

5G Overview

Basics

→ Frequency bands

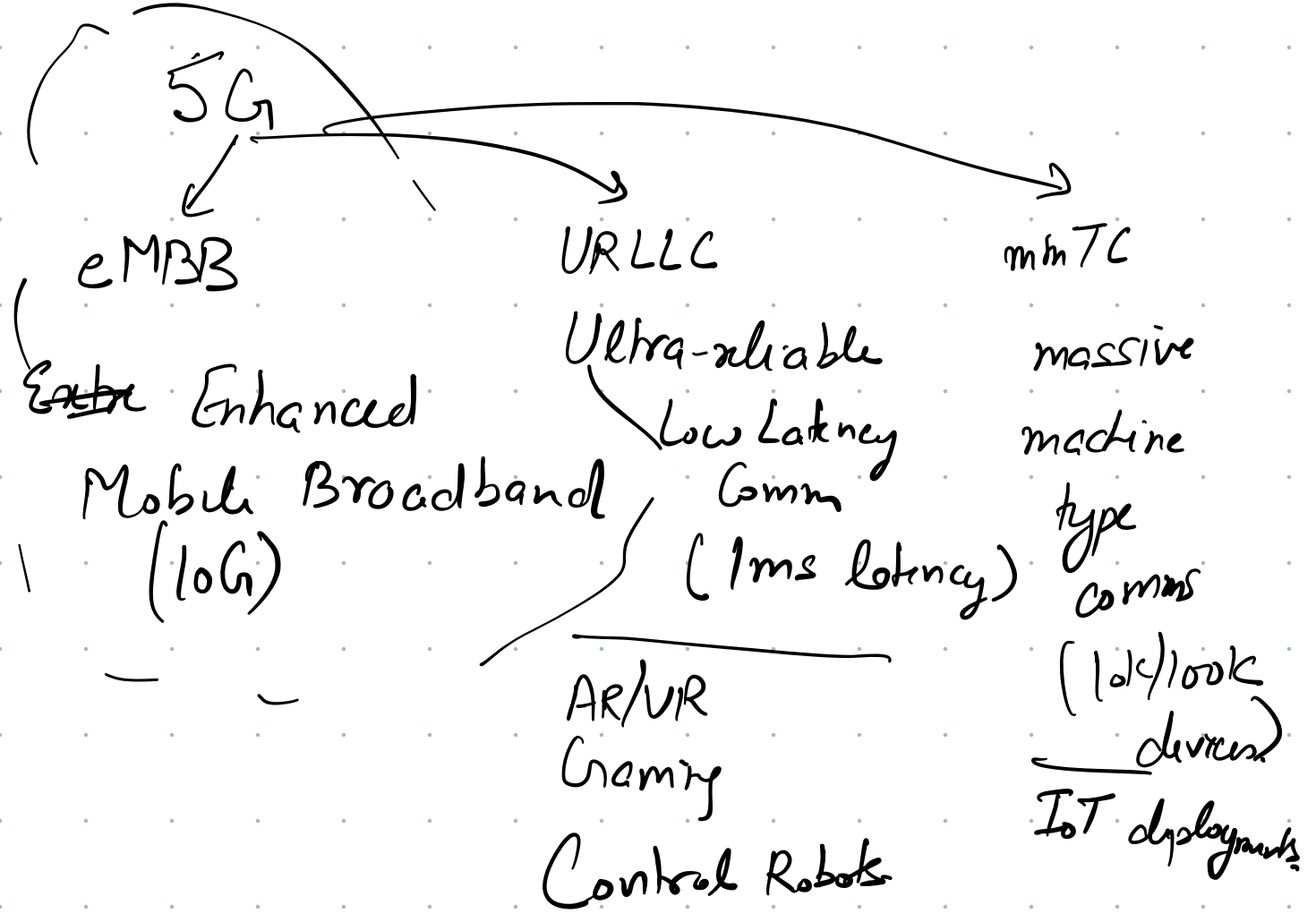
→ Frame structure

→ RAN vs Core

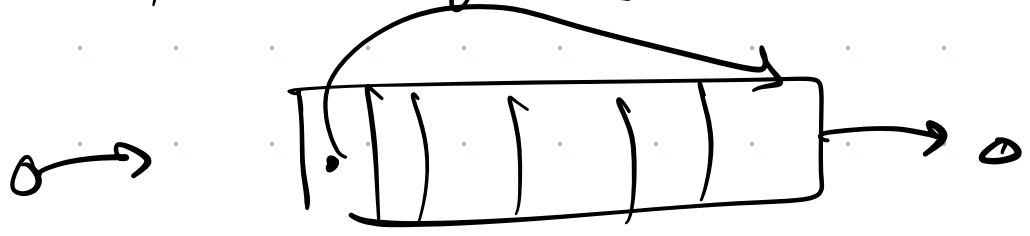
→ Measurements & analysis

5G : New Applications

4G - Video (100 Mbps)

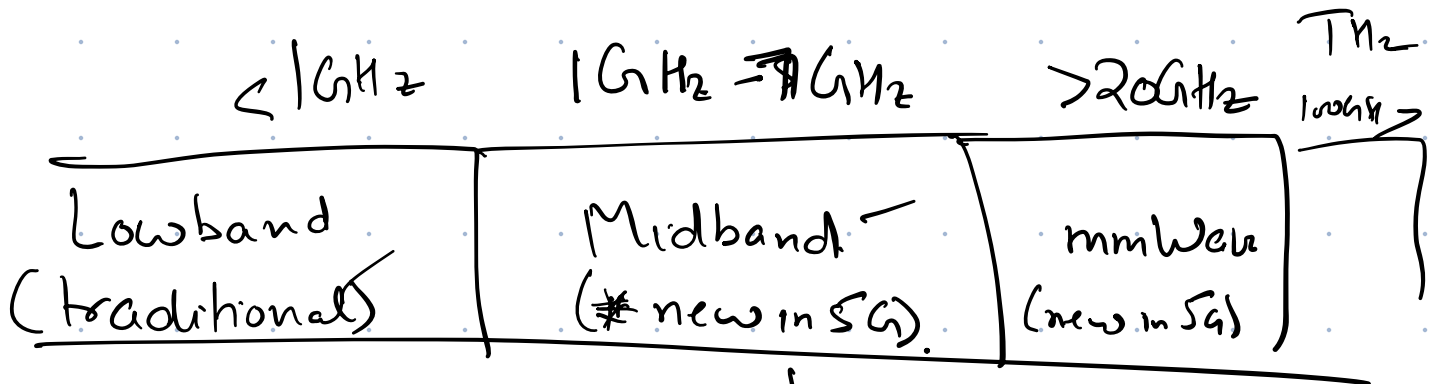


Network queues

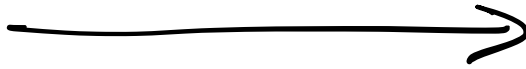


5G: Spectrum

4G - $< 2\text{GHz}$



more bw



more attenuation

less range

more prone to obstacles.

5G: MIMO

massive MIMO

multiplexing

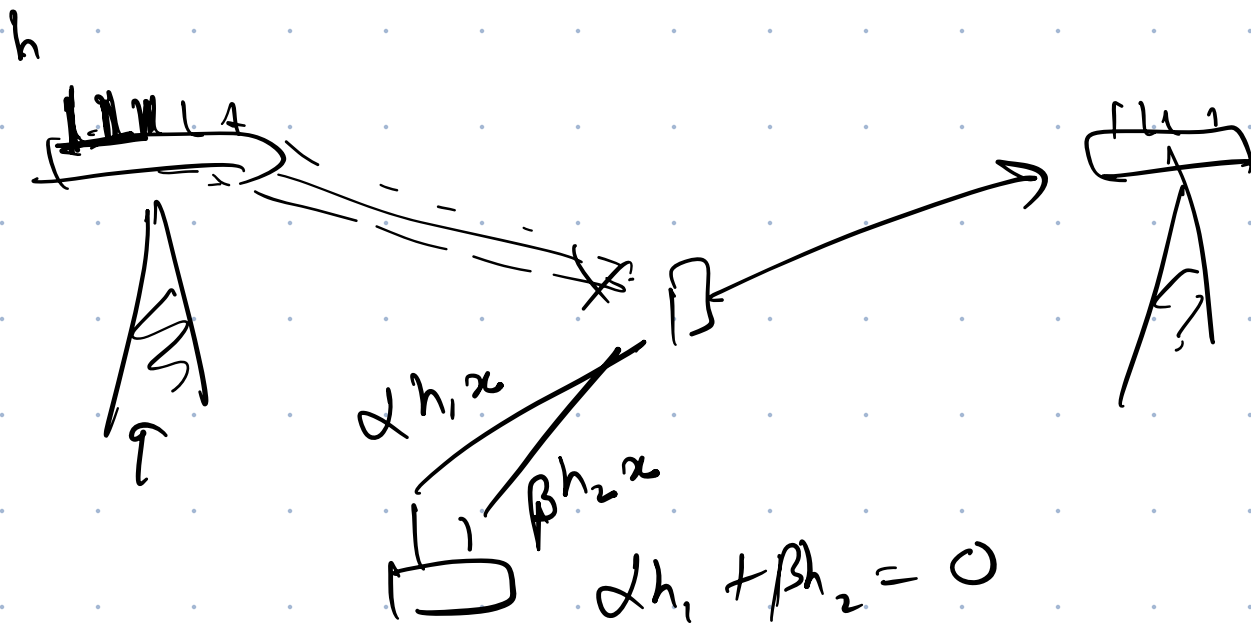
We can transmit to multiple devices at the same time.

diversity gains

for a given device, improve SNR

interference management

↳ nulling



5G: Frame Structure

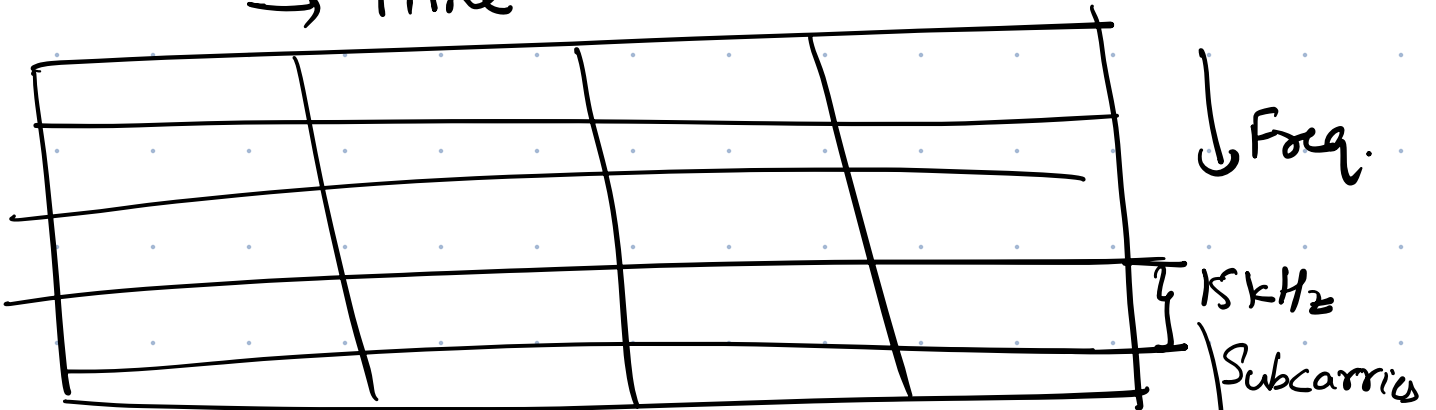
gNodeB / base station



UE
User element.

Frames \rightarrow 10 ms long
multiple UEs.

1 ms subframes. / OFDMA
 \rightarrow Time

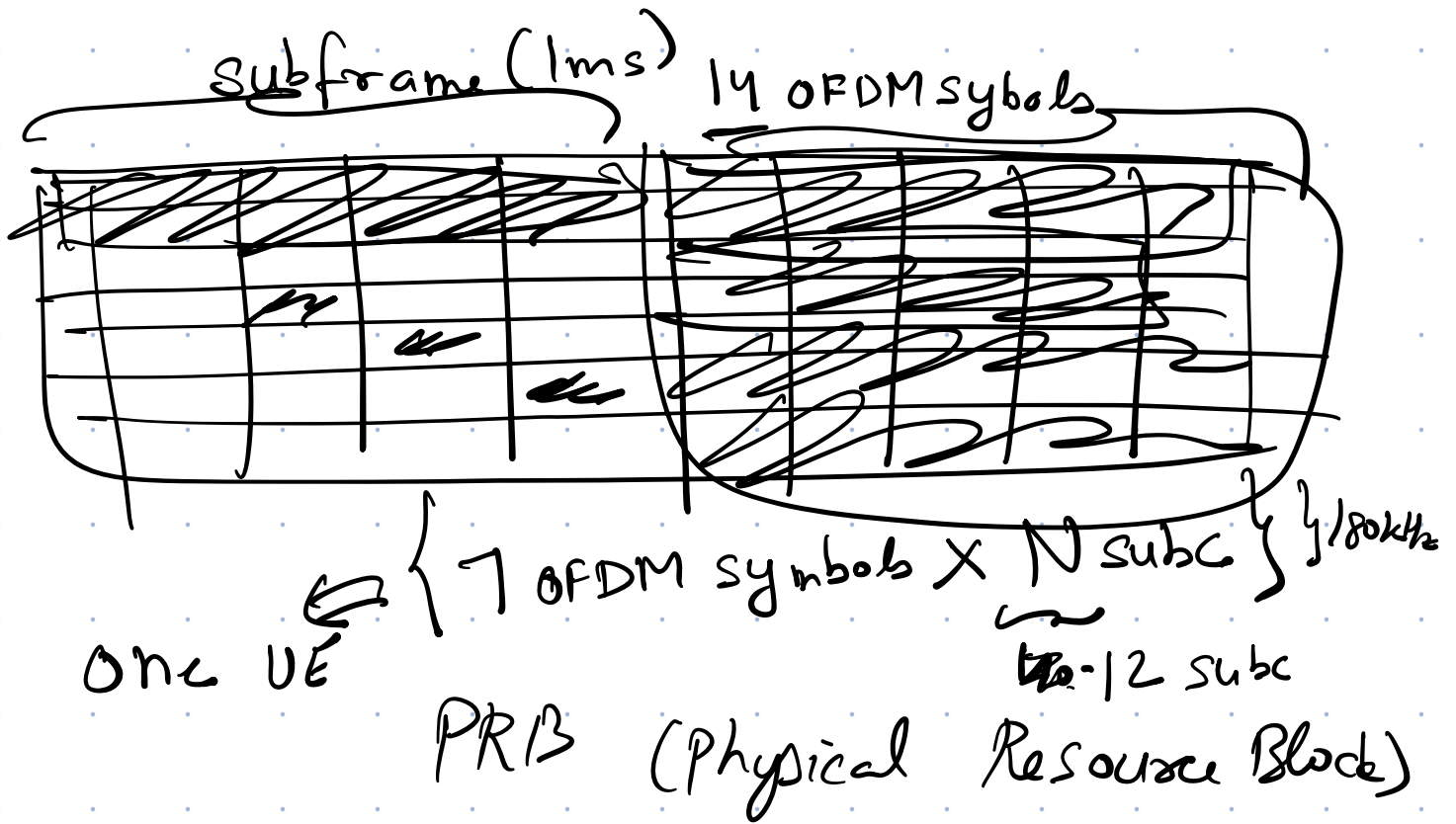


Wi-Fi 20 MHz \rightarrow 64 subcarriers

~~20 MHz~~ \rightarrow 1 subc.

~~64~~ 3 \approx 330 kHz

LTE 20MHz $\rightarrow \frac{20000}{15} \rightarrow 1000$ subc.



1-20 UEs/subframe
(reasonable)

5G \rightarrow control info can go anywhere
 \rightarrow more flexibility in subc size
(15kHz, 30kHz, 60kHz)