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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements at the interface between AS-FE and S-CSC-FE

ITU-T Q-series Recommendations – Supplement 55

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Supplement 55 to ITU-T Q-series Recommendations

Signalling requirements at the interface between AS-FE and S-CSC-FE

Summary

Supplement 55 to ITU-T Q-series Recommendations describes the general signalling requirements at the interface between AS-FE and S-CSC-FE for session-based services of NGN release 1.

Source

Supplement 55 to ITU-T Q-series Recommendations was agreed on 27 April 2007 by ITU-T Study Group 11 (2005-2008).

Keywords

NGN, Session control, Signalling requirements, SIP Application.

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Signalling requirements at the interface between AS-FE and S-CSC-FE

1 Scope

This Supplement provides signalling interface requirements for session services in NGN release 1 scope. The interface to be specified commonly lies between ASF/SSF (application support function/service support function) and service components in SCF (service control function). In NGN Release 1 stage, the ASF/SSF includes AS-FE, APL-GW-FE, SS-FE and APL-SCM-FE, and the SCF includes S-CSCF for IP multimedia service component and call server for PIEA (PSTN/ISDN emulation architecture) component. The AS-FE is referred to as a representative FE among the other FEs in ASF/SSF.

2 References

[ITU-T H.248.1] ITU-T Recommendation H.248.1 (2002), *Gateway control protocol: version 2*.

[ITU-T Q.1224] ITU-T Recommendation Q.1224 (1997), *Distributed functional plane for intelligent network Capability Set 2.*

[ITU-T Sup.1-Y] ITU-T Y.2000 series Supplement 1 (2006), *NGN release 1 scope.*

[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.2031] ITU-T Recommendation Y.2031 (2006), *PSTN/ISDN emulation architecture*.

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

[ITU-T Y.2211] ITU-T Recommendation Y.2211 (2007), *IMS-based real-time conversational multimedia services over NGN*.

[ETSI TS 123.218] ETSI TS 123 218 (2007), *IP Multimedia (IM) Session Handling; IM Call* Model.

[ETSI TS 123.228] ETSI TS 123 228 (2007), *IP Multimedia Subsystem (IMS)*.

[IETF RFC 3261] IETF RFC 3261 (2002), *SIP: Session Initiation Protocol*.

3 Definitions

This Supplement uses the following terms:

3.1 application support functional entity [ITU-T Y.2012]: It supports generic application server functions including hosting and executing services. The examples of AS-FE are call feature application servers, presence servers, various messaging servers, conferences servers, home application support servers and so on.

NOTE – In this Supplement, the AS-FE represents the functional entities of ASF/SSF because they have functionally the same interface with S-CSC-FE.

3.2 serving call session control functional entity [ITU-T Y.2012]: It handles functionality related to session control of session setup, modification, and teardown, and routing of session messages. It performs the functions of registration, service triggering, determination of routing of

session control messages. The S-CSC-FE maintains a session-related state as needed by the network operator for support of services.

NOTE – In this Supplement, the S-CSC-FE represents the functional entities of SCF including IMS-based and call-server-based service components, because they have functionally the same interface with AS-FE.

3.3 service trigger [ITU-T Q.1290]: A stimulus for initiating an action in support of a service on reception of a message or information.

4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

APL	Application
APL-GW-FE	Application Gateway Functional Entity
APL-SCM-FE	Application Service Coordination Manager Functional Entity
ASF	Application Support Function
AS-FE	Application Support Functional Entity
AS-ILCM	Application Server Incoming Leg Control Model
AS-OLCM	Application Server Outgoing Leg Control Model
B2BUA	Back-to-Back User Agent
BCSM	Basic Call State Model
CCF	Call Control Function
I-CSC-FE	Interrogating Call Session Control Functional Entity
iFC	Initial Filter Criteria
ILCM	Incoming Leg Control Model
ILSM	Incoming Leg State Model
IMS	IP Multimedia Subsystem
OLCM	Outgoing Leg Control Model
OLSM	Outgoing Leg State Model
P-CSC-FE	Proxy Call Session Control Functional Entity
POTS	Plain Old Telephone Service
RF	Routing Function
SCF	Service Control Function
S-CSC-FE	Serving Call Session Control Functional Entity
SIF	Signalling Interworking Function
SIP	Session Initiation Protocol
SIP UA	SIP User Agent
SSF	Service Support Function
SS-FE	Service Switching Functional Entity
UAC	User Agent Client
VAS	Value-Added Services

5 Reference architecture

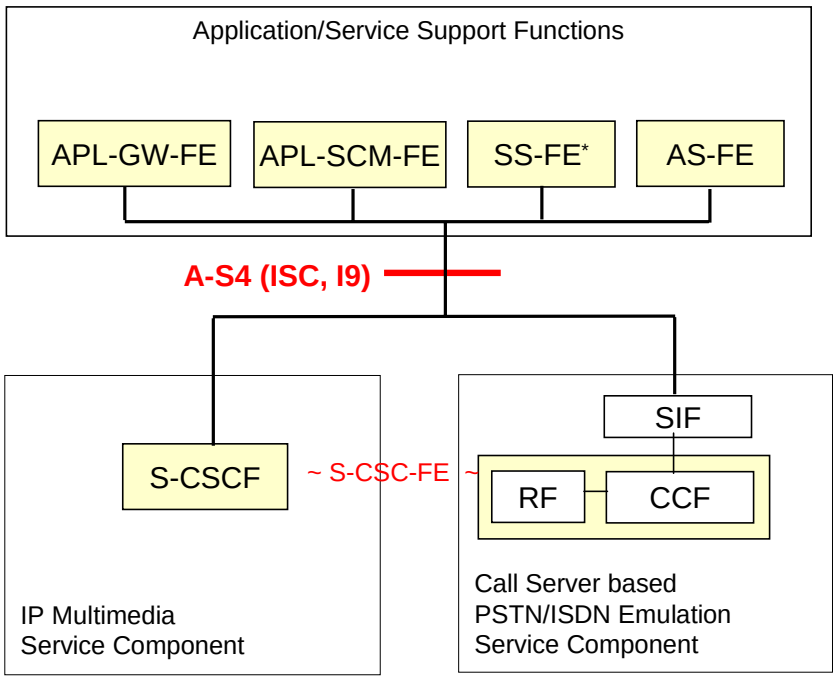
Figure 5-1 depicts a reference architecture for controlling session application services based on the NGN architecture [ITU-T Y.2012]. It highlights the reference point between ASF/SSF and two SCFs which are the IMS service component and the call-server-based PIEA service component.

The interface A-S4 is defined in NGN functional architecture [ITU-T Y.2012] and used to deliver information related to service control, including service triggering and call-control-related information.

The A-S4 interface corresponds to the ISC for the IP multimedia service component [ITU-T Y.2021], and I-9 for the PSTN/ISDN emulation service component [ITU-T Y.2031].

The A-S4, ISC and I-9 are the equivalent interfaces between APL-GW-FE, APL-SCM-FE, SS-FE and AS-FE in ASF/SSF and S-CSCF or SIF, RF and CCF in SCF. The SIF/CCF/RF of PIEA and S-CSCF of IMS correspond to S-CSC-FE [ITU-T Y.2012] and provide the same interface function to the ASF/SSF.

Since the IMS-based PIEA and IMS components have the same architecture from the viewpoint of interface with AS-FE, the service components are divided into IMS-based and call-server-based PIEA service components in Figure 5-1.



* For CS-PES case, SS-FE is located in PIEA [ITU-T Y.2031] component

Figure 5-1 – Reference architecture for session service control

6 General requirements

This clause describes the general requirements for the interface between AS-FE and S-CSC-FE. Justification references for each item are noted within brackets.

1) The interface is required to support multimedia session services including voice, video, text, etc. [ITU-T Sup.1-Y].

2) The interface is required to support QoS control during session set-up [ITU-T Sup.1-Y].

3) The interface is required for the AS-FE to be independent from the details of the network, such as network protocols [ITU-T Y.2201].

4) The interface is required to use SIP protocol for service control [ITU-T Sup.1-Y].

5) The interface is required to process multiple sessions simultaneously and each session should be uniquely identified [ITU-T Y.2201].

6) The interface is required to identify each session endpoint using the session identification mechanism [ITU-T Y.2201].

7) The interface is required for the AS-FE to register the possible service lists to provide, and un-register the lists when it does not provide the services any more [ITU-T Y.2012].

8) The interface is required to support a flexible service trigger mechanism and to exchange call and service control related information [ITU-T Y.2012].

9) The interface is required for AS-FE to provide disconnection reason information to S-CSC-FE in case of call disconnection.

10) The interface is required for AS-FE to connect and control MRC-FE through the S-CSC-FE [ITU-T Y.2012].

11) The interface is required for AS-FE to receive the session event notification such as successful connection, called party busy, network busy, connection fail, off-hook, on-hook, flash hook, or mid-call event from the S-CSC-FE.

12) The interface is required for S-CSC-FE and AS-FE to deal with service interaction problems when multiple services are invoked in AS-FEs simultaneously.

7 Applications

This Supplement specifies the signalling requirements for NGN session-based application services. NGN release 1 scope [ITU-T Sup.1-Y] includes the following session services:

- real-time conversational voice services;
- messaging services, such as IM, SMS, MMS, etc.;
- push-to-talk over NGN (PoN);
- presence and general notification services;
- PSTN/ISDN emulation services;
- PSTN/ISDN simulation services.

[ITU-T Y.2211] specifies IMS-based real-time conversational multimedia service requirements, service features, service architectures and implementation scenarios. It includes a comprehensive set of session-related service features, PSTN/ISDN simulation services, and IP multimedia application services.

The AS-FEs hosting the above services and S-CSC-FE to provide session services should satisfy the signalling requirements specified in this Supplement.

8 S-CSC-FE functional requirements

This clause reuses the functional requirements of IMS [ETSI TS 123.228] unless it is described otherwise.

IMS and call-server-based functional models are presented in separate clauses.

8.1 Functional model

8.1.1 IMS-based functional model

See Figure 8-1.

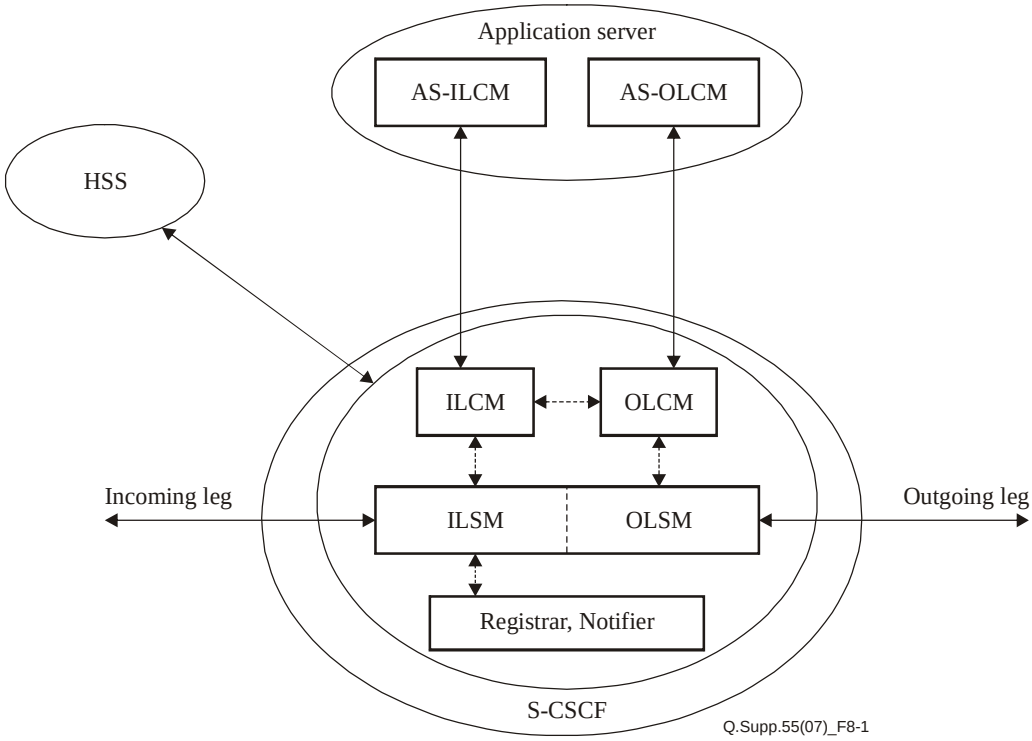


Figure 8-1 – IMS-based functional model of AS and S-CSCF

The S-CSCF includes the combined I/OLSM, the ILCM and OLCM and the registrar and notifier. There is a single combined I/OLSM, which shall be able to store session state information. It may act on each leg independently, acting as a SIP proxy, redirect server or user agent depending on the information received in the SIP request, the filter conditions specified, or the state of the session.

It shall be possible to split the application handling on each leg and treat each endpoint differently.

There is a single ILCM, which shall store transaction state information.

There is a single OLCM, which shall store transaction state information.

The registrar and notifier component handles registration and subscription to, and notification of, registration events [ETSI TS 123.228].

8.1.2 Call-server-based functional model

See Figure 8-2.

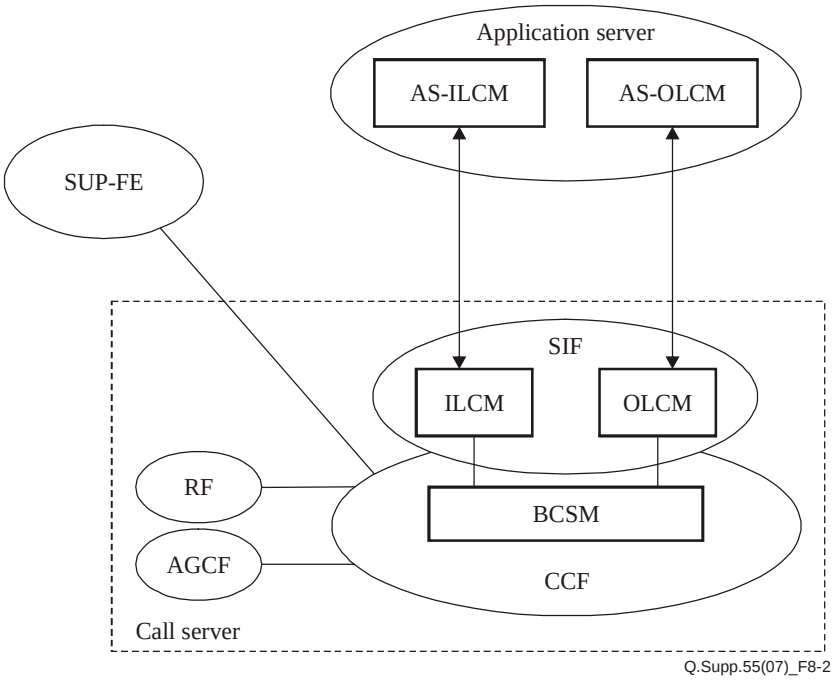


Figure 8-2 – Call-server-based functional model of AS-FE and call server

The CCF includes the BCSM which interworks with the ILCM and OLCM in SIF.

BCSM (basic call state model) [ITU-T Q.1224] handles basic call processing and it shall be able to store call session state information. It acts on each connection independently depending on the information received from the AGCF or on trigger conditions such as service key, calling party number, called party number, etc.

It shall be possible to split the application handling on each connection and treat each endpoint differently.

The signalling interworking function (SIF) providing SIP user agent function includes the ILCM and OLCM which store transaction state information, in order to send/receive SIP messages to/from the SIP application server

The CCF interworks with the routing function (RF) which analyses user characteristics (such as called party number, service profile) and chooses the route to the destination user.

8.2 Registration trigger

Registration trigger is the procedure for S-CSC-FE to authenticate and provide user 3rd-party registration services to application servers.

For IMS, the registration is SIP registration.

When S-CSCF receives REGISTER from a user, it authenticates the user, based on the service profile downloaded from the HSS. If the registration request from the user matches a trigger of the iFCs in the service profile, then S-CSCF performs a third-party registration to the application servers.

The AGCF registers on behalf of each line or group of lines connected to the media gateways it controls, based on the information contained in service change messages received from those media gateways and from local configuration information [ITU-T Y.2031].

For call servers, the registration procedures may be limited: the authentication may not be required in case of static provision.

8.3 Originating call trigger

Call origination trigger is the procedure for S-CSC-FE to admit and provide user connection to the application server when originating a call.

8.4 Terminating call trigger

Call termination trigger is the procedure for S-CSC-FE to admit and provide user connection to the application server when terminating a call.

8.5 Session release trigger

Session release trigger is the procedure for S-CSC-FE to provide user call disconnection through the application server when releasing a call.

In handling session release, the S-CSC-FE may either relay or initiate a release request.

9 AS-FE functional requirements

9.1 Functional model

The AS-FE functional model (see Figure 9-1) is the same with regard to IMS and call-server-based architecture.

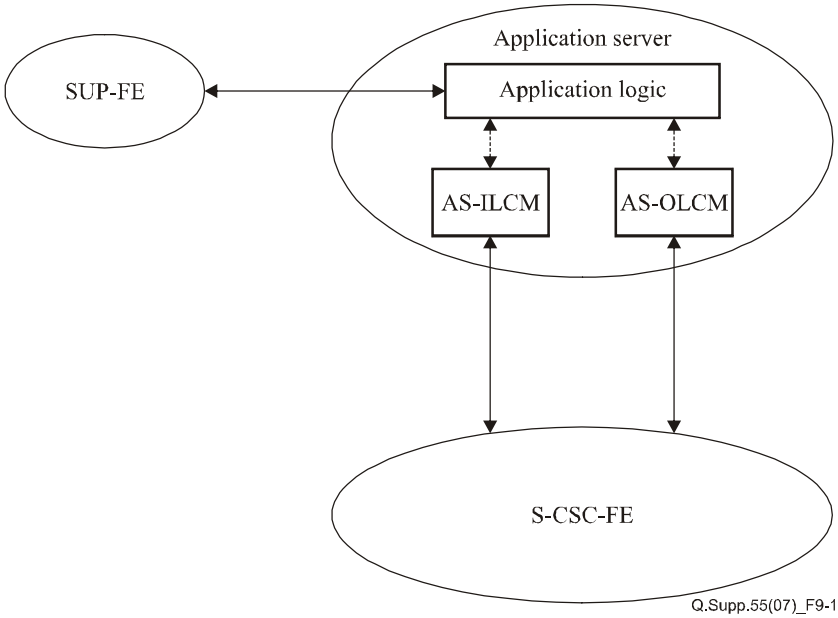


Figure 9-1 – AS-FE functional model

9.2 Interworking modes

The interface between S-CSC-FE and AS-FE is SIP based.

For the IMS case, the S-CSCF proxies the SIP messages to/from AS and the terminal.

For the call-server case, the call server has the termination at the CCF and acts as a SIP user agent to interwork with AS-FE.

There are five modes of operations for interworking between AS-FE and S-CSC-FE:

– AS-FE acting as terminating UA or redirect server;

– AS-FE acting as originating UA;

– AS-FE acting as a SIP proxy;

– AS-FE performing third party call control – routing B2BUA;

– AS-FE performing third party call control – initiating B2BUA.

Figures 9-2 and 9-3 depict application server interworking modes in IMS and call server, respectively.

In the call-server case in Figure 9-3, [ITU-T H.248] is indicated as an example protocol, as the call server has incoming and outgoing connections for POTS subscribers.

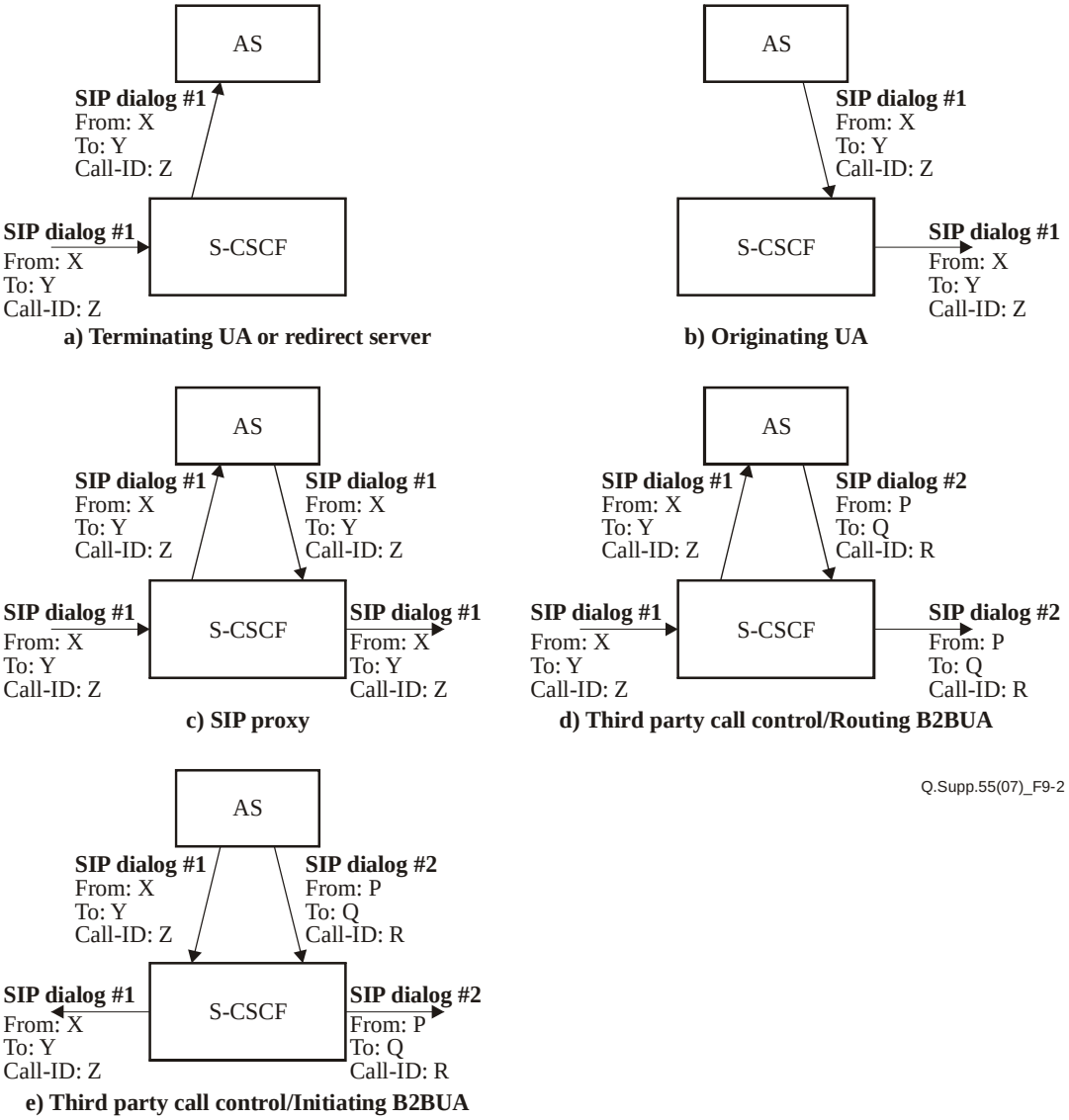


Figure 9-2 – Application server interworking mode (IMS)

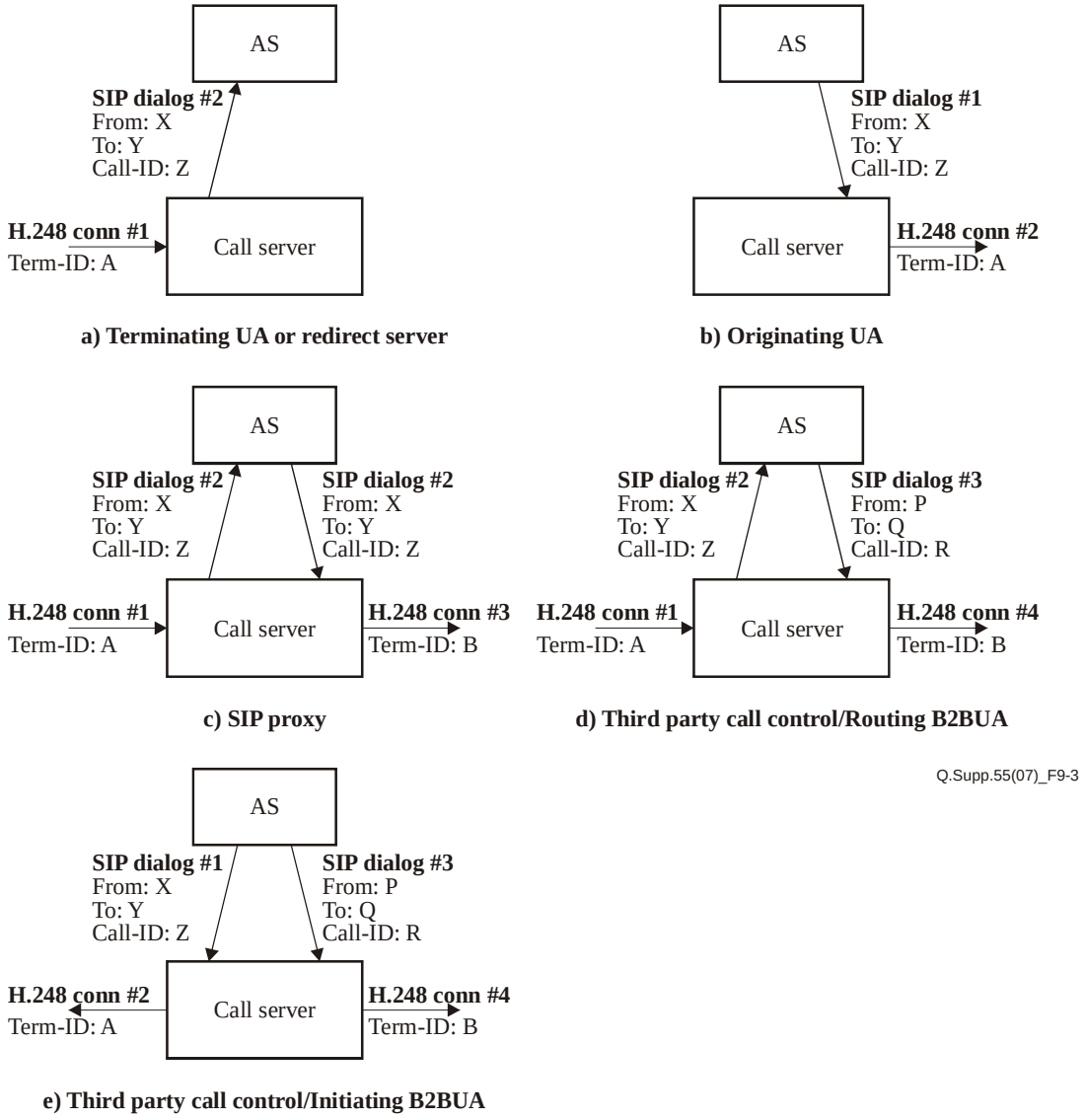


Figure 9-3 – Application server interworking mode (call server)

9.3 Application call processing

AS-FE provides the following procedures with regard to interworking with S-CSC-FE.

The detailed procedures are identical to [ETSI TS 123.228].

– AS-FE handling of call origination;
– AS-FE handling of call termination;
– AS-FE handling of SIP registration;
– AS-FE handling of session release.

10 S-CSC-FE signalling requirements

This clause reuses the signalling requirements of IMS and SIP [ETSI TS 123.218], [ETSI TS 123.228], [IETF RFC 3261].

10.1 3rd party registration

S-CSC-FE requests 3rd party registration to AS-FE when it receives the registration from a user; it performs 3rd party registration trigger after checking the user's filter criteria and deciding if they are met based on the service profile of the user.

In this case, the following information is delivered:

– address of AS-FE;

– address of S-CSC-FE;

– subscriber's public user ID;

– expiration time;

– charging identification.

For call servers, the 3rd party registration procedures may not be provided in case of static provision.

10.2 Service request

S-CSC-FE requests service to AS-FE when the following messages arrive based on the filter criteria of the user profile:

– call origination;

– call termination;

– 3rd party registration;

– event notification;

– message delivery.

When it triggers to AS-FE, the following information needs to be set:

– origination or termination indication;

– service key (service name);

– address of the AS-FE;

– dialog-id for identification of each SIP message in case of multiple trigger;

– event package name and values;

– charging identification to correlate each dialogue in a call.

11 AS-FE signalling requirements

In the AS-FE point of view, there is little difference when it is interworking with S-CSCF (IMS) and call server (PIEA).

As a UA, AS-FE does not register to S-CSC-FE and it is assumed that they know each other.

11.1 Terminating UA

This is the operation mode where the AS-FE acts as a terminating user agent as described in clause 9.2.

When AS-FE is acting as a terminating UA, if AS-FE generates a subsequent request that is different with the dialogue, then AS-FE should copy a charging identification from the INVITE and insert into the subsequent request INVITE.

11.2 Originating UA

This is the operation mode where the AS-FE acts as an originating user agent as described in clause 9.2.

When AS-FE acts as an originating UA, it generates an initial request for a dialogue and should insert charging identification information in the initial INVITE.

AS-FE may retrieve the S-CSC-FE address from the SUP-FE or obtain it from the static configuration.

AS-FE may indicate that S-CSC-FE do or do not allow some subsequent actions such as no-fork or no-trigger within a message.

11.3 Redirect server

This is the operation mode where the AS-FE acts as a redirect server as described in clause 9.2.

When AS-FE acts as a redirect server, it should send any received message to the S-CSC-FE.

Other requirements are the same as in clause 11.1.

11.4 Proxy

This is the operation mode where the AS-FE acts as a proxy as described in clause 9.2.

When AS-FE acts in proxy mode, it routes the received message according to the SIP proxy rule in [IETF RFC 3261].

AS-FE may modify the SIP requests based on service logic, prior to forwarding the request back to the S-CSC-FE.

An AS-FE acting as a SIP proxy shall send any received message body in the forwarded message.

11.5 3rd party call control

This is the operation mode where the AS-FE acts as a 3rd party call control as described in clause 9.2.

AS-FE performing 3rd party call control acts as a B2BUA. There are two kinds of 3rd party call control [ETSI TS 123.218]:

– Routing B2BUA: An AS-FE receives a request from the S-CSC-FE, terminates it and generates a new request, which is based on the received request.

– Initiating B2BUA: An AS-FE initiates two requests, which are logically connected together at the AS-FE, or an AS-FE receives a request from the S-CSC-FE and initiates a new request that is logically connected but unrelated to the incoming request from the originating user.

The B2BUA AS-FE will internally map the message headers between the two dialogs that it manages. It is responsible for correlating the dialog identifiers.

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