

MPI Implementation Health Assessment Through Multi-Institutional Distributed Testing

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OPEN MPI



MTT





OPEN MPI

Open MPI

Combine the expertise from across the HPC community
to create the highest-quality, open-source MPI
implementation capable of efficiently supporting
desktop to petaflop systems.

How well are we meeting our goals?

How can we assess the health of the project?





OPEN MPI

Lots & Lots of Testing

Configure (~100)

Unit Tests
(1000s)

Runtime (~500)

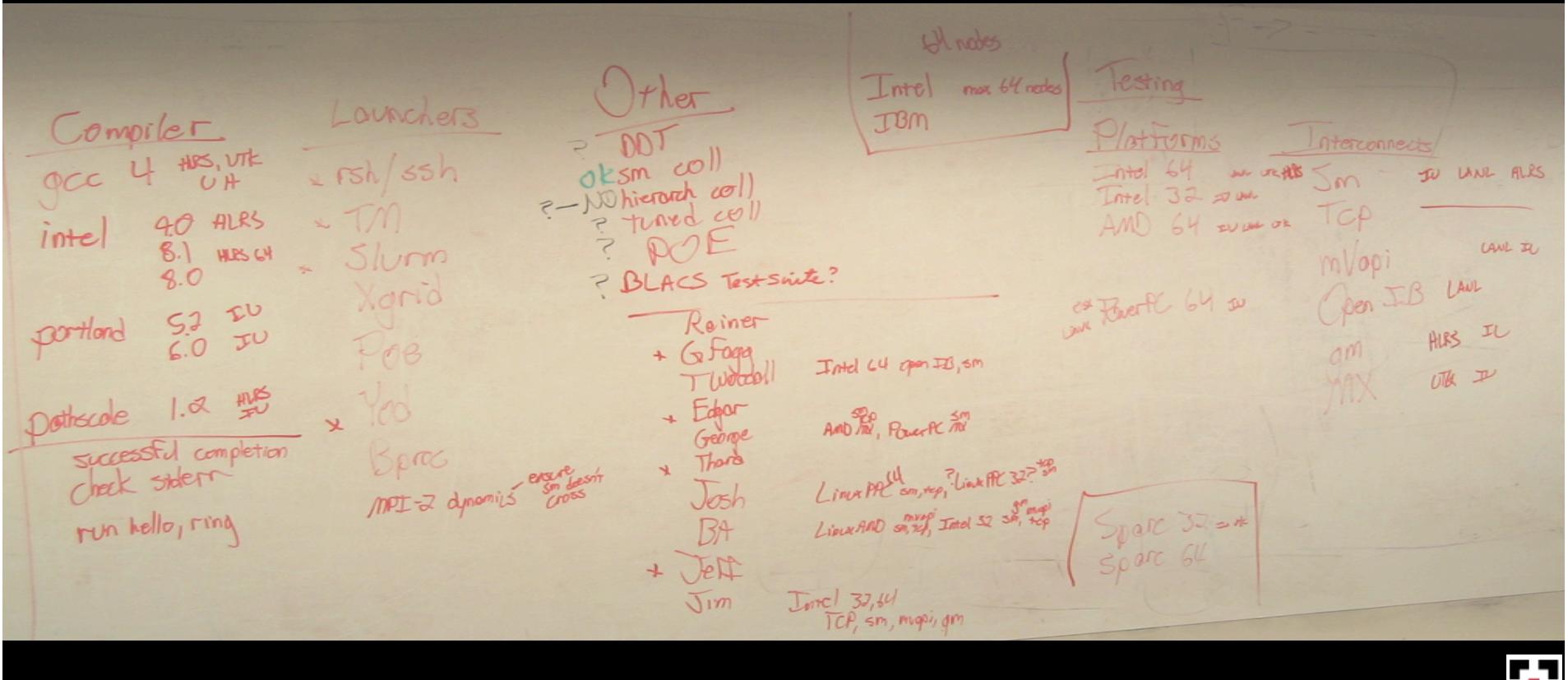
System Arch., Compiler,
interconnect, Resource Mgr.





OPEN MPI

Coverage: The Old Method



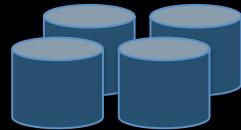


MTT

The MPI Testing Tool (MTT)

Infrastructure for automated, distributed testing

- Institutions volunteer testing resources
- Combine all testing results into a database
- Provide tools for testing analysis



	Test run				
	Δt _{min}	Δt _{avg}	Δt _{max}	Δt _{med}	Δt _{std}
1	48	0	0	0	0
2	48	0	0	0	0
3	28	0	0	0	0
4	84246	725	648	292	118
5	742	2	26	4	24
6	3013	632	56	375	0
7	1292	229	21	121	0
8	4120	0	0	0	104
9	2426	6	260	0	52
10	1873	18	142	8	26
11	118278	1547	1178	689	362

Local Testing

Data Storage

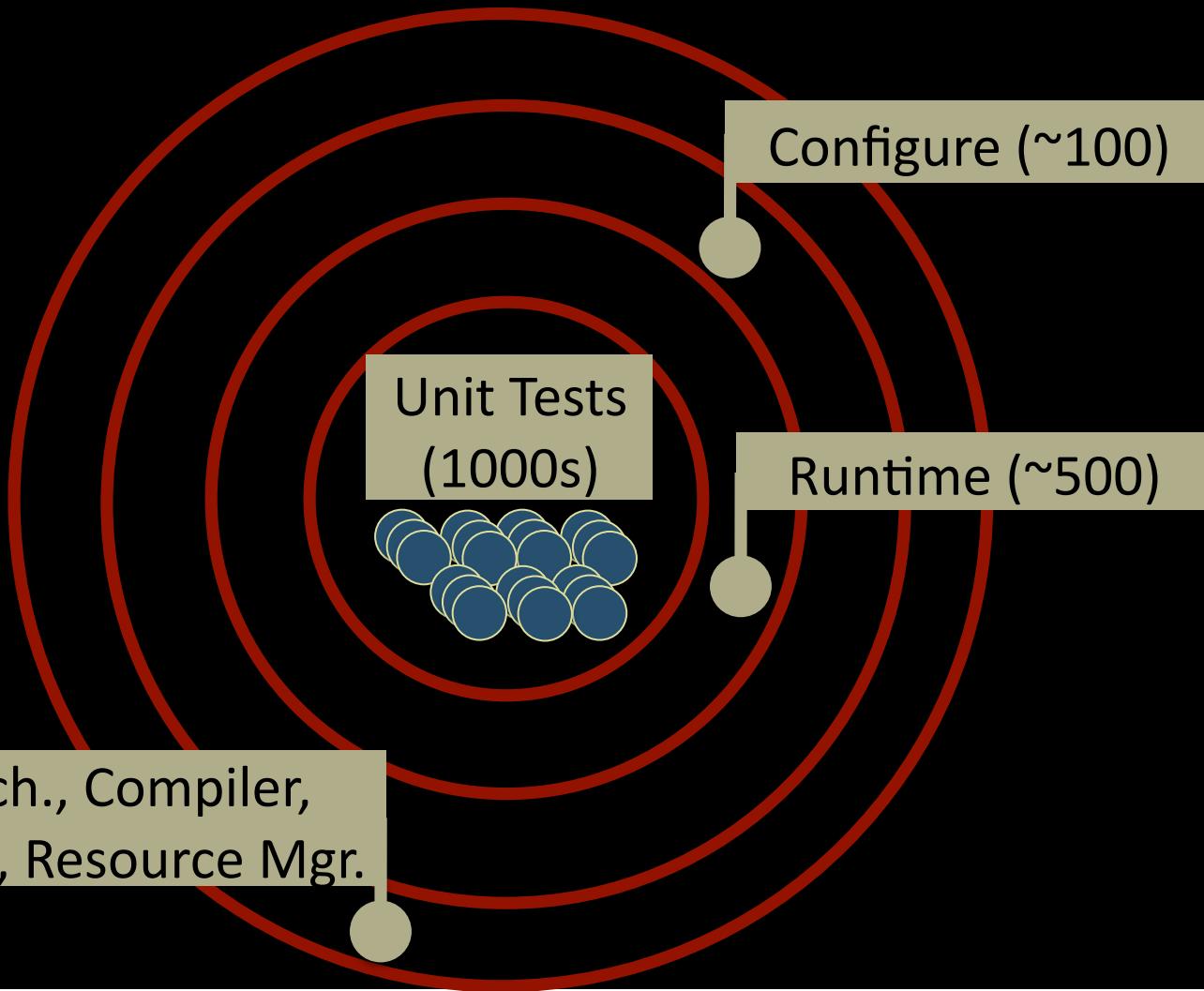
Analysis





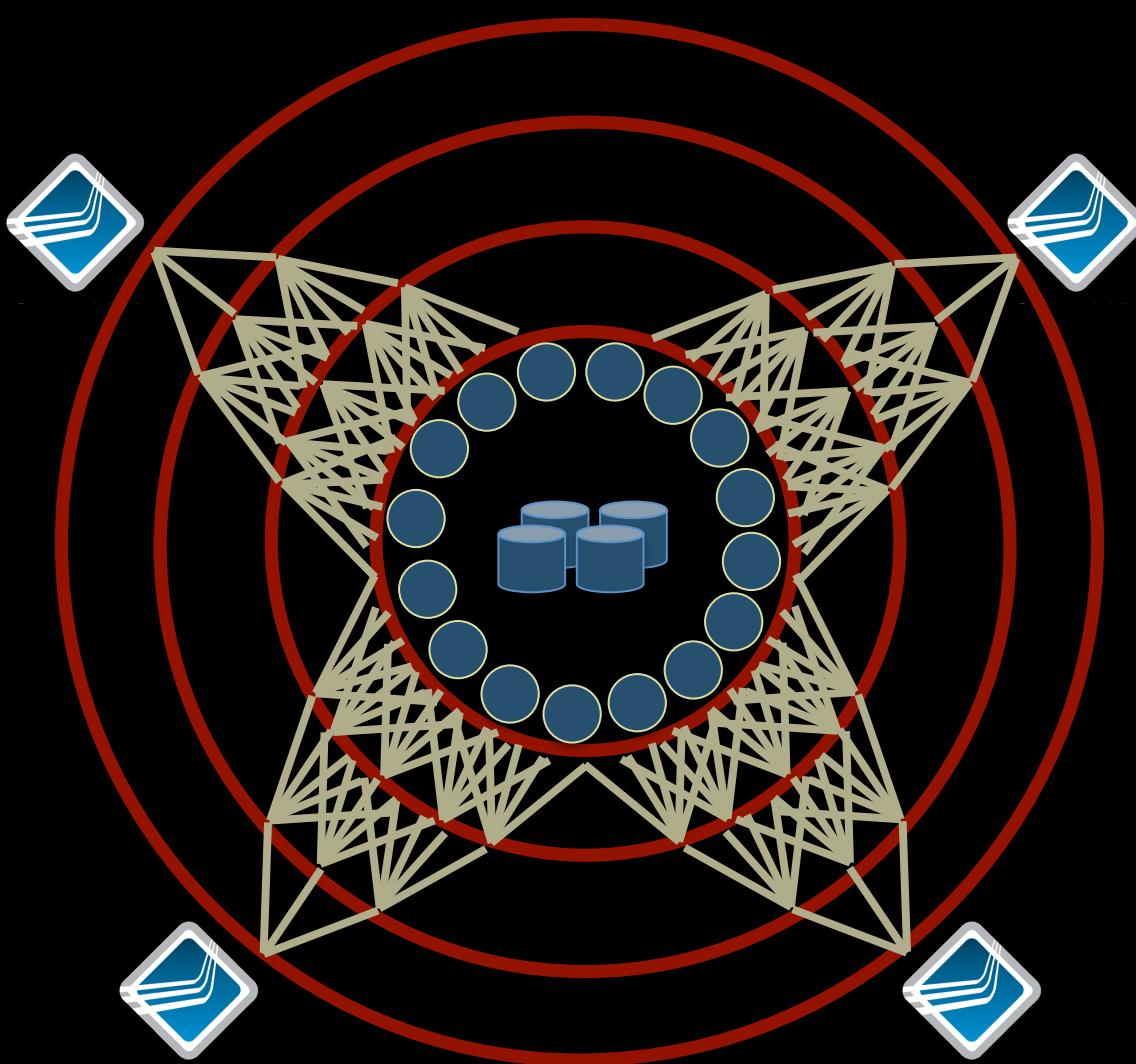
MTT

System Arch., Compiler,
interconnect, Resource Mgr.





MTT

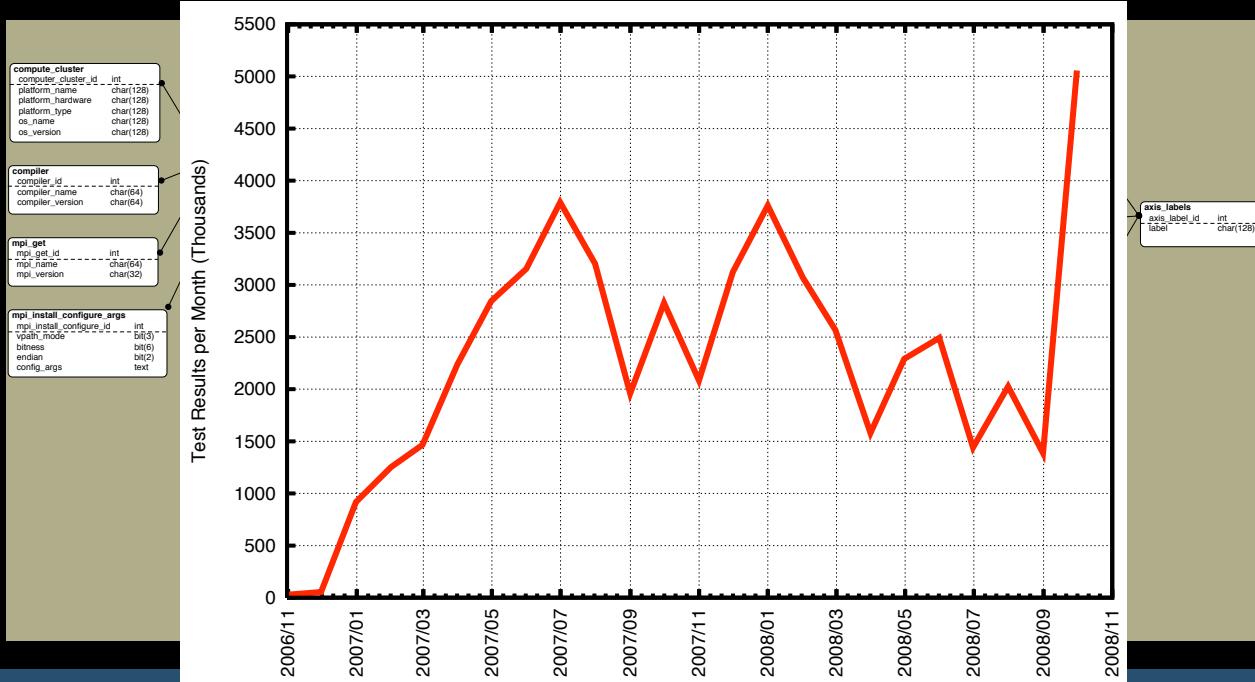




MTT



Data Storage



How do you make sense of .5 Million test results every day?





MTT

Analysis: The Old Way

	TCP	sm	pm	mx	mvopi	openib
Linux / Intel 32	[]	[]	[]	[]	[]	[]
Linux / IA64	[]	[]	[]	[]	[]	[]
Linux / AMD / EM64T 32 64	[]	[]	[]	[]	[]	[]
OSX PPC 32 64	[]	[]	[]	[]	[]	[]
ATIX PPC 32 64	[]	[]	[]	[]	[]	[]
Linux PPC 64	[]	[]	[]	[]	[]	[]
Solaris Sparc v8 v8+ v9	[]	[]	[]	[]	[]	[]

Test run						
Age	Age	Age	Age	Age	Age	Age
48	0	0	0	0	0	0
24	0	0	0	0	0	0
78	0	0	0	0	0	0
8254	722	688	282	118	52	0
243	3	36	1	0	0	0
2014	517	36	372	0	0	0
10704	179	213	80	0	0	0
233	0	0	0	0	0	0
8256	0	262	0	0	51	0
1373	18	147	0	0	0	0
116279	1547	1178	689	362	0	0





MTT

MTT Reporter

All	Test build	Test run	All	All
Test run				
All	All	All	All	All
48	0	0	0	0
24	0	0	0	0
78	0	0	0	0
8254	725	688	292	118
243	3	36	52	52
5014	517	36	375	0
10704	179	213	40	0
230	0	0	10	0
8256	6	261	8	52
187	18	147	8	31
118279	1547	1178	689	362

MTT Reporter

All phases MPI install Test build Test run

Date range:	past 24 hours	Hardware:	all	Show ▾
Org:	all	OS:	all	Show ▾
Local username:	all	MPI name:	all	Hide ▾
Platform name:	all	MPI version:	all	Hide ▾

[\[Reset form\]](#) [\[Start over\]](#) [Summary](#) [Detail](#) [Performance](#) [\[Preferences\]](#) [\[Advanced\]](#)

Current time (GMT): 2008-05-14 13:10:09
 Date range (GMT): 2008-05-13 13:10:09 - 2008-05-14 13:10:09
 Phase(s): MPI install, Test build, and Test run
 Number of rows: 10

Absolute date range: [Create permalink](#)
 Relative date range: [Create permalink](#)

#	▲Org▼	▲Hardware▼	▲OS▼	MPI install		Test build		Test run				
				▲Pass▼	▲Fail▼	▲Pass▼	▲Fail▼	▲Pass▼	▲Fail▼	▲Skip▼	▲Timed▼	▲Perf▼
1	absoft	ia32	Linux	2	0	2	0	48	0	0	0	0
2	absoft	ppc	Darwin	2	0	2	0	24	0	0	0	0
3	absoft	undef	undef	0	0	3	0	78	0	0	0	0
4	cisco	x86_64	Linux	8	5	56	0	84246	725	648	292	118
5	ibm	ia32	Linux	4	0	20	0	742	2	36	4	52
6	iu	ppc64	Linux	8	0	23	0	5014	617	36	375	0
7	iu	x86_64	Linux	15	12	71	0	19704	179	51	10	0
8	mellanox	x86_64	Linux	5	0	30	0	4120	0	0	0	104
9	sun	i86pc	SunOS	2	0	12	0	2426	6	260	0	52
10	sun	sun4u	SunOS	1	1	6	0	1873	18	147	8	36
Totals				47	18	225	0	118275	1547	1178	689	362

Total script execution time: 8 second(s)
 Total SQL execution time: 2 second(s)

Overall MTT contribution graph (updated nightly): [mtt-contrib.pdf](#)



MTT

MTT Reporter



#	1
Date range	2008-05-14 05:12:05
Org	iu
Platform name	IU_Odin
Hardware	x86_64
OS	Linux
Compiler	gnu
Vpath mode	unknown
Compiler version	3.4.6
Configure arguments	FCFLAGS=-m64 FFLAGS=-m64 CXXFLAGS=-m64 CXXLINKS=-m64 --with-openib=/usr/local/ofed --with-openib-ibdir=/usr/local/ofed/lib64 --with-wrapper-cflags=-m64 --with-wrapper-cxxflags=-m64 --with-wrapper-fflags=-m64 --with-wrapper-fcflags=-m64 --without=memory-monger --disable-debug --enable-binaries --with-devel-headers --disable-mpi-io --disable-mpi-f90 --disable-ipv6 --with-ftmx --with-blcrz/san/blcrz-0.6.5 --enable-mpi-thread --enable-ft-thread
Description	
Exit value	2
Signal	-1
Duration	00:06:33
Client serial	45755
Result message	Failed to build: make -j 8 all
Stdout	--- "make all result_stdout/result_stderr --- mv -f \$depbase.Tpo \$depbase.Plo depbase=`echo coll_sm_reduce.lo sed 's [^/]*/\$ deps/\$;s \.\.lo\$ '`;\\" bin/sh ../../libtool --tag=CC --mode=compile gcc -DMHAVE_CONFIG_H -I. -I../../../../opal/include -I../../../../orte/include -I../../../../ompi/include -I../../../../opal/mca/paffinity/linux/plp/sz/libplp -I../../../../... -O3 -DNDEBUG -m64 -finline-functions -fno-strict-alignment -fthread -fvisibilityhidden -fPIC coll_sm_reduce.lo -fPIC -fPI -fPIC \$depbase.Tpo -c -o coll_sm_reduce.lo coll_sm_reduce.c && mv -f \$depbase.Tpo \$depbase.Plo libtool: compile: gcc -DMHAVE_CONFIG_H -I. -I../../../../opal/include -I../../../../orte/include -I../../../../opal/include -I../../../../.../opal/mca/paffinity/linux/plp/sz/libplp -I../../../../... -O3 -DNDEBUG -m64 -finline-functions -fno-strict-alignment -fthread -fvisibilityhidden -fPIC coll_sm_reduce.lo -fPIC -fPI .deps/coll_sm_reduce.Tpo -c coll_sm_reduce.c -fPIC -fPI -o .libs/coll_sm_reduce.o libtool: compile: gcc -DMHAVE_CONFIG_H -I. -I../../../../opal/include -I../../../../orte/include -I../../../../opal/include -I../../../../.../opal/mca/paffinity/linux/plp/sz/libplp -I../../../../... -O3 -DNDEBUG -m64 -finline-functions -fno-strict-alignment -fthread -fvisibilityhidden -fPIC coll_sm_reduce.lo -fPIC -fPI .deps/coll_sm_reduce.Tpo -c coll_sm_reduce.c -fPIC -fPI -o .libs/coll_sm_reduce.o libtool: compile: gcc -DMHAVE_CONFIG_H -I. -I../../../../opal/include -I../../../../orte/include

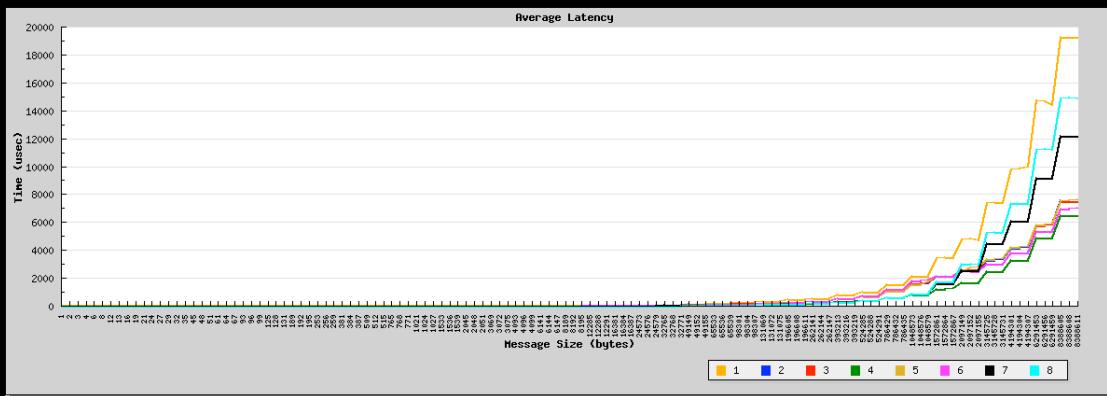
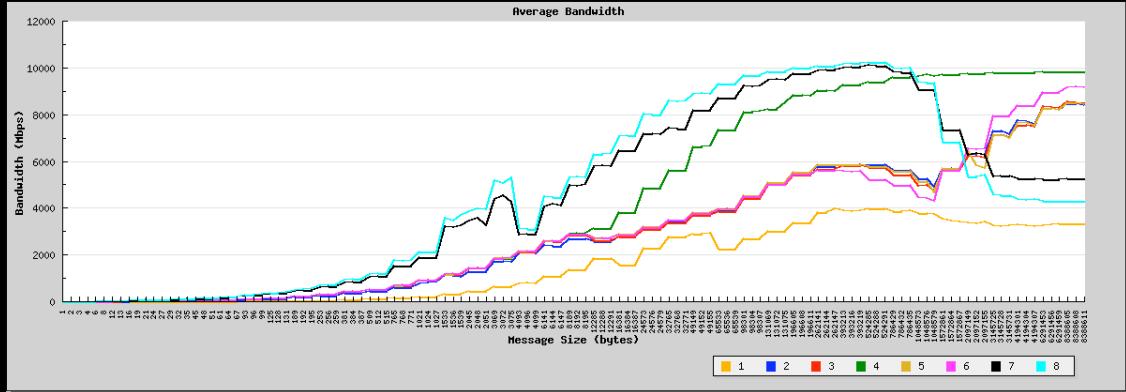




MTT

MTT Reporter

Test run	Actv ^Y	Actv ^N	Actm ^Y	Actm ^N	Actm ^M	Actm ^T	Actm ^S	Actm ^C
1	48	0	0	0	0	0	0	0
1	28	0	0	0	0	0	0	0
1	24	0	0	0	0	0	0	0
1	78	0	0	0	0	0	0	0
1	824	722	688	292	118	50	50	50
1	243	3	35	0	0	0	0	0
1	2014	517	365	372	0	0	0	0
1	10704	179	213	40	0	0	0	0
1	230	0	0	0	0	0	0	0
1	2626	6	262	0	0	0	0	0
1	182	18	187	8	31	0	0	0
1	116279	1547	1178	689	362	0	0	0





MTT

MTT Visualization

Arch	Compiler	Test run									
alpha	gcc	48	alpha	gcc	0	alpha	gcc	0	alpha	gcc	0
alpha	intel	24	alpha	intel	0	alpha	intel	0	alpha	intel	0
alpha	sun	78	alpha	sun	0	alpha	sun	0	alpha	sun	0
alpha	sunpro	8254	alpha	sunpro	722	alpha	sunpro	686	alpha	sunpro	224
alpha	sunpro	243	alpha	sunpro	34	alpha	sunpro	34	alpha	sunpro	50
alpha	sunpro	2014	alpha	sunpro	517	alpha	sunpro	35	alpha	sunpro	372
alpha	sunpro	10704	alpha	sunpro	179	alpha	sunpro	213	alpha	sunpro	10
alpha	sunpro	233	alpha	sunpro	0	alpha	sunpro	0	alpha	sunpro	10
alpha	sunpro	8256	alpha	sunpro	6	alpha	sunpro	261	alpha	sunpro	51
alpha	sunpro	1872	alpha	sunpro	18	alpha	sunpro	187	alpha	sunpro	31
alpha	sunpro	116279	alpha	sunpro	1547	alpha	sunpro	1178	alpha	sunpro	689
alpha	sunpro	116279	alpha	sunpro	1547	alpha	sunpro	1178	alpha	sunpro	689

Difficult to assess project health in the Reporter

Focus Groups:

Organization x Platform

Bitness x Compiler Name

MTT Visualization (Static)

ompi-nightly-trunk / 1.4a1r19857

Arch x Compiler:



Arch x NP:



Arch x Compiler Version:



Last Updated on: Fri Oct 31 16:07:36 EDT 2008





MTT

MTT Visualization

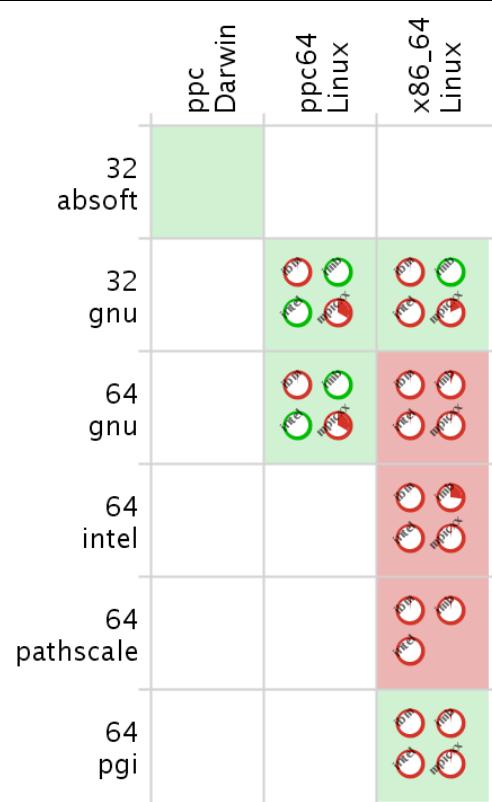
ompi-nightly-trunk : 1.4a1r19857
ALL Orgs : ALL Platforms
ALL Compilers : ALL Bitness

Legend

- | | |
|-------------------------------------------|---------------------------|
| 100% Passed | Trivial all pass |
| Some failures
(fill indicates percent) | Trivial at least one fail |
| 100% Failure | No tests applicable |



trivial (background)



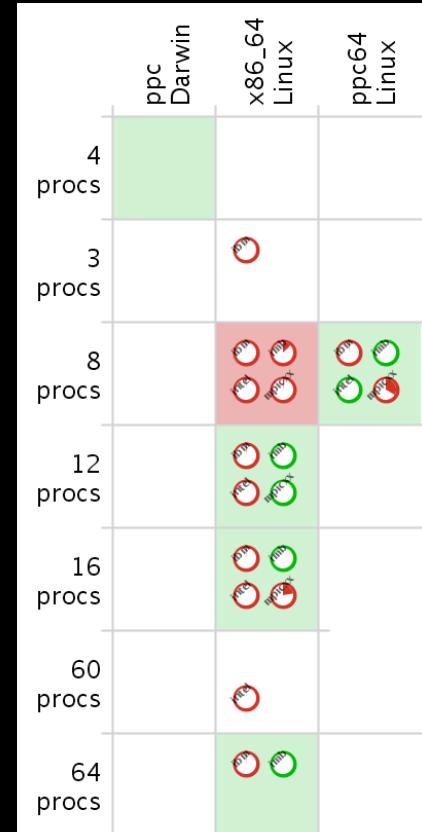
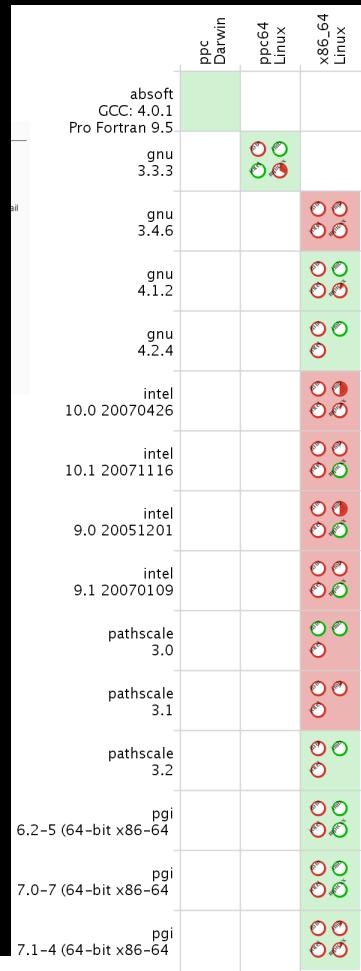
Test run				
Argon	Aizu	Argonne	Argonne	Argonne
48	0	0	0	0
1	24	0	0	0
1	78	0	0	0
1	8254	722	688	224
1	243	3	36	52
1	2016	517	36	372
1	10754	179	213	80
1	233	0	0	10
1	2626	6	261	9
1	1373	18	147	8
1	116279	1547	1178	689
	116279	1547	1178	689





MTT

MTT Visualization



Test run					
Arch	15	16	17	18	19
1	48	0	0	0	0
1	24	0	0	0	0
1	78	0	0	0	0
1	8254	722	688	282	118
1	243	3	36	50	50
1	2014	517	36	372	0
1	10704	179	213	80	0
1	233	0	0	10	0
1	2626	0	262	0	51
1	1373	18	147	8	31
1	116279	1547	1178	689	362

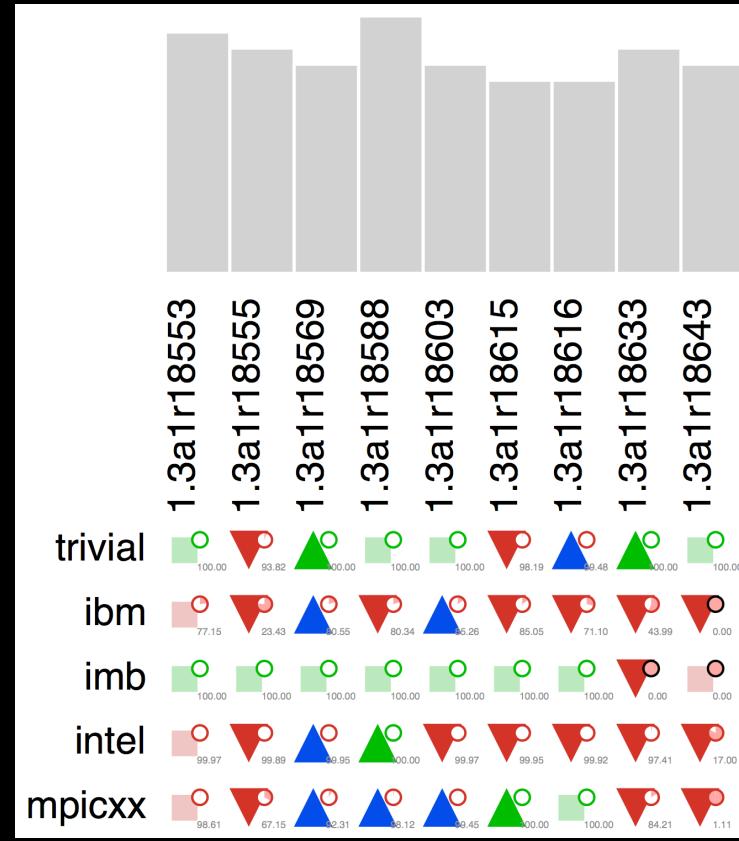




MTT



MTT Visualization



Future Directions



Local Testing



Data Storage

	Test case	Actual	Actual	Actual	Actual	Actual
	A12345	A12346	A12347	A12348	A12349	A12350
1	45	0	0	0	0	0
2	20	0	0	0	0	0
3	30	0	0	0	0	0
4	25	2	30	0	0	0
5	60	62	62	21	21	21
6	120	119	119	0	0	0
7	120	120	120	120	120	120
8	187	18	142	8	21	21
9	116279	1147	1178	669	361	361

Reporting

- Extended reporting (topology, hidden info)
- Parallel testing

- Improve Performance Reporting
- Information Tagging

- Interactive Visualization Environment
- Time based visualization



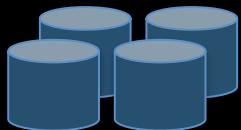
Questions & Comments



OPEN MPI



MTT



Local Testing

Data Storage

Test run					
	Δ _{run}	Δ _{ref}	Δ _{run}	Δ _{ref}	Δ _{run}
1	48	0	9	0	0
2	48	0	0	0	0
3	26	0	0	0	0
4	78	0	0	0	0
5	64246	724	648	292	118
6	742	2	36	4	52
7	501	631	26	51	16
8	17306	179	51	40	104
9	4120	0	0	0	0
10	2426	6	260	0	52
11	1873	18	147	8	36
12	118276	1547	1178	689	362

Analysis



