

Department of Electrical and Information Technology

Final Exam – 2011 ht2

2011-12-19, 14:00 – 19:00

## ETSF05/ETSF10 – Internet Protocols

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There are 22 questions in this exam, giving a total of 70 points. Minimum 42 points are needed to pass and get grade 3. You get part of the points for a question if your answer is only partially correct.

Each passed quiz gives you a bonus of 7 points (10% of the total score) in this part of the exam. Note that the bonus applies only to students registered on the course study period 2, fall term, 2011.

Use all the time given to you. Answer briefly and clearly. Choose your words carefully in order not to write answers too long. None of the questions requires an answer longer than 100 words; so grading the answer stops after that. Always motivate your answers. Unclear, confused, and too generic answers, containing irrelevant information, will decrease the grading!

If you want, you may use a pocket calculator and a notes page (one side of an A4-size paper, handwritten, which must be handed in with your answer sheets).

*Good luck!*

*Kaan & Jens*

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## Part A

*Questions overleaf...*

## Questions

### 1. Routing

- 1.1. [3 points] What is input port queuing? What is output port queuing? Why do they occur in routers?
- 1.2. [4 points] What kind of information is shared between the routers in Distance Vector Routing? How is this information processed by a router?
- 1.3. [4 points] What kind of information is shared between the routers in Link State Routing? How is this information processed by the routers?
- 1.4. [3 points] Given the forwarding table below, what is the next hop address for these destination addresses? (i) 191.231.194.55; (ii) 8.4.3.2; (iii) 85.34.23.10. Shortly motivate your answers.

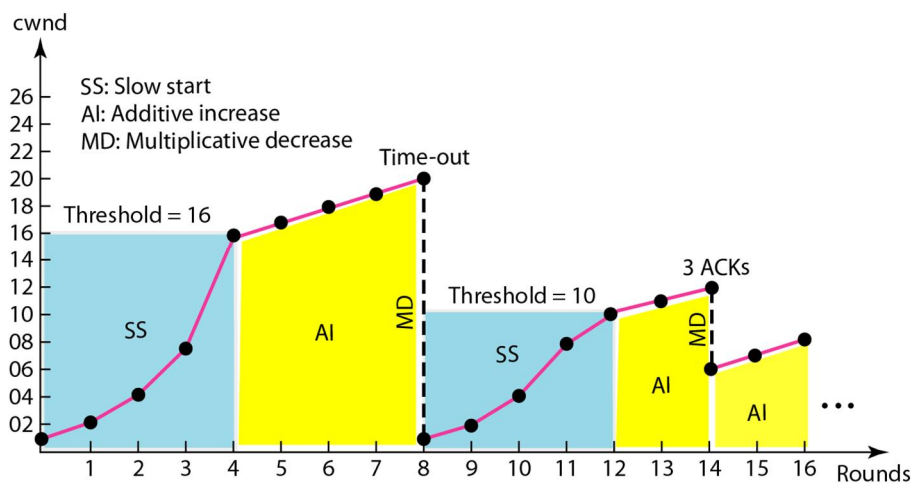
Net ID	Cost	Next Hop
130. 235. 0. 0/16	5	81. 12. 32. 4
191. 231. 194. 0/24	2	129. 100. 1. 1
84. 24. 0. 0/22	1	181. 14. 62. 5
100. 100. 12. 40/27	3	4. 235. 17. 9
191. 231. 194. 0/26	1	73. 32. 56. 123
0. 0. 0. 0/0	1	112. 123. 89. 1

### 2. Multicast routing

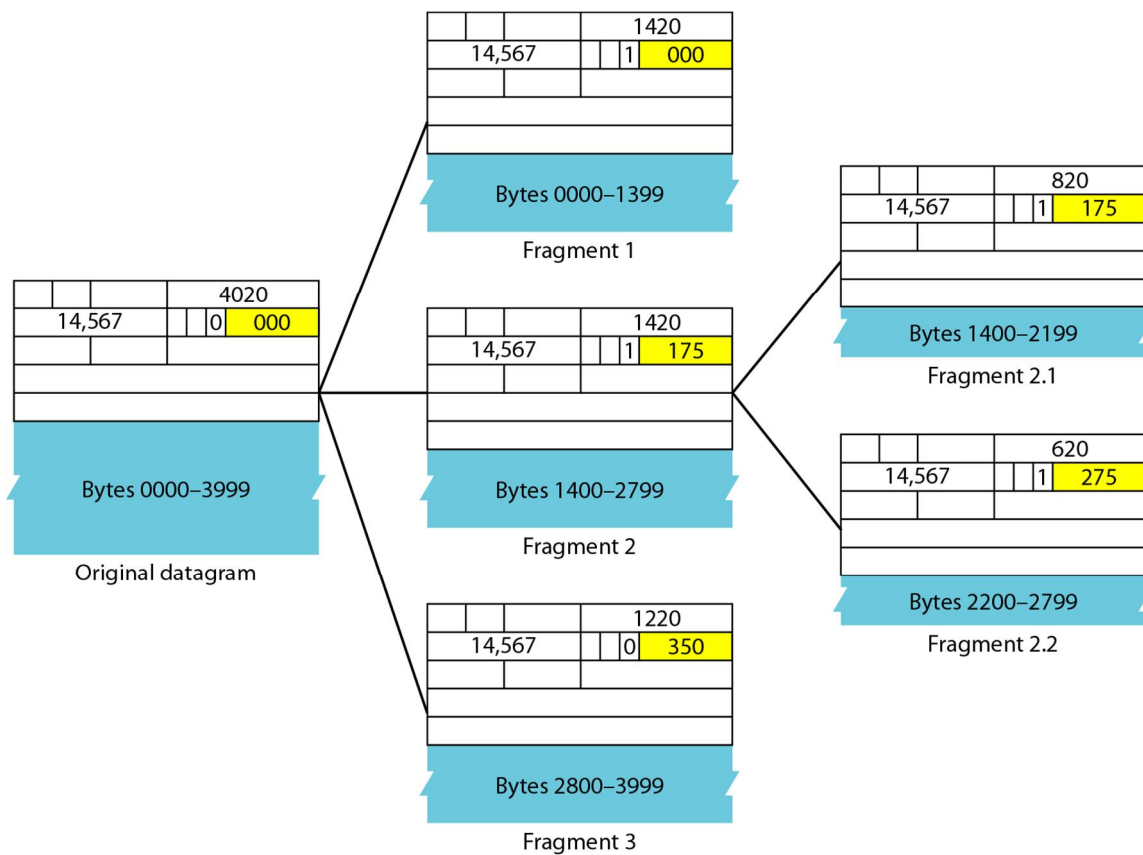
- 2.1. [3 points] Explain and compare source-based and group-shared multicast trees.
- 2.2. [2 points] What is the purpose of Multicast Backbone (MBONE)?
- 2.3. [2 points] What is the purpose of Internet Group Management Protocol (IGMP)?

### 3. Transport layer

- 3.1. [4 points] The TCP/IP model uses various types of addresses at each layer. Why? What is the purpose of: (i) TCP/UDP port numbers; (ii) IP addresses; (iii) MAC addresses, all on a single computer?
- 3.2. [4 points] How is flow control implemented in TCP? Explain using the terms “sliding window”, “receiver window”, “congestion window”, and “go-back-N”.
- 3.3. [4 points] Explain the slow start and congestion avoidance phases of TCP. How do these help preventing congestion? How is the congestion window size changed? (Use the figure below for help.)
- 3.4. [4 points] How does TCP detect congestion? How does it operate once congestion is detected? How is the congestion window size changed? (Use the figure below for help.)



4. Performance and Quality of Service (QoS)
  - 4.1. [2 points] What are the four major network performance metrics? How are they defined?
  - 4.2. [4 points] Explain and compare priority queuing and weighted fair queuing. How do they handle traffic flows with different priorities?
  - 4.3. [4 points] Explain and compare leaky bucket and token bucket. How do they handle bursty traffic?
  - 4.4. [2 points] Real-time Transport Protocol (RTP) was designed to support real-time audio/video services over the Internet because TCP was not very suitable for this type of traffic. Why was TCP not suitable?
5. Network layer, Internet Protocol
  - 5.1. [3 points] There are three strategies for transition from IPv4 to IPv6: What are these strategies called? How do they operate?
  - 5.2. [3 points] What is IP datagram fragmentation and why is it necessary? How is the fragmentation offset defined? Explain with a simple example. (Use the figure below for help.)



6. Application layer
  - 6.1. [3 points] Describe briefly the operation of DHCP.
  - 6.2. [3 points] Describe briefly the domain name resolution process of DNS. Explain both the iterative as well as the recursive methods.
  - 6.3. [3 points] Voice over IP (VoIP) applications can be implemented by the H.323 protocol, connecting telephone networks to computer networks. There are two important nodes in H.323, a gatekeeper (registrar) and a gateway. What is the function of the gateway?
7. Network security
  - 7.1. [3 points] IP Security (IPsec) has two modes, tunneling and transport. What do they do and what is the difference between them?
  - 7.2. [3 points] What is the biggest challenge (problem, difficulty) in symmetric key cryptography? Explain briefly how asymmetric key cryptography attempts to solve it.