CELTIC-NEXT
∑eureka Cluster

Project Achievements

F4iTECH

F4iTECH

Project ID: C2021/1-10

Start Date: 1 March 2022

Closure date: 28 February 2025

Partners:

DLIT, South Korea

Hankuk University of Foreign Studies, South Korea

Inosens, Türkiye

ISEP/IPP, Portugal

KocSistem, Türkiye

SAMM Teknology, Türkiye

SIDONIOS MALHAS S.A., Portugal

Sistrade Software Consulting S.A., Portugal

SmartCore, South Korea

TAV Technologies, Türkiye

TORUN, Türkiye

Co-ordinator:

Ismail Uzun

Inosens, Türkiye

E-mail: ismail.uzun@inosens.com.tr

Project Websites

www.celticnext.eu/project-fi4tech

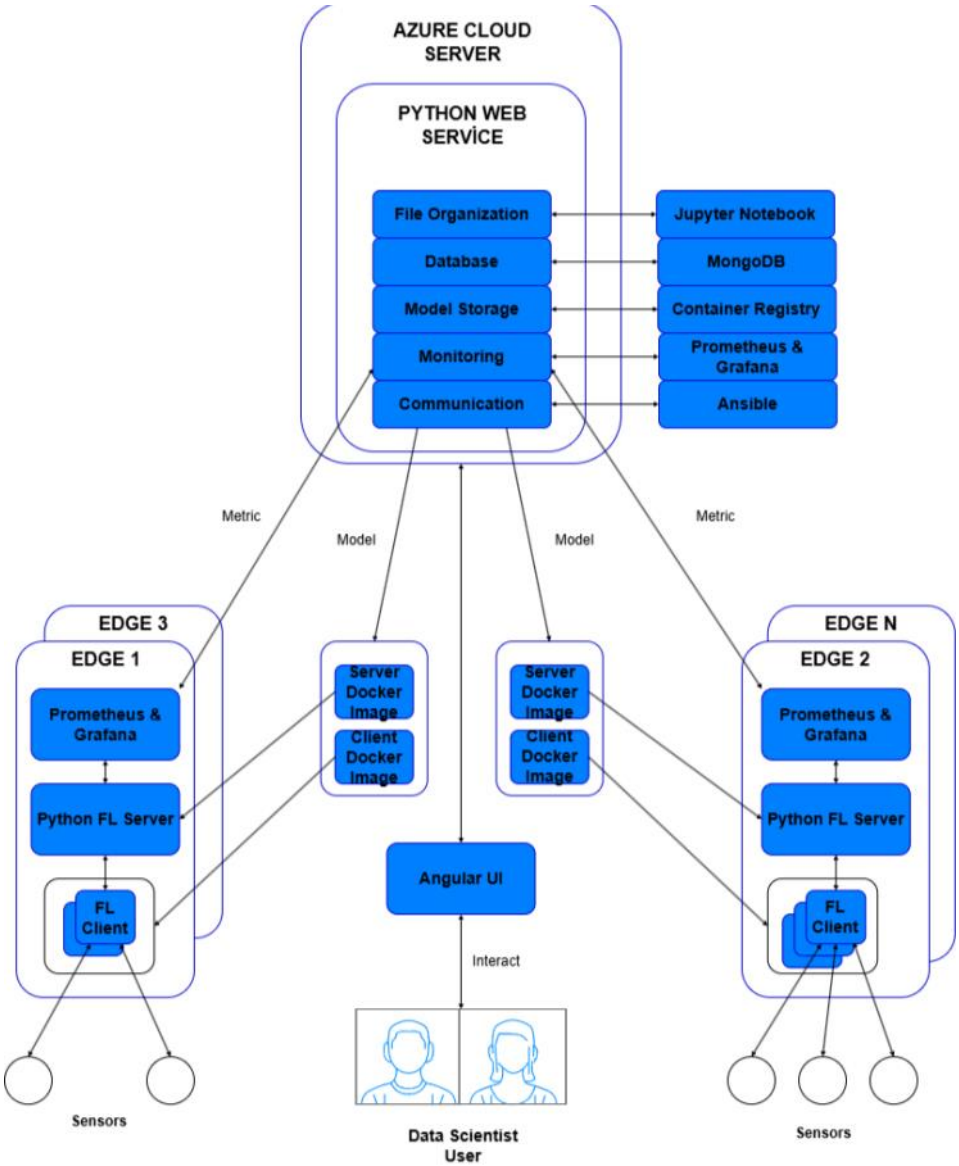
www.f4itech.eu

Federated AI Platform for Industrial Technologies

This project aims to help the manufacturing and transportation industries better use Artificial Intelligence (AI) technologies. By creating a Federated Learning (FL) platform and smart contract system, F4iTECH optimizes processes, solves invisible problems, and manages resources efficiently. It also ensures the secure management of data and intellectual property rights for all stakeholders.

Main focus

The F4iTECH project focuses on advancing AI-driven industrial and facility operations by integrating Federated Learning (FL) and artificial intelligence (AI) technologies. The platform enables decentralized model training, ensuring data privacy while supporting a wide range of industrial and facility management applications. By leveraging FL-based AI strategies, the system enhances real-time monitoring, operational efficiency, and decision-making without requiring sensitive data to be shared centrally. Additionally, the platform optimizes resource allocation, reduces operational costs, and improves overall system performance, contributing to more sustainable and intelligent industrial environments.



FLaction Architecture

For airport use cases, the project addresses operational inefficiencies caused by inaccurate predictions while mitigating data transmission and privacy challenges. The developed technologies are demonstrated across six pilot implementations, showcasing their potential to resolve hidden problems, reduce costs, and improve resilience in the manufacturing industry.

Approach

Traditional AI-based industrial applications follow a linear, sequential approach to data collection, processing, and model deployment. However, centralized systems often face critical limitations, such as inefficiency and privacy concerns. The F4iTECH project addresses these issues by leveraging Federated Learning (FL), which enables decentralized AI model development. This approach balances centralized and distributed processing, ensuring data privacy, accuracy, and cost-effectiveness.

By integrating blockchain technology, the project ensures secure data dissemination, offering incentives for data sharing while maintaining privacy. This innovative approach improves production line efficiency, delivering high-quality products at lower costs and significantly reducing machine maintenance expenses.

In airports, F4iTECH addresses challenges related to passenger safety, stakeholder collaboration, and the complex big data infrastructure required for decentralized AI. The FL architecture supports solutions like PAX Analyzer, enhancing operational efficiency while tackling critical privacy and data transmission issues. These cutting-edge advancements were demonstrated across six pilots, providing real-world insights and validating their transformative potential in aviation environments.

Achieved results

The project successfully demonstrated significant benefits for the manufacturing industry by integrating Federated Learning (FL)-based AI into production and operational workflows. A major achievement was the development of FLaction, a scalable and privacy-preserving federated learning platform that enables decentralized AI training across multiple edge devices. FLaction supports seamless model aggregation while ensuring data remains on local devices, addressing privacy concerns and regulatory requirements in industrial applications.

In the airport use case, the project delivered solutions that provide stakeholders with highly accurate, real-time predictions of passenger flows for specific time windows. By leveraging advanced machine learning models, these insights enabled airports, airlines, and ground handling services to optimize resource allocation, staffing, and facility management, leading to smoother operations and improved passenger experiences. As a result, the project significantly reduced operational inefficiencies stemming from outdated or inaccurate forecasting methods, minimising delays, overcrowding, and resource mismanagement. Furthermore, integrating Federated Learning (FL)-based AI tackled critical industry challenges, particularly in data transmission, security, and privacy. By enabling decentralised data analysis, the solution eliminated the need for large-scale centralized data repositories, thereby enhancing compliance with stringent regulatory frameworks while also preserving data sovereignty for participating stakeholders. This approach ensured the confidentiality of sensitive passenger information and fostered greater collaboration among stakeholders by allowing them to access valuable insights without compromising individual data ownership.

The project results are expected to have a lasting impact on management sectors, enhancing operational efficiency, reducing costs, and improving stakeholder collaboration. The technologies developed may serve as a foundation for new product developments, standardization efforts, and further research. Additionally, the project's outcomes, including methodologies and findings, have the potential for publication in major papers, fostering wider adoption and refinement of FL-based AI in industry applications.

- Scientific publication: 11
- Presentation: 16
- Event: 12

Impact

F4iTECH brings great benefits to the manufacturing and transportation industries by efficiently incorporating FL-based AI solutions. Distributed ledgers will be used to store all the relevant events and transactions of stakeholders in the Industry 4.0 ecosystem, which will allow industry stakeholders and end consumers to verify the data intuitively and create smart contracts.

The predictive maintenance and machinery inspection are a regular and systematic application of AI, which ensures proper functioning of equipment and reduces its rate of deterioration by 20%. This project is generating major advantages to the manufacturing and transportation industries by efficiently incorporating FL based AI into the production or operation line, to resolve and eliminate some invisible and internalized problems that cost a lot, aiming to reduce invisible and internalized problems by 15% and, therefore, reducing some unwanted costs.