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| Title: ITU logo | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATION STANDARDIZATION SECTOR**STUDY PERIOD 2022-2024 | TSAG-TD198 |
| TSAG |
| **Original: English** |
| **Question(s):** | N/A | Geneva, 30 May - 2 June 2023 |
| **TD(Ref:** [FG-MV-LS3](http://handle.itu.int/11.1002/ls/sp17-fg-mv-oLS-00003.docx)**)** |
| **Source:** | FG-MV |
| **Title:** | LS/i on Progress report of the Focus Group on metaverse (FG-MV) to TSAG (updates from December 2022 to May 2023) [from FG-MV] |
| **LIAISON STATEMENT** |
| **For action to:** | - |
| **For information to:** | TSAG |
| **Approval:** | ITU-T Focus Group on metaverse Management Team (22 May 2023 by correspondence) |
| **Deadline:** | N/A |
| **Contact:** | Shin-Gak Kang ETRI Rep. of Korea | Email: 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-00003.docx>.

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| A black and white logo  Description automatically generated with low confidence | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATION** **STANDARDIZATION SECTOR**STUDY PERIOD 2022-2024 | **FG-MV-LS3** |
| **Focus Group on metaverse** |
| **Original: English** |
| **WG(s):** | N/A |   |
| **LIAISON STATEMENT** |
| **Source:** | Chairmen, FG-MV |
| **Title:** | LS on Progress report of the Focus Group on metaverse (FG-MV) to TSAG (updates from December 2022 to May 2023) |
| **LIAISON STATEMENT** |
| **For action to:** | - |
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| **Approval:** | ITU-T Focus Group on metaverse Management Team (22 May 2023 by correspondence) |
| **Deadline:** | N/A |
| **Contact:** | Shin-Gak KangETRIRep. of Korea | Email: sgkang@etri.re.kr  |

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| **Abstract:** | This document contains the progress report of FG-MV with updates from December 2022 to May 2023 period. TSAG is invited to note this progress report. |

## 1 Introduction

The [ITU-T Focus Group on metaverse (FG-MV)](http://www.itu.int/go/fgmv) was established by TSAG in December 2022.

The objectives of FG-MV, as per the Terms of Reference (ToR, ref. [TSAG-TD164](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T22-TSAG-221212-TD-GEN-0164)), are:

* To study terminology, concepts, vision and ecosystem.
* To identify and study the enabling technologies, their evolution and key tasks for standardization purposes, including multimedia, network optimization, connectivity, interoperability of services and applications, security, protection of personally identifiable information, quality (including bandwidth), digital assets (e.g., digital currencies), IoT, accessibility, digital twin and environmental sustainability.
* To study and gather information to develop a pre-standardization roadmap.
* To build a community of experts and practitioners to unify the concepts, develop common understandings, so that it be benefiting not only the ITU standardization scene but also the global community.
* To identify stakeholders with whom ITU-T could collaborate and establish liaisons and relationships with other organisations that could contribute to the pre-standardisation activities and identify potential collective action and specific next steps.
* To stimulate international collaboration, to share knowledge and best practices, and to explore the opportunities and challenges related to interoperability.
* To provide a platform to share findings and for dialogue on economic, policy and regulatory implications of metaverse related to telecommunication/ICT.

## 2 Focus Group leadership, structure, deliverables and timeline

As of December 2022, the FG-MV management team is composed of one Chairman and six Vice-chairmen appointed by TSAG:

* 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)

and five additional Vice-chairmen appointed by the FG-MV at the first FG-MV meeting:

* 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))

FG-MV established eight working groups and a series of task groups with chairmanships as follows:

* Task Group on Collaboration under the Chairmanship of Ms Cristina Martinez (European Commission) and the Vice-chairmanship of ​​Ms Stella Kipsaita (Communications Authority, Kenya)
* Working Group 1 (WG1): General under the Chairmanship of Mr Leonidas Anthopoulos (University of Thessaly, Greece) and the Vice-chairmanship of Mr Younghwan Choi (ETRI, Rep. of Korea)
	+ Task Group on Terminology & Definitions under the Chairmanship of ​​Ms Xiaomi An (Renmin University of China, Ch​ina)
	+ Task Group on Gap Analysis under the Chairmanship of Mr Leonidas Anthopoulos (University of Thessaly, Greece)
	+ Task Group on implications of people in the metaverse under the Chairmanship of Ms Radia Funna (Build n Blaze)\*\*
* Working Group 2 (WG2): Applications & Services​ under the Chairmanship of Mr Yuntao Wang (China) and the Vice-chairmanship of Mr Ismael Arribas (Spain) and Mr James Kunle Olorundare (Nigeria)
	+ Task Group on Media Coding under the Co-chairmanship of ​Mr Zekun Wang (China Telecom, China) and Mr Marcelo Moreno (Fraunhofer IIS, Germany)
	+ Task Group on Artificial Intelligence Generated Content (AIGC)\*\*
* Working Group 3 (WG3): ​​Architecture & Infrastructure under the Chairmanship of Mr Hideki Yamamoto (OKI, Japan) and the Vice-chairmanship of Ms Yuan Zhang (China Telecom, China) and Mr Wilmer Azurza Neyra (Ministry of Transport and Communications of the Administration, Peru)
* Working Group 4 (WG4): Virtual/Real World Integration under the Chairmanship of Ms Shane He (Nokia, Finland)
* Working Group 5 (WG5): Interoperability under the Chairmanship of ​​Mr Hideo Imanaka (NICT, Japan) and the Vice-chairmanship of Mr Wook Hyun (ETRI, Rep. of Korea)
* Working Group 6 (WG6): Security, Data & Personally identifiable information (PII)​ Protection under the Co-chairmanship of ​​Mr Vincent Affleck (United Kingdom) and Ms Kavya Pearlman (XRSI)\*, and the Vice-chairmanship of Ms Naying Hu (CAICT, China), Ms Radia Funna (Build n Blaze) and Ms Hlekiwe Kachali (UNICEF)\*.
	+ Task Group on Child Online Protection under the Chairmanship of Mr Muhammad Khurram (King Saud University, Kingdom of Saudi Arabia)
	+ Task Group on Cybersecurity under the Co-chairmanship of Christian Alvarez (UNICEF)\* and Hanna Linderstål (EARHART Business protection agency)\*
	+ Task Group on Building confidence and security in the metaverse under the Chairmanship of Ms Radia Funna (Build n Blaze)\*
	+ Task Group on Child Online Protection under the Chairmanship of Mr Muhammad Khurram (King Saud University, Kingdom of Saudi Arabia)
	+ Task Group on issues on trustworthiness related to the metaverse under the Chairmanship of Mr Gyu Myoung Lee (KAIST)\*
* Working Group 7 (WG7): Economic, regulatory & competition aspects under the Co-chairmanship of ​​Mr Andrey Perez (Anatel, Brazil) and Mr Okan Geray (Digital Dubai, UAE) and the Vice-chairmanship of Mr Ahmed Said (Egypt).
* Working Group 8 (WG8): Sustainability, Accessibility & Inclusion​ under the Co-chairmanship of Ms Nevine Tewfik (Egypt) and Ms Pilar Orero (Universitat Autònoma de Barcelona)\* and the Vice-chairmanship of Mr Manuel Barreiro (Aston Group, Mexico), Ms Christina Yan Zhang (The Metaverse Institute) and Mr Khaled Koubaa (Medeverse)
	+ Task Group on Sustainability under the Chairmanship of ​ Ms Shuguang Qi (CAICT, China)​
	+ Task Group on Accessibility & Inclusion under the Chairmanship of Ms Pilar Orero (Universitat Autònoma de Barcelona, Spain)\*.

Annex A summarizes the Focus Group structure and deliverables under development in an overview with more details including the list of editors, and the list of the proposed deliverables (approved during the first meeting of the FG-MV).

**2.1 Interim Activities of the Working Groups and Task Groups**

The table below provides information on the interim activities carried out by the 8 Working Groups and the Task Group on Collaboration since the first meeting of FG-MV concluded on 9 March 2023. It also lists the deliverables that are currently being developed.

**Table 1 - Interim Activities of the Working Groups and Task Groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WG/TG** | **Leadership positions** | **No. of meetings** | **Total no. of input documents** | **Draft deliverables** |
| [**Task Group**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Task%20Group.aspx)**- Collaboration** | Chairman:* Ms Cristina MARTINEZ (European Commission)

Vice-chairman:* Ms Stella KIPSAITA (Communications Authority, Kenya)
 | 1 | 4 | * Deliverable on Pre-standardisation roadmap for an inclusive and sustainable CitiVerse\*\*
 |
| [**Working ​Group 1**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-1.aspx) - General | Chairman:* Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)

Vice-chairman:* Mr Younghwan CHOI (ETRI, Rep. of Korea)
 | 1 | 8 | * Deliverable on Exploring the metaverse: opportunities and challenges\*\*
* Deliverable on Metaverse overview
 |
| **​Task Group -terminology & definitions** | Chairman:* ​​Ms Xiaomi AN (Renmin University, Ch​ina)
 |  |  | * Deliverable on Principles and Processes for Building Concepts and Definitions Related to Metaverse\*\*
* Deliverable on Metaverse: an analysis of definitions
* Deliverable on Vocabulary for Metaverse
 |
| **Task Group -gap analysis** | Chairman:* ​​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)
 |  |  | * Deliverable on Gap analysis on metaverse standardization
 |
| **Task Group -implications of people in the metaverse\*** | Chairman:* Ms Radia FUNNA (Build n Blaze)\*
 |  |  | * Deliverable on Near-term and Long-term Implications of People in the Metaverse\*\*
 |
| [**Working Group 2**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-2.aspx) - Applications & Services | Chairman:* Mr Yuntao WANG (CAICT, China)

Vice-chairmen: ​* Mr Ismael ARRIBAS (Spain)
* Mr James Kunle OLORUNDARE (Nigeria)
 | 1 | 6 | * Deliverable on Framework and requirements for the construction of 3D manual driven digital human application system based on image\*\* recognition algorithm
* Deliverable on Use cases for Power Metaverse
* Deliverable on Mapping of physical spaces virtually to inform the development of tourism-related infrastructure projects\*\*
* Deliverable on Guidelines for metaverse application in energy power
 |
| **Task Group - media coding** | Co-chairmen:* Mr Zekun WANG, (China Telecom)
* Mr Marcelo MORENO, (Fraunhofer IIS, Germany)
 | 2 | 4 | * Deliverable on Use cases and requirements for virtual and real fusion coding in metaverse applications
 |
| **Task Group – Artificial Intelligence Generated Content\***  |  |  |  |  |
| [**Working Group 3**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-3.aspx) - Architecture & Infrastructure | Chairman:* Mr Hideki Yamamoto (OKI, Japan)

Vice-chairmen:* Ms Yuan ZHANG (China Telecom, China)
* Mr Wilmer Azurza Neyra (Ministry of Transport and Communications of the Administration, Peru)
 | 4 | 17 | * Deliverable on Requirements and challenge associated with network infrastructure to enable the metaverse
* Deliverable on Requirements and functional architecture of IoT- based metaverse service
* Deliverable on Reference architecture of industrial metaverse
* Deliverable on Setting the framework for an ICT architecture to enable the metaverse
 |
| [**Working Group 4**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-4.aspx) - Virtual/Real World Integration | Chairman:* ​​Ms Shane HE (Nokia, Finland)
 | 1 | 3 | * Deliverable on Use cases and requirements for the metaverse based on digital twins enabling integration of virtual and physical worlds
 |
| [**Working Group 5**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-5.aspx) - Interoperability | Chairman:* Mr Hideo IMANAKA (NICT, Japan)

Vice-chairman:* Mr Wook HYUN (ETRI, Rep. of Korea)
 | 2 | 14 | * Deliverable on Use cases and service requirements for metaverse cross-platform interoperability
* Deliverable on Interoperability and migration of identity of things across metaverses
 |
| [**Working Group 6**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-6.aspx) - Security, Data & Personally identifiable information (PII) Protection | Co-chairmen:* Mr Vincent AFFLECK (United Kingdom) [Vice-chairman of FG-MV]
* Ms Kavya Pearlman (XRSI)\*

Vice-chairmen:* Ms Naying HU (CAICT, China)
* Ms Radia FUNNA (Build n Blaze)
* Ms Hlekiwe Kachali (UNICEF)\*
 | 1 | 12 |  |
| **Task Group - cybersecurity** | Co-chairmen* Mr Christian Alvarez (UNICEF)\*
* Ms Hanna Linderstål (EARHART)\*
 |  |  | * Deliverable on Requirements and Framework for Digital Identity System
* Deliverable on Data management and security for things across metaverses
 |
| **Task Group - building confidence and security in the metaverse** | Chairman* Ms Radia FUNNA (Build n Blaze)\*
 | 1 | 3 | Deliverable on Risks, threats and potential harms in the metaverse  |
| **Task Group - child online protection** | Chairman* Mr Muhammad Khurram (King Saud University, Kingdom of Saudi Arabia)
 | 1 | 3 | * Deliverable on Responsible use of AI for child protection in the metaverse\*\*
* Deliverable on Children age verification in the metaverse\*\*
 |
| **Task Group - issues on trustworthiness related to the metaverse ​** | Chairman* Mr Gyu Myoung Lee (KAIST)\*
 | 1 |  |  |
| [**Working Group 7**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-7.aspx) - Economic, regulatory & competition aspects | Co-chairmen:* Mr Andrey PEREZ (Anatel, Brazil)
* Mr Okan GERAY (Digital Dubai, UAE)

Vice-chairman:* Mr Ahmed SAID (Egypt)
 | 1 | 4 | * Deliverable on Regulatory Aspects in the Metaverse: Data and Economic-Related\*\*
* Deliverable on Defining the business ecosystem and the value sources of metaverse
 |
| [**Working Group 8**](https://extranet.itu.int/sites/itu-t/focusgroups/mv/wg/SitePages/Working-Group-8.aspx) - Sustainability, Accessibility & Inclusion ​ | Co-chairmen:* ​Ms Nevine TEWFIK (Egypt)
* Ms Pilar ORERO (UAB, Spain) \*

​Vice-chairmen:* Mr Manuel BARREIRO, (Aston Group, Mexico)
* Ms Christina Yan ZHANG, (The Metaverse Institute)
* Mr Khaled KOUBAA, (Medeverse)
 | 1 | 8 | * Deliverable on Accessibility requirements for metaverse services supporting IoT\*\*
* Deliverable on Guidelines to evaluate metaverse-based learning platforms for the SDG values of equity, inclusion and quality education through digital transformation\*\*
 |
| **Task Group - sustainability** | Chairman:* Ms Shuguang QI (CAICT, China)​
 | 1 | 2 | * Deliverable on Guidance on green and low Carbon development of Metaverse
 |
| **Task Group - accessibility & inclusion** | Chairman:* Ms Pilar ORERO (UAB, Spain) \*
 | 1 | 1 |  |

**3 Summary of meetings and participation**

FG-MV was established for an initial lifetime of 12 months from its first meeting (March 2023 to March 2024). Since its establishment, FG-MV has held its first meeting and has achieved key agreements on its structure and leadership, as well as making progress on its tasks and deliverables and it has also collaborated with related groups on metaverse-related topics. The meeting was announced via the TSB Circular, the Focus Group website and the FG-MV mailing list. Remote participation was offered for the meeting.

The summary of meetings is in Table 2, below.

**Table - Summary of FG-MV meeting and its participation as of May 2023**

|  |  |
| --- | --- |
|  | **Riyadh, 8–9 March 2023** |
| **Host** | National Cybersecurity Authority (NCA), Kingdom of Saudi Arabia |
| **Contributions** | 41 |
| **Administrative (from TSB and FG-MV Management Team)** | 14 |
| **Incoming Liaison Statements** | 2 |
| **Outgoing Liaison Statements** | 2 |
| **Meeting report** | [FGMV-O-006-R2](https://extranet.itu.int/sites/itu-t/focusgroups/mv/output/FGMV-O-006-R2.docx) |
| **Total participants** | 656 |

## 3.1 Future meetings

The next FG-MV meeting will take place from 4–6 July 2023, followed by a Forum to take place on 7 July 2023 in Shanghai, China.

Future FG-MV meetings are tentatively planned to take place from 3–5 October 2023, in Geneva, and 4–6 December 2023, followed by a Forum to take place on 7 December 2023 in Queretaro, Mexico.

Two special sessions on FG-MV are scheduled for 12 September 2023, in Arusha (Tanzania), and for 18 October 2023, in Riga (Latvia).

Remote participation will be offered for all meetings.

**4 Summary of other activities**

In addition to FG-MV meetings, a forum and a webinar were organized in 2023 to promote wider participation of metaverse experts in FG-MV and solicit more contributions to advance work on FG deliverables. In addition, an Executive briefing on the metaverse was co-published by ITU and the United Nations World Tourism Organization (UNWTO).

* ITU and NCA co-organized the [first ITU Forum on Embracing the metaverse](https://www.itu.int/en/ITU-T/ssc/Pages/1st-forum-metaverse.aspx), which took place on 7 March 2023, in Riyadh, Kingdom of Saudi Arabia. The forum was organized as a physical event with remote participation. The presentations, outcome document and video highlights of the forum can be found [here](https://www.itu.int/en/ITU-T/ssc/Pages/1st-forum-metaverse.aspx).
* Mr. Shin-Gak Kang, Chairman of the ITU-T FG-MV, provided an overview of the Focus Group activities at the side meeting on metaverse of 116th IETF meeting that was held in Yokohama, Japan, on 30 March 2023.
* Mr. Hideo Imanaka, Vice-chairman of the ITU-T FG-MV, provided an overview of the Focus Group activities at the ASTAP industry workshop which was held as a part of 25th APT Standard Program (ASTAP) in Bangkok, Thailand, 17 April 2023. Mr. Seizo Onoe, Director, Telecommunication Standardization Bureau, ITU, also participated in the ASTAP industry workshop.
* Mr. Shin-Gak Kang, Chairman of the ITU-T FG-MV, provided an overview of the Focus Group activities at the [23rd meeting of the Global Standards Collaboration (GSC)](https://www.itu.int/en/ITU-T/gsc/23/Pages/default.aspx) that was hosted by ETSI, in London, 26-27 April 2023.
* Mr. Wilmer Azurza Neyra, Vice-chairman of WG3 “Architecture and Infrastructure”, presented an informative document containing an executive summary of the progress of the FG-MV to the Working Group on the Deployment of Technologies and Services of the Inter-American Telecommunications Commission (CITEL) in the Americas region on 27 April 2023.
* ITU, together with Saudi Arabia, jointly organized the [STI Forum 2023 “Side Event – Leveraging the metaverse in cities to achieve the SDGs”](https://www.itu.int/cities/standards4dt/ep25/) virtually on 4 May 2023, as part of ITU’s [Digital Transformation Webinar Series](https://www.itu.int/cities/standards4dt/) and the 8th UN Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals.
* ​​​​​​​The [ITU-UNWTO Executive briefing](https://www.itu.int/en/publications/Documents/tsb/2023-Executive-briefing-on-the-metaverse/index.html#p=1) on the metaverse was published in May 2023, and was contributed and reviewed by more than 40 experts from the FG-MV management team. The Executive briefing can be found [here](https://www.itu.int/metaverse).
* A new ITU webpage dedicated to ITU’s activities on metaverse has been created and is available at: [www.itu.int/metaverse](http://www.itu.int/metaverse).
* Mr. Shin-Gak Kang, Chairman of the ITU-T FG-MV, provided an overview of the Focus Group activities at the [ITU forum on "Future Networks"](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2023/Tashkent-FN.aspx) that took place from 23-25 May 2023, in Tashkent, Uzbekistan.
* Mr. Seizo Onoe, Director, Telecommunication Standardization Bureau, ITU will deliver a keynote speech during the forthcoming Global Symposium for Regulators which will have a session on metaverse.

A series of activities on metaverse are planned for 2023.

* The second ITU Forum on “Creating a metaverse for all through international standards” will take place on 7 July 2023, in Shanghai, China.
* Episode #32 on “Fashioning” the Metaverse to Accelerate Digital Transformation: What has gone out of style?” will take place on 2 October 2023, as part of the ITU’s [Digital Transformation Webinar Series](https://www.itu.int/cities/standards4dt/).

## 5 Relationships

As an open and collaborative platform on the pre-standardization aspects of metaverse, FG-MV has established liaison relationships with the following relevant groups: ITU-T Study Groups SG2, SG3, SG5, SG9, SG11, SG12, SG13, SG15, SG16, SG17 and SG20, TSAG, ITU-R Study Groups SG5 and SG6, ITU-D Study Groups SG1 and SG2, IEC SEG15, IEC TC57, IEC TC65, IEC TC79, IEC TC85, IEC TC100, ISO TC68, ISO TC69, ISO TC133, ISO TC184, ISO TC 307, ISO/IEC JTC1 SC24, ISO/IEC JTC1 SC27, ISO/IEC JTC1 SC29, ISO/IEC JTC1 SC38, ISO/IEC JTC1 SC41, ISO/IEC JTC1 SC43, IEEE SA, W3C, IETF, ETSI ISG-ARF, 3GPP SA1, 3GPP SA4, IPv6 Forum, Broadband Forum, TMForum, ISO/IEC JTC 1 SC42, INATBA, ITU IRG AVA, ETSI TC Cyber, ISO/IEC JTC1 SC35, World Metaverse Council, Metaverse Standards Forum, Open Metaverse Foundation, Digital Twin Consortium, VRM consortium, and IOWN Global Forum.

The first FG-MV meeting reviewed incoming Liaison Statements from ITU-T SG20 and the external group (IPv6 Forum).

FG-MV has taken note of the ongoing metaverse-related standardization activities and work items across ITU-T Study Groups and external groups, and has been sending outgoing Liaison Statements to all its liaison groups.

**6 Conclusion and action for TSAG**

FG-MV will advance its deliverables and report its progress to the next TSAG meeting.

TSAG is invited to note this progress report.

# Annex A – FG-MV structure and list of deliverables (as approved on 9 March 2023 during the 1st FG-MV meeting)

| **FG/ ​​WGs​** | **Subgroup** | **Leadership positions** | **ToR** | **Type** | **Title of deliverable** | **Editors​** |
| --- | --- | --- | --- | --- | --- | --- |
| **​ FG​​** | **metavers​e** |   |   | Template | Use case template | Wook HYUN (ETRI, Korea (Republic of)), FG Chairman and WG Chairmen |
| **TG-collaboration** | Chairman:* Ms Cristina MARTINEZ (European Commission)

Vice-chairman:* ​​Ms Stella KIPSAITA (Communications Authority, Kenya)
 | * ​​Collaboration and coordination with other groups inside and outside ITU-T
 |   |  |  |
| **​​WG 1​​** | **General**  | Chairman:* ​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)

Vice-chairman:* ​Mr Younghwan CHOI (ETRI, Rep. of Korea)
 | * ​​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 Specifications | Metaverse overview​ | Younghwan CHOI (ETRI, Korea (Republic of)) |
| **​TG-terminology & definitions** | Chairman:* ​​Ms Xiaomi AN (Renmin University, Ch​ina)
 | * Definition and terminology
 | Technical Specifications | Vocabulary for Metaverse | Xiaomi AN (Renmin, University of China, China) Jie SONG (State Grid Corporation of China) |
| Technical Report | An analysis of definitions | Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| **TG-gap analysis** | Chairman:* ​​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)
 |   | Technical ​Report | Gap analysis on metaverse standardization | Leonidas ANTHOPOULOS (University of Thessaly, Greece)​ |
| **​​WG​ 2** | **Applications & Services​** | Chairman:* Mr Yuntao WANG (CAICT, China)

Vice-chairmen: ​* ​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 Specifications | Use case on power metaverse | Jie SONG (State Grid Corporation of China, China)  |
| Technical Specifications | Guidelines for metaverse application in energy power | Dong WANG (State Grid Corporation of China, China)  |
| **TG-media co​ding** | Co-chairmen:* ​Mr Zekun WANG, (China Telecom)
* Mr Marcelo MORENO, (Fraunhofer IIS, Germany)
 | ​  | Tech​nical Specifications | Use case and requirements for virtual and real fusion coding in metaverse application | Zekun WANG (China Telecom, China) |
| **​​WG 3** ​  | **​​Architecture & Infrastructure** | ​​ Chairman:* Mr Hideki Yamamoto (OKI, Japan)

Vice-chairmen:* 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 | Jingwen LI (China Telecom, China) |
| Technical Specifications | Requirements and functional architecture of IoT- based metaverse service | Chao MA (CAICT, China) |
| Technical Specifications | Reference architecture of industrial metaverse | Cheng CHI (CAICT, China) |
| Technical Specifications | Settin​g the framework for an ICT architecture to enable the metaverse | Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| **WG 4** | **Virtual/Real World Integration** | Chairman:* ​​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 Specifications | Use cases and requirements for the metaverse based on digital twins enabling integration of virtual and physical worlds​ | Sangkeun YOO (ETRI, Korea (Rep. of)) |
| **WG ​5** | **Interoperability** | Chairman:* ​​Mr Hideo IMANAKA (NICT, Japan)

Vice-chairman:* Mr Wook HYUN (ETRI, Rep. of Korea)
 | * ​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 Specifications | Use cases and requirements for metaverse cross-platform interoperability | Jungha HONG (ETRI, Korea (Republic of)) |
| Technical Specifications | Interoperability and migration of identity of things across metaverses | Xiongwei JIA (China Unicom, China) |
| **​​​​​W​G 6​** | **​​Security, Data & Personally identifiable information (PII) Protection** | ​​ Chairman:* ​​Mr Vincent AFFLECK (United Kingdom) [Vice-chairman of FG-MV]

Vice-chairmen:* Ms Naying HU (CAICT, China)
* Ms Radia FUNNA (Build n Blaze)
 | * ​​​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
 | Technical Specifications | Requirements and framework for digital identity system | Jingwen LIU (China Mobile, China) |
| Technical Specifications | Data management and security for things across metaverses | Xiongwei JIA (China Unicom, China) |
| Technical Report | Risks, threats and potential harms in the metaverse | Sarah ABANUMAY (National Cybersecurity Authority (NCA) (Kingdom of Saudi Arabia)) Aljawharah Alsalem (National Cybersecurity Authority (NCA) (Kingdom of Saudi Arabia)) |
| **TG-cybersecurity** |  |   |  |  |  |
| **TG-building confidence and security in the metaverse** |  |  |  |  |  |
| **TG-child online protection** | Chairman* Mr Muhammad Khurram (King Saud University, Kingdom of Saudi Arabia)
 |   |   |   |  |
| ​**TG-issues on trustworthiness related to the metaverse** | ​  | ​ | ​ | ​ | ​ |
| **WG 7** | **Economic, regulatory & competition aspects** | Co-chairmen:* ​​Mr Andrey PEREZ (Anatel, Brazil)
* Mr Okan GERAY (Digital Dubai, UAE)

Vice-chairman:* ​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
 |   |   |   |
| **​WG 8​**​ | **Sustainability, Accessibility & Inclusion​** | Co-chairmen:* ​Ms Nevine TEWFIK (Egypt)

​Vice-chairmen:* 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** | Chairman:* ​ Ms Shuguang QI (CAICT, China)​
 | * Use cases, requirements, and technical solutions related to climate changes and environmental sustainability

  | Technical Specifications | Guidance on green and low carbon development of Metaverse | Shuguang QI (CAICT, China) |
| **TG-accessibility & inclusion** | ​ | * Use cases, requirements, and technical solutions related to accessibility

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