CDF way to Grid
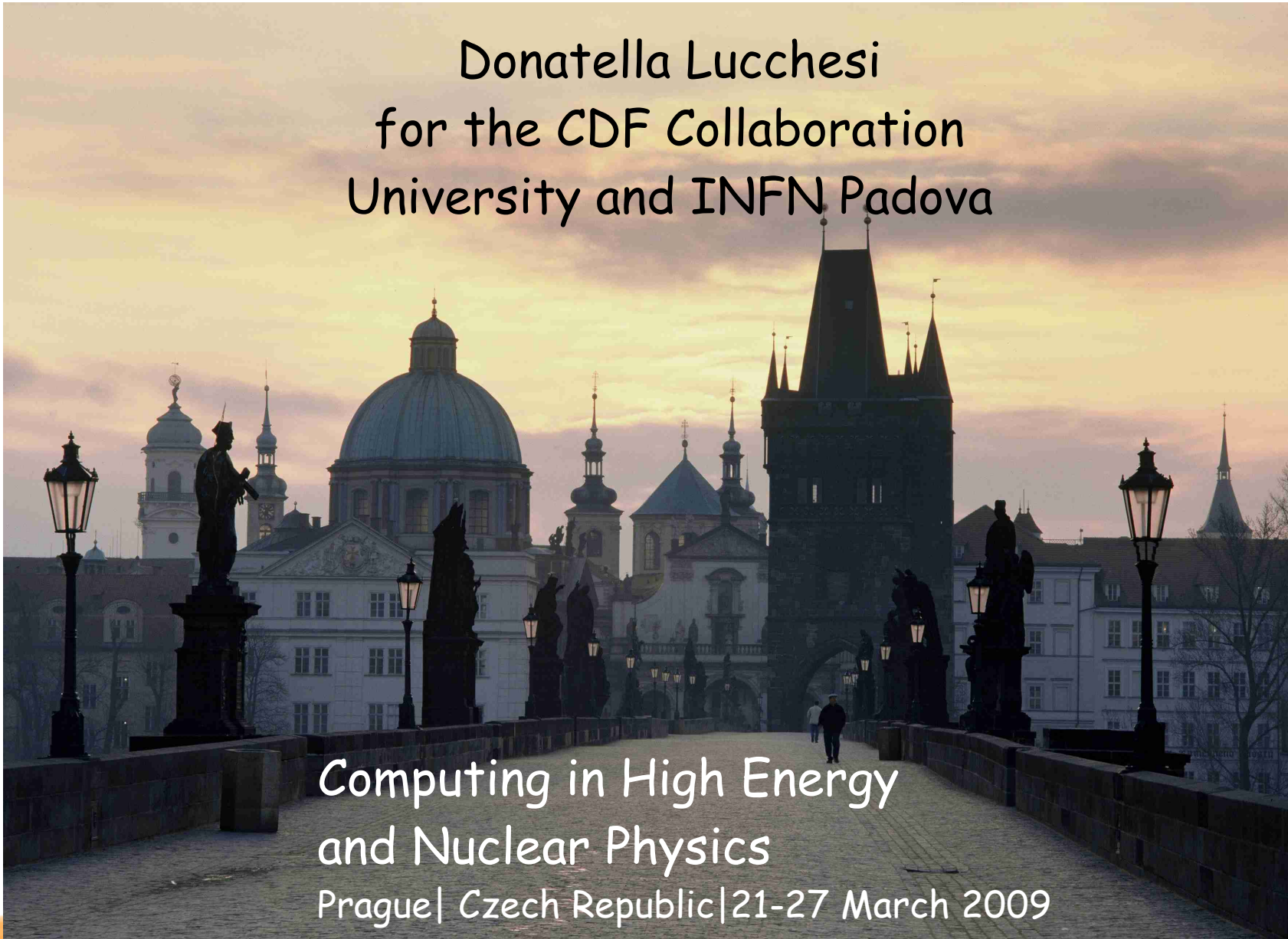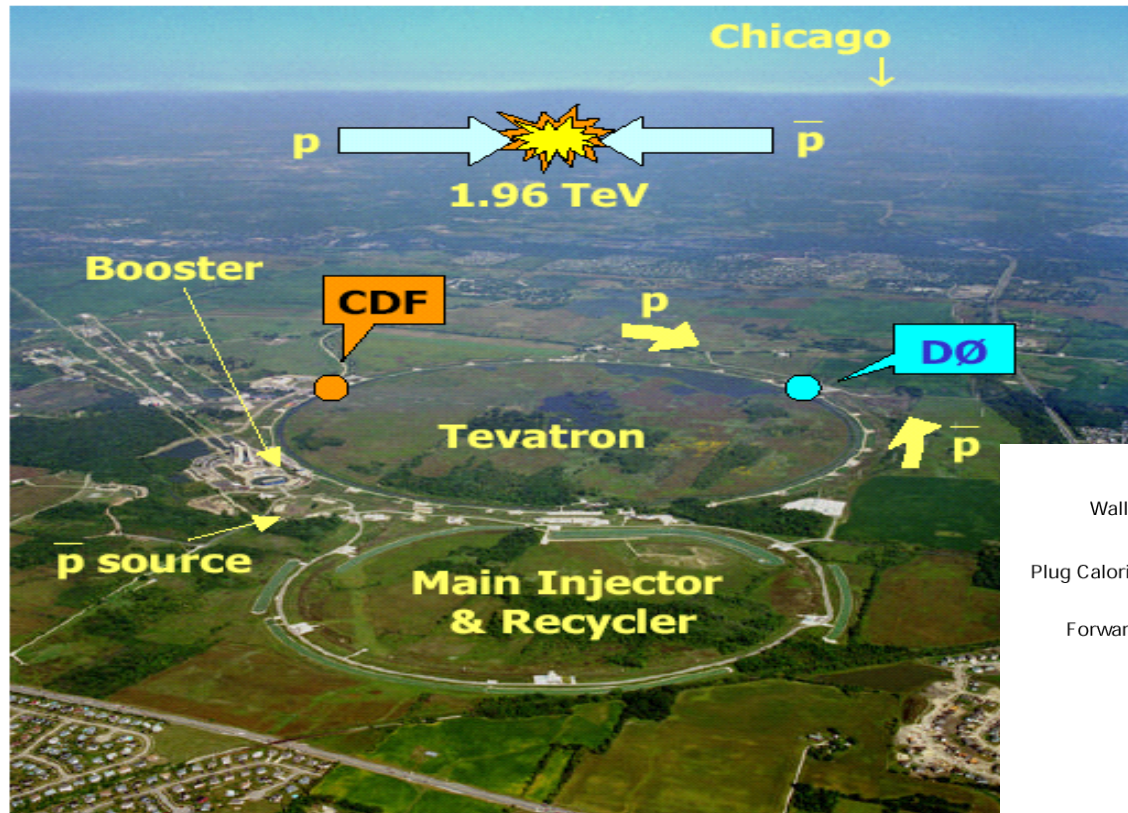
Donatella Lucchesi
for the CDF Collaboration
University and INFN Padova
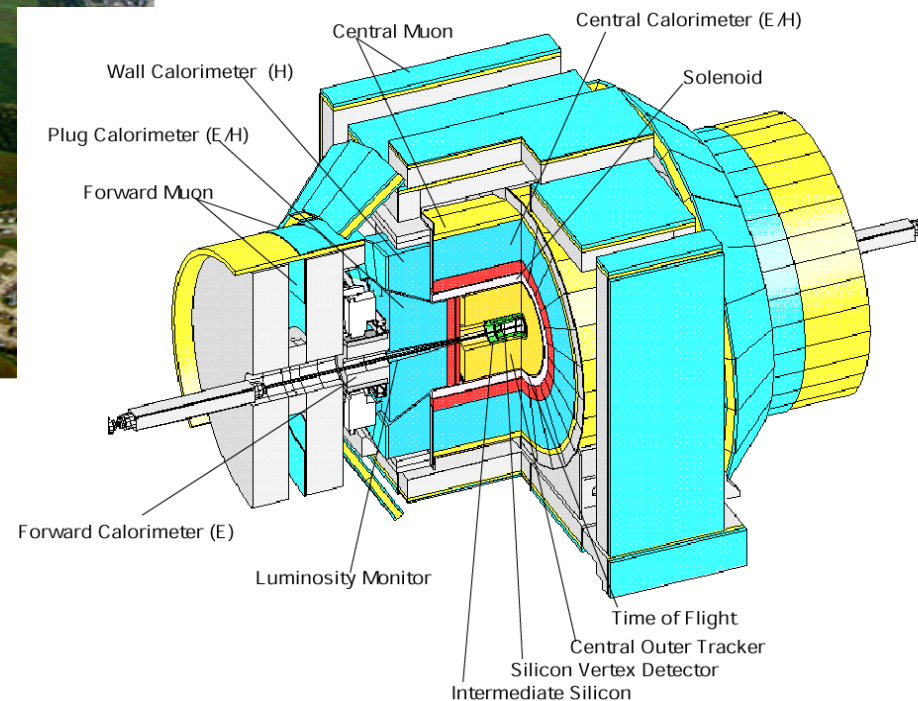
Computing in High Energy
and Nuclear Physics
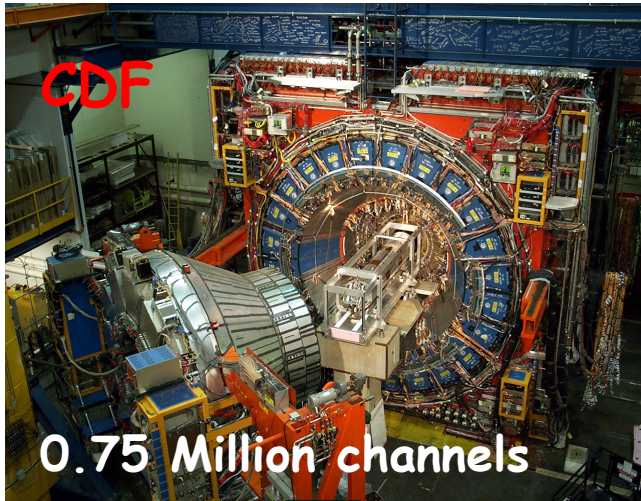Prague| Czech Republic|21-27 March 2009

The CDFII experiment

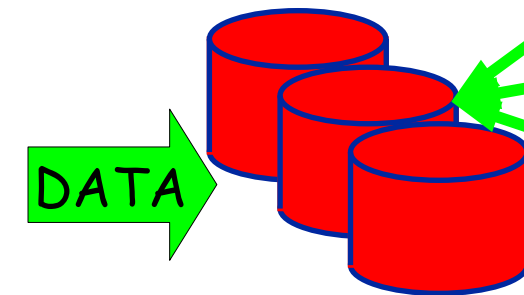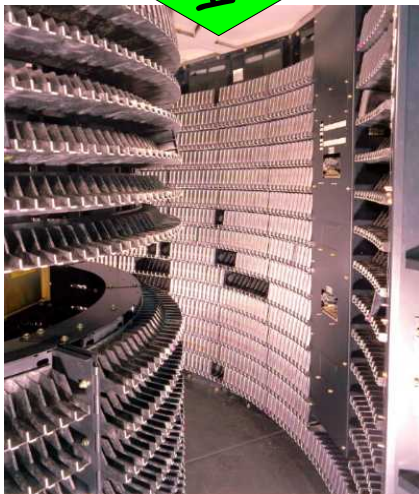CDFII (Collider Detector at Fermilab) takes data since 2001 using a multipurpose detector.

Data taking until 2010, under discussion further extension to 2011
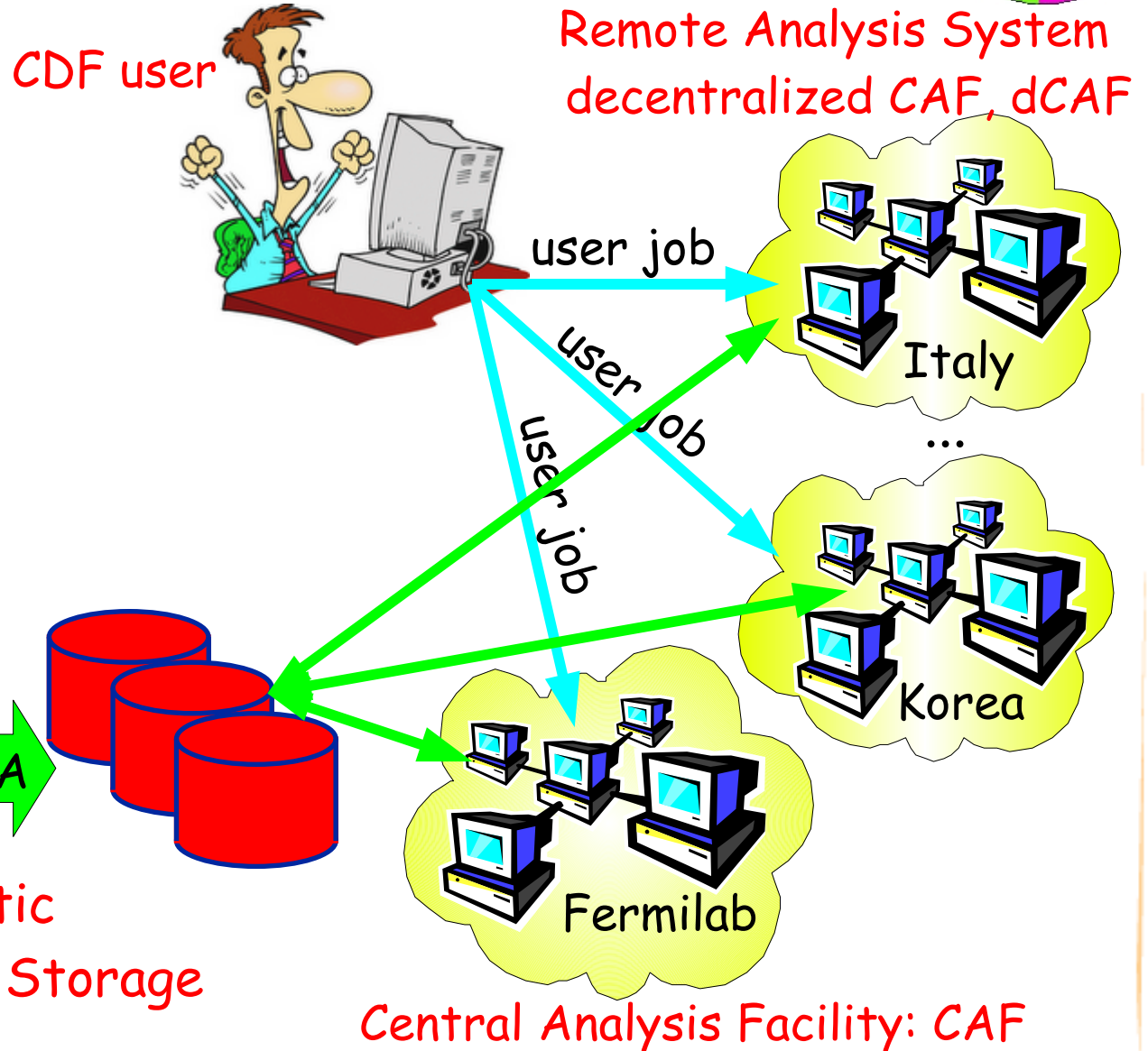
CDFII Computing Model

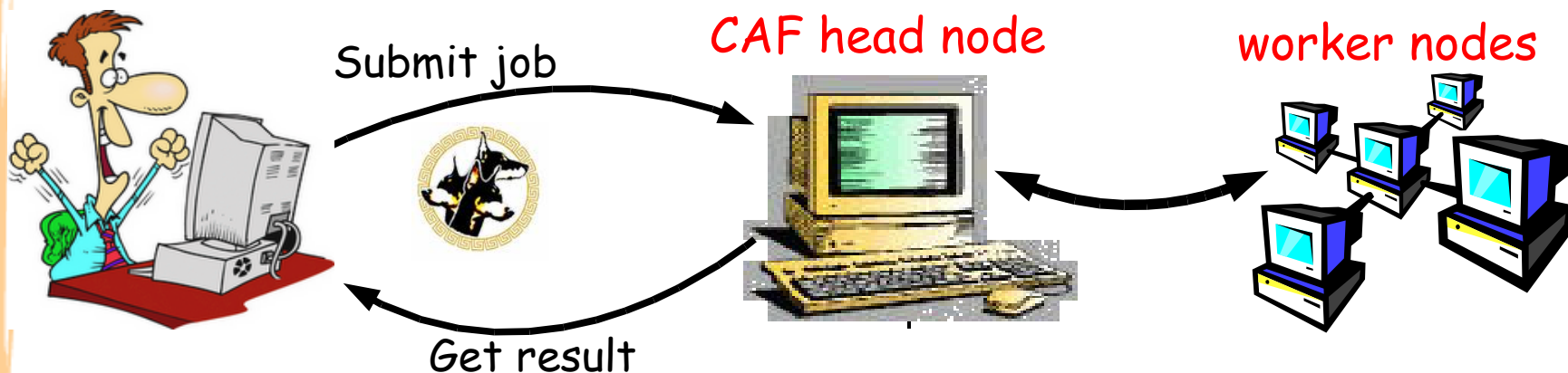

CDF

0.75 Million channels

DATA

CDF user

Remote Analysis System
decentralized CAF, dCAF

user job

user job

user job

Italy

...

Korea

DATA

Robotic
Tape Storage

Fermilab

Central Analysis Facility: CAF

The CAF

➢ Initially an head node plus a dedicated farm
➢ Intermediate layer between users and batch system
➢ User develops his/her job locally then submit it using CDF software and ... just wait for output!
➢ No need to stay connected
➢ Monitors: web interface and pseudo-interactive
➢ Notification and summary of the end of jobs via email

Submit job

CAF head node

worker nodes

Get result

CAF Implementation

First implementation used FBSNG, then adopted Condor

CAF Head Node

Worker Node

CAF Client

| Submitter Daemon |
| Monitor Daemons |
| Mailer Daemons |

| Collector |
| Negotiator |
| Schedd(s) |
| Shadows |

| Stard |
| Starter |
| Job wrapper |
| User's Job |

Condor

Condor

Red boxes — CAF code

Green boxes — Condor daemons

Prague CHEP 2009

CAF Job Monitors

Interactive Monitor

➢ Uses Condor's Computing on Demand (COD) system

➢ Most used commands:

CafMon jobs   CafMon kill

CafMon dir   CafMon tail

CafMon ps   CafMon top

```
/cdf/home/lucches>CafMon dir 4672 4

Analysis Farm: lcgcaf     Host: pcdf11.pd.infn.it

WARNING: Python C API version mismatch for module krb5:
  This Python has API version 1010, module krb5 has version 1007.
total 12
-rw-------   1 cdf009 cdf    0 Nov 28 23:22 job_4.err
-rw-------   1 cdf009 cdf  144 Nov 28 23:22 job_4.out
-rw-r--r--   1 cdf009 cdf    5 Oct  5  2006 quit.tcl
-rwxr-xr-x   1 cdf009 cdf  138 Sep  6 14:38 run.sh
```

WEB based Monitor

Monitor extracts job status information from log files and present to the user

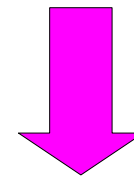# CDF Transition to Grid

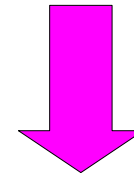## 2001-2003

Several dedicated farms supported by CDF people

Use Grid resources

Use five access points:

NAMCAF ⎫ American
CDFGRID ⎬ resources

LcgCAF ⎫ European
CNAFCAF ⎬ resources

PacCAF Asian Grid

Present

Grid Transition Strategy

Requirement:

■ Minimize the impact on CDF users so they can focus on science

Strategy:

➢ Adopt the CAF model: client, ie user tools like monitors
➢ Continue to use Kerberos V authentication for the users
  • X509 Authentication used across Grid components
➢ Data analysis happen @Fermilab and partially @CNAF
➢ Monte Carlo data production occur in any sites

Implementation:

✔ Modify the CAF head node to became a portal to interface to OSG and gLite middleware
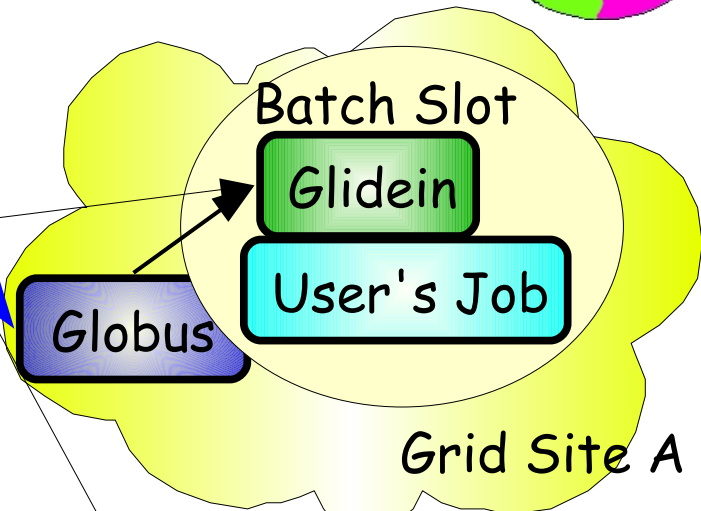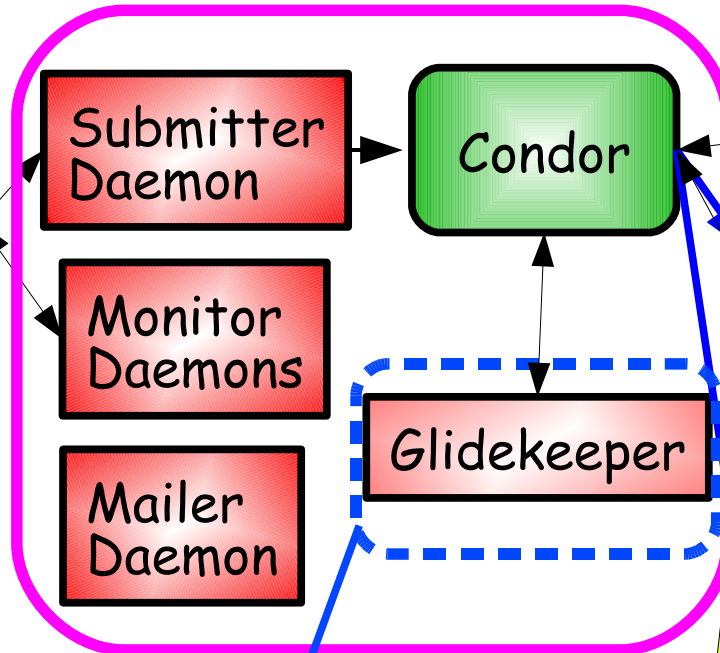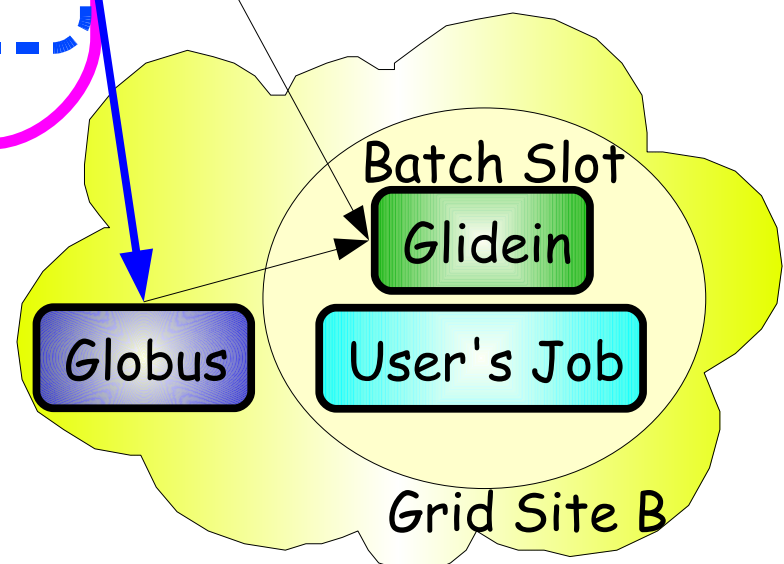 Two new CAFs: GlideCAF for OSG and LcgCAF for LCG

The GlideCAF: overview

GlideCAF more in details

CAF Portal

CAF Client

user job

Submitter Daemon

Collector Negotiator

Monitor Mailer Daemons

Schedd

Glidekeeper

Glide-in Schedd

Globus

Grid Site A

Batch queue

Globus

Grid Site B

Batch queue

Red boxes — CAF code
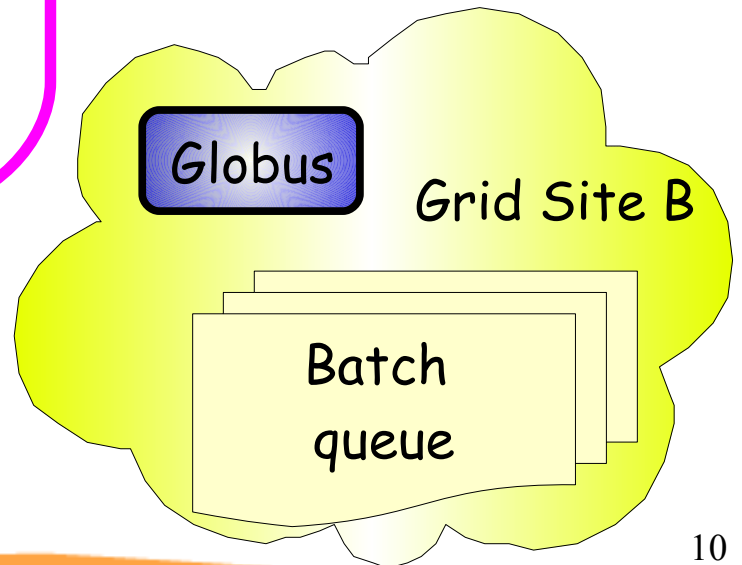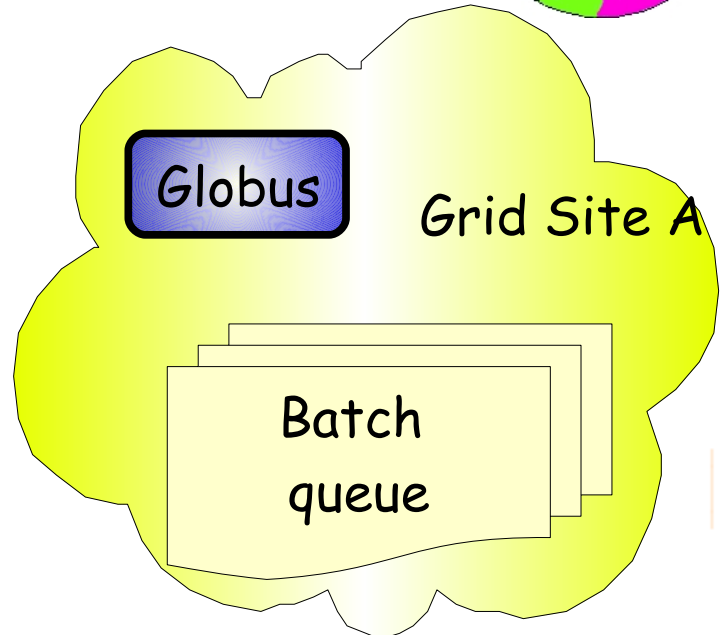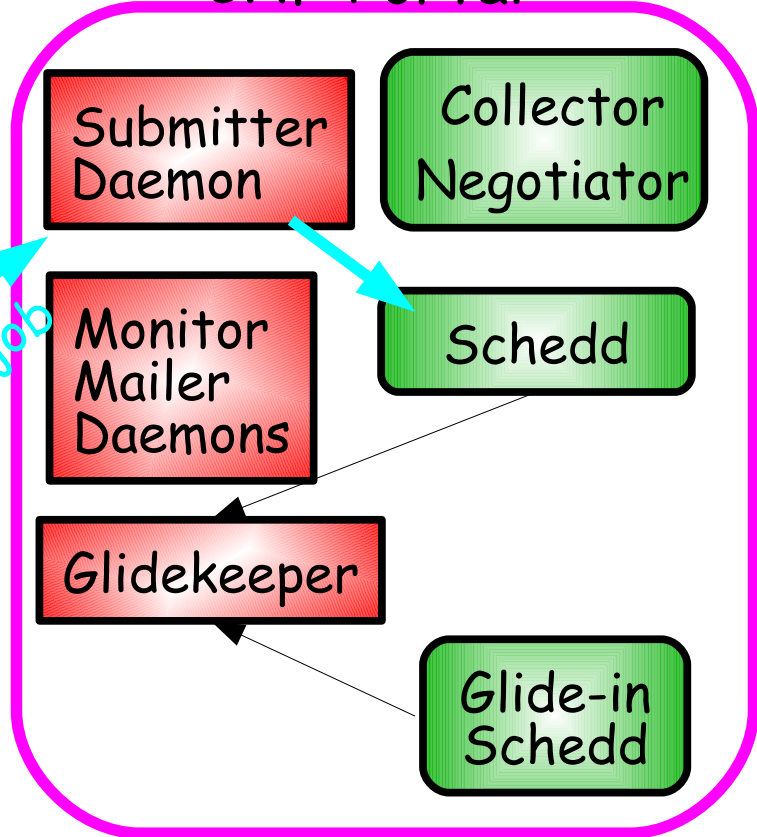
Green boxes — Condor daemons

GlideCAF more in details

CAF Portal

CAF Client

Submitter Daemon

Collector Negotiator

Monitor Mailer Daemons

Schedd

Glidekeeper

Glideins

Glide-in Schedd

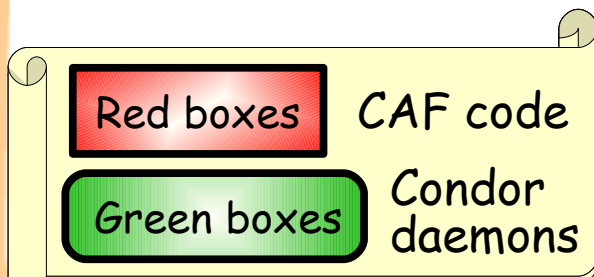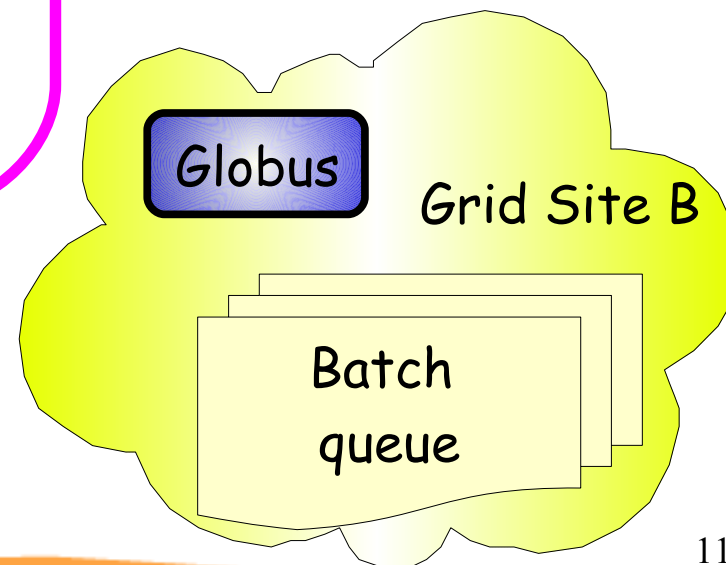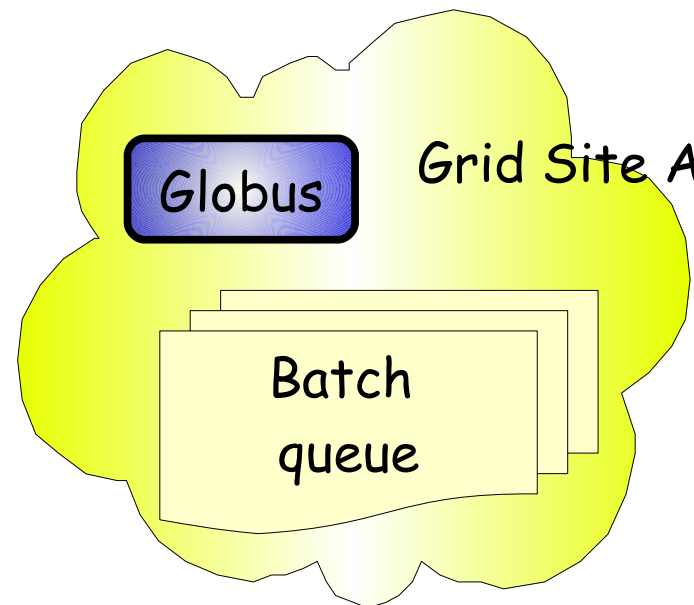Grid Site A

Globus

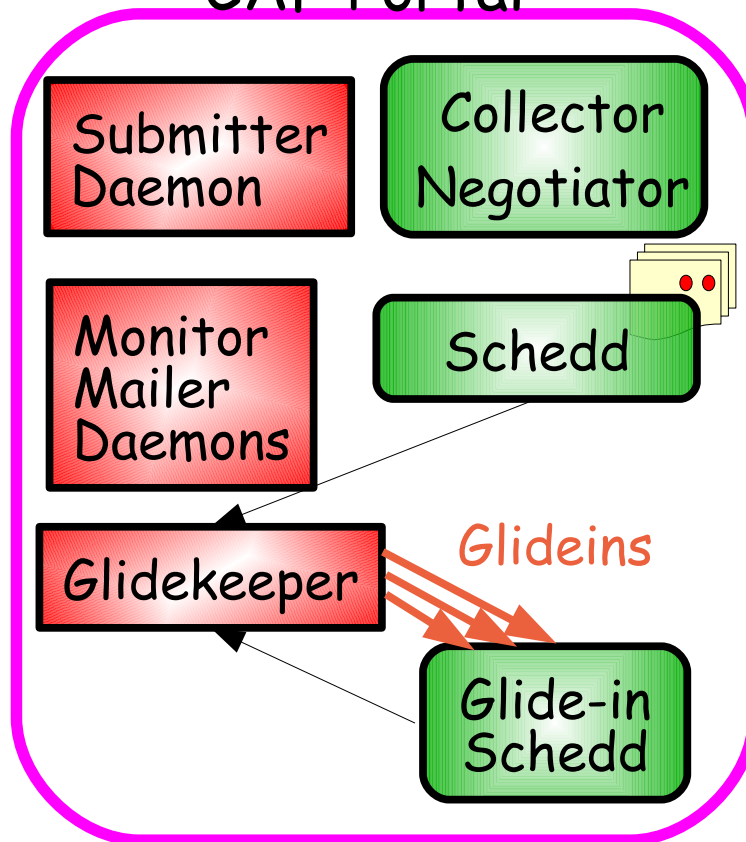Batch queue

Grid Site B

Globus

Batch queue

Red boxes — CAF code

Green boxes — Condor daemons

GlideCAF more in details

CAF Portal

CAF Client

Submitter Daemon

Collector Negotiator

Monitor Mailer Daemons

Schedd

Glidekeeper

Glide-in Schedd

Globus — Grid Site A

Batch queue

Glideins

Globus — Grid Site B

Batch queue

Red boxes — CAF code
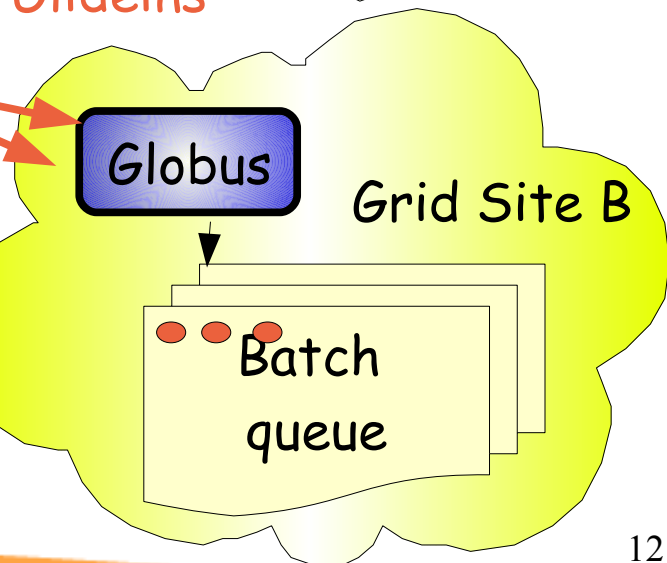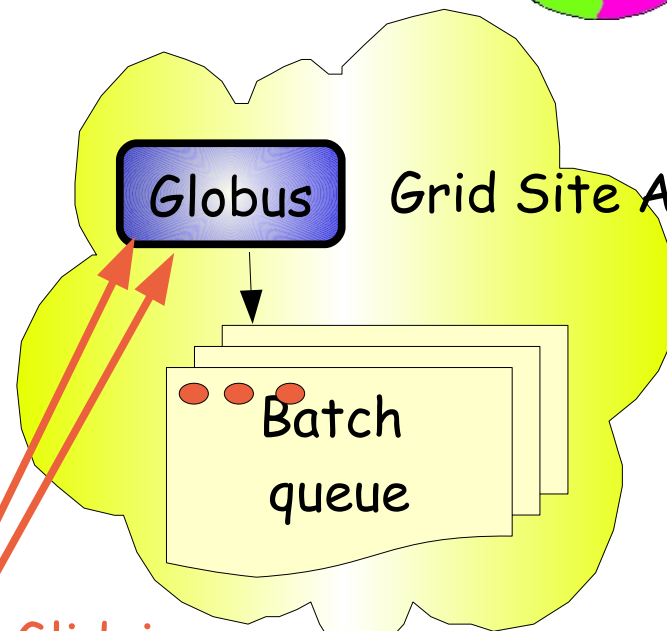
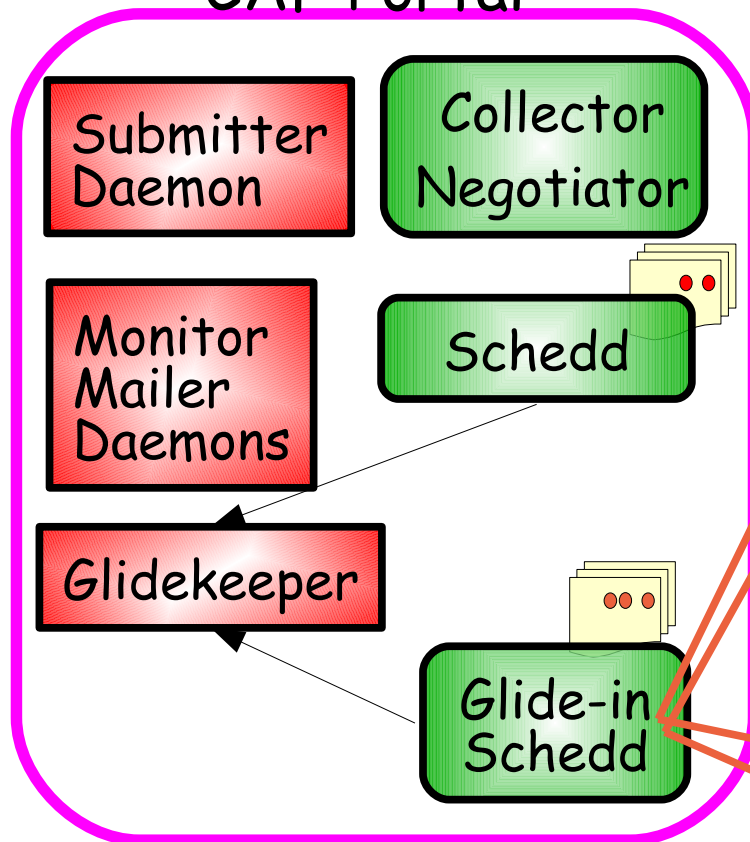Green boxes — Condor daemons

GlideCAF more in details

CAF Portal

CAF Client

- Submitter Daemon
- Collector Negotiator
- Monitor Mailer Daemons
- Schedd
- Glidekeeper
- Glide-in Schedd

Grid Site A

Globus

Batch Slot

Glidein

Grid Site B
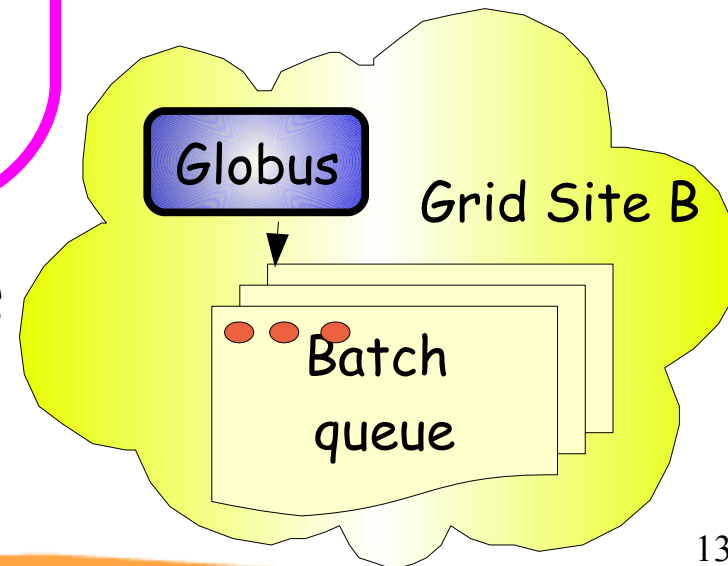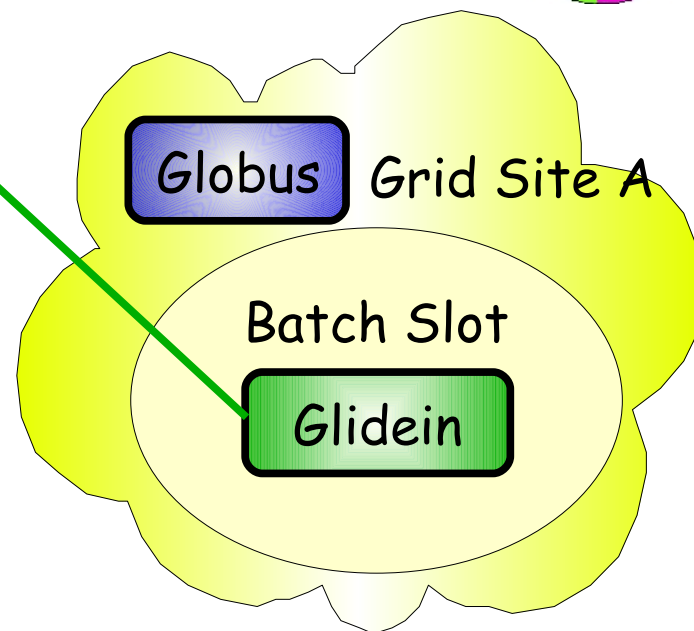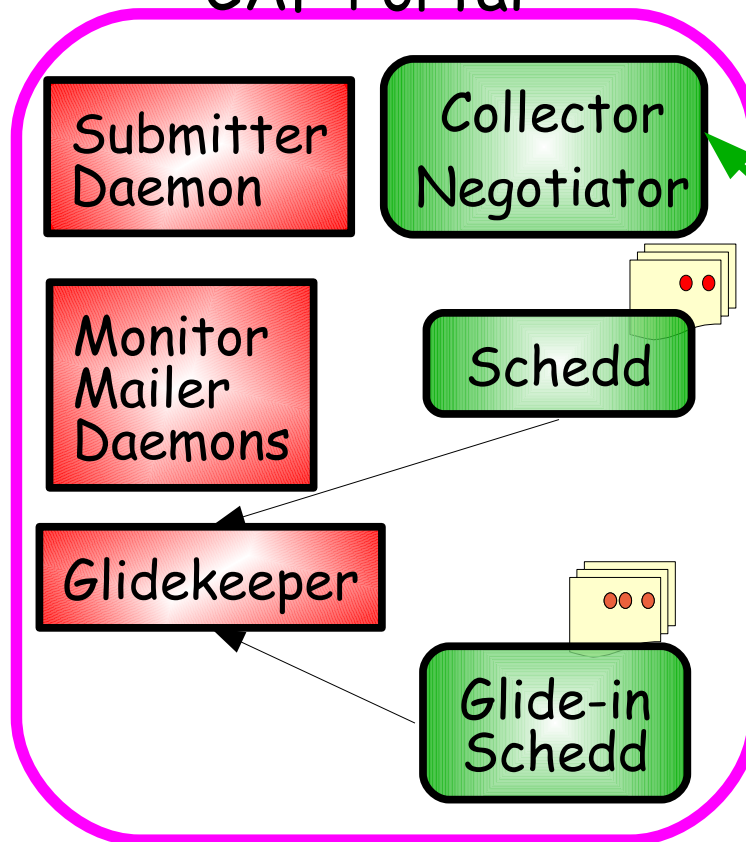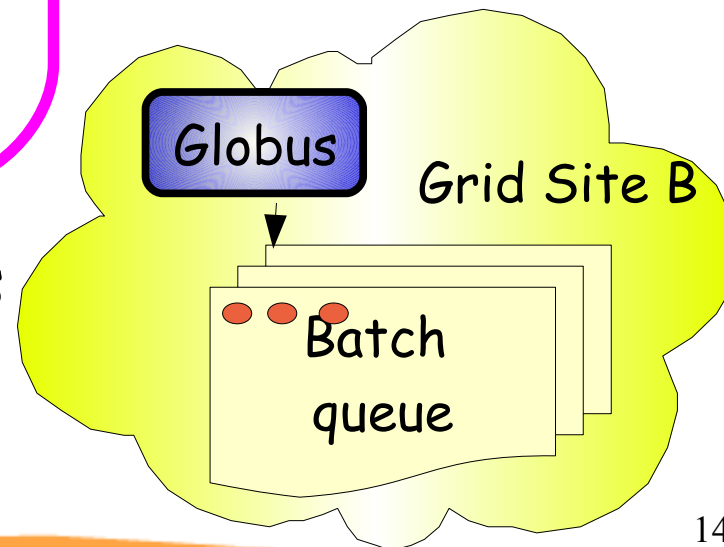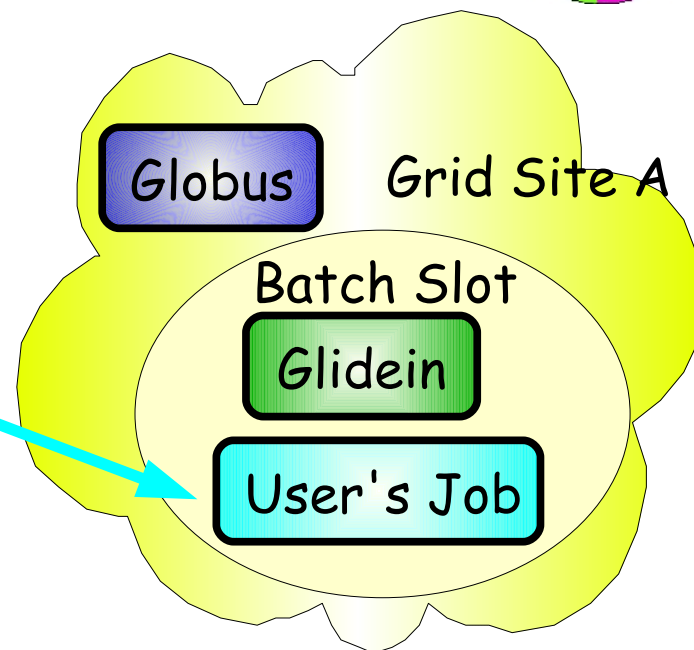
Globus

Batch queue

New resource joins CDF Grid pool!

Red boxes — CAF code

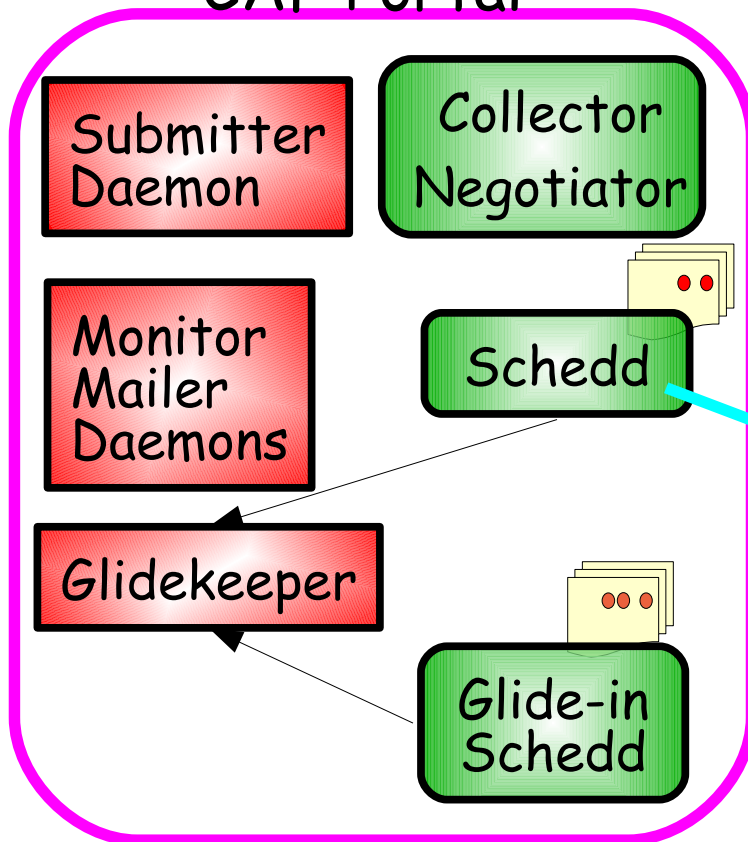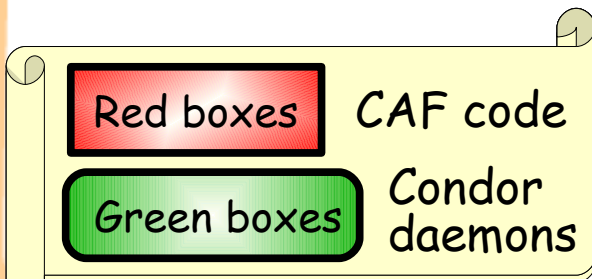Green boxes — Condor daemons

GlideCAF more in details

CAF Portal

- Submitter Daemon
- Collector Negotiator
- CAF Client
- Monitor Mailer Daemons
- Schedd
- Glidekeeper
- Glide-in Schedd

Grid Site A
- Globus
- Batch Slot
  - Glidein
  - User's Job

Grid Site B
- Globus
- Batch queue

Red boxes — CAF code
Green boxes — Condor daemons
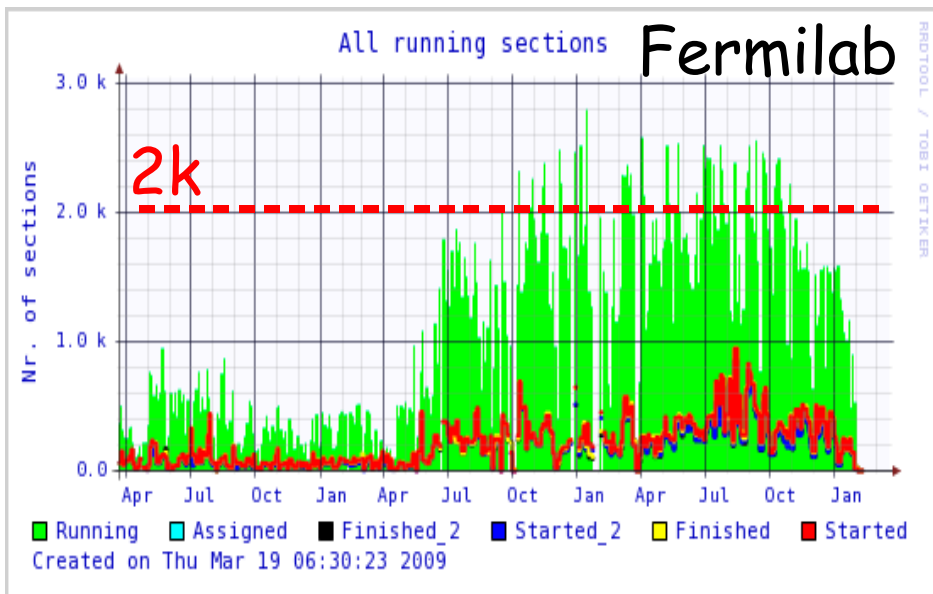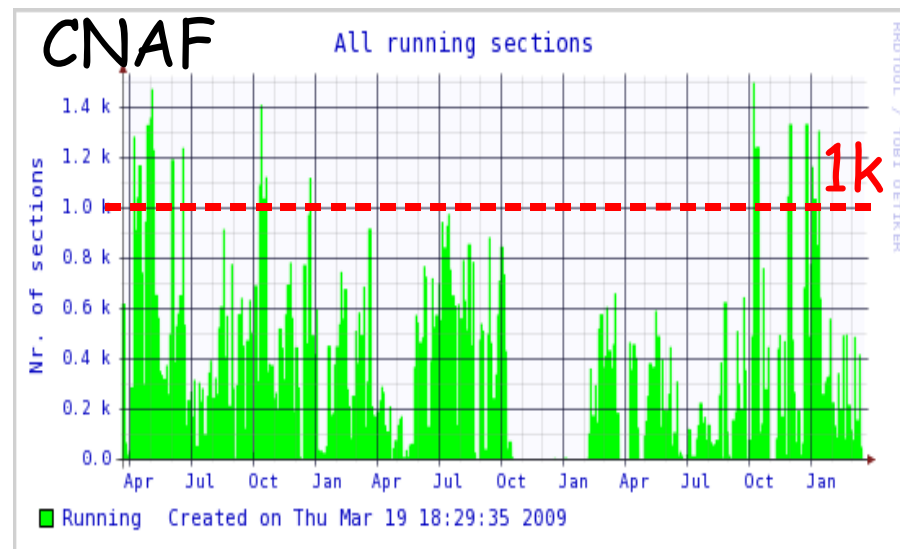
Same monitor tools available to users
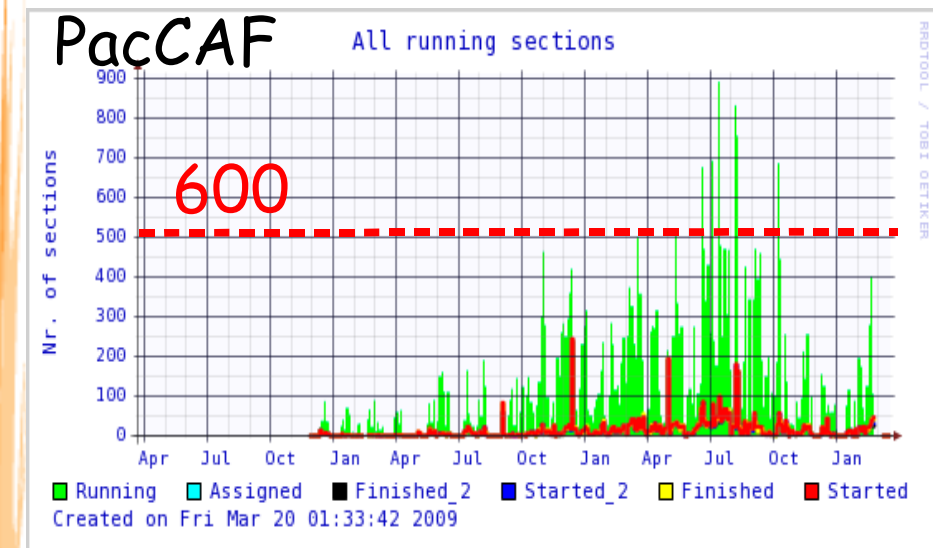
GlideCAF Performances – last 3 years

GlideCAF at Fermilab

Europe GlideCAF - CNAFCAF

Asian GlideCAF - PacCAF

GlideCAF and OSG

CDF 23%

USATLAS 20%

D0 21%

CMS 36%
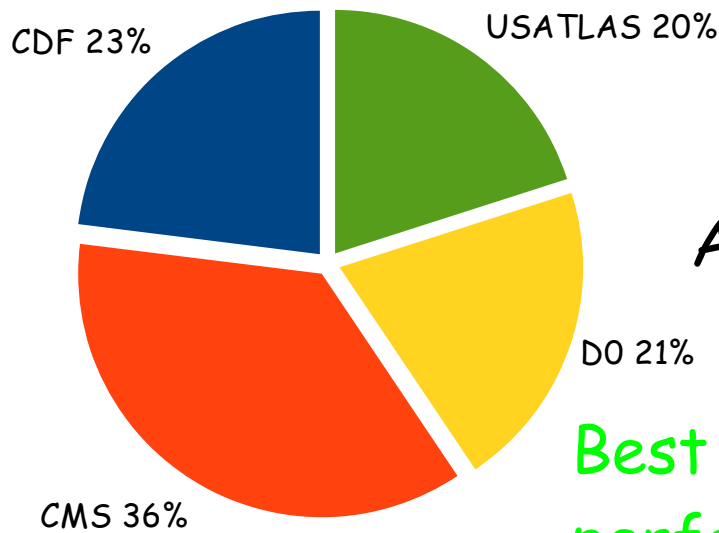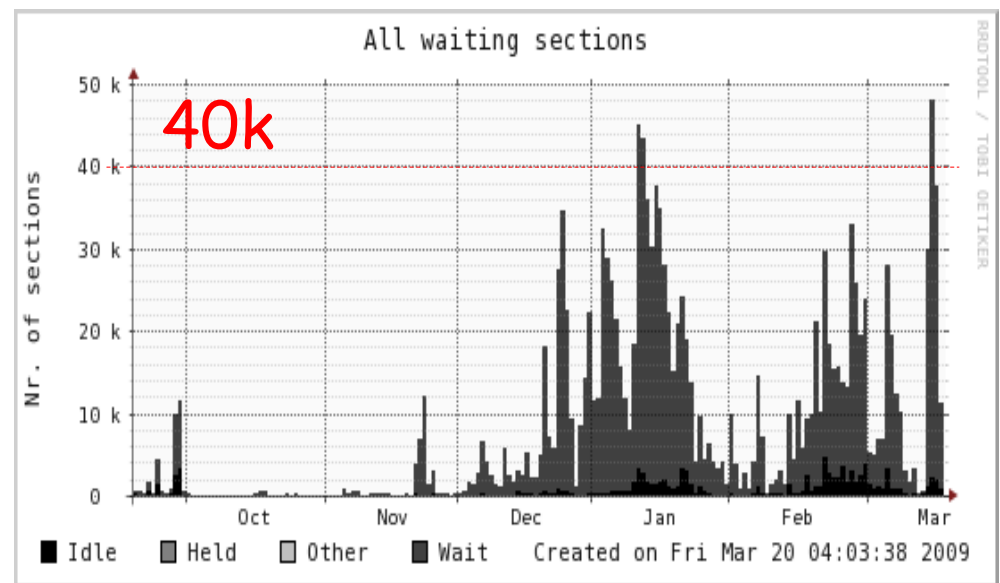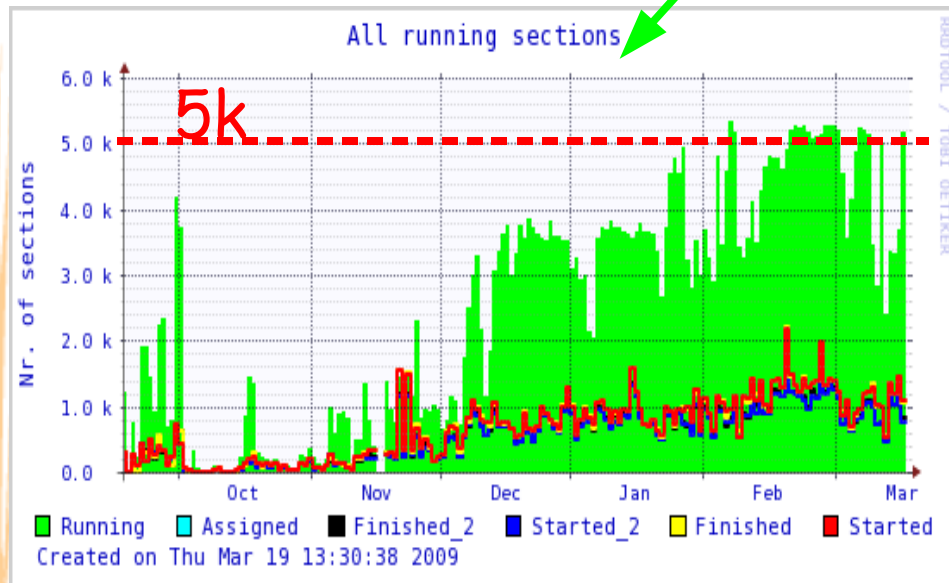
CPU time in OSG
by selected VO's
April 2008 – March 2009

Hit scalability issues not able
to submit jobs faster!
Need a new tool...

Best
performances

All running sections

5k

All waiting sections

40k
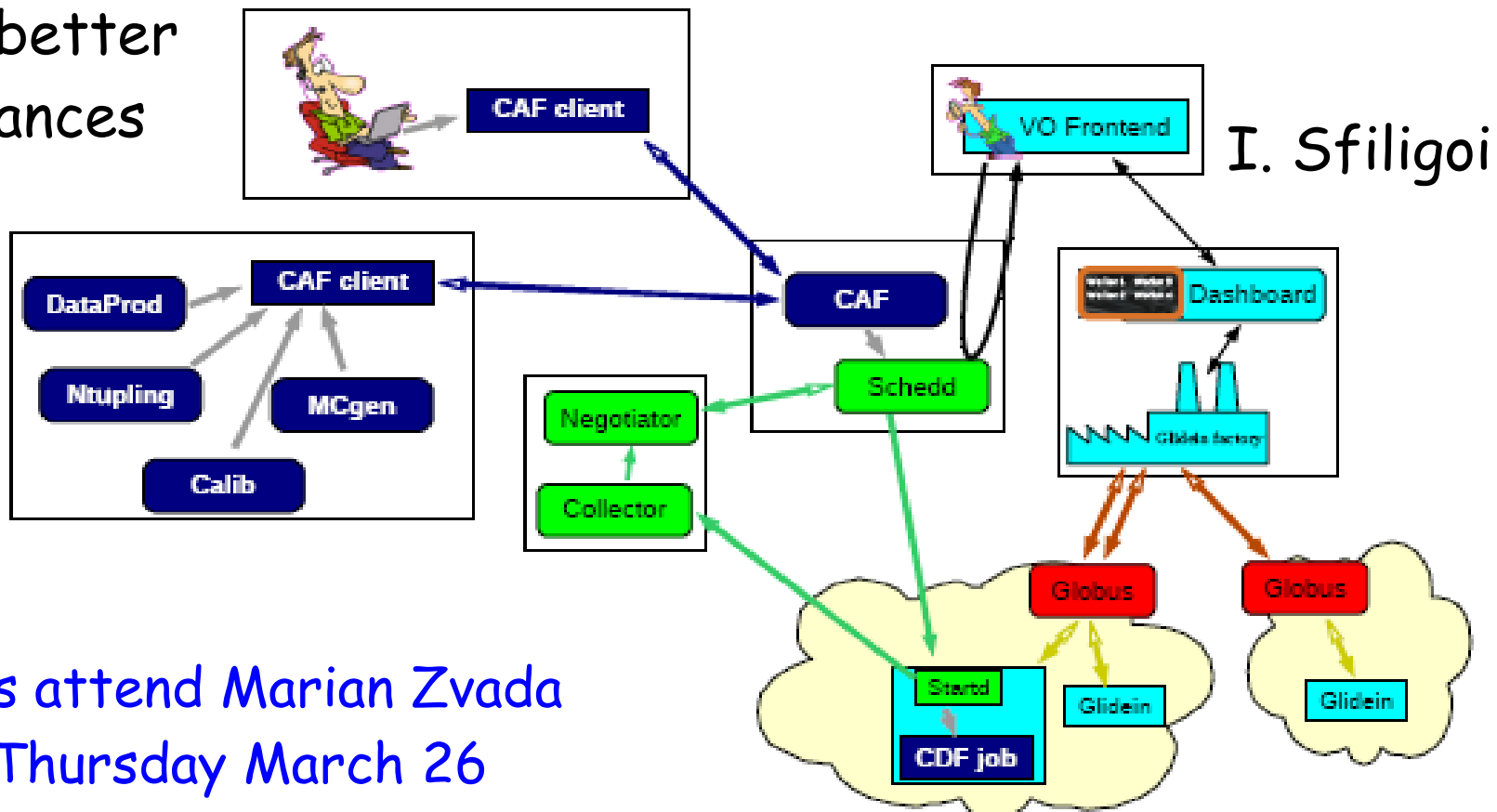
Brand New GlideinWMS

- ➢ GlideinWMS used by CMS already
- ➢ The glidekeeper has been replaced by GlideinWMS
- ➢ Scalable up to 15k concurrently jobs
- ➢ Overall better performances

I. Sfiligoi

For details attend Marian Zvada
talk 407 Thursday March 26
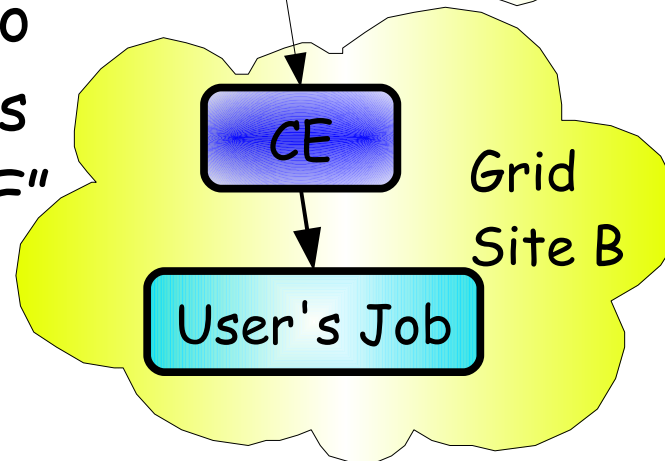Session Grid Middleware and Networking Technologies

LcgCAF in a nutshell

CAF Portal

CNAF Tier 1

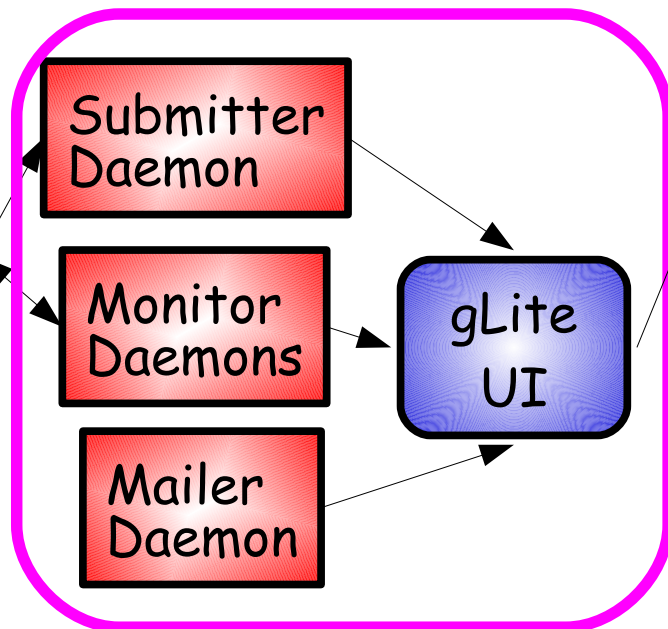Submitter Daemon

Monitor Daemons

Mailer Daemon

CAF Client

gLite UI

gLite WMS

CE

Grid Site A

User's Job

CE

Grid Site B

User's Job
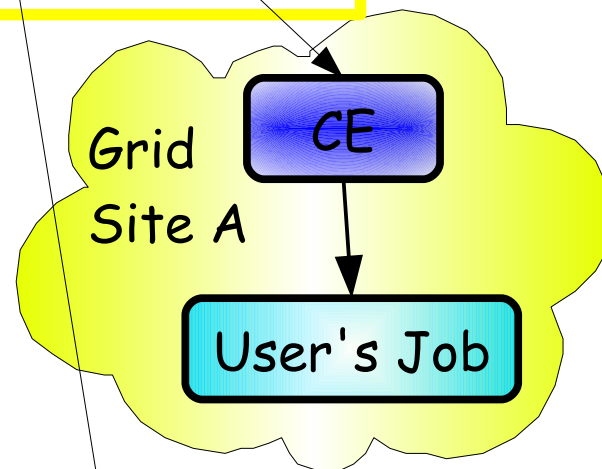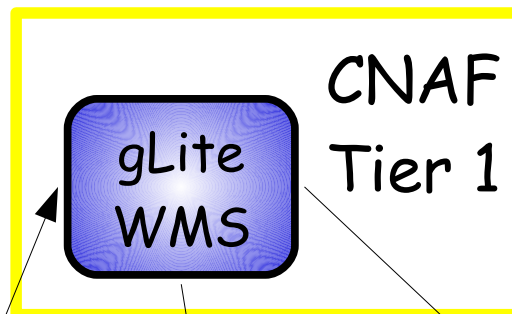
CAF code adapted to gLite so that it looks as "an other CAF"

Red boxes — CAF code

Blue boxes — gLite middleware

LcgCAF: job submission and execution

CAF Portal

CNAF Tier 1

CAF Client

Submitter Daemon

user job

Job Manager

gLite UI

Monitor Mailer Daemons

gLite WMS

Grid Site A

CE

CE

Grid Site B

Red boxes — CAF code

Blue boxes — gLite middleware

LcgCAF: job submission and execution

CAF Portal

CNAF Tier 1

CAF Client

Submitter Daemon

Job Manager

gLite UI

gLite WMS

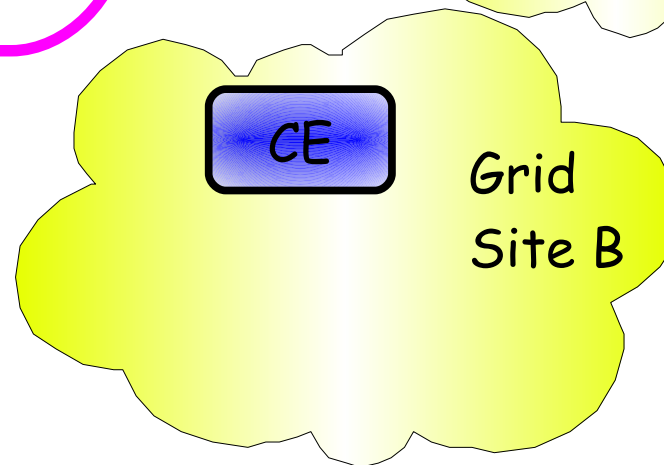Monitor Mailer Daemons

Grid Site A

CE

CE

Grid Site B

Red boxes — CAF code

Blue boxes — gLite middleware

LcgCAF: job submission and execution

CAF Portal

CAF Client

Submitter Daemon

Job Manager

gLite UI

Monitor Mailer Daemons

Match available resources

gLite WMS

System Inform.

CE

Grid Site A

CE

Grid Site B

Red boxes — CAF code

Blue boxes — gLite middleware

Prague CHEP 2009

LcgCAF: job submission and execution

CAF Portal

CAF Client

Submitter Daemon

Job Manager

gLite UI

Monitor Mailer Daemons

gLite WMS ↔ System Inform.

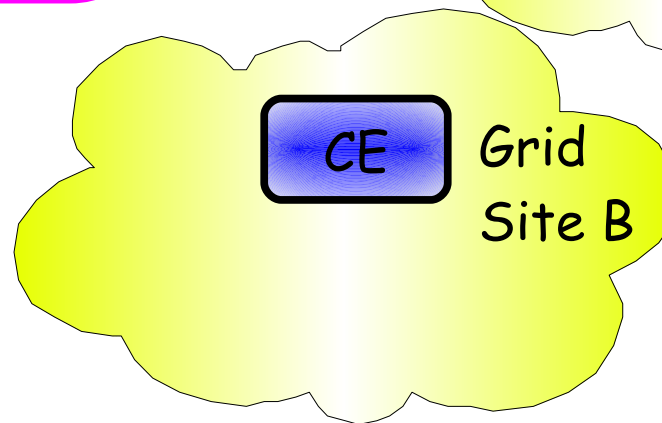Grid Site A

CE

Grid Site B

CE

User's Job

Automatic resubmission for Grid specific failures

Red boxes — CAF code

Blue boxes — gLite middleware
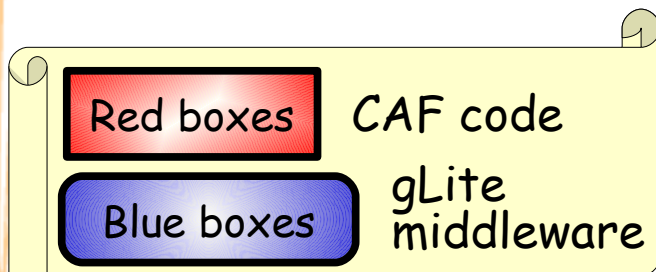
LCG Resources Usage

Italy Normalized CPU time
by Selected VO
April 2008 – March 2009

Alice 10% LHCB 12%
CDF 10%
Atlas 30%
Babar 3%
CMS 35%
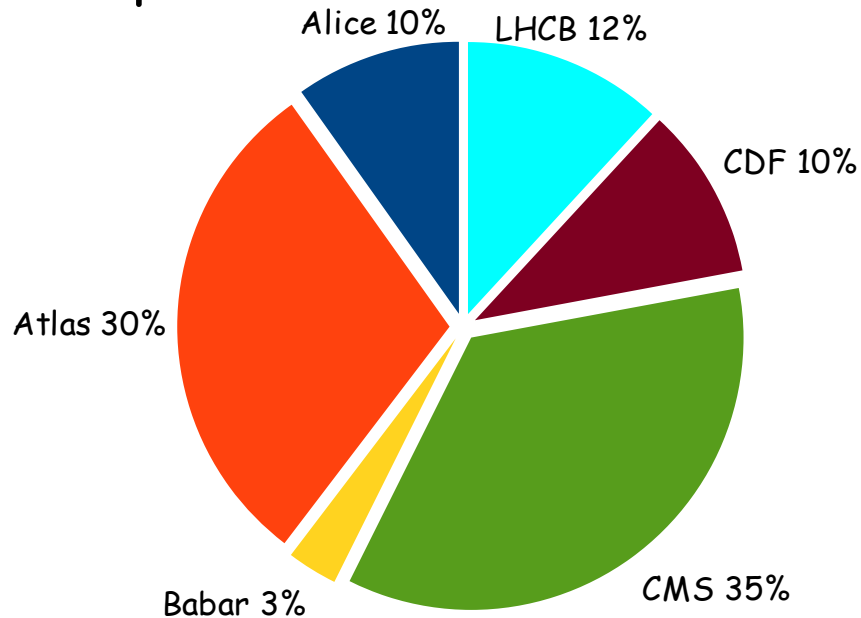
In Italy comparable to
one LHC VO

Europe Normalized CPU time
by Selected VO
April 2008 – March 2009

Alice 13% LHCB 14%
D0 4%
CDF 1%
CMS 19%
Atlas 46%
Babar 3%
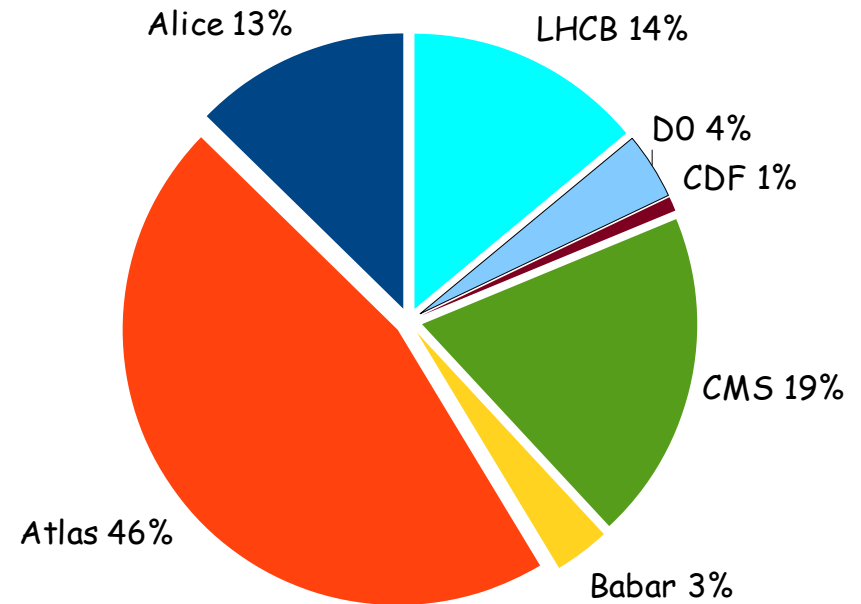
Need to improve European
Usage

CDF code distribution and Job Output Retrieval

CDF Code Distribution

OSG: No CDF code!

Self-contained tarball

LCG: CDF code available!

distributed via Parrot

/home/cdfsoft

Proxy Cache

HTTP

Parrot

Lcg site

CNAF server

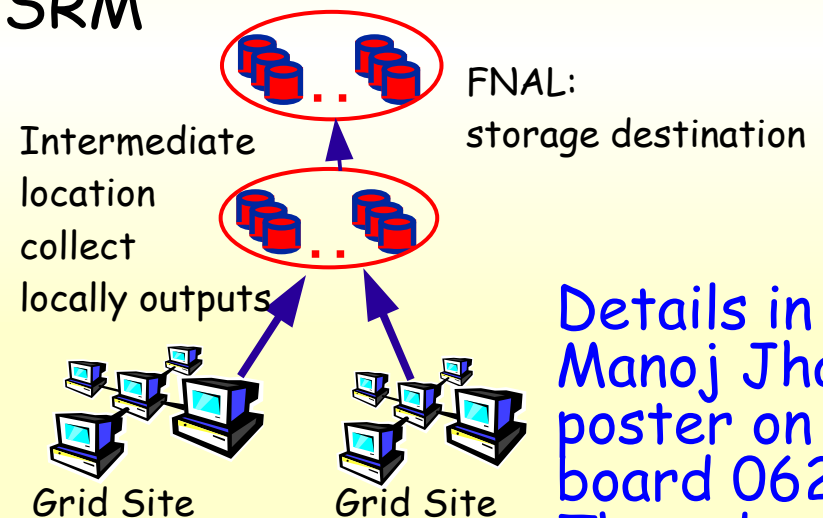Details in Gabriele Compostella talk 402 Tuesday March 24 Session: Grid Middleware and Networking Technologies

Job Output Retrieval

OSG & EGEE: rcp-like tools to copy output to final destination.

New data movement based on SRM

FNAL: storage destination

Intermediate location collect locally outputs

Grid Site   Grid Site

Details in Manoj Jha poster on board 062 Thursday

Conclusions

- CDF adapted the dedicated resources computer model to the Grid distributed resources using portals
- The transition was very successful:
  - Completely transparent for users
  - Submission methods officially supported by LCG and OSG
  - Easy to access new sites $\Rightarrow$ additional cpus available to CDF if needed

Acknowledgments:

FermiGrid department: in particular I. Sfiligoi and S. Timm

CDF CAF Developers: F. Wuerthwein, E. Lipeles, M. Neubauer, M. Norman, I. Sfiligoi, D. Benjamin, S. Sarkar, S. Pagan Griso, F. Delli Paoli, D. Cesini, G. Compostella, M. Zvada, D. Box, F. Moscato

INFN: CNAF Grid department, CNAF Tier1 departments