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Online Control and Configuration in KM3NeT

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The data acquisition infrastructure of the KM3NeT deep-sea neutrino telescope in the Mediterranean will be a massively distributed system. The control and configuration application will be distributed over some 2000 offshore embedded nodes and hundreds of onshore processes. The full run conditions and detector state will have to be reliably set up and traced for a valid scientific analysis of the data. The actual implementation of the online software system must also take into account the complexity of development processes involving multiple actors and laboratories. Following the development principles established during the KM3NeT Design Study, an implementation of the online control and configuration software framework has been developed for the KM3NeT pre-production model detection unit (PPM-DU) of the FP7 Preparatory Phase. It features a highly modular client-server architecture based on specialized components communicating over the ZeroC Ice distributed application middleware. The full detector configuration is implemented using a framework developed for KM3NeT which provides for a coherent development process among multiple teams through features such as automatic database mapping or default parameter value broadcasting. Key features of the different frameworks, their integration for the PPM-DU and the client-server architecture of the data acquisition system and its control and configuration architecture are presented.

Summary

This paper presents the key features of the client-server architecture for the KM3NeT neutrino telescope data acquisition and its implementation for the pre-production model detection unit (PPM-DU). The implementation of both offshore embedded software and onshore software modules is based on a configuration framework designed for KM3NeT (CompoundConfig) and an open-source middleware for distributed applications (ZeroC Ice). The highly modular, distributed and component-oriented architecture is described and justified according to the demands a very large volume detector calling for thousands of nodes over the acquisition network.

Authors: Mr CHATEAU, Frédéric (CEA Irfu); Mr LOUIS, Frédéric (CEA); Mr LE PROVOST, Hervé (CEA Irfu); Dr ANVAR, Shebli (CEA - Centre d'Etudes de Saclay (FR))

Co-authors: Dr VALLAGE, Bertrand (CEA - Centre d'Etudes de Saclay (FR)); Dr SIZUN, Patrick (CEA Irfu); Dr MOUDDEN, Yassir (CEA Irfu)

Presenter: Dr ANVAR, Shebli (CEA - Centre d'Etudes de Saclay (FR))

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