INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

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Informatique

Distributed systems and algorithms

IDENTIFICATION

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

HOURS

Lectures :	8.0 h
Seminars :	16.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	10.0 h
Total :	42.0 h

ASSESSMENT METHOD

Continuous control and 2h final exam.

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

All computer systems are distributed. From Web architecture to sensors networks, they are all build around heterogenous node, that are sharing neither time nor memory, but still need to understand each others. The goal of that course is to understand distributed systems.

This EC is part of the Development and Safety (TC-4-S2-DEV) teaching unit and contributes to the following skills:

C2 Specify, design and model communication networks and protocols (level 3)

Capacity: Design a distributed system without RPC-type main memory
Ability: Implement a proven transaction chain with Bitcoin dynamic concensus
Capacity: Implementing a P2P Chord hash table management network
Ability: Analyze security biases in a distributed system

Knowledge: Principles defining distributed systems regarding global memory and time
Knowledge: Vocabulary associated with large distributed algorithms and fault tolerance
Knowledge: Algorithms and results of reference in distributed: FLP, Paxos, Bitcoin, 2PC
Knowledge: Time Synchronization Mechanism Associated with Lamport and Vector Clocks
Knowledge: Distributed Protocols, Transactions, Consensus, Time Limits

A2 Exploit a model of a real or virtual system (level 1)

Capacity: Designing Remote Procedure Invocation Mechanisms

Knowledge: P2P Network: chord, bittorrent
Knowledge: Raft, Bitcoin

C7 Implement, implement, develop, deploy computer programs (level 2)

Knowledge: RPC
Knowledge: PageRank

In addition, it requires the mobilization of the following skills:

A4 Design a system that meets a specification

CONTENT

Communications
- Cours Modèles de communications
- TD RPC
- TP RPC

Infrastructures
- Cours Infrastructures et Données
- TD Scrapping
- TD PageRank

Consensus
- Cours Transactions et Consensus
- TD Horloge
- TD Raft

P2P / Blockchain
- Cours système pairs à pairs et Blockchain
- TD P2P/BC
- TD BC
- TP BC
- TP BC

BIBLIOGRAPHY

George Coulouris, Jean Dollimore, Tim Kindberg \"Distributed Systems : Concepts and Design| », Addison-Wesley*
Andrew S. Tanenbaum \"Distributed Operating Systems\", Prentice-Hall*
Sape Mullender, 2nd Edition \"Distributed Systems| », Addison-Wesley*
Clemens Szyperski with Dominik Gruntz and Stephan Murer, \"Component-Software Beyond Object-Oriented Programming\"*
Richard Monson-Haefel, \"Enterprise JavaBeans\", O'Reilly*
Thierry Brethes, François Hisquin and Pierre Pezziardi \"Serveurs d'applications\", Eyrolles*
Jean-Marie Chauvet, \"Services Web avec SOAP, WSDL, UDDI, ebXML\", Eyrolles*

PRE-REQUISITE

3TC-AGP
3TC-SDE
3TC-ELP
3TC-WEB
3TC-PRS

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