

# Physical Layer

The Physical Layer is the first and lowest layer in the seven-layer OSI model of computer networking. The implementation of this layer is often termed PHY.

The Physical Layer consists of the basic hardware transmission technologies of a network. It is a fundamental layer underlying the logical data structures of the higher level functions in a network. Due to the plethora of available hardware technologies with widely varying characteristics, this is perhaps the most complex layer in the OSI architecture.

The Physical Layer defines the means of transmitting raw bits rather than logical data packets over a physical link connecting network nodes. The bit stream may be grouped into code words or symbols and converted to a physical signal that is transmitted over a hardware transmission medium. The Physical Layer provides an electrical, mechanical, and procedural interface to the transmission medium. The shapes and properties of the electrical connectors, the frequencies to broadcast on, the modulation scheme to use and similar low-level parameters, are specified here.

Within the semantics of the OSI network architecture, the Physical Layer translates logical communications requests from the Data Link Layer into hardware-specific operations to affect transmission or reception of electronic signals.

## List of services

The major functions and services performed by the Physical Layer are:

- Bit-by-bit or symbol-by-symbol delivery
- Providing a standardized interface to physical transmission media, including
  - Mechanical specification of electrical connectors and cables, for example maximum-cable-length
  - Electrical specification of transmission line signal level and impedance
  - Radio interface, including electromagnetic spectrum frequency allocation and specification of signal-strength, analog bandwidth, etc.
  - Specifications for IR over optical fiber or a wireless IR communication link
- Modulation (the carrier signal)
- Line coding (type of data connection)
- Bit synchronization in synchronous serial communication
- Start-stop signalling and flow control in asynchronous serial communication
- Circuit switching
- Multiplexing
  - Establishment and termination of circuit switched connections
- Carrier-sense and collision detection utilized by some level 2 multiple access protocols

- Equalization filtering, training sequences, pulse shaping and other signal processing of physical signals
- Forward error correction for example bitwise convolutional coding
- Bit-interleaving and other channel coding

The Physical Layer is also concerned with

- Bit rate
- Point-to-point, multipoint or point-to-multipoint line configuration
- Physical network topology, for example bus, ring, mesh or star network
- Serial or parallel communication
- half duplex or full duplex transmission mode
- Autonegotiation is an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed, duplex mode, and flow control. In this process, the connected devices first share their capabilities regarding these parameters and then choose the highest performance transmission mode they both support. In the OSI model, autonegotiation resides in the physical layer. Autonegotiation was originally defined as an optional component in the fast Ethernet standard. It is backwards compatible with 10BASE-T. The protocol was significantly extended in the gigabit Ethernet standard, and is mandatory for 1000BASE-T gigabit Ethernet over copper.<sup>[1]</sup>

## List of protocols

- Telephone network modems- V.92
- IRDA Physical Layer
- USB Physical Layer
- EIA RS-232, EIA-422, EIA-423, RS-449, RS-485
- Ethernet physical layer Including 10BASE-T, 10BASE2, 10BASE5, 100BASE-TX, 100BASE-FX, 100BASE-T, 1000BASE-T, 1000BASE-SX and other varieties
- Varieties of 802.11 Wi-Fi Physical Layers
- DSL
- ISDN
- T1 and other T-carrier links, and E1 and other E-carrier links
- SONET/SDH
- Optical Transport Network (OTN)
- GSM Um radio interface physical layer
- Bluetooth Physical Layer
- ITU Recommendations: see ITU-T
- Firewire
- TransferJet Physical Layer
- Etherloop
- ARINC 818 Avionics Digital Video Bus