Grid Application Programming Environments: Comparing ProActive, Ibis, and GAT

Thilo Kielmann
Vrije Universiteit, Amsterdam
kielmann@cs.vu.nl
CoreGRID: Network of Excellence

• Funded by European Commission (IST, 6th Framework)
  – 8.2MEuro, for 4 years, started Sep 2004
• Goal: integrating the research of the major European groups working on Grids
  – Currently 42 partner sites
• 6 Virtual Institutes
  – Knowledge and Data Management
  – Programming Models
  – System Architecture
  – Information and Monitoring Services
  – Resource Management and Scheduling
  – Problem Solving Environments, Tools and Systems
A Grid Application Execution Scenario
Functional Properties

What applications need to do:

- Access to compute resources, job spawning and scheduling
- Access to file and data resources
- Communication between parallel and distributed processes
- Application monitoring and steering
Non-functional Properties

What else needs to be taken care of:

- Performance
- Fault tolerance
- Security and trust
- Platform independence
ProActive

Application

Components  Groups  Migration  Fault Tolerance  Security

ProActive Runtime

Communication  Process Creation  Lookup

ProActive

RMI  HTTP  Ibis  rsh  ssh  LSF  PBS  Grid Engine  RMI registry  Jini
Comparing ProActive/Ibis/GAT

<table>
<thead>
<tr>
<th>Property</th>
<th>ProActive</th>
<th>Ibis</th>
<th>GAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Functional Properties</td>
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<td></td>
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<tr>
<td>performance</td>
<td>✓</td>
<td>✓</td>
<td>○</td>
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<tr>
<td>fault tolerance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>security / trust</td>
<td>✓ / ○</td>
<td>✓ / ○</td>
<td>✓ / ○</td>
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<tr>
<td>platform independence</td>
<td>✓</td>
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<tr>
<td>Functional Properties</td>
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<tr>
<td>resources / job spawning / scheduling</td>
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<tr>
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<tr>
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<tr>
<td>application monitoring / steering</td>
<td>● / ○</td>
<td>○ / ○</td>
<td>● / ●</td>
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</tbody>
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Synthesizing a Generic Architecture

Application

- High-level (Grid-unaware) API
- Grid-aware API
- Runtime Engine
  - dynamically loaded proxies

deployment (configuration) information

service

resource

service

resource
Conclusions

• We identified a set of functional and non-functional properties for grid application runtime environments
• None of our systems currently addresses them all
• Work in progress:
  – CoreGRID virtual institute on Environments, Tools, and Systems
  – designing/building a generic grid platform

www.coregrid.net
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