

BLUE WATERS

SUSTAINED PETASCALE COMPUTING

Blue Waters Acceptance Testing: Overview

Celso Mendes, Brett Bode, William Kramer
NCSA



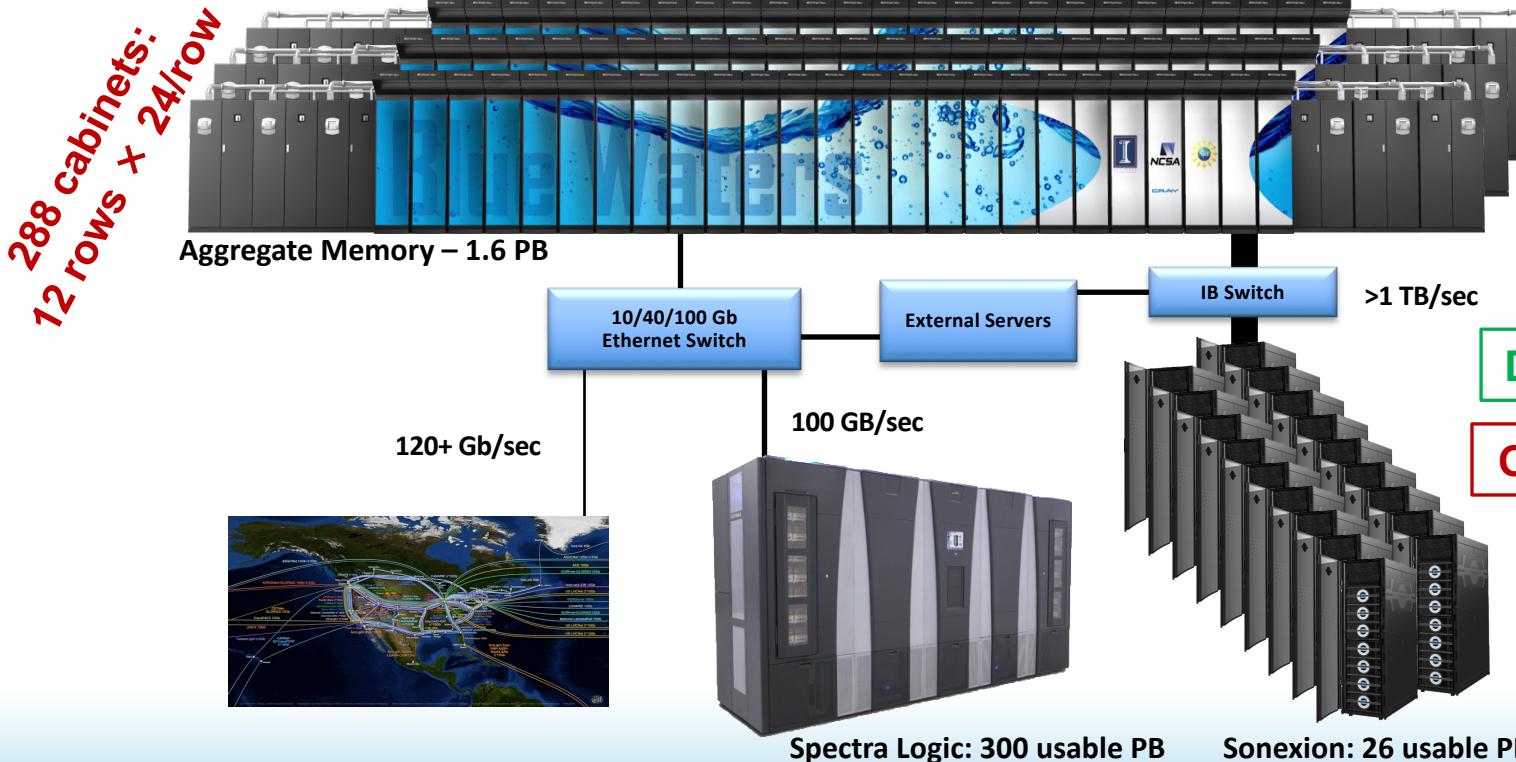
GREAT LAKES CONSORTIUM
FOR PETASCALE COMPUTATION

CRAY®

1 – Introduction - Blue Waters: Sustained-Petascale System



Aggregate Memory – 1.6 PB



Peak: 13.3 PF
XE: 7.1 PF
XK: 6.2 PF

3D-Torus:
 $24 \times 24 \times 24$

Deployment: 2012

Operation: 04/2013

27+ B. core-hrs

2 - Acceptance Testing

a) Structure of Test Plan: *what does acceptance look like at your center?*

- Acceptance Testing: Test Design + Execution + Verification
- Detailed test-design phase: 2011 – Test Matrix (ref: CUG-2012)

actions

filters

The screenshot shows a web-based application titled "BW Test Planning" running in Mozilla Firefox. The URL is https://internal.ncsa.illinois.edu/mis/bwtestplan/index.php?filters-submit=1&name=&category=&test_type=&wbs=&contact=&dedicated_system=&count=2&dec. The page displays a navigation menu on the left with options like "View All", "New Test", "Import Tests", "View Full Report", and "Duplicates Report". Below this is a "Filters" section with dropdown menus for "Test", "Category", "Test Type", "WBS", "Contact", "Dedicated System", and "Cray SOW". A "Counts by Status" summary table is shown above the main data table. The main table, titled "Viewable records", has columns for ID, Test, Point of Contact, Current Status, Category, Cray SOW, and Section in Cray-SOW. It lists 114 test entries, each with a brief description and status information.

ID	Test	Point of Contact	Current Status	Category	Cray SOW	Section in Cray-SOW
15	HPSS core/mover network performance	glasgow	Not Started	SP	No	
29	ioseek	arnoldg	In normal Progress, not yet in Inca	SP, F	No	
79	Hardware management	jfullop	Not Started	SM	Yes	9.6.2.3
92	Vector unit functionality	dhuo	In normal Progress, inside Inca	A, U	No	
93	PETSc installation	dhuo	In normal Progress, inside Inca	U	No	
96	HYPRE installation	dhuo	In normal Progress, inside Inca	U	No	
108	PAPI test	ruliu	In normal Progress, not yet in Inca	U	No	
109	PerfSuite test	ruliu	In normal Progress, not yet in Inca	U	No	
110	TAU test	ruliu	In normal Progress, not yet in Inca	U	No	
111	Performance Counters	ruliu	In normal Progress, not yet in Inca	U	Yes	9.10.4
113	Performance Profiling	ruliu	In normal Progress, not yet in Inca	U	Yes	9.10.4
114	Visit	semeraro	In normal Progress, not yet in Inca	U	No	

stats

TESTS (300+)

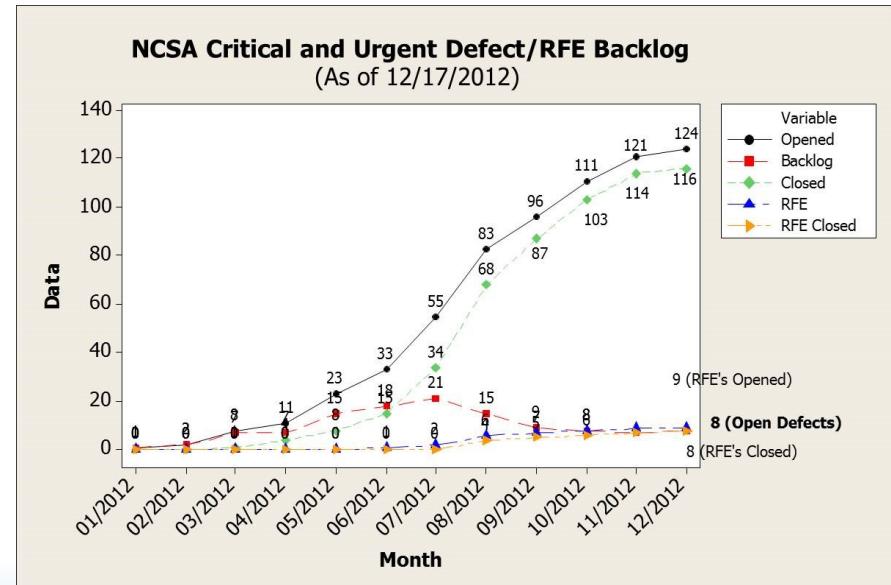
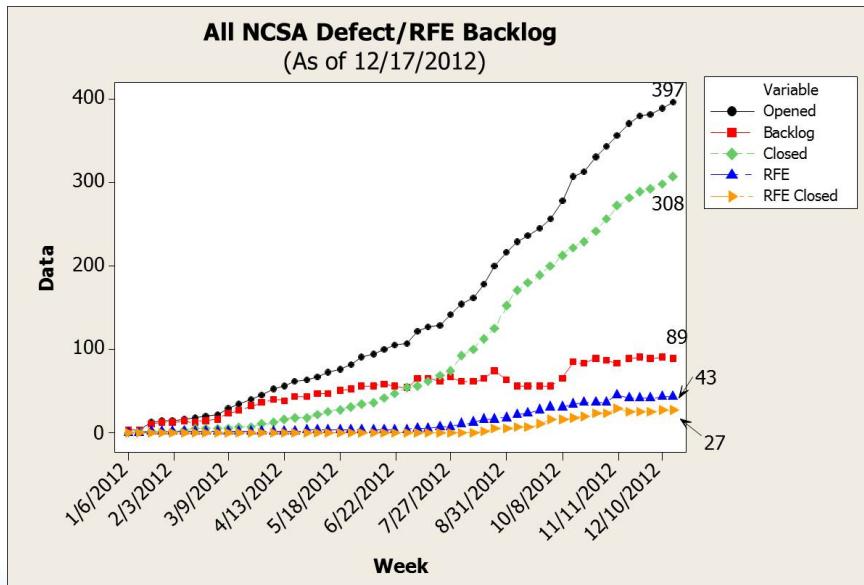
2 - Acceptance Testing

a) Structure of Test Plan: *How long does it take? How large is your team?*

- Timeframe of acceptance:
 - Jan-Jun/2012: Design and preparation of tests on TDS and Early-Sc.
 - Jul-Sep/2012: “Testing” of all tests – debugging, refining, etc
 - Many tests applied to Cray software on TDS
 - Oct-Nov/2012: Bulk of acceptance testing, availability evaluation
 - Dec/2012: Reporting, acceptance decisions
- Personnel involved in testing:
 - Entire Blue Waters team: ~40 people
 - Varied levels of participation and responsibility

2 - Acceptance Testing (cont.)

- Defects found during testing period, filed to CrayPort



2 - Acceptance Testing (cont.)

b) **Test Selection:** *How do you determine which tests to use? What about job sizes to use? Do you use benchmarks, full applications, or a mix?*

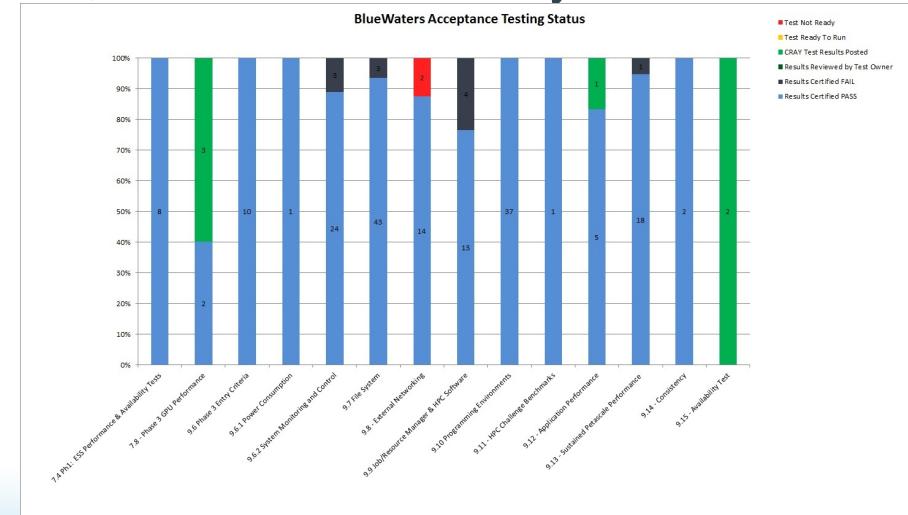
- Two classes of tests:
 - Tests directly derived from the NCSA/Cray contract (SOW): 219 tests
 - Tests specified by NCSA based on other system specs
- Job sizes:
 - Many full-system tests, to demonstrate sustained-petascale perform.
 - Some smaller tests to verify functionality
- Types of tests - Mix:
 - Full applications: Petascale apps, SPP apps – various areas of science
 - Benchmarks (HPCC, IOR, etc)

3 - Testing Tools

a) How do you execute your acceptance test? *By hand vs. home-grown tool vs. open source vs. comm*

- Special job queue created for tests, controlled manually 24/7
 - Test execution: *test owner*
 - Job scheduler: Joe Glenski!
- Tracking of progress: daily
 - Checked jointly by NCSA/Cray
 - All results stored at internal Wiki
 - Results classified into 5 levels

e.g. status on Oct.17, 2012:



3 - Testing Tools (cont.)

b) Have you considered other tools? e.g.: *Gitlab CI*, *Jenkins*, *CTest*, etc.

- NCSA is using Jenkins for regression testing on Blue Waters
- Tests run periodically or on demand
- Historical results remain available
- Help from R.Budiardja (ORNL)
- Described in paper @ CUG'2017

GUI of BW-Jenkins:

The screenshot shows the Jenkins interface for the Blue Waters system. On the left is a sidebar with the following items:

- New Item
- People (highlighted with a green arrow)
- Build History
- Edit View
- Delete View
- Log In
- Manage Jenkins
- My Views
- Credentials

Below the sidebar are two sections:

- Build Queue:** Shows "No builds in the queue."
- Build Executor Status:** Shows the status of 10 executors, each with a progress bar and a status indicator (Pass, Disabled, Fail). The last three executors (8, 9, 10) are highlighted with green arrows pointing to their status labels: "Disabled", "#197", and "Fail".

The main area displays a table of JYC tests:

Add JYC tests that are considered done and production-ready here with "Edit View".					
S	W	Name	Last Success	Last Failure	Last Duration
		cray-hdf5-parallel-jyc	1 day 18 hr - #48	5 mo 19 days - #21	10 min
		cuda-jyc	7 hr 45 min - #442	N/A	10 min
		HDF5Benchmarks	19 min - #2095	1 day 1 hr - #2085	58 sec
		IOR-jyc	8 hr 49 min - #613	N/A	11 min
		JobLaunch-JYC	50 min - #7394	1 day 2 hr - #7367	1 min 34 sec
		LAMMPS	1 day 0 hr - #2086	1 day 1 hr - #2085	46 min
		Lustre_Check_Ost_JYC	58 min - #6992	N/A	3.9 sec
		mdtest-jyc	1 hr 58 min - #529	17 days - #496	10 min
		MILC	4 hr 45 min - #1254	14 days - #1250	31 min
		NAMD	2 hr 44 min - #2135	14 days - #2126	29 min
		NWCHEM	22 hr - #1177	13 days - #1173	4 hr 6 min
		osu_reduce	10 hr - #418	N/A	10 min
		Ostat_JYC	38 min - #8032	N/A	3.9 sec
		stream-xe-jyc	12 hr - #445	26 days - #397	10 min
		testexternaljob	N/A	N/A	N/A
		TestSSH-JYC	2 days 4 hr - #21	1 day 2 hr - #25	6 sec

Acknowledgments

- Funding: NSF OCI-0725070/ACI-1238993, State of Illinois
- Personnel: **NCSA** Blue Waters team, Cray site team

