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                     SIP extensions for media control
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Status of this Memo

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Abstract

   This draft presents a requirement and proposes a solution to
   integration of Session Initiation Protocol (SIP), to the Real Time
   Streaming Protocol (RTSP and RTSP v2) [RFC 2326 and IDRTSP]
   especially in the context of converged media services or IPTV
   services. The document develops a rationale for using SIP with
   streaming media applications. One service on top of IPTV service is
   sketched out, which required SIP optimally.

Conventions used in this document

   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 RFC-2119.

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[1](#). **Introduction**

Internet Protocol based Television services (IPTV) are gaining popularity in telecom business circle specially telecom vendors and telecom operators. This service gives high revenue to telecom operators, in turn to telecom vendors, which lose revenue in the traditional voice services. In user point of view, they are able to access high quality video easily using IPTV. High penetration of broadband connectivity, improvement of multimedia codecs, and deployment of flexible triple play service delivery architecture by the operators contribute to the success of IPTV. This growth imposes challenging new requirements for converged media services in terms of flexibility and efficiency.

In order to realize the IPTV services based on IMS, IMS user deploys minimum four protocols such as HTTP, RTP, RTSP and SIP. One of the hurdles today to deliver the SIP services over corporate networks is firewall and NAT traversal. Opening the network other than HTTP/HTTPS still is a question for a network administrator. In some cases, opening the network for RTP and SIP is achieved using SIP and RTP aware firewall or session border controller. Rather than one opening for RTSP, it is desirable to have one unified session control protocol. In client side, having separate persistent connectivity for RTSP, SIP and RTP is not advisable in terms of performance. Therefore, reducing the number of protocol is a right option. At last in the context of IMS based IPTV architecture, SIP is used to manage the session. Extending SIP to manage the media control is a viable solution than deploying other protocol for media control.

This document proposes rational for using SIP for a signaling protocol for streaming media applications.

Note: The purpose of this document is to propose in detail one specific approach to using SIP for streaming-media applications. And, our intent is to stimulate discussion within the IETF community and catalyze future work in this area. To this end, our strategy has been to

o develop the rationale for using SIP

o evaluate, at a high-level, a SIP in the context of converged media services, and

   o identify, if appropriate, the future developments.

2. **Terminology**

   See [RFC3261] and [RFC2326] for terminology.

   In addition the following terms are defined: Trick Play: Play, stop,
   pause, restart and fast forward of streaming media.

   Note: we also use several terminologies in [TS182027] in order to
   explain architectural aspects of IPTV and IMS.

3. **Use Case Scenario**

   This section describes one value added services on top of streaming
   media application - use case scenario. This scenario illustrates the
   variety of conditions and Environments in which streaming media
   application needs to operate.

3.1. **Scope**

   The scope of streaming media applications for this document includes
   applications with the following characteristics: content-on-demand,
   streaming media, unicast-media streams, live or recorded content,
   ubiquitous access (any-device, any-access).

   Explicit exclusions include non-streaming (e.g., downloaded media);
   though of interest this is out of scope for the present document.

3.2. **Use Case**

   Use cases are used with the purpose of clarifying the "streaming
   media Application" and to explore the space of applications. The
   objective is to

   o clarify the frame / scope the discussion

   o illustrate some of usage scenarios

   o identify some of the key attributes that characterize these
     Scenario - Advertisement/Recommendation Services

Information of relevant videos (recommendation) or advertisement
need to be displayed on the screen of video display when user pauses
video session or video content is about to finish.

4. Proposed solution using SIP for both session and media control

4.1. Overview of proposed solution

SIP is used to setup or modify or terminating a session. In addition,
SIP UPDATE allows a client to update parameters of session.

The solution needs to satisfy the requirements for session setup,
media setup and media control. Session setup and media setup are
carried out using INVITE message. Trick plays and media control
features is mapped to the SIP message, which is UPDATE method. Media
control message such as play, pause is transferred from UE using
UPDATE message. Therefore, the semantics of SIP session is not
changed.

In order to differentiate many media control messages, SIP-MEX - new
header is defined and included into UPDATE message.

Even though, trick plays and media control features has to be
handled by SIP, some information has to be passed back to UE from
network when some events happen such as pause. Therefore, new header
(SIP-MEX) in UPDATE method with new XML body is used in our proposed
solution for tricks plays and media control features. This criterion
is used to select the UPDATE method. SIP-MEX is not standardized and
is used for carrying the media event information.

SIP session typically follows the cycle of many session-media states.
Session-media states are started, paused, restarted, and end.
Restarted happens after media pauses. Mostly, UPDATE is used to
change session media state. It means when session is started,
issuing an UPDATE command can trigger the state from started to
paused. Likewise, paused state can be trigged to restarted state by
UPDATE command. These UPDATE will not change the session parameters
instead change session-media state of a session.

UPDATE will contain SIP-MEX header with value: pause/restart. One
important change is that content-type is application/XML not SDP.
When UPDATE message is sent from UAC to UAS, it will carry new SIP
header called as SIP-MEX. The content type of the response message
is XML, which is simple and flexible enough to change. .

Main difficulty is how to identify that both ends support UPDATE
message and understand session-media state. According to RFC 3261,
Allow header in the initial invite message and its response can be
used to verify that both end supports UPDATE message. Session-media
state is understandable by UAS if UAS insert SIP-MEX header into the
response of UPDATE message which has SIP-MEX initially.

The fast forward and fast backward can be added into session-media
states. Parameters, which describe the fast forward and fast
backward, can be sent in XML via UPDATE message. In this document,
efforts are not devoted to discuss about these cases.

4.2. Demonstration

The proposed solution is demonstrated in IPTV context, whose
architecture is defined in [TS182027].Our mechanisms mainly work
within UE and SCF in the IPTV services. When UE sends the UPDATE
message with Pause details, SCF replies with information, which is
going to be displayed. Information of trick functions is sent in SIP
body. In reply, XML info is sent back to the UE. Based on the
unified session control protocol, IPTV architecture will have one
modification, which is removing the Xc interface between UE and IPTV
media control function. It is not focus of this document.

Based on the design, SCF behaves in UA mode and coordinates the MCF
via y2 interface. Details of the interface between SCF and MCF are
not discussed here. Optionally, SCF can perform in B2BUA mode
between user and MCF. In this case, MCF should be SIP aware. These
two options are used; because connectivity to MCF and MDF depends on
content provider s ability.

SCF implements the function, which is responsible to send
information (advertisement/recommendation) to the UE when Pause
event arrived. Moreover, way the SCF finds the information or
advertisement is beyond the scope, SCF may use semantic web services
and context enabler services. In the trick function, for example
Pause event, UE will send the UPDATE message with SIP-MEX header,
which contains of PAUSE event. In response, OK message will carry
relevant information in XML format to UE.

[4.3](). Detailed procedures of Session and media control

   In the context of on demand service, scenario can be explained as
   follows. User selects the corresponding the media content from UE,
   which is identified by URI. Let assume that address of the media
   content is movie1@vod.ims.eu.

   Once SCF receive the INVITE message, SCF instruct the media content
   delivery function to deliver the media. SCF may have one or two
   different interfaces to the media content delivery function.

   In Figure 1, SCF is connected to MCF using non-SIP protocol. When
   Pause happens in UE, UE directly send UPDATE message to SCF. OK
   message is sent to directly to UE with XML information. Since Figure
   1 does not show full description of message flow, important message
   is shown in dotted line.

```
        UE            IMSCore            SCF             MCF            MDF
        |               |                |               |              |
        |    INVITE      |                |               |              |
        |--------------->|    INVITE      |               |              |
        |               |--------------->|<<MESSAGE1>>    |              |
        |               |                |--------------->|<<MESSAGE2>>   |
        |               |                |               |------------ >|
        |          Media Session started                |              |
        |<==============================================================>|
        |               |                |               |              |
        |          UPDATE                |               |              |
        |------------------------------- >               |              |
        |               |                |<<MESSAGE1>>    |              |
        |               |                |--------------->|<<MESSAGE2>>   |
        |               |                |               |------------ >|
        |               |                |               |              |
        |            OK                  |               |              |
        |< ============================= |               |              |
        |               |                |               |              |
        |          Media Session Paused                 |              |
        |<==============================================================>|
        |               |                |               |              |
        |          UPDATE                |               |              |
        |------------------------------- >               |              |
        |               |                |<<MESSAGE1>>    |              |
        |               |                |--------------->|<<MESSAGE2>>   |
        |               |                |               |------------ >|
        |            OK                  |               |              |
```

```
|< =============================|                |              |
|                 Media Session Restarted                       |
|<=============================================================>|
|
|     BYE            |  BYE           |
|-------------->  |-------------- >|<<MESSAGE1>>    |           |
|                   |                |-------------- >|<<MESSAGE2>>  |
|                   |                              |------------->|
|                 Media Session Stopped                         |
|<=============================================================>|
```
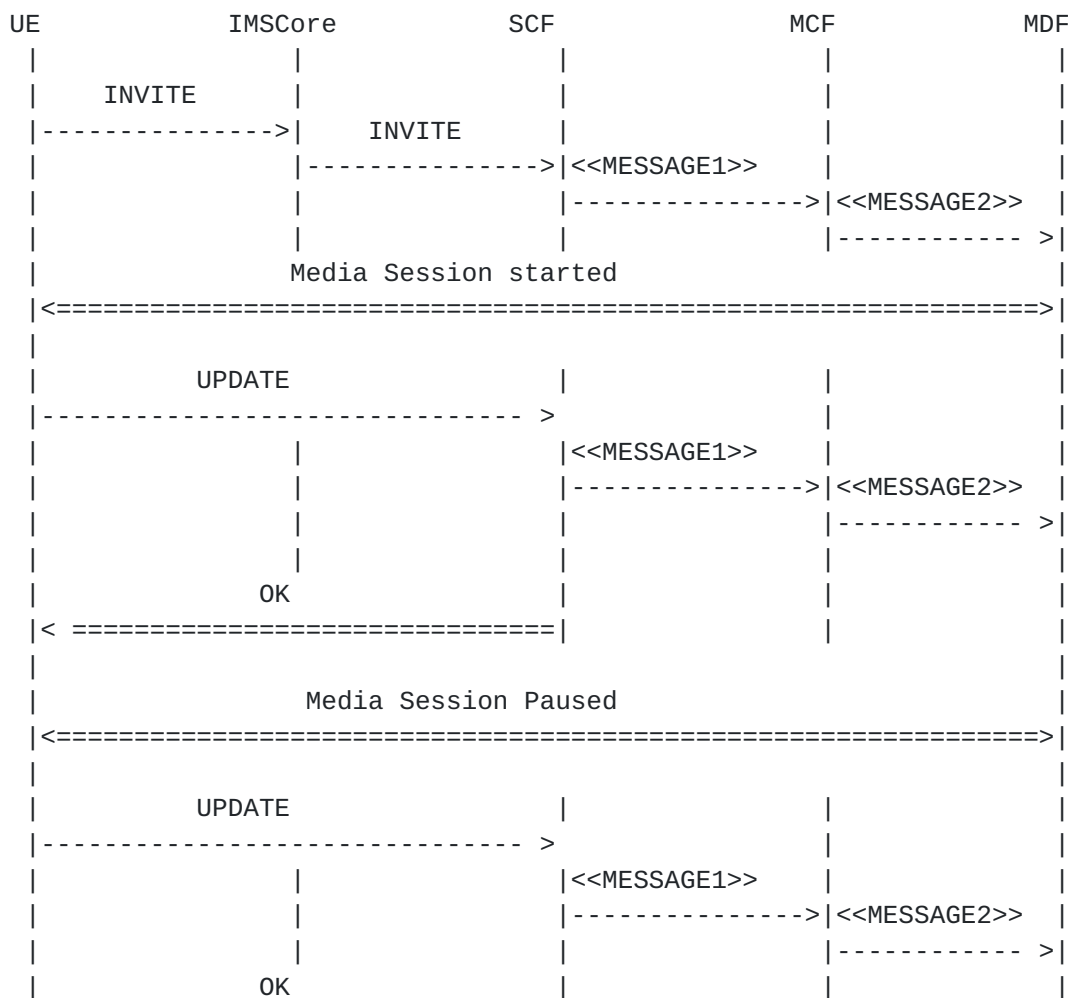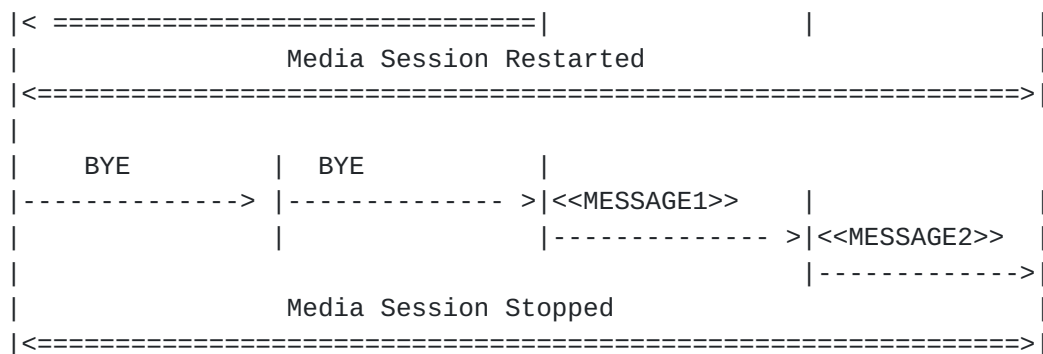
Figure 1. Sequence diagram when SCF connect to MCF through non-SIP protocol

Alternatively, connectivity between SCF and MCF can be SIP enabled. In this case, SCF can behave like B2BUA or proxy mode, but we choose B2BUA. Because SCF needs to send some information as response to UE when pause event happened. In the proxy mode, MCF will generate the OK response and SCF cannot modify the SDP of the OK message. This model can be used when MCF is responsible to deliver advertisement or information to UE. Alternative scenario, where SCF is in B2BUA and SCF is connected to MCF via SIP interface, is clearly shown in Figure 2.

```
   UE            IMSCore           SCF            MCF           MDF
   |                |               |              |             |
   |    INVITE      |               |              |             |
   |-------------->|    INVITE      |              |             |
   |-------------->|               |              |             |
   |                | INVITE        |              |             |
   |                |< -------------|              |             |
   |                |                INVITE        |             |
   |                |----------------------------- | <<MESSAGE2>> |
   |                |               |              |----------- >|
   |                |               |              |             |
   |                |               |              |             |
   |                 Media Session started                        |
   |<===========================================================>|
   |                                                             |
   |         UPDATE                  |              |
   |----------------------------- >                 |
                                                |
```

```
|                |                |UPDATE          |               |
|                |                |--------------->|<<MESSAGE2>>   |
|                |                |                |----------- >|
|                |                |                |               |
|                OK              |                |               |
|< ===========================|                |               |
|                                                                 |
|                Media Delivery Paused                            |
|<==============================================================>|
|                                                                 |
|                UPDATE          |                |               |
|----------------------------- >                 |               |
|                |                |UPDATE          |               |
|                |                |--------------->|<<MESSAGE2>>   |
|                |                |                |----------- >|
|                OK              |                |               |
|< ===========================|                |               |
|                Media Delivery Restarted                         |
|<==============================================================>|
|                                                                 |
|    BYE         |    BYE         |                |               |
|-------------> |------------- >|                |               |
|                |                |                |               |
|                |<-- -----------|                |               |
|                |                |                |<<MESSAGE2>>   |
|                |------------------------------->|-----------   |
|                Media Delivery Stopped                           |
|<==============================================================>|
```
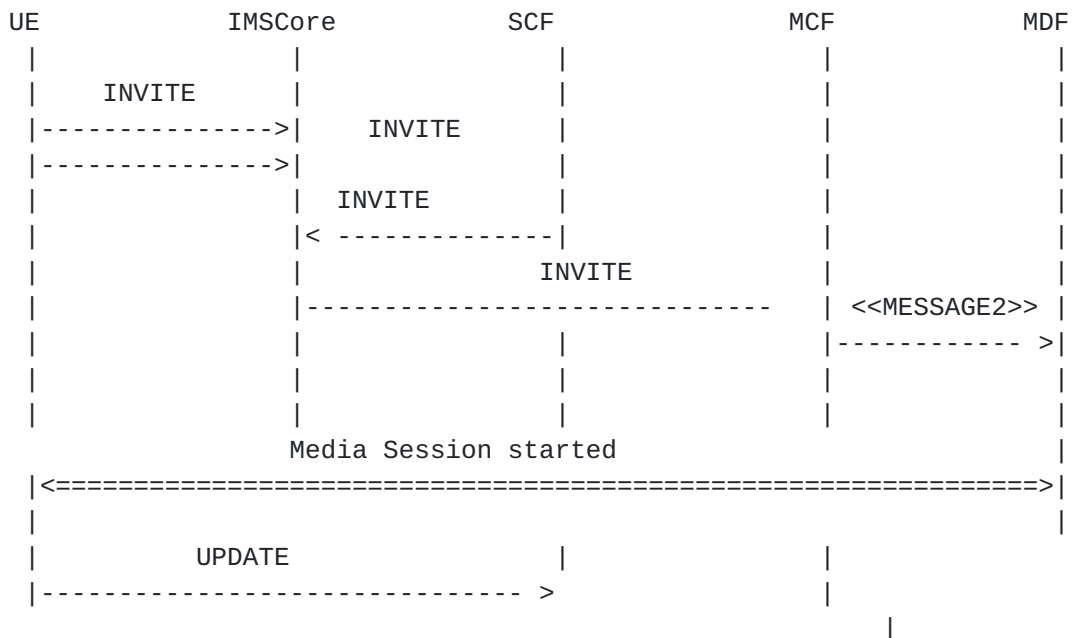
Figure 2. Sequence diagram when SCF connect to MCF through SIP
protocol

[5]. Alternative solution spaces for proposed use-cases

   o In ordinary case, media control event can be passed to IMS
     provider by the content provider and then IPTV application
     triggers the SIP Push to send the information to UE.

o Second solution is that SIP is for session management and RTSP is
  for media signaling. When user pause the VOD service, client can
  pull information from web server according to currently watching
  video information. But on the other hand, using proposed unified
  session control protocol, one advantage is that both ends can
  send the information to each other compared to HTTP. It means
  that network enable pause is possible. Even if network enabled
  pause takes place, server can send information to client in
  UPDATE message.

6. Advantages

o IMS based Telco become an efficient context provider who may know
  the media control.

o Easy to implement: Our solution tries to push information to
  screen where already existing TV is displaying the video.
  Therefore, we use same dialog (UPDATE/OK) to carry this push
  information.

o This method is relatively simple and easy to adopt in the SIP
  environment.

7. Security Considerations

This document does not require any specific security considerations.

8. IANA Considerations

This document has no actions for IANA.

9. References

9.1. Normative References

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