**3GPP TSG-SA WG4 Meeting #128S4-241594**

**Online, 19 – 23 August 2024**

**Source: Tencent, China Mobile Com. Corporation**

**Title: Pseudo-CR on immersive VR games use case for Haptics**

**Spec: 3GPP TR 26.854**

**Agenda item: 15.11**

**Document for: Agreement**

**1. Introduction**

The FS\_HapticsMed study was approved at the last SA plenary. A tentative workplan has been shared during the Release19 work plan offline session with the following objectives for this meeting.

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| SA4#129-e (19 - 23 August, Online) | * Agree TR skeleton and time plan * **Start (1)** Identify and extract the Haptic-related use cases and requirements defined in TR22.847 and/or in SA4 studies and refined them as necessary. * **Start (2)** Identify and describe the candidate input formats for haptic experience, relevant to the above use-cases. * **Start (3)** Identify relevant device types with support for haptic playback and/or capture |

The proposed contribution introduces a use case extracted from 3GPP TR 22.847 on immersive VR games.

**2. Reason for Change**

Introduction of a use case focused on the immersive gaming experience.

**3. Proposal**

It is proposed to agree the following changes to 3GPP TR 26.854 in the clause dedicated to the documentation of use cases (assumption of clause 5).

\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[AA] 3GPP TR22.847: “Study on supporting tactile and multi-modality communication services”

[BB] Kwang Soon Kim, et al., "Ultrareliable and Low-Latency Communication Techniques for Tactile Internet Services", PROCEEDINGS OF THE IEEE, Vol. 107, No. 2, February 2019

\* \* \* Next Change \* \* \* \*

## 5.X Immersive Virtual Reality games

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| **Use Case Name:** |
| Immersive Virtual Reality games  From:  TR 22.847 5.3 "Immersive VR games". |
| **Description:** |
| This use case is about supporting immersive VR games with tactile and multi-modal communication services. VR games have provided a better experience comparing to traditional games. As customers ask for more immersive game experience, haptic information has been taken into account including force and DOF. Traditional VR games provide video and audio information for players to create the real game scenarios. For better immersive VR games, haptic feedback is introduced, and which provides the reality of touching things in games as well as the interaction of team players.  To play the VR game, players buy VR games and related equipment like VR glasses, hand shank, analogue steering wheel and haptic gloves, which may be produced by different manufactures. In multi-player VR games, they act as different UEs and need to corporate to complete the mission. On application level, the VR gaming application will be able to distinguish these UEs and share the information with network that these UEs and data flows are grouping under this VR gaming service, and network need to provide corresponding QoS accordingly. |
| **Categorization** |
| **Type:** VR  **Delivery: Streaming, Interactive, Split**  **Device:** HMD, glove, VR controller, tactile suit.  **Other:** |
| **Preconditions** |
| - Gaming client is installed that permits to consume the game.  - The devices that support haptic and/or kinaesthetic modal are connected to the immersive multi-modal VR application server via the network without any UE relays.  - The VR game application interacted with the network about the UE and dataflow information, and network provides the pre-agreed policy between application and operator on QoS requirements of each kind of modal data flow.  - Haptic devices connected to UE  - UE application connected to 5G network |
| **Requirements** |
| Potential requirements are developed in clause 5.3.6 of 22.847 [AA]  [PR 5.3.6-1] The 5G system shall be able to support tactile and multi-modal communication service with following KPIs.  - max end-to-end latency: 20ms  - Reliability: > 99.99%  - Message size (byte): 2 - 8 /DoF  - Service bitrate: 16 kbits/ - 2Mbit/s (without haptic compression encoding); 0.8 - 200 kbit/s (with haptic  compression encoding)  [PR 5.3.6-2] The 5G system shall support a mechanism to allow an authorized 3rd party to provide QoS policy for coordination between flows of multiple UEs associated with an application. The policy may contain e.g. the set of UEs and data flows, the expected 5GS QoS handling(s) and associated triggering events, expected coordination assistance provided by 5G system between those multiple flows for different traffic types (e.g., haptic, audio and video).  [PR 5.3.6-3] The 5G system shall enable means to meet a synchronization threshold for flows of multiple UEs associated with an application based on input received from an authorized 3rd party.  [PR 5.3.6-4] Due to the separate handling of the multiple media components, synchronization between different media components is critical in order to avoid having a negative impact on the user experience (i.e. viewers detecting lack of synchronization). Applying synchronization thresholds in the 5G system may be helpful in support of immersive multi-modal VR applications when the synchronization threshold between two or more modalities is less than the latency KPI for the application.  - Audio-tactile synchronization threshold: audio delay 50 ms, tactile delay 25 ms;  - Visual-tactile synchronization threshold: visual delay 15 ms, tactile delay 50 ms; |
| **QoS/QoE Considerations** |
| Latency:  - The motion-to-photon latency less than 20ms [BB] offers a smooth experience in VR. The uplink dataflow in this loop is motion or haptic information, while the downlink in this loop is the video data.  Bitrate:  - 16 kbit/s -2 Mbit/s (without haptic compression encoding);  - 0.8 - 200 kbit/s (with haptic compression encoding) |
| **Feasibility** |
| - Gloves: Tactile gloves provide tactile feedback to the user's hands, allowing them to feel virtual objects as if they were real. They can simulate textures, resistance, and vibrations such as Manus® VR Gloves, HaptX® Gloves.  - Suits: The tactile suits usually cover the upper body (some cover the entire body and are specific to the body shape and size). They provide local vibrations with small motors that locally simulate impacts and pressure. Other types of devices simulate the temperature variations such as TeslaSuit®, bHaptics© TactSuit®.  - Input and Haptics OpenXR API Overview <https://registry.khronos.org/OpenXR/specs/0.90/refguide/OpenXR-0.90-web.pdf>  - Haptic Feedback: Native - Oculus Developer Center <https://developer.oculus.com/documentation/native/android/mobile-openxr-haptic/> |
| **Interoperability considerations** |
| - Haptic signals should be interpretable and usable across various types of devices, such as gloves, vests, and controllers.  - VR games often need to run on multiple platforms (e.g., PC, console, mobile VR). Ensuring that haptic signals are compatible across these platforms requires consideration of the different software environments. |
| **Potential Standardization Status and Needs** |
| The following aspects may require standardization work:  - Identify and describe the candidate input formats for haptic experience  - Identify candidate technologies (codec, storage format, and transport protocols) that may be suitable for enabling haptic experiences.  - Network Conditions that fulfill the QoS and QoE Requirements  - Delivery Protocol for haptic  - Storage and Cloud Access format  - Synchronization of different capturing devices. |

\* \* \* End of Changes \* \* \* \*