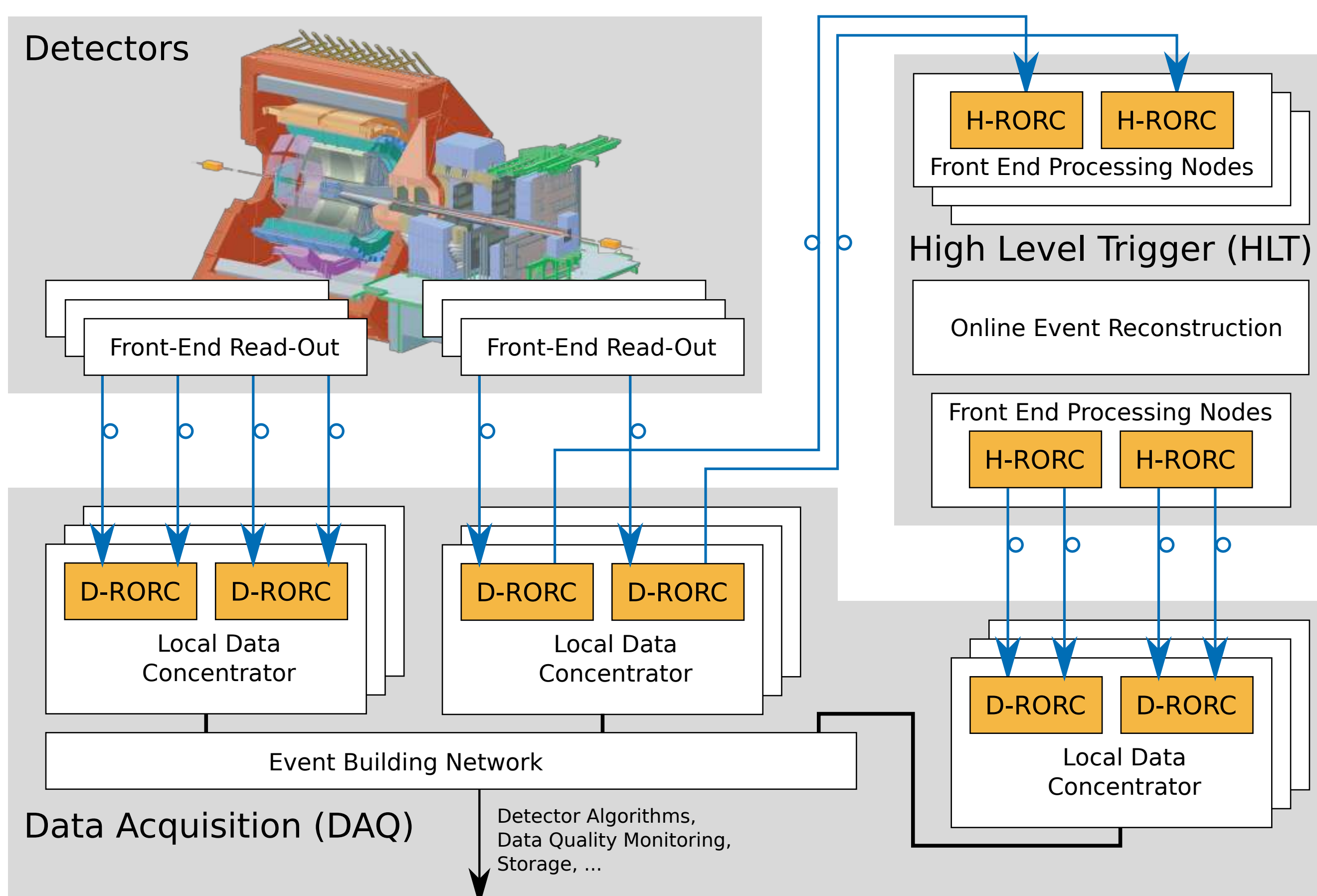


ALICE Read-Out Architecture



The ALICE experiment uses custom FPGA-based computer plug-in cards as interface between the optical detector readout link and the PC clusters of Data Acquisition (DAQ) and High-Level Trigger (HLT). These **Read-Out Receiver Cards (RORC)** have previously been developed as independent projects by Data Acquisition (→D-RORC) and High-Level Trigger (→H-RORC).

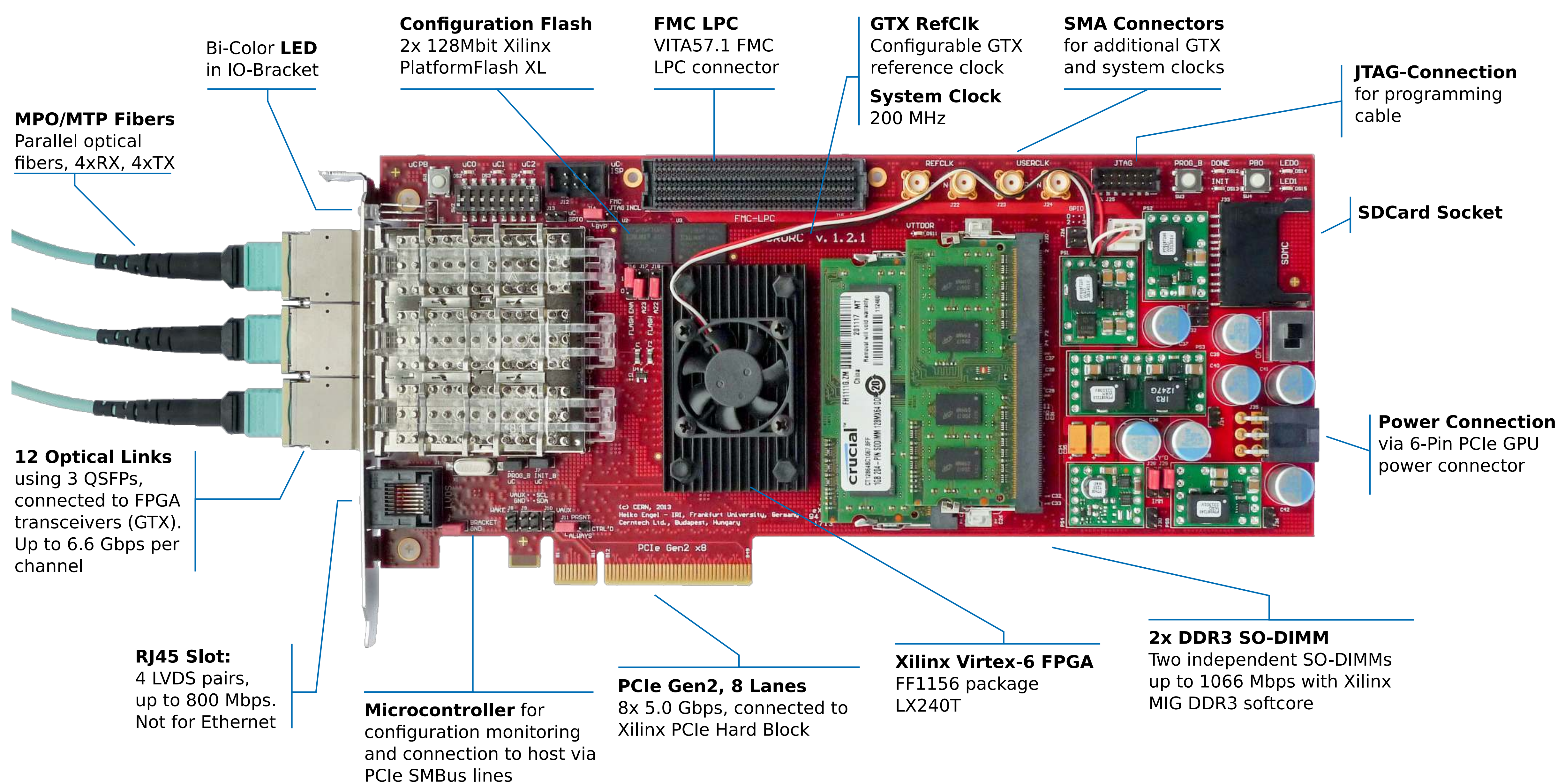
Limitations after Run1:

- Optical interfaces are limited in rate and density
- Obsolete electrical interfaces, especially PCI-X to host PC

Development of a **Common Read-Out Receiver Card (C-RORC)**

- Replacing D-RORCs and H-RORCs
- Compatible with the Run1 link rates and protocols
- Up-to-date interfaces
- Highly increased link density, decreasing number of nodes and costs per link
- Link rate & data preprocessing upgrade possibilities
- PCIe compliant form factor

C-RORC Overview



Features

- Configuration monitoring & management:
 - Onboard storage for multiple configurations
 - Monitor and retrigger configuration process even if PCIe link is down
 - Firmware upgrade via PCIe
 - FPGA configuration within less than 100 ms
- Custom scatter-gather DMA engine with 12 channels
- Host side: Microdriver with userspace library ^[1]
- Online data preprocessing: TPC FastClusterFinder ^[2]
- DDR3 tested up to 2x 8GB DDR3 SO-DIMM modules
- PCIe throughput: ~3400 MB/s (SandyBridge)
- Reusing existing fiber installation with break-out fibers and compatible QSFP transceivers

Status

- PCB layout and prototype production by Cerntech, HU
- First boards available since Dec. 2012
- Only minor hardware adjustments required
- 2nd series of boards available since May 2013
- Extensive hardware tests of all interfaces and board features over several months
- All hardware tests have been successful by now
- Test setup at CERN and several institutes
- ATLAS will use the same board for their ROS upgrade
 - Common purchase with ATLAS ongoing
- Production of the large series of boards is about to start.

[1] Microdrivers in High-Throughput and Real-Time Environments, D. Eschweiler and V. Lindenstruth, FIAS Scientific Report 2012
 [2] Status of the HLT-RORC and the Fast Cluster Finder, T. Alt and V. Lindenstruth, GSI Scientific Report 2009

