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Description of a Lightweight Bartering Grid Architecture

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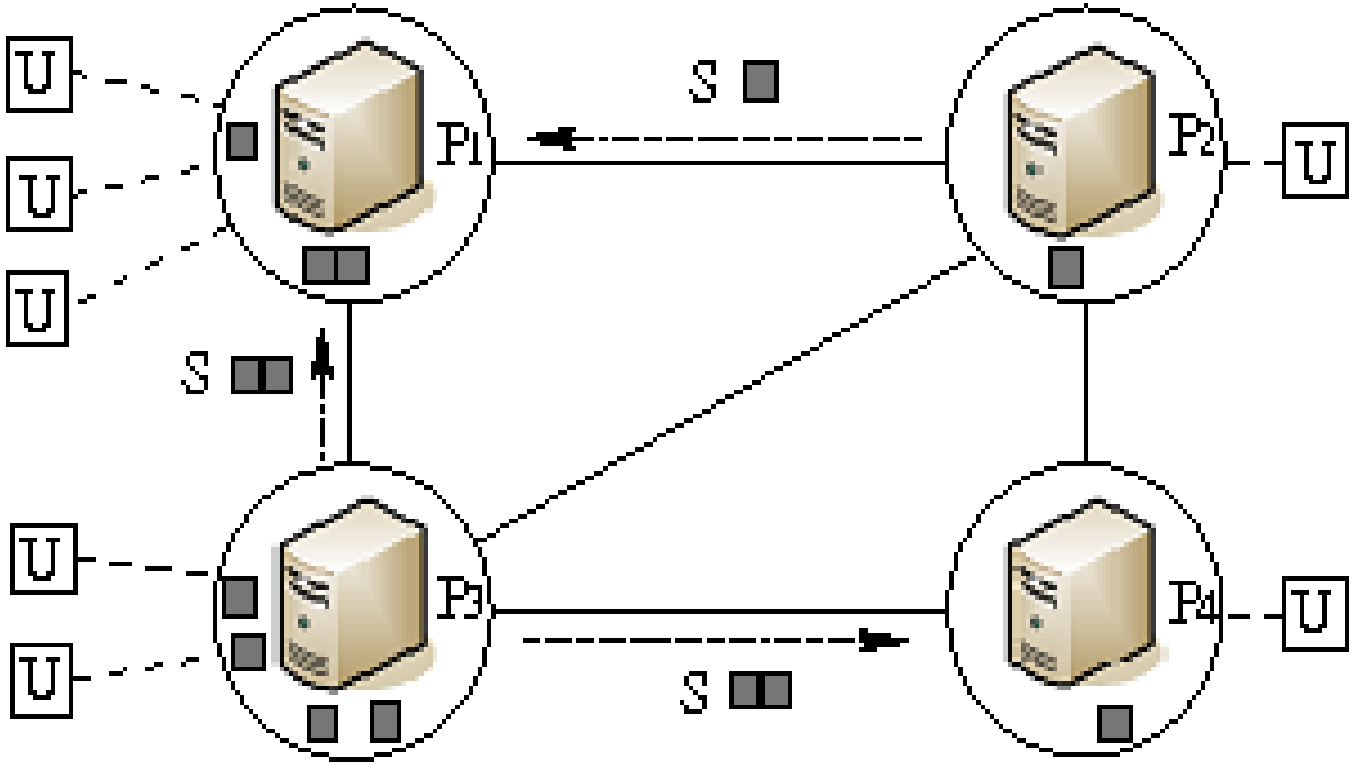
Overview

- **Context: P2P Grid model, Bartering**
- Motivation
- Architecture
- Summary

Context: P2P Grid model

Resources, Peers, Users, Bags of Tasks



Context: P2P Grid model

- Resource exchange between 2 Peers =

  a Resource of Peer 1 is supplied
  to run a Task of Peer 2,
  with expected reciprocity

- simple, direct negotiations

  (e.g. “I want to consume X resources”,
  “you are granted Y resources”)

Context: Bartering

- Bartering =

  decentralized, non-monetary, market-based resource exchange method

- each Peer accounts

  its own Resource consumption and supplying

- e.g.: OurGrid and its Network of Favors
  (= ranking consumers given consumption debts)

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Motivation

Study

bartering in **P2P Grids**

(i.e. scheduling, negotiation done by Peers)

where **Peers model their environment through interactions** with other Peers

in order to **optimize** future interactions

(i.e. consume reliable resources, when needed)

Challenges

- design, development of a suitable environment for the proposed study
- implementation of simulated algorithms should be easy
- related work is difficult to modify

=> new P2P Grid arch., simulator, middleware

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LBG: 1 architecture, 2 deployments

Lightweight Bartering Grid (LBG) Architecture

- enables to build **P2P Grids**
  where Peers model their environment
- can be deployed as a **Grid middleware**
  and as a **Grid simulator**
  - from the same Peers code
  - with minimum code reimplementation
    of Users and Resources

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  - **Peer managers**
  - Simulator
  - Middleware
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Request/Resource/Task Managers

- separate queueing of local, external Requests
- management of owned Resources
- ~~*modelling of external Resources*~~
- Task execution and control

Scheduler, Negotiator

Current bartering algorithms:

- scheduler: local, nonpreemptive, preemptive
- negotiator: random, NoF, NoF + reliability

Grid Register

3 databases of management data

model the environment through interactions:

- Grid Negotiation Profile
- Grid Bartering Profile
- Peer Profiles

Reminder: collected data is externally observable

Little trust => Limited access to other Peers' data

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Simulator

- discrete-event system simulator
  - Job submission events
  - Task completion/cancellation/failure events
  - scenario-based

- negotiation, scheduling
  after each time step with at least 1 event
  (= new submitted Tasks or free Resources)

- 1 Thread only
  - good for memory usage
  - trivially // activities may be //-ized in a few Threads

Related simulators

GridSim	SimGrid	OurGrid Sim	LBG Sim
Java	C	Java	Java
any Grid	any Grid	P2P Grid	P2P Grid
∞ threads	∞ threads	1 thread	1 thread
-	code sharing	-	code sharing

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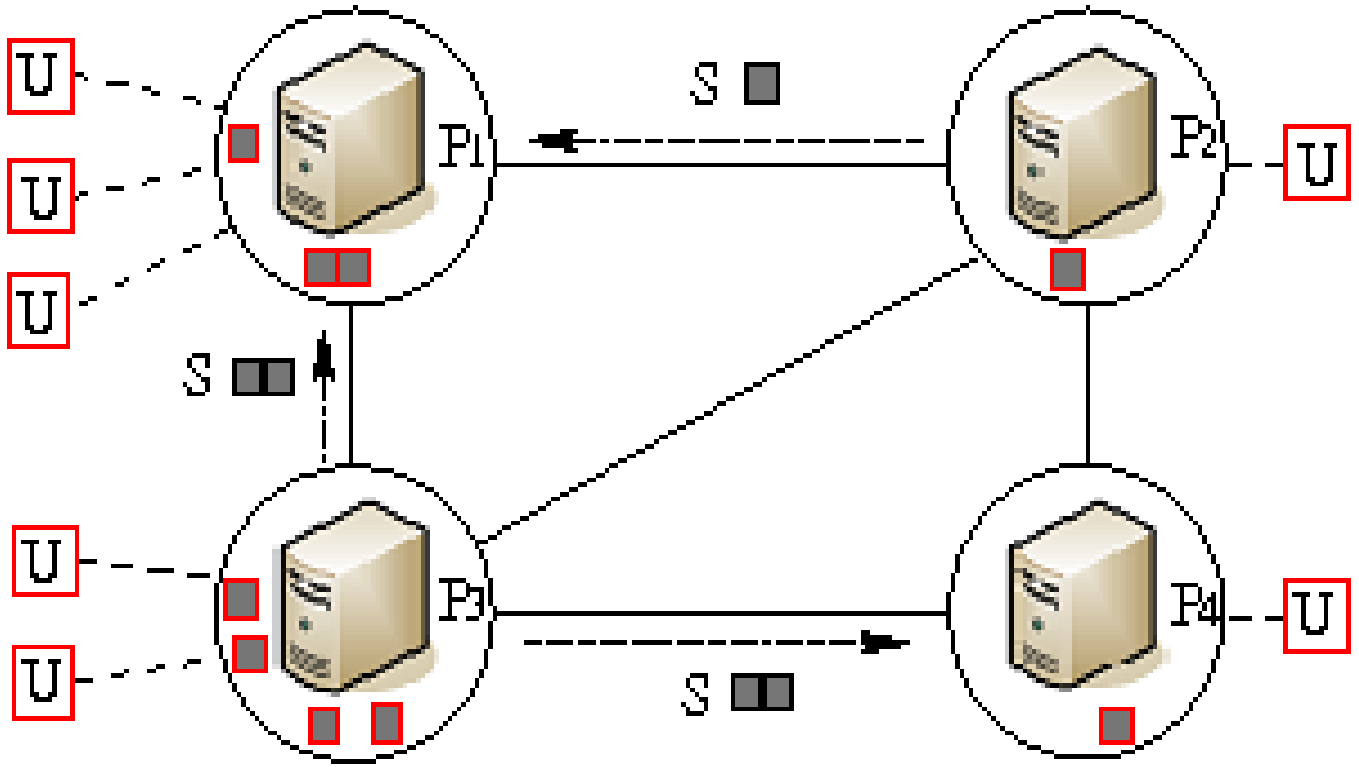
Middleware

- communications:
  serialized Java objects over TCP sockets
- Grid Task: 1 Jar file
  (several classes, 1 implements an interface)
- dynamic code uploading
  (to owned Resources, other Peers)
- automatic data transfer
- Peer discovery via a basic, centralized directory

Related middleware: OurGrid

Users + some managers + Resources = MyGrid



Related middleware: OurGrid

OurGrid	LBG
advanced MyGrid	simple User
« simple » Peer	advanced Peer
Network of Favors	Network of Favors
no bartering opt.	reliability bartering
used in production	used in testbed

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  - Middleware
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Summary

- The Lightweight Bartering Grid architecture enables to **build P2P Grids**
- Goal = study scheduling, negotiation algorithms in P2P Grids **where Peers model their environment**
- Can be deployed as a **simulator**, but also as a **middleware**, with the **same Peer managers**
- Java-based, supports Java Grid applications

Thank You !

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