

3mdeb - Embedded Systems Consulting

Service Catalogue

Open Source Firmware Validation

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3MDEB

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About Us



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1. Our areas of expertise

- Embedded Systems regression testing
- Recurring Firmware verification
- Mission Critical Systems and API based projects validation
- Performance analysis and reports
- Continuous Integration and Continuous Delivery for Automated Validation
- System and Firmware Management Projects Development
- Specialised Tools for Remote Supervision and Development
- Dockerization and Containerization

2. Industries we have experience with

- Network appliance
- Consumer IoT
- Security Systems
- Home Automation



3. Programming languages

- Python
- Robot Framework
- Javascript
- Shell script
- C

4. Tools and libraries

- GLib
- jQuery
- swupdate
- flashrom
- AWS Services
- OpenOCD
- SCM:
 - Git
- Containers:
 - Docker
 - virtualenv
- Continuous Integration / Delivery:
 - Jenkins
 - Travis CI
 - Gitlab CI
 - Circle CI
- Build systems:
 - Meson
- Security:
 - TPM2 tools
 - TrenchBoot
- Preboot Execution Environment (PXE)



5. Bootloaders validation:

- coreboot
- UEFI
- U-boot
- SeaBIOS
- MCUboot

6. OS verification:

- Debian
- Ubuntu
- Fedora
- FreeBSD
- pfSense
- OPNsense
- Xen
- Raspbian
- Yocto based systems
- Zephyr

7. Open-source projects we contribute to

- [flashrom](#)
- [fwupd](#)
- [Cockpit Project](#)

OSFV team has contributed to the community over 2.5k lines of code.



8. Open Hardware Validation products

- Remote Testing Environment

Tired of using many different peripherals and expensive hardware in testing and debugging your devices? That's all past!

RTE is a hat designed for Orange Pi Zero board which runs specially crafted Linux distribution using the Yocto Project (meta-rte) with REST API feature.

We developed RTE to enable programmers from around the world at a low level firmware development without hassle of expensive and bloated remote Keyboard-Video-Mouse devices.

Until now, we have enabled 15+ platforms for everyday development and validation with RTE:

- * PC Engines APUx (version 1-5)
- * LibreTrend Librebox (LT1000)
- * MinnowBoard Turbot (Dual and Quad)
- * SolidRun SolidPC
- * Vitrobian Crystal
- * Protectli Vault (all revisions)
- * Raspberry Pi (40-pin versions)

More information can be found at 3mdeb [website](#), online [shop](#) and [blog](#)!

- RTE RPi

Remote testing environment (RPi Hat version) is a hat designed for Raspberry Pi boards (and all 40-pin headers RPi compatible boards) which runs specially crafted Linux distribution using the Yocto Project (meta-rte).

Next revision of the open hardware RTE project gives us a tool which makes easier work with firmware debugging tasks. With RTE, your everyday development routines become much faster and easier to maintain from places not related to current setup location. Those include debugging tasks, flashing firmware, controlling GPIOs and power management for Device Under Test.

More information can be found at online [shop](#).



- MuxPi

The highest density of interfaces per square meter for a decent price. This open hardware device consists of the mainboard and NanoPi NEO.

The primary purpose of the muxPi board is to enable full remote work with devices being tested, where hardware setup can be separated from the developer. The main advantage of this board is a large number of various interfaces, making muxPi very versatile testing board.

More information can be found at 3mdeb [website](#), online [shop](#) and [blog](#)!

- OpenVizsla

An open hardware USB 2.0 sniffer and analyzer that provides user ability to see all the data flow between a host and target device. Provides streaming out a textual representation of USB traffic to stdout, making it indispensable in debugging USB devices.

OpenVizsla hardware is mainly composed of four chips connected together:

- * FTDI FT2232H High-Speed USB FIFO
- * Xilinx Spartan 6 LX FPGA
- * Micron MT48LC16M16A2P-xx SDRAM
- * SMSC USB3343 ULPI PHY

More information can be found at 3mdeb [website](#), online [shop](#) and [blog](#)!



9. Validation services

- Flashing Microcontroller Service

Trying to flash your device firmware? It can supercharge your microcontroller by altering the original features. With a flashed chip, you can install custom tools, custom OS or restore your device to factory settings. All this was done by the 3mdebs dedicated validation team with the guarantee of good quality.

More information can be found at online [shop](#).

- Regression Testing Solutions

Regression testing is a concept of validation practice which brings the answer to one of the most frequently asked questions: Does the new revision of the product is working as expected?

With regression testing, we can confirm, that a recent version of the hardware and/or embedded firmware has not adversely affected existing features.

Key features:

- * Fully automated, fast and accurate validation
- * Rigorous dependency analysis (requirements vs. test-cases)
- * Full (over 100 tests) or partial (on clients demand) testing package
- * RobotFramework infrastructure
- * Detailed HTML logs and spreadsheet reports attached
- * Bug management support
- * Time comparison summaries
- * Optional CI integration
- * Affordable pricing

More information can be found at online [shop](#).



10. Reference validation projects

- Recurring Regression Testing for PC Engines Firmware releases:

Firmware team prepares monthly coreboot releases which are then tested by OSFV team with fully automated regression tests to confirm the quality of the delivered firmware. We are providing this service for over 2 years (21 releases validated). Moreover, PC Engines platforms clients report issues regarding coreboot problems on GitHub service - this medium provides OSFV team valuable information about actual needs and bugs to concentrate on. If a firmware team confirms the existence of the issue, OSFV team focus on adding new automation tests to regression suite, which is a part of the bug management service that we are offering.

Programming languages used: **RobotFramework, Shell script**

Technologies used: PXE, tpm2-tools, Gitlab API, Jenkins, Google Spreadsheet (automated), Mailchimp

Hardware used: RTE, PC Engines APU 1/2/3/4/5

- Recurring Regression Testing for Vitro Technology Corporation Firmware releases:

Vitro Technology is a crypto-secure IoT technology partner focused on machine-to-machine communications, verified data collection and authenticated transactions. OSFV team has engaged in Vitro validation at the start of 2019. Tests concern both web services and their features (back-end) and physical layer (hardware). At the moment, OSFV team have validated in the scope of:

- * standard communication ports
- * automated tests (upgrade gateway, upgrade node, dump logs, status queries)
- * automated stress tests for gateway+node installations
- * issue management life-cycle

Programming languages used: **RobotFramework, Shell script**

Technologies used: AWS Services, Google Spreadsheet, Mailchimp

Hardware used: RTE, Vitrobian Crystal, Vitro Shard



- Validation of coreboot ported for Libretrend Librebox and Protectli Vault platforms:

Librebox and Vault hardware from now on can be powered by coreboot. Similar to PC Engines, 3mdeb Firmware team provides coreboot maintainership package with monthly releases - OSFV team delivers results of trimmed regression tests for internal and firmware verification purposes.

Moreover, we have verified the TPM modules (high quantity) in terms of correct operation, ROCA TPM vulnerability and PCR banks configuration.

Programming languages used: **RobotFramework, Shell script**

Technologies used: **PXE, tmp2-tools, Google Spreadsheet (automated)**

Hardware used: **RTE, Librebox, TPM for Librebox, Protectli Vault FW2B/FW4B/FW6A/FW6B/FW6C**

- Validation of IoT Infrastructure:

OSFV team took care of full-stack validation (firmware, software, partially hardware) of client's IoT infrastructure. The target number of supported production setups for maintenance will reach 200 units.

Programming languages used: **RobotFramework, Python, Shell script**

Technologies used: **Zephyr, AWS IoT Cloud, OpenThread, nRFutil, MCUboot**

Hardware used: **RTE, nRF52840-DK, Raspberry Pi 3 B**

- Performance and verification tests for wireless streaming devices:

The streaming devices comprises of various streaming and communication ideas for each we have prepared in-depth analysis and performance reports and technologies (Node.js / Golang / Rust) comparison. Alongside OSFV team run stress tests for power shortages and everyday plug-in and unplug the power supply, firmware releases verification and time-based maintenance of hundreds of units.

Programming languages used: **RobotFramework, Python, Shell script, Javascript**

Technologies used: **SocketIO, iperf,**

Hardware used: **RTE, Raspberry Pi Zero W, Raspberry Pi 3A+**



11. Reference development projects

- Expansion of remote manager for GNU/Linux servers:

A customer wanted to implement additional features regarding Docker options and network interfaces administration for the open-source Cockpit Project. Our role was to add:

- * Docker privileged and capabilities handlers
- * new NetworkManager monitors (Modem, WiFi, OpenVPN)

Programming languages used: Javascript, jQuery

Technologies used: Docker API, NetworkMaganer DBus API, WiFi authentication protocols

Hardware used: SoliSense N6 (i.MX6)

- Development of Firmware and Security Project

The project consists of two major products:

- * Flashrom (an open-source tool for flashing devices)
- * fwupd (an open-source daemon for managing the installation of firmware updates)

Our role was to implement missing libflashrom API functions and integrate new patches into flashrom plugin implemented in fwupd. The verification of firmware updates has been done with the LVFS portal (secure system for firmware uploads). New patches were validated with fully automated regression tests.

Programming languages used: C, RobotFramework, Shell script, XML

Technologies used: GLib, LVFS, Meson builder

Hardware used: Librebox



11. Contact

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