Online-Offline overlap areas - recent work

- High Level Trigger
  - Update on trigger configuration (CHEP06)
- Data Streaming
  - Where: RAW at Point1; ESD/AOD offline
  - Inclusive vs exclusive streams
- Distributed data management
  - Metadata from run control - into DQ2 at Point1 or Tier0
- Online Databases
  - Task force work finished
- Software installation at Point1
  - Offline + HLT-Monitoring procedure reasonable
  - Needs further steps to integrate with online

Trigger configuration - update

- Status presented recently at CHEP'06 in Mumbai (13-17 February)
- Paper also attached to this agenda

chep06

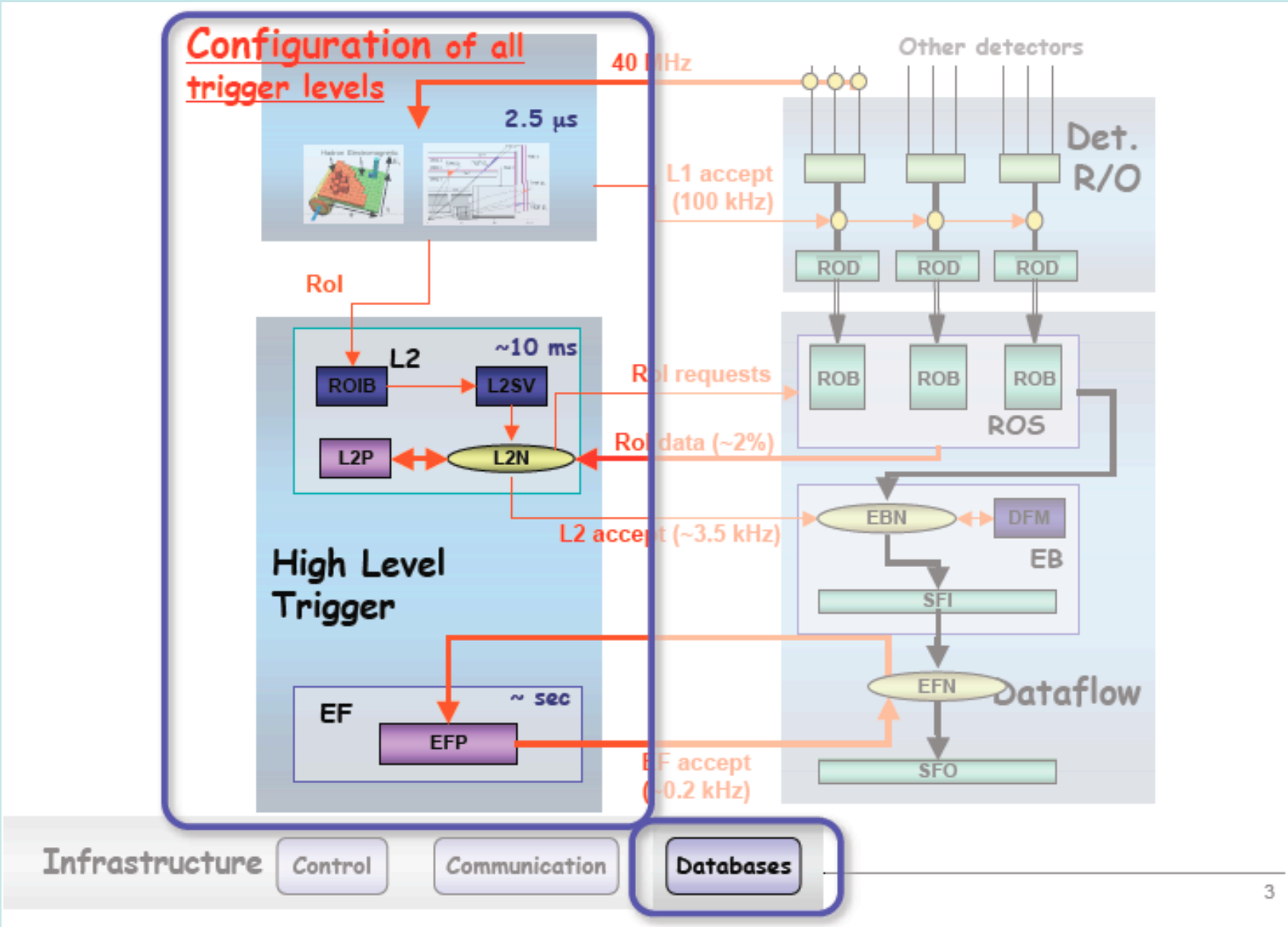
Computing in High Energy and Nuclear Physics

13-17 February 2006, T.I.F.R. Mumbai, India

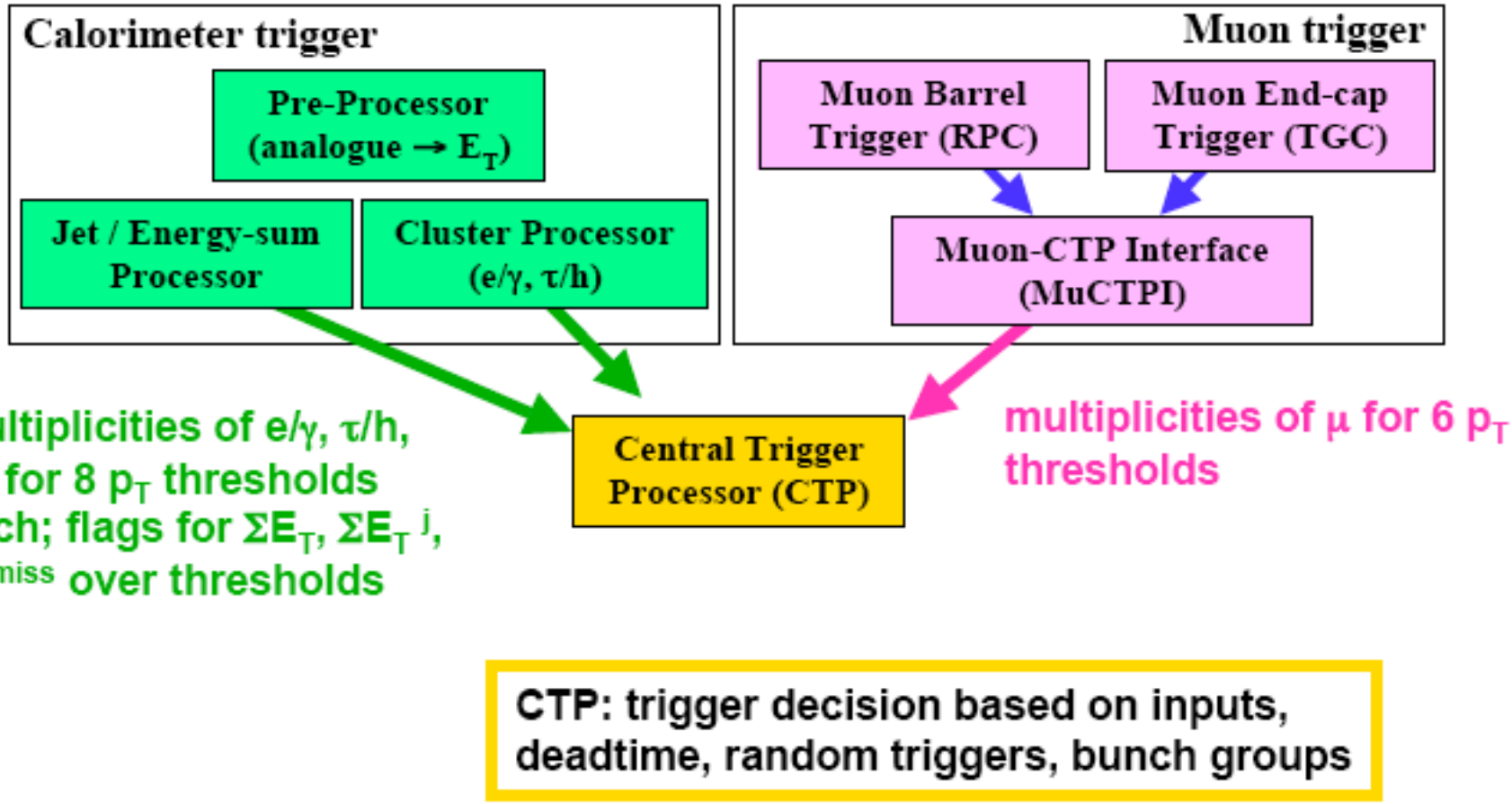
A configuration system for the ATLAS trigger

A. dos Anjos, N. Ellis, J. Haller, A. Höcker, T. Kohno, M. Landon, H. von der Schmitt, R. Spiwoks, T. Wengler, W. Wiedenmann, H. Zobernig

TDAQ context of trigger configuration



Level1 selection



Level1 trigger configuration

LVL1 trigger menu information for all LVL1 subsystems: muon trigger chambers, central muon trigger, calorimeter trigger, Central Trigger Processor (CTP)

A LVL1 trigger menu has a hierarchical stucture:

- A Trigger Menu (e.g. "lumi_01") is composed of many Items (e.g. "2J25+XE45")
- A Trigger Item is composed of some Thresholds (e.g. "J25")
- A Trigger Threshold is composed of many Threshold Values (e.g. "E_T=25, cone=4, η_{min}=1.2, η_{max}=1.4, φ_{min}=0., φ_{max}=0.2")

plus extra information like: dead-time parameters, bunch-group definition, random trigger rates, prescaled clocks, prescales, trigger type definition, jet input thresholds,…

example trigger menu:

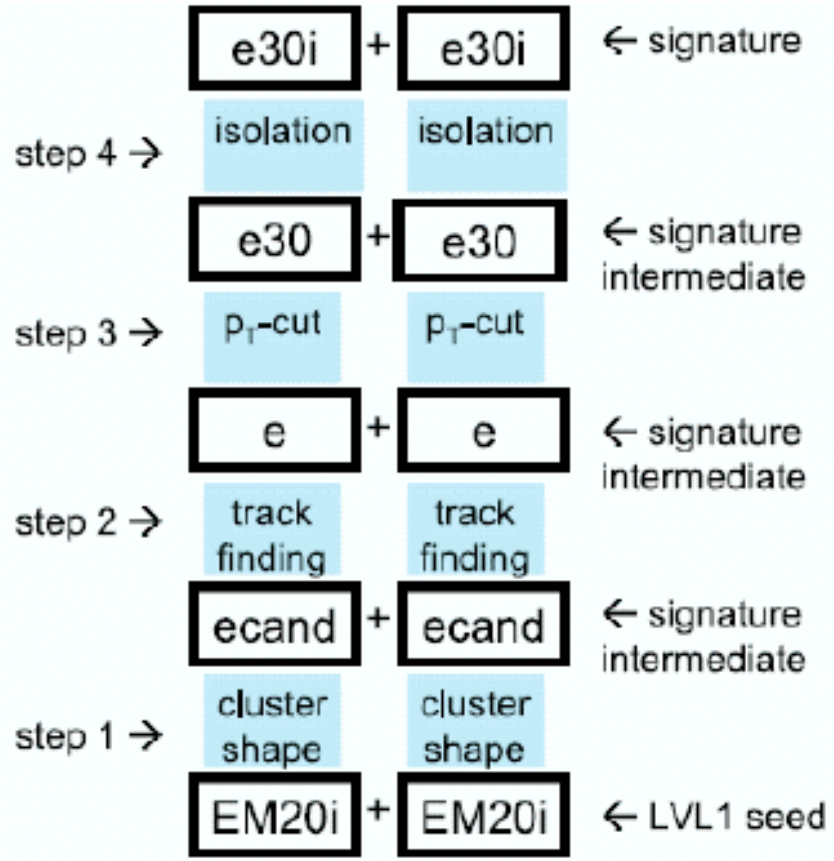
LVL1 Menu	$2x10^{33}cm^{-2}s^{-1}$
MU20	0.8
2MU6	0.2
EM25i	12.0
2EM15i	4.0
J200	0.2
3J90	0.2
4J65	0.2
J60+xE60	0.4
TAU25+xE30	2.0
MU10+EM15i	0.1
Others	5.0
Total rate (kHz)	**~ 25**

Configuration must fulfill hardware limitations, e.g. available thresholds, number of allowed inputs, LUT configuration in CTP, etc.

HLT selection and configuration

HLT strategy: refinement of TriggerElements (seeded from LVL1) in stepwise processing, perform stepwise decisions

example of step-wise processing:



HLT uses the offline reconstruction SW framework ATHENA on ~3000 CPUs

parts to be configured:

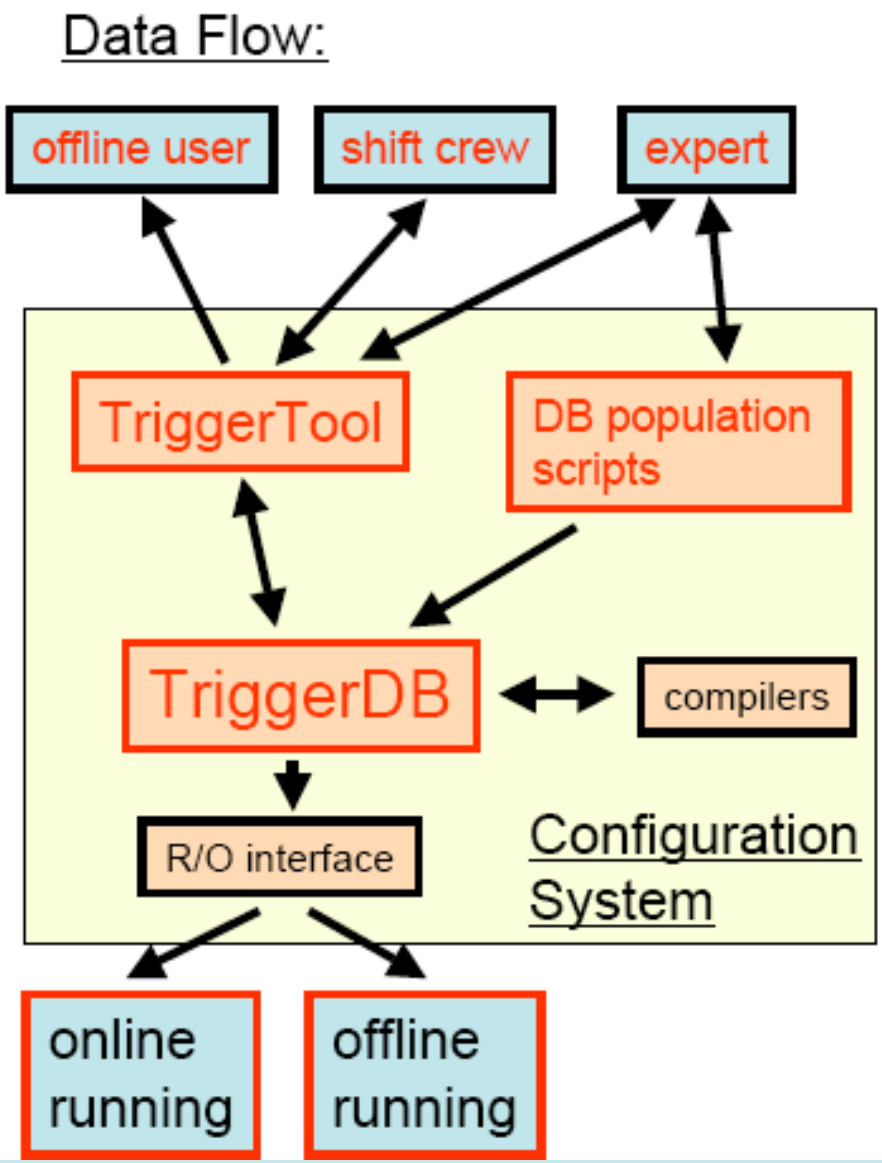
1) HLT Menu: determines which algorithms are called at which step and which signatures need to be fulfilled for accepted events
2) all configuration parameters of the algorithms and services, called JobOptions (JO), compatibility with offline important
3) release information

← Consistency (with LVL1) important

Requirements on trigger (L1+HLT) configuration

- must store all information to configure the trigger
- selection will change with time (some very often)
  → many versions of configurations
- must store all versions used and protect them
- must allow consistency checks (guidance) when preparing new configurations
- must allow easy trigger operation for experts, shift crews, offline users
- will be used for online trigger and offline trigger simulation
- parts must be compatible with offline SW (Athena)
- must be available at the detector, on the GRID, …

Overview of configuration system



TriggerTool:

- GUI for DB population
- easy and consistent menu changes for experts (LVL1 and HLT)

TriggerDB:

- stores all information to configure the trigger: LVL1 menu, HLT menu, HLT algorithm parameters (JO), HLT release information
- stores all versions used, with a key

→Configuration and Conditions DB

→DB available at Point and replicated to external sites

Retrieval of information for running:

get information by key via two paths:

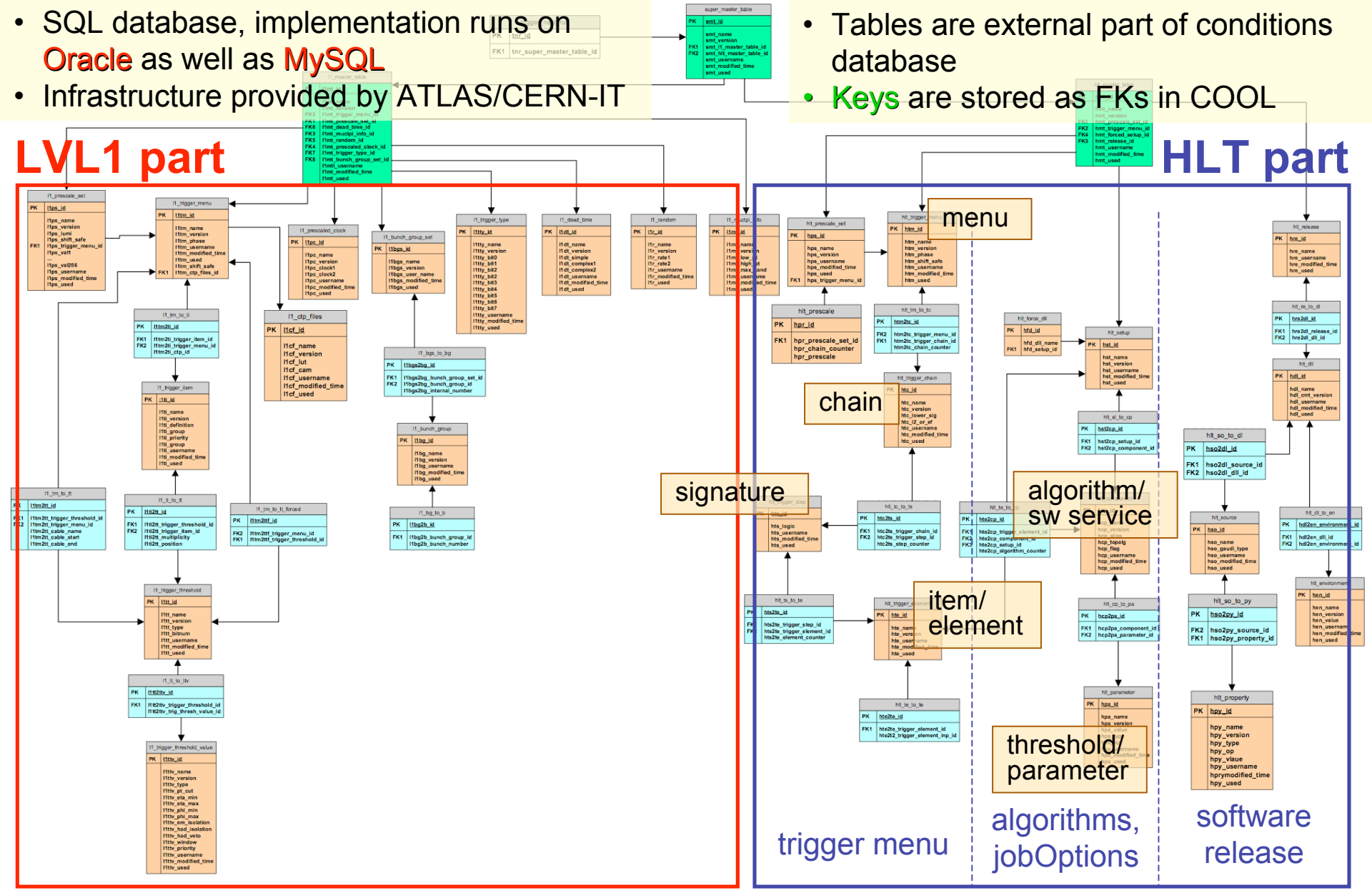
- extraction of data in XML/JO files
- direct read-out

for both online + offline running

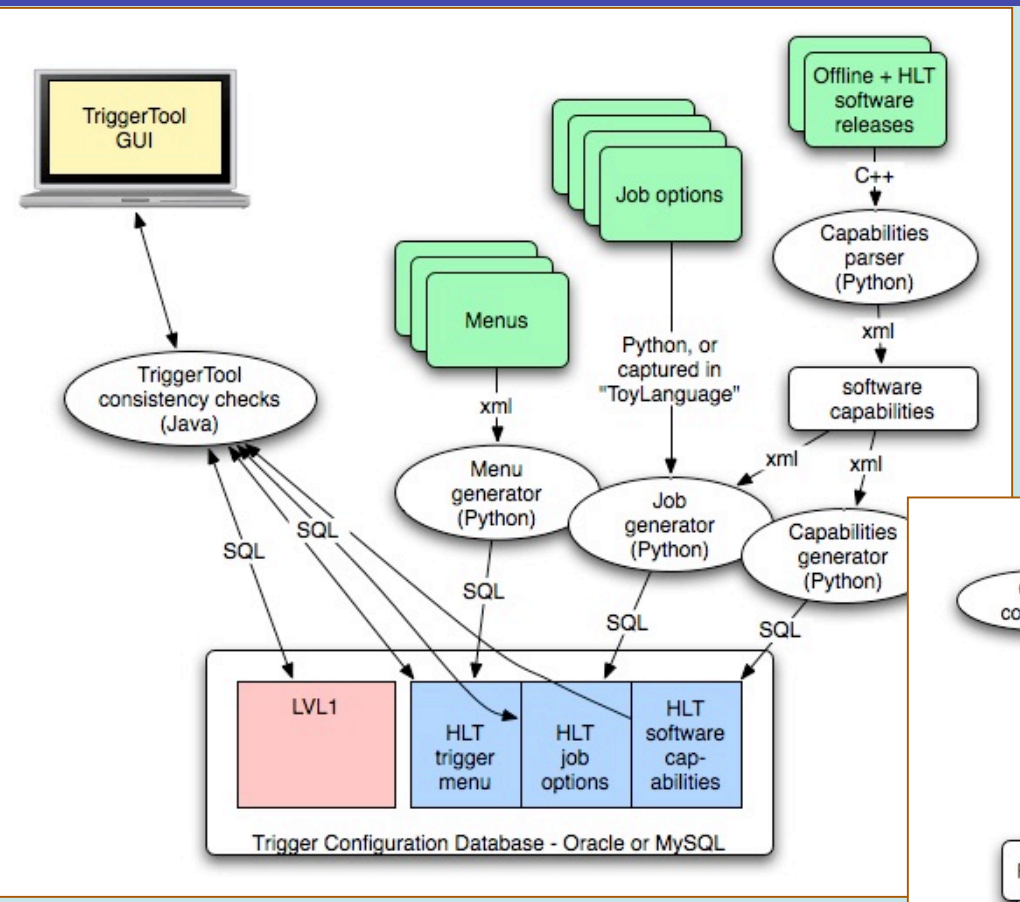
Trigger DB schema

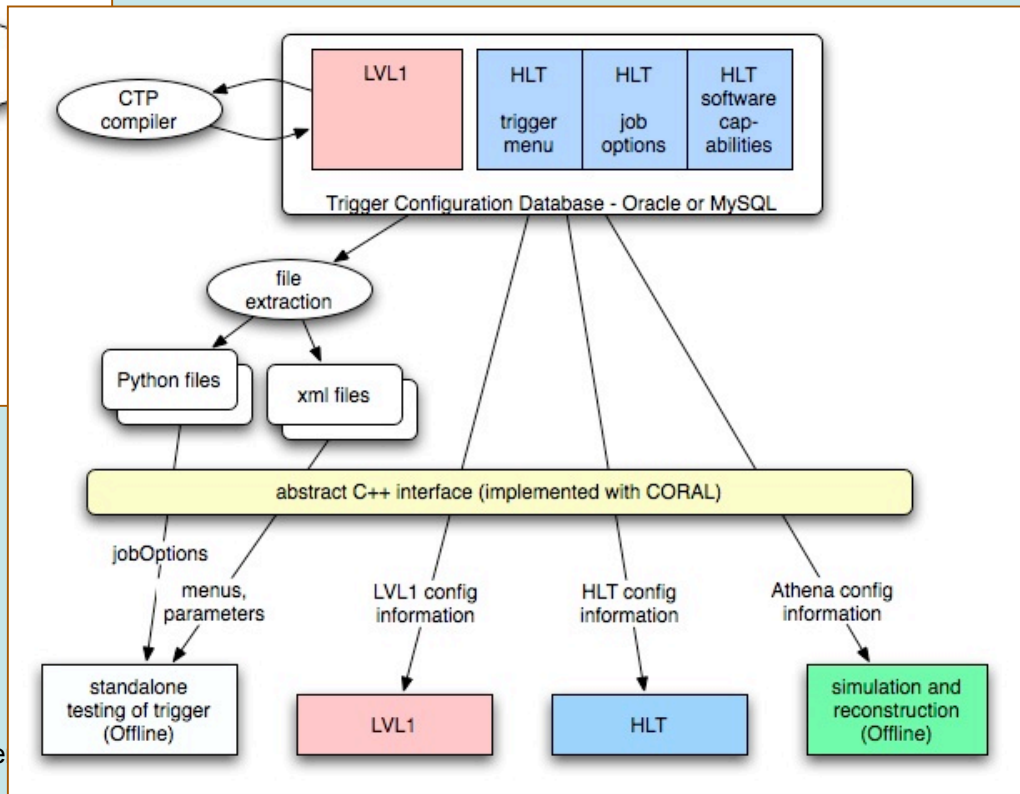
- SQL database, implementation runs on Oracle as well as MySQL
- Infrastructure provided by ATLAS/CERN-IT

- Tables are external part of conditions database
- Keys are stored as FKs in COOL



Trigger DB population and data retrieval





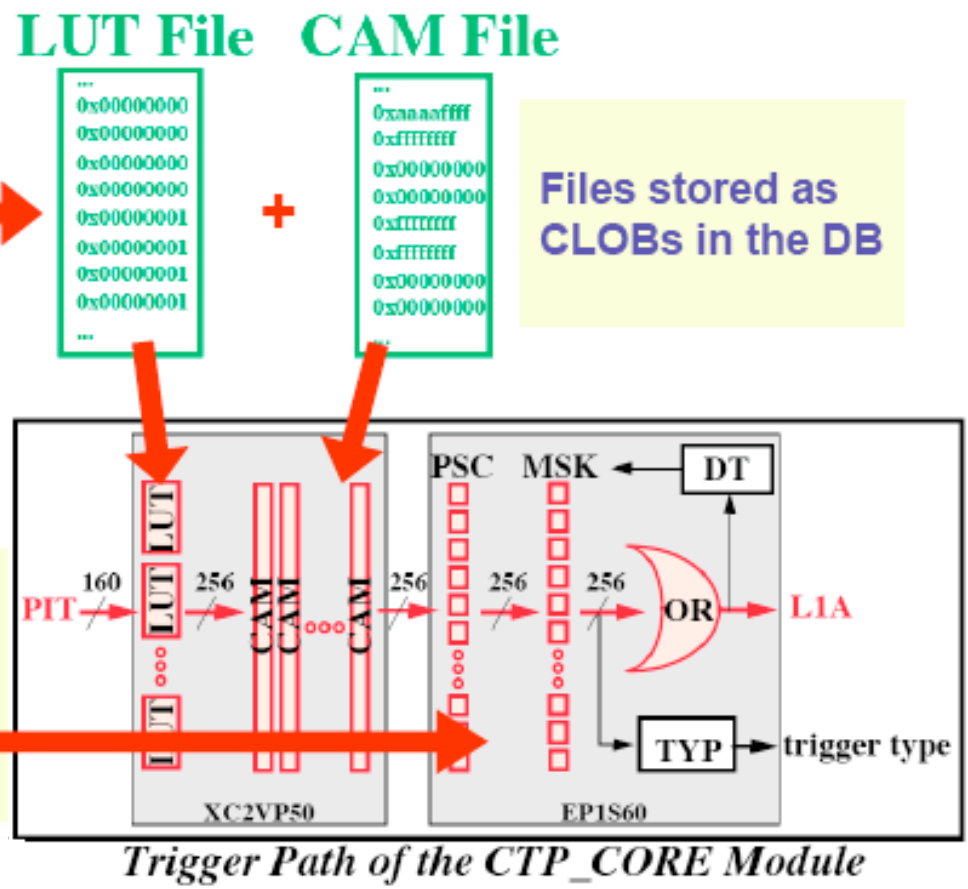
Central Trigger Processor: menu compiler

- Need to translate
  - from high-level definition of the LVL1-menu in the database
  - to settings e.g. for LUT, CAM, in the electronics

```
...
<TriggerItem TI_ID="i1EM10" mask="on" priority="low" prescale="1">
    <TriggerCondition triggerthreshold="EM10" mult="1" />
</TriggerItem>
...
<TriggerThreshold name="EM10" type="EM" bitnum="3">
  ...
  <TriggerThresholdValue thresholdval=      "10"
                         emisolation=       "1"
                         haisolation1=      "1"
                         haisolation2=      "2"
                         phimin=            "0"
                         phimax=            "0"
                         etamin=            "-2.5"
                         etamax=            " 0.0" />
  <Cable name="Cable02">
    <Signal range_begin="15" range_end="17"/>
  </Cable>
</TriggerThreshold>
...
```

(e.g. XML extracted from the TrigConf DB)

Registers can be set directly from DB values



Trigger Path of the CTP_CORE Module

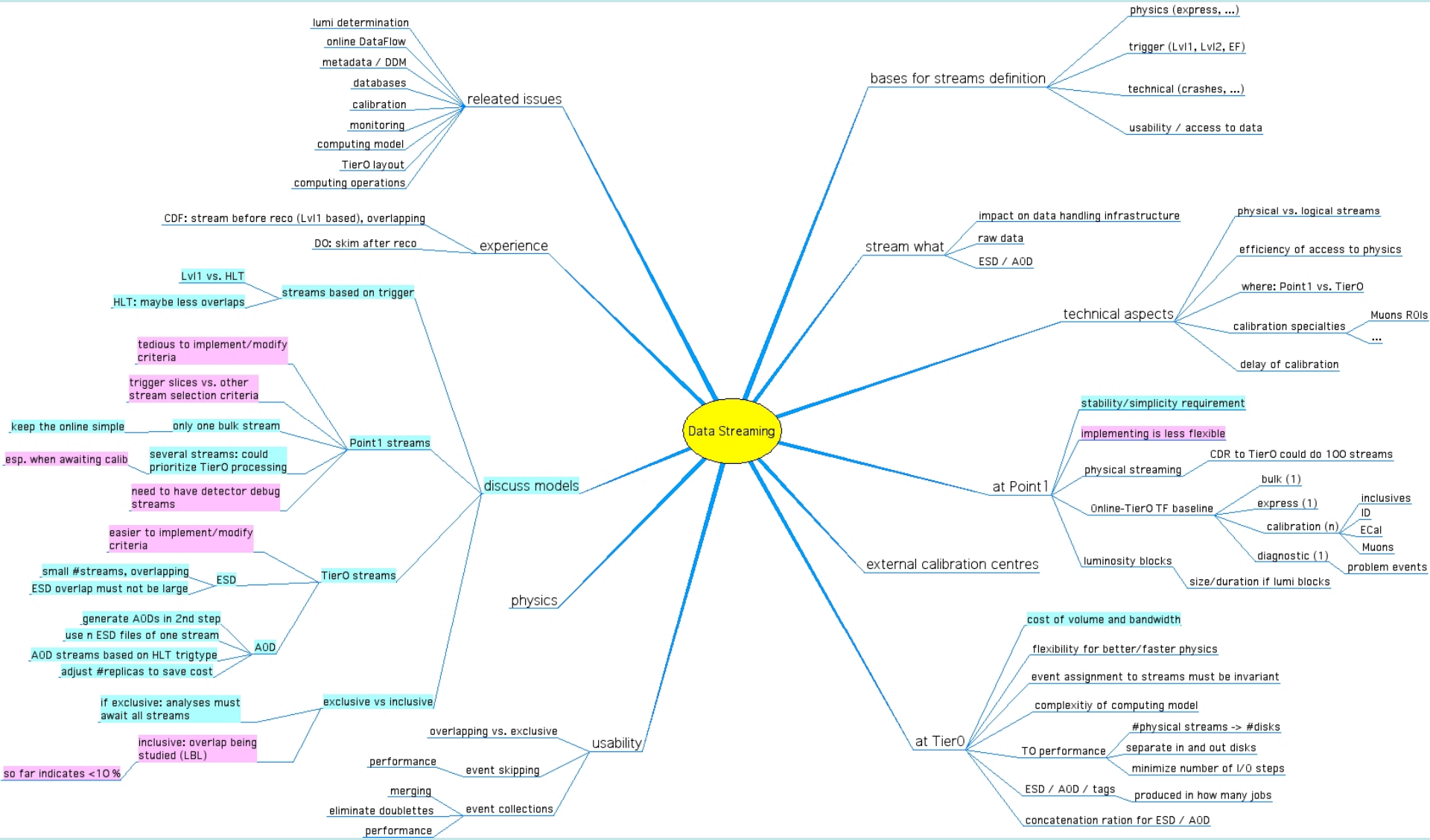
Trigger configuration - status

- Software: read options of a trigger job from the DB and materialize these into a Python set
  - This resembles normal Athena library configuration
  - Makes a few queries to the DB
- Used small testbed of six nodes running the HLT software
- Set up trigger job for LVL2 Muon Identification on these nodes
- The six nodes configure correctly from the DB
  - ~1 second total to access the MySQL configuration data
- Further investigations:
  - Integration with HLT menus and LVL1
  - Scalability (to be tested in the Large Scale Tests - end of 2006)

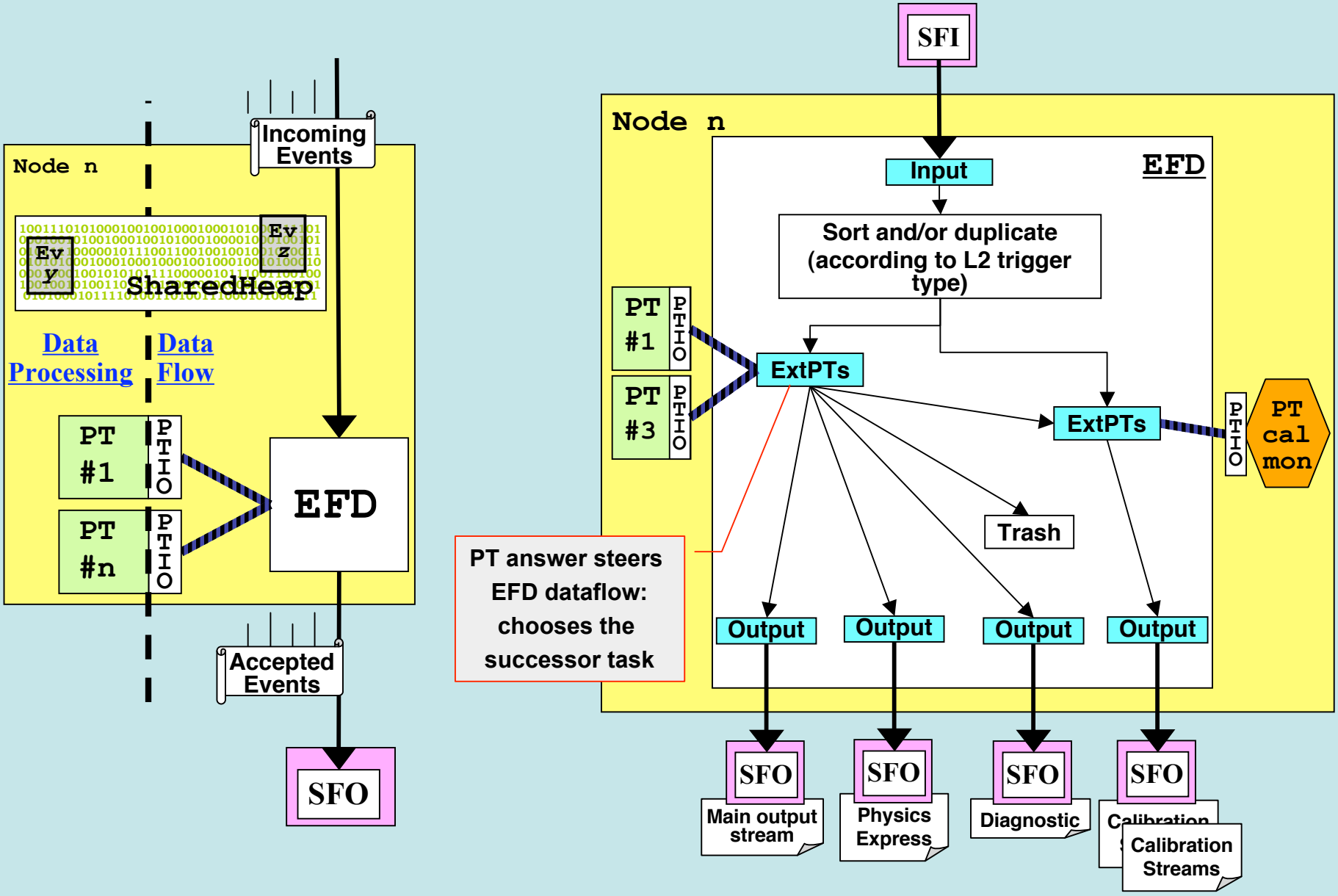
Data streaming

- Study group has been set up December 2005
  - About 12 participants, convenor hvds
- Participation from
  - TDAQ, Software, Computing Model, Physics and Luminosity
- Tasks: perform numerical studies and give recommendation to COB
- Subjects under study
  - Should we deviate from the "baseline" of Online-Tier0 task force and Computing TDR: added flexibility/prioritization of Tier0 processing
  - Implications for online and data management
  - Interplay with luminosity blocks
- More on the web: http://atlas.web.cern.ch/Atlas/GROUPS/SOFTWARE/COMMISSIONING/streaming.html
- Report on Trigger+Physics week (next week)

Data streaming context



Baseline for online: one bulk physics stream plus express, calibration(s), debug/diagnostic



Refined physics streams under study at present

(J.-F- Arguin, LBL)

- **Express stream**
- **Stream A: electrons**
  - e25i, 2e15i, e15imu10 + prescaled triggers
- **Stream B: muons**
  - mu20i, 2mu10 + prescaled triggers
- **Stream C: jets**
  - j400, 2j350, 3j165, 4j110, jetSumEt1000, SumEt1000 +prescaled triggers
- **Stream D: photons**
  - gam60i, 2gam20i + prescaled trigger
- **Stream E: missing Et and taus**
  - tau60i, tau35i+xE45, xE200, j70+xE70 + prescaled trigger
- **Stream F: B physics**
  - 2mu6+mass, 1mu6, etc.
- **Stream G: Luminosity, zero-bias**
  - min. bias, zero bias, roman pots, etc.

- Each stream contains similar physics:
  - similar users and reprocessing needs
  - Minimize overlaps
- Based on triggers information (TDR)
- Overlaps allowed between streams but not within a stream (see example next page)
- Note: separate e and mu to avoid excessive access to a "super" single lepton stream

Some results for overlaps (prel.)

(J.-F- Arguin, LBL)

Overlap Table: W→eν (rate in Hz)

Streams	electrons (A)	muons (B)	jets (C)	photons (D)	xE and taus (E)	B physics (F)
electrons (A)	12±0.11	0±0	0±0	0.002±0.002	2.1±0.062	0±0
muons (B)	–	0±0	0±0	0±0	0±0	0±0
jets (C)	–	–	0±0	0±0	0±0	0±0
photons (D)	–	–	–	0.031±0.0079	0.029±0.0076	0±0
xE and taus (E)	–	–	–	–	0.55±0.033	0±0
B physics (F)	–	–	–	–	–	0±0

Note: table contains only events passing 1 or 2 streams
Rate for passing 3 or more streams is 0.0061 ± 0.0035 Hz

Total overlap = 14.5 ± 0.401%

Off-diagonal: rates for passing two streams (overlapping events)

Diagonal: rates for passing one and only one stream (non-over-lapping events

Overlap Table: W→ μν (rate in Hz)

Streams	electrons (A)	muons (B)	jets (C)	photons (D)	xE and taus (E)	B physics (F)
electrons (A)	0.0015±0.0011	0.0046±0.0019	0±0	0±0	0±0	0±0
muons (B)	–	13±0.063	0±0	0.0023±0.0013	0.35±0.016	0.00077±0.00077
jets (C)	–	–	0±0	0±0	0.00077±0.00077	0±0
photons (D)	–	–	–	0±0	0.00077±0.00077	0±0
xE and taus (E)	–	–	–	–	0.19±0.012	0±0
B physics (F)	–	–	–	–	–	0±0

Note: table contains only events passing 1 or 2 streams
Rate for passing 3 or more streams is 0.0031 ± 0.0015 Hz

Total overlap = 2.64 ± 0.0367%

- Larger overlap for W->enu than W->munu mostly because of electron faking taus

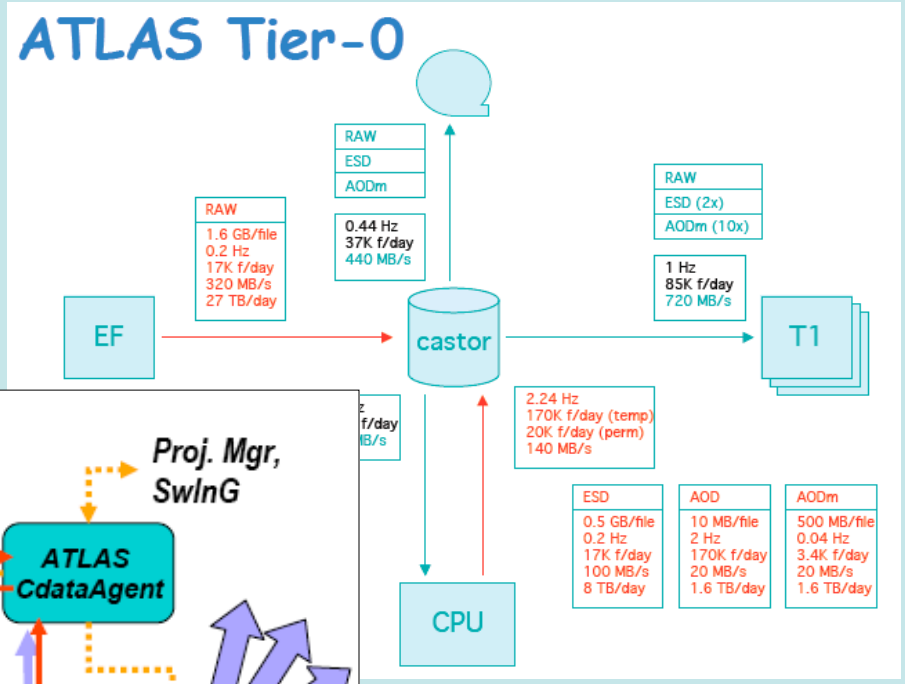
Extra slides

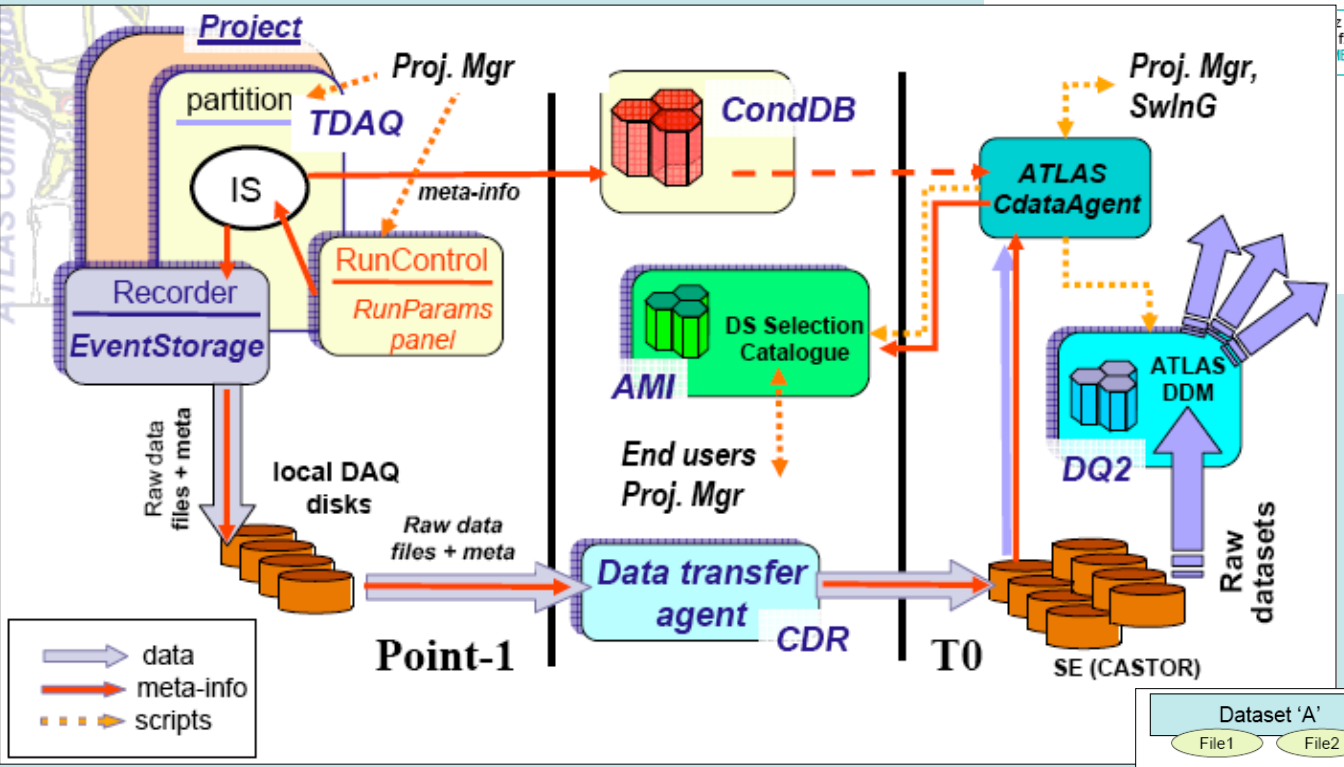
Distributed data management

Flow of Data and Metadata from the Cavern via Tier0 worldwide: **Distributed Data Management**

Primary metadata originate in RunControl and proceed via COOL to cataloging in DQ2 (AMI: metadata DB)

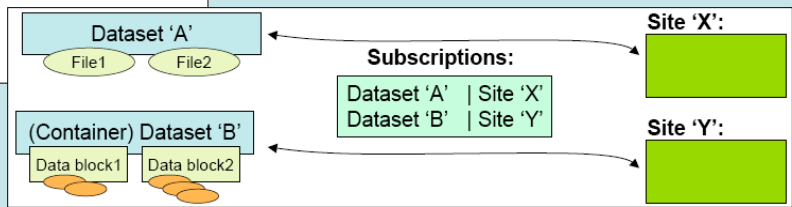
DQ2 replicates sets of data files (datasets) to the remote sites which can subscribe to datasets





Options under study:

CDR or DQ2 for data transfer from Point1 to Tier0

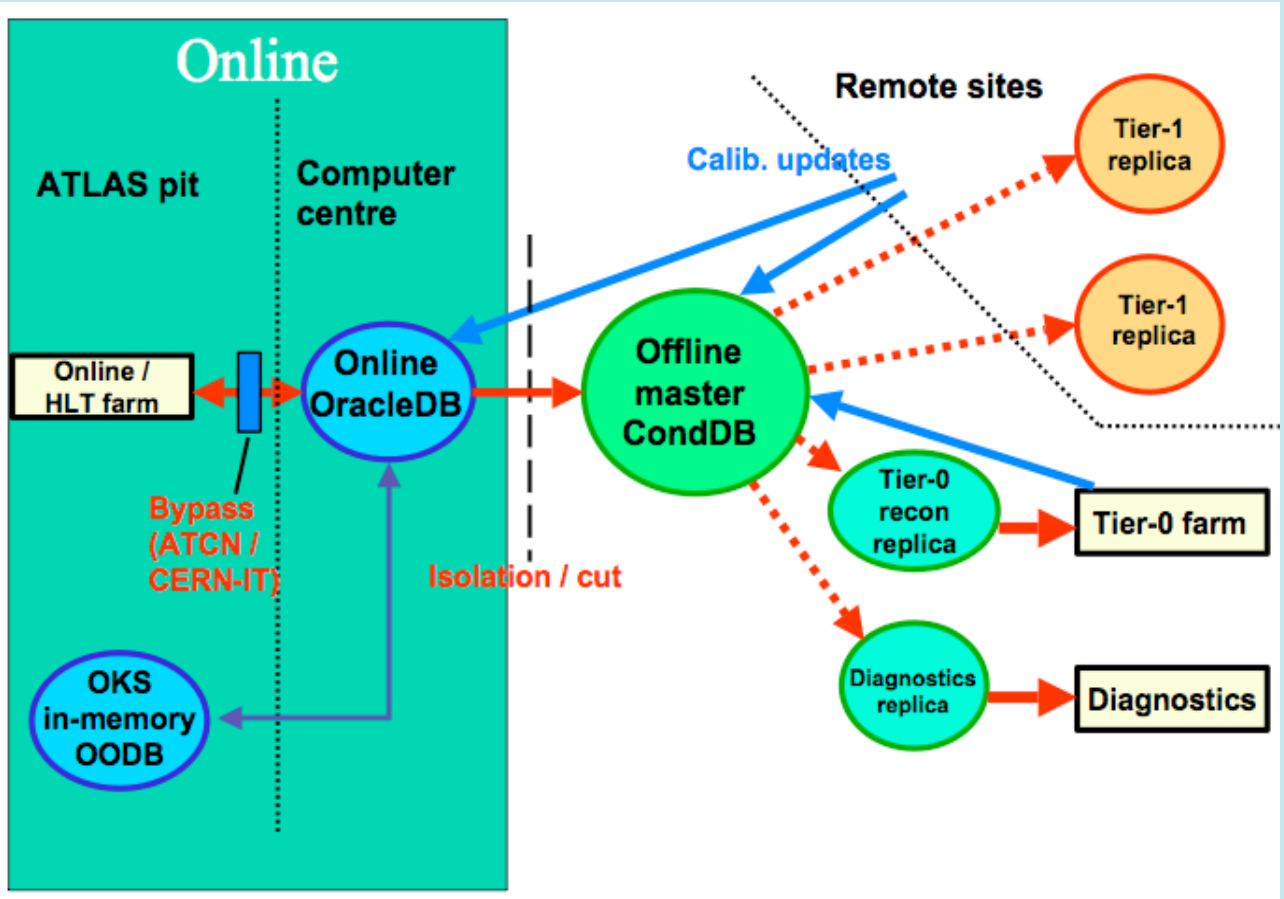


Online database task force

Databases usage

Online: for configuration and to store conditions (including the actual configuration)

Offline: for retrieval / update of conditions and to prepare future configurations



Task force

Convenor: Steinar S.

DB, Online, Detectors, Commissioning participation

Report nearly finalized