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Graph-based algorithm for the understanding of failures in the ATLAS infrastructure

The ATLAS Technical Coordination Expert System is a knowledge-based application describing and simulating the ATLAS infrastructure, its components, and their relationships, in order to facilitate the sharing of knowledge, improve the communication among experts, and foresee potential consequences of interventions and failures. The developed software is key for planning ahead of the future interventions and upgrades, and for discovering the most effective ways to improve the ATLAS operation and reliability. Currently, the system's database describes more than 11.000 elements and 73.000 relationships among them. It gathers information from diverse domains such as detector control and safety systems, gas and water supplies, cooling, ventilation, cryogenics, and electricity distribution.

Recently, a tool to identify the most probable cause of a failure state has been developed. This paper discusses the current graph-based algorithm implemented by the tool, its behaviour based on the parameters entered by the user, and a comparison of centrality algorithms for prioritizing the node state evaluation.

A simulation of a real event is explained as an example and demonstrates the potential of this Expert System in understanding major failures in a considerably reduced amount of time.

Significance

This paper offers a deeper and updated look at the graph-based algorithm for the understanding of failures in the ATLAS experiment. This paper explains the behaviour and the performance of the tool once the new set of parameters available for the user are used. The tool is tested in a real failure that occurred in July 2021 demonstrating its potential.

References

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