



Software for management and diagnostics

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About me

Wojciech TYLMAN

D.Sc. in Computer Science

- Role
 - Software for management and diagnostics module
- Relevant Experience:
 - 20+ years of experience in C++/C# programming
 - Design and implementation in C++ of SIL-4 systems for railway (including rapid transit) automation
 - Simulation tools for development of railway automation systems (C++/C#/Python)
 - FOSREM – from Sky across Ground up to Underground, The National Centre for Research and Development project – coordinator, design and implementation in C++ of computation algorithms for FPGA
 - "Personalized Protective Thermally Active clothiNg", The National Centre for Research and Development project – coordinator, AI implementation





Agenda

- The main requirements,
- The PoC version specification and scope,
- The functionality and design details,
- Implementation,
- Test results discussion,
- Full scale design plans,
- Summary



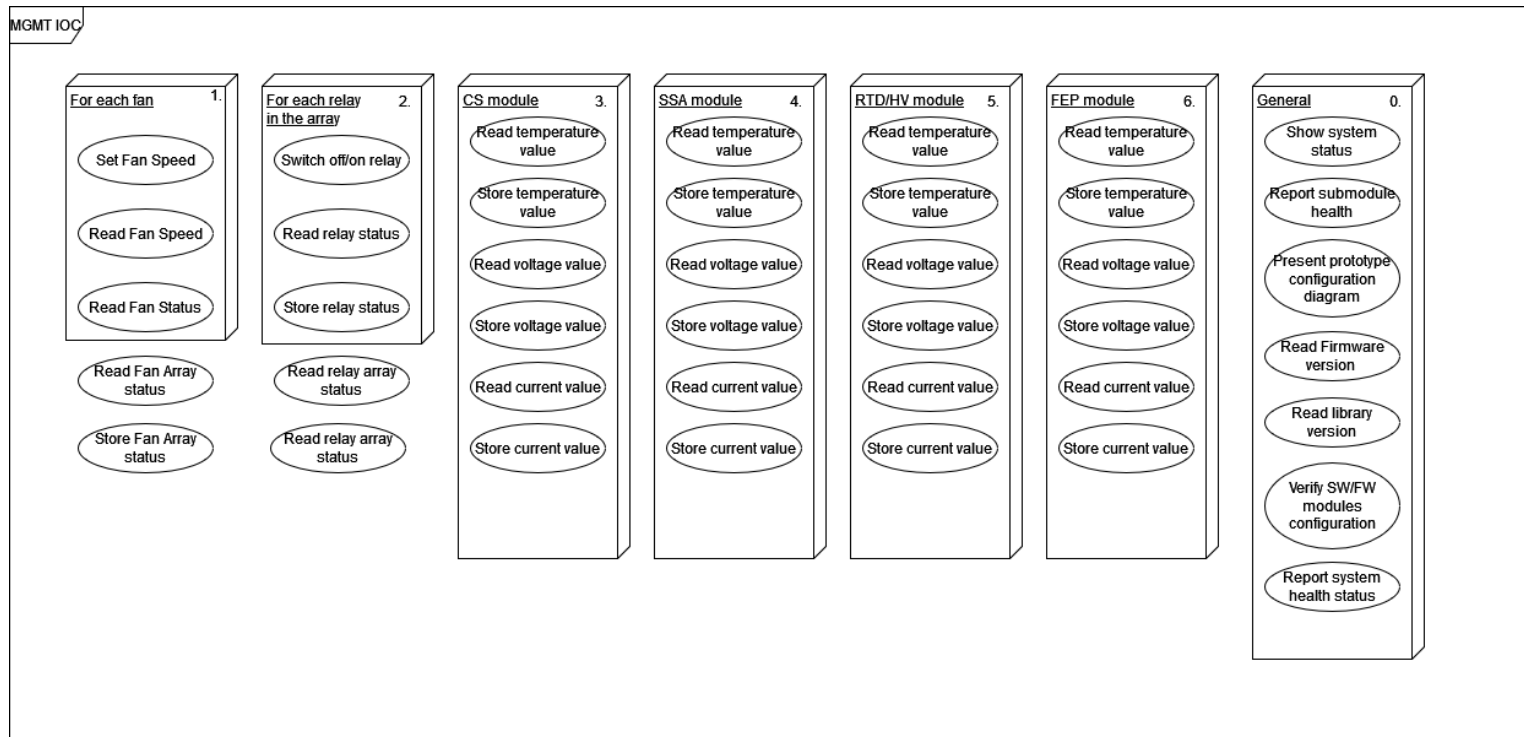
The main requirements

- Readout of sensors on the extension boards: voltage, humidity, current, voltage
- Control of 8 separate relays
- Control of chassis fan speed
- Overall structure of the software stack similar to that of the main board
- All functionality available through EPICS
- Additionally, all functionality available through Node-RED



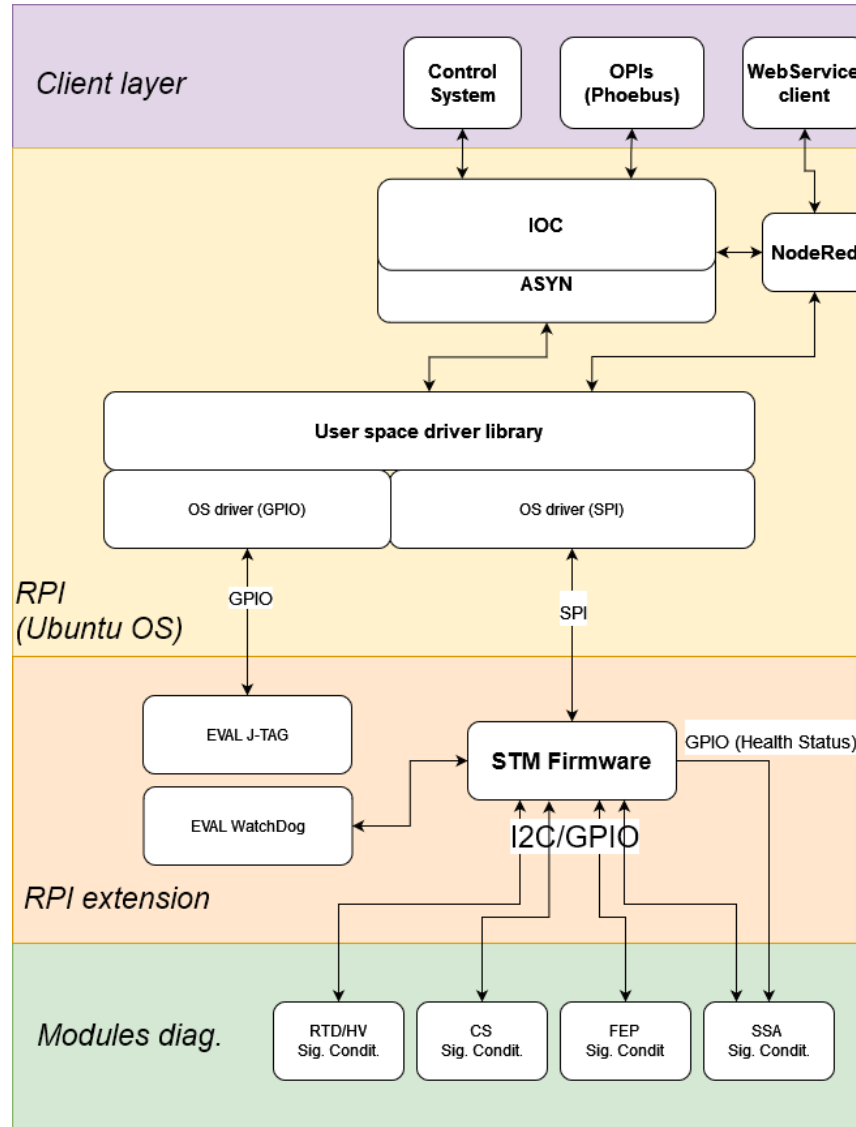
The PoC version specification and scope

- Operating system running on the management board
- EPICS running on the management board
- Custom drivers for management board
- Full control of management functionalities through EPICS
- Command-line tool for development purposes





The functionality and design details





Implementation

- Ubuntu OS v. 22.04.1 LTS
- EPICS v. 7.0.6.1
- Custom driver for interfacing between ASYN/CLT and STM (SPI): static library written in C++
- ASYN-based driver for management functionality
- EPICS database for management functionality
- Sample operator panels

Main

Boards

- MB
- CS
- SSA
- RTD
- FEP

General

- Relays
- Fans

Board Details

Ssa Board

- Current: 0.8 A
- Voltage: 6.7 V
- Temperature: 37.8 C
- Humidity: 24.1 %

Relays

Control Panel

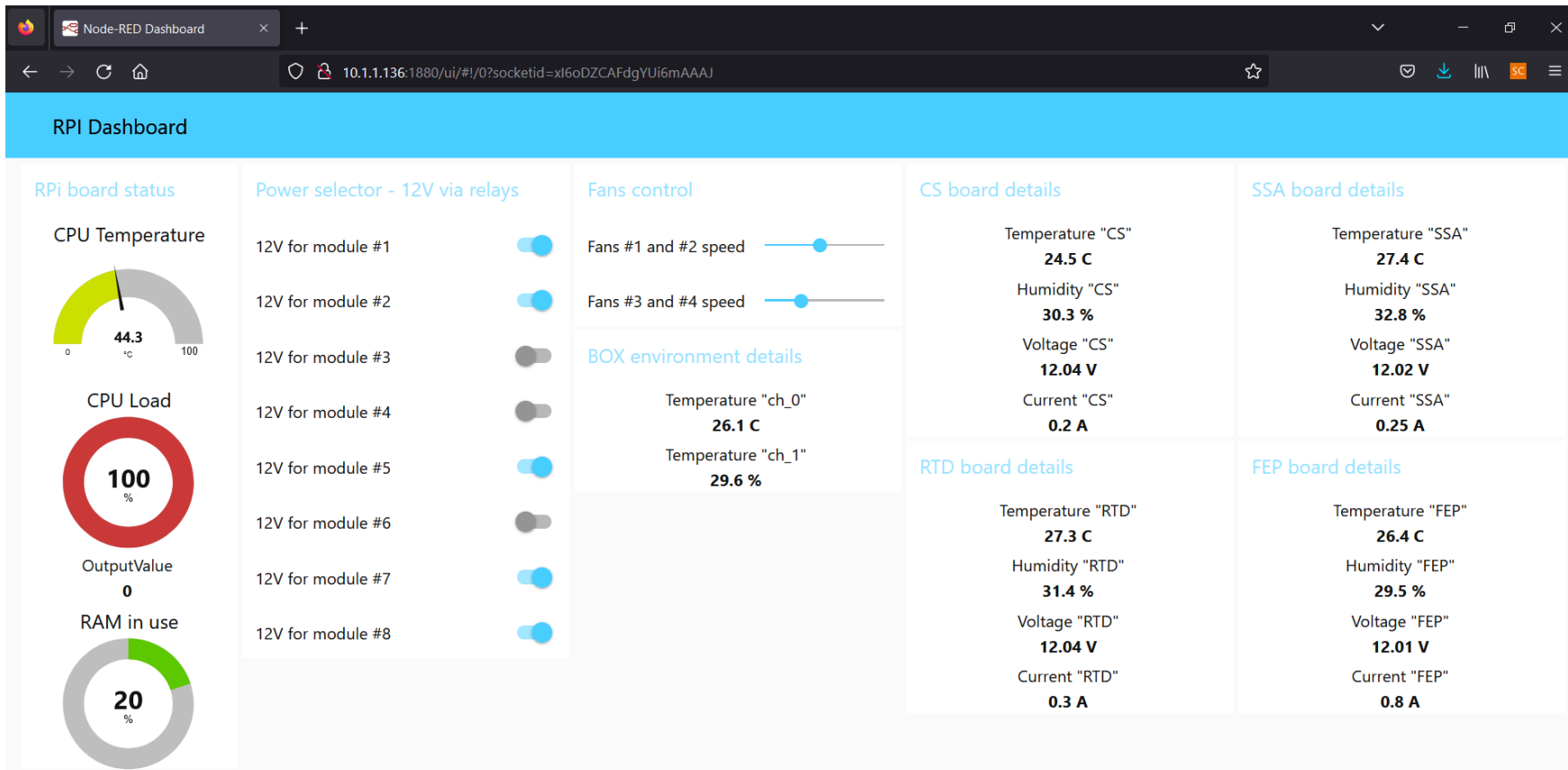
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Implementation

- Node-RED
 - health status of RPi
 - relays control
 - fans speed control
 - BOX environment details
 - CS, SSA, RTD, FEP boards details





Test results discussion

- Management functionalities fully available through EPICS 
- OS driver providing link between STM and ASYN/CLT 
- Stable operation of the IOC-ASYN-OS driver-STM chain 
- Additional sanity checks should be implemented for detection of misconfiguration 
- Management functionalities fully available through Node-RED 



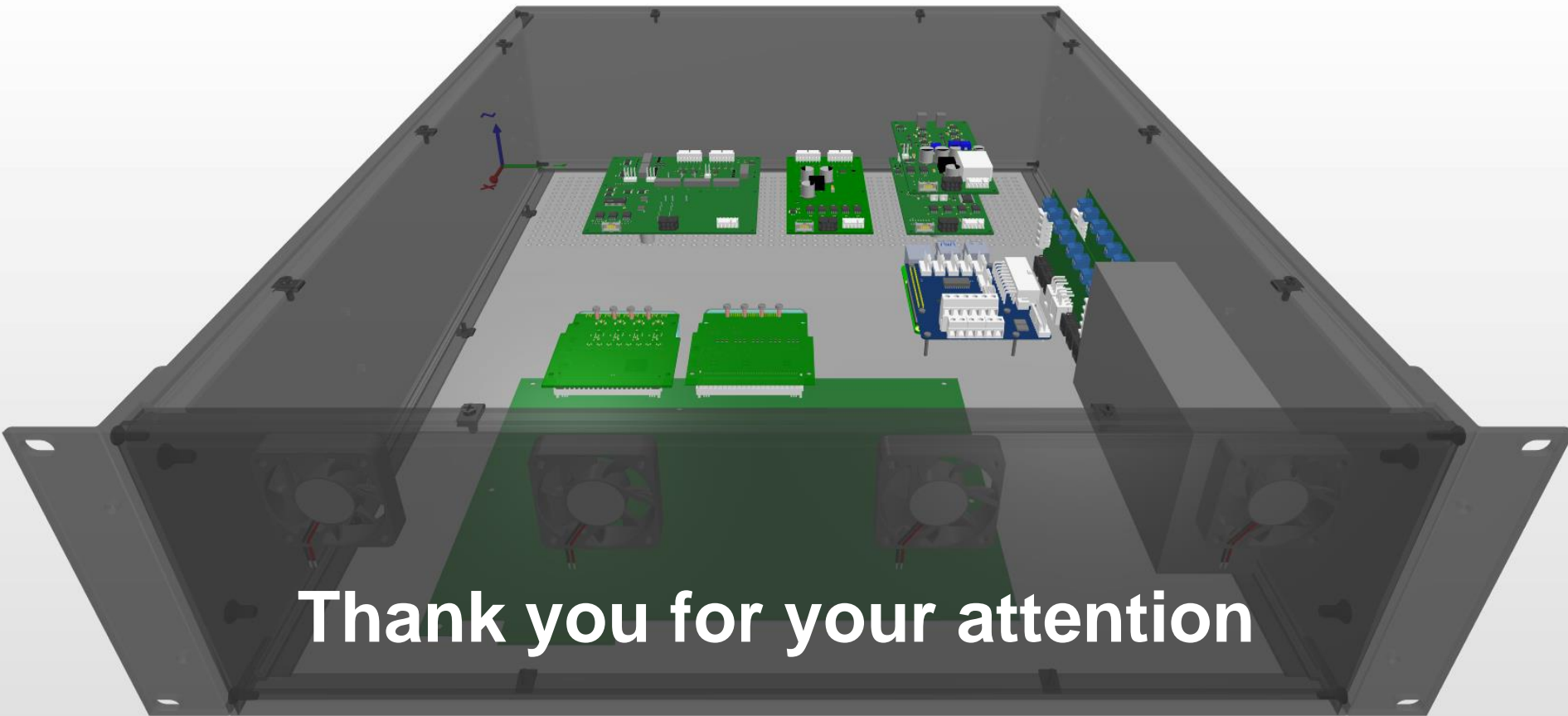
Full scale design plans

- Integrate libraries for current and voltage readout
- Extend functionality to cover watchdog and J-Tag interface
- Lessons learned will be used during design and implementation of EPICS/ASYN software for the main board



Summary

- Current solution is a good base for the final design



Thank you for your attention