OIPF

Feature Package

Content and Communication services to mobile / portable devices

[V1.0] – [2014-05-30]

Open IPTV Forum

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Foreword

This Technical Specification (TS) has been produced by the Open IPTV Forum, based on the Release 2 solution.

It covers a set of features that builds on version 2.3 and therefore it has to be used in conjunction with this version of the Open IPTV Forum specifications.

Introduction

Mobile and portable devices have become an integral part of our day-to-day life. Mobile devices have evolved from basic communication devices to "smart phones". Simply said, smart phones are mobile devices with built-in intelligence, supporting soft client hosting and display capabilities. Portable devices (such as notebooks) on the other hand have been widely used within the residential network to access and share information. By merging smart phone device capabilities and portable device power, a new breath of devices called "tablets" has been developed. Tablets and smart phones have the double advantage of being able to operate as communication device to control the various features of the media services, as well as an ITF with the added capacity of consuming content inside as well as outside the residential network. With these devices, a user has the capability to access and consume personalized linear and on-demand content wherever he is, whenever he wants, as well as sharing it.

Therefore, the purpose of this feature package is to allow a user to:

- Browse through content on his device with a view to consume later on the device of his choice in the residential network (e.g. PC, TV, or tablet)

- Send to other IPTV subscribers, through his mobile device, information about the content he sees on his TV set, so that they can watch the content seen by the user, even if he changes the device on which he consumes content or changes the content item (e.g. program) he consumes

- Access and consume content he purchased when he is in another IPTV subscriber residential network

- Consume content whenever and wherever he wants, meaning the possibility to change device over which he consumes it, whether he is inside or outside its residential network, maintaining content consumption continuity by using bookmarking

1 References

1.1 Normative References

1.1.1 Standard References

[UPNP]	UPnP, "UPnP Telephony version 1.0" V1.0, March 2011
[DLNA]	IEC 62481, Digital living network alliance (DLNA) home networked device interoperability guidelines
[RFC3891]	IETF, RFC 3891, "The Session Initiation Protocol (SIP) "Replaces" Header"
[TS124503]	ETSI, TS 124 503, "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); TISPAN; IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3" [3GPP TS 24.229 (Release 7), modified] (3GPP TS 24.503 Release 8)
[HTTP]	IETF, RFC 2616, "Hypertext Transfer Protocol -- HTTP/1.1"
[SIP]	IETF, RFC 3261, "SIP: Session Initiation Protocol"
[SRVCONT]	3GPP, TS 24.237, "IP Multimedia (IM) Core Network (CN) subsystem IP Multimedia Subsystem (IMS) service continuity; Stage 3"

1.1.2 Open IPTV Forum References

[OIPF_SVCS2]	Open IPTV Forum, "Services and Functions for Release 2" V1.0, October 2008.
[OIPF_REQS2]	Open IPTV Forum, "Service and Platform Requirements" V2.0, December 2008.
[OIPF_ARCH2]	Open IPTV Forum, "Functional Architecture - V2.3", January 2014.
[OIPF_OVIEW2]	Open IPTV Forum, "Release 2 Specification, Volume 1 – Overview" V2.3, January 2014.
[OIPF_AVC2]	Open IPTV Forum, "Release 2 Specification, Volume 2 – Media Formats" V2.3, January 2014.
[OIPF_HAS2]	Open IPTV Forum, "Release 2 Specification, Volume 2a – HTTP Adaptive Streaming" V2.3, January 2014.
[OIPF_META2]	Open IPTV Forum, "Release 2 Specification, Volume 3 – Metadata" V2.3, January 2014.
[OIPF_PROT2]	Open IPTV Forum, "Release 2 Specification, Volume 4 – Protocols" V2.3, January 2014.
[OIPF_PROTEX2]	Open IPTV Forum, "Release 2 Specification, Volume 4a – Examples of IPTV Protocol Sequences" V2.3, January 2014.
[OIPF_DAE2]	Open IPTV Forum, "Release 2 Specification, Volume 5 - Declarative Application Environment" V2.3, January 2014.
[OIPF_PAE2]	Open IPTV Forum, "Release 2 Specification, Volume 6 - Procedural Application Environment" V2.3, January 2014.
[OIPF_CSP2]	Open IPTV Forum, "Release 2 Specification, Volume 7 - Authentication, Content Protection and Service Protection" V2.3, January 2014.
[OIPF_PROF2]	Open IPTV Forum, "Profile Specification" V2.0, January 2014.
[OIPF_TSO]	Open IPTV Forum, "Test Specification Overview" V1.0, November 2010.

1.2 Informative References

[RFC2119]	IETF, RFC 2119, "Key words for use in RFCs to Indicate Requirement Levels"

2 Conventions and Terminology

2.1 Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except "Introduction", are normative, unless they are explicitly indicated to be informative.

2.2 Terminology

2.2.1 Definitions

In addition to the definitions provided in [OIPF_OVIEW2], the following definitions are used in this feature package.

Term	Definition
Portable device	A handheld terminal device (ITF), such as a notebook computer or a portable game machine, connected to services via a Fixed Network. The device may use wireless technology, e.g. WiFi, WiMax, to access the Fixed Network
Mobile device	A terminal device (ITF), e.g. a cellular phone, connected to IPTV Services via a Mobile Network
Mobile network	A cellular access network, such as a GSM or a WCDMA network
Broadcast network	Network which can transmit content in a 1-to-n topology to mobile and/or portable devices
Mobile Broadcast network	A broadcast network designed for mobility, such as e.g. DVB-H/SH network
Fixed Network	Access Network for a fixed location, such as ADSL or FTTH.

2.2.2 Abbreviations

In addition to the abbreviations provided in [OIPF_OVIEW2], the following abbreviations are used in this feature package.

Acronym	Explanation
CAT	Customized Alerting Tone
CRID	Content Reference Identifier
DTMF	Dual-Tone Multi-Frequency signalling
MRFP	Multimedia Resource Function Processor
PSI	Public Service Identifier
TPF	Transport Processing Function

3 Architecture

The feature "Content and communication services to mobile and portable devices" has no direct impact on the OIPF architecture as defined in [OIPF_ARCH2].

This feature ensures that existing OIPF features can be supported by new types of devices that users have adopted and are using in their everyday activities.

The major enhancements in support of such device types are three-fold:

- First, it allows a user to consume content whenever and wherever he wants, meaning the possibility to change device over which he consumes it, whether he is inside or outside its residential network, maintaining content consumption continuity by using bookmarking

- Second, it takes advantage of devices such as smart phones and tablets, which nowadays have become commonly used devices

    o Smart phones, which are basically mobile devices with built-in intelligence, are hosting soft client and display capabilities, making them ITF with the added capacity of consuming content inside as well as outside the residential network

    o Tablets are a new range of devices, which merge the power of a portable device and the capabilities of a smart phone

- Third, while tablets and smart phones can be used as an ITF, they can as well be used to control the various features of the media services (data traffic and control traffic).

3.1 Functional Entities

The Feature Package does not add any new functional entity to the Architecture. It will reuse the existing ones. The functional entities affected include:

- DLNA functions in the OITF are used when user exchange information between devices within the home network.

- Person-to-person Communication Enablers are reused when implementing content sharing and CAT.

- IPTV Application is used for content selection when the user switches devices. The IPTV Service Profile is used when checking the user's subscription information.

- CDN is used to distribute the CoD media.

- TPF is used to distribute the real-time multicast and unicast streams when users wish to watch the same content together.

3.2 Reference Points

The Feature Package does not add any new reference points but reuses the existing ones with enhanced services. The affected reference points include:

- NPI-3 is used for session setup procedure when implementing content sharing.

- UNIS-6 is used for user interaction with application logic for transfer of user requests and interactive feedback of user responses.

- NPI-6 is used for IPTV Control to retrieve the subscriber's IPTV-related service data when user selects and shares content.

- UNIS-11 is used for control of real time streaming when the user shares content with other users or watches the content together with other users.

- UNIT-17 and UNIT-19 are used to multicast data when users are watching content together.

3.3 Signalling Flows

This section of the feature package provides call flows for the following use cases:

- Content sharing across devices: The use cases describes how a mobile/portable device can be used to browse, select and order content to be consumed on an OITF,

- Content sharing across different subscribers: The use cases describe how a mobile/portable device can share content with other IPTV subscribers, including the case when the initiating user changes channel and/or device

- IPTV service continuity on network change: This use case describes how a user can continue to watch content when he changes the network on which he consumes it

Note: The use cases covered in this section apply to both mobile and portable devices, including smart phones and tablets which support both communications to control the IPTV services' features and IPTV services content consumption.

3.3.1 Content Sharing across devices

Content sharing across devices is a feature that allows users to explore some content on one device which could be consumed on other devices in the home network (e.g. PC, TV set, or tablet). For example, the user can use his phone to select the content and the view it on the TV set.

3.3.1.1 Content suggestion via alert clips and video calling

This feature allows the user to consume CAT content (i.e. a piece of music and/or video) on his TV set while calling someone. Before the callee answers the call, the caller can consume the CAT provided by callee on the TV, which has a better audio quality. While the callee answers the phone and the two sides start the conversation, the CAT can still be played on the TV, until the end of the CAT or end of the call. Thus caller can continue to enjoy a music video (which is one form of a CAT) on the TV set during the conversation
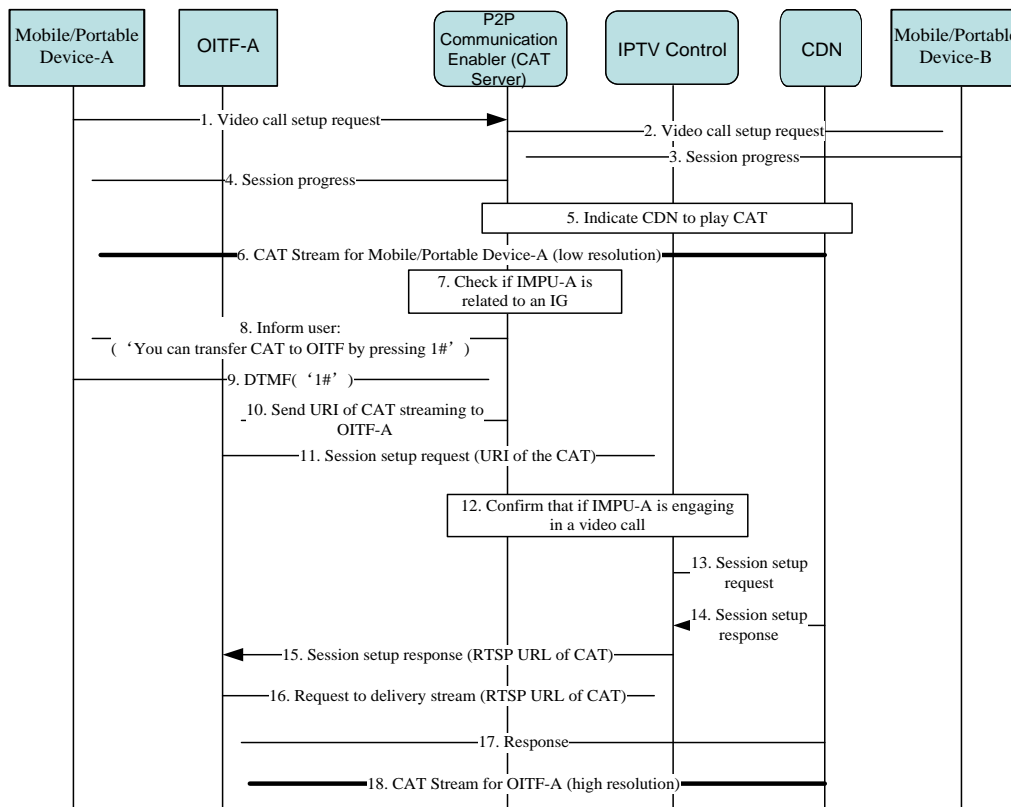

Figure 1: Content suggestion via alert clips and video calling

Figure 1 shows a call flow for transferring multimedia alerting between the UE and the OITF belonging to the same user. Below is a brief description of the call flow:

Note: A precondition is that user-B has subscribed to video CAT.

1-6.   User-A initiates a video call to user-B using his mobile/portable device. Mobile/Portable Device-B returns a session progress response to mobile/portable Device-A. P2P Communication Enabler instructs the CDN to start playing CAT on mobile/portable Device-A.

7-10.   At the same time, the P2P Communication Enabler checks if IMPU-A is also related to an IG. If this is case, it sends a notification message to mobile/portable Device-A. The notification should carry a prompt such as "You can transfer CAT to your TV by pressing '1#'". When user presses '1 #' keys on his mobile/portable device, the DTMF signals are transferred to the P2P Communication Enabler. On receiving the DTMF '1#', the P2P Communication Enabler retrieves the URI of the CAT streaming to the originating user and sends it to OITF-A.

11- 18. OITF-A sends a session setup request with the URI of the CAT to the IPTV Control FE. On receiving the session setup request, the IPTV Control FE checks if the PSI is set to the CAT service. If so, the IPTV Control FE interacts with the P2P Communication Enabler (CAT Server) to confirm that IMPU-A is really engaged in a video call and finds out the called party's IMPU for charging purposes, if needed. Then, the IPTV Control FE forwards the session setup request to the CDN. The CDN responds with the RTSP URL for the CAT stream to OITF-A. OITF-A sends a request which includes the RTSP URL of the CAT to the CDN and finally starts receiving and presenting the high resolution CAT stream.

3.3.1.2 2D/3D content selection and transfer to another device for watching

This feature allows the selection of a 2D/3D video program in the stream and handing it over to another device for watching. The user can search and select 2D/3D content using his mobile/portable device and watch it on the big screen in the home network. The 2D content on the big screen can be rendered as a picture-in-picture within the 3D picture.

Figure 2 shows a typical call flow for a 2D/3D content selected from a user's registered mobile/portable device and consumed on another device.
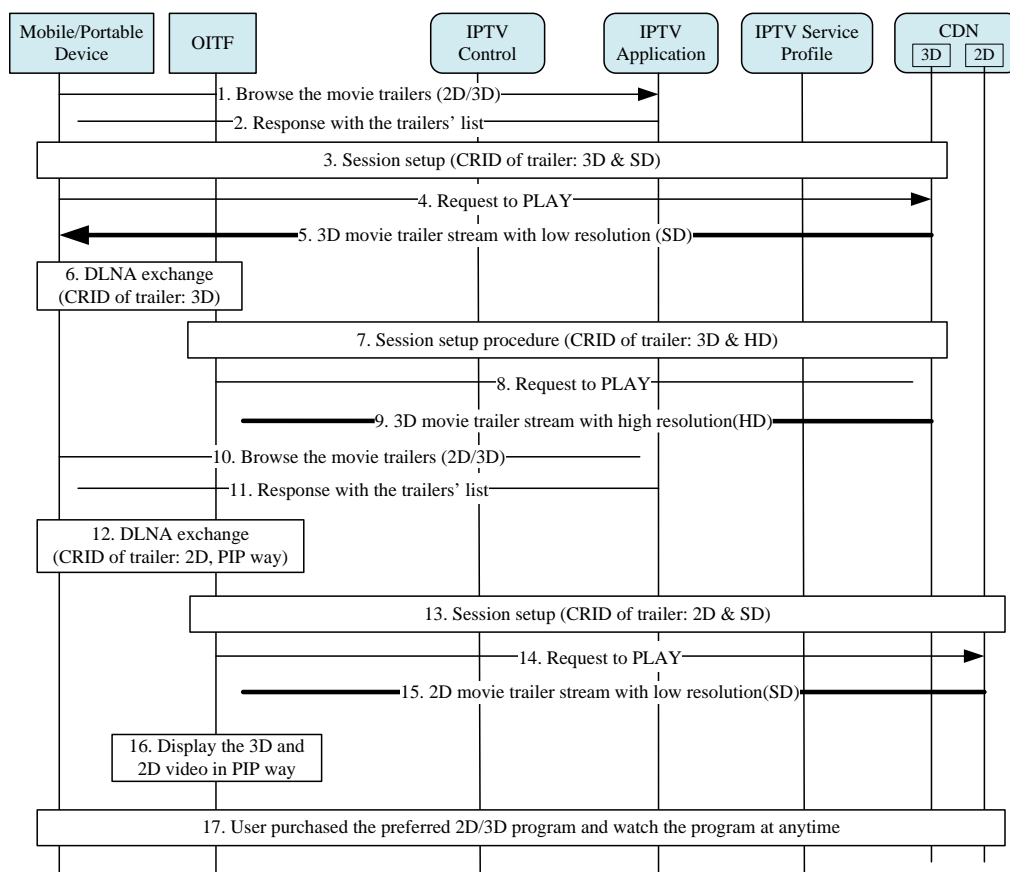

Figure 2: 2D/3D content selection and handover for watching

The following is a brief description of the steps in the message flow:

1-2.   The user browses available 2D and/or 3D movie trailers from his mobile/portable device when in his home network. The device sends a request to the IPTV Application, which responds with a list of trailers.

3-5.   The user selects a 3D movie trailer he wants to watch. The mobile/portable device sends a session setup request message to IPTV Control with the selected trailer's CRID. The IPTV Control Functional Entity selects the proper content based on the 2D/3D CRID and forwards the request message to the CDN, which responds to the mobile/portable device. Then, the mobile/portable device sends a streaming request to 3D CDN to start the stream.

6-9.   When the user wants to watch the 2D/3D content on TV set, he uses the mobile/portable device to transfer the trailer's CRID to the OITF using DLNA. The OITF sends the 3D trailer's CRID to the CDN via the IPTV Control FE. The OITF sends a streaming request to the CDN to start the stream, after which the user can watch the content on the TV in the home network.

10-16. When the user wants to watch other content items, he browses through the movie trailers again and selects a 2D movie trailer. As he wishes to watch the 2D trailer on the TV set, he uses his mobile/portable device to transfer the 2D trailer's CRID to the OITF using DLNA and selects the PIP mode. OITF sends the 2D trailer's CRID to CDN through the IPTV Control FE. The OITF sends a streaming request to the CDN to start the stream and receives two video streams at the same time in 2D/3D hybrid PIP mode, if OITF supports this capability. The primary picture shall be rendered in 3D mode, while the secondary picture will be in 2D. Therefore, the OITF displays the two streams based on their status, composing of the 3D stream as the primary picture with the 2D stream in PIP mode.

17.   If the user likes one of the trailers, he can use his portable device to perform the purchase. The mobile/portable device sends a purchase request to the IPTV Application. The IPTV Application updates the user's profile in the IPTV Service Profile. The IPTV Service Profile responds with the result of the successful purchase to the mobile/portable device, so that the user can watch the purchased program at any time.

3.3.2 Content Sharing across different subscribers

3.3.2.1 Watching together

The feature "Content Sharing across different subscribers" allows one user to utilize his mobile terminal to share the information shown on his TV set (i.e. channel id, content id), with an OITF in another residential network, allowing the other residential network's OITF user to display the content seen by the user controlling the content. When the user controlling the content changes the program he is watching, the remote user's OITF switches to the new program.

A prerequisite for this feature is that both users have the same service provider and that their subscriptions allow for the content to be viewed.

In this situation, the shared content will not be transmitted directly from one OITF to the other OITF. There are two modes for this feature, both of which are under the control of the service provider. The possible modes of operation are:

- Both sides could watch the same program at the same time, even when the user initiating content sharing switches channel, assuming that the remote user would like to continue watching.

- Both sides could watch the same program at the same time, even when the user initiating content sharing switches device, assuming that the remote user would like to continue watching.

3.3.2.1.1 Initiating user switching channel

Figure 3 shows a typical call flow for a content sharing generated by a user on a registered mobile device in the home network, sharing what he is watching on TV with another user in a remote site, in the situation where the initiating OITF switches channels.
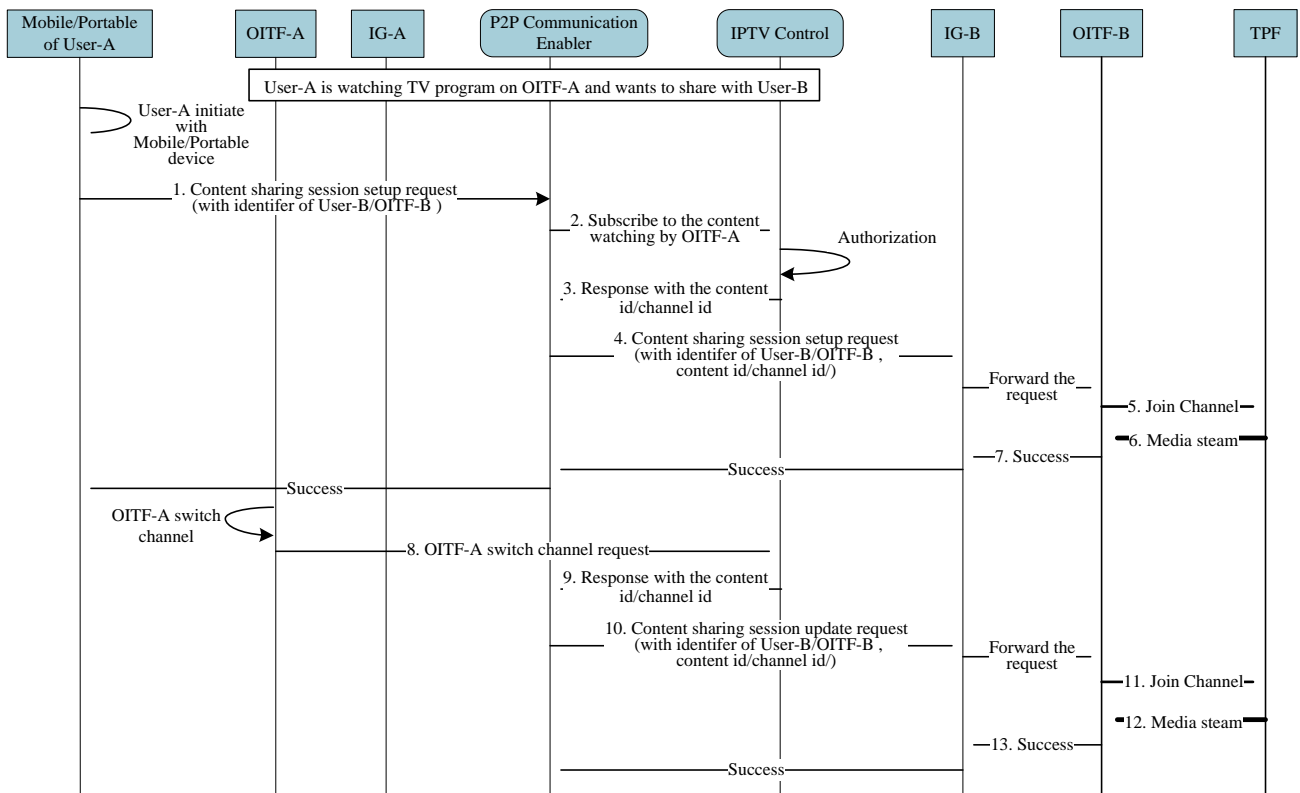
Figure 3: Content Sharing across different subscribers – Initiating user switching channel

1. User-A is watching a TV program using OITF-A and would like to watch the program together with user-B. User-A initiates a content sharing session with user-B by using his mobile/portable device in the home network and including the identifier of either user-B or OITF-B. The mobile/portable device will send a session setup request to the P2P Communication Enabler FE to provide content displayed on OITF-A to OITF-B.

2-3. The P2P Communication Enabler FE subscribes to OIPF-A's program information from the IPTV Control FE. If the IPTV Control FE validates that user-A is allowed to share the content with another user, then IPTV Control FE returns the requested information. It may include the content id, channel id, or multicast address of the content user-A is watching.

4-7. The P2P Communication Enabler provides the content displayed on OITF-A to OITF-B based on the identification information of the content. It forwards the session setup request including all the information obtained from the IPTV Control FE to OITF-B. OITF-B joins the channel user-A is watching, if user-B agrees to it. If so, the media stream is delivered to OITF-B and user-B starts to watch what user-A is watching.

8-13. When user-A switches channel (and therefore the content being watched), OITF-A sends a session update request to the IPTV Control FE to change the channel and content. The IPTV Control FE provides the new content id, channel id or multicast address of the new content watched by user-A to the P2P Communication Enabler, which re-invites OITF-B by including all the updated information obtained from IPTV Control FE. Then, user-B can join the new channel and receive the media stream as described above.

It is also possible to achieve this procedure through a DAE application interacting with an IPTV Application directly. Figure 4 shows the high level procedure in such a case.
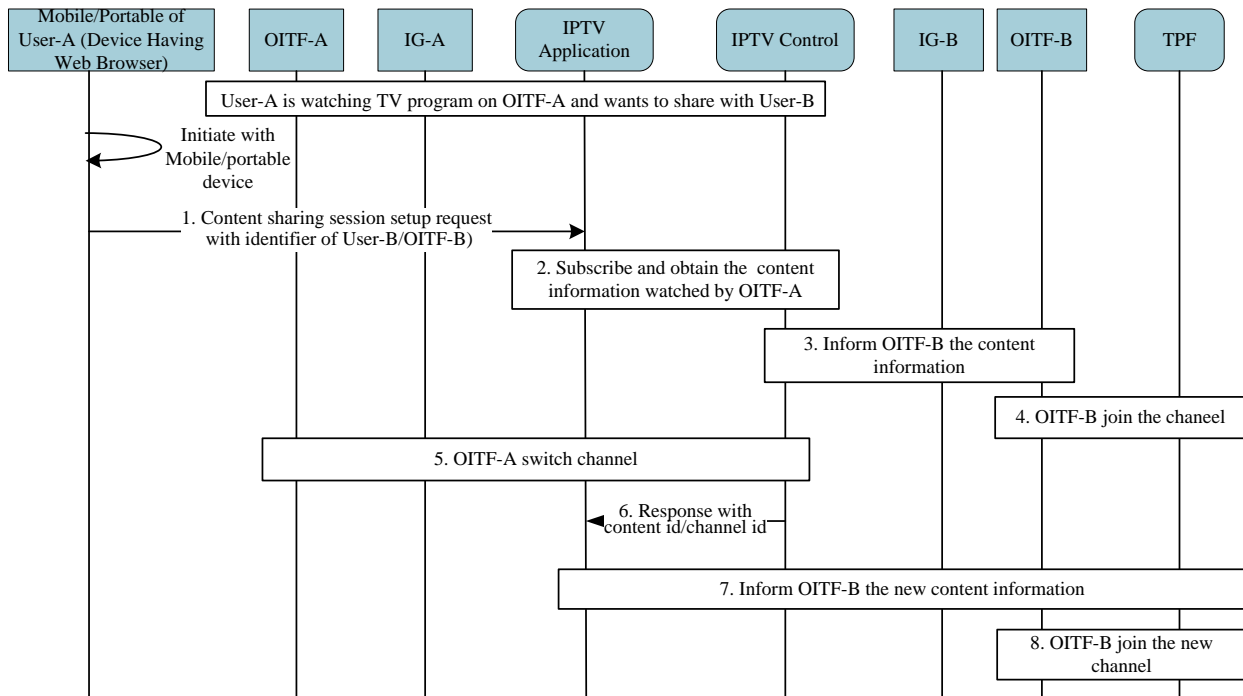
Figure 4: Content Sharing across different subscribers – DAE-based initiating user switching channel

3.3.2.1.2 Initiating user switching device

Figure 5 shows a typical call flow for content sharing generated by a user on a registered mobile/portable device in home network, sharing what he is watching on the TV with another user at a remote site, in the situation where the initiating user switches devices.

It is also possible to achieve this procedure through a DAE application interacting with an IPTV Application directly, as shown in the previous section. Therefore, it is not covered in this subsection.
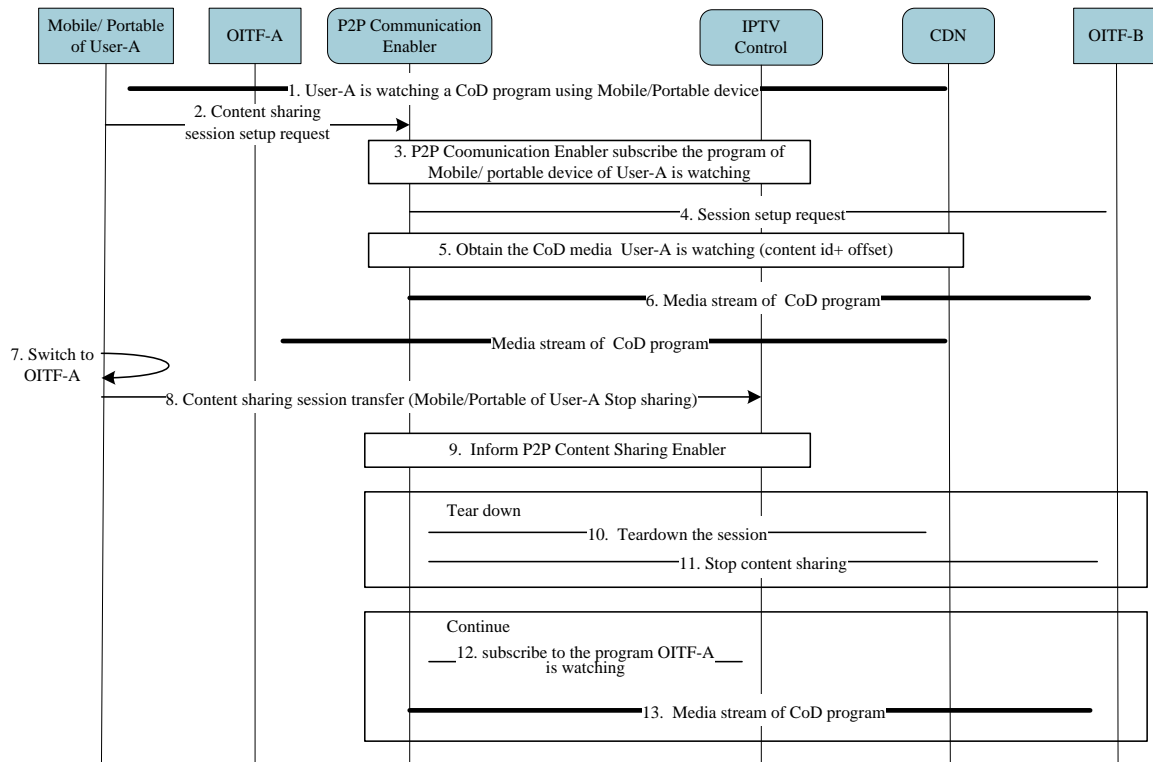
Figure 5: Content Sharing across different subscribers – Initiating user switching device

1-2.   User-A is watching a TV program using his mobile/portable device and would like to watch it together with user-B. User-A initiates a content sharing session with user-B by using his mobile/ portable device in his home network.

3.   The P2P Communication Enabler subscribes to the program information that user A's mobile/portable device is watching from the IPTV Control FE. Then, the IPTV Control FE validates that user-A is allowed to share the content with another user. If this is the case, the IPTV Control FE returns the requested information. It may include the content id, channel id, or multicast address of the content user-A is watching on his mobile/portable device.

4-6.   The P2P Communication Enabler forwards the session setup request including all the information obtained from IPTV Control FE to OITF-B. If user-B agrees to watch it, P2P Communication Enabler accesses the media stream user--A is watching on his mobile/portable device and forwards it to OITF-B. Then the media stream is delivered to the OITF-B and user-B starts watching what user-A is watching.

7-11.   When user-A switches device, the mobile/portable device of user A sends a request to IPTV Control FE to transfer the content sharing session to OITF-A. IPTV Control FE will notify the P2P Communication Enabler about the transfer status. Then, user-B can decide to continue the content sharing session with OITF-A or can request to tear it down. If it needs to tear down the session, IPTV Control FE will notify P2P Communication Enabler to tear down the content sharing session with OITF-B.

12-13.   In the case where user B wishes to continue, the P2P Communication Enabler will subscribe to the program OITF-A is watching and receive the notification from the IPTV Control FE about the program information including the new content id, channel id or multicast address of the content obtained. Then, OITF-B receives the media stream as described previously.

3.3.2.2 Watching what I have

The "Watching what I have" feature allows content to be shared across different IPTV subscribers when a user visits another user's home and would like to share some interesting content which he had previously purchased and watched. The visiting user can check his content list by using his mobile device and select the relevant content to share temporarily at another user's home network.

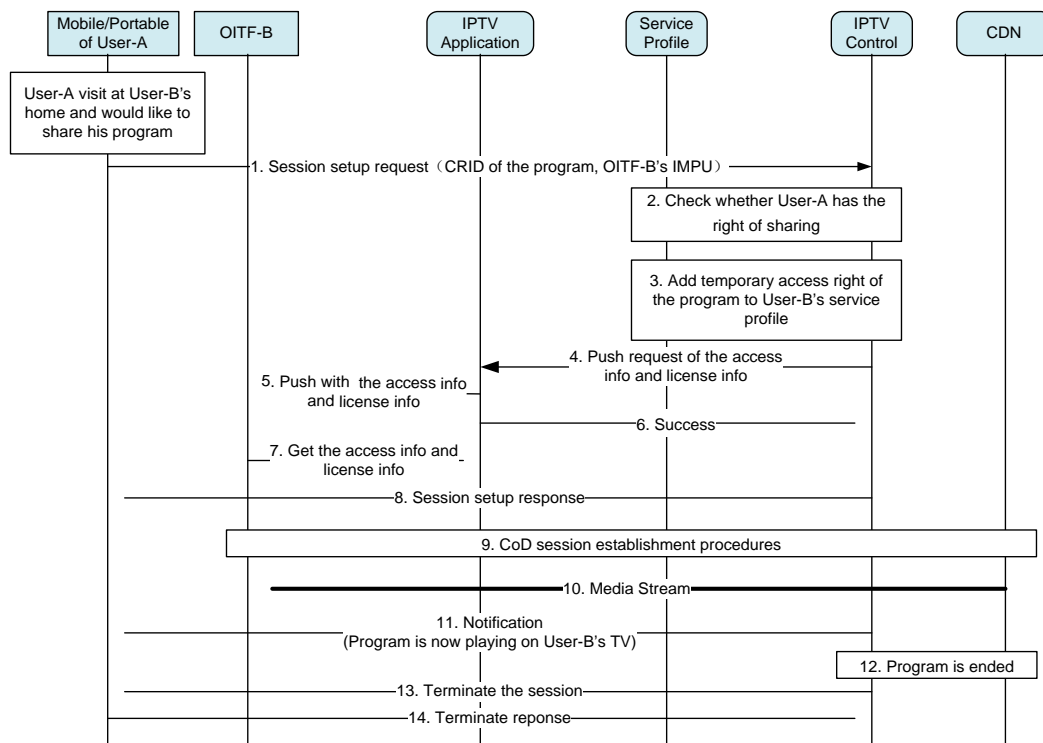Figure 6 shows a brief description of the steps in the message flow.

Figure 6: Watching what I have

1. User-A comes to user-B's home and wants to share the program which he has previously purchased, by using his mobile/portable device and showing the content on user-B's OITF. The mobile/portable device sends a session setup request message with the CRID of the program and OITF-B's IMPU to the IPTV Control FE.

2-5. On receiving the request message, the IPTV Control FE first checks whether user-A has the right to share the program on another user's OITF (e.g. license issues). If it is permitted, the IPTV Control FE shall add temporary access right to the program for user-B's service profile.

6-10. The IPTV Control FE then sends a request to the IPTV Application to initiate the push procedure for access request and license information. The IPTV Application pushes the access parameter and license information (e.g. rights object) of the program to OITF-B. The IPTV Control FE then sends a session setup response to user-A's mobile/portable device.

11-12. OITF-B establishes a CoD session based on the access and license information receives the program's stream and displays it.

13. The IPTV Control FE may send a notification message to user-A's device to notify it of user-B's watching status, such as "Program x is now playing on OITF-B."

14-16. When the program ends, the IPTV Control FE sends a session terminate message to user-A's mobile/portable device to end the session.

3.3.3 IPTV Service continuity over network change

This feature allows the user to switch access network and maintain service continuity.

Figure 7 shows a call flow for video watching while the IPTV network is changed. The use case addresses specifically a change from a mobile network to a residential network, although a similar approach could be considered for the reverse case. The user browses the received EPG on his mobile/portable device for ongoing TV programs. Upon selection and

approval, the content is delivered by a mobile network (e.g. 3G, LTE or a mobile broadcast network such as DVB-H/SH) to the mobile/portable device (through access network1). When the user gets home, his mobile/portable device recognizes the residential network environment (access network2). Once the application on his mobile/portable device detects that the content he is watching is also available on the fixed access network, the media application changes colour to indicate the availability of a free-of-cost network. Upon the user's confirmation, the mobile/portable device will access the new network based on the access information in the EPG, and can then continue watching the same content. The content is assumed to be available via multiple access networks and provided by one or more IPTV Service Providers. Also, bookmarking is used to avoid having to start over from the beginning of the content.

Note: Two pre-requisites are assumed:

(1) The mobile device has 3G or LTE and WiFi network connectivity (optionally network connectivity could be via a mobile broadcast network (e.g. such as DVB-H/SH)) and

(2) The user has a subscription to an IPTV service with multiple access networks enabled.
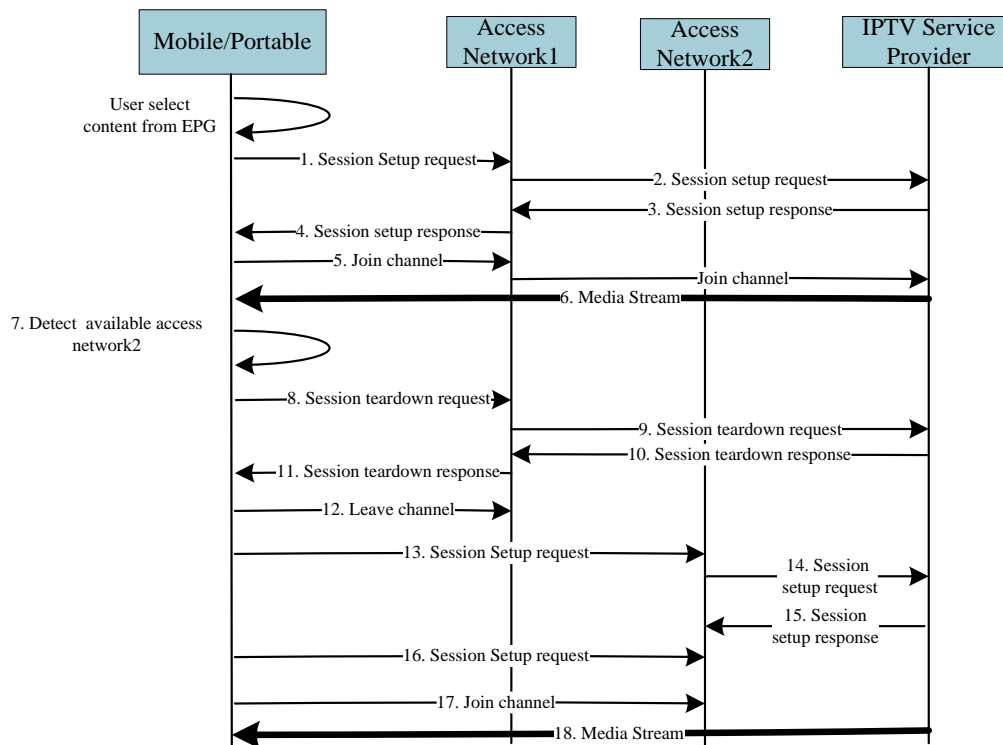
Figure 7: IPTV video watching and handover

1-6. A user browses the received EPG to select a content item and chooses to receive the content through Access Network1. The same content may be provided through multiple access networks, and therefore each access network has its own associated access information which is provided in the EPG (e.g. access network identifier). The OITF sends a session setup request to the IPTV Service Provider through Access Network1 to receive the content over network 1. Upon receiving the session setup response, the OITF joins the channel, which may be multicast, and watches the selected content.

7. When the OITF detects that there is another available access network, such as the residential network environment, and that the content being watched is also available on that other access network (as indicated on the EPG), it informs the mobile/ portable device.

8-18. If the user decides to switch to Access Network2, the mobile/portable device obtains the access information of Access Network2 from the EPG to receive the same content. The EPG can be updated as the available access network is found. It should send the session teardown request to the IPTV Service Provider through Access Network1 and leave the channel associated with Access Network1. If available, a bookmark indication is inserted in the content pointing to where the user stopped watching the content. Then, the mobile/portable device should send a session setup request to the IPTV Service Provider through the selected Access Network2 and join the

channel, which could also be multicast, to continue watching the content. If bookmarking indication is available, the user can continue watching the content from where they stopped when on Access Network1.

4 Solution

This section describes how this feature package affects the current OIPF solution specifications

4.1 Media Formats

No changes to this functionality are required by this Feature Package.

4.2 HTTP Adaptive Streaming

No changes to this functionality are required by this Feature Package.

4.3 Content Metadata

No changes to this functionality are required by this Feature Package.

4.4 Protocols

4.4.1 Changes for R2 V2.3 Volume 4 – Protocols

Although there is no new protocol involved to support this feature package, the existing protocols are being extended to support the use of new devices (smart phones and tablets), which users have adopted in their everyday activities. It addresses the following use cases already covered in section 3:

- Content sharing across devices

- Content sharing across subscribers

- Service continuity across network change

4.4.1.1 Content Sharing across devices using SIP session management

4.4.1.1.1 Procedure for OITF initiated devices switching for alert clips and video calling

When a user would like to play a content stream on another OITF, the required information needs to be delivered to P2P communication enabler in order to get a high quality media stream, i.e. alert clips and video calling.

User A may have two devices (transferor (e.g. mobile/portable device) and transferee (e.g. PC, TV, tablet, etc.)) when initiating a call to user-B. To initiate a content stream transfer from transferor to transferee in the home network while initiating the call to user-B, the OITF SHALL use the following procedure:

Step 1: The transferor device SHALL send a SIP INVITE request directly to the network over the UNIS-8 interface to the P2P Communication Enabler, as described in section 6.1.4.5.1 "Procedures for Content Sharing on UNIS–8" of [OIPF_PROT2]. The network will forward the request to the remote ITF (user-B) and display the call alerting tone on user-A's transferor device. The transferor device receives an indication allowing transferring the alerting tone media stream to a selected OITF. The transferor then sends an indication to the network authorizing the display of the call alerting tone or video clip on the transferee device. The network will validate the request and the P2P Communication Enabler retrieves the URI of the call alerting tone or video clip and sends a SIP REFER to the IG in user A's home network.

Step 2: It is assumed that the transferee device has an HTTP PENDING_IG request. At some point in time, when a REFER request for the transferee device is received by the IG, the IG SHALL return a HTTP 200 OK response to the OITF. The response SHALL include the list of SIP headers as per Table 1, in addition to the normal HTTP headers as per RFC 2616 [HTTP].

Step 3: The transferee device SHALL examine the incoming REFER request. In particular, the transferee device SHALL extract the body header, in order to use it later to construct its own SDP for the session transfer. If the transferee device cannot successfully validate the extracted SDP, it SHALL reject the incoming request. However, if the transferee device successfully validates the extracted SDP, it SHOULD accept the incoming request.

Step 4: Once the transferee device accepts the incoming SIP REFER, it SHALL send an HTTP POST PENDING_IG request to the IG. The content of the HTTP Request SHALL be as follows:

HTTP Request Header: It includes the following:

- <list of HTTP headers> - as per RFC 2616 [HTTP]

- <list of SIP headers encoded as HTTP headers> - as per Table 47 of [OIPF_PROT2] with the exception that the response in this case is a SIP 202 OK

HTTP Request Body: Empty

Step 5:   The transferee device SHALL also extract the following information from the incoming REFER request:

The alerting tone URI extracted from the "To" header included in the "Refer-To" header.

The body header.

Step 6:   The transferee device SHALL then construct an SDP that it can use to initiate a new session to handle the transfer. The transferee device MAY follow section 5.3.2.1.1 "Retrieval of Session Parameters" of [OIPF_PROT2], if needs be, towards the construction of the SDP.

Step 7:   The transferee device SHALL then invoke the procedure defined in section 5.3.2.1.2 "Session Initiation" of [OIPF_PROT2] according to the URI provided and presents the received high resolution alerting tone streaming.

Table 1: List of HTTP extension headers for an incoming SIP REFER request to the transferee (IG→OITF)

X-OITF HTTP Header	Source of Coding Information
X-OITF-Request-Line Note: The request URI SHALL be set to the transferee (target device OITF) contact information received during the device discovery process.	RFC 3261 [SIP] REFER <Request URI> SIP/2.0
X-OITF-From	RFC 3261 [SIP]
X-OITF-To The URI part of X-OITF-To SHALL be set to the value of the Request URI in the "X-OITF-Request-Line"	RFC 3261 [SIP]
X-OITF-Call-ID	RFC 3261 [SIP]
X-OITF-CSeq	RFC 3261 [SIP]
X-OITF-Refer-To SHALL be set to the remote target URI included in the contact header field returned in the SIP 200 OK associated with initial session setup with the transferor and extended with the following URI headers fields: • To header field SHALL contain the retrieved URI of the call alerting tone. • Optionally an Accept-Contact header field with the g.3gpp.icsi-ref media feature tag set to the IPTV Communication service identifier "urn%3Aurn-7%3A3gpp-service.ims.icsi.iptv" • P-preferred-Service set to IPTV Communication service Identifier urn:urn-7:3gpp-service.ims.icsi.iptv • Body header. Contains the SDP body to be included in the SIP request initiated from the transferor OITF. The SDP body shall contain the same number of media lines as the SDP used in the original session from the transferor OITF. Each media line shall indicate the same media type as its corresponding media component in the SDP used in the original session by the transferor OIPF. The media line for the media to be transferred SHALL include a port number	RFC 3261 [SIP] [SRVCONT] RFC 3891 [RFC3891]

with non-zero value. Example: Refer-To: <sip:remoteuser@home2.net;gr=urn:uuid:f81d4fae-7dec-11d0-a765-333333333333?Replaces=AB03a0s09a2sdfglkj490333%3Bremote-tag=Afgsdfg45%3Blocal-tag=U188gg&Require=replace&P-Preferred-Service=urn:urn-7:3gpp-service.ims.icsi.iptv&Accept-Contact=*%3b+g.3gpp.icsi-ref%3d%22urn%253Aurn-7%253gpp-service.ims.icsi.iptv%22	
X-OITF-Contact	RFC 3261 [SIP]
X-OITF-Content-Type SHALL be set to "application/vnd.oipf.session-transfer+xml" corresponding to section 5.3.13.2, "XML Schema for Session Transfer Information included in a session transfer request from the transferor to transferee" of [OIPF_PROT2]	
X-OITF-Content-Length	RFC 3261 [SIP]

4.4.1.1.2 Procedure for OITF initiated content selection across devices

When a user would like to use the mobile/potable ITF to select different contents to be displayed on the OITF, the content information needs to be delivered to the OITF and played appropriately in the PIP mode.

To initiate OIPF content selection from ITF, it SHALL use the following procedure:

Step 1: The ITF SHALL send a request directly to the network over the UNIS-6 interface to IPTV Application, as described in section 5.4.2.1, "Protocol over UNIS-6" of [OIPF_PROT2]. The network returns the content guide for selection. Then ITF sends the selected content information to OITF, i.e. CRID for 3D content.

Step 2: The OITF SHALL then construct an SDP that it can use to initiate a new session to obtain the first CoD. The OITF MAY follow section 5.3.2.1.1, "Retrieval of Session Parameters" of [OIPF_PROT2], if needs be, towards the construction of the SDP.

Step 3: The OITF SHALL then invoke the procedure defined in section 5.3.2.1.2, "Session Initiation" of [OIPF_PROT2] according to the CRID provided and presents the receiving content.

Step 4: The ITF SHALL send another request to IPTV Application for a second content, as described in section 5.4.2.1, "Protocol over UNIS-6" of [OIPF_PROT2]. The network returns the content guide for selection. Then ITF sends the selected content information to OITF, i.e. CRID for 2D content.

Step 5: The OITF SHALL then construct an SDP that it can use to initiate a second session to obtain the second CoD. The OITF MAY follow section 5.3.2.1.1, "Retrieval of Session Parameters" of [OIPF_PROT2], if needs be, towards the construction of the SDP.

Step 6: The OITF SHALL then invoke the procedure defined in section 5.3.2.1.2, "Session Initiation" of [OIPF_PROT2] according to the CRID provided and presents the receiving content. Then OITF receives two video streams at the same time in PIP mode, i.e. 2D/3D hybrid

4.4.1.2 Content Sharing across different subscribers using SIP session management

4.4.1.2.1 Watching together

4.4.1.2.1.1 Procedure for initiating user switching channel

Two IPTV service subscribers at different locations can share content and watch it simultaneously. The initiating user can use his mobile/portable ITF to set up a content sharing session of what he is watching on his OITF with a remote user's OITF.

Initiator's ITF and OITF devices are in his home network. To initiate the content sharing session from initiator's mobile/portable ITF with remote user's OITF, it SHALL use the following procedure:

Step 1: The ITF SHALL send a SIP INVITE request with the identifier of initiator OITF and remote OITF directly to the network over the UNIS-8 interface to P2P Communication Enabler, as described in section 6.14.5.1,

"Procedures for Content Sharing on UNIS–8" of [OIPF_PROT2]. The P2P Communication Enabler subscribes the identification information of content watched by initiator OITF, i.e. content id, channel id, or multicast address of the content watched, and generates a SIP INVITE to remote IG for remote OITF.

Step 2: It is assumed that the remote OITF has an HTTP PENDING_IG request. At some point in time, when a SIP INVITE request received for the OITF is received by the remote IG, the IG SHALL return a HTTP 200 OK response to the remote OITF. The response SHALL include the list of SIP headers as per table 95 of [OIPF_PROT2], in addition to the normal HTTP headers as per RFC 2616 [HTTP].

HTTP Request Body: application/sdp

The request body includes the SDP offer generated by the P2P Communication Enabler of the content played on initiator OITF according to the identification information of content. SDP SHALL be used as specified in [TS124503].

- An m=<media> <port> <transport> <fmt>

- A c =<network type> <address type> <connection address> to indicate connection data at media level

- One or more a=fmtp lines representing RTSP specific attributes

- An "a=" line with a "sendonly"

- One or more a=file-selector lines which parameterize the file to be transferred

- An "b=" to indicate the bandwidth for each media stream

Step 3: The remote OITF SHALL examine the incoming SIP INVITE request. In particular, the OITF SHALL extract the body header for the session transfer. If the OITF cannot successfully validate the extracted SDP, it SHALL reject the incoming request. If the OITF successfully validates the extracted SDP, it SHOULD accept the incoming request.

Step 4: When the IG receives the response, the IG SHALL return a HTTP 200 OK response (or other appropriate responses) to the initiator OITF to report the response to the SIP INVITE. The response includes a list of SIP headers as per table 96 of [OIPF_PROT2], in addition to the normal HTTP headers as per RFC 2616 [HTTP]. Then the content of what the initiating user is watching on his OITF is delivered to the remote OITF.

Step 5: When the initiator's OITF changes to new content, it SHALL send HTTP POST request to the initiator's IG, as described in section 5.3.1.1.1, "Session Initiation" of [OIPF_PROT2] for scheduled content service, and in section 5.3.2.1.2, "Session Initiation" of [OIPF_PROT2] for CoD service.

Step 6: The IG SHALL validate that the request includes all the mandatory SIP headers for the process as per table 2 and table 16 of [OIPF_PROT2]. The IG SHALL send a SIP re-INVITE to the network to request the initiation of the session modification procedure, and SHALL wait for the response to the request. The IG SHALL reject a request that is missing any mandatory SIP headers with a non-200 OK HTTP response, including the reason for rejection. If validated, P2P Communication Enabler will be notified about the information of the new content and generate a SIP re-INVITE to remote IG for remote OITF.

Step 7: The new content will be deliver to remote OITF by repeat step 2-4.

4.4.1.2.1.2 Procedure for initiating user switching device

Two IPTV service subscribers can share content and watch it simultaneously. The initiator can use his mobile/portable ITF to set up a content sharing session with the remote OITF. The initiating user can transfer the content consumption to another OITF in his home network.

To transfer the content sharing session from the initiator's mobile/portable ITF to his home network OITF, it SHALL use the following procedure:

Step 1: The ITF SHALL send a SIP INVITE request with the identifier of remote OITF directly to the network over the UNIS-8 interface to P2P Communication Enabler, as described in section 6.1.4.5.1, "Procedures for Content Sharing on UNIS–8" of [OIPF_PROT2] . The P2P Communication Enabler subscribes the identification information of content watched by ITF i.e. content id, channel id, or multicast address of the content watched and generates a SIP INVITE to remote IG for remote OITF.

Step 2: It is assumed that the remote OITF has an HTTP PENDING_IG request. At some point in time, when a SIP INVITE request received for the remote OITF is received by the remote IG, the IG SHALL return a HTTP 200 OK response to the remote OITF. The response SHALL include the list of SIP headers as per table 95 of [OIPF_PROT2], in addition to the normal HTTP headers as per RFC 2616 [HTTP].

HTTP Request Body: application/sdp

The request body includes the SDP offer generated by the P2P Communication Enabler of the content played according to the identification information of content. SDP SHALL be used as specified in [TS124503].

- An m=<media> <port> <transport> <fmt>

- A c =<network type> <address type> <connection address> to indicate connection data at media level

- One or more a=fmtp lines representing RTSP specific attributes

- An "a=" line with a "sendonly"

- One or more a=file-selector lines which parameterize the file to be transferred

- An "b=" to indicate the bandwidth for each media stream

Step 3: The remote OITF SHALL examine the incoming SIP INVITE request. In particular, the remote OITF SHALL extract the body header for the session transfer. If the remote OITF cannot successfully validate the extracted SDP, it SHALL reject the incoming request. If the remote OITF successfully validates the extracted SDP, it SHOULD accept the incoming request.

Step 4: When the IG receives the response, the IG SHALL return a HTTP 200 OK response (or other appropriate responses) to the ITF to report the response to the SIP INVITE. The response includes a list of SIP headers as per table 96 of [OIPF_PROT2], in addition to the normal HTTP headers as per RFC 2616 [HTTP]. Then the content of what the initiator is watching on its ITF is delivered to the remote OITF.

Step 5: When the ITF gets in reach of his residential network, it can change device to share content through his OITF at home. If so, it SHALL send a SIP REFER to IPTV Control FE with the identifier of his home's OITF. IPTV Control FE will notify P2P Communication Enabler about the transfer status. Then the content sharing session can be tore down or can continue to share the OITF's program with remote OITF according to the status notification. If it continues, P2P Communication Enabler subscribes the identification information of content watched by the initiator's OITF at home, i.e. new content id, channel id or multicast address of the content obtained. If it tears down, IPTV Control FE will notify P2P Communication Enabler to tear down the content sharing session with remote OITF.

Step 6: If the content sharing continues, the content will be delivered to remote OITF by repeat step 2-4, while initiating user continues watching the content played on his OITF.

4.4.1.2.2 Watching what I have

Two IPTV service subscribers can share a content item, which one of them has subscribed to, while he is at the other user's home network on that user's OITF.

To initiate the content sharing session from the initiator's mobile/portable ITF on the visited user's OITF, it SHALL use the following procedure:

Step 1: The ITF SHALL send a SIP INVITE request with the CRID of the program and remote OITF's IMPU to IPTV Control FE. The IPTV Control FE checks whether the initiator has the right to share his program on the visited user's OITF. If it is permitted, IPTV Control FE shall add temporary access right of the program to the visited user's service profile. The IPTV Control FE then sends a request to IPTV Application to initiate the push procedure for the access and license information. The IPTV Application FE pushes the access parameter and license information （i.e. right object, marlin license）of the program to the visited OITF. Then, the IPTV Control FE sends a session setup response to the IG of the visited OITF.

Step 2: It is assumed that the visited OITF has an HTTP PENDING_IG request. At some point in time, when a REFER request received for the visited OITF is received by the IG, the IG SHALL return a HTTP 200 OK response to the remote OITF. The response SHALL include the list of SIP headers as per Table 2, in addition to the normal HTTP headers as per RFC 2616 [HTTP].

Step 3: Once the OITF accepts the incoming SIP REFER, it SHALL send an HTTP POST PENDING_IG request to the IG. The content of the HTTP Request SHALL be as follows:

HTTP Request Header: It includes the following:

- \<list of HTTP headers\> - as per RFC 2616 [HTTP]

- \<list of SIP headers encoded as HTTP headers\> - as per table 47 of [OIPF_PROT2] with the exception that the response in this case is a SIP 202 OK

HTTP Request Body: Empty

Step 4: The OITF SHALL extract the following information from the incoming REFER request:

The Content URI extracted from the To header included in the Refer-To header.

The body header.

Step 5: The OITF SHALL then construct an SDP that it can use to initiate a new session. The OITF MAY follow section 5.3.2.1.1, "Retrieval of Session Parameters" of [OIPF_PROT2], if needs be, towards the construction of the SDP.

Step 6: The OITF SHALL then invoke the procedure defined in section 5.3.2.1.2 "Session Initiation" of [OIPF_PROT2] according to the CRID provided and presents the receiving content.

Table 2: List of HTTP extension headers for an incoming SIP REFER request to the transferee (IG→OITF)

X-OITF HTTP Header	Source of Coding Information
X-OITF-Request-Line Note: The request URI SHALL be set to target device OITF contact information received during the device discovery process.	RFC 3261 [SIP] REFER \<Request URI\> SIP/2.0
X-OITF-From	RFC 3261 [SIP]
X-OITF-To The URI part of X-OITF-To SHALL be set to the value of the Request URI in the "X-OITF-Request-Line"	RFC 3261 [SIP]
X-OITF-Call-ID	RFC 3261 [SIP]
X-OITF-CSeq	RFC 3261 [SIP]
X-OITF-Refer-To SHALL be set to the PSI (Public Service Identifier) of the CoD Services as follows: OIPF_IPTV_CoD_Service_*@\<domain name\> Where: • The wild card part (*) is a content instance identifier, constructed according to clause 4.3.2.2 of [OIPF_META2] when CoD content identifiers are delivered via the Content Guide. For DAE applications signalling CoD, the wild card part is constructed according to clause 8.1.2 of [OIPF_DAE2]. • The domain part (\<domain name\>) is the IPTV Service Provider domain name, obtained from the IPTV Service Provider discovery function. and extended with the following URI headers fields: • Optionally an Accept-Contact header field with the g.3gpp.icsi-ref media feature tag set to the IPTV Communication service identifier "urn%3Aurn-7%3A3gpp-service.ims.icsi.iptv" • P-preferred-Service set to IPTV Communication service Identifier urn:urn-7:3gpp-service.ims.icsi.iptv	RFC 3261 [SIP] [SRVCONT] RFC 3891 [RFC3891]

Example: Refer-To: <sip:remoteuser@home2.net;gr=urn:uuid:f81d4fae-7dec-11d0-a765-333333333333?Replaces=AB03a0s09a2sdfglkj490333%3Bremote-tag=Afgsdfg45%3Blocal-tag=U188gg&Require=replace&P-Preferred-Service=urn:urn-7:3gpp-service.ims.icsi.iptv&Accept-Contact=*%3b+g.3gpp.icsi-ref%3d%22urn%253Aurn-7%253gpp-service.ims.icsi.iptv%22	
X-OITF-Contact	RFC 3261 [SIP]
X-OITF-Content-Type SHALL be set to "application/vnd.oipf.session-transfer+xml" corresponding to section 5.3.13.2, "XML Schema for Session Transfer Information included in a session transfer request from the transferor to transferee" of [OIPF_PROT2]	
X-OITF-Content-Length	RFC 3261 [SIP]

4.4.1.3 Service continuity and transfer to home network

4.4.1.3.1 Procedure for service continuity and transfer to home network

Service transfer to home network enables the user to switch access network and keep the ongoing service when reaching the home network (although not covered here, a similar approach would apply for the case of leaving the home network). It is assumed that the same content may be provided through multiple access networks, where each access network would have its own associated network access identifier information provided in the EPG.

A User watches content by using the mobile/portable device connected to a mobile network outside the home network (e.g. 3G, LTE or a mobile broadcast network such as DVB-H/SH). At the certain moment, the ITF detects the available home network and performs the UPnP discovery procedure, as described in 10.1.1, "UPnP discovery" of [OIPF_PROT2]. To continue watching the same content when reaching the home network, the ITF SHALL perform an access network modification with the home network by sending a request to the IG for a new session initiation. The ITF checks the received EPG for obtaining the access information in home network for the same content (identified by BCServiceID, ProgramID, CRID, multicast address, etc in the original session). The ITF SHALL send HTTP POST request to the IG, as described in section 5.3.1.1.1, "Session Initiation" of [OIPF_PROT2] for scheduled content service, and in section 5.3.2.1.2, "Session Initiation" of [OIPF_PROT2] for CoD service. Then, the original session will be terminated and the ITF joins a multicast channel or set up a new CoD session to keep on watching. If bookmarking indication have been stored as described in section 5.3.9 "Content Bookmarking" of [OIPF_PROT2], the user can continue watching the content from where he stopped when leaving the mobile network.

When the user transfers an ongoing communication session (i.e. telephony session or messaging chat session) from one ITF to a DLNA-enabled home device, the DLNA Function in the ITF detects the available DLNA-enabled devices and transfers the ongoing session parameters using DLNA protocols. The interface between the DLNA Function of the ITF and DLNA-enabled home devices SHALL be compliant with the IEC 62481, Digital living network alliance (DLNA) home networked device interoperability guidelines [DLNA].

Note: The handover of content session information between different service providers is out-of-scope of this feature package.

4.4.2 Changes for R2 V2.3 Volume 4a – Examples of IPTV Protocol Sequences

The following sections provide examples of the changes to the protocols, required to support the described features in this package.

4.4.2.1 Content Sharing across devices using SIP session management

4.4.2.1.1 Content suggestion via alert clips and video calling
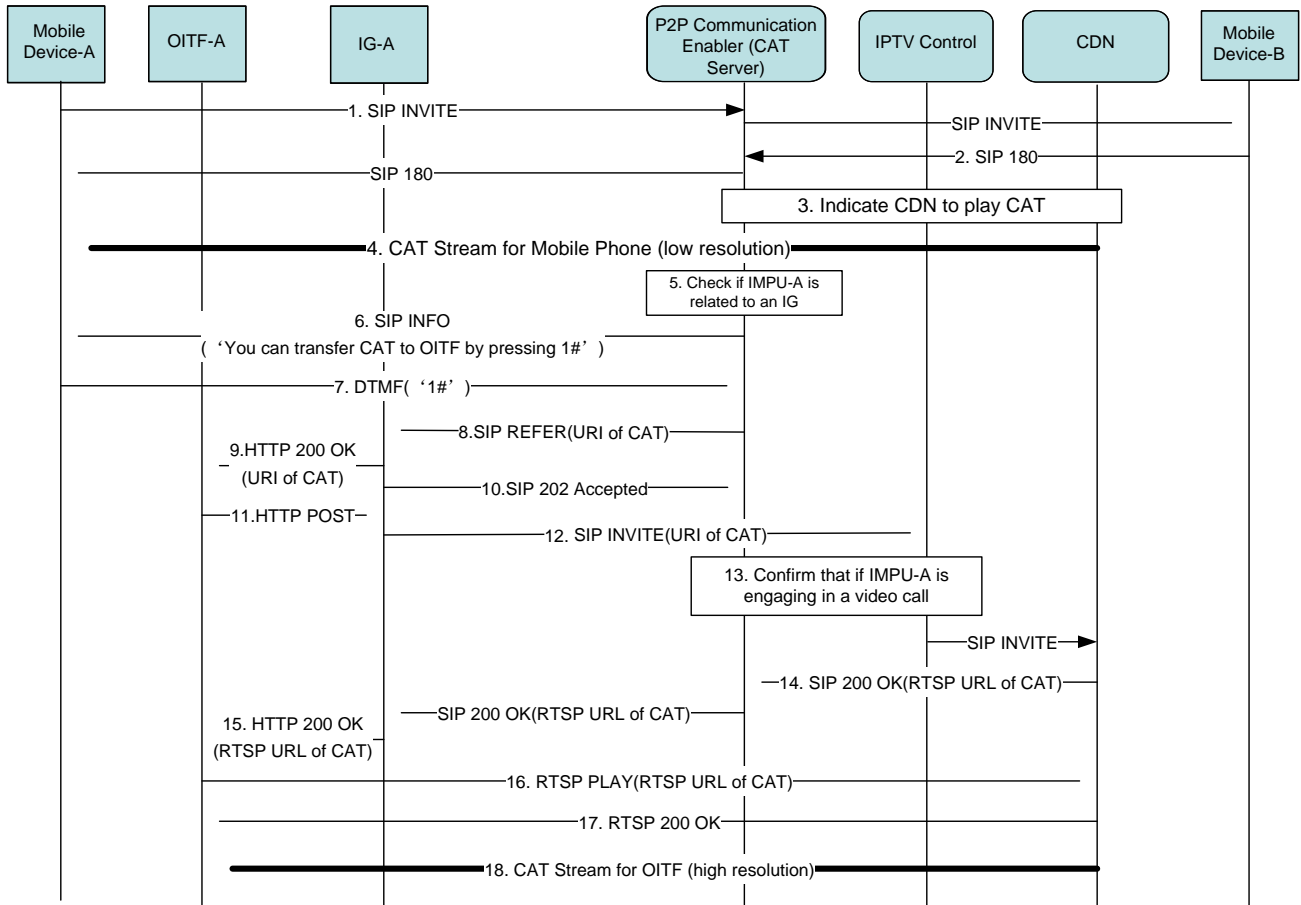

Figure 8: Content suggestion via alert clips and video calling using SIP session management

1-4. User-A initiates a video call to user-B by using his mobile/portable device. User-B mobile/portable device returns SIP 180 Ringing response to user-A mobile/portable device. P2P Communication Enabler instructs the CDN to start playing CAT on user-A's mobile/portable device.

5- 9. At the same time, the P2P Communication Enabler checks if IMPU-A is also related to an IG. If this is the case, it sends a SIP INFO message to user-A's mobile/portable deviceA. The SIP INFO message carries a prompt such as "You can transfer CAT to your TV by pressing '1#'". By pressing '1 #' keys on his mobile/portable device, the corresponding DTMF signals are transferred to the P2P Communication Enabler. On receiving the DTMF '1#', P2P Communication Enabler retrieves the URI of the CAT streaming to the originating user and sends an HTTP 200 OK message to OITF-A using a SIP REFER message.

10- 12. IG-A sends a SIP 202 Accepted response to the P2P Communication Enabler. OITF-A issues an HTTP POST request with the URI of the CAT to IG-A. IG-A generates a SIP INVITE and sends it to the IPTV Control FE. The Request URI of the INVITE message is set to the URI of the CAT.

13- 18. On receiving the INVITE message, the IPTV Control FE examines the Request URI to see if the PSI is set to the CAT service. If so, IPTV Control FE interacts with the P2P Communication Enabler (CAT Server) to confirm that the IMPU-A is really engaged in a video call and finds out the called party's IMPU for charging purposes, if needed. Then, IPTV Control FE forwards the INVITE message to the CDN, which responds with the RTSP URL of the CAT stream to OITF-A, forwarded by IG-A. OITF-A sends an RTSP PLAY request which includes the RTSP URL of the CAT to the CC/CDF and finally starts receiving and presenting the high resolution CAT stream.

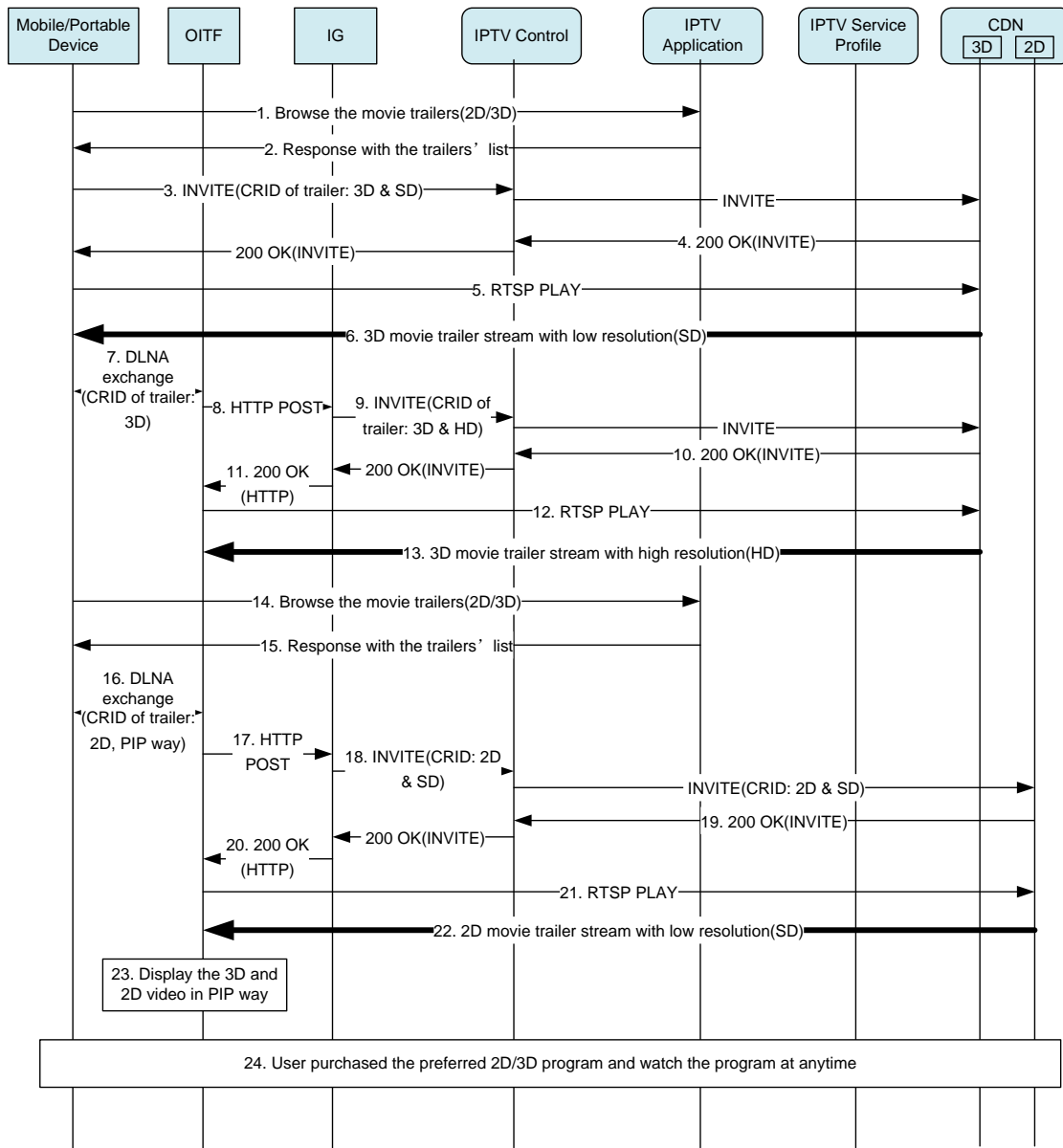## 4.4.2.1.2 2D/3D content selection and transfer for watching

Figure 9: 2D/3D content selection and handover for watching using SIP session management

The following is a brief description of the steps in the message flow:

1-2.   The user browses available 2D/3D movie trailers from his mobile/portable device within the home network by requesting the IPTV Application to provide a list of trailers.

3-6.   The user selects for viewing a 3D movie trailer. The mobile/portable device sends a SIP INVITE message to IPTV Control with the selected 3D trailer's CRID. IPTV Control selects a 3D CDN based on the 3D CRID and forwards the INVITE message to it. The 3D CDN responds to the mobile/portable device, which sends an RTSP PLAY to the 3D CDN to start the stream.

7-13.   When the user wants to watch the 3D content on the TV screen, he uses the mobile/portable device to transfer the trailer's CRID to the OITF using DLNA. The OITF sends the 3D trailer's CRID to the 3D CDN via the IPTV Control FE. Then, the OITF sends an RTSP PLAY to the 3D CDN to start the stream and the user can watch the content in the home network.

14-23. When the user wants to watch other content items, he browses the movie trailers again and selects a 2D movie trailer. He wants to watch the 2D trailer on the TV set, so he uses his mobile/portable device to transfer the 2D trailer's CRID to OITF using DLNA and selects the PIP mode. The OITF sends the 2D trailer's CRID to the 2D CDN via the IPTV Control FE. The 2D CDN responds to the OITF, which then sends an RTSP PLAY to the 2D CDN to start the stream and receives two video streams at the same time in 2D/3D hybrid PIP mode (assuming the

OIPF supports this capability). The primary picture shall be rendered in 3D mode, while the secondary picture will be in 2D mode.

24. If the user or his family likes one of the trailers, either 2D or 3D, he can use his mobile/portable device to perform the purchase procedure. The mobile/portable device sends a purchase request to IPTV Application. The IPTV Application updates the user's profile in the IPTV Service Profile which responds with the success result to the mobile/portable device, so that the user can watch the purchased program at any time.

4.4.2.2 Content Sharing across different subscribers using SIP session management

4.4.2.2.1 Watching together

As a reminder, the assumptions mentioned in section 3.3.2.1 apply to the examples below.

4.4.2.2.1.1   Initiating user switching channel
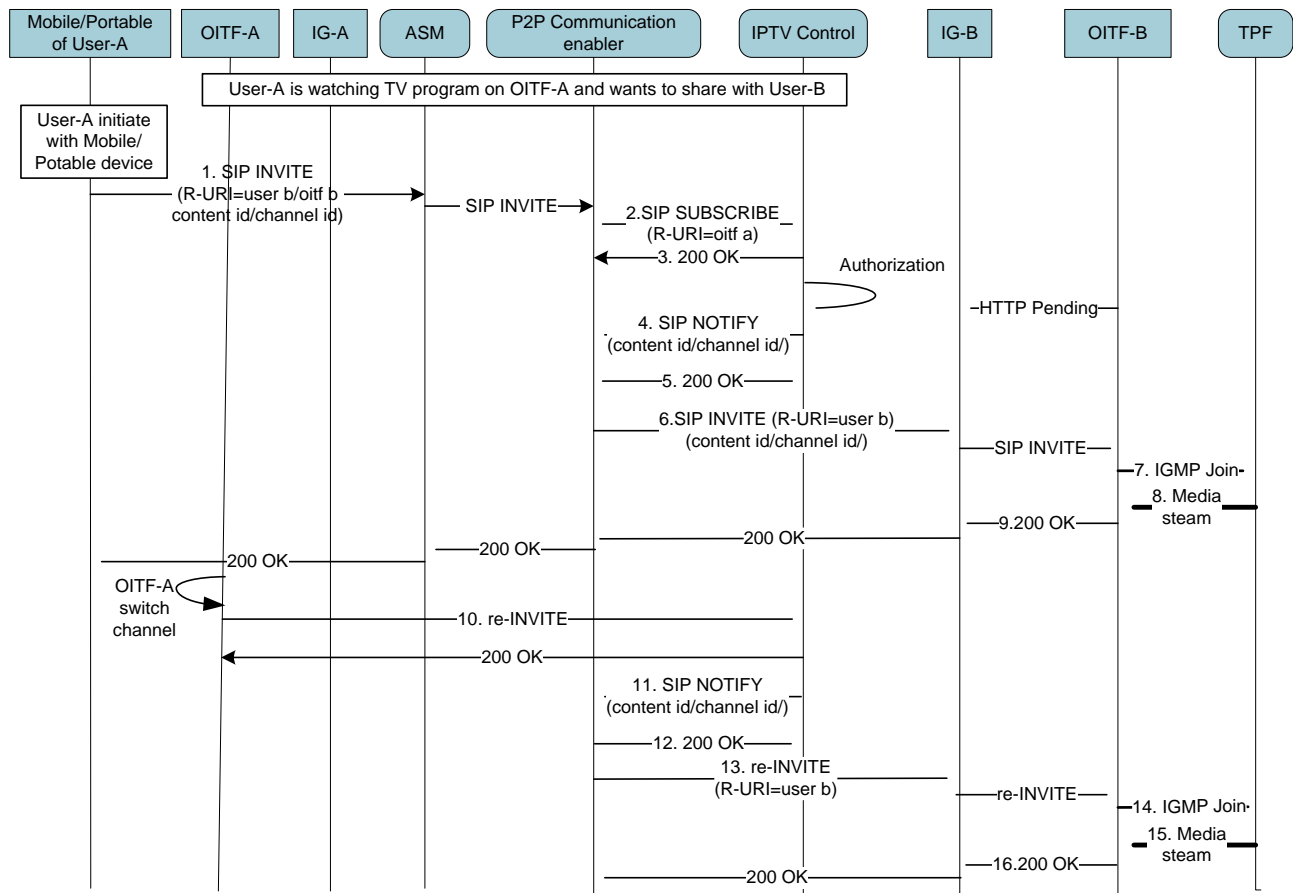

Figure 10: Content Sharing across different subscribers – Initiating user switching channel using SIP session management

1. User-A is watching a TV program using OITF-A and would like to watch the program together with user-B. User-A initiates a content sharing session with user-B by using his mobile/portable device in his home network and including an identifier for either user-B or OITF-B. The mobile/portable device will send a SIP INVITE to indicate to the P2P Content Sharing Enabler the request to provide the content displaying on OITF-A on OITF-B.

2-5. The P2P Communication Enabler (Content Sharing function) subscribes to OIPF-A's program information with the IPTV Control FE, in order to obtain the identification information of the content displayed by OITF-A. The IPTV Control FE validates that user-A is allowed to share the content with another user, whereupon it returns the requested information. It may include the content id, channel id, or multicast address of the content OITF-A is watching.

6-9. The P2P Communication Enabler provides the content OITF-A is watching to OITF-B according to the identification information of the content. It forwards the SIP INVITE including all the information obtained from IPTV Control FE to OITF-B. OITF-B joins the channel the OITF-A is watching if user B agrees to it. Then, the media stream is delivered to the OITF-B and user-B starts watching what user-A is watching.

10-15. When the User-A switches channels and therefore content he is watching, the OITF-A send a re-INVITE to the IPTV Control FE to also change the channel and therefore also the content. The IPTV Control FE notifies the P2P Communication Enabler of the new content id, channel id or multicast address of the new content watched by OITF-A. The P2P Content Sharing Enabler re-invites OITF-B by including all the updated information obtained from IPTV Control FE. Then, OITF-B joins the new IGMP group and receives the media stream as described above.

It is also possible to achieve this procedure through a DAE application interacting with an IPTV Application directly. Figure 11 shows a high level procedure.
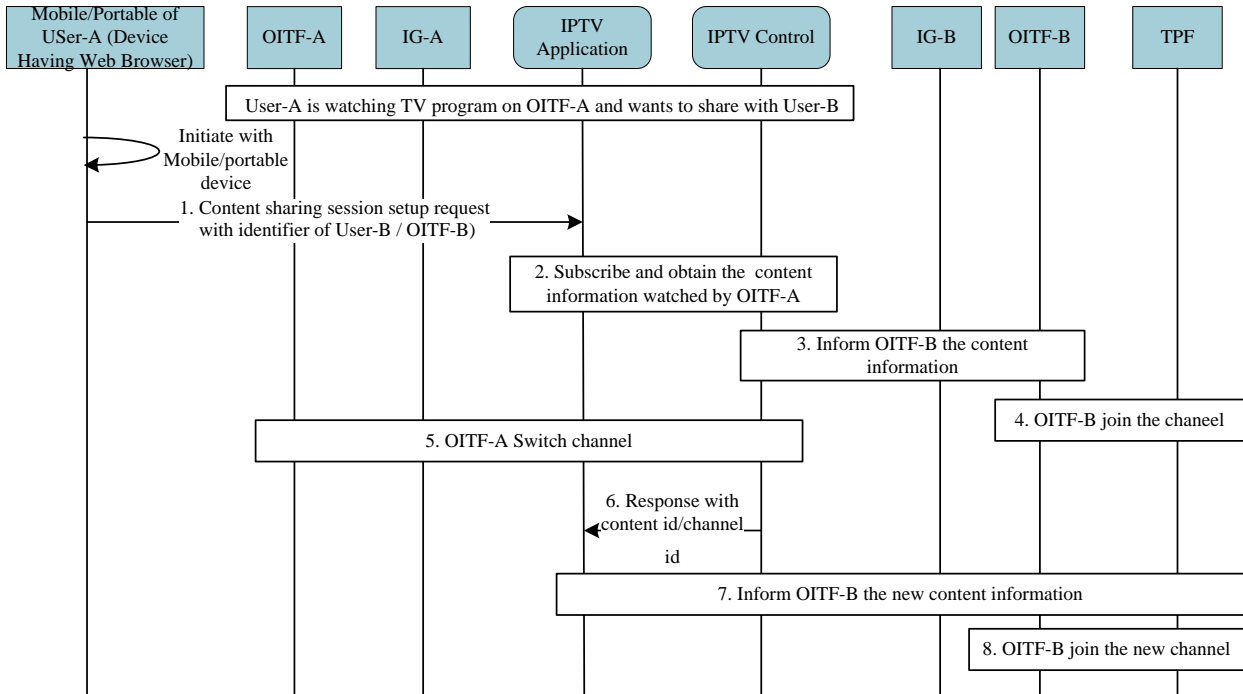

Figure 11: Content Sharing across different subscribers – DAE-based initiating user switching channel using SIP session management

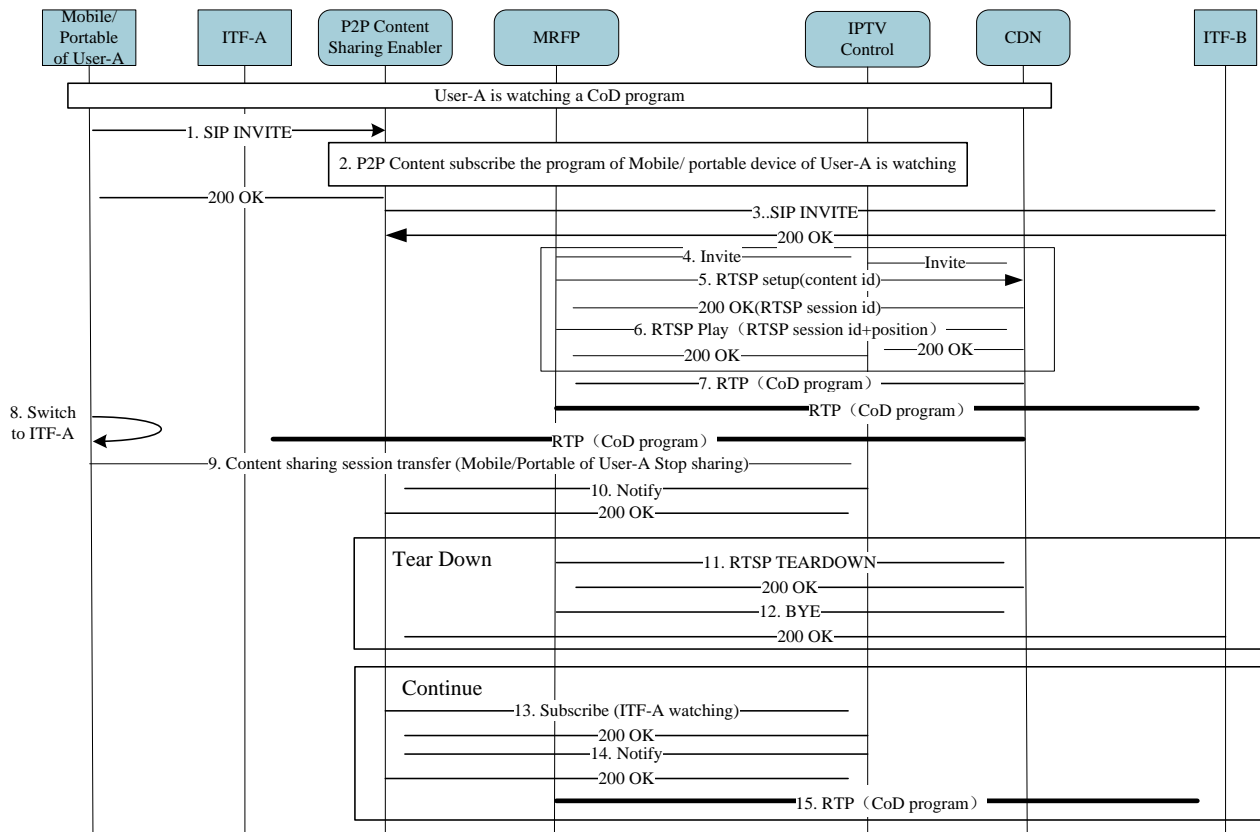#### 4.4.2.2.1.2 Initiating user switching device

Figure 12: Content Sharing across different subscribers – Initiating user switching device using SIP session management

1. User-A is watching a TV program using his mobile/portable device and would like to watch the program together with user-B. User-A initiates a content sharing session with user-B by using his mobile/portable device in his home network.

2. The P2P Communication Enabler subscribes to the program information user-A's mobile/portable device is watching from the IPTV Control FE. The IPTV Control FE validates that user-A is allowed to share the content with another user, whereupon it returns the requested information. It may include the content id, channel id, or multicast address of the content user-A is watching on his mobile/portable device.

3-7. The P2P Communication Enabler forwards the SIP INVITE, including all the information obtained from IPTV Control FE, to OITF-B. If user-B agrees to watch it, the P2P Communication Enabler accesses the media stream user-A is watching on his mobile/portable device and forwards it to OITF-B. Then, the media stream is delivered to the OITF-B and user-B starts watching what user-A is watching.

8-12. When the user-A switches device, the mobile/portable device of user-A sends a request to IPTV Control FE to transfer the content sharing session to OITF-A. The IPTV Control FE will notify the P2P Content Sharing Enabler about the transfer status. Then, the original content sharing session can either be torn down or can continue the sharing of OITF-A's program with OITF-B according to the status notification. If it is torn down, the IPTV Control FE will notify the P2P Communication Enabler to tear down the content sharing session with OITF-B.

13-15. In the case where the session continues, the P2P Content Sharing Enabler will subscribe to the program OITF-A is watching and receive the notification from the IPTV Control FE about program information including the new content id, channel id or multicast address of the content. Then, OITF-B receives the media stream as described above.
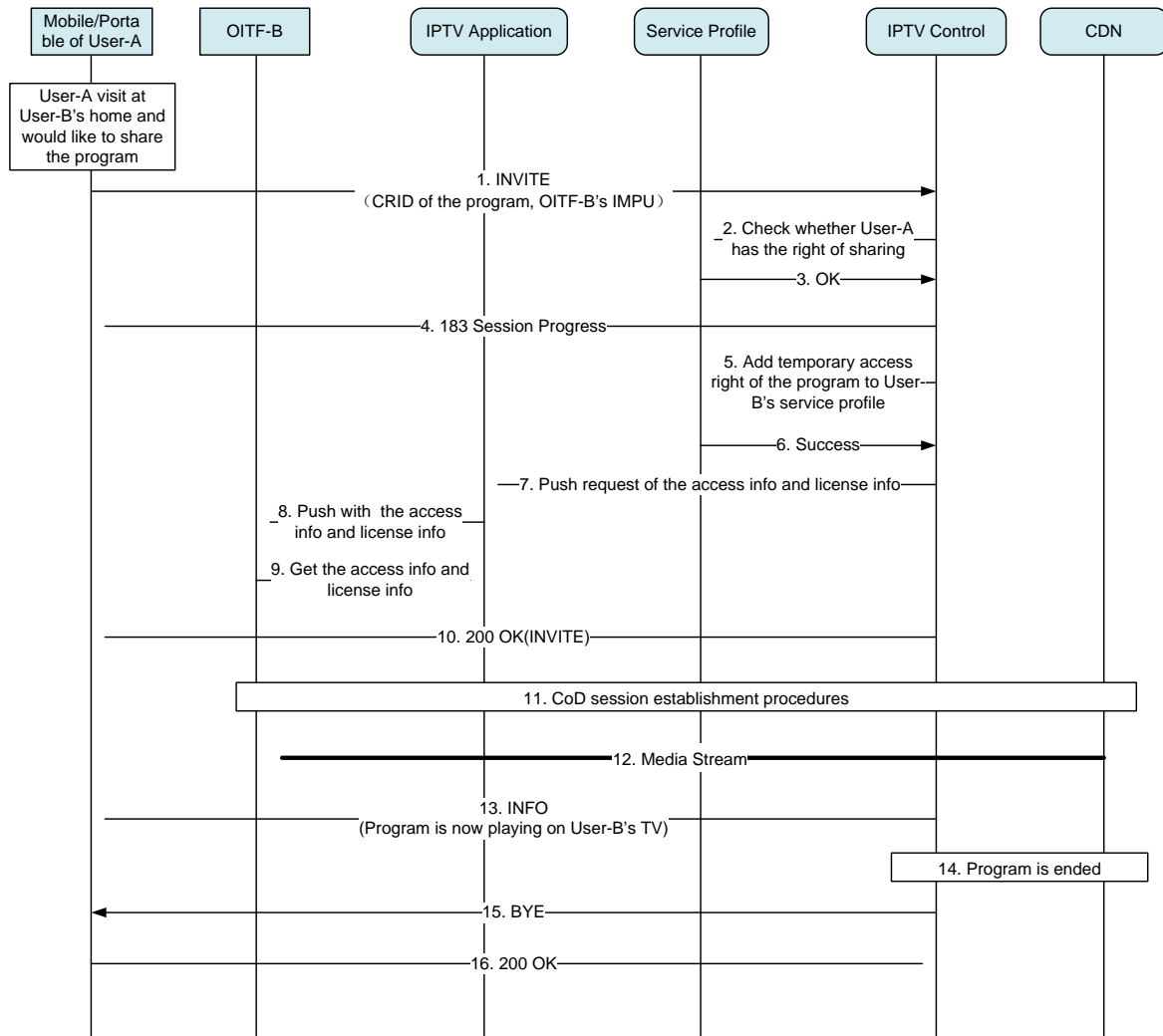
4.4.2.2.2 Watching what I have

Figure 13: Watching what I have using SIP session management

1. User-A comes to user-B's home and wants to share the program which he has subscribed to, by using his mobile/portable device to show content on user-B's OITF. The mobile/portable device sends an INVITE message with the CRID of the program and OITF-B's IMPU to the IPTV Control FE.

2-6. On receiving the INVITE message, the IPTV Control FE first checks whether user-A has the right to share his program on the other user's OITF (e.g. purchase issues). If it is permitted, the IPTV Control FE shall send a 183 session progress message to user-A's mobile/portable device and add temporary access rights for the program to user-B's service profile.

7-10. The IPTV Control FE then sends a request to the IPTV Application to initiate the push procedure for access and license information. The IPTV Application pushes the access parameter and license information (e.g. right object) for the program to OITF-B. Then, the IPTV Control sends a SIP 200 OK to user-A's mobile/portable device.

11-2. OITF-B establishes the CoD session based on the access and license information and then receives the program's stream and displays it.

13. The IPTV Control FE may send an INFO message to user-A's device to inform him of the status, such as "Program x is now playing on OITF-B."

14-16. When the program ends, IPTV Control FE shall send a BYE message to user-A's mobile/portable device to terminate the session.

4.4.2.3 Service continuity in home network on same device using SIP session management

The following example considers a user moving from a mobile network to his residential network. Although not covered, a similar approach could be considered for a user leaving his residential network and moving to a mobile network.

When getting in reach of his residential network, the mobile/portable device can continue the ongoing service delivered by a mobile network (e.g. 3G, LTE or a mobile broadcast network such as DVB-H/SH) in home network, and continue to watch the same content.
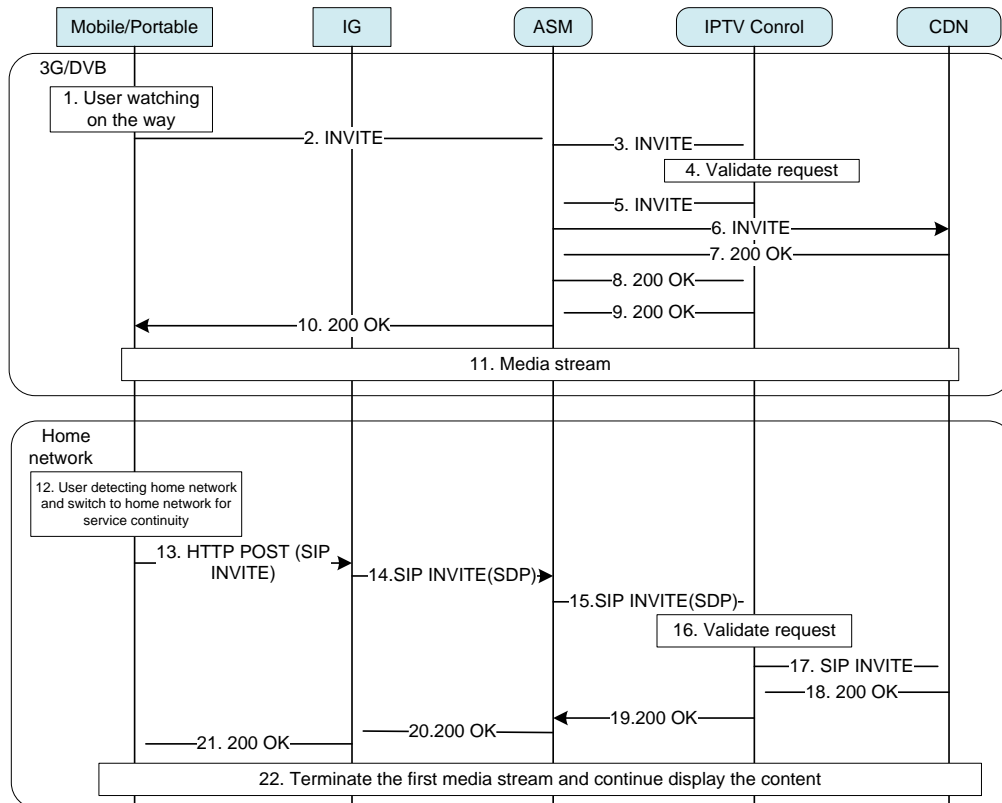

Figure 14: Service continuity in home network on same device using SIP session management

1-11. The ITF (mobile/portable device) connects to a mobile network (e.g. 3G, LTE or a mobile broadcast network such as DVB-H/SH) to get an EPG and browses the received EPG to select content. The ITF sends a SIP INVITE to the IPTV control FE through the mobile network to receive the content according to the access information of the mobile network. Upon receiving the session setup response, the OITF join the channel, which may be multicast, and watches the selected content.

12. When the ITF detects the residential network environment, and that the content being watched is also available on the home network (as indicated on the EPG)(note 1), it informs the mobile/portable device.

13-22. If the user decides to switch to home network, the mobile/portable device obtains the access information of the same content from the EPG updated with the home network information, as the EPG can be updated when identifying new available access networks. The mobile/portable device should send the session teardown request to the IPTV Service Provider through the mobile network and leave the multicast channel associated with the access network. Then, the mobile/portable device should send a session setup request to the IPTV Service Provider through the selected home network and join the channel, which could be multicast, to keep on watching the content. If bookmarking indication is available, it could be used to continue watching the content from where the user stopped when leaving the mobile network

Note 1: It is assumed that the same content may be provided through multiple access networks, where each access network would have its own associated network access identifier information provided in the EPG.

4.5 Declarative Application Environment

No changes to this functionality are provided by this Feature Package

4.6 Procedural Application Environment

No changes to this functionality are provided by this Feature Package

4.7 Authentication, Content Protection and Service Protection

For the use cases of this feature package involving only one CSP solution, content protection, service protection, service access protection, user identification, user authentication, and user authorisation as defined in [OIPF_CSP2] apply. For the "IPTV Service continuity over network change" use case covered in section 3.3.3, this may be different as it involves a user watching content in part on a mobile network device and in part on a device in its residential network. For the case where each network would use a different DRM system, an OIPF based standard solution to ensure content protection does not exist at the present time. Therefore, addressing content protection in this use case is left to the implementer, until such time an OIPF standard solution becomes available.

5 Testing

5.1 Conformance Testing

No conformance tests are defined for the functionality described in the Feature Package.

5.2 Interoperability Testing

No conformance tests are defined for the functionality described in the Feature Package.

Appendix A.   Requirements

This Section defines the high level requirements for the content service to mobile/portable devices. Some requirement may inherit from the previous Requirement releases. Such requirements that have a bearing on this feature package include [2-1031] [R2], [2-1798] [R2], [1-1090] [R1], [2-1799] [R2], [2-3081] [R2], [2-1797] [R2], [2-1799] [R2], [2-3082] [R2], [2-3015] [R2], [2-3016] [R2], [2-3017] [R2], [2-1797] [R2], [2-1799][R2], [2-1032] [R2], [1-3020] [R1] and [2-1033] [R2]. These requirements were partially fulfilled or not fulfilled at all in the two Solution releases. Some additional requirements are provided below to fulfil the additional use cases.

Note: The terms IPTV Terminal Function (ITF), Access Network, Service Provider, (end) user, mobile device, and portable device are defined in the OIPF Release 2 Requirements document (see www.oipf.tv/publications).

1. The IPTV Solution shall allow the ITF to discover access networks that provide access to a Service Provider's IPTV services and shall allow the end-user to select an appropriate network based on some end-user selected criteria (e.g., cost, preference etc.).

2. [2-1451] [R2] The IPTV Solution shall support a mechanism to receive information from a mobile or a portable device describing an item of IPTV content and enable the user to then access this IPTV content item on an ITF.

3. The IPTV Solution shall allow a user to share with another user information about a content item (e.g. the title, a URL to the content item metadata or a link to the content item itself) that is currently being rendered. The procedure can be initiated from an ITF implemented on any type of device.

4. The IPTV Solution shall support a mechanism for an IPTV Service Provider to duplicate and/or transfer an existing service session from one ITF to another ITF, either between different subscribers or between ITFs of a single subscriber.
    NOTE: This is a variant of the existing requirement [2-3017] [R2]

5. The IPTV Solution shall provide mechanisms for adaptation of content formats when one IPTV service session (e.g. with 3D content) is transferred to another ITF, which may have different capabilities.
    NOTE: This is a variant of the existing requirement [2-3081] [R2]

6. The IPTV Solution shall provide a mechanism for an ITF to search for content items in 3D format and select it provided it has the appropriate capabilities to consume it.
    Note: There may be a variant of this requirement that is addressed by the 3D FPP.

7. [2-1797] [R2]   The IPTV Solution shall provide a mechanism to support multiple devices of the user to participate in a video call in order to support different media types.

8. The IPTV Solution shall support continuous service experience as the user transfers an ongoing communication session (e.g. telephony session or messaging chat session) from one ITF to another ITF.

9. The IPTV Solution may support continuous service experience as the user transfers an ongoing communication session (e.g. telephony session or messaging chat session) from one ITF to a UPnP and/or DLNA-enabled home devices within the residential network.
    NOTE 1: The residential network can include devices that are connected through Remote Access as defined in DLNA
    NOTE 2: Fulfilment of this requirement depends on the availability of the appropriate DLNA specifications.
    NOTE 3: If DLNA addresses this functionality, there is a preference for using a DLNA specification as the reference, to avoid non-interoperability with DLNA implementations..

10. The IPTV Solution shall support service continuity when the user is moving between different Access Networks.

11. The IPTV Solution shall support the management or the control of individual media components of a communication session (e.g. video of an on-going video call) for rendering the individual media components on different devices in the residential network.

12. The IPTV Solution shall allow secure and authenticated access from an ITF to contact information on another device (e.g. contact information from the address book of a mobile phone) in the residential network belonging to the same user, to initiate a communication session.

13. The IPTV Solution shall provide a mechanism that allows an IPTV user to select the appropriate ITF to render the multimedia alert for an incoming video call.

14. The IPTV Solution shall support the ability to update (via both push and pull mechanisms) the EPG information when the ITF changes its Access Network.

15. The IPTV solution shall support the seamless transfer of content consumption session between devices in a residential network and mobile or portable devices, regardless of the content and service protection system(s) used on the mobile network or mobile Broadcast network and the residential network. The transfer shall ensure continuity in the rights that are associated with that session.