Certification & Testing

LCG Certification & Testing Team (C&T Team)

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LCG Software

- *LCG software is:*

  - Globus (subset of the VDT distribution) delivered by iVDGL
  - EDG WP1 (Workload Management System - "Resource Broker")
  - EDG WP2 (Data Management System)
  - Several components from other EDG WPs (config objects, InfoProviders, …)
  - GLUE 1.1 (Information schema)
  - MDS based Information System (Globus) with LCG enhancements
  - "StorageElement" (disk-based only, gridFTP), MSS via GFAL and SRM soon
  - LCG modifications and developments:
    - Job managers to avoid shared file-system problems
    - MDS – BDII LDAP
    - Globus gatekeeper enhancements (adding some accounting and auditing features, log rotation, that LCG requires)
    - Many, many bug fixes to EDG and Globus/VDT
    - GFAL lib to access MSS
    - ……………

Certification Process Scope

- the software that LCG is deploying has never been used in a large scale production system!

- the goal of the certification process is to provide LCG with *production quality* software satisfying experiment requirements

"production quality ":

- stability, robustness, avalability 24h x 7d
- performance, scalability, gracefully degrade
- operability
- maintainability
- user compliant

Certification Process

- ## feature testing
  - Workload Management System(WMS), Data Management (DMS), Information System (IS), ...

- ## different grid architectures / configurations
  - simulating the production service

- ## stress tests
  - single components, overall system

- ## destructive tests - error recovery
  - injecting problems to study system behaviour

- ## security
  - basic issues

Running the Certification

2 major activities:

- integrating components into LCG software
  - verifying its consistency (comes from several sources)
  - defining packaging and installation procedures
  - first level of debugging, testing of bug fixes
- C&T-testbed is where LCG release is built

- running a matrix of tests to cover all the relevant items
  - functionalities, stress tests, security
- changing the C&T-testbed setup
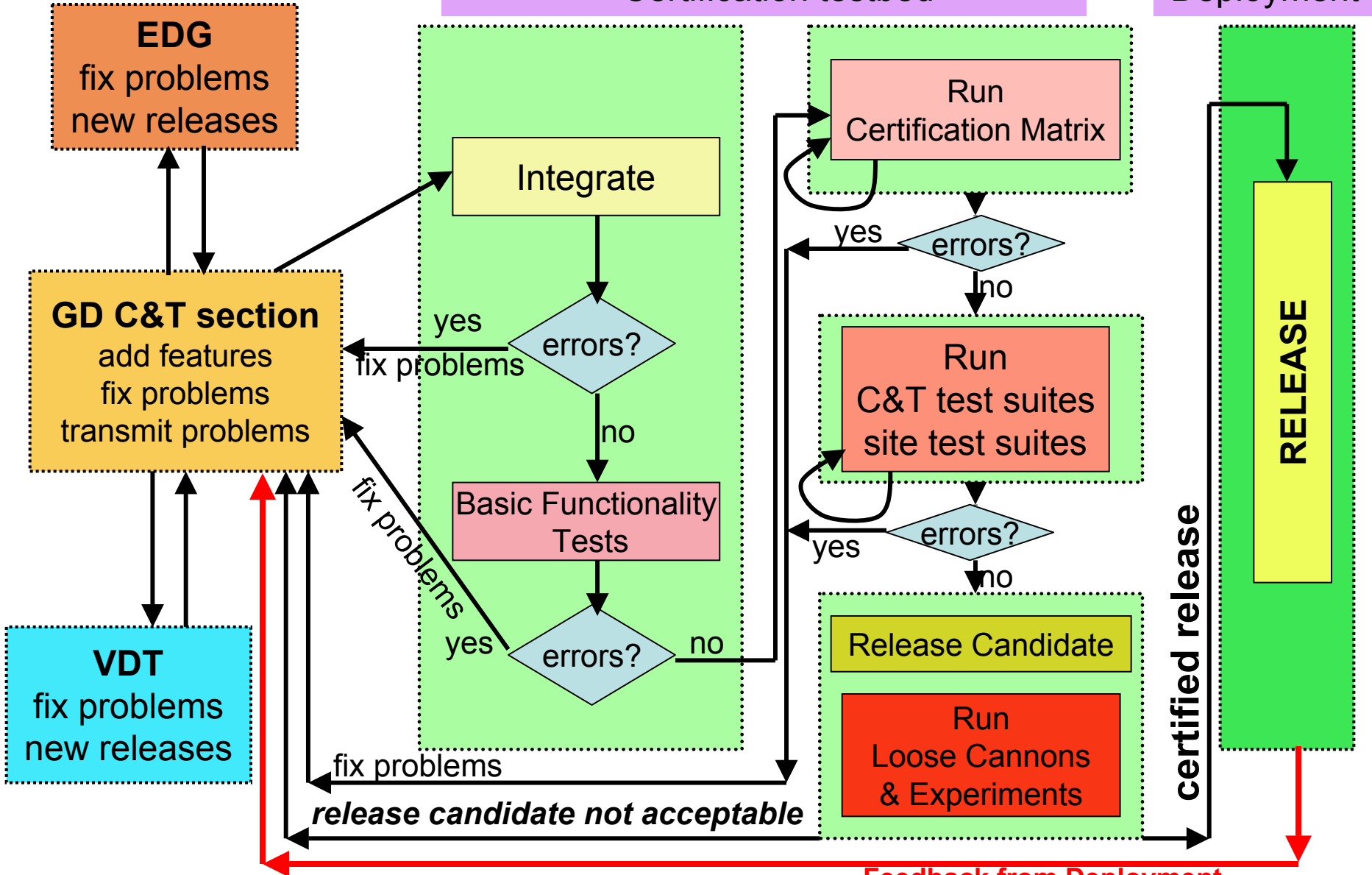 - different architectures, destructive tests

User Interface

workload management

cluster Taipei

cluster Wisconsin

data management

information system

cluster Budapest

cluster 3 LSF

cluster 2 Condor

cluster 1 PBS
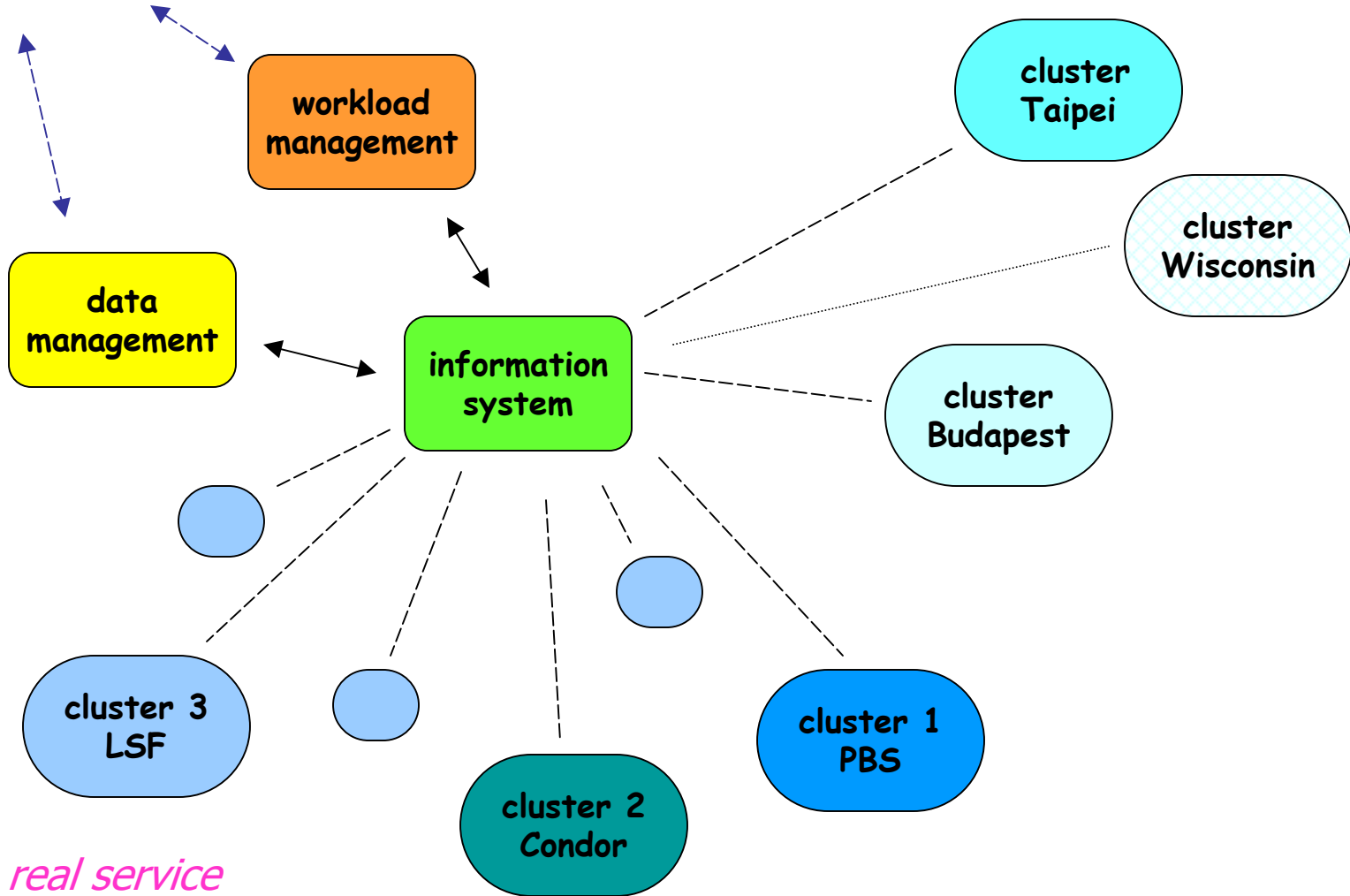
simulating the real service

LCG

UI_1

UI_4

RB_a

RB_b

RB_3

BDII_a

BDII_b

BDII_3

C&T-Testbed ~50 PCs @ CERN

MDS_a   **MDS_b**

MDS_3_a

MDS_3_b

CE_a

CE_b

CE_2

CE_4

CE_5

CE_6

SE_a

WN_b1

share local /home

SE_2_a

SE_4

wn01

WN_a1

WN_b2

SE_2_b

CE_3

WN_5_a

wn02

WN_4_a1

wn03

WN_a2

WN_b3

WN_2_a1

SE_3

WN_5_b

wn04

WN_4_a2

WN_a3

WN_2_a2

WN_3_a2

NO home sharing

wn05

WN_2_a3

WN_3_a1

NO home sharing

Proxy

RLS_MySQL

WN_2_a4

WN_3_a3

rlscert01(02) RLS_oracle

NO home sharing

PBS

Condor

LSF
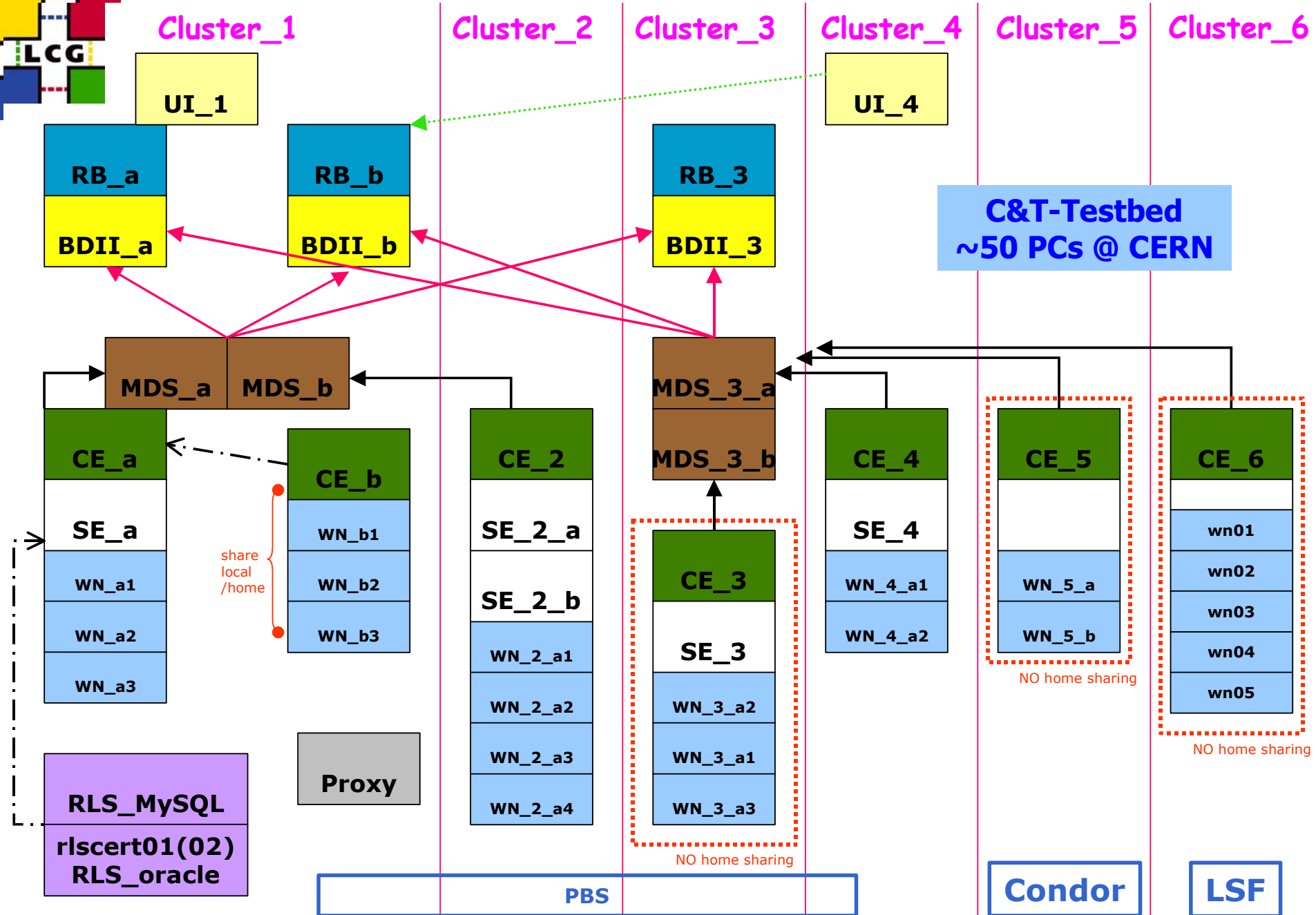
Grid Unit Testing

- globus
  - main functionalities, collaborative activity ongoing with VDT test team
- workload management system
  - load distribution, resources saturation,….
- data management system
  - data access, replication, catalog consistency, …
- security
  - certificates, ….

Grid Services Testing

- services interaction
  - jobs with input data, jobs with MSS access, ….
  - different batch systems (OpenPBS, LSF, Condor)

Test Results (examples)

- job submission tests
  - various and complex tests, success rate ~97%
  - ~1000 jobs in the system for 2 days: *ok*
  - ~1000 jobs to a single cluster (ComputingElement): *ok*
  - resources fully utilized
  - load correctly distributed: is function of CPUs available in each cluster ...
- data management tests
  - different protocols, replicating small/big data files: *ok*
  - single stream (~2000 files), multiple streams (~750 files): *ok*
- long jobs (running > 24h)
  - testing proxy renewal : *ok*

- guiding jobs to data
  - to check that jobs are dispatched only to clusters that allow access to specific files with a specific protocol: *ok*

- crash of services strongly reduced after the certification & debugging process

LCG Test Suite

- LCG has produced a "test suite" to allow for:
  - misconfiguration spotting
  - automated test procedure
  - interactive & nightly tests
  - performances evaluation, stress test
  - statistics about problems

- ultimate goal: regression testing for middleware validation

- a subset is the "site certification suite"
  - core functionalities
  - not exhaustive ....

- test suite is continuously updated to reflect new issues

- simultaneously we test the monitoring system

CERN

Row #	Title	Test list	Status	Command	Duration	Available
1	CEGate	01_GlobusGatekeeper	[OK]	command	337 sec.	options
2	CECycle	02_CECycle	[OK]	command	348 sec.	options
3	UI_ST	03_UI_config_test	[OK]	linkNameC	19 sec.	linkNameO
4	FTP_ST	04_GridFTP	[OK]	command	36 sec.	options
5	DNS	05_DNS-ReverseDNS	[OK]	command	0 sec.	options
6	RB	06_RB-BrokerInfo	[OK]	command	191 sec.	options
7	RB	06_RB-CheckVOVars	[OK]	command	192 sec.	options
8	RB	06_RB-Checksum	[OK]	command	168 sec.	options
9	RB	06_RB-HelloScript	[OK]	command	192 sec.	options
10	RB	06_RB-HelloWorld	[OK]	command	161 sec.	options
11	RB	06_RB-Sleep	[OK]	command	161 sec.	options
12	RLS	07_RLS-CheckRMC	[OK]	command	70 sec.	options
13	RLS	07_RLS-TestLRCAttributes	[OK]	command	53 sec.	options
14	RLS	07_RLS-TestLRCMapping	[OK]	command	199 sec.	options
15	RLS	07_RLS-TestRMCAttributes	[OK]	command	53 sec.	options
16	RLS	07_RLS-TestRMCMapping	[OK]	command	199 sec.	options
17	RMCycle	08_RMCycle	[OK]	command	178 sec.	options
18	SEwsCycle	09_SEwsCycle	[FAIL]	command	14 sec.	options
19	MM	10_MatchMaking	[OK]	command	676 sec.	options
20	MM_file	11_MatchMaking	[OK]	command	1584 sec.	options
21	MM_gridftp	12_MatchMaking	[OK]	command	1760 sec.	options
22	MM_rfio	13_MatchMaking	[FAIL]	command	1697 sec.	options
23	MDS	14_MDS-CheckConsistency	[FAIL]	command	1 sec.	options
24	MDS	14_MDS-CheckGRIS	[OK]	command	1 sec.	options
25	JStorm	15_JobStorm	[OK]	command	323 sec.	options
26	JS_sleep	16_JobStorm	[OK]	command	506 sec.	options

GlobusGatekeeper

Test run on Thu Oct 23 00:06:04 CEST 2003

step	lxshare0235.cern.ch	lxshare0241.cern.ch	lxshare0277.cern.ch
Step_0	ok	ok	ok
Step_1	ok	ok	ok
Step_2	ok	ok	ok
Step_3	ok	ok	ok
Step_4	ok	ok	ok
Step_5	ok	ok	ok
Step_6	ok	ok	ok
Step_7	ok	ok	ok
Step_8	ok	ok	ok
Step_9	ok	ok	ok
Step_10	ok	ok	ok

Step_0

```
Trying globus authentication... :
tryAuthentication :
globusrun -a -r lxshare0277.cern.ch/jobmanager
```

Step_1

```
Trying globus-job-run... :
sendRandom :
globus-job-run lxshare0277.cern.ch/jobmanager /bin/echo
```

C&T-Testbed Usage

- a testbed is required for many essential tasks
  - testing
  - certification
  - integrating the release
  - experiment testing
  - problem resolution of the deployed system

- contradictory activities
  - careful management required to maximize efficiency
  - fast changing environment (upgrades, different tests, bug fixing, ...)

- we would like to separate them into different testbeds
 - example: experiments testing could be indipendent from other activities

LCG-1 Lessons (C&T-team items)

- ## packaging/installation is an issue
  - different formats from different sources given to us

- ## configuration is too complex
  - too many interdependencies between different services
  - many parameters hardcoded in the configuration files

- ## testing is a huge issue when technology is still under (heavy) developement
  - around 200 bugs(!) open in ~7 months from C&T-team alone
  - architecture, interoperability, ...

- ## we needed to form an internal team for fast bug fixing
  - not forseen, the process within the *mw* projects was too slow → costly .... (3 people)
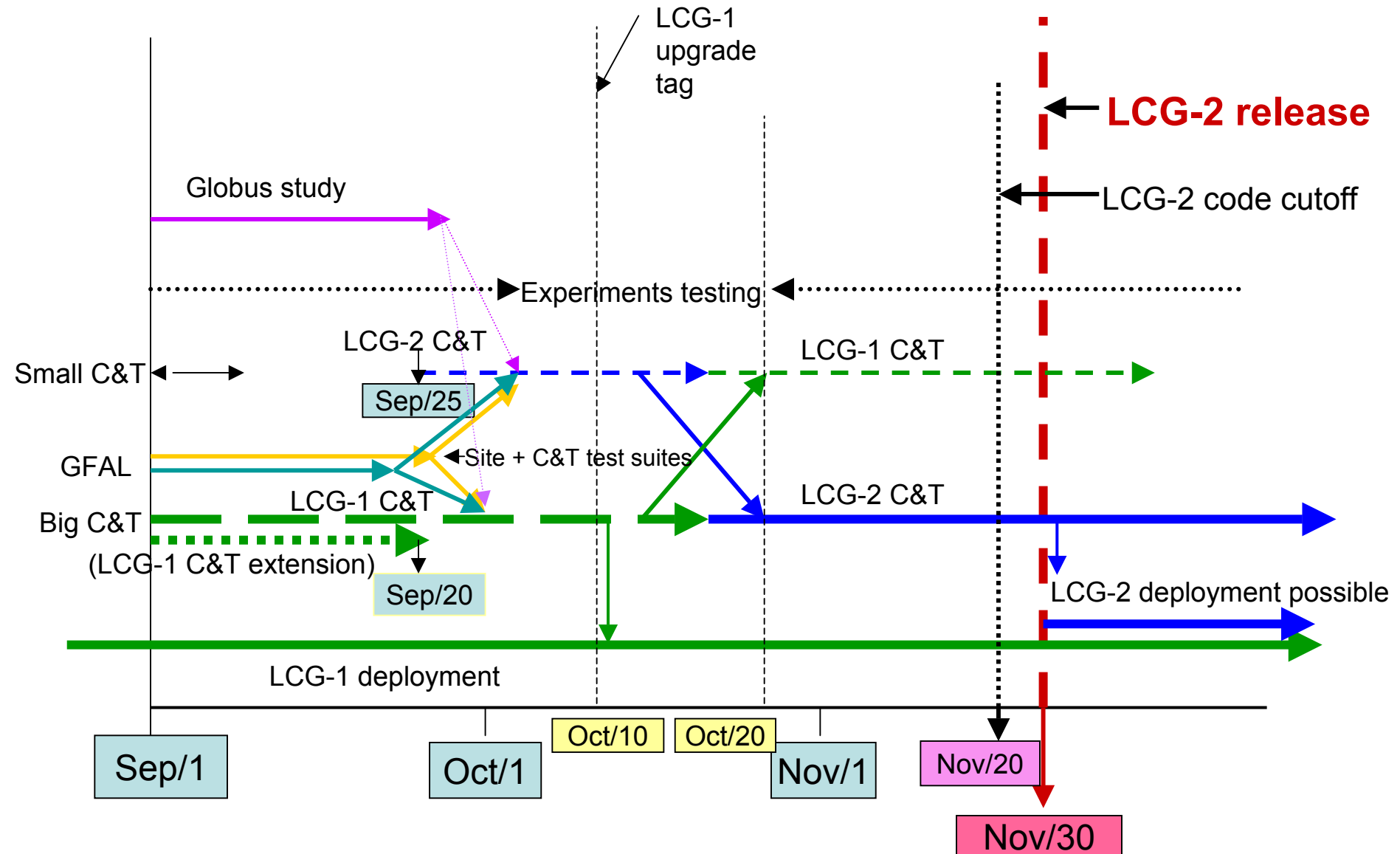
Summary

- **middleware delivery to LCG was late**
  - first reasonable set of middleware on the C&T test-bed end of July
  - short time to turn development software into production software
  - still a lot to do

- **certification process for middleware in place with a demonstrable value**
  - proven with LCG-1

- **open issues**
  - software is not at production level yet
  - performances
  - configuration complexity
  - site verification is not exhaustive

- **in progress**
  - operating procedures
  - scalability tests with complex jobs
  - simulating experiment production behaviour