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Scalable and standardized PLC development: an automated framework for CERN's Cooling and Ventilation systems

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This paper presents an automated development and testing framework for PLC-based control systems operating CERN's Cooling and Ventilation (CV) plants, addressing the challenge of engineering numerous new systems annually while maintaining over 500 existing ones with constrained resources. The framework enhances scalability through standardized, reusable control system components integrated with installation-specific logic to form complete PLC code. These components, stored in a centralized repository, undergo rigorous unit testing and comprehensive validation via GitLab pipelines, utilizing PLC manufacturer-specific Command-Line Interfaces and CERN's proprietary tools to ensure reliability, quality, and regression-free updates. This approach significantly reduces time and resource demands by optimizing development and maintenance processes, providing a scalable model for domains requiring frequent, standardized control system development under high system-to-resource ratios. This work presents insights for engineers seeking efficient, automated solutions for complex control system environments.

Footnotes

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