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**Registration Event Package Extension for Session Initiation Protocol  
(SIP) Globally Routable User Agent URIs (GRUUs)  
draft-ietf-sipping-gruu-reg-event-09**

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Abstract

[RFC 3680](#) defines a Session Initiation Protocol (SIP)[5] event package for registration state. This package allows a watcher to learn about information stored by a SIP registrar, including its registered contact.

However, the registered contact is frequently unreachable and thus not useful for watchers. The Globally Routable User Agent URI

(GRUU), defined in RFC YYYY [3], is a URI that is capable of reaching a particular contact. However this URI is not included in the document format defined in RFC 3680. This specification defines an extension to the registration event package to include GRUUs assigned by the registrar.

[[NOTE TO RFC-EDITOR/IANA: Please replace YYYY throughout this document with the RFC number assigned to the referenced draft [3] when it is published.]]

## Table of Contents

<a href="#">1.</a>	<a href="#">Introduction . . . . .</a>	<a href="#">3</a>
<a href="#">2.</a>	<a href="#">Terminology . . . . .</a>	<a href="#">4</a>
<a href="#">3.</a>	<a href="#">Description . . . . .</a>	<a href="#">4</a>
<a href="#">4.</a>	<a href="#">Notifier Processing of SUBSCRIBE Requests . . . . .</a>	<a href="#">4</a>
<a href="#">5.</a>	<a href="#">Notifier Generation of NOTIFY Requests . . . . .</a>	<a href="#">4</a>
<a href="#">6.</a>	<a href="#">Subscriber Processing of NOTIFY Requests . . . . .</a>	<a href="#">5</a>
<a href="#">6.1.</a>	<a href="#">Managing Temporary GRUU Lifetime . . . . .</a>	<a href="#">5</a>
<a href="#">7.</a>	<a href="#">Sample reginfo Document . . . . .</a>	<a href="#">6</a>
<a href="#">8.</a>	<a href="#">Examples . . . . .</a>	<a href="#">7</a>
<a href="#">8.1.</a>	<a href="#">Example: Welcome Notice . . . . .</a>	<a href="#">7</a>
<a href="#">8.2.</a>	<a href="#">Example: Implicit Registration . . . . .</a>	<a href="#">8</a>
<a href="#">9.</a>	<a href="#">XML Schema Definition . . . . .</a>	<a href="#">11</a>
<a href="#">10.</a>	<a href="#">IANA Considerations . . . . .</a>	<a href="#">12</a>
<a href="#">10.1.</a>	<a href="#">URN Sub-Namespace Registration . . . . .</a>	<a href="#">12</a>
<a href="#">10.2.</a>	<a href="#">XML Schema Registration . . . . .</a>	<a href="#">12</a>
<a href="#">11.</a>	<a href="#">Security Considerations . . . . .</a>	<a href="#">13</a>
<a href="#">12.</a>	<a href="#">Acknowledgements . . . . .</a>	<a href="#">14</a>
<a href="#">13.</a>	<a href="#">References . . . . .</a>	<a href="#">14</a>
<a href="#">13.1.</a>	<a href="#">Normative References . . . . .</a>	<a href="#">14</a>
<a href="#">13.2.</a>	<a href="#">Informative References . . . . .</a>	<a href="#">14</a>
	<a href="#">Author's Address . . . . .</a>	<a href="#">14</a>
	<a href="#">Intellectual Property and Copyright Statements . . . . .</a>	<a href="#">16</a>



## 1. Introduction

[RFC 3680](#) [2] defines a Session Initiation Protocol (SIP) event package for registration state. This package allows a watcher to learn about information stored by a SIP registrar, including the registered contacts.

However, a registered contact is frequently unreachable from hosts outside of the domain of the user agent. It is commonly a private address, or even when public direct access to it may be blocked by firewalls.

The Globally Routable User Agent URI (GRUU), defined in RFC YYYY [3], is a URI that reaches a particular UA instance, but is reachable by any host on the Internet. GRUUs assigned by the registrar represent additional registration state. However, GRUUs assigned by the registrar are not included in the notifications provided by [RFC 3680](#). For many applications of the registration event package, a GRUU is needed, and not the registered contact.

For example, the Welcome Notices example in [2] will only operate correctly if the contact address in the "reg" event notification is reachable by the sender of the welcome notice. When the registering device is using the GRUU extension, it is likely that the registered contact address will not be globally addressable, and a GRUU should be used as the target address for the MESSAGE.

Another case where this feature may be helpful is within the 3GPP IP Multimedia Subsystem (IMS). IMS employs a technique where a REGISTER of a contact address to one Address of Record (AOR) causes the implicit registration of the same contact to other associated AORs. If GRUUs are requested and obtained as part of the registration request, then additional GRUUs will also be needed for the implicit registrations. While assigning the additional GRUUs is straightforward, informing the registering UA of them is not. In IMS, UAs typically subscribe to the "reg" event, and subscriptions to the "reg" event for an AOR result in notifications containing registration state for all the associated AORs. The proposed extension provides a way to easily deliver the GRUUs for the associated AORs.

As specified in RFC YYYY [3], temporary GRUUs are invalidated when contact address bindings for the corresponding AOR and instance id are not refreshed, or when a registration to the AOR and instance id is performed with a new Call-Id. A UA cannot always determine with certainty which temporary GRUUs are valid based solely on the response to the REGISTER requests it has issued, or from notifications according to [RFC 3680](#) [2]. The herein defined



extension provides sufficient information for a UA to determine which temporary GRUUs are valid.

The "reg" event package has provision for including extension elements within the <contact> element. This document defines new elements that may be used in that context to deliver the public and temporary GRUUs corresponding to the contact.

## **2. Terminology**

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](#). [[1](#)]

## **3. Description**

Two new elements (<pub-gruu> and <temp-gruu>) are defined, each of which contains a GRUU. The <temp-gruu> element also identifies the oldest temporary gruu that is currently valid.

These optional elements may be included within the body of a NOTIFY for the "reg" event package when GRUUs are associated with the contact. The contact URI and the GRUUs are then all available to the watcher.

## **4. Notifier Processing of SUBSCRIBE Requests**

Unchanged from [RFC 3680](#) [[2](#)].

## **5. Notifier Generation of NOTIFY Requests**

A notifier for the "reg" event package [[2](#)] SHOULD include the <pub-gruu> element when a contact has an Instance ID and a public GRUU is associated with the combination of the AOR and the Instance ID. When present, the <pub-gruu> element MUST be positioned as a child of the <contact> element.

A notifier for the "reg" event package [[2](#)] MAY include the <temp-gruu> element when a contact has an Instance ID and a temporary GRUU is associated with the combination of the AOR and the Instance ID. This element SHOULD be included if the subscriber is also authorized to register to the AOR. This element SHOULD NOT be included if the subscriber is not authorized to register to the AOR, unless there is an explicitly configured policy directing that it be included. When



present, the <temp-gruu> element MUST be positioned as a child of the <contact> element.

Note that it is possible for multiple registered contacts to share the same instance ID. In such a case, each <contact> element will have child <pub-gruu> and <temp-gruu> elements, and those child elements of each <contact> element will be identical. Since a particular contact can not be associated with more than one instance ID, a <contact> element will never have more than one <pub-gruu> and one <temp-gruu> child element.

If the notifier includes the <pub-gruu> element it MUST populate the element with the public GRUU that is associated with the instance ID and AOR of the registered contact.

If the notifier includes the <temp-gruu> element it MUST populate the element with the most recently assigned temporary GRUU that is associated with the instance ID and AOR of the registered contact. It MUST also populate the element with the CSeq value of the first currently active temporary GRUU that is associated with the instance ID and AOR of the registered contact. The CSeq value is the CSeq of the REGISTER request that caused that temporary GRUU to be assigned.

## **6. Subscriber Processing of NOTIFY Requests**

When a subscriber receives a "reg" event notification with a <contact> containing a <pub-gruu> it MAY associate the public GRUU with corresponding AOR and Instance ID. Any previously received public GRUU for the same AOR and Instance ID MUST be discarded. (It will no longer function.)

When a subscriber receives a "reg" event notification with a <contact> containing a <temp-gruu> it MAY associate the temp GRUU, together with the "callid" and "cseq" attributes, with the corresponding AOR and Instance ID.

Subscribers that are unaware of this extension will, as required by [2], ignore the <pub-gruu> and <temp-gruu> elements.

### **6.1. Managing Temporary GRUU Lifetime**

[Section 4.2](#) of RFC YYYY [3] gives guidance for developers of UAs on how to ensure that only valid temporary GRUUs are retained and used by the UA. A UA cannot always determine with certainty which temporary GRUUs are valid based solely on the response to the REGISTER requests it has issued, or from notifications according to [RFC 3680](#) [2]. The herein defined extensions to [RFC 3680](#) provide





added information to help with that process. The following are steps that the UA MAY take to ensure it only retains valid GRUUs:

- o The UA should subscribe to the "reg" event package for the AOR it is registering.
- o When a UA receives a 2xx response to a REGISTER request, it may extract and retain temporary GRUUs from the response for future use as long as they remain valid. Appropriate GRUUs to retain are those corresponding to the Contact address and instance ID it has registered. (Typically the UA will register only one Contact address, and so receive at most one temporary GRUU.)
- o The UA may add the temporary GRUU to the set of valid temporary GRUUs associated with the AOR. (The To-address of the REGISTER request.) To aid in tracking validity the UA should also remember the Call-ID and CSeq values of the REGISTER response containing the temporary GRUU.
- o If the UA receives a "reg" event notification with an AOR that it supports and a <contact>, for a contact address and instance ID it has registered, that contains a <temp-gruu> it may update its set of valid temporary GRUUs associated with the AOR, as follows:
  - \* It may add the temporary GRUU to the set. To aid in tracking validity the UA should also remember the "callid" and "cseq" attributes of the <contact>.
  - \* It should remove any temporary GRUUs with a callid value different from that in the value of the "callid" attribute of the <contact>, or with a cseq value less than the value of the "first-cseq" attribute of the <temp-gruu>.
- o If the UA receives a "reg" event notification with an AOR that it supports, and there are no <contact> entries for its instance ID, then it should discard all the temporary GRUUs it has saved for that AOR.

## **7. Sample reginfo Document**

Note: This example and others in the following section are indented for readability by the addition of a fixed amount of whitespace to the beginning of each line. This whitespace is not part of the example. The conventions of [7] are used to describe representation of long message lines.

The following is an example registration information document including the new element:



```
<?xml version="1.0"?>
  <reginfo xmlns="urn:ietf:params:xml:ns:reginfo"
    xmlns:gr="urn:ietf:params:xml:ns:gruuinfo"
    version="0" state="full">
    <registration aor="sip:user@example.com" id="as9"
      state="active">
      <contact id="76" state="active" event="registered"
        duration-registered="36001" expires="3599"
        callid="1j9FpLxk3uxtm8tn@192.0.2.1" cseq="54321"
        q="0.8">
        <uri>sip:user@192.0.2.1</uri>
      <allOneLine>
        <unknown-param name="+sip.instance">
          "<urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6>"
        </unknown-param>
      </allOneLine>
      <allOneLine>
        <gr:pub-gruu uri="sip:user@example.com
          ;gr=hha9s8d-999a"/>
      </allOneLine>
      <allOneLine>
        <gr:temp-gruu uri="sip:8ffkas08af7fasklzi9@example.com
          ;gr" first-cseq="54301"/>
      </allOneLine>
    </contact>
  </registration>
</reginfo>
```

## 8. Examples

Note: In the following examples the SIP messages have been simplified, removing headers that are not pertinent to the example.

When the value of the Content-Length header field is "." this means that the value should be whatever the computed length of the body is.

### 8.1. Example: Welcome Notice

Consider the Welcome Notices example in [2]. When the application server receives a notification of a new registration containing the reginfo shown in [Section 7](#) it should address messages using the contained public GRUU as follows:



```
MESSAGE sip:user@example.com;gr=hha9s8d-999a SIP/2.0
To: <sip:user@example.com>
From: "SIPland Notifier" <sip:notifier@example.com>;tag=7xy8
Content-Type: text/plain
Content-Length: ...
```

```
Welcome to SIPland!
Blah, blah, blah.
```

## 8.2. Example: Implicit Registration

In an 3GPP IMS setting, a UA may send a single register message, requesting assignment of GRUUs, as follows:

```
REGISTER sip:example.net SIP/2.0
From: <sip:user_aor_1@example.net>;tag=5ab4
To: <sip:user_aor_1@example.net>
Call-Id: faif9a@ua.example.com
CSeq: 23001 REGISTER
Contact: <sip:ua.example.com>
        ;expires=3600
        ;+sip.instance="urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6"
Supported: path, gruu
Content-Length: 0
```

The response reports success of the registration and returns the GRUUs assigned for the combination of AOR, Instance ID, and Contact. It also indicates (via the P-Associated-URI header [6]) that there are two other associated AORs that may have been implicitly registered using the same contact. Each of those implicitly registered AORs will have unique GRUUs assigned. The REGISTER response will not include those GRUUs; it will only include the GRUUs for the AOR and instance ID explicitly included in the registration.

```
SIP/2.0 200 OK
From: <sip:user_aor_1@example.net>;tag=5ab4
To: <sip:user_aor_1@example.net>;tag=373392
Call-Id: faif9a@ua.example.com
CSeq: 23001 REGISTER
Path: <sip:proxy.example.net;lr>
Service-Route: <sip:proxy.example.net;lr>
Contact: <sip:ua.example.com>
        ;expires=3600
        ;+sip.instance="urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6"
        ;pub-gruu="sip:user_aor_1@example.net;gr=hha9s8d-999a"
        ;temp-gruu="sip:8ffkas08af7fasklzi9@example.net;gr"
P-Associated-URI: <sip:user_aor_2@example.net>,
        <sip:+358504821437@example.net;user=phone>
```



Content-Length: 0

The UA then subscribes to the "reg" event package as follows:

```
SUBSCRIBE sip:user_aor_1@example.net SIP/2.0
From: <sip:user_aor_1@example.net>;tag=27182
To: <sip:user_aor_1@example.net>
Call-Id: gbjg0b@ua.example.com
CSeq: 45001 SUBSCRIBE
Route: <sip:proxy.example.net;lr>
Event: reg
Expires: 3600
Accept: application/reginfo+xml
Contact: <sip:user_aor_1@example.net;gr=hha9s8d-999a>
Content-Length: 0
```

(The successful response to the subscription is not shown.) Once the subscription is established an initial notification is sent giving registration status. In IMS deployments the response includes, in addition to the status for the requested URI, the status for the other associated URIs.

```
NOTIFY sip:user_aor_1@example.net;gr=hha9s8d-999a SIP/2.0
From: <sip:user_aor_1@example.net>;tag=27182
To: <sip:user_aor_1@example.net>;tag=262281
Call-Id: gbjg0b@ua.example.com
CSeq: 633 NOTIFY
Subscription-State: active;expires=3600
Event: reg
Content-Type: application/reginfo+xml
Contact: <sip:registrar.example.net>
Content-Length: ...
```

```
<?xml version="1.0"?>
  <reginfo xmlns="urn:ietf:params:xml:ns:reginfo"
    xmlns:gr="urn:ietf:params:xml:ns:gruuinfo"
    version="1" state="full">
    <registration aor="sip:user_aor_1@example.net" id="a7"
      state="active">
      <contact id="92" state="active" event="registered"
        duration-registered="1" expires="3599"
        callid="faif9a@ua.example.com" cseq="23001">
        <uri>
          sip:ua.example.com
        </uri>
      </contact>
    </registration>
  </reginfo>
  <unknown-param name="+sip.instance">
    "<urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6>";"
```





```
</unknown-param>
</allOneLine>
<allOneLine>
    <gr:pub-gruu uri="sip:user_aor_1@example.net
;gr=hha9s8d-999a"/>
</allOneLine>
<allOneLine>
    <gr:temp-gruu uri="sip:8ffkas08af7fasklzi9@example.net
;gr" first-cseq="54301"/>
</allOneLine>
    </contact>
</registration>
<registration aor="sip:user_aor_2@example.net" id="a8"
    state="active">
    <contact id="93" state="active" event="created"
        duration-registered="1" expires="3599"
        callid="faif9a@ua.example.com" cseq="23001">
        <uri>
            sip:ua.example.com
        </uri>
</allOneLine>
        <unknown-param name="+sip.instance">
"<urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6>";"
</unknown-param>
</allOneLine>
<allOneLine>
    <gr:pub-gruu uri="sip:user_aor_2@example.net
;gr=hha9s8d-999b"/>
</allOneLine>
<allOneLine>
    <gr:temp-gruu uri="sip:07hcovy36vp6vngvbua@example.net
;gr" first-cseq="54301"/>
</allOneLine>
    </contact>
</registration>
<registration
    aor="sip:+358504821437@example.net;user=phone"
    id="a9"
    state="active">
    <contact id="94" state="active" event="created"
        duration-registered="1" expires="3599"
        callid="faif9a@ua.example.com" cseq="23001">
        <uri>
            sip:ua.example.com
        </uri>
</allOneLine>
        <unknown-param name="+sip.instance">
"<urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6>";"
```



```

</unknown-param>
</allOneLine>
<allOneLine>
    <gr:pub-gruu uri="sip:+358504821437@example.net
;user=phone;gr=hha9s8d-999c"/>
</allOneLine>
<allOneLine>
    <gr:temp-gruu uri="sip:h99egjbv17fe8ibvlka@example.net
;gr" first-cseq="54301"/>
</allOneLine>
    </contact>
  </registration>
</reginfo>

```

The status indicates that the associated URIs all have the same contact registered. It also includes the unique GRUUs that have been assigned to each. The UA may then retain those GRUUs for use when establishing dialogs using the corresponding AORs.

## 9. XML Schema Definition

The <pub-gruu> and <temp-gruu> elements are defined within a new XML namespace URI. This namespace is "urn:ietf:params:xml:ns:gruuinfo". The schema for these elements is:

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="urn:ietf:params:xml:ns:gruuinfo"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:tns="urn:ietf:params:xml:ns:gruuinfo">
  <xs:complexType name="pubGruu">
    <xs:attribute name="uri" type="xs:anyURI"
      use="required"/>
  </xs:complexType>
  <xs:complexType name="tempGruu">
    <xs:complexContent>
      <xs:extension base="tns:pubGruu">
        <xs:attribute name="first-cseq"
          type="xs:unsignedLong"
          use="required"/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:element name="pub-gruu" type="tns:pubGruu"/>
  <xs:element name="temp-gruu" type="tns:tempGruu"/>

```



</xs:schema>

## **10. IANA Considerations**

There are two IANA considerations associated with this specification.

### **10.1. URN Sub-Namespace Registration**

This section registers a new XML namespace, per the guidelines in [4].

URI: The URI for this namespace is urn:ietf:params:xml:ns:gruuinfo

Registrant Contact: IETF, SIPING working group, <sipping@ietf.org>, Paul Kyzivat <pkyzivat@cisco.com>

XML:

```
BEGIN
<?xml version="1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML Basic 1.0//EN"
    "http://www.w3.org/TR/xhtml1-basic/xhtml1-basic10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
  <meta http-equiv="content-type"
    content="text/html; charset=iso-8859-1"/>
  <title>Reg Information GRUU Extension Namespace</title>
</head>
<body>
  <h1>Namespace for Reg Information GRUU Extension</h1>
  <h2>urn:ietf:params:xml:ns:gruuinfo</h2>
  <p>See <a href="[URL of published RFC]">RFCXXXX [[NOTE
TO RFC-EDITOR/IANA: Please replace XXXX with the RFC Number of
this specification]]</a>.</p>
</body>
</html>
END
```

### **10.2. XML Schema Registration**

This section registers an XML schema per the procedures in [4].

URI: urn:ietf:params:xml:ns:gruuinfo.

Registrant Contact: IETF, SIPING working group, <sipping@ietf.org>, Paul Kyzivat <pkyzivat@cisco.com>



The XML for this schema can be found in [Section 9](#).

## **11. Security Considerations**

Security considerations for the registration event package are discussed in [RFC 3680](#) [2], and those considerations apply here.

If a contact address obtained via subscription to the registration event package is not reachable by the subscriber then its disclosure may arguably be considered a minimal security risk. In that case the inclusion of a GRUU may be considered to increase the risk by providing a reachable address. On the other hand requests addressed to a GRUU are always first processed by the servicing proxy before they reach the intended user agent. The proxy may control access as desired, just as it may for the AOR. For instance, the proxy servicing a GRUU may accept requests from senders whose identity appears on a white list, and reject other requests. In this respect disclosing a GRUU presents no more risk than disclosing the AOR.

Temporary GRUUs have an additional security consideration. The intent of the temporary GRUU is to provide a contact address that cannot be correlated to the identity of the calling party. The recipient of a call using a temporary GRUU may guess the identity of the calling party and then attempt to obtain the temporary GRUUs assigned to that caller to confirm the conjecture. Two possible approaches to obtaining the temporary GRUUs are:

- o Send a REGISTER request to a conjectured caller.
- o Send a SUBSCRIBE request for the "reg" event package to the conjectured caller.

Typically REGISTER is restricted to devices or users that are authorized to originate and received calls with the AOR. Anonymity among users of the same AOR is hard to achieve and typically unnecessary. It is recommended (see [Section 5](#)) that the authorization policy for the "reg" event package permit only those subscribers authorized to register to the AOR to receive temporary GRUUs. With this policy, the confidentiality of the temporary GRUU will be the same with and without the "reg" event package. User agents that use a temporary GRUU should note that confidentiality does not extend to parties that are permitted to register to the AOR or obtain the temporary GRUU when subscribing the "reg" event package.





## **12. Acknowledgements**

The author would like to thank Jonathan Rosenberg for help with this draft, and Jari Urpalainen for assistance with the XML.

## **13. References**

### **13.1. Normative References**

- [1] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [2] Rosenberg, J., "A Session Initiation Protocol (SIP) Event Package for Registrations", [RFC 3680](#), March 2004.
- [3] Rosenberg, J., "Obtaining and Using Globally Routable User Agent (UA) URIs (GRUU) in the Session Initiation Protocol (SIP)", [draft-ietf-sip-gruu-14](#) (work in progress), June 2007.
- [4] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), January 2004.

### **13.2. Informative References**

- [5] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", [RFC 3261](#), June 2002.
- [6] Garcia-Martin, M., Henrikson, E., and D. Mills, "Private Header (P-Header) Extensions to the Session Initiation Protocol (SIP) for the 3rd-Generation Partnership Project (3GPP)", [RFC 3455](#), January 2003.
- [7] Sparks, R., Hawrylyshen, A., Johnston, A., Rosenberg, J., and H. Schulzrinne, "Session Initiation Protocol (SIP) Torture Test Messages", [RFC 4475](#), May 2006.



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