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Title: **Draft Technical Report : UMTS Interworking with ANSI-41 Networks**

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Title
Draft Technical Report : UMTS

Purpose: **For information**

Agenda Item: **5.3.2**

This is the first draft of the technical report on the UMTS Interworking with ANSI-41 Networks. This contribution is submitted for information only, it will be studied at the next TSG SA Pleanary meeting or WG1 meeting.

- ✓ **Notice: Rapporteur for this WI was changed from Mr. Chang Yong to Mr. Han Yeong C. in TTA. For this WI, contact Mr. Han(ychan@lgic.co.kr).**

1 Indroduction

This is a technicalreport of feasibility study on UMTS CN Interworking to ANSI-41 CN.

2 Definition of UMTS CN Interworking with ANSI-41

UMTS CN Interworking with ANSI-41 CN could be defined as the necessary processes and functions which enable a roaming UMTS(or ANSI-41) network subscriber to get all of the services features in the visited ANSI-41(or UMTS) network as if in the home network. It would support interworking functions such as call handling, registration updating, authentication, SMS, handover, Supplementary Service and etc. The scope of this work item include circuit switched domain and packet switched domain.

3 Sets of service capabilities and telecommunication services

The roaming and the service interoperability between other family systems are good representatives of 3G service features which are distinct from 2G service features. ITU-T Q.1701 describes these service features as the key of IMT-2000 family members and recommends the NNI interworking function with other IMT-2000 family in Capability Set 1 (refer to Table 1/Q.1701)

So, 3GPP must have the responsibility for interworking UMTS CN to ANSI-41 CN in order to lead the development of IMT-2000 systems corresponding to Q.1701 recommendations. As a leader preparing specifications of IMT-2000, 3GPP must be willing to be a pioneer for making technical specification for UMTS Interworking to ANSI-41 Networks.

Service Requirements for interworking UMTS CN to ANSI-41 CN are as follows. These Service Requirements are made on the basis of Q.1701 Capability Set1.

1) Global Roaming for interworking UMTS CN and ANSI-41 CN(refer to Service Requirement 1 on appendix)
2) Service Interoperability between UMTS CN and ANSI-41 CN (refer to Service Requirement 2 on appendix))
3) Handover between UMTS CN and ANSI-41 CN (refer to Service Requirement 3 on appendix))
4) Architectures for interworking UMTS CN to ANSI-41 CN (refer to Service Requirement 4 on appendix))

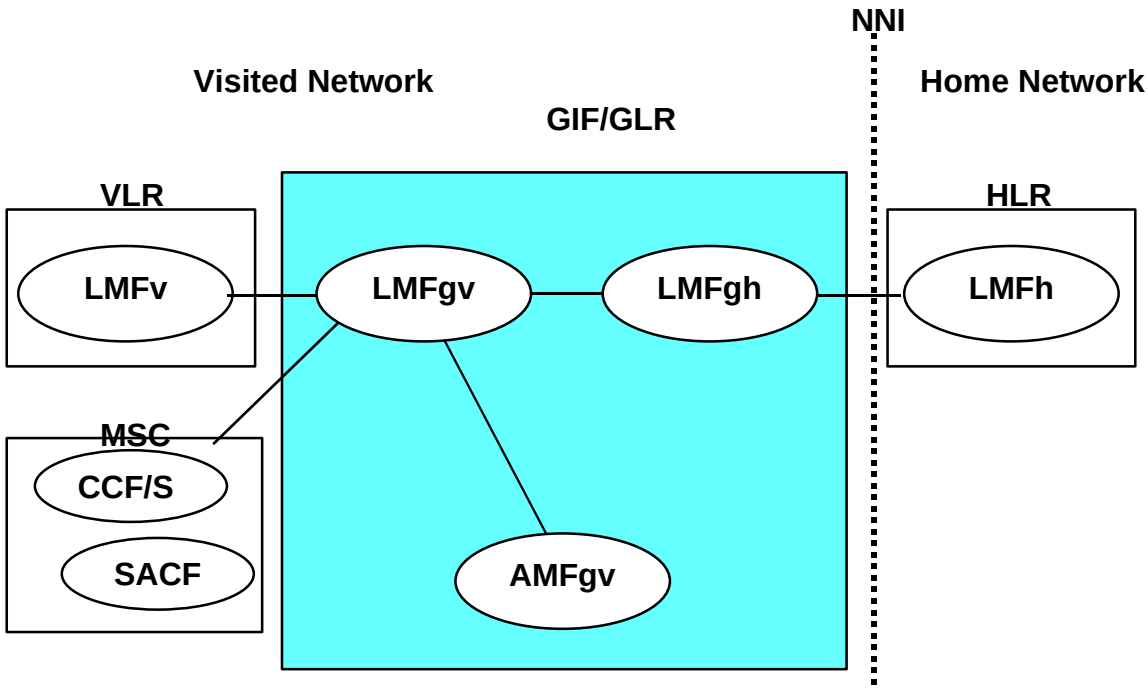
4 Functional Network Architecture

4.1 GIF resides within the visiting network(Option 1)

4.1.1 Scenarios

GIF is a node that can be placed in the visited network and include GLR function. And GIF converts signalling protocol for sending the information to other network. When a subscriber is roaming the GIF interrogate home network and decide whether allow or not roaming in visited network. Because GIF includes GLR, if roaming is allowed, GIF can insert subscriber profile that is received from home network. After finishing it, GIF behaves like GLR and HLR of home network. In the case authentication is needed to a subscriber, GIF executes the authentication algorithm instead of home network's AuC because of using the different authentication algorithm and policy between networks of

different operators.
IF using same authentication algorithm and policy, GIF don't execute it and passes signalling messages related the authentication to home network.



4.1.2 Conceptss

- GIF is placed in visited network that is allowed the roaming , includes GLR function(Gateway Location Register) and converts signalling protocol.
- Authentication Function for roaming subscriber is on AMFgv of GIF.
- GIF provides Security Feature related to equipment

4.1.3 Prerequisite

- Decision about mechanism and algorithm related to Authentication and Security
- Definitions and functions for Dual-mode MS
- UIM have to include all Security Information
- Roaming agreement
- The roamer's authentication algorithm complies with the policy on the visiting network

4.1.4 Functional Description

Interconnection between different IMT-2000 family networks is required for following purposes:

- Set-up and make call for roaming users
- Insert and retrieve location data of roaming users
- Transfer of call detail records/charging related information of roaming users
- Support supplementary service and short message service
- Include GLR function
- Network interconnections to support the interaction between UIM and home network
- Support Authentication and Security

1) LMFgv

- When a subscriber is roaming in the visited network, GIF sends location registration message to LMFgh and then, LMFgh converts MAP message and sends it to home network.
- After receiving the response from home network, subscriber data is stored in the database in the GIF.

2) LMFgh
- Convert and exchange MAP message between visited network and home network

3) AMFgv (optional and need in case using different authentication algorithm)
Execute algorithm related authentication
Produce authentication parameters(key, signature, random variables)

4.2 GIF resides within the home network(Option 2)

GIF function resides in the home network and performs interworking functions between the home network and visited networks such as message translations, outbound roaming subscriber authentication, and etc.
GLR resides in the visited network and doesn't get any user information data until the roaming subscriber requests to register to the network.
GIF functions for outbound roaming subscribers and GLR functions for inbound roaming subscribers can be implemented in the same system.

4.2.1 Functional Network Architecture

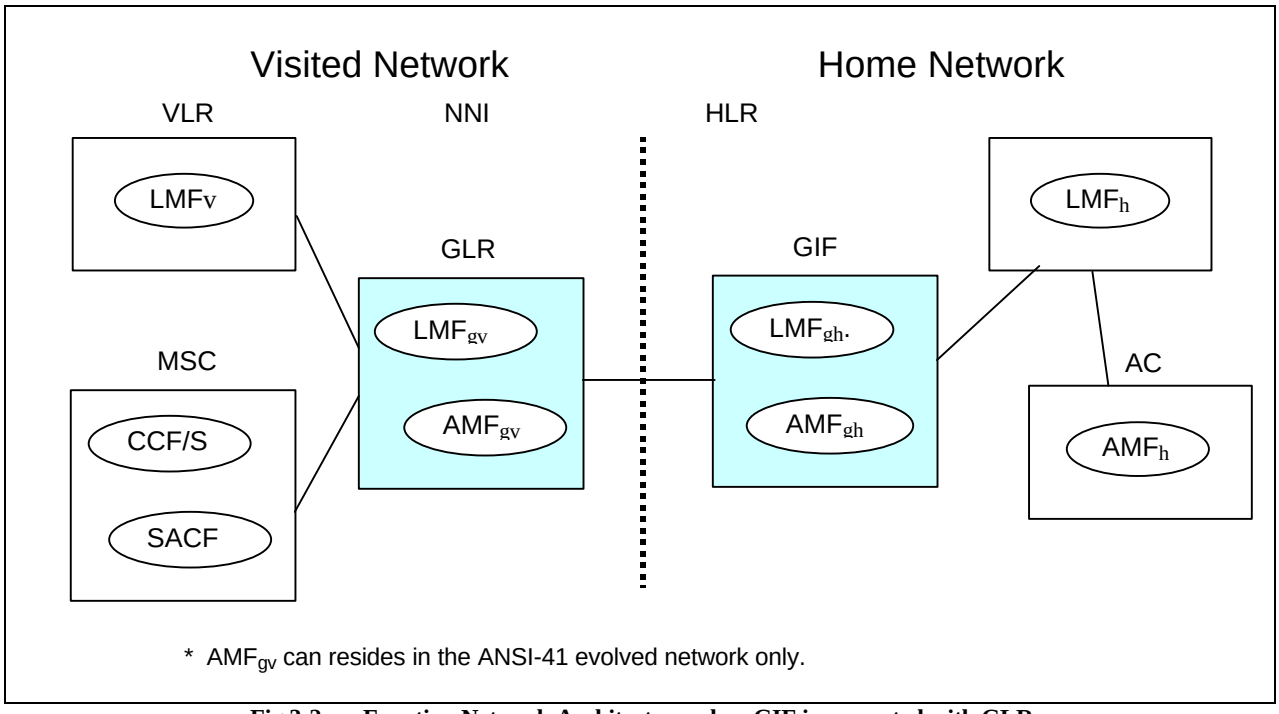


Fig.3-2 Function Network Architecture when GIF is separated with GLR

4.2.2 Concepts
- GIF functions shall be reside on the home network.
- GIF functions for outbound roaming subscribers and GLR functions for inbound roaming subscribers could be implemented in the same system.

- The generation and management of the information data for the outbound roaming subscribers shall be performed in the home network.
- Static information data of outbound roaming subscribers are generated in the LMFgh when the subscribers request for the roaming service.
- Dynamic information data of inbound roaming subscribers are generated in the LMFgv when the subscribers request to register to an MSC within the visited network at first time.
- As only the home network is responsible for generating, changing, and managing the subscriber's information data such as authentication key and etc., the subscriber can use the roaming service more easily and conveniently.
- While the roaming subscriber is moving within the same network, no message transaction to the home network is needed. It causes the reduction of signaling traffic between the home network and visited networks.
- For the subscribers of the UMTS network to roam in the ANSI-41 evolved network, AMFgh may download the authentication data to the AMFgv when it is regarded that the visited network supports the condition needed to perform the authentication of roaming subscribers.

4.2.3 Prerequisite

- The mobile station should support the authentication protocol that is used in the visited network.
- If the visiting network is using same authentication algorithm with home network, AMFgh shall be replaced with AMFh.

4.2.4 Functional Descriptions

4.2.4.1 LMFgv

LMFgv manages the inbound roamer data and operates as a HLR for visited system. Signaling volume can be reduced significantly using LMFgv.

When an inbound roamer tries to register on the currently visiting network at first time, the information data of the roamer is generated in the LMFgv in the visited network.

4.2.4.2 LMFgh

LMFgh manages the outbound roaming subscriber data and performs protocol conversion. It also operates as VLR for the home network.

When a subscriber requests the roaming service, the information data for the subscriber to roam is generated in the LMFgh in the home network.

4.2.4.3 AMFgh

AMFgh maintains the authentication data for outbound roaming subscribers and performs the authentication functions with the authentication algorithms the visited network supports.

4.2.4.4 AMFgv

AMFgv may reside in the visited network when subscribers of UMTS network are roaming in an ANSI-41 evolved network.

5 Charging and accounting requirements

TBD

6 Security requirements

TBD

7 MMI requirements

TBD

(In this section, MMI describes the interoperation between user and terminal for services which are supported by IWF)

8 Guidelines for other TSGs and WGs for the definitions of Architecture and Networks

TBD

9 Guidelines for the co-operation and the co-ordination between 3GPP-1 and 3GPP-2 for UMTS CN Interworking with ANSI-41

TBD

(This section only describes why the co-operation and the co-ordination are necessary between 3GPP-1 and 3GPP-2)

10 Identification of technical and operational issues to meet market requirements

TBD

11 Numbering plan

TBD

Appendix

Service Requirement 1.

Service Requirement for Global Roaming between UMTS CN and ANSI-41 CN

1. **Justification**

Global(worldwide) roaming between IMT-2000 Family Members is recommended in Q.1701 Capability Set 1 for IMT-2000. By the definitions of IMT-2000 Family and Family Members in Q.1701(refer to Q.1701 Section 6), UMTS IMT-2000 and IMT-2000 based on ANSI-41 CN belong to IMT-2000 Family Members. Therefore, Global(worldwide) roaming between UMTS CN and ANSI-41 CN is mandatory service feature.

2. **Requirements**

2.1. Service Aspects

1. Bearer interworking procedures must be considered for global roaming. Bearer interworking procedures contains bearer allocation, bearer connection adaptation/conversion, bearer mapping and bearer negotiation between UMTS CN and ANSI-41 CN.
2. The circuit and packet communications for handling voice, data, and video simultaneously will be supported by global romaing between UMTS CN and ANSI-41 CN.
3. Call internetworking procedures belonging to ANSI-41 CN come to be possible.
4. Interoperability and roaming between both CNs using a single subscription comes to be possible.
5. Ability to supplement mobility management and authentication control with IN-type service logic comes to be supported
6. Mobility and global roaming which contain the followings:
   - 6.1. Location management, including automatic update
   - 6.2. User Registration, Update and Cancellation
   - 6.3. Service Monitoring Registration, Update, Activation, Deactivation and Cancellation
   - 6.4. User Profile Database management and control
   - 6.5. Security and Authentication Database management and control comes to be supported.

2.2. MMI Aspects

F.F.S.

2.3. Charging Aspects

Charging principles and accounting when roaming are important issues relating to this requirement.

2.4. Security Aspects

This feature must be applied in a secure manner, possibly with impact on authentication.

3. Responsible TSG and its WGs in 3GPP1 (P: Primary)

- TSG-SA : TSG-SA WG1(P), WG2(P), WG3(P), WG5
- TSG-CN : TSG-CN WG1(P), WG3(P)

Service Requirement 2.

Service Requirement for Service Interoperability between UMTS CN and ANSI-41 CN

1. Justification

During an ANSI-41 roaming user stay in UMTS IMT-2000 system, UMTS CN should support fundamental service and Virtual Home Environment to enable the user to be offered the same service experience as if in his home ANSI-41 CN. The support of service interoperability may be mandatory or optional by the priority of service requirement

2. Requirements

2.1. Service Aspects

1. UMTS IMT-2000 CN should support services of an ANSI-41 roaming user based on the user profile information.
2. Seamless (i.e., transparent to users) service portability with IMT-2000 based on ANSI-41 CN comes to be supported
3. UMTS Virtual Home Environment Interoperability is able to enable an ANSI-41 roaming user to be offered the same service experience as if in his home ANSI-41 network.
4. The supplementary services shall be supported by service interoperability function.

2.2. MMI Aspects

F.F.S.

2.3. Charging Aspects

Charging principles and accounting for service interoperability during the roaming are important issues relating to this requirement.

2.4. Security Aspects

This feature must be applied in a secure manner, possibly with impact on authentication.

3. Responsible TSG and its WGs in 3GPP1 (P: Primary)

- TSG-SA : TSG-SA WG1(P), WG2, WG3(P), WG5
- TSG-CN : TSG-CN WG1(P), WG3(P)

Service Requirement 3.

Service Requirement for Handover between UMTS CN and ANSI-41 CN

1. **Justification**

During the duration of an ANSI-41 roaming user in UMTS IMT-2000 system, UMTS CN is able to support the handover procedures which include call transfer, handover across cell layers and location management functions. The handover service feature may be optionally considered.

2. **Requirements**

2.1. Service Aspects

- Design for the handover procedures which contain call transfer, handover across cell layers and Location Management
- F.F.S.

2.2. MMI Aspects

F.F.S.

2.3. Charging Aspects

F.F.S.

2.4. Security Aspects

This feature must be applied in a secure manner, possibly with impact on authentication.

3. Responsible TSG and its WGs in 3GPP1 (P: Primary)

- TSG-SA : TSG-SA WG1(P), WG2, WG3(P), WG5
- TSG-CN : TSG-CN WG1(P), WG3

Service Requirement 4.

Service Requirement for Architectures for interworking UMTS CN to ANSI-41 CN

1. Justification

For support the interworking UMTS CN to ANSI-41 CN, the functional architecture and the signalling protocol for NNI interface corresponding to ITU-T specified NNI protocol must be defined. The interworking UMTS CN to ANSI-41-CN can also be implemented by specifying an gateway interworking function (GIF) for protocol (and billing) information conversion between UMTS IMT-2000 and IMT-2000 based on ANSI-41 CN. This requirement is mandatory for implementation of interworking.

2. Requirements

2.1. Service Aspects

NNI which is the interface between UMTS CN and ANSI-41 CN supports the followings:

1. information exchange between UMTS CN and ANSI-41 CN of a subscriber for authentication control and subscriber-specific service control, especially related to the support of the Virtual Home Environment, as well as provision of location information.
2. Information exchange between the originating ANSI-41 CN and the terminating UMTS CN to enable establishment of mobile-terminated calls in case of a roaming user.
3. Information exchange between UMTS CN and ANSI-41 CN for call and service control purposes (incl. call set-up, negotiation of service capabilities, etc.).
4. For UMTS CN to ANSI-41 CN packet data communication, NNI support the architecture and signalling protocols.

2.2. MMI Aspects

F.F.S.

2.3. Charging Aspects

F.F.S.

2.4. Security Aspects

This feature must be applied in a secure manner, possibly with impact on authentication.

3. Responsible TSG and its WGs in 3GPP1 (P: Primary)

- TSG-SA : TSG-SA WG1, WG2(P), WG3, WG5
- TSG-CN : TSG-CN WG1, WG3(P)