Metaverse and its integration with IoT verticals

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Member of UNITED GROUP

at a glance

NOVA

1.900
Employees

€840 mil.
Revenues

€192 mil.
Adjusted EBITDA

120.500
Enterprises

1,2 εκ.
Residential Customers

3
International IP Exchanges &
National Network Protection
Rings

4
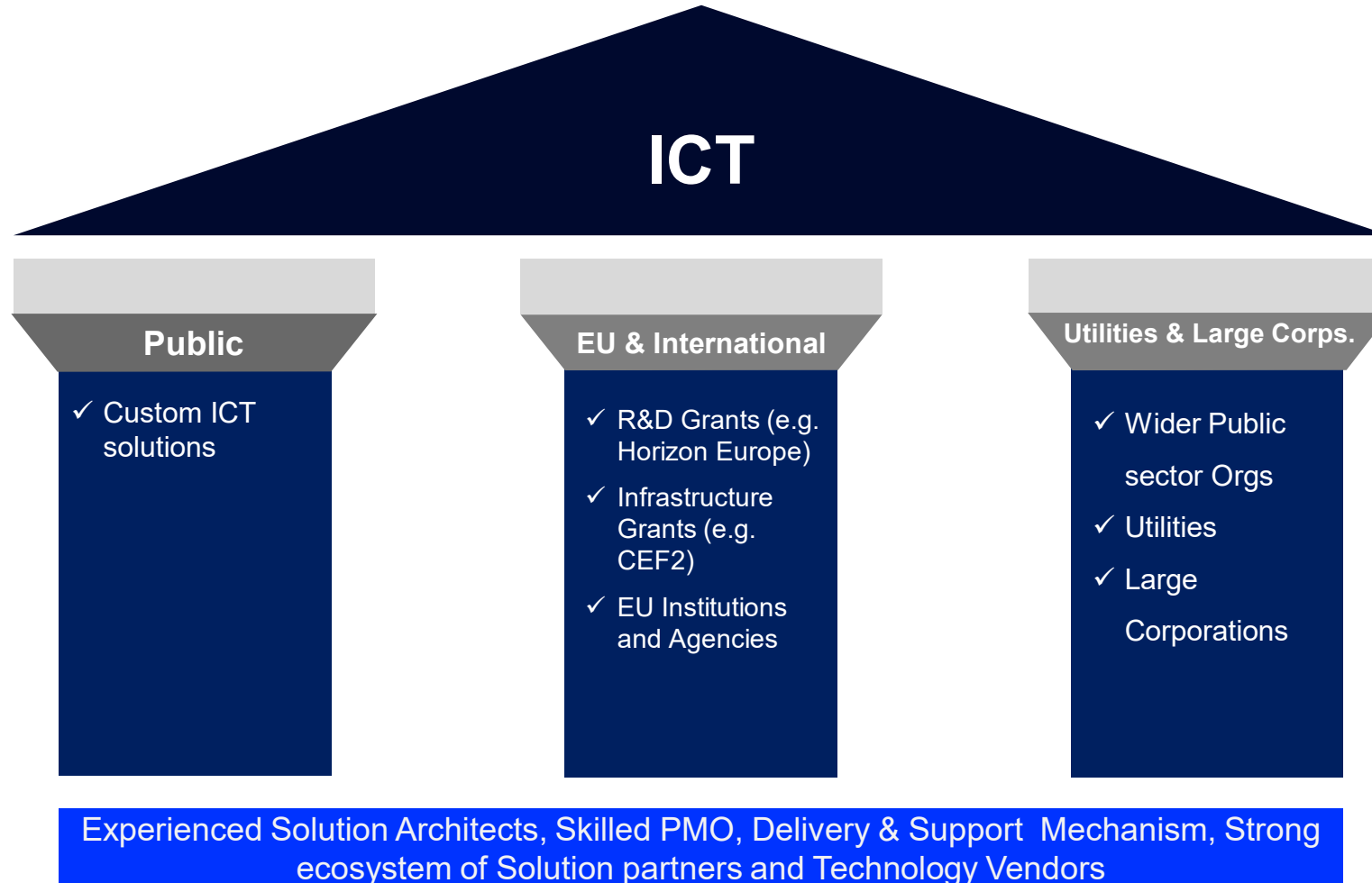Data Centers in Athens,
Thessaloniki & Crete

Certifications

ISO 9001, ISO 14001, OHSAS
18001, ISO 22301, ISO 27001,
Energy Management

NOVA ICT

Technology Integrator and Solution Provider

ICT

Public
- ✓ Custom ICT solutions

EU & International
- ✓ R&D Grants (e.g. Horizon Europe)
- ✓ Infrastructure Grants (e.g. CEF2)
- ✓ EU Institutions and Agencies

Utilities & Large Corps.
- ✓ Wider Public sector Orgs
- ✓ Utilities
- ✓ Large Corporations

Experienced Solution Architects, Skilled PMO, Delivery & Support Mechanism, Strong ecosystem of Solution partners and Technology Vendors

Project Overview

- **Project Name:**   **FIDAL** - **Field Trials beyond 5G**

- **Project website:**   **fidal-he.eu**

- **Stream:**   D-01-01

- **Members:**   NOVA | EBOS | ISI | PIIU | IQU | FORTH | TNOR | EKT | ADS | PSCE | PNET | UOP | UBI | TID | UMA | APART | STWS | OWO | ORAMA | ERIC

- **Key objective:**   FIDAL key objective is to extend and deliver advanced future proof Evolved 5G test infrastructures in Greece, Norway & Spain anticipating evolution into next SNS phase, open & accessible to support 3rd party vertical experiments, and environments for rapid prototyping and largescale validation of advanced, forward-looking applications.

- **Open Calls:**   https://fidal-he.eu/fidal-open-call-september-2023

Project Overview

- **Project Name:** **ACROSS -** **Automated zero-touch cross-layer provisioning framework for 5G and beyond vertical services**

- **Project website:** **across-he.eu.**

- **Stream:** A-01-07

- **Members:** NOVA | TID | NOKIA | ERI-LMI | NEC | UOP | UPM | CTTC | UBITECH | ICP | K3Y | WINGS

- **Key objective:** ACROSS develops a secure E2E network and service management platform that employs vertical and horizontal zero-touch mechanisms, enabling multi-objective service management optimizations in the presence of trade-offs between performance, energy consumption, and cost.

Metaverse and its integration with IoT verticals

Metaverse

The Metaverse is not just a vision of the future, but the potential, natural evolution of technologies that we are already using today.

This is especially true for digital twins empowered by IoT, whose advanced simulation capabilities are already helping today to develop products and processes or to plan factories, buildings and infrastructures and to optimise them during operation.

Key questions:

- What is the current state of play with Metaverse using IoT?

- How will the technology evolve and improve to enable real-time multi-business case simulation?

This presentation will evoke the opportunities that metaverse and IoT data may create for communities and enterprises.

Metaverse & IoT

The Metaverse can be thought of as an upgraded version of the Internet. In actuality, the Metaverse is not reliant on a computer screen; instead, it provides the ideal channel for expansive social interactions amongst individuals.

With this technology, people can interact with others while playing games, watching movies, or virtually visiting a popular tourist location. With the help of 3D technologies, VR, AR, and AI, Metaverse successfully expands internet possibilities.

Although the IoT already successfully connects physical objects to the Internet. However, incorporating Metaverse can undoubtedly give consumers new opportunities. When used in conjunction, these technologies would make it possible to transfer real-time data from the physical world to the digital one. As a result, the gap between the real world and the virtual world would be greatly diminished. With the help of the Metaverse, IoT devices will be more connected.

With the utilization of Digital Twins, among other things, the Metaverse is expected to impact IoT significantly. In fact, with the ongoing Metaverse implementation, IoT technology will advance much more quickly.
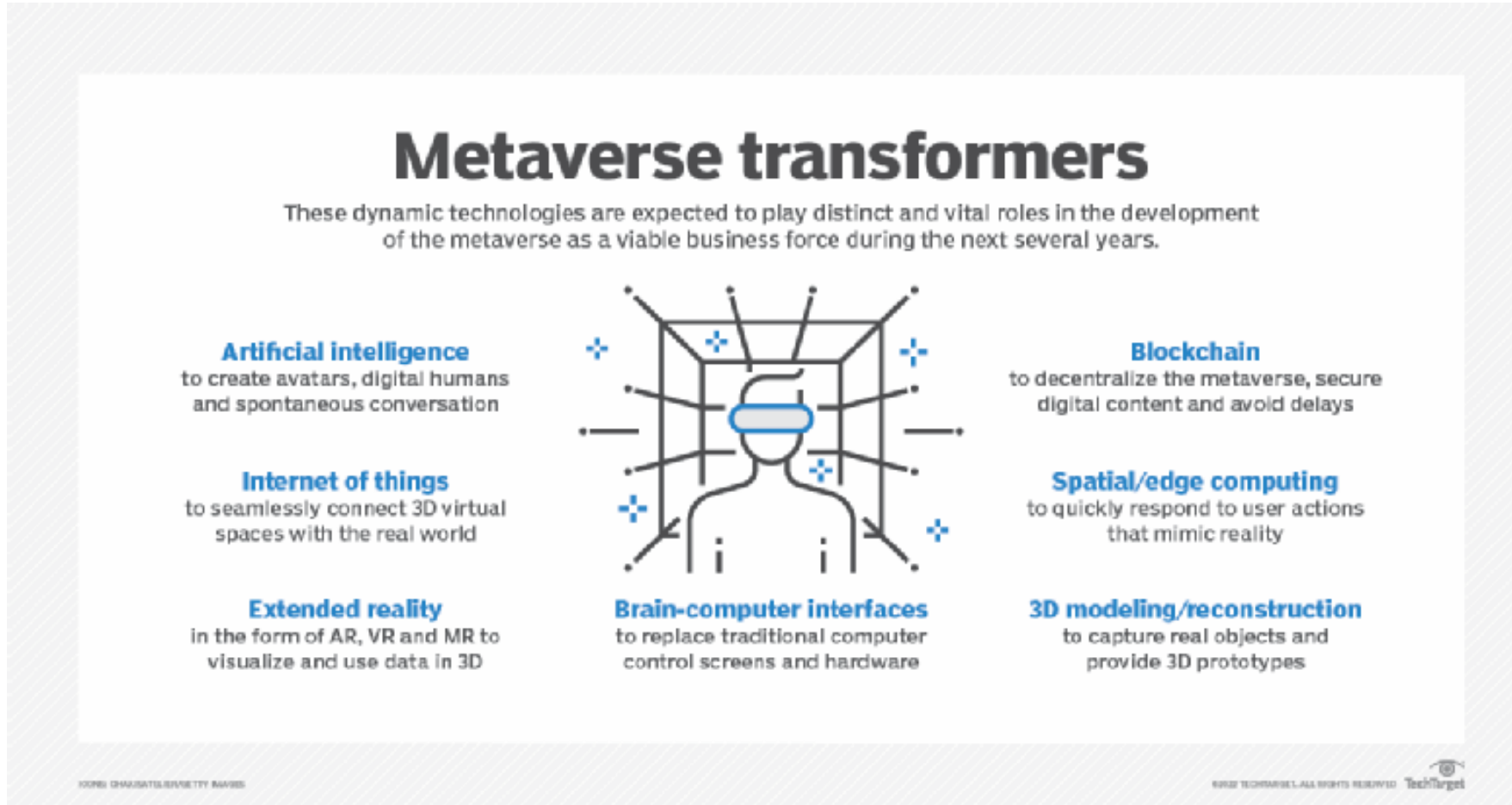
Market perspective

The market for metaverse is expected to grow significantly in the coming years, driven by the increasing adoption of 5G, IoT, etc. services and the need for more advanced and sophisticated applications that leverage the capabilities of the infrastructure. According to a report by MarketsandMarkets (May 2022), the global metaverse is expected to worth USD 61,8 Billion by 2027, growing ay a CAGR of 47,2% during the forecast period.

The adoption of 5G and IoT services is expected to be a major driver of this growth, as digital twins can be used to simulate and test new applications and services before they are deployed. This can help to reduce the time and cost of development and ensure that new services are optimized for performance and reliability. In addition, digital twins can be used to monitor and optimize the performance of infrastructure and processes in real-time, enabling operators to identify and resolve issues more quickly and effectively.

The market for metaverse is expected to grow across a range of industries, including manufacturing, healthcare, automotive, and aerospace, as organizations seek to leverage the power of 5G and IoT to drive innovation and growth.

Metaverse enablers

Metaverse transformers

These dynamic technologies are expected to play distinct and vital roles in the development of the metaverse as a viable business force during the next several years.

Artificial intelligence
to create avatars, digital humans and spontaneous conversation

Internet of things
to seamlessly connect 3D virtual spaces with the real world

Extended reality
in the form of AR, VR and MR to visualize and use data in 3D

Brain-computer interfaces
to replace traditional computer control screens and hardware

Blockchain
to decentralize the metaverse, secure digital content and avoid delays

Spatial/edge computing
to quickly respond to user actions that mimic reality

3D modeling/reconstruction
to capture real objects and provide 3D prototypes

Metaverticals

The idea behind realizing this vision is to treat IoT empowered verticals as the digital twins and metaverses of the physical ones, hence the newly introduced term Metaverticals.

The overarching innovation of the Metaverticals concept is to allow the materialisation of the symbiotic relationship between Verticals empowered by IoT and 5G/6G infrastructure, which will be achieved in a number of ways:

- facilitating the creation of a common framework for verticals deployment, instantiation and operations end-to end, agnostic of the type of the vertical.

- accelerating the introduction of metaverse technologies in 6G, which are expected to play a pivotal role in the future as every vertical is expected to have its digital counterpart, its Metavertical.

- allowing the digital counterparts as representatives of the physical verticals to become a commodity that can be ported and reused in other locations, thus creating a marketplace of Metaverticals.

- bridging the gap between Verticals and 5G/6G as it makes the network ready for Metaverticals and vice-versa.

- bridging the gap between network and vertical engineers as well, as it establishes a communication channel for co-creating applications and services.

A Metaveticals framework for the seamless instantiation of Verticals in E2E 5G and beyond facilities

This objective for the implementation of a Metaverticals framework reflects the verticals' perspective e.g. smart cities, health, automotive, manufacturing, agriculture, green shipping, etc. and their end-to-end technical, performance, societal and business requirements placed upon the underlying networks and infrastructures.

This gives rise to a new framework at the core of which lies the so-called Metaverticals as a Service (MVaaS).

MVaaS is a set of toolsets and mechanisms for deploying and operating Metaverticals while interactively communicating in real time with various set of sensors and knowledge bases.

The MVaaS provides a service for discovering and interconnecting Metaverticals with the requested resources of their physical verticals, as well as the underlying networks, end-to-end.

This involves the use of APIs and data models that enable the exchange of information among the Metaverticals, the network, and various data sources such as sensors, user equipment, and other applications.

The MVaaS also includes the necessary mechanisms for managing the lifecycle of Metaverticals, from their creation to their deletion, including their monitoring, scaling, and orchestration.

Overall, the framework should provide a scalable and flexible solution for supporting the deployment and operation of Metaverticals in a variety of verticals and will enable the seamless integration of Metaverticals with the underlying network and IoT by means of new APIs and data models.

Increase vertical awareness through seamless integration with networks, sensors and knowledge analysis

Metaverse technologies are offered through various platforms that allow one to build the environment to interact with.

Likewise, 5G/6G are not the only technologies that offer connectivity between Metaverticals and the various sources of data e.g. UEs, sensors etc.

They are rather part of a wider value chain, that involves IoT, Edge Cloud, Platforms etc. the integration of which needs to be considered.

The framework aims to enable the interconnectivity of different vertical domains for the purpose of creating a distributed application that allows the inter-Vertical communication in a federated environment. This will be a significant advancement beyond current use cases extending the reach to other geographical areas for service continuity.

This federation approach has enormous economic and social potential in various sectors, e.g. agriculture, where a collection of Metaverticals models and applications can control, monitor, and manage a multitude of greenhouses as a distributed application empowered by different network and IoT infrastructures.

A Metavertical Agriculture case

This Metavertical aims at developing a digital twin of trees which develops agronomic-based research, historically responding to the demands of growers, and with the major goal of sustainable production.

Currently, a significant concern at the global scale is the more efficient use of freshwater for irrigation in fruit trees. This is particularly relevant in areas of the Mediterranean basin, more susceptible to the effects of climate change. Monitoring the physiological state of a tree is typically time consuming, given that highly specialized personnel normally carry out these evaluations.

The technological innovation presents a promising alternative to promote sustainable fruticulture, combining plant physiology with computer science with the goal of mitigating the harmful effects of climate change, such as water scarcity. The technological advance will allow in the short/medium term the development of decision-based automated irrigation, through the process of data in real time.

From the perspective of research, this Metavertical will benefit agricultural research by the provision of invaluable information of tree performance under different irrigation scenarios, typically overlooked and understudied.

This is important for the transference of knowledge to small and large fruit growers, which will benefit from a more efficient use of nonrenewable resources such as water.

A Metavertical Smart City case

The Metavertical is dedicated to the development of Digital Twin (DT) Cities. It aims at deploying the framework for B5G-enabled live updates of DT of smart cities, based on many end-users interacting with the DT in real-time. In order to modify the DT model, the user may input metadata (text or other annotations), as well as when appropriate video, images and other sensors reading (e.g. their location, noise level, connectivity level etc.) to be uploaded towards the system hosting the DT in real-time.

Focusing on creating accurate, real-time, data-driven digital replicas of urban environments offers valuable insights and tools for city planning, infrastructure management, and environmental monitoring. The success of the Metavertical relies on its ability to stay up-to-date and accurately reflect changes within the urban landscape. To accomplish this, the framework is consistently updated and enriched with diverse data types, encompassing everything from alterations in the topology of the urban area to user-specific metadata, such as individual preferences and behaviors.

Federation of models in different cities will increase analysis capabilities based on consistent knowledge exchange thus effectively impacting sustainability planning

The vertical goes in line of fulfilling the European Union end goals towards a digital infrastructure where many people are interconnected at the same time, shaping the path towards digital city urban planning.

A Metavertical case in Green Maritime

Metavertical in green maritime refers to the application of a framework including digital twin technology complemented by the appropriate sensors and UEs in the maritime industry with a focus on sustainability and environmental impact.

In the context of green maritime, metaverticals can be used to optimize the efficiency of ships, reduce emissions, improve energy management, and enhance overall sustainability.

Here are some key applications of metaverticals in green maritime:

- Ship Design and Simulation
- Energy Management
- Predictive Maintenance
- Emission Reduction
- Training and Simulation

Models federation will enable comprehensive and timely knowledge exchange between vessels.

By leveraging real-time data, advanced analytics, and simulation capabilities, Meatverticals can drive innovation, optimize operations, and contribute to a greener and more sustainable maritime sector.

Way forward

The amount of digital content derived from real-world objects, such as structures, people, cars, clothing, etc., constantly expands in the Metaverse. As a result, businesses aim to replicate our physical world exactly in cyberspace. Companies can plan for many circumstances and improve their long-term goals with the aid of IoT and Metaverse.

Real-time data is crucial for accurate simulation of diverse scenarios and successful long-term planning. Industries like energy, transportation, healthcare, fashion, etc., may all greatly benefit from this. Above all, AI may play a big role in long-term planning.

The Metaverse's AR and VR technology usage will alter how we interact with IoT devices. Users won't even be able to tell if they are interacting in the actual or virtual environment. This will make the experience very realistic and contextualized. It will be made possible by IoT devices with extended reality capabilities. More immersive and interaction-based computing will be possible with the help of IoT with motion detection, AI-enabled edges, and tailored data-gathering sensors.

With the Metaverse and Web 3.0, it seems clear that the Internet's future will improve. Adding a Metaverse will also make IoT gadgets and programs far more innovative and immersive.

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Thank you