

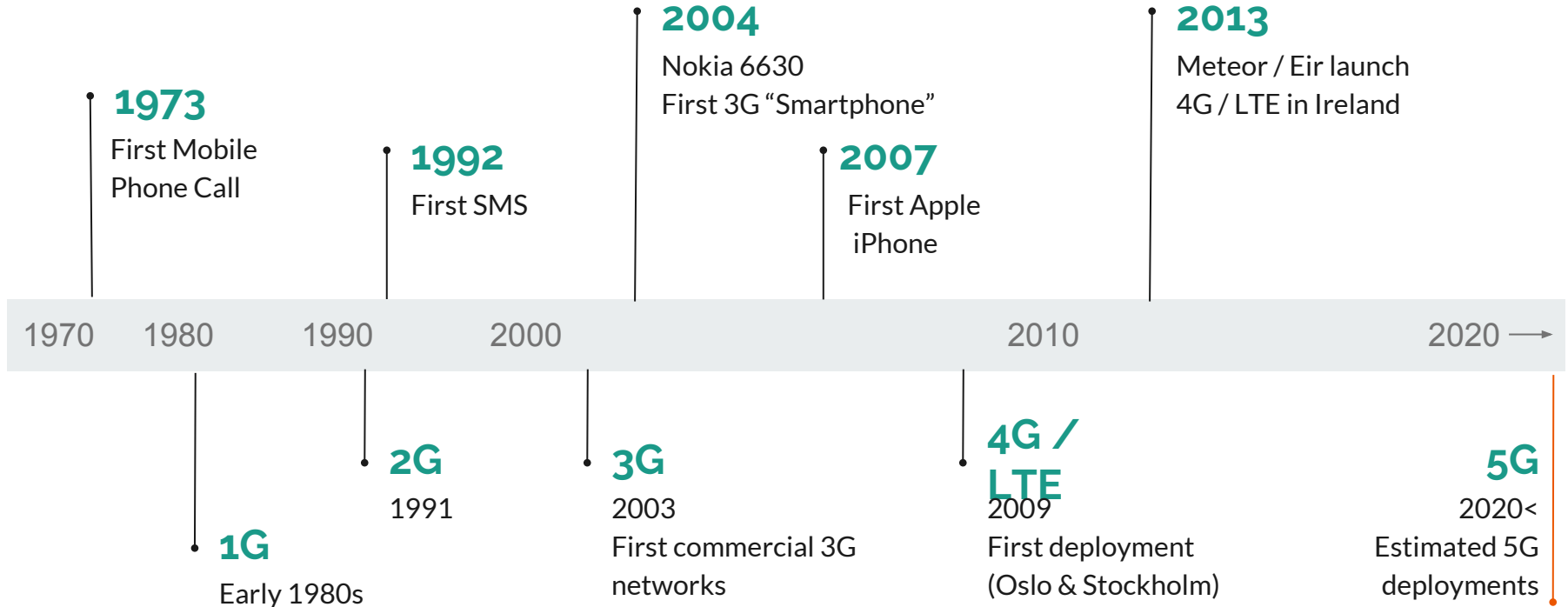


5G

The Next Step in Mobile Communications

Rebecca Kane

A Brief History



29 Billion (2022)

2016 - 16 billion

2018 - 20 billion

Figures include connected landlines etc - fixed phones, mobile phones, pcs, laptops, tablets, IoT devices

Might get rid of this slide?

Source: Ericsson IoT Outlook, 2017



Solving the Problem

... 4G not capable of sustaining increasing traffic etc

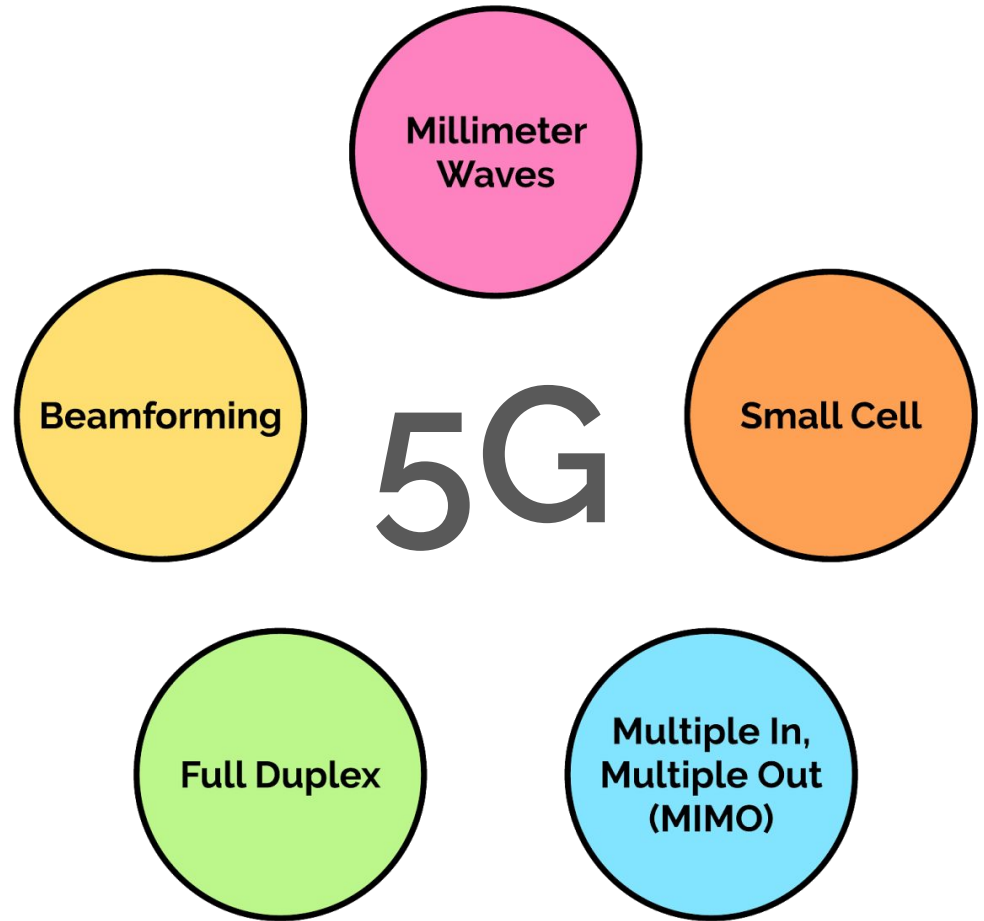
... IoT = more devices

...current problem = bandwidth (solved with mmWave)

... What if questions - downloading, streaming, gaming, wider applications - hospital/schools



Proposed Technologies





Millimeter Waves and Small Cells

mmWaves - opening up more bandwidth, but don't travel well through buildings/trees/even rain

Small Cells, i.e. loads of small stations, would fix that - waves bounce between obstructions using stations



Massive MIMO & Beamforming

4G base stations have about 12 ports - 5G stations could support up to 100 -> handle more users (+ mmWaves)

More ports = bigger risk of signal interference - beamforming solves this - plot the best transmission route through the air to each user, send individual data packets in many different directions(bouncing them off buildings and other objects in a precisely coordinated pattern) - allows users & antennae to exchange more information at one time

Full Duplex

4G stations operate on a stop go system (or on different frequencies if user wishes to transmit and receive data at the same time) - 5G transceivers will be able to transmit and receive data at the same time, on the same frequency. Two trains one track analogy.



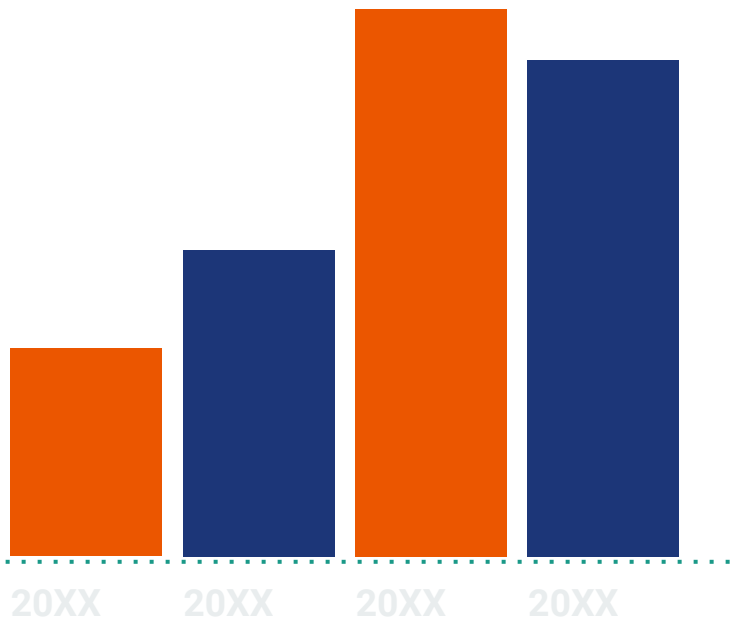
The Need for 5G - Why?

Obvious reason of more devices / more connectivity (connected home etc)

Lead into use cases -

... personal level (streaming etc)

... societal level (schools & hospitals)



An aerial photograph of the Chicago skyline at dusk. The city is densely packed with skyscrapers, including the Willis Tower and the Trump Tower. The city extends to the edge of Lake Michigan, which is visible in the background under a twilight sky with scattered clouds. The text "[Conclusion Slide]" is overlaid in white on the right side of the image.

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Proposed Technology



mmWave

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An aerial photograph of the New York City skyline at dusk. The Empire State Building is prominently featured in the center, its top section illuminated with red and green lights. The surrounding city is filled with numerous skyscrapers, many of which have their windows lit up. The sky is a mix of dark blue and orange, indicating the time is either early morning or late evening. The water of the harbor is visible in the distance.

The technology: GPS + RFID

Why now?

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