Technical Specification Group Services and System Aspects ***TSGS#14(01)0715***

Meeting #14, Kyoto, Japan, 17-20 December 2001

Source: **TSG SA WG2**
Title: **CRs on 23.236 v.5.0.0**
Agenda Item: **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #14.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

Tdoc #	**Title**	**Spec**	**CR #**	**cat**	**Rel**	**WI**
S2-013209	Clarifications of Section 4.5 and 4.7	23.236	001r1	F	Rel-5	IU Flex
S2-013211	Corrections and Clarifications on Technical Requirements	23.236	003r1	F	Rel-5	IU Flex
S2-013212	Clarification on chapter 4.2 “Overview”	23.236	004r1	F	Rel-5	IU Flex
S2-013213	Clarification on chapter 4.3 “Pool area and Network Resource Identification”	23.236	005r1	F	Rel-5	IU Flex
S2-013214	Clarification on chapter 4.4 “NAS node selection function”	23.236	006r1	F	Rel-5	IU Flex
S2-013215	Clarification on RNC functions	23.236	007r1	F	Rel-5	IU Flex
S2-013218	Clarification on MSC functions	23.236	008r2	F	Rel-5	IU Flex
S2-013219	Clarification on SGSN functions	23.236	009r2	F	Rel-5	IU Flex
S2-013494	IMSI paging	23.236	010r1	F	Rel-5	IUFLEX

3GPP TSG-SA WG2 IuFlex phone conference ***Tdoc S2-013209***
13th Nov 2001 **revision of *Tdoc S2-012888***

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **001** ⌘ rev **1** ⌘ Current version: **5.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Clarifications to sections 4.5 and 4.7
Source:	⌘	Nokia, Siemens
Work item code:	⌘	IUFLEX
Date:	⌘	09.11.01
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Clarifications to sections 4.5 and 4.7.
Summary of change:	⌘	4.5: It is described in this section that in case of handover/relocation a load balancing between the CN nodes serving the same pool-area is gained by configuration. However, the description how to make the configuration when both nodes support the feature "Intra Domain Connection of RAN Nodes to Multiple CN Nodes to CN nodes" is a bit unclear and is proposed to be clarified. 4.7: In the context of this specification a "default node" always supports Iu-flex feature therefore following text is suggested to be removed *the Intra Domain Connection of RAN Nodes to Multiple CN Nodes to CN nodes*
Consequences if not approved:	⌘	Text may be interpreted in different ways.

Clauses affected:	⌘	4.5, 4.7
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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Next modified section

4.5 Load Balancing

Preferably, the NAS Node Selection Function in the RAN node balances the load between the available CN nodes. This is performed by an appropriate selection of the CN node for an MS which was not yet assigned to a CN node, i.e. when there is no CN node configured for the NRI indicated by the MS, when no NRI can be derived or in exceptional cases, e.g. when the CN node corresponding to an NRI cannot be reached. The load-balancing algorithm is implementation specific.

In case of handover/relocation into a pool-area a load balancing between all the target CN nodes serving thise ~~same~~ pool-area is gained by configuration. Source CN nodes which support Intra Domain Connection of RAN Nodes to Multiple CN Nodes may be configured with all possible target CN nodes for each handover/relocation target. ~~For each of the handover/relocation targets in a pool-area another CN node is configured as the target CN node.~~ Source CN nodes which do not support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes can configure only one target CN node per handover/relocation target. In this case each of source CN nodes which handover/relocate to the same pool-area may be configured with another target CN node out of all target CN nodes serving the same handover/relocation target.~~CN nodes which do support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes may improve the availability by configuring multiple target CN nodes for each handover/relocation target in a pool-area.~~ The mechanism for distribution of the traffic between the handover/relocation target CN nodes is implementation specific. This load balancing is complemented by the NAS Node selection Function in the RAN, which distributes MSs between the CN nodes when these MSs enter the pool-area in idle mode.

As more than one SGSN may send downlink data at the same time for a cell or a BVCI the total possible downlink traffic has to shared between the SGSNs as described in chapter 0 "5.3.2 Gb mode".

Next modified section

4.7 Default CN node and Backwards Compatibility

CN nodes that can only derive one CN node from the LAI or RAI (e.g. because they do not support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes, or no detailed knowledge of the NRIs is configured) are not aware, that multiple CN nodes may serve a LA or RA. These nodes can therefore contact only one CN node per LA or RA, respectively. This node will further on be referred to as default node.

A default node ~~that supports the Intra Domain Connection of RAN Nodes to Multiple CN nodes~~ resolves the ambiguity of the multiple CN nodes per LA or RA by deriving the NRI from the TMSI and P-TMSI. The default node relays the signalling between the new CN node and the old CN node.

Note that the default node is configured per LA or RA. So different CN nodes in a network might have configured different default nodes for a LA or RA. With this approach more than one of the CN nodes that serve a pool-area can be used as default-node, so load concentration on one node and a single point of failure can be avoided.

Note further, that it may be required to keep information on ongoing MAP/GTP dialogues in the default nodes.

The handover/relocation from CN nodes which do support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes to CN nodes not supporting this features does not need a NAS Node Selection Function in the originating CN node as there is only one target CN node. The originating CN node discovers from its configuration data, that there is only one target CN node for the requested handover/relocation target ID.

3GPP TSG-SA2 ***Tdoc S2-0132101***
Iu-Flex phone conference Nov 137, 2001

CR-Form-v4

CHANGE REQUEST

⌘	23.236	CR	003	⌘	ev	1-	⌘	Current version:	5.0.0	⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network X Core Network X

Title:	⌘	Corrections and Clarifications on Technical Requirements
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-095
Category:	⌘	F
Release:	⌘	REL-5

Use one of the following categories:
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B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to start working on Iu-Flex. To enable these groups to effectively perform the required actions it appears to be necessary to clarify some parts of the current version of 23.236 to avoid misinterpretations.
Summary of change:	⌘	Correct and Clarify the technical requirements in chapter 4.1
Consequences if not approved:	⌘	Unclear/missing requirements in 23.236 as input to RAN, GERAN and CN groups

Clauses affected:	⌘	4.1		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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****** FIRST MODIFIED SECTION ******

4.1 Iu Flex Technical Requirements

This provides a (non-exhaustive) set of technical requirements:

1. IuFlex capable RAN nodes such as the RNC/BSC shallould be able to select any CN node such as the SGSN/MSC-Server within a pool area
2. IuFlex capable RAN nodes and CN nodes should shall be able to co-exist with pre release-5 RAN nodes and pre release-5 CN nodes.

3. The network should shall provide the CN node routing information to the UE and the UE should shall store it.
4. The UE shall provide the routing information received from the serving CN node to the RAN node. During the initial non-access stratum signalling, the UE should provide to the RAN node the routing information for the current serving CN.
5. The solution shall enable the reduction of signalling within the core network (e.g reduction of the HLR signalling traffic).
6. The solution shall enable an improved scaling between radio access nodes and the core network nodes.

3GPP TSG-SA2 ***Tdoc S2-0132102***

Iu-Flex phone conference Nov 137, 2001

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **004** ⌘ ev **1-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Clarification on chapter 4.2 "Overview"
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-095
Category:	⌘	F ~~D~~
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications of the pool-area concept
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups

Clauses affected:	⌘	4.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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****** FIRST MODIFIED SECTION ******

4.2 Overview

Note: Clarification is required in order to remove RAN nodes and CN node terminology and to capture that this is referring to the control signalling aspects.

The Intra Domain Connection of RAN Nodes to Multiple CN Nodes overcomes the strict hierarchy, which restricts the connection of a RAN node to just one CN node. This restriction results from routing mechanisms in the RAN nodes which differentiate only between information to be sent to the PS or to the CS domain CN nodes and which do not differentiate between multiple CN nodes in each domain. The Intra Domain Connection of RAN Nodes to Multiple CN Nodes introduces a routing mechanism (and other related functionality), which enables the RAN nodes to route information to different CN nodes within the CS or PS domain, respectively.

The Intra Domain Connection of RAN Nodes to Multiple CN Nodes introduces further the concept of "pool-areas" which is enabled by the routing mechanism in the RAN nodes. A pool-area is comparable to an MSC or SGSN service area as a collection of one or more RAN node service areas. In difference to an MSC or SGSN service area a pool-area is served by multiple CN nodes (MSCs or SGSNs) in parallel which share the traffic of this area between each other. Furthermore, pool-areas may overlap which is not possible for MSC or SGSN service areas. From a RAN perspective a pool-area comprises all ~~of one or more~~ LA(s)/RA(s) of one or more RNC/BSC that are served by a certain group of CN nodes in parallel. ~~This does not exclude that o~~One or more of the CN nodes in this group may in addition serve LAs/RAs outside this pool-area or may also serve other pool-areas. This group of CN nodes is also referred to as MSC pool or SGSN pool respectively.

The Intra Domain Connection of RAN Nodes to Multiple CN Nodes enables a few different application scenarios with certain characteristics. The service provision by multiple CN nodes within a pool-area enlarges the served area compared to the service area of one CN node. This results in reduced inter CN node updates, handovers and relocations and it reduces the HLR update traffic. The configuration of overlapping pool-areas allows to separate the overall traffic into different MS moving pattern, e.g. pool-areas where each covers a separate residential area and all the same city centre. Other advantages of multiple CN nodes in a pool-area are the possibility of capacity upgrades by additional CN nodes in the pool-area or the increased service availability as other CN nodes may provide services in case one CN node in the pool-area fails.

An MS is served by one dedicated CN node of a pool-area as long as it is in radio coverage of the pool-area. Figure 1 shows most of the possible pool-area configurations. It contains CS pool-area 1 (RAN area 1, 2, 5, 6 served by MSCs 1, 2, 3), CS pool-areas 2 (RAN area 2, 3, 6, 7 served by MSCs 4, 5, 6), PS pool-area 1 (RAN area 1, 5 served by SGSNs 1, 2) and PS pool-area 2 (RAN area 2, 3, 6, 7 served by SGSNs 3, 4, 5). In addition the RAN areas 4 and 8 are served by MSC 7 and SGSN 6 without any usage of the Intra Domain Connection of RAN Nodes to Multiple CN Nodes. The possibility to configure overlapping pool-areas is shown by the CS pool-areas 1 and 2. The PS pool-areas 1 and 2 are configured non-overlapping. The pool-areas of the CS and the PS domain may be configured identical as CS pool-area 2 and PS pool-area 2 or they may be configured differently as shown by CS pool-area 1 and PS pool-area 1. The number or capacity of CN nodes is configured independently for each pool-area. The usage of the Intra Domain Connection of RAN Nodes to Multiple CN Nodes may be configured in parts of the network only. It co-exists with other areas not using this feature as shown in the figure with RAN areas 4 and 8 which are served by MSC 7 and SGSN 6.

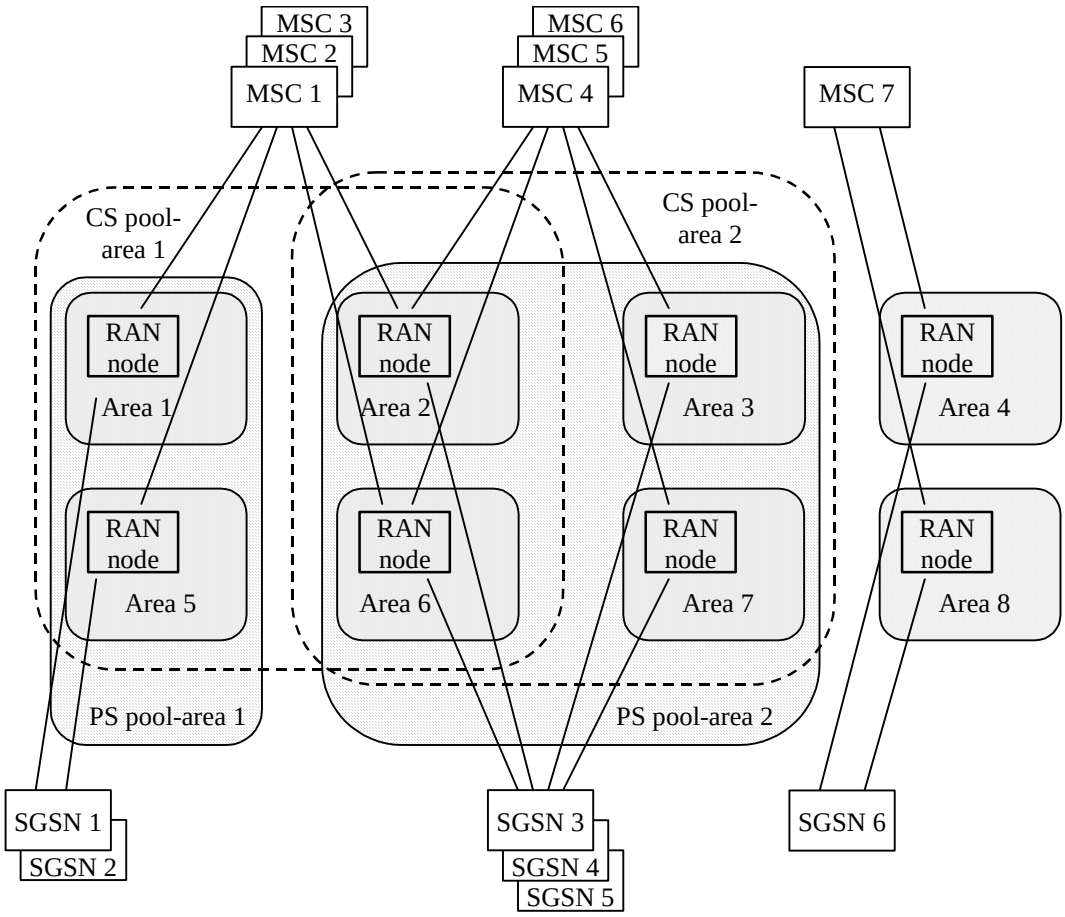

Figure 1: Pool-area configuration example

3GPP TSG-SA2 ***Tdoc S2-0132103***
Iu-Flex phone conference Nov 137, 2001

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **005** ⌘ ev **1-** ⌘ Current version: **5.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Clarification on chapter 4.3 "Pool area and Network Resource Identification"
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-095
Category:	⌘	F ~~D~~
Release:	⌘	REL-5

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F *(correction)*
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Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications on the pool-area and network resource identifier
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups and as a result slower progress on Iu-Flex

Clauses affected:	⌘	4.3		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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****** FIRST MODIFIED SECTION ******

4.3 Pool-Area and Network Resource Identification

A pool-area is an area within which an MS may roam without a need to change the serving CN node. A pool-area is served by one or more CN nodes in parallel. The complete service area of a RAN node (RNC or BSC) belongs to the same one or more pool-area(s). A RAN node service area may belong to multiple pool-areas, which is the case when multiple overlapping pool-areas include this RAN node service area. The pool-areas of the CS and of the PS domain are configured independently with the granularity of RAN node service areas. Therefore, all uniqueness statements below apply to each of the domains (CS/PS) separately. If LAs or RAs span over multiple RAN node service areas then all these RAN node service areas have to belong to the same pool-area.

The Network Resource Identifier (NRI) identifies uniquely an individual CN node out of all CN nodes, which serve in parallel a pool-area. The length of the NRI shall be the same in all nodes of a domain in one pool-area. In areas where pool-areas overlap the NRI identifies uniquely a CN node out of all CN nodes, which serve all these overlapping pool-areas, i.e. an NRI identifies uniquely a CN node within a RAN node. In case of overlapping pool-areas the NRI length shall be configured to be the same in all the nodes of a specific domain serving these pool-areas. Note again, that the NRIs of the CS and the PS domain are independent of each other as the PS and the CS domain CN nodes are addressed independently. More than one NRI may be assigned to a CN node.

The NRI is part of the temporary identity TMSI (CS domain) or P-TMSI (PS domain), which is assigned by the serving CN node to the MS. Each CN node which supports the "Intra Domain Connection of RAN Nodes to Multiple CN Nodes" is configured with its specific one or more NRI(s). The (P-)TMSI allocation mechanism in the CN node generates (P-)TMSIs which contain a configured NRI in the relevant bit positions. The NRI has a flexible length between 10 and 0 bits (0 bits means the NRI is not used and the feature is not applied).

In Iu mode the MS provides an Intra Domain NAS Node Selector (IDNNS) [5] in the AS part of the RRC-Initial-direct-transfer message to the RAN node (RNC or BSC). The IDNNS contains a routing parameter with a fixed length of 10 bits. This routing parameter transports the NRI value. In addition the IDNNS contains an indication from which identity (TMSI, IMSI, IMEI, ...) the routing parameter is derived. The RAN node masks the significant bits out of the routing parameter part of the IDNNS to determine the NRI which is relevant to identify the CN node. The most significant bit of the NRI shall correspond with the most significant bit of the routing parameter in the IDNNS.

In A/Gb-mode for the A interface the RAN node derives the NRI from any initial NAS signalling message. The RAN node masks the significant bits out of the TMSI to determine the NRI, which identifies the CN node. In A/Gb-mode for the Gb interface the RAN node derives the NRI from the TLLI. The RAN node masks the significant bits out of the TLLI to determine the NRI, which identifies the CN node. For all three cases, Iu, A interface and Gb mode, it is configured in the RAN node which bits out of the information elements provided by the MS are significant for the NRI.

The whole network may be configured as one pool-area, a network may configure multiple pool-areas and the configuration of pool-areas may be combined with MSC or SGSN service areas which are not belonging to pool-areas. The change of a pool-area is not visible to the MS. In general there is no need to detect a pool-area change. It may be advantageous for load balancing purposes to detect pool-area changes in the network to distribute MSs entering a pool-area to CN nodes with an appropriate load status. MSs changing a pool-area may be detected by configuration of different NRI values for adjacent pool-areas. The pool-area change information potentially provided in the IDNNS by an MS in Iu mode is ignored by the network.

3GPP TSG-SA2 ***Tdoc S2-0132104***

Iu-Flex phone conference Nov ~~7~~13, 2001

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **006** ⌘ ev **1-** ⌘ Current version: **5.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Clarification on chapter 4.4 "NAS node selection function"
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-0~~5~~9
Category:	⌘	~~D~~ F
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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R96	*(Release 1996)*
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R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications on the NAS node selection function in Iu-mode of operation
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups

Clauses affected:	⌘	4.4		
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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****** FIRST MODIFIED SECTION ******

4.4 NAS Node Selection Function

This function is used in RAN nodes and potentially in CN nodes. In the RAN node the function selects the specific CN node (i.e. MSC or SGSN) to which initial NAS signalling messages or LLC frames are routed. The NRI identifies the specific CN node. If the NAS Node Selection Function has a CN node address configured for the NRI derived from the initial NAS signalling message or from the LLC frame then this message or frame is routed to this address. If no CN node address is configured for the derived NRI or if no NRI can be derived (e.g. the MS indicated an identity which contains no NRI) then the NAS Node Selection Function selects an available CN node (e.g. according to load balancing) and routes the message or LLC frame to the selected CN node.

The pool-area has no influence on the decisions of the NAS Node Selection Function as pool-areas may overlap. The NAS Node Selection Function in the RAN node derives the NRI from the IDNNS when the MS is supported in Iu mode. When the MS is supported in Gb mode the NRI is derived from the TLLI and for A interface mode the NRI is derived from the TMSI.

Note:
A routing-area update after SRNS relocation is not an initial NAS signalling message, thus it is routed along the existing Iu-connection to the SGSN.

In case a MSC/VLR sends a paging-request/paging with IMSI, the NAS node selection function in the BSC/RNC shall upon reception temporarily store the MSC/VLR-identity of the node that issued the paging-request/paging message. If the MSC/VLR initiates the paging procedure via Gs-interface the SGSN has to add the MSC/VLR-identity to the paging-request/paging message.

If the NAS node selection function receives a paging-response with an IMSI then it should check the temporarily stored MSC/VLR-identities on entries matching this IMSI and forward the paging-response to the node identified by this MSC/VLR-identity.

An MS will return an Attach Request containing the IMSI parameter as a response to a PS IMSI paging. Also, a PS IMSI paging is not time supervised from the SGSN sending the message. Therefore the RAN node receiving such a paging request does not have to buffer the associated SGSN identity. This again means that the NAS Node Selection Function in the RAN node selects an available SGSN (e.g. according to load balancing) when it receives an Attach Request containing the IMSI parameter.

3GPP TSG-SA2 **Tdoc S2-0132~~1~~05**

Iu-Flex phone conference Nov ~~7~~13, 2001

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **007** ⌘ ev **1-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Clarification on RNC functions
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-09~~5~~
Category:	⌘	~~D~~ F
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications on the RNC functions for Iu-Flex support
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups

Clauses affected:	⌘	5.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** FIRST MODIFIED SECTION ******

5.2 RNC Functions

The RNC provides the NAS Node Selection Function. It masks the significant number of bits out of the IDNNS provided by the MS together with the initial NAS signalling message. The significant number of bits is configured in the RNC. The NAS Node Selection Function derives from the NRI the address of the specific CN node for the relevant domain (CS or PS). The association between NRI values and CN node addresses is configured in the RNC (O&M).

The RNC routes the initial NAS signalling messages according to the NRI and the "domain indicator" (CS or PS) to the relevant CN node if a CN node address is configured in the RNC for the specific NRI and the requested domain (CS or PS).

If no CN node address is configured in the RNC for the requested NRI or if the provided identity contains no NRI then the RNC routes the initial NAS signalling message to a CN node selected from the available CN nodes which serve the related domain (CS or PS). The selection mechanism is implementation dependent and should enable load balancing between the available CN nodes.

Note:
A routing-area update after SRNS relocation is not an initial NAS signalling message, thus it is routed along the existing Iu-connection to the SGSN.

In case a MSC sends a paging with IMSI, the RNC shall upon reception temporarily store the MSC/VLR-identity of the node that issued the paging message. If the MSC/VLR initiates the paging procedure via Gs-interface the SGSN has to add the MSC/VLR-identity to the paging message.

5.3.1 A interface mode

The BSC provides the NAS Node Selection Function. It is aware whenever a new RR connection is established. In particular, the BSC always examines the content of the Initial Layer 3 message sent by the MS in order to determine the position of the MS Classmark and to extract its contents. The examination of the Initial Layer 3 message content allows the BSC to observe the TMSI+LAI or IMSI or IMEI.

The BSC derives from Initial Layer 3 messages the NRI from the TMSI. It is configured in the BSC (O&M) which bits of the TMSI are significant for the NRI. The BSC routes the Initial Layer 3 message according to the NRI to the relevant MSC if an MSC address is configured in the BSC for the specific NRI. The association between NRI values and MSC addresses is configured in the BSC (O&M).

If no MSC address is configured in the BSC for the requested NRI, or if no TMSI is sent by the MS (e.g. an IMSI or IMEI), then the BSC routes the initial NAS signalling message to an MSC selected from the available MSCs. In addition, the BSC may route the initial NAS signalling message to an MSC selected from the available MSCs if this message is a Location Update Request messages and the PLMN ID in the LAI is not one of the PLMN IDs served by the BSC (FFS). The selection mechanism is implementation dependent and should enable load balancing between the available MSCs.

In case a MSC sends a paging-request with IMSI, the NAS node selection function in the BSC shall upon reception temporarily store the MSC/VLR-identity of the node that issued the paging-request message.

3GPP TSG-SA2 **Tdoc S2-0132180~~6~~**

Iu-Flex phone conference Nov ~~7~~13, 2001

CR-Form-v4

CHANGE REQUEST

⌘ **23.236** **CR** **008** ⌘ ev **2-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Clarification on MSC functions
Source:	⌘	L.M. Ericsson
Work item code:	⌘	IUFLEX
Date:	⌘	2001-11-0135
Category:	⌘	~~D~~ F
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications on required MSC functions to support Iu-Flex
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups

Clauses affected:	⌘	5.4		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** FIRST MODIFIED SECTION ******

5.4 MSC Functions

5.4.1 TMSI Allocation

Every MSC is configured with its one or more specific NRI (O&M). One of these specific NRIs is part of every temporary identity (TMSI) which the MSC assigns to an MS. The TMSI allocation mechanism in the MSC generates TMSIs, which contain one of the specific NRIs in the relevant bit positions. An NRI has a flexible length between 10 and 0 bits (0 bits means the NRI is not used and the feature is not applied). The use of the bits not used to encode the NRI is implementation dependent (e.g. to extent the TMSI space). An MSC applying “Intra Domain Connection of RAN nodes to multiple CN nodes” shall allocate TMSIs to the served MSs.

5.4.2 Mobility Management and Handover/Relocation

For MAP signalling between two MSCs which both support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes the new MSC derives the address of the old MSC from the old LAI and the NRI contained in the old TMSI. The MSC addresses for each LAI and NRI combination are configured in the MSC (O&M). If the network contains MSCs that cannot derive the old MSC from LAI and NRI the default MSC per LAI as described below shall be used (e.g. to reduce the configuration effort). Some redundancy may be required as the default MSC is a single point of failure.
The load balancing between multiple target MSCs at handover/relocation into a pool area is described in "4.5 Load Balancing". The handover/relocation from an MSC that supports the Intra Domain Connection of RAN Nodes to Multiple CN Nodes to an MSC not supporting the feature needs no new functionality, as there is only one MSC that serves the handover/relocation target.

5.4.3 Backward Compatibility and Default MSC

If a default MSC that is serving a pool-area receives MAP signalling (e.g. to fetch the IMSI or to get unused cipher parameters) it has to resolve the ambiguity of the multiple MSCs per LAI by deriving the NRI from the TMSI. The MSC relays the MAP signalling to the old MSC identified by the NRI in the old TMSI unless the default MSC itself is the old MSC. For every NRI value that is used in the pool-area an MSC address is configured in the default MSC (O&M). Note, that it might be required to keep information on ongoing MAP dialogues in the default MSC.

5.4.4 Support of Combined Procedures

If the SGSN does not support the Intra Domain Connection of RAN Nodes to Multiple CN Nodes then only one default out of the MSCs serving the related LA can be used for the combined procedures. A relaying or diverting from the default MSC to another is FFS. Distributing the associations of the combined procedures according to the LAs would result in MSC changes when the MS is still in the old MSC service area.

3GPP TSG-SA2 **Tdoc S2-01321907**
Iu-Flex phone conference Nov 713, 2001

CR-Form-v4

CHANGE REQUEST

⌘	**23.236**	**CR**	**009**	⌘ ev	**2-**	⌘ Current version:	**5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM [ ] ME/UE [ ] Radio Access Network [X] Core Network [X]

Title:	⌘	Clarification on SGSN functions	
Source:	⌘	L.M. Ericsson	
Work item code:	⌘	IUFLEX	***Date:*** ⌘ 2001-11-0145
Category:	⌘	D F	***Release:*** ⌘ REL-5
		Use one of the following categories: ***F*** *(correction)* ***A*** *(corresponds to a correction in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* Detailed explanations of the above categories can be found in 3GPP TR 21.900.	*Use one of the following releases:* 2 *(GSM Phase 2)* *R96 (Release 1996)* *R97 (Release 1997)* *R98 (Release 1998)* *R99 (Release 1999)* *REL-4 (Release 4)* *REL-5 (Release 5)*

Reason for change:	⌘	3GPP SA#2 has sent a LS to GERAN, RAN and CN group to detail the work done on Iu-Flex in SA2. To enable these groups to effectively perform the required actions it is necessary to clarify some parts of the current version of 23.236.
Summary of change:	⌘	Clarifications on the required SGSN function to support Iu-Flex
Consequences if not approved:	⌘	Unclear input to RAN, GERAN and CN groups

Clauses affected:	⌘	5.5		
Other specs affected:	⌘	[ ]	Other core specifications	⌘
		[ ]	Test specifications	
		[ ]	O&M Specifications	
Other comments:	⌘			

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** FIRST MODIFIED SECTION ******

5.5 SGSN Functions

5.5.1 P-TMSI Allocation

Every SGSN is configured with its specific one or more NRI (O&M). One of these specific NRIs is part of every temporary identity (P-TMSI) which the SGSN assigns to an MS. The P-TMSI allocation mechanism in the SGSN generates P-TMSIs which contain one of the specific NRIs in the relevant bit positions. An NRI has a flexible length between 10 and 0 bits (0 bits means the NRI is not used and the feature is not applied). The use of the bits not used to encode the NRI is implementation dependent (e.g. to extent the TMSI space). An SGSN applying "Intra Domain Connection of RAN nodes to multiple CN nodes" shall allocate P-TMSIs to the served MSs.

5.5.2 Mobility Management and Handover/Relocation

For the GTP signalling between two SGSNs supporting the Intra Domain Connection of RAN Nodes to Multiple CN Nodes the new SGSN derives the address of the old SGSN from the old RAI and the NRI contained in the old P-TMSI/TLLI. The SGSN addresses are configured in the SGSN (O&M) or in DNS for each RAI and NRI combination. If the network contains SGSNs that cannot derive the old SGSN from RAI and NRI the default SGSN per RAI as described below shall be used (e.g. to reduce the configuration effort).

The load balancing between multiple target SGSNs at handover/relocation into a pool area is described in "Load Balancing". The handover/relocation from an SGSN that supports the Intra Domain Connection of RAN Nodes to Multiple CN Nodes to an SGSN not supporting the feature needs no new functionality, as there is only one SGSN that serves the handover/relocation target.

5.5.3 Backward Compatibility and Default SGSN

If a default SGSN that is serving a pool-area receives GTP signalling (e.g. to fetch the IMSI or to get unused cipher parameters) it has to resolve the ambiguity of the multiple SGSNs per RAI by deriving the NRI from the P-TMSI. The SGSN relays the GTP signalling to the old SGSN identified by the NRI in the old P-TMSI unless the default SGSN itself is the old SGSN. For every NRI value that is used in the pool-area an SGSN address is configured in the relaying SGSN (O&M) or in DNS.

Note, that it might be required to keep information on ongoing GTP dialogues in the default SGSN.

5.5.4 Support of Combined Procedures

The SGSN has to select an MSC at the Gs interface for the combined procedures if multiple MSCs are configured for the relevant LAI. Preferably, the MSC out of the available MSCs is selected based on the IMSI. This prevents an MSC change for many MSs if an SGSN fails and the re-attaching MSs would get assigned another MSC by the new SGSN. Two HLR updates instead of one would be the result. ~~In addition the SGSN may perform load balancing at the Gs interface if this is required as the load balancing at the RAN - CN interface might be sufficient if not all MSs are attached to PS and CS (FFS).~~

Note, that the algorithm based on which the SGSN derives the MSC from the IMSI needs to be unique in all SGSNs and therefore should be standardized.

5.5.5 CS Paging

If a CS paging is received via the Gs interface from MSC with mobile identity type IMSI then the SGSN should include the MSC/VLR-id in the paging / paging-request message to RNC/BSC.

3GPP TSG-SA WG2 #21 ***S2-013494***
Cancun, Mexico, 26 – 30 November 2001 **revision of S2-013336**

CR-Form-v3

CHANGE REQUEST

⌘ **23.236** **CR** **010** ⌘ rev **2** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [X]

Title:	⌘	IMSI paging
Source:	⌘	Nokia
Work item code:	⌘	IUFLEX
Date:	⌘	27.11.2001
Category:	⌘	**C**
Release:	⌘	REL-5

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ⌘

This CR proposes to clarify the RNC functionality (Iu mode) and MS functionality in case of IMSI paging. 23.236 states that the RNC shall temporarily store MSC/VLR identity for IMSI paging. Even in this case, the TMSI previously allocated by the MSC/VLR may be available in the MS. If IMSI paging is initiated, it is initiated by this MSC/VLR e.g. in case of MSC/VLR reset or unsuccessful TMSI paging. The MS may use the available TMSI to derive IDNNS, and the RNC may use the routing parameter of IDNNS to select the right MSC/VLR.

In specific cases, TMSI may not be available in the MS. This may happen e.g. after an unsuccessful location updating attempt. If no TMSI is available, the MS has to derive IDNNS from IMSI.

When replying to IMSI paging, the MS deriving IDNNS from IMSI does not send the complete IMSI to the RNC. The MS derives only 10 bits of IMSI, which may not be sufficient in the RNC to find the right MSC/VLR identity in the case that the 10 bits derived from IMSI are not unique in the RNC.

Summary of change: ⌘

This CR proposes to allow deriving IDNNS from the available TMSI even in case of IMSI paging. It is also proposed that in 3GPP R5, the RNC may store (but does not have to store) the MSC/VLR identity for purposes to inrcrease the paging success rate.

Consequences if not approved: ⌘

If this CR is not approved, the RNC has to store MS specific information (the MSC/VLR identity for IMSI) during IMSI paging. If paging response is not received by the RNC after certain time, the RNC has to remove the stored information. Storing the information derived from paging messages and comparing that to paging responses makes the procedure much more inefficient when kept in mind that pagings plays a remarkable amount of procedures in real networks.

Clauses affected:	⌘	4.4, 5.1, 5.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

4.4 NAS Node Selection Function

This function is used in RAN nodes and potentially in CN nodes. In the RAN node the function selects the specific CN node (i.e. MSC or SGSN) to which initial NAS signalling messages or LLC frames are routed. The NRI identifies the specific CN node. If the NAS Node Selection Function has a CN node address configured for the NRI derived from the initial NAS signalling message or from the LLC frame then this message or frame is routed to this address. If no CN node address is configured for the derived NRI or if no NRI can be derived (e.g. the MS indicated an identity which contains no NRI) then the NAS Node Selection Function selects an available CN node (e.g. according to load balancing) and routes the message or LLC frame to the selected CN node.

The pool-area has no influence on the decisions of the NAS Node Selection Function as pool-areas may overlap. The NAS Node Selection Function in the RAN node derives the NRI from the IDNNS when the MS is supported in Iu mode. Wmhen the MS is supported in Gb mode the NRI is derived from the TLLI and for A interface mode the NRI is derived from the TMSI.

In case a MSC/VLR sends a paging-request/paging with IMSI (ie the paging message does not contain a TMSI), the NAS node selection function in the BSC~~/RNC~~ in A/ Gb mode shall upon reception temporarily store the Global-CN-ID~~MSC/VLR-identity~~ of the node that issued the paging-request/paging message. If the NAS node selection function in A/Gb mode receives a paging-response with an IMSI then it should check the temporarily stored Global-CN-ID on entries matching this IMSI and forward the paging-response to the node identified by this Global-CN-ID.

In case a MSC/VLR sends a paging-request/paging with IMSI (ie the paging message does not contain a TMSI), the NAS node selection function in the BSC/RNC in Iu mode may upon reception temporarily store the Global-CN-ID of the node that issued the paging-request/paging message. If the NAS node selection function in Iu mode receives an Initial Direct Transfer message with an IDNNS derived from IMSI as a result of IMSI paging, and if it has temporarily stored the Global-CN-ID then it should check the temporarily stored Global-CN-ID on entries matching this IDNNS and forward the paging-response to the node identified by this Global-CN-ID.

In UMTS, an MS answering a paging with IMSI includes in its response an IDNNS derived from its TMSI, if the MS has a valid TMSI. Temporarily storing the IMSI in the RNC increases the success rate to reach the MS that have both lost their TMSI and are paged with IMSI. In GSM, an MS paged with IMSI always answers with IMSI.

If the MSC/VLR initiates the paging procedure via Gs-interface the SGSN has to add the MSC/VLR-identity to the paging-request/paging message.

~~If the NAS node selection function receives a paging-response with an IMSI then it should check the temporarily stored MSC/VLR- identities on entries matching this IMSI and forward the paging-response to the node identified by this MSC/VLR-identity.~~

An MS will return an Attach Request containing the IMSI parameter as a response to a PS IMSI paging. Also, a PS IMSI paging is not time supervised from the SGSN sending the message. Therefore the RAN node receiving such a paging request does not have to buffer the associated SGSN identity. This again means that the NAS Node Selection Function in the RAN node selects an available SGSN (e.g. according to load balancing) when it receives an Attach Request containing the IMSI parameter.

< Next modified section>

5.1 MS Functions

In Iu mode the MS provides the IDNNS to the RNC in the access stratum part of the *RRC_initial_DT* message as described in [5].

When the MS in Iu mode replies to IMSI paging, it shall derive IDNNS from (P)TMSI if valid one is available. If (P)TMSI is not available, the MS shall derive IDNNS from IMSI.

No changes are expected in the MS for Gb or A interface mode.

5.2 RNC Functions

The RNC provides the NAS Node Selection Function. It masks the significant number of bits out of the IDNNS provided by the MS together with the initial NAS signalling message. The significant number of bits is configured in the RNC. The NAS Node Selection Function derives from the NRI the address of the specific CN node for the relevant domain (CS or PS). The association between NRI values and CN node addresses is configured in the RNC (O&M).

The RNC routes the initial NAS signalling messages according to the NRI and the "domain indicator" (CS or PS) to the relevant CN node if a CN node address is configured in the RNC for the specific NRI and the requested domain (CS or PS).

If no CN node address is configured in the RNC for the requested NRI or if the provided identity contains no NRI then the RNC routes the initial NAS signalling message to a CN node selected from the available CN nodes which serve the related domain (CS or PS). The selection mechanism is implementation dependent and should enable load balancing between the available CN nodes.

In case a MSC sends a paging with IMSI (ie the paging message does not contain a TMSI), the RNC mays~~hall~~, for purposes to increase the paging success rate, upon reception temporarily store the Global-CN-ID~~MSC/VLR identity~~ of the node that issued the paging message. If the MSC/VLR initiates the paging procedure via Gs-interface the SGSN has to add the Global-CN-ID~~MSC/VLR identity~~ to the paging message.