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## **Panasonic Avionics Corporation**

### APPROVALS FOR

#### eXW Digital Encoding Specification AVOD

#### Digital Media Encoding Specification for eXW AVOD Products

560898-311-39

Revision C

This document was approved electronically on the date displayed next to the approver.

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### **DIGITAL MEDIA ENCODING SPECIFICATION**

for the

**eXW AUDIO VIDEO ON DEMAND (AVOD) PRODUCTS**

**560898-311-39**

**Revision C**

**20 Pages**

**DIGITAL MEDIA ENCODING SPECIFICATION**  
**for the**  
**eXW AUDIO VIDEO ON DEMAND (AVOD) PRODUCTS**

February 20, 2015

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REVISION HISTORY

| REV | DATE              | REASON FOR REVISION  |
|-----|-------------------|--|
| NEW | March 12, 2013    | Initial Release, Program No. eXWireless-System-Init.   |
| A   | August 30, 2013   | Revised current sections 4.1 ad 4.2 - Added details on HLS file formatting.  |
| B   | June 20, 2014     | Changes are as follows:<br>4.1 Added Transport Stream quality requirements, including constraint for video and video-audio packet alignment<br>4.2 Clarified HLS segmentation is not required for delivery of files to Panasonic<br>4.3 Clarified requirement for Closed GOP and Number of B-Frames<br>4.3 Added support for multiple soundtracks<br>4.5 Removed, ID3 not needed |
| C   | February 20, 2015 | Added support for Closed Captions and Dynamic Subtitles.<br>Added new Section 4.0 File Title Format. Also renamed test file names to reflect the file naming convention.<br>5.2, HTTP Live Streaming File Formatting, added details for multi-audio tracks and subtitle tracks.<br>5.3.4.1, WebVTT File Format, added file naming conventions.                                   |
|     |                   |  |
|     |                   |  |
|     |                   |  |

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## 1.0 SCOPE

### 1.1 Introduction

This specification defines the criteria for delivering digital media for Panasonic Avionics Corporation eXW (wireless) Audio Video on Demand (AVOD) System. It is limited to source media that will be streamed as either Audio or Video on Demand using the eXW system.

In-Flight Entertainment (IFE) systems are generally constrained with respect to processing, storage capacity, communication bandwidth, and screen resolution by requirements imposed on carriers to meet low power, size and weight standards.

In addition, this specification provides for the ability to deliver digital audio-visual content from its origin to storage on board commercial aircraft, and comprises detailed specifications for source media, digitization, encoding, security, and media distribution.

### 1.2 Purpose

1.2.1 The purpose of this specification is to define the encoding parameters, format, and delivery of digital media to the Panasonic Avionics Corporation AVOD eXW IFE system.

### 1.3 Applications

1.3.1 Digital media shall be used for several IFE core applications, as listed in Table 1.

**Table 1. Core Applications**

|  |
|--|
| Full-Length Feature Motion Pictures (Video Movies) |
| Video Trailers                                     |
| Video Short Features                               |
| Video Graphics                                     |
| Video Advertisements                               |
| Video Help   |
| Audio Entertainment                                |

1.3.2 This specification applies to encoded audio/video content that is streamed from the File Server LRU to PEDs over a wireless distribution network.

### 1.4 Reference Documents

#### 1.4.1 Standards

The following reference documents contain industrial standards that, through reference in this specification, constitute provisions of this document. All standards are subject to revision, and parties to agreements based on this specification are encouraged to apply the most recent editions, if possible.

*Digital Content Delivery Methodology for Airline In-Flight Entertainment, Version 1.3*  
Airline Passenger Experience Association  
Document No. APEX 0403

*Content Delivery for In-Flight Entertainment, Version 2.0*  
World Airline Entertainment Association  
Document No. WAEA 0395

*Information Technology – Coding of Moving Pictures and Associated Audio for digital storage media at up to 1.5 Mb/s, Part 1: Systems a.k.a. MPEG-1 Systems*  
International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 11172-1:1993

*Information Technology – Coding of Moving Pictures and Associated audio for digital storage media at up to 1.5 Mb/s, Part 2: Video a.k.a. MPEG-1 Systems*

International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 11172-2:1993

*Information Technology – Coding of Moving Pictures and Associated Audio for Digital Storage Media at up to 1.5 Mb/s, Part 3: Audio a.k.a. MPEG-1 Systems*

International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 11172-3:1993

*Information Technology – Generic Coding of Moving Pictures and Associated Audio Information, Part 1: Systems, including Amendment 1: “Registration procedure for copyright-identifier” a.k.a. MPEG-2 Systems*

International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 13818-1:1993

*Information Technology – Generic Coding of Moving Pictures and Associated Audio Information, Part 2: Systems, Including Amendment 1: “Registration procedure for copyright-identifier” a.k.a. MPEG-2 Systems*

International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 13818-2:1993

*Digital Recording of Audio Signals*

International Telecommunication Union – Radio Communication  
Document No. REC ITU-R BR.648

*MPEG-4 Specification, Part 1*

Document No. ISO/IEC 14496-1

*MPEG-4 Specification, Part 2*

Document No. ISO/IEC 14496-2

*MPEG-4 Specification, Part 3*

Document No. ISO/IEC 14496-3

*MPEG-4 Specification, Part 10*

Document No. ISO/IEC 14496-10

*CD Digital Audio Systems*

IEC Electronics Corporation  
Document No. IEC Publication 908:1987

International Standards Organization/IEC Electronics Corporation  
Document No. ISO/IEC 639 3-Letter Language Codes

*WebVTT; Web Video Text Tracks Format*

W3C Text Tracks Community Group <http://dev.w3.org/html5/webvtt/>

## **1.5 Acronyms and Abbreviations**

|        |                                      |
|--------|--------------------------------------|
| AAC-LC | Advanced Audio Coding-Low Complexity |
| ACC    | Advanced Audio Coding                |
| ADTS   | Audio Data Transport Stream          |
| AES    | Audio Elementary Stream              |
| AI     | Aircraft Interface                   |
| AOD    | Audio On Demand                      |
| ASP    | Advanced Simple Profile              |
| ASPC   | Audio Server/PC Controller           |
| AVC    | Advanced Video Codec                 |

|      |   |
|------|---|
| AVOD | Audio Video On Demand   |
| BGM  | Background Music  |
| CAGE | Commercial and Government Entity  |
| CBR  | Constant Bit Rate   |
| CD   | Compact Disc  |
| CIF  | Common Interface Format   |
| COB  | Close of Business   |
| CS   | Content Server  |
| dBm  | Decibel (referenced to milliwatts)  |
| DMD  | Digital Media Distribution  |
| ECCN | Export Control Classification Number  |
| EFT  | Electronic File Transfer  |
| ENCR | Encrypted Method Registration (tag field)   |
| ES   | Elementary Stream – MPEG compressed audio or video data   |
| FS   | File Server   |
| GOP  | Group of Pictures   |
| HD   | High Definition   |
| HLS  | HTTP Live Streaming   |
| HTTP | Hypertext Transfer Protocol   |
| IDR  | Instantaneous Decoding Refresh  |
| IEC  | International Engineering Consortium  |
| IFE  | In-Flight Entertainment   |
| ISO  | International Organization for Standardization  |
| ITU  | International Telecommunication Union   |
| Kb/s | Kilobits per second ( = 1,000 bits per second)  |
| kHz  | KiloHertz   |
| LATM | Low-overhead Audio Transport Multiplex  |
| LRU  | Line Replaceable Unit   |
| Mb/s | Megabits per second ( = 1,000,000 bits per second)  |
| MPAA | Motion Pictures Association of America  |
| MPEG | Moving Pictures Experts Group   |
| NTSC | National Television Standards Committee   |
| PA   | Public Address  |
| PAL  | Phase Alteration by Line  |
| PAT  | Program Association Table – Packet that contains references to all programs on the TS.  |
| PCR  | Program Clock Reference – Packet that contains timing information used to synchronize the decoder clock with the program information. |
| PES  | Packetized Elementary Stream – MPEG compressed audio or video data that has been formatted for delivery in the MPEG Transport Stream. |
| PID  | Packet Identifier – MPEG-2 Transport Stream term used to identify individual data payloads carried by the Transport Stream.           |



|          |  |
|----------|--|
| PMT      | Program Map Table – Packet that refers to the specific PES PIDs of a program.  |
| PTS      | Presentation Time Stamp  |
| SD       | Standard Definition  |
| SP       | Simple Profile   |
| SPS      | Sequence Parameter Set   |
| SS       | Systems Stream   |
| TC       | Technical Committee  |
| TS       | Transport Stream – MPEG-2 protocol specification for transmission of one or more video, audio and private data programs. |
| VBR      | Variable Bit Rate  |
| VBV      | Video Buffering Verifier   |
| VES      | Video Elementary Stream  |
| VOD      | Video On Demand  |
| VPA      | Video PA   |
| WAEA     | World Airline Entertainment Association  |
| WebVTT   | Web Video Text Tracks – A file format for captioning video content   |
| X-Series | Refers to eFX/eX2  |

## 2.0 SYSTEM MODEL

### 2.1 Purpose

2.1.1 The system model identifies the pertinent interfaces between the source media and the IFE equipment, or AVOD sub-system. These interfaces are identified to facilitate a common understanding of the overall requirements.

### 2.2 Top-Level Description

2.2.1 The overall system flow deals with obtaining digital media from the media provider through the laboratories, and the process for secure delivery to IFE system components. The IFE system provides various service capabilities to passengers through the system distribution architecture. Figure 1 depicts the overall system flow.

2.2.2 The IFE system can consist of either the equipment on board an aircraft, or a secure IFE processing facility that supports on-board IFE equipment.

2.2.3 An acceptable IFE processing facility meets the security recommendations of the Motion Pictures Association of America (MPAA) and is subject to periodic audit by the same.

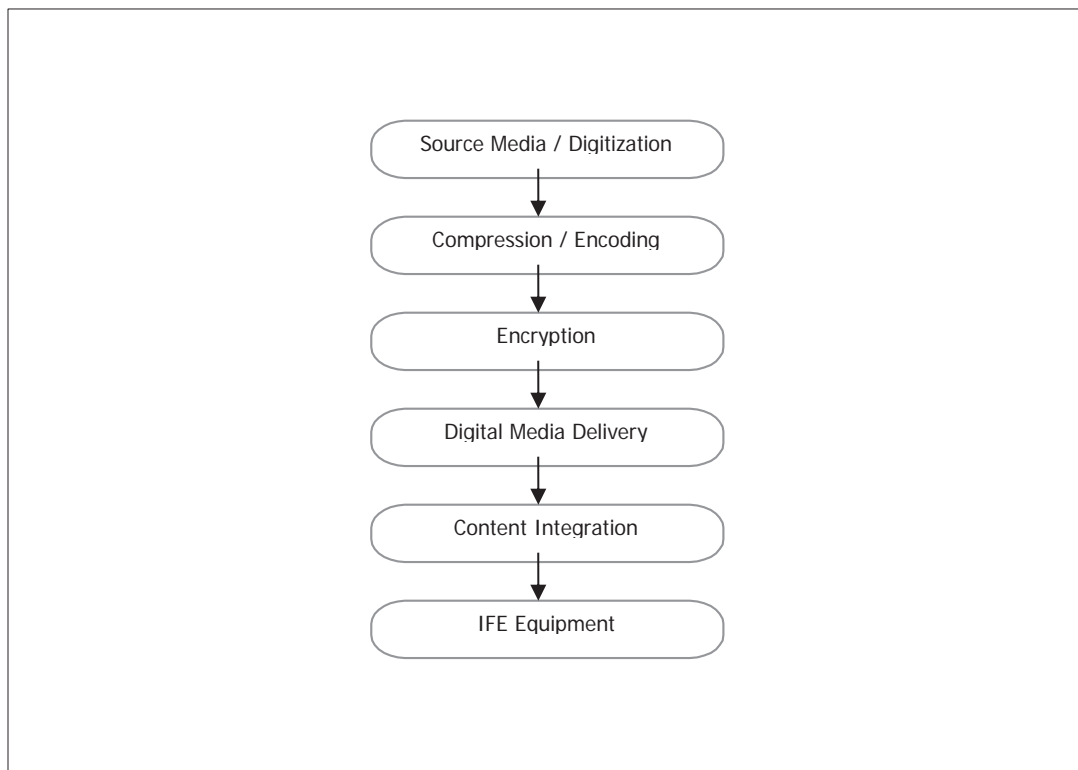


Figure 1. Top-Level Process Distribution Flow

### 3.0 SOURCE MEDIA

Because the condition and quality of the source media largely determines the quality of the resulting compressed digital output, only the highest-quality source media shall be considered for the following application types.

#### 3.1 Types

- 3.1.1 Potential forms of source media shall include film, digital media, analog videotape, and digital videotape.
- 3.1.2 Source media shall be in accordance with APEX Specification *Digital Content Delivery Methodology for Airline In-Flight Entertainment*.

#### 3.2 Program Information

- 3.2.1 Program information considered as source media for this application shall be in accordance with APEX Specification *Digital Content Delivery Methodology for Airline In-Flight Entertainment*.

#### 3.3 Entertainment Audio

- 3.3.1 Entertainment audio included with audio-only programming considered for use as source media for this application shall include digital media, digital audiotape, compact disc, and mini disc.
- 3.3.2 Source media shall be in accordance with APEX Specification *Digital Content Delivery Methodology for Airline In-Flight Entertainment*.

**4.0 FILE TITLE FORMAT**

**4.1 Applications**

4.1.1 For identification purposes, the title of each digital media file shall follow a specific format, as described in the following tables. All files are required to start with the 2-letter Panasonic Airline code. All file names shall be in lower case.

**Table 2. eXW File Title Format**

| MEDIA TYPE  | FILE NAMING CONVENTION   | EXAMPLE                                  |
|---|--|--|
| AOD   | Panasonic Airline Code<br>p = PRAM<br>Designated 9-digit #<br>(mmyyxxxxx)<br>Audio format designation (ma)<br>Required Extension   | sqa071300011ma.mp3<br>sqa071300017ma.mp3 |
| Advertisement   | Panasonic Airline Code<br>c = Advertisement<br>Designated 9-digit #<br>(mmyyxxxxx)<br>MPEG format/ (m1/m2/m4/h7)<br>Required Extension   | Cic071312345z4.mpg                       |
| Dummy File  | Panasonic Airline Code<br>d = Dummy File<br>Designated 9-digit #<br>(mmyyxxxxx)<br>MPEG format/ (m1/m2/m4/h7)<br>Required Extension  | Ekd071312345z4.mpg                       |
| Help Files, Safety Videos, Airline Info, Destination Videos, Duty Free Videos | Panasonic Airline Code<br>h = Help files, Safety Videos, Airline info, Destination Videos, Duty Free Videos<br>Designated 9-digit #<br>(mmyyxxxxx)<br>MPEG format/ (m1/m2/m4/h7)<br>Required Extension | nwh071312345z4.mpg                       |
| Movies  | Panasonic Airline Code<br>m = Movie<br>Designated 9-digit #<br>(mmyyxxxxx)<br>MPEG format/ (m1/m2/m4/h7)<br>Required Extension<br>(SA encryption per content owner requirements)                       | sam071312345z4.mpg                       |

| MEDIA TYPE                        | FILE NAMING CONVENTION  | EXAMPLE            |
|-----------------------------------|---|--------------------|
| Shorts, News, Sports, Documentary | Panasonic Airline Code<br>s = Short, News, Sports, Documentary<br>Designated 9-digit # (mmyxxxxx)<br>MPEG format (m1/m2/m4/h7)<br>Required Extension (SA encryption per content owner requirements) | sas110800001z4.mpg |
| Movie Trailers                    | Panasonic Airline Code<br>t = Trailer<br>Designated 9-digit # (mmyxxxxx)<br>MPEG format/ (m1/m2/m4/h7)<br>Required Extension  | klt020800021z4.mpg |

File name example: ***sqm060800101z4.mpg***

sq = 2-letter Panasonic Airline Code

m = Media Type:

- a = Audio on demand
- i = Audio Book
- b = Broadcast/Radio
- j= Audio Boarding Music
- c = Advertisement
- d = Dummy File
- f= Decompression files
- g = Graphic, screensaver
- h = Help files, Safety Videos, Airline info, Destination Videos, Duty Free Videos
- m = Movie
- p = Audio PRAM <Public Address>
- s = Short, News, Sports, Documentary
- t = Movie Trailer
- e = Encrypted TV content <HBO, Showtime>
- w = CD Audio <multi-track format>

06 = Month of Play Cycle

08 = Year of Play Cycle

00101 = Number of file <5 digits>

z4 = MPEG format/Aspect Ratio:

- z4 = eXW
- ma = Audio File Designation

mpg = File extension

## 5.0 ENCODING REQUIREMENTS FOR EXW

This section contains unique digital media encoding requirements for the eXW IFE system.

### 5.1 Media File Format Specifications

- 5.1.1 All digital VOD media files for eXW must be formatted in an MPEG-2 Transport Stream (TS) and packaged to support HTTP Live Streaming (HLS).
- 5.1.2 All digital AOD media files for eXW must be formatted in MP3 file format and packaged to support HTTP Live Streaming (HLS).
- 5.1.3 Various levels of video and audio quality and corresponding video and audio bit rates are supported by eXW. Because of this flexibility, the system configuration can be customized to meet each airline's requirements. However, for a given installation/configuration, the multiplex rate (established by prior agreement between the airline and Panasonic Avionics Corporation) of video and audio files are critical. The following is a basic requirement on the multiplexed file:
  - 5.1.3.1 The amount of NULL packets included in the TS file shall be minimized.
  - 5.1.3.2 For VOD files, the Program Clock Reference (PCR) Packet Identifier (PID) must be the same as the Video Elementary Stream (ES) PID.
  - 5.1.3.3 The average time period between PCR values must not exceed 100 ms.
  - 5.1.3.4 All Transport Stream formatted media is required to pass a T-STD buffer analysis as specified in MPEG-2, Part 1 specification.
  - 5.1.3.5 For VOD files, the video packets and the corresponding video-audio packets must be adjacent in the TS file; no more than 1 second difference in PTS values of adjacent video and video-audio TS packets. Maximum Audio Decode Delay parameter in the multiplexer can be used to affect this parameter; eXW requires a setting of 3 seconds, or less.
  - 5.1.3.6 For VOD files, the video PTS shall always be present.

## 5.2 HTTP Live Streaming (HLS) File Formatting Details

This section describes the HLS streaming file format used in the eXW system. HLS format is NOT required for delivery of eXW content unless specifically agreed to between Panasonic and the encoding lab.

- 5.2.1 Each HLS AOD/VOD program must be segmented into 10-second chunks and provided with a corresponding M3U8 file that calls out all file chunks that make up the AOD/VOD program.
- 5.2.2 The HLS naming convention and organization for the media chunks and M3U8 file that make up an AOD/VOD program is defined below.
  - 5.2.2.1 The base name for the m3u8 file, media chunk files and containing folder are all the same.
  - 5.2.2.2 Each media chunk file has a "-X" added to the base name, where X is equal to the sequence number of the media chunk file starting with 1.
  - 5.2.2.3 The file extension for the M3U8 file must be ".m3u8".
  - 5.2.2.4 The file extension for a video media chunk file must be ".ts".
  - 5.2.2.5 The first VOD soundtrack is included in the video file chunks.
  - 5.2.2.6 For a multi-soundtrack VOD program, all additional soundtracks, beyond the first soundtrack, must be in separate VOD audio soundtrack media chunks with file extension of ".aac".
  - 5.2.2.7 For a VOD program with WebVTT subtitles, all subtitle chunks must have a file extension of ".vtt".
  - 5.2.2.8 The file extension for an AOD audio media chunk file must be ".mp3".
  - 5.2.2.9 The M3U8 file and media chunk files that make up an AOD/VOD program must be included in a single folder. The contents of each folder must only include a single AOD/VOD program.
  - 5.2.2.10 The contents of the folder must be delivered in a single archive file with the same base name using the filenaming convention as detailed in section 4.1.1
  - 5.2.2.11 Example naming for VOD program files:
    - 5.2.2.11.1 Example naming for a single-soundtrack 30sec VOD file:  
sqm060800101z4.tar with the following contents:  
  
sqm060800101z4/sqm060800101z4.m3u8  
sqm060800101z4/sqm060800101z4-1.ts  
sqm060800101z4/sqm060800101z4-2.ts  
sqm060800101z4/sqm060800101z4-3.ts

5.2.2.11.2 Example naming for a multi-soundtrack 30sec VOD file:

sqm060800101z4.tar with the following contents:

```
sqm060800101z4/sqm060800101z4.m3u8
sqm060800101z4/sqm060800101z4-1.ts
sqm060800101z4/sqm060800101z4-2.ts
sqm060800101z4/sqm060800101z4-3.ts
sqm060800101z4/sqm060800101z4_audio2.m3u8
sqm060800101z4/sqm060800101z4_audio2-0.aac
sqm060800101z4/sqm060800101z4_audio2-1.aac
sqm060800101z4/sqm060800101z4_audio2-2.aac
...
sqm060800101z4/sqm060800101z4_audioN.m3u8
sqm060800101z4/sqm060800101z4_audioN-0.aac
sqm060800101z4/sqm060800101z4_audioN-1.aac
sqm060800101z4/sqm060800101z4_audioN-2.aac
```

Note: 'N' in the above naming convention represents the case where there are 3 or more soundtracks.

5.2.2.12 Example naming for a 30-second AOD program files:

sqa071300011ma.tar with the below contents:

```
sqa071300011ma/sqa071300011ma.m3u8
sqa071300011ma/sqa071300011ma-1.mp3
sqa071300011ma/sqa071300011ma-2.mp3
sqa071300011ma/sqa071300011ma-3.mp3
```

5.2.3 HLS M3U8 file examples.

5.2.3.1 An example M3U8 file for a 30-second single-soundtrack VOD program is listed below:

sqm060800101z4/sqm060800101z4.m3u8:

```
#EXTM3U
#EXT-X-TARGETDURATION:10
#EXT-X-ALLOW-CACHE:NO
#EXTINF:10,
./sqm060800101z4-1.ts
#EXTINF:10,
./sqm060800101z4-2.ts
#EXTINF:10,
./sqm060800101z4-3.ts
```



- 5.2.3.2 The multi-soundtrack programs must contain the multi-soundtrack m3u8 filename in the master m3u8. The following is an example of the master M3U8 file for a multi-soundtrack file with 4 languages:

sqm060800101z4/sqm060800101z4.m3u8:

```
#EXTM3U
#EXT-X-VERSION:4
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="Mult_Audio",NAME="Audio
1",LANGUAGE="49",DEFAULT=YES
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="Mult_Audio",NAME="Audio
2",LANGUAGE="50",DEFAULT=NO,URI="sqm060800101z4_audio2.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="Mult_Audio",NAME="Audio
3",LANGUAGE="51",DEFAULT=NO,URI="sqm060800101z4_audio3.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="Mult_Audio",NAME="Audio
4",LANGUAGE="52",DEFAULT=NO,URI="sqm060800101z4_audio4.m3u8"
#EXT-X-STREAM-INF:PROGRAM-ID=1,BANDWIDTH=1,AUDIO="Mult_Audio"
sqm060800101z4_video1.m3u8
```

- 5.2.3.3 An example M3U8 file for a 30-second multi-soundtrack VOD program is listed below:

sqm060800101z4/sqm060800101z4\_audio2.m3u8:

```
#EXTM3U
#EXT-X-TARGETDURATION:10
#EXT-X-VERSION:3
#EXT-X-MEDIA-SEQUENCE:0
#EXT-X-KEY:METHOD=NONE
#EXTINF:9.98400,
sqm060800101z4_audio2-0.aac
#EXTINF:9.98400,
sqm060800101z4_audio2-1.aac
#EXTINF:9.98400,
sqm060800101z4_audio2-2.aac
```

- 5.2.3.4 An example M3U8 file for a 30-second AOD program is listed below.

```
#EXTM3U
#EXT-X-TARGETDURATION:10
#EXT-X-ALLOW-CACHE:NO
#EXTINF:10,
./sqa071300011ma-1.mp3
#EXTINF:10,
./sqa071300011ma-2.mp3
#EXTINF:10,
./sqa071300011ma-3.mp3
```

## 5.2.4 HLS Formatting for Closed Captions and Dynamic Subtitles

- 5.2.4.1 The master VOD program m3u8 file must contain the subtitle m3u8 filename.
- 5.2.4.2 The base name of the subtitle m3u8 file, subtitle chunk files are all the same. The file extension for an subtitle chunk files must be ".vtt"

#### 5.2.4.3 Example naming for the first 3 chunks of the subtitle file.

```
sqm060800101z4/sqm060800101z4_subtitle1.m3u8  
sqm060800101z4/sqm060800101z4_subtitle1-0.vtt  
sqm060800101z4/sqm060800101z4_subtitle1-1.vtt  
sqm060800101z4/sqm060800101z4_subtitle1-2.vtt
```

#### 5.2.4.4 An example M3U8 file with 2 subtitles vtt tracks:

sqm060800101z4/sqm060800101z4.m3u8:

```
#EXTM3U  
#EXT-X-VERSION:4  
#EXT-X-MEDIA:TYPE=SUBTITLES,GROUP-ID="Subtitles",NAME="Subtitle  
1",LANGUAGE="60",DEFAULT=NO,AUTOSELECT=YES,FORCED=NO,URI="sqm060800101z4_subt  
itle1.m3u8"  
#EXT-X-MEDIA:TYPE=SUBTITLES,GROUP-ID="Subtitles",NAME="Subtitle  
2",LANGUAGE="61",DEFAULT=NO,AUTOSELECT=YES,FORCED=NO,URI="sqm060800101z4_subt  
itle2.m3u8"  
#EXT-X-STREAM-INF:PROGRAM-ID=1,BANDWIDTH=1200000,SUBTITLES="Subtitles"  
sqm060800101z4_video1.m3u8
```

#### 5.2.4.5 An example M3U8 file for a subtitle track:

sqm060800101z4/sqm060800101z4\_subtitle1.m3u8

```
#EXTM3U  
#EXT-X-TARGETDURATION:217  
#EXT-X-VERSION:3  
#EXT-X-MEDIA-SEQUENCE:0  
#EXT-X-KEY:METHOD=NONE  
#EXTINF:77.91100,  
sqm060800101z4_subtitle1-0.vtt  
#EXTINF:77.74500,  
sqm060800101z4_subtitle1-1.vtt  
#EXTINF:89.46400,  
sqm060800101z4_subtitle1-2.vtt
```

### 5.3 VOD Media

This section contains digital media encoding requirements for VOD files for the eXW IFE Entertainment System.

#### 5.3.1 Video Elementary Stream

All video elementary streams shall comply with ISO/IEC 14496-10 (MPEG-4, Part 10).

##### 5.3.1.1 Video Elementary Stream Parameters

- Advanced Video Coding (MPEG-4, Part 10, also called H.264)
- Main Profile, Level 3.0 (default)
- CABAC entropy coding
- Variable bit rate encoding
  - 800 kb/s for Full D1 resolution (VBR at 800kb/s average target, 4 x target peak)
  - (default) 500 kb/s for 360p (VBR at 500kb/s average target, 4 x target peak)
  - 400kb/s for CIF resolution (VBR at 400kb/s average target, 4 x target peak)
- VBV value shall be 130202 Bytes (default) or less

- GOP size shall be equal to 5 seconds (e.g., 120 frames for 24 frames/s source, or 150 frames for 30 frames/s) with the following exception:
  - Utilizing GOP sizes less than 5 second is acceptable and shall be used for scene change detection.
- Closed GOP. Specifically, every I-frame (key frame) must be in an IDR; i.e. IDR Frequency shall be set to 1.
- Streaming format is required, e.g. SPS and other sequence headers shall be repeated throughout the stream to facilitate fast decoder synchronization during random access.
- No referenced B-Frames
- Number of successive B-frames shall be from a minimum of 2 to a maximum of 5.
- Number of reference frames shall be set to 3
- Encode without weighted prediction
- Encoding from 23.976 frames/s film source shall be progressive scan
- Number of slices shall be set to 1, 2, or 4
- Deblocking filter shall be enabled

5.3.1.2 Encoded Video Resolutions:

- Full D-1 720x480
- 360p 640x360
- CIF 352x240

5.3.1.3 Target Display Aspect Ratios:

- 4:3
- 16:9 Anamorphic

5.3.2 Video-Audio Elementary Stream

5.3.2.1 ADTS AAC-HE v1 or v2 (ISO/IEC 14496-3) audio elementary streams are supported in the VOD file.

5.3.2.2 Up to 12 soundtracks (audio streams) shall be supported in a single video file.

5.3.2.3 Video-Audio Elementary Stream Parameters

- Audio encoding bit rate shall be between 48 Kb/s and 64 Kb/s (64 Kb/s is default) for AAC-HE encoded streams.
- Audio may be encoded as joint stereo (default), stereo or monaural
- Audio shall be sampled at 44.1 kHz or 48 kHz (default)

5.3.3 VOD Transport Stream File Format

5.3.3.1 The Transport Stream formatted VOD file shall contain a single video elementary stream and one, or more audio elementary stream(s). For example, the following shows the hierarchical relationship of the multiplex components. The actual PID values used can be different from those shown in the example below, but the Video ES PID and PCR PID must be equal to each other, as indicated in the following example:

```
PAT PID = 0x00
  PMT PID = 0x3F
    PCR PID = 0x30
      Video ES 1 PID = 0x30
      Audio ES 1 PID = 0x31
      (Optional) Audio ES 2 PID = 0x32
      (Optional) Audio ES 3 PID = 0x33
      (Optional) Audio ES 4 PID = 0x34
      ...
      (Optional) Audio ES N PID = 0xYY
```

### 5.3.4 Closed Captions and Dynamic Subtitling

This section contains digital media requirements for Closed Captions and Dynamic Subtitles for eXW Wireless IFE system. Specifically, the captioning and subtitling described here is not “burned” into the video image. Rather, this specification is for captioning and subtitles that are delivered as timed-text files separate from the video and associated video-audio and are to be displayed, or not displayed, based on passenger input. In summary, both Closed Captions and Dynamic Subtitles shall be delivered in WebVTT format.

For subtitle and captioning specifications relating to any other systems not detailed in this section, please contact the Panasonic Avionics Corporation media department for approval.

#### 5.3.4.1 WebVTT File Format

- Each timed-text track (Captions or Subtitles) shall be delivered in a separate WebVTT file.
- Up to 32 individual text track files can accompany any single video.
- Text tracks shall contain pop-on, pop-off text only. No scrolling text.
- WebVTT files shall be Unicode, UTF-8.
- The WebVTT files shall be named as follows:  
 <VOD\_File\_Name>\_<CC/Sub\_Language>\_<Caption\_Type>.VTT; where  
 <VOD\_File\_Name> = the base name of the corresponding mpeg video file  
 <CC/Sub\_Language> = the ISO 639 3-letter code for this language  
 <Caption\_Type> = CAP for Captions for hard of hearing persons, SUB for subtitles for language translation

Example: sqm060800101z4\_ENG\_SUB.VTT

**Table 3. WebVTT Cues**

| Cue      | Support* | Description  |
|----------|----------|--|
| line     | Yes      | Specifies where text appears vertically. If vertical is set, line specifies where text appears horizontally.                     |
| position | Yes      | Specifies where the text will appear horizontally. If vertical is set, position specifies where the text will appear vertically. |
| size     | Yes      | Specifies the width of the text area. If vertical is set, size specifies the height of the text area.                            |
| align    | Yes      | Specifies the alignment of the text. Text is aligned within the space given by the size cue setting if it is set.                |
| vertical | No       | Indicates that the text will be displayed vertically rather than horizontally, such as in some Asian languages.                  |
| region   | No       | Provides configuration options regarding the dimensions, positioning and anchoring of the display region.                        |

**\*NOTE:** Items with “No” support may be implemented in a future release of the IFE system and this specification. Please contact the Panasonic Avionics Corporation media department for approval before including any cues or tags that are not supported.

**Table 4. WebVTT Text Tags**

| Text Tag    | Support | Description  |
|-------------|---------|--|
| (Timestamp) | No      | Allows words or phrases to be added to the display, as is used in Karaoke  |
| c           | No      | Class Object. Style the contained text using a CSS defined class.  |
| i           | Yes     | Italics. Italicize the contained text.   |
| b           | Yes     | Bold. Bold the contained text  |
| u           | Yes     | Underline. Underline the contained text  |
| ruby        | No      | Ruby.Used with ruby text tags to display <u>ruby characters</u> (i.e. small annotative characters above other characters).         |
| rt          | No      | Ruby Text. Used with ruby tags to display <u>ruby characters</u> (i.e. small annotative characters above other characters).        |
| v           | No      | Voice. Similar to class tag, also used to style the contained text using CSS.  |
| lang        | No      | Language. Used to annotate parts of the cue where the applicable language might be different than the surrounding text's language. |

#### 5.3.4.2 Timing Validation

Subtitle and Caption media shall be validated for proper video-text synchronization prior to receipt by Panasonic Avionics Corporation.

## 5.4 AOD Media

This section contains digital media encoding requirements for AOD files for the eXW IFE System.

### 5.4.1 Audio Elementary Stream

All audio elementary streams shall comply with ISO/IEC 11172-3 (MPEG-1, Layer III, aka. MP3).

### 5.4.2 MP3 Audio Stream Parameters:

- Audio encoding bit rate shall be between 96 Kb/s and 256 Kb/s (128 Kb/s is default)
- Audio may be encoded as joint stereo (default), stereo or monaural
- Audio shall be sampled at 44.1 kHz or 48 kHz (default)