



RTU Course "Signalling Systems and Protocols"

13104 Telekomunikāciju tīklu katedra

General data

Code	RAE553
Course title	Signalling Systems and Protocols
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Electronics and Telecommunications
Responsible instructor	Ansis Kavacis
Academic staff	Mārtiņš Ekmanis
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	<p>The rapid development of telecommunications branches required specialists, who would be able to analyse current situation, forecast development directions, make long-term responsible solutions about favourable signalling/protocol system selection.</p> <p>The course provides students with the necessary skills for working in the sphere of signalling and communications protocols. Aspects of compatibility, scalability and security are emphasized. Message formats, time and state diagrams of protocols are analysed. Work with protocol analysers in emulation environment provides students with necessary skills for solving problems and preparing for changes in configuration.</p> <p>Within the framework of the course, students are acquainted with fundamental telecommunications signalings and protocols, analyse its historical development with some essential drawbacks, expand their personal vision for future task solutions in future</p>
Goals and objectives of the course in terms of competences and skills	To prepare professionals to work with telecommunications and signalling protocols. To provide skills to orient themselves in rapidly changing industry standards, recommendations and hardware products. To develop the skills to deal with the protocols, as well as the implementation and interoperability issues independently. To train specialists capable of signalling network alignment and modification.
Structure and tasks of independent studies	Part of the work is carried out in prepared lab emulated network environment. Here the student must switch to the proper router and perform configuration and debug operations, analysing the broadcast traffic (on bit, frame or packet level) The second part of the work is done independently at home, interpreting the traffic route in the context of the particular task. Students can access the lab network infrastructure remotely, and make additional measurements or configuration changes. Homework should be the formation of the particular characteristics assigned to DSS1 and SS # 7 signalling unit (SU) structures in line with international and national standard-setting documents.
Recommended literature	<p>A.Kavacis. Signalizācijas un protokoli: tipogrāfiskais konspekts. Rīga: RTU, 2003.</p> <p>A.Kavacis. ISDN, DSS1, CSSNo7, TCAP un SCCP: tipogrāfiskais konspekts. Rīga: RTU, 1995.</p> <p>A.Kavacis. Telekomunikāciju distribuīvās sistēmas: tipogrāfiskais konspekts + CD. Rīga: RTU, 2001.</p> <p>ITU-T (CCITT) Rekomendācijas, īpaši Q-sērija (tagad pieejamas internetā)</p> <p>Internetā brīvi pieejamie IETF dokumenti</p>
Course prerequisites	Skills in Linux. The principal activity Cisco IOS environment.

Course outline

Theme	Hours
Set of signalling problems. Kinds of telephone signalling. Subscriber and internode signalling	2
CAS and CSS. Comparison with OSI RM. Kinds of ISDN signalling: access, network, user-user	3
Sublayers and functions of SS7. Main types and subfields of SU. SS7 bearer services (MTP and SCCP)	5
DSS1. Physical and signalling data link. Organizing of D-channel. Procedures, messages and their formats	2
Protocol QSIG; PBX-to-PBX trunk signalling	2
Telecommunication protocols. Definitions, principles of formation and standardization. OSI and TCP/IP	4
Ethernet. Protocols, frame structure and subfields. Related protocols and standards	2
Frame Relay standards, protocols, subfields, messages and procedures	2
Facilities of IPv4 and IPv6	2
UDP. Features and implementation	1
TCP. Additional options of protocol, implementation, effective flow control	4
ICMP Protocol. Its implementation for management and diagnosis of IP networks	2
DNS. Data structures, organization of name spaces, implementation	2
SMTP. Implementation. Main problems	1
E-mail access protocols: POP3, IMAP, Web	1
HTTP. Principle, procedures, application	2

Web services, service access methods	1
FTP and TFTP. Loading of SW for remote telecommunications HW	2
Telnet and SSH. Structure, fields, procedures, encryption, authentication and authorization	2
Routing with BGPv4. Principles, procedures, security	2
Point-to-point protocol	1
Development of MPLS	2
Wi-Fi standards, protocols, subfields, messages and procedures	1

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able to form, document, modify and apply telephone signalling and CCSS#7 and their subsystem messages. Skills of using the standardized documents for coding of subfields of signalling messages and procedures	Homework
To be able to navigate the distributive system of internal electronic switching (inter-unit) signaling documenting (DX200 example)	Audit of test works
To be able to select conformable protocol/ signalling after analysis of standards, recommendations and technical documentation	Test work
To be able to identify requirements of security needs and select protection tools	Homework
To be able to analyse troubleshooting in protocol/signalling	Laboratory work
To be able to plan and take the necessary steps to ensure the continuous operation of the protocol	Homework
To be able to evaluate potential benefits and drawbacks on changing of protocol version	Test work
To be able to document and reproduce protocol/ signalling state diagram and message formats	Homework
To be able to analyse and solve protocol compatability problems	Laboratory works
To be able to use emulation tools (test environment) for configuration preparation and distribution	Laboratory works

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	2.0	0.0	1.0		*	