SA2#18   S2-011573

Puerto Rico, USA, 14-18 May 2001

Title: LS on Security Associations for IMS functional elements

Source: **SA2**

To: **SA3**

Attachments: **S2-011351, S2-011524**

Contact Person:
    Name: **Andrew Allen**
    Company: **Motorola**
    E-mail Address: **caa019@email.mot.com**

SA2 thanks SA3 for their assistance at the April 26th 2001 SA3-SA2 joint meeting with progressing the work on defining the Security Associations for IM CN subsystem functional elements and for the drafting of text for CR 040 against TS 23.228 contained in S2-011351.

SA2 would like to inform SA3 that although the text for CR 040 was drafted at the joint meeting, SA2#18 took the view that the scope of the CR should be broadened and made more generic to cover all IM CN subsystem network functional elements and the layout of the information modified to include a new section. The revised and agreed version of the CR is attached in S2-011524.

It is the intention of SA2 to present CR 040r1 to SA#12 for approval. SA2 requests SA3 to review the revised version of the CR and to inform SA2 if there are any security issues which should prevent the revised version being approved by SA#12.

SA2 thanks SA3 for their assistance with this issue.

3GPP SA2#18   **Tdoc S2-011351**
Puerto Rico, USA
14-18 May, 2001

Source: Motorola
Title: Security Associations for Roles of Session Control Functions
Document for: Approval

4Introduction

At the last SA2-SA3 joint meeting held in Gothenburg AT&T presented S2-010512 specifying
CSCF Security Requirements for TS 23.228. Although some security associations for P-CSCF
and S-CSCF were agreed in a subsequent revised version of that contribution it was not agreed
at this meeting to specify any security relationships between the I-CSCF and either the P-CSCF
or the S-CSCF. Motorola brought some proposed text to fix this problem to the SA3-SA2 joint
meeting and this contribution contains a CR against 23.228 which was agreed at the SA3-SA2
joint meeting which includes text that confirms that the I-CSCF will have a security association
towards the P-CSCF and the S-CSCF

Discussion

The current situation is of concern because the architecture outlined by SA2 in TS 23.228 and the
corresponding derived SIP session flows in TS 24.228 (being worked jointly by SA2 and CN1)
depend on the I-CSCF being able to read and modify headers in requests and responses from
the P-CSCF and the S-CSCF. The assumption during the development of the SIP session flows
in TS 24.228 was always that the I-CSCF would maintain a security relationship with the P-CSCF
and the S-CSCF. Without an agreed statement in TS 23.228 specifying that the I-CSCF has a
security association towards the P-CSCF and the S-CSCF the work of SA2 and CN1 is at risk.

It was also agreed to add similar security assocaition statements for the Breakout Gateway
Control Function (BGCF).

Proposal

It is proposed that SA2 approve the following CR the text of which the SA3-SA2 joint meeting ad
hoc group endorsed.

3GPP TSG-SA2#18
Puerto Rico, USA, 14-18 May 2001

CR-Form-v3

CHANGE REQUEST

⌘   **23.228 CR 040**   ⌘ rev **-** ⌘ Current version: **5.0.0** ⌘

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

Proposed change affects: ⌘   (U)SIM☐   ME/UE☐   Radio Access Network ☐   Core Network **X**

Title:	⌘	Security Associations for Roles of Session Control Functions
Source:	⌘	Motorola

Work item code: ⌘	1514		Date: ⌘	05.08.2001
Category:	⌘ **F**		Release: ⌘	REL-5

Use <u>one</u> of the following categories:
   F *(essential 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 <u>one</u> 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)*

Reason for change: ⌘	Security associations of Session Control functions are incorrect or missing
Summary of change: ⌘	Addition and Correction of security associations of Session Control Functions.
Consequences if not approved: ⌘	Security associations of Session Control functions will be incorrect or missing

Clauses affected: ⌘	2, 4.6.1, 4.6.2, 4.6.3, 4.6.4		
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications		
Other comments: ⌘			

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[2]	CCITT Recommendation E.164: "Numbering plan for the ISDN era".
[3]	CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterisation of services supported by an ISDN".
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[5]	GSM 03.64: "Digital cellular telecommunication system (Phase 2+); Overall Description of the General Packet Radio Service (GPRS) Radio Interface; Stage 2".
[6]	GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
[7]	3GPP TS 23.221: "Architectural Requirements".
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[9]	3GPP TS 23.207: "End-to-end QoS concept and architecture"
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[14]	RFC 2486: "The Network Access Identifier"
[15]	RFC 2806: "URLs for Telephone Calls"
[16]	RFC 2916: "E.164 number and DNS"
[17]	ITU Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies"
[18]	ITU Recommendation H.248: "Gateway control protocol"
[19]	3GPP TS 33.203xx: "Access Security for IP-based services"
[20]	3GPP TS 33.2xx00: "Network Domain Security: IP network layer security"

** Next changed section **

4.6 Roles of Session Control Functions

The CSCF may take on various roles as used in the IP multimedia subsystem. The following sections describe these various roles.

4.6.1 Proxy-CSCF

The Proxy-CSCF (P-CSCF) is the first contact point within the IM CN subsystem. Its address is discovered by UEs following PDP context activation, using the mechanism described in section "Procedures related to Local CSCF Discovery ". The P-CSCF behaves like a Proxy (as defined in RFC2543 or subsequent versions), i.e. it accepts requests and services them internally or forwards them on, possibly after

translation. The P-CSCF may also behave as a User Agent (as defined in the RFC2543 or subsequent versions), i.e. in abnormal conditions it may terminate and independently generate SIP transactions. The Policy Control Function (PCF) is a logical entity of the P-CSCF. If the PCF is implemented in a separate physical node, the interface between the PCF and the P-CSCF is not standardised.

The functions performed by the P-CSCF are:

- Forward the SIP register request received from the UE to an I-CSCF determined using the home domain name, as provided by the UE.

- Forward SIP messages received from the UE to the SIP server (e.g. S-CSCF) whose name the P-CSCF has received as a result of the registration procedure.

- As part of processing of the request and before forwarding, the P-CSCF may modify the Request URI of outgoing requests according to a set of provisioned rules defined by the network operator (e.g. Number analysis and potential modification such as translation from local to international format.)

- Forward the SIP request or response to the UE.

- Detect an emergency session and select a S-CSCF in the visited network to handle emergency sessions.

- ~~The g~~Generation of CDRs.

- Maintain a Security Association between itself and each UE, as defined in ~~Access Security for IP-based services Specification~~ TS 33.2<u>03</u> ~~xx~~ [19].

- ~~-~~ Provide security towards <u>Interrogating-CSCF and</u> Serving-CSCF by security methods defined in ~~Network Domain Security specification~~ TS 33.2<u>xx</u>~~00~~ [20].

Editor's Note: The following functions require further study:

- Authorisation of bearer resources and QoS management. Details of the P-CSCF role in QoS management and authorisation of bearer resources for the session are being investigated by the QoS ad-hoc group.

4.6.2 Interrogating-CSCF

Interrogating-CSCF (**I-CSCF**) is the contact point within an operator's network for all connections destined to a subscriber of that network operator, or a roaming subscriber currently located within that network operator's service area. There may be multiple I-CSCFs within an operator's network. The functions performed by the I-CSCF are:

Registration

- Assigning a S-CSCF to a user performing SIP registration (see section on Procedures related to Serving-CSCF assignment)

Session Flows

- Route a SIP request received from another network towards the S-CSCF.

- Obtain from HSS the Address of the S-CSCF.

- ~~-~~ Forward the SIP request or response to the S-CSCF determined by the step above

- Provide security towards Proxy-CSCF by security methods defined in TS 33.2xx [20].

- Provide security towards Serving-CSCF, if needed, by security methods defined in TS 33.2xx [20].

Charging and resource utilisation:

- Generation of CDRs.

In performing the above functions the operator may use the I-CSCF or other techniques to hide the configuration, capacity, and topology of the network from the outside. When the I-CSCF is chosen to meet the hiding requirement then for sessions traversing across different operators domains, the I-CSCF may forward the SIP request or response to another I-CSCF allowing the operators to maintain configuration independence.

4.6.3   Serving-CSCF

The Serving-CSCF (S-CSCF) performs the session control services for the UE. It maintains a session state as needed by the network operator for support of the services. Within an operator's network, different S-CSCFs may have different functionalities. The functions performed by the S-CSCF during a session are:

Registration
- May behave as a Registrar as defined in RFC2543 or subsequent versions, i.e. it accepts registration requests and makes its information available through the location server (eg. HSS).

Session flows
- Session control for the registered endpoint's sessions.

- May behave as a Proxy Server as defined in RFC2543 or subsequent versions, i.e. it accepts requests and services them internally or forwards them on, possibly after translation.

- May behave as a User Agent as defined in RFC2543 or subsequent versions, i.e. it may terminate and independently generate SIP transactions.

- Interaction with Services Platforms for the support of Services

- Provide endpoints with service event related information (e.g. notification of tones/announcement together with location of additional media resources, billing notification)

- Security towards Proxy-CSCF, as defined by the Network Domain Security specification TS 33.200.

- Provide security towards Interrogating-CSCF and BGCFs, if needed, by security methods defined in TS 33.2xx [20]

- Provide security towards Proxy-CSCF by security methods defined in TS 33.2xx [20]

- If interacting with external Networks, Security Associations are provided in accordance with operator policy.

- On behalf of an originating endpoint (i.e. the originating subscriber/UE)

    - Obtain from a database the Address of the I-CSCF for the network operator serving the destination subscriber from the destination name of the terminating subscriber (e.g. dialled phone number or SIP URL), when the destination subscriber is a customer of a different network operator, and forward the SIP request or response to that I-CSCF.

    - When the destination name of the terminating subscriber (e.g. dialled phone number or SIP URL), and the destination subscriber is a customer of the same network operator, forward the SIP request or response to an I-CSCF within the operator's network.

    - Depending on operator policy, forward the SIP request or response to another SIP server located within an ISP domain outside of the IM CN subsystem.

- On behalf of a destination endpoint (i.e. the terminating subscriber/UE)

- Forward the SIP request or response to a P-CSCF for a MT session to a home subscriber within the home network, or for a subscriber roaming within a visited network where the home network operator has chosen not to have an I-CSCF in the path

- Forward the SIP request or response to an I-CSCF for a MT session for a roaming subscriber within a visited network where the home network operator has chosen to have an I-CSCF in the path.

Charging and resource utilisation:
- Generation of CDRs.

4.6.4 Breakout Gateway Control Function

The Breakout Gateway control function (BGCF) selects the network in which PSTN breakout is to occur. If the BGCF determines that the breakout is to occur in the same network in which the BGCF is located within, then the BGCF shall select a MGCF which will be responsible for the interworking with the PSTN. If the break out is in another network, the BGCF will forward this session signalling to another BGCF, or an MGCF, depending on the configuration, in the selected network.

The functions performed by the BGCF are:

- Receives request from S-CSCF to select appropriate PSTN break out point for the session

- Select the network in which the interworking with the PSTN is to occur. If the interworking is in another network, then the BGCF will forward the SIP signalling to the BGCF of that network.

- Select the MGCF in the network in which the interworking with PSTN is to occur and forward the SIP signalling to that MGCF. This may not apply if the interworking is a different network.

- Provide security towards another BGCF by security methods defined in TS 33.2xx [20].

- Provide security towards Serving-CSCF and MGCFs, as needed, by security methods defined in TS 33.2xx [20].

Charging and resource utilisation:
- Generation of CDRs.

The BGCF may make use of information received from other protocols, or may make use of administrative information, when making the choice of which network the interworking shall occur.

Title:	**Proposed changes to 23.228 v5.0.0 at SA WG3 / SA WG2 joint ad-hoc on Roles of Security functions**
Source:	**SA WG3**
To:	**SA WG2**

The following changes to TS 23.228 version 5.0.0 were developed by the SA WG3 / SA WG2 joint ad-hoc meeting on IMS Security, 26 April 2001, based upon proposals in the attachment to input document S3z010034 (Motorola).

The ad hoc group endorsed the proposed modifications provided below.

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- Forward the SIP request or response to the UE.

- Detect an emergency session and select a S-CSCF in the visited network to handle emergency sessions.

- The gGeneration of CDRs.

- Maintain a Security Association between itself and each UE, as defined in Access Security for IP-based services Specification TS 33.203 xx [19].

- - Provide security towards Interrogating-CSCF and Serving-CSCF by security methods defined in Network Domain Security specification TS 33.2xx00 [20].

- Authorisation of bearer resources and QoS management. Details of the P-CSCF role in QoS management and authorisation of bearer resources for the session are being investigated by the QoS ad-hoc group.

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- Provide security towards Proxy-CSCF by security methods defined in TS 33.2xx [20].

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Charging and resource utilisation:
- Generation of CDRs.

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Charging and resource utilisation:
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3GPP SA2#18   **Tdoc S2-011351**
Puerto Rico, USA
14-18 May, 2001

Source: Motorola
Title: Security Associations for Roles of Session Control Functions
Document for: Approval

Proposal

It is proposed that SA2 approve the following CR and send the text to SA3 for endorsement.

CR-Form-v3

CHANGE REQUEST

⌘ **23.228 CR 040** ⌘ rev **1-** ⌘ Current version: **5.0.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title: ⌘	Security Associations for Roles of Session Control Functions	
Source: ⌘	Motorola	
Work item code: ⌘	1514	***Date:*** ⌘ 05.08.2001
Category: ⌘ **F**		***Release:*** ⌘ REL-5

Use one of the following categories:
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A *(corresponds to a correction in an earlier release)*
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R99 *(Release 1999)*
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REL-5 *(Release 5)*

Reason for change: ⌘	Security associations of ~~Session Control~~IM subsystem functions are incorrect or missing
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Consequences if not approved: ⌘	Security associations of ~~Session Control~~IM subsystem functions will be incorrect or missing

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Other specs affected: ⌘	☐ Other core specifications	⌘	
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Other comments: ⌘	

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[5]   GSM 03.64: "Digital cellular telecommunication system (Phase 2+); Overall Description of the General Packet Radio Service (GPRS) Radio Interface; Stage 2".

[6]   GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[7]   3GPP TS 23.221: "Architectural Requirements".

[8]   3GPP TS 22.228: "Service requirements for the IP multimedia core network subsystem"

[9]   3GPP TS 23.207: "End-to-end QoS concept and architecture"

[10]   3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP"

[11]   3GPP TS 25.301: "Radio interface protocol architecture"

[12]   RFC 2543: "SIP: Session Initiation Protocol"

[13]   RFC 2396: "Uniform Resource Identifiers (URI): Generic Syntax"

[14]   RFC 2486: "The Network Access Identifier"

[15]   RFC 2806: "URLs for Telephone Calls"

[16]   RFC 2916: "E.164 number and DNS"

[17]   ITU Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies"

[18]   ITU Recommendation H.248: "Gateway control protocol"

[19]   3GPP TS 33.203xx: "Access Security for IP-based services"

[20]   3GPP TS 33.2xx00: "Network Domain Security: IP network layer security"

** Next changed section **

4.6 Roles of Session Control Functions

The CSCF may take on various roles as used in the IP multimedia subsystem. The following sections describe these various roles.

4.6.1 Proxy-CSCF

The Proxy-CSCF (P-CSCF) is the first contact point within the IM CN subsystem. Its address is discovered by UEs following PDP context activation, using the mechanism described in section "Procedures related to Local CSCF Discovery ". The P-CSCF behaves like a Proxy (as defined in RFC2543 or subsequent versions), i.e. it accepts requests and services them internally or forwards them on, possibly after translation. The P-CSCF may also behave as a User Agent (as defined in the RFC2543 or subsequent versions), i.e. in abnormal conditions it may terminate and independently generate SIP transactions. The Policy Control Function (PCF) is a logical entity of the P-CSCF. If the PCF is implemented in a separate physical node, the interface between the PCF and the P-CSCF is not standardised. The functions performed by the P-CSCF are:
- Forward the SIP register request received from the UE to an I-CSCF determined using the home domain name, as provided by the UE.

- Forward SIP messages received from the UE to the SIP server (e.g. S-CSCF) whose name the P-CSCF has received as a result of the registration procedure.

- As part of processing of the request and before forwarding, the P-CSCF may modify the Request URI of outgoing requests according to a set of provisioned rules defined by the network operator (e.g. Number analysis and potential modification such as translation from local to international format.)

- Forward the SIP request or response to the UE.

- Detect an emergency session and select a S-CSCF in the visited network to handle emergency sessions.

- The gGeneration of CDRs.

- Maintain a Security Association between itself and each UE, as defined in Access Security for IP-based services Specification TS 33.203 xx [19].

- Provide security towards Interrogating-CSCF and Serving-CSCF by security methods defined in Network Domain Security specification TS 33.2xx00 [20].

Editor's Note: The following functions require further study:

- Authorisation of bearer resources and QoS management. Details of the P-CSCF role in QoS management and authorisation of bearer resources for the session are being investigated by the QoS ad-hoc group.

4.6.2 Interrogating-CSCF

Interrogating-CSCF (**I-CSCF**) is the contact point within an operator's network for all connections destined to a subscriber of that network operator, or a roaming subscriber

currently located within that network operator's service area. There may be multiple I-CSCFs within an operator's network. The functions performed by the I-CSCF are:

Registration

- Assigning a S-CSCF to a user performing SIP registration (see section on Procedures related to Serving-CSCF assignment)

Session Flows

- Route a SIP request received from another network towards the S-CSCF.

- Obtain from HSS the Address of the S-CSCF.

- - Forward the SIP request or response to the S-CSCF determined by the step above

Provide security towards Proxy-CSCF by security methods defined in TS 33.2xx [20].

Provide security towards Serving-CSCF, if needed, by security methods defined in TS 33.2xx [20].

Charging and resource utilisation:

- Generation of CDRs.

In performing the above functions the operator may use the I-CSCF or other techniques to hide the configuration, capacity, and topology of the network from the outside. When the I-CSCF is chosen to meet the hiding requirement then for sessions traversing across different operators domains, the I-CSCF may forward the SIP request or response to another I-CSCF allowing the operators to maintain configuration independence.

4.6.3   Serving-CSCF

The Serving-CSCF (S-CSCF) performs the session control services for the UE. It maintains a session state as needed by the network operator for support of the services. Within an operator's network, different S-CSCFs may have different functionalities. The functions performed by the S-CSCF during a session are:

Registration

- May behave as a Registrar as defined in RFC2543 or subsequent versions, i.e. it accepts registration requests and makes its information available through the location server (eg. HSS).

Session flows

- Session control for the registered endpoint's sessions.

- May behave as a Proxy Server as defined in RFC2543 or subsequent versions, i.e. it accepts requests and services them internally or forwards them on, possibly after translation.

- May behave as a User Agent as defined in RFC2543 or subsequent versions, i.e. it may terminate and independently generate SIP transactions.

- Interaction with Services Platforms for the support of Services

- Provide endpoints with service event related information (e.g. notification of tones/announcement together with location of additional media resources, billing notification)

- Security towards Proxy-CSCF, as defined by the Network Domain Security specification TS 33.200.

- Provide security towards Interrogating-CSCF and BGCFs, if needed, by security methods defined in TS 33.2xx [20]

- Provide security towards Proxy-CSCF by security methods defined in TS 33.2xx [20]

- On behalf of an originating endpoint (i.e. the originating subscriber/UE)

    - Obtain from a database the Address of the I-CSCF for the network operator serving the destination subscriber from the destination name of the terminating subscriber (e.g. dialled phone number or SIP URL), when the destination subscriber is a customer of a different network operator, and forward the SIP request or response to that I-CSCF.

    - When the destination name of the terminating subscriber (e.g. dialled phone number or SIP URL), and the destination subscriber is a customer of the same network operator, forward the SIP request or response to an I-CSCF within the operator's network.

    - Depending on operator policy, forward the SIP request or response to another SIP server located within an ISP domain outside of the IM CN subsystem.

- On behalf of a destination endpoint (i.e. the terminating subscriber/UE)

    - Forward the SIP request or response to a P-CSCF for a MT session to a home subscriber within the home network, or for a subscriber roaming within a visited network where the home network operator has chosen not to have an I-CSCF in the path

    - Forward the SIP request or response to an I-CSCF for a MT session for a roaming subscriber within a visited network where the home network operator has chosen to have an I-CSCF in the path.

Charging and resource utilisation:
- Generation of CDRs.

4.6.4　Breakout Gateway Control Function

The Breakout Gateway control function (BGCF) selects the network in which PSTN breakout is to occur. If the BGCF determines that the breakout is to occur in the same network in which the BGCF is located within, then the BGCF shall select a MGCF which will be responsible for the interworking with the PSTN. If the break out is in another network, the BGCF will forward this session signalling to another BGCF, or an MGCF, depending on the configuration, in the selected network.

The functions performed by the BGCF are:

- Receives request from S-CSCF to select appropriate PSTN break out point for the session

- Select the network in which the interworking with the PSTN is to occur. If the interworking is in another network, then the BGCF will forward the SIP signalling to the BGCF of that network.

- Select the MGCF in the network in which the interworking with PSTN is to occur and forward the SIP signalling to that MGCF. This may not apply if the interworking is a different network.

Charging and resource utilisation:
- Generation of CDRs.

The BGCF may make use of information received from other protocols, or may make use of administrative information, when making the choice of which network the interworking shall occur.

** New section **

4.7 Security Concepts

IM CN Subsystem functional elements provide security, as needed, by security methods defined in TS 33.2xx [20]. If interacting with external Networks, Security Associations are provided in accordance with operator policy.