emlix
embedded linux systems

based on
e2factory

Framework
TAF
TestApplication

services
e2ps
protection

your **embedded linux** partner

■ **innovative** concepts and solutions
■ **reliable** implementation
■ **dependable** lifecycle support

emlix

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We transfer system know-how, innovations from the open source world and market experience into the products of our more than 300 customers. Product-specific software platforms from emlix are successfully in use worldwide in millions of devices. Among others, you can find us in the following products:

- Nuclear medicine systems
- Inverter controllers
- Automotive control computers
- Petrochemical tank vehicles
- Security cameras
- Lift controllers
- Remote heating system controllers
- Vibration detection systems
- Real-time machine controllers
- Emergency medical systems

System solutions for the digitalization and networking of products

- Air conditioning controllers
- High-security card reading devices
- Web-based machine operation
- Telematics systems for commercial vehicles
- FDA certified blood analysis devices
- Laser inscription machines
- Turbine monitoring
- Mobile label printers
- Charging stations for electric vehicles
- VoIP telephone platforms

About emlix

emlix provides system solutions for the digitalization and networking of products. The company's core competence is the development of software for devices, plant and machinery. In addition to the design and development of functions at the device and process control levels, our services include server-side integration into cloud and ERP systems.
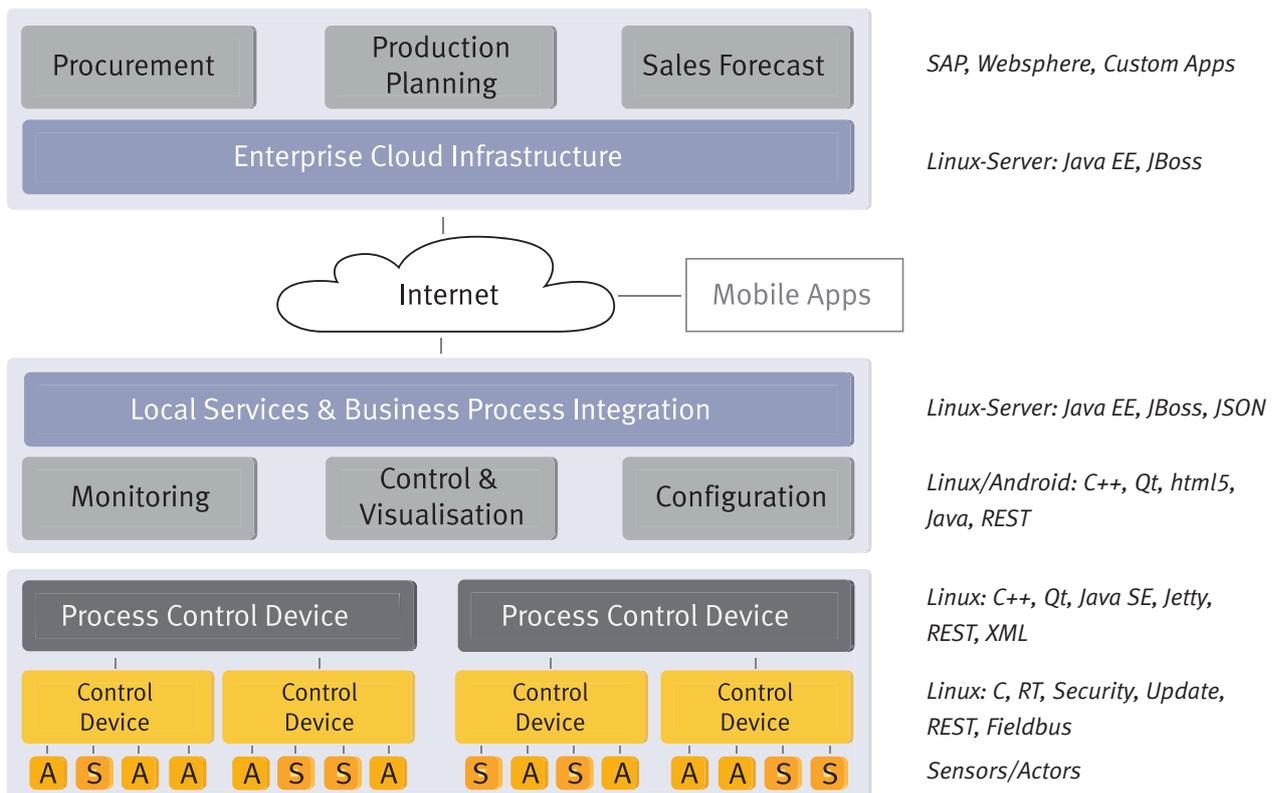
Our know-how encompasses all the stages from analysis via architecture right up to implementation as well as maintenance and ensuring the long-term IT security over the product life cycle.
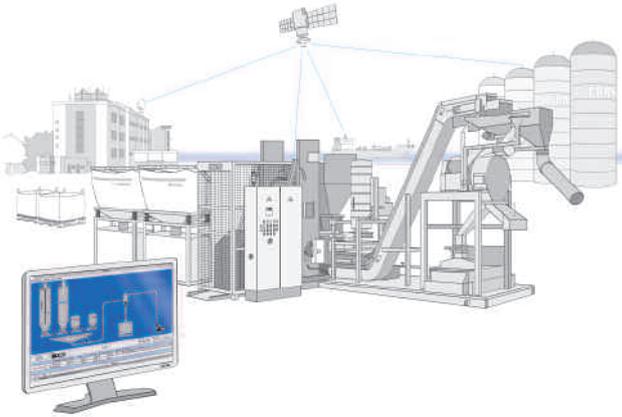
Our solutions are based on Linux, Android and industrially tested open source components. The development of applications for control and operation usually takes place on the basis of C, C++, Java, html5 and Qt. Boot loader, kernel

and driver development as well as functions such as update concepts, container architecture, security solutions and boot-time optimization are core competences of our company. Our system solutions have successfully achieved certification from the FDA and the PTB.

As a supplier of professional open source software we provide process security and transparency. Our tools and development standards are designed for industrial requirements and to meet the demands of certification. We offer long-term maintenance contracts for our solutions, thereby taking on responsibility for the product life cycle and the investments of our customers.

We are looking forward to working with you!

Procurement	Production Planning	Sales Forecast	*SAP, Websphere, Custom Apps*
Enterprise Cloud Infrastructure			*Linux-Server: Java EE, JBoss*

Internet — Mobile Apps

Local Services & Business Process Integration			*Linux-Server: Java EE, JBoss, JSON*
Monitoring	Control & Visualisation	Configuration	*Linux/Android: C++, Qt, html5, Java, REST*
Process Control Device		Process Control Device	*Linux: C++, Qt, Java SE, Jetty, REST, XML*
Control Device	Control Device	Control Device	Control Device	*Linux: C, RT, Security, Update, REST, Fieldbus*

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Sensors/Actors

The data communication with speciality chemical industry plants installed worldwide has to function securely even with poor network connections in order to communicate formulations, operating data and consumption information. Equally, the control system must be able to control automation components accurately using a heterogeneous fieldbus infrastructure. For the gateway and control computers at the plants as well as for the cloud server in Germany, emlix developed a continuous embedded-Linux-based solution and is also responsible for the maintenance of the systems.

- Secure network integration via GSM with VPN
- Remote management of plants worldwide
- Remote updating of control programs
- Central collection of consumption and operating data
- Component-based control and operation applications
- Integration of an SPS runtime environment
- Control of heterogeneous automation components
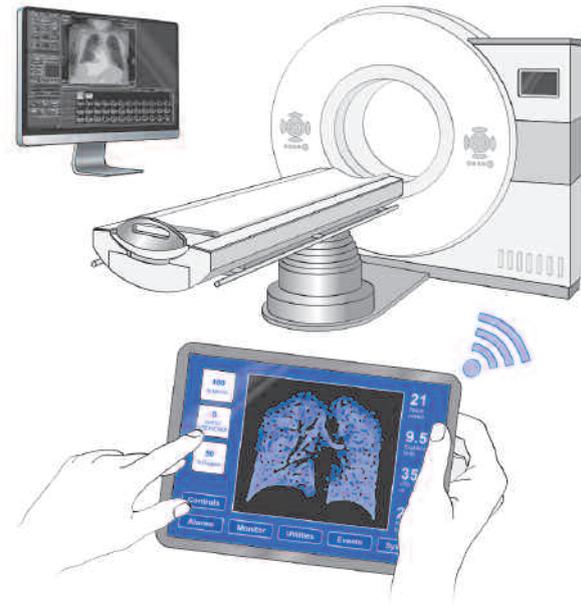
In the development of innovative operation systems nuclear medicine diagnosis, simple and extremely reliable handling must be achieved without compromising the integrity of the displayed data and taking into account the high certification requirements. On top of this there are requirements in terms of software component selection, declaration according to security classes and the necessary maintainability. For a mobile operation system, emlix realized these technical and organizational requirements according to IEC 62304.

- System design and component selection
- Mainline-based kernel and driver development
- Boot time minimization for fast availability
- Application-specific power management
- Continual checking of system integrity
- WebServer and RESTful API for HTML5 app
- Cryptographically secured display of data
- IEC 62304-complient system and test documentation
- Auditable build process with e2factory

Industries & fields of application

The markets in which we are active include:

- Medical and biotechnology
- Automation technology
- Security technology
- Trade and logistics
- Traffic systems
- Agricultural technology

- Mechanical engineering
- Measuring technology
- Energy technology
- House automation
- Railway technology
- Automotive industry

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Our services

Our Linux / Android-based systems are optimized according to our customer's hardware and the way in which it will be used. The essential characteristics of the product are realized through comprehensible, documented adaptations of open source software.

## Intelligent system solutions from design to end of life

This approach guarantees a high level of transparency and maintainability, and reduced complexity. We agree the requirements at the operating system level and for the application with our customer's management team and developers at an early stage, and also decide on the development process. Our portfolio includes all the necessary know-how:

- Concept, architecture, requirements engineering
- Hardware bring-up and driver development
- Linux / Android kernel and system development
- Network programming, protocol design, industrial fieldbuses
- Security concepts, update concepts and real-time solutions
- Application development on the basis of C++, Qt, Java, html5
- Cloud-based services for embedded systems and ERP integration
- Build / process automation, test automation
- Workshops, seminars and developer coaching

Technologies

emlix embedded open source systems can be found in the products of innovative companies in a wide range of industries and fields of application. Our system solutions are based on technologies that include the following:

- Operating systems: embedded Linux, Android
- System programming: C, Assembler
- Application development: Lua, C++, Qt, Java EE, JBoss, JSON, html5
- Version management: git, svn, Subversion
- Distributions: Yocto, Buildroot, LTIB etc.
- Build/process automation: emlix e2factory, BiteBake / Poky-Tiny Yocto, Jenkins
- Location-independent development: emlix e2factory Workbench
- Test automation / report generation: emlix Test Application Framework (TAF)
- IoT protocols: OPC/UA, MQTT
- Network protocols (TCP/IP, CAN etc.)
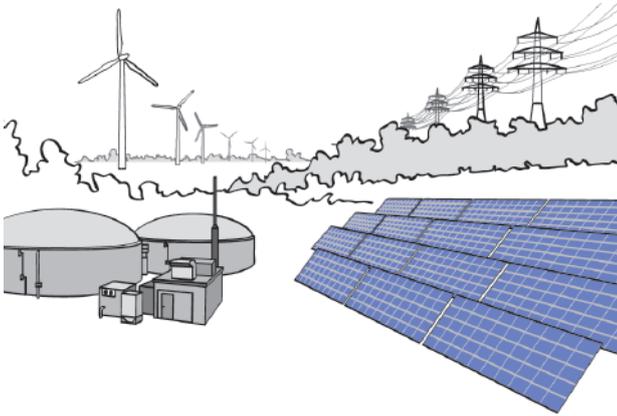
For manufacturers of systems for energy management, differences from country to country mean that a large number of product variants need to be developed. Inverter controllers must also meet considerable real-time requirements and security demands of the network control. emlix realizes Linux platform strategies for these manufacturers: with one software platform, product variants are developed quickly and economically and are tested, maintained and updated using standardized automated processes.

- Hardware-independent software platform
- Version and variant management
- Maintenance and IT security monitoring
- Trust zone concepts
- Secure network integration
- Linux real-time extensions
- FPGA / DSP integration

Operational security and life cycle support for the „industrial internet"

For liquid-transporting road tankers emlix has developed a telematics and logistics solution: a Linux system with control and operation applications is connected with the business IT of the fleet operator using the mobile telephone network. The system consists of a unit in the driver's cab and the control and operation system on the semi-trailer. Using these devices the loading and unloading procedures and the taking of samples can be controlled, and the operational security can be monitored.

- Mobile communication using GSM / GPRS
- Emergency call connections via satellite
- Navigation / vehicle monitoring using GPS
- MQTT-based integration into the central IT systems
- Component-based control and operation applications
- RFID authentication of the driver, vehicle and equipment
- Intelligent role and authorization concept
- CAN bus interface to the vehicle
- Sophisticated remote update concept

Tools & processes

The development of open-source-based systems for industrial use necessitates efficient and verifiable processes. This requires standardized development procedures, but also suitable tooling.

emlix offers its customers development tools that have been designed especially to meet these requirements: e2factory provides build and process automation for software life cycle management and certification. The emlix Test Application Framework (TAF) facilitates the automation of reproducible, hardware-near tests and the generation of reports.

Efficience through standardized development processes

Test Application Framework

With its Test Application Framework (TAF) emlix has developed a quality assurance tool which can adapt optimally to the dynamics of agile development and makes possible continual and economical testing at hardware level. All test runs are archived reproducibly in order to be able to check the results at a later time.

- Comprehensive database with standard tests
- Compilation of specific test sets
- Versioned test setup
- Automatically generated test reports
- Continual quality assurance
- Production and series accompanying tests
- Assurance of the system integrity

e2factory

maintained by emlix using e2factory, the emlix build automation and software management system. In contrast to standard distributions, each software version can be reproduced in detail throughout the life cycle in a manner which is easy to comprehend and can be validated. Based on e2factory, a centrally maintained platform can produce variants for different products which can be maintained economically. Its features include the following:

- Build computer and person-independent reproducibility which can be validated
- Continuous version management as well as variant management for product families
- Cryptographically secured build process
- Realization of platform strategies
- Integration of one's own applications into build process
- Central software and configuration management
- Cross-development for different architectures
- Documentation of the licences used
- Location-independent development (e2factory Workbench)
- e2factory is covered by GPL v3

Poky-Tiny Yocto

In addition to e2factory, emlix uses the Yocto build system **BitBake** in combination with **Poky-Tiny**, a minimal distribution from Yocto. Apart from the central components (e.g. the kernel) all the rest of the software elements can be directly downloaded in a targeted way from the mainline community and integrated into the Linux system. This approach is especially suitable when the certification requirements are less stringent.

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