F4iTECH

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Federated AI Platform for Industrial Technologies (F4iTECH)

The main objective of this project is to enable manufacturing and transportation industries to better utilize Artificial Intelligence (AI) technologies. By building a Federated Learning (FL) platform along with a smart contract system, AI will become more accessible to industry through efficient and usable analysis tools to optimize processes, identify invisible problems, and resolve them. The F4iTECH platform will allow efficient usage of computing resources while storing all the relevant events and transactions of stakeholders in the ecosystem. Furthermore, the platform will evaluate contributions to the final AI model, thus it will allow a compre-

F4iTECH Federated Learning Platform Architecture
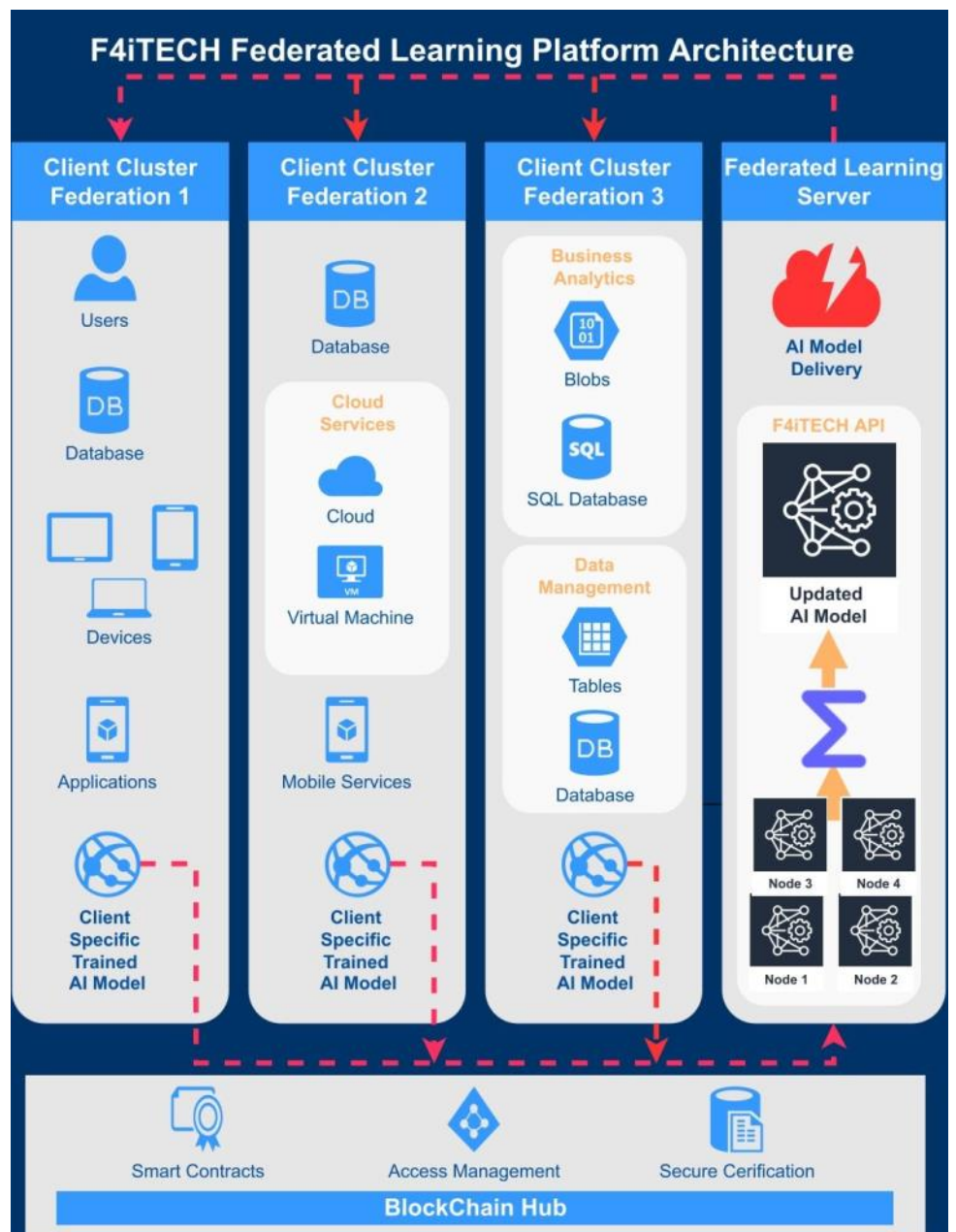
hensive handling of data and intellectual property rights.

Main focus

The F4iTECH project focuses on smart manufacturing and facilities, including airports. In particular, the project aims to build an FL and AI empowered smart manufacturing and facility platform combining ideas from cyber-physical systems, software robots, and big data manufacturing. The platform will support flexible adaptation for multiple types of manufacturing and facility services. The predictive maintenance and machinery inspection are a regular and systematic application of AI, which ensures proper functioning of equipment, reduces its rate of deterioration and contributes to the improvement of productive resilience. The improvement of energy usage will also be targeted through the use of FL-based AI predictive and optimization strategies, to reduce costs and carbon footprint, thus increasing the competitiveness and sustainability of European industry. With this project, it aimed to get a great benefit 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 have a significant cost.

In addition to this, with the airport use case scenario, the operational inefficiencies of airport stakeholders due to erroneous predictions will be reduced. FL will solve the heavy data transmission and privacy problems in the defined airport scenarios. The technologies developed throughout the project will be deployed and demonstrated in six pilots.

Approach

Current AI-based industrial applications have a linear sequential approach for data collection, processing, and model deployment cycles, where each part of the cycle has a clear task. However, current centralized approaches have several crucial disadvantages. The recent advances and trends in FL address some of these issues in other domains such as mobile applications. The F4iTECH project provides great benefit to the manufacturing industry by efficiently incorporating FL-based AI into the production line to resolve and eliminate some invisible and internalized problems. Our approach is to solve these issues by building AI models with decentralized data by using a balanced approach to the learning process between centralized and distributed processing. In the meantime, we aim to use the blockchain approach to disseminate data allowing accuracy and privacy as well as potential to pay for the data. This will enhance efficiency of the production line and result in high quality products with low cost. This project will also conceive smart manufacturing models to remarkably reduce maintenance cost of machines that are used in the production line.

From the aviation perspective, the protection of passengers and different stakeholders, the big data infrastructure, and network needs required for decentralized AI necessitate the federated learning architecture for the solutions like Common Use Analyser.

Main results

The aim of the project is to get a great benefit to the manufacturing and transportation industries by efficiently incorporating FL-based AI into the production or operation line to resolve and eliminate some invisible problems. In the smart factories use cases, detecting anomalies such as Remaining Useful Lifetime (RUL), overloading, and thermal errors of machines will be reduced while the water/oil concentration variation over the time, namely concentration ratio will be within the predetermined value throughout one month monitoring minimize quality losses and increase process efficiency due to cutting tool damage by predicting downtime. Within the project use case scenario to be developed for the airport, stakeholders participating in airport operations will receive predictions about how many passengers they will process in which time zone for the next day. The operational inefficiencies of airport stakeholders due to erroneous predictions will be reduced. Federated learning will solve the heavy data transmission and privacy problems in the defined airport scenarios.

Impact

F4iTECH brings a great benefit to manufacturing and transportation industries by efficiently incorporating FL-based AI solutions in industry. Distributed ledgers will be used to store all the relevant events and transactions of stakeholders in the Industry 4.0 ecosystem, which will allow industries stakeholders and end consumers to verify the data in an intuitive way 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 Federated Learning based Artificial Intelligence 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.