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| A picture containing graphics, logo, font, symbol  Description automatically generated | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | | TSAG-TD480R2 |
| TSAG |
| Original: English |
| **Question(s):** | | N/A | | | Geneva, 22 - 26 January 2024 |
| **TD** | | | | | |
| **Source:** | | Chair, WP2/TSAG | | | |
| **Title:** | | LS/o on metaverse [to all ITU-T SGs] | | | |
| **LIAISON STATEMENT** | | | | | | |
| **For action to:** | | | ITU-T SG2, SG3, SG5, SG9, SG11, SG12, SG13, SG15, SG16, SG17, SG20 | | | |
| **For information to:** | | | - | | | |
| **Approval:** | | | TSAG (26 January 2024) | | | |
| **Deadline:** | | | 25 July 2024 | | | |
| **Contact:** | | Gaëlle Martin-Cocher  InterDigital  Canada | | E-mail: [Gaelle.Martin-Cocher@InterDigital.com](mailto:Gaelle.Martin-Cocher@InterDigital.com) | |

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| **Abstract:** | TSAG agreed to extend the FG-MV’s lifetime until June 2024 and sent for information or allocated the deliverables received by the FG-MV. |

TSAG would like to inform you that it has agreed to extend the lifetime of the Focus Group on metaverse (FG-MV) until June 2024. FG-MV is requested not to initiate any new work and is encouraged to complete its ongoing workplan prioritizing the completion of the gap analysis and standardization roadmap.

TSAG agreed to allocate the deliverables received by the FG-MV as described in the table below.

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| **No.** | **Title** | **Approved** | **Sent as information only or Allocated** | **Summary of the deliverable** |
| [FGMV-01](http://handle.itu.int/11.1002/pub/82047d78-en) | Technical Report on Exploring the metaverse: opportunities and challenges​ | July 2023 | All for information | Summary:  This Technical Report explores the opportunities and challenges, and clarifies the role of international standards and the potential for the metaverse in the achievement of the United Nations Sustainable Development Goals. |
| [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 | All for information | Summary:  This Technical Report contains a detailed gap analysis in literature of “metaverse” definitions with an explained terminology. This Technical Report studied and analysed approximately 150 existing definitions of metaverse from various sources. |
| [FGMV-20](https://www.itu.int/en/ITU-T/focusgroups/mv/Documents/List%20of%20FG-MV%20deliverables/FGMV-20.pdf) | Technical Specification  Definition of metaverse | December 2023 | ITU-T SG16 | Summary:  This Technical Specification provides the definition of the term “metaverse”. It leverages a detailed analysis of 150 existing definitions of metaverse that was undertaken for the development of the ITU Technical Report on “Metaverse: an analysis of definitions”, which was approved at the third meeting of the ITU Focus Group on metaverse (FG-MV), held on 3-5 October 2023 in Geneva, Switzerland. |
| [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 | Summary:  Promoting diversity, equity, and inclusion in metaverse via accessibility implementation requires careful consideration of diverse factors. This Technical Report discusses how to realize the principles on metaverse by articulating accessibility. Values are generated through a mixture of virtual reality, augmented reality, mixed reality, and extended reality. [b-Dreamson and Park]’s empirical study articulates six values: bottom-up, collaboration, authorship, ownership, interconnectivity, and community. This Technical Report investigates and improves upon limitations found in earlier research and practices and validates the United Nations’ Sustainable Development Goal (SDG) principles, along with the six metaverse values for Digital Transformation (Dx) creating new values and cultures. Using these justifications, it explores guidelines for aligning metaverse platforms with the SDGs based on Dx, addressing the user experience dimensions of the platforms: conception, interaction, interface, information, and usability [b-Park a]. Universal design is the process of making a product accessible for everyone, regardless of their physical, sensory, or cognitive abilities. In this sense, metaverse should be inclusive of diverse cultures, languages, and perspectives, and should promote the SDG principles. By proposing guidelines and recommendations, the Technical Report strengthens the argument for articulating accessibility as a means of realizing inclusion in developing metaverse. The outcomes of the report are to articulate the values for metaverse SDGs in terms of digital transformation, to develop a set of guidelines for assessing inclusion and accessibility in metaverse, and to provide strategic and meaningful engagement with platforms towards SDGs. |
| [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 | Summary:  This Technical Specification provides high-level requirements for designers and developers to create an accessible immersive experience in the metaverse. This document considers the common accessibility requirements for the design and development phases of born accessible products and services in the metaverse. The document is related to “Requirements of accessible products and services in the metaverse: Part II – User perspective” and provides common accessibility requirements. |
| [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, and ITU-T SG2 | Summary:  This Technical Specification provides requirements on how to develop an accessible metaverse from a user perspective. This document considers the various metaverse components and the actions that users, regardless of their capabilities, may perform to access the metaverse, create an identity within the metaverse, navigate the metaverse and interact in the metaverse. The document is related to ITU FG-MV Technical Specification on “Requirements of accessible products and services in the metaverse: Part I – System design perspective” and provides requirements on the role of users in creating and assessing accessibility services. |
| [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 | Summary:  As the world becomes increasingly digital, the metaverse is emerging as a new frontier of social and economic interaction; allowing people to create, connect, and collaborate in ways that were previously thought impossible. In its nascent phase of user adoption, this is a timely opportunity to formulate guidelines for meaningful engagement, as well as to help mitigate challenges that continue to afflict the digital platforms that make up its infrastructure and ecosystems.  The need for trust and confidence, cornerstones in any environment necessitating user interaction and participation, is amplified in virtual environments [b-Gefen et al.]. This need takes on increased significance as the participatory nature of the metaverse and vast amounts and increasingly personalized nature of data collected, together usher in a new frontier for user safety and security.  The objective of this Technical Report is to develop a set of guidelines that address ethical aspects in the establishment of standards for engagement within the metaverse.  Given the importance of confidence to user engagement, the report puts forward a user-centric approach by emphasizing principles grounded in the Universal Declaration of Human Rights (UDHR) and the United Nations Sustainable Development Goals (SDGs).  User expectations, especially as they relate to personal safety, are a central component of confidence in navigating the metaverse and other digital platforms. Yet, historically, the reality (as it compares to these expectations) has fallen short, resulting in a discrepancy between anticipated and actual safeguards.  The report will explore user expectations and propose a new framework to define user confidence and how it is expressed in immersive environments. It will also introduce guiding principles to bolster user confidence in navigating metaverse platforms, with a goal of fostering a sense of safety, control, user autonomy, fairness, transparency, and access to adequate information during interactions within immersive spaces.  Where confidence in metaverse environments shares similarities with confidence in existing digital platforms will also be discussed, as will unique considerations introduced by the immersive and comprehensive nature of the metaverse as well as ways in which these can be addressed.  The report will subsequently explore distinct elements necessary for fostering meaningful engagement within the metaverse context.  By centring the user experience in building security and confidence in the metaverse, this Technical Report aims to support efforts to ensure the metaverse evolves in a way that serves its users and their needs, while also adhering to the principles of sustainable development. |
| [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 | Summary:  The transformative potential of the metaverse will require policymakers and regulators to strike the right balance between social, environmental, economic, and legal aspects of the metaverse. To support policy makers and regulators in this important endeavour, this Technical Report looks at the policy and regulatory challenges of the metaverse, including an overview of its key enabling technologies, as well as regional and national approaches to metaverse development.  With around one third of humanity lacking any digital connectivity, a primary policy and regulatory concern for the metaverse remains addressing the digital divide and ensuring an open, accessible, and inclusive metaverse. To be accessible by all, the metaverse will require energy-intensive data centres and communication networks, presenting substantial environmental challenges. Policymakers and regulators will need to address environmental concerns, including from e-waste, while accelerating the adoption of energy efficient metaverse practices enabled by Internet of Things and Digital Twin technologies. Development of standards and interoperability will play a key role in identifying efficiencies, as well as providing a seamless and enjoyable user experience in the metaverse while encouraging market competition.  The immersive nature of the metaverse is expected to generate vast amounts of personally identifiable information, making privacy, security, and trust vital concerns. Similarly, ethical, and human rights considerations will need to be considered to promote responsible behaviour in the metaverse. Policymakers and regulators will need to develop guidelines and frameworks to address these concerns and ensure that the metaverse aligns with societal values.  Lastly, the metaverse offers a unique opportunity for policymakers and regulators to harmonize their policy and regulatory efforts related to the metaverse and its enabling technologies. As whole regions around the world, as well as countries, and cities embrace the potential social and economic benefits of the metaverse, policymakers will need to be sensitive to different adoption and implementation approaches while promoting interoperability. The same applies to metaverse-enabling technologies such as AI, blockchain, and cloud computing. This harmonization will not only ensure that the metaverse develops for the benefit of all users but also accelerates sustainable digital transformation and achievement of the Sustainable Development Goals. |
| [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 and ITU-T SG20 | Summary:  Metaverse holds promises on accelerating progress towards the UN Sustainable Development Goals (SDGs), for instance, in health, biology computation, automotive, aerospace, education, and mitigation of the effects of extreme climate events. However, digital spaces have inherent costs and pose new environmental, social, and economic risks. If not properly governed, the rise of metaverse could amplify adverse environmental consequences inherent to its enabling technologies (e.g., AI, A/R, blockchains, IoT and digital twins) leading to increased CO2-emissions, e-waste, and resource consumption, harming local ecosystems, communities, and their businesses.  Moreover, emerging AI risks related, for instance, to manipulation, disinformation, isolation, echo chambers, and amplification of individual/group discriminations can be amplified by the metaverse. In business, high-performance hardware and costly resources needed to develop, test and maintain metaverse applications could be an economic barrier for SMEs, start-ups and non-profit organizations, thus deepening influence and power gaps. Moreover, the development of resource-intensive metaverse can amplify long-term rebound-effects risks, leading to a substantial increase in CO2 emissions and resource consumption. The contributions of this document are threefold: 1. A definition of a sustainable metaverse ecosystem; 2. Design criteria to integrate at design environmental, social and economic sustainability needs; 3. System requirements for sustainable metaverse ecosystems. |
| [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 SG20 and ITU-T SG13 | Summary:  This Technical Report provides steps for the realization and use cases of power metaverse applied in the power system from the perspectives of the user and the grid. Each use case describes the application scenario, the assumptions and the service scenario. |
| [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 | Summary:  This Technical Report emphasizes the importance of understanding the cybersecurity landscape in the metaverse. It provides an overview of this emerging digital realm and its potential, highlighting its transformative nature. It also analyzes and documents the specific cybersecurity risks, threats, and potential harms associated with the metaverse. This Technical Report covers areas such as identity theft, malware, data breaches, and social engineering. Moreover, it explores the background of cybersecurity risks in the metaverse. Additionally, this Technical Report examines the implications of these cybersecurity risks, including their impact on user trust, virtual economies, and assets. |
| [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 SG11 | Summary:  This Technical Report develops three key areas of a rights-based approach to embedding ethics and safety standards and user control of PII in developing the metaverse that build conceptually on each other:   * Data control and agency of users in relation to their service and platform provider, * Human rights test governing workflow design as well as the conduct of service and platform providers as that conduct relates to their public stakeholders, and * Principles for the development of safety standards in line with the SDGs that can effectively govern user conduct within the metaverse spaces such providers offer.   The report further maps out key lenses in which these three areas interact with one another, with platform design considerations, and other stakeholders. It also offers a practical use-case on an open source and decentralized protocol demonstrating how technical infrastructure can enable user control of PII. |
| [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 | Summary:  The metaverse offers a rich, immersive digital experience encompassing Extended Reality (XR) technologies like Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). With its potential to engage all human senses, the risks and online threats to children in the metaverse are intensified. These threats can originate from content, contact, or conduct, with the metaverse amplifying the impacts of such dangers. The ITU's Child Online Protection (COP) guidelines stress that digital protection measures should not infringe on children's other rights, necessitating age-appropriate content controls.  Age verification is pivotal in shielding children from online perils, prompting nations to impose age verification mandates. Methods like self-declaration, credit cards, biometrics, profiling, digital IDs, and third-party verification serve as age verification mechanisms. Existing regulations, such as GDPR and California's AADC, provide general guidelines on age verification and demand utilizing proper technology proportional to potential risks. The metaverse, with its array of sensors and devices, offers a unique avenue to bolster age verification procedures, especially with soft biometrics that do not compromise users' privacy.  As online threats in the metaverse surge, platforms should institute risk assessment frameworks considering content and immersion levels. Age verification methods should align with the risk levels, ensuring that the data collected is minimal and solely serves verification purposes. For example, Zero-knowledge proofs (ZKPs) can be used for age assertion without revealing exact ages. Trusted third-party verification is advocated because it enables platform interoperability and prevents sharing data with multiple sources. Thus, we discuss the potential challenges and provide general guidelines that should be helpful for implementing third-party age verification. |
| [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 | Summary:  This Technical Report explores the scope for the responsible use of A1 for child protection in the metaverse as a contribution in this area to assist in the achievement of the United Nations Sustainable Development Goals. |
| [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 and ITU-T SG17 | Summary:  In a world still striving for securing data protection and data sovereignty, the metaverse comes as one of the latest trends in technological developments and waves, especially that it involves a wide range of economic activities in a non-regulated new world. Similar to its previous counterparts, the idea opens up a multitude of risks and threats, coming hand-in-hand with the opportunities it creates. This technical report tries to explore the possible data protection concerns in the metaverse in terms of regulatory and economic perspectives. The technical report is divided into two parts; general data protection-related concerns and economic data protection-related concerns. The data protection topic is considered a foundational base for conducting economic activities in the metaverse and for regulating all activities on the metaverse. The contribution approaches this novel topic through the 'Life Cycle of Data Threat Model' that tries to pinpoint some threats in different stages of the data life cycle. The model depends on dividing the lifecycle of data into 7 stages; data generation, data transfer, data usage, data sharing, data storage, data archival and data destruction. The contribution finally presents a data protection assessment framework that can be used to assess the level of threat of each of the challenges presented, and therefore policy priorities may be determined accordingly. |
| [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 and ITU-T SG16 | Summary:  The virtual world based on real-world data collected through IoT technology and using XR technology as UX is collectively referred to as a metaverse supporting IoT. The ideally constructed metaverse interface should prevent persons with disabilities and those with specific needs who have difficulty using certain senses in the real world from feeling this difficulty in the metaverse. This Technical Specification defines the accessibility requirements that metaverse services supporting IoT should have. |
| [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 | Summary:  This Technical Report promotes and instructs on the adaptation of an integrated approach to accessibility and sustainability in the metaverse. It explores the integration of accessibility products and services in the metaverse and their associated social benefit and environmental impact. Emphasising the need for the early integration of accessibility and sustainability, this document presents information and guidance on how to incorporate sustainable accessibility products and services in the metaverse from the outset. Questions related to sustainability and accessibility in the metaverse need to consider the following:   * Social benefit of sustainable accessibility products and services in the metaverse. * Challenges and opportunities of an accessible and sustainable metaverse. |
| [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 | Summary:  This document provides guidelines and requirements on interpreting in the metaverse. It summarises typical use settings that require interpreting in the metaverse, including conference interpreting, public service interpreting and sign-language interpreting. It describes technical requirements for interpreting in the metaverse. It also provides advice for all parties in interpreted events in the metaverse, including organizers, speakers, interpreters and audience in interpreting-facilitated events in the metaverse. |
| [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 and ITU-T SG3 | Summary:  This document proposes some guidelines to ensure by default equity, accessibility, and inclusivity in the development of the metaverse. Its primary objective is to offer the context for the legal framework based on the United Nations (UN) mandates and Sustainable Development Goals (SDGs), along the derived standards. This document offers a comprehensive understanding of the current state of the background which should underlay any metaverse development. The document also identifies the key challenges that hinder the achievement of equity, accessibility, and inclusivity within the metaverse, and propose potential roadmaps towards constructing a metaverse leaving no one behind. |
| [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, ITU-T SG20, ITU-T SG13 and ITU-T SG11 | Summary:  This deliverable specifies the service scenarios and high-level requirements for metaverse cross-platform interoperability. With the increasing number of metaverse platforms being developed, there is a need to create an open and seamless metaverse interoperable environments between metaverse platforms that fosters innovation and collaboration. This deliverable aims to identify the various intended service scenarios and high-level requirements of four types of metaverse cross-platform interoperability: avatar interoperability, asset interoperability, content interoperability, identity interoperability. |
| [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 | All for Information | Summary:  This document establishes the principles for building terms, concepts and definitions related to metaverse, as the foundation for developing technical specification of vocabulary for metaverse. |
| [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 | Summary:  As the technology continues to evolve, there is an increasing demand for generative artificial intelligence (GAI) technology in the metaverse. GAI is crucial for creating immersive and interactive experiences in the metaverse. It has numerous capabilities in metaverse applications and services, from creating personalized avatars and environments to generating more immersive and personalized services. These capabilities can enrich the content of metaverse in more forms and significantly enhance the user experience within the metaverse, providing a more engaging and immersive environment.  This Technical Specification provides capabilities and requirements of Generative Artificial Intelligence in metaverse applications and services. This document specifies four common capabilities of Generative Artificial Intelligence in metaverse applications and services and analyzes the description, assumption, service scenario. And it specifies the requirements of Generative Artificial Intelligence in metaverse applications and services. |

It should be noted that:

* In the case where a Study Group is the sole recipient of an allocated deliverable, and its existing mandate allows it to commence standardization efforts, it may establish a new Work Item before the next scheduled TSAG meeting.

To minimize duplication of work, when more than one Study Group is assigned per deliverable, each Study Group is requested to review the deliverable and inform TSAG on its preferred course of action. If the Study Group would like to use either a portion or the entirety of the deliverable, then TSAG is required to be informed prior to commencing any work. If the Study Group's current mandate permits, standardization activities can begin following the next TSAG meeting; otherwise, commencement may take place after WTSA-24.

* If a Study Group is not listed in the table above, has reviewed the deliverable, and would like to use either a portion or the entirety of the deliverable, then TSAG is required to be informed prior to commencing any work.

Study Groups are requested to provide their feedback before the TSAG’s next meeting planned to be held in July/August 2024.

Study Groups are invited to consider the table above in the context of WTSA-24 preparations.

TSAG looks forward to collaborating with ITU-T Study Groups on this matter.

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