BaBar Grid Computing

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BaBar Grid Project Overview

HEP is one of the more interesting and interested testbed for GRID fully distributed technology

BaBar is a *running experiments* and needs a huge amount of computing resources

BaBar Grid Project motivations:

- Simulation Production (SP):
  - 25 production sites running the same executable
  - Simulation Production (SP) in BaBar is a typical distributed effort
  - The Grid concept is very appealing for SP
- Analysis:
  - BaBar uses several Tier-A in analysis context
  - A tool to automatically submit jobs where the data and CPU cycles are available could be very useful
  - The GridKa Tier-A will only be accessible through Grid
- Data Distribution:
  - Can be seen as a Grid application
  - The extraction from a Tier-A and transfer to a Tier-C of a deep-copy collection could nicely make use of Grid tools

BaBar Grid Project Overview (cont.)

The Babar Grid group has started to study the possibility to *gridify* Babar software

At the beginning, no stable middleware was available

Different approaches to start:

- *Soft migration* from "standard" BaBar software to Grid compatible software
- *Full gridification* of BaBar software
- Grid tools for data distribution

Simulation production, simpler than analysis, was the starting point

Standard simulation production

- Collect and centrally manage requests for simulation
  - Many user requests, many production jobs (>500,000), many events
  - Web interface to relational DB
- Distribute requests to production sites
  - Separate request into runs, usually 2K events, each of them requires 5-10 hours of computing
  - Assign to production sites "allocations" whose size depends on the size of the production farm (typically, a few million events)
- Jobs require:
  - A specific release of the BaBar software installed
  - Configuration and Conditions information for the BaBar detector, stored in an Objectivity database at each site.
  - Detector noise information (Background Trigger), stored in Root files, accessed from an xrootd server at each site
- Manage jobs at each site (ProdTools)
  - Set of perl scripts, interacting with relational DB
  - Automatic procedure to produce, merge and import runs to SLAC

Full Grid approach

In Italy Simulation Production was concentrated in one farm

An independent group started to implement SP on the Grid

Current Resources

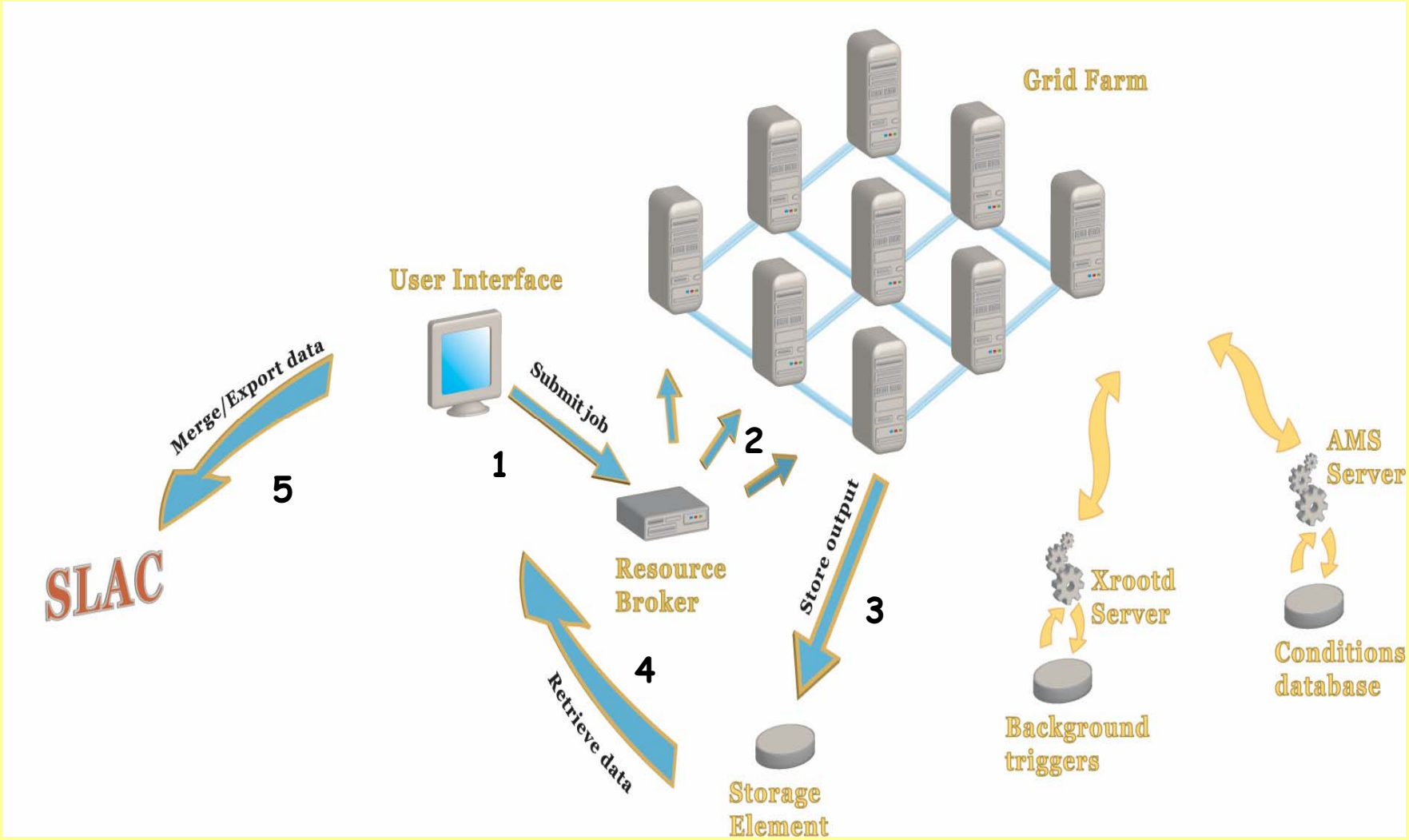
- LCG 2.4.0 middleware with SLC OS
- About 400 shared CPUs available for production
- AMS, for Objectivity db, and Xrootd servers installed in Ferrara, Naples and Padua
- ProdTools installed on User Interface in Ferrara
- BaBar Resource Broker in Ferrara
- 4 sites involved during production performance tests: Ferrara, Naples, Bari and Padua

Full Grid approach
Italy case

BaBar SP can use almost all Grid.it resources (not only dedicated ones)

- Involved in BaBar
- Conditions DB installed
- Background triggers installed
- Resource Broker installed

Production scheme



Software Installation

Simulation Software packaged and installed on involved sites

- Package distributed and tagged using LCG tools:
  - ManageSoftwareTool (submitted like a standard job)
    - Transfer packages from closest SE to WNs
    - Run scripts to install the simulation software
  - lcg-ManageVOTag
- Main script
  - Set all variables needed
  - Run Moose (SP executable)
  - Compress and transfer output to the SE
- ProdTools
  - spsub integrated with standard Grid submission
  - Output retrieved from SE to UI using a custom script
  - spmerge integrated in standard Grid submission

Full Grid recipe

Test of true Production Results

- Produced some thousands of runs of real SP6 data
- Mean elapsed time for run: ~ 8 hours (average on different sites)
- A few jobs (<5%) automatically resubmitted after failure due to wrong sites configuration

SP on Grid.it Future Plans

- Add new Grid.it sites to the BaBar VO
- Add specific BaBar resources (background trigger and Cdb servers) on more sites
- Gridify BaBar resources on Italian Tier 1
- Start true production of new SP8 software release on the "Grid Farm"
- Coordination with other national Grid sites

Smooth migration approach

- BaBar in UK already had distributed infrastructure with 7 farms, each with the BaBar software installed and local Objy CondDB etc.
- Decision was to initially add "grid" to SP production on these farms rather than gridify the SP software
- Used Globus to turn the remote farms into a single pseudo batch system
- SP Jobs are built, merged and exported as at any other SP site
- Submission is to Globus rather than a local batch system
- The software is made up of three parts:
  - Submitter
  - Unpacker
  - Monitoring
- When a working prototype was ready, started moving that to LCG

migration recipe

Completing migration…

- UK farms reinstalled with SL
- All BaBar UK Farm site are also GridPP Tier 2 sites
- LCG installed with minimal changes on UK farms
- Merging work done for UK-SPGrid and Italian-SPGrid
- Rewrite monitoring to monitor LCG Jobs
- Installation of BaBar SP8 software in LCG environment in progress

US and Canada Grid Activity

On the west side of Atlantic Ocean…

Slac is an Open Science Grid site

BaBar should use OSG at Slac

Sp Grid already tested in Europe, easier than analysis

BaBar should adopt OSG for SPGrid

In Canada BaBar Simulation Production is planned to use GridX1 resources

A LCG interface is possible, like ATLAS

SPGrid Summary

- We started with unstable middleware and different approaches
- Now we can follow a common line
- We coordinate our work to obtain a common SPGrid structure running Monte Carlo production
- In Europe we can run SPgrid jobs Italy, UK and soon in Germany
- Canadian GridX1 infrastructure can be used for SP and interfaced to European one
- We want to maintain compatibility with US OSG path
- We will take into account the disappearing of Objectivity as Cdb
- SP8 can be done in SPGrid

"Analysis" Grid

- "Analysis" in the following means any kind of experimental data processing
- Problems to face:
  - Large amount of data to analyze
  - Remote access to input data
  - Different kinds and sizes of output depending on the type of analysis
- A step by step approach can be useful to reduce the complexity of the problem
- Skimming of data is a candidate starting point

Skim Production in the Grid - Outline

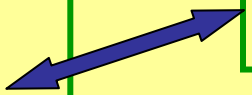
Short definition:

GRID = Submit a job locally and run it anywhere.

Skim Operator

Site Manager

• Submit skim jobs from a central site (i.e.SLAC)
• Check job requirements and run the job at an appropriate Tier-site
• Move job output to the pre-defined output area (~ 100 MB/job)



Import collection to be skimmed.

Site Requirements

- Software release has to exist.
- Conditions database has to exists.

Similar to SP

- Input collection has to be available.

New

- Local worker nodes need to have means to move data to remote locations using Grid Middleware.

Data Distribution: Xrootd

- Analysis needs efficient distributed data access
  - Scalable
  - Fault tolerant
  - Secure
- Xrootd could be seen as an alternative to standard Grid (LCG...) solutions
  - Xrootd was proposed also as a solution for some LHC experiments
  - Xrootd is distributed as part of CERN's root package

"Analysis" Summary

- Step by step approach for the analysis
- Skimming seems to be a good starting point
- We need to study data handling possibilities to obtain an efficient and simple way to handle and maintain data, also in non-BaBar sites
- Results of tests with grid-analysis special infrastructures (see Alien and children) tell us that they can be interesting but need more support and stability

Conclusions

- SPGrid is a reality for true SP production
- We are converging to a common solution
- With the Grid resources available in the different national grids, we could have a huge quantity of computing time for our simulations
- Our next goal is to have an Analysis Grid capable of running "standard" analysis programs (i.e. Skimming)
- We need to give special attention to data handling tools