NMI Build & Test Laboratory:

Continuous Integration Framework for Distributed Computing Software

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Motivation

- Difficult to reliably build and test software.
- Build and test system that allows for:
  - Dependability
  - Traceability
  - Manageability
  - Portability
  - Extensibility

Brief History

- Condor is a distributed batch system developed at the University of Wisconsin-Madison.
- The Condor team was building and testing software by hand:
  - Every release took weeks/months to complete.
  - Developers were assigned platforms to “shepherd”.
- Oracle shamed/inspired us

Oracle's Build & Test System

- Oracle used distributed computing to automate their build/test cycle, with great success.
- Oracle selected Condor as the resource manager underneath their build and test system for their flagship database server product:
  - Automatic nightly builds.
  - Extensive regression testing.
- If Oracle can do it, why can't we?

NMI Build & Test Framework

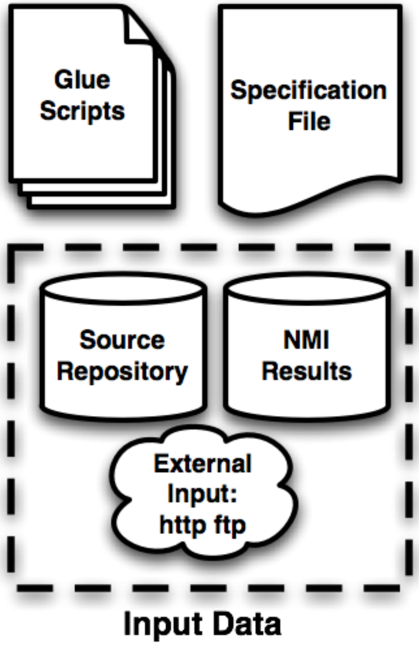
- Framework for building/testing software in a heterogeneous, multi-user, distributed computing environment.
- Abstracts the build/test procedures from the technology needed to execute on multiple resources.
- Built on top of Condor technologies.
- Part of NSF's Middleware Initiative (NMI)

Framework Design Principles

- Tool independent
- Lightweight
- Explicit environments
- Central results repository
- Fault tolerant
- Explicit task separation

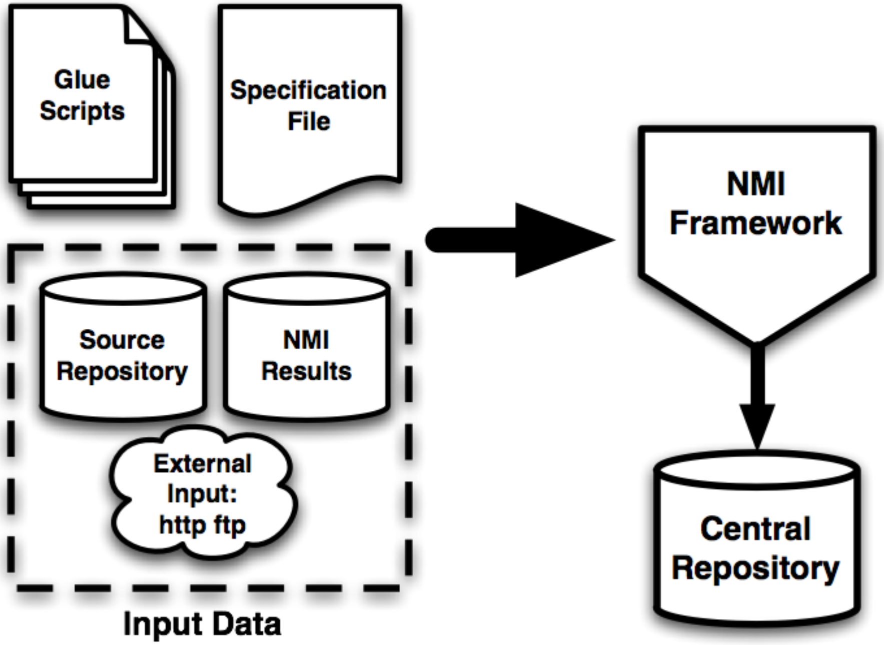
Using the Framework

- Users define a set of build/test procedures, and declare software dependencies and target platforms.



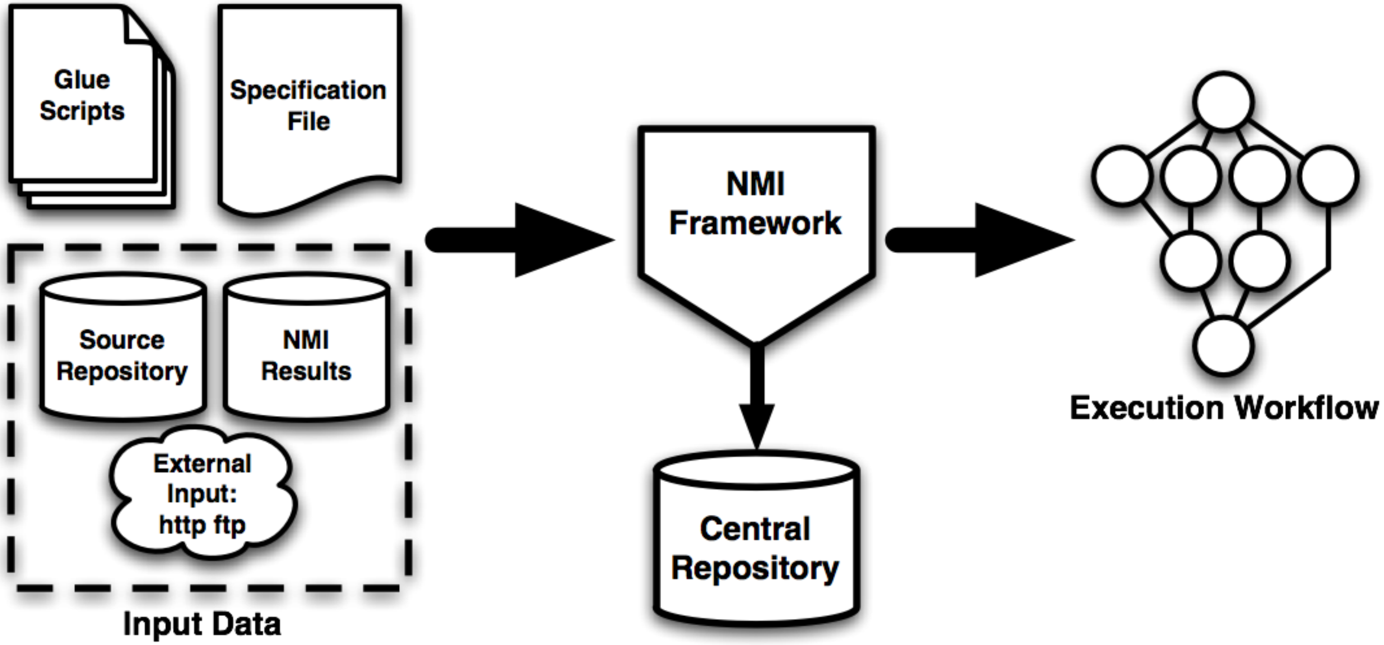
Using the Framework

- This information is submitted to the framework and stored in the central repository.



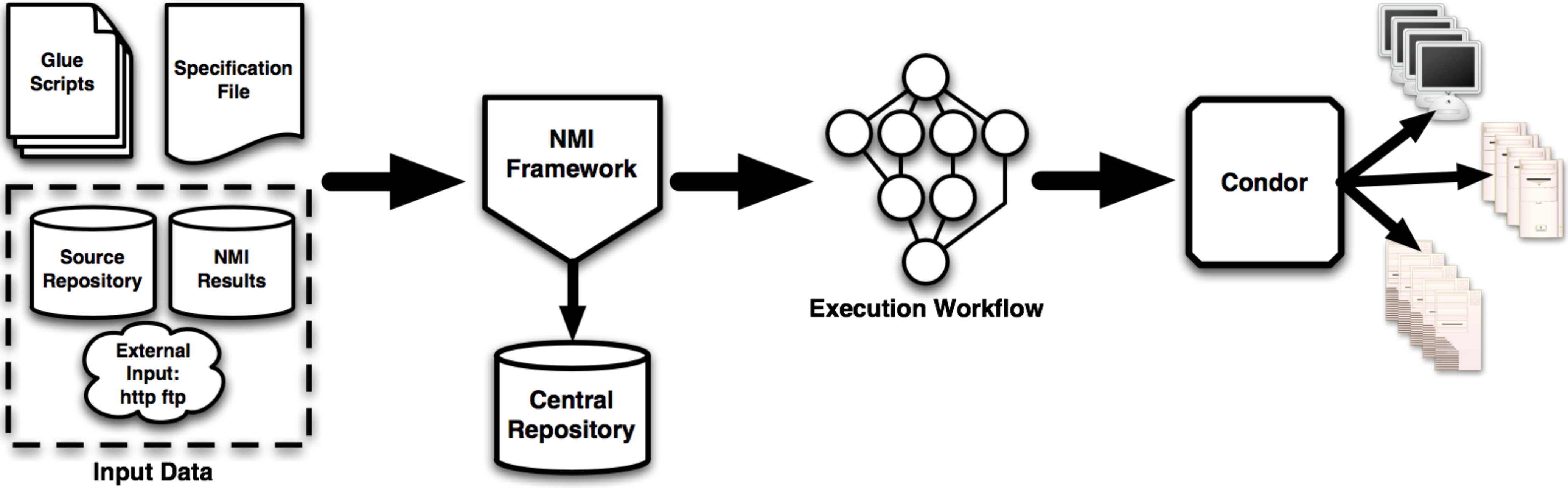
Using the Framework

- The build/test procedures are then translated into an execution workflow.



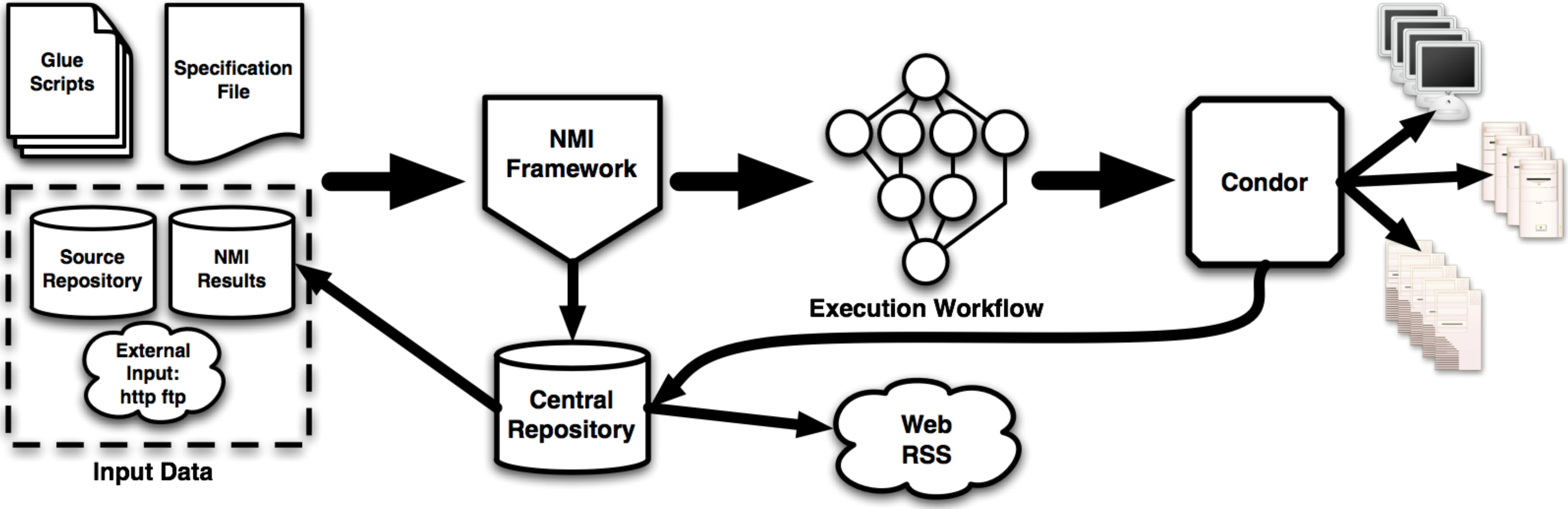
Using the Framework

- This workflow is submitted to Condor, which then submits build and test subtasks, along with special framework software, to one or more computing resources.



Using the Framework

- When the build/test is complete, the results are sent back to the central repository and made available at multiple user interfaces or for future builds and tests.



Building Software

- Automation:
  - Encapsulate procedures in self-contained entities.
- Resource availability:
  - Maintain balance between continuous integration practices and on-demand access to resources.
- Reproducible builds:
  - External software and tool chain provenance.
- Portable build environment:
  - No dependencies on “local” capabilities.

Software Testing Capabilities

- Use any testing harness/suite.
- Cross-site testing:
  - Test services across administrative boundaries.
- Cross-platform binary compatibility testing:
  - Example: “Deploy Linux binaries on FreeBSD”
- Version backlog testing:
  - Run <u>new</u> tests on <u>old</u> binaries.

Current & Future Research

- Parallel testing:
  - Synchronized deployment of services on multiple machines.
  - Test communication compatibility (platforms/versions)
- Automatic cross-site job migration:
  - Jobs automatically routed to remote sites when local resources are unavailable to satisfy requirements.
  - Completely transparent to users.

Current & Future Research

- Virtual machine support:
  - Maintain cache of available OS VM images.
  - Inject build & test scripts inside of VM image.
  - Extract appropriate status, log, and job artifacts.
  - Automatic discovery of image configuration.
- Integration with other software quality projects:
  - ETICS Project at CERN
  - OMII-UK/Japan
  - Assisting Yahoo!, Hartford Financial, and others...

Acknowledgments

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  - No. ANI-0330634
  - No. ANI-0330685
  - No. ANI-0330670

Availability

- The NMI Build & Test Laboratory continuous integration framework is available for download at our website under a BSD-like license:

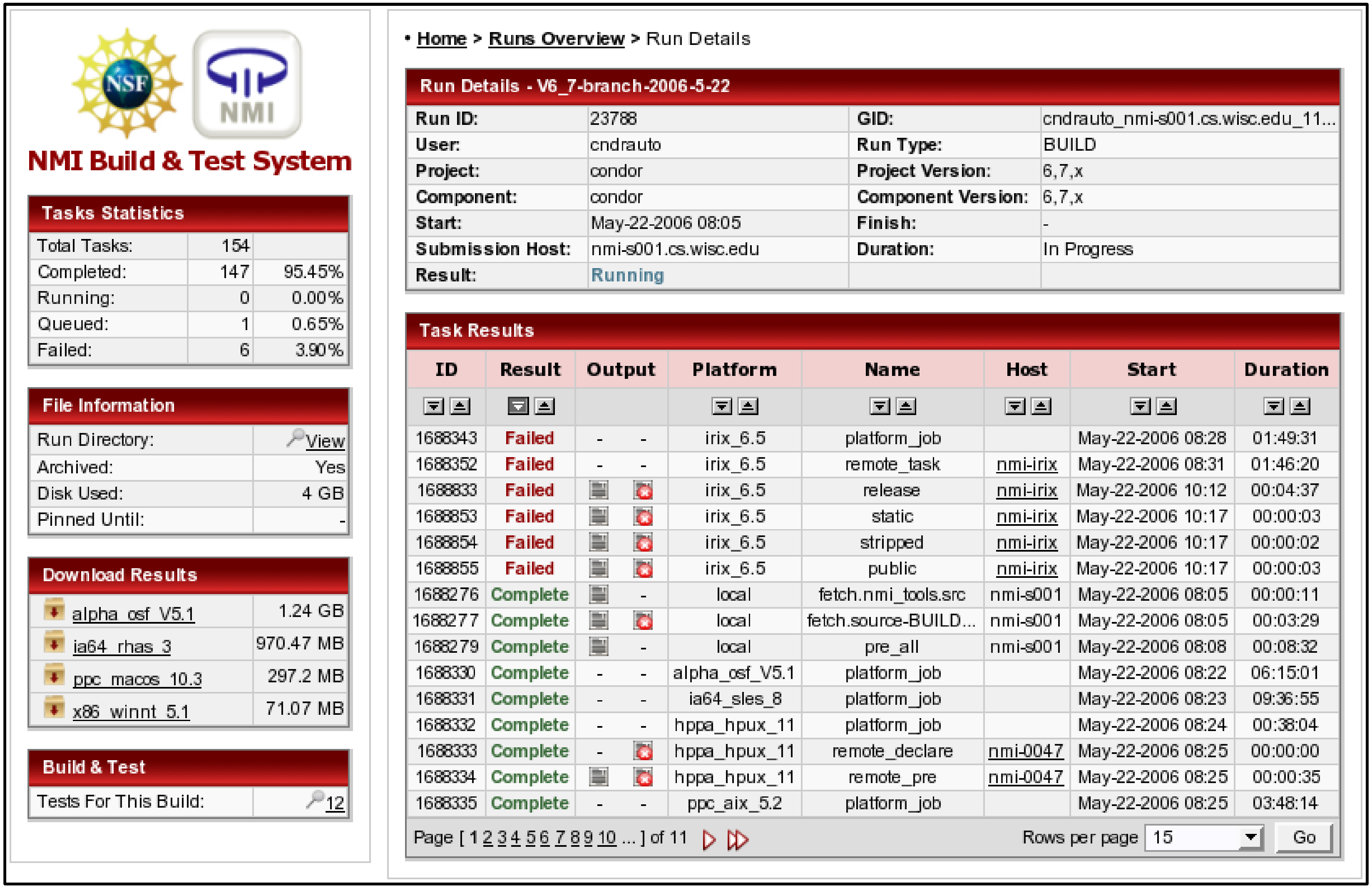
http://nmi.cs.wisc.edu

Job Openings

- The Condor Project is hiring!
  - **System Administrator**
  - Windows Systems Programmer
  - Unix Programmers

http://www.cs.wisc.edu/condor

NMI Web Interface



NMI Build & Test System

Tasks Statistics		
Total Tasks:	154	
Completed:	147	95.45%
Running:	0	0.00%
Queued:	1	0.65%
Failed:	6	3.90%

File Information	
Run Directory:	View
Archived:	Yes
Disk Used:	4 GB
Pinned Until:	-

Download Results	
alpha_osf_V5.1	1.24 GB
ia64_rhas_3	970.47 MB
ppc_macos_10.3	297.2 MB
x86_winnt_5.1	71.07 MB

Build & Test	
Tests For This Build:	12

• Home > Runs Overview > Run Details

Run Details - V6_7-branch-2006-5-22

Run ID:	23788	**GID:**	cndrauto_nmi-s001.cs.wisc.edu_11...
User:	cndrauto	**Run Type:**	BUILD
Project:	condor	**Project Version:**	6,7,x
Component:	condor	**Component Version:**	6,7,x
Start:	May-22-2006 08:05	**Finish:**	-
Submission Host:	nmi-s001.cs.wisc.edu	**Duration:**	In Progress
Result:	Running		

Task Results

ID	Result	Output		Platform	Name	Host	Start	Duration
▼ ▲	▼ ▲			▼ ▲	▼ ▲	▼ ▲	▼ ▲	▼ ▲
1688343	Failed	-	-	irix_6.5	platform_job		May-22-2006 08:28	01:49:31
1688352	Failed	-	-	irix_6.5	remote_task	nmi-irix	May-22-2006 08:31	01:46:20
1688833	Failed	▤	⊗	irix_6.5	release	nmi-irix	May-22-2006 10:12	00:04:37
1688853	Failed	▤	⊗	irix_6.5	static	nmi-irix	May-22-2006 10:17	00:00:03
1688854	Failed	▤	⊗	irix_6.5	stripped	nmi-irix	May-22-2006 10:17	00:00:02
1688855	Failed	▤	⊗	irix_6.5	public	nmi-irix	May-22-2006 10:17	00:00:03
1688276	Complete	▤	-	local	fetch.nmi_tools.src	nmi-s001	May-22-2006 08:05	00:00:11
1688277	Complete	▤	⊗	local	fetch.source-BUILD...	nmi-s001	May-22-2006 08:05	00:03:29
1688279	Complete	▤	-	local	pre_all	nmi-s001	May-22-2006 08:08	00:08:32
1688330	Complete	-	-	alpha_osf_V5.1	platform_job		May-22-2006 08:22	06:15:01
1688331	Complete	-	-	ia64_sles_8	platform_job		May-22-2006 08:23	09:36:55
1688332	Complete	-	-	hppa_hpux_11	platform_job		May-22-2006 08:24	00:38:04
1688333	Complete	-	⊗	hppa_hpux_11	remote_declare	nmi-0047	May-22-2006 08:25	00:00:00
1688334	Complete	▤	⊗	hppa_hpux_11	remote_pre	nmi-0047	May-22-2006 08:25	00:00:35
1688335	Complete	-	-	ppc_aix_5.2	platform_job		May-22-2006 08:25	03:48:14

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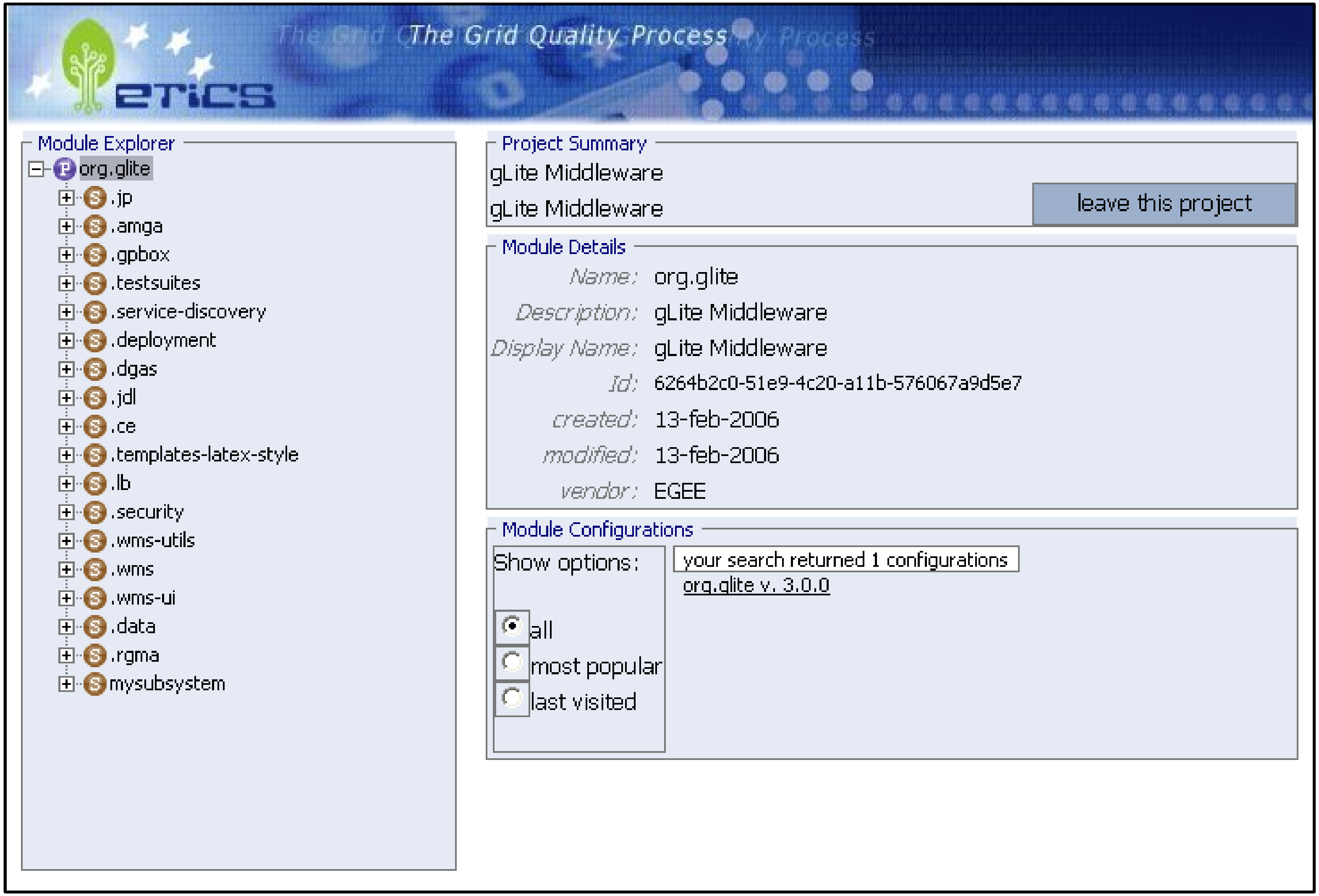
ETICS Client



Module Explorer

- org.glite
  - .jp
  - .amga
  - .gpbox
  - .testsuites
  - .service-discovery
  - .deployment
  - .dgas
  - .jdl
  - .ce
  - .templates-latex-style
  - .lb
  - .security
  - .wms-utils
  - .wms
  - .wms-ui
  - .data
  - .rgma
  - mysubsystem

Project Summary

gLite Middleware

gLite Middleware

Module Details

Name:	org.glite
Description:	gLite Middleware
Display Name:	gLite Middleware
Id:	6264b2c0-51e9-4c20-a11b-576067a9d5e7
created:	13-feb-2006
modified:	13-feb-2006
vendor:	EGEE

Module Configurations

Show options:

● all
○ most popular
○ last visited

your search returned 1 configurations

org.glite v. 3.0.0