

## Expression of Interest

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### 1. Motivation

Tons of data are generated everyday in an industrial plant. This data is processed and analysed in order to perform real actions. However, this data is rarely used for simulations that can support design and engineering teams to take informed decisions, increasing the efficiency of their activities.

On the other hand, pandemics situation has highlighted the need of developing virtual work environments where workers can perform their activity from other locations rather than an industrial plant. Otherwise, lockdowns, curfews and contagions may totally block the economic activities of the industry, increasing even more the crisis derived from such an anormal situation.

Extended reality has demonstrated to be an useful way for collaboration, and even for onboarding employees, grouping together different teams sharing virtual 3D objects in a secured way.

According to the IIoT World<sup>1</sup>, "*The Industrial Metaverse is an emerging concept that leverages the power of data to create new opportunities for innovation, collaboration, and efficiency*".

### 2. Current Status

The current Metaverse applications are thought for the user but not for the verticals that may benefit from it. Emerging technologies may support the combination of physical and virtual worlds in an industrial cyberspace. Current Industrial Internet of Things approach, combined with virtual reality, is nowadays a one-direction road. Industrial Metaverse is expected to go one step further, not only nurturing digital twins with real-world sensor data, but giving feedback back to the object to improve performance and efficiency.

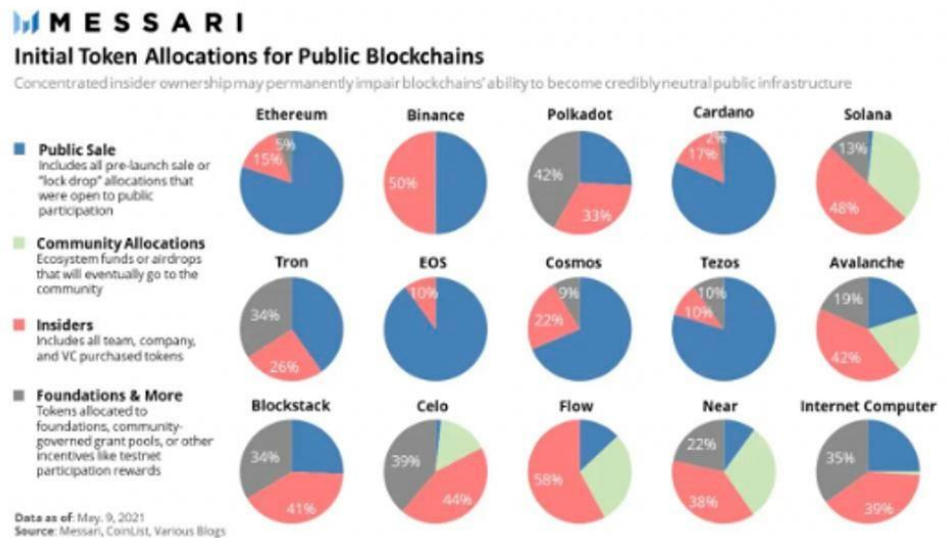
Current solutions, such as NVIDIA Omniverse<sup>2</sup>, offer the possibility of creating digital twins feed with real-time data acting as living mirrors of what is happening in a certain location what represents a great advantage for simulations. However, this kind of solutions are limited to the information provided by the user without having access to any other circulating on the Internet.

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<sup>1</sup> <https://www.iiot-world.com/industrial-iiot/connected-industry/the-industrial-metaverse-is-built-on-a-strong-data-fabric/>

<sup>2</sup> <https://www.nvidia.com/en-us/omniverse/>

On the other hand, Web3 is considered as the future of the World Wide Web, providing access to the Internet library in a decentralised and blockchain-based way. In Web3 users are connected to a decentralized network which provides them access to their own data.



However, there is still no connection between the Industrial Metaverse and Web3 even if both can benefit of trust or transparency features, or even concepts such as decentralised identity for protecting user data.

### 3. Research Challenges

This topic has several research challenges that need to be addressed:

- Digital twins for product design and engineering. Taking advantage of digital twin approach for virtually developing and testing new products what may remain in costs savings.
- Immersive training. For multi-users connected to the same room at the same time from different locations.
- Virtual (and remote work). Where users make use of virtual reality to e.g., control robotic arms without being present in the same room.
- Virtual reality/augmented reality using fungible tokens. Where blockchain means media technologies to enhance security.
- Holographic projections. For remote communications.
- Permissionless use. Where only valid transactions are allowed.
- Metaverse evolution. Considering that virtual reality is not only for fun, but a trusted environment where to perform different actions, like product design, remote work or training activities among others.
- Data management at the edge. Real data analytics at the edge to avoid latency, develop patterns and ensure real- or righ-time actions.

All these activities will take into account energy consumption and carbon footprint, while following data sovereignty rules.