Computer Networks and Internet Protocols

Programme course

6 credits

Datornät och internetprotokoll

TDTS11

Valid from: 2017 Spring semester

Determined by
Board of Studies for Computer Science and Media Technology

Date determined
2017-01-25

Main field of study
Information Technology

Course level
First cycle

Advancement level
G1X

Course offered for
- Information Technology, M Sc in Engineering

Specific information
The course is not available for exchange students

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Perspectives on Information Technology.

Intended learning outcomes

Computer networks are playing an increasingly important role in the society. It is predicted that there will be 50 billion devices connected to the Internet by 2020. With an enormous increase in the number of wired and wireless devices connected through the Internet, as well as improved network bandwidth and computer capabilities, we are moving towards a society in which users expect to access anything they want, whenever and wherever they are. To enable this trend and all the emerging services provided over the Internet (e.g., social networks, video streaming, and the Internet of things) it is therefore critical for today's computer science students to have a good understanding for computer networks.

TDTS11 is an introductory course in computer networks and Internet protocols. The course covers the basics for how a network and its applications operate; what a protocol is; how they work, and what the most important applications of the Internet are. In the labs you will look at measurement data to build a basic understanding about some of the most important and fundamental Internet protocols. The final exam will test your understanding and knowledge of the subject. There will also be an opportunity to write a report. After the course, you are expected to be able to:

- Explain, describe, and analyze a typical network architecture, including the importance of network layers and encapsulation
- Explain the different basic types of protocols, communication channels, and network types

Overall, you should have an applied understanding of the network architecture and the protocols associated with the different layers:

- Describe and analyze the most common application architectures in the Internet, how the most important application-layer protocols work and the service they provide
- Analyze and explain important design considerations at the transport layer, including describing how TCP's flow control and congestion control works, and how reliable data transfer is implemented in TCP
- Motivate and explain how routing and forwarding is implemented on the Internet, including describing how IP addressing and fragmentation works
- Describe and explain different link-layer technologies and how they work

By the end of the course, you should also be able to:

- Analyze network traces containing the most common Internet protocols
- Show a deeper knowledge in a selected topic of interest, as exemplified in a report in which you are expected to use RFCs and other computer science reports specific to network protocols and Internet techniques

Course content

Protocol terminology. Protocol layering concept. Reference model for networking architecture. Application areas for compute networks. Network types and components (router, switch, repeater, hub). Local area networks (LANs) (IEEE 802.3). Wireless LANs (IEEE 802.11). Extending LANs. Internet and standardization. TCP/IP protocol family. Distance vector and link-state routing. ICMP. ARP. NAT. IP, addressing and introduction to routing in the internet: RIP, OSPF, BGP, DHCP. TCP retransmission, flow control and congestion control. Reliable data transfer in TCP. Three-way handshake. IPv6. Internet applications (naming with DNS, e-mail, file transfer, file sharing, web). Network security (IEEE 802.11i, WPA2, ssh). P2P networks. Internet history. Internet design principlet. LAN background. Trends. Wireshark, analysis filter and functions, trace, packet header, packet search, bandwidth, ttcp. Ping, traceroute. Communicaton modes and channels. Acces network techniques. Different types of MAC protocols. Collision domain. Sliding window. Error detection.

Teaching and working methods

The course consists of lectures, laborations, report writing, and presentation seminars.

Examination

UPG1	Voluntary assignment	0 credits	U, G
BAS1	Study group activities	1 credits	U, G
LAB1	Laboratory work	2 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses:
Computer networks, Mobile systems, Project: Secure Mobile Systems, Advanced Networking

Department

Institutionen för datavetenskap

Director of Studies or equivalent

Patrick Lambrix

Examiner

Andrei Gurtov

Education components

Preliminary scheduled hours: 38 h
Recommended self-study hours: 122 h

Course literature

Kurose, J. F. & Ross, K. W. (2012), Computer networking: a top-down approach. Sixth Edition. Pearson.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.