



SWATCH: Common Software for Controlling and Monitoring the Upgraded CMS Level-1 Trigger

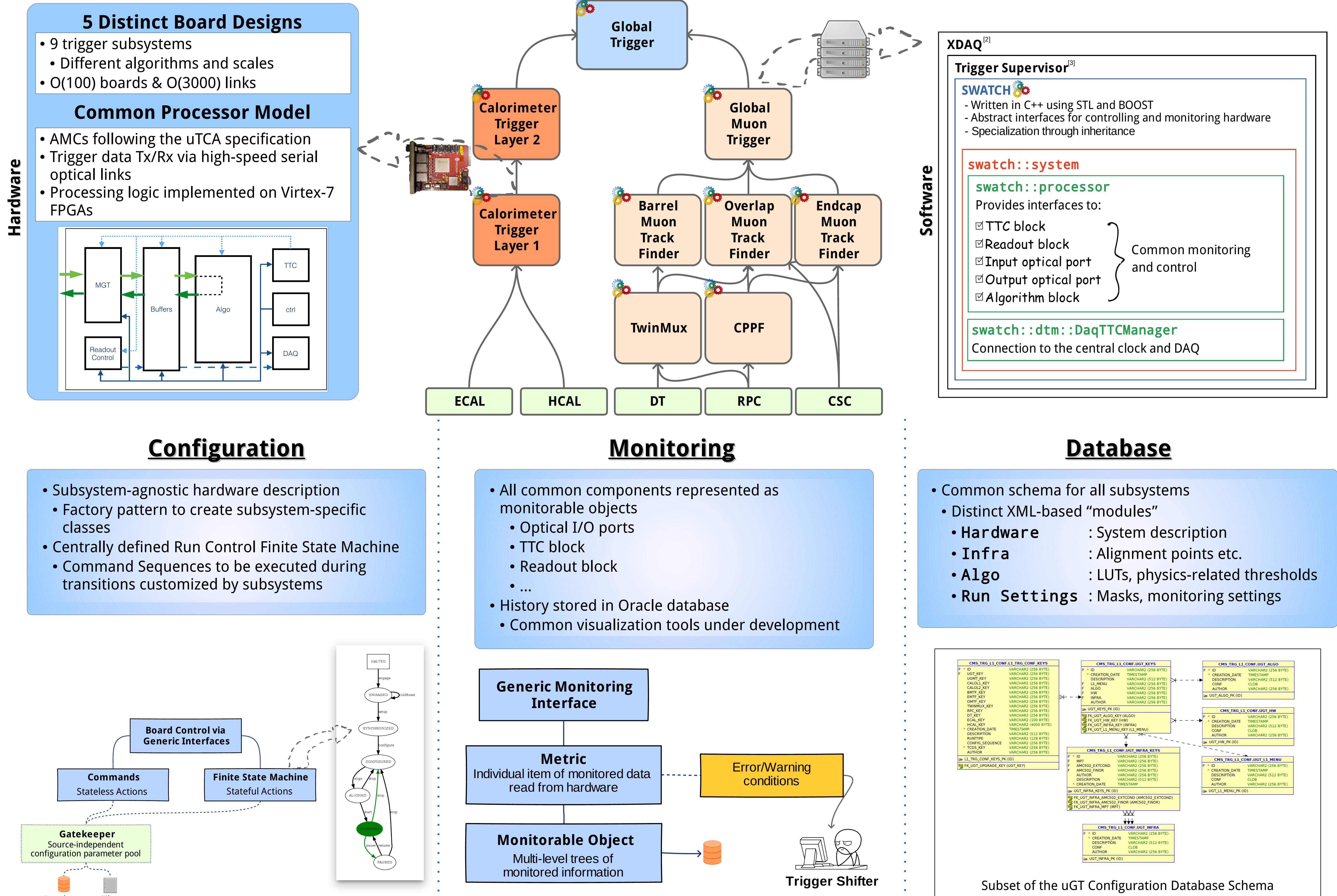
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The SWATCH Framework

The increased homogeneity of the upgraded CMS Level-1 trigger hardware^[1] deployed during the long shutdown of the LHC, prompted the creation of a common framework to exploit the commonalities between the new trigger processors. The SWATCH (**SoftWare for Automating the conTrol of Common Hardware**) framework provides a set of interfaces for controlling and monitoring the hardware of the trigger system while remaining independent of the driver software, thus reducing code and effort duplication for the subsystems.

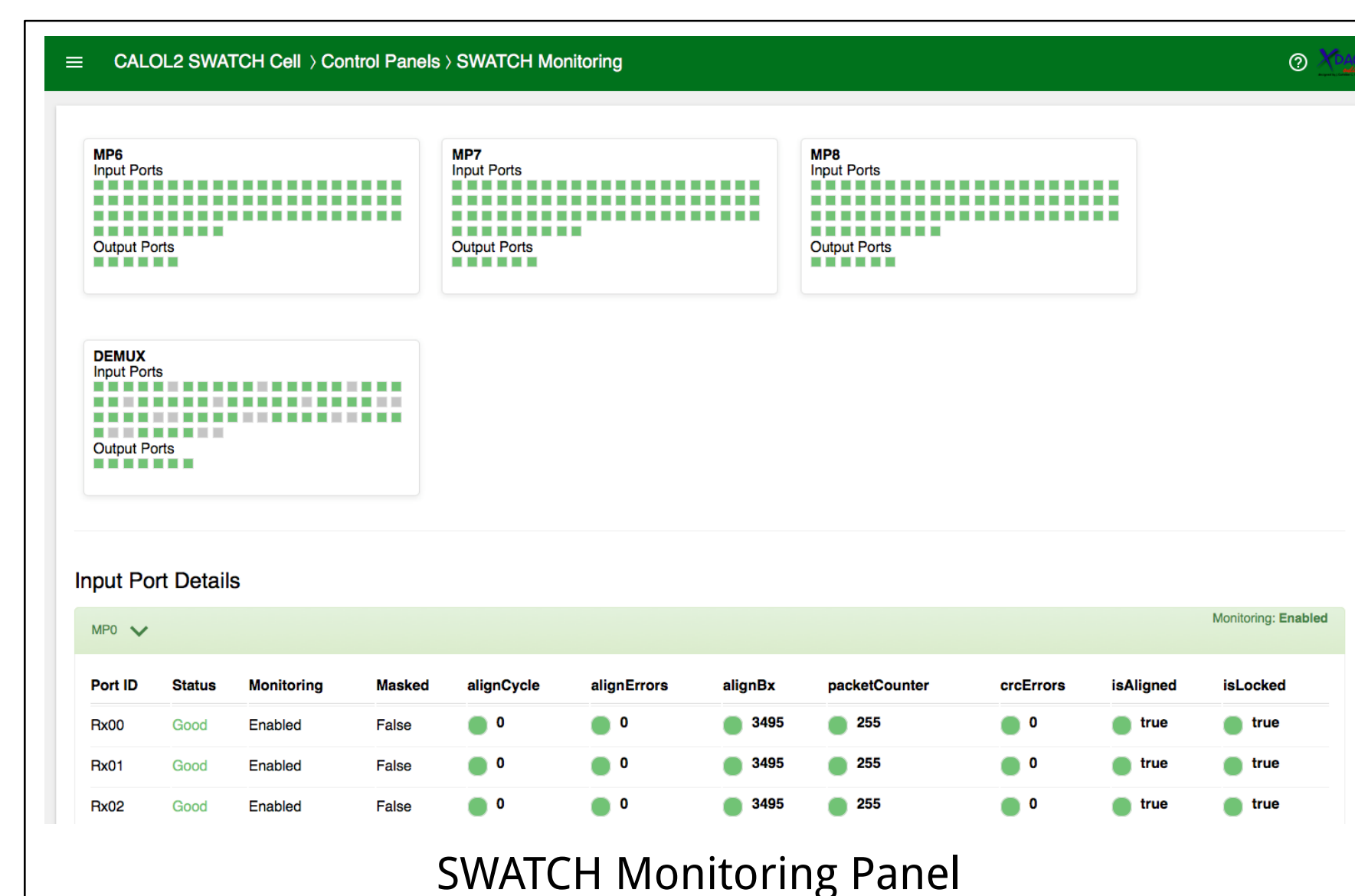
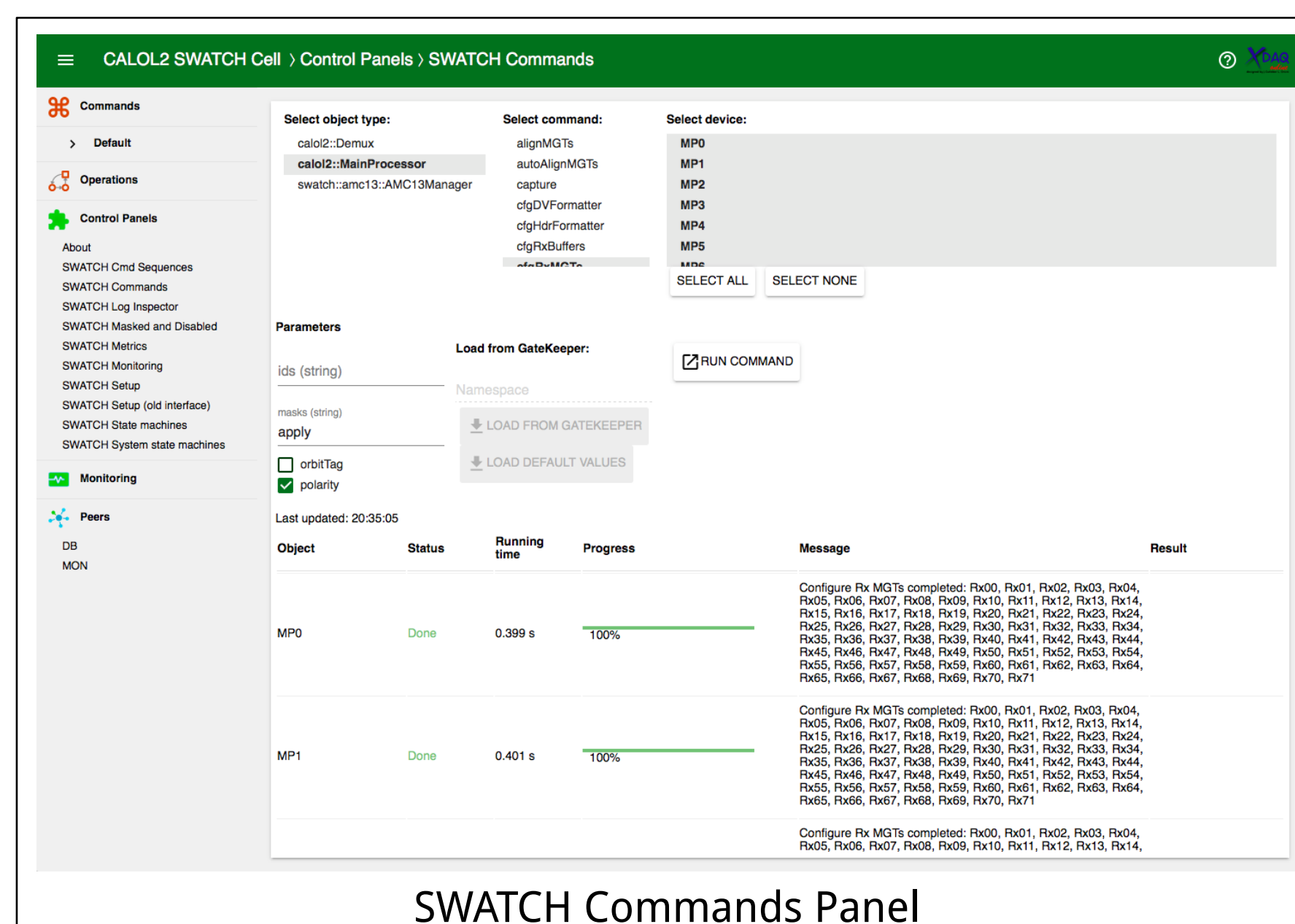
The Upgraded CMS Level-1 Trigger



Commissioning & Operations

SWATCH Cell

- “Baseline” SWATCH system
- Common control/monitoring panels
- Uniform interface for operation personnel
- HTML5 Polymer^[4] GUIs
- Integration with central run control



Subsystem integration

- SWATCH-independent low-level drivers
- Bridge via “plugin” libraries
- Common hardware between subsystems
- One SWATCH “plugin” per component
- Code validation using “dummy” hardware
- Framework tested by a comprehensive nightly build test suite
- Parallel and centralized software deployment
- Fast detection and treatment of potential problems

SWATCH had a great impact in the successful commissioning of the Upgraded CMS Level-1 Trigger

- Replaced a long-running and stable trigger system
- Despite the short transition time
- Significant gains from SWATCH hardware-agnostic approach
- Less code overhead
- Developers focus on subsystem-specific issues
- High operational efficiency
- Minimal trigger downtime during data taking

References:

- [1] The CMS collaboration, “CMS Technical Design Report for the Level-1 Trigger Upgrade,” CERN, Geneva, Tech. Rep. CERN-LHCC-2013-011, CMS-TDR-12, Jun 2013, <http://cds.cern.ch/record/1556311>
[2] XDAQ; <https://svnweb.cern.ch/trac/cmsos>
[3] I. Magrans de Abril, C. E. Wulz, and J. Varela, “Concept of the CMS trigger supervisor,” IEEE Trans. Nucl. Sci., vol. 53, pp. 474–483, 2006
[4] Polymer project; <https://www.polymer-project.org/>