

Test We Must !

Defective Software

cost Money

a lot of Money...!

Inadequate

Software Testing Infrastructure

cost the US

\$60 Billion Dollars a year.

That is
0.2% of GDP

Twice the
NIH Annual Budget

Mostly paid
in the work-around procedures
that users adopt

Skipping Testing is an
unprofessional way
of writing software

Testing differentiates

“Smart” Developers

From

Professional Developers

“Smart” Developers

Write **A LOT** of code

Very quickly

Most of Which

have to be thrown away !



Due to Incorrect Implementation

Lack of Readability

Lack of Maintainability

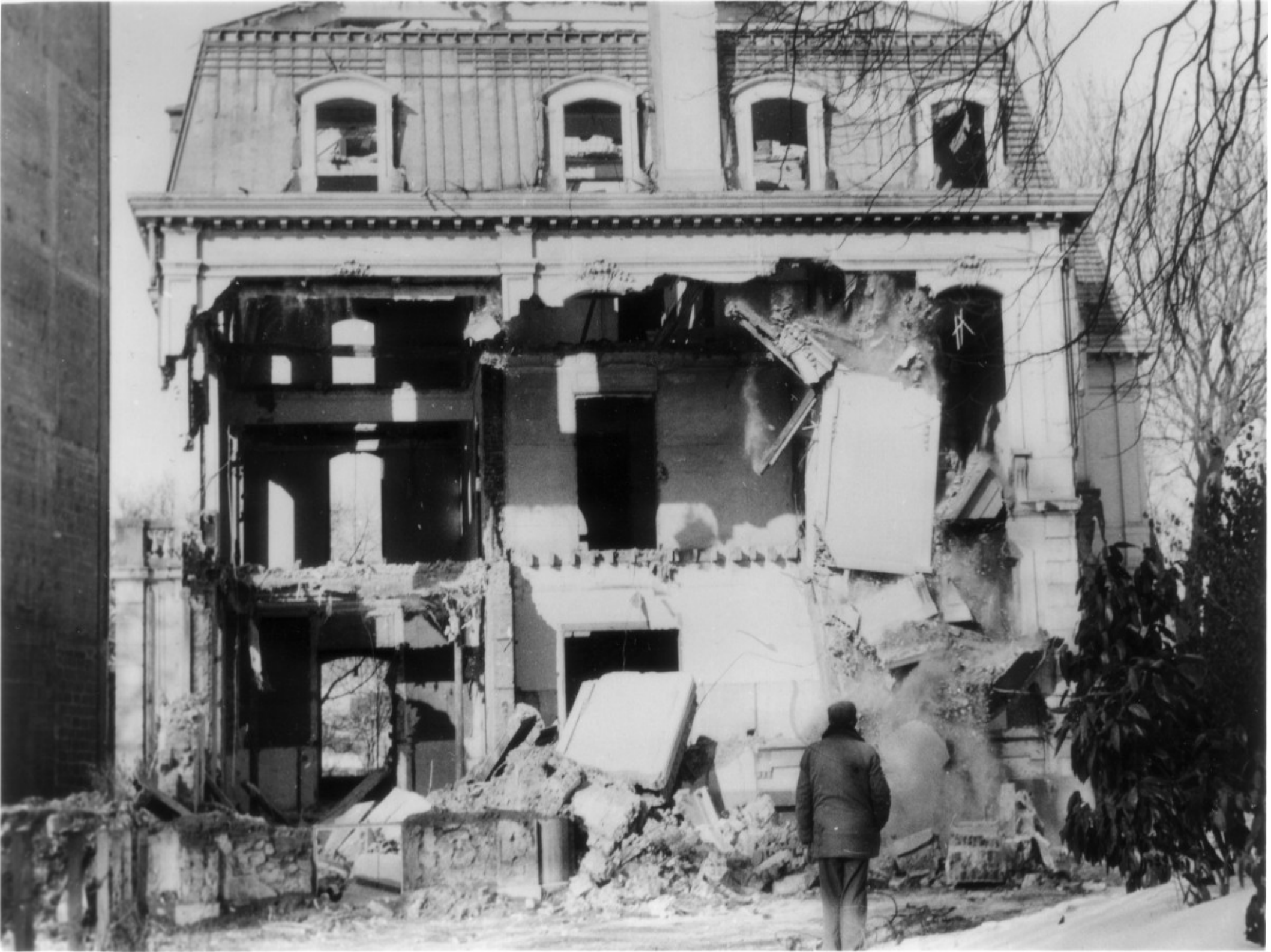
Poor Documentation



Source Code

that is **NOT Tested**

IS Broken !



Broken Code

disrupts the work
of the Community



Users will waste

Time Money and Effort

Trying to use the Software



Just to Discover

That it is indeed

Broken !



At which point

The code will have

to be thrown away

and rewritten



Or “somebody”
will have to debug it
and fix it

Debugging code is
about **FOUR** times
more expensive
than Writing new code

Most of the Debugging Time
gets used in “understanding”
what the software
was supposed to do...

Slicer Dashboard



SLICER3 Dashboard

DASHBOARD CALENDAR PREVIOUS CURRENT NEXT PROJECT

84	2	5	0
0	4	87	14

32 files changed by 6 authors as of Friday, December 11 2009 22:00:00 EST

239.1	84	17	217	111.2
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Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
tar-valon.kitwarein.com	Darwin-g++	0	0	0	0	0.1	0	50	148.5	0	4	87	6.9
JOE	Win32-vs9	0	0.1	0	0	0.8	3 ₋₃	50	74	0	3	88	26.5
Totals	2 Builds	0	0.1	0	0	0.9	3	100	222.5	0	7	175	33.4

No Continuous Builds

Experimental

Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
kope	Linux-g++	0	0	0	0	0	0	36	58.4	84 ₊₈₄	2 ₋₁	5 ₋₈₅	0
macondo.kitware	Linux-g++	0	0	0	0	0	0	0	0.1	0	2 ₋₂	89 ₋₈₉	7.2
thurmite.kitware	Darwin-g++	0	0	0	0	0.3	0	0	136.5	0	23	68	157
macondo.kitware	Linux-g++	0	0	0	0	0	0	0	0.2				
WENDYPLESNIF83B	Win32-vs9	0	0	0	0	0.2	0	1	0.2	5	86	0	1.1
thurmite.local	Darwin-g++	0	0	0	0	0.2	0	0	91.9	0	24	67	67.4
macondo.kitware	Linux-g++	0	0	0	0	0	0	24 ₋₁₂	14.1	0	2 ₋₂	89 ₋₂	8.1
ahnry-laptop	Linux-g++	0	0	0	0	0	0	50	95	84	2	5	0
lefty.bwh.harvard.edu	Darwin-g++	0	0	0	0	0.1	0	2	59.9	0	26	35	9.8
b2_d4_4.bwh.harvard.edu	Linux-g++	0	0	0	0	0.2	0	50	293.2	0	23	68	5.5
hjbldbox.local	Darwin-g++	0	0	0	0	0.1	0	50 ₋₂	50	0	4 ₋₂	87 ₋₂	7.1
Totals	11 Builds	0	0	0	0	1.1	0	213	799.5	173	194	513	263.2



	Test	
	Fail	Pass
lefty.bwh.harvard.edu	<u>26</u>	<u>35</u>
b2_d4_4.bwh.harvard.edu	<u>23</u>	<u>68</u>



	Build		
	Error	Warn	Min
lefty.bwh.harvard.edu	<u>0</u>	<u>2</u>	59.9
b2_d4_4.bwh.harvard.edu	<u>0</u>	<u>50</u>	293.2



WARNING
BEWARE OF
POISONOUS
SNAKES

Coverage

Site

Percentage

thurmite.kitware

6.35%

macondo.kitware

13.41%



Dynamic Analysis

Site	Defect Count
macondo.kitware	<u>78626</u>
macondo.kitware	<u>51645</u>



Site Name: macondo.kitware

Build Name: Linux-g++4.4.1-Qt-Debug

Build Date: 2009-12-17 07:41:28

[DiffusionEditorGlyphsTracts](#) **Failed**

```
profiling:/home/ibanez/src/Slicer3-build/Libs/MRML/CMakeFiles/MRML
profiling:/home/ibanez/src/Slicer3-build/Libs/MRML/CMakeFiles/MRML
profiling:/home/ibanez/src/Slicer3-build/Libs/MRML/CMakeFiles/MRML
profiling:/home/ibanez/src/Slicer3-build/Libs/MRML/CMakeFiles/MRML
vtkDebugLeaks has detected LEAKS!
```

```
Class "vtkCollection" has 2 instances still around.
```

```
Class "vtkObserverManager" has 3 instances still around.
```

```
Class "vtkMRMLSelectionNode" has 1 instance still around.
```

```
Class "vtkMRMLInteractionNode" has 1 instance still around.
```

```
Class "vtkCommand or subclass" has 8 instances still around.
```

```
Class "vtkSlicerApplicationLogic" has 1 instance still around.
```

```
child process exited abnormally
```



but...

It doesn't have
to end this way

Testing CAN be Done !



Together

We Can Fix It !



Building Community.
Building Houses.
Building Hope.

FIRE REBUILD ALTE
4 Homes, 5 Days
June 21-25, 2004



Building Community.
Building Houses.
Building Hope.

FIRE REBUILD ALTE
4 Homes, 5 Days
June 21-25, 2004

Yes !


We Can !

First:


Fix Existing

Failing Tests !

Nightly Changes as of 2009-12-30T22:00:00 EST

- [-]  Applications/CLI/RegisterImagesModule/MultiResApplicat
[CMakeLists.txt Revision: 11445](#) by casey.goodlett

COMP: Fix problems compiling and running tests on other pla
LAUNCH_EXE for tests so all libraries can be found 2) Use \${CMA
Create a Win32Header file for classes that are linked in multiple lib

- [-]  Base/GUI
[vtkSlicerMRMLTreeWidget.cxx Revision: 11459](#) by naucoin
BUG: fixing a memory leak

Second:

Add Unit Tests



3DSlicer

SLI

DASHBOARD

CALENDAR

PREVIOUS

CURRE

[71 files changed](#) by 6 authors as of **Tuesday, December 29**



Divide
and
Conquer !



Rehabilitate

Key

Directories

Slicer3/Libs/MRML

Slicer3/Base/

Slicer3/Base/QT*

Compute

Coverage

Locally


```
cd Slicer3-build
```

```
make -j4
```

```
lcov --directory . --zerocounters
```

```
ctest -R $1
```

```
lcov --directory . --capture --output-file app.info
```

```
genhtml app.info
```

```
firefox ./index.html
```

Testing Resources

<http://www.slicer.org/slicerWiki/index.php/Slicer3:Testing>

<http://www.na-mic.org/Wiki/index.php/NA-MIC-kit-curriculum>

```
cd Slicer3-build
```

```
make Experimental
```

```
cd Slicer3-build
```

```
ctest -D Experimental
```

```
cd Slicer3-build
```

```
ctest -D Nightly
```

```
cd Slicer3-build
```

```
ctest -R DiffusionTensor -V
```

```
cd Slicer3-build
```

```
ctest -R DiffusionTensor -VV
```

```
cd Slicer3-build
```

```
ctest -I 5,10,2
```


How Far

can

We Get ?



INSIGHT Dashboard

DASHBOARD CALENDAR PREVIOUS CURRENT PROJECT

2 files changed by 2 authors as of Monday, January 04 2010 21:00:00 EST

[Show Filters](#)




























Style

Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
dash21.kitware	KWStyle	<u>2</u>	0.3	<u>0</u>	<u>0</u>	0.5	<u>0</u>	<u>0</u>	0.9				
dash21.kitware	KWStyle-Review	<u>0</u>	0.1	<u>0</u>	<u>0</u>	0.5	<u>0</u>	<u>0</u>	2.5				
Totals	2 Builds	2	0.4	0	0	1	0	0	3.4	0	0	0	0

Nightly Expected

[Style](#) | [Nightly Applications](#) | [Nightly](#) | [Continuous](#) | [Nightly](#)

Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
purple.kitware.com	Darwin-c++	<u>2</u>	0.7	<u>0</u>	<u>0</u>	0.3	<u>0</u>	<u>0</u>	3.5	<u>0</u>	<u>0</u>	1473	24.1
cmac.jouy.inra.fr	Darwin-c++-4.2	<u>2</u>	0.7	<u>0</u>	<u>0</u>	0.5	<u>0</u>	<u>0</u>	8.1	<u>0</u>	<u>0</u>	1703	13.8
thurmite.kitware	Darwin-g++4.0.1	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0.2	<u>0</u>	<u>0</u>	194.3	<u>0</u>	<u>0</u>	1744	16.2
midworld.kitware	DarwinG5-g++	<u>1</u>	0	<u>0</u>	<u>0</u>	0.9	<u>0</u>	<u>0</u>	360.7	<u>0</u>	<u>0</u>	1689	36.1
kitty.hooperlab	Fedora-11-x86 64	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	18.4	<u>0</u>	<u>0</u>	1693	8.5
bambi.hooperlab	Fedora-11-x86 64	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	18.5	<u>0</u>	<u>0</u>	1693	8.9
murrn.hobbs-hancock	Fedora-12-x86 64	<u>2</u>	0.4	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	43.4	<u>0</u>	<u>0</u>	1689	8
zion.kitware	Linux-g++-3.4	<u>2</u>	0	<u>0</u>	<u>0</u>	0.3	<u>0</u>	<u>0</u>	118	<u>0</u>	<u>0</u>	1737	313.2

purple.kitware.com	Darwin-c++ 	<u>2</u>	0.7	<u>0</u>	<u>0</u>	0.3	<u>0</u>	<u>0</u>	3.5	<u>0</u>	<u>0</u>	1473	24.1
cmac.jouy.inra.fr	Darwin-c++-4.2 	<u>2</u>	0.7	<u>0</u>	<u>0</u>	0.5	<u>0</u>	<u>0</u>	8.1	<u>0</u>	<u>0</u>	1703	13.8
thurmite.kitware	Darwin-g++4.0.1  	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0.2	<u>0</u>	<u>0</u>	194.3	<u>0</u>	<u>0</u>	1744	16.2
midworld.kitware	DarwinG5-g++  	<u>1</u>	0	<u>0</u>	<u>0</u>	0.9	<u>0</u>	<u>0</u>	360.7	<u>0</u>	<u>0</u>	1689	36.1
kitty.hooperlab	Fedora-11-x86 64  	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	18.4	<u>0</u>	<u>0</u>	1693	8.5
bambi.hooperlab	Fedora-11-x86 64  	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	18.5	<u>0</u>	<u>0</u>	1693	8.9
murrion.hobbs-hancock	Fedora-12-x86 64  	<u>2</u>	0.4	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	43.4	<u>0</u>	<u>0</u>	1689	8
zion.kitware	Linux-g++-3.4  	<u>2</u>	0	<u>0</u>	<u>0</u>	0.3	<u>0</u>	<u>0</u>	118	<u>0</u>	<u>0</u>	1737	313.2
camelot.kitware	Linux-g++-4.1-Debug  	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0.2	<u>0</u>	<u>0</u>	125	<u>0</u>	<u>0</u>	1740	114.9
sanchome.megason-lab.hms	Linux-g++-4.4.2-x86 64-dbg-shared 	<u>0</u>	0.4	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	46.1	<u>0</u>	<u>0</u>	1685	44.2
sanchome.megason-lab.hms	Linux-g++-4.4.2-x86 64-dbg-static 	<u>2</u>	0.5	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	49.3	<u>0</u>	<u>0</u>	1683	43.9
sanchome.megason-lab.hms	Linux-g++-4.4.2-x86 64-rel-shared 	<u>0</u>	0.4	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	69.5	<u>0</u>	<u>0</u>	1685	11.1
sanchome.megason-lab.hms	Linux-g++-4.4.2-x86 64-rel-static 	<u>0</u>	0.3	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	70.2	<u>0</u>	<u>0</u>	1683	10.9
BillsBasement	Linux-gcc4.3.0-GLIBCXX DEBUG  	<u>2</u>	1.3	<u>0</u>	<u>0</u>	2	<u>0</u>	<u>0</u>	23.6	<u>0</u>	<u>0</u>	1738	365.9
boa.invivonmr.uu.nl	Linux-x86 64-g++-4.1.2 	<u>2</u>	1.4	<u>0</u>	<u>0</u>	0.6	<u>0</u>	<u>0</u>	9.7	<u>0</u>	<u>0</u>	1684	8.8
RogueResearch5	Mac10.5-InsightBS-dbg  	<u>0</u>	0.3	<u>0</u>	<u>0</u>	1.4	<u>0</u>	<u>0</u>	51.1	<u>0</u>	<u>0</u>	1510	39.9
RogueResearch6	Mac10.6-Insight-llvm-dbg-i386  	<u>2</u>	0.6	<u>0</u>	<u>0</u>	1	<u>0</u>	<u>0</u>	35.5	<u>0</u>	<u>0</u>	1151	25.6



Coverage

Site	Percentage
zion.kitware	<u>82.94%</u>
mtvernon.jhu	<u>97.22%</u>



Dynamic Analysis	
Site	Defect Count
brian.jouy.inra.fr	<u>34</u>
BigFish.megason-lab.hms	<u>94</u>



Test

NotRun	Fail	Pass	Min
<u>0</u>	<u>0</u>	<u>1473</u>	24.1
<u>0</u>	<u>0</u>	<u>1703</u>	13.8



Coverage









































Site	Percentage
Ubuntu.ISIS	<u>91.05%</u>
trillian.kitware	<u>92%</u>



CMAKE Dashboard

DASHBOARD CALENDAR PREVIOUS CURRENT PROJECT

Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
v20n17.pbm.ihost.com	AIX53-xIC	85	1.6	0	0	6.6	0	0	4.9	0	0	159	31.2
dash22	CVS-Win32-x86-bcc32	4	0.7	0	0	1	0	0	2.3	0	0	156	8.7
krondor.kitware	Darwin-c++	4	0.5	0	0	0.1	0	0	27.1	0	0	159	47.6
dashmacmini3.kitware	Darwin-Leopard-Xcode21-univ	0	0.2	0	0	0	0	0	10.4	0	0	151	20.7
dashmacmini3.kitware	Darwin-LeopardIntel-g++	4	0.5	0	0	0	0	0	2.2	0	0	161	14.5
dashmacmini3.kitware	Darwin-LeopardIntel-Universal	0	0.1	0	0	0	0	0	4.2	0	0	161	14.9
dashmacmini1.kitware	Darwin-Tiger-Xcode21	4	0.7	0	0	0.1	0	0	19.3	0	0	154	39.8
dashmacmini2.kitware	Darwin-Tiger-Xcode21-univ	0	0.5	0	0	29.2	0	0	21	0	0	159	33.7
midworld.kitware	DarwinG5-g++	4	0.3	0	0	0	0	0	6.8	0	0	159	33.6
midworld.kitware	DarwinG5-XCode15	0	0.2	0	0	0.1	0	0	11.7	0	0	152	33.1
dashmacmini2.kitware	DarwinIntel-g++	4	0.7	0	0	2.6	0	0	9	0	0	166	25.7
dashmacmini2.kitware	DarwinIntel-Universal	0	0.3	0	0	3.2	0	0	7.5	0	0	166	29.4
pre.vision.cs.rpi.edu	FreeBSD-CC-gmake	4	1	0	0	4.1	0	0	26.4	0	0	164	37.7
pre.vision.cs.rpi.edu	FreeBSD-CC-make	4	1.1	0	0	4.7	0	0	26.2	0	0	163	38.3
destiny.kitware	HP-UX-aCC	4	1	0	0	0.3	0	0	20.2	0	0	159	62.9
destiny.kitware	HP-UX-aCC-gmake	4	1	0	0	0.3	0	0	20.1	0	0	160	63.9
heart	HP-UXia64-aCC	5	0.3	0	0	5.8	0	0	7.8	0	0	161	23.4
ferrari	IRIX640720206.5IP35-CC	4	0.2	0	0	10.4	0	0	15.9	0	0	160	31.8
mi3c.mayo	Linux-1-SMP2.6.9-i686-Intel	342	3.6	0	0	1.1	0	0	1	0	0	164	9.1

Nightly 2.8 Release													
Site	Build Name	Update		Configure			Build			Test			
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min
v20n17.pbm.ihost.com	Rel28-AIX5300C518-xLC  	21	1	0	0	4	0	0	4.6	0	0	140	25.9
dash22	Rel28-CYGWIN2008-01.5.25i686-gcc 	0	0.6	0	0	3.9	0	0	2.1	0	0	140	76.2
heart	Rel28-HP-UXUB.11.2ia64-aCC  	1	0.2	0	0	4.8	0	0	7.4	0	0	142	20.5
ferrari	Rel28-IRIX640720206.5IP35-cc  	0	0.1	0	0	9.2	0	0	15.8	0	0	141	29.1
dash8.kitwarein.com	Rel28-Linux-1-SMP2.4.18ia64-gcc  	0	0.3	0	0	12.5	0	0	15.2	0	0	144	30.2
faraway	Rel28-Linux-1-SMP2.6.27x86_64-gcc 	0	0.1	0	0	0.7	0	0	0.3	0	0	147	7.1
krondor	Rel28-MacOSX10.3.9ppc-gcc  	0	0.4	0	0	13.7	0	0	24	0	0	142	52.2
dashmacmini2.kitwarein.com	Rel28-MacOSX10.4.11i386-gcc  	0	0.3	0	0	4.2	0	0	4.4	0	0	146	20.9
dashmacmini2.kitwarein.com	Rel28-MacOSX10.4.11i386-Xcode  	0	1.2	0	0	4	0	0	6.1	0	0	139	22.7
dashmacmini1.kitwarein.com	Rel28-MacOSX10.4.11ppc-gcc  	0	0.6	0	0	7.2	0	0	9.2	0	0	146	37.5
dashmacmini3.kitwarein.com	Rel28-MacOSX10.5.8i386-gcc  	0	0.4	0	0	3.1	0	0	3.8	0	0	142	12.4
dashsun1	Rel28-SunOSGeneri5.8sun4u-CC  	0	1.5	0	0	5	0	0	7	0	0	146	24.3
dash22.kitware	Rel28-wcl386  	0	0.6	0	0	0.8	0	0	3.1	0	0	133	6
DASH3.kitware	Rel28-Win32-nmake60  	0	0.6	0	0	1.1	0	0	3.5	0	0	139	16.9
dash22	Rel28-Win32-x86-bcc32  	0	0.4	0	0	0.7	0	0	2.1	0	0	138	7.9
dash22	Rel28-Win32-x86-cl-gmake  	0	0.4	0	0	1.8	0	0	4.7	0	0	140	24.4
dash22	Rel28-Win32-x86-cl-nmake  	0	0.5	0	0	0.9	0	0	3	0	0	140	12.4
dash22	Rel28-Win32-x86-MinGWgcc  	0	0.4	0	0	1.3	0	0	6.6	0	0	138	10
dash3	Rel28-Win32-x86-msvs6ide  	0	0.6	0	0	3.1	0	0	3.5	0	0	138	26.1
DASH20	Rel28-Win32-x86-msvs9ide  	0	0.5	0	0	2.2	0	0	2.1	0	0	140	16.8
dash22	Rel28-Win32-x86-MSYSgcc  	0	0.4	0	0	3.9	0	0	8.6	0	0	139	29.4
Totals	21 Builds	22	11.1	0	0	88.1	0	0	137.1	0	0	2960	508.9





CMAKE

Dashboard

DASHBOARD CALENDAR PREVIOUS CURRENT PROJECT

Coverage

Site	Build Name	Percentage
dash17.kitware	Linux-g++4.0	<u>75.21%</u>
dash16.kitware	Linux-g++4.3	<u>75.96%</u>
hythloth.kitware	Linux64-bullseye-cov	<u>85.73%</u>
dash22.kitware	Win32-vs9-Release-Coverage	<u>72.6%</u>

Site	Build Name	Update		Configure			Build			Test		
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass
macondo.kitware	Linux-g++4.4.1-KWScene-Debug 	<u>0</u>	0	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u>	<u>40</u>
macondo.kitware	Linux-g++4.4.1-KWScene-Debug 	<u>0</u>	0	<u>0</u>	<u>0</u>	0	<u>0</u>	<u>0</u> ₋₆	0	<u>0</u>	<u>0</u>	<u>40</u>
Totals	2 Builds	0	0	0	0	0	0	0	0	0	0	80

Coverage

Site

Percentage

macondo.kitware

98.58%

macondo.kitware

98.58%

Oh Yes !