CALICE Software

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LAL Orsay

- Calice Testbeam Data Taking
- Data Management
- Event Building and Reconstruction Software
- Summary and Outlook

EUDET Annual Meeting Geneva/Switzerland and CERN
October 2009

CALICE Testbeam Data Taking

CALICE collaboration is preparing/performing large scale testbeam

Data taking in Summer 2006/2007

Testbeam Setup at CERN 2007

Testbeam program poses software/computing " challenges"

- Data processing from Raw Data to final Clusters in a coherent way

- Handling of Conditions Data Detector Configuration Calibration, Alignment etc.

-Comparison with simulated data 'Physics' Output

TCMT

Analogue HCAL

ECAL
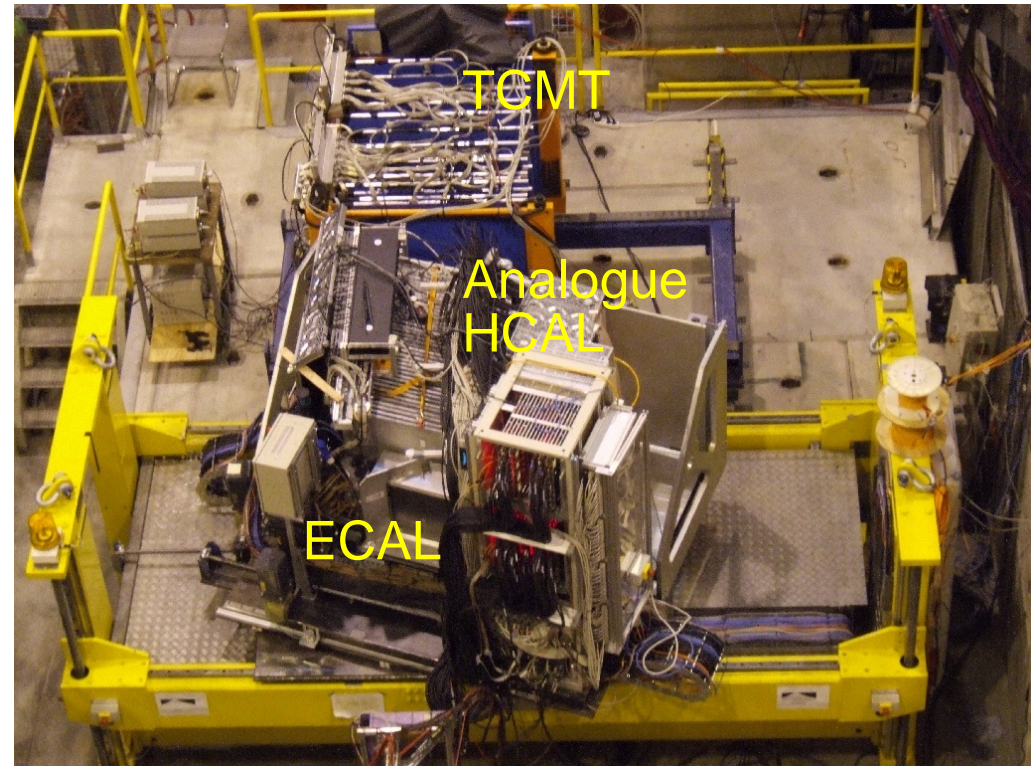
O(15000) calorimeter cells readout by Calice DAQ
No Zero Suppression

CALICE "TIER 0" – Infrastructure in the Control Room

Gigabit Uplink
- High Speed Connection to the outside world
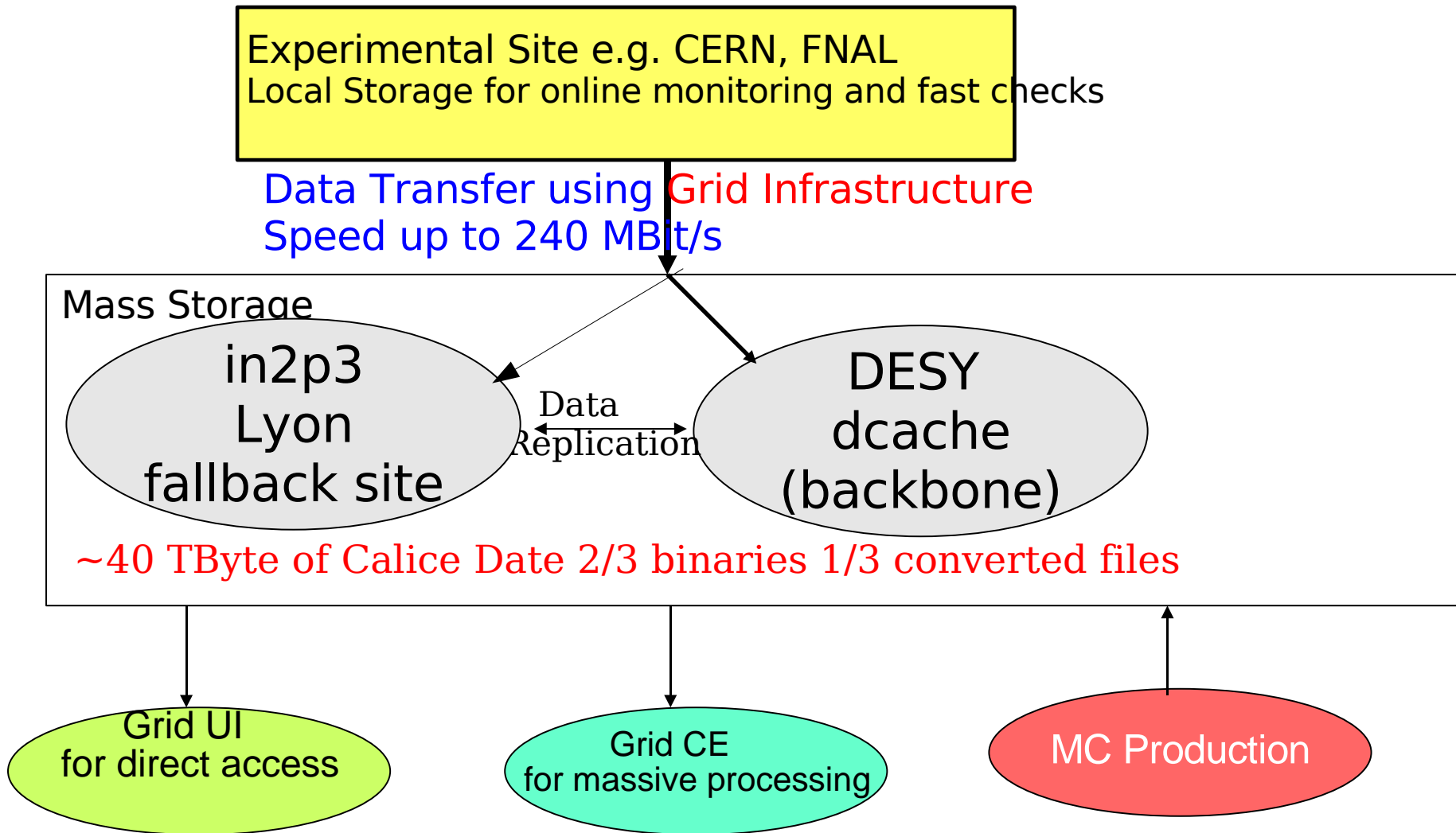- Serves all Calice Control Room Computers

caliceserv.cern.ch
- Online Monitoring
- Grid Transfers

Disk Array

DAQ Computer
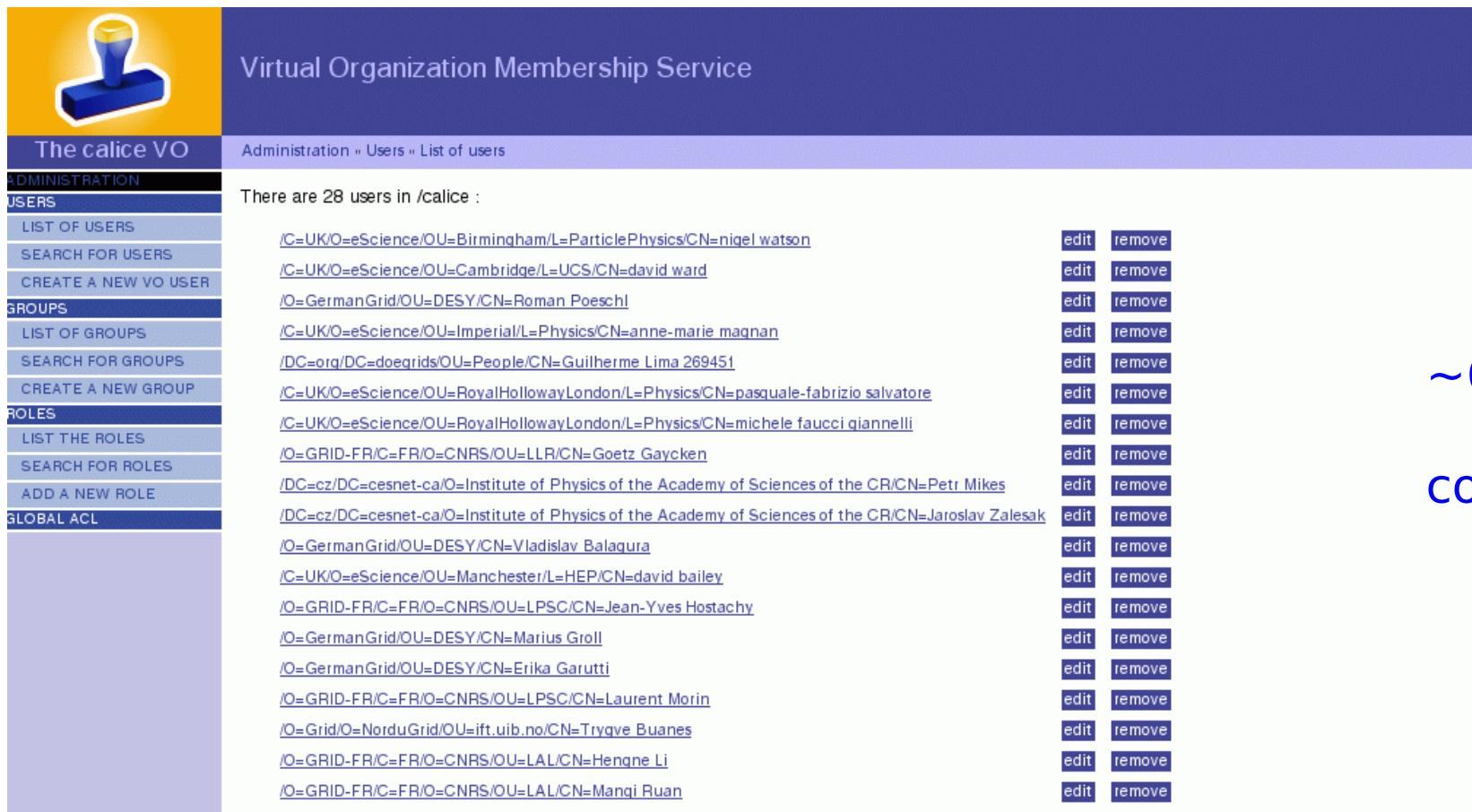
Well organized setup of computing
Thanks to B. Lutz

Picture courtesy of C. Rosemann DESY

Data Handling and Processing

Experimental Site e.g. CERN, FNAL
Local Storage for online monitoring and fast checks

Data Transfer using Grid Infrastructure
Speed up to 240 MBit/s

Mass Storage

in2p3
Lyon
fallback site

Data
Replication

DESY
dcache
(backbone)

~40 TByte of Calice Date 2/3 binaries 1/3 converted files

Grid UI
for direct access

Grid CE
for massive processing

MC Production

The Virtual Organisation - vo calice

Hosted by DESY:
Page for registration is https://grid-voms.desy.de:8443/voms/calice

~60 Members
and
counting ...

VO Manager: Niels Meyer/DESY, Deputy: A. Gellrich/DESY

Institutes which provide Grid support for Calice

Supported by:

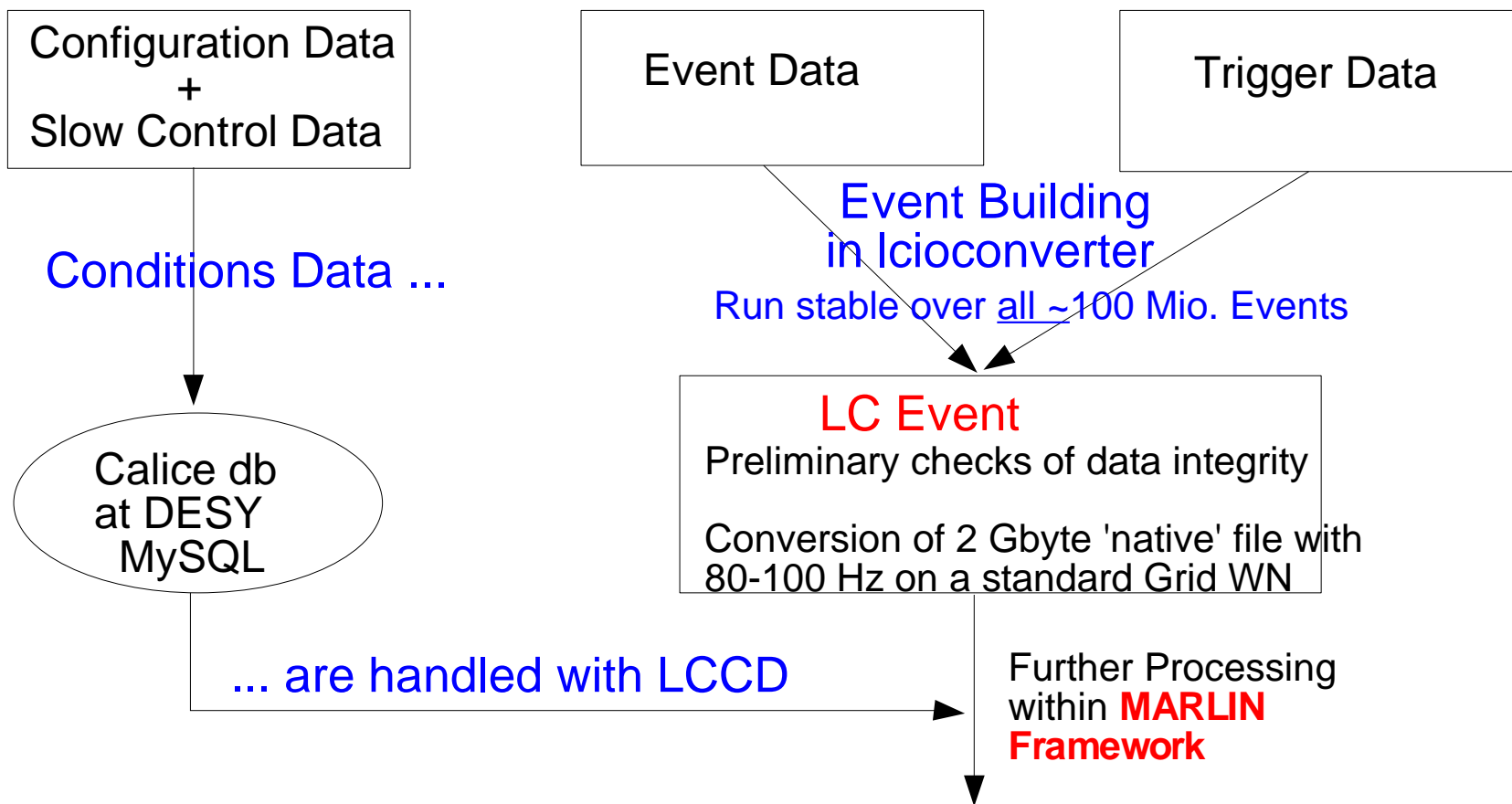|	
DESY Hamburg	Hosting, Computing and Storage
LAL	Computing and Storage
LLR	Computing and Storage
DESY Zeuthen	Computing and Storage
Imperial College	Computing and Storage
Birmingham	Computing and Storage
cc in2p3 Lyon	Computing and Storage
Cambridge	Computing and Storage
Institute of Physics Prague	Computing and Storage
University College	Computing and Storage
KEK	Computing and Storage
Manchester	Computing and Storage
CIEMAT Madrid	Computing and Storage
Fermilab	Computing and Storage
NIKHEF	Computing and Storage
University of Bonn	Computing and Storage
Univ. Liverpool	Computing and Storage
Univ. Oxford	Computing and Storage

- Most of the sites have been involved in recent data and MC processing
  Connectivity to Asian Sites still and Issue
- Full set of Rawdata avalaible at DESY HH and CC in2p3 Lyon!!!
  Grid exploitation of Calice paved the way for successful
  mass production for ILC detector LOIs

Conversion to LCIO

DAQ data types are converted/wrapped into LCIO on the basis of LCGenericObjects

DAQ Data Files/Types

Configuration Data
+
Slow Control Data

Event Data

Trigger Data

Conditions Data ...

Event Building
in lcioconverter
Run stable over all ~100 Mio. Events

Calice db
at DESY
MySQL

LC Event
Preliminary checks of data integrity

Conversion of 2 Gbyte 'native' file with
80-100 Hz on a standard Grid WN

... are handled with LCCD

Further Processing
within **MARLIN
Framework**

Installation of Software using tools developped in EUDET NA2 task
ilcinstall, cmake

Intermezzo – Conditions Data Handling

- **LCCD – Linear Collider Conditions Data Framework:**
  - Software package providing an Interface to conditions data
    - database
    - LCIO files
    Author Frank Gaede, DESY

  LCCD works and is heavily used within calice !!!

  Still too much an expert tool (No real development since 2005)

The importance of conditions data (not only) for 'real' data
renders the development of a fully functional cd data toolkit
to be a fundamental !!! piece of the ILC Software

- Efficient storage and access to conditions data
  Browsing, convenient interfaces
- How to 'distribute' conditions data (e.g w.r.t to grid) ?
  BTW.: LHC does have some headache with that!

Calice Software

Three main packages

Contributions by groups from
DESY, Imperial, LAL, LLR, NIU, RHUL

| calice_lcioconverter | ◄──► | calice_userlib | ◄──► | calice_reco |
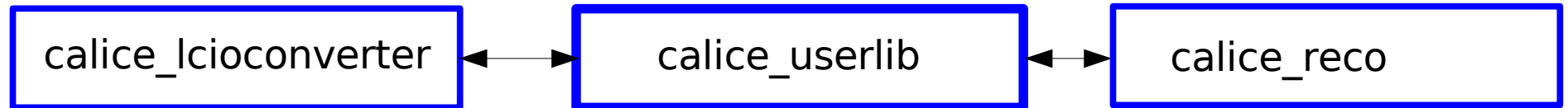
Current version
v04-02-06

converts
calice DAQ format
into LCIO (LCGenericObjects

needs DAQ software
expert work

MARLIN processors

Current version
v04-10

Interface classes to
LCGenericObjects
(these classes should
be defined by LCIO)

utililty functions e.g.
For TriggerHandling

Current version
v04-06-05
(v04-07 in prep.)

RawData into
CalorimeterHits
(standard LCIO)
TrackerHits

First stages of
higher level analysis
MARLIN processors

~250 classes or functions
Data of four different Calorimeter Prototypes are
available in LCIO format

Next Generation Protoypes – EUDET Modules

- From the beginning coherent interface between DAQ and offline processing (D. Decotigny et al.)

  LCIO will remain backbone!!!

  Consistent Handling of Low Level Data
  Coordinated handling of potentially frequent changes in startup phases

- Will continue to apply and help to develop ILC Software tools

  - Need for geometry package
    Consistent between Data and Simulation

Summary and Outlook

- Calice uses ILC Software for processing of Testbeam Data

    ILC Datataking in a (big) nutshell

    Allows users to switch easier between testbeam data analysis and physics/simulation studies

- Calice uses systematically Grid tools

    24h/24h 7h/7h during CERN, FNAL testbeams 2006-2009

- Experience with testbeam data clearly reveals the needs for a coherent concept to handle 'low level' data within ILC Software

- Effort will continue with EUDET Modules on an even broader basis
    Using of ILC s/w tools already in testbeams is (in the mean time)
    well established and accepted concept

CALICE did/does not only hardware-prototyping but also 'computing prototyping'
Computing benefits from collaborative effort and application of
ILC software toosl