

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based IPTV interoperability test specification



Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document specifies interoperability tests for IMS-based IPTV system for NGN Release 2. It covers the use of main IPTV functionality via different methods. Interoperability test descriptions have been specified following the ETSI IPT test specification framework described in EG 202 568 [i.1] and interoperability testing methodology defined in EG 202 237 [i.2], i.e. interoperability testing with a conformance relation. Each interoperability test description includes an end user test sequence as well as a table for checking of high level message flows at key standardized reference points in the TISPAN IMS-based IPTV infrastructure [1] and [2].

2 References

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

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

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI TS 182 027 (V2.4.1): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IPTV Architecture; IPTV functions supported by the IMS subsystem".
- [2] ETSI TS 183 063 (V2.4.2): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based IPTV stage 3 specification".
- [3] IETF RFC 2326: "Real Time Streaming Protocol (RTSP)".
- [4] IETF RFC 3261: " SIP: Session Initiation Protocol".
- [5] ETSI TS 102 034: "Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks".
- [6] IETF RFC 3376: "Internet Group Management protocol, Version 3".
- [7] IETF RFC 2616: "Hypertext Transfer Protocol - HTTP/1.1".
- [8] ETSI TS 183 048: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control System (RACS); Protocol Signalling flows specification; RACS Stage 3".

- [9] ETSI TS 183 017 (V2.3.1): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: DIAMETER protocol for session based policy set-up information exchange between the Application Function (AF) and the Service Policy Decision Function (SPDF); Protocol specification".
- [10] ETSI TS 102 539: "Digital Video Broadcasting (DVB); Carriage of Broadband Content Guide (BCG) information over Internet Protocol (IP)".
- [11] ETSI TS 102 323: "Digital Video Broadcasting (DVB); Carriage and signalling of TV-Anytime information in DVB transport streams".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] ETSI EG 202 568: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); Testing: Methodology and Framework".
- [i.2] ETSI EG 202 237: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); Generic approach to interoperability testing".
- [i.3] K. Taniguchi and K. Ishikawa: "MSF IMS-based IPTV Test Plan for GMI 2008", Multi Service Forum (MSF) contribution 2008.169.06.

3 Abbreviations

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

3GPP	3 rd Generation Partnership Project
A-RACS	Access - Resource and Admission Control Subsystem
AAA	AA-Answer
AAR	AA-Request
AS	(IMS) Application Server
BC	Broadcast
CF	(Test) Configuration
CoD	Content On Demand
CoDS	Content on Demand Server
CSCF	Call Session Control Function
EPG	Electronic Program Guide
FEC	Forward Error Correction
I-CSCF	Interrogating CSCF
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IP EN	IP Edge Node
IPTV	Internet Protocol Television
MCF	Media Control Function
MDF	Media Delivery Function
MLD	Multicast Listener Discovery
nPVR	network-side Personal Video Recorder
P-CSCF	Proxy CSCF
PO	Point of Observation
PVRS	Personal Video Recorder Server
RCEF	Resource Control Enforcement Function
RTSP	Real Time Streaming Protocol
S-CSCF	Serving CSCF
SIP	Session Initiation Protocol
SDP	Session Description Protocol

SCF	Service Control Function
SDF	Service Discovery Function
SPDF	Service-based Policy Decision Function
SSF	Service Selection Function
STA	Session-Termination-Answer
STR	Session-Termination-Request
T&A	Transport and Access
TCP	Transmission Control Protocol
TD	Test Description
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
UE	User Equipment
UPSF	User Profile Server Function
URI	Uniform Record Identifier

4 IMS-based IPTV Interoperability Test Specification

4.1 Introduction

The IMS-based IPTV interoperability test descriptions (TDs) defined in the following clauses are mainly derived from MSF 2008.169.06 [i.3], TS 183 063 [2] and TS 182 027 [1]. More specifically, these TDs focus on SIP/SDP [5], HTTP [7], RTSP [4], IGMP [6] related messaging procedures without RACS described in clauses 5, 6, 7, 8 and 11 of TS 183 063 [2]. TDs where RACS is involved are described in part in TS 183 048 [8].

The use of FLUTE and DVBSTP transport protocols on Xa reference point as well as IPv6 MLD are at this point not within the scope of the present document.

4.2 Test Prerequisites

4.2.1 IP Version and protocols

4.2.1.1 IP

The present document assumes that IP-based protocols all use IPv4.

4.2.1.2 RTSP

The present document assumes RTSP [3] messages are sent only via TCP.

4.2.1.3 SIP

The present document assumes that all SIP [4] messages are sent via UDP to ensure retransmission procedures based on SIP only and to simplify the match procedure between the message flows and real network capture.

4.2.1.4 IGMP

The present document assumes that IPTV aware UE requests for multicast group use IGMPv3 [6].

4.2.1.5 Media transport

The present document assumes that content is transported using one of the following transport technologies: MPEG2TS encapsulation or direct RTP transport (e.g. H264 over RTP). Further it is assumed that transport of IPTV content within MPEG2-TS layer over RTP and UDP is performed according the procedures defined in TS 102 034 [5].

4.2.2 Authentication and Security

4.2.2.1 SIP

The present document assumes that no SIP-based authentication is performed.

4.2.2.2 HTTP

Personalized service selection is out of the scope of the document. Hence, no HTTP authentication is required from the UE toward SSF or SCF. Also no authentication proxy is needed between the UE and the SCF.

4.2.3 Supported Options

4.2.3.1 Signalling Compression

"No SigComp" is the default signalling configuration in all test descriptions. Tests may be executed with signalling compression if the required nodes support it.

4.2.3.2 SIP Provisional Message Reliability

The present document assumes there is no use of SIP 100rel option tag.

4.2.3.3 SIP precondition option tag

The present document assumes there is no use of SIP precondition option tag.

4.2.3.4 SIP timer option tag (Session Timers)

The present document assumes there is use of SIP timer option tag which supports session timer extension. The inclusion of this option tag in a Supported header field of a SIP request or response indicates that the UE is capable of performing refreshes. The inclusion of this option tag in a Require header of a SIP request indicates that the IMS core network should understand the session timer extension to process the request. Its inclusion in a Require header field of a SIP response indicates that the UE should look for the Session-Expires header field in the response and process it according to [4].

4.2.4 Content related options

4.2.4.1 Encrypted contents

The present document assumes that encryption is not used for CoD or BC content provisioning.

4.2.4.2 Digital Rights Management

The present document assumes DRM is not used for CoD or BC content provisioning.

4.2.4.3 FEC

The present document assumes that FEC disabled for CoD and BC content provisioning.

4.2.5 Service discovery

Service discovery should follow the procedures defined in TS 102 539 [10] and TS 102 323 [11].

4.2.6 Miscellaneous

4.2.6.1 Network Address Translation (NAT) and Firewall function

The present document assumes there is neither NAT nor Firewall function activated.

4.3 Test Architecture

In figure 1, various nodes of an IMS-based IPTV system that pertain to testing are introduced. For each node configuration is described and relevant points of observation (POs) are identified. Based on these nodes a static test architecture is defined. Figure 1 shows the abstract test architecture of an IMS-based IPTV system based on the general IPTV architecture defined in [2], [8] and [9].

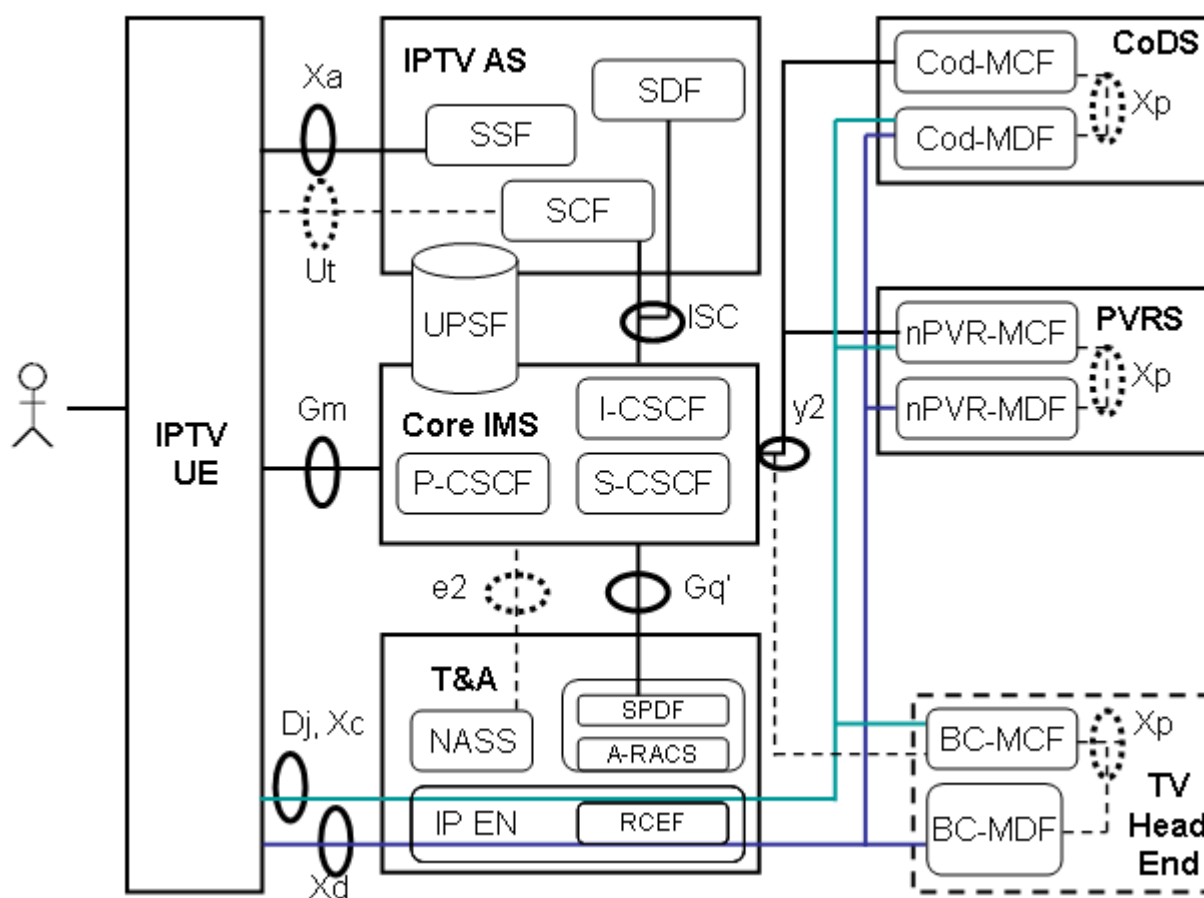


Figure 1: IMS-based IPTV test architecture (referred as CF_IMS_IPTV)

In figure 1, each node groups different IPTV logical functions. Interfaces within each node are considered internal and not taken into account in conformance criteria. It may however be of interest to also monitor these internal interfaces for debugging purposes.

Reference points (Ut, e2 and y2 towards BC-MCF) in dotted line are not in the scope of the present document.

NOTE: In a real IMS-based IPTV system some of the nodes shown in Figure 1 may also be collocated in the same equipment. In this case it is however still assumed that their connecting interfaces are still available for monitoring purposes

Each node framed with a solid line is considered an Equipment under Test (EUT) in the context of the ETSI interoperability testing methodology [i.2]. The collection of all EUTs makes up the System Under Test (SUT). Dashed nodes indicate other equipment, i.e. support nodes, required to execute at least some of the tests. The latter nodes are considered not to be part of the SUT.

4.3.1 IPTV Nodes

4.3.1.1 Core IMS

This node contains P-CSCF, I-CSCF and S-CSCF functions as well as potentially (a part of) the UPSF.

4.3.1.1.1 Relevant Reference Points

The Gm reference point between the IMS Core and the IP aware UE is used as a point of observation (PO) for testing purposes. The ISC reference point is between the IMS Core and IPTV AS and used as a PO for testing purposes. The y2 reference point is between the IMS Core and the PVRs and CoDS and used as a PO for testing purposes. The Gq' reference point is between the IMS Core and T&A and is used as a PO for testing purposes.

4.3.1.1.2 Node Configuration

The Core IMS should be configured to support the pre-requisites outlined in clause 4.2.

The UPSF should be configured with the following user identities

Private Identity	Public Identity (SIP URI)	Public Identity 2 (Tel URI)	Default Public Identity	Filter criteria
userIPTV_priv	userIPTV	na	1	contact IPTV AS

4.3.1.2 IPTV aware UE

4.3.1.2.1 Relevant Reference Points

The Gm interface is used as a PO for interoperability tests towards the IMS Core.

The Xa interface is used as a PO for interoperability tests towards the IPTV AS.

The Xc and Xd (Dj) interfaces are used as POs for interoperability tests towards the PVRs, CoDS and TV Head End.

4.3.1.2.2 Node Configuration

The IP aware UE should be configured to support the pre-requisites outlined in clause 4.2.

4.3.1.3 IPTV Application Server (AS)

This node contains SSF, SDF, and SCF functions as well as may contain also (a part of) the UPSF.

4.3.1.3.1 Relevant Reference Points

The Xa interface is used as a PO towards the IPTV aware UE whereas the ISC interface is used as a PO towards the IMS Core.

4.3.1.3.2 Node Configuration

The IPTV AS should be configured to support the pre-requisites outlined in clause 4.2.

The media content available in the PVRs, CoDS and TV Head End has to be described within the IPTV AS.

IPTV specific data information associated with the user has to be described within the IPTV AS [9].

4.3.1.4 Content on Demand Server (CoDS)

This node contains CoD-MCF and CoD-MDF functions.

4.3.1.4.1 Relevant Reference Points

The y2 reference point is used as a PO between the Core IMS and the CoDS. The Xd reference point is used as PO between the UE and the CoDS.

4.3.1.4.2 Node Configuration

The CoDS should be configured to support the pre-requisites outlined in clause 4.2.

The media contents as described in the EPGs have to be available on the CoDS.

4.3.1.5 Personal Video Recorder Server (PVRs)

This node contains nPVR-MCF and nPVR-MDF functions.

4.3.1.5.1 Relevant Reference Points

The y2 reference point is used as a PO between the Core IMS and the PVRs. The Xd reference point is used as PO between the UE and the PVRs.

4.3.1.5.2 Node Configuration

The PVRs should be configured to support the pre-requisites outlined in clause 4.2.

The media contents as described in the EPGs have to be available on the PVRs.

4.3.1.6 Transport and Access (T&A)

This node contains transport control and processing functions, A-RACS, SPDF, NASS and RCEF. The latter is located in the IP-Edge Node.

4.3.1.7 Relevant Reference Points

The Xd, Xc and Dj reference points are used as POs between the UE and the transport node.

Gq' reference point is used as Pos between SPDF and CORE IMS.

4.3.1.8 Node Configuration

The T&A should be configured to support the pre-requisites outlined in clause 4.2.

Regarding multicast support, the function has to implement IGMPv3, IGMPv2 with SSM (source specific mapping) and in case the multicast sources are not directly connected a CORE network a multicast protocol (e.g.: PIM).

4.3.2 External Nodes

This clause lists nodes which are required for performing some of the interoperability tests but not consider to be part of the SUT, i.e. supporting equipment required for the execution of tests.

4.3.2.1 TV Head End

This node contains BC-MDF and BC-MCF functions.

4.3.2.2 Relevant Reference Points

The Xd reference point is used as PO between the UE and the TV Head End.

y2 reference point is used between CORE IMS and BC-MCF. It is not a PO so far.

4.3.2.2.1 Node Configuration

The TV Head End should be configured to support the pre-requisites outlined in clause 4.2.

TV End Head should provide at least one BC channel unconditionally.

4.3.3 Summary of interfaces and protocols

Figure 1 includes also IPTV reference points to be monitored in interoperability testing.

Figure 2 identifies again the relevant reference points and provides more information about the protocols they use.

FE/ Ref.point (protocol)	UE	IMS core	UPSF	SDF	SSF	SCF	MCF	MDF	ECF/ EFF
UE	---	Gm (SIP/SDP)	---	via Core IMS (SIP/SDP)	Xa (HTTP, DVBSTP, FLUTE)	Ut (HTTP), via Core IMS (SIP/SDP)	Xc (RTSP) (Note 1)	Xd (UDP/RT) (Note 1)	Dj, Di IGMP/ MLD
IMS core	Gm (SIP/SDP)	---	Cx (Diameter)	---	---	ISC (SIP/SDP)	y2 (SIP/SDP)	---	---
UPSF	---	Cx (Diameter)	---	Sh (Diameter)	---	Sh (Diameter)	---	---	---
SDF	via Core IMS (SIP/SDP)	---	Sh (Diameter)	---	---	---	---	---	---
SSF	Xa (HTTP, DVBSTP, FLUTE)	---	---	---	---	---	---	---	---
SCF	Ut (HTTP), via Core IMS (SIP/SDP)	ISC (SIP/SDP)	Sh (Diameter)	---	---	---	via Core IMS & y2 (SIP/SDP)	---	---
MCF	Xc (RTSP) (Note 1)	y2 (SIP/SDP)	---	---	---	via Core IMS & y2 (SIP/SDP)	---	Xp (not defined)	---
MDF	Xd (UDP/RT) (Note 1)	---	---	---	---	---	Xp (not defined)	---	---
ECF/ EFF	---	---	---	---	---	---	---	---	---

Figure 2: Summary of relevant reference points and protocols

In addition, Gq' between IMS Core and TA carries diameter protocol.

4.3.4 Method 1 and Method 2

In the interoperability test descriptions defined in the present document, two methods regarding the procedures using RTSP for IMS-based IPTV are used. More information on these methods is available in clause 7 and Annex Q of [2].

4.4 Test Descriptions

This clause defines IMS-based IPTV interoperability test descriptions (TD) for systems composed of equipment by different vendors. Each TD includes a test sequence describing user interactions with IPTV equipment as well as messages exchanged between IPTV equipment at selected standardized reference points.

TD identifiers are constructed from a test suite identifier, a test group identifier and a test number. Table 1 summarizes the main identifiers used in the present document.

Table 1: Summary of TD identifier prefixes

Test Description Identifier Prefix	Scope of the test
TD_IMS_IPTV_ADS	Service attachment, discovery and selection
TD_IMS_IPTV_BC	Broadcast TV
TD_IMS_IPTV_BC1	Broadcast TV with trick mode using method 1
TD_IMS_IPTV_BC2	Broadcast TV with trick mode using method 2
TD_IMS_IPTV_CoD1	Content on Demand using method 1
TD_IMS_IPTV_CoD2	Content on Demand using method 2
TD_IMS_IPTV_nP1	nPVR using method 1
TD_IMS_IPTV_nP2	nPVR using method 2

4.4.1 Service Attachment, Service Discovery and Selection

In the following TDs, we consider step 1 of the IPTV Aware UE start-up procedure, i.e. Network attachment (UE to NASS), as being out of the scope of the test.

4.4.1.1 Manual configuration of SSF information in pull mode

Interoperability Test Description									
Identifier:	TD_IMS_IPTV_ADS_0001 (MSF S3A-0101)								
Summary:	UE displays EPG with manual SSF address configuration								
References:	TS 182 027 [1] clause 8.2; TS 183 063 [2] clause 6.1.1								
Configuration:	CF_IMS_IPTV								
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS								
Pre-test conditions:	<ul style="list-style-type: none"> • IPTV AS is configured not to act as a third-party registrar (push mode is disabled) • UE is configured statically with SSF information • UE and IPTV AS support the same EPG format 								
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User starts UE</td> </tr> <tr> <td>2</td> <td>User requests EPG</td> </tr> <tr> <td>3</td> <td>Verify that UE displays EPG</td> </tr> </tbody> </table>	Step		1	User starts UE	2	User requests EPG	3	Verify that UE displays EPG
Step									
1	User starts UE								
2	User requests EPG								
3	Verify that UE displays EPG								
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table				
Check									
1	Message exchange follows the below table								

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User starts UE
2			→			SIP	UE sends SIP REGISTER to CORE via Gm
3			←			SIP	CORE sends SIP 200 OK to UE via Gm
4				→		HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
5				←		HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
6		→					User requests EPG
7		←					UE displays EPG

Steps 4 and 5 may be repeated multiple times. Each HTTP message pair carries information (EPG) different from vendors.

4.4.2.1 Automatic provisioning of SSF in pull mode

Interoperability Test Description		
Identifier:	TD_ IMS_IPTV_ADS_0002 (MSF S3A-0101)	
Summary:	UE displays EPG with automatic SSF provision in pull mode	
References:	TS 182 027 [1] clause 8.2; TS 183 063 [2] clauses 5.1.2.2 and 6.1.1	
Configuration:	CF_ IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS	
Pre-test conditions:	<ul style="list-style-type: none"> • IPTV AS is configured not to act as a third-party registrar (push mode is disabled) • Core IMS is configured to forward service attachment information request to IPTV AS • UE is configured to request the EPG • UE and IPTV AS support the same EPG format 	
Test Sequence:	Step	
	1	User starts UE
	2	User requests EPG
	3	Verify that UE displays EPG
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User starts UE
2			→			SIP	UE sends SIP REGISTER to CORE via Gm
3		←				SIP	CORE sends SIP 200 OK to UE via Gm
2			→			SIP	UE sends SIP SUBSCRIBE to CORE via Gm
3				→		SIP	CORE sends SIP SUBSCRIBE to AS via ISC
4				←		SIP	AS sends SIP 200 OK to CORE via ISC
5		←				SIP	CORE sends SIP 200 OK to UE via Gm
6				←		SIP	AS sends SIP NOTIFY to CORE via ISC
7		←				SIP	CORE sends SIP NOTIFY to UE via Gm
8			→			SIP	UE sends SIP 200 OK to CORE via Gm
9				→		SIP	CORE sends SIP 200 OK to AS via ISC
10				→		HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
11		←				HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
12		→					User requests EPG
13		←					UE displays EPG

Steps 10 and 11 can be repeated multiple times. Each HTTP message pair carries information different from vendors.

4.4.2.2 Automatic provisioning of SSF in push mode

Interoperability Test Description		
Identifier:	TD_ IMS_IPTV_ADS_0003 (MSF S3A-0101)	
Summary:	UE can display EPG with automatic SSF provision in push mode	
References:	TS 182 027 [1] clause 8.2; TS 183 063 [2] clauses 5.1.2.1 and 6.1.1	
Configuration:	CF_ IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS	
Pre-test conditions:	<ul style="list-style-type: none"> • IPTV AS is configured to act as a third-party registrar (push mode enabled) • UPSF is configured to provide SSF information to SDF • UE is configured for SSF provision in push mode • UE and IPTV AS support the same EPG format 	
Test Sequence:	Step	
	1	User starts UE
	2	User requests EPG
	3	Verify that UE displays EPG
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User starts UE
2			→			SIP	UE sends SIP REGISTER to CORE via Gm
3			←			SIP	CORE sends SIP 200 OK to UE via Gm
4					→	SIP	CORE sends SIP REGISTER to AS via ISC
5					←	SIP	AS sends SIP 200 OK to CORE via ISC
6					←	SIP	AS sends SIP MESSAGE to CORE via ISC
7			←			SIP	CORE sends SIP MESSAGE to UE via Gm
8					→	SIP	UE sends SIP 200 OK to CORE via Gm
9					→	SIP	CORE sends SIP 200 OK to AS via ISC
10					→	HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
11					←	HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
12		→					User requests EPG
13		←					UE displays EPG

Steps 10 and 11 can be repeated multiple times. Each HTTP message pair carries information different from vendors.

4.4.2 Broadcast TV

4.4.2.1 Session initiation without RACS

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC_0001 (S3A-0201)	
Summary:	User requests to watch broadcast TV channel	
References:	TS 182 027 [1] clause 8.3.1; TS 183 063 [2] clauses 5.1.3.1 and 8.1.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> • UE is registered in Core IMS and received EPG from IPTV AS (see TD_IMS_IPTV_ADS_0001/2/3) • EPG has at least one broadcast channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End • UE is configured not to request QoS 	
Test Sequence:	Step	
	1	User requests to watch a broadcast TV channel
	2	Verify that UE displays the selected broadcast TV channel
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User requests to watch a broadcast TV channel
2			→			SIP	UE sends SIP INVITE to CORE via Gm
3					→	SIP	CORE sends SIP INVITE to AS via ISC
4					←	SIP	AS sends SIP 200 OK to CORE via ISC
5		←				SIP	CORE sends SIP 200 OK to UE via Gm
6			→			SIP	UE sends SIP ACK to CORE via Gm
7					→	SIP	CORE sends SIP ACK to AS via ISC
8			→			IGMP	UE sends IGMP JOIN to T&A via Dj
9		←					UE displays the selected broadcast TV channel
10			→			SIP	UE sends SIP INFO to CORE via Gm
11					→	SIP	CORE sends SIP INFO to AS via ISC

The SIP INFO messages are sent out with a delay after IGMP join message. If the channel is changed again within the delay, the INFO message is not sent out.

There is no strict sequence of the SIP and IGMP messages. The IGMP JOIN message may be sent before or after sending SIP ACK.

4.4.2.2 Channel Zapping without RACS

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC_0002 (S3A-0301)	
Summary:	User changes to a HD channel while watching a SD broadcast TV	
References:	TS 182 027 [1] clause 8.3.4; TS 183 063 [2] clauses 5.1.3.5 and 8.1.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> • UE is registered in Core IMS and displaying a broadcast TV channel (see TD_IMS_IPTV_BC_0001) • The EPG has at least 2 broadcast channels • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End • UE is configured not to request QoS 	
Test Sequence:	Step	
	1	User changes to another broadcast TV channel
	2	Verify that UE displays the other broadcast TV channel
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S			
1		→						User changes to another broadcast TV channel
2			→				IGMP	UE sends IGMP LEAVE INFO to T&A via Dj
3				→			SIP	UE sends SIP re-INVITE to CORE via ISC (optional)
4					→		SIP	CORE sends SIP re-INVITE to AS via ISC (optional)
5					←		SIP	AS sends SIP OK to CORE via ISC (optional)
6			←				SIP	CORE sends SIP OK to UE via ISC (optional)
7			→				IGMP	UE sends IGMP JOIN INFO to T&A via Dj
8		←						Verify that UE displays the other broadcast TV channel
9				→			SIP	UE sends SIP INFO to AS via ISC
10					→		SIP	CORE sends SIP INFO to AS via ISC

The SIP INFO messages are sent out with a delay after an IGMP JOIN message. If the channel is changed again within the delay, the SIP INFO message is not sent out.

4.4.2.3 Session termination without RACS

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC_0003 (S3A-0401)	
Summary:	User quits watching broadcast TV	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clauses 5.1.4.2 and 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> User is registered in Core IMS using userIPTV_priv identity UE is displaying a broadcast TV channel (see TD_IMS_IPTV_BC_0001) EPG has at least one broadcast TV channel T&A is configured with multicast rights for the UE TV Head End broadcasting TV content in real-time using multicast UE supports content protocols and coding used by TV Head End UE is configured not to request QoS 	
Test Sequence:	Step	
	1	User quits watching the broadcast TV channel
	2	Verify that the UE does not display the broadcast TV channel anymore
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S			
1		→						User quits watching the broadcast TV channel
2			→				IGMP	UE sends IGMP LEAVE INFO to T&A via Dj
3		←						UE does not display the broadcast TV channel anymore
4			→				SIP	UE sends SIP BYE to CORE via Gm
5				→			SIP	CORE sends SIP BYE to AS via ISC
6					←		SIP	AS sends SIP 200 OK to CORE via ISC
7		←					SIP	CORE sends SIP 200 OK to UE via Gm

4.4.2.4 Session initiation with RACS

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC_0004	
Summary:	User requests to watch broadcast TV channel using QoS	
References:	TS 182 027 [1] clause 8.3.1; TS 183 063 [2] clauses 5.1.3.1 and 8.1.2.1, TS 183 017 [9] clauses 5.1.1 and 5.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> UE is registered in Core IMS and received EPG from IPTV AS (see TD_IMS_IPTV_ADS_0001/2/3) EPG has at least one broadcast channel TV Head End broadcasting TV content in real-time using multicast UE supports content protocols and coding used by TV Head End UE is configured to request QoS 	
Test Sequence:	Step	
	1	User requests to watch a broadcast TV channel
	2	Verify that UE displays the selected broadcast TV channel
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User requests to watch a broadcast TV channel
2				→		SIP	UE sends SIP INVITE to CORE via Gm (SDP Bandwidth "b=" option is populated through EPG related information or static configuration)
3				←		SIP	CORE sends SIP 100 Trying to UE via Gm
4				←		Diameter	CORE sends AAR to T&A via Gq'
5				→		Diameter	T&A sends AAA to CORE via Gq' (Result-Code = DIAMETER_SUCCESS)
6					→	SIP	CORE sends SIP INVITE to AS via ISC
7					←	SIP	AS sends SIP 200 OK to CORE via ISC
8				←		Diameter	CORE sends AAR to T&A via Gq'
9				→		Diameter	T&A sends AAA to CORE via Gq' (Result-Code = DIAMETER_SUCCESS)
10				←		SIP	CORE sends SIP 200 OK to UE via Gm
11				→		SIP	UE sends SIP ACK to CORE via Gm
12					→	SIP	CORE sends SIP ACK to AS via ISC
13				→		IGMP	UE sends IGMP JOIN to T&A via Dj
14		←					UE displays the selected broadcast TV channel
15				→		SIP	UE sends SIP INFO to CORE via Gm
16					→	SIP	CORE sends SIP INFO to AS via ISC

The SIP INFO messages are sent out with a delay after IGMP join message. If the channel is changed again within the delay, the INFO message is not sent out.

There is no strict sequence of the SIP and IGMP messages. The IGMP JOIN message may be sent before or after sending SIP ACK.

The diagram above shows a two phases method on Gq' reference point (see clause 5.1.1 of [10]). Steps 5 request is for resource reservation, step 10 for resource commitment. Alternatively, steps 10 and 11 could be omitted if step 5 requests resource commitment (Flow-Status is different of DISABLED).

4.4.2.5 Channel Zapping with RACS

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_BC_0005						
Summary:	User changes to a HD channel while watching SD broadcast TV using QoS						
References:	TS 182 027 [1] clause 8.3.4; TS 183 063 [2] clauses 5.1.3.5 and 8.1.2; TS 183 017 [9] clauses 5.1.2 and 5.2.2						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A						
Pre-test conditions:	<ul style="list-style-type: none"> UE is registered in Core IMS and displaying a broadcast TV channel (see TD_IMS_IPTV_BC_0001) The EPG has at least 2 broadcast channels TV Head End broadcasting TV content in real-time using multicast UE supports content protocols and coding used by TV Head End UE is configured to request QoS 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User changes to another broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE displays the other broadcast TV channel</td> </tr> </tbody> </table>	Step		1	User changes to another broadcast TV channel	2	Verify that UE displays the other broadcast TV channel
Step							
1	User changes to another broadcast TV channel						
2	Verify that UE displays the other broadcast TV channel						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table		
Check							
1	Message exchange follows the below table						

Step	Direction					Protocol	Comment
	U s e r	U E	T & A	C O R E	A S		
1		→					User changes to another broadcast TV channel
2			→			IGMP	UE sends IGMP LEAVE INFO to T&A via Dj
3			→			SIP	UE sends SIP re-INVITE to CORE via ISC
4			←			Diameter	CORE sends AAR to T&A via Gq'
5			→			Diameter	T&A sends AAA to CORE via Gq'
6				→		SIP	CORE sends SIP re-INVITE to AS via ISC
7				←		SIP	AS sends SIP OK to CORE via ISC
8			←			Diameter	CORE sends AAR to T&A via Gq'
9			→			Diameter	T&A sends AAA to CORE via Gq'
10		←				SIP	CORE sends SIP OK to UE via ISC
11		→				IGMP	UE sends IGMP JOIN to T&A via Dj
12	←						Verify that UE displays the other broadcast TV channel
13			→			SIP	UE sends SIP INFO to AS via ISC
14				→		SIP	CORE sends SIP INFO to AS via ISC

The diagram above shows a two phases method on Gq' reference point (see clause 5.1.1 of [10]). Step 4 request is for resource reservation, step 8 for resource commitment. Alternatively, steps 8 and 9 could be omitted if step 4 requests resource commitment (Flow-Status is different of DISABLED).

4.4.2.6 Session termination with RACS

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_BC_0006						
Summary:	User quits watching broadcast TV using QoS						
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clauses 5.1.4.2 and 7.2.1; TS 183 017 [9] clauses 5.1.3 and 5.2.3						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A						
Pre-test conditions:	<ul style="list-style-type: none"> User is registered in Core IMS using userIPTV_priv identity UE is displaying a broadcast TV channel (see TD_IMS_IPTV_BC_0001) EPG has at least one broadcast TV channel TV Head End broadcasting TV content in real-time using multicast UE supports content protocols and coding used by TV Head End UE is configured to request QoS 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User quits watching the broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that the UE does not display the broadcast TV channel anymore</td> </tr> </tbody> </table>	Step		1	User quits watching the broadcast TV channel	2	Verify that the UE does not display the broadcast TV channel anymore
Step							
1	User quits watching the broadcast TV channel						
2	Verify that the UE does not display the broadcast TV channel anymore						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table		
Check							
1	Message exchange follows the below table						

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S			
1		→						User quits watching the broadcast TV channel
2			→				IGMP	UE sends IGMP LEAVE INFO to T&A via Dj
3		←						UE does not display the broadcast TV channel anymore
4				→			SIP	UE sends SIP BYE to CORE via Gm
5				←			Diameter	CORE sends STR to T&A via Gq'
6				→			Diameter	T&A sends STA to CORE via Gq'
7					→		SIP	CORE sends SIP BYE to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm

4.4.3 Broadcast TV with trick-play using Method 1

More information about Method 1 is given in clause 4.3.4.

4.4.3.1 Initiate trick-play on a live broadcast channel

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC1_0001 (S3A-0501)	
Summary:	User initiates trick mode while watching a broadcast TV channel	
References:	TS 182 027 [1] clause 8.3.5; TS 183 063 [2] clauses 5.1.3.3.1 and 8.1.2.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying a trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast channel 	
Test Sequence:	Step	
	1	User requests a pause on the broadcast TV channel
	2	Verify that the UE freezes the image of the broadcast TV channel
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests a pause on the broadcast TV channel
2				→			SIP	UE sends SIP RE-INVITE to CORE via Gm
3					→		SIP	CORE sends SIP RE-INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5					→		SIP	CORE sends SIP INVITE to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7					→		SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10				→			SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13					→		SIP	CORE sends SIP ACK to CoDS via y2
14				→			IGMP	UE sends IGMP LEAVE to T&A via Dj
15	←							UE freezes the image of the broadcast TV channel

It is acceptable to generate SIP UPDATE instead of re INVITE requests. In that case SIP ACK requests should not be sent.

There is no strict sequence of SIP and IGMP messages. The IGMP LEAVE message may be sent before or after sending SIP ACK.

4.4.3.2 Play in trick-play mode

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC1_0002 (S3A-0601)	
Summary:	User requests the normal play mode on a broadcast TV channel in trick play mode	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying frozen trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC1_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast channel 	
Test Sequence:	Step	
	1	User requests play on the paused broadcast TV channel
	2	Verify that UE displays the recorded broadcast TV channel content
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests play on the paused broadcast TV channel
2						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4	←							Verify that UE displays the recorded broadcast TV channel content

A RTSP PAUSE message may be sent between two consecutive RTSP PLAY messages.

4.4.3.3 Simple fast forward trick-play

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_BC1_0003 (S3A-0601)						
Summary:	User requests fast forward on a paused broadcast TV channel in trick play mode without reaching the end of recording						
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A						
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying frozen trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC1_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast channel 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests x2 fast forward on the paused broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE displays recorded broadcast TV channel in fast forward mode</td> </tr> </tbody> </table>	Step		1	User requests x2 fast forward on the paused broadcast TV channel	2	Verify that UE displays recorded broadcast TV channel in fast forward mode
Step							
1	User requests x2 fast forward on the paused broadcast TV channel						
2	Verify that UE displays recorded broadcast TV channel in fast forward mode						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table		
Check							
1	Message exchange follows the below table						

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast forward on the paused broadcast TV channel
2						→	RTSP	UE sends RTSP PLAY (scale +2) to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4	←							UE displays recorded broadcast TV channel in fast forward mode.

A RTSP PAUSE message may be sent between two consecutive RTSP PLAY messages.

4.4.3.4 Fast backward trick-play to beginning of recorded content

Interoperability Test Description									
Identifier:	TD_IMS_IPTV_BC1_0004 (S3A-0701)								
Summary:	User requests fast backward on a paused broadcast TV channel in trick play mode until the beginning of the recording is reached								
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1								
Configuration:	CF_IMS_IPTV								
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A								
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying paused recorded broadcast TV channel (see TD_IMS_IPTV_BC1_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast TV channel 								
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests x2 fast backward on the paused broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE displays recorded broadcast TV channel in fast backward mode</td> </tr> <tr> <td>3</td> <td>Verify that UE stops display when beginning of recording is reached</td> </tr> </tbody> </table>	Step		1	User requests x2 fast backward on the paused broadcast TV channel	2	Verify that UE displays recorded broadcast TV channel in fast backward mode	3	Verify that UE stops display when beginning of recording is reached
Step									
1	User requests x2 fast backward on the paused broadcast TV channel								
2	Verify that UE displays recorded broadcast TV channel in fast backward mode								
3	Verify that UE stops display when beginning of recording is reached								
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table				
Check									
1	Message exchange follows the below table								

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast backward on the paused broadcast TV channel
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY (scale -2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6	←							UE displays recorded broadcast TV channel in fast backward mode
7	←							UE stops display when beginning of recording is reached

4.4.3.5 Fast forward to move from trick-play to live broadcast mode

Interoperability Test Description									
Identifier:	TD_IMS_IPTV_BC1_0005 (S3A-0801)								
Summary:	User requests fast forward until the end of recording is reached and moves from trick play to live broadcast TV channel								
References:	TS 182 027 [1] clause 8.3.6; TS 183 063 [2] clauses 5.1.3.3.2, 7.2.1 and 8.1.2.1								
Configuration:	CF_IMS_IPTV								
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A								
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying paused recorded broadcast TV channel (see TD_IMS_IPTV_BC1_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS. • CoDS is recording the trick play enabled broadcast TV channel • UE is configured to change to live broadcast automatically after trick play ends 								
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests x2 fast forward on a paused broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE displays recorded broadcast TV channel in fast forward mode</td> </tr> <tr> <td>3</td> <td>Verify that UE displays live broadcast TV channel when end of recording is reached</td> </tr> </tbody> </table>	Step	Description	1	User requests x2 fast forward on a paused broadcast TV channel	2	Verify that UE displays recorded broadcast TV channel in fast forward mode	3	Verify that UE displays live broadcast TV channel when end of recording is reached
Step	Description								
1	User requests x2 fast forward on a paused broadcast TV channel								
2	Verify that UE displays recorded broadcast TV channel in fast forward mode								
3	Verify that UE displays live broadcast TV channel when end of recording is reached								
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check	Description	1	Message exchange follows the below table				
Check	Description								
1	Message exchange follows the below table								

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast forward on a paused broadcast TV channel
2						→	RTSP	UE sends RTSP PLAY(scale +2) to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4								UE displays recorded broadcast TV channel in fast forward mode
5						←	RTSP	CoDS sends RTSP ANNOUNCE to UE via Xc
6						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc
7						→	IGMP	UE sends IGMP JOIN to T&A via Dj
8						→	SIP	UE sends SIP REINVITE to CORE via Gm
9						→	SIP	CORE sends SIP REINVITE to AS via ISC
10						←	SIP	AS sends SIP BYE to CORE via ISC
11						→	SIP	CORE sends SIP BYE to CoDS via y2
12						←	SIP	CoDS sends SIP 200 OK to CORE via y2
13						→	SIP	CORE sends SIP 200 OK to AS via ISC
14						←	SIP	AS sends SIP 200 OK to CORE via ISC
15						←	SIP	CORE sends SIP 200 OK to UE via Gm
16						→	SIP	UE sends SIP ACK to CORE via Gm
17						→	SIP	CORE sends SIP ACK to AS via ISC
18		←						UE displays live broadcast TV channel when end of recording is reached

Upon receipt of the end-of-stream indication the CoDS sends in step 5 an RTSP ANNOUNCE to the UE with an indication that the end-of-stream has been reached. In case of BC sessions with trick-play, if the UE receives an RTSP ANNOUNCE request with an end-of-stream indication, the UE may initiate a session modification procedure in order to go back to a normal BC session in multicast mode (this is the case described above) or may alternatively take other actions (e.g. rewind, pause, terminate session, etc.).

There is a delay between the UE receiving the RTSP ANNOUNCE in step 5 and sending the SIP reINVITE in step 8.

It is acceptable to generate SIP UPDATE instead of SIP reINVITE requests. In that case SIP ACK requests should not be sent.

Before the RTSP PLAY message in step 2 a RTSP PAUSE message may be sent.

There is no strict sequence of the SIP and IGMP messages. The IGMP JOIN message may be sent before or after sending the SIP ACK request.

4.4.4 Broadcast TV with trick-play using Method 2

More information about Method 2 is given in clause 4.3.4.

4.4.4.1 Initiate trick-play on a live broadcast channel

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC2_0001 (S3A-0502)	
Summary:	User initiates trick mode while watching a broadcast TV channel	
References:	TS 182 027 [1] clause 8.3.5; TS 183 063 [2] clauses 5.1.3.3.1 and 8.1.2.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV HEAD END, T&A, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying a trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC_0001) • EPG has at least one broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS. • CoDS is recording the trick play enabled broadcast channel 	
Test Sequence:	Step	
	1	User requests to pause on the broadcast TV channel
	2	Verify that the UE freezes the image of the broadcast TV channel
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to pause on the broadcast TV channel
2				→			SIP	UE sends SIP RE-INVITE to CORE via Gm
3					→		SIP	CORE sends SIP RE-INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9			←				SIP	CORE sends SIP 200 OK to UE via Gm
10				→			SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to CoDS via y2
14						→	RTSP	UE sends RTSP DESCRIBE to CoDS via Xc
15					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
16						→	RTSP	UE sends RTSP SETUP to CoDS via Xc
17					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
18				→			SIP	UE sends SIP REINVITE to CORE via Gm
19					→		SIP	CORE sends SIP REINVITE to AS via ISC
20					←		SIP	AS sends SIP REINVITE to CORE via ISC
21						→	SIP	CORE sends SIP INVITE to CoDS via y2
22					←		SIP	CoDS sends SIP 200 OK to CORE via y2
23						→	SIP	CORE sends SIP 200 OK to AS via ISC
24					←		SIP	AS sends SIP 200 OK to CORE via ISC
25			←				SIP	CORE sends SIP 200 OK to UE via Gm
26				→			SIP	UE sends SIP ACK to CORE via Gm
27					→		SIP	CORE sends SIP ACK to AS via ISC
28					←		SIP	AS sends SIP ACK to CORE via ISC
29			→				IGMP	UE sends IGMP LEAVE to T&A via Dj
30						→	SIP	CORE sends SIP ACK to CoDS via y2
31		←						UE freezes the image of the broadcast TV channel

The RTSP DESCRIBE message in step 14 is sent in case the UE did not get content delivery description information (from the SSF or from the AS-IPTV/SS-MCF-IPTV during the SIP session initiation),

It is acceptable to generate SIP UPDATE instead of re-INVITE requests. In that case SIP ACK requests should not be sent.

There is no strict sequence of SIP and IGMP messages. The IGMP LEAVE message may be sent before or after sending SIP ACK.

4.4.4.2 Play in trick-play mode

Interoperability Test Description				
Identifier:	TD_IMS_IPTV_BC2_0002 (S3A-0602)			
Summary:	User requests the normal play mode on a broadcast TV channel in trick play mode			
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.2			
Configuration:	CF_IMS_IPTV			
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A			
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying frozen trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC2_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast channel 			
Test Sequence:	Step			
	<table border="1"> <tbody> <tr> <td>1</td> <td>User requests to play the current paused broadcast TV channel in trick play mode</td> </tr> <tr> <td>2</td> <td>Verify that UE displays the recorded broadcast TV channel</td> </tr> </tbody> </table>	1	User requests to play the current paused broadcast TV channel in trick play mode	2
1	User requests to play the current paused broadcast TV channel in trick play mode			
2	Verify that UE displays the recorded broadcast TV channel			
Conformance Criteria:	Check			
	1	Message exchange follows the below table		

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to play the current paused broadcast TV channel in trick play mode
2						→	RTSP	UE sends RTSP PLAY (scale : +1) to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4		←						Verify that UE displays recorded broadcast TV channel

4.4.4.3 Simple fast forward trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC2_0003 (S3A-0602)	
Summary:	User requests fast forward on a paused broadcast TV channel in trick play mode without reaching the end of recording	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying frozen trick-play enabled broadcast TV channel (see TD_IMS_IPTV_BC1_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast channel 	
Test Sequence:	Step	
	1	User requests x2 fast forward on the paused broadcast TV channel
	2	Verify that UE displays recorded broadcast TV channel in fast forward mode
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast forward on the paused broadcast TV channel
2						→	RTSP	UE sends RTSP PLAY(scale +2) to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4		←						UE displays recorded broadcast TV channel in fast forward mode

A RTSP PAUSE message may be sent between two consecutive RTSP PLAY messages.

4.4.4.4 Fast backward trick-play to beginning of recorded content

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_BC2_0004 (S3A-0702)	
Summary:	User request a fast backward on a paused broadcast TV channel in trick play mode	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying paused recorded broadcast TV channel (see TD_IMS_IPTV_BC2_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS. • CoDS is recording the trick play enabled broadcast TV channel 	
Test Sequence:	Step	
	1	User requests x2 fast backward on the paused broadcast TV channel
	2	Verify that UE displays recorded broadcast TV channel in fast backward mode
	3	Verify that UE stops display when beginning of recording is reached
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Diagram 1

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast backward on the paused broadcast TV channel
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY(scale -2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6								UE displays recorded broadcast TV channel in fast backward mode
7						←	RTSP	CoDS sends RTSP ANNOUNCE to UE via Xc (optional)
8						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc (optional)
9		←						UE stops display when beginning of recording is reached

In step 9, the UE is displaying a still image and then may switch to another mode. Handling of the start-of-stream in the ANNOUNCE message is up to the UE implementation.

4.4.4.5 Fast forward to move from trick-play to live broadcast mode

Interoperability Test Description									
Identifier:	TD_IMS_IPTV_BC2_0005 (S3A-0802)								
Summary:	User requests fast forward until the end of recording is reached and moves from trick play to live broadcast TV channel								
References:	TS 182 027 [1] clause 8.3.6; TS 183 063 [2] clauses 5.1.3.3.2, 7.2.2 and 8.1.2.1								
Configuration:	CF_IMS_IPTV								
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS, TV HEAD END, T&A								
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • User is registered in Core IMS using userIPTV_priv identity • UE is displaying paused recorded broadcast TV channel (see TD_IMS_IPTV_BC2_0001) • EPG has at least one trick play enabled broadcast TV channel • T&A is configured with multicast rights for the UE • TV Head End broadcasting TV content in real-time using multicast • UE supports content protocols and coding used by TV Head End and CoDS • CoDS supports content protocols and coding used by TV Head End • User has trick-play rights in IPTV AS • CoDS is recording the trick play enabled broadcast TV channel • UE is configured to change to live broadcast automatically after trick play ends 								
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests x2 fast forward on a paused broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE displays recorded broadcast TV channel in fast forward mode</td> </tr> <tr> <td>3</td> <td>Verify that UE displays live broadcast TV channel when end of recording is reached</td> </tr> </tbody> </table>	Step		1	User requests x2 fast forward on a paused broadcast TV channel	2	Verify that UE displays recorded broadcast TV channel in fast forward mode	3	Verify that UE displays live broadcast TV channel when end of recording is reached
Step									
1	User requests x2 fast forward on a paused broadcast TV channel								
2	Verify that UE displays recorded broadcast TV channel in fast forward mode								
3	Verify that UE displays live broadcast TV channel when end of recording is reached								
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table				
Check									
1	Message exchange follows the below table								

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast forward on a paused broadcast TV channel
2						→	RTSP	UE sends RTSP PLAY (scale +2) to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4								UE displays recorded broadcast TV channel in fast forward mode
5						←	RTSP	CoDS sends RTSP ANNOUCE to UE via Xc
6						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc
7						→	IGMP	UE sends IGMP JOIN to T&A via Dj
8								UE displays live broadcast TV channel when end of recording is reached
9						→	RTSP	UE sends RTSP TEARDOWN to CoDS via Xc
10						←	RTSP	UE sends RTSP 200 OK to CoDS via Xc
11						→	SIP	UE sends SIP REINVITE to CORE via Gm
12						→	SIP	CORE sends SIP REINVITE to AS via ISC
13						←	SIP	AS sends SIP BYE to CORE via ISC

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
14						→	SIP	CORE sends SIP BYE to CoDS via y2
15						←	SIP	CoDS sends SIP 200 OK to CORE via y2
16						→	SIP	CORE sends SIP 200 OK to AS via ISC
17						←	SIP	AS sends SIP 200 OK to CORE via ISC
18			←				SIP	CORE sends SIP 200 OK to UE via Gm
19						→	SIP	UE sends SIP ACK to CORE via Gm
20						→	SIP	CORE sends SIP ACK to AS via ISC

Upon receipt of the end-of-stream indication the CoDS sends in step 5 an RTSP ANNOUNCE to the UE with an indication that the end-of-stream has been reached. In case of BC sessions with trick-play, if the UE receives an RTSP ANNOUNCE request with an end-of-stream indication, the UE may initiate a session modification procedure in order to go back to a normal BC session in multicast mode (this is the case described above) or may alternatively take other actions (e.g. rewind, pause, terminate session, etc.).

There is a delay between the UE receiving the RTSP ANNOUNCE in step 4 and sending the RTSP TEARDOWN in step 8 as well as SIP reINVITE in step 10.

It is acceptable to generate SIP UPDATE instead of SIP reINVITE requests. . In that case SIP ACK requests should not be sent.

Before the RTSP PLAY message in step 2 a RTSP PAUSE message may be sent.

There is no strict sequence of the SIP and IGMP messages. The IGMP JOIN message may be sent before or after sending the SIP ACK request.

4.4.5 Content on Demand (CoD) using Method 1

4.4.5.1 Start CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0001 (S3A-1101)	
Summary:	User requests to watch Content on Demand	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE has received EPG from IPTV AS (see TD_ IMS_IPTV_ADS_0001/2/3) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to watch a CoD
	2	Verify that UE displays the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to watch a CoD
2			→				SIP	UE sends SIP OPTION to CORE via Gm
3					→		SIP	CORE sends SIP OPTION to AS via ISC
4					←		SIP	AS sends SIP OPTION to CORE via ISC
5						→	SIP	CORE sends SIP OPTION to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10			→				SIP	UE sends SIP INVITE to CORE via Gm
11					→		SIP	CORE sends SIP INVITE to AS via ISC
12					←		SIP	AS sends SIP INVITE to CORE via ISC
13						→	SIP	CORE sends SIP INVITE to CoDS via y2
14					←		SIP	CoDS sends SIP 200 OK to CORE via y2
15						→	SIP	CORE sends SIP 200 OK to AS via ISC
16					←		SIP	AS sends SIP 200 OK to CORE via ISC
17		←					SIP	CORE sends SIP 200 OK to UE via Gm
18			→				SIP	UE sends SIP ACK to CORE via Gm
19					→		SIP	CORE sends SIP ACK to AS via ISC
20					←		SIP	AS sends SIP ACK to CORE via ISC
21						→	SIP	CORE sends SIP ACK to CoDS via y2
22						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
23		←					RTSP	CoDS sends RTSP 200 OK to UE via Xc
24					←		SIP	CoDS sends SIP INFO to CORE via y2 (optional)
25						→	SIP	CORE sends SIP INFO to AS via ISC (optional)
26					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
27						→	SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
28	←							UE displays the CoD

The SIP OPTIONS message should be used for retrieving network parameters for the SDP payload in case that these parameters are not included in the SSF.

When CoDS receives the very first RTSP PLAY message, the IPTV AS may send a SIP INFO message with CoDDeliveryStatus set to "Ongoing".

4.4.5.2 Pause CoD with trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0002 (S3A-1201)	
Summary:	User requests to pause a CoD using trick-play	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD1_0001) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to pause CoD
	2	Verify that UE freezes the image of the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to pause CoD
2							RTSP	UE sends RTSP PAUSE to CoDS via Xc
3							RTSP	CoDS sends RTSP 200 OK to UE via Xc
4								UE freezes the image of the CoD

4.4.5.3 Play CoD in trick-play mode

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0003 (S3A-1201)	
Summary:	User requests play a CoD using trick-play	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying paused CoD (see TD_IMS_IPTV_CoD1_0002) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to play the paused CoD
	2	Verify that UE displays the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to play the paused CoD
2						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4		←						Verify that the UE displays the CoD

4.4.5.4 Simple fast forward of CoD using trick-play

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_CoD1_0004 (S3A-1201)						
Summary:	User requests fast forward on a paused CoD in trick play mode without reaching the end of recording						
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS						
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying paused CoD (see TD_IMS_IPTV_CoD1_0002) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests x2 fast forward on the paused CoD</td> </tr> <tr> <td>2</td> <td>Verify that UE displays images the CoD in fast forward mode</td> </tr> </tbody> </table>	Step		1	User requests x2 fast forward on the paused CoD	2	Verify that UE displays images the CoD in fast forward mode
Step							
1	User requests x2 fast forward on the paused CoD						
2	Verify that UE displays images the CoD in fast forward mode						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table		
Check							
1	Message exchange follows the below table						

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast forward on the paused CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY(scale +2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6		←						UE displays images the CoD in fast forward mode

4.4.5.5 Simple fast backward on CoD using trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0005 (S3A-1201)	
Summary:	User requests fast backward on a paused CoD using trick play in trick play mode without reaching the beginning of the recording	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying paused CoD (see TD_IMS_IPTV_CoD1_0002) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests x2 fast backward on the paused CoD
	2	Verify that UE displays images the CoD in fast backward mode
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests x2 fast backward on the paused CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4						→	RTSP	UE sends RTSP PLAY (scale -2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6	←							UE displays images the CoD in fast backward mode

4.4.5.6 Jump to specific location in CoD content

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0006 (S3A-1201)	
Summary:	User jumps to specific point in CoD using trick-play	
References:	TS 182 027 [1]; TS 183 063 [2] clause 7.2.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD1_0001) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to jump to a specific location in the CoD
	2	Verify that UE displays the CoD from this specific point
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to jump to a specific location in the CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4						→	RTSP	UE sends RTSP PLAY (range=z) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6		←						Verify that UE displays the CoD from this specific point

4.4.5.7 Quit watching CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0007 (S3A-1301)	
Summary:	User quits watching CoD	
References:	TS 182 027 [1] clause 8.4.3; TS 183 063 [2] clause 5.1.4.4.1	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD1_0001) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User quits watching the CoD
	2	Verify that UE does not display the CoD anymore
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User quits watching the CoD
2						→	SIP	UE sends SIP INFO to CORE via Gm (optional)
3						→	SIP	CORE sends SIP INFO to AS via ISC (optional)
4						←	SIP	AS sends SIP 200 OK to CORE via ISC(optional)
5						←	SIP	CORE sends SIP 200 OK to UE via Gm (optional)
6						→	SIP	UE sends SIP BYE to CORE via Gm
7						→	SIP	CORE sends SIP BYE to AS via ISC
8						←	SIP	AS sends SIP BYE to CORE via ISC
9						→	SIP	CORE sends SIP BYE to CoDS via y2
10						←	SIP	CoDS sends SIP 200 OK to CORE via y2
11						→	SIP	CORE sends SIP 200 OK to AS via ISC
12						←	SIP	AS sends SIP 200 OK to CORE via ISC
13						←	SIP	CORE sends SIP 200 OK to UE via Gm
14		←						UE does not display the CoD anymore

When a user requests to stop viewing a CoD with the intention of resuming it later, the UE may send a SIP INFO (with CoDOffset) request to the SCF.

4.4.5.8 Resume CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD1_0008 (S3A-1401)	
Summary:	User resumes a CoD from the last watching point	
References:	TS 182 027 [1] clause 8.3.3; TS 183 063 [2] clauses 5.1.3.4 and 8.1.2.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • User has stopped watching a CoD prior to its end (see TD_IMS_IPTV_CoD1_0007) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to resume a CoD
	2	Verify that UE displays the CoD from last watching point
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to resume a CoD
2				→			SIP	UE sends SIP OPTION to CORE via Gm
3					→		SIP	CORE sends SIP OPTION to AS via ISC
4					←		SIP	AS sends SIP OPTION to CORE via ISC
5						→	SIP	CORE sends SIP OPTION to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10				→			SIP	UE sends SIP INVITE to CORE via Gm
11					→		SIP	CORE sends SIP INVITE to AS via ISC
12					←		SIP	AS sends SIP INVITE to CORE via ISC
13						→	SIP	CORE sends SIP INVITE to CoDS via y2
14					←		SIP	CoDS sends SIP 200 OK to CORE via y2
15						→	SIP	CORE sends SIP 200 OK to AS via ISC
16					←		SIP	AS sends SIP 200 OK to CORE via ISC
17		←					SIP	CORE sends SIP 200 OK to UE via Gm
18				→			SIP	UE sends SIP ACK to CORE via Gm
19					→		SIP	CORE sends SIP ACK to AS via ISC
20					←		SIP	AS sends SIP ACK to CORE via ISC
21						→	SIP	CORE sends SIP ACK to CoDS via y2
22						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
23					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
24					←		SIP	CoDS sends SIP INFO to CORE via y2
25						→	SIP	CORE sends SIP INFO to AS via ISC
26					←		SIP	AS sends SIP 200 OK to CORE via ISC
27						→	SIP	CORE sends SIP 200 OK to CoDS via y2
28	←							UE displays the CoD from last watching point

The SIP OPTION message should be used for retrieving the network parameters for SDP when the parameters are not included in the SSF.

The RTSP PLAY message shall carry the range parameter. The range parameter value may be retrieved from the SDP h-offset attribute in SIP procedure. Or, the range parameter value may be retrieved from SSF as the service action data value of CoDOffset which indicates the last stop point.

4.4.5.9 CoD termination by IPTV AS

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_CoD1_0009 (-)						
Summary:	IPTV AS stops user from watching CoD						
References:	TS 182 027 [1] clause 8.4.3; TS 183 063 [2] clause 5.1.4.4.1						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS						
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD1_0001) • CoDS configured with CoD content • IPTV AS provides an interface that allows stopping of CoD provisioning • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>IPTV AS is requested to stop the CoD being watched by user</td> </tr> <tr> <td>2</td> <td>Verify that UE stops displaying the CoD</td> </tr> </tbody> </table>	Step	Description	1	IPTV AS is requested to stop the CoD being watched by user	2	Verify that UE stops displaying the CoD
Step	Description						
1	IPTV AS is requested to stop the CoD being watched by user						
2	Verify that UE stops displaying the CoD						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check	Description	1	Message exchange follows the below table		
Check	Description						
1	Message exchange follows the below table						

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								IPTV AS is requested to stop the CoD being watched by user
2					←		SIP	AS sends SIP BYE to CORE via ISC (towards the CoDS)
3						→	SIP	CORE sends SIP BYE to CoDS via y2
4					←		SIP	CoDS sends SIP 200 OK to AS via y2
5						→	SIP	CORE sends SIP 200 OK to AS via ISC
6					←		SIP	AS sends SIP BYE to CORE via ISC (towards the UE)
7		←					SIP	CORE sends SIP BYE to UE via Gm
8			→				SIP	UE sends SIP 200 OK to CORE via Gm
9						→	SIP	CORE sends SIP 200 OK to AS via ISC
10	←							UE stops displaying the CoD

4.4.5.10 End of CoD

Interoperability Test Description					
Identifier:	TD_IMS_IPTV_CoD1_0010 (-)				
Summary:	User watches a CoD until its end				
References:	TS 182 027 [1] clause 8.4.3; TS 183 063 [2] clause 5.1.4.4.1				
Configuration:	CF_IMS_IPTV				
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS				
Pre-test conditions:	<ul style="list-style-type: none"> • UE is registered in Core IMS using userIPTV_priv identity • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD1_0001) • CoDS configured with (short) CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 				
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Verify that UE stops display at end of CoD</td> </tr> </tbody> </table>	Step		1	Verify that UE stops display at end of CoD
Step					
1	Verify that UE stops display at end of CoD				
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table
Check					
1	Message exchange follows the below table				

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
(1)		←						UE displays CoD
2			←				RTSP	CoDS sends RTSP ANNOUNCE (end-of-stream) to UE via Xc (optional)
3					←		SIP	CoDS sends SIP INFO to CORE via ISC (optional, CoDDeliveryStatus = "Completed")
4						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc (optional)
5					→		SIP	CORE sends SIP INFO to AS via ISC (optional CoDDeliveryStatus = "Completed")
6					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
7						→	SIP	CORE sends SIP 200 OK to CoDS via y2
16		←						UE stops display at end of CoD

4.4.6 Video on Demand (CoD) using Method 2

4.4.6.1 Start CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0001 (S3A-1102)	
Summary:	User watches Video on Demand	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE has received EPG from IPTV AS (see TD_IMS_IPTV_ADS_0001/2/3) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to watch a CoD
	2	Verify that UE displays the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Three message flows are accepted for this TD.

- 1) With SIP re-INVITE messages for session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to watch a CoD
2				→			SIP	UE sends SIP INVITE to CORE via Gm
3					→		SIP	CORE sends SIP INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10				→			SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to CoDS via y2
14						→	RTSP	UE sends RTSP DESCRIBE to CoDS via Xc (optional, only to get missing SDP parameters)
15					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
16						→	RTSP	UE sends RTSP SETUP to CoDS via Xc
17					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
18						→	SIP	UE sends SIP reINVITE to CORE via Gm
19					→		SIP	CORE sends SIP reINVITE to AS via ISC
20					←		SIP	AS sends SIP reINVITE to CORE via ISC
21						→	SIP	CORE sends SIP reINVITE to CoDS via y2
22					←		SIP	CoDS sends SIP 200 OK to CORE via y2
23						→	SIP	CORE sends SIP 200 OK to AS via ISC
24					←		SIP	AS sends SIP 200 OK to CORE via ISC
25		←					SIP	CORE sends SIP 200 OK to UE via Gm
26				→			SIP	UE sends SIP ACK to CORE via Gm

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
27							SIP	CORE sends SIP ACK to AS via ISC
28							SIP	AS sends SIP ACK to CORE via ISC
29							SIP	CORE sends SIP ACK to CoDS via y2
30							RTSP	UE sends RTSP PLAY to CoDS via Xc
31							RTSP	CoDS sends RTSP 200 OK to UE via Xc
32							SIP	CoDS sends SIP INFO to CORE via y2 (optional with user related IPTV service action data)
33							SIP	CORE sends SIP INFO to AS via ISC (optional)
34							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
35							SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
36								UE displays the CoD

2) With UPDATE SIP messages for session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to watch a CoD
2							SIP	UE sends SIP INVITE to CORE via Gm
3							SIP	CORE sends SIP INVITE to AS via ISC
4							SIP	AS sends SIP INVITE to CORE via ISC
5							SIP	CORE sends SIP INVITE to CoDS via y2
6							SIP	CoDS sends SIP 200 OK to CORE via y2
7							SIP	CORE sends SIP 200 OK to AS via ISC
8							SIP	AS sends SIP 200 OK to CORE via ISC
9							SIP	CORE sends SIP 200 OK to UE via Gm
10							SIP	UE sends SIP ACK to CORE via Gm
11							SIP	CORE sends SIP ACK to AS via ISC
12							SIP	AS sends SIP ACK to CORE via ISC
13							SIP	CORE sends SIP ACK to CoDS via y2
14							RTSP	UE sends RTSP DESCRIBE to CoDS via Xc (optional, only to get missing SDP parameters)
15							RTSP	CoDS sends RTSP 200 OK to UE via Xc
16							RTSP	UE sends RTSP SETUP to CoDS via Xc
17							RTSP	CoDS sends RTSP 200 OK to UE via Xc
18							SIP	UE sends SIP UPDATE to CORE via Gm
19							SIP	CORE sends SIP UPDATE to AS via ISC
20							SIP	AS sends SIP UPDATE to CORE via ISC
21							SIP	CORE sends SIP UPDATE to CoDS via y2
22							SIP	CoDS sends SIP 200 OK to CORE via y2
23							SIP	CORE sends SIP 200 OK to AS via ISC
24							SIP	AS sends SIP 200 OK to CORE via ISC
25							SIP	CORE sends SIP 200 OK to UE via Gm
26							RTSP	UE sends RTSP PLAY to CoDS via Xc
27							RTSP	CoDS sends RTSP 200 OK to UE via Xc
28							SIP	CoDS sends SIP INFO to CORE via y2 (optional, with user related IPTV service action data)
29							SIP	CORE sends SIP INFO to AS via ISC (optional)

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
30					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
31						→	SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
32	←							UE displays the CoD

3) With RTSP Channel establishing without session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to watch a CoD
2			→				SIP	UE sends SIP INVITE to CORE via Gm
3					→		SIP	CORE sends SIP INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to CoDS via y2
6					←		SIP	CoDS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10			→				SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to CoDS via y2
14						→	RTSP	UE sends RTSP SETUP to CoDS via Xc
15		←					RTSP	CoDS sends RTSP 200 OK to UE via Xc
16						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
17		←					RTSP	CoDS sends RTSP 200 OK to UE via Xc
18					←		SIP	CoDS sends SIP INFO to CORE via y2 (optional with user related IPTV service action data)
19						→	SIP	CORE sends SIP INFO to AS via ISC (optional)
20					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
21						→	SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
22	←							UE displays the CoD

4.4.6.2 Pause CoD with trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0002 (S3A-1201)	
Summary:	User pauses a CoD using trick-play	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0001) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to pause CoD
	2	Verify that UE freezes the image of the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to pause CoD
2							RTSP	UE sends RTSP PAUSE to CoDS via Xc
3							RTSP	CoDS sends RTSP 200 OK to UE via Xc
4								UE freezes the image of the CoD

4.4.6.3 Play CoD with trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0003 (S3A-1201)	
Summary:	User plays a CoD using trick-play	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is in pause mode watching a CoD (see TD_IMS_IPTV_CoD2_0002) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to play the paused CoD
	2	Verify that UE displays the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to play the paused CoD
2						→	RTSP	UE sends RTSP PLAY to CoDS via Xc
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
4		←						Verify that the UE displays the CoD

4.4.6.4 Fast forward CoD using trick-play

Interoperability Test Description							
Identifier:	TD_IMS_IPTV_CoD2_0004 (S3A-1202)						
Summary:	User fast forwards CoD using trick play						
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2						
Configuration:	CF_IMS_IPTV						
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS						
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0003) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 						
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests to x2 fast forward CoD</td> </tr> <tr> <td>2</td> <td>Verify that UE displays images the CoD in fast forward mode</td> </tr> </tbody> </table>	Step		1	User requests to x2 fast forward CoD	2	Verify that UE displays images the CoD in fast forward mode
Step							
1	User requests to x2 fast forward CoD						
2	Verify that UE displays images the CoD in fast forward mode						
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table		
Check							
1	Message exchange follows the below table						

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to fast forward CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY(scale +2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6		←						UE displays images the CoD in fast forward mode

The UE may send a RTSP PAUSE before sending RTSP PLAY.

4.4.6.5 Fast backward CoD using trick-play

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0005 (S3A-1202)	
Summary:	User fast backwards CoD using trick play	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0003) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to x2 fast backward CoD
	2	Verify that UE displays images the CoD in fast backward mode
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to fast backward CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY (scale -2) to CoDS via Xc
5						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
6	←							Verify that UE displays images the CoD in fast backward mode

The UE may send a RTSP PAUSE before sending RTSP PLAY.

4.4.6.6 Jump to specific location in CoD content

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0006 (S3A-1202)	
Summary:	User jumps in CoD to specific point using trick-play	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0002) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to jump to a specific location in the CoD
	2	Verify that UE displays the CoD from this specific point
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User requests to jump to a specific location in the CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3			←				RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP PLAY (range=z) to CoDS via Xc
5			←				RTSP	CoDS sends RTSP 200 OK to UE via Xc
6		←						Verify that UE displays the CoD from this specific point

The UE may send a RTSP PAUSE before sending RTSP PLAY.

4.4.6.7 Terminate CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0007 (S3A-1302)	
Summary:	User quits watching CoD	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0003) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User quits watching the CoD
	2	Verify that the UE does not display the CoD anymore
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Two message flows are accepted for this TD.

- 1) With SIP messages exchange initiated by UE:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User quits watching the CoD
2				→			SIP	UE sends SIP INFO to CORE via Gm
3					→		SIP	CORE sends SIP INFO to AS via ISC
4					←		SIP	AS sends SIP 200 OK to CORE via ISC
5			←				SIP	CORE sends SIP 200 OK to UE via Gm
6						→	RTSP	UE sends RTSP TEARDOWN to CoDS via Xc
7					←		RTSP	CoDS sends RTSP 200 OK to UE via Xc
8						→	SIP	UE sends SIP BYE to CORE via Gm
9					→		SIP	CORE sends SIP BYE to AS via ISC
10					←		SIP	AS sends SIP BYE to CORE via ISC
11					→		SIP	CORE sends SIP BYE to CoDS via y2
12					←		SIP	CoDS sends SIP 200 OK to CORE via y2
13					→		SIP	CORE sends SIP 200 OK to AS via ISC
14					←		SIP	AS sends SIP 200 OK to CORE via ISC
15					←		SIP	CORE sends SIP 200 OK to UE via Gm
16	←							UE does not display the CoD anymore

2) With SIP messages exchange initiated by CoDS:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1		→						User quits watching the CoD
2						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
3						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
4						→	RTSP	UE sends RTSP TEARDOWN to MVS via Xc
5						←	SIP	CoDS sends SIP INFO (with CoDOffset) to CORE via y2 (optional)
6						→	SIP	CORE sends SIP INFO to AS via ISC
7						←	SIP	AS sends SIP 200 OK to CORE via ISC
8						→	SIP	CORE sends SIP 200 OK to CoDS via y2
9						←	RTSP	CoDS sends RTSP 200 OK to UE via Xc
10						→	SIP	UE sends SIP BYE to CORE via Gm
11						→	SIP	CORE sends SIP BYE to AS via ISC
12						←	SIP	AS sends SIP BYE to CORE via ISC
13						→	SIP	CORE sends SIP BYE to CoDS via y2
14						←	SIP	CoDS sends SIP 200 OK to CORE via y2
15						→	SIP	CORE sends SIP 200 OK to AS via ISC
16						←	SIP	AS sends SIP 200 OK to CORE via ISC
17						←	SIP	CORE sends SIP 200 OK to UE via Gm
18		←						UE does not display the CoD anymore

4.4.6.8 Resume CoD

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0008 (S3A-1402)	
Summary:	User resumes a CoD from the last watching point	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • User has stopped watching a program prior to its end (see TD_IMS_IPTV_CoD2_0006) • CoDS configured with CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	User requests to resume a CoD
	2	Verify that UE displays the CoD from last watching point
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Three message flows are accepted for this TD.

- 1) Using SIP re-INVITE messages for session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to resume a CoD
2							SIP	UE sends SIP INVITE to CORE via Gm
3							SIP	CORE sends SIP INVITE to AS via ISC
4							SIP	AS sends SIP INVITE to CORE via ISC
5							SIP	CORE sends SIP INVITE to CoDS via y2
6							SIP	CoDS sends SIP 200 OK to CORE via y2
7							SIP	CORE sends SIP 200 OK to AS via ISC
8							SIP	AS sends SIP 200 OK to CORE via ISC
9							SIP	CORE sends SIP 200 OK to UE via Gm
10							SIP	UE sends SIP ACK to CORE via Gm
11							SIP	CORE sends SIP ACK to AS via ISC
12							SIP	AS sends SIP ACK to CORE via ISC
13							SIP	CORE sends SIP ACK to CoDS via y2
14							RTSP	UE sends RTSP DESCRIBE to CoDS via Xc (optional, only to get missing SDP parameters)
15							RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
16							RTSP	UE sends RTSP SETUP to CoDS via Xc
17							RTSP	CoDS sends RTSP 200 OK to UE via Xc
18							SIP	UE sends SIP reINVITE to CORE via Gm
19							SIP	CORE sends SIP reINVITE to AS via ISC
20							SIP	AS sends SIP reINVITE to CORE via ISC
21							SIP	CORE sends SIP reINVITE to CoDS via y2
22							SIP	CoDS sends SIP 200 OK to CORE via y2
23							SIP	CORE sends SIP 200 OK to AS via ISC
24							SIP	AS sends SIP 200 OK to CORE via ISC
25							SIP	CORE sends SIP 200 OK to UE via Gm
26							SIP	UE sends SIP ACK to CORE via Gm
27							SIP	CORE sends SIP ACK to AS via ISC

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
28							SIP	AS sends SIP ACK to CORE via ISC
29							SIP	CORE sends SIP ACK to CoDS via y2
30							RTSP	UE sends RTSP PLAY (with range parameter) to CoDS via Xc
31							RTSP	CoDS sends RTSP 200 OK to UE via Xc
32							SIP	CoDS sends SIP INFO to CORE via y2 (optional)
33							SIP	CORE sends SIP INFO to AS via ISC (optional)
34							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
35							SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
36								UE displays the CoD from last watching point

Note that the range parameter value in step 30 may be retrieved from the SDP h-offset attribute in SIP procedure. Or, the range parameter value may be retrieved from SSF as the service action data value of CoDOffset which indicates the last stop point.

2) Using SIP UPDATE messages for session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to resume a CoD
2							SIP	UE sends SIP INVITE to CORE via Gm
3							SIP	CORE sends SIP INVITE to AS via ISC
4							SIP	AS sends SIP INVITE to CORE via ISC
5							SIP	CORE sends SIP INVITE to CoDS via y2
6							SIP	CoDS sends SIP 200 OK to CORE via y2
7							SIP	CORE sends SIP 200 OK to AS via ISC
8							SIP	AS sends SIP 200 OK to CORE via ISC
9							SIP	CORE sends SIP 200 OK to UE via Gm
10							SIP	UE sends SIP ACK to CORE via Gm
11							SIP	CORE sends SIP ACK to AS via ISC
12							SIP	AS sends SIP ACK to CORE via ISC
13							SIP	CORE sends SIP ACK to CoDS via y2
14							RTSP	UE sends RTSP DESCRIBE to CoDS via Xc (optional, only to get missing SDP parameters)
15							RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
16							RTSP	UE sends RTSP SETUP to CoDS via Xc
17							RTSP	CoDS sends RTSP 200 OK to UE via Xc
18							SIP	UE sends SIP UPDATE to CORE via Gm
19							SIP	CORE sends SIP UPDATE to AS via ISC
20							SIP	AS sends SIP UPDATE to CORE via ISC
21							SIP	CORE sends SIP UPDATE to CoDS via y2
22							SIP	CoDS sends SIP 200 OK to CORE via y2
23							SIP	CORE sends SIP 200 OK to AS via ISC
24							SIP	AS sends SIP 200 OK to CORE via ISC
25							SIP	CORE sends SIP 200 OK to UE via Gm
26							RTSP	UE sends RTSP PLAY (range parameter) to CoDS via Xc
27							RTSP	CoDS sends RTSP 200 OK to UE via Xc

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
28							SIP	CoDS sends SIP INFO to CORE via y2 (optional)
29							SIP	CORE sends SIP INFO to AS via ISC (optional)
30							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
31							SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
32								UE displays the CoD from last watching point

Note that the range parameter value in step 26 may be retrieved from the SDP h-offset attribute in SIP procedure. Or, the range parameter value may be retrieved from SSF as the service action data value of CoDOffset which indicates the last stop point.

3) Using RTSP channel establishment without session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								User requests to resume a CoD
2							SIP	UE sends SIP INVITE to CORE via Gm
3							SIP	CORE sends SIP INVITE to AS via ISC
4							SIP	AS sends SIP INVITE to CORE via ISC
5							SIP	CORE sends SIP INVITE to CoDS via y2
6							SIP	CoDS sends SIP 200 OK to CORE via y2
7							SIP	CORE sends SIP 200 OK to AS via ISC
8							SIP	AS sends SIP 200 OK to CORE via ISC
9							SIP	CORE sends SIP 200 OK to UE via Gm
10							SIP	UE sends SIP ACK to CORE via Gm
11							SIP	CORE sends SIP ACK to AS via ISC
12							SIP	AS sends SIP ACK to CORE via ISC
13							SIP	CORE sends SIP ACK to CoDS via y2
14							RTSP	UE sends RTSP SETUP to CoDS via Xc
15							RTSP	CoDS sends RTSP 200 OK to UE via Xc
16							RTSP	UE sends RTSP PLAY(with range parameter) to CoDS via Xc
17							RTSP	CoDS sends RTSP 200 OK to UE via Xc
18							SIP	CoDS sends SIP INFO to CORE via y2 (optional)
19							SIP	CORE sends SIP INFO to AS via ISC (optional)
20							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
21							SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
22								UE displays the CoD from last watching point

The range parameter value in step 16 may be retrieved from the SDP h-offset attribute in SIP procedure. Or, the range parameter value may be retrieved from SSF as the service action data value of CoDOffset which indicates the last stop point.

4.4.6.9 CoD termination by IPTV AS

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_0009 (S3A-1402)	
Summary:	AS IPTV stops user from watching CoD	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0001) • CoDS configured with CoD content • IPTV AS provides an interface that allows stopping of CoD provisioning • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	IPTV AS is requested to stop ongoing CoD
	2	Verify that UE stops displaying the CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
1								IPTV AS is requested to stop ongoing CoD
2							SIP	AS sends SIP BYE to CORE via ISC
3							SIP	CORE sends SIP BYE to UE via Gm
4							RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
5							RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
6							RTSP	UE sends RTSP TEARDOWN to CoDS via Xc
7							SIP	CoDS sends SIP INFO to CORE via y2 (optional with CoDOffset)
8							SIP	CORE sends SIP INFO to AS via ISC (optional)
9							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
10							SIP	CORE sends SIP 200 OK to CoDS via y2 (optional)
11							RTSP	CoDS sends RTSP 200 OK to UE via Xc
12							SIP	UE sends SIP 200 OK to CORE via Gm
13							SIP	CORE sends SIP 200 OK to AS via ISC
14							SIP	AS sends SIP BYE to CORE via ISC
15							SIP	CORE sends SIP BYE to CoDS via y2
16							SIP	CoDS sends SIP 200 OK to CORE via y2
17							SIP	CORE sends SIP 200 OK to AS via ISC
18								UE stops displaying the CoD

4.4.6.10 CoD termination at the end of stream

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_CoD2_00010 (S3A-1701)	
Summary:	User watches a CoD until its end	
References:	TS 182 027 [1] clause 8.4.1; TS 183 063 [2] clause 5.1.4.2	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, CoDS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, CoDS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • EPG has at least one CoD • UE is displaying a CoD (see TD_IMS_IPTV_CoD2_0001) • CoDS configured with (short) CoD content • IMS CORE configured to forward CoD related SIP requests to AS IPTV • UE supports content protocols and coding used by CoDS 	
Test Sequence:	Step	
	1	Verify that the UE stops at end of CoD
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Two message flows are accepted for this TD.

- 1) Using SIP INFO and RTSP ANNOUNCE messages:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
(1)								UE displays CoD
2		←					RTSP	CoDS sends RTSP ANNOUNCE (end-of-stream) to UE via Xc
3					←		SIP	CoDS sends SIP INFO to CORE via ISC (optional, CoDDeliveryStatus = "Completed")
4						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc (optional)
5					→		SIP	CORE sends SIP INFO to AS via ISC (optional CoDDeliveryStatus = "Completed")
6					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
7						→	SIP	CORE sends SIP 200 OK to CoDS via y2
8					→		SIP	UE sends SIP INFO to CORE via Gm (optional)
9					→		SIP	CORE sends SIP INFO to AS via ISC (optional)
10					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
11		←					SIP	CORE sends SIP 200 OK to UE via Gm (optional)
12		←						UE stops CoD

2) With SIP INFO messages on receiving RTSP TEARDOWN:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	C o D S		
(1)	←							UE displays CoD
2		←					RTSP	CoDS sends RTSP ANNOUNCE (end-of-stream) to UE via Xc
3						→	RTSP	UE sends RTSP 200 OK to CoDS via Xc
4						→	RTSP	UE sends RTSP PAUSE to CoDS via Xc (optional)
5		←					RTSP	CoDS sends RTSP 200 OK to UE via Xc (optional)
7					←		SIP	CoDS sends SIP INFO to CORE via ISC (optional, CoDDeliveryStatus = "Completed")
8					→		SIP	CORE sends SIP INFO to AS via ISC (optional CoDDeliveryStatus = "Completed")
9					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
10						→	SIP	CORE sends SIP 200 OK to CoDS via y2
11	←							UE stops CoD

4.4.7 NPVR using Method 1

4.4.7.1 Impulsive recording request

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_nP1_0001 (S3A-1901)	
Summary:	User requests an impulsive recording of a broadcast TV channel	
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV Head End, T&A, PVRS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, PVRS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • UE supports nPVR • EPG has at least one nPVR enabled broadcast TV channel • UE is displaying broadcast TV channel (see TD_IMS_IPTV_BC_0001) • User has nPVR rights in IPTV AS • IMS CORE configured to forward nPVR related SIP requests to AS IPTV • UE, PVRS and TV Head End support the same content protocols and coding 	
Test Sequence:	Step	
	1	User requests an impulsive recording of a broadcast TV channel
	2	Verify that UE confirms recording
	3	User requests EPG after the end of the recorded program
	4	Verify that UE displays EPG with the new entry
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests an impulsive recording of a broadcast TV channel
2				→			SIP	UE sends SIP MESSAGE (bookmark) to CORE via Gm
3					→		SIP	CORE sends SIP MESSAGE (bookmark) to AS via ISC
4					←		SIP	AS sends SIP 200 OK to CORE via ISC
5					←		SIP	CORE sends SIP 200 OK to UE via Gm
6		←						UE confirms parking
i				←			SIP	AS sends SIP to CORE via ISC immediately (not described in R2)
i					→		SIP	CORE sends SIP to PVRS via y2 (not described in R2)
i				←			IGMP Join	PVRS starts recording TV Channel program (not described in R2)
i				←			IGMP Leave	PVRS stops recording TV Channel program at the end of the program (not described in R2)
7					←		SIP	AS sends SIP MESSAGE to CORE via ISC (optional may exist prior to IGMP join)
8				←			SIP	CORE sends SIP MESSAGE to UE via Gm (optional may exist prior to IGMP join)
9					→		SIP	UE sends SIP 200 OK to CORE via Gm (optional may exist prior to IGMP join)
10					→		SIP	CORE sends SIP 200 OK to AS via ISC (optional may exist prior to IGMP join)
11		→						User requests EPG after the end of the recorded program
12					→		HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
13					←		HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
14		←						UE displays EPG with the new entry

Steps tagged "i" do not follow a given specification. They are here for information and show the simple message exchange that could happen between the NPVR, TA, CORE and AS nodes in this case.

Steps 11 and 12 allows UE to get TV content captured in steps "i" as described in clause 8.5.2 of [1].

4.4.7.2 Scheduled recording request

Interoperability Test Description	
Identifier:	TD_IMS_IPTV_nP1_0002 (S3A-2001)
Summary:	User requests a scheduled recording of a broadcast TV channel
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]
Configuration:	CF_IMS_IPTV
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV Head End, T&A, PVRS
Pre-test conditions:	<ul style="list-style-type: none"> • UE is registered in Core IMS and received EPG from IPTV AS (see TD_IMS_IPTV_ADS_0001/2/3) • UE, PVRS, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • UE supports nPVR • EPG has at least one nPVR enabled broadcast TV channel • UE is not displaying broadcast TV channel • User has nPVR rights in IPTV AS • IMS CORE configured to forward nPVR related SIP requests to AS IPTV • UE, PVRS and TV Head End support the same content protocols and coding

Interoperability Test Description		
Test Sequence:	Step	
	1	User requests a scheduled recording of a broadcast TV channel
	2	Verify that UE confirms parking
	3	User requests EPG after the end of the recorded program
	4	Verify that UE displays EPG with the new entry
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests a scheduled recording of a broadcast TV channel
2				→			SIP	UE sends SIP MESSAGE to CORE via Gm
3					→		SIP	CORE sends SIP MESSAGE to AS via ISC
4					←		SIP	AS sends SIP 200 OK to CORE via ISC
5				←			SIP	CORE sends SIP 200 OK to UE via Gm
6		←						UE confirms parking
i				←			SIP	AS sends SIP to CORE via ISC (not described in R2)
i					→		SIP	CORE sends SIP to PVRS via y2 (not described in R2)
i				←			IGMP Join	PVRS starts recording TV Channel program, at "start-time" (not described in R2)
i				←			IGMP Leave	PVRS stops recording TV Channel program at "end-time" (not described in R2)
7				←			SIP	AS sends SIP MESSAGE to CORE via ISC (optional may exist prior to IGMP join)
8				←			SIP	CORE sends SIP MESSAGE to UE via Gm (optional may exist prior to IGMP join)
9				→			SIP	UE sends SIP 200 OK to CORE via Gm (optional may exist prior to IGMP join)
10				→			SIP	CORE sends SIP 200 OK to AS via ISC (optional may exist prior to IGMP join)
11		→						User requests EPG after the end of the recorded program
12				→			HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
13				←			HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
14		←						UE displays EPG with the new entry

Steps tagged "i" do not follow a given specification. They are here for information and show the simple message exchange that could happen between the NPVR, TA, CORE and AS nodes in this case.

4.4.7.3 Watching a recorded nPVR content

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_nP1_0003 (S3A-2201)	
Summary:	User watches a recorded content	
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, PVRs	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, PVRs, Core IMS and IPTV AS are configured for method 1 • UE is registered in Core IMS using userIPTV_priv identity • UE supports nPVR • EPG has at least one nPVR enabled broadcast TV channel • nPVR content is available in PVRs based on either an impulsive or scheduled request to capture broadcast TV channel (see TD_IMS_IPTV_nP1_0001/2) • User has nPVR rights in IPTV AS • IMS CORE configured to forward nPVR related SIP requests to AS IPTV • UE, PVRs and TV Head End support the same content protocols and coding 	
Test Sequence:	Step	
	1	User requests to watch recorded content
	2	Verify that UE displays recorded content
Conformance Criteria:	Check	
	1	Message exchange follows the below table

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests to watch recorded content
2				→			SIP	UE sends SIP OPTION to CORE via Gm (to retrieve parameters to build SDP - optional)
3					→		SIP	CORE sends SIP OPTION to AS via ISC (optional)
4					←		SIP	AS sends SIP OPTION to CORE via ISC (optional)
5						→	SIP	CORE sends SIP OPTION to PVRs via y2 (optional)
6					←		SIP	PVRs sends SIP 200 OK to CORE via y2 (optional)
7					→		SIP	CORE sends SIP 200 OK to AS via ISC (optional)
8					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
9				←			SIP	CORE sends SIP 200 OK to UE via Gm (optional)
10				→			SIP	UE sends SIP INVITE to CORE via Gm
11					→		SIP	CORE sends SIP INVITE to AS via ISC
12					←		SIP	AS sends SIP INVITE to CORE via ISC
13						→	SIP	CORE sends SIP INVITE to PVRs via y2
14					←		SIP	PVRs sends SIP 200 OK to CORE via y2
15					→		SIP	CORE sends SIP 200 OK to AS via ISC
16					←		SIP	AS sends SIP 200 OK to CORE via ISC
17				←			SIP	CORE sends SIP 200 OK to UE via Gm
18				→			SIP	UE sends SIP ACK to CORE via Gm
19					→		SIP	CORE sends SIP ACK to AS via ISC
20					←		SIP	AS sends SIP ACK to CORE via ISC
21						→	SIP	CORE sends SIP ACK to PVRs via y2
22						→	RTSP	UE sends RTSP PLAY to PVRs via Xc
23					←		RTSP	PVRs sends RTSP 200 OK to UE via Xc

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
24							SIP	PVRS sends SIP INFO to CORE via y2 (optional)
25							SIP	CORE sends SIP INFO to AS via ISC (optional)
26							SIP	AS sends SIP 200 OK to CORE via ISC (optional)
27							SIP	CORE sends SIP 200 OK to PVRS via y2 (optional)
28								UE displays the recorded content

4.4.8 NPVR - Method 2

4.4.8.1 Impulsive recording request

Interoperability Test Description											
Identifier:	TD_IMS_IPTV_nP2_0001 (S3A-1902)										
Summary:	User requests to park and pickup a broadcast TV channel										
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]										
Configuration:	CF_IMS_IPTV										
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV Head End, T&A, PVRS										
Pre-test conditions:	<ul style="list-style-type: none"> UE, PVRS, Core IMS and IPTV AS are configured for method 2 UE is registered in Core IMS using userIPTV_priv identity UE supports nPVR EPG has at least one nPVR enabled broadcast TV channel UE is displaying broadcast TV channel (see TD_IMS_IPTV_BC_0001) User has nPVR rights in IPTV AS IMS CORE configured to forward nPVR related SIP requests to AS IPTV UE, PVRS and TV Head End support the same content protocols and coding 										
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests an impulsive recording of a broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE confirms recording</td> </tr> <tr> <td>3</td> <td>User requests EPG after the end of the recorded program</td> </tr> <tr> <td>4</td> <td>Verify that UE displays EPG with new entry</td> </tr> </tbody> </table>	Step	Description	1	User requests an impulsive recording of a broadcast TV channel	2	Verify that UE confirms recording	3	User requests EPG after the end of the recorded program	4	Verify that UE displays EPG with new entry
Step	Description										
1	User requests an impulsive recording of a broadcast TV channel										
2	Verify that UE confirms recording										
3	User requests EPG after the end of the recorded program										
4	Verify that UE displays EPG with new entry										
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check	Description	1	Message exchange follows the below table						
Check	Description										
1	Message exchange follows the below table										

The message flow is divided into two phases. The first one corresponding to the park request is given below:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1								User requests an impulsive recording of a broadcast TV Channel
2							SIP	UE sends SIP MESSAGE to CORE via Gm
3							SIP	CORE sends SIP MESSAGE to AS via ISC
4							SIP	AS sends SIP 200 OK to CORE via ISC
5							SIP	CORE sends SIP 200 OK to UE via Gm
6								UE confirms parking
i							SIP	AS sends SIP to CORE via ISC immediately (not described in R2)

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
i							SIP	CORE sends SIP to PVRS via y2 (not described in R2)
i							IGMP Join	PVRS starts recording TV Channel program (not described in R2)
i							IGMP Leave	PVRS stops recording TV Channel program at the end of the program (not described in R2)
7							SIP	AS sends SIP MESSAGE to CORE via ISC (optional may exist prior to IGMP join)
8							SIP	CORE sends SIP MESSAGE to UE via Gm (optional may exist prior to IGMP join)
9							SIP	UE sends SIP 200 OK to CORE via Gm (optional may exist prior to IGMP join)
10							SIP	CORE sends SIP 200 OK to AS via ISC (optional may exist prior to IGMP join)
11								User requests EPG after the end time of program
12							HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
13							HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
14								UE displays EPG with new entry

Steps tagged "i" do not follow a given specification. They are here for information and show the simple message exchange that could happen between the NPVR, TA, CORE and AS nodes in this case.

4.4.8.2 Scheduled recording request

Interoperability Test Description											
Identifier:	TD_IMS_IPTV_nP2_0002 (S3A-2102)										
Summary:	User requests the scheduled recording of a broadcast TV channel										
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]										
Configuration:	CF_IMS_IPTV										
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, TV Head End, T&A, PVRS										
Pre-test conditions:	<ul style="list-style-type: none"> • UE is registered in Core IMS and received EPG from IPTV AS (see TD_IMS_IPTV_ADS_0001/2/3) • UE, PVRS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • UE supports nPVR • EPG has at least one nPVR enabled broadcast TV channel • UE is not displaying broadcast TV channel • User has nPVR rights in IPTV AS • IMS CORE configured to forward nPVR related SIP requests to AS IPTV • UE, PVRS and TV Head End support the same content protocols and coding 										
Test Sequence:	<table border="1"> <thead> <tr> <th>Step</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>User requests the scheduled recording of a broadcast TV channel</td> </tr> <tr> <td>2</td> <td>Verify that UE confirms recording</td> </tr> <tr> <td>3</td> <td>User requests EPG after the end of the recorded program</td> </tr> <tr> <td>4</td> <td>Verify that UE displays EPG with new entry</td> </tr> </tbody> </table>	Step		1	User requests the scheduled recording of a broadcast TV channel	2	Verify that UE confirms recording	3	User requests EPG after the end of the recorded program	4	Verify that UE displays EPG with new entry
Step											
1	User requests the scheduled recording of a broadcast TV channel										
2	Verify that UE confirms recording										
3	User requests EPG after the end of the recorded program										
4	Verify that UE displays EPG with new entry										
Conformance Criteria:	<table border="1"> <thead> <tr> <th>Check</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Message exchange follows the below table</td> </tr> </tbody> </table>	Check		1	Message exchange follows the below table						
Check											
1	Message exchange follows the below table										

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1								User requests the scheduled recording of a broadcast TV channel
2							SIP	UE sends SIP MESSAGE to CORE via Gm
3							SIP	CORE sends SIP MESSAGE to AS via ISC
4							SIP	AS sends SIP 200 OK to CORE via ISC
5							SIP	CORE sends SIP 200 OK to UE via Gm
6								UE confirms recording
i							SIP	AS sends SIP to CORE via ISC (not described in R2)
i							SIP	CORE sends SIP to PVRS via y2 (not described in R2)
i							IGMP Join	PVRS starts recording TV Channel program, at "start-time" (not described in R2)
i							IGMP Leave	PVRS stops recording TV Channel program at "end-time" (not described in R2)
7							SIP	AS sends SIP MESSAGE to CORE via ISC (optional may exist prior to IGMP join)
8							SIP	CORE sends SIP MESSAGE to UE via Gm (optional may exist prior to IGMP join)
9							SIP	UE sends SIP 200 OK to CORE via Gm (optional may exist prior to IGMP join)
10							SIP	CORE sends SIP 200 OK to AS via ISC (optional may exist prior to IGMP join)
11								User requests EPG after the end of the recorded program
12							HTTP	UE sends HTTP GET to AS via Xa (1 to n times)
13							HTTP	AS sends HTTP 200 OK to UE via Xa (1 to n times)
14								UE displays EPG with new entry

The AS-IPTV may send additional MESSAGES to the UE to inform something, such as the current recording status.

4.4.8.3 Watching a recorded content

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_nP2_0003 (S3A-2202)	
Summary:	User watches a recorded nPVR content	
References:	TS 182 027 [1] clause 8.5; TS 183 063 [2]	
Configuration:	CF_IMS_IPTV	
Required Equipment:	IPTV aware UE, Core IMS, IPTV AS, PVRS	
Pre-test conditions:	<ul style="list-style-type: none"> • UE, PVRS, Core IMS and IPTV AS are configured for method 2 • UE is registered in Core IMS using userIPTV_priv identity • UE supports nPVR • EPG has at least one nPVR enabled broadcast TV channel • nPVR content is available in PVRS based on either an impulsive or offline request to capture broadcast TV channel (see TD_IMS_IPTV_nP2_0001/2) • User has nPVR rights in IPTV AS • IMS CORE configured to forward nPVR related SIP requests to AS IPTV • UE, PVRS and TV Head End support the same content protocols and coding 	
Test Sequence:	Step	
	1	User requests to watch the captured nPVR content
	2	Verify that UE displays the captured nPVR content
Conformance Criteria:	Check	
	1	Message exchange follows the below table

There are 3 accepted different possibilities for playing the recorded content:

- 1) With reInvite SIP messages for establishing the content delivery channel:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests to watch the recorded nPVR content
2				→			SIP	UE sends SIP INVITE to CORE via Gm
3					→		SIP	CORE sends SIP INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to PVRS via y2
6					←		SIP	PVRS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10				→			SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to PVRS via y2
14						→	RTSP	UE sends RTSP DESCRIBE to PVRS via Xc (optional, only to get missing SDP parameters)
15					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc (optional)
16						→	RTSP	UE sends RTSP SETUP to PVRS via Xc
17					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
18						→	SIP	UE sends SIP reINVITE to CORE via Gm
19					→		SIP	CORE sends SIP reINVITE to AS via ISC
20					←		SIP	AS sends SIP reINVITE to CORE via ISC
21						→	SIP	CORE sends SIP reINVITE to PVRS via y2
22					←		SIP	PVRS sends SIP 200 OK to CORE via y2
23						→	SIP	CORE sends SIP 200 OK to AS via ISC
24					←		SIP	AS sends SIP 200 OK to CORE via ISC
25		←					SIP	CORE sends SIP 200 OK to UE via Gm
26				→			SIP	UE sends SIP ACK to CORE via Gm
27					→		SIP	CORE sends SIP ACK to AS via ISC
28					←		SIP	AS sends SIP ACK to CORE via ISC
29						→	SIP	CORE sends SIP ACK to PVRS via y2
30						→	RTSP	UE sends RTSP PLAY to PVRS via Xc
31					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
32					←		SIP	PVRS sends SIP INFO to CORE via y2 (optional)
33						→	SIP	CORE sends SIP INFO to AS via ISC (optional)
34					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
35						→	SIP	CORE sends SIP 200 OK to PVRS via y2 (optional)
36		←						UE displays the recorded nPVR content

2) With UPDATE SIP messages for establishing the content delivery channel:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests to watch the recorded nPVR content
2			→				SIP	UE sends SIP INVITE to CORE via Gm
3					→		SIP	CORE sends SIP INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to PVRS via y2
6					←		SIP	PVRS sends SIP 200 OK to CORE via y2
7						→	SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10			→				SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to PVRS via y2
14						→	RTSP	UE sends RTSP DESCRIBE to PVRS via Xc (optional, only to get missing SDP parameters)
15					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc (optional)
16						→	RTSP	UE sends RTSP SETUP to PVRS via Xc
17					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
18			→				SIP	UE sends SIP UPDATE to CORE via Gm
19					→		SIP	CORE sends SIP UPDATE to AS via ISC
20					←		SIP	AS sends SIP UPDATE to CORE via ISC
21						→	SIP	CORE sends SIP UPDATE to PVRS via y2
22					←		SIP	PVRS sends SIP 200 OK to CORE via y2
23						→	SIP	CORE sends SIP 200 OK to AS via ISC
24					←		SIP	AS sends SIP 200 OK to CORE via ISC
25		←					SIP	CORE sends SIP 200 OK to UE via Gm
26						→	RTSP	UE sends RTSP PLAY to PVRS via Xc
27					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
28					←		SIP	PVRS sends SIP INFO to CORE via y2 (optional)
29						→	SIP	CORE sends SIP INFO to AS via ISC (optional)
30					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
31						→	SIP	CORE sends SIP 200 OK to PVRS via y2 (optional)
32		←						UE is displaying the recorded nPVR content

3) With RTSP Channel establishing without session modification:

Step	Direction						Protocol	Comment
	U s e r	U E	T & A	C O R E	A S	P V R S		
1		→						User requests to watch the recorded nPVR content
2			→				SIP	UE sends SIP INVITE to CORE via Gm
3					→		SIP	CORE sends SIP INVITE to AS via ISC
4					←		SIP	AS sends SIP INVITE to CORE via ISC
5						→	SIP	CORE sends SIP INVITE to PVRS via y2
6					←		SIP	PVRS sends SIP 200 OK to CORE via y2
7					→		SIP	CORE sends SIP 200 OK to AS via ISC
8					←		SIP	AS sends SIP 200 OK to CORE via ISC
9		←					SIP	CORE sends SIP 200 OK to UE via Gm
10			→				SIP	UE sends SIP ACK to CORE via Gm
11					→		SIP	CORE sends SIP ACK to AS via ISC
12					←		SIP	AS sends SIP ACK to CORE via ISC
13						→	SIP	CORE sends SIP ACK to PVRS via y2
14						→	RTSP	UE sends RTSP SETUP to PVRS via Xc
15					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
16						→	RTSP	UE sends RTSP PLAY to PVRS via Xc
17					←		RTSP	PVRS sends RTSP 200 OK to UE via Xc
18					←		SIP	PVRS sends SIP INFO to CORE via y2 (optional)
19					→		SIP	CORE sends SIP INFO to AS via ISC (optional)
20					←		SIP	AS sends SIP 200 OK to CORE via ISC (optional)
21						→	SIP	CORE sends SIP 200 OK to PVRS via y2 (optional)
22		←						UE is displaying the recorded nPVR content

Annex A (informative): Bibliography

IETF RFC 4566: "SDP: Session Description Protocol".

History

Document history		
V2.1.1	December 2009	Publication