SLOVENSKI STANDARD
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Komunikacijski protokol za signale, poslane transportnemu satelitu po IP-omrežjih

Communications protocol to transport satellite delivered signals over IP networks

Kommmunikationsprotokoll zum Transport von Satellitensignalen über IP-Netze

Protocole de communication pour le transport des signaux transmis par satellite sur les réseaux IP

Ta slovenski standard je istoveten z: **EN 50585:2014**

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Foreword

This document (EN 50585:2014) has been prepared by CLC/TC 209 "Cable networks for television signals, sound signals and interactive services".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-03-24
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2017-03-24

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Introduction

This standard describes a new communication protocol for the distribution of satellite signals onto IP networks. It effectively “translates” TV signals, received from satellites in the DVB-S and DVB-S2 formats and supplied in the first intermediate frequency range (1st IF range), into signals for use on internet-based devices in the IP world. This technology enables the reception of satellite TV on devices that do not have an integrated satellite receiver. Satellite signals can thus be transported via every IP infrastructure with or without cable.

This way, the entire satellite household can be provided with TV and sound radio programmes on tablets, PCs, laptops, smart phones, connected TVs, game consoles and media players.

This technology concept is commonly referred to as **SAT>IP** [1)].

1) **SAT>IP** is a short-term which covers the complete system for the transposition of SAT-IF signals to IP-based signals. This term is used in a widespread manner for marking software and hardware components used in such systems. More details are given in informative Annex E.

1 Scope

This European Standard describes the SAT>IP communication protocol. It enables a SAT>IP server to forward satellite delivered signals to SAT>IP clients over IP networks. The typical use case would be the transport of television programs that were received from the satellite by the SAT>IP server to the SAT>IP client via the IP network. SAT>IP specifies a control protocol as well as the media transport (Figure 1).

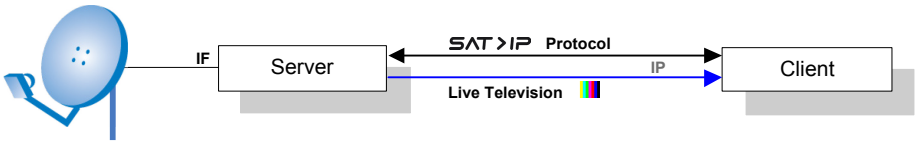

Figure 1 — Basic principle of the SAT>IP system

SAT>IP is **not** a device specification.

The SAT>IP protocol distinguishes between SAT>IP clients and SAT>IP servers.

SAT>IP Clients

SAT>IP clients may reside in set-top boxes equipped with an IP interface or may be implemented as software applications running on programmable hardware such as Tablets, PCs, Smartphones, Connected Televisions.

SAT>IP Servers

SAT>IP servers may take various forms ranging from large MDU headends servicing whole buildings or communities to in-home IP multiswitches to simple IP adapters for a set-top box to, ultimately, IP LNBs.

Actual devices may be clients or servers or both depending on their feature set.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 29341-1-1, *Information technology — UPnP Device Architecture — Part 1.1: UPnP Device Architecture Version 1.1*

ETSI TS 101 154 V1.9.1, Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream

RFC 2113 – IP Router Alert Option (Internet Engineering Task Force (IETF))

RFC 2131 – DHCP (Dynamic Host Configuration Protocol) (Internet Engineering Task Force (IETF))

RFC 2250 – RTP Payload Format for MPEG1/MPEG2 Video (Internet Engineering Task Force (IETF))

RFC 2279 – UTF-8, a transformation format of ISO 10646 (Internet Engineering Task Force (IETF))

RFC 2326 – Real Time Streaming Protocol (RTSP) (Internet Engineering Task Force (IETF))

RFC 3376 – Internet Group Management Protocol, Version 3 (Internet Engineering Task Force (IETF))

RFC 3550 – RTP: A Transport Protocol for Real-Time Applications (Internet Engineering Task Force (IETF))

RFC 4566 – SDP: Session Description Protocol (Internet Engineering Task Force (IETF))

draft-cai-ssdp-v1-03 – Simple Service Discovery Protocol/1.0 (Internet Engineering Task Force (IETF))

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
dynamic server operation
server that is dynamically connected to a tuner when a TV program is requested in the IP format by a user

3.1.2
live television
delivered from signal source to end-user equipment without significant delay but with the possibility of (several) changes of transmission format

3.1.3
multicast data transmission
unique transmission of data signals from one server to more than one client

3.1.4
multiswitch server
server that is connected to a number of tuners in order to deliver channels requested by customers

3.1.5
SAT>IP
short-term which covers the complete system for the transposition of SAT-IF signals to IP-based signals

Note 1 to entry: This term is used in a widespread manner for marking software and hardware components used in such systems.

3.1.6
SAT>IP client
receive satellite delivered signals from SAT>IP server via IP networks; which may reside in set-top boxes equipped with an IP interface or may be implemented as software applications running on programmable hardware such as tablets, PCs, smartphones, connected televisions

3.1.7
SAT>IP server
transforms satellite signals, delivered in the SAT-IF format, to the IP format and transport it to SAT>IP clients via IP networks; which may take various forms ranging from large MDU headends servicing whole buildings or communities to in-home IP multiswitches to simple IP adapters for a set-top box to, ultimately, IP LNBs

3.1.8
static server operation
server that is always connected to a number of tuners to provide the wanted TV programs in the IP format

3.1.9
unicast data transmission
data signal transmission from one server to only one client

3.2 Abbreviations

CSV	Comma Separated Values
DHCP	Dynamic Host Configuration Protocol
DiSEqC	Digital Satellite Equipment Control
DLNA	Digital Living Network Alliance
DSL	Digital Subscriber Line
DVB	Digital Video Broadcasting
DVB-S	DVB for Satellite
DVB-S2	2nd generation DVB for satellite
DVR	Digital Video Recorder
FEC	Forward Error Correction
GENA	General Event Notification Architecture
HTML	HyperText Markup Language
HTTP	Hyper Text Transfer Protocol
HSPA	High Speed Packet Access
IF	Intermediate Frequency
IGMP	Internet Group Management Protocol
IP	Internet Protocol
LAN	Local Area Network
LNB	Low Noise Block
MDU	Multi Dwelling Unit
MIME	Multipurpose Internet Mail Extensions
MPEG	Moving Picture Experts Group
MPTS	Multiple Program Transport Stream
MTU	Maximum Transmission Unit
MUDP	Multicast UDP
NAS	Network Attached Storage
PID	Packet Identifier
PLC	Power Line Communication
PoE	Power over Ethernet
PSK	Phase Shift Keying
PVR	Personal Video Recorder
QPSK	Quaternary Phase Shift Keying
RFC	Request For Comments
RTP	Real-time Transport Protocol
RTCP	Real-time Transport Control Protocol
RTSP	Real Time Streaming Protocol
SDES	Source Description

SDP	Session Description Protocol
SI	Service Information
SMATV	Satellite Master Antenna Television
SOAP	Simple Object Access Protocol
SPTS	Single Program Transport Stream
SR	Sender Report
SSDP	Simple Service Discovery Protocol
STB	Set-Top-Box
TCP	Transport Control Protocol
TS	Transport Stream
TTL, ttl	Time to live
UDP	User Datagram Protocol
UPnP	Universal Plug and Play
UPnP AV	UPnP Audio and Video
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
urn	universal resource name
UTF	UCS Transformation Format
WLAN	Wireless Local Area Network
XML	Extensible Markup Language

4 Basic description of SAT>IP system

4.1 SAT>IP concept

Unlike in today's satellite distribution schemes, the SAT>IP architecture allows the reception of satellite television programs also on devices which do not have a satellite tuner directly built-in. Satellite tuners and demodulators are moved or "remoted" into SAT>IP server devices. Clients control SAT>IP servers via the SAT>IP protocol. SAT>IP is a remote tuner control protocol which provides the possibility of remotely controlling tuning devices.

This means that the reception of satellite delivered programming can be dealt with by clients purely in software, provided a SAT>IP server is available on a network. Satellite programs become available on devices which would never be capable of supporting satellite TV otherwise e.g. Tablets.

From the distribution point of view, satellite distribution becomes physical layer agnostic and satellite services can be forwarded over all the latest types of wired or wireless technologies such as Powerline (PLC), Wireless LANs, Optical Fibre Distribution, etc.

4.2 Network topology

The SAT>IP protocol is designed to suit different application scenarios. The same SAT>IP client can communicate with various types of live media servers ranging from single satellite, single tuner servers to multi-satellite multi-tuner servers (Figure 2). SAT>IP clients can be designed to work in single home scenarios as well as in SMATV or large community systems.

The number of clients that can be simultaneously supported depends on the particular server implementation. Large servers can potentially serve an unlimited number of SAT>IP clients. SAT>IP servers can also be stacked and run in parallel on the same network.

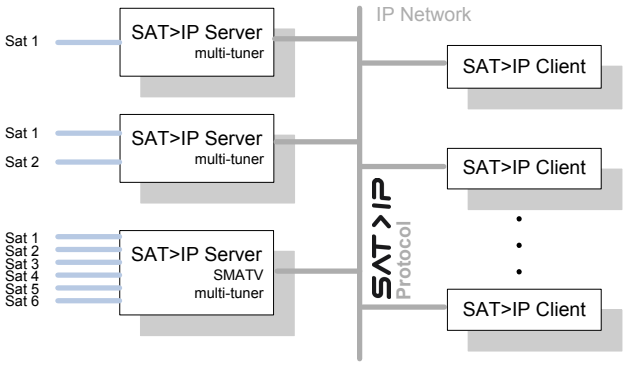

Figure 2 — Different types of live media servers

4.3 Client functionality

SAT>IP is a client driven architecture. Clients send requests to servers. Servers execute these requests and forward live television programs to clients.

SAT>IP servers ideally do not need to be configured. They are purely connected to IF satellite signals on their input and the IP network on their output.

Clients specify what they would like to receive. In this sense SAT>IP is very much comparable to today's satellite distribution architectures which are also not aware of the particular signals being received and watched by clients.

SAT>IP servers are flexible in the way in which signals are transported to clients, however the logic of what is being received resides in the clients.

SAT>IP does not specify the mechanisms through which SAT>IP clients learn about the streams which are available to them. Clients can parse DVB Service Information / Program Specific Information for learning about services available, but they can also rely on service lists containing this information.

4.4 Specification compliance

In order to be compliant with the SAT>IP specification, SAT>IP servers need to fully implement the following specification. All protocol mechanisms and tools shall be implemented.

SAT>IP clients on the other hand only need to implement the mechanisms which allow them to properly operate in a UPnP and RTSP environment.

4.5 Usage scenarios

The SAT>IP protocol has been designed with several use cases in mind which are described in informative Annex A. This listing is however not exhaustive, it is simply meant to describe the most common usage scenarios.

5 Protocol specification

5.1 General

The SAT>IP protocol allows IP based clients to interact/communicate with IP based satellite servers for live media forwarding.

SAT>IP builds on industry standards and does complement those only where necessary i.e. where there are no established satellite specific extensions.

The SAT>IP protocol makes use of:

- UPnP for Addressing, Discovery and Description,
- RTSP or HTTP for Control,
- RTP or HTTP for Media Transport.

The SAT>IP protocol stack is organised as shown in Figure 3.

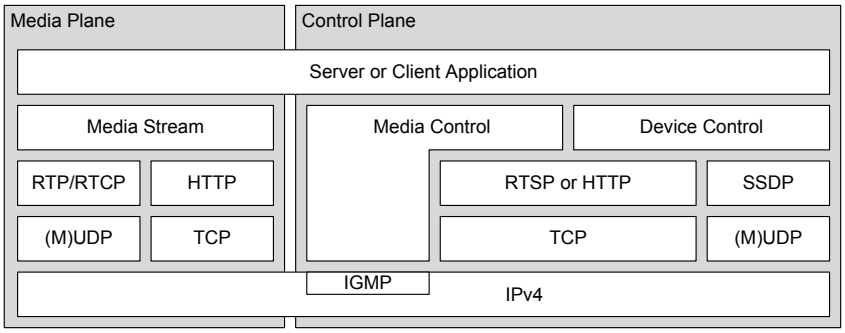

Figure 3 — SAT>IP protocol stack

SAT>IP uses a subset of the UPnP/DLNA architecture and protocols described in ISO/IEC 29341-1-1 and in RFC 2113 and SAT>IP devices can be extended to also become DLNA devices (Figure 4). As an example a SAT>IP client could access live media streams through the SAT>IP protocol and access recorded media streams through DLNA.

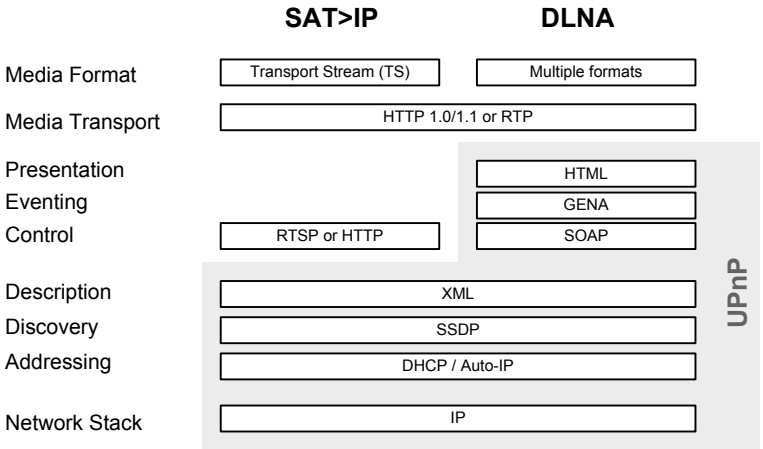

Figure 4 — Comparison between SAT>IP and DLNA

SAT>IP devices successively go through the following phases: Addressing, Discovery, Description, Control and finally Media Transport.

5.2 UPnP addressing

5.2.1 General

Addressing is the process for a SAT>IP device (client or server) to obtain a network address. This is a pre-requisite before any communication can take place. SAT>IP follows the UPnP specification (ISO/IEC 29341-1-1) by offering the following two options for address acquisition:

5.2.2 DHCP addressing

Every SAT>IP device shall have a Dynamic Host Configuration (DHCP) client and search for a DHCP server when the device is first connected to the network (RFC 2131). The device from that point onwards shall use the IP address assigned to it.

5.2.3 Auto-IP addressing

If no DHCP server can be located, the network is unmanaged and SAT>IP devices shall autoconfigure their IP address according to RFC 3376 from the Auto-IP range 169.254/16. In Auto-IP mode, SAT>IP servers shall periodically check for the existence of a DHCP server. All SAT>IP protocol mechanisms (SSDP, RTSP,..) shall work correctly whichever way the IP address is obtained.

5.3 UPnP Discovery

5.3.1 General

During the discovery phase SAT>IP servers advertise their presence to other SAT>IP servers and clients. When joining a network, SAT>IP clients search the network for available SAT>IP servers.

5.3.2 Simple service description protocol SSDP

Discovery in SAT>IP relies on draft-cai-ssdp-v1-03, Simple Service Description Protocol SSDP as specified in the UPnP Device Architecture 1.1 (ISO/IEC 29341-1-1).

As a minimum:

- a SAT>IP server is a UPnP Device and a UPnP Control Point,
- a SAT>IP client is a UPnP Control Point.

DEVICE TYPE / URN

Every UPnP device has a specific type corresponding to a certain category of device. This is expressed with a Unique Resource Name (URN) in UPnP.

The device type of a SAT>IP device shall be:

urn:**ses-com**:device:**SatIPServer**:**1**

where:

- "ses-com" is the domain-name,
- "SatIPServer" is the deviceType name,
- and "1" is the version of the device type.

UUID

Each instance of a SAT>IP server is uniquely identified by its Universally Unique Identifier (UUID) string. The UUID string shall have the format specified in ISO/IEC 29341-1-1: 4B-2B-2B-2B-6B where B represents a Byte written as two hexadecimal digits. The UUID of a device shall always remain fixed.

Example of a UUID string:
"2fac1234-31f8-11b4-a222-08002b34c003"