

FELIX: the Detector Interface for the ATLAS Experiment at CERN

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The Front-End Link eXchange (FELIX) system is an interface between the trigger and detector electronics and commodity switched networks for the ATLAS experiment at CERN. In preparation for the LHC Run 3, to start in 2022, the system is being installed to read out the new electromagnetic calorimeter, calorimeter trigger, and muon components being installed as part of the ongoing ATLAS upgrade programme. The detector and trigger electronic systems are largely custom and fully synchronous with respect to the 40.08 MHz clock of the Large Hadron Collider (LHC). The FELIX system uses FPGAs on server-hosted PCIe boards to pass data between custom data links connected to the detector and trigger electronics and host system memory over a PCIe interface then route data to network clients, such as the Software Readout Drivers (SW ROD), via a dedicated software platform running on these machines. The SW RODs build event fragments, buffer data, perform detector-specific processing and provide data for the ATLAS High Level Trigger. The FELIX approach takes advantage of modern FPGAs and commodity computing to reduce the system complexity and effort needed to support data acquisition systems in comparison to previous designs. Future upgrades of the experiment will introduce FELIX to read out all other detector components.

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