Data Considerations

Thursday AM, Lecture 1
Lauren Michael
Like all things

• I always think of HTC/OSG usage as a spectrum:

Mo Resources, Mo Planning

Laptop  Cluster  OSG
Planning?

• Can’t control a cluster like your laptop, where you can install any software and place files (until they flat-out don’t fit)

• OSG: heterogeneity, borrowed resources (including network and disk), lack of on-the-fly troubleshooting
Benefits!

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

• Automate job tasks (with HTCondor)!

• Doesn’t burn up your laptop!
Overview – Data Handling

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

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Review: HTCondor Data Handling

submit file
executable
dir/ input
output

submit server

HTCondor

exec server

(exec dir)/
executable
input
output
Network bottleneck: the submit server
Overview – Data Handling

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Data Management Tips

• Determine your per-job needs
  – minimize per-job data needs
• Determine your batch needs
• Leverage HTCondor and OSG data handling features!
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
First! Try to minimize 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
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What is big data?

- In reality, “big data” is relative
  - What is ‘big’ for you? Why?
What is big large data?

• In reality, “big data” is relative
  – What is ‘big’ for you? Why?

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

Submit server
- Submit file
- Executable
- Dir/ Input
- Output

HTCondor

Exec server
- Exec (exec dir)/
- Executable
- Input
- Output
'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 – 100MB</td>
<td>email attachment (managed transfer)</td>
</tr>
<tr>
<td>100MB – GBs</td>
<td>download from Google Drive, Drop/Box, other web-accessible repository</td>
</tr>
<tr>
<td>TBs</td>
<td>ship an external drive (local copy needed)</td>
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Large *input* in HTC and OSG

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</tr>
<tr>
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<td>StashCache (regional replication)</td>
</tr>
<tr>
<td>shared</td>
<td></td>
</tr>
<tr>
<td>20 GB - TBs</td>
<td>shared file system (local copy, local execute servers)</td>
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Transfers

More Data

HTCondor
File Transfer

HTTP
Proxies

StashCache

Local Storage
Large *input* in HTC and OSG

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Network bottleneck: the submit server

*Input transfers for many jobs will coincide*

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submit server
submit file
executable
dir/ input
output
```

```
HTCondor
(exec dir)/
executable
input
output
exec server
exec server
exec server
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Network bottleneck: the submit server

*Input transfers for many jobs will coincide*

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

#### Amount and Method of Delivery

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- Why are there fewer options than for input?
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Exercises

- 1.1 Understanding a job’s data needs
- 1.2 Using data compression with HTCondor file transfer
- 1.3 Splitting input (prep for large run in 2.1)
Questions?

- Next: Exercises 1.1-1.3
- Later: Handling *large* input data

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