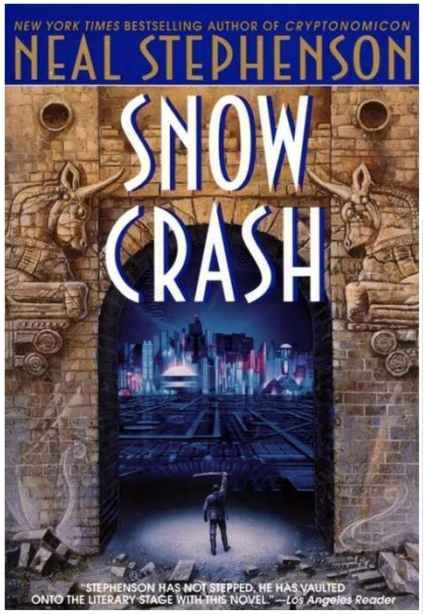

ICOIN 2024
The 38th International Conference on Information Networking (ICOIN 2024)
JAN.17 WED. - 19 FRI. 2024, Ho Chi Minh City, Vietnam & Virtual Conference
Keynote:
Opportunities, Challenges, and Standardization on Metaverse
2024.01.17.
Shin-Gak KANG
Assistant Vice President, ETRI (Electronics and Telecommunications Research Institute)
Chairman, ITU Focus Group on metaverse (FG-MV)

Biography

- 1984.03. ~ Present : Assistant Vice President of ETRI, Electronics and Telecommunications Research Institute in Republic of Korea
  - Head of the Standards and Opensource Research Division of ETRI
- 2022.12. ~ Present : Chairman of ITU Focus Group on metaverse (FG-MV)
- 2022.03. ~ Present : Vice-Chairman of ITU-T SG16(Multimedia and related digital technologies)
  - Chairman of WP1/16 on Infrastructure for multimedia systems
- 2022.07. ~ Present : Korea Metaverse Alliance, Technical Standards Committee Member
- 2019.05. ~ Present : MSIT, ICT International Standardization Maestro
- 2004.11. ~ Present : ISO/IEC JTC1/SC6/WG7(Future Network) Convenor
- 2013.01. ~ 2022.02. ITU-T SG11(Network Signaling) Vice-Chairman
  - Chairman of WP3/11(2013~2016), WP2/11(2017~2022) on control protocols on IMT-2020
- 2022.01. ~ 2023.07. : ITU-T SG16 CG-Metaverse Convenor
- Present : TTA Coordination Committee Chairman
- Present : TTA Technical Assembly Vice-Chairman

What is the Metaverse ?

- The term "metaverse" **originated in the 1992** science fiction novel Snow Crash as a portmanteau of "meta" and "universe."
  - the metaverse is described as a **parallel virtual world** that people could **enter through an avatar** representing the digital identity of a human's physical self



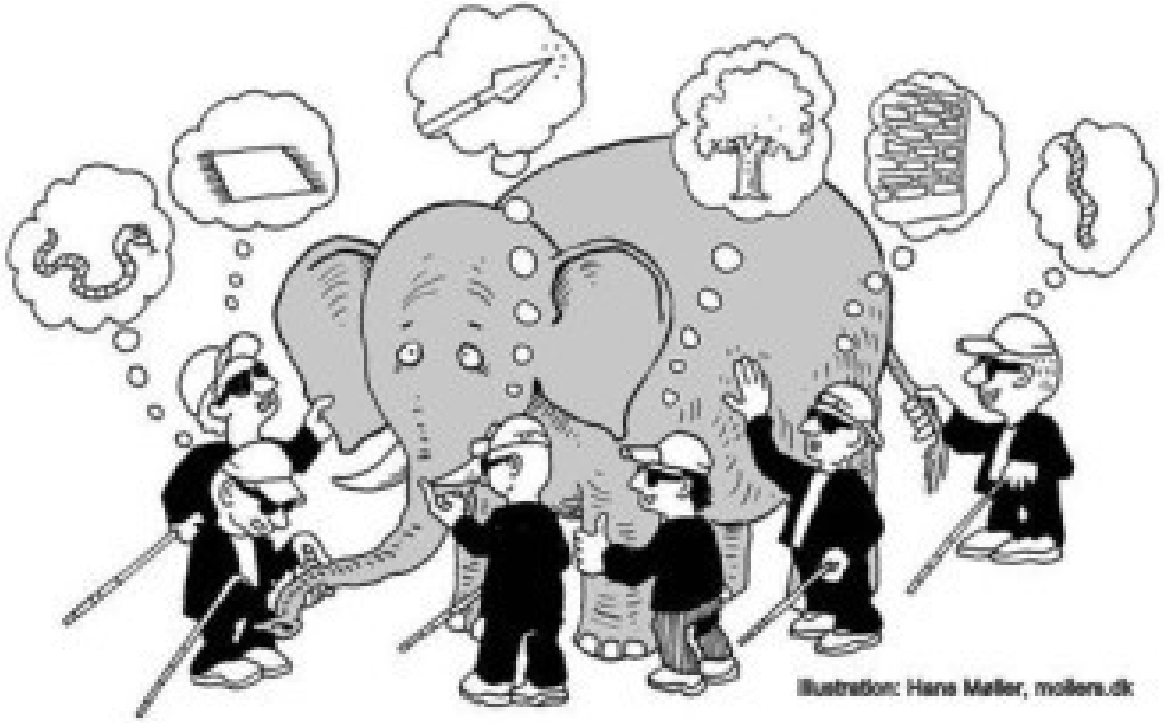
- **Ready Player One**
  - 2018 American science fiction action film, directed by Steven Spielberg
  - much of humanity uses the OASIS, a virtual reality simulation, to escape the real world * OASIS (Ontologically Anthropocentric Sensory Immersive Simulation)
    - ✓ Enter into the virtual world through an avatar
    - ✓ Using immersive and haptic devices
    - ✓ Closely related to the real world

What is the Metaverse ?

- [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.
- Other extended view on the Metaverse [in Korea’s Pan-Governmental Strategy on Metaverse]
  - In a **space** where the virtual and reality converge
  - **People** or **things interact** with each other
  - **Creating** economic, social, and cultural **values**

What is the Metaverse ?

- There's **no universally accepted definition** of a real "metaverse" *until recently*
  - Many SDOs have been working on definition



Rising interest in the 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

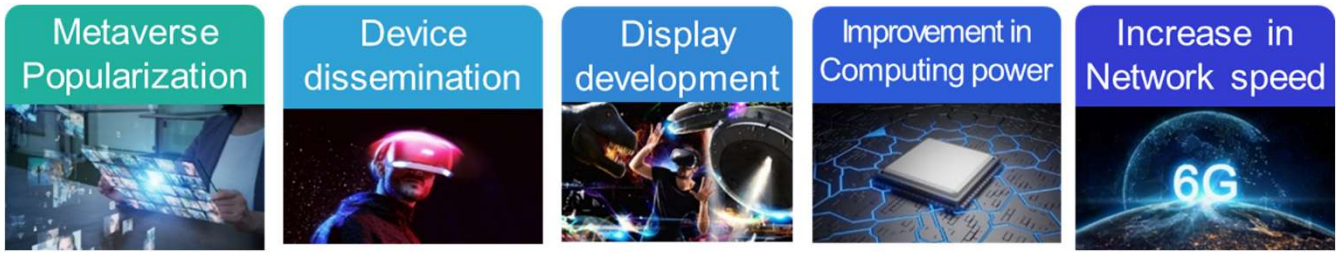
Change of Facebook to Meta
– Metaverse First!

Some factors of rising of the Metaverse

[from Korea's Pan-Governmental Strategy on Metaverse]

Technical Factor

- ✓ Development of digital technology
- ✓ Expectations for new platforms

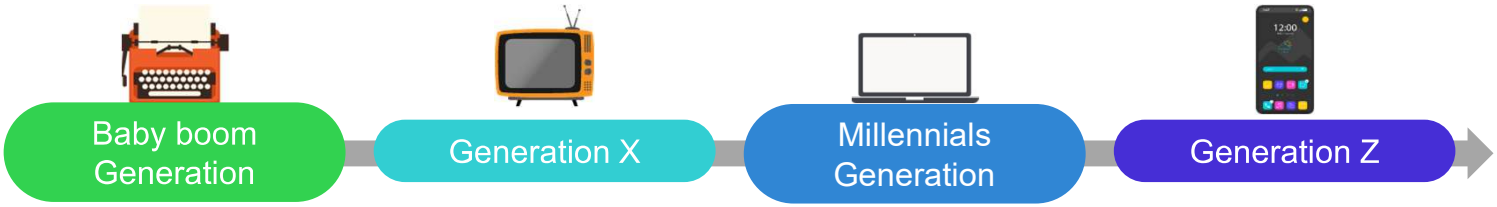


Industrial Factor

- ✓ Rise of the need for a **new business model**
  - Global Metaverse Market Size Forecast
  - Blockchain/NFT Market Size
  - New virtual economy and its ecosystem

Social Factor

- ✓ Proliferation of non-contact communication
- ✓ The emergence of the **digital native generation**

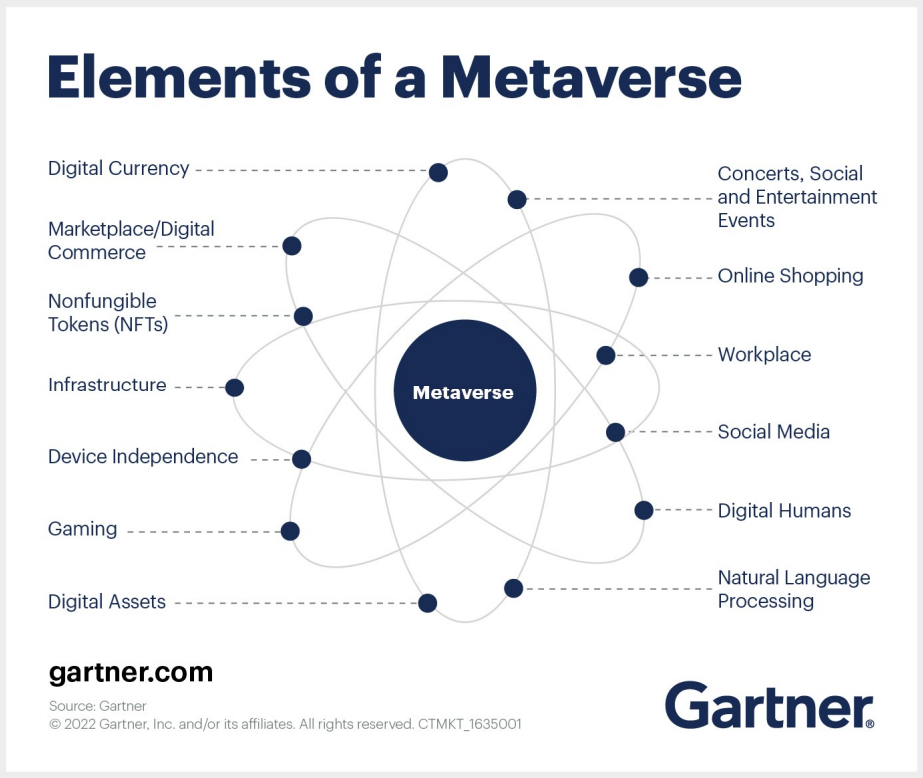


Some characteristics of the Metaverse

- 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

Elements and Underlying Technology of Metaverse

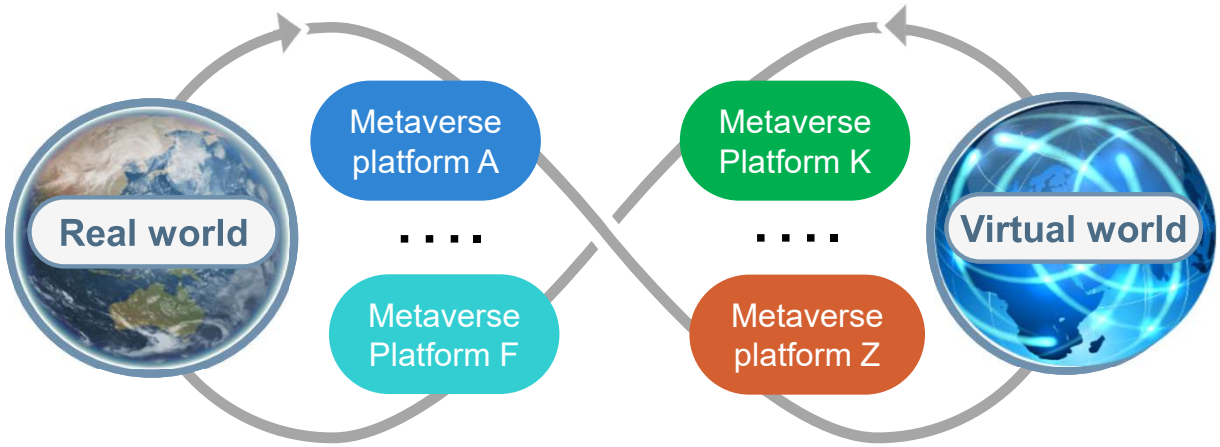


Metaverse is implemented through organic linkage of various ICT technologies such as XR, AI, Data, Network, Cloud, Digital twin, Blockchain, etc.

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

Evolving of the Metaverse

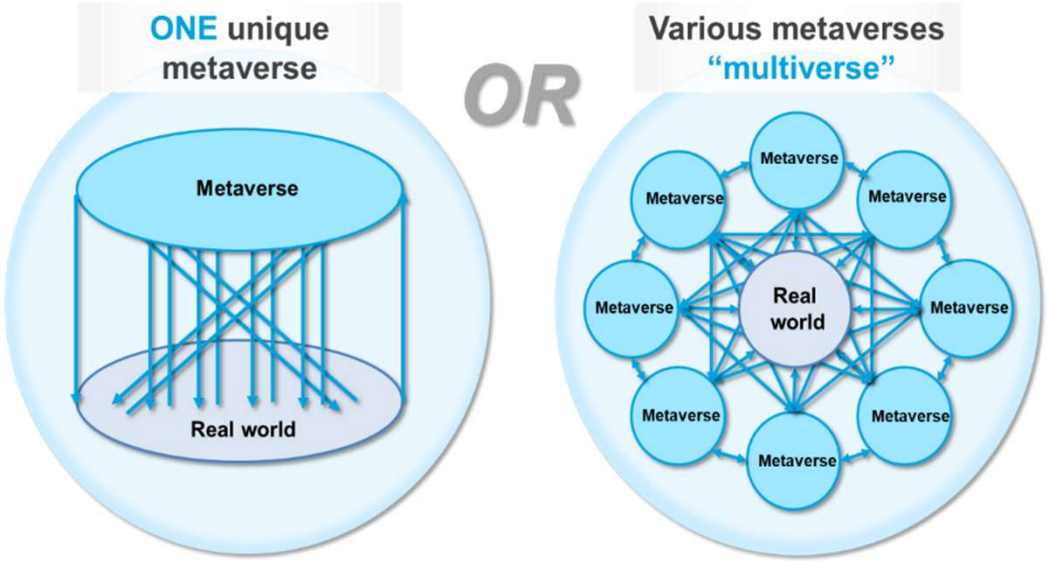
- The concept of metaverse continues to evolve with technology development and the advent of new services
- Today's metaverse is expanding as a concept in which the **boundaries between reality and virtual reality is blurred** and the **virtual world experience interlinks** into economic, social, and cultural activities in **the real world**



Concept of the Metaverse

- **A Metaverse**
  - is a universal digital platform
  - a collective space or a unified platform

- **Multi-verse (Metaverses)**
  - often interconnected metaverses interact simultaneously
  - has several integrated digital platforms and ecosystems that interact
  - a collective space, with interoperability as a key feature

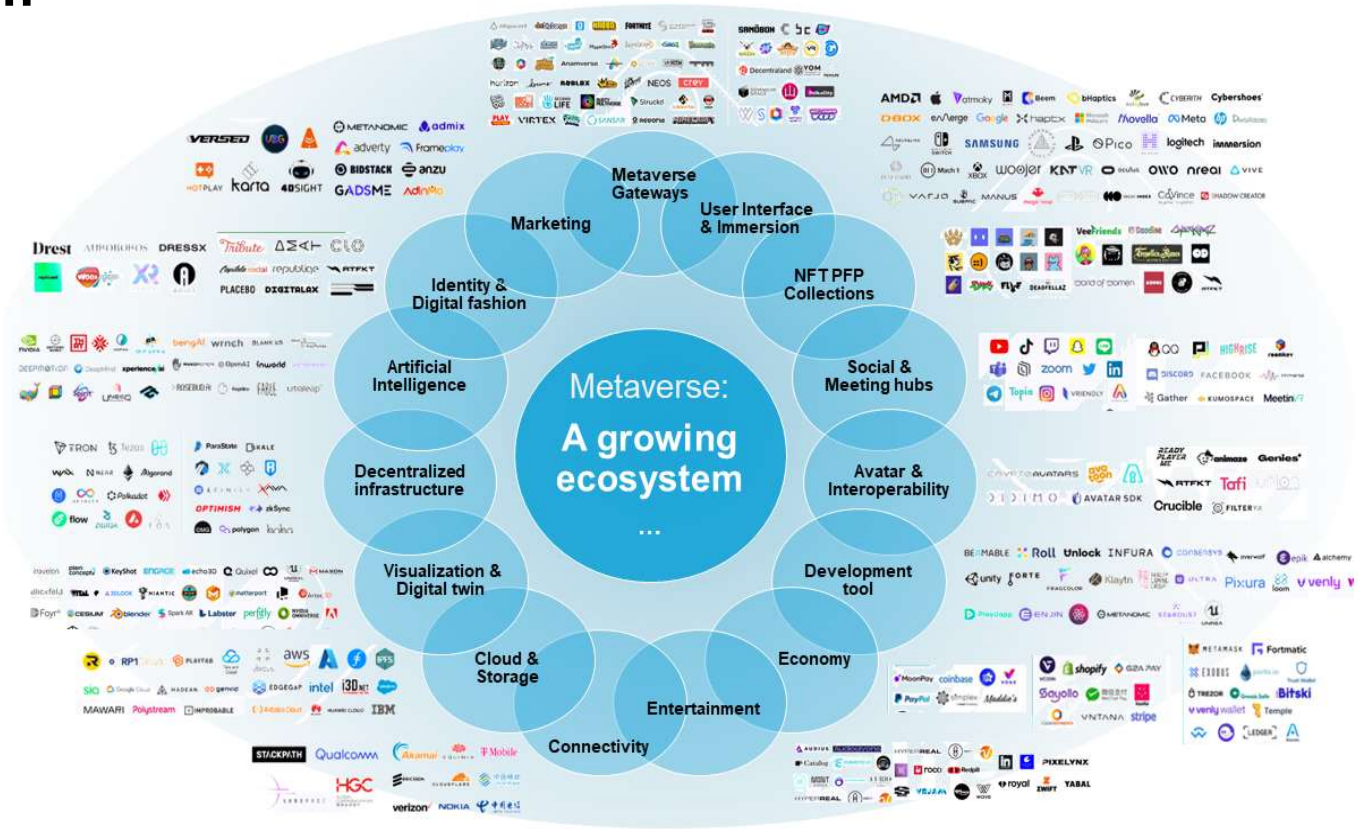


Reference: Technical Report "Exploring the metaverse: opportunities and challenges"

Concept of the Metaverse

Metaverse as an ecosystem

- a complex system that involves a wide range of stakeholders
- where people and businesses can interact, work, socialize, entertain and transact
- rapidly emerging, constantly evolving and expanding market



Reference: Technical Report “Exploring the metaverse: opportunities and challenges”

Definition of the metaverse

- **Work on the terminology and definition related to metaverse in ITU FG-MV**
  - TR “Metaverse: An analysis of definitions” [approved in ’23.07]
  - TR “Principles for building concepts and definitions related to metaverse” [approved in ‘23.12]
  - **TS “Definition of metaverse” [approved in ‘23.12]**
  - Under development: TS “Vocabulary for metaverse”
  - Under development: TS “Definition of CitiVerse”

- **Definition of the metaverse in ITU FG-MV [FG-MV-O-197-R1]**
  - An integrative ecosystem of virtual worlds offering immersive experiences to users, that modify pre-existing and create new value from economic, environmental, social and cultural perspectives.

    NOTE – A metaverse can be virtual, augmented, representative of, or associated with the physical world.

Opportunities of the metaverse

- Metaverse has the opportunity to **impact almost every sector** and could **drive a very different world** in the future
  - Various metaverse use cases promise to accelerate digital transformation, creating new opportunities and value models
- Metaverse has **become one disruptive area of innovation** with great potential to change our economy and society, and the way we live and communicate
  - According to a survey [by Nokia in 2022], 50% of enterprises believe that the **industrial metaverse will be a "real game changer"**
  - Metaverse could **provide opportunities to improve urban** design, increase citizen participation, improve operational efficiency, optimize energy consumption and enhance the capability of disaster and emergency management, etc.
- As the technology continues to develop, **more innovative and transformative applications** of the metaverse are **expected to appear**

Opportunities of the metaverse

- Today, metaverse is certainly still at a nascent stage, which provides a series of opportunities for
  - **People** that may change the way we work and live
    - ✓ Work, social interactions
    - ✓ Entertainment, shopping, etc.
  - **Industries** in various sectors
    - ✓ Manufacturing, Banking, Education, Transportation, Healthcare, etc.
  - **Governments and Cities**
    - ✓ Metaverse Seoul, Dubai
    - ✓ Digital real estate of Barbados, etc.

Consumer Metaverse
(Digitized Lifestyle for People)

Industrial Metaverse
(Digital Transformation for industries)

Citiverse
(Smart governance & operations for Cities and Countries)

Challenges of the metaverse

- Although there have been significant advancements in the metaverse, it is also facing various challenges
- Main challenges of the metaverse are ensuring that it is an **open, interoperable, safe and secure** place for people to interact and transact
  - Interoperability, Digital identity, Access (Connecting/Networking), Cybersecurity, Data protection and Privacy, Child online protection and other social challenges, Online harassment, Sexual assault, Dis/mis information, Accessibility and inclusion, Sustainability, Competition, Regulation, Intellectual property, etc.
- Many challenging issues should be considered from a **policy and regulatory perspectives** in the metaverse
  - To develop a metaverse for the benefit of all, governments, industry, and civil society will need to work together to address its key policy and regulatory issues

Technical Report “Exploring the metaverse: opportunities and challenges” was partially referenced.

Challenges of the metaverse

- Interoperability
- Digital Identity
- Access (Connecting/Networking)
- Cybersecurity & Trust
- Data protection & Privacy
- Child online protection
- Sexual assault
- Online harassment
- Dis/Mis information
- Accessibility and inclusion
- Sustainability
- Competition
- Regulation
- Intellectual property

Challenges of the metaverse

- Interoperability
  - The lack of interoperability between the various metaverse platforms is a significant challenge – a unifying framework and protocol are needed to facilitate user movement between metaverses and devices
- Digital identity
  - how individual users can prove who they are
  - Challenges concerning identity authentication or verification in the metaverse
- Dis/mis information
  - Unless regulated, the metaverse could become a dangerous tool of persuasion, promoting the spread of hate, harassment, and polarization
- Cybersecurity & Trust
  - comprehensive security guidelines and regulations need to be in place to protect metaverse users from scams, ransomware and other cyberthreats, etc.

Challenges of the metaverse

- Data protection and privacy
  - ensure that people's privacy rights are protected in virtual spaces
- Online harassment and Sexual assault
  - ensure that people are protected from abusive behavior in virtual spaces
- Accessibility and inclusion
  - The metaverse must be accessible and inclusive for everyone, regardless of their technology capabilities or socio-economic status
  - enables marginalized people to meaningfully participate in online social activities or access services which may be difficult for them to achieve in the physical world
- Child online protection
  - a potential risk for children, including cyberbullying and a lack of privacy, and exposure to harmful contents should be protected in virtual spaces

Challenges of the metaverse

- Sustainability
  - needs to consider adapting and mitigating climate change and the impacts on the environment such as greenhouse gas emissions, e-wastes
- Competition
  - enables market competition of ideas and avoids dominance by a few companies
- Regulation
  - consider applying proper legislation and regulations so that the virtual space is not vulnerable to users and the metaverse ecosystem can be established
- Intellectual property
  - consider that metaverse has the potential to create new forms of intellectual property such as virtual goods, digital assets, NFTs, and experiences
  - ensure that these new forms of intellectual property are protected, and that their owners can profit from them

The importance of standards in the metaverse

Support a safe, secure, and regulated metaverse

Ensure that the metaverse is open and accessible to all

Allow for interoperability within the metaverse

Ensure that technologies can work together seamlessly in the metaverse

Some standardization activities related to Metaverse

- Promotion of standardization of **element technologies** for Metaverse platform and applications **corresponding to their domains** for each standardization organization
  - **ITU-T SG 16**: Multimedia, Digital human, Immersive systems and Services, Blockchain, AI, etc.
  - **ITU-T SG 17**: Security aspects related to metaverse
  - **ITU-T SG 20**: IoT and smart city aspects related to metaverse
  - **ITU-T FG on metaverse (FG-MV)**
  - **ISO TC 172/SC 9**: Laser and electro-optical systems
  - **ISO TC 133**: Clothing sizing systems - size designation, size measurement methods and digital fittings
  - **ISO TC 133/WG 2**: Digital Fitting
  - **IEC TC 100/WG 12: Multimedia systems and equipment for metaverse**
  - **IEC TC 110/WG 6: 3D Display Devices**
  - **ISO/IEC Joint SEG 15** on Metaverse: Definition, needs and initial roadmap for standardization activities, etc.
  - 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.
  - ISO/IEC **JTC 1/SC 41**: Internet of Things and digital twin -- **SC 41/WG 6 (Digital Twin)**

Some standardization activities related to Metaverse

- **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.
- **IEEE 2048 WG:** Standard for Metaverse: Terminology, Definitions and Taxonomy
- **IEEE 7016 WG:** Standard for Ethically Aligned Design and Operation of Metaverse Systems
- **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)
  - ✓ Providing **timely** media to multiple users with sufficiently **low latency and synchronization** to enable services based on **rapid interaction with virtual objects**
  - ✓ TR 22.856, Study on Localized Mobile Metaverse Services (Release 19)
  - ✓ TR 26.998, Support of 5G glass-type Augmented Reality / Mixed Reality (AR/MR) devices
- **IETF** – Side meetings on Metaverse: 1st meeting (‘22.11), 2nd meeting (‘23.03), 3rd meeting (‘23.11)
  - ✓ List address: metaverse@ietf.org
  - ✓ https://mailarchive.ietf.org/arch/browse/metaverse/
  - ✓ https://github.com/giuseppefioccola/Metaverse side-meeting-at-IETF

Some standardization activities related to Metaverse

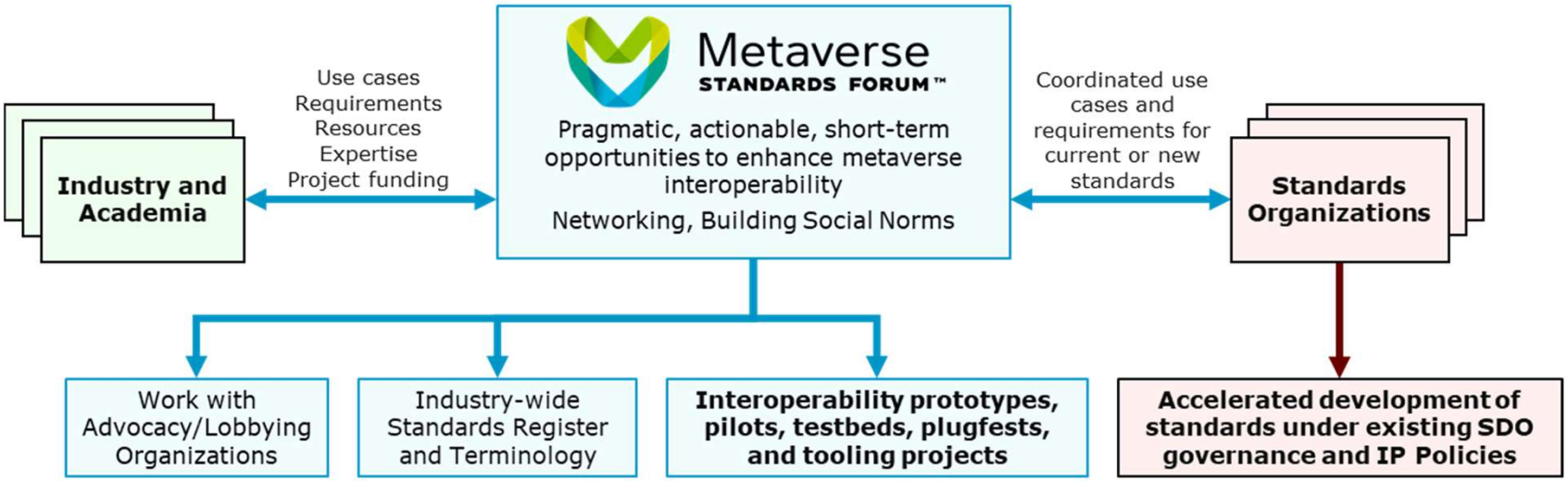
- **W3C – MICG(Metaverse Interoperability Community Group)**
  - ✓ Bridge virtual worlds by designing and promoting protocols for identity, social graphs, inventory, etc.
- **Khronos Group**: Computer graphics acceleration technology, VR. AR. MR device interface, etc.
  - ✓ glTF™ is a royalty-free specification for the efficient transmission and loading of 3D scenes and models by engines and applications
  - ✓ 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
- **OMI (Open Metaverse Interoperability) Group**
  - ✓ We bolster the metaverse as an open and interoperable resource for anyone, inspired by the collaborative efforts of the community
- **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
- **Open Metaverse Foundation (OMF)**: Established under LINUX Foundation (2023.01)
  - ✓ home to an open, vendor-neutral community dedicated to creating **open standards and software** to support the open, global, scalable Metaverse

Some standardization activities related to Metaverse

Metaverse STANDARDS FORUM™

Fostering interoperability standards for an open metaverse

- Metaverse Standards Forum launched in June 2022 – more than 2,400 members
- **Vision**: A Venue for Cooperation between Standards Organizations and Companies to **foster the development of Interoperability Standards for an Open and Inclusive Metaverse**
- Open to all, no participation fee, no NDA, no IP framework
- Coordinated cooperation between industry and Standards Developing Organizations (SDOs)



ITU-T Focus Group on metaverse: Exploring metaverse standardization

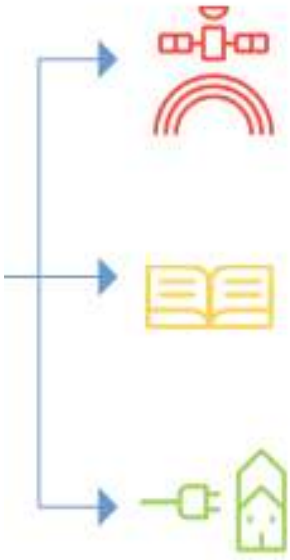
ITU – Who we are – Our Membership

UN agency for ICT
Information and communication technology

193
MEMBER STATES

900+
PRIVATE SECTOR

150+
ACADEMIA



ITU Radiocommunication **(ITU-R)**
Coordinating radio-frequency spectrum and **assigning** orbital slots for satellites

ITU Standardization **(ITU-T)**
Establishing global standards

ITU Development **(ITU-D)**
Bridging the digital divide

A unique platform for governments, private sector and academic institutions to build consensus on important and pressing ICT technical and regulatory issues facing our society today

ITU-T Study Groups 2022-2024

SG2: Operational aspects

SG3: Economic and policy issues

SG5: Environment, EMF and circular economy

SG9: Broadband cable and TV

SG11: Protocols, testing & combating counterfeiting

SG12: Performance, QoS and QoE

SG13: Future networks

SG15: Transport, access and home

SG16: Multimedia & digital technologies

SG17: Security

SG20: IoT, smart cities & communities

ITU FG-MV: Focus Group on metaverse

- A unique collaboration platform to shape an open and interoperable metaverse

Build **a community of experts and practitioners**

Facilitate **dialogues** and **sharing findings**

Identify stakeholders and liaise with **other organisations**

Stimulate **international collaboration**

ITU Focus Group on metaverse (FG-MV)

Unanimously established by TSAG in December 2022

- Scope of the FG-MV covers more than a single Study Group of ITU-T
- Most of the ITU-T SGs expressed their interest and willingness to participate in FG-MV

Open to non-ITU members;

Free of charge;

Physical meetings with remote participation & E-meetings

Diverse management team:

- Government, Industry, Academia, UN agencies
- Africa, Asia, Europe, Americas

60+ Work Items (Oct. 2023), including Technical Specifications & Reports

More than **500 experts involved in the FG-MV**

Outcomes of the First FG-MV Meeting

- *8–9 March 2023, in Riyadh, Kingdom of Saudi Arabia*
- The 1st FG-MV meeting broke the record!
  - ✓ Most attended ITU Focus Group meeting ever, with over 650 participants!

FG-MV Management Team extended

Government, industry, academia, UN agencies, Asia, Africa, Europe, the Americas

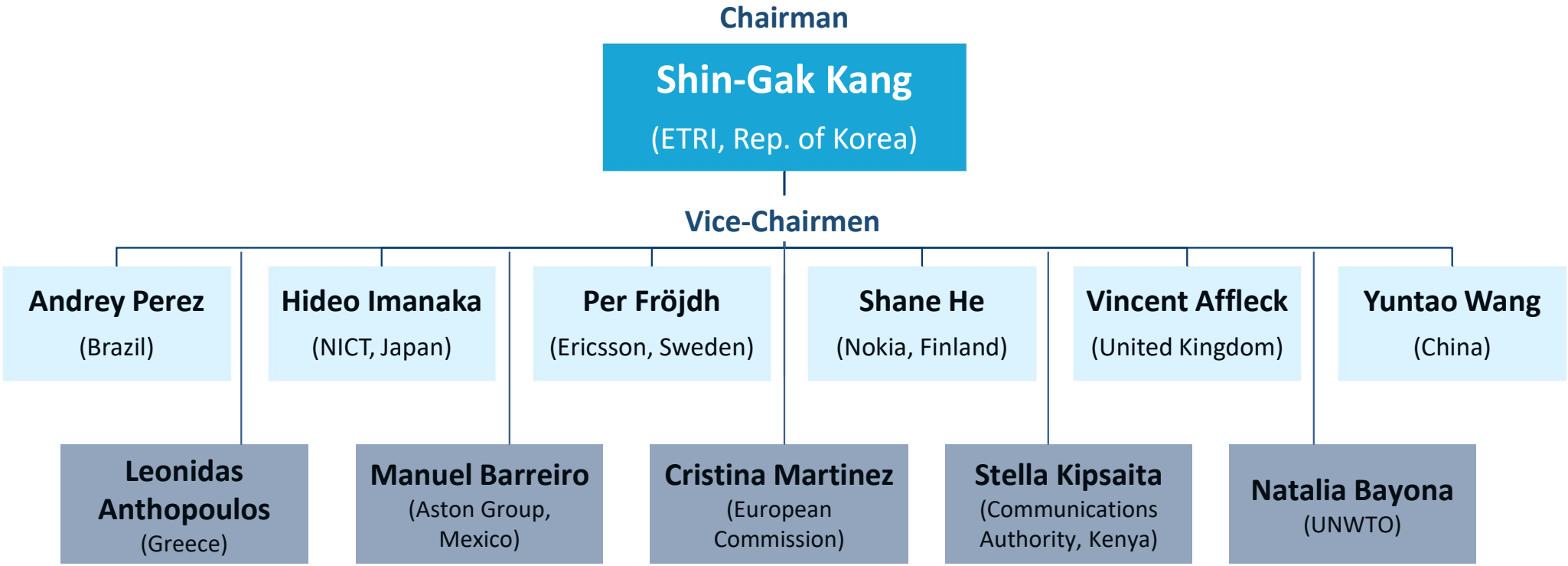
FG-MV Structure established

8 Working Groups and 10 Task Groups

Work Plan agreed

18 new work items were created and are moving fast!

ITU FG-MV Management Team (‘23.03.)



FG-MV Structure – WGs (‘23.03.)

WORKING GROUP 1

General

WORKING GROUP 2

Applications & Services

WORKING GROUP 3

Architecture & Infrastructure

WORKING GROUP 4

Virtual/Real World Integration

WORKING GROUP 5

Interoperability

WORKING GROUP 6

Security, Data & PII Protection

WORKING GROUP 7

Economic, Regulatory & Competition Aspects

WORKING GROUP 8

Sustainability, Accessibility & Inclusion

FG-MV Initial Structure (March 2023)

- **Task Groups (TGs)** can be formed under either FG or WG for intensive discussions and developing deliverables on **specific sub-areas or topics**. [FG's decision]
  - ✓ **10 Task Groups (TGs)** were established at the 1st ITU-T FG-MV meeting in Riyadh as an initial step, and they will be expanded in future meetings

FG	metaverse TG-collaboration
WG 1	**General** TG-terminology & definitions TG-gap analysis
WG 2	**Applications & Services** TG-media coding
WG 3	**Architecture & Infrastructure**
WG 4	**Virtual/Real World Integration**
WG 5	**Interoperability**
WG 6	Security, Data & Personally Identifiable Information (PII) Protection TG-child online protection TG-cybersecurity TG-building confidence and security in the metaverse TG-issues on trustworthiness related to the metaverse
WG 7	**Economic, regulatory & competition aspects**
WG 8	**Sustainability, Accessibility & Inclusion** TG-sustainability TG-accessibility & inclusion

Outcome of the 2nd FG-MV meeting

- 4 ~ 6 July 2023, in Shanghai, China
- The Focus Group meeting, was attended by **more than 2,000 participants** on-site and online
- The first deliverable of FG-MV, Technical Report on "**Exploring the metaverse: opportunities and challenges**" has been approved.
  - The 1st time that a deliverable has been approved at the 2nd Focus Group meeting.
- **39 new work items** have been approved.
  - total 57 on-going work items
- **1 new Working Group and 10 new Task Groups** have been approved.
  - Change of TG-collaboration to 'WG9 on collaboration' for promoting of relevant activities
- FG-MV encouraged ITU to organize a **UN Metaverse Week** in 2024.
- FG-MV encouraged ITU to establish a **Digital Coalition on CitiVerse**.

Outcome of the 2nd FG-MV meeting

- **1 new Working Group and 10 new Task Groups have been approved**

Working Groups	New Task Groups
WG1 - General	• TG on **implications for people** in the metaverse
	• TG on pre-standardization for the **CitiVerse**
WG2 - Applications & Services	• TG on **Generative Artificial Intelligence** in the metaverse
	• TG on **Embodied Artificial Intelligence** for metaverse
	• TG on **medical** metaverse
	• TG on metaverse **tourism**
	• TG on **power** metaverse
	• TG on **Industrial** metaverse
WG8 - Sustainability, Accessibility & Inclusion	• TG-design criteria and metrics with incentives for **sustainable metaverse**
	• TG-metaverse **social safety**
WG9 - Collaboration	• TG-gap analysis

FG-MV structure (06 July 2023)

WORKING GROUP 1

General

WORKING GROUP 2

Applications & Services

WORKING GROUP 3

Architecture & Infrastructure

WORKING GROUP 4

Virtual/Real World Integration

WORKING GROUP 5

Interoperability

WORKING GROUP 6

Security, Data & PII Protection

WORKING GROUP 7

Economic, Regulatory & Competition Aspects

WORKING GROUP 8

Sustainability, Accessibility & Inclusion

WORKING GROUP 9

Collaboration

Outcome of the 3rd FG-MV meeting

- 3~5 October, 2023, in Geneva, Switzerland
- The Focus Group meeting, was attended by **more than 248 participants** on-site and online. * *China's big holiday…*
- **8 draft deliverables** have been approved
- **9 new work items** have been approved
  - Total work items : 66 (9 WIs have been completed)
- 18 planned draft deliverables for approval during the 4th FG-MV meeting in December 2023

Outcome of the 3rd FG-MV meeting (3~5 October, 2023)

- **9 Approved Deliverables**

WGs	Type	Title of deliverable
WG1 - General	Technical Report	Metaverse: an analysis of definitions
WG2 - Applications & Services	Technical Report	Power metaverse: Use cases relevant to grid side and user side
WG6 - Security, Data & Personally identifiable information (PII) Protection	Technical Report	Guidelines for consideration of ethical issues in standards that build confidence and security in the metaverse
WG7 - Economic, regulatory & competition aspects	Technical Report	Policy and regulation opportunities and challenges in the metaverse
WG8 - Sustainability, Accessibility & Inclusion	Technical Report	Guidelines to assess inclusion and accessibility in metaverse standard development
	Technical Specification	Requirements of accessible products and services in the metaverse: Part I – System design perspective
	Technical Specification	Requirements of accessible products and services in the metaverse: Part II – User perspective
	Technical Specification	Design criteria and technical requirements for sustainable metaverse ecosystems

Outcome of the 3rd FG-MV meeting (3~5 October, 2023)

- Approved New Work Items

WGs	Type	Title of deliverable
WG1 - General	Technical Report	Definitions relating to confidence in the metaverse
	Technical Report	Building a People-centred CitiVerse
	Technical Specification	Definition of metaverse
	Technical Specification	Definition of CitiVerse
WG2 - Applications & Services	Technical Report	Use Cases for the Industrial metaverse
WG3 - Architecture & Infrastructure	Technical Specification	Multimedia aspect of metaverse architecture
WG8 - Sustainability, Accessibility & Inclusion	Technical Report	Guidance on accessibility of Web3 economy layer of the metaverse for women
WG9 - Collaboration	Technical Report	Standardization roadmap for metaverse
	Technical Report	Gap analysis on metaverse standardization

Structure of FG-MV - WGs/TGs (October 2023)

Working Groups	Task Groups
WG1 - General	• TG on **Terminology & definitions**
	• TG on **implications for people** in the metaverse
	• TG on pre-standardization for the **CitiVerse**
WG2 - Applications & Services	• TG on Media coding
	• TG on **Generative Artificial Intelligence** in the metaverse
	• TG on **Embodied Artificial Intelligence** for metaverse
	• TG on **Medical** metaverse
	• TG on metaverse **Tourism**
	• TG on **Power** metaverse
	• TG on **Industrial** metaverse
WG3 - Architecture & Infrastructure	
WG4 - Virtual/Real World Integration	

Structure of FG-MV - WGs/TGs (October 2023)

Working Groups	Task Groups
WG5 - Interoperability	
WG6 - Applications & Services	• TG on **Cybersecurity**
	• TG on **Building confidence and security** in the metaverse
	• TG on **Child online protection**
	• TG on **Issues on trustworthiness** related to the metaverse
WG7 - Economic, regulatory & competition aspects	
WG8 - Sustainability, Accessibility & Inclusion	• **Sustainability**
	• **Accessibility & inclusion**
	• **Design criteria and metrics with incentives for sustainable metaverse**
	• Metaverse **social safety**
WG9 - Collaboration	• **Gap analysis**

Outcome of the 4th FG-MV meeting

- 4~7 December, 2023, in Geneva, Switzerland
- The Focus Group meeting, was attended by **more than 277 participants** on-site and online
- A total of **201 input documents** were submitted and **90 output documents** were produced
- **13 draft deliverables** have been approved in the 4th FG-MV meeting
  - Total 22 deliverables have been approved until the 4th FG-MV meeting
- **4 new work items** have been approved - Total work items : 70
  - 1 WI cancelled, 22 WIs have been completed → currently 47 WIs remained
- It was agreed to request TSAG to extend the life time of FG-MV until **June 2024**

Outcome of the 4th FG-MV meeting

- **13 Approved Deliverables**

WGs	Type	Title of deliverable
WG1 - General	Technical Report	Principles for Building Concepts and Definitions Related to metaverse
	Technical Specification	Definition of metaverse
WG2 - Applications & Services	Technical Specification	Capabilities and requirements of Generative Artificial Intelligence in metaverse applications and services
WG5 - Interoperability	Technical Specification	Service scenarios and high-level requirements for metaverse cross-platform interoperability
WG6 - Security, Data & Personally identifiable information (PII) Protection	Technical Report	Cyber risks, threats, and harms in the metaverse
	Technical Report	Embedding safety standards and the user control of Personally Identifiable Information (PII) in the development of the metaverse
	Technical Report	Children's age verification in the metaverse
	Technical Report	Responsible Use of AI for Child Protection in the metaverse

Outcome of the 4th FG-MV meeting

- **13 Approved Deliverables (Cont.)**

WGs	Type	Title of deliverable
WG7 - Economic, regulatory & competition aspects	Technical Report	Regulatory and economic aspects in the metaverse: Data protection-related
WG8 - Sustainability, Accessibility & Inclusion	Technical Specification	Accessibility requirements for metaverse services supporting IoT
	Technical Report	Guidelines and requirements on interpreting in the metaverse
	Technical Report	Accessibility in a sustainable metaverse
	Technical Report	Guidance on how to build a metaverse for all – Part I: Legal Framework

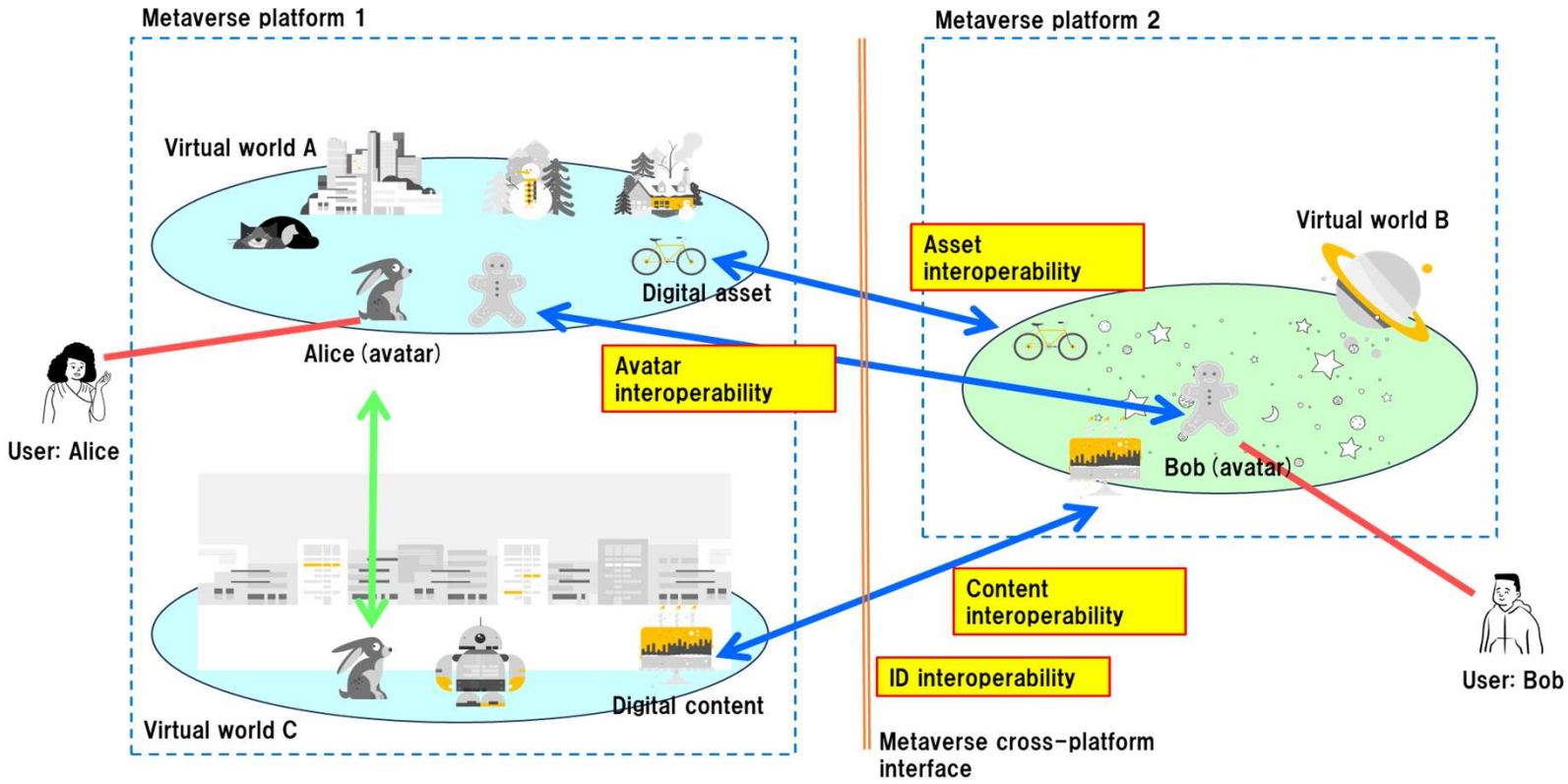
Outcome of the 4th FG-MV meeting

- Approved New Work Items

WGs	Type	Title of deliverable
WG6 - Security, Data & Personally identifiable information (PII) Protection	Technical Report	Considering online and offline implications in efforts to build confidence and security in the metaverse
	Technical Report	Guidelines on trusted data use in building a trustworthy metaverse
WG8 - Sustainability, Accessibility & Inclusion	Technical Specification	Methodology on assessment of GHG emissions of metaverse
	Technical Specification	Requirements for communication between human-avatar languages in the metaverse

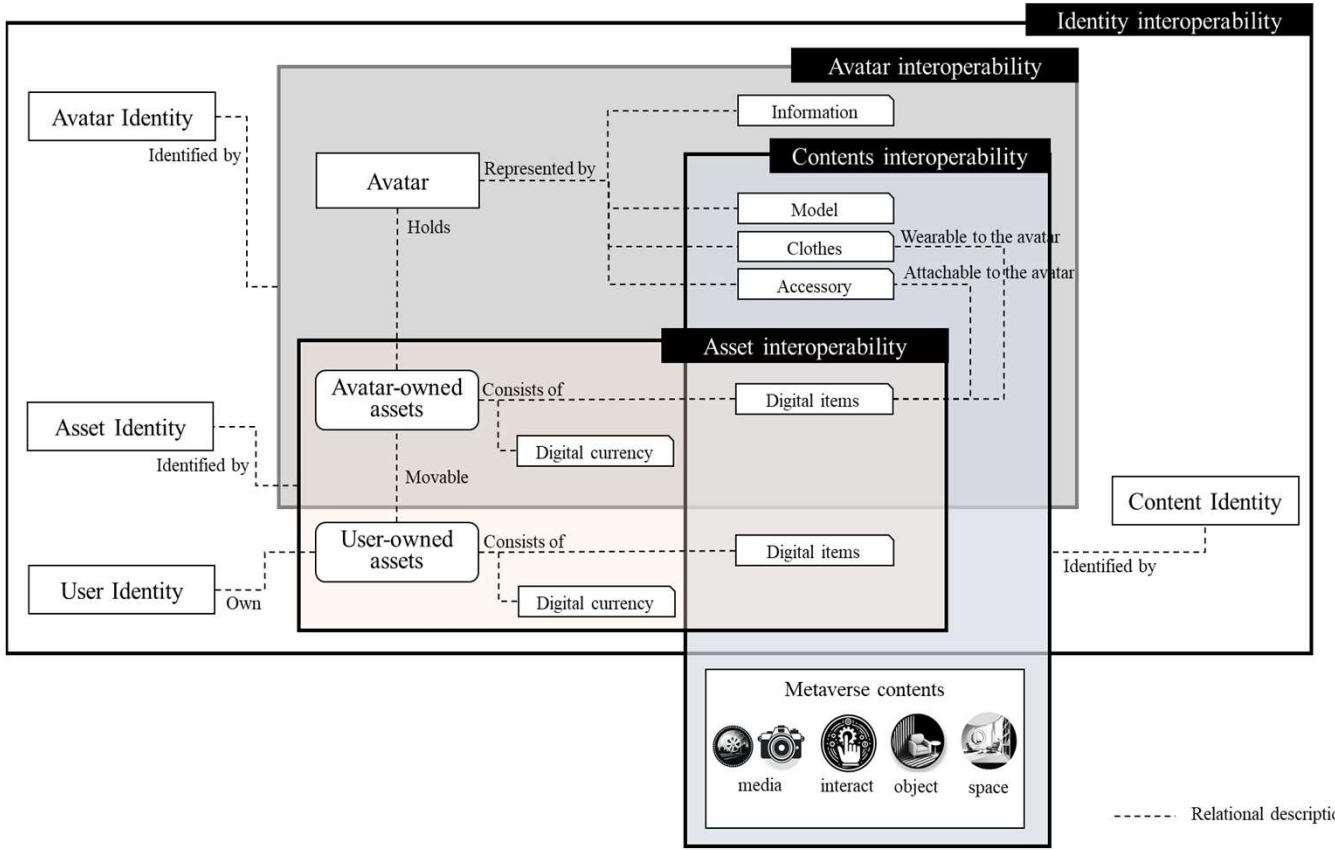
High-level interoperability architecture for cross-platform metaverse

- Overview of metaverse interoperability



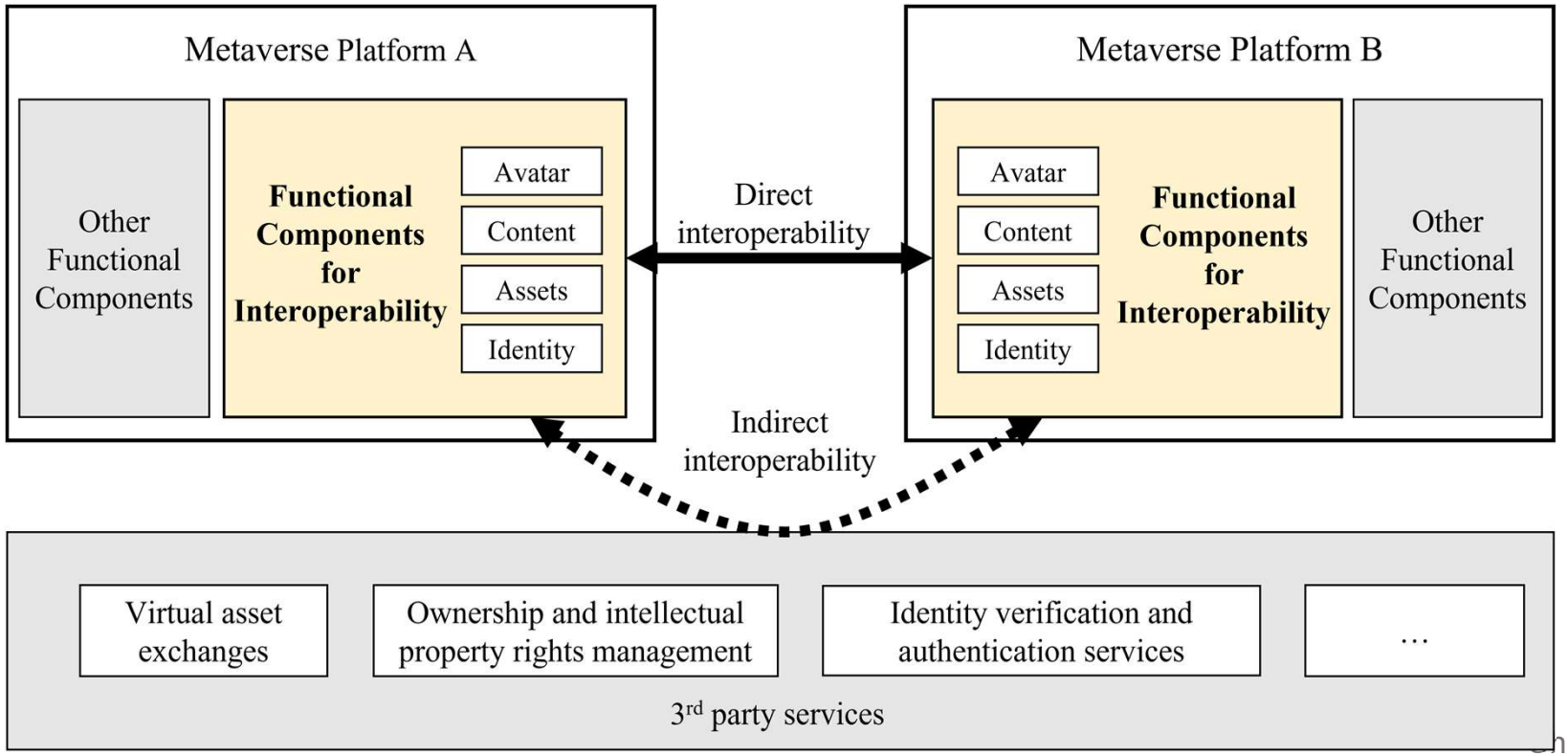
High-level interoperability architecture for cross-platform metaverse

- Relationships among cross-platform interoperability aspects



High-level interoperability architecture for cross-platform metaverse

- Concept of metaverse cross-platform interoperability



Roadmap of FG-MV and Forum

1st ITU Forum on “Embracing the metaverse” (10 Mar.)

First meeting
8-9 March 2023,
Riyadh, Saudi Arabia

Second meeting
4-6 July 2023,
Shanghai, China

2nd ITU Forum on “Creating a metaverse for all through international standards” (7 July)

3rd ITU Forum on “Cities and the metaverse: Shaping a citiverse for all” (13 Sep.)

Special session
12 September 2023,
Arusha, Tanzania

Third meeting
3-5 October 2023,
Geneva, Switzerland

Special session
18 October 2023,
Riga, Latvia

Fourth meeting
4-7 December 2023,
Geneva, Switzerland

***Special Sessions** on FG-MV is to promote FG-MV standardization activities.*

Fifth meeting & 4th Forum
4-8 March 2024, Queretaro, Mexico

1st ITU Forum on metaverse

Outcome document

650+

Participants in person and online

30+

speakers from governments, industries, UN agencies, SDOs

7 March 2023, Riyadh, Kingdom of Saudi Arabia

2nd ITU Forum on Creating a metaverse for all through international standards

7 July 2023, Shanghai, China

15,000+

Participants in person and online

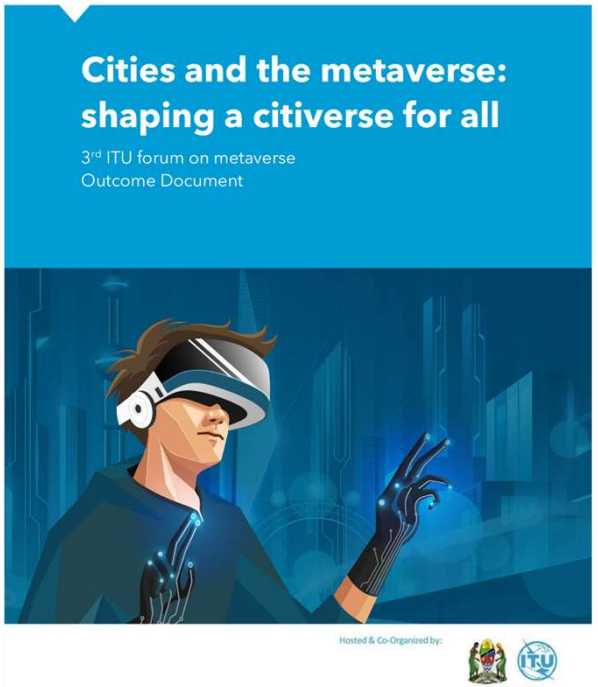
Showcase of metaverse applications

Exhibition on ITU Focus Group on metaverse

Outcome document

3rd ITU Forum on “Cities and the metaverse: Shaping a citiverse for all”

13 September 2023, Arusha, Tanzania



[Outcome Document]

- The Forum concluded with the adoption of the Arusha Call to Action

Join us! – Let's shape the future of the metaverse!

FG-MV

Recently, metaverse has become one disruptive area of innovation with great potential to change our economy, way of living and communicating and society. In this nascent phase of the metaverse, the industry has not converged towards common terms and definitions. The metaverse concept has attracted considerable public attention.

The ITU Focus Group on metaverse was established under TSAG on 16 December 2022. The group will analyse the technical requirements of the metaverse to identify fundamental enabling technologies in areas from multimedia and network optimization to digital currencies, Internet of Things, digital twins, and environmental sustainability.

It will also provide a collaboration platform for dialogue, for identifying stakeholders with whom ITU-T could collaborate, and for enabling the inclusion of non-members to contribute to the technical pre-standardization work. The Focus Group work will be enriched with the identification of relevant use cases.

The FG-MV Workplan including the FG-MV structure, the list of deliverables along with information concerning the designated Chairs and Vice-chairs for the Working Groups (WGs) and Task Groups (TGs) is available here.

Participation in the Focus Group is **open to any interested stakeholder willing to contribute** — to sign up, please join our mailing list!

Parent Group: TSAG

- Terms of reference
- Recommendation ITU-T A.7 Focus groups: Establishment and working procedures
- Press release

Meetings and related events | Templates | Past Meetings

5th FG-MV Meeting
Queretaro, Mexico, 5-8 March 2024

- Announcement
- Registration
- Draft agenda
- Deadlines
  - **Requests for visa support letters:** 1 February 2024 (More information available in the practical information document)
  - **Contributions:** 21 February 2024 (Submit written contributions by e-mail to tsbfgmv@itu.int using the contribution template)
  - **Pre-registration:** 28 February 2024
- Meeting room allocation
- Remote participation platform
- Documents
- Practical information
- Report
- The meeting will be preceded by the **Fourth ITU Forum on "Shaping the CitiVerse: People centred cities & virtual worlds"** that will take place on 4 March 2024, at the same venue.

The report of the fourth meeting of the Focus Group on metaverse (FG-MV) (Geneva, Switzerland, 4-7 December 2023) is available here.

Upcoming events | Past events | Videos

- **Working Group and Task Group meetings**
- The list of Working Group and Task Group meetings and e-meetings is available here.

MANAGEMENT TEAM AND CONTACTS

Chairs:

- Shin-Gak Kang (ETRI, Rep. of Korea)

Vice-Chairs:

- Andrey Perez (Brazil)
- Hideo Imanaka (NICT, Japan)
- Per Fröjdh (Ericsson, Sweden)
- Shane He (Nokia, Finland)
- Vincent Affleck (United Kingdom)
- Yuntao Wang (China)
- Leonidas Anthopoulos (University of Thessaly, Greece)
- Manuel Barreiro (Aston Group, Mexico)
- Cristina Martinez (European Commission)
- Stella Kipsaita (Communications Authority, Kenya)
- Natalia Bayona (World Tourism Organization (UNWTO))

Secretariat:

- Cristina Bueti, Counsellor
- Yining Zhao, Junior Communication Officer
- Chiara Co, Secretariat
- Email: tsbfgmv@itu.int

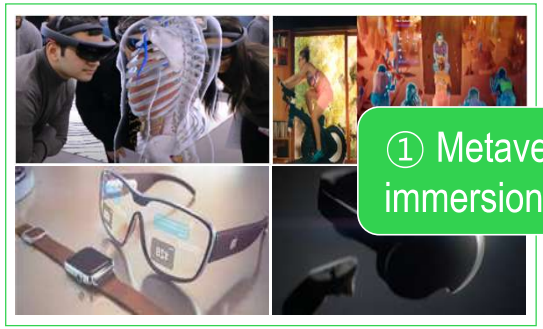
APPROVED ITU FG-MV DELIVERABLES

- Divided across nine Working Groups, 22 Technical Specifications and Technical Reports were developed and approved.
- The full list of approved deliverables is available here.

MAILING LISTS

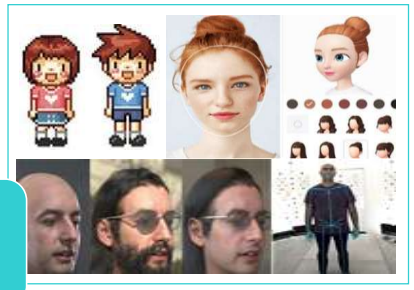
- **Collaboration site:**
- Documents are available at the Collaboration site (A free ITU Account is required to access relevant documentation and participate).
- **Mailing lists:**
- List of FG-MV, Working Groups and Task Groups mailing lists
  - WG1 - General
    Mailing list: fgmv-wg1@lists.itu.int
  - WG2 - Applications & Services
    Mailing list: fgmv-wg2@lists.itu.int
  - WG3 - Architecture & Infrastructure
    Mailing list: fgmv-wg3@lists.itu.int
  - WG4 - Virtual/Real World Integration
    Mailing list: fgmv-wg4@lists.itu.int
  - WG5 - Interoperability
    Mailing list: fgmv-wg5@lists.itu.int
  - WG6 - Security, Data & Personally identifiable information (PII) Protection
    Mailing list: fgmv-wg6@lists.itu.int
  - WG7 - Economic, regulatory & competition aspects
    Mailing list: fgmv-wg7@lists.itu.int
  - WG8 - Sustainability, Accessibility & Inclusion
    Mailing list: fgmv-wg8@lists.itu.int
  - WG9 - Collaboration
    Mailing list: fgmv-wg9@lists.itu.int
- Please subscribe to the FG-MV mailing list (fgmv@lists.itu.int) to receive news, updates, invitations, and access the e-meetings:
  - Sign up for a (free) ITU account, if you do not already have one.
  - Account holders log in here: select the mailing list >click *subscribe*.
  - To view previous exchanges on this mailing list, visit the mailing list archive.
  - Step by step instructions

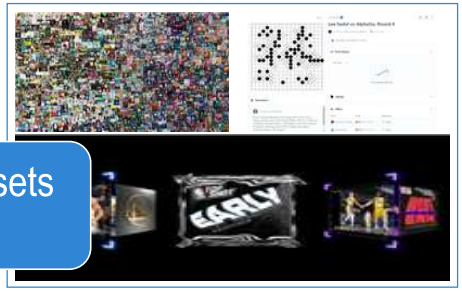
The Evolutionary Directions of the Metaverse



① Metaverse that maximizes immersion through immersive technology

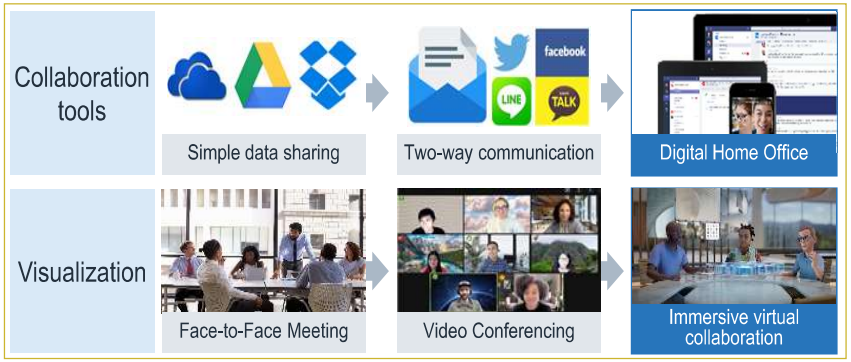
② Metaverse that expands the experience of reality through avatars



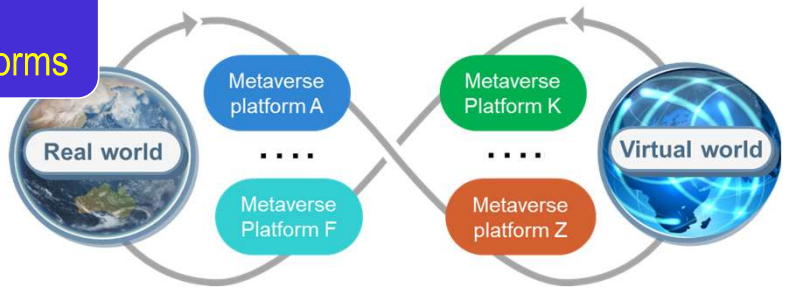


③ Metaverse that enables collaboration and communication beyond time and space constraints

④ Metaverse where digital assets are produced and distributed



⑤ Metaverse that allows full interoperability between platforms



[from Korea's Pan-Governmental Strategy on Metaverse]

Metaverse is coming, Are you ready?

Email
tsbfgmv@itu.int

Website
www.itu.int/metaverse

Shin-Gak KANG (sgkang@etri.re.kr)