Inca User-level Grid Monitoring

Shava Smallen
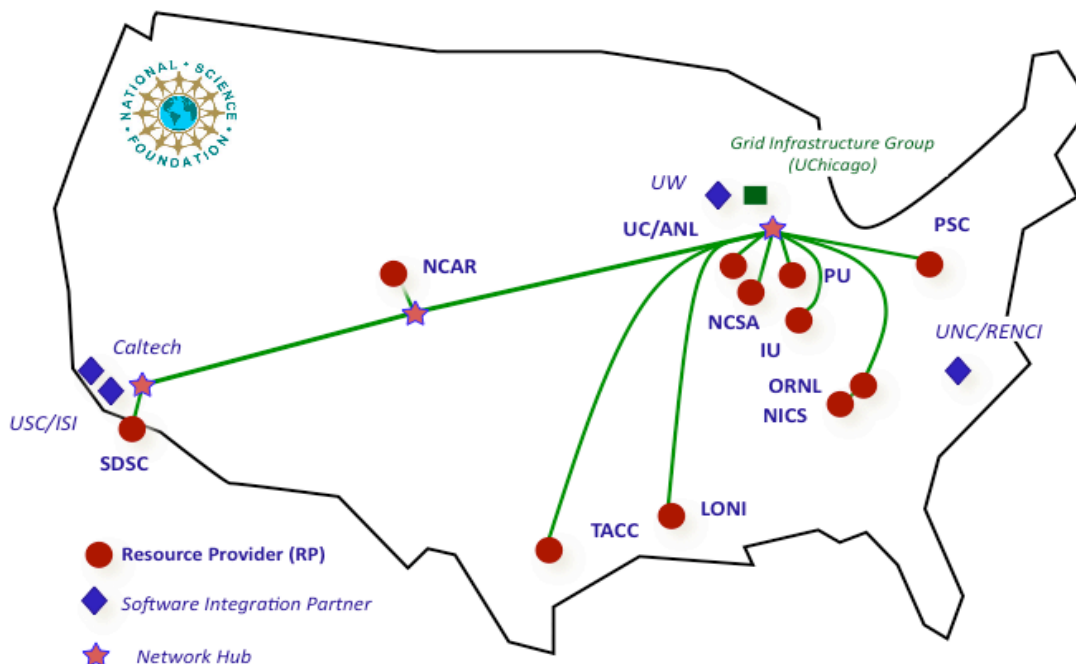
ssmallen@sdsc.edu

SC'09
November 17, 2009

SDSC SAN DIEGO SUPERCOMPUTER CENTER

Goal: reliable grid software and services for users

- Over 750 TF

- Over 30 PB of online and archival data storage

- Connected via dedicated multi-Gbps links

- 30-63 software packages and 6-23 services per resource
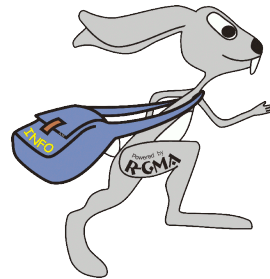
11 TeraGrid sites, 21 resources

Related Grid monitoring tools

BIG BROTHER™

MonALISA
MONitoring Agents using a Large
Integrated Services Architecture

GridICE
the eyes of the Grid

Nagios

Service Availabilty Monitoring

Inca's primary objective: user-level Grid monitoring

User-level grid monitoring

- Runs from a standard user account

- Executes using a standard GSI credential

- Uses tests that are developed and configured based on user documentation

- Automates periodic execution of tests

- Verifies user-accessible Grid access points

- Centrally manages monitoring configuration

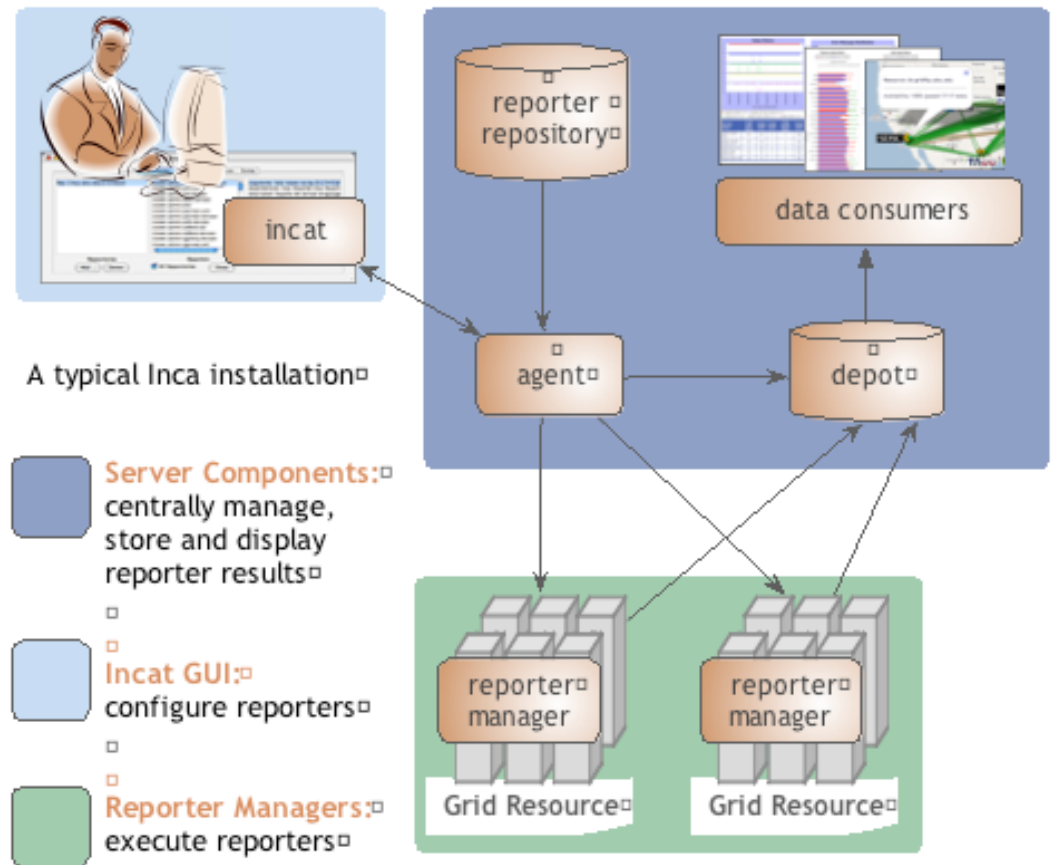- Easily updates and maintains monitoring deployment

Who benefits from user-level grid monitoring?

- **Grid managers**
  - Verify requirements are fulfilled by resource providers
  - Identify failure trends

- **System administrators**
  - Email notification
  - Debugging support

- **End users**
  - Debug user account/ environment issues
  - Advanced users: feedback to Grid/VO
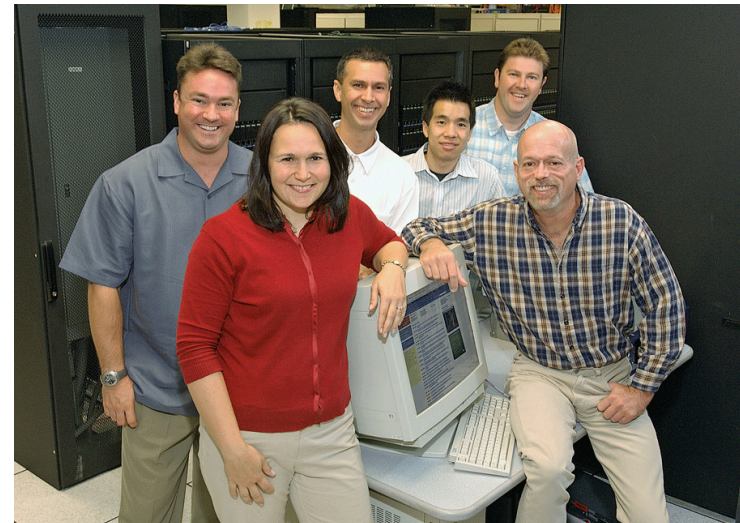
Inca provides user-level grid monitoring

- Stores and archives a wide variety of monitoring results

- Captures context of monitoring result as it is collected

- Eases the writing, deploying, and sharing of new tests or benchmarks

- Flexible and comprehensive web status pages

- Secure

A typical Inca installation

Server Components:
centrally manage, store and display reporter results

Incat GUI:
configure reporters

Reporter Managers:
execute reporters

reporter repository

data consumers

agent

depot

reporter manager

reporter manager

Grid Resource

Grid Resource

incat

Reporters collect monitoring data

- Executable programs that measure some aspect of the system or installed software

- Supports a set of command-line options and writes XML to stdout

- Schema supports multiple types of data

- Extensive library support for perl and python scripts (most reporters < 30 lines of code)

- Independent of other Inca components

Libraries support common reporter tasks

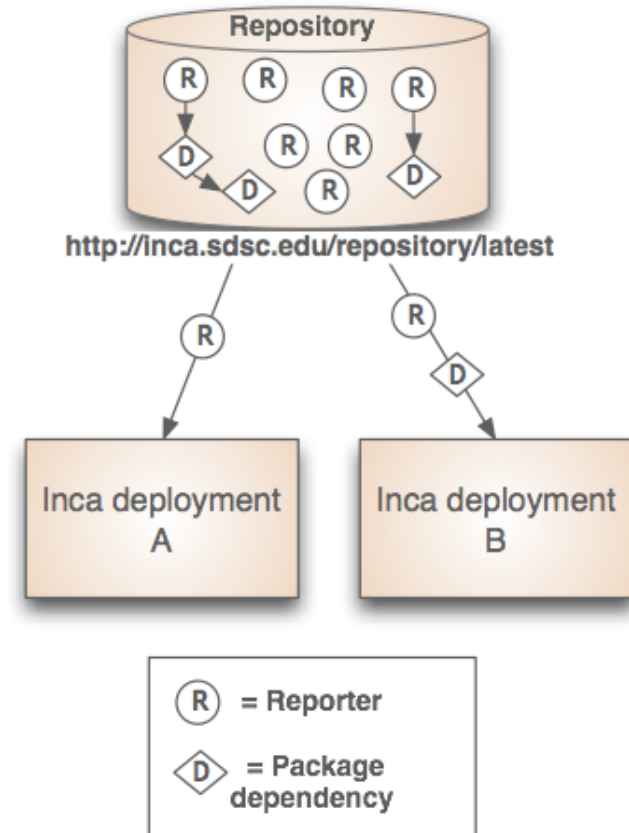| Reporter Purpose	Perl Library	Python Library
General report	Inca::Reporter	inca.Reporter
Software version testing	Inca::Reporter::Version	inca.VersionReporter
Software unit testing	Inca::Reporter::SimpleUnit	inca.SimpleUnitReporter
Globus unit testing	Inca::Reporter::GlobusUnit	inca.GlobusUnitReporter
System performance testing	Inca::Reporter::Performance	inca.PerformanceReporter

Documentation

http://inca.sdsc.edu/releases/latest/repdocs/perl.html

http://inca.sdsc.edu/releases/latest/repdocs/python.html

**SDSC** **SAN DIEGO SUPERCOMPUTER CENTER**

Repositories support sharing

- Collection of reporters available via a URL

- Supports package dependencies

- Packages versioned to allow for automatic updates

- Inca project repository contains 150+ reporters
  - Version, unit test, performance benchmark reporters
  - Grid middleware and tools, compilers, math libraries, data tools, and viz tool

Repository

http://inca.sdsc.edu/repository/latest

Inca deployment A

Inca deployment B

(R) = Reporter

(D) = Package dependency

# Agent provides centralized configuration and management

- Implements the configuration specified by Inca administrator

- Stages and launches a reporter manager on each resource - local, SSH, GRAM, WS-GRAM

- Sends package and configuration updates

- Manages proxy information

- Administration via GUI interface (incat)
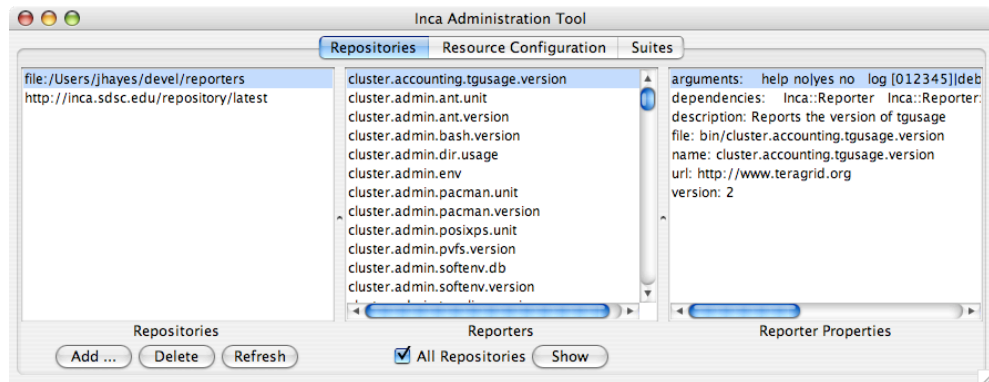
Screenshot of Inca GUI tool, incat, showing the reporters that are available from a local repository

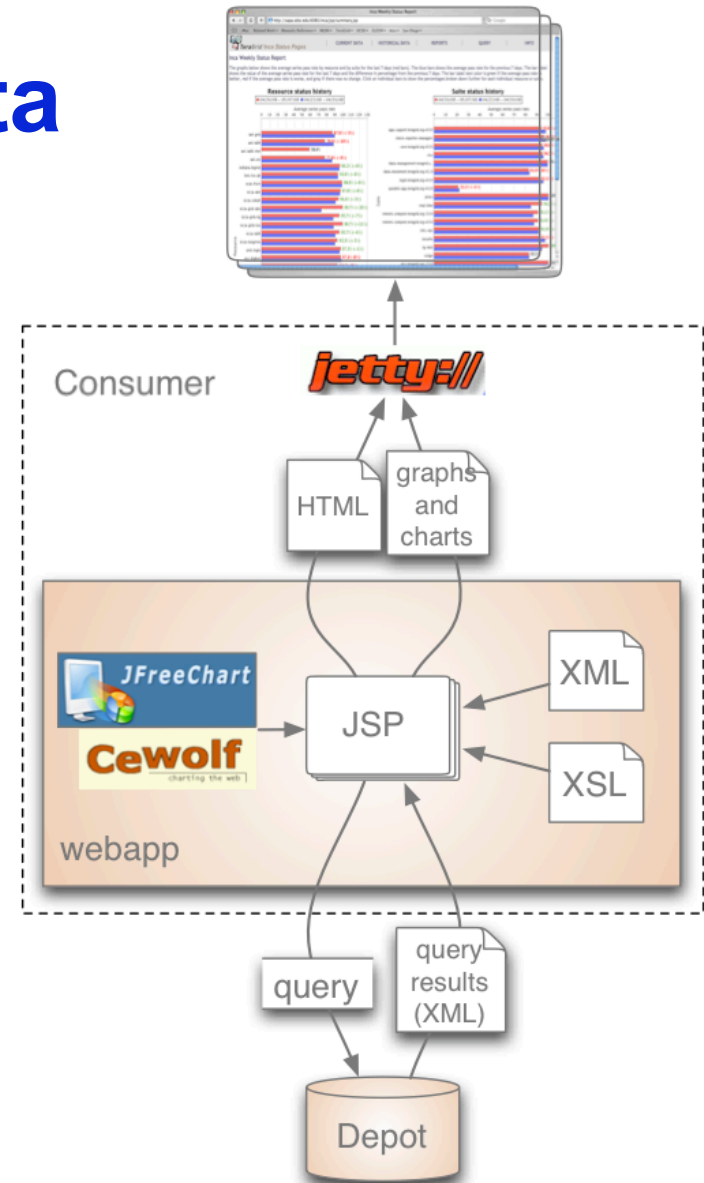**SDSC** **SAN DIEGO SUPERCOMPUTER CENTER**

Depot stores and publishes data

- Stores configuration information and monitoring results

- Provides full archiving of reports

- Uses relational database backend via Hibernate

- Supports HQL and predefined queries

- Supports plug-in customization (e.g., email notifications, downtimes)

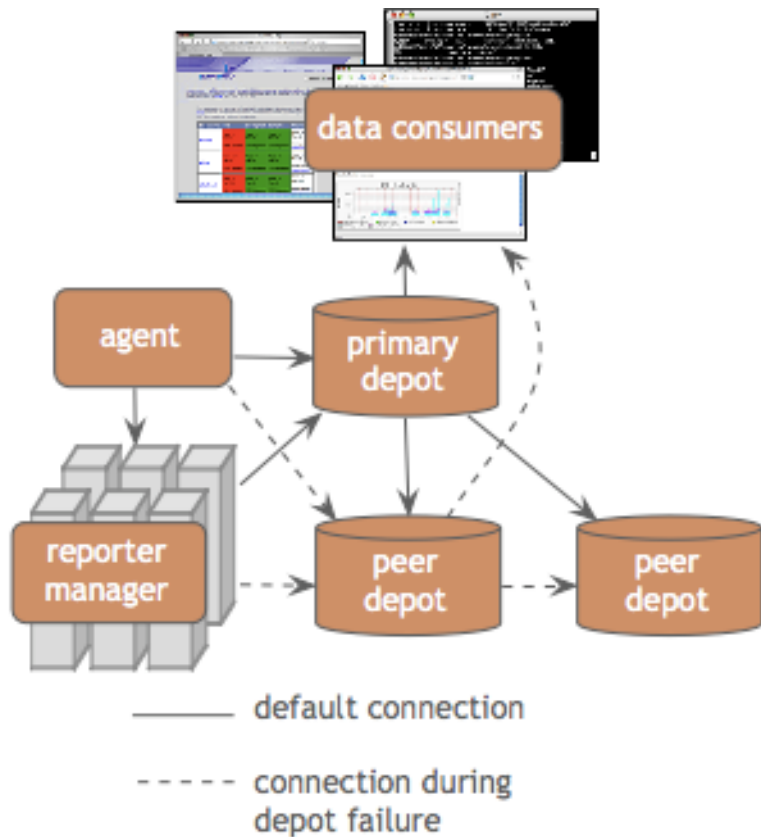- Web services - Query data from depot and return as XML
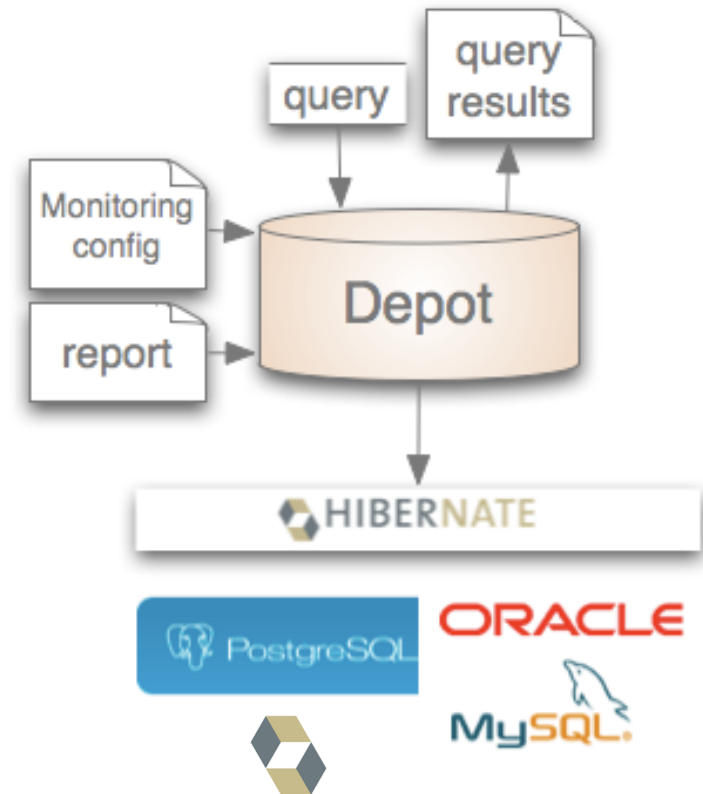
Consumer displays data

- Current and historical views

- Web application packaged with Jetty

- JSP 2.0 pages/tags to query data and format using XSLT

- CeWolf/JFreeChart to graph data

- Ability to fetch Inca data in HTML or XML format via REST URLs *new*

- Allow "run nows" from the Inca web status pages *new*

SDSC

inca

Tests Summary

Resource status history

Weekly status report

Cumulative test status by resource

Error history summary

Test status by package and resource

Related test histories

Individual test history

Individual test result details

Test Details

Historical

Current status

New features

Depot peering provides fault tolerance

"Approval" mode allows system administrators greater control over testing on their resources

Software status and deployments

Current software version: 2.5
(available from Inca website)

http://inca.sdsc.edu

Inca TeraGrid deployment

- Running since 2003

- Resource registration in information services (IIS)

- Total of ~2200 tests running on 18 login nodes, 2 grid nodes, and 3 servers

- Email notifications for critical services

- Cross-site tests

- CA certificate and CRL checking

Screenshot of Inca status pages for TeraGrid

http://inca.teragrid.org/

IIS paper to be given on Friday at GCE'09 by JP Navarro

SDSC SAN DIEGO SUPERCOMPUTER CENTER

inca

Using Inca and IPM to measure performance variation on TeraGrid

- Joint work with Nick Wright (LBL) and PMaC group
- Performance variation makes code optimization challenging
- Benchmarks: Paratec, WRF, PingPong, and HPCC (naturally ordered ring and random ring)
- Machines: NCSA Abe, NICS Kraken, and TACC Ranger
- 256 processors twice a day during March 2009
- Variance due to network contention; higher for WRF
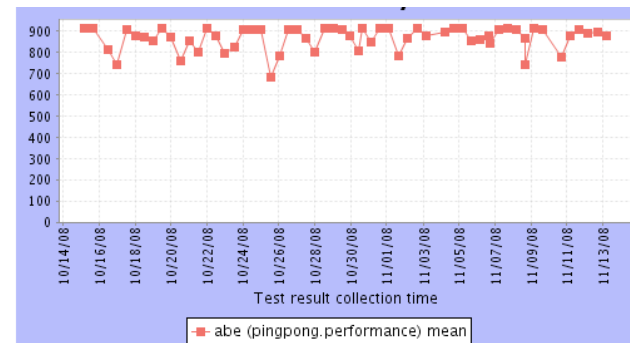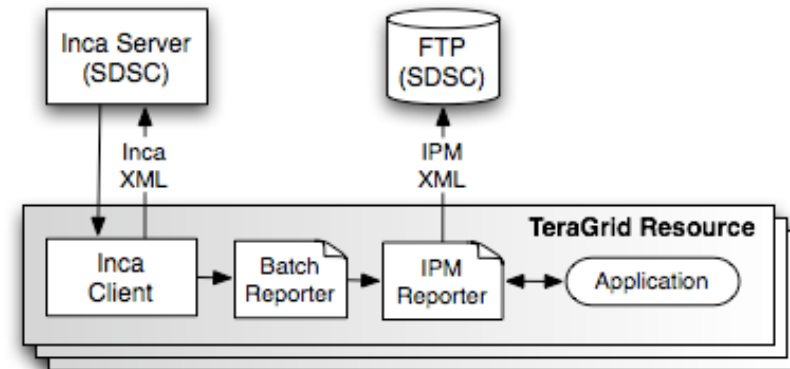
Mean MPI ping pong bandwidth history

Wright, N., Smallen, S., Olschanowsky, C., Hayes, J., Snavely, A. "Measuring and Understanding Variation in Benchmark Performance", *published in HPCMP UGC 2009*

SAN DIEGO SUPERCOMPUTER CENTER

Inca UC Grid deployment

- University of California campuses

- Lead by UCLA

- First deployed in August and now includes 4 campuses

- Total of 71 tests running on 5 portal servers, 4 appliance nodes, and the myproxy server

http://inca.ucgrid.org

SDSC SAN DIEGO SUPERCOMPUTER CENTER

inca

Inca monitoring benefits end users

"Inca reported errors mirror failures we've observed and as they are addressed we've noticed an improvement in TeraGrid's stability."

-- Suresh Marru (LEAD developer)

- Tests resources and services used by LEAD. E.g.
  - Pings service every 3 mins
  - Verifies batch job submission every hour
- Automatically notifies admins of failures
- Show week of history in custom status pages
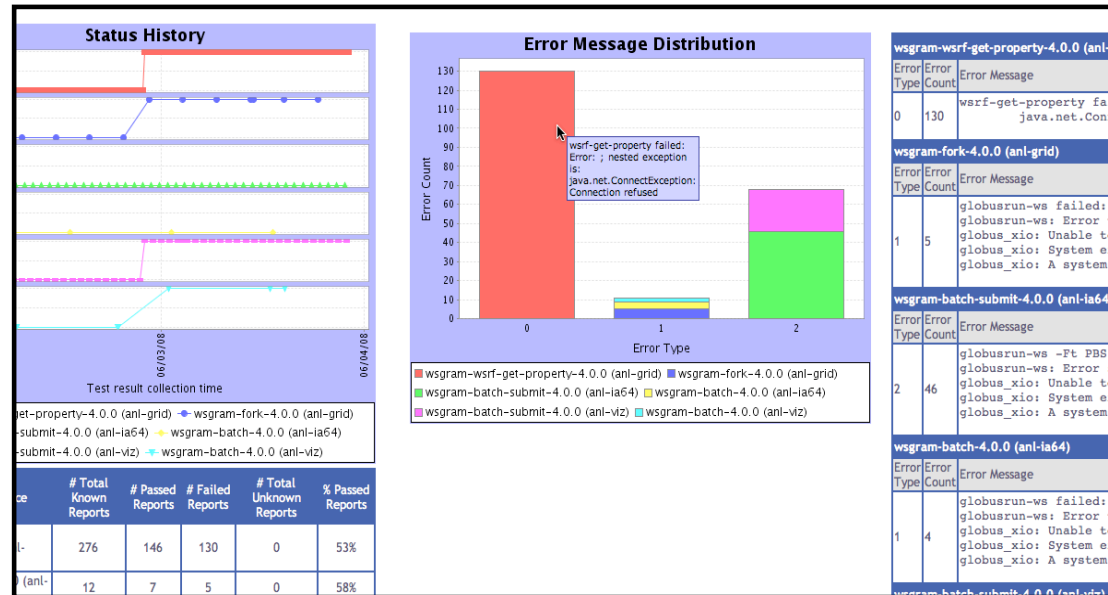
Benefits of using Inca

- Detect problems before the users notice them

- Easy to write and share tests and benchmarks

- Easy to deploy and maintain

- Flexible and comprehensive displays

SDSC SAN DIEGO SUPERCOMPUTER CENTER
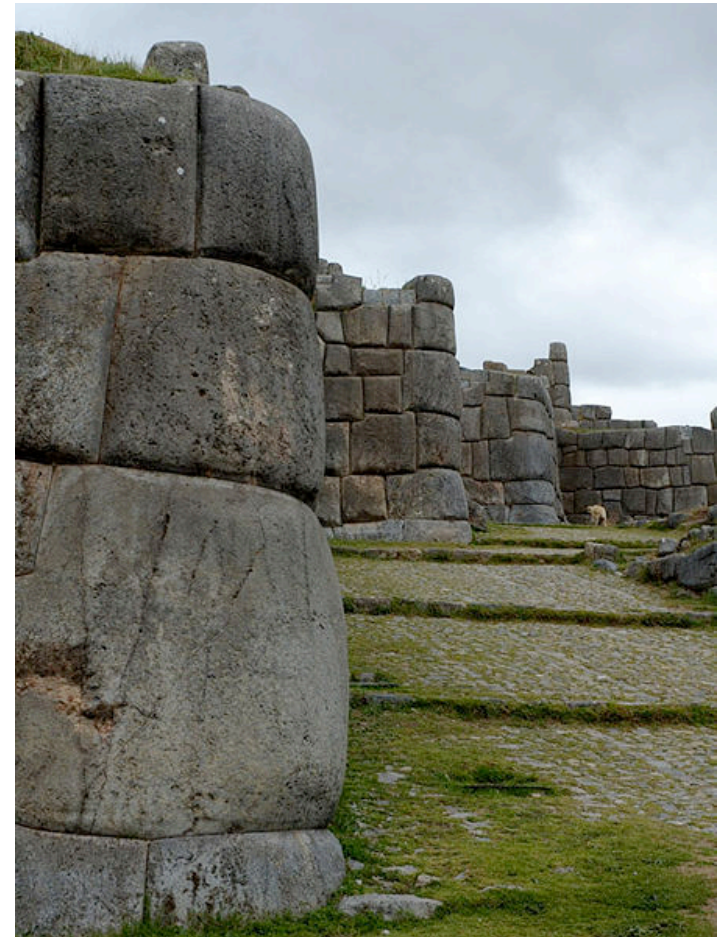
Inca Information

- Announcements:
  inca-users@sdsc.edu

- Email:
  inca@sdsc.edu

- Website:
  http://inca.sdsc.edu

- Supported by: