GlideinWMS's use of cvmfsexec

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GlideinWMS

- GlideinWMS is a pilot based resource provisioning tool for distributed High Throughput Computing
- Provides reliable and uniform virtual clusters
- Submits Glideins to unreliable heterogeneous resources
- Leverages HTCondor
  - Provides HTCondor pools
  - Uses HTCondor capabilities
Frontend

• Monitors jobs to see how many Glideins are needed
• Compares what entries (sites) are available
• Requests Glideins from the Factory
• Requests Factory to kill Glideins if there are too many
• Pressure-based system
  – Works keeping a certain number of Glideins running or idle at the sites
  – Gradual Glideins requests to avoid spikes and overloads
• Manages credentials and delegates them to the Factory
Factory

• A Glidein Factory knows how to submit to sites
  – Sites are described in a local configuration
  – Only trusted and tested sites are included
• Each site entry in the configuration contains
  – Contact info (hostname, resource type, queue name)
  – Site configuration (startup dir, OS type, …)
  – VOs authorized/supported
  – Other attributes (Site name, core count, max memory, …)
  – Glideins can also auto-detect resources
• Configuration can be auto-generated (e.g. from CRIC),
  admin curated, stored in VCS (e.g. GitHub)
• Condor does the heavy lifting of submissions.
Glidein: node testing and customization

• Mostly shell scripts
• Scouts for resources and validates the Worker node
  – Cores, memory, disk, GPU, …
  – OS, software installed
  – CVMFS
  – VO specific tests
• Customizes the Worker node
  – Environment, GPU libraries, …
  – Starting containers (Singularity, …)
  – Setup of CVMFS
  – VO specific setup
• Provides a reliable and customized execute node to HTCondor
• Reports back to the Factory
GlideinWMS and CernVM-FS

- Used by the Glideins
- Hosts the Singularity binary provided by OSG
- Hosts most Singularity images shared by OSG
  - Fermilab worker nodes replicas
  - OSG images (default for GlideinWMS)
- Hosts the software of several VOs
Glidein structure (current*)

- Spawns multiple Glideins if needed (MPI, multi-glidein, ...)
- Initial checks
- Download of scripts and setup
  - includes CVMFS mounting and Singularity testing
- Start HTCondor startd and join the pool
  - Start Singularity for each job individually (via wrapper)
- Cleanup
  - included modular scripts
Glidein downloads

- signed HTTP downloads from Factory and Frontend
Glidein downloads

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- HTTP downloads from Job or user server
Glidein downloads

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- credentials (x509 proxies and JWTokens) are forwarded via secure channels
Glidein downloads

- signed HTTP downloads from Factory and Frontend
- HTTP downloads from Job or user server
- credentials (x509 proxies and JWTokens) are forwarded via secure channels
- Singularity images and VO software from CVMFS
cvmfsexec use (current*)

• During setup
  – check OS
  – check support for unprivileged user namespaces
  – check FUSE (packages installed, user in fuse group)
  – download cmfsexec package (both OSG and EGI distributions)
  – if desired use cmfsmount (with the configuration selected)
    • mounted on /cvmfs if possible

• During Singularity startup (job wrapper)
  – bind mount the mount directory to /cvmfs

• During cleanup
  – use cmfsunmount if there are mounted file systems
cvmfsexec use (planned)

- During initial setup
  - check OS
  - check support for unprivileged user namespaces
  - check FUSE (packages installed, user in fuse group)
  - download cvmfsexec distribution if needed (only the configuration desired)
  - decide best option between cvmfsexec and cvmfsmount (given the OS and configuration)
    - mounted on /cvmfs if possible
- During re-invocation (if needed)
  - use cvmfsexec
- During Singularity startup (job wrapper)
  - bind mount the mount directory to /cvmfs
- During cleanup
  - use cvmfsunmount if needed
Glidein structure (planned)

- Spawns multiple glideins if needed (MPI, multi-glidein, ...)
- Initial checks
- Download of scripts and setup
  - includes CVMFS mounting and Singularity testing
- **Exec the inner part of the Glidein**
- Complete setup
- Start HTCondor startd and join the pool
  - Start Singularity for each job individually (via wrapper)
- **Cleanup**
  - included modular scripts
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References

https://github.com/glideinWMS/glideinwms
Summary

- Glideins are pilot jobs that allow setup and cleanup for each experiment job
- Currently (next production version) support `cvmfsmount/umount`
  - Thanks to Singularity CVMFS always available in `/cvmfs` for the experiments
- To improve reliability will support all `cvmfsexec` modes