**Source:** **Audio SWG**

**Title: Status of IVAS fixed-point conversion**

**Document for: Agreement**

**Agenda Item: 7.5**

# Introduction

The floating-point code of the IVAS codec was standardized in Rel-18 in TS 26.258 [1]. The task to convert the floating-point implementation to fixed-point code using Basic Operators (BASOP) is being done by Ittiam, under a contract issued by ETSI. The organization, including floating-point to fixed-point (FL-to-FX) conversion requirements, of this conversion is outlined in [2], which is also attached to the contract.

The current milestones include:

* **SA4#130, Nov 18-22, 2024: Agreement by TSG SA WG 4 (SA4) on Delivery of Decoder and Renderer, fulfilling the FL-to-FX requirements**
* Nov 30, 2024: Delivery of complete IVAS fixed-point Encoder to SA4, fulfilling the FL-to-FX requirements
* **SA#106, Dec 10-13, 2024: Approval by TSG SA of Delivery of Decoder and Renderer, fulfilling the FL-to-FX requirements, based on agreement in SA4**
* SA4#131, Feb 17-21, 2025: Agreement by TSG SA WG 4 (SA4) on Delivery of Encoder, fulfilling the FL-to-FX requirements
* Feb 28, 2025: Delivery of maintenance for IVAS fixed-point Encoder/Decoder/Renderer
* SA#107, Mar 12-14, 2025: Approval by TSG SA of Delivery of Encoder, fulfilling the FL-to-FX requirements, based on agreement in SA4
* Jun 2025: Approval by TSG SA on TS 26.251 and TR 26.997

An extensive verification of the decoder and renderer delivery has been carried out, as reported in [3]. The report includes a summary on fulfilment of formal requirements in clause 4.2, observations on the source code in clause 5 and a summary of the main problematic areas identified from objective and subjective evaluations. Because of delayed verification of the Decoder and Renderer, the verification of IVAS fixed-point Encoder has so far been very limited. The initial evaluations however show that the first deliveries are not yet fulfilling the requirements [4].

# Conclusions and proposals

Overall the fixed-point Decoder/Renderer delivered by Ittiam serves as a decent baseline for the IVAS fixed-point code, although as reported in [3] there are several problematic areas that would need further work in order for the requirements to be fulfilled. It is assumed that the present Decoder/Renderer deliverable fulfils the requirements at a level of [90]%. However, the delivery of the fixed-point Encoder is considered of higher priority than further corrections and optimizations of the Decoder and Renderer.

It is therefore proposed to:

1. Split the fixed-point Decoder and Renderer deliverable into two parts, where the first part corresponds to the current deliverable constituting [90]% of the requirements and where the remaining work addressing the problematic areas in the maintenance phase constitutes [10]% of the requirements.
2. Ask SA4 for agreement on the [90]% portion of the Delivery of the Decoder and Renderer, which TSG-SA is asked to approve.
3. Extend the term of the contract to allow more time for:
	1. Encoder development (priority one)
	2. Maintenance (further corrections and optimizations) to Encoder, Decoder and Renderer (priority two)

It is further suggested to split the fixed-point Encoder deliverable into two parts, where the first part corresponds to the deliverable of IVAS Encoder v2 constituting [90]% of the Encoder requirements and where the remaining work addressing problematic areas in IVAS Encoder v2 in the maintenance phase constitutes [10]% of the Encoder requirements. Thus, [10] % of the funds currently allocated to decoder/renderer deliverable and [10]% of the funds currently allocated to the Delivery of the Encoder would be allocated to the work on Maintenance (further corrections and optimizations) of the Encoder, Decoder and Renderer.

It is proposed to update the time plan as follows:

* SA4#130, Nov 18-22, 2024: Agreement by TSG SA WG 4 (SA4) on Delivery of Decoder and Renderer, fulfilling FL-to-FX requirements
* Nov 30, 2024: Delivery of IVAS fixed-point Encoder v1 to SA4, targeting fulfilment of FL-to-FX requirements
* SA#106, Dec 10-13, 2024: Approval by TSG SA of Delivery of Decoder and Renderer, fulfilling FL-to-FX requirements, based on agreement in SA4
* Jan 31, 2025: Delivery of the Encoder v2, targeting fulfilment of FL-to-FX requirements, as basis for subjective verification
* Audio SWG Telco, Mar 14: Verification by TSG SA WG 4 (SA4) on Encoder v2 (with potential additional bugfixes)
* Mar 31, 2025: Delivery of the Encoder v3 (addressing most severe issues identified by the verification)
* SA4#132, May 19-23, 2025: Agreement by TSG SA WG 4 (SA4) on Delivery of Encoder, fulfilling FL-to-FX requirements
* TSG SA#108, Jun 10-13, 2025: Approval by TSG SA of Delivery of Encoder, fulfilling FL-to-FX requirements, based on agreement in SA4
* Jun 30, 2025: Delivery of Maintenance (further corrections and optimizations) to IVAS fixed-point Encoder/Decoder/Renderer
* SA4#133-e, Jul 21-25, 2025: Agreement by TSG SA WG 4 (SA4) on Delivery of Maintenance (further corrections and optimizations) to IVAS fixed-point Encoder/Decoder/Renderer
* TSG SA#109, Sep 16-19, 2025: Approval on Delivery of Maintenance (further corrections and optimizations) to IVAS fixed-point Encoder/Decoder/Renderer

Finally, ETSI is kindly asked to amend their contract with Ittiam to reflect the extended term of the contract, with the updated milestones and allocation of funds.

**References**

1. [3GPP TS 26.258](https://www.3gpp.org/ftp/Specs/archive/26_series/26.258/26258-i20.zip), Codec for Immersive Voice and Audio Services (IVAS); C code (floating-point)

1. [SA4aA240038](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/3GPP_SA4_AHOC_MTGs/SA4_Audio/Docs/SA4aA240038.zip), Organization of IVAS Characterization Phase rev 1

1. [S4-242054](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_130_Orlando/Docs/S4-242054.zip), Verification of IVAS BASOP code, Decoder and Renderer

1. [S4-241866](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_130_Orlando/Docs/S4-241866.zip), Report on Audio SWG Call 18 October 2024