
Parallel and Distributed Computing

Finalità

Part 1

The aim of the course is to define and characterize computing systems, focusing on parallel and distributed computing systems. A sound theoretical foundation will be developed, related to performance evaluation and programming models of complex computing systems. From a practical point of view, some important tools for parallel and distributed programming will be illustrated.

Part 2

The aim of the course is to illustrate the peer-to-peer paradigm and the most important distributed architectures based on it. Moreover, the principles of autonomic computing will be introduced, as well as a design solution for adaptive peer-to-peer systems. The last part of the course will be related to the simulation of complex systems, in particular peer-to-peer and autonomic systems.

Programma

Part 1

Systems e models

- State space
- Deterministic and stochastic models
- Complex systems
- Complex adaptive systems
- Population dynamics
- Network topologies
- DEVS models

Computing systems

- Information theory
- Taxonomy of computing systems
- Automata
- Von Neumann architecture

Parallel computing

- General concepts
- Multicore systems, Cell, General Purpose GPU Programming
- NUMA architecture; Onyx2
- Massive parallelism, CM2
- Programming models
- Parallel programming
- Message Passing Interface (MPI)

Distributed computing

- Cluster computing
- Grid computing
- Cloud computing
- Pervasive computing

Part 2

Peer-to-Peer Systems

- State variables
- Dynamics of peer-to-peer networks
- Design issues
- Design strategies for overlay schemes
- Popular overlay schemes (Napster, BitTorrent, eMule, JXTA, Skype, Chord)

Autonomic Computing

- The four principles of autonomic computing
- Adaptive Evolutionary Framework

Simulation

- General concepts about simulation
- Event-driven simulation

- DEUS: a simple tool for complex simulations

Modalità d'esame

Written examination and practical test (short essay).

Testi consigliati

Official notes, slides and other training aid will be made available on my.unipr.it