TSG-RAN Meeting #15 ***RP-020041***
Jeju-do, Korea, 5 - 8 March 2002

(S2-020860, to TSG-RAN) Response to LS (R3-020286) on Shared network scenarios considered by TSG-RAN WG3

Title: **Response LS on Shared network scenarios considered by TSG-RAN3**

To: **RAN 3, SA 1, RAN, SA**

CC: **CN 4, CN 1, GERAN, SA 5**

Source: **SA 2**

Contact Person: Name: Chris Pudney
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Attachments: S2-020460 (=R3-020286)

SA 2 thanks RAN 3 for copying them the LS to SA 1 in R3-020286 (=S2-020460) on 'shared network scenarios'.

SA 2 are surprised that such a large architectural change is being started under the TEI work item in RAN 3. However SA 2 are pleased to see that SA 1 are now becoming involved in the establishment of the requirements for this Feature.

SA 2 suspect that this Work Item has architectural impacts, at least in as far as it impacts TS 23.002 and possibly interacts with the approved R'5 work item "Iu-flex". (Intra Domain Connection of RAN Nodes to Multiple CN Nodes).

SA 2 believe any change in the architecture should be correctly documented, at least, in order to ensure that future architectural developments interoperate with RAN 3's TEI.

SA 2 are uncertain as to whether or not a consistent set of stage 1, 2 and 3 specifications can be completed in the release 5 timeframe.

Following a brief review, some detailed issues are:

1) Does network sharing need to be considered for other radio access networks? (eg GERAN-Iu mode; GERAN A/Gb mode; or W-LAN)

2) Experience of national roaming has shown that it is beneficial to provide different national roaming rights to different subsets of one operator's subscribers. It is difficult to see how RAN 3 can provide this functionality

without the use of new MAP signalling (or by CN 4 approving the abuse of existing MAP signalling).

3) With regard to Figure 1 from R3-020286, there are likely to be multiple underlying GSM networks. Different subscribers within the GSM networks may have different “handover rights” to the different UMTS network segments. Has RAN 3 analysed this, and if so, does it have any impact on the GERAN, SA 2 or CN specifications?

3GPP TSG-SA WG2 meeting #23 **Tdoc S2-020460**
Sophia-Antipolis, France, 18th – 22nd February 2002

TSG-RAN WG 3 meeting #26 ***TSG R3-020286***
Vienna, Austria, 14th – 18th January 2002

To: **TSG SA WG1**

CC: **TSG SA WG2, TSG SA WG5**

Source: **TSG RAN WG3**

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Title: **Shared network scenarios considered by TSG-RAN3**

Introduction

Already during several meetings TSG-RAN3 has been working on the introduction of support for shared networks in the UTRAN.

In RAN3 there is consensus regarding the significance of enabling the support for shared networks, and therefore it is considered important to have the necessary features finalised in the UTRAN no later than release-5. This work is performed under the TEI-WI.

In the following pages, RAN3 described the shared network scenarios and related requirements it considers relevant to be covered by any UTRAN solution. RAN3 is currently investigating different solutions and will use the described shared network scenarios and requirements as a basis for selecting a solution.

Action

RAN3 would kindly like to ask SA1 to review the next sections and determine if it considers the correct scenarios/requirements to be covered. If SA1 has the opinion that any significant scenario/requirement is missing, RAN3 would like to ask SA1 to inform RAN3 with a liaision to RAN3#27 so that RAN3 is still able to take this input into account before finalising the Release-5 UTRAN solution.

Coming meetings

WG3#27	*18 – 22 February 2002*
TSG RAN#15	*05 - 08 March 2002*
WG3#28	*08 – 12 April 2002*

1. Considered shared network scenarios

RAN3 has considered two basic shared network scenarios:

1) Geographically Split Network

   E.g. 2 operators both covering part of the country, together providing UMTS access in the whole country.

2) Common Shared Network

   E.g. one UMTS operator providing UMTS service for himself and 2 other GSM operators

1.1. Geographically Split Network

The Geographically Split network solution results in a situation in which different UE's which are allowed access to a UTRAN have different access restrictions to different parts of this UMTS RAN. An example situation is shown in figure 1:

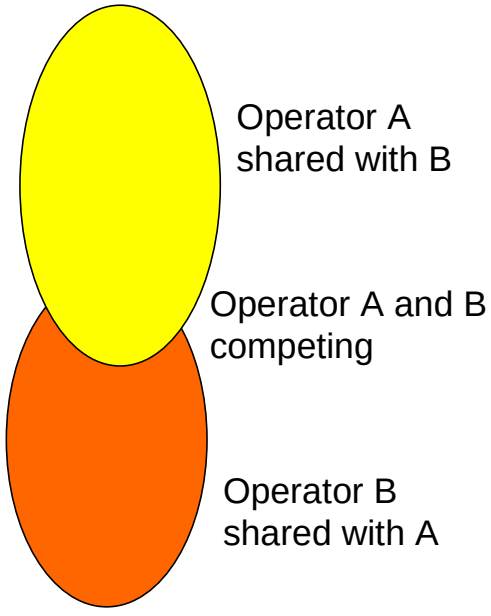

Figure 1: Geographically Split example

In this example, operator A and B work together to cover a whole country but still compete in the middle area where they both have coverage. The PLMN's of Operator A and B UMTS RAN's will typically be equivalent PLMN's in this solution. UE's of operator B might be allowed in the whole UTRAN of operator A except where the two UTRAN's overlap. In these overlap areas, access of

operator B UE's to LA/cells of operator A would normally be restricted. In Idle mode and connected mode other than CELL-DCH, national roaming on a regional basis (based on LA's), solves the problem. A consistent solution is needed for CELL-DCH state.

1.2. Common Shared Network

In the Common Shared Network scenario, there are no access issues within the UTRAN but at the borders of the UTRAN, the UTRAN has to consider the correct neighbouring GSM/UMTS cells as possible candidates for handovers.

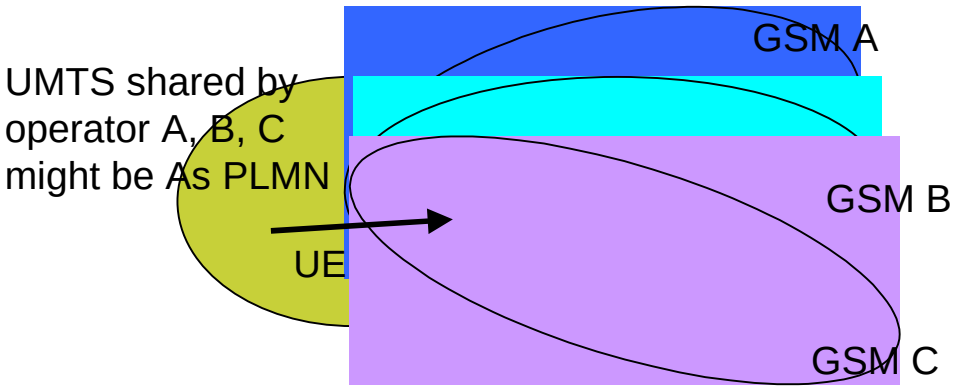

Figure 2: Common Shared Network example

In figure 2, UMTS operator A has allowed access to UE's from operators B and C to its UMTS network. When a UE moves as indicated, the correct GSM cells should be considered for handovers. The situation is further complicated because national roaming restrictions might exist between e.g. operator C and operator B. These NRR should be extended to all UE states.

1.3. Comparison

Note that although in figure 2, the neighbouring networks are considered to be GSM networks, this is not required; they could also be UMTS networks. Although in such a situation, there is more than 1 UMTS network involved, still this Common Shared Network case is quite different from the Geographically Split Network case:

- In the Geographically Split Network case, the shared UMTS area is covered by multiple (equivalent) UTRANs each with their own PLMN-Id, whereas in Common Shared Network case, the shared UMTS area is covered by one UTRAN (one PLMN-Id).
- In the Geographically Split case, the focus is on access restriction issues within the shared UTRAN. In the Common Shared Network case, the focus is on access restriction issues at the boundary of the shared UTRAN to cells of neighboring networks.

The above two cases should be considered "school examples". Real-life configurations might be complex combinations of these two cases. E.g., since the "equivalent PLMN UTRANs" of the

Geographically Split will typically also have neighbouring networks, the problem described for the Common Shared network might also occur at the boundary of the Geographically Split network.

In Idle mode, the CN will inform the UE about the applicable access restrictions when the UE performs Locations/Routing Area Updates (LAU/RAU). However, in CELL-DCH connected mode the UTRAN will be quite heavily involved in the accesss restrictions handling. This because for a UE in connected mode, the CN will not be informed about the mobility of the UE. As a result, for handovers the UTRAN will have to filter out the valid handover candidate cells from the list of all neighbouring cells present. In other modes than CELL-DCH connected mode, the access restrictions are handled thanks to NRR on a per LA basis. The access rights in all the UE modes/states must be aligned.

2. Requirements

RAN3 is using the following requirements for the UTRAN shared network solution:

1. The UTRAN shared network solution shall be able to handle the 2 shared network scenarios described above and (possibly complex) combinations of these scenarios.
2. The UTRAN shared network solution shall support a situation of up to 6 UTRAN operators together providing a UMTS coverage solution in a country.
3. The UTRAN shared network solution shall provide the possibility to handle differently the subscribers of each operator and roamers based on international roaming agreements. Access rights to a given area/cell shall be the same whatever the UE mode/state.
4. The UTRAN shared network solution shall also provide the possibility to handle an additional subscriber differentiation allowing e.g. to have different access rights for different international roamers.
5. The UTRAN shared network solution shall not exclude usage in multi-country situations i.e. situations where in neighbouring countries different existing shared network configurations are to be merged.