

메타버스표준전문연구실 – 메타버스 국제표준기술 워크숍 (2025.09.16, 과총회관)

# Standardization activities and issues on metaverse in ITU-T

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16 September 2025

Shin-Gak KANG, ETRI/Korea

ITU-T SG21 Vice-Chair  
ITU-T SG21 WP4 Chair  
ITU-T SG21 AHG-MV Convenor  
ITU-T TSAG JCA-MV Chair



# ITU – Who we are – Our Membership



**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*

# Progress on metaverse standardization in ITU-T (1/2)

## January 2022: ITU-T SG16 meeting

- ❖ The necessity of standardization work on multimedia related metaverse issues was first discussed. (Initiated by Chinese experts)
- ❖ **Correspondence Group on Metaverse (CG-Metaverse) was established** with ToR
  - Co-chairman : Shin-Gak KANG (ETRI/Korea), Kepeng LI (Tencent/China)

## July-Sep. 2022: CG-Metaverse

- ❖ Discussed standardization issues and the need for FG establishment through 3 e-meetings
  - First (06 July 2022), Second (10 August 2022), Third (8 September 2022)
- ❖ **Decided to propose the establishment of a new Focus Group** for metaverse standardization issues and working methods to ITU-T SG 16 meeting in October 2022

## October 2022: : ITU-T SG16 meeting

- ❖ **Decided to establish a new FG-MV and propose to ITU-T TSAG** for approval.  
(\* TSAG: Telecommunication Standardization Advisory Group)
- ❖ Agreed to establish **AHG-MV** for coordination on metaverse issues within ITU-T SG16

# Progress on metaverse standardization in ITU-T (2/2)

## December 2022: ITU-T TSAG meeting

- ❖ Decided to establish the Focus Group on metaverse (FG-MV) under TSAG
- ❖ Appointed FG-MV chair: Shin-Gak KANG (ETRI, Korea)

## January 2023 ~ June 2024: ITU FG-MV activities

- ❖ 7 times of FG-MV meetings and 155 WGs/TGs (e)-meetings
- ❖ Developed total of 52 FG-MV deliverables over 18 months life-time

## October 2024: WTSA-24

- ❖ Approved new WTSA Resolution 105 (Promoting & strengthening metaverse standardization)

## January 2025: ITU-T SG20 and SG21 meeting

- ❖ Korea and Japan proposed the draft ToR for JCA-MV to ITU-T SG20 and SG21 meeting
- ❖ The harmonized ToR for JCA-MV was submitted to TSAG
- ❖ Established the SG21 AHG-MV to discuss about the necessity of establishing new Question

## May 2025: ITU-T TSAG meeting

- ❖ TSAG established new JCA-MV under TSAG with the ToR and appointed Co-chairs

# ITU Focus Group on metaverse (FG-MV)

**Unanimously established by TSAG in December 2022**

❖ *(ITU) 193 Member States as well as more than 900 companies, research institutes and International Organizations*



**FG: 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



**63 Work programs**

including Technical Specifications & Reports



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

# FG-MV Management Team

**Chairman**

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

**Vice-Chairmen**

**Andrey Perez**  
(Brazil)

**Hideo Imanaka**  
(NICT, Japan)

**Per Fröjdh**  
(Ericsson, Sweden)

**Shane He**  
(Nokia, Finland)

**Vincent Affleck**  
(United Kingdom)

**Yuntao Wang**  
(China)

**Leonidas  
Anthopoulos**  
(Greece)

**Manuel Barreiro**  
(Aston Group,  
Mexico)

**Cristina Martinez**  
(European  
Commission)

**Stella Kipsaita**  
(Communications  
Authority, Kenya)

**Natalia Bayona**  
(UNWTO)

# FG-MV Structure

- ❖ A unique collaboration platform to shape an open, secure, and interoperable metaverse
- ❖ **9 WGs** (Working Groups) and **18 TGs** (Task Groups)



## 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



## ITU FG-MV meetings – held in different regions

**FG-MV Lifetime: December 2022 ~ June 2023 (about 18 months)**

**Regular FG-MV meetings: held 7 times**



**500+**

Experts involved

1st FG-MV meeting: 8~9 March 2023, Riyadh, Saudi Arabia;

2nd FG-MV meeting: 4~6 July 2023, Shanghai, China;

3rd FG-MV meeting: 3~5 October 2023, Geneva, Switzerland;

4th FG-MV meeting: 4~7 December 2023, Geneva, Switzerland;

5th FG-MV meeting: 5-8 March 2024, Queretaro, Mexico;

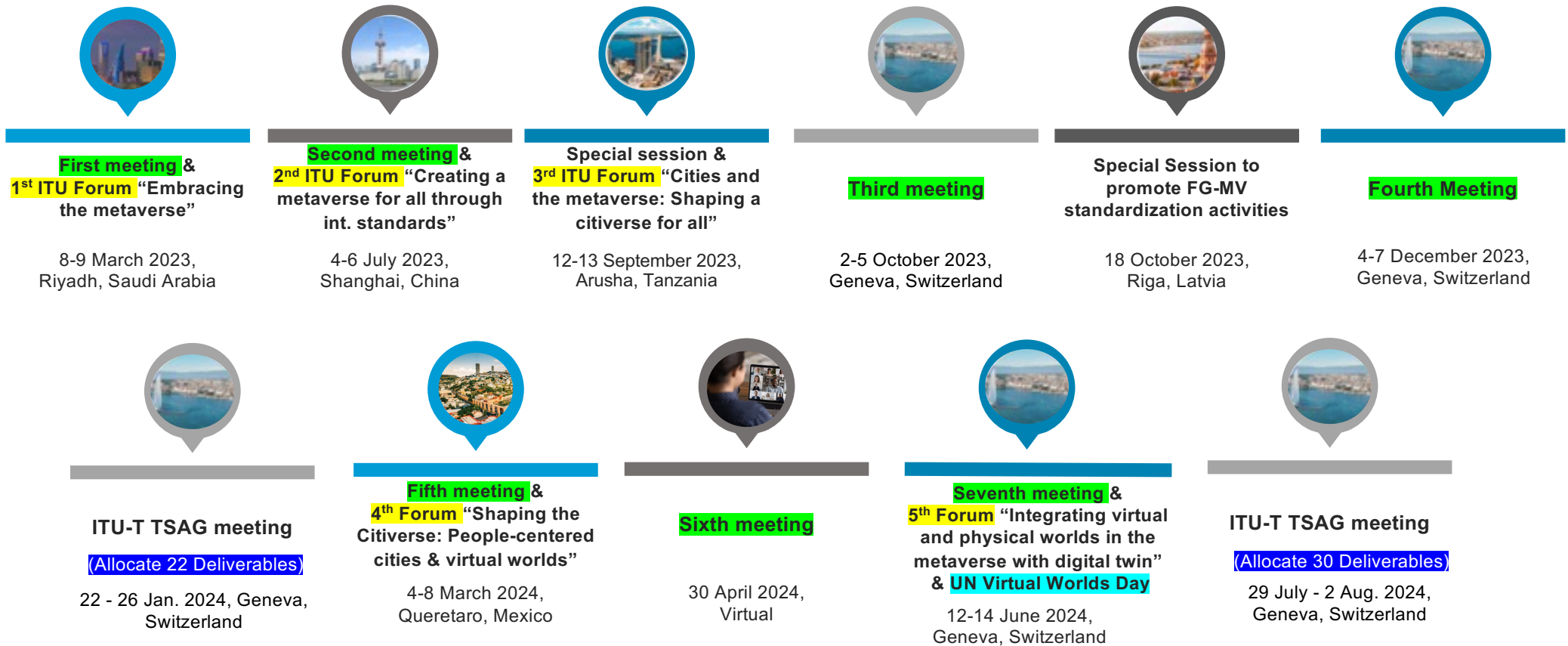
6th FG-MV meeting: 30 April 2024, Virtual;

7th FG-MV meeting: 12-13 June 2024, Geneva, Switzerland.

**155 WGs/TGs (e)-meetings**



# Journey of ITU FG-MV and related events





# ITU FG-MV Work Programs & Deliverables

Total work programs (June 2024): **63**

**Deliverables approved: 52** (including a definition of metaverse)

- ❖ March ~ December 2023: **22**
- ❖ January ~ June 2024: **30**

**Deliverables unfinished: 11**

**Allocation of FG-MV deliverables to ITU-T Study Groups by TSAG**

- ❖ TSAG meeting in January 2024 (22 deliverables)
- ❖ TSAG meeting in August 2024 (30 deliverables)



## ITU FG-MV's Definition of metaverse

### **The metaverse is...**

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.

# Subsequent status of ITU FGMV deliverables (1/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-01</a>	Technical Report on Exploring the metaverse: opportunities and challenges	All for information	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-02</a>	Technical Report on Metaverse: an analysis of definitions	All for information	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-03</a>	Technical Report on Guidelines to assess inclusion and accessibility in metaverse standard development	ITU-T SG16	SG 21 decided not consider further work.
<a href="#">FGMV-04</a>	Technical Specification on Requirements of accessible products and services in the metaverse: Part I – System design perspective	ITU-T SG16, ITU-T SG9, ITU-T SG20	SG21 adopted as a new work of F.ACC-MV-SD (January 2025).
<a href="#">FGMV-05</a>	Technical Specification on Requirements of accessible products and services in the metaverse: Part II – User perspective	ITU-T SG16, ITU-T SG9, ITU-T SG20, and ITU-T SG2	SG21 adopted as a new work of F.ACC-MV-UP (January 2025).
<a href="#">FGMV-06</a>	Technical Report on Guidelines for consideration of ethical issues in standards that build confidence and security in the metaverse	ITU-T SG17	Need further observation.
<a href="#">FGMV-07</a>	Technical Report on Policy and regulation opportunities and challenges in the metaverse	ITU-T SG3	Need further observation.
<a href="#">FGMV-08</a>	Technical Specification on Design criteria and technical requirements for sustainable metaverse ecosystem	ITU-T SG5 and ITU-T SG20	SG20 interested.
<a href="#">FGMV-09</a>	Technical Report on Power metaverse: Use cases relevant to grid side and user side	ITU-T SG20 and ITU-T SG13	SG20 adopted as a new work of Y.PM-FUSG (January 2025).
<a href="#">FGMV-10</a>	Technical Report on Cyber risks, threats, and harms in the metaverse	ITU-T SG17	SG17 adopted as a new work of TR.cr-mv (April 2025).

## Subsequent status of ITU FGMV deliverables (2/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-11</a>	Technical Report on Embedding safety standards and the user control of Personally Identifiable Information (PII) in the development of the metaverse	ITU-T SG17 and ITU-T SG11	Need further observation.
<a href="#">FGMV-12</a>	Technical Report on Children's age verification in the metaverse	ITU-T SG17	Need further observation.
<a href="#">FGMV-13</a>	Technical Report on Responsible Use of AI for Child Protection in the metaverse	ITU-T SG17	Need further observation.
<a href="#">FGMV-14</a>	Technical Report on Regulatory and economic aspects in the metaverse: Data protection-related	ITU-T SG3 and ITU-T SG17	Need further observation.
<a href="#">FGMV-15</a>	Technical Specification on Accessibility requirements for metaverse services supporting IoT	ITU-T SG20 and ITU-T SG16	SG20 adopted as a new work of Y.ACC-IoTMV (July 2024).
<a href="#">FGMV-16</a>	Technical Report on Accessibility in a sustainable metaverse	ITU-T SG16	SG16 published as a FSTP-ACC-MV-SUST (April 2024).
<a href="#">FGMV-17</a>	Technical Report on Guidelines and requirements on interpreting in the metaverse	ITU-T SG16	SG21 adopted as a new work of HSTP-ACC-MV-INTERPR (April 2024).
<a href="#">FGMV-18</a>	Technical Report on Guidance on how to build a metaverse for all – Part I: Legal Framework	ITU-T SG16 and ITU-T SG3	SG21 allocated to Q1/21 for further work.
<a href="#">FGMV-19</a>	Technical Specification on Service scenarios and high-level requirements for metaverse cross-platform interoperability	ITU-T SG16, ITU-T SG20, ITU-T SG13 and ITU-T SG11	SG21 adopted as a new work of H.MV-PIOP (January 2025).

## Subsequent status of ITU FGMV deliverables (3/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-20</a>	Technical Specification – Definition of metaverse	ITU-T SG16	SG 21 allocated to Q9/21 for further work. SG17 proposed to modify definition. <i>NOTE: TSAG allocated the harmonization work on definition of metaverse to JCA-MV (May 2025).</i>
<a href="#">FGMV-21</a>	Technical Report on Principles for Building Concepts and Definitions Related to metaverse	All for Information	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-22</a>	Technical Specification on Capabilities and requirements of Generative Artificial Intelligence in metaverse applications and services	ITU-T SG16	SG 21 allocated to Q5/21 for further work.
<a href="#">FGMV-23</a>	Technical Report on Considering online and offline implications in efforts to build confidence and security in the metaverse	SG17	Need further observation.
<a href="#">FGMV-24</a>	Technical Report on A framework for confidence in the metaverse	SG17	Need further observation.
<a href="#">FGMV-25</a>	Technical Report on Near-term and long-term Implications for people in the metaverse	All SGs	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-26</a>	Technical Specification on Requirements for communication between human-avatar languages in the metaverse	SG16 and SG13	SG 21 allocated to Q1/21 for further work.
<a href="#">FGMV-27</a>	Technical Report on Guidelines for metaverse application in power system	SG20	SG20 adopted as a new work of Y.MetaSkISys (January 2025).
<a href="#">FGMV-28</a>	Technical Specification on Requirements for the metaverse based on digital twins enabling integration of virtual and physical worlds	SG20	SG20 adopted as a new work of Y.dtmv-reqts (July 2024).
<a href="#">FGMV-29</a>	Technical Specification on Reference model for the metaverse based on a digital twin enabling integration of virtual and physical worlds	SG20	SG20 adopted as a new work of Y.dtmv-ref (July 2024).

## Subsequent status of ITU FGMV deliverables (4/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-30</a>	Technical Report on Overview of the application requirements of metaverse on emergency management in chemical industrial parks	SG20	SG20 adopted as a new work of Y.CIP (July 2024).
<a href="#">FGMV-31</a>	Technical Specification on Requirements, functional framework and capability of IoT for metaverse	SG20	SG20 adopted as a new work of Y.IoT-MV (January 2025).
<a href="#">FGMV-32</a>	Technical Report on Overview of metaverse	All SGs	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-33</a>	Technical Specification on Glossary for metaverse	All SGs, SCV	SG 21 allocated to Q9/21 for further work. <i>NOTE: It may need to be further developed in JCA-MV for coordination with other groups, including ITU-T SGs and relevant SDOs.</i>
<a href="#">FGMV-34</a>	Technical Report on Definitions of CitiVerse	SG20	SG20 adopted as a part of a new work of Y.citiverse-reqts (January 2025).
<a href="#">FGMV-35</a>	Technical Report on Building a People-centred CitiVerse	SG20	SG20 adopted as a part of a new work of Y.citiverse-reqts (January 2025).
<a href="#">FGMV-36</a>	Technical Report on The future of travel in the metaverse: landscape and use cases	SG16, SG20	SG21 allocated to Q3/21 for further work. SG20 adopted a new related work of Y.MetaExpSys (January 2025). <i>NOTE: Y.MetaExpSys is not based on FGMV-36.</i>
<a href="#">FGMV-37</a>	Technical Report on Landscape and Use cases for the Industrial metaverse	All SGs	SG20 interested. SG21 interested and allocated to Q9/21 for further work.

## Subsequent status of ITU FGMV deliverables (5/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-38</a>	Technical Specification on Framework and requirements for the construction of human-driven 3D digital human application system for metaverse	SG16	SG 21 allocated to Q9/21 for further work.
<a href="#">FGMV-39</a>	Technical Specification on Use case and requirements for virtual and real fusion coding in metaverse application	SG16	SG 21 allocated to Q6/21 for further work.
<a href="#">FGMV-40</a>	Technical Specification on Multimedia aspect of metaverse architecture	SG16	SG21 adopted as a new work of H.MV-MAMA (January 2025).
<a href="#">FGMV-41</a>	Technical Specification on the reference framework of industrial metaverse	SG20	SG20 interested.
<a href="#">FGMV-42</a>	Technical Report on Interoperability of identity of things across metaverse platforms	SG20	SG20 published as a Y.4812 (January 2025)
<a href="#">FGMV-43</a>	Technical Specification on High-level interoperability architecture for cross-platform metaverse	SG16	SG21 adopted as several new works: - H.MV-HIA (January 2025) - H.MV-FRAVI (January 2025) - H.MV-FRADAI (July 2025)
<a href="#">FGMV-44</a>	Technical Report on Security for things across metaverses in aspects of data processing and management	SG17	SG17 adopted as a new work of X.stm-dpm (September 2024).
<a href="#">FGMV-45</a>	Technical Report on Challenges to achieving trustworthy metaverse	SG17	SG17 adopted as a new work of TR.trust-metaverse (April 2025).
<a href="#">FGMV-46</a>	Technical Report on The essential components of trusted data use in building a trustworthy metaverse	SG17	Need further observation.



## Subsequent status of ITU FGMV deliverables (6/7)

No.	Title	TSAG Allocation	Current status
<a href="#">FGMV-47</a>	Technical Report on Economic Value Creation and Competition in metaverse	SG3	Need further observation.
<a href="#">FGMV-48</a>	Technical Report on Guidance on how to build a metaverse for all: Part II - Survey	All SGs	SG21 allocated to Q1/21 for further work.
<a href="#">FGMV-49</a>	Technical Report on Metaverse Sustainability: Driving energy efficiency and GHG emissions reduction	SG5	Need further observation.
<a href="#">FGMV-50</a>	Technical Specification on Methodology on assessment of GHG emissions of metaverse	SG5	Need further observation.
<a href="#">FGMV-51</a>	Technical Report on Standardization roadmap for metaverse	All SGs	SG 21 allocated to Q9/21 for further work. <i>NOTE: It may need to be further developed in JCA-MV for coordination with other groups, including ITU-T SGs and relevant SDOs.</i>
<a href="#">FGMV-52</a>	Technical Report on Metaverse standardization landscape for gap analyses	All SGs	SG 21 allocated to Q9/21 for further work. <i>NOTE: It may need to be further developed in JCA-MV for coordination with other groups, including ITU-T SGs and relevant SDOs.</i>

## Unfinished work items of FG-MV (7/7)

Type	Title of deliverable	WG/TG
Draft TR	Pre-standardisation roadmap for an inclusive and sustainable CitiVerse	WG1/TG-pre-standardization for the CitiVers
Draft TS	Use cases and requirements on immersive audio coding for metaverse applications and services	WG2/TG-media coding
Draft TS	Requirements and framework for extended reality content creation system based on artificial intelligence	WG2/TG-Generative AI
Draft TR	Use case and requirements for remote amusement service with automatic movable robot (AMR) with multimedia functions on metaverse	WG2/TG-metaverse tourism
Draft TR	Medical metaverse: Use-case Relevant to Medical Training and Hospital	WG2/TG-medical metaverse
Draft TR	Requirements and challenge associated with network infrastructure to enable the metaverse	WG3
Draft TS	Setting the framework for an ICT architecture to enable the metaverse	WG3
Draft TR	The framework of building a trustworthy digital human	WG6/TG-trustworthiness in MV
Draft TS	Incentive strategies to boost high-impact sustainable metaverse applications	WG8/TG-sustainable MV design
Draft TS	Metrics and indicators to drive the design of sustainable metaverse applications	WG8/TG-sustainable MV design
Draft TR	Metaverse social safety: mitigating harassment in the metaverse	WG8/TG-metaverse social safety

**\* It needs further consideration at the relevant ITU-T SGs and others.**

FG-MV had been concluded.  
But the work is not over yet...



**Moving forward to ITU-T SGs & other SDOs**

# World Telecommunication Standardization Assembly (WTSA-24)

## - New Delhi, India, 15 – 24 October 2024

\* WTSA is held every four years and defines the next period of study for ITU-T.

### **All regions of ITU-T proposed a new Resolution on metaverse standardization**

- APT – Asia-Pacific Telecommunity
- AST – League of Arab States / Arab Standardization Team
- ATU – African Telecommunications Union
- CEPT – European Conference of Postal and Telecommunications Administrations
- CITEEL – Inter-American Telecommunication Commission
- RCC – Regional Commonwealth in the Field of Communications

*APT Common Proposal (ACP) on the new resolution for metaverse was adopted based on Korea's proposal and widely referenced by other regions*

### **New Resolution 105 was approved at WTSA-24**

- ❖ **Resolution 105: Promoting and strengthening metaverse standardization**

# WTSA-24 Resolution 105

## Resolution 105 – Promoting and strengthening metaverse standardization

Resolves;

- to carry out standardization work to ensure that the various telecommunication/ICT components of metaverse can be effectively integrated and interoperated, including architectures, requirements, protocols, systems and services;
- to promote and strengthen the ITU-T SGs' standardization work related to enabling technologies, systems, applications, services, protocols, security, accessibility and sustainability for metaverse;
- to work collaboratively and cooperatively with other SDOs, recognized external organizations, industry and relevant entities;
- to promote the potential of an accessible and sustainable metaverse, including for enhancing the value of future telecommunication/ICT applications and services;
- to take necessary steps to achieve a comprehensive understanding of threats and foster cooperation among different stakeholders to develop a safe and secure metaverse environment that enhances the well-being of users;
- to ensure trust, confidence and security in metaverse applications and services, thereby providing a safe and secure environment for all users;
- to establish a joint coordination activity on metaverse (JCA-MV) under the TSAG to coordinate standardization activities on metaverse and to maintain a standardization roadmap for the purpose of having coordination across relevant ITU-T SGs and with related SDOs and relevant parties outside ITU-T;
- that ITU forums be held to present progress in the work and the results achieved by the ITU-T study groups in charge of metaverse standardization before the next WTSA

# Study Period 2025~2028 of ITU-T Study Groups

## New structure of ITU-T SGs – consolidation of SG9 and SG16

- ❖ 11 SGs (study period 2022~2024) → **10 SGs** (study period 2025~2028)
- ❖ **New SG21 - Consolidation of SG9 (CATV) and SG16 (Multimedia)**
  - \* SG21: Technologies for multimedia, content delivery and cable television

## WTSA Resolution 2 was approved

### *\* Resolution 2: Scope and mandate of the ITU-T study groups*

- **General areas of study** of ITU-T SGs
- **Lead ITU-T Study Groups** in specific areas of study
  - \* SG20: smart sustainable cities and communities and related digital services, including effective energy management, digital twins and **citiverse**
  - \* SG21: **immersive multimedia technologies**, including **metaverse**
- **Points of guidance** to ITU-T SGs for the development of the post-2024 work programme

# ITU-T SG21 activities on metaverse standardization

## Structure

- ❖ WP1: Integrated broadband and cable television systems
- ❖ WP2: Multimedia digital services and human aspects
  - Q1: Multimedia system, service and application accessibility for digital inclusion
  - Q4: Human factors for intelligent user interfaces and services
- ❖ WP3: Media authenticity, processing and AI-enabled applications
  - Q5: AI-enabled multimedia applications
- ❖ **WP4: Infrastructure for multimedia systems, services and applications, including metaverse**
  - Q8: Immersive live experience systems and services
  - **Q9: Multimedia framework, applications and services**
- ❖ AHG-FQS: Ad hoc Group on future questions structure
- ❖ AHG-MMA: Ad hoc Group on coded multimedia authenticity
- ❖ **AHG-MV: Ad hoc Group on metaverse**
- ❖ IRG-AVA: ITU Intersector Rapporteur Group on Audiovisual Media Accessibility
- ❖ JVET: Joint Video Experts Team

# ITU-T SG21 activities on metaverse standardization

## AHG-MV: Ad hoc Group on metaverse

- ❖ Convenor: Shin-Gak KANG (Korea)
- ❖ Scope: study relevant issues for the establishment of a new Question on metaverse in ITU-T SG21 until the next SG21 meeting in October 2025
- ❖ Objective: monitor the progress of metaverse related work in SG21 and carefully analyze advantages and disadvantages of establishing a new Question, along with analyzing the workload of existing Q9/21
- ❖ Discussion results: Proposed that it needs to establish a new Question on metaverse but it should be discussed at the AHG-FQS considering the numbers and workloads of Questions in SG21

## Change the ToR of Q9/21 to enhance metaverse standardization work

- ❖ It was agreed at SG21 meeting in January 2025 and submitted to TSAG for endorsement
- ❖ The modified Q9/21 ToR **was approved at TSAG meeting** held in May 2025
  - Title: Multimedia framework, applications and services, **and related metaverse aspects**
  - Study general and common **multimedia aspects of metaverse applications, systems and services**, including definition and glossary
  - study use cases, requirements, framework, functional architectures, **protocols** on multimedia aspects of metaverse technologies, applications, systems and services for **supporting interoperability**;



# ITU-T SG21 activities on metaverse standardization

## Q9/21 work programs related to metaverse (2025.09)

### ❖ Metaverse platform, Interoperability, maturity

- H.MV-FRADAI: Functional requirements and architecture for digital asset interoperability in cross-platform metaverse
- H.MV-FRAVI: Functional requirements and architecture for avatar interoperability in cross-platform metaverse
- [H.MV-HIA: High-level interoperability architecture for cross-platform metaverse](#)
- H.MV-MAMA: Multimedia aspect of metaverse architecture
- H.MV-PIOP: Service scenarios and high-level requirements for metaverse cross-platform interoperability
- [TR.MV-MML: Maturity levels for metaverse service and application](#)

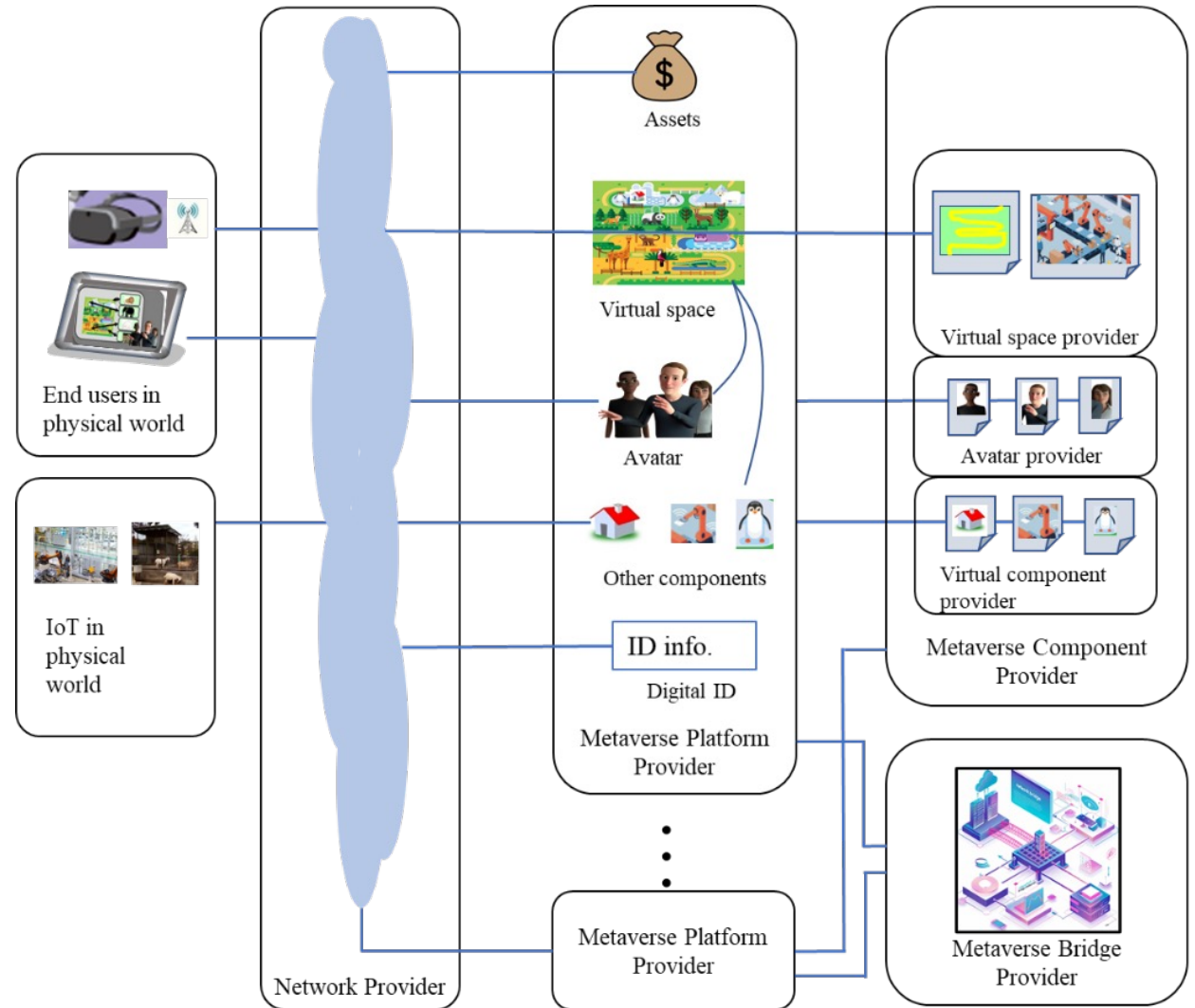
### ❖ Core technologies for metaverse

- F.3DCS-reqts: Requirements and functional architecture for 3D collaborative design services
- H.3DRS-PF: Requirements and functional architecture of real-scene 3D reconstruction system for power facilities
- H.CAR-FA: Functional Architecture for cloud-based augmented reality systems
- H.CVR-IF: Interfaces for interaction in cloud virtual reality systems
- H.CVR-OP: Functional architecture of optimized processing for cloud virtual reality systems
- H.LVR: Requirements and reference framework for large-scale virtual reality system

# ITU-T SG21 activities on metaverse standardization

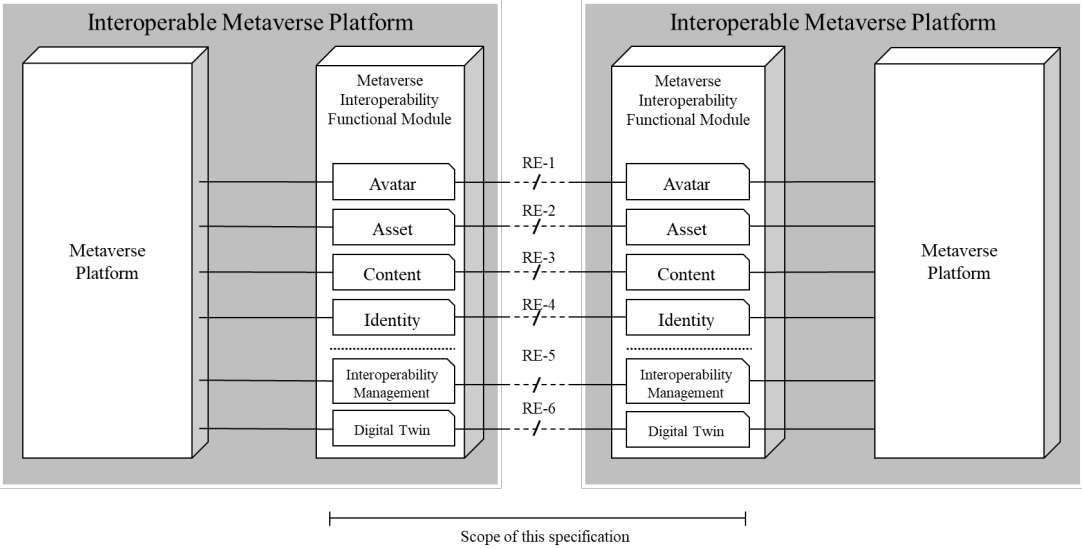
## High-level interoperability architecture for cross-platform metaverse

### ❖ Stakeholders for metaverse cross-platform interoperability

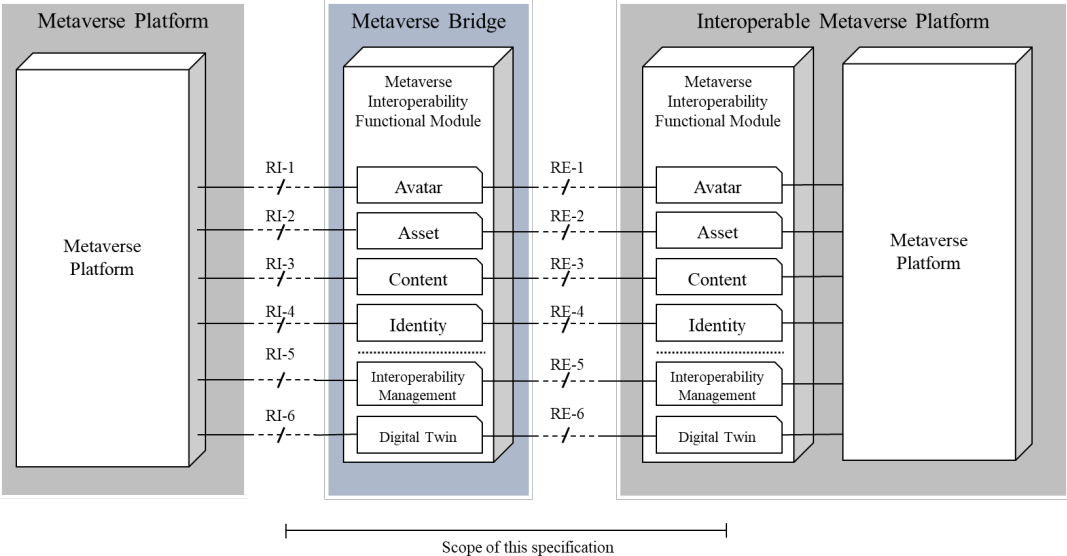


# ITU-T SG21 activities on metaverse standardization

## Architectural overview of interoperation between metaverse platforms



## Architectural overview of interoperability using metaverse bridges



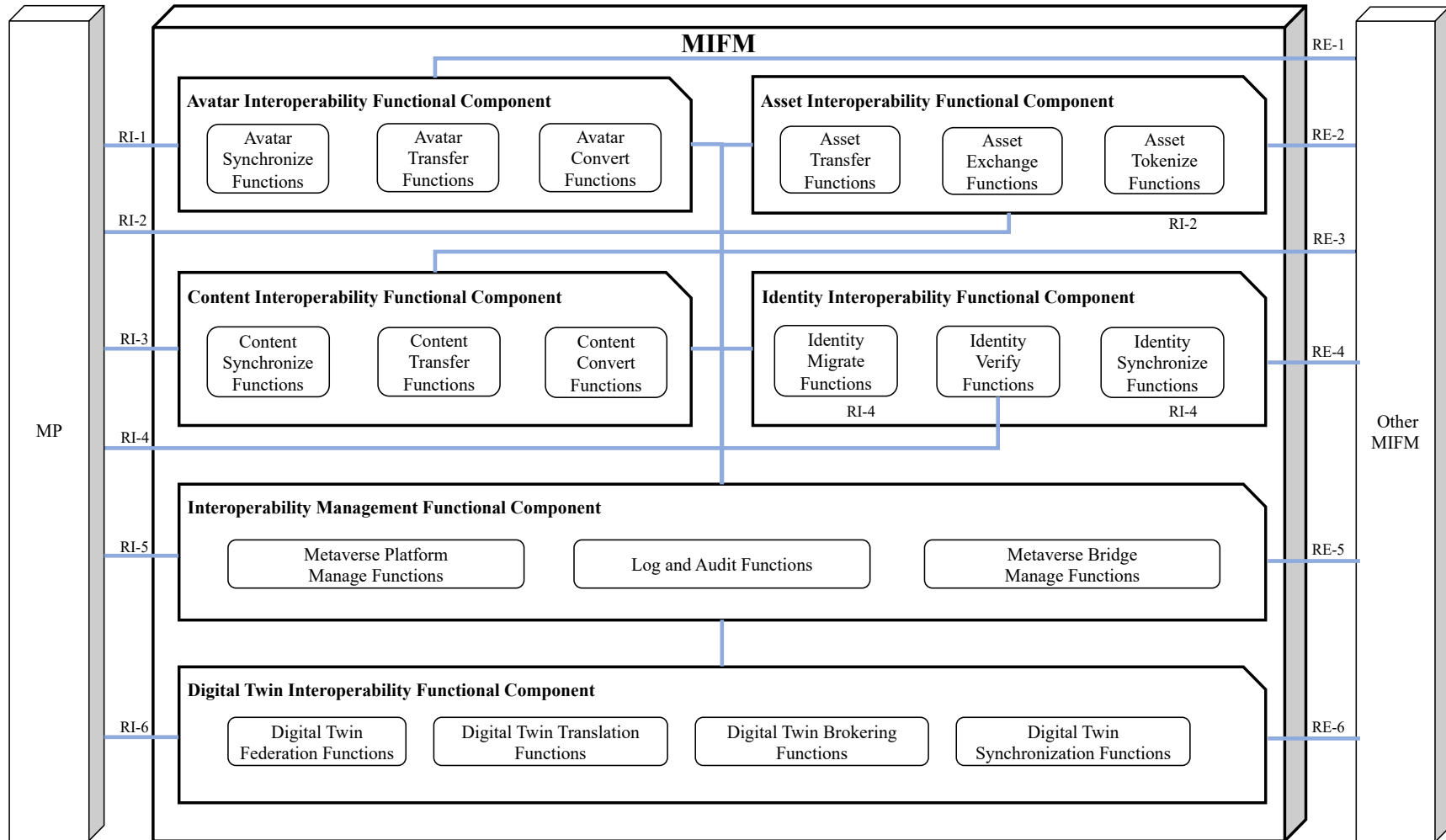
# ITU-T SG21 activities on metaverse standardization

## High-level metaverse interoperability functional architecture

- Functional Components
- Reference points
- High-level Information Flows

### Information Flows:

- Avatar migration
- Asset migration
- Content migration
- Identity migration
- Metaverse platform registration for establishing an interoperable communication channel



# ITU-T SG21 activities on metaverse standardization

## Work programs related to metaverse in other Questions of SG21 (2025.09)

- F.ACC-MV-SD (Q1/21), Reqs. of accessible products and services in the metaverse - Part I System design perspective
- F.ACC-MV-UP (Q1/21), Requirements of accessible products and services in the metaverse - Part II User perspective
- HSTP-ACC-MV-INTERPR (Q1/21) Guidelines and requirements on interpreting in the metaverse
- J.CLE-ARVR (Q1/21), Terminology, Metrics and Functional reqs. for Cognitive Load Estimation for AR/VR services
- F.LVR-CHS (Q3/21), Requirements and reference framework for large-scale VR system of cultural heritage sites
- F.MRN-CHS (Q3/21), Requirements and framework of mixed reality navigation system for cultural heritage sites
- F.FDHC (Q4/21), Framework for digital human customization
- F.FLDH (Q4/21), Framework of human-machine interaction for developing intelligent digital humans
- F.GI-WD (Q4/21), Framework and requirements of gesture interaction in VR and AR environment with wearable devices
- F.DH-LM (Q5/21), Reference architecture and technical requirements of large model enhanced digital human system
- F.DH-PE (Q5/21), Requirements and evaluation methods of digital human platform
- F.DHPIE (Q5/21), Metrics and evaluation methods for the presentation and interactive effect of 3D digital human
- H.ILE-3DIT (Q8/21), Functional requirements and frameworks of 3D model-based immersive telepresence services
- H.ILE-3DINR (Q8/21), Framework and requirements of 3D reconstruction systems based on implicit neural representation for immersive live experience (ILE) services
- H.ILE-AR (Q8/21), Requirements and framework of augmented reality for immersive live experience (ILE) services

# ITU-T SG's activities on metaverse standardization

## Work programs related to metaverse in other ITU-T SGs that are not based on FG-MV deliverables (2025.09)

- Q8/11, Q.FITSM: Framework of interoperable telepresence suits for metaverse
- Q1/12, GSTR-MVQ: QoS and QoE standards related to the metaverse
- Q16/13, Y.trust-MVInf-fr: Framework of a trustworthy metaverse infrastructure
- Q6/17, X.sg-eimv: Technical Report - Technical challenges to achieving trustworthy metaverses
- Q7/17, TR.dpama: Technical Report - Landscape analysis for data protection of avatars in metaverse applications
- Q7/17, X.AA-LLM: Guidelines for Preventing and Mitigating Adversarial Attacks on LLMs in Metaverse and Digital Twin Environments
- Q1/20, Y.dtmv-if: Interface model and requirements for integrating virtual and physical worlds through digital twins in the metaverse
- Q3/20, Y.Fram-ssdp: Requirements and framework of metaverse simulation service for disaster prevention in electric power facilities
- Q6/20, Y.metalD: Framework and requirements for identity visualization in and across metaverse
- Q8/20, Y.Frwk-mwell: Requirements and capability framework for IoT enabled well-being methods measurement through metaverse

# ITU-T JCA-MV (metaverse standardization)

- ❖ ITU-T SG20 and SG21 meeting (January 2025, Geneva)
  - **Korea and Japan proposed the draft ToR for JCA-MV** to ITU-T SG20 and SG21 meeting
  - The harmonized ToR for JCA-MV was agreed at the joint meeting of SG20 and SG21
  - Draft ToR was submitted to TSAG for consideration
  
- ❖ ITU-T TSAG meeting (May 2025, Geneva)
  - **Korea proposed the establishment of JCA-MV** according to the WTSA Resolution 105
    - ✓ JCA-MV: Joint Coordination Activity on metaverse standardization
  - TSAG agreed to **establish a new JCA-MV under TSAG** & the ToR
  - **TSAG appointed JCA-MV Co-Chairs**
    - ✓ Shin-Gak KANG (ETRI, Korea),                      Muath AlRumayh (CST, Saudi Arabia)
  
- ❖ Kick-off meeting of JCA-MV (<http://itu.int/en/ITU-T/jca/mv>)
  - 9 October 2025 (Geneva), collocated with ITU-T SG21 meeting (6 to 17 October 2025)

# ITU-T JCA-MV (metaverse standardization)

## ❖ Scope

- to **coordinate ITU-T MV standardization work** and **foster collaboration** across all relevant SGs within ITU-T, while providing a visible contact point and coordinating communication **with external SDOs, consortia and forums** working on metaverse-related standards, enabling effective two-way communications with these bodies.

## ❖ Objectives

- To ensure that the ITU-T metaverse standardization work related to enabling technologies, systems, applications, services, protocols, security, accessibility, and sustainability for metaverse, progresses **in a well-coordinated manner among all relevant ITU-T study groups**;
- To encourage relevant groups in ITU-T, the ITU-R and the ITU-D to contribute to the JCA and share information;
- To **develop, maintain and update a roadmap for metaverse standardization**, taking into account ongoing and published standard deliverables from ITU, other relevant SDOs, consortia, and forums;
- To consider and promote **cooperation and complementarity** in the development of international standards for metaverse with relevant organizations;
- To **report to the TSAG whenever duplication of efforts or other issues requiring coordination are discovered**, to support TSAG coordination function among ITU-T study groups;
- To **act as a point of contact within ITU-T and with other SDOs, consortia and forums**, working on metaverse related standards especially **to avoid duplication of efforts**;
- To **maintain a list of contacts and representatives** of relevant ITU-T SGs and other related ITU groups;
- To maintain a list of contacts and representatives from other relevant SDOs, regional/national organizations, consortia, and forums who participate in the JCA-MV.



The metaverse continues to evolve  
and the key is “**standardization**”.



**Website**

[www.itu.int/metaverse](http://www.itu.int/metaverse)

[itu.int/en/ITU-T/jca/mv](http://itu.int/en/ITU-T/jca/mv)



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