.1. - OSI layers 5,6,7 are combined into one Application layer in TCP/IP
- OSI layers 1,2 are combined into one Network Access Layer in TCP/IP but TCP/IP does not take responsibility for sequencing and acknowledgement functions, leaving these to the underlying transport layer.
- TCP/IP is a functional model designed to solve specific communication problems, and which is based on specific standard protocols. OSI is a generic, protocol independent model to describe all forms of network communication
- In TCP/IP, most applications use all the layers while OSI simple applications do not use all seven layers Only layers 1,2 and 3 are required to enable any data communication.

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OSI model has 7 layers, while TCP/IP model has 5 layers. OSI model is a conceptual model in theory while TCP/IP model is implemented in practice

Part I: Tutorial – 1

1. Compare the two layering models – OSI vs. Internet (TCP/IP).

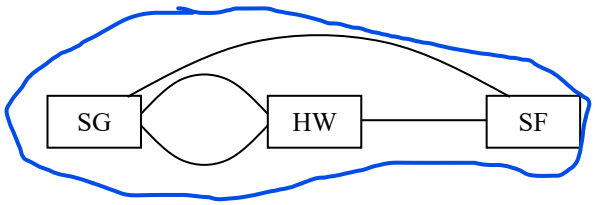
2. Show with the help of a diagram, the various headers that are appended to data at the sending host. Explain what happens to these headers at the switching nodes in a Wide Area Network.

3. In network resilience, the link failure probability can be interpreted as the percentage of the time that the link goes down during a time window. In a carrier-grade network, it is often required that the network should have 6 9's (i.e, 99.9999%) reliability. Please calculate the duration of allowable downtime per year for this network? (hint: *using the definition of failure probability*)

3. Tavail = ((1year-Tdowntime)/1year) x100 = 99.9999
Tdowntime = 0.0000001yrs = 31.536s

4. Singapore (SG) is connected to San Francisco (SF), via an intermediate node at Hawaii (HW). Two independent links connect between Singapore and Hawaii, and a long-range link connects between Singapore and San Francisco. Assume that each link fails independently with probability of 0.05. Calculate the probability in which SG is disconnected from SF.

4. Prob SG-HW broken = 0.05 x 0.05 = 0.0025
Prob HW-SF broken = 0.05
Prob of indirect SG-HW broken = 1-((1-0.05) * (1-0.0025))
=0.052375
Prob of SG disconnected from SF = 0.052375 * 0.05
= 0.00261875



file a
↓
2. Sender
↓
Data: Application Layer
Port no. ↓
a j Data: Transport Layer
↓
IP address A P Data: Network Layer
↓
H2 Data T2 : Data Link Layer
Link Address ↓
Physical Layer

Each layer encapsulate data from higher layer by adding its header with addresses and the complete data is sent at the physical layer. The physical addresses change at the switching nodes in a Wide Area Network

At the sender, as the message moves down the OSI layers, each layer addds a header to it. By default, a switching node has only three layers: network, data link, and physical layers since a switching node does not need to have higher layers to process the message eg. a switching node just needs to forward the message without knowing the meaning of the content). Hence, at a switching node, the message first travels up the layers and then travels down the layers. When the message travels up the layers, headers are stripped by the layers. When the message travels down the layers, headers are added by the layers.

Random slides info:
- Layering
  - -Explicit struccture allows identification, relationship of complex system's pieces
  - -Modularization eases maintenance, reduces design complexity, allows incremental changes
- Network organised as a stack of layers
  - -Purpose of the layer is to offer services to the layer above it and passes data & control information to the layer below.
  - -Protocols: set of rules governing communication between two peering parties
    - -format, order of messages and received among network entities, and actions taken on message transmission & receipt

Network architecture is the design of a computer network. It's a framework that specifies a network's physical components, functional organization, configuration, operational principles and procedures, and communication protocols