Switching

Academic Year: (2019 / 2020) **Review date: 15-05-2020**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: CUEVAS RUMIN, ANGEL

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Communications Networks and Services

OBJECTIVES

OBJECTIVE: To present the fundamentals of the main switching technologies used in communications networks, protocols and architectures of control nodes that are built with telecommunication services. The student must know the internal architecture of the types of switches, with particular emphasis on packet switches, including design alternatives internal switching network, and basic algorithms for classification, planning packages, route search and queuing. On these elements are implemented mechanisms for reliability, QoS and traffic engineering are essential for the design and management of communications networks.
KNOWLEDGE:
- The existing switching techniques.
- Basic operating principles of packet switching, circuits, cells, messages or bursts.
- Technological challenges of today optical switching (OBS and OPS).
- Internal architecture and algorithms used in simple packet switches (shared memory, shared bus, centralized vs. distributed processing, routers with switching fabric) and complex (knock-out, banyan, batcher-banyan, benes).
- Main route lookup techniques.
- Items required to implement Quality of Service in a packet switch architectures and their associated protocols (classification, planning and management of queues).
- Label switching technology and IP integration, applications in Traffic Engineering, protection and implementation of virtual private network service. Extension to Optical Networks.
CAPACITIES:
Specific:
- Analyze and compare design alternatives of a switch.
- Undertake the design aspect of a packet switching network for the sizing of capacity switches.
- Identify and troubleshoot routers load.
- Analyze the scalability of designs label switching networks.
- Set various parameters of traffic control in a switch, QoS aspects of routers a packet network to support different traffic classes and / or service, and a VPN backbone network based on packet switching.
- Perform traffic engineering calculations.
General or skills:
- Overview about the different mechanisms implemented on switched networks judiciously applying the knowledge acquired (PO a).
- Ability to work as a team to solve the raised work, distributing the workload to deal with complex problems and access to technical literature and understand it, and the information required to know the details of a particular configuration (PO C and E).
- Contact with technologies widely used in networks and telecommunications operators in the business world (PO k).
ATTITUDES:
- Proactive issue with their peers and the necessity to understand the involve technologies.

DESCRIPTION OF CONTENTS: PROGRAMME

This is a basic course of introduction to switching communications networks that are studied in the basic technologies that let you design, configure and operate the nodes that form a communications network.
The program is divided into four parts:
PART ONE: Introduction to the different types of switching networks.

PART TWO: simple and complex architecture of switching networks. Digital circuit switches, cells, packets, bursts and labels. Buffering alternatives.
PART THREE: Elements of quality of service in packet switches.
PART FOUR: Switching core network. Label Switching: Technology and Applications: Traffic Engineering, Fast Recovery and Virtual Private Networks.

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:
(1) Lectures, which will present the knowledge that students should acquire. To facilitate their development, students will receive lecture notes and key reference texts will allow them to complete and examine those issues which are most interested (PO j).
(2) laboratory classes where students will practice designed to reinforce the theoretical content taught in different teaching sessions using practical examples (c and k PO).
(3) Resolution of exercises by the student that will serve to assess their knowledge and acquire the necessary skills (PO a, c and e).
(4) Sharing of the answers to the exercises and joint correction should serve to consolidate knowledge and develop the ability to analyze and communicate relevant information to solve problems (PO a and i).

ASSESSMENT SYSTEM

Evaluation is based on the following scheme:
* Short exams of specific items during the course: 25% (POs: a, c, e, k)
* Class work: 10% (PO a, c, e, k)
* Evaluation of laboratories: 15%. Students will perform several laboratory practice in groups. The teacher will evaluate the outcome of them (PO a, c, e, k).
* Final exam: 50%. Which assessed the knowledge acquired by students (PO a, c, e, k). The grade in the final exam must be more than 35% to pass the subject.

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- BELLAMY, J. Digital Telephony, 3ª, John Wiley, 2000. .
- CHAO, H. J. , LAM, C. H. OKI, E. Broadband packet switching technologies, John Wiley & sons, 2001
- DAVIE, B., REKHTER, Y. MPLS Technology and Applications, Morgan Kaufmann. 2000..
- MCDYSAN D.E., SPOHN, D. L. ATM theory and applications, Signature edition. McGraw-Hill ,1999..
- MEDHI, D. , RAMASAMY, K. Network Routing Algorithms, Protocols and Architectures , Morgan-Kaufmann, 2007
- PATTAVINA, A. Switching Theory., Wiley, 1998..

ADDITIONAL BIBLIOGRAPHY

- AHMADI, H., DENZEL, W. A survey of modern High-Performance Switching Techniques, IEEE, 1989..
- McKEOWN, N. Fast Switched Backplane for a Gigabit Switched Router, Stanford Univ..
- PARTRIDGE, C. gigabit Networking, Addison-Wesley, 1994.
- SCWARTZ, M. Telecommunication Networks: Protocols, Modeling and Analysis, Addison-Wesley, 1987..
- SEMERIA, C. Internet Backbone Routers and Evolving Internet design, Juniper Network, 1998..
- THAKKER, P. Survey of Switch architectures, University of Illinois, 1998..