The Smart World by FIWAREfor Digital Twins



The Smart World by FIWARE built by Lego® bricks is the world's biggest demonstrator with FIWARE technologies inside showcasing dozens of use cases based on FIWARE Open Source solutions. They focus on domains like Smart AgriFood, Smart Cities, Smart Energy, Smart Industry and, Smart Water addressing the urge for more efficient and sustainable digital transformation agendas. To accelerate such digital transformation, the use of Digital Twins are more and more seen to be a crucial enabler in both the private and public sectors.



Experience and interact with a real Digital Twin

The Smart World by FIWARE built by Lego® bricks helps visitors to experience how FIWARE's Open Source technology enables actors in the digital transformation space to forster transformation throughout a variety of interconnected domains. Countries worldwide have welcomed changes in the new digital era at various speeds and to different degrees, embracing more and more interconnected spaces of life.

The digital transformation journey centers on people. The digital transformation journey is is complex and not an easy win. That's why we've developed - and are constantly growing the Smart World by FIWARE. It impressively shows interoperability between vertical solutions and domains and how to unlock new and required use-cases and benefits. Through the combination of FIWARE's Context Broker and de facto standardized Smart Data Models, such interoperability can be achieved. The displayed Smart World modules showcase in an interactive way how sectors like Cities, Energy, Industry, Agrifood, Tourism or Water can interact to become truly smart. Interoperable spaces require a series of ingredients. FIWARE brings a framework of open source software platform components available to be assembled to local or global requirements. The architecture of smart solutions 'Powered by FIWARE' can be based on the management of digital twin data using the standard NGSI API. How? Connecting the Internet of Things with state-of-the-art Context Information Management solutions allows the creation of Digital Twins and brings Big Data or AI services on the Cloud to reality. All use cases and modules of the Smart World by FIWARE reflect real and successful implementations and projects in different countries and environments - brought by the FIWARE community to the public.

Smart Data Models

Smart Data Models is a global and collaborative program driving the adoption as "de facto" standards of data models for digital twin classes across a wide range of domains. Mapping of these data models into concrete JSON/JSON-LD structures provided under this program becomes a crucial asset for developers looking for means to guarantee interoperability between different Internet and Cloud solutions, breaking vertical data silos within organizations and enabling data sharing among organizations within data spaces - all at market speed.

This program, led by FIWARE, IUDX, OASC and TM Forum, follows a truly open approach and has been boosting the creation of a global open data and open source community since its birth.



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AI Marketplace



The AI Marketplace is the digital platform for Artificial Intelligence (AI)I in engineering. In this German R&D project funded by the Federal Ministry for Economic Affairs and Climate Action, a consortium of 19 partners develop a marketplace for AI solutions in the field of product development. The platform itself offers a matchmaking process in which companies looking for AI solutions can place challenges that solve their respective problems. The matchmaking process will match the challenge with one of the existing solutions placed on the marketplace.

Al in Product Development



With this module, you can observe how Artificial intelligence (AI) is used in product development processes. The showcased use case is demonstrating how AI can recognize parts from already existing agricultural machinery products and implement them into the development process of new machinery. In this way the production costs, time and complexity are reduced. This use-case is featured in the AI Marketplace - a project funded under the umbrella of the Federal Ministry of Economic Affairs and Climate Action.

Smart Construction Site



This module, which is part of the EU-funded project IMPRESS, focuses on the construction site of the university building Zukunftsmeile 2, built in 2019 in the city of Paderborn (Germany), a FIWARE user. An impressive construction crane visualizes a smart solution for a more cost-effective usage of Construction Machinery, based on weight and impacting external data such as weather details, for instance. Machinery and equipment leasing rates can thus be properly reduced or increased, depending on the actual construction sites' needs and users' behavior.

Smart Cultural Spaces



The building "Dokk 1" is part of the city's effort to reshape former industrial areas of the Port of Aarhus (Denmark) into residential and commercial areas. It includes future-ready public housing, a library, a culture center with an underground parking facility including Smart Parking solutions and a station and light rail system with trains running through and beneath the building. This cultural city center connects it all: Living, Culture, Mobility, and sustainable urban development. Digital Infrastructure Center



This module brings you to the headquarters of FIWARE's Gold member ADDIX, based in the city of Kiel, Germany. Addix provides big parts of the digital infrastructure for Kiel's innovative approach to turn the city into a real smart city. This includes a glass fiber node connected to the worldwide internet node in Frankfurt, Main, public WiFi, LoRaWAN and a server center. All used to enable the city to create and use the digital twin of their mobility stations.

eGovernance



This space represents the city hall of Vienna in Austria. Vienna is among the smartest and most innovative cities in Europe today. The future of governance is digital - and this is explained here: Digital governance does not only make city governance less complex, but also creates easier and more resilient lifes for citizens. An inclusive approach allows citizens at the same time to actively participate in the decision making of city governances via digital platforms. That's smart!

Smart Energy



This sector represents a variety of energy management systems that can be realized with FIWARE technology. FIWARE tech. is used to measure and display the energy production and usage of a city or factory: it enables the design of energy optimized production plans using Artificial Intelligence. Another concept is laid out in Northern Germany: If renewable energy sources produce more energy than needed in a certain moment, the excess energy is used to transform hydrogen into hydrogen fuel. This fuel in return is provided to the gas fuel station to support a bus.

Smart House



To make cities really smart, citizens' private homes can't be ignored. The Smart House on show here is supported by the IoT sensor hub, which combines and evaluates various data sources and environmental sensors. The data generated through these devices can be used to heat and cool homes in a more sustainable way or optimize their energy consumption. Additionally, this model shows that air pollution can be reduced in living areas by changing the traffic flow showcasing a traffic light that changes from green to red if air pollution is too high.

Smart Industry



This section features examples of Digital Twin and Supply Chain Management in the industrial sector through different robots controlled by FIWARE-based platforms. StoneOne, a 'Web Software Factory' that offers innovative technologies and complementing consulting services for Cloud IT, presents an example from the field of Predictive Maintenance. Besides, NEC Lab shows how FIWARE's reference architecture is successfully used in the "Industry 4.0" area.

Smart Mobility



The Smart Mobility sector demonstrates how various intelligent transport concepts are interlinked. Sustainable and citizen-friendly cities require well organized public transportation as well as Smart Solutions for private transport services like Smart Parking. This includes Smart Mobility as a Service solutions making these different kinds of transportation models easily accessible to everyone. FIWARE users across the world provide feasible and smart solutions for such types of implementations like Smart Parking and Digital Twins of Mobility Stations.

Smart Tourism



The mountain module drives the attention to the village of Werfenweng, a small community in Upper Austria. The village follows a "Soft Mobility" (SaMo) approach that enables tourists to enjoy emission free transportation during their holiday. This is an example of fully integrated green and sustainable mobility – a role model for smart mobility of the future. Visitors are required to leave their cars at the entrance to the holiday resort and must choose from there between low-impact and sustainable ways of transport.

Smart Water and Smart Tourism



These Water showcases point to Emergency Management, Leisure and Mobility activities when it comes to civil protection as well as to use of vehicles and boats in coastal areas. The city of Kiel monitors water levels in its coastal areas to create relevant right-in-time data for their water warning systems, including water storage in the streets in case of floods. It also features sensors detecting the occupancy and punctuality rate of naval vehicles in real-time. For Tourists, this solution offers the possibility to reserve their yacht space in one of the many sportboat harbors.

The Digital Twin of Smart World by FIWARE...

The Digital Twin created from the Smart World by FIWARE connects real-world data (coming from modules built by Lego® bricks) with Digital Twins data to provide a cohesive single source of truth across multiple platforms.

The Digital Twin of the Smart World by FIWARE, enriched with data, helps to explain the importance of better and faster decision making by understanding the past, observing the present, and predicting the future. In this map, the different implemented sensors reveal and access real-time data which are displayed through respective clickable icons as shown in the legend to the right.

A 3D version Digital Twin of the demonstrator will go on a European Tour later this year. The Digital Twin implements actual real-time data as well as historical context data from different sources which come to live in one Data Space to make it available to the city, the citizens and other business parties to create a more livable city, a more transparent Smart City management, and new business opportunities.

On a large scale FIWARE technology enables the management of huge Data Spaces in one Data Platform. This Digital Twin showcases how we enable this on a smaller scale.

...as business accelerators

FIWARE enables users to break up vertical data silos by creating a Context Information Management layer and providing a complete picture of what is happening in a defined system.

These systems can be in different kinds of domains: Cities, Factories, Energy Plants, or others. In the current age of data, gathering data in subject related data spaces (e.g. one city), enables all stakeholders to create Digital Twins and data marketplaces.

They are called to play an increasingly important role in the emerging data economy. Here, right-time and historic information can be merged with data from different providers, to build on new solutions and participate in upcoming monetization opportunities.

Digital Twins enable the analysis, prediction and maintenance of these systems.

FIWARE provides you with an Open Source framework that makes it possible to gather data from all different kinds of IoT sensors.

Some technical insights

The Digital Twin is using FIWARE technology and other Open Source components only. The sensors are run over microcontrollers (ESP8266), which communicate via a Mosquitto MQTT broker with the FIWARE IoT Agent to pass on context information to a Orion Context Broker. This includes basic information such as location and sensor type, metadata information, and references to the monitored entities - in this particular case, which Smart World module the sensor is located on, and are stored in a MongoDB database.

Historical Data is also stored in a Timescale database using the FIWARE component QuantumLeap. The historical data is visualized using Grafana dashboard displays and can be used for analysis and prediction of events.



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