Technical Specification Group Services and System Aspects *TSGS#5(99)436*
Meeting #5, Kyongju, Korea, 11-13 October 1999

Source: **S1**

Title: **Collection of CRs to 22.129 on handover**

Document for: **Approval**

Agenda Item: **5.1.3**

S1-99500	22.129	002	R99	SMS handover requirement clarification
S1-99516	22.129	003	R99	GSM UMTS Handover
S1-99533	22.129	004	R99	Revised terminology to 22.129
S1-99540	22.129	005	R99	For R99 there can only be one target PLMN for HO in addition to the serving PLMN for R99 in a given geographical area.
S1-99541	22.129	006	R99	from 489 - Clarification of the scope of mandatory requirements
S1-99565	22.129	007	R99	Removes all non-R99 requirements, by changing them into Cross phase compatibility requirements which apply to R99.

TSG-SA Working Group 1 (Services) meeting #4
Quebec City, Canada 5th-9th July 1999

TSGS1#4(99)500

CHANGE REQUEST No : **002** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification 3GPP: 22.129 Version 3.0.0

Submitted to TSG SA *list plenary meeting or STC here ↑*		for approval	X	without presentation ("non-strategic")	X
		for information		with presentation ("strategic")	

PT SMG CR cover form. Filename: crf26_3.doc

Proposed change affects: *(at least one should be marked with an X)* SIM [ ] ME [X] Network [X]

Work item: 22.129 GSM UMTS Handover

Source: Ericsson **Date:** 1 July, 1999

Subject: SMS handover requirement clarification

Category: *(one category and one release only shall be marked with an X)*

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
UMTS	X

Reason for change: This CR proposes a clarification on the SMS requirements. This is an outstanding issue from the Handover Workshop held on the 9th and 10th of June 1999 in Sophia Antipolis, France. This CR contains as well an editorial alignment of section 6 and 7.

Clauses affected: 6 and 7

Other specs affected:

Other releases of same spec		→ List of CRs:
Other core specifications		→ List of CRs:
MS test specifications / TBRs		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments: A short message may be lost at a lower layer due to handover. A higher layer SMS protocol shall then retransmit the lost short message as in GSM. This retransmission can take place in any core network node (e.g. 3G-SGSN, 3G-MSC or SMS service centre) that relays the short message.

6 Requirements for Handover from UMTS to GSM

6.1 Operational Requirements

6.1.2 GSM bands

The standard shall support handover to any combination of GSM bands supported by the GSM standards.

6.2 Performance Requirements

The following service principles apply to performance requirements:

- when the UE performs handover to GSM then the service requirements of GSM that relate to handover between different cells in different location areas is taken as the benchmark. It is not the intention to setmore stringent service requirements for UMTS to GSM handover than are already commonly accepted for handover within GSM.

6.2.1 Detection Time of Potential GSM Handover Candidates

Means shall be defined which allow the UE to achieve as good detection time performance as the GSM benchmark: ie to behave in such a way as to detect potential GSM handover candidates as quickly as a GSM mobile performing an intra GSM handover is required to do so.

6.2.2 Number of GSM handover candidates to detect

Means shall be available which allow UE to detect an equal number of GSM handover candidates relative to the GSM benchmark, ie to behave in such a way as to detect as many potential GSM handover candidates as a GSM mobile performing an intra GSM handover is required to do so.

6.2.3 Probability of Connection Loss

The service requirement is that it should be possible to hand over to GSM from UMTS with a probability of connection loss that fulfils the corresponding service requirement for intra GSM handover.

6.2.4 Temporary degradation of service caused by handover

The service requirement is that means should be defined so that it is possible to construct networks comprising GSM and UTRA radio resources in such a way that the duration and extent of any degradation of service during handover from UMTS to GSM is no worse than during intra GSM handover.

6.3 Specific Requirements for Individual Services from UMTS to GSM

6.3.1 Speech

Handover of a UMTS Speech channel to GSM shall result in a GSM speech teleservice connection. This requirement also applies to emergency calls:

- any call based on the default UMTS speech codec shall be mapped to the FR GSM speech codec. In the case the terminal and the GSM network support AMR and /or EFR and/or HR, it shall be the operators choice to define the appropriate mapping.

Means shall be defined which make it possible to limit any temporary degradation on handover so it meets the performance specified by GSM service requirements for speech handover.

6.3.2 Short Message Service

There are no requirements related to handover for short message service.~~Handover does not apply to this service since there is no connection context maintained between successive short messags within the UMTS system.~~

~~There may be a temporary degradation of service during handover from UMTS to GSM since when the transmission or reception of a short message coincides with handover, the short message transfer in progress might be aborted (in this case, signalling protocols in the SMS service may automatically attempt to resend the message – see below).~~

~~After handover from UMTS to GSM the service will continue to be provided by means of GSM short message service.~~

~~Means may be provided to allow the re-transmission without user intervention of any short message transfer that was aborted. This may depend upon whether the SMS was mobile originated or mobile terminated.~~

6.3.3 Cell Broadcast

There are no requirements related to handover for cell broadcast.

6.3.4 USSD

The technical standards shall provide means to ensure that any handover that occurs during a USSD interaction need no more affect the service than intra-GSM handover.

6.3.5 Facsimile

It is not required that a facsimile transmission that is active between UE and network at the time of handover from UMTS to GSM completes successfully.

6.3.6 Data Bearer Services

Standards shall be defined to permit the possibility of handover of a UMTS connection oriented data bearer service to GSM which shall result in an appropriate GSM/GPRS bearer service. The mapping between UMTS data bearer services and appropriate GSM/GPRS data bearer services will depend upon many factors such as data rate, delay constraints, error rate etc. Means shall be provided for the application to indicate minimum acceptable QoS for service continuation after handover.

Means shall be defined (eg existing GSM flow control mechanisms) which make it possible to limit any temporary degradation on handover so it meets the performance specified by GSM service requirements for connection oriented data bearer service handover.

It is required to handover a user context between GPRS and UMTS . Independently of the used air interface, the user shall stay connected to an external network (internet, intranet).

6.3.7 ~~GSM~~ Supplementary Services

Control and *use* of Supplementary Services to be according to GSM or UMTS standard as applicable at the time, although close synergy between these should be encouraged to ensure that handover has no effect on their correct operation or continuity of service.

Where a GSM supplementary services is supported in UMTS then the technical standards should allow handover to GSM to have no effect, at least where the GSM and UMTS networks have the same network operator.

6.4 Requirements on multiple bearer services handover from UMTS to GSM

Consideration must be given to multimedia services which may involve multiple bearer services. The mapping between UMTS data bearer services and GSM/GPRS bearer services will depend upon many factors such as data rate, delay constraints, error rate etc.. Means shall be provided for the application(s) to indicate minimum acceptable QoS for services continuation after handover. In the event certain UMTS bearer services cannot be handed over to GSM/GPRS, the handover of some of the bearers to maintain the service should not be precluded.

7 Requirements for Handover from GSM to UMTS

7.1 Operational Requirements

7.1.2 GSM bands

The standard shall support handover from any combination of GSM bands supported by the GSM standards.~~The technical standards should ensure that it is possible to handover from GSM to UMTS in such a way that temporary degradations are no worse than GSM to GSM handovers.~~

7.2 Performance Requirements

The technical standards should ensure that it is possible to handover from GSM to UMTS in such a way that temporary degradations are no worse than GSM to GSM handovers.

7.3 Specific Requirements for Individual Service Handover from GSM to UMTS

7.3.1 Speech

AMR, EFR, FR and HR calls shall be mapped to the default UMTS speech codec.

7.3.2~~3~~ Short M~~m~~essage Service

There are no requirements related to handover for short message service.~~No connection is maintained within the UMTS system between successive short messages, so handover of this service is not a meaningful concept.~~

~~There may be a temporary degradation of service during handover from UMTS to GSM since when the transmission or reception of a short message coincides with handover, the short message transfer in progress might be aborted (in this case, signalling protocols in the SMS service may automatically attempt to resend the message – see below).~~

7.3.3~~4~~ Cell Broadcast

There are no requirements related to handover for cell broadcast.

7.3.4~~5~~ USSD

In GSM, USSD is a connection mode teleservice according to the definition above: in USSD the association between endpoints is called a 'transaction' (see GSM 03.90). In GSM, USSD transaction from the UE can terminate at the local MSC, the VLR or the HLR. It is not required to standardise means to handover into UMTS of transactions with the local MSC. The need to standardise handover of transactions with the VLR and HLR is for further study.

7.3.5~~6~~ Facsimile

It is not required that a facsimile transmission that is active between UE and network at the time of handover from GSM to UMTS completes successfully.

7.3.6~~7~~ ~~Circuit switched GSM~~ Data Bearer Services

7.3.6.1 Circuit Switched Data

Note: the requirements in this section should not delay the release 99 standardisation process and may need review.

Standards shall be defined to permit the possibility of handover of a GSM circuit switched data bearer to UMTS which shall result in a UMTS connection oriented data bearer service . Means shall be provided for the application to indicate minimum acceptable QoS for service continuation after handover. If this cannot be provided by theUMTS network handover will not take place (which may result in call loss once the UE moves outside GSM coverage).

Means shall be defined which make it possible to limit any temporary degradation on handover so it meets the performance specified by GSM service requirements for circuit switched data handover.

7.3.6.27 Packet Switched Data ~~Services~~

It is required to handover a user context between GPRS and UMTS . Independently of the used radio interface, the user shall stay connected to an external network (internet, intranet). Any change in the QoS shall be seen at the service access points as a network initiated renegotiation of QoS. If the supported QoS is not acceptable, the MS may terminate the connection/context.

Means shall be defined which make it possible to limit any temporary degradation on handover so it meets the performance specified by GSM service requirements for packet switched data handover.

7.3.78 Supplementary services

Where a GSM supplementary services is supported in the target UMTS network then the technical standards should allow handover from GSM to UMTS to have no effect on that service, at least where the GSM and UMTS networks have the same network operator.

TSG-SA Working Group 1 (Services) meeting #4 *TSGS1#4(99)516*
Quebec City, Canada, 5-9 July 1999 Agenda 6.6

CHANGE REQUEST No : **003** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.129 Version: 3.0.0

Submitted to TSG_SA *list TSG plenary meeting no. here ↑* | for approval [ ] | without presentation ("non-strategic") [ ]
for information [ ] | with presentation ("strategic") [ ]

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Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [X] Network [X]

Work item: GSM UMTS Handover

Source: Rapporteur **Date:** 6.7.99

Subject: Removal of out-of-date appendix.

Category: *(one category and one release Only shall be Marked with an X)*

F	Correction	[ ]	**Release:**	Phase 2	[ ]
A	Corresponds to a correction in an earlier release	[ ]		Release 96	[ ]
B	Addition of feature	[ ]		Release 97	[ ]
C	Functional modification of feature	[ ]		Release 98	[ ]
D	Editorial modification	[X]		UMTS 99	[X]

Reason for change: The information in Annex 6 is of a project mangement nature and is now superceded by the report giving the outcome of HO/NS ad-hoc.

Clauses affected:

Other specs Affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:


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A.6 Completeness of Service Requirements

The subject areas below have been raised as important issues for inter-operator handover, and some may be developed further at a future time:

- operator requirements (regulatory issues, Clearing house requirements, inter-operator requirements, signalling access requirements);
- roaming IN services;
- end-user services (eg VPN, Prepaid, Numbering, tariffing, zone services, data services);
- optimal routing;
- MS display aspects;
- CCBS arrangements and billing principles.
- information transfer between the networks or network operators, since both networks need to get up-to-date system information from the other network (further broadcasting of such an information should be studied);
- continuity of Supplementary Services;
- requirements for network selection criteria in preparation to handover;
- admission control requirements for recipient network.

TSG-SA Working Group 1 (Services) meeting #4 *TSGS1#4(99)533*
Quebec City, Canada, 5-9 July 1999 Agenda 6.6.8

CHANGE REQUEST No : **004** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.129 Version: 3.0.0

Submitted to TSG_SA *list TSG plenary meeting no. here ↑* | for approval [ ] | for information [ ] | without presentation ("non-strategic") [ ] | with presentation ("strategic") [ ]

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Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [X] Network [X]

Work item: GSM UMTS Handover

Source: S1 ad hoc on handover 8.7.99 **Date:** 8.7.99

Subject: Editorial improvements of definitions and alignment of terminology.

Category: *(one category and one release Only shall be Marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		UMTS 99	X

Reason for change:

To carry out CR agreed at "ad hoc on handover during S1#5" ie:

Consistent use of the term 'UTRA radio access mode' to distinguish FDD/TDD, 'radio system' for UMTS-other

Improve the definition of handover, clarifying that the point of handover is that defined bearer QoS is maintained during a process in which the radio transmitter changes.

Clarify 'Same network' means same MCC+MNC

Clauses affected: 7.4

Other specs Affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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1st Editorial Change

1 Scope

The scope of this document includes service requirements for handover (terms are defined below) within UMTS systems and between UMTS, other IMT-2000 family members and 2nd generation systems. Particular emphasis has been placed on the description of requirements for handover between UMTS and GSM but requirements specific to other systems are incorporated as required.

UMTS is a "third generation" mobile cellular radio telecommunications system which provides telecommunication and information services to wireless terminals. Mobile cellular systems have the defining characteristic that they are capable of maintaining continuity of service to a wireless terminal as it moves between the radio coverage area, or "cells", associated with different base station sites . This functionality is called "handover". Handover can also occur due to change of radio resource providing a service without necessarily any change of the base stations involved. In particular, when the radio resources providing a service change from one of the UTRA radio access modes to the other (UTRA-FDD and UTRA-TDD), this is regarded as handover.

It is a key requirement of UMTS that it allows for dual or multi-mode (eg UMTS/GSM) terminals to handover traffic from UMTS to other radio systems such as GSM and visa versa. This document describes the service requirements for intra- and inter- system handover that shall be used by other SMG STCs to guide the implementation of UMTS-to-(eg) GSM handover specifications. It defines requirements for the enhancement of the GSM specifications to allow GSM-to-UMTS handover.

The following subject areas are within the scope of these service requirements:

- user perceived performance that may be influenced by handover;
- operational requirements relating to handover;
- security requirements.

The requirements set forth in this document are service requirements, in that they fulfil the following:

- the requirements are independent of the implementation of the URAN;
- the extent to which the requirements are met are in principle verifiable using observables that are not internal to the URAN.

1.1 Situations in which Service Requirements apply

The service requirements in this document are as far as possible independent of the implementation of the UTRA. They therefore apply to situations where handover would occur regardless of how the UTRA is implemented. Situations envisaged are:

- handover within UMTS due to change of radio resource caused by UE movement between areas covered by different transmitters;
- handover within UMTS due to change of UTRA radio access mode;
- handover due to change of radio system (eg UMTS to GSM).

It is possible that handover (ie change of radio resource) will occur in other situations, for example the technical implementation of the URAN may necessitate it or O&M procedures initiated by the operator may force it. Requirements for these situations are not within the scope of this document, with the exception of two remarks:

- where the technical implementation of the URAN necessitates handover as a matter of normal operation (i.e. not related to the above situations), then services shall in no way be degraded or adversely affected;
- the service requirements for handover occurring in situations such as O&M activity are outside the scope of this document.

2nd Editorial Change

3.1 Definitions

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

Connection mode (for a bearer service): characterizes the type of association between two endpoints as required by the bearer service for the transfer of information. A bearer service is either connection-oriented or connectionless. In a connection oriented mode, a logical association called *connection* needs to be established between the source and the destination entities before information can be exchanged between them. Connection oriented bearer services lifetime is the period of time between the establishment and the release of the connection.

Connectionless (for a bearer service): In a connectionless bearer, no connection is established beforehand between the source and the destination entities ; the source and destination network addresses need to be specified in each message. Transferred information cannot be guaranteed of ordered delivery. Connectionless bearer services lifetime is reduced to the transport of one message.

GSM coverage: an area where mobile cellular services are provided in accordance with GSM standards

UMTS coverage: an area where mobile cellular services are provided in accordance with UMTS standards.

Multi mode terminal: UE that can obtain service from at least one UTRA radio access mode ~~of UMTS~~, and one or more different systems such as GSM bands or possibly other radio systems such IMT-2000 family members.

Handover: The process in which the radio access network changes the radio transmitters or radio access mode or radio system ~~changing the network radio resources that are~~ used to provide the bearer services ~~for active connection mode teleservice.~~, while maintaining a defined bearer service QoS.

Intra PLMN ~~network~~ handover: Handover within the same ~~radio~~ network, ie having the same MCC-MNC regardless of radio access system. Note: this includes the case of UMTS <>GSM handover where MCC-MNC are the same in both cases.

Inter PLMN ~~network~~ handover: Handover between different PLMNs ~~radio networks~~, ie having different MCC-MNC ~~irrespective if within or between MSC or CN~~.

Inter system handover: Handover between networks using different radio systems ~~technologies~~, e.g. UMTS – GSM.

UTRA Radio access mode: the selected UTRA radio access mode ie UTRA-FDD;UTRA-TDD.

Radio system: the selected 2nd or 3rd generation radio access technology, eg UMTS or GSM.

3rd Editorial Change

4.2 General Operational Considerations

4.2.1 Coverage environment

Mechanisms defined to support handover between UMTS and other radio systems (such as ~~other UMTS modes,~~ other IMT 2000 family members, or GSM) or UTRA radio access modes should effectively cope with a number of coverage scenarios:

- limited UMTS coverage in a 'sea' of coverage provided by another radio system or UTRA radio access mode, or vice-versa;
- selective operation at a geographical boundary, with extensive UMTS coverage on one side and extensive coverage from another radio system on the other side;
- geographically co-located areas of UMTS coverage and another radio system.

However the standards should impose no restrictions or assumptions on how an operator might deploy or operate the network in both GSM and UMTS.

4.2.2 Inter ~~Operator~~ PLMN Handover Issues

Handovers between ~~GSM and UMTS networks operated by different operators~~ PLMNs should remain an optional feature to implement. It is envisaged that handover would take place due to changing radio conditions caused eg by movement of the terminal causing it toleave the coverage area of a ~~network~~PLMN.

The following networks may be involved with an inter-PLMN~~network~~ handover procedure. These concepts are illustrated in Annex A:

- the user's *home network*, i.e. the operator where the user's subscription may be found;
- the user's *visited network* where the subscriber user is currently registered, i.e. the network where the subscriber user has performed the last successful update location procedure. As long as the subscriber user is roaming roams within the home network, home and visited network are identical.
- the user's *serving network* covering the cell that serves the subscriber. After successful completion of the update location update procedure, the serving network is identical with the visited network. After an inter-PLMN~~network~~ handover, the visited network is different from the serving network until a location update procedure has been successfully completed (excepted the case that the subscriber returns into the visited network).
- the *target network* covering candidate target cell(s) for inter-PLMN~~network~~ handover. The target network has overlapping radio coverage with the serving network but not necessarily with the visited network.

The minimum requirements for inter PLMN~~network~~ HO are:

- continuity of an *active call* across the handover procedure, where this would be possible for intra-PLMN~~operator~~ handover;
- charging, billing and accounting for inter-PLMN~~network~~ handover should be according to the principles defined in UMTS 22.15. For R'99 the mechanisms currently used in GSM should be provided as a minimum (charging for handover leg is based on vistited network tariff, etc., settlement between operators is based on bulk metering, etc.);
- the ability to check with the home network whether the user is permitted to handover from the visited network to a target network;
- the decision whether the handover request is accepted must be taken by the target network;
- invocation of the handover procedure only occurs if the target network provides the radio channel type required

for the respective call;

- the avoidance of "network hopping", i.e. successive handover procedures between neighbouring networks for the same call;

- the possibility of user notification of inter PLMN~~network~~ HO (eg possible tariff change) when it occurs.

4.2.3 Charging and Network Management

Means shall be standardised which allow charging records to record the time of handover in the case of inter PLMN~~network~~ operator handover. Charging records must be able to reflect the level of service , ~~operation~~ UTRA radio access mode ~~(eg. FDD or TDD)~~ and network type after handover.

A capability to provide network management information relating to frequency of occurrence and type of handover should be defined.

4th Editorial Change

5.1 Handover due to UE Movement

It should be possible to provide a technical implementation of handover such that there is no measurable impact on the quality of any service when handover due to UE movement occurs. This does not imply that all UMTS handovers will achieve this ideal. However, the standards shall define at least one UTRA radio access mode in which this is possible given the following:

- UE speed stays within limits for given service;
- UE stays constantly within UMTS coverage of a single UTRAN.

5.2 Handover Between ~~UMTS~~ UTRA Radio Access Modes

The standards shall permit a technical implementation of handover between radio access modes~~in which service is continued~~, although there may be a temporary degradation ~~which may affect~~ of QoS on bearer ~~tele~~services at the time of handover.

5th Editorial Change

Annex A (informative): Illustration of elements in inter-PLMN~~operator~~ handover

Figure 1 illustrates the above definitions taking an example of European GSM networks. The subscriber's home network is France. The visited network where the subscriber is registered in a VLR is Germany. The signalling connection between HLR and VLR is indicated by dotted lines. The calls for the subscriber are controlled by the MSC collocated to the VLR where the subscriber is registered. This MSC is called "*anchor MSC*".

Handover to a different MSC may occur if the cell serving the subscriber after handover is not controlled by the anchor MSC. This MSC is called the "*serving MSC*".Even after the call has been handed over to a different MSC, the call control function remains in the anchor MSC. The signalling connection and circuit switched connection established between anchor MSC and serving MSC are indicated by a solid line.

When the French subscriber registered in a German network roams near the border to the Netherlands, inter-PLMN~~network~~ handover may occur. In this case a Dutch network is the *target network*. After handover, the anchor MSC located in a German network continues to control the call. The German network remains the *visited network* where the subscriber is registered. The subscriber's location information stored in the HLR remains unchanged. The signalling and circuit switched connections between the anchor MSC and the previously serving MSC in theGerman network will be released when the Mobile Station (MS) is served by a cell within a Dutch network. The Dutch network becomes the *serving network*. From the Dutch network the subscriber may be handed over to a Belgian network.

TSG-SA Working Group 1 (Services) meeting #4 *TSGS1#4(99)540*
Quebec City, Canada, 5-9 July 1999 Agenda 6.6.8

CHANGE REQUEST No : **005** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.129 Version: 3.0.0

Submitted to TSG_SA *list TSG plenary meeting no. here ↑* | for approval [ ] | without presentation ("non-strategic") [ ]
for information [ ] | with presentation ("strategic") [ ]

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [X] Network [X]

Work item: GSM UMTS Handover

Source: S1 ad hoc on handover 8.7.99 **Date:** 8.7.99

Subject: 1-1 handover principle.

Category: *(one category and one release Only shall be Marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			UMTS 99	X

Reason for change: To elucidate 1-1 handover principle for R99

Clauses affected: 4.2.2

Other specs Affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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4.2.2 Inter Operator Handover Issues

Handovers between GSM and UMTS networks operated by different operators should remain an optional feature to implement. It is envisaged that handover would take place due to changing radio conditions caused eg by movement of the terminal causing it toleave the coverage area of a network.

The following networks may be involved with an inter-network handover procedure. These concepts are illustrated in Annex A:

- the user's *home network*, i.e. the operator where the user's subscription may be found;
- the user's *visited network* where the subscriber user is currently registered, i.e. the network where the subscriber user has performed the last successful update location procedure. As long as the subscriber user is roaming roams within the home network, home and visited network are identical.
- the user's *serving network* covering the cell that serves the subscriber. After successful completion of the update location update procedure, the serving network is identical with the visited network. After an inter-network handover, the visited network is different from the serving network until a location update procedure has been successfully completed (excepted the case that the subscriber returns into the visited network).
- the *target network* covering candidate target cell(s) for inter-network handover. The target network has overlapping radio coverage with the serving network but not necessarily with the visited network.

The minimum requirements for inter network HO are:

- continuity of an *active call* across the handover procedure, where this would be possible for intra-operator handover;
- charging, billing and accounting for inter-network handover should be according to the principles defined in UMTS 22.15. For R'99 the mechanisms currently used in GSM should be provided as a minimum (charging for handover leg is based on vistited network tariff, etc., settlement between operators is based on bulk metering, etc.);
- the ability to check with the home network whether the user is permitted to handover from the visited network to a target network;
- the decision whether the handover request is accepted must be taken by the target network;
- invocation of the handover procedure only occurs if the target network provides the radio channel type required for the respective call;
- the avoidance of "network hopping", i.e. successive handover procedures between neighbouring networks for the same call;
- the possibility of user notification of inter network HO (eg possible tariff change) when it occurs.

For R99 there can only be one target PLMN for HO in addition to the serving PLMN for R99 in a given geographical area.

TSG-SA Working Group 1 (Services) meeting #4 *TSGS1#4(99)541*
Quebec City, Canada, 5-9 July 1999 Agenda 6.6.6

CHANGE REQUEST No : **006** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.129 Version: 3.0.0

Submitted to TSG_SA *list TSG plenary meeting no. here ↑* | for approval [ ] | for information [ ] | without presentation ("non-strategic") [ ] | with presentation ("strategic") [ ]

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [X] Network [X]

Work item: GSM UMTS Handover

Source: Rapporteur **Date:** 24.5.99

Subject: Clarification of the scope of mandatory requirements

Category: *(one category and one release only shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
UMTS 99	X

Reason for change: This CR arise in response to an action on TSG-S1 rapporteurs, viz: to clarify whether 'shall' or 'should' mandates either the development of technical standards, the capabilities of the implemenation, or both. Having examined 22.129, one ambiguity has come to light (see change).

Clauses affected: 7.4

Other specs Affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments: This change clarifies section 7.4 to indicate that there is no mandatory requirement for the implemenation of either the terminal or network to provide handover of multiple data bearer services from GSM to UMTS. However, the standards 'shall' define signalling to allow this possibility, ie TSG-S1 mandates the development of such standards.

Note: this is already clear in the case of UMTS to GSM handover (section 6.4), and UMTS to UMTS handover (section 5.4). Only section 7.4 (GSM to UMTS) needed changing.


help.doc

<--------- double-click here for help and instructions on how to create a CR.

7.4 Requirements on multiple bearer services handover from GSM to UMTS

Consideration must be given to multimedia services which may involve the use of multiple bearer services. For example Class A GPRS terminals will be capable of simultaneously supporting more than one data bearer services. The mapping between GSM/GPRS ~~data~~ bearer services and UMTS bearer services will depend upon many factors such as data rate, delay constraints, error rate etc. Means shall be ~~provided~~ defined to allow handover of several data bearer services from GSM to UMTS. Means shall be defined ~~provided~~ for the application(s) to indicate minimum acceptable QoS for services continuation after handover.

TSG-SA Working Group 1 (Services) meeting #4
Bernried, Starnberger, Germany 27th Sept – 1st Oct 1999

TSG S1 (99)565
Agenda Item: 6.3.6

CHANGE REQUEST No :	**007**	*Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*	
Technical Specification / Report UMTS	22.129	Version:	3.0.0
Submitted to TSG_SA *list TSG plenary meeting no. here ↑*		for approval	
		for information	
		without presentation ("non-strategic")	
		with presentation ("strategic")	

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: USIM [ ] TE [X] Network [X]
(at least one should be marked with an X)

Work item: GSM UMTS Handover

Source: Rapporteur **Date:** 21.7.99

Subject: Removes all non-R99 requirements, by changing them into Cross phase compatibility requirements which apply to R99.

Category: *(one category and one release Only shall be Marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			UMTS 99	X

Reason for change: (1) To carry out action on rapporteurs of 22.xxx documents: "include only requirements relating to R99" (2) To re-phrase Tdoc 539 on Subscriber preference for inter-PLMN handover.

Clauses affected: Passim

Other specs Affected:

Other releases of same spec		→ List of CRs:
Other core specifications		→ List of CRs:
MS test specifications / TBRs		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

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<--------- double-click here for help and instructions on how to create a CR.

1st Change *[Text deleted, in preparation for move to new section 8]*

5 Requirements for Handover from UMTS to UMTS

5.1 Handover due to UE Movement

It should be possible to provide a technical implementation of handover such that there is no measurable impact on the quality of any service when handover due to UE movement occurs. This does not imply that all UMTS handovers will achieve this ideal. However, the standards shall define at least one UTRA mode in which this is possible given the following:

- UE speed stays within limits for given service;
- UE stays constantly within UMTS coverage of a single UTRAN.

5.2 Handover Between UMTS Modes

The standards shall permit a technical implementation in which service is continued, although there may be a temporary degradation which may affect teleservices at the time of handover.

~~5.3 Handover Between Environments~~

~~UMTS is expected to provide coverage in a number of environments including fixed and mobile. The standard shall enable handover between these environments as described in the table below. The following are indicative of long term requirements and do not necessarily apply to R99. However, technical standardisation should not preclude the possiblity of implementing these requirements.~~

~~To~~ / ~~From~~	~~Terrestrial Cellular~~	~~Fixed/Cordless~~	~~Satellite~~
~~Terrestrial Cellular~~	~~Yes~~	~~Yes~~	~~Yes~~
~~Fixed/Cordless~~	~~Yes~~	~~Yes~~	~~Yes~~
~~Satellite~~	~~Yes~~	~~Yes~~	~~No~~

5.4 UMTS cell capacity

Consideration must be given services such as multimedia which may involve use of multiple bearers. Due for example to cell loading, it may happen that a target cell cannot support the combination of bearer services provided by the current serving cell. Means shall be provided for the application(s) to indicate minimum acceptable QoS for services continuation after handover. Although all UMTS bearer services may not be handed over, the handover to another UMTS cell should not be precluded.

2nd Change *[addition of a new section 8 in the normative text, incorporating text from 5.3, discussion of cross phase compatibility and future requirement for 'Subscriber Inter-PLMN handover preference']*

8 Cross Phase Compatibility for R99

This section details the cross phase compatibililty requirements relating to the service requirements in this document.

Note: when a change is introduced which affects the UMTS technical standards, it is said to be 'backward compatible' if existing equipment can continue to operate and perform correctly with equipment that conforms to the new implemenation.

8.1 Compatiblity With Existing Standards

There are no earlier releases of the UMTS standards for which backward compatibility is required.

Where the service and operational requirements in this document relate to a GSM PLMN, compatibility is required with GSM systems conforming to the R99 GSM standard.

8.2 Compatibility With Future UMTS Standards

It is envisaged that UMTS will evolve beyond R99, for example with the addition of new service requirements. The standards which define the technical implementation of R99 should be developed in such a way that it is practical to add the requirements in this section in a backward compatible manner.

8.2.1 Handover Between Environments

UMTS is expected to provide coverage in a number of environments including fixed and mobile as described in the table below. The technical standards should not preclude the possiblity of implementing these requirements in a backward compatible manner.

To / From	Terrestrial Cellular	Fixed/Cordless	Satellite
Terrestrial Cellular	Yes (R99)	Yes	Yes
Fixed/Cordless	Yes	Yes	Yes
Satellite	Yes	Yes	No

8.2.2 Subscriber Inter-PLMN handover Preference

The standards shall not preclude the backward compatible introduction of technical means which enable inter-PLMN handover based on subscriber’s preferred PLMN. A situation is illustrated in Annex A which explains the background to this service requirement. Since this requirement is motivated by particular circumstances which may not exist in every PLMN, its implementation within a given PLMN should be optional.

3rd Change *[Illustration of 'Subscriber Inter-PLMN handover preference' in non-normative annex]*

Annex A (informative): Illustration of elements in inter-operator handover

Figure 1 illustrates the above definitions taking an example of European GSM networks. The subscriber's home network is France. The visited network where the subscriber is registered in a VLR is Germany. The signalling connection between HLR and VLR is indicated by dotted lines. The calls for the subscriber are controlled by the MSC collocated to the VLR where the subscriber is registered. This MSC is called "*anchor MSC*".

Handover to a different MSC may occur if the cell serving the subscriber after handover is not controlled by the anchor MSC. This MSC is called the "*serving MSC*".Even after the call has been handed over to a different MSC, the call control function remains in the anchor MSC. The signalling connection and circuit switched connection established between anchor MSC and serving MSC are indicated by a solid line.

When the French subscriber registered in a German network roams near the border to the Netherlands, inter-network handover may occur. In this case a Dutch network is the *target network.* After handover, the anchor MSC located in a German network continues to control the call. The German network remains the *visited network* where the subscriber is registered. The subscriber's location information stored in the HLR remains unchanged. The signalling and circuit switched connections between the anchor MSC and the previously serving MSC in theGerman network will be released when the Mobile Station (MS) is served by a cell within a Dutch network. The Dutch network becomes the *serving network*. From the Dutch network the subscriber may be handed over to a Belgian network.

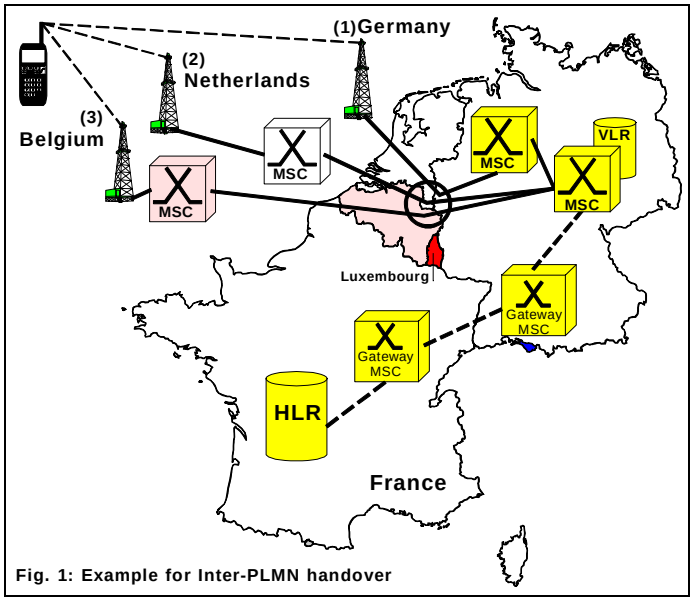

Figure 1: Example for inter-PLMN handover

A.1 Subscriber Inter-PLMN handover Preference

If a French subscriber within the Luxembourg network moves toward the German and French borders and a handover is desired, he should preferrably be handed over to his home PLMN (i.e., the French network). Note that in this same scenario a Luxembourg subscriber may prefer to be handed over to (eg) the German network. This illustrates the service requirement for subscriber preference on inter-PLMN handover.