3GPP TSG-RAN meeting #21 **RP-030524**
Frankfurt, Germany, 16th – 19th September 2003

Agenda Item: 7.3.5

Source: Vodafone Group

Title: Discussion on removing the RRC Connection releasing option while Emergency camped on a F-PLMN during OOS

Document for: Discussion.

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1. Introduction

At RAN #20, CRs 1988-9 on 25.331 was approved. They stated that for R99 and Rel-4, the UE was allowed either to release the RRC connection when it camped on a cell for 'Limited Service' or to keep the connection and behave as in 'Idle' mode whilst camped on that cell. In addition, it was decided that Rel6+ UEs would always keep the RRC Connection under these conditions. However, despite a shadow CR being approved for Rel5 where both solutions are allowed, the final decision on whether the UE shall release or keep the RRC connection during 'Limited Service' in out of service conditions will only be made in RAN Plenary #21.

This paper discusses the technically endorsed CR's from by RAN2, highlighting the justifications, and pushing for a decision regarding the inclusion with RAN#21 plenary.

2. Background

The UE behaviour whilst in out of service conditions has been much debated in previous RAN2 and RAN meetings. During the Paging AdHoc meeting held in Paris on the 24th-25th of April, a number of issues related to mobility management procedures specified in Rel.99 were highlighted.

Mainly two major issues were found:

1. During OOS while UE is in Connected Mode, if timer T317 expires, the UE has to release the RRC connection without informing the network, causing a state de-synchronisation between the network and the UE. Thus the UE could not be reached by paging until the expiration of the (generally larger) timer T305. The solution (considering the T317 value to be equal to infinity) was discussed in RAN2 #36 and the relevant CR approved at RAN #20.

2. During OOS while the UE is in Connected Mode, no PLMN selection is performed, since PLMN search seemed to be specified only for Idle Mode. The solution has been discussed in RAN2 #36, with general agreement that the PLMN search should be performed by OOS UEs in connected mode, but due to lack of agreement on the exact UE actions, the issue has been given to the RAN Plenary to decide. At RAN #20, the major disagreement was about the action the UE has to perform while, after searching for another PLMN, it only finds a PLMN that is in the Forbidden PLMN list. The two options are:

    a.) For the UE to release the RRC connection and transit to Idle mode. Then if the UE will re-gain the RPLMN coverage it will re-establish the RRC connection.
    b.) For the UE to maintain the RRC connection. If the UE regains the RPLMN coverage, it will continue using the RRC connection. However, if the UE accesses the F-PLMN (for an emergency call), then the previous signalling connection will be released in advance.

    As said at the very beginning, the agreement at RAN #20 was that for:

    - For R99 and Rel-4, the UE may implement either the option a.) or the option b.) above.
    - For Rel6 and onwards UEs would always keep the RRC Connection under these conditions. (option b.))
    - Despite a shadow CR being approved for Rel5 where both solutions are allowed, the final decision on whether the UE shall release or keep the RRC connection during 'Limited Service' in out of service conditions will only be made in RAN Plenary #21

3. Advantages and Drawbacks

As far as UE implementation effort is concerned, it has been generally agreed that option a.) is simpler. However a number of companies stated that the due to the advantages of option b.), we should have this specified as the only solution.

The option b.) benefits are summarized as follows:

I. The extra load on the UTRAN and CN caused by the re-establishment of the RRC and Iu connection caused by the UE needing to perform RAU/LAU on return to RPLMN coverage would be saved.

II. The extra load on the UTRAN and CN caused by the extra functions (i.e. security) in the CN/UTRAN caused by the LAU/RAU when the UE regains RPLMN coverage would be saved.

From a system capacity point of view, the above advantages are for sure very important. It is quite easy to verify the positive impacts of the load saving, and from an Operator perspective this is very important.

However on the other hand, from an end-user perspective, a UE implementing the RRC release option might seem to have better performance if it implements option a.): this is due to the fact that in performing the LAU/RAU, the CN would potentially immediately trigger, for example, SMS delivery from the CS domain.

Hence there is currently no attraction for a UE manufacturer to implement solution b), even if it would be beneficial for the overall system capacity, since into added benefit is directly experienced by the end-user. Also the “maintaining RRC connection” option requires more effort from the UE side, since non-negligible software impacts are foreseen. Thus there is the concrete risk that a (generally agreed) BETTER solution would never be implemented if there were the possibility to implement both solutions to enable emergency camping!

4. Conclusion

Analysing the advantages and drawbacks of the two options, it is clear the option b.) is technically more beneficial. At the last RAN Plenary, it was agreed to have option b.) as the only solution for Rel.6, but still disagreement to have it as the only solution in Rel.5.

Vodafone believes that a single UE behaviour is always preferable and that option b.) is strongly required for avoiding unnecessary network load. In the Rel.99 and Rel.4 timeframe, this should be not so critical, bearing in mind the foreseen traffic growth and the UMTS penetration. However, in the Rel.5 timeframe, Vodafone strongly believe that option b.) should be the only one allowed.

It is therefore proposed to the RAN to agree on having option b.) as the only solution to enable emergency camping for Rel.5.