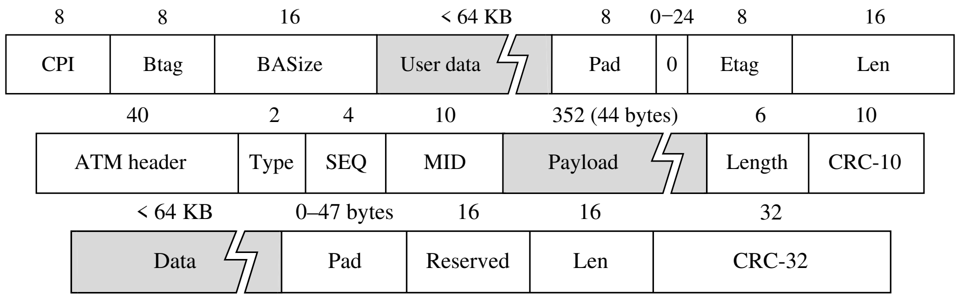
Distributed Computing and Networking—CS 461

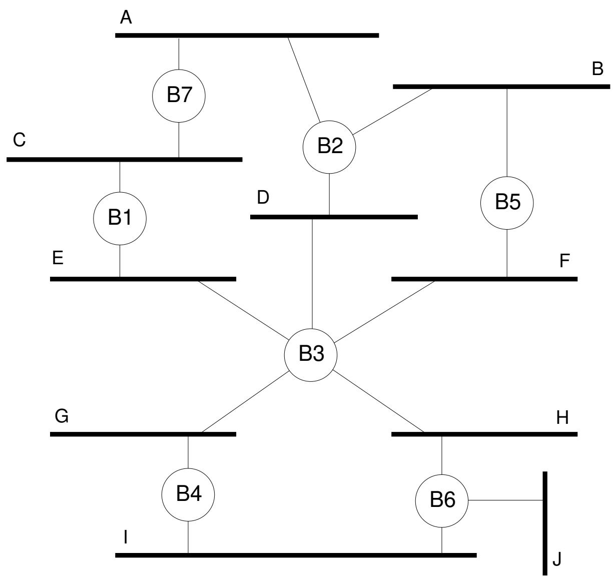
MIDTERM EXAM March 11, 1999

1. Explain why the ethernet protocol does not scale to cross-country distances. Be precise. **[5 points]**

2. The CS-PDU for AAL5 contains up to 47 bytes of padding, while the AAL3/4 CS-PDU only contains up to 3 bytes of padding. Explain why the effective bandwidth of AAL5 is always the same as, or higher than, that of AAL3/4, given a PDU of a particular size. The CS-PDU and cell formats for AAL3/4, and the CS-PDU format for AAL5, respectively, are shown below. **[5 points]**



3. Given the extended LAN shown below, indicate which ports are not selected by the spanning tree algorithm. **[5 points]**



4. Suppose a router has built up the routing table given below. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3 or R4. Describe what the router does with a packet addressed to each of the following destinations. **[5 points]**

SubnetNumber	**SubnetMask**	**NextHop**
128.96.39.0	255.255.255.128	interface 0
128.96.39.128	255.255.255.128	interface 1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
⟨default⟩		R4

   (a) 128.96.39.10
   (b) 128.96.40.12
   (c) 128.96.40.151
   (d) 192.4.153.17
   (e) 192.4.153.90

5. While TCP uses the same sliding window algorithm that is commonly found at the data link level, TCP differs from data link protocols in several important ways. For each of the following ways in which TCP differs from a data link protocol, give the TCP feature that addresses this difference. Be as precise as possible. **[5 points]**

   (a) Mismatch between sender's and receiver's processing speeds.
   (b) Multiple connection endpoints.
   (c) Variable length RTT.
   (d) Potentially long delay on the Internet.
   (e) Intermediate shared buffers.

6. Suppose you are defining a new version of the TCP header that accommodates: (1) a RTT of 200ms, (2) a network bandwidth of 100Mbps, and (3) a maximum segment lifetime of 150 seconds. How many bits will you need for the *advertized window* field and for the *sequence number* field (show your work). Give the exact number of bits these two fields need without worrying about whether the fields are awkward to process on machines with 8-bit bytes. **[10 points]**

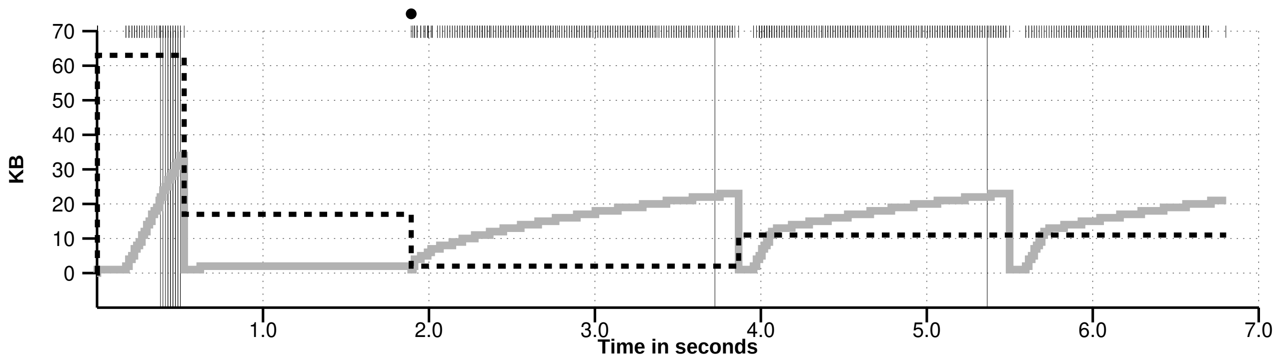
7. Consider the TCP trace given below. Match each of the labels on the trace with the following phenomenon. Give the answer "N/A" if the phenomenon is not shown on the trace. Not all labels will be used. **[5 points]**

   (a) slow start
   (b) additive increase

(c) multiplicative decrease

(d) fast retransmit

(e) fast recovery



8. For the TCP trace in the previous problem, explain why the sender does not transmit for the period of time between (roughly) 0.5 seconds and 1.9 seconds. Be sure to identify all the contributing factors. **[5 points]**