

Technology Group Report:

ATSC Usage of the MPEG-2 Registration Descriptor

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The Advanced Television Systems Committee (ATSC), is an international, non-profit membership organization developing voluntary standards for the entire spectrum of advanced television systems.

Specifically, ATSC is working to coordinate television standards among different communications media focusing on digital television, interactive systems, and broadband multimedia communications. ATSC is also developing digital television implementation strategies and presenting educational seminars on the ATSC standards.

ATSC was formed in 1982 by the member organizations of the Joint Committee on InterSociety Coordination (JCIC): the Electronic Industries Association (EIA), the Institute of Electrical and Electronic Engineers (IEEE), the National Association of Broadcasters (NAB), the National Cable Television Association (NCTA), and the Society of Motion Picture and Television Engineers (SMPTE). Currently, there are approximately 190 members representing the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

ATSC Digital TV Standards include digital high definition television (HDTV), standard definition television (SDTV), data broadcasting, multichannel surround-sound audio, and satellite direct-to-home broadcasting.

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1. INTRODUCTION

MPEG-2 Systems [MPEG] has defined a registration descriptor: “The registration_descriptor provides a method to uniquely and unambiguously identify formats of private data”. SMPTE is the registration authority for the 32 bit format identifier field, guaranteeing that every assigned value will be unique. The MPEG-2 Registration Descriptor (MRD) is the basis for a set of guidelines developed to avoid collisions with the usage of privately defined fields and ranges within ATSC transport streams.

The purpose of this ATSC Technology Group Report is to clarify ATSC usage constraints that may not have been stated explicitly in the MPEG-2 Systems standard with the intention of defining usage for ATSC.

2. REFERENCES

[MPEG] ITU-T Rec. H.222.0 | ISO/IEC 13818-1:2000, Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Systems.

[A65] ATSC Standard A/65A: Program and System Information Protocol for Terrestrial Broadcast and Cable.

3. SCOPE OF REGISTRATION DESCRIPTOR

The MRD can be placed in a number of possible locations in an MPEG-2 Transport Stream. The following sections discuss the rules for the scope of the MRD for each location.

3.1 Transport Stream Description Table

The Transport Stream Description Table (TSDT) is a relatively new PSI table defined in MPEG-2 Systems. PID 0x0002 is reserved for the carriage of TSDT table sections. The TSDT itself is composed of a section header followed by a descriptor loop (and is constrained to carry only descriptors as a payload in the descriptor loop). As stated in MPEG-2 systems, the descriptors carried in this table are scoped to the entire transport stream.

A few cautions should be noted for the general usage of the TSDT:

- The TSDT is a relatively new table and much of the legacy equipment in the field may not support its usage, although it should not cause compliant legacy equipment to crash.
- The TSDT is an optional table, with no requirement for it to either be present in the Transport Stream nor for a compliant receiver (legacy or new) to decode the table.
- When present in the transport stream, there are no requirements of transmission frequency (bitrate).

The preceding cautions (plus a potential timing issue of possibly not receiving a TSDT before the PMT), suggest that relying on an MRD placed in the TSDT would not guarantee deterministic behavior for parsing of the MPEG PSI. As an example, the TSDT (if used) is transmitted asynchronously to the PMT. If a PMT is received that has an MRD at the program loop level, then an identification applicable to the entire program is established (see below). If a

TSDT carrying an MRD is received, later it could change the interpretation of the identification from the PMT—not a desirable situation.

With the above considerations, MRD's should only be used in the TSDT when the MRD has relevance to the entire transport stream and when the reception (or lack of reception) of the TSDT will not change the interpretation of the semantics of the remaining elements of the transport stream.

3.2 PMT Program Loop

MRD's may be placed in the program loop in the PMT (otherwise known as the “outer” loop—the descriptor loop following the `program_info_length` field). When used in this location, the scope of the MRD is the entire MPEG-2 program, meaning all of the program elements (PIDs) defined in this instance of the Program Map Table. When the MRD is used to identify the format of private data, then the identification applies to all program elements comprising the MPEG-2 program (subject to the precedence rules described below).

3.3 PMT Program Element Loop

MRD's may be placed in the program element loop in the PMT (otherwise known as the “inner” loop—the descriptor loop following the `es_info_length` field). When used in this location, the scope of the MRD is the individual program element (PID) that the MRD is bound to. When the MRD is used to identify the format of private data, then the identification applies to the single program element. The scope of the MRD also covers the `stream_type` used for this program element, in the case that a privately defined `stream_type` is used.

3.4 Master Guide Table (MGT) Outer Loop

An MRD may be placed in the `descriptors_length` “for” loop in the MGT [A65] (the “for” loop following the `descriptors_length` field). When used in this location, the scope of the MRD is all the user private `table_types` referenced in the MGT. At most, one MRD shall appear in the `descriptors_length` “for” loop.¹

3.5 MGT Inner Loop

MRD's may be placed in the `tables_defined` “for” loop of the MGT (the “for” loop following the `tables_defined` field). When used in this location, the scope of the MRD is the individual `table_type` being described in that iteration of the `tables_defined` “for” loop. At most, one MRD shall appear in the each `tables_defined` “for” loop.

4. PRECEDENCE

When multiple MRDs are found at different levels (program loop, program element loop), then the lower (deeper) level MRD shall further refine the meaning of the identification (i.e., assume the characteristics set by the higher level MRD and add additional characteristics). As an example, if an MPEG-2 program carries the ATSC registration descriptor (“GA94”) then in general, the usage of private data for all the program elements comprising that MPEG-2 program

¹ The `table_type` is the only semantic element in the MGT that has a user private range.

must follow the rules defined in the ATSC standards. If, however, one program element additionally carries a service provider's MRD, then the meaning of the fields in that single program element in addition to following the ATSC rules, are further identified to that service provider.

At most, one MRD for any entity at any level shall appear (in other words, no more than one MRD can appear in the PMT program loop; no more than one MRD can appear in the PMT program element loop for a particular program element). The reason for this restriction is that a second occurrence of an MRD in the same loop will totally replace the first (the descriptors have the same tag, so the MPEG practice is to ignore the first occurrence once a second occurs). There is no guarantee of how remultiplexing equipment will behave in the presence of multiple MRDs in a single loop, especially in regards to retaining the original ordering of descriptors in the loop.

Certain combinations of MRDs at different levels may result in streams that may cause problems for standard decoders. As an example, a combination of MRDs which identify the program as ATSC and a particular program element as DVB could lead to contradictions in interpreting semantic elements. The behavior of a receiver upon receiving a non-conformant stream of this type cannot be specified.