

# SPD Course Introduction

Strumenti di programmazione per sistemi paralleli e  
distribuiti (SPD)

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Complementi di piattaforme abilitanti distribuite  
(CPA)

23/02/2010, with timetable updates on 24/02/2010

# The course

- A possible merge of two courses
- Programming Tools for Parallel and Distributed Systems (SPD)
  - 9 credits
  - Teacher : Massimo Coppola
  - Contact : [massimo.coppola@isti.cnr.it](mailto:massimo.coppola@isti.cnr.it)
- Distributed Enabling Platform II
  - 9 credits
  - Teacher : Nicola Tonello
  - Contact : [nicola.tonello@isti.cnr.it](mailto:nicola.tonello@isti.cnr.it)
- Overall 9 Credits (6 lessons, 3 practical)

## Description and Analysis of parallel and distributed programming platforms and models

- Theoretical foundations
- Standards for platforms and programming systems
- State-of-the-art solutions
- Practical use
- Applications

# How the course is structured

- 72 hours : ~48 lessons, ~24 laboratory
- Agreement on room and timetable
  - Depending on other courses
- Laboratory Resources
- Students to take notes of lessons in turn
  - Contributes up to 20% of final grade
- Notes and references on a wiki page
  - Available here

[www.cli.di.unipi.it/doku/magistraleinformaticanetworking/spd](http://www.cli.di.unipi.it/doku/magistraleinformaticanetworking/spd)

[www.cli.di.unipi.it/doku/magistraleinformaticanetworking/cpa](http://www.cli.di.unipi.it/doku/magistraleinformaticanetworking/cpa)

- Final examination : a project + short talk
  - Can be: a seminary at the end of the course

# Timetable

Tuesday	11:30	13:30
Wednesday	16:00	18:00
Friday	9:30	11:30

- First lesson at Polo Fibonacci, room R1
- Following lessons at S.Anna/CNIT building within CNR Research Area, room 10B
- Exceptions to be reported in the news on the wiki page
- ~~Wednesday 24/2 room I-06 at ISTI (within CNR area)~~

- Foundation, Technologies
  - Elementary mechanisms to distribute computation
  - Virtualization
  - Basics of scheduling algorithms and resource management
  - Basics of Service Oriented Architectures SOA
- Platforms
  - Grids
  - Clouds
  - XtremOS
- Programming systems/frameworks
  - MPI
  - ASSIST
  - Map&Reduce
- Applications

- Mechanisms to distribute computation 2h
  - RPC/RMI
  - CORBA
  - .NET remoting
- Virtualization 6h
  - Concepts and application on x86 CPUs
  - The XEN hypervisor
  - OpenVZ

**(approx. lesson hours are reported)**

- Basics of scheduling algorithms and resource management 4-6h
  - Recap of Scheduling within the OS
  - Scheduling of cluster resources
  
- Basics of Service Oriented Architectures (SOA) 2h



- Grids 6h
  - Concepts and characteristics
  - Middlewares: Globus Toolkit
  
- Clouds 6h
  - Definition, comparison with Grids
  - Technology
  - Open source implementations
    - OpenNebula, Nimbus, Eucaliptus
  
- XtremOS 2h-4h
  - OS approach to distributed computing
  - Machine abstraction and OS architecture

- Message Passing Interface (MPI) 6h
  - Standard for MP (version 2.1)
  - Core of the MPI standard + I/O if time enough
- ASSIST 4h
  - Parallel Programming Environment
  - Extension of Structured Parallel Programming
  - Dynamicity, adaptivity of parallel applications
- Map&Reduce 6h-8h
  - Common programming paradigm derived from functional /skeleton programming
  - Easily applied in-the-large
  - Examples with Yahoo, Google implementations