

Configuration tool for railroad switches and signals

Degree programme: MAS Information Technology

A key part of the reliability of the Swiss railroad network is Domino-67, the component that drives the switches and signals. It is a well-functioning system that has been in operation for more than 50 years, but lacks modifiability. To address this issue, Bär Bahnsicherung AG currently develops a modern and flexible signaling system called Eurolocking. As part of the project, I have created a desktop application to configure the default behavior of the infrastructure.

Problem statement

The Eurolocking system consists of a central computer connected through safe Ethernet to interface cards that control switches and signals (figure 1). The logic resides in the central computer, while the interface cards execute the directives. In case of network interruption, the cards take over the control of their outputs, ensuring that the tracks do not remain in a potentially dangerous condition.

The default states of the outputs – along with the communication settings of the interface card – are stored on a separate electronic board. It is made of a non-volatile ferroelectric RAM provided with a socket to program it with the I2C protocol. Having an independent module allows for modifications of the configuration without reprogramming the interface card. In collaboration with its client Bär Bahnsicherung AG, CSA Engineering AG designed a process describing how to configure the module, and realized a Windows application to program it.

Solution

The configuration tool takes as input an XML file containing the configuration of an interface card, and displays it in human readable form. After connecting the configuration module to the host computer with an I2C/USB adapter, the programming process follows the workflow described hereafter. First, the configu-

ration is serialized and checksums are added to its binary representation, which is then uploaded to the ferroelectric RAM. The written data is read out and compared with the original configuration. If they match, an etiquette with a QR code identifying the configuration is printed, affixed to the module, and scanned to ensure its correctness. Finally, the XML file containing the programmed configuration is committed to a version control repository.

Results

The configuration process has been designed, documented, and implemented as an application using the Windows Presentation Foundation framework (figure 2). The integrity of the data throughout the process is guaranteed by checksums, whereas the quality of the software is asserted by static code analysis, unit tests, semi-automated integration tests, and manual system tests.

The next milestones for this product are the conduction of acceptance tests on the client side, the technical approval of the whole Eurolocking project by the Federal Office of Transport, and eventually the start of operation of the first signal boxes.



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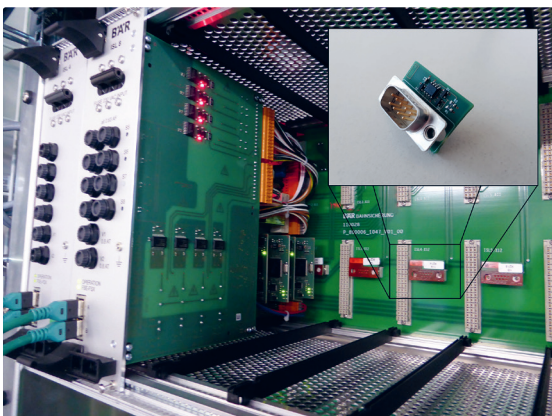


Figure 1: an interface card with its configuration module

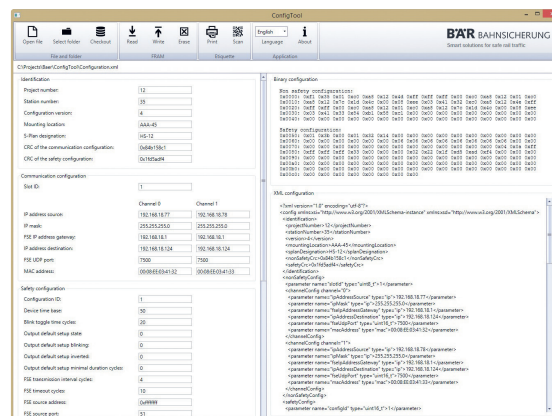


Figure 2: the configuration tool