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Source :	**TSG RAN WG3**
Title:	**LS on CFN handling during hard handover**
To:	**TSG RAN WG2**
CC:	**TSG RAN WG1, TSG RAN WG4**
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TSG RAN WG3 is currently considering the issue of the CFN handling during hard handover.
Until now R3 specs do not adequately describe how the CFN is handled in this situation. In fact it has always been assumed that the CFN does not change during hard handover, but it seems that this cannot always be assured.
A precondition for handover without discontinuity in the CFN counters is that the UTRAN knows the correct value OFF_{target} which is needed to derive the Frame_Offset to be applied in the target Node B to map the SFN into the CFN (for uplink DCH frames) or the CFN into SFN (for downlink DCH frames), using the equations:

CFN = (SFN - Frame Offset) mod 256 (for uplink DCH frames)

SFN mod 256 = (CFN + Frame Offset) mod 256 (for downlink DCH frames)

The relation between Frame Offset and OFF_{target} may be found in 25.402 section 9.

Two cases have been identified:

a) the real value of OFF_{target} ($OFF_{target} = SFN_{arget} - CFN$) is known by the UTRAN before handover execution:
- a1) either because the SFN_{target} has been measured by the UE and reported to the UTRAN by means of the OFF_{target} before handover;
- a2) or because the UTRAN already knows the difference between serving cell SFN_{source} and target cell SFN_{target} and derives OFF_{target} from OFF_{source} by applying the difference between SFN_{target} and SFN_{source} (this difference between SFNs may be known in the UTRAN from previous UE's measurement reports);
- a3) [TDD - or because cells involved in the handover are synchronised – and hence OFF_{target} equals OFF_{source}].

b) the OFF_{target} is not known by the UTRAN before handover execution because the SFN_{target} cannot be measured by the UE before handover and the UTRAN does not know the difference between serving cell SFN and target cell SFN.

While in case a) no correction to CFN is needed during handover, it seems that in case b) the CFN need to be re-initialised after handover execution.

From TSG RAN WG3 point of view the solution in case b) could be to re-initialise the CFN as at first radio link setup. This requires that:

- the UE shall report an error indication to the UTRAN in case the UE fails in measuring the SFN_{target}.
- the PHYSICAL CHANNEL RECONFIGURATION message shall allow to report a new value of the DOFF parameter.
- the UE shall re-initialise the CFN as at first radio link setup when it receives a new value of the DOFF parameter in the PHYSICAL CHANNEL RECONFIGURATION message.

This solution implies that in case b):

- the CFN jumps during handover (i.e. there is a discontinuity in the CFN).
- there may be a discontinuity of the TTI during handover (due to the discontinuity in the CFN).

Furthermore this solution implies extra complexity from RAN WG3 prospective, e.g. transport bearers must be release and re-established (i.e. no transport bearer reuse can be adopted). Therefore RAN WG3 would prefer to avoid this solution.

TSG RAN WG3 would therefore like to ask TSG RAN WG2 the following questions:

1. in which cases the SFN_{target} cannot be measured by the UE before handover?
2. what value of OFF_{target} is reported by the UE in case the SFN_{target} cannot be measured by the UE before handover?
3. does the UE report any error indication to the UTRAN in case the SFN_{target} cannot be measured by the UE before handover? If not, could RAN WG2 introduce such an indication?
4. is there any problem if the CFN jumps (i.e. there is a discontinuity in the CFN) during handover?
5. is it acceptable to have a discontinuity of the TTI during handover (due to the discontinuity in the CFN)?
6. how does currently the UE behave when it receives a new value of the DOFF parameter in the PHYSICAL CHANNEL RECONFIGURATION message?