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Networks for ATLAS Trigger and Data Acquisition

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The ATLAS experiment will rely on Ethernet networks for several purposes. A control network will provide infrastructure services and will also handle the traffic associated with control and monitoring of trigger and data acquisition (TDAQ) applications. Two independent data networks (dedicated TDAQ networks) will be used exclusively for transferring the event data within the High Level Trigger and Data Acquisition system, all the way from detector read-out to mass storage.

This article presents a networking architecture solution for the whole ATLAS TDAQ. While the main requirements for the control network are connectivity and resiliency, the data networks need to provide high-bandwidth, high-quality transfers with minimal packet loss and latency.

As the networks size is large – O(1000) end-nodes – we propose to use a multilayer topology, with an aggregation layer (typically at rack level) and a core layer. In order to achieve high resiliency, we propose to distribute the core of each network on multiple devices interconnected via high-speed links, and to deploy a protocol that efficiently uses redundant traffic paths. In addition, geographical aspects (e.g. distances requiring optical fibre instead of copper) are addressed. The proposed network architecture will be mapped on typical commercial devices.

Sample performance evaluation results, meant to validate the data network from the pre-series system (a 10% slice of the final TDAQ system). Traffic patterns similar to the ones created by real applications have been used to determine the network performance under TDAQ specific conditions.

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