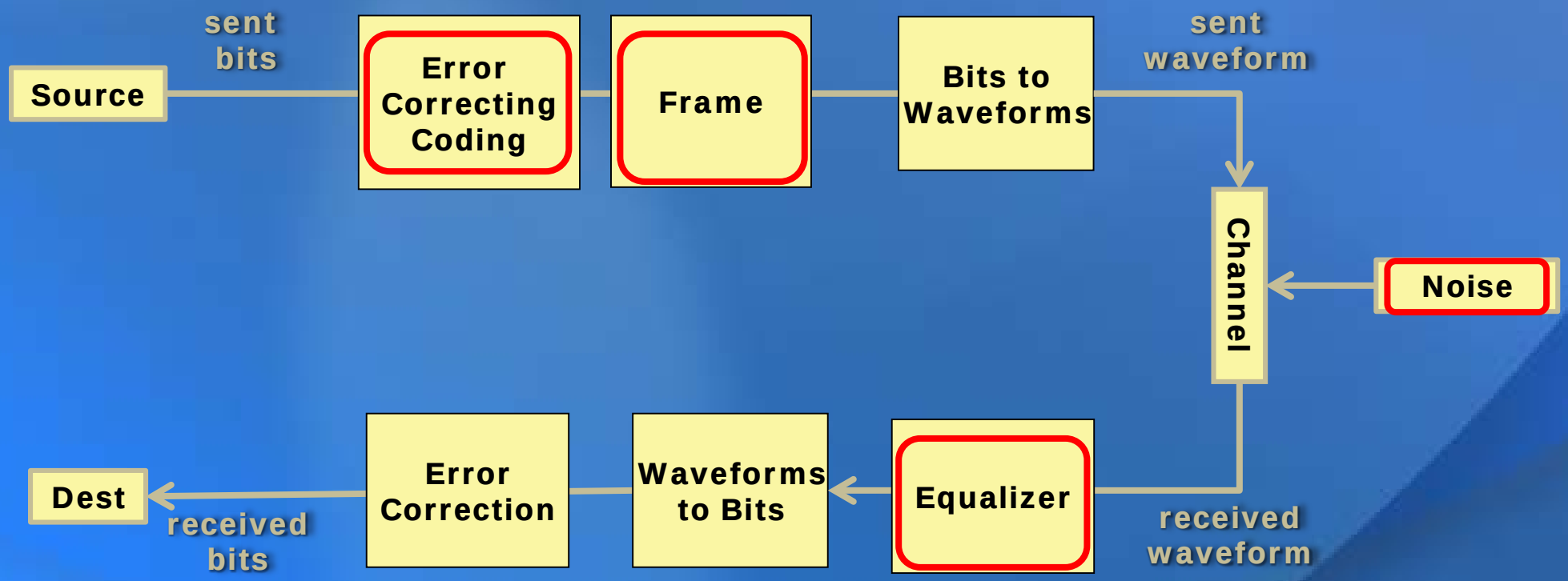
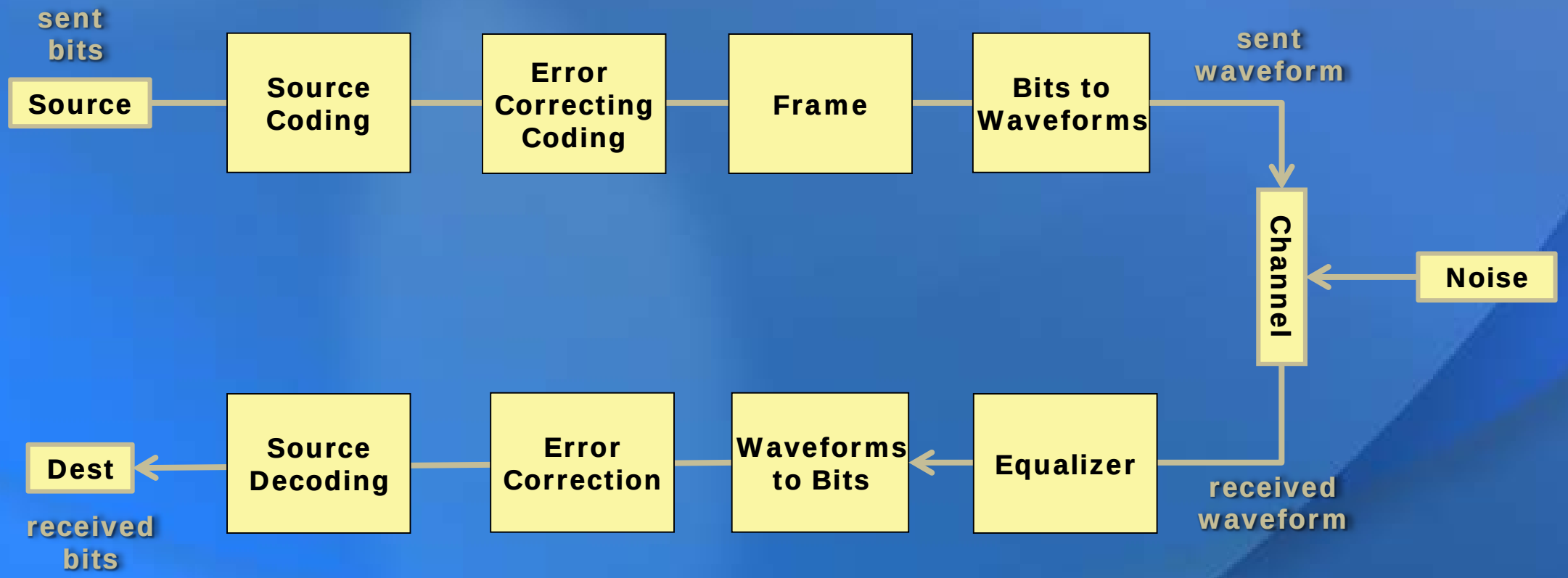
Part I: Communications Systems

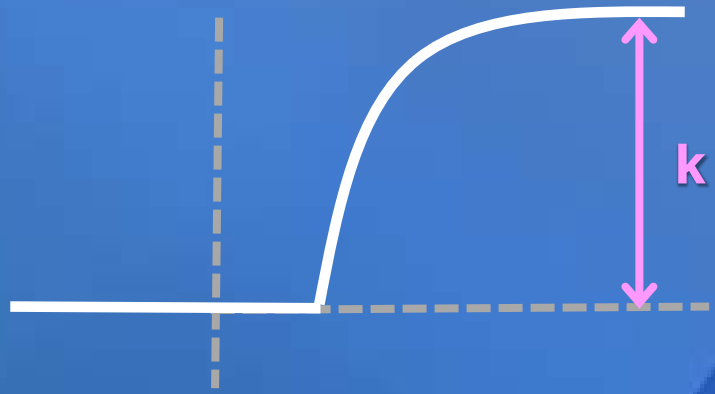


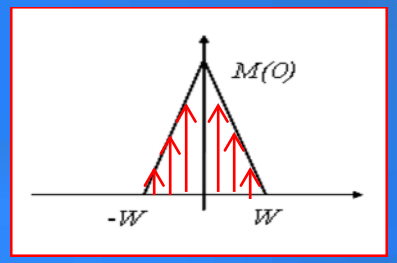
Part II: Source Coding & Frequency Analysis

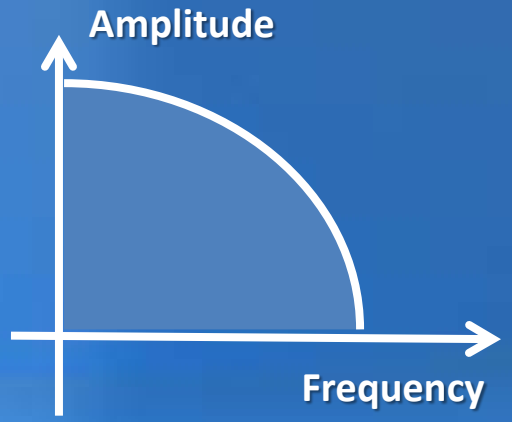


Part II: Source Coding & Frequency Analysis

IR Channel

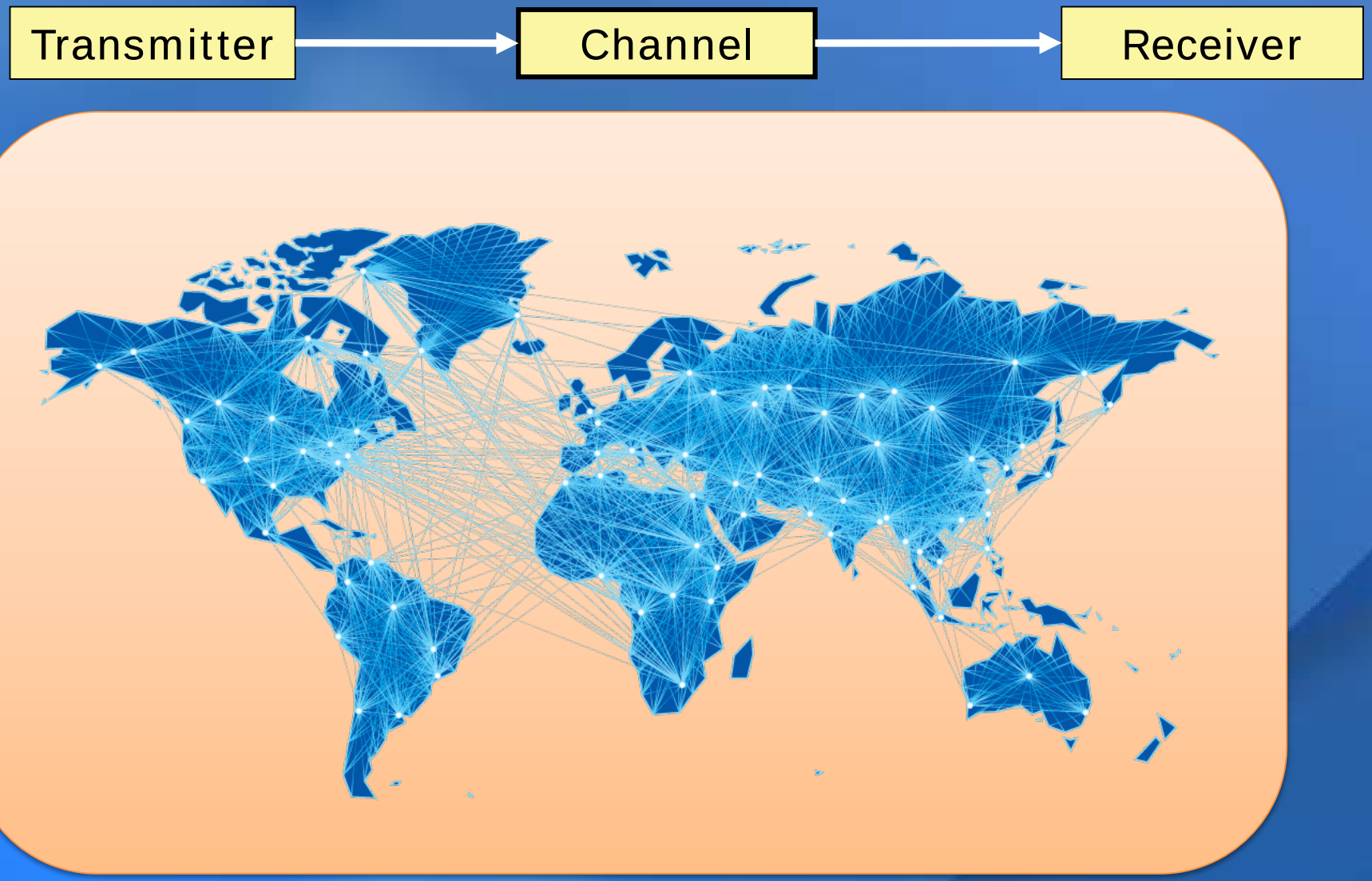




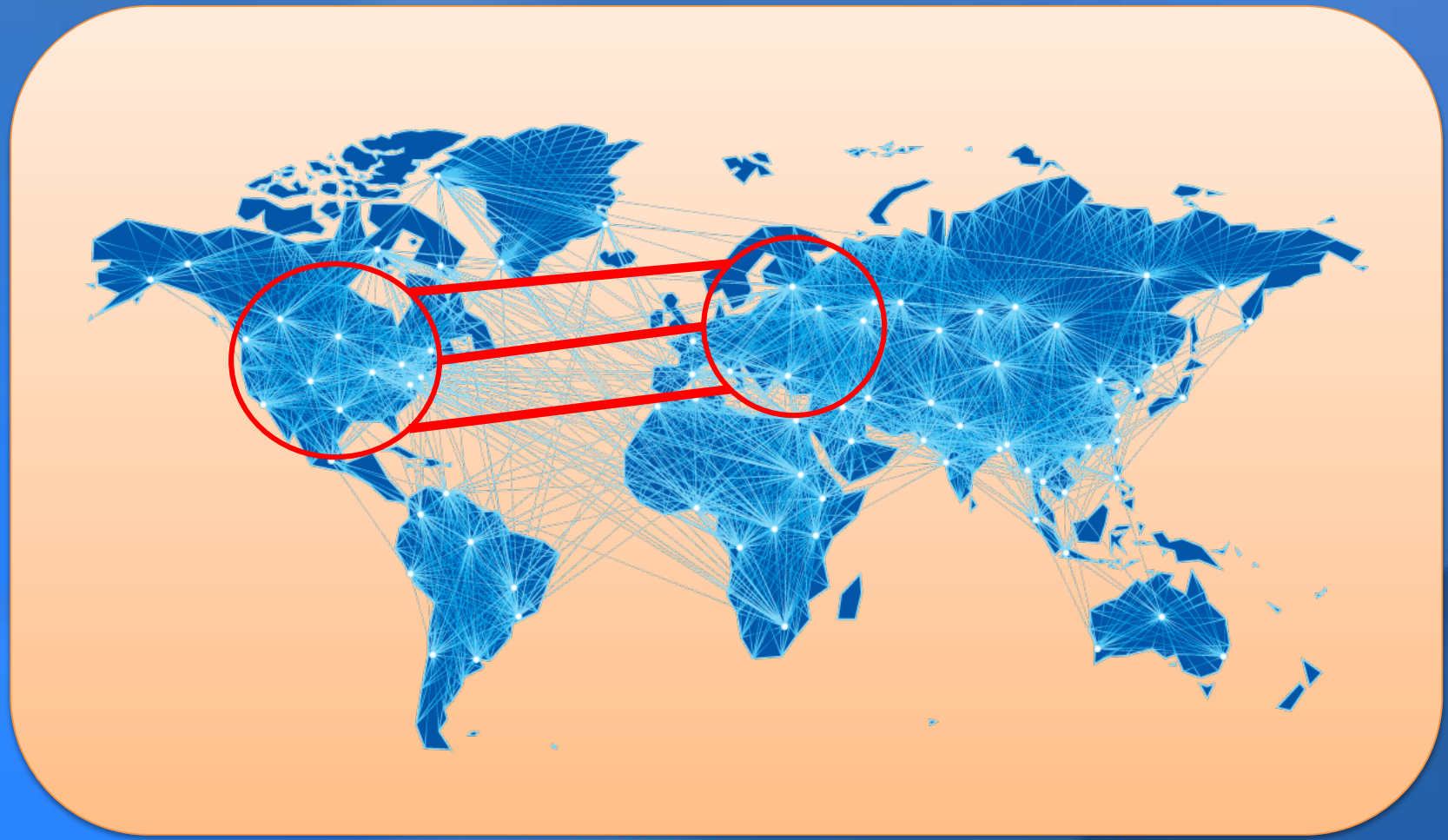


FDM & Modulation (BPSK / QPSK)

From Point-to-Point Link to Network

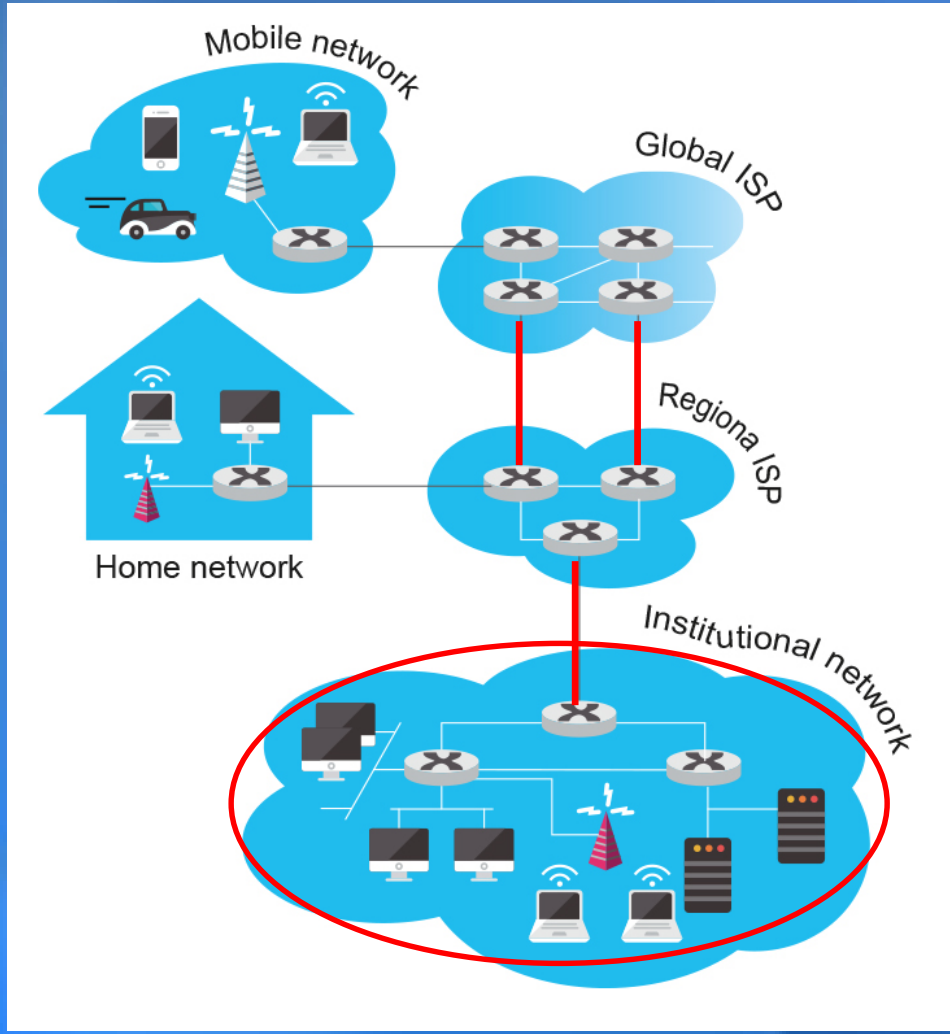


Hierarchical Network



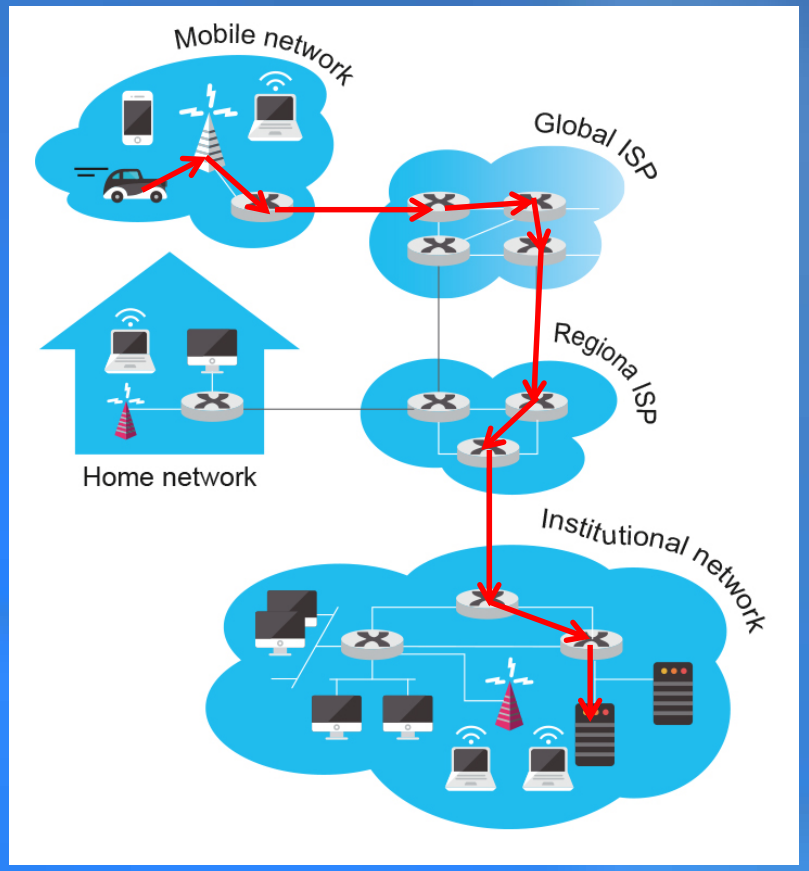
Hierarchical Network

Billions of Nodes



Layered Protocol

Complex Systems



Layered Protocol

Complex Systems

- application
- transport
- network
- link
- physical

Between Neighbors

Bits “on the wire”

Hierarchical Network & Layered Protocol

application

transport

network

link

physical

Between Neighbors

Bits “on the wire”

Multiple Access Control: ALOHA

application

transport

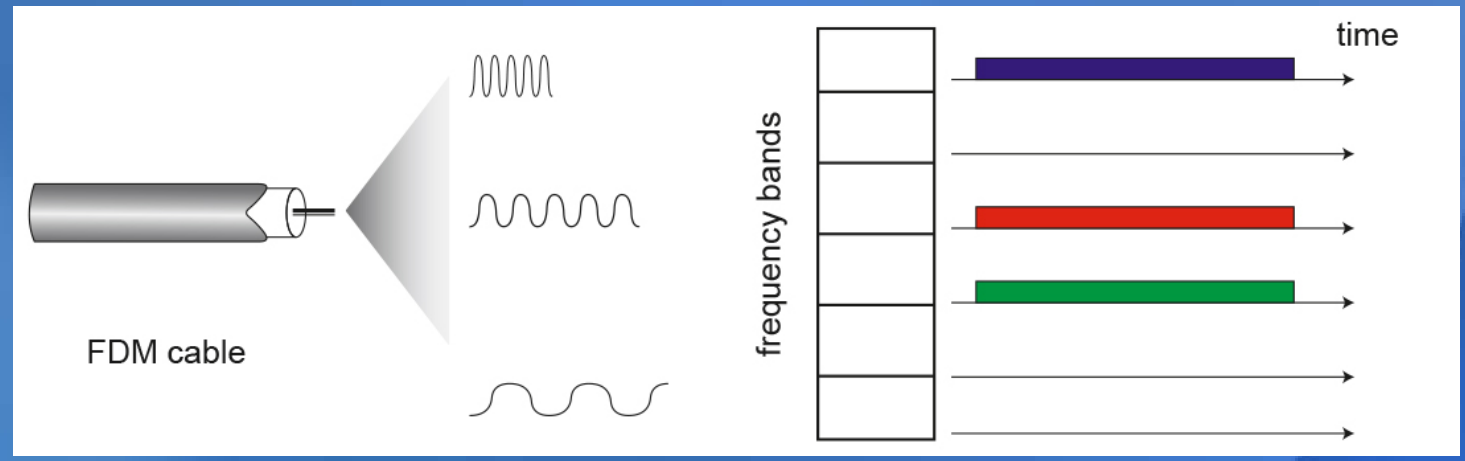
network

link

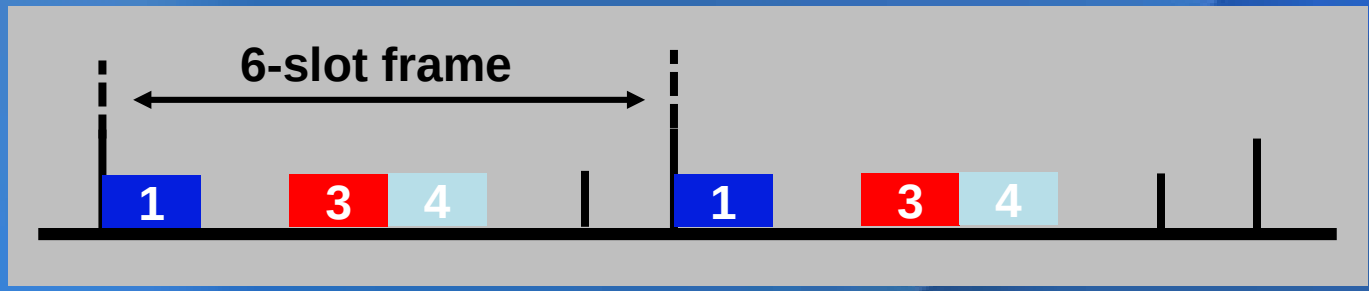
physical

MAC

FDMA / 1G

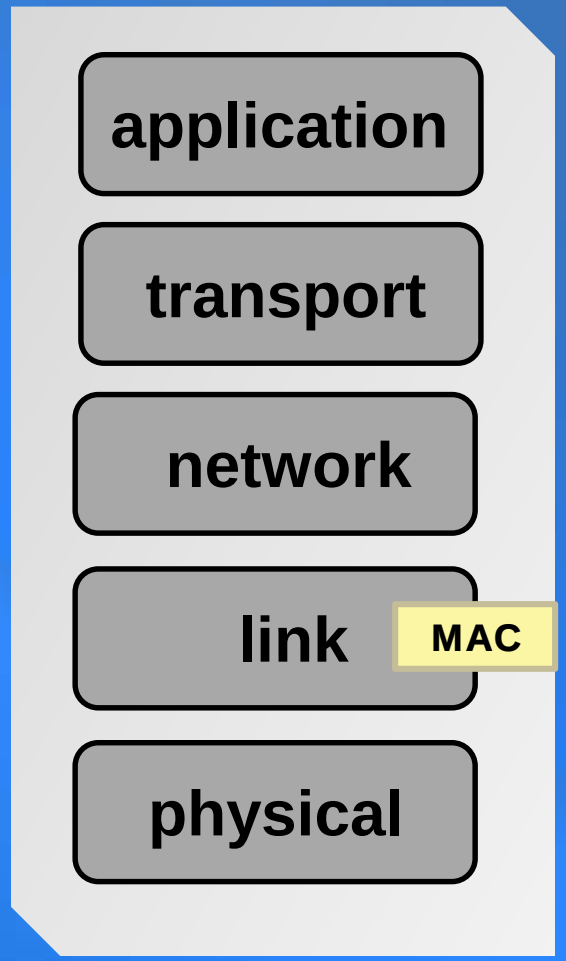
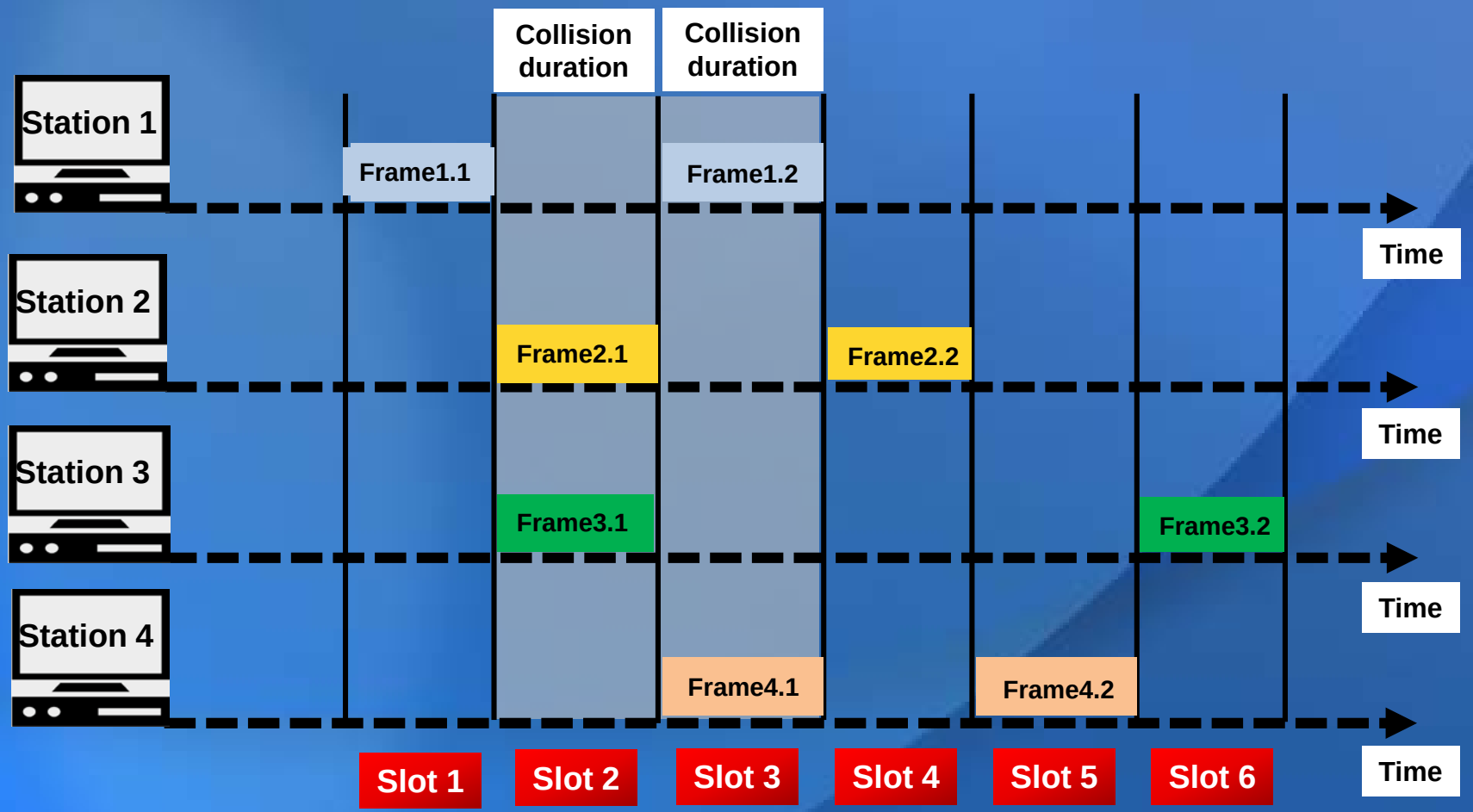


TDMA / 2G



CDMA / 3G

OFDMA / 4G

Random Access Protocols

Multiple Access Control: ALOHA