



UNIVERSITÀ  
CATTOLICA  
del Sacro Cuore

# Cloud computing Technologies

## Course Organization

Federico Accetta

# **Course Organization**



# Course aims

This course presents an overview of cloud computing paradigms with the aim at developing applications that take advantage of cloud technologies.

The main topics include **cloud architectures, distributed/parallel computing in the cloud, distributed storage systems, virtualization and cloud services**.

During the course students will get familiar with an overview of cloud computing technologies and emerging trends and the most popular frameworks adopted for developing cloud-based solution for big data problems.

At the end of the course students will be able to devise solutions based on cloud computing for classes of problems and to take advantage of modern cloud offering to identify optimal resource provisioning for their solutions.



# Course organization

## Cloud computing technologies

- Review of the basics: computer architecture, computer networks
- Introduction to Cloud Computing
- Service models on Cloud: IaaS, PaaS and SaaS
- Cloud services: Storage, Infrastructure, Computing, Data, etc.
- Virtualization: VMs and containers
- Parallel/distributed computing. Distributed storage systems
- Microservices and serverless computing
- Cloud native development
- Containers and orchestration (Kubernetes)
- Development lifecycle: continuous integration and continuous deployment, working with git
- NoSQL databases
- Real-time analysis: stream processing and in-memory processing
- Principles of Information Security: security on the cloud



# Course repository & communications

Our primary channel for communications is **Blackboard**  
[https://blackboard.unicatt.it/ultra/courses/\\_155723\\_1/outline](https://blackboard.unicatt.it/ultra/courses/_155723_1/outline)



You will find there:

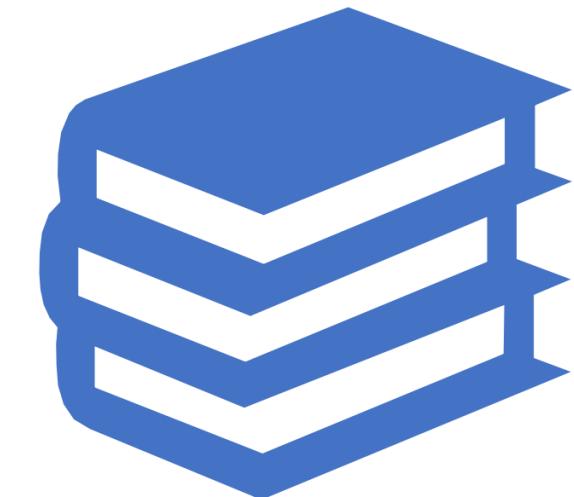
- announcements
- links to online lectures
- lecture recordings
- materials
- readings
- insights

For any question, please use my work e-mail  
[federico\\_accetta@it.ibm.com](mailto:federico_accetta@it.ibm.com)



# Reading List

- There's no book
- List of scientific papers and blog posts
- On Blackboard (updated weekly)





# LECTURES

**THURSDAY 14:30 – 17:30**

## Theory

Proposed time:  
14:30-15:30 lecture  
15:30-15:45 break  
15:45-17:00 lecture

**SOME WEDNESDAYS 08:30 – 10:30**

## Labs and Exercises

Proposed time:  
09:00-10:30 lab



# Tentative Schedule

Date	Aula	Type	Topics
02/10/25	G27	Theory	Introduction, computer architecture, networking
09/10/25	G27	Theory	Introduction to cloud computing. Service models: *aaS. Public, private, hybrid cloud
15/10/25	G19	Lab	Python configuration and first examples
16/10/25	G27	Theory	Virtualization: VMs and containers
22/10/25	G19	Lab	Setting up the environment - VMs
23/10/25	G27	Theory	Containers and distributed computing
29/10/25	G19	Lab	Create a REST API
30/10/25	G27	Theory	Microservices
05/11/25	G19	Lab	Create a containerized application
06/11/25	G27	Theory	Kubernetes
12/11/25	G19	Lab	Deploy to kubernetes
13/11/25	G27	Theory	Kubernetes, Cloud Native Concepts
19/11/25	G19	Lab	Deploy to kubernetes
20/11/25	G27	Theory	Devops and Terraform
26/11/25	G19	Lab	Finish deploy to kubernetes, work with GIT
27/11/25	G27	Theory	Serverless, Big data
03/12/25	G19	Lab	extra - recover missing parts - spare
04/12/25	G27	Theory	Information security: Security on the cloud



# Exam

Written Test  
(open questions)

CLOUD COMPUTING  
TECHNOLOGIES  
30/30

PLUS: Active participation



# IMPORTANT

please give **frequent feedbacks**  
to help setting up the pace



# Cloud computing, big data, security





# "Cloud computing"



Cloud computing is the **on-demand** availability of computer system resources, especially **data storage** (cloud storage) and **computing power**, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet.

[ [https://en.wikipedia.org/wiki/Cloud\\_computing](https://en.wikipedia.org/wiki/Cloud_computing) ]



# "Big Data"



Big data is a field that treats ways to analyze, systematically extract information from, or otherwise deal with **data sets that are too large or complex to be dealt with by traditional data-processing application software.**

[[https://en.wikipedia.org/wiki/Big\\_data](https://en.wikipedia.org/wiki/Big_data) ]



# "Security"



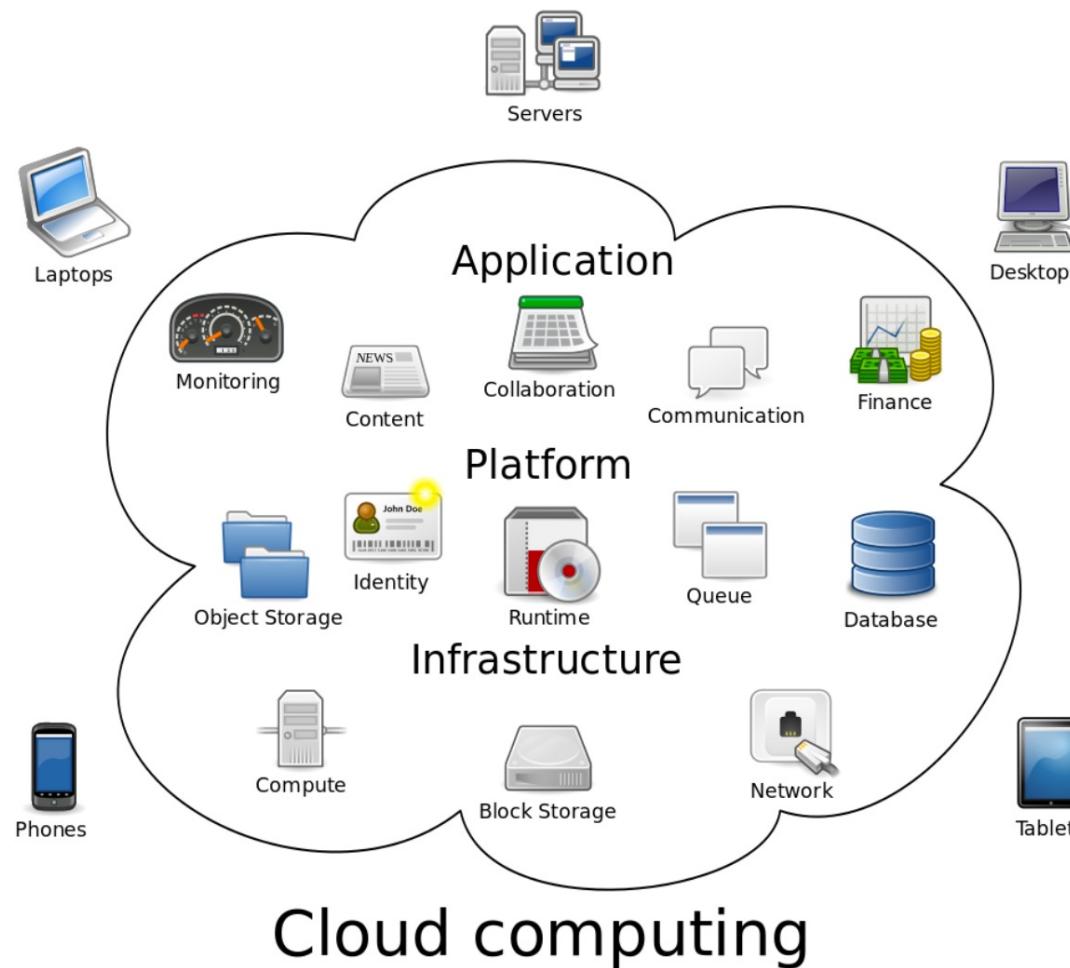
Information security [...] is the practice of **protecting information by mitigating information risks**. [...] It typically involves preventing or at least reducing the probability of unauthorized/inappropriate access to data, or the unlawful use, disclosure, disruption, deletion, corruption, modification, inspection, recording or devaluation of information.

[[https://en.wikipedia.org/wiki/Information\\_security](https://en.wikipedia.org/wiki/Information_security) ]

# Motivation



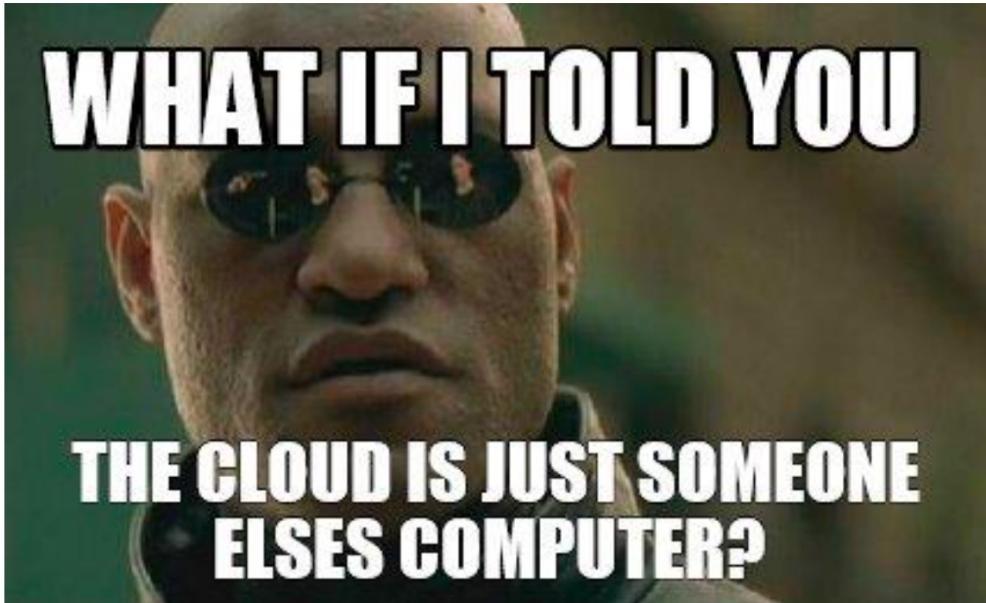
# Cloud computing in a nutshell



By Sam Johnston - Created by Sam Johnston using OmniGroup's OmniGraffle and Inkscape (includes Computer.svg by Sasa Stefanovic) This W3C-unspecified vector image was created with Inkscape., CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=6080417>



# "Cloud" computing



<https://news.microsoft.com/innovation-stories/project-natick-underwater-datacenter/>



# Examples

## Cloud storage

- Dropbox
- iCloud
- MS OneDrive
- Google Drive
- ...

Files and folders are stored in the cloud and accessible from many devices



# Examples

## Web-based office applications

- Google Docs, Sheets, Slides, Gmail, Calendar
- Microsoft365 Word, Excel, PowerPoint, Outlook
- ...

Previously this kind of applications were standalone software running on personal computers, now they are running on browsers and on servers, storing documents in the cloud.



# Examples

## Netflix

Netflix is a client of AWS (Amazon Web Services).

Netflix uses AWS for nearly all its computing and storage needs, including databases, analytics, recommendation engines, video transcoding, and more—hundreds of functions that in total use more than 100,000 server instances on AWS[1].

Netflix is one of the largest AWS customers, spending over £18,500,000 per month across a variety of Amazon products[2].

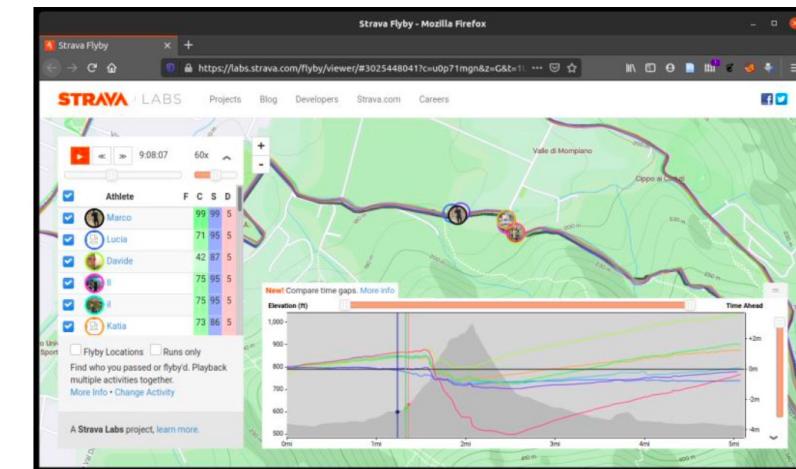
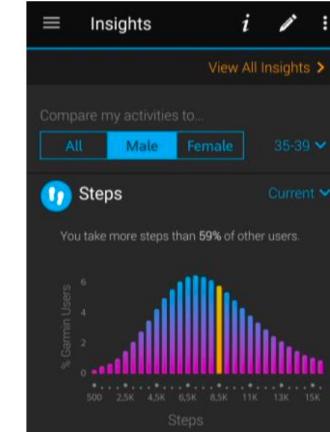
- (1) <https://aws.amazon.com/solutions/case-studies/netflix/>
- (2) <https://marccreighton.co.uk/technology/cloud-costs/>



# Examples

## Garmin connect

Example of health app





# Questions?