Inca Control Infrastructure

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Inca Workshop
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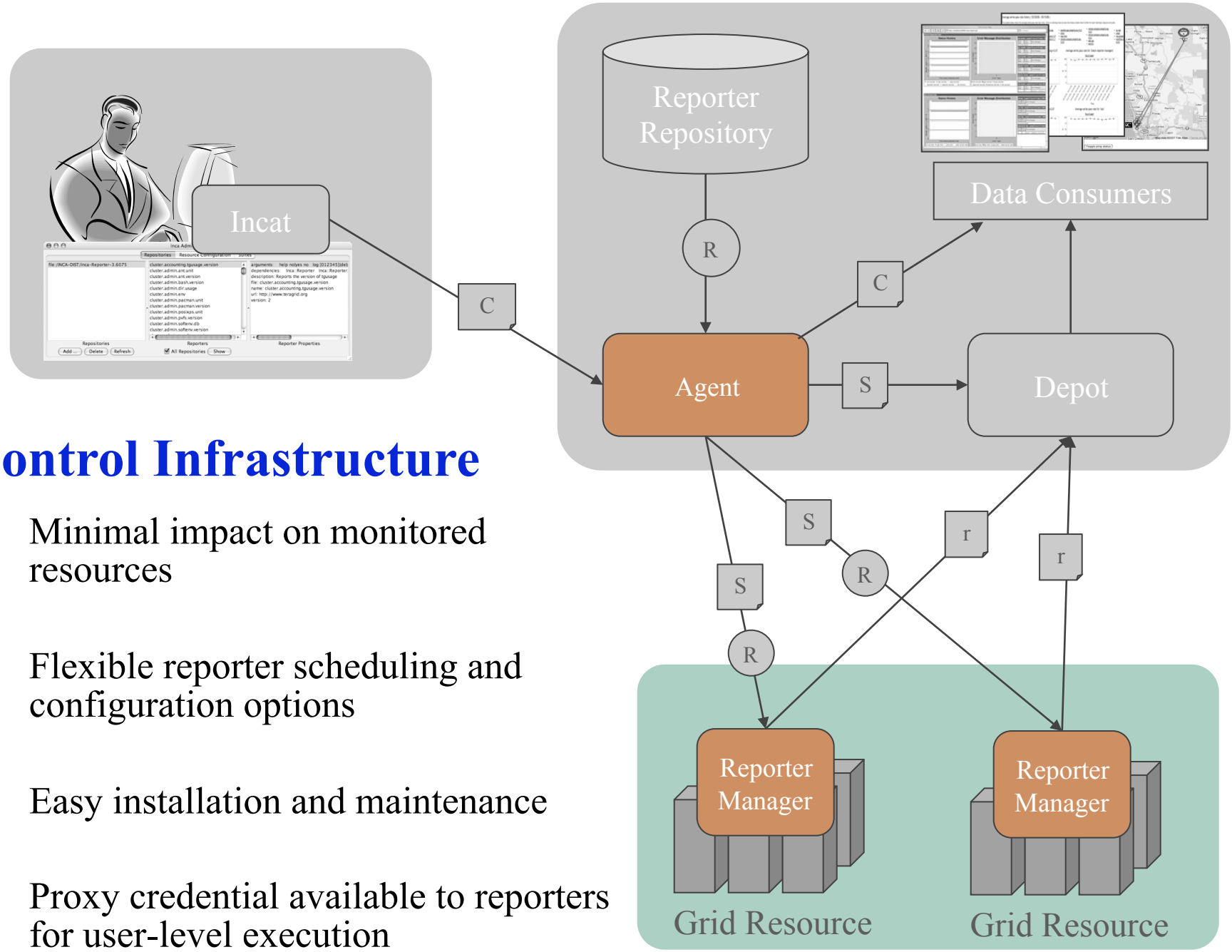
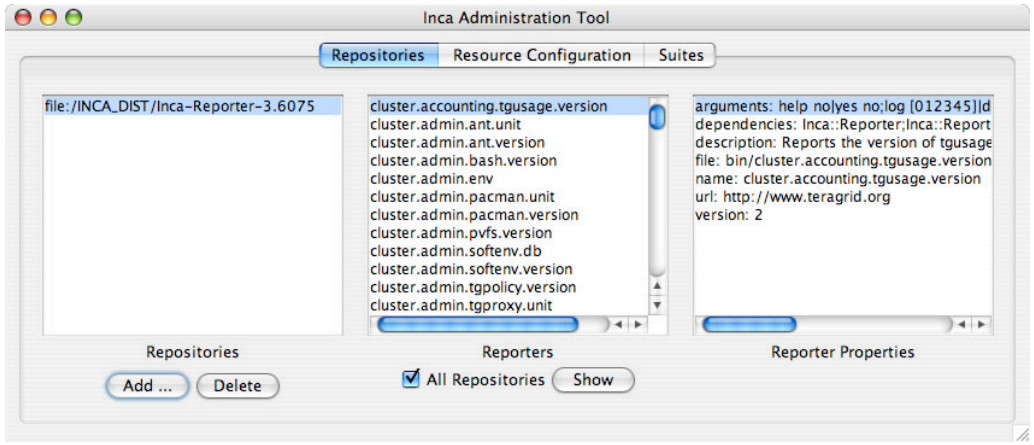
Control Infrastructure

- Minimal impact on monitored resources
- Flexible reporter scheduling and configuration options
- Easy installation and maintenance
- Proxy credential available to reporters for user-level execution



Agent provides centralized configuration and management

- Implements the configuration specified by Inca administrator
- Stages and launches a reporter manager on each resource
- Sends package and configuration updates
- Manages proxy information
- Administration via GUI interface (incat)



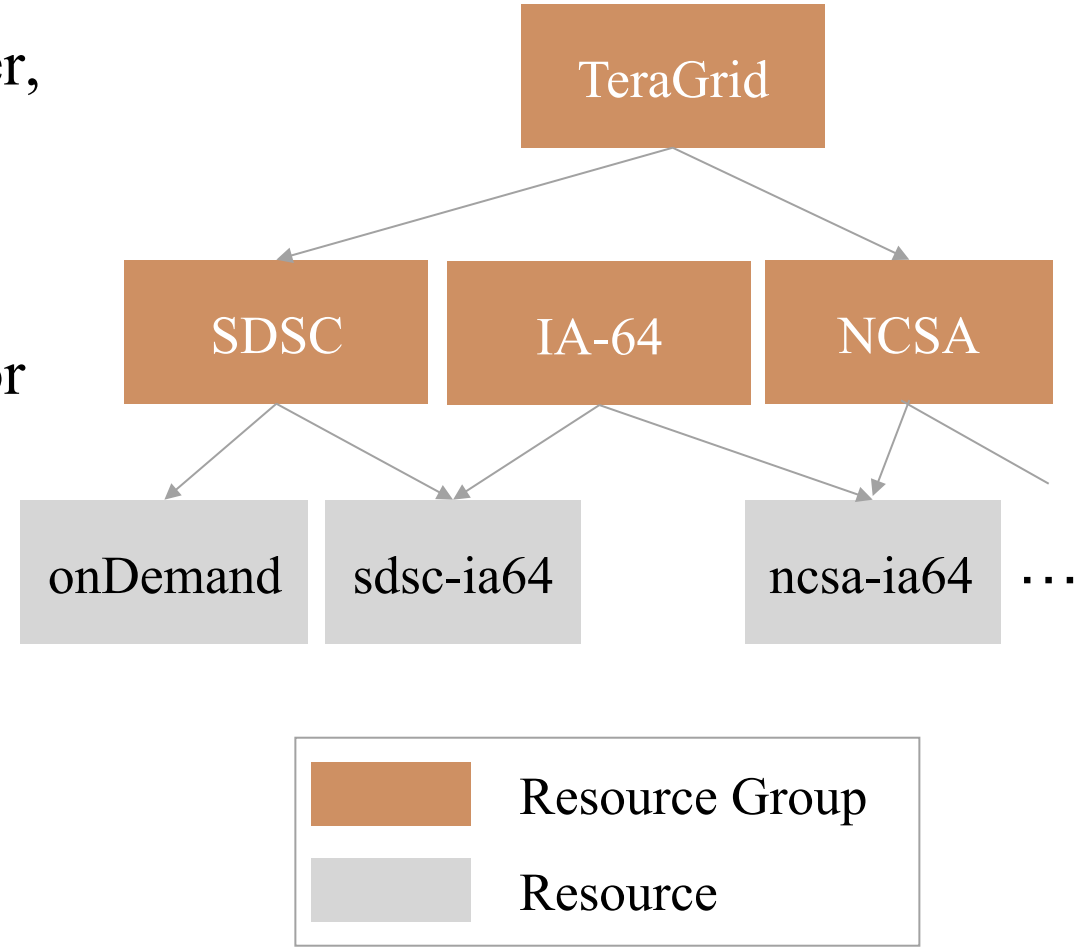
Screenshot of Inca GUI tool, incat, showing the reporters that are available from a local repository

A configuration is a description of an Inca deployment

1. Which resources do you want to monitor?
2. What do you want to monitor?
3. How do you want to monitor?

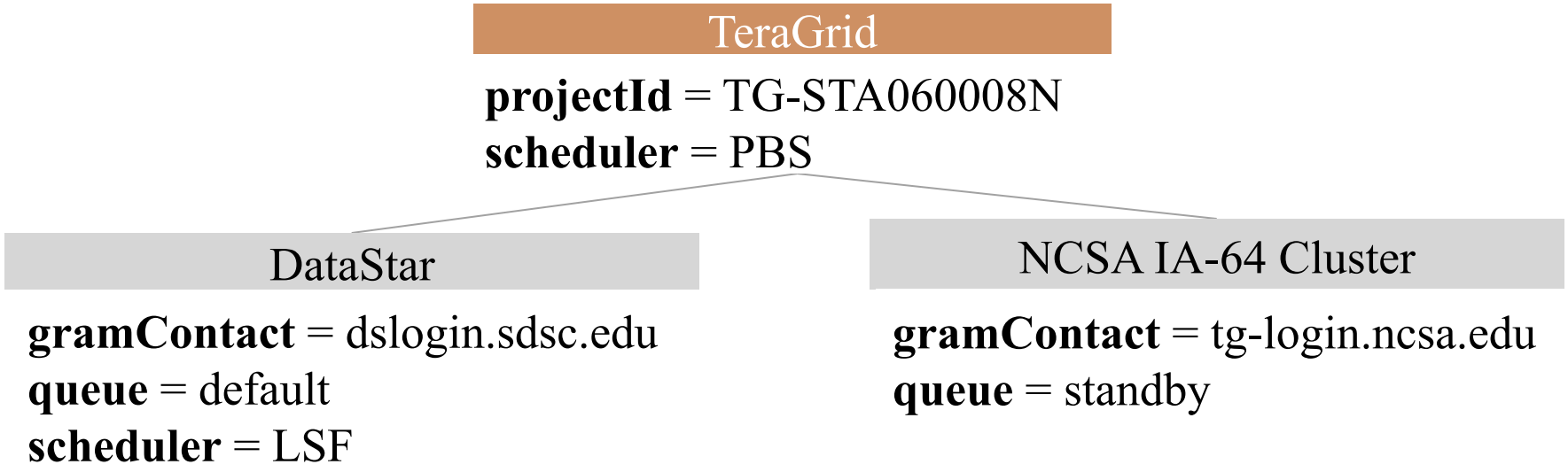
Step 1a: Defining your resources

- A **resource** can be a cluster, supercomputer, or server
- A **resource group** is two or more related resources
  - Shared characteristic (e.g., ia64 arch)
  - Site
  - VO

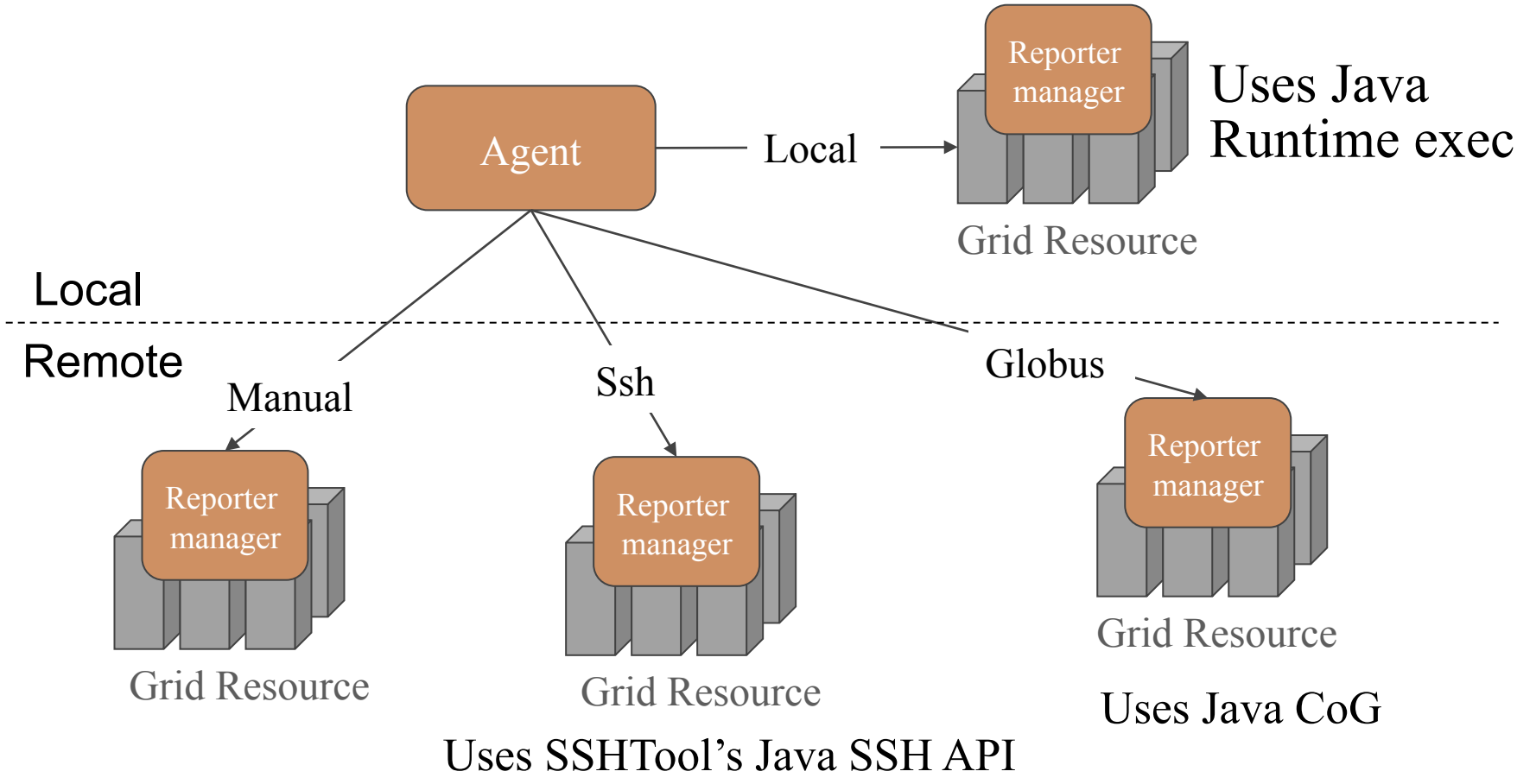


Step 1b: Describing your resources

- **Macros** - Attributes (or variables) that describe your resource
- Can be defined in a resource or in a resource group
- Can be inherited -- most specific value wins
- Can have multiple values



Step 1c: Automating access to resource



Installs in **$HOME/incaReporterManager** by default

A configuration is a description of an Inca deployment

1. Which resources do you want to monitor?
2. What do you want to monitor?
3. How do you want to monitor?

Step 2: Selecting or creating reporters

1. Use local repository
   - Copy of the standard Inca reporter repository installed by default
   - Use file:// or http:// (recommended)

2. Use Inca project reporter repository + local repository
   - Receive updates

A configuration is a description of an Inca deployment

1. Which resources do you want to monitor?
2. What do you want to monitor?
3. How do you want to monitor?

What is a report series?

A set of reports collected at different points in time by executing a reporter with a set of arguments in a context on a particular resource.

Step 3a: Find reporter to execute

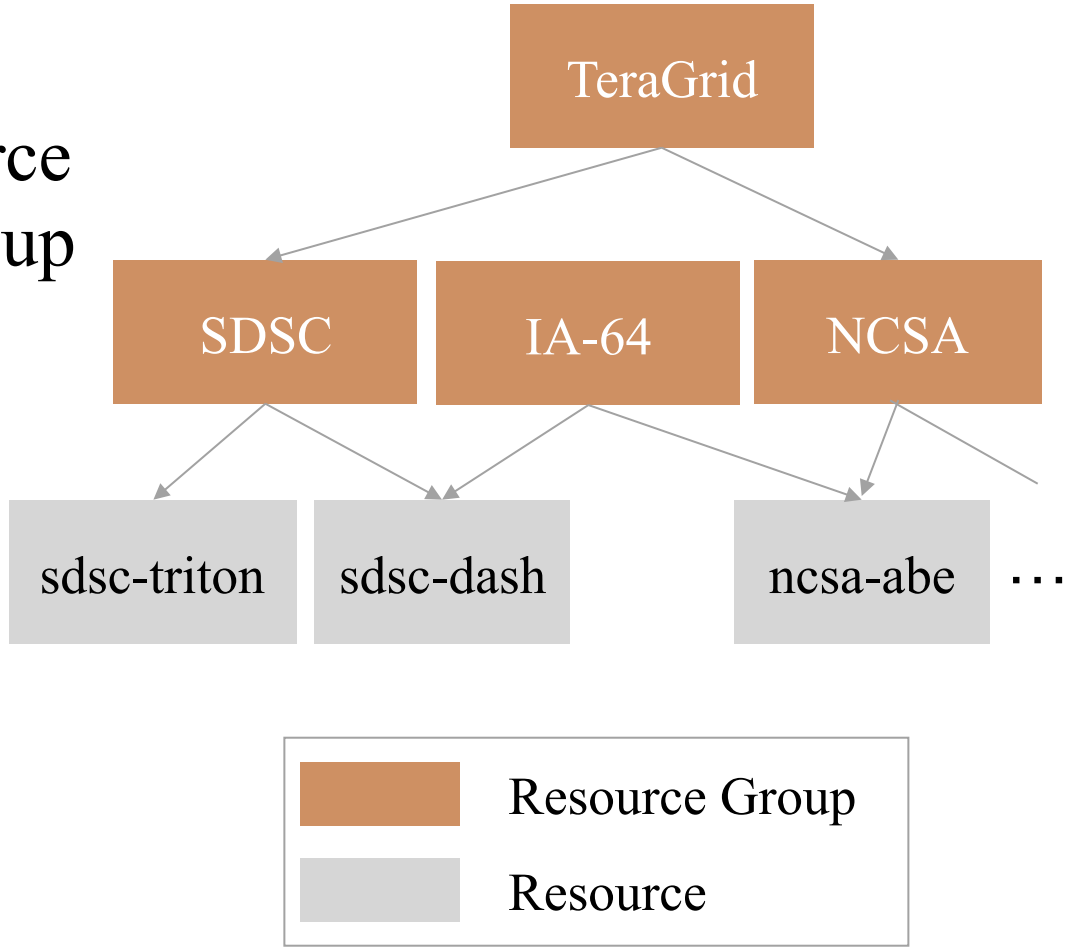
- E.g., can you submit a batch job via Globus WS-GRAM to Grid resources

- Select reporter: grid.middleware.globus.unit.wsgram.jobsubmit

```
% grid.middleware.globus.unit.wsgram.jobsubmit \
    -host="tg-condor.purdue.teragrid.org:8443" \
    -log="5" \
    -maxMem="2048" \
    -nodes="1" \
    -project="TG-STA060008N" \
    -queue="standby" \
    -scheduler="Condor"
```

Step 3b: Decide where to run reporter

- Select a single resource name or resource group
- E.g.,
  - `sdsc-dash`
  - `SDSC`
  - `TeraGrid`
  - `flash`



Step 3c: Configure reporter arguments

```
% grid.middleware.globus.unit.wsgram.jobsubmit \
        -host="@gramContact@" \
        -log="5" \
        -maxMem="2048" \
        -nodes="1" \
        -project="@projectId@" \
        -queue="@queue@" \
        -scheduler="@scheduler@"
```

Resource macros

Resource group macro

TeraGrid

projectId = TG-STA060008N
scheduler = PBS

DataStar

gramContact = dslogin.sdsc.edu
queue = default
scheduler = LSF

NCSA IA-64 Cluster

gramContact = tg-login.ncsa.edu
queue = standby

Agent “expands” macro values in series

TeraGrid

```
grid.middleware.globus.unit
.wsgram.jobsubmit \
-host=”@gramContact@" \
-log="5" \
-maxMem="2048" \
-nodes="1" \
-project=”@projectId@" \
-queue=”@queue@" \
-scheduler=”@scheduler@"
```

SDSC IA-64

```
grid.middleware.globus.unit.wsgram
.jobsubmit \
-host=”tg-login.sdsc.edu:8443" \
-log="5" \
-maxMem="2048" \
-nodes="1" \
STA060008N" \
e@" \
```

NCSA IA-64

```
grid.middleware.globus.unit.wsgram
.jobsubmit \
-host=”tg-login.ncsa.edu:8443" \
-log="5" \
-maxMem="2048" \
-nodes="1" \
-project=”TG-STA060008N" \
-queue=”standby” \
-scheduler=”PBS”
```

Agent "expands" multi-valued macro values in series

NCSA IA-64

```
grid.performance.ping \
-host=@hosts@
```

Reporter will be executed once for each value in macro.

hosts = `tg-login.sdsc.edu, tg-login.uc.edu, tg-login.psc.edu`

NCSA IA-64

```
grid.performance.ping \
-host=tg-login.sdsc.edu
```

NCSA IA-64

```
grid.performance.ping \
-host=tg-login.uc.edu
```

NCSA IA-64

```
grid.performance.ping \
-host=tg-login.psc.edu
```

Agent "expands" *multiple* multi-valued macro values in series

- Multiple multi-valued macros ⇒ cross product
  - E.g.,

```
@gridftpServers@ = bglogin.sdsc.edu, tg.ncsa.edu
@dirs@ = /gpfs/inca, /users/inca, /scr/inca

data.transfer.unit -host=@gridftpServers@ -dir=@dirs@
```

⇒ Will expand to:

```
1. data.transfer.unit -host=bglogin.sdsc.edu -dir=/gpfs/inca
2. data.transfer.unit -host=bglogin.sdsc.edu -dir=/users/inca
3. data.transfer.unit -host=bglogin.sdsc.edu -dir=/scr/inca
4. data.transfer.unit -host=tg.ncsa.edu -dir=/gpfs/inca
5. data.transfer.unit -host=tg.ncsa.edu -dir=/users/inca
6. data.transfer.unit -host=tg.ncsa.edu -dir=/scr/inca
```

New expansion feature available in v2.6

```
@TeraGrid->gridftpServers@ = bglogin.sdsc.edu, tg.ncsa.edu
@TeraGrid->dirs@ = /gpfs/inca, /users/inca, /scr/inca
```

- @RESOURCE/GROUP->macro@
- By default RESOURCE/GROUP assumed to be resource the series is being executed on

Step 3d: Specify an execution context

- Optional execution string can be used to set the context the reporter runs under
- E.g., run reporter under fresh shell:

```
/bin/sh -l -c 'net.benchmark.wget –args'
```

- E.g., softenv/modules configuration

```
soft add +atlas; cluster.math.atlas.version –args
```

- E.g., batch configuration

```
$INSTALL_DIR/bin/cluster.batch.wrapper
-scheduler="pbsxt" -nodes=":8:8" -walllimit=420
-exec='performance.hpcc …'
```

Step 3e: Choose a scheduling frequency

- Expressed in extended cron syntax

```
minute hour dayOfMonth month dayOfWeek
```

minute = The minute of the hour the reporter will be executed (range: 0-59)
hour = The hour of the day the reporter will be executed (range: 0-23)
dayOfMonth = The day of the month the reporter will be executed (range: 0-23)
month = The month the reporter will be executed (range: 1-12)
dayOfWeek = The day of the week the reporter will be executed (range: 0-6)

- "?" in the field tells Inca to pick a random time within the specified range -- spreads out load
  - ? * * * * = run anytime every hour
  - ?-59/10 * * * * = run anytime every 10 minutes

Step 3f: Specify a unique nickname

- Descriptive name that describes the test
- Can contain macros -- important for multi-valued macros
- E.g., `atlas_version`
- E.g., `gridftp_test_to_@site@`

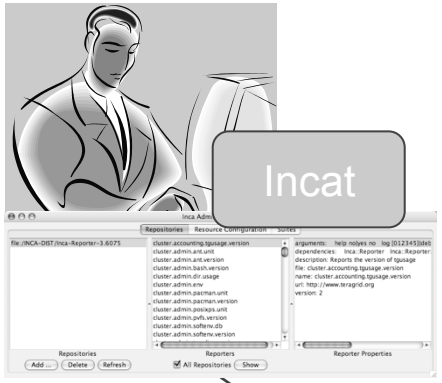
Step 3g: Limit resource usage of reporter (optional)

- Wall clock time
  - E.g., no more than 10 seconds
- Cpu seconds
  - E.g., no more than 2 cpu seconds
- Memory
  - E.g., no more than 20 MB
- Reporter will be killed and an error report will be sent indicating the resource usage exceeded

What is a suite?

- A set of report series that share a common theme. E.g.,
  - data management
  - job management
  - file transfer
  - LiDAR workflow

Inside the agent



Incat

Reporter Repository

R

C

Refresh repository

Download reporters

C

Expand series

Distribute

Depot

Repository cache

Suites

RM controller

S

S

S

r

r

R

R

Reporter Manager

Reporter Manager

Grid Resource

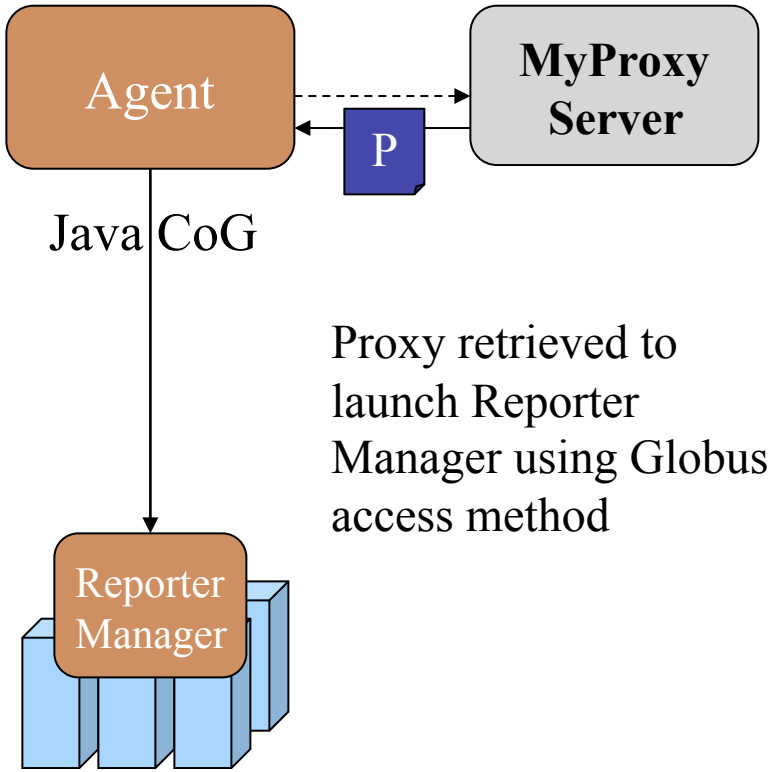
Grid Resource

Configuration contains:

1. Repository URLs
2. Resources
3. Suites

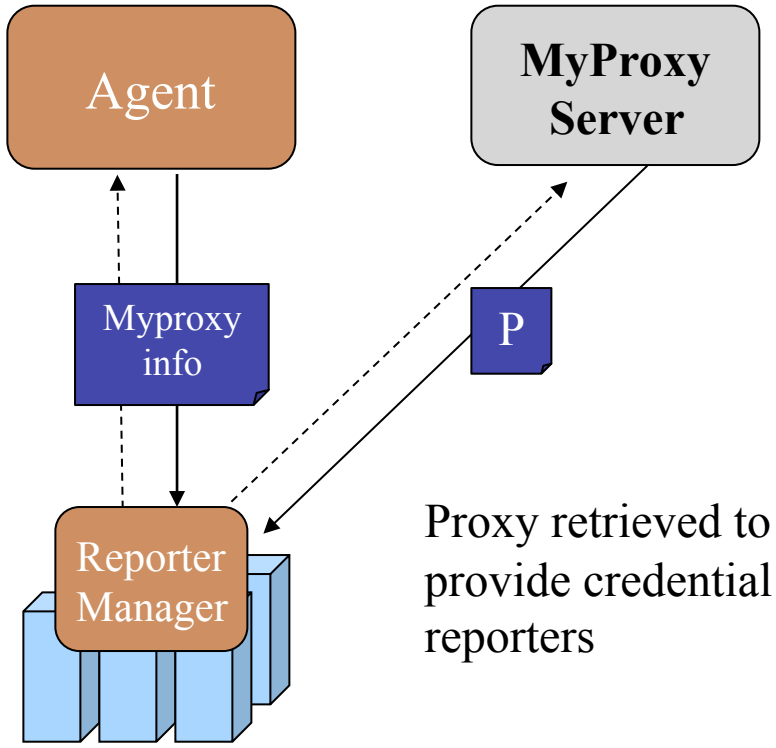
Agent supports proxy credentials

Case 1:



Proxy retrieved to launch Reporter Manager using Globus access method

Case 2:



Proxy retrieved to provide credential for reporters

Agent supports “run now” execution for debugging

- Each series can be scheduled for immediate execution
  - Invoked from Incat (inca admins)
  - Invoked from command-line (system admins)

- Run a series before its next scheduled execution time to update a series result

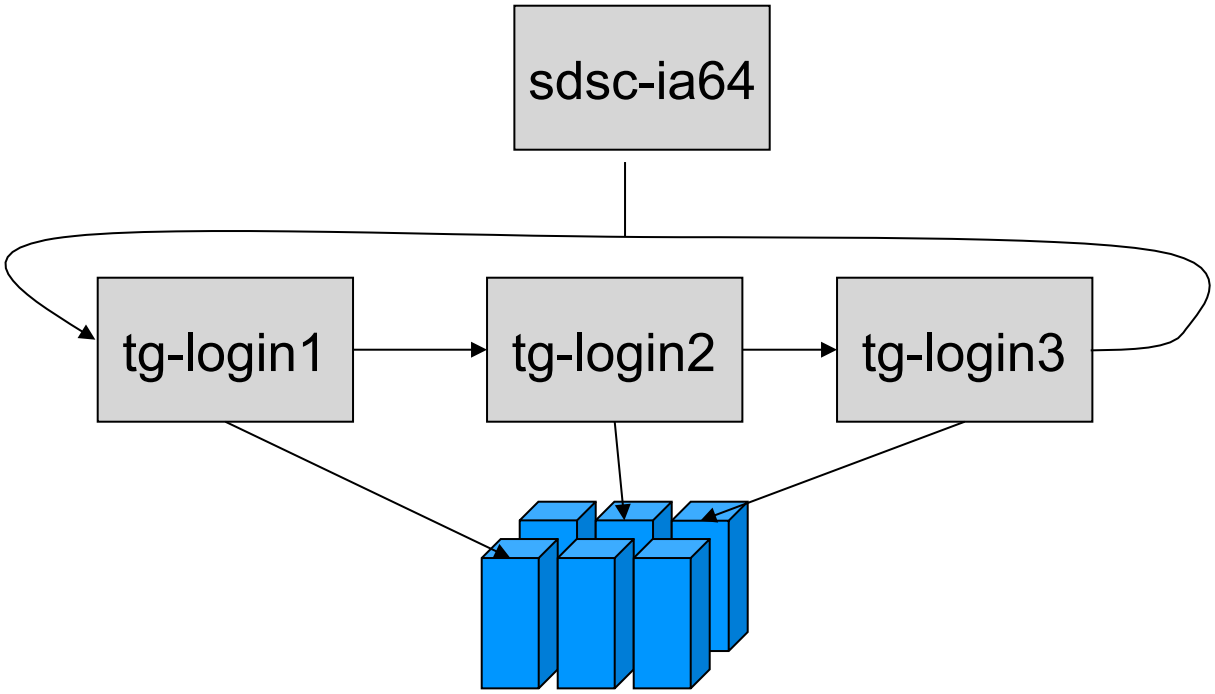
Agent supports approval mode

- Provide control to resource administrators (while providing consistent testing)
- Changes queued at agent and notification sent to resource administrator
- Resource administrator approves changes via "inca approveChanges" GUI

Screenshot of Inca approveChanges GUI tool

Agent monitors reporter managers

- Pings reporter managers every 10 minutes
- Attempts to restart every hour
- If multiple hosts specified for a resource, will try each host



Reporter Manager

- Minimal functionality to limit load on resource
- Receives from reporter agent that started it:
  - Reporters and libraries
  - Reporter configuration and schedules
- Executes reporters periodically (cron) or now and forwards reports to the depot
- Profiles reporter system usage and enforces timeouts

Grid Resource

Summary

- Inca control infrastructure provides centralized configuration and management
- Provides flexible reporter scheduling and configuration options
- Eases installation and maintenance via macros, access methods, and automatic package updates
- Limits impact on monitored resources
- Proxy credential available to reporters for user-level execution

Agenda -- Day 1

9:00 - 10:00	Inca 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)