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Beyond the Physical Layer
Network Performance 101

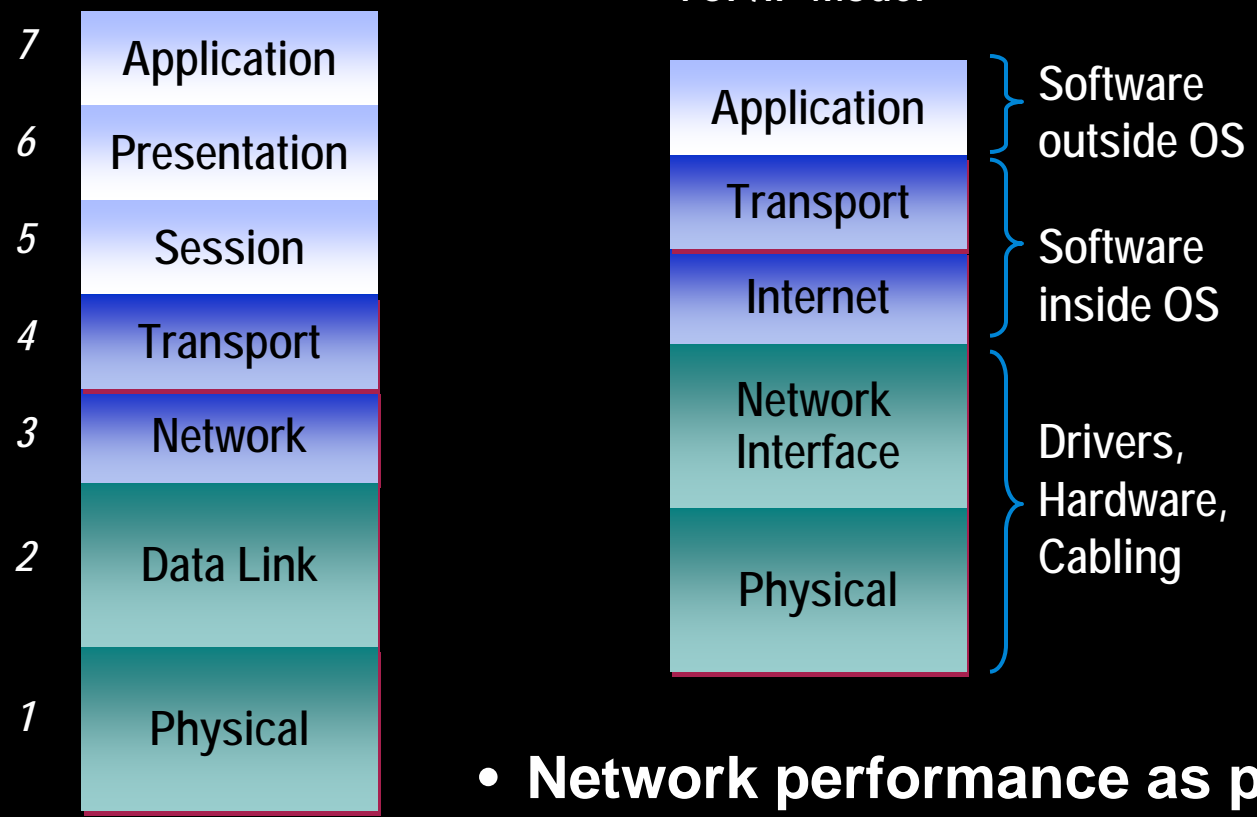


Agilent Technologies
Innovating the HP Way

OSI (Open System Interconnection) vs. TCP/IP (Transmission Control Protocol/Internet Protocol)

Layer ISO Model

TCP/IP Model



- Network performance as perceived by the end-user is as good as the weakest layer

Application Layer

Layer TCP/IP Model

5	Application
4	Transport
3	Internet
2	Network Interface
1	Physical



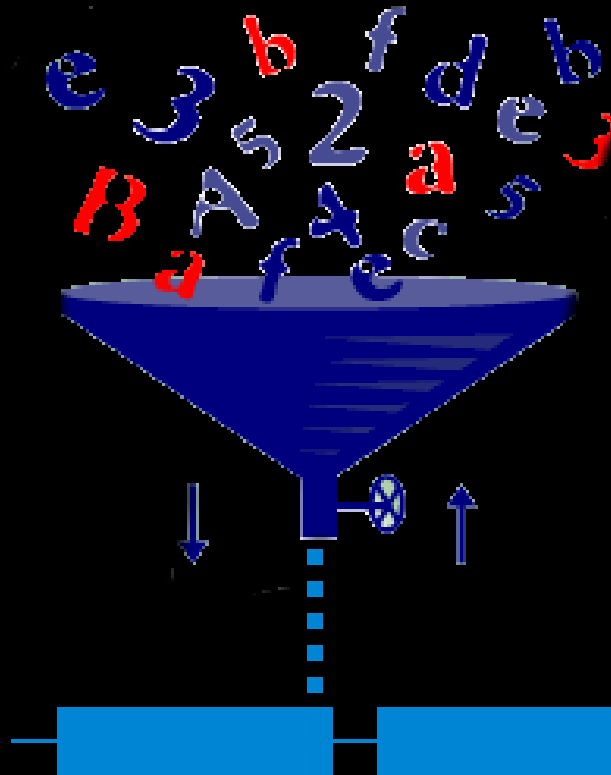
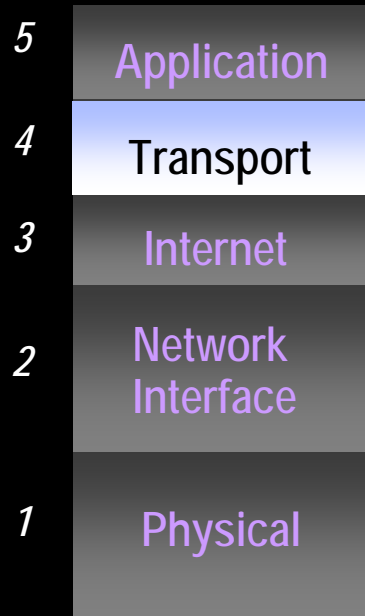
Examples of Bandwidth-hungry Applications

- **Movies on demand**
- **Broadcasts**
- **Games**
- **Distance Learning**
- **Video Telephony**
- **Tele Medicine**
- **Video Conferencing**



Transport Layer

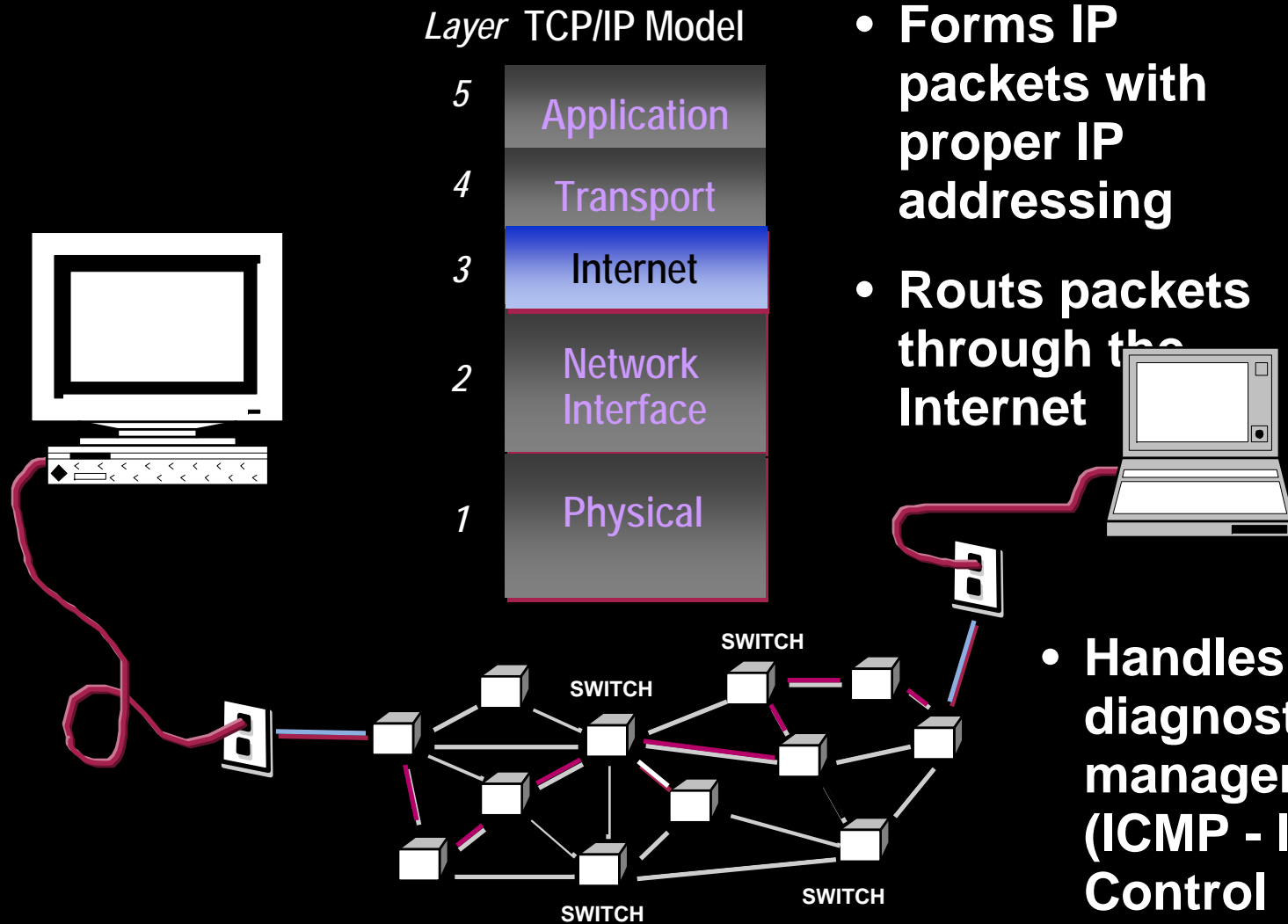
Layer TCP/IP Model



- Transport Layer breaks data into frames
- Verifies that all frames are received properly and in the right sequence
- Arranges for retransmission of missing or corrupt frames



Internet Layer

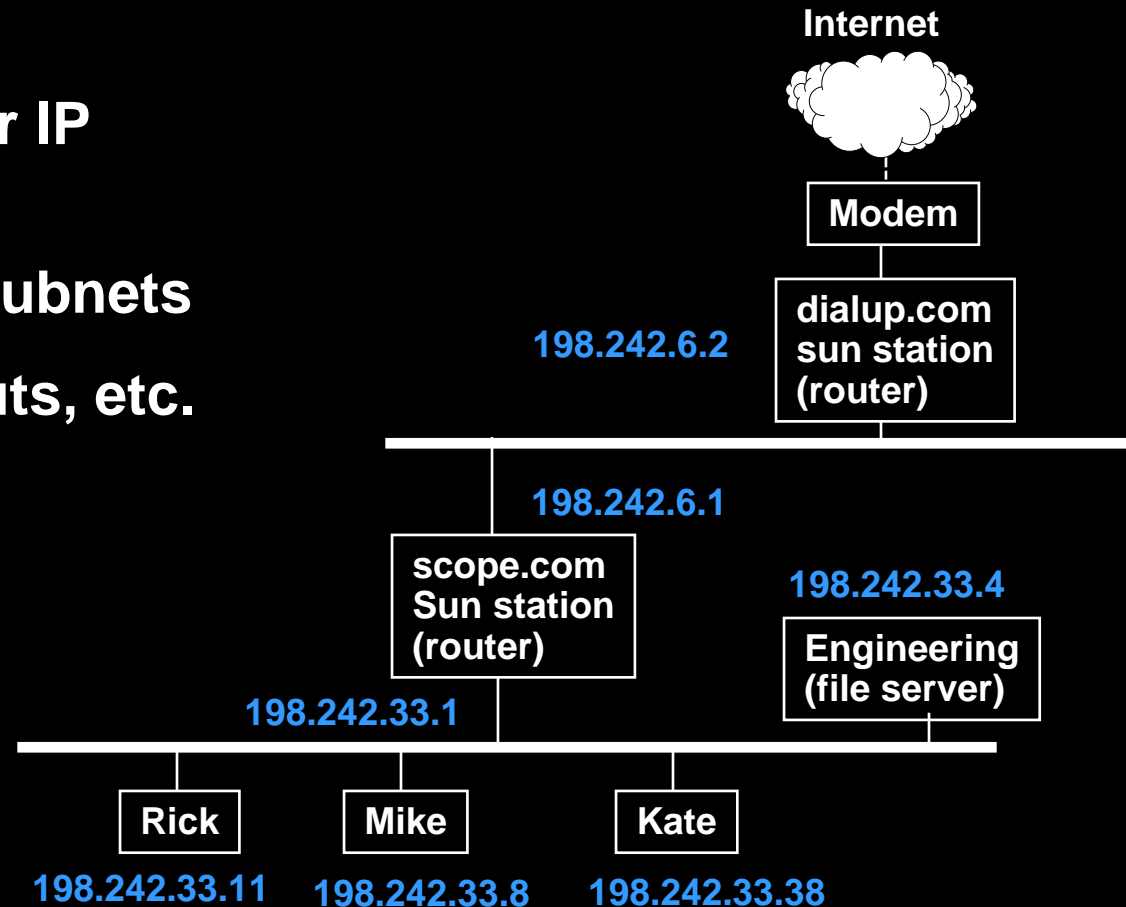


- Forms IP packets with proper IP addressing
- Routes packets through the Internet

- Handles diagnostics and management (ICMP - Internet Control Message Protocol)

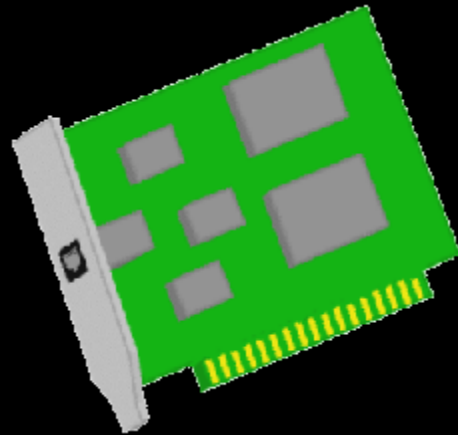
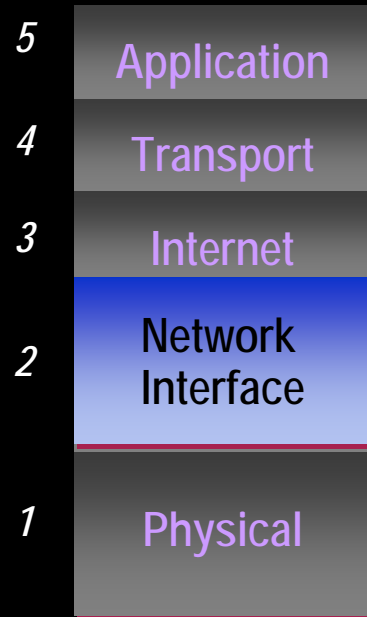
Internet Layer

- Enforces proper IP addressing
- Works with IP subnets
- Pings, Tracerouts, etc.



Network Interface Layer

Layer TCP/IP Model

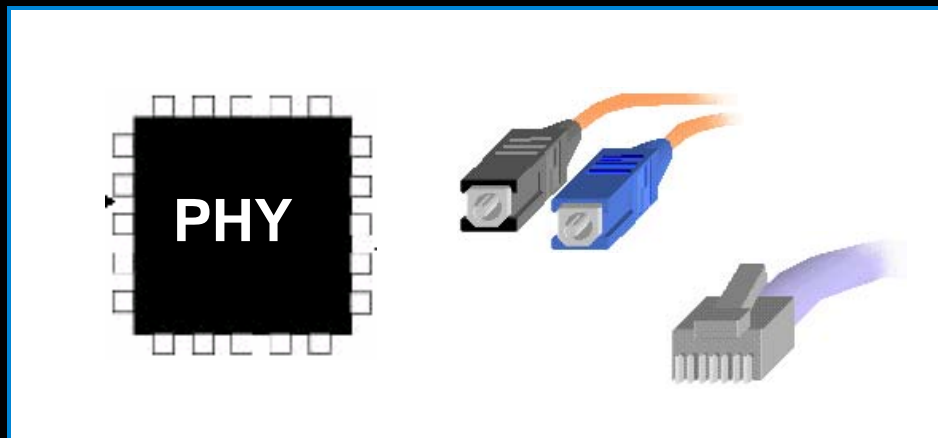
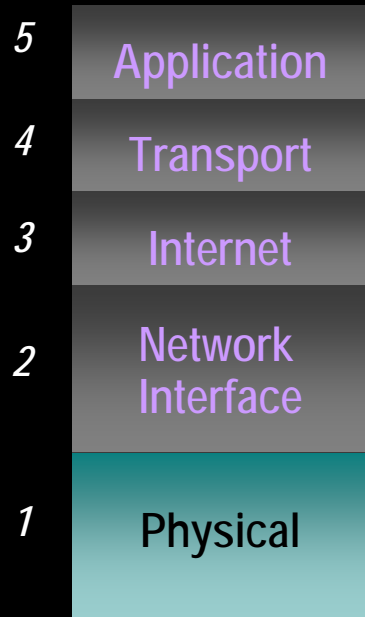


- **Implements network interface device, e.g. Ethernet or DSL**
- **Includes device hardware and software drivers**



Physical Layer

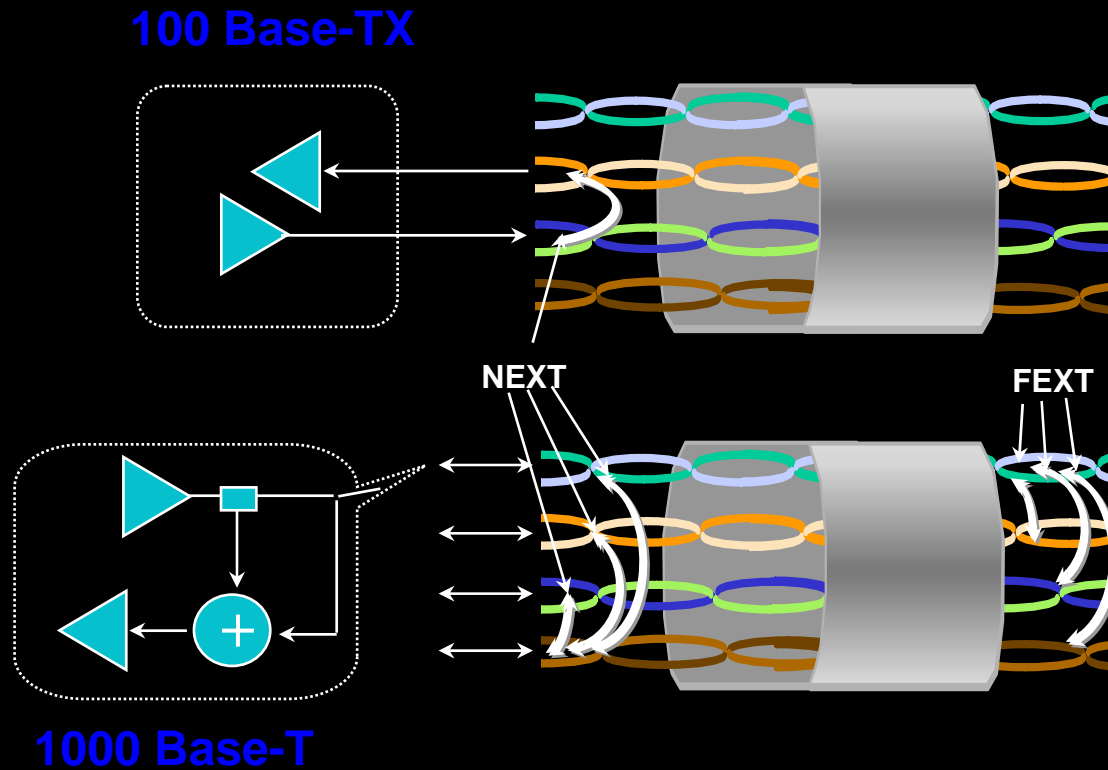
Layer TCP/IP Model



- **Physical layer consists of cabling and transceiver hardware**

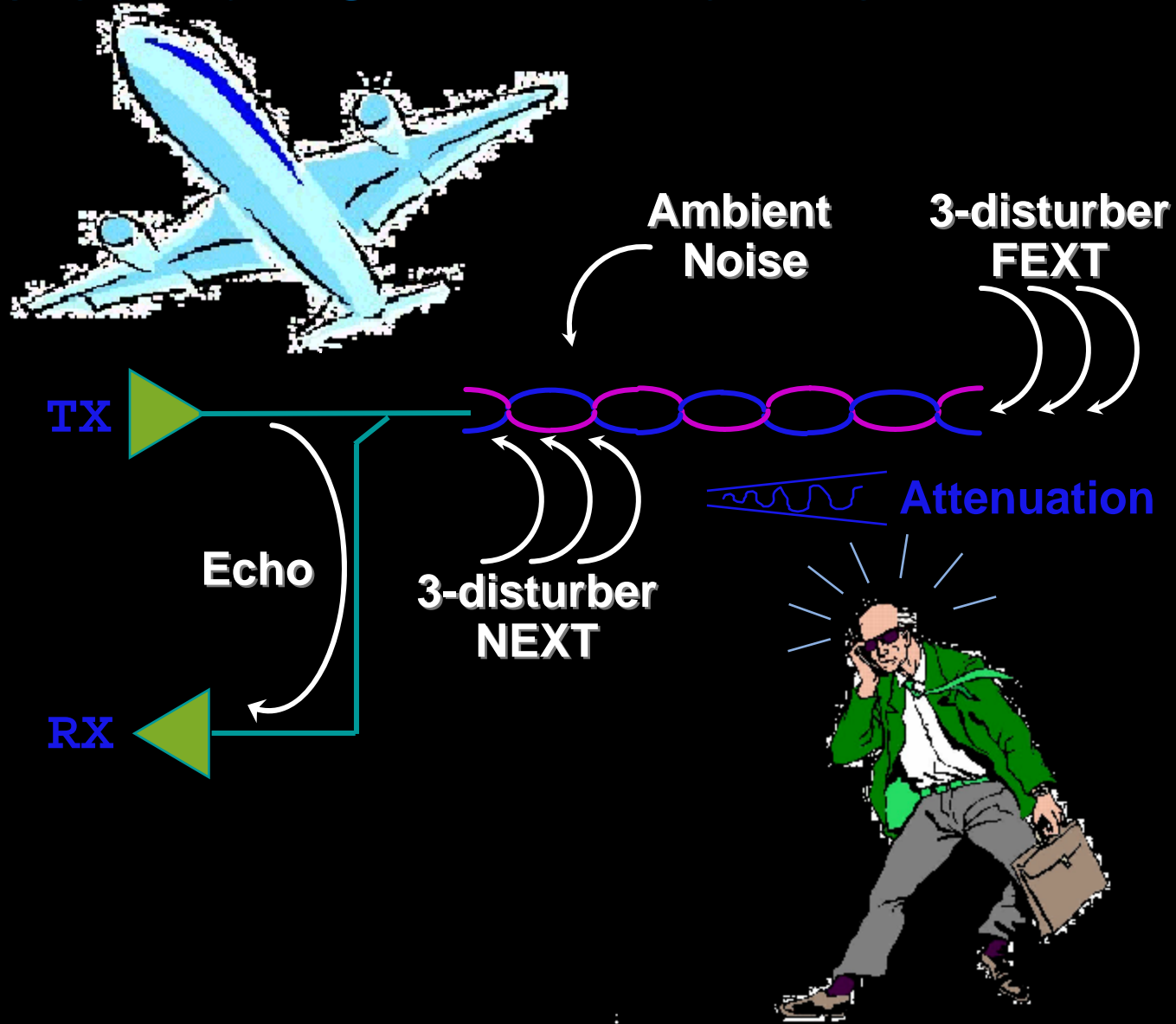


Physical Layer - Key to Throughput Performance



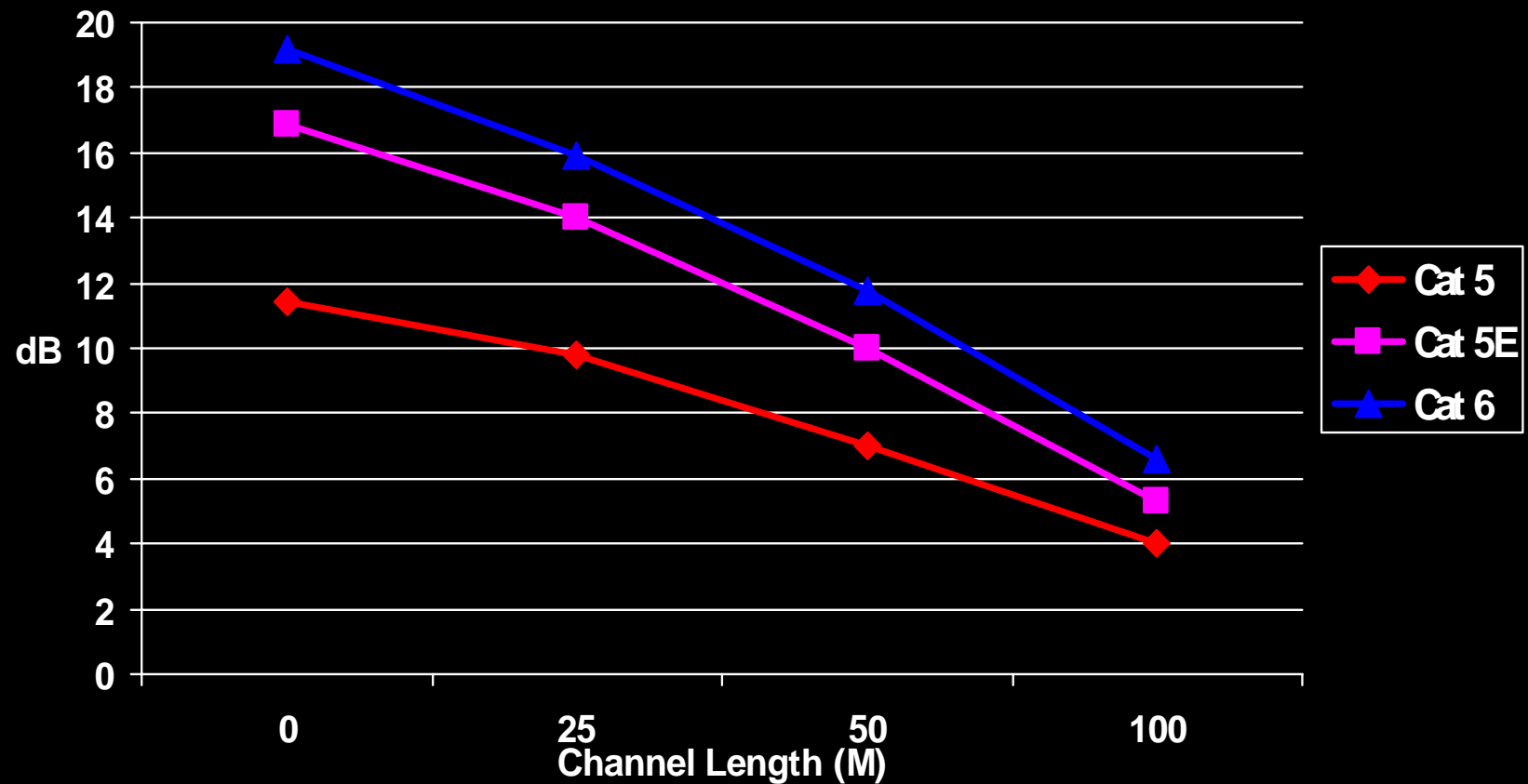
- Physical layer determines Bit Error Rate (BER) and therefore data throughput
- Cable properties determine SNR environment
- Quality of transceiver hardware is also key to BER performance

Twisted Pair SNR Environment

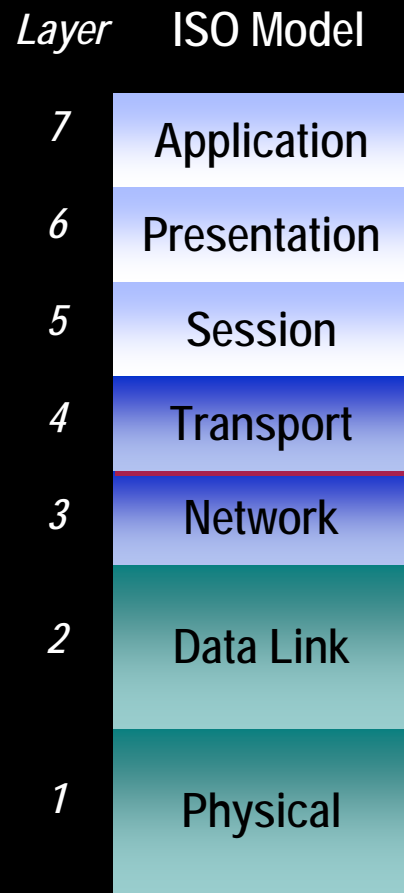


Category Quality Comparisons

1000Base-T SNR Headroom vs. Channel Length



Summary



- **This is the age of bandwidth-hungry voice-video-data applications**
- **Network performance is as good as the weakest layer**
 - **Pay attention to proper configuration and operation of all networking functions**
- **Integrity of the physical layer is the foundation and key to good throughput performance**

