

Liste d'éléments pédagogiques

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Security fundamentals



ECTS
5 crédits



Hourly volume
77h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain:

- main concepts of operating systems, TCP/IP networks and language C and assembling programming;
- main concepts of dependability
- main concepts of cryptography

The student will be able to:

- describe the main components of an information system
- describe the main principles of the network protocols, analyse network traces and understand the flow encapsulation
- design and implement basic and advanced language C programs as well as basic assembling programs
- understand the different issues of the safety and security domains and correctly use the associated terminology
- distinguish the different cryptographic tools, understand when and how choose a specific tool, its capabilities and weaknesses
- find the main international cryptographic standards, and understand their content

- deploying high level security tools such as PKI, VPN, IPSEC tools or low-level security tools such as openssl, and choosing purposely the parametrisation of such tools

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Practical info

Location(s)

 Toulouse

Software security



ECTS
4 crédits



Hourly volume
47h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The different types of software vulnerabilities that are frequently encountered, especially in programs written in C language;
- The main memories protections to protect software from these types of vulnerabilities;
- The theory related to worms and viruses, especially the algorithms used by these malware to infect computer systems and spread on the internet; the protection against these malicious software and the methods employed by antivirus to detect worms and viruses;
- Best practices for developing software securely.
- Formal methods for security

The student will be able to:

- Develop software taking into account the risks associated with software vulnerabilities;
- Use formal methods to detect software vulnerabilities;
- Appreciate the challenges of viral protection, describe the different types of computer infection, viral and analyze the technical and antiviral éagir in case of

infection.

Necessary prerequisites

- Good programming skills in C and assembly language;
- A minimum of knowledge about the internals of the OS;
 - Bases in algebra and the use of automata theory.

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Practical info

Location(s)

 Toulouse

System security, hardware security and reverse



ECTS
4 crédits



Hourly volume
54h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The main protection mechanisms that now exist in the kernel of operating system;
- The main attacks carried out from hardware component and associated countermeasures;
- The internals of the key hardware components for security such as hypervisor and IOMMU;
- The advantages of latest advances in hardware protection carried out by the founders of processors and chipset;
- The logic of physical attacks targeting computer systems;
- Reverse engineering software (reverse engineering) while being able to explain the toolchain of the compilation with the models used by compilers to generate machine code;
- Strategies to make reverse engineering software more difficult to achieve.

The student will be able to:

- Identify the most suitable software components to protect the operating system software against attacks;

- Identify threats from lower layers to higher layers and attack vectors to be considered in a system;
- Obtain an overview of the exchanges between the hardware components of a system to identify critical components and determine the countermeasures to integrate into the operating system;
- Identify threats on the physical components of a system;
- Conduct a reverse engineering of malware to understand their behavior and generate signatures to detect them.

Necessary prerequisites

Good programming skills in C and assembly language;

- A minimum of knowledge about the internals of the OS;
- Bases in algebra and the use of automata theory.

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Practical info

Location(s)

 Toulouse

Networks and protocols security



ECTS
3 crédits



Hourly volume
40h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- the main concepts of network security, main threats targeting these networks and associated protection mechanisms
- the main concepts of non wired network security (Wifi, GSM, GPRS, LTE, UMTS)
- the main weaknesses of the network protocols and how to eliminate these weaknesses

The student will be able to:

- Understand and carry out basic networks attacks in the context of intrusion tests ; identify and implement protection mechanisms mitigating these attacks, use and install protection infrastructures
- Choose a security solution dedicated to a Wifi access point; carry out intrusion tests on an access point
- Distinguish the security objectives in different cellular networks ; describe authentication mechanisms and key exchange protocols ; describe the different attacks targeting these different technologies ; identify the architectural components of security in operator networks

- Identify the weak protocols currently used in networks ; propose solutions for these weaknesses, through the use of tunnels when this is necessary ; use SSH and its associated functionalities (file transfers ,proxies, etc) ; describe the good practices for the definition of a secure network protocol

Necessary prerequisites

Knowledges and skills in computer networks and the underlying protocols are required (TCP/IP, routing protocols). The corresponding terminology must be known and the main concepts of cryptography must be clearly understood.

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Practical info

Location(s)

 Toulouse

Architectures of secured networks



ECTS
4 crédits



Hourly volume
54h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The main concepts associated to the design and the implementation of secure network architectures
- The main tools and technics allowing to implement protection measures, and their usage according to the different contexts and objectives
- The vulnerabilities inherent in system architectures and network and major intrusion techniques;
- The operation of the main vulnerabilities of the web.

The student will be able to:

- Identify the different classes of firewalls as well as their functionalities and weaknesses
- Define and audit a filtering architecture dedicated to a specific network
- Choose, for an IPSEC tunnel, the correct protocols, the correct execution modes and a routing plan adapted to the associated gateways
- Implement and audit such an IPSEC tunnel
- Deploy and audit a VPN based on IPSEC, either by configuring it by hand or by using all-in-one

preconfigured tools available

- Deploy and audit a network intrusion detection system (or intrusion prevention system)
- Design a complete security architecture for a complex network
- Identify the advantages and limitations of different intrusion detection solutions;
- Position the intrusion detection sensors efficiently;
- Analyze the events collected by the sensors and correlate these events to identify a real threat.
- Identify vulnerabilities in web architectures and propose solutions to achieve effective protection.

Necessary prerequisites

Good knowledge of web architectures, cryptography and networks.

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Practical info

Location(s)

[FRANCAIS] Sécurité des systèmes embarqués critiques



ECTS
5 crédits



Hourly volume
31h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The different techniques used today to secure ground / air communications with satellites;
- Issues related to different types of mission and standards used;
- The means for securing transmissions spread spectrum (TRANSSEC);
- The principles of the computer network for air traffic management (ATM) and related security issues;
- The principles and issues of security management in the context of the DGAC.

The student will be able to:

- Make relevant choice for securing ground / air communications architectures;
- Perform a black box analysis of a critical embedded system

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Practical info

Location(s)

 Toulouse

Évaluation

[FRANCAIS] SHSJ



ECTS
5 crédits



Hourly volume
42h

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse

[FRANCAIS] UE commune M2 RT



ECTS
9 crédits



Hourly volume
45h

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse