VME Rear Transition Module with Backplane Data Access Capability for the ATLAS FTK Upgrade

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The ATLAS Fast Tracker (FTK) is a hardware-based track finder for the ATLAS High Level trigger. It solves the problems of fast tracking through massive parallelization with a combination of ASICs and FPGAs

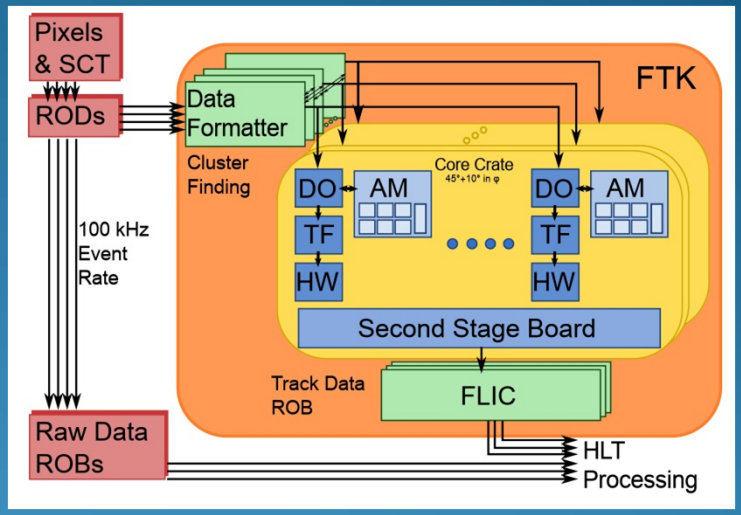

Figure 1. FTK System Diagram.

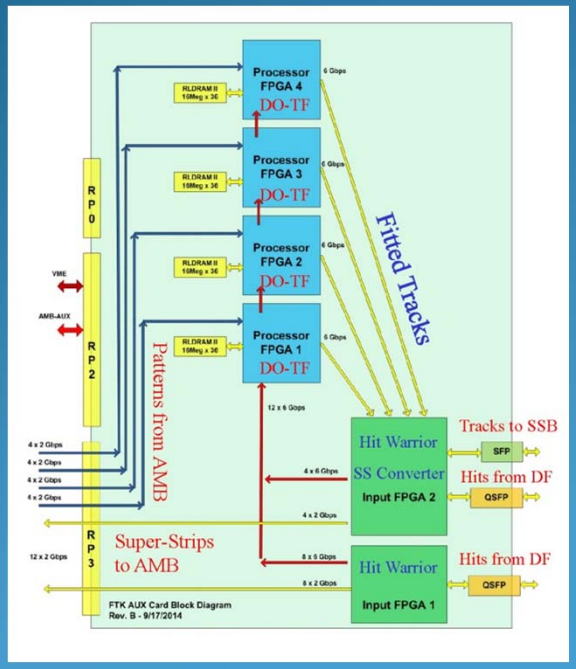

Figure 2. Block Diagram of the FTK-AUX card. The AUX card contains the Data Organizer, Track Fitter, and Hit Warrior blocks

The FTK VME Processing Unit consists of two boards:

- Associative Memory Board (AMB): uses custom associative memory chips for pattern matching;
- Auxiliary Card (AUX): powerful Rear Transition Module (RTM) for linearized fits of AMB track candidates.

The AUX card utilizes 6 Altera Arria V FPGAs to process up to 32 Gbps of hit data, and fit one track candidate per ns per FPGA.

FTK AUX – VME RTM with Data Access Capability

The VME Standard provides for communications with the crate's front modules only, while the RTMs are not actually part of the VME bus.

Complex RTMs such as the FTK-AUX, require full VME access to their logic devices, and a new data communication method had to be developed.

This method allows the front VME interface block to control data transfers for devices on both the front and the rear modules in the same slot.

The rear card becomes practically an extension of the front module. A remote user will see devices on this rear card as being part of the corresponding front module.

All VME protocols are supported, and other standard VME modules can run in the same crate.

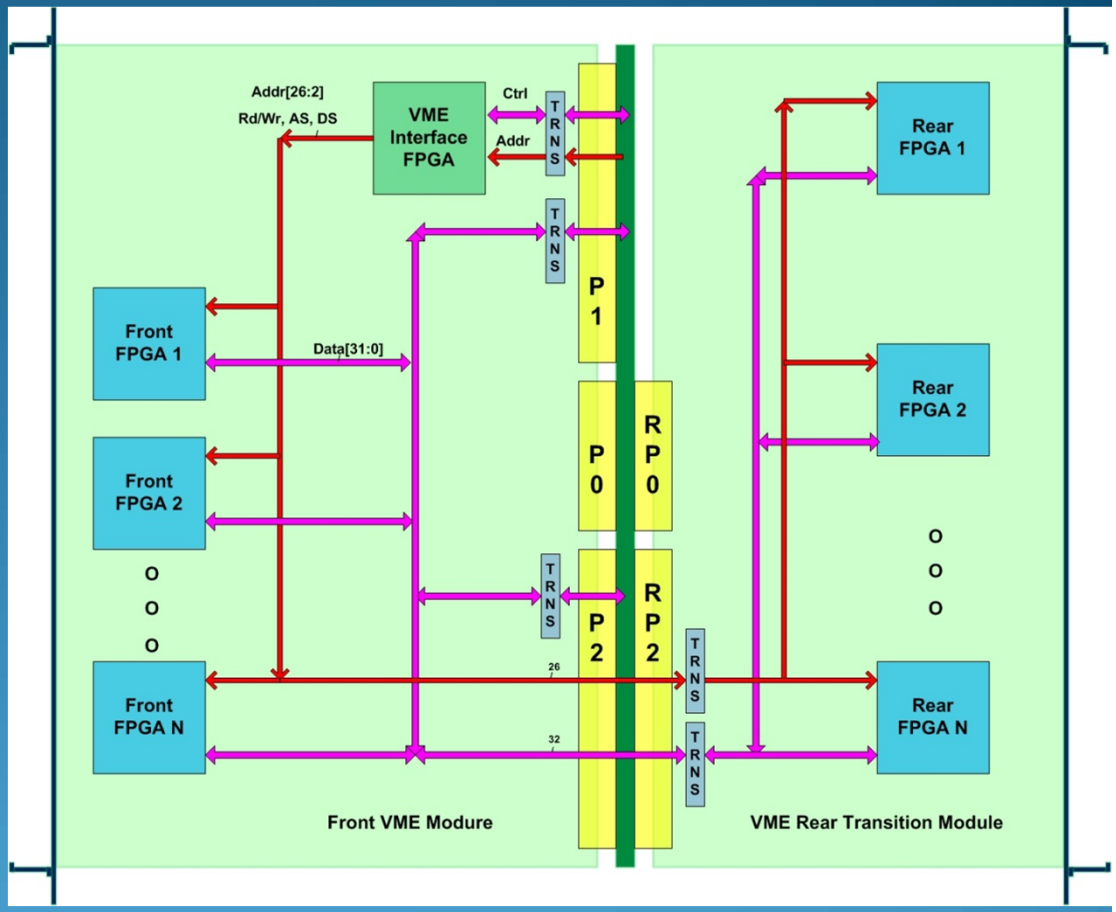

Figure3. VME Data Communication Structure for the VME Rear Transition Module. The method employs the J2, user-defined, feed-through pins to communicate with the corresponding front module, and extend its local data, address, and control lines to the rear.