FELIX: Commissioning the New Detector Interface for the ATLAS Trigger and DAQ System

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ATLAS TDAQ for Phase-I Upgrade

After the current LHC shutdown (2019-2022), the ATLAS experiment will operate in an increasingly harsh collision environment, motivating a series of upgrades. In order to improve the capacity and flexibility of the detector readout system, the Front-End Link eXchange (FELIX) system has been developed. FELIX acts as the interface between the data acquisition system and new or upgraded trigger and detector front-end electronics. FELIX is also interfaced with the detector control and TTC (Timing, Trigger and Control) system.

FELIX System

FELIX is a router between front-end serial links and a commodity network for detector control, configuration, calibration, monitoring and event data. The TTC distribution has been integrated.

Performance, Integration and Commissioning

- Each FELIX server hosts up to two FELIX cards and one NIC.
- Low level software has been developed for basic configuration and monitoring.
- High level software has been developed for data rate and channel monitoring.

GBT mode:
- The transmission is stable, and the parallel communication is reliable during multi-hours operation which is longer than the average LHC fill time.
- BUSY signal propagation correctly handled
- Emitter ramp-up demonstrated rates 50% above expectation

FULL mode:
- The transmission is stable during multi-hours operation which is longer than the average LHC fill time.
- Stress test: Backpressure shows up at ~ 200 kHz

Performance tests results show FELIX can fully meet the requirements in 2022-2025
- More than 200 FELIX cards have been delivered and tested, installation is ongoing
- Commissioning and deployment are ongoing, software development is progressing