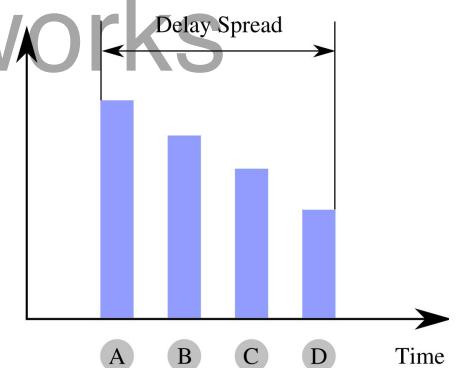
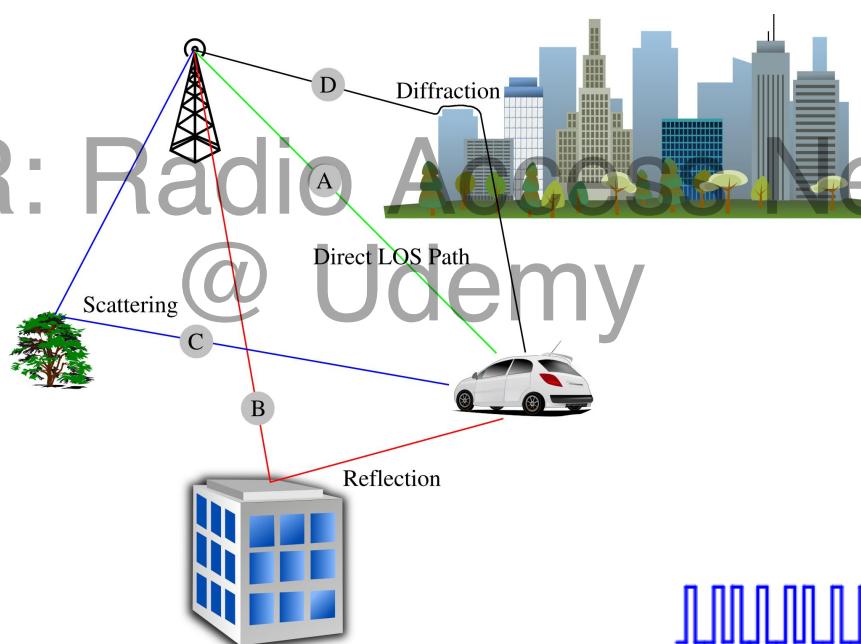
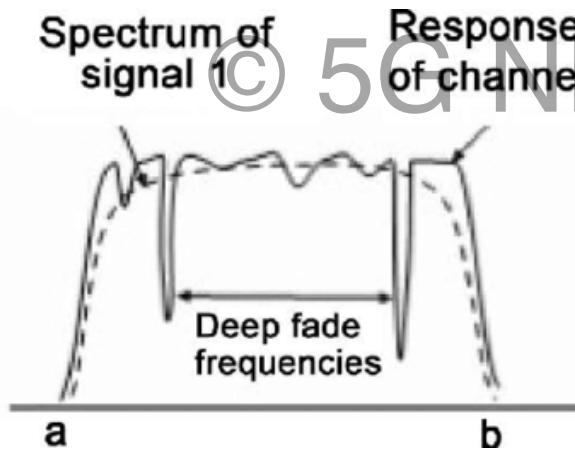


5G NR: Radio
Access
Networks

THE PHYSICAL LAYER
STRUCTURE

Modulation Scheme

High data rates

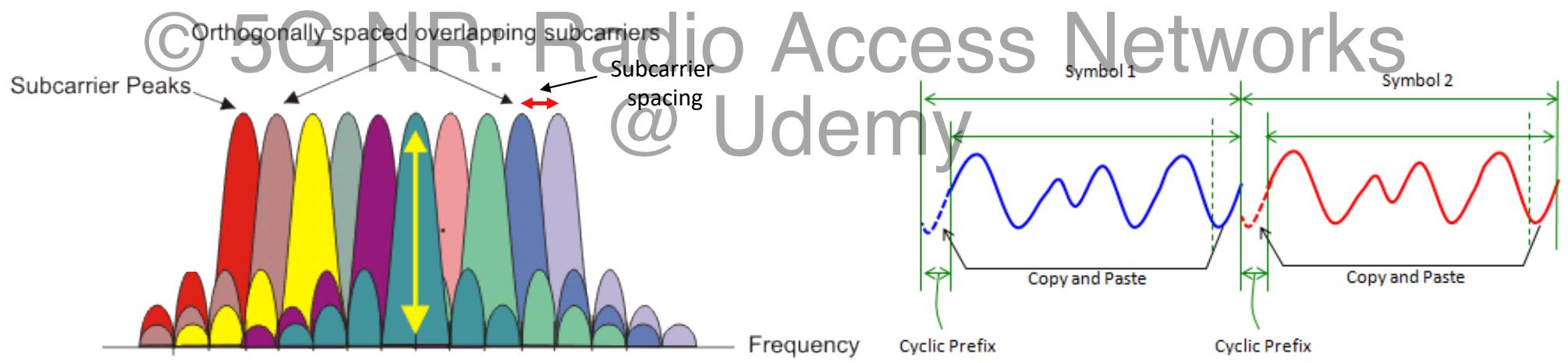


Intersymbol Interference

Complex equalizer

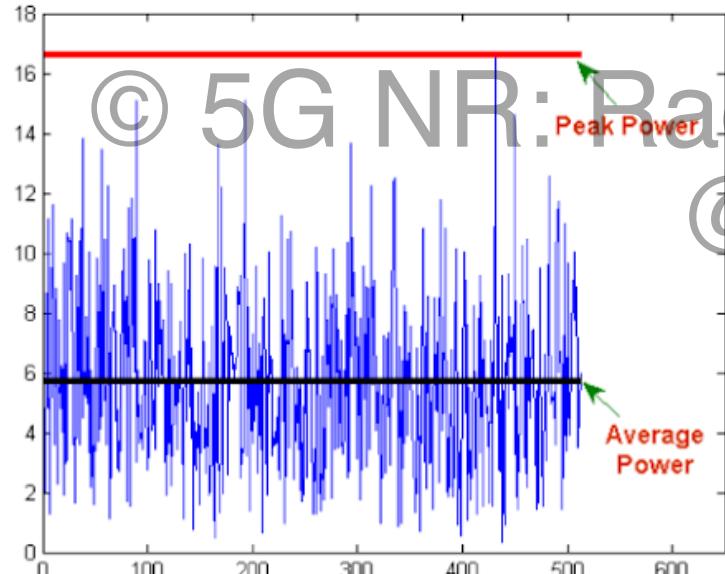
Modulation Scheme - OFDM

"can be used to transmit a wideband signal using multiple narrow band signals"



Modulation Scheme - OFDM

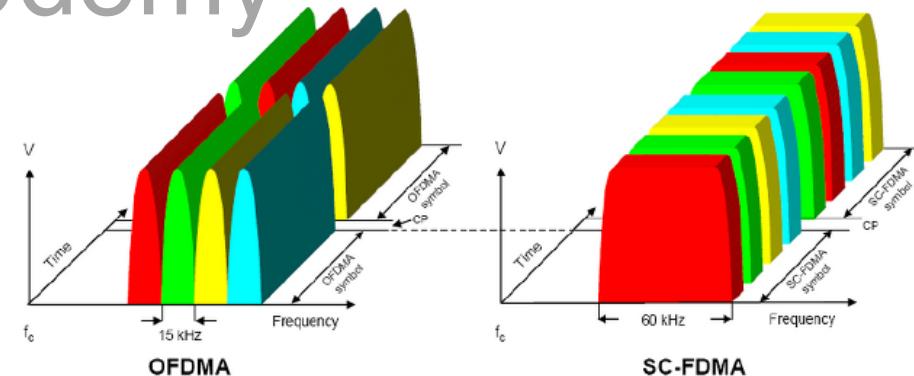
High PAPR



Downlink: OFDM

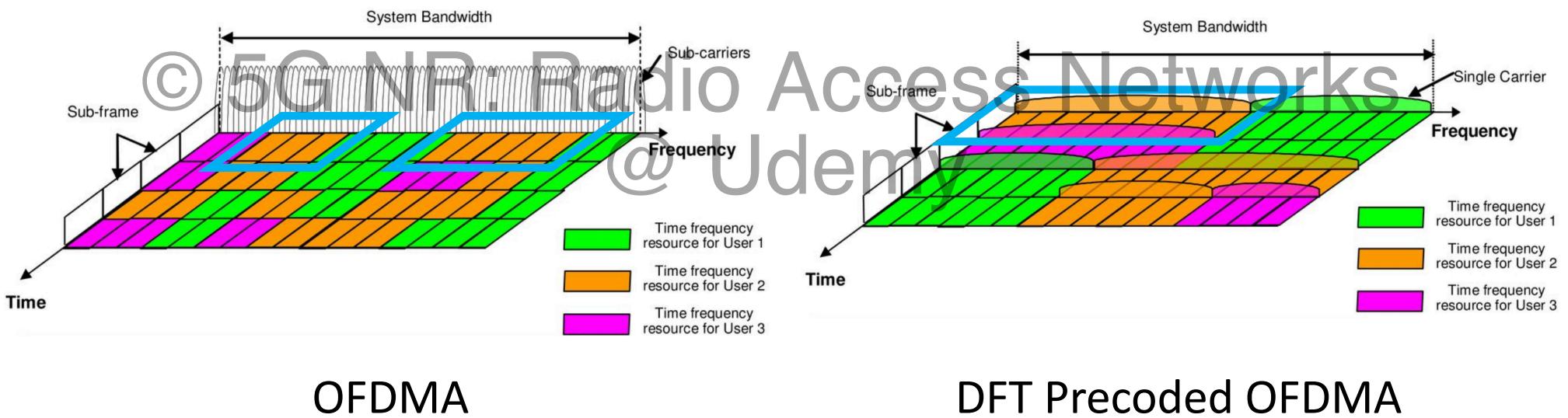
Uplink:

- OFDM
- DFT precoded OFDM (SC-FDM)



Multiple Access Scheme

“technique that lets multiple mobile users share the allotted spectrum in the most effective manner”



Flexible Numerology

Large SCS

- Less sensitivity to f errors
- Inefficient CP

Small SCS

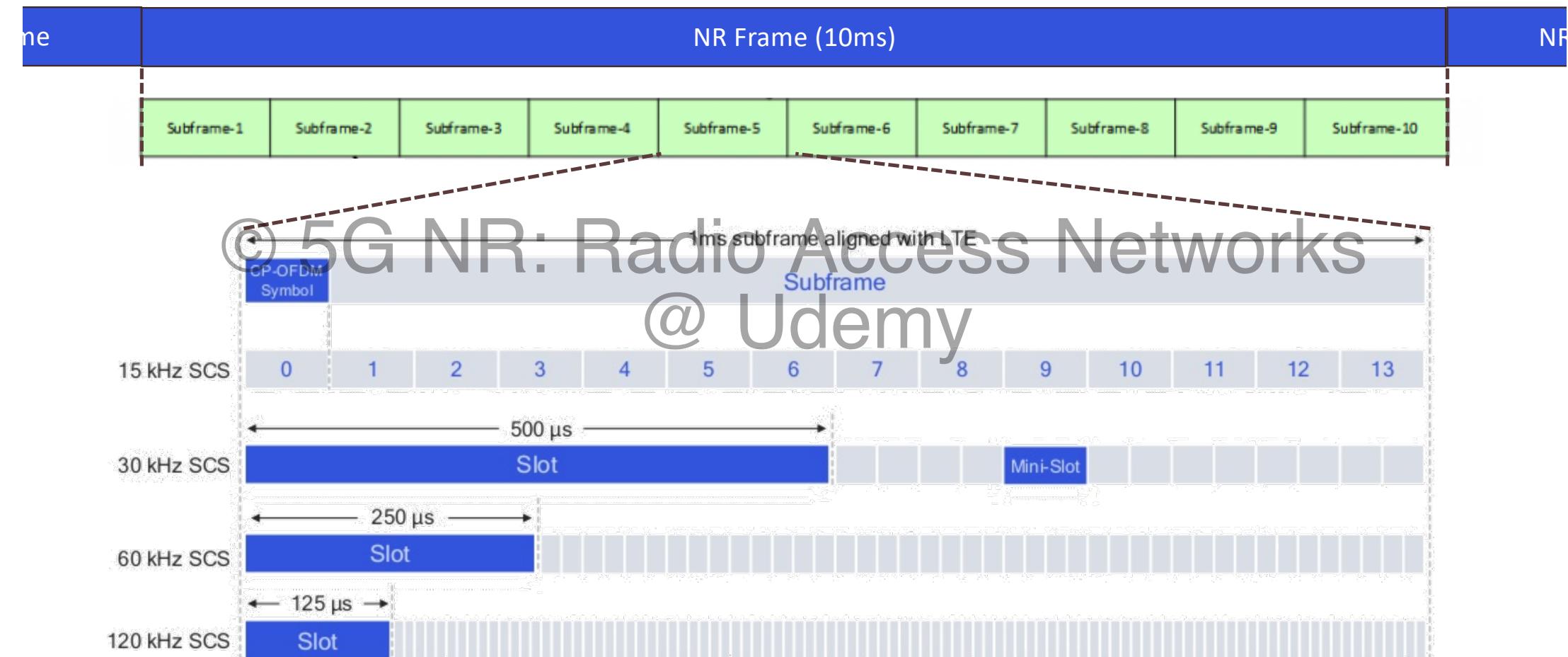
- Efficient CP
- Sensitive to f errors

NR:

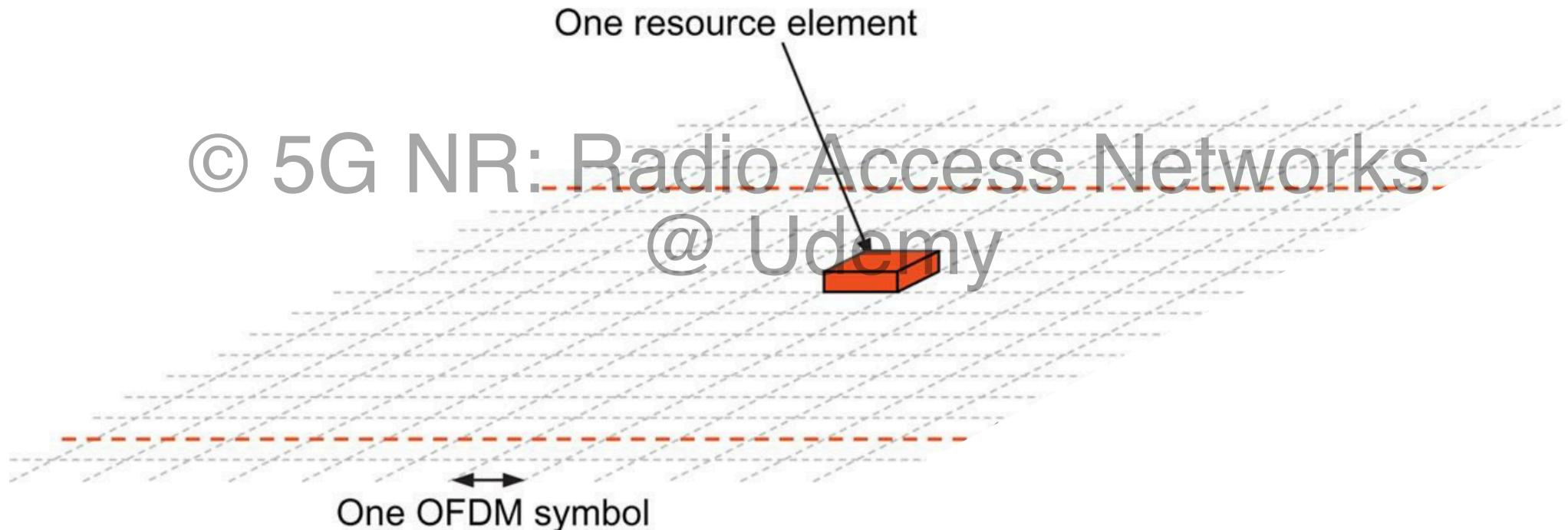
- wide range of frequency bands
- wide range of bandwidths
- wide range of cell sizes

| Subcarrier Spacing (kHz) | Useful Symbol Time, T_u (μs) | Cyclic Prefix, T_{CP} (μs) |
|--------------------------|--------------------------------|------------------------------|
| 15 | 66,7 | 4,7 |
| 30 | 33,3 | 2,3 |
| 60 | 16,7 | 1,2 |
| 120 | 8,33 | 0,59 |
| 240 | 4,17 | 0,29 |

Time Domain

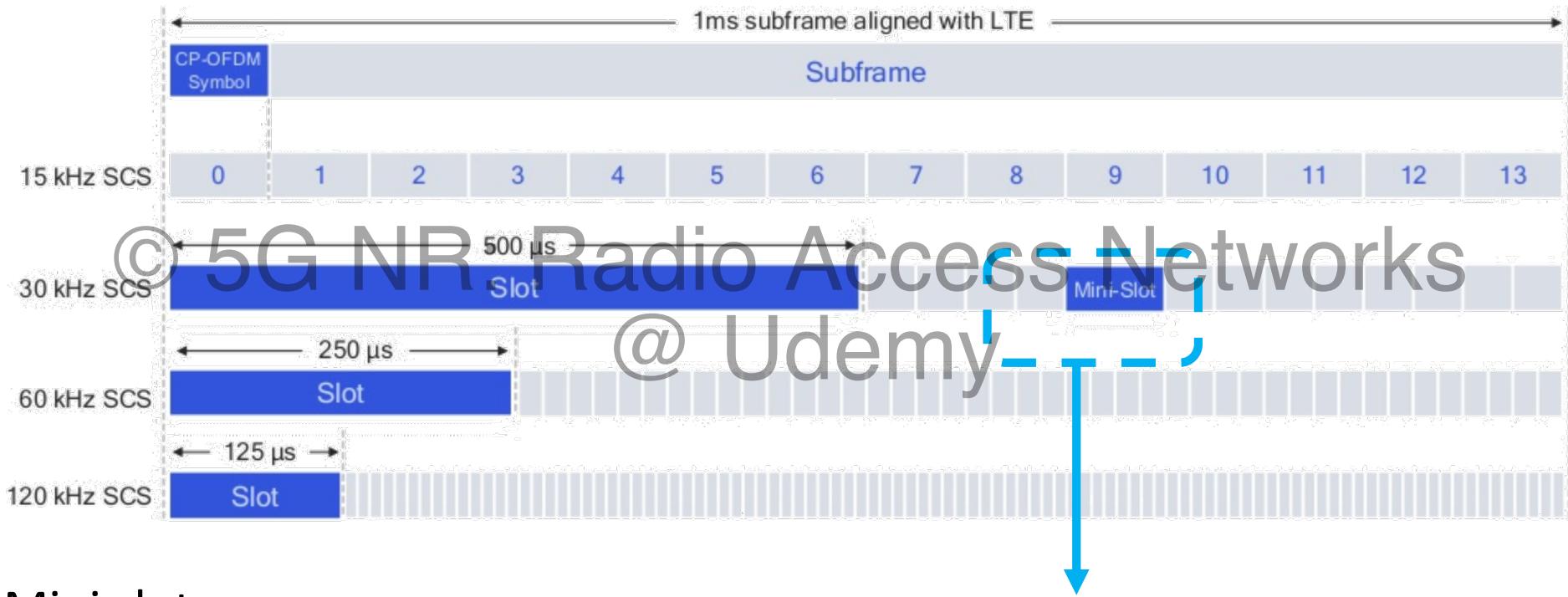


Resource Element and Resource Block



SLIV – Start and Length Indicator Value

Mini Slots



Mini slots:

- 2,4 or 7 symbols long
- Can begin in symbol boundary instead of slot boundary

Summary

- Modulation
- Multiple Access
- Numerology
- Time domain Structure
- Resource Element
- Resource Block
- Mini Slots

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