Module 1 Tutorials & Solutions
Overview of the Internet (Forouzan 4th edition, Chapter 2)

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2.1 How are OSI and ISO related to each other?

A: OSI is the protocol suite, ISO is the standards body that produced it.

2.2 Match the following to one or more layers of the OSI model:

A:

(a) Routing: Network layer

(b) Flow control: Transport layer

(c) Interface to tx media: Physical layer

(d) Interface to end user: Application layer

2.3 Match the following to one or more layers of the OSI model:

A:

a Reliable message delivery - Transport

b Route selection - Network

c Define frames - Data link

d High level user services (e.g. file transfer, e-mail): Application

e Bitstream transmission: Physical

2.4 Match the following to one or more layers of the OSI model:

A:

a Communicates directly with user's application program - Session

b Error correction and retransmission - Transport (end-to-end) / Data Link (local)

c Mechanical, electrical, and functional interface - Physical

d Responsibility for carrying frames between adjacent nodes - Data Link

2.5 Match the following to one or more layers of the OSI model:

A:

a Format and code conversion services: Presentation

b Establish, manage, terminate sessions: Session

c Reliable tx: Data link + transport

d Log in/out: Session

e Independence from data format: Presentation

2.6 Show the communication at the application layer for the simple private internet in Figure 1.

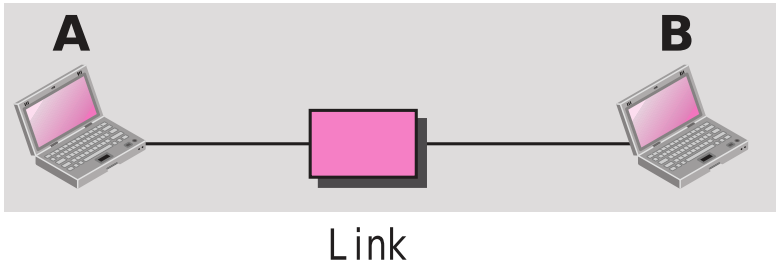

Figure 1: Simple private internet (Forouzan 4th ed., problem 2.6)

A: This is TCP/IP: packet goes from

App(A)→Transport(A)→Network(A)→DataLink(A)→Phys(A-B)→Datalink(B)→Network(B)→Transpo

2.7 Show the communication at the application layer for the simple private internet in Figure 2.

A:

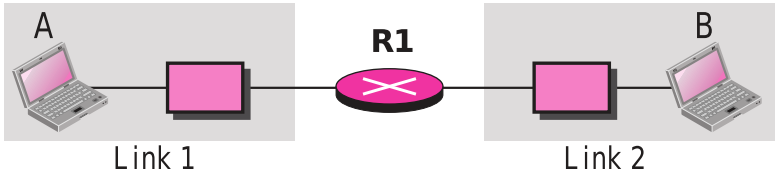

Figure 2: Simple private internet (Forouzan 4th ed., problem 2.7)

Assuming the links are just dumb switches, as above but going back up and down to Network layer at R1

2.8 A 100-byte message is sent through a private internet using the TCP/IP protocol suite. If the protocol adds a 10-byte header at each layer, what is the efficiency of the system (the ratio of the number of useful bytes to the number of total bytes)?

A:

Rather vague question because some of the layers always add more than 10 bytes! So lets say for minimum Ethernet header of 26 bytes (assuming no VLAN tag), IP header size of 20 bytes, minimum UDP header size of 8 bytes or TCP 20 bytes, we have $26 + 20 + 8 = 54$ bytes (for

UDP) or 26 + 20 + 20 = 66 bytes (TCP) of overhead. Assuming the application layer adds another 10 bytes this comes to 64 or 76 bytes of overhead to send the 100 bytes of actual payload. Note that to calculate efficiency you also need to remember that Ethernet requires a 12 byte interframe gap (effectively 12 additional bytes of padding). For TCP this is 57% (no padding) or 53% (padding included).

2.9 If a port number is 16 bits (2 bytes), what is the minimum header size at transport layer of the TCP/IP protocol suite?

A: Source and dest port numbers are needed, therefore 4 bytes; also stupid question because you also need some sort of payload checksum!

2.10 If a logical address is 32 bits (4 bytes), what is the minimum header size at network layer of the TCP/IP protocol suite?

A: Again you need a source and destination, so 8 bytes (plus header checksum and a few other flags etc.)

2.11 If a physical address is 48 bits (6 bytes) what is the minimum header size at the data link layer of the TCP/IP protocol suite?

A: Again, 6 + 6 = 12 bytes. But we also need a preamble, checksum etc. etc.

2.12 Do we encapsulate our message when we send a regular letter to a friend? When we send a post card to a friend while we are vacationing in another country, do we encapsulate our message?

A: There is only so far you can go with an analogy, but yes, you put it in an envelope. In a sense you also do this with a postcard (the destination and sender address are included).

2.13 Why do you think that we do not need addresses at the physical layer?

A: That's the job of the data link layer. Phy just turns frames into waveforms and back again with an agreed physical/mechanical/electrical interface. This is either broadcast or send point to point.

2.14 Why do you think a radio station does not need the addresses of its listeners when a message is broadcast?

A: Intrinsically destined for anyone who might be listening (Broadcast)

2.15 Why do you think both the sender and receiver addresses are needed in the Internet?

A: So we can locate the recipient and so that the recipient can locate the sender in order to reply (if desired)

2.16 Why do you think there is a need for four levels of addresses in the Internet, but only one level of addresses (telephone numbers) in a telephone network?

A: Everything on a telephone network uses a common physical layer and there's only one application (telephony; faxes and modems pretend to be telephones). So a single address (international telephone #) can uniquely identify someone anywhere in the world, and the

address provides enough info for routing (country, city/region, local exchange and individual subscriber).