

**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  $\alpha$ -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 respect 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.