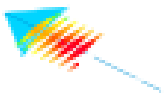

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The KM3NeT Control Unit: advanced techniques and best practices in data acquisition software development

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The Control Unit of the KM3NeT Data Acquisition is the software suite that is responsible for operating all the components of the KM3NeT telescopes in a coordinated and scientifically proficient way. It controls a wide span of parameters and procedures, from the power supplies, to the operating voltages of more than 64000 photomultipliers in each detector block, to the setup of the various trigger algorithms that are applied online. The same software suite is also used in all test and qualification benches, from single Digital Optical Modules to full Detection Units. As the KM3NeT detectors are being incrementally built, the Control Unit is employed in a variety of setups and configurations, and is a dynamic software project, still adapting to shifting needs.

The conflicting requirements of flexibility and stability are reconciled by proper code development policies. The Control Unit is able to cope with dynamically changing scenarios of multiple firmware generations coexisting in the same detector, for various reasons including hardware compatibility as well as testing purposes. The code also allows for static verification and extensive unit tests.

A Central Logic Board Simulator software was also developed to help test the whole architecture. Such a simulator provides properly faked slow control parameters, features a fully specification-compliant state machine and can generate fake data with specific profiles to feed the Trigger and Data Acquisition System. In this way, offline integration tests can be executed at each new software release, ensuring their smooth deployment to production sites and minimising operator chances of mistakes.

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