S-GAE
SunGrid Graphical Accounting Engine

http://rdlablsi.upc.edu
rdlablsi.upc.edu

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1. Who we are

• RDlab: Research and Development Laboratory.

• Belongs to LSI department at UPC University.

• Created on fall 2010.

• Currently composed by 5 people.
1. Who we are II: Our numbers

• Over 130 computer servers
  > 70 nodes RDlab HPC cluster
  > 60 project servers

• TIC support for 8 research groups at LSI
  ALBCOM    KEMLG    GRPLN    GIE
  LOGPROG   LARCA    MOVING   SOCO

• CEE projects & Enterprise Agreements
1. Who we are III: Our homepage
2. The RDlab Cluster: Our size

- More than 70 nodes.
- More than 560 execution cores.
- More than 1 Terabyte of RAM.
- More than 10 Terabytes of disk space.
- More than 120 users.
- More than 339,000 executed jobs since January 1st!
2. The RDlab Cluster II: Facilities

- Located at UPC’s Data Processing Centre (CPD).
- More than 250m² surface area.
- Back-up generator with complete autonomy.
2. The RDlab Cluster III: Software

- Oracle GridEngine
- Ubuntu LTS Server Linux x64
- Lustre
- 2 Fujitsu DX80 arrays
3. Accounting

• User activity

Large number of users
+ A load of jobs per user
LOTS of raw accounting data

• We needed to monitor all this information
• Oracle GridEngine saves this data in a plain text file
• We needed an interface to get easy access to it
3. Accounting II

- Objectives:
  - Monitor and control accounting information
  - Avoiding *Command Line Interface*
  - Form-based customization filters
  - Show aggregated values (avg., %, ...)
  - Customized view for cluster users, queue managers and cluster administrators.
4. Existing software

• ARCo:
  – Excessively large database size.
  – SQL based interface for queries.

• Gridsafe: [http://gridsafe.sourceforge.net/index.html](http://gridsafe.sourceforge.net/index.html)
  – Large list of requirements
  – Poor documentation
  – Not specifically designed for SGE

• PHPQstat: [http://sourceforge.net/projects/phpqstat/](http://sourceforge.net/projects/phpqstat/)
  – Only a qstat interface.
4. Existing software II

• None of them suited our expectations
• We decided to develop our own product

SunGrid Graphical Accounting Engine

• Trivia:
  – Oracle Engine is not SunGrid anymore.
  – Why “s-gae” and not simply “sgae”...?
5. The S-GAE Application

- Transform tons of raw data into eye-candy charts
6. S-GAE quick view I: How it works

• Parses Oracle GridEngine accounting data.
  – Periodically (in batch mode): cron
  – On demand: administrator interface

• Compacts and processes data.

• Store it into a MySQL database
  – Group data according to queue name
  – Group by year / month of submission
6. S-GAE quick view II: How it works

• PHP gets data from the database
  – Ready for graphs generation (no further processing).

• Customize results through filters and show graphs
6. S-GAE quick view III: Database

- Most of work is done by the Database Engine
- Data processing is done by Procedures
  - Creates a view with the data needed
  - Calculates averages, top ten orders, etc.
  - Leave result in a single-row table
- PHP calls stored procedures and gets the result
- This reduces data transmission and PHP workload
6. S-GAE quick view IV: Database

- Main index: 1 table
  - Name of queues, enabled, last check date

```sql
main_index

id INT
queue_name VARCHAR(64)
queue_index_table_name VARCHAR(64)
last_checked_date INT
enabled_queue BOOLEAN
queue_year_summarize_table VARCHAR(...)

Indexes

PRIMARY
queue_name_UNIQUE
```
6. S-GAE quick view V: Database

- Queue index: 1 table per queue
  - Name of data tables by year and month

```
queue_index_QQQ

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>INT</td>
</tr>
<tr>
<td>year</td>
<td>INT</td>
</tr>
<tr>
<td>month</td>
<td>INT</td>
</tr>
<tr>
<td>queue_data_table_name</td>
<td>VARCHAR(64)</td>
</tr>
<tr>
<td>num_rows</td>
<td>BIGINT(20)</td>
</tr>
</tbody>
</table>

Indexes

- PRIMARY
- year_month_UNIQUE
```
6. S-GAE quick view VI: Database

• Data table:
  – 1+ per queue
  – Parsed data
6. S-GAE quick view VII: Database

- Year summarize charts: 1 per queue

```
queue_year_summarize_charts

- id INT
- year INT
- last_update_time INT
- jobs_execution_time_longest INT
- jobs_execution_time_average INT
- jobs_execution_time_shortest INT
- jobs_execution_time_1d INT
- jobs_execution_time_7d INT
- jobs_execution_time_31d INT
- jobs_execution_time_xxd INT
- jobs_success INT
- jobs_failure INT
- jobs_memory_maximum BIGINT
- jobs_memory_average BIGINT
- jobs_memory_minimum BIGINT
- jobs_memory_xxgb INT
- jobs_memory_8gb INT
- jobs_memory_4gb INT
- jobs_memory_1gb INT

- hostname_usage_top1 INT
- hostname_usage_top10 INT
- hostname_usage_top1_host VARCHAR(64)
- hostname_usage_top10_host VARCHAR(64)
- jobs_sent_user_top1 INT
- jobs_sent_user_top10 INT
- jobs_sent_user_top1_owner VARCHAR(64)
- jobs_sent_user_top10_owner VARCHAR(64)
- jobs_memory_usage_top1 BIGINT
- jobs_memory_usage_top10 BIGINT
- jobs_memory_usage_top1_owner VARCHAR(64)
- jobs_memory_usage_top10_owner VARCHAR(...)
6. S-GAE quick view VIII: Roles

- Common user
- Queue administrator
- Cluster and Application administrator
6. S-GAE quick view IX: Interface

http://rdlab.lsi.upc.edu - rdlab@lsi.upc.edu
7. How S-GAE is released

• GNU General Public License v3

• Visit our homepage http://rdlab.lsi.upc.edu/s-gae
Live demo

CONNECT
S-GAE

- Web browser interface with eye-candy charts
- Form-based data filtering and aggregated values
- User, queue and full cluster statistics
- Licensed under GPL v3

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