

ICT Infrastructure - Appunti

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Course info

Don't be shy to send multiple emails, prof. Cisternino receives many emails, and he knows he can't reply to each one. He is okay to be contacted through teams using the @ symbol to "mention" him.

He designed the UniPi datacenters.

"Italy is more about the multiple micro businesses than the few existing industries"

Exam

The exam is **oral**.

Prof. Cisternino expects students to get the full picture, and understand key concepts, not to remember everything—which still wouldn't be bad ☺—.

Chapter 1

Introduction

Prof. Cisternino dropped a lot of measures in terms of Watts, Dollars, Gigabits and so on.

He mentioned with emphasis the problem of energy consumption. To give an idea, a single rack of a datacenter designed ~ 10 years ago, absorbs up to $15kW$. The datacenter in *San Piero a Grado* is made up of 60 racks. It is not meant to provide the maximum energy possible for all racks simultaneously, but it still helps to get an idea of how things work in similar contexts.

1.1 Course map

1. Elements
 - i. Datacenters
 - (a) Power
 - (b) Cooling
 - ii. Cabling
 - iii. Networking
 - iv. Storage
 - v. Compute
 - vi. Virtualization
 - (a) Hypervisor
 - (b) Containers
2. Cloud
 - i. Reference architecture
 - ii. Resilience
 - iii. Security
 - iv. Legal aspects
 - (a) GDPR
 - (b) Security frameworks
 - v. Procurement aspects
 - vi. Operations
 - i.e. Keep the system up and running while upgrading the system

Chapter 2

Datacenter

10 years ago datacenters were no more than a room with some computers, air conditioners and some plugs to power up the devices. Later on, customers started asking server vendors to include in the servers utilities to allow an *automated datacenter management*. Thus the trend moved towards **Software Defined Datacenter**, which currently is the only possible way to deploy a Datacenter.

An **Active Datacenter** allows for internet storage (?)

A Datacenter should be **future-proof**: servers may be replaced, but updating a whole datacenter is at least a 1-year project.

2.1 Structure

Racks are made of —~ 42— *units*.

Besides server themselves, there is a **cooling system**. The first issue is the how to provide cool air. Then there is also how to define an evacuation plan, which must take into account dust.

However also the **floor** is not to be neglected.

- ◇ *Floating floor* or Ground floor
 - “A “floating floor” in a data center, also known as a “raised floor”, is a type of construction used in data centers to create a void between the actual concrete floor and the floor tiles where the servers and other equipment are located¹². This space is typically used for routing cables and for air circulation, which helps with cooling the equipment¹.”¹
- ◇ *Resistance* usually around $1 \frac{\text{ton}}{\text{m}^2}$

For example, in San Piero A Grado, there was a power cabin receiveing current from three lines. Now the whole power management components are in a container outside the building placed close to the facility.

Cables are not super-resistant to current. A lot of current passing through a copper wire will *exhaust* both the wire and the components receiving such current; hence the current should also be balanced among different cables, to avoid exhausting some components before the others.

A UPS —first of all— stabilizes the output current.

In theory $1V * 1A = 1W$, but in reality, performing such conversion something gets lost, so we have

$$I * V * \cos\phi = W$$

¹ChatGPT 4.0 - Generated