Importance and Benefits of 5G for the Arab Region

Workshop on 5G and its Impact
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Agenda

- 5G and Intel
- Importance of 5G for Arab Region
- Conclusions and Recommendations

5G
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WHAT IS 5G?

- Next generation of wireless networks
- Provides higher speeds, greater capacity, and lower latency
- Transforms infrastructure to be virtualized and software-defined
- Distributes intelligence throughout the network

2G

Cellular Comms.

3G

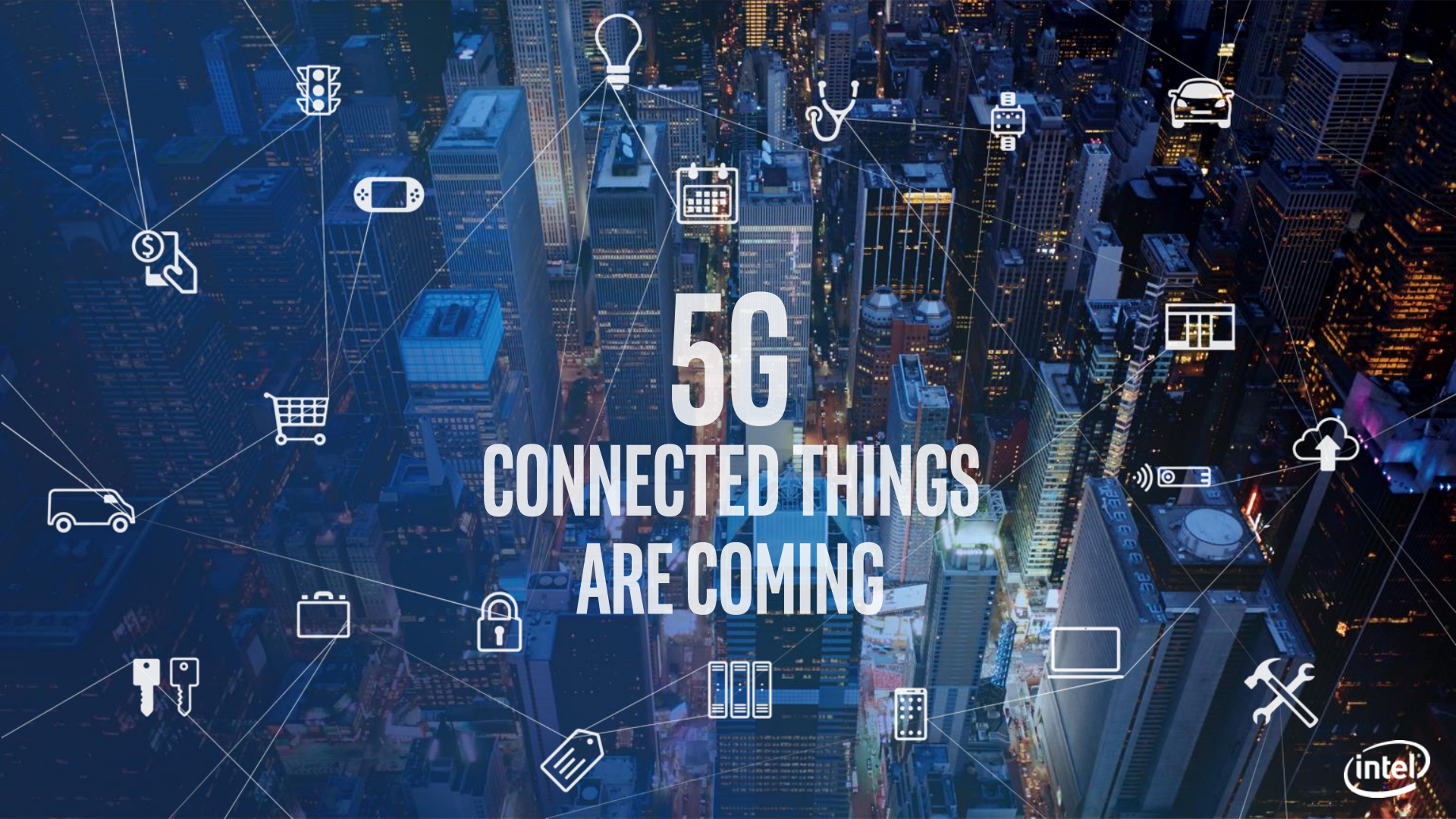
Data and the ‘app’ revolution

4G

Faster data rates

5G

Reactive, smart, and connected devices


5G
CONNECTED THINGS
ARE COMING
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THE INCOMING FLOOD OF DATA

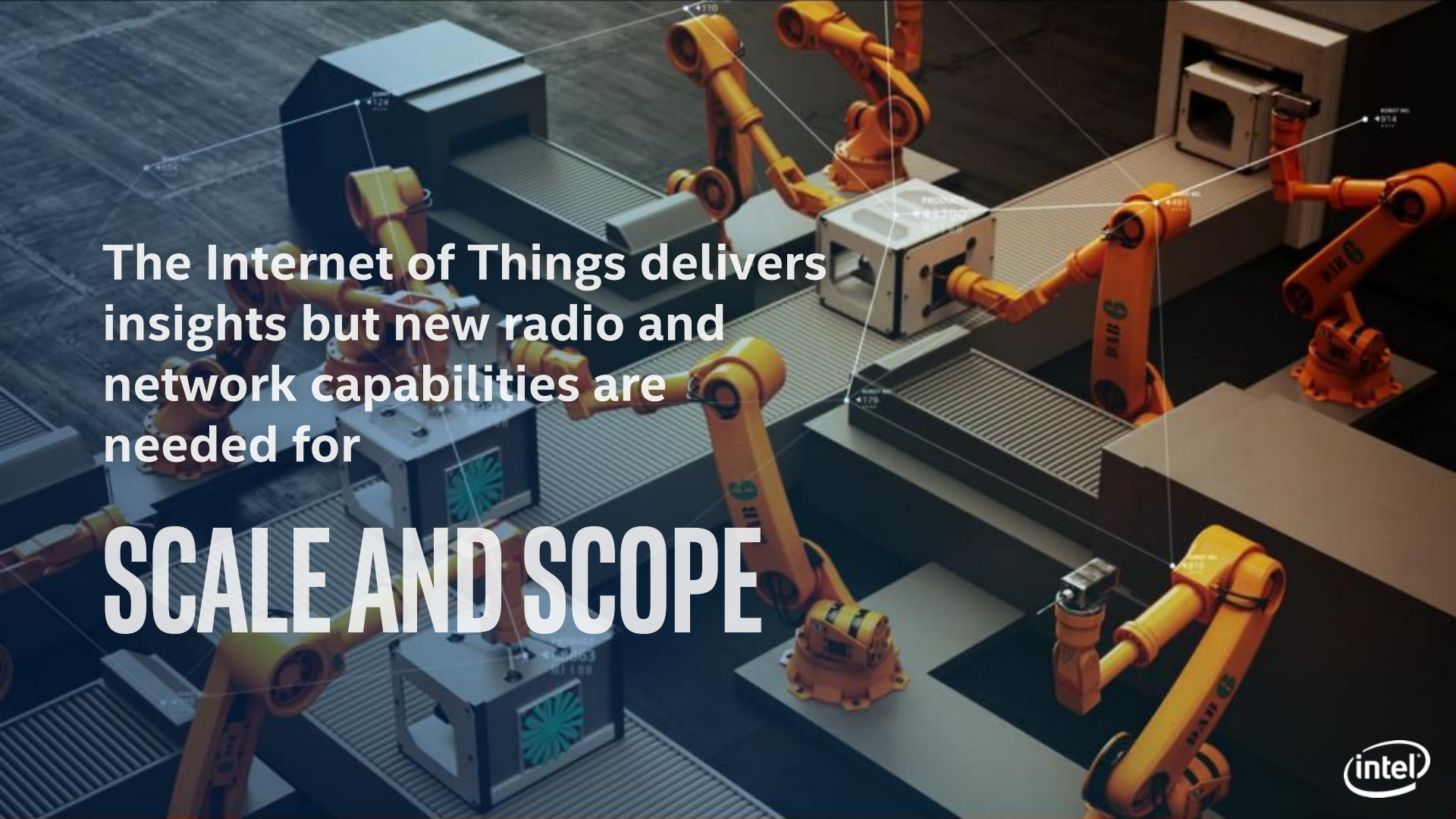
The rise of connected things and media by 2020

- **212B** sensors
- **50B** devices
- **47%** connections will be machine to machine

Generating tremendous amounts of data every day in 2020

- Internet users **1.5 GB** per day
- Self-driving cars **4,000 GB** per day
- Connected planes **20,000 GB** per day
- Connected factory **1 Million GB** per day
- Smart Hospitals **3,000 GB** per day

Source: Amalgamation of analyst data and Intel analysis.
And VNI Global Traffic Forecast. VNI stands for Visual Networking Index.


The Internet of Things delivers insights but new radio and network capabilities are needed for
SCALE AND SCOPE
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The visual cloud will alter how we perceive reality but immersive experiences will require
MORE BANDWIDTH
intel

Automated vehicles are almost here but ultra reliability requires
ULTRA LOW LATENCY
intel

A NEW GENERATION OF
NETWORKS IS NEEDED

5G UNLEASHES NEW CAPABILITIES

Services

Social Gaming
Automotive Entertainment
3D Video & Hologram Calls
Enhanced Position-location

Industrial Applications

Smart Cities
Energy
Safety & Security
Health & Wellness

Immersive User Experiences

Augmented & Virtual Reality
Interactive HD TV
freeD Technology*
Context-aware Devices
Multi-user Telepresence

ENABLED BY HIGH-SPEED & CAPACITY, LOW-LATENCY CLOUD COMPUTING

DIVERSE 5G TECHNOLOGIES WILL FUEL IOT SUCCESS

Diverse 5G solutions will help grow IoT deployments by matching requirements to industry use cases

LTE ADVANCED PRO

NB-IOT

802.11AX

5G NEW RADIO

5G UNLEASHES THE FULL POTENTIAL OF THE CLOUD

Opens up new business opportunities for operators

Gives more granular control for workloads and usages

Creates whole new classes of cloud services

Enables the cloud to deliver deeper insights and more accurate analysis

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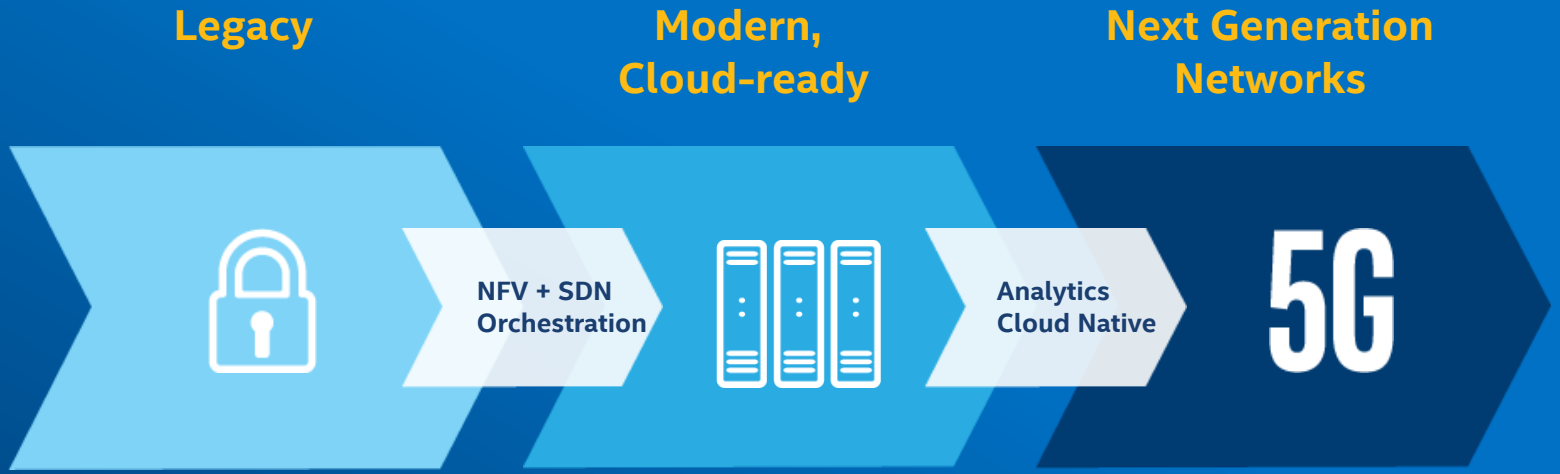
TRANSFORMING THE NETWORK FOR 5G READINESS



Custom
Proprietary
Hardware Defined

Software Defined
Agile
Open

Network Slicing
Analytics Core to Edge
Visual Cloud

intel

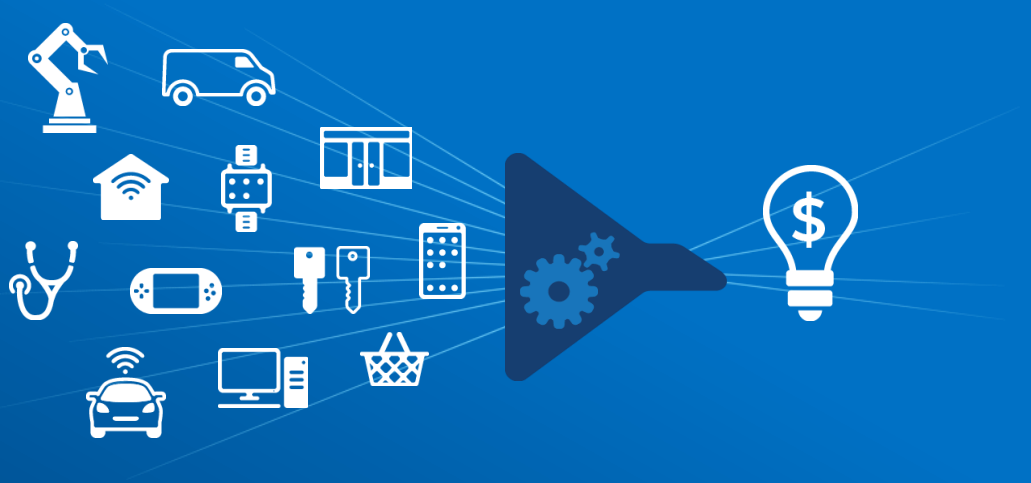
5G IS A CRITICAL ELEMENT OF THE NEW DATA ECONOMY

Connecting billions of devices will generate a massive wave of data. Only 5G has the scale and scope to enable new insights, drive business efficiencies, and create data monetization.

Autonomous Driving
1 GB/second

Smart Hospital
4000 GB/day

Connected Factory
1 million GB/day



Source: Amalgamation of analyst data and Intel analysis.
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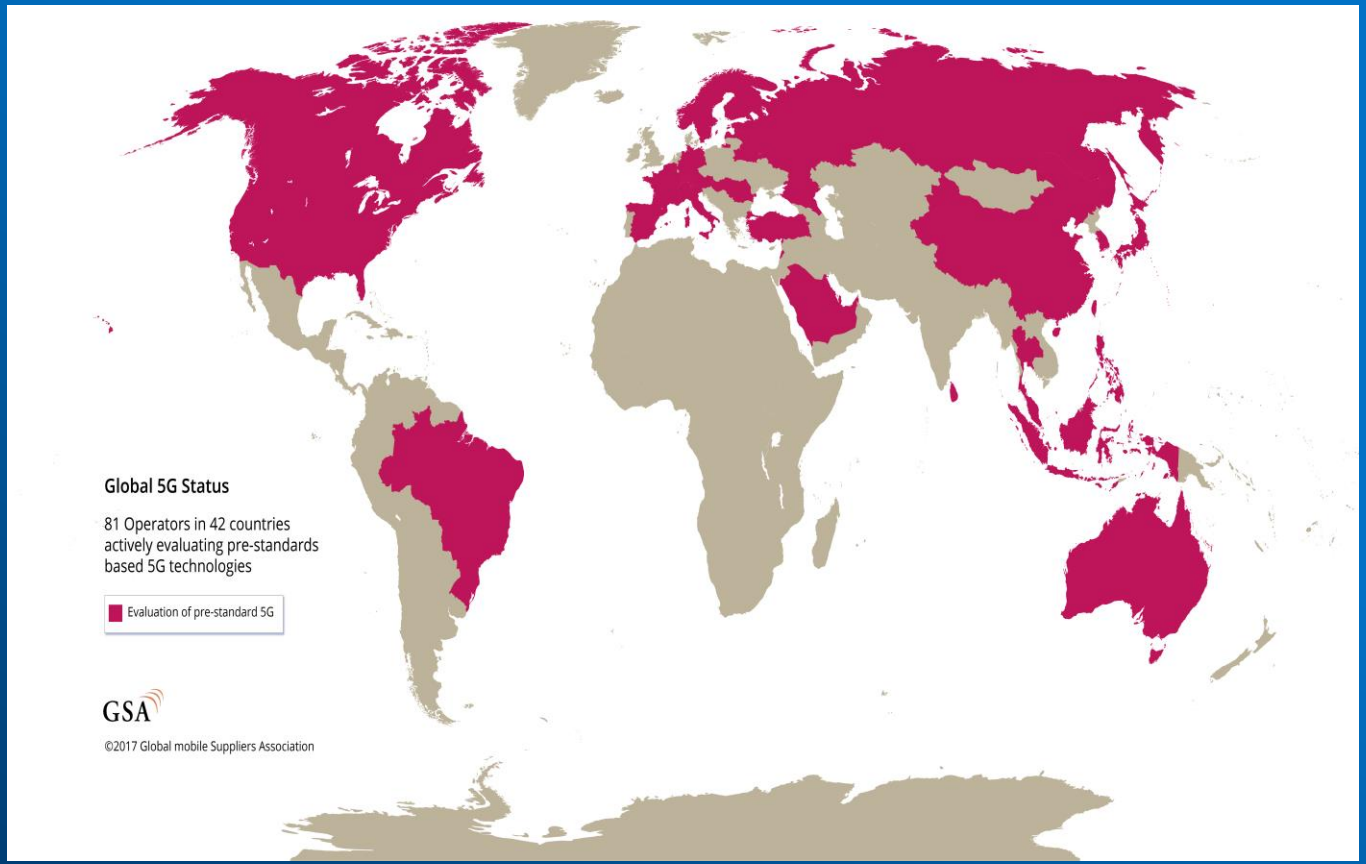
Global 5G Status

(https://gsacom.com/paper/81-operators-42-countries-evaluating-5g)



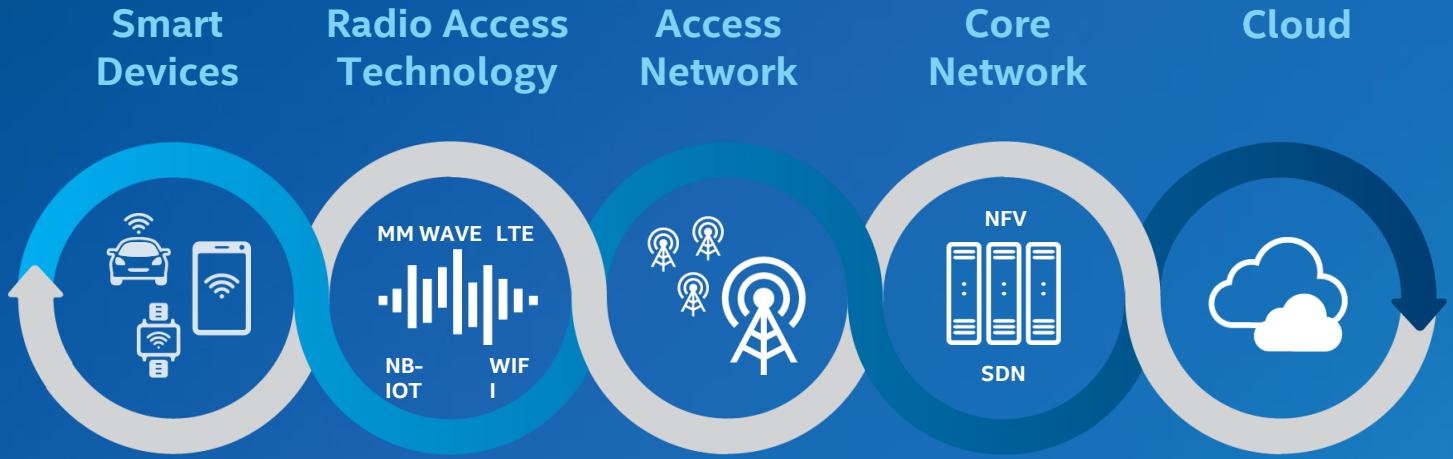
-Over 140 separate demonstrations, tests or trials

-Arab States: Bahrain, Kuwait, Qatar, Saudi Arabia, UAE

-28 GHz has been the spectrum band most often utilized."

INTEL'S WORK TODAY IN 5G

BEYOND JUST WIRELESS, 5G INCORPORATES COMPUTING AND CLOUD TECHNOLOGIES TO MAKE EVERYTHING SMART AND CONNECTED



Intel Powers 5G End-to-End

Ecosystem Collaboration

ONE YEAR AGO

Intel Products
Announced Intel® 5G Mobile Trial Platform & partners

5G Standards
- Intel is partnering with operators including NTT DoCoMo, KT, SKT, AT&T and Verizon to drive the development and standardization of 5G.

5G Partners
- Intel is accelerating the path to 5G development by working with industry leaders to deliver optimized solutions for both devices and the network, including collaborations with:

LG, kt, AT&T, Ericsson, 中国移动 China Mobile, ZTE, Cisco, SK, NTT docomo, NOKIA, Telefónica, vodafone, T-Mobile, verizon

TODAY

Intel Products
- World's first 5G global modem on both sub-6Ghz bands and mmWave spectrum
- Intel® GO Automotive 5G Connectivity Platform
- 2nd and 3rd 5G Mobile Trial Platforms

5G Trials Around the World
- Global trial, test, and standards engagements with:

Ericsson, kt, verizon, AT&T, Telefónica, NOKIA, vodafone, Sprint, 中国移动 China Mobile, NTT docomo, orange, T-Mobile, SK, BMW, And many more

Collaboration
- 5G Network Transformation disclosures: AT&T, Verizon & NEC
- BMW Group, Intel and Mobileye team up to bring fully autonomous driving to streets by 2021
- China Mobile, Ericsson and Intel showcase application of latest cellular IoT technology at MWC Shanghai 2016

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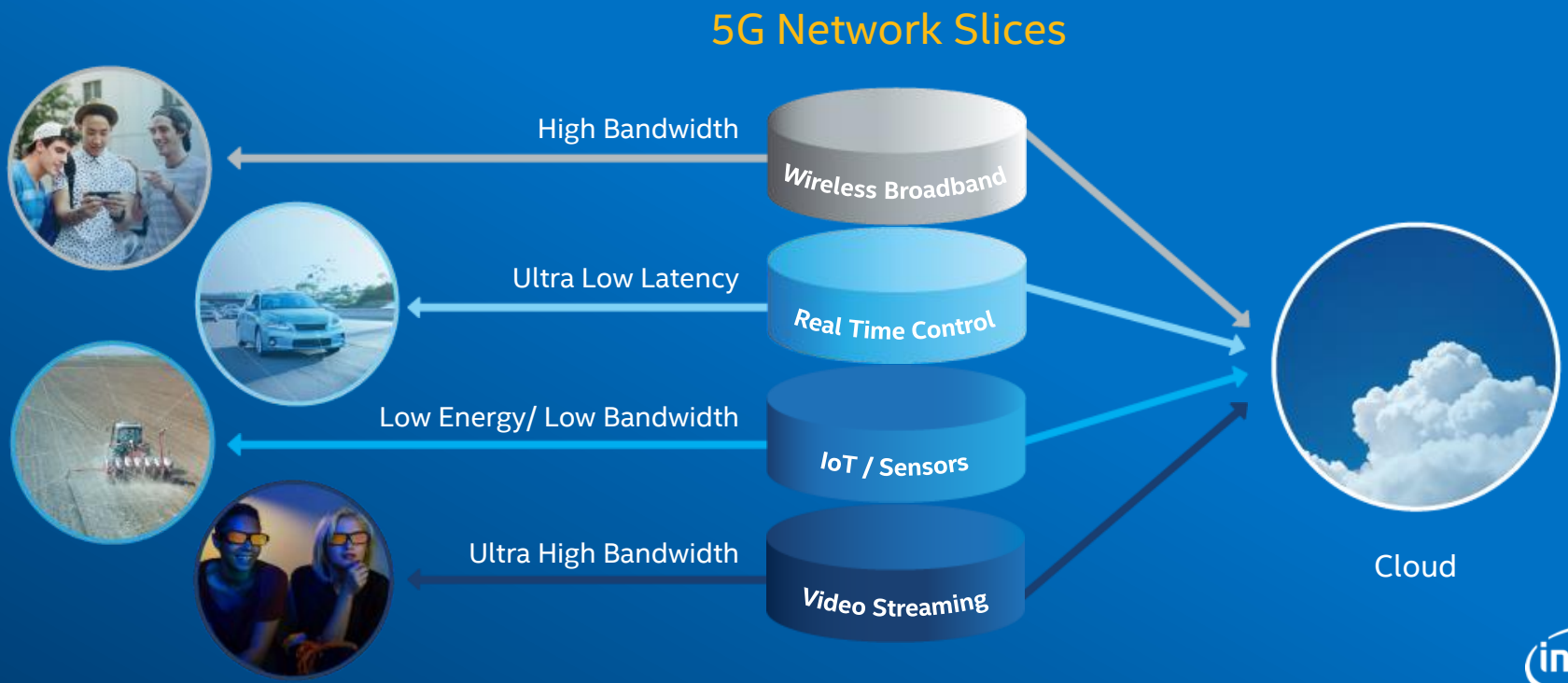
PROMISE OF IOT DELIVERED THROUGH AI AND 5G

Artificial intelligence will unleash new wave of opportunity

- 5G's billions of connected things will require AI and analytics for accurate insights and a path to monetization
- Intelligence to power AI will be embedded in devices, the edge, and the cloud
- Intel servers fuel analytics today, and we're investing in future technologies to make AI ubiquitous

MATCHING CLOUD SERVICES TO DIVERSE DELIVERY NEEDS

Intel technology delivers the diverse processing requirements to power 5G network slicing



PUTTING IT ALL TOGETHER: AUTONOMOUS DRIVING

Cloud

Powerful analytics required to make sense of massive data from moving vehicles

Core Network

Network will isolate vehicle data in a ‘slice’ separating it from other types of data

Access Network

Cloud computing at the mobile edge lowering latency

Wireless Technology

5G radios integrate ‘vehicle to vehicle’ and ‘vehicle to everything’ connectivity

Smart Devices

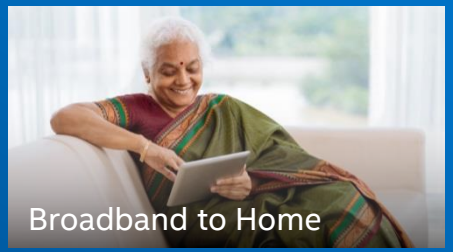
Vehicles will have intelligence to manage internal systems and connect to cloud

IMPORTANCE OF 5G FOR ARAB REGION

5G - Transformation into a Knowledge-based Economy

- Saudi Arabia: Vision 2030
- UAE: Vision 2021
- Egypt: Vision 2030
- Qatar: Vision 2030
- Algeria: Vision 2035
- Jordan: Vision 2025

5G BRINGS OPPORTUNITY TO ARAB REGION



Important 5G Vertical Industries for Arab Region

- **Smart Transportation Systems:** According to WHO, 90% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately half of the world's vehicles.
- **e-health:** Remote surgery will reduce the latency to enable remotely assisted surgery. Specialists are not available in many hospitals and could join a local surgeon remotely to perform procedures which require expert skills (5G's latency will be around one millisecond -unperceivable to a human and about 50 times faster than 4G).
- **Smart Learning:** 5G will enter the classroom and bring new ways of learning to students. Augmented Reality, Virtual Reality and Virtual Presence will mean that students will be immersed in a more visual and interactive learning experience where students and teachers may not necessarily be in the same location.
- **Water Management and Agriculture**: 5G will also bring a solution for smart water management and smart agriculture systems in developing countries. Such as sensors with wireless connectivity for crop fields can help optimize growing and minimize use of water and fertilizers through more targeted application.
- **Oil and Gas Industry:** Analytics to survey land , optimizing well and field work, equipment maintenance and remote performance .
- **And others.**

5G Vertical Industry

Vertical industry	Example use cases and applications	Partners
Healthcare	Connected Care, Precision Medicine, Imaging and Diagnostics, Genomics/Big Data, Remote Surgery	Medical Device Manufacturers, Insurers (public or private), Researchers, Ministries of Health
Automotive	Engine alert and automatic maintenance scheduling, autonomous driving, collision avoidance, V2V	OEM's, Researchers, Ministries of Transportation
Public Safety	Enhanced Incident/disaster alert and response, real time traffic management	Venues (i.e. stadiums, etc.), municipalities and governments, infrastructure vendors, operators, OEMs, etc.
Sustainability/ Environmental	Adaptive air sensors, water management systems, energy	Researchers, Government Parks services, Agriculture
Education	wireless real-time interactions, virtual and augmented reality interactions without visual delay	School Districts, OEM's, Ministries of Education, Regulators, Researchers
Smart City	Remote monitoring of roads and city infrastructure, smart meters/parking	Service Providers, Universities, Local Municipalities, Federal Policy Makers, Utilities, etc.
Public Transportation	Flexible/adaptive bus/fleet management, Allowing more efficient routes	Transit Systems, Operators, Municipal Governments, Researchers, etc.
Wearables	Fully connected devices (no need for a smartphone tether), tagged devices to assist with inventory management	OEM's
Smart Homes	Remote security monitoring and controls (i.e. locks, hi res camera surveillance, etc.)	Infrastructure Vendors, Heating and Cooling Systems, Cable Companies, etc.
Smart Grid	Smart 'end to end' power distribution networks with predictive analytics	See Smart City
Industrial	Sensors with wireless connectivity for crop fields can help optimize growing and minimize use of water and fertilizers through more targeted application.	Farmers/Agriculture, Ministries of Agriculture, etc.

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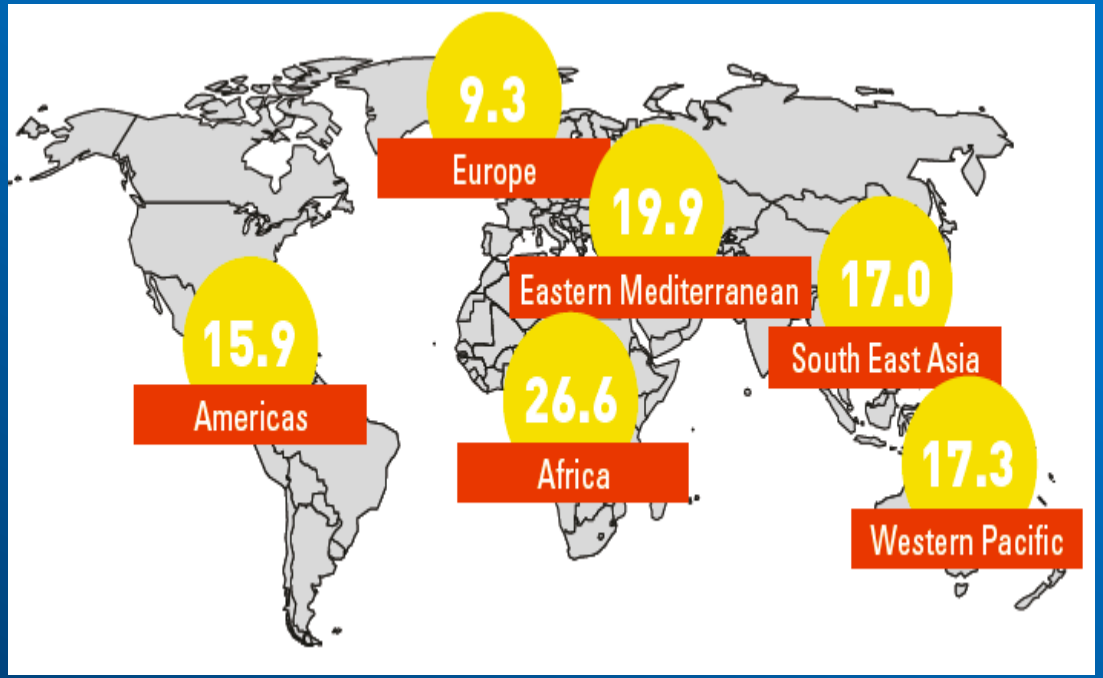
Road Traffic Deaths per 100.000 Population (WHO)



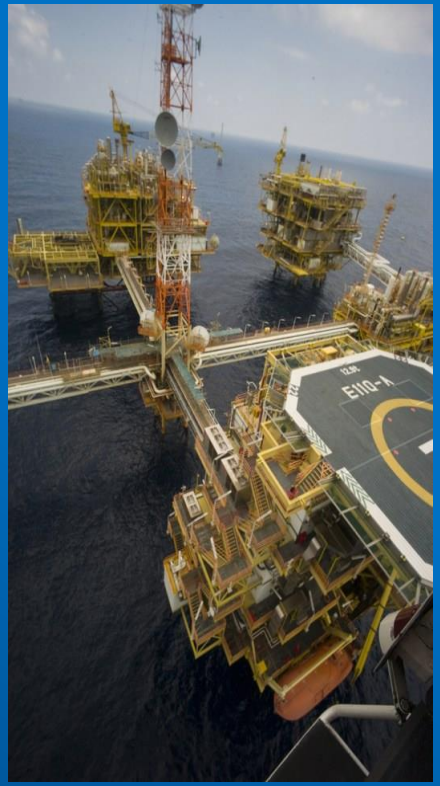
1.25 million road traffic deaths occur every year in the world.

Traffic accidents in 2016 killed 9,031 people, in Saudi Arabia, with an average of over 25 deaths a day and one death an hour

Egypt loses about 12 000 lives due to road traffic crashes every year. Road Accidents Cost to Egypt EGP 30.5 Billion in 2015 (1.73 Billion US Dollar). Source: CAPMAS- *Central Agency for Public Mobilization and Statistics)*

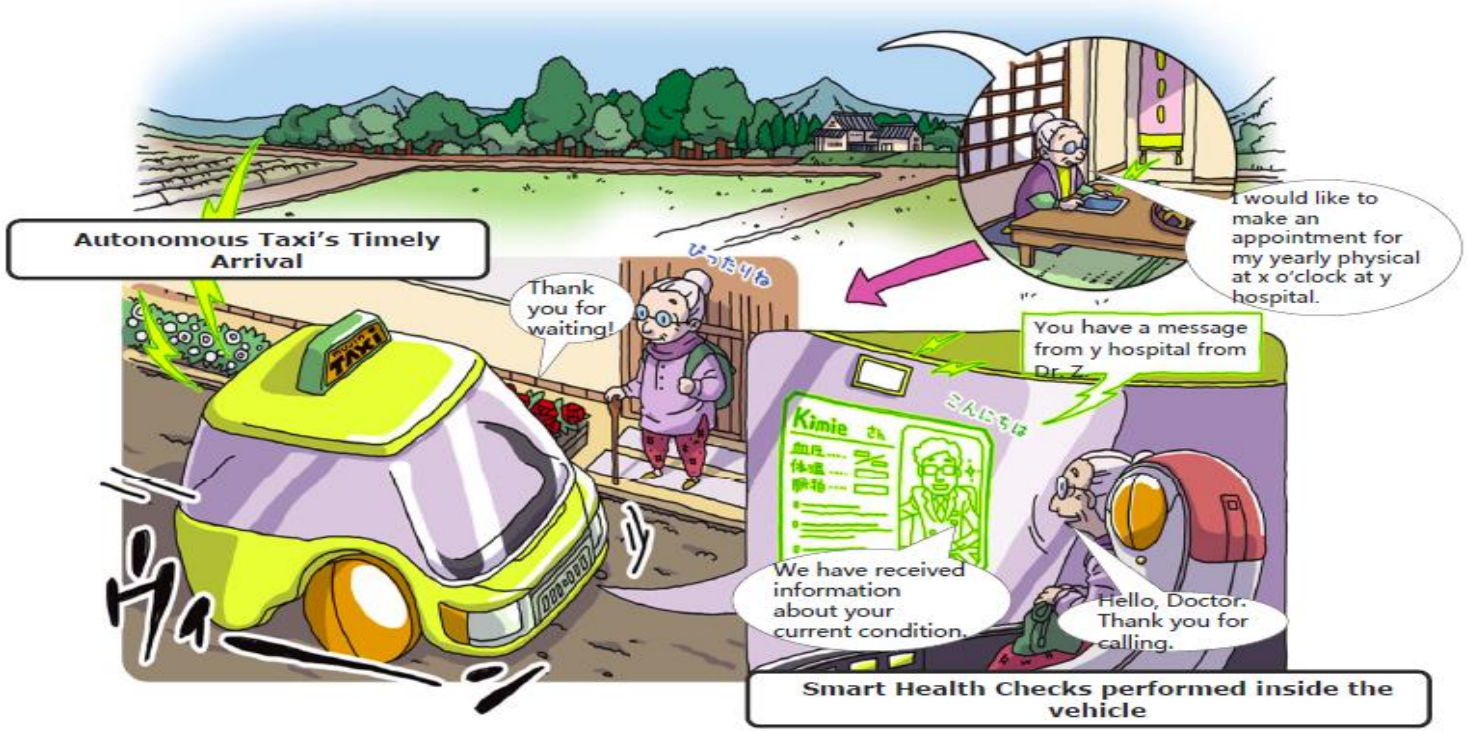
5G/IoT for The Oil and Gas Industry

- Analytics to survey land for new potential drilling sites and extract the oil from the ground
- Internet-connected sensors used to provide environmental metrics about extraction sites.
- By fully optimizing the IoT solutions an oil and gas company with $50 billion in annual revenue could increase its profits by nearly $1 billion.
- **Optimizing well and field work:** Gathering and organizing data has never been more important. By some estimates, internal data generated by large integrated oil and gas companies now exceeds 1.5 terabytes a day.
- Equipment maintenance, remote performance monitoring, predicting production.



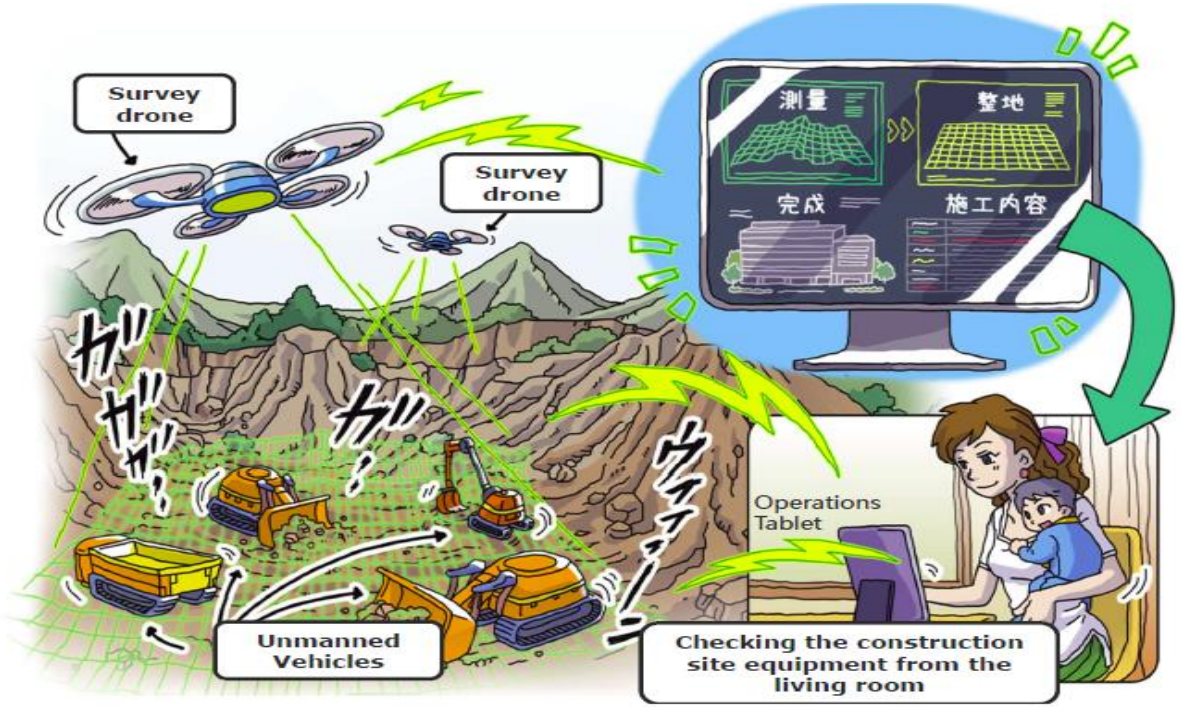
Source: RCRWireless

Changes in Rural Life



Source : MIC (Japan)

Changing the Way We Do Work



Source : MIC (Japan)

Changes in Town

Source : MIC (Japan)

5G Hologram

KT and Verizon held the world's first live hologram international call.

How 5G will contribute to the economy?

- According to IHS report In 2035, 5G will enable $12.3 trillion of global economic output. That is nearly equivalent to US consumer spending in 2016 and more than the combined spending by consumers in China, Japan, Germany, the United Kingdom and France in 2016 https://www.ihs.com/Info/0117/5g-technology-global-economy.html

- The global 5G value chain will generate $3.5 trillion in output and support 22 million jobs in 2035. This figure is larger than the value of today's entire mobile value chain

- **Arab States should be able to get maximum benefit from this opportunity without any delay.**

CONCLUSIONS AND
RECOMMENDATIONS

5G Plans

- **European Union: 5G Action Plan:** *http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131*
  - Timely deployment of 5G: a strategic opportunity for Europe
  - The need for a coordinated approach
  - A common EU timetable for the introduction of 5G:
    i) Member States to develop, by end 2017, national 5G deployment roadmaps as part of the national broadband plans
    ii) Every Member State will identify at least one major city to be "5Genabled" by the end of 2020 and that all urban areas and major terrestrial transport paths have uninterrupted 5G coverage by 2025.

- **Germany: 5G-Strategy**
  (*https://www.bmvi.de/SharedDocs/DE/Publikationen/DG/098-dobrindt-5g-strategie.html?nn=12830*)

- **Turkey: 5GTR Forum**
-
- **UAE: National 5G Committee**

- **UK: 5G Strategy:**
  (*https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/597421/07.03.17_5G_strategy_-_for_publication.pdf*)

- **South Korea:** Creative 5G Mobile Strategy and 5GForum *(https://www.5gforum.org)*

- **Japan:** 5G Development Roadmap toward 2020 *(http://5gmf.jp/en)*

Spectrum Needs of 5G

Success requires sufficient spectrum in a variety of bands with economies of scale

5G applications drive technical requirements, including type and amount of spectrum

< 1 GHz – for wide area applications, e.g. sensor networks, etc.

< 6 GHz – for coverage/capacity trade-off, e.g. massive MIMO, outdoor-to-indoor

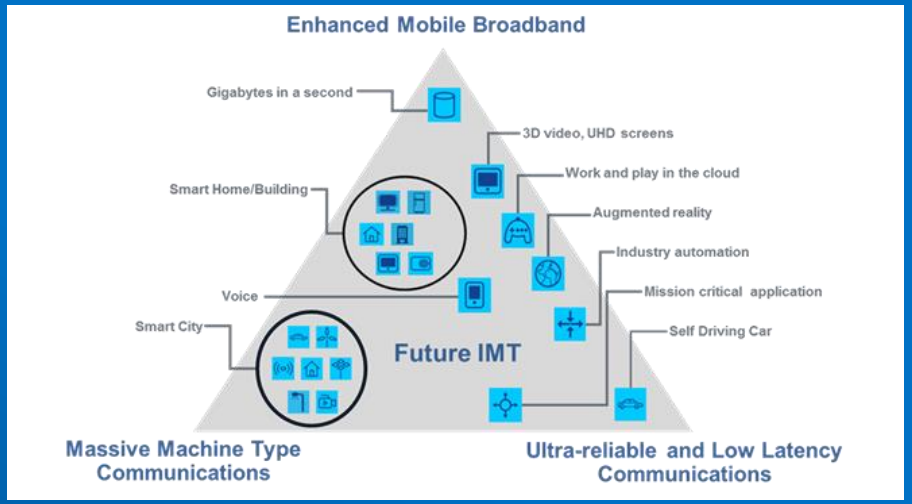
Higher MM Wave – for apps needing ultra-wide channels, e.g. 4k/8k video, VR, etc.

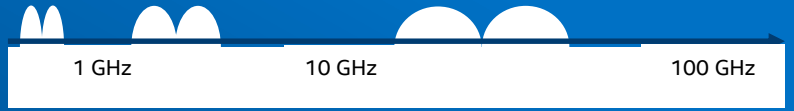
Continuous flow of sufficient, adequate, new spectrum is key to:

Expansion of wireless market to 5G and beyond

Building a strong and healthy eco-system

IMT for 2020 and Beyond





Harmonization

Harmonization crucial to enable:

- Global roaming
- Economies of scale
- Harmonization of radio tuning ranges, rather than exact bands

Recommendations

- Develop Regional and National 5G Plans to accelerate the 5G and vertical applications.
- Support to prioritize 5G for the next four year at WTDC-2017 and consider a regional 5G initiative.
- Launch a 5G network at least in one major city by 2020.
- Transform existing ICT networks according to 5G need (Smart City, smart government networks and networks of operators).

- Allocate sufficient low-band, mid-band and high-band spectrum for mobile broadband in collaboration with industry (consider to benefit from the harmonization of 26+28 GHz tuning range, 26 GHz: 24.5-27.5 GHz and 28 GHz: 26.5-29.5GHz)
- Adopt policies/regulations to accelerate the 5G such as small cells and backhauls for 5G (71-76 GHz/81-86 GHz)
- Allocate unlicensed spectrum at 66-71 GHz (this is important as an extension band for Wireless Gigabit Networks as defined in the ITU).

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THANK YOU