# Data Acquisition for EUDET
## Example: JRA1 DAQ

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**Outline**

- EUDET

- JRA1 to JRA3

- DAQ within JRA1

- Trigger Logic Unit

- Current Agreement within EUDET for DAQ
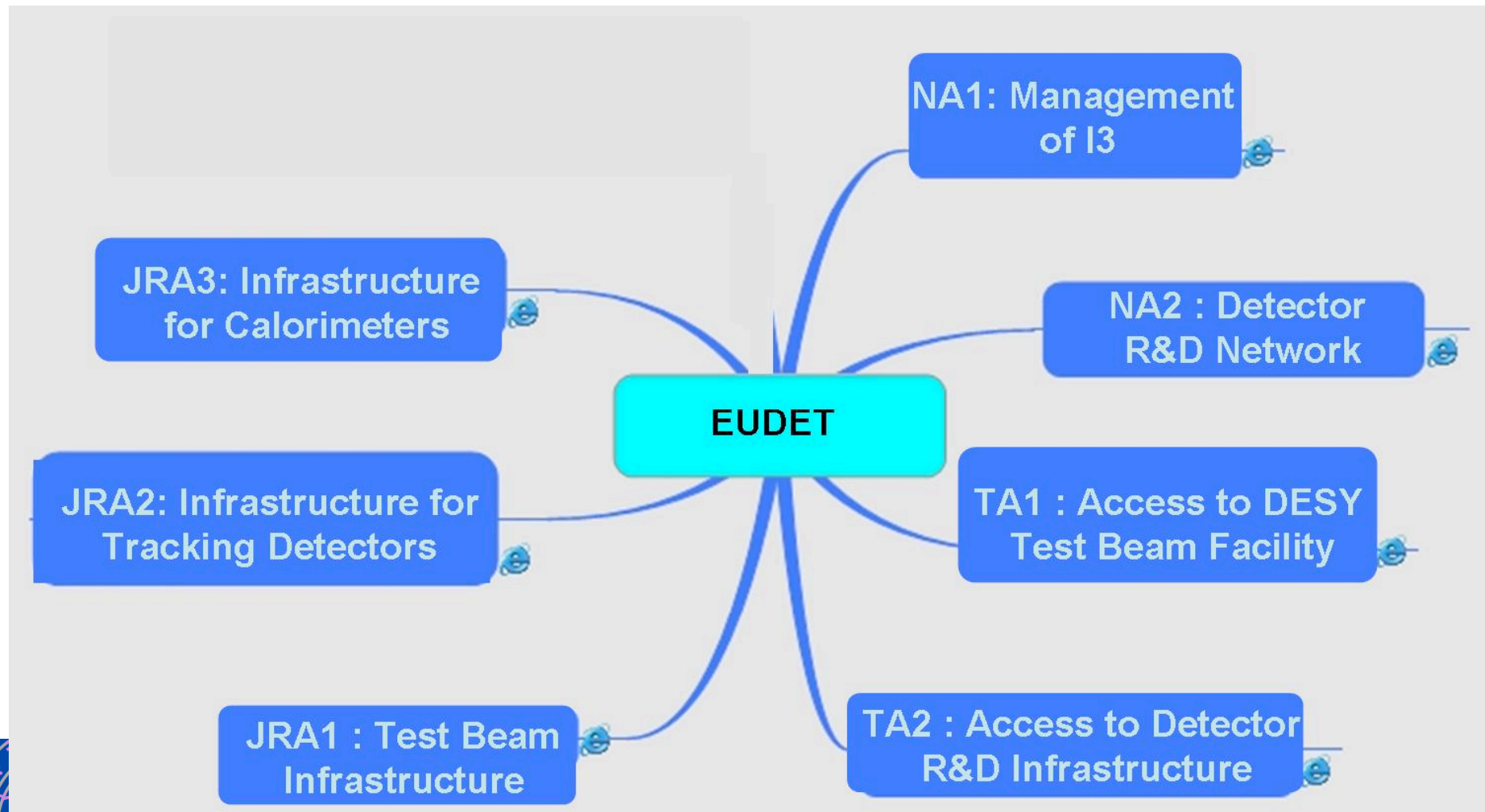
- Outlook and Conclusions

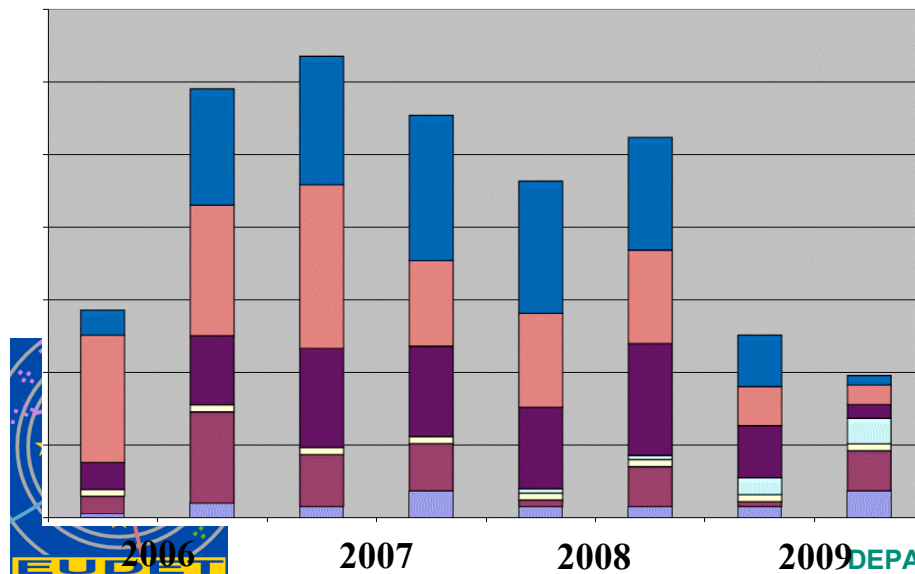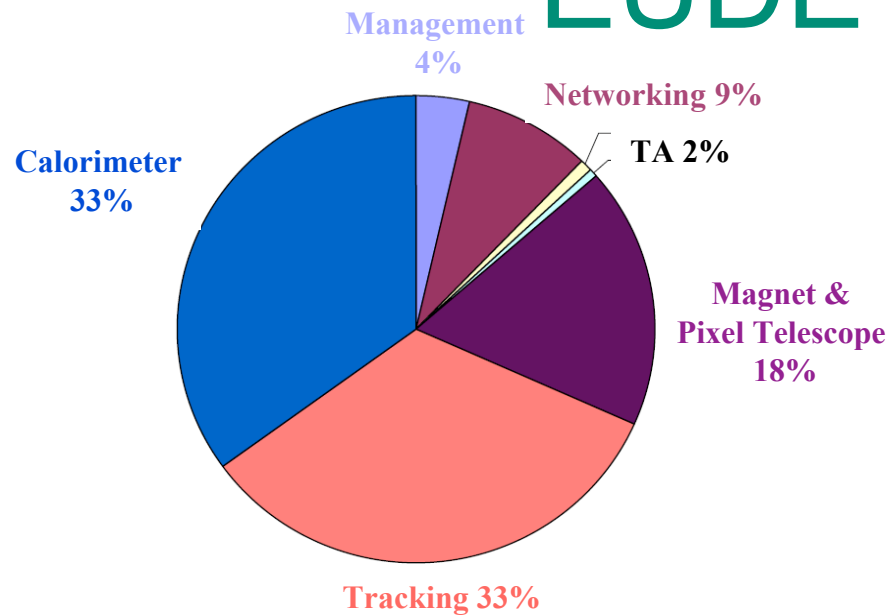UNIVERSITÉ
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# EUDET Overview

- Goal: Create infrastructure to support R&D for International Linear Collider

- 6th framework program of EU
(21 M€, 7 M€ from EU)

- Timeline 2006-2009 (Kickoff @Desy Feb'06)

- 31 european partner institutes, 20 associates

# EUDET Activities

NA1: Management of I3

JRA3: Infrastructure for Calorimeters

NA2 : Detector R&D Network

**EUDET**

JRA2: Infrastructure for Tracking Detectors

TA1 : Access to DESY Test Beam Facility

JRA1 : Test Beam Infrastructure

TA2 : Access to Detector R&D Infrastructure

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# EUDET Budget



- **most of the resources for the development of the infrastructures**

- **ramp-up first half 2006**

- **full swing activities for 2.5 years**

- **last year: phase-out and exploitation of infrastructures**

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# Joint Research Activities

## JRA2: Tracking Detectors

- Large TPC prototype:
  - low mass field cage (for JRA1 magnet)
  - modular endplate system for large surface GEM & µMegas systems
  - development of prototype electronics for GEM & µMegas
- Silicon TPC readout:
  - development MediPix → TimePix
  - TPC diagnostic endplate module incl. DAQ
- Silicon tracking:
  - large & light mechanical structure for Si strip detectors
  - cooling & alignement system prototypes
  - multiplexed deep submicron FE electronics

*Dedicated talk on Saturday*

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# Joint Research Activities

## JRA3: Calorimeter

- ECAL:
  - scalable prototype with tungsten absorbers
  - Si-sensors & readout chips

- HCAL:
  - scalable protoype
  - multi-purpose calibration system for various light sensing devices

- Very Forward Calorimeter:
  - laser-based positioning system
  - calibration system for silicon and diamond sensors

- FE Electronics and Data Acquistion System for the calorimeters

*2 dedicated talks today*

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# JRA1 - Testbeam Infrastructure

- Large bore magnet:
  - ≈ 1 Tesla, Ø ≈ 85 cm, stand-alone He cooling, supplied by KEK
  - infrastructure (control, field mapping, etc.) through EUDET

- Pixel beam telescope
  - 4-6 layers of MAPS detectors
  - CCD and DEPFET pixel detectors for validation, maybe TPC
  - DAQ system

- Note: all EUDET infrastructure is movable
  - construction & initial tests at DESY
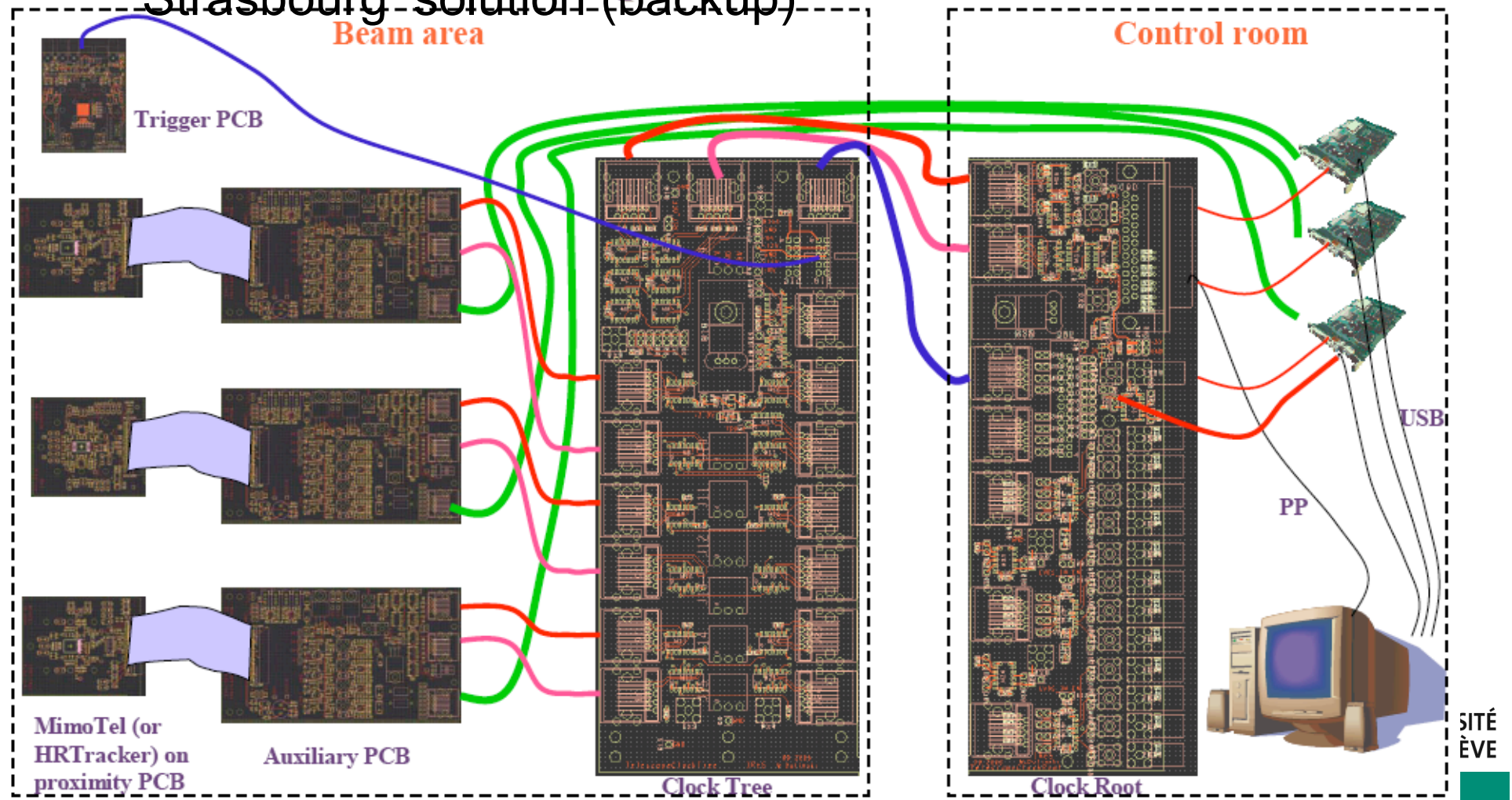  - later exploitation at CERN, FNAL etc. possible

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# DAQ-Architecture JRA1

**Key:**

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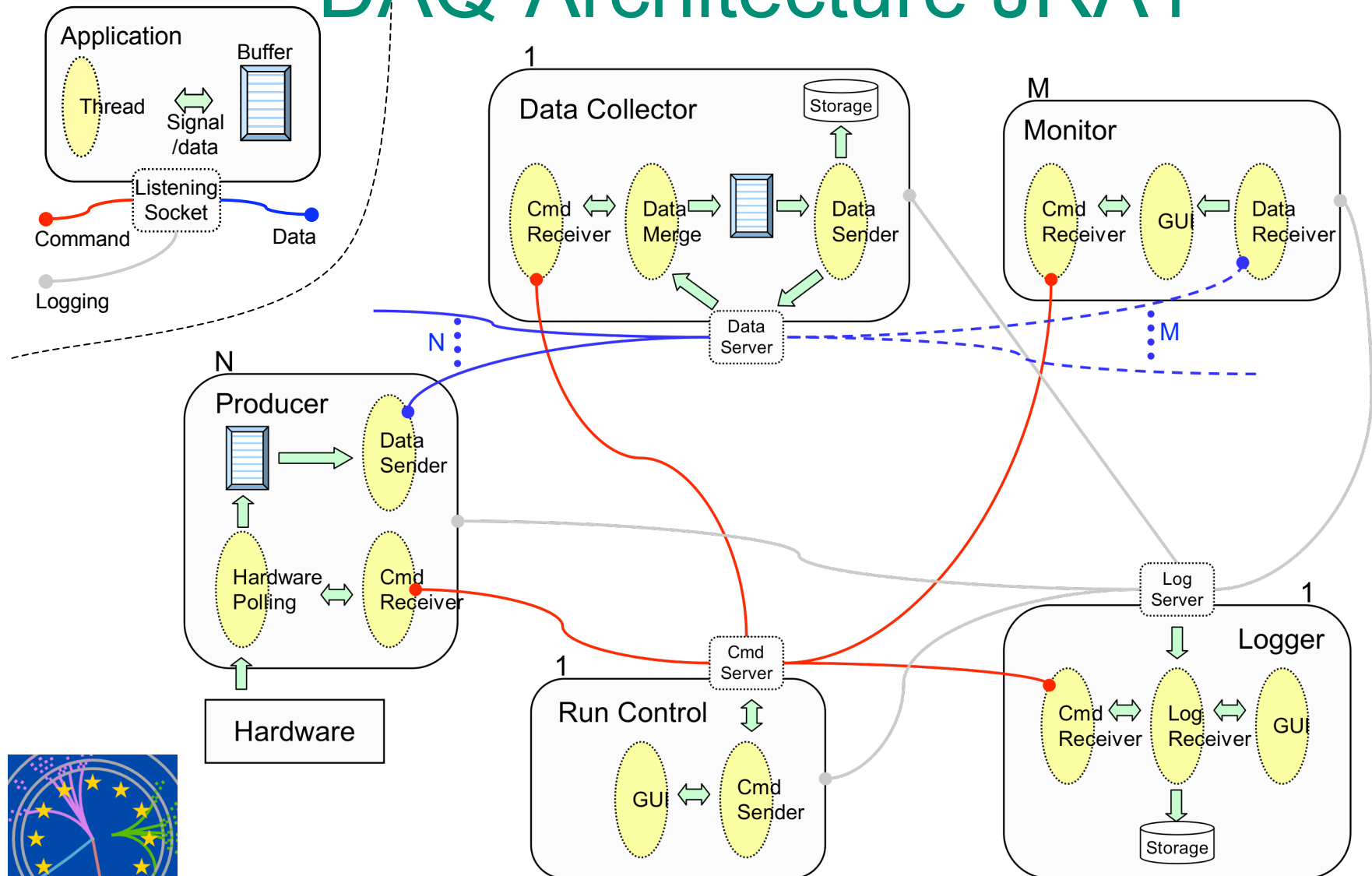
# Readout Hardware

2 solutions: EUDRB (INFN Ferrara, dedicated talk)

'Strasbourg' solution (backup)

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# JRA1 DAQ Features

- Platform independent (Linux, MacOS X, Windows under Cygwin) and highly modular

- current suite of ILC software (LCIO/Marlin etc) also runs under MacOS, but no official support yet

- DUTs could (and should) be easily integrated in our DAQ, simple examples and help will be provided

- First 'users' expected for CERN testbeam in October: (DEPFET from Bonn, maybe CCDs from Bristol)

- SVN Repository and Documentation at:
  http://eudet.unige.ch/
  (not now, machine is here in Hamburg)

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# Internal Event classes

- Base class (Event) and derived classes:
- Event(runnumber, triggernumber)
  - EventTLU(timestamp)
  - EventRaw(vector[width*height] of pixels)
  - EventSparse(vector[nhits] of Hit)
    - Hit(x, y, adc)
- Begin/End of Run Events (BORE/EORE)
- All can be serialized and sent over network/to file etc.
- Internal Events will be converted to LCIO format by DataCollector (not yet!)

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# JRA1 - Trigger Logic Unit

- Simple Handshake via Trigger/Busy/Reset on RJ45 LVDS lines (or TTL-Lemo)
- Timestamp and event-number via USB
- Eventnumber via advanced data handshake on RJ45 available
- In collaboration with Bristol

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# Common DAQ efforts...

**DAQ has been identified as key issue of EUDET**

- part of the infrastructures

- easy-to-use for users

- cross-JRA issue

- combined testbeam run of several sub-detectors

- relations to software framework ($\rightarrow$ NA2)

**DAQ is also an important issue for ILC detectors**

- EUDET is not going to design/build anything close to the final ILC DAQ system but we must stay connected to the international R&D efforts to go into the same direction

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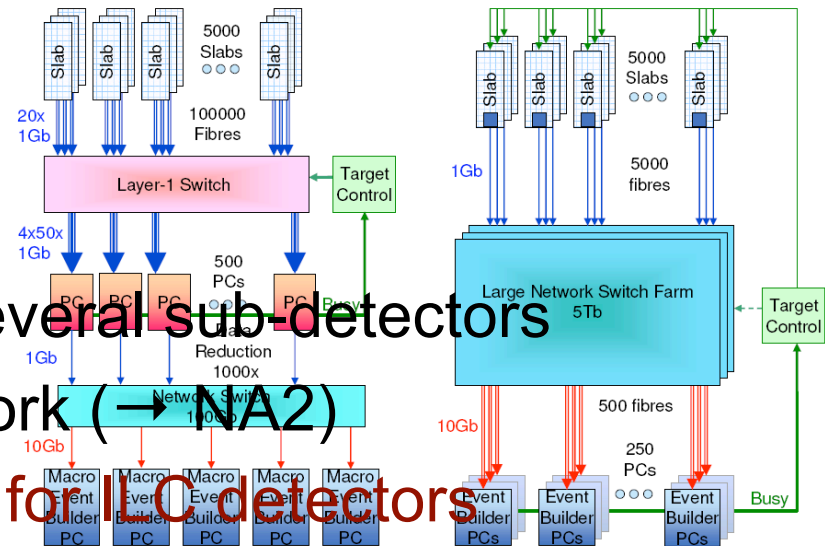
# ...Common DAQ efforts

## Conclusions from DAQ group discussions (March '07):

- JRA1 to JRA3 will keep independent DAQ systems in the beginning

- JRAs will try to use common TLU for triggering

- JRAs will (try to) use LCIO as data format

- Update of this schedule in July, after 1st JRA1 testbeam

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# Outlook & Conclusions

- 3 JRA still have independent DAQ systems (and different requirements), but:
  - Will (try to) join at the trigger level using TLU
  - Will (try to) use LCIO as data format
- Testbeam activities this summer will serve as 'proof of concept'
- Outside 'Users' welcome to stresstest JRA1
- Further harmonization is foreseen and will be needed for a common testbeam activity

## Stay Tuned!!

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