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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 ÉLÉCtrotechnique (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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Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"must" and "must not" are NOT allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document specifies an end-to-end Native IP broadcast system for DVB broadcast bearers. It relies as much as possible on existing DVB specifications and complements those where necessary. The Native IP broadcast system is built upon DVB-I for service discovery and program metadata, DVB-AVC and DVB-DASH for source coding and stream formatting and DVB-MABR, DVB-GSE and the physical layer specifications DVB-S2X, DVB-S2 and DVB-T2 for transport. DVB Native IP facilitates the integration of OTT and Broadcast technologies into an efficient and contemporary IP media distribution solution.

The Native IP specification addresses both consumer and professional applications.
1 Scope

The present document describes a Native IP end-to-end broadcast system based on existing DVB standards.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 302 307-1: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 1: DVB-S2".

[2] ETSI EN 302 307-2: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 2: DVB-S2 Extensions (DVB-S2X)".


[5] ETSI TS 102 606-2: "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 2: Logical Link Control (LLC)".

[6] ETSI TS 102 606-3: "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 3: Robust Header Compression (RoHC) for IP".

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


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


2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.


3 Definition of terms, symbols and abbreviations

3.1 Terms

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

**aggregator:** any entity in charge of aggregating one or more bouquets of services

**asset:** any file object directly retrievable by NIP Clients through a URI

**bootstrap process:** initialization process for broadcast receivers joining a NIP broadcast network and learning about the topology of the network including the availability of channels, streams and services on those streams

**bootstrap streams:** any NIP stream according to the present document that is involved in the bootstrap or initialization process of receivers joining a NIP network and wanting to learn about the topology of the network

**broadcast service:** Any NIP Service broadcast over a NIP compliant network as opposed to a service provided via OTT

**broadcast service list:** A DVB-I Service List according to ETSI TS 103 770 [9] broadcast over a DVB-NIP Broadcast System and listing services available via broadcast or broadband
broadcast service list entry points: A Service List Entry Points file broadcast via a DVB-NIP Broadcast System according to the present document

NOTE: The Broadcast Service List Entry Points file provides to a DVB-I client the list of all DVB-I Service Lists that are broadcast on a NIP network.

commercial operator: any entity in charge of providing one or more bouquets of services. Commercial Operators typically aggregate services and provide these generally against payment but sometimes free-to-air to End-Users

connected device: any device, capable of receiving broadcast content and also connected to a terrestrial fixed or mobile broadband network or connected to a satellite network with return channel functionality providing access to the open internet

content preparation platform: all functions involved in the video encoding, encryption, key management and packaging of media assets for broadcast via a NIP compliant network

deployment model: refers to a logical grouping of receiver functions or features for a particular usage scenario

DVB-I Client: implementation of the client side of ETSI TS 103 770 [9]

NOTE: This may be integrated into the User Interface (UI) of a device such as a television or set-top box or part of an app on devices such as mobile phones or tablets.

DVB-NIP Broadcast System: an end-to-end broadcast system that complies with the specification of the present document

DVB-TS Broadcast Headend: in the context of the present document refers to the functions part of a traditional Transport Stream based DVB Head-end: Linear encoding into PES packets, DVB Multiplexing, DVB Conditional Access etc

headend: all functions involved in the editing of services before being broadcast

hybrid service: service consisting of components carried via a.) broadcast and b.) broadband means

media object: single externally addressable unit of packaged encoded media essence or related metadata to be conveyed via a multicast transport session or via a unicast transport session e.g. a presentation manifest or DASH segment identified by a URI

metadata: all data related to the description of the network: Channels and Streams, Services available on the Network: Service List Entry Points and Service Lists, Content within those services: Content Guide and Content Presentation

multicast gateway: as defined in clause 5.3.5 of ETSI TS 103 769 [8]

multicast rendezvous service: as defined in clause 5.3.9 of ETSI TS 103 769 [8]

multicast server: as defined in clause 5.3.3 of ETSI TS 103 769 [8]

NIP Client: device or software application featuring DVB-I client functionality as defined in ETSI TS 103 770 [9], including the capability to decode, decrypt and display NIP Services plus depending on the deployment scenario, the NIP defined device discovery methods in clause 11.1 of the present document

NIP Gateway: device including one or more broadcast reception frontends plus all functions required to interface with DVB-NIP Clients according to the present document

NIP Receiver: generic term for a reception device according to the present document

NOTE: The NIP Receiver always includes at least one or more physical broadcast tuner/demodulator functions, capable of receiving streams according to the present document. The NIP receiver may additionally include some or all NIP Gateway functions as well as some or all NIP Client functions.

NIP Service: any service according to DVB-I (ETSI TS 103 770) [9] which is discovered using the mechanisms defined in the present document, and which is using DVB-DASH (ETSI TS 103 285 [11]) delivery via broadcast or broadband
**NIP Service Aggregation Platform:** all head-end components, cloud or on-premises, at the Technical Network Operator or at one or more Commercial Operator(s) involved in the compilation of signalling and metadata information for the correct operation of NIP broadcast services according to the present document

**NIP Service Identifier:** URL of the NIP Service manifest

**NIP Stream:** Layer 2 packet stream consisting of a succession of GSE-Lite packets or TS/MPE sections

**over-the-top (OTT):** a media service offered directly to viewers via the Internet. OTT bypasses cable, broadcast, and satellite television platforms

**provider name:** the name of the provider of a DVB-I (ETSI TS 103 770 [9]) Service List in a human readable form

**regular stream:** any NIP Stream according to the present document that carries NIP Services but does not carry information specifically required during the bootstrap process of receivers

**regulator:** entity in charge of defining rules for broadcasters and the editing of broadcast programs

NOTE: In the context of the present document, the regulator is considered a key source when defining regionally applicable Service Lists.

**reserved_zero_future_use:** when used in the clause defining the coded bit stream, indicates that the value may be used in the future for ETSI defined extensions

NOTE: All "reserved_zero_future_use" bits are set to "0".

**RF Carrier:** modulated radio frequency signal carrying one or more NIP Streams

**RF Channel:** refers to a logical subdivision of the RF broadcast spectrum

NOTE: In the context of satellite transmissions RF Channels are commonly called Transponders.

**technical network operator:** entity in charge of running the broadcast network

### 3.2 Symbols

Void.

### 3.3 Abbreviations

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

- ABR  Adaptive Bit Rate
- API  Application Programming Interface
- ASCII  American Standard Code for Information Interchange
- AV  Audio Visual
- AVC  Advanced Video Coding
- B2B  Business to Business
- B2C  Business to Consumer
- CA  Conditional Access
- CDN  Content Delivery Network
- CENC  Common Encryption
- CSR  Central Service Registry
- DASH  Dynamic Adaptive Streaming over HTTP
- DASH-IF  DASH Industry Forum
- DM  Deployment Model
- DRM  Digital Rights Management
- DTT  Digital Terrestrial Television
- DVB-HB  Digital Video Broadcasting – Home Broadcast
- DVB-I  Digital Video Broadcasting – Internet
- DVB-SI  Digital Video Broadcasting – Service Information
- EME  Encrypted Media Extensions
- EPG  Electronic Programme Guide
- ETSI  European Telecommunications Standards Institute
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>FLUTE</td>
<td>File Delivery over Unidirectional Transport</td>
</tr>
<tr>
<td>GSE</td>
<td>Generic Stream Encapsulation</td>
</tr>
<tr>
<td>HbbTV</td>
<td>Hybrid Broadcast Broadband Television</td>
</tr>
<tr>
<td>HEVC</td>
<td>High Efficiency Video Coding</td>
</tr>
<tr>
<td>HEM</td>
<td>High Efficiency Mode</td>
</tr>
<tr>
<td>HD</td>
<td>High Definition</td>
</tr>
<tr>
<td>HDMI</td>
<td>High-Definition Multimedia Interface</td>
</tr>
<tr>
<td>HLS</td>
<td>HTTP Live Streaming</td>
</tr>
<tr>
<td>HTML</td>
<td>HyperText Markup Language</td>
</tr>
<tr>
<td>HTTP</td>
<td>HyperText Transfer Protocol</td>
</tr>
<tr>
<td>HTTPS</td>
<td>HyperText Transfer Protocol Secure</td>
</tr>
<tr>
<td>IANA</td>
<td>Internet Assigned Numbers Authority</td>
</tr>
<tr>
<td>ID</td>
<td>Identifier</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>IETF</td>
<td>Internet Engineering Task Force</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>IPTV</td>
<td>Internet Protocol Television</td>
</tr>
<tr>
<td>ISI</td>
<td>Input Stream Identifier</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organization</td>
</tr>
<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>LCD</td>
<td>Link Control Data</td>
</tr>
<tr>
<td>LCN</td>
<td>Logical Channel Numbering</td>
</tr>
<tr>
<td>LNB</td>
<td>Low Noise Block</td>
</tr>
<tr>
<td>MABR</td>
<td>Multicast Adaptive Bit Rate</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control</td>
</tr>
<tr>
<td>MPD</td>
<td>Media Presentation Description</td>
</tr>
<tr>
<td>MPE</td>
<td>Multiprotocol Encapsulation</td>
</tr>
<tr>
<td>MPEG</td>
<td>Moving Picture Experts Group</td>
</tr>
<tr>
<td>NIC</td>
<td>Network Interface Card</td>
</tr>
<tr>
<td>NID</td>
<td>Network Identifier</td>
</tr>
<tr>
<td>NIF</td>
<td>Network Information File</td>
</tr>
<tr>
<td>NIP</td>
<td>DVB Native IP</td>
</tr>
<tr>
<td>NIT</td>
<td>Network Information Table</td>
</tr>
<tr>
<td>NCD</td>
<td>Network Control Data</td>
</tr>
<tr>
<td>NTP</td>
<td>Network Time Protocol</td>
</tr>
<tr>
<td>OTT</td>
<td>Over The Top</td>
</tr>
<tr>
<td>PES</td>
<td>MPEG Packetized Elementary Stream</td>
</tr>
<tr>
<td>PHY</td>
<td>Physical Layer</td>
</tr>
<tr>
<td>PLP</td>
<td>Physical Layer Pipe</td>
</tr>
<tr>
<td>PTP</td>
<td>Precision Time Protocol</td>
</tr>
<tr>
<td>RF</td>
<td>Radio Frequency</td>
</tr>
<tr>
<td>RFC</td>
<td>Request For Comments</td>
</tr>
<tr>
<td>RoHC</td>
<td>Robust Header Compression</td>
</tr>
<tr>
<td>ROUTE</td>
<td>Real-Time Object Delivery over Unidirectional Transport</td>
</tr>
<tr>
<td>RTP</td>
<td>Real-Time Transfer Protocol</td>
</tr>
<tr>
<td>RX</td>
<td>Receiver</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Definition</td>
</tr>
<tr>
<td>SDT</td>
<td>Service Description Table</td>
</tr>
<tr>
<td>SIF</td>
<td>Service Information File</td>
</tr>
<tr>
<td>SLR</td>
<td>DVB-I Service List Registry</td>
</tr>
<tr>
<td>STB</td>
<td>Set-Top Box</td>
</tr>
<tr>
<td>TCP</td>
<td>Transmission Control Protocol</td>
</tr>
<tr>
<td>TLS</td>
<td>Transport Layer Security</td>
</tr>
<tr>
<td>TRP</td>
<td>Transponder</td>
</tr>
<tr>
<td>TS</td>
<td>MPEG Transport Stream</td>
</tr>
<tr>
<td>TX</td>
<td>Transmitter</td>
</tr>
<tr>
<td>UDP</td>
<td>User Datagram Protocol</td>
</tr>
<tr>
<td>UHD</td>
<td>Ultra High Definition</td>
</tr>
<tr>
<td>UI</td>
<td>User Interface</td>
</tr>
<tr>
<td>URI</td>
<td>Uniform Resource Identifier</td>
</tr>
<tr>
<td>URL</td>
<td>Universal Resource Locator</td>
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</tbody>
</table>
4 System Description

4.1 Overview

The present document describes a Native IP (NIP) Broadcast System based on existing DVB technologies that have been adapted and complemented for the requirements of network operators and broadcasters that want to leverage IP for the distribution of content.

It is designed to be applicable to DVB-S2X, DVB-S2 and DVB-T2 based broadcast networks.

The Native IP Broadcast System is an end-to-end IP-based system architecture that leverages DVB-I as a contemporary service discovery and programme metadata scheme, state-of-the-art Adaptive Bit Rate (ABR) video coding, packaging and delivery technologies as specified in DVB-DASH [11] and DVB-AVC [10] and multicast file transfer mechanisms as specified in DVB-MABR [8] for the distribution of audio-visual content.

The advantages of this approach are more flexibility, better integration with terrestrial IP infrastructures, the possibility to re-use streams coming from OTT cloud head-ends rather than having to purposely run a DVB-TS Broadcast Head-end for the sole distribution via traditional DVB broadcast networks, better compatibility with contemporary IP devices, such as smartphones, tablets, PCs..., and finally the option to use one and the same Native IP broadcast transmission to simultaneously address several very different B2B and B2C use cases.

Leveraging ABR technologies makes it possible to provide AV assets reliably not only directly to TV sets but also indirectly via gateway functions to any contemporary IP device. Such gateways may sit in provider and telecom networks or directly in consumer’s homes as an extension to DVB Home Broadcast [13].

Using the mechanisms defined in DVB-MABR also makes it possible to provide fully and inherently hybrid services in a totally seamless manner with some service components being delivered via broadcast and others via OTT. All this being invisible to the end-user. Applications for this may be live television channels carrying Targeted Advertising wherein the live channel content is provided via broadcast and the Targeted Advertisements are being delivered invisibly via broadband, or services where the lesser watched representations are delivered via broadband and the most common representations/components are delivered via broadcast. All the content seamlessly blends in a single consistent presentation to the end-user.

The mass distribution of identical content is still best served via broadcast and by leveraging contemporary video technologies in a hybrid context, the best of IP unicast and IP multicast distribution can be seamlessly combined.

Finally, the continued use of broadcast technologies in large scale content distribution systems represents a non-negligible contribution by the television industry to making television sustainable and contributing to the preservation of scarce resources.

4.2 System Features

The DVB Native IP Broadcast System works in both connected and unconnected scenarios. In unconnected scenarios, i.e. without return path, some features are not available yet.

The core features of the Native IP solution are:

1. Carriage of real-time live linear television and radio services
   - Real-time delivery of assets purely via broadcast.
   - Real-time delivery of assets in a fully hybrid manner some via broadcast and some via broadband.
   - Easier upgrade for the introduction of new audio and video codecs.
2. Professional and Consumer Usage Scenarios
   - Delivered directly from the same head-end to - consumers homes or indirectly – to CDN Edge Caches which make the content available via intermediate LAN or WAN fixed or mobile networks.
   - In professional environments, the possibility to store received content, i.e. "Live to VoD" service.

3. Extended Content Guide
   - All the functionalities provided by DVB-I ETSI TS 103 770 [9].

4. Multiscreen support
   - Addresses Native IP devices with or without built-in broadcast tuner.

5. Content protection
   - Supports content protection with the same DRM solutions that are used on broadband networks (fully connected scenario).
   - Supports proprietary DRM solutions for unconnected client scenarios.

6. Targeted Advertising
   - Uses the advantages of ABR for flexible ad replacement.

7. Accessibility services
   - Supports EBU-defined subtitling.

5 Overall System Architecture

5.1 Introduction
The DVB Native IP (DVB-NIP) specification describes an end-to-end IP delivery architecture leveraging Internet content delivery technologies such as Adaptive Bit Rate (ABR) streaming also for broadcast applications. The DVB-NIP Broadcast System is made up of two major parts (see figure 5.3-1):

- All functions related to the Native IP Headend.
- All functions related to the Native IP broadcast reception and content consumption.

The overall system design and the headend functions are described in the present clause. The receiver functions are described in clause 6.

5.2 Layered System Design

5.2.1 General
The DVB-NIP Broadcast System relies on a layered system architecture.

At the top of the Native IP stack is a DVB-I based television service discovery and metadata layer according to ETSI TS 103 770 [9]. This layer is responsible for informing receivers about the various services available on the broadcast and broadband networks. DVB-NIP Services may be grouped into different DVB-I Service Lists coming from different Technical or Commercial Operators on the broadcast network. One or more such DVB-I Service List(s) may be present on each broadcast network. The DVB-I Service List Entry Points mechanism is used to announce all the different DVB-I Broadcast Lists available on the network.

Included in each DVB-I service list are DVB-DASH based services according to ETSI TS 103 285 [11]. DVB-DASH based services in DVB-NIP can be carried using the DVB-MABR defined FLUTE/ROUTE protocols via the DVB broadcast network as defined in ETSI TS 103 769 [8]. Alternatively, a receiver might fetch the same services using standard HTTP/HTTPS requests via the broadband network. In addition, some components or representations of the same DASH service may be carried via the broadcast network and others via the broadband network. All this shall happen invisibly to the end-user of such services.
DVB-NIP defines an Announcement Channel mechanism under clause 8.2 and signalling tables called the NIF (Network Information File) and the SIF (Service Information File) under clause 8.4. These two signalling tables enable all the previously mentioned DVB specifications to be run on a broadcast network consisting of several broadcast RF Channels and potentially one or more logical NIP Streams. The NIF provides information about the different Streams and their physical parameters on the broadcast network. The SIF provides information on the location of Services and metadata within those Streams. NIF plus SIF allow broadcast receivers to dynamically re-tune to the Streams and physical Channels carrying the different broadcast Services.


5.2.2 Core DVB Specifications underlying NIP (informative)

The DVB-NIP Broadcast System is based on the following core DVB specifications. This list is purely informative and the exhaustive list is provided in clause 2.

- **DVB-I** (ETSI TS 103 770 [9]) provides the service discovery and programme metadata scheme for the DVB-NIP Broadcast System. DVB-NIP is designed in such a manner as to allow the re-use of unmodified DVB-I Clients. All features present in DVB-I are also available to DVB-NIP Clients. In particular DVB-I is used in DVB-NIP for announcing the media services that are available via broadcast and/or broadband.

- **DVB-DASH** (ETSI TS 103 285 [11]) and **DVB-AVC** (ETSI TS 101 154 [10]) are the underlying specifications for the coding, packaging and distribution of audio-visual services in the context of DVB-NIP.

- **DVB-MABR** (ETSI TS 103 769 [8]): DVB-NIP leverages the multicast object transport solution(s) provided by DVB-MABR for the carriage of file-based content, including segmented media.

- **DVB-GSE** (ETSI TS 102 660-1 [4]) and DVB-MPE (ETSI EN 301 192 [7]) are the two link layer protocols selected for the carriage of IP multicast datagrams in DVB-NIP. DVB-GSE is applied to the latest DVB physical layer specifications whereas MPE is used as an S2 compatible solution.

- **DVB-S2X** (ETSI 302 307-1 [1], ETSI 302 307-2 [2]), **DVB-S2** (ETSI 302 307-1 [1]) and **DVB-T2** (ETSI TS 102 755 [3]) may be used as the physical layer specifications in the context of an end-to-end DVB-NIP Broadcast System.
5.3 End-to-End System Architecture

The DVB-NIP Broadcast System is significantly different from traditional Transport Stream based broadcast architectures. Content sourcing in a NIP context is no longer from a dedicated DVB Encoding Platform but from the same Content Preparation and Hosting Platform that also source(s) OTT platforms. The OTT headend functions can run in the public cloud or on the premises of a Technical Network Operator or Commercial Operator. The interface between the OTT Content Preparation and Hosting Platform and the NIP platform is as described in clause 5.3.3.1 of the DVB-MABR specification [8].

The NIP architecture consists at the top level of NIP Headend and NIP Receiver functions. These NIP Headend and NIP Receiver functions can be subdivided into smaller functions that may themselves be grouped again into logical entities. NIP Headend functions will be described hereunder in clause 5 and the NIP Receiver logical functions are described in clause 6.

Figure 5.3-1 shows the overall NIP architecture. Logical functions are represented as named boxes and these boxes may be nested in cases where a higher-level function is composed of several subfunctions.
Figure 5.3-1 shows the overall NIP architecture. Logical functions are represented as named boxes and these boxes may be nested in cases where a higher-level function is composed of several lower-level functions.
5.4 NIP Headend Functions (informative)

The DVB-NIP Headend is made up of the following high-level functions (each with nested sub-functions):

1. The **OTT Content Preparation and Hosting platform** consists of media encoding, Content Encryption, Content Packaging and Content Hosting functions. It generally provides the same streams for over-the-top content delivery and, in the case of a DVB-NIP system, also for delivery via Native IP broadcasting. The OTT Content Preparation and Hosting platform can run at the premises of the broadcaster or can be run entirely in the cloud. It may be a single fully integrated and co-located headend, or it may comprise a collection of distributed headends, with each headend responsible for a few NIP Services. The OTT Content Preparation and Hosting platform interfaces with the Multicast server function at reference points $O_{in}$, $P_{in}$ or $P_{in}'$ as defined in clause 5.3.3.1 of ETSI TS 103 769 [8].

2. The **NIP Service Aggregation Platform** is responsible for:
   - The compilation of one or more DVB-I Service List(s).
   - The compilation of a list of DVB-I Service List Entry Points that is conveyed to NIP Gateways via the signalling channel and which helps DVB-I Clients select the corresponding DVB-I Service List that is to be used for receiving NIP services.
   - The creation of the NIF table which associates logical identification of streams and their physical parameters on the broadcast network.
   - The creation of the SIF table which associates services and metadata with their logical location on the broadcast network.
   - The compilation of the broadcast specific DVB-I Content Guide.

   The NIP Service Aggregation platform may be operator-specific or can be a shared system running in a private or public cloud.

3. The **Content Provider platform** deals with content acquisition, scheduling and monetisation. It is also in charge of collecting usage analytics from subscribers. It is not further described in the present document.

4. The **NIP Signalling Server** builds the multicast signalling channel specified in clause 8.2. The NIP Signalling Server gets the information from the NIP Service Aggregation platform and generates one or more multicast signalling channels. Each channel, on a fixed multicast IP address, is associated with a particular NIP Stream. The NIP Signalling Server may be a standalone unit or may be part of the modulator(s) generating the DVB-NIP-compliant broadcast stream(s). The NIP Signalling Server provides signalling information regarding the physical and logical parameters of NIP services as well as accurate system time information.

5. The **Multicast server** is specified in ETSI TS 103 769 [8] and is responsible for generating multicast transport sessions carrying one or more DVB-DASH Services. One Multicast server instance is associated with one logical NIP Stream. The Multicast server is responsible for managing, at any time, the bit rate allocation(s) across the generated multicast transport sessions.

6. The **Service Provisioning Platform** represents all operational support systems, handling the platform headend operation and service reporting from Multicast Gateway devices.

7. The **Encapsulation and Modulation** function handles the encapsulation of IP multicast datagrams into NIP Streams according to clause 7.3.4 and RF signal modulation according to the Physical Layer Specifications described in clause 7.2. If available, robust header compression as defined in clause 7.4 may be applied to incoming multicast signals.
5.5 NIP Reference Points

The following is a listing of logical reference points specific to the DVB-NIP Broadcast System as specified in the present document (see figure 5.3-1):

**NH1**: The interface between the Native IP Service Aggregation platform and the Native IP Signalling Server.

**NH2**: The interface between the Broadcast DVB-I Content Guide Asset File and the Multicast Server.

**NM1**: The interface between the NIP Signalling Server and the GSE/MPE Encapsulator/Modulator. This interface carries the IP multicast Announcement Channel.

**NM2**: The interface between the Multicast Server and the GSE/MPE Encapsulator/Modulator. This interface shall be compliant with reference point M interface as defined by DVB-MABR in ETSI TS 103 769 [8].

**NB**: Over-the-air interface carrying Native IP Broadcast physical and data link layer signals as specified in clause 7 of the present document. This interface carries the following network layer signals:

- The IP multicast transport sessions originating from the Multicast Server as defined in ETSI TS 103 769 [8] and according to clause 8.5 of the present document.

- The IP multicast Announcement Channel according to clause 8.2 of the present document.

**NGC**: The NIP Gateway to Client Interface specifies the interactions between the NIP Client functions and the NIP Gateway functions. This interface is specified in clauses 8.3, 8.5 and 11.1.

6 Receiver Deployment Models (informative)

6.1 Introduction

The present specification targets three receiver Deployment Models (DMs) in particular. This listing is not exhaustive, and industry can come up with other Deployments Models, but this particular logical grouping should help implementations of Native IP receivers. Other deployment models not described here may be added in subsequent releases of the present specification.

The intention is that the same DVB Native IP media distribution system can feed all three of the Deployment Models presented here with the same identical broadcast streams.

The first Deployment Model (DM1) represents a professional business-to-business (B2B) scenario with professional edge cache receivers installed at the edge of provider or telecom networks. These edge cache receivers are fed via the DVB broadcast network. Such edges may be telecom nodes for fixed and mobile networks, local CDN caches, broadcast transmitter nodes, caches on board of cruise ships and planes, hotspots in underserved areas etc. These nodes will feed DVB-I clients indirectly via respective intermediary public or private IP networks. Professional edge caches may rely only on a subset of the functions specified in the present document but shall leverage the same transport and stream formats specified herein.

The second (DM2) and third (DM3) deployment models are business-to-consumer (B2C) oriented models.

The second deployment model DM2 is directly addressing next generation TV sets implementing Native IP broadcast reception capabilities as a part of their built-in broadcast stack. Such television sets provide access to Native IP delivered services as they do with DVB Transport Stream based systems, but leverage DVB-I functionality together with latest generation DASH delivery and contemporary video and audio coding technologies. These Native IP television sets enable a full hybridisation of television services with some service components being delivered via broadcast and some via broadband connectivity. Wherever the service components are sourced, this happens entirely invisibly to the end-user who only sees a consistent service presentation.

The third deployment scenario DM3 is for services provided directly to all-IP end-consumer devices at home. Such services will rely on a Native IP Gateway function being available at home. Such Native IP Gateway function may reside in an existing device (e.g. a television set according to DM2 feeding also other mobile devices at home) or may
be a separate device such as a STB, antenna adapter, signal distribution component, ISP router, or a dedicated low-cost server device with broadcast reception functionality.

6.2 Generic Receiver Design

6.2.1 Introduction

This clause describes the generic virtual functions that are part of NIP Receivers. Not all receivers need to implement all functions. Receiver functions are there to describe and structure the receiver design. Some functions may be combined, or some functions may not exist at all in some receiver implementations. Clause 6.6 describes which receiver functions are mandatory, optional or not applicable in each of the deployment models (DMs) described in this document.

Figure 6.2.1-1: DVB-NIP Generic Receiver Architecture (informative)

Functionally NIP Receivers can be split into two parts: A high level NIP Gateway function and a high-level NIP Client function. The gateway function typically contains one or more DVB tuners that physically receive the NIP broadcast transmissions and forwards them onto a logical or physical IP network connection. The NIP Client function is typically an off-the-shelves DVB-I Client and provides access to the actual content transmitted. All interactions between NIP Client and NIP Gateway functions shall be according to ETSI EN 103 770 [9].

6.2.2 NIP Gateway Functions

All NIP Gateways shall include the following sub-functions:

- Single or multiple DVB-S2/S2X/T2 tuner(s)/demodulator(s).
- The capability to receive at least one of the two: MPE via TS or GSE-Lite via GSE-HIEM.
- The capability to receive IP multicast streams (with and without IP Robust Header Compression applied).
- The capability to receive and parse the NIP announcement channel.
- The capability to temporarily store assets received from the broadcast network.
- The capability to serve assets to clients using HTTP.
• The capability to connect to a broadband network to retrieve content assets or metadata.

Some NIP Gateways may additionally include the following sub-functions:
• The capability to announce themselves on the local network to which they may be connected.
• The capability to answer DVB-I Service List Entry Points Queries.
• The capability to be remotely configured.

6.2.3 NIP Client Functions

The NIP Client includes the following sub-functions:
• The capability to interact with a DVB-I Service List Entry Points Registry Server.
• The capability to interact with a DVB-I Service List Server.
• The capability to display a DVB-I Service List to the End User.
• The capability to select the most appropriate instance from a DVB-I List.
• The capability to discover a NIP Gateway.
• The capability to request and display NIP services.
Professional Edge Cache Receivers according to the present document are deployed at the edge of telecom, CDN or broadcast networks or act as local wireless hotspots. They receive DVB-NIP formatted content from a broadcast network via multicast and make that content available locally to other networks (e.g. CDN, Fixed, Mobile, Wi-Fi Hotspot or DVB networks), which in-turn indirectly feed IP clients wanting to access that content.

Professional Edge Cache Broadcast Receivers are installed when a massive distribution of identical content is required and where the large multiplication effect of broadcast technologies can bring considerable distribution gains.

![Figure 6.3-1: Example of a Professional Edge Cache receiver at the edge of a CDN network](image)

Professional Edge Cache receivers generally feature multi-tuner front-ends for the parallel reception of multiple DVB-NIP Streams and extensive storage space to act as large local data caches. Professional Edge Caches generally act as local http/https web servers with reverse proxy functionality. The exact interaction between such proxies and clients, and the way that clients get re-directed to these caches is outside the scope of the present document. Clause 6.6 lists the functions that are mandatory, optional or not applicable for professional receiver implementations.

![Figure 6.3-2: DVB-NIP DM1 Receiver Architecture (informative)](image)
6.4 Integrated Native IP TV (DM2)

The same DVB-NIP broadcast streams that are built for feeding professional DM1 receivers can also be used for direct reception at home. The simplest reception solution for consumer applications under the present document is DM2. It refers to a fully integrated smart television set. Television sets according to DM2 might be capable of receiving, in addition to legacy Transport Stream (TS) based television services also, television transmissions that are carried natively in IP over the broadcast network. DM2 receivers may or may not be connected to a broadband network.

![Figure 6.4-1: Simplified view of Deployment Model 2](image)

DM2 television sets are capable of receiving via broadcast the same streams that are potentially made available also via OTT platforms and CDN distribution networks. They implement DVB-I and DVB-DASH defined mechanisms. These television sets are also able to seamlessly blend, in a fully hybrid manner, streams that are received via broadcast with streams that are delivered via OTT. As an example, a given DVB-I service may have some DVB-DASH representations and/or components that are available via broadcast and others that are only available terrestrially. Native IP television sets can indistinguishably present such services to end users as one and the same service.

![Figure 6.4-2: DVB-NIP DM2 Integrated Native IP TV Simplified Architecture (informative)](image)
6.5 Home Gateway + IP Client (DM3)

Deployment Model 3 (DM3) is a split model in which the NIP Gateway and the NIP Client functions are implemented in separate devices.

The NIP Gateway may be an additional feature of an existing hardware device such as a TV set, a STB, an antenna multiswitch, etc. or may be a dedicated standalone Gateway device located on the local network. NIP Gateways may or may not be connected to a broadband network.

The NIP Client (typically a client implementing DVB-I according to ETSI TS 103 770 [9]) is generally a software application or component running on a tunerless smart IP device such as a tablet, smartphone, laptop, PC, IP media player, smart television set etc.

In order for a NIP Client and a NIP Gateway to discover themselves on the local network, DM3 implementations according to the present document shall make use of the Network Device Discovery Protocol mechanisms specified in cause 11.1.

![Figure 6.5-1: Simplified view of Deployment Model 3](image)

In DM3 all interactions between the DVB-I client and the NIP provided DVB-I server functions shall be according to ETSI TS 103 770 [9]. The NIP specification has been designed so as to allow the use of standard unmodified DVB-I Clients also in a DVB-NIP Broadcast System.

A simplified view of the split NIP Client Gateway architecture is shown below:

![Figure 6.5-2: DVB-NIP DM3 Split Gateway Client simplified architecture (informative)](image)
6.6  Receiver Configurations and Deployment Models

Depending on the specific deployment model, receiver configurations may require different functions and features to be implemented. The table below associates the receiver functions and the deployment models. At least "Mandatory" subsystems and functionalities shall be implemented in reception equipment to comply with the present document for a specific deployment model.

Table 6.6-1: Receiver Configurations and Deployment Models

<table>
<thead>
<tr>
<th>Receiver configurations</th>
<th>DM1 NIP Edge Cache Receiver</th>
<th>DM2 Integrated NIP TV</th>
<th>DM3 NIP Gateway</th>
<th>DM3 NIP Client</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DVB-NIP Functions or Features</strong></td>
<td>M(1)</td>
<td>M(1)</td>
<td>M(1)</td>
<td>NA</td>
</tr>
<tr>
<td>GSE-Lite for S2X and T2 receivers</td>
<td>M(1)</td>
<td>M(1)</td>
<td>M(1)</td>
<td>NA</td>
</tr>
<tr>
<td>GSE-HEM mode for S2X and T2 reception</td>
<td>M(1)</td>
<td>M(1)</td>
<td>M(1)</td>
<td>NA</td>
</tr>
<tr>
<td>MPE for S2</td>
<td>M(2)</td>
<td>M(2)</td>
<td>M(2)</td>
<td>NA</td>
</tr>
<tr>
<td>LL signalling</td>
<td>M(3)</td>
<td>M(3)</td>
<td>M(3)</td>
<td>NA</td>
</tr>
<tr>
<td>IP RoHC</td>
<td>M(3)</td>
<td>M(3)</td>
<td>M(3)</td>
<td>NA</td>
</tr>
<tr>
<td>Multicast rendezvous service</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>Multicast gateway function</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>Multicast GW, bootstrap and config file</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>FLUTE and ROUTE reception</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>DVB-I Service List Entry Points Registry</td>
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<td>M</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>DVB-I Service List Discovery</td>
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<td>M</td>
<td>NA</td>
<td>M</td>
</tr>
<tr>
<td>DVB-I Service Lists</td>
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<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>DVB-I Content Guide (connected)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Announcement Channel reception</td>
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<td>NIF Table</td>
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<td>NA</td>
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<tr>
<td>Device Discovery: UPnP</td>
<td>NA</td>
<td>NA</td>
<td>M</td>
<td>M(4)</td>
</tr>
<tr>
<td>Device Discovery: mDNS</td>
<td>NA</td>
<td>NA</td>
<td>M</td>
<td>M(4)</td>
</tr>
<tr>
<td>Content Decoding</td>
<td>NA</td>
<td>M</td>
<td>NA</td>
<td>M</td>
</tr>
<tr>
<td>Content Decryption (connected)</td>
<td>NA</td>
<td>M</td>
<td>NA</td>
<td>M</td>
</tr>
</tbody>
</table>

M = Mandatory, O = Optional, NA = Not Applicable, ND = Not yet defined

NOTE 1: Not mandatory for DVB-S2 Receivers implementing only Annex A.
NOTE 2: Mandatory only for deployments supporting Annex A.
NOTE 3: Not mandatory for receivers only supporting Annex A.
NOTE 4: DM3 clients shall implement at least one of the Device Discovery Protocol clauses 11.1.2 and/or 11.1.3.

Within the present document, a number of configurations and mechanisms are defined as "Optional". Configurations and mechanisms explicitly indicated as "optional", for a given deployment model, need not be implemented in the equipment to comply with the present document. Nevertheless, when an "Optional" mode or mechanism is implemented, it shall comply with the specification as given in the present document.

7  Native IP Carriage

7.1  Introduction

DVB Native IP is designed for deployment on top of the following physical layer systems:
• DVB-S2X (ETSI EN 302 307-2 [2], ETSI EN 302 307-1 [1]),
• DVB-S2 (ETSI EN 302 307-1 [1]) and
• DVB-T2 (ETSI TS 102 755 [3]).

The data link layer in DVB Native IP uses either:
• Generic Stream Encapsulation (GSE), ETSI TS 102 606-1 [4], ETSI TS 102 606-2 [5], ETSI TS 102 606-3 [6]
• Multi-Protocol Encapsulation ETSI EN 301 192 [7], clause 7.

In the case of GSE, the GSE-Lite profile of the GSE specification (ETSI TS 102 606-1 [4], annex D) has been chosen for Native IP purposes. The particular modes and settings of the aforementioned layer 1 and layer 2 specifications to be used for DVB-NIP are described in detail in this clause.

7.2 Physical Layer: DVB-S2X, DVB-S2, DVB-T2

7.2.1 Overview

There is a high degree of commonality between DVB-S2X (ETSI EN 302 307-2 [2]), DVB-S2 (ETSI EN 302 307-1 [1]) and DVB-T2 (ETSI TS 102 755 [3]) with regards to the mode adaptation, but some settings for NIP purposes are specific to each physical layer system and hence related definitions are described separately in the following clauses 7.2.2 to 7.2.4.

The following mapping of data link layer protocols to physical layer systems applies:
• DVB-S2X: GSE (GSE-Lite profile)
• DVB-S2: MPE
• DVB-T2: GSE (GSE-Lite profile)

7.2.2 DVB-S2X

The entirety of DVB-S2X is defined by the two specifications ETSI EN 302 307-1 (DVB-S2, [1]) making up the core part and (ETSI EN 302 307-2 [2]) (DVB-S2X) making up the extension of and the difference to the core part. The whole physical layer system DVB-S2X can be deployed as defined by the two aforementioned specifications – with the attributes and restrictions described below:

System configurations (table 1, clause 4.3 of ETSI EN 302 307-2 [2]):

• The system configuration for Broadcast Services according to clause 4.3, table 1 of ETSI EN 302 307-2 [2] shall be used for consumer applications or applications targeting simultaneously both consumer and professional use cases. Alternatively, the system configuration for Professional Services according to clause 4.3, table 1 of ETSI EN 302 307-2 [2] shall be used for applications purely targeting professional use cases.

Mode adaptation (clauses 5.1 of ETSI EN 302 307-1 [1] and ETSI EN 302 307-2 [2], respectively)

• Physical layer slicing – see ETSI EN 302 307-1 [1], clause 5.1.5 – is applicable.
• Baseband Frame mode shall be set to High Efficiency Mode (HEM) for NIP, see ETSI EN 302 307-2 [2], clause 5.1.7. The following settings (binary indication for all) of the MATYPE-1 field of the BBHEADER have to be selected:
  TS/GS: 10 (GSE-HEM)
  NPD/GSE-Lite: 1 (GSE-Lite)
• Baseband frame mode shall be set to High Efficiency Mode (HEM) for NIP, see ETSI EN 302 307-2 [2], clause 5.1.7:
  MODE (EXORed with CRC-8): 0000 0001 (High Efficiency Mode, HEM)
• A single Input Stream of the format GSE-HEM is transmitted.
• Since NIP makes use of GSE and HEM, ETSI EN 302 307-2 [2], clause 5.1.7 including figure 1 is applicable.
• All other BBHEADER settings are set according to the definitions in ETSI EN 302 307-1 [1] and ETSI EN 302 307-2 [2].

![Figure 7.2.2-1: DVB-S2X High Efficiency Mode for GSE (based on Figure 1 in ETSI EN 302 307-2 [2])](image)

Due to the deployment of HEM and GSE-Lite for NIP, PDU fragmentation can’t be used, i.e. the only packet segmentation approach applicable is physical layer slicing.

7.2.3 DVB-S2

DVB-S2 is defined by the specification ETSI EN 302 307-1 [1]. The whole physical layer system DVB-S2 can be deployed as defined by the aforementioned specification – with the following attributes and restrictions:

System configurations (table 1, clause 4.3 of ETSI EN 302 307-1 [1]):
• “Broadcast Services” is used for consumer applications or applications targeting simultaneously both, consumer and professional use cases. Alternatively, the system configuration “Professional Services” shall be used for applications purely targeting professional use cases.

Mode adaptation (clause 5.1 of ETSI EN 302 307-1 [1]):
• Physical layer slicing – see ETSI EN 302 307-1 [1], clause 5.1.5 – is applicable.
• The following setting (binary indication) of the MATYPE-1 field of the BBHEADER – see ETSI EN 302 307-1 [1], clause 5.1.6, table 3, has to be selected:
  
<table>
<thead>
<tr>
<th>TS/GS:</th>
<th>11 (Transport Stream)</th>
</tr>
</thead>
</table>

• A single Input Stream of the format MPEG-2 Transport Stream with Constant Coding and Modulation (CCM) is transmitted. Accordingly, table 4 in ETSI EN 302 307-1 [1], clause 5.1.6, applies.
• All other BBHEADER settings are chosen according to the definitions in ETSI EN 302 307 [1].

7.2.4 DVB-T2

DVB-T2 is defined by the specification ETSI TS 102 755 [3]. The whole physical layer system DVB-T2 can be deployed as defined by the aforementioned specifications – with the following attributes and restrictions:

System overview (clause 4.1 of ETSI TS 102 755 [3]):
• It is assumed that the receiver will always be able to decode one data PLP and its associated common PLP – if any – in parallel. See ETSI TS 102 755 [3], clause 4.1.
Mode adaptation (clause 5.1 of ETSI TS 102 755 [3]):

- Physical layer slicing is applicable, see ETSI TS 102 755 [3], clause 5.1.0 and clause 5.1.8, figure 8.
- The following settings (binary indication for all) of the MATYPE-1 field of the BBHEADER have to be selected (see ETSI TS 102 755 [3], clause 5.1.7):
  
  TS/GS:     10 (GSE)  
  NPD/GSE-Lite:  1 (GSE-Lite profile)  

- Baseband frame mode shall be set to High Efficiency Mode (HEM) for NIP, see ETSI TS 102 755 [3], clauses 5.1.7 and 5.1.8:
  
  MODE (EXORed with CRC-8): 0000 0001 (High Efficiency Mode, HEM)

- Since NIP makes use of GSE and HEM, figure 8 as part of clause 5.1.8 in ETSI TS 102 755 [3] and related text is applicable.

- All other BBHEADER settings are chosen according to the definitions in ETSI TS 102 755 [3].

Due to the deployment of HEM and GSE-Lite for NIP, PDU fragmentation can’t be used, i.e. the only packet segmentation approach applicable is physical layer slicing.

7.3 Data link layer: GSE-Lite, MPE

7.3.1 Overview

Depending on the physical layer system deployed, either GSE (ETSI EN 102 606-1 [4], ETSI EN 102 606-2 [5], ETSI EN 102 606-3 [6]) with its GSE-Lite profile or MPE (ETSI EN 301 192 [7], clause 7) is used on the data link layer. Further details are outlined in clauses 7.3.2 and 7.3.3 below.

7.3.2 Generic Stream Encapsulation (GSE), GSE-Lite profile

On the data link layer, Generic Stream Encapsulation (GSE, EN 102 606-1 [4], EN 102 606-2 [5], EN 102 606-3 [6]) is used for NIP purposes in conjunction with the physical layer systems DVB-S2X (EN 302 307-1 [1] and EN 302 307-2) and DVB-T2 (EN 302 755 [3]). Of the two available GSE profiles, only the GSE-Lite profile (see EN 102 606-1 [4], annex D) is used for DVB-NIP as defined by the present document.

Due to the deployment of HEM and GSE-Lite for NIP, PDU fragmentation can’t be used, i.e. the only packet segmentation approach applicable is physical layer slicing.

7.3.3 Multi-Protocol Encapsulation (MPE)

On the data link layer, Multi-Protocol Encapsulation (MPE, EN 301 192 [7], clause 7) shall be used for NIP purposes in conjunction with the physical layer system DVB-S2 (EN 302 307-1 [1]).

The presence of a Multiprotocol data stream in a DVB Service shall be indicated in the program map section, according to ISO/IEC 13818-1 [15] of that service by setting the stream type to the value “0x0D”. A given service shall not include more than one MPE section stream. However more than one service carrying an MPE section stream may be present in a given Transport Stream according to ISO/IEC 13818-1 [15]. The table_id in the header of MPE sections shall be set to “0x3E”

LLC/SNAP is not used. Accordingly, the LLC_SNAP_flag field of the datagram section has the value “0” and the datagram section carries an IP datagram.

7.3.4 NIP Stream Definition

A DVB-NIP broadcast platform carries IP multicast data within NIP Streams. A NIP Stream is a succession of network layer IP packets that are carried via data link layer frames with no specific timing constraints. The data link layer for NIP shall be a GSE-Lite stream according to clause 7.3.2 or an MPE stream according to clause 7.3.3.

A NIP Stream is therefore identical to a GSE-Lite stream or an MPE stream.

In a single input stream DVB-S2X implementation a single GSE-Lite stream shall be carried in a single physical transponder/channel. In a multi-stream implementation, more than one GSE-Lite stream may be carried over a single physical transponder/channel. The same logic applies to single or multiple PLP DVB-T2 implementations.

In the context of DVB-S2 the NIP Stream is carried using an MPE stream declared as the sole component of a DVB Service. A Transport stream may carry more than one DVB Service carrying each a single MPE stream.

The multicast data transmitted over the broadcast channel is generated primarily by the Multicast Server, but also the NIP Signalling Server associated to each NIP Stream. Every NIP Stream shall have only a single Multicast Server associated to it. The Multicast Server generates multicast transport sessions consisting each out of one or more multicast streams.

If on a given physical channel more than one logical Multicast Server function will have to be supported, then use shall be made of the multiple input stream / PLP mechanisms as defined in the corresponding physical layer standards.

A NIP Stream is uniquely identified by the following four parameters: NIPNetworkID, NIPCarrierID, NIPLinkID, NIPServiceID.

**Figure 7.3.4-1: Example Illustration showing NIP Streams on GSE-Lite and MPE Transponders**

7.4 Network Layer: IP Robust Header Compression (ROHC)

7.4.1 Introduction and Principles

DVB-NIP provides support for both uncompressed and compressed IP header transport. When IP header compression is used, the IP header compression scheme shall be ROHC-U as described in GSE-ROHC, ETSI EN 102 606-3 [6].

In the GSE-ROHC framework, multiple header compression profiles are defined. Each profile indicates a specific protocol combination, and the profile identifiers are allocated by the Internet Assigned Numbers Authority (IANA). For DVB-NIP, the profile ‘0x0002’ is used for multicast streams.

In DVB-NIP, signalling information is carried through an announcement channel on a fixed IP multicast address and UDP port number. For the stable reception and fast acquisition of the announcement channel without additional processing, the announcement channel IP headers shall not be compressed.

When DVB-NIP is used in a backwards compatibility mode as described in Annex A using the MPE protocol as defined in ETSI EN 301 192 [7], IP ROHC shall not be applied.
7.4.2 ROHC channel mapping

The ROHC framework defines channels to identify the compressed packet flows. In a DVB-NIP system, a single ROHC channel shall be configured per GSE stream. Therefore, the Link ID can be mapped to a ROHC channel ID and the CID is managed separately for each GSE stream.

7.4.3 Context ID (CID) assignment

The CID can be assigned for each IP stream based on the combinations of upper layer protocols. An IP stream can be classified based on the IP address and port number. It can be considered as the same IP stream when the IP packet has the same combination of source IP address, destination IP address, source UDP port, and destination UDP port. For the same IP/UDP stream, the same CID can be assigned.

In ROHC, each ROHC channel can define three types of CID configuration: small CID, 1-byte large CID, and 2-byte large CID. Among these configurations, small CID and 1-byte large CID should be configured for DVB-NIP Systems as described in GSE-ROHC, ETSI EN 102 606-3 [6].

7.4.4 Transmission of Context Information

In the case of unidirectional links, if a receiver has no context information, the ROHC decompressor cannot recover the received packet header until it receives full context data. The context information and configuration parameters are sent in the ROHC-U descriptor or ROHC-U multicast descriptor.

Based on the GSE-ROHC specification ETSI EN 102 606-3 [6], the adaptation module at the transmitter constructs the ROHC-U descriptor or the ROHC-U multicast descriptor using configuration parameters and context information from the ROHC process. The adaptation module at the transmitter can use the previous configuration parameters and context information to transmit the ROHC-U descriptor or ROHC-U multicast descriptor periodically.

DVB-NIP supports the transmission method which sends context information separately from a compressed packet stream. The ROHC-U descriptor or ROHC-U multicast descriptor, including extracted context information, may be transmitted separately from the related ROHC packet flow, along with other signalling data. An updated ROHC-U descriptor or ROHC-U multicast descriptor shall be transmitted when the contained context information changes. The updated ROHC-U descriptor or ROHC-U multicast descriptor shall be sent prior to any GSE packets reflecting the change.
7.4.5 Link Layer Signalling

Generally, link layer signalling operates below the IP layer. In the receiver, link layer signalling can be obtained earlier than IP-level signalling such as announcement channel signalling.

Figure 7.4.5-1 shows the data link layer architecture and related identifiers on the transmission side of the DVB-NIP Broadcast System.

![Figure 7.4.5-1: GSE layer architecture for DVB-NIP](image)

NIP multicast IP streams are generated by both the Multicast Server and the NIP Signalling Server. These are shown as Data Sources in Figure 7.4.5-1 and identified each by a Multicast Stream ID. IP Multicast Streams may or may not be compressed. IP multicast streams which are compressed (header_compression_flag=1) pass through the IP ROHC compression module associated to that GSE Stream also referred to as GSE Stream Generator in figure 7.4.5-1. All IP multicast streams destined for a given ISI or PLP are then encapsulated in the corresponding GSE Stream. In DVB-NIP the NIPLinkID and NIPCarrierID are related as described in clause 7.3.4. The NIPLinkIDs are mapped to PHY Stream IDs (as defined in 8.4.5.15 of ETSI EN 301 192 [7]) in the Link Layer. Both these values equate to the PLP ID in the case of DVB-T2 (ETSI TS 102 755 [3]) or ISI in the case of DVB-S2 (ETSI EN 302 307-1 [1]) or DVB-S2X (ETSI EN 302 307-1 [1], ETSI EN 302 307-2 [2]) of the corresponding NIP Stream.

Link layer signalling shall be encapsulated into GSE-LLC packets as described in GSE-LLC, EN 102 606-2 [5]. The GSE-LLC packet can contain multiple descriptors.

7.4.6 Descriptors for the NIP system

To support the GSE layer structure above and multicast delivery, the following descriptors can be used for link layer signalling in an NIP system.

- IP Multicast List descriptor: This descriptor conveys a list of IPv4 multicasts carried in a physical link. This descriptor also provides additional information for processing the UDP/IPv4 packets carrying the multicasts in the DVB-GSE layer. This descriptor only provides information on UDP/IPv4 multicasts.
- IPv6 Multicast List descriptor: This descriptor conveys a list of IPv6 multicasts carried in a physical link. This descriptor also provides additional information for processing the UDP/IPv6 packets carrying the multicasts in the DVB-GSE layer. This descriptor only provides information on UDP/IPv6 multicasts.
- ROHC-U Multicast descriptor: This descriptor conveys configuration parameters for a ROHC channel which uses ROHC for IP as defined in ETSI TS 102 606-3 [6].
- ROHC-U descriptor: This descriptor conveys configuration parameters for the single CID of ROHC as defined in ETSI TS 102 606-3 [6].

7.4.7 Link Layer Signalling Example (informative)

Figure 7.4.7-1 shows the construction of link layer signalling using GSE-LLC.

Multiple logical IP multicast configuration loops can be considered in a NCD record table. Each IP multicast configuration loop contains a target loop and an operational loop. Multiple descriptors can be configured in a target loop or operational loop. The IP multicast configuration loop can be constructed for each GSE stream. Each GSE stream can be identified by the link_id in the IP/MAC_link_location_descriptor.

In the target descriptor loop of NCD tables, the IP_multicast_list_descriptor can be configured. If IPv4 multicast and IPv6 multicast streams are conveyed together in the same GSE stream, both the IP_multicast_list_descriptor and the IPv6_multicast_list_descriptor can be contained in a target descriptor loop of NCD.

In an operational descriptor loop of NCD tables, ROHC-U_multicast_descriptor and IP/MAC_link_location_descriptor can be configured. In this case, because a single ROHC channel can be configured in a GSE stream, one Multicast_ROHC-U_descriptor is configured for a link_id. If no header compression is used in a GSE stream, Multicast_ROHC-U_descriptor is not contained in a descriptor loop.

Each link_id is mapped to the PLP or ISI of each physical layer as configured in the LCD tables.

---

**Figure 7.4.7-1: Mapping to LLC tables and lookup path for DVB-NIP**
Figure 7.4.7-2 shows the relation between multicast_stream_id and rohc_flag in the NIP Gateway.

Figure 7.4.7-2: Multicast stream ID and ROHC flag mapping

The multicast stream ID is assigned to each IP/UDP stream based on IP addresses and UDP port numbers. If ROHC is applied to an IP stream, the header compression flag is set for that particular IP stream. Therefore, if the header compression flag is set in the IP Multicast list descriptor, the NIP Gateway needs to check the Multicast ROHC-U descriptor for the IP stream.

When ROHC is applied to an IP stream, the multicast stream ID is mapped to a context ID for each compressed stream. Therefore, the NIP Gateway can find the context information based on the combination of multicast stream ID and context ID.

7.5 Transport Layer: DVB-MABR

7.5.1 DVB-MABR Scope

NIP according to the present document relies on DVB-MABR for the transport of Media Objects. Every NIP Stream shall have a single Multicast Server function according to ETSI TS 103 769 [8] associated with it, generating all the multicast transport objects for that NIP stream. A single logical Multicast Server function shall not span more than one NIP Stream. A physical server instantiating multiple logical Multicast Server functions may however produce multicast sessions for more than one NIP Stream.

As a consequence of this, every NIP Stream – GSE-Lite or MPE - shall carry only a single multicast gateway configuration instance document as defined in clause 8.5.2.

All protocols defined in DVB-MABR for the transport of Media Objects via multicast are applicable to DVB-NIP under the restrictions depicted in clause 8.5.
7.5.2 Data Plane: DVB-MABR

DVB-MABR has been specified to be independent from the underlying transport protocol. ETSI TS 103 769 [8] specifies two multicast media transport protocols in its annexes.

- The FLUTE protocol specified in annexes F and G of [8] is based on 3GPP MBMS FLUTE and may be used for the carriage of NIP Streams.
- The ROUTE-based multicast media transport protocol specified in annexes H and I of [8] is based on ATSC 3.0 ROUTE and may be used for the carriage of NIP Streams.

8 Service Signalling Protocols

8.1 Signalling Overview

8.1.1 Introduction

DVB-NIP Signalling, as defined in the present document, relies on the concept of a broadcast Announcement Channel carrying signalling information under the form of XML Tables to NIP receivers. The Announcement Channel mechanism is defined under clause 8.2.

8.1.2 Signalling Data Structures

DVB-NIP signalling information is split across 6 tables. The purpose of these tables is to inform NIP receivers about

1) The technical parameters required to access DVB-NIP services.

2) The availability of Service Lists, Services and content on the broadcast network and potentially via broadband.

The first table is called NIF: Network Information File. This table informs receivers about the logical identification of Streams and their physical parameters. It can be edited by the Technical Operator of the broadcast network providing an overall view of the entirety of a broadcast network or it can be edited by Commercial Operators present on that broadcast network and informing only about the Streams part of their own operations. The NIF table is carried on one or more so-called network Bootstrap Streams and is formatted as an XML file.

The second table is called SIF: Service Information File. This table informs receivers about the location of Services across the different NIP Streams and physical Transponders/Channels. It can be edited by the Technical Operator of the broadcast network providing an overall view of the entirety of a broadcast network or it can be edited by Commercial Operators present on that broadcast network and informing only about the location of services part of their own operations. The SIF table is carried on one or more so-called network Bootstrap Streams and is formatted as an XML file.

The third and fourth tables are related to the detailed technical operation of DVB-MABR in the context of NIP. The Bootstrap Multicast Gateway Configuration Instance Document is present in the announcement channel on each NIP Stream. It points to the DVB-MABR multicast session carrying the Multicast Gateway Configuration Instance Document as specified in DVB-MABR (ETSI TS 103 769 [8]). This latter table shall be present once on each NIP Stream and provides the link between service URLs and the IP multicast addresses in use on the broadcast Stream to convey the Services. It also provides information on other technical mechanisms available in DVB-MABR (ETSI TS 103 769 [8]) such as e.g. unicast repair mechanisms. Both tables are formatted as XML.

The fifth table is called the DVB-I Service List Entry Points table and provides information on the presence of DVB-I Service Lists across the broadcast network. This table is fully compliant with the DVB-I Service List Entry Points specification in ETSI TS 103 770 [9] and further described under clause 8.3.2. It is formatted as a dedicated broadcast XML file and lists the DVB-I Service Lists available.

Finally different DVB-I Service Lists may be provided by the Technical Operator of the network or Commercial Operators present on the network. These list the Services present on the broadcast network and provide the URLs required to access the services. DVB-I Service Lists are specified in ETSI TS 103 770 [9] and formatted as XML.

The definition and use of all these tables as defined in NIP is described in the corresponding sections below.
8.1.3 Service Delivery Model

A DVB-NIP broadcast network is made up of one or more RF Channels (called transponders in a satellite context). Each RF Channel can carry one or multiple input streams (ISIs) as defined in DVB-S2X (ETSI EN 302 307-1 [1], ETSI EN 302 307-2 [2]) or one or more physical layer pipes (PLPs) as defined in DVB-T2 (ETSI TS 102 755 [3]). Each input stream or physical layer pipe shall carry only a single NIP Stream encapsulated in GSE-Lite as defined under clause 7.3.2 or a single Transport Stream carrying one or more MPE streams as defined in clause 7.3.3 of the present document.

![Figure 8.1.3-1: NIP Service Delivery Model](image)

8.1.4 Bootstrap and Regular NIP Streams

8.1.4.1 Definition

DVB-NIP distinguishes two types of streams: so-called Bootstrap NIP Streams and Regular NIP Streams.

Bootstrap Streams participate in the bootstrap setup phase of receivers and shall carry NIF, SIF and DVB-I Service List Entry Points. If one or more of these documents are missing, the Stream cannot be considered as Bootstrap Stream, as the receiver will not be able to discover the entirety of services.

Regular Streams do not participate in the Bootstrap Process. The Bootstrap Process helps receivers joining a network to learn about the extent of the network and the physical location of all services on that network.

8.1.4.2 NIP Stream Identifiers

NIP Streams are identified by the following 4 parameters:

- NIPNetworkID identifying the network
- NIPCarrierID identifying uniquely the RF Carrier within the network identified with NIPNetworkID
- NIPLinkID identifying the NIP Stream in the context of DVB-GSE (ETSI TS 102 606-2 [5]) or in the context of DVB-S2 Professional services (ETSI EN 302 307-1 [1])
- NIPServiceID identifying the NIP Stream in the context of DVB-MPE (ETSI EN 301 192 [7])

![Diagram of NIP Service Delivery Model](image)
Depending on the Data Link Layer, these respectively correspond to:

- For GSE-Lite encapsulated Streams:
  - NIPNetworkID = interactive_network_id as defined in ETSI TS 102 606-2 [5].
  - NIPCarrierID = T2_system_id or S2_system_id as defined in ETSI TS 102 606-2 [5].
  - NIPLinkID = Input Stream Identifier \(^{(1)}\) (ISI) as defined in DVB-S2X (ETSI EN 302 307-1 [1], ETSI EN 302 307-2 [2]) or plp_id \(^{(1)}\) as defined in DVB-T2 (ETSI TS 102 755 [3])
  - NIPServiceID = 0 as not relevant in a GSE-Lite context.

Note \(^{(1)}\): In the case of Single Input Stream or unique PLP, NIPLinkID = 0.

- For MPE over TS:
  - NIPNetworkID = original_network_id as defined in ETSI EN 300 468 [14]
  - NIPCarrierID = transport_stream_id as defined in ETSI EN 300 468 [14]
  - NIPLinkID = Input Stream Identifier \(^{(2)}\) (ISI) as defined in DVB-S2 Professional services (ETSI EN 302 307-1 [1])
  - NIPServiceID = service_id as defined in ETSI EN 300 468 [14]

Note \(^{(2)}\): In the case of Single Input Stream or in the context of DVB-S2 Broadcast services (ETSI EN 302 307-1 [1]), NIP Link Id = 0.

### 8.1.5 Table Generation and Broadcast

DVB-NIP tables are generated as files by the NIP Service Aggregation Platform and broadcast from the NIP Headend. The Signalling Server function of a NIP Headend collects or generates the signalling information and converts it for multicast transmission via the broadcast Announcement Channel. Every NIP Stream shall carry an Announcement Channel on a fixed IP multicast address and port, as specified in clause 8.2.1 of the present document.
8.1.6 Signalling Broadcast Location

DVB-NIP tables are carried via the Announcement Channel mechanism described under 8.2. The Announcement Channel shall be present in every NIP Stream.

The table below shows which DVB-NIP specified tables are mandatory on the Announcement Channel of the two different stream types as described in clause 8.1.4.

Table 8.1.6-1: Possible locations of DVB-NIP Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Bootstrap Stream</th>
<th>Regular Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap multicast gateway configuration instance doc.</td>
<td>M*1</td>
<td>M*1</td>
</tr>
<tr>
<td>Broadcast NIF</td>
<td>M</td>
<td>N.A.</td>
</tr>
<tr>
<td>Broadcast SIF</td>
<td>M</td>
<td>N.A.</td>
</tr>
<tr>
<td>DVB-I Broadcast Service List Entry Points</td>
<td>M</td>
<td>N.A.</td>
</tr>
<tr>
<td>DVB-I Broadcast Lists</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>NIP Timing Information</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>DVB-I Content Guide</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>DVB-I Playlists</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

M: Mandatory  O: Optional  N.A.: Not Available  A: Alternative but requires one

NOTE 1: The Bootstrap multicast gateway configuration instance document is only required for Streams carrying DVB-MABR content.

Bootstrap Streams shall carry at least the following information: NIF, SIF and the DVB-I Service List Entry Points table in addition to the “bootstrap” multicast gateway configuration instance document which is mandatory on each NIP Stream carrying DVB-MABR information, as specified in Annex C.2 of ETSI TS 103 769 [8].

8.1.7 Receiver Signalling Usage Sequence

8.1.7.1 Introduction

The clauses hereunder describe the different steps that a NIP receiver follows in order to gain access to NIP services.
8.1.7.2 Receiver Bootstrapping Mechanism

A NIP receiver, in idle mode, joining a NIP broadcast network initially tunes to the Bootstrap Stream and listens for the NIF, SIF tables and DVB-I Service List Service Entry Points document on the announcement channel of that stream.

A NIP Bootstrap Stream is identified thanks to:

- The NIP Stream identifiers as defined in 8.1.4.2.
- Satellite Orbital Position and West_East_flag (for satellite networks only).
- ProviderName.

The NIF/SIF tables inform the broadcast receiver about the location of NIP Services and other Assets available on the different physical channels of the broadcast network and how to access them through their technical parameters.

The NIP broadcast receiver then listens for the DVB-I Service List Entry Points Table. This table informs the receiver about all the DVB-I Service Lists broadcast as part of the current network.

The NIP receiver caches these 3 tables in its memory for later use.

8.1.7.3 Device Announcement and Discovery Mechanism

NIP receivers according to Deployment Model 3 (DM3) implement a functional split between the DVB-I Client rendering the services to end users and the NIP Gateway which receives the content from the broadcast network. NIP specifies two main mechanisms in clause 11.1 which allow both NIP Clients and NIP Gateways to announce and discover themselves while part of the same local network.

At the end of the discovery process, as specified in clause 11.1, the NIP Gateway provides the URL to the client through which the DVB-I Client can locally retrieve the DVB-I Service List Entry Points file from the Gateway.

8.1.7.4 DVB-I Service List Discovery Mechanism

DVB-I Clients contact the local DVB-I Service List Registry (SLR) function part of the NIP Gateway to get the DVB Service List Entry Points table. That table lists all the DVB-I Service Lists available on the broadcast network.

A DVB-I Client shall request from the NIP Gateway:

1.) the entire list that the Gateway received via broadcast and containing all the URLs of all the DVB-I Service Lists or

2.) the DVB-I Client may also include as part of its request the DVB-I defined query parameters such as “TargetCountry”, “regulatorListFlag”, “Language”, “Genre” and “ProviderName”. In such a case the NIP Gateway shall compute and return only those DVB-I Service List Entry Points corresponding to the query parameters. This functionality means that the NIP Gateway has to implement a minimum amount of DVB-I (ETSI TS 103 770 [9]) syntax to be able to filter the DVB-I Service List Entry Points table based on query parameters.

8.1.7.5 DVB-I Service Discovery Mechanism

Once the DVB-I Client has received the entire or down-filtered list of DVB-I Service Lists available on the broadcast network it can itself or through interaction with the end-user select the DVB-I Service List to use for the selection of DVB-I Services.

The DVB-I Client will request the selected DVB-I Service List from the NIP Gateway. If the NIP Gateway does not have the list in its cache, it will retrieve the DVB-I Service List from the broadcast stream. To locate the corresponding Service List on the broadcast network:

- the NIP Gateway shall match the URL of the DVB-I Service List (originally from the DVB-I Service List Entry Points table) with the DVB-I Service List URLs in the SIF table.
- It will then, using the NIF table, tune to the physical channel to receive the corresponding DVB-I Service List.

To improve the user experience, it is recommended for NIP Gateways to pre-cache as many of the DVB-I tables as possible.
8.1.7.6 Service Tuning and Service Access Mechanism

Each time the end-user selects a broadcast service instance from the DVB-I Service List, the DVB-I Client function sends a request for the MPEG-DASH manifest to the NIP Gateway function. These instance requests are automatically sent to the Gateway due to the format of the URLs for such instances.

8.2 Signalling Carriage Description

8.2.1 Principles

Every NIP GSE-Lite/MPE stream according to the present document shall carry an announcement channel on a fixed IP multicast address and UDP port number. The announcement channel carries all the signalling information required for a Native IP system to operate.

The fixed IP multicast address and UDP number of the announcement channel shall never be compressed with the RoHC-U algorithm described in clause 7.4.

8.2.2 IP Multicast Address and Port

Signalling information shall be carried in the payload of IP multicast packets with a well-known IP address and UDP port number dedicated to this function. This address has been registered by DVB (dvbservdsc) with IANA described in IETF RFC 5328 [19] and is 224.0.23.14 for IPv4 and FF0X:0:0:0:0:0:0:12D for IPv6. The port number is 3937/udp.

The same IP multicast address shall be used in each GSE/MPE stream and care has to be taken at the headend that each GSE/MPE stream only carries the information relative to the stream in which it resides. The multicast announcement channel signalling stream only exists between the headend signalling server and the NIP Gateway Receiver function.

8.2.3 IP Packet Format

The announcement channel stream consists of a succession of IP datagrams using the IP multicast address and UDP port specified in clause 8.2.2. The IP datagram packets consist of an Announcement Channel header and the Announcement Channel payload.

<table>
<thead>
<tr>
<th>Uncompressed Binary Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
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</tr>
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<td>2</td>
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<td></td>
</tr>
</tbody>
</table>

Fig 8.2.3-1 IP Announcement Channel Packet Format
8.2.4 Announcement Channel Header

This clause defines the announcement channel header format. The announcement channel header is a binary coded structure that allows rapid filtering on the incoming announcement channel IP packet stream. The announcement channel header shall not be compressed.

Table 8.2.4-1: Syntax of the Announcement Channel Header

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Number of bits</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement_channel_header(){}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>file_id</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>section_syntax_indicator</td>
<td>1</td>
<td>bsibf</td>
</tr>
<tr>
<td>reserved_future_use</td>
<td>1</td>
<td>bsibf</td>
</tr>
<tr>
<td>Reserved</td>
<td>2</td>
<td>bsibf</td>
</tr>
<tr>
<td>total_element_size</td>
<td>24</td>
<td>uimsbf</td>
</tr>
<tr>
<td>element_id</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>element_version</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>last_element_number</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>compression</td>
<td>3</td>
<td>uimsbf</td>
</tr>
<tr>
<td>current_next_indicator</td>
<td>1</td>
<td>bsibf</td>
</tr>
<tr>
<td>section_number</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>last_section_number</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>NIPNetworkID</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>NIPCarrierID</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>NIPLinkID</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>NIPServiceID</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>CRC_8</td>
<td>8</td>
<td>rpchof</td>
</tr>
</tbody>
</table>

Semantics for the Announcement Channel header:

**File id:** An 8-bit value used to identify the type of data being carried within the payload. The values this may take are set out in Table 8.2.4-2.

Table 8.2.4-2: Allocation of file_ID values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>Reserved</td>
</tr>
<tr>
<td>0x01</td>
<td>Bootstrap multicast gateway configuration instance document</td>
</tr>
<tr>
<td>0x02</td>
<td>Broadcast NIF</td>
</tr>
<tr>
<td>0x03</td>
<td>Broadcast SIF</td>
</tr>
<tr>
<td>0x04 - 0x3F</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0x40</td>
<td>Broadcast DVB-I Service List Entry Points</td>
</tr>
<tr>
<td>0x41 - 0x45</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0x46</td>
<td>DVB-I Broadcast Lists</td>
</tr>
<tr>
<td>0x47 - 0x4F</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0x50</td>
<td>NIP Timing Information</td>
</tr>
<tr>
<td>0x51 - 0x5F</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0x60</td>
<td>DVB-I Content Guide</td>
</tr>
<tr>
<td>0x61 - 0x6F</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0x70</td>
<td>DVB-I Playlists</td>
</tr>
<tr>
<td>0x71 - 0xFE</td>
<td>reserved_future_use</td>
</tr>
<tr>
<td>0xFF</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

reserved: These 2 bits are reserved and shall take the value "00".

reserved_future_use: in the coded bit stream, indicates that the value may be used in future for ETSI defined extensions. All "reserved_future_use" bits shall be set to "1".

Total element size: A 24 bit field that specifies a size in bytes. For uncompressed data (i.e. Compression is "000"), this is the cumulative size of all the payloads of all the sections comprising the element (i.e. ignoring headers and CRC).
For compressed data that is usable in the compressed form (e.g. GZIP), this is the cumulative size of all the payloads of all the sections comprising the element (i.e. ignoring headers and CRC) - this is referred to as the "transmitted size". For compressed data that shall be decompressed before use (e.g. zlib), this is the size of the element once decompressed by the specified algorithm (note that this may not be the same size as that of the original XML) - this is referred to as the "decompressed size". The definition of the compression field value shall also define which of these two interpretations of total element size shall apply.

**Element ID:** An 8-bit value used to identify an element of data for the declared file_id.

**Element version:** An 8-bit value used to define the current version of the element being carried, i.e. the element version is keyed on file_id together with Element ID. Thus when the data within an element changes, the element version fields of all packets that comprise that element ID and file_id change. No other payload version fields are necessarily changed. The element version is modulo 256, and wraps round.

The element version should only change at the start of an element. However, to handle packet loss, a receiver should cope with the element version changing at any point in the element.

**Last Element number:** An 8-bit field which specifies the last element number (the one with the highest element number) for a given file_id.

**Compression:** A 3-bit field used to indicate the compression scheme, if any, used on the payload. All elements of a given file_id shall share the same compression value. The meanings of these values are given in Table 8.2.4-3.

<table>
<thead>
<tr>
<th>Compression value</th>
<th>Meaning</th>
<th>Total Element Size Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>No Compression</td>
<td>Transmitted Size</td>
</tr>
<tr>
<td>001</td>
<td>GZIP</td>
<td>Transmitted Size</td>
</tr>
<tr>
<td>010</td>
<td>EXI (as defined in the present document)</td>
<td>Transmitted Size</td>
</tr>
<tr>
<td>011 to 110</td>
<td>Reserved</td>
<td>Transmitted Size</td>
</tr>
<tr>
<td>111</td>
<td>User Private</td>
<td>User Defined</td>
</tr>
</tbody>
</table>

**current_next_indicator:** This 1-bit indicator, when set to “1” indicates that the current table is the currently applicable table. When the bit is set to “0”, it indicates that the table sent is not yet applicable and shall be the next table to be valid.

**Section number:** A 16-bit field identifying the number of this section. The first section in an element shall be 0.

**Last Section number:** A 16-bit field which specifies the last section number (the one with the highest section number) in an element.

**NIPNetworkID:** This 16-bit field identifies the NIP Network as defined under clause 8.1.4.2.

**NIPCarrierID:** This 16-bit field identifies the RF Carrier as defined under clause 8.1.4.2.

**NIPLinkID:** This 16-bit field identifies the NIP Stream as defined under clause 8.1.4.2.

**NIPServiceID:** This 16-bit field identifies the NIP Stream in the context of MPE (ETSI EN 301 192 [7]) as defined under clause 8.1.4.2.

**CRC 32:** This is a 32-bit field that contains the CRC value that gives a zero output of the registers in the decoder defined in annex B of [14].
8.2.5 Announcement Channel Payload

8.2.5.1 Payload Data

The announcement channel payload carries the actual XML table(s) referred to by the file_id in the announcement channel header. Signalling information is carried as different XML formatted files among which the following:

- Bootstrap multicast gateway configuration instance document.
- Broadcast NIF.
- Broadcast SIF.
- DVB-I Broadcast Service List Entry Points.
- DVB-I Broadcast Lists.
- DVB-I Playlists.
- DVB-I Broadcast Content Guide.

The payload data starts with the first byte of a compressed XML file. Multiple files of the same type can be carried using the same file_id. When multiple files of the same file_id are carried the element_id for each file shall be different. A new file shall only start with the first byte of a new section. One section shall not carry more than one file. Only when all elements have been received, can the receiver be assured to have collected all the data.

8.2.5.2 Payload Data Compression

As the signalling payload information consists of XML files which are verbose, payload data compression shall always be applied. DVB-NIP mandates GZIP as specified in IETF RFC 1952 [22] compression for implementation in both headend and reception equipment. The DVB-NIP announcement channel format however allows for signalling other compression schemes to be used in particular implementations e.g. EXI (Efficient XML Interchange Format) (http://www.w3.org/TR/exi/).

8.2.5.3 Payload Data Segmentation: Use of Sections

8.2.5.3.1 General

The size of elements may be substantially larger than that supported by the underlying network. To allow efficient delivery of data, it is necessary to be able to divide the elements into smaller units for delivery. The section mechanism provides this functionality.

Each section shall be sent in exactly one UDP datagram, and each UDP datagram shall carry exactly one section.

To assemble the entire element, the NIP receiver collects the payload from all the sections and orders them based on their section numbers. Only after an entire element has been assembled can the CRC, if present, be checked.

Figure 8.2.5.3-1 illustrates the relationship between signalling files, elements and sections.

![Figure 8.2.5.3-1: Relationship between files, elements and sections](image-url)
8.2.5.3.2 Maximum section size

The amount of data that can be encapsulated in each UDP packet, and therefore the potential size of a section, is limited by the maximum size of the IP datagram (65,535 octets for both IPv4 and IPv6), minus the UDP and multicast protocol header sizes. To avoid network fragmentation, it is recommended to set the maximum size such that the underlying Maximum Transmission Unit (MTU) of the network is not exceeded.

8.2.6 Announcement Channel Repetition Rates

The table below lists the minimum repetition times for each table carried via the NIP announcement channel.

Table 8.2.6-1: Minimum table repetition rates

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
<th>Table Repetition Rate (at least once every x seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>0x01</td>
<td>Bootstrap multicast gateway configuration instance doc.</td>
<td>1</td>
</tr>
<tr>
<td>0x02</td>
<td>Broadcast NIF</td>
<td>5</td>
</tr>
<tr>
<td>0x03</td>
<td>Broadcast SIF</td>
<td>5</td>
</tr>
<tr>
<td>0x04 — 0x3F</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0x40</td>
<td>DVB-I Broadcast Service List Entry Points</td>
<td>5</td>
</tr>
<tr>
<td>0x41 — 0x45</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0x46</td>
<td>DVB-I Broadcast Lists</td>
<td>5</td>
</tr>
<tr>
<td>0x47 — 0x4F</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0x50</td>
<td>NIP Timing Information</td>
<td>0.250</td>
</tr>
<tr>
<td>0x51 — 0x5F</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0x60</td>
<td>DVB-I Content Guide</td>
<td>5</td>
</tr>
<tr>
<td>0x61 — 0x6F</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0x70</td>
<td>DVB-I Playlists</td>
<td>5</td>
</tr>
<tr>
<td>0x71 — 0xFE</td>
<td>reserved_future_use</td>
<td></td>
</tr>
<tr>
<td>0xFF</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>

To reduce service access times and receiver scan times each table should be repeated more frequently. The DVB-MABR Bootstrap Configuration Document relating to each stream has to be accessed on each physical stream change and therefore should be provided at least once per second.

8.3 Service Discovery and Programme Metadata: DVB-I

8.3.1 Overview

DVB-NIP relies on DVB-I for Service Discovery and Program Metadata as specified in ETSI TS 103 770 [9].

A DVB-NIP broadcast network according to the present document shall carry at least one DVB-I Service List listing the services available on the broadcast network. Larger broadcast networks may carry several DVB-I Service Lists. DVB-I Service Lists may be provided by the Technical Operator of the network (e.g. the satellite or terrestrial network operator) and/or by one or more Commercial Operators present on that technical network. Typically different commercial DVB-I Service Lists only carry a subset of the broadcast services available on that technical network.

8.3.2 DVB-I Broadcast List Discovery: Service List Entry Points

8.3.2.1 Principles

For DVB-NIP Receivers to discover all the DVB-I Service Lists available on the broadcast network, the DVB-I Service List Entry Points mechanism as specified in clause 5.3 of ETSI TS 103 770 [9] shall be used.

The DVB-I Service List Entry Points mechanism is used to provide a table to NIP Receivers listing all DVB-I Service Lists of the given broadcast network. The DVB-I Service List Entry Points table shall always be broadcast as part of the signalling information on the bootstrap stream for that network.
A NIP Receiver therefore when tuned to the network bootstrap stream shall acquire the DVB-I Service List Entry Points table to learn about all the DVB-I Service Lists available on the actual network.

Note that the broadcast of the Service List Entry Points table is mandatory even when only a single DVB-I Service List table is provided on that network.

Each DVB-I table available on the broadcast network is referenced in the Service List Entry Points file through a unique URL. By matching the URL for a given Service List with the URL in the SIF table, the receiver can physically locate this table on the broadcast network and tune to the given transponder to listen for that table on the Announcement Channel.

No recommendations are made in the present document as to when the receiver shall acquire a given DVB-I Service List table listed in the Service List Entry Points table. This is normally implementation dependent and may be done automatically at start-up or only when a given client on the network requests a particular table.

The Service List Entry Points table broadcast in a DVB-NIP system shall follow the XML schema defined in clause 5.3 of ETSI TS 103 770 [9].

An example broadcast DVB-I Service List Entry Points table is shown below:

Listing 8.3.2.1-1: Example Broadcast List Entry Points Table

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE xml>
<!-- Example of ServiceListEntryPoint Table as broadcast over the announcement channel -->
  <ServiceListRegistryEntity>
    <Name>Satellite Europe</Name>
  </ServiceListRegistryEntity>
  <ProviderOffering>
    <Provider>
      <Name>Provider A</Name>
    </Provider>
    <ServiceListOffering>
      <ServiceListName>Service List A1</ServiceListName>
      <ServiceListURI contentType="application/xml">
      </ServiceListURI>
    </ServiceListOffering>
  </ProviderOffering>
  <ProviderOffering>
    <Provider>
      <Name>Provider B</Name>
    </Provider>
    <ServiceListOffering>
      <ServiceListName>Service List B1</ServiceListName>
      <ServiceListURI contentType="application/xml">
      </ServiceListURI>
    </ServiceListOffering>
  </ProviderOffering>
</ServiceListEntryPoints>
```
8.3.2.2 DVB-I Broadcast Service List Discovery: Service List Registry Function

The Broadcast DVB-I Service List Entry Points file is multicast as a pre-compiled file (listing all the DVB-I broadcast Service Lists on the actual network) within the DVB-NIP Announcement Channel on the bootstrap stream. It is used by the Service List Registry (SLR) function part of the NIP Gateway. The Service List Registry function shall act as a local DVB-I Service List Registry (SLR) as defined in clause 5.1.3.2 of ETSI TS 103 770 [9].

The local Service List Registry function receives the Service List Entry Points table from the broadcast network and exposes the table to DVB-I clients on the network. The local Service List Registry shall accept queries from DVB-I clients.

Queries from DVB-I clients to NIP Gateways may be issued with or without query parameters as specified in ETSI TS 103 770 [9]. Query parameters may take advantage of the DVB-I’s client knowledge of location or other preferences. Query Parameters defined in ETSI TS 103 770 [9] are “TargetCountry”, “regulatorListFlag”, “Language”, “Genre” and “ProviderName”. Query parameters shall be used in queries in the order presented here and as defined in clause 5.1.3.2 of ETSI TS 103 770 [9].

8.3.2.3 URL Coding in DVB-I Broadcast Service List Entry Points Table

In the context of NIP, DVB-I Broadcast Service Lists shall be declared in the Broadcast Service List Entry Points table using the following URL coding convention: Links towards DVB-I Broadcast Service Lists shall always be prefixed with the local domain name ‘dvb.gw’.

Example of a DVB-I Broadcast Service List URL in a DVB-I Broadcast Service List Entry Point Table:

https://dvb.gw/service-list-provider1/international_channels.xml

Such local prefix shall allow NIP Gateways in split deployment models to rapidly parse and replace this particular domain name by the local IP address of a Gateway capable of serving that Service List.

The domain name “dvb.gw” cannot be publicly resolved and is only meant to be used in the context of DVB-NIP table broadcasts.

8.3.3 DVB-I Broadcast Service Lists

8.3.3.1 Introduction

Services made available via DVB-NIP compliant broadcast networks shall be signalled using the DVB-I Service List mechanism specified in section 5.5 of ETSI TS 103 770 [9]. All syntactical elements specified in ETSI TS 103 770 [9] are also available in NIP. In a DVB-NIP compliant broadcast network, DVB-I service lists are compiled by the – Technical Operator of the network and/or - one or many Commercial Operators on that network. DVB-I Service Lists shall be broadcast on the NIP Announcement Channel as defined in clause 8.2. DVB-I Service Lists may be broadcast on any stream part of the broadcast network. The physical location of the stream carrying a particular DVB-I Service List can be found from the NIF and SIF tables described in clause 8.4.

DVB-I Service Lists broadcast on a DVB-NIP network contain services that have at least one representation or service component available on the broadcast network.

8.3.3.2 NIP Service Instances in DVB-I Service Lists

NIP Broadcast Services shall be declared in DVB-I Service Lists as Service instances according to 5.5.4 of ETSI TS 103 770 [9].

NIP Service declarations shall use the DVB-I declared “DASHDeliveryParametersType” as defined in 5.5.18.6 of ETSI TS 103 770 [9]. The URL within the “URIbasedLocation” shall point towards the manifest file of the service.

NIP Services are uniquely identified through their manifest URL. The manifest URL therefore acts as the NIP Service Identifier. The presence of a NIP Service on a broadcast network is defined by the declaration of the NIP Service Identifier in the Service Information File (SIF). Matching of the Service URL between the URL declared in the DVB-I Service List instance and the URL declared in the SIF does not take into account the optional query parameters.

The manifest of the service shall declare all representations and components of a particular service. At least one of these representations or components shall be available via broadcast and some may only be available via broadband delivery.
All broadcast representations and inherent broadcast components of a service shall be broadcast within the same NIP Stream as the service manifest.

In operational situations where a particular service representation, e.g. a UHD 4K version of a service made available via broadcast, cannot be conveyed via the same NIP Stream as the other representations then it shall be declared as a different service with a separate service entry in the DVB-I broadcast Service List. The downside of this is that automatic switching between ABR representations is no longer possible.

8.3.3.3 URL Coding for NIP Services declared in DVB-I Broadcast Lists

NIP Broadcast Service Instances in DVB-I Service Lists shall follow the following URL convention: NIP broadcast service URLs shall always use the local domain name prefix ‘dvb.gw’.

Example of a NIP Broadcast Service URL in a DVB-I Broadcast List:

https://dvb.gw/media.bbc.co.uk/simulcast/bbc-one/scotland/manifest.mpd

Such local prefix, in front of the original domain, which shall be maintained, shall allow NIP receivers in split deployment models to rapidly parse and replace this particular domain name by the local IP address of a NIP Gateway capable of serving that service.

The domain name “dvb.gw” cannot be publicly resolved and is only meant to be used in the context of NIP table broadcasts.

Note that a DASH instance without the “dvb.gw” prefix means that the service is accessible to a DVB-I Client only via broadband.

The listing below shows an example of a NIP DVB-I broadcast list:

Listing 8.3.3.3-1: Example of NIP DVB-I broadcast list

```xml
<?xml version="1.0" encoding="utf-8"?>
  <Name>Germany FTA</Name>
  <ProviderName>SES</ProviderName>
  <RegionList version="1">
    </RegionList>
  <LCNTableList>
  </LCNTableList>
  <Service version="1">
    <UniqueIdentifier>tag:ses.com,2019:DasErste.DasErste</UniqueIdentifier>
    <!-- NIP Broadcast Instance HD and below-->
    <ServiceInstance priority="1">
      <DisplayName>Das Erste HD</DisplayName>
      <SourceName xmlns="urn:dvb:metadata:source:dvb-dash">
        <MediaType>application/dash+xml</MediaType>
        <URI>https://dvb.gw/ard.de/dash/live/manifestDasErste.mpd</URI>
      </SourceName>
    </ServiceInstance>
    <ServiceName>Das Erste HD</ServiceName>
    <ProviderName>ARD</ProviderName>
    <RelatedMaterial xsi:type="tva:RelatedMaterialType">
      <tva:MediaLocator>
        <MediaUri xmlns="urn:dvb:metadata:source:dvb-dash">
          <MediaType>image/jpeg</MediaType>
          <URI>http://www.tv-logo.com/images/logo/ard_das_erste.jpg</URI>
        </MediaLocator>
      </RelatedMaterial>
    </ServiceName>
    <ServiceType href="urn:dvb:metadata:cs:ServiceTypeCS:2019:linear"/>
  </Service>
  <Service version="1">
    <UniqueIdentifier>tag:ses.com,2019:ZDF_HD.ZDF_HD</UniqueIdentifier>
    <!-- NIP Broadcast Instance HD and below-->
    <ServiceInstance priority="1">
      <DisplayName>ZDF HD</DisplayName>
      <SourceName xmlns="urn:dvb:metadata:source:dvb-dash">
        <MediaType>application/dash+xml</MediaType>
        <URI>https://dvb.gw/zdf.de/dash/live/manifestZDF.mpd</URI>
      </SourceName>
    </ServiceInstance>
    <ServiceName>ZDF HD</ServiceName>
    <ProviderName>ARD</ProviderName>
    <RelatedMaterial xsi:type="tva:RelatedMaterialType">
      <tva:MediaLocator>
        <MediaUri xmlns="urn:dvb:metadata:source:dvb-dash">
          <MediaType>image/jpeg</MediaType>
          <URI>http://www.tv-logo.com/images/logo/ard_das_erste.jpg</URI>
        </MediaLocator>
      </RelatedMaterial>
    </ServiceName>
    <ServiceType href="urn:dvb:metadata:cs:ServiceTypeCS:2019:linear"/>
  </Service>
</ServiceList>
```
8.3.4 DVB-I Content Guide Metadata

8.3.4.1 Connected Receivers

In the context of a NIP receiver (NIP Gateway + DVB-I Client), connected to a bidirectional broadband network, the DVB-I Content Guide metadata according to clause 6 of ETSI TS 103 770 [9] shall be queried through the IP broadband connection.

The DVB-I Content Guide Source URL shall be declared in the DVB-I Service List.

8.3.4.2 Unconnected Receivers

The signalling and carriage of DVB-I Content Guide metadata through broadcast means for unconnected receivers will be specified in a later revision of the present document.

8.4 Broadcast Network Signalling: NIF and SIF

8.4.1 Overview

The main purpose of Broadcast Network Signalling is to describe the broadcast network with its logical streams and their physical channel parameters and the location of services across those streams. DVB-NIP defines two tables that describe the broadcast network:

- **NIF:** The Network Information File provides logical and physical parameters of declared streams and channels of the broadcast network.

- **SIF:** The Service Information File provides information about the location of DVB-I Service List(s), Service manifest files, interactive applications and other metadata (e.g. DVB-I Content Guide) within the logical streams on the broadcast network.

As mentioned in clause 8.1 (Signalling Overview) both NIF and SIF files shall always be present on bootstrap streams. Any stream broadcasting a NIF/SIF couple shall also carry the relevant DVB-I Service List Entry Points .xml file.

8.4.2 Network Information File (NIF) Definition

8.4.2.1 NIF Purpose

The Network Information File (NIF) describes the broadcast network. It provides information about the logical streams and physical parameters of the different RF Channels in a particular broadcast network. In that sense it is comparable to the function of the NIT in traditional DVB systems.

The NIF table also provides information on the location of bootstrap streams that help DVB-NIP receivers in the initial configuration phase.

A NIF is identified thanks to its NIPNetworkID, as specified in clause 8.1.4.2.

It is mandatory that NIF identified with the same NIPNetworkID shall be identical on any Channel of a Broadcast Network conveying such NIF.

As an option, NIF may declare Channels from any other Broadcast Network.
8.4.2.2 Network Information File

8.4.2.2.1 NIF Schema Declaration

```
    xmlns:dvbisd="urn:dvb:metadata:servicediscovery:2022">
    <import namespace="urn:tva:mpeg7:2008" schemaLocation="tva_mpeg7.xsd"/>
    <element name="NetworkInformationFile" type="dvbnipsd:NetworkInformationFileType"/>
</schema>
```

8.4.2.2.2 NetworkInformationFileType

```
<complexType name="NetworkInformationFileType">
    <sequence>
        <element name="VersionUpdate" type="dvbisd:ZuluTimeType"/>
        <element name="NIFType">
            <restriction base="mpeg7:TextualType">
                <enumeration value="Physical Network"/>
                <enumeration value="Commercial Operator"/>
            </restriction>
        </element>
        <element name="ActualBroadcastNetwork" type="dvbnipsd:BroadcastNetworkType"/>
        <element name="OtherBroadcastNetwork" type="dvbnipsd:BroadcastNetworkType" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
</complexType>
```

Table 8.4.2.2.2-1: Network Information File Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>VersionUpdate</td>
<td>as version number of the NIF. It indicates the date of modification of the present NIF. Formatted in Zulu Time Format.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NIFType</td>
<td>Indicates the scope of the NIF. Only two possible values:</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- &quot;Physical Network&quot; indicates that the present NIF describes the complete physical broadcast network. Such NIF is generated by the Technical Network Operator or the Regulator.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- &quot;Commercial Operator&quot; indicates that the present NIF describes streams carrying content for a specific Bouquet, as defined in ETSI EN 300 468 [14]. Such NIF is generated by the Commercial Network Operator or the Content Aggregator.</td>
<td></td>
</tr>
<tr>
<td>ActualBroadcastNetwork</td>
<td>Structure describing all NIP Streams of the Broadcast Network carrying the present NIF.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>OtherBroadcastNetwork</td>
<td>Structure describing all NIF required parameters of any other Broadcast Networks. There can be as many OtherBroadcastNetwork structures as:</td>
<td>Optional 0 .. (\infty)</td>
</tr>
<tr>
<td></td>
<td>- Different NIPNetworkID.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Different orbital position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Different network type.</td>
<td></td>
</tr>
</tbody>
</table>
8.4.2.2.3 BroadcastNetworkType

```xml
<complexType name="BroadcastNetworkType">
  <sequence>
    <element name="NetworkType" type="mpeg7:TextualType" />
    <simpleType>
      <restriction base="mpeg7:TextualType">
        <enumeration value="Satellite"/>
        <enumeration value="Terrestrial"/>
      </restriction>
    </simpleType>
    <element name="NetworkName" type="mpeg7:TextualType" />
    <element name="NIPNetworkProviderName" type="dvbisd:ProviderName" />
    <element name="SatellitePosition" type="dvbisd:SatellitePositionType" minOccurs="0"/>
    <element name="NIPNetworkID" type="xs:unsignedShort" minvalue="1" maxvalue="65280"/>
    <element name="NIPStream" type="dvbnipsd:NIPStreamType" maxOccurs="unbounded" />
  </sequence>
</complexType>
```

Table 8.4.2.2.3-1: Broadcast Network Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetworkType</td>
<td>Indicates the type of broadcast network. Only two possible values:</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- Satellite for S2/S2X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Terrestrial for DVB-T2</td>
<td></td>
</tr>
<tr>
<td>NetworkName</td>
<td>The name of the network in a human readable form as Multilingual_Network_Name_descriptor specified in ETSI EN 300 468 [14]. Multiple service list names can be specified as long as they have different @xml:lang values.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NIPNetworkProviderName</td>
<td>The name of the provider of this broadcast network.</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Refers to ProviderName as specified by DVB-I (ETSI TS 103 770 [9]). The operator of the NIF is the NIPNetworkProviderName declared in the Actual Broadcast Network. Formatted in a human readable form. Multiple values for the provider name can be specified as long as they have different @xml:lang values.</td>
<td></td>
</tr>
<tr>
<td>SatellitePosition</td>
<td>only mandatory for NetworkType = &quot;Satellite&quot;.</td>
<td>Optional</td>
</tr>
<tr>
<td>NIPNetworkID</td>
<td>- If LinkLayerFormat = &quot;GSE-Lite&quot;, then this tag refers to interactive_network_id as specified in ETSI TS 102 606-2 [5]. Value in Decimal, between 1 and 65 280 (0xFF00).</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- If LinkLayerFormat = &quot;TS&quot;, then this tag refers to original_network_id as specified in ETSI EN 300 468 [14]. Value in decimal, between 1 and 65 280 (0xFF00).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>These values correspond to the original_network_id/network_id registered at DVB Services Sàrl.</td>
<td></td>
</tr>
<tr>
<td>NIPStream</td>
<td>Structure describing logical identifiers, physical parameters of a NIP Stream.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

DVB BlueBook A180 (February 2022)
8.4.2.2.4 SatellitePositionType

```
<complexType name="SatellitePositionType">
    <element name="OrbitalPosition" type="double"/>
    <simpleType>
        <restriction base="double">
            <minInclusive value="0.0"/>
            <maxInclusive value="180.0"/>
        </restriction>
    </simpleType>
    <element name="West_East_flag" type="string"/>
    <simpleType>
        <restriction base="xs:string">
            <enumeration value="West"/>
            <enumeration value="East"/>
        </restriction>
    </simpleType>
</complexType>
```

Table 8.4.2.2.4-1: Satellite Position Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrbitalPosition</td>
<td>Value in degrees, from 0.0° to 180.0°</td>
<td>Mandatory</td>
</tr>
<tr>
<td>West_East_flag</td>
<td>Indicates if the satellite position is in the western or eastern part of the orbit.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

8.4.2.2.5 NIPStreamType

```
<complexType name="NIPStreamType">
    <sequence>
        <element name="LinkLayerFormat" type="mpeg7:TextualType"/>
        <simpleType>
            <restriction base="mpeg7:TextualType">
                <enumeration value="GSE-Lite"/>
                <enumeration value="TS"/>
            </restriction>
        </simpleType>
        <element name="NIPStreamProviderName" type="dvbisd:ProviderName"/>
        <element name="NIPCarrierID" type="positiveInteger" minvalue="0" maxvalue="65535"/>
        <element name="NIPLinkID" type="positiveInteger" minvalue="0" maxvalue="255"/>
        <element name="NIPServiceID" type="xs:unsignedShort" minvalue="0" maxvalue="65535"/>
        <element name="BootstrapStream" minOccurs="0"/>
        <complexType>
            <Sequence>
                <element name="BootstrapType" type="mpeg7:TextualType"/>
                <simpleType>
                    <restriction base="mpeg7:TextualType">
                        <enumeration value="Physical Network"/>
                        <enumeration value="Commercial Operator"/>
                    </restriction>
                </simpleType>
            </Sequence>
            <element name="Status" type="mpeg7:TextualType"/>
            <simpleType>
                <restriction base="mpeg7:TextualType">
                    <enumeration value="Active"/>
                    <enumeration value="Not Active"/>
                    <enumeration value="Deprecated"/>
                </restriction>
            </simpleType>
        </complexType>
        <Choice>
            <element name="DVBS2_NIPDeliveryParameters" type="DVBS2_NIPDeliveryParametersType"/>
            <element name="DVBS2X_NIPDeliveryParameters" type="DVBS2X_NIPDeliveryParametersType"/>
            <element name="DVBT2_NIPDeliveryParameters" type="DVBT2_NIPDeliveryParametersType"/>
        </Choice>
    </sequence>
</complexType>
```

Table 8.4.2.2.5-1: NIP Stream Fields
<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
</table>
| LinkLayerFormat               | Describes the data link layer as:  
  - "GSE-Lite": transmission as specified in DVB GSE (ETSI TS 102 606-1 [4])  
  - "TS": transmission based on MPEG-2 TS, conveying MPE services and/or MPEG/PES services.                                                                 | Mandatory   |
| NIPStreamProviderName         | The name of the operator of the NIPStream. It refers to ProviderName as specified by DVB-I (ETSI TS 103 770 [9]). It is possible that the NIPStreamProviderName differs from NIPNetworkProviderName. Formatted in a human readable form. Multiple values for the provider name can be specified as long as they have different @xml:lang values. | Mandatory   |
| NIPCarrierID                  | If LinkLayerFormat = "GSE-Lite", then this tag refers to S2_system_id or T2_system_id as specified in ETSI TS 102 606-2 [5].  
  Value in Decimal, between 1 and 65 535 (0xFFFF).  
  If LinkLayerFormat = "TS", then this tag refers to transport_stream_id as specified in ETSI EN 300 468 [14].  
  Value in Decimal, between 1 and 65 535 (0xFFFF). | Mandatory   |
| NIPLinkID                     | If LinkLayerFormat = "GSE-Lite", then this tag refers to Input Stream Identifier as specified in clauses 6.2.13.3 and 6.4.6.5 of ETSI EN 300 468 [14], respectively for DVB-S2 (ETSI EN 302 307-1 [1]) and DVB-S2X (ETSI EN 302 307-1 [1], ETSI EN 302 307-2 [2]) or plp_id as specified in clause 6.4.6.3 of ETSI EN 300 468 [14] for DVB-T2 (ETSI TS 102 755 [3]).  
  Value in Decimal, between 0 and 255 (0xFF).  
  For a single input stream or single plp, this tag shall be set to "0".  
  If LinkLayerFormat = "TS", then this tag refers to Input Stream Identifier as specified in clause 6.2.13.3 of ETSI EN 300 468 [14], for DVB-S2 (ETSI EN 302 307-1 [1]).  
  Value in Decimal, between 0 and 255 (0xFF).  
  For a single input stream, this tag shall be set to "0". | Mandatory   |
| NIPServiceID                  | If LinkLayerFormat = "TS", this tag refers to service_id, as specified in ETSI EN 300 468 [14], of the MPE service.  
  Value in Decimal, between 1 and 65 535 (0xFFFF).  
  If LinkLayerFormat = "GSE-Lite", this tag is not used and shall be set to "0". | Mandatory   |
| BootstrapStream               | If present, the declared Stream carries the following documents: NIF, SIF, DVB-I Service List Entry Points.                                                                                                       | Optional    |
| BootstrapType                 | Indicates the scope of the NIF carried by the declared Bootstrap Stream. Two possible values:  
  - "Physical Network" indicates that the NIF describes the complete physical broadcast network.  
  - "Commercial Operator" indicates that the NIF describes streams carrying content for a specific Bouquet, as defined in ETSI EN 300 468 [14]. | Mandatory   |
| Status                        | Describes the bootstrap status as:  
  - "Active": bootstrap stream in operation  
  - "Not Active": bootstrap stream not in operation (maintenance or not activated, yet)  
  - "Deprecated": this is not a bootstrap stream anymore.                                                                                      | Mandatory   |
| DVBS2_NIPDeliveryParameters   | Structure providing stream physical parameters as specified in clause 8.4.2.2.6.1.                                                                                                                             | Mandatory   |
| DVBS2X_NIPDeliveryParameters  | Structure providing stream physical parameters as in clause 8.4.2.2.6.2.                                                                                                                                          | Mandatory   |
| DVBT2_NIPDeliveryParameters   | Structure providing stream physical parameters as specified in clause 8.4.2.2.6.3.                                                                                                                             | Mandatory   |
8.4.2.2.6 DeliveryParametersTypes

8.4.2.2.6.1 DVBS2_NIPDeliveryParametersType

```xml
<complexType name="DVBS2_NIPDeliveryParametersType">
  <sequence>
    <element name="Frequency" type="positiveinteger"/>
    <element name="Polarization" type="string">
      <restriction base="xs:string">
        <enumeration value="horizontal"/>
        <enumeration value="vertical"/>
        <enumeration value="left circular"/>
        <enumeration value="right circular"/>
      </restriction>
    </element>
    <element name="Modulation_Type" type="string">
      <restriction base="xs:string">
        <enumeration value="QPSK"/>
        <enumeration value="8PSK"/>
        <enumeration value="16APSK"/>
        <enumeration value="32APSK"/>
      </restriction>
    </element>
    <element name="Roll_off" type="byte">
      <restriction base="xs:string">
        <enumeration value="0.35"/>
        <enumeration value="0.25"/>
        <enumeration value="0.20"/>
      </restriction>
    </element>
    <element name="SymbolRate" type="short"/>
    <element name="FEC" type="string">
      <restriction base="xs:string">
        <enumeration value="1/2"/>
        <enumeration value="2/3"/>
        <enumeration value="3/4"/>
        <enumeration value="5/6"/>
        <enumeration value="7/8"/>
        <enumeration value="8/9"/>
        <enumeration value="3/5"/>
        <enumeration value="4/5"/>
        <enumeration value="9/10"/>
      </restriction>
    </element>
    <element name="InputStreamIdentifier" type="integer" minvalue="0" maxvalue="255"/>
  </sequence>
</complexType>
```
### Table 8.4.2.6.1-1: DVBS2_NIP Delivery Parameter Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Frequency value coded in GHz as specified in clause 6.2.13.2 of ETSI EN 300 468 [14]</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>
| Polarization       | Polarization of the transmitted signal. It shall be set with one over the 4 following values, as specified in clause 6.2.13.2 of ETSI EN 300 468 [14]:  
- horizontal  
- vertical  
- left circular  
- right circular | Mandatory |
| Modulation_Type    | Specifies the modulation scheme. It shall be set with one of the two following values:  
- QPSK  
- 8PSK  
- 16APSK (for Professional Services)  
- 32APSK (for Professional Services) | Mandatory |
| Roll_off           | Roll-off factor shall be set with one of the 3 following values, as specified in clause 6.2.13.2 of ETSI EN 300 468 [14]:  
- 0.35  
- 0.25  
- 0.20 | Mandatory |
| SymbolRate         | Symbol rate value is coded in Symbol/s. | Mandatory |
| FEC                | FEC value shall be set with one over the 9 following values, as specified in clause 6.2.13.2 of ETSI EN 300 468 [14]:  
- 1/2  
- 2/3  
- 3/4  
- 5/6  
- 7/8  
- 8/9  
- 3/5  
- 4/5  
- 9/10 | Mandatory |
| InputStreamIdentifier | Carries the DVB-S2 input_stream_identifier (ISI) as defined in clause 6.2.13.3 of ETSI EN 300 468[14].  
InputStreamIdentifier = NIPLinkID as defined in clause 8.1.4.2. | Mandatory |

#### 8.4.2.6.2 DVBS2X_NIPDeliveryParametersType

```xml
<complexType name="DVBS2X_NIPDeliveryParametersType">
    <sequence>
        <element name="receiver_profiles" type="string"/>
        <simpleType>
            <restriction base="xs:string">
                <enumeration value="Broadcast services"/>
                <enumeration value="Professional services"/>
            </restriction>
        </simpleType>
        <element name="S2X_mode" type="string"/>
        <simpleType>
            <restriction base="xs:string">
                <enumeration value="S2X"/>
                <enumeration value="S2X channel bonding"/>
            </restriction>
        </simpleType>
        <element name="Frequency" type="positiveinteger"/>
        <element name="Polarization" type="string"/>
        <simpleType>
            <restriction base="xs:string">
                <enumeration value="horizontal"/>
                <enumeration value="vertical"/>
                <enumeration value="left circular"/>
            </restriction>
        </simpleType>
    </sequence>
</complexType>
```
<enumeration value="right circular"/>
</restriction>
</simpleType>
<element name="Roll_off" type="byte">
  <restriction base="xs:string">
    <enumeration value="0.35"/>
    <enumeration value="0.25"/>
    <enumeration value="0.20"/>
    <enumeration value="0.15"/>
    <enumeration value="0.10"/>
    <enumeration value="0.05"/>
  </restriction>
</element>
<element name="SymbolRate" type="short"/>
<element name="PLS" type="integer" minOccurs="0" minvalue="0" maxvalue="262143"/>
<element name="InputStreamIdentifier" type="integer" minOccurs="0" maxvalue="255"/>
</sequence>
</complexType>

Table 8.4.2.2.6.2-1: DVBS2X_NIP Delivery Parameters Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>receiver_profiles</td>
<td>This field indicates which receiver profiles are targeted by the stream. It shall be set to one of the following values: - Broadcast services - Professional services</td>
<td>Mandatory</td>
</tr>
<tr>
<td>S2X_mode</td>
<td>This field indicates in which DVB-S2X mode the stream is operated. It shall be set to one of the following values: - S2X - S2X channel bonding</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Frequency</td>
<td>Frequency value coded in GHz as specified in clause 6.4.6.5 of ETSI EN 300 468 [14].</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Polarization</td>
<td>Polarization of the transmitted signal. It shall be set with one of the 4 following values, as specified in clause 6.2.13.2 of ETSI EN 300 468 [14]: - horizontal - vertical - left circular - right circular</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Roll_off</td>
<td>Roll-off factor shall be set with one of the 6 following values, as specified in clause 6.4.6.5 of ETSI EN 300 468 [14]: - 0.35 - 0.25 - 0.20 - 0.15 - 0.10 - 0.05</td>
<td>Mandatory</td>
</tr>
<tr>
<td>SymbolRate</td>
<td>Symbol rate value is coded in Symbol/s.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>PLS</td>
<td>Shall be set as specified in clause 5.5.2 of ETSI EN 302 307-2 [2]. Decimal value between 0 and 262143</td>
<td>Optional</td>
</tr>
<tr>
<td>InputStreamIdentifier</td>
<td>Carries the DVB-S2 input_stream_identifier (ISI) as defined in clause 6.2.13.3 of ETSI EN 300 468 [14]. InputStreamIdentifier = NIPLinkID as defined in clause 8.1.43.2.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

NOTE: In the context of NIP the DVB-S2X TS_GS_S2X_mode shall always be set to GSE High Efficiency Mode.
8.4.2.6.3  
DVBT2_NIPDeliveryParameters

8.4.2.6.3.1  
DVBT2_NIPDeliveryParametersType

```
<complexType name="DVBT2_NIPDeliveryParametersType">
    <sequence>
        <element name="plp_id" type="xs:unsignedShort" minvalue="0" maxvalue="255"/>
        <element name="T2_system_id" type="xs:unsignedShort" minvalue="1" maxvalue="65565"/>
        <element name="long_T2_system_delivery_descriptor" type="dvbnipsd:long_T2_system_delivery_descriptorType" minOccurs="0"/>
    </sequence>
</complexType>
```

Table 8.4.2.6.3.1-1: DVBT2_NIP Delivery Parameters Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>plp_id</td>
<td>it identifies uniquely a PLP within T2 System as specified in clause 6.4.6.3 of ETSI EN 300 468 [14]. plp_id = NIPLinkID as defined in clause 8.1.4.2.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>T2_system_id</td>
<td>it identifies uniquely the T2 system within the DVB network as specified in clause 6.4.6.3 of ETSI EN 300 468 [14]</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

8.4.2.6.3.2  
long_T2_system_delivery_descriptorType

```
<complexType name="long_T2_system_delivery_descriptorType">
    <element name="SISO_MISO" type="mpeg7:TextualType"/>
    <simpleType>
        <restriction base="mpeg7:TextualType">
            <enumeration value="SISO"/>
            <enumeration value="MISO"/>
        </restriction>
    </simpleType>
    <element name="bandwidth" type="mpeg7:TextualType"/>
    <simpleType>
        <restriction base="mpeg7:TextualType">
            <enumeration value="8 MHz"/>
            <enumeration value="7 MHz"/>
            <enumeration value="6 MHz"/>
            <enumeration value="5 MHz"/>
            <enumeration value="10 MHz"/>
            <enumeration value="1.712 MHz"/>
        </restriction>
    </simpleType>
    <element name="guard_interval" type="mpeg7:TextualType"/>
    <simpleType>
        <restriction base="mpeg7:TextualType">
            <enumeration value="1/32"/>
            <enumeration value="1/16"/>
            <enumeration value="1/8"/>
            <enumeration value="1/4"/>
            <enumeration value="1/128"/>
            <enumeration value="19/256"/>
        </restriction>
    </simpleType>
    <element name="transmission_type" type="mpeg7:TextualType"/>
    <simpleType>
        <restriction base="mpeg7:TextualType">
            <enumeration value="2k"/>
            <enumeration value="8k"/>
            <enumeration value="4k"/>
            <enumeration value="1k"/>
            <enumeration value="16k"/>
            <enumeration value="32k"/>
        </restriction>
    </simpleType>
    <element name="other_frequency_flag" type="boolean"/>
    <element name="tfs_flag" type="boolean"/>
    <complexType name="cell_idType">
        <element name="cell_id" type="xs:unsignedShort" minvalue="0" maxvalue="65535"/>
        <element name="centre_frequency" type="double" minvalue="10" maxvalue="42949672950"/>
    </complexType>
</complexType>
```
Table 8.4.2.6.3.2-1: long_T2_system delivery descriptor Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>SISO_MISO</td>
<td>Indicates one of the following modes:</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- SISO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- MISO</td>
<td></td>
</tr>
<tr>
<td>bandwidth</td>
<td>Indicates one of the following bandwidth values:</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- 8 MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 7 MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 6 MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 5 MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 10 MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1712 MHz</td>
<td></td>
</tr>
<tr>
<td>guard_interval</td>
<td>Indicates one of the following guard interval values:</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>- 1/32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/128</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 19/128</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 19/256</td>
<td></td>
</tr>
<tr>
<td>transmission_type</td>
<td>Indicates the FFT size of the signals transmitted within the associated cell.</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>One of the following modes:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 2k</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 8k</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 4k</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1k</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 16k</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 32k</td>
<td></td>
</tr>
<tr>
<td>other_frequency_flag</td>
<td>This flag shall be set according to clause 6.4.6.3 of ETSI EN 300 468 [14].</td>
<td>Mandatory</td>
</tr>
<tr>
<td>tfs_flag</td>
<td>This flag shall be set according to Table 138 of ETSI EN 300 468 [14].</td>
<td>Mandatory</td>
</tr>
<tr>
<td>cell_id</td>
<td>Uniquely identifies a cell_id.</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>Value in decimal, between 0 and 65 535.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell_id = 0, indicates that no cell_id.</td>
<td></td>
</tr>
<tr>
<td>centre_frequency</td>
<td>Indicates the frequency value in Hz. The coding range is from minimum 10 Hz up to</td>
<td>Mandatory</td>
</tr>
<tr>
<td></td>
<td>a maximum of 42 949 672 950 Hz.</td>
<td></td>
</tr>
<tr>
<td>cell_id_extension</td>
<td>Identifies a sub-cell within a cell.</td>
<td>Optional</td>
</tr>
<tr>
<td>transposer_frequency</td>
<td>Indicates the centre frequency that is used by a transposer in the sub-cell</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>indicated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shall be set according to clause 6.4.6.3 of ETSI EN 300 468 [14].</td>
<td></td>
</tr>
</tbody>
</table>

8.4.2.6.7 NIF Example

The following NIF.xml example depicts a Satellite Technical Operator declaring:

- 2 NIP Streams belonging to the same NIPNetworkID. One of them is declared as Bootstrap Stream.
- 1 NIP Stream, on the same orbital position but with different NIPNewtorkID
- 1 NIP Streams, declared as a Bootstrap, from another orbital position.
8.4.3 Service Information File (SIF) Definition

8.4.3.1 SIF Purpose

The SIF (Service Information File) describes, for each stream identified logically, the location of:

- DVB-I Service Lists,
- Service manifests
- DVB-I Playlists,
- DVB-I Content Guide Sources
- Interactive Applications not linked directly to a particular service

The SIF is one of the three mandatory tables to be broadcast on a Bootstrap Stream.

The SIF is broadcast by the operator, in charge of the Broadcast Stream. The SIF is identified through the Provider Name as defined in clause 3.1.

The operator can be:

- a Technical Network Operator.
- a Commercial Operator.
- an Aggregator.
- a Regulator.

The SIF lists, for each logically identified NIP Stream, the URLs of all Services carried by the Broadcast Network.
For each NIP Stream declared in the SIF, there shall be a corresponding entry in the NIF table carried on the same Bootstrap Stream.

The SIF table operated by an Operator on one Broadcast Network, can be broadcast on one, at least, or several NIP streams, but shall be identical on all these NIP Streams at any time.

8.4.3.2 Service Information File

8.4.3.2.1 SIF Schema Declaration

```xml
  <import namespace="urn:tva:mpeg7:2008" schemaLocation="tva_mpeg7.xsd"/>
  <element name="ServiceInformationFile" type="dvbnipsd:ServiceInformationFileType"/>
</schema>
```

8.4.3.2.2 ServiceInformationFileType

```xml
<complexType name="ServiceInformationFileType">
  <sequence>
    <element name="VersionUpdate" type="dvbisd:ZuluTimeType"/>
    <element name="NetworkName" type="mpeg7:TextualType" />
    <element name="ProviderName" type="dvbisd:ProviderName" />
    <element name="BroadcastMediaStream" type="dvbnipsd:BroadcastMediaStreamType" minOccurs="1" maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>VersionUpdate</td>
<td>Indicates the date of modification of the present NIF. Formatted in Zulu Time Format.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NetworkName</td>
<td>The name of the network in a human readable form as Multilingual_Network_Name_descriptor as specified in ETSI EN 300 468 [14]. Multiple service list names can be specified as long as they have different @xml:lang values.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>ProviderName</td>
<td>The name of the provider of this Service Information File (SIF). Refers to ProviderName as specified by DVB-I (ETSI TS 103 770 [9]). This provider operates the NIP Stream conveying this SIF. Formatted in a human readable form. Multiple values for the provider name can be specified as long as they have different @xml:lang values.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>BroadcastMediaStream</td>
<td>Structure of streams carrying content described by the present SIF.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

**Note:** All streams declared in SIF BroadcastMediaStream shall be declared in the co-located NIF.

8.4.3.2.3 BroadcastMediaStreamType

```xml
<complexType name="BroadcastMediaStreamType">
  <sequence>
    <element name="NIPNetworkID" type="xs:unsignedShort" minvalue="1" maxvalue="65280"/>
    <element name="NIPCarrierID" type="positiveInteger" minvalue="0" maxvalue="65535"/>
    <element name="NIPLinkID" type="positiveInteger" minvalue="0" maxvalue="255"/>
    <element name="NIPServiceID" type="xs:unsignedShort" minvalue="0" maxvalue="65535"/>
    <element name="BroadcastMedia" type="complexType">
      <sequence>
        <element name="URI" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
    </element>
    <element name="InteractiveApplications" type="dvbnipsd:InteractiveApplicationsType" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</complexType>
```
Table 8.4.3.2.3-1: Broadcast Media Stream Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIPNetworkID</td>
<td>If LinkLayerFormat = “GSE-Lite”, then this tag refers to interactive_network_id as specified in ETSI TS 102 606-2 [5]. Value in Decimal, between 1 and 65 280 (0xFF00). If LinkLayerFormat = “TS”, then this tag refers to original_network_id as specified in ETSI EN 300 468 [14]. Value in Decimal, between 1 and 65 280 (0xFF00). These values correspond to the original_network_id/network_id registered at DVB Services Sàrl.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NIPCarrierID</td>
<td>If LinkLayerFormat = “GSE-Lite”, then this tag refers to S2_system_id or T2_system_id as specified in ETSI TS 102 606-2 [5]. Value in Decimal, between 1 and 65 535 (0xFFFF). If LinkLayerFormat = “TS”, then this tag refers to transport_stream_id as specified in ETSI EN 300 468 [14]. Value in Decimal, between 1 and 65 535 (0xFFFF).</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NIPLinkID</td>
<td>If LinkLayerFormat = “GSE-Lite”, then this tag refers to Input Stream Identifier as specified in clauses 6.2.13.3 and 6.4.6.5 of ETSI EN 300 468 [14], respectively for DVB-S2 (ETSI EN 302 307-1 [1]) and DVB-S2X (ETSI EN 302 307-1 [1], ETSI EN 302 307-2 [2]) or plp_id as specified in clause 6.4.6.3 of ETSI EN 300 468 [14] for DVB-T2 (ETSI TS 102 755 [3]). Value in Decimal, between 0 and 255 (0xFF). For a single input stream or single plp, this tag shall be set to “0”. If LinkLayerFormat = “TS”, then this tag refers to Input Stream Identifier as specified in clause 6.2.13.3 of ETSI EN 300 468 [14], for DVB-S2 (ETSI EN 302 307-1 [1]). Value in Decimal, between 0 and 255 (0xFF). For a single input stream, this tag shall be set to “0”.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>NIPServiceID</td>
<td>If DataLinkFormat = “TS”, this tag refers to ServiceID, as specified in ETSI EN 300468 [14], of the MPE service carrying the BroadcastMedia or InteractiveApplications. Value in Decimal, between 1 and 65 535 (0xFFFF). If DataLinkFormat = “GSE-Lite”, this tag is not used and can be set to “0”.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>BroadcastMedia</td>
<td>Structure describing the URL of Services and/or Interactive Applications carried by the declared NIP Stream broadcast on the current stream.</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>
| URI                 | Any Media Content URL such as:  
- .../DVB-I_ServiceList.xml  
- .../DVB-I_ContentGuideSC.xml  
- .../Service_manifest.mpd  
- .../Service_manifest.m3u8  
- ...  
This URL shall point to the local NIP Gateway with the Local Network Domain “dvb.gw” as specified in clause 8.3.2.3.                                                                                      | Optional 0 .. ∞|
| InteractiveApplications | structure describing interactive applications parameters carried by the GSE stream.                                                                                                                   | Optional 0 .. ∞|
8.4.3.2.4 Interactive Applications signalling structure

Interactive applications signalled in a SIF are specific to operators, identified with their ProviderName, e.g: HbbTV OpApp.

Such signalling cannot be used to declare interactive applications linked to a NIP Service, as such mechanism is specified by DVB-I (ETSI TS 103 770 [9].

```
<complexType name="InteractiveApplicationsType">
  <sequence>
    <element name="ApplicationType" type="mpeg7:TextualType"/>
    <simpleType>
      <restriction base="mpeg7:TextualType">
        <enumeration value="HbbTV"/>
        <enumeration value="MHP"/>
        <enumeration value="MHEG5"/>
        <enumeration value="Proprietary"/>
      </restriction>
    </simpleType>
    <element name="ApplicationID" type="Integer"/>
    <element name="ApplicationURI" type="xs:string"/>
  </sequence>
</complexType>
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>ApplicationType</td>
<td>ApplicationType as defined in ETSI EN 300 468 [14] or any Proprietary application type.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>ApplicationID</td>
<td>Application_id as defined in ETSI EN 300 468 [14] or Proprietary application identifier.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>ApplicationURI</td>
<td>Interactive application URL. This URL shall point to the local NIP Gateway and shall be labelled the Local Network Domain as dvb.gw/</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>

8.4.3.4.5 SIF Example

The following SIF.xml example depicts a Satellite Technical Operator declaring:

- 9 broadcast streamed services over 3 NIP streams, from 3 different Providers
- 3 DVB-I Service Lists over 2 NIP Streams
- 1 DVB-I Content Guide Source
- 1 HbbTV Op App

```xml
<?xml version="1.0" encoding="utf-8"?>
  <VersionUpdate>2021-12-20T22:00:00Z</VersionUpdate>
  <NetworkType>Satellite</NetworkType>
  <NetworkName>SES</NetworkName>
  <ProviderName>SES</ProviderName>
  <BroadcastMediaStream>
    <NIPNetworkID>1</NIPNetworkID>
    <NIPCarrierID>1028</NIPCarrierID>
    <NIPLinkID>0</NIPLinkID>
    <NIPServiceID>100</NIPServiceID>
    <BroadcastMedia>
      <URI>https://dvb.gw/SES_1_ServiceList/A.xml</URI>
      <URI>https://dvb.gw/SES_1_ServiceList/B.xml</URI>
      <URI>https://dvb.gw/SES_1_ContentGuide.xml</URI>
      <URI>https://dvb.gw/SES/1/CNN_International_Europe.mpd</URI>
    </BroadcastMedia>
  </BroadcastMediaStream>
</ServiceInformationFile>
```
<ServiceInformationFile>
  <BroadcastMediaStream>
    <NIPNetworkID>1</NIPNetworkID>
    <NIPCarrierID>1021</NIPCarrierID>
    <NIPLinkID>0</NIPLinkID>
    <NIPServiceID>0</NIPServiceID>
    <BroadcastMedia>
      <URI>https://dvb.gw/ARD-digital.de/live-streaming/ARD_ServiceList.xml</URI>
      <URI>https://dvb.gw/ARD-digital.de/live-streaming/WDR_Fernsehen_Köln.mpd</URI>
      <URI>https://dvb.gw/ARD-digital.de/live-streaming/WDR_Studio_Bonn.mpd</URI>
    </BroadcastMedia>
    <InteractiveApplications>
      <ApplicationType>HbbTV</ApplicationType>
      <ApplicationId>12</ApplicationId>
      <URI>https://dvb.gw/ARD_Op_App_ait.xml</URI>
    </InteractiveApplications>
  </BroadcastMediaStream>
  <BroadcastMediaStream>
    <NIPNetworkID>133</NIPNetworkID>
    <NIPCarrierID>9</NIPCarrierID>
    <NIPLinkID>0</NIPLinkID>
    <NIPServiceID>1339</NIPServiceID>
    <BroadcastMedia>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_one.mpd</URI>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_one.m3u8</URI>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_comedy.mpd</URI>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_comedy.m3u8</URI>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_sport.mpd</URI>
      <URI>https://dvb.gw/sky.de/livestreaming/sky_sport.m3u8</URI>
    </BroadcastMedia>
  </BroadcastMediaStream>
</ServiceInformationFile>
8.5 DVB-MABR Adaptation and Signalling

8.5.1 Introduction

The present document relies on the DVB Multicast ABR specification (ETSI TS 103 769 [8]) for transporting ABR-coded Media Objects via multicast streaming over the DVB-NIP Broadcast System.

Figure 8.5.1-1, extracted from ETSI TS 103 769 [8] represents the DVB MABR simplified architecture. This clause describes a unidirectional deployment model and depicts signalling arrangements between the Multicast Server and the Multicast Gateway.

![Figure 8.5.1-1: Simplified DVB-MABR reference architecture](image)

The unidirectional deployment models defined in clauses 6.2 and 6.3 of ETSI TS 103 769 [8] are applicable to DVB-NIP.

- Clause 6.2 of ETSI TS 103 769 [8] corresponds to Deployment Model DM3 as described in clause 6.5 of the present document.
- Clause 6.3 of ETSI TS 103 769 [8] corresponds to Deployment Model DM2 as described in clause 6.4 of the present document.

Reference point A is optional meaning that the Multicast Gateway may not be able to access the Content hosting function through a bidirectional (unicast) access network. Similarly, the Content playback function may not be able to access the Content hosting function via reference A. Reference point CMR is not available in the absence of a bidirectional (unicast) access network.

8.5.2 Multicast Gateway Configuration

8.5.2.1 General

The Multicast Gateway is configured through at least one of the four methods defined in clause 10.1.2 of ETSI TS 103 769 [8]. In unidirectional NIP deployments, the Multicast Gateway configuration shall be provided through either the in-band method or the just-in-time method.

The multicast gateway configuration instance document is specified in clause 10.2.1.2 of ETSI TS 103 769 [8].
In the present document, the multicast session itself is identified by the PresentationManifestLocator URL (the URL of the manifest).

A multicast session is associated with a NIP Service that is also identified by the @serviceIdentifier attribute (clause 10.2.2 of ETSI TS 103 769 [8]) that shall correspond to the DVB-I service UniqueIdentifier as specified in clause 5.5.2. of ETSI TS 103 770 [9].

As specified in clause 7.5, the multicast gateway configuration instance document signals only information about the multicast transport sessions carried over the same NIP Stream (see clause 7.3.4).

As a consequence, as stated in clause 8.3.5 and clause 10.1.2 of ETSI TS 103 769 [8], there shall be one multicast gateway configuration transport session and one multicast gateway configuration instance document per NIP Stream.

8.5.2.2 Bootstrapping: Bootstrap Multicast Gateway Configuration Instance Document

The multicast gateway configuration instance document is transported over a specific multicast gateway configuration transport session as specified in clause 8.3.5 of ETSI TS 103 769 [8]. The characteristics of this specific transport session are declared in the “bootstrap” multicast gateway configuration instance document depicted in clause 10.2.5 of ETSI TS 103 769 [8]. This document shall be carried as part of the NIP Gateway signalling information on the Announcement Channel specified in clause 8.2 of the present document.

An example of a “bootstrap” multicast gateway configuration instance document is shown below:

```xml
<?xml version="1.0" encoding="UTF-8"?>
  <MulticastGatewayConfigurationTransportSession transportSecurity="integrityAndAuthenticity">
    <EndpointAddress>
      <NetworkSourceAddress>10.1.100.1</NetworkSourceAddress>
      <NetworkDestinationGroupAddress>232.98.1.1</NetworkDestinationGroupAddress>
      <TransportDestinationPort>9999</TransportDestinationPort>
      <MediaTransportSessionIdentifier>1</MediaTransportSessionIdentifier>
    </EndpointAddress>
    <BitRate maximum="200000"/>
  </MulticastGatewayConfigurationTransportSession>
</MulticastGatewayConfiguration>
```

8.5.3 DVB-MABR Operation and Workflow

The NIP Gateway shall instantiate a Multicast Gateway and Multicast Rendezvous Service as specified in clause 7.2 of ETSI TS 103 769 [8] and these instantiations shall be compliant with the following specification.

The NIP Gateway shall follow the mode of operation specified in clause 7.2 of ETSI TS 103 769 [8]. The following description takes precedence over the steps described in clause 7.2 of ETSI TS 103 769 [8] in case of conflicting statements.
Figure 8.5.3-1 is an adaptation of figure 7.2-1 from ETSI TS 103 769 [8] with the NIP Gateway featuring a co-located Multicast Gateway and Multicast Rendezvous Service, and the NIP Client featuring a co-located DVB-I Client and Content playback function.

The steps are as follows:

1) The Network control subfunction configures the Multicast server with the current provisioned set of multicast sessions. The Multicast server producing the multicast gateway configuration instance document shall take into account the constraints defined in clause 8.5.2 above.

2) The Multicast server acquires the presentation manifest and media segments, per the corresponding step in clause 7.2 of ETSI TS 103 769 [8].

3) The Multicast server sends the presentation manifest(s) as well as the media segments over the NIP Broadcast Network according to the multicast server configuration. Each NIP Stream conveys one multicast gateway configuration instance document describing the presentation manifests and all media segments carried on that NIP Stream.
   a. The Multicast server also sends the multicast gateway configuration instance document in a dedicated multicast gateway configuration transport session at reference point M, per the corresponding step in clause 7.2 of ETSI TS 103 769 [8].
   b. The Multicast server may send the manifest and segment initialization files over the dedicated multicast gateway configuration transport session at reference point M.

4) The Multicast gateway is active and discoverable by the NIP Client (see clause 11.1).
   a. The NIP Client may discover the NIP Gateway by means of local system discovery (see clause 11.1). It can associate the IP address and port number with the Multicast Rendezvous Service.
   b. The DVB-I Service List Entry Points and the DVB-I Service Lists shall be exposed by the NIP Gateway (see clause 8.3) and are therefore accessible by the DVB-I Client.
   c. The NIP Gateway shall be capable of handling the associations between this DVB-I Service List, the Service manifest URLs and the Service Information file (SIF) described in clause 8.4.3.
5) Once a service has been selected from the DVB-I Service List (ETSI TS 103 770 [9]) exposed by the NIP Gateway (see clause 8.3), the DVB-I Client obtains the URL of the presentation manifest listed in the selected DVB-I service instance.
   a. The presentation manifest URL shall refer to the Multicast Rendezvous Service co-located with the Multicast Gateway.
   b. The URL shall follow the following syntax (the serviceId parameter is optional).
      
      \[http[s]://<NIP Gateway host name>:<Multicast Rendezvous Service port number>://><original targeted domain name>/<manifest path>/<manifest name>[?serviceId=<DVB-I service identifier>]\]

6) The NIP Client launches the Content playback function (i.e. the media player) with the presentation manifest URL.
   a. The URL shall refer to the Multicast Rendezvous Service co-located with the Multicast Gateway.
   b. The URL may include the optional request query parameters specified in clause 7.5.1 of ETSI TS 103 769 [8].
   c. The URL may optionally include the DVB-I service identifier as an additional query parameter as specified in step 5b above. For example:
      

NOTE: The DVB-I Client may get the presentation manifest either directly from the DVB-I Service instance (NIP Service Identifier) as indicated in the previous step or by any other means.

7) The Content playback function resolves the host name (if any) of the Multicast Rendezvous Service.

NOTE: In the case where a domain name is to be resolved, it is assumed that the lookup is processed through a suitable mDNS server located in the NIP Gateway conforming to clause 11.1.3.2.

8) The Content playback function sends an HTTP(S) request to the Multicast Rendezvous Service over reference point B with the presentation manifest URL corresponding to the selected DVB-I service instance.
   a. The Multicast Rendezvous Service relies on the Service Information File (SIF: see clause 8.4) to check whether the service is provided via broadcast (the SIF and NIF tables associate the MPD URL with a NIP Stream on a physical RF Carrier).
      i. The Multicast Rendezvous Service shall compute the NIP Service Identifier from the received requested manifest URL according to the following:
         
         - Starts the URL with the received URL scheme and adds the prefix “dvb.gw”.
         - Adds the original manifest path without any parameters:
           
           \<original scheme>://dvb.gw/<original targeted domain name>/<manifest path>/<manifest name>\)

         Assuming the following received request example:
         
         “https://my.nip.dvb.gw/media.bbc.co.uk/simulcast/bbc-one/scotland/HDmanifest.mpd?serviceId=tag:bbc.co.uk:2021-12:bbc-one:scotland”, The NIP Service Identifier is composed with the path part extracted from after the third ‘/’ character without the query string parameter, and add the prefixed “dvb.gw”: https://dvb.gw/media.bbc.co.uk/simulcast/bbc-one/scotland/HDmanifest.mpd.

      ii. If there is no entry matching the NIP Service Identifier in the SIF table then the Multicast Rendezvous Service shall return 404 (Not Found).
   b. The Multicast Rendezvous Service shall check whether the NIP Gateway is tuned to the right channel.
      i. The NIP Gateway checks the Network Information File and tunes to the correct NIP Stream if necessary (i.e. not already tuned to).
   c. The Multicast Rendezvous Service may locate and read the multicast gateway configuration instance document to locate the multicast configuration entry related to the service corresponding to the NIP Service Identifier.
i. The Multicast Rendezvous Service may match the NIP Service Identifier (computed during step 8a) with the PresentationManifestLocator element attached to the multicast sessions/services.

ii. Alternatively, the Multicast Rendezvous Service may match the DVB-I Service identifier (possibly present in the received request URL (see step 5).

iii. If a match is found then the Multicast Rendezvous Service may compile a just-in-time multicast gateway configuration instance document according to clause 7.5.2.1 of ETSI TS 103 769 [8].

d. The Multicast Rendezvous Service shall redirect the request received at reference point B to reference point L of the co-located Multicast Gateway by means of an HTTP redirect if the corresponding service is present as part of the Service Information File per step 8a) and if the NIP Gateway is rightly tuned per step 8b).

i. The URL shall refer to the co-located Multicast Gateway according to clause 7.5.2.1 of ETSI TS 103 769 [8].

ii. The URL may include some of the optional fields specified in clause 7.5.2.1 of ETSI TS 103 769 [8].

https://dvb.gw:8088/B456789B5CC4FF/media.bbc.co.uk/simulcast/bbc-one/scotland/HDmanifest.mpd

iii. The URL may include the DVB-I Service identifier as a query string parameter as shown in step 5).

9) The Content playback function follows the redirect and requests the presentation manifest from the Multicast Gateway per clause 7.2 of ETSI TS 103 769 [8].

10) Void: This step is not required in the context of a DVB-NIP Broadcast System.

11) The Multicast Gateway receives the HTTP request from the Content playback function for the presentation manifest. The Multicast gateway shall check its Content storage cache and return the presentation manifest if it is present in the cache.

NOTE: The cache key used to index content in the Content storage subfunction is implementation specific. but the NIP service identifier defined below may, for example, be used for this purpose.

a. The Multicast Gateway shall internally construct a URL called the NIP Service Identifier from the presentation manifest request URL according to the following.

- Starts the URL with the received URL scheme and targeted domain name.
- Adds the original manifest path without any parameters.

<original scheme>://<original targeted domain name>/<manifest path>/<manifest name>

Assuming the received request with a session identifier (i.e. token): “https://dvb.gw:8088/#456789B5CC4FF/media.bbc.co.uk/simulcast/bbc-one/scotland/HDmanifest.mpd?serviceId= tag:btc.co.uk:2021-12:bbc-one:scotland “, the NIP Service Identifier is composed with the path part extracted from after the fourth ‘/’ character without the query string parameter: https://media.bbc.co.uk/simulcast/bbc-one/scotland/HDmanifest.mpd.

b) If the requested presentation manifest is not present in Content storage cache, the Multicast gateway shall retrieve it from the Content hosting function via unicast bidirectional access at reference point A (if present in the deployment) according to table 8.5.3-1.

c) If the requested presentation manifest file is not present in the Content storage cache, assuming the Multicast Gateway is tuned to the correct NIP Stream (see step 8.b), the Multicast gateway inspect the current multicast gateway configuration instance document to check if the NIP Gateway is already subscribed to the corresponding multicast transport sessions.

i. The Multicast Gateway may match the NIP Service Identifier (computed during step 11a) with the URL in the PresentationManifestLocator element attached with the multicast session corresponding entry.
Alternatively, the Multicast gateway may match the DVB-I Service identifier (possibly present in the received request as a query string parameter) with the DVB-I Service identifier attached with the multicast session corresponding entry.

Alternatively, the Multicast gateway reads the Multicast Gateway Configuration Instance Document dedicated to the service and received as part of the requested URL (as depicted in clause 7.5.2.1 of ETSI TS 103 769 [8]).

If a matching is successful then the Multicast gateway shall subscribe to all relevant multicast transport session(s) according to the configuration (if not already done).

NOTE: At this stage, the Multicast gateway should be receiving media files (including manifest and segments). In case that the requested objects are not yet available, the Multicast gateway has several options depending on the availability of a unicast access as expressed in table 8.5.3-1 below.

If/when no matching is possible then the service is not supposed to be delivered by multicast/broadcast. The Multicast gateway should rely on the unicast access, if existing, to downstream the manifest and possibly further related media elements.

NOTE: At this stage, the unicast access should exist because the Multicast Rendezvous Service has redirected the original request to the co-located Multicast gateway due to the presence of the corresponding service in the Service Information File (as explained in step 8d). The Multicast Gateway has several options depending on the availability of a unicast access as expressed in table 8.5.3-1.

<table>
<thead>
<tr>
<th>Not in cache AND tuned to the right channel</th>
<th>NIP Gateway Unicast available</th>
<th>NIP Gateway NO Unicast (by design or by error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multicast session configured in the multicast gateway configuration instance document.</td>
<td>The Multicast gateway forwards the request over the unicast access. If UnicastRepairParameters element (see clause 10.2.3.12 in ETSI TS 103 769 [8]) is present the URL is computed according to clause 10.2.3.13 of ETSI TS 103 769 [8]. Otherwise, the URL is &lt;original scheme&gt;://(original targeted domain name)/(optional session ID)/&lt;manifest path&gt;/&lt;manifest name&gt;</td>
<td>The Multicast gateway forwards the request over the unicast access. If UnicastRepairParameters element (see clause 10.2.3.12 in ETSI TS 103 769 [8]) is present the URL is computed according to clause 10.2.3.13 of ETSI TS 103 769 [8]. Otherwise, the URL is &lt;original scheme&gt;://(original targeted domain name)/(optional session ID)/&lt;manifest path&gt;/&lt;manifest name&gt;</td>
</tr>
<tr>
<td>Multicast session not configured in the multicast gateway configuration instance document.</td>
<td>The Multicast gateway forwards the request over reference point A. The request URL is &lt;original scheme&gt;://(original targeted domain name)/&lt;optional session ID&gt;/&lt;manifest path&gt;/&lt;manifest name&gt;</td>
<td>The Multicast rendezvous service returns error 404 (Not Found) according to clause 7.5.2.2 in ETSI TS 103 769 [8].</td>
</tr>
</tbody>
</table>

12) The Multicast gateway returns the presentation manifest back to the Content playback function via reference point L, per clause 7.2 of ETSI TS 103 769 [8].

13) The Content playback function requests a media segment (or presentation manifest) at reference point L per clause 7.2 of ETSI TS 103 769 [8].

14) The Multicast gateway receives the HTTP(S) request for a media segment. The Multicast gateway shall check its Content storage cache and return the requested media object if it is present in the cache.

NOTE: The cache key used to index content in the Content storage subfunction is implementation-specific, but the NIP Service Identifier defined in step 11a above may, for example, be used for this purpose.

a. The Multicast gateway shall internally construct the NIP Service Identifier from the media segment request URL received at reference point L in order to locate the corresponding associated multicast session configuration elements as described in clause 10.2.2 of ETSI TS 103 769 [8].

i. If the URL includes a session token then the Multicast gateway shall associate the segment request with the NIP Service Identifier corresponding to the most recent presentation manifest request at reference point L including the same session token.
ii. If the URL does not contain a session token, then the Multicast gateway shall assume the segment request path contains the related manifest request path. According to the step 11a:

\[ \text{original scheme}://\text{original targeted domain name}/\text{manifest path}/\text{segment path} \]

For example, assuming the following manifest request has been processed previously:

https://dvb.gw:8088/media.bbc.co.uk/simulcast/bbc-one/scotland/Hdmanifest.mpd

the corresponding multicast session identifier would be the following:

https://media.bbc.co.uk/simulcast/bbc-one/scotland/Hdmanifest.mpd

Further related segment requests over reference point L shall correspond to the following:

https://dvb.gw:8088/media.bbc.co.uk/simulcast/bbc-one/scotland/<segment path>

For example:

https://dvb.gw:8088/media.bbc.co.uk/simulcast/bbc-one/scotland/segment/HD/237.m4s

b. If the requested media segment is not in cache, the Multicast gateway shall retrieve it from the Content hosting function via unicast bidirectional access at reference point A (if present in the deployment) according to table 8.5.3-2.

Table 8.5.3-2: Media segment processing options

<table>
<thead>
<tr>
<th>Not in cache</th>
<th>NIP Gateway Unicast available</th>
<th>NIP Gateway No Unicast (by design or by error)</th>
<th>NIP Client No Unicast</th>
<th>NIP Client Unicast available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multicast session configured in the multicast gateway configuration instance document.</td>
<td>The Multicast gateway forwards the request over the unicast access. If UnicastRepairParameters element (see clause 10.2.3.12 in ETSI TS 103 769 [8]) is present the URL is computed according to clause 10.2.3.13 of ETSI TS 103 769 [8]. Otherwise, the URL is &lt;original scheme&gt;://&lt;original targeted domain name&gt;/&lt;optional session ID&gt;/&lt;manifest path&gt;/&lt;manifest name&gt;</td>
<td>The Multicast gateway waits an implementation-specific time period for the media segment to be received and cached, and returns error 404 (Not Found) if the waiting period expires.</td>
<td>The Multicast gateway forwards the request over the unicast access.</td>
<td>The Multicast gateway waits an implementation-specific time period for the media segment to be received and cached, and returns error 404 (Not Found) if the waiting period expires.</td>
</tr>
<tr>
<td></td>
<td>The Multicast gateway forwards the request over reference point A. The request URL is &lt;original scheme&gt;://&lt;original targeted domain name&gt;/&lt;optional session ID&gt;/&lt;manifest path if no Session ID&gt;/&lt;segment path&gt;/&lt;segment name&gt;</td>
<td>The Multicast gateway forwards the request over reference point A. The request URL is &lt;original scheme&gt;://&lt;original targeted domain name&gt;/&lt;optional session ID&gt;/&lt;manifest path if no Session ID&gt;/&lt;segment path&gt;/&lt;segment name&gt;</td>
<td>The Multicast gateway forwards error 404 (Not Found).</td>
<td>The Multicast gateway forwards error 404 (Not Found).</td>
</tr>
</tbody>
</table>

i. If the requested media segment is not present in the Content storage cache, the Multicast gateway shall match the NIP session identifier (computed during step 14a) with the URL in the PresentationManifestLocator element of a multicast session declared in the current multicast gateway configuration.

ii. Alternatively, the Multicast gateway may match the DVB-I Service identifier (if present in the received media segment request as a query string parameter) with the @serviceIdentifier attribute of a multicast session in the current multicast gateway configuration.

iii. If matching is successful, the Multicast gateway shall subscribe to all relevant multicast transport session(s) declared by the matched multicast session (if this is not already the case).
NOTE: At this stage, the Multicast gateway should be receiving media objects (including the presentation manifest and media segments). However, it may take time to populate the Asset storage cache due to acquisition latency. The Multicast gateway has several options depending on the availability of unicast access to a Content hosting function via reference point A, as expressed in table 8.5.3-2 above.

iv. If/when no matching is possible then the service is not delivered by multicast/broadcast. The Multicast gateway should rely on the unicast access at reference point A (if available in the deployment) to acquire the requested media segments.

NOTE: At this stage, the unicast access exists because the Multicast rendezvous service has redirected the original request to the co-located Multicast gateway due to the presence of the corresponding service in the Service Information File (as explained in step 8). The Multicast gateway has several options depending on the availability of unicast access, as expressed in table 8.5.3-2.

8.6 Network Time Information

8.6.1 Broadcast Rules and Format

Network Time Information shall be delivered as an XML file in Announcement Channel packets with file_id set to “0x50” according to clause 8.2.3. Network system information shall be present in every NIP stream (Single Input stream, Multiple Input Streams/PLPs).

Time shall be formatted according to EN ISO 8601 [23]. Network Time Information includes UTC time, all possible offsets and datet ime saving flags.

8.6.2 Network Time Information file

8.6.2.1 NTI Schema Declaration

```xml
  xmlns:dvbisd="urn:dvb:metadata:servicediscovery:2022">
  <import namespace="urn:tva:mpeg7:2008" schemaLocation="tva_mpeg7.xsd"/>
  <element name="NetworkTimeInformationFile" type="dvbnipsd:NetworkTimeInformationFileType"/>
</schema>
```

8.6.2.2 NetworkTimeInformationType

```xml
<complexType name="NetworkTimeInformationType">
  <Sequence>
    <element name="UTC_Time" type="dvbisd:ZuluTimeType"/>
    <element name="Local_Time_Offset" type="dvbnipsd:Local_Time_OffsetType" minOccurs="0"/>
  </Sequence>
</complexType>
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC_Time</td>
<td>UTC time formatted in Zulu Time Format</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Local_Time_Offset</td>
<td>Structure describing Local Time Offsets</td>
<td>Optional</td>
</tr>
</tbody>
</table>

8.6.2.3 Local_Time_OffsetType

```xml
<complexType name="Local_Time_OffsetType">
  <element name="country_code" type="mpeg7:TextualType" lengthvalue="3"/>
  <element name="country_region_Id" type="integer" minOccurs="0" minvalue="1" maxvalue="63"/>
  <element name="local_time_offset_polarity" type="boolean"/>
  <element name="local_time_offset_value" type="positiveInteger" minOccurs="0" maxvalue="43119"/>
  <element name="time_of_change" type="dvbisd:ZuluTimeType" minOccurs="0"/>
  <element name="next_time_offset_value" type="integer" minOccurs="0"/>
</complexType>
```
Table 8.6.2-1: Network Time Information Fields

<table>
<thead>
<tr>
<th>Name</th>
<th>Semantic Definition</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>country_code</td>
<td>As specified in local_time_offset_descriptor in clause 6.2.20 of ETSI EN 300 468 [14]</td>
<td>Mandatory</td>
</tr>
<tr>
<td>country_region_Id</td>
<td>As specified in local_time_offset_descriptor in clause 6.2.20 of ETSI EN 300 468 [14]</td>
<td>Optional</td>
</tr>
<tr>
<td>local_time_offset_polarity</td>
<td>As specified in local_time_offset_descriptor in clause 6.2.20 of ETSI EN 300 468 [14]</td>
<td>Mandatory</td>
</tr>
<tr>
<td>local_time_offset_value</td>
<td>Contains offset time from UTC time in seconds.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>time_of_change</td>
<td>UTC time of change, if applicable, formatted in Zulu Time Format.</td>
<td>Optional</td>
</tr>
<tr>
<td>next_time_offset_value</td>
<td>Contains next offset time from UTC time in seconds.</td>
<td>Optional</td>
</tr>
</tbody>
</table>

8.6.2.4 NTI Example

```xml
<?xml version="1.0" encoding="UTF-8"?>
  <UTC_Time>2021-11-22T14:00:00Z</UTC_Time>
  <Local_time_offset>
    <country_code>FRA</country_code>
    <local_time_offset_polarity>0</local_time_offset_polarity>
    <local_time_offset_value>3600</local_time_offset_value>
    <time_of_change>2022-03-26T03:00:00Z</time_of_change>
    <next_time_offset_value>7200</next_time_offset_value>
  </Local_time_offset>
</NetworkTimeInformation>
```

8.6.3 Network Time Synchronization

To ensure a consistent end-user experience, all head-end functions shall be synchronized via NTP or PTP servers with an accuracy to within 500ms of UTC.

9 Application and Presentation Layer

9.1 Audio and Video Coding Standards

DVB-NIP only requires a single mandatory system format for the carriage of audio-visual presentations: MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks ETSI TS 103 285 [11].

Audio Video Coding and Packaging for Native IP Adaptive Bit Rate applications shall be according to ETSI TS 103 285 [11].

9.2 Captions and Subtitles

NIP Clients shall be able to correctly render TTML based subtitles according to clause 7 of DVB-DASH (ETSI TS 103 285 [11]).

9.3 Time Shifting

Timeshifting for connected receivers shall be according to ETSI TS 103 285 [11].

Timeshifting for unconnected receivers is outside the scope of the present document.

9.4 Service Usage Reporting

Service Usage Reporting for connected receivers shall be according to clauses 5.3.6.1, 5.3.8.4, 10.2.2.3 and 11 of ETSI TS 103 769 [8]. Service Usage Reporting for unconnected receivers is outside the scope of the present document.
10 Content Protection

10.1 Introduction

Content protection signalling shall be according to clause 8.4 of ETSI TS 103 285 [11]. DVB NIP does not specify a full end-to-end content protection system (DRM).

DVB NIP re-uses the content protection principles set out by DVB-DASH [11]. Such principles are the usage of specific parameters that are defined within the MPEG DASH ISO/IEC 23009-1 [i.1] MPD and within the ISO Common Encryption “CENC” (ISO/IEC 23001-7 [i.2]). This enables multiple DRMs to protect the content, sharing information (such as KeyIDs and ivs), and then using an opaque container for each DRM to carry DRM specific data (such as licence or licence acquisition information).

The protection of content is optional in DVB NIP but if used, it shall be in accordance with clause 8 of DVB-DASH [11].

10.2 Connected Receivers

In the case of DVB-I Clients connected to a NIP Gateway and/or to an IP network via broadband, the DVB-I Client secure player shall comply to content protection mechanisms as specified in DVB-DASH ETSI TS 103 285 [11].

10.3 Unconnected Receivers

The signalling and the carriage of secure key assets and processes in a non-IP connected environment will be specified in a subsequent version of the present document.

11 Deployment Specific Protocols

11.1 NIP Gateway Announcement and Discovery Protocols

11.1.1 Introduction

Consumer NIP Gateways according to DM3 shall support at least two network device discovery and announcement protocols:

- UPnP/SSDP according to the DVB-HB specification (DVB Document A179 [13]) as described in clause 11.1.2 and
- DNS-SD/mDNS as described under clause 11.1.3

Additionally, optional HTTP-based or implementation-specific network device discovery and announcement protocols (see clause 11.1.4) may be supported as well.

This guarantees that network clients can easily discover the presence of a NIP Gateway on the local network and discover the services provided by the NIP Gateway.

NIP clients shall support at least a single Network Device Announcement and Discovery Protocol as specified under clauses 11.1.2 or 11.1.3.

11.1.2 UPnP SSDP

The NIP Gateway shall support the discovery mechanism based on Universal Plug and Play (UPnP) according to DVB Document A179 [13], clause 6.3.2.

The NIP Client may support the discovery mechanism based on Universal Plug and Play (UPnP) according to DVB Document A179 [13], clause 6.3.2.
11.1.3 mDNS/DNS-SD

The NIP Gateway shall support the discovery mechanism based on multicast DNS, as defined in IETF RFC 6762 [17] and DNS Service Discovery (DNS-SD) as defined in IETF RFC 6763 [18], according to the following:

The NIP Gateway service shall be registered. At least three DNS records are created: a service (SRV) record, a pointer (PTR) record, and a text (TXT) record.

The NIP Client may support the NIP Gateway discovery based on mDNS/DNS-SD and according to IETF RFC 6762 [17] and IETF RFC 6763 [18] respectively taking into account the information exposed in the DNS records as described further in the section.

11.1.3.1 Service record (SRV)

The service record has the following structure.

\[
<\text{Instance Name}.>.<\text{Service Type}.>.<\text{Domain}> \quad \text{TTL} \quad \text{IN} \quad \text{SRV} \quad 0 \quad 0 \quad <\text{transport port}> \quad <\text{host name or IP address}>
\]

It associates a service name with the host name and the port number allowing a terminal to discover the NIP Gateway service. The service name is structured according to the following.

\[
<\text{Instance Name}>.\quad <\text{Service Type}>.\quad <\text{Domain}>
\]

<Instance Name> may be up to 63 bytes. It shall be set to “dvb:nip:gw:” followed by the MAC address of the LAN interface in colon-hexadecimal notation.

<Service Type> is a standard IP protocol name and a transport protocol both prefixed with the underscore ‘_’ character. The NIP Gateway shall use the following Service Type: “_http._tcp”

<Domain> shall be set to “local.”

The following example is a NIP Gateway service record:

\[
\]

11.1.3.2 Pointer record (PTR)

The pointer record gathers the type of service and the list of names corresponding to that service.

\[
<\text{Service Type}>.\quad <\text{Domain}> \quad \text{TTL} \quad \text{PTR} \quad <\text{Instance Name}>.\quad <\text{Service Type}>.\quad <\text{Domain}>
\]

The following example is a NIP Gateway PTR record.

\[
\]

11.1.3.3 Text record (TXT)

The text record shall be formatted according to DNS-SD: RFC 6763 [18] and the following.
The version field is optional. The Service list entry point shall correspond to the extended Service List Entry Point .xml file exposed by the NIP Gateway as explained in clause 11.1.

The following example is a NIP Gateway text record.

```
```

### 11.1.4 HTTP-based or implementation-specific

NIP Gateway announcement and discovery may support one or more discovery mechanisms based on HTTP or implementation-specific according to clauses 6.3.3 and 6.3.4 of DVB Document A179 [13].

The terminal may support one or more discovery mechanisms based on HTTP or implementation-specific according to clauses 6.3.3 and 6.3.4 of DVB Document A179 [13].

### 11.1.5 Information exposed by the NIP Gateway

As a result of the discovery process, the NIP Gateway shall expose basic information about itself in the form of an extended Service List Entry Point .xml file according to DVB Document A179 [13], clauses 9.3 and 7.2.

The NIP Gateway shall expose in element `ServiceListEntryPoints.ProviderOffering` the local URLs to the offered DVB-I Service Lists.

NOTE: The offered DVB-I Service Lists may be a copy of those received via the broadcast channel in the DVB-I Service List Entry Points table, or the NIP Gateway may manipulate them according to the actual receiving installation constraints.

The NIP Gateway shall implement Service List Registry (SLR) capability, enabling server-side filtering of the DVB-I Service Lists to be presented to clients. NIP Gateways implementing SLR capabilities shall expose the URL of the local SLR server in element `ServiceListEntryPoints.ServiceListRegistryEntity.Address.ElectronicAddress.Url`, which shall respond to queries according to clause 5.1.3.2 of ETSI 103 770 [9].

An example of a Service List Entry Point published by a NIP Gateway is shown in listing 11.1.5-1.

**Listing 11.1.5-1: Example of Service List Entry Points published by a NIP Gateway**

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE xml>
<!Example of ServiceListEntryPoint published by a NIP Gateway []>
<ServiceListRegistryEntity>
  <Name>NIP Gateway Service List Registry</Name>
  <ElectronicAddress>
  </ElectronicAddress>
  <Address>
    <ElectronicAddress>
    </ElectronicAddress>
  </Address>
</ServiceListRegistryEntity>
<ProviderOffering>
  <Provider>
    <Name>Provider A</Name>
  </Provider>
  <ServiceListOffering>
    <ServiceListName>Service List A1</ServiceListName>
    <ServiceListURI contentType="application/xml">
    </ServiceListURI>
  </ServiceListOffering>
</Provider>
<Provider>
  <Name>Provider B</Name>
</Provider>
<Provider>
  <Name>Provider C</Name>
</Provider>
<ServiceListEntryPoints>
  <ServiceListName>Service List A2</ServiceListName>
  <ServiceListURI contentType="application/xml">
  </ServiceListURI>
</ServiceListEntryPoints>
</ServiceListEntryPoints>
```
11.2 Professional Edge Cache Receiver Configuration

11.2.1 Control API

A REST Control API for professional Edge Cache Receivers will be provided in a subsequent version of this document.
Annex A (normative):
Transport Stream based carriage

A.1 Introduction

Receivers deployed with hardware that cannot be upgraded to the use of GSE-Lite according to ETSI TS 102 606-1 [4] may nevertheless support DVB Native IP transmissions with adapted software. In such deployments, the data link layer protocol to be used shall be Multi-Protocol Encapsulation (MPE) as specified in ETSI EN 301 192 7 [7] and based on data section transport using Transport Stream Packets according to ISO/IEC 13818-1 [15].

A.2 Multi-Protocol Encapsulation (MPE)

Using Multi-Protocol Encapsulation, IP datagrams are encapsulated in datagram_sections that are mapped into Transport Stream packets as defined in MPEG-2 systems ISO/IEC 13818-1 [15]. MPE datagram sections are specified in clause 7 of ETSI EN 301 192 7 [7]. The LLC-SNAP_flag in Table 3 of clause 7 of ETSI EN 301 192 7 [7] shall be set to “0”.

In DVB-NIP, MPE datagram sections are carried as part of a DVB defined Service within a Transport Stream. MPE sections are identified through their table_id in the section header (set to “0x3E”) and their stream_type 0x0D in the PMT. A given service shall carry not more than one MPE stream. However within a transport stream multiple services, each carrying an MPE stream may coexist.

Services carrying MPE shall be identified in their TS as specified in ETSI EN 301 192 7 [7] and ETSI EN 300 468 [14]. At NIP level MPE services shall be described in the SIF table via their service_id, transport_stream_id and network_id.

All NIP Stream related features specified in the current document equally apply between GSE-Lite and MPE Streams with a single exception: IP ROHC according to clause 7.4 shall not be applied when carrying IP datagrams within MPE Streams.

A.3 MPE Signalling

A.3.1 In the Network Information File

Signalling mechanisms described under clause 8 of the present document shall also apply for Streams carried using MPE. In particular the use of MPE for the transport of all or some of the Streams part of DVB-NIP platforms shall be indicated in the Network Information File (NIF) <LinkLayerFormat> element carried as part of the NIP Announcement Channel.

A 3.2 Linkage descriptor in a Transport Stream NIT or BAT

NIP receivers supporting MPE may locate the presence of a NIP platform by following the linkage descriptor specified under this clause. Such linkage descriptor may be provided in the NIT of a TS based network in order to facilitate access to a NIP platform, where the bootstrap streams of a certain provider platform cannot be located through other means. This descriptor shall be carried in the first loop of the NIT or BAT. Several instances of this descriptor may be present on a given network linking to different Operators. If the same descriptor for the same provider_name appears in both the NIT and BAT, the BAT takes precedence.

An MPE based NIP receiver shall follow the provider name linkage for which it was designed or present to the user a choice of available provider names. At the end of the process a NIP compliant MPE based receiver shall tune to the Transport Stream and service_id indicated in the corresponding linkage_descriptor and that carries the Bootstrap Stream information as part of its Announcement Channel (clause 8.1.5).
Table A3.2-1 defines a User Defined Linkage Descriptor pointing from a NIT or BAT to the Bootstrap Stream of a NIP platform provider_name.

### Table A3.2-1: Syntax for the linkage descriptor of type 0x21

<table>
<thead>
<tr>
<th>Syntax</th>
<th>No. of bits</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>linkage_descriptor() {</td>
<td></td>
<td></td>
</tr>
<tr>
<td>descriptor_tag</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>descriptor_length</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>transport_stream_id</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>original_network_id</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>service_id</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>linkage_type</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>if (linkage_type == 0x21) {</td>
<td></td>
<td></td>
</tr>
<tr>
<td>provider_name_length</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>for (i=0; i&lt;provider_name_length; i++) {</td>
<td></td>
<td></td>
</tr>
<tr>
<td>text_char</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BootstrapType</td>
<td>1</td>
<td>bslbf</td>
</tr>
<tr>
<td>reserved_zero_future_use</td>
<td>7</td>
<td>uimsbf</td>
</tr>
<tr>
<td>for (j=0; j&lt;N; j++) {</td>
<td></td>
<td></td>
</tr>
<tr>
<td>private_data_byte</td>
<td>8</td>
<td>uimsbf</td>
</tr>
<tr>
<td>}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Semantics of the private data bytes for linkage type 0x21:

- **transport_stream_id**: This is a 16-bit field which identifies the TS containing the NIP Bootstrap Stream.

- **original_network_id**: This 16-bit field gives the label identifying the network_id of the originating delivery system of the transport stream carrying the NIP Bootstrap Stream.

- **service_id**: This is a 16-bit field which identifies the service containing the NIP Bootstrap Stream.

- **linkage_type**: This is an 8-bit field specifying the type of linkage, and shall be set to 0x21.

- **provider_name_length**: This 8-bit field specifies the total length in bytes of the following provider_name.

- **text_char**: This is an 8-bit field. A string "text_char" fields specifies the platform name as described above. Text information is coded using the character sets and methods described in annex A of ETSI EN 300 468 [14].

- **BootstrapType**: This 1-bit field indicates the scope of the NIF carried by the declared Bootstrap Stream. A value “0” indicates that the NIF describes the complete physical broadcast network from a “Technical Operator”. A value “1” indicates that the NIF describes streams from a “Commercial Operator” carrying content for a specific Bouquet, as defined in ETSI EN 300 468 [14].

- **private_data_byte**: This is an 8-bit field, the value of which is privately defined.

### A.4 Simultaneous GSE-Lite and MPE operation

Operation with some streams being carried via MPE using DVB-S2 according to clause 7.2.3 and others via GSE-Lite using DVB-S2X according to clause 7.2.2 may be supported as part of some NIP deployments.
Annex B (informative):
Sequence Diagram

DVB BlueBook A180 (February 2022)
Annex C (informative):
System Operation and Implementation Guidelines

C.1 Introduction

This chapter provides informative recommendations to Operators and Manufacturers in order to help optimize the implementation of end-to-end NIP deployments. In particular this chapter provides best practices for broadcasters and for manufacturers developing NIP Gateways designed for horizontal or vertical markets defined as:

- **Horizontal Markets** describe those NIP deployments which are not linked to any specific Commercial Operator. Such deployments rely on standardised receivers which are distributed through open retail channels and are capable of receiving any compliant broadcast signal.

- **Vertical Markets** describe deployments in relation to a particular Commercial Operator.

C.2 Horizontal versus vertical market deployments

A NIP Gateway designed for Horizontal Markets should provide access to any broadcast network, independently of any proprietary features related to any specific Commercial Operator.

Such NIP Gateways will target, as a preference, Bootstrap Streams tagged with BootstrapType value = “Physical Network”.

This should not preclude any DVB-I Client connected to such NIP Gateway to access a Commercial Operator or an Aggregator Bootstrap Stream, present on the Broadcast Network, as described hereafter under clause C.4.2.

A NIP Gateway designed for a particular Vertical Market may integrate proprietary features and specific Bootstrap Stream(s) presets.

C.3 Recommendations to content originators

As specified in clause 8.3.2, Broadcast Service List Entry Points should reflect Broadcast Service Lists as proposed on the current Broadcast Network.

DVB-I Service Lists carried over the Broadcast Network should be optimized for that network.

As specified in clause 8.3.1, all representations of a given Service and declared in the service MPD are present on the current Broadcast Stream or available via broadband. Therefore, the service manifest should be designed on purpose for the actual broadcast network.

C.4 Recommendations to NIP Gateway manufacturers

C.4.1 Discovery of Bootstrap Streams

NIP Gateways should integrate a list of pre-stored settings of Bootstrap Streams – In the case of Horizontal Market Gateways, those are the Bootstrap Streams provided by Technical Network Operators and in the case of Vertical Markets those are the Bootstrap Stream(s) provided by the Commercial Operator or Aggregator.

In the event of obsolete pre-stored settings – see clause 8.1.4.1, there should be a fallback method based on physical scanning of the broadcast network. For each frequency locked, the receiver should attempt to tune to and parse the Announcement Channel for NIF, SIF and DVB-I Service List Entry Points.

- **Horizontal Market** receivers should target the NIF, SIF and co-located DVB-I Service List Entry Points searching for Bootstrap Streams tagged with BootstrapType value = “Physical Network”.

- **Gateways** designed for Vertical Market Operators identified by their ProviderName should target the NIF, SIF and co-located DVB-I Service List Entry Points searching for Bootstrap Streams tagged with BootstrapType value = “Commercial Operator”.

DVB BlueBook A180 (February 2022)
C.4.2 Switching between Provider Bootstrap Streams

A NIP Gateway designed for horizontal markets and installed thanks to the Physical Network Bootstrap Stream, should still be capable of providing access to any Bootstrap Stream of any Commercial Operator or Aggregator, present on the current Broadcast Network, if requested by a DVB-I Client.

It is indeed possible, as specified in ETSI TS 103 770 [9] that a DVB-I client during the discovery phase queries a DVB-I service list for a particular ProviderName.

The NIP Gateway should then parse the NIF, searching for a Bootstrap Stream declared for that particular ProviderName and subsequently tune to this Bootstrap Stream. The NIP Gateway should download NIF, SIF and DVB-I Service List Entry Points for that Provider. The rest of the process remains identical as nominal one.

The flexibility described here requires that the Commercial Operator or Aggregator provides up-to-date Bootstrap Stream parameters to the Technical Network Operator.

C.4.3 Caching of Signalling Information

DVB-NIP signalling relies on the download and parsing of multiple files to discover the broadcast network topology. Some of these files are only broadcast on the dedicated bootstrap streams. In order to optimize the end-user experience it is recommended that NIP Gateways cache the following files and perform regular update checks:

- NIF.
- SIF.
- Service List Entry Points.

And for each NIP Stream, the corresponding Multicast Gateway Configuration Instance Document.

In order to propose a maximum amount of content to End-Users, a NIP Gateway should concatenate cached DVB-I Service List Entry Points.

C.5 Support of MPEG/PES based services

C.5.1 DVB-I Service List signalling

The broadcast DVB-I Service Lists may also include signalling of services provided by a DVB TS-broadcast head-end, by indicating the relevant DVBSDeliveryParameters or DVBTDeliveryParameters elements according to ETSI TS 103 770 [9].

C.5.2 Integrated Native IP TVs (DM2)

Support of MPEG/PES based services is feasible for any Integrated Native IP TV featuring an MPEG demultiplexer and Audio-Video decoder.

C.5.3 Home Gateway + IP Clients (DM3)

Support of MPEG/PES based services is feasible for NIP Gateways implementing DVB-HB Profile B according to DVB document A179 [13].
Annex D (informative): Amendments to existing DVB specifications

The following specifications will need amendments for the implementation of DVB-NIP:

<table>
<thead>
<tr>
<th>Specification, Reference and Version</th>
<th>Clause</th>
<th>Amendment</th>
</tr>
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<tbody>
<tr>
<td>DVB-S2X ETSI EN 302 307-1 [1] V1.3.1 (2021-07)</td>
<td>5.1.7</td>
<td>UPs can be sliced except if ISSY is active.</td>
</tr>
<tr>
<td>DVB-GSE Part 1 ETSI TS 102 606-1 [4] V1.2.1 (2014-07)</td>
<td>Annex D.2.2</td>
<td>Remove following paragraph: “For maximum efficiency and to provide a simple receiver mode where PDU fragmentation is not necessary, it is required that when HEM (High Efficiency Mode) is used on the physical layer, the maximum number of concurrent GSE fragments is 1, which means that PDU fragmentation is not performed on the GSE layer. In this case it is expected that physical layer slicing will be performed as necessary.”</td>
</tr>
<tr>
<td>DVB-GSE Part 2 ETSI TS 102 606-2 [5] V1.2.1 (2016-12)</td>
<td>5.1 5.2.1 5.2.2.10 5.2.2.15 5.2.2.16 5.2.2.17 Annex A.3 Annex A.4.3 (Figure A.8)</td>
<td>Record Structures Descriptor Identification and Location Modified Descriptor: ROHC-U descriptor Additional Descriptors: IP multicast list descriptor IPv6 multicast list descriptor ROHC-U multicast descriptor Underlying data model Example of multicast transport</td>
</tr>
<tr>
<td>DVB-SI ETSI EN 300 468 [14] V1.16.1 (2019-06)</td>
<td>Figure 60 clause 6.2.19</td>
<td>Add linkage_type 0x21 pointing towards a DVB-NIP bootstrap stream.</td>
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Annex E (informative):
Change History

<table>
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<tr>
<th>Date</th>
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<th>Information about changes</th>
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<tbody>
<tr>
<td>February 2022</td>
<td>A180</td>
<td>First BlueBook publication</td>
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