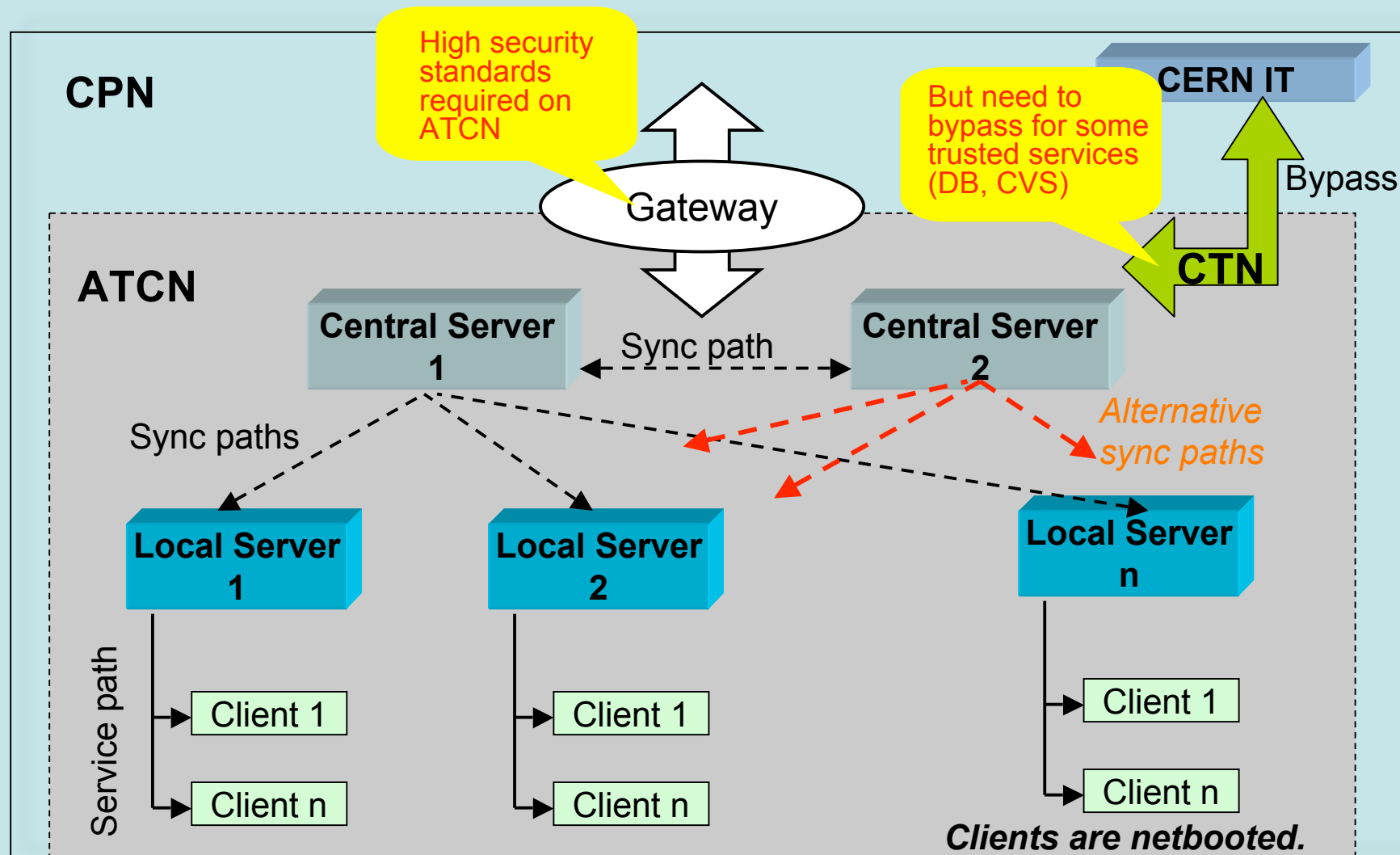# Computing Environment for Detector Commissioning

- ◆ ATLAS Control Network Environment
- ◆ Databases for Commissioning
- ◆ Online Monitoring for Commissioning
- ◆ Simulation issues

- ◆ Detector plans & requests

Computer and network architecture at Point1

- ATCN: Atlas Technical Control Network
- CPN: CERN Public Network

Offline SW in the online environment

◆ Meetings of online+HLT+offline on this subject
  - ◆ Main players: the librarians - Emil+Vasily, Jiri, Andrei
  - ◆ Online system admins Marc, Gorkhan, Offline commissioning HvdS
  - ◆ 20 June, 9+12 August, 2 Sept - ongoing

◆ Offline kit validation runs successfully on the ATCN network
  - ◆ Thanks to Emil
  - ◆ Access to atlasdbdev from ATCN (bypass) established by online sysmgrs for that purpose

◆ Procedure used to install offline releases on ATCN
  - ◆ Procedure developed/tested using 10.0.4 so far
  - ◆ Copy pacman snap file to ATCN at Point 1
  - ◆ Login there as swinstaller on pc-tdaq-cfs-01
  - ◆ Use pacman on this machine on ATCN
  - ◆ Run KitValivation on this machine

◆ To come: installation of 10.5.0, 11.0.0 on ATCN
  - ◆ Release date 10.5.0: 7 September
  - ◆ Release 11.0.0 now due 5 October

Offline SW in the online environment (2)

- **Changes made locally are written back to CVS**
  - Mainly monitoring changes, but also BS converter changes, ...
  - Then changes by different detectors put together in nightly builds (1-2 times per week)

- **Projects based builds will proceed in a cascade**
  - Projects:

    Core <= Conditions <= Event <= Reconstruction <= HLT <= Analysis (Monitoring)

    ... <= Simulation

    Avg. 150 packages per project

    Need one release manager per package...
  - So if LCG or Gaudi change, the whole chain needs to be redone
  - If monitoring changes, the rest can remain untouched
  - If BS formats change, this percolates through Event and downwards...

  - Project based builds in production from 11.0.0 onwards (still in parallel to monolithic release build)
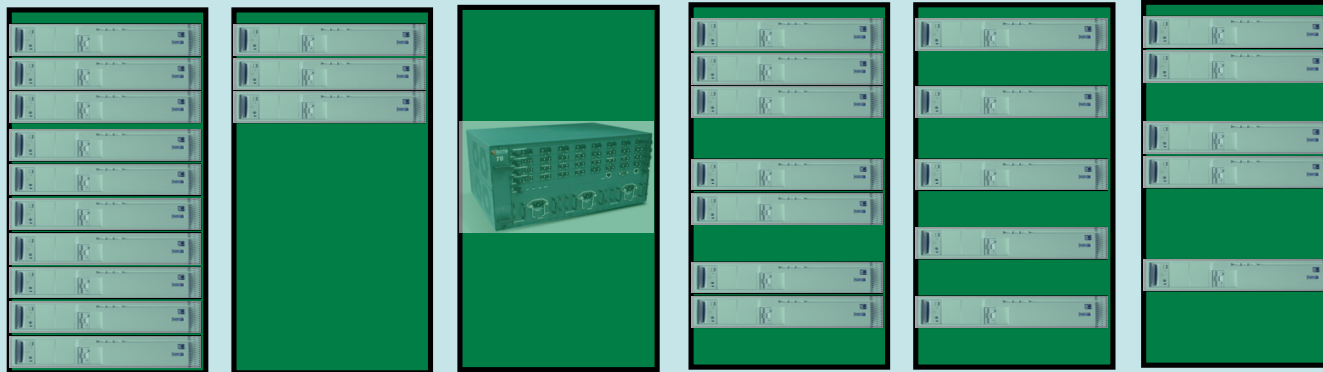
Pre-series installed at Point1

USA15 | **SDX1**
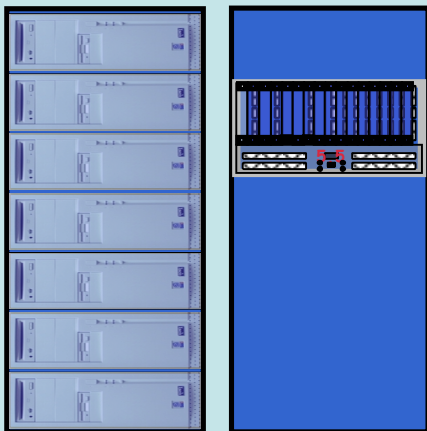
One ROS rack

-
TC rack
+ horiz.
cooling
-
12 ROS
48 ROBINs

RoIB rack

-
TC rack
+ horiz.
cooling
-
50% of
RoIB

One Full L2 rack
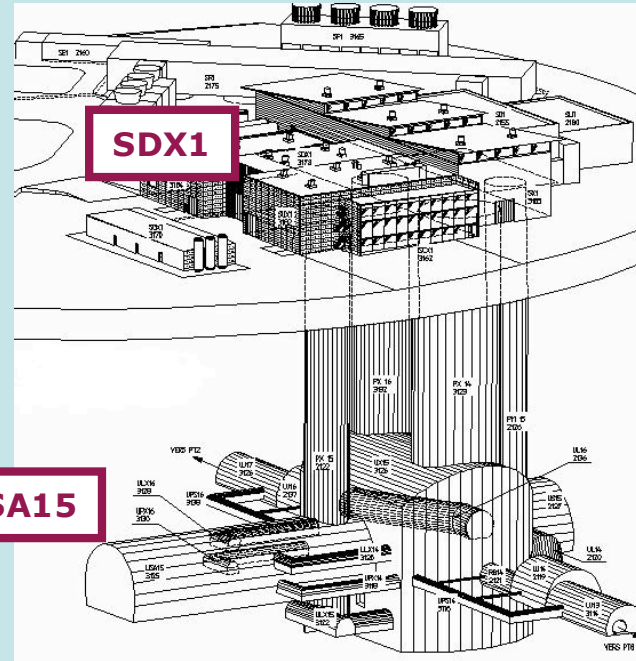
-
TDAQ rack
-
30 HLT
PCs

Partial Superv'r rack

-
TDAQ rack
-
3 HE PCs

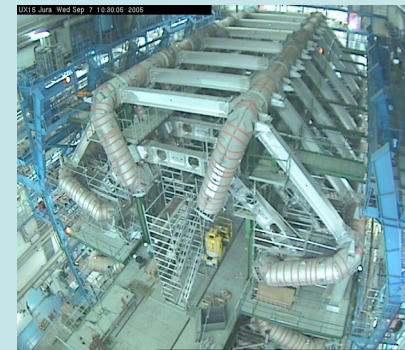## Monitoring resources at Point 1

- 32 PCs will be commissioned by TDAQ:
  - Where - definitely upstairs, not flexible
  - When – has to be checked
- HLT nodes commissioning:
  - When - will be started by Jan 06
  - Where - in HLT racks (upstairs)
  - How many:
    - As less as possible from TDAQ point of view
    - Is flexible to some extent if detectors will express clear requirements for them

October 10, 2005   Commissioni
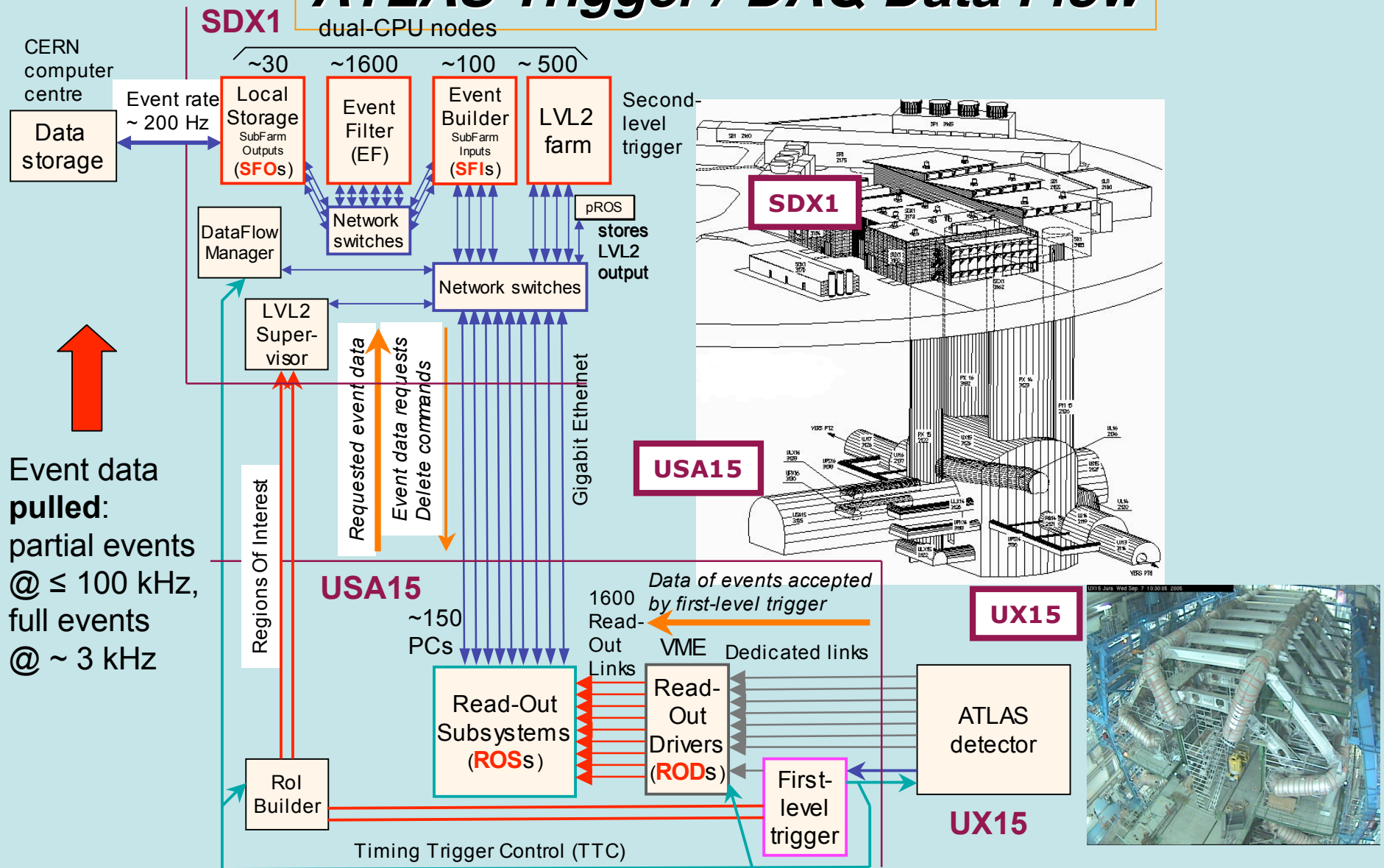
ATLAS Trigger / DAQ DataFlow

SDX1

USA15

UX15

ATLAS Trigger / DAQ Data Flow

SDX1

CERN computer centre

dual-CPU nodes

~30 ~1600 ~100 ~ 500

Data storage

Event rate ~ 200 Hz

Local Storage SubFarm Outputs (**SFO**s)

Event Filter (EF)

Event Builder SubFarm Inputs (**SFI**s)

LVL2 farm

Second-level trigger

SDX1

DataFlow Manager

Network switches

pROS

stores LVL2 output

Network switches

LVL2 Super-visor

Requested event data

Event data requests Delete commands

Gigabit Ethernet

USA15

Event data **pulled**: partial events @ ≤ 100 kHz, full events @ ~ 3 kHz

Regions Of Interest

USA15

~150 PCs

1600 Read-Out Links

Data of events accepted by first-level trigger

UX15

VME   Dedicated links

Read-Out Subsystems (**ROS**s)

Read-Out Drivers (**ROD**s)

First-level trigger

ATLAS detector

UX15

RoI Builder

Timing Trigger Control (TTC)

Event data **pushed** @ ≤ 100 kHz, 1600 fragments of ~ 1 kByte each

October 10, 2005   Commissioning / hvds mpi   7

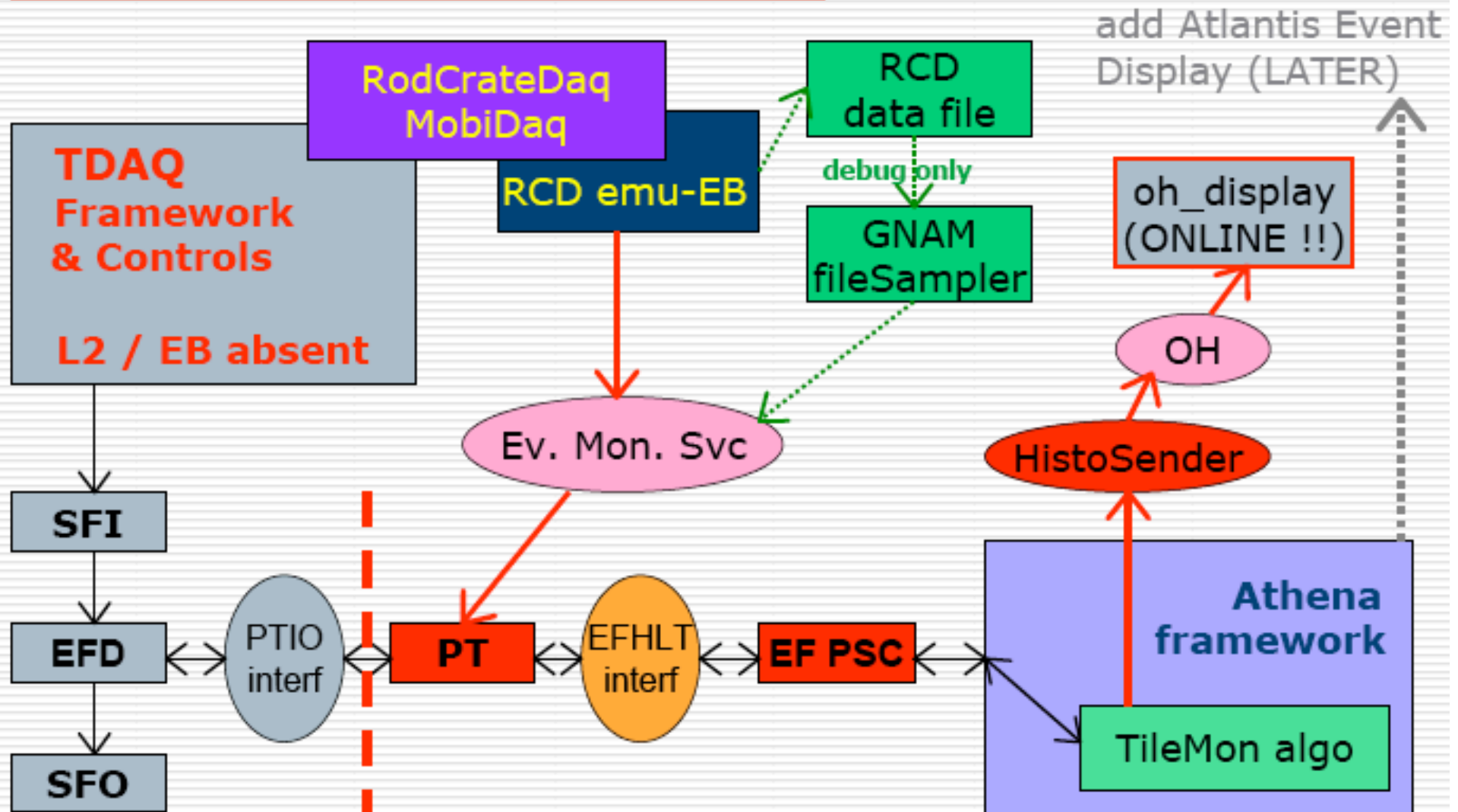# Monitoring Framework
(Serguei Kolos)
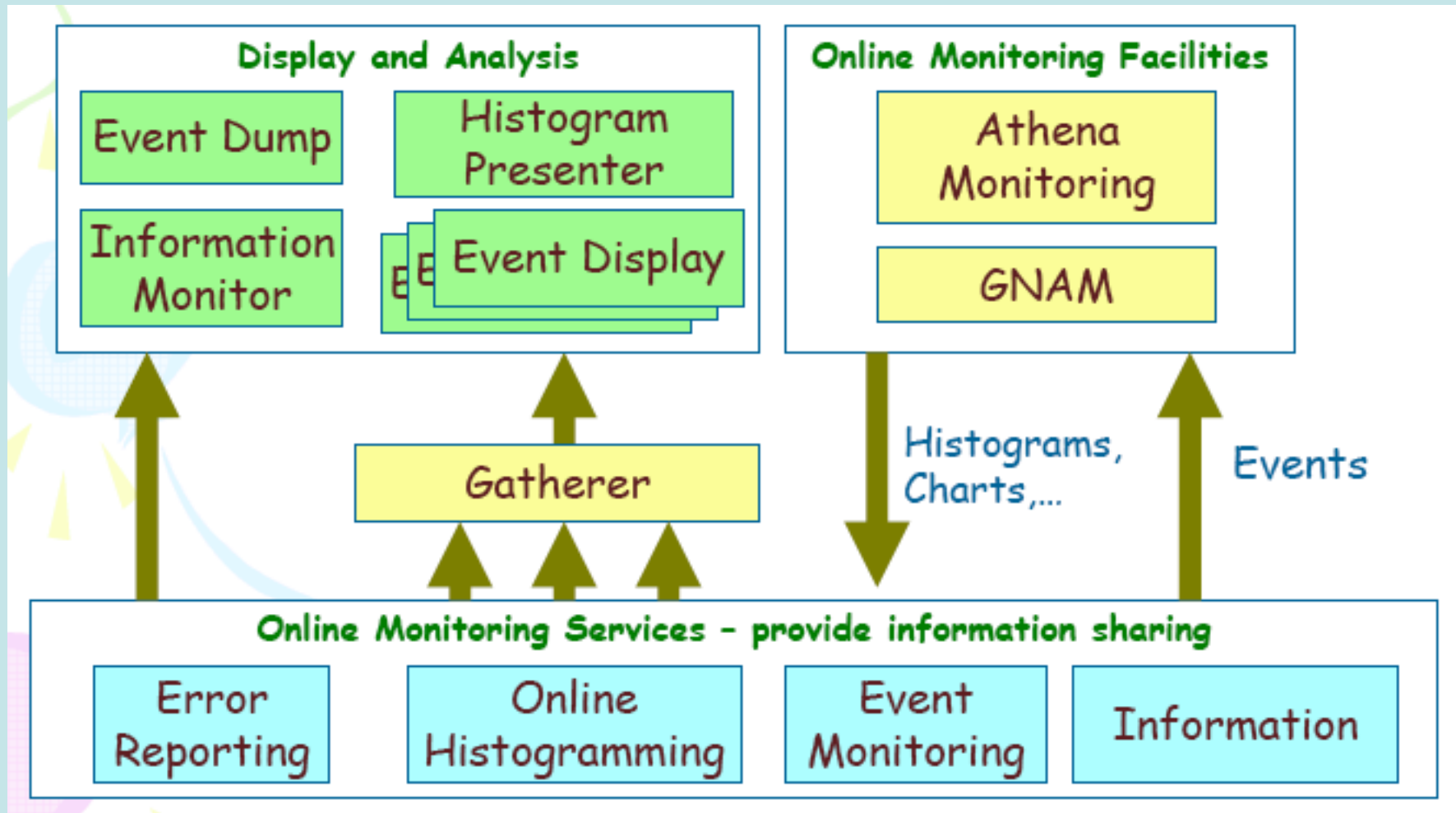
Monitoring: development steps
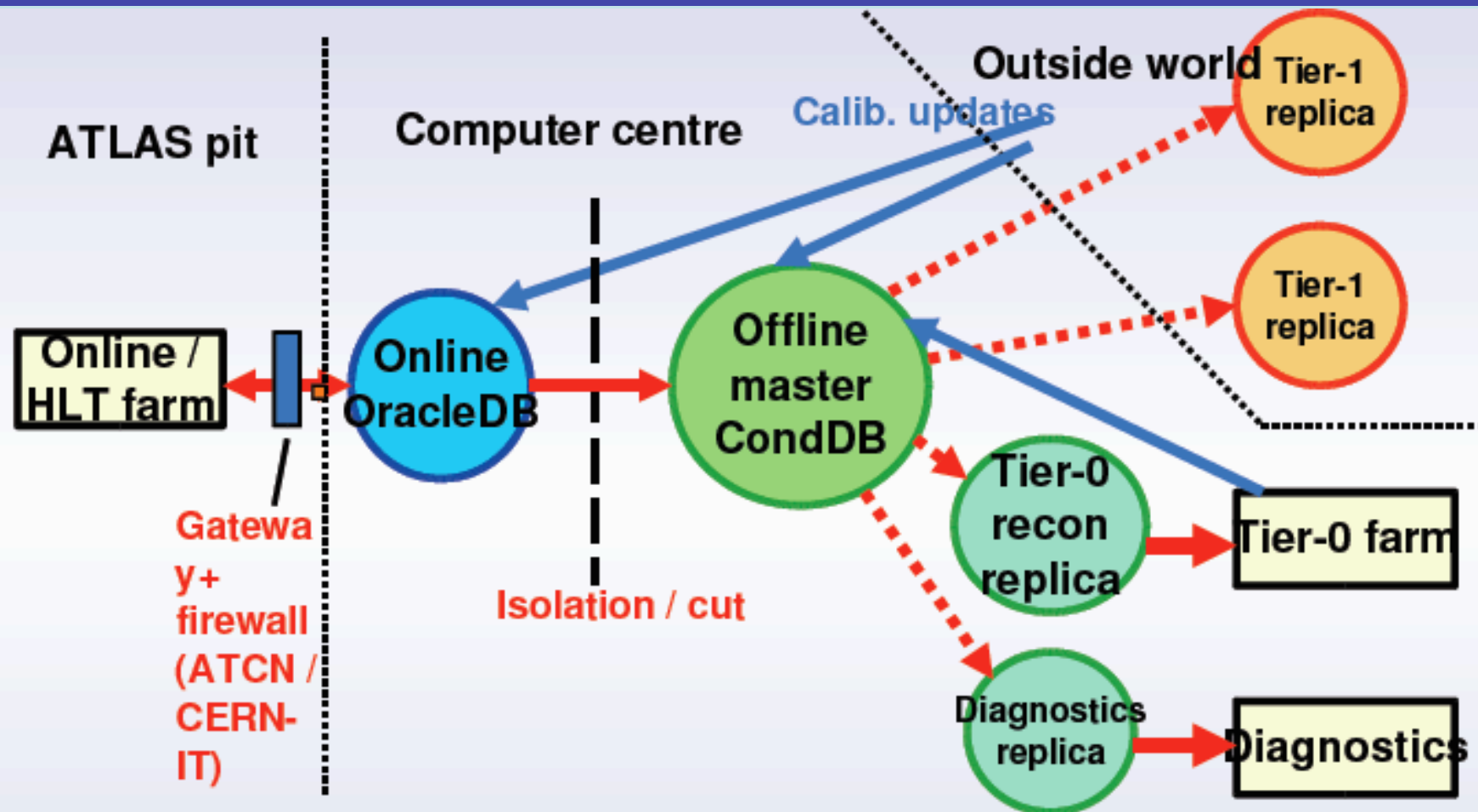## (Serguei Kolos)

- ◆ **Step 0 – now:**
    - ▪ Verifying software installation, connectivity, usability of services
- ◆ **Step 1 - Dec 05/Feb 06:**
    - ▪ Operational monitoring using GNAM and/or Athena,
    - ▪ Hardware monitoring
- ◆ **Step2 - May 06:**
    - ▪ Physics monitoring after Event Builder using Athena
- ◆ **Step 3 - Sep 06:**
    - ▪ Automated monitoring analysis including reference histograms comparison, alarms generation

RCD MobiDaq EF+Athena monitoring schema

add Atlantis Event Display (LATER)

RodCrateDaq MobiDaq

RCD emu-EB

RCD data file

debug only

GNAM fileSampler

oh_display (ONLINE !!)

OH

HistoSender

TDAQ Framework & Controls

L2 / EB absent

Ev. Mon. Svc

SFI

EFD

PTIO interf

PT

EFHLT interf

EF PSC

Athena framework

TileMon algo

SFO

2005-08-08   S.Sushkov – EF Monitoring TileCal MobiDaq

Databases: planned online architecture
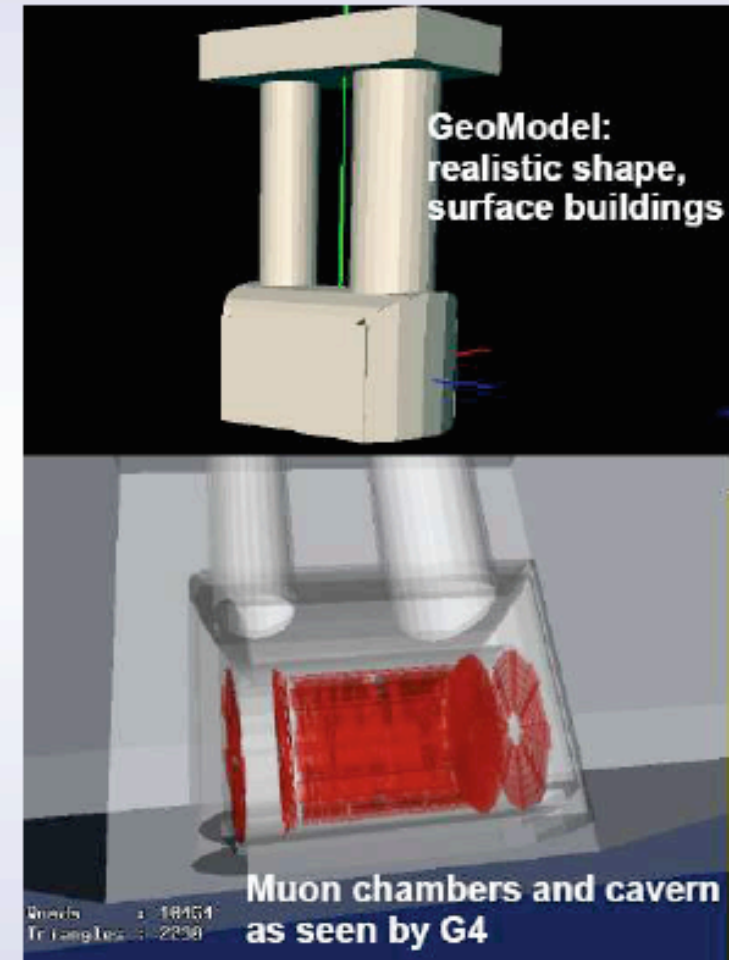## (Richard Hawkings)

- Online OracleDB server in b513 but visible from pit network
  - For online COOL conditions DB, but also custom subdetector & trigger DBs, OKS archive
  - Can cut all links between online and offline when necessary ('isolate ATLAS pit')
- Replication from online to offline master server also in b513

Distributed Data Management (DDM)

◆ **Commissioning data has so far been copied by hand into castor**

◆ **Try to move to Distributed Data Management system (DDM) as soon as possible**

  – **Will manage data on pit machines a la SFO**

  – **Provides book-keeping and file set browsing**

  – **Allows institutes to subscribe to data sets during commissioning period**

◆ **Action item for offline commissioning / DDM team / detectors:**

  – **Try using DDM for commissioning data**

G4 Cosmics Simulation

- ◆ **The full description of the overburden (+-300m) is in G4**
  - ■ Option to force the muon to be pointing to the interaction point
    - ● Cut on distance to the I.P.
  - ■ Plane to record the muons entering and exiting the calorimeter
    - ● Can be used as for trigger time
    - ● Not quite fully functional
  - ■ In ATLAS coordinate system
    - ● Missing HEC hits problem gone
- ◆ **Release 10.4.1 has been in use for test production of cosmic muons**
  - ■ Bug found in CosmicGenerator / cosmic2.f (same generator used in G3 samples)
  - ■ Particularly distorts muons with
    - ● Higher energies
    - ● Larger Zenith angle
  - ■ Fixed for 11.0.0


GeoModel: realistic shape, surface buildings

Quads : 18454
Triangles : 2298

Muon chambers and cavern as seen by G4

Forward Scintillator for Commissioning - in G4

- Recall that part of the JM moderator is being replaced by scintillator sheets read out via Tile light-guides
- Useful for beam-halo and beam-gas trigger
    - Also min bias trigger

- **Location : JM moderator**
- **z = ± 3.5 m**
- **~25 cm < R < ~115 cm**
- **→ ~1.8 < η < ~3.3**
- **φ segmentation : 8 wedges**
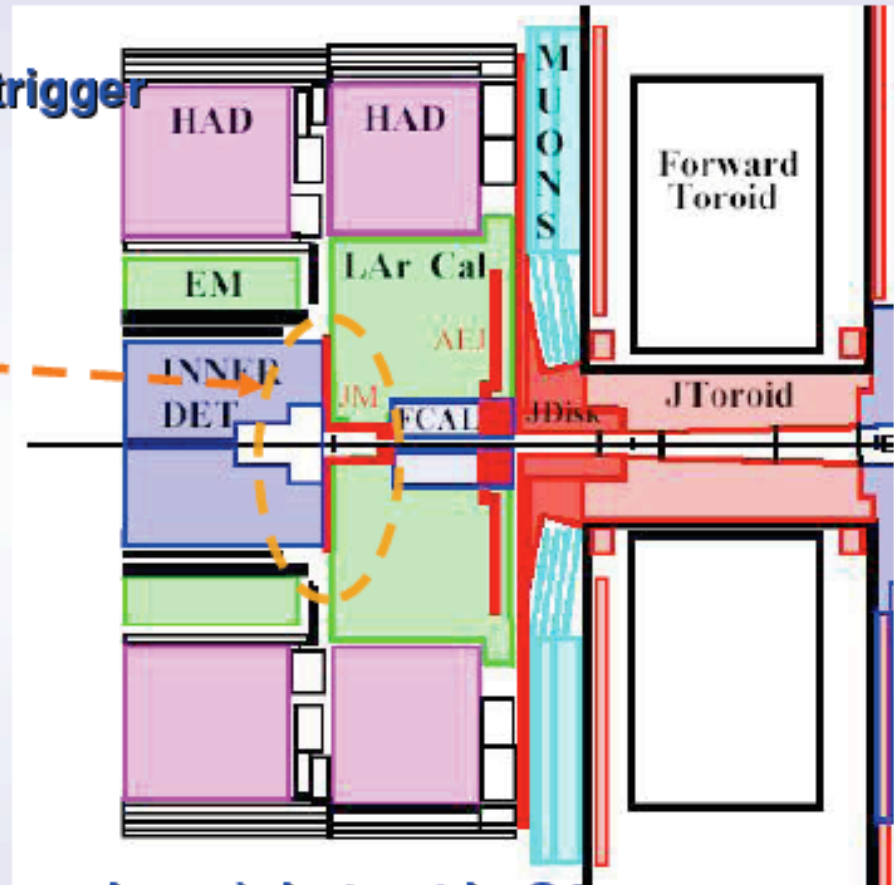
- Studies performed in G3 (Maarten Boonekamp), but not in G4
- Plan (over next ~ month) Joey Huston (project leader) will visit Pittsburgh an implement min-bias scintillator in Geomodel ATLAS DD

Timing Reference for Trigger - simulation in G4

- **Cosmic generator already has ability to store/retrieve particle entering ATLAS cavern (several talks from Andrea di Simone)**

- **For a trigger time and digitization reference: inject scoring surfaces into simulation and record position/time when particle crosses those surfaces -- "TTR"**
  - Closed circular cylinder surrounding calorimeters
  - Closed circular cylinder surrounding inner-detector
  - Still has an envelope overlap problem

- **Hong has implemented a timing reference tool in new Commission/CommissionUtils package**
  - Due to current envelope problems for the new scoring planes, he currently uses LAr hits as the time reference

- **All systems: must converge on common trigger time in simulation**
  - First: use this scoring-plane based system
  - Next: must emulate common TTC clock (1 / 40.08MHz)
  - Finally: Need emulation of different triggers (Tiles, RPC,...)

2005/09/30   Rob McPherson / Hans von der Schmitt   12

Subdetector simulation plans

- **Inner Detector**
    - Concentration has been primarily on SR1 configurations
    - But do want samples in full pit-geometry for studies
    - Trigger time emulation currently under study
- **Calorimeters**
    - Both LAr and Tiles now record hits in time bins
        - Allows later full digitization with better time reference
    - Also a "CaloClusterCellSlimmer" (Hong)
        - Makes new CaloCellContainer containing only cells that were in clusters
        - Much smaller file size
- **Muons**
    - Concentrating on sector 13, but using full DD
    - "Trigger time" from RPC hit time
    - Want large samples with detector displacements in DD

Computing System Commissioning - CSC (ex DC3)
(Mike Losty coordinates)

- Sub-system tests with well-defined goals, preconditions, clients and quantifiable acceptance tests
    - Full Software Chain
        - From generators to physics analysis
    - Tier-0 Scaling
    - Calibration & Alignment
    - Trigger Chain & Monitoring
    - Distributed Data Management
    - Distributed Production (Simulation & Re-processing)
    - (Distributed) Physics Analysis
    - Integrated TDAQ/Offline
- Each sub-system is decomposed into components
    - E.g. Generators, Reconstruction (ESD creation)
- Goal is to minimize coupling between sub-systems and components and to perform focussed and quantifiable tests

https://uimon.cern.ch/twiki/bin/view/Atlas/ComputingSystemCommissioning

David R. Quarrie: Computing System Commissioning

Detector status and plans
(from offline commissioning session, September 28, 2005)

Inner Detector: working in SR1
(Hauschild)

- **3 different SR1 detector set-ups in 2005/06**

    we are here!

    - **TRT Barrel (early Oct – mid Nov)**
        - **Tests with new RODs and TTCs**

        New Bytestream converter needed
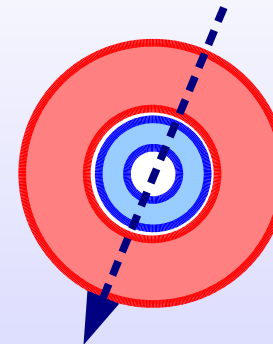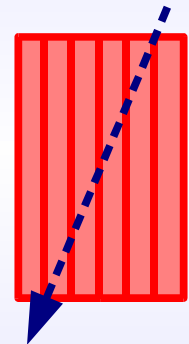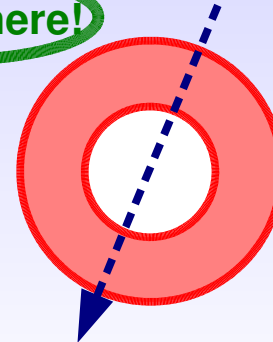
    - **TRT Endcap (mid Nov – mid Dec)**
        - **self-triggering tests**
        - **in parallel:**
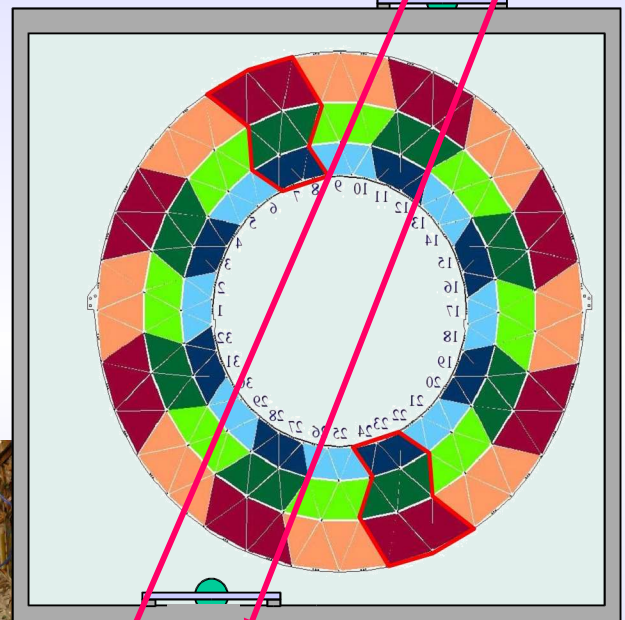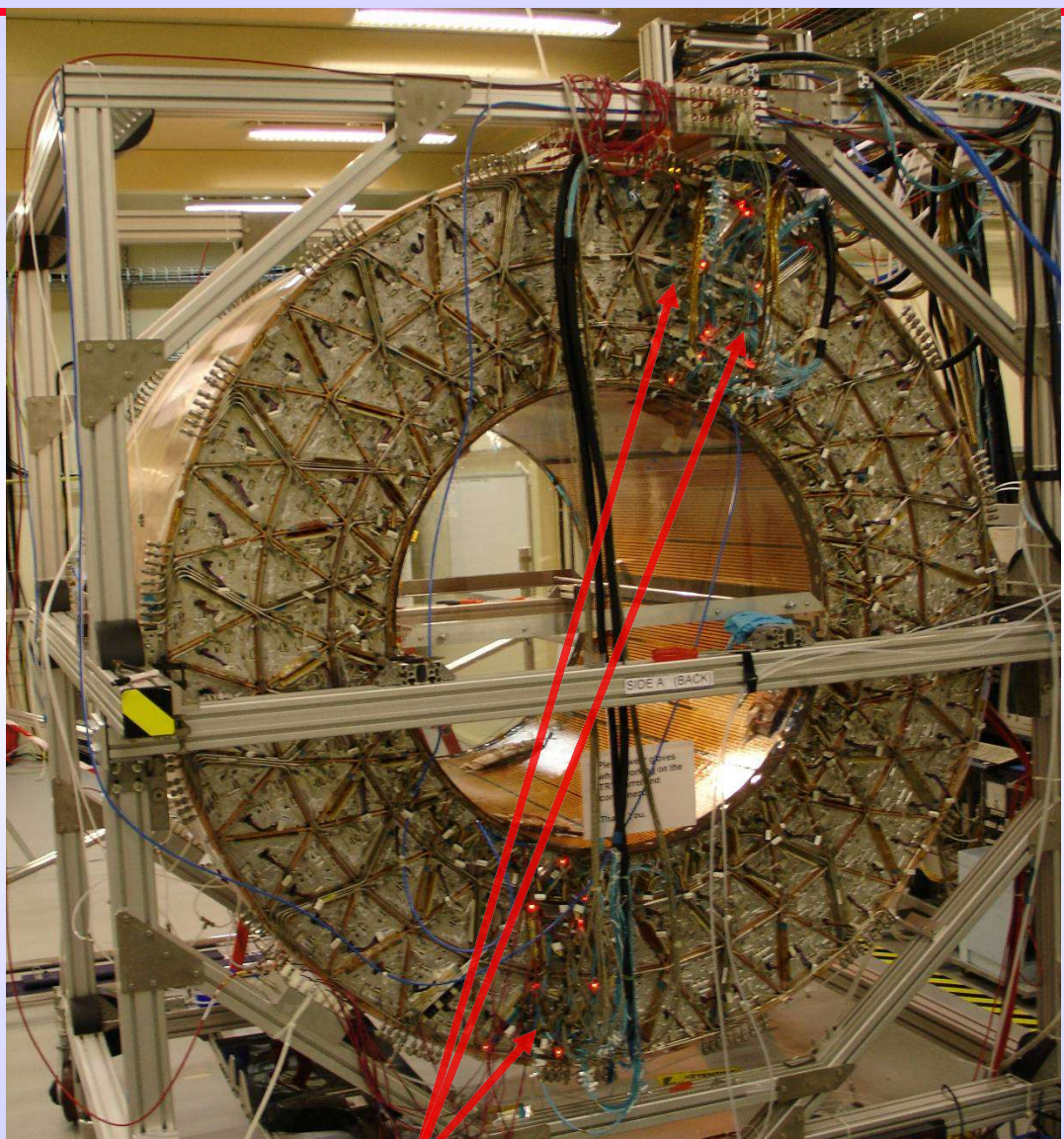   - ◆ **SCT Barrel insertion into TRT Barrel**

    - **TRT Barrel + SCT Barrel (Jan 06 - ???)**
        - **combined test**

- **Possible SR1 combined endcap tests April – June 2006???**
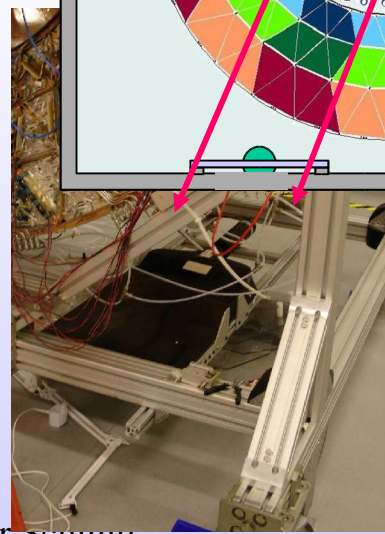
ID: Status/Plans
(Hauschild)

- **TRT (barrel) has started to take cosmics data in SR1**
  - **no ByteStream Converter in Athena (yet)**

- **TRT calibration procedure being migrated to Athena**
  - **database access tools have been developed, fitting etc. still to come, limited manpower**
  - **some worries on memory and CPU needs**

- **Request for SR1 + cavern cosmics simulated data (Alignment WG)**
  - **w/o and w/ misalignment (details under discussion)**

- **SCT on the way to use COOL for cond. and configuration data**
  - **various transformation tools needed**

- **Next milestone: Combined TRT+SCT cosmics test in SR1 starting in January**

LAr: Current Commissioning Schedule (Ma)

- ♦ **Phase 1 electronics installation --- on-going**
- ♦ **End of Oct: Barrel Calorimeter moves to Interaction Point**
- ♦ **End of 2005: finish electronics installation**
- ♦ **Jan-Feb, 2006: Electronics integration tests**
- ♦ **Mar-Apr, 2006: Cool down, electronics calibration**
- ♦ **May, 2006--- : Cosmic muon runs**

LAr: Areas of activities
(Ma)

- ◆ **Databases**
  - ■ **Support calibration data storage in CondDB**
  - ■ **Access to online databases: DCS, configuration**
- ◆ **Electronics Calibration**
  - ■ **Calibration data classes for POOL**
  - ■ **EM electronics calibration software development**
- ◆ **(Quasi-) Online Monitoring**
  - ■ **Prepare the monitoring software for phase 2 Commissioning in Jan, 2006**
  - ■ **Extend existing CTB monitoring tools, combine phase 1 electronics installation and testing experience**
- ◆ **Cosmic muons**
  - ■ **Producing G4 MC events**
  - ■ **Combined analysis with Tile**

Tiles
(Maneira)

◆ **Have had several cosmic data-taking periods since June**

◆ **Reconstruction status**

- Follow the changes in the core software
  - New Gaudi version
  - New identifiable container
  - Event format V3
  - all changes already in 10.4.0
- Taking data with RODs this week
  - Cosmics, CIS
  - For now, running in transparent mode
    - ◆ No calculation inside DSP
    - ◆ Same data as with ROD emulator
  - Later, will need
    - ◆ New fragments
    - ◆ To update ByteStream converter (Valencia)

◆ **Status**

- ■ **Can't test online event filter monitoring yet, since it's still based on release 10.0.x (old event format) and online TDAQ is using V3 now**

- ■ **Work ongoing offline with July data**

- ■ **Level 2 monitoring ongoing offline w/ 10.0.x (G. Usai)**

- ■ **Discussing what information to have in monitoring**

  - ● **For ex., summary histos for integrated charge, channels outside "good" region**

◆ **Request**

- ■ **Synchronize HLT, TDAQ and offline versions as soon as possible.**

Tile: Event Display

https://uimon.cern.ch/twiki/bin/view/Atlas/TileEventDisplay

◆ **Status**

- **Atlantis is used to look at physics events,**
- **v-atlas is used to spot the problems**
- **Status is the same as in July**

◆ **Request**

- **Need to be able to run an event display online, during data taking**

Sector 13 hardware status and schedule* :

- *Sector 13 test setup:* 3 BML and 3 BOL (side A) installed and positioned by end of September

(3 BML side C not considered here)

- *Gas system, HV, LV, DCS, alignment* installed and running

end of September (BML) or October (BOL).

- *MDT fiber* system installed. RPC in progress.

- *USA15 DAQ* should be available mid October

Back-up DAQ system using pit setup may be used for the

start but with only 2+2 chambers
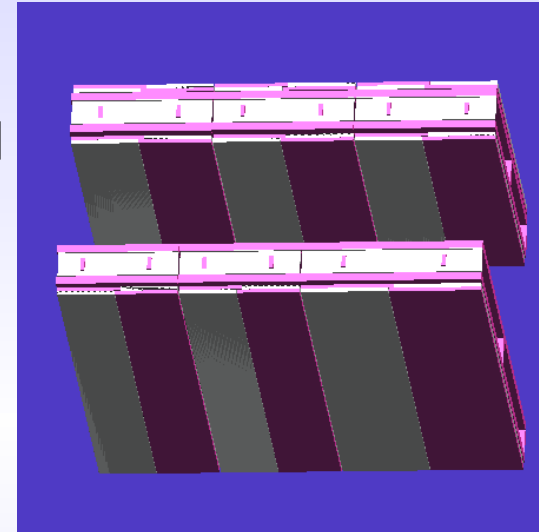
- *LVL1 cosmic trigger* commissioning during October and November. May start with a scintillator based trigger for debugging.
- *Monitoring* (histos/GNAM) developed and tested during summer
- *Event Display:* Possibility of plugging PERSINT to start with (stand alone DAQ period) for debugging.
Move to the ATLAS display package when full insertion in ATLAS TDAQ (with Athena monitoring) is achieved.
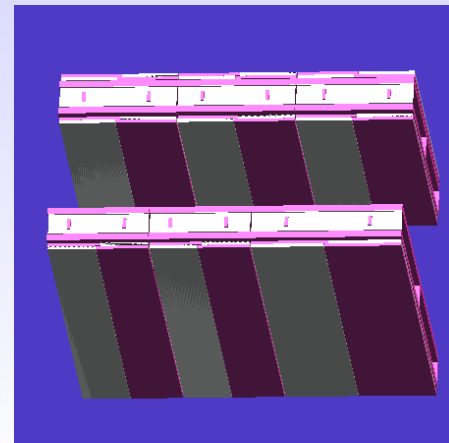
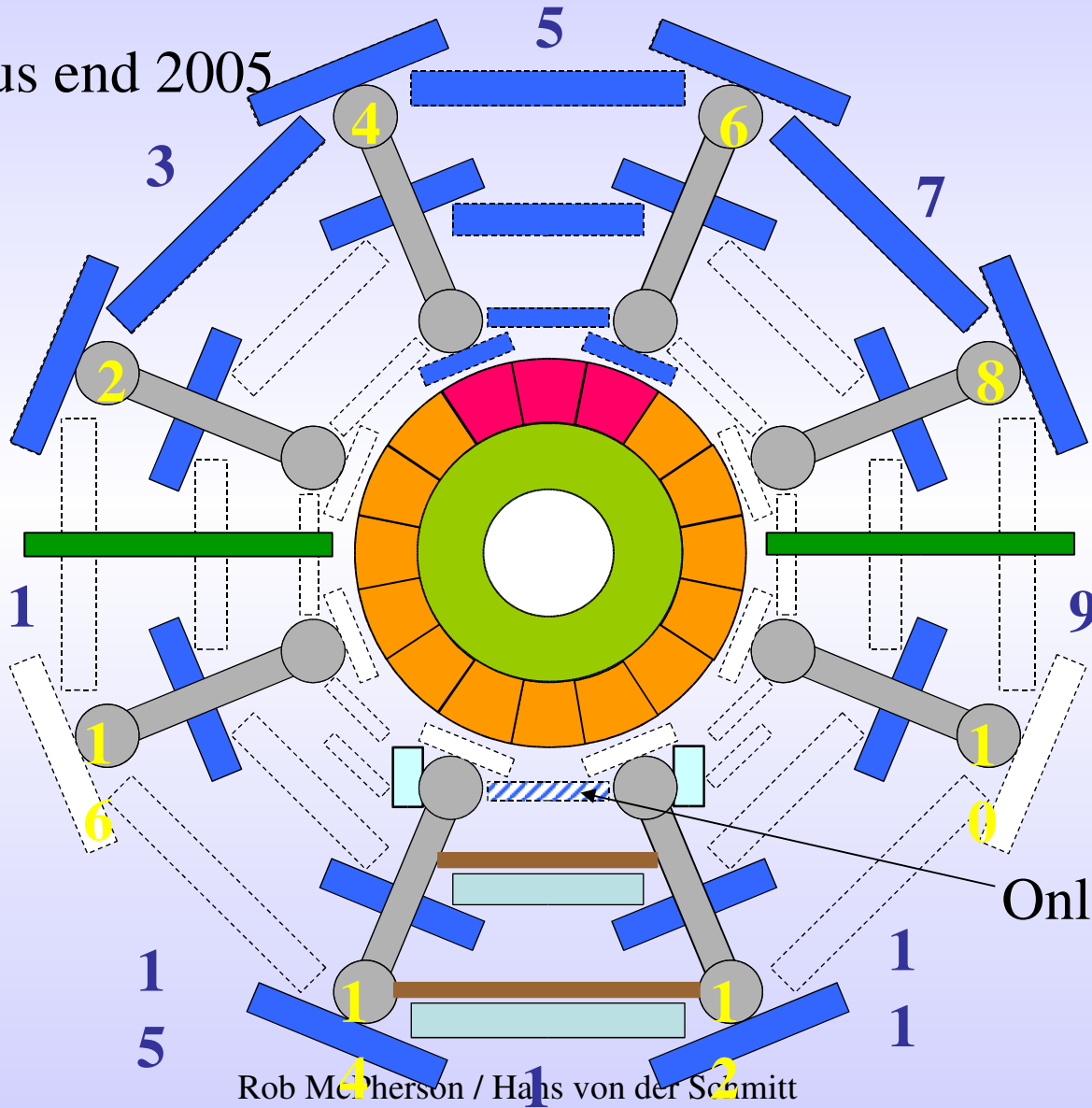## *Sector 13 data taking schedule:*

- Run in November
- Keep the Cosmic Ray facility of sector 13 in stand by to have the possibility of testing electronics, DAQ, Trigger and more as hardware became available: gas system resumed for a short (~week) data taking period when required (in advance: 2-3 weeks notice).
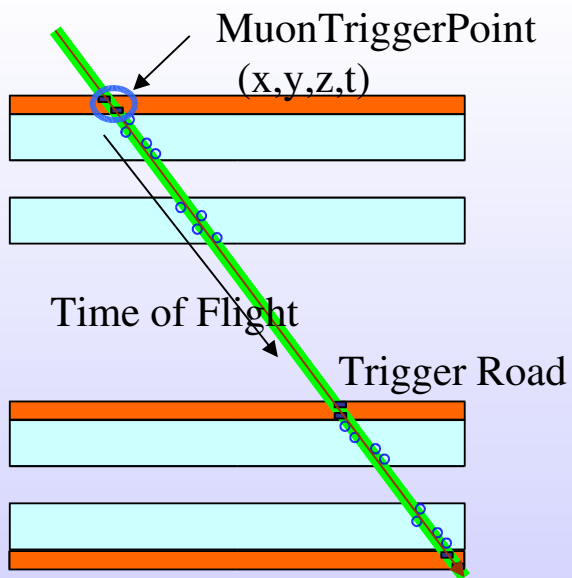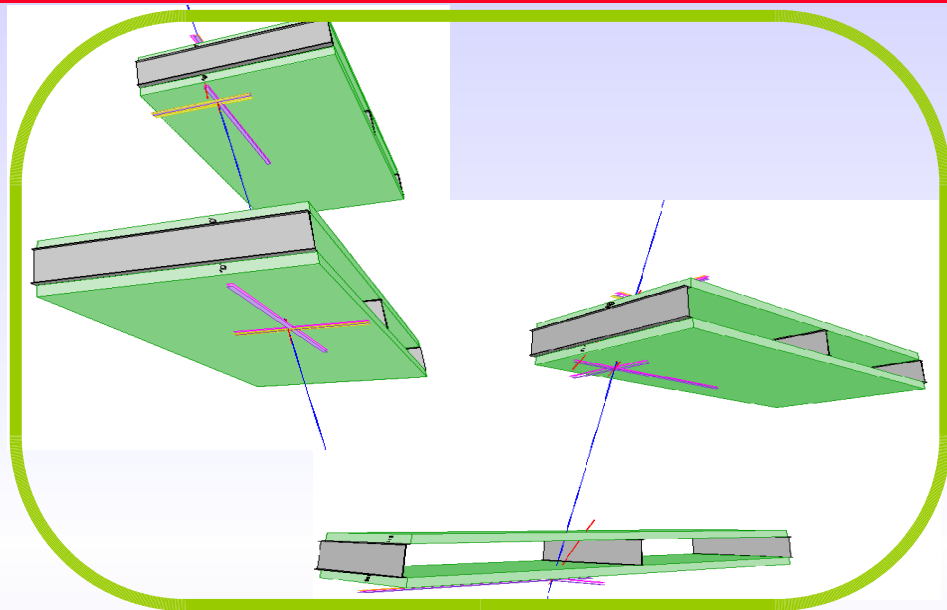
Expected status end 2005

Only in January?

Muons: cosmic reconstruction

- **Both MuonBoy and MOORE have been tuned to increase efficiency for cosmics**

- **A dedicated fast pattern recognition for cosmics has been developed, and tested with data from NIKHEF test stand (J.Snuverink)**

- **And a new set of tools to handle TOF for cosmics (N. van Eldik)**

- **New EDM implemented for 11.0.0**

Summary

- **Moving into detector commissioning phase quickly**
  - All systems standalone, moving toward integration
- **Online computing and software environment preseries now exists**
  - Online computers for monitoring: detectors must give feedback on needs and timescales ASAP
- **Common release of SW for offline / HLT needed**
  - Important for online monitoring applications
- **Plan to try DDM for commissioning data, but needs testing**
- **Cosmic muon production(s) with 11.0.0**
  - Critical to common time reference for digitization and trigger emulation for all systems