CS422 Computer Networks (Fall 2025): Homework 1

1. (6 points) The Purdue campus deploys wireless access points and campus routers to offer PAL.
2. (2 points) Do these wireless access points belong to the access network or the core network? Why?

It points belong to the access network because they provide the connection point for end-user to the network.

1. (2 points) Could you make three other examples of access networks you have used?

Wifi at home, cellular data and ethernet at university lab.

1. (2 points) What are two basic functions of network core (routers) in the Internet?

Packet forwarding and routing between different networks.

1. (16 points) Consider sending THREE packets from Node A to Node D. They are separated by 1,000 metersand are connected by a direct link with a transmission rate of 2 Mbps (2Mbps = 2x106 bits per second). The propagation speed over the link is 1x106 meters per second and each packet length is 500 bytes (500 \* 8 bits).

A starts transmitting the first packet at time t = 0,

1. (3 points) What are the transmission delay for a single packet and the propagation delay of the A–D link?

A math equations on a graph paper

AI-generated content may be incorrect.

1. (3 points) When will the last bit of the 3rd packet arrive at D?

A math equations on a graph paper

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1. (10 points) Assume there is no direct link between A and D. Instead, packets must traverse two routers, B and C (see the figure below). Each packet length is still 500 bytes (500 \* 8 bits). The propagation delay of links A–B, B–C, and C–D is 1 msec (0.001 second). The transmission rates of links A–B and B–C are 2 Mbps, and the transmission rate of link C–D is 1 Mbps. Assume the routers’ buffers are empty, large enough, and that there are no other packets besides these THREE packets. A starts transmitting the first packet at time t = 0,

A diagram of a network

AI-generated content may be incorrect.

1. (4 points) When does the first packet arrive at D?

A math equations on a graph paper

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1. (3 points) What is the time gap between the first and second packets when they arrive at D? (i.e. the time gap between receiving the last bit of the first packet and the last bit of 2nd packet)

A close up of a graph paper

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1. (3 points) When will D receive all the three packets?

A math equation written on a graph paper

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1. (10 points) Web browsing and HTTP.

(a) (3 points) What is the purpose the following request sent to www.cs.purdue.edu? Which web browser is used?

GET / HTTP/1.1\r\n

Host: www.cs.purdue.edu\r\n

User-Agent: Firefox/3.6.10\r\n

Accept: ... \r\n

Accept-Language: ... \r\n

\r\n

The purpose is request the default webpage from [www.cs.purdue.edu](http://www.cs.purdue.edu) in firefox browser.

(b) (2 points) If this HTTP request is served by the website normally, what will be the first line in the

response message?

HTTP/1.1 200 OK

(c) (3 points) Suppose we want to fetch the image with URL = www.cs.purdue.edu/images/home/student-new.jpg. What will be the first line in the request message?

GET /images/home/student-new/jpg HTTP/1.1

1. (2 points) If the previously requested image does not exist on the server, what will be the first line in the response message?

HTTP/1.1 404 Not Found

1. (8 points) A client is fetching a base html file with 10 referenced objects from an Internet server. Assume the base html file is extremely small, <1KB and each object file size is L = 1KB (1B = 8 bit) and it is also small. Assume the transmission rate for each file and referenced objects is constant, if any, is R = 100M bps.Assume that the only transmission/reception bottleneck in the network is the access link through which the client is connected to the Internet and the RTT is also constant, say RT T = 1s.
2. (3 points) If the client uses HTTP/1.1, compute the delay for non-persistent HTTP connection without parallel TCP connections.

A math equation on a graph paper

AI-generated content may be incorrect.

1. (3 points) If the client uses HTTP/1.1, compute the delay for the persistent HTTP without pipelining.

A math equations on a graph paper

AI-generated content may be incorrect.

1. (2 points) Compute the delay for non-persistent HTTP with parallel TCP connections. (no limit on the number of parallel connections)

A math equations on a graph paper

AI-generated content may be incorrect.