

Network Working Group
Request for Comments: 3842
Category: Standards Track

R. Mahy
Cisco Systems, Inc.
August 2004

A Message Summary and Message Waiting Indication Event Package for
the Session Initiation Protocol (SIP)

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Copyright Notice

Copyright (C) The Internet Society (2004).

Abstract

This document describes a Session Initiation Protocol (SIP) event package to carry message waiting status and message summaries from a messaging system to an interested User Agent.

Table of Contents

1.	Conventions	2
2.	Background and Appropriateness	3
3.	Event Package Formal Definition	4
3.1.	Event Package Name	4
3.2.	Event Package Parameters	4
3.3.	SUBSCRIBE Bodies	4
3.4.	Subscription Duration.	4
3.5.	NOTIFY Bodies.	4
3.6.	Subscriber Generation of SUBSCRIBE Requests.	6
3.7.	Notifier Processing of SUBSCRIBE Requests.	6
3.8.	Notifier Generation of NOTIFY Requests	7
3.9.	Subscriber Processing of NOTIFY Requests	7
3.10.	Handling of Forked Requests.	7
3.11.	Rate of Notifications.	7
3.12.	State Agents and Lists	8
3.13.	Behavior of a Proxy Server	8
4.	Examples of Usage	8
4.1.	Example Message Flow	8
4.2.	Example Usage with Callee Capabilities and Caller Preferences.	14
5.	Formal Syntax	14
5.1.	New Event-Package Definition	15
5.2.	Body Format Syntax	15
6.	Security Considerations	15
7.	IANA Considerations	16
7.1.	SIP Event Package Registration for message-summary . .	16
7.2.	MIME Registration for application/ simple-message-summary	16
8.	Contributors	17
9.	Acknowledgments	17
10.	References	17
10.1.	Normative References	17
10.2.	Informational References	18
11.	Author's Address	18
12.	Full Copyright Statement	19

1. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, RFC 2119 [3].

2. Background and Appropriateness

Message Waiting Indication is a common feature of telephone networks. It typically involves an audible or visible indication that messages are waiting, such as playing a special dial tone (which in telephone networks is called message-waiting dial tone), lighting a light or indicator on the phone, displaying icons or text, or some combination.

Message-waiting dial tone is similar to but distinct from stutter dial tone. Both are defined in GR-506 [11].

The methods in the SIP [1] base specification were only designed to solve the problem of session initiation for multimedia sessions, and rendezvous. Since Message Waiting Indication is really status information orthogonal to a session, it was not clear how an IP telephone acting as a SIP User Agent would implement comparable functionality. Members of the telephony community viewed this as a shortcoming of SIP.

Users want the useful parts of the functionality they have using traditional analog, mobile, and PBX telephones. It is also desirable to provide comparable functionality in a flexible way that allows for more customization and new features. SIP Specific Event Notification (RFC 3265 -- SIP Events) [2] is an appropriate mechanism to use in this environment, as it preserves the user mobility and rendezvous features which SIP provides.

Using SIP-Specific Event Notification, a Subscriber User Agent (typically an IP phone or SIP software User Agent) subscribes to the status of their messages. A SIP User Agent acting on behalf of the user's messaging system then notifies the Subscriber each time the messaging account's messages have changed. (This Notifier could be composed with a User Agent that provides a real-time media interface to send or receive messages, or it could be a stand-alone entity.) The Notifier sends a message summary in the body of a NOTIFY, encoded in a new MIME type defined later in this document. A User Agent can also explicitly fetch the current status.

A SIP User Agent MAY subscribe to multiple accounts (distinguished by the Request URI). Multiple SIP User Agents MAY subscribe to the same account.

Before any subscriptions or notifications are sent, each interested User Agent must be made aware of its messaging notifier(s). This MAY be manually configured on interested User Agents, manually configured on an appropriate SIP Proxy, or dynamically discovered based on

requested caller preferences [4] and registered callee capabilities [5]. (For more information on usage with callee capabilities, see Section 4.2)

3. Event Package Formal Definition

3.1. Event Package Name

This document defines a SIP Event Package as defined in RFC 3265 [2]. The event-package token name for this package is:

"message-summary"

3.2. Event Package Parameters

This package does not define any event package parameters.

3.3. SUBSCRIBE Bodies

This package does not define any SUBSCRIBE bodies.

3.4. Subscription Duration

Subscriptions to this event package MAY range from minutes to weeks. Subscriptions in hours or days are more typical and are RECOMMENDED. The default subscription duration for this event package is one hour.

3.5. NOTIFY Bodies

A simple text-based format is proposed to prevent an undue burden on low-end user agents, for example, inexpensive IP phones with no display. Although this format is text-based, it is intended for machine consumption only.

A future extension MAY define other NOTIFY bodies. If no "Accept" header is present in the SUBSCRIBE, the body type defined in this document MUST be assumed.

The format specified in this proposal attempts to separate orthogonal attributes of messages as much as possible. Messages are separated by message-context-class (for example: voice-message, fax-message, pager-message, multimedia-message, text-message, and none), by message status (new and old), and urgent and non-urgent type.

The text format begins with a simple status line, and optionally a summary line per message-context-class. Message-context-classes are defined in [7]. For each message-context-class, the total number of new and old messages is reported in the new and old fields.

In some cases, detailed message summaries are not available. The status line allows messaging systems or messaging gateways to provide the traditional boolean message waiting notification.

Messages-Waiting: yes

If the Request-URI or To header in a message-summary subscription corresponds to a group or collection of individual messaging accounts, the notifier MUST specify to which account the message-summary body corresponds. Note that the account URI MUST NOT be delimited with angle brackets ("**<**" and "**>**").

Message-Account: sip:alice@example.com

In the example that follows, more than boolean message summary information is available to the User Agent. There are two new and four old fax messages.

Fax-Message: 2/4

After the summary, the format can optionally list a summary count of urgent messages. In the next example there are one new and three old voice messages, none of the new messages are urgent, but one of the old messages is. All counters have a maximum value of 4,294,967,295 ($(2^{32}) - 1$). Notifiers MUST NOT generate a request with a larger value. Subscribers MUST treat a larger value as $2^{32}-1$.

Voice-Message: 1/3 (0/1)

Optionally, after the summary counts, the messaging systems MAY append RFC 2822 style message headers [9], which further describe newly added messages. Message headers MUST NOT be included in an initial NOTIFY, as new messages could be essentially unbounded in size. Message headers included in subsequent notifications MUST only correspond to messages added since the previous notification for that subscription. A messaging system which includes message headers in a NOTIFY MUST provide an administrator configurable mechanism to select which headers are sent. Headers likely for inclusion are To, From, Date, Subject, and Message-ID. Note that the formatting of these headers in this body is identical to that of SIP extension-headers, not the (similar) format defined in RFC 2822.

Implementations which generate large notifications are reminded to follow the message size restrictions for unreliable transports articulated in Section 18.1.1 of SIP [1].

Mapping local message state to new/old message status and urgency is an implementation issue of the messaging system. However, the

messaging notifier MUST NOT consider a message "old" merely because it generated a notification, as this could prevent another subscription from accurately receiving message-summary notifications. Likewise, the messaging system MAY use any suitable algorithm to determine that a message is "urgent".

Messaging systems MAY use any algorithm for determining the appropriate message-context-class for a specific message. Systems which use Internet Mail SHOULD use the contents of the Message-Context header [7] (defined in RFC 3458) if present as a hint to make a context determination. Note that a composed messaging system does not need to support a given context in order to generate notifications identified with that context.

3.6. Subscriber Generation of SUBSCRIBE Requests

Subscriber User Agents will typically SUBSCRIBE to message summary information for a period of hours or days, and automatically attempt to re-SUBSCRIBE well before the subscription is completely expired. If re-subscription fails, the Subscriber SHOULD periodically retry again until a subscription is successful, taking care to backoff to avoid network congestion. If a subscription has expired, new re-subscriptions MUST use a new Call-ID.

The Subscriber SHOULD SUBSCRIBE to that user's message summaries whenever a new user becomes associated with the device (a new login). The Subscriber MAY also explicitly fetch the current status at any time. The subscriber SHOULD renew its subscription immediately after a reboot, or when the subscriber's network connectivity has just been re-established.

The Subscriber MUST be prepared to receive and process a NOTIFY with new state immediately after sending a new SUBSCRIBE, a SUBSCRIBE renewal, an unsubscribe, a fetch, or at any other time during the subscription.

When a user de-registers from a device (logoff, power down of a mobile device, etc.), subscribers SHOULD unsubscribe by sending a SUBSCRIBE message with an Expires header of zero.

3.7. Notifier Processing of SUBSCRIBE Requests

When a SIP Messaging System receives SUBSCRIBE messages with the message-summary event-type, it SHOULD authenticate the subscription request. If authentication is successful, the Notifier MAY limit the duration of the subscription to an administrator defined amount of time as described in SIP Events [2].

3.8. Notifier Generation of NOTIFY Requests

Immediately after a subscription is accepted, the Notifier MUST send a NOTIFY with the current message summary information. This allows the Subscriber to resynchronize its state. This initial synchronization NOTIFY MUST NOT include the optional RFC 2822 style message headers [8].

When the status of the messages changes sufficiently for a messaging account to change the number of new or old messages, the Notifier SHOULD send a NOTIFY message to all active subscribers of that account. NOTIFY messages sent to subscribers of a group or alias, MUST contain the message account name in the notification body.

A Messaging System MAY send a NOTIFY with an "Expires" header of "0" and a "Subscription-State" header of "terminated" before a graceful shutdown.

3.9. Subscriber Processing of NOTIFY Requests

Upon receipt of a valid NOTIFY request, the subscriber SHOULD immediately render the message status and summary information to the end user in an implementation specific way.

The Subscriber MUST be prepared to receive NOTIFYs from different Contacts corresponding to the same SUBSCRIBE. (The SUBSCRIBE may have been forked).

3.10. Handling of Forked Requests

Forked requests are allowed for this event type and may install multiple subscriptions. The Subscriber MAY render multiple summaries corresponding to the same account directly to the user, or MAY merge them as described below.

If any of the "Messages-Waiting" status lines report "yes", then the merged state is "yes"; otherwise the merged state is "no".

The Subscriber MAY merge summary lines in an implementation-specific way if all notifications contain at least one msg-summary line.

3.11. Rate of Notifications

A Notifier MAY choose to hold NOTIFY requests in "quarantine" for a short administrator-defined period (seconds or minutes) when the message status is changing rapidly. Requests in the quarantine which become invalid are replaced by newer notifications, thus reducing the total volume of notifications. This behavior is encouraged for

implementations with heavy interactive use. Note that timely notification resulting in a change of overall state (messages waiting or not) and notification of newly added messages is probably more significant to the end user than a notification of newly deleted messages which do not affect the overall message waiting state (e.g., there are still new messages).

Notifiers SHOULD NOT generate NOTIFY requests more frequently than once per second.

3.12. State Agents and Lists

A Subscriber MAY use an "alias" or "group" in the Request-URI of a subscription if that name is significant to the messaging system. Implementers MAY create a service which consolidates and summarizes NOTIFYS from many Contacts. This document does not preclude implementations from building state agents which support this event package. One way to implement such a service is with the event list extension [10].

3.13. Behavior of a Proxy Server

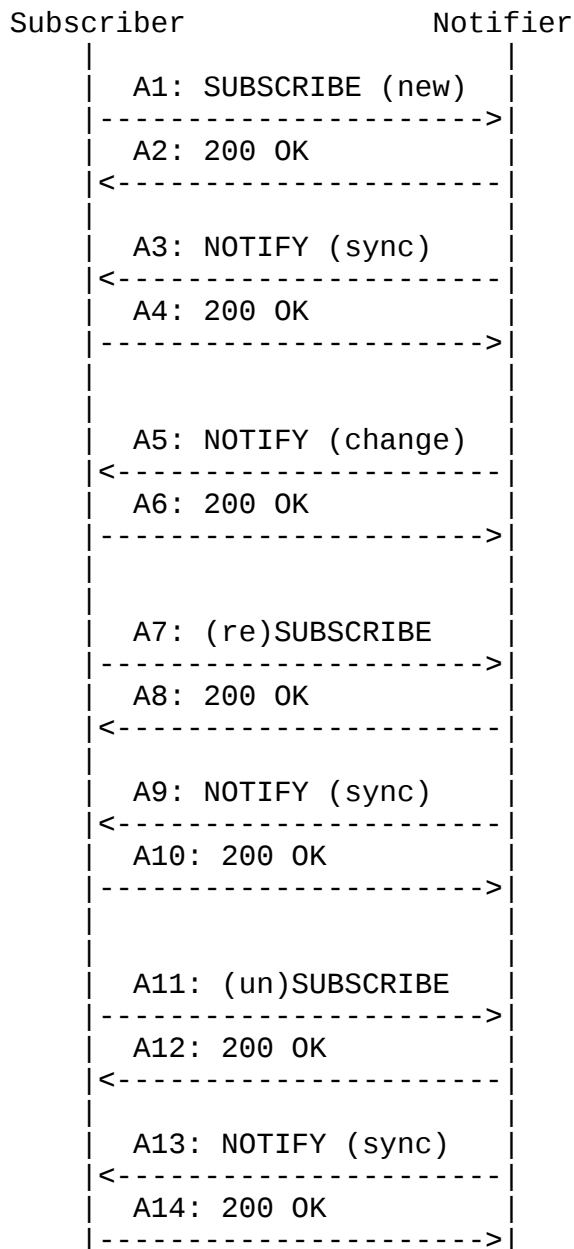
There are no additional requirements on a SIP Proxy, other than to transparently forward the SUBSCRIBE and NOTIFY methods as required in SIP. However, Proxies SHOULD allow non-SIP URLs. Proxies and Redirect servers SHOULD be able to direct the SUBSCRIBE request to an appropriate messaging notifier User Agent.

4. Examples of Usage

4.1. Example Message Flow

The examples shown below are for informational purposes only. For a normative description of the event package, please see sections 3 and 5 of this document.

In the example call flow below, Alice's IP phone subscribes to the status of Alice's messages. Via headers are omitted for clarity.



A1: Subscriber (Alice's phone) ->
 Notifier (Alice's voicemail gateway)
 Subscribe to Alice's message summary status for 1 day.

SUBSCRIBE sip:alice@vmail.example.com SIP/2.0
 To: <sip:alice@example.com>
 From: <sip:alice@example.com>;tag=78923
 Date: Mon, 10 Jul 2000 03:55:06 GMT

Call-Id: 1349882@alice-phone.example.com
CSeq: 4 SUBSCRIBE
Contact: <sip:alice@alice-phone.example.com>
Event: message-summary
Expires: 86400
Accept: application/simple-message-summary
Content-Length: 0

A2: Notifier -> Subscriber

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=4442
From: <sip:alice@example.com>;tag=78923
Date: Mon, 10 Jul 2000 03:55:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 4 SUBSCRIBE
Expires: 86400
Content-Length: 0

A3: Notifier -> Subscriber
(immediate synchronization of current state:
2 new and 8 old [2 urgent] messages)

NOTIFY sip:alice@alice-phone.example.com SIP/2.0
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 03:55:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 20 NOTIFY
Contact: <sip:alice@vmail.example.com>
Event: message-summary
Subscription-State: active
Content-Type: application/simple-message-summary
Content-Length: 99

Messages-Waiting: yes
Message-Account: sip:alice@vmail.example.com
Voice-Message: 2/8 (0/2)

A4: Subscriber -> Notifier

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 03:55:08 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 20 NOTIFY
Content-Length: 0

A5: Notifier -> Subscriber

This is a notification of new messages.

Some headers from each of the new messages are appended.

NOTIFY sip:alice@alice-phone.example.com SIP/2.0
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 04:28:53 GMT
Contact: <sip:alice@vmail.example.com>
Call-ID: 1349882@alice-phone.example.com
CSeq: 31 NOTIFY
Event: message-summary
Subscription-State: active
Content-Type: application/simple-message-summary
Content-Length: 503

Messages-Waiting: yes
Message-Account: sip:alice@vmail.example.com
Voice-Message: 4/8 (1/2)

To: <alice@atlanta.example.com>
From: <bob@biloxi.example.com>
Subject: carpool tomorrow?
Date: Sun, 09 Jul 2000 21:23:01 -0700
Priority: normal
Message-ID: 13784434989@vmail.example.com

To: <alice@example.com>
From: <cathy-the-bob@example.com>
Subject: HELP! at home ill, present for me please
Date: Sun, 09 Jul 2000 21:25:12 -0700
Priority: urgent
Message-ID: 13684434990@vmail.example.com

A6: Subscriber -> Notifier

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 04:28:53 GMT
Call-ID: 1349882@alice-phone.example.com
CSeq: 31 NOTIFY
Content-Length: 0

A7: Subscriber -> Notifier
Refresh subscription.

SUBSCRIBE sip:alice@vmail.example.com SIP/2.0
To: <sip:alice@example.com>;tag=4442
From: <sip:alice@example.com>;tag=78923
Date: Mon, 10 Jul 2000 15:55:06 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 8 SUBSCRIBE
Contact: <sip:alice@alice-phone.example.com>
Event: message-summary
Expires: 86400
Accept: application/simple-message-summary
Content-Length: 0

A8: Notifier -> Subscriber

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=4442
From: <sip:alice@example.com>;tag=78923
Date: Mon, 10 Jul 2000 15:55:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 8 SUBSCRIBE
Contact: <sip:alice@alice-phone.example.com>
Expires: 86400
Content-Length: 0

A9: Notifier -> Subscriber
(immediate synchronization of current state)

NOTIFY sip:alice@alice-phone.example.com SIP/2.0
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 15:55:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 47 NOTIFY
Contact: <sip:alice@vmail.example.com>
Event: message-summary
Subscription-State: active
Content-Type: application/simple-message-summary
Content-Length: 99

Messages-Waiting: yes
Message-Account: sip:alice@vmail.example.com
Voice-Message: 4/8 (1/2)

A10: Subscriber -> Notifier

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442

Date: Mon, 10 Jul 2000 15:55:08 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 47 NOTIFY
Contact: <sip:alice@vmail.example.com>

A11: Subscriber -> Notifier
Un-subscribe after "alice" logs out.

SUBSCRIBE sip:alice@vmail.example.com SIP/2.0
To: <sip:alice@example.com>;tag=4442
From: <sip:alice@example.com>;tag=78923
Date: Mon, 10 Jul 2000 19:35:06 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 17 SUBSCRIBE
Contact: <sip:alice@alice-phone.example.com>
Event: message-summary
Expires: 0
Accept: application/simple-message-summary
Content-Length: 0

A12: Notifier -> Subscriber

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=4442
From: <sip:alice@example.com>;tag=78923
Date: Mon, 10 Jul 2000 19:35:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 17 SUBSCRIBE
Contact: <sip:alice@alice-phone.example.com>
Expires: 0
Content-Length: 0

A13: Notifier -> Subscriber
(immediate synchronization of current state,
which the subscriber can now ignore)

NOTIFY sip:alice@alice-phone.example.com SIP/2.0
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 19:35:07 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 56 NOTIFY
Contact: <sip:alice@vmail.example.com>
Event: message-summary
Subscription-State: terminated;reason=timeout
Content-Type: application/simple-message-summary
Content-Length: 99

Messages-Waiting: yes
Message-Account: sip:alice@vmail.example.com
Voice-Message: 4/8 (1/2)

A14: Subscriber -> Notifier

SIP/2.0 200 OK
To: <sip:alice@example.com>;tag=78923
From: <sip:alice@example.com>;tag=4442
Date: Mon, 10 Jul 2000 19:35:08 GMT
Call-Id: 1349882@alice-phone.example.com
CSeq: 56 NOTIFY
Event: message-summary
Content-Length: 0

4.2. Example Usage with Callee Capabilities and Caller Preferences

The use of callee capabilities is optional but encouraged. If callee capabilities are used, a messaging notifier MAY REGISTER a Contact with an appropriate methods and events tag as shown in the example below. To further distinguish itself, the messaging notifier MAY also REGISTER as a Contact with the actor="msg-taker" tag. An example of this kind of registration follows below.

```
REGISTER sip:sip3-sj.example.com SIP/2.0
To: <sip:alice@example.com>
From: <sip:alice@example.com>;tag=4442
...
Contact: <sip:alice@vm13-sj.example.com>
        ;actor="msg-taker";methods="SUBSCRIBE"
        ;automata;events="message-summary"
```

The following SUBSCRIBE message would find the Contact which registered in the example above.

```
SUBSCRIBE sip:alice@example.com SIP/2.0
...
Accept: application/simple-message-summary
Event: message-summary
Accept-Contact: *;automata;actor="msg-taker"
```

5. Formal Syntax

The following syntax specification uses the augmented Backus-Naur Form (BNF) as described in RFC 2234 [6].

5.1. New Event-Package Definition

This document defines a new event-package with the package name:

message-summary

5.2. Body Format Syntax

The formal syntax for the application/simple-message-summary MIME type is described below. The message-context-class production is defined in Section 6.2 of RFC 3458 [7]. Note that all productions described here are case insensitive.

```
message-summary = msg-status-line CRLF
                  [msg-account CRLF]
                  [*(msg-summary-line CRLF)]
                  [ *opt-msg-headers ]
```

```
msg-status-line = "Messages-Waiting" HCOLON msg-status
```

```
msg-status = "yes" / "no"
```

```
msg-account = "Message-Account" HCOLON Account-URI
```

```
Account-URI = SIP-URI / SIPS-URI / absoluteURI
```

```
msg-summary-line = message-context-class HCOLON newmsgs SLASH oldmsgs
                  [ LPAREN new-urgentmsgs SLASH old-urgentmsgs RPAREN ]
```

```
opt-msg-headers = CRLF 1*(extension-header CRLF)
```

```
newmsgs = msgcount
```

```
oldmsgs = msgcount
```

```
new-urgentmsgs = msgcount
```

```
old-urgentmsgs = msgcount
```

```
msgcount = 1*DIGIT ; MUST NOT exceed 2^32-1
```

6. Security Considerations

Message summaries and optional message bodies contain information which is typically very privacy sensitive. At a minimum, subscriptions to this event package SHOULD be authenticated and properly authorized. Furthermore, notifications SHOULD be encrypted and integrity protected using either end-to-end mechanisms, or the hop-by-hop protection afforded messages sent to SIPS URIs.

Additional and privacy security considerations are discussed in detail in SIP [1] and SIP Events [2].

7. IANA Considerations

7.1. SIP Event Package Registration for message-summary

Package name: message-summary

Type: package

Contact: [Mahy]

Published Specification: This document.

7.2. MIME Registration for application/simple-message-summary

MIME media type name: application

MIME subtype name: simple-message-summary

Required parameters: none.

Optional parameters: none.

Encoding considerations: This MIME type was designed for use with protocols which can carry binary-encoded data. Although the format of this MIME type is similar to RFC 2822, it is not identical. (Specifically, line folding rules are SIP-specific and included URIs can contain non-ASCII characters.) Protocols which do not carry binary data (which have line length or character-set restrictions for example) MUST use a reversible transfer encoding (such as base64) to carry this MIME type.

Security considerations: See the "Security Considerations" section in this document.

Interoperability considerations: none

Published specification: This document.

Applications which use this media: The simple-message-summary application subtype supports the exchange of message waiting and message summary information in SIP networks.

Additional information:

1. Magic number(s): N/A
2. File extension(s): N/A
3. Macintosh file type code: N/A

8. Contributors

Ilya Slain came up with the initial format of the text body contained in this document. He was previously listed as a co-author, however, he is no longer reachable.

9. Acknowledgments

Thanks to Dan Wing, Dave Oran, Bill Foster, Steve Levy, Denise Caballero-McCann, Jeff Michel, Priti Patil, Satyender Khatter, Bich Nguyen, Manoj Bhatia, David Williams, and Bryan Byerly of Cisco, Jonathan Rosenberg and Adam Roach of Dynamicsoft, Eric Burger of Snowshore, Nir Chen of Comverse, and Eric Tremblay of Mediatatrix.

10. References

10.1. Normative References

- [1] 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.
- [2] Roach, A.B., "Session Initiation Protocol (SIP)-Specific Event Notification", RFC 3265, June 2002.
- [3] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [4] Rosenberg, J., Schulzrinne, H., and P. Kyzivat, "Caller Preferences for the Session Initiation Protocol (SIP)", RFC 3841, August 2004.
- [5] Rosenberg, J., Schulzrinne, H., and P. Kyzivat, "Indicating User Agent Capabilities in the Session Initiation Protocol (SIP)", RFC 3840, August 2004.
- [6] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", RFC 2234, November 1997.

- [7] Burger, E., Candell, E., Eliot, C., and G. Klyne, "Message Context for Internet Mail", RFC 3458, January 2003.

10.2. Informational References

- [8] Freed, N. and N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types", RFC 2046, November 1996.
- [9] Resnick, P., Ed., "Internet Message Format", RFC 2822, April 2001.
- [10] Rosenberg, J., Roach, A.B., and B. Campbell, "A Session Initiation Protocol (SIP) Event Notification Extension for Resource Lists", Work in Progress, June 2003.
- [11] Telcordia, "GR-506: Signaling for Analog Interfaces, Issue 1, Revision 1", Nov 1996.

11. Author's Address

Rohan Mahy
Cisco Systems, Inc.
5617 Scotts Valley Drive, Suite 200
Scotts Valley, CA 95066
USA

EMail: rohan@cisco.com

12. Full Copyright Statement

Copyright (C) The Internet Society (2004). This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

