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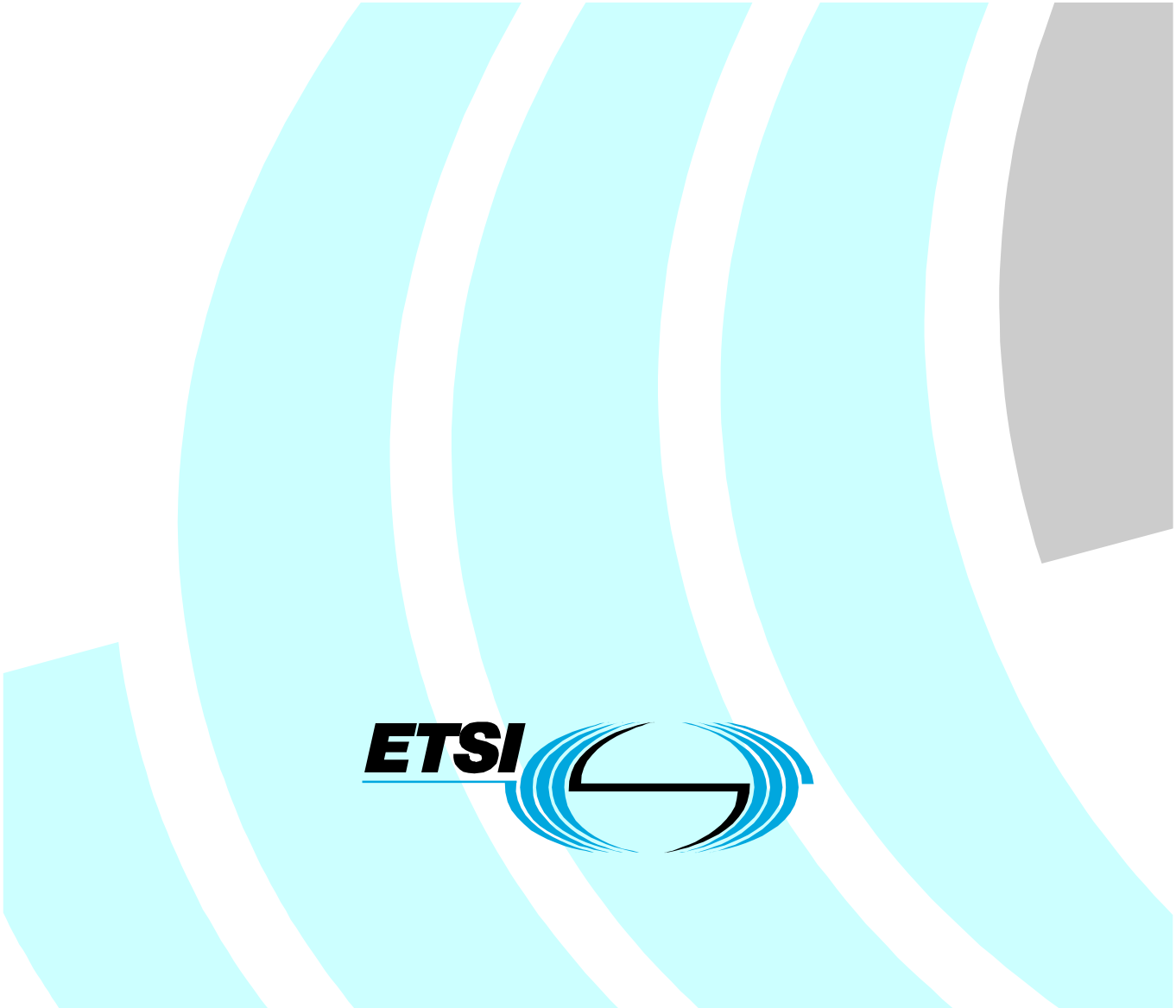
Technical Specification

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); TIPHON/UMTS Harmonization; Extensions and additions to the Network Architecture and Reference Points



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Project Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON).

1 Scope

The present document provides an analysis of the TIPHON Release 4 Network Architecture and Reference Points [1] in comparing to the UMTS IP Multimedia Subsystem (IMS) architecture with a view to identifying where, if necessary, the TIPHON architecture needs to be extended to ensure harmonization between the two.

Clause 4 provides a comparison of the TIPHON and UMTS architectural concepts.

Clause 5 identifies UMTS functional groupings and identifies where the equivalent TIPHON functionality is found in the TIPHON architecture.

2 References

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

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
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Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] ETSI TS 101 314: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Abstract Architecture and Reference Points Definition; Network Architecture and Reference Points".

[2] ETSI TS 123 002: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Network architecture (3GPP TS 23.002)".

[3] ETSI TS 123 226: "Universal Mobile Telecommunications System (UMTS); Global Text Telephony (GTT); Stage 2 (3GPP TS 23.228)".

[4] ETSI TS 123 205: "Universal Mobile Telecommunications System (UMTS); Bearer-independent circuit-switched core network; Stage 2 (3GPP TS 23.205)".

[5] ITU-T Recommendation H.248: "Gateway control protocol".

[6] ETSI TS 122 127: "Universal Mobile Telecommunications System (UMTS); Service Requirement for the Open Services Access (OSA); Stage 1 (3GPP TS 22.127)".

[7] ETSI TS 123 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228)".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AS	Application Server
BGCF	Breakout Gateway Control Function
CN	Core Network
CSCF	Call Session Control Function
GPRS	General Packet Radio Service
HSS	Home Subscriber Server
I-CSCF	Interrogating CSCF

IMS	IP Multimedia core network Subsystem
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Services Digital Network
MGCF	Media Gateway Control Function
MGW	Media GateWay
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
MSISDN	Mobile Station ISDN Number
OSA	Open Systems Access
P-CSCF	Proxy CSCF
PLMN	Public Land Mobile Network
SCS	OSA Service Capability Server
S-CSCF	Serving CSCF
SLF	Subscription Locator Function
UMSC	UMTS MSC
UMTS	Universal Mobile Telecommunications System
VLR	Visitor Location Register
VoIP	Voice over IP

4 Comparison of architectural concepts

4.1 TIPHON architecture

The TIPHON architecture is a generic architecture from which technology specific architectures can be derived. It describes the network architecture and shows reference configurations to support specific services and service capabilities.

4.2 UMTS architecture

The UMTS architecture is a technology specific architecture specified for an access network based on the air interface and a core network that provides access to services, such as telephony and messaging. The UMTS architecture is split into both circuit and packet switched domains. The circuit switched domain provides support for traditional ISDN-based telephony services (including supplementary services), whereas the packet switched domain provides support for access to data networks in general and the Internet in particular to enable the provision of new value added services including data and voice communications (including VoIP).

5 Configuration of a Public Land Mobile Network (PLMN)

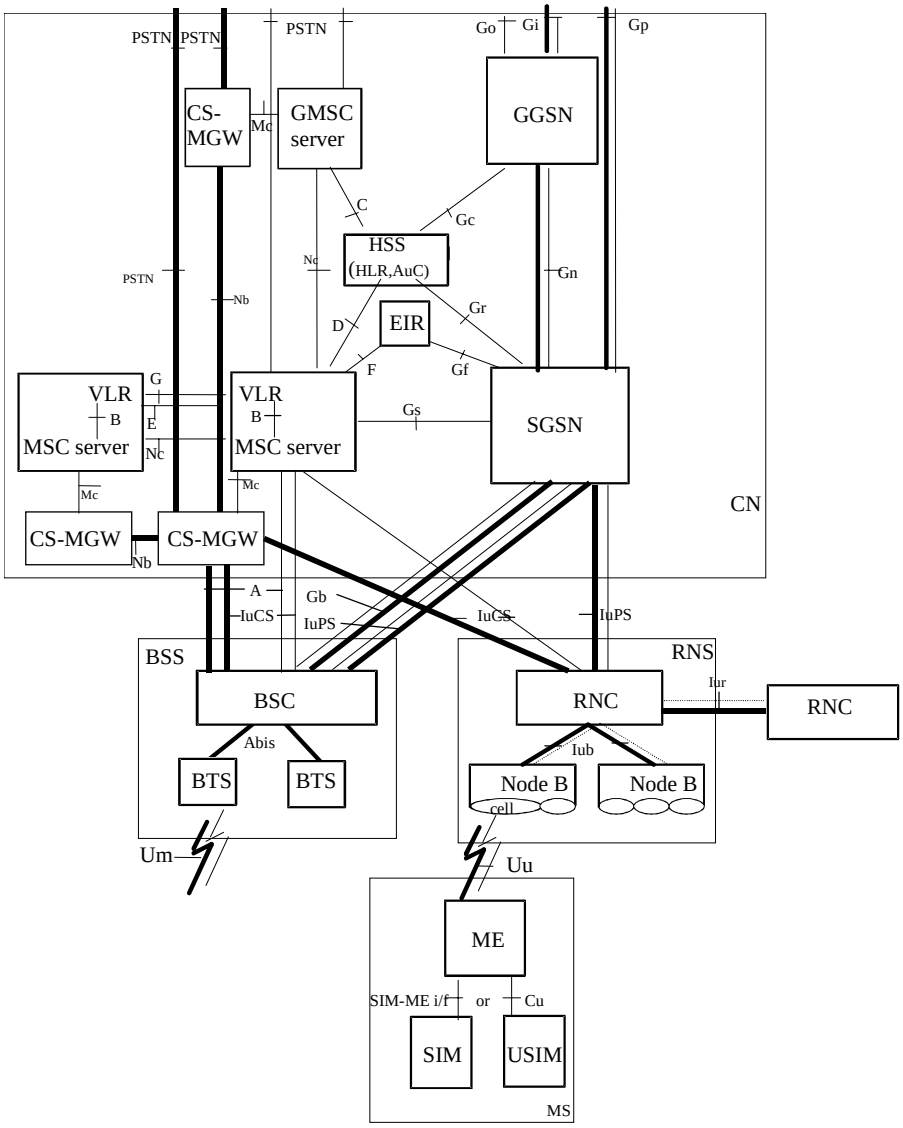
NOTE: The text in this clause describing the PLMN is extracted from TS 123 002 [2] which remains the normative source.

5.1 Basic configuration

The basic configuration of a Public Land Mobile Network (PLMN) supporting GPRS and the interconnection to the PSTN/ISDN and PDN is presented in figure 1. This configuration presents signalling and user traffic interfaces which can be found in a PLMN. Specific implementations may be different: for example some functions may be collected in the same equipment and then some interfaces may become internal interfaces.

In the basic configuration presented in figure 1, all the functions are considered implemented in different equipments. Therefore, all the interfaces within PLMN are external. Interfaces A and Abis are defined in the TS 148 xxx-series. Interfaces Iu, Iur and Iub are defined in the TS 125 4xx-series. Interfaces B, C, D, E, F and G need the support of the Mobile Application Part of the signalling system No. 7 to exchange the data necessary to provide the mobile service. No protocols for the H-interface and for the I-interface are standardized. All the GPRS-specific interfaces (G- series) are defined in the TS 123 xxx-series and TS 124 xxx-series. Interfaces Mc, Nb, and Nc are defined in TS 123 205 [4] and in the TS 129 xxx-series.

From this configuration, all the possible PLMN organizations can be deduced. In the case when some functions are contained in the same equipment, the relevant interfaces become internal to that equipment.



Legend:
Bold lines: interfaces supporting user traffic;
Dashed lines: interfaces supporting signalling.

NOTE 1: The figure shows direct interconnections between the entities. The actual links may be provided by an underlying network (e.g. SS7 or IP): this needs further studies.
NOTE 2: When the MSC and the SGSN are integrated in a single physical entity, this entity is called UMTS MSC (UMSC).
NOTE 3: A (G)MSC server and associated CS-MGW can be implemented as a single node: the (G)MSC.
NOTE 4: The Gn interface (between two SGSNs) is also part of the reference architecture, but is not shown for layout purposes only.

Figure 1: Basic configuration of a PLMN supporting CS and PS services and interfaces

5.2 IP Multimedia (IM) Core Network (CN) Subsystem entities

The architecture of the UMTS IP Multimedia Subsystem is shown in figure 1.

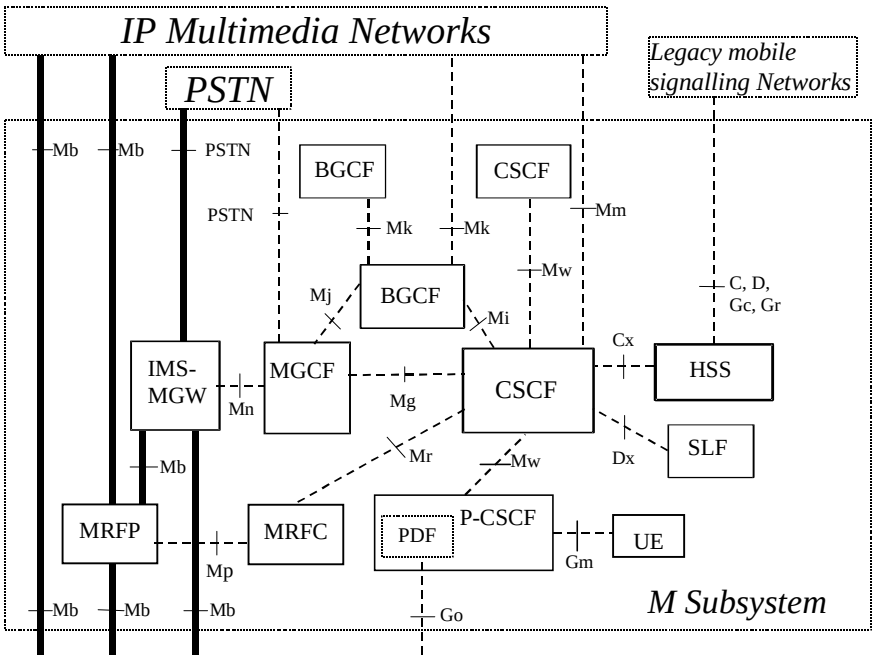


Figure 2: Configuration of the UMTS IP Multimedia Subsystem

5.2.1 Call Session Control Function (CSCF)

The CSCF can act as Proxy CSCF (P-CSCF), Serving CSCF (S-CSCF) or Interrogating CSCF (I-CSCF). The P-CSCF is the first contact point for the UE within the IM subsystem (IMS); the S-CSCF actually handles the session states in the network; the I-CSCF is mainly the contact point within an operator's network for all IMS connections destined to a subscriber of that network operator, or a roaming subscriber currently located within that network operator's service area. Further definitions of the P-, S- and I-CSCF are provided in TS 123 228 [7].

NOTE: The CSCF is equivalent to the TIPHON CC entity.

5.2.2 Home Subscriber Server (HSS)

This clause provides a high level and not exhaustive description of HSS functionality.

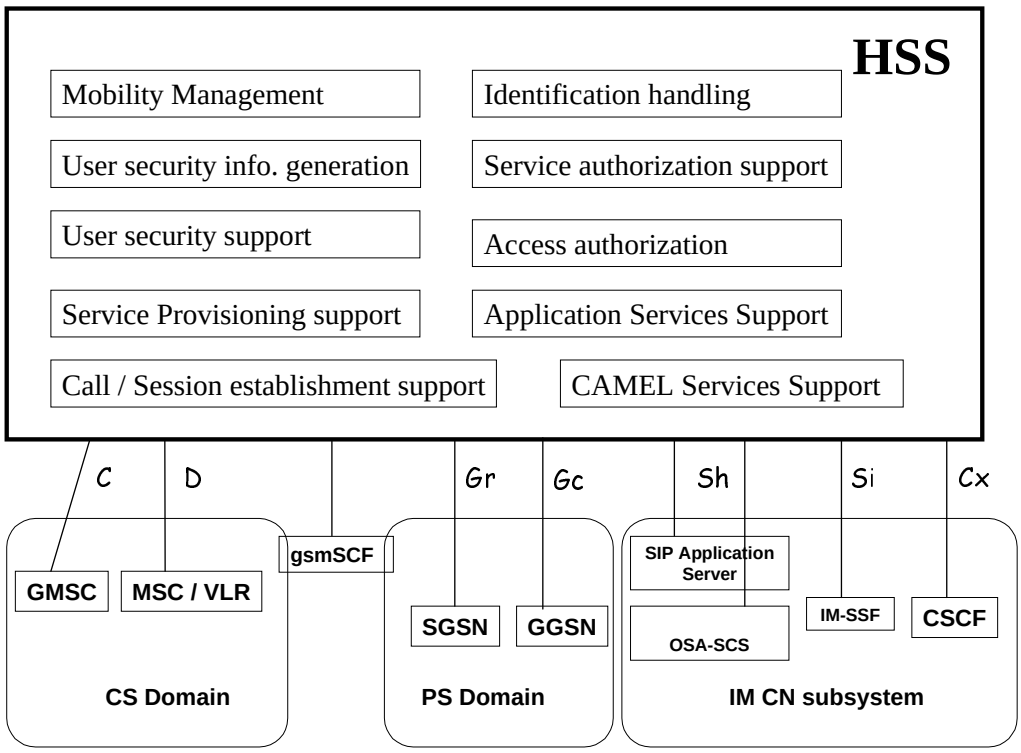


Figure 3: HSS logical functions

- Mobility Management:
  - This function supports the user mobility through CS Domain, PS Domain and IM CN subsystem.
- Call and/or session establishment support:
  - The HSS supports the call and/or session establishment procedures in CS Domain, PS Domain and IM CN subsystem. For terminating traffic, it provides information on which call and/or session control entity currently hosts the user.
- User security information generation:
  - The HSS generates user authentication, integrity and ciphering data for the CS and PS Domains and for the IM CN subsystem. User security support.
  - The HSS supports the authentication procedures to access CS Domain, PS Domain and IM CN subsystem services by storing the generated data for authentication, integrity and ciphering and by providing these data to the appropriate entity in the CN (i.e. MSC/VLR, SGSN or CSCF).
- User identification handling:
  - The HSS provides the appropriate relations among all the identifiers uniquely determining the user in the system: CS Domain, PS Domain and IM CN subsystem (e.g. IMSI and MSISDNs for CS Domain; IMSI, MSISDNs and IP addresses for PS Domain, private identity and public identities for IM CN subsystem).
- Access authorization:
  - The HSS authorizes the user for mobile access when requested by the MSC/VLR, SGSN or CSCF, by checking that the user is allowed to roam to that visited network.

- Service authorization support:
  - The HSS provides basic authorization for MT call/session establishment and service invocation. Besides, the HSS updates the appropriate serving entities (i.e. MSC/VLR, SGSN, CSCF) with the relevant information related to the services to be provided to the user.
- Service Provisioning Support:
  - The HSS provides access to the service profile data for use within the CS Domain, PS Domain and/or IM CN subsystem. Application Services and CAMEL Services Support.
  - The HSS communicates with the SIP Application Server and the OSA-SCS to support Application Services in the IM CN subsystem. It communicates with the IM-SSF to support the CAMEL Services related to the IM CN subsystem. It communicates with the gsmSCF to support CAMEL Services in the CS Domain and PS Domain.

NOTE: The HSS is equivalent to the TIPHON registrar entity.

5.2.3 Media Gateway Control Function (MGCF)

The MGCF:

- Controls the parts of the call state that pertain to connection control for media channels in an IMS-MGW.
- Communicates with CSCF.
- Selects the CSCF depending on the routing number for incoming calls from legacy networks.
- Performs protocol conversion between ISUP and the IM subsystem call control protocols.
- Out of band information assumed to be received in MGCF and may be forwarded to CSCF/IMS-MGW.

NOTE: The MGCF is equivalent to the combination of elements in the TIPHON BC and CC entities.

5.2.4 IP Multimedia Subsystem - Media Gateway (IMS-MGW) function

NOTE: In the present document the term Media Gateway (MGW) function is used when there is no need to differentiate between the CS domain entity and the IP Multimedia CN Subsystem entity. When referring specifically to the CS domain entity the term CS-MGW is used. When referring specifically to the IP Multimedia CN Subsystem entity, the term IMS-MGW is used.

A IMS-MGW may terminate bearer channels from a switched circuit network and media streams from a packet network (e.g. RTP streams in an IP network). The IMS-MGW may support media conversion, bearer control and payload processing (e.g. codec, echo canceller, conference bridge), it:

- Interacts with the MGCF for resource control.
- Owns and handles resources such as echo cancellers, etc.
- May need to have codecs.

The IMS-MGW will be provisioned with the necessary resources for supporting UMTS/GSM transport media. Further tailoring (i.e. packages) of the ITU-T Recommendation H.248 [5] may be required to support additional codecs and framing protocols, etc.

NOTE: The IMS-MGW is equivalent to the combination of elements in TIPHON referred to as ICF (BC, MC, TRM).

5.2.5 Multimedia Resource Function Controller (MRFC)

The MRFC:

- Controls the media stream resources in the MRFP.
- Interprets information coming from an AS and S-CSCF (e.g. session identifier) and control MRFP accordingly.
- Generates CDRs.

NOTE: The MRFC is equivalent to the TRM in TIPHON.

5.2.6 Multimedia Resource Function Processor (MRFP)

The MRFP:

- Controls bearers on the Mb reference point.
- Provides resources to be controlled by the MRFC.
- Mixes incoming media streams (e.g. for multiple parties).
- Sources media streams (for multimedia announcements).
- Processes media streams (e.g. audio transcoding, media analysis).

NOTE: The MRFP is equivalent to the TIPHON MC entity.

5.2.7 Subscription Locator Function (SLF)

The SLF:

- Is queried by the I-CSCF during the Registration and Session Setup to get the name of the HSS containing the required subscriber specific data. Furthermore the SLF is also queried by the S-CSCF during the Registration.
- Is accessed via the Dx interface.

The SLF is not required in a single HSS environment. An example for a single HSS environment is a server farm architecture.

NOTE: The SLF forms part of the registration sub-system in TIPHON and in particular acts within the routing and authorization elements of TIPHON. There is no single functional element in TIPHON that is directly equivalent.

5.2.8 Breakout Gateway Control Function (BGCF)

The Breakout Gateway control function (BGCF) selects the network in which PSTN breakout is to occur and - within the network where the breakout is to occur - selects the MGCF.

NOTE: Within TIPHON the routing function maps to this.

5.2.9 Application Server (AS)

An Application Server (AS) i.e. SIP Application Server, OSA Application Server, or CAMEL IM-SSF, offers value added IM services and resides either in the user's home network or in a third party location. The third party could be a network or simply a stand-alone AS.

NOTE: The OSA Application Server does not directly interact with the IMS network entities but through the OSA Service Capability Servers (OSA SCS-s). Further information on OSA is provided in TS 122 127 [6].

The AS (SIP Application Server and/or the OSA Service Capability Server and/or IM-SSF) can communicate with the HSS. The Sh and Si interfaces are used for this purpose.

The Serving-CSCF to AS interface is used to provide services residing in an AS. Two cases were identified:

- Serving-CSCF to an AS in Home Network.
- Serving-CSCF to an AS in a trusted External Network (e.g. Third Party or Visited). The S-CSCF does not provide authentication and security functionality for secure direct third party access to the IM Subsystem. The OSA framework provides a standardized way for third party access to the IM Subsystem.

An Application Server may influence and impact the SIP session on behalf of the services supported by the operator's network. An AS may host and execute services.

NOTE: The AS is outside the current scope of TIPHON although for some services e.g. simple call and registration mappings to explicit entities has already been made.

History

Document history		
V1.1.1	November 2003	Publication