WIA Wireless
Infrastructure
Association

The Promise of 5G

Exploring the benefits and use cases of 5G

AGENDA

What is 5G?

5G Use Cases

Envisioning Robust 5G in South Africa

What is 5G?

Mobile Technology Generations

- Original analog cellular networks (1G) broad commercial adoption in 1980s

- 2G (second generation) digital cellular networks (1990s)

- 3G deployment begins during 2000s to incorporate voice *and data* communications

Mobile Technology Generations

- 4G increases in bandwidth speeds and network capacity (commercial deployment in 2010s)

- 5G further, major increases in network speed and capacity and ultra-low latency (as low as one millisecond, fiber-like reliability)

- 6G (under early development, likely 100x faster than 5G)

Projected Impact of 5G

- Predicted to power the digital economy, enabling up to US$13 trillion+ in global economic value by 2035

- Will expand mobile ecosystem to new industries and for new uses

Source: FN – May 2020 Qualcomm commissioned study by IHS Markit

Future of Mobile Generations

What are the driving forces behind the need for next generation of technology?
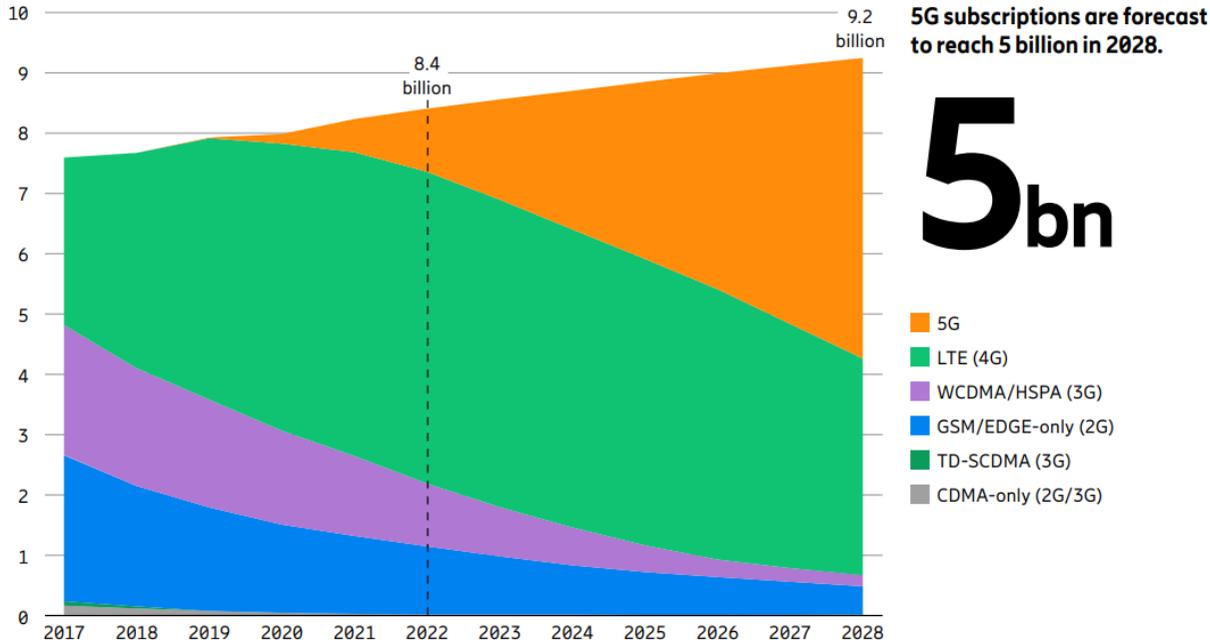
Source: Ericsson Mobility Report (2022)

- 1 billion 5G subscriptions by the end 2022.

- LTE subscriptions peaked in 2022 at 5.2 billion.

- LTE will decline to around 3.6 billion by the end of 2028 as subscribers migrate to 5G.

World Population Coverage by Technology

4G

2022	>85%
2028	>95%

5G

2022	>30%
2028	~85%
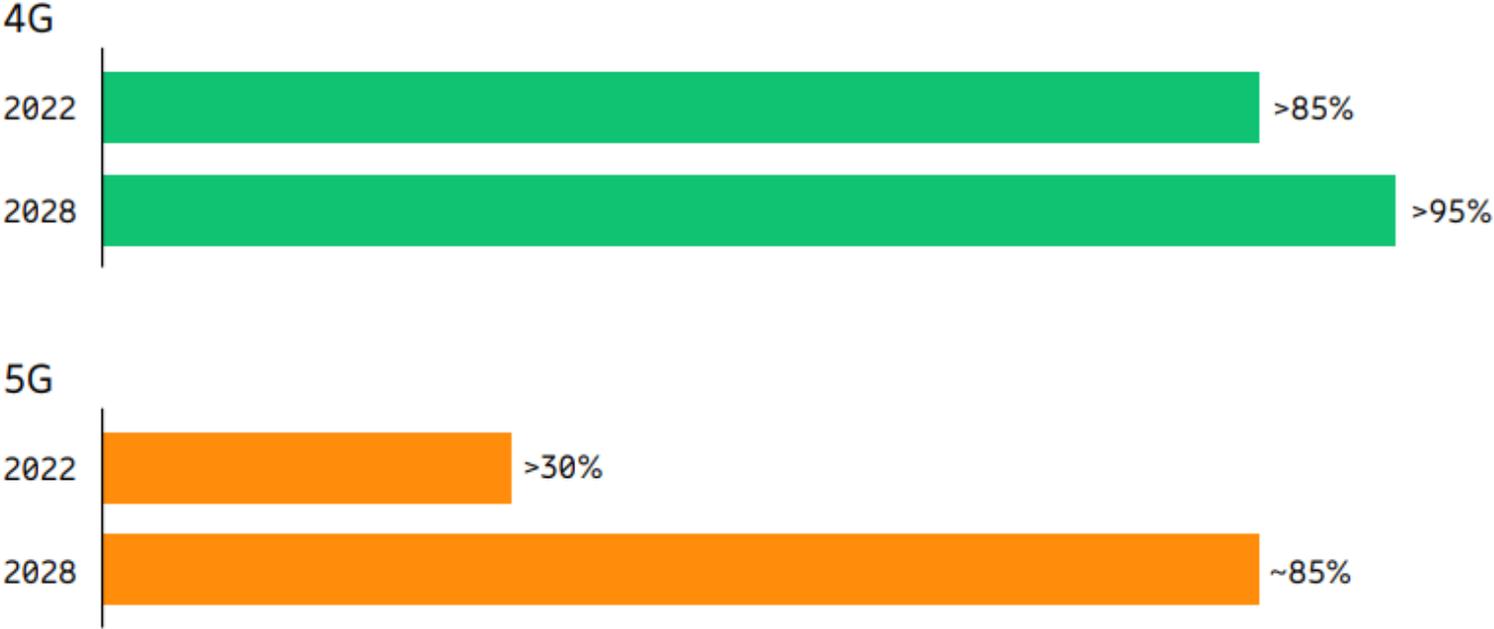
Source: Ericsson Mobility Report (2022)

5G Technology Change

- The push to bring next-generation wireless network technology was causing a lot of excitement and created some commotion across the telecom space in the last few years.

- By the end of 2028, 5 billion 5G subscriptions globally

- Questions remain:
  - What exactly constitutes a <u>generational technology change</u> beyond the marketing hype?
  - What is the business case for such a move?

Source: Ericsson Mobility 2022 Report

Current state of 5G

Is 5G standardized?
- Yes. But improvements will continue. 5G capabilities and features will continue to enhance → 5G Advanced

"5G is an end-to-end ecosystem to enable a fully mobile and connected society."

Next Generation Mobile Networks (NGMN)

This is NOT how 4G was created
- 4G was the natural evolution of air-interface technology (driven by technology upgrades).
- 5G is driven by use cases, business models, and value creation. Technology improvement is a side-product.

Birth of 5G:

Academia and Industry Research	Pre-Standardization Research	Standardization – ITU etc.	Trials and Initial Deployment	Commercial Deployment	Commercial Availability of 6G

2011   2014   2016   2018   2020   2022   2024   2026   2030

Current state of 5G

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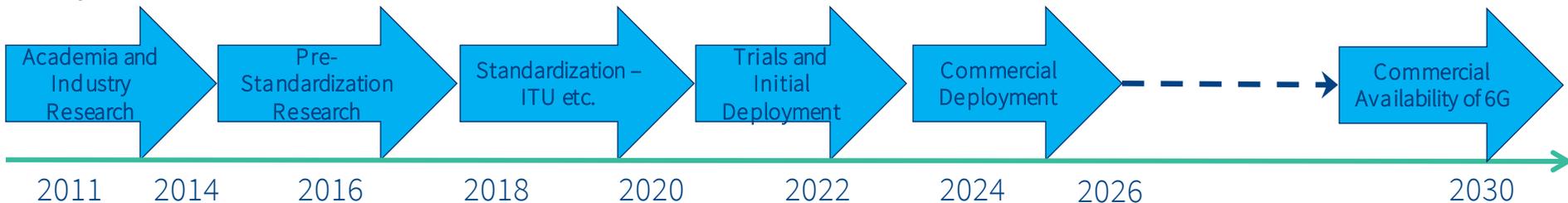- Yes. But improvements will continue. 5G capabilities and features will continue to enhance → 5G Advanced

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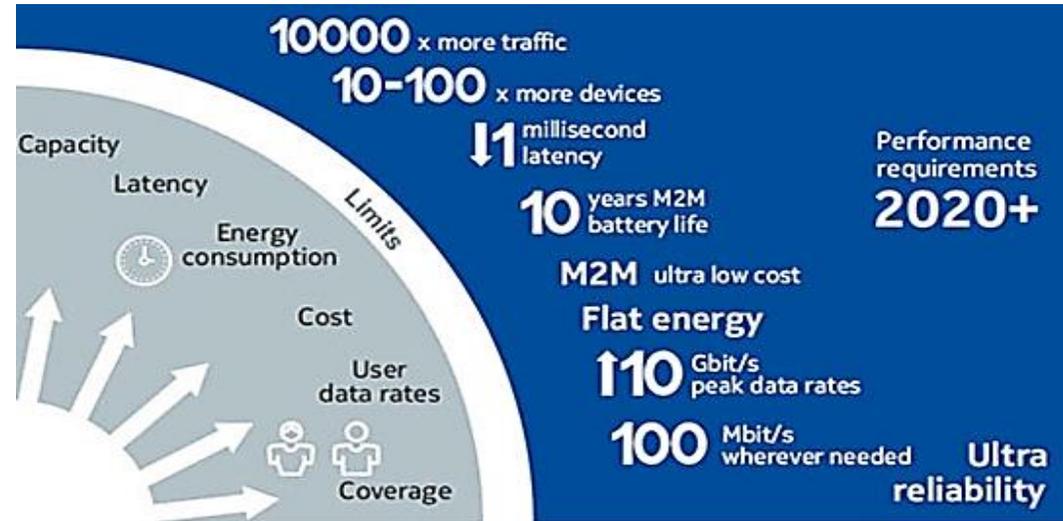
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Drivers for 5G Adoption

10000 x more traffic
10-100 x more devices
↓1 millisecond latency
10 years M2M battery life
M2M ultra low cost
Flat energy
↑10 Gbit/s peak data rates
100 Mbit/s wherever needed

Performance requirements 2020+

Ultra reliability

Capacity
Latency
Energy consumption
Cost
User data rates
Coverage
Limits

In 2017, Cost Per Bit Exceeds Revenues:
- Operators face cost-revenue convergence
- The cost of delivering data becomes greater than the revenues derived from doing so.

- Subscribers are **demanding more bandwidth** such as streaming video, augmented reality, peer-to-peer gaming, and other bandwidth-intensive services.

- Mobile network operators (MNOs) seeking new ways to profit from their networks. 5G opens up the capability to **offer new applications and services**.
  - A new generation of applications that are (or soon will be) in use, from the **Internet of Things (IoT) to self-driving cars to virtual reality**.

12

Image Source: Nokia Networks, 5G use cases and requirements

5G Speeds and Features
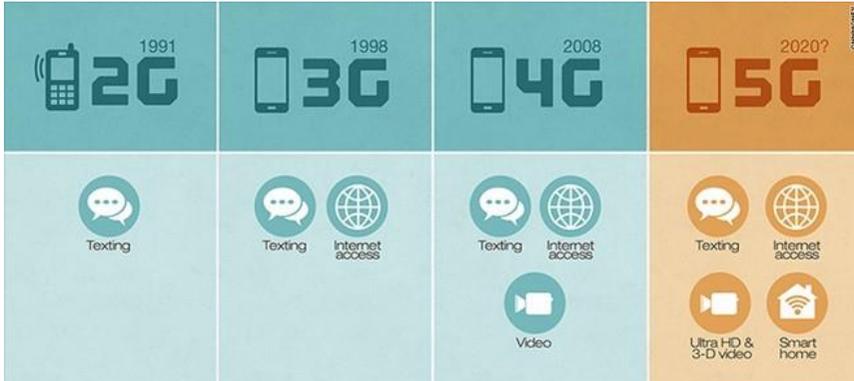
Evolution of supported features
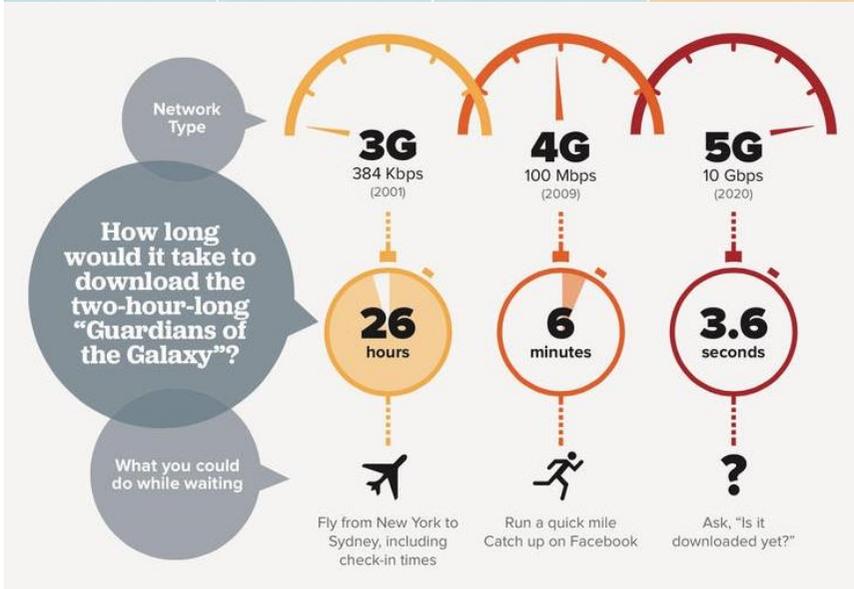
The real-world translation of "wireless fiber optics"

5G Use Cases

5G Use Cases

Three broad use cases that 5G wireless technology seeks to transform:

- Broadband Speed/Access
- Low Latency/High Reliability
- Machine-to-Machine Communication

Enhanced Mobile Broadband

Gigabytes In a Second

3D Video, UHD Screens

Smart Home Building

Work and Play in the Cloud

Augmented Reality

Voice

Industry Automation

Smart City

Mission Critical Applications

Self Driving Cars

Massive Machine Type Communications

Ultra-Reliable and Low Latency Communications
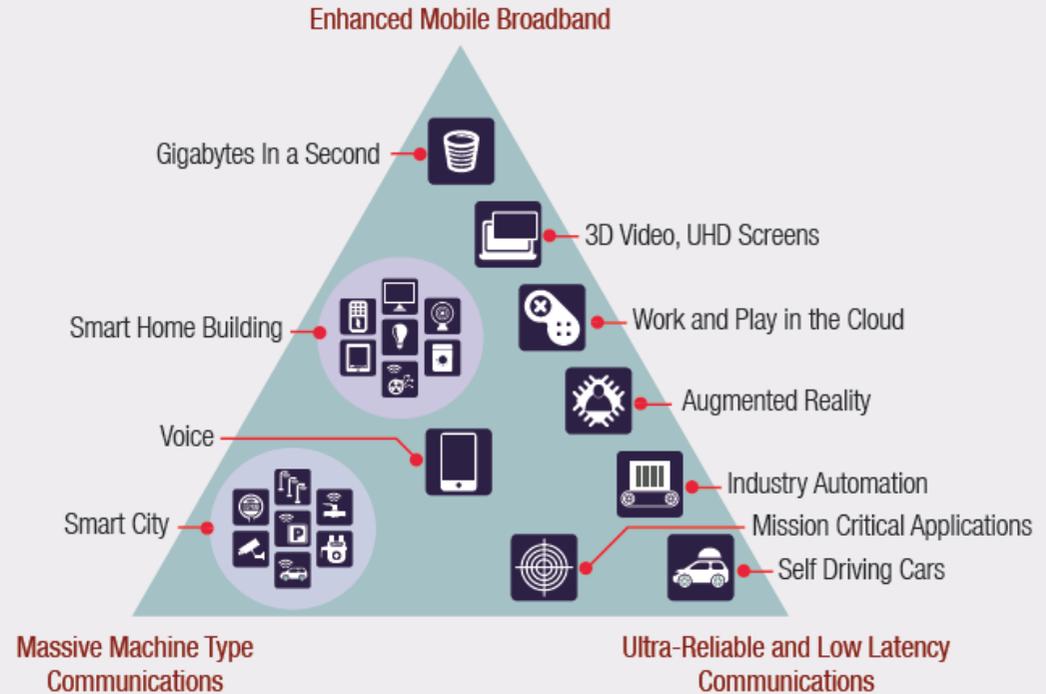
5G Use Cases

Early Use Cases

- Fixed Wireless: Home Internet through 5G mmWave spectrum and beamforming
- Enhanced Mobile Broadband: Always-on, high-speed links with real-time responsiveness with the goals of 20 Gbps peak throughput and 1 Gpbs with high mobility. AR/VR applications

Later Use Cases

- Massive Machine-Type Communication: Embedded sensors in virtually everything. 27B of IoT by 2025. Industrial IoT with smart cities, smart utilities, agriculture.
- Ultra-Reliance Low-Latency Communications: self-driving vehicles, smart-grid control, industrial automation, robotics, drone control.

5G Use Cases

Self-Driving Cars

- 5G can help solve the issue of lag and latency by improving the communication between the car's sensors and the data center sending information to the car.
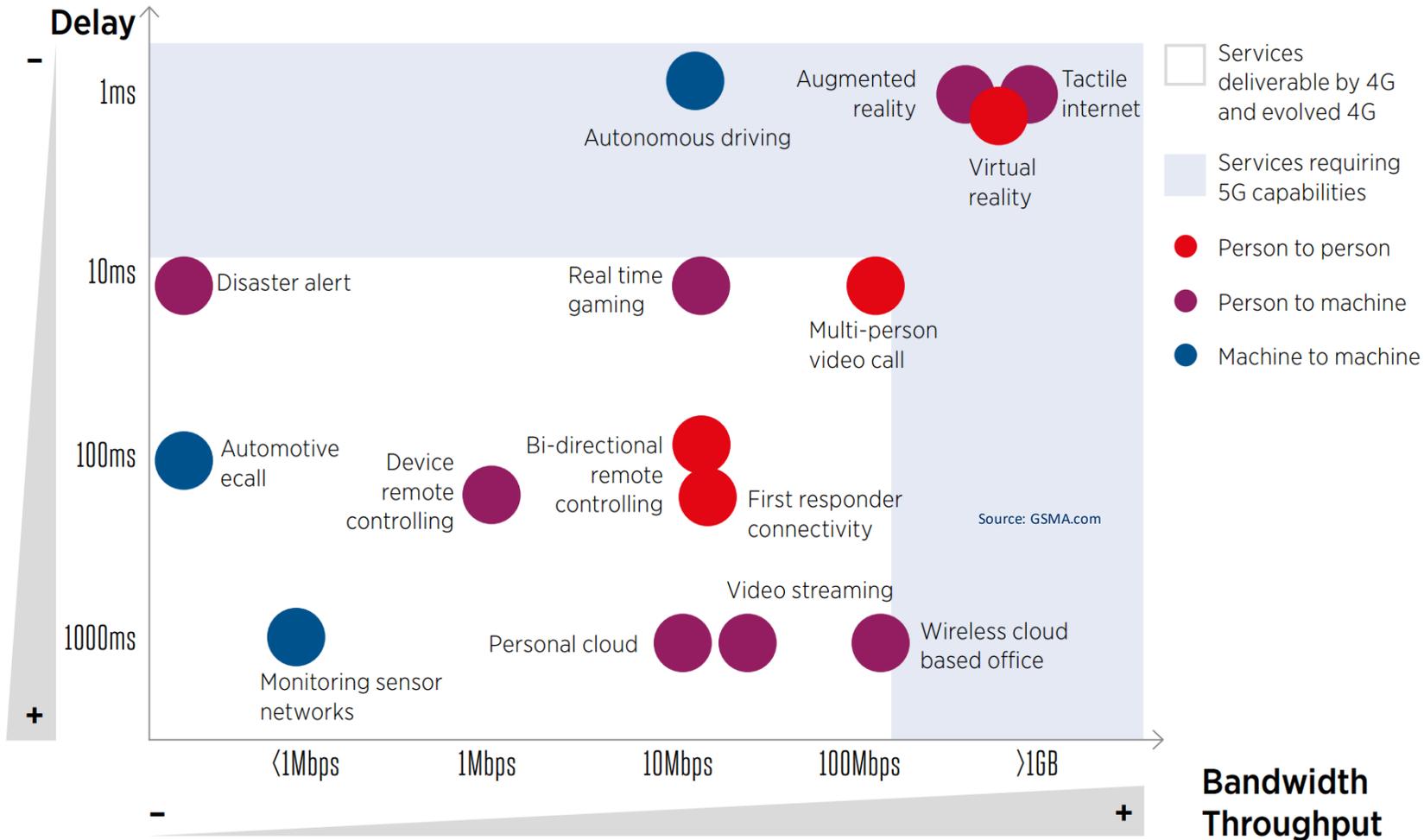
Networked Robots

- Networked robots will be very useful in healthcare and manufacturing. For example, a robot reacting *in real-time*, to a doctor's commands.

Virtual Reality

- VR users can benefit from seamless communication and data transfers from around the world. This could usher in a new era of gaming and remote collaboration.

5G Supported Services

Delay (vertical axis, decreasing top to bottom: −)

- 1ms
- 10ms
- 100ms
- 1000ms

Bandwidth Throughput (horizontal axis): <1Mbps, 1Mbps, 10Mbps, 100Mbps, >1GB

Plotted services:
- Autonomous driving (Machine to machine)
- Augmented reality (Person to machine)
- Tactile internet (Person to machine)
- Virtual reality (Person to person)
- Disaster alert (Person to machine)
- Real time gaming (Person to machine)
- Multi-person video call (Person to person)
- Automotive ecall (Machine to machine)
- Device remote controlling (Person to machine)
- Bi-directional remote controlling (Person to person)
- First responder connectivity (Person to person)
- Monitoring sensor networks (Machine to machine)
- Personal cloud (Person to machine)
- Video streaming (Person to machine)
- Wireless cloud based office (Person to machine)

Legend:
- Services deliverable by 4G and evolved 4G
- Services requiring 5G capabilities
- Person to person
- Person to machine
- Machine to machine

Source: GSMA.com

18

The "Killer App"

- In 2010, as 4G rolled out, there were many conferences about the great things 4G would bring:
  - They talked about bigger bandwidth and about streaming and mobile broadband
  - NO ONE said anything about
    - Uber
    - Waze
    - WhatsApp

- No one predicted the impact of combining geolocation and broadband

- And now we watch as 5G is launched…

- The Point: <u>The "killer app" for 5G has not been written yet.</u> What will it bring?
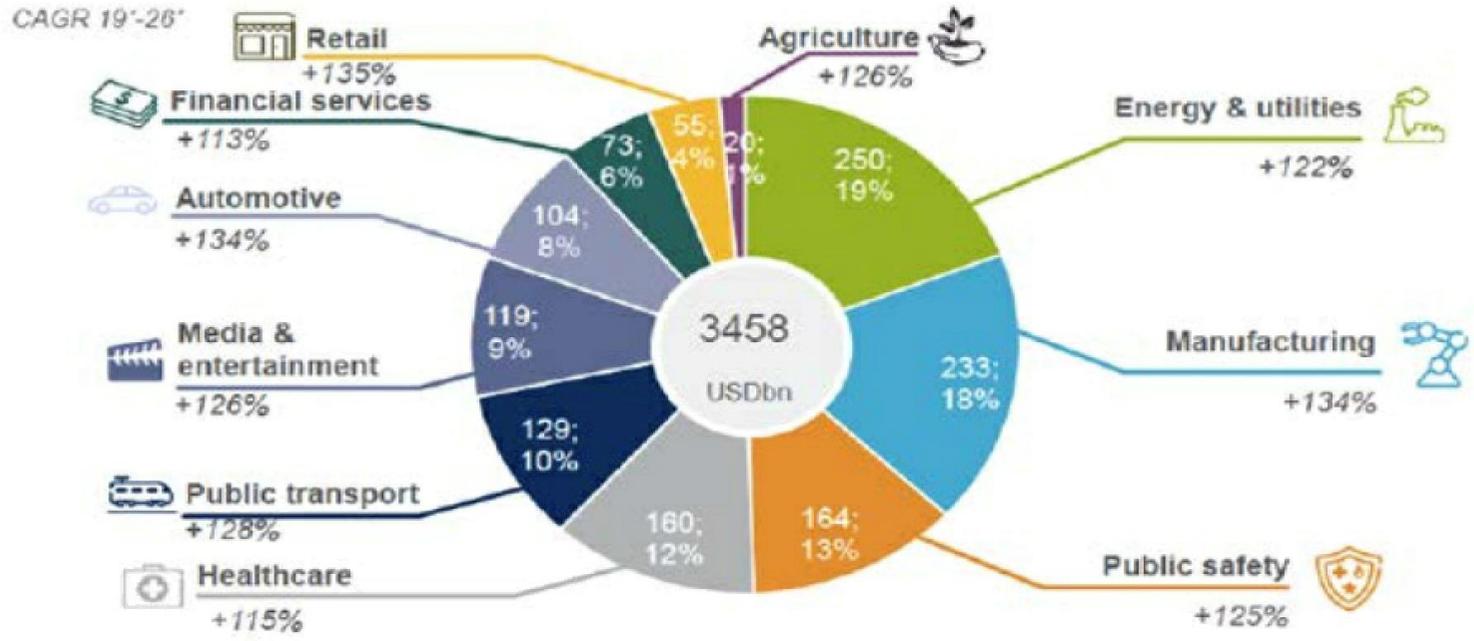
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Recommended Use Cases

- Remote working
- Enhanced distance learning
- Telemedicine
- Security, public safety and disaster response

- Agriculture
- Mining
- Manufacturing
- Financial Services

Source: 2021 ICASA 5G Annual Report

5G Use Cases and Benefits

CAGR 19'-26'

- Retail +135%
- Financial services +113%
- Automotive +134%
- Media & entertainment +126%
- Public transport +128%
- Healthcare +115%
- Agriculture +126%
- Energy & utilities +122%
- Manufacturing +134%
- Public safety +125%

3458 USDbn

- 73; 6%
- 55; 4%
- 20; 1%
- 250; 19%
- 104; 8%
- 233; 18%
- 119; 9%
- 129; 10%
- 160; 12%
- 164; 13%

5G Supported Uses

High Speed Home & Office Broadband

Education

5G Supported Uses

Healthcare

**Security,
Public Safety &
Disaster Response**

5G Supported Uses

Agriculture & Water

Mining

5G Supported Uses

Manufacturing

Financial
Services

5G Supported Uses

Smart Cities & Transportation

Travel & Tourism

Questions?

Please contact Doug, Sam or Jonathan with any questions you may have on this presentation.

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Thank You!