

Sam and Grid developments

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Outline

- Introduction to SAM
- SAM and DZero
- The commissioning of SAM for CDF
- SAM and the Grid

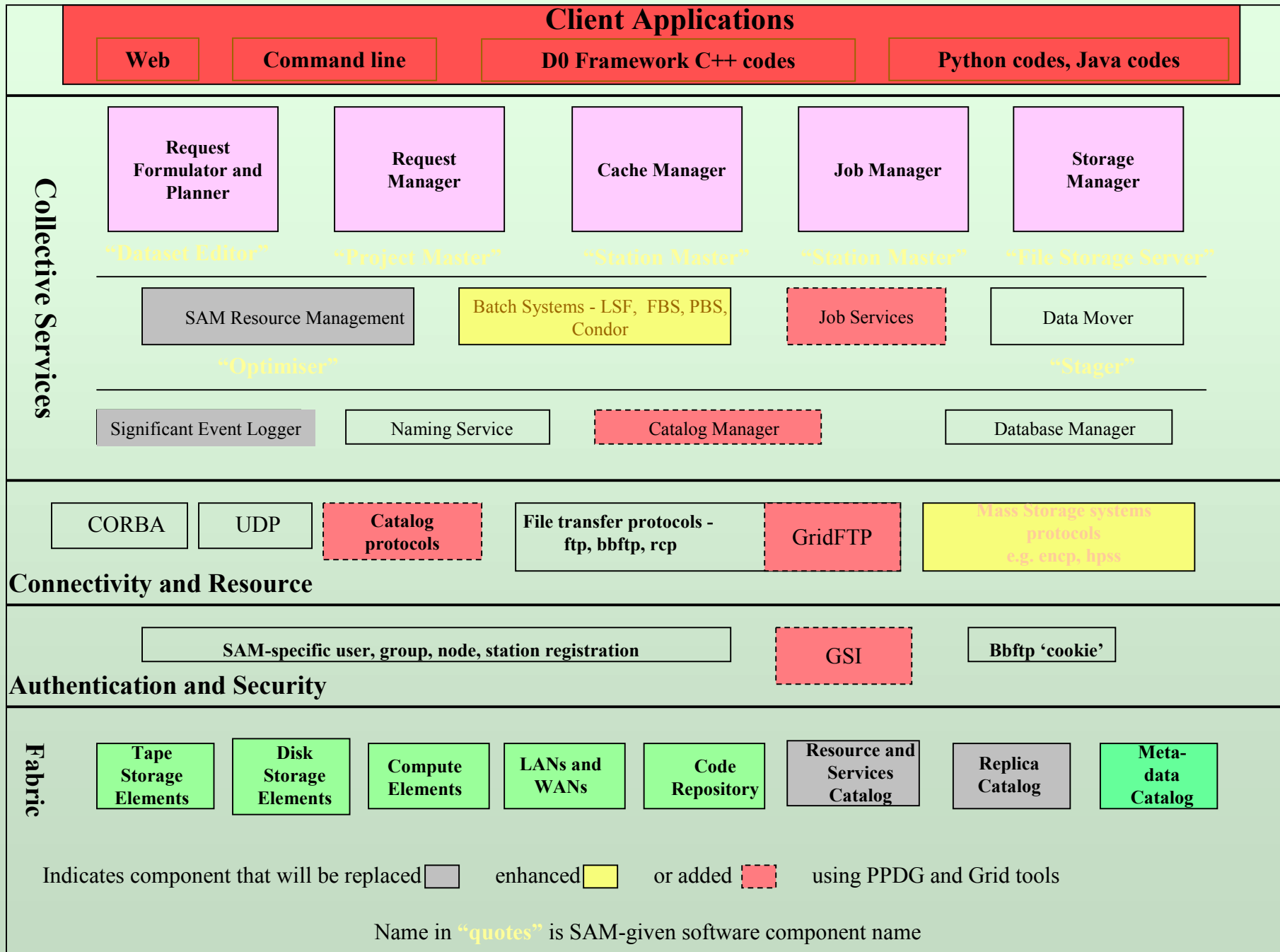
Introduction to SAM

History

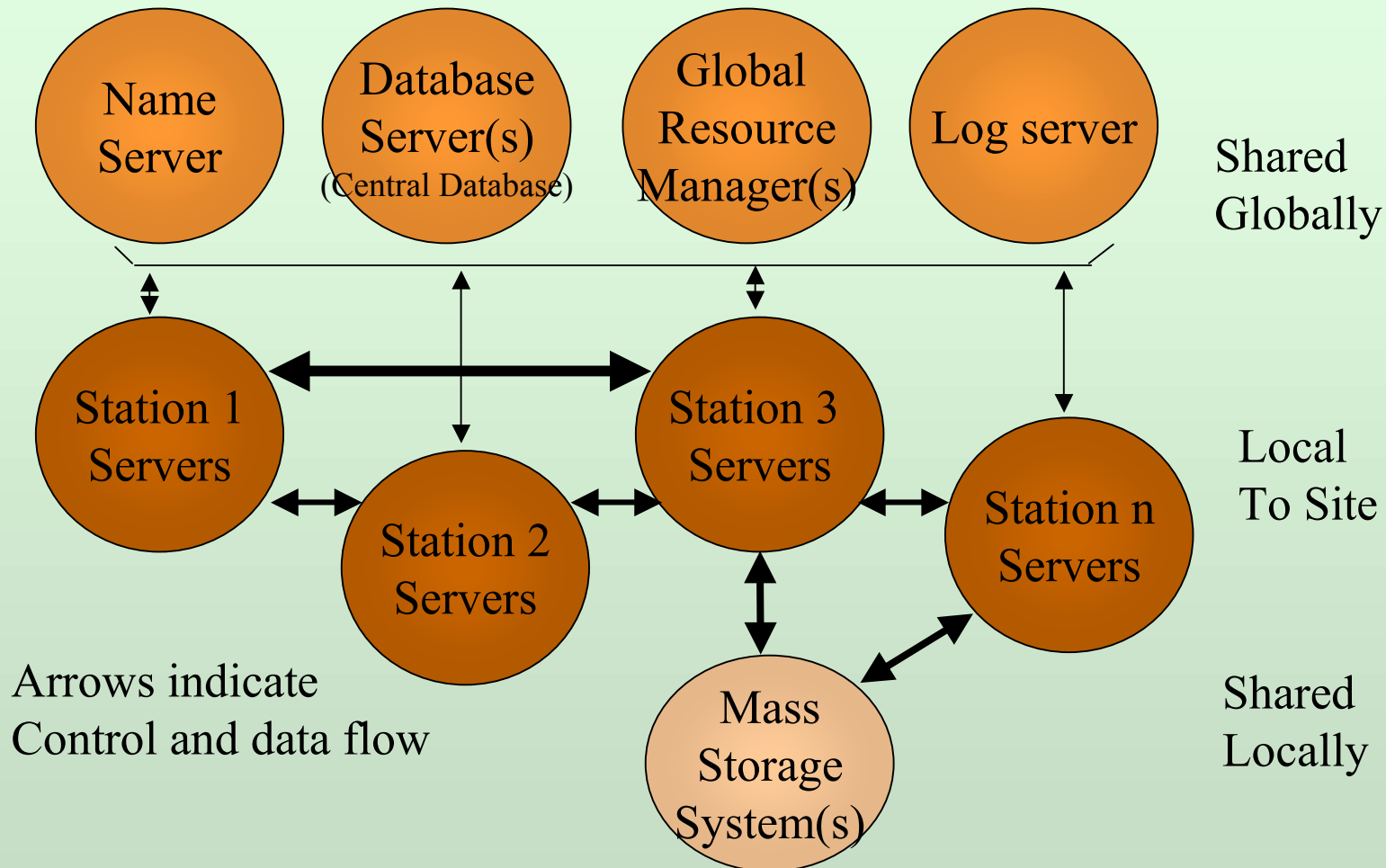
- SAM is Sequential data Access via Meta-data
- Project started in 1997 as a CD/DZero joint project to handle DZero's needs for Run II data system.
- DZero is now completely integrated with the SAM Data Handling System.
- CDF started the evaluation of SAM in Dec 2001; more resources have been dedicated to the commissioning during the last month.
- <http://d0db.fnal.gov/sam>
- <http://runIIcomputing.fnal.gov>

The SAM Architecture

- SAM is a vertically integrated system: its components span throughout all the layers of a standard Grid diagram
- SAM is a Grid-enabled system

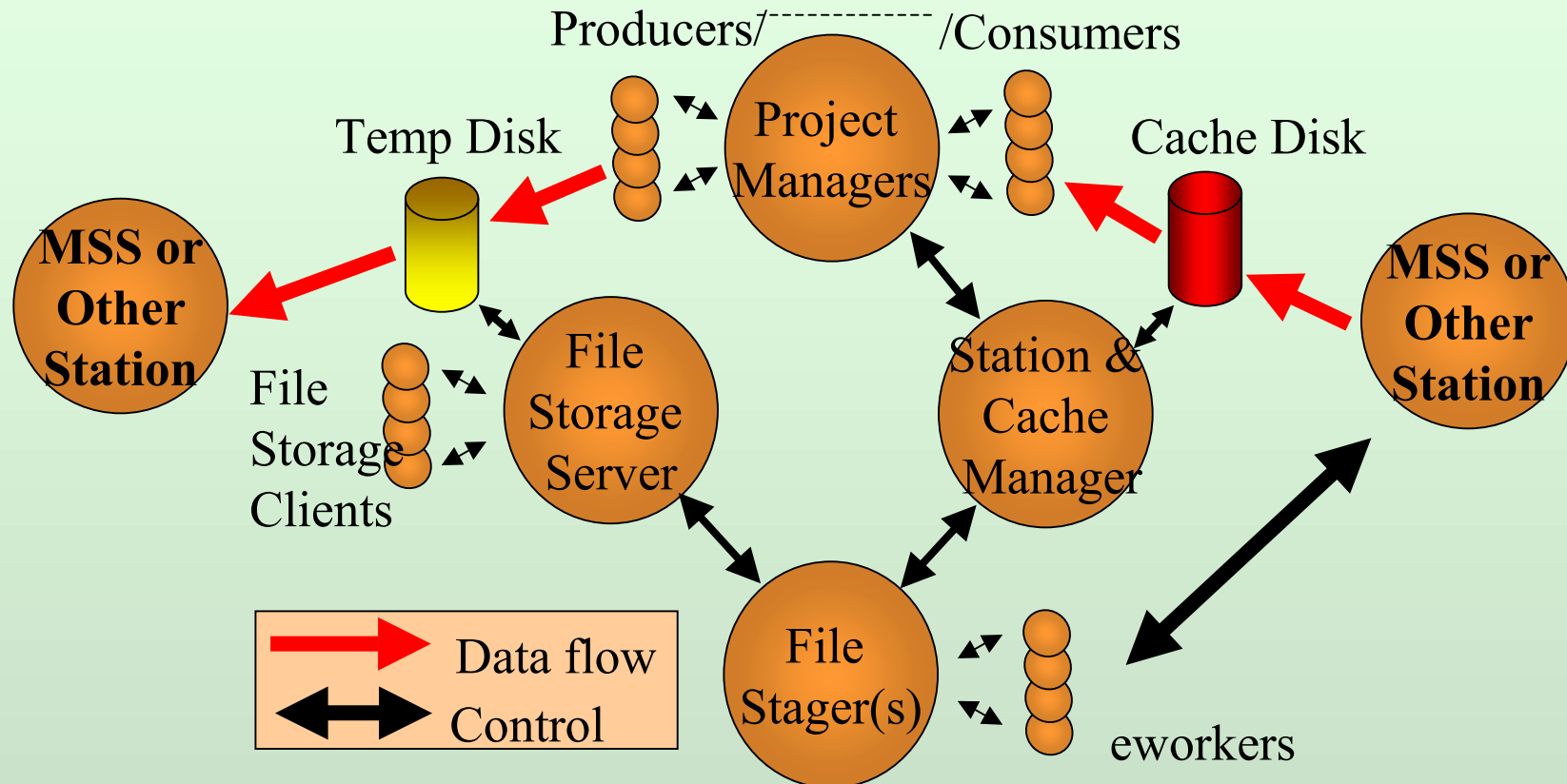


SAM as a Distributed System



- A Station is a collection of resources controlled by the SAM system.

Components of a SAM Station

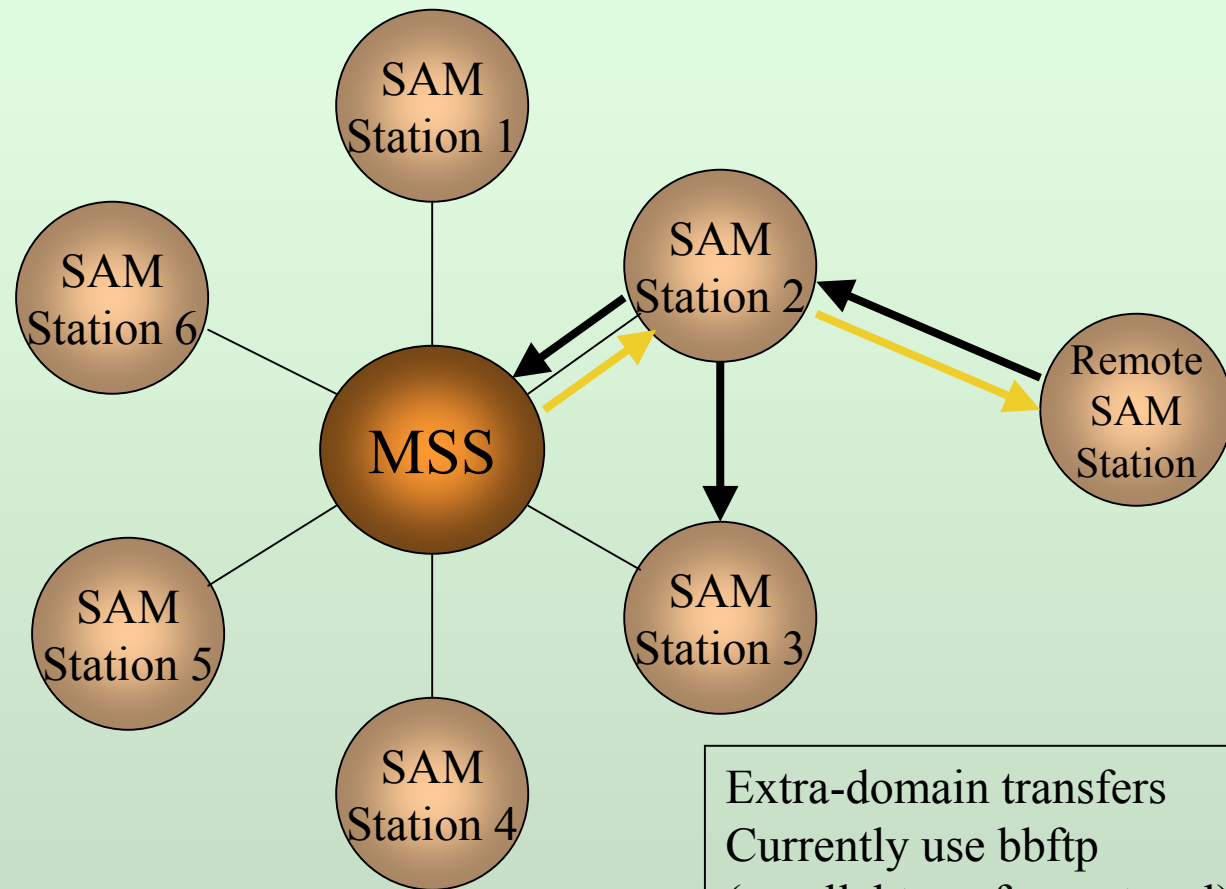


- SAM manages data replication by the use of disk caches.
- EVERY file in SAM is fully characterized by the use of meta-data (reproducibility, data identification, bookkeeping,...).

Data to and from Remote Sites

Station Configuration

- Replica location
 - Prefer
 - Avoid
- Forwarding
 - File stores can be forwarded through other stations
- Routing (now)
 - Parasitic Stagers on D0mino
 - Working for Imperial, Lancaster, BU, Arizona, Wuppertal, Columbia
 - Direct file retrieval via DCache



Current status of SAM at DZero

SAM usage statistics for DZero

- 497 registered SAM users in production
 - 360 of them have at some time run at least one SAM project
 - 132 of them have run more than 100 SAM projects
 - 323 of them have run a SAM project at some time in the past year
 - 195 of them have run a SAM project in the past 2 months
- 340 registered nodes at two dozen stations
- 197,119 cached files on disk somewhere
- 668,490 data files known to SAM (409,087 actually stored)
 - 88,597 raw file
 - 181,414 reconstructed files
 - 86,733 root-tuple files
 - 293,041 montecarlo related files

How physicists use SAM to do physics

Central Analysis Configuration

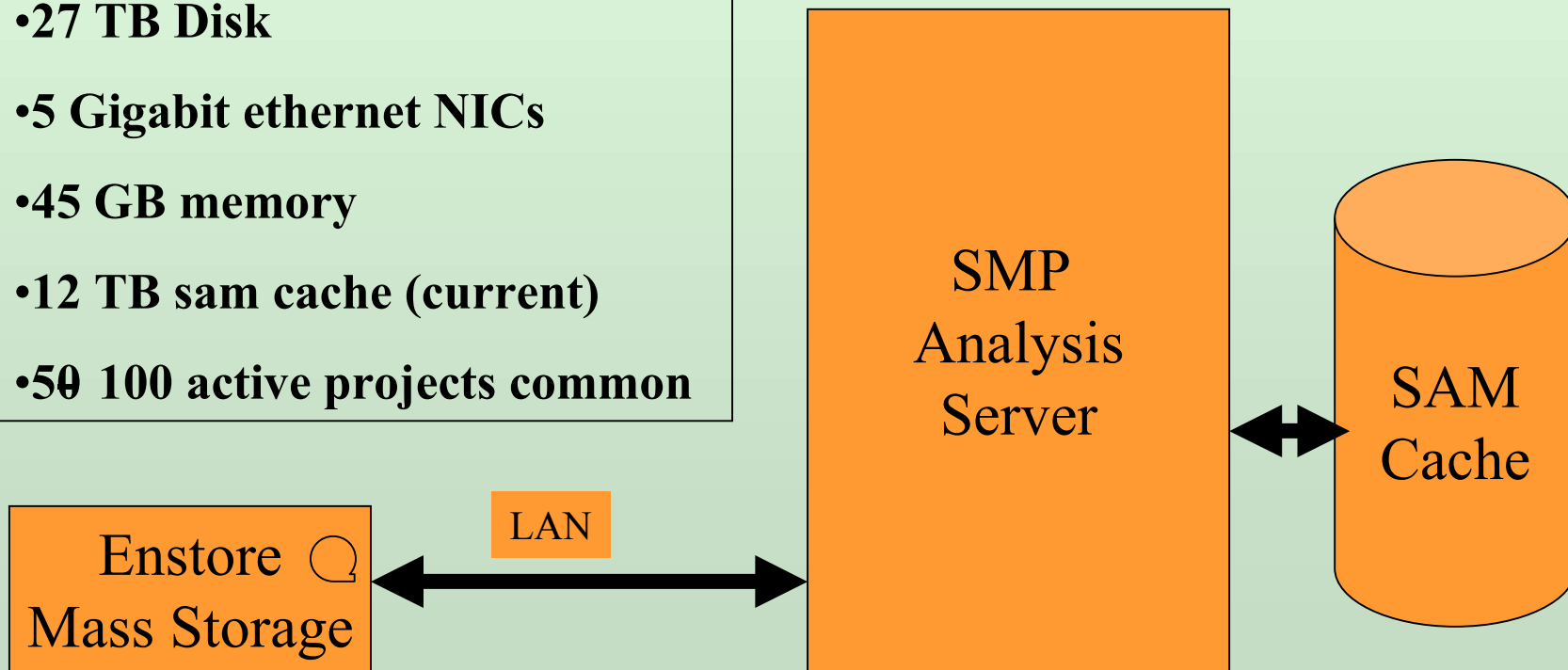
- 176 processor SGI O2000
- 27 TB Disk
- 5 Gigabit ethernet NICs
- 45 GB memory
- 12 TB sam cache (current)
- 50 100 active projects common

Enstore 
Mass Storage

LAN

SMP
Analysis
Server

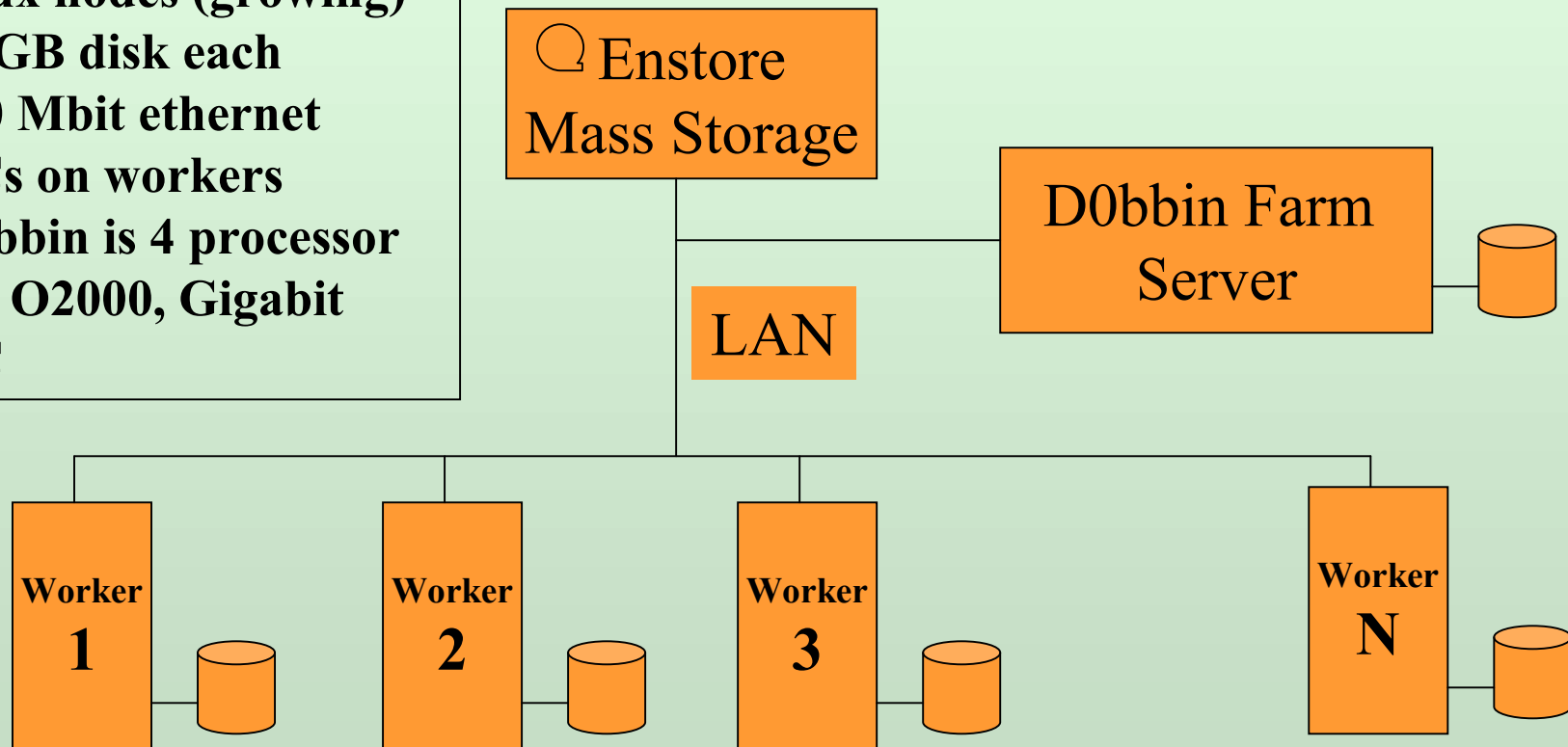
SAM
Cache



How physicists use SAM to do physics

Distributed Reconstruction Farm Configuration

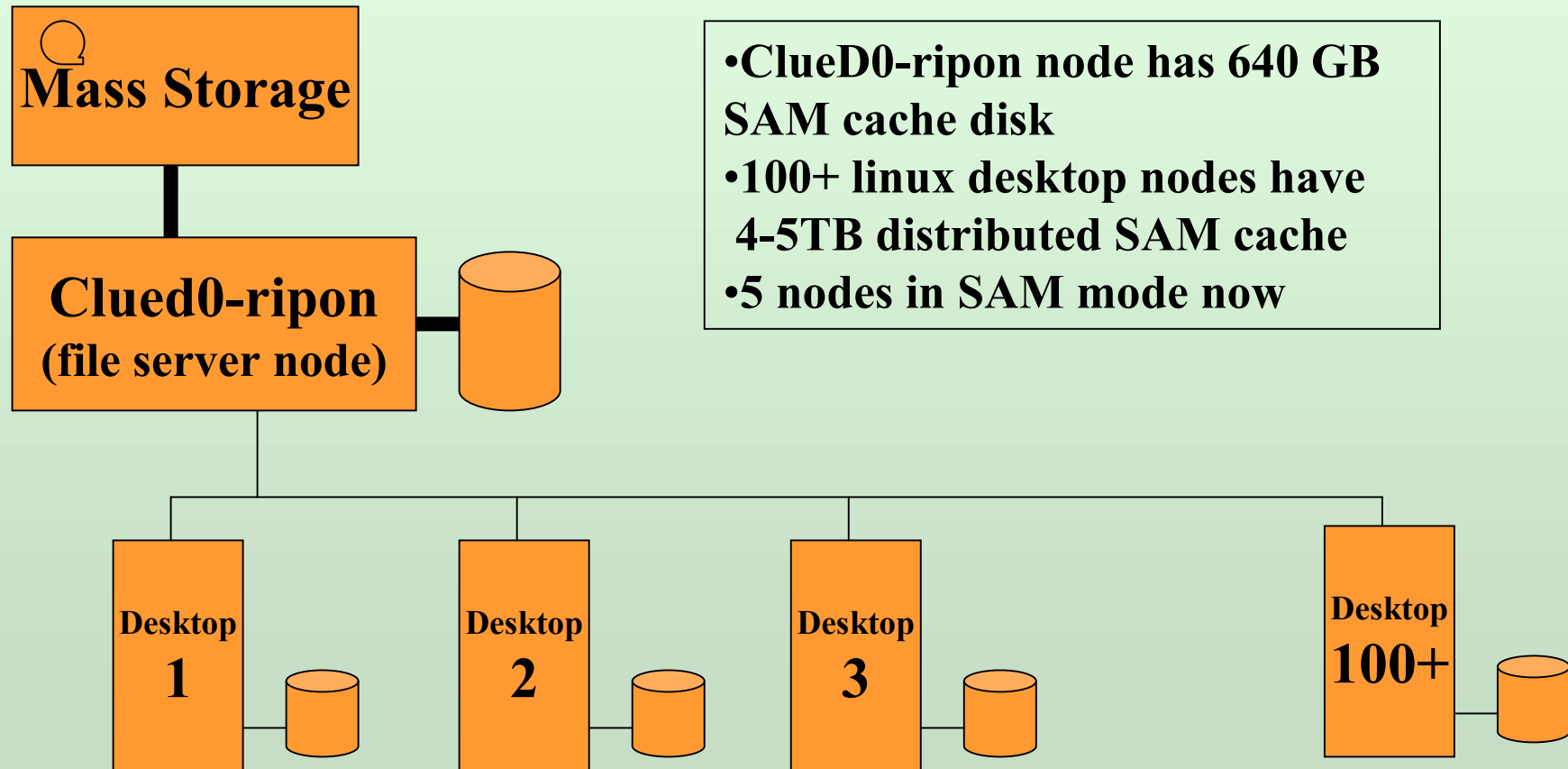
- 90 dual processor Linux nodes (growing)
- 30 GB disk each
- 100 Mbit ethernet NICs on workers
- D0bbin is 4 processor SGI O2000, Gigabit NIC



No disks are cross mounted. Worker nodes get files directly from MSS via encp. Data is moved by SAM using rcp from where it is cached to where it is needed.

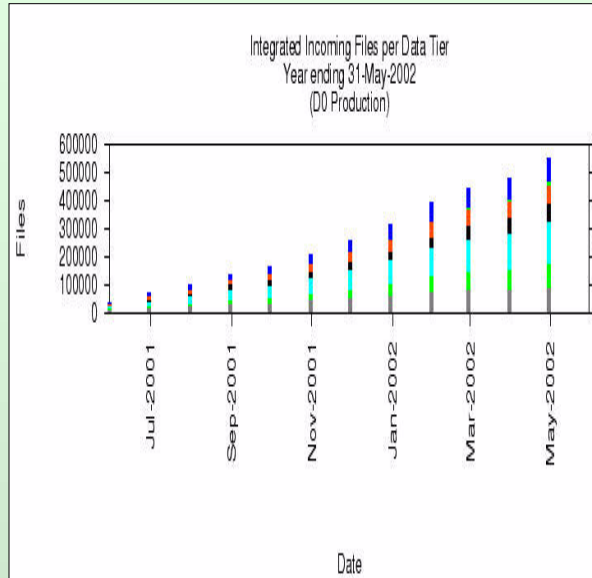
How physicists use SAM to do physics

Distributed Analysis Cluster Configuration

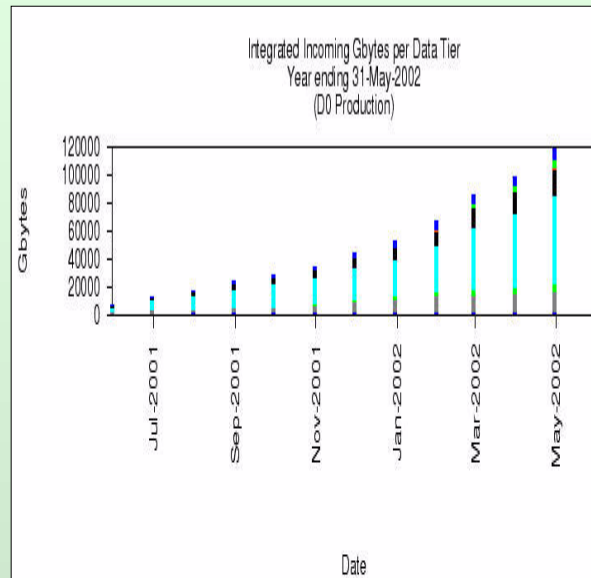


All (tape) data enters the ClueD0 station through the main file server node ClueD0-ripon. The station migrates data as needed and manages the cache distributed among desktop constituents.

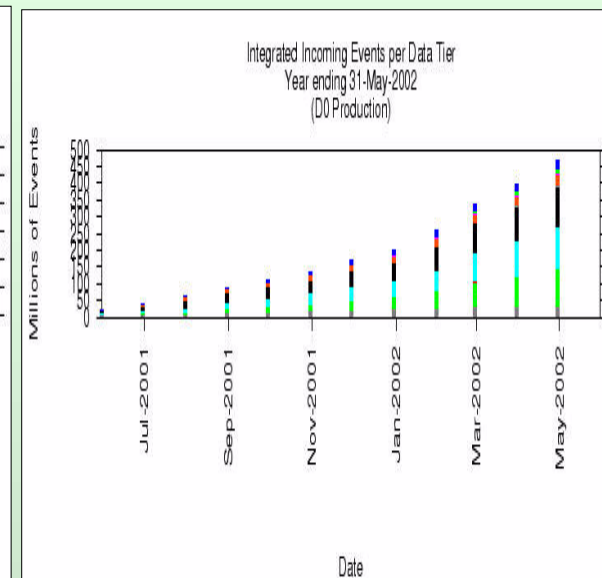
Data Stored in SAM last 12 Months



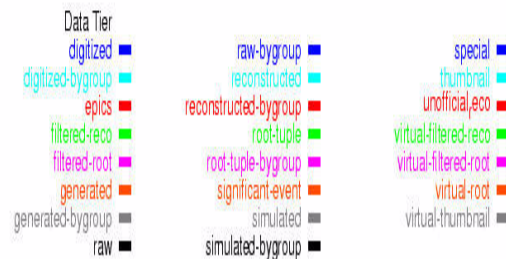
Number of Files
550,000



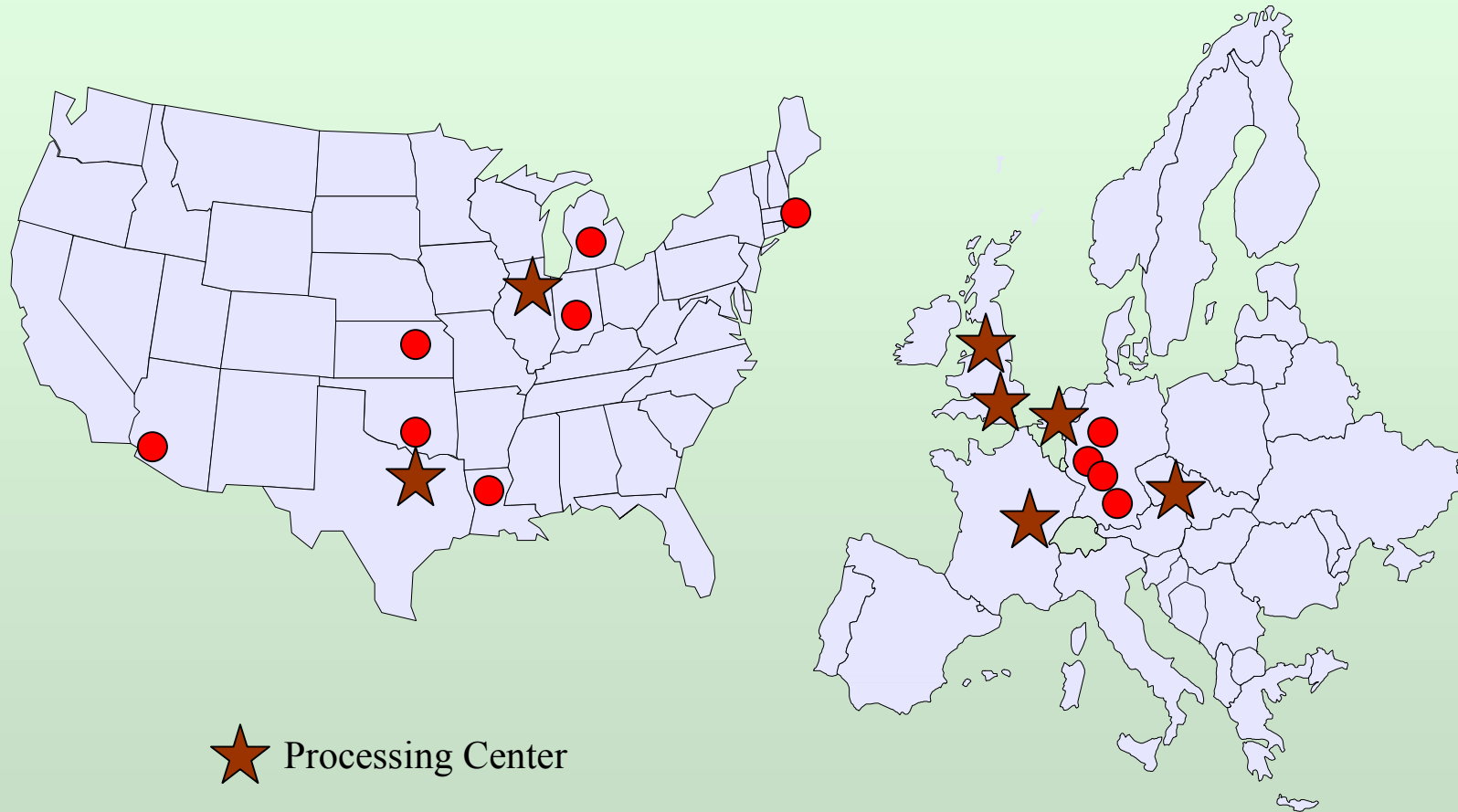
Data Size
120 TB



Number of Events
470M
(~140M RAW)



DZero SAM Deployment Map



★ Processing Center

● Analysis site

The commissioning of SAM for CDF

The Commissioning Project

- **History**

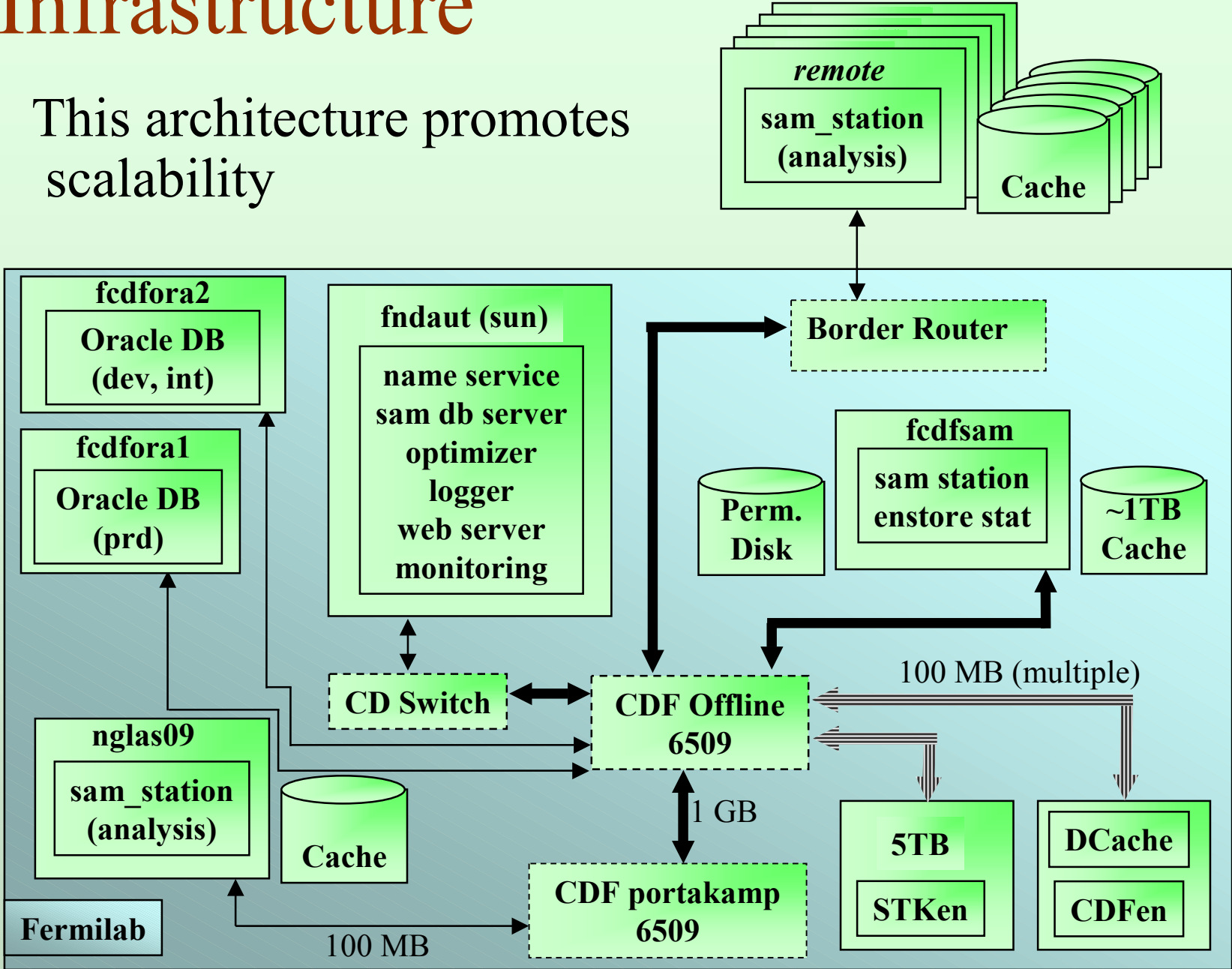
- CDF started the evaluation of SAM at the end of year 2001
- During the last months more CD/DZero/CDF efforts have been committed.

- **Goals of the Commissioning Project**

- supporting 5 groups for data analysis
- enabling access to datasets of interest
- production availability of the systems
- limited impact on CDF enstore

Infrastructure

- This architecture promotes scalability



Status

- Hardware and Software infrastructure in place
- Translation of the CDF DFC in production on Monday June 3.
- Developed AC++ interfaces to SAM to retrieve and analyze files. Automatic output to SAM not ready, yet.
- Enabled access to DCache.
- Deploying to test sites to sort out configuration issues.
- Test users in UK, Italy and US are starting to use SAM to do physics.

Open Question

(outside the scope of this review)

- The SAM infrastructure needs to be maintained.
- People from DZero and CD have worked to set up the commissioning infrastructure for CDF.
- CDF needs to dedicate FTEs to SAM.
- If more users want to join the commissioning infrastructure, need more hardware, software upgrades (licenses).

My hopes for the future

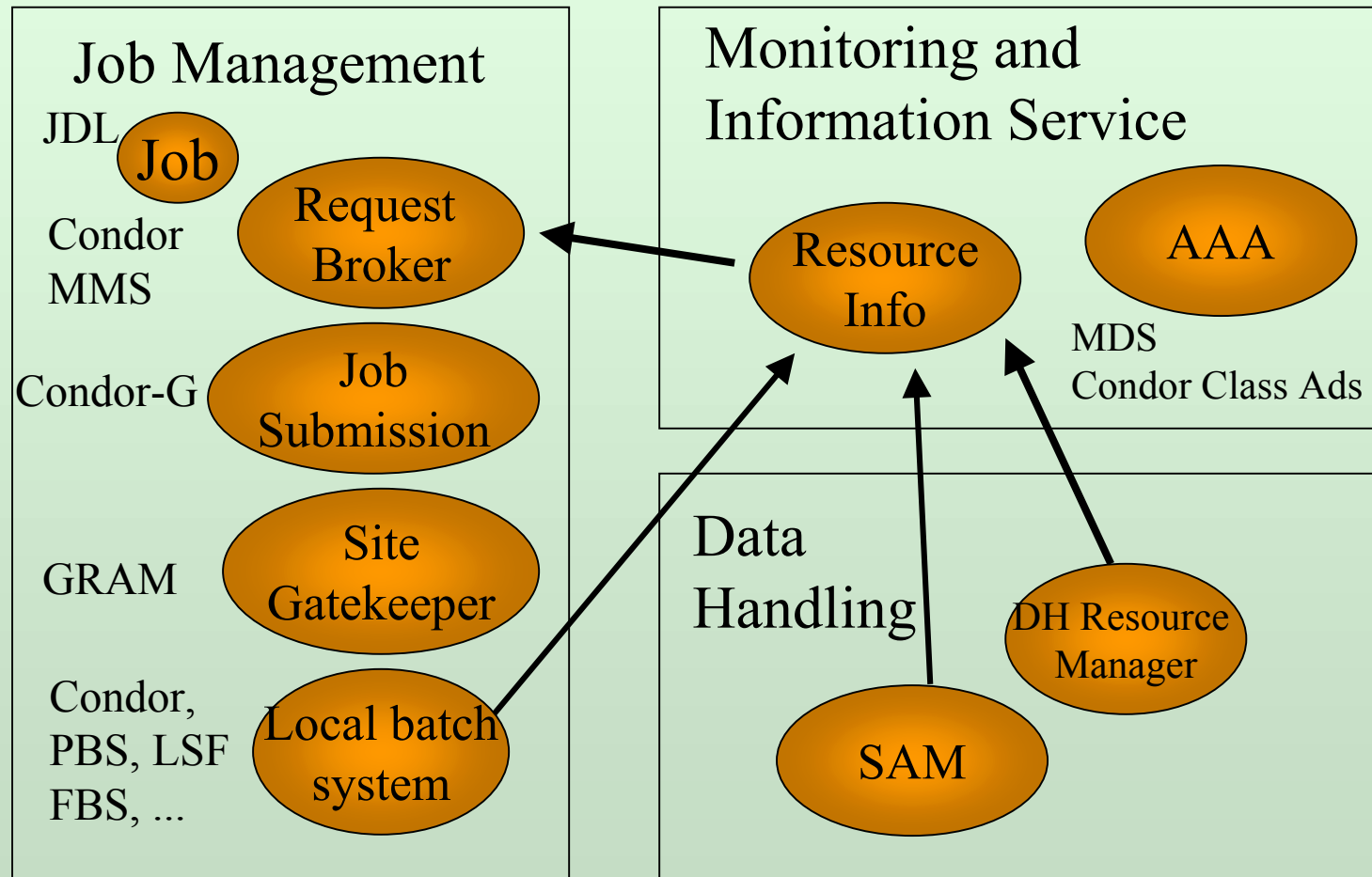
- In order to enable CDF to use SAM, some modifications/additions have been implemented. For the rest of the commissioning phase, CDF should not ask to use features that are not already available in SAM.
- In the longer term, CDF will contribute with manpower to the SAM project with operators, developers, coordinators... and experiment specific requests will be more easily addressed.
- The SAM development should continue as a single project.

SAM and the Grid

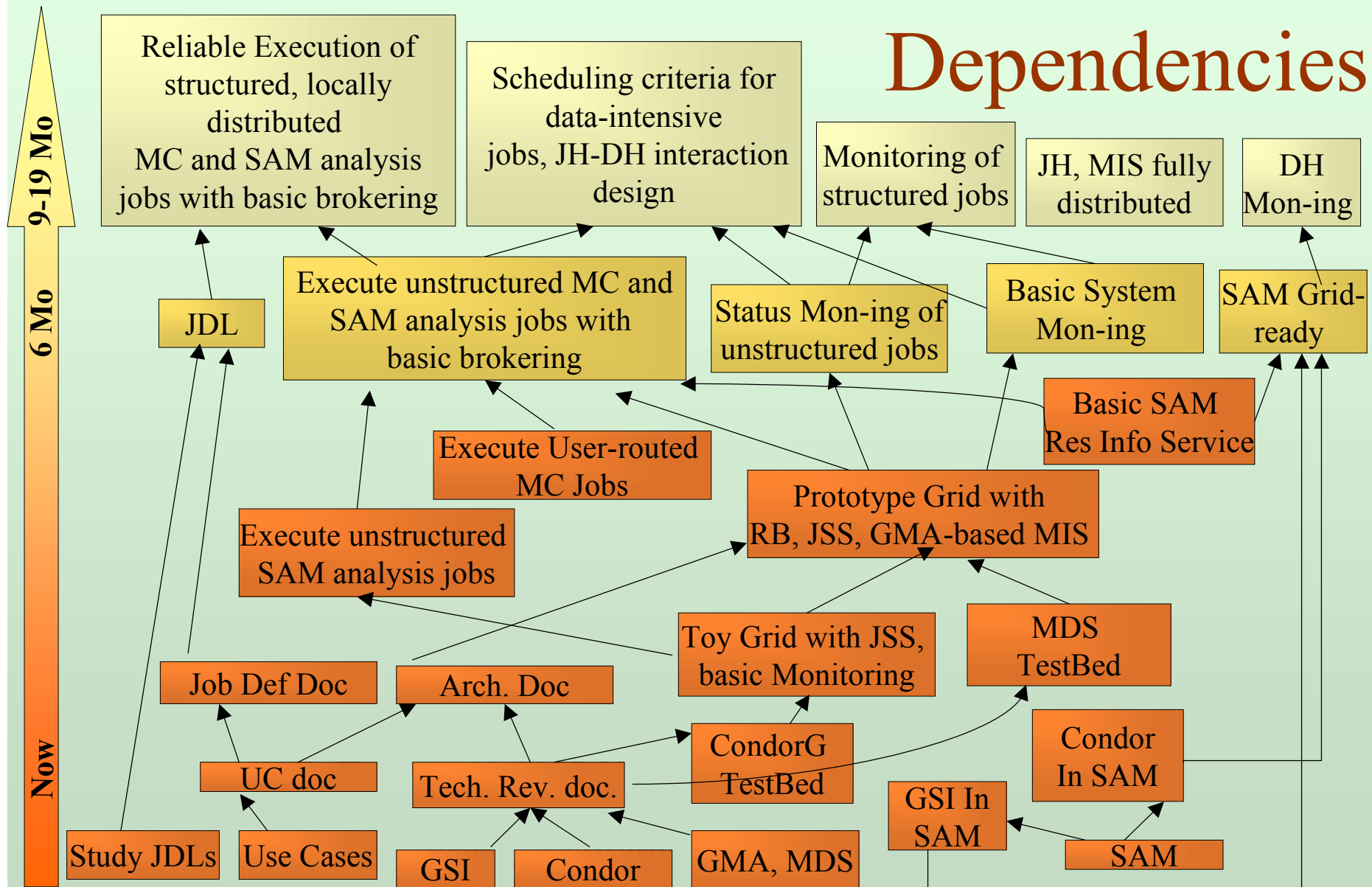
The Goal

- Enable fully distributed computing for the **experiments** (DZero and CDF), by enhancing SAM as the distributed data handling system, incorporating standard Grid tools and protocols, and developing new solutions for Grid computing, in a secure and accountable environment.
- The SAM griddification is funded by PPDG and GridPP. Among the collaborators we are working with, there is the Condor Team (via PPDG) and Imperial College (via GridPP)
- We are collaborating with other groups working on Grid technologies as well (EDG among them).
- We started holding weekly CDF/DZero joint grid meeting
- We promote interoperability and code reuse (via modularization).

Components layout for the SAM girdification



The Milestones Dependencies



Goals

- Reliable Execution of structured, locally distributed Monte Carlo and SAM analysis jobs with basic brokering
- Scheduling criteria for data-intensive jobs, full Job Handling – Data Handling interaction
- Monitoring of structured jobs
- Data Handling Monitoring
- Job Handling, Monitoring and Information Services fully distributed

Conclusions

- SAM is the Data Handling System of the DZero experiment and in phase of commissioning for CDF.
- SAM is in the process of being integrated with standard Grid technologies, in order to enable fully distributed computing for DZero and CDF.
- We are funded by PPDG and GridPP and we collaborate with Grid groups in US and EU to best tailor and develop the technologies for the experiments.