

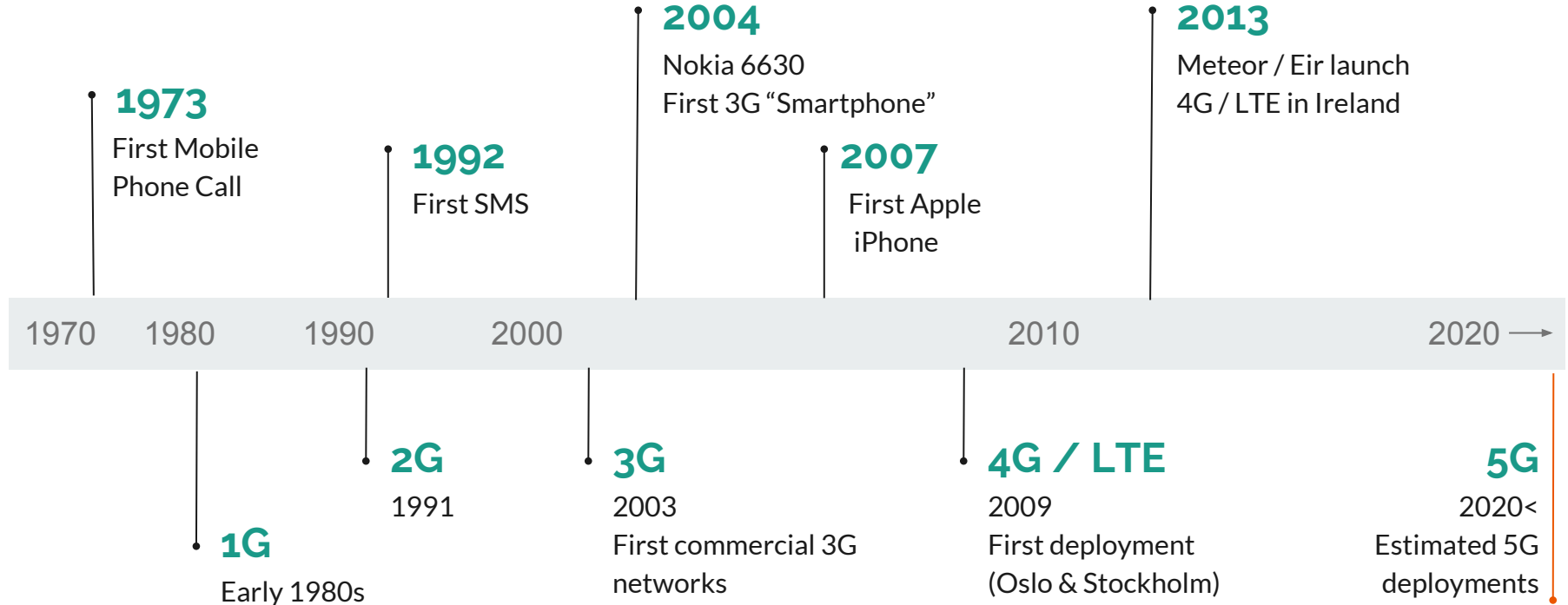


# 5G

## The Next Step in Mobile Communications

*Rebecca Kane*

# A Brief History



# 18 Billion

Connected Devices, 2017

**7.5 Billion**  
People

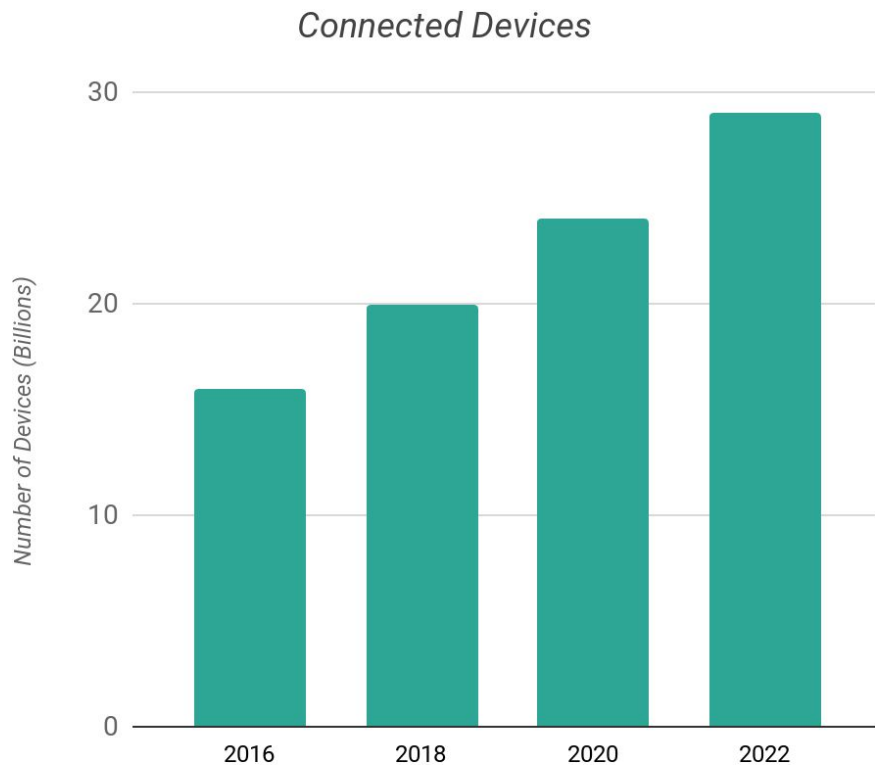
*2.4 Devices Per Person*

# 29 Billion

Estimated Connected Devices, 2022

**7.7 Billion**  
People

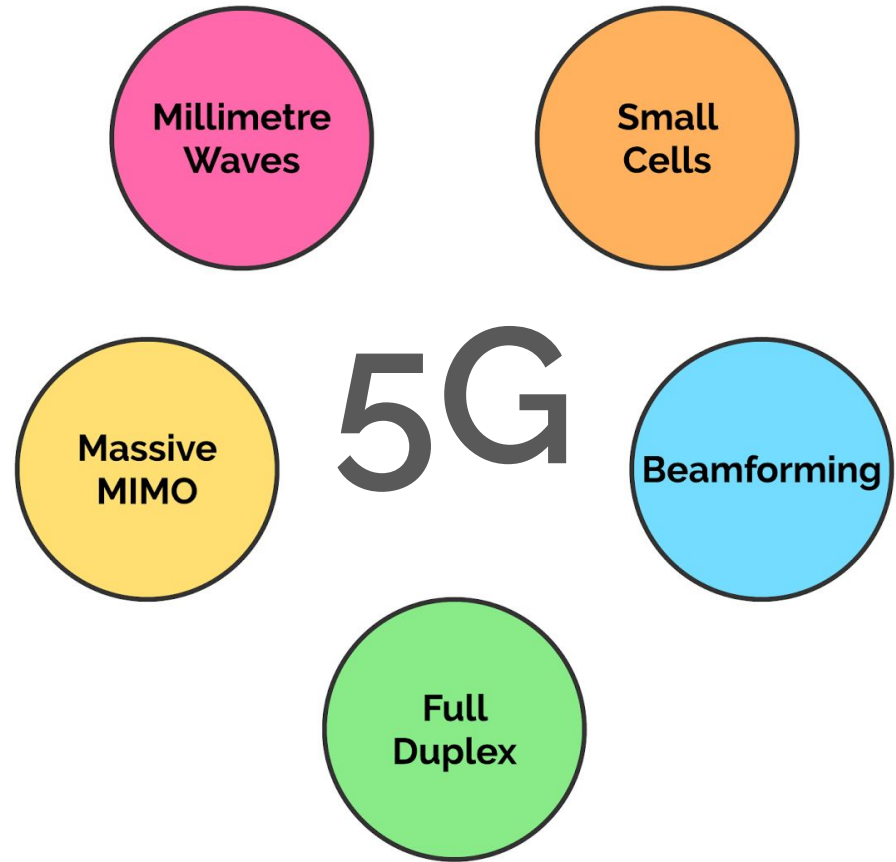
*3.7 Devices Per Person*



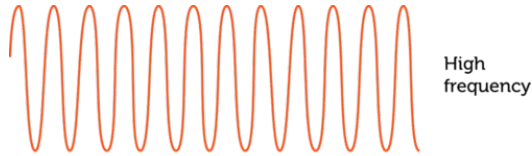
Source: Ericsson IoT Outlook, 2017



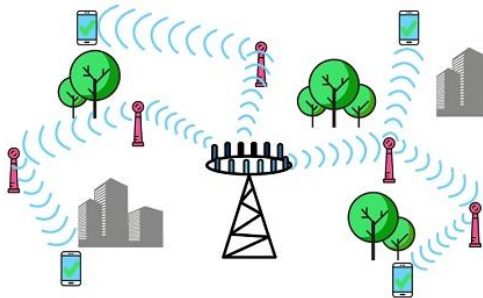
# Proposed Technologies



# Millimetre Waves



## Small Cells



## Electromagnetic Spectrum in GHz



Whole New Area of the Spectrum

=

More Bandwidth for Everyone

## *What about the obstacles?*

Portable Miniature Base Stations

=

Stronger Signals



# 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.



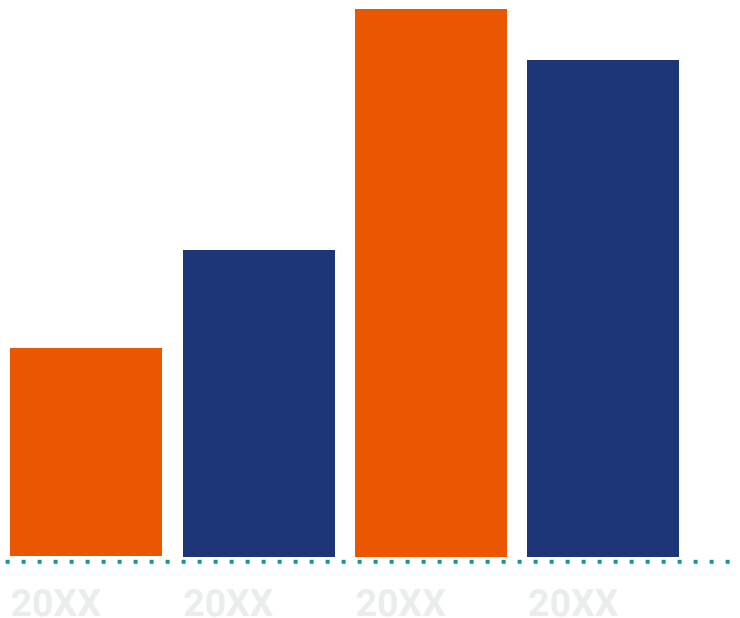
# The Need for 5G - Why?

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.

[ Conclusion Slide ]

# 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 illuminated with red and green lights. The city is densely packed with skyscrapers, many of which have their lights on. 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 background.

# The technology: GPS + RFID

Why now?

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