COMARCH

SILICON LABS

HW-Independent Z-Wave for Silicon Labs

About Silicon Labs

Silicon Laboratories, Inc., is a provider of silicon, software, and various Internet of Things (IoT) solutions aimed at fostering a new connected world. The company's award-winning technologies play a pivotal role in shaping the future of several sectors, such as smart homes, industrial IoT, smart retail, smart cities, and healthcare.

Established in 1996 in Austin, Texas, Silicon Labs is one of the leaders in intelligent wireless technology. Improving the company's products with the help of Comarch enables them to transform industries, grow economies, and improve people's lives.

Silicon Labs & Comarch

Since 2013, Comarch has maintained a strong partnership with Silicon Labs. **This long-lasting collaboration allows our experts to deliver outstanding support and execute numerous versatile projects that showcase our extensive capabilities.** We successfully finished many projects together. The expertise within our company, our background, our skilled team, and the strong bond between Comarch and Silicon Labs are the main reasons for choosing Comarch.

Project objective

The main goal of this project was to make the Z-Wave and the app layer independent of the hardware. In that way, other vendors can easily integrate with the present Silicon Labs' solution.
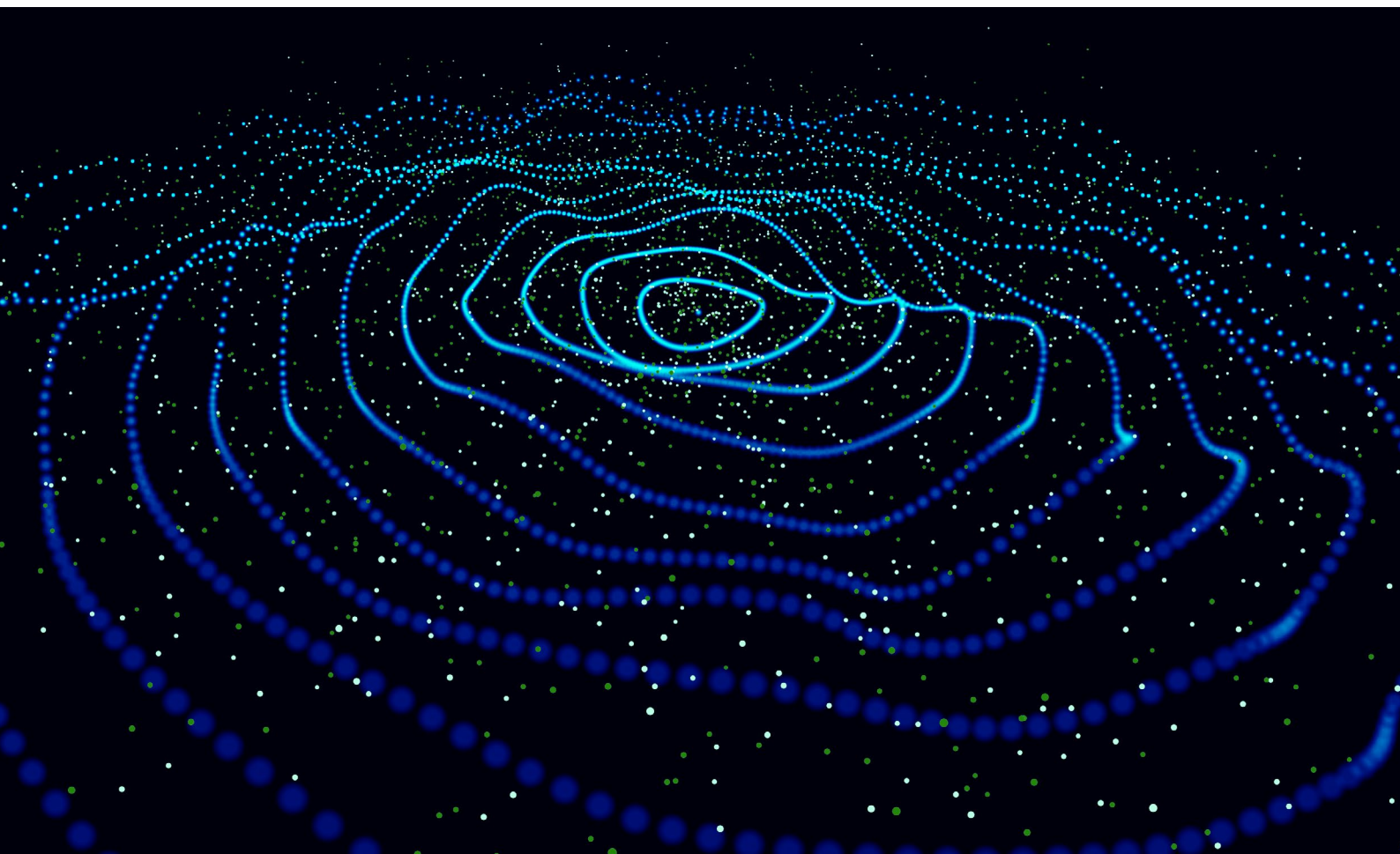
What do we offer?

- Meeting the client's needs
- Wide range of competences
- Highly skilled team
- Hands-on experience with the newest technologies

- Time and material model of cooperation
- SLA depending on the client
- Flexible business model and pricing

Advantages for Silicon Labs

- Adaptable capacity model, depending on the project
- Additional competence regarding project management, planning and SCRUM methodology

- Union between Silicon Labs' technology and Comarch's extensive knowledge of the IT industry
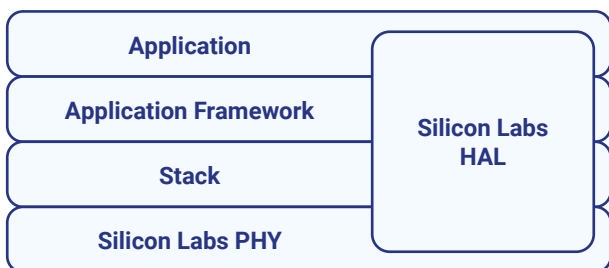- Possibility to plan cooperation based on a strong, long-term partnership with Comarch
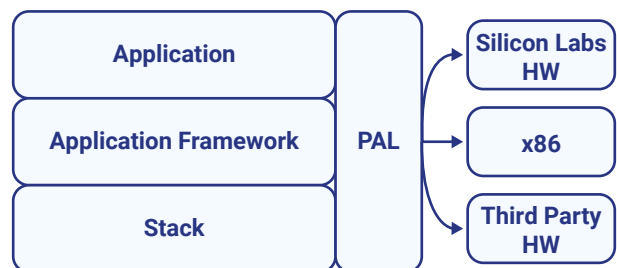
Project overview – Platform Abstraction Layer

To simplify the procedures of hardware change without the need to change application or stack code, it was necessary to implement the platform abstraction layer (PAL). Thanks to this, to utilize new hardware, the user has to write a new implementation of features defined on PAL.

To achieve this transition, Comarch's team joined forces with Silicon Labs' developers. First, the client's developers planned which modules should appear inside PAL (e.g., radio module, entropy, UART). During the production process, modules could be in three states: TODO → Designed → Implemented. Module designing consisted of API and documentation preparation in the header file. The next step was to implement the file into the Silicon Labs module and substitute all hardware function calls in the application with selected functions from the PAL module. Quality control was based on automatic tests performed on the client's hardware.
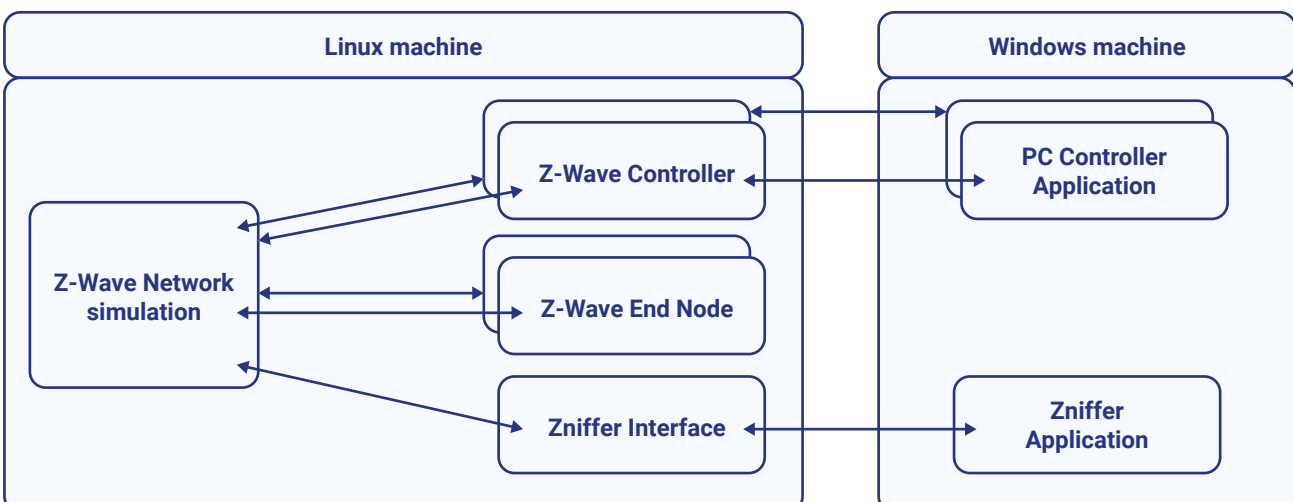
Before:

| Application |
| Application Framework |
| Stack |
| Silicon Labs PHY |

Silicon Labs HAL

After

| Application |
| Application Framework |
| Stack |

PAL

- Silicon Labs HW
- x86
- Third Party HW

The proof of Comarch's success: a Linux simulator

The biggest challenge in this case was Z-Wave network emulation. To overcome it, a simulator communicating inside the localhost network had to be created. Additionally, the official FreeRTOS Posix port had to be extended with additional features to make it compatible with our solution.

Comarch's engineers integrated the new solution with Silicon Labs developers' applications for network traffic monitoring and network management. This resulted in the creation of a Z-Wave network simulation working on one Linux computer. This serves as a base to develop scalable test system without a need to add and maintain physical hardware.

Linux machine

- Z-Wave Controller
- Z-Wave Network simulation
- Z-Wave End Node
- Zniffer Interface

Windows machine

- PC Controller Application
- Zniffer Application

The final phase of the project: test system

Having the x86 implementation allows users to run simulations with Z-Wave devices as operating system processes. A simulation like this was used to create an environment enabling to test advanced network topologies network topologies, traffic monitoring and simulations of other network events within one machine without the need to use real Z-Ware hardware.

The last step was to use the created system to implement a set of tests for MAC and Network layers of Z-Wave protocol.
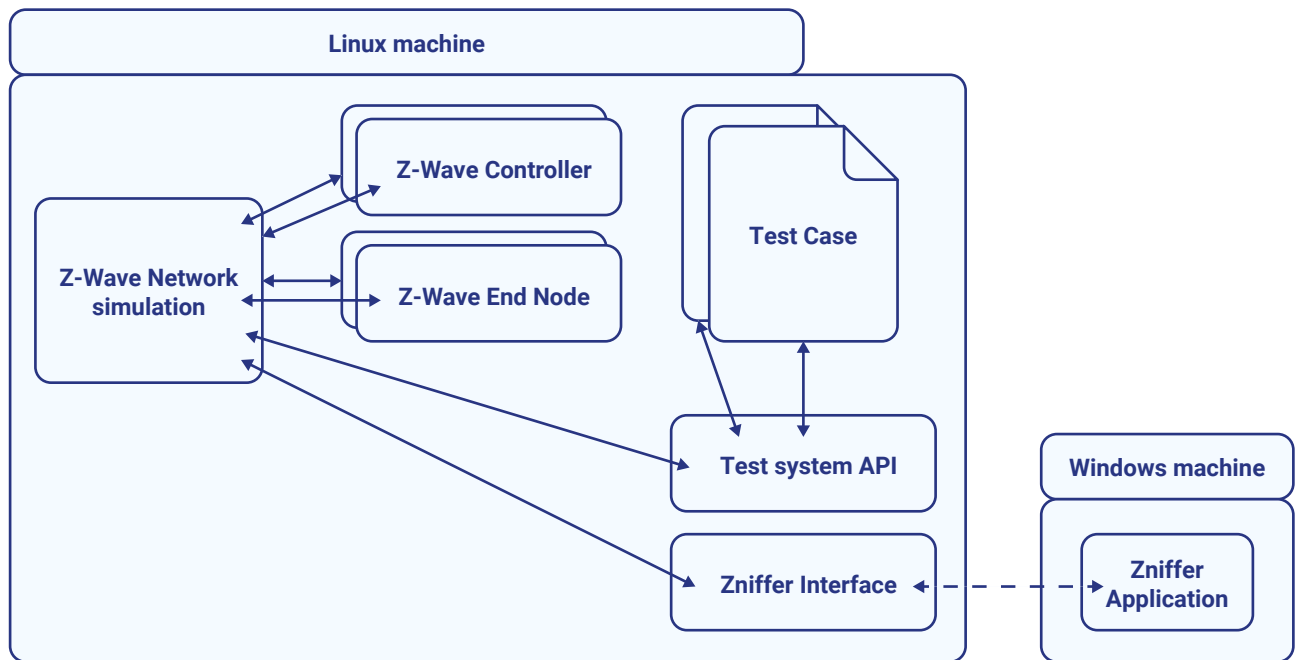
Important project milestones

1. Design platform abstraction layers modules API based on HW-dependent code

2. Implement PAL for Silicon Labs' hardware

3. Prepare documentation of PAL

4. Implement PAL for x86 architecture to prove the PAL layer is HW-independent

5. Design and implement test system capable of testing MAC and network layers of the Z-Wave protocol

6. Implement MAC and network tests

Successful execution

Comarch's team of engineers worked on development, testing, bug fixing and documentation to ensure the effective implementation of this project. The cooperation with Silicon Labs resulted in successful delivery, showcasing Comarch's ability to meet client needs and provide comprehensive tech support.
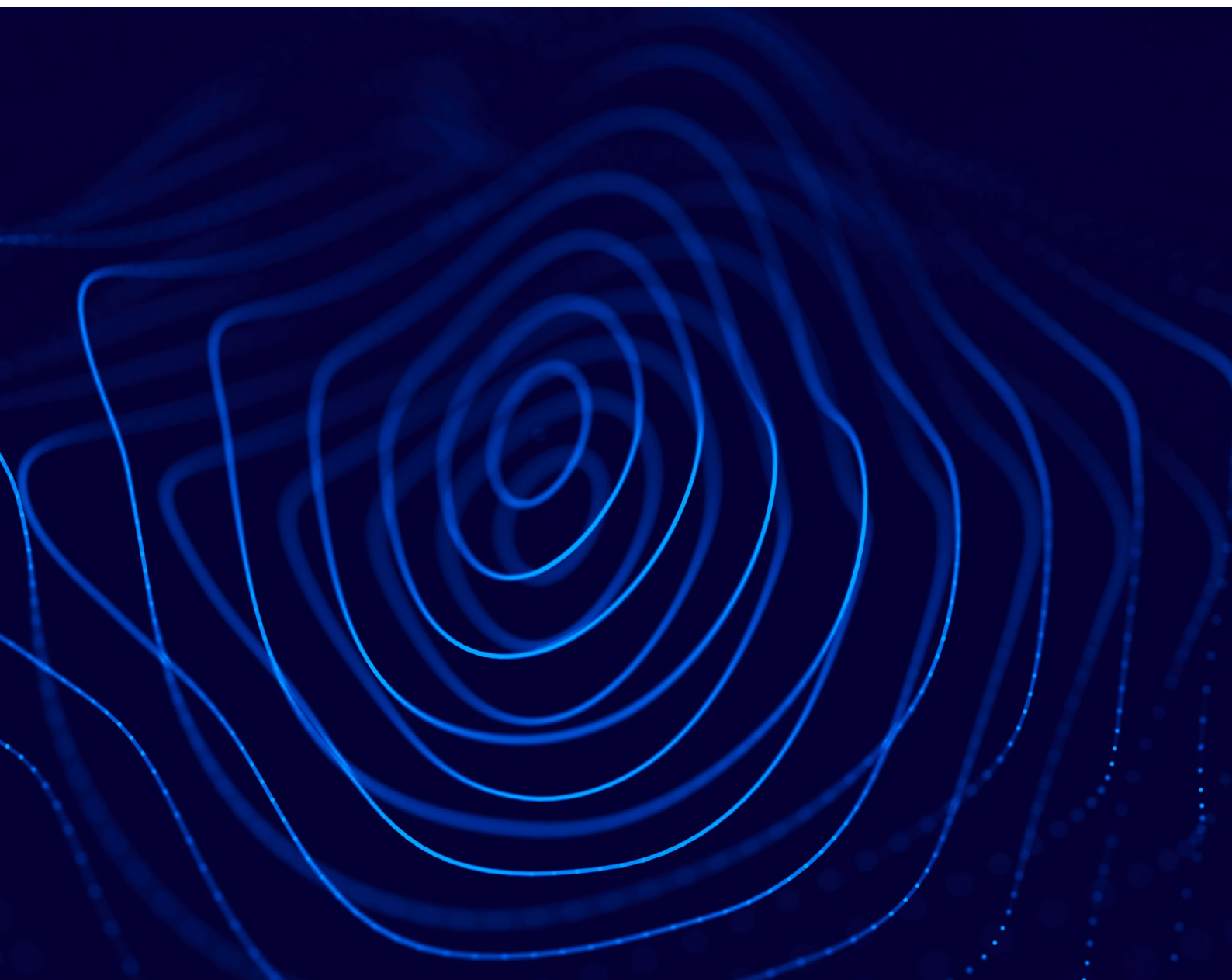
COMARCH

About Comarch

Comarch (headquartered in Kraków) is a leading global IT company with a portfolio of thousands of complex and successful IT projects and implementations of software development for more than 40,000 companies worldwide. We have wide knowledge of IT systems and solutions including cloud services, IoT ecosystems and embedded software. Comarch has been a reliable partner for global IT standards organizations since 2007. Over the years, we've worked with various organizations and gained knowledge and expertise in how to support certification bodies at each step of the creation of certification programs and aid their members in technology adoption.

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