Guia docent
300108 - DCDESIG - Disseny i Operacions de Centres de Dades

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Unitat responsable: Escola d'Enginyeria de Telecomunicació i Aeroespacial de Castelldefels
Unitat que imparteix: **Titulació:** MÀSTER UNIVERSITARI EN INTEL·LIGÈNCIA ARTIFICIAL PER A INDÚSTRIES CONNECTADES (AI4CI) (Pla 2025). (Assignatura optativa).

Curs: 2025 **Crèdits ECTS:** 4.0 **Idiomes:** Anglès

PROFESSORAT

Professorat responsable: Francesco De Pellegrin (Unv. Avignon)
Antonio Cisternino (Univ. Pisa)
Salvatore Spadaro (UPC)

Altres:

CAPACITATS PRÈVIES

Algorithmic design, network protocols, data-structures

METODOLOGIES DOCENTS

On-line lectures, laboratories, autonomous work

OBJECTIUS D'APRENENTATGE DE L'ASSIGNATURA

This course is meant to provide an introduction to datacenter technologies. It addresses the properties of datacenter computing and networking infrastructures, and provides elements on the management of computing and networking resources therein. It introduces the fundamental problems of scheduling tasks on multiple machines. Additional elements to be covered are datacenter networking, hyper-converged architectures, security and SLAs in cloud computing.

HORES TOTALS DE DEDICACIÓ DE L'ESTUDIANTAT

Tipus	Hores	Percentatge
Hores aprenentatge autònom	64,0	64.00
Hores grup gran	36,0	36.00

Dedicació total: 100 h

CONTINGUTS

Datacenter Design and Operations

Descripció:
The course will cover a legacy syllabus focusing on the technological specificities of datacenter networks.

- Introduction to datacenter architecture; history of data centers; data center structure. Datacenters and constructive metrics: energy, robustness, and load distribution. Power and cooling in datacenters.
- Datacenter management techniques. Introduction to fabric, Fabric cabling and active fabric. L2 fabric and architectures CLI management, network overlay and spine and leaf.
- Datacenter operations: capacity planning and service operations.
- Scheduling. Classification of scheduling problems. Scheduling for one machine. Scheduling for several machines. Scheduling with deadlines. Scheduling of jobs in a cluster. Scheduling containers with Kubernetes.
- Allocation of computing resources in data centers. Distributed computing applications and resource allocation. Migration models and hot/cold models. Caching and registries.

Complementary content:

- Hyper-converged infrastructure (HCI) a distributed approach to storage. Introduction to storage systems. Drives (HDD and solid state). NAS and SAN. Storage abstraction functions and interconnect (deduplica, compression, LUN, Fibre channel, iSCSI)
- Server architectures and form factors. Server architecture and management (BMC).
- Inter-datacenter networks: computational issues for multi-region datacenters; calendaring and synchronization of operations.
- Datacenter networks: learn routing techniques and resource allocation (wavelength) to estimate traffic load and better size inter-datacenter networks. Learn the main network architectures in datacenters, and the roles of SDN controllers for dynamic routing. Learn flow scheduling techniques in data center networks, particularly for the problem of scheduling flows and coflows.
- Datacenter operations with a security perspective: tools and processes.
- Compliance to regulation and to service level agreements, a brief legal overview of the datacenter landscape.

Dedicació: 100h
Grup gran/Teoria: 36h
Aprenentatge autònom: 64h

SISTEMA DE QUALIFICACIÓ

Final exam (oral or written) and/or continuous monitoring

RECURSOS

Altres recursos:
In the Moodle platform