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UNIVERSITÀ DEGLI STUDI DI MILANO

Introduction to the Lab Course

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These slides are based on previous versions created by Letizia Bertolaja, Sergio Mascetti, Dario Freni, Claudio Bettini, Gabriele Civitarese, Riccardo Presotto and Luca Arrotta

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Some slides for this course are partly adapted from the ones distributed by the publisher of the reference book for this course (Distributed Systems: Principles and Paradigms, A. S. Tanenbaum, M. Van Steen, Prentice Hall, 2007).

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Course Outline

- Multi-threaded Servers and Thread Synchronization
- Machine to Machine Communication
- Remote Procedure call
- REST Servers and MQTT

Organization

- 1° Lesson:
  - Multi-threaded Servers
  - Thread Synchronization – synchronized
- 2° Lesson:
  - Thread Signaling – wait and notify
  - Machine to Machine Communication – JSON and XML
- 3° Lesson:
  - Protocol Buffers
  - Remote Procedure Call and GRPC Framework
- 4° Lesson:
  - REST Servers
  - MQTT

Organization

Once the final project will be presented, the last lessons will be focused on its development. We will provide suggestions about the project development, and you can work on it during these lab lessons supported by the tutors.

- 1° Lesson:
  - System and protocol design
  - Communication development
- 2° Lesson:
  - Synchronization problems analysis
- 3° Lesson:
  - REST Server and MQTT development
- 4° Lesson:
  - Possible project evaluation

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Project and Exam

- The text of the project will be presented at the end of the fourth lab lesson
  - Next lab classes will consist of support for the project development
- Once you obtain the theory exam mark, you can present the project you developed
- During the last lab lesson, you can present your project
  - Then, there will be the other regular exam sessions
- During the project discussion you will
  - Describe the high-level structure of the project
  - Execute the project
  - Explain the code
  - Answer to theoretical questions (about the lab lessons)

Language and IDE

- We will use Java as programming language
- You **CAN'T** use other languages to develop the final project
- You **CAN'T** use other high-level libraries in the project
- We will show you some exercises and examples through the *IntelliJ* IDE, but its use is not mandatory

Plagiarism

- The project must be developed **individually**
- It is not allowed to share neither small portions of the code
- We use anti-plagiarism softwares that in the last years has discovered some plagiarism cases
- You can talk and share ideas, but you can’t share code
- Shared code cases are clear! We can discover them even if you try to hide them
  - By changing the names of the variables
  - By inverting the order of the methods of a class
  - …

Motivation

Why low-level development nowadays?

- These lessons will be focused on processes communication, low-level concurrency and synchronization in Java

- More recent and higher-level tools exist but…
  - …the purpose of this lab is to deeply understand the synchronization problems
  - …we will provide you references to more recent technologies

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Contact

- You can contact me via email for any clarification or meeting:

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