IR.3505 – Advanced Routing and Architecture

General information

Module Title: Advanced Routing and Architecture
Module ID: II.3505
Module leader: Yousra Chabchoub
ECTS: 5
Average amount of work per student: from 100 to 150 hours, including 46 hours supervised
Teamwork: yes
Keywords: NAT, IPv6, MPLS, BGP, OSPF

Presentation

The Internet has grown dramatically in recent years following the emergence of social networks on the web and the expansion of the Internet of Things, generating a mass of gigantic data carried by telecommunications networks. This new context has pushed operators and large enterprises to evolve the infrastructure and technologies deployed in their multi-service networks to cope with this strong growth. Their goal is to best meet these new needs based on very high-speed networks that guarantee availability, reliability, security and quality of services.

This module provides an overview of advanced architectures and security methods for metropolitan networks and large inter-operator interconnection networks at the Internet level.

Educational objectives

- Select and implement advanced routing protocols in the context of large networks, multi-zone, or inter-AS (autonomous system)
- Define and implement core network architectures based on protocols such as MPLS
- Make communications more reliable through redundant routes and manage load sharing
- Implement IPv6 networks, and plan migrations of existing networks
- Protect access using firewalls and control the associated network architectures (demilitarized zone, NAT)

Prerequisite

- Fundamentals of Networks (IR.1101)
- Basic knowledge in "Routing and Switching" (IR.2401) and "Network Security" (IR.2406) is a plus but is not a requirement: a small refresher on these concepts is planned for the first courses of "Routing and Advanced Architectures", but personal work will be required.

Content/Program

Concepts

- Core network architectures based on protocols such as MPLS
- IPv6 network implementation, and migration planning of existing networks
- Advanced inter-AS (autonomous system) routing protocols

Tools used

- Network equipment required for the implementation of a small-scale network (router, switch, firewall, etc.)

Pedagogical methods

Learning methods

- The module begins with theoretical lectures followed by practical work sessions.
- The practical work takes place in project mode in groups of 5 to 6 students using real network equipment (routers, switches, PCs, firewalls, etc.). The theoretical concepts are illustrated by the establishment of a small-scale network.

Evaluation methods

- A project in teams of 4 to 5 students (50% of the module average)
- An individual assessment in the form of a knowledge test (50% of the module average)

Language of work

- The materials are in English. The course is also taught in English.
- Project deliverables can be submitted in English or French. The knowledge test is in English.

Bibliography, Webography, Other sources

- Course material on moodle: https://educ.isep.fr/moodle/course/view.php?id=247
- The networks, Guy Pujolle, Eyrolles, 2018
- CCNP 1: Advanced Routing Companion Guide (Cisco Networking Academy Program), 2nd Edition, Cisco Press, 2014