

Current activities and future direction of Metaverse standardization

18 October 2022

Dr. Shin-Gak KANG

ITU-T SG16 Vice-Chairman, Co-Chair of Metaverse CG

ETRI, Republic of Korea

1 What is the Metaverse ?

The term "metaverse" **originated in the 1992** science fiction novel **Snow Crash** as a **portmanteau of "meta" and "universe."**

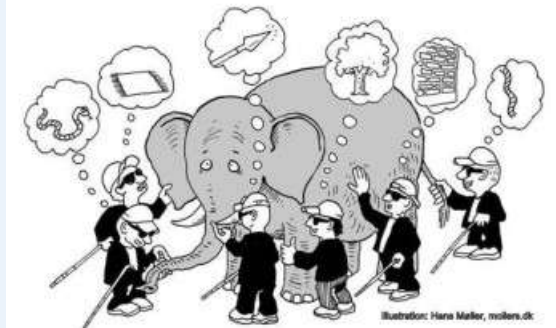
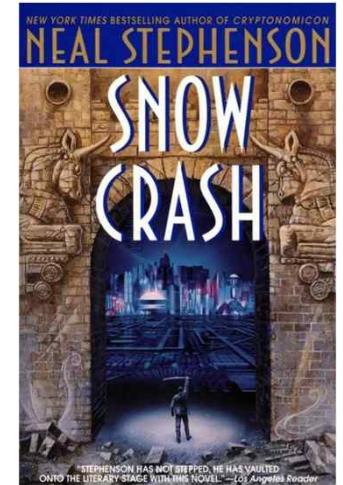
[ASF] “The **convergence of 1) virtually enhanced physical reality** and 2) **physically persistent virtual space.**” It is a fusion of both.

*ASF: Acceleration Studies Foundation, USA

[Facebook] “The ‘metaverse’ is a **set of virtual spaces** where you can create and explore with other people who aren’t in the same physical space as you.”

[New York Times] Metaverse is a massive, operable **Real-time rendering 3D virtual world networks**, which can bring synchronous and persistent experience for unlimited number of users, while it also has data continuity, include identity, history, rights, communication, payment, etc.

There’s **no universally accepted definition** of a real “metaverse.” The **term has grown** beyond Stephenson’s 1992 vision of an immersive 3D virtual world.



1 What is the Metaverse ?

Other extended view on the Metaverse in Korea

- ① In a **space** where the virtual and reality converge
- ② People or things **interact** with each other
- ③ **Creating** economic, social, and cultural **values**

1 What is the Metaverse ?

Some characteristics of the Metaverse

[by Matthew Ball]

- Persistent
- Synchronous and Live
- Without any cap to concurrent users, while also providing each user with an individual sense of “presence”
- Fully functioning economy - produces “value” that is recognized by others
- Experience that spans both the digital & physical worlds
- **Offer unprecedented interoperability of data, digital items/assets, content, etc.**
- Populated by “content” and “experiences” created and operated by an incredibly wide range of contributors

[by Mark Zuckerberg]

- Presence
- Avatars
- Home Space
- Teleporting
- **Interoperability**
- Privacy & Safety
- Virtual Goods
- Natural Interface

2

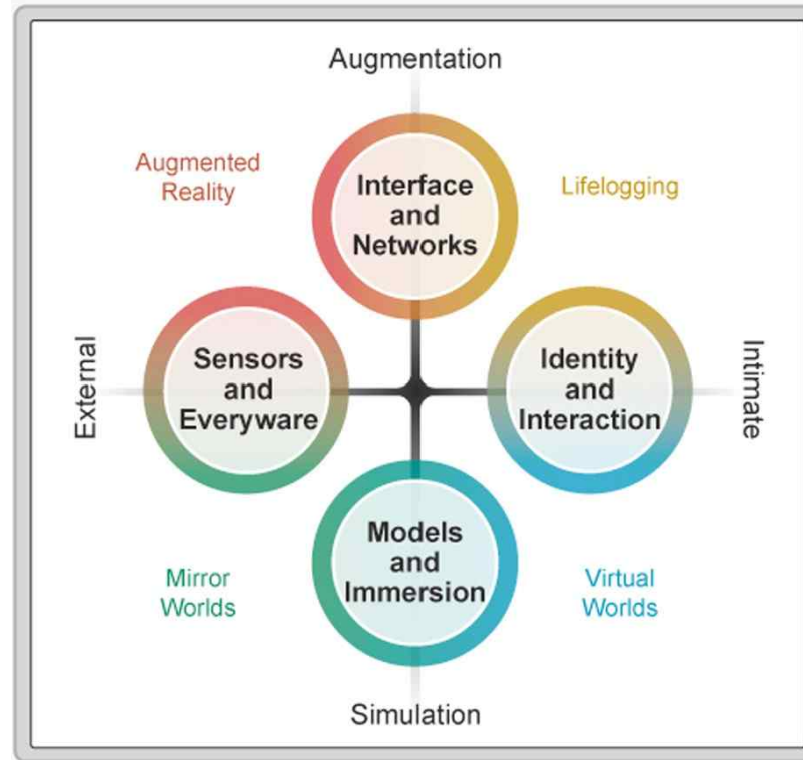
Metaverse Scenarios (by ASF Metaverse Roadmap)



Artist's idea of augmented reality heads-up display (HUD)



Google Earth home screen, North America



Evolving into a fusion form of each scenario.



Nike+ and iPod: Personal trainer, global running community



A panel discussion inside Second Life

3 Rising interest in Metaverse

“The Metaverse is coming!” in GTC Oct. 2020, by Jensen Huang (NVIDIA CEO)



“The Metaverse returns!”

Metaverse is not new, it is a trend that is rising again recently



Background for returning of Metaverse

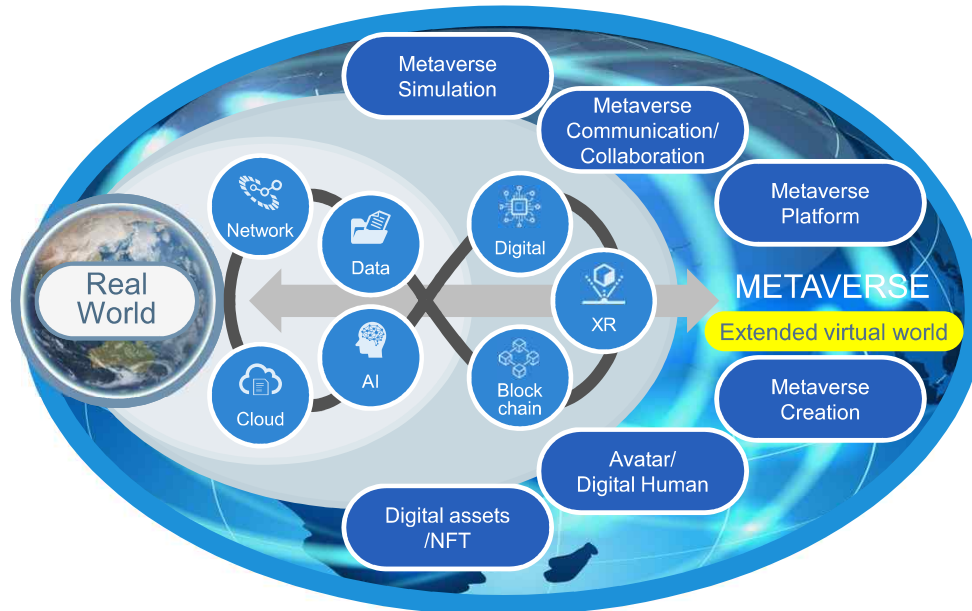
- 1 Innovative development of ICT
- 2 Rapid change to Untact Society
- 3 Digital Transformation across industries








Change of Facebook to Meta – Metaverse First!



4 Underlying Technology of Metaverse

Metaverse is implemented through **organic linkage of various ICT technologies** such as XR, AI, data, network, cloud, digital twin, blockchain, etc.



	XR (eXtended Reality)
	Artificial Intelligence
	Data
	Network
	Cloud
	Digital Twin
	Blockchain

5

Some standardization activities related to Metaverse

Promotion of standardization of **element technologies** for Metaverse platform **corresponding to their domains** for each standardization organization

- **ISO/IEC JTC 1/SC 29**: Media-oriented virtual-reality media interworking format, compression, etc.
- **ISO/IEC JTC 1/SC 24**: 3D Computer Graphics, Mixed Reality, Augmented Reality, etc.
- **IEEE 2888 WG**: Interface for Cyber and Physical World, Orchestration of Digital Synchronization between Cyber and Physical World, Holographic Visualization, etc.
- **IEEE 3079 WG**: HMD based VR Sickness Reducing, Mixed Reality for Motion Learning, etc.
- **Khronos Group**: Computer graphics acceleration technology, VR. AR. MR device interface, etc.
- **W3C – MICG**(Metaverse Interoperability Community Group): Bridge virtual worlds by designing and promoting protocols for identity, social graphs, inventory, etc.
- **OpenHMD project**: provide a Free and Open Source API and drivers for immersive tech., such as HMDs
- **Open Metaverse Operating System**: providing a common and open source OS for the Metaverse
- **METaverse STANDARDS FORUM**: A Venue for cooperation between Standards Organizations and Companies to foster the development of interoperability standards for an Open and Inclusive Metaverse
- **ITU-T SG 16**: Multimedia, Digital human, Immersive systems and Services, Blockchain, AI, etc.

5

Some standardization activities related to Metaverse

JTC 1/SC 24 (Computer graphics, image processing and environmental data representation)

- ISO/IEC TS 23884:2021, Material property and parameter representation for model-based Haptic simulation of objects in Virtual, Mixed and Augmented Reality (VR/MAR)
- ISO/IEC 23488:2022, Object/Environmental representation for image-based rendering in Virtual/Mixed and Augmented Reality (VR/MAR)
- ISO/IEC 18520:2019, Benchmarking of vision-based spatial registration and tracking methods for Mixed and Augmented Reality (MAR)

JTC 1/SC 29 (Coding of audio, picture, multimedia and hypermedia information)

- ISO/IEC 23005-1:2020, MPEC-V — PART 1: ARCHITECTURE
- ISO/IEC 23005-2:2018, MPEC-V — PART 2: CONTROL INFORMATION
- ISO/IEC 23005-3:2019, MPEC-V — PART 3: SENSORY INFORMATION
- ISO/IEC 23005-4:2018, MPEC-V — PART 4: VIRTUAL WORLD OBJECT CHARACTERISTICS
- ISO/IEC 23005-5:2019, MPEC-V — PART 5: DATA FORMATS FOR INTERACTION DEVICES
- ISO/IEC 23005-6:2019, MPEC-V — PART 6: COMMON TYPES AND TOOLS
- ISO/IEC 23005-7:2019, MPEC-V — PART 7: CONFORMANCE AND REFERENCE SOFTWARE

5

Some standardization activities related to Metaverse

JTC 1/SC 29 (Coding of audio, picture, multimedia and hypermedia information)

- ISO/IEC 23090-5:2021, Coded representation of Immersive Media — Part 5: VISUAL VOLUMETRIC VIDEO-BASED CODING (V3C) AND VIDEO-BASED POINT CLOUD COMPRESSION (V-PCC)
- ISO/IEC FDIS 23090-9, Coded representation of Immersive Media — PART 9: GEOMETRY-BASED POINT CLOUD COMPRESSION [under development]
- ISO/IEC FDIS 23090-12, Coded representation of Immersive Media — PART 12: MPEG Immersive Video [under development]
- ISO/IEC 23093-1: Internet of Media Things (IoMT) — Architecture
- ISO/IEC 23093-2: Internet of Media Things (IoMT) — Discovery and Communication API
- ISO/IEC 23093-3: Internet of Media Things (IoMT) — Media data formats
- ISO/IEC 23093-4: Internet of Media Things (IoMT) — Reference Software and Conformance

ISO TC 172/SC 9 (Laser and electro-optical systems)

- ISO 17901-1, Holography, Part 1: Methods of measuring diffraction efficiency and associated optical characteristics of holograms
- ISO 17901-2, Holography, Part 2: Methods for measurement of hologram recording characteristics

5

Some standardization activities related to Metaverse

ISO TC 133 (Clothing sizing systems - size designation, size measurement methods and digital fittings), WG 2(Digital Fitting)

- ISO 18825-1:2016, Clothing -- Digital fittings -- Part 1: Vocabulary and terminology used for the **virtual human body**
- ISO 18825-2:2016, Clothing -- Digital fittings -- Part 2: Vocabulary and terminology used for attributes of the **virtual human body**
- ISO 20947-1:2021, Performance evaluation protocol for digital fitting systems -- Part 1: Accuracy of **virtual human body** representation

IEC TC 110/WG 6 (3D Display Devices)

- IEC TR 62629-41-1 ED1, 3D display devices - Part41-1: Generic introduction of holographic display

5

Some standardization activities related to Metaverse

IEEE 2888 Working Group (Interfacing Cyber and Physical World)

- IEEE 2888.1: Specification of Sensor Interface for Cyber and Physical World
- IEEE 2888.2: Standard for Actuator Interface for Cyber and Physical World
- IEEE 2888.3: Orchestration of Digital Synchronization between Cyber and Physical World
- IEEE 2888.4: Architecture for Virtual Reality Disaster Response Training System with Six degrees of Freedom (6 DoF)
- IEEE 2888.5: Evaluation Method of Virtual Training System
- IEEE 2888.6: Holographic Visualization for interfacing Cyber and Physical Worlds

IEEE 3079 Working Group (Human Factor for Immersive Content)

- IEEE 3079: HMD based VR Sickness Reducing Technology
- IEEE 3079.1: Motion to Photon (MTP) Latency in Virtual Environments
- IEEE 3079.2: Mixed Reality Standard Framework for Motion Learning

5

Some standardization activities related to Metaverse

Khronos Group

- **glTF™** is a royalty-free specification for the **efficient transmission and loading of 3D scenes and models** by engines and applications. The current version of glTF is 2.0.
- **OpenXR** is a royalty-free, open standard that provides **high-performance access to Augmented Reality (AR) and Virtual Reality (VR)**, collectively known as XR, platforms and devices.

World Wide Web Consortium (W3C) - MICG (Metaverse Interoperability Community Group)

- established in **April 2021** to bridge virtual worlds by designing and promoting protocols for identity, social graphs, inventory, and more.
- to bolster the metaverse as an **open and interoperable resource for anyone**, inspired by the collaborative efforts of the community
- interest in the Identity, Virtual world URIs, **Avatar portability**, and **Digital asset portability**, etc.

5

Some standardization activities related to Metaverse

3GPP

- 5G/6G standards have been evolving to support XR and multimedia services with immersive user experiences
- Local Metaverse Study Item has been approved in Feb. 2022. in 3GPP SA1(Services WG)
- The need for and implications of providing **locally relevant interactive XR media and services efficiently**
- Providing **timely** media to multiple users with sufficiently **low latency and synchronization** to enable services based on **rapid interaction with virtual objects**
- 30 companies supported metaverse study item including Samsung (Rapporteur), LG Uplus, Tencent, KDDI, KT, AT&T, SKT, Verizon UK Ltd., Ericsson, intel, China Mobile, Huawei, Qualcomm, Sony, ETRI, etc.

ITU-T SG 16 (Multimedia and related digital technologies)

- ITU-T F.748.15 "Framework and metrics for **digital human** application system"
- ITU-T F.748.14 "Requirements and evaluation methods of non-interactive 2D real-person **digital human** application system"

6

METAVVERSE STANDARDS FORUM

Metaverse Standards Forum launched in June 2022



Fostering interoperability standards for an open metaverse

The Vision

A Venue for Cooperation between Standards Organizations and Companies to Foster the Development of Interoperability Standards for an Open and Inclusive Metaverse

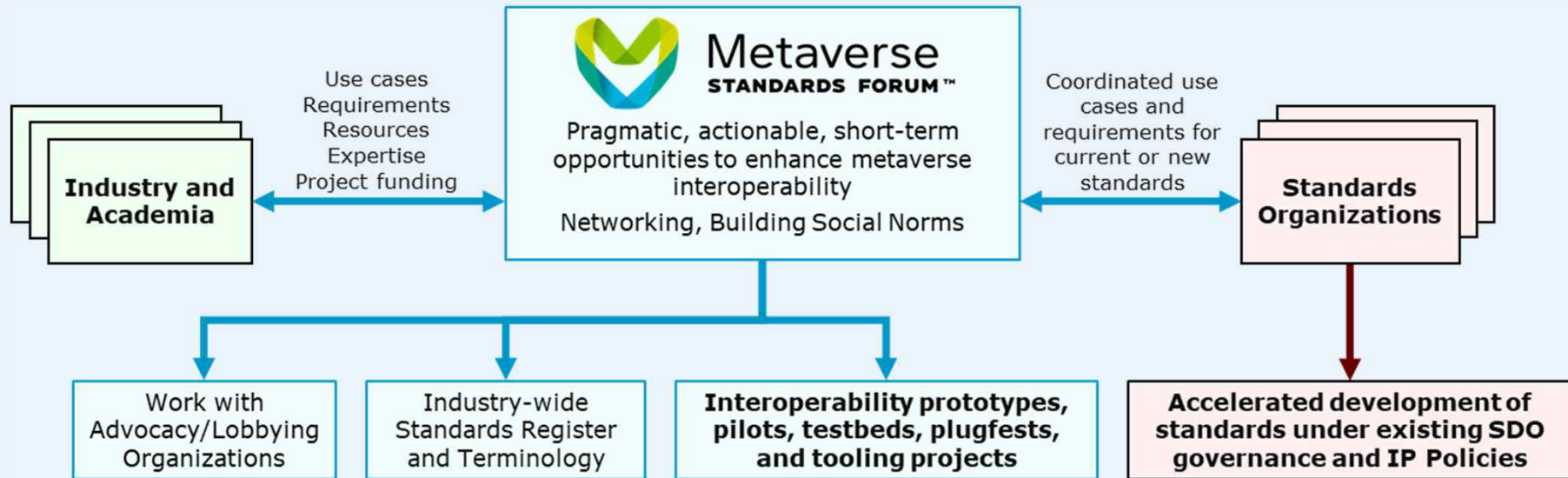
Mission

Identify TODAY'S interoperability pain points and coordinate pragmatic action to help solve them through standardization

6

METAVERSE STANDARDS FORUM

- Industry-wide forum to coordinate and encourage metaverse interoperability
- Open to all, no participation fee, no NDA, no IP framework
- Coordinated cooperation between industry and Standards Developing Organizations (SDOs)



6

METaverse STANDARDS FORUM

Forum Standards Organization Members

- Standards and Advocacy Organizations can leverage Forum for networking, visibility and cooperation to accelerate their own mission

 ASWF ACADEMY SOFTWARE FOUNDATION VFX and Animation 	 CALCONNECT Scheduling	 CES Consumer Technology Association Consumer	 enosema Concept Management	 EXE EXPRESS Language Foundation Information Models	 IEEE Advancing Technology for Humanity XR and Networking
 KHRONOS GROUP Run time APIs and file formats 	 OMG Object Management Group Business	 Open Geospatial Consortium Geospatial Standards 	 AR CLOUD Connecting physical and digital worlds	 OMIgroup Open Metaverse	
 SPATIAL WEB FOUNDATION IOT and Digital Twins IEEE P2874	 Volumetric Format Association Volumetric Video	 VORM CONSORTIUM Avatars	 web3D CONSORTIUM X3D	 W3C Web Standards 	 XRSI XRSI Privacy and Safety Framework

7

ITU-T SG 16 activities on Metaverse

Various technical aspects of ITU-T SG 16 (Multimedia and related digital technologies)

Technical issues	Relevant internal groups
Multimedia	Q1(Coordination), Q11(MM Systems, Terminals), Q13(Content delivery, MM application platforms), Q21(MM framework, applications and services), Q27(Vehicular MM communications, systems)
Audio and Visual coding	Q6 (Visual, audio and signal coding)
Artificial intelligence	Q5 (Artificial intelligence-enabled multimedia applications) Q12 (Intelligent visual systems and services)
Immersive live experience	Q8 (Immersive live experience systems and services)
DLT (Blockchain)	Q22 (Multimedia aspects of distributed ledger technologies and e-services)
Accessibility	Q26 (Accessibility to multimedia systems and services)
Human factor	Q24 (Human factors for intelligent user interfaces and services)
Digital Culture	Q23 (Digital culture-related systems and services)
Digital Health	Q28 (Multimedia framework for digital health applications)

7

ITU-T SG 16 activities on Metaverse

ITU-T SG 16 CG-Metaverse

*CG: Correspondence Group

- **Established at the ITU-T SG16 meeting in January 2022**
- **Co-Chairman : Shin-Gak KANG (ETRI/Korea)
Kepeng LI (Tencent/China)**
- **ToR of CG-Metaverse**
 - carry out the preliminary standardization analysis to help SG16 effectively make decision on appropriate standardization issues and work method in the next SG16 meeting
 - to discuss technical aspects leading to a SG16 analysis of future standardization directions, potential work items and future coordination needs
 - report the results of the CG activities two weeks before to the next SG16 meeting in 2022 for further SG16 discussion on the direction and work method of metaverse standardization work
 - active until the next SG16 meeting in September/October 2022, and whether to extend CG activities will be decided at the next SG16 meeting

7

ITU-T SG 16 activities on Metaverse

ITU-T SG 16 CG-Metaverse

➤ CG meetings

- First e-meeting : 06 July 2022
- Second e-meeting : 10 August 2022
- Third e-meeting : 8 September 2022

➤ Major issues and some achievements during the CG activity

- Collects various Use cases, technical issues for standardization
- Discuss New work item proposal for supporting Metaverse interoperability
- General consensus on the creation of a new Focus Group on Metaverse
- Different opinions on the scope of the FG : SG 16 oriented FG (Multimedia & AI) vs. FG with wide scope
- Different opinions on the Governance of the FG : under SG 16 vs. under TSAG
- Discuss and prepare a draft ToR for FG-Metaverse through email discussion, if possible

➤ SG 16 will discuss further Metaverse ToR based on the results of CG-Metaverse activities

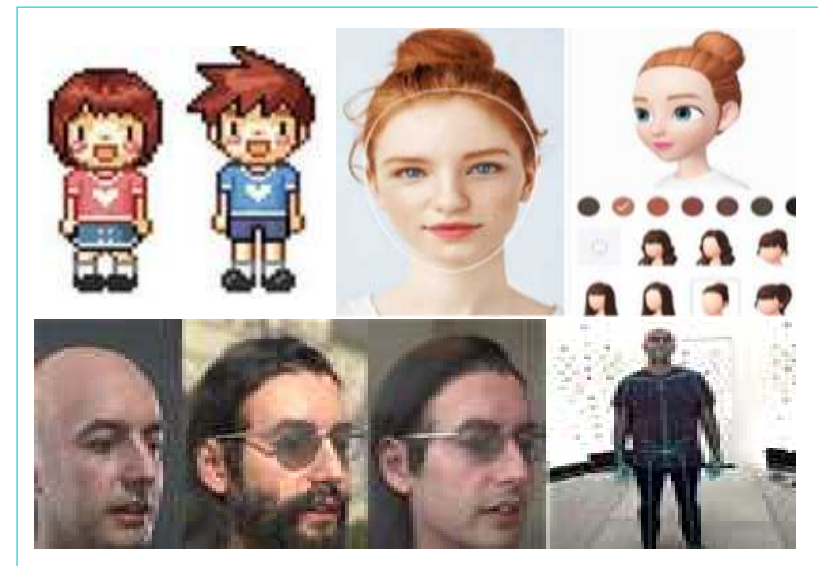
➤ It's expected to be further discussed and decided at TSAG meeting in December 2022

8 The Evolutionary Directions of Metaverse

① Metaverse that maximizes immersion through immersive technology



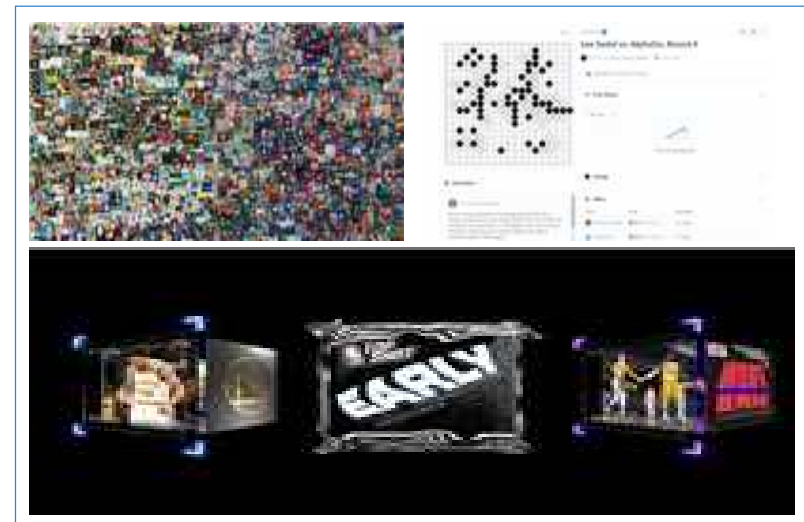
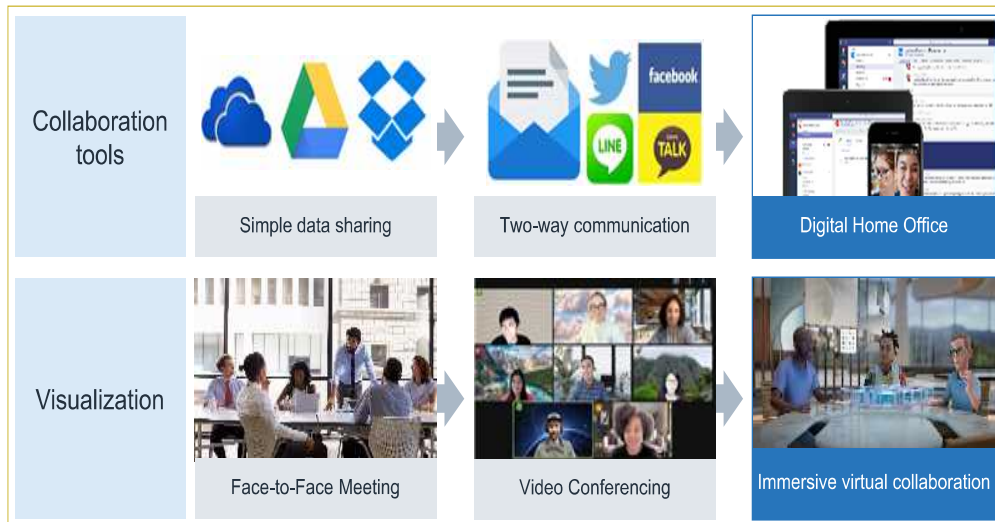
② Metaverse that expands the experience of reality through avatars & digital human



8 The Evolutionary Directions of Metaverse

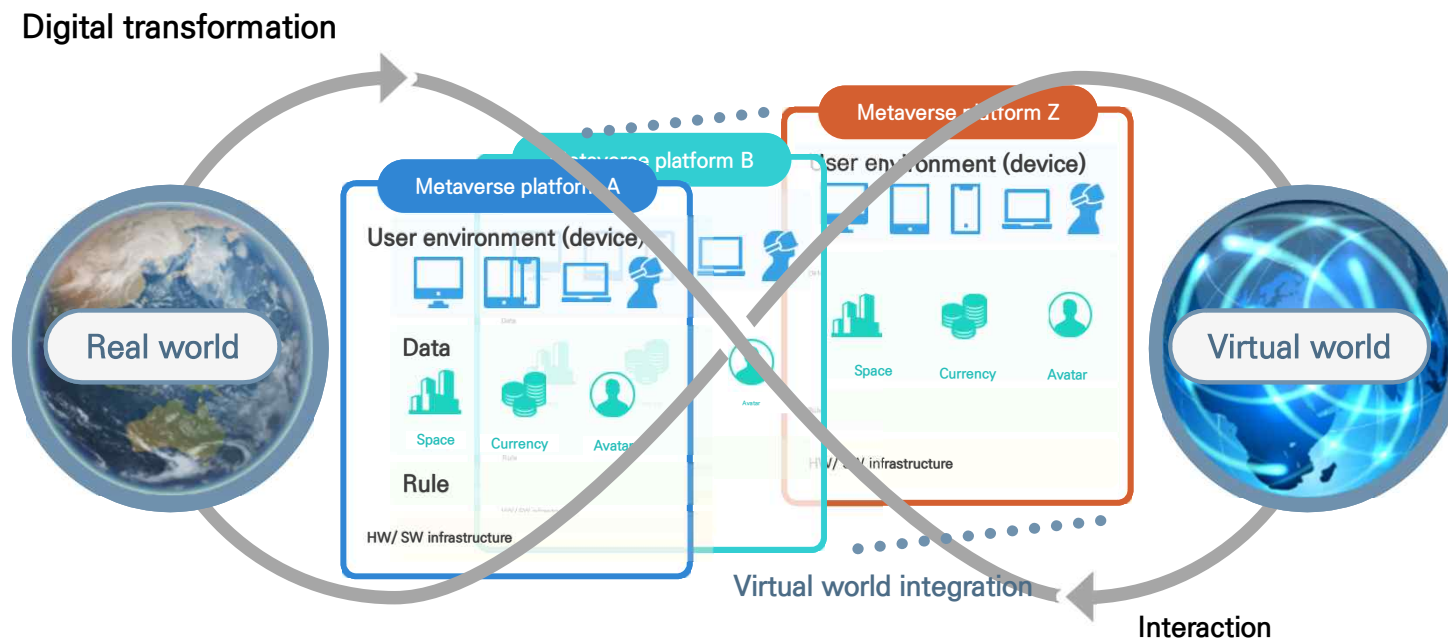
③ Metaverse that enables collaboration and communication beyond time and space constraints

④ Metaverse where digital assets are produced and distributed



8 The Evolutionary Directions of Metaverse

- ⑤ Metaverse that allows full interoperability between platforms



9

Direction of Metaverse Standardization

By Jon Radoff ('22.01.)

Most of current metaverse platforms are **closed (walled garden) type** and it **limits the expansion of the Metaverse ecosystem** through the connection of platforms

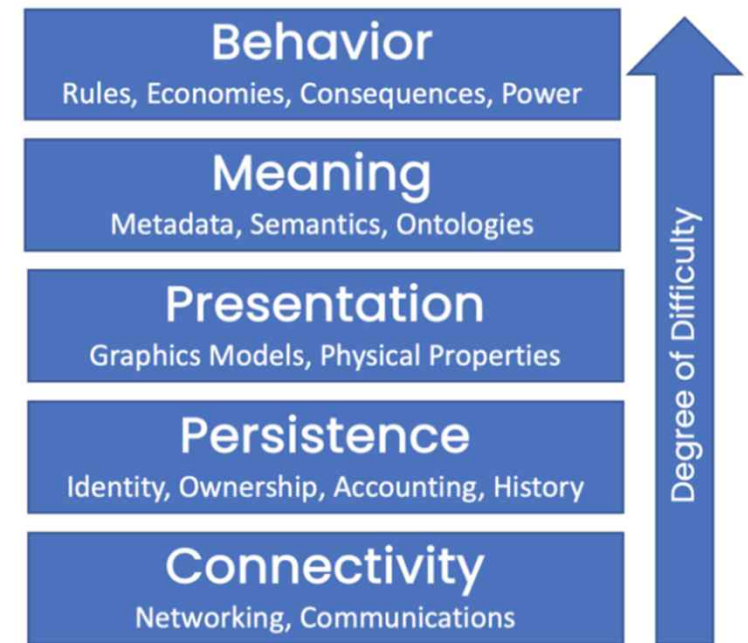
Building an open metaverse can expand the Metaverse industry and lower the entry barriers for latecomers

- **Open Metaverse** - All data and functions are distributed and interoperable between metaverse platforms



Towards a Multi-verse era in which Metaverse platforms are interconnected, and **grow together through standardization** of related technologies

Domains of Interoperability in the Metaverse



Different level of Interoperability

Thank you