



ATSC Mobile DTV Receiver

Profile Guidelines

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ATSC A/153 Mobile DTV Receiver Profile Guidelines

Introduction

Consumers increasingly demand access to local content and enhanced television services on their portable devices, which makes Mobile DTV a great opportunity for consumer electronics device manufacturers. By developing Mobile DTV receivers, manufacturers can tap into the growing universe of consumers who want to tune in to live, local news, traffic information, weather, sporting events and entertainment programs while on the go -- in their car, on the beach, or wherever they may be.

The Open Mobile Video Coalition (OMVC), working with device manufacturers through their participation in the Mobile DTV Forum, and in collaboration with broadcasters and other stakeholders in the Mobile DTV ecosystem, has developed these ATSC A/153 Mobile DTV Receiver Profile Guidelines. They provide directional guidance to consumer electronics manufacturers on the device features and functionalities that will help ensure that devices have robust reception capability and interoperability with services offered by broadcasters -- and that consumers have an enjoyable and secure Mobile DTV experience.

These guidelines provide two Mobile DTV receiver profiles for illustrative purposes. The first profile represents a basic Mobile DTV receiver that can receive broadcast transmissions and that is interoperable with real-time linear Mobile DTV broadcast services. The second profile represents an enhanced Mobile DTV receiver that includes all the basic elements plus many of the advanced features and functionalities that many consumers will demand.

Consumer electronics manufacturers will be familiar with many elements of the ATSC A/153 Mobile DTV Receiver Profiles, such as digital recording and pausing functionality. However, both profiles also address three new elements that OMVC believes are critical to Mobile DTV's success, conditional access, service/audience measurement and Internet protocol (IP) connectivity:

- **Conditional Access.** The ATSC A/153 Mobile DTV standard incorporates a conditional access system that is based on the OMA-DRM standard. Because we anticipate that some Mobile DTV services will use service protection, both profiles require support for conditional access. In both cases, registration with a Mobile DTV trust authority is required so that unique digital certificates can be issued to each Mobile DTV receiver. Short term keys are sent over the broadcast channel. In order to provide a Mobile DTV system that can effectively handle a large volume of users, OMVC believes the Mobile DTV service protection system must incorporate the use of an interaction channel.
- **Service/Audience Measurement.** To date, broadcasters have only been able to make decisions using audience estimates based on sampling techniques. Mobile DTV's new

service and audience measurement tools will enable broadcasters to identify which channels are viewed, the duration and time of viewing, and channel changing and video download activity from every viewer who agrees to share such information. This data allows broadcasters to provide a more effective advertising-supported Mobile DTV service.

- **IP Connectivity.** To facilitate the operation of the conditional access system and the transmission of service and audience data, the Mobile DTV receiver must offer IP connectivity at least once every seven days using, for example, an Internet, Wi-Fi, 2G, 3G, 4G, USB, or Bluetooth connection.

Since the Advanced Television System Committee adopted the ATSC A/153 Mobile DTV standard in 2009, broadcasters have developed new and innovative Mobile DTV services and business models based on the standard. Ongoing innovation, in turn, drives the development of features and functionalities that consumers will demand as part of the Mobile DTV experience. These ATSC Mobile DTV Receiver Profile Guidelines are an important step in helping consumer electronics device manufacturers predict and meet this demand.

OMVC encourages manufacturers to continue working closely with broadcasters and other industry stakeholders not only in implementing the functionalities in these Receiver Profile Guidelines but also in developing exciting new features that go beyond these baseline requirements. Naturally, commercial Mobile DTV service providers may have additional device requirements and should be contacted directly. We will continue to support all key stakeholders as they work to advance Mobile DTV and ensure its commercial success.

— The Open Mobile Video Coalition

ATSC MOBILE DTV RECEIVER PROFILE GUIDELINES TABLE

Functions & Features	Base Profile (Required)	Enhanced Profile (Optional)	Comments
RF			
Channel tuning	US Channels 7 - 56	US Channels 7 - 56	Receivers built to either profile should tune Ch 7-56. Because of the physics of the receive system, the general power levels allowed in Low-band VHF, and the noise environment in that band, Low-band VHF has been excluded.
External Antenna Connection	Desirable	Desirable	An external antenna connection is desirable in both profiles where it is practical in a specific device
Second tuner	Not Required	Desirable	In either profile the mix of capabilities is left up to the receiver designers' assessment of the market
SFCMM	Not Required	Desirable	SFCMM is acceptable in both profiles, but the mix of capabilities is left up to the receiver designers' assessment of the market
Essence (Video / Audio) Decoding			
H.264 profile	Base profile level 1.3 & Main profile up to level 3.1	Base profile level 1.3 & Main profile up to level 3.1	The ATSC Mobile DTV Standard specifies use of SVC for frame sizes greater than 416x240. OMVC members plan to provide a single layer of video coded per Main Profile, Level 3.1 when resolutions greater than 416x240 are sent.
SVC	Not Used	Not Used	SVC has not appeared in the marketplace and since H.264 Level Main Profile 3.1 can replace it, currently there is no plan to use SVC
Audio	HE-AAC V2 (w/SBR) as constrained in A/153 Part 8	HE-AAC V2 (w/SBR) as constrained in A/153 Part 8	HE-AAC V2 with SBR is part the standard and is required in both profiles
Multiple audio services	Required	Required	The capability to receive different audio services (one at a time) is required in both profiles. Second language and Descriptive Video Services are two currently available services
Conditional Access/Service Protection			
CA Type	ATSC-M/H Compliant-Broadcast & Interactive mode Required	ATSC-M/H Compliant-Broadcast & Interactive mode Required	OMVC has been informed that many service offerings will use service protection. We have concluded that the practical way to implement a usable service protection scheme is to use the interaction channel. We advise device manufacturers that devices without any kind of interaction channel will most likely may not be able to receive at least some services that are planned.
Long term key delivery	For practical implementation the Interaction channel is required	For practical implementation the Interaction channel is required	Broadcasters need the interaction channel for long term key delivery especially as receiver volume scales to large values

Functions & Features	Base Profile (Required)	Enhanced Profile (Optional)	Comments
Conditional Access/Service Protection (continued)			
Short term key delivery	In Band from broadcast service	In Band from broadcast service	Required for business plans
Trust Authority Registration (Neustar)	Required	Required	Required for business plans
Clear-to-air (no encryption)	Supported	Supported	Required for business plans
Additional Connectivity (interaction channel)			
Periodic IP Connectivity, such as connected Internet, WIFI, 2G, 3G 4G, others or USB or bluetooth via helper device	Required from one	Required from one	Periodic IP Connectivity is required from at least from one of the following: Internet, WIFI, 2G, 3G 4G, USB, bluetooth or others at least once a week.
Electronic Service Guide			
Type	OMA-Bcst, as constrained by A/153	OMA-Bcst, as constrained by A/153	Broadcasters plan to use the OMA-Bcst for Service Guides delivered in band.
Delivery method: Out of Band via IP connectivity	Not Required	Required	Broadcasters plan to use out-of-band delivery for more enhanced Service Guides.
Delivery method: In Band from broadcast service	Required	Required	Broadcasters plan to use the OMA-Bcst for Service Guides delivered in band.
On device aggregation of ESG information collected from multiple providers	Required	Required	It is likely that individual broadcasters will deliver their own services guides and therefore aggregation on devices is necessary. This capability is referenced in the OMA-Bcst standard
DVR Functionality			
Pause Only	Preferred	Required	This feature is very useful for mobile applications given the expected behavior in mobile environments. The limitations in pause time is recognized, therefore a 'reasonable' length of time given the expected behavior.
Impulse Recording	Not Required	Desired	This feature would also be useful in mobile environments given the reasonable expectations of consumers
Scheduled DVR	Not Required	Desired	This feature would also be useful in mobile environments given the reasonable expectations of consumers
Other			
Service/Audience Measurement	Data collected and cached on device. Data is downloaded to service agency at least once per week or the same time as CA/SP long term (encryption) key delivery. Integration TBD.	Data collected and cached on device. Data is downloaded to service agency at least once per week or the same time as CA/SP long term (encryption) key delivery. Integration TBD.	This is a selected means for monetizing ad/underwriting supported services. Specific mechanisms to be used for data collection of the audience service usage are being developed.
Unique Device ID	Required	Required	A Device ID is required to uniquely identify the device, which then becomes an enabler of multiple features such as data collection. This may be the subjectKeyIdentifier in the x.509 certificate assigned by the OMVC's trust authority.
File Based Delivery	Recommended for mobile aspects of NRT Candidate Standard	Required for mobile aspects of NRT Candidate Standard	Broadcasters believe that file-based delivery will be an important feature of their MDTV business plans

Functions & Features	Base Profile (Required)	Enhanced Profile (Optional)	Comments
Other (continued)			
Closed Captioning	Required	Required	Broadcasters believe closed captioning to be essential for practical mobile services and the FCC is likely to mandate captioning on all mobile DTV devices.
Interactive Components	Not Required	RME Required	Broadcasters expect OMA-RME to be an essential part of enhanced services
Cell Information Table (CIT)	Required	Required	CIT operations maximize consumers' services as consumers change geographical areas. CIT will be an important feature for practical mobile business operations
Geo Location	Required (if GPS or other positioning aware, i.e. cell vectoring capability is present on device it must have the ability to share the location info with Mobile DTV apps)	Required (if GPS or other positioning aware, i.e. cell vectoring capability is present on device it must have the ability to share the location info with Mobile DTV apps)	Broadcasters plan to use the geo-location data in various applications. OMVC notes the concerns expressed for usage of data and the possible need for opt-in capabilities. OMVC also has concerns over privacy of data.
Certification	Individual Business Discussion	Individual Business Discussion	Device certification should remain an individual business discussion and decision, and should not be a general requirement.
Instant Play	Power off settings and authorizations retained	Power off settings and authorizations retained	All settings and authorizations should be retained when devices are powered off to make the devices more useable
Wake-up Function wake up and provide emergency alert to user	Not Required	Required after capability is added to the ATSC standard	Wake-up functions on Mobile 1-Seg devices were essential in the recent Japanese earthquake and tsunami. The wake-up function may require enhancements to the ATSC standard.
Recommended Minimal Receiver Performance Criteria	Recommended that minimal performance meet or exceed the guide lines in ATSC A/174 * Note that the development of a recommended practice on ATSC MDTV receiver performance that will become ATSC A/174 is still in process.	Recommended that minimal performance meet or exceed the guide lines in ATSC A/174 * Note that the development of a recommended practice on ATSC MDTV receiver performance that will become ATSC A/174 is still in process.	In general the industry believes that device performance criteria should be left to the marketplace and not be required.
Parallel Parades: The ability to receive more than one parade at the same time. This may be required if the receiver needs to receive EMM parade for CA, or data parade for ESG or for other purposes while it receives the A/V parade. This also enables some advance features like PIP (Picture In Picture), or reception of NRT parade while watching an A/V parade etc.	Not Required	Required	Parallel parades offer the potential for a better user experience in a broadcast, such as PIP
Legacy ATSC support (Device also receives A/53 broadcasts)	Not Required	Not Required	Legacy ATSC support (A/53 reception) is not required but is allowed if appropriate for the product

Glossary of Key MDTV Terms

Base Profile Level 1.3	A Profile of the Advanced Video Codec video compression algorithm for AVC video (ISO/IEC 14496-10) [1]. The allowable parameters are bounded by the upper limits specified for the Baseline Profile at Level 1.3 as further constrained by Section 7.1 of ATSC A/153 Part 7 AVC and SVC Video System Characteristics.
CA	<p>Conditional Access (CA) or Conditional Access System (CAS) sometimes call Service Protection is a system that selectively allows access to program services within the MDTV transmission. The ATSC MDTV standard uses a CA system that is based on the OMA-DRM standard.</p> <p>See ATSC A/153 Part 6 Service Protection.</p>
Certification	A process that can be performed on a product to confirm a set of capabilities exist in the product.
CIT	<p>The Cell Information Table for ATSC-M/H (CIT-MH), provides carrier frequency information on selected transmitters in adjacent cells that are transmitting services that are the same as, or very similar to, services in the M/H Broadcast where the CIT appears. The purpose of this table is to allow a viewer to continue watching the same service, or a very similar service, when traveling from the coverage area of one M/H transmitter to the coverage area of others. A directed channel change based on received signal strength or geo location of the receiver would utilize the CIT information.</p> <p>See ATSC A/153 Part 3 Service Multiplex and Transport Subsystem Characteristics.</p>
Clear-to-air	Clear-to-air is an MDTV service model where mobile transmission(s) are sent unencrypted without the use of Service Protection or Conditional Access. The MDTV viewer is able to receive the content on any basic receiver and without any enforcement of any additional action such as data collection.
Free- to-air	Free-to-air is an MDTV service model where mobile transmission(s) are sent with the use of Service Protection or Conditional Access. The receiver must be equipped with decryption software. The viewer must access a sign up portal and agree to the terms of use for the service(s) in exchange for the electronic keys to unlock the content.
File Based Delivery	The delivery of content as a file rather than as a linear stream. This delivery method allows content to be sent for viewing at a later time and also can be used to deliver interactive and program associated content that may be user selected.

See ATSC A/153 Part 3 Service Multiplex and Transport Subsystem Characteristics.

Geo Location	An optional feature on an MDTV receiving device that utilizes GPS or wireless carrier signals to determine the location of the MDTV device. This information can be used to select location based advertising, trigger receiver hand off when moving between MDTV service areas or other location sensitive applications.
H.264	<p>A simplified and widely used reference to MPEG-4 Advanced Video Codec and Scalable Video Codec as described in ITU-T Rec. H.264/ISO/IEC 14496 Part 10.</p> <p>When used in the Mobile DTV context a subset of capabilities is inferred as per ATSC A/153 Part 7 AVC and SVC Video System Characteristics.</p>
HE-AAC v2.0	High Efficiency Advanced Audio Coding version 2 as described in ISO/IEC 14496-3 and constrained by ATSC A/153 Part 8 HE AAC Audio System Characteristics.
Impulse Recording	An MDTV receiver feature that incorporates a digital recorder function that is capable of recording a selected MDTV program stream at the push of a button based on the viewer's impulse decision.
In Band	Information that is delivered to MDTV receiver devices by the MDTV broadcast channel. Typically this would include linear and file based program content, basic and advanced ESG data and short term encryption keys.
Instant Play	Instant Play is a feature of the MDTV receiver that remembers the previous session settings and returns to those settings upon power of the receiver. This eliminates the need to select an MDTV channel or stream and then set audio listening levels.
Long Term Key Message	<p>A Long Term Key Message (LTKM) is equivalent to an EMM in CAS in subscription TV systems. It contains the Rights Encryption Keyset (REK) that is delivered to a receiver via a registration protocol and is specific to that particular receiver. The REK is used to protect the Service Encryption Key (SEK) and the Program Encryption key (PEK). LTKM's are usually delivered to the receiver via the interactive channel or out-of-band.</p> <p>See ATSC A/153 Part 6 Service Protection and ATSC A/154 ATSC Mobile DTV Recommended Practice.</p>
Main Profile Level 3.1	A Profile of the Advanced Video Codec (AVC) video compression algorithm of AVC video (ISO/IEC 14496-10) [1]. The allowable parameters are bounded by the upper limits specified for the Main

Profile at Level 3.1.
See ATSC A/153 Part 7 AVC and SVC Video System Characteristics.

OMA-BCAST	<p>The Open Mobile Alliance – BCAST is a standard that is for the transmission of an electronic service guide for MDTV. The OMA-BCAST standard was adopted with some modification as part of the ATSC A/153 Mobile DTV Standard.</p> <p>See ATSC A/153 Part 4 Announcement and ATSC A/154 ATSC Mobile DTV Recommended Practice.</p>
OTAG	<p>OMVC Technical Advisory Group (OTAG) is the technical body of the OMVC. It is made up representatives of the various broadcaster members of the OMVC. OTAG works in conjunction with the OMVF Forum, ATSC and other groups to further the ATSC MDTV technology and system architecture.</p>
Out of Band	<p>Information that is delivered to MDTV receiver devices by the interaction channel as opposed to the MDTV broadcast channel. Typically this would include advanced ESG, long term encryption keys and some file based content.</p>
Pause Only	<p>Pause Only function on an MDTV receiver allows the viewer to go to take a break while watching a real time linear program and then resume watching at a later time. This mode requires the receiver to have recordable memory that is capable of buffering program content for a reasonable period of time i.e. >30 minutes.</p>
SBR	<p>Spectral band replication (SBR) is a technology that is part of the HE-AAC v2.0 audio codec selected for inclusion by the ATSC A/153 Standard. It is based on harmonic redundancy in the frequency domain. Some guidance information for reconstruction of the high-frequency spectral envelope is transmitted as side information.</p> <p>When the audio is encoded using SBR, the replicated audio will sound “dull” due to the lack of high frequency information if SBR is not implemented in the audio decoder.</p> <p>See ATSC A/153 Part 8 HE AAC Audio System Characteristics</p>
Scheduled DVR	<p>An MDTV receiver feature that incorporates a digital recorder function that is capable of being programmed to record a selected MDTV program stream at a selected time without any assistance once the information has been programmed.</p>
Service/Audience Measurement	<p>The collection of service usage data such as channel watched, duration of viewing, channel change activity, time of day for viewing that is stored on the receiver for a period of time and then transferred via the interactive channel. The transfer of this</p>

information might be coordinated with the delivery of the LTKM. Broadcasters are expected to require viewers to opt into the transmission of this data as condition to access some services.

SFCMM

Scalable Full Channel Mobile Mode is an alternative mode of MDTV operation that allows higher data rates up to the full channel capacity for mobile service without assurance of protection for legacy ATSC services.

See ATSC A/153 Part 9 Scalable Full Channel Mobile Mode

Short Term Key Message

Short Term key Messages (STKM) contain the Service Encryption Key (SEK) and the Program Encryption Key (PEK). The STKM is equivalent to an ECM in CAS in a subscription TV system. The lifetime of the SEK and PEK is very short and must be changed every few seconds. The STKM is sent via the broadcast channel and is a small message (100 to 130 bytes). Some broadcasters may send it in every RS frame to prevent it from increasing channel change time.

See ATSC A/153 Part 6 Service Protection and ATSC A/154 ATSC Mobile DTV Recommended Practice.

Trust Authority

The trust authority is an independent agency that administers the public key infrastructure for the service protection system. The authority issues unique digital certificates to each MDTV receiver at the time of manufacturing. In the case of ATSC MDTV, the Open Mobile Video Coalition has selected Neustar Inc. as the MDTV Trust Authority. They also will manage the full lifecycle of MDTV trust relationships from registration to ordering, delivery, authentication, status checking and revocation.

Unique Device ID

A Device ID is required to uniquely identify the device, which then becomes an enabler of multiple features such as data collection. This may be the subjectKeyIdentifier in the x.509 certificate assigned by the OMVC's trust authority.

Wake-up Function

There are two types of wake-up function. The first is based on the user of the MDTV receiver programming in a specific time to turn on thus reminding the viewer that a desired program is available. The programming of this feature might be as simple a clicking on a specific listing from the program guide.

The second is a function in the ATSC MDTV receiver that will respond to specific alerting message and bring the receiver to operation while it is normally not in use. The function periodically samples the broadcast transmission looking for the alert code.

This feature is currently being developed.

Reference Documents

ATSC: "ATSC Mobile DTV Standard, Part 3 – Service Multiplex and Transport Subsystem Characteristics," Doc. A/153 Part 3:2009, Advanced Television Systems Committee, Washington, DC, 15 October 2009.

ATSC: "ATSC Mobile DTV Standard, Part 4 – Announcement," Doc. A/153 Part 4:2009, Advanced Television Systems Committee, Washington, DC, 15 October 2009.

ATSC: "ATSC Mobile DTV Standard, Part 6 – Service Protection," Doc. A/153 Part 6:2011, Advanced Television Systems Committee, Washington, DC, 23 May 2011.

ATSC: "ATSC Mobile DTV Standard, Part 7 – AVC and SVC Video System Characteristics," Doc. A/153 Part 7:2009, Advanced Television Systems Committee, Washington, DC, 15 October 2009.

ATSC: "ATSC Mobile DTV Standard, Part 8 – HE AAC Audio System Characteristics," Doc. A/153 Part 8:2009, Advanced Television Systems Committee, Washington, DC, 15 October 2009.

ATSC: "ATSC Mobile DTV Standard, Part 9 – Scalable Full Channel Mobile Mode," Doc. A/153 Part 9:2011, Advanced Television Systems Committee, Washington, DC, 01 June 2011.

ATSC: "ATSC Mobile DTV Recommended Practice, Doc. A/154:2011, Advanced Television Systems Committee, Washington, DC, 05 May 2011.

OMA: "Service and Content Protection for Mobile Broadcast Services," Doc. OMA-TSBCAST_SvcCntProtection-V1_0, Open Mobile Alliance.

OMA: "Service Guide for Mobile Broadcast Services," Version 1.0, OMA-TSBCAST_Service_Guide-V1_0, Open Mobile Alliance, URL: <http://www.openmobilealliance.org>