

Why do mobile networks need synchronization?

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Frequency Synchronization

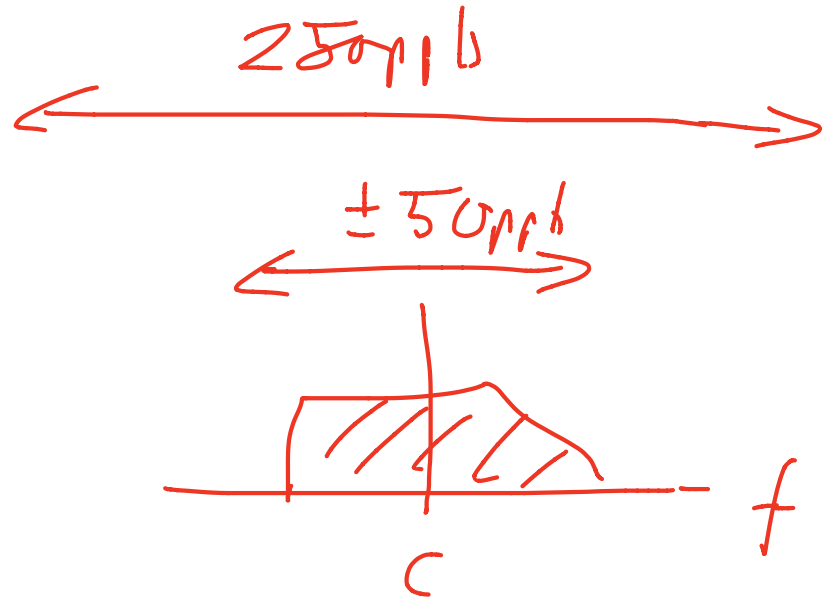
Regulation

Handoff

Doppler Effect

Interference

QoS



Doppler Shift

320 km/h 300 mph
1800 MHz 540 MHz



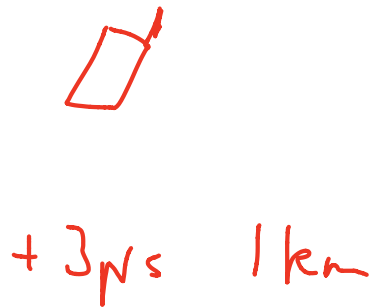
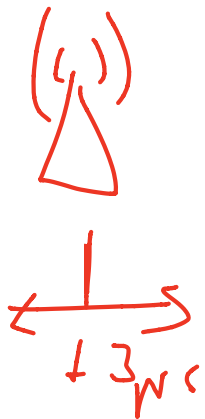
180 mph 160 km/h
100 mph 100 mph



Time Synchronization

CDMA 2000 $\therefore$ $10\mu\text{s}$
 $3\mu\text{s}$ in normal operation

Soft Handoff

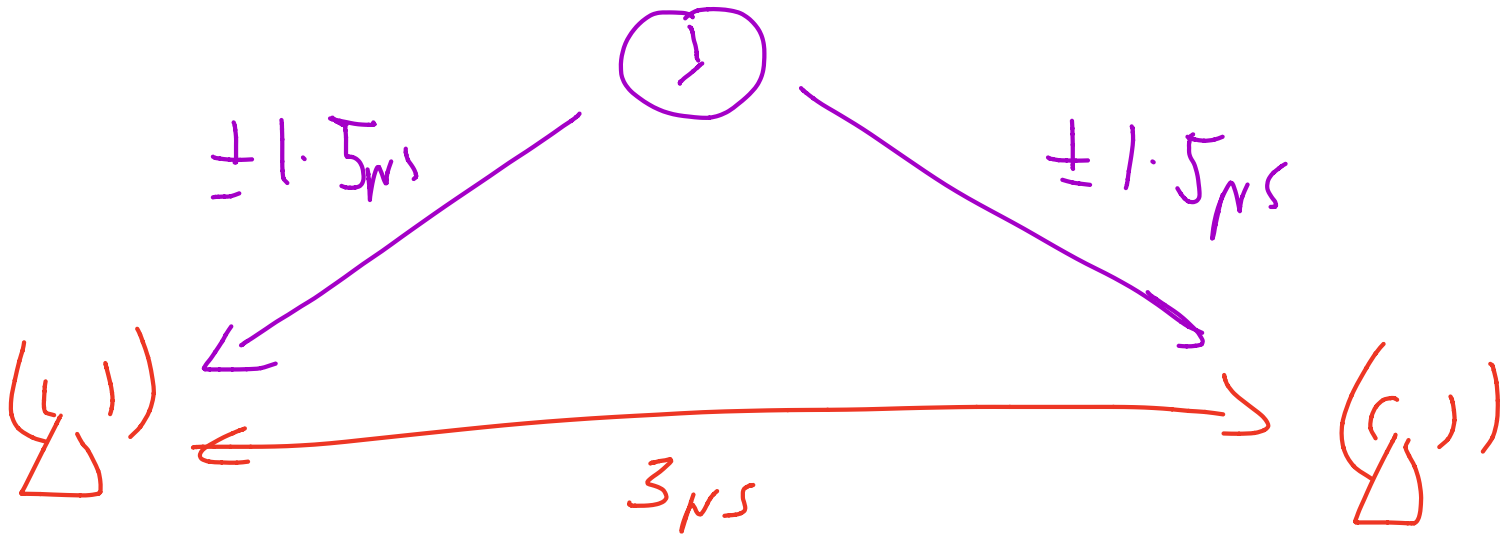


LTE

Frequency - 50ppb

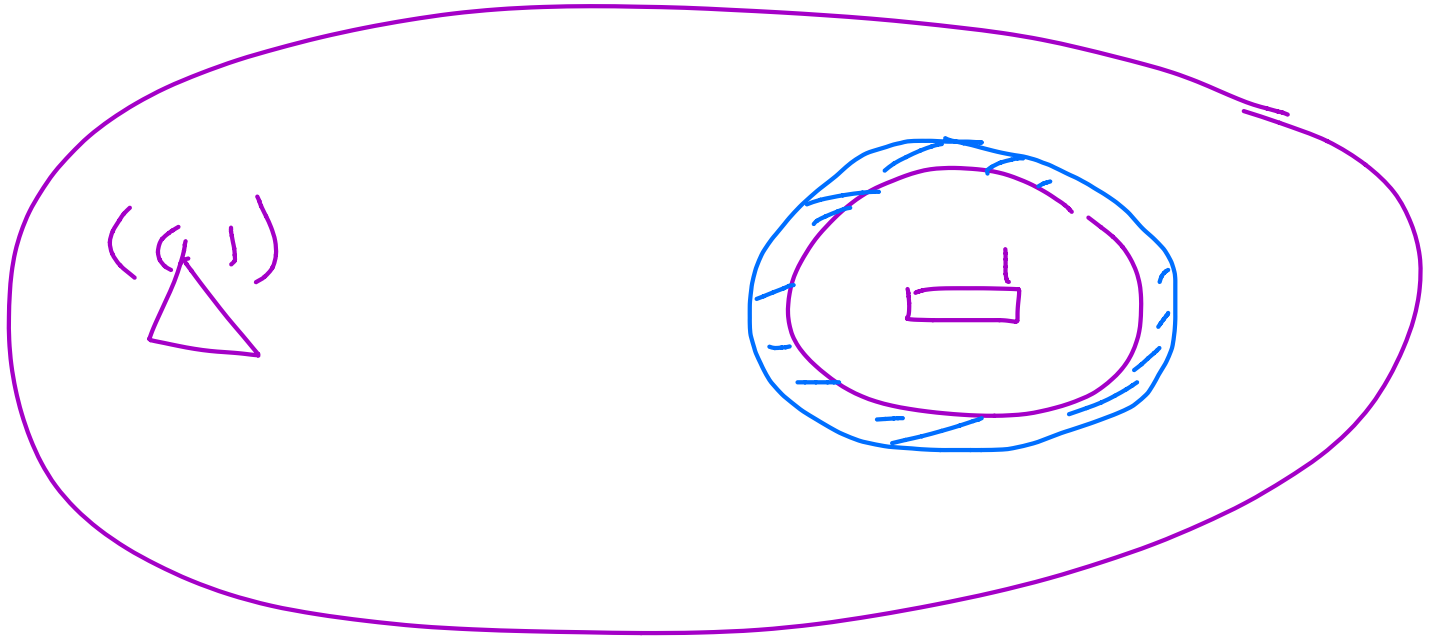
TDD

3 μ s phase



Small Cells

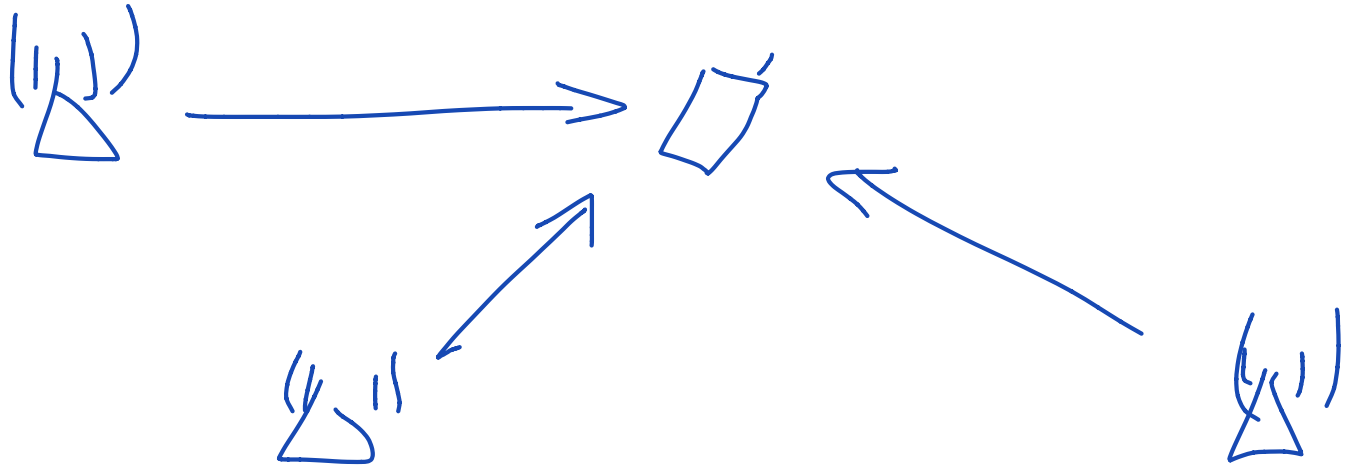
- Interference
- EICIC



ABSF - almost blank subframes

Time sync: ± 1 to $5 \mu s$

COMP - coordinated scheduling
- " joint processing
- " beamforming



Time sync: $\pm 1.5 \mu s$

Don't forget ...

Wednesday Night is Whisky Night



Hollywood's finest in attendance!