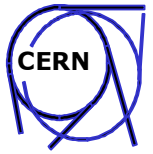


LCG-1 Status

Markus Schulz
LCG

EDG Project Conference
29 September 2003

Overview

- Our goals, scale, milestones (no visions etc.)
- Deployment status
- Software is in LCG-1 now
- Release and Deployment Procedures
- Services, Operation etc.
- First experience
- What do we plan to do in the near future (2003, mid 2004)
- Summary

Many slides stolen/inspired

What is LCG?

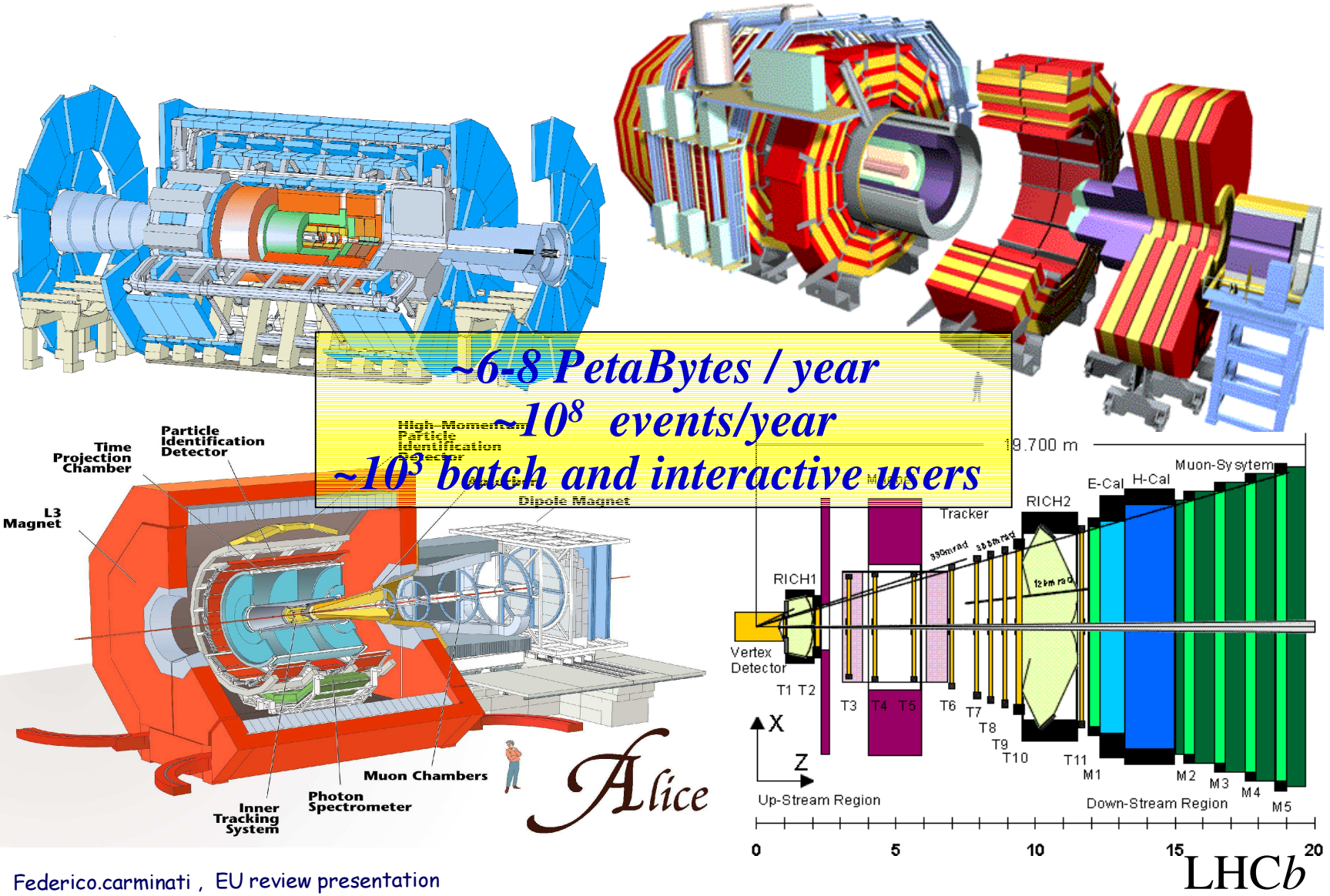
- **L**HC **C**omputing **G**rid ->http://lcg.web.cern.ch/lcg
- The goal of the LCG project is to prototype and deploy the computing environment for the LHC experiments

- Two phases:
  - **Phase 1: 2002 – 2005**
  - Build a service prototype, based on existing grid middleware
  - Gain experience in running a **production** grid **service**
  - Produce the TDR for the final system

  - **Phase 2: 2006 – 2008**
  - Build and commission the initial LHC computing environment

LCG is NOT a development project

Our Customers



Federico.carminati , EU review presentation

2003 Milestones

Project Level 1 Deployment milestones that had been set for 2003:

- July: Introduce the initial publicly available LCG-1 global grid service
  - With 10 Tier 1 centres in 3 continents
- November: Expanded LCG-1 service with resources and functionality sufficient for the 2004 Computing Data Challenges
  - Additional Tier 1 centres, several Tier 2 centres – more countries
  - Expanded resources at Tier 1s
    - (e.g. at CERN make the LXBatch service grid-accessible)
  - Agreed performance and reliability targets

LCG Resources (promised) – 1Q04

	CPU (kSI2K)	Disk TB	Support FTE	Tape TB
CERN	700	160	10.0	1000
Czech Republic	60	5	2.5	5
France	420	81	10.2	540
Germany	207	40	9.0	62
Holland	124	3	4.0	12
Italy	507	60	16.0	100
Japan	220	45	5.0	100
Poland	86	9	5.0	28
Russia	120	30	10.0	40
Taiwan	220	30	4.0	120
Spain	150	30	4.0	100
Sweden	179	40	2.0	40
Switzerland	26	5	2.0	40
UK	1656	226	17.3	295
USA	801	176	15.5	1741
Total (1kSI2K is a 2.8GHz P4)	5600	1169	120.0	4223

LCG-1 Deployment Status

- Up to date status can be seen here:
  - http://www.grid-support.ac.uk/GOC/Monitoring/Dashboard/dashboard.html
    - Has links to maps with sites that are in operation
    - Links to GridICE based monitoring tool (history of VO's jobs, etc)
      - Using information provided by the information system
    - Tables with deployment status

- Sites that are currently in LCG-1 (here) expect 18-20 by end of 2003
  - PIC-Barcelona (RB)
  - Budapest (RB)
  - CERN (RB)
  - CNAF (RB)
  - FermiLab. (FNAL)
  - FZK
  - Krakow
  - Moscow (RB)
  - RAL (RB)
  - Taipei (RB)
  - Tokyo

Total number of CPUs ~120 WNs

Sites to enter soon

BNL, Prague,(Lyon)

Several tier2 centres in Italy and Spain

Sites preparing to join

Pakistan, Sofia, Switzerland

Users (now):

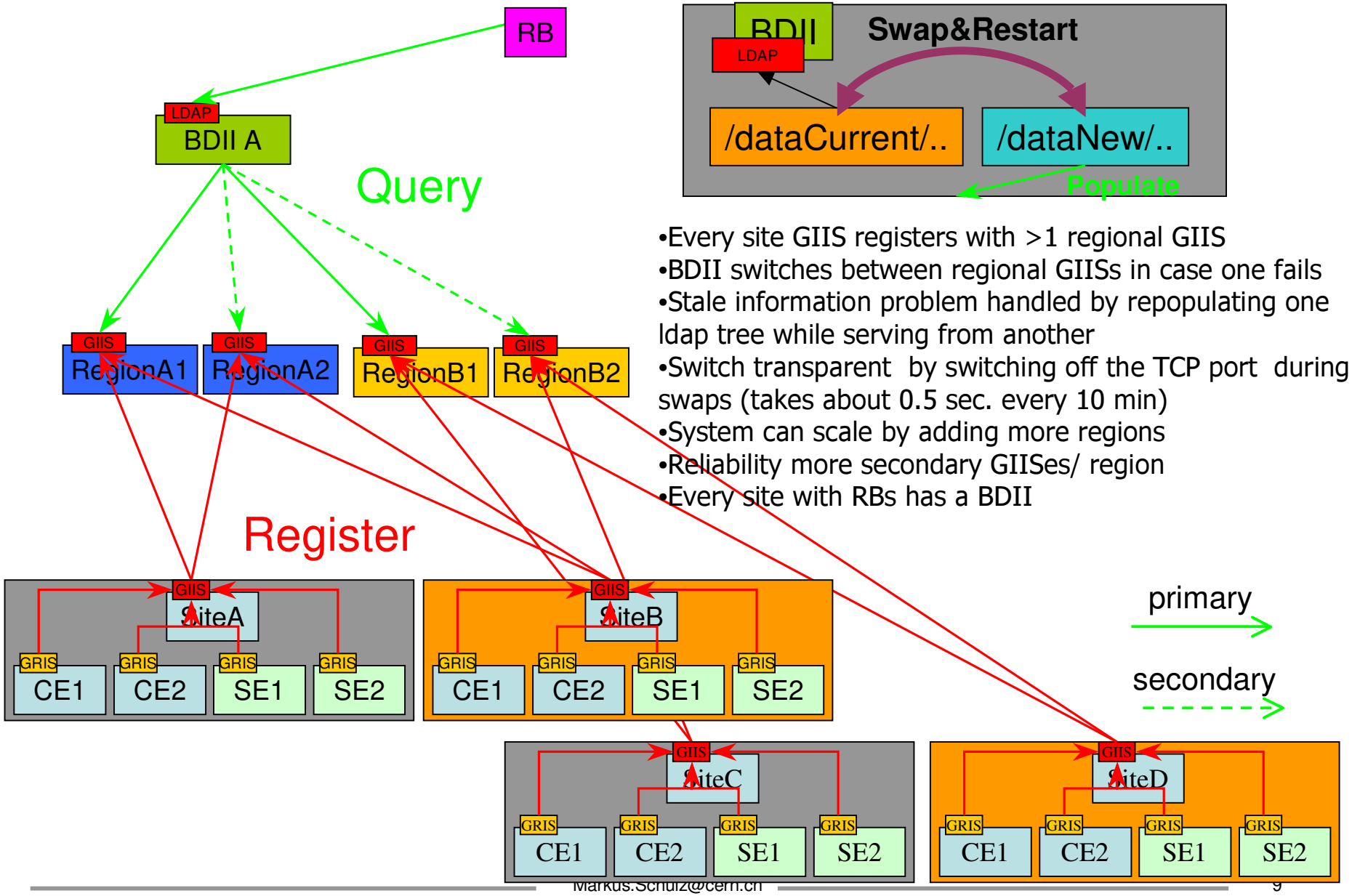
Loose Cannons Deployment Team Experiments starting (Alice, ATLAS,..)

Some comments later….

LCG-1 Software

- LCG-1 (LCG1-1_0_2) is:
  - VDT (Globus 2.2.4)
  - EDG WP1 (Resource Broker)
  - EDG WP2 (Replica Management tools)
    - One central RMC and LRC for each VO, located at CERN, ORACLE backend
  - Several bits from other WPs (Config objects, InfoProviders, Packaging…)
  - GLUE 1.1 (Information schema) + few essential LCG extensions
  - MDS based Information System with LCG enhancements
  - SE-Classic (disk based only, gridFTP) **NO MSS**
  - EDG components approx. edg-2.0 version
  - LCG modifications:
    - Job managers to avoid shared filesystem problems (GASS Cache, etc.)
    - MDS – BDII LDAP (see more later)
    - Globus gatekeeper enhancements ((adding some accounting and auditing features, log rotation, that LCG requires)
    - Many, many bug fixes to EDG and Globus/VDT

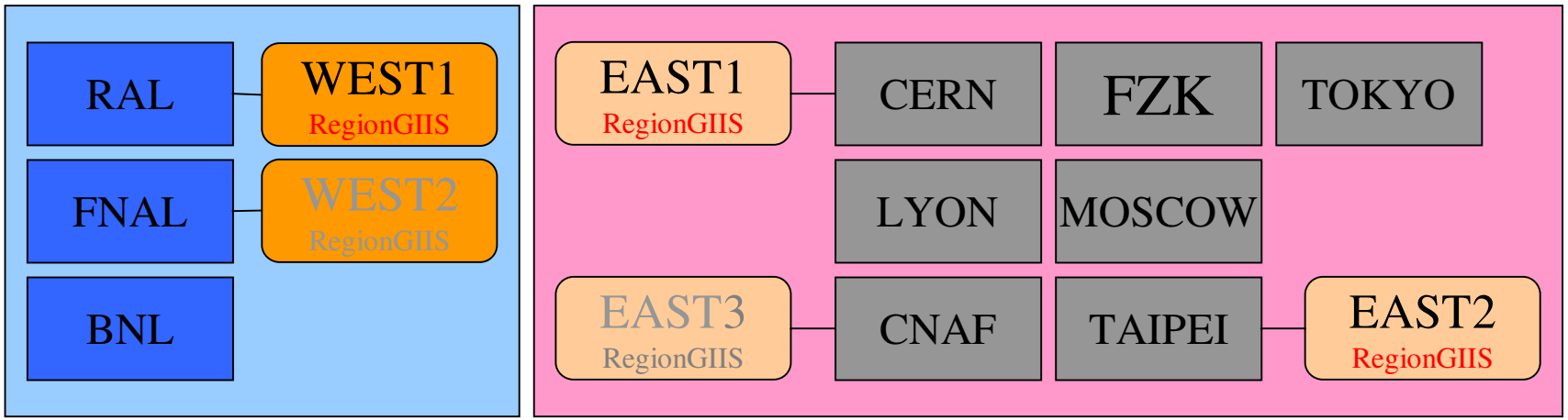
LCG-1 Information System



- Every site GIIS registers with >1 regional GIIS
- BDII switches between regional GIISs in case one fails
- Stale information problem handled by repopulating one ldap tree while serving from another
- Switch transparent by switching off the TCP port during swaps (takes about 0.5 sec. every 10 min)
- System can scale by adding more regions
- Reliability more secondary GIISes/ region
- Every site with RBs has a BDII

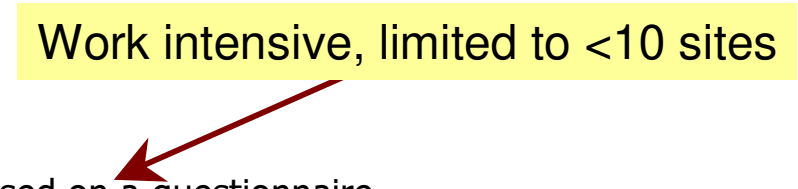
LCG-1 IS

- Current separation of the World:
  - Limit the number of sites/region
  - Started with 2, split along 0 degree into east and west
  - Currently 2 regional GIISes in East, only one in West (deployment)



Release Procedure

- Similar to what has been discussed for EDG in the past
  - Software first assembled on the Certification & Test Testbeds
    - 4 sites at CERN, + some external sites U. Wisconsin, FNAL,Moscow, Italy (soon)
    - Installation tests and functional test (resolving problems found in the LCG1 service)
    - Certification test suite almost finished
  - Software handed to the Deployment Team
    - Adjustments in the configuration
    - Release notes for the external sites
    - Decision on time to release
- How do we deploy?
  - Service Nodes (RB, CE, SE …)
    - LCFGng, sample configurations in CVS
    - We provide for new sites config files based on a questionnaire
  - Worker nodes – aim is to allow sites to use existing tools as required
    - LCFGng – provides automated installation **YES**
    - Instructions allowing system managers to use their existing tools **SOON**
  - User interface
    - LCFGng **YES**
    - Installed on a cluster (e.g. Lxplus at CERN) LCFGng-lite **YES**
    - Instructions allowing system managers to use their existing tools **SOON**



Services

- Operations Service:
  - RAL is leading sub-project on developing operations services
  - Initial prototype http://www.grid-support.ac.uk/GOC/
    - Basic monitoring tools
    - Mail lists and rapid communications/coordination for problem resolution
    - Working on defining policies for operation, responsibilities (draft document)
  - Monitoring:
    - GridICE (development of DataTag Nagios-based tools) http://tbed0116.cern.ch/gridice/site/site.php
    - GridPP job submission monitoring http://esc.dl.ac.uk/gppmonWorld/
- User support
  - FZK leading sub-project to develop user support services
  - Draft on user support policy
  - Web portal for problem reporting http://gus.fzk.de/

http://www.grid-support.ac.uk/GOC/Monitoring/Dashboard/dashboard.html

LCG Grid Operations Centre

GridICE — the eyes of the Grid

LCG

DataTAG

Site View VO view about

Info from Grid Discovery System

Site	Computing power	%JOB Load	%StorageArea Load	Tot. SA (GB)	SA Avail. (GB)	Phys CPUs Tot	Phys CPUs %Load	JOBs Run	JOBs Queue
cern.ch	n/a	n/a	10%	87	78	n/a	n/a	0	0
cr.cnaf.infn.it	n/a	n/a	11%	63	56	n/a	n/a	0	0
fzk.de	n/a	n/a	5%	177	168	n/a	n/a	0	0
grid.sinica.edu.tw	n/a	n/a	2%	208	204	n/a	n/a	0	0
icepp.s.u-tokyo.ac.jp	n/a	n/a	5%	63	60	n/a	n/a	0	0

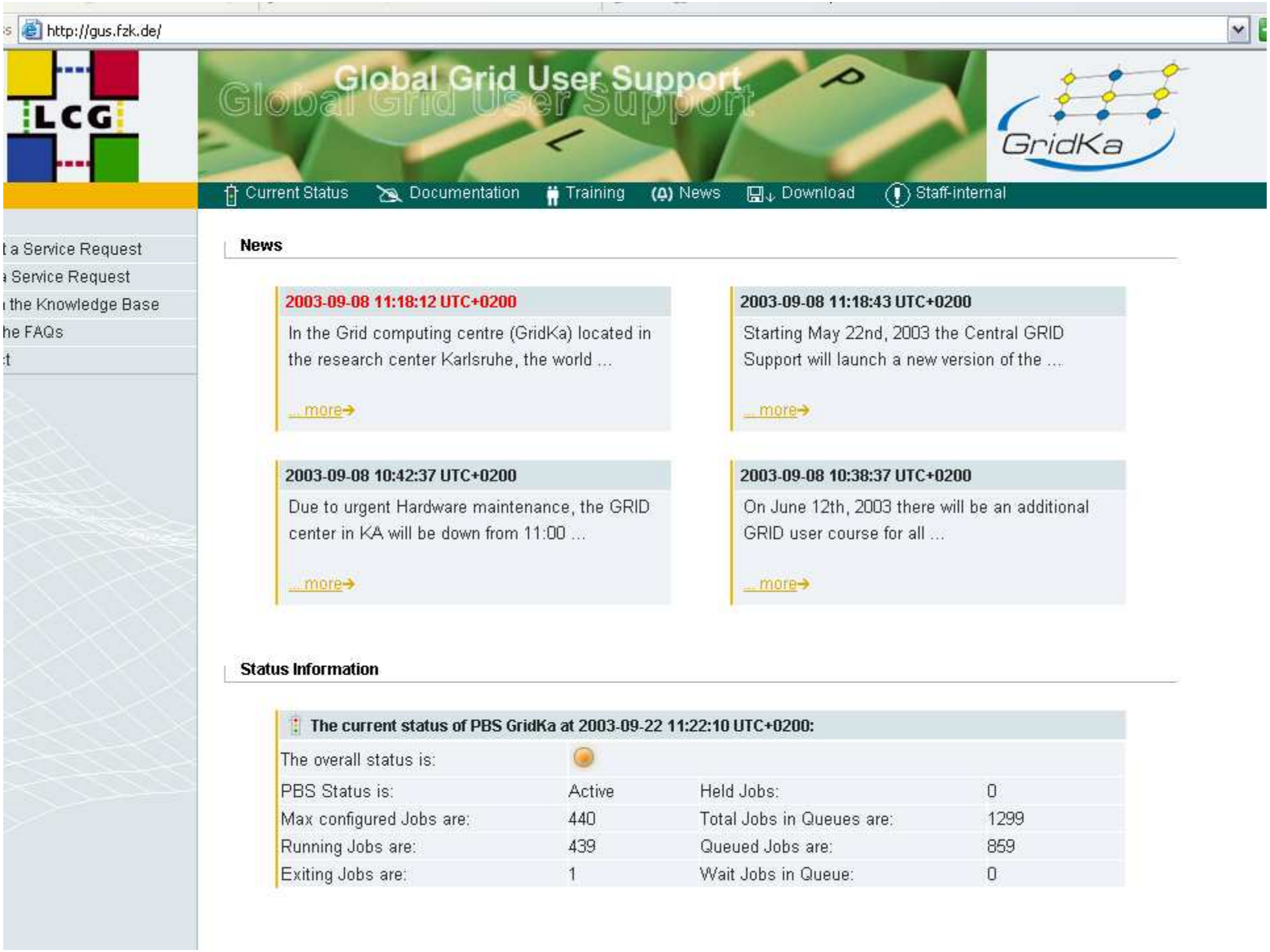
Mapcenter Monitoring of the LCG-1

Status Map showing the status of nodes with respect to submitted test globus jobs

GRIDICE Monitoring fo LCG-1 at CERN

Status table of LCG-1 sites

Sites in LCG-1


http://gus.fzk.de/
LCG
Global Grid User Support
GridKa
Current Status
Documentation
Training
News
Download
Staff-internal
t a Service Request
Service Request
the Knowledge Base
he FAQs
t
News
2003-09-08 11:18:12 UTC+0200
In the Grid computing centre (GridKa) located in the research center Karlsruhe, the world ...
...more
2003-09-08 11:18:43 UTC+0200
Starting May 22nd, 2003 the Central GRID Support will launch a new version of the ...
...more
2003-09-08 10:42:37 UTC+0200
Due to urgent Hardware maintenance, the GRID center in KA will be down from 11:00 ...
...more
2003-09-08 10:38:37 UTC+0200
On June 12th, 2003 there will be an additional GRID user course for all ...
...more
Status Information
The current status of PBS GridKa at 2003-09-22 11:22:10 UTC+0200:
The overall status is:
PBS Status is: Active
Held Jobs: 0
Max configured Jobs are: 440
Total Jobs in Queues are: 1299
Running Jobs are: 439
Queued Jobs are: 859
Exiting Jobs are: 1
Wait Jobs in Queue: 0

User Support

- Experiments provide 1st level triage
  - Experiments contacts send problems through the FZK portal
  - First test very soon, since the experiments start using LCG1
- Experiment integration support by CERN based group
- http://grid-deployment.web.cern.ch/grid-deployment/cgi-bin/index.cgi?var=eis/homepage

- Documentation
  - Installation guides (do first this, then that, if this happens do that..)
  - First version of user guide (very useful document)
  - Missing:
    - Collection of sample jobs
    - Tutorial
    - Operations manual

Getting the Experiments on

No better place found for this slide

- Experiments start to use the service now and are welcome!!
  - Agreement between LCG and the experiments
    - System has limitations, testing what is there
    - Focus on:
      - Testing with loads similar to production programs (long jobs, etc)
      - Testing the experiments software on LCG
    - We don't want:
      - Destructive testing to explore the limits of the system with artificial loads
        - » This can be done in scheduled sessions on C&T testbed
  - Adding experiments and sites at a brisk pace in parallel is problematic
    - Getting the experiments on one after the other
      - A can learn from what B went through (B can claim fame for being 1st)
    - Limited number of users that we can interact with and keep informed
      - JJ's famous "Deadly Embrace until things are working"

Testing 10k "hello world" jobs on a system with 120CPUs doesn't help much to understand what has to be done to get 240 production jobs running for 12h.

LCG needs the experiments NOW

Security

- LCG Security Group (Dave Kelsey (RAL))
  - LCG1 usage rules
  - Registration procedures and VO management
    - Agreement to collect only minimal amount of personal data
    - Currently registration is only valid for 6 month (procedures will change)
  - Initial audit requirements are defined
  - Initial incident response procedures
    - Site security contacts etc. are defined
  - Set of trusted CAs (including Fermilabs online KCA)
  - Draft of security policy (to be finished end of year)
  - Web site http://proj-lcg-security.web.cern.ch/proj-lcg-security/

History

- First set of reasonable middleware on C&T Testbed end of July (PLAN April)
  - limited functionality and stability

middleware was late

- Deployment started to 10 initial sites
  - Focus not on functionality, but establishing procedures
  - Getting sites used to LCFGng
- End of August only 5 sites in
  - Lack of effort of the participating sites
  - Gross underestimation of the effort and dedication needed by the sites
    - Many complaints about complexity
    - Inexperience (and dislike) of install/config Tool
    - Lack of a one stop installation (tar, run a script and go)
    - Instructions with more than 100 words might be too complex/boring to follow
- First certified version LCG1-1_0_0 release September 1st (PLAN in June)
  - Limited functionality, improved reliability
  - Training paid off -> 5 sites upgraded (reinstalled) in 1 day
  - Last after 1 week….
- Security patch LCG1-1_0_1 first not scheduled upgrade took than 24h.
- Sites need between 3 days and several weeks to come online
  - None in not using the LCFGng setup (status Thursday)
- Now: 11 in and several Tier 2 sites waiting, 2 of the original 10 missing

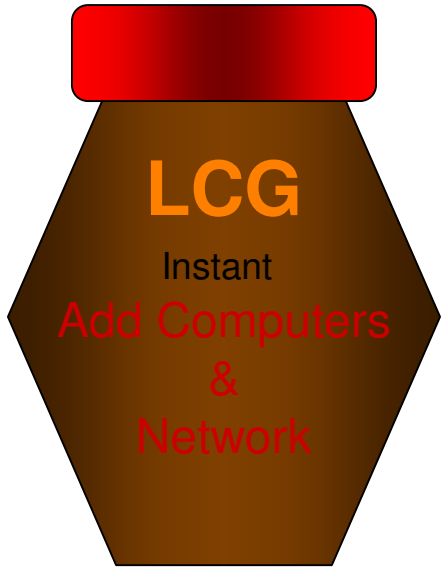
Adding a Site

I. Site contacts us (LCG)
II. Leader of the GD decides if the site can join (hours)
III. Site gets mail with pointers to documentation of the process
IV. Site fills questionnaire
V. We, or primary site write LCFGng config files and place them in CVS
VI. Site checks out config. files, studies them, corrects them, asks questions…
VII. Site starts installing
VIII. Site runs first tests locally (described in the material provided)
IX. Site maintains config. in CVS (helps us finding problems)
X. Site contacts us or primary site to be certified
   - Currently we run a few more tests, certification suite in preparation
   - Site creates a CVS tag
   - Site is added to the Information System

- We currently lack proper tool to express this in the IS

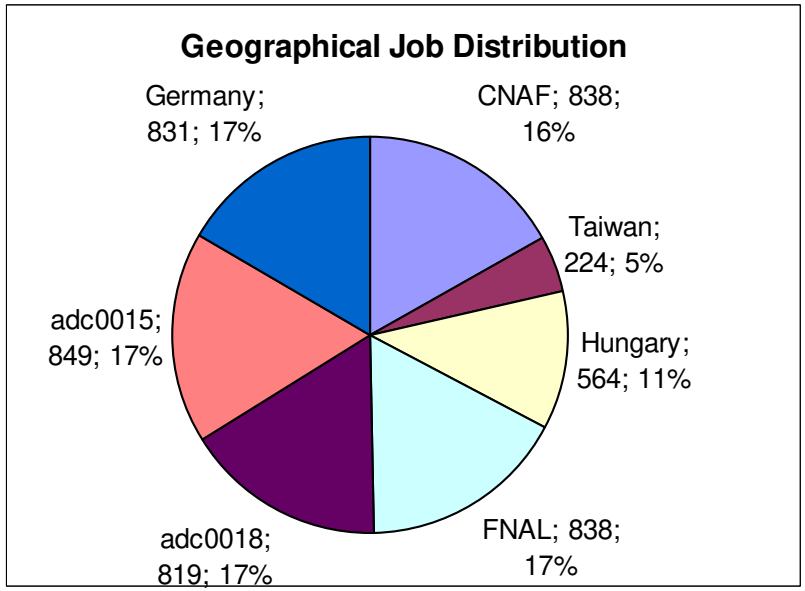
Difficulties

- Sites without LCFGng (even using lite) have severe problems getting it right
  - We can't help too much, dependencies depend on base system installed
  - The configuration is not understood well enough (by them, by us)
  - Need one keystroke "Instant GRID" distribution (hard..)
  - Middleware's dependencies too complex
- Debugging a site
  - Can't set the site remotely in a debugging mode
  - The glue status variable covers the LRM's state
  - Jobs keep on coming
  - Discovery of the other site's setup for support is hard
- History of the components, many config files
  - No tool to pack config and send to us
  - Sites fight with FireWalls
- Some sites are in contact with grids for the 1st time
  - There is nothing like "Beginners Guide to Grids"
- LCG is on many sites not a top priority
  - Many sysadmins don't find time to work for several hours in a row
  - Instructions are not followed correctly (short cuts taken)
- Time zones slow things down a bit (The grid where the sun never sets)



Stability-Operation

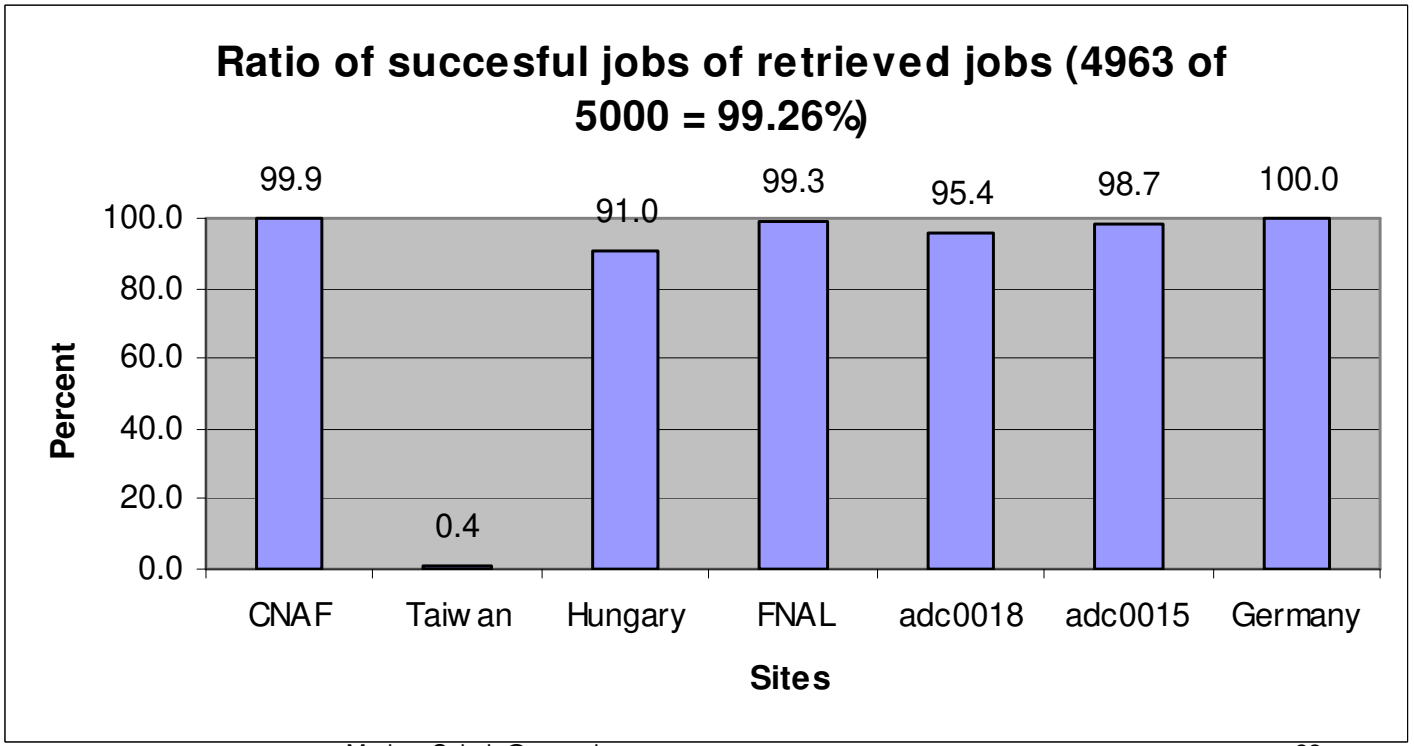
- Running jobs has now greatly improved
  - "Hello World" jobs are about 95% successful
  - Services crash with much lower rate (some bug fixes already on C&T)
  - Some bugs in LCG1-1_0_x already fixed on C&T
  - Grid services degrade gracefully
- So far the MDS is holding up well
- Focus in this area during the next few month
  - Long running jobs with many jobs
  - Complex jobs (data access, many files,…)
  - Scalability test for the whole system with complex jobs
  - Chaotic (many users, asynchronous access, bursts) usage test
  - Tests of strategies to stabilize the information system under heavy load
    - We have several that we want to try as soon as more Tier2 sites join
  - We need to learn how the systems behave if operated for a long time
    - In the past some services tended to "age" or "pollute" the platforms they ran on
  - We need to learn how to capture the "state" of services to restart them on different nodes
  - Learn how to upgrade systems (RMC, LRC…) without stopping the service
    - You can't drain LCG1 for upgrading



LCG 1.0 Test (19./20. Sept. 2003):

- 5 streams
- 5000 jobs in total
  - Input and OutputSandbox
  - Brokerinfo query
  - 30 sec sleep

Ingo Augustin gave this slide to me



Next Steps

- Get everything needed for LCG2 (used in the 2004DCs) Nov. 20th
  - System for distributing experiments SW (RPMS through us won't do)
  - GCC3.2
  - VDT Globus 2.4.x
  - VOMS
    - Tests started, server is set up, will be used first for CE (Storage access later)
    - Even if we will use initially very few roles for authorization still many benefits
      - Amount of information in the IS becomes independent of number of grid users
      - Might be used to do grid wide admin. Work
      - See some problems mapping to UNIX file access (No ACL in UNIX)
  - Access to storage
    - GFAL, SRM integration with CASTOR and ENSTORE (very soon)
    - What to do with disk only sites (make them run DCASH)?
  - Distributed RLSs (can of worms -> see next slides)
  - POOL integration with distribution and RLSs
  - Basic simple accounting system (agreed on plan, found volunteers)
  - Integration of not dedicated production clusters (WNs on non routed nets)

Worms are in the extra **s**

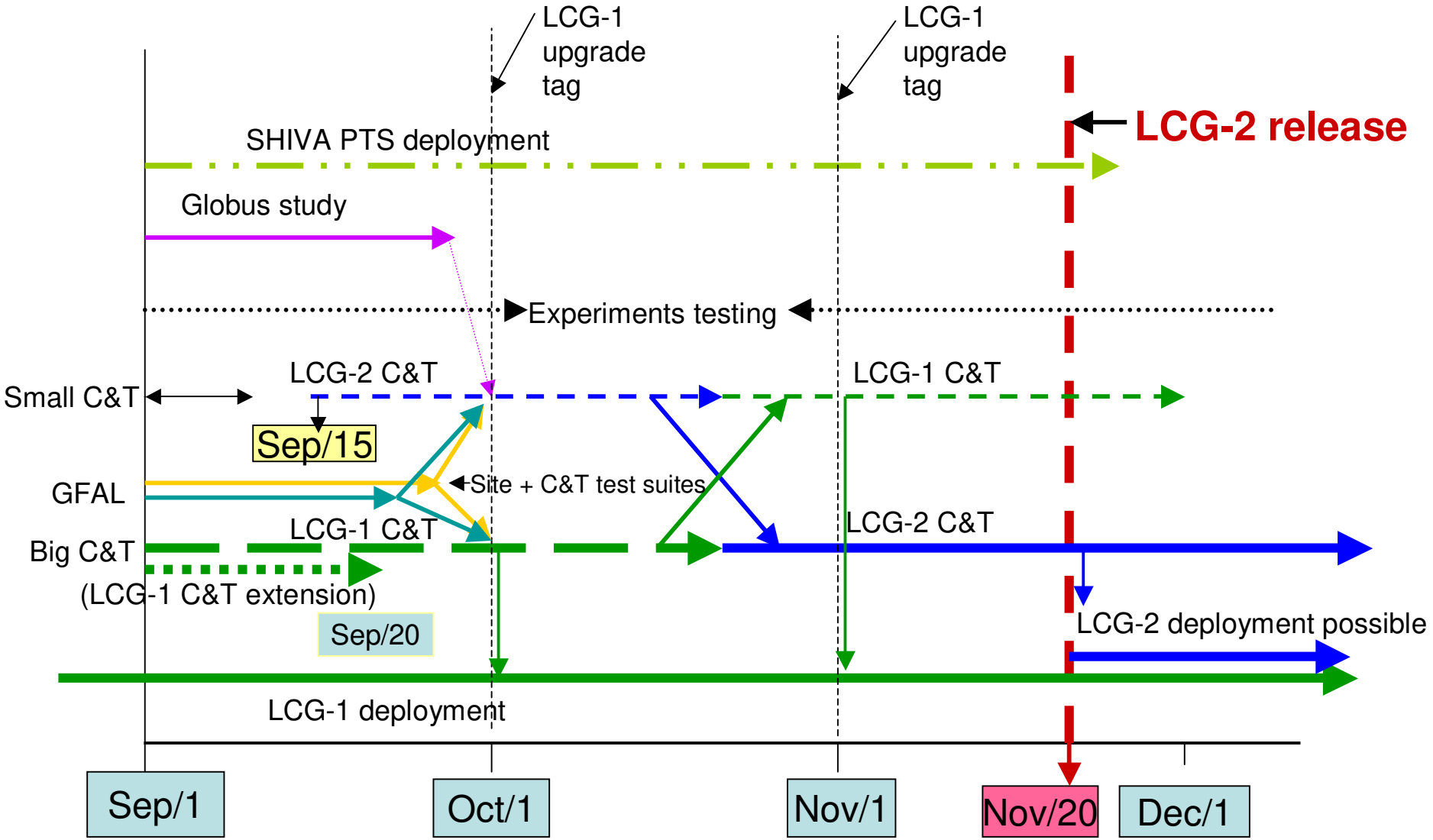
Next Steps II

- Part2 (mainly deployment):
  - Automate installation as far as possible
  - Define installation and configuration to allow tool independent usage
  - Establish procedure to integrate Tier2 centres
    - Hierarchical model (CERN can't support 20 sites)
- Integrate US Tier2 centres
  - Middleware (based on GRID3/OSG not fully interoperable)
  - Many challenges, tests will be done together with ATLAS

Next III

- R-GMA
  - R-GMA still in the process of stabilization
  - Timescale:
    - Until November not testing RGMA as an replacement for MDS
    - Interoperability with US grid infrastructure is a must
    - If time permits comparison tests on the deployed system

Timeline - Preparation



RLSs

- Why the RLSs are a can of worms
  - In LCG two, currently non interoperable versions will be used.
  - The US Tier2 centres will deploy the Globus-RLS
  - This cuts LCG practically into two
- Plan (short version, more detailed after the summary slides)
  - Make POOL configurable to work with either of the RLSs (11/03)
  - POOL group provides tools to cross populate file catalogues (11/03)
  - Globus-RLS modified to use ORACLE as back-end
  - Integrate the RLSs (goal 5/04)
    - Integrate the Globus-RLI and EDG-LRC
    - APIs
    - Update clients (POOL, RB, ..)
- Now: Run EDG-RLS at CERN (ORACLE back-end)
  - No EDG-RLI deployed

RLSs II

- January 2004 start with minimal solution for 2004 Data Challenges
  - Sites provide a service based either on **LOCAL** EDG-LRCs or Globus RLS
  - Cross-population every few hours
  - A few sites (like CERN) will get all updates and then push back out
    - Latency for the RBs has to be taken into account by production managers
    - Most production work will do anyway bulk updates at end of job
    - "Solves" requirement for a proxy replica manager. Bulk updates can be run from appropriate nodes.

This is the current plan.
We have changed our plans quite often!!!

Summary

- Middleware was 3 months late
  - Less: functionality, tests, experience with operation
  - **Core functionality**
    - Is clearly there
    - Reliability improved fundamentally compared to edg-1.4
- System now at scale foreseen (11 sites in)
  - Integration between US and European sites still an issue
- Experiments are getting ready to test the system
  - This will help to discover problems
- Very little time to turn this into a real production system
  - Critical components are just coming in (SE)
  - Has to be done incrementally on the running service
- Deploying the software at new sites not always easy
  - Different reasons (attitude, complexity, priorities,acceptance of tools)

RLS

- Issue – 2 non-interoperable implementations

- **Proposed Strategy – development**
- Integrate POOL with Globus RLS, so that it is able to communicate with both RLS implementations (but not from the same process).
  - Assuming all the above conditions are met the earliest this work could be completed would be November 2003.
  - This requires close collaboration between the POOL group and someone (a developer?) very familiar with the Globus RLS.
  - Also might require some additions/changes in the RLS API?
- POOL group provide the tools to enable cross population of POOL file catalogs between RLS implementations. These tools are basically available now.
- Globus RLS is ported to Oracle as the database back-end.
- In parallel we work on the interoperability roadmap, with a target date of May 2004 for this to be available:
  - Agree the APIs for RLS and RLI. This discussion should include agreement on the syntax of filenames in the catalog.
  - Implement the Globus RLI in the EDG RLS, make the EDG LRC talk the "Bob" protocol.
  - Implement the client APIs
  - Define and implement the proxy replica manager service
  - Update the POOL and other replica manager clients (e.g. EDG RB)

RLS Proposed Strategy – services

- Now: Run EDG RLS at CERN and at US Tier 1 sites – at least until Globus RLS is running with Oracle.
  - The EDG RLS in this scenario is the LRC only – we will not deploy the RLI.
- By January 2004: LCG service is provided by local EDG LRCs or Globus RLS, and cross-population tools to enable catalog updates. This is the minimal solution for the 2004 Data Challenges.
  - Most batch production work will in any case use bulk updates of the catalogs rather than file-by-file updates from the job.
  - Suggest initially CERN catalog gets all updates and then pushes back out. This implies that pre-job file replication is required so that data is already at site where the job will run.
  - This model removes the requirement for a proxy replica manager since the bulk updates can be run from externally visible nodes.