High Throughput Urgent Computing

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High Throughput Urgent Computing

- Urgent computing provides immediate, cohesive access to computing resources for emergency computations

- Support for urgent high throughput computing environments is necessary
  - Support for high throughput emergency computing applications
  - Urgent cycle scavenging
## Resources for Urgent Computing Environments

<table>
<thead>
<tr>
<th>Dedicated Resources</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>❑ Immediate access</td>
<td>❑ Wasted cycles</td>
</tr>
<tr>
<td></td>
<td>❑ Cost</td>
<td></td>
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<table>
<thead>
<tr>
<th>Shared Resources</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>❑ Reuse existing resources</td>
<td>❑ Resource contention</td>
</tr>
<tr>
<td></td>
<td>❑ Increased utilization</td>
<td>❑ Scheduling, authorization</td>
</tr>
</tbody>
</table>
SPRUCE

- Special PRiority Urgent Computing Environment (SPRUCE)
  - TeraGrid Science Gateway
  - http://spruce.teragrid.org

- **GOAL**: Provide cohesive urgent computing infrastructure for emergency computations
  - Authorization
  - Resource Selection
  - Resource Allocation
SPRUCE Architecture Overview (1/2)

Event

Automated Trigger

1

First Responder

Human Trigger

2

SPRUCE Gateway / Web Services

Right-of-Way Token

Source: Pete Beckman, ‘SPRUCE: An Infrastructure for Urgent Computing’
SPRUCE Architecture Overview (2/2)

User Team
Urgent Computing Job Submission

Conventional Job Submission Parameters

Local Site Policies

Urgent Computing Parameters

Choose a Resource

SPRUCE Job Manager

Authentication

Priority Job Queue

Supercomputer Resource

Source: Pete Beckman, ‘SPRUCE: An Infrastructure for Urgent Computing’
SPRUCE Resources

- Deployed on TeraGrid resources at IU, NCSA, NCAR, Purdue, TACC, SDSC, UC/ANL

- Supported Resource Managers
  - PBS
  - PBS Pro
  - LSF
  - SGE
  - LoadLeveler
  - Cobalt

- Local and Grid resource managers supported
SPRUCE and Condor

User Team

Urgent Computing
Job Submission

Conventional
Job Submission
Parameters

⚠️ Urgent Computing
Parameters

Authentication

Choose a Resource

SPRUCE Job
Manager

Local Site
Policies

Condor Pool

Adapted from Pete Beckman, ‘SPRUCE: An Infrastructure for Urgent Computing’
SPRUCE / Condor Integration

- Added support for urgent computing ClassAds
  - SPRUCE_URGENCY
  - SPRUCE_TOKEN_VALID
  - SPRUCE_TOKEN_VALID_CHECK_TIME

- Modifications to the Condor schedd that support identifying SPRUCE jobs

- SPRUCE Grid ASCII Helper Protocol (GAHP) Server
  - Asynchronously invoke SPRUCE Web service operations
  - GAHP calls integrated into the Condor schedd
SPRUCE / Condor Integration
SPRUCE / Condor Integration

- SPRUCE provides an authorization mechanism for access to Condor resources
  - “Right-of-Way” access to Condor resources
  - Same authorization infrastructure for supercomputer and Grid resource access

- Leverage existing Condor features to enhance scheduling policies
  - Job ranking / suspension / preemption
  - Site administrators define local scheduling policies
SPRUCE / Condor Status

- Prototype complete August, 2007
  - Demonstrated urgent authorization and scheduling capabilities
  - Deployed and tested on equipment at the University of Colorado
- Currently revising the prototype for a stable software release
  - Condor 7.0 support
  - Final software development iteration before official release
  - Evaluation of SPRUCE-related software integrated into larger Condor pools
Future Work

- High throughput support for urgent computing applications
  - SURA SCOOP CH3D Grid Appliance

- Many additional evaluation tasks
  - Application requirements
  - Security
  - Deadline scheduling / response time
  - Reliability / fault tolerance analysis
  - Data management
Questions?

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http://spruce.teragrid.org