CENTER FOR HIGH THROUGHPUT COMPUTING

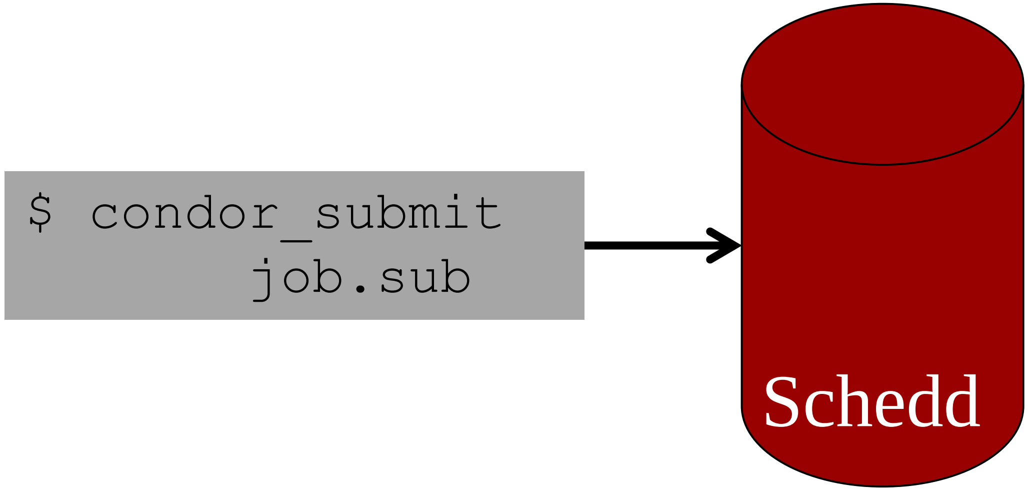
HTCondor

Schedd Transforms

Overview

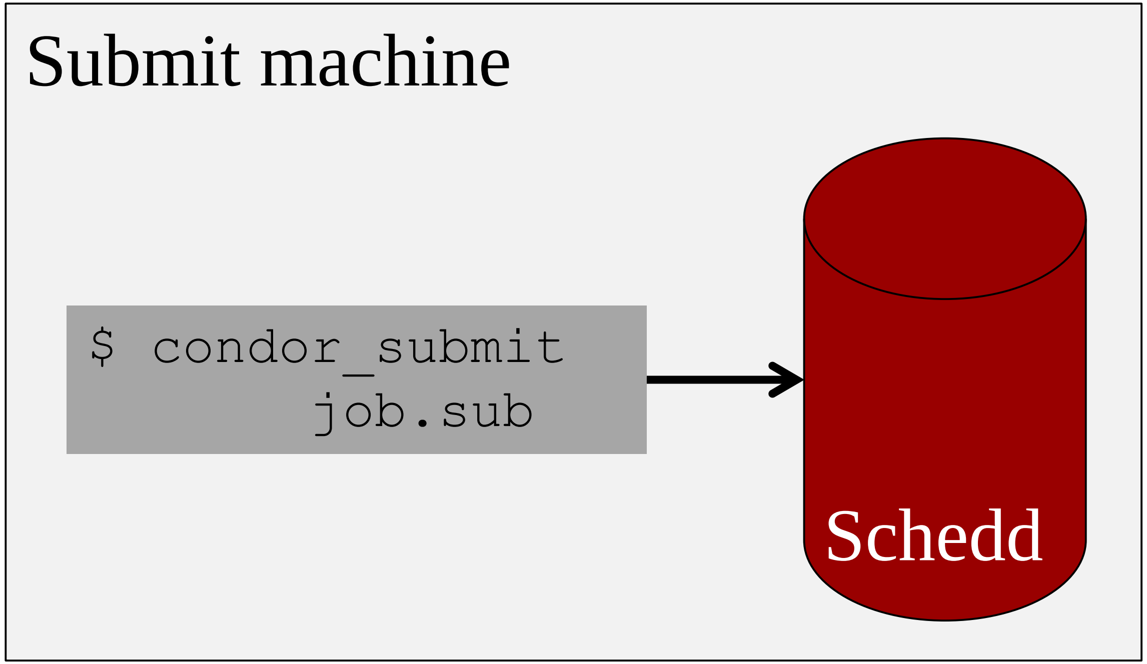
- Policy options for **admin** to change jobs
  - Limits
  - Job policy
  - Mutating jobs
  - Preventing changes
  - The ONE POLICY everyone wants!

The Old way to submit jobs



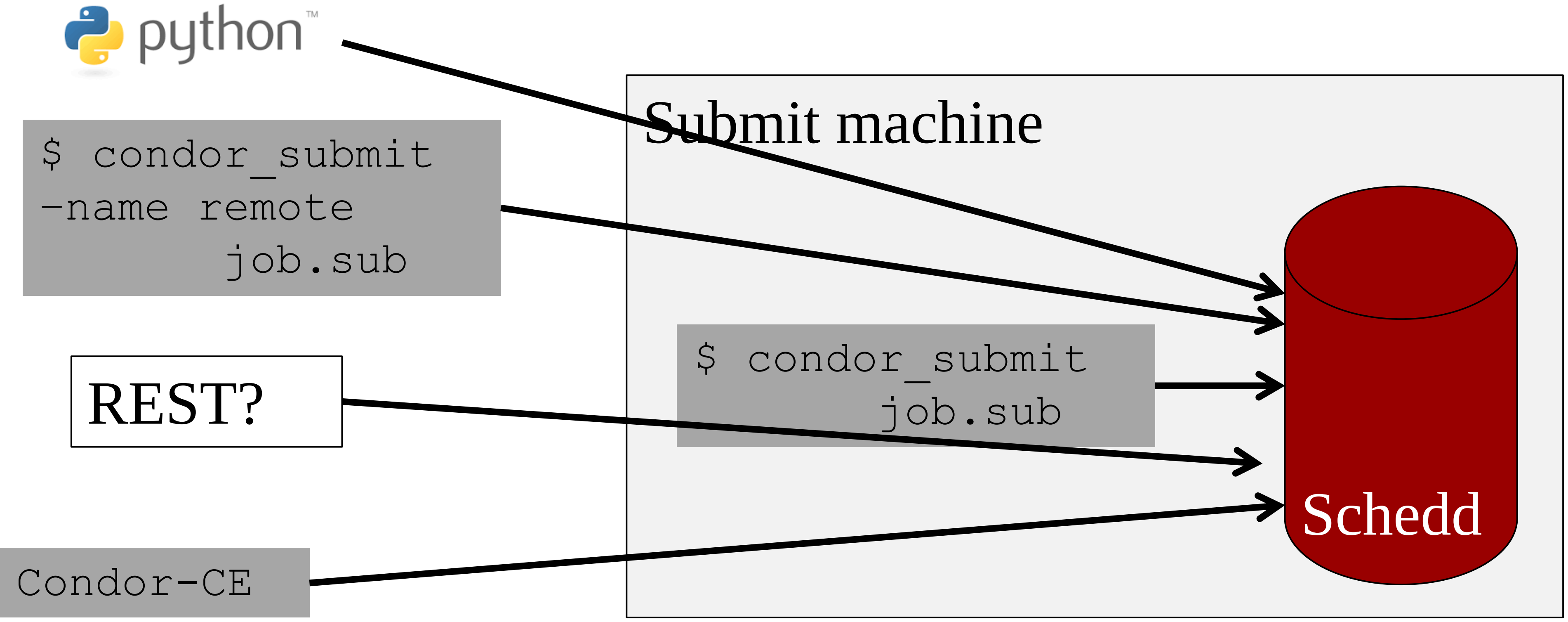
```
$ condor_submit
          job.sub
```

The Old way to submit jobs



```
$ condor_submit
          job.sub
```

The many WAYS to submit jobs



Limits

A detour about terms…

Owner vs Submitter (vs User)

Owner attribute

- *Owner* attribute of job
  - The Unix 'user'
  - Shadow **always** runs as Owner
    - file ownership
    - Permissions / os_limits / ps output, etc.
  - Set by SCHEDD based on submit identity
  - Immutable – just try to condor_qedit it
  - Starter may run job as *Owner* (or maybe not)

Submitter Attribute

- Sometimes (often?) the same as Owner
- Accounting ‘principal’ a.k.a. Submitter
- Negotiator only knows about submitters
  - Who’s quota/priority is checked/docked
  - **User can change at will!!!**
- Many users ***can*** map to one submitter
- One user ***can*** map to many submitters

- Seeing the Owner attribute
  - `$ condor_q -af Owner`
- Showing submitters
  - `$ condor_status -submitter`
  - `$ condor_userprio`

END
DETOUR

Limits

- Max jobs running
- Max jobs per submission
- Max jobs per Owner
- Max running DAGs per Owner
- Max active input transfers
- Max active output transfers

Schedd Limits (i.e. Owner)

- Max jobs running / existing per schedd
  - `MAX_JOBS_RUNNING`
  - `MAX_JOBS_SUBMITTED`
- Max jobs per submission
  - `MAX_JOBS_PER_SUBMISSION`
- Max jobs per Owner
  - `MAX_JOBS_PER_OWNER`

Schedd Limits redux

- Max running DAGs per Owner
  - `MAX_RUNNING_SCHEDULER_JOBS_PER_OWNER`
- Max active input transfers
  - `MAX_CONCURRENT_DOWNLOADS`
- Max active output transfers
  - `MAX_CONCURRENT_UPLOADS`

Limiting SPOOL usage

› ALTERNATE_JOB_SPOOL
    = strcat(“/home/”, Owner)

Most limits are *Submitter* limits

- “Fair” share is by submitter
  - Negotiator only knows about submitters
  - Priority / Quota
  - Transfer queue
- In the negotiator, pool-wide
  - Whole talk on this…

Monitoring the limits

- Schedd Stats
  - condor_status –schedd –long –direct name
- Per submitter stats
  - condor_status –submit –long
  - condor_q –tot –long -allusers
- Show jobs doing file transfer
  - condor_q –io -allusers

End of Limits, on to Policy…

SUBMIT_ATTRS

- Good for setting defaults
- Work happens outside of the SCHEDD
- User can override or un-configure
- Unconditional
- May not happen with remote submit
- Will not happen with python, REST, etc.

Defaulting job attributes

- SUBMIT_ATTRS adds attributes to jobs.

```
SUBMIT_ATTRS = $(SUBMIT_ATTRS) Experiment
Experiment = "CHTC"
```

- Job ad starts with **`Experiment="CHTC"`** before the submit file is processed

Job policy

- You want to have a policy about what jobs are allowed, or require certain attributes?

- And…
- You've got remote condor_submit-ters

Example job policy

- All jobs must have "Experiment" attribute
- Reject jobs that don't.

SUBMIT_REQUIREMENTS

- Schedd requirement, not condor_submit…

- SUBMIT_REQUIREMENT_NAMES = foo ..
- SUBMIT_REQUIREMENT_foo = expr
- SUBMIT_REQUIREMENT_foo_REASON =
  - Expr that evals to string

Example job policy

```
SUBMIT_REQUIREMENT_NAMES = $(SUBMIT_REQUIREMENT_NAMES) CheckExp
SUBMIT_REQUIREMENT_CheckExp = \
    JobUniverse == 7 || Experiment isnt undefined
SUBMIT_REQUIREMENT_CheckExp_REASON = \
   "submissions must have +Experiment"


# JobUniverse 7 is Scheduler universe, i.e. DAGMAN.
# JobUniverse 12 is Local universe, maybe except this also?
```

Mutating jobs using job transforms

› Configure JOB_TRANSFORM_*

```
JOB_TRANSFORM_NAMES = SOME_NAME1 ANOTHER_NAME …
JOB_TRANSFORM_SOME_NAME1 = [ set_Attribute = value; ]
```

Example job transform

```
JOB_TRANSFORM_NAMES = $(JOB_TRANSFORM_NAMES) SetExp
JOB_TRANSFORM_SetExp = [ set_Experiment = "CHTC"; ]
```

- `Experiment="CHTC"` written into each job ad as it is submitted.
  probably not a good thing in this case

Transforming only some jobs

```
JOB_TRANSFORM_NAMES = $(JOB_TRANSFORM_NAMES) SetExp
JOB_TRANSFORM_SetExp @=end
[
  Requirements = JobUniverse != 7 && Experiment is undefined
  set_Experiment = "CHTC";
]
@end
```

› Adds `Experiment="CHTC"` to each job that doesn't already have that attribute

About job transforms

- Converted to native syntax on startup
- Job router syntax is loosely ordered
  - copy > delete > set > eval_set
- Native syntax is
  - Confusing (and might be changing)
  - Top to bottom
  - Has temporary variables
  - Has Conditionals

Job transform native syntax

```
# Use job transform to add pool constraint to vanilla jobs
# based on whether the job needs GPUs or not
#
JOB_TRANSFORM_GPUS @=end
  REQUIREMENTS JobUniverse == 5
  tmp.NeedsGpus = $(MY.RequestGPUs:0) > 0
  if $INT(tmp.NeedsGpus)
    SET Requirements $(MY.Requirements) && (Pool == "ICECUBE")
  else
    SET Requirements $(MY.Requirements) && (Pool == "CHTC")
  endif
@end
```

Preventing change

- IMMUTABLE_JOB_ATTRS
  - Cannot be changed once set
- PROTECTED_JOB_ATTRS
  - Cannot be changed by the user
- SECURE_JOB_ATTRS
  - Like protected, but have security implications

```
IMMUTABLE_JOB_ATTRS=$(IMMUTABLE_JOB_ATTRS) Experiment
```

The motivating case for all this

- How do I assign jobs to accounting groups automatically, preventing cheating users

  Job transforms + Immutable attributes

- But doing this in classad language is *painful*

```
eval_set_AcctGroup=\
  IfThenElse(Owner=="Bob","CHTC",
    IfThenElse(Owner=="Alice","Math",
      IfThenElse(Owner=="Al","Physics","Unknown")
  ))
```

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Introducing Map files

- Map file is text, with 3 fields per line
- * <key_or_regex> <result_list>

```
* Bob         CHTC, Security
* Alice       CHTC, Math, Physics
* /.*Hat/i Problem
* /.*/        CHTC
```

- Yes, the first field must be *

Defining a map

```
SCHEDD_CLASSAD_USER_MAP_NAMES = MyMap

CLASSAD_USER_MAPFILE_MyMap = /path/to/mapfile
            <or>
SCHEDD_CLASSAD_USER_MAPDATA_MyMap @=end
 * Bob CHTC,Security
 * Alice CHTC,Math,Physics
 * /.*Hat/i Problem
 * /.*/ CHTC
@end
```

Can now use the userMap("MyMap") function in Classad expressions in the SCHEDD.

The Classad userMap function

```
result = userMap(mname, input)
```

- map input to first result

```
result = userMap(mname, input, preferred)
```

- map input to preferred result

```
result = userMap(mname, input, pref, def)
```

- map input to preferred or default result

Putting it all together

```
SCHEDD_CLASSAD_USER_MAP_NAMES = $(SCHEDD_CLASSAD_USER_MAP_NAMES) Groups
CLASSAD_USER_MAPFILE_Groups = /path/to/mapfile

# Assign groups automatically
JOB_TRANSFORM_NAMES = AssignGroup
JOB_TRANSFORM_AssignGroup @=end
 [
  copy_Owner="AcctGroupUser";
  copy_AcctGroup="RequestedAcctGroup";
  eval_set_AcctGroup=usermap("AssignGroup",AcctGroupUser,AcctGroup);
]
@end

# Prevent Cheating
IMMUTABLE_JOB_ATTRS = $(IMMUTABLE_JOB_ATTRS) AcctGroup AcctGroupUser
SUBMIT_REQUIREMENT_NAMES = $(SUBMIT_REQUIREMENT_NAMES) CheckGroup
SUBMIT_REQUIREMENT_CheckGroup = AcctGroup isnt undefined
SUBMIT_REQUIREMENT_CheckGroup_REASON = strcat("Could not map ", Owner, " to a group")
```

Or, to put it another way

```
use FEATURE:AssignAccountingGroup(/path/map)
```

You can run

```
condor_config_val use feature:AssignAccountingGroup
```

to see what this metaknob expands to

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Any Questions?