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Next Generation Networks – Service aspects: Service
capabilities and service architecture

IMS-based real-time conversational multimedia services over NGN

ITU-T Recommendation Y.2211

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IMS-based real-time conversational multimedia services over NGN

Summary

NGN release 1 makes provision for a category of services which are referred to as real-time conversational multimedia services, as shown in Supplement 1 to the ITU-T Y.2000-series Recommendations. These include PSTN/ISDN simulation services and other services. When these real-time conversational multimedia services are provided by using an IMS-based service environment, the implementations will use SIP protocol between the application/service support functions and the service control functions within the service stratum of the NGN architecture. IMS-based NGNs which meet these service requirements will be capable of supporting real-time conversational multimedia services with enhanced service features, as well as allowing for enhanced implementation scenarios. This Recommendation defines the service requirements, service features, service architecture and implementation scenarios of IMS-based real-time conversational multimedia services.

FOREWORD

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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.

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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.

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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/.

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IMS-based real-time conversational multimedia services over NGN

1   Scope

This Recommendation defines the service requirements, service features, service architecture and implementation scenarios of IMS-based real-time conversational multimedia services.

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; 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T M.3050.1]   ITU-T Recommendation M.3050.1 (2007), *Enhanced Telecom Operations Map (eTOM) – The business process framework*.

[ITU-T Q.1290]   ITU-T Recommendation Q.1290 (1998), *Glossary of terms used in the definition of intelligent network*.

[ITU-T Y.2012]   ITU-T Recommendation Y.2012 (2006), *Functional requirements and architecture of the NGN release 1*.

[ITU-T Y.2021]   ITU-T Recommendation Y.2021 (2006), *IMS for Next Generation Networks*.

[ITU-T Y.2201]   ITU-T Recommendation Y.2201 (2007), *NGN release 1 requirements*.

3   Definitions

3.1   Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1   customer [ITU-T M.3050.1]: The customer buys products and services from the enterprise or receives free offers or services. A customer may be a person or a business.

3.1.2   service feature [ITU-T Q.1290]: A reusable part of one or more service capabilities forming all or part of a service.

3.1.3   subscriber [ITU-T M.3050.1]: The person or organization responsible for concluding contracts for the services subscribed to and for paying for these services.

3.2   Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1   IMS-based real-time conversational multimedia services: Multimedia services provided in real time by using an IMS-based service environment.

NOTE – These services may involve two or several parties using various media resources and are usually bidirectional.

3.2.2   served user: The user who subscribes to and, possibly, invokes a service.

3.2.3 **service**: A selection from the portfolio of offerings made available by a service provider, characterized by one or more service features, which the user may subscribe to and be optionally charged for.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

3PCC	Third Party Communication Control
AC	Authorization Code
ACB	Automatic Communication Back
ACR	Anonymous Communication Rejection
AGC-FE	Access Gateway Control Functional Entity
AOC	Advice of Charge
AOC-D	Advice of Charge: Charging information during the communication
AOC-E	Advice of Charge: Charging information at the end of the communication
AOC-S	Advice of Charge: Charging information at communication set-up time
AS-FE	Application Server Functional Entity
BGC-FE	Breakout Gateway Control Functional Entity
CA	Customized Announcement
CB	Communication Barring
CBM	Customized Background Music
CCBS	Completion of Communication to Busy Subscriber
CD	Communication Deflection
CDIST	Communication DISTribution
CDIV	Communication DIVersion
CDIVN	Communication DIVersion Notification
CF	Communication Forwarding
CFB	Communication Forwarding Busy
CFNL	Communication Forwarding on Not Logged in
CFNR	Communication Forwarding No Reply
CFNRc	Communication Forwarding on subscriber Not Reachable
CFU	Communication Forwarding Unconditional
CL	Communication Logging
CLI	Calling Line Identification
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	COnnected Line identification Presentation
COLR	COnnected Line identification Restriction
CONF	CONFerence

CR	Customized Routing
CRBT	Customized Ring-Back Tone
CRG	Customized Ringing
CTD	Click-To-Dial
CW	Communication Waiting
DMTQ	Destination-associated Message Type Query
ECT	Explicit Communication Transfer
FE	Functional Entity
FMD	Follow-Me Diversion
GC	Group Communication
GSM	Global System for Mobile communications
HOLD	Communication HOLD
ICB	Incoming Communication Barring
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MCID	Malicious Communication IDentification
MGC-FE	Media Gateway Control Functional Entity
MPC	Multi-Party Communication
MRC-FE	Media Resource Control Functional Entity
MRP-FE	Media Resource Processing Functional Entity
MW	Message Waiting
MWI	MW Indication
NR	No Reply
OCB	Outgoing Communication Barring
OCS	Originating Communication Screening
OFLC	Off-Line Charging
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
ONLC	On-Line Charging
P-CSC-FE	Proxy Call Session Control Functional Entity
PI	Personal Identifier
PSTN	Public Switched Telecommunication Network
QoS	Quality of Service
RC	Reverse Charging
RP	Ring Pattern
SC	Split Charging
S-CSC-FE	Serving Call Session Control Functional Entity

SIP	Session Initiation Protocol
SUP-FE	Service User Profile Functional Entity
TCS	Terminating Communication Screening
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
UCN	Unsuccessful Communication Notification
UE	User Equipment
UIPR	User Identification Presentation and Restriction
UMTS	Universal Mobile Telecommunication System
UPM	User Profile Management
UPT	Universal Personal Telecommunication
URL	Uniform Resource Locator

5 Conventions

This Recommendation deals with a transition to the NGN. As a result, terms that were used in the PSTN have to be transformed to apply to the new environment. Additionally, some terms have been ingrained over time and in some instances a number of terms have the same meaning. For readability, sometimes one term is given preference and hence is used over the others.

Specifically:

• the terms "end user", "party" and "user" are used interchangeably depending on context,

• the terms "served user" and "subscriber" are used interchangeably depending on context,

• the PSTN/ISDN term "call" is replaced in most instances with the term "communication" when used in the context of NGN,

• in this Recommendation, when the term "real-time service" is used, it is intended that it applies to at least the voice, video and text media types.

In some instances there is a need to talk about users who originate communication, users who receive communication, and users who have subscribed to services that provide information in addition to the original communication. For these situations, the following conventions are used:

• When dealing with situations where a user is invoking a service, the user is referred to as the user or user A.

• When dealing with situations where a communication involves a number of users, the following convention is used: the user for whom the service was subscribed is referred to as "user A", "user B" would be the second user associated with the communication, "user C" would be the third user associated with the communication, etc. For example, user A calls user B and then calls user C.

• A served user is the user who subscribes to and, possibly, invokes a service, and need not have originated the communication. For example, a user who subscribes to the authorization code service feature would be referred to as the served user and the user that originates the communication for which the served user receives information would be referred to as user A or the calling party. As a second example, if a served user subscribes to calling line identification, then the served user, i.e., the called party or terminating party, will receive the calling line identification of the calling or originating party.

6 General requirements for IMS-based real-time conversational multimedia services

NGN release 1 is required to support provisioning of real-time conversational multimedia services within an IMS-based service environment. This clause describes general requirements which are required to be supported to enable IMS-based real-time conversational multimedia services [ITU-T Y.2201]. This clause also describes general objectives which would enable IMS-based real-time conversational multimedia services [ITU-T Y.2201].

- NGN is required to support various media resources during sessions to enable a wide range of IMS-based real-time conversational multimedia services, including voice, video, real-time text, data, etc.

- NGNs offering IMS-based real-time conversational multimedia services are required to be able to support identical media types in both directions.

- NGNs offering IMS-based real-time conversational multimedia services are required to support the addition and removal of individual media to/from a multimedia service communication.

- NGN is required to support QoS for IMS-based real-time conversational multimedia services, from the point of view of users.

- NGN is required to allow priority for some services, e.g., emergency telecommunication, over other services.

- NGN is required to support end-to-end negotiation of codecs, to reduce the need for transcoding and thus not needlessly degrade the quality of real-time sessions.

- NGN is required to use SIP between service control functions and application/service support functions within the service stratum to support the IMS-based real-time conversational multimedia services [ITU-T Y.2012].

- NGN is required to use appropriate security mechanisms to meet the security needs of users and of the IMS-based real-time conversational multimedia services.

- NGN is required to support the use of both legacy and intelligent terminals for the provision of IMS-based real-time conversational multimedia services. Subscribers who use intelligent terminals may have access to more service features.

- NGNs are required to support flexible service trigger mechanisms to allow for creation of real-time conversational multimedia services.

- NGN is required to provide service features for IMS-based real-time conversational multimedia services that are equivalent to the services features available in legacy networks, or equivalent services.

- NGN is required to support interworking of the IMS-based real-time conversational multimedia services with the existing fixed and mobile networks, including PSTN, ISDN, GSM/UMTS and Internet.

7 IMS-based real-time conversational multimedia services architecture details

Figure 1 below depicts a functional architecture, based on the NGN architecture [ITU-T Y.2012], which can be used to support IMS-based real-time conversational multimedia services. Application support functions and service support functions contain a variety of service features for real-time conversational multimedia services. These service features may be used to implement different services in response to different requirements. Application support functions and service support functions will interact with S-CSC-FE, MRC-FE, SUP-FE and end-user functions using A-S$_4$, A-S$_3$, A-S$_6$ and A-U$_1$ respectively to deliver various service-related information.

- A-S$_4$ is used to deliver information related to service control, including service triggering information and call control-related information. This is identified as the ISC reference point in [ITU-T Y.2021].

- A-S$_3$ is used by application/service support functions to notify the MRC-FE of media resources control information.

  NOTE – A-S$_3$ is shown within NGN environment [ITU-T Y.2012]. This is used for media resources control. A set of implementation scenarios including information flow on A-S$_3$ is shown in Appendix IV.

- A-S$_6$ is used to transfer user profile information from SUP-FE to the application/service support functions, e.g., user service-related information. This is identified as the Sh reference point in [ITU-T Y.2021].

- A-U$_1$ is used for self-management of service profiles by subscribers. This is identified as the Ut reference point in [ITU-T Y.2021].

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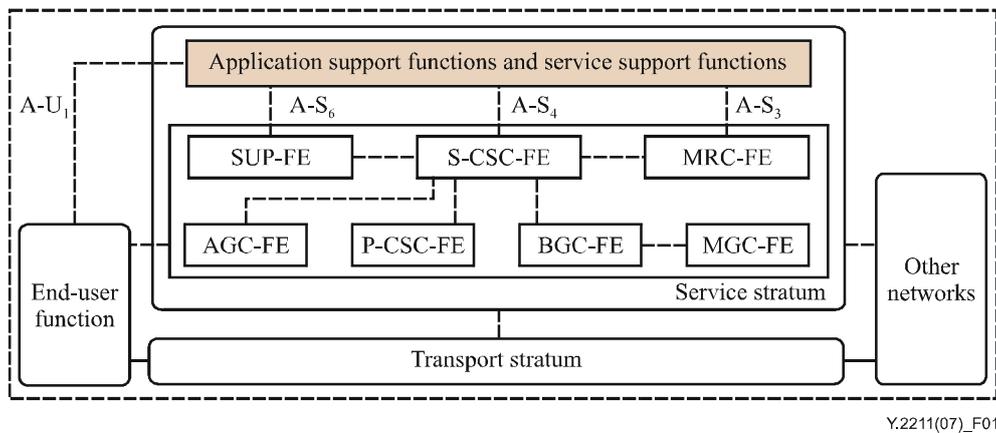
Figure 1 – IMS-based real-time conversational multimedia services functional architecture

8 Service features for IMS-based real-time conversational multimedia services

This clause describes service features of IMS-based real-time conversational multimedia services. A service feature is a key aspect of communication services and forms a general and primitive component to compose specific communication services. Specific communication services characterized by service features are described in clauses 9 through 12.

Authorization code (AC)

This service feature allows the served user to override calling restrictions of the terminal from which the communication is made. Different sets of calling privileges can be assigned to different authorization codes and a given authorization code can be shared by multiple users.

Automatic communication back (ACB)

This service feature allows the called party to automatically initiate a communication back to the calling party of the most recent communication directed to the called party.

Customized announcement (CA)

This service feature allows a served user to send customized announcements during the establishment of a communication session or during an established communication session, for example, to explain the reason for rejecting a communication request, to notify of a diversion or a hold, to indicate a message waiting, or to provide a ring-back tone or media in place of a ring-back

tone. The announcement may use any type of media, e.g., it may be an audio announcement, a video clip or a text message.

Customized background music (CBM)

This service feature allows playing background music during a communication, e.g., music.

The background music could be configured in advance by the user. The user could insert a song during a communication.

Communication distribution (CDIST)

This service feature allows the served user to specify the percentage of calls to be distributed among two or more destinations. Other criteria may also apply to the distribution of calls to each destination.

Communication forwarding (CF)

This service feature allows the called party to forward his incoming communication to another party depending on conditions specified by the called party, including busy, no reply, not logged in or unconditional. A notification of diversion may be provided to the calling party and the diverting user. As part of this service feature, when a served user attempts to initiate the call forwarding feature, the system will review the proposed "forwarded to identifier" against a disallowed forwarded to identifier database. If the identifier is found, the request to call forward to that party will be rejected (i.e., the emergency service identifier could not be set as the forwarded to identifier).

Communication hold (HOLD)

This service feature allows the user to suspend one or more media within a session, and resume that/those media at a later time. A notification may be provided to the held party.

Communication logging (CL)

This service feature allows for a communication detail record to be prepared each time a communication is received to a specified communication number.

Customized routing (CR)

This service feature enables the subscriber to accept or reject a call and, in case of acceptance, to route this call, according to a set of rules which may be based on: the calling party geographical location, the time of day, the day, and/or presence information.

When this feature is applied, the service (e.g., UPT service) queries the subscriber's routing rule to obtain an appropriate terminating identifier, and routes the communication to the appropriate terminal.

Customized ringing (CRG)

This service feature allows the user to set the media provided by the media server for ringing which may be different depending on the called party, special day, etc. When the user equipment receives a communication, it detects whether the ringing is networked or local. If the ringing is networked, the user equipment activates the service by initiating a request to connect to the media server and then the user equipment plays the media stream received from the media server. The customized ringing media could be a specific song, an image, or a multimedia stream.

Communication transfer (CT)

This service feature enables a user to transfer an established (i.e., active) communication to a third party.

Click-to-dial (CTD)

This service feature allows the user to initiate a request to establish a communication conveniently by clicking on a web page icon or button. The use of this service feature alone is not sufficient to establish a communication, this service feature needs to combine with the third party communication control service feature.

Communication waiting (CW)

This service feature allows the called party to receive a notification that another party is trying to reach his number while he is busy communicating to another party.

Destination-associated message type query (DMTQ)

This service feature allows the user to pre-define possible message types, with this information being accessible by other users. When this feature is applied, the user is able to access this information by querying the application server to obtain a destination terminal address and the associated pre-defined message types.

Follow-me diversion (FMD)

With this service feature, a user may register for incoming calls to any terminal access. When registered to a terminal access, all incoming calls to the user will be presented to that terminal access. A registration for incoming calls will cancel any previous registration. Several users may register for incoming calls to the same terminal access simultaneously. The user may also explicitly de-register for incoming calls.

Group communication (GC)

This service feature allows the user to request pre-defined group information stored in the network when establishing multiple simultaneous communication with other parties. The use of this service feature alone is not sufficient to establish the communication. Different users are added to the communication according to their pre-defined privileges.

Multi-party communication (MPC)

This service feature allows the user to establish multiple simultaneous communication with other parties.

Message waiting (MW)

This service feature enables a user to be informed that messages for his attention are waiting.

Originating communication screening (OCS)

This service feature allows the subscriber to specify that outgoing calls be either restricted or allowed, according to a screening list and, optionally, by time of day control. This can be overridden on a per-communication basis by anyone with the proper authorization code.

Off-line charging (OFLC)

This service feature allows for off-line charging for services where delayed charging is acceptable.

ON-line charging (ONLC)

This service feature allows applying on-line charging for services where real-time charging and control are critical and required.

Personal identifier (PI)

This service feature allows the user to hold a unique identifier as personal identification while communicating with others. The user can use a personal identifier as his/her unique identification to communicate with others. All of the user's terminal devices could be bound with a personal

identifier. The service capabilities would be defined with respect to a personal identifier. No matter whether a binding fixed terminal or a binding mobile terminal is used, the user could enjoy the same service experience.

Reverse charging (REVC)

This service feature allows the service subscriber (e.g., free phone) to accept receipt of calls at its expense and be charged for the entire cost of the communication.

Ring pattern (RP)

This service feature supports various ring patterns of destination number, i.e., parallel ring, sequential ring, combination ring of the previous two.

Split charging (SC)

This service feature allows for the separation of charges for a specific communication, the calling and called party each being charged for one part of the communication.

Terminating communication screening (TCS)

Terminating calls may be controlled by the terminating communication screening capability. This allows the called party to specify that incoming calls be either restricted or allowed, according to a screening list of identifiers of the calling parties and, optionally, by time of day control.

Typical scenarios include:

1) Calling user A attempts to make a communication to B. The communication is screened via the screening list assigned to B. The communication is allowed to complete and A is connected to B.

2) Calling user A attempts to make a communication to B. The communication is screened via the screening list assigned to B. The communication is not allowed to complete and A is connected to an announcement.

Third party communication control (3PCC)

This service feature allows a user to set up, release and control a communication between parties when the user is different from the parties directly involved in the communication.

Unsuccessful communication notification (UCN)

This service feature allows the subscriber to be informed of the unsuccessful incoming calls in a preset way, e.g., e-mail message, etc.

User identification presentation and restriction (UIPR)

This service feature allows the user to receive user identification information from the other party or prevent presentation of his user identification information to the other party within a communication. The user could be either a calling party or a called party. As government policy or operator policy, this feature is sometimes forced to be supported.

User profile management (UPM)

This service feature allows the served user to manage his service profile, e.g., terminating destinations, announcements to be played, communication forwarding, and so on.

9 PSTN/ISDN simulation services

9.1 Introduction

An important aspect of the PSTN/ISDN simulation service is to provide PSTN/ISDN-like services. Nevertheless, the requirements are independent of the media that is used during the communication.

This clause covers part of the transition from PSTN/ISDN to an NGN. Interconnection between the existing networks and an NGN is also covered.

9.2 General

There is no mandatory requirement to offer PSTN/ISDN simulation services in a particular network deployment.

The PSTN/ISDN simulation services support interworking with existing fixed and mobile networks, including PSTN, ISDN, GSM/UMTS and Internet. Services not interoperated across the different network types should be declined in a graceful and consistent manner.

In addition to the capabilities to establish a bidirectional point-to-point communication between two parties, a selected number of PSTN/ISDN simulation services, corresponding to perceived popular PSTN/ISDN supplementary services, are included in this Recommendation. PSTN/ISDN simulation services are described from a user's perspective and are similar, and in some instances almost identical, to the corresponding PSTN/ISDN supplementary services. The services described are not limited to the voice media as in PSTN/ISDN, but are intended to be generally applicable regardless of the media used (voice, video, text, etc.).

However, from a functionality distribution perspective, this clause places no particular requirements on the functionality distribution between the network and terminals. Further, the need to preserve the split of functionality, between the network and terminals, provided for supplementary services in an ISDN or PSTN is not a requirement with regard to the NGN.

This clause only deals with services using IMS. Services provided by an NGN to support legacy terminals and interfaces (PSTN/ISDN emulation) are defined in existing PSTN/ISDN documents. Requirements for PSTN/ISDN emulation are out the scope of this Recommendation and are described in other Recommendations (e.g., [b-ITU-T Y.2271] and [b-ITU-T Y.2031]).

Provision, withdrawal, registration, erasure, activation, deactivation and invocation are defined in [b-ITU-T I.210].

The remaining subclauses within this clause provide the description of the PSTN/ISDN simulation services.

For each PSTN/ISDN simulation service, the following is provided:
• a short service definition;
• a description of the normal operation with successful outcome.

And, when applicable, also:
• a description of exceptional operation or unsuccessful outcome;
• descriptions on interaction with other PSTN/ISDN simulation services; and
• considerations for interworking with the PSTN/ISDN.

If one simulation service is not mentioned within the interaction clause, then there is no impact or the interaction is described in the clause related to that simulation service.

9.3 Interworking considerations

9.3.1 Interworking with existing PSTN/ISDN networks

An NGN supports the interoperability of the PSTN/ISDN simulation services with PSTN/ISDN services and vice versa. This includes interworking PSTN/ISDN supplementary services with the services defined in this Recommendation and vice versa. The scope of this interworking may result in a limited service capability.

9.3.2 Interworking with other NGNs

An NGN supports the interoperability of the simulation services defined in this Recommendation with other NGNs if the services are supported by both NGNs.

9.3.3 Interworking with emulation services

An NGN supports the interoperability of the PSTN/ISDN simulation services with the services provided by the NGN PSTN/ISDN emulation subsystems where both are deployed. The scope of this interworking may result in the same limited service capability as interworking with an existing PSTN/ISDN network.

9.4 Originating identification presentation (OIP)

9.4.1 Description

The OIP simulation service provides the terminating party with the asserted identification information of the originating party.

9.4.2 OIP service interactions with other PSTN/ISDN simulation services

Originating identification restriction: The OIR service shall have precedence over OIP.

NOTE – The requirements for support of emergency telecommunication may override the user request for suppression.

Communication forwarding unconditional (CFU): When a communication has been forwarded and the forwarded-to party has subscribed to the OIP simulation service, the forwarded-to party receives the identification information of the original originating party, if the original originating party has not subscribed to or invoked the OIR simulation service.

Communication forwarding busy (CFB): When a communication has been forwarded and the forwarded-to party has been provided with the OIP simulation service, the forwarded-to party receives the identification information of the original originating party, if this original originating party has not subscribed to or invoked the OIR simulation service.

Communication forwarding no reply (CFNR): When a communication has been forwarded and the forwarded-to party has been provided with the OIP simulation service, the forwarded-to party receives the identification information of the original originating party, if this original originating party has not subscribed to or invoked the OIR simulation service.

Communication forwarding on not logged in (CFNL): When a communication has been forwarded and the forwarded-to party has been provided with the OIP simulation service, the forwarded-to party receives the identification information of the original originating party, if this original originating party has not subscribed to or invoked the OIR simulation service.

Communication deflection (CD): When a communication has been deflected and the deflected-to party has been provided with the OIP simulation service, the deflected-to party receives the identification information of the original originating party, if this original originating party has not subscribed to or invoked the OIR simulation service.

Communication forwarding on subscriber not reachable (CFNRc): When a communication has been forwarded and the forwarded-to party has been provided with the OIP simulation service, the forwarded-to party receives the identification information of the original originating party, if this originating party has not subscribed to or invoked the OIR simulation service.

Communication diversion notification (CDIVN): When a communication diversion is being notified to a served user (who has subscribed for CDIV notification) and the served user has been provided with the OIP simulation service, then the served user receives the identification information of the originating party, if:

- this originating party has not subscribed to or invoked the OIR simulation service; and
- the served user has not disabled delivery of originating party identification within the CDIV notification.

Communication waiting (CW): If a party has the OIP service active and is notified that an incoming communication is waiting, then this party receives the identification information of the originating party, if this originating party has not subscribed to or invoked the OIR simulation service.

9.4.3 OIP interoperability with PSTN/ISDN networks

The NGN supports the interoperability of the OIP service with the PSTN/ISDN supplementary service CLIP and vice versa. The scope of this interworking may result in a limited service capability (only E.164 numbers can be used in the PSTN/ISDN).

9.5 Originating identification restriction (OIR)

9.5.1 Description

The originating identification restriction (OIR) simulation service enables the originating party to withhold the presentation of its identification information to the terminating party.

NOTE – The requirements for support of emergency telecommunication may override the user request for suppression, i.e., a properly authorized terminating party may invoke an override capability.

9.5.2 OIR service interactions with other PSTN/ISDN simulation services

Originating identification presentation: The OIR service shall have precedence over OIP.

NOTE – The requirements for support of emergency telecommunication may override the user request for suppression.

Communication forwarding unconditional (CFU), communication forwarding busy (CFB), communication forwarding no reply (CFNR), communication forwarding on not logged in (CFNL), communication deflection (CD), communication forwarding on subscriber not reachable (CFNRc): When the OIR simulation service has been invoked, the originating party's identification information is not presented to the forwarded-to party unless the forwarded-to party has invoked an override capability.

Communication diversion notification (CDIVN): When the OIR simulation service has been invoked, the originating party's identification information shall not be notified to the user who has subscribed for the CDIVN service.

Explicit communication transfer (ECT): Originating party's restriction requirements from the original communication are used in order to restrict the presentation of that party's identification information to any party in a transferred communication, unless the forwarded-to party has invoked an override capability.

9.5.3 OIR interoperability with PSTN/ISDN networks

An NGN supports the interoperability of OIR service with the PSTN/ISDN supplementary service CLIR and vice versa. The scope of this interworking may result in a limited service capability. The originating party's identification restriction information is conveyed from an NGN to a PSTN/ISDN and vice versa. The network to which the terminating party is connected to is responsible to handle this service.

In case of limited interoperability, OIR/CLIR shall have precedence over OIP/CLIP.

9.6 Terminating identification presentation (TIP)

9.6.1 Description

The TIP simulation service provides the originating party with the asserted identification information of the terminating party.

9.6.2 TIP service interactions with other ISDN/PSTN simulation services (NGN)

Terminating identification restriction (TIR): TIR shall have precedence over TIP.

Communication diversion (CDIV): If forwarding party B chooses to restrict the presentation of the forwarded-to party, i.e., C's identification information, the originating party A does not receive the terminating party C's identification information, irrespective of whether the terminating party C has TIR activated or not.

9.6.3 TIP interoperability with PSTN/ISDN networks

The NGN supports the interoperability of the TIP services with the PSTN/ISDN supplementary service COLP and vice versa. The scope of this interworking may result in a limited service capability.

9.7 Terminating identification restriction (TIR)

9.7.1 Description

The terminating identification restriction (TIR) enables the terminating party to withhold presentation of its asserted identification information to the originating party.

NOTE – The requirements for support of emergency telecommunication may override the user request for suppression.

9.7.2 TIR service interactions with other PSTN/ISDN simulation services

Terminating identification presentation (TIP): TIR shall have precedence over TIP.

9.7.3 TIR interoperability with PSTN/ISDN networks

The NGN supports the interoperability of the TIR services with PSTN/ISDN supplementary service COLR and vice versa. The scope of this interworking may result in a limited service capability.

In case of limited interoperability, TIR/COLR shall have precedence over TIP/COLP.

9.8 Malicious communication identification (MCID)

9.8.1 Description

The malicious communication identification (MCID) simulation service enables an incoming communication to be identified and registered.

The service is required for all communications, irrespective of which network originated the communication. It is normally provided following a request from the customer concerned, and may be subject to authorization before being invoked.

9.8.2 MCID service interactions with other PSTN/ISDN simulation services

Communication diversion (CDIV): The MCID simulation service can be invoked for a diverted communication. In addition to the normal operation of the MCID simulation service, the identifier of the first diverting party is registered and, as a network option, the last diverting party may be registered.

Communication forwarding no reply (CFNR): If the terminating party has activated CFNR, once forwarding has taken place, the forwarding party cannot invoke the MCID simulation service.

Communication deflection (CD): If the terminating party has activated communication deflection, once deflection has taken place, the deflecting party cannot invoke the MCID simulation service.

Explicit communication transfer (ECT): The transferring party cannot invoke the MCID simulation service on a communication after transfer of that communication has been successfully invoked.

If, after a transfer has been completed, the transferred-to party successfully invokes the MCID service, then the network registers the identities of all parties involved.

Conference (CONF): The conference controller cannot invoke the malicious call identification supplementary service for participants within the conference.

NOTE – To activate the malicious call identification supplementary service, the conference controller should first create a private communication with the user to be identified using the malicious call identification supplementary service.

If a participant invokes the malicious call identification supplementary service, only information about the connection to the conference controller is registered. No information about the other participants is registered.

9.8.3 MCID interoperability with PSTN/ISDN networks

The MCID service interoperates for all communication from a PSTN/ISDN to an NGN and vice versa. The registered information is stored in the invoking party's network and may also be stored in the network that serves the malicious party.

9.9 Anonymous communication rejection (ACR)

9.9.1 Description

The anonymous communication rejection (ACR) simulation service allows the terminating party to reject incoming communication from originating parties that cannot be identified.

9.9.2 ACR service interactions with other PSTN/ISDN simulation services

Originating identification presentation (OIP): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Originating identification restriction (OIR): If the terminating party has activated the ACR simulation service, then the OIR simulation service causes the execution of the ACR simulation service.

If the terminating party has the override capability according to the OIR simulation service, then the ACR simulation service is not applicable.

Communication diversion (CDIV): If the diverted-to user has activated the ACR simulation service, then the ACR simulation service takes precedence over the communication diversion simulation service, i.e., the communication is rejected according to the ACR simulation service.

NOTE 1 – The precedence that ACR takes over the communication diversion services does not exclude the use of forwarding functionality in the ACR functionality itself. As an example, forwarding of anonymous communication (e.g., to a voice mailbox) as part of the ACR functionality is possible.

Communication forwarding no reply (CFNR): If the forwarding party has activated the ACR simulation service, then there is no impact, i.e., neither simulation service affects the operation of the other simulation service.

NOTE 2 – If the originating party has restricted its identification information due to the OIR simulation service, the communication will not be presented.

Communication waiting (CW): If the terminating party has activated the ACR simulation service, then the ACR simulation service takes precedence over the communication waiting simulation service. The ACR simulation service can be activated while a communication is waiting without changing the state of the waiting communication session.

Completion of communication to busy subscriber (CCBS): Assuming the originating party connects to the terminating party and the terminating party activates the ACR simulation service (or has activated the ACR simulation service), two cases are possible:

a)   The ACR simulation service was activated by the terminating party before the originating party originates a communication: No impact, i.e., neither simulation service affects the operation of the other simulation service.

    NOTE 3 – If the originating party has restricted the presentation of its identification information due to the invocation of the OIR simulation service and if the terminating party is busy, the originating party will receive no busy indication, and the completion of communication to busy subscriber simulation service will not apply. Instead, the communication session attempt is rejected according to the normal procedures of the ACR simulation service.

b)   The ACR simulation service is activated by the terminating party after the originating party has activated the completion of communication to busy subscriber simulation service on the terminating party: If the terminating party activates the ACR simulation service after the originating party has activated the completion of communication to busy subscriber simulation service on the terminating party, then the communication resulting from the completion of communication to busy subscriber simulation service is rejected if the originating party has restricted its identification information due to the OIR simulation service.

    NOTE 4 – A CCBS recall (from the network to the originating party) resulting from the completion of communication to busy subscriber simulation service is not rejected due to the application of the ACR simulation service.

Assuming the originating party connects to the terminating party and the terminating party activates the ACR simulation service (or has activated the ACR simulation service), two cases are possible:

a)   The ACR simulation service was activated by the terminating party before the originating party originates a communication: There is no impact, i.e., neither simulation service affects the operation of the other simulation service.

    NOTE 5 – If the originating party has restricted its identification information due to the OIR simulation service and if the terminating party is busy, the originating party will receive no busy indication, and the completion of communication to busy subscriber simulation service will not apply. Instead, the communication session attempt is rejected according to the normal procedures of the ACR simulation service.

b)   The ACR simulation service is activated by the terminating party after the originating party has activated the completion of communication to busy subscriber simulation service on the terminating party: If the terminating party activates the ACR simulation service after the originating party has activated the completion of communication to busy subscriber simulation service on the terminating party, then the communication resulting from the completion of communication to busy subscriber simulation service is rejected if the originating party has restricted its identification information due to the OIR simulation service.

9.9.3   ACR interoperability with PSTN/ISDN

The NGN supports the interoperability of the ACR services with PSTN/ISDN supplementary service ACR and vice versa. The scope of this interworking may result in a limited service capability.

9.10 Communication diversion (CDIV)

9.10.1 Description

The following communication diversion simulation services are described:
- Communication forwarding unconditional (CFU).
- Communication forwarding busy (CFB).
- Communication forwarding no reply (CFNR).
- Communication forwarding on not logged in (CFNL).
- Communication deflection (CD).
- Communication forwarding on subscriber not reachable (CFNRc).
- Communication diversion notification (CDIVN).

For all communication diversion simulation services, a service provider option of notification of diversion may be provided to the originating party. This service provider option may also include support for the invoking user to suppress the notification.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication forwarding unconditional (CFU)

The CFU service enables a user to have the network redirect all communication to another user. The CFU service may operate on all communication, or just those associated with specified services. The user's ability to originate communication is unaffected by the CFU simulation service. After the CFU service has been activated, communication is forwarded independently of the status of the user.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFU service has been activated. This indication may be provided when the user originates a communication if the CFU service has been activated for the user and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication forwarding busy (CFB)

The CFB service enables a user to have the network redirect communication, which would otherwise be regarded as busy, to another user. The CFB service may operate on all communications, or just those associated with specified services. The user's ability to originate communication is unaffected by the CFB simulation service.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFB service has been activated. This indication may be provided when the user originates a communication if the CFB service has been activated for the user and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication forwarding no reply (CFNR)

The CFNR service enables a user to have the network redirect communication, when the communication request is not responded to within a defined period of time, to another user. The

CFNR service may operate on all communications, or just those associated with specified services. The user's ability to originate communication is unaffected by the CFNR simulation service.

The CFNR service can only be invoked by the network after the communication has been offered to the user and an indication that the user has been informed of the communication request.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFNR service has been activated. This indication may be provided when the user originates a communication if the CFNR service has been activated for the user and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication forwarding on not logged in (CFNL)

The CFNL service enables a user to redirect incoming communication, when the user is not currently registered (logged in), to another user. The CFNL service may operate on all communications, or just those associated with specified services.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFNL service has been activated. This indication may be provided when the user next registers (logs in). An indication may also be provided as part of de-registration (log out).

The maximum number of diversions permitted for each communication is a service provider option. The service provider defines the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication deflection (CD)

The CD service enables the user to respond to an incoming communication by requesting redirection of that communication to another user. The CD service can only be invoked before the communication is established by the user, i.e., in response to the offered communication, or during the period that the user is being informed of the communication. The user's ability to originate communication is unaffected by the CD simulation service.

Communication forwarding on subscriber not reachable (CFNRc)

The CFNRc service enables a user to have the network redirect all incoming communication, when the user is not reachable (e.g., there is no IP connectivity to the user's terminal), to another user. The CFNRc service may operate on all communication, or just those associated with specified services. The user's ability to originate communication is unaffected by the CFNRc simulation service.

As a service provider option, a subscription option can be provided to enable the user to receive an indication that the CFNRc service has been activated. This indication may be provided when the user originates a communication if the CFNRc service has been activated for the user and for the service requested for the communication.

The maximum number of diversions permitted for each communication is a service provider option. The service provider shall define the upper limit of diversions. When counting the number of diversions, all types of diversion are included.

Communication diversion notification (CDIVN)

The CDIVN service enables a user to receive notifications about the diversions (or forwarding) of incoming communication, post execution of at least one other CDIV service.

As a service provider option, a subscription option can be provided to enable the served user to receive an indication that the CDIVN service has been activated. This indication is provided when

the served user originates a communication if the CDIVN service has been activated for the served user.

9.10.2 CDIV service interactions with other PSTN/ISDN simulation services

Originating identification presentation (OIP): When a communication has been diverted and the diverted-to party has been provided with the originating identification presentation simulation service, the diverted-to party receives the identification information of the originating party, if this originating party has not subscribed to or invoked the originating identification restriction simulation service.

Originating identification restriction (OIR): When the originating identification restriction simulation service has been invoked, the originating party's identification information is not presented to the diverted-to party unless the diverted-to party has an override capability.

Terminating identification presentation (TIP): When a communication has been diverted and the originating party has been provided with the terminating identification presentation simulation service, the originating party receives the identification information of the diverted-to party, unless the diverting user has selected the option to suppress the notification of diversion.

Terminating identification restriction (TIR): If the diverting party or the diverted-to party has invoked the terminating identification restriction simulation service, then the diverted-to party's identification information is not provided to the originating party unless the originating party has an override capability.

Malicious communication identification (MCID): As described in the MCID clause.

Anonymous communication rejection (ACR): As described in the ACR clause.

Communication forwarding unconditional (CFU) with CFU: Not applicable.

Communication forwarding unconditional (CFU) with communication diversion notification (CDIVN): No impact, as CDIVN only enables a notification of communication diversion information, post execution of at least one CDIV service.

Communication forwarding unconditional (CFU) with other CDIV services: Invocation of CFU takes precedence over other CDIV simulation services.

Communication forwarding busy (CFB) with communication forwarding busy (CFB): Not applicable.

Communication forwarding busy (CFB) with communication forwarding no reply (CFNR): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding busy (CFB) with communication forwarding not logged in (CFNL): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding busy (CFB) with communication deflection (CD): If the terminating party is not network-determined user busy, then the CD simulation service or the communication forwarding busy simulation service can be invoked, depending on the response from the terminating party.

Communication forwarding busy (CFB) with communication forwarding subscriber not reachable (CFNRc): If the terminating party is network-determined user busy, then CFB takes precedence over CFNRc. Otherwise, if the terminating party is not network-determined user busy, then there is no impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding busy (CFB) with communication diversion notification (CDIVN): No impact, as CDIVN only enables a notification of communication diversion information, post execution of at least one CDIV service.

Communication forwarding no reply (CFNR) with communication forwarding busy (CFB): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding no reply (CFNR) with communication forwarding no reply (CFNR): Not applicable.

Communication forwarding no reply (CFNR) with communication forwarding on not logged in (CFNL): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding no reply (CFNR) with communication deflection (CD): No impact, i.e., neither simulation service affects the operation of the other simulation service.

NOTE 1 – If the network indicates the arrival of an incoming communication to the terminating party, then the CD simulation service, or the communication forwarding no reply simulation service can be invoked, depending on the response, or lack of response, from the terminating party.

Communication forwarding no reply (CFNR) with communication forwarding on subscriber not reachable (CFNRc): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding no reply (CFNR) with communication diversion notification (CDIVN): No impact, as CDIVN only enables a notification of communication diversion information, post execution of at least one CDIV service.

Communication forwarding on not logged in (CFNL) with communication forwarding on not logged in (CFNL): Not applicable.

Communication forwarding on not logged in (CFNL) with communication diversion notification (CDIVN): No impact. In case of CFNL activation, the CDIVN service buffers the communication diversion notification information and notifies the user when the user logs in again. The communication diversion information is buffered for a time-period configurable by the user and/or the provider.

Communication forwarding on not logged in (CFNL) with other CDIV simulation services: No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication deflection (CD) with communication deflection (CD): Not applicable.

Communication deflection (CD) with communication forwarding on subscriber not reachable (CFNRc): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication deflection (CD) with communication diversion notification (CDIVN): No impact, as CDIVN only enables a notification of communication diversion information, post execution of at least one CDIV service.

Communication forwarding on subscriber not reachable (CFNRc) with communication forwarding on subscriber not reachable (CFNRc): Not applicable.

Communication forwarding on subscriber not reachable (CFNRc) with communication diversion notification (CDIVN): No impact. In case of CFNRc activation, the CDIVN service buffers the communication diversion notification information and notifies the user, until the time the user is reachable again. The communication diversion information is buffered for a time-period configurable by the user and/or the provider.

Communication forwarding on subscriber not reachable (CFNRc) with other CDIV services: No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication forwarding unconditional (CFU) with communication waiting: CW has no impact on CFU. The communication will be forwarded without regard to the terminating party's state. A forwarded-to party may have communication waiting service and this will be activated if busy. A forwarded communication can result in the communication waiting simulation service.

Communication forwarding busy (CFB) with communication waiting: CW cannot co-exist with CFB. Service provider options to prevent both services being active at the same time include:

• One service cannot be activated while the other service is active.

• CFB has priority over CW (i.e., the CW never occurs).

• CW has priority over CFB (i.e., the CFB never occurs).

Communication forwarding no reply (CFNR) with communication waiting: If terminating party has activated the CFNR simulation service, then a waiting communication shall still be offered. If the CFNR timer expires before an answer is received then the CFNR simulation service shall be invoked and the communication shall be forwarded and communication waiting ceased. A forwarded communication can result in the communication waiting simulation service.

Communication forwarding on not logged in (CFNL) with communication waiting: No impact.

NOTE 2 – If a party with an active communication waiting logs out, the all active and offered communication would be released.

Communication deflection (CD) with communication waiting: When receiving the communication waiting indication, terminating party can invoke the CD simulation service. A deflected communication can result in the communication waiting simulation service.

Communication forwarding on subscriber not reachable (CFNRc) with communication waiting: No impact, i.e., neither simulation service shall affect the operation of the other simulation service.

Outgoing communication barring (OCB): If the outgoing communication barring simulation service has already been activated, a request to activate any CDIV simulation service shall be rejected if the forwarding party's communication to the diverted-to party would be barred by the outgoing communication barring simulation service.

If the CDIV simulation service was activated before the activation of the outgoing communication barring simulation service, the outgoing communication barring simulation service can still be activated. When the two services have already been activated, a request to invoke the CDIV simulation service shall be rejected if the forwarding party's communication to the diverted-to party would be barred by the outgoing communication barring simulation service at the time of the invocation attempt of the CDIV simulation service.

Completion of communication to busy subscriber (CCBS): CCBS recalls are never diverted, and are always provided to the original originating party.

CCBS cannot be activated on a diverted communication.

Charging information at the end of the communication (AOC-E) activated at the originating party: No impact, i.e., neither simulation service affects the operation of the other simulation service.

Charging information at the end of the communication (AOC-E) activated at the forwarding party: When a communication is forwarded and the forwarding party is charged for the forwarded part of the communication then, as a network option, the charging information can be transferred to the forwarding user when the communication is terminated provided that the served user has subscribed to the advice of charge: charging information at the end of the communication simulation service with the value of the subscription option set to "for all communication automatically".

9.10.3 CDIV interoperability with PSTN/ISDN

The NGN supports the interoperability of the CDIV service with PSTN/ISDN supplementary service CF and vice versa. The scope of this interworking may result in a limited service capability. The CLI information of the originating party as well as further CLI information (first redirected address, last redirected address) may be provided to the final called party, if the PSTN/ISDN allows this.

9.11 Communication hold (HOLD)

9.11.1 Description

The communication hold simulation service enables a user to suspend one/more media within a session, and resume that/those media at a later time.

Each party in a communication can hold and retrieve the communication independently from the other party. This also applies when a communication involves more than two parties (e.g., CONF).

9.11.2 HOLD service interactions with other PSTN/ISDN simulation services

Conference (CONF): A, B and C are in a conference that was created by B invoking the CONF service. B can interrupt his own participation in the conference by using the HOLD service. When B does this, A and C shall not receive the HOLD notification and are not prevented from carrying on their conversation.

9.11.3 HOLD interoperability with PSTN/ISDN

The NGN supports the interoperability of the HOLD service with PSTN/ISDN supplementary service HOLD and vice versa. The scope of this interworking may result in a limited service capability.

9.12 Communication barring (CB)

9.12.1 Description

Communication barring consists of two simulation services:

Outgoing communication barring (OCB)

This service enables a user to bar certain categories of outgoing communication. The network provides the capability for a user to select a set of categories (e.g., identifiers or range of identifiers) for barring. The type of barring is chosen by the user at provision time, and is valid for all outgoing communication. The network provides the capability for the user to bar outgoing communication based on user-defined identifiers or identifier ranges. Barring of an outgoing communication for a specific identifier, a number of specific identifiers, or a range of identifiers is dependent on an entry in an OCB identifier list held in the network. This list is either a "black list" or "white list". A "black list" contains the identifiers or identifier ranges to be barred by the network for outgoing communication. A "white list" contains the identifiers or identifier ranges that are allowed by the network for outgoing communication, i.e., all identifiers not in the "white list" are barred.

The ability of the served user to receive communication and to originate emergency telecommunication is unaffected by OCB.

NOTE 1 – This service uses the OCS service feature.

Incoming communication barring (ICB)

This service allows a user to bar certain categories of incoming communication. The service also allows the user to have the barring of incoming calls activated always or only during certain conditions. The network shall provide the capability for a user to select from a set of categories (e.g., identifiers or range of identifiers) for barring. The type of barring is chosen by the user at

provision time and may be valid for all incoming communication, or be limited to a specific service group or certain conditions (e.g., when the user is roaming).

The ability of the served user to set-up outgoing communication is unaffected by ICB.

NOTE 2 – This service uses the TCS service feature.

9.12.2 Service interactions with other PSTN/ISDN simulation services

Communication diversion (CDIV): The interactions between communication barring and communication diversion services are described in clause 9.10.2.

9.12.3 Communication barring interoperability with PSTN/ISDN

The NGN supports the interoperability of the CB service with PSTN/ISDN supplementary service CB and vice versa. The scope of this interworking may result in a limited service capability.

9.13 Completion of communication to busy subscriber (CCBS)

9.13.1 Description

The CCBS simulation service enables an originating party, encountering a busy terminating party, to have the communication completed without having to make a new communication attempt when the terminating party becomes free.

When the originating party requests the CCBS simulation service, the network will monitor for the terminating party becoming free.

When the terminating party becomes free, then the network will wait a short time in order to allow the resources to be re-used for originating a communication. If the resources are not re-used by the terminating party within this time, then the network will automatically inform the originating party that the terminating party has become free. The originating party can then generate the CCBS communication to the terminating party.

When the originating party accepts the CCBS recall, then the network automatically generates a CCBS communication to the terminating party.

NOTE – A simulation service provided to the terminating party which prevents the registration of CCBS requests is outside the scope of this Recommendation.

During the CCBS recall, information is provided which indicates it is a CCBS recall. The information provided in the original communication attempt is included in the CCBS recall.

9.13.2 CCBS service interactions with other PSTN/ISDN simulation services

Anonymous communication rejection (ACR): A CCBS recall (from the network to the originating party) resulting from the completion of communication to busy subscribers does not result in a rejection due to the application of the ACR simulation service.

Assuming the terminating party activates or has activated the ACR simulation service:

If the terminating party activates the ACR simulation service after the originating party has activated the completion of communication to busy subscriber simulation service on the terminating party, then the communication resulting from the completion of communication to busy subscriber simulation service is rejected if the originating party has restricted its identification information due to the OIR simulation service.

Communication diversion (CDIV): CCBS recalls are never diverted. They are provided to the original originating party.

Communication waiting (CW): If the communication waiting indication cannot be provided at the terminating party, the originating party will receive busy indication and can invoke the CCBS simulation service to the terminating party.

CCBS requests in the terminating party's CCBS queue are only processed if there is no communication waiting.

NOTE 1 – For a waiting communication, the terminating party is not considered as busy.

CCBS cannot be activated on a diverted communication.

Communication hold (HOLD): No impact, i.e., neither simulation service affects the operation of the other simulation service.

NOTE 2 – When receiving a CCBS communication indication, the originating party may invoke the communication hold simulation service in order to make interface resources available for the establishment of the CCBS communication.

NOTE 3 – When the originating party is busy or CCBS busy and is notified that the terminating party is free, invocation of the communication hold simulation service does not result in the CCBS communication being established.

Communication barring (CB): The originating party calls the terminating party who is busy, and then the originating party invokes CCBS. If the originating party invokes OCB before the CCBS has timed out or the terminating party becomes free, then the CCBS communication may be rejected due to the OCB invocation.

Completion of communication to busy subscriber (CCBS): A user can be both an "originating party" and a "terminating party" simultaneously, i.e., that user can have activated the CCBS simulation service and have CCBS requests outstanding whilst at the same time that user can be the destination of CCBS requests from other users.

If a user receives a CCBS recall while that terminating party's CCBS queue is being processed, then the CCBS recall takes priority over the handling of the terminating party's CCBS queue. The handling of CCBS requests activated by this user has priority over the handling of CCBS requests activated by other users on this user.

If one of the user's CCBS requests matures as a result, then the user is provided with a CCBS recall or notification. The terminating party idle guard timer, if running, is cancelled.

Advice of charge (AOC): Charging information can be provided for the original communication, and for the resulting CCBS communication.

9.13.3 CCBS interoperability with PSTN/ISDN

The NGN supports the interoperability of the CCBS service with PSTN/ISDN supplementary service CCBS and vice versa. The scope of this interworking may result in a limited service capability.

9.14   Communication waiting (CW)

9.14.1 Description

The communication waiting (CW) service enables a terminating party to be informed at the time that a new communication is requested, and that no resources are available for that incoming communication.

The user then has the choice of accepting, rejecting or ignoring the incoming communication.

The maximum number of calls that may be waiting is a service provider option.

If the current number of calls waiting is equal to the maximum, then any new attempted incoming communication request shall be rejected with a busy cause.

NOTE – This simulation service may be provided entirely by means of a terminal or other user equipment, e.g., utilizing the communication hold simulation service; in which case, communication waiting may not be provided by the network.

9.14.2 Service interactions with other PSTN/ISDN simulation services (NGN)

Anonymous communication rejection (ACR): If the terminating party has activated the ACR simulation service, then the ACR simulation service shall take precedence over the communication waiting simulation service. The ACR simulation service can be activated while a communication is waiting without changing the state of the waiting communication session.

Communication diversion (CDIV): The interactions between communication waiting and communication diversion services are described in clause 9.10.2.

Completion of communication to busy subscriber (CCBS): If a subscriber to the completion of communication to busy subscriber simulation service places a communication to a terminating party who has subscribed to the CW simulation service, and the terminating party has provided the communication waiting indication, then the invocation of the completion of communication to busy subscriber simulation service cannot occur.

9.14.3 Interoperability with PSTN/ISDN

No special requirement.

9.15   Message waiting indication (MWI)

9.15.1 Description

The MWI simulation service enables the network, upon the request of a controlling user, to indicate to the receiving user that there is at least one message waiting. The indication is sent to the receiving user when a message is deposited. Optionally, the network may send an indication to the user that there are no more unread messages in the mail box. This indication may be sent when the last unread message is read.

NOTE – As an example, a voice message is stored by the network for a particular user. The network then provides the MWI to the user to indicate there is a message for retrieval. Having received this indication, the receiving user can subsequently access the mail box to listen to the message.

The means by which the receiving user accesses and manages the mail box voice message service are outside the scope of this recommendation.

9.15.2 MWI service interactions with other services (NGN)

Communication diversion (CDIV): MWI is never diverted.

Communication forwarding on not logged in (CFNL): MWI is never diverted. The indication is provided to the user on re-registering (logging in).

9.15.3 MWI interoperability with PSTN/ISDN

There is no interoperability with PSTN/ISDN because MWI is a local service.

9.16   Conference (CONF)

9.16.1 Description

The CONF simulation service enables a user to participate in and control a simultaneous communication involving a number of users.

When the CONF simulation service is invoked, conference resources are allocated to the served user.

Once a conference is active, users can join and leave a conference, and remote users can be added to or removed from the conference.

Conference participants can request to be informed of these actions.

9.16.2 CONF service interactions with other PSTN/ISDN simulation services

Conference (CONF): A user can be involved as the conference controller separately in more than one conference. However, a user cannot add any conference to another conference.

Communication diversion (CDIV): No impact, i.e., neither simulation service affects the operation of the other simulation service.

Advice of charge (AOC): No impact, i.e., neither simulation service affects the operation of the other simulation service.

NOTE – Every communication within the CONF service may be charged according to the normal communication procedures. Special arrangements (e.g., conference initiator may be charged for other parties' communication in the conference) are out of scope of this Recommendation.

Terminating identification presentation (TIP): The conference controller shall ensure that privacy policies on identity information that it includes in conference notifications are enforced.

Terminating identification restriction (TIR): The conference controller shall ensure that privacy policies on identity information that it includes in conference notifications are enforced.

9.16.3 CONF interoperability with PSTN/ISDN

The NGN supports the interoperability of the CONF service with PSTN/ISDN supplementary service CONF and vice versa. The scope of this interworking may result in a limited service capability.

9.17 Advice of charge (AOC)

9.17.1 Description

AOC is a group of simulation services as follows:

Advice of charge: Charging information at communication set-up time (AOC-S)

The advice of charge at communication set-up simulation service provides the user with information about the charging rates at the time of communication establishment or during the communication in the case of charging rate changes. The charge information provided relates to the charges incurred on the network to which the served user is attached.

Advice of charge: Charging information during the communication (AOC-D)

The advice of charge during the communication simulation service enables the user to receive information on the recorded charges for a communication during the active phase of the communication. The charging information rates provided may be exchanged between different operator domains if those operators have interconnecting agreements to do so.

Advice of charge: Charging information at the end of the communication (AOC-E)

The advice of charge at end of communication simulation service provides the user with charging information for a communication when the communication is terminated. Depending on the option chosen at the time of subscription, the information can be sent for all communication, or on a per-communication basis. The charge information provided relates to the charges incurred on the network to which the served user is attached.

9.17.2 AOC service interactions with other PSTN/ISDN simulation services

Communication diversion (CDIV) activated at the originating party: No impact, i.e., neither simulation service affects the operation of the other simulation service.

Communication diversion (CDIV) activated at the forwarding party: When a communication is forwarded and the forwarding party is charged for the forwarded part of the communication, then as

a network option, the charging information can be transferred to the forwarding user when the communication is terminated.

Completion of communication to busy subscriber (CCBS): Charging information is provided for the original communication, and for the resulting CCBS communication.

9.17.3 AOC interoperability with PSTN/ISDN

The NGN supports the interoperability of the AOC service with PSTN/ISDN supplementary services and vice versa. The scope of this interworking may result in a limited service capability.

9.18 Explicit communication transfer (ECT)

9.18.1 Description

The ECT simulation service enables a transferring party A to transform two of that party's communication, e.g., an active communication to party B and a communication on hold to party C, each of which can be an incoming communication or an outgoing communication, into a new communication between party B and party C.

Prior to transfer, the media session has been established on the communication between transferring party A and party B. On the communication between transferring party A and party C, either the media session has been established prior to transfer, or, as a service provider option, transfer can occur while the communication to party C is requested or being established (i.e., the media session has not yet been established).

The minimum requirement for NGN release 1 is to perform an "immediate" communication transfer for an incoming communication, without waiting for a response from the party originating that communication. The service should be applicable independent of whether party B and party C are NGN users or not.

This service description is based on the service description in [b-ITU-T I.256.3].

9.18.2 ECT service interactions with other PSTN/ISDN simulation services

Terminating identification restriction (TIR): A terminating party's restriction requirements from the original communication apply for the presentation of that party's identification information to the other user in a transferred communication.

NOTE 1 – If the media flow(s) is established on the communication to party C after transfer, the presentation of party C's identification information is restricted according to party C's terminating identification restriction simulation service (i.e., as for the normal operation of the terminating identification restriction simulation service).

Communication barring (CB): In case the transferring party A has outgoing communication barring active towards party C, transferring party A's request for communication transfer between party B and party C is barred if it occurs in relation to the establishment of the communication to C.

Conference (CONF): The conference controller cannot transfer the conference to another party.

NOTE 2 – Conferees can invoke the ECT simulation service in order to transfer their connection to the conference to another party after that connection has been established.

Advice of charge at communication set-up (AOC-S): When party A transfers a communication, AOC-S is considered as completed.

For party B and party C, there is no impact, i.e., neither simulation service affects the operation of the other simulation service.

Advice of charge during the communication (AOC-D): When party A transfers a communication and has activated AOC-D, the charge up to the transfer time is sent as a subtotal charge for that communication. The AOC-D simulation service is then considered as completed.

NOTE 3 – If party A has activated AOC-D, then party A receives information separately for both of the communications which generated the transfer.

For party B and party C, there is no impact, i.e., neither simulation service affects the operation of the other simulation service.

Advice of charge at the end of a communication (AOC-E): If party A is charged for the transferred part of the communication and has activated AOC-E, then either:

a)   the charging information is sent to party A when the transferred communication is terminated; or

b)   when the communication is transferred, party A is informed that charging information is not available. The AOC-E is then considered as completed.

For party B and party C, there is no impact, i.e., neither simulation service affects the operation of the other simulation service.

Explicit communication transfer (ECT): The ECT simulation service can be invoked simultaneously by any of the parties on an active communication, but this is not regarded as a normal situation. The network is not required to explicitly prevent this from occurring.

Therefore, both parties (party A and party B) in a normal communication, who have each subscribed to the ECT simulation service, can simultaneously transfer the communication. That is, if party A and party B are involved in a communication on which the connection has been established, party A can transfer the communication to party C and party B can transfer the communication to another party.

NOTE 4 – Mechanisms which prevent the ECT simulation service from resulting in a connection which contains no parties able to terminate the communication may result in rejection of simultaneous requests to invoke the ECT simulation service by the parties involved in the communication.

9.18.3   ECT interoperability with PSTN/ISDN

No restrictions.

9.19   Reverse charging (RC)

9.19.1   Description

The reverse charging at communication set up time simulation service allows the terminating party to be charged for the entire communication. Only usage-based charges can be applied to the terminating party. The service is requested by the originating party at communication set up time. The terminating party receives an explicit indication of a reverse charge communication request.

This service description is based on the service description in [b-ITU-T I.256.3].

9.19.2   Reverse charging service interactions with other PSTN/ISDN simulation services

None.

9.19.3   Reverse charging interoperability with PSTN/ISDN

The NGN supports the interoperability of reverse charging with the PSTN/ISDN supplementary services and vice versa.

9.20   Use of authorization option in relation to PSTN/ISDN simulation services

9.20.1   Description

Some PSTN/ISDN simulation services (e.g., communication barring) may be offered to a user with the subscription option of authorization to control the service. When this option is selected, every

action (related to that simulation service), such as registration, erasure, activation or deactivation is performed by the user with concurrent authentication.

When the subscription option of authorization is provided for a PSTN/ISDN simulation service, authentication handling is supported by the network.

9.20.2 Management – Normal procedures and successful outcome

Provision of authorization

Each simulation service which requires authorization to control the service itself may be offered with the subscription option of authorization. The values of this option may be:

• user authentication;

• service-provider authentication.

Withdrawal of authorization

Authorization may be withdrawn for administrative reasons or due to subscription modification.

Authentication requirements

The network is required to provide, and allow the user to maintain, the authentication credentials.

10 Universal personal telecommunication (UPT)

The following text is intended to describe the service and not to define it. It was developed to assist in the development of the related service features.

The UPT service allows the subscriber to use his/her unique UPT number to bind all his/her available terminals.

The UPT service supports several service features, such as personal identifier (PI), customized announcement (supporting different ring-back tones according to the different destination numbers), ring pattern (RP) (including parallel ring feature, sequential ring feature, etc.), customized routing (CR), destination-associated message type query (DMTQ), etc.

When the UPT service is activated by the UPT number, the UPT service queries the subscriber's routing rules to obtain an appropriate subscriber's terminal based on the UPT number, and routes the communication to the appointed subscriber's terminal. Also, the UPT service selects an appropriate media resource according to the information of the calling/called party and the media resource, and indicates the selected media resource to play the ring-back tone set by the subscriber to the calling party.

The routing rules may include:

– route incoming calls to the appointed terminal based on caller number, rest day or working day, rest time or working time;

– screen incoming calls according to caller number, etc.;

– route all incoming calls to a terminal;

– route incoming calls to a default terminal if there is no satisfied condition.

If the appointed terminal is busy or not replying, the incoming communication will be routed to another terminal.

11 Customized ring-back tone (CRBT)

The following text is intended to describe the service and not define it. It was developed to assist in the development of the related service features.

The customized ring-back tone service enables the calling party to receive customized ring-back tones other than the traditional ring-back tone. Customized ring-back tones may be of different types, for example, a specific song, a multimedia stream or even a traditional tone plus a customized image.

Each CRBT user may have their own customized ring-back tone depository. The CRBT user can choose customized ring-back tone contents of his preference. A plentiful supply of customized ring-back tone contents may be available for the CRBT user, e.g., on a website, for searching, trying and ordering. Customized ring-back tone contents may be provided by content providers as well as service providers. Besides, the CRBT user may share his customized ring-back tones with other people, e.g., by uploading them to a website.

Playing of a customized ring-back tone follows a set of rules deployed by the CRBT user. The rule information includes the numbers of the calling party or the called party, the current time, the state and location of the called party, etc. The state of the called party can be turned off, roaming, busy, no service, etc. When the CRBT user receives an incoming communication request, the information of the calling party, the called party and the current network situation will be gathered. And a specific piece of customized ring-back tone will match from his pre-arranged customized ring-back tone depository based on one type or a random combination of the gathered information. The selected customized ring-back tone is played to the calling party. If no appropriate customized ring-back tone can be found in his pre-arranged depository, the default ring-back tone is played.

If an incoming communication is distributed to multiple users or terminals that provide different customized ring-back tones, the priority among the various customized ring-back tones follows the service provider policy.

12   Customized ringing tone (CRT)

The following text is intended to describe the service and not define it. It was developed to assist in the development of the related service features.

The CRT service enables the user to allocate and send distinctive caller information to a called party. When the user (calling party) makes a communication, the pre-selected contents (e.g., video business card) are played to the user equipment of the called party, until the called party answers. Different media types are allowed for the contents presented to the called party, including audio, video and image. The media types presented to the called party's terminal are negotiated with those of original contents according to the capabilities of the terminal.

The customized ringing tone contents may be configured by service web pages.

The priority between the network-based customized ringing tone and the default ringing tone (music bell) from the phone follows the service provider policy.

The CRT service concept is opposite to the CRBT service concept since the customized ring-back tone presents called party's information to the calling party, while the customized ringing tone presents calling party's information to the called party.

13   Additional services and service features

NOTE – Appendices I and II contain additional services that require further service features.

14   Security consideration

Security aspects are contained in clause 6.

Appendix I

Multimedia conference (MultiCONF)

(This appendix does not form an integral part of this Recommendation)

The multimedia conference service provides a conference-form conversation, which allows multiple users from different places to communicate with each other or together using multiple types of real-time media. This service also offers the means for a user to create, manage, reconfigure and terminate the conference. It also provides the involved users with information about the conference, which consists of a set of rules governing the conference, the set of participants connected to the conference, and the state of their respective conversation.

The multimedia conference uses the following service features:

- Customized announcement
- Customized background music
- Communication hold
- Communication logging
- Click to dial
- Communication waiting
- Destination-associated message type query
- Group communication
- Multi-party communication
- Off-line charging
- On-line charging
- Split charging
- Third party communication control
- Terminating communication screening
- Unsuccessful communication notification
- User identification presentation and restriction
- User profile management

The multimedia conference also allows for capabilities such as conference policy, media mixing, floor control, multiple conference configuration, and conference management, which are not addressed in this Recommendation.

Appendix II

IP Centrex

(This appendix does not form an integral part of this Recommendation)

IP Centrex is not a service in its own right, rather it is a collection of services that are packaged and marketed as IP Centrex.

IP Centrex uses the following service features:

- Customized announcement
- Communication distribution
- Communication forwarding
- Communication hold
- Communication logging
- Customized ringing
- Customized routing
- Communication transfer
- Communication waiting
- Follow-me diversion
- Group communication
- Multi-party communication
- Message waiting
- Originating communication screening
- Off-line charging
- On-line charging
- Personal identifier
- Ring pattern
- Terminating communication screening
- User identification presentation and restriction
- User profile management

IP Centrex also allows for capabilities such as closed user groups, session management, private numbering plan, and automated console, which are not addressed in this Recommendation.

Appendix III

Mappings between IMS-based real-time conversational multimedia services and service features

(This appendix does not form an integral part of this Recommendation)

This appendix describes the relationship between service features in clause 8 and services in clauses 9 through 12, and in Appendices I and II.

Table III.1 describes the service features associated to each service. The row headings contain the service features defined in clause 8. The column headings contain the services described in clauses 9 through 12, and in Appendices I and II.

Character "C" indicates that the particular service feature is fundamental to the service, i.e., a core feature.

Character "O" indicates that the service feature can be regarded as an optional enhancement to the service.

**Table III.1 – Mapping between IMS-based real-time conversational
multimedia services and service features**

Service features	PSTN/ISDN simulation services																UPT	CRBT	CRT	MultiCONF	IP Centrex
	OIP	OIR	TIP	TIR	MCID	ACR	CDIV	HOLD	CB	CCBS	CW	MWI	CONF	AOC	ECT	RC					
Authorization code (AC)																	O				
Automatic communication back (ACB)										C											
Customized announcement (CA)						O	O	O	O		O	O		O			O	C		O	O
Customized background music (CBM)																				O	
Communication distribution (CDIST)																					O
Communication forwarding (CF)							C														C
Communication hold (HOLD)								C					O							C	C
Communication logging (CL)	O	O	O	O	C	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Customized routing (CR)							O										C				O
Customized ringing (CRG)																	O		C		C

Table III.1 – Mapping between IMS-based real-time conversational multimedia services and service features

Service features	PSTN/ISDN simulation services																UPT	CRBT	CRT	MultiCONF	IP Centrex
	OIP	OIR	TIP	TIR	MCID	ACR	CDIV	HOLD	CB	CCBS	CW	MWI	CONF	AOC	ECT	RC					
Communication transfer (CT)															C						C
Click-to-dial (CTD)																				O	
Communication waiting (CW)											C									O	C
Destination-associated message type query (DMTQ)												O					O				O
Follow-me diversion (FMD)																	C				O
Group communication (GC)													C							C	
Multi-party communication (MPC)													C							C	C
Message waiting (MW)												C									O
Originating communication screening (OCS)									C												C
Off-line charging (OFLC)														O		C				C	C

Table III.1 – Mapping between IMS-based real-time conversational multimedia services and service features

Service features	PSTN/ISDN simulation services																UPT	CRBT	CRT	MultiCONF	IP Centrex
	OIP	OIR	TIP	TIR	MCID	ACR	CDIV	HOLD	CB	CCBS	CW	MWI	CONF	AOC	ECT	RC					
On-line charging (ONLC)														C		O				C	C
Personal identifier (PI)																	C	O			O
Reverse charging (REVC)																C					
Ring pattern (RP)																	C				C
Split charging (SC)																	C		C		
Terminating communication screening (TCS)						C			C								O	O		C	C
Third party communication control (3PCC)																				O	
Unsuccessful communication notification (UCN)																	O			O	
User identification presentation and restriction (UIPR)	C	C	C	C													O	C	C	C	C
User profile management (UPM)							O		O				O				C		O	C	C

Appendix IV

Implementation scenarios for IMS-based real-time conversational multimedia services

(This appendix does not form an integral part of this Recommendation)

This appendix describes possible scenarios, including information flows, for implementation of some service features for IMS-based real-time conversational multimedia services. The implementation scenarios and information flows are only examples of how these features could be implemented, and are not normative.

IV.1   Customized announcement

There are two scenarios for customized announcement, the announcement and the customized ring-back tone.

The first scenario, which is the announcement, includes the following steps:

1)   User A initiates a request to the application/service support function and sets up a connection with the AS-FE. A specific service is triggered by the request.

2)   The application/service support function AS-FE discovers that user A has an announcement feature involved in the service, and then sends the announcement request. Then the AS-FE sets up a session to connect to MRC-FE, including an identification of the announcement multimedia clip to be played, and associates this session with the previous session initiated by the user.

3)   The MRC-FE passes the identification of the announcement to the MRP-FE and allocates MRP-FE media resources that are needed for playing the announcement multimedia clip to user A.

4)   The connection and the media channel are set up between user terminal A and the MRP-FE under control of the application/service support function.

5)   The MRP-FE plays the announcement to user A.
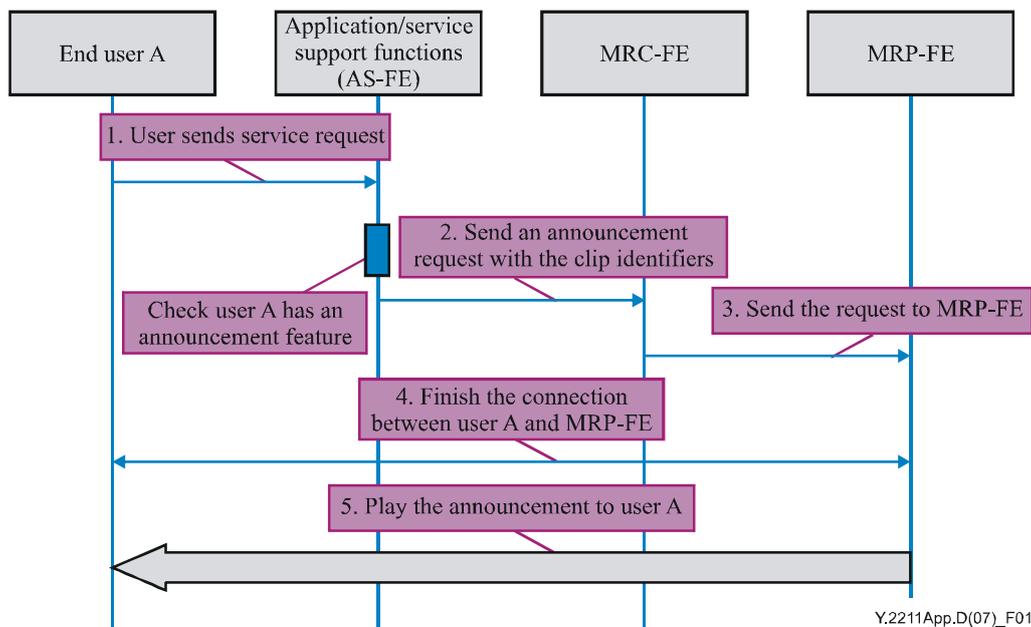
Figure IV.1 – Customized announcement

The second scenario is customized ring-back tone. The calling party hears the distinctive ring-back tone set by the called party.

In this scenario, the information of ring-back tone can be set on the user equipment. The user subscribes to a specific service with the customized announcement feature which stores the user's identification information. When the user is called, the service is triggered and sends a request to the user equipment about the information of ring-back tone. The user equipment generates the indication of ring back-tone according to the user's configuration and sends it back to the service. The service directs the media resource function to play the distinctive ring-back tone to the calling party according to the indication. The detailed steps are as follows:

1) The AS-FE receives a communication request from user A, discovers user B's subscription of customized ring-back tone and the specific service is triggered.

2) The AS-FE checks the called party subscription, and sends a request to user B to get an indication of the customized ring-back tone.

3) The equipment of user B returns this information according to user B's configuration.

4) The AS-FE gets the information of ring-back tone media and notifies the MRC-FE/MRP-FE to play the customized ring-back tone for the calling party user A.

5) The MRC-FE/MRP-FE prepares media resources and returns response to the AS-FE.

6) The AS-FE forwards response to user A, and user A starts listening to the ring-back tone indicated by user B.

7) User B answers the communication.

8) The AS-FE sends to the MRC-FE/MRP-FE a notify indicating disconnect from the calling party.

9) The MRC-FE/MRP-FE replies to the AS-FE.

10-12) The AS-FE continues the normal communication process.
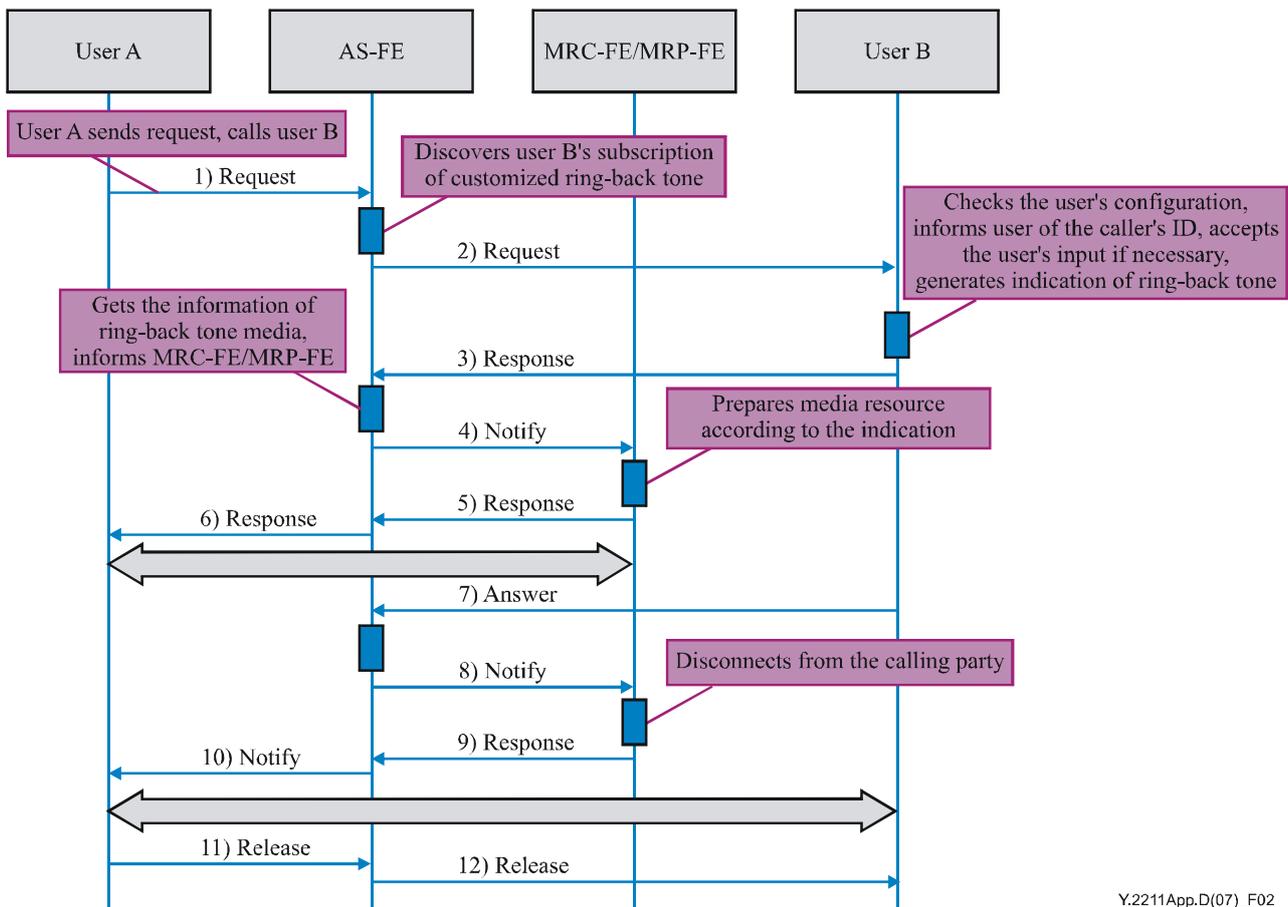
Figure IV.2 – Customized ring-back tone

IV.2 Group communication

This clause describes a possible scenario for information flows associated with the use of the group communication feature. User A would like to inform his colleagues (user B1, user B2) of the agenda of an important meeting. He initiates a group communication to his colleagues instead of initiating multiple one-to-one communication. During the group communication conversation, User B1 wishes to invite user Bn to join the current conversion:

1) User A initiates a group communication to users B1 and B2.

2) The destination users are informed that this is a group communication request from user A to users B1 and B2.

3) The destination users accept the communication and send a response to the AS-FE.

4) User A receives the response from the destination users indicating that the request is accepted, the group starts the conversation.

5) User B1 wants to invite Bn to join the current conversation, and sends a request to the AS-FE.

6) The AS-FE checks the user B1's rights and the information of user Bn, and then sends an invitation to user Bn.

7) User Bn accepts the invitation and sends a response to the AS-FE.

8) The AS-FE forwards the response to user B1.

9) The AS-FE notifies user A and user B2 that user Bn has joined in the current conversation.

10) User A ends the communication.
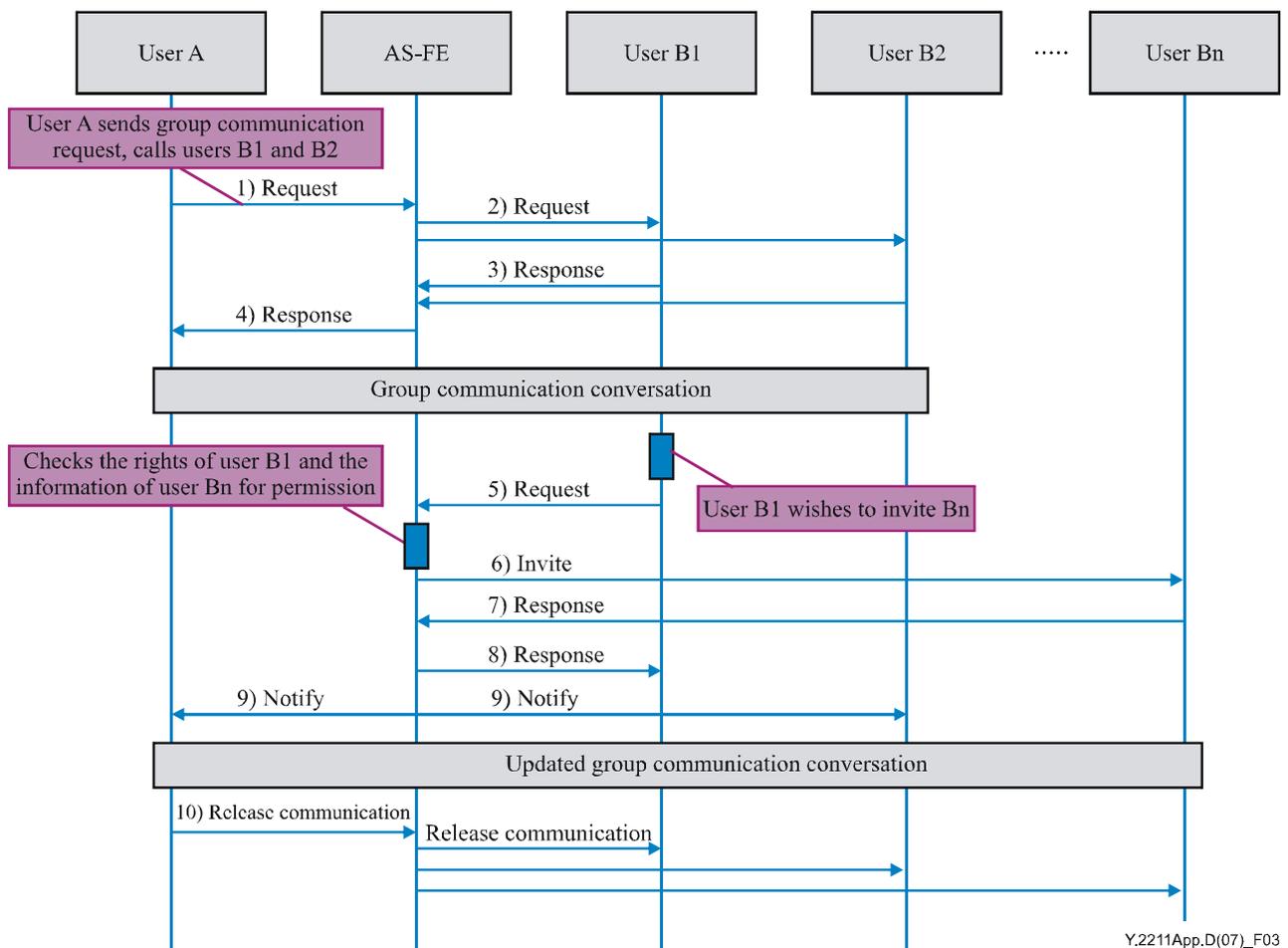
Figure IV.3 – Group communication

IV.3 Customized routing

The customized routing feature allows services to support policy-based routing. For example, routing may be based on presence information or on time.

The first scenario is about routing based on presence information:

– A personal identifier is assigned to a user.

– The user's status is synchronized between the presence service server and the customized routing server.

– When this personal identifier is called, the customized routing server routes the communication according to the user's status.

The information flow includes the following steps:

1) The presence server notifies user B's status to the customized routing server.

2-3) The personal identifier of user B (according to B's status) is called and communication is requested to the customized routing server.

4) The customized routing server routes the communication to the appropriate terminal according to user B's status.
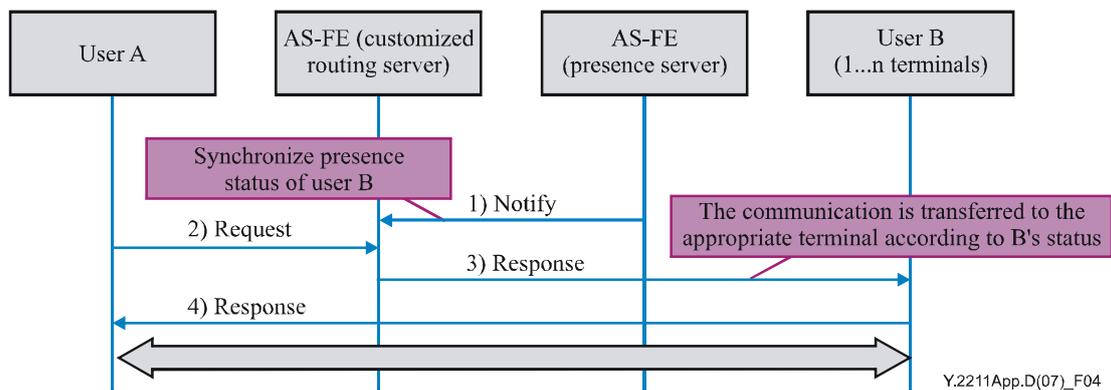
Figure IV.4 – Customized routing based on presence information

The second scenario is about routing based on time:

1) At 11 a.m., a communication request for the subscriber arrives at the destination S-CSC-FE.

2) S-CSC-FE proxies the communication request to the AS-FE.

3) The AS-FE checks the subscriber's customized routing table and finds a currently optimal number which is pointed to the subscriber's office phone.

4-5) The AS-FE tries to connect the subscriber via the office phone number.

6) At 7 p.m., another communication request for the subscriber arrives at the destination S-CSC-FE.

7) S-CSC-FE proxies the communication request to the AS-FE.

8) The AS-FE checks the subscriber's customized routing table and finds a currently optimal number which is pointed to the subscriber's mobile phone.

9-10) The AS-FE tries to connect the subscriber via the mobile phone number.
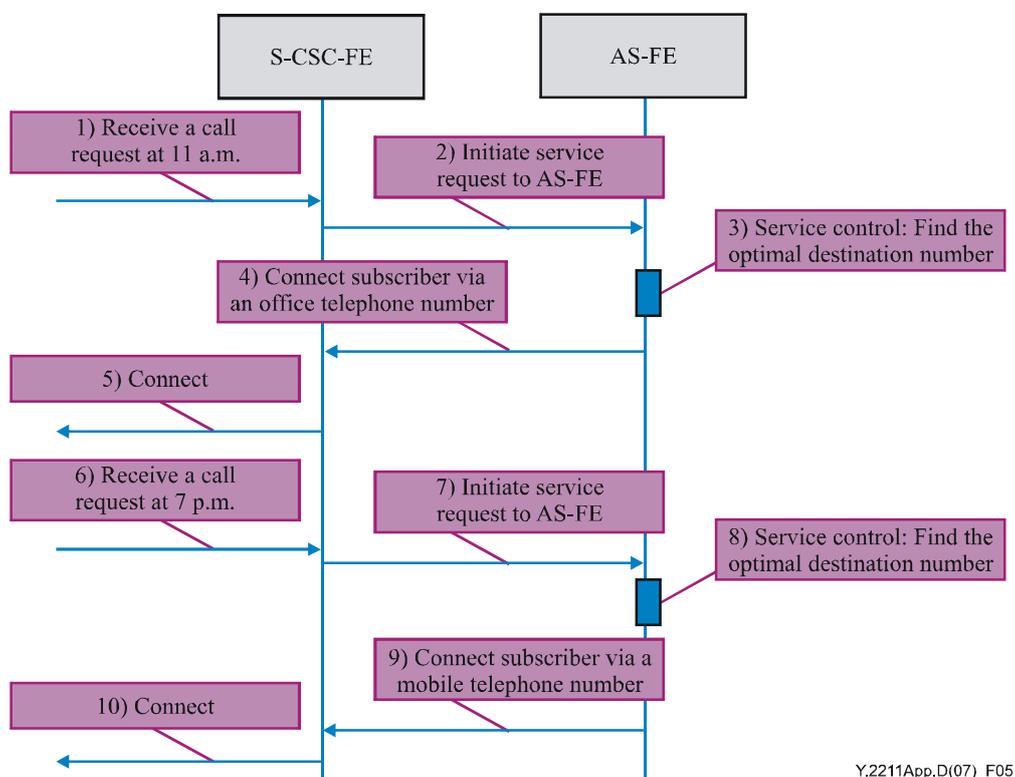
Figure IV.5 – Customized rating based on time

It is assumed that the subscriber prefers using an office telephone from 9 a.m. to 5 p.m., while using a mobile telephone at remaining time.

IV.4 Click-to-dial

The information flows of the click-to-dial (CTD) feature include the following steps:

1) User A has subscribed to a CTD-based service and wants to initiate a communication between user B and user C.

2) User A clicks the button on the web page associated to a client of the CTD-based service.

3) The client of the CTD-based service sends the communication request to the CTD server.

4) The CTD server then initiates a communication between user B and user C.

5) The CTD server continuously updates the CTD-based client so that User A knows the status of the communication.

6) The communication is terminated and the CTD server informs user A about the termination.

IV.5 User profile management

There are various ways to manage a user profile. Two examples are provided below.

If a web portal is used to manage the profile, when user profile change requests are received by the portal, the corresponding web pages are sent back to the user profile management AS. The related AS database is updated accordingly.

If a user profile change request is initiated by a UE (e.g., user phone), the steps are as follows:

1) The UE initializes the user profile change request.

2) The specific media resources are requested to the MRC-FE/MRP-FE by the AS-FE, according to the user's request.

3) The MRC-FE/MRP-FE plays the media to the UE under control of the AS- FE.

4) The user profile update information by the UE is sent to the AS-FE after the interaction between the user and the MRC-FE/MRP-FE is finished.

5) The AS-FE validates the user profile update information.

6) The AS-FE updates the related database and requests the MRC-FE/MRP-FE to notify the UE about success (or failure) of the update.

IV.6 Customized background music

The customized background music feature allows the playing of a background music during a communication, e.g., music. The network activates the customized background music feature for a specific service according to predefined service triggers when a communication is received by the network. A customized background music server, which stores and plays background music, exists on the network side. The network sets up a three-way exchange among the calling party, the called party and the customized background music server. The steps are as follows:

1) The calling party (user A) sends a communication request to the called party (user B). According to some service-specific criteria, e.g., the specific service number, the request is routed to the AS-FE (customized background music server), which identifies the corresponding background music information.

2) The AS-FE routes the communication request to User B.

3) User B sends a response.

4) The AS-FE notifies the MRC-FE/MRP-FE about the background music information identified in step 1.

5-6) The MRC-FE/MRP-FE receives the notification, prepares the customized background music according to the media indication and sends a response. The three way exchange among the calling party, the called party and the MRC-FE/MRP-FE is now established.

7-8) The AS-FE monitors the calling party during the communication, and if the calling party sends any change request (e.g., change the background music, change its volume), the AS-FE notifies the MRC-FE/MRP-FE to adapt correspondingly.

9-10) The MRC-FE/MRP-FE responds with the media resource according to the indication.
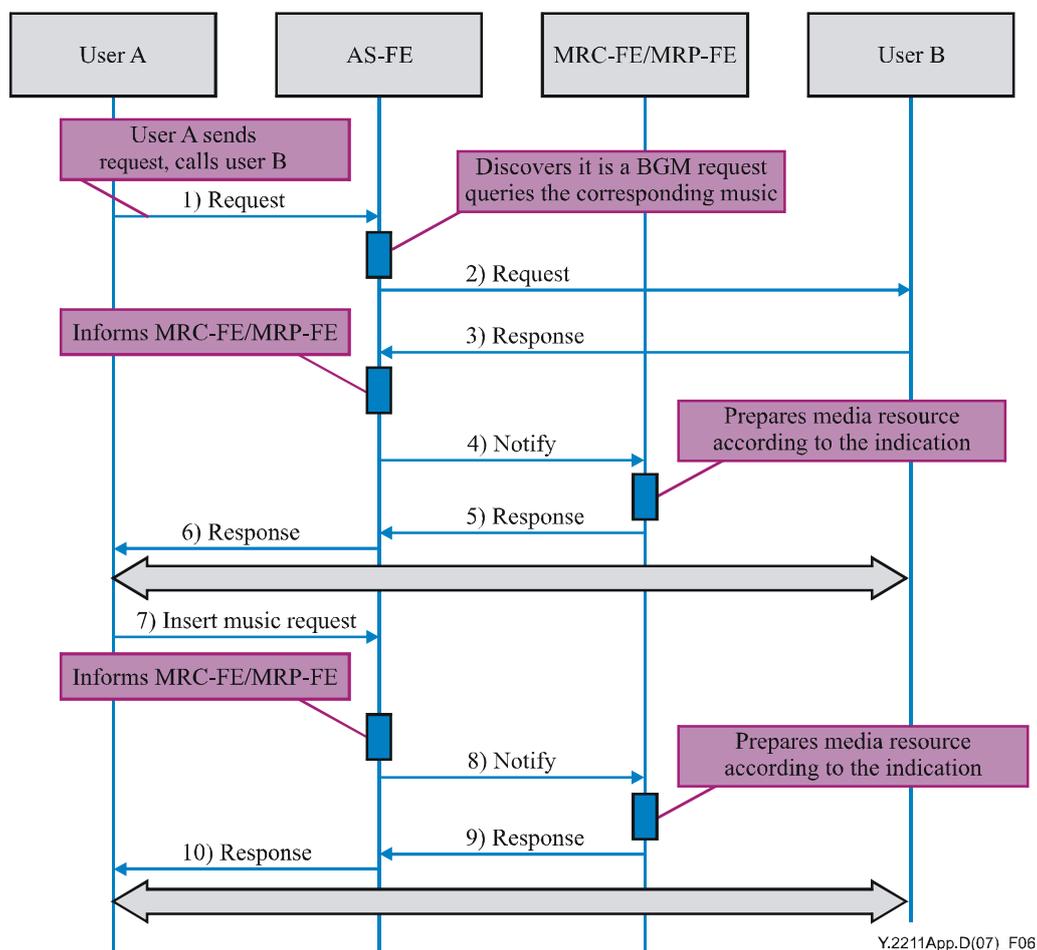
Figure IV.6 – Customized background music

IV.7 Ring pattern

The ring pattern feature supports various types of ring patterns, i.e., parallel ring, sequential ring, combination ring of the previous two.

The first example scenario is about parallel ring:

1) A subscriber is called via the personal identifier, so that the originating S-CSC-FE initiates a service request to the AS-FE. The AS-FE checks whether the called party is a legal subscriber. After authentication, the AS-FE gets subscriber-related information such as destination numbers and parallel ring pattern.

2) The AS-FE tries to connect the user and sends a ring-back tone to the calling party.

3) The AS-FE splits the communication into three simultaneous communication to the three bound destination numbers.

4) It is assumed that the user answers the communication with a certain terminal. The terminating S-CSC-FE sends a response to the AS-FE.

5) The AS-FE asks the originating S-CSC-FE to update the communication.

6) The AS-FE disconnects the other calls. The calling and called parties begin the conversation.
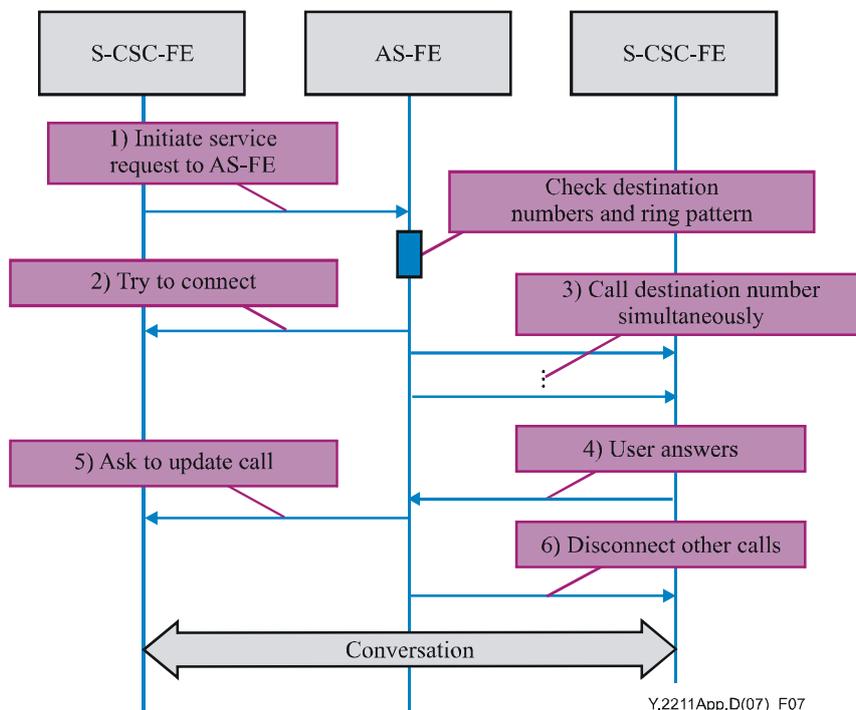
Figure IV.7 – Parallel ring pattern

It is assumed that the subscriber binds his personal identifier with three destination numbers of different user terminals.

The second scenario is about sequential ring:

1) A subscriber is called via the personal identifier, so that the originating S-CSC-FE initiates a service request to the AS-FE. The AS-FE checks whether the called party is a legal subscriber. After authentication, the AS-FE gets subscriber-related information such as destination numbers and sequential ring pattern.

2) The AS-FE tries to connect the user and sends a ring-back tone to the calling party.

3) The AS-FE sequentially calls the three destination numbers.

4) It is assumed that the subscriber answers the communication with a certain terminal. The terminating S-CSC-FE sends a response to AS-FE.

5) The AS-FE asks the originating S-CSC-FE to update the communication, then the AS-FE stops attempting to connect the remaining destination numbers. The calling and called parties begin a conversation.
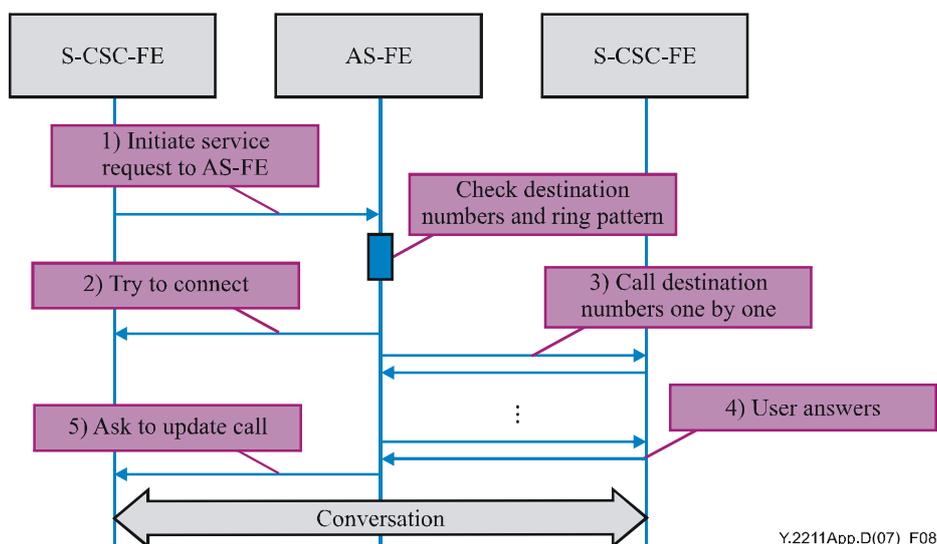
Figure IV.8 – Sequential ring pattern

It is assumed that the subscriber binds his personal identifier with three destination numbers of different user terminals.

IV.8 Personal identifier

The scenario is as follows:

1) A subscriber is called via the personal identifier, so that the originating S-CSC-FE initiates a service request to the AS-FE. The AS-FE checks whether the called party is a legal subscriber. After authentication, the AS-FE gets subscriber-related information such as destination numbers and ring pattern, and selects an appropriate destination number according to the subscriber's configuration through personal identifier.

2) The AS-FE selects a destination number and initiates a call to it.

3) The subscriber-related information includes a customized ring-back tone. The AS-FE selects the appropriate media resource according to the detailed information of the calling/called party, the location of media resource and the ring-back tone information set by the subscriber, then requests the MRC-FE/MRP-FE to allocate specific media resources.

4) The AS-FE connects the user and sends the customized ring-back tone to the calling party.

5) It is assumed that the user answers with a certain terminal. The terminating S-CSC-FE sends a response to the AS-FE.

6) The AS-FE asks the originating S-CSC-FE to update the communication.

7) The AS-FE disconnects other calls. The calling and called parties begin a conversation.
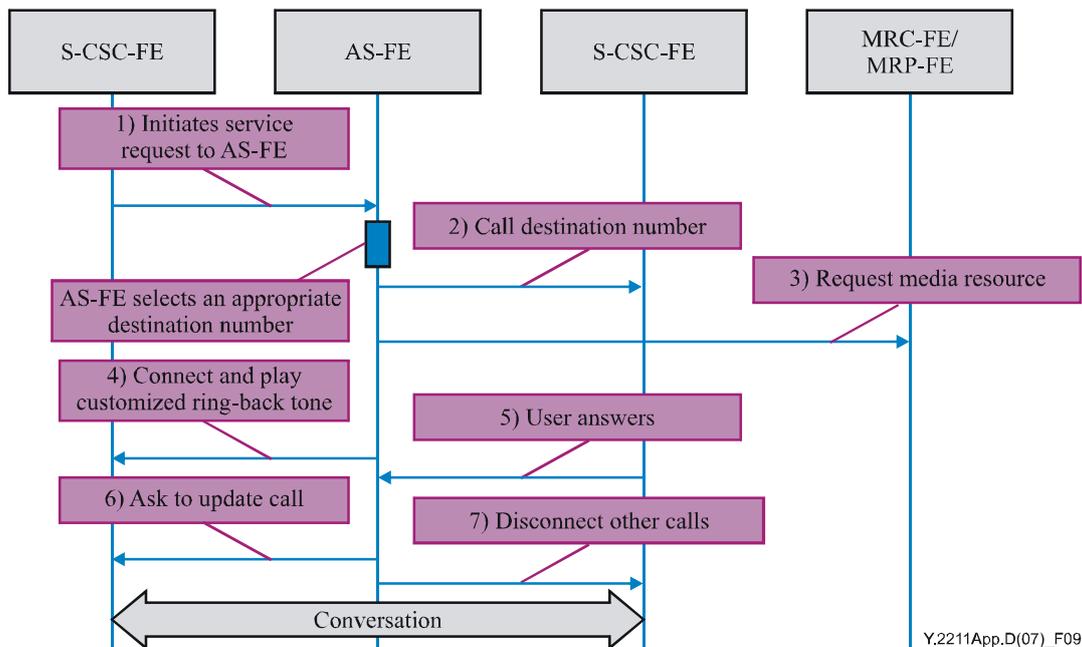
Figure IV.9 – Personal identifier

IV.9   Unsuccessful communication notification

1)   A communication request addressed to the subscriber is received at the S-CSC-FE.

2)   The S-CSC-FE proxies the communication request to the AS-FE.

3)   The AS-FE tries to connect the calling party.

4)   The AS-FE does not receive any reply.

5)   The AS-FE checks whether the called party has subscribed to the "unsuccessful communication notification" feature and determines the notification pattern.

6-7)   The AS-FE releases the communication with the calling party.

8-9)   The AS-FE sends a notification of unsuccessful communication to the called party according to the notification pattern (e.g., via SMS).
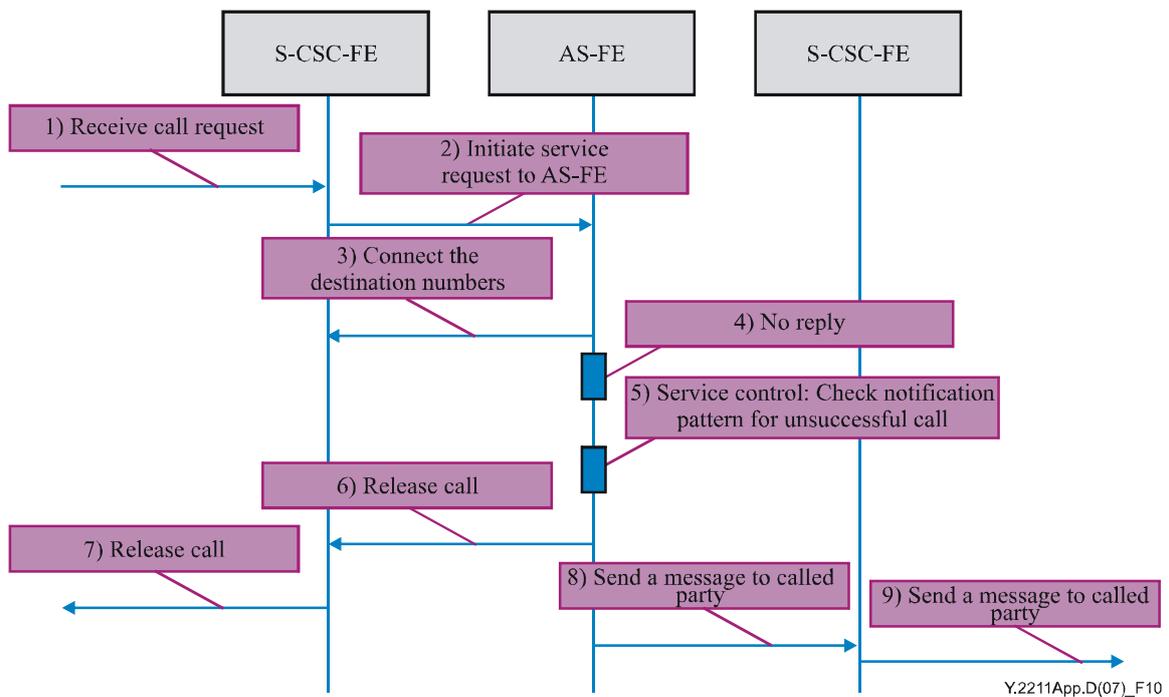
Figure IV.10 – Unsuccessful communication notification

It is assumed that the subscriber of a specific service is provided with a notification feature for unsuccessful communication addressed to himself.

IV.10 Originating communication screening

1) A communication request addressed to the subscriber arrives at the terminating S-CSC-FE.

2) The S-CSC-FE proxies the communication request to the AS-FE.

3) The AS-FE checks the validity of the destination number and finds it is a special number used by an emergency service.

4-5) The AS-FE cancels the communication.

6) The AS-FE requests the subscriber to change his destination number by a notification message or other means.
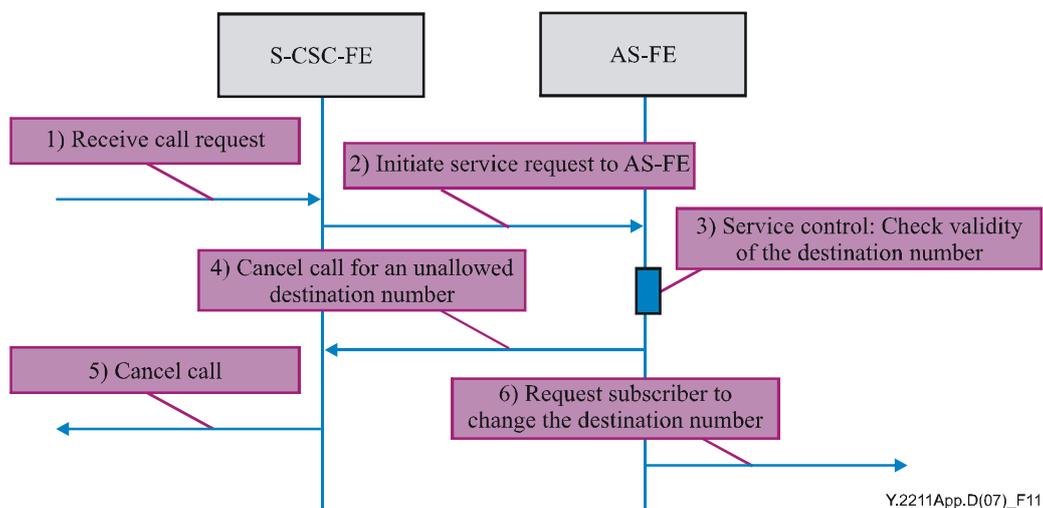
Figure IV.11 – Originating communication screening

It is assumed that, by mistake, the subscriber binds his number with a special destination number, for example an emergency service number, which is not allowed to be set as a destination number.

IV.11   Terminating communication screening

1)   A communication request from user A arrives at the terminating S-CSC-FE.

2)   The S-CSC-FE proxies the communication request to the AS-FE.

3)   The AS-FE checks the subscriber's screening list and finds that incoming communication from user A is restricted.

4-5)   The AS-FE cancels the communication.
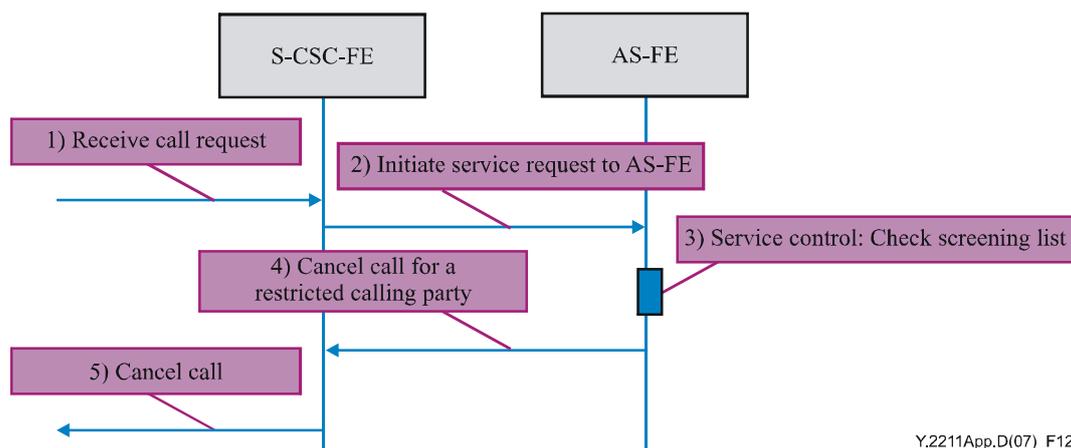
Figure IV.12 – Terminating communication screening

It is assumed that user A initiates a communication to the subscriber. As user A is in the screening list of the subscriber, the communication is cancelled.

IV.12   Destination-associated message type query

This service feature allows the user to pre-define possible message types, with this information being accessible by other users. The sender sends a message whose destination address is a personal identifier to a unified message centre. The unified message centre queries through personal identifier to obtain the destination terminal address and the associated message types. The unified message centre transforms the message if the message type is different from the pre-defined message type and stores it in the unified message storage. The unified message centre sends the message to the destination.

The steps are as follows:

1)   A sender sends a message to a subscriber using a personal identifier. The message is sent to the unified message centre.

2-4)   The message centre triggers the service and queries the related AS-FE through personal identifier to obtain the destination terminal address and the associated pre-defined message types. Then the AS-FE obtains the destination address and message types and returns them to the message centre.

5)   The message centre transforms the message if the message type is different from the pre-defined message types, and stores it in the unified message storage.

6)   The message centre sends the message to the destination.
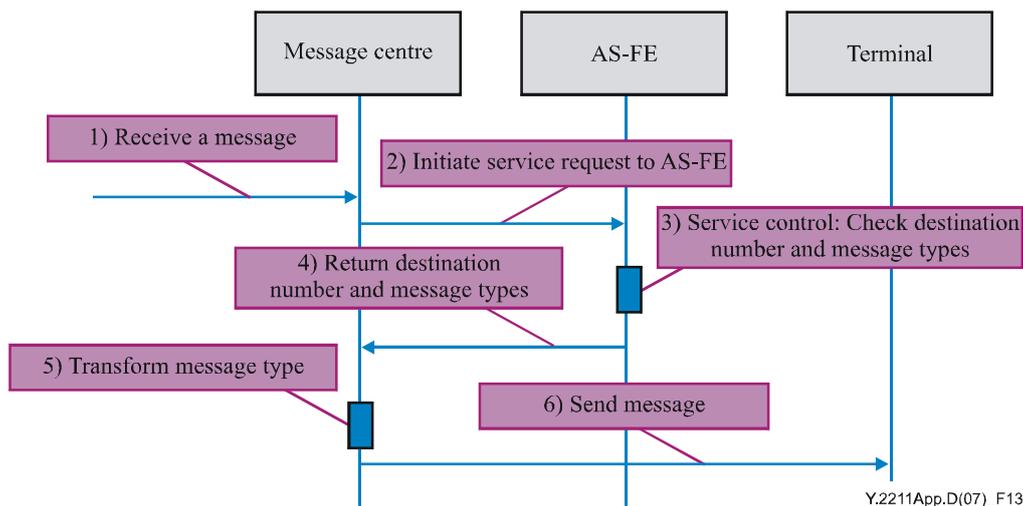
Figure IV.13 – Destination-associated message type query

IV.13 Customized ringing

This service feature allows that the customized ringing tone contents pre-selected by the subscriber (user A) are played to the called party (user B) during the ringing period of the communication from user A to user B.

The customized ringing tone contents may be audio, video, text, etc., and may also be retrieved via a web URL. The following scenario is about playing of network-based (MRC-FE/MRP-FE) customized ringing tone contents to the called party. The detailed steps are as follows:

1) The AS-FE receives a communication request from user A who has subscribed to the customized ringing tone service. The service is triggered from the originating S-CSC-FE to the AS-FE (not shown here).

2) The AS-FE checks the service subscription of the calling party and sends a request to user B.

3) User B retrieves the indicated web URL of customized ringing tone contents and sends a response. The AS-FE knows if user B's terminal is in an idle state based on the response.

4) The response is relayed to user A.

5) The AS-FE notifies the MRC-FE/MRP-FE to play the customized ringing tone contents for the called party (user B).

6) The MRC-FE/MRP-FE responds to the AS-FE and plays the customized ringing tone contents.

7) User B answers.

8) The AS-FE notifies the MRC-FE/MRP-FE for disconnection from the called party and stop of streaming.

9) The MRC-FE/MRP-FE replies to the AS-FE.

10-12) The AS-FE continues the normal communication process.

User A — AS-FE — MRC-FE/MRP-FE — User B

User A sends request, calls user B

1) Request

Discovers user A's subscription to CRT

Gets the information of CRT media, informs MRC-FE/MRP-FE

2) Request

May retrieve the indicated URL of CRT contents

3) Response

4) response

5) Notify

Prepares media resource according to the indication

6) Response

Customized ringing tone play

Informs MRC-FE/MRP-FE

7) Answer

8) Notify

Disconnects from called party

9) Response

10) Response

Normal call connection

11) Release

12) Release

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Figure IV.14 – Customized ringing

Appendix V

Table of service interactions between pairs of PSTN/ISDN simulation services

(This appendix does not form an integral part of this Recommendation)

Table V.1 summarizes the service interactions between pairs of PSTN/ISDN simulation services, as identified in clause 9.

Each case in the table represents a scenario where services on the horizontal row heading are invoked when services on the vertical column heading are already active.

The case is filled with one of three possible options:

- character "Y" indicates interaction has been identified between the corresponding services and described in this Recommendation,
- character "N" indicates no interaction has been identified,
- grey colour filling is for scenarios which are not applicable.

Table V.1 – Identified service interactions between pairs of PSTN/ISDN simulation services

	OIP	OIR	TIP	TIR	MCID	ACR	CFU	CFB	CFNR	CFNL	CD	CFNRc	CDIVN	CW	HOLD	CB	CCBS	MWI	CONF	AOC	ECT	RC
Originating identification presentation (OIP)		Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Originating identification restriction (OIR)	N		N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	N
Terminating identification presentation (TIP)	N	N		Y	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
Terminating identification restriction (TIR)	N	N	Y		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Malicious communication identification (MCID)	N	N	N	N		N	N	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N
Anonymous communication rejection (ACR)	Y	Y	N	N	N		Y	Y	Y	Y	N	Y	N	N	N	N	Y	N	N	N	N	N
Communication forwarding unconditional (CFU)	Y	Y	Y	Y	N	Y		Y	Y	Y	Y	Y	N	N	N	Y	Y	N	N	Y	N	N
Communication forwarding busy (CFB)	Y	Y	Y	Y	N	Y	Y		N	N	Y	Y	N	see 9.14.1	N	Y	Y	N	N	Y	N	N
Communication forwarding no reply (CFNR)	Y	Y	Y	Y	Y	Y	Y	N		N	N	N	N	Y	N	Y	Y	N	N	Y	N	N
Communication forwarding on not logged in (CFNL)	Y	Y	Y	Y	N	Y	Y	N	N		N	N	N	N	N	Y	Y	N	N	Y	N	N

Table V.1 – Identified service interactions between pairs of PSTN/ISDN simulation services

	OIP	OIR	TIP	TIR	MCID	ACR	CFU	CFB	CFNR	CFNL	CD	CFNRc	CDIVN	CW	HOLD	CB	CCBS	MWI	CONF	AOC	ECT	RC
Communication deflection (CD)	Y	Y	Y	Y	Y	Y	Y	Y	N	N		N	N	Y	N	Y	Y	N	N	Y	N	N
Communication forwarding on subscriber not reachable (CFNRc)	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N		N	Y	N	Y	Y	N	N	N	N	N
Communication diversion notification (CDIVN)	Y	Y	N	N	N	N	N	N	N	N	N	N		N	N	N	N	N	N	N	N	N
Communication waiting (CW)	N	N	N	N	N	Y	N	see 9.14.1	Y	N	Y	Y	N		N	N	Y	N	N	N	N	N
Communication hold (HOLD)	N	N	N	N	N	N	N	N	N	N	N	N	N	N		N	N	N	N	N	N	N
Communication barring (CB)	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N		N	N	N	N	N	N
Completion of communication to busy subscriber (CCBS)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y		Y	N	N	Y	N
Message waiting indication (MWI)	N	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N		N	N	N	N
Conference (CONF)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		Y	N	N
Advice of charge (AOC)	N	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y		N	N
Explicit communication transfer (ECT)	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	Y		N
Reverse charging (RC)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	

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