2018 ACE SCHOOL & RUS SYMPOSIUM
TERMINUS
CONNECTING POINTS OF OPPORTUNITY

5G Network Update

Speaker: Chris Konechne, Project Engineer, Finley Engineering

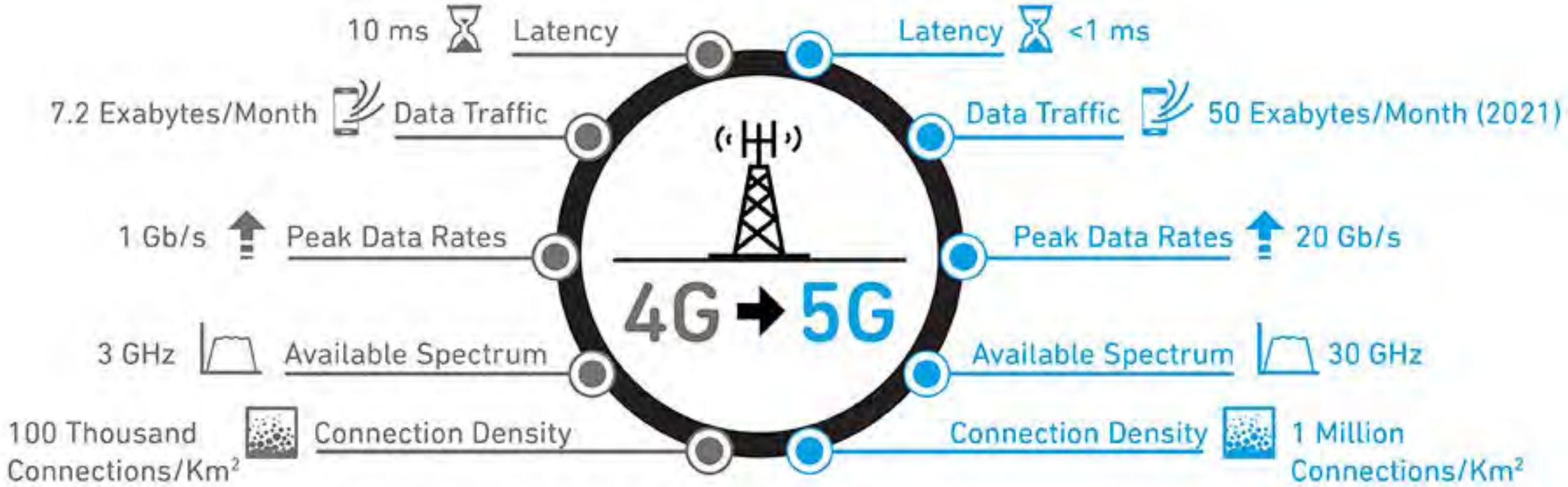
Association of Communication Engineers
ACE

What is 5G?

When people talk about “5G” they're actually talking about a collection of technologies, most of which remain in development. It’s still not clear whether 5G will turn out to be a compound collection of various technologies or whether there will be a deeper integration that ties them all together. So when people discuss 5G in the media, they often emphasize very different technologies to explain it. So it’s a simple, umbrella term for multiple technology advancements still under development.

Ivan Seskar - co-chair of the IEEE 5G Tested Working Group

Comparing 4G and 5G



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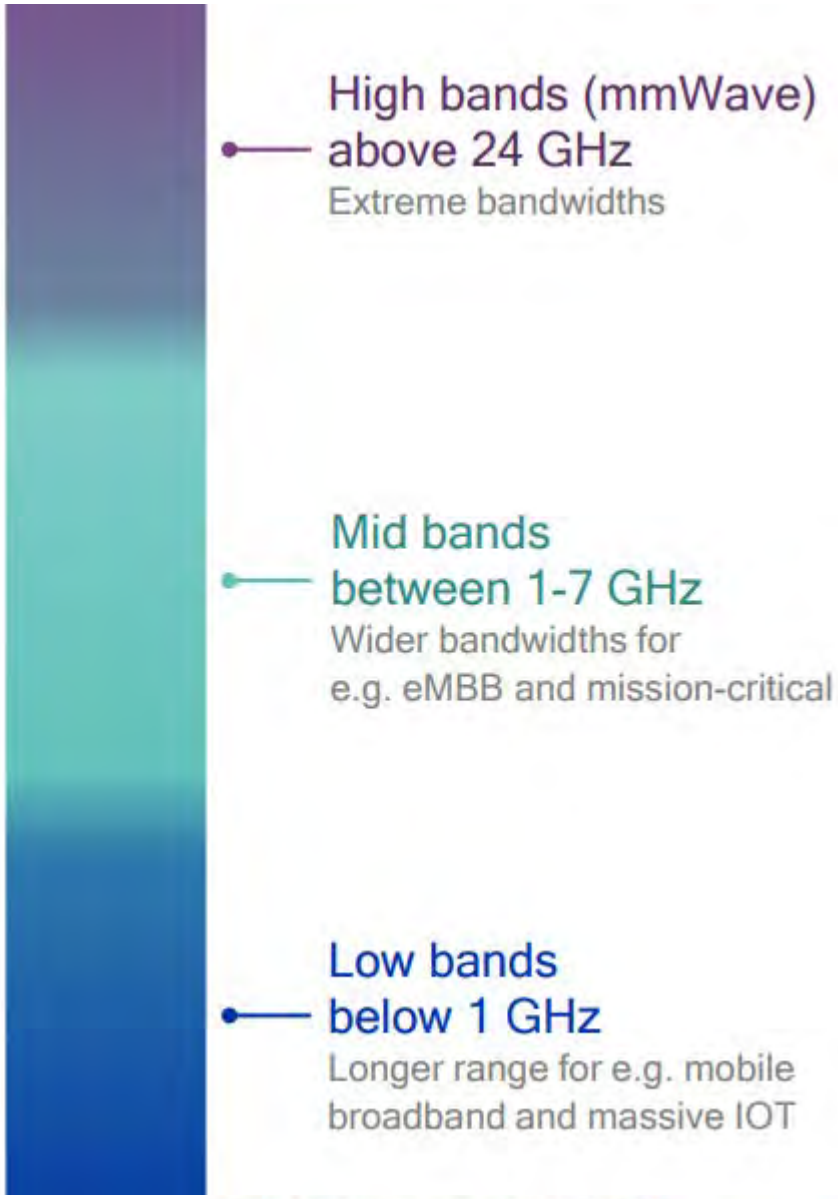
Design Challenges

- Spectrum Flexibility
  - 4G operates on sub 6Ghz bands
  - 5G will need to operate on bands from <1Ghz up to and above 60Ghz
- Massive Connectivity
  - 1 Million Devices/km^2
- Service Quality and Reliability
- Latency Requirements
  - Tactile Internet

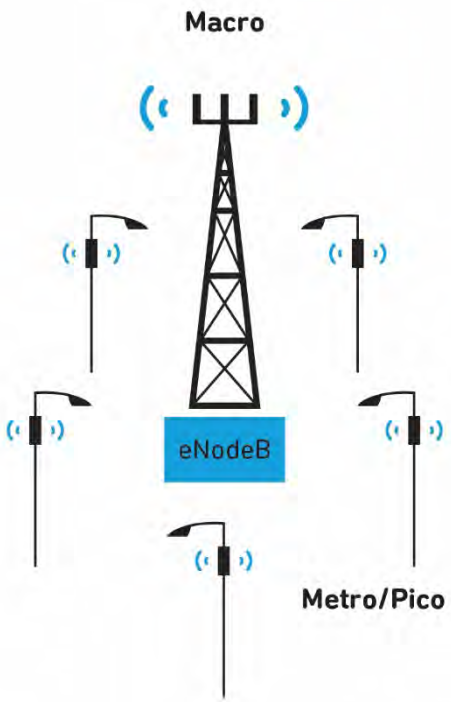
Spectrum(s)

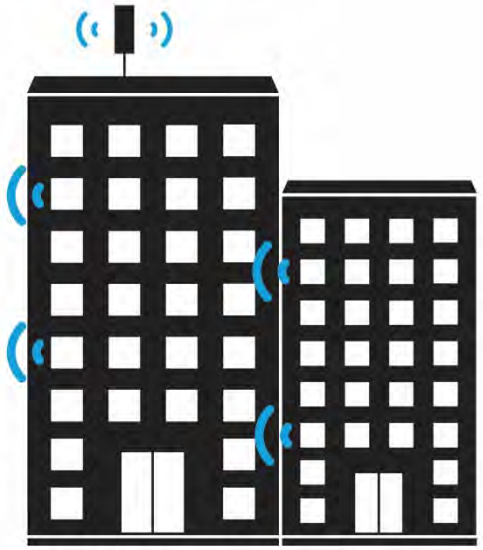
- 5G will likely utilize several spectrum bands to achieve multiple goals
- Carrier Aggregation to allow use of non-contiguous bands, even unlicensed bands.

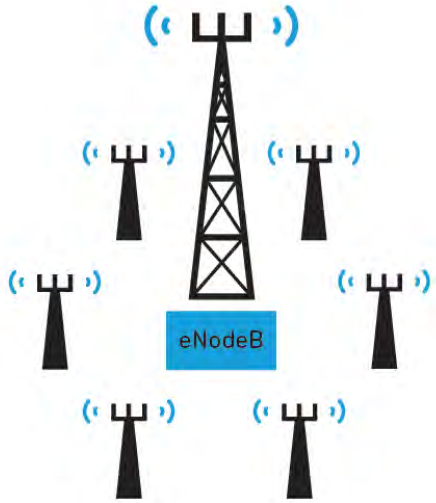


Small Cells Everywhere

- Less dropped signals, better coverage
- Allow for reuse of spectrum and lower power antennas
- Short range will make rural infrastructure difficult







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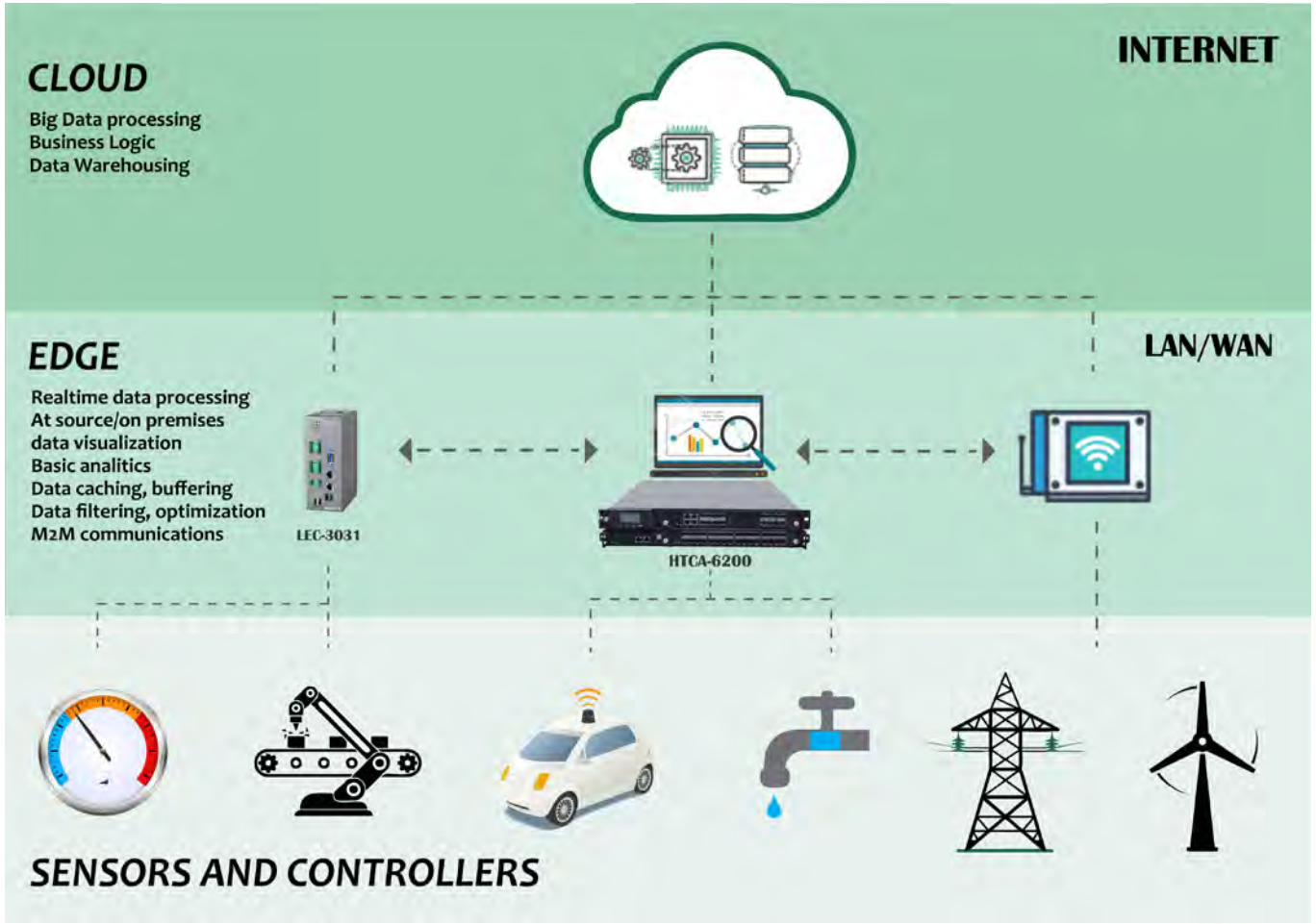
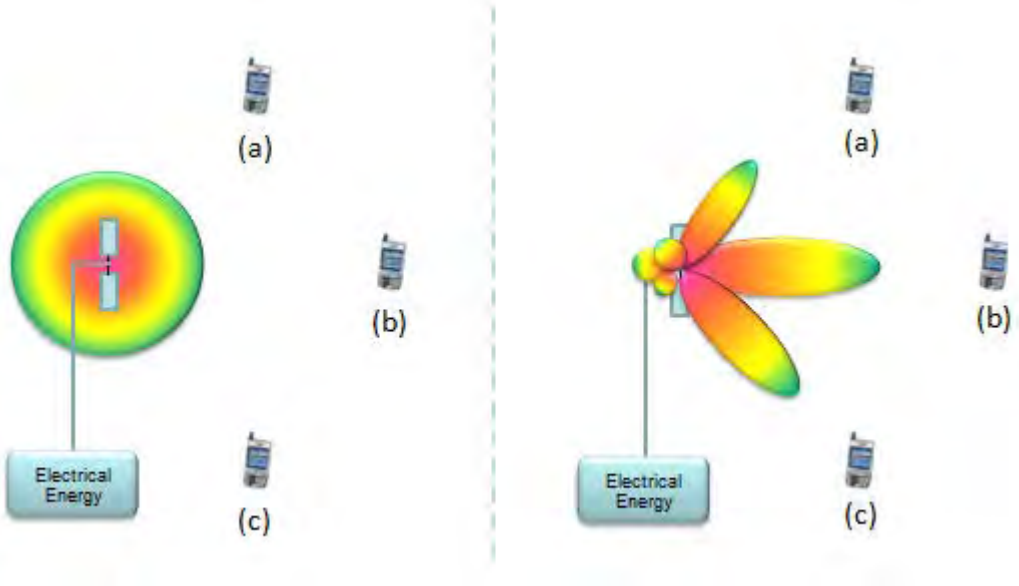
Edge Computing – Beyond the Cloud

- Infrastructure that allows data processing as close to the endpoint as possible.
- Allows lower latency and improved customer experience.
- 5G towers may need mini data centers.



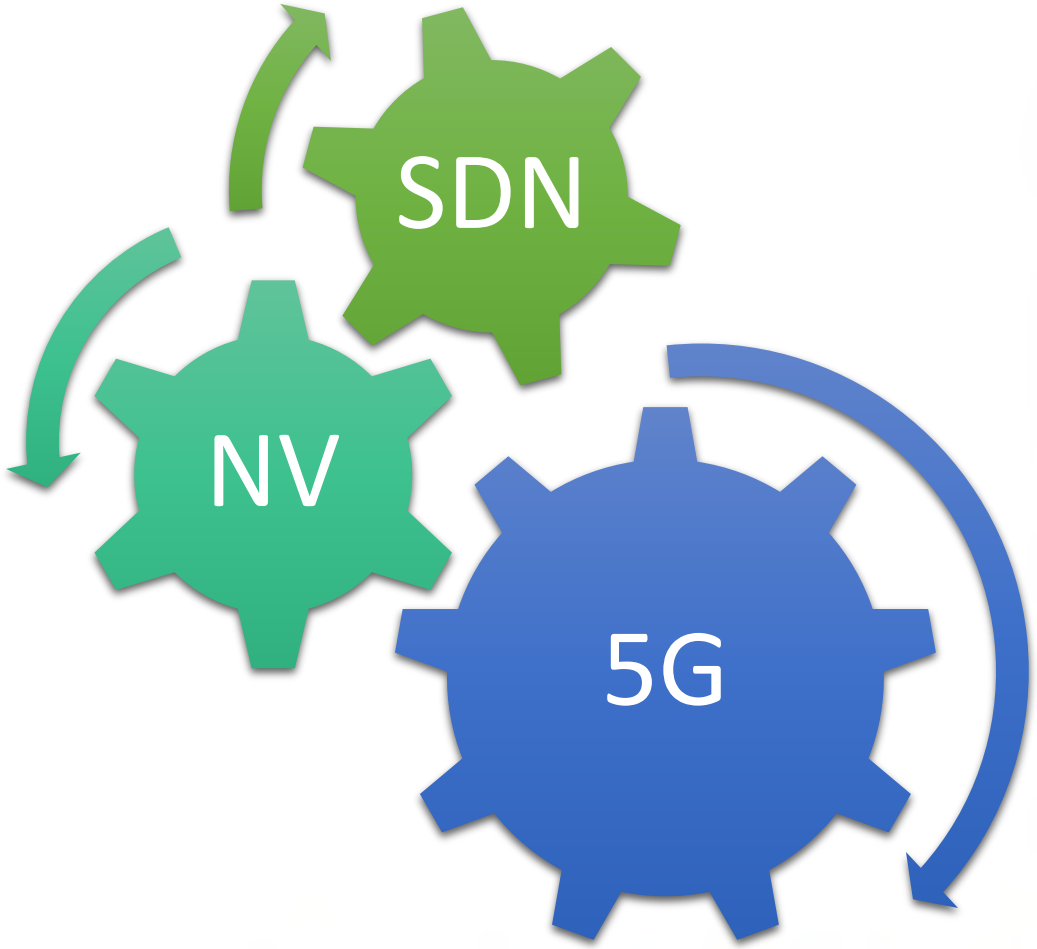
MIMO

- Multiple In Multiple Out
- Beamforming
- Today 4x4 and 8x8 MIMO
- 5G will use 16x16, 64x64, and beyond



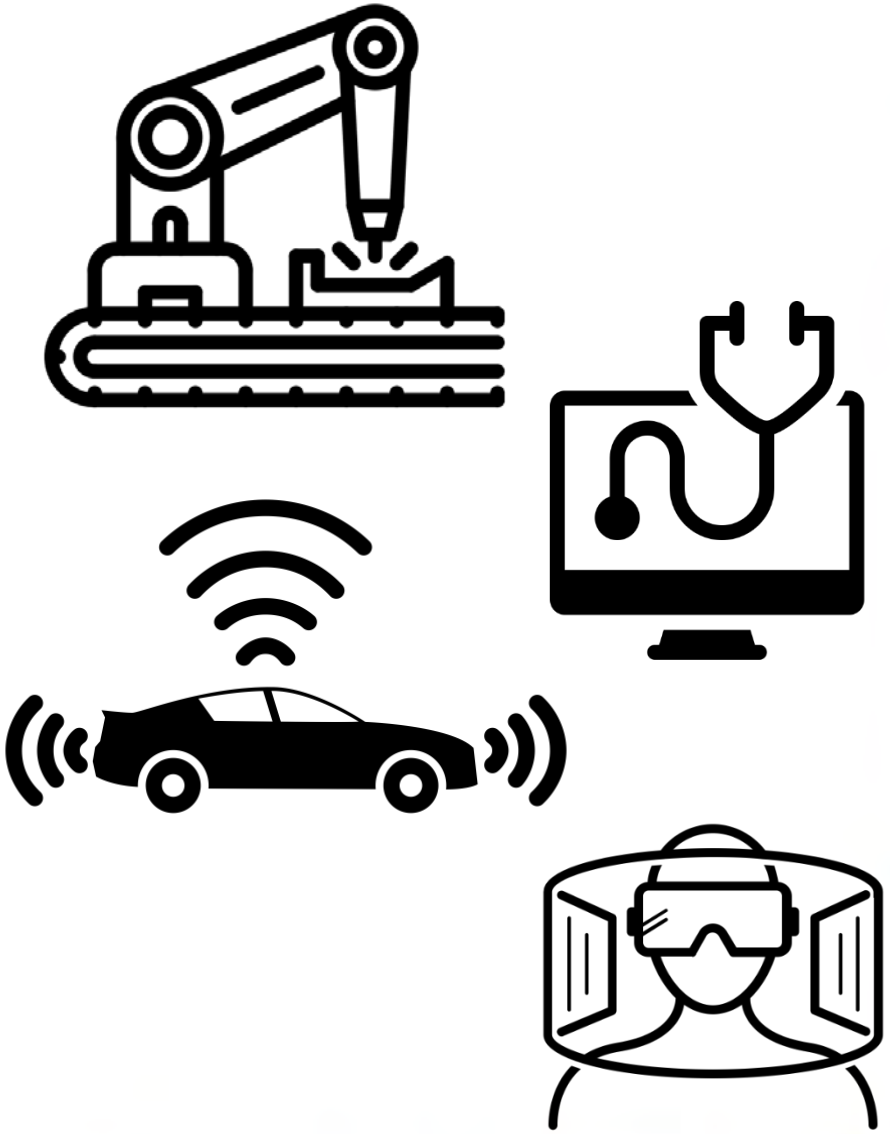
SDN & NFV

- SDN and NFV will enable network slicing to create and partition network services on a single network.
- SDN will allow services to be provided without proprietary hardware components.
- NFV will allow resources to be located deeper in the network to accelerate operations.

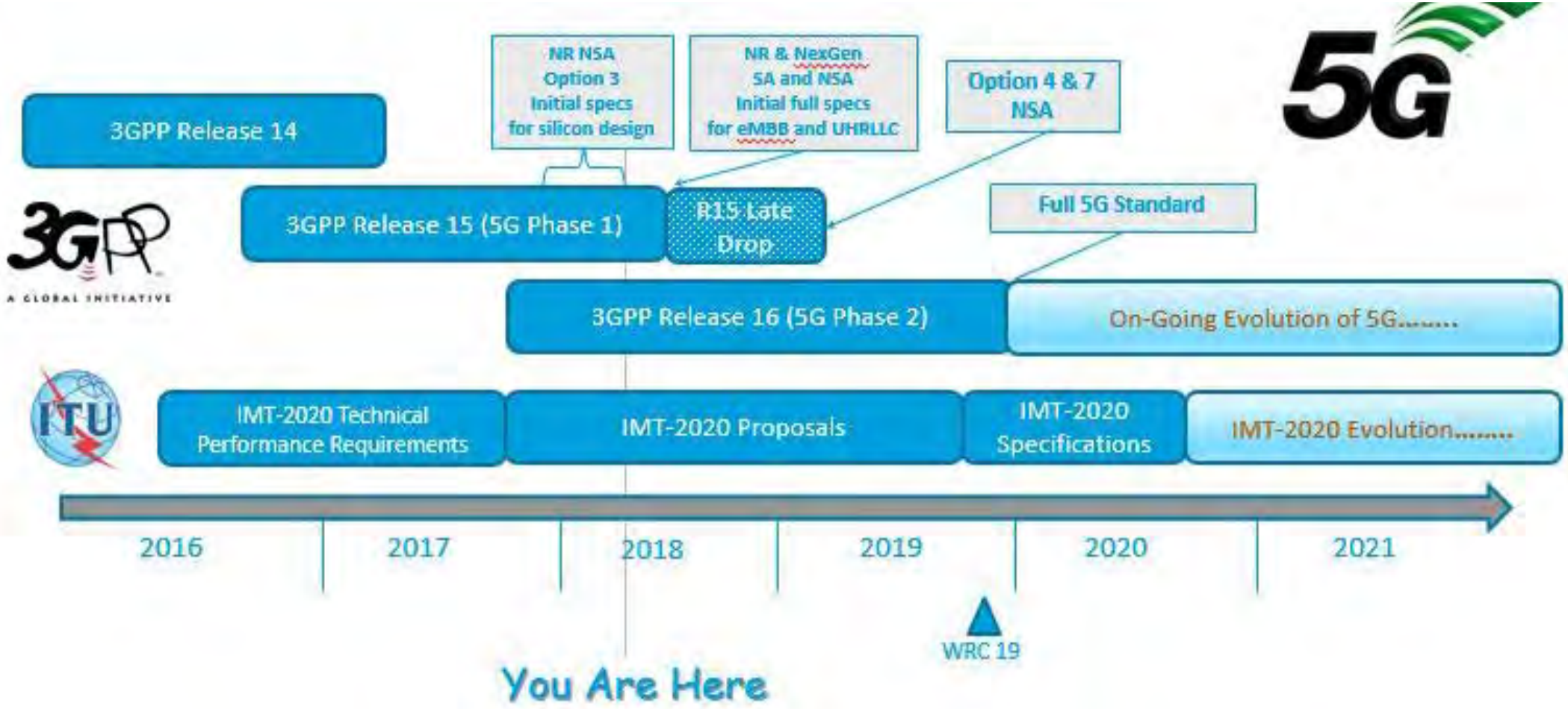


5G Use Cases

- Industry
  - Smart Manufacturing and Agriculture
- Healthcare
  - Telemedicine, Patient Monitoring, Remote Surgery
- Transportation
  - Self-driving Cars, Drones, Traffic Management and Monitoring
- Entertainment
  - Virtual Reality and Gaming, 8K Video, Virtual Conferencing/Calling



5G Timeline


NR NSA
Option 3
Initial specs
for silicon design
NR & NexGen
SA and NSA
Initial full specs
for eMBB and UHRLLC
Option 4 & 7
NSA
3GPP Release 14
3GPP Release 15 (5G Phase 1)
R15 Late
Drop
Full 5G Standard
3GPP Release 16 (5G Phase 2)
On-Going Evolution of 5G.....
IMT-2020 Technical
Performance Requirements
IMT-2020 Proposals
IMT-2020
Specifications
IMT-2020 Evolution.....
2016
2017
2018
2019
2020
2021
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Questions?