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TELECOMMUNICATION
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Signalling requirements and protocols for IMT-2000

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Next Generation Networks – Generalized mobility

Fixed-mobile convergence general requirements

ITU-T Recommendation Q.1762/Y.2802

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ITU-T Recommendation Q.1762/Y.2802

Fixed-mobile convergence general requirements

Summary

ITU-T Recommendation Q.1762/Y.2802 defines the requirements for fixed-mobile convergence (FMC). For this purpose, this Recommendation describes the considerations for FMC, including the fundamental characteristics, service requirements, network capabilities, approach, scenarios and the relevant network environments.

Source

ITU-T Recommendation Q.1762/Y.2802 was approved on 21 September 2007 by ITU-T Study Group 19 (2005-2008) under the ITU-T Recommendation A.8 procedure.

Keywords

Convergence, fixed, FMC, mobile, NGN, Systems beyond IMT-2000.

FOREWORD

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Fixed-mobile convergence general requirements

1 Scope and purpose

This Recommendation is intended to be used as the general requirements document leading to the development of recommendations and implementation guidelines for the realization of fixed-mobile convergence (FMC). This is to ensure that all elements required for interoperability and the associated network capabilities to support applications globally across an FMC environment are adequately addressed by ITU-T standardization activities.

The scope of this Recommendation is to provide FMC principles, high-level service requirements and capabilities. More specifically, this Recommendation identifies the fundamental characteristics, requirements and capabilities that FMC supports.

As next generation networks (as described in [ITU-T Y.2011]) evolve, they will increasingly support the general FMC requirements and capabilities defined in this Recommendation. NGN specific FMC requirements will be captured in releasing specific NGN requirements Recommendations.

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 Q.1741] ITU-T Recommendation Q.1741-series:

- Q.1741.1 (2002), *IMT-2000 references to release 1999 of GSM evolved UMTS core network with UTRAN access network.*
- Q.1741.2 (2002), *IMT-2000 references to release 4 of GSM evolved UMTS core network with UTRAN access network.*
- Q.1741.3 (2003), *IMT-2000 references to release 5 of GSM evolved UMTS core network.*
- Q.1741.4 (2005), *IMT-2000 references to release 6 of GSM evolved UMTS core network.*

[ITU-T Q.1742] ITU-T Recommendation Q.1742-series:

- Q.1742.1 (2002), *IMT-2000 references to ANSI-41 evolved core network with cdma2000 access network.*
- Q.1742.2 (2003), *IMT-2000 references (approved as of 11 July 2002) to ANSI-41 evolved core network with cdma2000 access network.*
- Q.1742.3 (2004), *IMT-2000 references (approved as of 30 June 2003) to ANSI-41 evolved core network with cdma2000 access network.*
- Q.1742.4 (2005), *IMT-2000 references (approved as of 30 June 2004) to ANSI-41 evolved core network with cdma2000 access network.*

– Q.1742.5 (2006), *IMT-2000 references (approved as of 31 December 2005) to ANSI-41 evolved core network with cdma2000 access network.*

– Q.1742.6 (2007), *IMT-2000 references (approved as of 31 December 2006) to ANSI-41 evolved core network with cdma2000 access network.*

[ITU-T Q.1761] ITU-T Recommendation Q.1761 (2004), *Principles and requirements for convergence of fixed and existing IMT-2000 systems*.

[ITU-T Y.2001] ITU-T Recommendation Y.2001 (2004), *General overview of NGN*.

[ITU-T Y.2011] ITU-T Recommendation Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.

[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.2091] ITU-T Recommendation Y.2091 (2007), *Terms and definitions for Next Generation Networks*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 identifier [ITU-T Y.2091]: An identifier is a series of digits, characters and symbols or any other form of data used to identify subscriber(s), user(s), network element(s), function(s), network entity(ies) providing services/applications, or other entities (e.g., physical or logical objects). Identifiers can be used for registration or authorization. They can be either public to all networks, shared between a limited number of networks or private to a specific network (private IDs are normally not disclosed to third parties).

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 fixed mobile convergence: In a given network configuration, the capabilities that provide services and application to the end user defined in [ITU-T Y.2091] regardless of the fixed or mobile access technologies being used and independent of the user's location. In the NGN environment [ITU-T Y.2011], it means to provide NGN services to end users regardless of the fixed or mobile access technologies being used.

3.2.2 fixed network: A network that provides wire-based (e.g., copper, fibre) or wireless access to its services. The fixed network may support nomadism, but does not support mobility.

3.2.3 mobile network: A network that provides wireless access to its services and supports mobility.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

2G Second Generation

API Application Programming Interface

AS Application Server

ATM	Asynchronous Transfer Mode
CAMEL	Customized Applications for Mobile network Enhanced Logic
CAP	CAMEL Application Part
CATV	Community Antenna Television (commonly referred to as Cable TV)
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CS	Circuit Switched
DAB	Digital Audio Broadcast
DSL	Digital Subscriber Line
DVB	Digital Video Broadcasting
DVB-H	Digital Video Broadcasting Hand-held
FMC	Fixed-Mobile Convergence
FTTH	Fibre to the Home
GAN	Generic Access Network
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GW	Gateway
HRPD	High Rate Packet Data
IM	Instant Message
IMS	IP Multimedia Subsystem
IMT-2000	International Mobile Telecommunications – 2000
INAP	Intelligent Network Application Protocol
IP	Internet Protocol
IPTV	IP-based TV
ISDN	Integrated Services Digital Network
ISIM	IMS Subscriber Identity Module
LAN	Local Area Network
LMSD	Legacy Mobile Station Domain
LTE	Long Term Evolution
MMD	Multimedia Domain
MMS	Multimedia Message Service
NGN	Next Generation Network
OSA	Open Service Architecture
PBX	Private Branch Exchange
PDA	Personal Digital Assistant (typically a small hand-held computer)
PES	PSTN Emulation Subsystem
PHS	Personal Handyphone System

PLC	Power Line Communication
PLMN	Public Land Mobile Network
POTS	Plain Old Telephone Service
PSDN	Packet Switched Data Network
PSTN	Public Switched Telephone Network
QoS	Quality of Service
SAE	System Architecture Evolution
SCP	Service Control Point
SIP	Session Initiation Protocol
SMS	Short Message Service
SSP	Service Switching Point
UMA	Unlicensed Mobile Access
UMTS	Universal Mobile Telecommunication System
UTRAN	UMTS Terrestrial Radio Access Network
VCC	Voice Call Continuity
VoIP	Voice over IP
VPMN	Virtual Private Mobile Network
VPN	Virtual Private Network
WAN	Wide Area Network
W-CDMA	Wideband CDMA
WiMAX	World Interoperability for Microwave Access
WLAN	Wireless LAN
xDSL	Any of the various types of DSL

5 Conventions

5.1 Usage of the term "IMS"

The term "IMS" without any prefix as used in this Recommendation refers to the IMS concept in [ITU-T Y.2021] and as updated in the most recent versions of [ITU-T Q.1741] and [ITU-T Q.1742].

6 Objectives of FMC

6.1 General objectives of FMC

The following points provide the general objectives for FMC:

- Seamless service operation from the end user perspective across heterogeneous fixed networks (i.e., PSTN, ISDN, PSDN, WAN/LAN/CATV, etc.) and mobile networks (i.e., GSM, CDMA2000, WiMAX, etc.), subject to any limitations imposed by the characteristics of the particular access technology being used.

- Seamless service provisioning from the service provider's perspective across heterogeneous fixed and mobile networks, subject to any limitations imposed by the characteristics of the particular access technology being used.
- Generalized Mobility defined in [ITU-T Y.2001] is supported in FMC (i.e., terminal device mobility, user mobility and session mobility). For a given scenario, different levels of mobility may be needed.
- Ubiquity of service availability where the end users can enjoy virtually any application, from any location, on any terminal device subject to any limitations imposed by the characteristics of the particular access technologies and terminal devices being used, given that the service has been subscribed.
- Support of multiple user identifier and authentication/authorization mechanisms.

6.2 Objectives from different perspectives

The following subclauses provide more specific objectives for FMC:

6.2.1 End users' perspective

- Converged services that function consistently independent of the access technology or terminal device being used with associated, reduced complexity of telecommunications operation and subscription.
- Convenient access to and usage of a wide range of services of multiple service providers through technology that enables easy configuration, allowing an end user to obtain only one bill if so desired by this end user, even when multiple service providers are involved.
- Seamless service experiences, whenever desired and wherever the end user may be, limited only by the capabilities of the access technology and the terminal device being used, and with the expectation that the end user will have access to multiple terminal devices with different ranges of capabilities.

6.2.2 Service providers' perspective

- Ability to offer a wide range of services.
- Simplified network deployment and operation through the ability to offer access and terminal device independent services, as opposed to having to provide multiple access-specific and terminal device-specific instances of the same service.
- Ability to reuse the fixed-line assets from traditional fixed service providers and mixed service providers in an FMC context.
- Ability to provide better coverage and QoS to end users compared to traditional mobile service providers in an FMC context.

7 Fundamental characteristics of FMC

The following points describe the fundamental characteristics of FMC:

- Consistency of user experience is provided through a generic service delivery environment, which satisfies the needs of the fixed network and of the mobile network. The user is able to obtain services in a consistent manner as allowed by the connectivity and terminal device capabilities. Services are offered in accordance with FMC capabilities. For example, an ongoing call could be downgraded for some reasons, such as change of access technology or terminal device capability. A video communication may be downgraded to a voice communication when the user migrates to mobile-only coverage where the access technology is not able to support it.
- Subscriptions and service provisioning are access-technology agnostic but the service stratum may be aware of both the access and terminal device capabilities involved in a

communication instance. Services are supported in all existing and emerging fixed and mobile access technologies where possible and subject to user preferences. Service registration, triggering and execution adapt to network and terminal device capabilities. The user's availability, reachability, and the terminal device's capabilities are perceptible to network functions, and as needed to services and applications, including those provided by a third party; assuming that

FMC respects

– the user's privacy and privacy-sensitive data (e.g., address book, preferences, presence settings, billing/payment settings and other security settings) contained in the user's profile,
– the user's personal preferences (e.g., availability, reachability), and
– the terminal's device capabilities;

and adequately protects this information

– against loss of privacy and loss of confidentiality,
– against unauthorized access, and
– against unauthorized manipulation;

during storage and/or during communication within and beyond a service provider's domain.

- FMC's service and application processing may depend on terminal device capabilities. Compatible terminal device capabilities may be selected by end-to-end interaction between terminal devices, or between the terminal device and the FMC service stratum according to the service and application needs.
- Support of generalized mobility, which includes service mobility, user, terminal device and network mobility. Reduced or partial mobility may be supported in some specific networks.
- A generic user profile for services which contains the criteria for session establishment and connectivity and is applicable both in fixed and in mobile networks, and which is specific to an individual user's subscription, containing, e.g., the user's address book, preferences, presence options, billing and payment options, service subscriptions and authentication parameters.

8 FMC service requirements

The following service requirements are defined.

8.1 Access service support

FMC is required to provide access-independent service for users.

FMC is required to offer the user the choice to select a suitable access transport to obtain service.

NOTE 1 – Typical access transports include xDSL, WLAN, LAN, optical fibre and ATM, etc.

If the user has given specific permission to FMC to make a choice on his/her behalf, FMC may select from available access transports without further user intervention.

NOTE 2 – This service allows users to choose an access mode, or makes a suitable choice on behalf of the user providing seamless access and a better service experience for users.

8.2 Enhanced VPN

Enhanced VPN service is an access-independent virtual private service network supporting multiple terminal types.

Enhanced VPN makes it possible to provide a consistent virtual private network service by using a variety of public network resources, i.e., consistent VPN service across fixed networks, mobile networks and converged networks, and a variety of terminal devices.

It is required to support the capability to allow users connecting to different public networks (i.e., PSTN, PLMN, etc.). For this, it is required to support private network capabilities, such as use of a private numbering plan.

8.3 Unified messaging

Unified messaging means users can receive several types of messages, such as short message service, multimedia message service, instant messaging, e-mail, etc.

FMC is required to let an end user choose the message type to be received. The end user may express message types to be received based on favourites, online state or terminal device type. FMC is required to support all types of messages from the sender and to transcode messages as far as possible into a format which the recipient is able to receive.

An example scenario is where a user could receive instant messages on his mobile phone as short message service (SMS) messages when he is otherwise offline.

9 FMC capability requirements

The following general requirements for FMC capabilities are defined.

NOTE – Specific FMC charging, security, public service, reliability and interworking requirements are not given. Such FMC requirements are deferred for further study.

9.1 Access independence

Services and features offered via FMC are required to be access-independent so that services are offered to users regardless of how they gain access.

9.2 Uniform authentication and uniform authorization mechanism

Due to the nature of FMC (see Appendix I for an analysis of FMC scenarios), FMC is required to provide a uniform authentication and a uniform authorization mechanism at the FMC service stratum applicable to any given configuration.

NOTE 1 – Uniform security mechanism (authentication or authorization) is meant to encompass a single, common, generic security mechanism and is understood in the sense to bridge both for wireless- and for wire-based access networks at the FMC service stratum. Thus, the notion of uniform applies only to the security mechanism as such but does not impose any requirements to use uniform security keys/credentials, such as used by a single-sign on mechanism for example.

NOTE 2 – As FMC may contain access-specific or access-dependent parts, a uniform authentication and uniform authorization mechanism may not be available at the FMC transport stratum. For different users, the data relating to authentication and authorization may vary, and the parameters in the related messages may also differ, but the procedure for handling these is uniform.

It is left for future study to identify FMC security requirements for uniform authentication and authorization mechanisms (i.e., authentication and authorization combined).

9.3 Charging and management

FMC is required to provide charging and management mechanisms.

NOTE – This requirement supports collecting resource usage information and managing data relating to subscriber resource usage.

9.4 Service access environment

FMC is required to provide the capabilities to access a wide range of application servers or service platforms. The underlying network may be circuit-based or packet-based.

9.5 Quality of service

FMC is required to provide QoS mechanisms.

NOTE – This requirement enables service level agreements supporting user and service requirements, such as dynamic negotiation of QoS parameters between the service and transport layers, including both the access and the core networks.

9.6 Interworking

FMC is required to support interworking with existing networks, e.g., the legacy PSTN.

Interworking does not impose any new requirements upon existing, non-FMC-capable networks other than to provide interfaces to interworking functions according to standardized mechanisms that are already supported by existing networks.

9.7 Reliability requirements

FMC is required to support reliable communications, including appropriate overload control and failure recovery mechanisms. The support of specific overload control and failure recovery mechanisms to manage and mitigate the consequences of such events to achieve the required level of reliability is not needed if the transport network and the processing systems are considered to yield sufficient reliability and are able to adequately mitigate overload situations.

9.8 Security requirements

FMC is required to provide security mechanisms to meet service requirements.

9.9 Public services issues

FMC is required to provide all the means to support public interest services required by regulations or laws of relevant national or regional administrations and international treaties. This includes requirements for:

- lawful interception;
- malicious communication identification;
- unsolicited bulk telecommunications;
- emergency telecommunications;
- location information related to emergency telecommunication;
- user identity presentation and privacy;
- network or service provider selection;
- users with disabilities;
- number portability; and
- service unbundling.

9.10 Network selection

FMC is required to support that a provider is able to define the preferred access network for service delivery in case the user has both fixed and mobile coverage. A user may indicate via the terminal device the preferred access network for access to services.

The provider defines the policy regarding when handover between access networks is required to occur.

For example, an ongoing communication over a mobile access network may be switched to a wire-based access technology for connection when it is determined that the terminal has moved to a location where it is able to access the service via fixed coverage.

9.11 Location identification

FMC is required to support the ability to identify a user's location, and offers the location information to location-related services when the end user has given permission, and this is subject to public service requirements.

The resolution of location information is dependent on the capabilities of the access technology.

FMC is required to harmonize the different location identification mechanisms from existing networks.

9.12 Personalized configuration

FMC is required to support the ability to provide personalized services according to a user's requirement.

NOTE – This capability may be implemented through a network-based profile which can be customized by the user within defined limits and such that all services work well according to the indications in the profile.

9.13 Personal data network storage

FMC is required to store personal data on behalf of (or with permission by) the end user. It is required that the end user is able to access and manipulate those personal data through one of the user's various terminal devices.

For example, FMC can store a contact address book on behalf of (or with permission by) the end user. The end user can utilize this address book from different terminal devices thereby avoiding multiple independent and unsynchronized address books for the different terminal devices the end user may have.

9.14 Accounting support capabilities

FMC is required to support the ability to collect CDR information from different network elements, which are used by the charging/billing system to gather together relevant usage data to initiate a unified bill to the specific user for multiple kinds of services with different terminal devices.

NOTE – CDR information collection among one or several providers can only take place if the end user has given implicit or explicit permission.

In the case that the end user may be reachable by one identifier on different terminal devices, FMC is required to support to associate all relevant CDR information with the particular identifier.

9.15 Message processing

FMC is required to support the storage, transcoding, conversion and relay of different types of messages (SMS, MMS, IM, email, etc.).

For example, it may be appropriate to transcode and to convert a video contained within an IM into an MMS message with associated compression and recoding of the content. These functions are implemented by application servers or by application gateways with control elements recognizing the need to do the transformation in relation to the type of message being sent and the capabilities of the terminal device to which it is being sent.

NOTE – Transport-level interworking through encapsulation may be appropriate in certain scenarios.

9.16 Presence information

FMC is required to be able to store user presence information which can be accessed by appropriate applications.

9.17 Mechanism for applications to access user data

With permission given by the end user, FMC is required to provide mechanisms to enable applications to access relevant user data independent of where the end user data is stored.

9.18 User identifier management

An end user may have several different kinds of terminal devices, such as a legacy fixed terminal, a mobile phone, a PDA, a portable computer with extended capabilities, or a desktop fixed computer operating as a terminal with substantial multimedia capabilities.

FMC has the ability to provide a unique user identifier at the transport stratum which allows differentiation among user terminal devices. Additional identifiers may be used at the service stratum to identify the user for end-user services.

NOTE – The Administration or service providers choose the identification scheme and the corresponding identifier(s). Such identifiers can exhibit the property of being public or of being private. In some FMC environments, a user may have different identifiers depending on the access network technology.

It is required to support user identification by:

a) a single and unique identifier related to the user's subscription; or

b) a number of such user identifiers mapped to a unique user identifier.

FMC may apply a different end users' identifier when end user accesses different technologies, therefore Administrations or service providers may require common user identifier management to provide registration and authorization for the user regardless of the access mechanisms or terminals being used.

10 Network environment

10.1 General network environments

FMC needs to cover the possibilities for convergence across existing different network infrastructures and access mechanisms.

The following are among the envisaged network infrastructures:

- Fixed network, such as PSTN/ISDN, cable TV network, softswitch-based/IMS-based PES, IPTV service network, H.323 VoIP network and IMS-based NGN.
- Mobile network, multiple IMT-2000 family members consisting of the various releases of GSM evolved UMTS core network with UTRAN access network [ITU-T Q.1741], the various releases of ANSI-41 evolved core network with cdma2000 access network [ITU-T Q.1742], mobile WiMAX, etc.

The following are among the envisaged access mechanisms:

- The access network parts of IMT-2000: GSM/UTRAN and ANSI-41/cdma2000.
- WLAN in hot spots or as mesh networks.
- WiMAX broadband wireless access.
- xDSL, Cable, PLC, FTTH fixed access.
- Legacy PSTN systems used for narrow-band IP services access.
- The access network parts of digital audio broadcast (DAB) and digital video broadcasting (DVB)/digital video broadcasting handheld (DVB-H).

NOTE – The various systems listed above encompass very different network infrastructures, different bandwidth capabilities, as well as very different access technologies. It is therefore not anticipated that a single multimode terminal device will be able to handle every possible access. Rather, it is anticipated that users will access their services via a range of terminal devices, some of them capable of multimode operation. Consequently, mobility across this heterogeneous environment requires service adaptation for terminal device mobility as well as for personal mobility.

10.2 FMC network scenarios

The following subclauses describe several scenarios for fixed-mobile convergence and indicate requirements associated with these scenarios.

10.2.1 IMS-based FMC

This convergence of fixed and mobile networks enables users to move between fixed and mobile access networks and still have access to the same set of IMS-based services. The fixed and mobile access networks might both be part of the user's home network, but it is a requirement that the case where one or both are visited networks is also supported.

IMS-based FMC includes the scenario that during mobility, only one access is on an IMS-based network. Service continuity needs to be supported between the fixed and the mobile access technologies if the session control layer corresponding to one of the access technologies is IMS-based (i.e., handover of voice calls between the mobile circuit domain and the fixed network controlled by IMS).

Service provisioning is required to be independent of the access technologies.

User experience may be limited by the access network capabilities when using different access technologies, such as lower quality video communication when low bandwidth access is used, etc.

ISIM functionalities are required for user identification mechanisms, but it is also necessary to support legacy terminal devices without ISIM functionality for service access, especially when one side is not IMS-based network.

Broadcasting/Multicasting capabilities are needed but may be limited by the network capabilities.

Access-agnostic uniform mechanisms are required; the end user could access the services from broadband fixed-access (e.g., xDSL, cable) and mobile access (e.g., WiMAX).

Voice call continuity (VCC) is required in this scenario to provide ongoing call continuity between the cellular CS domain and the IMS domain. When users with dual-mode terminal devices move between the two domains, handover may happen from a cellular CS domain to an IMS domain or the reverse and no break is perceived by users during the handover.

Enhanced VPN support is required in this scenario.

IMS-based FMC could in principle also support service continuity for video calls between the IMS and a cellular CS domain. This capability is for further study.

IMS-based FMC may provide services to mobile as well as PSTN/ISDN terminal devices through IMS-based PSTN/ISDN emulation. This FMC scenario is detailed in [ITU-T Y.2031]. Specific requirements for this scenario are for further study.

10.2.2 FMC between circuit-switched mobile and PSTN networks

This convergence of fixed and mobile networks enables users to roam into the legacy PSTN network outside a GSM/UTRAN or ANSI-41/cdma2000 network. The requirement to support that users roam into a PBX network is for future study.

Limited mobility is supported, e.g., nomadism, but service continuity (handover) is not required to be supported for this scenario.

NOTE – Technologies for access to the PSTN could be GSM/UTRAN or ANSI-41/cdma2000 radio technologies and local radio technologies such as Bluetooth or Wi-Fi.

Voice communication services in this scenario are required to be supported using a single personal number or user identifier. Video communication services could also be supported in this scenario.

GSM/UTRAN or ANSI-41/cdma2000 supplementary services are required to be supported when the user makes and receives calls under PSTN access unless limited by PSTN network capabilities.

Enhanced VPN support is required in this scenario.

10.2.3 FMC in access network by UMA/GAN

This convergence of fixed and mobile networks to enable the provision of service continuity for a multi-mode WLAN/2G terminal device when it changes its point of attachment is known as unlicensed mobile access (UMA). Demand for such capabilities is driven by competition on price and user convenience and the desire to extend service coverage in buildings with poor mobile radio reception.

UMA is also known as generic access network (GAN) [b-ETSI TS 143 318].

This scenario does not provide an evolution path to an all-IP NGN, since it keeps voice calls in the CS domain. This scenario is for further study.

Appendix I

FMC approach and scenarios

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

NGN gives the framework to provide FMC service capabilities irrespective of the different access technologies. Service providers may also provide FMC services based on existing networks they operate by changing or upgrading selected components of their network. Different approaches are required to obtain the ability to provide the desired FMC service experience to users.

End users are able to use FMC services from both the fixed access network and from the mobile access network.

An example FMC solution is a single multi-mode terminal device, which supports both fixed and mobile access can provide the user a better service experience, than when using different terminal devices to achieve the same service result. However, multi-mode terminals may not be able to fully support all necessary access networks.

Several scenarios for network implementation to achieve FMC services are given in the following clauses.

The transport network is not explicitly shown in these figures. FMC may also support seamless mobility in transport network between heterogeneous access networks, so the service continuity between these access transport networks can be achieved. From the service aspect, a multi-mode terminal attached to different access transport networks may access unified and consistent services and applications. From the network aspect, mobility-enabled transport network may support any type of IP-based access transport network regardless of its mobility features. Transport network convergence is for further study.

I.1 Convergence in the control layer

In this scenario, a unified control layer network is provided to support both fixed and mobile access. This convergence occurs in the control layer as shown in Figure I.1. In this architecture, both the fixed access network and the mobile access network are controlled by this unified control layer network enabling the same applications/service support functions to be adopted for the network.

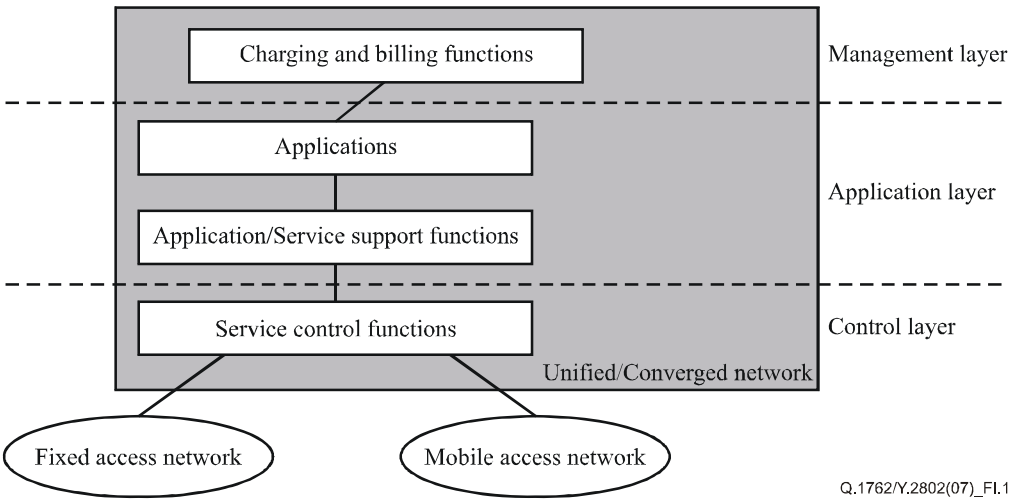

Figure I.1 – Scenario: Convergence in service control functions

NOTE – IMS-based solution described in [ITU-T Y.2021] uses the access-independent IMS network to support different accesses to provide FMC services. The UMA solution [b-ETSI TS 143 318] uses the unified GSM/UMTS network to provide FMC services.

I.2 Convergence in application layer

In this scenario, the different service control network is used to provide the service when the user accesses FMC using fixed access network or mobile access network. Convergence does not occur in the service control layer (call control or session control functions), but occurs in the service support functions in the application layer as illustrated in Figure I.2.

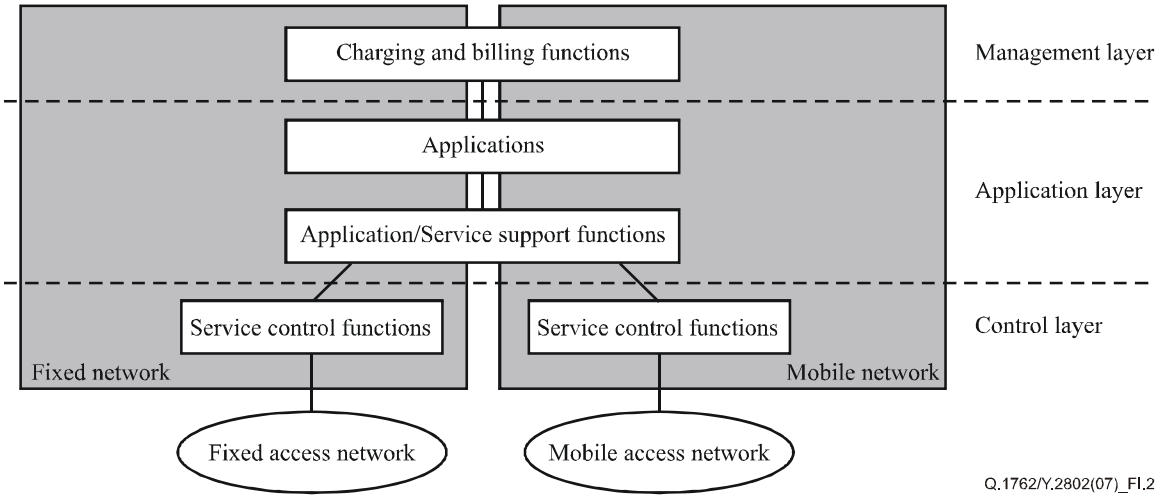

Figure I.2 – Scenario: Convergences in application/service support functions

NOTE – The example in Figure I.2 is a scenario where convergence occurs in the application/service support functions.

Convergence may also occur only in the applications in the application layer as shown in Figure I.3.

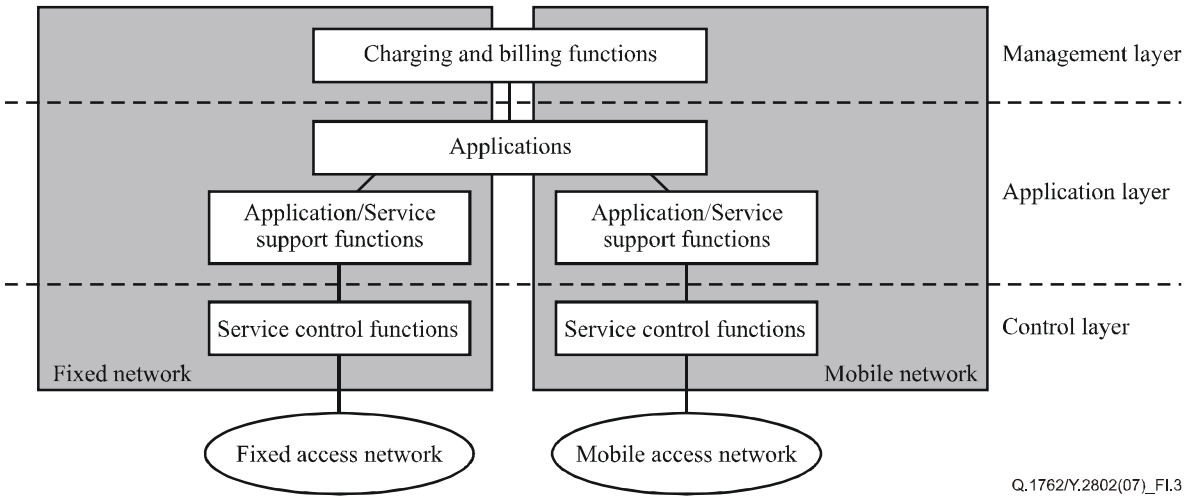

Figure I.3 – Scenario: Convergence in applications

I.3 Convergence in the management layer

In this scenario, the control layer and the application layer of the fixed and mobile networks are unchanged, but some changes occur in the charging and billing functions to provide bundled billing of at least some services. This may also be referred to as FMC and is illustrated in Figure I.4.

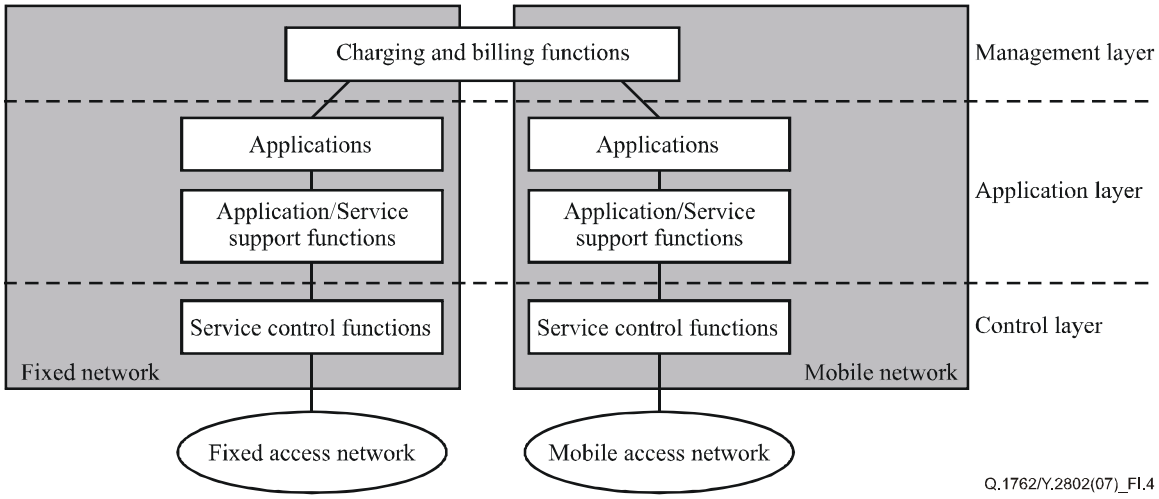

Figure I.4 – Scenario: Convergence in charging and billing functions

Bibliography

[b-ETSI TS 143 318] ETSI TS 143 318 (2008), *Digital cellular telecommunications system (Phase 2+); Generic Access Network (GAN); Stage 2*.

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