Application Assessment of Production Service

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Information Society

Introduction

- **Talk content**
  - Objectives of “application deployment and support” activity and its structure
  - Major achievements for this past period
  - Major issues and mitigation

- **Specific focus on**
  - % of results/resources coming from production service
  - list of applications in each domain and status (number of jobs submitted, number of users etc.)
  - list of outstanding issues and short-comings

Objectives of "application deployment and support" activity

- To identify through the dissemination partners and a well defined integration process a portfolio of early user applications from a broad range of application sectors from academia, industry and commerce

- To support development and production use of all of these applications on the EGEE infrastructure and thereby establish a strong user base on which to build a broad EGEE user community

- To initially focus on two well-defined pilot application areas, Particle Physics and Biomedicine

The role of the pilot applications – HEP and Biomedicine

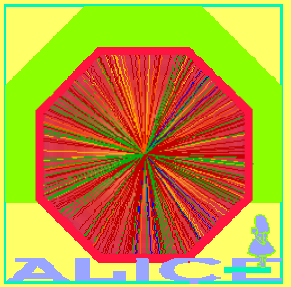
- **Initial area of focus to establish a strong user base on which to build a broad EGEE user community**
- **Provide early feedback to the infrastructure activities on their experience with application deployment and VO management**
- **Act as guinea pigs and provide early feedback to the middleware developers on their experience with new services**

The characteristics of pilot HEP applications

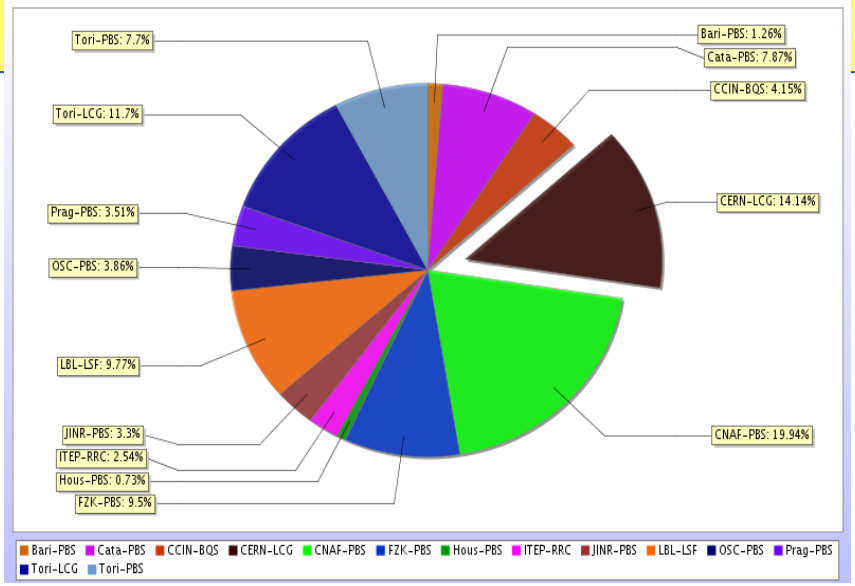
- Very large scale from project day 1
- Virtual Organizations were already set up at project day 1
- Very centralized: jobs are sent in a very organized way
- Multi-grid: data challenges are deployed on several grids

Data Challenges – ALICE

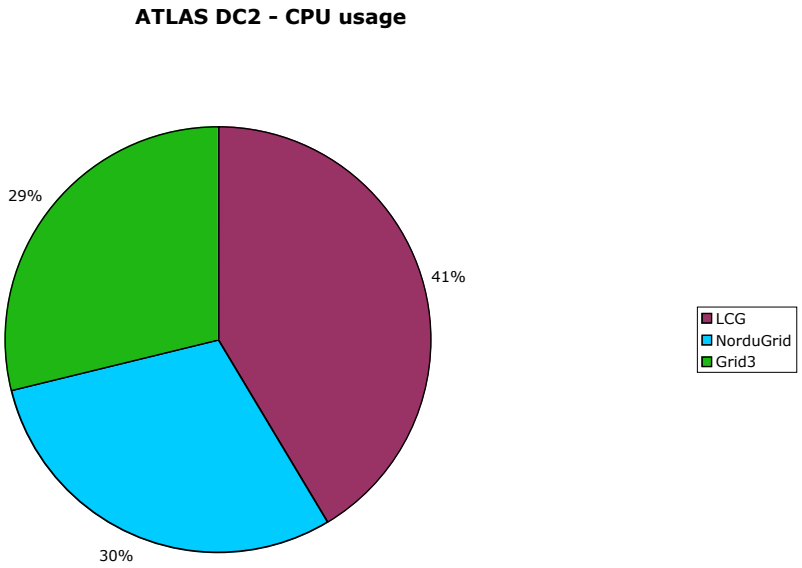
- Phase I
  - 120k Pb+Pb events produced in 56k jobs
  - 1.3 million files (26TByte) in Castor@CERN
  - Total CPU: 285 MSI-2k hours (2.8 GHz PC working 35 years)
  - ~25% produced on LCG-2

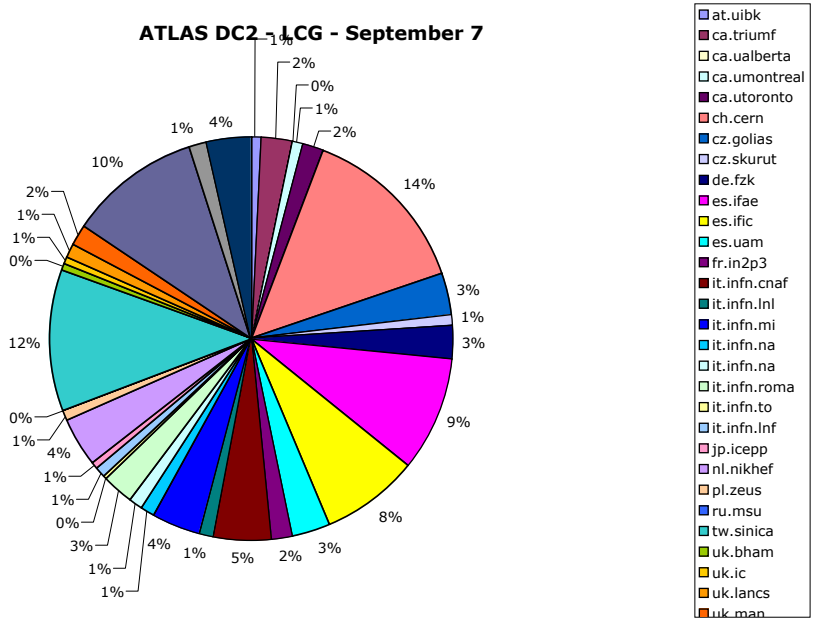


- **Phase II**
  - 340k jobs, 40 TB produced, 200TB transferred ,750 MSI2k hours CPU
  - ~11% on LCG-2



Data Challenges – ATLAS

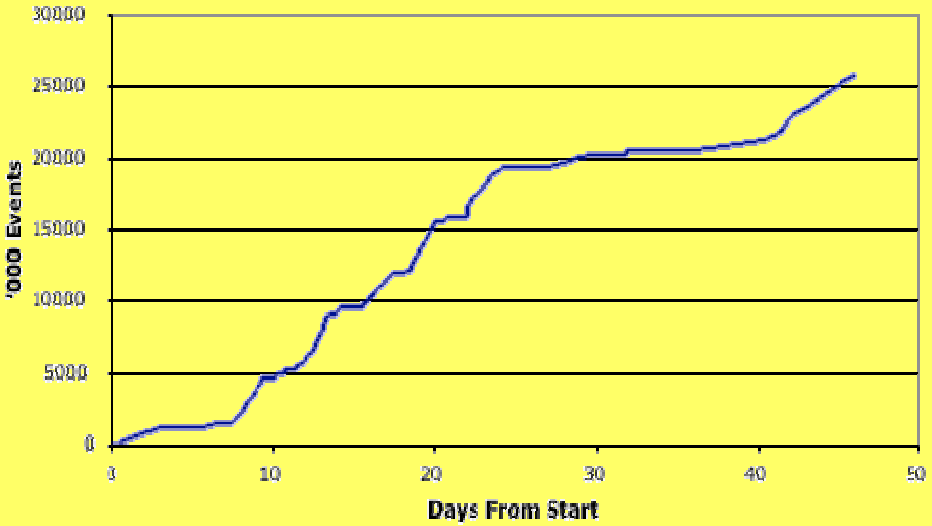




- Phase I
  - **7.7 Million events fully simulated (Geant 4) in 95.000 jobs**
  - **22 TByte**
  - **Total CPU: 972 M SI-2k hours**
  - **>40% produced on LCG-2 (used LCG-2, GRID2003, NorduGrid)**

Data Challenges – CMS

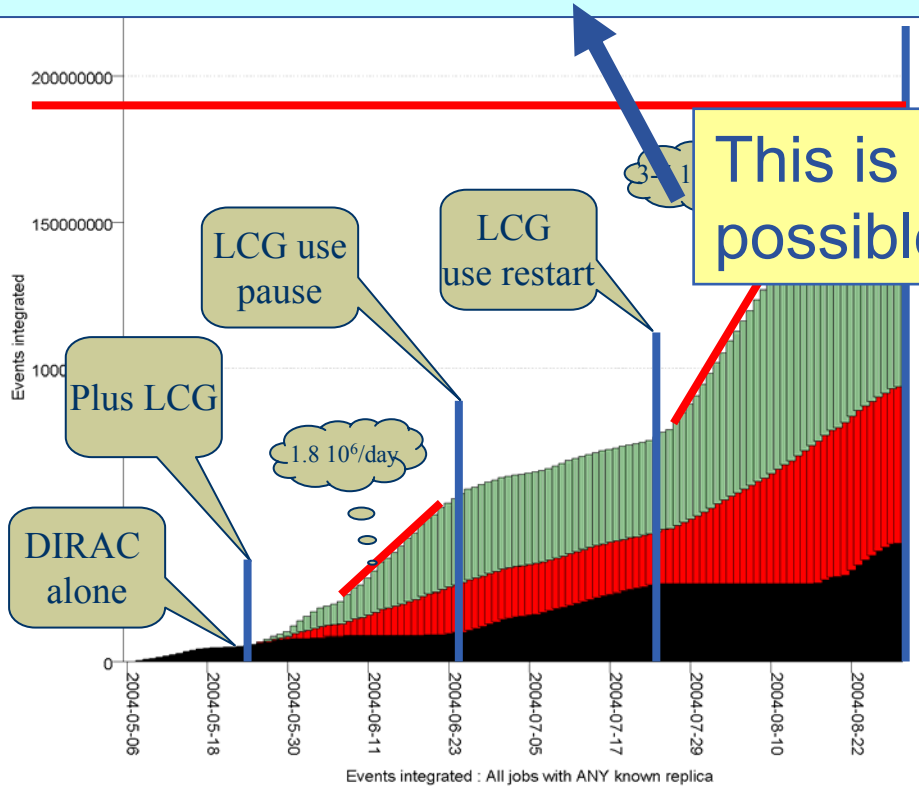
- ~30 M events reconstructed at Tier-0
- 25Hz reached for flow to analysis in Tier-1
  - (only once for a full day)
  - RLS, Castor, control systems, T1 storage, …



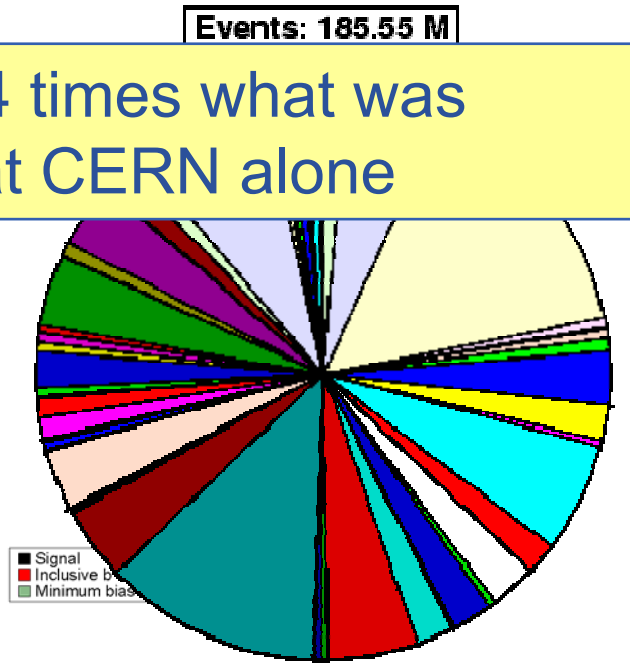
- Not a CPU challenge, but a full chain demonstration
- Pre-challenge production in 2003/04
  - **70 M Monte Carlo events (30M with Geant-4) produced**
  - **Classic and grid (CMS/LCG-0, LCG-1, Grid3) productions**

Data Challenges – LHCb

- Phase I
  - 186 M events 61 TByte
  - Total CPU: 424 CPU years (43 LCG-2 and 20 DIRAC sites)
  - Up to 3500 concurrent running jobs in LCG-2



This is 3-4 times what was possible at CERN alone



Overview of experiences with LHC data challenges

- **There was continual evolution throughout 2004, with LCG and experiments gaining more experience in the development and use of an expanding LCG grid**
- **All experiments had excellent relations with LCG-EIS support – a model for the future support of VOs**
- **Global job efficiencies ranged from 60-80% as experience developed – must get up to 90+% for user analysis - look to new middleware developments and tighter operational procedures**
- **Sources of problems and losses**
  - Site configuration, management and stability
  - Data Management (especially metadata handling)
  - Difficult to monitor job running and causes of failure
- **D0 in early 2005 showed that one can run with good efficiency with a set of well controlled sites**

D0 MC efficiency on LCG2 since Xmas (but small statistics)

CE	Success	Failed
bohr0001.tier2.hep.man.ac.uk	237	3
cclcgceli01.in2p3.fr	-	14
grid-ce.physik.uni-wuppertal.de	-	-
gridkap01.fzk.de	2564	19
golias25.farm.particle.cz	198	15
heplnx131.pp.rl.ac.uk	246	4
lcgce02.gridpp.rl.ac.uk	293	10
mu6.matrix.sara.nl	397	7
tbn18.nikhef.nl	154	2
Total	4089	74

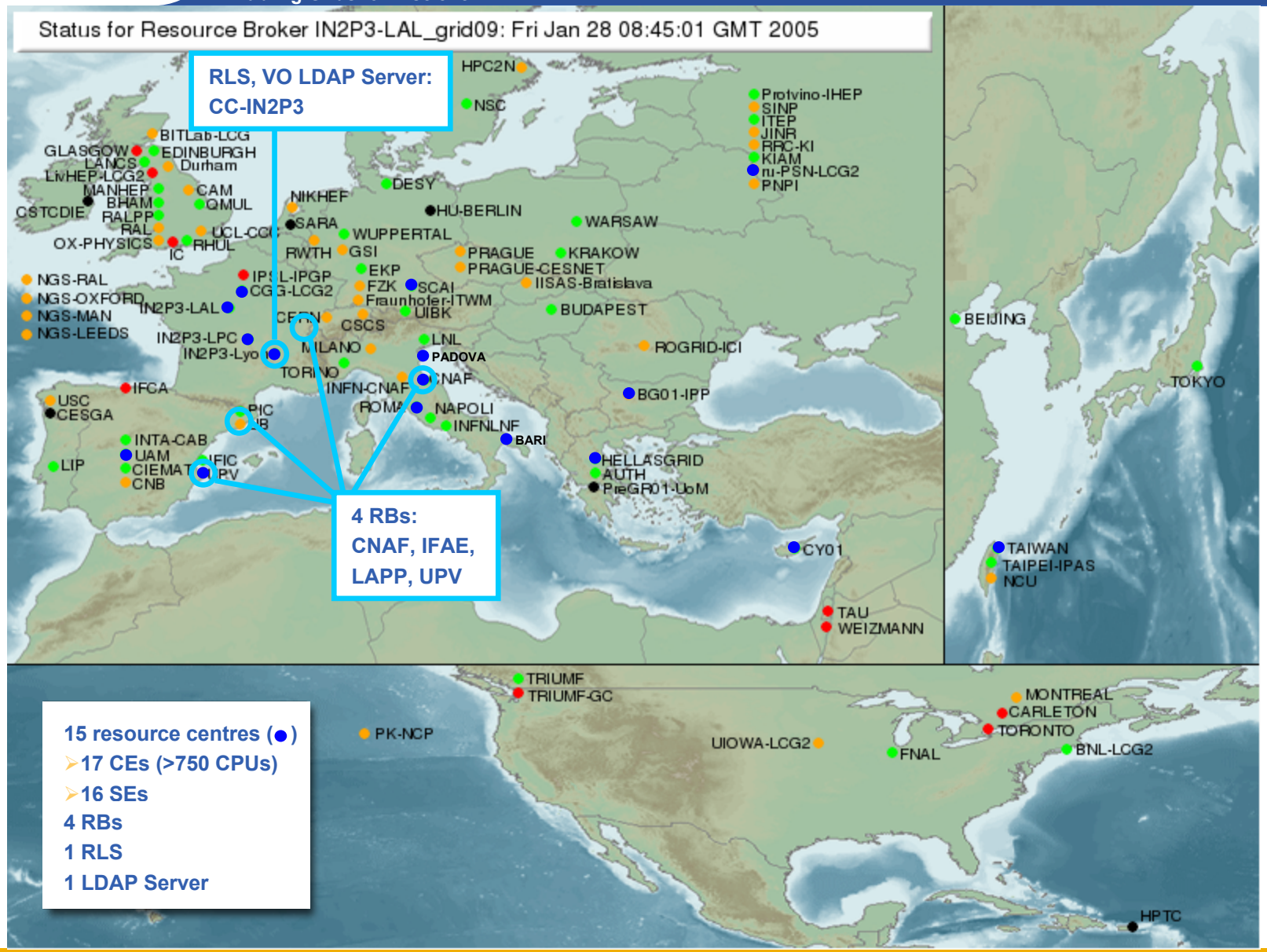
- Efficiency 98 %
- System running monitored very closely by 'run-manager' in close contact with sites

The characteristics of biomedical pilot applications

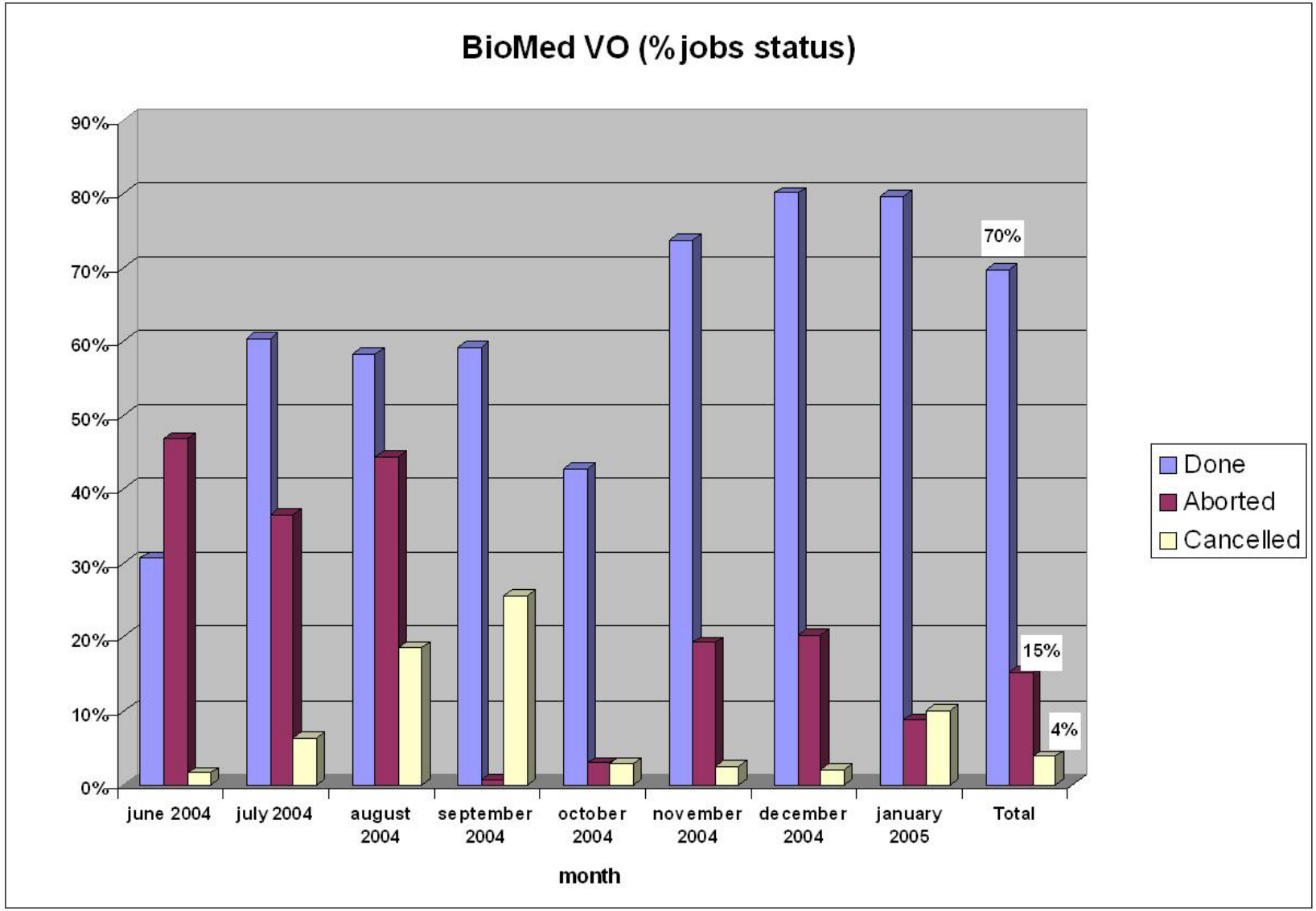
- Prototype level at project day 1
- VO was created after the project kicked-off
- Very decentralized: application developers use the grid at their own pace
- Very demanding on services
  - Compute intensive applications
  - Applications requiring large amounts of short jobs
  - Need for interactivity or guaranteed response time

- **Resources were focused on the deployment of large scale applications on LCG-2**
  - Integration of Biomed VO used to identify issues relevant to all VOs to be deployed during EGEE lifetime
  - Decentralized usage of the infrastructure highlights different weaknesses from the more centralized HEP data challenges

Status of biomedical VO



Biomedical VO: production jobs on EGEE



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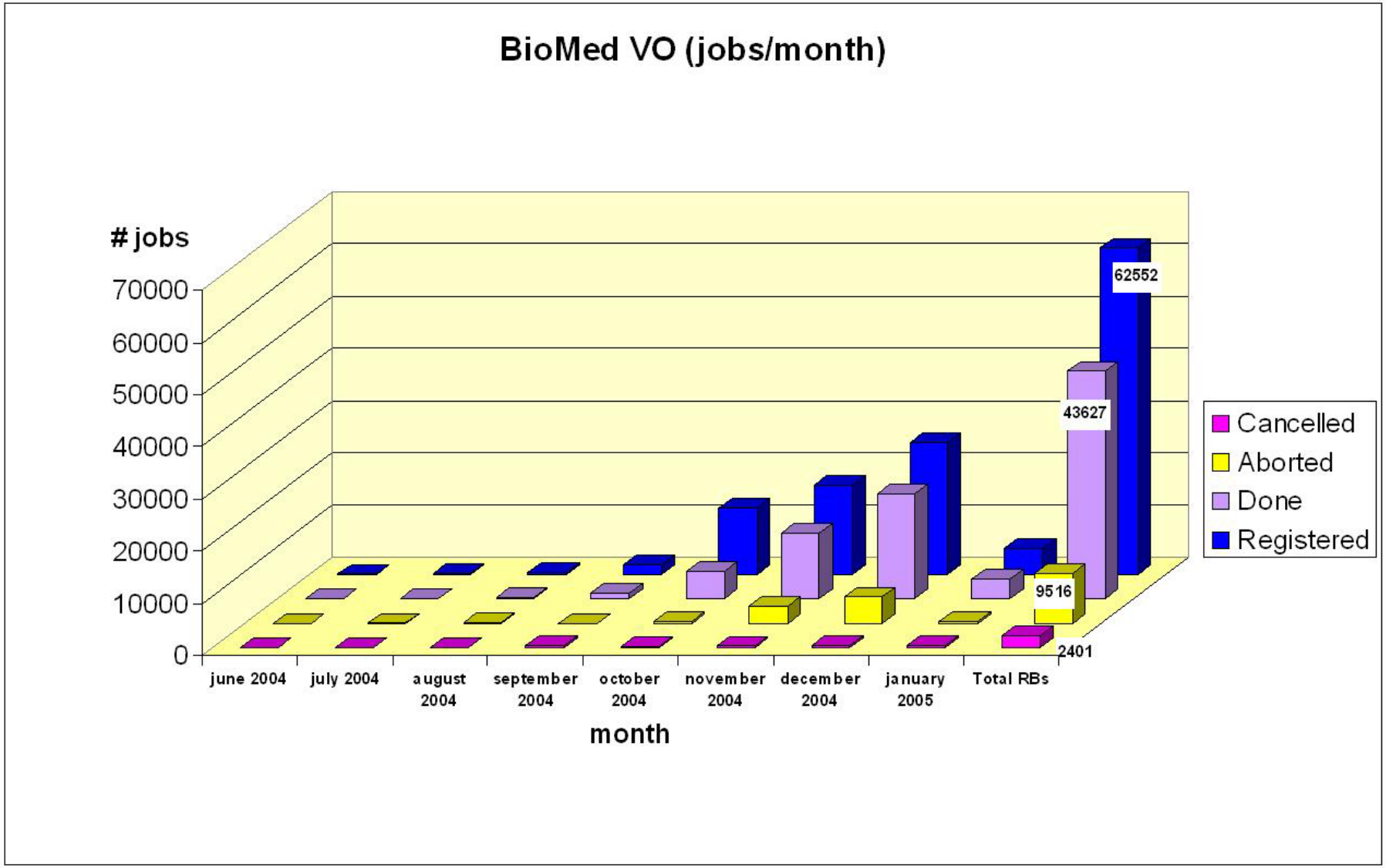


Experience with LCG2 middleware

- **Two categories of applications had different levels of success**
  - Batch-oriented application (high performance): well adapted EGEE infrastructure, gridification has significant impact on performances
  - More dynamic applications (high throughput): gridification has less impact and/or turn-around needed to bypass some limitations
- **Still a high failure rate reported on LCG2 (order of 25%)**
  - Users tend to adapt manually their application (selection of sites to submit job, store data...)
  - Irregular through time (instability of the infrastructure)
  - This makes it difficult to estimate the failure ratio
- **The SA1-biomed interaction loop is being set up**
  - Significant improvement in feedback and solutions since Dec'04

Biomedical applications

- 3 batch-oriented applications ported on LCG2
  - SiMRI3D: medical image simulation
  - xmipp_MLRefine: molecular structure analysis
  - GATE: radiotherapy planning
- 3 high throughput applications ported on LCG2
  - CDSS: clinical decision support system
  - GPS@: bioinformatics portal (multiple short jobs)
  - gPTM3D: radiology images analysis (interactivity)

  DEMO
- New applications to join in the near future
  - Especially in the field of drug discovery

Evolution of biomedical applications

- **Growing interest of the biomedical community**
  - Partners involved proposing new applications
  - New application proposals (in various health-related areas)
  - Enlargement of the biomedical community (drug discovery)

- **Growing scale of the applications**
  - Progressive migration from prototypes to pre-production services for some applications
  - Increase in scale (volume of data and number of CPU hours)

- **Towards pre-production**
  - Several initiatives to build user-friendly portals and interfaces to existing applications in order to open to an end-users community

New communities identification

- **NA4 identifies the communities already using advanced computing and keen to use EGEE infrastructure;**
- **A scientific advisory panel (EGAAP) assesses and chooses among the interested communities the ones which seem the most mature to deploy their applications on EGEE;**
- **NA4 agrees with SA1 on the required resources and technical requirements and with NA3 on their training requirements;**
- **NA4 collects the requirements expressed by the new disciplines and transfers them to the joint research activities (JRA1, JRA3, JRA4).**

EGAAP

- **EGEE Generic Applications Advisory Panel is the entry door for all new applications that want to be deployed on the EGEE infrastructure**
- **Important step in the EGEE virtuous cycle**
  - Encourages communities to submit a well documented proposal
  - Fosters discussion on the added value brought by the Grid to the applications
  - Points out needs and resources for migration and deployment for each application
  - Prioritizes the deployment of the selected applications
  - Monitors the progress of the selected portfolio
- **Participation in EGAAP of 5 external members is useful to reach out to new communities**

Summary of EGAAP activities

- **First call for proposals: limited distribution on May 17 2005**
- **First EGAAP meeting June 14 2004, at CERN**
  - 5 applications, 3 recommended for approval
    - Computational Chemistry
    - MAGIC, Astrophysics
    - Earth Science
- **EGAAP Recommendations approved by EGEE management on July 14.**

- **Second call for proposals : widest distribution possible on Sep 28, 2004**
- **Second EGAAP meeting November 25, Den Haag**
  - 7 applications received, 4 recommended for approval
    - Earth sciences (Solid Earth Physics, Hydrology)
    - Cosmology (Planck collaboration)
    - Drug discovery (Molecular docking)
    - Search engines for digital knowledge (GRACE)
- **Recommendations approved by EGEE management on 17 December 2004.**

EGEE Industry Forum

- Objectives:
  - **To promote and disseminate Grid concepts towards industry and service groups**
  - **To raise the awareness of EGEE within industry**
  - **To encourage businesses to participate in the project**
- Members: interested companies having activities in Europe
- Management:
  - **Steering Committee**
  - **Representatives of EGEE partners**
  - **Representatives of main industrial sectors**

Industry Forum members

MICHELIN

CEA

GRIDSYSTEMS

CREDIT LYONNAIS

CNES

BNP

PALLAS-INTEL

DASSAULT AVIATION

EADS CCR

SNECMA

STMicroelectronics Srl

Hewlett-Packard

CSTB

Daimler

Oracle

PSA

PLATFORM COMPUTING

GRIDXPERT

PECHINEY CRV

France Télécom

ACRI-ST

TOTAL

IFP

C-S

DATA SYNAPSE

THALES

LION Bioscience AG

BULL

Sanofi-Aventis

SOCIETE GENERALE

NICE

NOVARTIS PHARMA AG

EDF

ESI

Sun

ICATIS

CERFACS

MICROSOFT

British Telecom

CENAERO

Pôle Européen Plasturgie

SCAI

GENIAS Benelux

Arcelor

Fugitsu

IBM

HUTCHINSON

Gridwise Technologies

Compagnie Générale de Géophysique

SCHLUMBERGER

Datamat

AGENIUM Technologies

HLRS

Telefonica Spain

AIRBUS

DUTCH SPACE paris Office

ORION LOGIC Ltd.

CSCS

Industry forum activities

- **Organisation of a meeting twice a year**
- **Quarterly newsletter**
- **Participation to EGEE working groups**
  - EGAAP
  - Project Technical Forum
  - EGEE PhaseII
  - Security group
- **Internal Working groups**
  - Technical aspects of Grid
  - Business models and economical aspects

Functions in integrating new communities

- Provision of training to the community application developers
- Dissemination of information proactively addressing the needs (user support, middleware evolution,…)
- Identification of resources for new application deployment
- Definition of common application interfaces and tools
- Assistance in interfacing applications to grid services
- Monitoring of the integration process
- Provision of essential feedback to other activities -dissemination, middleware and management

GILDA, an infrastructure for dissemination and demonstration

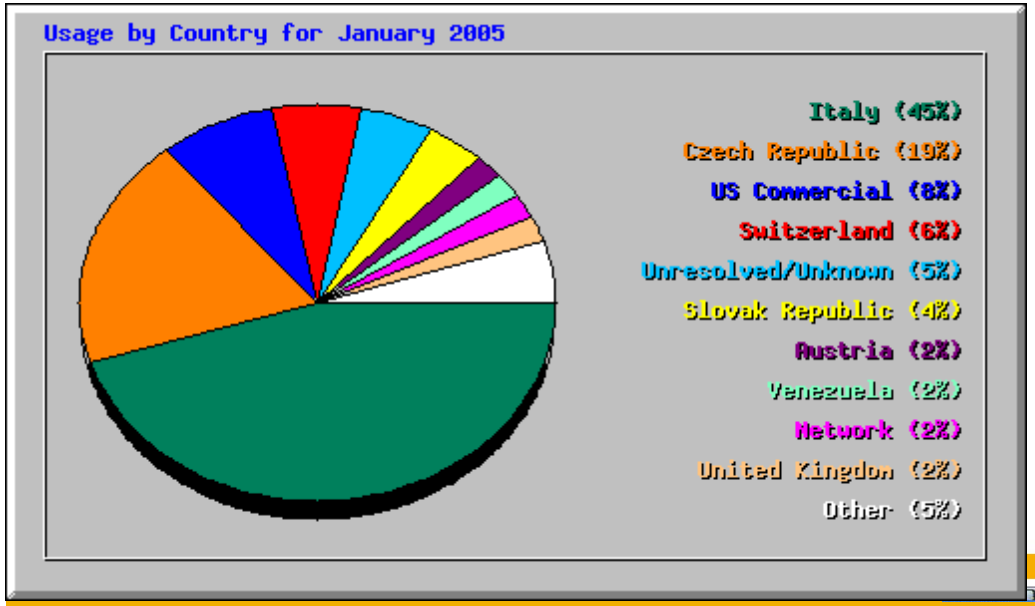
- **Goals:**
  - Demonstration of grid operation for tutorials and outreach
  - Initial deployment of new applications for testing purposes

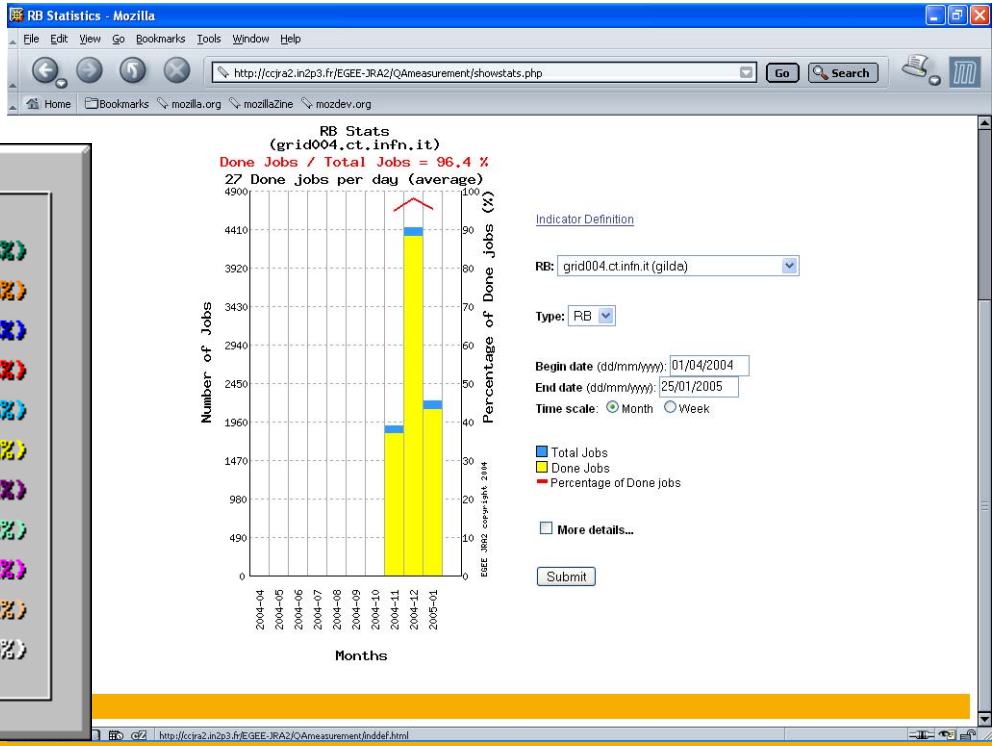
- **Key features**
  - Initiative of the INFN Grid Project using LCG-2 middleware
  - On request, anyone can quickly receive a grid certificate and a VO membership allowing them to use the infrastructure for 2 weeks.
  - Certificate expires after two weeks but can be renewed
  - Use of friendly interface: Genius grid portal

- **Very important for the first steps of new user communities on to the grid infrastructure**

GILDA numbers

- 14 sites in 2 continents
- >700 certificates issued, more than 10% renewed al least once
- >35 tutorials and demos performed in 10 months
- >25 jobs/day on the average
- Job success rate above 96%
- >320,000 hits on the web site from 10's of different countries
- >200 copies of the UI live CD distributed in the world





NA4 Applications and GILDA

- 7 Virtual Organizations supported:
  - Biomed
  - Earth Science Academy (ESR)
  - Earth Science Industry (CGG)
  - Astroparticle Physics (MAGIC)
  - Computational Chemistry (GEMS)
  - Grid Search Engines (GRACE)
  - Astrophysics (PLANCK)

- Development of complete interfaces with GENIUS for 3 Biomed Applications: GATE, hadronTherapy, and Friction/Arlecore

- Development of complete interfaces with GENIUS for 4 Generic Applications: EGEODE (CGG), MAGIC, GEMS, and CODESA-3D (ESR) (see demos!)

- Development of complete interfaces with GENIUS for 16 demonstrative applications available on the GILDA Grid Demonstrator (https://grid-demo.ct.infn.it)

Transition from GILDA to Production Service

- **The transition from GILDA to the EGEE production infrastructure requires creating a new Virtual Organisation and deploying its services.**

- **Each new Virtual Organisation requires the following services:**
  - a VO administration service
  - a set of sites providing resources
  - Potential access to a Resource Broker & Replica Location Service

- **The VO is administered by a VO manager who is a member of the associated scientific community. He is in charge of**
  - managing the list of VO users
  - monitoring the VO services and informing the VO users of their availability

- **Monitoring the resources is available to the VO users**

Earth Science

Achievements

- The ESR (Earth Sciences Research) VO at SARA was created in July 2004 and is functional now using EGEE resources. 17 registered users from 6 countries
- The EGEODE (Expanding GEOsciences on DEmand) VO was created at IN2P3 (Lyon) in mid-October for CGG and Geocluster partners. Developing now prior to migration to EGEE production service
- An important EGEODE application has successfully been deployed on GILDA and demonstrated at the 2nd EGEE Conference in The Hague using the GENIUS portal

  DEMO

- Production of ozone profiles from the satellite experiment GOME and their validation by using LIDAR data has been run on EGEE production service

Issues

- Need secure access to data and metadata for authorised groups/sub-groups
- Access to licensed software

Comp Chem

Achievements

- A cluster of 13 nodes + CE + SE + VOMS server has been deployed in GILDA for dedicated use by CompChem.
- The Grid based Molecular Simulator(GEMS) has been ported onto the GILDA test cluster and interfaced to GENIUS

  DEMO
- The CompChem VO has been activated
- Work in hand now to move to production service

Issues

- Requirements for interactive work
  - IP connectivity of nodes
  - Fast turnaround in jobs
- Access to licensed software

- **A Magic Virtual Organisation already exists in EGEE**
  - VO server is hosted by SARA/NIKHEF
  - Successful first running in GILDA as well as in Crossgrid testbed using LCG-2 middleware
- **Developments underway for EGEE data challenge in early 2005**
  - CNAF will support the Magic VO with a Resource Broker
  - PIC will support the Magic VO with storage and the RLS
  - CNAF, PIC and GridKA will provide CPU
  - GILDA can be used for the first test as well

- **Education**
  - 'EGEE for dummies'
- **Getting extra EGEE resources for data challenge**
  - Precise 'process' definition and its execution

Major issues and their mitigation

- **Issue 1:**

  the planning and execution of the migration of applications currently deployed on LCG2, both HEP and non-HEP, to the new gLite middleware

- **Issue 2:**

  the provision of management and support structures for the integration of multiple user communities, and taking into account the significant increase in the number of EGEE active users

- **Issue 3:**

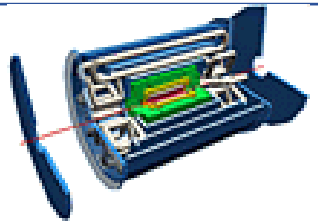
  the availability of security-enhanced services for data manipulation and job execution

Issue 1: Migration to gLite - the role of ARDA

- **High Energy Physics activity focused on the next generation applications**
  - Goal: allow physicists to do individual analyses of LHC data
  - Method: develop end-to-end prototypes based on the new gLite middleware
  - Resources: joint LCG-EGEE effort in ARDA (A Realisation of Distributed Analysis for LHC)

Migration to gLite: the role of ARDA

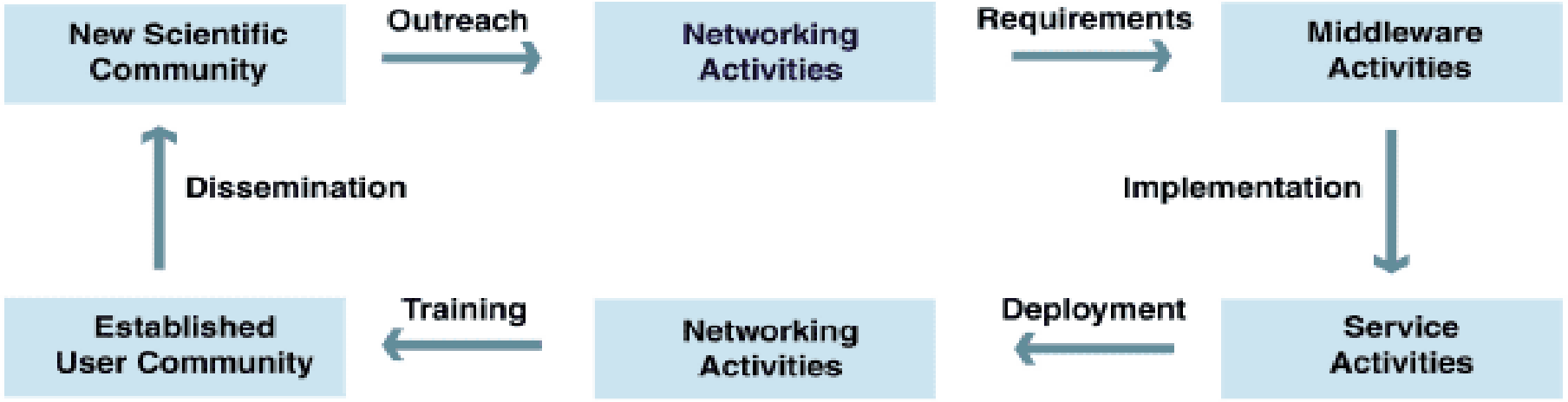
Enabling Grids for E-sciencE

LHC Experiment	Main focus	Basic prototype component	Experiment analysis application framework	Middleware
LHCb	GUI to Grid	GANGA	DaVinci	gLite Lightweight Middleware for Grid Computing
ALICE	Interactive analysis	PROOF ROOT	AliROOT	
	High level services	DIAL	Athena	
CMS	Exploit native gLite functionality	Aligned with APROM strategy	ORCA	

Migration to gLite: the role of the NA4 Test team

- **Goal: develop and execute test cases corresponding to application use cases**
- **Strategy:**
  - Propose test cases based on use cases collected from application developers (http://marianne.in2p3.fr/egee/testgroup/testcase/Tables/)
  - Design and implement a test suite based on the test cases and compliant with EGEE test strategy
  - Perform tests on the pre-production service and the production service
- **Milestone MNA4.1 accepted**
- **Status**
  - Implementation of a new set of components: improved modularity, easier test building, better integration in a test framework, new functionality
  - Participation to EGEE common testing activities

Issue 2: enabling the virtuous cycle



- **Provision of management and support structures for the integration of multiple user communities is a project wide challenge**

- **Identified needs:**
  - Strong interface between VO managers and infrastructure operation management
  - User support structure needs to handle a growing number of users
  - Single entry point to the project for external user communities

Issue 2: role of the NA4/SA1 joint group

- Understands the detailed requirements for new communities joining EGEE
- Assists in negotiations for resources for the new applications community
- Ensures that the full services of the infrastructure will be available to the new VO
- Ensure that the new VO demonstrates an appropriate commitment to the project
- Negotiate that sites provide a slice of their resources for test purposes in order to encourage applications to join EGEE
- Also broker for existing applications needing more resources

Issue 3: security-enhanced services

- **Security-enhanced services for data manipulation and job execution are critical for industrial partners and non-HEP scientific applications**

- **gLite 1.0 will provide new security-enhanced services**
  - VOMS for VO management
  - The File and Replica Catalog provides support to ACLs
  - These services must be tested by the biomedical pilot applications

- **Additional support needed**
  - ACL support at Storage Element level
- **Secure access to licensed software – open issue**

Plan for next period

MNA4.2	M12	First external review of Applications Identification and Support with feedback
DNA4.3.2	M15	First revision of EGEE Application Migration Progress report
DNA4.3.3	M21	Second revision of EGEE Application Migration Progress report
MNA4.3	M24	•Second external review of Applications Identification and Support with feedback
DNA4.4	M24	Final Report of Application Identification and Support Activity

- No change w.r.t. to TA
- Lack of resources to address issues identified in relation to the integration of new user communities

Summary

- **Top 3 accomplishments**
  - The successful deployment of several biomedical applications
  - The successful outreach to new generic communities through a well established process, providing education and application migration for the new application areas selected by EGAAP, using GILDA and GENIUS as tools
  - The Demonstration of prototype analysis systems using gLite for all 4 LHC experiments
- **Major challenges for the coming months**
  - Planning and execution of the migration to gLite of applications currently deployed on LCG2
  - Provision of management and support structures for the integration of multiple user communities taking into account the significant increase of the number of EGEE active users
  - Availability of security-enhanced services for data manipulation and job execution