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| Title: ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | TSAG-TD400 |
| TSAG |
| **Original: English** |
| **Question(s):** | | N/A | | Geneva, 22-26 January 2024 |
| **TD (Ref.:** [FG-MV-LS33](http://handle.itu.int/11.1002/ls/sp17-fg-mv-oLS-00033.docx)**)** | | | | |
| **Source:** | | FG-MV | | |
| **Title:** | | LS/i on Results of the fourth meeting of the FG-MV [from FG-MV] | | |
| **LIAISON STATEMENT** | | | | |
| **For action to:** | | | TSAG | |
| **For information to:** | | | ITU-T SG2, SG3, SG5, SG9, SG11, SG12, SG13, SG15, SG16, SG17, SG20 | |
| **Approval:** | | | FG-MV meeting (Geneva, 7 December 2023) | |
| **Deadline:** | | | N/A | |
| **Contact:** | | | Shin-Gak Kang   FG-MV Chair | E-mail: [sgkang@etri.re.kr](mailto:sgkang@etri.re.kr) |

A new liaison statement has been received from FG-MV.

This liaison statement follows and the original file can be downloaded from the ITU ftp server at <http://handle.itu.int/11.1002/ls/sp17-fg-mv-oLS-00033.docx>.

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|  | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | | **FG-MV-LS33** | |
| **Focus Group on metaverse** | |
| **Original: English** | |
| **WG(s):** | | PLEN | | | Geneva, 4–7 December 2023 | |
| **Ref.: FG-MV-O-187-R2** | | | | | | |
| **Source:** | | FG-MV | | | | |
| **Title:** | | LS on Results of the fourth meeting of the FG-MV | | | | |
| **LIAISON STATEMENT** | | | | | | |
| **For action to:** | | | | TSAG | | |
| **For information to:** | | | | all ITU-T Study Groups | | |
| **Approval:** | | | | **FG-MV meeting (Geneva, 7 December 2023)** | | |
| **Deadline:** | | | | N/A | | |
| **Contact:** | | | Shin-Gak Kang  FG-MV Chair | | | E-mail: [sgkang@etri.re.kr](mailto:sgkang@etri.re.kr) |

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| **Abstract:** | This document contains information on the results of the fourth meeting of the FG-MV. |

The Focus Group on metaverse (FG-MV) was established under the ITU-T Telecommunication Standardization Advisory Group (TSAG) on 16 December 2022. FG-MV aims to lay the groundwork for international standards that can help create an underlying technology and business ecosystem. The group analyses the technical requirements of the metaverse to identify fundamental enabling technologies in areas ranging from multimedia and network optimization to digital currencies, Internet of Things, digital twins, and environmental sustainability. It also provides 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 international technical pre-standardization work. FG-MV has established nine working groups (WGs):

* Working Group (WG) 1 - General
* Working Group (WG) 2 - Applications & Services
* Working Group (WG) 3 - Architecture & Infrastructure
* Working Group (WG) 4 - Virtual/Real World Integration
* Working Group (WG) 5 - Interoperability
* Working Group (WG) 6 - Security, Data & Personally identifiable information (PII) ​Protection
* Working Group (WG) 7 - Economic, regulatory & competition aspects
* Working Group (WG) 8​ - Sustainability, Accessibility & Inclusion​ ​​
* Working Group (WG) 9 - Collaboration

# Meetings

FG-MV held four meetings since its establishment, as summarized in the table below.

**Table 1 – FG-MV meeting summaries**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **1st meeting**  **Riyadh, 8**–**9 March 2023** | **2nd meeting**  **Shanghai, 4**–**6 July 2023** | **3rd meeting**  **Geneva, 3**–**5 October 2023** | **4th meeting**  **Geneva, 4**–**7 December 2023** |
| **Input documents** | 91 | 172 | 222 | 201 |
| **Output documents** | 7 | 66 | 99 | 90 |
| **Meeting report** | [FGMV-O-006-R2](https://extranet.itu.int/sites/itu-t/focusgroups/mv/output/FGMV-O-006-R2.docx) | [FGMV-O-068-R1](https://extranet.itu.int/sites/itu-t/focusgroups/mv/output/FGMV-O-068-R1.docx) | [FGMV-O-133-R2](https://extranet.itu.int/sites/itu-t/focusgroups/mv/output/FGMV-O-133-R2.docx) | [FGMV-O-199-R2](https://extranet.itu.int/sites/itu-t/focusgroups/mv/input/FGMV-O-199-R2.docx) |
| **Number of participants (on-site and remote)** | 650 | 1276 | 250 | 277 |
| **Number of participants (webcast)** | N/A | 859 | N/A | N/A |

The planned meeting of the FG-MV is shown in the table below.

**Table 2 – FG-MV planned meetings**

|  |  |  |  |
| --- | --- | --- | --- |
| **List of planned meetings of the FG-MV** | | | |
| **Date** | **Meetings** | **Location** | **SGs, Events** |
| 5–8 March 2024 | 5th FG-MV Meeting | Queretaro, Mexico | 4th ITU Forum on “Shaping the CitiVerse: People centred cities & virtual worlds” to take place on 4 March 2024, in Queretaro, Mexico. |

Meetings are announced on the Focus Group website and mailing list.

**Focus Group leadership, structure and deliverables**

The management team consists of the following:

**Chair:** 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))

Please refer to Annex A for the list of FG-MV Workplan, Structure, and list of deliverables (Geneva, 4–7 December 2023) for more details. The FG-MV Workplan is also available at: <https://www.itu.int/en/ITU-T/focusgroups/mv/Pages/FG-MV-structure-and-workplan.aspx>

**Definition of metaverse**

We are pleased to inform you that the FG-MV approved the definition of metaverse which reads as follows:

*“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.”*

**Completed deliverables**

FG-MV would like to inform TSAG and all ITU-T Study Groups that the following deliverables have been completed:

**Table 3 – FG-MV approved deliverables**\*() entities or groups that might be interested in these deliverables

| **No.** | **Title** | **Approved** | **Proposed allocation to ITU-T Study Groups and/or other entities** |
| --- | --- | --- | --- |
| [FGMV-01](http://handle.itu.int/11.1002/pub/82047d78-en) | Technical Report on Exploring the metaverse: opportunities and challenges​ | July 2023 | ITU-T SG3, SG16, SG20 (ITU-D SGs) |
| [FGMV-02](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-02.pdf) | Technical Report on Metaverse: an analysis of definitions | October 2023 | ITU-T SG3 and SG16 (SG20, ITU-T SCV, ITU-D SGs) |
| [FGMV-03](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-03.pdf) | Technical Report on Guidelines to assess inclusion and accessibility in metaverse standard development | October 2023 | ITU-T SG16 (ITU-T SG9, ITU-T SG20, JCA-AHF, IRG-AVA) |
| [FGMV-04](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-04.pdf) | Technical Specification on Requirements of accessible products and services in the metaverse: Part I – System design perspective | October 2023 | ITU-T SG16, ITU-T SG9, ITU-T SG20 (JCA-AHF, IRG-AVA) |
| [FGMV-05](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-05.pdf) | Technical Specification on Requirements of accessible products and services in the metaverse: Part II – User perspective | October 2023 | ITU-T SG16, ITU-T SG9, ITU-T SG20 (JCA-AHF, IRG-AVA) |
| [FGMV-06](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-06.pdf) | Technical Report on Guidelines for consideration of ethical issues in standards that build confidence and security in the metaverse | October 2023 | ITU-T SG17, ITU-T SG16 (OHCHR, UNDESA) |
| [FGMV-07](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-07.pdf) | Technical Report on Policy and regulation opportunities and challenges in the metaverse | October 2023 | ITU-T SG3 (ITU-T SG16, ITU-T SG17, ITU-T SG20) |
| [FGMV-08](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-08.pdf) | Technical Specification on Design criteria and technical requirements for sustainable metaverse ecosystem | October 2023 | ITU-T SG5 (ITU-T SG16, ITU-T SG13, ITU-T SG20, UNDESA) |
| [FGMV-09](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-09.pdf) | Technical Report on Power metaverse: Use cases relevant to grid side and user side | October 2023 | ITU-T SG16 and ITU-T SG20 |
| [FGMV-10](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-10.pdf) | Technical Report on Cyber risks, threats, and harms in the metaverse | December 2023 | ITU-T SG17 |
| [FGMV-11](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-11.pdf) | Technical Report on Embedding safety standards and the user control of Personally Identifiable Information (PII) in the development of the metaverse | December 2023 | ITU-T SG17 and ITU-T SG16 |
| [FGMV-12](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-12.pdf) | Technical Report on Children's age verification in the metaverse | December 2023 | ITU-T SG17 (UNICEF and ITU-D SG2) |
| [FGMV-13](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-13.pdf) | Technical Report on Responsible Use of AI for Child Protection in the metaverse | December 2023 | ITU-T SG17 (ITU-T SG3, UNICEF and ITU-D SG2) |
| [FGMV-14](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-14.pdf) | Technical Report on Regulatory and economic aspects in the metaverse: Data protection-related | December 2023 | ITU-T SG3 (ITU-T SG17, ITU-T SG20) |
| [FGMV-15](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-15.pdf) | Technical Specification on Accessibility requirements for metaverse services supporting IoT | December 2023 | ITU-T SG20 (ITU-T SG16, ITU-T SG9, JCA-AHF, IRG-AVA) |
| [FGMV-16](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-16.pdf) | Technical Report on Accessibility in a sustainable metaverse | December 2023 | ITU-T SG16 (ITU-T SG9, ITU-T SG20, JCA-AHF, IRG-AVA) |
| [FGMV-17](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-17.pdf) | Technical Report on Guidelines and requirements on interpreting in the metaverse | December 2023 | ITU-T SG16 (ITU-T SG9, ITU-T SG20, JCA-AHF, IRG-AVA) |
| [FGMV-18](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-18.pdf) | Technical Report on Guidance on how to build a metaverse for all – Part I: Legal Framework | December 2023 | ITU-T SG16 (ITU-T SG9, ITU-T SG20, JCA-AHF, IRG-AVA) |
| [FGMV-19](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-19.pdf) | Technical Specification on Service scenarios and high-level requirements for metaverse cross-platform interoperability | December 2023 | ITU-T SG16 |
| [FGMV-20](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-20.pdf) | Technical Specification on Definition of metaverse | December 2023 | ITU-T SG16 (SG3, SG20, ITU-T SCV) |
| [FGMV-21](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-21.pdf) | Technical Report on Principles for building concepts and definitions related to metaverse | December 2023 | ITU-T SG16 (SG3, SG20, ITU-T SCV) |
| [FGMV-22](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-22.pdf) | Technical Specification on Capabilities and requirements of generative artificial intelligence in metaverse applications and services | December 2023 | ITU-T SG16 (ITU-T SG9, ITU-T SG20) |

Additional information on the FG-MV can be found at: <https://www.itu.int/en/ITU-T/focusgroups/mv/Pages/default.aspx>

FG-MV invites TSAG to consider these deliverables as a basis for further consideration and appropriate action.

All interested parties are invited to use the approved deliverables in their related activities.

**Discussion on the extension of the lifetime of the FG-MV**

* Japan and Korea (Republic of) submitted contributions (as contained in [FGMV-I-453](https://extranet.itu.int/sites/itu-t/focusgroups/mv/input/FGMV-I-453.docx) and [FGMV-I-470](https://extranet.itu.int/sites/itu-t/focusgroups/mv/input/FGMV-I-470.docx)) to extend the lifetime until March 2025. There were different views on the duration of the extension. Consensus was reached to request TSAG to consider extending the lifetime until June 2024.

# Next steps

* The FG-MV would like to request TSAG to consider the extension of the lifetime of the Focus Group from March 2024 until June 2024.
* FG-MV has approved 22 deliverables and would like to invite TSAG to consider the proposed allocation to various ITU-T Study Groups and other entities as contained in Table 3.

ANNEX 1 – List of FG-MV Workplan, structure, and list of deliverables (Geneva, 4–7 December 2023)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **FG/ ​​WGs​** | **Subgroup** | **Leadership positions** | **ToR** | **Type** | **Title of deliverable** | **Editors​** |
| **​ FG​​** | **metavers​e** |  |  | Template  [*Approved at the second FG-MV meeting*] | Use case template | Wook HYUN (ETRI, Korea (Republic of)), FG-MV Chair and WG Chairs |
| **​​WG 1​​** | **General** | Chair:   * ​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)   Vice-Chairs:   * ​Mr Younghwan CHOI (ETRI, Korea (Republic of)) * Ms Radia FUNNA (Build n Blaze) | * ​​Business ecosystem * Collection of best practices, including a gap analysis * Roadmap for setting technical standards * Overall concepts, service model, related technologies of metaverse platforms and services * Issues outside the scope of other WGs | Technical Specification | Overview of metaverse  ​ | Younghwan CHOI (ETRI, Korea (Republic of)) |
| Technical Report  [*Approved at the second FG-MV meeting*] | Exploring the metaverse: opportunities and challenges | Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| **​TG-terminology & definitions** | Chair:   * ​​Ms Xiaomi AN (Renmin University of Ch​ina) |  | Technical Specification | Vocabulary for metaverse | Xiaomi AN (Renmin, University of China)  Jie SONG (State Grid Corporation of China) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Principles for building concepts and definitions related to metaverse | Xiaomi AN (Renmin University of China) |
| Technical Report  [*Approved at the third FG-MV meeting*] | Metaverse: An analysis of definitions | Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| Technical Specification  [*Approved at the fourth FG-MV meeting*] | Definition of metaverse | Leonidas ANTHOPOULOS (University of Thessaly, Greece)  Xiaomi AN (Renmin University of China)  Radia FUNNA (Build n Blaze)  Christina Yan ZHANG (The Metaverse Institute) |
| Technical Specification | Definition of CitiVerse | Leonidas ANTHOPOULOS (University of Thessaly, Greece)  Xiaomi AN (Renmin University of China)  Radia FUNNA (Build n Blaze)  Christina Yan ZHANG (The Metaverse Institute) |
| **TG- pre-standardization for the CitiVerse** | Co-Chairs:   * ​​Ms Cristina MARTINEZ (European Commission) * Ms Christina Yan ZHANG (The Metaverse Institute) |  | Technical Report | Pre-standardisation roadmap for an inclusive and sustainable CitiVerse | Cristina MARTINEZ and Miguel Alvarez RODRIGUEZ (European Commission) |
| Technical Report | Building a People-centred CitiVerse | Christina Yan ZHANG (The Metaverse Institute)  Nicholas YOU (Guangzhou Institute for Urban Innovation)  Teppo T Rantanen (The City of Tampere)  Leonidas ANTHOPOULOS (University of Thessaly, Greece)  Irina KARAGYAUR (BQ9) |
| **TG-​implications for people in the metaverse** | ​Chair:   * Ms Radia FUNNA (Build n Blaze) | ​ | ​ Technical ​Report | ​ Near-term and long-term implications for people in the metaverse | ​ Radia FUNNA (Build n Blaze) |
| Technical Specification | A framework for confidence in the metaverse | Radia FUNNA (Build n Blaze) |
| **WG2** | **Applications & Services** | Co-Chairs:   * Mr Yuntao WANG (CAICT, China) * Ms Yuan ZHANG (China Telecom)   Vice-Chairs: ​   * ​Mr Ismael ARRIBAS (Spain) * Mr James Kunle OLORUNDARE (Nigeria) | * Use cases for relevant applications and services required by interested parties in each domain, including vertical industries (e.g., Gaming and entertainment, remote work and collaboration, education and training, commerce, real estate, social interactions, health care, tourism, art and culture, etc.) * High-level requirements for supporting related use cases for specific applications and services | Technical Report | Overview of the application requirements of metaverse on emergency management in chemical industrial parks | Ziqin SANG (CICT, China)  Keng LI (CICT, China)  Hao WU (CICT, China) |
| **T​G-media co​ding** | Co-Chairs:   * ​Mr Zekun WANG (China Telecom) * Mr Marcelo MORENO​ (Fraunhofer IIS, Germany) |  | Tech​nical Specification | Use case and requirements for virtual and real fusion coding in metaverse application | Zekun WANG (China Telecom) |
| Tech​nical Specification | Use cases and requirements on immersive audio coding for metaverse applications and services | Marcelo MORENO (Fraunhofer IIS, Germany) |
| ​**TG-Generative Artificial Intelligence in the metaverse** | ​Chair:   * Ms Qiuhong ZHENG​ (China Telecom)   Vice-Chair:   * Ms Liang WANG (ZTE) | ​ | Technical Specification | Framework and requirements for the construction of 3D human driven digital human application system based on image recognition algorithm | Qiuhong ZHENG (China Telecom) Liang WANG (ZTE) |
| Technical Specification  [*Approved at the fourth FG-MV meeting*] | Capabilities and requirements of Generative Artificial Intelligence in metaverse applications and services | Qiuhong ZHENG (China Telecom) Liang WANG (ZTE) |
| Technical Specification | Requirements and framework for extended reality content creation system based on artificial intelligence | Jiaxin WEI (China Unicom)  Liya YUAN (ZTE)  Zehua HU (China Telecom) |
| **TG- Embodied Artificial Intelligence for metaverse** | Chair:   * Ms Xiaoou LIU​ (China Telecom) |  |  |  |  |
| **TG-medical metaverse** | Chair:   * Robin ROWE (Heroic Robots) |  | Technical Report | Medical metaverse: use-case relevant to medical training and hospital | Robin ROWE (Heroic Robots) |
| **TG-metaverse tourism** | Chair:   * Salma ARAFA (UNWTO) |  | Technical Report | Guidelines and use cases on tourism in the metaverse | Salma ARAFA (UNWTO) |
| Technical Report | Use case and requirements for remote amusement service with automatic movable robot (AMR) with multimedia functions on metaverse | Hideki YAMAMOTO (Oki, Japan) |
| **TG-power metaverse** | Chair:   * Mr Jie SONG (State Grid Corporation of China) |  | Technical Report  [*Approved at the third FG-MV meeting*] | Power metaverse: Use Cases Relevant to Grid Side and User Side | Jie SONG (State Grid Corporation of China) |
| Technical Specification | Guidelines for metaverse application in energy power | Dong WANG (State Grid Corporation of China) |
| **TG-Industrial metaverse** | Chair:   * Mr Julien MAISONNEUVE (Nokia, Finland) |  | Technical Report | Landscape and Use cases for the Industrial metaverse | Julien MAISONNEUVE (Nokia, Finland) |
| **​​WG 3** ​ | **​​Architecture & Infrastructure** | ​​ Chair:   * Mr Hideki YAMAMOTO (OKI, Japan)   Vice-Chairs:   * Ms Yuan ZHANG (China Telecom, China) * ​Mr Wilmer Azurza Neyra (Ministry of Transport and Communications of the Administration, Peru) | * ​​Infrastructure-related issues including use cases, requirements, technical solutions, capabilities for supporting of metaverse platforms and services (e.g., Cloud and edge computing infra, networking infra, blockchain infra, etc.) * Architectures, their functionalities, interfaces, intelligent management mechanisms, connectivity technologies, APIs, and QoS/QoE, performance, minimum requirements for infrastructure requirements, etc. | Technical Report | Requirements and challenge associated with network infrastructure to enable the metaverse | Meiling DAI, Jingwen LI, Xingyu SHANG, Xiaoou LIU (China Telecom, China) |
| Technical Specification | Requirements and reference framework of IoT-based metaverse service | Yi XIE, Jie CHENG, Minshi CHEN, Yue WANG (China Mobile, China) Chao MA, Ye SUN (CAICT, China), |
| Technical Specification | Reference architecture of industrial metaverse | Cheng CHI , Zihang YIN, Can LUO (CAICT, China) |
| Technical Specification | Settin​g the framework for an ICT architecture to enable the metaverse | Sophia PAPATHANASOPOULOU (General Secretariat of Telecommunications and Post of the Ministry of Digital Governance, Greece)  Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| Technical Specification | Multimedia aspect of metaverse architecture | Hideki YAMAMOTO (OKI, Japan) |
| **WG 4** | **Virtual/Real World Integration** | Chair:   * ​​Ms Shane HE (Nokia, Finland) | * Interoperable technologies, including use cases and requirements, to enable the integration of virtual world with real world, and to enable the convergence between virtual world and real world (e.g., Mechanisms for synchronization) * Structured data models for virtual and real worlds mapping * Applications and services integration between virtual and real worlds | Technical Specification | Use cases and requirements for the metaverse based on digital twins enabling integration of virtual and physical worlds​ | Changkyu LEE (ETRI, Korea (Republic of)) |
| Technical Specification | Reference model for the metaverse based on a digital twin enabling integration of virtual and physical worlds | Haksuh KIM (ETRI, Korea (Republic of)) |
| **WG ​5** | **Interoperability** | Chair:   * ​​Mr Hideo IMANAKA (NICT, Japan)   Vice-Chair:   * Mr Wook HYUN (ETRI, Korea (Republic of)) | * ​Use cases and requirements for cross-platform interoperability * Functional enablers for interoperability of services and applications * Functional architecture and interfaces for cross-platform interoperability * Interfaces amongst platform, users and devices | Technical Specification  [*Approved at the fourth FG-MV meeting*] | Service scenarios and high-level requirements for metaverse cross-platform interoperability | Jungha HONG (ETRI, Korea (Republic of))  Wook HYUN (ETRI, Korea (Republic of))  MiYoung HUH (ETRI, Korea (Republic of))  Xiaojun MU (China Unicom) |
| Technical Specification | High-level interoperability architecture for cross-platform metaverse | Wook HYUN (ETRI, Korea (Republic of))  Xiongwei JIA (China Unicom) |
| Technical Specification | Interoperability of identity of things across metaverses | Xiongwei JIA (China Unicom) |
| **​​​​​W​G 6​** | **​​Security, Data & PII Protection** | ​​ Chair:   * ​​Mr Vincent AFFLECK (United Kingdom)   Vice-Chairs:   * Ms Naying HU (CAICT, China) * Ms Radia FUNNA (Build n Blaze) * Ms Hlekiwe KACHALI (UNICEF) * Mr Bhanujeet CHOUDHARY (XRSI) | * ​​​Use cases and requirements related to security and PII protection aspects * Security of networks and technology underpinning the metaverse platform, including cybersecurity and identity management * Building confidence and security including Personally identifiable information (PII) protection-related aspects plus preventing online and offline harm and considering ethical issues and standards * Consider the issues on trustworthiness related to the metaverse * Child online protection * Data ownership and protection * Digital asset ownership |  |  |  |
| **TG-cybersecurity** | Co-Chairs:   * Mr Christian ALVAREZ (UNICEF) * Ms Hanna LINDERSTÅL (EARHART Business protection agency) ​ |  | Technical Specification | Data management and security for things across metaverses | Xiongwei JIA (China Unicom) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Cyber risks, threats, and harms in the metaverse | Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia)  Hussain ALDAWOOD (NEOM, Kingdom of Saudi Arabia) |
| Technical Specification | Security framework for the metaverse architecture | Sarah ABANUMAY (National Cybersecurity Authority (NCA), Kingdom of Saudi Arabia)  Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specification | Identity management Security guidelines in the metaverse | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specification | Guidelines for security management of using metaverse applications | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specification | Asset management Security guidelines for owners within the metaverse | Aljawharah Alsalem (NCA, Kingdom of Saudi Arabia)  Betania ALLO (NEOM, Kingdom of Saudi Arabia) |
| **TG-building confidence and security in the metaverse** | Chair:   * Ms Radia FUNNA (Build n Blaze) |  | Technical Report  [*Approved at the third FG-MV meeting*] | Guidelines for consideration of ethical issues in standards that build confidence and security in the metaverse | Radia FUNNA (Build n Blaze)  Gayoung PARK  (The State University of New York, Korea (Korea, (Republic of)) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Embedding safety standards and the user control of Personally Identifiable Information (PII) in the development of the metaverse | Jan EISSFELDT (Wikimedia Foundation) Sarah Nicole  (Project Liberty Institute)  Neha VIJAY (Radix) |
| Technical Report | Considering online and offline implications in efforts to build confidence and security in the metaverse | Radia FUNNA (Build n Blaze) Araba Sey (Research ICT Africa, South Africa) Wendy Teresa Goico Campagna (Permanent Mission of the Dominican Republic to the United Nations and Other International Organizations in Geneva) |
| **TG-child online protection** | Chair:   * Mr Muhammad Khurram KHAN (King Saud University, Kingdom of Saudi Arabia) |  | Technical Report  [*Approved at the fourth FG-MV meeting*] | Responsible use of AI for child protection in the metaverse | Muhammad Khurram KHAN (King Saud University, Kingdom of Saudi Arabia)  Zaheema IQBAL (Global Foundation for Cyber Studies and Research)  Paul GRAINGER (University College London)  Farhan KHAN (Metaronical) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Children age verification in the metaverse | Yazeed ALABDULKARI Muath ALDUHISHY Bushra ALAHMADI Louai ALARABI  (SITE, Kingdom of Saudi Arabia) |
| Technical Report | Extended reality and children: key issues and recommendations for government stakeholders, including policymakers and regulators, and technology companies | Afrooz Kaviani JOHNSON  Steven VOSLOO Hlekiwe KACHALI (UNICEF) |
| ​**TG-issues on trustworthiness related to the metaverse** | ​Chair:   * Mr Gyu Myoung LEE (KAIST)​ | ​ | ​Technical Report | ​Trustworthy metaverse | ​ Gyu Myoung LEE (KAIST)  Woojoo PARK (ETRI (Republic of))  Xiaojia SONG (China Mobile)  Xiongwei JIA (China Unicom) |
| ​ Technical Report | The framework of building a trustworthy digital human | Naying HU (CAICT, China)  Sumin GUO (Beijing Normal University, China) |
| Technical Report | Guidelines on trusted data use in building a trustworthy metaverse | Xiaoshuang JIA Xiaomi AN  Jinfa Li  (Renmin University of China)  Gyu Myoung LEE  (KAIST)  Meijie ZHANG  (Beijing Wuzi University) |
| **WG 7** | **Economic, regulatory & competition aspects** | Co-Chairs:   * ​​Mr Andrey PEREZ (Anatel, Brazil) * Mr Okan GERAY (Digital Dubai, UAE)   Vice-Chair:   * ​Mr Ahmed SAID (Egypt) | * Economic aspects and competition * Metaverse value chain: main agents' role and interactions * Impacts on revenues and investments, with a focus on the telecom sector * Main competitive dynamics: scale and scope economies * Metaverse potential market failures and regulatory remedies * Public sector value models | Technical Specification | Economic value creation and competition in metaverse | Okan GERAY (Digital Dubai, UAE) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Regulatory and economic aspects in the metaverse: Data protection-related | Ahmed SAID (MCIT, Egypt)  Hedaia NABIL (MCIT, Egypt) |
| Technical Report  [*Approved at the third FG-MV meeting*] | Policy and regulation challenges of the metaverse | Andrey PEREZ (Anatel, Brazil) Okan GERAY (Digital Dubai, UAE) |
| **​WG 8​**  ​ | **Sustainability, Accessibility & Inclusion​** | Co-Chairs:   * ​Ms Nevine TEWFIK (Egypt) * Ms Pilar ORERO (UAB, Spain)   ​Vice-Chairs:   * Mr Manuel BARREIRO (Aston Group, Mexico) * Ms Christina Yan ZHANG (The Metaverse Institute) * Mr Khaled KOUBAA (Medeverse) | * Impact on the climate changes (e.g., Green and low carbon issues, etc.) * Environmental Sustainability related issues * Accessibility related issues * ​Social considerations * Diversity, equity and inclusion​ * Circular economy related issues |  |  |  |
| **TG-sustainability** | Chair:   * ​ Ms Shuguang QI (CAICT, China)​ | * Use cases, requirements, and technical solutions related to climate changes and environmental sustainability | Technical Specification | Guidance on green and low carbon development of metaverse | Shuguang QI (CAICT, China) |
| Technical Specification | Methodology on assessment of GHG emissions of metaverse | Shuguang QI, Mengdi WANG (CAICT, China)  Jean Manuel CANET (Orange) |
| **TG-accessibility & inclusion** | ​Co-Chairs:   * Ms Paola CECCHI-DIMEGLIO (Harvard University) * Mr Yong Jick LEE (Center for Accessible ICT, Korea (Republic of))   ​ | * Use cases, requirements, and technical solutions related to accessibility | Technical Specification  [*Approved at the fourth FG-MV meeting*] | Accessibility requirements for metaverse services supporting IoT | Yong Jick LEE (Center for Accessible ICT, Korea (Republic of))  Hark SOHN (SCE Korea, Inc., Korea (Republic of))  Jee-In KIM (Konkuk University, Korea (Republic of)) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Guidelines and requirements on interpreting in the metaverse | Binhua WANG (University of Leeds)  Yong Jick LEE (Center for Accessible ICT, Rep. of Korea)  Fei GAO (Chongqing University of Posts and Communications)  Lihong PAN (University of Leeds) |
| Technical Report  [*Approved at the third FG-MV meeting*] | Guidelines to assess inclusion and accessibility in metaverse standards development | Gayoung PARK (The State University of New York, Korea (Republic of))  Neal DREAMSON (The State University of New York, Korea (Republic of)) |
| Technical Specification  [*Approved at the third FG-MV meeting*] | Requirements of accessible products and services in the metaverse: Part I – System design perspective | Estella ONCINS (UAB, Spain)  Carlo EUGENI (University of Leeds)  Anna Matamala (UAB, Spain) |
| Technical Specification  [*Approved at the third FG-MV meeting*] | Requirements of accessible products and services in the metaverse: Part II – User perspective | Estella ONCINS (UAB, Spain)  Carlo EUGENI (University of Leeds)  Anna Matamala (UAB, Spain) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Accessibility for a sustainable metaverse | Sarah Anne MCDONAGH (UAB, Spain) |
| Technical Report  [*Approved at the fourth FG-MV meeting*] | Guidance on how to build a metaverse for all: Part I – Legal framework | Christina Yan ZHANG (The Metaverse Institute)  Pilar ORERO (UAB, Spain) |
| Technical Report | Guidance on how to build a metaverse for all: Part II | Christina Yan ZHANG (The Metaverse Institute)  Pilar ORERO (UAB, Spain) |
| Technical Specification | Use of metaverse as a mitigation strategy for people with cognitive development difficulties in flood regions | Ashwini SATHNUR (Zero Hunger Champion) |
| Technical Specification | Requirements for communication between human-avatar languages in the metaverse | Pilar PRERO (UAB, Spain) Rahel LUDER, Louis AMARA (SwissTxt) |
| **TG-sustainable metaverse design​** | Chair:   * Ms Daniela TULONE (CNIT, Italy) |  | Technical Specification  [*Approved at the third FG-MV meeting*] | Design criteria and technical requirements for sustainable metaverse ecosystems | Daniela TULONE (CNIT, Italy)  Antonio PULIAFITO (CINI, Italy)  Gustavo MARFIA (University of Bologna, Italy) |
| Technical Specification | Incentive strategies to boost high-impact sustainable metaverse applications | Daniela TULONE (CNIT, Italy)  Antonio PULIAFITO (CINI, Italy)  Gustavo MARFIA (University of Bologna, Italy) |
| Technical Specification | Metrics and indicators to drive the design of sustainable metaverse applications | Daniela TULONE (CNIT, Italy)  Antonio PULIAFITO (CINI, Italy)  Gustavo MARFIA (University of Bologna, Italy) |
| **TG-metaverse social safety** | Chair:   * Ms Gabrielle PANTERA (Heroic Robots) |  | Technical Report | Metaverse social safety: mitigating harassment in the metaverse | Gabrielle PANTERA (Heroic Robots) |
| **WG9** | **Collaboration** | Co-Chairs:   * ​​Ms Stella KIPSAITA (Communications Authority, Kenya) * Mr Ziqin SANG (CICT, China) | * Promote more active collaboration with other SDOs by setting up a close liaison relationship, including the appointment of an FG-MV liaison rapporteur to other relevant SDOs * Focal point on collaboration issues, including coordination of incoming and outgoing Liaison Statements in FG-MV * Develop deliverable on gap analysis, in collaboration with other SDOs * Develop deliverable on standardization roadmap on metaverse, in collaboration with other SDOs * Other collaboration-related issues of FG-MV | Technical Report | Standardization roadmap for metaverse | Ziqin SANG (CICT, China)  Hao WU (CICT, China) |
| **TG-gap analysis** | Co-Chairs:   * ​​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece) * Ms Jungha HONG (ETRI, Korea (Republic of))​ |  | Technical ​Report | Gap analysis on metaverse standardization | Leonidas ANTHOPOULOS (University of Thessaly, Greece)  Jungha HONG (ETRI, Korea (Republic of))​ |

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