

Quality Control in the dCache team.



Owen Synge
dCache Team

GEFÖRDERT VOM



Bundesministerium
für Bildung
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- Quality Control in the dCache team.
- Test Driven development (Our Tests).
 - Unit Tests and Code Analysis.
- Developer Code Flow.
- Code Review.
- Automated build and tests.
- Upload to Web Site.
- Recommended Releases.
- What can be improved?

Test Driven development (Our Tests)



- Static Code analysis.
 - FindBugs.
- Unit Tests.
 - With junit framework.
- Functional tests.
 - DcacheTestSuite.
 - S2 SRM test Suite.
 - G2 dcacheTestSuite.
 - Port of dCache test suite to junit reporting for Hudson.

- Findbugs.
 - Allows reporting on many coding errors.
 - Very good for coding style suggestions.
 - Very low impact on code produced by developers.
- Unit tests via junit.
 - Graphs generated by Hudson are very nice.
 - Main reason G2 dCache test suite ported to junit.
 - Winner 2008 Dukes Choice Java Development tool.
 - Score Board.
 - Not so useful (though often right).
 - Points go up and down to much.

Unit Tests and Code Analysis



• Hudson Showing jUnit and FindBugs Output

The screenshot displays the Hudson web interface for the 'dCache-Build' project. The browser address bar shows 'http://svn.dcache.org/build/job/dCache-Build/'. The Hudson header includes a search bar and the user 'omsynge | log out'. The main content area is titled 'Project dCache-Build' and includes a description: 'Full dCache build including cells, core, SRM, replica manager, gPlazma and infoProvider'. Below this, there are links for 'Workspace', 'Last Successful Artifacts' (listing 'dcache-server-1.9.3-1rc.noarch.rpm'), 'Recent Changes', and 'Latest Test Result (20 failures / ±0)'. A 'Build History' table is visible on the left, listing builds from #2007 to #2028 with dates and times. The right side features two trend graphs: 'Test Result Trend' and 'FindBugs Trend'. The 'Test Result Trend' graph shows a count of test results over time, with a significant increase in failures starting around build #1970. The 'FindBugs Trend' graph shows a count of FindBugs issues, which remains relatively stable around 2000.

Build Number	Date and Time
#2028	May 1, 2009 2:02:16 PM
#2027	May 1, 2009 1:47:48 PM
#2026	Apr 29, 2009 12:24:38 PM
#2025	Apr 29, 2009 11:57:38 AM
#2024	Apr 29, 2009 10:14:38 AM
#2023	Apr 28, 2009 11:37:38 PM
#2022	Apr 24, 2009 2:24:42 PM
#2021	Apr 24, 2009 2:10:38 PM
#2020	Apr 22, 2009 1:06:38 PM
#2019	Apr 22, 2009 12:47:39 PM
#2018	Apr 22, 2009 12:28:38 PM
#2017	Apr 17, 2009 2:46:49 PM
#2016	Apr 17, 2009 9:41:26 AM
#2015	Apr 17, 2009 9:23:49 AM
#2014	Apr 16, 2009 4:43:49 PM
#2013	Apr 16, 2009 4:28:59 PM
#2012	Apr 16, 2009 4:08:49 PM
#2011	Apr 16, 2009 10:18:48 AM
#2010	Apr 16, 2009 9:53:48 AM
#2009	Apr 15, 2009 9:22:48 AM
#2008	Apr 14, 2009 11:23:49 PM
#2007	Apr 14, 2009 11:05:48 PM

Code Analysis.



- FindBugs Provides good results.
 - Few fixes have come from FindBugs.

Hudson FindBugs Warnings

FindBugs Result

Warnings Trend

All Warnings	New Warnings	Fixed Warnings
2089	0	6

Summary

Total	High Priority	Normal Priority	Low Priority
2089	161	1928	0

Details

High

- File: CellShell.java, Line: 1696, Type: DMI_BLOCKING_METHODS_ON_URL, Priority: High, Category: CORRECTNESS**
dmg.cells.nucleus.CellShell.ac_copy_\$_2(Args) invokes java.net.URL.equals(Object), which blocks to do domain name resolution. The equals and hashCode method of URL perform domain name resolution, this can result in a big performance hit. See <http://michaelscharf.blogspot.com/2006/11/javaneurlequals-and-hashcode-make.html> for more information. Consider using java.net.URI instead.
- File: PnfsManagerV3.java, Line: 1672, Type: RV_ABSOLUTE_VALUE_OF_HASHCODE, Priority: High, Category: CORRECTNESS**
Bad attempt to compute absolute value of signed 32-bit hashcode in diskCacheV111.namespace.PnfsManagerV3.messageArrived(CellMessage). This code generates a hashcode and then computes the absolute value of that hashcode. If the hashcode is Integer.MIN_VALUE, then the result will be negative as well (since Math.abs(Integer.MIN_VALUE) == Integer.MIN_VALUE).
- File: LoginCell.java, Line: 154, Type: DE_MIGHT_IGNORE, Priority: High, Category: CORRECTNESS**
dmg.cells.services.login.LoginCell.cleanUp() might ignore java.lang.Exception. This method might ignore an exception. In general, exceptions should be handled or reported in some way, or they should be thrown out of the method.
- File: ChimeraNameSpaceProvider.java, Line: 432, Type: DE_MIGHT_IGNORE, Priority: High, Category: CORRECTNESS**
org.dcache.chimera.namespace.ChimeraNameSpaceProvider.getChecksums(PnfsId) might ignore java.lang.Exception. This method might ignore an exception. In general, exceptions should be handled or reported in some way, or they should be thrown out of the method.
- File: EasyCopyCellModule.java, Line: -1, Type: SE_BAD_FIELD, Priority: High, Category: CORRECTNESS**
Class diskCacheV111.replicaManager.EasyCopyCellModule defines non-transient non-serializable instance field _poolInfoHandler. This Serializable class defines a non-primitive instance field which is neither transient, Serializable, or java.lang.Object, and does not appear to implement the Externalizable interface or the readObject() and writeObject() methods. Objects of this class will not be deserialized correctly if a non-Serializable object is stored in this field.
- File: Manager.java, Line: 3489, Type: SQL_NONCONSTANT_STRING_PASSED_TO_EXECUTE, Priority: High, Category: CORRECTNESS**

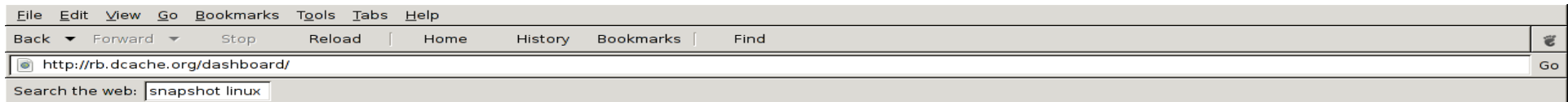


- Developers check code against Unit tests.
- Patch against appropriate branches.
 - Submitted to Review Board.
 - Forcing details of Patch details to be documented.
 - Often use Mercurial to manage patches.
- Patch Reviewed.
 - Can cause friction (Usually Positive).
- Approved Patches are applied to SVN.
 - Post commit SVN hook triggers Hudson.
 - SVN comment taken from Review Board Patch
 - Also includes Review Board.

Code Review – Surprisingly works



• Review Board : My Dashboard of Pending Patches



Review Board beta

Welcome, **Owen Syng** - [My account](#) - [Log out](#) - [Documentation](#) - [Bugs](#) - [Report bug](#)

[My Dashboard](#) [New Review Request](#) - [All review requests](#) [Groups](#) [Submitters](#)

★ Starred Reviews		0	All Incoming Review Requests			
Outgoing Reviews		0	Summary			
Incoming Reviews		19	Submitter	Posted	Last Updated	...
To Me	0	☆ Refactors the dcache script	behrmann	March 6th, 2009, 7:50 a.m.	5 days, 5 hours ago	
all	17	☆ Code for logging Request Execution time gauges to the RRD DB and for generation of the graphics and html.	timur	April 26th, 2009, 9:22 p.m.	6 days, 20 hours ago	
pnfs	2	☆ Patch to make pnfs code 64-bit compatible.	vladimir	April 25th, 2009, 9:15 a.m.	1 week ago	
All My Requests		4	☆ Measure SRM Server V1 functions using RequestExecutionTimeGauges	timur	April 25th, 2009, 2:14 p.m.	1 week, 1 day ago
		☆ Dynamic Proxy for decoration of any class with execution counters and execution time gauges	timur	April 24th, 2009, 9:17 p.m.	1 week, 2 days ago	
		☆ New RequestExecutionTimeGauge classes for measuring the execution times	timur	April 22nd, 2009, 8:23 p.m.	1 week, 3 days ago	
		☆ automatic logging of counters in RRD Databases and generation of the history pages	timur	April 18th, 2009, 2:03 p.m.	1 week, 4 days ago	
		☆ reply NOENT to client if readdir issued on nonexisting direcotry	tigran	April 16th, 2009, 5:38 a.m.	1 week, 5 days ago	
		☆ Fixes Ticket 4450 and other bugs in PartitionManager	Irina	April 16th, 2009, 7:45 a.m.	1 week, 6 days ago	
		☆ Add support for an option to tell comparator to continue when faced with an inconsistency	paul	April 14th, 2009, 6:59 a.m.	2 weeks, 5 days ago	
		☆ A new implementation of Trash interface using NFS	vladimir	March 26th, 2009, 8:46 a.m.	1 month ago	
		☆ Allow "pool create" to work on non-existing directories.	behrmann	March 19th, 2009, 1:10 a.m.	1 month, 2 weeks ago	
		☆ Postgres Continuous Archiving and Point-In-Time Recovery (PITR) Scripts	timur	February 11th, 2009, 1:03 p.m.	1 month, 2 weeks ago	
		☆ Fix ChimeraInfoExtractor so it is a replacement for GenericInfoExtractor	paul	March 13th, 2009, 8:43 a.m.	1 month, 3 weeks ago	
		☆ I forgot to remove unused datamember from Srmls (Gerd's suggestion on http://rb.dcache.org/r/118/)	DmitryLitvintsev	March 4th, 2009, 11:25 a.m.	1 month, 3 weeks ago	
		☆ removing unnecessary log-message in chimeraDomain.log	Irina	March 5th, 2009, 12:52 a.m.	1 month, 4 weeks ago	
		☆ Berkeley Db implementation of PNFS.	vladimir	February 9th, 2009, 4:18 p.m.	2 months, 2 weeks ago	
		☆ The same as in "#3570 ACL for FTP door, 11 Feb 2009"	Irina	February 12th, 2009, 1:29 a.m.	2 months, 3 weeks ago	
		☆ Patch to disable suspend functionality in RequestContainerV5	tdh	February 4th, 2009, 9:21 a.m.	2 months, 4 weeks ago	

http://rb.dcache.org/r/212/

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Code Review : Annotating Code



- Reviewer can annotate the code.
 - And provide links to details of comments.

```
File Edit View Go Bookmarks Tools Tabs Help
Back Forward Stop Reload Home History Bookmarks Find
http://rb.dcache.org/r/71/diff/#index_header
Search the web: snapshot linux
26 4. Make modifications to scripts so that they work in your environment, send patches to us.
27 this will make scripts better to everyone.
28 5. Make sure to test the recovery procedures described in
29 http://www.postgresql.org/docs/8.3/static/continuous-archiving.html at least once.

/postgres/backup/backupRaw.sh
New File
1 #!/bin/sh
2
3 source ${dbBackupScriptsHome}/dbBackupConfig
4
5
6 # Cleanup save area
7 if [ -z "${dbLocation}" ] || [ ! -d ${dbLocation} ] ||
8 [ -z "${backupLocation}" ] || [ -z "${backupHost}" ] ; then
9 echo "Backup location not defined or inexistent"
10 exit -1
11 fi
12
13
14 # Init credentials
15 generated=0
16 if [ ! -z "${ticket}" ] ; then
17 KRBSCCNAME=${ticket} ; export KRBSCCNAME ; klist -s
18 if [ $? -eq 1 ] ; then
19 if [ "a$notifyBackupNotDone" != "a" ] ; then $notifyBackupNotDone ; fi
20 exit 1 ;
21 fi
22 elif [ ! -z "${keytab}" ] ; then
23 Potential security issue: what happens if someone generates a sym-link or hard-link between ${tmp...
24 kinit -k -t ${keytab} ; generated=1 ; klist -s
25 if [ $? -eq 1 ] ; then
26 if [ "a$notifyBackupNotDone" != "a" ] ; then $notifyBackupNotDone ; fi
27 exit 1 ;
28 fi
29 elif [ ! -z "${usekcron}" ] ; then
30 KRBSCCNAME=${tmpDir}/krb5cc_myjob_$$ ; export KRBSCCNAME
31 kcron ; generated=1 ; klist -s
32 if [ $? -eq 1 ] ; then
33 if [ "a$notifyBackupNotDone" != "a" ] ; then $notifyBackupNotDone ; fi
34 exit 1 ;
35 fi
36 elif [ ! -z "${session}" ] ; then
37 ${session}
38 fi
39
40
41 # Start
42 echo "Instructing Postgres"
```

Details of Code Review



- Detailed Comments. Comments on Comments.
 - No commit till reviewed.

The screenshot shows a web browser window with the address bar containing 'http://rb.dcache.org/r/71/'. The page title is 'Summary: Postgres Continuous Archiving and Point-In-Time Recovery (PITR) Scripts'. The page includes a summary section with fields for Submitter (Timur Perelmutov), Branch, Bugs, Change Number (None), Reviewers, Groups (all), People, and Repository (dCache svn trunk). A description section follows, stating that the scripts provide an easy way for a site to implement Continuous Archiving and Point-In-Time Recovery (PITR) postgres backup. Below the description, there are two comment threads. The first comment by Tigran Mkrtchyan, posted on February 11th, 2009, states that all absolute paths must be moved into an external configuration file. The second comment by Timur Perelmutov, posted on March 18th, 2009, responds that the paths have been moved and asks for a distribution model. The third comment by Gerd Behrmann, posted on February 12th, 2009, shows a diff snippet for a script named 'dbBackupConfig.sh' and asks if the script truly relies on bash. Timur Perelmutov's response to Gerd is that he changed to sh everywhere for Solaris compatibility.

Hudson Driven Build



- Shows all errors and warnings during build.

File Edit View Go Bookmarks Tools Tabs Help

Back Forward Stop Reload Home History Bookmarks Find

http://svn.dcache.org/build/job/dCache-Build/1966/testReport/

Search the web:

Hudson omsynge | log out

Hudson > dCache-Build > #1966 > Test Result ENABLE AUTO REFRESH

[Back to Project](#)
[Status](#)
[Changes](#)
[Console Output](#)
[Tag this build](#)
Test Result
[Find Bugs Warnings](#)
[Score card](#)
[Previous Build](#)
[Next Build](#)

Test Result

20 failures (±0) 310 tests (±0)

All Failed Tests

Test Name	Duration	Age
org.dcache.tests.repository.RepositorySubsystemTest.testOpenEntryFileNotFound	1.562	1
org.dcache.tests.repository.RepositorySubsystemTest.testRemoveWhileReading	1.588	1
org.dcache.tests.repository.RepositorySubsystemTest.testCreateEntryOutOfSpace	1.714	1
org.dcache.tests.repository.RepositorySubsystemTest.testInitTwiceFails	3.229	4
org.dcache.tests.storageinfo.StorageInfoTest.testNotEqualsByMap	0.047	17
org.dcache.tests.poolmanager.CostModuleTest.testPoolUpWithCost	0.015	32
org.dcache.tests.poolmanager.CostModuleTest.testPoolUpAndDown	0.0070	32
org.dcache.tests.poolmanager.HsmRestoreTest.testRestoreNoLocations	0.158	32
org.dcache.tests.poolmanager.HsmRestoreTest.testRestoreNoLocationsOnePoolCantStage	0.015	32
org.dcache.tests.poolmanager.HsmRestoreTest.testRestoreNoLocationsSinglePool	0.021	32
org.dcache.tests.poolmanager.HsmRestoreTest.testRestoreNoLocationsAllPoolsCantStage	0.017	32
org.dcache.tests.poolmanager.LinkGroupInfoTest.testLinkGroupSizePool_p0	0.116	32
org.dcache.tests.poolmanager.LinkGroupInfoTest.testLinkGroupSizePool_p0p1	0.019	32
org.dcache.tests.poolmanager.LinkGroupInfoTest.testLinkGroupSizeLink_bc	0.031	32
org.dcache.tests.poolmanager.LinkGroupInfoTest.testLinkGroupSizePool_aa	0.019	32
org.dcache.tests.poolmanager.PoolMonitorTest.testPartialFromStore	0.196	194
org.dcache.tests.auth.UserAuthRecordTest.testNotEqualsByFQAN	0.021	233
org.dcache.tests.util.ThreadManagerTest.testMaxExclusive	2.044	464
org.dcache.tests.util.ThreadManagerTest.testSetGetMax	0.014	464
junit.framework.TestSuite.org.dcache.tests.pinmanager.PinManagerTest	0.0020	801

All Tests

Package	Duration	Fail	(diff)	Total	(diff)
junit.framework	2 ms	1		1	
org.dcache.services.info.base	0.75 sec	0		63	
org.dcache.tests.auth	1.1 sec	1		13	
org.dcache.tests.cells	0.54 sec	0		3	
org.dcache.tests.ftp	0.11 sec	0		4	
org.dcache.tests.hsm	7.7 sec	0		9	
org.dcache.tests.namespace	1.5 sec	0		50	
org.dcache.tests.poolmanager	0.98 sec	11		32	

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- Hudson „Artefacts“ are the dCache released code.
 - Uploaded to Public Web Site for release.
 - Detailed change log generated from Review Board.
- Sites customers pick their version.
 - Upgrading dCache is work.
 - Stateful service, downtime announced and planned.
 - Based upon recommendations and change log.
 - Driven by features required.
 - Tier 1's have complex requirements forcing upgrade.
 - DESY HERA version is 5 Years old.
 - But may upgrade soon for Chimera.

Hudson Deployment Testing



- Hudson „Projects“ run on remote hosts.
 - Triggered by „Upstream Projects“ Scripts or time.

The screenshot shows the Hudson web interface for the project 'dCacheTestVmDeploy'. The browser address bar shows 'http://svn.dcache.org/build/job/dCacheTestVmDeploy/'. The interface includes a navigation menu on the left with options like 'Back to Dashboard', 'Status', 'Changes', 'Workspace', 'Build Now', 'Delete Project', and 'Configure'. The main content area displays the project name, a description 'prepare 4 virtual machines to be ready for dCache server install', and links for 'Workspace' and 'Recent Changes'. Below this, there are sections for 'Upstream Projects' (listing 'YUM repository update') and 'Downstream Projects' (listing several sub-projects like 'dCacheTestVmDeployAdmin', 'dCacheTestVmDeployClient', etc.). A 'Permalinks' section provides links for the last build, last stable build, last successful build, and last failed build. On the left, a 'Build History' table lists recent builds with their IDs and timestamps.

Build ID	Timestamp
#394	May 4, 2009 5:12:31 AM
#393	May 3, 2009 5:11:28 AM
#392	May 2, 2009 5:10:57 AM
#391	May 1, 2009 5:11:57 AM
#390	Apr 30, 2009 5:12:55 AM
#389	Apr 29, 2009 5:13:18 AM
#388	Apr 28, 2009 5:11:21 AM
#387	Apr 27, 2009 5:12:22 AM
#386	Apr 26, 2009 5:12:21 AM
#385	Apr 25, 2009 5:13:18 AM
#384	Apr 24, 2009 5:12:22 AM
#383	Apr 23, 2009 5:11:21 AM
#382	Apr 22, 2009 5:11:20 AM
#381	Apr 21, 2009 5:13:20 AM
#380	Apr 20, 2009 5:10:51 AM
#379	Apr 19, 2009 5:10:47 AM
#378	Apr 18, 2009 5:11:50 AM
#377	Apr 17, 2009 5:10:50 AM
#376	Apr 16, 2009 5:11:50 AM
#375	Apr 15, 2009 5:10:51 AM
#374	Apr 14, 2009 11:23:50 AM
#373	Apr 14, 2009 5:11:50 AM
#372	Apr 13, 2009 5:10:49 AM
#371	Apr 12, 2009 5:11:49 AM

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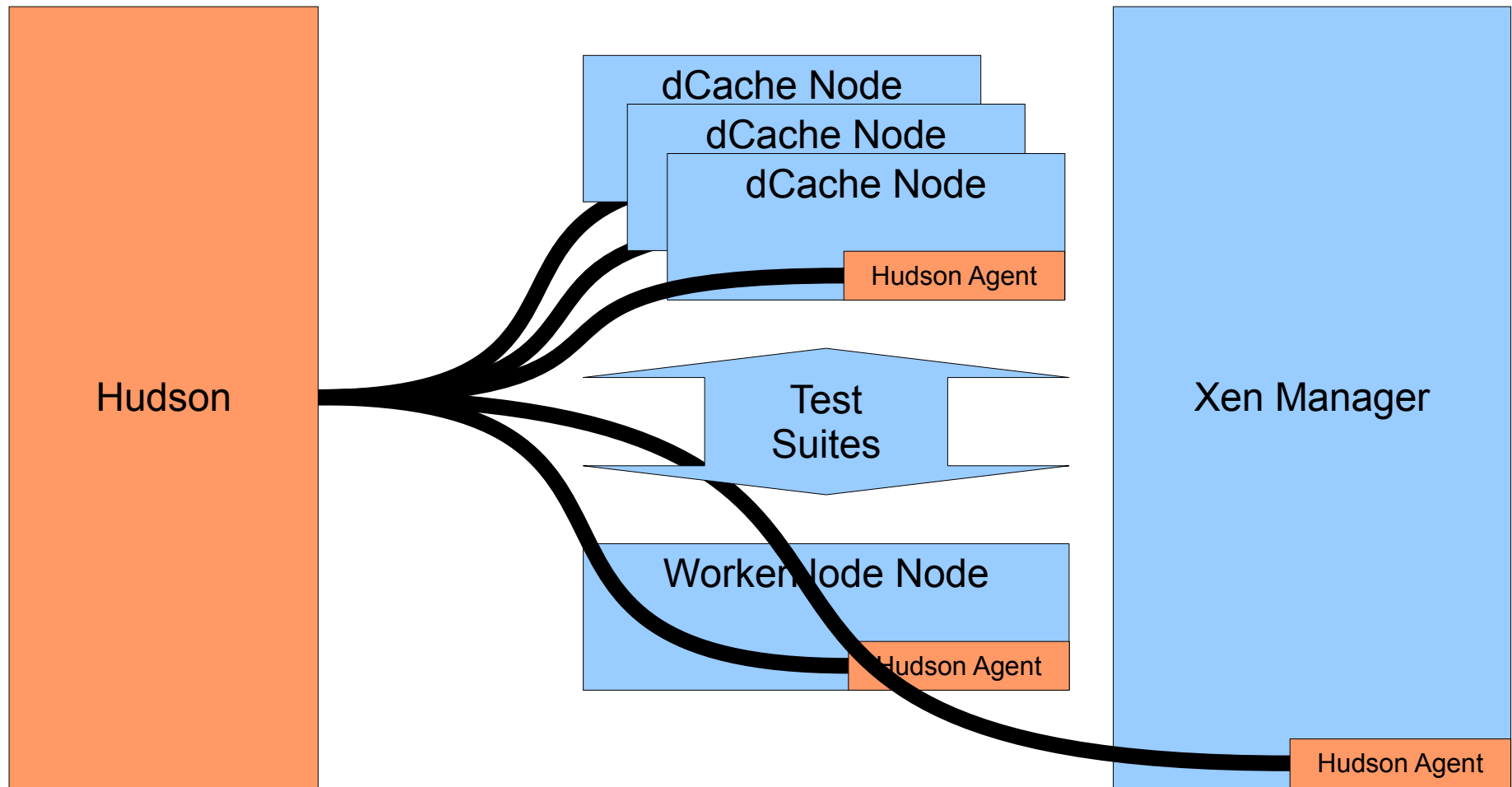
Complex Multi Node Deployment.



Hudsons Agents can launch Scripts on multiple hosts.

These scripts run tests and virtual machines (SL4).

Leads to fresh install testing, via dCacheConfigure.sh* and fresh install testing.



*YAIM now uses dCacheConfigure to configure dCache.

Hudson Multi Node Deployment



- Graph display of test results on deployment.

The screenshot shows the Hudson web interface for the project 'G2_functional_tests_4_node_Client'. The browser address bar shows the URL 'http://svn.dcache.org/build/job/G2_functional_tests_4_node_Client/'. The page title is 'Project G2_functional_tests_4_node_Client' and the description is 'G2 functional test suite against srm-devel.desy.de'. The 'Build History' table lists builds from #343 to #366, with the most recent build (#366) on May 4, 2009 at 5:49:29 AM. The 'Test Result Trend' chart shows a bar chart of test results over time, with a peak in the number of failures around May 3, 2009. The chart is titled 'Test Result Trend' and has a y-axis labeled 'count' ranging from 0 to 20. The x-axis represents time, with labels for each day from May 1 to May 4, 2009. The chart shows a significant increase in failures on May 3, reaching a peak of approximately 16 failures. The chart is interactive, with options to 'edit description', '(just show failures)', and 'enlarge'.

Build Number	Date and Time
#366	May 4, 2009 5:49:29 AM
#365	May 3, 2009 5:46:25 AM
#364	May 2, 2009 5:49:56 AM
#363	May 1, 2009 5:49:56 AM
#362	Apr 30, 2009 5:47:56 AM
#361	Apr 28, 2009 5:46:20 AM
#360	Apr 27, 2009 5:50:19 AM
#359	Apr 26, 2009 5:50:19 AM
#358	Apr 25, 2009 5:52:19 AM
#357	Apr 24, 2009 5:49:20 AM
#356	Apr 23, 2009 5:49:20 AM
#355	Apr 22, 2009 5:47:20 AM
#354	Apr 21, 2009 5:50:19 AM
#353	Apr 18, 2009 5:52:48 AM
#352	Apr 17, 2009 5:46:48 AM
#351	Apr 16, 2009 5:47:49 AM
#350	Apr 15, 2009 5:46:48 AM
#349	Apr 13, 2009 5:52:48 AM
#348	Apr 12, 2009 5:49:49 AM
#347	Apr 11, 2009 5:50:49 AM
#346	Apr 9, 2009 5:50:04 AM
#345	Apr 8, 2009 4:44:04 PM
#344	Apr 8, 2009 5:55:04 AM
#343	Apr 7, 2009 5:46:04 AM

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- Certification Testbed is 4 single nodes.
 - LCG tools tested against them.
 - Test suites run against nodes.
- Proves critical in finding integration bugs.
 - Information system.
 - LCG tools.
 - Confidence that will work on Grid.
- Takes a lot of effort.
 - Due to complexity of configuring SRM Spaces.
 - Impossible to Automate, far to multidimensional

Recommended dCache Versions.



- Recommended dCache release.
 - Passes upgrade tests.
 - Many Tier 1's upgrade to this.
 - Some Tier 2's upgrade to this.
- My repository release. (Yum/Apt repository)
 - Passed SA3 Certification Test Bed tests.
 - Announce on user mailing list.
 - Most Tier 2's use this release.
- Glite repository release.
 - Cautious Tier 2's use this release.

What Could Be Better.



- Performance Tests.
 - Knowing if releases get faster or slower.
- Archive of old releases.
 - Some times people clean up releases!
- Configuration Management.
 - Flexibility of dCache is too great.
 - Cant check all features. (As configuration is code).
- Less variety of dCache versions in production.
- Better build scripts (Ant and Make have limits)
- Better dependency handling.

What Could Be Worse.



- Not Having the central SA3 gang.
 - Critical for bugs in clients.
 - Having an outside Party to test your deployment.
 - SRM Space management is important here.
 - Comparing with DPM.
 - Finding / Offloading communication to third parties.
- More feature creep in requirements, clients.
- Dependency issues.
 - We Statically link and include all dependencies
 - But we don't manage them well (yet).
- Political Releases. (non functioning but required)

- Design Review.
 - Extending Code Review process.
- Golden Releases.
 - 6-12 Months of Support.
 - Others will have short term support.
- Time Based Releases.
 - We tried it before.
 - We intend to be more strict about this.

- Test Driven Development
 - Using available tools.
 - SVN, Hudson, Review Board are all good tools.
- Sites pick version. (And if they run your software).
 - Features demanded by customers (Tier 1's).
 - Based on Change log (Of critical importance).
 - Which is based on Review Board. (Very Good Tool).
 - Trust of recommendations (Honesty and Work).
 - SA3 helped find Grid Integration Bugs. (Which client?)
 - And streamlined fixing them and communication
 - Their own upgrade tests. (Only trust us so much).
 - Tier 2's don't have manpower. (So have to be cautious).