Data Considerations

Thursday AM, Lecture 2
Derek Weitzel
OSG
Like all things

• I always think of Grid usage as a spectrum
• As you get access to more resources, it gets more difficult
Like all things

More Resources

Laptop  Cluster  OSG
Like all things

More Difficult

Laptop  Cluster  OSG
Difficult?

- Can’t control a cluster like your laptop, install anything
- Worry about different sites
- Can’t have interactive jobs in the OSG
Benefits!

• On a cluster & OSG you can access 1000+ cores!

• More Memory!

• Doesn’t heat up your laptop!
Transfers

More Data

HTCondor File Transfer
HTTP Proxies
StashCache
Owned Storage
Overview – Data Handling

• Review of HTCondor Data Handling
• Data Management Tips
• What is ‘Large’ Data?
• Dealing with Large Data
  – Next talks: local and OSG-wide methods for large-data handling
Overview – Data Handling

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Review: HTCondor Data Handling

submit file
executable
dir/ input
output

HTCondor

exec server

(exec dir)/
executable
input
output

submit server
Network bottleneck: the submit server
Overview – Data Handling

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Data Management Tips

- Determine your job needs
- Determine your *batch* needs
- Leverage HTCondor data handling features!
- Reduce per-job data needs
Determining In-Job Needs

• “Input” includes any files transferred by HTCondor
  – executable
  – transfer_input_files
  – data and software

• “Output” includes any files copied back by HTCondor
  – output, error
Data Management Tips

• Determine your job needs
• Determine your *batch* needs
• Leverage HTCondor data handling features!
• Reduce per-job data needs
First! Try to reduce your data

- split large input for better throughput
- eliminate unnecessary data
- file compression and consolidation
  - job input: prior to job submission
  - job output: prior to end of job
  - moving data between your laptop and the submit server
Overview – Data Handling

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What is big data?

• For researchers “big data” is relative
  – What is ‘big’ for you? Why?
What is big data?

• For researchers “big data” is relative
  – What is ‘big’ for you? Why?

• Volume, velocity, variety!
  – think: a million 1-KB files, versus one 1-GB file
Network bottleneck: the submit server

submit server
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dir/input
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HTCondor

(exec dir)/executable
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exec server
‘Large’ input data:
The collaborator analogy

- What method would you use to send data to a collaborator?

<table>
<thead>
<tr>
<th>amount</th>
<th>method of delivery</th>
</tr>
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<tbody>
<tr>
<td>words</td>
<td>email body</td>
</tr>
<tr>
<td>tiny – 10MB</td>
<td>email attachment (managed transfer)</td>
</tr>
<tr>
<td>10MB – GBs</td>
<td>download from Google Drive, Drop/Box, other web-accessible server</td>
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<tr>
<td>TBs</td>
<td>ship an external drive (local copy needed)</td>
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What methods should you use for HTC and OSG?

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<tr>
<td>10MB – 1GB, shared</td>
<td>download from web proxy (network-accessible server)</td>
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<td>1GB - 20GB, unique or shared</td>
<td>StashCache (regional replication)</td>
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<tr>
<td>20 GB - TBs</td>
<td>shared file system (local copy, local execute servers)</td>
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## Large input in HTC and OSG

- What methods should you use for HTC and OSG?

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Network bottleneck: the submit server

Input transfers for many jobs will coincide

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HTCondor

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Network bottleneck: the submit server

Input transfers for many jobs will coincide

Output transfers are staggered
### Output for HTC and OSG

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Output for HTC and OSG

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- Why are there fewer options?
Exercises

• 2.1 Understanding a job’s data needs
• 2.2 Using data compression with HTCondor file transfer
• 2.3 Splitting input (prep for large run in 3.1)
Questions?

• Feel free to contact me:
  – dweitzel@cse.unl.edu

• Next: Exercises 2.1-2.3

• Later: Handling large input data