



**Alliance for AI, IoT and Edge
Continuum Innovation**



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Intelligent Immersive Technologies

IoT and Edge Computing Integrated Sensing and Communication

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Edge IoT Industrial Immersive Technologies and Spatial Computing Continuum



Alliance for IoT
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Innovation

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Edge IoT Industrial Immersive Technologies

The Position paper provides the vision of the convergence of edge IoT, artificial intelligence (AI), digital twins (DT), immersive triplets (IMT), intelligent mesh connectivity, IoT of senses (IoTS), software-defined automation (SDA) and spatial computing technologies to create an industrial real-digital-virtual continuum.

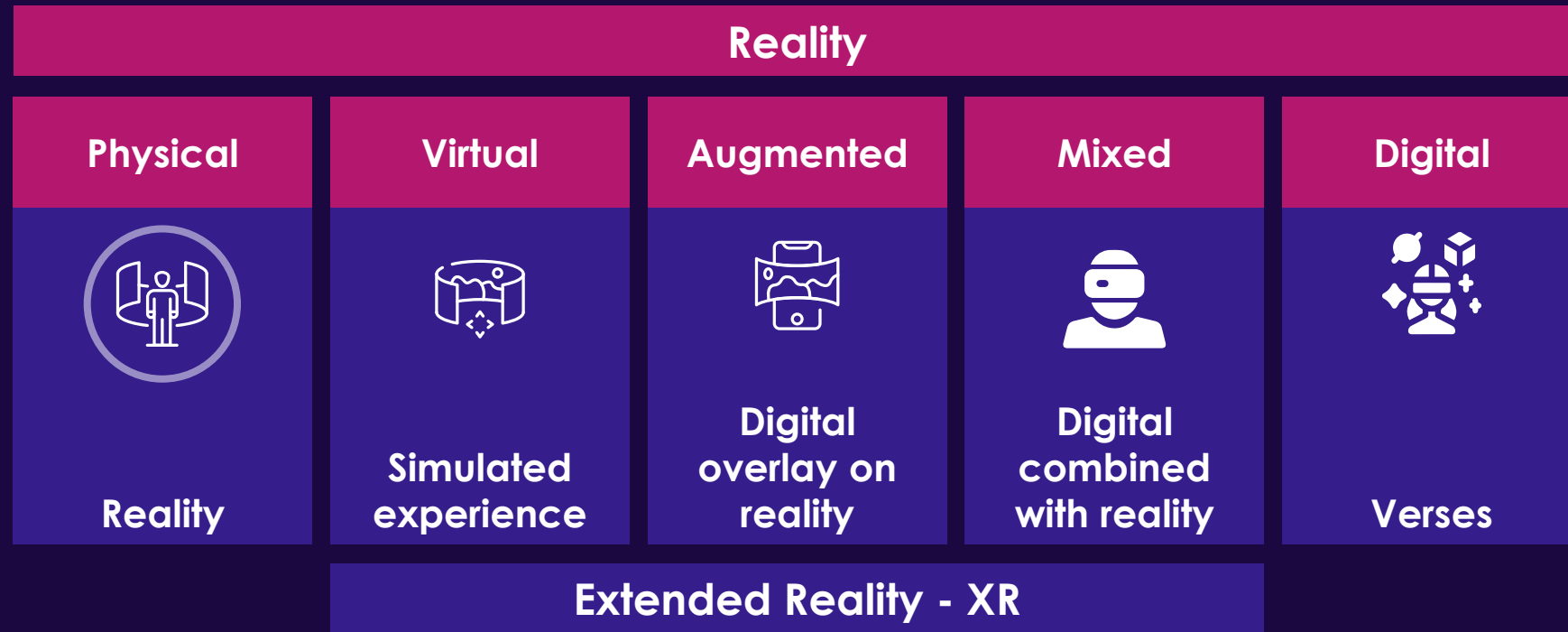
The continuum is made of immersive environments, which are computer-generated virtual worlds where users can sense as if they were physically embodied in that generated perception context.

The convergence of these technologies into industrial immersive solutions advances the integration and application of edge intelligent immersive technologies combining augmented reality (AR), virtual reality (VR), mixed reality (MR), and extended reality (XR) with concepts like metaverses, omniverse, multiverses, next generation spatial web, Web 4.0 as part of future virtual worlds.

<https://aioti.eu/wp-content/uploads/AIOTI-Paper-Edge-AI-IoT-Immersive-Technologies-Published.pdf>

Immersive Technologies

Immersive technologies create experiences by merging the physical world with a digital and virtual simulated reality.






Verses



VERSE

A vision of next iteration of the internet of machines and people. A shared, immersive, persistent, 3D virtual space where humans and machines experience life by extending the physical world.

	 Metaverse	 Multiverse	 Omniverse
Overview	<p>A universal network of 3D virtual worlds where unlimited numbers of users can work, play, shop, learn and explore.</p>	<p>The concept of multiple, separate universes existing in parallel. The term describes a collection of the digital world with limited interoperability.</p>	<p>The convergence of all worlds, all metaverses, and multiverses. Name used for an industrial metaverse commercial platform.</p>
Key Elements	<p>Provide a fully interconnected experience across different applications and platforms. Requires high level interoperability.</p>	<p>Users can move from one world to another in the multiverse, but the worlds share little or no data.</p>	<p>Model being developed to unify engineering and business experiences and workflows across applications.</p>

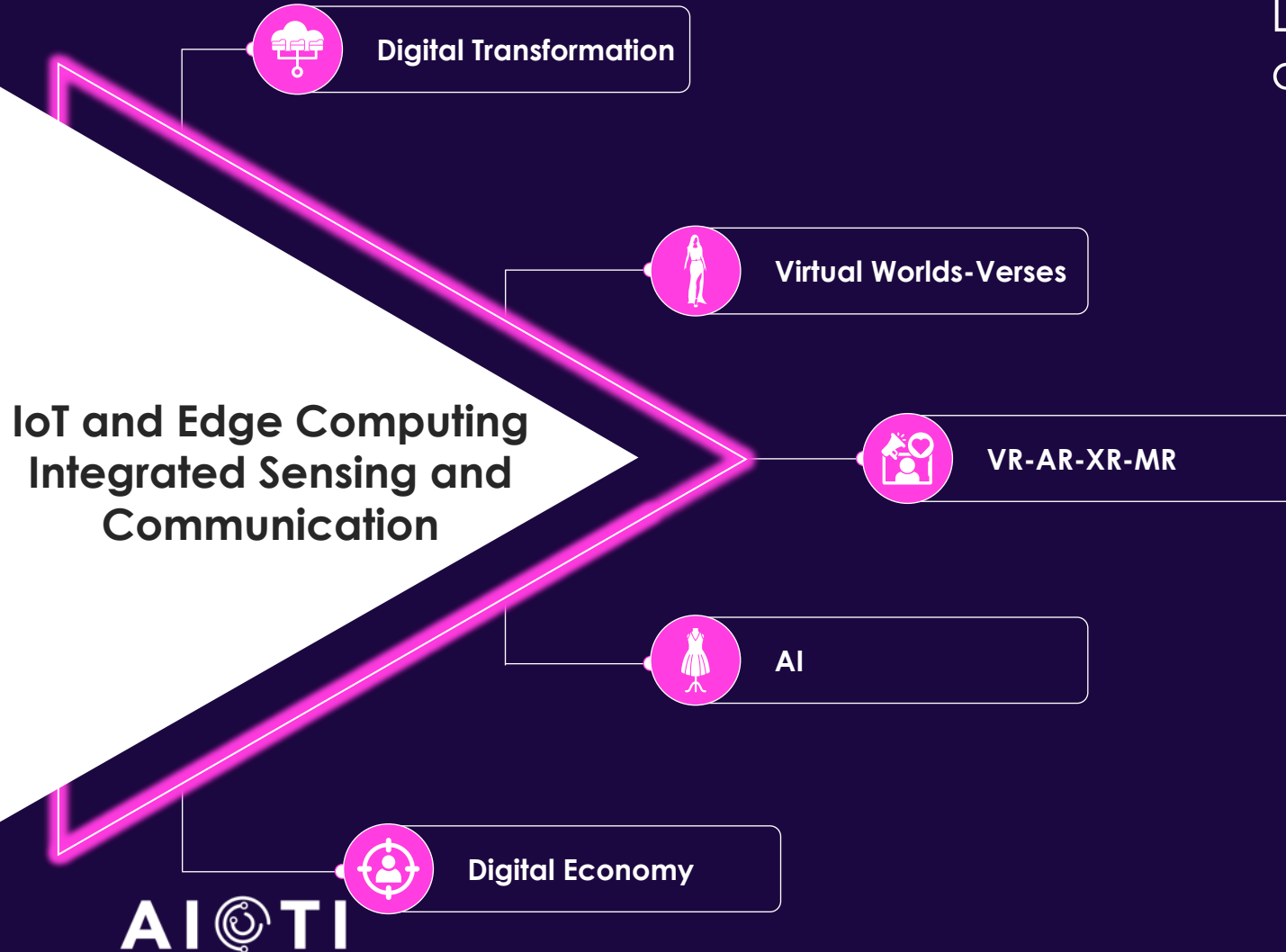
Integrated Sensing and Communication



- *Bridge the gap between physical and digital worlds.*
- *Immersive triplets/digital twins, the dynamic, virtual models that mirror real-world entities and environments, require high-speed intelligent communication and precise sensing.*
- *Dual capability - ensures the transmission of vast amounts of data at high speeds, while its sensing capabilities enable detailed capture and replication of physical world data.*
- *Impact the industrial sectors by enhancing virtual experiences, improving the efficiency of digital infrastructure, and contributing to the overall growth of the digital economy.*

Integrated Sensing and Communication

Leveraging immersive technologies developments for sustainable goals.



- Environmental Sustainability
- Energy Efficiency
- Enhancing Operational Efficiency
- Promoting Resilience and Adaptation
- Fostering Ethical AI Development
- Advancing Awareness and Education
- Carbon Footprint Reduction
- Responsible Consumption and Production

Challenges

Digital ecology

- *Green IT (greener digital technology)*
- *IT for Green (a use of digital technology that supports the ecological transition).*
- *Immersive technologies must achieve both.*
- *By Design: As immersive technologies are the convergence of edge IoT, artificial intelligence (AI), digital twins (DT), immersive triplets (IMT), intelligent mesh connectivity, IoT of senses (IoTS), software-defined automation (SDA) and spatial computing technologies.*
- *Immersive technologies have the capacity to expand knowledge for cross-border sustainable development that benefit the new ecosystem which facilitate the design of data and AI-driven policies to achieve the SDGs*

**Immersive Technologies Environmental Impact Variables:
Resource use, Data use, Waste generation.**



Challenges

- Digital technology, advancements and improvement, consumes energy, scarce resources (metals) and represents a considerable emission of waste.

Immersive technologies must address:

- High-quality, reality-defying immersive technologies require a global computing infrastructure that is 1,000 times more powerful.
- Truly immersive experience needs good graphics and more processing power, which means more power consumption.
- The renewal of electronic devices such as glasses or virtual reality bracelets.
- The digital waste.
- The intelligence sustainability – AI and generative AI environment impact.
- Video streaming sustainability - Half an hour of video streaming emits 1.6 kilograms of CO₂
- Internet accounts for almost 4% of global GHG emissions, and this percentage is expected to double this year.
- Web4.0 integrating all these immersive, AI, communication technologies into a virtual world, increase the volume of data collected, transferred, processed and stored.



Challenges



- *Sustainability traditional definition focuses on balancing economic growth, social equity, and environmental protection.*
- *Redefining the concept of sustainability in the Virtual Worlds and immersive technologies.*
- *In the virtual worlds and immersive applications, the concept of sustainability must include the use of resources, the management of data, AI models efficiency and performance, connectivity and computing infrastructure, and the impact of technology on society to create a more sustainable future.*
- *Sustainability can be achieved by incorporating green technology, promoting digital transformation and more secure and transparent methods of managing efficient data and transactions.*
- *Sustainable development - virtual vs. physical products and services.*



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Thank you!

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