|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Title: ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | TSAG-TD349 |
| TSAG |
| **Original: English** |
| **Question(s):** | | N/A | | Geneva, 22-26 January 2024 |
| **TD (Ref.:** [FG-MV-LS14](http://handle.itu.int/11.1002/ls/sp17-fg-mv-oLS-00014.docx)**)** | | | | |
| **Source:** | | FG-MV | | |
| **Title:** | | LS/i on Results of the second meeting of the FG-MV and approval of its first deliverable [from FG-MV] | | |
| **LIAISON STATEMENT** | | | | |
| **For action to:** | | | TSAG | |
| **For information to:** | | | ITU-T SG2, SG3, SG5, SG9, SG11, SG12, SG13, SG15, SG17, SG20 | |
| **Approval:** | | | FG-MV meeting (Shanghai, 6 July 2023) | |
| **Deadline:** | | | N/A | |
| **Contact:** | | | Shin-Gak Kang  ETRI Rep. of Korea | 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-00014.docx>.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A black and white logo  Description automatically generated with low confidence | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2022-2024 | | | **FG-MV-LS14** | |
| **Focus Group on metaverse** | |
| **Original: English** | |
| **WG(s):** | | PLEN | | Shanghai, 4–6 July 2023 | |
| **Ref.: FG-MV-O-022-R1** | | | | | |
| **Source:** | | FG-MV | | | |
| **Title:** | | LS on Results of the second meeting of the FG-MV and approval of its first deliverable | | | |
| **LIAISON STATEMENT** | | | | | |
| **For action to:** | | | TSAG | | |
| **For information to:** | | | all ITU-T Study Groups | | |
| **Approval:** | | | FG-MV meeting (Shanghai, 6 July 2023) | | |
| **Deadline:** | | | N/A | | |
| **Contact:** | | Shin-Gak Kang  ETRI  Rep. of Korea | | | E-mail: [sgkang@etri.re.kr](mailto:sgkang@etri.re.kr) |

|  |  |
| --- | --- |
| **Abstract:** | This document contains information on the results of the second meeting of the FG-MV and the approval of its first deliverable, Technical Report D.WG1-01 - Exploring the metaverse: opportunities and challenges. |

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.

# Meetings

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

|  |  |  |
| --- | --- | --- |
|  | **1st meeting**  **Riyadh, 8**–**9 March 2023** | **2nd meeting**  **Shanghai, China, 4**–**6 July 2023** |
| **Input documents** | 91 | 172 |
| **Output documents** | 7 | 66 |
| **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) |
| **Number of participants (on-site and remote)** | 650 | 1276 |
| **Number of participants (webcast)** | N/A | 859 |

The Focus Group lifetime is set for one year from the first meeting, with the possibility of extension.

The planned meetings of the FG-MV are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **List of planned meetings of the FG-MV** | | | |
| **Date** | **Meetings** | **Location** | **SGs, Events** |
| 12 September 2023 | Special Session on FG-MV | Arusha, Tanzania | Special Session will be held on 12 September 2023 followed by a Forum on “Cities and the metaverse: shaping a citiverse for all” on 13 September 2023 and the ITU-T Study Group 20, 13–22 September 2023, Arusha, Tanzania |
| 3–5 October 2023 | 3rd FG-MV Meeting | Geneva |  |
| 18 October 2023 | Special Session on FG-MV | Riga, Latvia | To be held during the annual 5G Techritory Ecosystem forum |
| 4–7 December 2023 | 4th FG-MV Meeting | Geneva |  |
| 26 February – 1 March 2024  (Date - TBC) | TSAG | Geneva | Report on FG-MV is expected to be presented. |

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

**Focus Group leadership, structure and deliverables**

The management team consists of the following:

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

**Vice-Chairmen:**

* Andrey Perez (Brazil)
* Hideo Imanaka (NICT, Japan)
* Per Fröjdh (Ericsson, Sweden)
* Shane He (Nokia, Finland)
* Vincent Affleck (United Kingdom)
* Yuntao Wang (China)
* Leonidas Anthopoulos (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 (Shanghai, 4–6 July 2023) for more details.

**Completed deliverable**

# ITU-T FG-MV would like to inform TSAG and all ITU-T Study Groups that, during its meeting in July 2023, FG-MV approved its first deliverable:

|  |  |  |
| --- | --- | --- |
| **No.** | **Title** | **Download** |
| Technical Report D.WG1-01 | Exploring the metaverse: opportunities and challenges | [PDF](http://handle.itu.int/11.1002/pub/82047d78-en) |

# ITU-T FG-MV invites TSAG to consider this Technical Report as a basis for further consideration and appropriate action.

All interested parties are invited to use this approved deliverable in their related activities.

# Next steps

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

ANNEX 1 – List of FG-MV Workplan, Structure, and list of deliverables (Shanghai, 4–6 July 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 Chairman and WG Chairmen |
| **​​WG 1​​** | **General** | Chairman:   * ​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece)   Vice-chairmen:   * ​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 Specifications | 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** | Chairman:   * ​​Ms Xiaomi AN (Renmin University of Ch​ina) |  | Technical Specifications | Vocabulary for metaverse | Xiaomi AN (Renmin, University of China)  Jie SONG (State Grid Corporation of China) |
| Technical Report | Principles and Processes for Building Concepts and Definitions Related to metaverse | Xiaomi AN (Renmin University of China) |
| Technical Report | An analysis of definitions | Leonidas ANTHOPOULOS (University of Thessaly, Greece) |
| **TG- pre-standardization for the CitiVerse** | **Co-chairmen:**   * ​​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) |
| **TG-​implications for people in the metaverse** | ​Chairman:   * Ms Radia FUNNA (Build n Blaze) | ​ | ​ Technical ​Report | ​ Near-term and Long-term Implications of People in the metaverse | ​ Radia FUNNA (Build n Blaze) |
| **WG2** | **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 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-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) |
| Tech​nical Specifications | 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** | ​Chairman:   * Ms Qiuhong ZHENG​ (China Telecom) | ​ | Technical Specifications | Framework and requirements for the construction of 3D manual driven digital human application system based on image recognition algorithm | Qiuhong ZHENG (China Telecom) Liang WANG (ZTE) |
| Technical Specifications | Use cases and requirements for Generative Artificial Intelligence in metaverse applications and services | Qiuhong ZHENG (China Telecom) Liang WANG (ZTE) |
| Technical Specifications | 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** | Chairman:   * Ms Xiaoou LIU​ (China Telecom) |  |  |  |  |
| **TG-medical metaverse** | Chairman:   * Robin ROWE (Heroic Robots) |  | Technical Report | Medical metaverse: Use-case Relevant to Medical Training and Hospital | Robin ROWE (Heroic Robots) |
| **TG-metaverse tourism** | Chairman:   * 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** | Chairman   * Mr Jie SONG (State Grid Corporation of China) |  | Technical Specifications | Power metaverse: Use Cases Relevant to Grid Side and User Side | Jie SONG (State Grid Corporation of China) |
| Technical Specifications | Guidelines for metaverse application in energy power | Dong WANG (State Grid Corporation of China) |
| **TG-Industrial metaverse** | Chairman   * Mr Julien MAISONNEUVE (Nokia, Finland) |  |  |  |  |
| **​​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​ | Changkyu LEE (ETRI, Korea (Republic of)) |
| Technical Specifications | 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** | Chairman:   * ​​Mr Hideo IMANAKA (NICT, Japan)   Vice-chairman:   * 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 Specifications | Use cases and requirements for metaverse cross-platform interoperability | Jungha HONG (ETRI, Korea (Republic of)) |
| Technical Specifications | High-level interoperability architecture for cross-platform metaverse | Wook HYUN (ETRI, Korea (Republic of))  Xiongwei JIA (China Unicom) |
| Technical Specifications | Interoperability and migration of identity of things across metaverses | Xiongwei JIA (China Unicom) |
| **​​​​​W​G 6​** | **​​Security, Data & 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) | * ​​​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-chairmen   * Mr Christian ALVAREZ (UNICEF) * Ms Hanna LINDERSTÅL (EARHART Business protection agency) ​ |  | Technical Specifications | Requirements and framework for digital identity system | Jingwen LIU (China Mobile) |
| Technical Specifications | Data management and security for things across metaverses | Xiongwei JIA (China Unicom) |
| Technical Specifications | Security Framework for the Metaverse Architecture | Sarah ABANUMAY (National Cybersecurity Authority (NCA), Kingdom of Saudi Arabia)  Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specifications | Identity management Security guidelines in the metaverse | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specifications | Guidelines for security management of using metaverse applications | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| Technical Specifications | Asset management Security guidelines in the Metaverse | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah Alsalem (NCA, Kingdom of Saudi Arabia) |
| **TG-building confidence and security in the metaverse** | Chairman:   * Ms Radia FUNNA (Build n Blaze) |  | Technical Report | 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 (Republic of)) |
| Technical Report | Embedding safety standards and the user control of Personally Identifiable Information (PII) in the development of the metaverse | Jan EISSFELDT (Wikimedia Foundation) Sarah Nicole  (McCourt Institute) |
| Technical Report | Risks, threats and potential harms in the metaverse | Sarah ABANUMAY (NCA, Kingdom of Saudi Arabia) Aljawharah ALSALEM (NCA, Kingdom of Saudi Arabia) |
| **TG-child online protection** | Chairman   * Mr Muhammad Khurram KHAN (King Saud University, Kingdom of Saudi Arabia) |  | Technical Report | 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 Specifications | 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** | ​Chairman:   * 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 Specifications | The framework of building a trustworthy digital human | Naying HU (CAICT, China)  Sumin GUO (Beijing Normal University, China) |
| **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 | Technical Specifications | Economic Value Creation and Competition in metaverse | Okan GERAY (Digital Dubai, UAE) |
| Technical Report | Regulatory and economic aspects in the metaverse: Data protection-related | Andrey PEREZ (Anatel, Brazil)  Okan GERAY (Digital Dubai, UAE)  Ahmed SAID (MCIT, Egypt)  Hedaia NABIL (MCIT, Egypt) |
| Technical Report | Policy and regulation challenges of the metaverse | Andrey PEREZ (Anatel, Brazil) Okan GERAY (Digital Dubai, UAE) |
| **​WG 8​**  ​ | **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) | * 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** | ​Co-chairmen:   * 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 Specifications | Accessibility requirements for metaverse services supporting IoT | Yong Jick LEE (Center for Accessible ICT, Korea (Republic of)) |
| Technical Report | Interpreting in the metaverse | Binhua WANG (University of Leeds) |
| Technical Report | 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 Specifications | Accessible products and services in the metaverse | Estella ONCINS (UAB, Spain)  Carlo EUGENI (University of Leeds) |
| Technical Report | Accessibility for a Sustainable Metaverse | Sarah Anne MCDONAGH (UAB, Spain) |
| Technical Report | Guidance on how to build a metaverse for all | Christina Yan ZHANG (The Metaverse Institute)  Pilar ORERO (UAB, Spain) |
| Technical Specifications | Use of metaverse as a mitigation strategy for people with cognitive development difficulties in flood regions | Ashwini SATHNUR (Zero Hunger Champion) |
| **TG-design criteria and metrics with incentives for sustainable metaverse** | Chairman:   * Ms Daniela TULONE (CNIT, Italy) |  | Technical Specifications | Requirements and design criteria for sustainable metaverse systems | Daniela TULONE (CNIT, Italy)  Antonio PULIAFITO (CINI, Italy)  Gustavo MARFIA (University of Bologna, Italy) |
| Technical Specifications | Incentive strategies to boost high-impact sustainable metaverse applications | Daniela TULONE (CNIT, Italy)  Antonio PULIAFITO (CINI, Italy)  Gustavo MARFIA (University of Bologna, Italy) |
| Technical Specifications | 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** | Chairman:   * Ms Gabrielle PANTERA (Heroic Robots) |  | Technical Report | Metaverse Social Safety: Mitigating Harassment in the Metaverse | Gabrielle PANTERA (Heroic Robots) |
| **WG9** | **Collaboration** | Co-chairmen:   * ​​Ms Stella KIPSAITA (Communications Authority, Kenya) * Mr Ziqin SANG (CICT, China) | * Promote more active collaboration with other SDOs by setting up a close liaison relation-ship, 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 |  |  |  |
| **TG-gap analysis** | Chairman:   * ​​Mr Leonidas ANTHOPOULOS (University of Thessaly, Greece) |  | Technical ​Report | Gap analysis on metaverse standardization | Leonidas ANTHOPOULOS (University of Thessaly, Greece)​ |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_