

Distributed Analysis with ASAP

Akram Khan¹, Craig Munro¹, Julia Andreeva², J Herrala², O
Kodolova²

¹ Brunel University, ² CERN

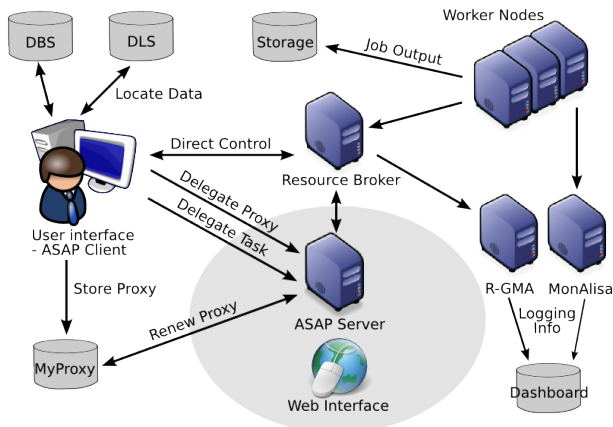
CHEP 07



- Background
- ASAP Client
- ASAP Server
- Agents
- Conclusions

- ARDA project created to prototype distributed analysis applications for the LHC experiments.
- ARDA/CMS investigated new gLite Middleware, created job submission framework - ASAP (ARDA Support for CMS Analysis Processing)
- Server side component created to manage resubmission.
- Using experience from initial version ASAP redesigned from ground up
 - Security, performance and modularity included from start.

- ASAP can:
 - Create and manage jobs on the Grid.
 - Manage submission and monitoring of jobs on behalf of user.
 - Manage resubmission of failed jobs.
 - Improve turnaround time of users task.



Task Creation

- User creates tasks which are composed of jobs with the same configuration
- A configuration file is used to specify parameters:

```
primary_dataset = mc-onsel-120_PU_Zee
tier = DIGI
processed_dataset = CMSSW_1_2_0-NoPU-DIGI-1169220692
events_required = -1
events_per_job = 5000
pset_file = TracksMonitoring.cfg
input_files = auth.xml, sistripfedcabling.db, SiStripFedCablingCatalog.xml
output_files = dqm_tracks.root
output_se = srm.cern.ch
output_se_path = /castor/cern.ch/user/m/munro/output
```

- User code belonging to CMSSW application is packaged
- Wrapper which controls execution on Worker Node created
 - unpacks code, creates environment, fetches input, runs application, checks for errors, stores output

- Published Data
 - User specifies dataset they wish to analyse
 - ASAP queries DBS for dataset metadata and DLS for dataset location
 - Jobs are split according to user requirements and location of data
- Simulate Data
 - User specifies number of events they wish to generate and a random seed
- Private Data
 - User can specify input files and parameters for each job using a text file

```
srm://srm.cern.ch:8443/castor/cern.ch/user/u/user/cpv/ttbb1_gen_comphep.root 0 10 1234 ...
srm://srm.cern.ch:8443/castor/cern.ch/user/u/user/cpv/ttbb1_gen_comphep.root 10 10 5678 ...
file:///afs/cern.ch/user/u/scratch0/my_root.root 0 100 8769
```
 - Input data can be local or remote (ASAP will transport data to Worker Node)

Task Management

- Tasks can be created for LCG, gLite and gLite WMPProxy
- Command line client used for generating tasks:
 - `asap --create task.conf --submit`
 - `taskid` provided for future control of task

- Status can be checked:

- `asap --taskid 12345 --update --list`

Job	ASAP	Status	GRID	Status	GRID	Reason
1		DONE	*	Done (Success)	Job	terminated successfully
2		DONE	*	Done (Success)	Job	terminated successfully

* - job is registered with the server

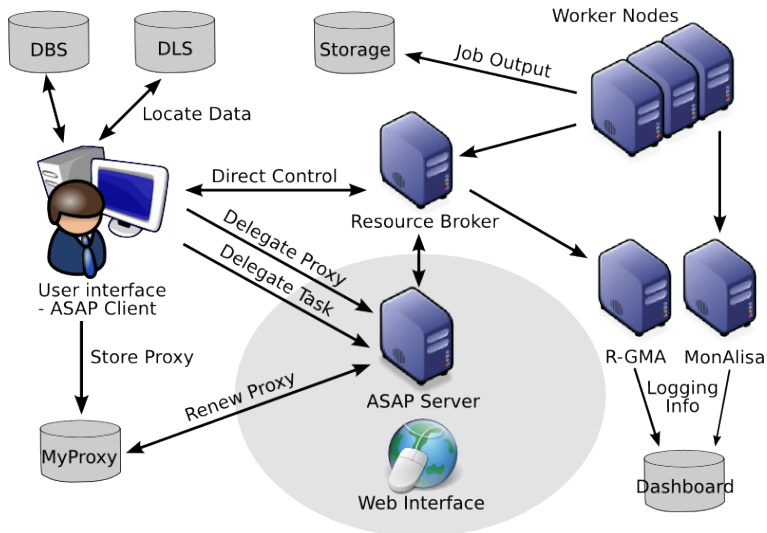
- and output retrieved:
 - `asap --taskid 12345 --fetch`

- Motivation:
 - Jobs on the grid fail.
 - Managing large numbers of jobs is time consuming.
 - Analysing the output of those jobs for errors is even more time consuming
- The ASAP Server automates all of these steps.
- Once a task has been created it can be registered or unregistered from the server at any point

```
asap --taskid 12345 {--register, --unregister}
```

- The server submits jobs and monitors them for changes in status.
- Completed jobs are fetched and the logs analysed for failures.
- Failed jobs are resubmitted (up to a certain limit).
- Jobs are not resubmitted to sites they have previously failed at (subject to users requirements).

ASAP Distributed System



- All communication between the client and server occurs through Apache or delegation service and is secure.
- DN and VOMS attributes used to limit access to the server.
- Server has to act on users behalf - requires users proxy.
- User registers with the server:
 - Registration consists of delegating a copy of the users proxy to the server and storing a long-lived copy of the
 - Server registers proxy in the gLite Proxy Renewal Service
- Input/output files transferred using HTTPS PUT/GET using mod_gridsite
 - Grid Access Control List only allows owner of task to read/write directory.

Monitoring

ASAP3 19535 - Mozilla Firefox

File Edit View History Bookmarks Tools Help deLicio.us

https://lkarda13.cern.ch/status.php?task_id=19535&dn=%2FC%3DRU%2FO%3DRDII

Gmail Calendar BBC NEWS Radio Player Gantoo Apache TFL BOS TV Haven cern

TASK 19535

ASAP Task 19535

8.0
6.0
4.0
2.0
0.0

10:30 10:40 10:50 11:00 11:10 11:20 11:30 11:40 11:50 12:00

FAILED CREATED MATCHED FETCHED WORKER SUBMITTED

click on the column headings to sort

ID	ASAP Status	GRID Status	GRID Reason	Exit Code	Events	Registered	Modified	
<input type="checkbox"/>	3	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1342/1342	2007-05-17 10:25:59	2007-05-17 11:52:59
<input type="checkbox"/>	2	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1339/1339	2007-05-17 10:25:59	2007-05-17 11:41:25
<input type="checkbox"/>	4	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1341/1341	2007-05-17 10:26:00	2007-05-17 11:43:25
<input type="checkbox"/>	5	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1341/1341	2007-05-17 10:26:00	2007-05-17 11:45:39
<input type="checkbox"/>	6	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1339/1339	2007-05-17 10:26:00	2007-05-17 11:41:31
<input type="checkbox"/>	7	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1343/1343	2007-05-17 10:26:01	2007-05-17 11:45:39
<input type="checkbox"/>	1	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1341/1341	2007-05-17 10:25:59	2007-05-17 11:51:22
<input type="checkbox"/>	8	FETCHED	Done (Success)	There were some warnings: some output sandbox file(s) needed truncating	0	1341/1341	2007-05-17 10:26:01	2007-05-17 11:51:35

resubmit jobs cancel jobs

https://lkarda13.cern.ch/status.php lkarda13.cern.ch

ASAP3 19535 / 3 - Mozilla Firefox

File Edit View History Bookmarks Tools Help deLicio.us

https://lkarda13.cern.ch/job.php?task_id=19535&dn=%2FC%3DRU%2FO%3DRDIG%...

Google

Gmail Calendar BBC NEWS Radio Player Gentoo Apache TFL BOS TV Haven cern

TASK 19535 / JOB 3

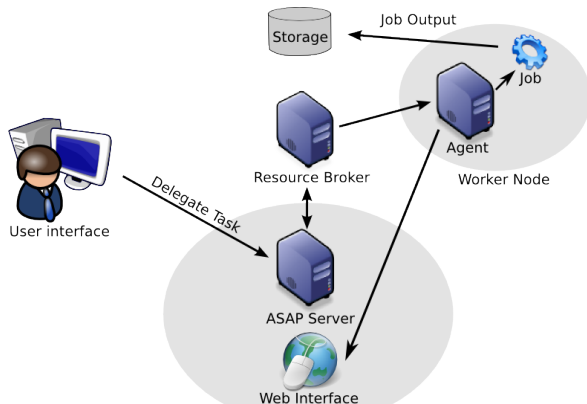
APPLICATION:	CMSSW_1_3_0
DATASET:	/mc-onsel-120_QCD_pt_300_470/FEVT/CMSSW_1_2_0-FEVT-1166726320
REGISTERED:	2007-05-17 10:25:59
MODIFIED:	2007-05-17 11:52:59
ASAP STATUS:	FETCHED
GRID STATUS:	Done (Success)
GRID ID:	https://rb107.cern.ch:9000/AR00aQbmSYSS1Uv#HALUSQ
GRID REASON:	There were some warnings: some output sandbox file(s) needed truncating
SITES:	cms.srm.hep.wisc.edu.srm.cern.ch
CE:	cmsgrid02.hep.wisc.edu:2119/jobmanager-condor-cms
GRID:	lcg
EXIT_CODE:	0
REQUIRED EVENTS:	1342
PROCESSED EVENTS:	1342
RETRY COUNT:	3
STDOUT:	stdout (113k)
STDERR:	stderr (0k)
HISTORY:	Thu May 17 10:25:59 2007 REGISTERED Thu May 17 10:26:27 2007 MATCHED Selected Virtual Organization name (from EDG_WL_UI_CONFIG_VO env variable): cms Connecting to host rb122.cern.ch, port 7772 ***** COMPUTING ELEMENT ID's LIST The following CE(s) matching your job requirements have been found: *CEId* cmsgrid02.hep.wisc.edu:2119/jobmanager-condor-cms ***** Thu May 17 10:27:16 2007 SUBMITTED https://rb107.cern.ch:9000/AR00aQbmSYSS1Uv#HALUSQ Thu May 17 10:31:19 2007 SUBMITTED Scheduled Job successfully submitted to Globus Thu May 17 10:35:23 2007 SUBMITTED Scheduled Job successfully submitted to Globus Thu May 17 10:39:27 2007 SUBMITTED Scheduled Job successfully submitted to Globus Thu May 17 10:43:31 2007 SUBMITTED Scheduled Job successfully submitted to Globus

Done

lkarda13.cern.ch

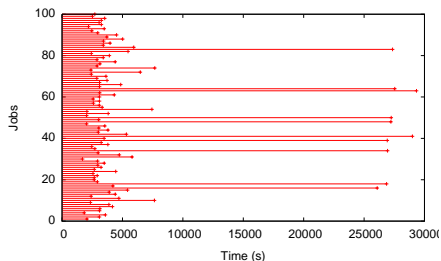
Agents

- Each job in a task differs only by the arguments it receives (input files, skipEvents, maxEvents, site)
- An agent can request these parameters directly from the server so that multiple jobs can be executed per submission.
- Transparent to user

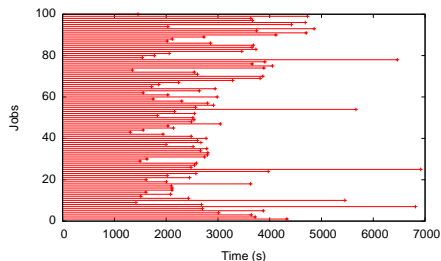


Agents

- Using Agents decreases turnaround time of users task by communicating directly with the server and redundant execution of jobs.



(a) Original Method



(b) Agent Method

Figure: Time from job registration to completion for (a) Original Model and (b) Agent Model

- System used by a number of CMS physicists
- Server reduces effort required from user and increases success rate.
- Agents reduces turnaround time for the task.