

IP over MPEG-2/DVB Transport BOF
(ip-dvb)

Monday, July 14 at 1530-1730

CHAIRS:

Gorry Fairhurst <gorry@erg.abdn.ac.uk>

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REQUIRED READING:

draft-fair-ipdvb-req-03.txt

draft-clausen-ipdvb-enc-01.txt

draft-fair-ipdvb-ule-00.txt

draft-fair-ipdvb-ar-00.txt

<http://www.erg.abdn.ac.uk/ip-dvb/charter.html>

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IP over MPEG-2/DVB Transport BOF
(ip-dvb)

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To subscribe: subscribe ip-dvb at
majordomo@erg.abdn.ac.uk

Archive: <http://www.erg.abdn.ac.uk/ip-dvb/archive>

Slides at: ?

Agenda

Agenda Bashing (5 minutes)

- Election of scribes (jabber scribe?)

What is MPEG-2? and Why is this an IETF activity? (10 minutes)

[draft-fair-ipdvb-req-03.txt](#) (B C-N)

Simple Encapsulation (10 minutes)

[draft-clausen-ipdvb-enc-01.txt](#) (GF)

Ultra-Lightweight Encapsulation (10 minutes)

[draft-fair-ipdvb-ule-00.txt](#) (GF)

Address Resolution for IPv4/IPv6 (10 minutes)

[draft-fair-ipdvb-ar-00.txt](#) (GF for Marie-Jose Montpetit)

Requirements for Two-way Systems (10 minutes) (Sébastien Josset)


FMKE (2 minutes)

[draft-duquer-fmke-00.txt](#) (to be raised in MSEC)

Proposed Roadmap (20 minutes) (GF)

Open Mic

What is MPEG-2? Why is this an
IETF activity?



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TOC

- What is MPEG/DVB/ATSC?
- Why IETF?
- What are the goals?
- What is a starting point?
- What next?

TOC

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- Why IETF?
- What are the goals?
- What is a starting point?
- What next?

What is MPEG?

- **Moving Picture Experts Group**
 - working group of ISO/IEC in charge of the development of standards for coded representation of digital audio and video.
 - Established in 1988, the group has produced
 - MPEG-1, the standard on which such products as Video CD and MP3 are based
 - MPEG-2, the standard on which such products as Digital Television set top boxes and DVD are based
 - MPEG-4, the standard for multimedia for the fixed and mobile web
 - MPEG-7, the standard for description and search of audio and visual content.
 - Work on the new standard MPEG-21 "Multimedia Framework" has started in June 2000.

MPEG standards

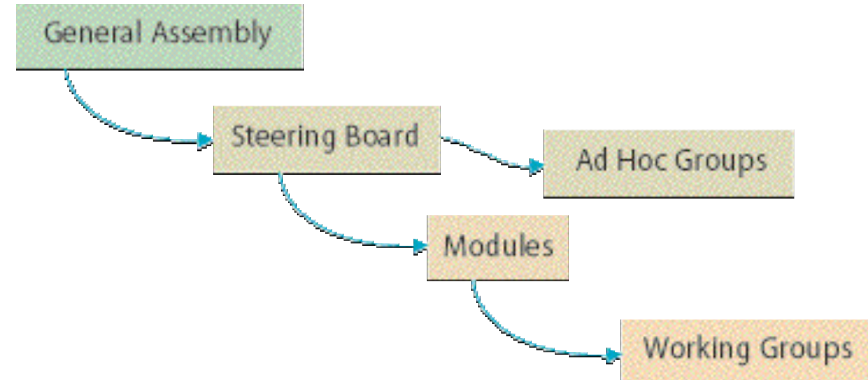
- ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio information: Systems".
- ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".
- ETSI ETR 162: "Digital Video Broadcasting (DVB); Allocation of Service Information (SI) codes for DVB systems".
- ETSI TR 101 211: "Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)".
- ISO/IEC 13818-6: "Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extensions for DSM-CC".

What MPEG not is!

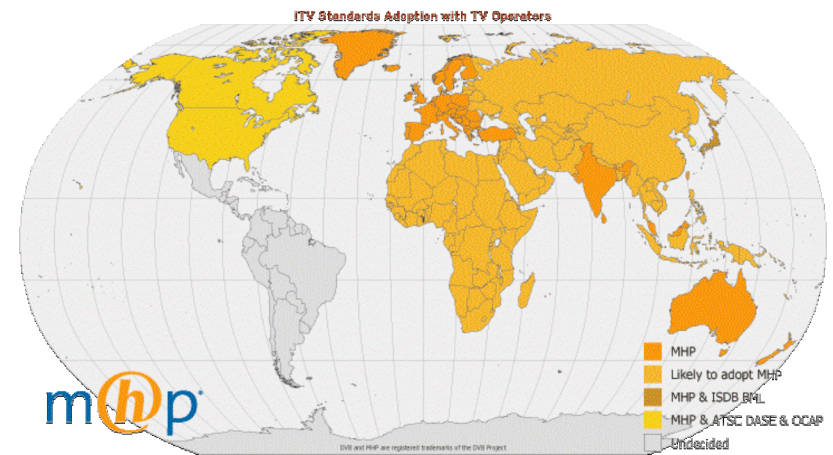
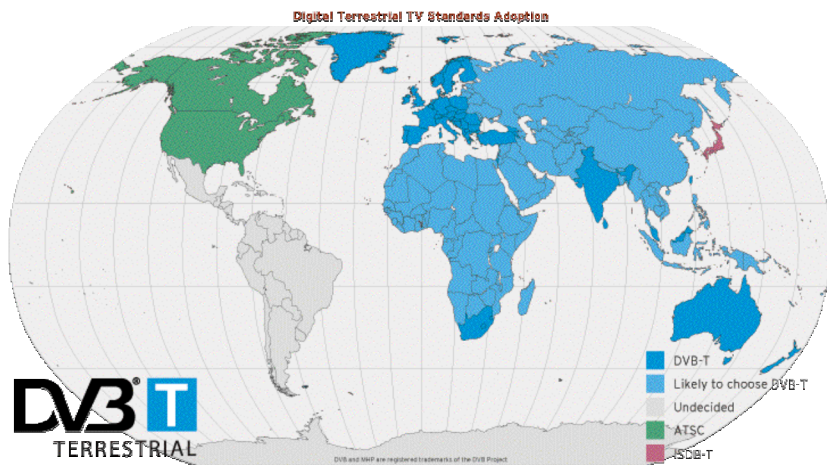
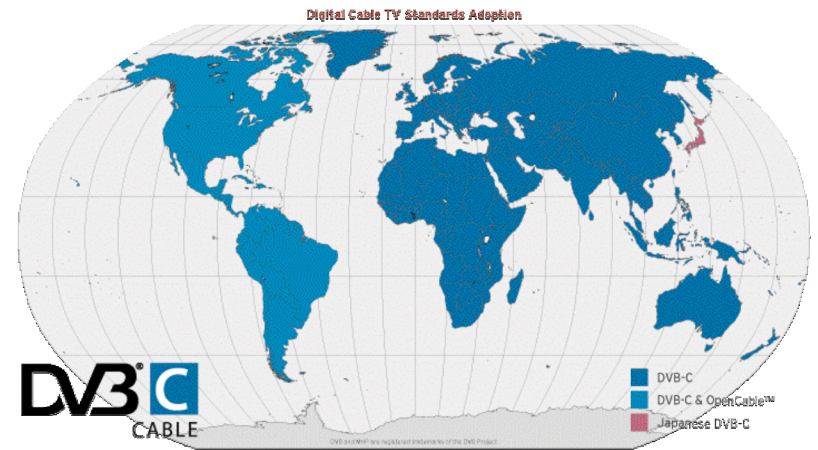
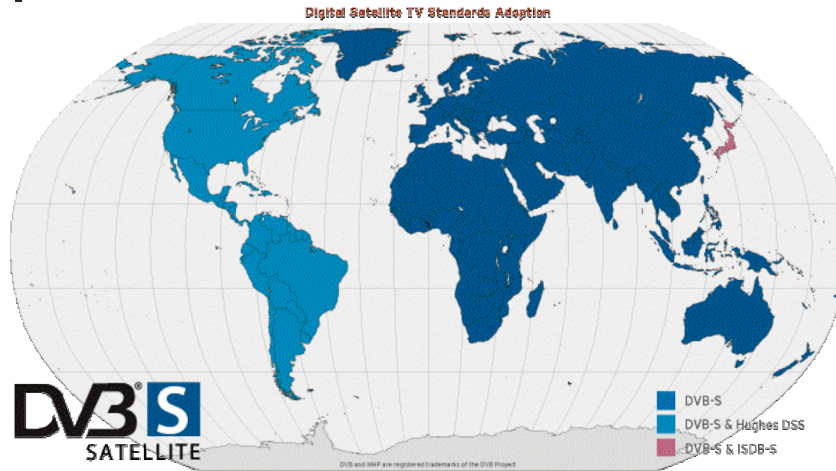
- <http://www.chiariglione.org/mpeg/index.htm>
 - „MPEG is a committee of ISO/IEC that is open to experts duly accredited by an appropriate National Standards Body.“
- [http://www.chiariglione.org/mpeg/frommpeg-1 to mpeg-21.htm](http://www.chiariglione.org/mpeg/frommpeg-1%20to%20mpeg-21.htm)
 - Creating an Interoperable Multimedia Infrastructure
- An open standard(isation process)!

What is DVB?

- Digital Video Broadcasting Project
 - industry-led consortium of over 300 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others in over 35 countries committed to designing global standards for the global delivery of digital television and data services.



DVB relevance



DVB standards

- Search for „DVB“ results in 108 items
<http://pda.etsi.org/pda/queryform.asp>
- History of Data Broadcasting
 - Eutelsat/Astra ~1994
- Search for „data broadcast“ results in 8 items
 - DVB specification for data broadcasting
 - ETSI EN 301 192 V1.1.1 (1997-12), DVB-33
 - ETSI EN 301 192 V1.2.1 (1999-06), DVB-88
 - ETSI EN 301 192 V1.3.1 (2003-05), DVB-127
 - Implementation guidelines for Data Broadcasting
 - ETSI TR 101 202 V1.2.1 (2003-01), DVB-142

What DVB is not!

- Open
- Protocol or network/transport oriented
 - Audio, Conditional Access, Cookbook, Interactivity, Interfacing, Measurement, MHP, Multiplexing, Subtitling, Transmission
 - **DVB-DATA**, DVB-MPEG, DVB-SI, DVB-TXT, DVB-VBI
 - ETSI Ref: EN 301 192, Edition: 1.2.1
 - Specification for data broadcasting
 - ETSI Ref: TR 101 202, Edition: 1.1.1
 - Specification for data broadcasting; Guidelines for the use of EN 301 192
 - ETSI Ref: TS 102 006-1, Edition: 1.1.1
 - DVB Data Download Specification; Part 1 Simple Profile

What is ATSC? Any better?

- The Advanced Television Systems Committee, Inc., is an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.
- 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 standards


- <http://www.atsc.org/standards.html>
 - ATSC Standard A/53B with Amendments 1 and 2: 7 August 2001: ATSC Digital Television Standard, Rev. B
 - ATSC Recommended Practice A/69: 25 June 2002: Program and System Information Protocol Implementation Guidelines for Broadcasters
 - ATSC Standard A/90 with Amendment 1 and Corrigendums 1 and 2: 26 July 2000: Data Broadcast Standard
 - ATSC Recommended Practice A/91: 10 June 2001: Implementation Guidelines for the Data Broadcast Standard
 - ATSC Standard A/92: 31 January 2002: Delivery of IP Multicast Sessions over Data Broadcast Standard

Why IETF?

- Protocol Engineers needed
 - Encapsulation for IPv4 and IPv6
 - Addressing
 - Address Resolution
 - Multicast Routing
 - Multicast Mapping
 - Quality of Service and Multiplexing
- Opportunity to reach large numbers users and systems
- Pave way for convergence

Simple Encapsulation

draft-clausen-ipdvb-enc-01

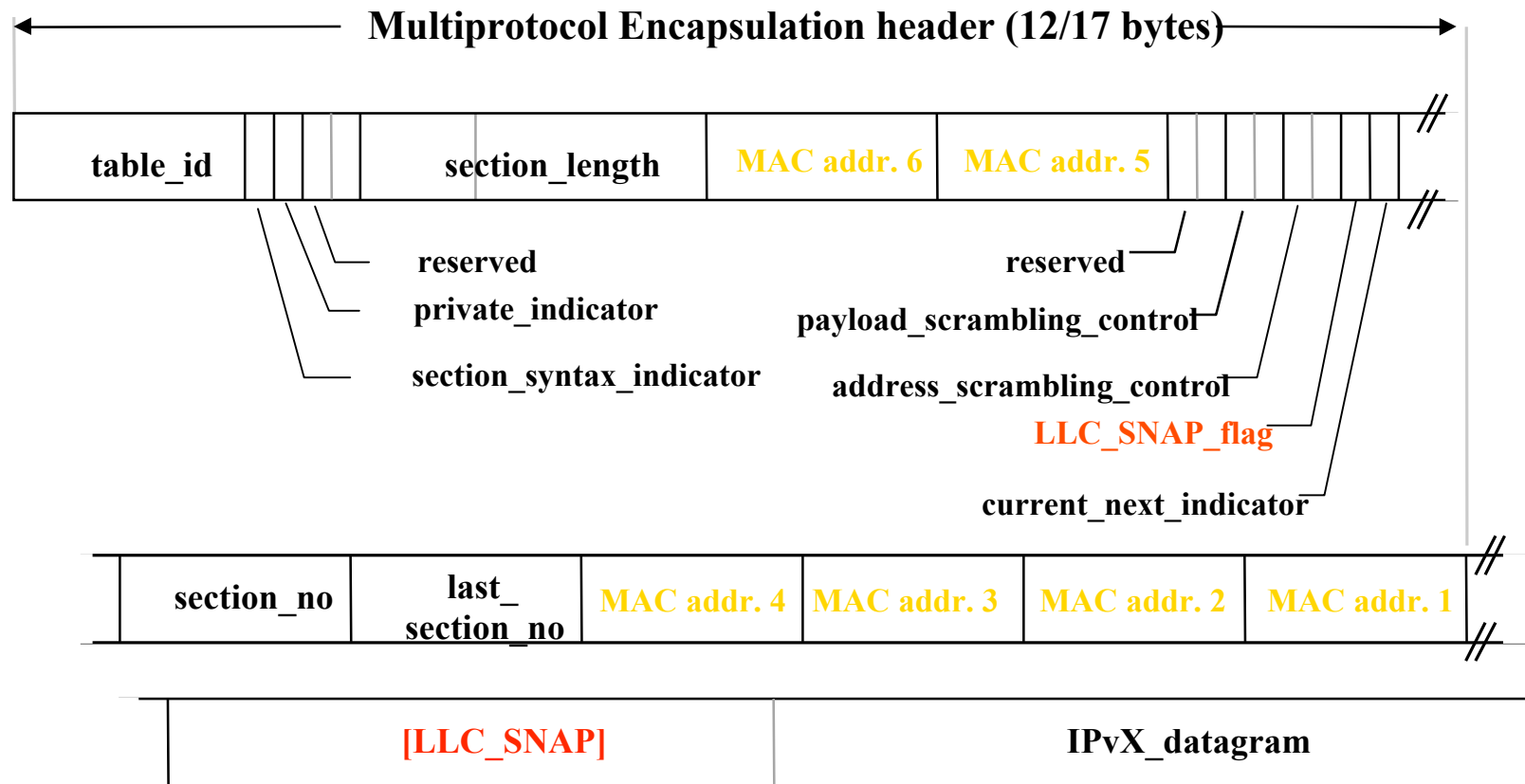
A decorative L-shaped line consisting of a vertical line on the left and a horizontal line extending to the right, both in a dark grey color.

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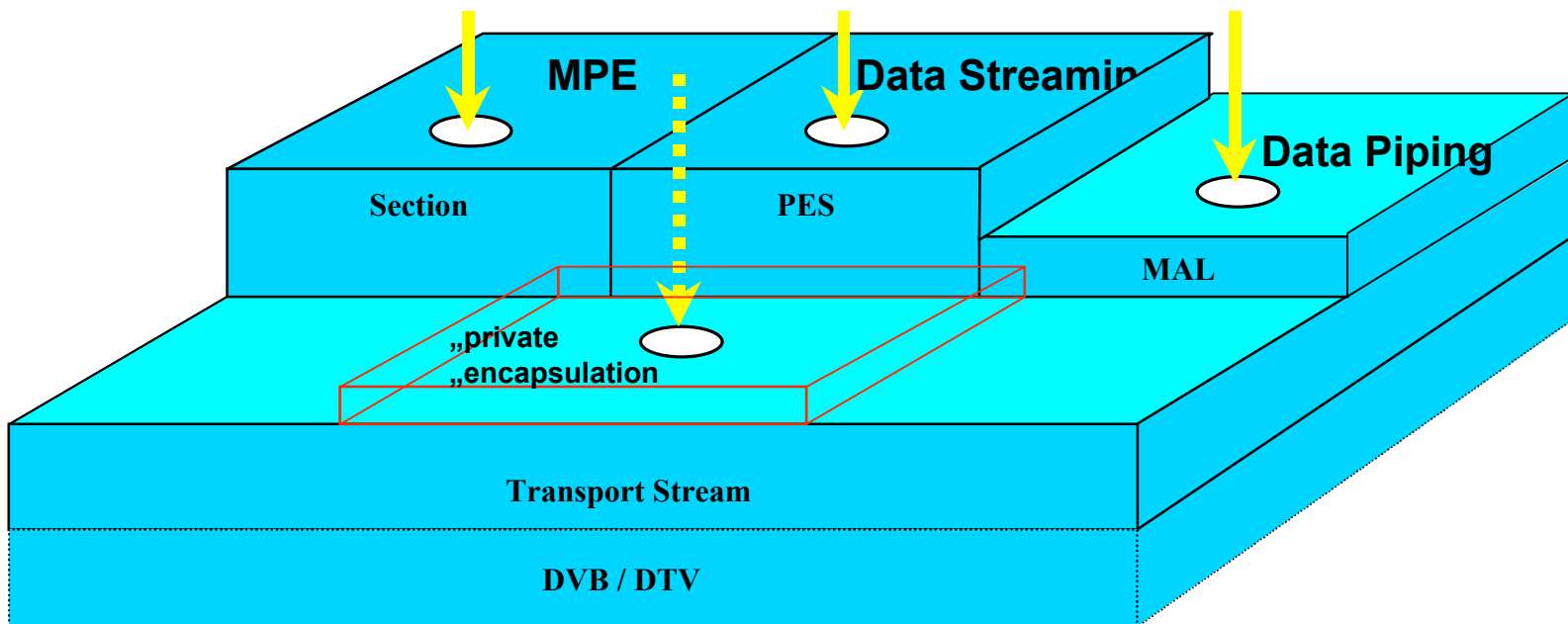
What is a starting point?

- `draft-fair-ipdvb-req-03`
- `draft-clausen-ipdvb-enc-01`
- `draft-fair-ipdvb-ule-00`
- `draft-fair-ipdvb-ar-00`

Multi Protocol Encapsulation

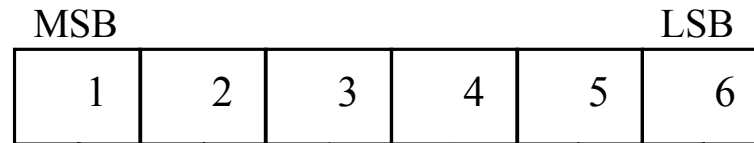


MPEG-2 stack

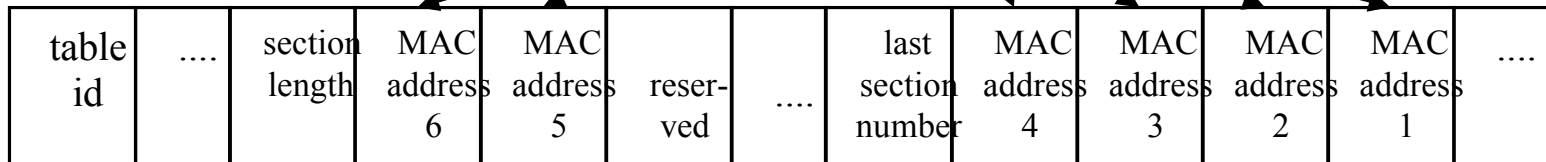


MPE MAC addresses

48-bit MAC address byte:

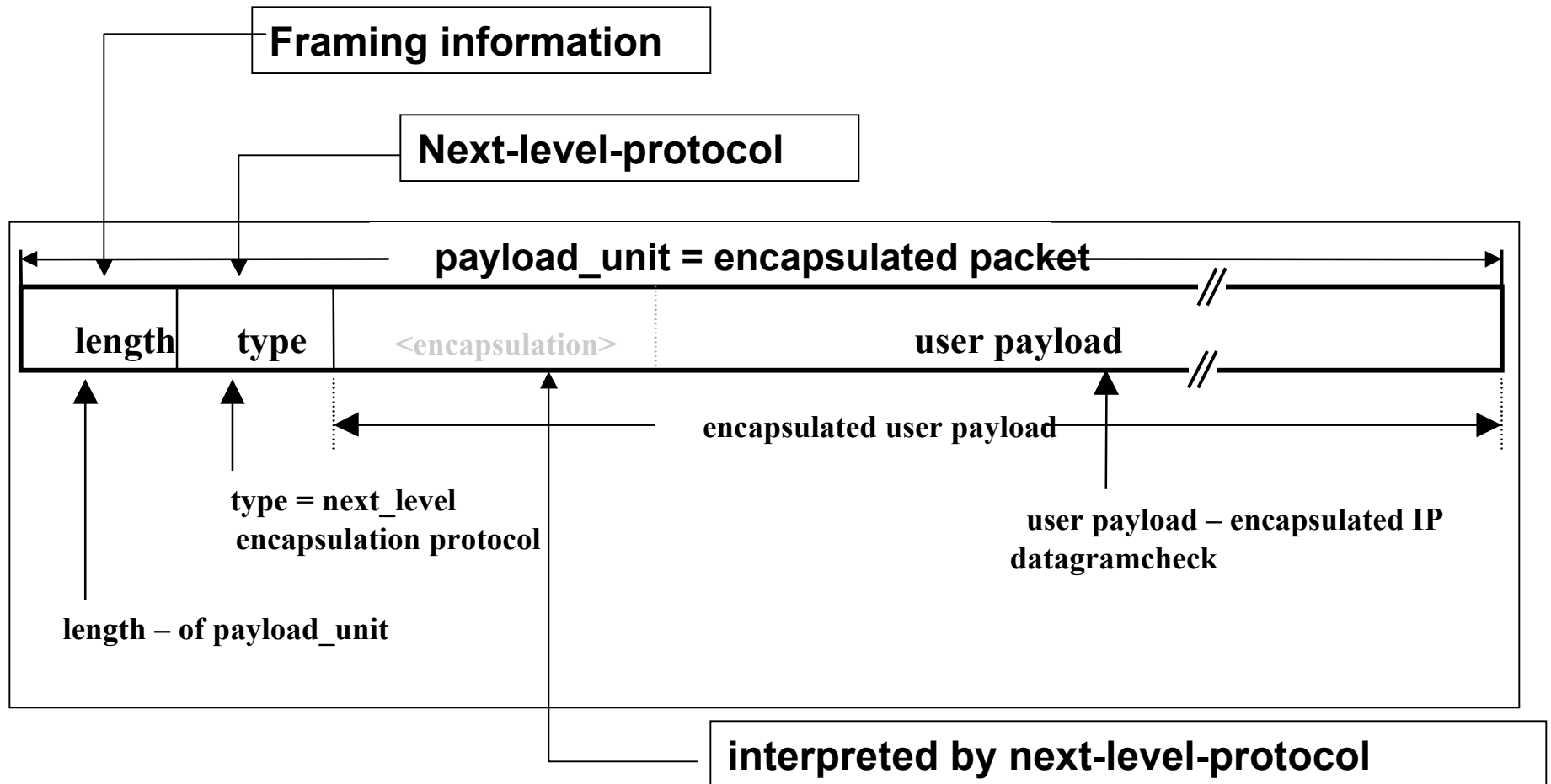


section :

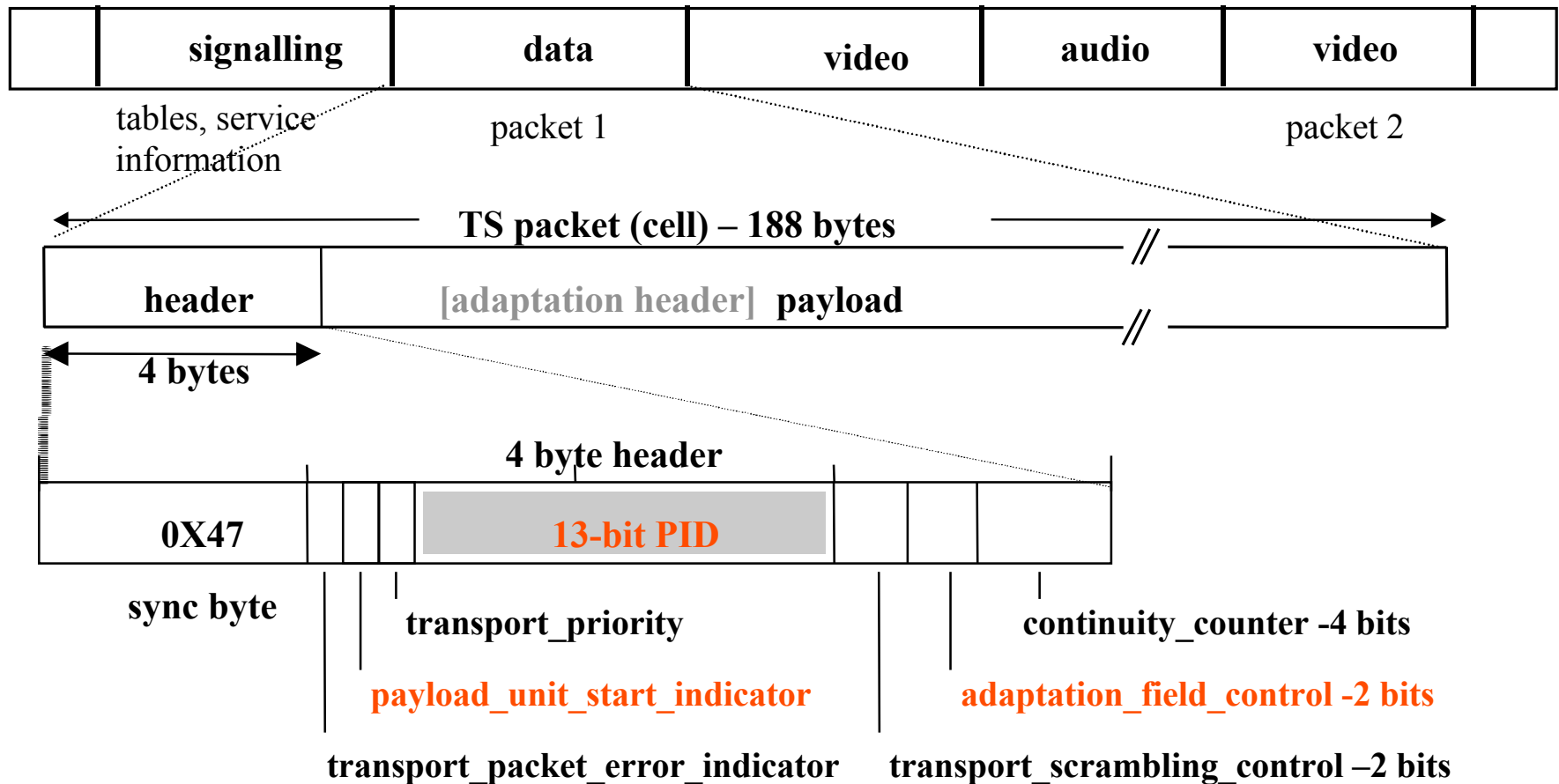


None, one, or two?

Minimal Encapsulation



Simple Encapsulation?



Header Fields

- Length Field
 - A 16-bit value indicates the length in bytes of the SNDU (encapsulated Ethernet frame, IP datagram or other packet) counted from the byte following the type field up to and including the CRC. The value 0x0000 is reserved, but all other values are allowed. The maximum value is 65531 bytes.
- Type Field
 - The 16-bit type field indicates the type of payload being sent. Three types are suggested. These are:
 - 0x0800 : IPv4 Payload (according to IANA EtherTypes)
 - 0x86DD : IPv6 Payload (according to IANA EtherTypes)
 - 0x???? : Bridged Ethernet Frame

Adaptation Field Meaning

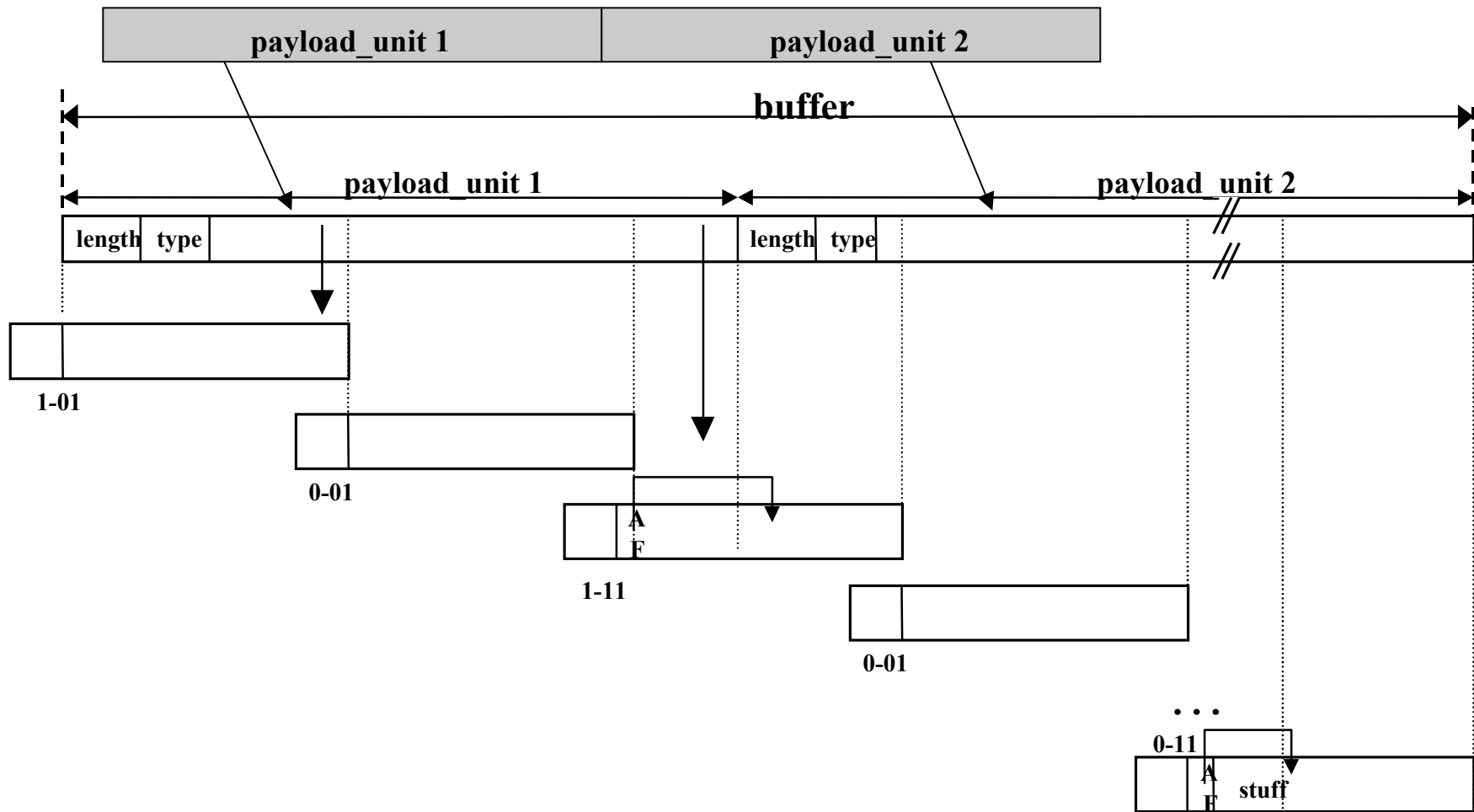
- ISO/IEC 13818

- 00 - Reserved for future use by ISO/IEC 00
- 01 - No adaptation_field, payload only 01
- 10 - Adaptation_field only, no payload 10
- 11 - Adaptation_field followed by payload 11

- Draft-unisal-ipdvb-enc

- 00 - reserved for future use
- 01 - no adaptation field - only SNDU data is contained in the payload of the TS Packet
- 10 - adaptation field only - currently not used for carrying SNDU data
- 11 - adaptation field followed by payload; the TS Packet contains an adaptation field which is followed by SNDU data.

Adaptation Field Usage



What next?

- Decide whether WG is appropriate
- Discuss and decide strategy
- ESA funds
 - open reference implementation for Penta and TechnoTrend Linux drivers
 - Test set-up and test-bed (tbd)

Ultra-Lightweight Encapsulation (ULE)

draft-fair-ipdvb-ule-00.txt

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IETF-57 Vienna

IP/MPEG-2

Ultra Lightweight Encapsulation

Conclusions

Questions

Need to support ROHC, IPv6, etc
Little deployed support for IPv6
MPE has no type field - need LLC/SNAP

MPE has no source MAC Address
Need to use LLC/SNAP+Bridging header

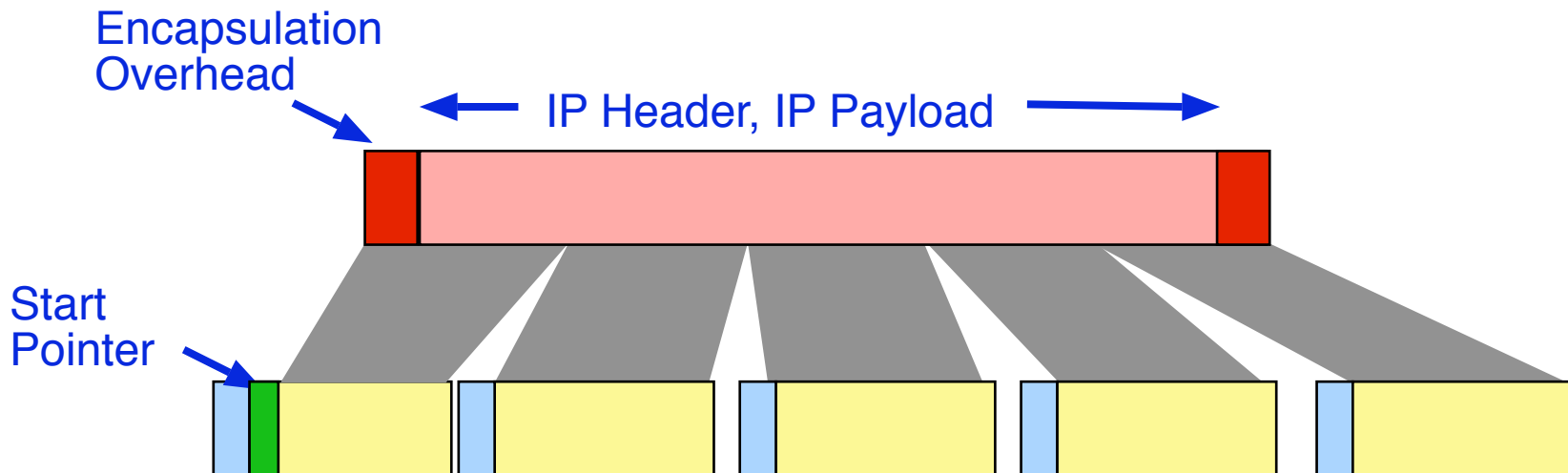
Software Processing of MPE “hard”
Many fields of various sizes
Many options

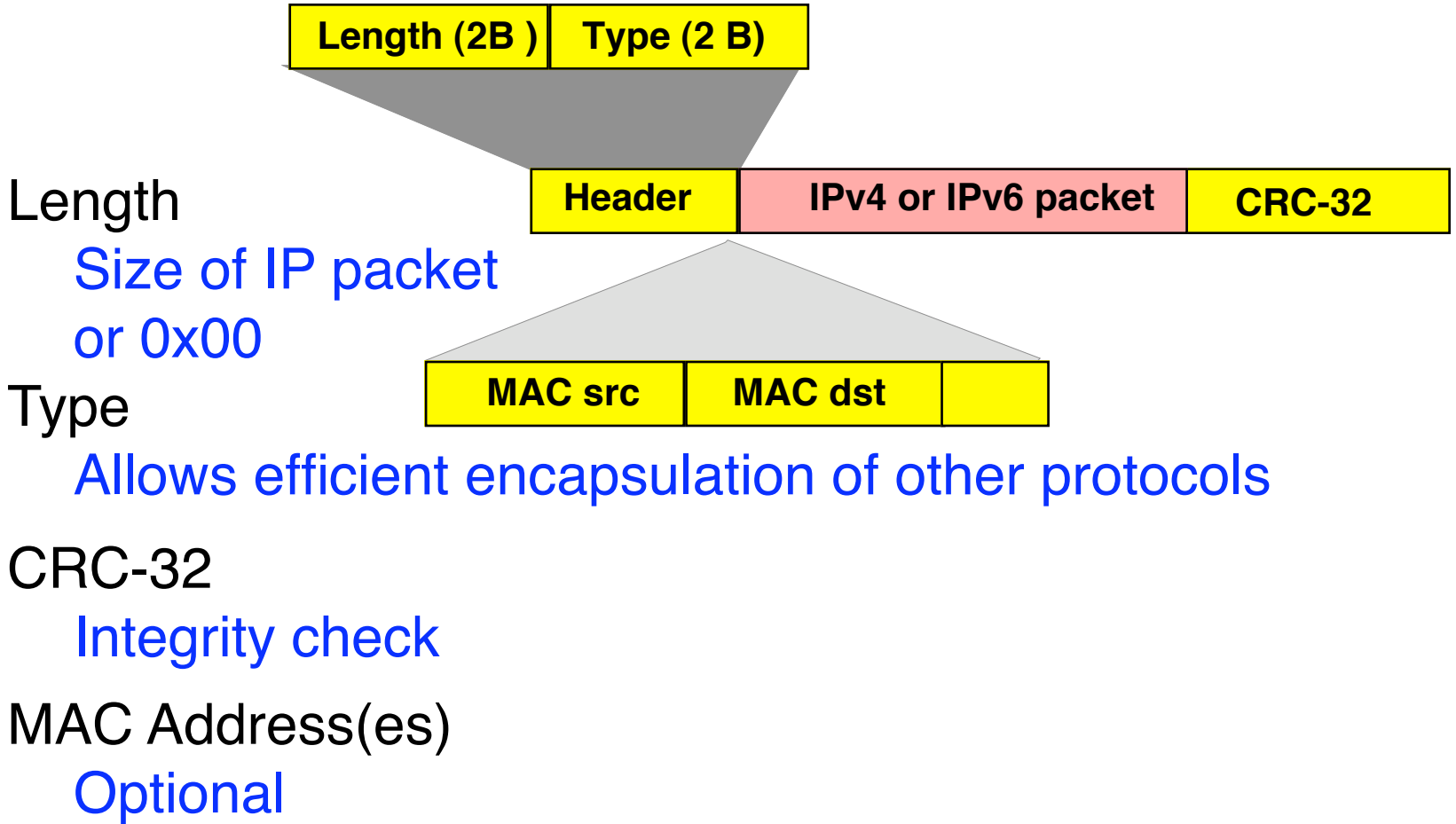
	Number and size of header fields				
	< 1 Byte	1 Byte	2 Byte	12 Bit	4 Byte
MPE	8	11	0	1	1
ULE	0	0	2	0	1

Variable sized IPv4/IPv6 packets

Fixed sized MPEG-2 TS Packet payload 184 B

IP packets encapsulated





Length
 Size of IP packet
 or 0x00

Type
 Allows efficient encapsulation of other protocols

CRC-32
 Integrity check

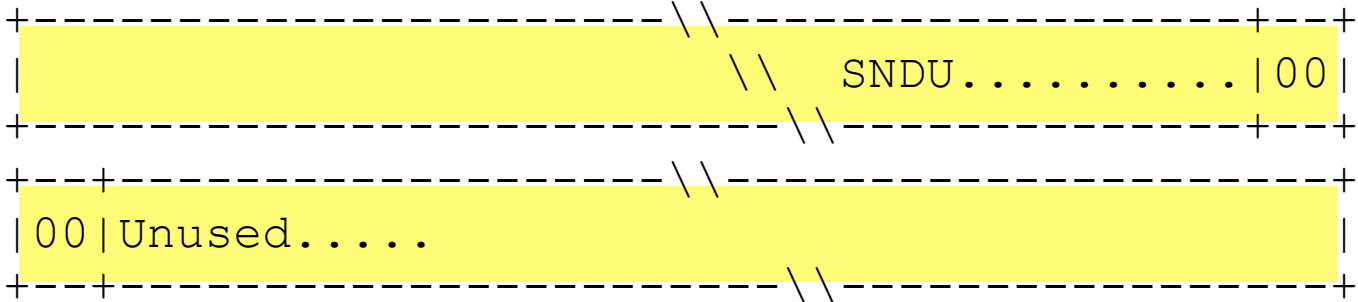
MAC Address(es)
 Optional

When PUSI ==1, payload_pointer has values 0...182

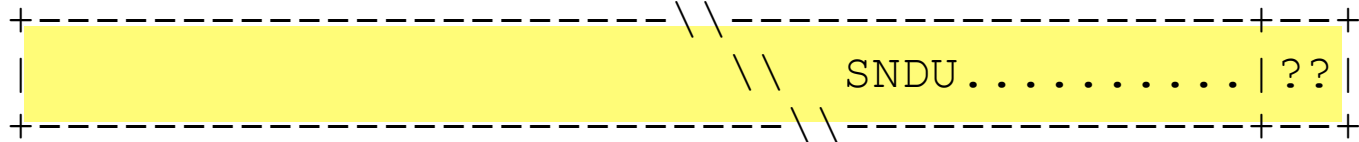
Implementation Problem ..

Problem when TS Packet payload is nearly full...

One byte in TS-Packet payload and no pending SNDUs:



One byte in TS-Packet payload and further SNDUs queued:



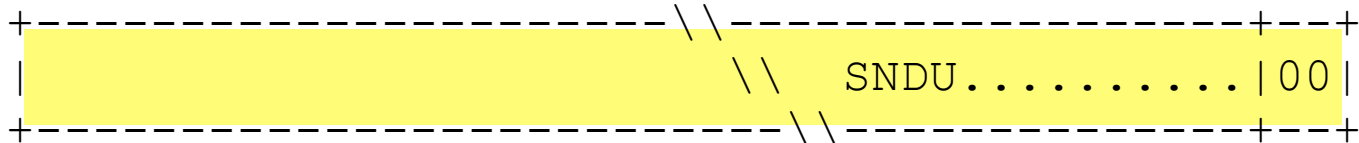
PUSI==0 -- no space for PUSI PTR field!!!

Proposed Remedy?

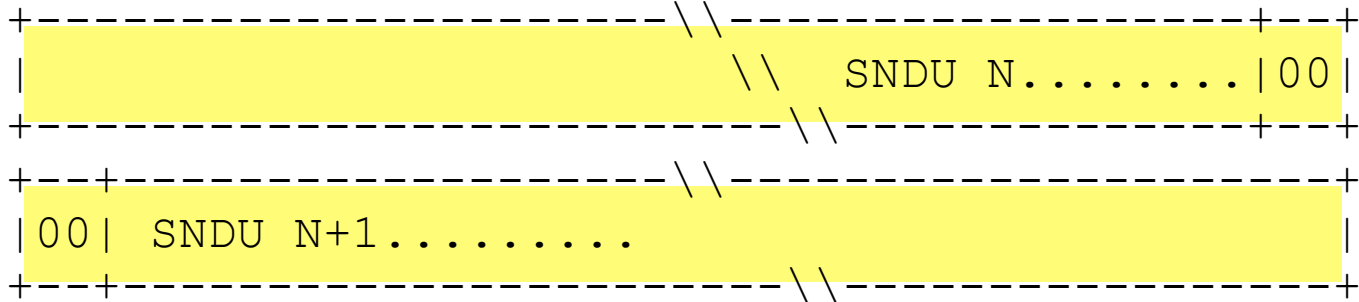
One byte left in a TS-Packet and no pending SNDUs:

New Last-byte padding rule

If payload has 1B left after last SNDU, skip the byte!



One byte left in a TS-Packet and further SNDUs queued:



PUSI==1

Proposed Remedy?

New sender rule for filling TS Packets:

No bytes free in payload	PUSI (payload_pointer?)	Action
0	0 or 1	<i>New()</i>
1	0 or 1	Place "0x00" at end & <i>New()</i>
2	0	Place "0x00 00" at end & <i>New()</i>
2	1	Place "0x00 00" at end & <i>New()</i>
		OR
>2	0	Start new SNDU in TS Packet { Set PUSI==1; Insert payload_pointer; Start new SNDU in TS Packet }
>2	1	Start new SNDU in TS Packet

```

New()
{Set PUSI==1;
  Insert payload_pointer = 0;
  Start new SNDU in new TS Packet
}

```

1) Use the “Ethernet Payload Type” field
Or PPP? Or ...?

2) Should we have a MAC-address option flag(s)?

e.g.:

00 = NO MAC Address - use with end hosts

01 = MAC destination address - any system

10 = MAC Source address only - why?

11 = MAC Source + Destination address - bridging?

Can we take these two bits from the “Length” field?
i.e. max length = 16 KB?

Can/should Receivers discover the encapsulation?

Do we need to define two encapsulations:

Direct ULE transmission over MPEG-2 Transport.

Simple framing with AF.

Discuss & Decide

Revise ID & Freeze

Implementers required

Submit to IESG as a Standards-Track document

Interoperability testing

Address Resolution For IP Datagrams Over MPEG-2 Networks

draft-fair-ipdvb-ar-00.txt

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July 14 2003

Address Resolution for MPEG-2

- Associates an IPv4/IPv6 with to a specific L2 MPEG-2 address (transmission multiplex, PID, MAC)
- Complements the higher layer resource discovery tools that advertise IP sessions
- Must be robust to the layer 2 address characteristics especially non unique addresses
- It can also complement other mechanisms related to QoS and load balancing (filtering, favorite addresses)
- Inform the IP over MPEG-2 community about mechanisms that may bind an IPv4/v6 address to a specific L2 MPEG-2 address

Multicast Issues

- MPEG2 networks are well suited for IP multicast
- IP multicast over MPEG-2 Transmission also involves:
 - Differentiate between multicast and non multicast transmission using the same lower layer addresses
 - Provide signaling information to allow a Receiver to locate an IP multicast flow within an MPEG-2 TS Multiplex
 - Map IP multicast groups to the underlying MPEG-2 TS Logical Channel (PID) and the MPEG-2 TS Multiplex
 - Determine group membership (using IGMP/MLD)
 - Determine if duplicate packets were received
- Involves not only address resolution, but also address filtering
- Some applications require dynamic update of multicast addresses

Potential Solutions (1)

- Static configuration
 - Simple, but not very flexible
- MPEG-2 Table based solutions
 - Use the SI table to transmit the addressing information
 - The Receiver needs to process the information
 - Some approaches:
 - IP/MAC Notification Table (INT) of DVB
 - Application Information Table (AIT) in the Multimedia Home Platform (MHP) specifications
 - Multicast Mapping Table (MMT) by some DVB-RCS systems
 -

Input required for other systems (e.g. ATSC, ISDB-T, ...)

(1) Potential Solutions

- Use an IPv6 ND or IPv4 ARP “like” protocol
 - Query/response mode:
 - “I want this IP address, what is your MAC/PID”
 - Unsolicited distribution:
 - “Here are the MAC/PIDs for these IP addresses”
 - Simple, flexible but potentially operator specific
 - PIDs are not addresses, but unidirectional virtual channels
 - Some ideas, no standard yet
- Related solutions?
 - DVB working group IP Infrastructure - DVB-IPI
 - More the inverse problem of DVB over IP
 - DVB IP Datacast
 - Cablelabs – DOCSIS and PacketCable projects (IP over DVB-like)
 - Inputs needed from these groups

(2) INT Table Solution

- Part of the current DVB Data standard
Development by DVB WG on data broadcasting (DVB-GBS)
- Uses broadcast MPEG-2 SI tables
 - Centralized management of addresses
 - Issue for dynamic address resolution
- Supports subnets and overlapping IP networks
- Set of descriptors for IP address resolution to MAC addresses
- Defined for MPE- extensions needed for other approaches
- Complex method - users need guidance
- Support for dynamic addresses / authentication / encryption?

Status

- IETF draft (for informational) published:
 - draft-fair-ipdvb-ar-00, June 2003
- To be refined with comments from the IP over MPEG-2 community

Open Issues

- Dynamic Address Resolution
- Mapping MAC Addresses to PIDs
- Multicasting support
- Ensuring a technology agnostic solution

Inputs needed:
ip-dvb@erg.abdn.ac.uk

IP over MPEG-2/DVB Transport BOF
(ip-dvb)

Road Map

<http://www.erg.abdn.ac.uk/ip-dvb/charter.html>

IP over MPEG-2/DVB Transport BOF (ip-dvb)

Encapsulation

MPE (defined by DVB)

Simple Encapsulation (using AF)

ULE (direct over TS)

Address Resolution

Table-based?

IP-based?

Proposed Documents

STANDARDS TRACK RFC on Encapsulation

INFO RFC on Address Resolution


INFO RFC on Architecture

Investigate the need for further protocols

- * IP-based Address Resolution (ND) components
- * Negotiation/association of IP QoS with MPEG-2 TS
- * Management - SNMP MIBs

Multi-homing support

Security



IP over MPEG-2/DVB BOF
2-Way Services over DVB-RCS

IETF 57 - Vienna
14/07/2003
Sébastien Josset,
Stéphane Combes

Requirements for future WG work

- > According to the charter, requirements should consider the range of MPEG-2 based platforms currently (or anticipated to be) in use
 - **DVB-RCS based satellite meshed systems** are being developed (ESA/HISPASAT AMERHIS project, on-board Amazonas satellite to be launched in 2004)
 - these are **new systems**, like IPv6, which are badly supported by old solutions : this working group shall concentrate on this.

- > MPEG-2 satellite meshed systems must therefore be considered with the particularities they bring :
 - need for **security** of ptp & ptm links
 - need for **scalability** of connection control (lots of connections !) and PID distribution (lots of PIDs are being used !)

- > MPE has shown strong limitations w.r.t. this kind of systems
 - already highlighted during DVB-RCS standard definition
 - discussed on the IP/DVB mailing list
 - need for an addressing scheme

Position wrt current I-Ds

> Requirements I-D :

- requirements for duplex link layers (DVB-RCS) and meshed systems shall be added
- requirements for duplex security shall be added
- requirements for scalable & efficient multicast security and layer 2 control (connection control, PID assignment) shall be added

> Encapsulation I-Ds :

- a kind a Service Specific Convergence Sublayer (as in some ATM AAL) shall be added :
 - it can be null
 - it can include SAR (Segmentation & Reassembly) function, in order to have a single SNDU per MPEG-2 packet
 - encasulation shall include description for MPLS and “connectionless” mode (like “IP-dedicated” as was discussed on the mailing-list)

> Address resolution I-D :

- DVB-RCS proposal of Connection Control Protocol shall be evaluated and if necessary completed.

Security

- > An Integrated Security Scheme for unicast/multicast MPEG-2 systems should be defined:
 - Current standard security defined for one way diffusion
 - Need for dynamic authentication & configuration
 - Layer 2 secure Data plane
 - Multicast & Multi-source aware
 - Based on strong algorithms
 - Per flow
 - Layer 2 secure Ctrl plane
 - Forward only & Bi-directional compliant
 - Scalable

- > FMKE I-D presented at MSEC

IP over MPEG-2/DVB Transport BOF (ip-dvb)

STANDARDS TRACK RFC on Encapsulation

[draft-clausen-ipdvb-enc-01.txt](#)

[draft-fair-ipdvb-ule-00.txt](#)

(review Oct 2003 & then Freeze, Implement)

(to IESG by Dec 2003)

INFO RFC on Address Resolution

[draft-fair-ipdvb-ar-00.txt](#)

(review Mar 2004)

(to IESG by June 2004)

INFO RFC on Architecture

[draft-fair-ipdvb-req-03.txt](#)

(review Mar 2004)

(to IESG by Jun 2004)

Discussion

- Are people prepared to write / implement this?
- Does this need an IETF WG?