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Agenda Item : AH22 : Terminal power saving features
Source : Nortel Networks
Title : Interactions between DPCCH gating and monitoring for handover purposes
Document for : Discussion

1. Introduction

During RAN1#17 in Stockholm, it was identified that interaction between gating mode and compressed mode still needed some elaboration. Indeed the current assumption in RAN1 is that gating mode and compressed mode cannot be activated at the same time as stated in the technical report 25.840. More precisely gating has to be terminated by higher layer signalling before compressed mode can be activated i.e. when a compressed mode pattern sequence is active gating cannot be used during non compressed frames if this compressed mode pattern sequence contains a certain number of non compressed frames in between compressed frames.

This paper lists a number of issues in the interactions between handover preparation and gating mode. Two cases are studied : configuration of measurements which require compressed mode and configuration of measurements which do not require compressed mode.

2. Measurements which require the activation of compressed mode.

This corresponds to a UE which needs compressed mode either inter-frequency or inter-system measurements.

?? Gating mode and compressed mode are mutually exclusive this implies that either the UE does not need to perform measurements during the time when gating is active or gating has to be disabled whenever measurements are needed by the UTRAN to manage the mobility of the UE.

the 1st case leads to a very restrictive use of gating i.e. the UE has to be in low mobility conditions where measurements are not needed by the UTRAN so often. It is still to be clarified whether this is a realistic case and to which extent it would not degrade the performance as far as mobility management is concerned. This could lead to dropped calls due to the lack of information reported by the UE. The UTRAN might miss the opportunity to handover the UE to another cell.

This point can be further detailed if we consider the different types of measurements normally performed by the UE i.e. when gating is not activated

- inter-frequency measurements : this might not be so critical since there can be some solutions in terms of networks deployment to overcome the issue. If the UE is not able to measure on another frequency but measurements are still needed, as most operators will have several carriers measurements can be performed on one frequency (same as the current frequency) and used assuming the two frequencies are co-located.
- inter-system measurements : in this case it seems very difficult to use the same method as proposed above. So this latter case would simply mean no measurements performed by the UE during gating mode. It is difficult at this point to predict the impact of such a mode of operation (no inter-system measurement) considering realistic mobility conditions.

the 2nd case means continuously switching between gating mode and compressed mode. This will generate some higher layer signalling and moreover also implies that the claimed battery savings are not likely to be met. What is the impact of switching between gating mode and compressed mode for measurement purposes on the battery life gains presented in TR 25.840? This kind of evaluation should also take into account the fact that gating has to be turned off not only to allow the UE to perform the measurement but also to allow the UE to report the performed measurements. This latter case could be avoided by using the embedded mode

provided the amount of information to be reported corresponds to the allowed transport format combinations during the embedded mode.

There is currently no data available to assess the feasibility of either options. Which one is the most likely to be used? Which connection can handle a lack of measurement for certain period of time? What is this time and is this compatible with the foreseen use of gating mode? In the other case what is the amount of signalling generated by the turn on/off of gating and can it be supported by the interfaces still preserving the estimated gain in terms of battery saving?

3. Measurements which do not require the activation of compressed mode

This corresponds either to intra-frequency measurements or to inter-frequency or inter-system measurements performed by UEs which do not require compressed mode.

In this configuration gating can be maintained as far as performing the measurements is concerned (if RX gating is not enabled) however there is need to ensure that the measurements performed by the UE can be reported to the UTRAN. Typically as gating can be maintained while the UE performs the measurements, the reporting would correspond to the embedded DPDCH mode of gating.

If Rx gating is enabled it should be clarified whether for all cases of gating rate the amount of time when the UE receiver is switched on is sufficient to perform the necessary tasks on the active connection plus some measurements on other cells. This latter point might be particularly critical for intra-frequency measurements.

Indeed either if the UE has some intra-frequency measurements to perform and it is often the case it will not be able to enter Rx gating or Rx gating prevents the UE from performing these measurements.

This last points also needs to be studied to clarify whether this implies that the UE will always be in embedded mode or whether the reporting rate of measurements will be decreased.

4. Conclusion

This paper lists a number of issues in the interactions between monitoring for handover purposes (either soft or hard handover) and DPCCH gating. From a first high level analysis it appears that either mobility management is going to be degraded by the activation of DPCCH gating or the claimed battery savings are not likely to be met since normal gating mode will seldom be activated.

5. References

[1] : TR 3GPP25.840 : terminal power saving features (Release 4).

[2] RP-00-xxxx: RAN plenary #10 meeting minutes.