



A Cabot Technical Paper:

A Guide to MHEG-5 Profile Specification

Television broadcasters and service providers around the world are steadily making the transition from analogue transmission to digital. To capitalise on these new digital services, application programs can be transmitted to digital receivers to provide new ways for the viewer to interact with television. The most successfully deployed interactive application language for digital TV consumer electronics is MHEG-5 which provides consistent application programs across the market.

MHEG-5 is a presentation language and its compact and efficient transmission to digital TV devices makes it ideal for incorporation into low cost receivers, exactly the right kind of feature enhancement for ensuring the successful take-up of digital TV services.

MHEG-5 in the UK: 1.06 Profile

MHEG-5 is an open standard specification for interactive services. The 1.06 Profile removed some historical MHEG-5 requirements, while also adding new ones and providing clarification on others. It was adopted by the UK's Digital Television Group (DTG) and all UK digital TV receivers are certified against this profile.

Huge effort has been expended on the progression of this profile through corrigenda built on the shared experiences of broadcasters, MHEG-5 engine vendors, application authors and test engineers. The 1.06 Profile is the most successfully deployed MHEG-5 in the world to date and due to its success the 1.06 Profile is often chosen as the base line for MHEG-5 deployments around the world.

In Ireland the 1.06 Profile is specified for its Boxer digital network and New Zealand also specifies 1.06, but with special adaptations for its markets. This is how the profile specification begins: by using the 1.06 Profile (or a derivative) as the starting point.

Defining an MHEG-5 Profile

From this start point, a profiler must consider many aspects of digital TV; from the broadcast head end equipment to the digital receiver in the home, from the requirements of the digital TV services to be broadcasted to high level government directives. The following sections outline those areas of digital TV that should be considered when defining an MHEG-5 profile.

Broadcast Bandwidth

The profiler must consider whether all the TV services within the market will each have their own data service or will share a single data service or a data service

per bouquet. Such requirements can reflect available bandwidth so MHEG-5 behaviour regarding application lifecycle should be considered.

It is also important to know if an MHEG-5 application will be destroyed at channel change and this needs to be specified if it differs from the 1.06 Profile which always terminates the application on a channel change (even if the application instigates the change).

User Interface

UK 1.06 digital receivers receive both interactive and non-interactive TV and Radio services and such devices provide channel navigation and electronic program guides. However, these are vendor specific and rely on broadcasted SI and EIT information and so consistency across platforms is lost. Certain markets, such as New Zealand, have opted for greater consistency with an MHEG-5 based EPG. Such a capability allows textual TV programme information to be enriched with graphics which provides an engaging and more informative experience.

The profiler must decide how much of the user interface is to be based on MHEG-5 and must also consider the knock-on effects for equipment manufacturers. A wide user interface will create pockets of inconsistency where particular receiver features are not represented by the profile.

Remote Control Keys

MHEG profiles require a strictly defined set of keys. A profiler may see the need for new keys beyond those in the baseline 1.06 Profile and must provide new numeric codes in order for the new keys not to clash with existing keys. The receiver itself may also have front panel keys but these normally do not interact with MHEG-5.

Character Sets and Fonts

MHEG-5 applications can contain codes to display special characters. To ensure support for these characters the profiler must identify all the characters needed and provide a font that supports them.

The 1.06 Profile specifies Tiresias as the built-in font. It is presented in a minimum of 4 different point sizes and the font was designed with readability in mind by the BBC and the RNIB. The profiler may wish to specify alternatives but at the very least one built-in font should be specified.

The profiler may wish to incorporate downloadable fonts but should consider the speed at which the fonts are delivered to the application. Text using downloadable fonts remains invisible until the font has been fully received. Fonts usually need licensing and this aspect must be investigated with countywide licences often being applicable.

Colours

The 1.06 Profile specifies a colour palette of just 188 colours. More capable receivers can render many more colours including true colour. A profiler must consider the capabilities of the receiver, often the development of both go hand in hand.

Graphics

The 1.06 Profile allows for the display of PNG (bitmap-like) files and I-frames (a single frame from an mpeg-2 file). The profiler should consider support for jpeg rendering for improved graphics efficiency.

A profiler should also consider the number of OSDs that a receiver should provide. Multiple OSDs allow simultaneous presentation of MHEG, native GUI and/or subtitles.

Full SD video provides for 720 x 576 pixels and the 1.06 Profile requires the same size OSD. The UK HD specification allows for higher video resolution but retains the 720x576 address range despite the larger OSD. This approach allows authoring of applications at a single resolution. The profiler may need to consider the rendition of MHEG-5 on HD if this service is to be provided.

Persistent Storage

The 1.06 Profile allows for 1k of RAM style storage. This storage is used to hold MHEG-5 ingredient contents (data) during channel changes and the information is essentially retained until the power is cycled on the STB. A profiler may want to define greater storage, retention during power cycle or perhaps service specific storage. As time goes by and the price of hardware falls, storage allowances can be increased many fold.

DVR

Digital Video recorders are gradually penetrating the market. For MHEG-5 to be able to make and manage recordings requires the specification of resident programs to access the receiver's recording and playback facilities. Ideally such extensions should be hardware agnostic allowing access to flash based storage or external disk drives. With these extensions comes the possibility of 'trailer booking'; a receiver can make a booking to record a program that has been signalled at the same time as its trailer is played out.

Internet Access

Greater interactivity for an MHEG-5 application can be achieved through the specification of Internet connectivity. The retrieval of text, images and sound/video clips across the Internet helps to offset the bandwidth available via

the airwaves. A profiler must consider whether there is a requirement for feedback and thus allow a user to post information back to a web server.

A key part of Internet access is security, ensuring that the right viewer gets to see the information that the broadcaster presents. This can be achieved by transmission over the air of a public digital certificate key that matches the private key used to sign the files retrieved over the Internet. This ensures that the Internet content is as trustworthy as the over the air content.

It is also of paramount importance that the viewer's posted information is secure. Application authors would need to exercise due care in the type of information returned by a viewer.

A suitably equipped back end system is required for the serving of content and the retrieving of viewer data, for potentially millions of viewers. An interesting aspect of this is that specially authored MHEG-5 applications may request files that help signal to the broadcaster the presence of the viewer. Internet Access has been fully specified by the InteractionChannelExtension and the ICStreamingExtensions.

TV Licensing

The 1.06 Profile allows for simple request/response access to a CAM and one might imagine that a CAM could be provided upon renewal of a TV licence and so prevent all viewing unless the CAM was contemporary. The control of viewer access to TV services, such as Pay TV is a well-known requirement and this facility can be further specified via the CI+ Profile. Such a profile allows a CAM to execute MHEG-5 applications. This is useful if the TV service does not provide MHEG-5 applications via a broadcasted data carousel.

Alternatives to CAMs are receivers with viewing rights granted via information retrieved over the Internet or receivers with built in unique identity codes (rather like MAC addresses). However licensing control is achieved one must consider what needs to be done to prevent reception by unlicensed receiver equipment, which is beyond the scope of this document.

Testing and Certification

Whatever the profile contains must ultimately be testable, so avoiding ambiguity. Testability ensures that digital receivers entering the market perform appropriately thereby ensuring consistency, high standards and the integrity of broadcasters and digital receiver manufacturers.

If you would like any further information regarding the topic covered in this paper, please contact info@cabot.co.uk

Glossary

CAM	Conditional Access Module
CI+	Common Interface Plus
DTG	Digital Television Group
DVR	Digital Video Recorder
EIT	Event Information Table
EPG	Electronic Program Guide
HD	High Definition (greater than 720x576 pixels)
MAC	Media Access Control – 6 Byte unique addresses
MHEG	Multimedia Hyper Media Expert Group
OSD	On Screen Display
RNIB	Royal National Institute for the Blind
SD	Standard Definition (720x576 pixels)
SI	Service Information
STB	Set Top Box (a digital TV receiver)



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