



# DAQ Summary

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# Agenda (Reminder)

<b>DAQ Overview</b>		<b>20'</b>
Overview of Topics not covered in detail	Beat Jost	20'
<b>TFC (Timing and Fast Control)</b>		<b>1h5'</b>
Status/Partitioning	Beat Jost	20'
Requirements to readout supervisor	Richard Jacobsson	20'
Status of TTCrx	Joergen Christiansen	5'
Discussion	All	20'
<b>10:20 Coffee</b>		<b>20'</b>
<b>Throttling</b>		<b>1h</b>
Infrastructure, dead time, monitoring	Beat Jost	30'
Discussion	All	30'
<b>Readout unit</b>		<b>1h</b>
Data formatting, error handling, performance	Hans Muller	30'
Discussion	All	20'
		<b>3h45'</b>



## DAQ Overview

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- ❑ Basically description of the event building and its protocol
- ❑ Discussion
  - Problems of memory overflows (1 MB currently) in smart NICs and corresponding loss of integrity of event data
    - ↳ have to study how often this would happen and how system would recover and decide on acceptable error levels (Xon/Xoff flow control should help a lot)
    - ↳ With Xon/Xoff protocols this might lead to deadlocks-> throttle timeouts in RS due to buffer in RU getting full
    - ↳ should avoid at all costs an 'event manager' since it introduces
      - a non-scalable element in the system
      - difficulties to implement partitioning
      - add complication to the RUs

## □ Partitioning

- Idea to define partitions starting from the LOE chip didn't go down very well
- suggestion to start at the level of the TTCrx or even at the level of the TTCtx
- care needs to be taken that there is coherency between the partition definition and the configuration of the readout and controls system such that all the data that have to be read are read and that no data are expected from regions where no data are to be expected (connection between partition definition and configuration database)
  - ↳ **EVERY** level of the readout has to be aware of from which sources data are to be expected and from which sources not
- TFC switch specs non controversial !!!!!!!



## TFC (Cont'd)

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### ❑ Readout Supervisor Specifications

- well received
- basically agreed
- Question of “Universal time stamping” and synchronization between readout system and controls system (alarms) was raised. Conclusion was that RS could provide universal time-stamps for events and effort should be made to synchronize all processors to universal time with an accuracy of ~10 ms, such that correlations between physics data and controls events can be made.

### ❑ Status of TTCrx

- few ‘old’ chips available
- slight problem with PIN diode acting as particle detector disturbing PLL in TTCrx (fixed).
- Prototype production soon (~100 chips for LHCb, no cost).
- Final production mid 01



# Throttling

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- ❑ Hardware infrastructure for throttling of L0 and L1 trigger proposed
  - throttling will NOT introduce bias, since it only depends on history and doesn't know about which events will be thrown away
  - Throttle OR agreed, question on number of inputs has to be answered. Need number of initial throttle sources, eventually, to determine optimum.
  - No conclusion on electrical characteristic of input/output (optical/differential electrical?)
- ❑ Monitoring (OR, RS, switch) most likely sufficient



## Readout Unit

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- ❑ Two prototypes in use, two more in preparation
- ❑ performance not yet sufficient for VELO use, but sufficient for DAQ use (~150 kHz for ~250 bytes input fragment size), being optimized
- ❑ Question of FEM use (16 inputs instead of 4) plus smaller event fragment needs to be studied.
- ❑ Studies of output stage will start eventually. Question on output strategy (single output buffer, scatter-gather by NIC, shared memory push?)



# Issues for TFC

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- ❑ General
  - Architecture fixed
  - Partitioning scheme
- ❑ Readout Supervisor
  - Addressed commands to individual TTCrx
  - L1 de-randomiser throttle, central or cabled?
  - How many RS'
  - RS jitter requirements
  - L0 rejects before reset to empty L0 de-randomizer
  - L0 latency within RS -> try 4 clock cycles, budget 6 clock cycles
- ❑ Throttling
  - Throttling architecture and philosophy agreed
  - Monitoring capabilities of TFC switch and Throttle OR





## Topics for Next Workshop

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- Raw data format?
- Partitioning again?
- ????????
- ????????
- ????????
- ????????

And... I will keep my mouth shut...