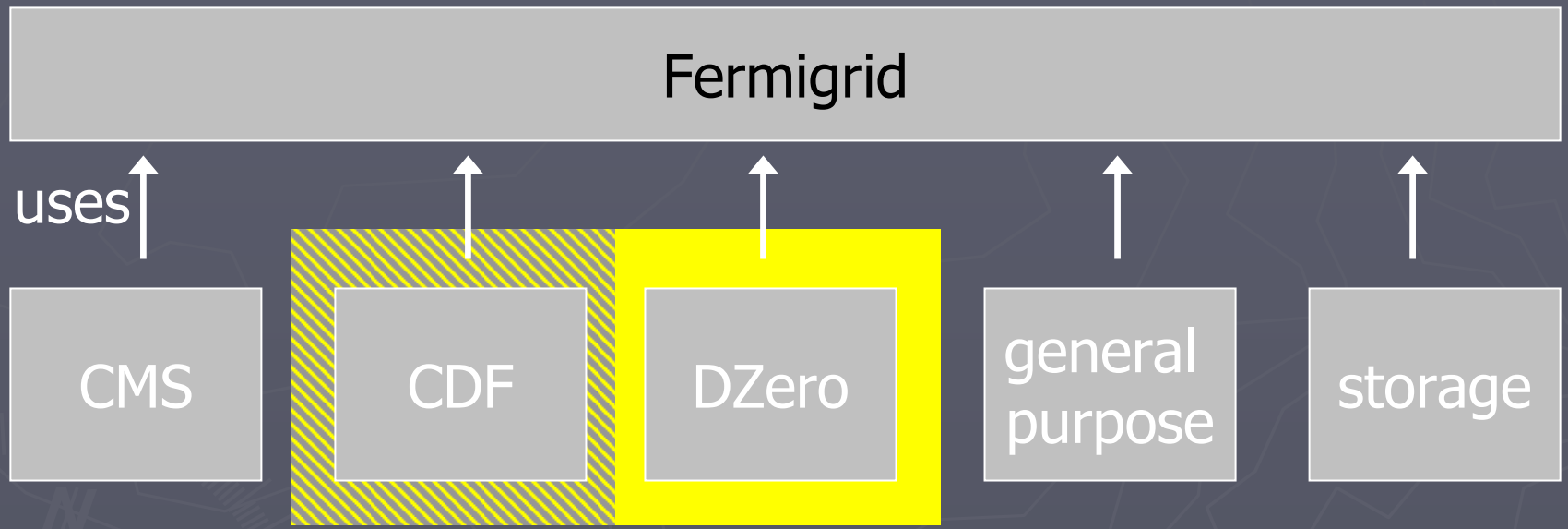
SAMGrid as a Stakeholder of FermiGrid

Valeria Bartsch
Computing Division Fermilab

Overview



- example: SAMGrid used by 2 stakeholders
- interfaces to our campus grid Fermigrid

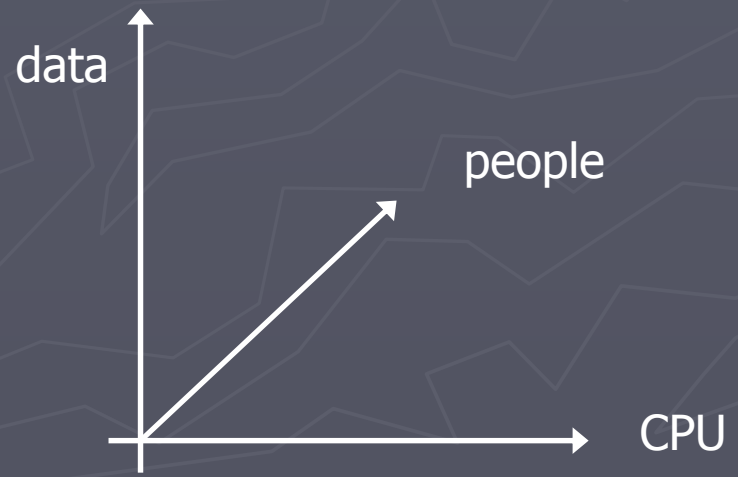
Overview of Fermilab

- **Mission:** High-Energy Physics, the science of matter, space and time.
- **Accomplishments:** Research at Fermilab has led to scientific discoveries and technological advances: discovery of the top, bottom quark, …
- **Current Experiments:** CDF, DZero, Minos
- **Contributions to:** CMS, SDSC, Pierre Auger, …

Requirements for our GRID

⇒Data collected by each running experiment
1 PetaByte p.a.
⇒ experiments with a High Energy physics user community

Consequences for our GRID:
- ✓ data driven GRID
- ✓ interoperability possible



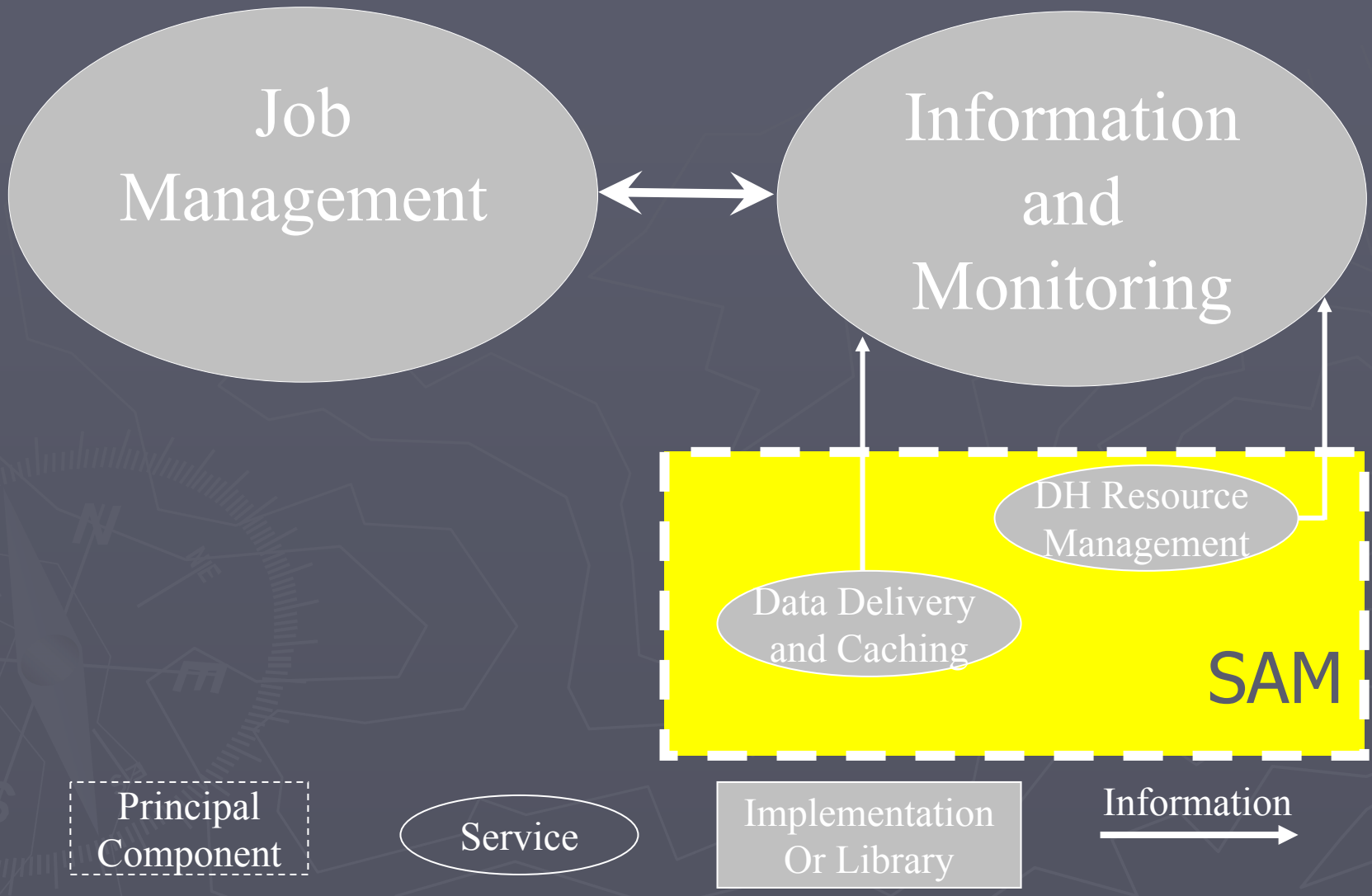
Basic SAMGrid Requirements

- Transfer enormous amounts of data needed for different activities (scalable)
- … sometimes over large distances and with commodity hardware (robust)
- Maintain knowledge of what we are doing and what we did (monitoring and bookkeeping)
- Maximize use of our resources (efficient)
- Don't want to know the details [where files sit, where jobs run] (helpful)

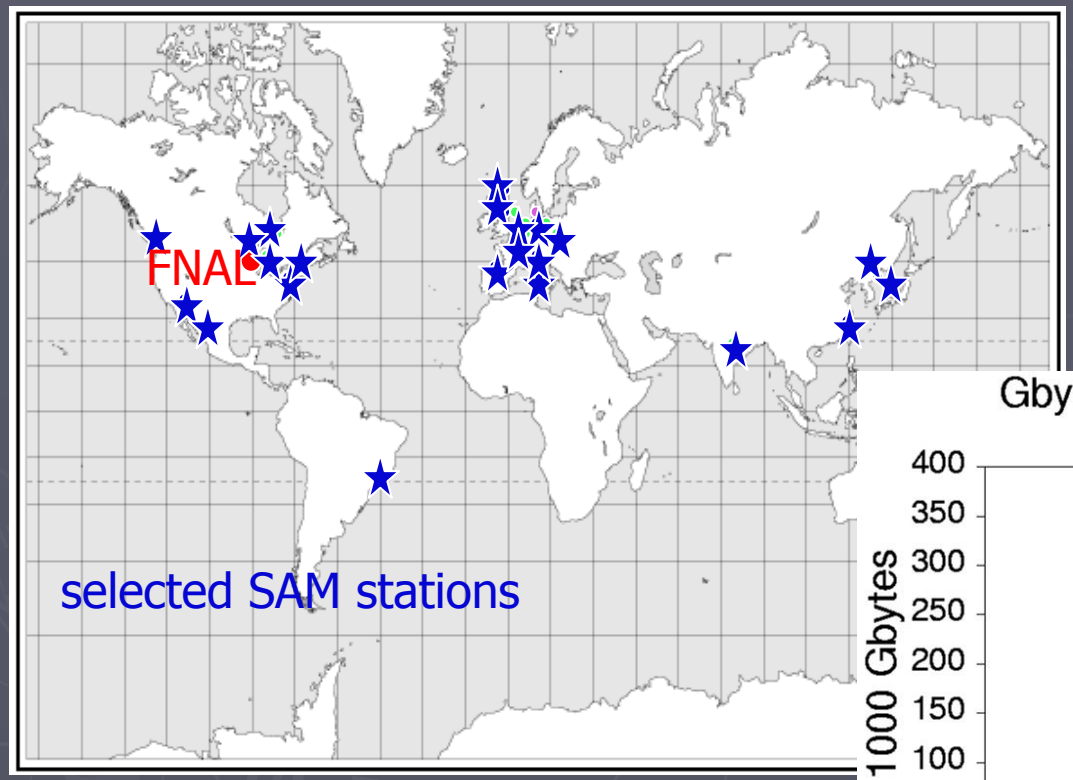
Solution…

- A data handling and job management system
- SAM + JIM = SAMGrid
- SAM used by CDF, SAMGrid used and developed by DZero

The Data Handling: SAM

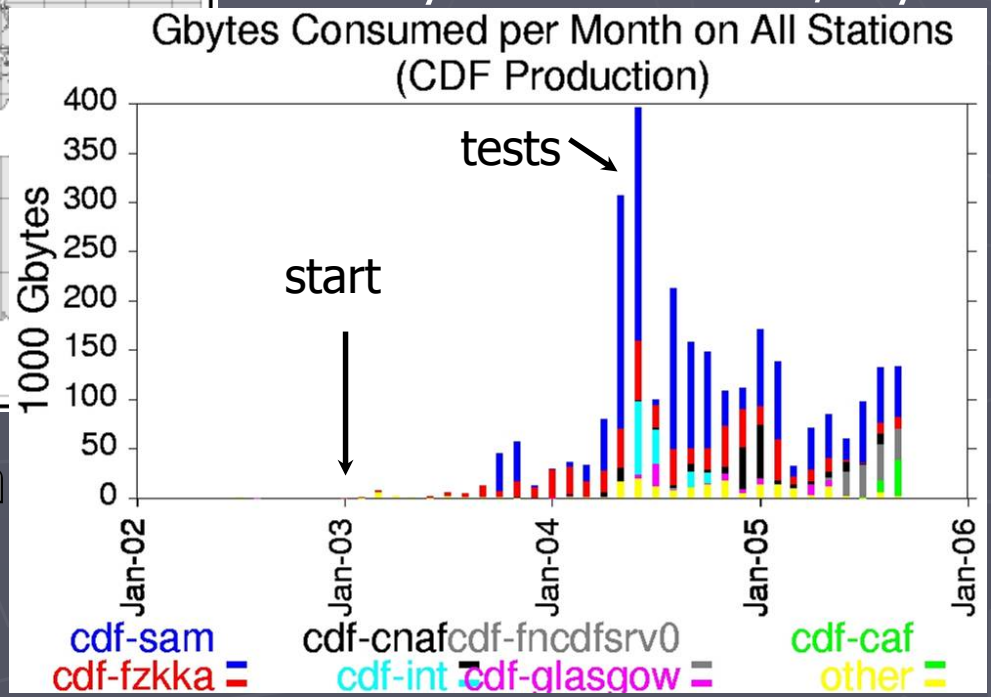


World wide distribution of SAM stations



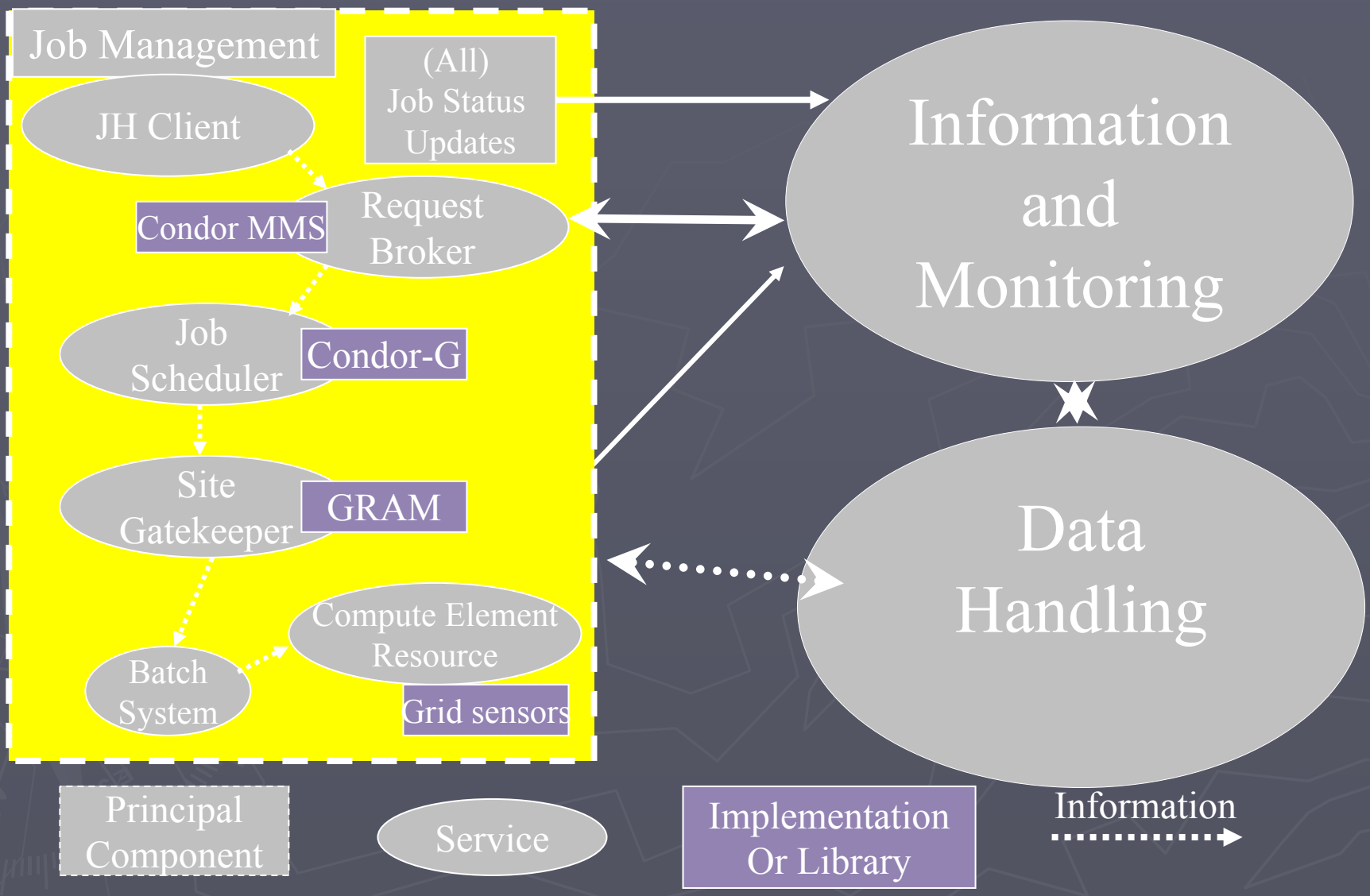
DZero and CDF:

- ✓ 10k/20k Files declared/day
- ✓ 15k Files consumed/day
- ✓ 8 TByte of Files cons./day

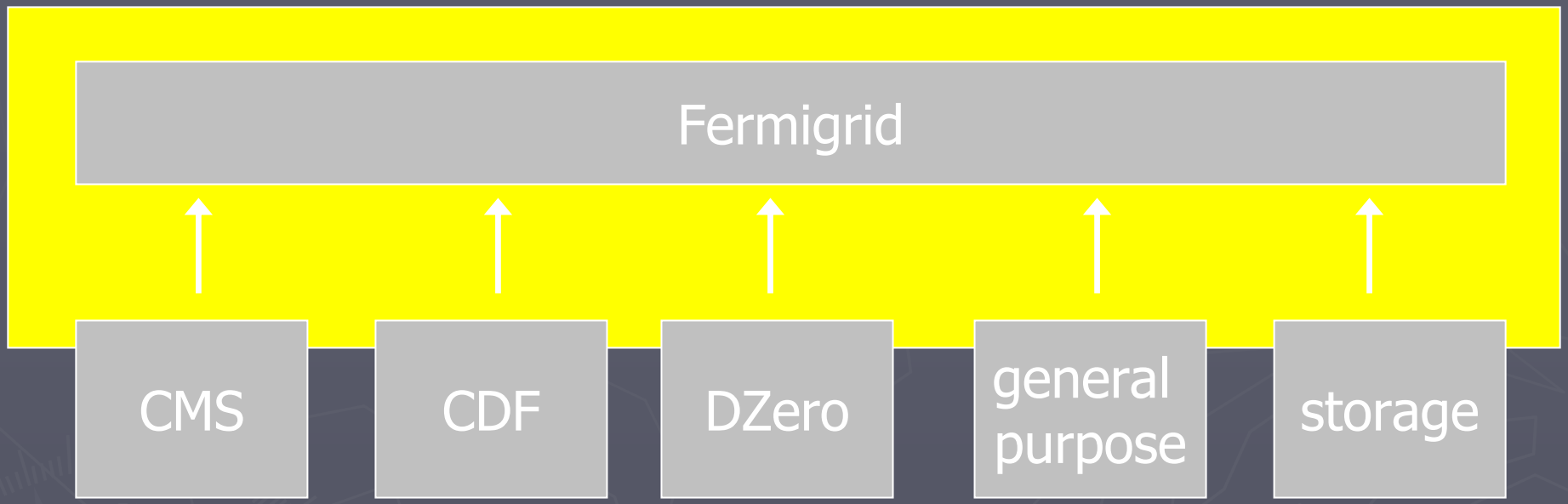


- ➢ main consumption of data still central
- ➢ remote use on the rise

The Job Management (JIM)



Overview



- example of SAMGrid for 2 stakeholders
- interfaces to our campus grid Fermigrid

Bilateral Interoperability Matrix

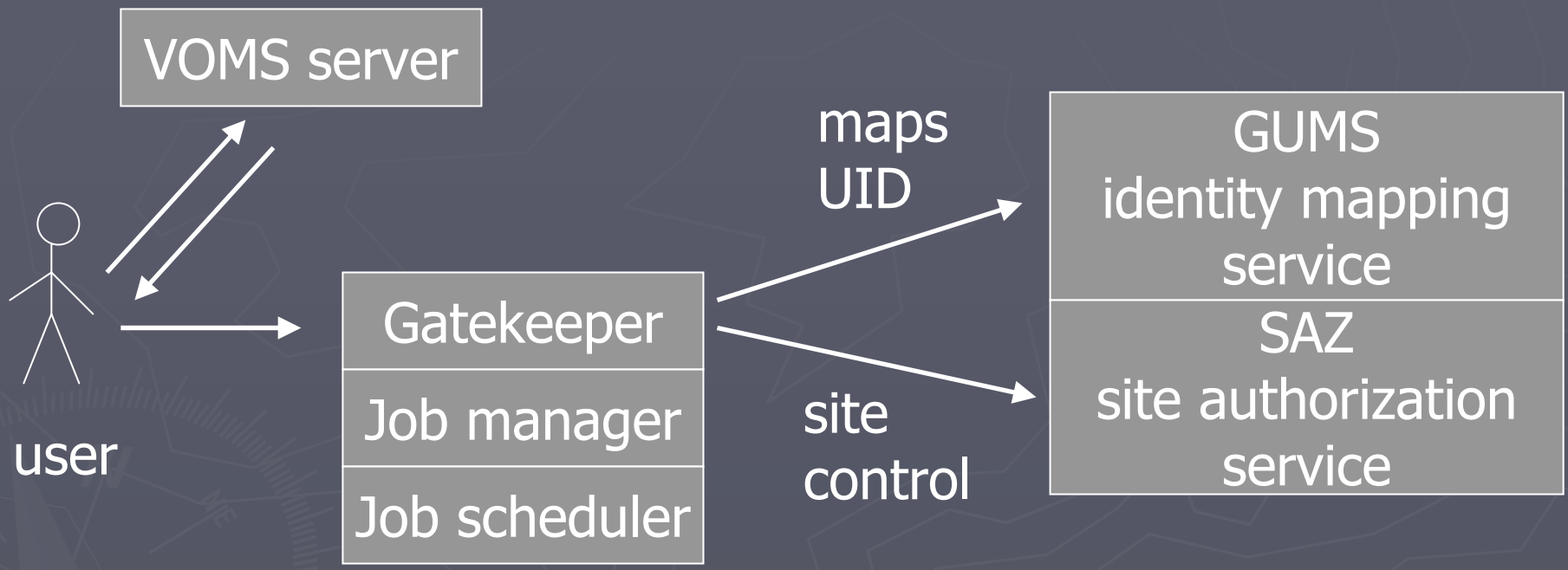
resource / stake holder	CDF	US CMS	DZero	General Purpose Farm	OSG	Fermilab Storage
CDF	√	√	X	√	progress	√
USCMS	X	√	progress	√	√	√
DZero	X	√	√	√	progress	√
GP Farm	X	√	progress	√	progress	√
OSG	X	√	progress	√	√	progress

⇒ work to do for a joint use of resource
⇒ will focus on the CDF/DZero effort which use a common data handling system

FermiGrid – 4 Components

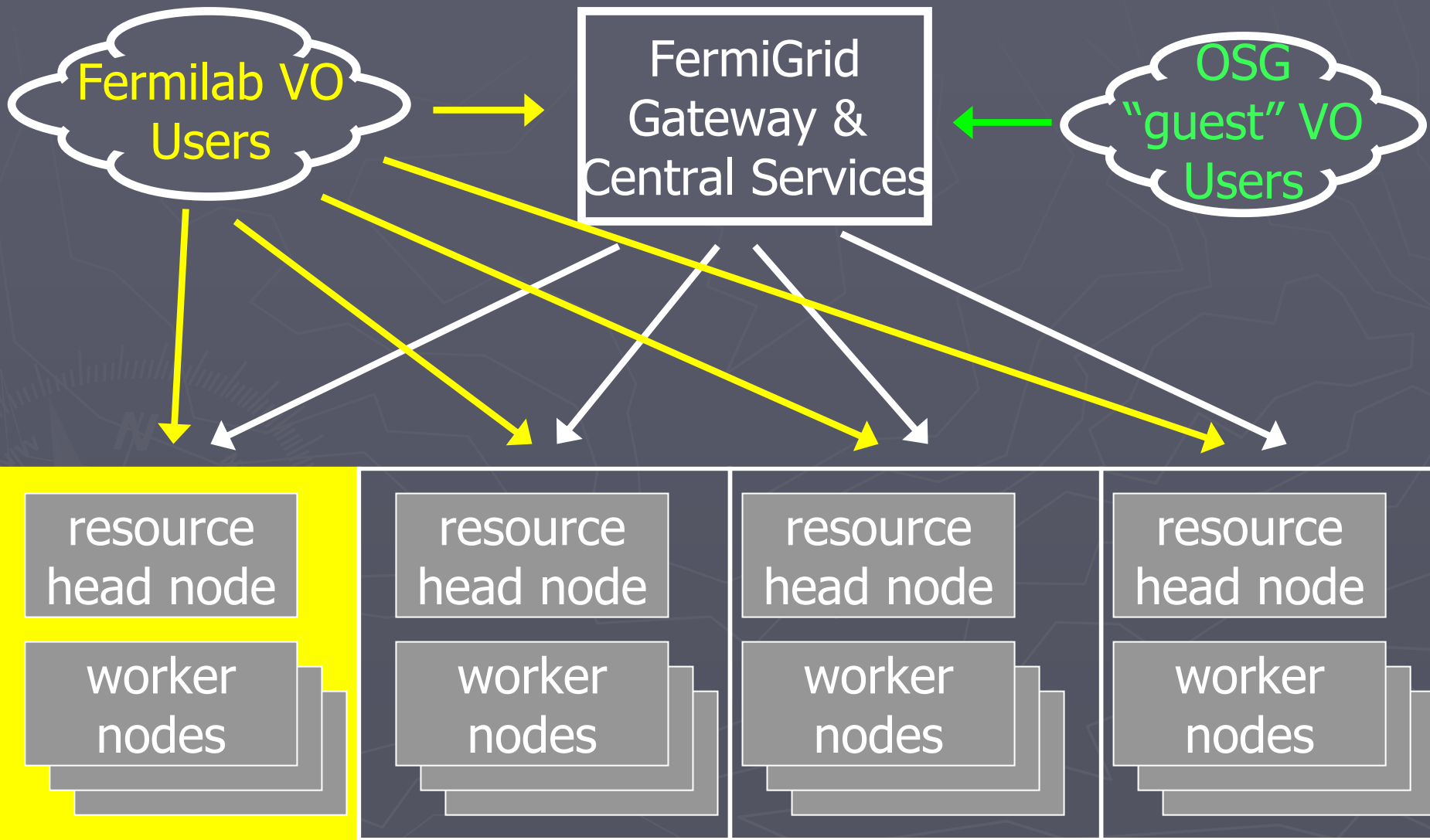
- Common Grid Services
- Fostering Stakeholder Bilateral Interoperability
- Development of Open Science Grid (OSG) Interfaces
- Exposure of the Permanent Storage System to the Open Science Grid

FermiGrid – Common Grid Services

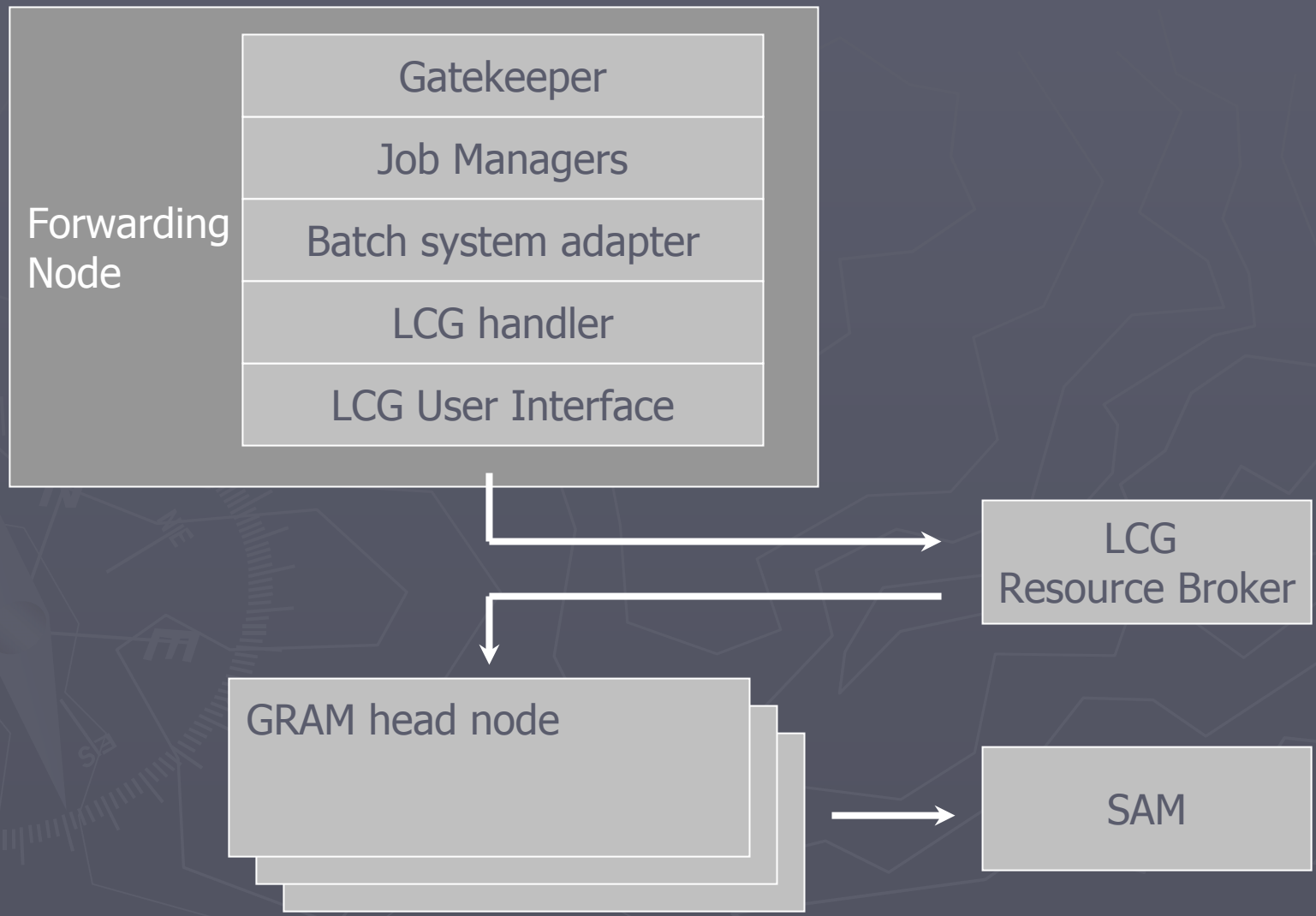


- accept jobs schedule these jobs for execution
- utilize several Common Grid Services

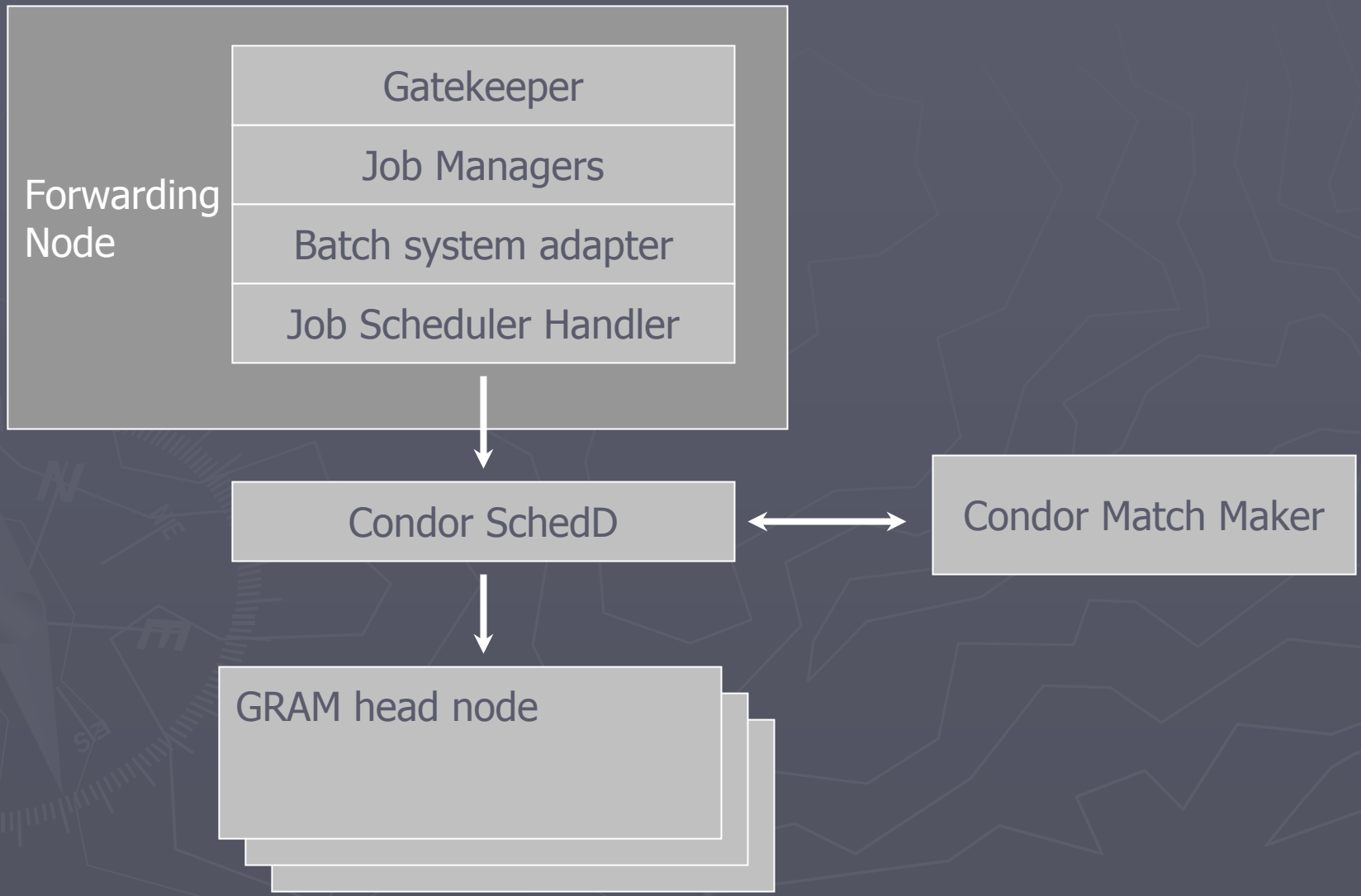
FermiGrid – stakeholder bilateral interoperability



Testbed of SAMGrid forwarding mechanism / LCG



FermiGrid: OSG gateway



FermiGrid – Milestones & Time Line

Work done:

End Feb 2005	Hardware installation
May 2005	Common Grid Services available
Summer 2005	Gridify the General Purpose Farm

Current Work:

Work with DZero to transition from static gridmap files to use FermiGrid Common Grid Services

Plans 2006:

install general purpose desktop cluster
add general availability storage
service failover

Acknowledgement

We are standing on the shoulders of giants.

Current members of the GRID development teams:
Running experiments

Krzysztof Genser	Andrew Baranovski	Steve Sherwood
Stephen White	Dehong Zhang	Rober Illingworth
Adam Lyon	Art Kreymer	Randolph Herber

Grid software

Gabriele Garzoglio	Parag Mhashilkar	Sinisa Veseli
Lauri Loebel-Carpenter		

students

Anoop Rajendra	Sudhamsh Reddy

DZero LCG integration effort
Remote SAM shifters and of course our predecessors

Additional slides

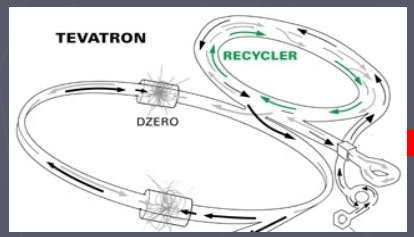
This part of the slides not officially released by Computing division, just reminder in case questions

Computing Model

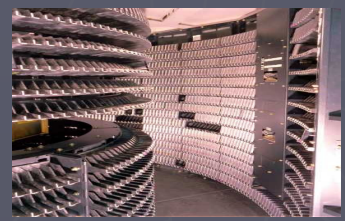
Remote Farms

Central Farms

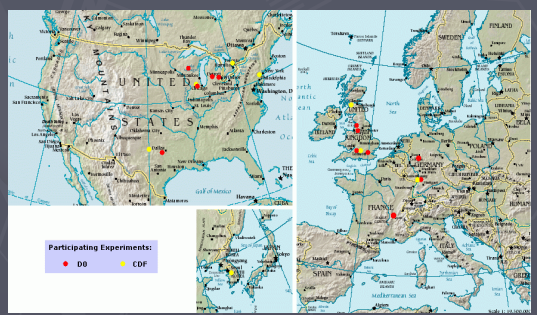
Raw Data
Reco Data
Reco MC
User Data



Data Handling Services



Central Storage



Remote Analysis Systems

Central Analysis Systems

Stakeholder of our campus grid

- running experiments: CDF and DZero
- experiment in preparation (for CERN, CH): US-CMS
- smaller experiments*: e.g. Minos
- storage systems
- OSG (Open Science Grid)

⇒ Common interfaces for stakeholders needed
⇒ Management on the level above each system
⇒ first step: SamGrid common for CDF, DZero and Minos

* From the data handling point of view

Fermilab: example of computing resources

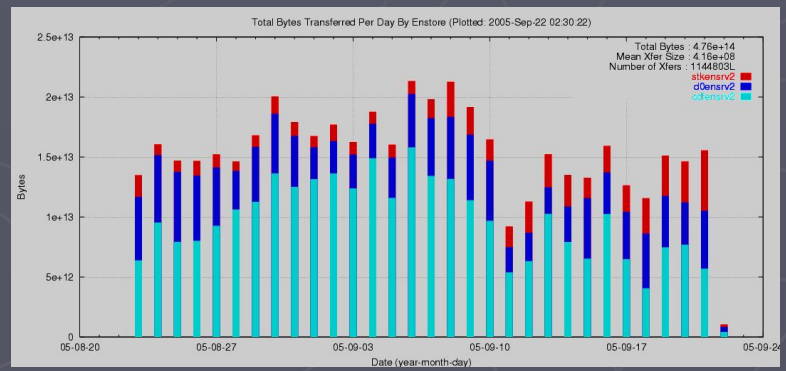
- CPU:

CDF analysis farms: 3300 GHz CPU, 370TByte disks
DZero analysis farms: 400 dual processing, however Condor system on desktops

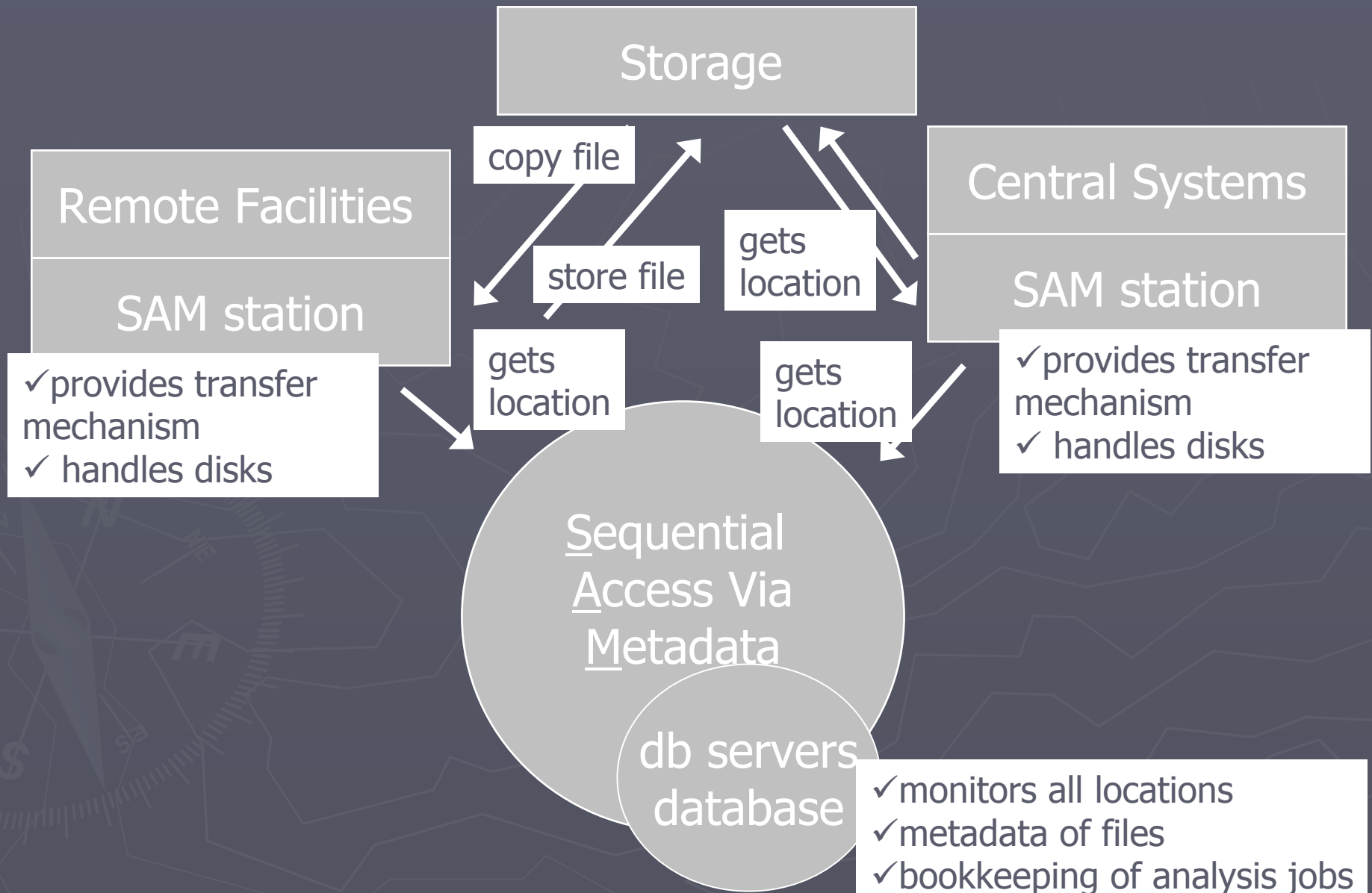
CMS Tier1 center cur.: 3000 S12K, 1100TByte disks
General Purpose Farm:

- permanent storage:

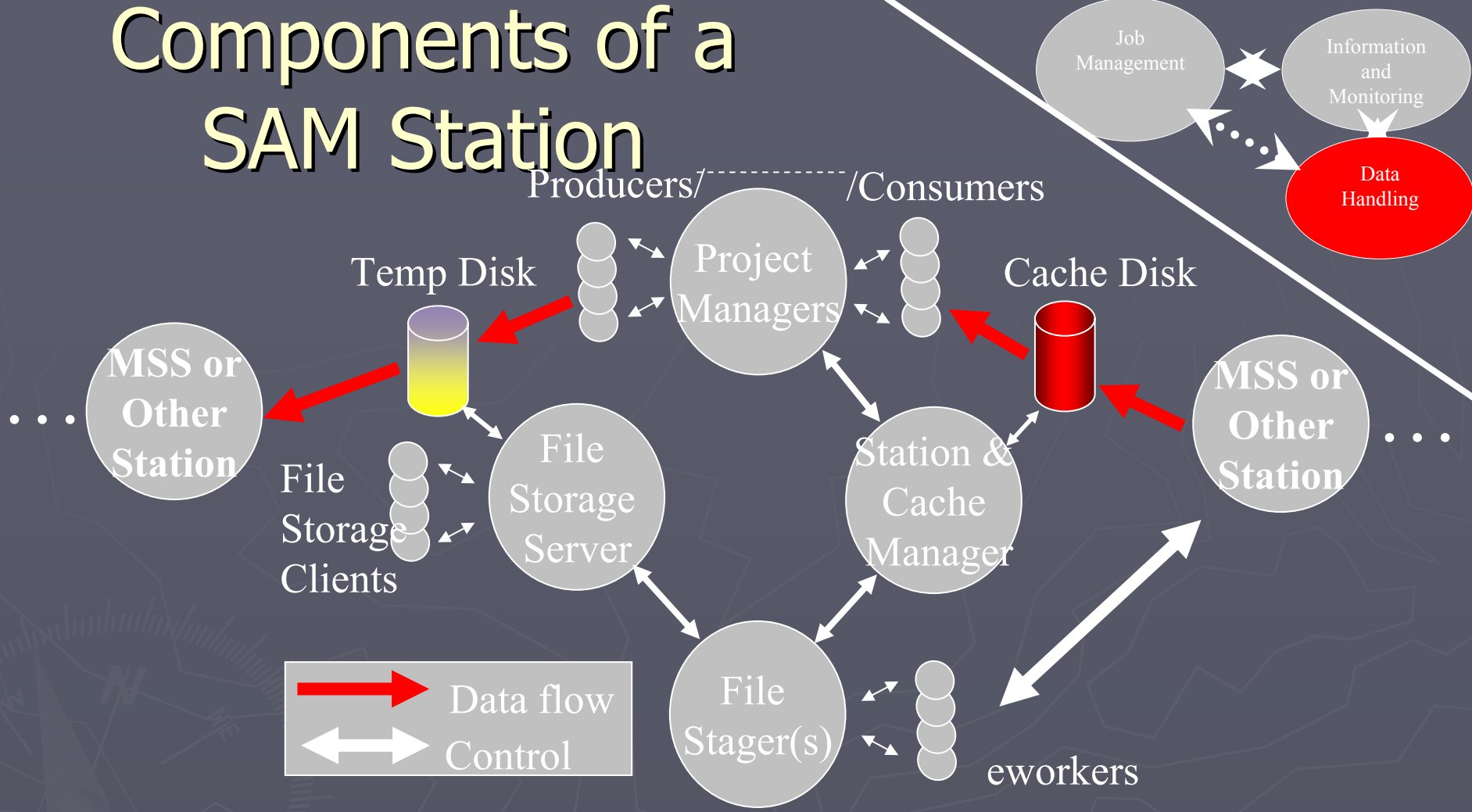
using DCache / Enstore
3PByte on tape
daily usage ~10TByte



Global Collaboration

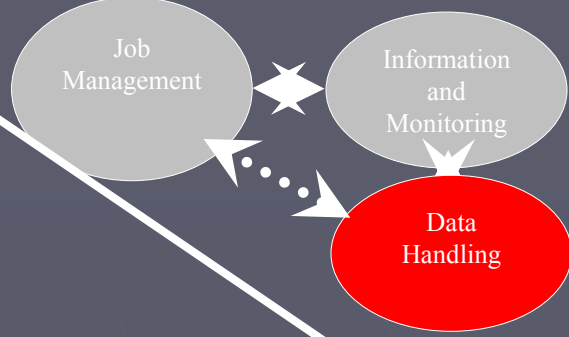


Components of a SAM Station



- SAM is a distributed data movement and management service: data replication is achieved by the use of disk caches during file routing.
- SAM is a fully functional meta-data catalog.

Global Collaboration



Central Storage

✓ dCache: developed in collaboration with DESY (Hamburg)
✓ enstore robots

Remote Facilities

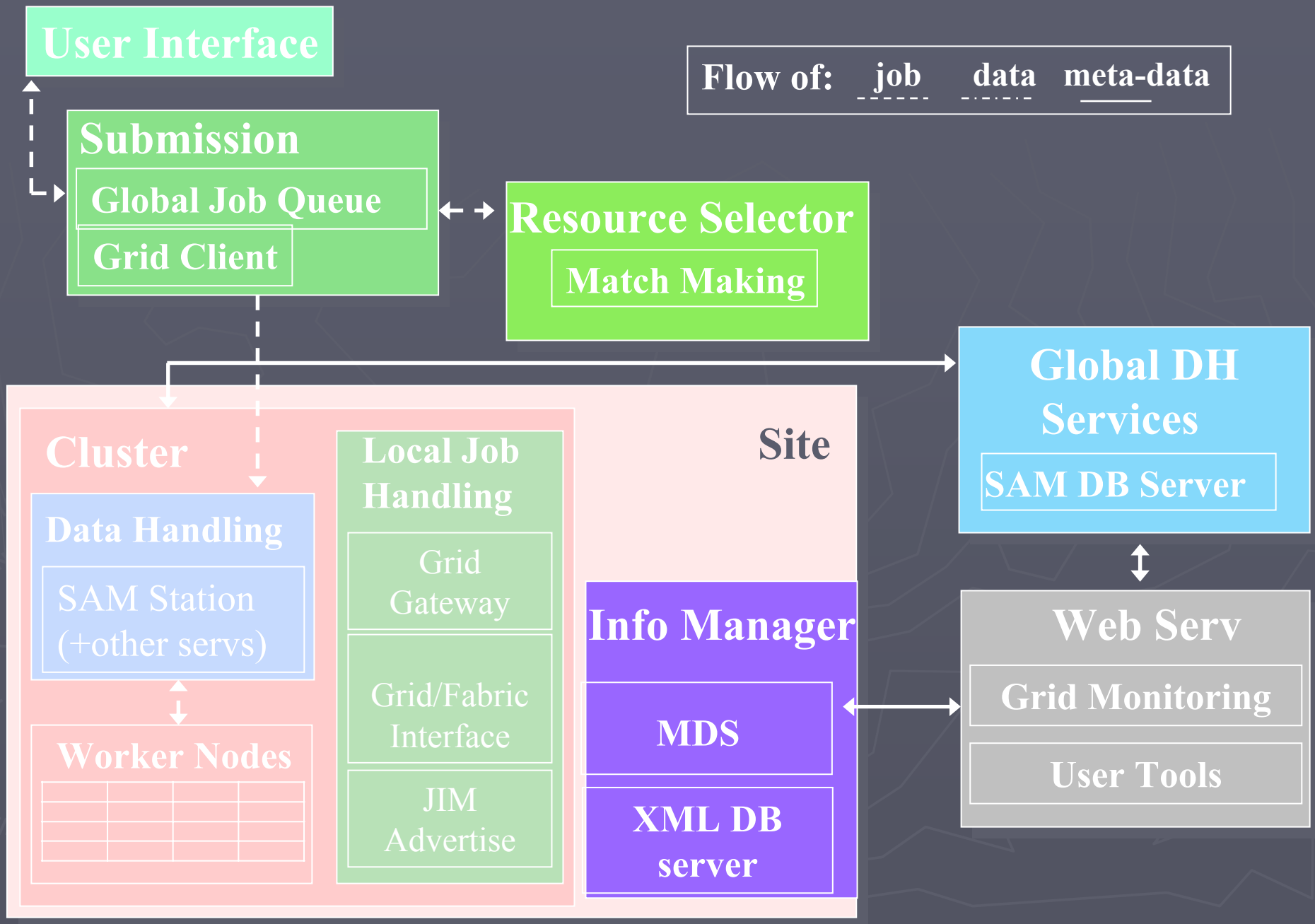
✓provides user analysis, MC generation, reprocessing for DZero
✓ different stages of services: for users at own institutes, for users of own experiment, opportunistic use of GRID systems

Central Systems

✓ still major facilities for user analysis
✓ CDF: 1000 GHz CPU, DZero: .....
✓ CDF: reprocessing farms

Sequential Access Via Metadata & Job&Information Monitoring

SAM-Grid Diagram



CAF for CDF

- Condor batch system
- kerberos authentification
- input/output tarball
- new development: use Condor-Glideins (condor_g)

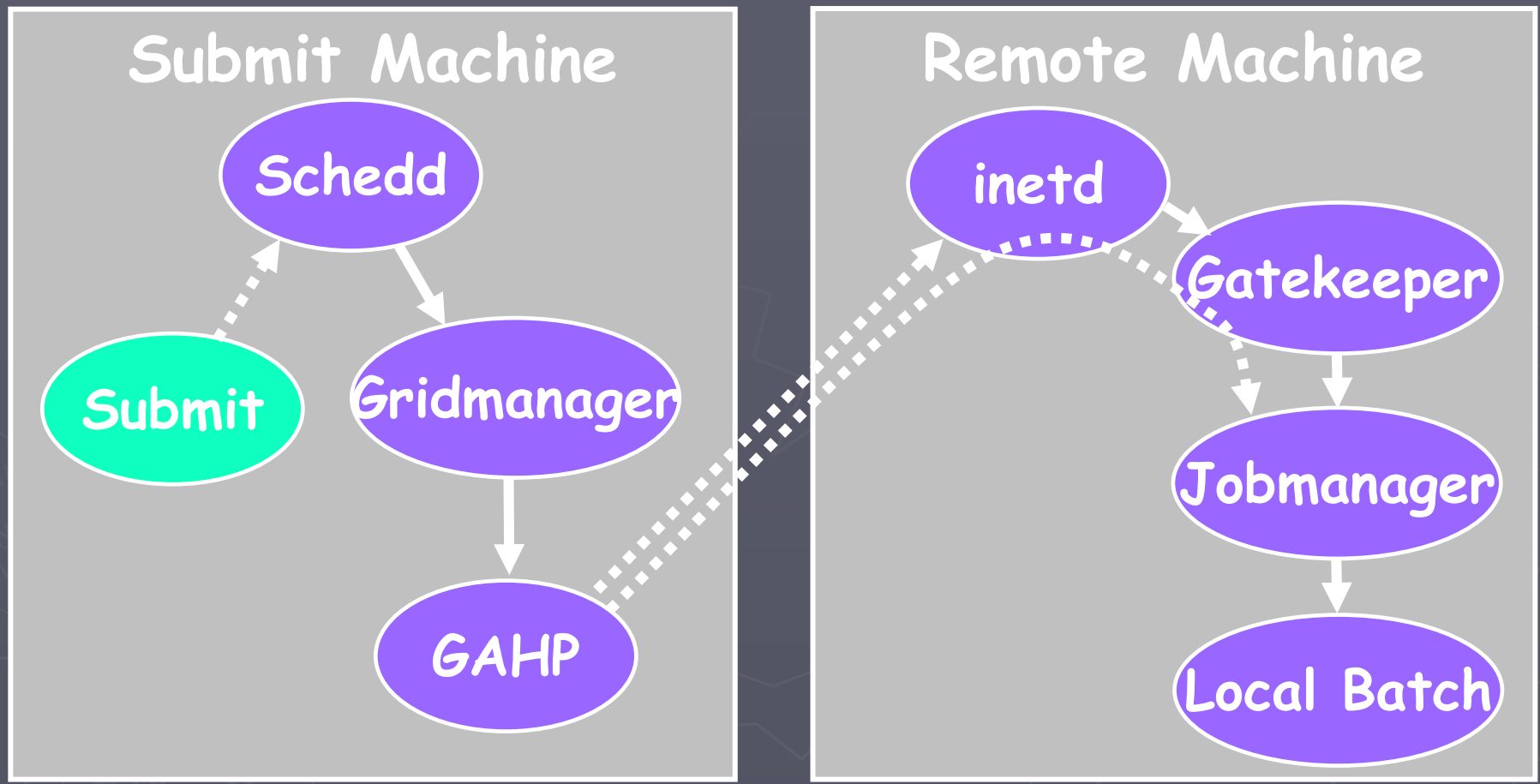
⇒ utilization of LCG resource possible without software installations on worker nodes

⇒ still CDF software needs to be around but very flexible for users, authorization a bit awkward

⇒ at the moment no thoughts of interoperability

⇒ very good monitoring available

Condor-G to Globus 2



CDF deployment challenges

	CDF requirements / s	DZero max / s
project starts	1	0.01
process starts	1	0.09
file delivery	8	0.44
file storage	50	0.01

DZero started with SAMGrid as sole data handling (DH) system

⇒DH was allowed evolution

CDF had another DH system

⇒specific requirements on SAM for the central systems

⇒ lesson learnt: hard to change DH system on the fly

Monitoring and Information: the glue