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Interception regarding IMS

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Document for: Discussion & Action.

Summary

This contribution identifies issues associated with IMS interception that require consideration and resolution by the group. Specific areas identified include: correlation of IRI and content, isolation of media streams, parameters of encapsulated SIP message, dialled digit extraction, and start of interception with an active IMS call.

A. Introduction

This contribution identifies a number of shortcomings in the area of interception of IP Multimedia Subsystem (IMS) based communications. TS 33.107 and TS 33.108 define an approach involving the interception and reporting of IMS signalling messages, but do not address a number of issues associated with IMS interception. Some issues that require further consideration are provided below.

1. Both TS 33.107 and TS 33.108 identify the correlation of IRI and content as an issue for further study. This contribution identifies some issues that should be considered in resolving this area. An example is the issue of how an S-CSCF would know about the correlation number associated with a specific PDP context.

2. Currently when content is intercepted, the packet domain interception approach is used. That is, interception of an entire PDP context is performed and those contents are delivered to the LEA. IMS oriented content interception and delivery needs to be considered. Note that, for IMS, the relevant fundamental content-based communication association is a media stream, not a PDP context. Thus, interception of individual media streams needs to be considered.

3. In terms of reporting a SIP message, it is not clear how the parameters included within the SIP message (sent to the LEA) are determined. This requires clarification. Note that there are several SIP messages to choose from, one sent by the interception subject and one that is the result of the processing of that SIP message. It is not clear which message is sent to the LEA. This might require clarification.

4. A capability called dialled digit extraction needs to be supported in the context of IMS interception. The capability entails accessing post-cut-through dialled digits (that may be sent without processing by the accessing network) and reporting those digits to the LEA. Support for this capability is needed by LEAs. This capability is supported in the circuit switched domain and is needed for IMS.

5. Currently, when interception is started in the middle of an active PDP context, the LEA is provided with a status of the PDP context and content (if authorized). With IMS, when activation of interception starts in the middle of an active IMS session, it is not clear what the LEA will get. Following the packet domain precedence, the LEA should receive information on all active IMS sessions and be able to access those contents. Consideration needs to be given to supporting this capability.

The above capabilities should be considered as part of the IMS interception.

B. Discussion

This contribution identifies a number of shortcomings in the area of interception of IP Multimedia Subsystem based communications. TS 33.107 and TS 33.108 define an approach involving the interception and reporting of IMS

B.1 Correlation of IRI and CC for IMS

Both TS 33.107 and TS 33.108 identify the correlation of IRI and content as an issue for further study. This contribution identifies some issues that should be considered in resolving this area. An example is the issue of how an S-CSCF would know about the correlation number associated with a specific PDP context.

The fourth dashed item of Clause 7A.3 of TS 33.107 states:

> "- The use of a correlation ID for SIP to bearer correlation is a topic for further study."

Furthermore, TS 33.107 does not list correlation ID in the list of items related to an IMS interception event.

In addition to the statements of TS 33.107, the second paragraph of Section 7.1 of TS 33.108 states:

> "For the delivery of CC and IRI the SGSN, GGSN and CSCF's provide correlation numbers and target identities to the HI2 and HI3. The correlation number is unique per PDP context and is used to correlate CC with IRI and the different IRIs of one PDP context.
>
> [Editors Note: For Further Study: correlating SIP messages with its corresponding media stream in the contexts]."

The above text of TS 33.108 implies that there is only one correlation number, the number that uniquely identifies a PDP context. It is not clear how the CSCF's, especially the S-CSCF, would have knowledge of the PDP context and its associated correlation number. This requires clarification.

The definition of correlation number provided in Clause 7.1.3 of TS 33.108 is identical to that provided for the packet domain. The following note is included in this section:

> "[Editors Note: For Further Study: correlating SIP messages with its corresponding media stream in the contexts]."

Again Clause 7.1.3 of TS 33.108 implies that the correlation number is known to the entity reporting the event (e.g., the S-CSCF).

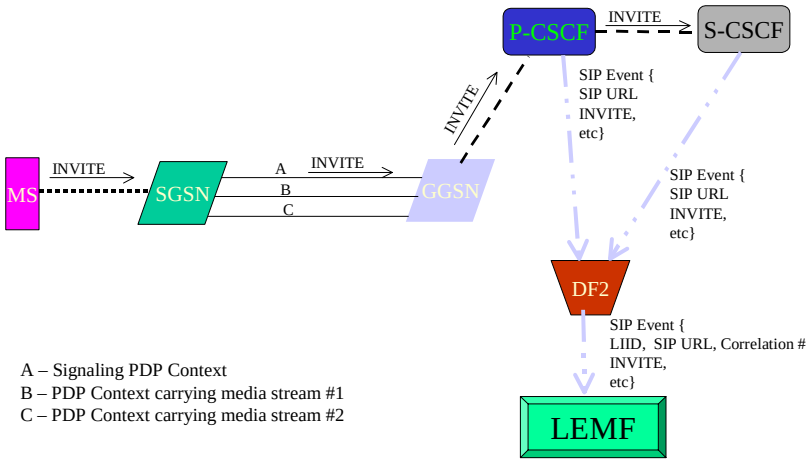

Figure 1 - Message flow and Interception for Invite

Figure 1 above shows a typical message flow for IMS call origination by the intercept subject and the interception capabilities applied by the network with respect to SIP signalling messages.

According to Section 6.2 of TS 23.207v5.4.0, an IP media flow is uniquely identified at the GGSN by the combination of a media authorization token (generated by the P-CSCF, sent to the UE in SIP signalling, and provided to the GGSN during PDP context activation by the UE) and one or more flow identifiers (used by UE, GGSN, and the P-CSCF). Ultimately, Clause 6.2 of TS 23.207 defines a binding mechanism or correlation mechanism that correlates a media streams (or an IP Flow) to and IMS call. Therefore, the network has information to enable to perform this correlation. In support of LEA needs to quickly identify and correlate media to an IMS call, the network should provide a correlation identifier to correlate an IMS media flow to an IMS call.

An additional consequence is the need to consider including the media authorization token and the flow identifiers (as a potential correlation identifier) when reporting the establishment of a PDP context in support of Ims interception. This will impact TS 33.107 and TS 33.108.

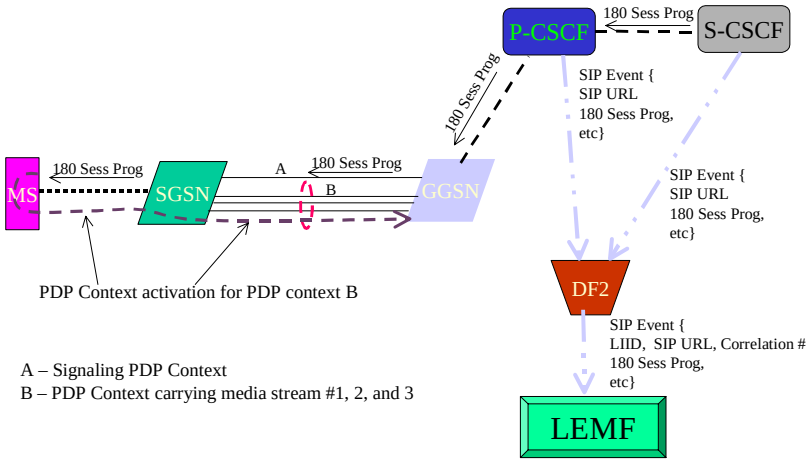

Figure 2 Establishment of Media PDP Context

Finally, Clause 5.1.2 of TS 33.107 indicates that the ADMF only provides a single target identity to the DF2. To support IMS, it should be possible for the DF2 to be provisioned with all of the target identities that could be received from any of the IAPs. This includes a SIP url. This should be changed.

S3LI should consult with the core network group of 3GPP to determine whether the S-CSCF will know the PDP context based correlation number. Separately from this, S3LI will need to clarify which PDP context (of possibly more than one PDP context) is being referenced when the correlation number is included in Tables 7.2 and 7.3 of TS 33.108. Finally, S3LI will need to address the issue of why multiple PDP contexts are not identified if more than one PDP context is used to carry the media streams associated with an IMS call.

B.2 Isolation of media streams involved in an IMS call

The current IMS interception solution delivers IMS call content to the LEA as aggregate content with no differentiation of one IMS call versus another call and no differentiation of one media stream from another that are associated with the same IMS call.

Lack of differentiation of media streams occurs because content interception is performed on a packet domain level, more specifically at a PDP context level rather than at an IMS level. To develop an interception based solution for IMS calls that is consistent with the approach supported for interception of contents for circuit switched calls, consideration should be given to supporting the isolation of each media stream associated with a given IMS call and delivering that media stream to the LEA in a format negotiated between the NOW/AP/SvP and the LEA.

There are several motivating factors for considering the isolation of a media stream:

1) To handle interception orders that may require interception of only a subset of the media types (e.g., voice only)

2) Consistency with the handling of the bearer in the circuit domain and in the IMS domain.

3) To allow a NWO/AP/SvP to deliver voice calls, to those LEAs that so desire, in converted tdm format.

4) To allow for easy and fast discrimination between IMS call contents and other communications contents (e.g., one IMS call versus another IMS call, IMS call content versus packet domain content, media streams associated with a single IMS call).

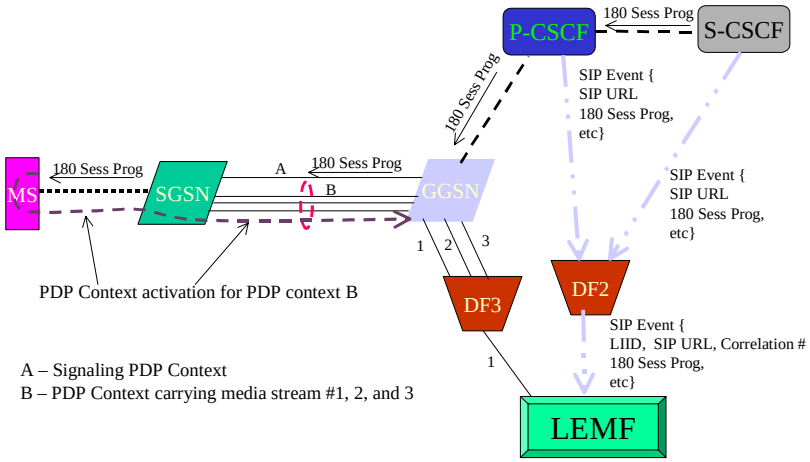

Figure 3 Example - Isolating media streams

In order to pursue this consistency, the media streams would need to be isolated before being delivered to the LEA. Two candidates for this isolation are possible: the GGSN and the DF3. According to the IMS architecture of TS 23.228, 24.228, and TS 23.207, the GGSN needs to be aware of the media streams in order to perform the Policy Enforcement Function (PEF) including the function of opening and closing the gate (enabling or disabling media flow). This function has to be done on an individual media stream basis. In addition, the GGSN must be able to set the DIFFSERV QoS marking in the packets associated with a particular media stream. Thus, there is no question that the GGSN has to have the capability of distinguishing media streams. Since the GGSN can distinguish media streams, it is a potential candidate for isolating media streams. Figure 3 shows the GGSN providing distinguished media streams to DF3 while DF3 only allows media stream 1 to be sent to the LEMF to the particular interception order requirements.

The other alternative is for the Delivery Function 3 to distinguish media streams and deliver the isolated media streams to the LEA. In order for the DF3 to distinguish the media streams, DF3 will need additional information that identifies these streams. Since this information is not available at the DF3, it will need to be provided with this information. One approach for addressing this is for the DF2 to provide this information to DF3 using a DF2 to DF3 communications link.

S3LI should consider which of these alternatives should be pursued and then develop specific proposals based on this selection.

B.3 Parameters included in encapsulated SIP message

Section 7A.3 of TS 33.107 states the following with respect to the capture of SIP messages:

“All SIP messages to or from a targeted subscriber, and all SIP messages executed on behalf of a targeted subscriber for multi-media session control are intercepted by the P CSCF and S CSCF and sent to DF2.”

It is clear from this requirement that a SIP message received by the CSCF from a target subscriber will be intercepted. The issue is what will be in the message sent to DF2. As shown in Figure 4, if the CSCF receives the incoming SIP message (message 1), processes the SIP message and sends an outbound SIP message (message 2), does the LEA receive message 1 or message 2? The current interception model is not clear on which message is sent to the LEA.

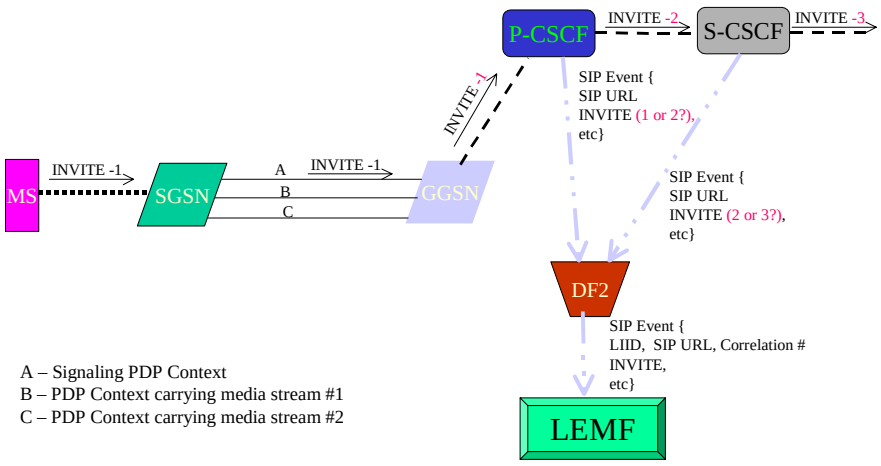

Figure 4 - Choosing SIP message for reporting

Note that the CSCF may change the headers or perhaps even the body of a SIP message. Thus for example, message A may include the untranslated called party identity. The SIP server may determine the location of the called party and send the call request to that new address. If only the incoming SIP message is reported, the LEA will be missing information as result of internal processing of the message. If SIP message B is reported, then the LEA may miss some information input by the user (which could provide hints/clues as to what their intent is).

In consideration of the above, it may be beneficial to either consider reporting both (pre-processed messages and post processing messages) messages with an indication of which message was received from the subscriber and which was output by the CSCF. Alternatively, the CSCF could provide the incoming message and include additional information as a header to the interception event.

S3LI should consider which approach should be supported and clarify TS 33.107 and TS 33.108 in this regard.

B.4 Dialed Digit Extraction in IMS

A capability called Dialled Digit Extraction needs to be supported in IMS, as this is a need from the LEAs. Dialled Digit Extraction entails accessing post-cut-through dialled digits (that may be sent transparently by the accessing network) and reporting those digits to the LEA.

According to Section 5.4.1 of 23.228, DTMF tones are sent by the MS via SIP information. The following is the specific quote (last paragraph of Section 5.4.1) from the document:

> "In order to support existing network capabilities, it is required that a UE be able to send DTMF tone indications to the terminating end of a session via the IMS. This can be done using SIP information. An additional element for bearer interworking is the interworking of these DTMF tones between one network and another. This may involve the generation of tones on the bearer of one network based on out of band signaling on the other network. In such a case, the MGW shall provide the tone generation under the control of the MGCF."

It is not clear what is meant by SIP information. In addition, TS 24.228 does not address the sending of DTMF tones via SIP signalling. In general, there are several ways to actually send "DTMF" signals:

1) Inband as sampled and encoded audio within media streams

2) Explicitly coded packets sent along with the media as defined in IETF RFC 2833.

3) Out-of-band messages included within SIP signalling messages

The above are the 3 general ways that DTMF can be sent as illustrated in Figure 5.

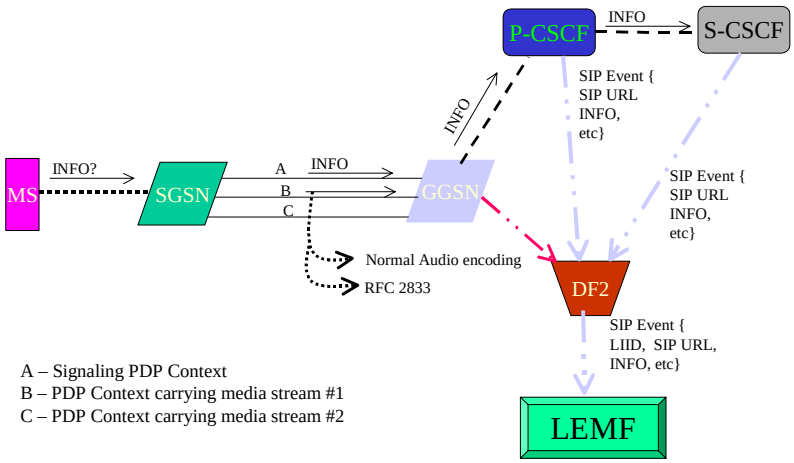

Figure 5 Dialed Extraction Handling Alternatives

If tones could be sent via mechanism 1 or 2 above, then the network that is to perform the dialled digit extraction capability must be able to capture these and report them to the LEA. This could be done by a Gateway that acts on the media or by the DF3. If the DF3 is to detect this information, then for example, the contents could be intercepted and sent to DF3 for processing, as if normal content interception were to occur. At the DF3, the media stream is processed and any DTMF tones that are detected are sent to the DF2 for delivery as IRI. If the gateway performs this function, then any DTMF it detects could be sent directly to the DF2 as IRI.

If tones are sent via mechanism 3, then the mechanism needs to be clearly defined. Currently, no reference is made within TS 23.228 or 24.228 to any specification that defines how to carry DTMF tones in SIP signalling. One mechanism that could be used is the SIP INFO method as defined in IETF RFC 2976. However, in order to use this, 3GPP would need to specify exactly how the INFO method would carry the DTMF since the RFC 2976 does not provide such details. RFC 2976 merely defines a container to carry information, but does not define exactly what is carried and how that is encoded, interpreted, etc. Another mechanism is that associated with the "tel-url" as specified in IETF RFC 2806. RFC 2806 provides a means to include "post-dial" digits as part of the tel-url for the called party. However, this presumes that the user will provide all of the "post-dial" digits prior to call initiation. If the user were to provide "post-dial" digits after call initiation, then RFC 2806 would not be of help.

If mechanism 3 is to be used, then support of this capability can be provided by the current method of intercepting the SIP messages sent by the interception subject. If mechanism 1 or 2 is to be used, then additional work in S3LI will be required to support this capability.

S3LI should consult the core network group of 3GPP as to how the requirement in Section 5.4.1 of TS 23.228 is to be implemented. Where do they expect these DTMF tones to be included as SIP information? This will allow us to determine how to address the dialled digit extraction issue.

B.5 Start of Interception during active IMS

Interception could be activated at any time relative to an IMS call. The current approach to interception activation in TS 33.107 and TS 33.108 would cause activation to occur at the SGSN/GGSN as well as at the P-CSCF and S-CSCF.

If, for example, an IMS call is active currently (i.e., an INVITE has been sent and a 200 OK has been received, including the exchange of the ACK) and media streams are flowing, it is not clear what would happen if interception were to be activated (see Figure 6).

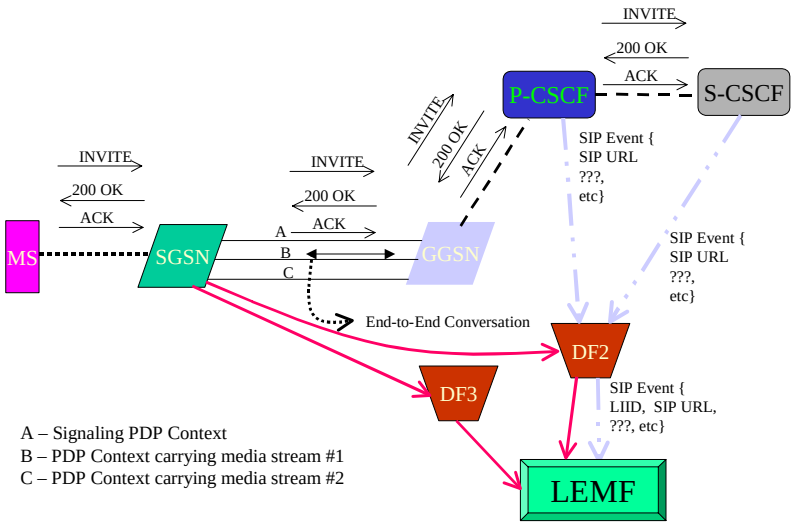

Figure 6 - Start of Interception with Active IMS Call

Based on interception in the packet domain, the following would be expected to occur:

- The LEA would receive IRI associated with PDP contexts including those used for IMS.
- If authorized to receive content, they would receive the packet contents of those PDP contexts as well.

In terms of the IMS signalling messages, the call would be in a state where signalling messages probably would not be exchanged. Thus, if IMS interception for IRI is solely based on capturing and sending SIP messages, then the LEA would be missing information regarding the call. This includes the identities of the calling and called parties, the types of bearers used for the call, etc.

Not providing this information is inconsistent with the treatment provided for the packet domain. In fact, only partial information is being provided to the LEA in this case.

To address IMS interception for the start of interception with an active IMS call in a manner that is consistent with the packet domain interception procedures, IRI associated with an existing IMS call needs to be provided to the LEA.

While the SIP signalling messages may not be retained by the network, the network will need to retain some information for charging purposes in any case, including identification of the calling and called parties, start of the call, the type of call (including what bearers are being used for the call) and some bearer correlation information (to open and close the gate at the GGSN). Since this information will be in the network for the call, the network should be able to report this information to the LEA.

S3LI should consider how to handle the start of interception with an existing IMS call.

C. Recommendations

It is recommended that S3LI group consider the issues described in Section B of this contribution and work towards resolving these issues.