

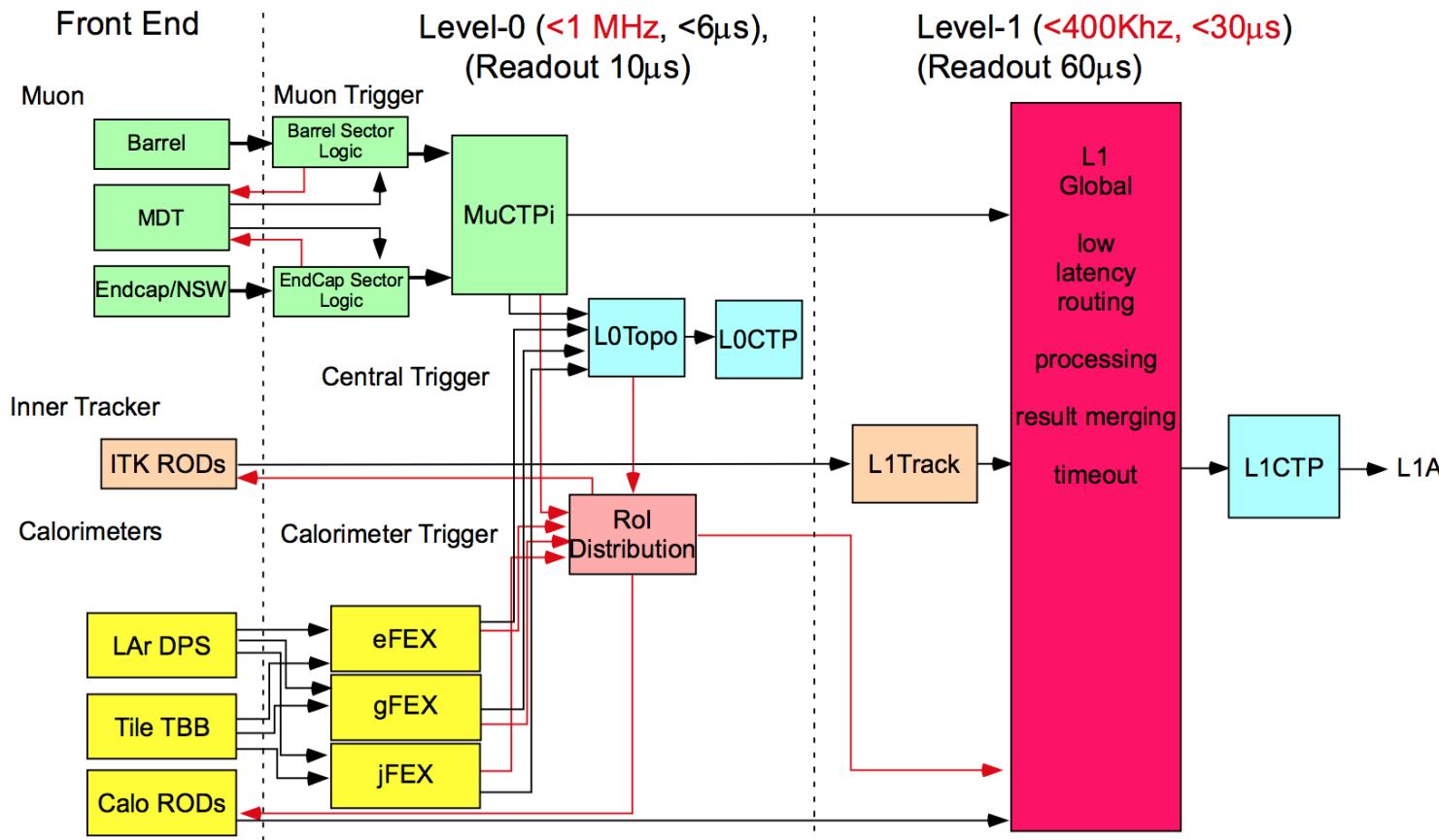
The ATLAS Global Trigger Processor

U. Schäfer

High speed data links and processors

Phase-2 Upgrade

ATLAS Trigger upgrade Phase-2



- Re-baptise current Level-1 trigger (Calorimeters & Muons)
→ "Level-0" trigger
- Add track trigger
- **Add global level-1 processor**

Level-1 requirements

Currently (ATLAS Runs 1 & 2)

- Very low trigger latency ($2.5\mu\text{s}$) including cabling (!)
- Fixed latency, pipelined processor
- Dead time-less system
- Operating at 40,08 MHz LHC bunch clock or multiples
→ Processors based on ASICs and FPGAs only

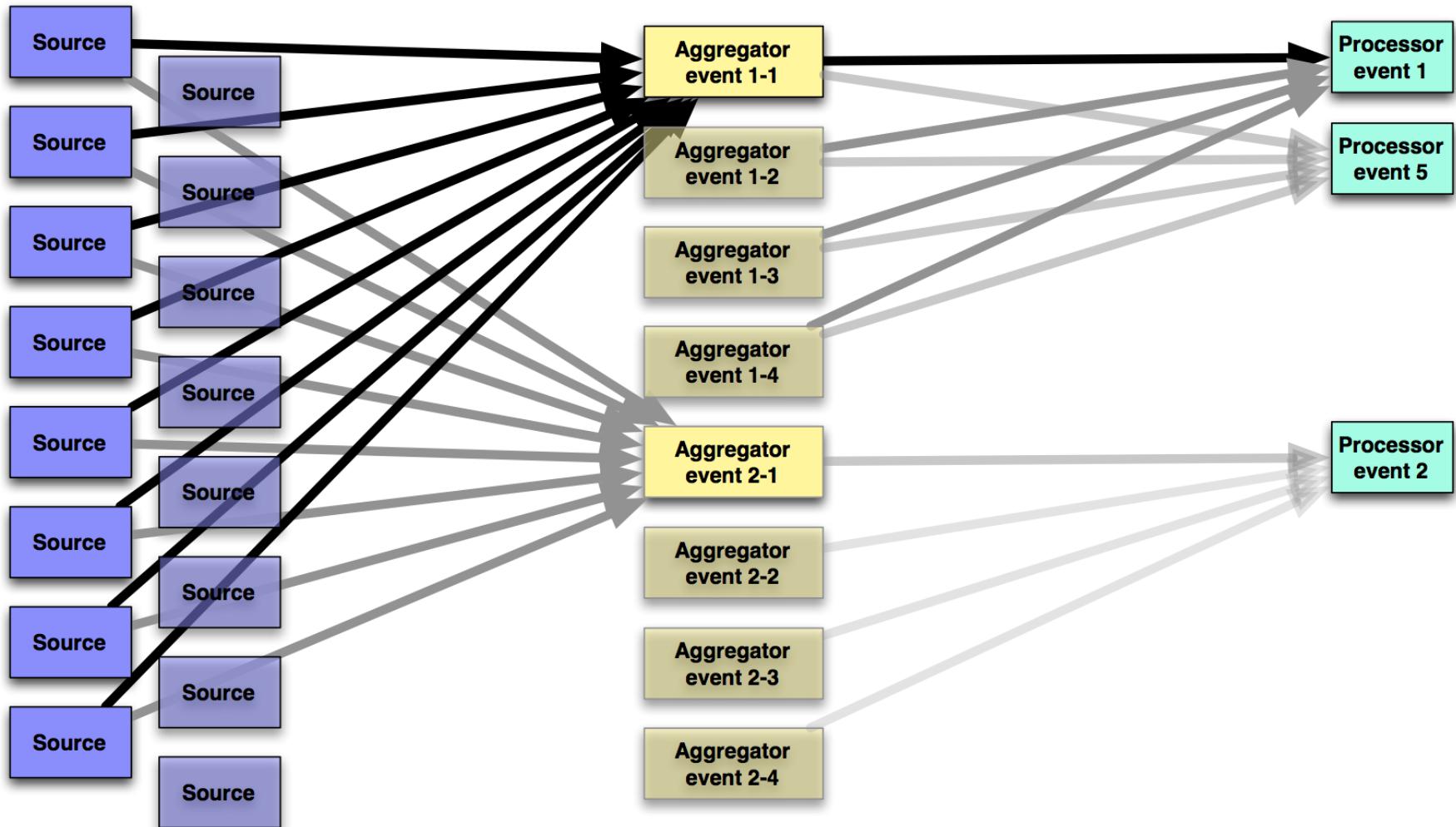
Separate feature extraction stage for various trigger object types

Post upgrade

- Low latency ($\times 10$)
- Some de-randomizing possible, but still limited latency
- Very low dead time is acceptable
- Not necessarily tied to LHC bunch clock
→ any alternatives to FPGA based scheme ?

Process all trigger objects in one processor (per event) to correlate them

ATLAS Global Level-1 Processor



Latency: spend on processing, not on routing / buffering !!!!

Activities -- L1Calo Mainz / PRISMA

- Initially: **architectural** discussions
 - First conceptual design under way
 - Initially FPGA-based
 - A couple of feeder FPGAs
 - Powerful processor FPGA
- Thorough module level planning / **Simulation**
 - Power
 - Thermal (!)
 - Signal integrity
 - ...
- **Evaluation** of high-end processors available on the markets
 - Link bandwidth
 - Link count
 - Processing power
 - **Xilinx, Altera, ... ???... ???** / Eval boards ? **GPUs** ?
- **Demonstrator** module
 - Detailed design from mid 2016
- Ask for close collaboration with Detector Lab in several fields of expertise
 - PCB simulation
 - Generic high-speed link design
 - GPU-FPGA communication