5G Practitioner's View

Anit Lohtia

VP Advanced Technologies

Apr 5, 2019

Who am I

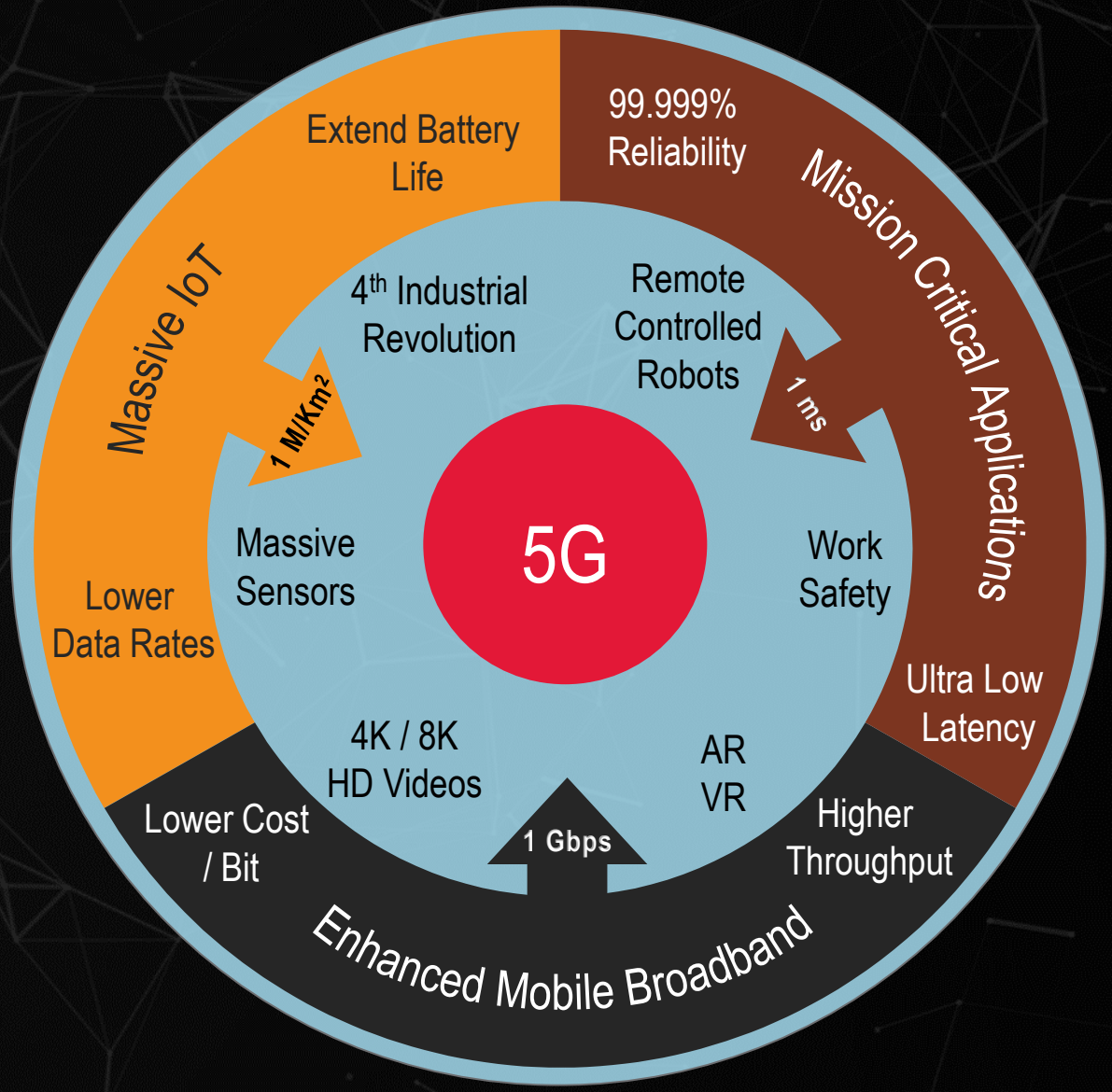
- Lead 5G, cloud, and SDN/NFV transformation initiatives at Tech Mahindra
- Have been instrumental in 3G/4G evolution driving standards, product and business.
- Engaged in ONAP, Acumos, DANOS, OpenStack, ODL and other open source initiatives
- Co-author of Artificial Intelligence for Autonomous Network book
- Always looking to new advances in technology (minus hype)

Agenda

- Introduction
- 5G key attributes
- Coverage, Capacity and Cost balance
- Making right choices
- Summary

What is 5G

- Amalgamation of many technologies
- Air Interface
- Antenna Technologies
- Software Designed Networking (SDN)
- Network Function Virtualization (NFV)
- 3GPP defined standards

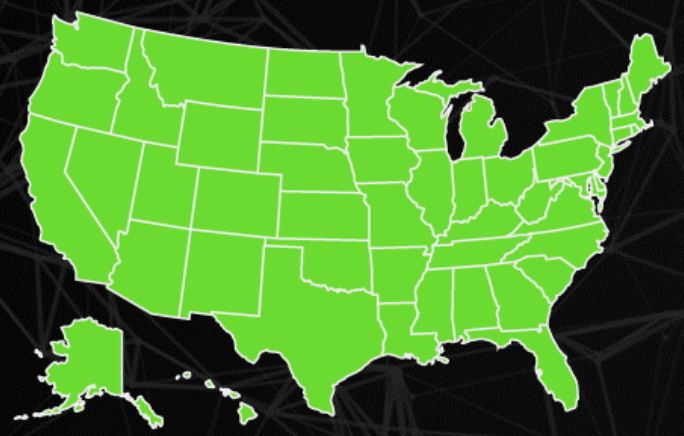


5G – Is it A Panacea?

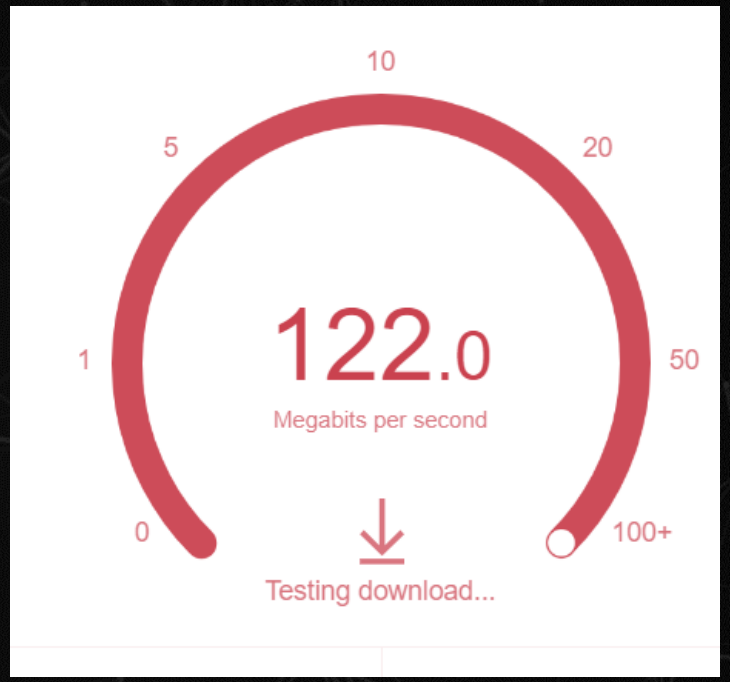
YES, may be

Laws of Physics Still Apply

Back to Basics – 3C’s of Cellular



Coverage



Capacity

Cost

Ultra High Throughput

Upper Bound to Channel Capacity

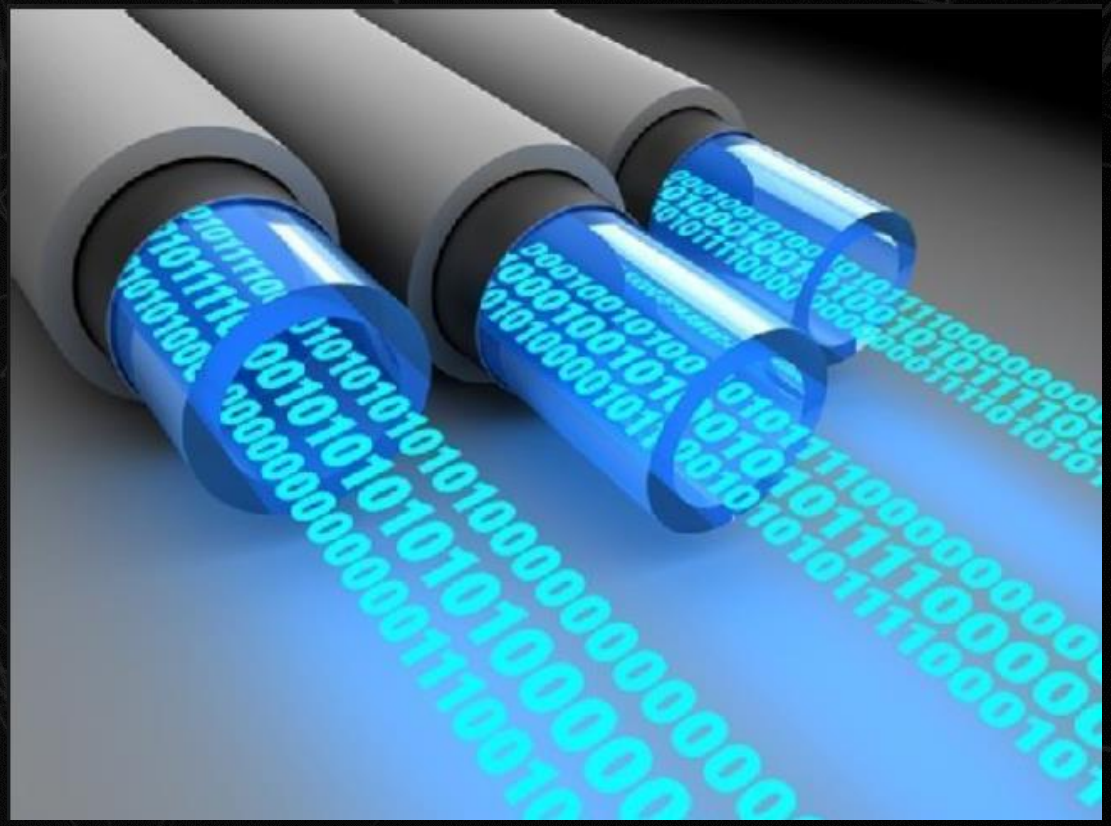
$$C = B \log_2 \left(1 + \frac{S}{N}\right)$$

For Ultra High Throughput

- Higher bandwidth channels
- Carrier aggregation
- Multiple channels - MIMO

Higher frequency band

- Smaller coverage at higher frequency bands



Low Latency

Where does latency come:

- Connection setup
- Over the air transmission
- Network node processing
- Network propagation delay (~ 300 km/ms)

And 5G magic:

- Faster connection time
- Higher throughput
- Control & User Plane Separation (CUPS) architecture
  - User plan function closer to the customer
  - Less distance to travel and lower number of nodes to traverse

Ultra Reliability

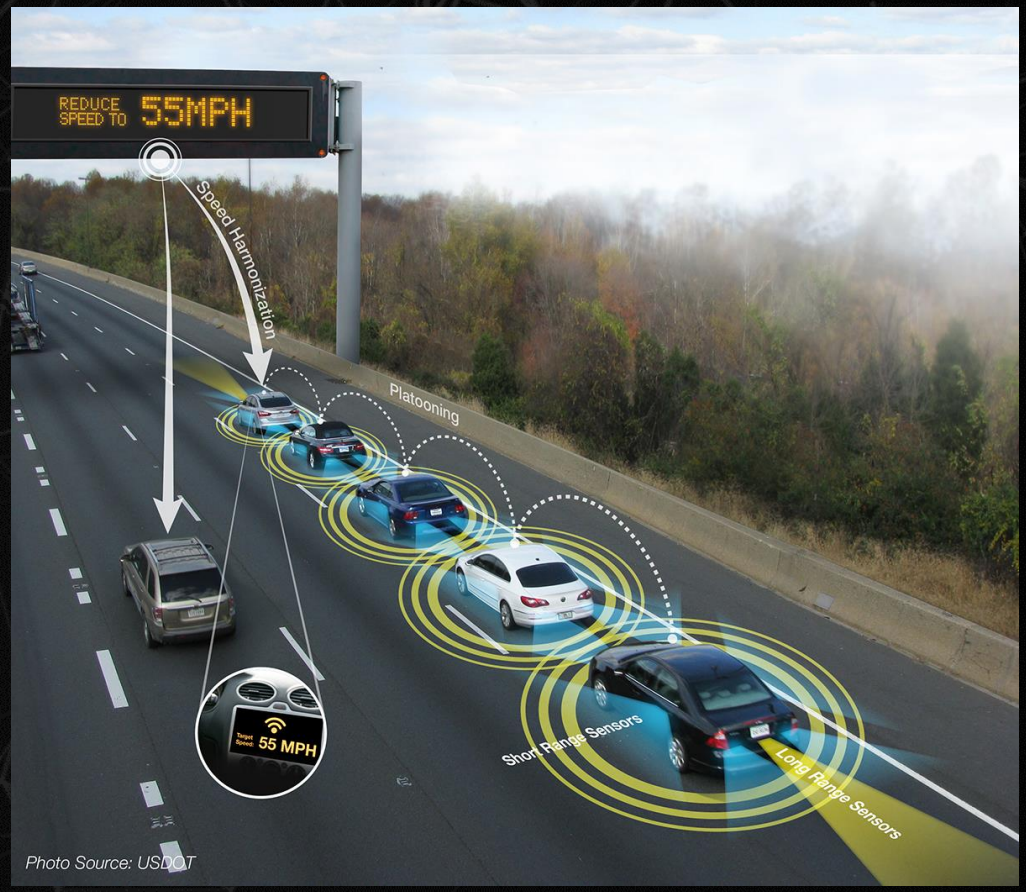
How is reliability achieved in wireless

- High SNR
- Coding
- Re-transmission

Cost of redundancy

- Lower throughput
- Higher latency

Optimal solutions still being worked out



Massive Machine Type Communication

Massive Machine Type Communication requirements

- Large number of connections
- Long battery life
- Very small packets with minimal overhead

5G magic

- Service oriented architecture
- Network slicing
- Air interface enhancements

Optimal solutions still being worked out

What Does It All Mean Then

- It is about business requirements not technology
  - Pick components needed for the business requirements
  - It’s NOT all or nothing
- Cost Benefit economic analysis
  - Coverage
  - Complexity
- Timing
  - 5G Capabilities rolled out over a period of time

Summary

- 5G is a collection of many technologies
- Ultra high data rates require higher bandwidth and MIMO
- Smaller coverage at higher frequency bands
- Fast processing at edge to lower latency
- 5G has many tools – Pick the right ones!!