Data Transfer in the Physical Layer Using LTE and Free-space Optical Communication as Guides

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Signals

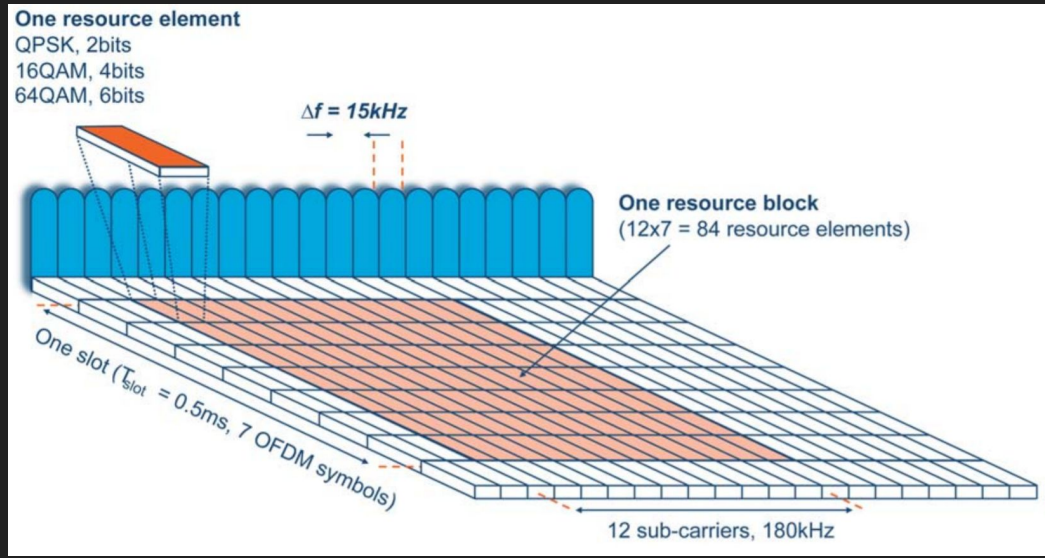
- Source -> transmission medium -> destination
- Analog (physical) vs discrete (logical / digital) signals
- Line codes

EM Waves

- $\lambda = c/f$
- Must be modulated somehow to create two different “states”
- E.g., AM vs FM

LTE

- Long-Term Evolution
- Ranges from 500 to 3500 MHz
- Bandwidths from 1.4 to 20 MHz
- Orthogonal frequency division multiplexing



Optical Data Transfer

- Packets of photons sent through fiber optic “tubes”
- Must also be modulated somehow
- Wave division multiplexing to increase throughput and allow for multidirectional transfer

Free-space Optical Comms

- Space as transmission medium instead of optical fiber
- Communication via lasers
- NASA beamed the Mona Lisa to the Lunar Reconnaissance Orbiter
- European Data Relay System (terrestrial to satellite comms) (1.8 Gbit/s)
- Starlink (satellite to satellite comms)

Sources

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