

Agenda Item: 11
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1 INTRODUCTION

In this contribution, we discuss about issues, which are important and critical from cell selection performance point of view. A text proposal is also provided into the relevant part of the idle mode specification.

2 DISCUSSION

One of the important performance measures for cell selection is cell selection delay. From user point of view the time it takes from power on to service state should not be too long especially when HPLMN is available. This means that cell selection algorithm at switch on should be such that it allows HPLMN or the last registered PLMN to be selected as soon as it has been found. Minimum cell selection delay for HPLMN or the last registered PLMN should also be possible in case of initial cell selection, where no prior knowledge of RF channels is available. The optimum cell for the selected PLMN can then be found by utilising neighbour cell list given on BCCH and therefore there is no need to continue the blind search of rest of the carriers after finding HPLMN or the last registered PLMN. This way the cell selection delay can significantly be reduced e.g. when returning to the home country.

Searching of more than one cell per carrier for identifying possible PLMNs to camp on should be carefully considered since it may dramatically increase the cell selection delay without really giving any extra benefit. The scanning of all RF carriers in the WCDMA system is not so straightforward and reliable as e.g., in GSM. Methods do not exist to limit the number of carrier frequencies to be searched. When no stored information is available in the UE, the number of frequencies to be searched is very large due to the 200kHz frequency raster. The choosing only one cell per carrier frequency for PLMN identification does not, however, prevent the UE to camp on the most suitable cell of the selected PLMN, since the optimum cell can be found by using the neighbour cell list as mentioned before.

The only case, when all the cells on one particular frequency band could not be found when searching for one cell per carrier and then utilising the neighbour cell list, is country borders where more than one operator share the same frequency band. Fair cell and PLMN selection on country borders could be handled on other fashion.

For instance, the operators sharing the RF band could agree on used transmission power in order not to interfere each other too much. In order to make initial cell selection delay acceptable, the cell with the highest peak in the first step of the 3-step cell search algorithm should be chosen for the scrambling code identification and furthermore for the PLMN identification. On the other hand HPLMN can always be found any way with relatively short delay since when selecting some other PLMN but HPLMN the UE regularly searches for HPLMN. So even if the UE searches for one cell per carrier and thereby it temporarily misses HPLMN (e.g. when coming back to the coverage area of HPLMN), HPLMN is found soon and thereby no harm has been caused.

5.1 PLMN selection and reselection

The non-access stratum selects a suitable PLMN. Normally, the UE operates on its Home PLMN (HPLMN). However, a visited PLMN (VPLMN) may be selected, e.g., if the UE loses coverage with its HPLMN. There are two modes for PLMN selection:

- i) Automatic mode - This mode utilizes a list of PLMNs in priority order. The highest priority PLMN that is available and allowable is selected.
- ii) Manual mode - Here the UE indicates which PLMNs are available to the user. Only when the user makes a manual selection does the UE try to obtain normal service on the VPLMN.

In the automatic mode, the UE will look for more suitable PLMNs regularly, if necessary. This is referred to as PLMN-reselection. Particularly, ~~in the home country of the UE~~, the UE will try to get back to its Home PLMN. The repetition cycle of the regular HPLMN search can be different in the home country and abroad.

~~Selection of the radio access system may be part of the PLMN selection and reselection process or it may be a separate process inside NAS [FFS].~~

~~[Note: Details of the possible NAS process of the radio access system selection are out of the scope of TSG-RAN WG2.]~~

5.2.1 Cell Selection Process

For a selected PLMN the UE attempts to find a suitable cell to camp on. The cell selection can be performed with two following methods.

a) Normal Cell Selection

In this case the cell selection is made without prior knowledge of RF carriers. The UE searches all the carriers to find a suitable cell. However, in case HPLMN or the last registered PLMN is found before going through all carriers, the search of the rest of carriers can be stopped. On each carrier, the UE searches first for a scrambling code for the strongest cell in order to find out, which PLMNs are available. After the UE has found one suitable cell for a selected PLMN, it makes neighbour cell measurement e.g. based on neighbour cell list in order to camp on the most suitable cell of the selected PLMN.

b) Stored Information Cell Selection

The cell selection is made based on information stored in the UE. The UE stores carrier frequency and PLMN information and potentially also scrambling code information. The scrambling code information should not, however, be requirement to camp on the last registered PLMN. After the UE has found one suitable cell for a selected PLMN, it makes neighbour cell measurement e.g. based on neighbour cell list in order to camp on the most suitable cell of the selected PLMN. The cells belonging to the selected PLMN and not barred or forbidden are compared between each other using the cell selection criteria.

[Note: The scrambling code information may not be necessary for the Stored Information Cell Selection.]

4 REFERENCES

- [1] TS 25.304, v1.2.0, "UE procedures in idle mode", source: TSG RAN WG2.