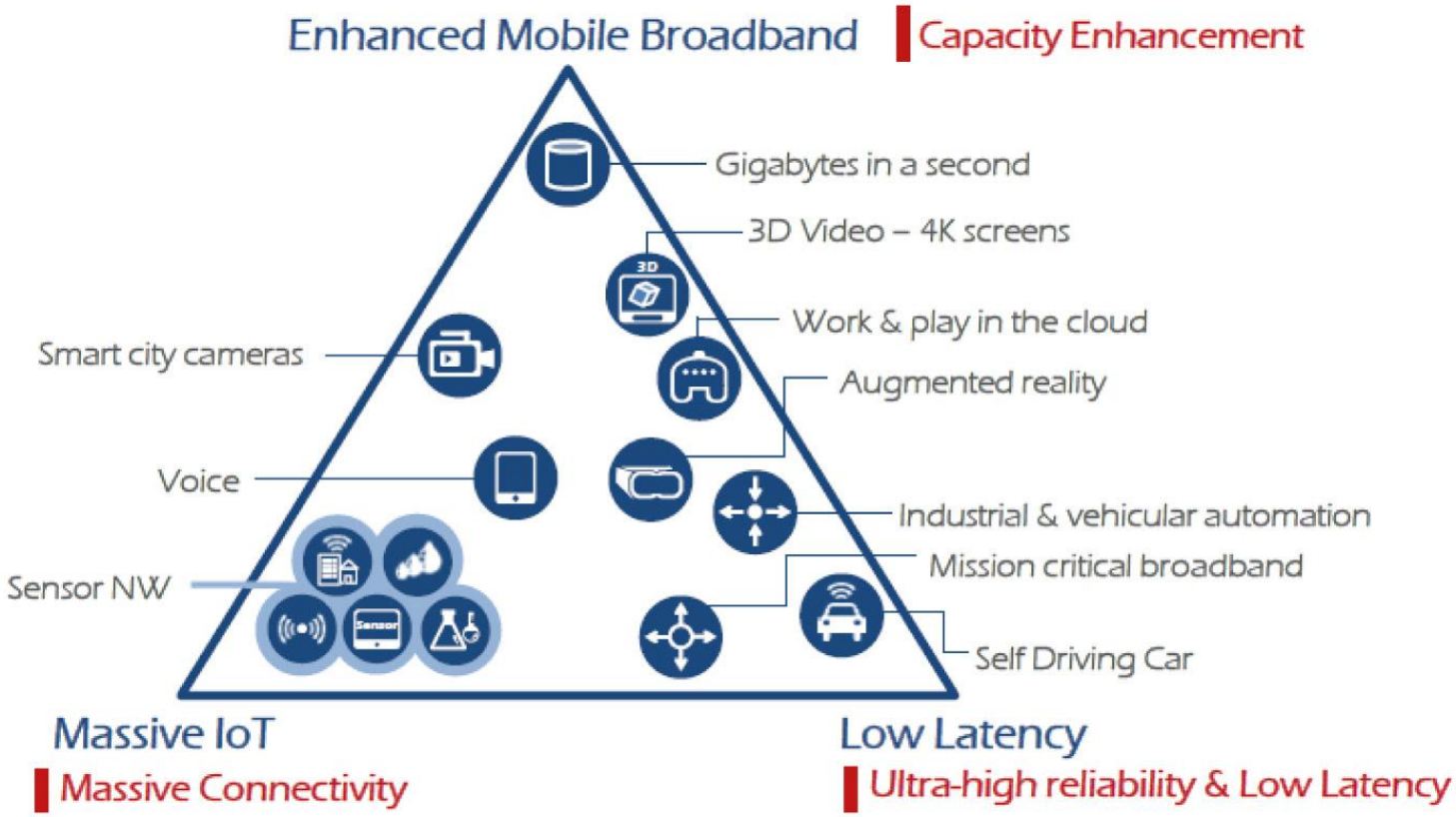
Let’s take a look at 5G



(Source: ETRI graphic, from ITU-R IMT 2020 requirements)

5G enhancements

Enhanced Mobile Broadband: The stated goal is 1 Gbps to your device, or better. To put that in perspective, the best performing 4G networks right now top out at about 45 Mbps, so not even 5% of the goal for 5G.

Massive Machine-to-Machine Communications: connect up to 1 million devices per square kilometer, compared to around 2,000 connected devices per square kilometer with 4G.

Ultra-high Reliability & Low Latency: all packets must get to their destination and do so extremely quickly (in 1 millisecond). For mission critical communications and advanced applications like remote surgery, etc.

Examples of 5G use-cases

- Network slicing
- Autonomous vehicles
- Remote surgery
- Gaming and virtual reality (e.g. Google Stadia)
- Smart home

5G is a Different Kind of Generational Change

In some ways 5G is just a continuation of 4G with incremental improvements to radio performance and a focus on smaller cells and therefore higher throughput.

However, it also adds numerous additional areas of focus that benefit machine-to-machine communications and a hyper-consumerist model of mobile broadband.

What's New?

Antennas: Massive MIMO and Beamforming

Radios: incremental improvements

Spectrum: multiple frequencies

Network deployment: small cells

5G has serious drawbacks

- The amount of spectrum and infrastructure (base stations, fiber, etc.) necessary to fully deploy is substantial and unprecedented
    - **Upwards of $3 trillion US Dollars, globally!**
- Uses 2 to 3 times more energy vs. 4G
- Transfer of ownership of urban infrastructure (e.g. streetlamps)

5G and the Digital Divide

5G does not have much to offer if our goal is the effective communication of people and their ability to access information and express themselves freely.

There are other, more affordable and appropriate options:

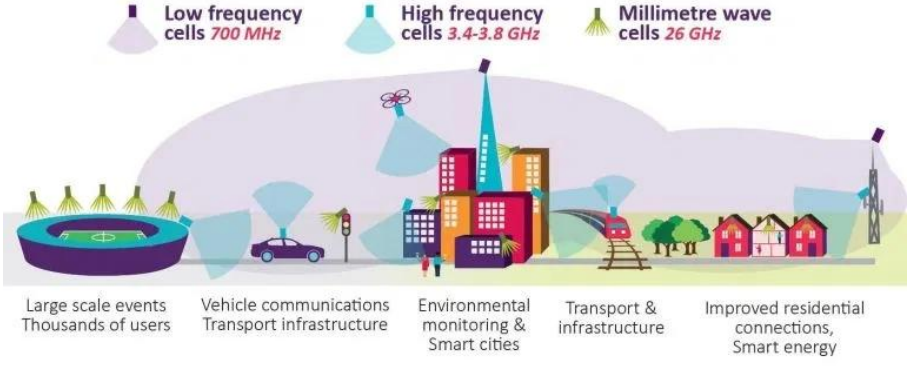
- Build out more terrestrial fiber lines
- WiFi
- Open-Source 4G

5G will not solve the Digital Divide

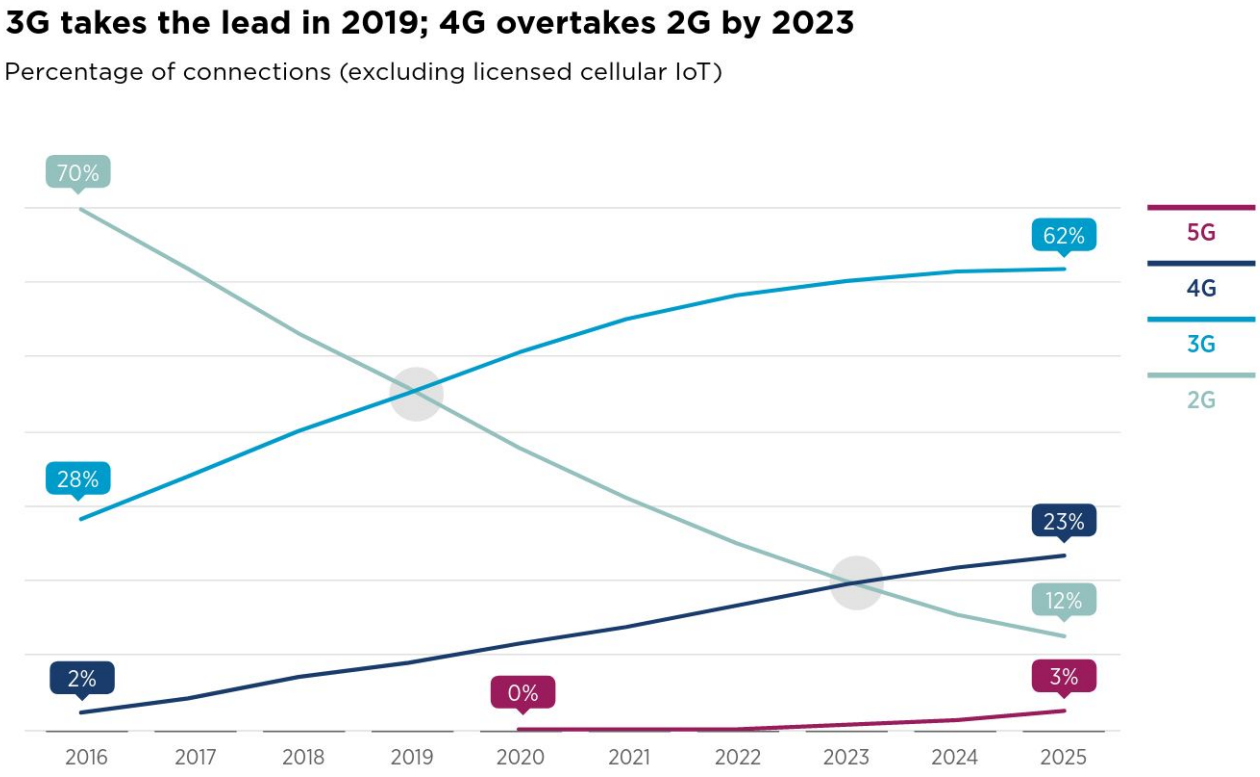

5G NEEDS ALL SPECTRUM BANDS
mmW
DENSE URBAN
MID BAND METRO
LOW BAND NATIONWIDE
CAPACITY
COVERAGE

Frequencies and uses for 5G

- Low-band (sub-1 GHz)
  - Best coverage but limited capacity
  - Macro cell deployment
- Mid-band (3.4 - 4.5 GHz)
  - Capacity but limited penetration
- High-band (24GHz and up)
  - Very high throughput but poor coverage and penetration
  - Many, many small cells needed e.g. streetlamps



Mobile Trends in SSA



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