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Technical Specification

Digital Video Broadcasting (DVB); DVB-S2 Adaptive Coding and Modulation for Broadband Hybrid Satellite Dialup Applications

European Broadcasting Union   Union Européenne de Radio-Télévision

EBU·UER

Reference

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Foreword

This Technical Specification (TS) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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Founded in September 1993, the DVB Project is a market-led consortium of public and private sector organizations in the television industry. Its aim is to establish the framework for the introduction of MPEG-2 based digital television services. Now comprising over 200 organizations from more than 25 countries around the world, DVB fosters market-led systems, which meet the real needs, and economic circumstances, of the consumer electronics and the broadcast industry.

1 Scope

The present document forms the baseline specification for the provision of the DVB-S2 adaptive coding and modulation (DVB-S2 ACM) for GEO satellite interactive networks with dialup return channel terminals. It facilitates the use of such terminals for individual or collective communications in a domestic environment. It also supports the connection of such terminals with in-house satellite forward link and return channel telephone networks. The present document may be applied to all frequency bands allocated to GEO satellite services. The DVB-S2 standard is for forward link transmission. DVB-S2 is the second generation standard for satellite transmission, which provides higher power and bandwidth efficiency as well as adaptive coding and modulation.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1]   ETSI EN 302 307: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications".

[2]   ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[3]   ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio: Systems".

[4]   IEEE 802.3: "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements -
Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[5]   ETSI TR 102 376: "Digital Video Broadcasting (DVB); User guidelines for the second generation system for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)".

[6]   ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".

[7]   ISO/IEC 13818-6: "Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extensions for Digital Storage Media Command and Control (DSM-CC)".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACM   Adaptive Coding and Modulation
ACM_ACK   ACM DVB-S2 ACKnowledgement of ACM_RQ
ACM_CAP   ACM DVB-S2 CAPabilities List
ACM_RQ   ACM DVB-S2 REQuest for MODCOD change

CNI	Carrier to Noise Interference
DVB	Digital Video Broadcasting
DVB-S2	DVB-S system generation as specified in EN 302 307 [1]
GS	Generic Stream
GW	GateWay at hub station
IP	Internet Protocol
ISI	Input Stream Identifier
ISP	Internet Service Provider (Terrestrial)
MPEG-2	Motion Picture Experts Group version 2
MSB	Most Significant Bit
PLFrame	Physical Later Frame for DVB-S2
PPP	Point to Point Protocol
ST	Satellite (receiving) Terminal
TBD	To Be Determined
TS	Transport Stream
UDP	Unicast Datagram Packet

4 System description

4.1 Block description ACM system

Figure 1 shows the scheme of a generic ACM satellite link from the DVB-S2 User Guideline (see TR 102 376 [5]), composed by the Gateway (GW), which includes the ACM DVB-S2 modulator, the Satellite, the Satellite (receiving) Terminal (ST) connected to the GW via a return channel. In the present document the return channel is a dial-up system.
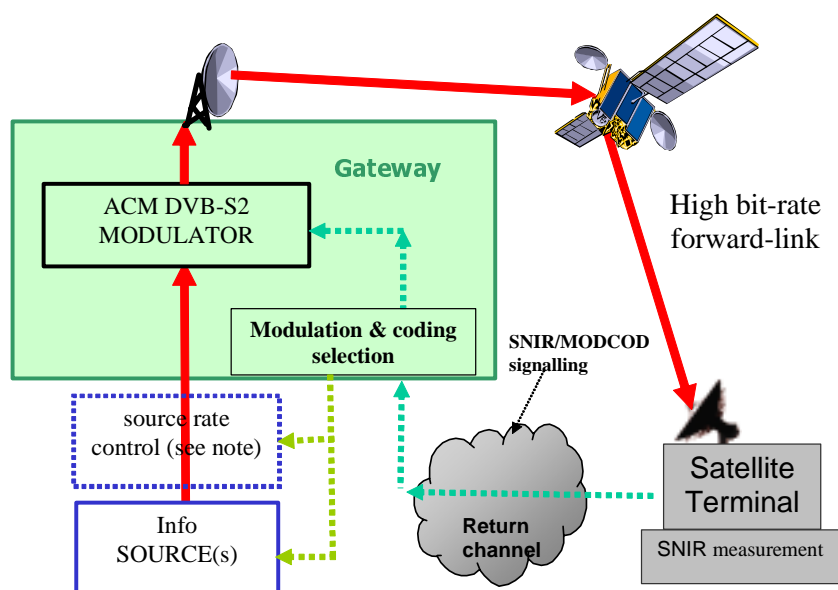
NOTE: Source rate control may be directly applied to source(s) or locally at the GTW inputor via network traffic control.

Figure 1: Block diagram of a DVB-S2 ACM link

The system is to be used for ACM control messages as per the DVB-S2 system standards [1]. The High bit-rate forward link will transport both MPEG2 Private Sections for physical layer ACM signalling and some IP encapsulation method that may have ACM control messages plus IP traffic.

4.2   Block description satellite terminal

For discussion purposes the Satellite Terminal will consist of three block parts; the Receiver, The User PC, and the Modem. The Receiver functionality should be to process information in the Forward Link and forward onto the User PC. The User PC functionality is to handle IP Traffic but more importantly to ensure the Receiver is optimally tuned (reading CNI and adjusting ISI/MODCOD) to receive traffic by the use of control messages between the User PC and Receiver. Definitions of messaging between the User PC and Receiver are out of scope of the present document and Vendor Specific. The Modem is to send and receive IP traffic via the Return Channel. The Satellite Terminal can consist of one to three individual units and are split in three pieces for clarification.
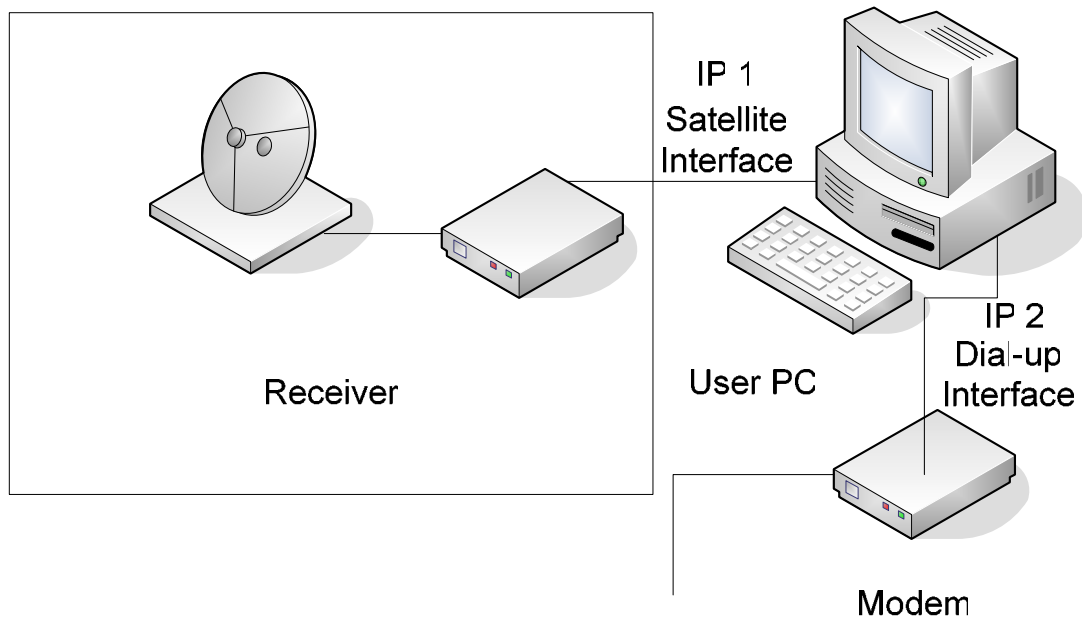
Figure 2: Block diagram of a satellite terminal

4.3   Network topology

The satellite terminal network topology will consist of a satellite and dial-up interface. The satellite interface will emulate a network adapter with a unique IP address assigned by the Satellite Network. The dial-up connection will be to an ISP and with a unique IP address assigned by ISP. The ISP is not aware of the Satellite Network and the return channel is to the Internet (not necessarily back to the Satellite Network Operator). The dashed (red) line in the figure below shows the signalling path for DVB-S2 ACM command. The S2 Uplink Station is as defined in figure 1.
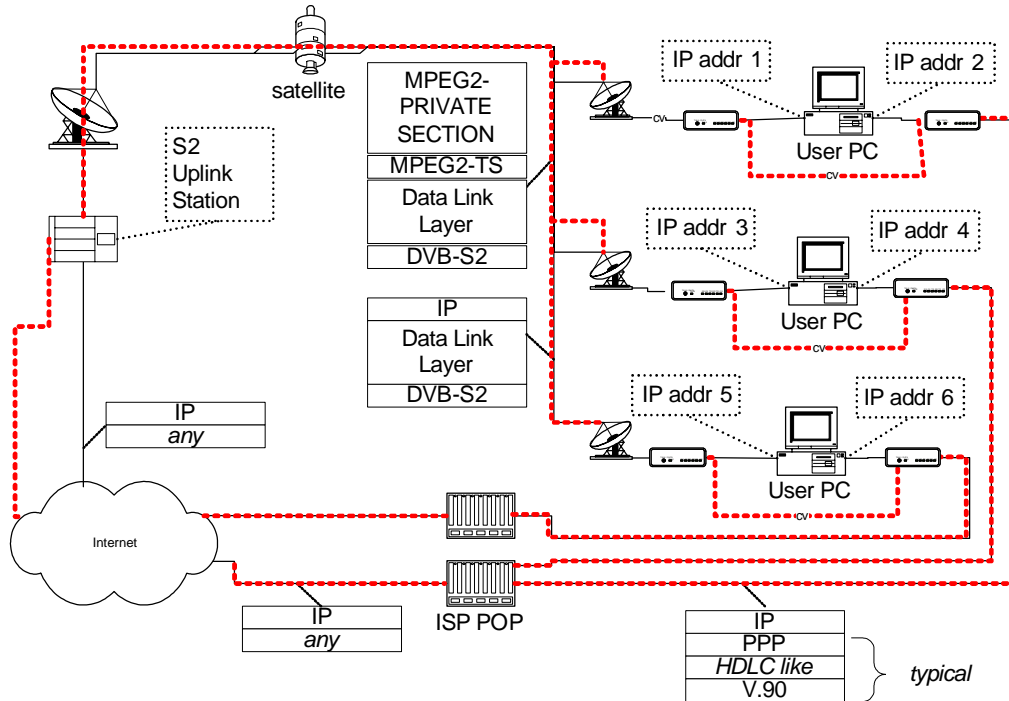
Figure 3: Network topology of a DVB-S2 ACM hybrid satellite dialup system

This network topology introduces two physical layers both using the same upper layer. This introduces issues related to timing of message delivery, often referred to as race conditions. ACM control messages and traffic delivery need to be synchronized for transparent traffic delivery to not affect TCP/IP performance.

5 Protocol stack

5.1 Session control signalling

Session control protocols are normatively required in terminals for DVB-S2 ACM interactive services.

The subset of messages required is as follows:

> **Session sequence:**
>
> ACM_RQ/ACM_ACK

For implementation of session control signalling see clause Session Control in DVB-S2 ACM interactive services.

5.1.1 ACM_RQ

The Satellite Terminal will send this message whenever the CNI values do not match the thresholds listed in the ACM Capabilities List (ACM_CAP).

Return channel:

A terminal sends this message over the dial-up connection to the hub station. The message is contained in the payload of a UDP datagram as described in table 1.

Table 1: Session control via dialup connection

UDP
IP
PPP(MP)

Table 2: Protocol structure of ACM_RQ

MAC_Address	48	Uimsbf
Timestamp	32	Uimsbf
password_length	16	Uimsbf
for (i=0;i<password_length;i++) {		
Password	8	Uimsbf
}		
MODCOD_RQ	8	Uimsbf
CNI	8	Uimsbf
ACM_ACK_MODE	8	Uimsbf

MAC_Address of the DVB-S2 receiver is defined as per IEEE 802.3 [4].

Timestamp is a time identifier within the User PC.

password_length is defined as the number bytes the password is maximum of 16 384 Bytes. If zero, no password authentication is present.

Password is defined as a method to authenticate a message at the hub station. The actual method of authentication is open to manufacturer of hub stations and terminals implementing DVB-S2 ACM.

MODCOD_RQ is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

CNI is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

ACM_ACK_MODE is defined on how the hub is to process and reply to this ACM_REQ.

Table 3: ACM_ACK_MODE type

Value	ACM ACK category	Meaning of ACM_ACK MODE
0	NONE	NO ACM_ACK is sent
1	FLMPEGPS	ACM_ACK sent in the forward link using the MPEG Private Sections for real-time processing
2	FLIP	ACM_ACK sent in the forward link using UDP
3	RCIP	ACM_ACK sent in the return channel using UDP

5.1.2　ACM_ACK

This is a response from the ACM_RQ message. This message is required when more than one input stream is used in the system.

There are two options for sending the ACM_ACK message.

Satellite Link:

The hub station will send the ACM_ACK message over the satellite link when the last IP datagram has been transmitted on the "old" MODCOD.

Table 4: DVB-S2 ACM_ACK via satellite link with MPEG private section

MPEG2 Private Section
MPEG2 TS

The *DVB-S2 ACM ACK table* consists of sections called dvb_s2_acm_ack_section(), which are private sections as defined in the MPEG-2 Systems standard (see ISO/IEC 13818-1 [3]).

Syntax	No. of bits	Mnemonic
Dvb_s2_acm_ack_section(){		
table_id	8	Uimsbf
Section_syntax_indicator	1	Bslbf
Private_indicator	1	Bslbf
Reserved	2	Bslbf
Section_length	12	Uimsbf
MAC_address_6	8	Uimsbf
MAC_address_5	8	Uimsbf
Reserved	2	Bslbf
MODCOD_ACK	8	Uimsbf
Input_Stream_Identifier	8	Bslbf
Reserved	8	Uimsbf
MAC_address_4	8	Uimsbf
MAC_address_3	8	Uimsbf
MAC_address_2	8	Uimsbf
MAC_address_1	8	Uimsbf
reply_len	16	Uimsbf
for(i=0;i< reply_len;i++) {		
Reply	8	Uimsbf
}		
Timestamp	32	Uimsbf
Checksum	32	Uimsbf
}		

table_id is set to 0x81

section_syntax_indicator is set to "0".

private_indicator is set to "0".

section_length specifies the number of remaining bytes in the section immediately following the private_section_length field. The value must not exceed 4 093.

MAC_address_[1..6]: This 48-bit field contains the MAC address of the destination. The MAC address is fragmented in 6 fields of 8-bits, labelled MAC_address_1 to MAC_address_6. The MAC_address_1 field contains the most significant byte of the MAC address, while MAC_address_6 contains the least significant byte.

   NOTE: The order of the bits in the bytes is not reversed and that the Most Significant Bit (MSB) of each byte is still transmitted first.

MODCOD_ACK is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

Input_Stream_Identifier (ISI) in the BBHeader as defined in the DVB-S2 system standards [1] for the resulting PLFrame to be demodulated.

reply_len is defined as the number bytes the reply is maximum of 16 384 Bytes. If zero, no password authentication is present.

Reply is defined as a method to send a message to the terminal for interpretation by the hub station. The actual method of reply is open to manufacturer of hub stations and terminals implementing DVB-S2 ACM.

Timestamp is the time to switch to this MODCOD/ISI.

Checksum is the checksum of the entire message as defined in the DSM-CC standard [7].

Return channel:

The hub station sends this message over the dial-up connection to the Satellite Terminal. This message will be sent when traffic is interrupted for a **TBD** period of time. The message is contained in the payload of a UDP datagram as described in table 1.

Table 5: Protocol structure of ACM_ACK

MODCOD_ACK	8	Uimsbf
Input_Stream_Identifier	8	Uimsbf
reply_len	16	Uimsbf
for (i=0; i<reply_len;i++) {		
Reply	8	Uimsbf
}		
Timestamp	32	Uimsbf

MODCOD_ACK is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

Input_Stream_Identifier in the BBHeader as defined in the DVB-S2 system standards [1] for the resulting PLFrame to be demodulated.

reply_len is defined as the number bytes the reply is maximum of 2^4 Bytes. If zero, no password authentication is present.

Reply is defined as a method to send a message to the terminal for interpretation by the hub station. The actual method of reply is open to manufacturer of hub stations and terminals implementing DVB-S2 ACM.

Timestamp is the time to switch to this MODCOD/ISI.

5.2 DVB-S2 ACM MODCOD capability transfer

The hub station stores a list that maps each MODCOD to thresholds and a magic_number used for authentication of the return channel request for new MODCOD. It creates the DVB-S2 ACM Capabilities table from this list. It transmits this table repeatedly and creates a new version when the content has changed.

The subset of messages required is as follows:

     Session sequence:

       ACM_CAP

5.2.1 ACM_CAP

This message is read at start-up and whenever the version number changes.

Satellite link: Two categories are provided:

(i) Definition of a MPEG2 private section table across the satellite link.

Table 6: DVB-S2 MODCOD via satellite link with private sections

MPEG2 Private Section
MPEG2 TS

The *DVB-S2 ACM Capabilities table* consists of sections called dvb_s2_acm_capabilities_section(), which are private sections as defined in the MPEG-2 Systems standard (see ISO/IEC 13818-1 [3]).

Syntax	No. of bits	Mnemonic
dvb_s2_acm_capabilities_section(){		
table_id	8	Uimsbf
Section_syntax_indicator	1	Bslbf
Private_indicator	1	Bslbf
Reserved	2	Bslbf
Section_length	12	Uimsbf
table_id_extension	16	Uimsbf
Reserved	2	Bslbf
Version_number	5	Uimsbf
current_next_indicator	1	Bslbf
Section_number	8	Uimsbf
last_section_number	8	Uimsbf
number_stream_inputs	8	Uimsbf
modcod_available_length	8	Uimsbf
for (i=0; i<modcod_available_length; i++) {		
MODCOD	8	Uimsbf
lower_CNI_threshold	8	Uimsbf
upper_CNI_threshold	8	Uimsbf
}		
Magic_number	32	Uimsbf
Ip_router_ipaddress	32	Uimsbf
Ip_router_portnumber	16	Uimsbf
CRC_32	32	Rpchof
}		

table_id is set to 0x80.

section_syntax_indicator is set to "1".

private_indicator is set to "0".

section_length specifies the number of remaining bytes in the section immediately following the private_section_length field. The value must not exceed 4 093.

table_id_extension is reserved.

version_number, current_next_indicator, section_number, last_section_number, CRC_32 as defined for private sections in ISO/IEC 13818-1 [3].

number_stream_inputs indicates if a single or multiple input stream. "1" indicates one input stream, any other number indicates multiple inputs streams in the system. See annex B for an explanation.

modcod_available_length is the number of MODCODs available on this network.

MODCOD is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

lower_CNI_threshold is the recommended value for minimum signal to noise measurements before moving down to the next MODCOD.

upper_CNI_threshold is the recommended value for maximum signal to noise measurements before moving up to the next MODCOD.

magic_number is used in the UDP/IP ACM_RQ for packet authentication sent to the hub station.

ip_router_ipaddress is the IP address of the IP router.

ip_router_portnumber is the IP port number of the IP router.

    (ii)   Definition of a Multicast message across the Satellite Link.

Table 7: Multicast via satellite link

MULTICAST
IP
Datalink Layer
MPEG2 TS

Version_number	4	uimsbf
number_stream_inputs	8	uimsbf
Modcod_available_length	4	uimsbf
for (i=0; i< modcod_available_length; i++) {		
MODCOD	8	uimsbf
lower_CNI_threshold	8	uimsbf
upper_CNI_threshold	8	uimsbf
}		
Magic_number	32	uimsbf
lp_router_ipaddress	32	uimsbf
lp_router_portnumber	16	uimsbf

version_number indicates the current version of this information. All information needs to be updated in the terminal when it is detected this value has changed.

number_stream_inputs indicates if a single or multiple input stream. "1" indicates one input stream, any other number indicates multiple inputs streams in the system. See annex B for an explanation.

modcod_available_length is the number of MODCODs available on this network.

MODCOD is defined in the sections for Signalling of reception quality via return channel (Normative for ACM) of the DVB-S2 system standards [1].

lower_CNI_threshold is the recommended value for minimum signal to noise measurements before moving down to the next MODCOD.

upper_CNI_threshold is the recommended value for maximum signal to noise measurements before moving up to the next MODCOD.

magic_number is used in the UDP/IP ACM_RQ for packet authentication sent to the hub station.

ip_router_ipaddress is the IP address of the IP router.

ip_router_portnumber is the IP port number of the IP router.

6 Session control in DVB-S2 ACM interactive services

6.1 Introduction

Connection-less session control is needed to provide the service of informing the terminal of the MODCODs available and the terminal requesting from the hub station an appropriate MODCOD for its given Signal to Noise measurements.

All basic message flows are identical where establishing a session, changing the MODCOD due to changing CNI values, and the loss of messages.

Shown is two figures, one where the ACM_CAP and ACM_ACK messages use DVB-Private Sections in the Forward Link for multiple input streams and the other the ACM_CAP in the Forward Link IP Layer and ACM_ACK in the return channel IP layer.

In all both instances the ACM_RQ is sent in the return channel.

The Satellite Terminal will need to be configured for the method of finding the ACM_CAP message via PID or PID and Multicast IP address.

6.1.1   ACM messaging Using DVB private sections

The ACM_CAP and ACM_ACK message is done at the DVB Private Section level so that the Receiver can process the information in real-time with minimum interaction with the User PC and Modem. This reduces timing issues and can centralize all functionality in the Receiver.

The ACM_ACK is required for systems using multiple input streams and optional otherwise.
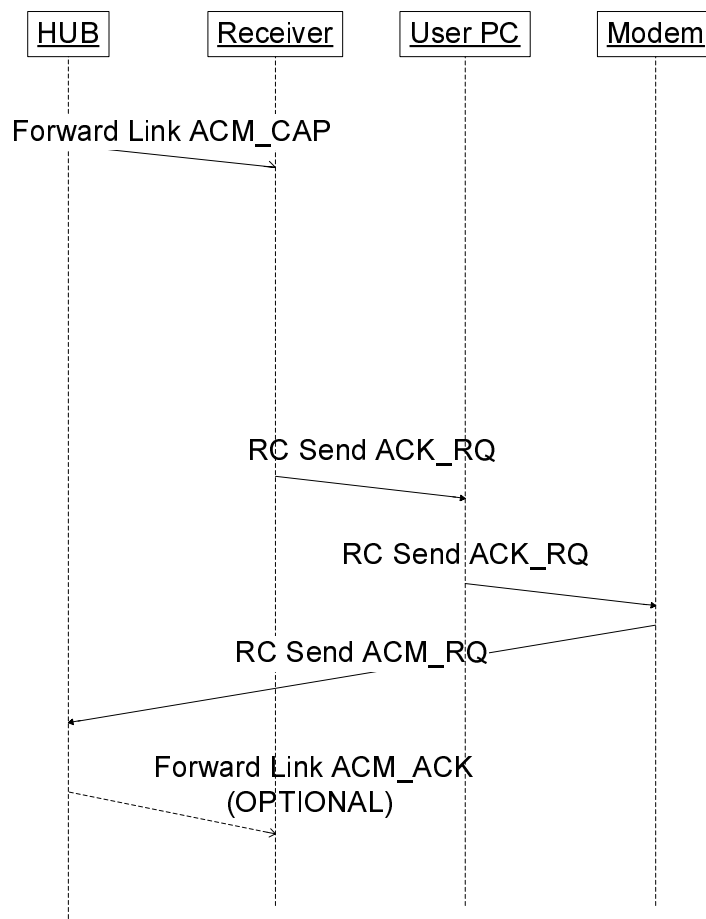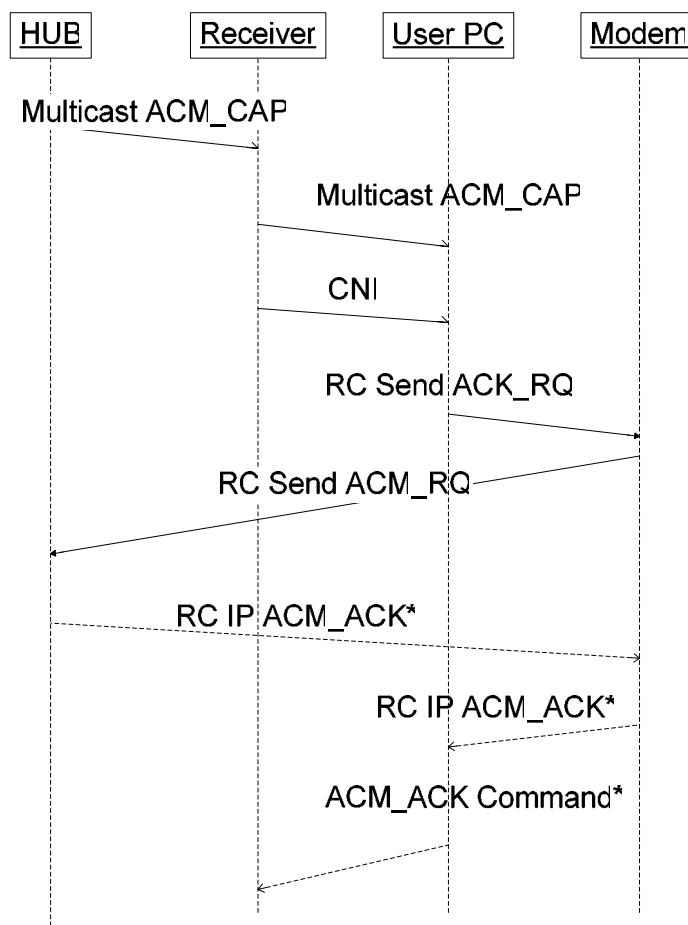

Figure 4: Message sequence using DVB private sections to deliver the ACM_CAP and ACM_REQ

6.1.2 ACM messaging multicast and dial-up session control

The ACM_CAP and ACM_ACK are sent via the IP layer. This requires the system to be of a single input stream and that the ACM_ACK is not required to be processed in real-time. The ACM_ACK is optional in this instance.

NOTE: Those messages with an "*" are optional.

Figure 5: Message sequence using the IP layer to deliver the ACM_CAP in the forward link and ACM_ACK/ACM_REQ in the return channel

6.2 Session Establishment

This connection-less session is established by the act of the Satellite Terminal reading data off the Satellite Link via a table or multicast message that consists of the MODCODs in the system, Signal to noise thresholds for choosing a MODCOD, and a "magic_number" for MODCOD message authentication (ACM_CAP message). Additional contact information will be provided. This information needs to updated for every version number change.

The magic_number, IP and port number should change periodically for security reasons. Authentication of the ACM_RQ is recommended and implementation is not defined here.

An ACM_RQ will be sent to request the correct MODCOD for the given measurements and thresholds listed.

Once the ACM_RQ is sent the terminal can wait for an ACM_ACK or demodulate everything it can. With multiple input streams, the ACM_ACK is required to configure the Receiver to de-capsulate the correct ISI.

6.3   Client initiated session reset

The terminal at any time may send an ACM_RQ whenever CNI changes enough to warrant moving to a more appropriate modulation and/or forward error correction.

This flow can also be initiated if the Satellite Terminal suspects message loss.

This CNI is measured and the thresholds to change to are in the ACM_CAP message. Once the ACM_RQ is sent, the terminal can wait for an ACM_ACK or demodulate everything it can. With multiple input streams, the ACM_ACK is required to configure the Receiver to demodulate the correct MODCOD and ISI.

Authentication of the ACM_RQ is recommended and implementation is not defined here.

Annex A (informative):
Assumptions for hub station

ACM commands are primarily for the switching of IP traffic from one MODCOD to another. The traffic has to be moved based on the IP destination or MAC Address of the terminal. Modulators are thus assumed to have an internal mechanism for moving data identified in a MODCOD_RQ. This could be envisioned by having a three pieces of information on each piece of data: MODCOD, destination, and counter. The MODCOD and destination are obvious with the counter being used for tracking the order of the data pieces.

Systems with multiple input streams each having a unique ISI code will need to find a clean mechanism of timing between the hub station and terminal. This timing is needed coordinate the switching of ISI codes without traffic interruption.

The hub station will prevent a race condition for arrival of data affected by an ACM command. This situation is aggravated by having signalling at the IP layer via the physical layer and then this signalling needs to be re-directed back to the terminal for processing. This creates a virtual queue in the system that IP data packets arrive after the ACM command is received and processed before the ACM command takes affect.

Annex B (informative):
Input Streams Defined

In a DVB-S2 standard [1] three general types of implementation are possible for interactive services for BBHeader coding.
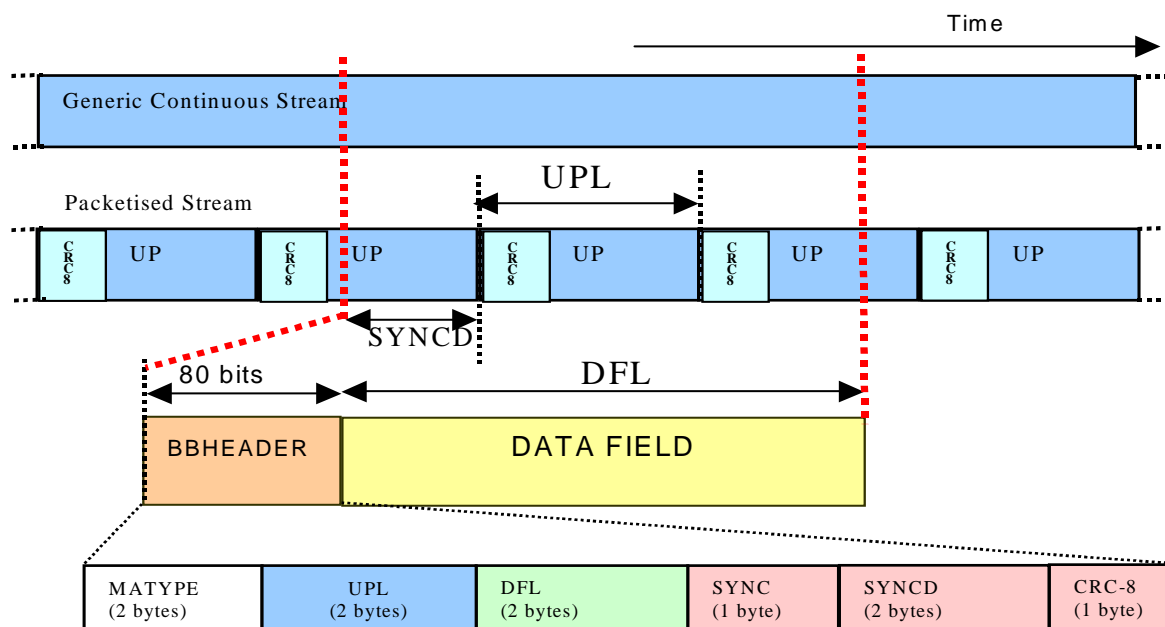

Figure B.1: Stream format at the output of the Mode Adapter

In this figure from the DVB-S2 standard [1] the packetized stream data is not split on the User Packet (UP) boundaries. This functionality requires the BBFrames be ordered or sortable at the de-modulator to re-construct the UP correctly.

B.1 Single Input Stream

The order of these UP is preserved PLFrame to PLFrame independent of the ISI value. This mean the demodulator either has to sort by ISI or rely on the DVB-S2 modulator to guarantee that a split UP packet always starts on the next BBFrame data field. Thus BBFrame with ISI value 5 could end with a partial data segment and continues when the next BBFrame transmitted with a different ISI value.

B.2 Multiple Input Stream

The order of these UP is preserved PLFrame to PLFrame by ISI value. The order of the data is preserved by demodulation of a specific ISI values. Thus BBFrame with ISI value 5 could end with a partial data segment and only continues when the next BBFrame with ISI value 5.

Annex C (informative):
SI and PSI

C.1   General

MPEG Program Specific Information and (PSI) and DVB Service Information (SI) enables DVB to locate and select the data that belongs to a particular program or service on a network. In the kind of networks considered in the present document, PSI and SI enables a terminal to locate and select the Internet Protocol data it shall receive, together with the signalling for ACM.

The DVB-S2 standard [1] defines in table D.4.1 three configurations for interactive services with ACM:

*   Multiple Transport Streams.

*   Multiple Generic Streams.

*   Single Generic Stream.

In the following, use of PSI and SI is described for the three configurations.

C.2   Multiple Transport Streams

In the case of Multiple Transport Streams, IP datagrams are encapsulated into the MPEG Transport Streams (TS) by DVB Multiprotocol Encapsulation (DVB-MPE), which is defined in the DVB Data Broadcast standard (see EN 301 192 [6]). On each TS, a single program in the MPEG sense (or service) is sufficient. In a simple case, the program contains a single DVB-MPE stream. In addition, the program must contain the DVB-S2 ACM ACK Table and the DVB-S2 ACM ACK Capabilities Table. It is assumed that sections of these two tables can be carried in the same Private Section stream.

For compliance with the MPEG-2 Systems standard (see ISO/IEC 13818-1 [3]), any TS contains a PAT, and a PMT for each program. In DVB-S2 ACM sat/terrestrial networks, the TS contains one PMT for the single program. The PMT contains information about the DVB-MPE stream and the Private Section stream. For compliance with the DVB-SI standard (see EN 300 468 [2]), any TS contains a NIT, which contains tuning parameters for the TS in a network. For In DVB-S2 ACM sat/terrestrial networks it is assumed that the NIT contains at least the TS with most robust MODCOD on every DVB-S2 carrier.

A terminal that shall use a DVB-S2 ACM sat/terrestrial network needs to know the transport_stream_id of the most robust MODCOD. With this transport_stream_id given, it accesses the IP data and control by the following steps:

1)   Tune to any transponder. In the case of a DVB-S2 transponder, select any TS on it.

2)   Read the NIT from TS packets with PID = 16.

3)   Derive from NIT the tuning parameters and ISI for the given transport_stream_id.

4)   Tune to the transponder that carries the TS with given transport_stream_id.

5)   Select the ISI that carries the TS with given transport_stream_id.

6)   Read the PAT from TS packets with PID = 0.

7)   Derive from PAT the PID value of the single PMT.

8)   Read the PMT.

9)   Derive from PMT the PID value of the stream with stream type 14. This is the DVB-MPE stream.

10) Derive from PMT the PID value of the stream with stream type 5. This is the stream that contains the S2 ACM ACK Table and the DVB-S2 ACM ACK Capabilities Table.

11) Select continuously from the DVB-MPE stream the sections that contain the own MAC address. De-capsulate IP datagrams and process them.

12) Read the DVB-S2 ACM ACK Capabilities Table and observe continuously whether a different MODCOD is required.

13) If a MODCOD change is required, then continue with the following steps.

14) Request the MODCOD change through the return channel (dial-up connection).

15) Read continuously the S2 ACM ACK Table until it contains an acknowledgement for the requested MODCOD change.

16) Select the TS with the ISI that is contained in the acknowledgement.

17) Go back to step 7).

C.3   Multiple Generic Streams

In the case of Multiple Generic Streams (GS), a specification for encapsulating IP datagrams on a DVB-S2 GS is required. A DVB specification for this kind of encapsulation was not yet available when the present document has been finalized. If a future specification allows to transmit MPEG private sections in addition to encapsulated IP datagrams on the same GS, then PSI and SI can be used in a similar way as described above for multiple Generic Streams.

A possible encapsulation uses a structure similar to a TS, but without the requirement for constant bit rate.

C.4   Single Generic Stream

In the case of Single Generic Stream, a specification for encapsulating IP datagrams on a DVB-S2 GS is required, like for the case of Multiple Generic Streams.

It is not necessary to transmit an acknowledgement on the satellite forward link. The DVB-S2 ACM MODCOD Capability transfer can be done by IP multicast. Therefore, no private section transmission is required.

A possible encapsulation must tolerate that a particular terminal does not receive those parts of the stream that are transmitted with a less robust MODCOD.

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History

Document history		
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