



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.3612

(06/2011)

SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN –
Service and session control protocols – supplementary
services

Signalling Requirements and Protocol Profiles for IP Centrex service

CAUTION !

PREPUBLISHED RECOMMENDATION

This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU [had/had not] received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2011

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Recommendation ITU-T Q.3612 (Q. centrexSig)

Signalling Requirements and Protocol Profiles for IP Centrex service

Summary

The IP Centrex service is defined in Recommendation ITU-T Y.2211, which can be provided over either IMS based or Call server based components. This Recommendation provides the general architecture of IP Centrex service, and specifies the signalling requirements and protocol profiles for IP Centrex service. The signalling flows of IP Centrex service are also provided in this Recommendation.

Keywords

IP Centrex, NGN, SIP, SDP

Introduction

The IP Centrex service is a PBX like service but provided by the central office rather than customer's premises and implemented over IP basic network, such as NGN. The IP Centrex service is defined in [ITU-T Y.2211]. This Recommendation specifies the signalling requirements and protocol profiles for IP Centrex service provided over NGN. The signalling flows of IP Centrex service are also provided in this Recommendation.

Content

1	Scope	4
2	References.....	4
3	Definitions	5
3.1	Terms defined elsewhere	5
3.2	Terms defined within this Recommendation.....	5
4	Abbreviations and acronyms	5
5	Conventions	6
6	Service Architecture	6
6.1	General Architecture	6
6.2	Functional Entities involved in IP Centrex service	7
7	Signalling Requirements.....	8
7.1	General description.....	8
7.2	Signalling requirements.....	8
7.2.1	Internal communication.....	8
7.2.2	Outgoing communication	9
7.2.3	Incoming communication.....	10
7.2.4	Originating identification presentation.....	11
7.2.5	Originating identification restriction	12
7.2.6	Terminating identification presentation	14
7.2.7	Terminating identification restriction.....	15
7.2.8	Communication Transfer.....	16
7.2.9	Communication Diversion.....	18
7.2.10	Communication Pickup	19
7.2.11	Communication Hold	21
8	Protocol profiles.....	22
9	Security considerations	22
	Appendix I <IMS based signalling flows for IP Centrex service>	24
	I.1 Internal Communication.....	24
	I.2 Outgoing Communication	26
	I.3 Incoming Communication.....	28
	I.4 Originating identification presentation.....	29
	I.5 Originating identification restriction	31
	I.6 Terminating identification presentation	33

I.7 Terminating identification restriction.....	35
I.8 Communication Transfer.....	36
I.9 Communication Diversion	38
I.10 Communication Pickup	41
I.11 Communication Hold	42
Appendix II <Call Server based signalling flows for IP Centrex service>.....	45

Recommendation ITU-T Q.3612 (Q. centrexSig)

Signalling Requirements and Protocol Profiles for IP Centrex service

1 Scope

This Recommendation specifies signalling requirements and protocol profiles of IP Centrex service. The Recommendation also contains signalling flows.

The IP Centrex service can be provided over either IMS based or Call server based networks, as per [ITU-T Y.2211].

2 References

The following ITU-T Recommendations and other references contain provisions, which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- | | |
|-----------------|---|
| [ITU-T Q.3402] | Recommendation ITU-T Y.3402 (2008), <i>NGN UNI signalling profile (Protocol set 1)</i> |
| [ITU-T Y.2211] | Recommendation ITU-T Y.2211 (2007), <i>IMS-based real-time conversational multimedia services over NGN</i> |
| [ITU-T Y.2701] | Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1.</i> |
| [IETF RFC 2246] | IETF RFC 2246 (1999), <i>The TLS Protocol Version 1.0.</i> |
| [IETF RFC 2401] | IETF RFC 2401 (1998), <i>Security Architecture for the Internet Protocol.</i> |
| [IETF RFC 2633] | IETF RFC 2633 (1999), <i>S/MIME Version 3 Message Specification.</i> |
| [IETF RFC 3262] | IETF RFC3262 (2002), <i>Reliability of Provisional Responses in the Session Initiation Protocol (SIP)</i> |
| [IETF RFC 3323] | IETF RFC3323 (2002), <i>A Privacy Mechanism for the Session Initiation Protocol (SIP)</i> |
| [IETF RFC 3325] | IETF RFC3325 (2002), <i>Private Extensions to the Session Initiation Protocol (SIP) for Asserted Identity within Trusted Networks</i> |
| [IETF RFC 3515] | IETF RFC3325 (2002), <i>The Session Initiation Protocol (SIP) Refer Method</i> |
| [IETF RFC 3891] | IETF RFC3891 (2004), <i>The Session Initiation Protocol (SIP) "Replaces" Header</i> |
| [IETF RFC 3892] | IETF RFC3892 (2004), <i>The Session Initiation Protocol (SIP) Referred-By Mechanism</i> |
| [IETF RFC 4244] | IETF RFC4244 (2005), <i>An Extension to the Session Initiation Protocol (SIP) for Request History Information</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 pickup group [b-ITU-T H.450.5]: A group of users that may be notified when one of the group members receives a call that can be picked up. Each group member is authorized to answer the call.

3.1.2 picking-up user [b-ITU-T H.450.5]: A user that picks-up an alerting call.

3.2 Terms defined within this Recommendation

This Recommendation defines the following terms:

3.2.1 Centrex service: a services package which provide an emulation of a private branch exchange (PBX) by using special programming software at the central office, instead of at the customer's premises.

Note: The typical feature is that users within the same group can communicate with each other by using Private number instead of the public number (i.e. full subscriber number).

3.2.2 communication pickup : A service that enables an IP Centrex user to pickup an alerting call within the same Centrex group when the alerted user is unavailable to answer the call.

3.2.3 group pickup: One of the two service features for Communication Pickup. Group pickup enables a pickup group user to pickup an alerting call within the same pickup group without dialing the picked-up user's Private number.

3.2.4 IP Centrex service: a certain type of Centrex service which is provided over IP based network, such as NGN. The typical service features included in IP Centrex service are defined in Y.2211.

3.2.5 picked-up user: A user whose call is picked up by a picking-up user.

3.2.6 private number: A certain number only used within a given Centrex group. It is shorter than user's local public number, and typically has only 3,4 or 5 digits , depending on how large the Centrex group is.

4 Abbreviations and acronyms

This Document uses the following abbreviations and acronyms:

AGC-FE	Access Gateway Control Functional Entity
ASF	Application Service Function
AS-FE	Application Server Functional Entity
EUF	End User Function
I-CSC-FE	Interrogating Call Session Control Functional Entity
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MGC-FE	Media Gateway Control Functional Entity
PBX	Private Branch eXchange
P-CSC-FE	Proxy Call Session Control Functional Entity

SCF	Service Control Function
S-CSC-FE	Serving Call Session Control Functional Entity
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SUP-FE	Service User Profile Functional Entity
UE	User Equipment
UNI	User Network Interface

5 Conventions

In this Recommendation:

The keywords "shall" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "shall not" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "should" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "should not" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this Recommendation can still be claimed even if this requirement is present.

The keywords "may" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6 Service Architecture

6.1 General Architecture

The IP Centrex service is defined in [ITU-T Y.2211], which can be provided over either IMS based or Call server based subsystem. Figure 6-1 depicts general architecture [ITU-T Y.2211].

The IP Centrex service logic and service executing environments are provided by application service function (ASF) within the service stratum. The originating and terminating IP Centrex service logics serving for a designated Centrex group are provided by one ASF. When serving for originating network, it performs the originating IP Centrex service logic invoked by originating service control function (SCF), which shall include internal communication and originating identification restriction service feature. When serving for terminating network, it performs the terminating IP Centrex service logic invoked by terminating SCF, which shall include the internal communication, originating identification presentation and terminating identification restriction.

The SCF holds the service subscription profile for the NGN user and performs the service trigger function. The end user who subscribes to IP Centrex service may reside in the IMS component or the Call Server component. And both of these components can invoke the IP Centrex service.

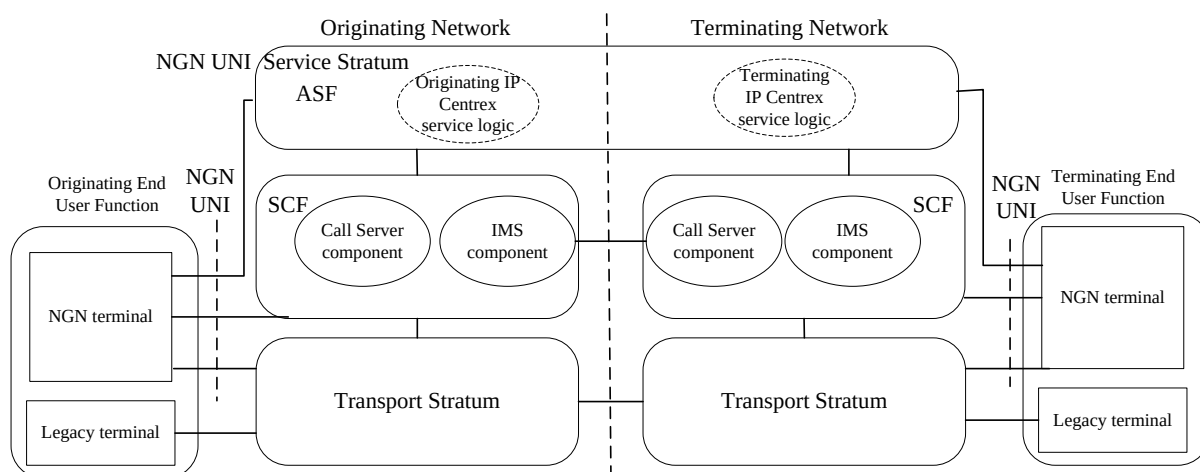


Figure 6-1 – The general architecture of IP Centrex service

6.2 Functional Entities involved in IP Centrex service

Figure 6-2 illustrates the functional entities involved in the IP Centrex service.

In the originating network, the originating end user function is the end user that originates the IP Centrex session. If the end user function resides in the Call Server based component, the related functional entities shall be Call Server, SUP-FE and AS-FE. When the end user function resides in the IMS based component, the related functional entities shall be AGC-FE, P/S-CSC-FE and AS-FE.

In the terminating network, the Terminating End User Function is the end user that terminates the IP Centrex session. When end user resides in the Call Server based component, the related functional entities shall be Call Server, SUP-FE and AS-FE. When the end user resides in the IMS based component, the related functional entities shall be AGC-FE, P/S/I-CSC-FE and AS-FE.

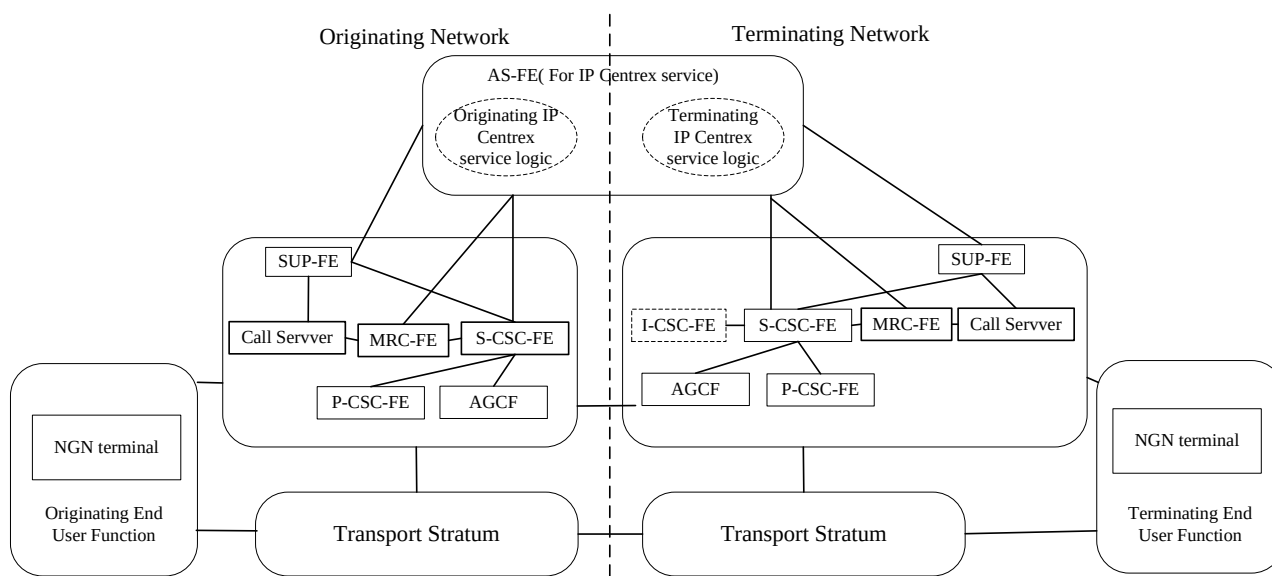


Figure 6-2 – The functional entities involved in IP Centrex service

7 Signalling Requirements

7.1 General description

According to [ITU-T Y.2211] and service features used in current PBX service, this Recommendation defines the signalling requirements of the following service features:

- (1) Internal communication
- (2) Outgoing communication
- (3) Incoming communication
- (4) Originating identification presentation
- (5) Originating identification restriction
- (6) Terminating identification presentation
- (7) Terminating identification restriction
- (8) Communication Transfer
- (9) Communication Diversion
- (10) Communication Pickup
- (11) Communication Hold

7.2 Signalling requirements

7.2.1 Internal communication

The Internal Communication service feature enables a Centrex user to communicate with another user in the same Centrex Group with a private number.

The originating party can directly dial the private number of the terminating party when initiating a call. Based on the terminating party's service profile, if the originating party's identities can be presented to the terminating party, the private number of originating party shall be presented.

7.2.1.1 Requirements for the Originating UE

When the Originating UE initiates an INVITE request, the private number of terminating party shall be included in the Request-URI.

7.2.1.2 Requirements for the Originating AGC-FE

When the Originating AGC-FE initiates an INVITE request, the private number of terminating party shall be included in the Request-URI.

7.2.1.3 Requirements for the Originating P-CSC-FE

No special requirement to this FE.

7.2.1.4 Requirements for the Originating S-CSC-FE

No special requirement to this FE.

7.2.1.5 Requirements for the Originating Call Server

No special requirement to this FE.

7.2.1.6 Requirements for the AS-FE

When sending an INVITE request to the terminating I-CSC-FE, or the terminating S-CSC-FE, or the terminating Call Server, the AS-FE shall:

- 1) include the private number of originating party in the P-Asserted-identity header field.
- 2) include the public user identity of terminating party in the Request-URI.

7.2.1.7 Requirements for the Terminating Call Server

No special requirement to this FE.

7.2.1.8 Requirements for the Terminating I-CSC-FE

No special requirement to this FE.

7.2.1.9 Requirements for the Terminating S-CSC-FE

No special requirement to this FE.

7.2.1.10 Requirements for the Terminating P-CSC-FE

No special requirement to this FE.

7.2.1.11 Requirements for the Terminating UE

If the originating party's identities are allowed to be presented to the terminating party, the private number shall be presented.

7.2.1.12 Requirements for the Terminating AGC-FE

If the originating party's identities are allowed to be presented to the terminating party, the private number shall be presented.

7.2.2 Outgoing communication

The Outgoing Communication service feature enables a Centrex user to initiate the communication with a public user.

7.2.2.1 Requirements for the Originating UE

No special requirement for this FE.

7.2.2.2 Requirements for the Originating AGC-FE

No special requirement for this FE.

7.2.2.3 Requirements for the Originating P-CSC-FE

No special requirement for this FE.

7.2.2.4 Requirements for the Originating S-CSC-FE

No special requirement for this FE.

7.2.2.5 Requirements for the Originating Call Server

No special requirement for this FE.

7.2.2.6 Requirements for the AS-FE

When the AS-FE sends an INVITE request to the Originating S-CSC-FE or the Originating Call Server, the public user identity of terminating party shall be included in the Request-URI header field.

7.2.2.7 Requirements for the Terminating Call Server

No special requirement for this FE.

7.2.2.8 Requirements for the Terminating I-CSC-FE

No special requirement for this FE.

7.2.2.9 Requirements for the Terminating S-CSC-FE

No special requirement for this FE.

7.2.2.10 Requirements for the Terminating P-CSC-FE

No special requirement for this FE.

7.2.2.11 Requirements for the Terminating UE

No special requirement for this FE.

7.2.2.12 Requirements for the Terminating AGC-FE

No special requirement for this FE.

7.2.3 Incoming communication

The Incoming Communication service feature enables a public user to initiate the communication with a Centrex user.

7.2.3.1 Requirements for the Originating UE

No special requirement for this FE.

7.2.3.2 Requirements for the Originating AGC-FE

No special requirement for this FE.

7.2.3.3 Requirements for the Originating P-CSC-FE

No special requirement for this FE.

7.2.3.4 Requirements for the Originating S-CSC-FE

No special requirement for this FE.

7.2.3.5 Requirements for the Originating Call Server

No special requirement for this FE.

7.2.3.6 Requirements for the AS-FE

When the AS-FE sends an INVITE request to the Terminating I-CSC-FE, or the Terminating S-CSC-FE, or the Call Server, the originating party's identities contained in the P-Asserted-Identity header field can be used to call back directly by the terminating party.

If the Outgoing Communication needs a prefix, the public user identity with the prefix shall be presented to the terminating party in the Incoming Communication.

7.2.3.7 Requirements for the Terminating Call Server

No special requirement for this FE.

7.2.3.8 Requirements for the Terminating I-CSC-FE

No special requirement for this FE.

7.2.3.9 Requirements for the Terminating S-CSC-FE

No special requirement for this FE.

7.2.3.10 Requirements for the Terminating P-CSC-FE

No special requirement for this FE.

7.2.3.11 Requirements for the Terminating UE

No special requirement for this FE.

7.2.3.12 Requirements for the Terminating AGC-FE

No special requirement for this FE.

7.2.4 Originating identification presentation

The Originating identification presentation service feature enables the originating party's identification present to the terminating party.

- 1) The private number of the originating party shall be presented to the terminating party in the Internal communication scenario;
- 2) The public user identity of the originating party shall be presented to the terminating party in the Incoming communication scenario.

This service feature can be activated by the terminating party.

7.2.4.1 Requirements for the Originating UE

No special requirement for this FE.

7.2.4.2 Requirements for the Originating AGC-FE

When sending an INVITE request to the originating S-CSC-FE, the AGC-FE shall insert a P-Asserted-Identity header field. The P-Asserted-Identity header field shall be set to the public user identity which has been registered in the network by the originating party.

7.2.4.3 Requirements for the Originating P-CSC-FE

When sending an INVITE request to the originating S-CSC-FE, the P-CSC-FE shall insert a P-Asserted-Identity header field. The P-Asserted-Identity header field shall be set to the public user identity which has been registered in the network by the originating party.

7.2.4.4 Requirements for the Originating S-CSC-FE

No special requirement for this FE.

7.2.4.5 Requirements for the Originating Call Server

When sending an INVITE request to the originating AS-FE, the Call Server shall insert a P-Asserted-Identity header field. The P-Asserted-Identity header field shall be set to the public user identity which has been registered in the network by the originating party.

7.2.4.6 Requirements for the AS-FE

When AS-FE receives an INVITE request from the Terminating S-CSC-FE or Call Server, terminating party AS-FE shall:

- 1) verify whether the terminating party has activated the Originating identification presentation service. If not, the AS-FE shall add the Privacy header field if it is not contained in the INVITE

request and set the value to “id”, then set the From header field to “Anonymous” and send the INVITE request to the Terminating S-CSC-FE or the Call Server.

NOTE: The value of Privacy header field refers to [IETF RFC3323] and [IETF RFC3325].

- 2) verify whether the originating party and the terminating party are in the same Centrex group. If they are, then AS-FE shall change the public user identity of the originating party in the P-Asserted-Identity header field into Private number.

7.2.4.7 Requirements for the Terminating Call Server

When receiving an INVITE request,

- 1) if the Privacy header field is contained with the value unequal to “none”, the Terminating Call Server shall delete the P-Asserted-Identity header field if it is contained in the INVITE request before forwarding the message to the terminating party.
- 2) otherwise, the P-Asserted-Identity header field shall be forwarded to the terminating party.

7.2.4.8 Requirements for the Terminating I-CSC-FE

No special requirement for this FE.

7.2.4.9 Requirements for the Terminating S-CSC-FE

No special requirement for this FE.

7.2.4.10 Requirements for the Terminating P-CSC-FE

When receiving an INVITE request,

- 1) if the Privacy header field is contained with the value unequal to “none”, the P-CSCF-FE shall delete the P-Asserted-Identity header field if it is contained in the INVITE request before forwarding the INVITE request to the terminating party.
- 2) otherwise, the P-Asserted-Identity header field shall be forwarded to the terminating party.

7.2.4.11 Requirements for the Terminating UE

If a P-Asserted-Identity header field is included in an INVITE request, the originating identification in the header field shall be presented to the terminating party. If more than one P-Asserted-Identity header field are received, the identity that is presented will be decided by a local policy.

If the P-Asserted-Identity header field is not contained in the INVITE request, the information of FROM header field shall be presented to the terminating party.

7.2.4.12 Requirements for the Terminating AGC-FE

When receiving an INVITE request,

- 1) If a P-Asserted-Identity header field is contained in the INVITE request, and the Privacy header field is not contained or is contained with the value setting to “none”, the information of P-Asserted-Identity shall be presented to the terminating party.
- 2) Otherwise, the information of FROM header field shall be presented to the terminating party.

7.2.5 Originating identification restriction

The Originating identification restriction service feature restricts the calling party’s identities to be presented to the called party, even when the called party has activated the originating identification presentation.

This service feature shall be activated by the calling party.

7.2.5.1 Requirements for the Originating UE

No special requirement to this FE.

7.2.5.2 Requirements for the Originating AGC-FE

No special requirement to this FE.

7.2.5.3 Requirements for the Originating P-CSC-FE

No special requirement to this FE.

7.2.5.4 Requirements for the Originating S-CSC-FE

No special requirement to this FE.

7.2.5.5 Requirements for the Originating Call Server

No special requirement to this FE.

7.2.5.6 Requirements for the AS-FE

When the AS-FE receives an INVITE request from the originating S-CSC-FE or Call Server and executes the originating IP Centrex service logic, the INVITE request sent from the AS-FE shall:

- 1) include the Privacy header field with the value setting to “id”;
- 2) set the From header field to “Anonymous”.

7.2.5.7 Requirements for the Terminating Call Server

When receiving an INVITE request, the Terminating Call Server shall delete the P-Asserted-Identity header field before forwarding the message to the called party if the Privacy header field is contained with the value unequal to “none”.

7.2.5.8 Requirements for the Terminating I-CSC-FE

No special requirement to this FE.

7.2.5.9 Requirements for the Terminating S-CSC-FE

No special requirement to this FE.

7.2.5.10 Requirements for the Terminating P-CSC-FE

When receiving an INVITE request, the P-CSC-FE shall delete the P-Asserted-Identity header field before forwarding the message to the called party if the Privacy header field is contained with the value unequal to “none”.

7.2.5.11 Requirements for the Terminating UE

When receiving an INVITE request, the information of FROM header field shall be presented to the called party.

7.2.5.12 Requirements for the Terminating AGC-FE

When receiving an INVITE request, if a Privacy header field is contained with the value unequal to “none”, the information of FROM header field shall be presented to the called party.