CS 577 /ECE537 **Fall 2007**

Preliminary Questions for Final Exam

TCP Sliding Windows & Congestion Control

1a. What is 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) mechanism for congestion control at a router. What are the advantages and disadvantages of this scheme?
d. How does the Jacobson/Karls algorithm deal with determining a TCP timeout value?

RED and Tuning RED for Web Traffic

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

Core-Stateless Fair Queueing

3a. Explain the Fair Queueing 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. Explain in detail the differences between edge routers and core routers.
c. Explain the RIO-PS scheme and how the two router types fit within the RIO-PS scheme.
d. Under what user circumstances could the proposed strategy not improve performance?

Preliminary Questions for Final Exam

On Designing Improved Controllers for AQM Routers Supporting TCP Flows

5a. Discuss the limitations of the Proportional Controller.
b. Give the pseudo code for the PI controller.
c. Explain the computational differences between PI and RED that includes the PI parameters and how they are derived.
d. Use the results of two experiments to demonstrate the advantages of PI over RED. What disadvantages does PI have?

Enhancing TCP Fairness in Ad Hoc Wireless Networks Using Neighborhood RED

6a. Discuss the two unique features of ad hoc wireless networks considered by the authors to be the key to understanding TCP unfairness in ad hoc networks.
b. Why does RED not help improve TCP unfairness in ad hoc networks?
c. Explain the concept of neighborhood distributed queues in wireless ad-hoc networks.
d. Explain the network congestion detection scheme used by NRED.

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

7a. Explain the differences between Link State and Distance Vector routing.
b. Explain the DSDV 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 DSDV and DSR demonstrated in the paper.

Improving TCP Performance over Mobile Ad Hoc Networks by Exploiting Cross-Layer Information Awareness

8a. Briefly describe the EPLN and BEAD mechanisms.
b. Explain the concept of TCP being frozen.
c. Discuss the tradeoffs between freezing TCP upon route failures and upon packet losses.
d. How does cross layer information awareness help in improving TCP performance in ad hoc networks?

Preliminary Questions for Final Exam

Characterization and Analysis of Multi-Hop Wireless MIMO Network Throughput

9a. Describe spatial reuse and explain how it can improve performance in a MIMO wireless network.
b. Describe spatial division multiplexing and explain how it can improve performance in a MIMO wireless network.
c. Explain the changes in performance of SRP and SMP as more antennas are added to each node.
d. Under which conditions do SRP or SMP offer better performance?

XORs in the Air: Practical Wireless Network Coding

10a. Define and explain the three main techniques incorporated in the COPE architecture.
b. Discuss two of the design decisions of the COPE packet coding algorithm.
c. Explain the difference between coding gains and coding and MAC gains?
d. Why are hop-by-hop ACKs required in COPE?

Solutions to Performance Problems in VoIP Over a 802.11 Wireless LAN

11a. What problems occur when VoIP is implemented in 802.11 networks?
b. Explain the components of the proposed VoIP M-M scheme and how AP performance can improve when this scheme is implemented.
c. Discuss the causes of the significant difference in analytic and simulation results for the M-M scheme with VBR sources in Table VI.
d. Explain how the MMP modification to 802.11 DCF improves VoIP session performance. Under what circumstances could MMP be problematic?

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

Robust Rate Adaptation for 802.11 Wireless Networks

13a. Define rate adaptation and explain the rationale for its use in WLANs.
b. Explain how ARF works. Under what circumstances was it shown that ARF performance is worse than fixed wireless data rates?
c. Name and discuss the authors' critique of the second guideline considered.
d. Discuss the lost estimation and the adaptive RTS filter components of RRAA.

CARA: Collision-Aware Rate Adaptation for IEEE 802.11 WLANS

14a. Explain the concept of CSMA/CA with RTS/CTS.
b. What are hidden terminals, and how do they impact performance?
c. What are the inherent performance tradeoffs of using RTS/CTS in 802.11?
d. How does CARA use RTS probing and Clear Channel Assessment to outperform ARF?

Defending against Distributed Denial of Service Attacks: A Tutorial

15a. 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.

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. Name and explain the two new classes or security attacks on WSN routing introduced by the authors.

c. Describe possible countermeasures for these two attacks.
d. Explain the TinyOS beaconing routing protocol for WSNs and describe one laptop-class adversary attack for this routing protocol.

WiseMAC: An Ultra Low Power MAC Protocol for the Downlink of Infrastructure Wireless Sensor Networks

17a. Describe the WiseMAC protocol in an infrastructure WSN.
b. How does WiseMAC minimize the time that sensor nodes spend in idle listening?
c. How does WiseMAC mitigate overhearing?
d. How does clock drift affect the duration of WiseMAC's wakeup preamble?
e. Under what conditions does WiseMAC consume more power than Zigbee, and why does this occur?

An Energy-Efficient MAC Protocol for Wireless Sensor Network &
Ultra-Low Duty Cycle MAC with Scheduled Channel Polling

18a. Explain the SMAC algorithm.
b. How does it reduce the duty cycle for a WSN?
c. Explain the difference between LPL channel polling and SCP-MAC channel polling.
d. Explain the concept of two-phase contention in SCP-MAC.

Energy-Efficient Communication Protocol for Wireless Microsensor Networks

19a. What is the basic idea of a MTE routing protocol for WSNs?
b. Under what circumstances can using MTE yield less than optimal energy use?
c. Explain the LEACH protocol in detail.
d. Discuss the advantages and disadvantages of using TDMA within clusters in a WSN.