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Marie-Jose Montpetit
MJMontpetit.com, USA

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Protocols for MPEG-2 network configuration

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Abstract

This document describes novel protocols to bind IPv4/IPv6 addresses and flows to MPEG-2 Transport Streams (TS). For MPEG-2 systems to become true subnetworks of the general Internet, methods are required to signal IPv4/v6 addresses to the link receivers and transmitters; this is known as Address Resolution (AR), or Neighbour Discovery (ND). In MPEG-2 networks, an IP address must be associated with a Packet ID (PID) and specific transmission multiplex. In this documents 2 mechanisms based on standard XML semantics and multimedia signalling are introduced to comply to established IP over DVB AR established. These protocols are seen to complement the current approaches based on SI table with a more IP centric approach.

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Document History

- 00 This draft is intended as a study item for proposed future work by the IETF in this area.

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1. Introduction

The MPEG-2 stream is defined in the specification ISO/IEC 13818-1. It provides a time-division multiplexed (TDM) stream that may contain audio, video and other information. Each frame, known as an MPEG-2 TS Packet, contains 4 bytes of header and 188 bytes of data. The standard also defines the PES packet (Packetized Elementary Stream) and the Section or Transport Stream (TS) packet. The PES packet can carry video, audio, private data and was originally used for some data streaming applications; this usage is now historical. Each MPEG-2 TS Packet is associated with one Transport Stream (TS) logical channel, which is identified by a 13 bit Packet ID (PID) carried in the MPEG-2 TS Packet header.

The standard also defines a MPEG-2 control plane that may be used to transmit control information. For example, using System Information (SI) Tables (ETSI-SI, ETSI-SI1], or Program Specific Information (PSI) Tables. The Tables can be used to carry PID information about the transported stream. MPEG-2 address resolution assigns IP addresses to particular transmission multiplexes, and within a multiplex to a specific PID. The protocol signals this mapping to the other communicating devices (Gateways and Receivers). In some address resolution schemes, this address space is sub-divided into logical contexts known as Platforms or Sections. One use of this sub-division is to associate a separate context with each IP service provider that shares a common MPEG-2 TS (uses the same PID).

MPEG-2 Receivers may optionally be assigned a Network Point of Attachment (NPA) to uniquely identify the L2 node within the MPEG-2 transmission network. An example of an NPA is the IEEE Medium Access Control (MAC) address. Where such addresses are used, these must also be signalled by the address resolution procedure. Finally, address resolution may need to signal the format of the data being transmitted. For example, the encapsulation used or any compression scheme that was used at the sender [[ID-IPDVB-ARCH](#)].

The development of IP_layer address resolution would have merit, particularly for IP-only services and two-way MPEG-2 transmission networks. Not only would it release a Receiver from performing MPEG-2 table processing, it would also allow much more dynamic association of PIDs to traffic. Examples of dynamic associations include: association/freeing of PIDs in response to join or prune actions taken by multicast routing protocols, or on assignment of new IP addresses using DHCP/DHCPv6. Implementing such protocols above the IP layer (e.g. using multicast IP transport, as used by ND), would allow this protocol to be

implemented in a portable way not dependent on specific receiver hardware/drivers and would allow future integration of the functions within IP routers.

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The nature of an MPEG-2 transport network and the need to maintain flexibility for the operator, means that a protocol would need to use operator specifics for address resolution. Adding to this complexity, 2-way MPEG-2 services (e.g. DVB-RCS) employ a pair of logically separate unidirectional TS, requiring separate return and forward resolution. No address resolution protocol has yet been defined for MPEG-2 transmission networks.

Another possible approach is to design a query/response protocol (similar to, or based on the neighbour advertisements of the IPv6 ND protocol), which operates over an MPEG-2 TS Logical Channel using a previously agreed PID (e.g. configured, or communicated

using a SI table). While the Neighbour Advertisement Protocol [[RFC2461](#)] could be used as a basis for such a design for IPv6 addresses, the extensive use of broadcast messages to request and transmit layer 2 addresses would prove inefficient for systems using a wireless physical layer.

Both ARP and ND allow unsolicited advertisements of bindings by a sender that are broadcast/multicast to the network, without requiring the overhead of a client request. However, both ND and ARP are currently restricted to advertising a single association per message. To achieve efficient transmission and receiver processing over broadcast physical layer, a method needs to be found that advertises several associations in a single message (e.g., following the method used in MPEG-2 Tables).

This document presents 3 IP-oriented protocols to allow link configuration of a ULE/MPE link above the IP layer. The specification and definition of address resolution mechanisms relating to MPEG-2 PID to/from IP address mapping function, QoS association and other mapping functions (e.g. parameters associated with a PID/Multiplex) will be supported using a table-based protocol to be extensible to ensure a wide applicability to different types of MPEG-2 networks and intended applications.

The mechanisms introduced here extensively re-use existing protocol machinery. XML schemas are to be defined and used to present the required information from the tables. Because XML implements standard grammar and syntax this address resolution information would be common to all MPEG-2 networks. SOAP protocol exchanges may be a suitable method to transfer the table information and SIP could provide the signalling mechanism in between hosts.

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2. Conventions used in this document

AIT: Application Information Table specified by the Multimedia Home Platform (MHP) specifications [ETSI-MHP]. This table may carry IPv4/IPv6 to MPEG-2 TS address resolution information.

ATSC: Advanced Television Systems Committee [ATSC]. A set of framework and associated standards for the transmission of video, audio, and data, using the ISO MPEG-2 standard.

DVB: Digital Video Broadcast [ETSI-DVB]. A set of framework and associated standards for the transmission of video, audio, and data, using the ISO MPEG-2 standard.

DVB-RCS: Digital Video Broadcast Return Channel via Satellite. A bi-directional IPv4/IPv6 service employing low-cost Receivers.

MPE: Multiprotocol Encapsulation [[ETSI-DAT](#), ETSI-DAT1]. A scheme that encapsulates Ethernet frames or IP Packets, creating a DSM-CC Section. The Section will be sent in a series of TS Packets over a TS Logical Channel.

MPEG-2: A set of standards specified by the Motion Picture Experts Group (MPEG), and standardized by the International Standards Organisation (ISO) [[ISO-MPEG](#)].

NPA: Network Point of Attachment. Addresses primarily used for station (receiver) identification within a local network (e.g. IEEE MAC address).

PES: Packetized Elementary Stream. A format of MPEG-2 TS packet payload usually used for video or audio information in MPEG-2 [[ISO-MPEG](#)].

PID: Packet Identifier. A 13-bit field carried in the header of all MPEG-2 Transport Stream packets [[ISO-MPEG](#)]. This is used to identify the TS Logical Channel to which it belongs.

SI TABLE: Service Information Table. In this document, the term is used to describe any table used to convey information about the service carried in a TS Multiplex (e.g. [[ISO-MPEG](#)]). SI tables are carried in MPEG-2 private sections.

TS: Transport Stream [[ISO-MPEG](#)], a method of transmission at the MPEG-2 level using TS Packets; it represents level 2 of the ISO/OSI reference model. See also TS Logical Channel and TS Multiplex.

TS LOGICAL CHANNEL: A channel identified at the MPEG-2 level; it represents level 2 of the ISO/OSI reference model. All packets sent over a channel carry the same PID value.

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TS MULTIPLEX: A set of MPEG-2 TS Logical Channels sent over a single common physical bearer (i.e. a link transmitting at a specified symbol rate, FEC setting, and transmission frequency).

TS PACKET: A fixed-length 188B unit of data sent over an MPEG-2 multiplex [[ISO-MPEG](#)]; it corresponds to the cells, of e.g. ATM networks, and is frequently also referred to as a TS_cell. Each TS Packet carries a 4B header, plus optional overhead. Each TS packet carries a PID value to associate it with a single TS Logical Channel.

[3.](#) Configuration table

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8. Acknowledgments

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9.1 Normative References

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8.2 Informative References

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[ETSI-DVBC] EN 300 800 Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV), European Telecommunications Standards Institute (ETSI).

[ISO-MPEG] ISO/IEC DIS 13818-1:2000 "Information technology ? Generic coding of moving pictures and associated audio information: Systems", International Standards Organisation (ISO).

[ETSI-DAT] EN 301 192 Specifications for Data Broadcasting, European Telecommunications Standards Institute (ETSI).

http://www.atsc.org/standards/Code_Point_Registry.pdf

9. Author's Address

Marie-Jose Montpetit
MJMontpetit.com
Email: marie@mjmontpetit.com

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12. IANA Considerations

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