

Prepared (also subject responsible if other) ETXDAKN		No. 3/155 19-CRH 109 776/1 Uen		
Approved EAB/UPM/A [Staffan Pernler]	Checked	Date 2006-03-28	Rev B	Reference

## ISC Interface Interwork Description

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## 1 General information

### 1.1 Document history

Revision	Date	Author	Comments
A	2005-11-02	etxdakn	Approved
B	2006-03-28	etxdakn	Approved

### 1.2 Purpose

The purpose with this document is to describe the interface between the S-CSCF and the Application Server (AS). This interface is called the IP multimedia Subsystem Service Control Interface (ISC) in 3GPP.

This document specifies the SIP signaling flows between the S-CSCF and the AS that can be used to provide value added services.

### 1.3 Scope

The service logic of the value added services is not the subject of this document.

The change requests cript00011233 AS initiated call on behalf of B user, and cript00011234 New session type - originating unregistered, are not considered in this document.

### 1.4 Terminology

#### 1.4.1 Definitions.

Initial request	A SIP request that is either sent outside of any existing SIP dialog as defined by [1]. This includes requests that establish a new dialogue such as INVITE.
Subsequent request	A SIP request that is sent within an existing SIP dialog as defined by [1]. A BYE request for an existing session is an example of a subsequent request.
Stand alone request	A SIP request as defined by [1]. That don't establish a new dialogue such as OPTIONS.

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### 1.4.2 Abbreviations

B2BUA	Back-to-Back User Agent
ISC	IP multimedia Subsystem Service Control Interface
UAS	User Agent Server
UAC	User Agent Client

## 1.5 Introduction

In the 3GPP network architecture, the S-CSCF is responsible for checking the service triggering criteria set for a user and routing SIP requests to AS's if the criteria are met. The AS provides a platform for value added services to execute.

The interactions between the S-CSCF and the AS can be modeled into several cases:

- AS acting as a SIP UAC
- AS acting as a SIP UAS
- AS acting as a SIP proxy
- AS acting as a B2BUA

The following figures have been taken from [3] and describe these high level interactions. In these figures the "SIP leg" is equivalent with SIP dialog from [1] and is sometimes referred to as call leg.

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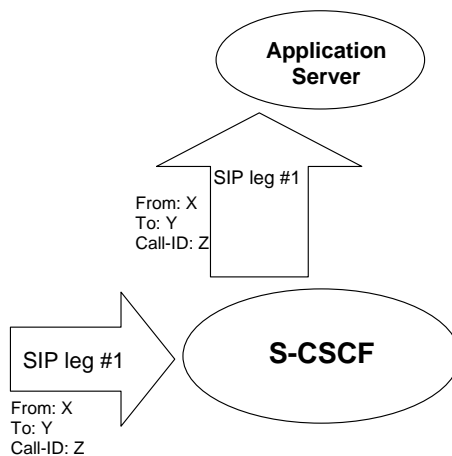


Figure 1 - AS acting as a SIP UAS

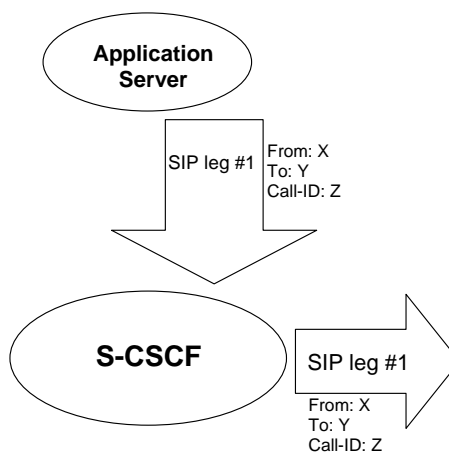


Figure 2 - AS acting as a SIP UAC

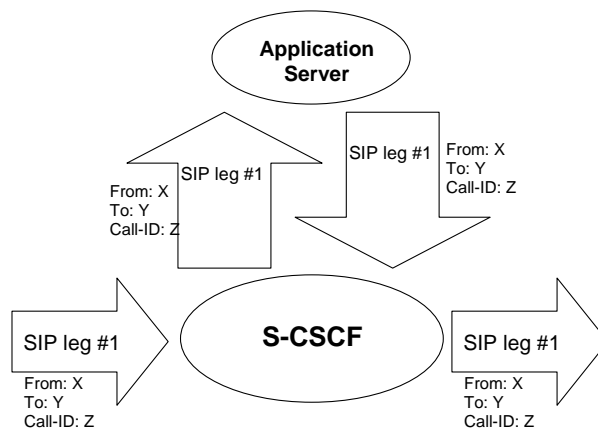


Figure 3 - AS acting as a SIP proxy

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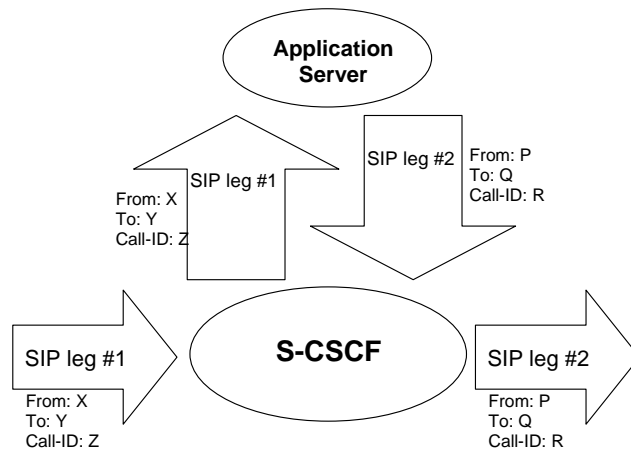


Figure 4 – AS acting as a B2BUA

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## 1.6 Document Structure

The document is structured in the following way:

Section 2 “General procedures” defines the common procedures and general principals applicable for several procedures within this document. Procedures in other sections typically refer to these common procedures in order to avoid the repetition of normative text.

Section 3 “Initial Request Procedures” defines the procedures when an initial request is either sent from the S-CSCF to the AS, or when an initial request is sent from the AS to the S-CSCF.

Section 4 “Subsequent Request Procedures” defines the procedures when a subsequent request within a SIP dialog is either sent from the S-CSCF to the AS, or when a subsequent request is sent from the AS to the S-CSCF. These procedures are independent of how the dialog was established.

Section 5 “Multiple AS support” defines the procedures for the invocation of services on multiple AS's for the same request.

Section 6 “AS Fail-over Support” defines the procedures at the S-CSCF that provide support for network redundant AS's. These procedures do not preclude other high availability strategies to be used by the AS.

Section 7 “AS Session case determination” defines three procedures the AS can use to determine the session case for the service invocation.

Section 8 “Security Considerations” describes the security considerations of the ISC interface.

## 2 General procedures

This section describes the common procedures at the S-CSCF and AS applicable for the various interactions between the S-CSCF and the AS.

### 2.1 Service Triggering principal

The service triggering in the S-CSCF relies on the service trigger data downloaded from the HSS in the user's profile. The behavior of the S-CSCF for the evaluation of the trigger criteria for a request depends on if it is the initial evaluation for a request or if it is a subsequent evaluation.

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### 2.1.1 Service Trigger data

The service triggers consist of service point triggers that define the conditions that determine if the request matches, and service trigger routing data that is used when the criteria are met, as defined in [8].

Service trigger data:

- Priority: defines the order in which triggers are evaluated.
- Session case: originating, terminating, terminating-unregistered.
- SIP method: Any method.
- Request-URI content: A regular expression.
- SIP header:
  - SIP header name: SIP header name defining the name of a header that must be present in the request
  - SIP header content: (optional) extended regular expression defining match for the value of any SIP header of the specified name.

Service trigger routing data:

- Application server name: SIP URI defines where the request is sent. This SIP URI must contain the lr-parameter, the application server must behave as SIP “loose” router as defined in [1].

The following service point triggers are grouped and linked by Boolean operators AND or OR, and each trigger criteria can be negated.

- Request URI
- SIP Method
- SIP Header
- Session Case

### 2.1.2 Service trigger evaluation order

#### 2.1.2.1 Initial service trigger evaluation

For a given initial request the highest priority trigger is evaluated first. If the criteria are met, the request is routed to the AS in the Application server name field. If the criteria are not met, the trigger with the next highest priority is evaluated. This process is repeated until there is either a match or there are no more triggers to evaluate.



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### 2.1.2.2 Subsequent service trigger evaluation

After performing initial service triggering evaluation, finding a trigger that matches the criteria and routing a request to the AS, if the AS routes a request back to the S-CSCF (either acting as a proxy or as a B2BUA), the S-CSCF inspects the request.

#### For originating session case:

The S-CSCF checks if the request contains the Route header the S-CSCF inserted before the request was sent to the AS. For subsequent service triggering, the Route header inserted by S-CSCF in the SIP request sent to AS and which was pointing back to S-CSCF, must be present in the message.

#### For the terminating and terminating unregistered session cases:

If the AS has changed the Request-URI of the request, or has added additional Route headers to the request, no additional triggers are evaluated. The request is routed based on the contents of the request.

If the AS has included the Route header added by the S-CSCF when the previous request was sent to the AS, trigger evaluation continues. The S-CSCF uses state information stored in the user portion of the Route header to continue trigger evaluation with the next highest priority trigger condition. This allows an AS acting as a B2BUA to have the S-CSCF behave as if the AS was acting as a proxy.

For subsequent service triggering, the Route header inserted by S-CSCF in the SIP request sent to AS and which was pointing back to S-CSCF must be present in the message.

## 2.2 SIP Routing principal

The S-CSCF and AS follow the provisions for SIP routing specified in [1] and [2] with the clarifications provided in this section.

The S-CSCF and AS is behaving as SIP “loose” routers as defined in [1].

## 2.3 Initial requests from S-CSCF to AS

When the triggering criteria are met, and an initial request is sent to the AS, the S-CSCF routes the request to the AS. This routing is done by using the address of the AS (AS SIP URI) received in the trigger data.

- 1 The S-CSCF adds a Route header to the request with the interface of the S-CSCF the request must be proxied to in the form of a SIP URI. This URI may contain tokens in the user portion. This Route header may also be used to route requests to the S-CSCF when the AS is acting as a B2BUA.

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- 2 If the AS SIP URI has the “lr” parameter defined in [1], the SIP URI is added as the top Route header in the request. If the AS SIP URI does not have the “lr” parameter, the S-CSCF aborts service triggering and generates an error response.
- 3 The S-CSCF will also add a Record-Route header containing an interface of the S-CSCF. This is to be used for subsequent requests within the dialog created by the following SIP methods:
  - INVITE
  - SUBSCRIBE (For SUBSCRIBE this is configurable)

The address and transport used to route to the AS is determined by using the process defined in [2] for locating where to send a SIP request based on the AS SIP URI.

The MSISDN should be provisioned in the HSS. HSS will include it as a parameter in the AS URI when sending the user profile to SCSCF.

One example URI can look like :

`sip:applicationserver.ericsson.com;msisdn=+123456789`

## 2.4 Subsequent requests from S-CSCF to AS

The trigger data is only checked during the processing of the initial request. The S-CSCF routes all subsequent requests based on the Route set established by the initial request as defined in [1].

## 2.5 Response routing

The responses follow the path established by the Via headers added during the processing of the request as specified in [1].

## 2.6 Initial requests sent from AS to S-CSCF

### 2.6.1 AS authorization

When an initial request is received from the AS, the source IP address is compared against a list of authorized UAC AS addresses in the S-CSCF. If the address of the AS is not in the list, a 403 (Forbidden) is returned to the AS. If the address of the AS is in the list, then processing continues.

## 2.7 S-CSCF discovery

This section describes the cases when the AS needs to determine the address of the S-CSCF to use for routing.

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### 2.7.1 AS acting as a UAC / B2B UA

When the AS needs to send an initial request to the S-CSCF, it needs to determine the address of the S-CSCF to be used. This address can be obtained from:

- 1 Configuration data in the AS or service logic. When the AS is acting UAC.
- 2 If the AS is acting B2B UA the address to the S-CSCF can be obtained from the hostname in the Route header added by the S-CSCF if the as wants to stop trigger evaluation. If trigger evaluation should continue the AS should use the entire SIP URI from the second Route Header.

### 2.7.2 AS acting as a UAS

The AS uses the address received in the top Via header in the request, to route the response to the S-CSCF.

### 2.7.3 AS acting as a Proxy

The AS uses the address located in the second Route header in the request, to proxy the request to the S-CSCF. This address or port may be different from the address or port the request was sent from by the S-CSCF. The first Route header is the address of the AS.

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### 3 Initial Request Procedures

#### 3.1 Registration

The triggering on the REGISTER request is handled in a different way compared to other non-INVITE requests, see reference [6], [8].

If the REGISTER request from the user matches a trigger, the S-CSCF performs a third party registration to the application servers which are interested to be informed about the user registration event of this public user identity.

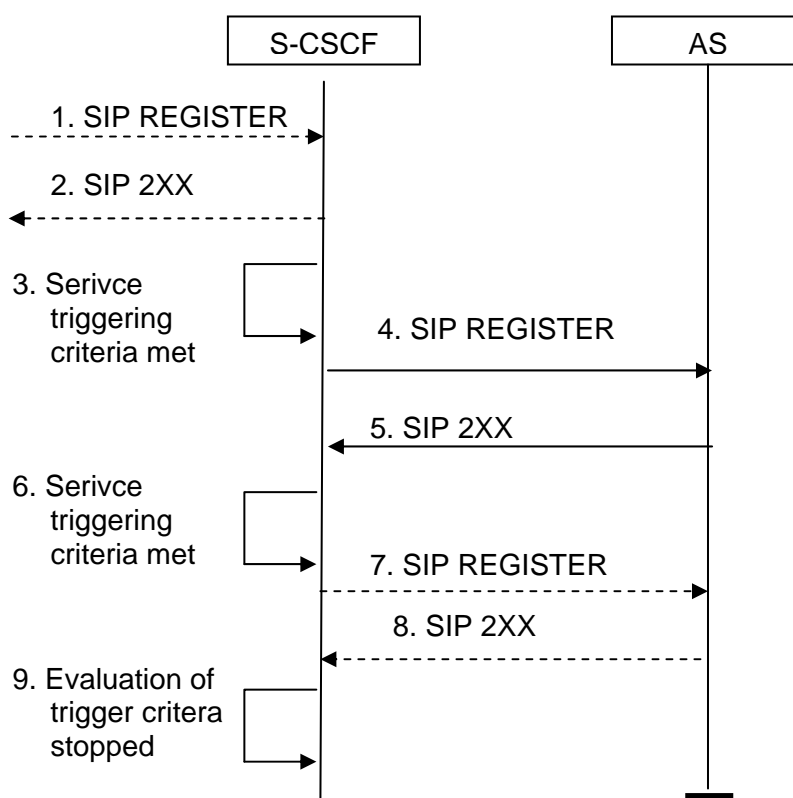


Figure 5 - Third-party registration.

- 1 When a REGISTER request is received the S-CSCF performs normal REGISTER handling.

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- 2 If the registration was successful the S-CSCF responds with a 200 OK.
- 3 If the registration is successful, the service triggering criteria are checked.
- 4 If the service triggering criteria are satisfied, the S-CSCF follows the procedure defined in section 2.3 to route a new REGISTER request to the AS. The new REGISTER request has a new Call-ID, From, Contact and Request-URI compared to the initial REGISTER received. The Contact is based on local S-CSCF configuration. The information in the Contact header will either be the S-CSCF address or the contact address of the UE.
- 5 The AS sends a final response.
- 6 The S-CSCF receives a final response and continues the service triggering. If the service triggering criteria are satisfied, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS again. If the trigger criteria are not met, the S-CSCF stops trigger criteria evaluation for the request.
- 7 The service triggering criteria are checked. If the service triggering criteria are satisfied, follows the procedure defined in section 4 above.
- 8 The AS sends a final response.
- 9 No more service triggering criteria are met.

#### 3.1.1.1 Signaling parameters

The following sections contain tables of the key contents of the REGISTER request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1].

#### 3.1.1.2 REGISTER request sent to AS from S-CSCF

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Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	Which contains the AS's SIP URI
2	From	Which contains the S-CSCF's SIP URI
3	To	Which contains either the public user identity as contained in the REGISTER request received from the UE.
4	Contact	Which contains the S-CSCF's SIP URI or the contact as contained in the REGISTER request received from the UE.. The behaviour is controlled by a S-CSCF configuration parameter.
5	Call-ID	Generated by the S-CSCF.
6	Expires	Which contains the same value that the S-CSCF returned in the 200 (OK) response for the REGISTER request received from the UE
7	P-Charging-Vector	Which contains the icid that the S-CSCF received in the original REGISTER request.
8	P-Charging-Function-Addresses header	Which contains the values received from the HSS if the message is forwarded within the S-CSCF home network.

### 3.1.1.3 Final response

Item (Note)	Header	The procedure specific values of the parameter
Note 1: Any final response or no respons contiues service trigger evaluation.		

## 3.2 AS acting as a SIP UAS

This section describes the procedures when the AS is acting as a SIP UAS. The behavior and responsibilities of a SIP UAS are defined in [1].

### 3.2.1 Pre-conditions

This section describes the pre-conditions to the procedure described in the sections 3.2.2 and 3.2.3.

Prior to the AS acting as a SIP UAS, the service triggering data for the user served by the S-CSCF must be populated including the triggering criteria and the AS address in the form of a SIP URI.

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### 3.2.2 Initial INVITE Procedure

This section defines the procedures when the AS is acting as a SIP UAS for an initial INVITE request by sending a 2XX response.

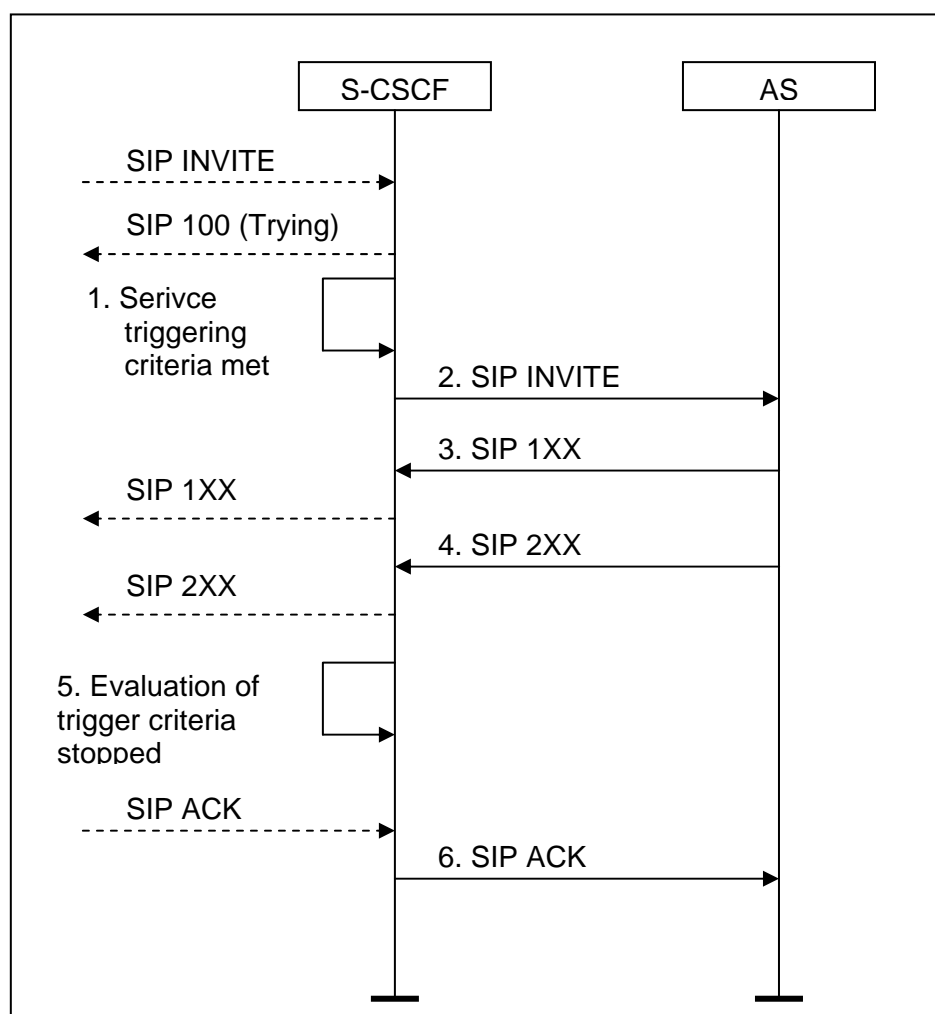


Figure 6 - AS acting as a SIP UAS for initial INVITE request

- 1 After determining the INVITE request received as an initial request, the service triggering criteria are checked.
- 2 If the triggering criteria are met, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS. If the triggering criteria are not met, then the normal S-CSCF processing continues as specified in [4], [7].

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- 3 The AS may send zero or more provisional responses. The construction and usages of provisional responses as governed by [1]. The S-CSCF proxies the provisional responses based on the Via headers except 100 Trying, as described by [1].
- 4 The AS sends one final 2XX response. The construction and usages of final responses as governed by [1]. The S-CSCF proxies the final response based on the Via headers.
- 5 The S-CSCF stops evaluating triggering criteria for the request when the final response is received from the AS.
- 6 The S-CSCF forwards the ACK received to the AS using the established route set for this dialogue. The AS must store the Route set established by the INVITE request and use it for all subsequent requests as defined in [1].

### 3.2.2.1 Signaling parameters

The following sections contain tables of the key contents of the SIP INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1] or other relevant SIP extensions.

### 3.2.2.2 INVITE request From S-CSCF to AS

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The SIP URI configured in the trigger data for this service invocation
	Route	The address of the S-CSCF interface for the AS to use when acting as a SIP proxy. This address may be different from the source IP address of the request or the address contained in the Via header.
2	Record-Route	The address of the S-CSCF to be used in the route set for subsequent requests within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header. (Note2)
3	Contact	The contact address of the UAC.
4	P-Charging-Vector	This header is received from the original INVITE request., else it is created by the S-CSCF.
5	P-Charging-Function-Addresses header	This header is created and added by the S-CSCF.
<p>Note : The S-CSCF will not add or remove any additional headers or modify the body of the INVITE request before routing the INVITE to the AS.</p> <p>Note 2: There may be additional Record-Route headers from the other nodes in the network.</p>		



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### 3.2.2.3 1XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the INVITE request. Allowed in 18X responses. (Note 1)
Note 1: If the Record-Route headers from the INVITE request are sent in the 18X response, then every Record-Route header from the INVITE must be sent.		

### 3.2.2.4 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	All of the Record-Route headers in the INVITE request
2	Contact	The contact address of the AS. This is the address subsequent requests within this dialog will be sent to.

#### 3.2.2.4.1 ACK for 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	The contact address the AS put in the contact header of the 2XX response
2	Contact	The contact address of the UAC

### 3.2.2.5 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

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### 3.2.3 Initial non-INVITE Request Procedure

This section defines the procedures when the AS is acting as a SIP UAS for an initial non-INVITE request by sending a 2XX response.

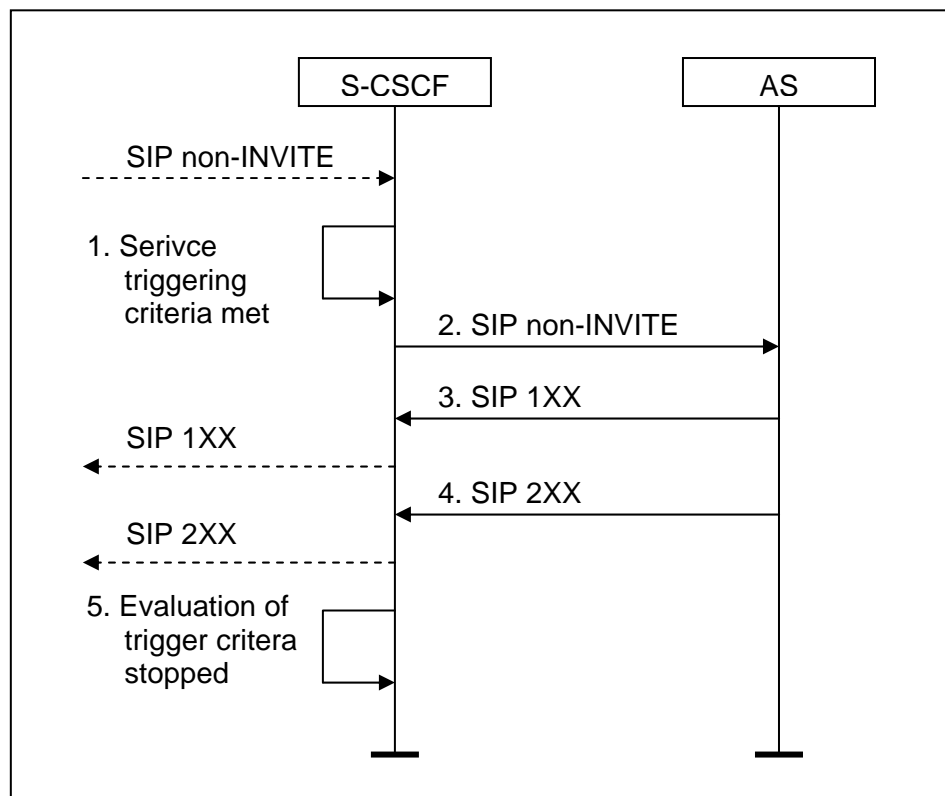


Figure 7 - AS acting as a SIP UAS for initial non-INVITE request

1. After determining the SIP non-INVITE request is an initial request, the service triggering criteria are checked
2. If the service triggering criteria are satisfied, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS. If service triggering criteria are not satisfied, then the normal S-CSCF processing continues as specified in [4], [7].
3. The AS may send zero or more provisional responses. The construction and usages of provisional responses as governed by [1].

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The S-CSCF proxies the provisional responses based on the Via headers.

4. The AS sends one final response. The construction and usages of provisional responses as governed by [1]. The S-CSCF proxies the final response based on the Via headers. If the AS responds with a 2XX response that establishes a SIP dialog, the Route set must be created and stored by the AS and used for subsequent requests as defined in [1]. Note that not all non-INVITE messages can establish a SIP dialog.
5. The S-CSCF stops evaluating triggering criteria for the request when the final response is received from the AS.

### 3.2.3.1 Signaling parameters

The following sections contain tables of the key contents of the initial SIP non-INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1].

### 3.2.3.2 Non-INVITE request from S-CSCF to AS

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The SIP URI configured in the trigger data for this service invocation
	Route	The address of the S-CSCF interface for the AS to use when acting as SIP proxy case. This address may be different from the source IP address of the request or the address contained in the Via header.
2	Record-Route	The address of the S-CSCF to be used in the route set for subsequent requests within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header. (Note 2 and Note 3)
3	Contact	The contact address of the UAC. (Note 4)
4	P-Charging-Vector	This header is received from the original INVITE request, else it is created by the S-CSCF.
5	P-Charging-Function-Addresses header	This header is created and added by the S-CSCF.
<p>Note : The S-CSCF will not add or remove any additional headers or modify the body of the non-INVITE request before routing the request to the AS.</p> <p>Note 2: There may be additional Record-Route headers from the other nodes in the network.</p> <p>Note 2: The Record-Route header will only be present in requests based on the procedure described in section 2.3.</p> <p>Note 2: The Record-Route handling is configurable for SUBSCRIBE requests.</p> <p>Note 3: The Contact header may be present depending on the SIP method type of the non-INVITE request.</p>		

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### 3.2.3.3 1XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the non-INVITE request. (Note 1)
Note 1: May be present depending on the SIP method type of the non-INVITE request		

### 3.2.3.4 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	All of the Record-Route headers in the INVITE request. (Note 1)
2	Contact	The contact address of the AS. This is the address subsequent requests within this dialog will be sent to. (Note 2)
Note 1: May be present depending on the SIP method type of the non-INVITE request		
Note 2: The Contact header may be present depending on the SIP method type of the non-INVITE request.		

### 3.2.3.5 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

## 3.3 AS acting as a SIP UAC

This section describes the procedures when the AS is acting as a SIP UAC. The behavior and responsibilities of a SIP UAC are defined in [1].

### 3.3.1 Pre-conditions

This section describes the pre-conditions to the procedure described in sections 3.3.2 and 3.3.3.

The IP address of the AS is configured in the S-CSCF list of UAC authorized AS's. Refer to section 2.6.1.

### 3.3.2 Initial INVITE procedure

This section defines the procedures when the AS is acting as a SIP UAC for an initial INVITE request by sending an INVITE request.

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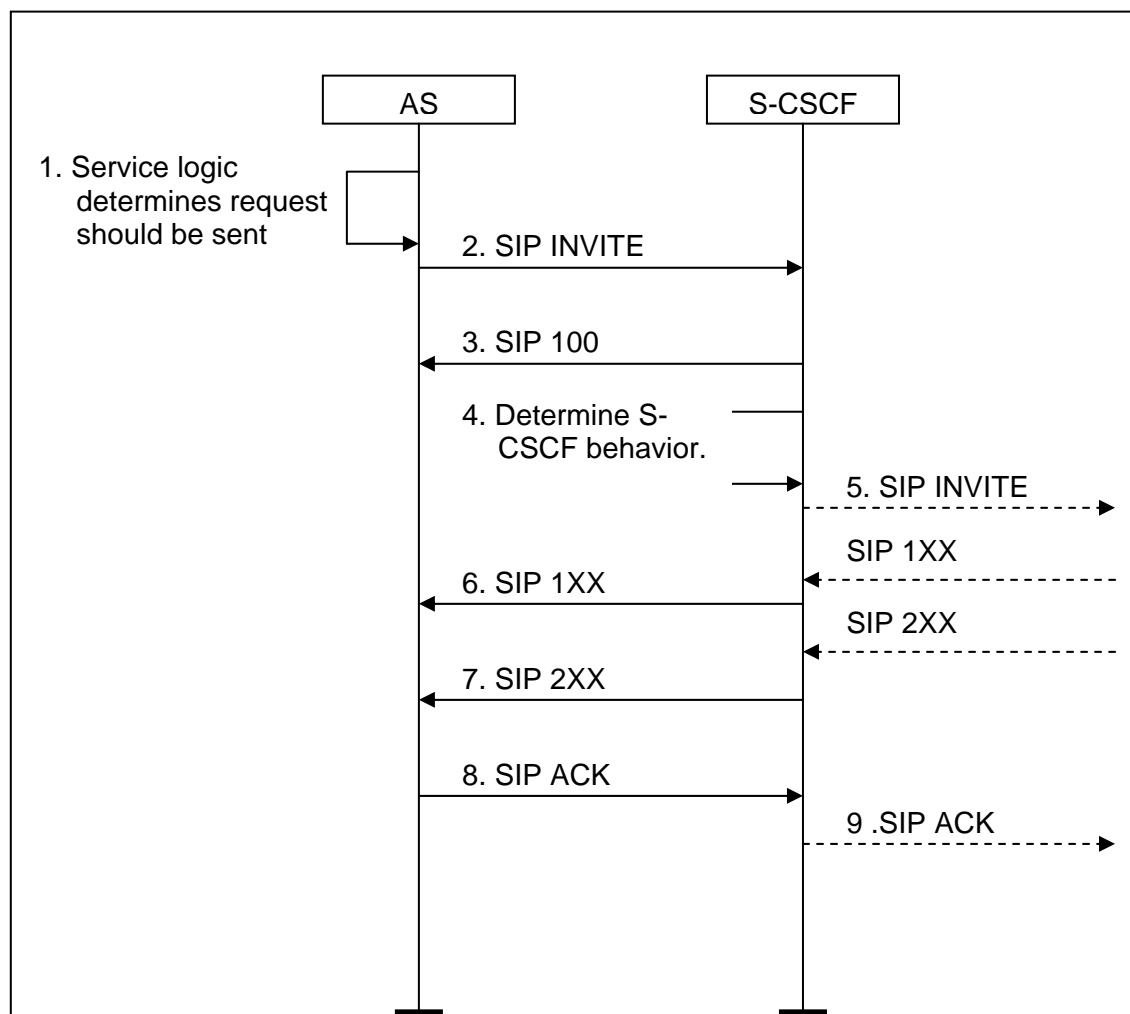


Figure 8 - AS acting as a SIP UAC for initial INVITE request

- 1 The service logic determines that an initial INVITE request should be sent.
- 2 The AS builds an INVITE request and sends the message to the S-CSCF. The address of the S-CSCF is determined by the procedure in section 2.7.1.
- 3 The S-CSCF sends a 100 (Trying) response to the AS using the Via header the AS put in the INVITE request.
- 4 The S-CSCF behavior is determined by following factors.
  - a If the received top Route from the AS contains an orig parameter.

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- If the calling user is registered in the S-CSCF, originating behavior and service trigger evaluation will be performed.
  - If the calling user is not registered in the S-CSCF, the call is rejected with a 403 Calling user not registered response.
- b If the received top Route from the AS doesn't contains an orig parameter.
- If the called user identified by the request-URI, is registered in the S-CSCF, terminating behavior and service trigger evaluation will be performed.
  - If the called user identified by the request-URI, is not registered in the S-CSCF, originating behavior is performed, but no user trigger evaluation is performed.
- 5 If trigger matching should be performed the S-CSCF executes the procedure in section 2.3.
- 6 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 7 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response. If this response establishes a SIP dialog the route set must be stored by the AS and used for subsequent requests as defined in [1].
- 8 The AS sends an ACK for the final response(s) received as defined in [1].

### 3.3.2.1 Signaling parameters

The following sections contain tables of the key contents of the SIP INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1].

### 3.3.2.2 INVITE request from AS to S-CSCF

Item (Note)	Header	The procedure specific values of the parameter
1	P-Charging-Vector	If a P-Charging-Vector header is received in the S-CSCF will use this header. If no P-Charging-Vector header is received the S-CSCF will add a new P-Charging-Vector header.
2	P-Charging-Function-Addresses header	This header will be ignored.

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### 3.3.2.3 INVITE request sent out from S-CSCF to AS

See bullet 5 figure 7.

Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	This is the target of the request. (Note 2)
2	Contact	The contact address of the AS.
3	P-Charging-Vector	This header is received from the original INVITE request . (Note 1)
Note 1: The Request-URI may be modified according to chapter 2.6.3.		
Note 3: If no P-Charging-Vector is received in the S-CSCF will generate a new new P-Charging-Vector header		

### 3.3.2.4 1XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the INVITE request. Allowed in 18X responses. (Note 1)
Note 1: If the Record-Route headers from the INVITE request are sent in the 18X response, then every Record-Route header from the INVITE must be sent.		

### 3.3.2.5 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	The address of the S-CSCF to be used for subsequent requests.
2	Contact	The contact address of the UAS that is responding to the Request.
Note 1: This address may differ from the address the INVITE request was sent to. The address in the Record-Route header must be used for all subsequent requests within the dialog established by this 2XX response.		
Note 1: There may additional Record-Route headers in the 2XX response from other nodes in the network.		

### 3.3.2.6 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

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### 3.3.3 Initial non-INVITE procedure

This section defines the procedures when the AS is acting as a SIP UAC for an initial SIP non-INVITE request.

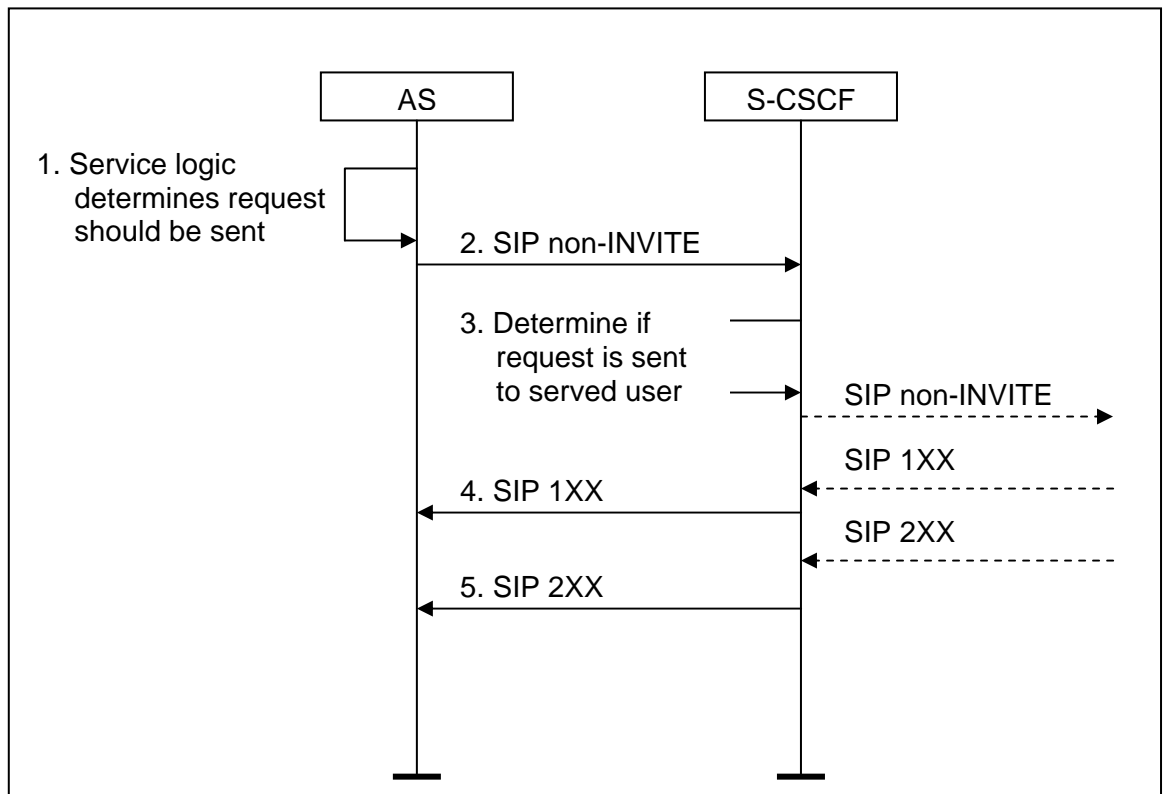


Figure 9 - AS acting as a SIP UAC for initial non-INVITE request

- 1 The service logic determines that an initial non-INVITE request should be sent.
- 2 The AS builds an non-INVITE request and sends the message to the S-CSCF. The address of the S-CSCF is determined by the procedure in section 2.7.1.
- 3 The S-CSCF executes the procedure in section 2.3.
- 4 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 5 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response. If this response establishes a SIP dialog the Route set must be stored by the AS and used for subsequent requests.



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### 3.3.3.1 Signaling parameters

The following sections contain tables of the key contents of the SIP non-INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1].

### 3.3.3.2 non-INVITE request from AS to S-CSCF

Item (Note)	Header	The procedure specific values of the parameter
1	P-Charging-Vector	If a P-Charging-Vector header is received in the S-CSCF will use this header. If no P-Charging-Vector header is received the S-CSCF will add a new P-Charging-Vector header.
2	P-Charging-Function-Addresses header	This header will be ignored.

### 3.3.3.3 non-INVITE request sent out From S-CSCF to AS

Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	This is the target of the request. (Note 3)
2	Contact	The contact address of the AS. (Note 1)
3	P-Charging-Vector	This header is received from the original INVITE request. (Note 2)
<p>Note 1: The Request-URI may be modified according to chapter 2.6.3.</p> <p>Note 2: The presence of the contact header in the request may be mandatory or optional or prohibited depending on the SIP method type of the non-INVITE request.</p> <p>Note 3: If no P-Charging-Vector is received in the S-CSCF will generate a new new P-Charging-Vector and icid.</p>		

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#### 3.3.3.4 1XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the INVITE request. (Note 1, Note 2)
Note 1: Record-Route headers may be present depending on the SIP method type of the non-INVITE request		
Note 2: There may additional Record-Route headers in the 2XX response from other nodes in the network. .		

#### 3.3.3.5 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	The address of the S-CSCF to be used for subsequent requests. (Note 1, Note 2, Note 3)
2	Contact	The contact address of the UAS that is responding to the Request. (Note 4)
Note 1: Record-Route headers may be present depending on the SIP method type of the non-INVITE request.		
Note 1: This address may differ from the address the INVITE request was sent to. The address in the Record-Route header must be used for all subsequent requests within the dialog established by this 2XX response.		
Note 1: There may additional Record-Route headers in the 2XX response from other nodes in the network.		
Note 2: Contact headers may be present depending on the SIP method type of the non-INVITE request.		

#### 3.3.3.6 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

### 3.4 AS acting as a SIP proxy

This section describes the procedures when the AS is acting as a SIP proxy. The behavior and responsibilities of a SIP proxy are defined in [1].

#### 3.4.1 Pre-conditions

This section describes the pre-conditions to the procedures described in sections 3.4.2 and 3.4.2.1.

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Prior to the AS acting as a SIP Proxy, the service triggering data for the user served by the S-CSCF must be populated including the triggering criteria and the AS address in the form of a SIP URI with an “lr” parameter indicated the AS is a loose-router as defined in [1].

### 3.4.2 Initial INVITE Procedure

This section defines the procedures when the AS is acting as a SIP proxy for an initial INVITE request by proxying an INVITE request to the S-CSCF.

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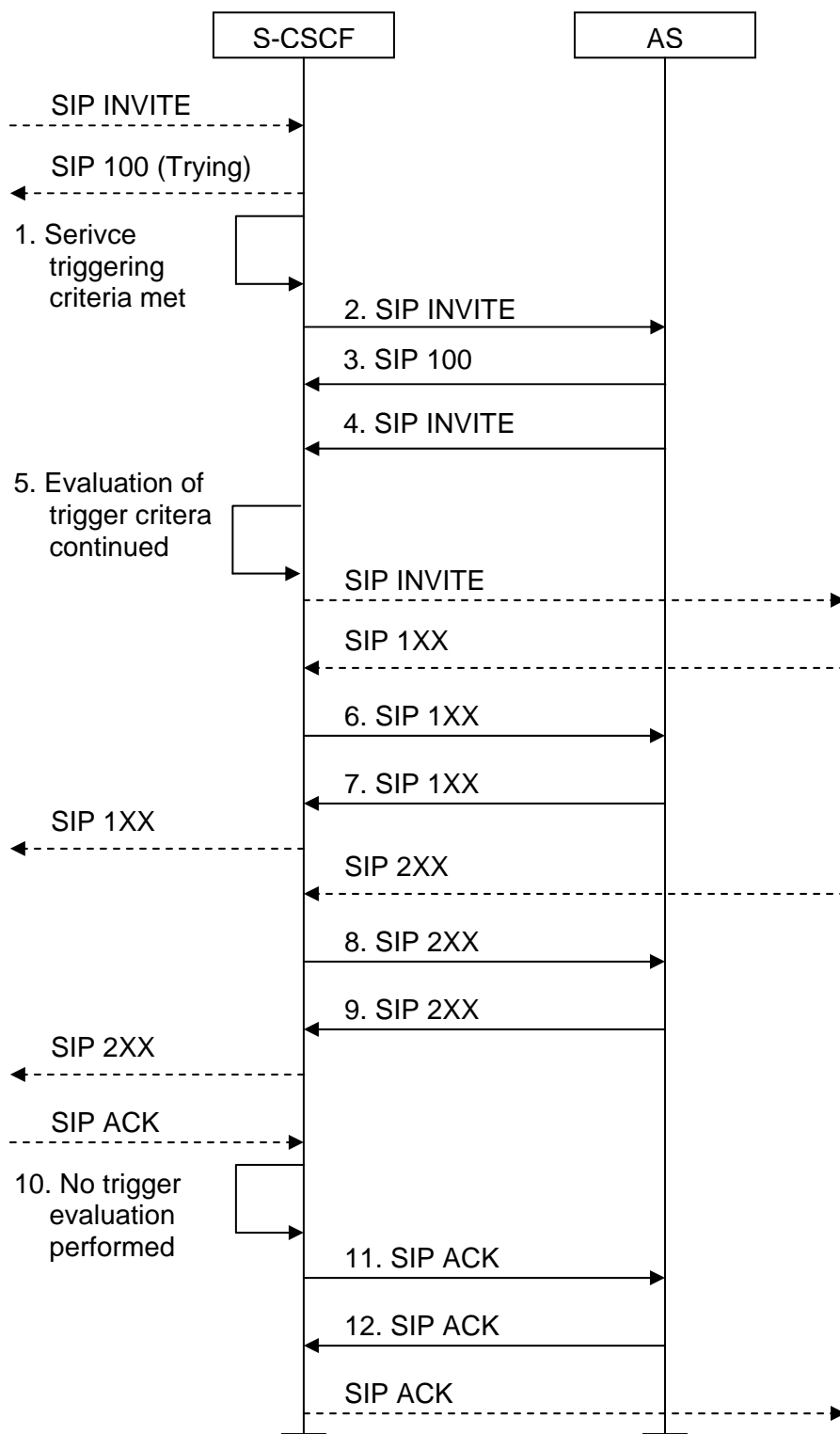


Figure 10 - AS acting as a SIP proxy for initial INVITE request

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- 1 After determining the INVITE request received is an initial request, the service triggering criteria are checked as defined in section 2.1.
- 2 If the triggering criteria are met, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS. If the triggering criteria are not met, then the normal S-CSCF processing continues as specified in [4], [7].
- 3 The AS sends a 100 (Trying) response to the S-CSCF using the Via header the S-CSCF put in the INVITE request.
- 4 Based on service logic the AS proxies the request back to the S-CSCF using the Route header added by the S-CSCF in the message as governed by [1]. The AS may add a Record-Route header to the request when it is proxied to the S-CSCF to indicate that the AS wants to receive subsequent requests within the dialog established by this INVITE request.
- 5 The S-CSCF evaluates the remaining trigger criteria as defined in section 2.1.2.2. If subsequent trigger criteria match, the request is proxied to the next AS, repeating step 2. If no subsequent trigger criteria match, the S-CSCF executes the request processing as defined in section 2.2.
- 6 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 7 Any provisional responses sent by the AS to the S-CSCF are sent using the Via headers in the response.
- 8 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 9 Any final responses sent by the AS to the S-CSCF are sent using the Via headers in the response. All final responses that the AS receives for the request must be proxied back to the S-CSCF.
- 10 When the ACK is received, no service triggering criteria are evaluated, because the ACK is sent within the dialog established by the 2XX response.
- 11 The S-CSCF routes the ACK request to the AS only if the AS inserted a Record-Route header in the initial INVITE request.
- 12 The AS proxies the ACK request back to the S-CSCF using the Route set in the request.

#### 3.4.2.1 Signaling parameters

The following sections contain tables of the key contents of the SIP INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1] or other relevant SIP extensions.

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#### 3.4.2.2 INVITE request from S-CSCF to AS

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The SIP URI configured in the trigger data for this service invocation
	Route	The address of the S-CSCF interface for the AS to use when acting as a SIP proxy.
2	Record-Route	The address of the S-CSCF to be used in the route set for subsequent requests within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header. (Note2)
3	Contact	The contact address of the UAC.
4	P-Charging-Vector	This header is received from the original INVITE request.
5	P-Charging-Function-Addresses header	This header is generated by the S-CSCF.
Note : The S-CSCF will not add or remove any additional headers or modify the body of the INVITE request before routing the INVITE to the AS.		
Note 2: There may be additional Record-Route headers from the other nodes in the network.		

#### 3.4.2.3 INVITE request from AS to S-CSCF

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The address of the S-CSCF interface for the AS to use when acting as a SIP proxy. This address may be different from the source IP address of the request or the address contained in the Via header.
2	Record-Route	(Optional) The AS may include a Record-Route header with the address of the AS to be used in the route set for subsequent request within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header.
3	Contact	The contact address of the UAC.
4	P-Charging-Vector	The S-CSCF will ignore the P-Charging-Vector received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Vector from the forwarded request to the AS.
5	P-Charging-Function-Addresses header	The S-CSCF will ignore the P-Charging-Function-Addresses header received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Function-Addresses header from the forwarded request to the AS.
Note : The S-CSCF will not add or remove any additional headers or modify the body of the INVITE request before routing the INVITE to the AS.		
Note 2: There may be additional Record-Route headers from the other nodes in the network.		

#### 3.4.2.4 1XX response

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Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the INVITE request. Allowed in 18X responses. (Note 1)
Note 1: If the Record-Route headers from the INVITE request are sent in the 18X response, then every Record-Route header from the INVITE must be sent.		

#### 3.4.2.5 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	All of the Record-Route headers in the INVITE request
2	Contact	The contact address of the UAS. This is the address subsequent requests within this dialog will be sent to.

##### 3.4.2.5.1 ACK for 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	The contact address the UAS put in the contact header of the 2XX response
2	Contact	The contact address of the UAC

#### 3.4.2.6 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

#### 3.4.3 Initial non-INVITE procedure

This section defines the procedures when the AS is acting as a SIP proxy for an initial SIP non-INVITE request by sending proxying a SIP non-INVITE request to the S-CSCF.

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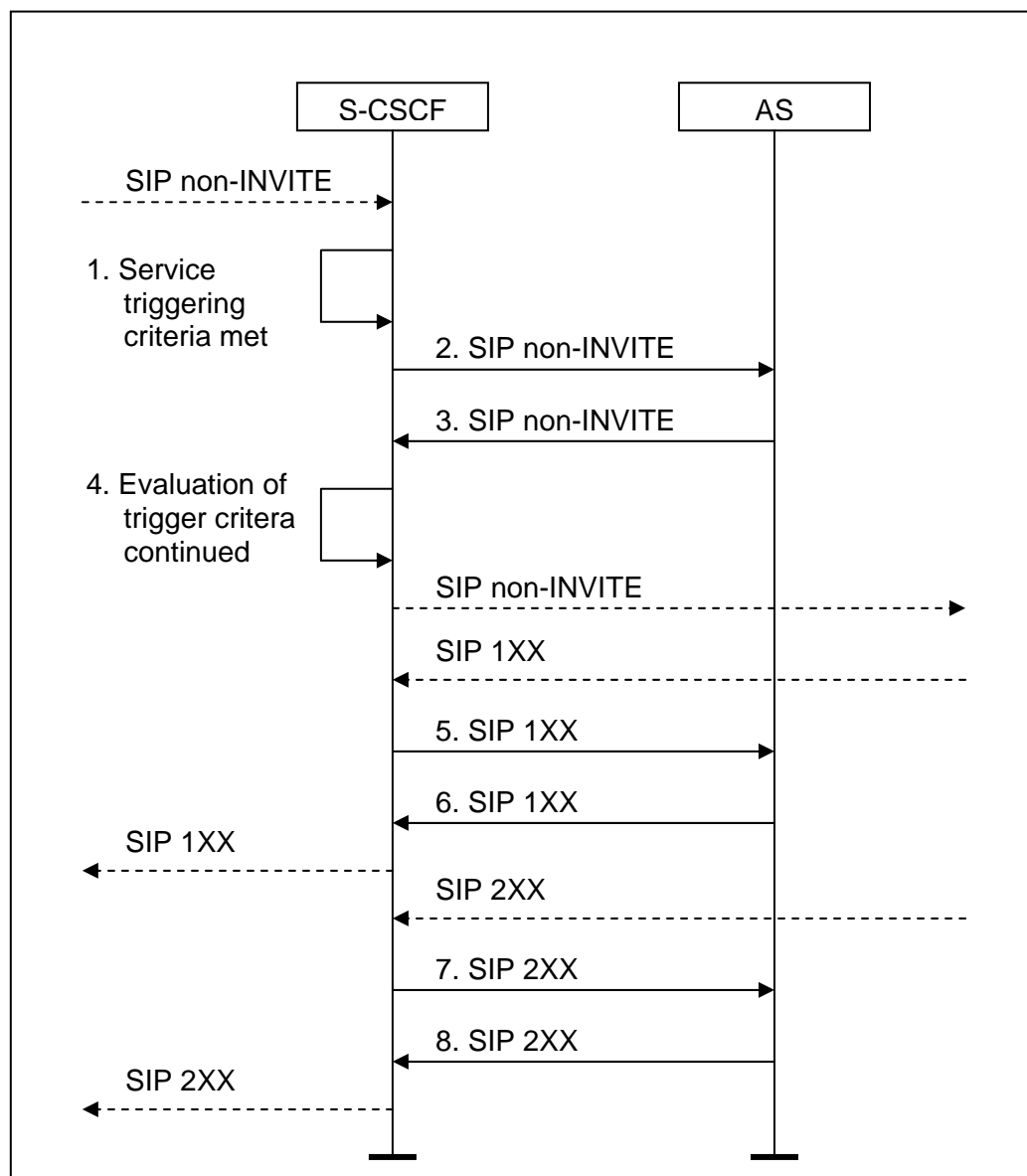


Figure 11 - AS acting as a SIP proxy for initial non-INVITE request

- 1 After determining the non-INVITE request received is an initial request, the service triggering criteria are checked as defined in section 2.1.
- 2 If the triggering criteria are met, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS. If the triggering criteria are not met, then the normal S-CSCF processing continues as specified in [4], [7].
- 3 Based on service logic the AS proxies the request back to the S-CSCF using the Route header added by the S-CSCF in the message as governed by [1]. The AS may add a Record-Route header, if allowed by the relevant SIP specification, to the request when it is proxied to the S-



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CSCF to indicate that the AS wants to receive subsequent requests within the dialog established by this non-INVITE request.

- 4 The S-CSCF evaluates the remaining trigger criteria as defined in section 2.1.2.2. If subsequent trigger criteria match, the request is proxied to the next AS, repeating step 2. If no subsequent trigger criteria match, the S-CSCF executes the request processing as defined in section 2.2.
- 5 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response. It is not well behaving to send 1XX for non-INVITE requests but this is handled by the S-CSCF as described above.
- 6 Any provisional responses sent by the AS to the S-CSCF are sent using the Via headers in the response. It is not well behaving to send 1XX for non-INVITE requests but this is handled by the S-CSCF as described above.
- 7 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 8 Any final responses sent by the AS to the S-CSCF are sent using the Via headers in the response. All final responses that the AS receives for the request must be proxied back to the S-CSCF.

#### 3.4.3.1 Signaling parameters

The following sections contain tables of the key contents of the SIP INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1] or other relevant SIP extensions.

#### 3.4.3.2 non-INVITE request from S-CSCF to AS

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Item (Note)	Header	The procedure specific values of the parameter
1	Route	The SIP URI configured in the trigger data for this service invocation
	Route	The address of the S-CSCF interface for the AS to use when acting as a SIP proxy. This address may be different from the source IP address of the request or the address contained in the Via header.
2	Record-Route	The address of the S-CSCF to be used in the route set for subsequent requests within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header. (Note2)
3	Contact	The contact address of the UAC.
4	P-Charging-Vector	This header is received from the original INVITE request.
5	P-Charging-Function-Addresses header	This header is generated by the S-CSCF.
<p>Note : The S-CSCF will not add or remove any additional headers or modify the body of the non-INVITE request before routing the non-INVITE to the AS.</p> <p>Note 2: There may be additional Record-Route headers from the other nodes in the network.</p>		

#### 3.4.3.3 non-INVITE request from AS to S-CSCF

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The address of the S-CSCF interface for the AS to use when acting as a SIP proxy. This address may be different from the source IP address of the request or the address contained in the Via header.
2	Record-Route	(Optional) The AS may include a Record-Route header with the address of the AS to be used in the route set for subsequent request within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header.
		The address of the S-CSCF to be used in the route set for subsequent requests within this dialog. This address may be different from the source IP address of the request or the address contained in the Via header. (Note2)
3	Contact	The contact address of the UAC.
4	P-Charging-Vector	The S-CSCF will ignore the P-Charging-Vector received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Vector from the forwarded request to the AS.
5	P-Charging-Function-Addresses header	The S-CSCF will ignore the P-Charging-Function-Addresses header received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Function-Addresses header from the forwarded request to the AS.
<p>Note : The S-CSCF will not add or remove any additional headers or modify the body of the non-INVITE request before routing the non-INVITE request to the AS.</p> <p>Note 2: There may be additional Record-Route headers from the other nodes in the network.</p> <p>Note 4: The S-CSCF will ignore the P-Charging-Vector received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Vector from the forwarded request to the AS.</p> <p>Note 5: The S-CSCF will ignore the P-Charging-Function-Addresses header received. For additional subsequent AS invocations the S-CSCF will use the stored P-Charging-Function-Addresses header from the forwarded request to the AS.</p>		

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#### 3.4.3.4 1XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	(Optional) All of the Record-Route headers in the non-INVITE request. Allowed in 18X responses. (Note 1)
Note 1: If the Record-Route headers from the non-INVITE request are sent in the 18X response, then every Record-Route header from the non-INVITE request must be sent.		

#### 3.4.3.5 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Record-Route	All of the Record-Route headers in the non-INVITE request
2	Contact	The contact address of the UAS. This is the address subsequent requests within this dialog will be sent to.

##### 3.4.3.5.1 ACK for 2XX response

Item (Note)	Header	The procedure specific values of the parameter
1	Request-URI	The contact address the UAS put in the contact header of the 2XX response
2	Contact	The contact address of the UAC

#### 3.4.3.6 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

### 3.5 AS acting as B2BUA

When the AS is acting as a SIP B2BUA, the procedures defined in 3.2 for the UAS transaction and in 3.3 for the UAC transaction are followed. There is no special handling or processing for this behavior.

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## 4 Subsequent Request Procedures

The procedures in this section apply for requests sent within SIP dialogs established by the procedures in section 3. These procedures are independent from how the SIP dialog was established. These procedures have no special handling for INVITE or non-INVITE requests beyond what is specified in [1].

### 4.1 AS acting as SIP UAS

#### 4.1.1 Pre-conditions

This section describes the pre-conditions to the procedures described in section 4.1.2.

The AS is an end point in an existing SIP dialog that was established previously by the AS sending a dialog establishing request, and receiving a successful response, or by the AS sending a successful response to a dialog establishing request.

#### 4.1.2 Subsequent SIP Request Procedure

This section defines the procedures when the AS is acting as a SIP UAS for a subsequent INVITE request by sending a 2XX response.

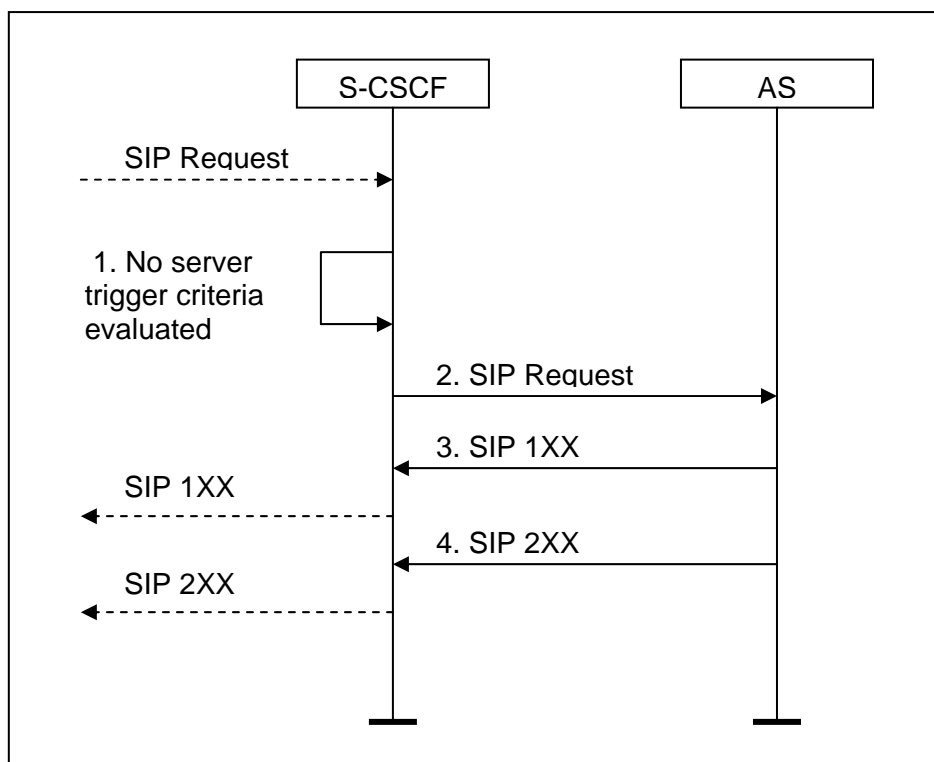


Figure 12 - AS acting as SIP UAS for an subsequent SIP request

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- 1 The S-CSCF determines the SIP request is a subsequent request based on the presence of a To tag. The S-CSCF does not evaluate any trigger criteria.
- 2 The request is routed to the AS using the procedure described in section 2.4.
- 3 The AS may send zero or more provisional responses. The construction and usages of provisional responses as governed by [1]. The S-CSCF proxies the provisional responses based on the Via headers.
- 4 The AS sends one final response. The construction and usages of provisional responses as governed by [1]. The S-CSCF proxies the final response based on the Via headers.

#### 4.1.2.1 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

## 4.2 AS acting as UAC

### 4.2.1 Pre-conditions

This section describes the pre-conditions to the procedures described in section 4.2.2.

The AS is an end point in an existing SIP dialog that was established previously by the AS sending a dialog establishing request, and receiving a successful response, or by the AS sending a successful response to a dialog establishing request.

### 4.2.2 Subsequent SIP Request Procedure

This section defines the procedures when the AS is acting as a SIP UAC for a subsequent SIP request.

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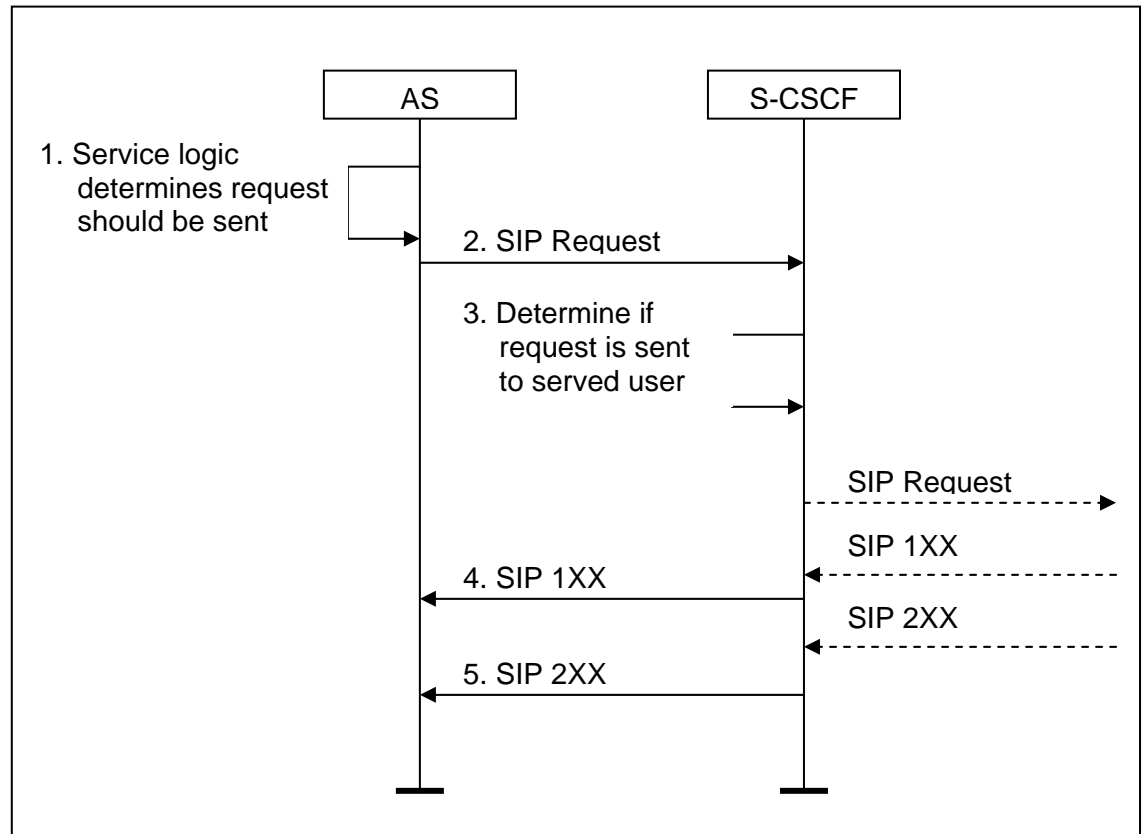


Figure 13 - AS acting as SIP UAC for an subsequent SIP request

- 1 The service logic determines that a subsequent SIP request should be sent.
- 2 The AS builds a SIP request and sends the message to the AS. The address of the S-CSCF is obtained from the top most Route header in the Route set for this dialog.
- 3 The S-CSCF determines if the request is sent to a user served by this S-CSCF. The S-CSCF executes the procedure in section 2.2. No trigger criteria are evaluated for this request.
- 4 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 5 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.

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#### 4.2.2.1 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

### 4.3 AS acting as Proxy

#### 4.3.1 Pre-conditions

This section describes the pre-conditions to the procedures described in section 4.3.2.

The AS inserted a Record-Route header in the SIP request that established the SIP dialog used by this request.

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### 4.3.2 Subsequent SIP Request Procedure

This section defines the procedures when the AS is acting as a SIP Proxy for a subsequent SIP request.

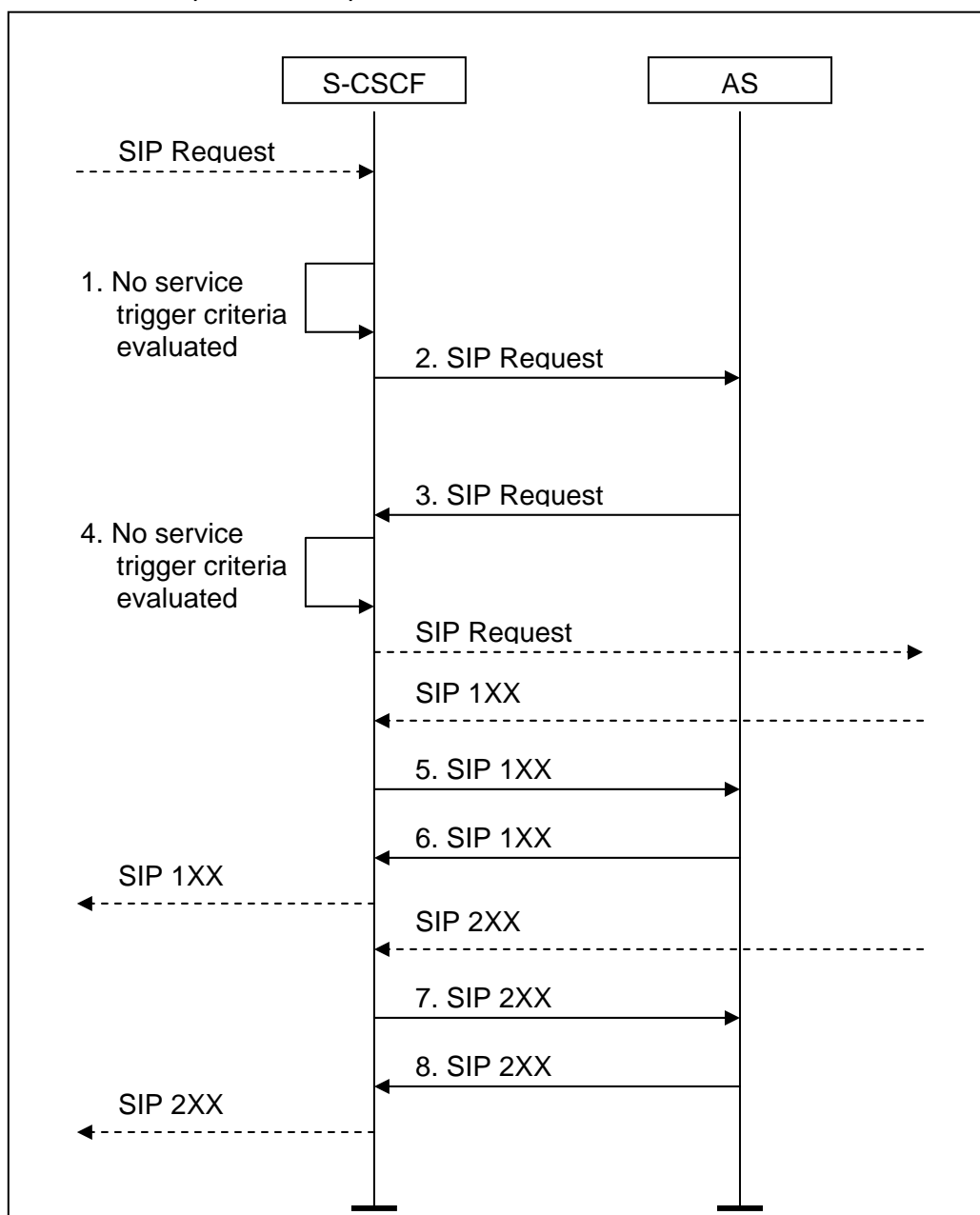


Figure 14 - AS acting as SIP Proxy for a subsequent SIP request



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- 1 The S-CSCF determines the SIP request is a subsequent request based on the presence of a To tag. The S-CSCF does not evaluate any trigger criteria.
- 2 The request is routed to the AS using the procedure described in section 2.4.
- 3 The AS must proxy the request back to the S-CSCF using the Route header in the request.
- 4 The S-CSCF determines the SIP request is a subsequent request based on the presence of a To tag and routes the request based on the contents of the request.
- 5 Any provisional responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 6 Any provisional responses sent by the AS to the S-CSCF are sent using the Via headers in the response.
- 7 Any final responses received by the S-CSCF in response to this request are sent to the AS using the Via headers in the response.
- 8 Any final responses sent by the AS to the S-CSCF are sent using the Via headers in the response. All final responses that the AS receives for the request must be proxied back to the S-CSCF.

### 4.3.3 Signaling parameters

The following sections contain tables of the key contents of the subsequent SIP INVITE request and SIP responses to the request as it relates to the ISC interface. The syntax of the messages and contents not listed in the table are governed by [1].

#### 4.3.3.1 INVITE request to AS from S-CSCF

Item (Note)	Header	The procedure specific values of the parameter
1	Route	The address the AS put in the Record-Route header of the request that established this SIP dialog.
		The address the S-CSCF put in the Record-Route header of the request that established this SIP dialog.

#### 4.3.3.2 INVITE request to S-CSCF from AS

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Item (Note)	Header	The procedure specific values of the parameter
1	Route	The address the S-CSCF put in the Record-Route header of the request that established this SIP dialog.

#### 4.3.3.3 Unsuccessful Cases

For protocol errors or errors outside the scope of this document refer to [1].

## 5 Multiple AS support

This section describes the procedures when multiple AS's are invoked for processing the same request. These procedures make extensive use of the procedures defined in section 3 and 4.

### 5.1 Pre-conditions

This section describes the pre-conditions to the procedures described in sections 5.2.

Prior to each AS acting as a SIP Proxy, the service triggering data for the user served by the S-CSCF must be populated including the triggering criteria and the AS address in the form of a SIP URI.

### 5.2 Initial SIP Request Procedure

This section defines the procedures when multiple AS's act as SIP proxies for an initial SIP request by proxying a SIP request to the S-CSCF.

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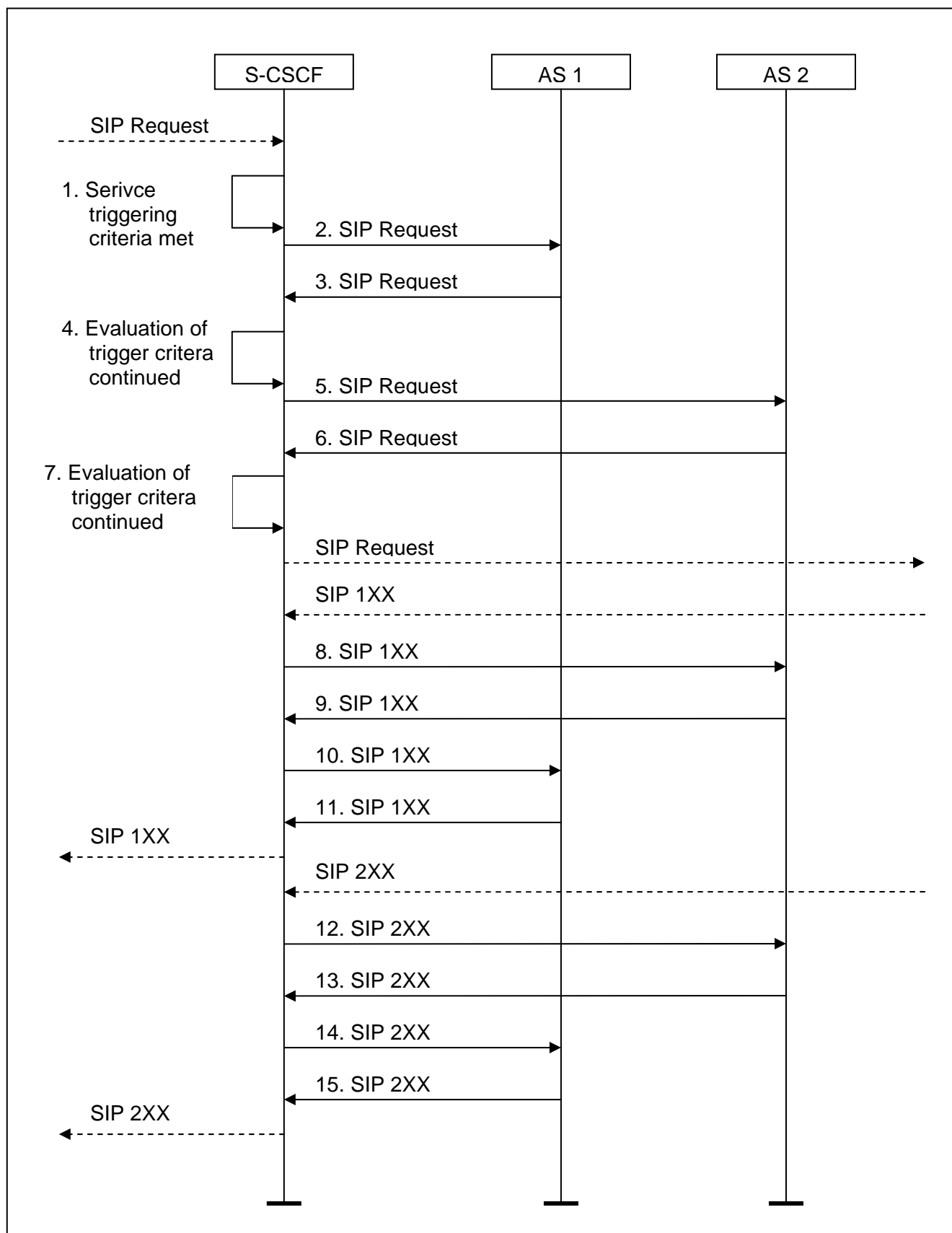


Figure 15 – Multiple AS's acting as a SIP proxy for initial SIP request

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- 1 The procedures in section 3.4 are applied for the initial trigger evaluation and routing the request to AS1.
- 2 When the request is proxied back from AS1, The S-CSCF evaluates the remaining trigger criteria as defined in section 2.1.2.2. If subsequent trigger criteria match, the request is proxied to the next AS. If no subsequent trigger criteria match, the S-CSCF executes the request processing as defined in section 2.2.
- 3 The procedures in section 3.3 are applied for the remainder of processing the request.

## 6 AS Fail-over Support

The S-CSCF provides support for multiple AS's nodes deployed in a network redundant configuration. The support is provided by using the mechanisms defined in [1] and [2].

### 6.1 Configuration Parameters

The S-CSCF has two operator configurable timeouts values that are used for all AS service invocations.

Parameter	Description
CscfAsFailoverTimeInvite	This parameter overrides the default SIP timer value Timer B in [1], default 32 sec.
CscfAsFailoverTimeNonInvite	This parameter overrides the default SIP timer value Timer F in [1], default 32 sec.

### 6.2 Pre-conditions

This section describes the pre-conditions to the procedures described in section 6.3.

The service triggering data for the user served by the S-CSCF must be populated, including the triggering criteria and the AS address in the form of a SIP URI. This AS host name must be in the form of a domain name.

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The DNS SRV entry for the domain name in the AS host name is configured to resolve to multiple target AS nodes. These targets may have the same priority, in which case the requests from the S-CSCF are distributed across the various targets using the weight parameter as described in [5]. If these targets have different priority values, then the server with the lowest number priority is contacted first as described in [5].

### 6.3 AS Fail-over Procedure

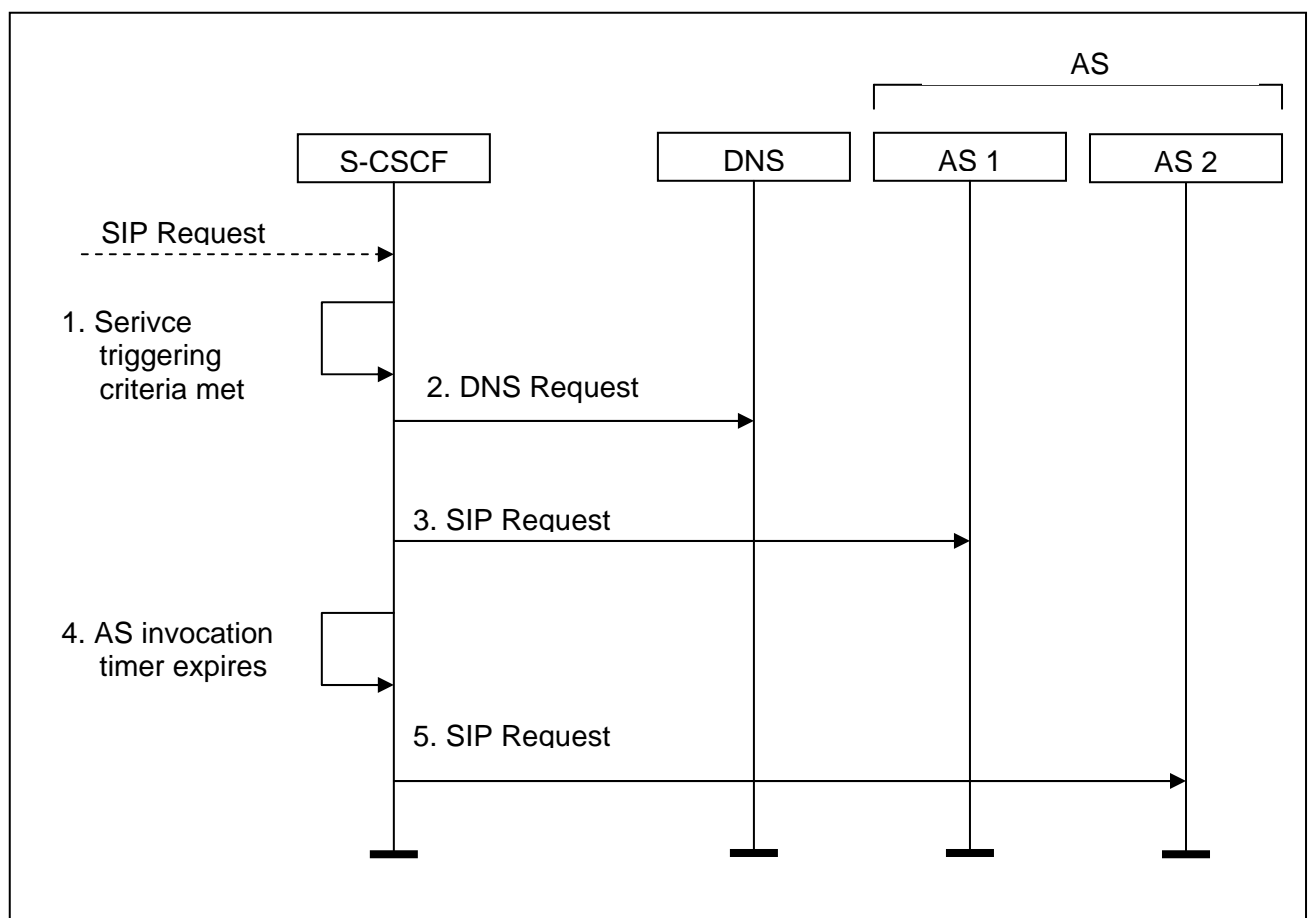


Figure 16 – AS Fail-over

- 1 After determining the INVITE request received is an initial request, the service triggering criteria are checked as defined in section 0. If the triggering criteria are met, the S-CSCF follows the procedure defined in section 2.3 to route the request to AS domain.

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- 2 The S-CSCF uses the procedures defined in [2] to query DNS to determine to what IP address port and transport to use to send the request to the AS domain.
- 3 The S-CSCF uses the results of the DNS query to route the request to AS1. The S-CSCF sets the SIP layer timers for this transaction based on the configuration data.
- 4 If no provisional response is received before the timer expires, AS1 is considered to be unreachable for this request.
- 5 The S-CSCF uses the results of the previous DNS query to determine if there are any other targets for this request. If there is another target, the request is routed to that AS and the timer is reset. If there are no more targets to try, the S-CSCF generates an error response.

## 7 AS Session case determination

When requests are sent to the AS by the S-CSCF, the AS or the value added service running on the AS may need to know the session case (originating, terminating or terminating unregistered) for the request. There are three mechanisms described in the following sections that the AS or service can use to make this determination. The selection of which mechanism is used is outside the scope of this document.

### 7.1 Separate Interfaces

The AS could have separate interfaces for receiving originating triggered request, terminating triggered request. Using different AS SIP URI in the trigger data for the different session cases would represent these separate interfaces. The AS SIP URI would be configured with either explicit ports or with different host names for each interface.

### 7.2 SIP URI tokens

The AS or service can require a token to be configured in the user portion of the AS SIP URI when the trigger data is provisioned. This SIP URI will appear as the top most Route header in the request forwarded to it by the S-CSCF. If these tokens are unique for each session case, the AS or service can extract the token and use the token to determine the session case.

### 7.3 SIP URI parameters

The AS or service can require a SIP URI parameter be configured in the AS SIP URI when the trigger data is provisioned. This SIP URI will appear as the top most Route header in the request forwarded to it by the S-CSCF. If the value of the parameter is unique for each session case, the AS or service can use the value of the parameter to determine the session case.

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## 8 Security Considerations

There is only minimal security protection for the ISC specified in this document. The S-CSCF and AS rely on the IP network security to provide a security association that allows the S-CSCF and the AS to trust messages sent on the ISC interface. The S-CSCF and the AS may use additional security associations to other network elements or the UE.

The mechanisms used by the IP network and any additional mechanisms implemented by the S-CSCF or AS to other network elements are outside the scope of this document.

## 9 References

- [1] IETF: RFC 3261 "SIP: Session Initiation protocol"
- [2] IETF: RFC 3263 "Session Initiation Protocol (SIP): Locating SIP Servers"
- [3] 3GPP: TS 23.228
- [4] IWD Basic SIP procedures on the CSCF - CSCF interface (Mw) 1/155 19-CRH 109 776/1 Uen
- [5] IETF: RFC 2782 "A DNS RR for Specifying the Location of Services (DNS SRV)"
- [6] 3GPP: TS 23.218
- [7] IWD Basic SIP procedures on the UE - CSCF interface (Gm) 2/155 19-CRH 109 776/1 Uen
- [8] FS Service Invocation 1/155 17-1/HSC 113 03 Uen