ETSI TS 123 380 V9.4.0 (2011-06)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
LTE;
IMS Restoration Procedures
(3GPP TS 23.380 version 9.4.0 Release 9)

Reference
RTS/TSGC-0423380v940

Keywords
LTE, UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Intellectual Property Rights

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

Although network nodes in the IMS Core Network should have a very high availability, some maintenance downtime and occasional failures are unavoidable. Communication links although designed with robust protocols between the network elements are also subject to failures. This document specifies a set of standardized procedures for automatic restoration after loss or corruption of data reducing the impact of these problems in order to improve service to the users. The scenarios covered here for the IMS Domain are similar to those covered in 3GPP TS 23.007 [2] for the CS and PS Domains.

1 Scope

The present document specifies the procedures required in 3GPP IMS to handle a S-CSCF service interruption scenario with minimum impact to the service to the end user.

NOTE: IMS Restoration Procedures covering service interruption of other network elements are not defined in this version of the specification.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.007: "Restoration procedures".

[3] 3GPP TS 29.228: "IP Multimedia (IM) Subsystem Cx and Dx interfaces; Signalling flows and message contents".

[4] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification".

[5] 3GPP TS 29.213: "Policy and charging control signalling flows and Quality of Service (QoS) parameter mapping".

[6] 3GPP TS 29.212: "Policy and Charging Control over Gx reference point".

[7] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[8] 3GPP TS 29.060: "General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp interface".

[9] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[10] 3GPP TS 29.274: "3GPP Evolved Packet System. Evolved GPRS Tunnelling Protocol for EPS (GTPv2)".

[11] IETF RFC 3361: "Dynamic Host Configuration Protocol (DHCP-for-IPv4) Option for Session Initiation Protocol (SIP) Servers".

[12] IETF RFC 1034: "Session Initiation Protocol (SIP): Locating SIP Servers".

[13] IETF RFC 3319: "Dynamic Host Configuration Protocol (DHCPv6) Options for Session Initiation Protocol (SIP) Servers".

[14] draft-ietf-sipcore-keep-01 (Dec 2009): "Indication of support for keep-alive".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Service Interruption: A period of time in which one or more network elements do not respond to requests and do not send any requests to the rest of the system.

S-CSCF Restoration Information: Information required for the S-CSCF to handle traffic for a registered user. This information is stored in HSS and if lost, retrieved by the S-CSCF.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

LIR	Location Information Request
LIA	Location Information Answer
SAR	Server Assignment Request
SAA	Server Assignment Answer
UAR	User Authorization Request
UAA	User Authorization Answer

4 Restoration of Data in the S-CSCF

4.1 General

The following clauses describe the IMS Restoration Procedures for the S-CSCF service interruption in each of the scenarios where they apply.

4.2 Registration Procedure

4.2.1 Introduction

The following clauses specify the behaviour of HSS and S-CSCF if they support the IMS restoration feature.

4.2.2 S-CSCF Restoration after Failure

If the UE initiates a SIP REGISTER and the S-CSCF returned by the HSS during user registration status query procedure fails, the I-CSCF is unable to contact the S-CSCF. In this case, regardless of this registration is an initial registration, a re-registration or a de-registration, the I-CSCF shall send UAR with Authorization Type set to REGISTRATION_AND_CAPABILITIES to the HSS to explicitly request S-CSCF capabilities. After re-assignment of another S-CSCF according to the S-CSCF capabilities, the I-CSCF shall forward the REGISTER to the new S-CSCF. For registrations and re-registrations, S-CSCF shall proceed with the registration procedure as for initial registration, except for the clauses specified in 4.2.3.

For de-registrations, S-CSCF shall proceed as for user-initiated de-registration.

4.2.3 S-CSCF Restoration during Registration Process

During the registration procedure, the HSS shall send all the registered Private User Identities sharing the same Public User Identity which is being registered in the SAA, in addition to the basic user data to the S-CSCF. Then the S-CSCF

compares the registered Private User Identities received from the HSS with the ones it stores. If there are any registered Private User Identities the S-CSCF does not have their registration data, the S-CSCF shall send SAR with Server Assignment Type set to NO_ASSIGNMENT to the HSS to retrieve the S-CSCF restoration information for the registered Public User Identity. If there are S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA to the S-CSCF. The result code shall be set to DIAMETER_SUCCESS.

If there are more than one group of S-CSCF restoration information related to the Public User Identity stored in the HSS, which may happen if the Public User Identity is shared by multiple Private User Identities, the HSS shall include all of the S-CSCF restoration information in the SAA. One group of S-CSCF restoration information corresponds to one Private User Identity.

If the S-CSCF receives an initial registration request for a Public User Identity that does not match any Public User Identity currently registered with the same Private User Identity as in the request at this S-CSCF, the S-CSCF shall check whether there is a reg-id parameter in the Contact header in the SIP REGISTER message and whether there is an "sos" SIP URI parameter in the SIP REGISTER message. If a reg-id parameter or an "sos" SIP URI parameter exists, the S-CSCF shall indicate to the HSS that the registration is related to a multiple registration.

If the HSS receives an SAR request with multiple registration indication, and the Public User Identity is stored as registered in the HSS, and there is restoration information related to the Private User Identity, the HSS shall not overwrite stored restoration information, instead, it shall send the stored S-CSCF restoration information together with the user profile in the SAA. The result code shall be set to DIAMETER_ERROR_IN_ASSIGNMENT_TYPE. The S-CSCF shall send a new SAR with Server-Assignment-Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE to update the restoration information in the HSS in accordance to the current registration event.

If the S-CSCF receives a user-initiated deregistration request for a Public User Identity that does not match any Public User Identity currently registered with the same Private User Identity as in the request at this S-CSCF, the S-CSCF shall check whether there is a reg-id parameter in the Contact header in the received SIP REGISTER message,

- if a reg-id parameter exists, the S-CSCF shall:

    - 1. Send SAR with Server-Asignment-Type set to NO_ASSIGNMENT to retrieve the S-CSCF restoration information associated with the Public User Identity. The Result-Code shall be set to DIAMETER SUCCESS.

    - 2. Compare the contact address(es) received in SAA with the contact address(es) in REGISTER request:

    - If they are not the same, the S-CSCF shall send SAR with Server-Asignment-Type set to RE_REGISTRATION to update the S-CSCF restoration information in HSS with the Contact address(es) still associated with the Public User Identity after the deregistration event.

  Otherwise, the S-CSCF shall send SAR with Server-Asignment-Type set to USER_DEREGISTRATION.

4.3 UE Terminating Procedure

4.3.1 Introduction

The following clauses specify the behaviour of HSS, I-CSCF and S-CSCF if they support the IMS Restoration feature.

4.3.2 S-CSCF Restoration after Restart

The S-CSCF lost all user data if it restarts after a failure or it is unable to trust any data after it resumes operation, due to the fact that it may have lost profile updates from the HSS in the service interruption period. If such a S-CSCF receives a terminating service request from the I-CSCF, it sends an SAR to the HSS for unregistered service data. In this case, HSS and S-CSCF proceed as indicated in 3GPP TS 29.228 [3], except that

- if the Public User Identity is stored as registered in the HSS, and there are S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA. The result code shall be set to

DIAMETER_ERROR_IN_ASSIGNMENT_TYPE. The S-CSCF shall trigger matched registered services for the Public User Identity.

If there are more than one group of S-CSCF restoration information related to the Public User Identity, which may happen if the Public User Identity is shared by multiple Private User Identities, the HSS shall include all of the S-CSCF restoration information in the SAA. One group of S-CSCF restoration information corresponds to one Private User Identity.

If the S-CSCF restoration information received includes the UE"s subscription information, the S-CSCF shall construct a NOTIFY message according to the information and send it to the UE (or UEs if the IMPU is shared between several IMPIs) to trigger a new registration at anytime after normal processing of the terminating request.

4.3.3 S-CSCF Restoration after Failure

If the S-CSCF returned by the HSS during location query procedure fails, the I-CSCF is unable to contact the S-CSCF during terminating procedure. In this case, the I-CSCF shall send LIR to the HSS to explicitly request S-CSCF capabilities. If the HSS returns the S-CSCF capabilities to the I-CSCF, after re-selection of another S-CSCF according to the S-CSCF capabilities, the I-CSCF shall forward the service request to the new S-CSCF. The HSS and this new S-CSCF shall behave as described in clause 4.3.2, except that the HSS shall overwrite the S-CSCF name when receiving the SAR request, only if there is a previous explicit LIR request for S-CSCF capabilities.

4.4 UE Originating Procedure

4.4.1 Introduction

The following clauses specify the behaviour of HSS, S-CSCF and P-CSCF if they support the IMS Restoration feature.

4.4.2 S-CSCF Restoration after Restart

The S-CSCF lost all user data if it restarts after a failure or it is unable to trust any data after it resumes operation, due to the fact that it may have lost profile updates from the HSS in the service interruption period. If such a S-CSCF receives an originating request different from SIP REGISTER coming from the UE, the S-CSCF shall send SAR to the HSS with Server Assignment Type set to NO_ASSIGNMENT to restore the user data. If the S-CSCF name sent in the Server-Assignment-Request command and the previously assigned S-CSCF name stored in the HSS are different, which may happen if S-CSCF reassignment occurred during a terminating restoration before, the HSS shall not overwrite the S-CSCF name; instead it shall send a response to the S-CSCF with result code set to DIAMETER_UNABLE_TO_COMPLY, as specified in the 3GPP TS 29.228 [3]. If there are S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA to the S-CSCF. If the HSS returns an error DIAMETER_UNABLE_TO_COMPLY to the S-CSCF, the S-CSCF shall then return a specific error response to the UE to trigger a new registration.

If there are more than one group of S-CSCF restoration information related to the Public User Identity stored in the HSS, which may happen if the Public User Identity is shared by multiple Private User Identities, the HSS shall include all of the S-CSCF restoration information in the SAA. One group of S-CSCF restoration information corresponds to one Private User Identity.

If the S-CSCF receives SAA with the service profile of the user, the S-CSCF shall continue the originating service as normal.

If the S-CSCF receives SAA with S-CSCF restoration information and the S-CSCF restoration information includes the UE"s subscription information, the S-CSCF shall construct a NOTIFY message according to the information and send it to the UE (or UEs if the IMPU is shared between several IMPIs) to trigger a new registration at anytime after normal processing of the originating request.

4.4.3 S-CSCF Restoration after Failure

If the UE initiates an originating service request different from SIP REGISTER and the P-CSCF is unable to contact the S-CSCF in the Route, the P-CSCF shall return a specific error response to the UE to trigger a new registration.

4.5 SIP-AS Originating Procedure

4.5.1 Introduction

The following clauses specify the behaviour of HSS, I-CSCF and S-CSCF if they support the IMS Restoration feature.

4.5.2 S-CSCF Restoration after Restart

The S-CSCF lost all user data if it restarts after a failure or it is unable to trust any data after it resumes operation, due to the fact that it may have lost profile updates from the HSS in the service interruption period. If such S-CSCF receives an originating request on behalf of a user (i.e. top-most route header in request contains "orig" parameter) coming from an AS, the S-CSCF shall send SAR to the HSS with Server Assignment Type set to UNREGISTERED_USER to inform the HSS that the user is unregistered. HSS and S-CSCF proceed as indicated in 3GPP TS 29.228 [3], except that:

- if the Public User Identity is stored as registered in the HSS, and there is S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA. The result code shall be set to DIAMETER_ERROR_IN_ASSIGNMENT_TYPE. The S-CSCF shall trigger matched originating services for the Public User Identity.if the Public User Identity is stored as registered in the HSS, and there is no S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the user profile in the SAA and set the registration state for the Public Identity to unregistered. The result code shall be set to DIAMETER_SUCCESS. The S-CSCF shall trigger matched originating unregistered services for the Public User Identity.

- if the S-CSCF name sent in the Server-Assignment-Request command and the previously assigned S-CSCF name stored in the HSS are different, the HSS shall not overwrite the S-CSCF name. Result Code will be DIAMETER_IDENTITY_ALREADY_REGISTERED. The S-CSCF shall return a specific error response to AS. The AS shall resend the request to the I-CSCF.

NOTE: The address of the S-CSCF can be obtained by AS either by querying the HSS on the Sh interface or during third-party registration. It may happen that if AS is using third party registration and a reassignment occurred during a terminating request, AS will have the wrong S-CSCF name.

4.5.3 S-CSCF Restoration after Failure

If the application server sends the originating service request on behalf of the user to the S-CSCF, and the S-CSCF can not be contacted, after timeout, the application server shall resend the originating service request to the I-CSCF.

If the application server sends the originating service request directly to the I-CSCF, or resends the originating service request to the I-CSCF due to the S-CSCF can not be contacted, the I-CSCF shall behave as in section 4.3.3. The S-CSCF and HSS shall behave as in section 4.5.2, except that the HSS shall overwrite the S-CSCF name when receiving the SAR request, only if there is a previous explicit LIR request for S-CSCF capabilities.

4.6 S-CSCF Data Restoration Information Backup and Update Procedures

4.6.1 Introduction

The following clauses specify the behaviour of HSS and S-CSCF if they support the IMS Restoration feature.

4.6.2 Backup and Update of S-CSCF Restoration Information during Registration Process

The S-CSCF shall backup the following data in the HSS during the initial registration process.

- the list of SIP proxies in the path (normally it would be just the P-CSCF address)
- the Contact Information (Contact Addresses and Contact Header parameters)
- the Authentication Information (SIP-Authentication-Scheme)

This is done with an additional information element in the SAR requesting user information, in addition to the basic set of information required to handle traffic, as specified in the 3GPP TS 29.228 [3]. The information is associated with the Private User Identity and the Implicit Registration Set that is affected by the SAR request. The HSS shall store this information.

If any of the above data is changed, the S-CSCF shall update it in the HSS using SAR request with Server-Assignment-Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE, as specified in the 3GPP TS 29.228 [3].

4.6.3 Backup and Update of S-CSCF Restoration Information after UE"s Subscription

If the S-CSCF receives the UE"s subscription to notification of the reg-event for the first time, the S-CSCF shall send an SAR to the HSS to store the following UE"s subscription information.

- Call-ID, From, To, Record-Route, Contact

To avoid frequent storing of the subscription information in the HSS, the CSeq should not be included in the S-CSCF restoration information. Instead, the CSCF shall ensure that subsequent notification after retrieving this data includes a sufficiently large Cseq value so that the UE is able to accept it.

This is done with Server Assignment Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE in the SAR, as specified in the 3GPP TS 29.228 [3]. The information is associated with the Private User Identity affected by the SAR request. The HSS shall store this information.

If any of the above data is changed, the S-CSCF shall update it in the HSS using SAR request with Server-Assignment-Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE, as specified in the 3GPP TS 29.228 [3].

The S-CSCF shall send the registration data together with the subscription data as one S-CSCF restoration information. Each time the HSS receives the S-CSCF restoration information related to the same Private User Identity in the SAR with Server-Assignment-Type set to RE_REGISTRATION, the HSS shall overwrite the previous S-CSCF restoration information.

5 Recovery after P-CSCF failure

5.0 General

The following clauses show the requirements and information flows of IMS Restoration Procedures for the P-CSCF service interruption in each of the scenarios where they apply.

Procedures over S9 between V-PCRF and H-PCRF are not supported in this release of the specification.

5.1 Update PDP context/Bearer at P-CSCF failure

These flows show the procedures performed by the network at P-CSCF failure after user initiated registration..

5.1.1 General requirements

The following points are considered as requirements for the purpose of these procedures.

1. P-CSCF discovery is performed by requesting and provisioning P-CSCF address(es) within Protocol Configuration Options (PCO), as specified in 3GPP TS 29.061 [9], subclause 13a.2.1

2. The UE supports PCO IE, as specified in 3GPP TS 24.008 [4], subclause 10.5.6.3.

3. GTPv1, as specified in 3GPP TS 29.060 [8] or GTPv2, as specified in 3GPP TS 29.274 [10] are supported by the GGSN/PDN-GW.

5.1.2 Network recovery information flow - Update PDP context / Bearer

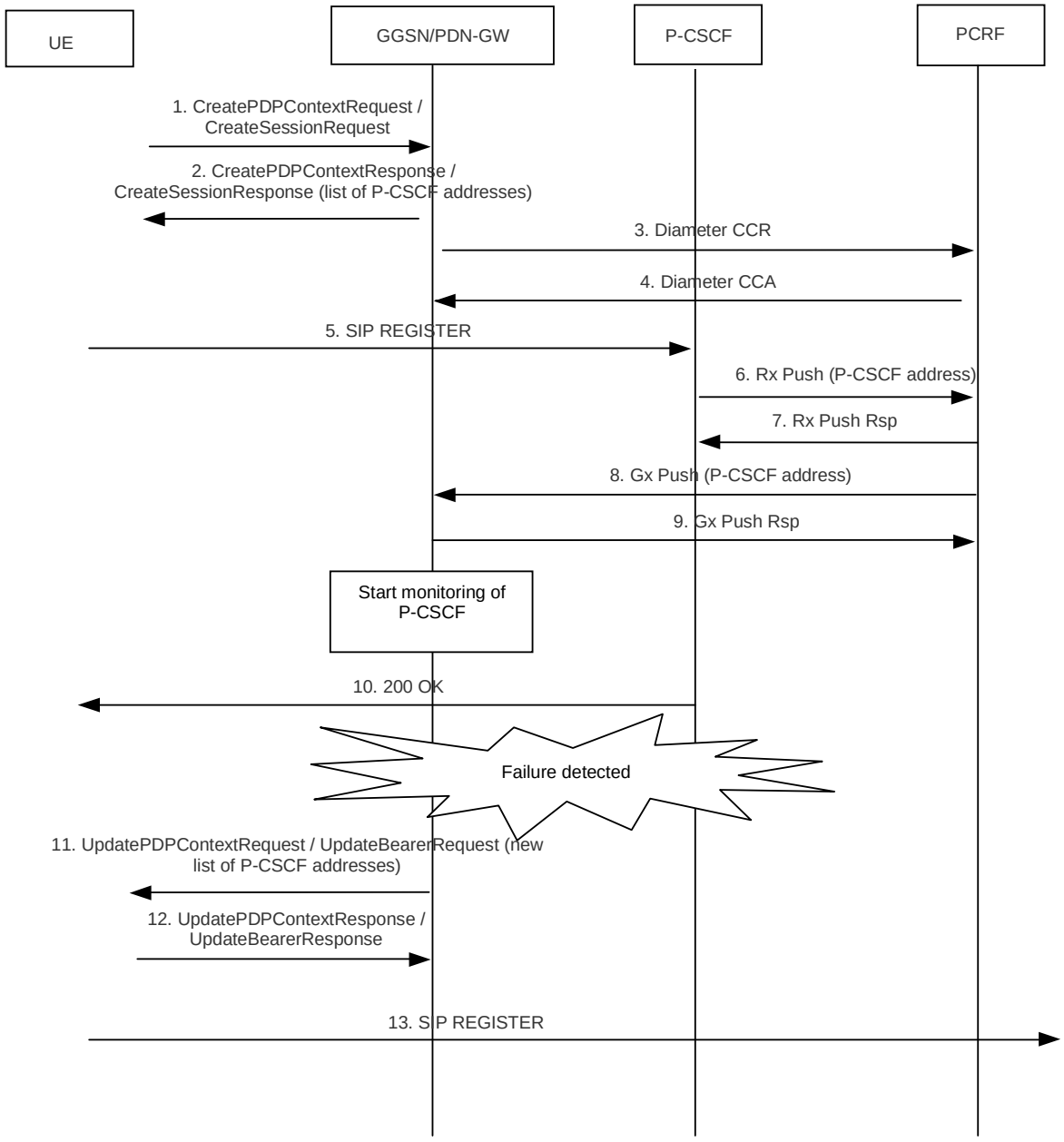

Figure 5.1.2a: P-CSCF failure (new list of P-CSCFs in PCO)

1. The UE initiates an IP-CAN session.
2. P-CSCF discovery is performed. A list of P-CSCF addresses is received in CreatePDPContextResponse / CreateBearerResponse within the PCO IE.
3. The GGSN/PDN-GW sends CCR to request for PCC rules, as specified in 3GPP TS 29.212 [6].
4. The PCRF provides PCC rules to be applied in CCA.
5. The UE performs an initial registration towards a P-CSCF from the received list.

6. The P-CSCF sends Rx Push (see 3GPP TS 29.214 [7]) to provide the PCRF with the P-CSCF selected by the UE.
7. The PCRF sends Rx Push reponse.
8. The PCRF uses a Gx push procedure to provide the GGSN/PDN-GW with the P-CSCF address.
9. The GGSN/PDN-GW stores this address for the UE and sends Gx Push Rsp. Also, the GGSN/PDN-GW starts monitoring the health of the P-CSCF if not already done.
10. The P-CSCF sends 200 OK to the UE.
11. A failure in P-CSCF is detected via Gi/sGi by the GGSN/PDN-GW. The GGSN/PDN-GW sends a new PCO IE with a new list of P-CSCF addresses (which does not include the failed P-CSCF) to all UEs associated to the failed P-CSCF address.
12. The UEs acknowledge the request.
13. Upon receiving the new list of P-CSCFs, if the P-CSCF in use is missing, each UE performs an initial registration towards a new P-CSCF.

5.2 Inform UE about P-CSCF failure

These flows show the procedures performed by the network at P-CSCF failure after user initiated registration..

5.2.1 General requirements

The following points are considered as requirements for the purpose of these procedures.

4. P-CSCF discovery is performed by requesting P-CSCF address(es) via DHCP method, as specified in 3GPP TS 29.061 [9], subclause 13a.2.1
5. The UE supports PCO IE, as specified in 3GPP TS 24.008 [4], subclause 10.5.6.3.
6. GTPv1, as specified in 3GPP TS 29.060 [8] or GTPv2, as specified in 3GPP TS 29.274 [10] are supported by the GGSN/PDN-GW

5.2.2 Network recovery information flow – Inform UE at P-CSCF failure

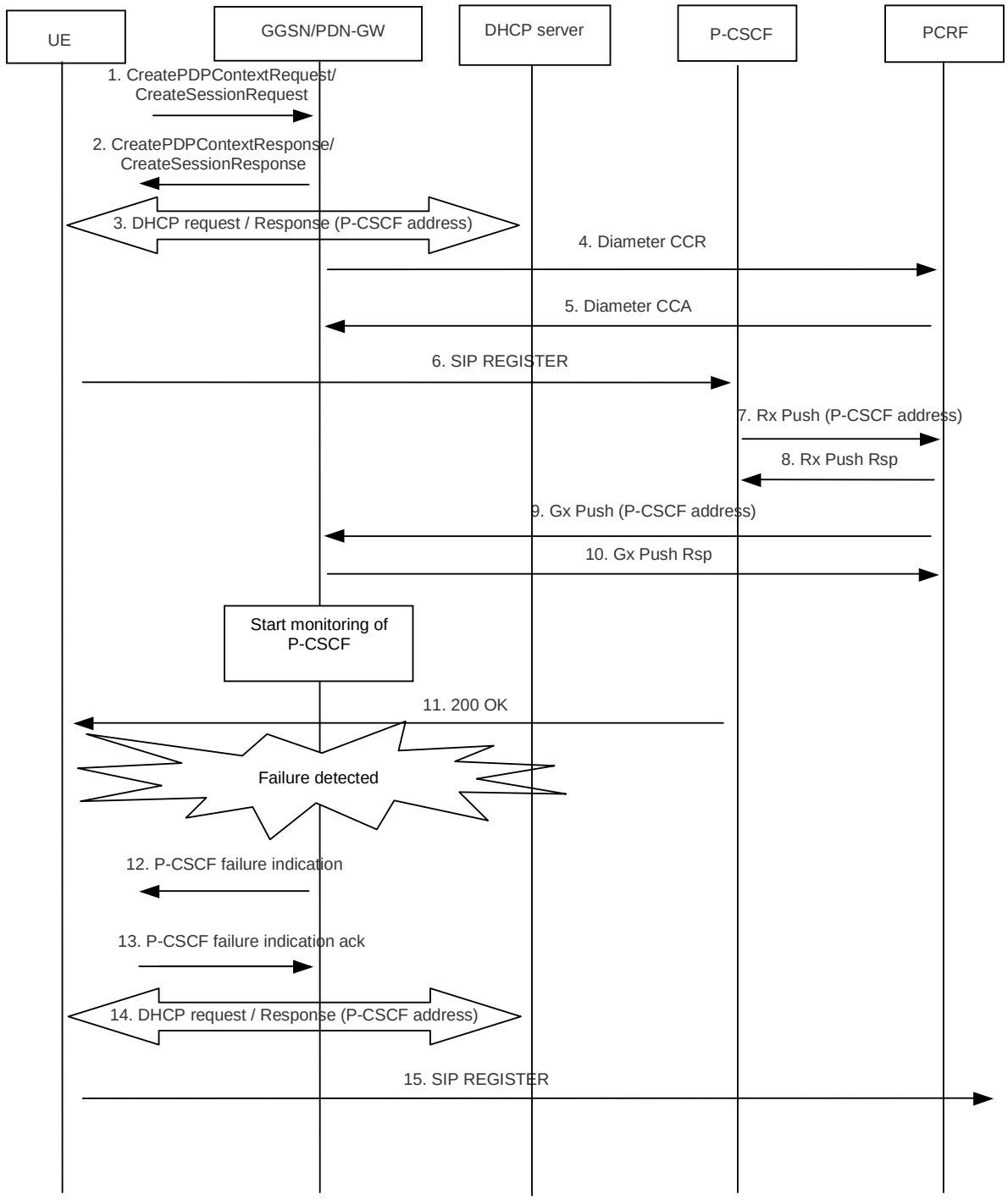

Figure 5.2.2a: P-CSCF failure for DHCP based scenarios

1-2. The UE initiates an IP-CAN session.

3. P-CSCF discovery is performed using DHCP based method. The GGSN/PDN-GW relays/send the list of P-CSCF addresses in DHCP response.

NOTE: The DHCP response can include either a list of P-CSCF IPv4/IPv6 addresses or a list of FQDNs (see IETF RFC 3361 [11] and IETF RFC 3319 [13]). If P-CSCF FQDNs were provided, the UE uses DNS SIP server resolution mechanism (see IETF RFC 3263 [12])

4. The GGSN/PDN-GW sends CCR to request for PCC rules, as specified in 3GPP TS 29.212 [6].

5. The PCRF provides PCC rules to be applied in CCA.
6. The UE performs an initial registration towards the P-CSCF received.
7. The P-CSCF sends Rx Push (see 3GPP TS 29.214 [7]) to provide the PCRF with the P-CSCF selected by the UE,
8. The PCRF sends Rx Push reponse.
9. The PCRF uses a Gx push procedure to provide the GGSN/PDN-GW with the P-CSCF address.
10. The GGSN/PDN-GW stores this address for the UE and sends Gx Push Rsp. Also, the GGSN/PDN-GW starts monitoring the health of the P-CSCF if not already done.
11. The P-CSCF sends 200 OK to the UE.
12. A failure in P-CSCF is detected via Gi/sGi by the GGSN/PDN-GW. The GGSN/PDN-GW informs to all UEs associated to the failed P-CSCF address that the P-CSCF is not available.
13. The UEs acknowledge the request.
14. The UE requests P-CSCF addresses (if needed) via new DHCP request.
15. The UE selects a new P-CSCF and initiates an initial IMS registration.

5.3 Network recovery information flow – UE uses keep alive mechanism

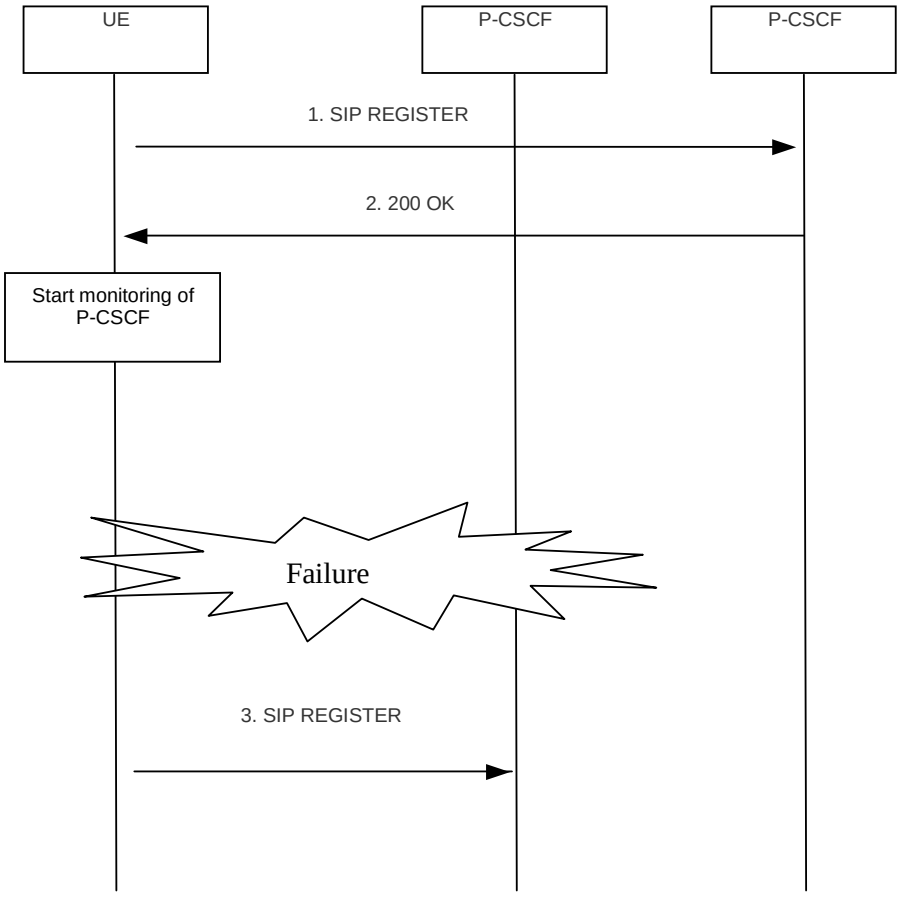

Figure 5.3a: P-CSCF failure detected by UE

1. After establishment of an IP-CAN session and acquiring P-CSCF addresses, the UE performs initial registration towards a P-CSCF.

2. If registration is successful, the UE monitors the P-CSCF health according to draft-ietf-sipcore-keep-01 [14]

3. When a failure is detected, the UE acquires new P-CSCF addresses (if needed) and performs an initial registration.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
	CT#41				V1.0.0 was approved in CT#41	1.0.0	8.0.0
2008-12	CT#42	CP-080698	0003		Re-selection of S-CSCF at de-registration	8.0.0	8.1.0
		CP-080698	0004	1	Subscription to registration information recover		
		CP-080963	0007	3	AS originating procedures		
		CP-080698	0008		Multiple contacts restoration at re-registration		
		CP-080698	0009	1	Multiple contacts restoration at de-registration		
2009-03	CT#43	CP-090026	0010		Multiple Registrations in De-Registration	8.1.0	8.2.0
			0011		Multiple Registrations in Registration		
2009-06	CT#44	CP-090303	0019		Contact storage in reg event subscription	8.2.0	8.3.0
2009-12	CT#46	CP-090796	0020	1	P-CSCF restoration procedures: stage 2	8.3.0	9.0.0
2010-03	CT#47	CP-100045	0022	1	P-CSCF failure indication removal	9.0.0	9.1.0
			0023	1	P-CSCF failure handling for DHCP based scenarios		
			0024	1	P-CSCF monitoring performed by UE		
			0025	1	S9 interface procedures		
2010-06	CT#48	CP-100285	0027		Notification is to be sent to all UEs sharing the IMPU	9.1.0	9.2.0
2010-09	CT#49	CP-100462	0030	1	Restoration Data Backup	9.2.0	9.3.0
2011-06	CT#52	CP-110354	0032		Emergency Restoration	9.3.0	9.4.0

History

Document history		
V9.0.0	February 2010	Publication
V9.1.0	April 2010	Publication
V9.2.0	June 2010	Publication
V9.3.0	October 2010	Publication
V9.4.0	June 2011	Publication