Overview of ARDA Project
Between Grid middleware and LHC experiments

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Evolution of ARDA

- **November 2003**: ARDA RTAG Report
  - ARDA Blueprint = Architectural Roadmap for Distributed Analysis
    - Set of collaborating Grid services and their interfaces
- **January 2004**: ARDA Workshop 1
  - ARDA Project = A Realisation of Distributed Analysis
    - Coordination and early integration between Generic Middleware (EGEE) and LHC Experiments' Software
- **May 2004**: EGEE prototype
  - **glite** = *new-generation generic middleware*
    - *Very first prototype available* internally to ARDA group
- **June 2004**: ARDA Workshop 2
  - “First 30 days of ARDA prototype”
- **Fall 2004**: ARDA Workshop 3
  - Summary of the first phase of ARDA prototype
EGEE Middleware vs ARDA

- Interfacing middleware to the experiment frameworks
- Early deployment of (a series of) end-to-end prototypes to ensure functionality and coherence
  - Middleware as a building block
  - Validation of the design
  - Feedback, discussions
- Identification of common/generic components

- New service decomposition
  - Strong influence of Alien system
    - the Grid system developed by the ALICE experiments and used by a wide scientific community (not only HEP)
- Role of experience, existing technology…
  - Web service framework
EGEE Grid Operation will grow out of the LCG Operation
- LCG includes many US and Asian partners
- EGEE includes other sciences
- substantial part of infrastructure common to both

parallel production lines
- LCG-2 production Grid (based on EDG)
  - 2004 data challenges
- pre-production prototype
  - EGEE/Glite MW
  - ARDA playground for the LHC experiments
ARDA @ Regional Centres

• Collaboration with Regional Centres
  - valuable practical experience and know how
    - deployment
    - database technologies
    - web services
  - deployment of testbeds and pilot installations
    - EGEE Middleware test bed
    - ARDA pilot installations
  - stress and performance tests
    - experiment-specific components (e.g. a Meta Data catalogue)
    - exploit local know how of the Regional Centres
• Starting point:
  - existing experiments software: Production and Data Challenge software
• Goals:
  - provide a fast feedback to the EGEE MW development team
    - avoid uncoordinated evolution of the middleware
    - coherence between users’ expectations and final product
  - attract and involve users:
    - prototypes with realistic workload and conditions, thus real users from LHC experiments required!
    - expose the experiments (and the community in charge of the deployment) to the current evolution of the whole system
• adapt/complete/refactorise the existing components:
  we do not need yet another system!
Scope of the Prototype

- The initial prototype will have a reduced scope of functionality
  - initial selection of components for the first prototype
- Not all use cases/operation modes will be supported
  - other production systems (with multiple backends, like PBS, LCG, DIRCAC, NorduGrid, …)
  - focus on end-user analysis on a EGEE MW based infrastructure
- Simple generic analysis use-case:
  - physicist selects a data sample from Data Challenge production and prepares an analysis job using provided application template
  - job is split in sub-jobs, dispatched to the Grid, some error-recovery is automatically performed if necessary, and finally merged back in a single output
  - output (histograms, ntuples) + simple information on the job-end status is returned
LHCb - ARDA
• **GANGA** as a principal component
  ▪ user-friendly interface for Grid services
  ▪ goal: enable physicists (via GANGA) to analyse DC04 data
  ▪ ARDA starting point:
    • interface Ganga to EGEE middleware
    • run DaVinci analysis via EGEE middleware
• **DIRAC** is also an important component
  ▪ LHCb grid system, used mainly in production so far
  ▪ useful target to understand the detailed behaviour of LHCb-specific grid components, like the file catalog.
• Convergence between DIRAC and GANGA anticipated.
• Gaudi/Athena: LHCb/ATLAS frameworks
  - The Athena uses Gaudi as a foundation
• Single “desktop” for a variety of tasks
• Help configuring and submitting analysis jobs
• Keep track of what they have done, hiding completely all technicalities
  - Resource Broker, LSF, PBS, DIRAC, Condor
  - Job registry stored locally or in the roaming profile
  - Automate config/submit/monitor procedures
• Provide a palette of possible choices and specialized plug-ins (pre-defined application configurations, batch/grid systems, etc.)
• Friendly user interface (CLI/GUI) is essential
  - GUI Wizard Interface
    - Help users to explore new capabilities
    - Browse job registry
  - Scripting/Command Line Interface
    - Automate frequent tasks
    - Python shell embedded into the Ganga GUI

**GANGA**

**Gaudi/Athena and Grid Alliance**
CERN/Taiwan tests on LHCb metadata catalogue

- Clone Bookkeeping DB in Taiwan
- Install the WS layer
- Performance Tests
  - Database I/O Sensor
  - Bookkeeping Server performance tests
    - Taiwan/CERN Bookkeeping Server DB
    - XML-RPC Service performance tests
    - CPU Load, Network send/receive sensor, Process time
  - Client Host performance tests
    - CPU Load, Network send/receive sensor, Process time
- Feedback to LHCb metadata catalogue developers
ATLAS

• ATLAS has a relatively complex strategy for distributed analysis, addressing different areas with specific projects
  ▪ Fast response (DIAL)
  ▪ User-driven analysis (GANGA)
  ▪ Massive production with multiple Grids, etc…
  ▪ For additional information see the ATLAS Distributed Analysis (ADA) site: http://www.usatlas.bnl.gov/ADA/

• The ATLAS system within ARDA has been agreed
  ▪ Starting point is the DIAL service model for distributed interactive analysis; users will be exposed to different user interface (GANGA)

• The AMI metadata catalog is a key component in ATLAS prototype
  ▪ mySQL as a back end
  ▪ Genuine Web Server implementation
  ▪ Robustness and performance tests from ARDA

• In the start up phase, ARDA provided some assistance in developing production tools
AMI studies in ARDA

• Atlas File Metadata Catalogue:
  ▪ Simulation/Reconstruction-Software Version
  ▪ Does not contain physical filenames

• Implementation Features:
  ▪ dynamic schema versioning
  ▪ Java/AXIS Web Service Framework + MySQL Backend

• Good collaboration in place with ATLAS-Grenoble
AMI behaviour using many concurrent clients:

- Large network traffic overhead due to schema independent tables
- SOAP Web Services proxy supposed to provide DB access
  - Note that Web Services are “stateless” (not automatic handles to have the concept of session, transaction, etc…): 1 query = 1 (full) response
- Large queries might crash server
- Shall SOAP front-end proxy re-implement all the database functionality?
Alice - ARDA
• Strategy:
  - The ALICE-ARDA will evolve the analysis system presented at SuperComputing 2003 ‘Grid-enabled PROOF’

• Where to improve:
  - Heavily connected with the middleware services
  - “Inflexible” configuration
  - No chance to use PROOF on federated grids like LCG
  - User libraries distribution

• Activity on PROOF
  - Robustness
  - Error recovery
Improved PROOF system

- Original problem: no support for hierarchical Grid infrastructure, only local cluster mode.
- The remote proof slaves look like a local proof slave on the master machine
- Booking service is usable also on local clusters
CMS - ARDA
The CMS system within ARDA is still under discussion.

Provide easy access (and possibly sharing) of data for the CMS users is a key issue in discussions.
Potential starting point for the prototype

Bookkeeping engine to plan and steer the production across different phases (simulation, reconstruction, to some degree into the analysis phase)

Contains all necessary information except file physical location (RLS) and info related to the transfer management system (TMDB)

The actual mechanism to provide these data to analysis users is under discussion

Measuring performances underway (similar philosophy as for the LHCb Metadata catalog measurements)
Coordination and forum activities
Workshops and meetings
Coordination and forum activities

• “Forum activities”
  ▪ fundamental in the ARDA project definition
  ▪ channel information to and from EGEE
  ▪ mediate and coordinate activities

• Regular meetings
  ▪ discuss results, problems, new/alternative solutions and possibly agree on some coherent program of work
  ▪ workshop every three months.

• Special relation with LCG
  ▪ LCG GAG is a forum for Grid requirements and use cases
  ▪ Experiments representatives coincide with the EGEE NA4 experiments representatives
    ▪ EGEE NA4 = Application Identification and Support
Workshops and meetings

- 1st ARDA workshop
  - January 2004 at CERN; open
  - Over 150 participants
- 2nd ARDA workshop “The first 30 days of EGEE middleware”
  - June 21-23 at CERN; by invitation
  - ~ 30 participants
- EGEE NA4 Meeting mid July
  - NA4/JRA1 (middleware) and NA4/SA1 (Grid operations) sessions
  - Organised by M. Lamanna and F. Harris
- 3rd ARDA workshop
  - Currently scheduled for September 2004 close to CHEP; open
“The first 30 days of the EGEE middleware”

- 2nd ARDA Workshop (21-23 June 2004)
  - Glite prototype
    - Alien base + selected components from EDG
      - RLS, VO management
    - First tests and integration efforts
  - Hot topics
    - Service Interaction and Architecture
    - Data Management
    - Files on the GRID
    - Metadata Catalogs
    - Interactivity on the GRID
    - Technology: SOAP, Jabber, ...

- http://lcg.web.cern.ch/LCG/peb/arda/LCG_ARDA_Workshops.htm
Summary and Outlook

• LCG ARDA has started
  ▪ Main objective: experiment prototypes for analysis
  ▪ EGEE/Glite middleware becoming available
  ▪ Good feedback from the LHC experiments
  ▪ Good collaboration within EGEE project
  ▪ Good collaboration with Regional Centres.

• Aggressive schedule
  ▪ Milestone for the first end-to-end prototypes is December 2004
http://cern.ch/arda