

CUSTOMER FIRST

24 - 26 SEPTEMBER, 2019 | CASCAIS, PORTUGAL



DAY 2, TOMORROW'S HERE
09:30 - 10:00, WEDNESDAY, SEPT 25

5G (r)evolutions

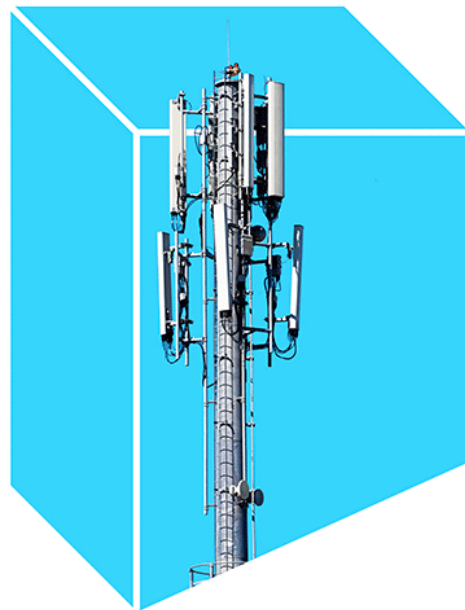
What innovations is 5G bringing already and what is the role of the IPX?

Bill Welch

Sr Product Manager, Mobile Solutions and Innovation, iBASIS

Weimin Liu, Ph.D.

Sr Strategic Partnership Manager, Verizon



Biggest challenges leading up to 5G deployment and biggest challenges faced after launch?

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WHAT WILL 5G BRING?



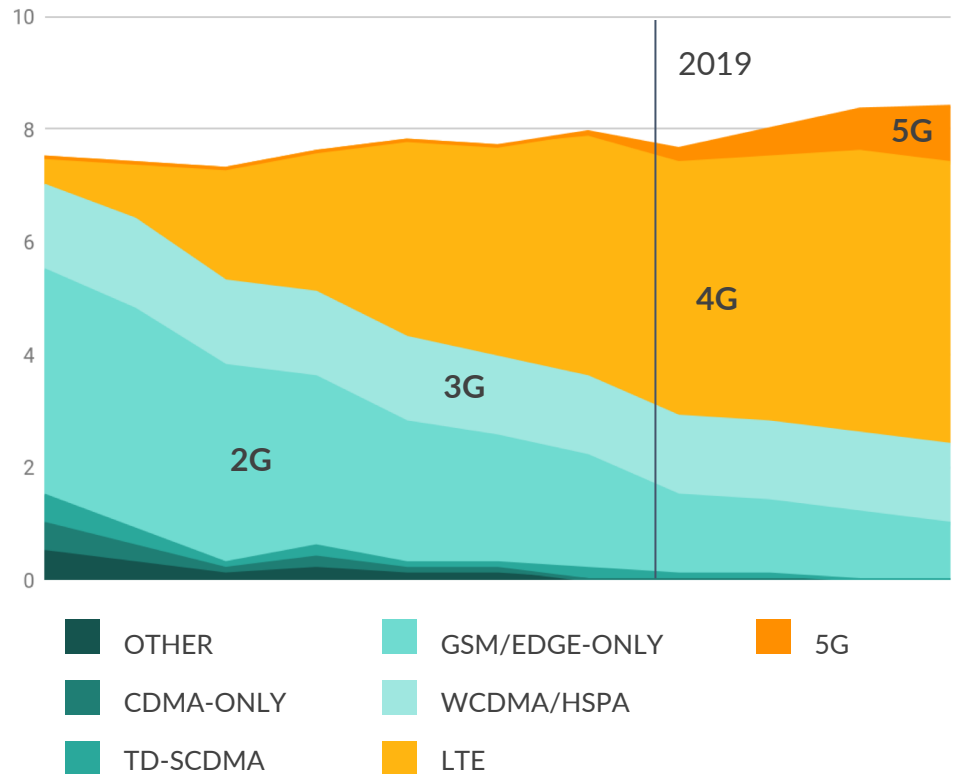
Improve your speed, reach,
and latency

Expanded Capabilities

Autonomous vehicles (Low latency)
4K – 12K Ultra HD video (Speed increase)
Digital transformation (Massive IoT)

New radio, core, and network
architectures

MOBILE SUBSCRIPTIONS BY TECHNOLOGY



Source: Ericsson Mobility report

		4G	5G
Usage Scenarios		• MBB	• eMBB • URLLC • mMTC
Applications		<ul style="list-style-type: none"> • High-Definition Videos • Voice • Mobile TV • Mobile Internet • Mobile Pay 	<ul style="list-style-type: none"> • VR/AR/360° Videos • UHD Videos • V2X • IoT • Smart City/Factory/Home • Telemedicine • Wearable Devices
Network Characteristics		Flat and All-IP	<ul style="list-style-type: none"> • Cloudization • Softwarization • Virtualization • Slicing
Service Objects		People	Connection (People and Things)
KPI	Peak Data Rate	100 Mb/s	20 Gb/s
	Experienced Data Rate	10 Mb/s	0.1 Gb/s
	Spectrum Efficiency	1×	3× that of 4G
	Network Energy Efficiency	1×	10–100× that of 4G
	Area Traffic Capacity	0.1 Mb/s/m ²	10 Mb/s/m ²
	Connectivity Density	10 ⁵ Devices/km ²	10 ⁶ Devices/km ²
	Latency	10 ms	1 ms
	Mobility	350 km/h	500 km/h

Source: ITU/3GPP

Same services as 4G plus higher speed (eMBB)

URLLC – Ultra-reliable low-latency communication

mMTC – Massive Machine-Type Communications

2X to 10x increase in speed

10x increase connection density

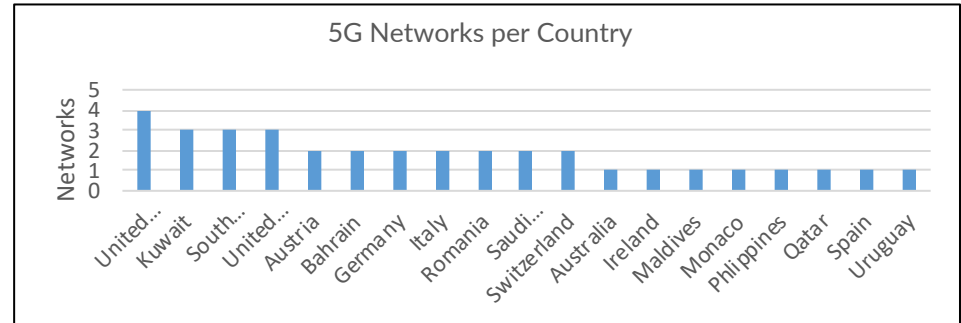
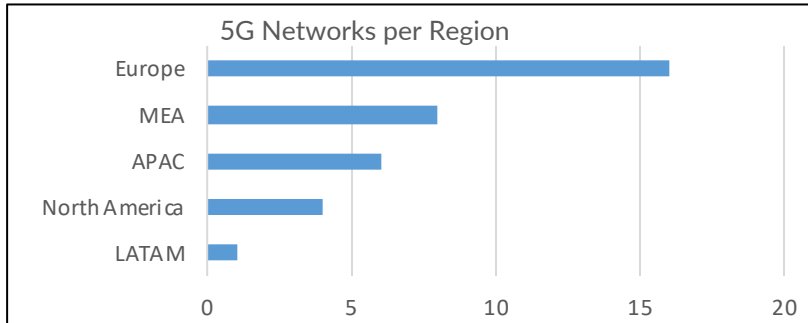
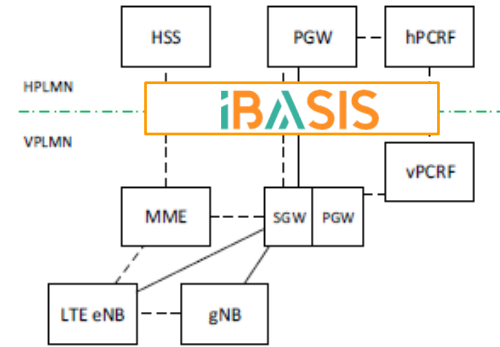
Start with eMBB using NSA

URLLC and mMTC come later

5G DEPLOYMENTS TO DATE (SEPTEMBER 2019)

- (35) 5G deployments World Wide
- NSA allowed operators to start fast with devices and radios and upgrade to 5G Core later
- Existing 4G IPX services are used for roaming
- US and South Korea kick started 5G
- Europe, Middle East, APAC and South America all are represented

Home Routed Non-Standalone Architecture



Verizon 5G

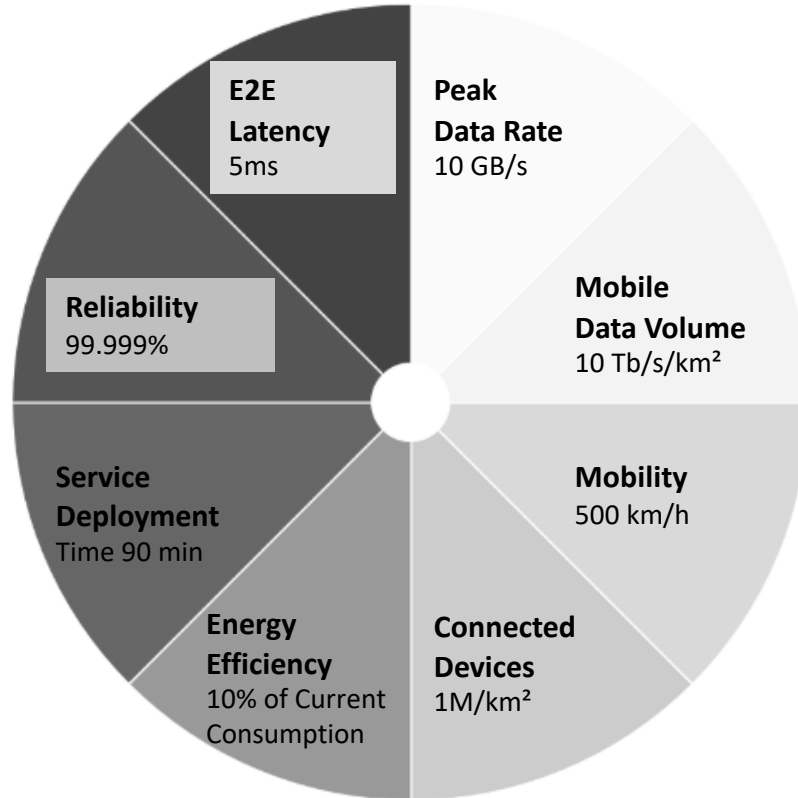
Weimin Liu, Ph.D.

5G Labs/Technology Development



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Eight Currencies of 5G



Verizon – Industry Leader in 5G Development

Broad Ecosystem Collaboration 5GTF Specifications + Chipset Commitment



Verizon Early 5G Activities

2015 – Lab Work

Early testing of basic features and capabilities

2016 – Field Technical Trials

Structured and systematic testing

2017 – Pre-Commercial Pilots

Multi-vender environment
Full system testing (5GTF RAN+Core)

2018 – Commercialization

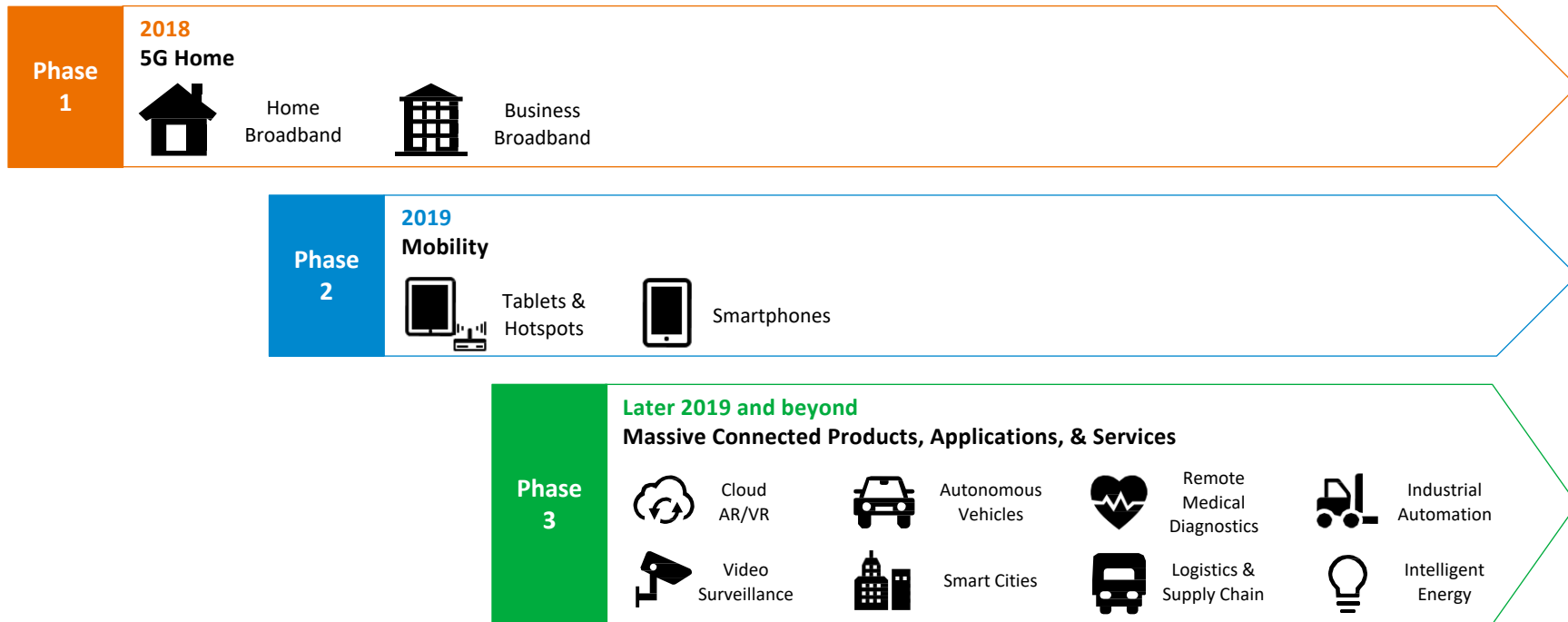
Early testing of basic features and capabilities

Verizon 5G Specifications

- V5G.201-Verizon 5th generation radio access; overall description
- V5G.212-Verizon 5th generation radio access; multiplexing and channel coding
- V5G.300-VZ5G access technology overall description
- V5G.322-RLC (Radio Link Control) Layer procedures and protocol
- V5G.331-RRC (Radio resource control) layer procedures and protocol
- V5G.211-Verizon 5th generation radio access; physical channels and modulation
- V5G.213-Verizon 5th generation radio access; physical layer procedures
- V5G.321-MAC (Medium Access Control) layer procedures and protocol
- V5G.323-PDCP (Packet Data Convergence Protocol) Layer procedures and protocol
- Air interface-Test Plan

Verizon 5G Home and 5G Mobility Are Now Live

Ushering in transformational new use cases in 2019 and beyond



Verizon 5G Labs Accelerate Innovation Using an Outside-in Approach

COLLABORATORS



Academia/NGOs



Startups



Enterprises



Consumers

Verizon Media Co-Labs

Themes



OUTCOMES

Inspiration and education about the 5G Future

Exploration and validation of 5G use cases

Development of real 5G experiences

5G
PALO ALTO
LAB

Live

5G Sunnyvale Lab

Big Data
Emerging Tech

5G
LOS ANGELES
LAB

Live

5G RYOT Lab

Immersive
Experiences

5G
DC
LAB

Live

First Responders
Gov't and Cities

5G
NEW YORK
LAB

Live

Media, Retail
Finance, Edu

5G
CAMBRIDGE
LAB

Live

Enterprise, Healthcare
Robotics



Verizon Local and National Programs



5G EdTech Challenge

10 total winners will each receive \$100k -- totaling \$1M.

We'll put these solutions into our Verizon Innovative Learning Schools in fall 2019

5G[✓] FIRST RESPONDER LAB

Our 5G DC Lab will support 15 first responder driven startups throughout 2019



5G Robotics Challenge

\$300k in grants to 10 researchers exploring the intersection of smart manufacturing, collaborative robotics, and 5G



RYOT ifp



NEXT GENERATION
5G STORYTELLING
INITIATIVE

In partnership with the Independent Filmmaker Project we are putting next generation tools in the hands of up and coming 5G storytellers.

South Korea @ 1M subscribers in 69 days – 11 days faster than LTE

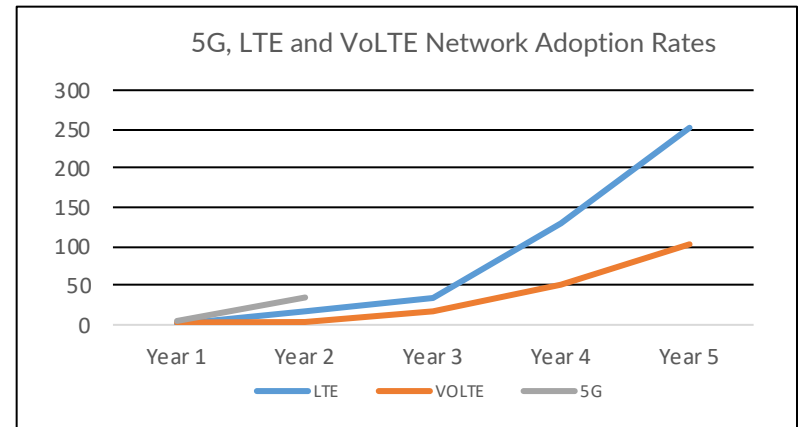
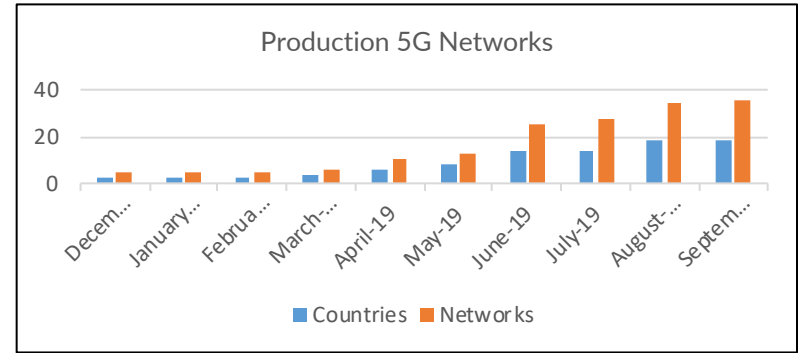
South Korea @ 2M subs in 128 days

5G deployments heated up June, July and August

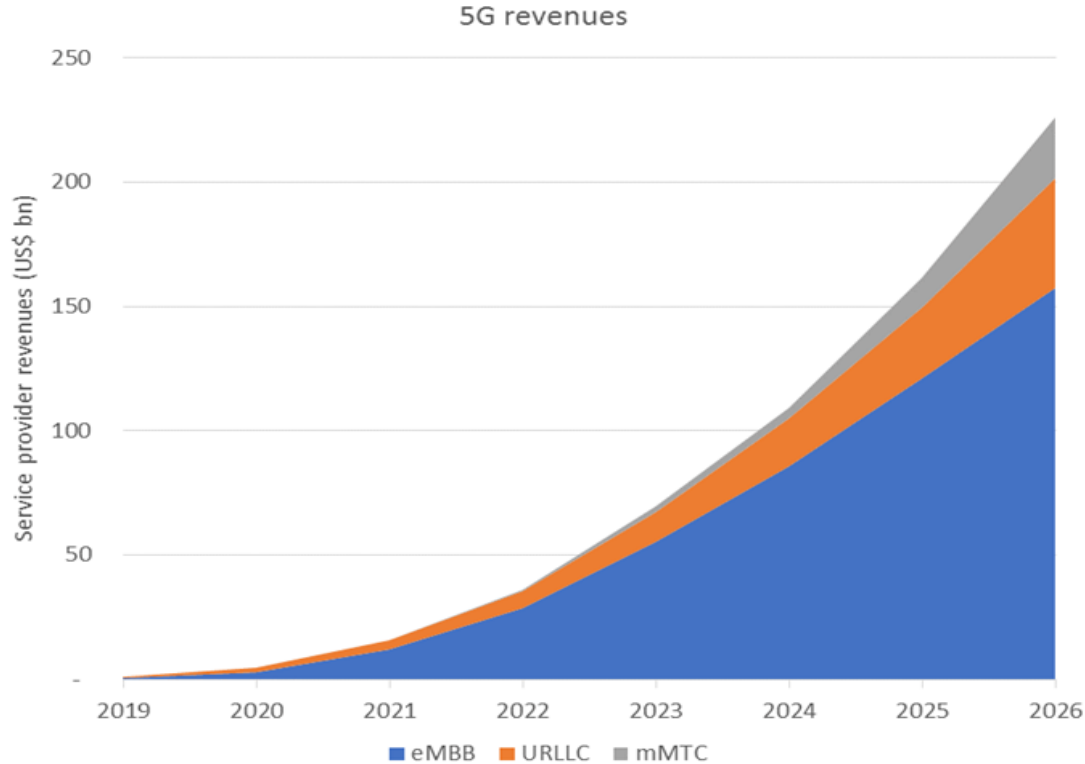
5G has faster adoption rates than LTE and VoLTE

Gartner, IDC and Nomura have all increased the projected amount of phones by 5 to 10%

- Nomura now predict 512M 5G phones in 2021



5G REVENUE BREAKDOWN



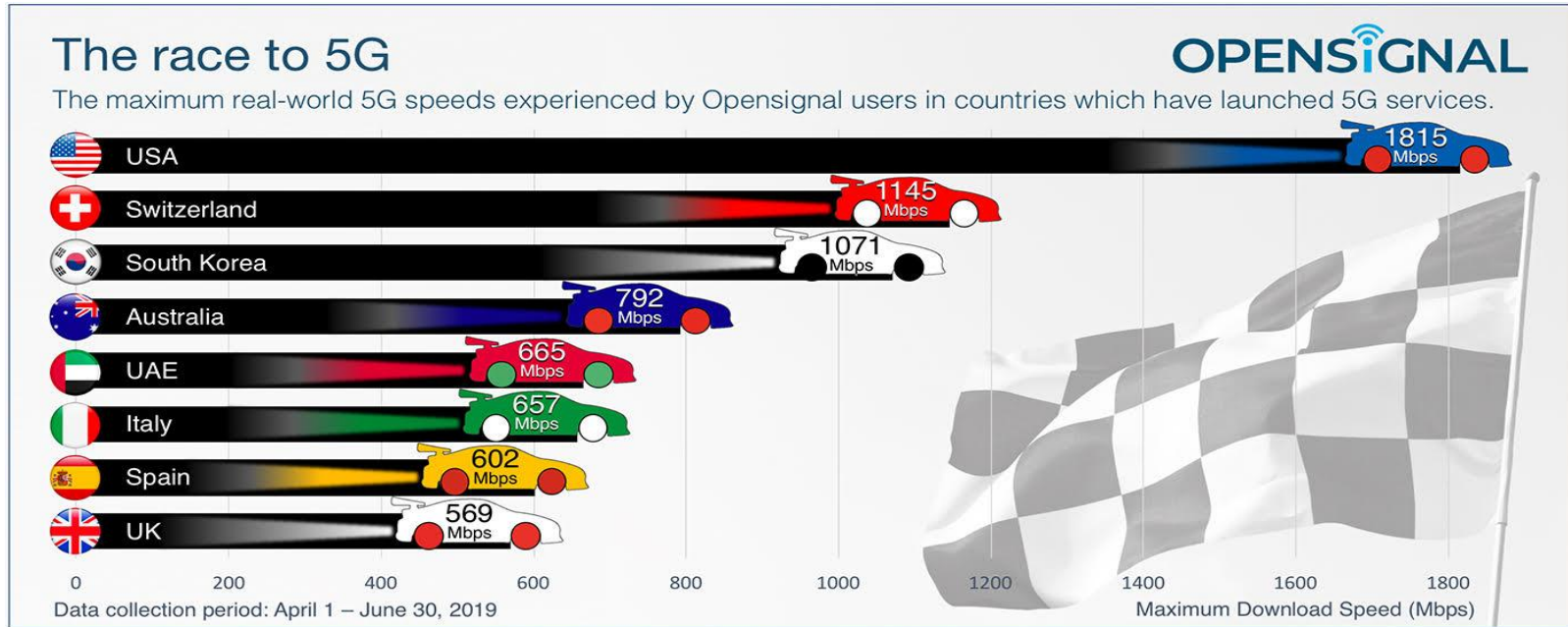
eMBB drives 5G revenue

Ultra reliable and low latency services (URLLC) starts to have impact in 2022 and beyond

Massive Machine Type Communication will come even later

3GPP release 17

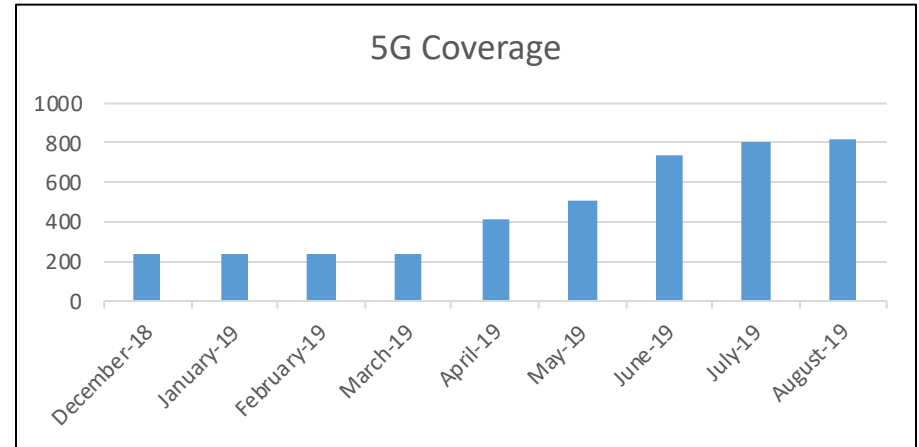
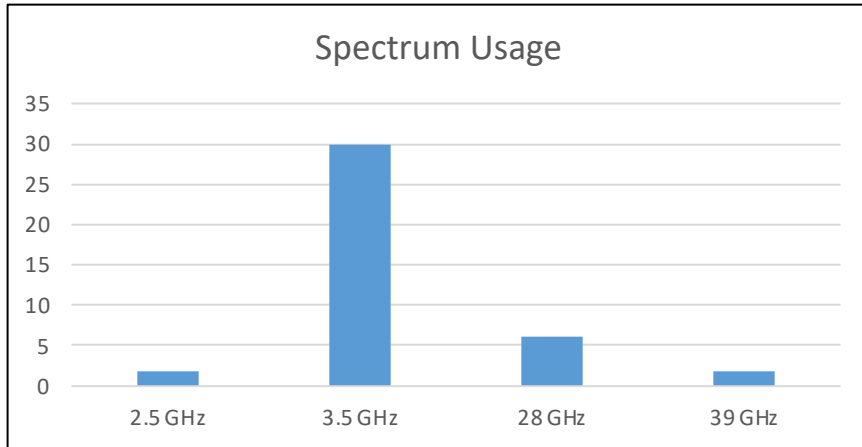
Success of NB-IoT and LTE-M



Peak Speed as high as 1815 Mbps

Reported averages around 100 to 300 Mbps

Source: <https://www.opensignal.com/5g>



- MNOs mostly using 3.5GHz Spectrum which increases interoperability and roaming
- 5G coverage is growing month by month

- Vodafone kicked off intra-Vodafone 5G device roaming and others followed
- 5G NSA roaming across the existing iBASIS IPX roaming services

Source: https://en.wikipedia.org/wiki/List_of_5G_NR_networks

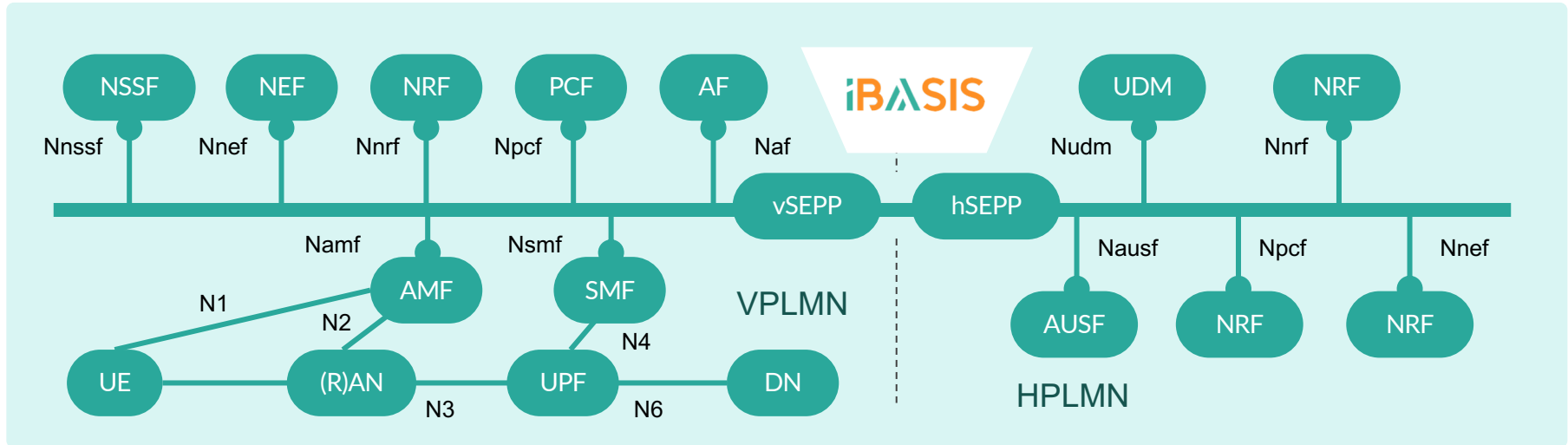
TODAY

5G NSA roaming using existing 4G Services
5G Signaling Sandbox for testing 5G Core

ROADMAP

2020 Commercial
5G Signaling Service

2021 iBASIS Hosted 5G core
Accelerate testing
Prove out business cases
Regional Breakout



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WAS#10

VOLTE & 5G BREAKFAST
ROUNDTABLE

October 28, 2019 | 7h30 AM

Palau de les Arts Reina Sofia | Valencia, Spain

Join the discussion on the LinkedIn Group



ABIresearch for visionaries iBASIS POWERED BY TOFANE

LOOKING PAST THE 5G HYPE AND IMPLICATIONS ON ROAMING

Co-developed with iBasis

ABI Research: Dimitris Mavrakis and Emanuel Kolta
iBasis: Bill Welch, Head of 5G Roaming

THANK YOU

