

Teaching & Research Project

Public competition Number: 81 - Place: 7 - University of Lleida

Candidate: Jordi Mateo-Fornés

Area: Architecture and Technology of Computers

Department: Department of Informatics and Industrial Engineering (DIEI)

Position: Lecturer

March 12, 2021



Universitat
de Lleida



Dr. Jordi Mateo Fornés

31 years old

Postdoctoral Researcher (Lecturer) at UdL

<http://www.udl.cat/>

Member of the Distributed Computing Group

<http://gcd.udl.cat/>

Email: jordi.mateo@udl.cat

Twitter: <https://twitter.com/MatForJordi>

Github: <https://github.com/JordiMateoUdL>



Campus Universitari Cappont

Jaume II 69, 25001, Lleida, Spain | EPS(3.08)

Campus Universitari d'Igualada

Av. Pla de la Massa, 8, 08700, Igualada, Spain | A12



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Outline

Academic and Professional Background

Teaching Experience

Teaching Proposal

Research Project

Sample Seminar

Academic and Professional Background



Academic Background



1. Technical Engineering: Computer Science (2009) - University of Lleida
2. Bachelor of Science: Computer Science (2012) - University of Lleida
 - Internship in Distributed Computing Group.
3. Master of Science: Computer Science (2013) - University of Lleida
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 - Extraordinary award for the best academic record.
4. PhD: Computer Science (2019) - University of Lleida

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- **Keywords:**
 - Cloud
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 - Mathematical models
 - Decision Support Systems
 - Agroindustry
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 - Dr. Lluís Plà (*Expert in Operations Research*)
- **University:** University of Lleida
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Teaching Experience



Teaching Experience

Year	Subject	Titulation	Course	ECTS	S.Survey	Coordinator
15-16	Operating Systems	Computer Engineering Degree	2	3	4.29 / 5	NO
16-17	Operating Systems	Computer Engineering Degree	2	3	4.25 / 5	NO
17-18	Operating Systems	Computer Engineering Degree	2	3	4.30 / 5	NO
18-19	High Performance Computing	Computer Engineering Master	-	3	4.30 / 5	NO
19-20	Operating Systems	Degree in Digital Interaction and Computing Techniques	2	6	4.65 / 5	YES
19-20	Computing Techniques	Degree in Digital Interaction and Computing Techniques	2	6	4.73 / 5	YES
19-20	Innovation in ICT	Degree in Digital Interaction and Computing Techniques	2	6	4.92 / 5	YES

Subjects assigned in the Place 7, public competition 81 (UdL Lecturer)

Teaching Experience

Year	Subject	Titulation	Course	ECTS	S.Survey	Coordinator
19-20	Applications for Mobile Devices	Degree in Digital Interaction and Computing Techniques	2	6	4.92 / 5	YES
20-21	Operating Systems	Degree in Digital Interaction and Computing Techniques	2	6	-	YES
20-21	Systems Administration and Virtualization	Degree in Digital Interaction and Computing Techniques	3	6	-	YES
20-21	Innovation in ICT	Degree in Digital Interaction and Computing Techniques	2	6	-	YES
20-21	Applications for Mobile Devices	Degree in Digital Interaction and Computing Techniques	2	6	-	YES

Subjects assigned in the Place 7, public competition 81 (UdL Lecturer)

Master's and bachelor thesis supervised

Year	Title	Author	Titulation	Category
2016	A new cloud service for solving numerical linear problems	Kevin Borrell	Computer Engineering Degree	TFG
2017	A cloud DSS for sow farms	Didac Florensa	Computer Engineering Degree	TFG
2018	Optimizing a supply chain model for the pig sector and developing a DSS	Víctor Gil	Double Degree Computer Engineering and Business Administration Management	TFG
2018	A new parallel DSS (P-CoMG) to assist decisions in power networks.	Marcos Susín	Computer Engineering Degree	TFG
2019	eFat, a prototype of Cloud DSS for optimal delivery of fattened pigs to abattoir	Mireia Moix	Double Degree Computer Engineering and Business Administration Management	TFG
2019	A scalable parallel PHA for stochastic cluster-scenario-based MIP	Joan Pau Castells	Computer Engineering Degree	TFG
2020	eHQoS, a QoS-aware container-based cloud architecture to assist eHealth	Pere Piñol	Computer Engineering Degree	TFG

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Thesis awarded with AETI Best Project



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Teaching Innovation projects

19-20 **Active auto evaluation strategies in courses with programming competences.** Funding: 2.500 €.



Courses/Workshops/Seminars

- **Cloud Computing & BigData:**

- 2nd International Winter School on BigData. 2016.

- **Operations Research:**

- Workshop on Optimitization Under Uncertainty in Sustainable Agriculture and Agrifood Industry. 2016.
- Summer School OR. 2017.

- **Entrepreneurship:**

- Programa Explorer Empendre. *Finalist in Lleida space*. 2019.
- Programa Empenta ESADE. 2019.

- **Teaching tools and methodologies:**

- Academic and teaching management in the Polytechnical School (EPS). 2019.
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Teaching Proposal



Target Degree: GTIDIC

Summary

Qualification: Bachelor's degree in
Digital Interaction and Computing
Techniques

Knowledge area: Engineering and
Architecture

Duration: 3 years

Credits ECTS: 180

Starting course: 18/19

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Fully prepared to work as professionals in the ICT sector, with a special emphasis on the design and implementation of interactive applications.



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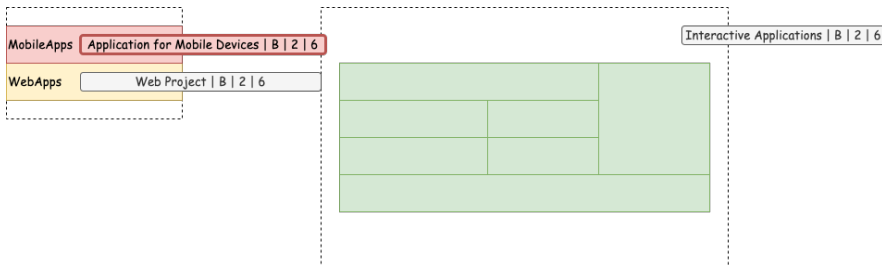
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Dual Training

Pioneering degree in dual training, which is carried out in the third year. Competences linked to the 3rd year subjects are worked within the company.

Teaching proposal: Context

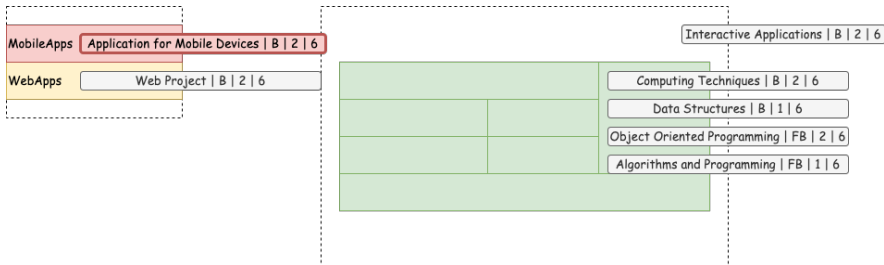
Degree in Digital Interaction and Computing Techniques



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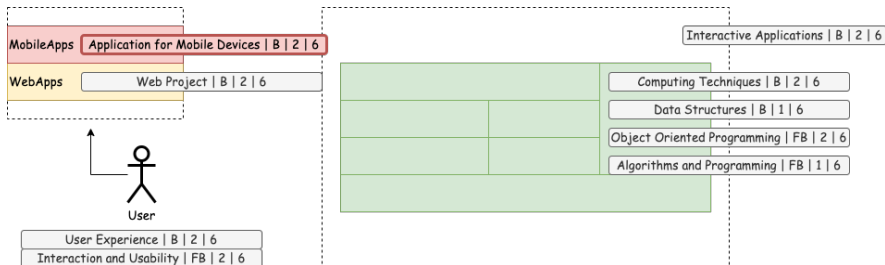
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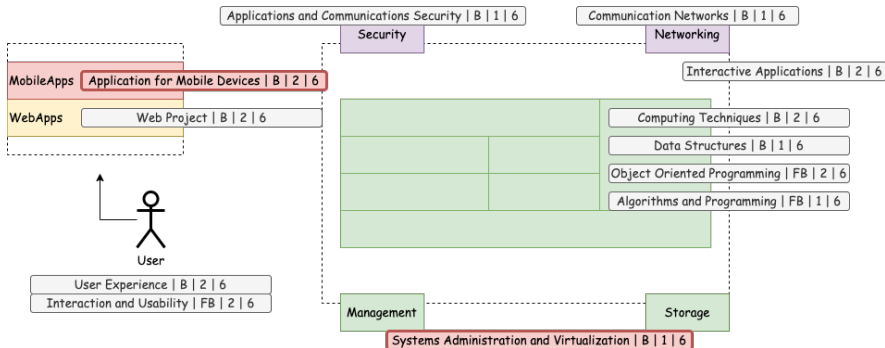
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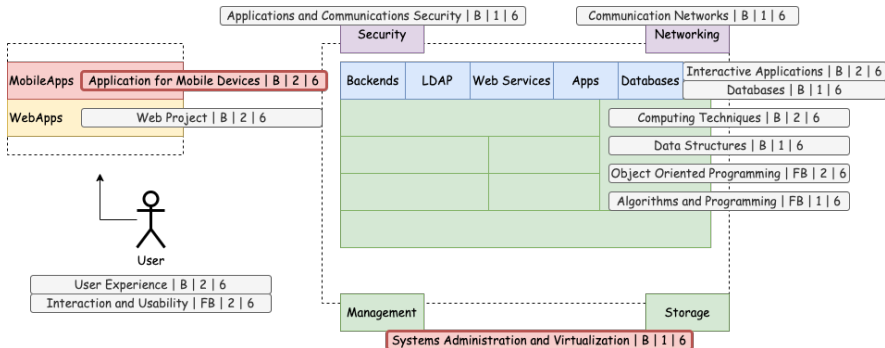
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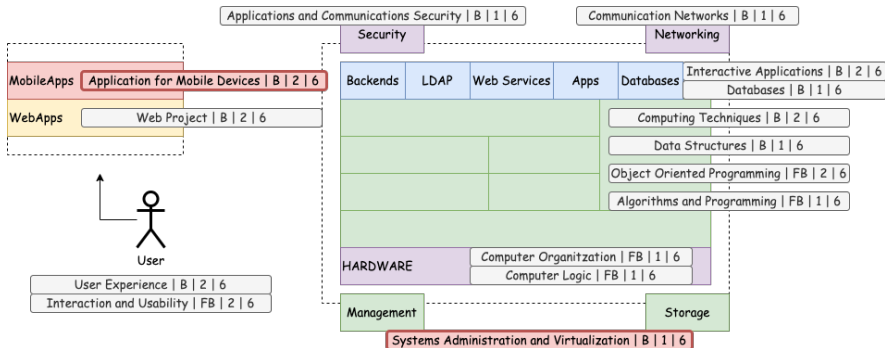
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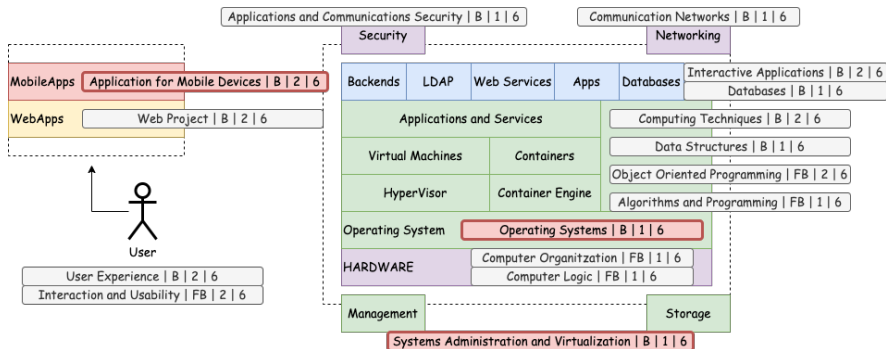
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Teaching proposal: Context

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Teaching proposal: Context

Operating Systems

System Administration and Virtualization

Application for Mobile devices

Teaching proposal: Context

Operating Systems

The objective is that students have a basic knowledge of the major components of an operating system.

System Administration and Virtualization

Application for Mobile devices

Teaching proposal: Context

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System Administration and Virtualization

The objective is to learn the central administrative systems tasks and configurations (**sysadmin**), identify the different pieces and architectures of servers and data-centers and how they (work/interact) together.

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System Administration and Virtualization

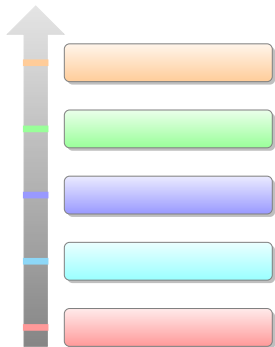
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Application for Mobile devices

The objective is to learn the principles in design and development to build efficient applications on Android devices.

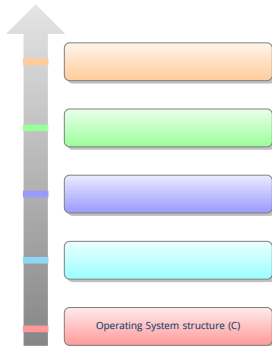
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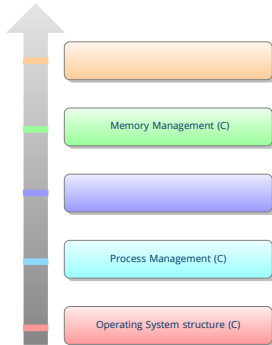
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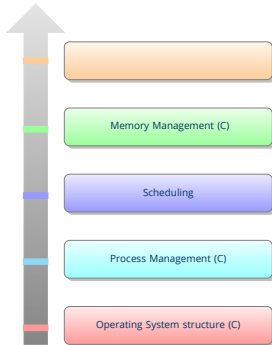
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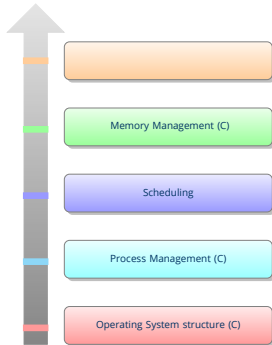
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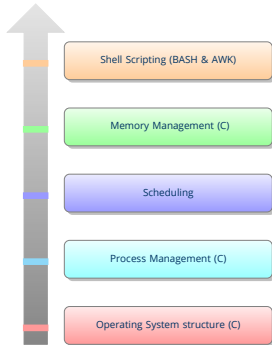
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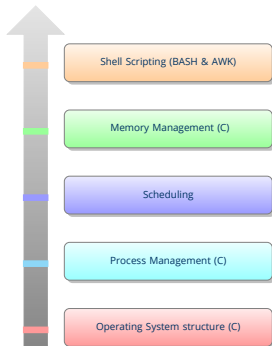
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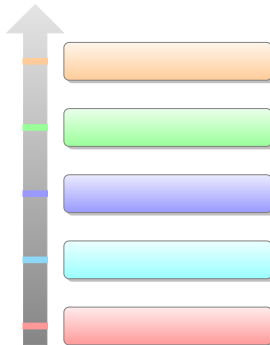


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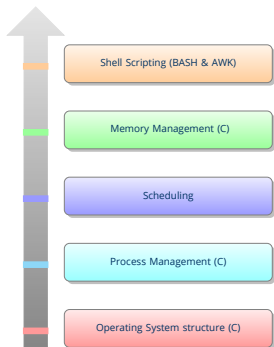


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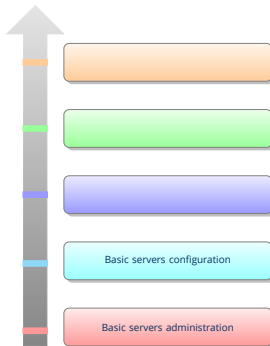


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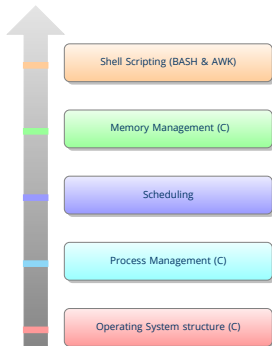


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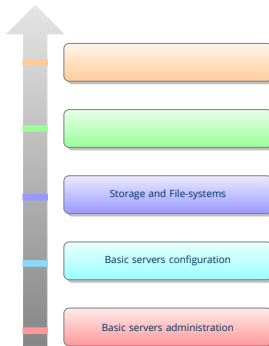


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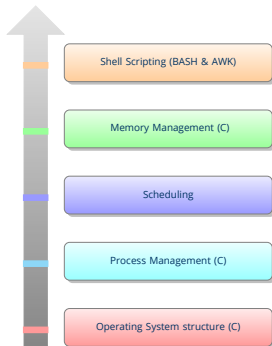


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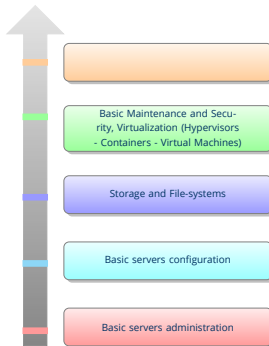


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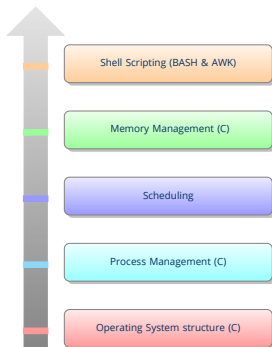


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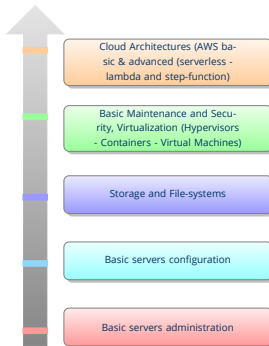


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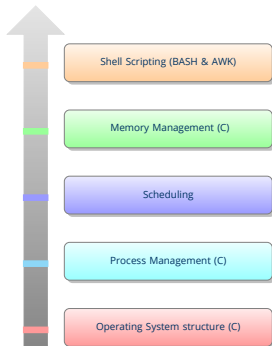


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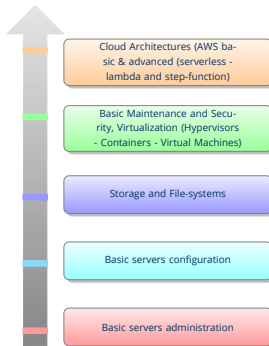


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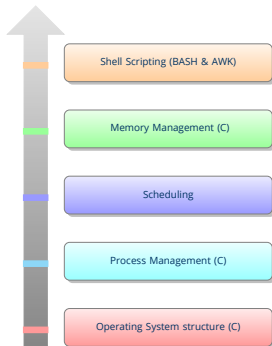


Applications for Mobile Devices

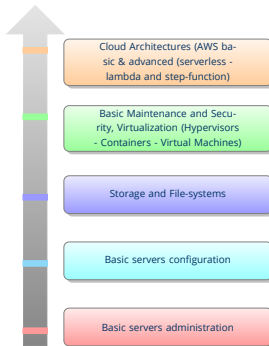


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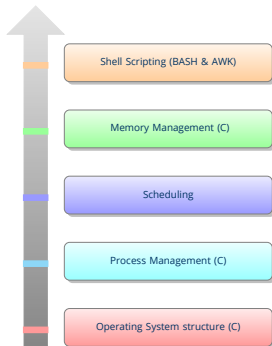


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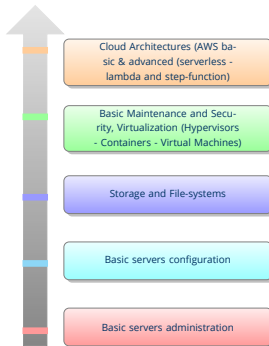


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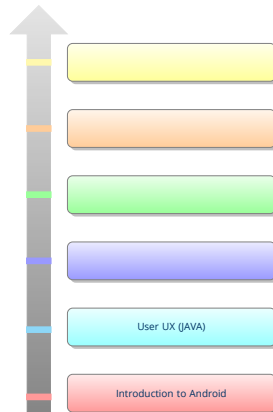
Operating Systems



SysAdmin & Virtualization

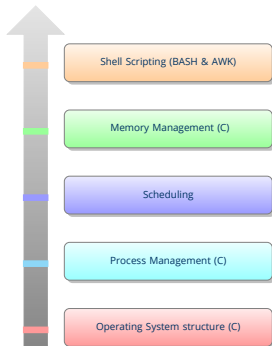


Applications for Mobile Devices

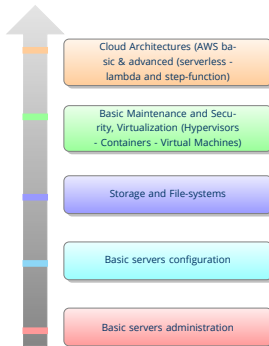


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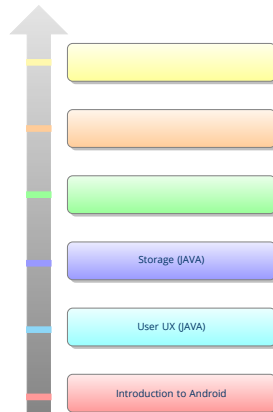
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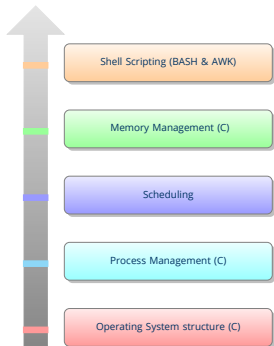


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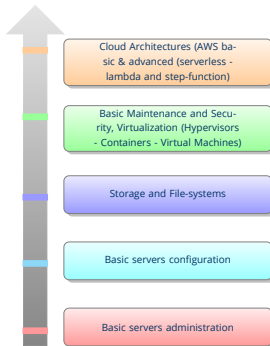


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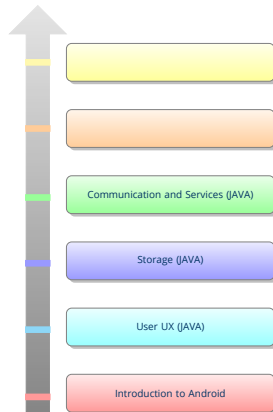
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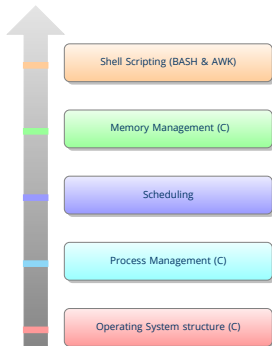


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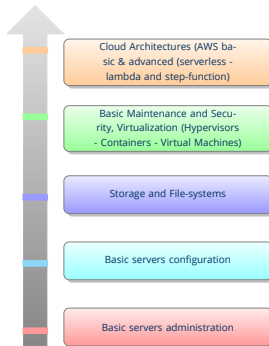


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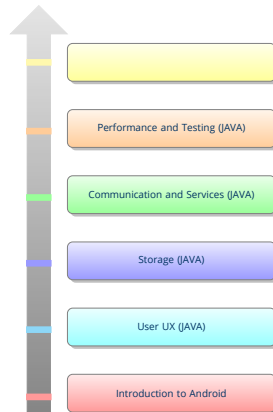
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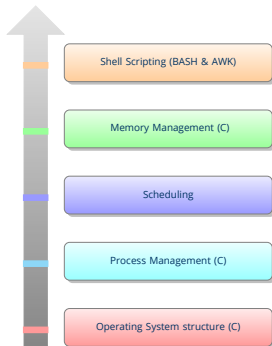


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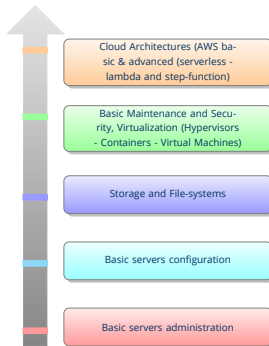


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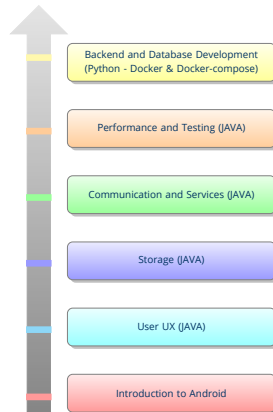
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Applications for Mobile Devices



Teaching Methodology

Based on..

SIGNIFICATIVE, GUIDED & ACTIVE learning

- **Theory sessions:** Theoretical contents of the subject are introduced and to the students, and also practical implications are discussed with them.
- **Asynchronous sessions:** An active methodology is used, where the students are the protagonist by performing and looking for solutions to different activities.
- **Practical sessions:** Live-coding sessions, where (teacher and students) together read, interpret and implement code fragments.
- **Self-employment:** Students in groups need to apply the knowledge acquired in the theoretical and practical sessions to solve the challenges proposed by the professor. The design and resolution of the challenges must be presented and discussed with other groups using oral presentations.

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Teaching Methodology: Integrated Project

Purpose

Training IT professionals capable of leading and developing a technological project.

► More information



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Teaching Methodology: Integrated Project

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The integrated project is...

focused on encouraging students to face a real scenario, which aims to consolidate an innovative startup based on mobile app.

► More information



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Teaching Methodology: Integrated Project

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Training IT professionals capable of leading and developing a technological project.

The integrated project is...

focused on encouraging students to face a real scenario, which aims to consolidate an innovative startup based on mobile app.

Learning

Take their learning beyond traditional practices and try to get students out of their comfort zones and apply all the knowledge acquired so far, not only in the course that make up the project.

► More information



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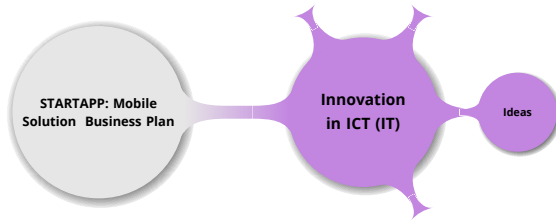
Teaching Methodology: Integrated Project



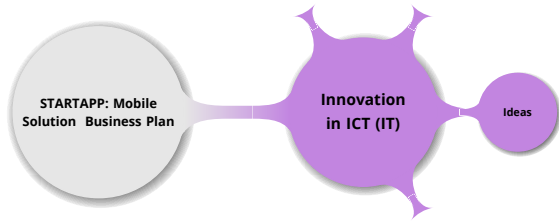
**STARTAPP: Mobile
Solution Business Plan**



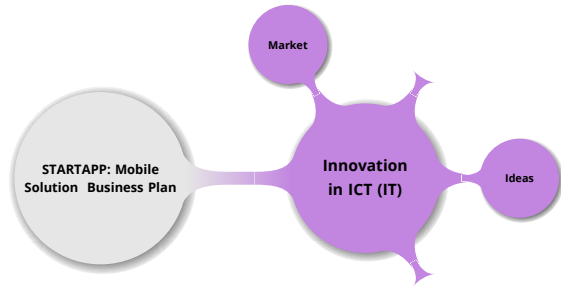
Teaching Methodology: Integrated Project



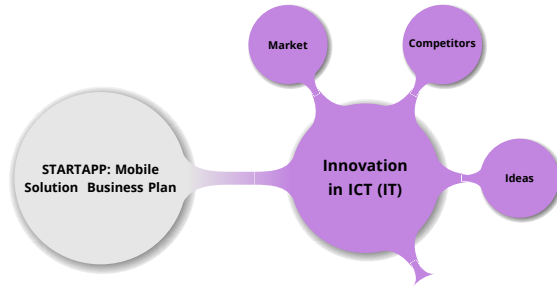
Teaching Methodology: Integrated Project



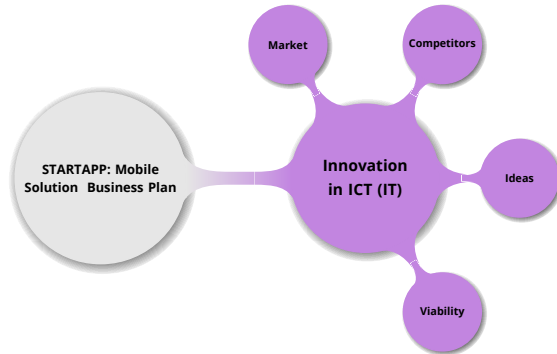
Teaching Methodology: Integrated Project



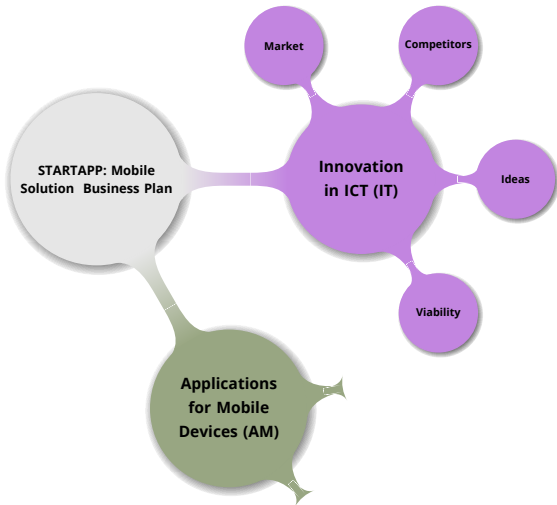
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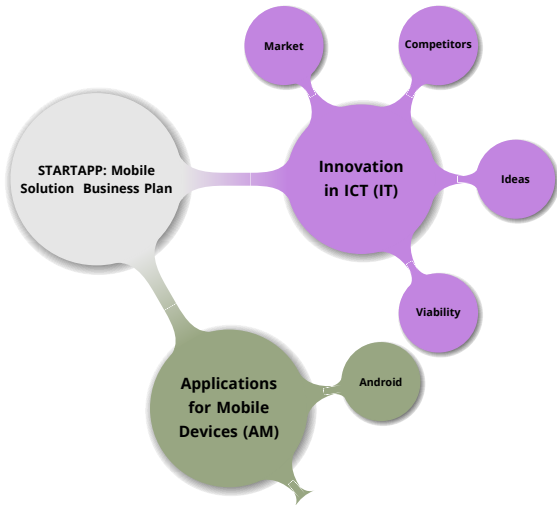
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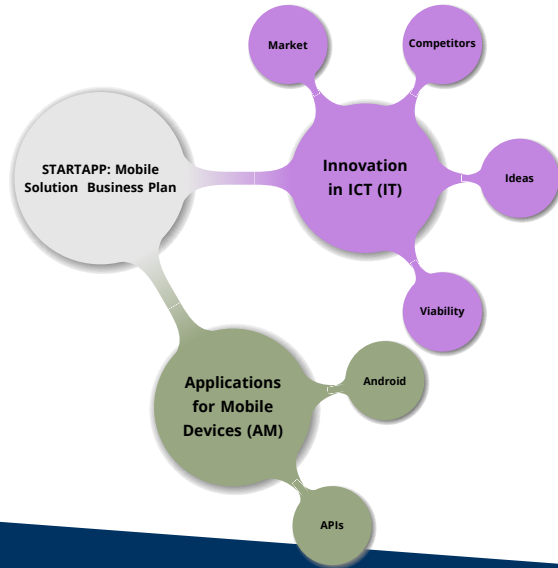
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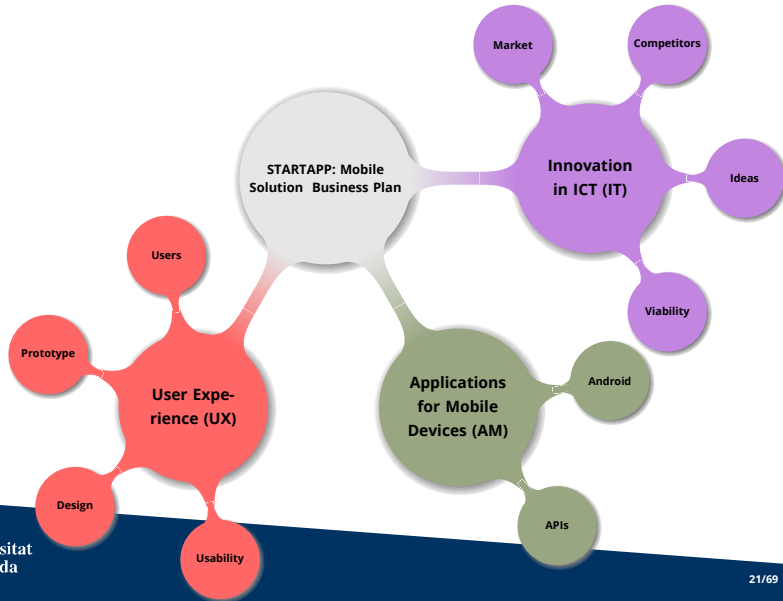
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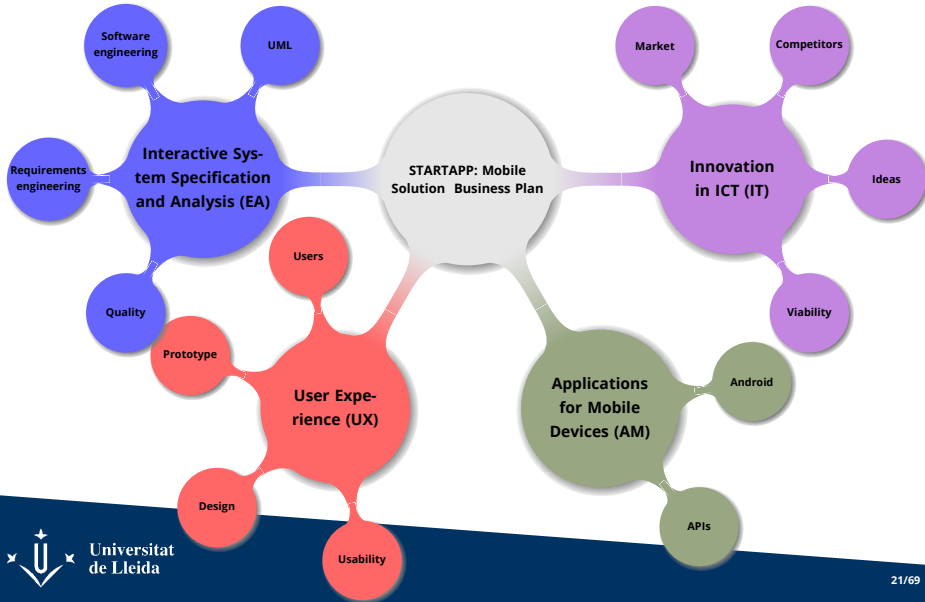
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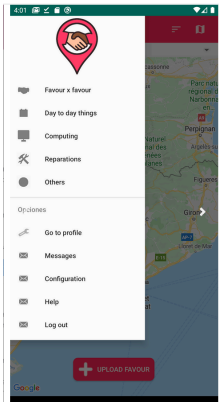
Teaching Methodology: Integrated Project



Teaching Methodology: Integrated Project



Students' Projects

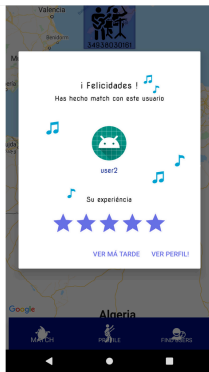


► StartApp Portfolio



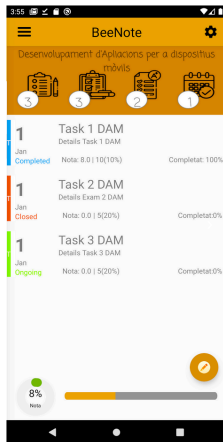
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Students' Projects

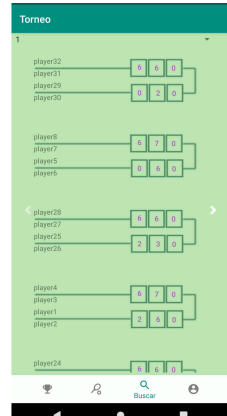


► StartApp Portfolio

Students' Projects



Students' Projects



► StartApp Portfolio

Students' Projects

SCHSIM Form

Nº of cpus

1

3

5

Nº of jobs

Arrival Time

Job Burst

Priority

A

Arrival Time

Job Burst (3, 2, 3 = 3CPU, 2E/S, 3CPU)

Priority

+

Mode

☐ Preemptive

☐ Non-Preemptive

Algorithm

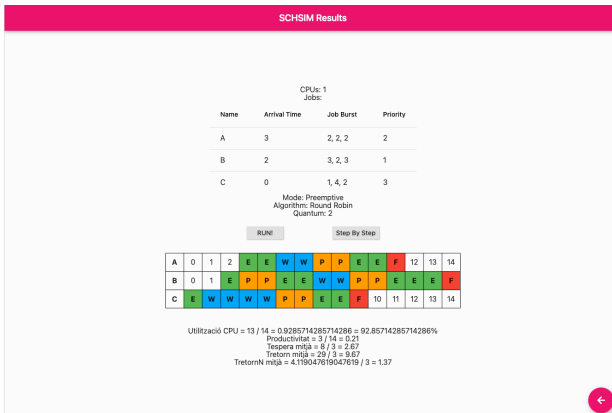
Quantum

► Code - Github



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Students' Projects



► [Code - Github](#)



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Students' Comments

Operating Systems 20/21

- La teva pròpia dedicació Jordi, encara d'haver estat un any difícil has aconseguit, com a mínim per a mi, que acabés aprenent.
- Crec que potser no he arribat a aprendre la complexitat real de com funciona un sistema operatiu com Linux (perquè en 5 mesos crec que és impossible) però sens dubte sí que m'he n'he fet una idea molt aproximada i sí que crec que he après les bases d'aquest.
- L'assignatura no és fàcil i s'ha de treballar molt, així i tot quedo força satisfet/a.
- Moltes gràcies per tot el que ens has ensenyat. Espero poder seguir aprenent igual o més en l'assignatura del següent quadrimestre. Happy coding!! ;)
- Sens dubte ets dels millors profes que hem tingut en aquesta carrera i tinc moltes ganes de continuar aprenent amb tu en les següents assignatures que ens impartiràs. Moltes gràcies per la teva paciència i el teu ajut.

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Evaluations

Operating System

Evaluation Activities	Weight	Minimum Mark	Groups	Mandatory	Recoverable
First Exam (P1)	15%	YES ≥ 5	NO	YES	YES
Second Exam (P2)	15%	YES ≥ 5	NO	YES	YES
Challenge 1 (R1)	10%	YES ≥ 5	YES	YES	YES
Challenge 2 (R2)	15%	YES ≥ 5	YES	YES	YES
Challenge 3 (R3)	10%	YES ≥ 5	YES	YES	YES
Challenge 4 (R4)	15%	YES ≥ 5	YES	YES	YES
Tracking	20%	NO	NO	NO	NO

► More information



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Evaluation

System Administration and Virtualization

Evaluation Activities	Weight	Minimum Mark	Groups	Mandatory	Recoverable
First Exam (P1)	15%	YES ≥ 5	NO	YES	YES
Second Exam (P2)	15%	YES ≥ 5	NO	YES	YES
Project (P)	30%	YES ≥ 5	YES	YES	YES
TIDIC-CLOUDOPS (TCO)	20%	YES ≥ 5	YES	YES	YES
HansdOn (HO)	20%	NO	YES	YES	YES

► More information



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Evaluation

Application for Mobile devices

Evaluation Activities	Weight	Minimum Mark	Groups	Mandatory	Recoverable
First Exam (P1)	15%	YES ≥ 5	NO	YES	YES
Second Exam (P2)	15%	YES ≥ 5	NO	YES	YES
Milestone 1 (M1)	12%	NO	YES	YES	YES
Milestone 2 (M2)	14%	NO	YES	YES	YES
Milestone 3 (M3)	24%	NO	YES	YES	YES
Common Project (PC)	20%	NO	YES	YES	YES

► More information



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Research Project



Research Experience: Summary

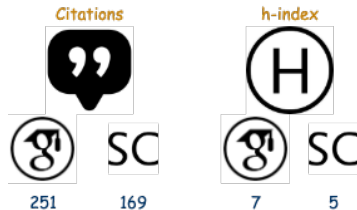


JCR Indexed Journals (Q1,Q2,Q3 and others)



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Research Experience: Summary



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Universitat
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Research Experience: Summary



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1. National Projects:

- 2018-2021 Aprovechando los nuevos paradigmas de cómputo para los retos de la sociedad digital. *Computing Distributed Group - University of Lleida.*
- 2015-2018 Pensamiento computacional e ingeniería del rendimiento para aplicaciones de ciencias de la vida y medioambientales. *Computing Distributed Group - University of Lleida.*

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- 2019-2020 Utilització de sensors per mesurar el consum de pinso i l'aigua en granges.
- 2018-2019 Modelo de simulación de una sala de despiece de cerdo.
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Research Experience: Cloud Computing

- **Cloud Services**

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

- **Features**

- On demand
- Elasticity
- Pay per Use

- **Challenges**

- Quality of the service (QoS)
- Availability
- Reliability
- Performance
- Security
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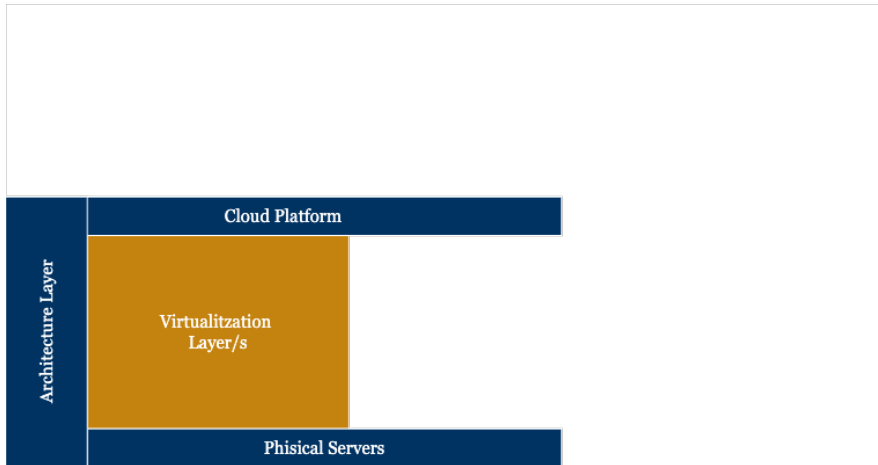
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Research Lines: Proposal

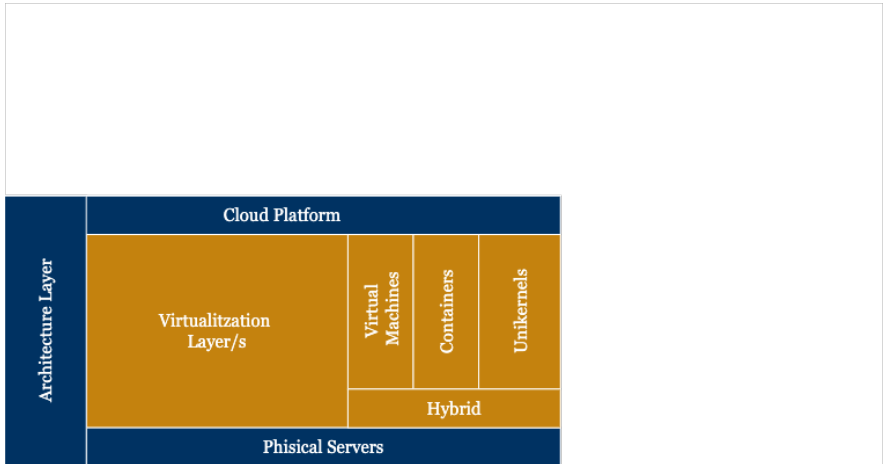
Cloud Platform



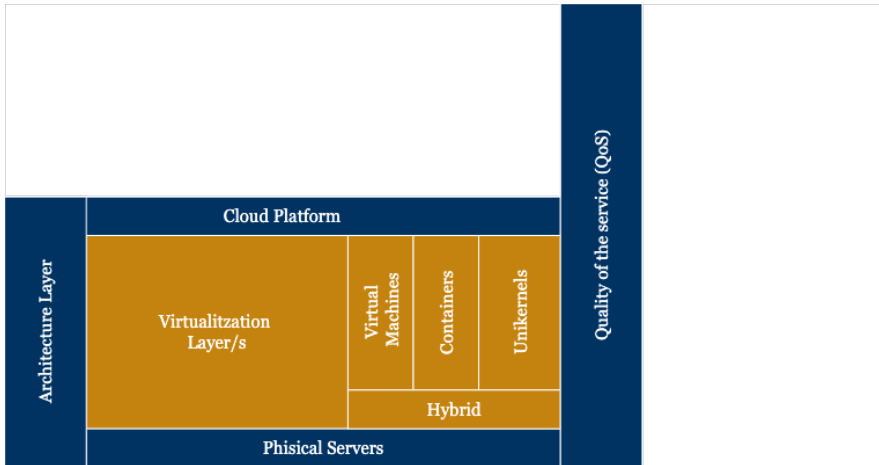
Research Lines: Proposal



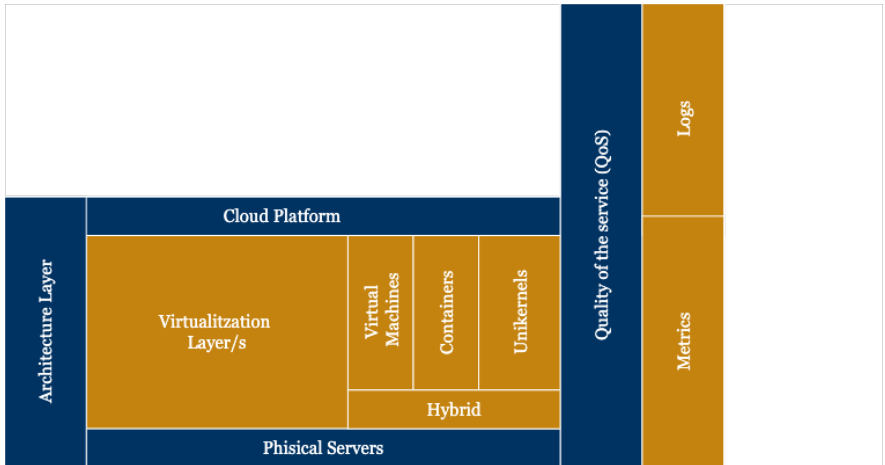
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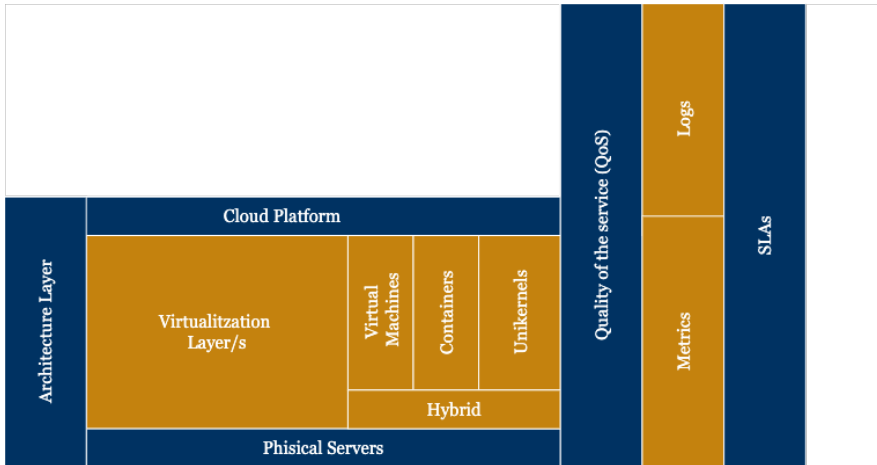
Research Lines: Proposal



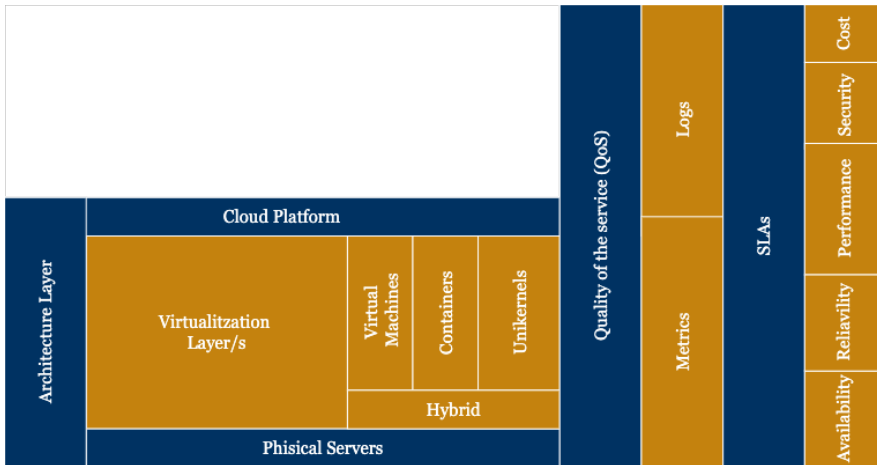
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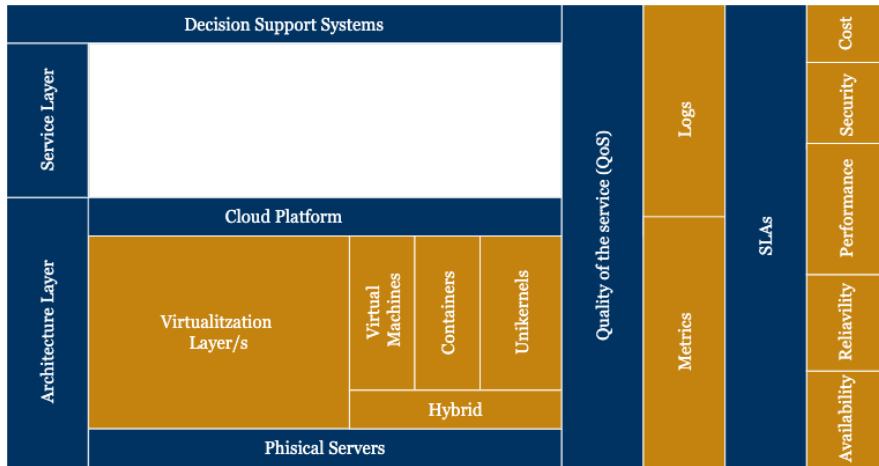
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Research Lines: Proposal

Decision Support Systems					Quality of the service (QoS)	Logs	SLAs	Cost
Service Layer	Business Tier							Security
	Composite Tier							Performance
	Data Tier							Reliability
Architecture Layer	Cloud Platform							Metrics
	Virtualization Layer/s	Virtual Machines	Containers	Unikernels				
		Hybrid						
		Physical Servers						



Research Lines: Proposal

Decision Support Systems						Quality of the service (QoS)	Metrics	Logs	SLAs	Cost	
Service Layer	Business Tier		Mathematical Models	High Performance Computing	Data Integration						Data Analysis
	Composite Tier										
	Data Tier										
Architecture Layer	Cloud Platform					Metrics					
	Virtualization Layer/s		Virtual Machines	Containers	Unikernels						
			Hybrid								
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Research Lines

Guaranteeing QoS and SLAs

- Design and implement a QoS-aware cloud architecture able to scale up and down according to IaaS and SaaS constraints.
- Develop policies to guaranteeing SLAs.
- Develop load balancing algorithms to avoid overloading/underloading virtual resources or services.
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Systems **ADAPT** efficiently to user/service **NEEDS** in **REAL-TIME**

Publications

Guaranteeing QoS and SLAs

- Q1** CART, a Decision SLA Model for SaaS Providers to Keep QoS Regarding Availability and Performance. *IEEE Access*, 2019.
- Q2** An SLA and power-saving scheduling consolidation strategy for shared and heterogeneous clouds. *Journal of supercomputing*, 2015.
- Q3** A queuing theory model for cloud computing. *Journal of supercomputing*, 2014.
A green strategy for federated and heterogeneous clouds with communicating workloads. *Scientific World Journal*, 2014.

Work in progress: A new proposal to extend a private cloud based on OpenNebula to a QoS-aware container-based architecture.

Research Lines

Developing cloud based decision support system

- Design and implement models (predictive or prescriptive) as a service of society.
- Methods to extract further knowledge from data gathered.
- Build ecosystems where traditional tools and emerging innovation can coexist and cooperate.
- Use high-performance computing to speed up the resolution of models, algorithms and data analysis techniques.

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ANYTHING as a service to ASSIST **DECISION MAKERS**

Publications

Developing cloud based decision support system

- Q1** Rare Disease Discovery: An Optimized Disease Ranking System. *IEEE Transactions on Industrial Informatics*, 2017.
- Q2** A scalable parallel implementation of the Cluster Benders Decomposition algorithm. *Cluster Computing*, 2019.
- Q2** A production planning model considering uncertain demand using two-stage stochastic programming in a fresh vegetable supply chain context. *SpringerPlus*, 2016.
- Q2** CatSent: a Catalan sentiment analysis website. *Multimedia tools and Applications*, 2019.

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- A cloud-based Decision Support System to support decisions in sow farms. Submitted to Springer book chapter.
- SPOS, a new cloud-based service for solving optimization models. Submitted to Software Tools for Technology Transfer.

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Transferring expertise and know-how to society

Cloud based **Decision Support Systems** (line 2) **QoS and Slas aware** (line1) to assist decision making in **Health, Agrobusiness** and *other economical sectors*.

Publications

Transferring expertise and know-how to society

- Q1** S-PC: An e-treatment application for management of smoke-quitting patients. *Computer Methods and Programs in Biomedicine*, 2014.
- Q2** CatDetect, a framework for detecting Catalan tweets. *Multimedia Tools and Applications*, 2020.
- Q2** Database constraints applied to metabolic pathway reconstruction tools *Scientific World Journal*, 2014
- Q3** BPControl: A mobile app to monitor hypertensive patients. *Applied Clinical Informatics*, 2016.
- Q3** H-PC: a cloud computing tool for supervising hypertensive patients. *Journal of supercomputing*, 2014.
- Q4** Economic Assessment of Pig Meat Processing and Cutting Production by Simulation. *International Journal of Food Engineering*, 2019.

Publications

Transferring expertise and know-how to society

- Q4** Increasing online shop revenues with web scraping: a case study for the wine sector. *British Food Journal*, 2020.
- Q4** MetReS, an Efficient Database for Genomic Applications. *Journal of Computational Biology*, 2018.
- HBPF: A Home Blood Pressure Framework with SLA guarantees to follow up hypertensive patients. *PeerJ*, 2016.
- Reliability framework for power network assessment. *E3S Web of Conferences (Proceedings)*, 2019.
- A propósito del momento óptimo de envío de los cerdos de engorde al sacrificio. *Eurocarne*, 2020.
- Modelo de simulación para salas de despiece *Eurocarne*, 2018.

Publications

Transferring expertise and know-how to society

In progress:

- The Use of Multiple Correspondence Analysis to Explore Associations between Categories of Qualitative Variables and Cancer Incidence. **Minor revision**, *IEEE Journal of Biomedical and Health Informatics*.
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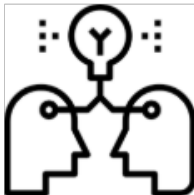
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Scientific-technical service

eHealth Advisory and Development Service (SADeH)

Goals and purpose

Knowledge Transfer



► [More information](#)

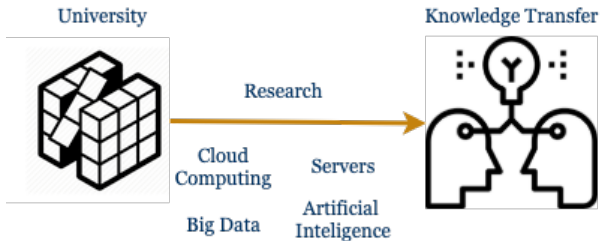


Universitat
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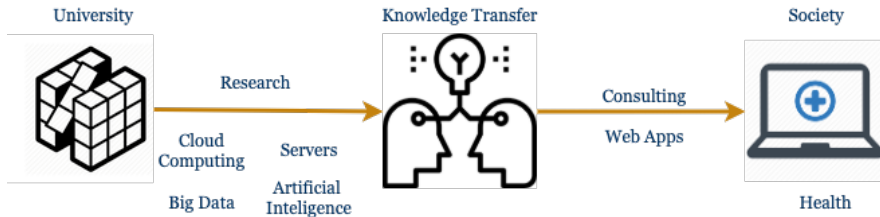


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Research Collaborations

1. Collaborations with the Santa Maria and Arnau de Vilanova hospitals in Lleida
 - Data analysis
 - Data visualization
 - Data processing
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2. Collaborations with SINTEF (Norway) and Tallinn University of Technology (Estonia)
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Expected impact and final remarks

- Drive forward the current and future research lines
- Publish scientific papers in international journals
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Sample Seminar



Contextualitzation

Degree in Digital Interaction and Computing Techniques

Operating System (second year - first semester)

- Unit 3: Process Management
 - Introduction
 - Communication and Synchronization Mechanism
 - Pipes and FIFOs
 - **Signals**
 - Threads



Signals: Overview

1. How many have ever send a signal in UNIX?
2. How many have ever kill a process with `ctrl+c`?
3. How many have ever kill a process with *kill -9*?



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Well, all of you that raise the hand in 2 and 3 have sent a signal :)



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Well, all of you that raise the hand in 2 and 3 have sent a signal :)

Today, we are going to dig inside the kernel, signals and processes.



Situation 1

Imagine this piece of code is running under a process

```
1 // Process A
2 int x = 0;
3 int y = 5 / x;
```

What is happening here?

- Process A is running in our CPU.
- Process A causes a division by zero error, see (3).
- The CPU will notify the kernel that process A causes an error. \Rightarrow **Exception**
- The kernel will send to the process the signal SIGFPE. \Rightarrow **Signal**
- Process A is terminated. \Rightarrow **Signal handler**



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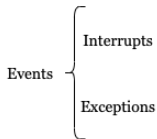
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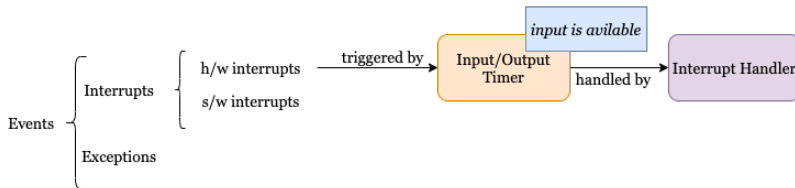
We can define a signal as a notification tool. One process can be alerted that some event occurs and take some action.



What is a signal?

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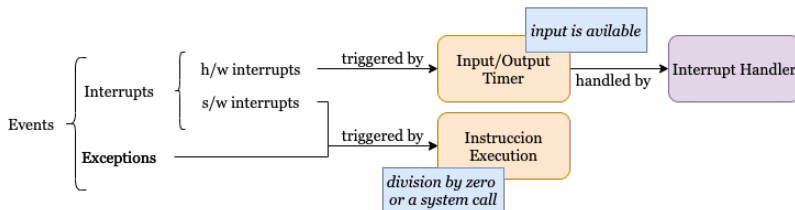
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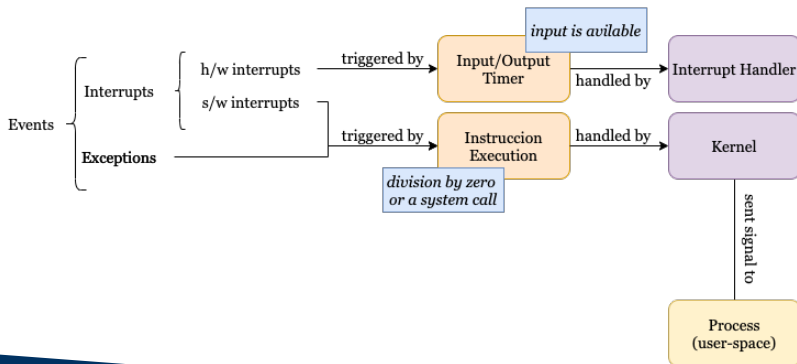
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Reflection 1

Tell me an example (use case) of a process sending a signal to another process?



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Reflection 1

Tell me an example (use case) of a process sending a signal to another process?

Pressing ctrl+c in a terminal.

What is different between both situation?

Of course. Situation 1 the event is **synchronous** while Situation 2 the event is **asynchronous**.

Exercise 1: Digging with prompt

Open a prompt and ...

```
1 yes > /dev/null
2 ^Z
3 ps -o pid,state,command
4 bg
5 ps -o pid,state,command
```

Questions?

1. How many signals are we sending?
2. Which ones?
3. What happens to the process when receives these signals?

Exercise 1: Digging with prompt

Open a prompt and ...

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1 yes > /dev/null
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Questions?

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Exercise 1: Digging with prompt

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1 yes > /dev/null
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Questions?

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Exercise 1: Digging with prompt

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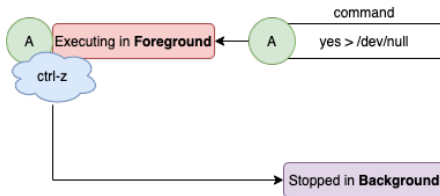
1. How many signals are we sending? 2
2. Which ones? SIGSTOP & SIGCONT
3. What happens to the process when receives these signals? stop execution & continue execution



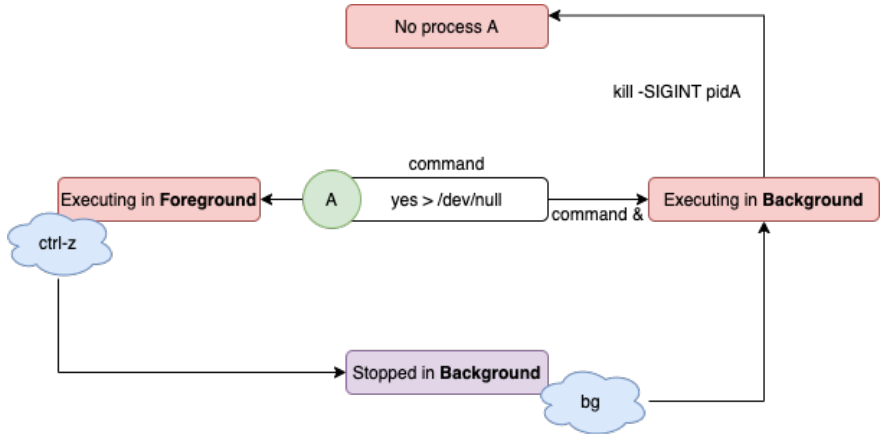
Exercise 1: Explanation



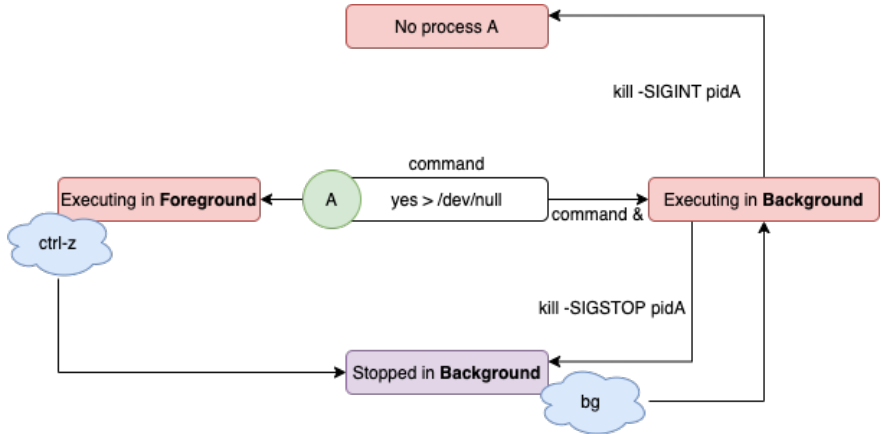
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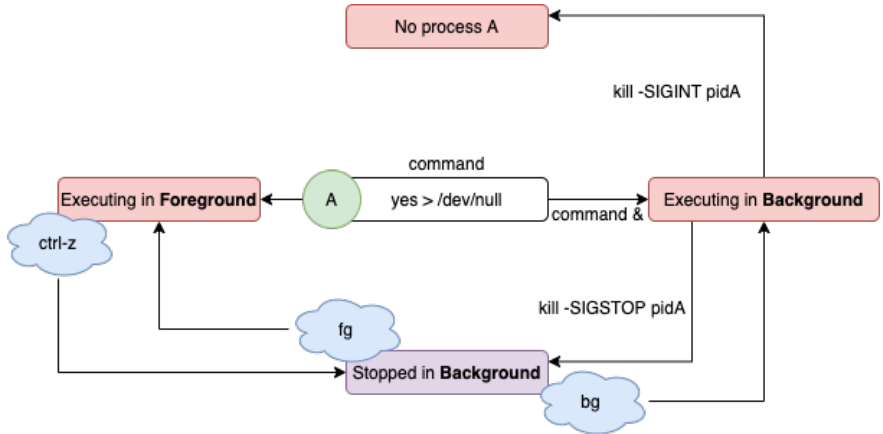
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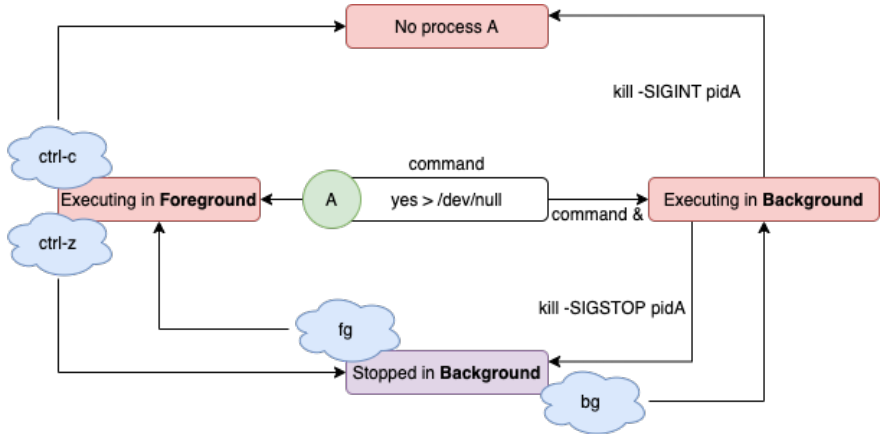
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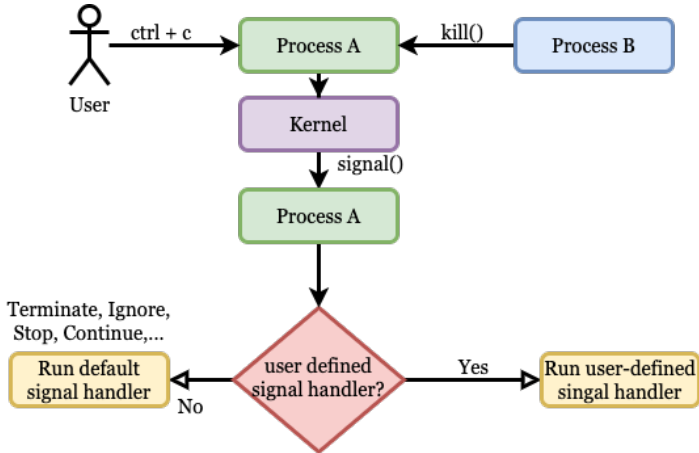
Exercise 1: Explanation



Exercise 1: Explanation



How signals are handled?



How signals are handled?

The signals SIGKILL and SIGSTOP cannot be caught, blocked, or ignored for security reasons.



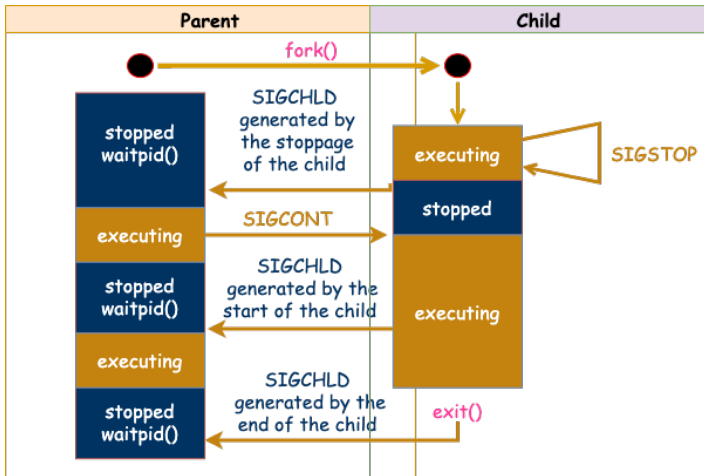
Activity 2

Analyse the following code fragment:

Which issue could have a process running this code, if we receive a SIGINT. How we can fix it?

```
1  int main(void) {  
2      FILE *psFile;  
3      psFile = fopen("temp.txt", "w");  
4      ...  
5      fclose(psFile);  
6      remove("temp.txt");  
7      return 0;  
8  }
```


Special Case: SIGCHLD



Sending Signals: kill

Definition

```
1 #include <signal.h>  
2 int kill(pid_t pid, int sig);
```

- **pid > 0** : sent to the process with the pid specified.
- **pid = 0** : sent to every process in the process group of the calling process.
- **pid = -1** : sent to every process for which the calling process has permission to send signals, except for process 1 (init)
- **pid < -1** : If pid is less than -1, then sig is sent to every process in the process group whose ID is -pid.

Return values

- On Success -> **return 0**.
- On Error -> **return SIG_ERR**.

Sending Signals: raise

Definition

```
1 #include <signal.h>
2 int raise(int sig);
```

Return values

- On Success -> **return 0**.
- On Error -> **return SIG_ERR**.

Example

```
1 // The process makes a seppuku
2 int ret = raise(SIGINT);
3 assert(ret != 0);
```

Handling signals

Definition

When the process receives the signal *signum* executes the handler *sighandler*, or executes the default actions *SIG_DFL* or ignores the signal *SIG_IGN*.

```
1 #include <signal.h>
2 typedef void (*sighandler_t)(int);
3 sighandler_t signal(int signum,
4 sighandler_t sighandler);
```

Return values

- On Success -> Returns a pointer to the handler function.
- On Error -> **return SIG_ERR.**

Waiting for signals

Definition

```
1 #include <unistd.h>  
2 int pause(void);
```

Return value

Always returns -1.



Sending Signals: alarm

Definition

```
1 #include <unistd.h>  
2 unsigned int alarm(unsigned int sec);
```

Observation

The process sends itself after `sec` seconds `SIGALRM` signal. Returns the number of seconds pending if there was a previous alarm call or zero in another case.

HandsOn: Pokemon

Definition

We want to make a process that simulates the activity of a **Pokedex**. To do it, we assume that **Ash** wants to check information related to pokemon at any time. We need to assume:

- **Pokedex** is configured to read information from **stdin [0]** and writes information to **stdout [1]**.
- The file `pokedex.c` contains the code that read pokemon information from `pokedex.csv` and loads them into Memory.

Tasks:

1. We can not start working with the **Pokedex** until the device is ready. It will be ready when the process finishes reading into Memory the information of `pokedex.csv`.
2. The Pokedex process must finish only when **SIGUSR1** is received.

HandsOn: Pokemon

pokedex.c

```
1 struct pokemon pokedex[151];
2 int main(int argc, char** argv) {
3     FILE* f=fopen("pokedex.csv","r");
4     ...
5     while (fgets(buf, 151, f) != NULL) {
6         // read csv file line by line
7         // init pokemon struct
8         // append to pokedex.
9     }
10    // ash can start using the pokedex
11    while(1){...}
12        // wait for stdin information
13        // write info for stdout
```



Task 1: Notify when device ready

pokedex.c

```
1 int main(int argc, char** argv) {
2     // ash can start using the pokedex
3     kill(getppid(), SIGUSR1);
4     while(1){
5         int pokemonId;
6         if (read(0, &pokemonId, sizeof(int)) < 0)
7             perror("Error[Pokedex] reading pipe");
8         struct pokemon p;
9         p = pokedex[pokemonId - 1];
10        write(1, &p, sizeof(struct pokemon));
11    };
12 }
```



Task 2: Finishing with SIGUSR1

pokedex.c

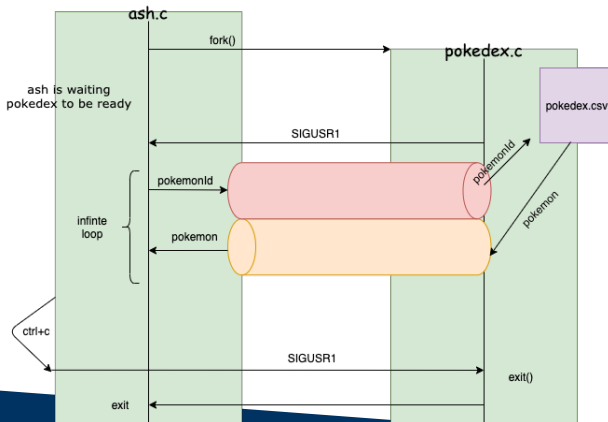
```
1 void end(){
2     sprintf(msg, "[%d] Received the signal SIGUSR1
3     from ash process [%d] ENDING\n", getpid(), getppid());
4     logger("INFO", msg);
5     exit(0);
6 }
7 int main(int argc, char** argv) {
8     signal(SIGUSR1, end);
9     signal(SIGINT, SIG_IGN);
10    ...
11 }
```



Ash process

Lessons learned!

It time to put into practise all lessons learned until this moment. Let's rock!



Challenge: Pokemon Go

Instructions

Let's go! Gotta Catch 'Em All! Now is time to simulate the gameplay of Pokemon Go (simplified in a very basic one xD). **Ash** process is going to create a child that will represent a wild **Pokemon**. The parent (**Ash**) must generate a random integer between 1 and 151 and send to the **Pokedex** to determine which **Pokemon** appears in front of us. The parent process shows a menu (**stdout [1]**) with the following actions, Throw Pokeball, Throw berry (optional) or run. Moreover, **Ash** is the responsible to write all the messages to **stdout [1]**.

Design TIP

You must uses signals and exit status code! Happy coding :)!

Challenge: Tasks

1. **Throw pokeball:** The **Pokemon** uses a probability distribution to answer **Ash** action. We generate a random number between 1 and 10. If the number is 7, the **Pokemon** escaped and we lose the opportunity to catch (the child process **Pokemon** ends, after notifying the result to **Ash** process.). If the number is 2, then gotcha, **Pokemon** was caught. The others values represents that the **Pokemon** breaks free but we can try again (note here the **Pokemon** not ends).
2. **Throw a berry:**[Optional] Each berry increase the probability to catch the **Pokemon**. This way, the first berry allows a catch [2,4], second berry [2,4,6] and so on until max [2,4,6,8]. To simplify you can avoid the berries and assume that [2,4,6,8] allows **Ash** to catch the wild **Pokemon**.
3. **Run away:** Makes **Pokemon** process end, then **Ash** shows a certain log message (**stdout [1]**) and return to the main menu.

Challenge: Screenshots (1)

```
jordi@jordi-VirtualBox:~/pokemon/capture$ ./ash
#####
# E. Explore
# Q. Quit
#####
E
Ash: [2657] --> Wild pokemon appeared [2659]
@oooooooooooooooooooo
Farfetch'd (83)
+++ Type1: Normal, Type2: Flying
+++ Total: 352, Hp: 52,
+++ Attack: 65, Defense: 55
+++ SpAttack: 58, SpDefense: 62, Speed: 60
+++ Gen: 1 Legendary: 0
@oooooooooooooooooooo
# P. Throw pokeball
# R. Run
P
Gotcha!The pokemon was caught.
#####
# E. Explore
# Q. Quit
#####
E
Ash: [2657] --> Wild pokemon appeared [2660]
@oooooooooooooooooooo
Moltres (146)
+++ Type1: Fire, Type2: Flying
+++ Total: 580, Hp: 90,
+++ Attack: 100, Defense: 90
+++ SpAttack: 125, SpDefense: 85, Speed: 90
+++ Gen: 1 Legendary: 1
@oooooooooooooooooooo
```



Challenge: Screenshots (2)

```
Oh no!The pokemon broke free.
# P. Throw pokeball
# R. Run
P
Gotcha!The pokemon was caught.
#####
# E. Explore
# Q. Quit
#####
E
Ash:[2657] --> Wild pokemon appeared [2661]
#####
Omanyte (138)
+++ Type1: Rock, Type2: Water
+++ Total: 355, Hp: 35,
+++ Attack: 40, Defense: 100
+++ SpAttack: 90, SpDefense: 55, Speed: 35
+++ Gen: 1 Legendary: 0
#####
# P. Throw pokeball
# R. Run
P
Oh no!The pokemon broke free.
# P. Throw pokeball
# R. Run
P
The pokemon escaped already
#####
# E. Explore
# Q. Quit
#####
Q
!!!!I'm tired from all the fun...
jordi@jordi-VirtualBox:~/pokemon/capture$
```



Teaching & Research Project

Public competition Number: 81 - Place: 7 - University of Lleida

Candidate: Jordi Mateo-Fornés

Area: Architecture and Technology of Computers

Department: Department of Informatics and Industrial Engineering (DIEI)

Position: Lecturer

March 12, 2021



Universitat
de Lleida