Outline

- Background
- MRG Status
- Condor and Deltacloud
- Condor/Red Hat Collaboration
- Condor at 10K+ scale
Background

- Red Hat is investing in a set of defining technologies, actively being developed in conjunction with partners. These key projects include among others...
  - Grid/Distributed computing (Partnership with UW around Condor)
  - Real-time (provides pre-emption and latency determinism)
  - Virtualization (provides scale, VM, KVM, and ability to provide environment with Job)
  - Distributed computing / Messaging (built on AMQP) www.apache.org/qpid www.amqp.org
  - Cloud APIs with Deltacloud www.deltacloud.org
  - .... just to name a few

- The combination of these types technologies in a standard Linux distribution will provide a new generation of compute platforms.
MRG Status

• **Coming up on the 3\textsuperscript{rd} update, MRG 1.3**
  - http://www.redhat.com/mrg
  - Qpid graduated to top level Apache project
  - Enhanced Condor manageability

• **Red Hat Global Professional Services**
  - Engaging around MRG Grid
  - Strategic planning
  - Pilot and integration testing
  - Integration into standard operating environment
  - Full life-cycle management and migration
  - Custom development around Condor
Enhanced Condor manageability

- **MRG Management Console**
  - http://www.youtube.com/watch?v=kPi8ickYN84
  - Improved job visualization with rollup into submissions
  - Integrating dynamic EC2 resources into pool views
  - Addition of user focused interface
  - Scale by removing backend load from Schedd

- **Alerting infrastructure over Messaging**

- **Configuration management**
  - Model params, features, nodes, groups
  - Configuration validation, feature param resolution
  - Ensure configuration application
  - See Will and Rob’s talk later
Condor and Deltacloud

- Deltacloud is an API that abstracts the differences between clouds
  - http://www.deltacloud.org/drivers.html
  - EC2, RHEV-M, Rackspace, RimuHosting, OpenNebula, …
- Deltacloud from Condor-G
  - grid_resource = dcloud
- Deltacloud to Condor resources
  - Build on VM Universe, Condor’s resource management and scheduling capabilities
  - Decisions to make: image management, VM sizing, realms
- Positioning Condor as a core component in Cloud building
**Condor Project and Red Hat Collaboration**

**Condor Week 2007**
- Red Hat/Condor collaboration
  - Condor open source
  - Red Hat Madison office

**Condor Week 2008**
- EC2
  - Management

**Condor Week 2009**
- Collaboration update

**Condor Week 2010**

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**Condor 7.0 Release**
- 1st release with source
  - Condor into Fedora
  - Beta MRG release

**Condor 7.2 Release**
- UW/Red Hat features
  - Red Hat MRG 1.1 GA

**Condor 7.4 Release**
- Open Source advancement
  - UW/Red Hat features
Open Source advancement

- UW source code repository now available via a public repository
  - git clone http://condor-git.cs.wisc.edu/repos/condor.git

- UW ticket tracking system now available to anonymous users
  - http://condor-wiki.cs.wisc.edu
  - Ticket/issue tracking (bugs, features, todo, doc)
  - Wiki with developer, user, administrator documentation

- Transparency
  - Ticket numbers (#XYZ)
Open Source advancement

• Tickets (from 13 Jan 2009 to 14 April 2010)
  • 1,352 total tickets
  • 289 resolved defects
  • 143 resolved enhancements

• Commits (as of 14 April 2010)
  • 3,196 commits in the last 260 working days by 34 individuals

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<td>Jaime Frey</td>
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<td>Robert Rati</td>
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<td>Todd Tannenbaum</td>
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UW/Red Hat features

• VM Universe enhancements
  • The condor_vm-gahp now supports KVM and links with libvirt, rather than calling virsh command-line tools. (#688, #1079, …)
  • VM Universe support for helper scripts to generate libvirt XML (#618)
• DAEMON_LIST to be reconfigurable (#1306)
  • Add multiple Startds or Schedds without restarting
• kill_sig for Vanilla Universe (#1289)
  • Allows programs a chance to cleanup or checkpoint
• Modernizing build chain with cmake (was imake) (#779)
  • For developers mostly, proper dependencies, consistent across platforms (Windows), enhanced packaging
• Configuration table, enhanced usability (#123, #988)
  • …
Condor at 10K+ scale

- **Negotiator and Collector**
  - Both want fast CPUs and modest amounts of RAM
  - Negotiator speed directly influences utilization, through speed in producing matches and interrupt (blocking) interaction with Schedds
  - Collector speed impacts utilization through Negotiator interaction and the accuracy of its pool view

- **Schedd and Shadows**
  - Submit host for 10K CPU pool needs >16GB of memory
  - Shadow private memory O(1.5MB)
  - 8GB DDR3 DIMMs at ~$1,000 each, need 3 to be >16GB
  - Double that for an HA Schedd configuration
  - Triple it to allow for backup hardware
  - That’s ~$0.90 per CPU for memory
Improvements for scale

• **Negotiator** –
  • Development of asynchronous negotiation protocol on the development roadmap (#928)

• **Collector** –
  • When anything leaves the pool it sends an INVALIDATE message to the Collector
  • Invalidation was $O(\text{number of ads in the Collector})$
  • From 7.4.3 on the Collector has an $O(1)$ algorithm (#1316)

• **Shadow** –
  • Memory & code analysis needed

• **Schedd** –
  • Ongoing efforts reducing file system operations, optimizing event loop
  • #921, #749, #1061, …
Schedd scale

- Jobs: 20,000 sleep 45 (no log), SPOOL on NFS
- Patched –
  - #1287, #1288 (March)
- Duration –
  - 7.4.3-0.5: 5,853 sec
  - Patched: 1,261 sec
- Concurrent (mean) –
  - 7.4.3-0.5: 544 shadows
  - Patched: 1,255 shadows
- More! 10x speedup
  - #1348 (just this week)
  - ~27 to ~277 jobs/sec
Thank You

We are still hiring, contact matt@redhat.com