INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

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Network

Performance Evaluation of Network Systems

IDENTIFICATION

CODE : TC-4-S1-EC-PRF
ECTS : 2.0

HOURS

Lectures :	14.0 h
Seminars :	14.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	40.0 h
Personal work :	20.0 h
Total :	60.0 h

ASSESSMENT METHOD

Mid-term exam [1h, coef 0.25]
Final exam [2h, coef 0.75]

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

Be able to conduct a performance analysis of a networking system, through analytical and simulation tools.

This EC is part of the teaching unit Network Modeling and Architectures [TC-4-S1-MAR] and contributes to the following skills:

C2 Specify, design and model communication networks and protocols
Capacity: To be able to model a network system using analytical tools
Capacity: To know how to simulate a system using discrete-event simulation
Capacity: To know how to evaluate the transient and stationary regimes of a system by using analytical or simulation tools.
Capacity: To know how to size a network by conducting an adequate performance evaluation
Knowledge: analytical modeling tools: discrete time Markov chain, continuous time Markov chain, Queueing theory, Queue networks.
Knowledge: equations characterizing the transient and permanent regimes of the analytical models.
Knowledge: random number generation
Knowledge: fundamentals of discrete event simulation and the basics of NS2.

C1 Specify, design and model transmission and signal / image / data processing systems
Capacity: To be able to model and evaluate some simple transmission systems [channel access approaches, correcting codes, retransmissions, etc.] using analytical tools
Knowledge: analytical modeling tools: discrete time Markov chain, continuous time Markov chain, Queueing theory, Queue networks.

C8 Operate, analyze, improve digital systems
Knowledge: using analytical tools and simulations for performance assessments of already deployed digital systems [capabilities, limits, reliability, bottlenecks, etc.]

A2 Exploit a model of a real or virtual system
Capacity: To know how to develop a scientific approach allowing the analysis of the performances of a system by i] correctly modeling the system and the inputs and by ii] computing and analyzing output performance metrics

A6 Communicate an analysis or a scientific approach with adapted scenarios
Capacity: To model some engineering problems using analytical tools [Markov Chain]
Knowledge: Know some analytical and simulation tools useful for different engineering problems

In addition, it requires the following skills:

C3 Specify, design and model algorithms and computer programs
B2 Work, learn, evolve autonomously
B3 Interact with others, work in a team

CONTENT

- Introduction to network modeling and performance analysis
- Introduction to simulation theory
- Markov chains [discrete-time and continuous-time]
- Introduction to queuing theory
- Analysis of single queue : M/M/1, M/M/C/K, ...
- Queueing networks
- Applications to networks performances studies

BIBLIOGRAPHY

[1] Bruno Baynat, Théorie des files d'attente,
Hermès 2000
[2] M. Schwartz, Computer communication : networks, design and analysis, Prentice-Hall
[3] Leonard Kleinrock, Communication Nets, stochastic message flow and delay, Mc Graw-Hill

PRE-REQUISITE

Probablities and statistics [3TC-PBS], Networking [3TC-NET]

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