2020 NAAAEA Annual Conference Program

"Network OSI Models “ Conceptual Definition with Use Cases

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We use the concept of layers in our daily life. As an example, let us consider two friends who communicate through postal mail. The process of sending a letter to a friend would be complex if there were no services available from the post office.
Layered Tasks, Example

Sender

The letter is written, put in an envelope, and dropped in a mailbox.

The letter is carried from the mailbox to a post office.

The letter is delivered to a carrier by the post office.

The parcel is carried from the source to the destination.

Higher layers

Middle layers

Lower layers

Receiver

The letter is picked up, removed from the envelope, and read.

The letter is carried from the post office to the mailbox.

The letter is delivered from the carrier to the post office.
Established in 1947, the International Standards Organization (ISO) is a multinational body dedicated to worldwide agreement on international standards. An ISO standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model. It was first introduced in the late 1970s.

Note:
- ISO is the organization.
- OSI is the model.
Seven layers of the OSI model

1. Physical
2. Data link
3. Network
4. Transport
5. Session
6. Presentation
7. Application
Interfaces b/w Layers

Device A

Intermediate node

Intermediate node

Device B

7
Application

7-6 interface

Presentation

6-5 interface

Session

5-4 interface

Transport

4-3 interface

Network

3-2 interface

Data link

2-1 interface

Physical

Peer-to-peer protocol (7th layer)

Peer-to-peer protocol (6th layer)

Peer-to-peer protocol (5th layer)

Peer-to-peer protocol (4th layer)

3rd

2nd

1st

Physical communication

7
Application

7-6 interface

Presentation

6-5 interface

Session

5-4 interface

Transport

4-3 interface

Network

3-2 interface

Data link

2-1 interface

Physical
Exchange using the OSI Model

Transmission medium

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LAYERS IN THE OSI MODEL

- Physical Layer
- Data Link Layer
- Network Layer
- Transport Layer
- Session Layer
- Presentation Layer
- Application Layer
The physical layer is responsible for movements of individual bits from one hop (node) to the next.

- Physical characteristics of interface and medium: pin assignment, connector, cables
- Representation of bits: encoding
- Data rate
- Synchronization of bits
- Line configuration: point-to-point, multipoint
- Physical topology
- Transmission mode: simplex, half-duplex, full-duplex
Data Link Layer

- The data link layer is responsible for moving frames from one hop (node) to the next.
  - Framing
  - Physical addressing
  - Flow control
  - Error control
  - Access control
Network Layer

- The network layer is responsible for the delivery of individual packets from the source host to the destination host.
  - Logical addressing
  - Routing
Transport layer

- The transport layer is responsible for the delivery of a message from one process to another.
  - Service-point addressing
  - Segmentation and reassembly
  - Connection control
  - Flow control
  - Error control
Session layer

- The session layer is responsible for dialog control and synchronization.
Presentation layer

- The presentation layer is responsible for translation, compression, and encryption.
Application layer

- The application layer is responsible for providing services to the user.
Summary of layers

- **Application**: To allow access to network resources
- **Presentation**: To establish, manage, and terminate sessions
- **Session**: To provide reliable process-to-process message delivery and error recovery
- **Transport**: To move packets from source to destination; to provide internetworking
- **Network**: To organize bits into frames; to provide hop-to-hop delivery
- **Data link**: To transmit bits over a medium; to provide mechanical and electrical specifications
- **Physical**: To translate, encrypt, and compress data
The layers in the TCP/IP protocol suite do not exactly match those in the OSI model. The original TCP/IP protocol suite was defined as having four layers: host-to-network, internet, transport, and application. However, when TCP/IP is compared to OSI, we can say that the TCP/IP protocol suite is made of five layers: physical, data link, network, transport, and application.
Relationship of layers and addresses in TCP/IP

Application layer
- Processes

Transport layer
- SCTP
- TCP
- UDP

Network layer
- IP and other protocols

Data link layer
- Underlying physical networks

Physical layer
- Specific addresses
- Port addresses
- Logical addresses
- Physical addresses
IP addresses

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TCP/IP thru a Router

Host A

**IP** (1,2)

**NI** 3487

**data**

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Host B

**IP** (2,5)

**NI** 3903

**data**

---

Router

**IP** (1,1)

**data**

---

**IP** (2,3)

**data**

---

**NI** 6543

**NI** 1002

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**NI** 3487

**NI** 6543

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Example of Protocol, http (1)

Listening on port 80
Connection established
Send a request
GET/index.html HTTP/1.0
Send a result code
HTTP/1.1 200
Read and send the file
<html> <head> ... 
Disconnect the connection

Request to 134.68.80.4:80
Connection established
Send a request
GET/index.html HTTP 1.0
Interpret and display the html
TCP and Socket in Client/Server

Host B (Server)
- socket
- bind
- listen
- accept (blocks)
- accept (returns)
- read (blocks)
- read
- returns
- write

Host A (Client)
- socket
- connect (blocks)
- connect returns
- write
- read (blocks)
- read
- returns

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