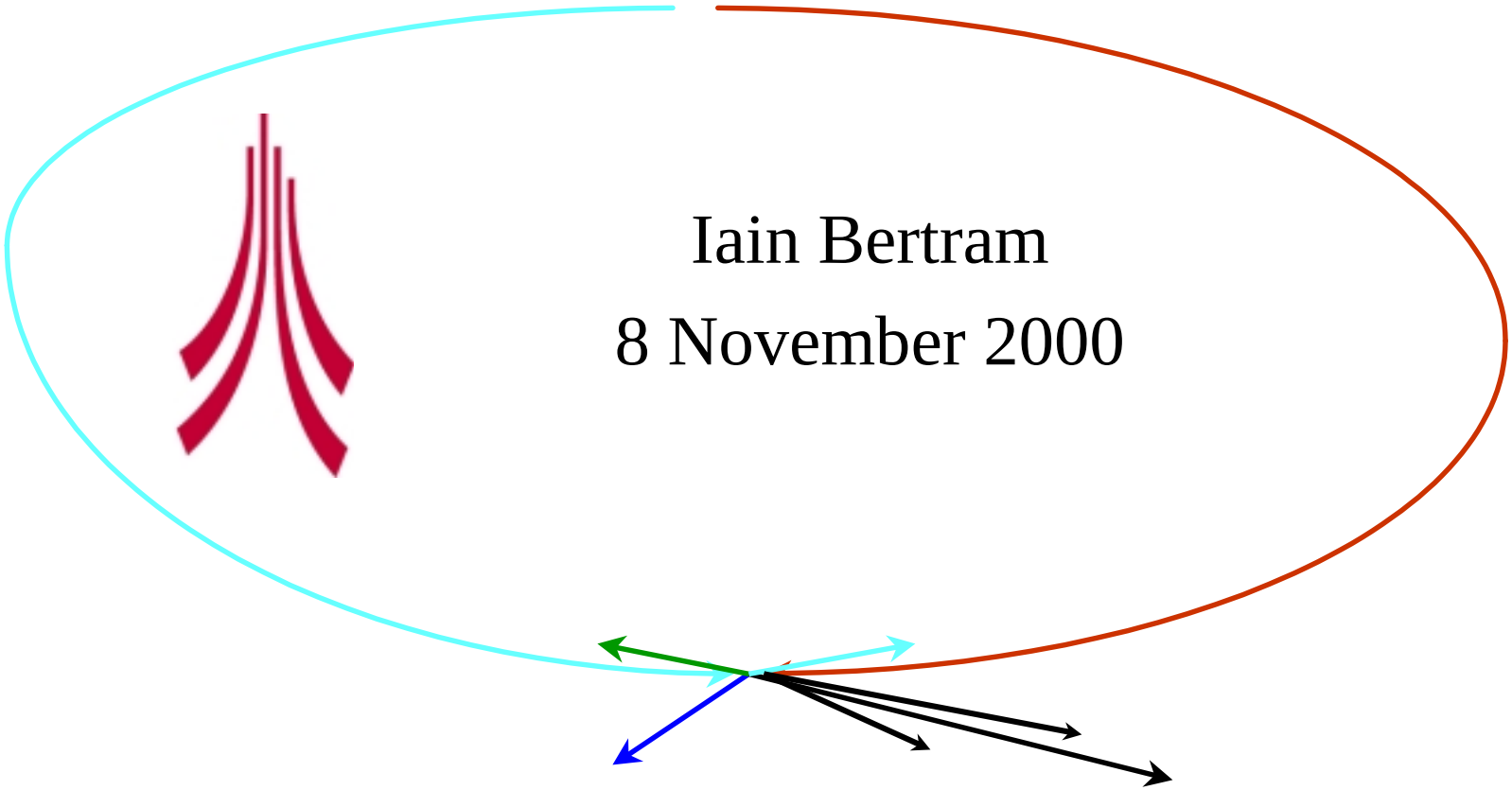
Computing plans from UKDØ.



Iain Bertram

8 November 2000

DØ Computing Platform

- Two supported operating Systems
  - IRIX
  - Linux (Fermilab version of Redhat 6.1, 7.0 under development)
- New Detector – New Experiment – New Code
  - Fully Object Orientated C++.
    - Required Commercial Compiler (KAI) due to C++ ANSII compliance.
    - Code Framework based on SoftRelTools (Portable)
    - Standard Event Data Model and access framework built.
    - Complete DØ code structure successfully imported to UK.
- Data Analysis Tool - Root

DØ Data Storage

- Data Interface via SAM model (see later).
- Data Storage Format – EVPACK
  - DØOM Front End Interface to allow change of storage media and interface with databases.
  - Based on DSPACK (NA49)
  - Self describing data
- Metadata Storage
  - Luminosity, Event Catalogues, Triggers, Run Conditions, Calibration.
  - Oracle Relational Database.
  - Export Format still under consideration, combination EVPACK, FLAT files, or network access to central site.

DØ Data Samples

- DØ begins data taking 1 March 2001.

Trigger Rate	50 Hz (20 Hz DC)
Raw Data Size	250 kb
Raw Data Storage	~150 TB/year
(Run 1 Storage)	~60 TB
Events/day	~2 Mevents

- Require ~250 CPU's to keep up with data processing (Will have 200-400 processors at FNAL).

Data Analysis

- Store Data of different sizes:

Data Type	Event Size	Storage/year	
Raw	250 kB	150 TB	Tape Archive
Full Record Reco'd Data	~300-350 kB	21 TB	10% of Sample
Data Summary	75 kB	45-90 TB	100% on Tape
Thumbnail	10 kB	6 TB	100% on Disk

- Thumbnail for basic analysis and event selection.
- Data Summary contains enough information for almost all analyses.
- Full record mainly for Debugging purposes

DØ Monte Carlo Production

- **Plan** to generate **ALL** MC events off-site:
  - Currently 1 CPU can fully simulate ~400-500 events/day.
  - Total ~500 CPU's at beginning of 2000
  - Generate 75M-100M events/year.

Location	# CPU's
NIKHEF	100
UTA	64
Lyon*	100
Boston Univ.*	O2000 (192)
Prague	~15
Lancaster	200
TATA (Bombay)	proposal
Rio	proposal

UK 33% of Current

*Not Completely DØ

MC Data Storage Requirements

- MC Produced, Stored, and Analysed at Remote Sites – Only transport summary information to central sites.
  - Event data base maintained centrally
- MC Storage
  - 0.5–0.75 MB/event
    (more during commissioning phase, up to 4MB)
  - **50 TB/year** (up to 400!)
  - UK Share – 40%: **20 TB**

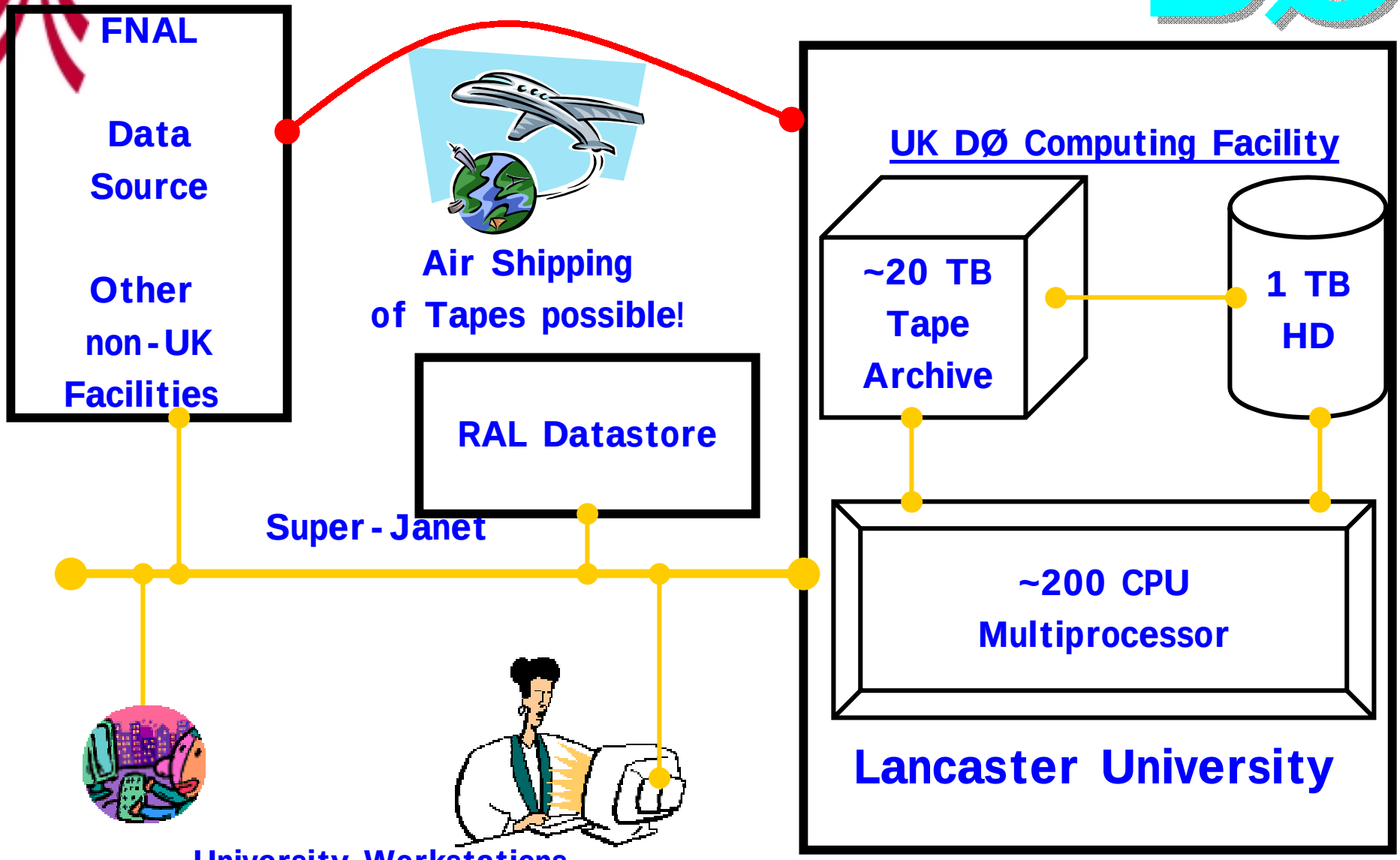
- Analysis framework and shared operating systems allow jobs to be run remotely and developed locally
  - Already have common MC generation software framework implemented.

UKDØ Computing Facility

- JREI Award Granted at start 2000
- AIM:
  Central Computing facility to generate MC data and to provide UK access to data sets of interest.
- Tender Awarded to Workstations UK
- Delivery Date: **End November 2000**

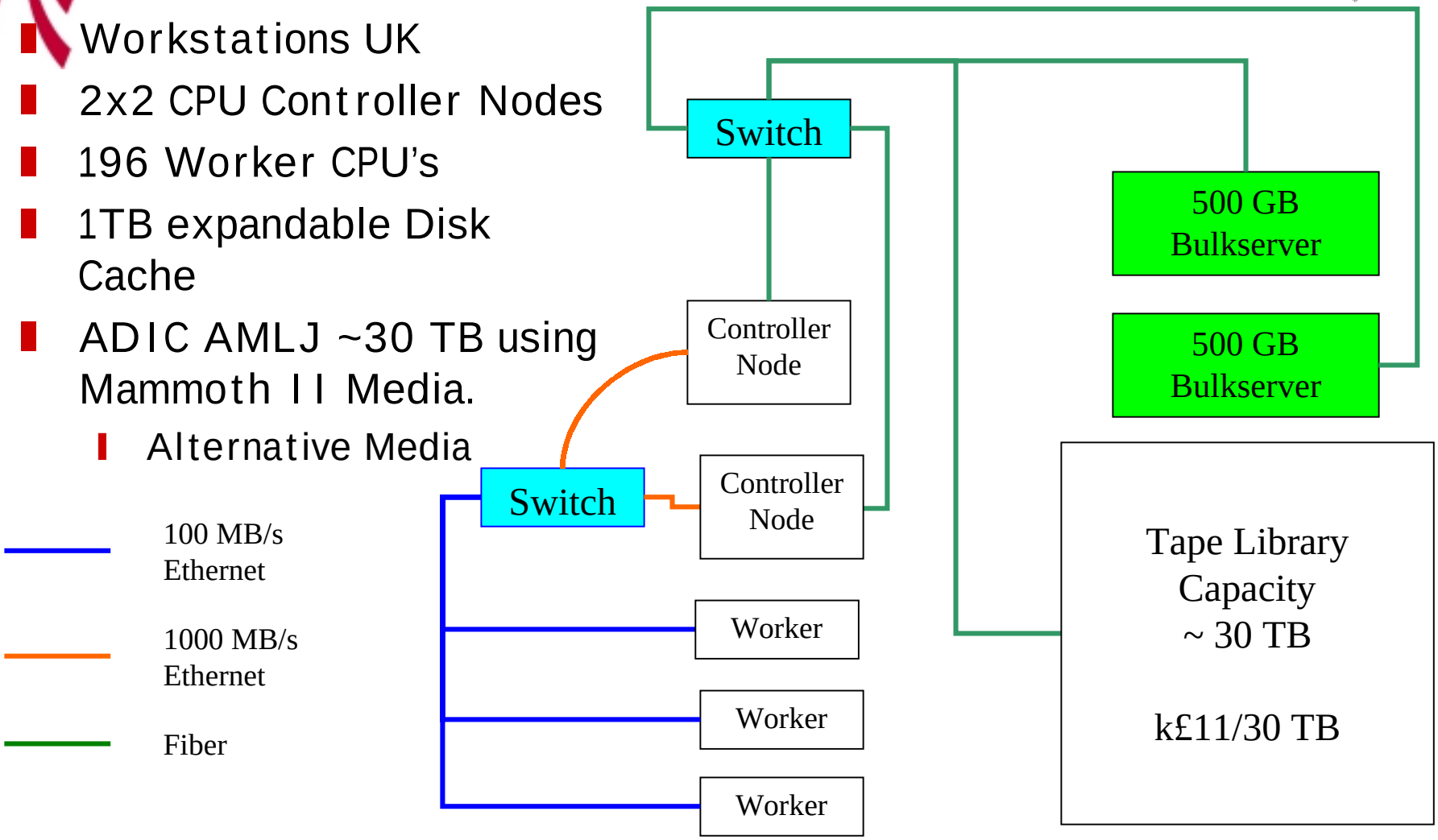
- Fully Commissioned by early 2001
  - Data Taking 1 March 2001.

UKDØ Computing Facility



UKDØ Computing Kit

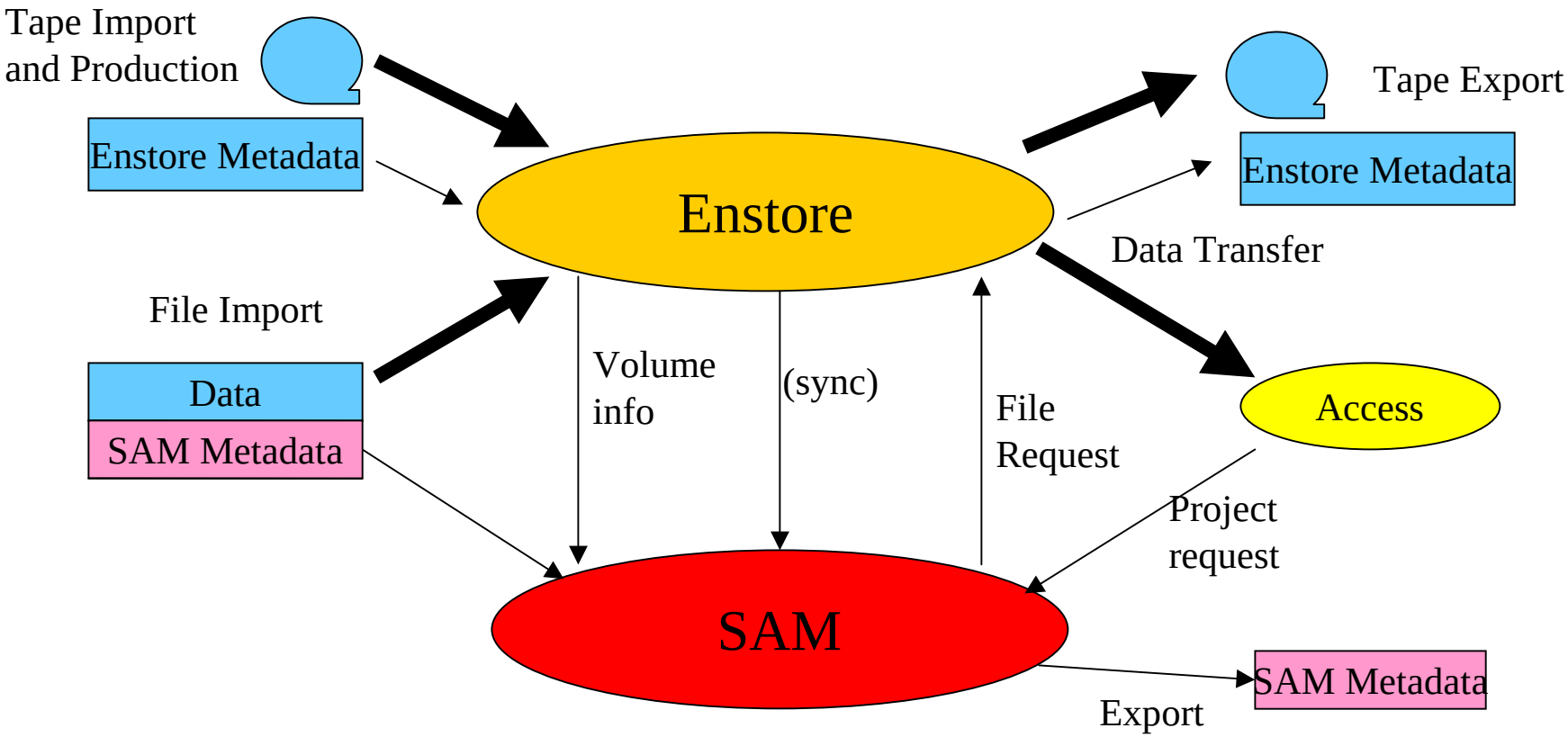
- Workstations UK
- 2x2 CPU Controller Nodes
- 196 Worker CPU's
- 1TB expandable Disk Cache
- ADIC AMLJ ~30 TB using Mammoth II Media.
  - Alternative Media



196 Worker CPUs

Lancaster Data Access via SAM

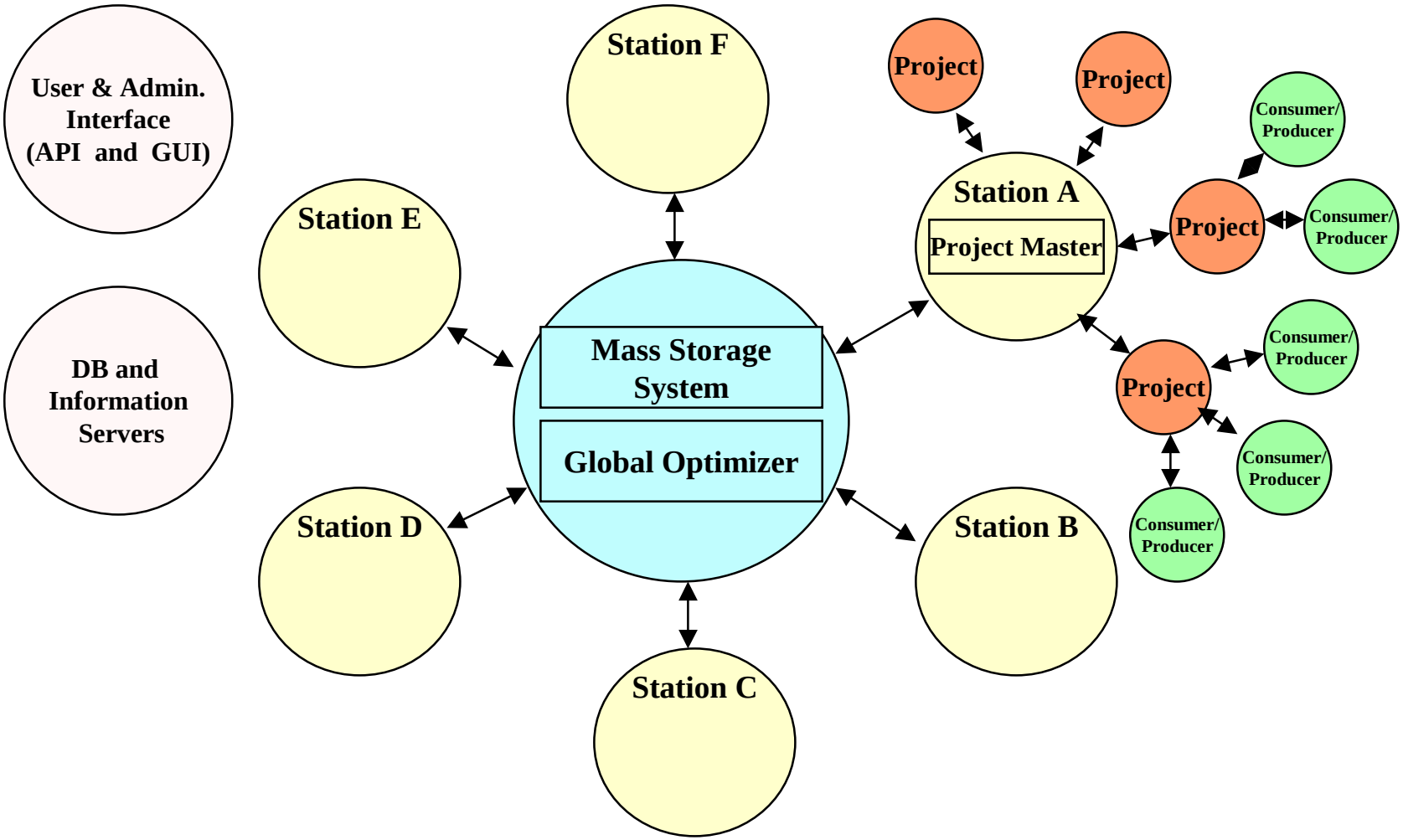
SAM sits on top of local storage, in DØ's case ENSTORE. Can change storage solution.



DØ: SAM Data Access

- Sam stations provide file stagers, and disk cache management.
- Analysis Projects are run under a station using allocated resources.
- The “central-analysis” station runs on D0mino
- Work is being done to test stations running outside FNAL. For example, in France, the “ccin2p3-analysis” station has been run under development.

SAM Data Access



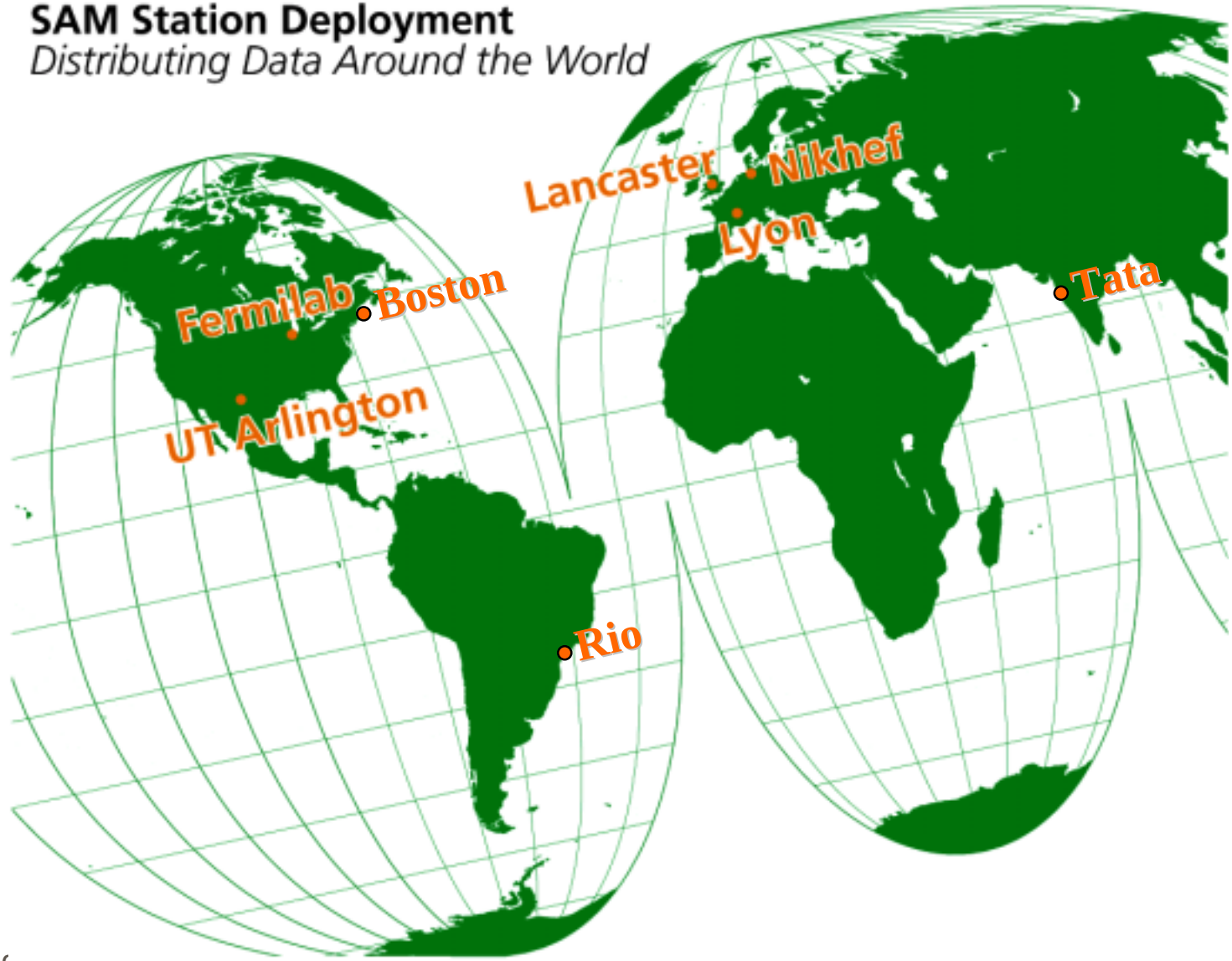
Remote SAM Installation

- Sam is designed to be highly scalable.
- Station support at remote sites is anticipated to be be routine in the future.
- Heavily used data can be cached in the stations at remote sites.
- Features like parallel ftp will be built into the transfer mechanism and moving data to and from remote sites will be as simple as “sam run project” and “sam store”.
- Data produced at remote sites can be stored in their local tape management systems and the locations recorded in sam. Interfaces to their local sam stations will make the data accessible anywhere a sam station exists.

UK Access to Data

- Access to data will require setting up local SAM station.
  - All DØ data will be available
  - Can be used for storing analysis sets – reproducible analyses.
- Develop tools to allow analysis jobs to be run on UKDØ computing facility as required.

DØ Data Grid: Data Locations



Conclusions

- UKDØ will have major impact on DØ computing.
  - World Wide Grid (2-3 continents)
  - All DØ data available in UK
  - Frequently used data sets can be stored locally
- Lancaster Farm designed to be expandable
  - Tape Library 30 – 600 TB
  - Multiple Media Allowed
- Look to upgrade CPU's, Hard Disks, 2002.