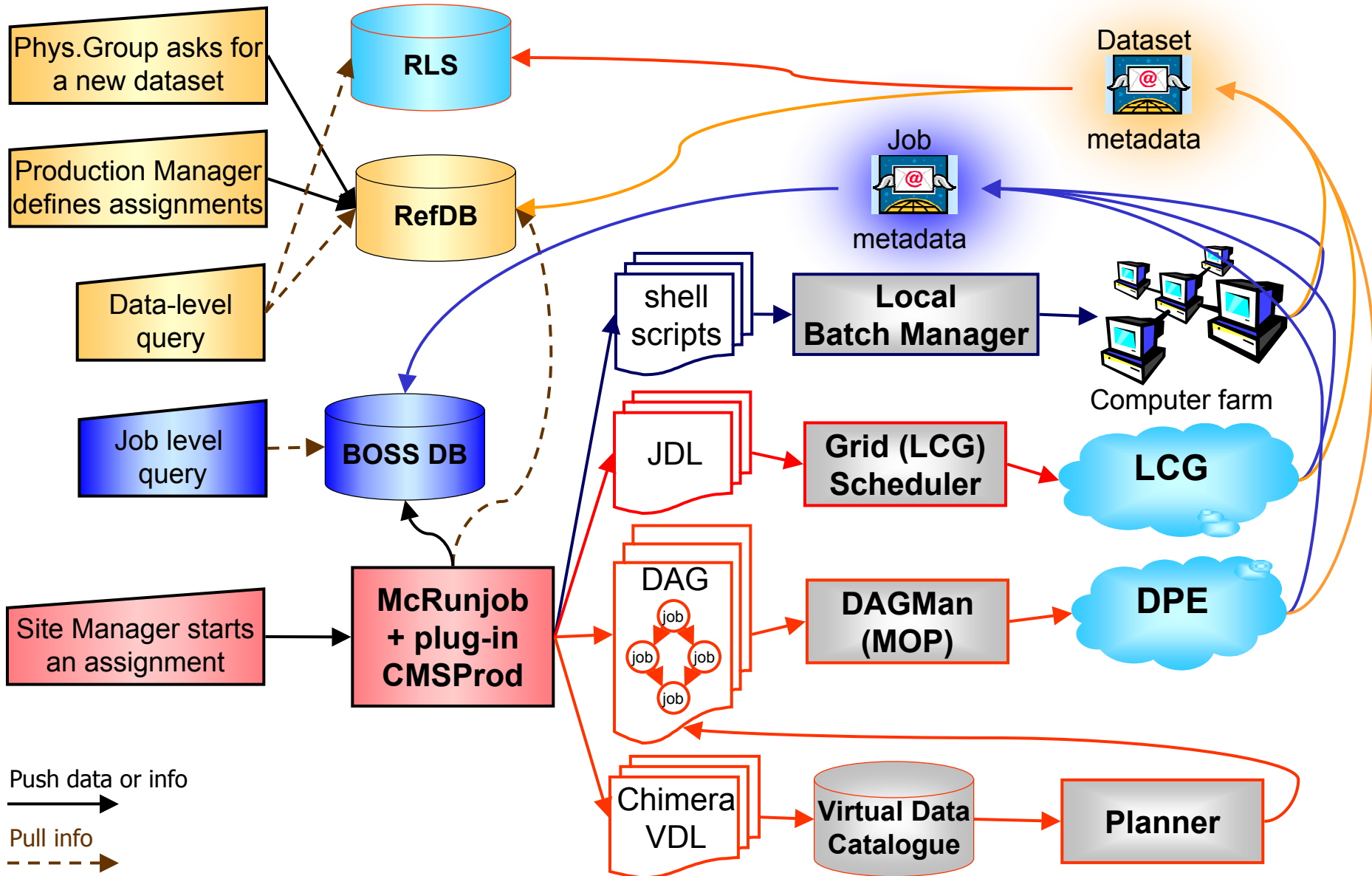# CMS Experience with LCG

Claudio Grandi

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Outline

OCTOPUS: CMS production system

USCMS grid production system

CMS/LCG-0 testbed

Tests on LCG-1

Summary

OCTOPUS Production System

US DPE production system

Running on Grid2003

- Based on VDT1.1.11

- to be compatible with lower level services of LCG-<n>

- EDG VOMS for authentication

- GLUE Schema for MDS Information Providers

- Dagman and Condor-G for specification and submission

- Condor-based match-making process selects resources

US DPE Production on Grid2003
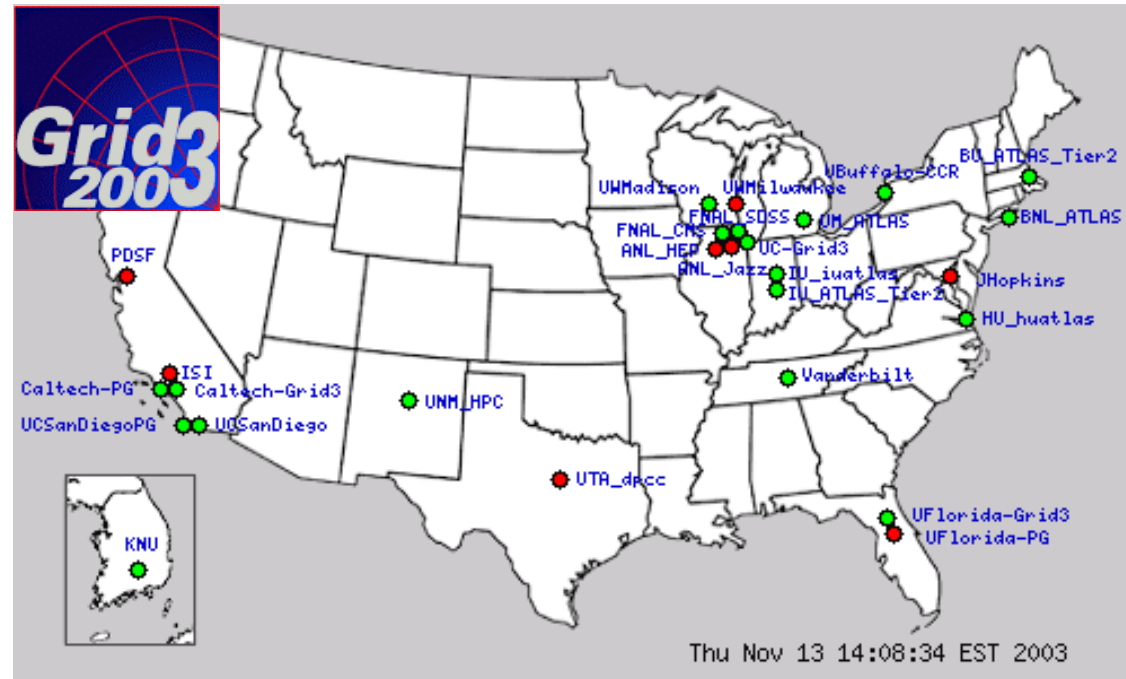
US MOP Regional Centre used dedicated US resources for

- 7.7 Mevts pythia: ~30000 jobs ~1.5min each, ~0.4 KSI2000 months
- 2.3 Mevts cmsim: ~9000 jobs ~10hours each, ~50 KSI2000 months

Commissioning Grid2003 resources for OSCAR Production

CMS/LCG-0 testbed

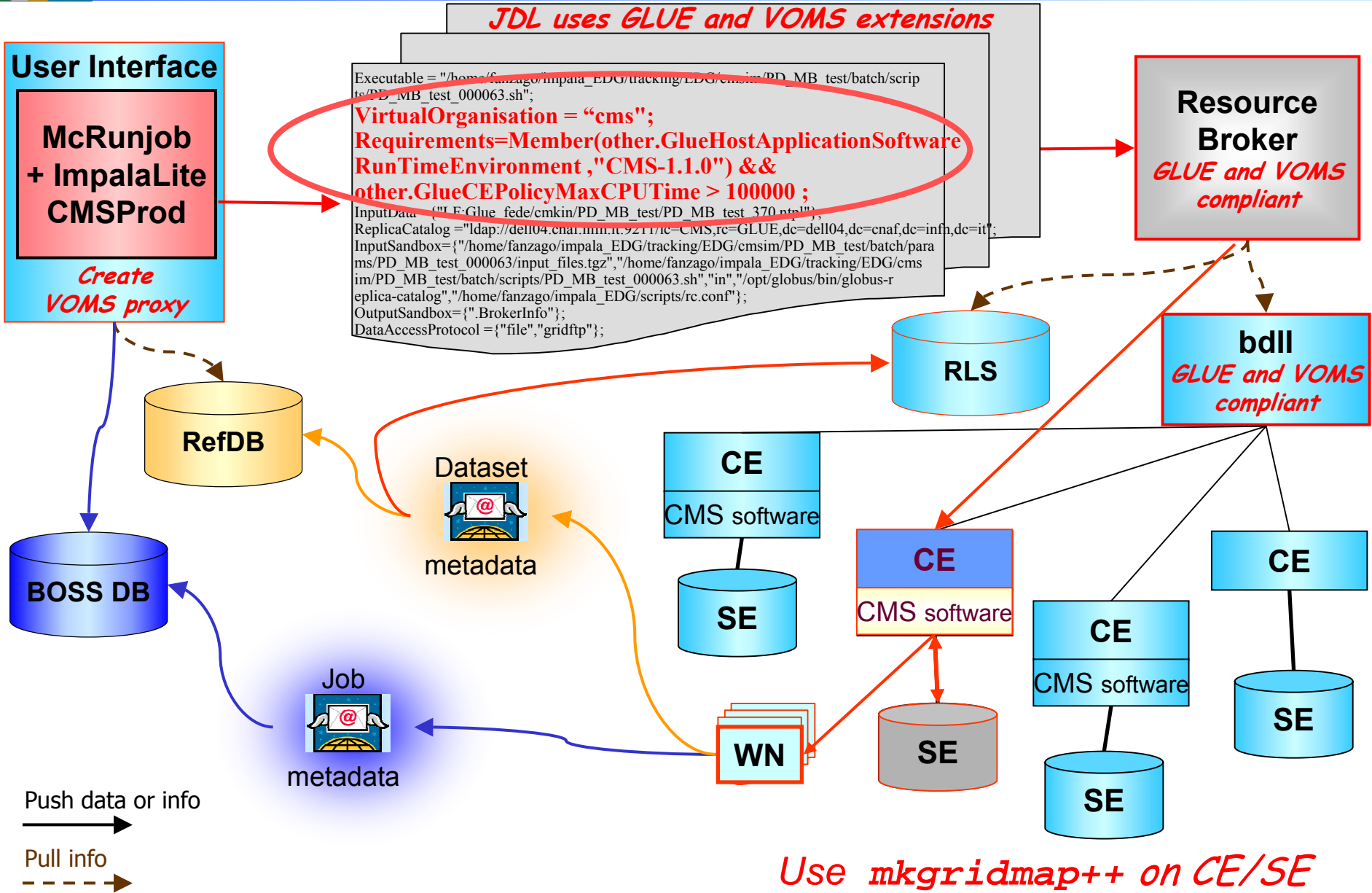CMS/LCG-0 is a CMS-wide testbed based on the LCG pilot distribution (LCG-0), <u>owned by CMS</u>

– joint CMS – DataTAG-WP4 – LCG-EIS effort

– started in june 2003

– Red Hat 7.3 (7.3.2 with CERN kernel recommended)

– Components from VDT 1.1.6 and EDG 1.4.X (LCG pilot)

– Components from DataTAG (GLUE schemas and info providers)

– Virtual Organization Management: VOMS

– RLS in place of the replica catalogue (uses `rlscms` by CERN/IT!)

– Monitoring: GridICE by DataTAG

– tests with R-GMA (as BOSS transport layer for specific tests)

– no MSS direct access (*bridge* to SRB at CERN)

About 170 CPU's, 4 TB disk

– Bari Bologna Bristol Brunel CERN CNAF Ecole Polytechnique Imperial College ISLAMABAD-NCP Legnaro Milano NCU-Taiwan Padova U.Iowa

Allowed to do CMS software integration while LCG-1 was not out

GLUE schema and VOMS

JDL uses GLUE and VOMS extensions

User Interface

McRunjob
+ ImpalaLite
CMSProd

Create VOMS proxy

```
Executable = "/home/fanzago/impala_EDG/tracking/EDG/cmsim/PD_MB_test/batch/scrip
ts/PD_MB_test_000063.sh";
VirtualOrganisation = "cms";
Requirements=Member(other.GlueHostApplicationSoftware
RunTimeEnvironment ,"CMS-1.1.0") &&
other.GlueCEPolicyMaxCPUTime > 100000 ;
InputData ={"LF:Glue_fede/cmkin/PD_MB_test/PD_MB_test_370.ntpl"};
ReplicaCatalog ="ldap://dell04.cnaf.infn.it:9211/lc=CMS,rc=GLUE,dc=dell04,dc=cnaf,dc=infn,dc=it";
InputSandbox={"/home/fanzago/impala_EDG/tracking/EDG/cmsim/PD_MB_test/batch/para
ms/PD_MB_test_000063/input_files.tgz","/home/fanzago/impala_EDG/tracking/EDG/cms
im/PD_MB_test/batch/scripts/PD_MB_test_000063.sh","in","/opt/globus/bin/globus-r
eplica-catalog","/home/fanzago/impala_EDG/scripts/rc.conf"};
OutputSandbox={".BrokerInfo"};
DataAccessProtocol ={"file","gridftp"};
```

Resource Broker
GLUE and VOMS compliant

bdII
GLUE and VOMS compliant

RLS

RefDB

Dataset
metadata

CE
CMS software
SE

CE
CMS software

CE
CMS software
SE

CE
SE

BOSS DB

Job
metadata

WN

SE

Push data or info

Pull info

Use `mkgridmap++` *on CE/SE*

RLS and POOL

RLS used in place of the Replica Catalogue

– using ad-hoc *endpoints*… thanks to IT for supporting them!

POOL based applications

– CMS framework (COBRA) uses POOL

– Tests of COBRA jobs started on CMS/LCG-0. Will move to LCG-1(2)

– Using SCRAM to re-create run-time environment on Worker Nodes

– Interaction with POOL catalogue. Two steps:

- COBRA uses XML catalogues
- OCTOPUS (job wrapper) handles XML catalogue and interacts with RLS
  ➔ *see examples*

– definition of metadata to be sotred in POOL catalogue in progress

Examples of COBRA – RLS interaction

```
# define catalog names
CentralRLS =    "edgcatalog_http://rlscms.cern.ch:7777/cms/…"
LocalXML   =    "file:COBRAFileCat.xml"


# get the files created by COBRA, store on SE and register to RLS
filelist = `FClistPFN -u $LocalXML`
for local_pfn in $filelist; do
    globus-url-copy -vb file://$local_pfn gsiftp://<Final SE PFN>
    FCrenamePFN -p $local_pfn -n <Final SE PFN> -u $LocalXML
done
FCpublish -d $CentralRLS -u $LocalXML


# get the list of logical files of a given dataset from RLS
FClistLFN -q "dataset like Validation_LCGB0" -u $CentralRLS
```

get LFN list from XML catalog

loop on LFN's

Upload files to SE

Update PFN in XML catalog

Eventually update the RLS catalog

```
##EVD0_Events.1b6318ac116d11d88f0c0002b35da8ea.10000010.Validation_LCGB0.sw_Hit7 50_g133##
##EVD0_Events.b7c82e9a116c11d898fd0002b3337c68.10000009.Validation_LCGB0.sw_Hit7 50_g133##
##EVD0_Events.e18860901547 11d892970002b33378c4.10000008.Validation_LCGB0.sw_Hit7 50_g133##
##EVD1_MCInfo.1b6318ac116d11d88f0c0002b35da8ea.10000010.Validation_LCGB0.sw_Hit7 50_g133##
##EVD1_MCInfo.b7c82e9a116c11d898fd0002b3337c68.10000009.Validation_LCGB0.sw_Hit7 50_g133##
##EVD1_MCInfo.e18860901547 11d892970002b33378c4.10000008.Validation_LCGB0.sw_Hit7 50_g133##
##EVD2_Hits.1b6318ac116d11d88f0c0002b35da8ea.10000010.Validation_LCGB0.sw_Hit750 _g133##
##EVD2_Hits.b7c82e9a116c11d898fd0002b3337c68.10000009.Validation_LCGB0.sw_Hit750 _g133##
##EVD2_Hits.e18860901547 11d892970002b33378c4.10000008.Validation_LCGB0.sw_Hit750 _g133##
```

GridICE Monitoring

R-GMA and BOSS

BOSS allows job monitoring and real-time book-keeping

R-GMA used as BOSS transport layer provides:

- fault tollerance for network or server crashes
- full functionality on WN without outbound connectivity
- AAA

Still under test

Use of R-GMA in BOSS

CMS/LCG-0 performance
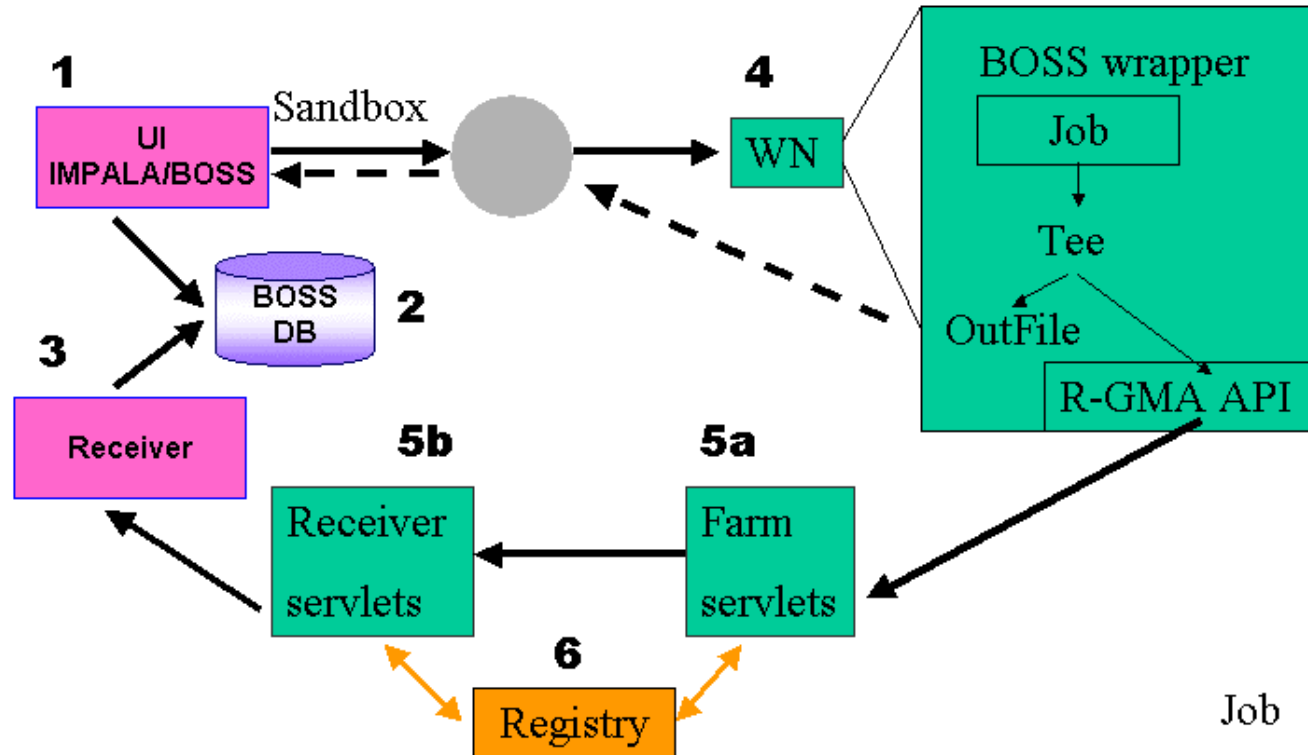
CMS-LCG Regional Center is based on CMS/LCG-0

- 500 Kevts (heavy) CMKIN and 1500 Kevts CMSIM
- ~42 KSI2000 months, ~3 TB data

Inefficiency estimation:

- 5% to 10% due to sites' misconfiguration and local failures
- 0% to 20% due to RLS unavailability (time dependent)
- few errors in execution of job wrapper
- *Overall inefficiency: 5% to 30% (time dependent)*

Migration to LCG-2 of a subset of the testbed as soon as new release is available

Tests on LCG-1

Porting of CMS production software to LCG-1

- on Italian (Grid.it) testbed and on LCG Certification & Testing testbed
- improved interface to user simplifies job preparation

Testing on official LCG-1 testbed

- CMS software deployed everywhere on oct 28th 2003
- CMKIN (few min's) & CMSIM (7 hours) submitted in bunches of ~50 jobs
- Failure rate is 10-20% for short jobs and ~50% for long jobs
  - Mainly due to sites not correctly configured
  - excluded in the JDL (until ClassAd size exceeded maximum limit!)
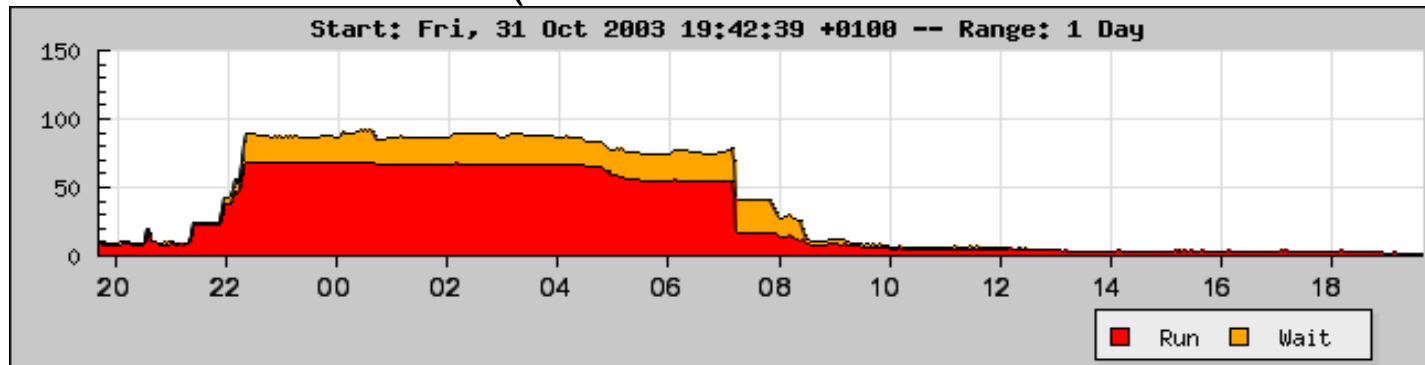
Will move all activities on LCG-1(2) official system as soon as CMS software to be deployed grid-wide will be more stable

- Stress test before the end of the year
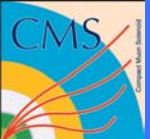
CMS jobs on LCG-1 at IST 2003

Genius portal installed on a CMS User Interface

CMS production jobs submitted to the LCG-1 testbed

Summary

Good experience with CMS/LCG-0

– LCG-1 components used in CMS/LCG-0 are working well

– Close to production-quality

First tests with LCG-1 promising

– main reason of failure are mis-configured sites

POOL/RLS tests under-way

– CMS reconstruction framework (COBRA) is "naturally" interfaced to LCG grid catalogs

Large scale tests still to be done on LCG-1(2)

– LCG-2 preferred because it will likely have VOMS, SRM, GFAL