

Preliminary Questions for Final Exam**TCP Sliding Windows and 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) congestion control scheme 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 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. What factors affect the performance of short TCP flows?
- b. Explain the RIO-PS scheme that includes the differences in the role of the edge routers versus the role of core routers.
- c. Compare the fairness of Drop tail, RED and RIO-PS queuing with respect to short flows.
- d. Discuss the weaknesses of the paper in explaining and justifying the RIO-PS parameters chosen for the simulations presented.

Preliminary Questions for Final Exam**Congestion Control for High Bandwidth-Delay Product Networks**

- 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.

An Implementation and Experimental Study of the eXplicit Control Protocol (XCP)

- 5d. What weaknesses in XCP did this paper uncover?

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

- 6a. Explain the difference between the Host Cache and the Buddy List in Skype.
- b. Discuss the purpose of Bootstrap Supernodes. 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.

Understanding the Power of Pull-based Streaming Protocol

- 7a. Define the two metrics, delivery ratio and α -playback delay, as used in this study.
- b. Explain the concept of a pull-based method within a streaming P2P application.
- c. What are the advantages of the proposed pull-push hybrid system?
- d. List the limitations of both of these protocols.

Defending against Distributed Denial of Service Attacks: A Tutorial

- 8a. 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.

Preliminary Questions for Final Exam**Inferring Internet Denial of Service Activity**

- 9a. 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 assumption and results of this study?

Denial of Service Attack and Prevention on SIP VoIP Infrastructures Using DNS Flooding

- 10a. Explain the goal and scope of a DoS attack on a SIP proxy.
- b. What is an irresolvable domain name and how can an attacker construct one?
- c. Explain the design and implementation of the DADP scheme.
- d. How can this scheme improve the performance of a SIP proxy that is being attacked?
- e. What are the weaknesses of the proposed DADP design?

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

- 11a. 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

- 12a. 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?

Preliminary Questions for Final Exam**Robotic-based Location Sensing Using Wireless Ethernet**

- 13a. Define location awareness in the context of wireless nodes and name two indoor applications where location awareness would be important.
- b. Define sensor fusion. What impact did this technique have on the results presented in this paper?
- c. Discuss the advantages and disadvantages of the location-support method with RF signals used in this paper.
- d. Describe two physical phenomena that affect the signal strengths of wireless signals in a way that makes them difficult to model analytically.

Understanding and Mitigating the Impact of RF Interference on 802.11 Networks

- 14a. Draw a picture that shows all the fields in PLCP header with a long preamble and briefly explain the role of each field within the 802.11 MAC layer protocol.
- b. Explain the basic strategy used by an attack that uses header processing interference.
- c. Discuss the details of the rapid channel hopping scheme implemented in this paper.
- d. Why can rapid channel hopping be effective? When will it be ineffective?

CARA: Collision-Aware Rate Adaptation for IEEE 802.11 WLANS

- 15a. Explain the concept of CSMA/CA with RTS/CTS.
- b. Explain how ARF works.
- c. How does CARA use RTS probing and Clear Channel Assessment to outperform ARF?
- d. Explain hidden terminals. How could they impact the performance of CARA?

TRAMA (TRAffic-Adaptive Media Access) Protocol

- 16a. Explain the role of the NP component of TRAMA.
- b. Discuss the difference between transmission slots and signaling slots in TRAMA.
- c. What are the differences in the Absolute Winner node, the Alternate Winner node and the Possible Transmitter Set in TRAMA?
- d. Briefly compare the performance of TRAMA versus SMAC in terms of average delivery ratio and average queuing delay for one traffic scenario presented in the paper.

Preliminary Questions for Final Exam**Secure Routing in Wireless Sensor Networks: Attacks and Countermeasures**

- 17a. Explain directed diffusion routing and minimum cost forwarding for a WSN.
- b. Discuss in detail a Sybil attack and a Wormhole attack on WSN routing.
 - c. Describe possible countermeasures for these two attacks.
 - d. What is the different between a mote-class attack and laptop-class attack with respective to severity of a potential attack and the difficulty in finding appropriate countermeasures?

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

- 18a. Define duty cycle in WSNs.
- b. Explain the SCP-MAC protocol and how it reduces the duty cycle.
 - 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 implementation and performance?

AS-MAC: An Asynchronous Scheduled MAC Protocol for Wireless Sensor Networks

- 19a. Explain the AS-MAC protocol.
- b. Specifically, discuss the role of Hello packets in AS-MAC.
 - c. Discuss how/why AS-MAC outperforms SCP-MAC in terms of energy consumption.
 - d. Explain the techniques used to measure energy consumption in the physical AS-MAC experiments conducted.