Mapping and interworking of Diversion information Between Diversion and History-Info Headers in the Session Initiation Protocol (SIP)

draft-mohali-diversion-history-info-02

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Abstract

Diversion header is not standardized but widely used to convey diverting information in Session Initiation Protocol (SIP) signaling. This informational document proposes a way to make interwork call diversion information contained in a Diversion header with a History-Info header or with the Voicemail-URI which are standardized solutions. In addition, an interworking policy is proposed to manage the headers coexistence.

The History-Info header is described in [RFC4244] and the Voicemail URI in [RFC4458].

Since the Diversion header is used in many existing networks implementations for transport of diversion information and its interworking with standardized solutions is not obvious, an interworking recommendation is needed.

Requirements Language

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].
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1. Introduction

1.1. Overview

For some network services (e.g., Voicemail, IVR or automatic call distribution), it is necessary for the called SIP user agent to identify from whom and why the session was diverted. In order to be used by various service providers or applications, redirection information needs to pass through the network. This is possible with two different SIP headers: History-Info header [RFC4244] and Diversion header which are both able to transport diversion information in SIP signaling. Because of the current widely use of Diversion header even if it is not a standard, it is necessary to have a guideline to make this header interwork with History-Info header.

This document provides a mechanism of translation between the Diversion header and the History-Info header and between the Diversion header and the Voicemail URI.

1.2. Background

The History-Info header [RFC4244] and a the URI extension (including Voicemail URI) [RFC4458] are recommended by IETF to convey redirection information. They are also recommended in the "Communication Diversion (CDIV) service" 3GPP specification [TS 24.604].

At first, the Diversion header was described in [draft-levy-sip-diversion-08], which is today discarded. This header contains the list of the diverting user(s) with associated information and the expired draft could explain why many implementations are based on this header. It has been chosen to standardized the History-Info header because it could transport "request history" information which allows the receiving application to determine hints about how and why the session arrived at the application/user. As History-Info header information is larger than call diversion information, it is really important to be sure of not loosing information and be able to extract the good data with help of the retargeting cause described in [RFC4458] for the transport of the diversion reason.

Those headers have different syntaxes described below. Note that the main difference is that the History-Info header is a chronological writing header whereas the Diversion header is the opposite (i.e. the first diversion entry read correspond to the last diverting user).
2. Problem Statement

2.1. Interworking need

The Diversion header is used for recording communication diversion information which could be useful to downstream network entities. Today, this SIP header is implemented by several manufacturers and deployed in several networks.

The History-Info header is standardized, among other needs, for the transportation of diversion information.

As both are answering to call forwarding needs, according to the one created or completed in one side and the one interpreted in the other side, diverting information could be mixed-up if they are both present in the INVITE request. So, Diversion and History-Info headers MUST NOT independently coexist for the session signalling.

For the transportation of consistent diversion information downstream, it is necessary to make the two headers interwork. Interworking between the Diversion header and the History-Info header is presented in sections 5 and 6. As the interworking is not obvious and the coexistence not easy according the use cases, it is proposed a policy to manage the headers interaction.

In addition, Voicemail URI proposes an other way to convey diversion information in the R-URI. So, it is also necessary to describe the interworking between Diversion header and a Voicemail URI. This interworking is presented in section 7.4.

2.2. Interworking recommendations

History-Info header is a standardized solution, so a network using the Diversion header MUST be able to provide information at the good format to a network using the History-Info header. In this case, to avoid both headers coexistence it is recommended as often as possible to replace the Diversion header per the History-Info header in the INVITE request during the interworking.

For some specific interworking situations (see section 7.5), it could be needed to create a Diversion header from a received History-Info header. Since, the History-Info header has a boarder scope than the Diversion header and could be used for other services than call diversion ; in addition to trace call diversion information, it is acting as a session history and could store all successive R-URI values. So, even if it should be better to remove the History-Info header after the Diversion header has been created to avoid confusion; if the History-Info header contains supplementary information it MUST be remained and passed transparently in this
These are the more simple interworking situations where a header is created from the other one. More interworking cases, like situation where persistence of both headers is needed, are described in section 7.5.

If some information could be lost and use downstream or according the header used per network elements, it is necessary to have a local policy to find the best way to keep information up to the terminating user agent.

SIP network/terminal using Diversion to SIP network/terminal using History-Info header:

When the Diversion header is used to create a History-Info header, the Diversion header MUST be removed in the outgoing INVITE. It is considered that all information present in the Diversion header is transferred in the History-Info header.

If a History-Info header is present in the incoming INVITE (in addition to Diversion header), the Diversion header and History-Info header present MUST be mixed and only the diversion information not yet present in the History-Info header MUST be inserted as a last entry (more recent) in the existing History-Info header as recommended in [RFC4244].

As an example, this could be the case of an INVITE coming from a network_2 using Diversion header but before passed through a network_1 using History-Info header (or the network_2 uses History-Info header to transport successive URI information) and going to a network_3 using History-Info header.
In this case, the incoming INVITE contains a Diversion header and a History-Info header. So that, it is necessary to create, for network_3, a single History-Info header gathering existing information in the History-Info header received and those present in the Diversion header. Then network_3 could use call forwarding information that are present in a single header and add its own diversion information if necessary.

Note: if a network is not able either to use only one header each time, or to maintain both headers up to date, the chronological order could not be certified.

Note: it is not possible to have only Diversion header when the History-Info header contains more than call diversion information. If previous policy recommendations are applied, the chronological order is respected as Diversion entries are inserted at the end of the History-Info header taking into account the Diversion internal chronology.

SIP network/terminal using History-Info header to SIP network/terminal using Diversion header:

When the History-Info header is interpreted to create a Diversion header, some precautions MUST be taken.

If the History-Info header contains only communication diversion information, then it MUST be suppressed after the interworking.
If the History-Info header contains other information, then only the information of concern to the diverting user MUST be used to create entries in the Diversion header and the History-Info header MUST be kept as received in the INVITE forwarded downstream.

Note: The History-Info header could be used for other reasons than CDIV services, for example by a service which need to know if a specific AS had yet been invoked in the signalling path. If the call is after forwarded to a network using History-Info header, it would be better to not loose history information due to passing though the network which only support Diversion header. A recommended solution MUST NOT disrupt the standard behaviour and networks which not implement History-Info header MUST be transparent to an incoming History-Info header.

If a Diversion header is already present in the incoming INVITE (in addition to History-Info header), only diversion information present in the History-Info header but not in the Diversion header MUST be inserted from the last entry (more recent) into the existing Diversion header as recommended in the Diversion draft [draft-levy-sip-diversion-08]. Note that the chronological order could not be certified. If previous policy recommendations are respected, this case SHOULD NOT happen.

Forking case:
The History-Info header enables the recording of sequential forking for the same served-user. During a interworking from the History-Info header to Diversion header, the History-Info entries containing a forking situation (with an incremented "index" parameter) could be either mapped for each entry with a call forwarding "cause" parameter, the interworking entity could choose to create only one Diversion entry or to not apply the interworking. The choice could be done according a local policy.

The same logic is applied for an interworking with Voicemail URI (see section 7.4).

3. Headers syntaxes reminder

3.1. History-Info header syntax

History-Info = "History-Info" HCOLON hi-entry *(COMMA hi-entry)  
hi-entry = hi-targeted-to-uri *( SEMI hi-param )  
hi-targeted-to-uri= name-addr  
hi-param = hi-index / hi-extension  
hi-index = "index" EQUAL 1*DIGIT *(DOT 1*DIGIT)
The History-Info header is specified in [RFC4244]. Amongst the information contained in the header list is the diversion information with a specific cause code mentioning the diversion reason. These optional cause codes are defined in [RFC4458]. The RFC4244 contains a Privacy section introducing the use of Privacy header defined in [RFC3323] for diversion information. The top-most History-Info entry (first in the list) corresponds to the oldest history information. A diverting user information is identifiable by the History-Info entry containing a cause-param with cause value as listed in [RFC4458] and by the entry just before. The last diversion target is identifiable by the last History-Info entries containing a cause-param with cause value as listed in RFC 4458.

The cause-param is inserted in the hi-targeted-to-uri of the address were the communication is diverted to. The index parameter is a string of digits, separated by dots to indicate the number of forward hops and retargets.

Note: A history entry could contain the "gr" parameter. Regardless the rules concerning "gr" parameter define in which must be applied, this parameter has no impact on the mapping and must only be copied with the served user address. [TS_24.604]

Example:

History-Info:
<sip: diverting_user1_addr?Privacy=none >;index=1,
<sip: diverting_user2_addr?Privacy=history;cause=302>;index=1.1,
<sip:last_diversion_target;cause=486>; index=1.1.1,

Policy concerning "histinfo" option tag in Supported header:
According to [RFC4244], a proxy that receives a Request with the "histinfo" option tag in the Supported header should return captured History-Info in subsequent, provisional and final responses to the Request. The behaviour depend whether the local policy support the capture of History-Info or not.

3.2. Diversion header syntax

The current document is not written to define again the Diversion header and its use but to be shure that the syntax is interpreted in the same way by everyone. So that, the Diversion syntax is here a little changed to correspond to the current ABNF[RFC4234]:

hi-extension = generic-param
Diversion = "Diversion" HCOLON diversion-params *(COMMA diversion-params)
diversion-params = name-addr *(SEMI (diversion-reason / diversion-counter / diversion-limit / diversion-privacy / diversion-screen / diversion-extension))
diversion-reason = "reason" EQUAL ("unknown" / "user-busy" / "no-answer" / "unavailable" / "unconditional" / "time-of-day" / "do-not-disturb" / "deflection" / "follow-me" / "out-of-service" / "away" / token / quoted-string)
diversion-counter = "counter" EQUAL 1*2DIGIT
diversion-limit = "limit" EQUAL 1*2DIGIT
diversion-privacy = "privacy" EQUAL ("full" / "name" / "uri" / "off" / token / quoted-string)
diversion-screen = "screen" EQUAL ("yes" / "no" / token / quoted-string)
diversion-extension = token [EQUAL (token / quoted-string)]

Note: The Diversion header could be used in the comma-separated format as described below and in a header-separated format. Both formats could be combined a received INVITE as RECOMMENDED in [RFC3261].

Example:

Diversion:
diverting_user2_addr; reason="user-busy"; counter=1; privacy=full,
diverting_user1_addr; reason="unconditional"; counter=1; privacy=off

4. Headers in SIP Method

You can find here a reminder of History-Info header field and Diversion header field in relation to methods. As those headers do not have the same capabilities, it is necessary to clarify the interworking.
Use of History-Info header field:

```plaintext
+-----------------+-------------------+------------------+-------------------+-------------------+----------------+-------------------+-------------------+
|     Header field         | proxy | ACK | BYE | CAN | INV | OPT | REG | MSG |
|-------------------------+-------+-----+-----+-----+-----+-----+-----+-----|
| History-Info            | amdr  | -   | -   | -   | o   | o   | o   | o   |
|                         |       | SUB | NOT | REF | INF | UPD | PRA | PUB |
|                        |       | --- | --- | --- | --- | --- | --- | --- |
| History-Info            | amdr  | o   | o   | -   | -   | -   | -   | o   |
```

Use of Diversion header field:

```plaintext
+---------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
|     Header field         | enc. e-e | ACK | BYE | CAN | INV | OPT | REG |
|-------------------------+-----------+-----+-----+-----+-----+-----+-----|
| Diversion               | R         | h   | -   | -   | -   | o   | -   |
| Diversion               | 3xx       | h   | -   | -   | -   | o   | -   |
```

The recommended interworking presented in this document SHOULD apply only for INVITE requests.

In 3xx responses, both headers could be present. When a proxy wants to interwork with a network supporting the other header field, it SHOULD apply the interworking between Diversion header and History-Info header in the 3xx response. When a recursing proxy redirects an initial INVITE after receiving a 3xx response, it SHOULD add as a last entry either a Diversion header or History-Info header (according to its capabilities) in the forwarded INVITE. Local policies could apply to send the received header in the next INVITE or not.

Other messages where History-Info could be present are not used for the Call Forwarding service and SHOULD NOT be changed into Diversion header. The destination network MUST be transparent the received History-Info header.

Note: the following mapping is inspired from the ISUP to SIP interworking described in. [TS_29.163]

5. Diversion header to History-Info header

The following text is valid only if no History-Info is present in the INVITE request. If at least one History-Info header is present, the interworking function shall adapt its behaviour to respect the chronological order. See section 2.2. For N Diversion entries N+1 History-Info entries MUST be created. To create the History-Info entries in the same order than during a session establishment, the Diversion entries MUST be mapped from the bottom-most until the top-most. Each Diversion entry shall be mapped...
into a History-Info entry. An additional (the last one) History-Info entry must be created with the diverted-to party address presents in the R-URI of the received INVITE. The mapping is described below.

The first entry created in the History-Info header contains:

- a hi-target-to-uri with the name-addr parameter of the bottom-most Diversion header

- if a privacy parameter is present in the bottom-most Diversion entry, then a Privacy header could be escaped in the History-Info header as described below,

- an index set to 1.

For each following Diversion entry (from bottom to top), the History-info entries are created as following (from top to bottom):
Source                                   Destination
Diversion header component:              History-Info header component:
Name-addr                                Hi-target-to-uri
=======================================================================
Reason of the previous Diversion entry              cause-param
"unknown"---------------------------------404
"unconditional"---------------------------302
"user-busy"-------------------------------486
"no-answer"-------------------------------408
"deflection "-----------------------------480 or 487
"unavailable"---------------------------------404
"time-of-day"---------------------------------404 (default) or 302
"do-not-disturb"---------------------------404 (default) or 302
"follow-me"---------------------------------404 (default) or 302
"out-of-service"---------------------------404 (default)
"away"-------------------------------------404 (default) or 302
=======================================================================
Counter                                   Hi-index
"1" or parameter --------------------------The previous created index
no present                                is incremented with ".1"
Superior to "1" (i.e. N) -------------------Create N-1 placeholder History
entry with the previous index
incremented with ".1"
Then the History-Info header
created with the Diversion
entry with the previous index
incremented with ".1"
=======================================================================
Privacy                                   Privacy header escaped in the
hi-targeted-to-uri
"full"---------------------------------"history"
"Off"-----------------------------------Privacy header field
absent or "none"
"name"-----------------------------------"history"
"uri"-----------------------------------"history"
=======================================================================
A last History-Info entry is created and contains:
- a hi-target-to-uri with the Request-URI of the INVITE request.
- a cause-param from the top-most Diversion entry, mapped from the
diversion-reason as described above.
- if a privacy parameter is present in the top-most Diversion entry, then a Privacy header could be escaped in the History-Info header as described above,

- an index set to the previous created index and incremented with ".1"

Note: For other optional Diversion parameters, there is no recommendation.

Note: For values of the "reason" parameter which are mapped with a recommended default value, it could also be possible to choose an other value or to omit the parameter.

Note: The Diversion header could contain a Tel:URI in the name-addr parameter but it seems to not be possible to have a Tel:URI in the History-Info header. RFC3261 gives an indication as to the mapping between sip: and tel: URIs but in this particular case it is difficult to assign a valid hostport as the diversion has occurred in a previous network and a valid hostport is difficult to determine. So, it is suggested that in case of Tel:URI in the Diversion header, the History-Info header should be created with a SIP URI with user=phone.

Note: The Diversion header allows the carrying of a counter which had retained the information about the number of redirections which have occurred. History-Info does not have an equivalent because to trace and count diversion occurred it is necessary to count cause parameter containing a value associated to a call diversion. To read the index value is not enough. With the use of the "placeholder" entry the History-info header entries could reflect the real number of diversion occurred. Example of placeholder entry in the History-Info header: <sip:unknown@unknown.invalid;cause=404>;index=1.1 For a placeholder History entry the value "404" shall be taken.

Concerning local policies recommendations about headers coexistence in the INVITE request, see sections 2.2 and 7.5.

6. History-Info header to Diversion header

To create the Diversion entries in the same order than during a session establishment, the History-Info entries MUST be mapped from the top-most until the bottom-most. The first History-Info header entry selected will be mapped into the last Diversion header entry and so on. One Diversion header entry MUST be created for each History-Info entry with a cause-param reflecting a diverting reason as listed in the [RFC4458].
In this case, the History-Info header MUST be mapped into the Diversion header as following:

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>History-Info header component:</td>
<td>Diversion header component:</td>
</tr>
<tr>
<td>Hi-target-to-uri of the History-Info which precedes the one containing a diverting cause-param</td>
<td>Name-addr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause-param</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>404----------</td>
<td>&quot;unknown&quot;</td>
</tr>
<tr>
<td>302----------</td>
<td>&quot;unconditional&quot;</td>
</tr>
<tr>
<td>486----------</td>
<td>&quot;user-busy&quot;</td>
</tr>
<tr>
<td>408----------</td>
<td>&quot;no-answer&quot;</td>
</tr>
<tr>
<td>480 or 487---</td>
<td>&quot;deflection&quot;</td>
</tr>
<tr>
<td>503----------</td>
<td>&quot;unavailable&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hi-index</th>
<th>Counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory parameter for History-Info reflecting the chronological order of the information.</td>
<td>The counter is set to &quot;1&quot;.</td>
</tr>
</tbody>
</table>

Privacy header [RFC3323] escaped in the hi-targeted-to-uri of the History-Info which precedes the one containing a diverting cause-param. This Privacy indicates that this specific History-Info header SHOULD not be forwarded. "history"---------- | "full" |
Privacy header field Absent or "none" |

Concerning local policies recommendations about headers coexistence in the INVITE request, see section 2.2.
7. Examples

7.1. Example with Diversion header changed into History-Info header

INVITE last_diverting_target
Diversion:
diverting_user3_address; reason=unconditional; counter=1; privacy=off,
diverting_user2_address; reason=user-busy; counter=1; privacy=full,
diverting_user1_address; reason=no-answer; counter=1; privacy=off

Mapped into:
History-Info:
<sip: diverting_user1_address; privacy=none >; index=1,
<sip: diverting_user2_address? privacy=history; cause=408>; index=1.1,
<sip: diverting_user3_address? privacy=none; cause=486>; index=1.1.1,
<sip: last_diverting_target; cause=302>; index=1.1.1.1,

7.2. Example with History-Info header changed into Diversion header

History-Info:
<sip: diverting_user1_address? privacy=history >; index=1,
<sip: diverting_user2_address? privacy=none; cause=302>; index=1.1,
<sip: last_diverting_target; cause=486>; index=1.1.1

Mapped into:
Diversion:
diverting_user2_address; reason=user-busy; counter=1; privacy=off,
diverting_user1_address; reason=unconditional; counter=1;
privacy=full

7.3. Example with two SIP networks using History-Info header interworking with a SIP network using Diversion header

A -> P1 -> B -> C -> P2 -> D-> E
A, B, C, D and E are users.
B, C and D have Call Forwarding service invoked.
P1 and P2 are proxies.
Only relevant information is shown on the following call flow.

IWF*          IWF*
SIP network using | SIP network using | SIP net.  
History-Info    Diversion     using  
                |                       Hist-Info
<table>
<thead>
<tr>
<th>UA A</th>
<th>P1</th>
<th>AS B</th>
<th>P2</th>
<th>AS C</th>
<th>UA C</th>
<th>AS D</th>
<th>UA E</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supported: histinfo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History-Info:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:proxyP1</a>; index=1,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:userB</a>; index=1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History-Info:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:proxyP1</a>; index=1,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:userB</a>; index=1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;sip:userC; cause=302&gt;; index=1.1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversion:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B reason= unconditional counter=1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History-Info:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:proxyP1</a>; index=1,</td>
<td></td>
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</tr>
<tr>
<td><a href="">sip:userB</a>; index=1.1</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><a href="">sip:proxyP2</a>; cause=302; index=1.1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No modification of Diversion due to P2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>INVITE</td>
<td>-----&gt;</td>
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<td>&lt;--180--</td>
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<tr>
<td>No response timer expire</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>---INVITE----&gt;</td>
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<td></td>
</tr>
<tr>
<td>Diversion:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>userC; reason=no-answer; counter=1; privacy=full,</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>userB; reason=unconditional; counter=1; privacy=off,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History-Info:</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:proxyP1</a>; index=1,</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="">sip:userB</a>; index=1.1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;sip:proxyP2; cause=302&gt;; index=1.1.1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>INVITE</td>
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</tbody>
</table>
**7.4. Interworking between Diversion header and Voicemail URI**

Voicemail URI is a mechanism described in [RFC4458] to provide a simple way to transport only one redirecting user address and the reason why the diversion occurred in the R-URI of the INVITE request. This mechanism is mainly used for call diversion to a voicemail.

**Diversion header to Voicemail URI:**

```
Received: 
Diversion: userA-address;reason=user-busy;counter=1;privacy=full
```

```
Sent (Voicemail URI created in the R-URI line of the INVITE):
sip: voicemail@example.com;target=userA-address;cause=408 SIP/2.0
```

Mapping of the Redirection Reason is the same as for History-Info header with a default value set to 404. If the Diversion header contains more than one Diversion entry, the choice of the redirecting user information inserted in the URI is in charge of the network local policy. For example, the choice criterion of the redirecting information inserted in the URI could be the destination of forwarded INVITE request (if the voicemail serves...
this user or not).

Note: This interworking could be done in addition to the interworking of the Diversion header into the History-Info header.

Voicemail URI to Diversion header:
In case of real Voicemail, this way of interworking should not happen. However, if for any reason it occurs, it is recommended to do it as following:

Received:
INVITE sip: voicemail@example.com;\n target=sip:+33145454500%40example.com;user=phone;\n cause=302 SIP/2.0

Sent in the forwarded INVITE:
Diversion: sip:+33145454500%40example.com;user=phone;reason=unconditional;counter=1

7.5. Additional interworking Cases

Even if for particular cases in which both headers could coexist it should be the network local policy responsibility to make it work together, here are described some situations and some recommendations on the behaviour to follow.

In the case where there is one network which includes different nodes, some of which support Diversion header and some which support History-info header, the problem is when any node handling a message does not know which node will next handle the message. This case can occur when the network has new and old nodes, the older ones using Diversion header and the more recent History-Info header. While a network replacement may be occurring there will be a time when both nodes exist in the network. If the different nodes are being used to support different subscriber types due to different node capabilities then the problem is more important. In this case there is a need to pass both History-Info header and Diversion header within the network core.

These headers need to be equivalent to ensure that whatever node receives the message the correct diversion information is received. This requires that whichever header is received there is a requirement to be able to compare the headers and to convert the headers. Depending upon node capability then it may be possible to make assumptions as to how this is handled.

If it is known that the older Diversion header supporting nodes do not pass on any received History-Info header then the interworking becomes easier. If a message is received with only Diversion headers
then it has originated from an ‘old’ node. The equivalent History-Info entries can be created and these can then be passed as well as the Diversion header.

If the node creates a new History-Info header for a call diversion, then an additional Diversion header must be created.

If the next node is an ‘old’ node then the Diversion header will be used by that node and the History-Info entries will be removed from the message when it is passed on.

If the next node is a new node then the presence of both Diversion header and History-Info header means that interworking has already occurred and the Diversion and History-Info entries must be considered equivalent.

If both nodes pass on both History-Info header and Diversion header but only actively use one, then both types of node need to perform the interworking and must maintain equivalence between the headers. This will eventually result in the use of Diversion header being deprecated when all nodes in the network support History-Info header.

8. IANA Considerations

This document makes no request of IANA.

9. Security Considerations

The use of Diversion header or History-Info header require to apply the requested privacy and integrity asked by each diverting user or entity. Without integrity, the requested privacy functions could be downgraded or eliminated, potentially exposing identity information. Without confidentiality, eavesdroppers on the network (or any intermediaries between the user and the privacy service) could see the very personal information that the user has asked the privacy service to obscure. Unauthorised insertion, deletion of modification of those headers can provide misleading information to users and applications. A SIP entity that can provide a redirection reason in a History-Info header or Diversion header SHOULD be able to suppress this in accordance with privacy requirements of the user concerned.

10. Acknowledgements

The editors would like to acknowledge the constructive feedback provided by Ian Elz, Jean-Francois Mule, Lionel Morand, Xavier Marjou, Philippe Fouquart, Mary Barnes, Francois Audet, Erick Sasaki and Shida Schubert.
11. References

11.1. Normative References


11.2. Informative References


[RFC4458] "Session Initiation Protocol (SIP) URIs for Applications such as Voicemail and Interactive Voice Response (IVR)", RFC 4458, April 2006.


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