. Build a solid base for IoT

73%
First Mover Advantage

54%
To be seen as an innovator

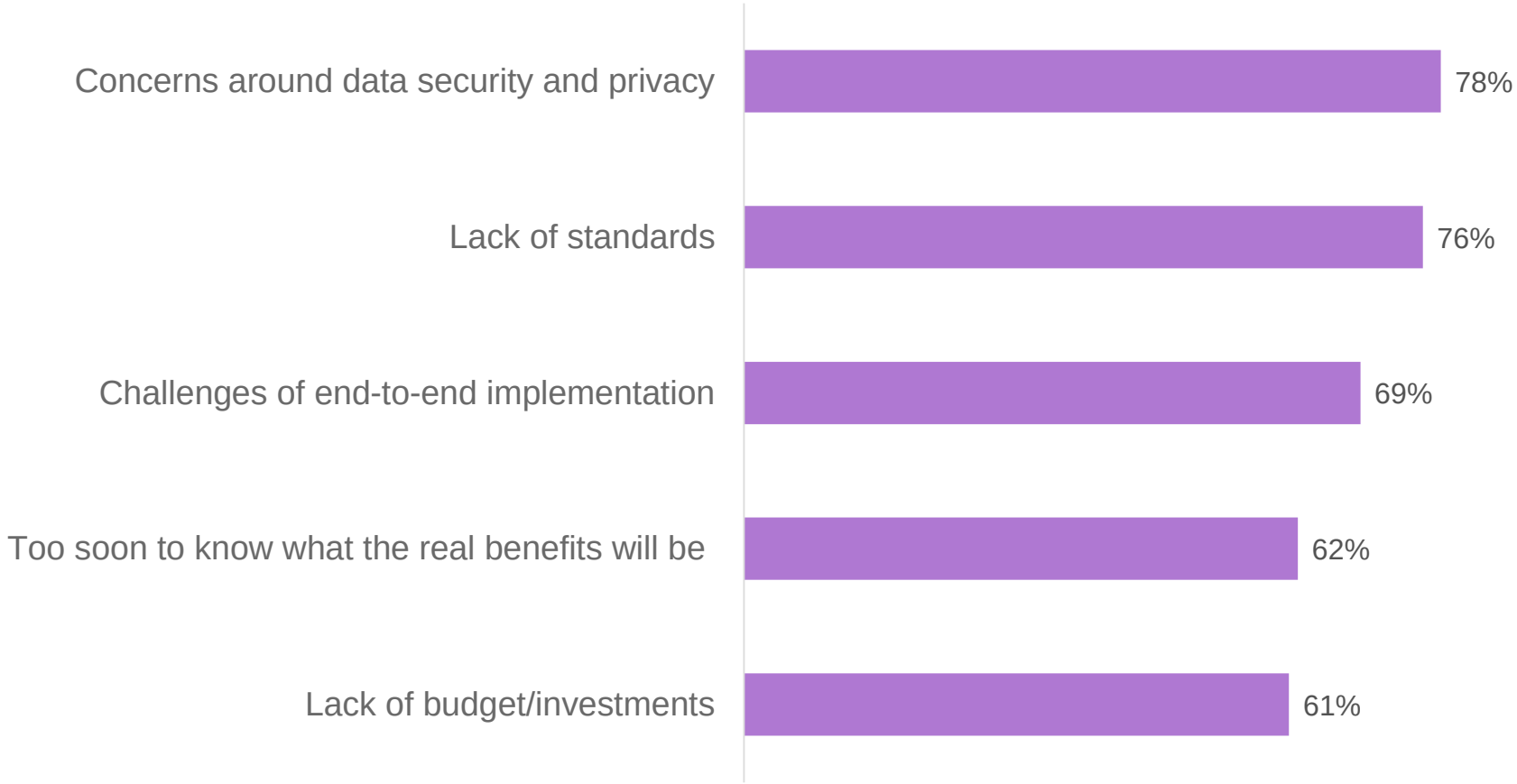
53%
Critical to Digital Transformation

46%
Fundamental to IoT projects

TTM
expected remain strong driver for strategic agendas. Both for initial explorations and full fledged service launches

Source: The industry impact of 5G - Insights from 10 sectors into the role of 5G, Ericsson, January 2018

Key barriers to adoption of 5G
Top-5 this year

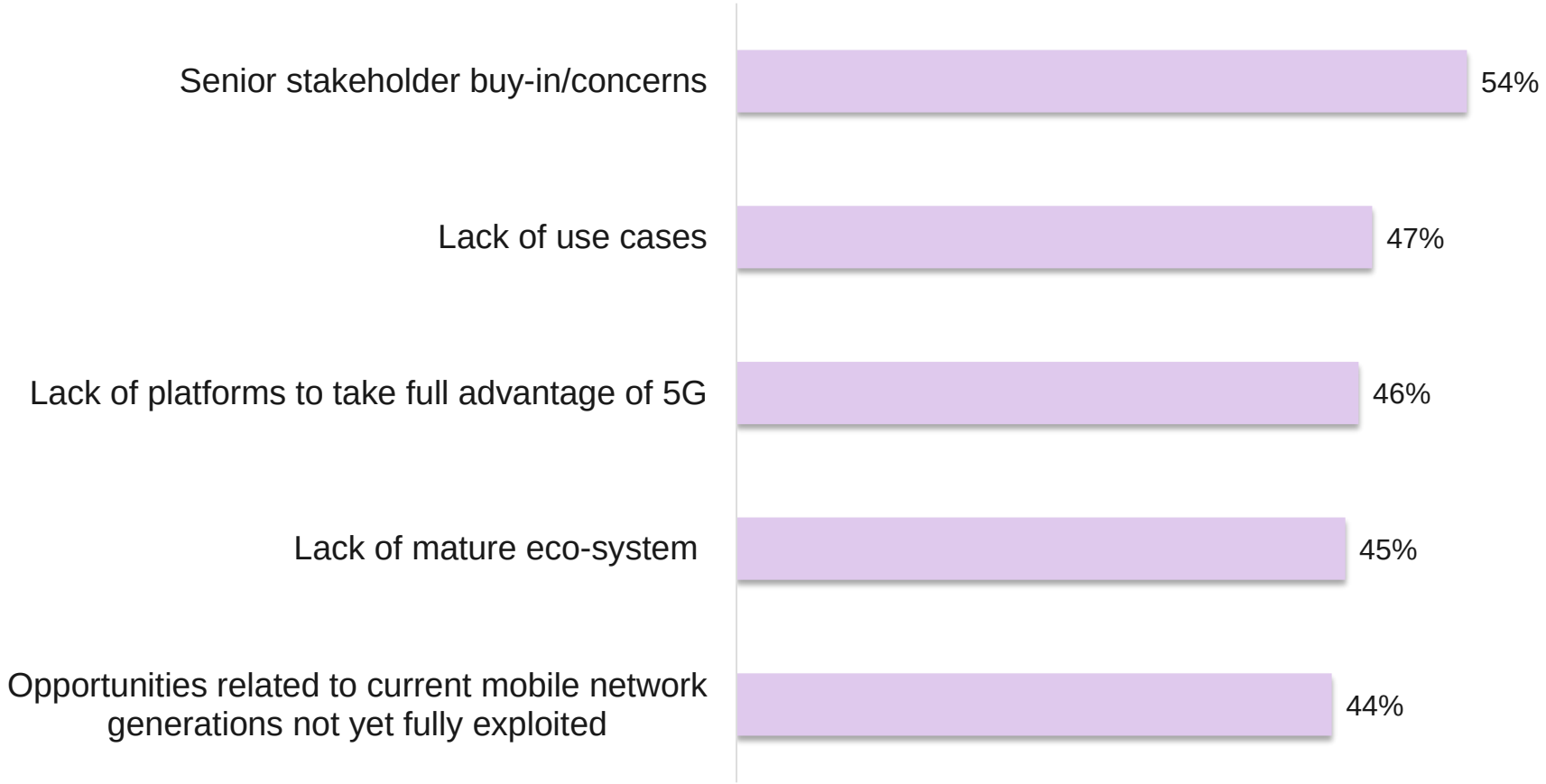


2018

the accelerated industry momentum put spotlight on outstanding issues

Source: The industry impact of 5G - Insights from 10 sectors into the role of 5G, Ericsson, January 2018

Key barriers to adoption of 5G Additional in Top-10



3 of 5

issues have seen drops from the 2016 survey indicating issues outside Top-5 has progressed well in 2017

Source: The industry impact of 5G - Insights from 10 sectors into the role of 5G, Ericsson, January 2018

Digital Engagement & Experiences

Legal & Regulatory Reflections

- "Implicit Consent / Knowing Consent / Quality Consent" - Whether it's been collected legally from individuals who have knowingly provided consent understand the implications of consent or has the owner essentially surrendered control of data in lieu for services provided
- "Transparency, Choice & Control" - Can obtain details of the data that the controller holds about them. And consumer must be able to withdraw consent previously given and to object to the processing of data relating to them
- "Purpose Limitation" - Data can only be collected for specified, explicit and legitimate purposes. These purposes must be defined before processing
- "Repurposed Data" - Knowledgeable consent to the primary requestor does not automatically imply consent for use of the data by third parties for reasons beyond those originally explained
- "Data Controller Transparency" – Identity of the controller, the purposes of the processing, the recipients of the data and the existence of data users rights.
- "Fair Collection & Usage" - The individual should be aware data is collected and how it is going to be used

New Revenue, Business Model & Ecosystem

Legal & Regulatory Reflections

- “Product Liability" – How to establish liability in a complex interconnected value chain involving multi party services & responsibilities with interdependencies for performance and security
- “Data Ownership" – Who owns what data ? Establishing clear boundaries for data ownership, restricted use data licensing and address information asymmetry on contracted performance
- “Industry Vertical Regulations & Standards" – Application of relevant industry vertical rules & regulations, consumer protection / safety standards / rights
- “Intellectual Property & Copyright" – Protection of IPR in a platform economy; With multi component IoT solutions involving systems integration of multiple components, handling issues of patent infringement & indemnification
- “Cybersecurity in a Platform Economy” – Roles and responsibilities for cybersecurity management by different players in a complex digital value chain encompassing hardware, software and services
- "Baking Security & Privacy In Contract" - Ensure service creation and innovation does not expose their customers to more risk than is necessary

IaaS / PaaS / SaaS / Public Cloud

Legal & Regulatory Reflections

- “Personal Data Protection" – What data can be put on the public cloud ? Issues of data controller & processors, involvement of ‘sub’ parties, legalities around data transfers, applicable law & competent court

- “Cloud Contracting" – Remember cloud is low barrier entry but can scale out very quickly

    1. Small contract, big liability
    2. Liability of hosting provider not in line with risk
    3. Exclusions related to service availability, service credits & other remedies for poor performance
    4. Direct, indirect, incidental, consequential damages for loss of profit & good will
    5. Vendor lock in issues - legal requirements for data export on cloud contract termination
    6. Unilateral termination possibility – Cloud provider often may reserve right to unilaterally terminate

- “Multi Party Contracting” - Multi parties increasingly involved with cloud brokerage & intermediaries in multi cloud setup. Establishing delineation of responsibility and E2E service levels

- “Auditing & Compliance” – Ability to audit cloud service provider, meeting compliance on data retention, taxation, electronic invoicing etc.

Big Data / Machine Learning & AI
Legal & Regulatory Reflections

- "Data Minimization" - Necessary data should not be collected, stored “just in case” or because “it might be useful later”. Personal data from a user should be deleted as soon as the user ends the subscription
- "Sensitive Data Handling" - Some classes of data more sensitive than others. E.g. individual’s health
- Lost Anonymity - Multi Source Aggregation / Single Source High Volume Data" – Data from different sources about an individual increase in voluminous, remaining anonymous becomes increasingly difficult
- "Control Loss" - Where device connectedness results in personal data generation, storage and communication over which the user has no control.
- "Economic Interest" - Ruling on Google Spain established that economic interest itself is not sufficient grounds for legitimization of data collection & processing
- “Emerging Issues – ML & AI” – Training data set quality for ML, ethical & fair application of AI, ML & AI Bias, AI black boxes vs decision reasoning

5G Deplyment Challenges

— Here are the things that need to be in place for 5G, things that are lacking today:

— **Regulatory conditions** – Harmful regulation such as net neutrality which is over interpreted, roam like at home, WiFi4EU, The European Electronic Communications Code, GDPR, e-privacy, and the litany of EU regulations which limit opportunities in 5G, particularly with small cells.

— **Value chain** – The Nordic region used to be the hotbed for mobile industry with research & development funded in large part by the telecom industry. When EU telecom investment dried up, so did the funding for R&D. Today 5G innovations is developed primarily in the US and Asia.

— **Business models** – 5G business models and monetization is still unclear to some extent. The uncertain regulatory environment reduces incentives for experimentation.

— **User adoption** – American consumers are already buying 5G products and services while the EU falls further behind on networks and innovation

— **Network expansion** – Here are two things that must be in place, access to the required frequencies and conditions that allow the mobile mast and small cells to form a 5G network. In Europe, there are many countries where they have not started the process to create the framework conditions to build and operate 5G networks.

— Thank you!