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Session Initiation Protocol (SIP) INFO Method and Package Framework

Abstract

This document defines a method, INFO, for the Session Initiation Protocol (SIP), and an Info Package mechanism. This document obsoletes RFC 2976. For backward compatibility, this document also specifies a "legacy" mode of usage of the INFO method that is compatible with the usage previously defined in RFC 2976, referred to as "legacy INFO Usage" in this document.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc6086.

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1. Introduction

This document defines a method, INFO, for the Session Initiation Protocol (SIP) [RFC3261].

The purpose of the INFO message is to carry application level information between endpoints, using the SIP dialog signaling path. Note that the INFO method is not used to update characteristics of a SIP dialog or session, but to allow the applications that use the SIP session to exchange information (which might update the state of those applications).

Use of the INFO method does not constitute a separate dialog usage. INFO messages are always part of, and share the fate of, an invite dialog usage [RFC5057]. INFO messages cannot be sent as part of other dialog usages, or outside an existing dialog.

This document also defines an Info Package mechanism. An Info Package specification defines the content and semantics of the information carried in an INFO message associated with the Info Package. The Info Package mechanism also provides a way for user

agents (UAs) to indicate for which Info Packages they are willing to receive INFO requests, and which Info Package a specific INFO request is associated with.

A UA uses the Recv-Info header field, on a per-dialog basis, to indicate for which Info Packages it is willing to receive INFO requests. A UA can indicate an initial set of Info Packages during dialog establishment and can indicate a new set during the lifetime of the invite dialog usage.

> NOTE: A UA can use an empty Recv-Info header field (a header field without a value) to indicate that it is not willing to receive INFO requests for any Info Package, while still informing other UAs that it supports the Info Package mechanism.

When a UA sends an INFO request, it uses the Info-Package header field to indicate which Info Package is associated with the request. One particular INFO request can only be associated with a single Info Package.

1.1. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. Motivation

A number of applications, standardized and proprietary, make use of the INFO method as it was previously defined in RFC 2976 [RFC2976], here referred to as "legacy INFO usage". These include but are not limited to the following:

- RFC 3372 [RFC3372] specifies the encapsulation of ISDN User Part (ISUP) in SIP message bodies. ITU-T and the Third Generation Partnership Project (3GPP) have specified similar procedures.

- [ECMA-355] specifies the encapsulation of "QSIG" in SIP message bodies.

- RFC 5022 [RFC5022] specifies how INFO is used as a transport mechanism by the Media Server Control Markup Language (MSCML) protocol. MSCML uses an option-tag in the Require header field to ensure that the receiver understands the INFO content.

- RFC 5707 [RFC5707] specifies how INFO is used as a transport mechanism by the Media Server Markup Language (MSML) protocol.

- Companies have been using INFO messages in order to request fast video update. Currently, a standardized mechanism, based on the Real-time Transport Control Protocol (RTCP), has been specified in RFC 5168 [RFC5168].

- Companies have been using INFO messages in order to transport Dual-Tone Multi-Frequency (DTMF) tones. All mechanisms are proprietary and have not been standardized.

Some legacy INFO usages are also recognized as being shortcuts to more appropriate and flexible mechanisms.

Furthermore, RFC 2976 did not define mechanisms that would enable a SIP UA to indicate (1) the types of applications and contexts in which the UA supports the INFO method or (2) the types of applications and contexts with which a specific INFO message is associated.

Because legacy INFO usages do not have associated Info Packages, it is not possible to use the Recv-Info and Info-Package header fields with legacy INFO usages. That is, a UA cannot use the Recv-Info header field to indicate for which legacy INFO usages it is willing to receive INFO requests, and a UA cannot use the Info-Package header field to indicate with which legacy INFO usage an INFO request is associated.

Due to the problems described above, legacy INFO usages often require static configuration to indicate the types of applications and contexts for which the UAs support the INFO method, and the way they handle application information transported in INFO messages. This has caused interoperability problems in the industry.

To overcome these problems, the SIP Working Group has spent significant discussion time over many years coming to agreement on whether it was more appropriate to fix INFO (by defining a registration mechanism for the ways in which it was used) or to deprecate it altogether (with the usage described in RFC 3398 [RFC3398] being grandfathered as the sole legitimate usage). Although it required substantial consensus building and concessions by those more inclined to completely deprecate INFO, the eventual direction of the working group was to publish a framework for registration of Info Packages as defined in this specification.

3. Applicability and Backward Compatibility

This document defines a method, INFO, for the Session Initiation Protocol (SIP) [RFC3261], and an Info Package mechanism. This document obsoletes RFC 2976 [RFC2976]. For backward compatibility,

this document also specifies a "legacy" mode of usage of the INFO method that is compatible with the usage previously defined in RFC 2976, here referred to as "legacy INFO Usage".

For backward compatibility purposes, this document does not deprecate legacy INFO usages, and does not mandate users to define Info Packages for such usages. However:

1. A UA MUST NOT insert an Info-Package header field in a legacy INFO request (as described in Section 4.2.1, an INFO request associated with an Info Package always contains an Info-Package header field).

2. Any new usage MUST use the Info Package mechanism defined in this specification, since it does not share the issues associated with legacy INFO usage, and since Info Packages can be registered with IANA.

3. UAs are allowed to enable both legacy INFO usages and Info Package usages as part of the same invite dialog usage, but UAs SHALL NOT mix legacy INFO usages and Info Package usages in order to transport the same application level information. If possible, UAs SHALL prefer the usage of an Info Package.

4. The INFO Method

4.1. General

The INFO method provides a mechanism for transporting application level information that can further enhance a SIP application. Section 8 gives more details on the types of applications for which the use of INFO is appropriate.

This section describes how a UA handles INFO requests and responses, as well as the message bodies included in INFO messages.

4.2. INFO Request

4.2.1. INFO Request Sender

An INFO request can be associated with an Info Package (see Section 5), or associated with a legacy INFO usage (see Section 2).

The construction of the INFO request is the same as any other non-target refresh request within an existing invite dialog usage as described in Section 12.2 of RFC 3261.

When a UA sends an INFO request associated with an Info Package, it MUST include an Info-Package header field that indicates which Info Package is associated with the request. A specific INFO request can be used only for a single Info Package.

When a UA sends an INFO request associated with a legacy INFO usage, there is no Info Package associated with the request, and the UA MUST NOT include an Info-Package header field in the request.

The INFO request MUST NOT contain a Recv-Info header field. A UA can only indicate a set of Info Packages for which it is willing to receive INFO requests by using the SIP methods (and their responses) listed in Section 5.

A UA MUST NOT send an INFO request outside an invite dialog usage and MUST NOT send an INFO request for an Info Package inside an invite dialog usage if the remote UA has not indicated willingness to receive that Info Package within that dialog.

If a UA receives a 469 (Bad Info Package) response to an INFO request, based on RFC 5057 [RFC5057], the response represents a Transaction Only failure, and the UA MUST NOT terminate the invite dialog usage.

Due to the possibility of forking, the UA that sends the initial INVITE request MUST be prepared to receive INFO requests from multiple remote UAs during the early dialog phase. In addition, the UA MUST be prepared to receive different Recv-Info header field values from different remote UAs.

> NOTE: If the User Agent Server (UAS) (receiver of the initial INVITE request) sends an INFO request just after it has sent the response that creates the dialog, the UAS needs to be prepared for the possibility that the INFO request will reach the User Agent Client (UAC) before the dialog-creating response, and might therefore be rejected by the UAC. In addition, an INFO request might be rejected due to a race condition, if a UA sends the INFO request at the same time that the remote UA sends a new set of Info Packages for which it is willing to receive INFO requests.

4.2.2. INFO Request Receiver

If a UA receives an INFO request associated with an Info Package that the UA has not indicated willingness to receive, the UA MUST send a 469 (Bad Info Package) response (see Section 11.6), which contains a Recv-Info header field with Info Packages for which the UA is willing

to receive INFO requests. The UA MUST NOT use the response to update the set of Info Packages, but simply to indicate the current set. In the terminology of multiple dialog usages [RFC5057], this represents a Transaction Only failure, and does not terminate the invite dialog usage.

If a UA receives an INFO request associated with an Info Package, and the message body part with Content-Disposition "Info-Package" (see Section 4.3.1) has a Multipurpose Internet Mail Extensions (MIME) type that the UA supports but not in the context of that Info Package, it is RECOMMENDED that the UA send a 415 (Unsupported Media Type) response.

The UA MAY send other error responses, such as Request Failure (4xx), Server Failure (5xx), and Global Failure (6xx), in accordance with the error-handling procedures defined in RFC 3261.

Otherwise, if the INFO request is syntactically correct and well structured, the UA MUST send a 200 (OK) response.

> NOTE: If the application needs to reject the information that it received in an INFO request, that needs to be done on the application level. That is, the application needs to trigger a new INFO request, which contains information that the previously received application data was not accepted. Individual Info Package specifications need to describe the details for such procedures.

4.2.3. SIP Proxies

Proxies need no additional behavior beyond that described in RFC 3261 to support INFO.

4.3. INFO Message Body

4.3.1. INFO Request Message Body

The purpose of the INFO request is to carry application level information between SIP UAs. The application information data is carried in the payload of the message body of the INFO request.

> NOTE: An INFO request associated with an Info Package can also include information associated with the Info Package using Info-Package header field parameters.

If an INFO request associated with an Info Package contains a message body part, the body part is identified by a Content-Disposition header field "Info-Package" value. The body part can contain a single MIME type, or it can be a multipart [RFC5621] that contains other body parts associated with the Info Package.

UAs MUST support multipart body parts in accordance with RFC 5621.

> NOTE: An INFO request can also contain other body parts that are meaningful within the context of an invite dialog usage but are not specifically associated with the INFO method and the application concerned.

When a UA supports a specific Info Package, the UA MUST also support message body MIME types in accordance with that Info Package. However, in accordance with RFC 3261, the UA still indicates the supported MIME types using the Accept header.

4.3.2. INFO Response Message Body

A UA MUST NOT include a message body associated with an Info Package in an INFO response. Message bodies associated with Info Packages MUST only be sent in INFO requests.

A UA MAY include a message body that is not associated with an Info Package in an INFO response.

4.4. Order of Delivery

The Info Package mechanism does not define a delivery order mechanism. Info Packages can rely on the CSeq header field [RFC3261] to detect if an INFO request is received out of order.

If specific applications need additional mechanisms for order of delivery, those mechanisms, and related procedures, are specified as part of the associated Info Package (e.g., the use of sequence numbers within the application data).

5. Info Packages

5.1. General

An Info Package specification defines the content and semantics of the information carried in an INFO message associated with an Info Package. The Info Package mechanism provides a way for UAs to indicate for which Info Packages they are willing to receive INFO requests, and with which Info Package a specific INFO request is associated.

5.2. User Agent Behavior

5.2.1. General

This section describes how a UA handles Info Packages, how a UA uses the Recv-Info header field, and how the UA acts in re-INVITE rollback situations.

5.2.2. UA Procedures

A UA that supports the Info Package mechanism MUST indicate, using the Recv-Info header field, the set of Info Packages for which it is willing to receive INFO requests for a specific session. A UA can list multiple Info Packages in a single Recv-Info header field, and the UA can use multiple Recv-Info header fields. A UA can use an empty Recv-Info header field, i.e., a header field without any header field values.

A UA provides its set of Info Packages for which it is willing to receive INFO requests during the dialog establishment. A UA can update the set of Info Packages during the invite dialog usage.

If a UA is not willing to receive INFO requests for any Info Packages, during dialog establishment or later during the invite dialog usage, the UA MUST indicate this by including an empty Recv-Info header field. This informs other UAs that the UA still supports the Info Package mechanism.

Example: If a UA has previously indicated Info Packages "foo" and "bar" in a Recv-Info header field, and the UA during the lifetime of the invite dialog usage wants to indicate that it does not want to receive INFO requests for any Info Packages anymore, the UA sends a message with an empty Recv-Info header field.

Once a UA has sent a message with a Recv-Info header field containing a set of Info Packages, the set is valid until the UA sends a new Recv-Info header field containing a new, or empty, set of Info Packages.

Once a UA has indicated that it is willing to receive INFO requests for a specific Info Package, and a dialog has been established, the UA MUST be prepared to receive INFO requests associated with that Info Package until the UA indicates that it is no longer willing to receive INFO requests associated with that Info Package.

For a specific dialog usage, a UA MUST NOT send an INFO request associated with an Info Package until it has received an indication that the remote UA is willing to receive INFO requests for that Info

Package, or after the UA has received an indication that the remote UA is no longer willing to receive INFO requests associated with that Info Package.

NOTE: When a UA sends a message that contains a Recv-Info header field with a new set of Info Packages for which the UA is willing to receive INFO requests, the remote UA might, before it receives the message, send an INFO request based on the old set of Info Packages. In this case, the receiver of the INFO requests rejects, and sends a 469 (Bad Info Package) response to, the INFO request.

If a UA indicates multiple Info Packages that provide similar functionality, it is not possible to indicate a priority order of the Info Packages, or to indicate that the UA wishes to only receive INFO requests for one of the Info Packages. It is up to the application logic associated with the Info Packages, and particular Info Package specifications, to describe application behavior in such cases.

For backward compatibility purposes, even if a UA indicates support of the Info Package mechanism, it is still allowed to enable legacy INFO usages. In addition, if a UA indicates support of the INFO method using the Allow header field [RFC3261], it does not implicitly indicate support of the Info Package mechanism. A UA MUST use the Recv-Info header field in order to indicate that it supports the Info Package mechanism. Likewise, even if a UA uses the Recv-Info header field to indicate that it supports the Info Package mechanism, in addition the UA still indicates support of the INFO method using the Allow header.

This document does not define a SIP option-tag [RFC3261] for the Info Package mechanism. However, an Info Package specification can define an option-tag associated with the specific Info Package, as described in Section 10.6.

5.2.3. Recv-Info Header Field Rules

The text below defines rules on when a UA is required to include a Recv-Info header field in SIP messages. Section 7.1 lists the SIP methods for which a UA can insert a Recv-Info header field in requests and responses.

- The sender of an initial INVITE request MUST include a Recv-Info header field in the initial INVITE request, even if the sender is not willing to receive INFO requests associated with any Info Package.

- The receiver of a request that contains a Recv-Info header field MUST include a Recv-Info header field in a reliable 18x/2xx response to the request, even if the request contains an empty Recv-Info header field, and even if the header field value of the receiver has not changed since the previous time it sent a Recv-Info header field.

- A UA MUST NOT include a Recv-Info header field in a response if the associated request did not contain a Recv-Info header field.

  NOTE: In contrast to the rules for generating Session Description Protocol (SDP) answers [RFC3264], the receiver of a request is not restricted to generating its own set of Info Packages as a subset of the Info Package set received in the Info-Package header field of the request.

As with SDP answers, the receiver can include the same Recv-Info header field value in multiple responses (18x/2xx) for the same INVITE/re-INVITE transaction, but the receiver MUST use the same Recv-Info header field value (if included) in all responses for the same transaction.

5.2.4. Info Package Fallback Rules

If the receiver of a request that contains a Recv-Info header field rejects the request, both the sender and receiver of the request MUST roll back to the set of Info Packages that was used before the request was sent. This also applies to the case where the receiver of an INVITE/re-INVITE request has included a Recv-Info header field in a provisional response, but later rejects the request.

NOTE: The dialog state rollback rules for Info Packages might differ from the rules for other types of dialog state information (SDP, target, etc.).

5.3. REGISTER Processing

This document allows a UA to insert a Recv-Info header field in a REGISTER request. However, a UA SHALL NOT include a header value for a specific Info Package unless the particular Info Package specification describes how the header field value shall be interpreted and used by the registrar, e.g., in order to determine request targets.

Rather than using the Recv-Info header field in order to determine request targets, it is recommended to use more appropriate mechanisms, e.g., based on RFC 3840 [RFC3840]. However, this document does not define a feature tag for the Info Package mechanism, or a mechanism to define feature tags for specific Info Packages.

6. Formal INFO Method Definition

6.1. INFO Method

This document describes one new SIP method: INFO. This document replaces the definition and registrations found in RFC 2976 [RFC2976].

This table expands on Tables 2 and 3 in RFC 3261 [RFC3261].

Header field	where	INFO
Accept	R	o
Accept	415	o
Accept-Encoding	R	o
Accept-Encoding	2xx	o
Accept-Encoding	415	c
Accept-Language	R	o
Accept-Language	2xx	o
Accept-Language	415	o
Accept-Resource-Priority	2xx,417	o
Alert-Info		-
Allow	R	o
Allow	405	m
Allow	r	o
Authentication-Info	2xx	o
Authorization	R	o
Call-ID	c	m
Call-Info		o
Contact		-
Content-Disposition		o
Content-Encoding		o
Content-Language		o
Content-Length		o
Content-Type		*
CSeq	c	m
Date		o
Error-Info	3xx-6xx	o
Expires		-
From	c	m
Geolocation	R	o

Geolocation-Error	r	o	
Max-Breadth	R	-	
Max-Forwards	R	o	
MIME-Version		o	
Min-Expires		-	
Organization		-	
Priority	R	-	
Privacy		o	
Proxy-Authenticate	401	o	
Proxy-Authenticate	407	m	
Proxy-Authorization	R	o	
Proxy-Require	R	o	
Reason	R	o	
Record-Route	R	o	
Record-Route	2xx,18x	o	
Referred-By	R	o	
Request-Disposition	R	o	
Require		o	
Resource-Priority		o	
Retry-After	R	-	
Retry-After	404,413,480,486	o	
Retry-After	500,503	o	
Retry-After	600,603	o	
Route	R	o	
Security-Client	R	o	
Security-Server	421,494	o	
Security-Verify	R	o	
Server	r	o	
Subject	R	o	
Supported	R	o	
Supported	2xx	o	
Timestamp		o	
To	c	m	(w/ Tag)
Unsupported	420	o	
User-Agent		o	
Via		m	
Warning	r	o	
WWW-Authenticate	401	m	
WWW-Authenticate	407	o	

Table 1: Summary of Header Fields

7. INFO Header Fields

7.1. General

This table expands on Tables 2 and 3 in RFC 3261 [RFC3261].

Header field	where	proxy	ACK	BYE	CAN	INV	OPT	REG	PRA	INF	MSG	UPD
Info-Package	R		-	-	-	-	-	-	-	m*	-	-
Recv-Info	R		-	-	-	m	-	o	o	-	-	o
Recv-Info	2xx		-	-	-	o**	-	-	o***	-	-	o***
Recv-Info	1xx		-	-	-	o**	-	-	-	-	-	-
Recv-Info	469		-	-	-	-	-	-	-	m*	-	-
Recv-Info	r		-	-	-	o	-	-	o	-	-	o

Header field	where	SUB	NOT	RFR
Info-Package	R	-	-	-
Recv-Info	R	-	-	-
Recv-Info	2xx	-	-	-
Recv-Info	1xx	-	-	-
Recv-Info	469	-	-	-
Recv-Info	r	-	-	-

Table 2: INFO-Related Header Fields

The support and usage of the Info-Package and Recv-Info header fields are not applicable to UAs that only support legacy INFO usages.

* Not applicable to INFO requests and responses associated with legacy INFO usages.

** Mandatory in at least one reliable 18x/2xx response, if sent, to the INVITE request, if the associated INVITE request contained a Recv-Info header field.

*** Mandatory if the associated request contained a Recv-Info header field.

As defined in Section 20 of RFC 3261, a "mandatory" header field MUST be present in a request, and MUST be understood by the UAS receiving the request.

7.2. Info-Package Header Field

This document adds "Info-Package" to the definition of the element "message-header" in the SIP message grammar [RFC3261]. Section 4 describes the Info-Package header field usage.

For the purposes of matching Info Package types indicated in Recv-Info with those in the Info-Package header field value, one compares the Info-package-name portion of the Info-package-type portion of the Info-Package header field octet by octet with that of the Recv-Info header field value. That is, the Info Package name is case sensitive. Info-package-param is not part of the comparison-checking algorithm.

This document does not define values for Info-Package types. Individual Info Package specifications define these values.

7.3. Recv-Info Header Field

This document adds Recv-Info to the definition of the element "message-header" in the SIP message grammar [RFC3261]. Section 5 describes the Recv-Info header field usage.

8. Info Package Considerations

8.1. General

This section covers considerations to take into account when deciding whether the usage of an Info Package is appropriate for transporting application information for a specific use-case.

8.2. Appropriateness of Info Package Usage

When designing an Info Package, for application level information exchange, it is important to consider: is signaling, using INFO requests, within a SIP dialog, an appropriate mechanism for the use-case? Is it because it is the most reasonable and appropriate choice, or merely because "it’s easy"? Choosing an inappropriate mechanism for a specific use-case can cause negative effects in SIP networks where the mechanism is used.

8.3. INFO Request Rate and Volume

INFO messages differ from many other sorts of SIP messages in that they carry application information, and the size and rate of INFO messages are directly determined by the application. This can cause application information traffic to interfere with other traffic on that infrastructure, or to self-interfere when data rates become too high.

There is no default throttling mechanism for INFO requests. Apart from the SIP session establishment, the number of SIP messages exchanged during the lifetime of a normal SIP session is rather small.

Some applications, like those sending Dual-Tone Multi-Frequency (DTMF) tones, can generate a burst of up to 20 messages per second. Other applications, like constant GPS location updates, could generate a high rate of INFO requests during the lifetime of the invite dialog usage.

A designer of an Info Package, and the application that uses it, need to consider the impact that the size and the rate of the INFO messages have on the network and on other traffic, since it normally cannot be ensured that INFO messages will be carried over a congestion-controlled transport protocol end-to-end. Even if an INFO message is sent over such a transport protocol, a downstream SIP entity might forward the message over a transport protocol that does not provide congestion control.

Furthermore, SIP messages tend to be relatively small, on the order of 500 Bytes to 32K Bytes. SIP is a poor mechanism for direct exchange of bulk data beyond these limits, especially if the headers plus body exceed the User Datagram Protocol (UDP) MTU [RFC0768]. Appropriate mechanisms for such traffic include the Hypertext Transfer Protocol (HTTP) [RFC2616], the Message Session Relay Protocol (MSRP) [RFC4975], or other media plane data transport mechanisms.

RFC 5405 [RFC5405] provides additional guidelines for applications using UDP that may be useful background reading.

8.4. Alternative Mechanisms

8.4.1. Alternative SIP Signaling Plane Mechanisms

8.4.1.1. General

This subsection describes some alternative mechanisms for transporting application information on the SIP signaling plane, using SIP messages.

8.4.1.2. SUBSCRIBE/NOTIFY

An alternative for application level interaction is to use subscription-based events [RFC3265] that use the SIP SUBSCRIBE and NOTIFY methods. Using that mechanism, a UA requests state information, such as keypad presses from a device to an application server, or key-map images from an application server to a device.

Event Packages [RFC3265] perform the role of disambiguating the context of a message for subscription-based events. The Info Package mechanism provides similar functionality for application information exchange using invite dialog usages [RFC5057].

While an INFO request is always part of, and shares the fate of, an existing invite dialog usage, a SUBSCRIBE request creates a separate dialog usage [RFC5057], and is normally sent outside an existing dialog usage.

The subscription-based mechanism can be used by SIP entities to receive state information about SIP dialogs and sessions, without requiring the entities to be part of the route set of those dialogs and sessions.

As SUBSCRIBE/NOTIFY messages traverse through stateful SIP proxies and back-to-back user agents (B2BUAs), the resource impact caused by the subscription dialogs needs to be considered. The number of subscription dialogs per user also needs to be considered.

As for any other SIP-signaling-plane-based mechanism for transporting application information, the SUBSCRIBE/NOTIFY messages can put a significant burden on intermediate SIP entities that are part of the dialog route set, but do not have any interest in the application information transported between the end users.

8.4.1.3. MESSAGE

The MESSAGE method [RFC3428] defines one-time instant message exchange, typically for sending MIME contents for rendering to the user.

8.4.2. Media Plane Mechanisms

8.4.2.1. General

In SIP, media plane channels associated with SIP dialogs are established using SIP signaling, but the data exchanged on the media plane channel does not traverse SIP signaling intermediates, so if there will be a lot of information exchanged, and there is no need for the SIP signaling intermediaries to examine the information, it is recommended to use a media plane mechanism, rather than a SIP-signaling-based mechanism.

A low-latency requirement for the exchange of information is one strong indicator for using a media channel. Exchanging information through the SIP routing network can introduce hundreds of milliseconds of latency.

8.4.2.2. MRCP

One mechanism for media plane exchange of application data is the Media Resource Control Protocol (MRCP) [SPEECHSC-MRCPv2], where a media plane connection-oriented channel, such as a Transmission Control Protocol (TCP) [RFC0793] or Stream Control Transmission Protocol (SCTP) [RFC4960] stream is established.

8.4.2.3. MSRP

MSRP [RFC4975] defines session-based instant messaging as well as bulk file transfer and other such large-volume uses.

8.4.3. Non-SIP-Related Mechanisms

Another alternative is to use a SIP-independent mechanism, such as HTTP [RFC2616]. In this model, the UA knows about a rendezvous point to which it can direct HTTP requests for the transfer of information. Examples include encoding of a prompt to retrieve in the SIP Request URI [RFC4240] or the encoding of a SUBMIT target in a VoiceXML [W3C.REC-voicexml21-20070619] script.

9. Syntax

9.1. General

This section describes the syntax extensions to the ABNF syntax defined in RFC 3261 required for the INFO method, and adds definitions for the Info-Package and Recv-Info header fields. The previous sections describe the semantics. The ABNF defined in this specification is conformant to RFC 5234 [RFC5234].

9.2. ABNF

```
INFOm               = %x49.4E.46.4F ; INFO in caps
Method              =/ INFOm

message-header      =/ (Info-Package / Recv-Info) CRLF
Info-Package        =  "Info-Package" HCOLON Info-package-type
Recv-Info           =  "Recv-Info" HCOLON [Info-package-list]
Info-package-list   =  Info-package-type *( COMMA Info-package-type )
Info-package-type   =  Info-package-name *( SEMI Info-package-param )
Info-package-name   =  token
Info-package-param  =  generic-param
```

10. Info Package Requirements

10.1. General

This section provides guidance on how to define an Info Package, and what information needs to exist in an Info Package specification.

If, for an Info Package, there is a need to extend or modify the behavior described in this document, that behavior MUST be described in the Info Package specification. It is bad practice for Info Package specifications to repeat procedures defined in this document, unless needed for purposes of clarification or emphasis.

Info Package specifications MUST NOT weaken any behavior designated with "SHOULD" or "MUST" in this specification. However, Info Package specifications MAY strengthen "SHOULD", "MAY", or "RECOMMENDED" requirements to "MUST" if applications associated with the Info Package require it.

Info Package specifications MUST address the issues defined in the following subsections, or document why an issue is not applicable to the specific Info Package.

Section 8.4 describes alternative mechanisms, which should be considered as part of the process for solving a specific use-case, when there is a need for transporting application information.

10.2. Overall Description

The Info Package specification MUST contain an overall description of the Info Package: what type of information is carried in INFO requests associated with the Info Package, and for what types of applications and functionalities UAs can use the Info Package.

If the Info Package is defined for a specific application, the Info Package specification MUST state which application UAs can use the Info Package with.

10.3. Applicability

The Info Package specification MUST describe why the Info Package mechanism, rather than some other mechanism, has been chosen for the specific use-case to transfer application information between SIP endpoints. Common reasons can be a requirement for SIP proxies or

back-to-back user agents (B2BUAs) to see the transported application information (which would not be the case if the information was transported on a media path), or that it is not seen as feasible to establish separate dialogs (subscription) in order to transport the information.

Section 8 provides more information and describes alternative mechanisms that one should consider for solving a specific use-case.

10.4. Info Package Name

The Info Package specification MUST define an Info Package name, which UAs use as a header field value (e.g., "infoX") to identify the Info Package in the Recv-Info and Info-Package header fields. The header field value MUST conform to the ABNF defined in Section 9.2.

The Info Package mechanism does not support package versioning. Specific Info Package message body payloads can contain version information, which is handled by the applications associated with the Info Package. However, such a feature is outside the scope of the generic Info Package mechanism.

> NOTE: Even if an Info Package name contains version numbering (e.g., foo_v2), the Info Package mechanism does not distinguish a version number from the rest of the Info Package name.

10.5. Info Package Parameters

The Info Package specification MAY define Info Package parameters, which can be used in the Recv-Info or Info-Package header fields, together with the header field value that indicates the Info Package name (see Section 10.4).

The Info Package specification MUST define the syntax and semantics of the defined parameters. In addition, the specification MUST define whether a specific parameter is applicable to only the Recv-Info header field, only the Info-Package header field, or to both.

By default, an Info Package parameter is only applicable to the Info Package for which the parameter has been explicitly defined.

Info Package parameters defined for specific Info Packages can share the name with parameters defined for other Info Packages, but the parameter semantics are specific to the Info Package for which they are defined. However, when choosing the name of a parameter, it is RECOMMENDED to not use the same name as an existing parameter for another Info Package, if the semantics of the parameters are different.

10.6. SIP Option-Tags

The Info Package specification MAY define SIP option-tags, which can be used as described in RFC 3261.

The registration requirements for option-tags are defined in RFC 5727 [RFC5727].

10.7. INFO Message Body Parts

The Info Package specification MUST define which message body part MIME types are associated with the Info Package. The specification MUST either define those body parts, including the syntax, semantics, and MIME type of each body part, or refer to other documents that define the body parts.

If multiple message body part MIME types are associated with an Info Package, the Info Package specification MUST define whether UAs need to use multipart body parts, in order to include multiple body parts in a single INFO request.

10.8. Info Package Usage Restrictions

If there are restrictions on how UAs can use an Info Package, the Info Package specification MUST document such restrictions.

There can be restrictions related to whether UAs are allowed to send overlapping (outstanding) INFO requests associated with the Info Package, or whether the UA has to wait for the response for a previous INFO request associated with the same Info Package.

There can also be restrictions related to whether UAs need to support and use other SIP extensions and capabilities when they use the Info Package, and if there are restrictions related to how UAs can use the Info Package together with other Info Packages.

As the SIP stack might not be aware of Info Package specific restrictions, it cannot be assumed that overlapping requests would be rejected. As defined in Section 4.2.2, UAs will normally send a 200 (OK) response to an INFO request. The application logic associated with the Info Package needs to handle situations where UAs do not follow restrictions associated with the Info Package.

10.9. Rate of INFO Requests

If there is a maximum or minimum rate at which UAs can send INFO requests associated with the Info Package within a dialog, the Info Package specification MUST document the rate values.

If the rates can vary, the Info Package specification MAY define Info Package parameters that UAs can use to indicate or negotiate the rates. Alternatively, the rate information can be part of the application data information associated with the Info Package.

10.10. Info Package Security Considerations

If the application information carried in INFO requests associated with the Info Package requires a certain level of security, the Info Package specification MUST describe the mechanisms that UAs need to use in order to provide the required security.

If the Info Package specification does not require any additional security, other than what the underlying SIP protocol provides, this MUST be stated in the Info Package specification.

> NOTE: In some cases, it may not be sufficient to mandate Transport Layer Security (TLS) [RFC5246] in order to secure the Info Package payload, since intermediaries will have access to the payload, and because beyond the first hop, there is no way to assure subsequent hops will not forward the payload in clear text. The best way to ensure secure transport at the application level is to have the security at the application level. One way of achieving this is to use end-to-end security techniques such as Secure/Multipurpose Internet Mail Extensions (S/MIME) [RFC5751].

10.11. Implementation Details

It is strongly RECOMMENDED that the Info Package specification define the procedure regarding how implementors shall implement and use the Info Package, or refer to other locations where implementors can find that information.

NOTE: Sometimes an Info Package designer might choose to not reveal the details of an Info Package. However, in order to allow multiple implementations to support the Info Package, Info Package designers are strongly encouraged to provide the implementation details.

10.12. Examples

It is RECOMMENDED that the Info Package specification provide demonstrative message flow diagrams, paired with complete messages and message descriptions.

Note that example flows are by definition informative, and do not replace normative text.

11. IANA Considerations

11.1. Update to Registration of SIP INFO Method

IANA updated the existing registration in the "Methods and Response Codes" registry under "Session Initiation Protocol (SIP) Parameters" from:

Method: INFO
Reference: [RFC2976]

to:

Method: INFO
Reference: [RFC6086]

11.2. Registration of the Info-Package Header Field

IANA added the following new SIP header field in the "Header Fields" registry under "Session Initiation Protocol (SIP) Parameters".

Header Name: Info-Package
Compact Form: (none)
Reference: [RFC6086]

11.3. Registration of the Recv-Info Header Field

IANA added the following new SIP header field in the "Header Fields" registry under "Session Initiation Protocol (SIP) Parameters".

Header Name: Recv-Info
Compact Form: (none)
Reference: [RFC6086]

11.4. Creation of the Info Packages Registry

IANA created the following registry under "Session Initiation Protocol (SIP) Parameters":

Info Packages

Note to the reviewer:

The policy for review of Info Packages is "Specification Required", as defined in [RFC5226]. This policy was selected because Info Packages re-use an existing mechanism for transport of arbitrary session-associated data within SIP; therefore, new Info Packages do not require the more extensive review required by specifications that make fundamental protocol changes. However, the reviewer is expected to verify that each Info Package registration is in fact consistent with this definition. Changes to the SIP protocol and state machine are outside of the allowable scope for an Info Package and are governed by other procedures including RFC 5727 and its successors, if any.

The following data elements populate the Info Packages Registry.

- Info Package Name: The Info Package Name is a case-sensitive token. In addition, IANA shall not register multiple Info Package names that have identical case-insensitive values.

- Reference: A reference to a specification that describes the Info Package.

The initial population of this table shall be:

Name	Reference

11.5. Registration of the Info-Package Content-Disposition

IANA added the following new header field value to the "Mail Content Disposition Values" registry under "Mail Content Disposition Values and Parameters".

Name: info-package
Description: The body contains information associated with an Info Package
Reference: RFC6086

11.6. SIP Response Code 469 Registration

IANA registered the following new response code in the "Session Initiation Protocol (SIP) Parameters" -- "Response Codes" registry.

Response Code: 469
Default Reason Phrase: Bad Info Package
Reference: RFC6086

12. Examples

12.1. Indication of Willingness to Receive INFO Requests for Info Packages

12.1.1. Initial INVITE Request

The UAC sends an initial INVITE request, where the UAC indicates that it is willing to receive INFO requests for Info Packages P and R.

```
INVITE sip:bob@example.com SIP/2.0
Via: SIP/2.0/TCP pc33.example.com;branch=z9hG4bK776
Max-Forwards: 70
To: Bob <sip:bob@example.com>
From: Alice <sip:alice@example.com>;tag=1928301774
Call-ID: a84b4c76e66710@pc33.example.com
CSeq: 314159 INVITE
Recv-Info: P, R
Contact: <sip:alice@pc33.example.com>
Content-Type: application/sdp
Content-Length: ...

...
```

The UAS sends a 200 (OK) response back to the UAC, where the UAS indicates that it is willing to receive INFO requests for Info Packages R and T.

```
SIP/2.0 200 OK
Via: SIP/2.0/TCP pc33.example.com;branch=z9hG4bK776;
     received=192.0.2.1
To: Bob <sip:bob@example.com>;tag=a6c85cf
From: Alice <sip:alice@example.com>;tag=1928301774
Call-ID: a84b4c76e66710@pc33.example.com
CSeq: 314159 INVITE
Contact: <sip:bob@pc33.example.com>
Recv-Info: R, T
Content-Type: application/sdp
Content-Length: ...

...
```

The UAC sends an ACK request.

```
ACK sip:bob@pc33.example.com SIP/2.0
Via: SIP/2.0/TCP pc33.example.com;branch=z9hG4bK754
Max-Forwards: 70
To: Bob <sip:bob@example.com>;tag=a6c85cf
From: Alice <sip:alice@example.com>;tag=1928301774
Call-ID: a84b4c76e66710@pc33.example.com
CSeq: 314159 ACK
Content-Length: 0
```

12.1.2. Target Refresh

The UAC sends an UPDATE request within the invite dialog usage, where the UAC indicates (using an empty Recv-Info header field) that it is not willing to receive INFO requests for any Info Packages.

```
UPDATE sip:bob@pc33.example.com SIP/2.0
Via: SIP/2.0/TCP pc33.example.com;branch=z9hG4bK776
Max-Forwards: 70
To: Bob <sip:bob@example.com>;tag=a6c85cf
From: Alice <sip:alice@example.com>;tag=1928301774
Call-ID: a84b4c76e66710@pc33.example.com
CSeq: 314163 UPDATE
Recv-Info:
Contact: <sip:alice@pc33.example.com>
Content-Type: application/sdp
Content-Length: ...

...
```

The UAS sends a 200 (OK) response back to the UAC, where the UAS indicates that it is willing to receive INFO requests for Info Packages R and T.

```
SIP/2.0 200 OK
Via: SIP/2.0/TCP pc33.example.com;branch=z9hG4bK893;
     received=192.0.2.1
To: Bob <sip:bob@example.com>;tag=a6c85cf
From: Alice <sip:alice@example.com>;tag=1928301774
Call-ID: a84b4c76e66710@pc33.example.com
CSeq: 314163 INVITE
Contact: <sip:alice@pc33.example.com>
Recv-Info: R, T
Content-Type: application/sdp
Content-Length: ...

...
```

12.2. INFO Request Associated with Info Package

12.2.1. Single Payload

The UA sends an INFO request associated with Info Package "foo".

```
INFO sip:alice@pc33.example.com SIP/2.0
Via: SIP/2.0/UDP 192.0.2.2:5060;branch=z9hG4bKnabcdef
To: Bob <sip:bob@example.com>;tag=a6c85cf
From: Alice <sip:alice@example.com>;tag=1928301774
Call-Id: a84b4c76e66710@pc33.example.com
CSeq: 314333 INFO
Info-Package: foo
Content-type: application/foo
Content-Disposition: Info-Package
Content-length: 24

I am a foo message type
```

12.2.2. Multipart INFO

12.2.2.1. Non-Info Package Body Part

SIP extensions can sometimes add body part payloads into an INFO request, independent of the Info Package. In this case, the Info Package payload gets put into a multipart MIME body, with a Content-Disposition header field that indicates which body part is associated with the Info Package.

```
INFO sip:alice@pc33.example.com SIP/2.0
Via: SIP/2.0/UDP 192.0.2.2:5060;branch=z9hG4bKnabcdef
To: Alice <sip:alice@example.net>;tag=1234567
From: Bob <sip:bob@example.com>;tag=abcdefg
Call-Id: a84b4c76e66710@pc33.example.com
CSeq: 314400 INFO
Info-Package: foo
Content-Type: multipart/mixed;boundary="theboundary"
Content-Length: ...

--theboundary
Content-Type: application/mumble
...

<mumble stuff>

--theboundary
Content-Type: application/foo-x
Content-Disposition: Info-Package
Content-length: 59

I am a foo-x message type, and I belong to Info Package foo
--theboundary--
```

12.2.2.2. Info Package with Multiple Body Parts inside Multipart Body Part

Multiple body part payloads can be associated with a single Info Package. In this case, the body parts are put into a multipart MIME body, with a Content-Disposition header field that indicates which body part is associated with the Info Package.

```
INFO sip:alice@pc33.example.com SIP/2.0
Via: SIP/2.0/UDP 192.0.2.2:5060;branch=z9hG4bKnabcdef
To: Alice <sip:alice@example.net>;tag=1234567
From: Bob <sip:bob@example.com>;tag=abcdefg
Call-Id: a84b4c76e66710@pc33.example.com
CSeq: 314423 INFO
Info-Package: foo
Content-Type: multipart/mixed;boundary="theboundary"
Content-Disposition: Info-Package
Content-Length: ...

--theboundary
Content-Type: application/foo-x
Content-length: 59
```

```
I am a foo-x message type, and I belong to Info Package foo

<mumble stuff>

--theboundary
Content-Type: application/foo-y
Content-length: 59

I am a foo-y message type, and I belong to Info Package foo
--theboundary--
```

12.2.2.3. Info Package with Single Body Part inside Multipart Body Part

The body part payload associated with the Info Package can have a Content-Disposition header field value other than "Info-Package". In this case, the body part is put into a multipart MIME body, with a Content-Disposition header field that indicates which body part is associated with the Info Package.

```
INFO sip:alice@pc33.example.com SIP/2.0
Via: SIP/2.0/UDP 192.0.2.2:5060;branch=z9hG4bKnabcdef
To: Alice <sip:alice@example.net>;tag=1234567
From: Bob <sip:bob@example.com>;tag=abcdefg
Call-Id: a84b4c76e66710@pc33.example.com
CSeq: 314423 INFO
Info-Package: foo
Content-Type: multipart/mixed;boundary="theboundary"
Content-Disposition: Info-Package
Content-Length: ...

--theboundary
Content-Type: application/foo-x
Content-Disposition: icon
Content-length: 59

I am a foo-x message type, and I belong to Info Package foo
--theboundary--
```

13. Security Considerations

By eliminating multiple usages of INFO messages without adequate community review, and by eliminating the possibility of rogue SIP UAs confusing another UA by purposely sending unrelated INFO requests, we expect this document’s clarification of the use of INFO to improve the security of the Internet. While rogue UAs can still send unrelated INFO requests, this mechanism enables the UAS and other security devices to associate INFO requests with Info Packages that have been negotiated for a session.

If the content of the Info Package payload is private, UAs will need to use end-to-end encryption, such as S/MIME, to prevent access to the content. This is particularly important, as transport of INFO is likely not to be end-to-end, but through SIP proxies and back-to-back user agents (B2BUAs), which the user may not trust.

The INFO request transports application level information. One implication of this is that INFO messages may require a higher level of protection than the underlying SIP dialog signaling. In particular, if one does not protect the SIP signaling from eavesdropping or authentication and repudiation attacks, for example by using TLS transport, then the INFO request and its contents will be vulnerable as well. Even with SIP/TLS, any SIP hop along the path from UAC to UAS can view, modify, or intercept INFO requests, as they can with any SIP request. This means some applications may require end-to-end encryption of the INFO payload, beyond, for example, hop-by-hop protection of the SIP signaling itself. Since the application dictates the level of security required, individual Info Packages have to enumerate these requirements. In any event, the Info Package mechanism described by this document provides the tools for such secure, end-to-end transport of application data.

One interesting property of Info Package usage is that one can re-use the same digest-challenge mechanism used for INVITE-based authentication for the INFO request. For example, one could use a quality-of-protection (qop) value of authentication with integrity (auth-int), to challenge the request and its body, and prevent intermediate devices from modifying the body. However, this assumes the device that knows the credentials in order to perform the INVITE challenge is still in the path for the INFO request, or that the far-end UAS knows such credentials.

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Appendix A. Acknowledgements

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