Network Requirements and Capabilities to Support Metaverse Applications
Domain Working Group Charter
Version 2.0

1. Status and Change History

- Created Jan 25th 2023 - Omar Elloumi
- Updated March 6th 2023 - Thibaud Biatek : Incorporation of contributions from DT, Intel and Nokia and of comments raised during the EG calls
- Updated March 22nd 2023 - Omar Elloumi: Incorporation of comments raised offline or during the call. Approved EG version.
- Updated April 5th 2023 - Omar Elloumi: to address comments raised by Oversight members.
- April 19th 2023 – Approved by Oversight Committee
- April 9th 2025 - New Charter Proposed by WG
- May 7th 2025 - Approved by Oversight Committee

2. Officers

The Working Group will follow current Forum Domain Group processes, with initial elected officer positions of a minimum of 2 co-chairs.

Pro-Tem Chairs

- DJ Lal, Adeia
- Omar Elloumi, Nokia

3. Motivation and Goals (and NON-Goals)

Deploying metaverse applications at scale will have an important impact on communication networks, increase the need for cloud-aware networking and potentially drive the evolution paths of communication network technologies. Several SDOs are working on defining network connectivity solutions to address the needs of XR and Metaverse related applications. Supporting those SDOs activities through industry driven requirements is both timely and important.

The goal for this proposal is to focus on networks (including access and core networks: e.g. 5G, 6G, Wi-Fi, BBF, DOCSIS 10G, Non-Terrestrial Networks) and infrastructure elements, including cloud and edge computing, to address coordination amongst multiple communication types and to support secure and resilient connectivity for flawless and seamless user experiences. Special attention would be attributed to opportunities for cooperation between multiple initiatives to increase synergy and reduce duplication of effort, gaps, fragmentation and confusion, for the good of the industry.

The scope of "Network requirements and capabilities to support Metaverse applications" Working Group includes:

- Collecting service and application use cases, identify and describe one or several end-to-end high level exemplary architectures[1] to support scalable distribution to users with different device types including phones, HMDs, glasses, etc.
- Identify and describe QoE metrics such as audio-visual quality, immersiveness, latencies and other factors. Recommend QoE metrics measurement methodology and tools.
- Identify and describe different distribution scenarios and architectures for splitting compute and rendering across different entities, e.g. split rendering, streaming, cloud rendering, etc.
- Identify typical E2E data flows (compressed data, content delivery protocols) and traffic characteristics for signals operating over networks.
- Based on identified distribution scenarios, identify, and describe relevant QoS requirements including latency, jitter, throughput, reliability, time synchronization, etc.
- Considerations for delivering Metaverse content across multiple access networks.
- Network management support for interfacing with Metaverse applications for dynamic configuration.
- Analyze features in existing and ongoing Standards-related Publications and Projects (SPPs) in MSF Pre-qualified Organizations and Groups(POGs) (3GPP, IETF, BBF, W3C, ITU-T (in particular SG15), IEEE, WBA, TIP Metaverse Network Ready Working Group, OMA3, CAMARA project, ETSI ARF, SVTA, 5G-MAG, DASH Industry Forum, TM-Forum, etc.) to assess if they address the requirements and identify gaps or enhancements.

[1] The architecture work is only meant to help formulating requirements and will not lead to specification work.

- Security, privacy, ownership and sustainability considerations.
- Coordinate with POGs to ensure requirements from MSF and gaps are addressed in a timely fashion.
- Reference tools, validation prototypes and simulation considerations.

Non goals of the Domain Group:

- The Domain Working Group will not specify protocols, APIs nor detailed architectures (as in other SDOs).
- The Domain Working Group will not work on assets, behaviors, interactions, content-related topics, avatars, wearables, real and virtual applications, application security, X3D graphics, etc.

4. Project Deliverables and Requirements

The group will produce one deliverable in 2025 and conduct one ongoing activity measured as a "deliverable":

- D1 (T0+10): Technical report on network compute requirements for metaverse services and use cases. The report will detail use cases with specifications on optionality of compute from various points in the network and the impact on Quality of Experience.
- D2: Educational talks and speaker series that bridge the gap between networking protocol/API advancements and Metaverse applications. These talks will focus on bringing Metaverse application developers and networking practitioners on the same page.

5. Milestone Plan

The work is scheduled over a 12 months cycle described in the table below.

Phase	Description	Milestone	Start, Duration
1	Develop taxonomy of metaverse use cases with potential to use deployed network compute.	Taxonomy of metaverse use cases.	T0, 2 months
2	Collect service and application use-cases from the industry that benefit from network compute. This should be inclusive and diverse in terms of sources and organizations.	Classified list of use-cases.	T0+2, 4 months
3	Conduct 4 educational talks for MSF members on networking protocol advancements that benefit metaverse applications.	4 delivered talks (Deliverable D2)	T0, 6 months
4	Draft a technical report describing how network compute may be deployed for each use case collected during the use case/requirements gathering phase.	Technical report on network compute requirements and KPIs for metaverse applications and services (Deliverable D1)	T0+6, 3 months
5	Coordination with POG to liaise and ensure requirements from MSF have been addressed and mapped to network compute requirements.	Conclusions are communicated to relevant organizations.	T0+9, 2 months
6	Assessment of new goals for the charter, update of the milestones, deliverable, etc …	Re-evaluation of the charter	T0+12

6. Coordination

- The Group shall coordinate with the Standards Register Working group for identifying relevant standards to support Metaverse applications
- The Group shall coordinate with the POG to ensure requirements from MSF and gaps are addressed in a timely fashion.
- The Group shall seek to establish appropriate liaisons with SDOs dealing with communications (e.g. in the form of 3GPP Market representation partner). Those liaisons must be established in accordance with MSF defined procedures for liaisons. Note: Liaisons work better when members submit contributions to SDOs to ensure the liaisons have the right and timely impact on specifications.

7. Communication Plan

- The Working Group will provide quarterly updates to the Forum Oversight Committee and Forum membership or when major milestones are achieved.
- The Working Group will provide material to the outreach taskforce to feed potential dissemination actions.

8. Risk Factors

- SDOs may refuse to liaise with MSF. Incorporation of MSF as a non-trade legal entity is critical to establish formal liaisons with established SDOs and associations.
- SDOs may look for other sources of requirements themselves. An essential success factor for this group is to take into account applications and device makers requirements. Without clear effective representation of requirements, SDOs may not adhere to the requirements from MSF or look for other sources of industry requirements.

9. Working Group Renewal

One year after the approval of the charter

10. Project Funding and Resources

None

11. References

None

12. List of acronyms and definitions

3GPP: 3rd Generation Partnership Project
5G: 5th generation mobile network
5G-MAG: 5G-Media Action Group
6G: 6th generation mobile network
API: Application Programming Interface
BBF: Broadband Forum
CAMARA project: an open source project within Linux Foundation to define, develop and test APIs.
DOCSIS : Data Over Cable Service Interface Specifications
ETSI ARF: European Telecommunications Standards Institute – Augmented Reality Framework
HMD: Head Mounted Display
IEEE: Institute of Electrical and Electronics Engineers
IETF: Internet Engineering Task Force
ITU-T: International Telecommunication Union-Telecommunication Standardization Sector
ITU-T SG15: ITU-T Study Group 15
OMA3: Open Metaverse Alliance
OMF: Open Metaverse Foundation
QoE metrics: Quality of Experience metrics
SDO: Standards Development Organization
SVTA: Immersive Video Study Group
TIP: Telecom Infra Project
TM-Forum: Telemanagement Forum
W3C: World Wide Web Consortium
WBA: Wireless Broadband Alliance
WiFi: Wireless Fidelity
XR: eXtended Reality