

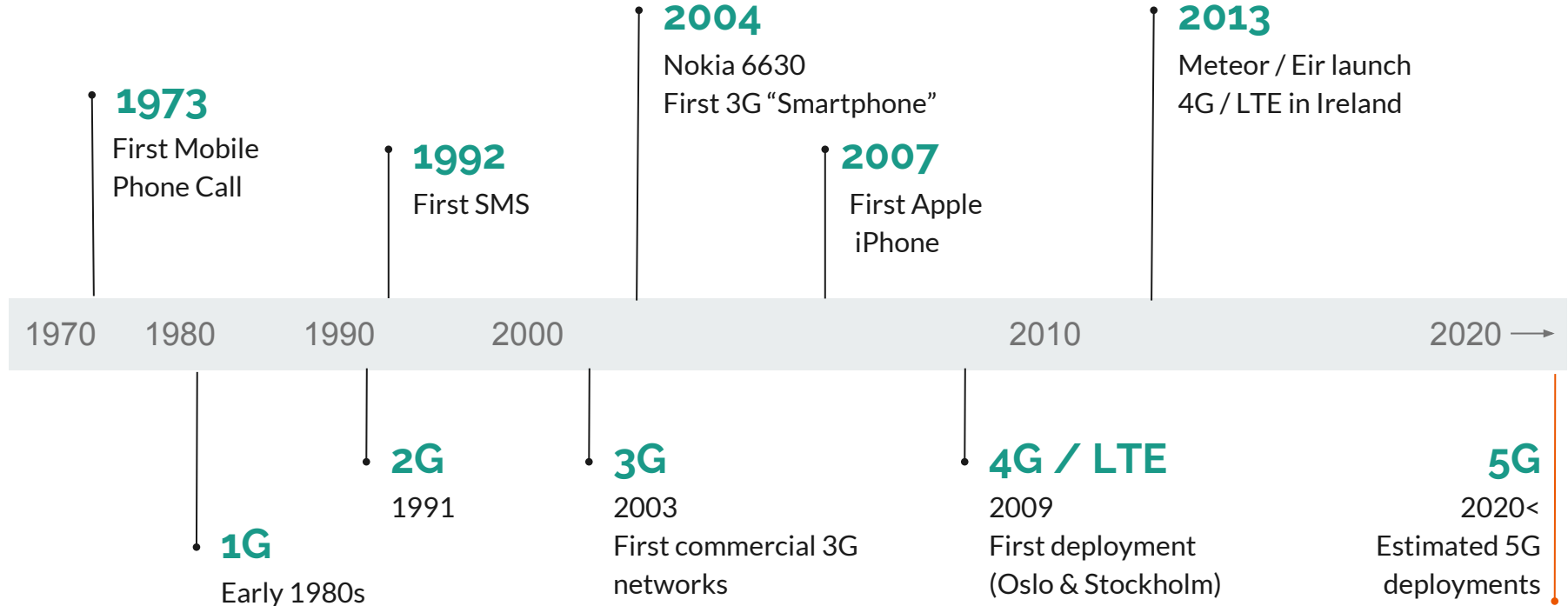


# 5G

## The Next Step in Mobile Communications

*Rebecca Kane*

# A Brief History



# 18 Billion

Connected Devices, 2017

**7.5 Billion**  
People

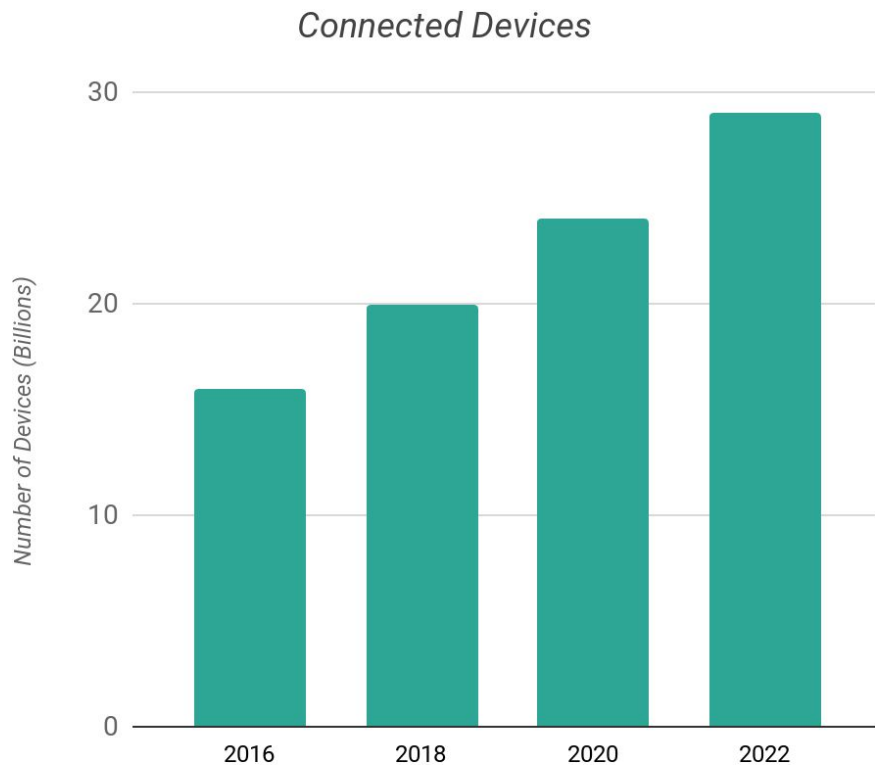
*2.4 Devices Per Person*

# 29 Billion

Estimated Connected Devices, 2022

**7.7 Billion**  
People

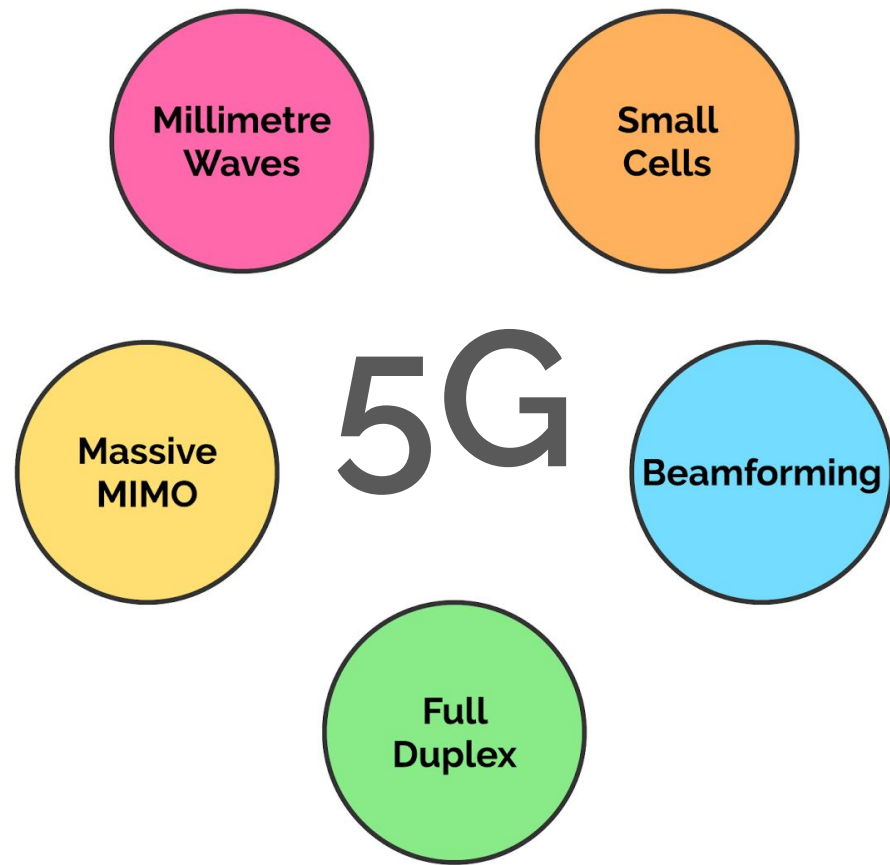
*3.7 Devices Per Person*



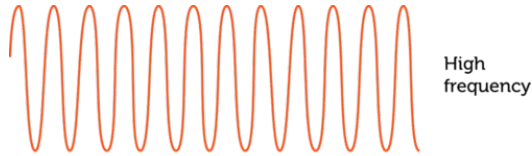
Source: Ericsson IoT Outlook, 2017



# Proposed Technologies



# Millimetre Waves

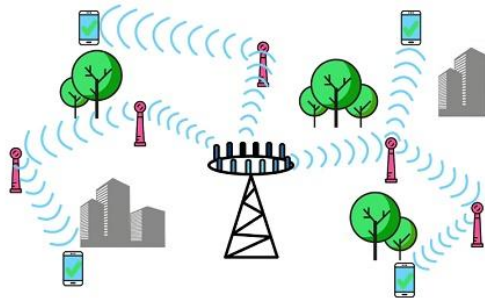


High  
frequency



Low  
frequency

## 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

*Multiple Input Multiple Output*

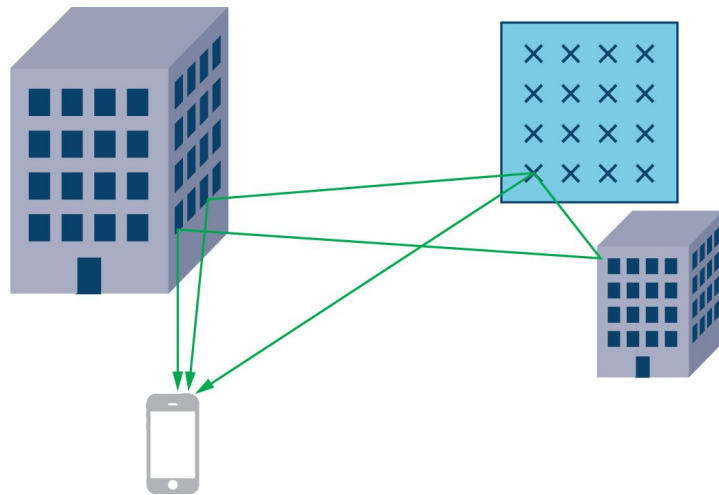
4G Stations > 12 Ports  $\begin{cases} > 8 \text{ Transmitting} \\ > 4 \text{ Receiving} \end{cases}$

5G Stations > **100 Ports**

*Handling more data at once*

***More Antennae = More Interference***

# Beamforming



Identify the most efficient route,  
***reduce interference***

# Full Duplex

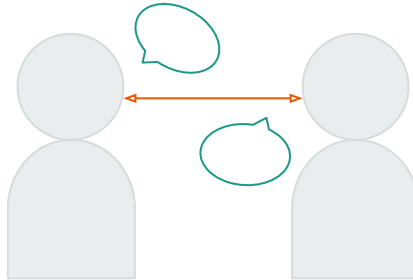
Half Duplex :

*Information can flow both ways on the same frequency, but **not at once**.*

Full Duplex :

*Send and receive data simultaneously over the same frequency.*

→ **Twice** as fast





# Personal

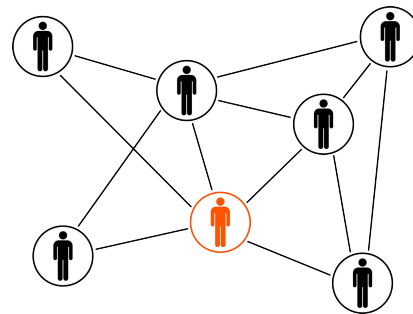
Streaming



Gaming



Smart Home

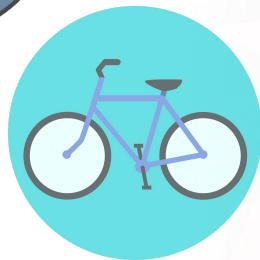


Always Connected





# The Bigger Picture



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 ]