# OMTP

# CODECS

## DEFINITION AND REQUIREMENTS

| | |
|---|---|
| **VERSION:** | OMTP CODECS 1_0, RELEASE 1 |
| **STATUS:** | SUBJECT TO BE - APPROVED BY BOARD 21 JULY 2005 |
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| **OWNER:** | P4: HARDWARE REQUIREMENTS AND DE-FRAGMENTATION |

# CONTENTS

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# 1 INTRODUCTION

This document represents the de-fragmentation and requirements developed for codecs within OMTP. It defines recommended classes of codecs for mobile terminals. Further classes will be added in future versions of the documents with the availability of the on-going technologies.

The reason for defining these classes is the large variety of codecs and characteristics available on mobile terminals, which results in the following potential issues:

1. The user experience of 'look & feel' is affected.

2. By making application developers and content providers address all the codecs paradigms, operational costs are increased.

3. The perceived quality of video services is heavily influenced by codec characteristics.

4. Business opportunities depend on bandwidth utilisation which, in turn, is determined by codec characteristics.

OMTP has addressed the codec de-fragmentation issue in order to:

1. Reduce the operational costs.

2. Improve user perception of the video services provided.

3. Make the specification of requirements for mobile terminals easier and more precise.

4. Reduce the NRE cost due to the re-engineering of applications and contents to support new terminals.

See 3 for some example cases.

## 1.1 DOCUMENT PURPOSE

This document has the general objective of helping to define the terminal requirements and allowing development and deployment of new services, as well as de-fragmenting the codecs capabilities onboard of terminals. Its scope is to guarantee consistency, quality and performance of video and audio services by:

- Definition of the audio and video capability of mobile terminals, in terms of the coding techniques supported.

- Ensuring the codec features suit both application and baseband processor capabilities.

The document focuses on:

- Voice codecs

- Audio codecs

- Video codecs

- Image codecs

In particular, the document concurs with the OMTP Main Objectives:

**Facilitate Implementation of Open Mobile Terminal Platforms**

- Work as appropriate to drive the development of specific mobile terminal platforms to meet OMTP requirements.

  ❑ Influence the standardisation of relevant platforms.

  ❑ Work with vendors of proprietary platforms to adopt OMTP requirements and/or resulting standards.

  ❑ Understand the implementation roadmap and ensure conformance to OMTP requirements.

In particular, it addresses the hardware enablers through the production chain to facilitate OMTP terminal development.

**Define De-fragmentation Guidelines**

- De-fragmentation guidelines reduce costs (for both operators and manufacturers) and increase consistency by defining:

  ❑ Hardware component parameters.

  ❑ Software component parameters.

  ❑ Performance guidelines and benchmarks.

## 1.2  INTENDED AUDIENCE

The document is intended to be used as reference in:

- Terminal requirements definition by operators.

- Platform and terminal characteristics definition.

- To refer to supported codecs in the definition of mobile terminal performance.

Some examples of usage follow:

Within terminal requirements*: "Codecs set: capable of supporting codecs defined in OMTP CDV1 (OMTP CODECS v1.0)".*

Within hardware requirements for an application: *"The application requires codecs defined in OMTP CDV1, OMTP CDA1 and OMTP CDI0 (OMTP CODECS v1.0) to be able to run".*

Within content database*: "The video is formatted to be viewed with a terminal capable of supporting codecs defined in OMTP CDV1 (OMTP CODECS v1.0)".*

Within platform description*: "The platform can support codecs defined in OMTP CDA1 (OMTP CODECS v1.0)".*

## 2 DEFINITION OF TERMS

This chapter contains the definition of terms used in this document.

### 2.1 CONVENTIONS

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119] (see [1] in 7).

- MUST: This word, or the terms "REQUIRED" or "SHALL", means that the definition is an absolute requirement of the specification.

- MUST NOT: This phrase, or the phrase "SHALL NOT", means that the definition is an absolute prohibition of the specification.

- SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

- SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED" means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.

- MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides).

# 3    OMTP CODEC PROFILES

Five profiles are defined:

- OMTP CDA0 – Basic Audio

- OMTP CDA1 – Advanced Audio

- OMTP CDV0 – Basic Video

- OMTP CDV1 - Advanced Video

- OMTP CDI0 – Basic Imaging

The following table lists the required algorithms and standards for audio, video, image and vector graphics. (See Appendix 7 for example cases used for reference in this document.) A terminal entitled to be compliant with a certain profile SHALL support all the codecs with an '6' in the respective column. The RECOMMENDED codecs are marked with an 'R'.

## 3.1    AUDIO DECODE

| CDA0 | CDA1 | CODEC | VARIANT |
|---|---|---|---|
| 6 | 6 | **AMR-NB** [1] | Adaptive Multi-Rate Narrowband |
| 6 | 6 | **FR** [2] | GSM Full Rate |
| 6 | 6 | **HR** [3] | GSM Half Rate |
| 6 | 6 | **EFR** [4] | GSM Enhanced Full Rate |
| 6 | 6 | **MIDI** [5] | Standard MIDI 1.0 formats 0&1 |
| 6 | 6 | **SP-MIDI** [6] | Scalable Polyphonic MIDI |
| 6 | 6 | **AAC** [7] | MPEG4 AAC - Low complexity up to 48kHz, up to 2 channels, up to 96 kbps (AAC-LC) |
|  | 6 | **AMR-WB** [16] | Adaptive Multi-Rate Wideband |
|  | R | **AMR-WB+** [17] | Extended Adaptive Multi-Rate Wideband |
|  | 6 | **E-AAC+** [19] | Enhanced AAC plus, MPEG-4 High Efficiency AAC, up to 48kHz, up to 2 channels, up to 64 kbps |

### 3.2 AUDIO ENCODE

| CDA0 | CDA1 | CODEC | VARIANT |
|:---:|:---:|---|---|
| 6 | 6 | **AMR-NB** [1] | Adaptive Multi-Rate Narrowband |
| 6 | 6 | **FR** [2] | GSM Full Rate |
| 6 | 6 | **HR** [3] | GSM Half Rate |
| 6 | 6 | **EFR** [4] | GSM Enhanced Full Rate |
| | 6 | **AAC** [7] | MPEG4 AAC - Low complexity up to 48kHz, up to 2 channels, up to 64 kbps (AAC-LC) |
| | 6 | **AMR-WB** [16] | Adaptive Multi-Rate Wideband |

### 3.3 VIDEO DECODE

| CDV0 | CDV1 | CODEC | VARIANT |
|:---:|:---:|---|---|
| 6 | 6 | **H.263 0/10** [8] | H.263 Profile 0 Level 10 |
| 6 | 6 | **MPEG4 SP** [9] | MPEG4 Simple Profile Level 0 |
| | 6 | **MPEG4 SP** [9] | MPEG4 Simple Profile Level 0b |
| | 6 | **H.264 BP/1b** [18] | H264 baseline level 1b |
| | 6 | **H.263 0/45** [8] | H.263 Profile 0 Level 45 |

### 3.4 VIDEO ENCODE

| CDV0 | CDV1 | CODEC | VARIANT |
|:---:|:---:|---|---|
| 6 | 6 | **H.263 0/10** [8] | Profile 0 Level 10 |
| | 6 | **H.264 BP/1b** [18] | H.264 baseline level 1b |
| | 6 | **H.263 0/45** [8] | H.263 Profile 0 Level 45 |

### 3.5 IMAGE DECODE

| CDI0 | CODEC | VARIANT |
|---|---|---|
| 6 | **JPEG** [10] | JPEG Baseline |
| 6 | **GIF89a** [12] | GIF89a - Animated GIF (includes 87a) |
| 6 | **WBMP** [13] | Wireless Bitmap |
| 6 | **PNG** [14] | Should support transparency |

### 3.6 IMAGE ENCODE

| CDI0 | CODEC | VARIANT |
|---|---|---|
| 6 | **JPEG** [10] | JPEG Baseline |

### 3.7 VECTOR DECODE

| CDV1 | CODEC | VARIANT |
|---|---|---|
| 6 | **SVG-Tiny** [15] | SVG Tiny Profile 1.1 |

# 4 FUTURE VERSIONS

OMTP will define additional combinations of audio/video codecs and define mandatory codecs for identified use cases in future specification releases in order to improve interoperability between open mobile terminal platforms.

## 5   APPENDIX

The following tables give an overview of possible use cases and codec combinations as an example, not defining implementation details.

The following tables are for information only. They are provided to indicate the correlation between codecs and use cases and to provide a reference for a particular combination of features.

| # | USE CASE | REFERENCE |
|---|---|---|
| 1 | TELEPHONY VOICE CALL | 3GPP TS 26.103 Rel6 |
| 2 | 2 WAY VIDEO CALL | 3GPP TS 26.111 Rel6; 3GPP TS 26.235 Rel6 |
| 3 | RINGTONE PLAYBACK | |
| 4 | MUSIC PLAYBACK FROM STORED FILES | 3GPP TS 26.140 Rel6 |
| 5 | MUSIC PLAYBACK, OTA STREAMING | 3GPP TS 26.234 Rel6** |
| 6 | IMAGE VIEWING | 3GPP TS 26.140 Rel6;  OMA-MMS-Conf-v1_2 |
| 7 | VECTOR GRAPHICS VIEWING | 3GPP TS 26.140 Rel6 (on 2D vector graphics devices) |
| 8 | VIDEO PLAYBACK FROM STORED FILES | 3GPP TS 26.140 Rel6 |
| 9 | VIDEO PLAYBACK, OTA STREAMING | 3GPP TS 26.234 Rel6; 3GPP TS 26.140 Rel6 |
| 10 | CAPTURE STILL IMAGE | 3GPP TS 26.140 Rel6 |
| 11 | CAPTURE VIDEO | 3GPP TS 26.140 Rel6 |
| 12 | MUSIC/VOICE RECORDER | 3GPP TS 26.140 Rel6 |

** Not for AAC+

## 5.1 USE CASES AND CODECS MAPPING

| CODECS<br><br>USE CASES<br>(D) = DECODE<br>(E) = ENCODE<br>(DE) = DECODE AND ENCODE | TELEPHONY VOICE CALL | 2 WAY VIDEO CALL | RINGTONE PLAYBACK | MUSIC PLAYBACK FROM STORED FILES | MUSIC PLAYBACK, OTA STREAMING | IMAGE VIEWING | VECTOR GRAPHICS VIEWING | VIDEO PLAYBACK FROM LOCAL FILES | VIDEO PLAYBACK, OTA STREAMING | CAPTURE STILL IMAGE | CAPTURE VIDEO | MUSIC OR VOICE RECORDER PLAYBACK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FR*(DE) | 6 | | | | | | | | | | | |
| EFR*(DE) | 6 | | | | | | | | | | | |
| HR*(DE) | 6 | | | | | | | | | | | |
| AMR-NB (DE) | 6 | 6 | 6 | 6 | 6 | | | 6 | 6 | | 6 | 6 |
| MIDI (D) | | | 6 | 6 | | | | | | | | |
| SP-MIDI (D) | | | 6 | 6 | | | | | | | | |
| AAC (D) | | | 6 | 6 | 6 | | | | | | | |
| AMR-WB (D) | | 6 | 6 | 6 | 6 | | | | | | | |
| AMR-WB+ (D) | | | | R | | | | | | | | |
| EAAC+ (D)** | | | 6** | 6** | 6 | | | | | | | |
| AMR-WB (E) | | 6 | | | | | | | | | | |
| AAC (E) | | | | | | | | | | | | 6 |
| H263 0/10 (D) | | 6 | | | | | | 6 | 6 | | | |
| MPEG4 SP (DE) | | 6 | | | | | | 6 | 6 | | 6 | |
| H263 0/10 (E) | | 6 | | | | | | | | | 6 | |
| H263 0/45 (D) | | 6 | | | | | | 6 | 6 | | | |
| H264 BP/1b (D) | | 6 | | | | | | 6 | 6 | | | |
| H263 0/45 (E) | | 6 | | | | | | | | | 6 | |
| H264 BP/1b (E) | | 6 | | | | | | | | | 6 | |
| JPEG (D) | | | | | | 6 | | | | | | |
| GIF89a (D) | | | | | | 6 | | | | | | |
| WBMP (D) | | | | | | 6 | | | | | | |
| PNG (D) | | | | | | 6 | | | | | | |
| JPEG (E) | | | | | | | | | | 6 | | |
| SVG TINY (D) | | | | | | | 6 | | | | | |

* For 2G services only   ** Must also support AAC+ (D)

# 6 ABBREVIATIONS

| Abbreviation | Description |
| --- | --- |
| 3GPP | 3$^{rd}$ Generation Partnership Project |
| AAC | Advanced Audio Coding |
| AAC-LC | Advanced Audio Coding – Low Complexity |
| AMR | Adaptive Multi Rate |
| E-AAC+ | Enhanced  Advanced Audio Coding plus |
| EFR | Enhanced Full Rate |
| FR | Full Rate |
| GIF | Graphics Interchange Format |
| HR | Half Rate |
| IEC | International Electrotechnical Commission |
| IETF | Internet Engineering Task Force |
| ISO | International Standards Organisation |
| ITU-T | International Telecommunications Union – Telecommunication Standardisation Sector |
| JPEG | Joint Photographic Experts Group |
| MIDI | Musical Instrument Digital Interface |
| MPEG | Motion Picture Experts Group |
| NB | Narrowband |
| NRE | Non-recurring engineering charge |
| OMA | Open Mobile Alliance |
| OMTP | Open Mobile Terminal Platform |
| OTA | Over The Air |
| PNG | Portable Network Graphics |
| RFC | Request for comments |
| SP-MIDI | Scalable Polyphonic MIDI |
| SVG | Scaleable Vector Graphics |
| W3C | World Wide Web Consortium |
| WAP | Wireless Application Protocol |
| WB | Wideband |
| WBMP | Wireless Bitmap |

# 7 REFERENCED DOCUMENTS

| No. | DOCUMENT |
|---|---|
| [1] | 3GPP TS 26.071: "AMR speech codec; General description. |
| [2] | 3GPP TS 46.001: "Full rate speech; Processing functions". |
| [3] | 3GPP TS 46.002:"Half rate speech; Half rate speech processing functions". |
| [4] | 3GPP TS 46.051: "Enhanced Full Rate (EFR) speech processing functions; General description". |
| [5] | "Standard MIDI Files 1.0", RP-001, in "The Complete MIDI 1.0 Detailed Specification, Document Version 96.1" The MIDI Manufacturers Association, Los Angeles, CA, USA, February 1996. |
| [6] | Scalable Polyphony MIDI Specification, RP-34, MIDI Manufacturers Association.<br>Scalable Polyphony MIDI Device 5-to-24 Note Profile for 3GPP, RP-35, MIDI Manufacturers Association. |
| [7] | MPEG4 AAC: ISO/IEC 14496-3:2001, "Information technology -- Coding of audio-visual objects -- Part 3: Audio". |
| [8] | ITU-T Recommendation H.263: "Video coding for low bit rate communication" 01/2005. |
| [9] | ISO/IEC 14496-2 (1999): "Information technology - Coding of audio-visual objects - Part 2: Visual".<br>ISO/IEC 14496-2:1999/FDAM4, ISO/IEC JTC1/SC 29/WG11 N3904, Pisa, January, 2001. |
| [10] | ITU-T Recommendation T.81: "Information technology: Digital compression and coding of continuous-tone still images: Requirements and guidelines".<br>"JPEG File Interchange Format", Version 1.02, September 1, 1992. |
| [11] | CompuServe Incorporated: "GIF Graphics Interchange Format: A Standard defining a mechanism for the storage and transmission of raster-based graphics information", Columbus, OH, USA, 1987. |
| [12] | CompuServe Incorporated, Columbus, Ohio (1990): "Graphics Interchange Format (Version 89a)". |
| [13] | WAP-237-WAEMT-20010515-a: "Wireless Application Environment Defined Media Type Specification" |
| [14] | IETF RFC 2083: "PNG (Portable Networks Graphics) Specification version 1.0 ", T. Boutell, et. al., March 1997. |

| No. | DOCUMENT |
|---|---|
| **[15]** | W3C Working Draft: "Scalable Vector Graphics (SVG)". W3C Working Draft: "Mobile SVG Profiles: SVG Tiny and SVG Basic"3GPP 22.140: "Service Aspects; Stage 1; Multimedia Messaging Service". |
| **[16]** | 3GPP TS 26.171: "Speech codec speech processing functions; Adaptive Multi-Rate – Wideband (AMR-WB) speech codec; General description" |
| **[17]** | 3GPP TS 26.290: "Audio codec processing functions; Extended Adaptive Multi-Rate - Wideband (AMR-WB+) codec; Transcoding functions". |
| **[18]** | ITU-T Recommendation H.264: "Advanced video coding for generic audiovisual services" 03/05. |
| **[19]** | 3GPP TS 26.401: "General audio codec audio processing functions; Enhanced AAC plus general audio codec; General description". |