HTCondor-CE 5 and Job Router Transforms

John (TJ) Knoeller, Brian Lin
Center for High Throughput Computing
For a detailed introduction, see this “HTCondor-CE Overview” talk
https://indico.cern.ch/event/936993/contributions/4022131/

Or watch the YouTube video on our channel!
https://www.youtube.com/watch?v=6lWaMbofG7M
Resource Allocation Requests (RARs)

- Access Point
- RAR Factory
- Compute Entrypoint
- Local Batch System
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HTCondor-CE 5!

- The new major version available alongside the HTCondor 9.0 and 9.1 series
- Support added for an improved Job Router configuration syntax: Job Router Transforms
- `condor_mapfile` formatting and location changes
- Moved to Python 3 and added support for Enterprise Linux 8 based operating systems
- `$HOME` is no longer set by default in the RAR environment
HTCondor-CE 5 Mapping Configuration

- CE administrators must now place their own RAR credential → local user mappings in a dedicated directory, /etc/condor-ce/mapfiles.d/
- Keep an eye out for /etc/condor-ce/condor_mapfile.rpmsave
- Downstream packagers can include default mappings in /usr/share/condor-ce/mapfiles.d/
- Credential matching strings must be converted to regular expressions
  - In the old syntax, a mapping based on the token issuer:
    SCITOKENS "https://scitokens.org/osg-connect" osgpilotuser
  - In the new syntax:
    SCITOKENS /^https:\/\//scitokens\.org\/osg-connect,/, osgpilotuser
  - Additionally, SciTokens/WLCG tokens can be mapped based on the token’s subject (e.g., “testing”):
    SCITOKENS /^https:\/\//scitokens\.org\/osg-connect,testing$/ osgtestuser
New Job Router config for HTCondor 9.0
Motivation

- Job Router use has changed
- Two different transform languages - Schedd submit transforms vs Job Router
  - Submit transforms are more powerful
  - Job router trying to do too much with a single transform.
Backward compatibility

- Pre HTCondor 9.0 configuration still works,
- Individual routes can use the new syntax
- If there is a route name conflict
  - old syntax route is ignored
  - logged in JobRouterLog on startup
Review: old config

- **JOB_ROUTER_DEFAULTS**
  - One huge ClassAd for all routes

- **JOB_ROUTER_ENTRIES**
  - List of ClassAds, one for each route

Job Router splits the ENTRIES into individual route ads, then merges each with DEFAULTS ad(s) to get the effective route ads
New config splits things up

- One config knob for each route
- "defaults" is now pre and post route transforms
- Effective route is now a sequence
  - Zero or more pre-route transforms
  - One Route transform
  - Zero or more post-route transforms
New config knobs

**JOB_ROUTER_ROUTE_NAMES**
- list of route names to be matched in order

**JOB_ROUTER_ROUTE_<name>**
- defines a single route and match constraint

**JOB_ROUTER_PRE_ROUTE_TRANSFORM_NAMES**

**JOB_ROUTER_POST_ROUTE_TRANSFORM_NAMES**
- Applied to all jobs as they are routed

**JOB_ROUTER_TRANSFORM_<name>**
- Defines a single pre or post route transform
A route is a sequence

- Route REQUIREMENTS evaluated until a match is found
- A single route is applied:
  1. Create a temporary variable set
  2. Apply Pre-route transforms that match the job
  3. Apply the route
  4. Apply Post-route transforms that match the job
  5. Send the modified job classad to the destination schedd
  6. Clear the temporary variable set
- Each transform has access to changes to the job and variable set that are made by earlier transforms
Route/Transform commands

● Commands start with a keyword to modify the job
  SET, DEFAULT, EVALSET
  RENAME, COPY, DELETE

● or configure the route
  REQUIREMENTS, UNIVERSE, NAME

● or set a temp variable
  EVALMACRO
Route syntax similar to submit

name = value
○ sets a temp variable - job is not changed
○ temp variables used for $() substitution
○ cleared before the next job is routed
○ a few are interpreted by the job router

if / else / endif
○ used to make a block of statements conditional
○ use EVALMACRO for complex conditionals
Some temp variables control routing

# Some special variable names configure the route
# These a read when the route is loaded
JOB_ROUTER_ROUTE_EX @=jre
    # if UNIVERSE is not used, then TargetUniverse is checked
    TargetUniverse = 5
    GridResource = "condor submit.area41.nv submit.area41.nv"
    MaxJobs = 100
    MaxIdleJobs = 50
    FailureRateThreshold = 0.03
    JobShouldBeSandboxed = <bool-expression>
    JobFailureTest = <bool-expression>
    EditJobInPlace = <bool-expression>
    UseSharedcX509UserProxy = <bool-expression>
    SharedX509UserProxy = <string-expression>

...
Route example

JOB_ROUTER_ROUTE_AREA41 @=jre
  UNIVERSE Grid
  REQUIREMENTS Project == "blue-book"

  # some temp variables in the route configure the router
  GridResource = "batch slurm"
  MaxIdleJobs = 20

  SET GPUNumber = 1
  SET ReferringSite = "$(MY_ROUTER_ID)"
@jre

  # set config knobs that the route can use via $() substitution
  MY_ROUTER_ID = wisc.edu
# Example - Jobs that don't have a project defined, get a default
# project of "prj_<Owner>_<month>"

JOB_ROUTER_TRANSFORM_PROJECT @=jrt
    REQUIREMENTS Project is undefined
    EVALSET Project=join("_", "prj", Owner, formattime(qdate,"%b"))
@jrt

# This could also be written as

JOB_ROUTER_TRANSFORM_PROJECT @=jrt
    EVALMACRO tmp = join("_", "prj", Owner, formattime(qdate,"%b"))
    DEFAULT Project = "\$(tmp)"
@jrt
$(name) - name is route temp variable OR condor config variable

$(MY.name) - name is a job attribute when there is a job, expands to nothing otherwise

$() substitution happens before evaluation
  ○ for a few variables when the route is loaded
  ○ for most variables when the route is used
ex: Modify job requirements

JOB_ROUTER_ROUTE_Foo @=jre

....

SET Requirements = ($(My.Requirements)) && site=="$(SITE)"

@jre
SITE = CHTC

Job ClassAd has

Requirements = Arch == "x86_64"

SET Statement
Requirements = ($(My.Requirements)) && site=="$(SITE)"

After $() substitution
Requirements = (Arch == "x86_64") && site=="CHTC"
ex: Modify job environment

JOB_ROUTER_ROUTE_Foo @=jre
....
EVALMACRO addenv = join(" ", "HOME=$(home)" , "Y=$\text{INT}(\text{my.y})"")
SET Environment = "$(My\text{-}\text{Environment})\ $(addenv)"
@jre

Job ClassAd has
Environment = "A=B"
y = 10 + 1

Transform Statements
addenv = join(" ", "HOME=$(HOME)" , "Y=$\text{INT}(\text{my.y})"")
Environment = "$(My\text{-}\text{Environment})\ $(addenv)"

After $()$ substitution
addenv = [eval] join(" ", "HOME=/usr/home/" , "Y=11")
addenv = HOME=/usr/home Y=11
Environment = "A=B HOME=/user/home Y=11"
Testing your transforms

- condor_job_router_info (and condor_ce_job_router_info)
  - simulate routing of a job and see the result
    `condor_job_router_info -job <in> -route <out>`

- condor_transform_ads
  - stand alone tool for testing a single transform
  - -verbose mode logs the transform steps
    `condor_transform_ads -rules <xfm> -in <in>
    condor_transform_ads -help rules`
Questions?

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