



CVSSP Job Control System

aka HTCondor

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[cvssp wiki page](#)

Overview

- What is Condor?
- Interaction with Condor: basic commands
- What Condor ISN'T
- How do you get Help?
- Condor Tutorial
 - Example #1: Hello World!
 - Example #2: Interactive jobs
 - ...
 - Example #7: Condor with Docker

Honourable Mention

- Cihan Used to present this slides (and spear-headed condor)



Honourable Mention

- Cihan Used to present this slides (and spear-headed con...
- **We've since upgraded!**



Running heavy jobs - the conventional way

- Login to a server:

```
$ ssh server.eps.surrey.ac.uk
```

- Execute the job:

```
$ nohup myexe -al one -a2 two >& log_file &
```

No HangUP:
safe to logoff

Your program

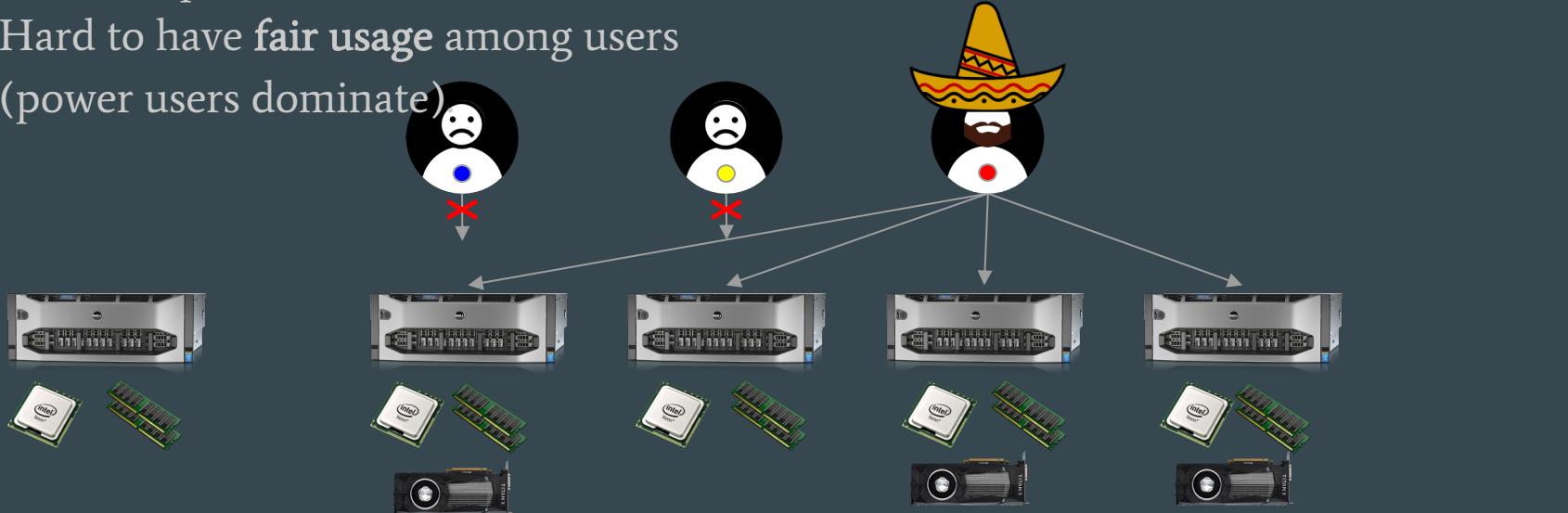
Arguments

Redirect stdout/stderr
to a log file

Detach from terminal

Problems

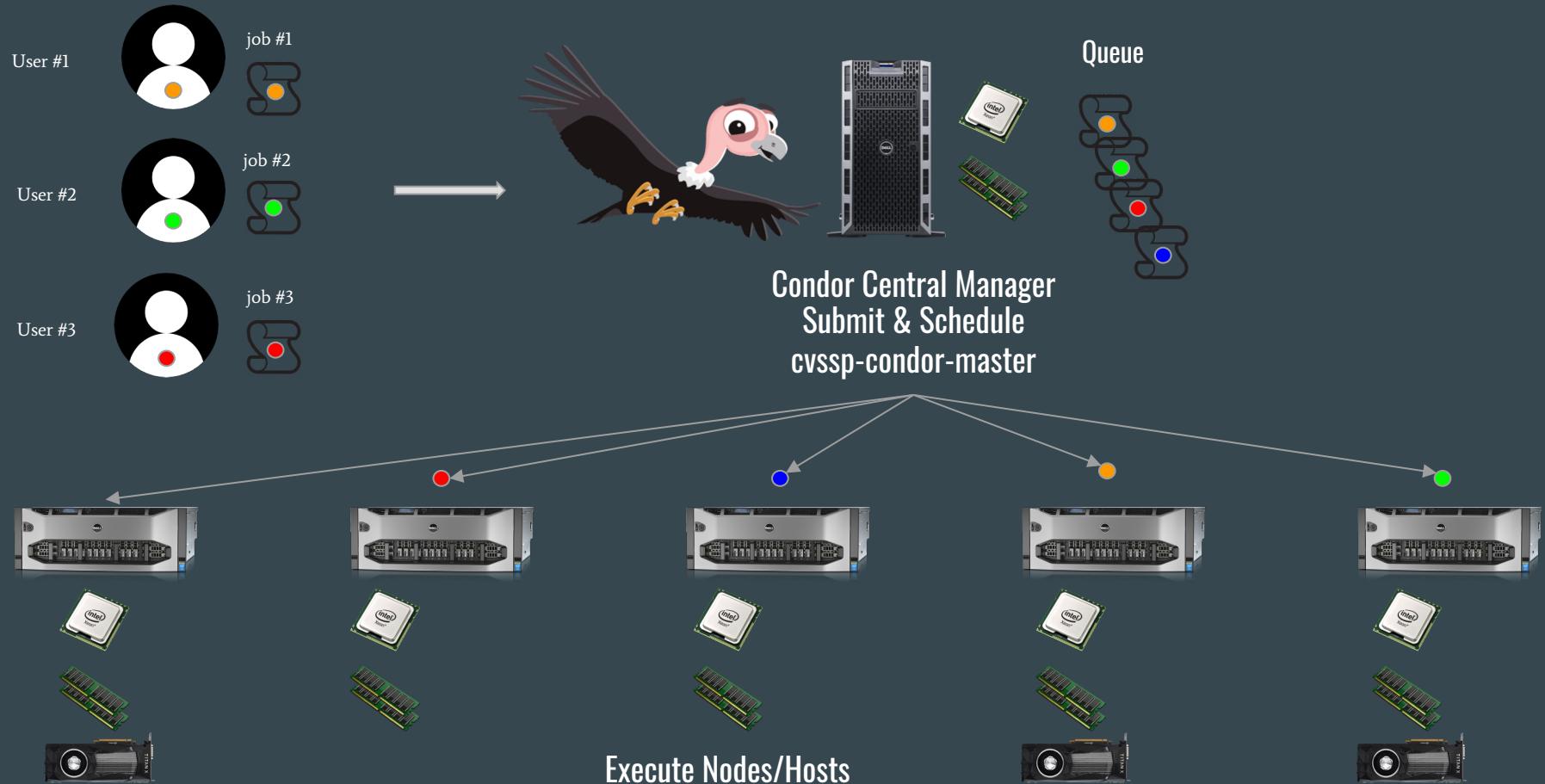
- What servers? When available?
 - CVSSP has >40 servers with different resources (RAM, GPU, CPU, StorNext, ...)
 - <http://personal.ee.surrey.ac.uk/Personal/J.Collomosse/load.html>
- Hard to update/maintain
- Hard to have **fair usage** among users
(power users dominate)



Dude, there's a **secret** server recently added in CVSSP.

I'll treat ya ice-cream. Tell me about it.

What is HTCondor?



How does Condor work

How Condor matches jobs to hosts/servers?

ClassAds

Job requirements

Job 1: 2 CPUs, 1GB RAM, 1 GPU
Job 2: 3GB RAM, docker
Job 3: 2 CPUs, stornext

Available resources

Host 1: 32 CPUs, 160GB RAM, docker
Host 2: 16 CPUs, 64 GB RAM, 7 GPUs
Host 3: 16 CPUs, StorNext, Matlab

User priority

User	Jobs	Prio
	6 CPUs, 30 GB RAM, 1 GPU	5000
	10 CPUs, Matlab	1000
	10 GB RAM	200

Host priority

Host	Resource currently available	Prefer job from
#1*	16 CPUs, 100 GB RAM, 2 GPU	
#2	17 CPUs, 160 GB RAM, Matlab	-
#3	32 CPUs, 52 GB RAM, StorNext	-

Behavior control

Host	resources	Custom requirements
#1	7 GPUs	Use 1 GPU or nothing
#2	32 CPUs, 128GB RAM	All I can spare: 10 CPUs, 30GB RAM
#3	160 GB RAM, Matlab	I won't run jobs for > 2h unless from

How to run a job with Condor

- Login to **condor**.eps.surrey.ac.uk :

```
$ ssh condor
```

- Create a submit_file

```
universe = vanilla  
executable = myexe  
arguments = -al one -a2 two
```

- Submit the job with Condor:

```
$ condor_submit submit_file
```

```
log    = mycondor.log  
output = myoutput.log  
error  = myerror.log
```

```
request_GPUs   = 1  
request CPUs   = 4  
request_memory = 2000
```

```
# QUEUE is the "start button"  
queue 1
```

NOTE: Submit files modified from your PC might take time to update on server!

Submit file → Jobs

```
pk0011@cvssp-condor-master:~ $ cat submit_file
#####
# Example Job for HTCondor
#####

# -----
# Executable and its arguments
executable    = myexe
arguments     = -al one -a2 two

# -----
# Docker: Executable might be stated in docker image so can be omitted
# If specified, overrides the one stated in docker image
# Need to specify the docker image to use
universe      = docker
docker_image   = nvidia/cuda

# -----
# Input, Output and Log files
log           = ${cluster}.${process}.myexe.log
input          = ${cluster}.${process}.myexe.in
output         = ${cluster}.${process}.myexe.out
error          = ${cluster}.${process}.myexe.error

should_transfer_files = YES

# -----
# Requirements for the Job
requirements  = ( HasStornext == true ) & ( CUDACapability >= 5 )

# -----
# Resource requirements
request_GPUs  = 1
request_CPUs  = 2
request_memory = 400

# -----
# Queue the job
queue
```

Different than just a path to an executable

- Required Resources
(i.e. #GPU, #CPU, ...)
- Requirements
(i.e. Docker, StorNext, SW)
- Preferences
(i.e. target machine)
- Environment
(i.e. Vanilla, Docker)
- Mounting Points
(i.e. /vol/vssp)
(NOTE: Don't mount homespaces, it's slow and might cause trouble with anaconda, etc.)
- Submit Multiple Jobs

Never use CUDA_VISIBLE_DEVICES

Interaction with HTCondor - Pool status



condor_status

```
pk0011@cvssp-condor-master:~ $ condor_status
Name          OpSys     Arch   State      Activity LoadAv Mem    ActvtyTime
slot1@bilbo.eps.surrey.ac.uk  LINUX    X86_64 Unclaimed Idle    0.050 120749 9+03:05:02
slot1_1@bilbo.eps.surrey.ac.uk  LINUX    X86_64 Claimed  Busy    0.000  4096  0+01:44:12
slot1_2@bilbo.eps.surrey.ac.uk  LINUX    X86_64 Claimed  Busy    0.000  4096  0+00:33:12
slot1@gnasher1.eps.surrey.ac.uk  LINUX    X86_64 Unclaimed Idle    0.180 145057 7+11:49:20
slot1@gnasher2.eps.surrey.ac.uk  LINUX    X86_64 Unclaimed Idle    0.070 145057 7+11:51:19
slot1@gnasher3.eps.surrey.ac.uk  LINUX    X86_64 Unclaimed Idle    0.010 145057 2+03:15:00
slot1@gnasher4.eps.surrey.ac.uk  LINUX    X86_64 Unclaimed Idle    0.140 145057 2+03:14:55
slot1@willow.eps.surrey.ac.uk    LINUX    X86_64 Unclaimed Idle    0.160  24065 0+03:04:50
slot1_2@willow.eps.surrey.ac.uk  LINUX    X86_64 Claimed  Busy    0.000  8064  0+01:01:49

          Total Owner Claimed Unclaimed Matched Preempting Backfill  Drain
X86_64/LINUX      9     0      3       6      0        0        0        0
Total            9     0      3       6      0        0        0        0
pk0011@cvssp-condor-master:~ $ 
```

Condor Central Manager
Submit & Schedule
cvssp-condor-master

Interaction with HTCondor - Queue status



Condor Central Manager
Submit & Schedule
cvssp-condor-master

`condor_q`

```
pk0011@cvssp-condor-master:~ $ condor_q pk0011
```

```
-- Schedd: cvssp-condor-master.eps.surrey.ac.uk : <131.227.81.42:1870?... @ 05/10/18 20:49:33
OWNER  BATCH_NAME          SUBMITTED    DONE     RUN     IDLE     HOLD   TOTAL JOB_IDS
pk0011  CMD:                4/30 12:11      -       -       -       2      2 249.0 ... 250.0
pk0011  CMD: /usr/sbin/sshd  5/1 17:45      -       2       -       1      3 269.0 ... 424.0
pk0011  CMD: /bin/echo       5/10 14:35     -      -       2       -      2 348.0 ... 351.0
7 jobs; 0 completed, 0 removed, 2 idle, 2 running, 3 held, 0 suspended
```

Interaction with HTCondor - Priorities status



Condor Central Manager
Submit & Schedule
cvssp-condor-master

condor_userprio

```
pk0011@cvssp-condor-master:~ $ condor_userprio -allusers
Last Priority Update: 5/10 20:51
          Effective  Priority   Res  Total Usage  Time Since
User Name           Priority   Factor   In Use (wghted-hrs) Last Usage
-----
ms01384@surrey.ac.uk      500.00  1000.00     0       348.64  37+12:29
mv00008@surrey.ac.uk      536.88  1000.00     0        1.70  0+00:32
nc00396@surrey.ac.uk    1137.51  1000.00     5       101.11  <now>
pk0011@surrey.ac.uk     4624.32  1000.00     4      2125.86  <now>
-----
Number of users: 4           9      2577.31
```

Interaction with HTCondor - GPUs



Condor Central Manager
Submit & Schedule
cvssp-condor-master

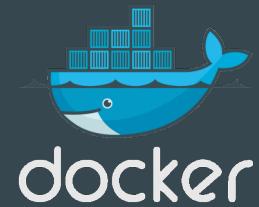
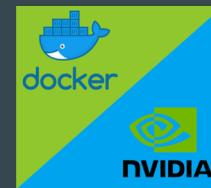
condor_gstatus

Host	State	Activity	GPUs	Owner	Job	Assigned GPUs
bifur			3			
slot1_1	Claimed	Busy	2	pk0011	436.0	CUDA0, CUDA1
willow			2			
slot1_1	Claimed	Busy	1	pk0011	435.0	CUDA0
Total GPUs		5				
Used GPUs		3				
Free GPUs		2				



HTCondor & Docker

- Just like any other job!
- Can run job as a Docker container
- Can use any image accessible on DockerHub or any private/public registry
- If GPUs requested NVIDIA runtime is used
- Good if you want a special running environment
- Access to Home Dir
- Access to project spaces
- Access to network ports
- CUDA_VISIBLE_DEVICES:
 - IF you are using a library that uses this, you should be using Docker!



```
universe      = docker
docker_image = registry.eps.surrey.ac.uk/archangel:4df819e
executable   = myexe
arguments    = -a1 one -a2 two
```

What Condor ISN'T

- Magic
 - Condor isn't Magic: You will hear me say this.
 - You will need to put in WORK to make condor work.
- A replacement for **niceness** and **good will**:
 - Respect Deadlines
 - Don't launch 1000's of jobs right before a deadline
 - Respect Resources
 - Don't launch CPU jobs on GPU machines
 - Don't take a 40GB GPU for something that needs 5GB
 - Respect Others:
 - POLITELY let people know if you think they are misusing condor
 - If you are told you are misusing condor, listen
- Bulletproof
 - There ARE bugs, annoyances, quirks, hacks, abuses, etc.

What Condor ISN'T

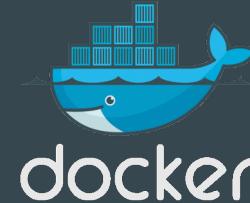
- A buffet:
 - We try to cater for everyone, but generic solutions are always preferable.
- Your personal supercomputer:
 - BE NICE!
- A programmer:
 - Condor won't fix your code
 - You **WILL** need to make your code condor friendly (it's normally easy!)
- Static
 - If you run into problems, let us know.
 - If condor isn't working for you, let us know
 - Condor is constantly evolving to meet our needs
- MAGIC
 - Condor isn't magic!
 - We rely on **YOU** for that.

How do you get help?

- CVSSP wiki
 - https://cvssp.org/mediawiki/index.php/CVSSP_Job_Control_System
 - <https://bookstack.eps.surrey.ac.uk/books/htcondor---job-scheduling>
- Gitlab:
 - <https://gitlab.eps.surrey.ac.uk/cvssp-condor/condor-examples>
 - <https://gitlab.eps.surrey.ac.uk/cvssp-shared-dockerfiles>
- TEAMS:
 - <https://teams.microsoft.com/l/team/19%3a883397201ec940b196b41f388818f5e3%40thread.skype/conversations?groupId=fde0b9b2-64af-4716-9229-172c7e247262&tenantId=6b902693-1074-40aa-9e21-d89446a2ebb5>
- Google: Htcondor + keywords
- IT helpdesk (usersupport@surrey.ac.uk)
- Kosta (k.polyzos@surrey.ac.uk)
- Colleagues!



Condor Tutorial



- Hello World!
- Interactive Job
- MATLAB
- Python + Catching SIGTERM
- Caffe (Compilation)
- TensorFlow < 1.5 + MNIST
- TensorFlow > 1.5 + MNIST



Example01 - Hello World!



cvssp-condor-master:/scratch/CondorDemo



Example02 - Interactive Job = SSH



cvssp-condor-master:/scratch/CondorDemo



Example03 - MATLAB



cvssp-condor-master:/scratch/CondorDemo



Example04 - Python + Catching SIGTERM



cvssp-condor-master:/scratch/CondorDemo



Example05 - Caffe Compilation



cvssp-condor-master:/scratch/CondorDemo



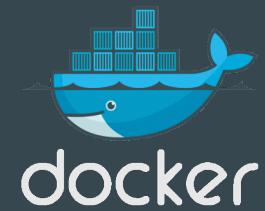
Example06 - TensorFlow < 1.5 + MNIST



cvssp-condor-master:/scratch/CondorDemo



Example07 - TensorFlow > 1.5 + MNIST



cvssp-condor-master:/scratch/CondorDemo