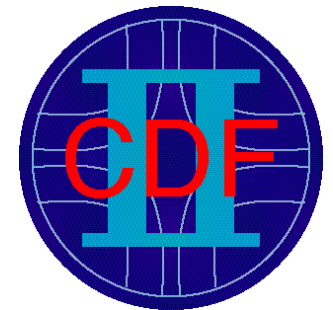


CDF Computing Experience

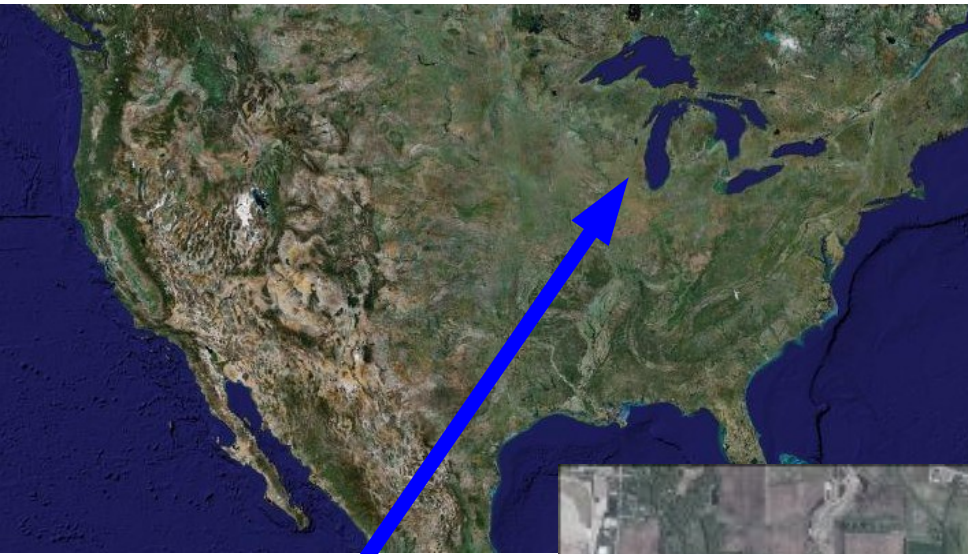


Gabriele Compostella,
University of Trento and INFN
compostella@tn.infn.it

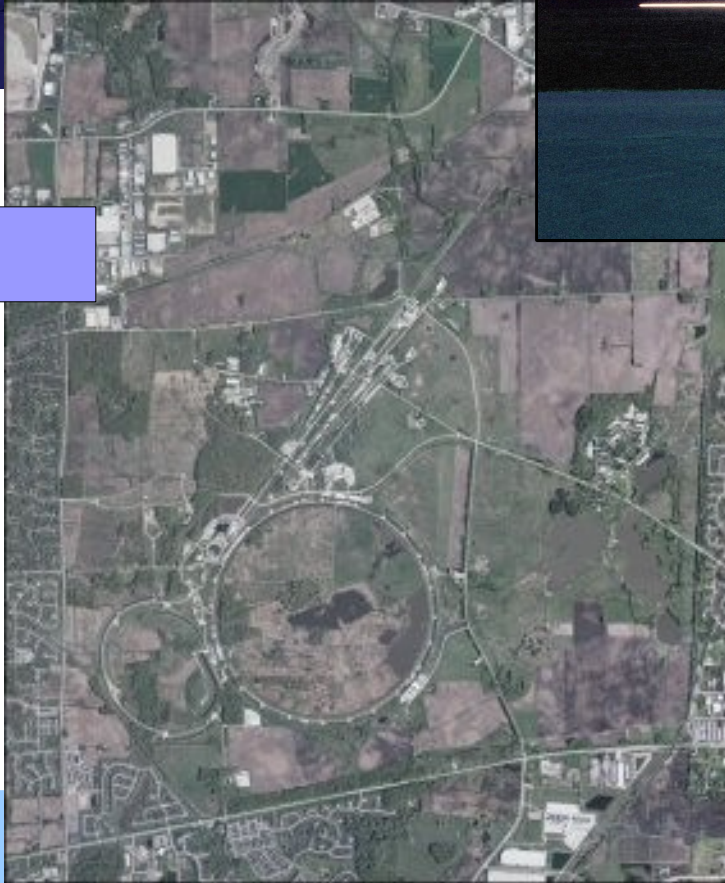


on behalf of CDF computing Group

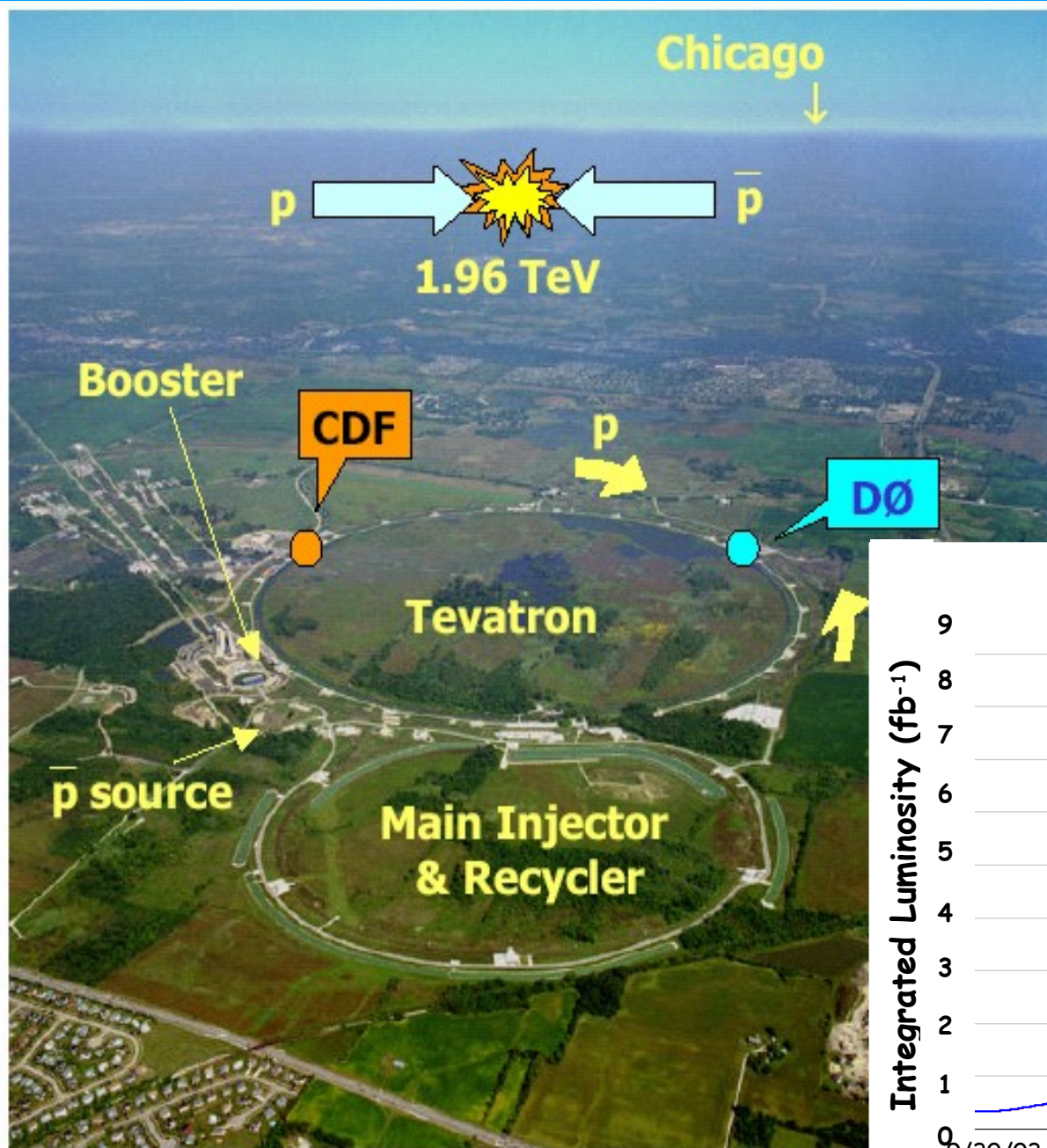
Fermilab Accelerator Complex



Batavia, IL, USA

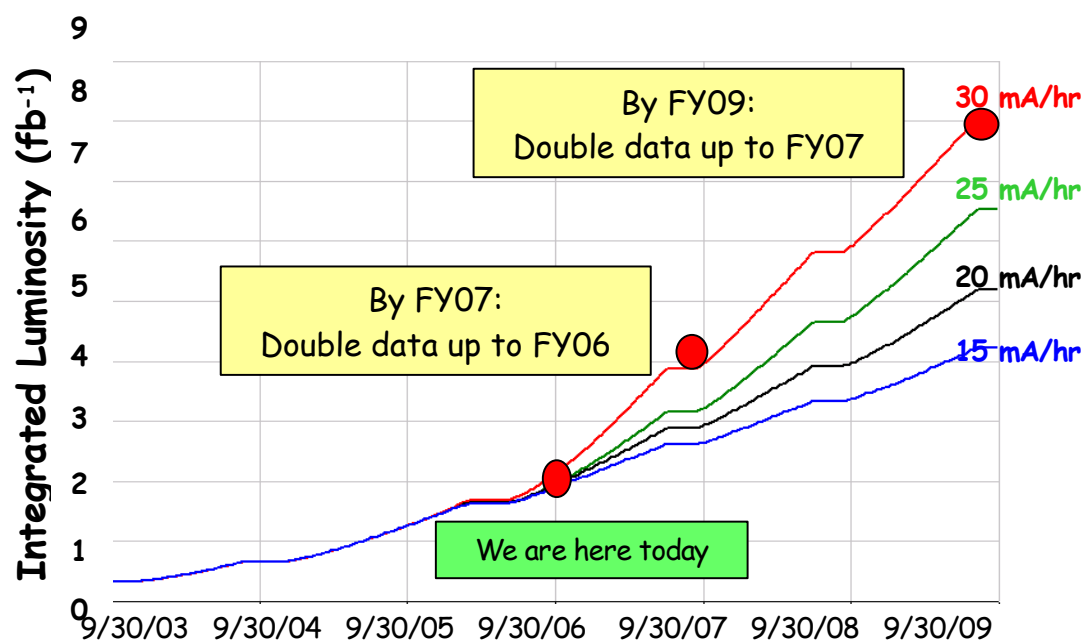


CDF Experiment Luminosity

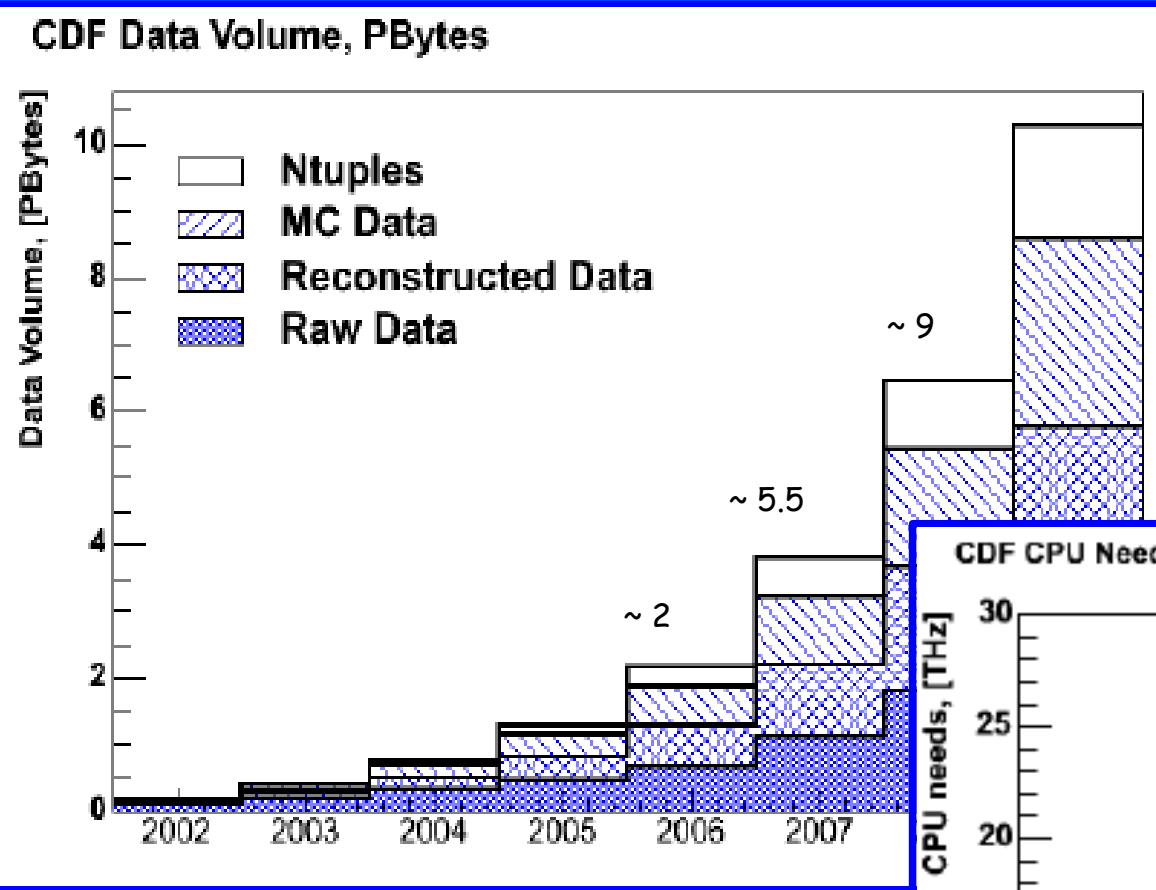


- $L_{\text{peak}} : 2.3 \times 10^{32} \text{ s}^{-1} \text{ cm}^{-2}$
- 36 bunches, 396 ns crossing time

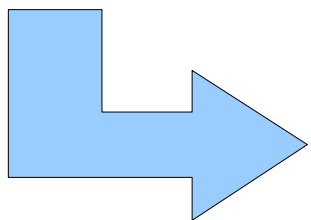
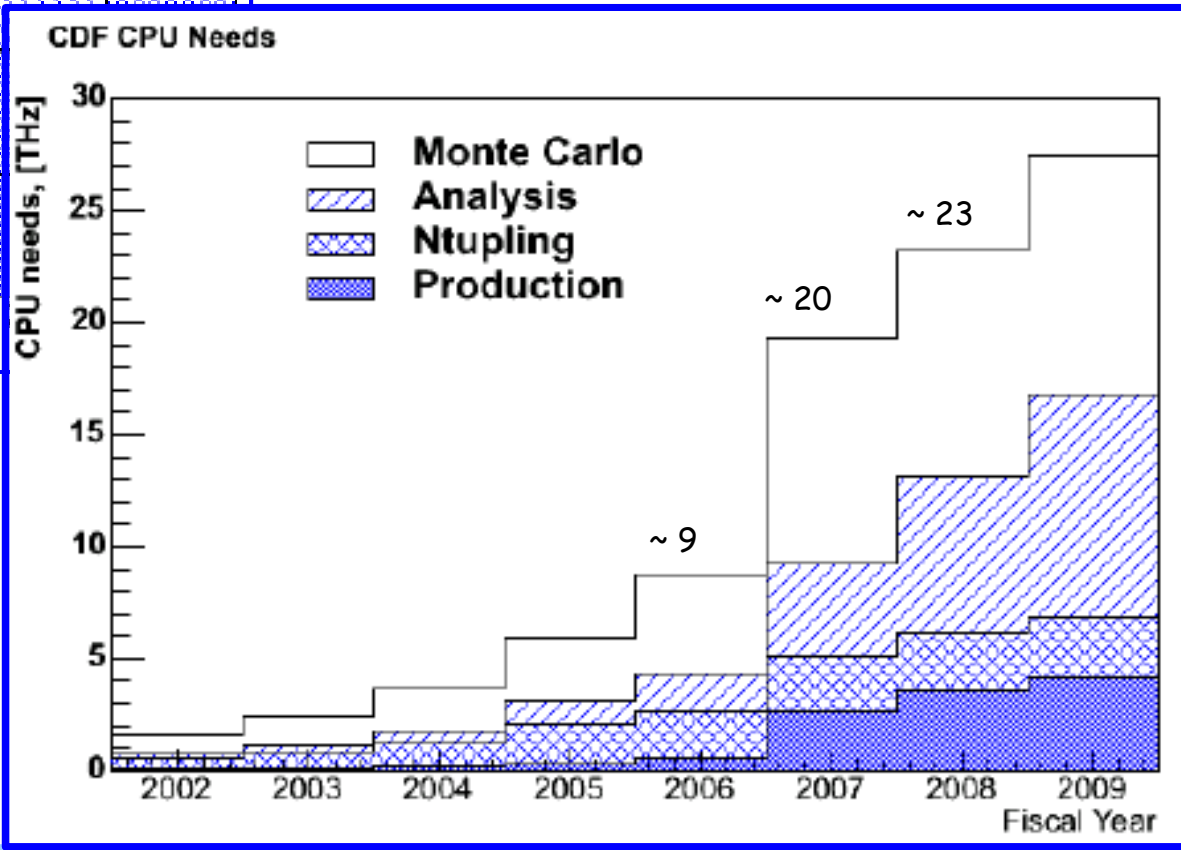
Collected Luminosity



CDF Experiment Data Volumes

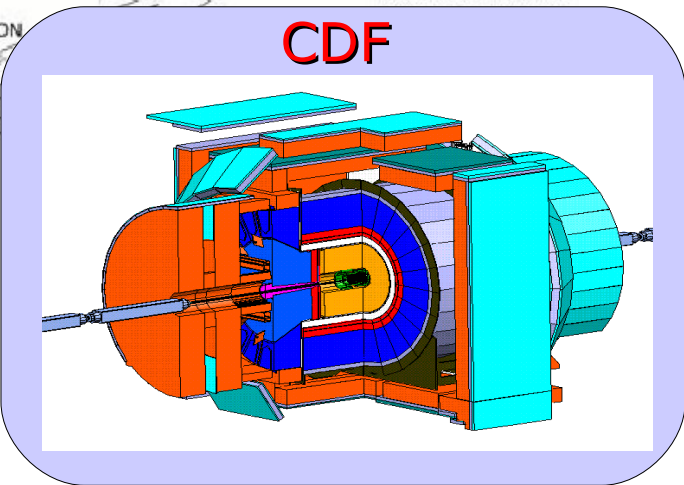
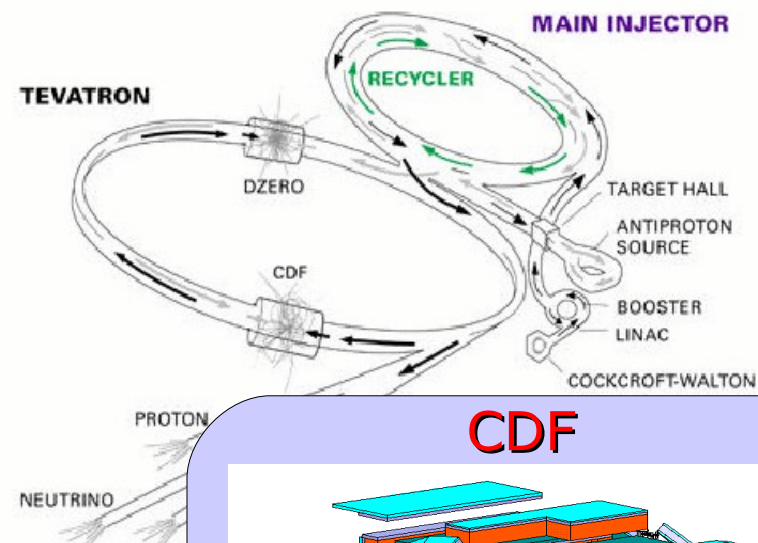


Collected Data
 $(2fb^{-1} \approx 3.9 \times 10^9 \text{ events})$



Estimated CPU needs

CDF Data Production



L3 Trigger

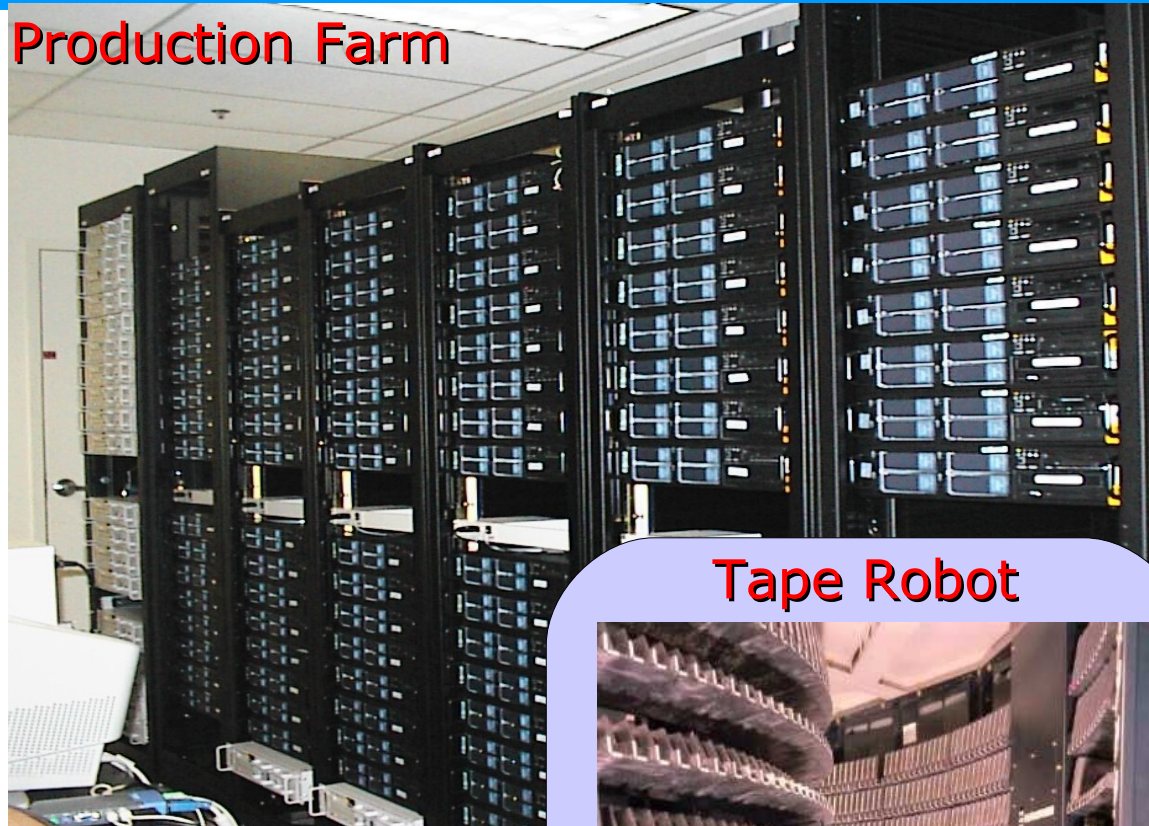


SAM

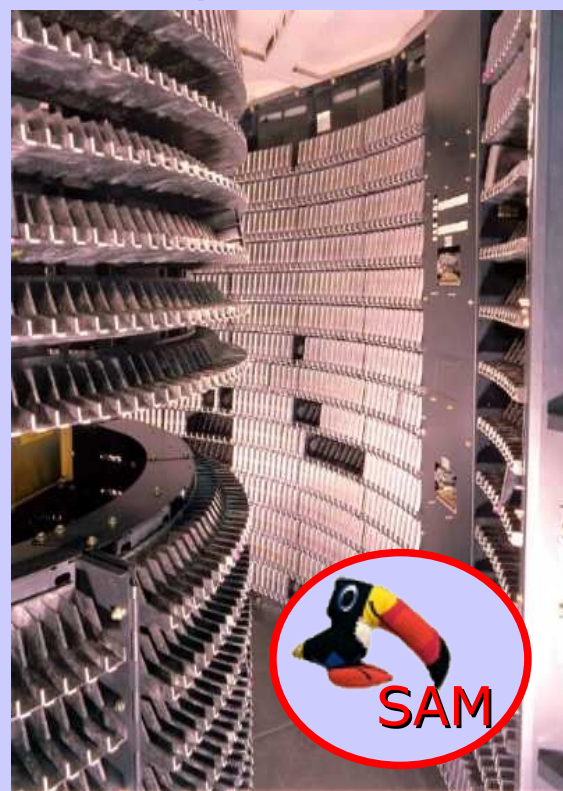
Disk Cache



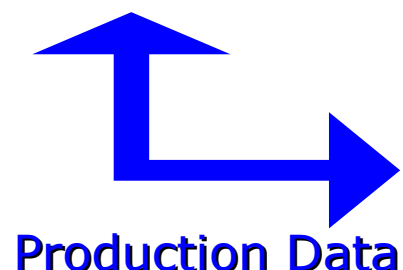
Production Farm



Tape Robot



SAM



Production Data

Raw Data





- Data Handling model relies on **SAM** (Sequential data Access via Metadata), a centralized system that manages all official data
- File Catalog for data on tape and on disk:
 - Files based, with metadata attached
 - Files are organized in datasets, users can create their own
- Manage File Transfers: tape-to-cache, cache-to-disk, disk-to-tape
- For jobs accessing data:
 - copy necessary files from the closest location to local cache
 - provide files in the optimal order
 - keep track of processed and unprocessed files
 - Failed sections can be automatically recovered
- Each site serving data needs to have a SAM Station

Users Analysis and MC Production

- **CAF** Central **A**nalysis **F**acility: mostly **User analysis**
FNAL hosts data -> farm used to analyze them
- Decentralized **CAF** (**dCAF**): mostly **Monte Carlo production**
Remote sites produce Monte Carlo, some (ex. CNAF) have also data
Produced files are then uploaded to SAM
- CAF and dCAF are CDF **dedicated** farms

CAF Model

Develop, debug
and submit from
personal PC

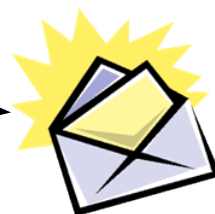


CDF user must
have access to
CAF clients
and
specific CDF
certificate

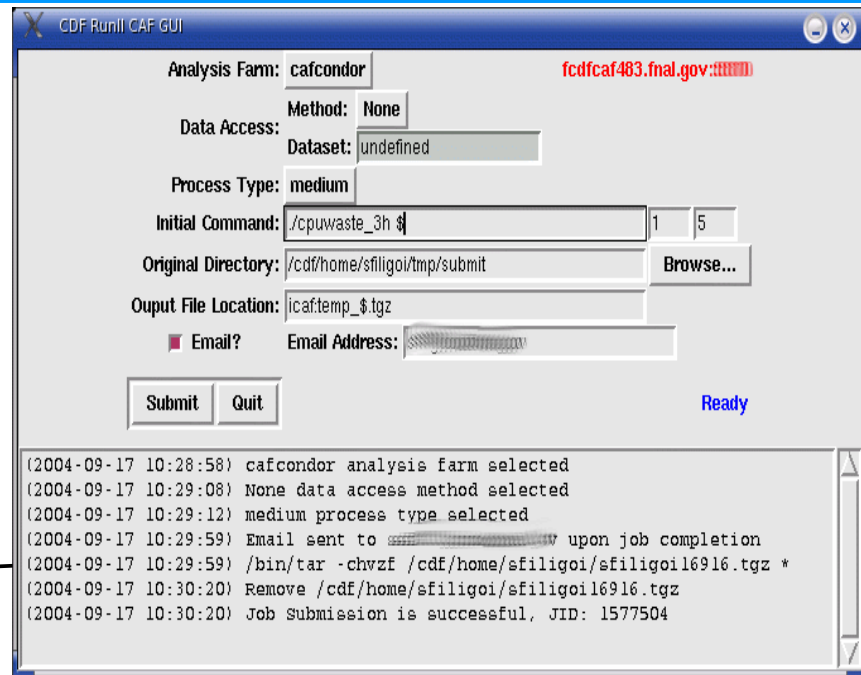
No need to
stay connected



Output to
any place

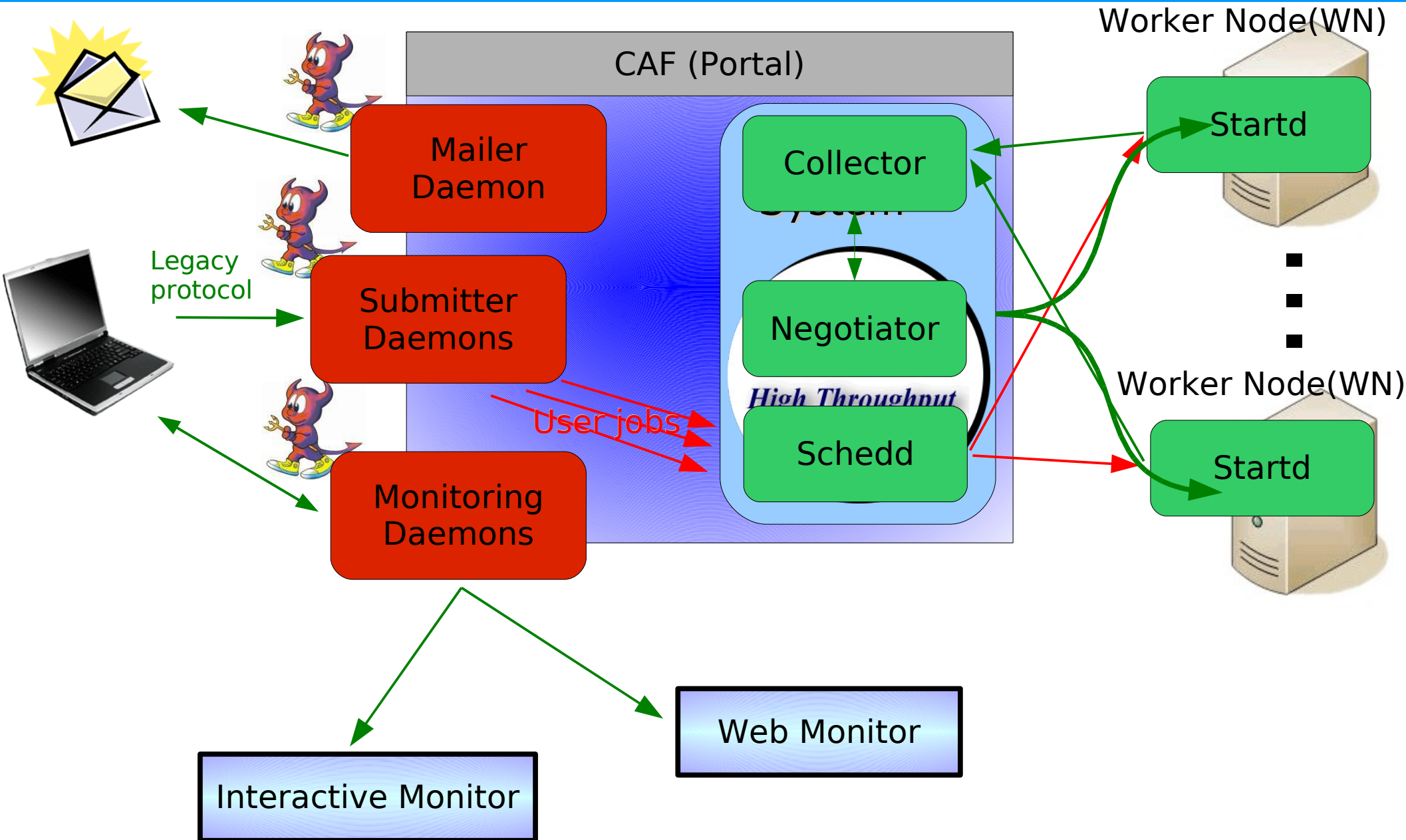


Submit and forget
until receiving a mail



Developed by: H. Shih-Chieh, E. Lipeles, M. Neubauer, I. Sfiligoi, F. Wuerthwein

The CAF Headnode



Job Monitoring

The screenshot displays the 'CAF Web Monitor' interface. The main section, 'CAF overview [History|Analyze]', provides a summary of system status with the following data:

	Total VMs	Usable	Claimed	Load=0	Load<30	Assigned	Free	VM Load	...
Current	3000	2496	2297	199	163	28	171	1952	1
Avg.	2972	2477	2403	220	183	38	35

System Info includes:

Total CAFMarks	Claimed CAFMarks	Free CAFMarks	VM Load CAFMarks	Avg. CAFM
2700.0k	2511.5k	188.5k	2078.6k	1079.0

Sections by Accounting Group (ordered by AcctGroup) table:

Accounting Group	Quota	Running	Assigned	Idle	Wait	Held	Completed	Removed	Total	Jobs
common	700*	1262	0	514	3264	0	5870	7	10917	84
group_dqm	50	0	0	7	0	0	0	0	7	7

User-specific job details for 'andrew' are shown in a separate window:

```

User: andrew Length: long
Accounting User: group_MCprod.andrew
Input Source: none
Status: Running Load: 0.99
Submitted: Apr 06 11:41 Ready: Apr 07 20:32
Started: Apr 10 20:37
Used time: 13h 2' Limit: 72h
VM: vm2@fcdcfca979.fnal.gov
Site: FermiGridCDF Entry: fmalcdf1_5_002
Condor ID: 94162 Schedd: schedd_1@fcdhead5.fnal.gov
    
```

Two graphs are visible on the right: 'Load on vm2@fcdcfca979.fnal.gov' and 'Memory usage on vm2@fcdcfca979.fnal.gov', both showing data over time.

Web based Monitor: information on running jobs for all users and jobs/users history

Interactive job Monitor:

Available commands:

- CafMon list
- CafMon kill
- CafMon dir
- CafMon tail
- CafMon ps
- CafMon top

```

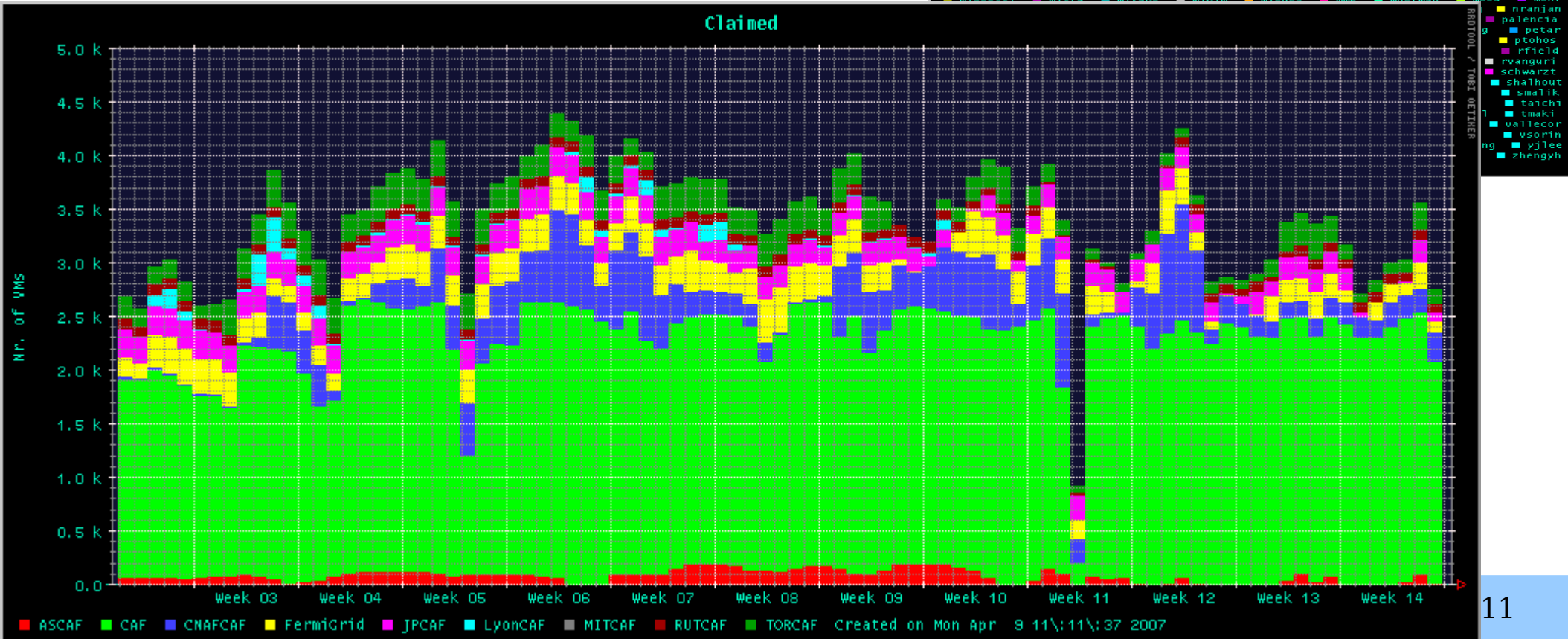
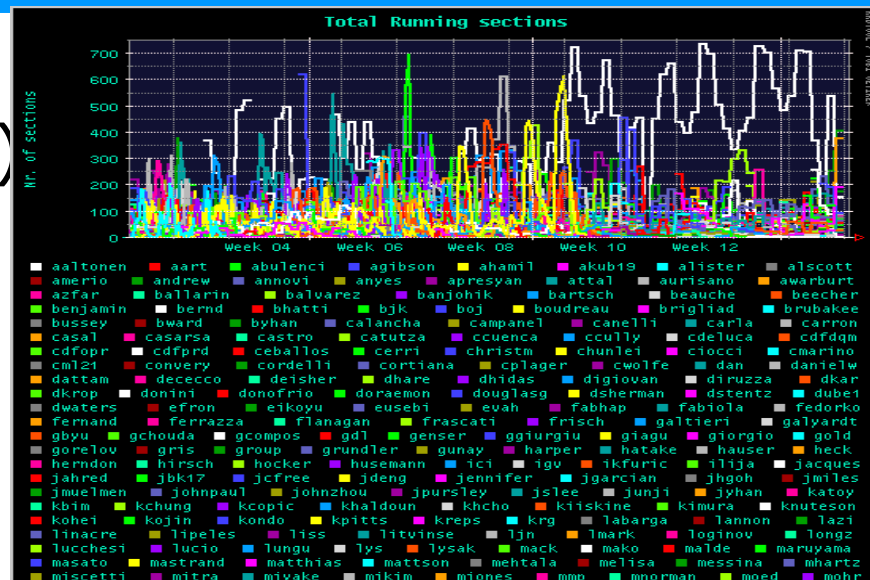
$ CafMon jobs
Analysis Farm: lcgcaf Host: pdcf11.pd.infn.it
Job Group From To Status
-----
1208 short Total: 50
-----
1208 short 1 11 Pending
1208 short 7 15 Running
1208 short 16 50 Success
-----
1208 short Success: 42 Pending: 8
1208 short Success: 84% Pending: 16%
$
    
```

CDF batch computing in numbers

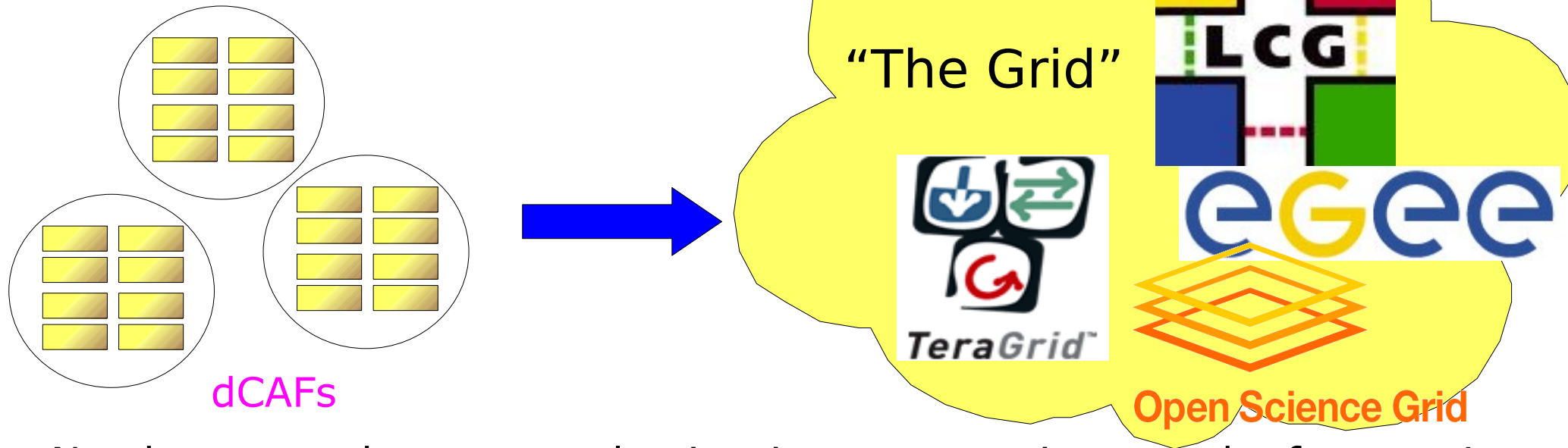
Up to 4000 batch slots (last 3 months)

Almost 800 registered users,

Approx. 100 active at any given time



Moving to the Grid



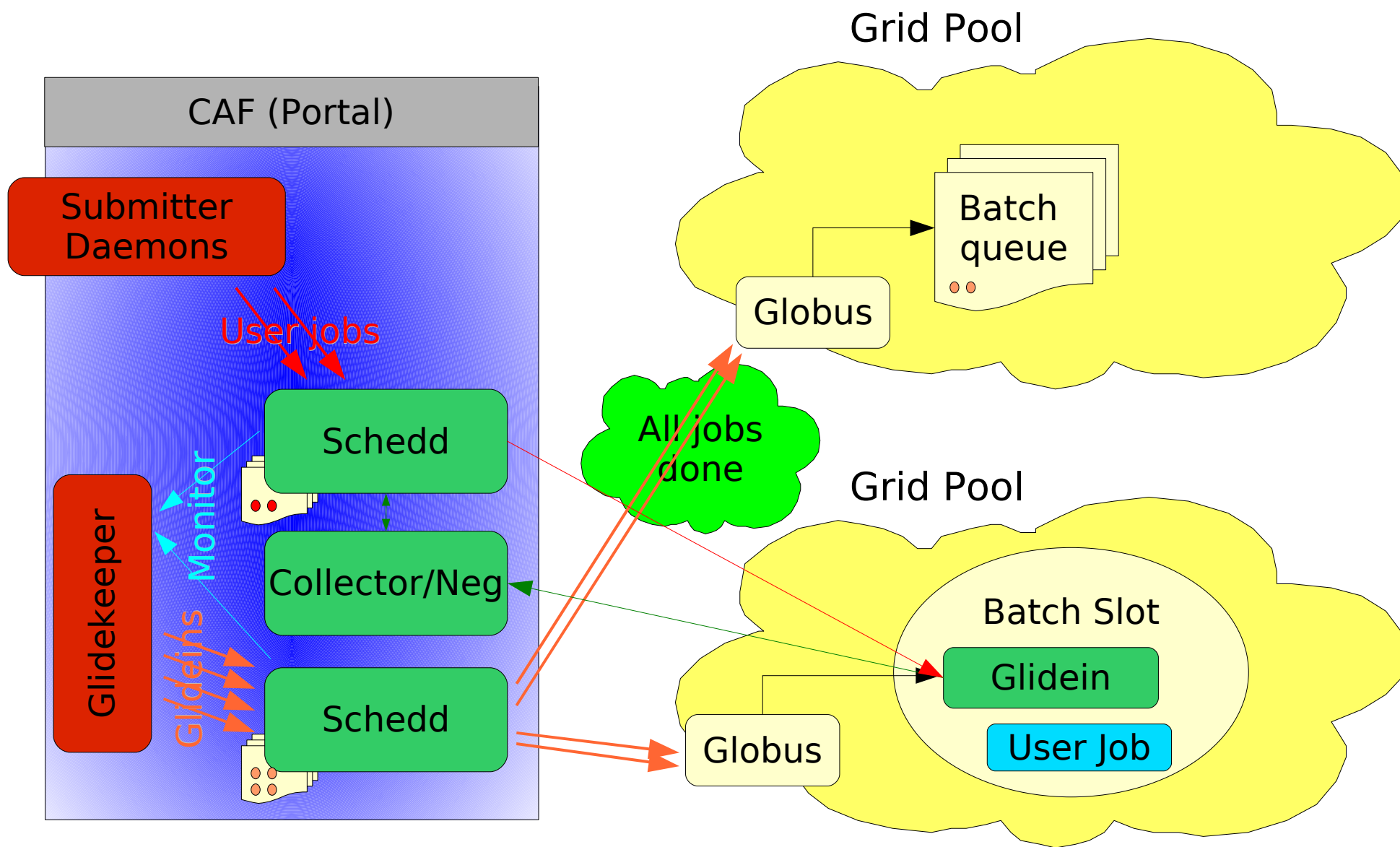
- Need to expand resources, luminosity expect to increase by factor ~ 4 until CDF stops taking data.
- Resources were in dedicated pools: limited expansion and need to be maintained by CDF personnel
- GRID resources can be fully exploited before LHC experiments will start to analyze data
- As a first step, we can move MC jobs to the Grid (no data access...)
- Keep on using CAF (and CNAF) for data analysis.
- CDF developed 2 portals to the GRID:
 - [NamCAF](#) for OSG and [LcgCAF](#) for LCG

NamCAF

Condor Glidein based CAF

More info at:
<http://cdfcaf.fnal.gov>
<http://cdfcaf.fnal.gov/namcaf>

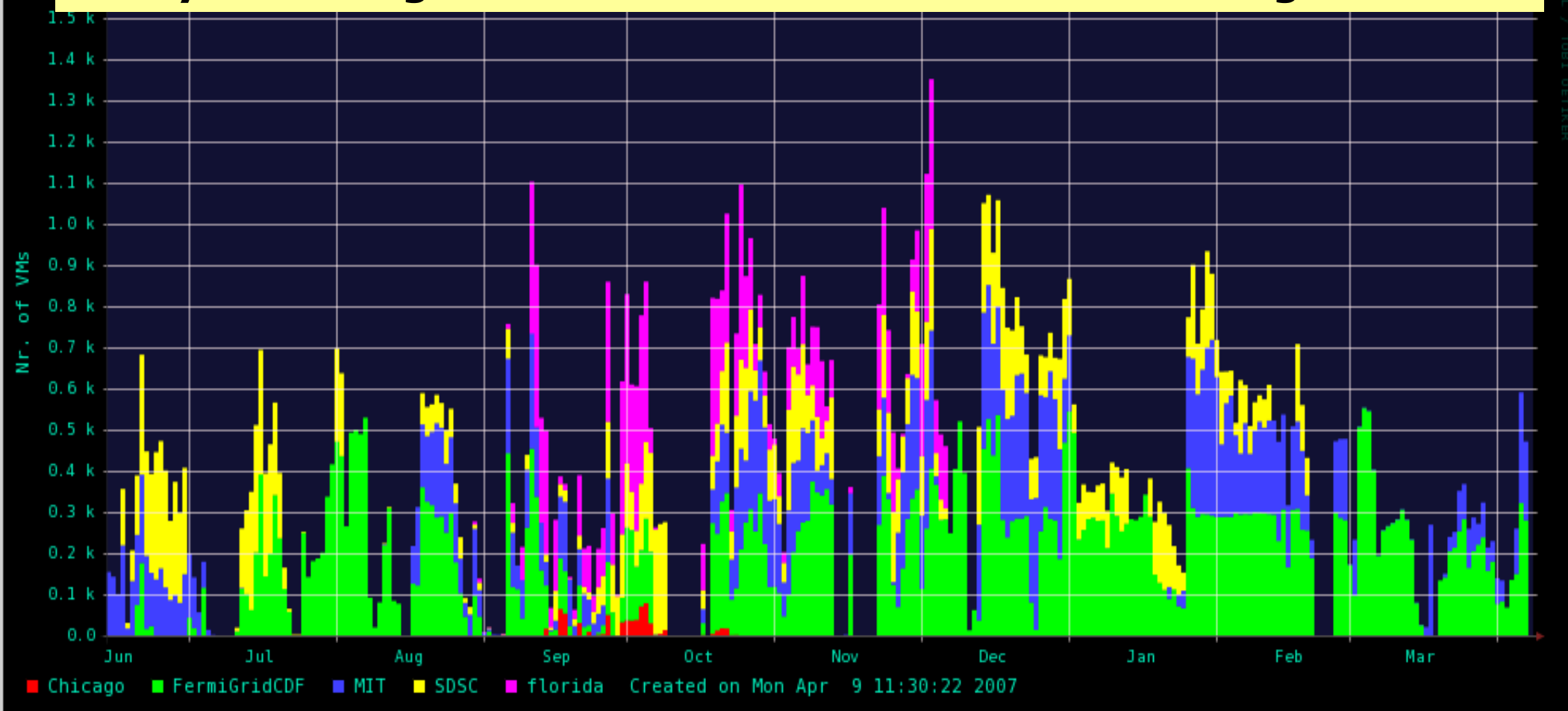
CDF use of Condor glide-ins



By I. Sfiligoi, S. Sarkar

CDF usage of OSG resources per site

Last year's usage of different OSG Sites accessed through NamCAF

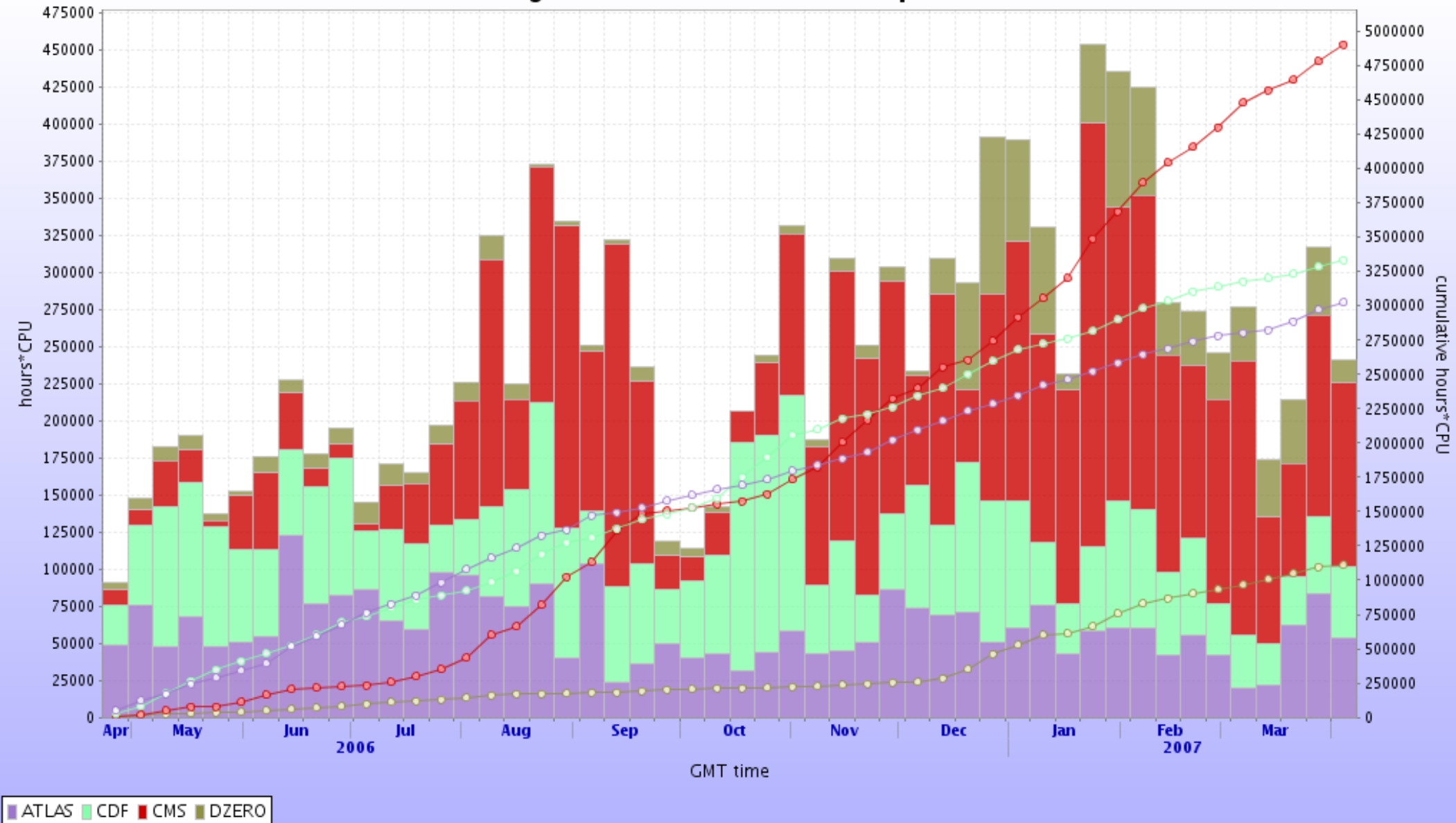


- ...Up to 1500 batch slots
- Self contained tarballs
- No specific support on Grid sites

<http://cdfcaf.fnal.gov/namcaf/>

CDF usage of OSG resources

Integrated CPU time consumed per VO



<http://grid02.uits.indiana.edu:8080/show?page=index.html>

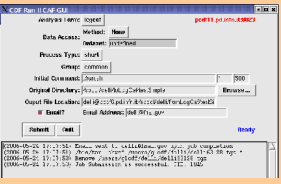
LcgCAF

CDF Submission Portal to LCG

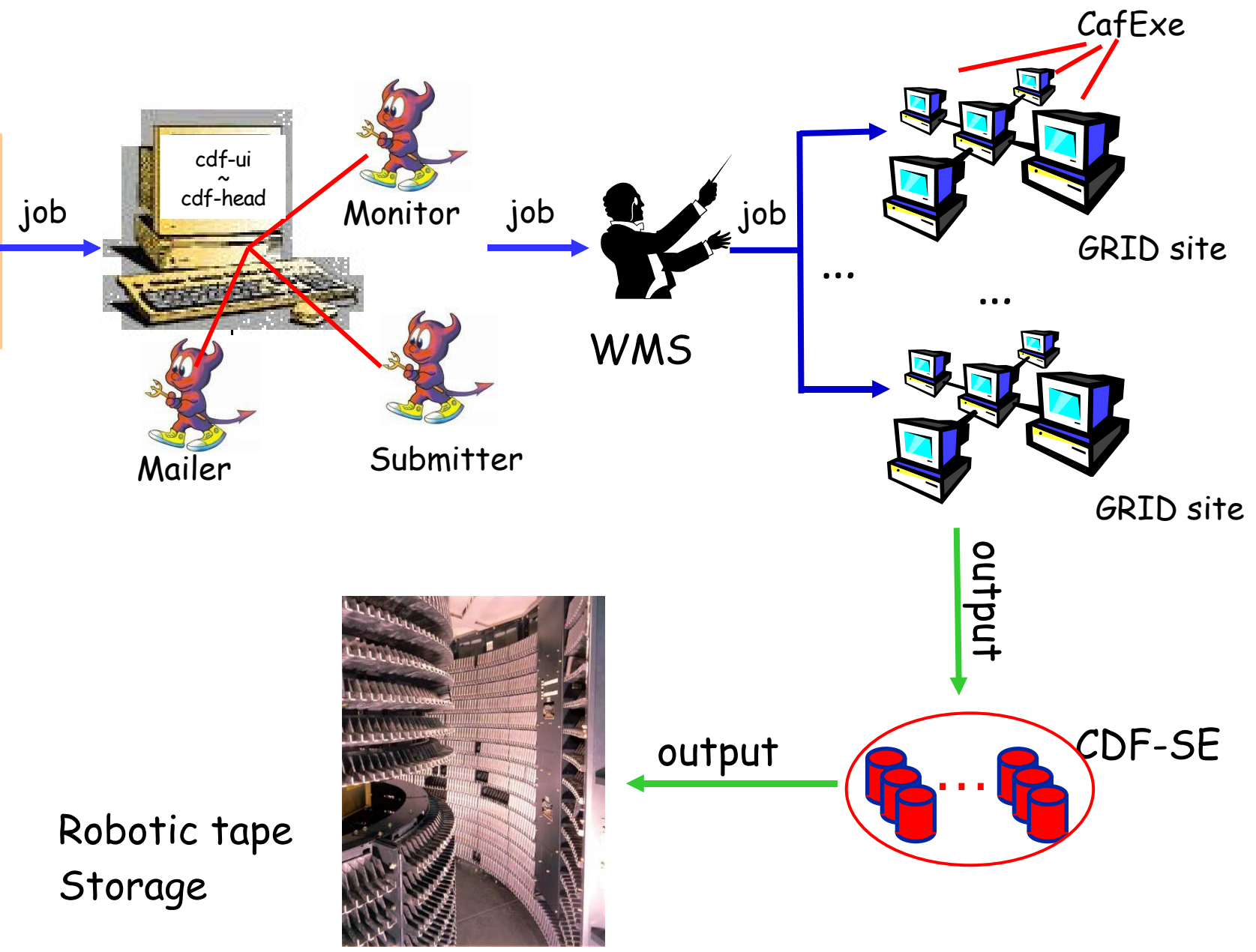
More info at:
<http://www.ts.infn.it/cdf-italia/public/offline/lcgcaf.html>

LcgCAF: General Architecture

User Desktop

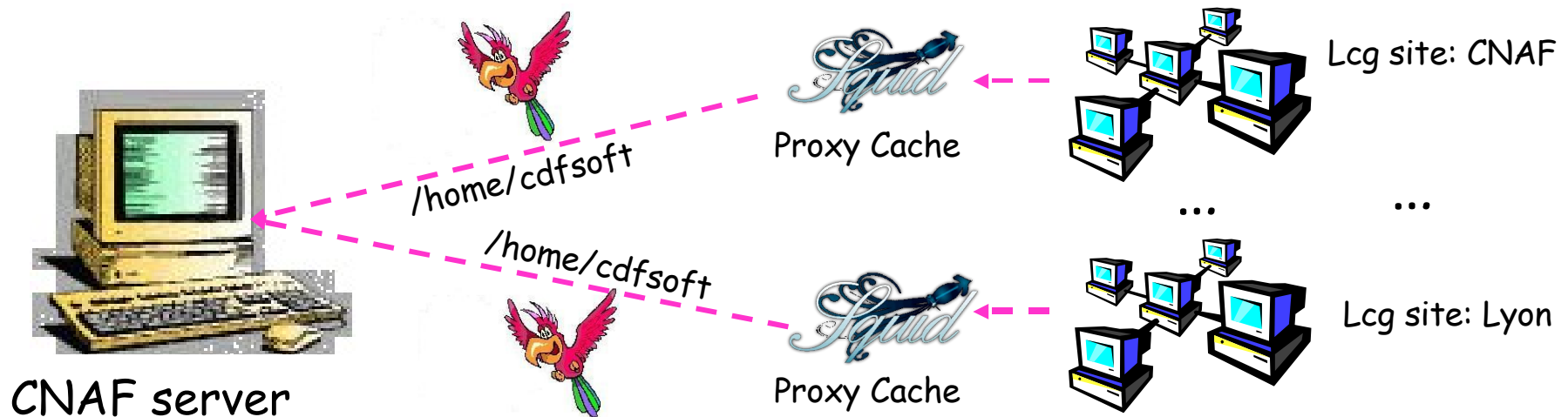


CDF user must have access to CAF clients and Specific CDF certificate



Developed by: F.Delli Paoli, D.Jeans, D.Lucchesi, S.Sarkar, I.Sfiligoi

CDF Code Distribution



In order to run, a CDF MC job needs available to the WN:

- CDF code distribution:

Parrot is used as virtual file system for CDF code

To have good performances with Parrot, a **Squid** web proxy cache is also needed.

- Run Condition DB:

FroNTier is used for DB access (...in NamCAF too)

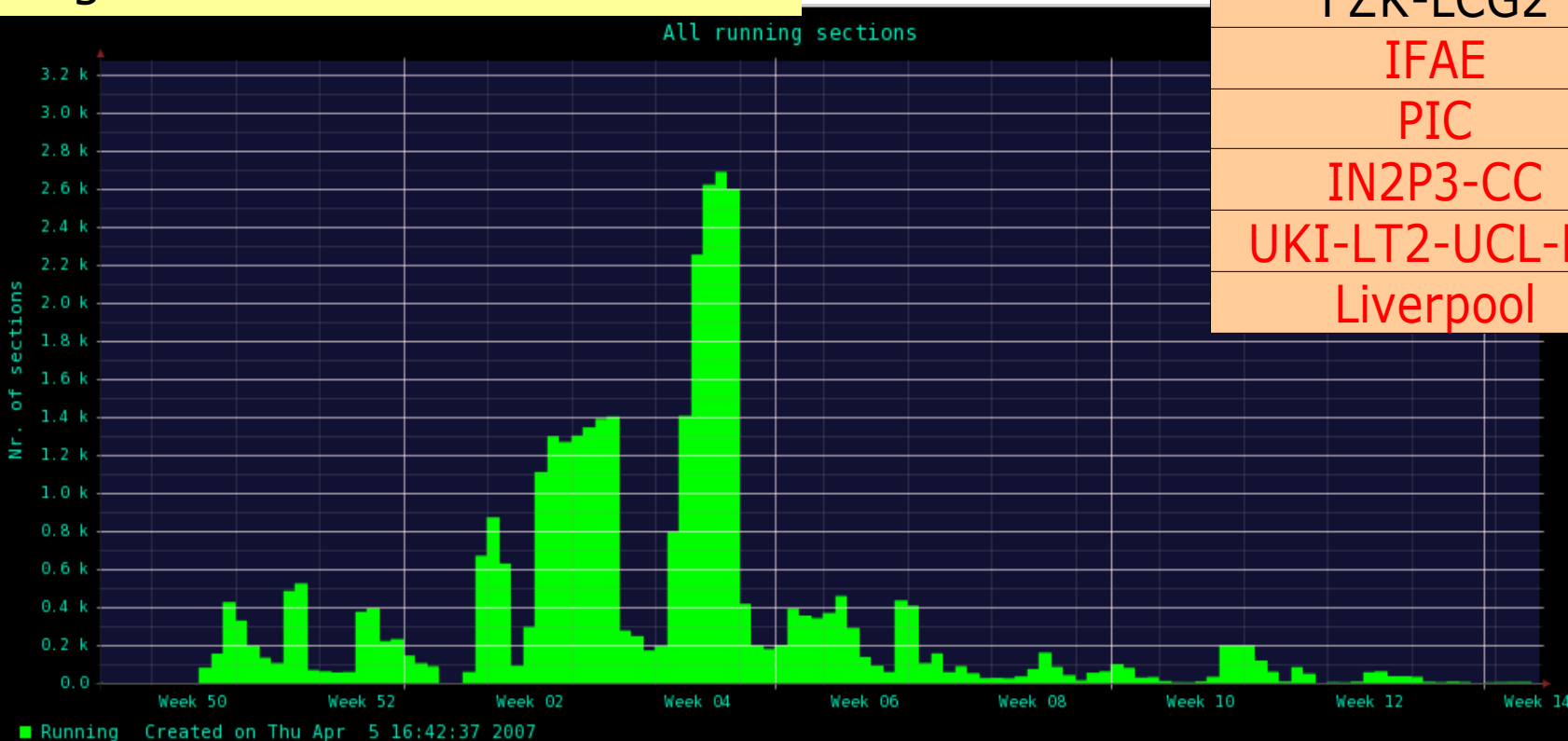
- Job monitor (implementation different from CAF, same functionalities)

LcgCAF Usage

LcgCAF opened to all users and officially supported by CDF since November 2007.

Currently an average of 10 users running, peaks of more than 2500 running sections.

LcgCAF Monitor: last 4 months



Sites accessed through LcgCAF

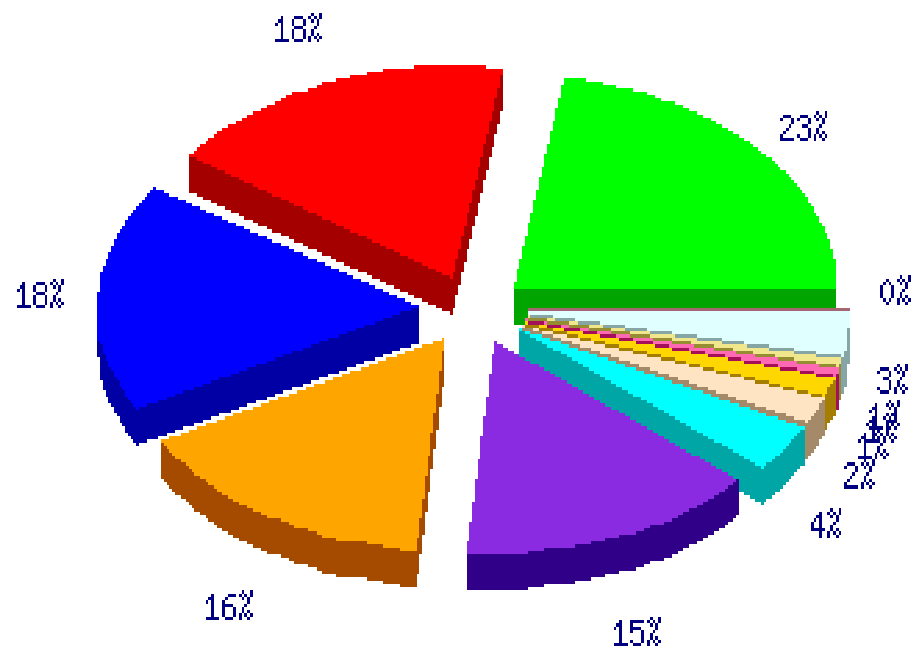
INFN-Padova	Italy
INFN-Catania	Italy
INFN-Bari	Italy
INFN-Legnaro	Italy
INFN-Roma1	Italy
INFN-Roma2	Italy
INFN-Pisa	Italy
FZK-LCG2	Germany
IFAE	Spain
PIC	Spain
IN2P3-CC	France
UKI-LT2-UCL-HE	UK
Liverpool	UK

CDF Usage of LCG resources

VO: ALL Site: ALL

Stats res usage

startTime: 12 Oct 2006 00:00
 endTime: 10 Apr 2007 20:55



Site name	Time (hours)
atlas	2003458
cdfcaf	1589159
cms	1560681
alice	1403284
lhcb	1345847
bioned	321569
theophys	162881
bio	119619
babar	59764
zeus	52082
res free	282525
Total used	8900869

(European sites not included in this plot)

Conclusions and Future developments

...GRID can serve also a running experiment!

CDF proved to have an adaptable, expandable and successful computing model

Great effort has been put on exploiting GRID, using opportunistic resources, and MC production is completely moving towards distributed systems

Future Developments:

- Plan to add more resources into NamCAF and LcgCAF
- Plan to implement a mechanism of policy management for LcgCAF on top of GRID policy tools
- Explore the possibility of running on data moving jobs towards sites that can serve the desired files
- SAM-SRM interface under development to allow:
 - output file declaration into catalogue directly from LcgCAF
 - automatic transfer of output files from local CDF storage to FNAL tape