

Computer Networks Qualifying Exam

Fall 2012

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Note: Please attempt all questions. Justify all your answers. This examination is open book and notes.

[1.] All the sub-questions relate to the application layer of the TCP/IP stack. [30 pts: 10 pts + 10 pts + 5 pts + 5 pts]

- a. Draw a graph with the asymptotic number of messages sent between nodes in a DHT for search on the Y-axis and the average degree of nodes in the network on the X-axis, where the number of nodes are 1000. Assume for each value of degree you can use all the edges in the topology and can use the best possible topology. *What can you infer from the graph?*

Ans: The graph is a heavy tailed graph with the graph starting at (1, 1000), (3, 3), and terminating at (1000, 1). Shows that increase in the node degree beyond $\mathcal{O}(\log n)$ does not add much to the reducing the message complexity for the search.

- b. Assume that you create a VoIP system consisting of one or more servers and several clients logged in at the same time from their own network to perform video/voice/text chat. Given that all clients are connected from within their network using a NAT/Firewall and cannot be accessed from outside, how do two clients in separate networks connect and communicate? Explain the set-up and the protocol clearly.

Ans: With the help of the servers, who work as relays. That is why you need to have more than one server in the system.

- c. If you know the canonical name of the website you want to connect to and ONLY your local DNS server is down, can you connect to the website through your browser? Please explain your answer.

Ans: No. Don't have access to higher level DNS.

- d. Is there a way to perform a denial of service attack with the help of a DNS server? Please support your answer with detailed explanation.

Ans: Yes. Making the DNS server send too many DNS replies to the host.

[2.] All the sub-questions relate to the transport layer of the TCP/IP stack.

- a. Which protocol TCP/UDP do you think is used in the Internet for a large majority of the multimedia traffic? Please comment on the suitability of use of this protocol for such traffic including: If it is TCP, what about congestion control reducing throughput? If it is UDP, what about unfettered transmission causing network congestion? [10 pts]

Ans: It is TCP. We manage because the Internet is over-provisioned to a large extent, hence we do not see throughput degradation.