CS 577/ECE537 Fall 2011
Preliminary Questions for Final Exam

TCP Sliding Windows and Congestion Control

1a. Explain the difference between the advertised window and the congestion window in TCP.
b. Explain the concepts of slow start, fast retransmit and fast recovery in TCP Reno and their effects on TCP performance.
c. Explain the Explicit Congestion Notification (ECN) congestion control scheme at a router. What are the advantages and disadvantages of this scheme?
d. Discuss the reasons for the shift away from TCP Reno and towards TCP Compound and TCP Cubic as new TCP variants.

RED and Tuning RED for Web Traffic

2a. Explain **in detail** the RED router mechanism.
b. Discuss three of the RED parameters and the rationale behind Sally Floyd's suggestions with respect to choosing the settings for these three parameters.
c. What were the specific goals of RED?
d. Discuss the conclusions of the "RED Tuning" paper.

Core-Stateless Fair Queuing

3a. Explain the Fair Queuing mechanism for congestion control at a router.
b. Explain the CSFQ architecture including the estimates used in the packet algorithm.
c. Discuss CSFQ performance when compared with FIFO, RED and DRR via ns-2 simulations.
d. Discuss the advantages and disadvantages of CSFQ versus RED with respect to handling Web traffic and UDP traffic.

The War between Mice and Elephants

4a. Why are drop-tail routers unfair to Mice as compared to Elephants?
b. What factors affect the performance of short TCP flows?
c. Provide an explanation of the RIO-PS scheme that includes the differences in the role of the edge routers versus the role of core routers.
d. Compare the fairness of Drop tail, RED and RIO-PS queuing with respect to short flows.

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XCP

5a. Draw and briefly explain the role of the fields in the XCP congestion header.
b. Explain why and how XCP significantly outperforms TCP over RED and CSFQ.
c. Define the role of the Efficiency Controller and the Fairness Controller in XCP.
d. Discuss two XCP problems/issues uncovered in the paper ***An Implementation and Experimental Study of the eXplicit Control Protocol (XCP)***.

Defending against Distributed Denial of Service Attacks: A Tutorial

6a. Explain how direct and reflector DDoS attacks work.
b. Explain Attack Detection and Filtering as a line of defense against DDoS attacks.
c. What are the issues to be faced when attack detection and filtering is performed:
   1. at the source networks
   2. at the victim's network
   3. at a victim's upstream ISP network?
d. Explain the basic idea in the RPF approach.

An Analysis of the Skype Peer-to-Peer Internet Telephony Protocol

7a. Explain the difference between the Host Cache and the Buddy List in Skype.
b. Discuss the purpose of Bootstrap Supernodes in Skype. How does the Skype client find out about these nodes?
c. Explain the steps taken by the Skype protocol when a three-way conference is established.
d. Explain how media is transferred between users who are behind NATs.

Inferring Internet Denial of Service Activity

8a. Explain the backscatter analysis used in this paper to infer denial of service activity.
b. What assumptions are made in this paper and how do they impact the interpretation of the results?
c. What techniques are used to filter the packets used in the backscatter analysis?
d. What methods did the authors use to validate the assumptions and results of this study?

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DDoS Defense by Offense

9a. What are the two conditions necessary to make speak-up a viable defense?
b. Why must these conditions be present for speak-up to work?
c. Explain the role of the 'thinner' in speak-up.
d. Discuss adequate provisioning of the 'thinner' for speak-up to work properly.

Wireless Primer

10a. Explain the difference between an infrastructure WLAN and an ad hoc WLAN.
b. Discuss the differences between 802.11b and 802.11g.
c. Draw a diagram and explain virtual channel sensing in CSMA/CA.
d. Explain dynamic rate adaptation and discuss how it is used to improve WLAN performance.

CARA: Collision-Aware Rate Adaptation for IEEE 802.11 WLANS

11a. Explain how ARF works.
b. Describe how CARA differentiates collisions from channel errors.
c. What are the differences between CARA-1 and CARA-2?
d. Explain hidden terminals. How could they impact the performance of CARA?

802.11 User Fingerprinting

12a. Discuss briefly the significance of the Implicit Identifier Problem.
b. Name the four implicit identifiers described in the paper and provide at least one scenario in which each of them could be used.
c. Define the components of accuracy used by the authors.
d. Discuss how training sessions and classifier thresholds are used with the accuracy metrics to attempt to distinguish users.

Preliminary Questions for Final Exam

A Performance Comparison of Multi-Hop Wireless Ad Hoc Network Routing Protocols

13a. Explain the differences between Link State and Distance Vector routing.
b. Explain the TORA and DSR ad hoc routing protocols,
c. Define the following three metrics: packet delivery ratio, routing overhead and path optimality.
d. Use these metrics to discuss the performance differences between TORA and DSR demonstrated in the paper.

XORs in the Air: Practical Wireless Network Coding

14a. Define and explain the three main techniques incorporated in the COPE architecture.
b. Explain the pseudo broadcast and the acknowledgement technique used in COPE.
c. Explain the difference between coding gains and coding + MAC gains?
d. Why are hop-by-hop ACKs required in COPE?

Wireless Sensor Networks Primer

15a. Explain the difference between overhearing and idle listening in a WSN.
b. Define duty cycle.
c. Discuss the three techniques to lower duty cycle and reduce idle listening.
d. How is T-MAC different from S-MAC?

Secure Routing in Wireless Sensor Networks: Attacks and Countermeasures

16a. Explain some of the characteristics of a WSN that make routing security difficult to implement.
b. Discuss in detail a Sybil attack and a Wormhole attack on WSN routing.
c. Describe possible countermeasures for these two attacks.
d. Explain the TinyOS beaconing routing protocol for WSNs and describe one adversary attack for this routing protocol.

Preliminary Questions for Final Exam

SCP-MAC: Ultra-Low Duty Cycle MAC with Scheduled Channel Polling

17a. Explain the basic concepts of LPL.
b. Draw a diagram and explain the SCP-MAC protocol.
c. Explain the concept of two-phase contention in SCP-MAC.
d. What are the important differences between CC2420 and CC1000 radios? How do these differences impact SCP-MAC overhearing avoidance?

An Empirical Study of UHF RFID Performance

18a. Explain the concept of backscatter with respect to RFID reader and tag communications.
b. Draw a diagram and explain the sequence of commands that make up a *Query Round.*
c. Discuss two physical layer changes proposed by this paper and explain how these changes can enhance RFID performance.

Power-Aware MAC WSN Protocols

19a. Explain the differences between sender-initiated and receiver-initiated WSN MAC protocols.
b. Draw diagrams (for all three protocols) and explain the differences between sender and receiver behavior for X-MAC, A-MAC and ContikiMAC.