Sleeve Embedded Dev

Sleeve - platform for remote development and sharing of embedded hardware

Programm / Ausschreibung	IWI 24/26, IWI 24/26, Basisprogramm Ausschreibung 2024	**Status**	abgeschlossen
Projektstart	01.05.2024	**Projektende**	31.05.2025
Zeitraum	2024 - 2025	**Projektlaufzeit**	13 Monate
Keywords			

Projektbeschreibung

Während Software grundsätzlich leicht vervielfältigt und von mehreren Personen gleichzeitig verwendet werden kann, bedarf es bei der Entwicklung von eingebetteten Systemen an physischer Hardware, auf die für Entwicklung und Testung zugegriffen werden kann. Diese eingebetteten Systemplattformen können allerdings nicht von mehreren Entwicklern gleichzeitig genutzt werden. Da sie darüber hinaus ziemlich kostenintensiv sein können, müssen Unternehmen bei ihrer Anschaffung sorgfältig abwägen. Sleeve positioniert sich als bahnbrechende Lösung, welche es ermöglicht, eingebettete Entwicklungsplattformen zeitgleich und örtlich ungebunden zu nutzen, wodurch reduzierte Entwicklungszeiten und -kosten ermöglicht werden. Der Markt in der Entwicklung eingebetteter Systeme wird dadurch auf eine vergleichbare Weise verändert, wie etwa Uber den Sektor des Personentransports verändert hat.
Sleeve ist ein Hilfsmittel zu automatisierter Softwareentwicklung, -testung und -anwendung auf eingebetteten Systemen ohne örtliche Einschränkung. Es ist eine effiziente, sichere und allumfassende Entwicklungsplattform, die es Entwicklern ermöglicht, auf Hardware-Entwicklungsboards fern zuzugreifen und sie nahtlos in ihre Entwicklungsprozesse zu integrieren. Die Hauptzielgruppe von Sleeve sind Unternehmen, die sich mit der Entwicklung eingebetteter Systeme befassen. Unsere drei wichtigsten Alleinstellungsmerkmale sind 1.) die Möglichkeit, Remote-Entwicklung auf eingebetteten Systemen vorzunehmen, 2.) ein erschwingliches Preismodell sicherzustellen und 3.) die Möglichkeit, überall darauf zuzugreifen, da es browserbasiert ist.

Endberichtkurzfassung

The Sleeve GmbH project has successfully completed its second year, achieving all planned objectives and demonstrating robust progress towards its overarching goals. Despite initial challenges related to personnel recruitment, strategic reallocation of resources and adaptive project management ensured the project remained on track. The focus of this period was on developing and refining core functionalities, enhancing security, and establishing critical market engagements.

Key Technical Achievements:

Significant strides were made in advancing the Sleeve platform's technical capabilities:

AI-driven Automated Tools Configuration: The system for automated, AI-based configuration of development environments was fully implemented, streamlining user setup based on device type, licenses, and workspace purpose. Responding to market trends, the architecture has been adapted to facilitate future LLM-driven development environments and AI Agent-based tool interaction. The last part is only in the POC phase and full development is planned for next year as this represents complete new set of features.
Secure Hardware Sharing: Comprehensive secure mechanisms for booking, user, device, and group management were fully implemented, enabling controlled and secure sharing of embedded hardware across multiple companies. This includes robust device reservation and release functionalities, coupled with detailed user type, role, and session management.
Parallel Debugging for Cross-Functional Development: An advanced debugging feature allowing multiple users to simultaneously access, debug, and dynamically switch control of the same embedded device in real-time was successfully integrated. This significantly enhances collaborative efficiency for distributed teams.
Automated Execution of Actions for Continuous Testing, Integration, and Deployment: Full automation of Sleeve actions was achieved, including robust handling of events like reboots and seamless integration with external CI/CD infrastructure. Crucially, the secure booking, connection, and spawning of peripheral devices within these automated actions were also implemented, enabling comprehensive automated hardware-in-the-loop testing.
AI-driven Predictive Infrastructure Maintenance: A dynamic infrastructure monitoring dashboard was implemented, providing real-time insights into the health and utilization of Sleeve Docks and embedded devices. This is complemented by an AI-driven mechanism that predicts optimal maintenance times and identifies areas for improvement, minimizing downtime and optimizing resource use.
Infrastructure-as-Code (IaC) for Scalability: IaC capabilities were implemented, allowing programmatic management of embedded targets, Sleeve Docks, workspaces, and actions.

Strategic Partnerships & Market Engagement:

The project established key strategic partnerships with

NXP,
TTTech Auto (exclusive for logging),
TU Vienna (specifically the Institute of Computer Technic for specialized FPGA research),
GLIWA.

Dissemination efforts included presentations at

Embedded World 2025,
Testing Expo,
ELIV 2024,
White Paper with Vector

Informatik(https://sleeve.dev/2024/07/sleeve-and-vector-informatik-unveil-innovative-white-paper-on-remote-embedded-development-integration/)
White Paper with
CARIAD(https://sleeve.dev/2025/04/how-sleeve-streamlines-remote-access-and-boosts-development-efficiency-with-edge-to-cloud/)

enhancing market visibility.

Customer engagement progressed positively with

CARIAD,
Berg Propulsion,
TTTech Auto.

Sustainability Contributions:

The project's results significantly contribute to sustainability by promoting decent work (remote access, reduced travel), increasing productivity through technological innovation and automation, developing resilient infrastructure (predictive maintenance, robust monitoring), and enabling the upgrade of existing industrial infrastructure for increased efficiency and environmentally sound resource utilization.

In conclusion, Year 2 of the Sleeve project has been highly successful, delivering significant technical advancements, solidifying key partnerships, and laying a strong foundation for future growth and market adoption, while maintaining a clear focus on security, scalability, and customer-driven development.

Projektpartner

- Sleeve GmbH