Technical Specification Group Services and System Aspects
Meeting #10, Bangkok, Tailand, 11-14 December 2000

TSGS#10(00)0619

Source: **Vodafone**

Title: Work Item Description: Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture

Document for: **Approval**

Agenda Item: **9.1**

3GPP TSG SA2#15 **S2-001983**
Makuhari, Japan, November 13th – 17th, 2000

Work Item Description

Title

Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture

1 3GPP Work Area

X	Radio Access
X	Core Network
	Services

2 Linked work items

BB2 RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[RAN 3 is predicted to lead the work in RAN]

BB3 GERAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[GERAN 2 is predicted to lead the work in GERAN]

BB4 CN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[CN 1 is predicted to lead the work in CN]

3 Justification

In the current network architecture, an RNC can only be connected to one MSC and/or one SGSN. The same restriction applies to BSCs. This has the following consequences:

a) when a BSC (or RNC) has a relatively large capacity compared to that of an MSC/SGSN there are frequently significant wastages of hardware. (For example, if a BSC has 40% of the capacity of an MSC, do you connect 2 or 3 BSCs to that MSC?)

b) as networks carry more traffic, the geographic area covered by one MSC or SGSN (of a given capacity) decreases. However, subscribers still tend to travel the same physical distances and therefore there are more inter-MSC/SGSN registration updates. The signalling associated with these inter MSC/SGSN updates causes additional load on MSCs, SGSNs, HLRs, the core network signalling networks and on the radio interface signalling channels.

The ability to connect RNCs and BSCs to more than one MSC and to more than one SGSN could reduce the above problems. In addition, the ability to provide load sharing between MSCs (SGSNs) would further improve the efficiency of hardware utilisation.

This work will focus on a solution where a routeing function is placed in the RNC (or BSC). This avoids most of the problems of a standalone node (TR 23.913 called it the Turbo Routeing Function), while retaining the other advantages of described in R'99, TR 23.913.

This Work Item (which is a Feature) proposes to provide a standardised mechanism for the connection of multiple MSCs (and SGSNs) to an RNC or a BSC (both A/Gb mode and Iu mode) which reduces mobility management signalling and permits improved efficiency in hardware utilisation.

It is intended that this new concept is an architectural option for any PLMN. Its deployment, or non-deployment, by one network operator should not place requirements on other network operators.

4 Objective

The objective of this Work Item is to produce a new stage 2 Technical Specification for this concept and to provide the necessary change requests to affected existing stage 2 and stage 3 specifications.

The new stage 2 would include:

- description of the proposed architecture
- identification of benefits and constraints
- impacts on mobility management and CN nodes
- impacts on handover/relocation in the CN
- impact on GSM BSS (both A/Gb and Iu cases) and on UMTS RNS
- techniques to avoid changes to mobiles and techniques to provide compatibility with R'99 and older mobiles
- proposals for control of the routeing from the RAN.

The list of affected existing specifications is given in section 10.

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects:	USIM	ME	AN	CN	Others
Yes		X	X	X	
No	X				X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for information at plenary#	Approved at plenary#	Comments
23.xxx	3G TS "Intra Domain NAS Node Selection Function"	SA2		SA#11	SA#11	

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
23.002		Overall architecture description		
23.003		Rules for TMSI partitioning		
23.007		None?		Need to verify that no changes are needed.
23.060		1) PS domain architecture 2) RA update handling 3) (combined) LA update handling 4) inter SGSN SRNC relocation		
24.008		Coding of NAS routeing parameter		
25.331		Inclusion of NAS routeing parameter in Initial Direct Transfer message.		
25.401		RAN architecture description		
25.413		Addition of "current MSC/SGSN load" message to RANAP		
29.002		None?		Need to verify that no changes are needed.
29.018		None?		Need to verify that no changes are needed.
29.060		None?		Need to verify that no changes are needed.
43.051		GERAN architecture description		
44.018				This feature does not require changes to 44.018. However, work on the "future BSS" Work Item may need to take this feature into account
48.008 48.018		Addition of "current MSC load" message to BSSMAP Addition of "current SGSN load" message to BSSGP		

11 Work item raporteurs

Stephen Terrill, Ericsson

12 Work item leadership

SA 2

13 Supporting Companies

Vodafone, Nokia, Ericsson, Nortel, Mannesmann

14 Classification of the WI (if known)

X	Feature (go to 14a)
	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

BB2 RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[RAN 3 leads the work in RAN]
This work involves the changes to 25.401, 25.413 and 25.331.

BB3 GERAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[GERAN 2 leads the work in GERAN]
This work involves changes to 43.051, 48.008, 48.018 and possibly 44.018.

BB4 CN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[CN 1 leads the work in CN]
CN 1 needs to update 24.008 and check 29.018.
CN 4 work is expected to only involve the verification that changes are NOT needed to their specifications.

14b The WI is a Building Block: parent Feature

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

3GPP TSG SA2#15 **1st attachment to S2-001983**
Makuhari, Japan, November 13th – 17th, 2000

Work Item Description

Title

RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

F1 Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture
SA 2 is responsible for this.

BB3 GERAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[GERAN 2 is predicted to lead the work in GERAN]

BB4 CN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[CN 1 is predicted to lead the work in CN]

3 Justification

In the current network architecture, an RNC can only be connected to one MSC and/or one SGSN. The same restriction applies to BSCs. This has the following consequences:

c) when a BSC (or RNC) has a relatively large capacity compared to that of an MSC/SGSN there are frequently significant wastages of hardware. (For example, if a BSC has 40% of the capacity of an MSC, do you connect 2 or 3 BSCs to that MSC?)

d) as networks carry more traffic, the geographic area covered by one MSC or SGSN (of a given capacity) decreases. However, subscribers still tend to travel the same physical distances and therefore there are more inter-MSC/SGSN registration updates. The signalling associated with these inter MSC/SGSN updates causes additional load on MSCs, SGSNs, HLRs, the core network signalling networks and on the radio interface signalling channels.

The ability to connect RNCs and BSCs to more than one MSC and to more than one SGSN could reduce the above problems. In addition, the ability to provide load sharing between MSCs (SGSNs) would further improve the efficiency of hardware utilisation.

This work will focus on a solution where a routeing function is placed in the RNC (or BSC). This avoids most of the problems of a standalone node (TR 23.913 called it the Turbo Routeing Function), while retaining the other advantages of described in R'99, TR 23.913.

This Work Item (which is a Feature) proposes to provide a standardised mechanism for the connection of multiple MSCs (and SGSNs) to an RNC or a BSC (both A/Gb mode and Iu mode) which reduces mobility management signalling and permits improved efficiency in hardware utilisation.

It is intended that this new concept is an architectural option for any PLMN. Its deployment, or non-deployment, by one network operator should not place requirements on other network operators.

4 Objective

The objective of this Work Item is to produce the necessary updates to the RAN TSs.

The list of affected existing specifications is given in section 10.

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects:	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2nd ary rsp. WG(s)	Presented for information at plenary#	Approved at plenary#	Comments

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
25.331		Inclusion of NAS routeing parameter in Initial Direct Transfer message.		
25.401		RAN architecture description		
25.413		Addition of "current MSC/SGSN load" message to RANAP		

11 Work item raporteurs

Brendan McWilliams, Vodafone

12 Work item leadership

RAN 3

13 Supporting Companies

Vodafone, Nokia, Ericsson, Nortel, Mannesmann

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

14b The WI is a Building Block

Parent feature: F1: Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture

SA 2 is responsible for this.

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

3GPP TSG SA2#15 **2nd attachment to S2-001983**
Makuhari, Japan, November 13th – 17th, 2000

Work Item Description

Title

GERAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

F1 Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture
SA 2 is responsible for this.

BB2 RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[RAN 3 is predicted to lead the work in RAN]

BB4 CN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[CN 1 is predicted to lead the work in CN]

3 Justification

In the current network architecture, an RNC can only be connected to one MSC and/or one SGSN. The same restriction applies to BSCs. This has the following consequences:

e) when a BSC (or RNC) has a relatively large capacity compared to that of an MSC/SGSN there are frequently significant wastages of hardware. (For example, if a BSC has 40% of the capacity of an MSC, do you connect 2 or 3 BSCs to that MSC?)

f) as networks carry more traffic, the geographic area covered by one MSC or SGSN (of a given capacity) decreases. However, subscribers still tend to travel the same physical distances and therefore there are more inter-MSC/SGSN registration updates. The signalling associated with these inter MSC/SGSN updates causes additional load on MSCs, SGSNs, HLRs, the core network signalling networks and on the radio interface signalling channels.

The ability to connect RNCs and BSCs to more than one MSC and to more than one SGSN could reduce the above problems. In addition, the ability to provide load sharing between MSCs (SGSNs) would further improve the efficiency of hardware utilisation.

This work will focus on a solution where a routeing function is placed in the RNC (or BSC). This avoids most of the problems of a standalone node (TR 23.913 called it the Turbo Routeing Function), while retaining the other advantages of described in R'99, TR 23.913.

This Work Item (which is a Feature) proposes to provide a standardised mechanism for the connection of multiple MSCs (and SGSNs) to an RNC or a BSC (both A/Gb mode and Iu mode) which reduces mobility management signalling and permits improved efficiency in hardware utilisation.

It is intended that this new concept is an architectural option for any PLMN. Its deployment, or non-deployment, by one network operator should not place requirements on other network operators.

4 Objective

The objective of this Work Item is to produce the necessary updates to the GERAN and RAN TSs.

The list of affected existing specifications is given in section 10.

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects:	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for information at plenary#	Approved at plenary#	Comments

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
25.413		Addition of "current MSC/SGSN load" message to RANAP		
43.051		GERAN architecture description		
44.018				This feature does not require changes to 44.018. However, work on the "future BSS" Work Item may need to take this feature into account
48.008 48.018		Addition of "current MSC load" message to BSSMAP Addition of "current SGSN load" message to BSSGP		

11 Work item raporteurs

Claude Arzelier, Vodafone

12 Work item leadership

GERAN 2

13 Supporting Companies

Vodafone, Nokia, Ericsson, Nortel, Mannesmann

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block:

Parent Feature, F1 Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture

SA 2 is responsible for this.

The Iu interface changes in 25.413 are one Work Task for this BB. This work task is part of BB2: RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

3GPP TSG SA2#15 **3rd attachment to S2-001983**
Makuhari, Japan, November 13th – 17th, 2000

Work Item Description

Title

CN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes

1 3GPP Work Area

	Radio Access
X	Core Network
	Services

2 Linked work items

F1 Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture
SA 2 is responsible for this.

BB2 RAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[RAN 3 is predicted to lead the work in RAN]

BB3 GERAN work for Intra Domain Connection of RAN Nodes to Multiple CN Nodes
[GERAN 2 is predicted to lead the work in GERAN]

3 Justification

In the current network architecture, an RNC can only be connected to one MSC and/or one SGSN. The same restriction applies to BSCs. This has the following consequences:

g) when a BSC (or RNC) has a relatively large capacity compared to that of an MSC/SGSN there are frequently significant wastages of hardware. (For example, if a BSC has 40% of the capacity of an MSC, do you connect 2 or 3 BSCs to that MSC?)

h) as networks carry more traffic, the geographic area covered by one MSC or SGSN (of a given capacity) decreases. However, subscribers still tend to travel the same physical distances and therefore there are more inter-MSC/SGSN registration updates. The signalling associated with these inter MSC/SGSN updates causes additional load on MSCs, SGSNs, HLRs, the core network signalling networks and on the radio interface signalling channels.

The ability to connect RNCs and BSCs to more than one MSC and to more than one SGSN could reduce the above problems. In addition, the ability to provide load sharing between MSCs (SGSNs) would further improve the efficiency of hardware utilisation.

This work will focus on a solution where a routeing function is placed in the RNC (or BSC). This avoids most of the problems of a standalone node (TR 23.913 called it the Turbo Routeing Function), while retaining the other advantages of described in R'99, TR 23.913.

This Work Item (which is a Feature) proposes to provide a standardised mechanism for the connection of multiple MSCs (and SGSNs) to an RNC or a BSC (both A/Gb mode and Iu mode) which reduces mobility management signalling and permits improved efficiency in hardware utilisation.

It is intended that this new concept is an architectural option for any PLMN. Its deployment, or non-deployment, by one network operator should not place requirements on other network operators.

4 Objective

The objective of this Work Item is to produce the necessary updates to the CN TSs and to verify that there is no impact on other CN TSs.

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects:	USIM	ME	AN	CN	Others
Yes				X	
No	X	X	X		X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for information at plenary#	Approved at plenary#	Comments

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
23.003		Rules for TMSI partitioning		Is this an SA2 or CN specification?
23.007		None?		Need to verify that no changes are needed.
24.008		Coding of NAS routeing parameter		
29.002		None?		Need to verify that no changes are needed.
29.018		None?		Need to verify that no changes are needed.
29.060		None?		Need to verify that no changes are needed.

11 Work item raporteurs

Duncan Mills, Vodafone

12 Work item leadership

CN 1

13 Supporting Companies

Vodafone, Nokia, Ericsson, Nortel, Mannesmann

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block:

Parent Feature, F1: Intra Domain Connection of RAN Nodes to Multiple CN Nodes: Overall System Architecture

SA 2 is responsible for this.

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)