

# Proposal for a DØ Remote Analysis Model (DØRAM)

*DØRACE Workshop*

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- Introduction
- Remote Analysis Station Architecture
- Requirement for Regional Analysis Centers
- Suggested Storage Equipment Design
- What Do I Think We Should Do?
- Conclusions

# Why do we need a DØRAM?

- Total Run IIa data sizes are
  - 350TB for RAW
  - 200-400 TB for Reco + root
  - $1.4 \times 10^9$  Events total
    - At the fully optimized 10sec/event reco. →  $1.4 \times 10^{10}$  Seconds for one time reprocessing
    - Takes one full year w/ 500 machines
  - Takes ~8mos to transfer raw data for dedicated gigabit network
- Centralized system will do a lot of good but not sufficient (DØ analysis model proposal should be complemented with DØRAM)
- Need to allow remote locations to work on analysis efficiently
- Sociological benefits within the institutes
- Regional Analysis Centers should be established

# DØRACE Strategy

- Categorized remote analysis system set up by the functionality

- Desk top only
- A modest analysis server
- Linux installation
- UPS/UPD Installation and deployment
- External package installation via UPS/UPD
  - CERNLIB
  - Kai-lib
  - Root

Phase 0  
Preparation

- Download and Install a DØ release
  - Tar-ball for ease of initial set up?
  - Use of existing utilities for latest release download

Phase I  
Rootuple  
Analysis

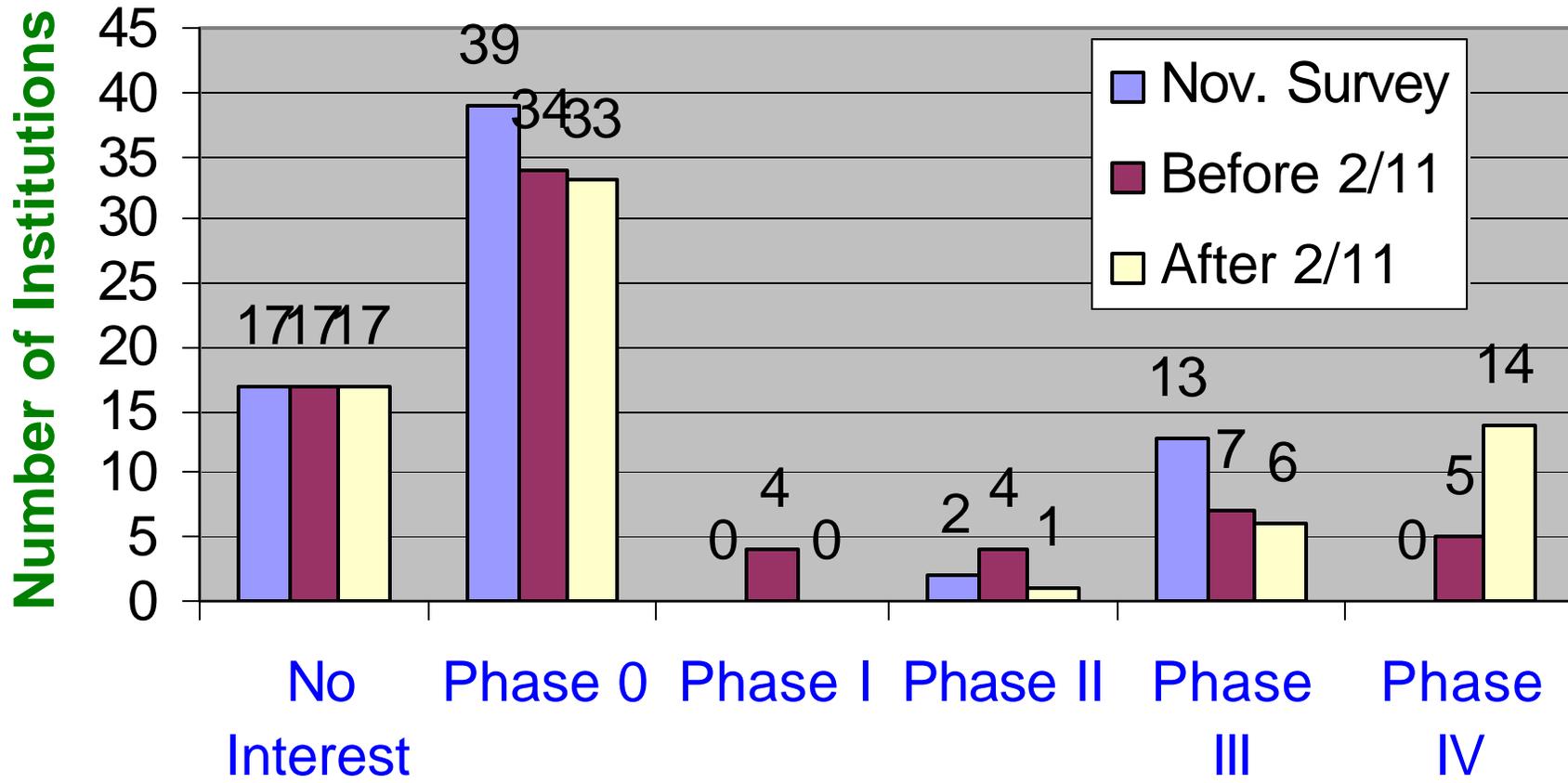
- Installation of cvs
- Code development
- KAI C++ compiler
- SAM station setup

Phase II  
Executables

Phase III  
Code Dev.

Phase IV  
Data Delivery

# DØRACE Status by Setup Phases

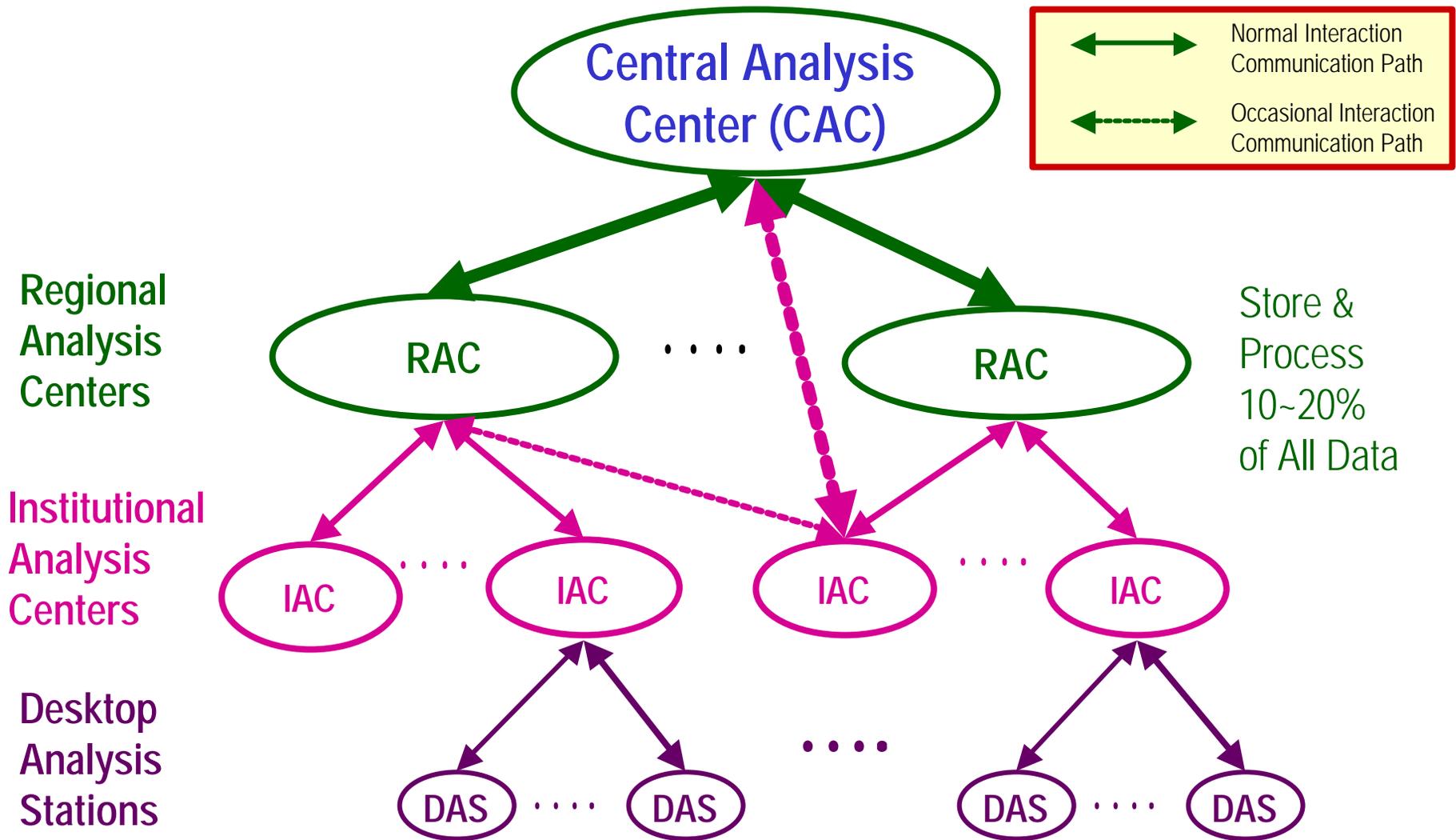


**Phases**



**Progressive**

# Proposed DØRAM Architecture



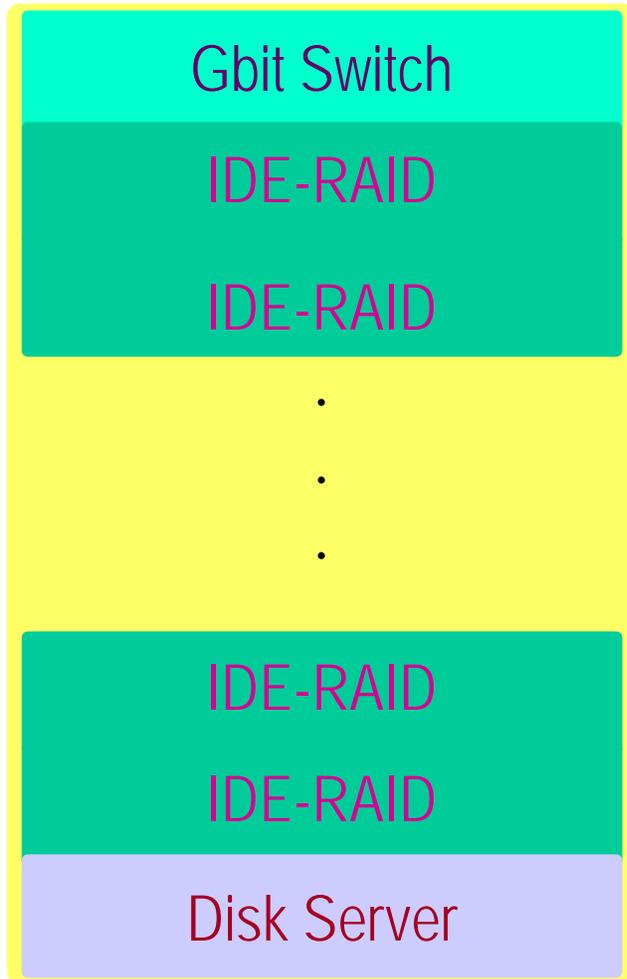
# Regional Analysis Centers

- A few geographically selected sites that satisfy requirements
- Provide almost the same level of service as FNAL to a few institutional analysis centers
- Analyses carried out within the regional center
  - Store 10~20% of statistically random data permanently
  - Most the analyses performed on these samples with the regional network
  - Refine the analyses using the smaller but unbiased data set
  - When the entire data set is needed → Underlying Grid architecture provide access to remaining data set

# Regional Analysis Center Requirements

- Become a Mini-CAC
- Sufficient computing infrastructure
  - Large bandwidth (gigabit or better)
  - Sufficient Storage Space to hold 10~20% of data permanently and expandable to accommodate data increase
    - >30TB just for Run IIa RAW data
  - Sufficient CPU resources to provide regional or Institutional analysis requests and reprocessing
- Geographically located to avoid unnecessary network traffic overlap
- Software Distribution and Support
  - Mirror copy of CVS database for synchronized update between RAC's and CAC
  - Keep the relevant copies of data bases
  - Act as SAM service station

# Regional Storage Cache



- IDE Hard drives are \$1.5~\$2./Gb
- Each IDE RAID array gives up to ~1TByte – hot swappable
- Can be configured to have up to 10TB in a rack
- Modest server can manage the entire system
- Gbit network switch provides high throughput transfer to outside world
- Flexible and scalable system
- Need an efficient monitoring and error recovery system
- Communication to resource management

# What Do I Think We Should Do?

- Most the students and postDocs are at FNAL, thus it is important to provide them sufficient computing and cache resources for their analysis. → The Current suggestion for backend analysis clusters should be built!!
- In the mean time, we should select a few sites as RACs and prepare sufficient hardware and infrastructure
  - My rough map scan gives FNAL+3RACs in the US, and a few in Europe
- Software effort for Grid should proceed as fast as we can to supplement the hardware
  - We cannot afford to spend time for Test beds
  - Our set ups should be the Test Bed and the actual Grid
- A working group to determine number of RAC sites, their requirements, and select RACs within the next couple of months.

# Suggestions and Comments from The Working Group

- Data characteristics
  - Specialized data set, in addition to service data set for reprocessing
  - Some level of replication should be allowed
  - Consistency of data must be ensured
  - Centralized organization of reprocessing
  - Book keeping of reprocessing
- Two staged approach:
  - Before Full gridification → All data kept in the CAC
  - After full gridification
    - Fully distributed within the network
    - Data sets are mutually exclusive

- In Europe, some institutions are already in the works to become an RAC
  - Karlsruhe (Germany)
  - NIKHEF (Netherlands)
  - IN2P3, Lyon (France)
- We want more US participation
- Agreed to form a group to formulate RAC more systematically → Write up a document within 1-2 mos.
  - Functions
  - Services
  - Requirements
  - Etc.

# Conclusions

- DØ must prepare for large data set era
- Need to expedite analyses in timely fashion
- Need to distribute data set throughout the collaboration
- Establishing regional analysis centers will be the first step toward DØ Grid
- Will write up a proposal for your perusal