



# HTCondor-CE: Managing the Grid With HTCondor

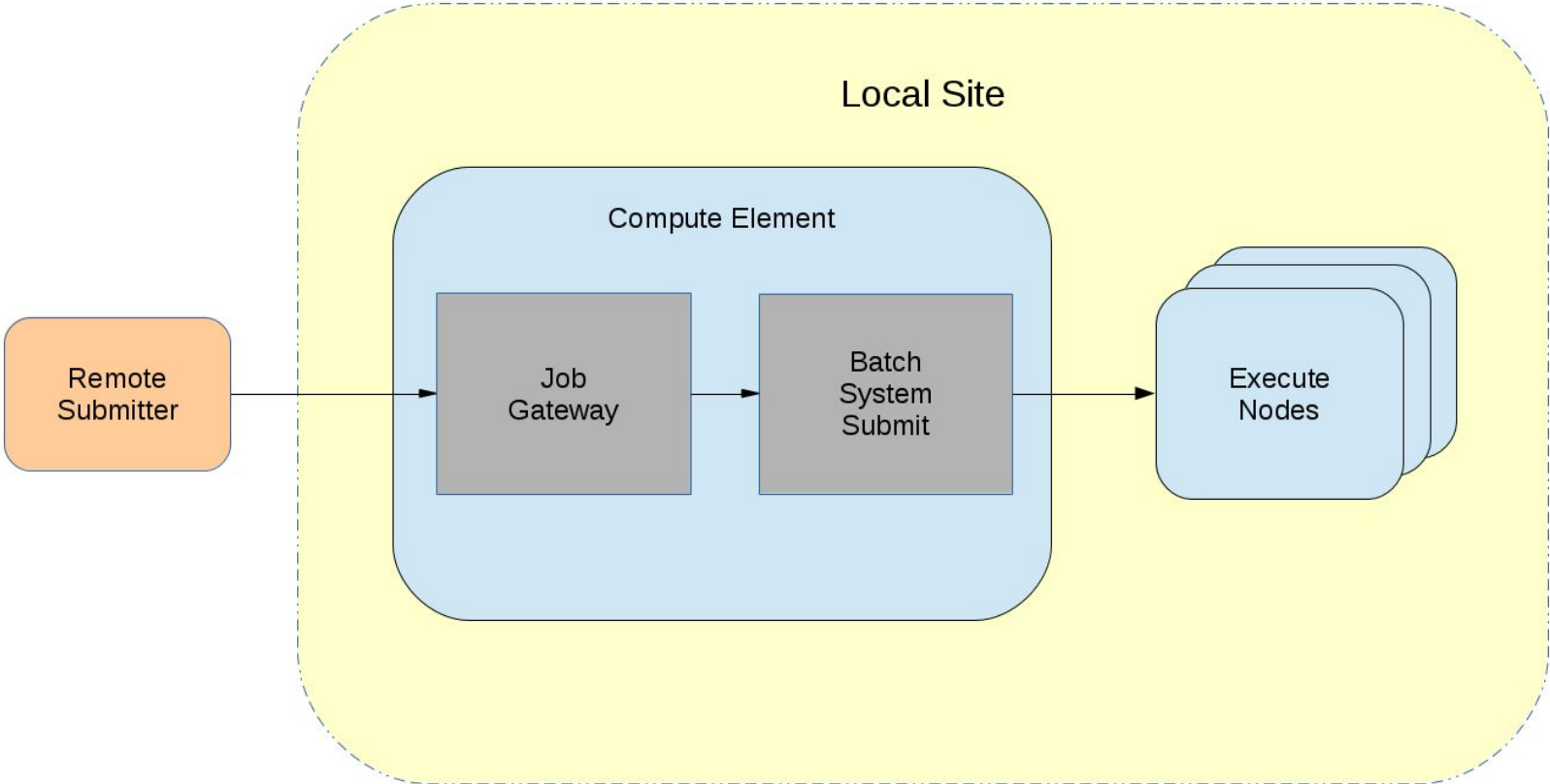
Brian Lin

OSG Software Team

HEPix Oct 2015

[blin@cs.wisc.edu](mailto:blin@cs.wisc.edu)

# Anatomy of a Compute Element (CE)

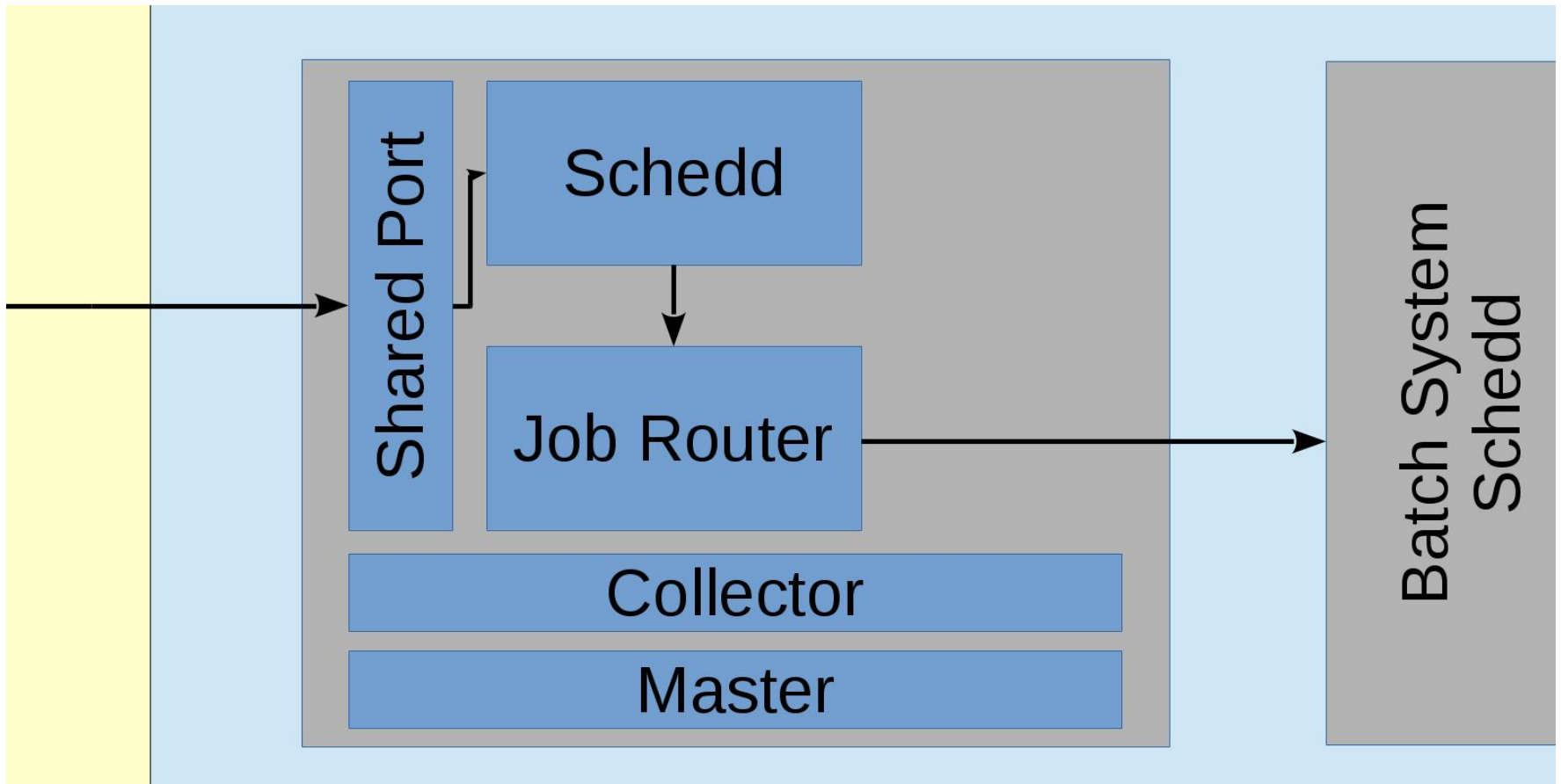


## HTCondor-CE: Job Gateway Software

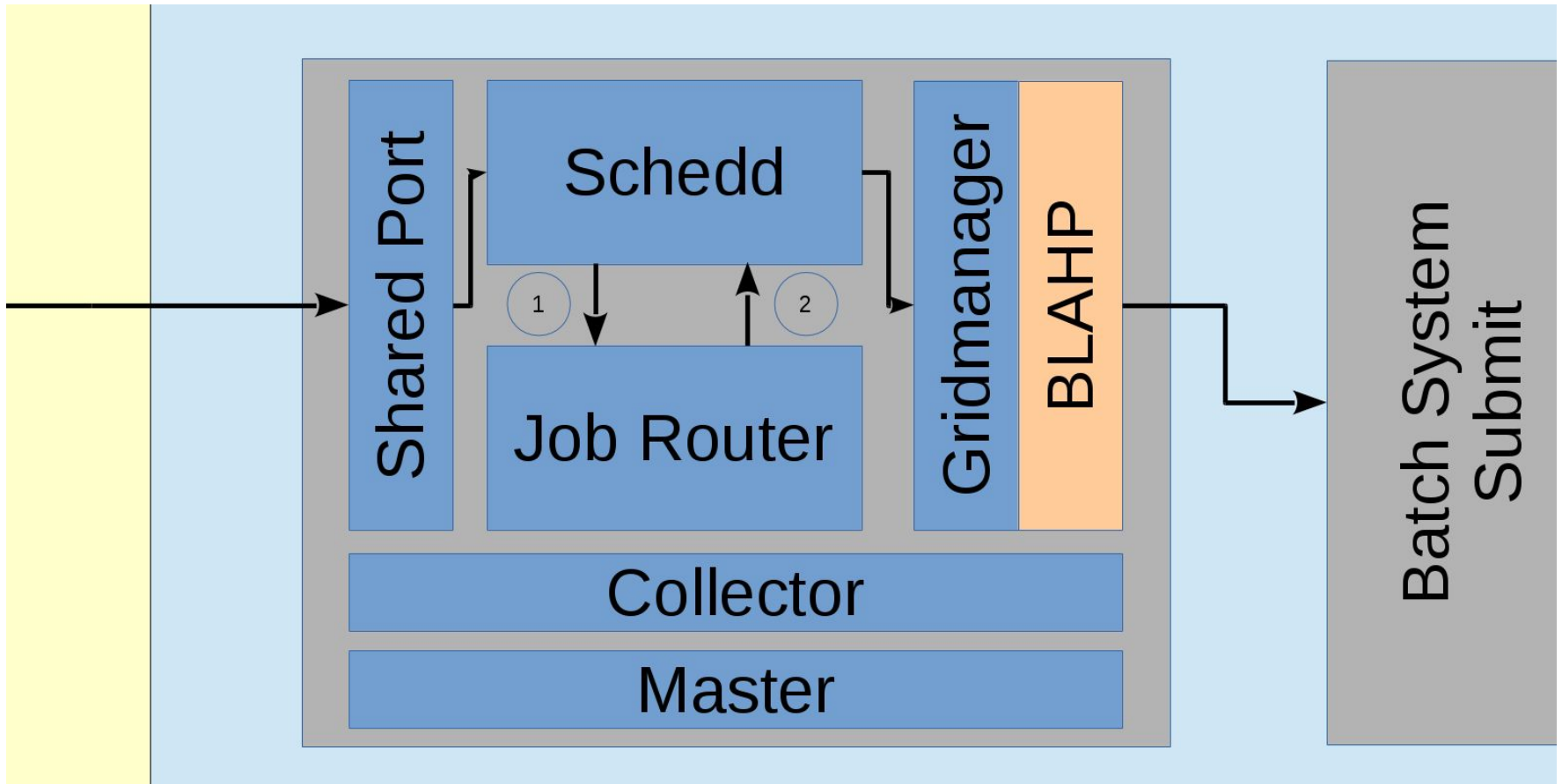
HTCondor-CE is just a special configuration of HTCondor distributed as an RPM.

- ⦿ Accepts remote jobs via Condor-C
- ⦿ GSI authentication; LCMAPS authorization
- ⦿ Interface with local batch systems via job router daemon (plus the grid manager daemon for Torque, PBS Pro, SLURM, LSF and SGE batch systems)

## Anatomy of HTCondor-CE: HTCondor Batch System



## Anatomy of HTCondor-CE: Non-HTCondor Batch System



## Job Router Configuration

- ⦿ Job router filters and transforms incoming grid jobs into “routed” jobs
- ⦿ Configured using declarative ClassAds with the `JOB_ROUTER_ENTRIES` variable
- ⦿ Each entry in `JOB_ROUTER_ENTRIES` is combined with the `JOB_ROUTER_DEFAULTS` configuration variable to create each job route

## Example HTCondor Job Route

Cameron has an HTCondor pool and she wants CMS jobs submitted to her CE to be forwarded to her pool and requesting x86\_64 Linux machines and setting the attribute “foo” on her routed job to “bar”. All other jobs should be submitted to the pool without any changes.

```
JOB_ROUTER_ENTRIES = [ \  
    name = "condor_pool_cms"; \  
    TargetUniverse = 5; \  
    Requirements = target.x509UserProxyVOName =?= "cms"; \  
    set_requirements = (Arch == "X86_64") && (TARGET.OpSys == "LINUX"); \  
    set_foo = "bar"; \  
] \  
[ \  
    name = "condor_pool_other"; \  
    TargetUniverse = 5; \  
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Documentation: <https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/JobRouterRecipes>

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## Example PBS Job Route

Cameron has a PBS pool and she wants CMS jobs submitted to her CE to be forwarded to her pool. All other jobs should be submitted to her pool without any changes

```
JOB_ROUTER_ENTRIES = [ \  
    name = "pbs_pool_cms"; \  
    TargetUniverse = 9; \  
    GridResource = "batch pbs"; \  
    Requirements = target.x509UserProxyVOName =?= "cms"; \  
] \  
[ \  
    name = "pbs_pool_other"; \  
    TargetUniverse = 9; \  
    GridResource = "batch pbs"; \  
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# Abbreviated Troubleshooting Tips

The screenshot shows a web browser window with the URL <https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/TroubleshootingHTCondorCE>. The page content includes a navigation sidebar on the left and a main content area on the right.

**Navigation Sidebar:**

- Open Science Grid**
  - About OSG
  - About VOs
  - Operations
  - Security
  - Documentation
  - Glossary of Terms
- End Users**
  - Grid Accounts
  - Grid Basics
  - Advanced Use Cases
  - User Support
- Install OSG 3!**
  - Compute Elements
  - Storage Elements
  - Small Sites/Campus Grids
  - Admin Support/Help
  - Current Release - 3.x
  - Previous Release - 1.2
- VO Administration**
  - VO Support Centers
  - User Authorization
  - VO Team Web
- Get Support/Help**
  - Participate/Get Help
  - Operations Blog
  - Chat
- Documentation Links**
  - How To Write Documents

**Main Content Area:**

You are here: TWiki > Documentation/Release3 Web > TroubleshootingHTCondorCE (16 Sep 2015, BrianLin)

## HTCondor-CE Troubleshooting Guide

- ↓ [HTCondor-CE Troubleshooting Guide](#)
  - ↓ [About This Guide](#)
  - ↓ [HTCondor-CE Troubleshooting Data](#)
    - ↓ [MasterLog](#)
    - ↓ [SchedLog](#)
    - ↓ [JobRouterLog](#)
    - ↓ [GridmanagerLog](#)
    - ↓ [SharedPortLog](#)
    - ↓ [Messages log](#)
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  - ↓ [HTCondor-CE Troubleshooting Tools](#)
    - ↓ [condor\\_ce\\_run](#)
    - ↓ [condor\\_ce\\_trace](#)
    - ↓ [condor\\_submit](#)
    - ↓ [condor\\_ce\\_ping](#)
    - ↓ [condor\\_ce\\_q](#)
    - ↓ [condor\\_ce\\_history](#)
    - ↓ [condor\\_ce\\_job\\_router\\_info](#)
    - ↓ [condor\\_ce\\_router\\_q](#)
    - ↓ [condor\\_ce\\_status](#)
    - ↓ [condor\\_ce\\_config\\_val](#)
    - ↓ [condor\\_ce\\_reconfig](#)
    - ↓ [condor\\_ce\\_{on,off,restart}](#)
  - ↓ [General Troubleshooting Items](#)
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    - ↓ [Verify package contents](#)
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    - ↓ [Jobs stay idle on the CE](#)
    - ↓ [Jobs stay idle on a remote host submitting to the CE](#)
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    - ↓ [Identifying the corresponding job ID on the local batch system](#)
    - ↓ [Missing HTCondor tools](#)
  - ↓ [Known Issues](#)
  - ↓ [Getting Help](#)
  - ↓ [Reference](#)



## Abbreviated Troubleshooting Tips

- ⦿ Increase log level in your configuration e.g.  
`ALL_DEBUG = D_FULLDEBUG`
- ⦿ Logs + troubleshooting tools
  - `condor_ce_trace`: End-to-end job testing
  - `condor_ce_host_network_check`: DNS issues  
required expertise in HTCondor
  - `condor_ce_job_router_info`: Why aren't my jobs being  
routed?
- ⦿ If all else fails, contact us! [goc@opensciencegrid.org](mailto:goc@opensciencegrid.org)

Documentation: <https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/TroubleshootingHTCondorCE>

## Why Switch to HTCondor-CE?

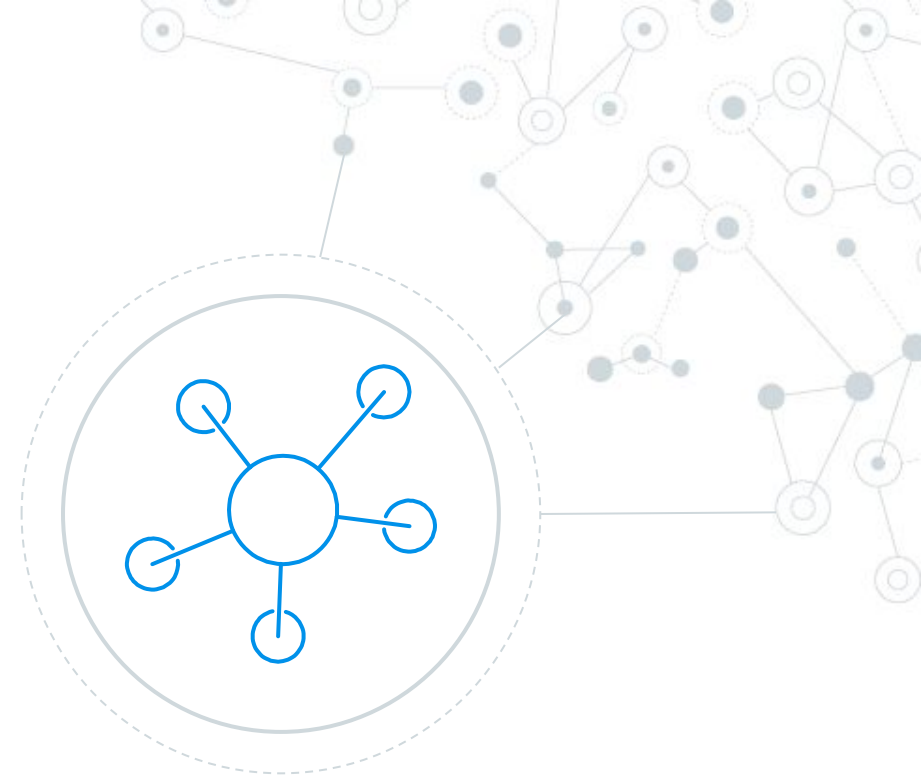
- ◎ If you're using HTCondor as your batch system
  - One less software provider: just a special HTCondor configuration
  - Take full advantage of HTCondor features e.g. Docker universe
- ◎ If not, there are still some advantages
  - Scalability: tests achieved 16k max jobs on one CE
  - Declarative ClassAd language: flexible routing policy
  - Job traceability: via debugging tools + logs
  - Fewer open ports: 1 for HTCondor > 8.3.2, otherwise 2

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  - Declarative ClassAd language: flexible routing policy
  - Job traceability: via debugging tools + logs
  - Fewer open ports: 1 for HTCondor > 8.3.2, otherwise 2
- ◎ And some disadvantages...
  - Declarative ClassAd language: can get complicated
  - BLAHP layer is not feature complete

# Deployment in the OSG

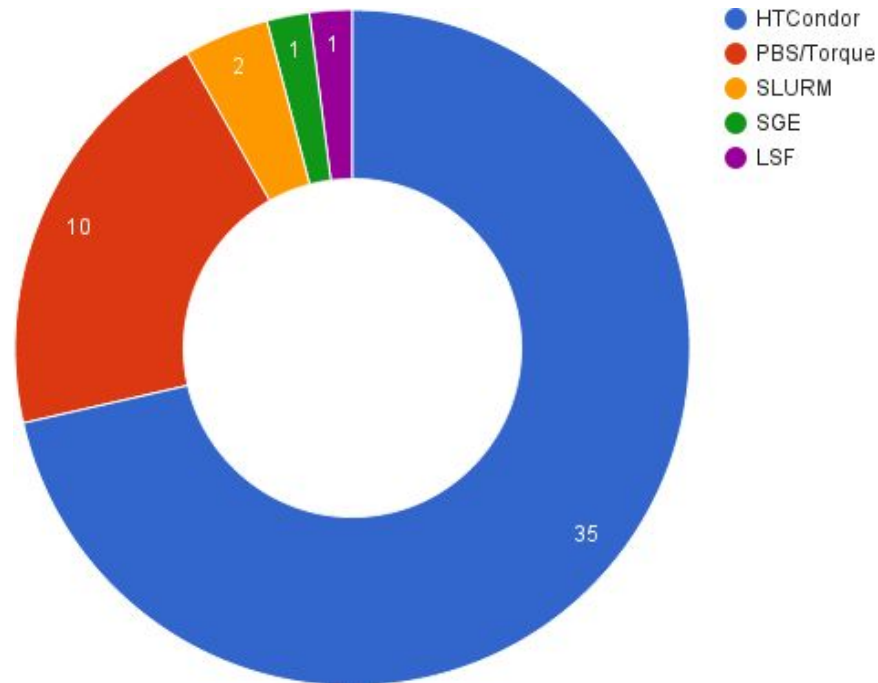
HTCondor-CE and OSG  
infrastructure



## New Installations

- © Last year, 10-15 installations of HTCondor-CE in the OSG. Today, we have 49!

```
condor_status -schedd -pool collector.opensciencegrid.org:9619 -af  
OSG_BatchSystems | sort | uniq -c
```



## HTCondor-CE Central Collector

- ◎ Each site HTCondor-CE advertises itself and its resources to the central HTCondor collector in the OSG
- ◎ Next step in information services (resource availability in the grid) after BDII
  - Consolidates software providers: just another special HTCondor config
  - Only resource provisioning: no site reporting
  - Extendable: we can add more attributes easily
- ◎ Also accepts StashCache ClassAds

## HTCondor-CE Central Collector

```
$ condor_ce_info_status --name='GLOW CE'
[
  OSG_BatchSystems = "Condor";
  MaxWallTime = 1440;
  CPUs = 8;
  Name = "GLOW CE";
  Memory = 16030;
  OSG_Resource = "GLOW-OSG";
  Transform =
    [
      set_MaxMemory = RequestMemory;
      set_xcount = RequestCPUs
    ];
  grid_resource = "condor osggrid01.hep.wisc.edu osggrid01.hep.wisc.edu:9619";
  Requirements = TARGET.RequestCPUs <= CPUs && TARGET.RequestMemory <= Memory;
  OSG_ResourceGroup = "GLOW"
]
```

# Deployment at CERN

HTCondor-CE at a non-  
OSG site





## HTCondor-CE at CERN

- ◎ Running HTCondor-CE in front of an HTCondor pool
  - Rebuilt the RPM for their repos
  - Required changes to OSG-specific configuration
  - Main blocker was due to an upstream bug in HTCondor
- ◎ Quickly ramping up, they hope to add more nodes to their pool and more CEs to scale
- ◎ Central collector combined with a BDII publisher for Virtual Organizations (VOs) that haven't made the transition

# HTCondor-CE: Days of Future Past

Development since HEPix  
2014 and upcoming work



## A Look Back: Docker Universe

- Available in HTCondor 8.3.6, requires an HTCondor pool
- An example job route (WARNING: untested, try at your own risk!)

```
[ TargetUniverse = docker; \  
name = "s17_HEP"; \  
set_docker_image = s17_and_HEP_stack; \  
]
```

- More information can be found
  - Todd Tannenbaum's talk on Friday
  - [http://research.cs.wisc.edu/htcondor/manual/v8.4/2\\_12Docker\\_Universe.html](http://research.cs.wisc.edu/htcondor/manual/v8.4/2_12Docker_Universe.html)
  - [http://research.cs.wisc.edu/htcondor/manual/v8.4/3\\_14Setting\\_Up.html](http://research.cs.wisc.edu/htcondor/manual/v8.4/3_14Setting_Up.html)

## A Look Back

- ◎ Local collector accepts pilot payload ads
- ◎ BLAHP improvements: Basic PBS Pro support and LSF fixes
- ◎ Added `condor_ce_network_host_check`, `condor_ce_info_status`. Made improvements to existing tools
- ◎ EL7 support

## Future Work

### ◎ Improvements to job router configuration

- Easily add defaults to your job routes

```
MERGE_JOB_ROUTER_DEFAULT_ADS = True
```

```
JOB_ROUTER_DEFAULTS = $(JOB_ROUTER_DEFAULTS_GENERATED) [TargetUniverse = 5; \  
set_foo = "bar";]
```

- Flexible AccountingGroup assignments

```
set_AccountingGroup = ifThenElse(regex(".*Brian Lin.*", \  
x509UserProxySubject), "naughty users", AccountingGroupOSG)
```

### ◎ Improvements to the BLAHP

- PBS Pro MPI support
- Integration into HTCondor source

## Future Work

- ◎ Expanding the central collector
  - Long-lived resource ads
  - More non-CE resource types
  - ATLAS Global Information System (AGIS) adapter

## Resources

- ⦿ HTCondor manual

<http://research.cs.wisc.edu/htcondor/manual/v8.4/ref.html>

- ⦿ HTCondor-CE Overview

<https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/HTCondorCEOverview>

- ⦿ HTCondor-CE Install Guide

<https://twiki.grid.iu.edu/bin/view/Documentation/Release3/InstallHTCondorCE>

- ⦿ HTCondor-CE Troubleshooting Guide

<https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/TroubleshootingHTCondorCE>

- ⦿ HTCondor-CE Job Router Configuration Examples

<https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/JobRouterRecipes>

- ⦿ Submitting Test Jobs to HTCondor-CE

<https://twiki.opensciencegrid.org/bin/view/Documentation/Release3/SubmittingHTCondorCE>

## Credits

I'd like to thank:

- ⊙ The HTCondor team
- ⊙ Brian Bockelman at UNL
- ⊙ Iain Steers at CERN
- ⊙ All the sites that helped test HTCondor-CE

Special thanks to all the people who made and released these awesome resources for free:

- ⊙ Presentation template by [SlidesCarnival](#)
- ⊙ Photographs by [Unsplash](#) & [Death to the Stock Photo](#) ([license](#))





# Thanks!

## Any questions?

You can find me at:

[blin@cs.wisc.edu](mailto:blin@cs.wisc.edu)

[osg-software@opensciencegrid.org](mailto:osg-software@opensciencegrid.org)

Support requests should go to:

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