3GPP TSG CN Plenary Meeting #25 **NP-040416**
8th – 10th August 2004 Palm Springs, US.

Source: TSG CN WG4

Title: Corrections on IMS Rel-5 Cx-/Dx-interface

Agenda item: 8.1

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level N4-04	Phase	Subject	Cat	Ver_C
29.228	108	3	0845	Rel-5	LIR and services related to unregistered state	F	5.8.0
29.228	109	1	0846	Rel-6	LIR and services related to unregistered state	A	6.3.0
29.228	119	3	1208	Rel-5	Use of regular expressions	F	5.8.0
29.228	120	3	1209	Rel-6	Use of regular expressions	A	6.3.0

3GPP TSG CN WG4 Meeting #23bis **N4-040845**
Helsinki, FINLAND, 21st – 23rd JUNE 2004

CR-Form-v7

CHANGE REQUEST

⌘ **29.228** **CR** **108** ⌘ **rev** **3** ⌘ Current version: **5.8.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	LIR and services related to unregistered state
Source:	⌘	CN4
Work item code:	⌘	IMS-CCR
Date:	⌘	23/06/2004
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	Essential correction. When there is a public identity which has state “unregistered” and has no services related to unregistered state and the public identity receives a terminating session, the I-CSCF sends a LIR command to the HSS. 3GPP TS 23.228 section 5.12.2 requires that the HSS should respond with a LIA command containing an indication that the public identity is unregistered, and has no services related to unregistered state. The same applies also to the “not registered” state.
Summary of change:	⌘	The S-CSCF name is sent to the I-CSCF if the user is in state “unregistered” or “not registered” and *has* services related to the unregistered state. If the user is in state “unregistered” or “not registered” and *has no* services related to the unregistered state, the S-CSCF name is not sent to the I-CSCF and a DIAMETER_ERROR_IDENTITY_NOT_REGISTERED error is indicated to the I-CSCF.
Consequences if not approved:	⌘	Misalignment between stage 2 and stage 3 leading to incorrect handling of the SIP messages at the I-CSCF for subscribers with no services associated with the unregistered state.

Clauses affected:	⌘	6.1.4

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	-

How to create CRs using this form:

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.1.4 User location query

This procedure is used between the I-CSCF and the HSS to obtain the name of the S-CSCF where a public identity is registered. The procedure is invoked by the I-CSCF, is performed per public identity, and corresponds to the functional level operation Cx-Location-Query (see 3GPP TS 23.228 [1]).

This procedure is mapped to the commands Location Info Request/Answer in the Diameter application specified in 3GPP TS 29.229 [5]. Tables 6.1.4.1 and 6.1.4.2 detail the involved information elements.

Table 6.1.4.1 : User Location query

Information element name	Mapping to Diameter AVP	Cat.	Description
Public User Identity (See 7.2)	Public-Identity	M	User public identity
Routing information (See 7.13)	Destination-Host, Destination-Realm	C	If the I-CSCF knows HSS name Destination-Host AVP shall be present in the command. Otherwise, only Destination-Realm AVP shall be present and the command shall be routed to the next Diameter node, e.g. SLF, based on the Diameter routing table in the I-CSCF.

Table 6.1.4.2 : User Location response

Information element name	Mapping to Diameter AVP	Cat.	Description
Result (See 7.6)	Result-Code / Experimental-Result	M	Result of the operation. Result-Code AVP shall be used for errors defined in the Diameter Base Protocol. Experimental-Result AVP shall be used for Cx/Dx errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.
S-CSCF Name (See 7.4)	Server-Name	C	Name of the assigned S-CSCF.
S-CSCF capabilities (See 7.5)	Server-Capabilities	O	It contains the information to help the I-CSCF in the selection of the S-CSCF.

6.1.4.1 Detailed behaviour

The HSS shall, in the following order (~~in case of~~ if an error occurs in any of the steps the HSS shall stop processing and return the corresponding error code, see 3GPP TS 29.229 [5]):

1. Check that the user is known. If not the Experimental-Result-Code shall be set to DIAMETER_ERROR_USER_UNKNOWN.

2. Check the state of the public identity received in the request, and where necessary, check if the Public User Identity has services related to the unregistered state.

   - If it is registered, or it is unregistered (i.e. registered as a consequence of a terminating call or there is a S-CSCF keeping the user profile stored) and has services related to the unregistered state, the HSS shall return the stored S-CSCF name. The Server-Name AVP shall contain the SIP URL of the server. The Server-Capabilities AVP shall not be present. The Result-Code AVP shall be set to DIAMETER_SUCCESS.

- If it is not registered, but has services related to unregistered state, the HSS shall check if there is at least one identity of the user with an S-CSCF name assigned~~:~~. If this is the case the HSS shall return the S-CSCF name assigned for that user. The Server-Name AVP shall contain the SIP URL of the server. The Server-Capabilities AVP shall not be present. The Result-Code shall be set to DIAMETER_SUCCESS.

  - If there is not any S-CSCF name assigned for that user, the HSS may return information about the required S-CSCF capabilities, which enables the I-CSCF to select an S-CSCF. The Server-Capabilities AVP may be present. The HSS shall send the same server capability set that is sent in the user registration status response during the registration. If Server-Capabilities AVP is not present, the I-CSCF shall understand that any S-CSCF is suitable to serve the user. The Server-Name AVP shall not be present. The Experimental-Result-Code shall be set to DIAMETER_UNREGISTERED_SERVICE.

- If it is not registered or unregistered, and has no services related to the unregistered state~~unregistered services related data~~, the response shall contain Experimental-Result-Code set to DIAMETER_ERROR_IDENTITY_NOT_REGISTERED.

If the HSS cannot fulfil received request, e.g. due to database error, it shall set Result-Code to DIAMETER_UNABLE_TO_COMPLY. No S-CSCF name or S-CSCF capabilities shall be present in the response.

3GPP TSG CN WG4 Meeting #23bis **N4-040846**
Helsinki, FINLAND, 21st – 23rd JUNE 2004

CR-Form-v7

CHANGE REQUEST

⌘ **29.228** **CR** **109** ⌘ **rev** **1** ⌘ Current version: **6.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	LIR and services related to unregistered state
Source:	⌘	CN4
Work item code:	⌘	IMS2-CCR
Date:	⌘	23/06/2004
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	When there is a public identity which has state "unregistered" and has no services related to unregistered state and the public identity receives a terminating session, the I-CSCF sends a LIR command to the HSS. 3GPP TS 23.228 section 5.12.2 requires that the HSS should respond with a LIA command containing an indication that the public identity is unregistered, and has no services related to unregistered state. The same applies also to the "not registered" state.
Summary of change:	⌘	The S-CSCF name is sent to the I-CSCF if the user is in state "unregistered" or "not registered" and *has* services related to the unregistered state. If the user is in state "unregistered" or "not registered" and *has no* services related to the unregistered state, the S-CSCF name is not sent to the I-CSCF and a DIAMETER_ERROR_IDENTITY_NOT_REGISTERED error is indicated to the I-CSCF.
Consequences if not approved:	⌘	Misalignment between stage 2 and stage 3 leading to incorrect handling of the SIP messages at the I-CSCF for subscribers with no services associated with the unregistered state.

Clauses affected:	⌘	6.1.4			
Other specs affected:	⌘	**Y**	**N**		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	-			

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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This procedure is used between the I-CSCF and the HSS to obtain the name of the S-CSCF where a public identity is registered. The procedure is invoked by the I-CSCF, is performed per public identity, and corresponds to the functional level operation Cx-Location-Query (see 3GPP TS 23.228 [1]).

This procedure is mapped to the commands Location Info Request/Answer in the Diameter application specified in 3GPP TS 29.229 [5]. Tables 6.1.4.1 and 6.1.4.2 detail the involved information elements.

Table 6.1.4.1 : User Location query

Information element name	Mapping to Diameter AVP	Cat.	Description
Public User Identity (See 7.2)	Public-Identity	M	User public identity
Routing information (See 7.13)	Destination-Host, Destination-Realm	C	If the I-CSCF knows HSS name Destination-Host AVP shall be present in the command. Otherwise, only Destination-Realm AVP shall be present and the command shall be routed to the next Diameter node, e.g. SLF, based on the Diameter routing table in the I-CSCF.

Table 6.1.4.2 : User Location response

Information element name	Mapping to Diameter AVP	Cat.	Description
Result (See 7.6)	Result-Code / Experimental-Result	M	Result of the operation. Result-Code AVP shall be used for errors defined in the Diameter Base Protocol. Experimental-Result AVP shall be used for Cx/Dx errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.
S-CSCF Name (See 7.4)	Server-Name	C	Name of the assigned S-CSCF.
S-CSCF capabilities (See 7.5)	Server-Capabilities	O	It contains the information to help the I-CSCF in the selection of the S-CSCF.

6.1.4.1 Detailed behaviour

The HSS shall, in the following order (~~in case of~~ if an error occurs in any of the steps the HSS shall stop processing and return the corresponding error code, see 3GPP TS 29.229 [5]):

1. Check that the user is known. If not the Experimental-Result-Code shall be set to DIAMETER_ERROR_USER_UNKNOWN.

2. Check the state of the public identity received in the request, and where necessary, check if the Public User Identity has services related to the unregistered state.

   - If it is registered, or it is unregistered (i.e. registered as a consequence of a terminating call or there is a S-CSCF keeping the user profile stored) and has services related to the unregistered state, the HSS shall return the stored S-CSCF name. The Server-Name AVP shall contain the SIP URL of the server. The Server-Capabilities AVP shall not be present. The Result-Code AVP shall be set to DIAMETER_SUCCESS.

- If it is not registered, but has services related to unregistered state, the HSS shall check if there is at least one identity of the user with an S-CSCF name assigned~~:~~. If this is the case the HSS shall return the S-CSCF name assigned for that user. The Server-Name AVP shall contain the SIP URL of the server. The Server-Capabilities AVP shall not be present. The Result-Code shall be set to DIAMETER_SUCCESS.

  - If there is not any S-CSCF name assigned for that user, the HSS may return information about the required S-CSCF capabilities, which enables the I-CSCF to select an S-CSCF. The Server-Capabilities AVP may be present. The HSS shall send the same server capability set that is sent in the user registration status response during the registration. If Server-Capabilities AVP is not present, the I-CSCF shall understand that any S-CSCF is suitable to serve the user. The Server-Name AVP shall not be present. The Experimental-Result-Code shall be set to DIAMETER_UNREGISTERED_SERVICE.

- If it is not registered or unregistered, and if it has no services related to the unregistered state ~~unregistered services related data~~ , the response shall contain Experimental-Result-Code set to DIAMETER_ERROR_IDENTITY_NOT_REGISTERED.

If the HSS cannot fulfil received request, e.g. due to database error, it shall set Result-Code to DIAMETER_UNABLE_TO_COMPLY. No S-CSCF name or S-CSCF capabilities shall be present in the response.

3GPP TSG-CN WG4 Meeting #24 ***N4-041208***

Sophia Antipolis, France. 16th to 20th August 2004.

CR-Form-v7.1

CHANGE REQUEST

⌘ **29.228** **CR** **119** ⌘ **rev** **3** ⌘ Current version: **5.8.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Use of regular expressions
Source:	⌘	CN4
Work item code:	⌘	IMS-CCR
Date:	⌘	16/08/2004
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	**Essential correction** The usage of regular expressions in SPTs is defined only in an informatiove annex and in there the description is very vague. The headers in SIP messages may be written in a compact or long form as defined in chapter 7.3.3. in RFC 3261, for example, the Call-ID header may be present in a message either in the long form "Call-ID" or in the compact form "i". The corresponding value of the Header attribute of a SIP Header is defined to be a string in 29.228 and hence, to create a trigger point that matches to any given SIP header a separate SPT needs to be defined for both to the compact and to the short form of the header which complicates the trigger points significantly. The content of several SPT attributes is not defined.
Summary of change:	⌘	The definition of using regular expressions in SPTs is clarified. The value of the Header attribute of a SIP Header is defined to be a regular exdpression. The content of the Header and Content attributes of SIP Header SPT, and the content of the Line and Content attributes of the Session Description SPT is defined.
Consequences if not approved:	⌘	If there are S-CSCFs from several vendors in the network, it may not be possible to steer the users freely to any one of the S-CSCFs since the interpretation of regular expressions in iFC may differ between the S-CSCFs from different vendors and hence the triggering of SIP messages may be incorrect. Also the operator may need to define the trigger points in a different way depending on

	the S-CSCF that is to be assigned for the user. If the content of the SPT attributes is not properly defined, it may prevent using S-CSCFs from different vendors within the same IMS and a HSS and a S-CSCF from different vendor may not interoperate.

Clauses affected:	⌘	2, B.2.3, new Annex XXX added			
Other specs affected:	⌘	Y / N	Other core specifications	⌘	-
			Test specifications		
			O&M Specifications		
Other comments:	⌘	-			

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

[1] 3GPP TS 23.228: “IP Multimedia (IM) Subsystem – Stage 2 (Release 5)”.

[2] 3GPP TS 24.228: “Signalling flows for the IP multimedia call control based on SIP and SDP”.

[3] 3GPP TS 33.203: “Access security for IP-based services”.

[4] 3GPP TS 23.002 “Network architecture”.

[5] 3GPP TS 29.229: “Cx Interface based on Diameter – Protocol details”

[6] 3GPP TS 23.218: “IP Multimedia (IM) Session Handling; IP Multimedia (IM) call model”

[7] Freed, N. and N. Borestein, “Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies”, RFC 2045, November 1996.

[8] 3GPP TS 24.229: “IP Multimedia Call Control Protocol based on SIP and SDP” – stage 3

[9] IETF RFC 3588 “Diameter Base Protocol”

[x] IETF RFC 3261 "SIP: Session Initiation Protocol"

[y] IETF RFC 2327 "SDP: Session Description Protocol"

[z] IEEE 1003.1-2004, Part 1: Base Definitions

B.2.3 Service Point Trigger

The following picture gives an outline of the UML model of Service Point Trigger class:

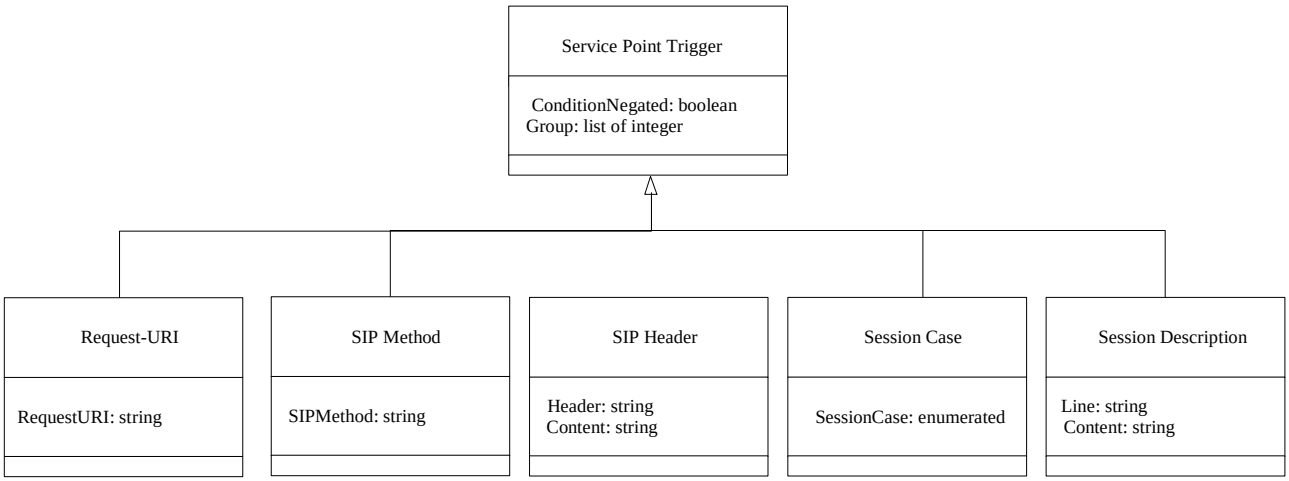

Figure B.2.3.1: Service Point Trigger

The attribute Group of the class Service Point Trigger allows the grouping of SPTs that will configure the sub-expressions inside a CNF or DNF expression. For instance, in the following CNF expression (A+B).(C+D), A+B and C+D would correspond to different groups.

In CNF, the attribute Group identifies the ~~Ored~~ ORed sets of SPT instances. If the SPT belongs to different ~~Ored~~ ORed sets, SPTcan have more than one Group values assigned. At least one Group must be assigned for each SPT.

In DNF, the attribute Group identifies the ANDed sets of SPT instances. If the SPT belongs to different ANDed sets, SPTcan have more than one Group values assigned. At least one Group must be assigned for each SPI.

The attribute ConditionNegated of the class Service Point Trigger defines whether the individual SPT instance is negated (i.e. NOT logical expression).

Request-URI class defines SPT for the Request-URI. Request-URI contains attribute RequestURI.

SIP Method class defines SPT for the SIP method. SIP Method contains attribute SIPMethod which can evaluate to any existent SIP method.

SIP Header class defines SPT for the presence or absence of any SIP header or for the content of any SIP header. SIP Header contains attribute ~~SIP~~ Header which identifies the SIP Header, which is the SPT, and the Content attribute defines the value of the SIP Header if required. ~~The value of the Content attribute is a string that shall be interpreted as a regular expression. Perl-like regular expressions shall be taken as a model for legal regular expressions for this function. A regular expression would be as simple as a literal (e.g. "john") or a more elaborated one, allowing to match a string "containing" a substring, beginning with a substring, etc. Examples of regular expressions valid for the "Match" attribute could be:~~

~~"Joe": meaning that a given header matches exactly with the string "Joe".~~

~~"^(Jo).*": meaning that a given header contains a value that begins with "Jo".~~

~~".*Jo.*": meaning that a given header contains the sub string "Jo" at any position.~~

The absence of the Content attribute and ConditionNegated = TRUE indicates that the SPT is the absence of a determined SIP header.

Session Case class represents an enumerated type, with possible values "Originating", "Terminating_Registered", "Terminating_Unregistered" indicating if the filter should be used by the S-CSCF handling the Originating, Terminating for a registered end user or Terminating for an unregistered end user services.

Session Description Information class defines SPT for the content of any SDP field within the body of a SIP Method. The Line attribute identifies the line inside the session description. Content is a string defining the content of the line identified by Line. ~~Perl-like regular expressions shall be taken as a model for regular expressions for this function (as described above).~~

Annex YYY (normative): Definition of parameters for service point trigger matching

Table YYY.1 defines the parameters that are transported in the user profile XML.

Table YYY.1: Definition of parameters in the user profile XML

Tag	Description
SIPHeader	A SIP Header SPT shall be evaluated separately against each header instance within the SIP message. The SIP Header SPT matches if at least one header occurrence matches the SPT.
Header (of SIPHeader)	Header tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the header-name of the SIP header. For definition of header and header-name, see IETF RFC 3261 [x]. Before matching the header-name to the pattern, all SWSs shall be removed from the header-name and all LWSs in the header-name shall be reduced to a single white space character (SP). For definition of SWS and LWS, see IETF RFC 3261 [x].
Content (of SIPHeader)	Content tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the header-value of the SIP header. For definition of header and header-value, see IETF RFC 3261 [x]. If the SIP header contains several header-values in a comma-separated list, each of the header-value shall be matched against the pattern for the Content separately. Before matching the header-value to the pattern, all SWSs shall be removed from

	the header-value and all LWSs in the header-value shall be reduced to a single white space character (SP). For definition of SWS and LWS, see IETF RFC 3261 [x].
SessionDescription	A Session Description SPT shall be evaluated separately against each SDP field instance within the SIP message. The Session Description SPT matches if at least one field occurrence matches the SPT.
Line (of SessionDescription)	Line tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the type of the field inside the session description. For definition of type, see chapter 6 in IETF RFC 2327 [y].
Content (of SessionDescription)	Content tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the value of the field inside the session description. For definition of value, see chapter 6 in IETF RFC 2327 [y].

Annex C (informative): Conjunctive and Disjunctive Normal Form

A Trigger Point expression is constructed out of atomic expressions (i.e. Service Point Trigger) linked by Boolean operators AND, OR and NOT. Any logical expression constructed in that way can be transformed to forms called Conjunctive Normal Form (CNF) and Disjunctive Normal Form (DNF).

A Boolean expression is said to be in Conjunctive Normal Form if it is expressed as a conjunction of disjunctions of literals (positive or negative atoms), i.e. as an AND of clauses, each of which is the OR of one of more atomic expressions.

Taking as an example the following trigger:

Method = “INVITE” OR Method = “MESSAGE” OR (Method=”SUBSCRIBE” AND NOT Header = “from” ~~Match~~ Content = “joe”)

The trigger can be split into the following atomic expressions:

Method=”INVITE”

Method=”MESSAGE”

Method=”SUBSCRIBE”

NOT header=”from” ~~Match~~ Content=”joe”

Grouping the atomic expressions, the CNF expression equivalent to the previous example looks like:

(Method=”INVITE” OR Method = “MESSAGE” OR Method=”SUBSCRIBE”) AND (Method=”INVITE” OR Method = “MESSAGE” OR (NOT Header = “from” ~~Match~~Content = “joe”))

This result in two “OR” groups linked by “AND” (CNF):

(Method=”INVITE” OR Method = “MESSAGE” OR Method=”SUBSCRIBE”)

(Method=”INVITE” OR Method = “MESSAGE” OR (NOT Header = “from” Content = “joe”))

The XML representation of the trigger is:

```
<?xml version=”1.0” encoding=”UTF-8”?>
<testDatatype xmlns:xsi=”http://www.w3.org/2001/XMLSchema-instance” xsi:noNamespaceSchemaLocation=”D:\
\CxDataType.xsd”>
        <IMSSubscription>
          <PrivateID>IMPI1@homedomain.com</PrivateID>
          <ServiceProfile>
              <PublicIdentity>
                  <BarringIndication>1</BarringIndication>
                  <Identity> sip:IMPU1@homedomain.com </Identity>
              </PublicIdentity>
              <PublicIdentity>
                  <Identity> sip:IMPU2@homedomain.com </Identity>
              </PublicIdentity>
              <InitialFilterCriteria>
                  <Priority>0</Priority>
                  <TriggerPoint>
                      <ConditionTypeCNF>1</ConditionTypeCNF>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>0</Group>
                          <Method>INVITE</Method>
```

```
                    </SPT>
                    <SPT>
                        <ConditionNegated>0</ConditionNegated>
                        <Group>0</Group>
                        <Method>MESSAGE</Method>
                    </SPT>
                    <SPT>
                        <ConditionNegated>0</ConditionNegated>
                        <Group>0</Group>
                        <Method>SUBSCRIBE</Method>
                    </SPT>
                    <SPT>
                        <ConditionNegated>0</ConditionNegated>
                        <Group>1</Group>
                        <Method>INVITE</Method>
                    </SPT>
                    <SPT>
                        <ConditionNegated>0</ConditionNegated>
                        <Group>1</Group>
                        <Method>MESSAGE</Method>
                    </SPT>

                    <SPT>
                        <ConditionNegated>1</ConditionNegated>
                        <Group>1</Group>
                        <SIPHeader>
                            <Header>From</Header>
                            <Content>”joe”</Content>
                        </SIPHeader>
                    </SPT>
                </TriggerPoint>
                <ApplicationServer>
                    <ServerName>sip:AS1@homedomain.com</ServerName>
                    <DefaultHandling>0</DefaultHandling>
                </ApplicationServer>
            </InitialFilterCriteria>
        </ServiceProfile>
    </IMSSubscription>
</testDatatype>
```

A Boolean expression is said to be in Disjunctive Normal Form if it is expressed as a disjunction of conjuctions of literals (positive or negative atoms), i.e. as an OR of clauses, each of which is the AND of one of more atomic expressions.

The previous example is already in DNF, composed by the following groups:

Method=”INVITE”

Method=”MESSAGE”

Method=”SUBSCRIBE” AND (NOT header=”from” ~~Match~~Content=”joe”)

The XML representation of the trigger is:

```
<?xml version=”1.0” encoding=”UTF-8”?>
<testDatatype xmlns:xsi=”http://www.w3.org/2001/XMLSchema-instance” xsi:noNamespaceSchemaLocation=”D:\
CxDataType.xsd”>
    <IMSSubscription>
        <PrivateID>IMPI1@homedomain.com</PrivateID>
        <ServiceProfile>
            <PublicIdentity>
                <BarringIndication>1</BarringIndication>
```

```
            <Identity> sip:IMPU1@homedomain.com </Identity>
        </PublicIdentity>
        <PublicIdentity>
            <Identity> sip:IMPU2@homedomain.com </Identity>
        </PublicIdentity>
        <InitialFilterCriteria>
            <Priority>0</Priority>
            <TriggerPoint>
                <ConditionTypeCNF>0</ConditionTypeCNF>
                <SPT>
                    <ConditionNegated>0</ConditionNegated>
                    <Group>0</Group>
                    <Method>INVITE</Method>
                </SPT>
                <SPT>
                    <ConditionNegated>0</ConditionNegated>
                    <Group>1</Group>
                    <Method>MESSAGE</Method>
                </SPT>
                <SPT>
                    <ConditionNegated>0</ConditionNegated>
                    <Group>2</Group>
                    <Method>SUBSCRIBE</Method>
                </SPT>
                <SPT>
                    <ConditionNegated>1</ConditionNegated>
                    <Group>2</Group>
                    <SIPHeader>
                        <Header>From</Header>
                        <Content>”joe”</Content>
                    </SIPHeader>
                </SPT>
            </TriggerPoint>
            <ApplicationServer>
                <ServerName>sip:AS1@homedomain.com</ServerName>
                <DefaultHandling index=”0">0</DefaultHandling>
            </ApplicationServer>
        </InitialFilterCriteria>
    </ServiceProfile>
</IMSSubscription>
</testDatatype>
```

3GPP TSG-CN WG4 Meeting #24 ***N4-041209***

Sophia Antipolis, France. 16th to 20th August 2004.

CR-Form-v7.1

CHANGE REQUEST

⌘ **29.228** **CR** **120** ⌘ **rev** **3** ⌘ Current version: **6.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Use of regular expressions
Source:	⌘	CN4
Work item code:	⌘	IMS-CCR
Date:	⌘	16/08/2004
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	**Essential correction** The usage of regular expressions in SPTs is defined only in an informatiove annex and in there the description is very vague. The headers in SIP messages may be written in a compact or long form as defined in chapter 7.3.3. in RFC 3261, for example, the Call-ID header may be present in a message either in the long form “Call-ID” or in the compact form “i”. The corresponding value of the Header attribute of a SIP Header is defined to be a string in 29.228 and hence, to create a trigger point that matches to any given SIP header a separate SPT needs to be defined for both to the compact and to the short form of the header which complicates the trigger points significantly. The content of several SPT attributes is not defined.
Summary of change:	⌘	The definition of using regular expressions in SPTs is clarified. The value of the Header attribute of a SIP Header is defined to be a regular exdpression. The content of the Header and Content attributes of SIP Header SPT, and the content of the Line and Content attributes of the Session Description SPT is defined.
Consequences if not approved:	⌘	If there are S-CSCFs from several vendors in the network, it may not be possible to steer the users freely to any one of the S-CSCFs since the interpretation of regular expressions in iFC may differ between the S-CSCFs from different vendors and hence the triggering of SIP messages may be incorrect. Also the operator may need to define the trigger points in a different way depending on

	the S-CSCF that is to be assigned for the user. If the content of the SPT attributes is not properly defined, it may prevent using S-CSCFs from different vendors within the same IMS and a HSS and a S-CSCF from different vendor may not interoperate.

Clauses affected:	⌘	2, B.2.3, new Annex YYY added, Annex C			
Other specs affected:	⌘	Y / N	Other core specifications	⌘	-
			Test specifications		
			O&M Specifications		
Other comments:	⌘	-			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

[1] 3GPP TS 23.228: “IP Multimedia (IM) Subsystem – Stage 2 (Release 5)”.

[2] 3GPP TS 24.228: “Signalling flows for the IP multimedia call control based on SIP and SDP”.

[3] 3GPP TS 33.203: “Access security for IP-based services”.

[4] 3GPP TS 23.002 “Network architecture”.

[5] 3GPP TS 29.229: “Cx Interface based on Diameter – Protocol details”

[6] 3GPP TS 23.218: “IP Multimedia (IM) Session Handling; IP Multimedia (IM) call model”

[7] Freed, N. and N. Borestein, “Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies”, RFC 2045, November 1996.

[8] 3GPP TS 24.229: “IP Multimedia Call Control Protocol based on SIP and SDP” – stage 3

[9] IETF RFC 3588 “Diameter Base Protocol”

[10] 3GPP TS 23.141: "Presence Service; Architecture and Functional Description"

[x] IETF RFC 3261 “SIP: Session Initiation Protocol”

[y] IETF RFC 2337 “SDP: Session Description Protocol”

[z] IEEE 1003.1-2004, Part 1: Base Definitions

B.2.3 Service Point Trigger

The following picture gives an outline of the UML model of Service Point Trigger class:

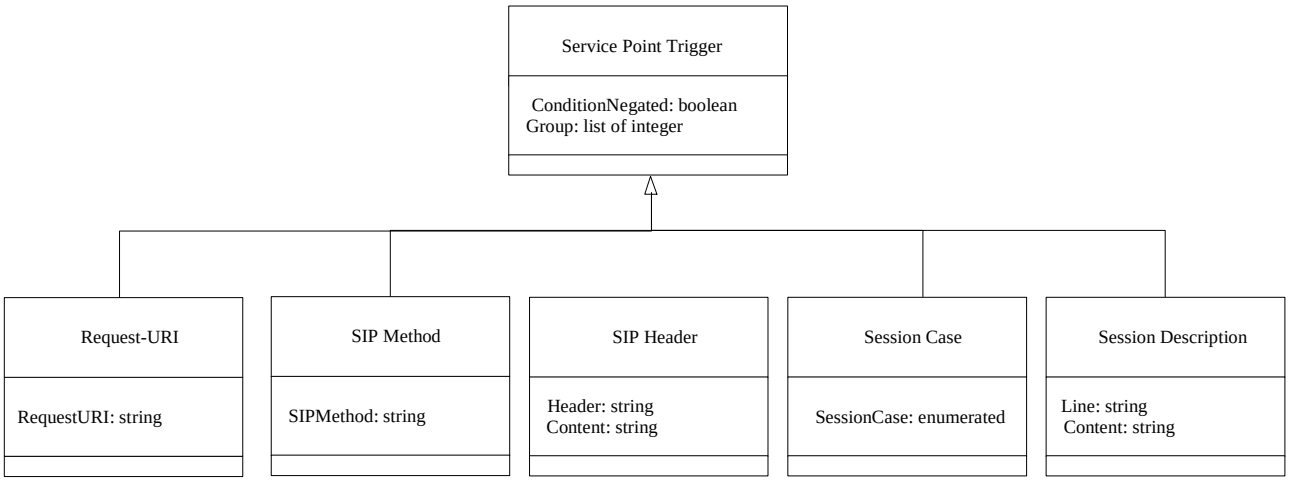

Figure B.2.3.1: Service Point Trigger

The attribute Group of the class Service Point Trigger allows the grouping of SPTs that will configure the sub-expressions inside a CNF or DNF expression. For instance, in the following CNF expression (A+B).(C+D), A+B and C+D would correspond to different groups.

In CNF, the attribute Group identifies the ORed ~~Ored~~ sets of SPT instances. If the SPT belongs to different ORed ~~Ored~~ sets, SPTcan have more than one Group values assigned. At least one Group must be assigned for each SPT.

In DNF, the attribute Group identifies the ANDed sets of SPT instances. If the SPT belongs to different ANDed sets, SPTcan have more than one Group values assigned. At least one Group must be assigned for each SPI.

The attribute ConditionNegated of the class Service Point Trigger defines whether the individual SPT instance is negated (i.e. NOT logical expression).

Request-URI class defines SPT for the Request-URI. Request-URI contains attribute RequestURI.

SIP Method class defines SPT for the SIP method. SIP Method contains attribute SIPMethod which can evaluate to any existent SIP method.

SIP Header class defines SPT for the presence or absence of any SIP header or for the content of any SIP header. SIP Header contains attribute ~~SIP~~ Header which identifies the SIP Header, which is the SPT, and the Content attribute defines the value of the SIP Header if required. ~~The value of the Content attribute is a string that shall be interpreted as a regular expression. Perl like regular expressions shall be taken as a model for legal regular expressions for this function. A regular expression would be as simple as a literal (e.g. "john") or a more elaborated one, allowing to match a string "containing" a substring, beginning with a substring, etc. Examples of regular expressions valid for the "Match" attribute could be:~~

~~"Joe": meaning that a given header matches exactly with the string "Joe".~~

~~"^(Jo).*": meaning that a given header contains a value that begins with "Jo".~~

~~".*Jo.*": meaning that a given header contains the sub string "Jo" at any position.~~

The absence of the Content attribute and ConditionNegated = TRUE indicates that the SPTis the absence of a determined SIP header.

Session Case class represents an enumerated type, with possible values "Originating", "Terminating_Registered", "Terminating_Unregistered" indicating if the filter should be used by the S-CSCF handling the Originating, Terminating for a registered end user or Terminating for an unregistered end user services.

Session Description Information class defines SPTfor the content of any SDP field within the body of a SIP Method. The Line attribute identifies the line inside the session description. Content is a string defining the content of the line identified by Line. ~~Perl-like regular expressions shall be taken as a model for regular expressions for this function (as described above).~~

Annex YYY (normative): Definition of parameters for service point trigger matching

Table YYY.1 defines the parameters that are transported in the user profile XML.

Table YYY.1: Definition of parameters in the user profile XML

Tag	Description
SIPHeader	A SIP Header SPT shall be evaluated separately against each header instance within the SIP message. The SIP Header SPT matches if at least one header occurrence matches the SPT.
Header (of SIPHeader)	Header tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the header-name of the SIP header. For definition of header and header-name, see IETF RFC 3261 [x]. Before matching the header-name to the pattern, all SWSs shall be removed from the header-name and all LWSs in the header-name shall be reduced to a single white space character (SP). For definition of SWS and LWS, see IETF RFC 3261 [x].
Content (of	Content tag shall include a regular expression in a form of Basic Regular Expressions (BRE)

SIPHeader)	as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the header-value of the SIP header. For definition of header and header-value, see IETF RFC 3261 [x]. If the SIP header contains several header-values in a comma-separated list, each of the header-value shall be matched against the pattern for the Content separately. Before matching the header-value to the pattern, all SWSs shall be removed from the header-value and all LWSs in the header-value shall be reduced to a single white space character (SP). For definition of SWS and LWS, see IETF RFC 3261 [x].
SessionDescription	A Session Description SPT shall be evaluated separately against each SDP field instance within the SIP message. The Session Description SPT matches if at least one field occurrence matches the SPT.
Line (of SessionDescription)	Line tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the type of the field inside the session description. For definition of type, see chapter 6 in IETF RFC 2327 [y].
Content (of SessionDescription)	Content tag shall include a regular expression in a form of Basic Regular Expressions (BRE) as defined in chapter 9 in IEEE 1003.1-2004 Part 1 [z]. The regular expression shall be matched against the value of the field inside the session description. For definition of value, see chapter 6 in IETF RFC 2327 [y].

Annex C (informative): Conjunctive and Disjunctive Normal Form

A Trigger Point expression is constructed out of atomic expressions (i.e. Service Point Trigger) linked by Boolean operators AND, OR and NOT. Any logical expression constructed in that way can be transformed to forms called Conjunctive Normal Form (CNF) and Disjunctive Normal Form (DNF).

A Boolean expression is said to be in Conjunctive Normal Form if it is expressed as a conjunction of disjunctions of literals (positive or negative atoms), i.e. as an AND of clauses, each of which is the OR of one of more atomic expressions.

Taking as an example the following trigger:

Method = “INVITE” OR Method = “MESSAGE” OR (Method=”SUBSCRIBE” AND NOT Header = “from” Content ~~Match~~ = “joe”)

The trigger can be split into the following atomic expressions:

Method=”INVITE”

Method=”MESSAGE”

Method=”SUBSCRIBE”

NOT header=”from” Content~~Match~~=”joe”

Grouping the atomic expressions, the CNF expression equivalent to the previous example looks like:

(Method=”INVITE” OR Method = “MESSAGE” OR Method=”SUBSCRIBE”) AND (Method=”INVITE” OR Method = “MESSAGE” OR (NOT Header = “from” Content ~~Match~~ = “joe”))

This result in two “OR” groups linked by “AND” (CNF):

(Method=”INVITE” OR Method = “MESSAGE” OR Method=”SUBSCRIBE”)

(Method=”INVITE” OR Method = “MESSAGE” OR (NOT Header = “from” Content = “joe”))

The XML representation of the trigger is:

```
<?xml version=”1.0” encoding=”UTF-8”?>
<testDatatype xmlns:xsi=”http://www.w3.org/2001/XMLSchema-instance” xsi:noNamespaceSchemaLocation=”D:\
\CxDataType.xsd”>
        <IMSSubscription>
          <PrivateID>IMPI1@homedomain.com</PrivateID>
          <ServiceProfile>
              <PublicIdentity>
                  <BarringIndication>1</BarringIndication>
                  <Identity> sip:IMPU1@homedomain.com </Identity>
              </PublicIdentity>
              <PublicIdentity>
                  <Identity> sip:IMPU2@homedomain.com </Identity>
              </PublicIdentity>
              <InitialFilterCriteria>
                  <Priority>0</Priority>
                  <TriggerPoint>
                      <ConditionTypeCNF>1</ConditionTypeCNF>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>0</Group>
                          <Method>INVITE</Method>
                      </SPT>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>0</Group>
                          <Method>MESSAGE</Method>
                      </SPT>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>0</Group>
                          <Method>SUBSCRIBE</Method>
                      </SPT>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>1</Group>
                          <Method>INVITE</Method>
                      </SPT>
                      <SPT>
                          <ConditionNegated>0</ConditionNegated>
                          <Group>1</Group>
                          <Method>MESSAGE</Method>
                      </SPT>

                      <SPT>
                          <ConditionNegated>1</ConditionNegated>
                          <Group>1</Group>
                          <SIPHeader>
                              <Header>From</Header>
                              <Content>”joe”</Content>
                          </SIPHeader>
                      </SPT>
                  </TriggerPoint>
                  <ApplicationServer>
                      <ServerName>sip:AS1@homedomain.com</ServerName>
                      <DefaultHandling>0</DefaultHandling>
                  </ApplicationServer>
              </InitialFilterCriteria>
```

```
        </ServiceProfile>
      </IMSSubscription>
</testDatatype>
```

A Boolean expression is said to be in Disjunctive Normal Form if it is expressed as a disjunction of conjuctions of literals (positive or negative atoms), i.e. as an OR of clauses, each of which is the AND of one of more atomic expressions.

The previous example is already in DNF, composed by the following groups:

Method=”INVITE”

Method=”MESSAGE”

Method=”SUBSCRIBE” AND (NOT header=”from” Content~~Match~~=”joe”)

The XML representation of the trigger is:

```
<?xml version=”1.0” encoding=”UTF-8”?>
<testDatatype xmlns:xsi=”http://www.w3.org/2001/XMLSchema-instance” xsi:noNamespaceSchemaLocation=”D:\
CxDataType.xsd”>
      <IMSSubscription>
        <PrivateID>IMPI1@homedomain.com</PrivateID>
        <ServiceProfile>
          <PublicIdentity>
            <BarringIndication>1</BarringIndication>
            <Identity> sip:IMPU1@homedomain.com </Identity>
          </PublicIdentity>
          <PublicIdentity>
            <Identity> sip:IMPU2@homedomain.com </Identity>
          </PublicIdentity>
          <InitialFilterCriteria>
            <Priority>0</Priority>
            <TriggerPoint>
              <ConditionTypeCNF>0</ConditionTypeCNF>
              <SPT>
                <ConditionNegated>0</ConditionNegated>
                <Group>0</Group>
                <Method>INVITE</Method>
              </SPT>
              <SPT>
                <ConditionNegated>0</ConditionNegated>
                <Group>1</Group>
                <Method>MESSAGE</Method>
              </SPT>
              <SPT>
                <ConditionNegated>0</ConditionNegated>
                <Group>2</Group>
                <Method>SUBSCRIBE</Method>
              </SPT>
              <SPT>
                <ConditionNegated>1</ConditionNegated>
                <Group>2</Group>
                <SIPHeader>
                  <Header>From</Header>
                  <Content>”joe”</Content>
                </SIPHeader>
              </SPT>
            </TriggerPoint>
            <ApplicationServer>
              <ServerName>sip:AS1@homedomain.com</ServerName>
              <DefaultHandling index=”0">0</DefaultHandling>
```

```
                    </ApplicationServer>
                </InitialFilterCriteria>
            </ServiceProfile>
        </IMSSubscription>
</testDatatype>
```