**3GPP TSG-SA WG4 Meeting #127S4-240238**

**Sophia-Antipolis, France, 29 January - 2 February 2024**

**Source: Fraunhofer IIS, [??Dolby Sweden AB??, ??VoiceAge Corporation??, ??Ericsson LM??, ??Nokia Corporation??, ??Qualcomm Incorporated??, ??Philips International??]**

**Title: Study on Audio Codec APIs**

**Document for: Approval**

**Agenda Item: 6.2**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on Audio Codec APIs

Acronym: FS\_ACAPI

Unique identifier:

{A number to be provided by MCC at the plenary}

Potential target Release: Rel-19

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X |  | X |  |
| No | X |  | X |  |  |
| Don't know |  |  |  |  | X |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
| X | Study  |
|  | Normative – Stage 1 |
|  | Normative – Stage 2 |
|  | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| N/A |  |  |  |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 950015 | EVS Codec Extension for Immersive Voice and Audio Services | IVAS already comes with an API  |
| 950014 | Immersive Real-time Communication for WebRTC | iRTCW needs to describe how 3GPP's speech and audio codecs can be used |
| 940010 | Study on 5G Media Service Enablers (FS\_5G\_MSE) | The TR 26.857 provides principles to support functionalities defined in 3GPP as components in 3GPP and third-party media services. Concepts documented in TR 26.857 may apply also to codecs. |
|  | EVS, AMR-WB, ... | May potentially be updated if a common API can be defiend |

# 3 Justification

3GPP's speech and audio codecs were mainly developed with a focus on implementations in modems and DSP chipsets. Consequently, APIs were not considered essential and were rarely provided with those codecs. Instead, vendors chose to provide their individual API or no API at all. In hindsight, having a common API for each codec would have proven useful. Taking the EVS codec as an example there is still no API, only an example API was provided in S4-211541. This API is a C-language API for the C-code in TS 26.442 and TS 26.443 which can serve as a template but was never standardized. Only the recently standardized IVAS codec comes with an API. In the following, two aspects that would benefit from common APIs are outlined and where such APIs are essential to enable the combination of Web-based technologies with 3GPP high-quality speech and audio codecs.

The first aspect of this WI relates to 3GPP's services based on IMS, which are expected to be complemented by WebRTC-based real-time communication as defined in TS 26.506 (stage-2) and TS 26.113 (Protocols and APIs) to leverage benefits of combining the Web and 3GPP ecosystems for enhanced web-based communication over 3GPP networks. Part of this feasibility study is the evaluation to support 3GPP's real-time media (e.g. 2D video and EVS mono audio) and immersive media such as the IVAS codec for spatial audio and 3D video.

3GPP's video codecs are ubiquitous in the industry beyond 3GPP and therefore already partially enabled in WebRTC implementation by major platforms. 3GPP's speech and audio codecs as defined in MTSI however are tailored for the 3GPP requirements and IMS-based MNO services and generally not available in WebRTC for use by native or browser-based applications, despite the mentioning of some previous generation codecs in RFC 7875.

For a codec to be usable for iRTCW by applications, it needs to be offered by the WebRTC libraries in use. To enable the 3GPP codecs of MTSI in iRTCW, it is necessary that the WebRTC libraries either have own codec implementations or there would need to be access to these codecs that are already present in a device. This second option would allow access by the WebRTC libraries to on-device codecs and thus eliminate the need for duplicate implementations. This SI aims to address this option of leveraging the 3GPP MTSI codecs already present in a terminal and offering them for usage in WebRTC by studying how providing common APIs could be of benefit to the developers and users and support their usage in iRTCW.

The second aspect of this SI relates to other upcoming convergence of the Web and the 3GPP ecosystem where codecs on a terminal are offered as a WebCodec. Having 3GPP's speech and codecs available as a WebCodec would e.g. allow decoding of 3GP files also in browser environments and enlarge access to efficiently coded high-quality media. The speech and audio codecs defined in TS 26.117 (besides eAAC+) are currently not available in Web platforms, despite the potential benefit of using 3GPP codecs, thus those codecs can not be generally used despite their availability on terminals.

Currently W3C only specifies the usage of codecs within the W3C realm, thus W3C's Web specifications WebRTC and WebCodecs do not provide the necessary support for 3GPP's codec. Studying how this gap could be closed is the target of this study. Once the study is completed, the adapters to use the 3GPP codecs in WebRTC or as a WebCodec could be defined in a potential follow-up WI to e.g. define common APIs for 3GPP's speech and audio codecs in TS 26.117.

APIs and adapters identified within this SI could potentially be developed using 3GPP Forge or in cooperation with 5G-MAG.

# 4 Objective

The overall objective of this study item is to provide the necessary APIs to provide support for 3GPP's speech and audio codecs in TS 26.114 and TS 26.117 for enhanced Web-based applications over 3GPP networks.

More specifically, the following objectives should be achieved with this work item:

1) Identify gaps in the 3GPP and W3C specifications to simplify the use of the codecs in TS 26.114 and TS 26.117 in WebCodecs and WebRTC

2) Develop common APIs for the relevant codecs defined in TS 26.114 and TS 26.117.

3) Provide recommendations for interfaces and adapters to WebRTC and WebCodecs

4) Provide recommendations for potential normative work in 3GPP and/or other organizations, for example W3C and IETF

The results of this study item should be communicated to other SDOs, including W3C and IETF.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| TR | 26.8xx | Study on APIs for 3GPP Speech and Audio Codecs | SA#104 (Sep ’24) | SA#105 (Dec ’24) |  |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

Stefan Döhla (stefan DOT doehla AT iis DOT fraunhofer DOT de)

# 7 Work item leadership

SA4

# 8 Aspects that involve other WGs

# 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| Fraunhofer IIS |
| [??Dolby Sweden AB] |
| [??VoiceAge Corporation] |
| [??Ericsson LM] |
| [??Nokia Corporation] |
| [??Qualcomm Incorporated] |
| [??Philips International] |
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