CELTIC-NEXT
∑eureka Cluster

Project Information

Internet of Digital Twin Things

IoDT²

Project ID: C2023/1-10

Start Date: 1 May 2024

Closure date: 30 April 2027

Partners:

Anser Information Technologies, Türkiye

Blockchain Customs Technology, Spain

Electronic Media Services Ltd., United Kingdom

Innova, Türkiye

Loughborough University, United Kingdom

Netcad, Türkiye

Türk Telekom, Türkiye

Co-ordinator:

Posco Tso

Loughborough University

E-Mail: p.tso@lboro.ac.uk

Project Website

www.celticnext.eu/project-iodt2

The project aims to revolutionise digital twin technology through IoDT², an open framework that addresses scalability and collaboration challenges. By leveraging serverless edge computing and digital twin -centric networking, IoDT² enables seamless sharing of distributed models and real -time responsiveness. This approach enhances interoperability, optimises performance, and simplifies digital twin creation, benefiting various industries and promoting widespread adoption.

Main focus

The project focuses on creating the IoDT² framework to advance digital twin technology and address key issues of scalability and collaboration found in centralised systems. Existing problems such as data bottlenecks, increased latency, and technological silos are tackled by enabling seamless sharing of distributed models and data across networks. The framework integrates serverless edge computing to improve real-time responsiveness and reduce latency, and employs digital twin-centric networking to enhance interoperability and simplify access to digital twin resources. The expected impact includes optimised system performance, easier creation and configuration of digital twin models, and improved collaboration among industry practitioners, researchers, and technology providers. This innovation will facilitate the widespread adoption of digital twins, benefiting sectors like manufacturing, aerospace, energy, and infrastructure by enhancing decision-making, reducing downtime, and improving resource utilisation.

Approach

The project will fulfil its objectives through a series of strategic steps, listed as follows.

- Distributed Digital Twin Architecture: We will develop modular and well-defined digital twin models that can be dynamically composed and chained from atomic models. This enables the creation of larger, customisable models, enhancing flexibility and interoperability. Open descriptive software standards will be established to interface with these models, revolutionising the conventional centralised approach.
- Serverless Edge Computing: By extending serverless computing capabilities from the cloud to the edge, we aim to run digital twin simulations closer to the physical assets. This involves researching resource visibility and reliability at the edge and developing intelligent container caching algorithms to optimise computational power. These advancements will ensure real-time responsiveness and reduced latency in simulations.
- Digital Twin Centric Networking: We will apply information-centric networking principles to create a “digital-twin centric network”, which allows users to query and access digital twin models without

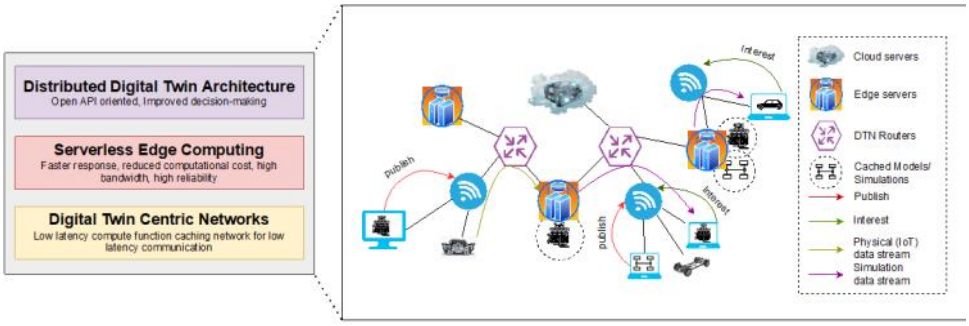

Figure 1: IoDT² System View

specifying data locations. This simplifies collaboration and sharing across geographically dispersed systems. The approach will co-locate data and functions needed for simulations within the network, improving efficiency.

- Validation and Testing: The framework will be validated through use cases in both simulated and real environments. This ensures its practical applicability and effectiveness.
- Influencing Industry Standards: We will collaborate with industry users to influence and develop open standards for digital twin models, promoting widespread adoption and compatibility among different solutions.

Main results

The IoDT^2 project will achieve several key results, including:

1. Software Stack Development: Creation of comprehensive tools for digital twin models and simulations for enabling real-time analytics and efficient resource management.

2. Standardised Data Models: Establishment of data models for smart cities and built environments for promoting interoperability and seamless data exchange.

3. Digital Twin-Centric Networks: Introduction of specialised networks to support the communication and interaction needs of digital twin models for enhancing simulation efficiency and data sharing.

4. Edge Computing Integration: Leveraging serverless edge computing to bring computational power closer to physical assets, reducing latency and improving real-time responsiveness.

These advancements will significantly enhance decision-making, operational efficiency, and collaboration across industries such as urban planning, infrastructure management, and industrial applications. The expected value includes optimised system performance, reduced downtime, improved resource utilisation, and promoting innovation and widespread adoption of digital twin technology.

Impact

The IoDT^2 project results will have a profound impact on various business, R&D, and industry activities. By providing an open framework for distributed digital twins, businesses can enhance decision-making, optimise operations, and improve resource utilization. This will lead to reduced downtime and increased efficiency in sectors such as manufacturing, healthcare, and smart cities. The project's innovations in serverless edge computing and digital twin-centric networking will enable real-time analytics and seamless data sharing, fostering collaboration and interoperability. R&D activities will benefit from the standardised data models and the comprehensive software stack, providing a foundation for further advancements and new applications. Overall, the project will drive innovation, promote the widespread adoption of digital twin technology, and establish new industry standards, positioning organizations to leverage cutting-edge solutions for improved performance and competitiveness.

About CELTIC-NEXT

CELTIC-NEXT is the EUREKA Cluster for next-generation communications enabling the digital society. CELTIC-NEXT stimulates and orchestrates international collaborative projects in the Information and Communications Technology (ICT) domain.

The CELTIC-NEXT programme includes a wide scope of ICT topics based on new high-performance communications networks supporting data-rich applications and advanced services, both in the ICT sector and across all vertical sectors.

CELTIC-NEXT is an industry-driven initiative, involving all the major ICT industry players as well as many SMEs, service providers, and research institutions. The CELTIC-NEXT activities are open to all organisations that share the CELTIC-NEXT vision of an inclusive digital society and are willing to collaborate to their own benefit, aligned with their national priorities, to advance the development and uptake of advanced ICT solutions.

CELTIC Office

c/o Eurescom, Wieblinger Weg 19/4
69123 Heidelberg, Germany
Phone: +49 6221 989 0
E-mail: office@celticnext.eu
www.celticnext.eu

eureka