Mittuniversitetet
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Försättsblad Prov Original

Kurskod	Provkod	Tentamensdatum
DT092G	T101	2019-04-26

Kursnamn	Datateknik GR (C), TCP/IP-nät
Provnamn	Tentamen
Ort	Sundsvall
Termin	
Ämne	

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Final Exam

DT092G TCP/IP Internetworking

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Instructions

Carefully read the questions before you start answering them. Note the time limit of the exam and plan your answers accordingly. Only answer the question, do not write about subjects remotely related to the question. The questions are *not* sorted by difficulty. Clearly show which answer you are giving your solution to, *Always motivate your answers and show your calculations.*.

Time 5 hours.

Exam Aids Non-programmable calculator.

Maximum points 30

Questions 10

Preliminary grades

The following grading criteria applies: E $\geq$ 50%, D $\geq$ 60%, C $\geq$ 70%, B $\geq$ 80%, A $\geq$ 90%.

Covered ILO

This exam covers the following Intended Learning Outcomes (ILO)

- ILO: 1 – analyze, apply and evaluate the TCP / IP family protocols
- ILO: 2 – explain and evaluate routing protocols used for unicast and multicast on the Internet
- ILO: 3 – describe methods and categorize problems related to reliable transport, time delay, flow control and traffic congestion management
- ILO: 4 – design and evaluate a simpler network
- ILO: 5 – explain and apply the principles of queue theory related to QoS and switching
- ILO: 10 – describe and reflect on technologies for wireless communication on the Internet
- ILO: 11 – Evaluate and compare security solutions for communication based on the internet model

Questions

The questions below are not given in any particular order.

(3p) 1. *(ILO: 1)* Explain the concept of cookies used on web-sites. Elaborate on benefits and drawbacks. Use examples and illustrations if needed.

(3p) 2. *(ILO: 1)* Explain multiplexing and discuss why multiplexing is placed in the transport layer and not further down or up in the TCP/IP model?

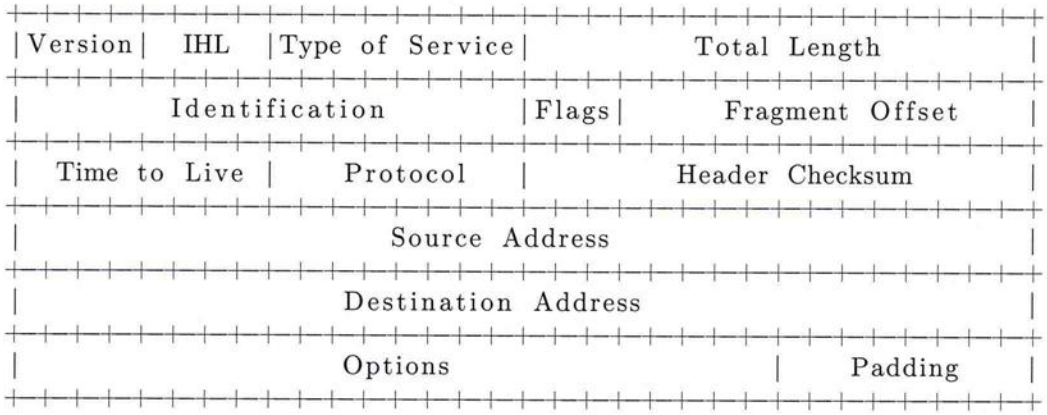
(3p) 3. *(ILO: 11)* Create a simple MAC scheme, explain each step and its purpose.

(3p) 4. *(ILO: 11)* Using the layers in the TCP/IP model as a reference. Explain tunneling using IPSec.

(3p) 5. *(ILO: 2)* Compare the traditional approach and the SDN approach in putting the routing protocols in the control plane. Name at least one upside and one downside for each approach.

(3p) 6. *(ILO: 3)* In the IP-header, the total length field is 16 bits, and the fragmentation offset is 13 bits. Explain the relationship between these two fields. Why is 13 bits enough for fragmentation offset? Assume the smallest ip fragment is 1 byte.

Listing 1: IP Header from RFC 791



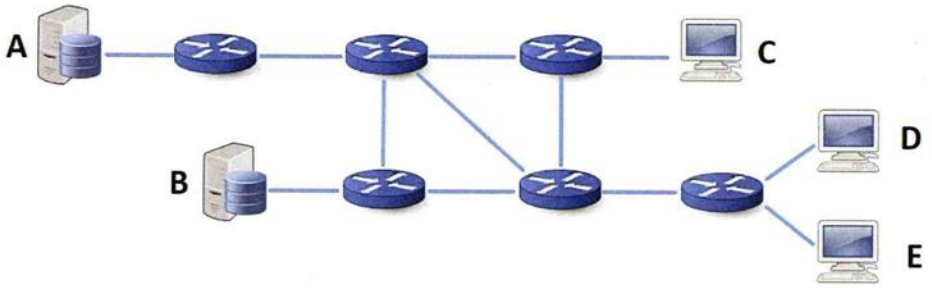
(3p) 7. *(ILO: 3)* When wanting to design a reliable data transfer protocol, how do we handle:

- Broken router interface
- A full queue at a router interface.
- A full queue at the receiving host.
- Sharing bandwidth.
- Bad cable.

(3p) 8. *(ILO: 4)* How does hosts know the IP-address of the others on the LAN? What protocols are used? Explain with an example.

(3p) 9. *(ILO: 4)* Explain how MPLS (Multiprotocol label switching) and VLAN(Virtual Local Area Network) works. What purpose do they serve? Are there similarities? What are the differences?

(3p) 10. *(ILO: 5)* The packet switching network in figure is used to transmit three unicast UDP streams S_1, S_2 and S_3. Let S_1 be the stream from A to C, S_2 the stream from A to D, S_3 the stream from B to E. There is no packet loss in the network. We measure the average and maximum end-to-end delay for each of the three streams. The average end-to-end delays are $T_1 = 120$ ms, $T_2 = 100$ ms and $T_3 = 200$ ms, the maximum end-to-end delays are $\widehat{T}_1 = 150$ ms, $\widehat{T}_2 = 180$ ms and $\widehat{T}_3 = 225$ ms. Given that the average packet generated per second by S_1 and S_2 are respectively $\lambda_1 = 100$ packet/s and $\lambda_2 = 80$ packet/s; find the average number of packets of S_1 and S_2 that are in the network.
Next assume that the average number of packets in the network is 25, and that there is no other traffic outside of the three unicast streams; find the number of packet generated in a second by stream S_3.



References

[KR17] James F Kurose and Keith W Ross. *Computer networking: a top-down approach*. Addison-Wesley Reading, 2017.