The OSI Seven Layer Network Model

Teaching Presentation

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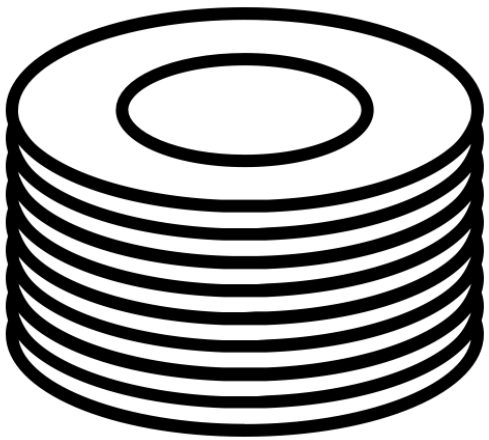
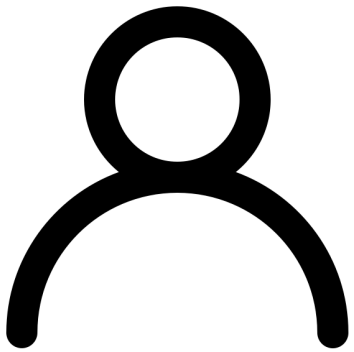
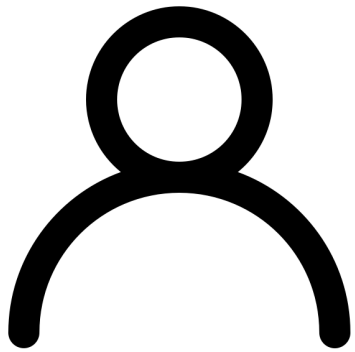
Introduction

- What is the OSI model?
- Where does it fit in the nature of things?
- Why do we use it?



Alice and Bob — A Short Story





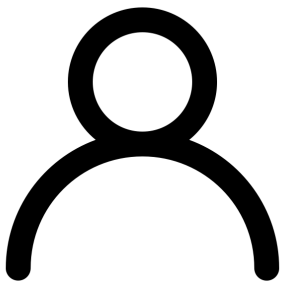
Alice works for Acme Products.

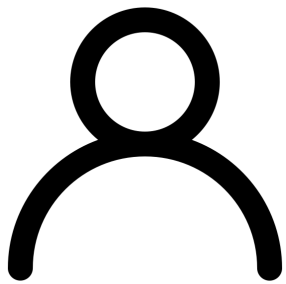
She does data analysis. She uses a software application to create a report and send it to Bob for review.

Bob works for Acme Products.

He reviews reports for errors and correctness. he uses the same software application as Alice and receives reports form Alice.

Creating a Report





Alice creates reports

using Word, Excel, PowerPoint, Visual Basic, or something else. Alice will send a report to Bob to review.

Bob reads reports

using Word, Excel, PowerPoint, Visual Basic, or something else. Bob will receive a report from Alice.

Workflow

Alice creates a report

using Word, Excel, PowerPoint, Visual Basic, or something else. She sends it to Bob.

?

The "Wire"

Bob reads the report

using Word, Excel, PowerPoint, Visual Basic, or something else. Bob received it from Alice.

?

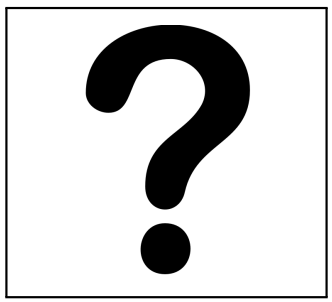
Software and Hardware

Productivity Software

- word processor
- spreadsheet
- presentation
- a program

Productivity Software

- word processor
- spreadsheet
- presentation
- a program



The Wire

- copper wire
- fiber optic cable
- twisted pair cable
- a wireless (RF) connection

What Comes Between

Productivity Software

Word, Excel, PowerPoint, Outlook, Etc.

?

The Wire

twisted pair, Ethernet, fiber optic, wireless

Productivity Software

Word, Excel, PowerPoint, Outlook, Etc.

?

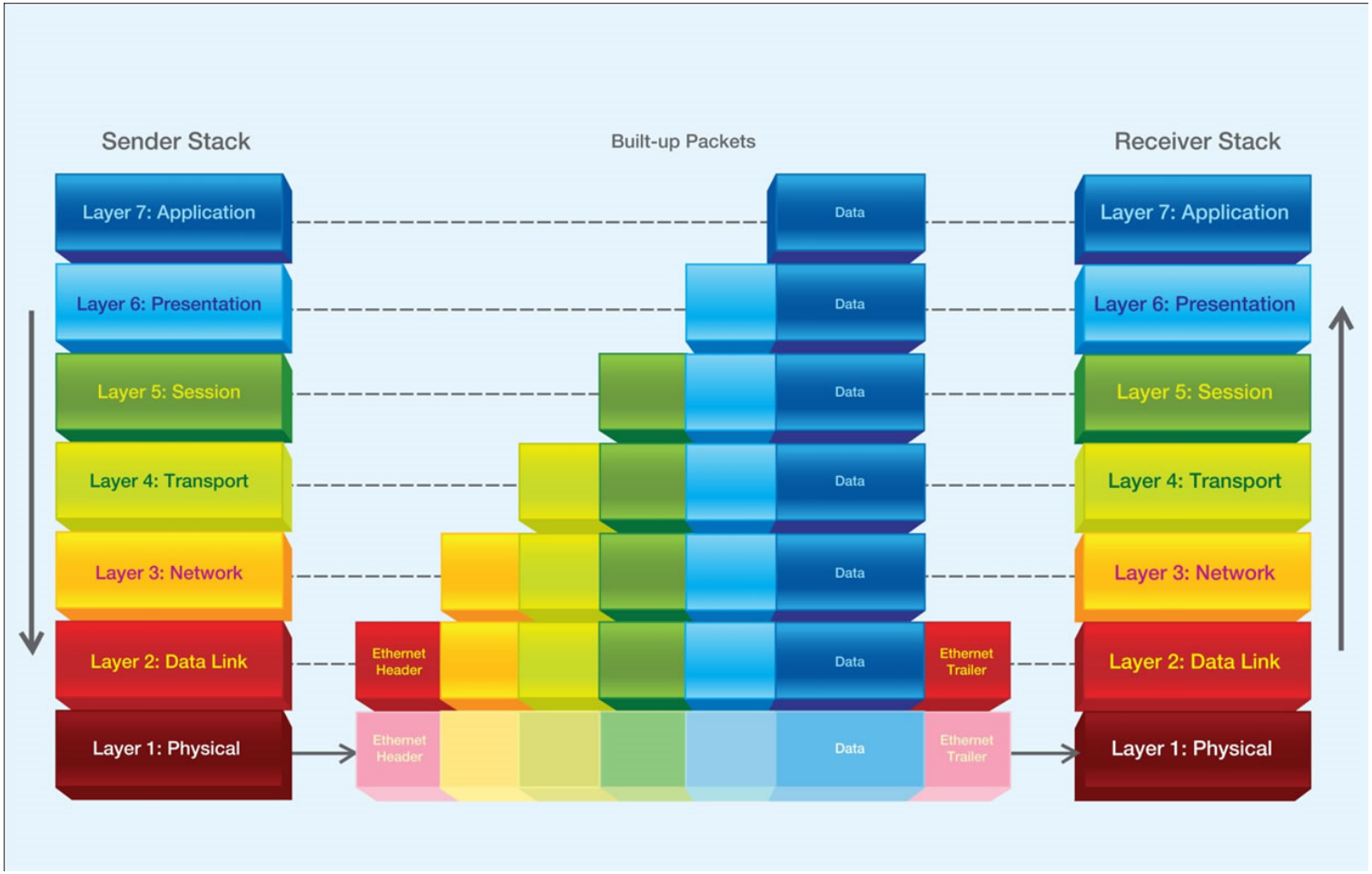
The Wire

twisted pair, Ethernet, fiber optic, wireless

OSI Model

- Open Systems Interconnect
- The OSI model is a conceptual (theoretical) model
- It sits between the application software and the transmission medium
- It packages up the data prepared using the application software in a form suitable for transmission
- It also unpacks the data in a form suitable for use by the application software

What is the Seven Layer Model?



Application, Layer 7

This layer is application specific. It is the closest layer to the user. It provides services to user applications. Services include checking that a communication exists, establishing and synchronizing the communication and user authentication. In effect, the application layer prepares the data to be transferred on down through the layers and over to the receiving device.

SOURCE:
`http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm`

- FTP
- DNS
- SNMP
- SMTP
- NFS

Presentation, Layer 6

This layer presents the data in a form such that the data is exchangeable between network devices. Both ends of the connection agree on points like the format of the data, compression, and encoding /decoding methods to use.
As an example, the network file system, (NFS) operates at layer 6 (and layer 7). Imagine you can access files on a remote server, such that the files appear as if they are on your own local drive and you can perform normal operations such as cut, copy paste etc. This is the type of task the presentation layer has to perform.
SOURCE:
`http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm`

- HTML
- ASCII
- JPEG
- GIF
- MIDI

Session, Layer 5

This layer provides services to the presentation layer by opening up, managing and terminating sessions between the communicating devices.
SOURCE:
`http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm`

- RPC
- SQL
- NetBIOS
- SCP

Transport, Layer 4

The transport layer is responsible for managing the flow of data between the two communicating devices. It is also responsible for, error detection and recovery, requesting re-transmission of data if an error in the data is detected.

Importantly, at this layer, data is segmented at the sending end and reassembled at the receiving end. As an analogy, think of a train with different compartments. This is the first layer where transport of data becomes an issue. The upper layer are concerned with application issues, whereas the lower layers, including this layer are concerned with transport issues.

- TCP
- UDP
- SPX

SOURCE:
http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm

Network, Layer 3

The network layer is concerned with the path data has to take to reach the receiving device. It includes logical addressing so packets can be routed to the correct destination. One example of a logical address is an IP address. Whereas at the layer above, the transport layer, divided the data into segments, at this layer, the data is placed into units called packets.

SOURCE:
http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm

- IP
- IPX
- DDP
- DECnet

Data Link, Layer 2

The data link layer deals with reliable delivery at the lowest physical level. It is concerned with network topology, controlling the flow of frames and error notification. It is also concerned with addressing - not with logical addressing like the upper network layer but with with physical addressing. An example of a physical address is a MAC address. This layer is actually divided into two sublayers, the Logical Link Control (LLC) sublayer and the Media Access Control)(MAC) sublayer.

SOURCE:
http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm

- IEEE 802.2
- IEEE 802.3
- Frame Relay
- ATM

Physical, Layer 1

The physical layer deals with the data in the form of electrical pulses, light or radio signal, depending on the media over which the data must be transmitted. The data is converted into a bit-stream and transmitted over the media. This layer deals with timing issues, voltage levels, and physical distances. It also defines cables, cards, connectors and other physical aspects.

SOURCE:
`http://units.folder101.com/cisco/sem1/Notes/ch2-osi/osi.htm`

- IEEE 802.2
- IEEE 802.3
- Ethernet
- RJ45
- FDDI

Sliding Down the Stack

Application

Presentation

Session

Transport

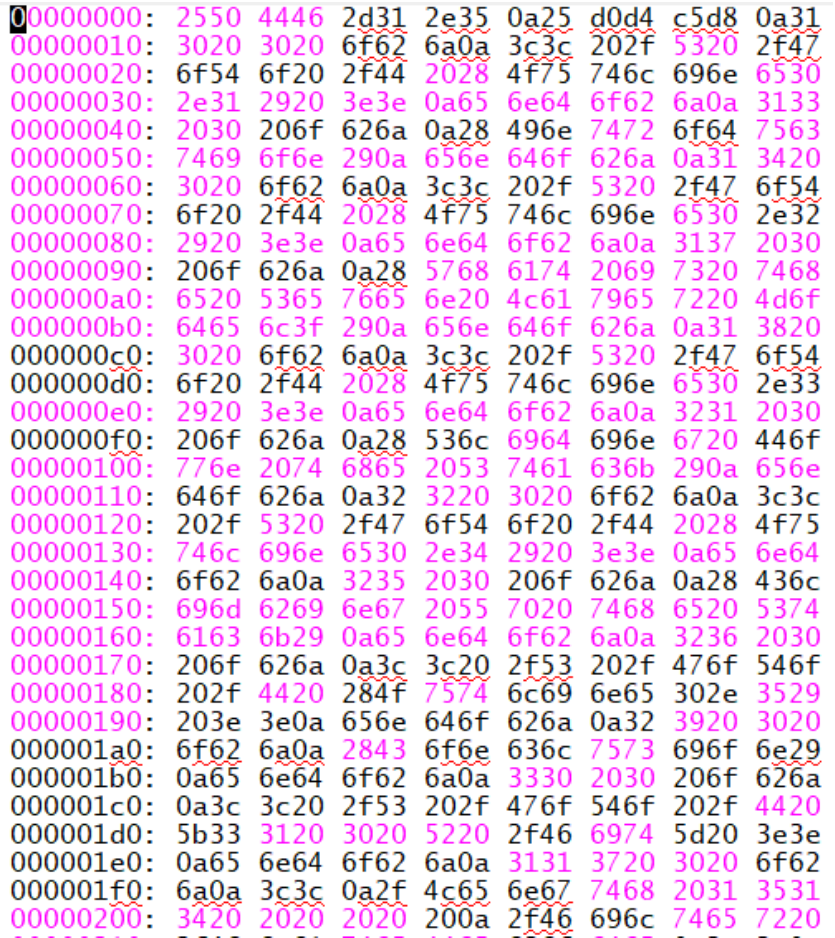
Network

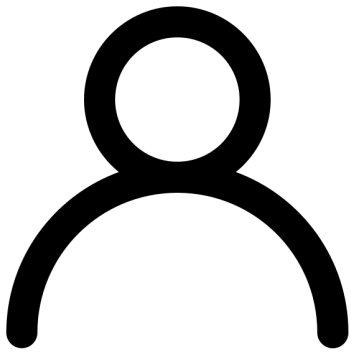
Data Link

Physical

Using Your Productivity Software

Humans understand words and images. Computer understand ones and zeros. Software converts words and images into ones and zeros. When Alice sends her report to Bob down the pipe, it's converted to a form the computer understands.





Application Layer

This layer accepts the user's data and interfaces with the Presentation Layer going down the stack. It interfaces with the User going up the stack.

Presentation Layer

Application Layer

Presentation Layer

This layer presents the data to the Session Layer. It translates the data between the sender and the receiver into bits. It formats the data for as required by the receiver. It may also encrypts and decrypts the data as it passes between up and down the stack. It may also compress and decompress the data in the case of large files.

Session Layer

Presentation Layer

Session Layer

This layer lets users prepare active communication sessions. It provides synchronization between two applications, which is necessary to deliver data without any loss.

Transport Layer

Session Layer

Transport Layer

This layer provides error-free connection. This is the first layer that takes data and divides it into packets, which it sends to the network layer. It guarantees that the data will be in the same order in which it was transmitted. It provides an end to end supply of the data segments for communication over the networks. A host will recognize its peer host at the remote network by its port number.

Network Layer

Transport Layer

Network Layer

The Network Layer adds the logical addressing information to the packets. The addressing information consists of IP addresses (like 192.169.20.33) that we call a "dotted quad." It is responsible for finding the best route for the packets to travel between the network connections. Internet routers work at this layer.

Data Link Layer

Network Layer

Data Link Layer

This layer performs error detection and combines the data bits into frames. It combines the raw data into bytes and bytes to frames and transmits the data packet to the network layer of the desired destination host. At the destination end, the data-link layer receives the signal, decodes it into frames and delivers it to the hardware.

Physical Layer

Data Link Layer

Physical Layer

This layer interfaces between the frames received from the Data Link Layer and the physical transmission medium. 1t transforms the ones and zeros into voltages and placed on the wire for sending.

The Wire

Climbing Up the Stack

1. Physical
2. Data Link
3. Network
4. Transport
5. Session
6. Presentation
7. Application

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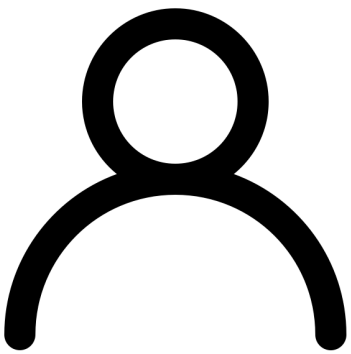

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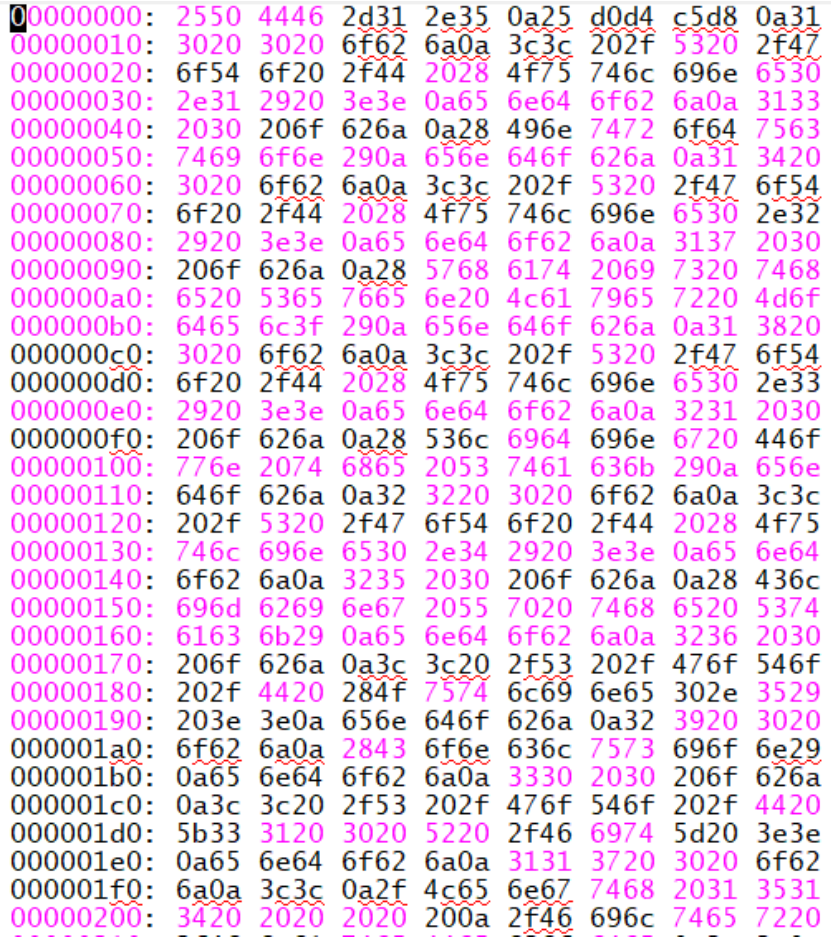

Conclusion
Questions
Comments