

TSG-RAN Working Group 1 meeting #21 TSGW1#2(99)112 ~~doc RAN WG1/98~~

Place : Yokohama (Japan), 22<sup>nd</sup>-25<sup>th</sup> February 99

**Agenda item** : **7.6 & 8.4** ~~Date~~ : ~~22<sup>nd</sup> - 25<sup>th</sup>~~  
~~1999~~

**Source** : **Nortel Networks**

**Title** : **Recommendations concerning the merging process for RACH**

**Document for** : **discussion** ~~Source~~ : **Nortel Networks**

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## 1. Introduction

In the merging process between ARIB and ETSI on the RACH scheme, ~~we have~~ Nortel has identified some potential problem with the current preamble repetition timing. As this issue is very linked to ~~Layer 23~~ radio interface protocols, we propose to initiate discussion with ~~L23~~ WG2 experts, for example through a Liaison statement to RAN WG2 on the issue, and to remove any assumption on this timing from the S1 description to prevent any misunderstanding between WG1 and WG2.

## 2. Description of the problem and recommendation

In the current ETSI RACH scheme, which is advised by ad-hoc 3 to be selected in the merging process for 3GPP, if the UE has not received the AI (Acquisition Indicator) from the BS in the slot following its preamble access, it is supposed to re-send its preamble in the following slot. However, there are some problems with this timing. If the UE does not receive the AI because of bad downlink transmission, then it will repeat its preamble over and over systematically with very short interval, and increase its power at each repetition, which will increase dramatically the interference without solving the problem. There should be some means to regulate that.

Another issue is the worst scenario when a limited number of only one signatures, or even one single signature, is available in a cell. Such case is indeed allowed for cells with low capacity, the number of signatures and number of access slots being a way to dimension the capacity of the RACH, for example in case of low capacity cell. In the protocol described in XX.07 (and now S1.14) in case of collision, the UE reselects a signature and retransmits the preamble in the following slot. In this case if a collision occurs between two UEs having selected using the same signature, at the same transmission instant, at the same distance from and they are received at about the same power by the BS (no capture effect), then they will retry at the following same time with the same signature with probability 1 in the case of one signature, or with a high probability in the case of a low number of signatures, over and over.

Thus ~~we see that~~ this scheme may create some problem in the access protocol. It could certainly be improved through some kind of randomisation of the re-transmission instants or other scheme, which would also increase the global performance of the access scheme, but this has to be discussed further in accordance with WG2-Layer23 considerations. Thus we propose to inform WG2 of the issue and initiate discussion with them to solve the problem. In order not to create any misunderstanding or inconsistency between the two groups documents, we propose to remove this assumption from the S1 description.

Also, the regulation of the uplink random access traffic is typically a function of the MAC layer, based on some admission control policy, and also with some potential differentiation between UEs depending on the service priority. Therefore, initial access after pre-amble decoding by the BS may be refused by the network, and WG2 has already started some discussions on how to perform admission control on the RACH by sending not only positive acknowledgements after pre-amble decoding, but also some scheduling information or even refusal for uplink access. This could be added to the random access procedure where clever arbitration can be performed on the randomisation procedure.

### **3. Conclusion**

In this document, we identified some potential problems linked to the current timing of preamble repetition in the ETSI scheme. Since ~~this is a~~ there is an important dependency on protocol issue aspects, we propose to initiate discussion on this issue with WG2, and to remove any reference to it in the S1 documents in order to prevent any misunderstanding between WG1 and WG2, or at least to put the point FFS pending further information coming from WG2.-