

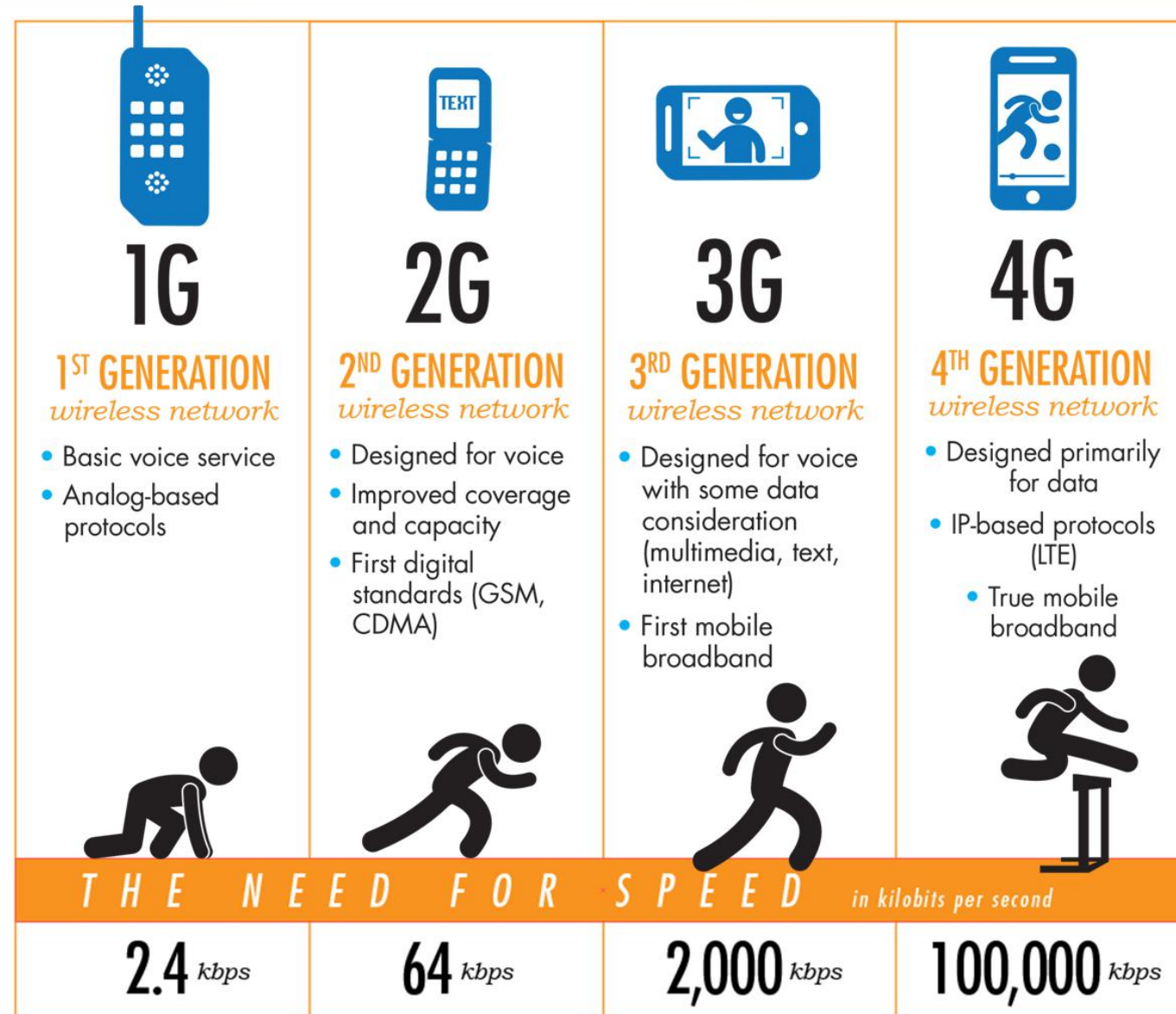
# 5G Network

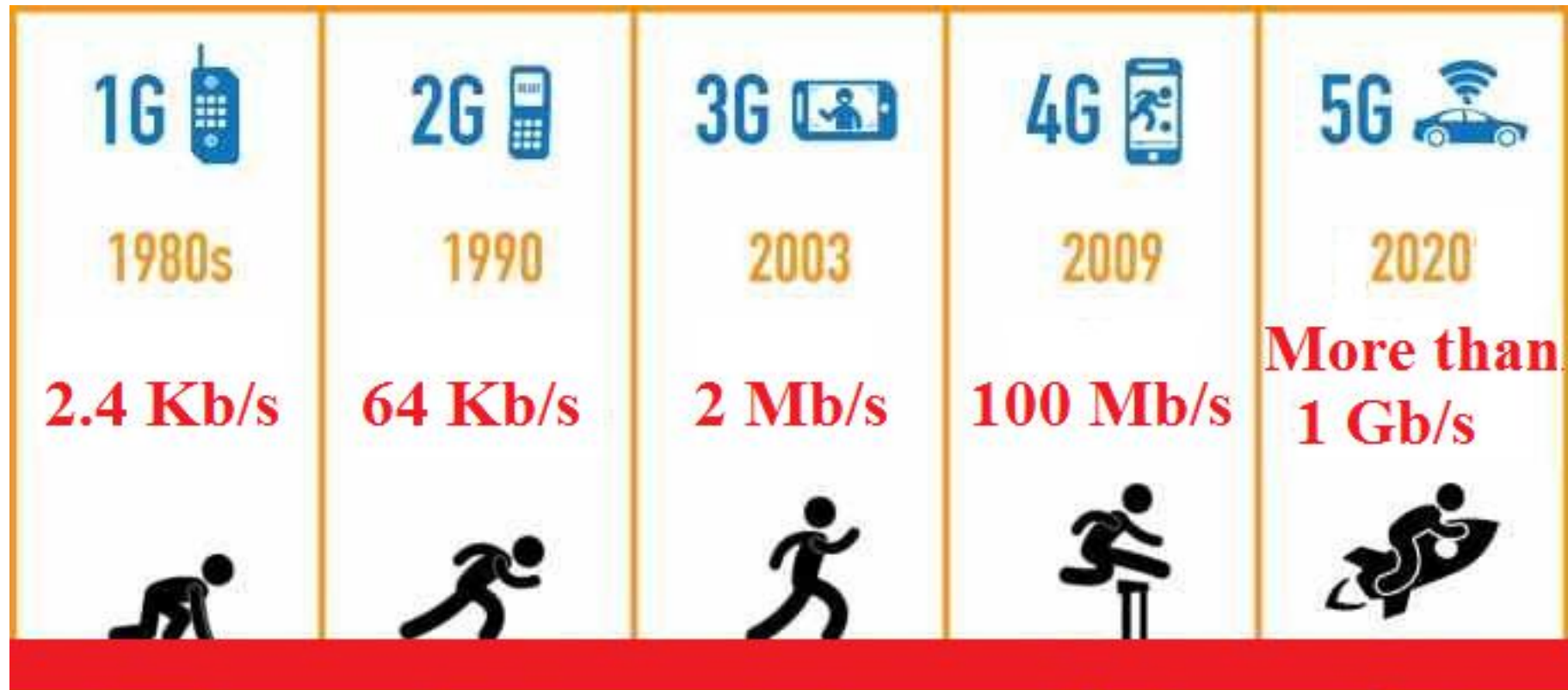
Yiqiao Jin

Lab 5

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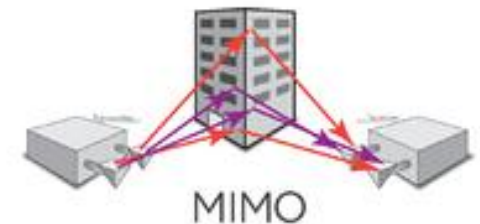
# Starting from the 1980s...



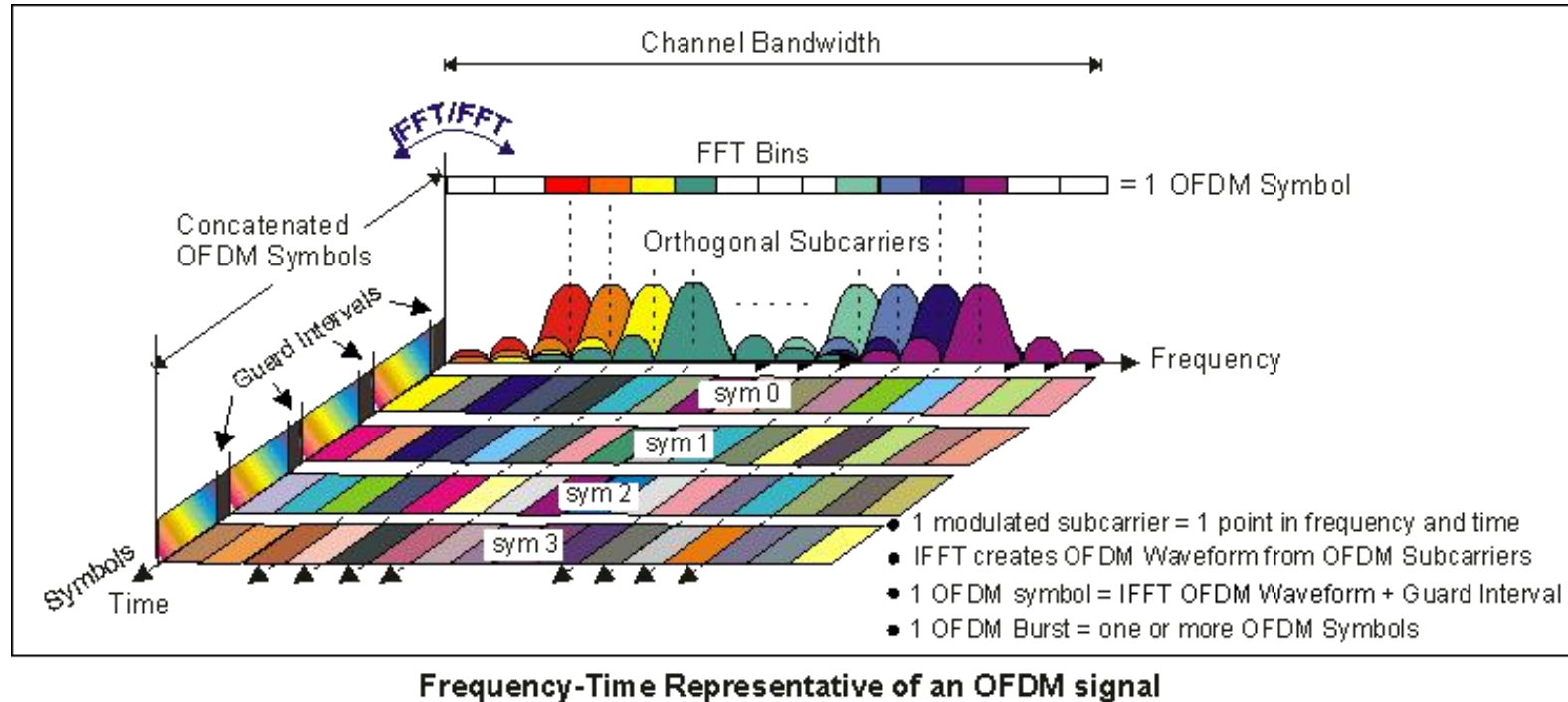




1. high data rate
2. reduced latency
3. massive device connectivity



# OFDM - orthogonal frequency division multiplexing



Multiple carrier waves are transmitted in the frequency channel

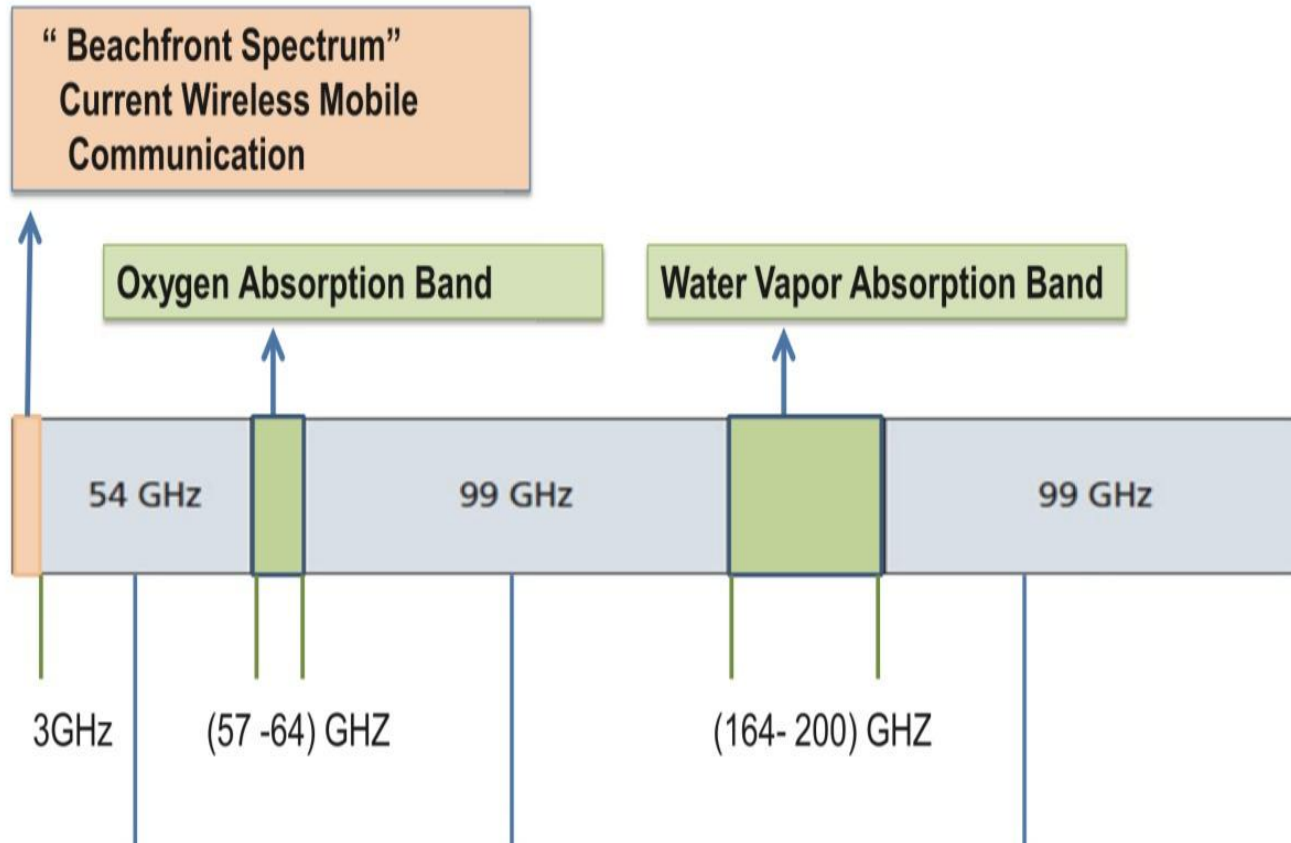
Transfer multiple bits of info simultaneously  
more subcarriers per bandwidth

# Release 15

The set of standards detailing the use of the 5G New Radio standard as it applies to networks, software, silicon, handsets and the broader telecom ecosystem

-- 3GPP

# Targeted band



**In use - by 1G - 4G**  
300MHz - 3GHz

**Unavailable**  
57 - 64 GHz  
164 - 200 GHz

**Available**  
252GHz of Potential Bandwidth  
in huge chunks



# Targeted band

3-6 GHz

eMBB

## High Frequencies

### Super Data Layer

Addressing specific use cases  
requiring extremely high data rates

eMBB, URLLC, mMTC  
(wide-area but no  
deep coverage)

## Medium Frequencies

### Coverage & Capacity Layer

Best compromise between capacity  
and coverage

mMTC, eMBB, URLLC

## Low Frequencies

### Coverage Layer

Wide-area and deep indoor coverage





Smaller Coverage  
4G as supplement



# Hand-over of base stations



Supported Max Moving Speed: >500km/h

- **New applications**
  - VR & AR (data-heavy)
  - Machine to Machine interaction in the IoT
    - e.g. Communication between Self-driving cars

- [1] Hoffman, Chris (7 January 2019). "What is 5G, and how fast will it be?". ACM TechNews. 23 January 2019.
- [2] "Predicting real-world performance of 5G NR mobile networks and devices". Qualcomm. 07 March 2018.
- [3] Nordrum, Amy; Clark, Kristen (27 January 2017). "Everything you need to know about 5G". IEEE Spectrum magazine. Institute of Electrical and Electronic Engineers. 18 January 2019.
- [4] Loughran, Jack. "5G: the benefits and difficulties of creating a new wireless standard". Engineering & Technology.