

Lukas Ernst

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 [Lukas Ernst](#) |  [Cyber-Luke](#)

71364 Winnenden, Gertrud-Bäumer-Allee 8, Germany

PROFESSIONAL EXPERIENCE

Technical Lead | IoT & Data Integration, Security Responsible

October 2023 – Present

Alfred Kärcher SE & Co. KG 

Winnenden, Germany

Technical Lead for IoT backend development of the cleaning robot platform. 1.5 years as Security Responsible for platform security and vulnerability management. Professional leadership of an international 5-member team (1 Frontend Developer Albania, 1 Backend Developer Vietnam, 1 Student, 2 Apprentices). Responsible for architecture, mentoring, and security. Progression from Junior Developer to Technical Lead role within 2 years.

- **Cloud Backend for IoT Device Integration:** Development and enhancement of a Backend-for-Frontend (BFF) as middleware layer between IoT Platform Provider (AWS IoT Core) and mobile control applications. Consumption of real-time events and telemetry data from autonomous cleaning robots via event streaming, implementation of customer-facing business logic (Remote Control, Live Map Creation, Status Monitoring, Push Notifications, Role-based Permissions, Audit Logging), and command forwarding to devices. Design and implementation of scalable APIs (GraphQL, REST, WebSockets) for low-latency communication with mobile clients.
- **Building Test Infrastructure for Distributed Systems:** Conceptualization and construction of comprehensive test infrastructure for distributed IoT applications. Systematic implementation of integration tests, end-to-end tests, and load tests for microservice architectures. Custom development of a GraphQL load testing framework with Vegeta integration for automated performance validation and regression detection.
- **Multi-Source Data Integration & Data Quality Engineering:** Design and implementation of importer components to consolidate heterogeneous product data from multiple third-party systems (ERP, PIM, DAM) into a central DynamoDB. Development of adapter patterns for system-specific data formats and provisioning via unified GraphQL interface. Systematic analysis of 86,931 datasets to identify structural inconsistencies (ID format issues, duplicates), development of automated data quality checks, and structured migration of 5,647 problematic datasets to ensure data integrity.
- **Performance Optimization:** Dramatic improvement of API response time from ± 5 seconds to ± 600 ms through query optimization, database tuning (DynamoDB, PostgreSQL), and strategic caching. Systematic performance analysis and bottleneck identification using New Relic APM, CloudWatch, Postman, and custom load testing framework.
- **Security Engineering, DevSecOps & Team Leadership:** Responsibility for security operations of the IoT platform with proactive vulnerability management (npm audit, Dependabot, GitHub Advanced Security CodeQL), SBOM analysis, and coordinated patch management. Implementation of key rotation policies (AWS IAM, Secrets Manager) and security-relevant code review processes. Complete responsibility for Bitbucket \rightarrow GitHub migration including CI/CD modernization (Jenkins \rightarrow GitHub Actions), Branch Protection Rules, and CODEOWNERS. Introduction of security-conscious development standards (OAuth 2.0, IAM policies, ESLint, Prettier, husky) and technical mentoring for sustainable code quality and reduced onboarding time.

Dual Study Student | Computer Science (B.Sc.)

October 2020 – October 2023

Alfred Kärcher SE & Co. KG 

Winnenden, Germany

Contribution to innovative projects in the fields of machine learning, IoT, cloud architectures, and DevSecOps. Focus on developing modern solutions to improve efficiency, security, and product quality.

- **Bachelor Thesis – Zero-Knowledge Cloud Architecture with Single Sign-On:** Solution to a fundamental security problem: How to enable client-side encryption despite Single Sign-On without key loss risk? Development of a complete system architecture with smartphone-based key management. Design of cryptographic protocols for secure key exchange (ECIES brainpoolP384r1, HMAC authentication) and key recovery (Shamir Secret Sharing with 300-node client pools, threshold-50). Mathematical security proof using hypergeometric distribution. Serverless AWS implementation (Lambda, AppSync/GraphQL, DynamoDB, SNS/SQS, Cognito, WebSockets). Comprehensive security assessment with threat model, vulnerability analysis, and risk assessment according to BSI TR-02102-1. Functional prototype with simulation-based validation.
- **Device Simulator – IoT Development Acceleration:** Conceptualization and development of a hardware-in-the-loop simulator that mimics the behavior of real machines and significantly accelerates the development process. Implementation of three components: CLI tool (React Ink), interactive web UI (React), cloud backend (AWS AppSync, GraphQL, DynamoDB). Enables parallel software development without physical hardware availability.

- **Sound Based Status Detection (SBSD) – Edge ML:** Development of an AI-powered system for acoustic analysis of device states in React Native. Implementation of TensorFlow.js for on-device machine learning. FFT-based frequency analysis for precise detection of defects and malfunctions. Integration of C++ native modules for performance-critical audio processing.

EDUCATION

Baden-Wuerttemberg Cooperative State University (DHBW) Stuttgart

October 2020 – October 2023

Bachelor of Science – Computer Science

Stuttgart, Germany

GPA: **1.8** (German scale, equivalent to 3.2 US GPA) | Specializations: Software Engineering, Cloud Computing, Artificial Intelligence, IT Security

Technical High School Backnang (TG)

July 2020

Abitur (German University Entrance Qualification)

Backnang, Germany

GPA: **1.9** (German scale, equivalent to 3.1 US GPA)

CERTIFICATIONS

ISAOB Certified Professional for Software Architecture (CPSA-F)

February 2025

Software Architecture Patterns, Quality-driven Design, Microservices, Event-Driven Architectures, Domain-Driven Design

iSAQB e.V.

PROJECTS

Photofeeler – AI-based Likability Assessment

April 2023

Python, FastAPI, React, MongoDB, TensorFlow, PyTorch, scikit-learn, YOLOv7, DeepFace, Docker, GitHub Actions, AES-GCM



AI system for automatic prediction of the likability effect of people in images. Construction of a novel dataset through online study (188 participants, 350 rated images), training and systematic comparison of multiple ML models. Production-ready deployment as containerized full-stack application (React, FastAPI, MongoDB, Docker, CI/CD).

Crypto-Cloud: Zero-Knowledge Architecture with Single Sign-On

January 2023 – Present

Express, React, OAuth 2.0, GraphQL, Docker, Zero-Knowledge Cryptography, AES-256

Practical implementation of bachelor thesis concepts as production-ready system. Complete implementation of smartphone based key management with end-to-end encrypted key recovery, multi-device synchronization, and automatic key rotation. Further development: Biometric authentication (Face ID/Touch ID), cross-platform support (iOS/Android/Web), vault management for passwords and documents.

TECHNICAL SKILLS

Specialization in cloud-native architectures for IoT systems and distributed real-time applications, with focus on security-by-design, event-driven architecture, and performance optimization. Experience in developing scalable microservices, cryptographic protocols, and security-critical systems.

Programming Languages & Frameworks

- **Production:** TypeScript/JavaScript (Node.js, NestJS, React, React Native, Next.js, Express), Python (FastAPI)
- **Proficient:** C++ (Native Modules, Performance-Critical Components), Java
- **Academic:** C (Embedded Systems), C#/.Net

Backend & API Design

- GraphQL (Apollo, AppSync) · REST (OpenAPI/Swagger) · WebSockets · MQTT
- Event-Driven Architecture · Microservices · BFF Pattern · Testing (Jest, Integration Tests, Load Testing)

Databases & Data Engineering

- **SQL:** PostgreSQL, MySQL · **NoSQL:** DynamoDB, MongoDB · **Analytics:** DuckDB
- **ORMs:** Prisma, TypeORM · Query Optimization · Caching Strategies

Cloud & Infrastructure

- **AWS:** Lambda, AppSync, DynamoDB, EKS, IoT Core, CloudWatch, IAM, SNS/SQS, CloudFormation
- **Container Orchestration:** Kubernetes (EKS), Docker
- **IaC:** Terraform, AWS CloudFormation · **Other:** Firebase

DevSecOps & Security

- **CI/CD:** GitHub Actions, Jenkins · **Security Scanning:** CodeQL, GitHub Advanced Security
- **Auth:** OAuth 2.0, OIDC, SAML, JWT · **Crypto:** AES-GCM, ECIES, HMAC, Zero-Knowledge Architecture
- **Monitoring:** New Relic, CloudWatch, Postman · **Code Quality:** ESLint, Prettier, husky

Tools & Methods

- Git/GitHub/Bitbucket · Jira · draw.io/miro · Agile/Scrum · Code Review · Technical Documentation

PERSONAL INFORMATION

Languages: German (Native), English (C1), French (B2)

Interests: Data Science, Machine Learning, Cyber Security, Football, Cycling, Reading