

Study program: Multimedia Communication Technologies

Course title: Active Network Devices

Professor/assistant: Dušan M. Stefanović, Ph.D.

Type of course: compulsory

ECTS credits: 6

Pre-requisites: none

Aims of the course:

Students' introduction with the role of active network devices in IP communication networks on the client and provider's side through dynamic and static routing of network traffic by selecting the appropriate IGP routing protocol based on parameters that affect the scalability and convergence of the protocol itself. They will learn techniques used to speed up the routing protocol convergence, optimize routing tables and discover and solve problems such as loops or non-optimal routes by tracking network traffic.

Learning outcomes:

Student will be able to classify routing protocols in terms of operation, convergence rate, size of routing domain, implementation, and therefore, to select a routing protocol that will be the most efficient for the given network topology. Student will be able to design routing and tuning routing protocols within an autonomous system and routing protocol used for communication between autonomous systems. He/She will learn to design an intelligent and scalable IP network infrastructure resistant to link fails, loops, suboptimal routes using advanced dynamic routing protocols, control network paths by changing metrics and administrative distance, establish communication between routing protocols in a heterogeneous environment by redistributing networks and provide secure exchange routing information between adjacent routers.

Syllabus

Theoretical part

- TCP / IP network layer protocols and packets routing on routers
- Routing table structure
- Static routing, advantages and disadvantages
- Dynamic routing protocols, selection by mode and implementation location
- Selecting the best route, the principle of a more specific route, metrics, administrative distance and network summarization
- Distance vector routing protocols, Bellman Ford and Dual Algorithms.
- Link state routing protocols, the Dijkstra algorithm
- Path Vector Routing Protocol (BGP)
- Multicast communication and multicast packet routing.

Practical part

Design and simulation of complex computer network infrastructures in the Cisco Packet Tracer and GNS3 software package. Implementation of dynamic routing protocols within the autonomous system (RIPv2, EIGRP, OSPF), communication between autonomous systems using the BGP routing protocol, secure SSH access to active network devices, provider's infrastructure simulation in the form of a leased line, Frame Relay and MPLS infrastructure. Methods of balancing network traffic between redundant links and intelligent network design techniques. Tools and techniques for problem detection and problem correction. Loops and suboptimal routes simulation and their correction.

Literature

1. Todd Lammle, CCNA-Cisco Certified Network Associate, Computer library, 2006.
2. W. Odom, R. Healy, D. Donohue, CCIE Routing and Switching Certification Guide, Cisco Press, 2010.
3. W. Odom, CCNP Route 642-902 Official Certification Guide, Cisco Press, 2010.

Number of active classes 75

Lectures: 45 Practical classes: 30 Research work:

Other forms of teaching:

Teaching methods

Combined, interactive approach with practical problem solving.

Grading system (maximum 100 points), **grading scale** from 5 to 10: below 51 points grade 5, grade 6 from 51-60 points, grade 7 from 61-70 points, grade 8 from 71-80 points, grade 9 from 81-90 points, grade 10 from 91-100 points.

Pre-exam obligations	points	Final exam	points
activity during theoretical lectures	10	written exam	30
practical training	20	oral exam	
colloquium(s)/seminar papers	25 +15		
Sum	70	Sum	30