**3GPP TSG-SA WG6 Meeting #61 S6-242505(V2)**

**Jeju Island, South Korea, 20th – 24th May 2024 (revision of S6-242243)**

**Title: Reply LS on request clarification on mobile metaverse services**

**Response to: LS S6-242016/S3-241497 on request clarification on mobile metaverse services from SA3**

**Release: Rel-19**

**Work Item: FS\_Metaverse\_App**

**Source:** 3GPP TSG SA WG6

**To: SA3, SA1**

**Cc: SA2, SA4**

**Contact person: Sapan Shah (****sapan.shah@samsung.com****)**

**Send any reply LS to: 3GPP Liaisons Coordinator,** **mailto:3GPPLiaison@etsi.org**

**Attachments:** None

# 1 Overall description

SA6 would like to thank SA1 for sending LS on request clarification on mobile metaverse services.

SA6 considered following general information into their study.

1. Referring to the definition of digital asset as defined in clause 3.1 of 3GPP TS 22.156, for the purpose of digital asset access and management, each digital asset needs a unique identifier.
2. Referring to requirement [R-5.2.3-001] of 3GPP TS 22.156, multiple digital assets can be associated with a user. That means, **multiple** digital assets are associated (or linked) to **a user identity** (e.g. subscriber’s identity). So, a user identity (e.g. subscriber identity) is not sufficient to uniquely identify the digital asset and a new identifier (digital asset identifier) is required to uniquely identify the digital asset.
3. SA6 assumes that - User identity, Digital identity (of a user) and digital identifier (of a digital asset) are different terms.
	1. User’s identity identifies user.
	2. Digital identity of a human (e.g. Passport, Credit card) are associated with user and they are assets of the user.
	3. Digital identifier (of the digital asset) uniquely identifies the digital asset of the user. Each digital asset will have a digital identifier to uniquely identify the asset. For example, an Avatar is one of the digital assets associated with the user. So, digital asset identifier is the Avatar ID for an Avatar.
4. A user can own multiple digital assets (1:n), e.g. a user can have multiple Avatars to be used at different applications, however, each digital asset will be owned by a single user (1:1).
	1. Please refer to clause 7.5.3.1 of TR 23.700-21, quote: "The application specific avatar profile(s) may be create for a single user or it can be used by multiple users. For application specific avatar profile(s) which can be used by multiple users, the users can use the avatar at a same time simultaneously or one at a time depending on the application requirement."
5. From usage perspective, one user can use one or more digital assets, similarly a digital asset can be used by one or more users (n:m), e.g. as per clause 5.16 of TR 22.856, a digital representation can be used by multiple shop assistants/users.
	1. See reference provided in d).
6. Please refer to KI #3 and solution #5, #6 and #7 of 3GPP TR 23.700-21.

Further, please consider SA6 reply given below for your work in SA3.

1. For the purpose of digital asset access and management, does each digital asset need a unique identifier?
2. What is the definition of digital identifier and how that is related to the digital asset(s)?
3. Whether SA1 and/or SA6 is considering to use user identifier to identify a digital asset?
4. If answer to above question is no, then which identifier is used to identify a digital asset and who has control over the namespace for the identifiers?

***[SA6 answer for Q-1 to 4]***

* Please refer to above general information.
1. Does the term “digital asset identifier” in the enclosed proposal define the identifier for digital asset?

**[SA6]** Yes. SA6 would like to suggest to make the definition 3GPP specific and not limited to the TR.

1. In digital asset definition in clause 3 of TS 22.156, it describes "Examples of digital assets include digital representation (avatar), software licenses, gift certificates, tokens and files (e.g., music files) that have been purchased". In the same clause and clause 5.2.3 (Digital asset management), it mentioned that EU digital identity wallet management is one example of digital asset management. In 4.2 of TR 23.700-21, it specially mentioned "digital assets with clear ownership rights", For example, a user designed and produced a digital human image which can be sold to others.

According to above information, can we understand there're four types of digital asset:

a. Digital identity, e.g. similar to European Digital Identity, which can be used to uniquely identify a "human", which including information such as national ID, passport, tax number, driving license, etc.

b. Digital identity for specific services, e.g. credit card, mobile subscriber number (SUPI, MSISDN, etc.), digital representation for specific service/application (e.g. avatar), certificate, token, etc.

c. Digital product purchased by a human, e.g. software licenses, gift certificates, music files

d. Digital product produced by a human with intellectual property concerns, e.g. a user designed and produced a digital human image. When another user likes the digital human image and wants to use it, he/she needs to request and obtain the owner's consent.

If so, which type of the digital asset will be managed in 3GPP defined digital asset container? Which type of the digital asset will be used in 5G defined metaverse services and how will the digital asset be used?

**[SA6]** SA6 considers all 4 types (a, b, c and d) described above as digital assets. Please refer to above general information. Further inputs from SA1 is required.

1. How is a digital asset associated with a user (i.e. owner of the digital asset) or a 3GPP subscription?
	1. Is it an 1:m, an n:1 or an n:m relation (and is this different for avatars)?
	2. Are these relationships stable or can they change (can user release ownership / acquire ownership of digital assets / trade digital assets)

**[SA6]** Please refer to above general information. Further, inputs from SA1 is required.

1. What exactly is a digital asset, i.e. is it only data or does it encompass an execution environment to model interaction and render the digital asset?

**[SA6]** SA6 considers the digital asset information contains mainly two aspects,

1. Details on how the digital assets can be rendered (e.g. base Avatar details); and
2. Other digital asset related information (e.g. metadata for Avatar, like owner details, allowed user details, allowed location details, etc.)

See solutions #5, #6 and #7 of 3GPP TR 23.700-21. Please note, solutions are under discussion and yet to be concluded.

1. Where does the digital asset reside when not being actively used (operator controlled NF, external AF, and/or UE)?

**[SA6]** SA6 believes that the digital asset can reside anywhere based on user’s choice. User may decide to store it in operator controlled NF, external application server or locally on UE. Further inputs on residing on operator controlled NF can be provided by SA2.

1. Where does the digital asset reside when being actively used (same NF, AF, UE as when not being actively used, or moved to different entity for execution)?
	1. Is a digital asset considered to be mobile, i.e. can it be moved between platforms while not being actively used and/or while being actively used?

**[SA6]** SA6 believes that the digital asset, while in active use, can reside locally at UE or at network function to render the media.

* There are use cases (for example, clause 5.14 of TR 22.856) where a user in one mobile metaverse service moves to another mobile metavese service. So, interoperability of avatar in different metaverse platform is required.
1. Can a digital asset/avatar be copied and does the copied digital asset retain the digital asset identifier after copying?
2. Can a digital asset/avatar be modified and does the modified avatar retain the digital asset identifier after modification?
	1. Who can modify an avatar (user/operator/ external entity) and how (modifying the data directly or calling APIs)?
	2. Who can set/change the avatar identifier that is being displayed to the parties interacting with the avatar?
3. In case an avatar represents a user in communication, is it only one digital asset representing a user, or multiple (i.e. are skins / behaviours of an avatar part of one digital asset that that represents a user or are there several digital assets representing that user?)

**[SA6 answer to Q-11 to 13]**

In SA6 studied solution, SA6 considered following aspects in their solutions:

* Digital asset (with a digital asset ID) can be accessed by multiple user(s) (without being copied). In this case, the ownership does not change, and so digital asset ID also remains unchanged.
* Digital asset can be purchased by another user (i.e. ownership rights changes). In this case, digital asset can be copied for the new owner and so digital asset ID of the copied digital asset is different from original digital asset.
* Some digital assets can be modified (like Avatar) while some digital assets cannot be modified (like purchased digital painting). Modification of the digital asset does not require the digital asset identifier to be changed the same identifier can be retained. If the digital asset is copied, then the modified digital asset will have a different digital asset identifier than the original one.
* Any authorized person can modify the Avatar (ideally owner). Modification can be done by calling API to change the appropriate data. But how the modification is done is to be further discussed in SA6.
* The avatar identifier can be set by the external AF/UE who is managing the avatar. It cannot be changed for the avatar unless it is copied.
* An avatar mainly has two aspects (as indicated in answer 8) – base avatar and metadata related to avatar. The whole avatar should be identified by using a digital asset identifier (i.e. Avatar identifier).
* Please note that an avatar can have associated digital asset (like an avatar can have a new hat purchased by the user – in this case, the hat (another digital asset) is associated with avatar.
1. In case an avatar represents a user in communication, do all digital assets reside on servers / devices under control of one entity, i.e. is there the necessity of interaction of different metaverse platforms?

**[SA6]** See answer to 10. There are use case where user moves from one metaverse platform to another platform.

* 1. Do all avatars reside on operator controlled servers, or can they also reside on UEs / external AFs?

**[SA6]** See answer to 9 and 10.

* 1. Where are the avatars rendered?

**[SA6]** The avatars can be rendered locally at UE/operator controlled NF/external AF.

1. In case of XR, when several XR applications are running at the same time in the same location, are the digital artefacts of the applications expected to interact with each other?
	1. When the applications are run by the same user
	2. When the applications are run by different users

**[SA6]** SA1 inputs required.

1. What could be other use cases of avatar besides non-IMS based Avatar communications?

**[SA6]** Avatar can be used in both IMS and non-IMS based communications. As specified in key issue #3 (of TR 23.700-21), SA6 considers non-IMS based metaverse services (e.g. immersive games or shopping experience) in their study. SA1 can provide additional inputs if required.

# 2 Actions

**To SA3**

**ACTION:** SA6 kindly asks SA3 to consider above responses in their work.

# 3 Dates of next TSG SA WG 6 meetings

SA6#61 20th May – 24th May 2024 Jeju, Korea

SA6#62 19th August – 23rd August 2024 Maastricht, Netherlands