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Indo-European dialogue on
ICT standards &
Emerging Technologies
(Growth, Profitability & Nation Building)
13-14th March 2014 • New Delhi, INDIA

IN THE FRAMEWORK OF
Project
SESEI
http://eustandards.in/

Improving Radio Spectrum Efficiency

Addressing 1000x capacity increase

Nitin Dahiya, Head of Mobile Broadband Sales Development, NSN, India

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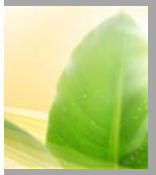
Socio-technical Evolution Requirements for Beyond 2020

Broadband Internet connectivity widely available

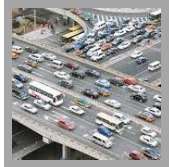


need for strong limit on energy dissipation and CO_2 footprint per capita

More context-related information (e.g. augmented reality).

Increased extent of remote virtual collaboration

Increasing average age and higher importance of health care



Need for more efficient and safer transportation means

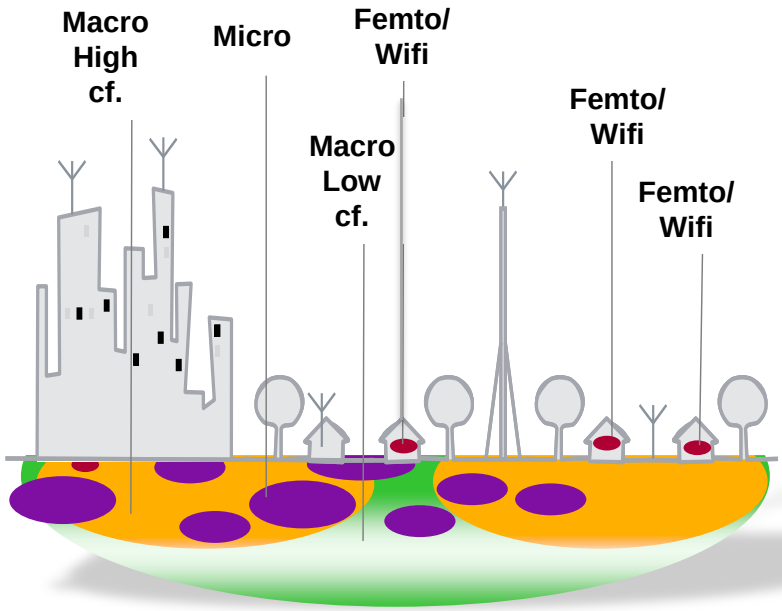
Personal data stored in the cloud and transmitted over wireless channels

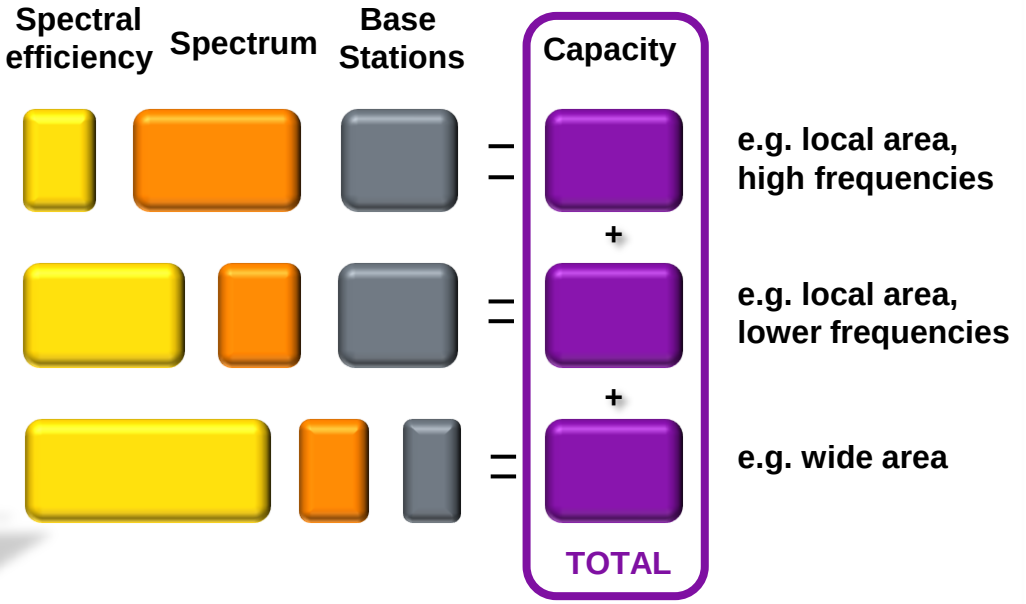
'Internet of things': Smart Homes, Smart Cites, Smart Society

How to increase Capacity of the networks?

Capacity = Spectral Efficiency x Amount of Spectrum x Number of Base Stations

Beyond 4G will be HetNet , where each layer will see different factors





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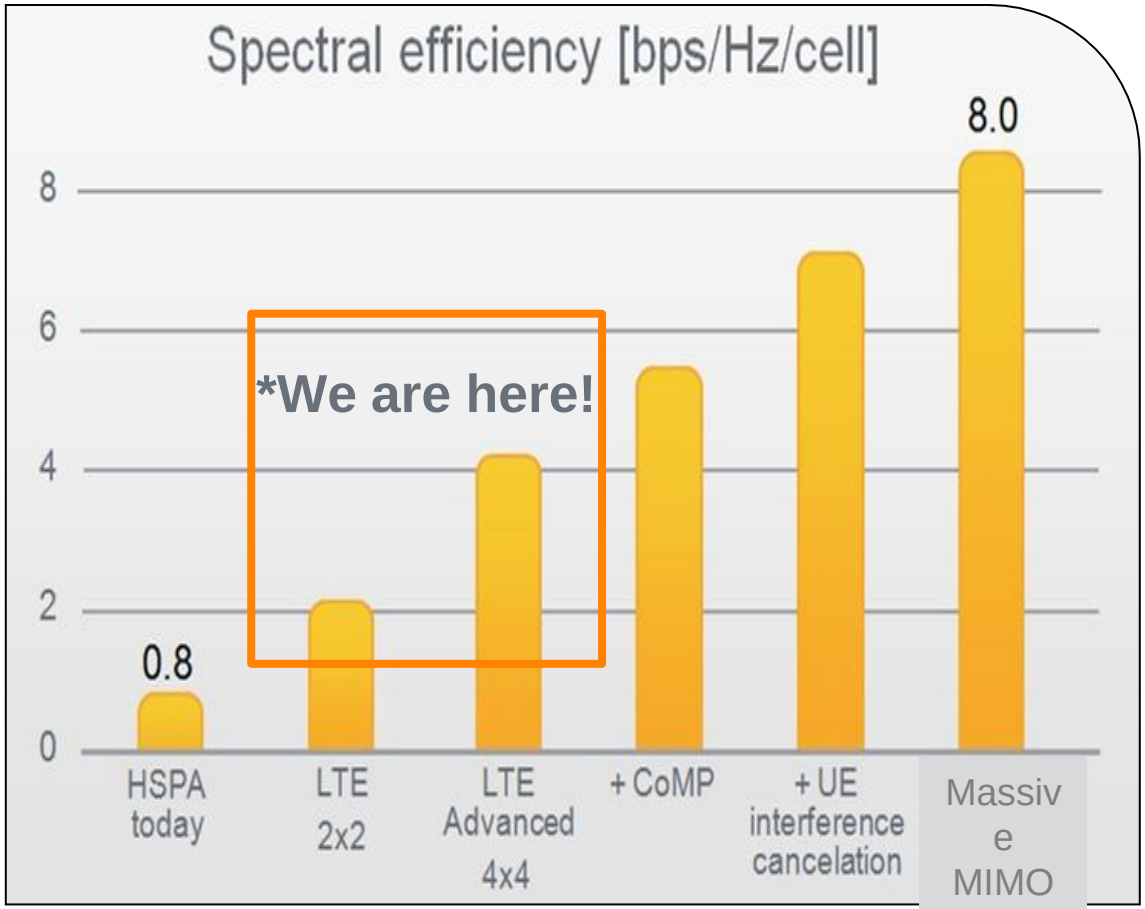
Technology Evolution Requirements

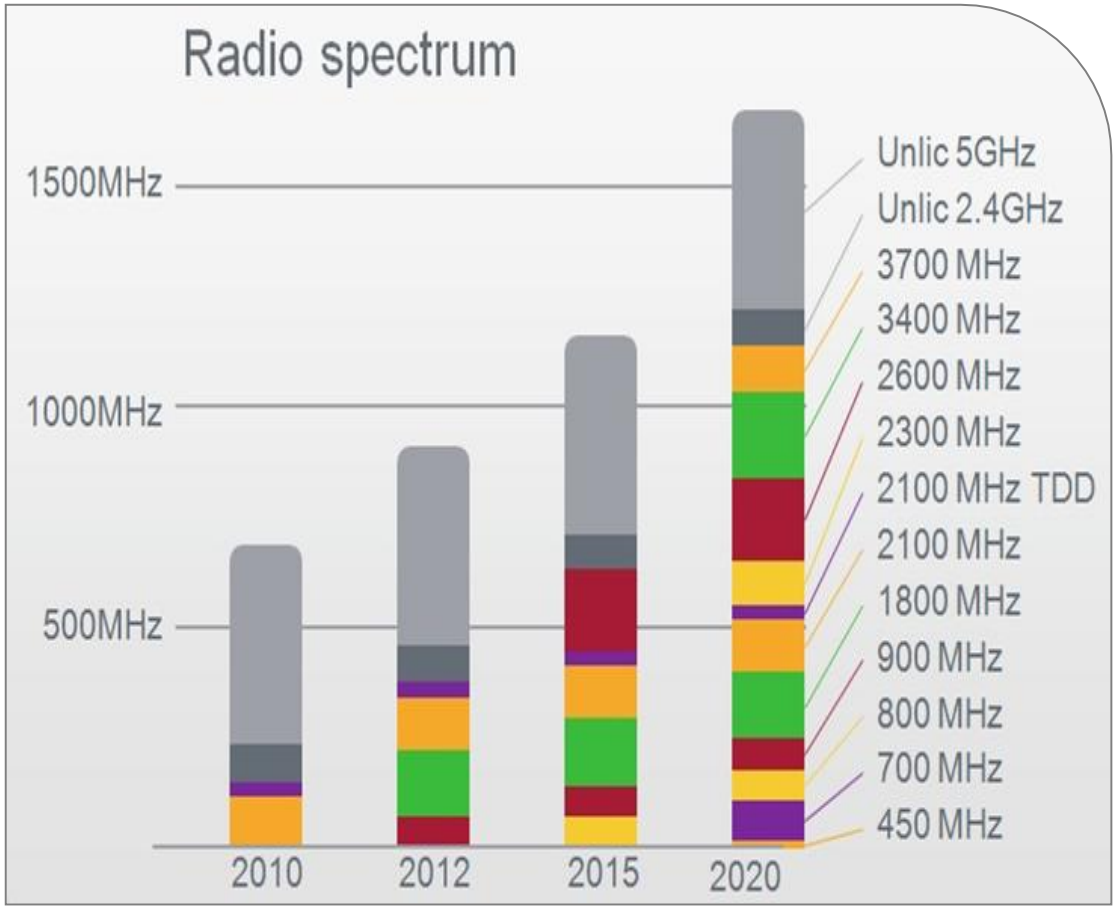
Efficiency 10x



*Actual LGU+ measured at 1.5-3.0 bpHz, with 2.0-2.5 avg
*DL COMP, SPS, TTI Bundling, eICIC, MRO, ….

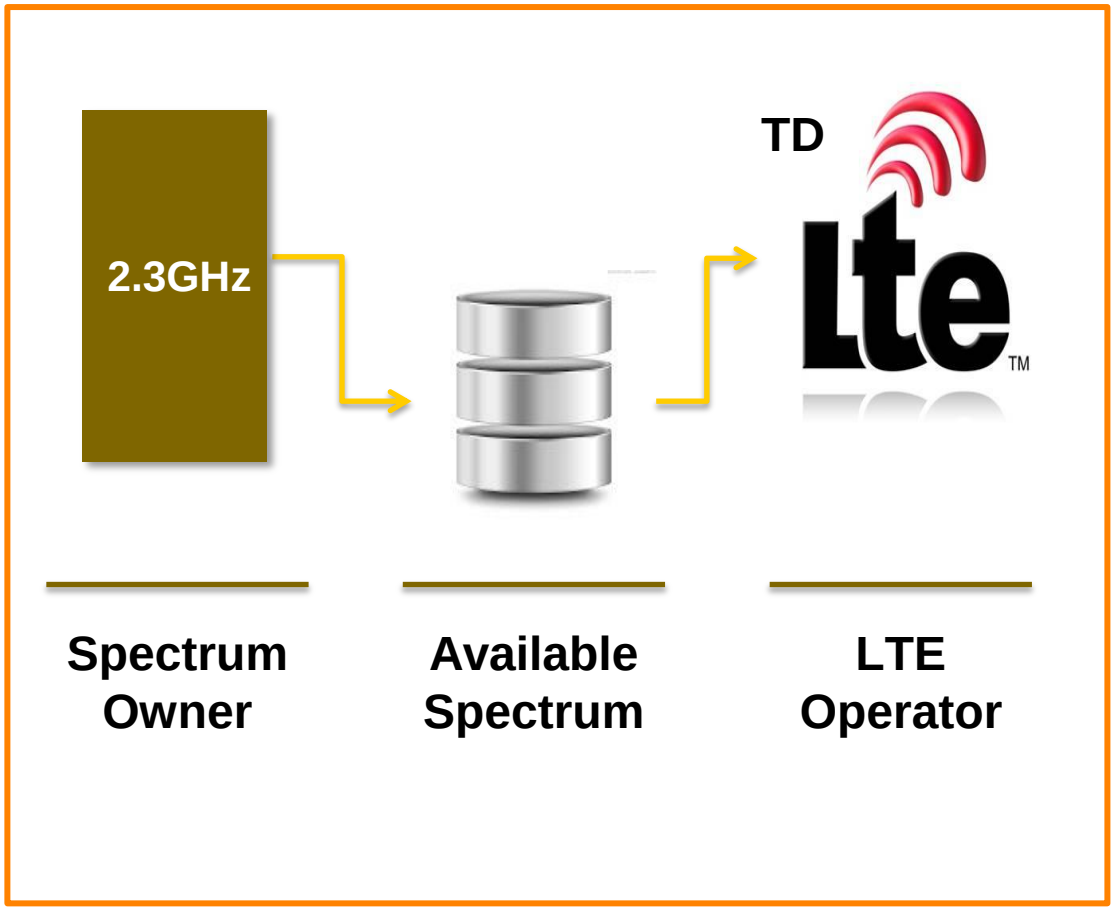
Regulatory Requirements

Spectrum 10x



Authorized Shared Access

September 26, 2013



World's First Trial

- Shared spectrum
- 2.3GHz
- "Rented"

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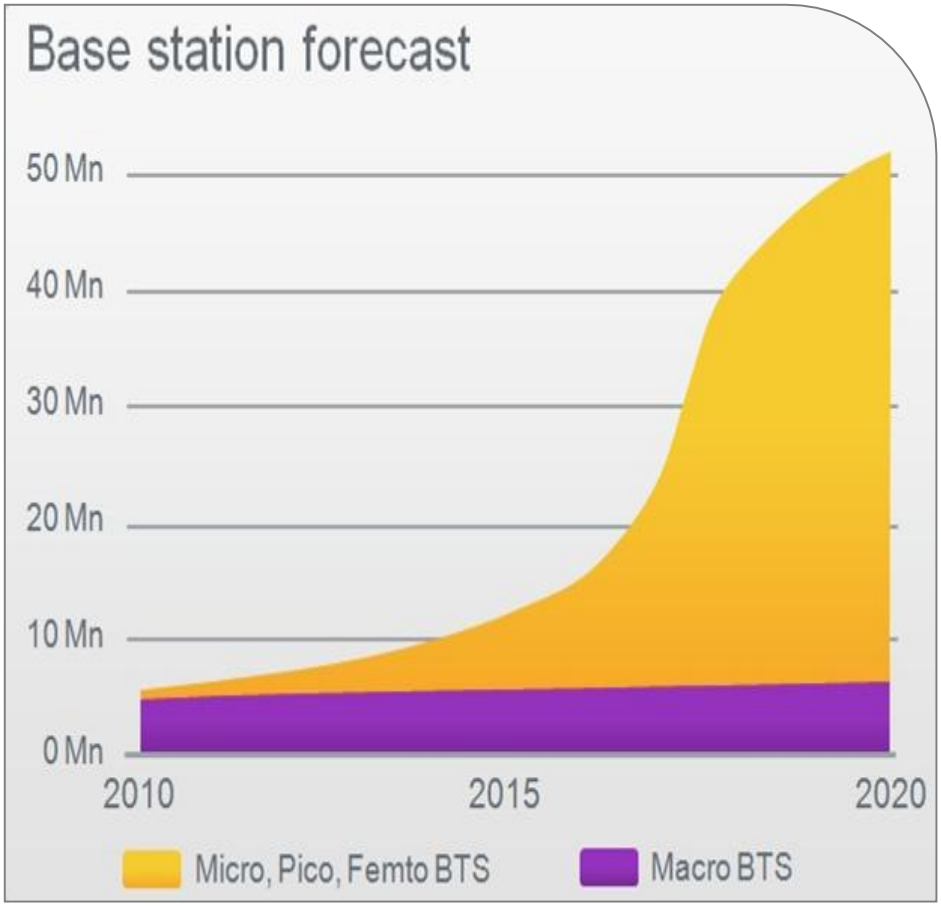
Small Cells

Cells 10x



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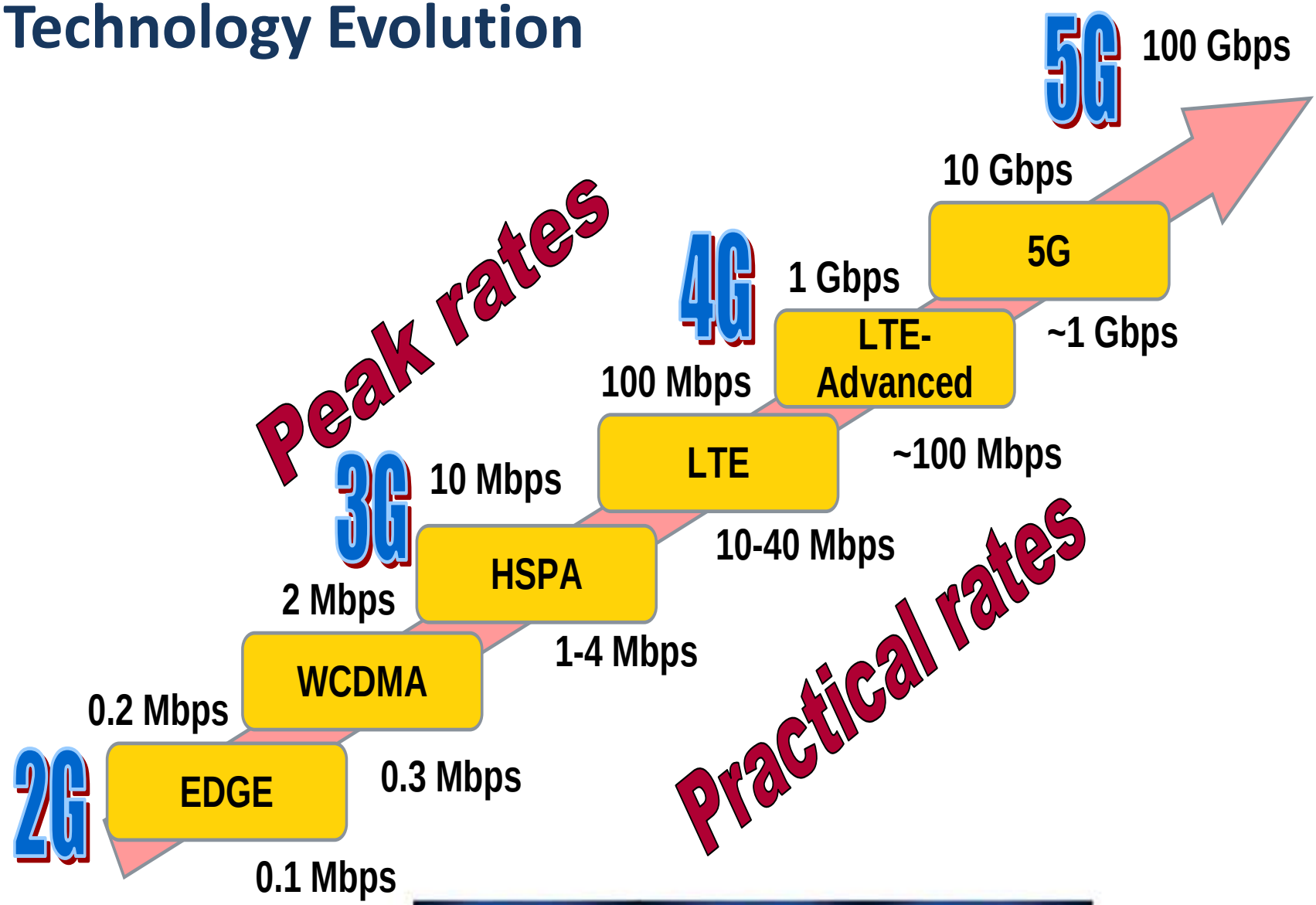
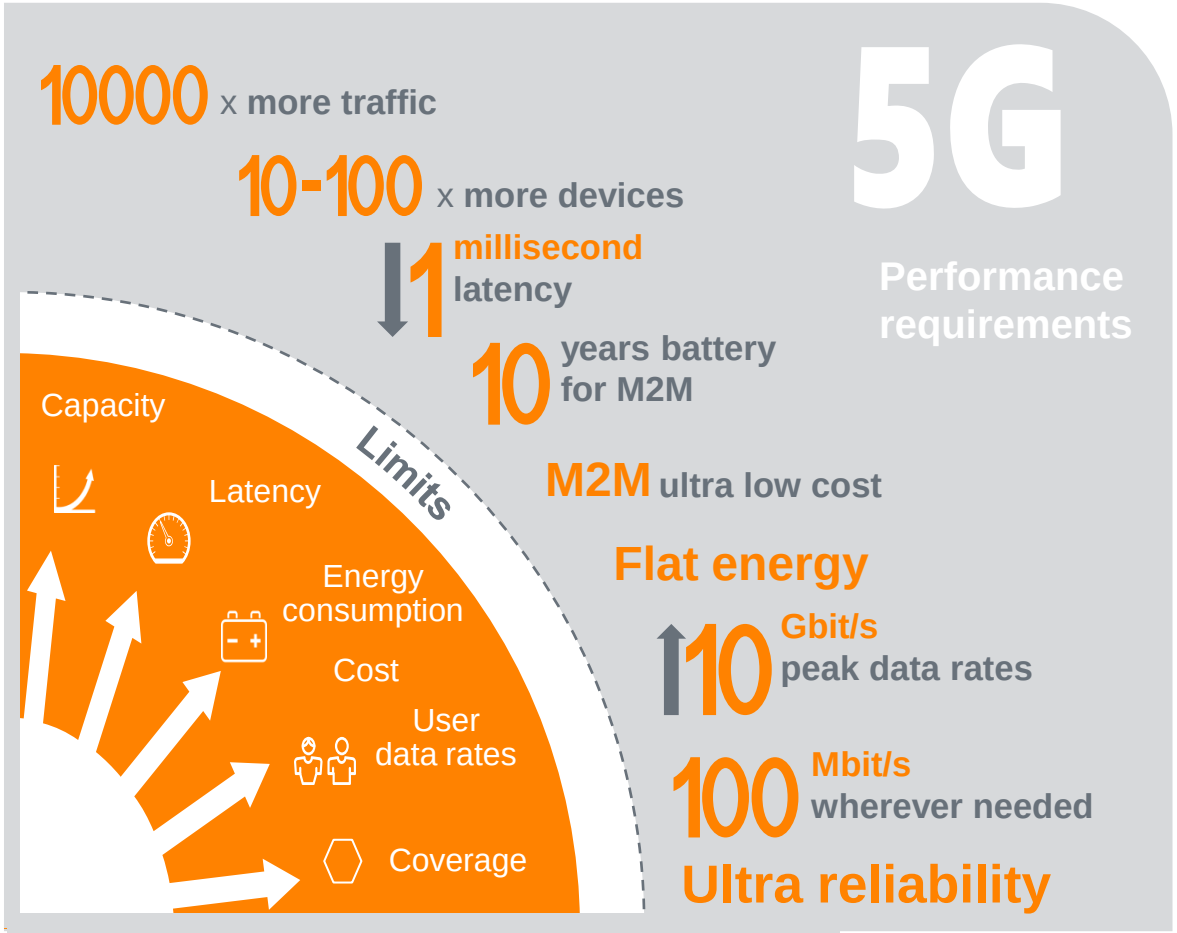
Technology Evolution



Stretching targets for 5G beyond 2020

Sustained research will be needed to create a high performance 5G environment



5G is stretching far beyond 2020 and will enable a more scalable service experience on demand. People and machines will enjoy a virtual zero latency gigabit experience when and where it matters.

5G will not be a completely new wide area radio technology, but an integration of both novel and existing access technologies such as LTE-A and Wi-Fi.

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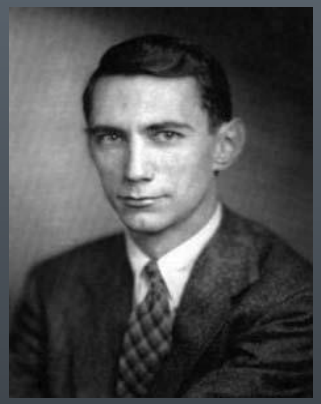
How to Increase Spectral Efficiency for 5G?

Single link optimization

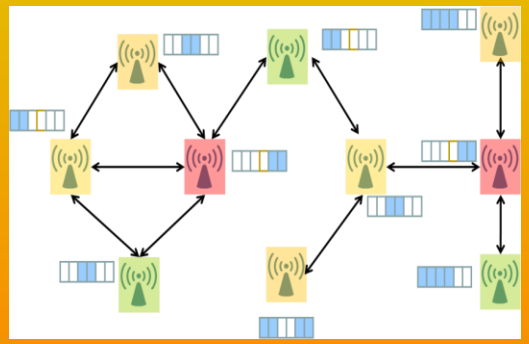
- Single link capacity is already close to Shannon:
- Fast adaptive modulation and coding
- Hybrid ARQ



Claude Elwood Shannon (1916–2001)

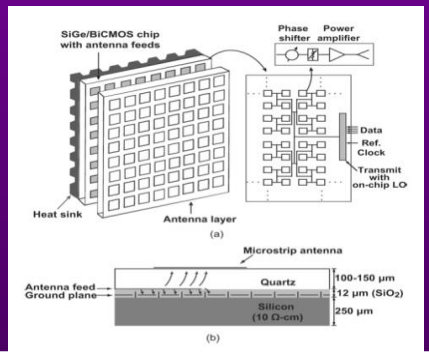
Interference coordination

- Minor or no gain in average
- Large improvement in outage



Multi Antenna Technology and advanced receivers:

- Commercial evolution of multi antenna technology has gone slow in past but ease with higher carrier frequency
- Receivers with interference rejection capability has great potential but requires more signal processing



Small potential

Medium potential

Large potential

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New Spectrum for 5G

Basic Link budget / Cell size

LOS/NLOS ? LOS+reflections

Carrier Frequency

Single Antennas (or low efficiency)	Multi Antenna Technology (High Rank)	Multi Antenna Technology (Low Rank)

5G must be flexible in supporting new spectrum:
(cell size, carrier frequency, system bandwidth and antenna technologies)

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the best mobile broadband experience

Thank You

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