Welcome to the

Inca 2.0 Workshop

Sponsored by the San Diego Supercomputer Center

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SDSC SAN DIEGO SUPERCOMPUTER CENTER

Thank you for attending

Workshop Goals

- Understand Inca goals and objectives
- Learn new features of v2
- Deploy or upgrade to an Inca v2 installation
- Give feedback to Inca project team

Agenda -- Day 1

9:00 - 10:00	Inca 2.0 overview
10:00 - 11:00	Working with Inca Reporters
11:15 - 12:00	Hands-on: Reporter API and Repository
1:00 - 2:00	Inca Control Infrastructure
2:00 - 3:00	Administering Inca with incat
3:15 - 4:00	Hands-on: Inca deployment (part 1)

Agenda -- Day 2

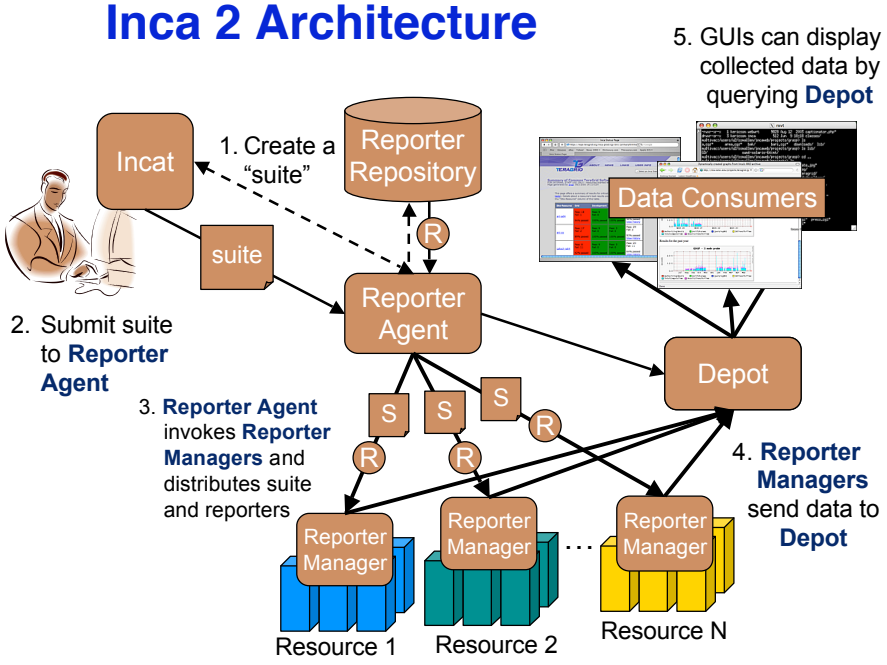
9:00 - 10:00	Inside the Inca Depot
10:00 - 11:00	Data display (data consumers)
11:15 - 12:00	Hands-on: Data display (data consumers)
1:00 - 3:00	Hands-on: Inca deployment (part 2)
3:15 - 4:00	Wrap up

Inca Information

- Announcements: inca-users@sdsc.edu
- Bugs/Feature Requests: http://inca.sdsc.edu/bugs
- Email: inca@sdsc.edu
- Website: http://inca.sdsc.edu
- Supported by:

SDSC TeraGrid NMI PMaC Performance Modeling and Characterization

Inca 2 Architecture



Inca 2 Components

- Data Collection

R — A **Reporter** is an executable program that tests or measures some aspect of the system or installed software.

Reporter Repository — A **Reporter Repository** contains a collection of reporters and is available via an URL.

Suite — A **Suite** specifies a set of reporters to execute on selected resources, their configuration, and frequency of execution.

Inca 2 Components (cont.)

- Administration and control

Reporter Manager

A **Reporter Manager** is responsible for managing the schedule and execution of reporters on a single resource

Reporter Agent

A **Reporter Agent** is a server that implements the configuration specified by the Inca Administrator.

Incat

Incat is a GUI used by the Inca administrator to control and configure the Inca deployment on a set of resources.

Inca 2 Components (cont.)

- Data Storage and Display

Depot

A **Depot** is a server that is responsible for storing the data produced by reporters.

Data Consumer

A **Data Consumer** is typically a web page client that queries a Depot for data and displays it in a user-friendly format.

v1/v2 Inca Components

Components	Version 1	Version2
Data Consumers	X	X
Depot	X	X
Reporter	X	X
Controller	X	
Reporter Manager		X
Collector	X	
Incat		X
Reporter Agent		X
Reporter Repository		X

Inca 2.0 Overview

Shava Smallen
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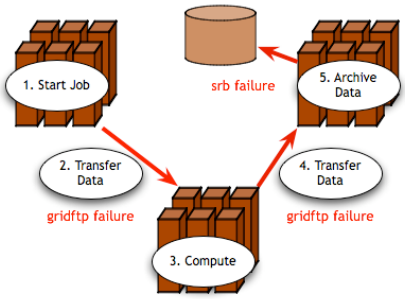
Inca 2.0 Workshop
February 23, 2006

Grid Reliability

- **Grid computing**: The ability to dynamically link resources together as an ensemble to support the execution of large-scale, resource-intensive, and distributed applications

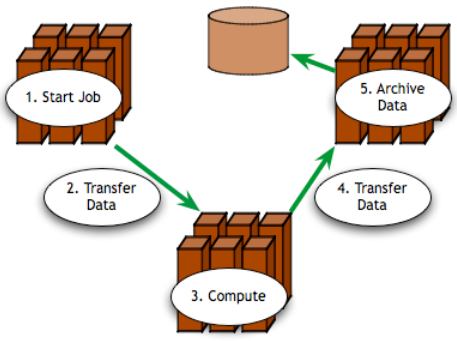


Simple Grid application

"You know you have [a distributed system] when the crash of a computer you've never heard of stops you from getting any work done." -- Leslie Lamport

Is the Grid up?

- Can user X run application[s] Y on Grid[s] Z? Access dataset[s] N?
  - Can I login?
  - Are Grid services the application[s] use available? Compatible versions?
  - Are dataset[s] N accessible to user X? Credentials?
  - …



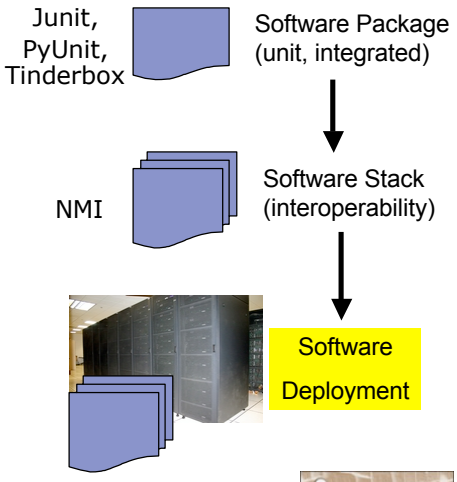
Testing a Grid

1. Iteratively define a set of concrete requirements
2. Write tests to verify requirements
3. Periodically run tests and collect data
4. Publish data

Automate Steps 3 and 4

What type of testing?

- Deployment testing
  - Automated, continuous checking of Grid services, software, and environment
  - Installed? Configured correctly? Running? Accessible to users? Acceptable performance?
  - E.g., gatekeeper ping or scaled down application



Who are the consumers?

- Grid/VO management
  - Responsible for designing & maintaining requirements
  - Verify requirements are fulfilled by resource providers
- System administrators
  - Notified of problems
  - Enough information to understand context of problem
- End users
  - View results and compare to problems they are having
  - Debug user account/environment issues
  - Advanced users: feedback to Grid/VO

Inca

- Inca is a framework for the automated testing, benchmarking and monitoring of Grid resources
- Inca provides:
  - Scheduled execution of information gathering scripts (reporters)
  - Data management
    - collection
    - archiving
    - publishing

Related Grid monitoring tools

BIG BROTHER™

CLUMON
The Cluster Monitoring System

Ganglia
.sourceforge.net

GridICE
the eyes of the Grid

Hawkeye

the globus toolkit
MDS

MonALISA
MONitoring Agents using a Large Integrated Services Architecture

Nagios

Inca's primary objective: user-level Grid functionality testing and performance measurement

Unique features of Inca

- Debugging
  - Runs under a regular user account
  - Flexibly expresses results
  - Captures reporter execution context
  - Securely re-runs reporters
  - Archives full reports
  - Reporters can be run outside framework

Unique features of Inca (cont.)

- Compares results to a specification
- Easily and securely configured
  - Data collection
  - Installation
- Profiles and logs reporter resource use

Outline

- Inca in use
- Architecture overview
- Software Status

Inca today

- Version 1
  - aka 0.10.3
  - available from website and NMI distribution
- Version 2 pre-release
  - Available as of 02/06
  - Production version available in 1-3 months
- *Both versions of Inca are currently being used in production environments*

Inca in use

1) Software stack validation and verification (v1)
2) Network bandwidth measurements (v1)
3) Grid benchmarking

1) Inca in use: TeraGrid software stack V&V

- TeraGrid - an “enabling cyberinfrastructure” for scientific research
  - ANL, Indiana Univ., NCSA, ORNL, PSC, Purdue Univ., SDSC, TACC
  - 40+ TF, 1+ PB, 40Gb/s net
- Common TeraGrid Software & Services
  - Common user environment across heterogeneous resources
  - TeraGrid VO service agreement

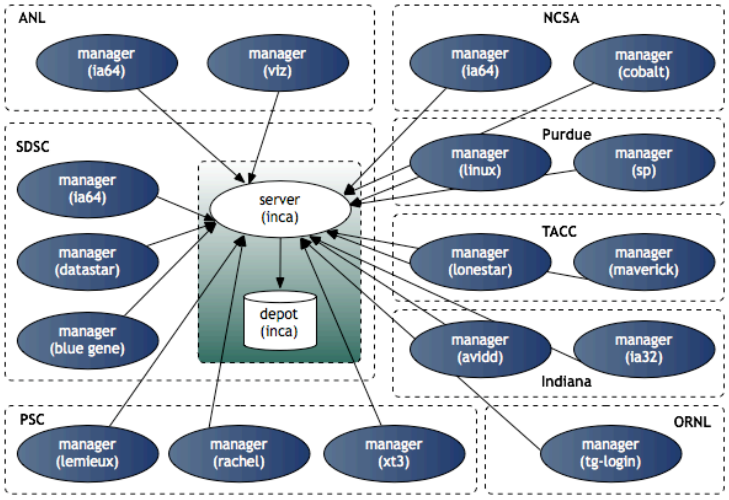
1) Inca in use: TeraGrid software stack V&V

- Common software stack:
  - **20 core packages**: Globus, SRB, Condor-G, MPICH-G2, OpenSSH, SoftEnv, etc.
  - **9 viz package/builds**: Chromium, ImageMagick, Mesa, VTK, NetPBM, etc.
  - **21 IA-64/Intel/Linux packages**: glibc, GPFS, PVFS, OpenPBS, intel compilers, etc.

➡ 50 version reporters: compatible versions of SW

➡ 123 tests/resource: package functionality
  - **Services**: Globus GRAM, GridFTP, MDS, SRB, DB2, MyProxy, OpenSSH
  - **Cross-site**: Globus GRAM, GridFTP, OpenSSH

1) Inca in use: TeraGrid deployment



- 8 sites/17 resources
- Run under user account inca

1) Inca in use: Summary status page

TERAGRID Summary * CTSS * SoftEnv (detail) * Default User Environment

Summary of Common TeraGrid Software and Services 2.0

Page generated by Inca: 07/13/04 18:39 CDT

This page offers a summary of results for critical grid, development, and cluster tests (view list of tests). Details about a resource's test results are available by clicking on the resource name in the "Site-Resource" column of the table.

Site-Resource	Grid	Development	Cluster	Total Pass
site1-resource1	Pass: 32 Fail: 1 96% passed	Pass: 23 Fail: 0 100% passed	Pass: 1 Fail: 1 50% passed	Pass: 56 Fail: 2 96% passed
site1-resource2	Pass: 22 Fail: 7 75% passed	Pass: 23 Fail: 0 100% passed	Pass: 1 Fail: 1 50% passed	Pass: 46 Fail: 8 85% passed
site2-resource1	Pass: 1 Fail: 18 5% passed	Pass: 2 Fail: 10 16% passed	n/a	Pass: 3 Fail: 28 9% passed

Expanded View of Errors

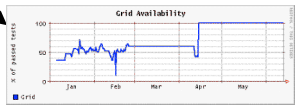
site1-resource1

Grid

1. globus-2.4.3-intel-r3: failed: duroc_mpi_helloworld_to_jobmanager-pbs test

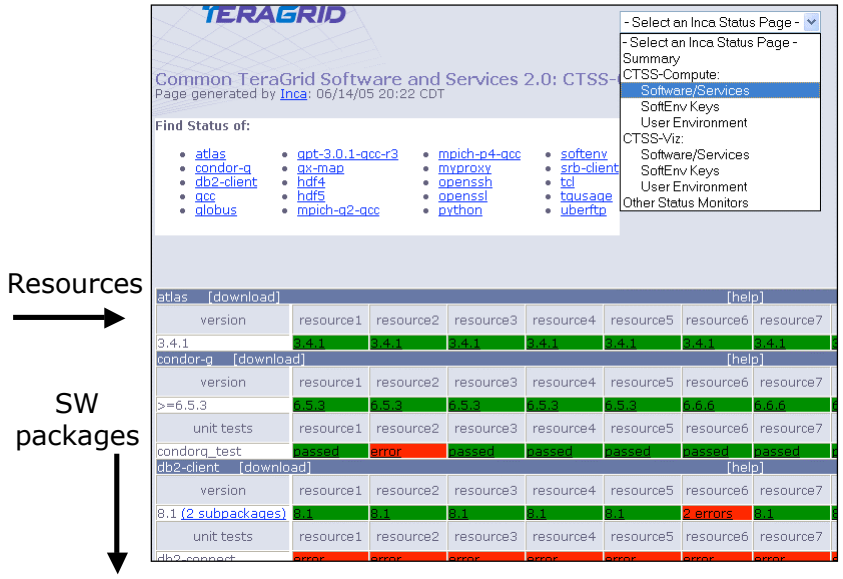
Key

- All tests passed: 100%
- One or more tests failed: < 100%
- Tests not applicable to machine or have not yet been ported



History of percentage of tests passed in "Grid" category for a 6 month period

1) Inca in use: Detailed Status View



1) Inca in use: Detailed view

Reporter details:

reporter name	grid.middleware.globus.unit.gatekeeper *(click on reporter name to view reporter script)*
description	This test runs globusrun -a [hostname] to check that the gatekeeper at the host is accessible from the local machine
version	1.4
status	production
url	http://www.ncsa.uiuc.edu/People/jbasney/teragrid-setup-test.html

Execution information:

inputs	verbose 1 help no log 3 host test_hostname
ran at (GMT)	Wed Jun 15 00:13:02 2005
age	27 mins
runs every	1 hour(s)

Reporter system command log:

The following are the *system* commands executed by the reporter. Note that the reporter may execute other actions in between system commands (e.g., change directories). Please click the on reporter name above for the full reporter code.

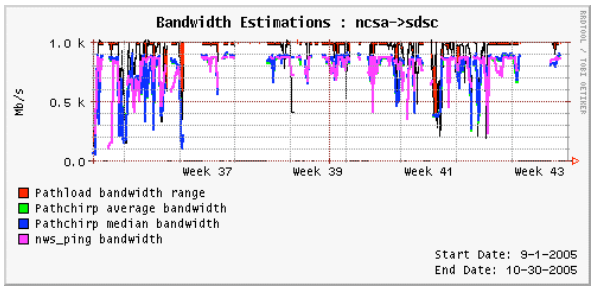
```
% globusrun -a -r test_hostname 2>&1
```

Host information:

hostname	ran_on_hostname
ipaddr	192.100.00.000
uname	Linux ##### SMP Fri Jun 3 11:44:48 EST 2005 i686 i686 i386 GNU/Linux

2) Inca in use: Comparison of end-to-end bandwidth measurement tools

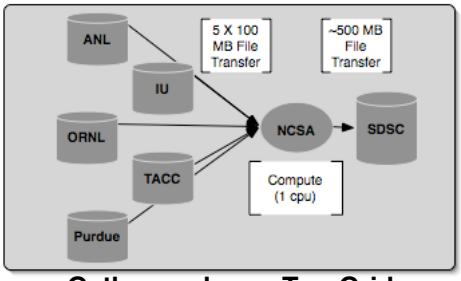
- Joint work with Margaret Murray (TACC) and Martin Swany (UDel)
- Compare bandwidth measurement tools:
  - Pathload [Dovrolis]
  - Pathchirp [Ribeiro]
  - NWS ping [Wolski]



- Deployed to TeraGrid, GEON
- Poster presented at Grid 2005

3) Inca in use: Grid benchmarks

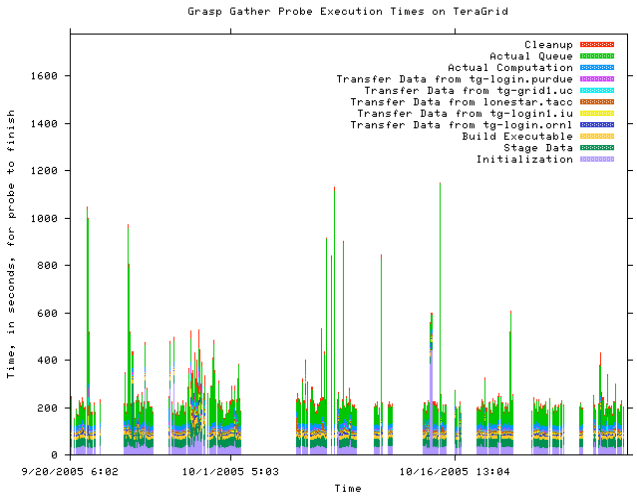
- GrASP: Grid Assessment Probes
  - Set of probes designed to emulate Grid applications
  - Deployed to GEON and TeraGrid



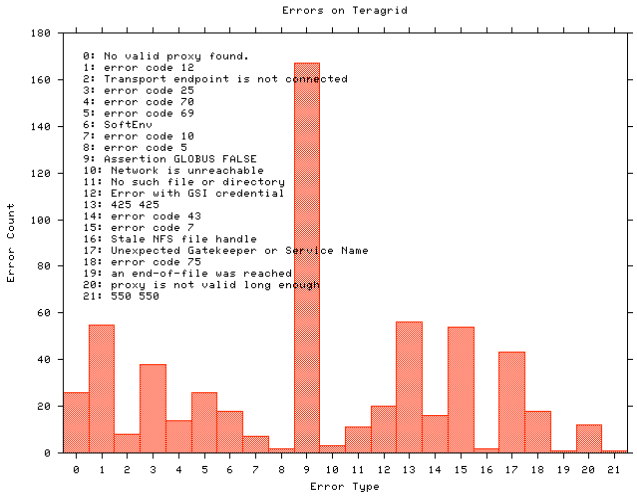
Gather probe on TeraGrid

- C. Olschanowsky, O. Khalili, J. He, H. Casanova, A. Snavely. Acquiring and Using Benchmark Data from Computational Grids, *submitted for publication*

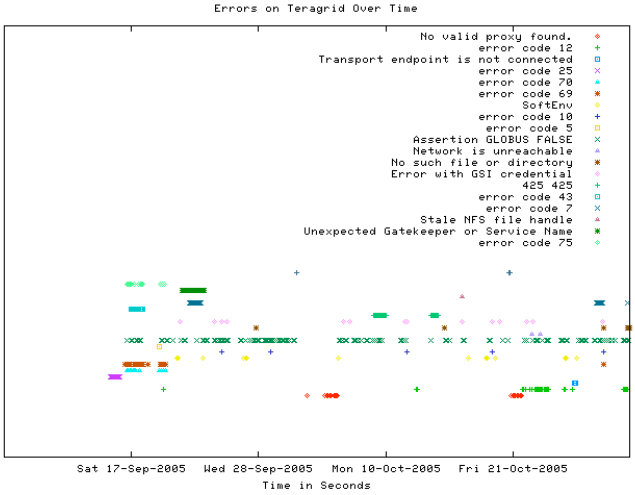
3) Inca in use: Measuring Grid middleware performance



3) Inca in use: Monitoring Grid middleware reliability



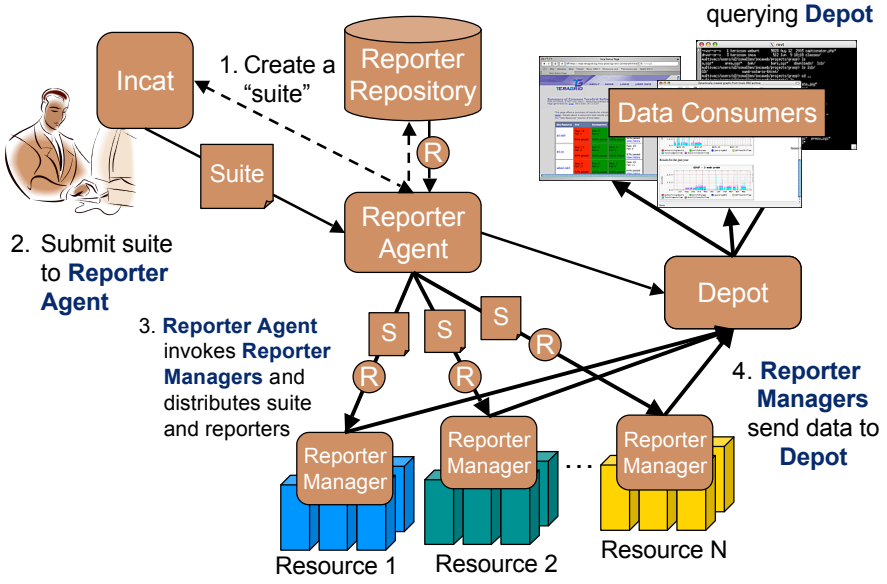
3) Inca in use: Error tracking over time



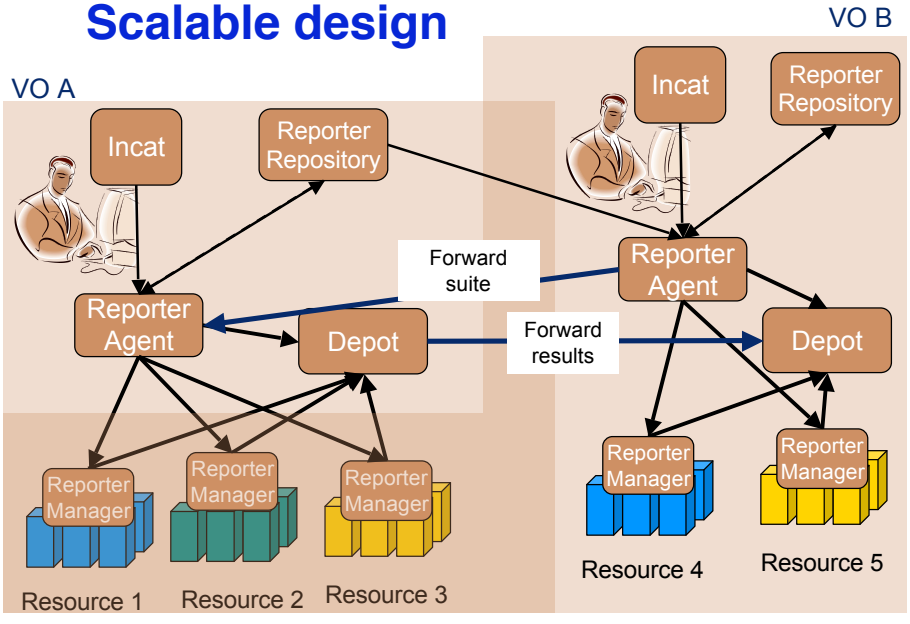
Outline

- Inca in use
- Architecture overview
- Software Status

Architecture overview



Architecture overview: Scalable design



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New features of v2

- Full report archiving
- Flexible querying interface
- Improved installation and configuration control
  - GUI tool for centralized administration
  - Proxy management via MyProxy
  - Reporter sharing via repositories
  - Binary distribution
- Profile reporter system usage
- Inca components communicate using SSL

Software Status

- 2.0 Pre-release
  - Available as of February 6, 2006
  - More integration/stability testing
  - Not recommended for production deployments
  - Binary distribution
- 2.0 Production release in 1-3 months
  - Source and binary distributions

http://inca.sdsc.edu/prerelease.html

Summary

- Periodic, automated, user-level functionality testing needed to monitor Grid reliability
- Inca provides a unique, automated framework for functionality testing and performance measurement
- Inca is successfully deployed on several Grids today