
Source: Nokia
Title: Selection of a PLMN accessed via an I-WLAN
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1. Summary

CR S1-040549 outlined a PLMN network selection procedure with no reference to e.g. SSID selection and WLAN-AN functionality in general, since these are considered “out of scope” of 3GPP. As this paper seeks to highlight, the algorithm as described contains several implicit assumptions about WLAN-AN behaviour and functionality in general and SSID selection in particular. It is the first target of this paper to highlight those assumptions. The paper then goes further to suggest refinements and improvements to the overall PLMN selection. Note that we do NOT seek to add WLAN-AN functionality and SSID selection to a PLMN selection procedure – as we demonstrate such functionality is already implicitly there. Rather we seek to use SSID selection more efficiently in order to improve the overall PLMN selection procedure.

2. Discussion

In the following, we will:

- (1) Describe how the proposed PLMN selection procedure (the first step in both automatic and manual network selection procedures) implicitly makes use of an SSID selection mechanism.
- (2) Demonstrate that the whole algorithm described below is heavily reliant on the WLAN-AN specific “Network Advertisement” procedure (i.e. a procedure very much out of 3GPP scope to mandate as mandatory)
- (3) Describe an important use case not covered in the original algorithm

2.1 Implicit SSID selection in PLMN discovery procedure

For the first step of both the automatic and manual selection procedures, the following is performed:

For each of the WLANs available the UE shall attempt to discover the PLMNs available via the particular WLAN.

The quote above implies that “**for each of the WLANs available**” the UE shall perform a search procedure. In practice this means associating with each SSID in turn and performing the network discovery procedure. The question arises: in which order shall the WLAN-UE associate with the SSIDs? It may have identified e.g. 20 SSIDs and must now search each. To do so randomly or in alphabetical order could potentially be very inefficient and costly (remember that this is costly in terms of both WLAN-UE power dissipation and network signalling). The efficiency of the search procedure is improved greatly by using a preferred SSID list, configured either by the operator or the user into the USIM or terminal. The WLAN

UE attempts to connect directly through each of the SSIDs in turn, taking the most preferred SSID first and progressively working through the list.

It is therefore proposed that the usage of SSID lists should be allowed in order to optimize the PLMN search procedure.

2.2. Reliance on WLAN-AN specific “Network Advertisement” Procedure

Step (1) of the PLMN selection procedure contains two key functionalities:

- (i) An attempt to find a direct connection to the HPLMN. This is done by performing network discovery i.e. sending the EAP-response/Identity message containing the root-NAI ([username@hplmn_id](#)).
- (ii) Discovery of the list of PLMNs through which the WLAN-UE can try to connect indirectly to the HPLMN, if no direct connection is found to exist. This is realized by functionality in the WLAN-AN, *the Network advertisement procedure*: if WLAN-AN cannot supply a direct connection to the HPLMN it **may** send back a list of supported PLMNs using the optional WLAN-AN specific “network advertisement procedure”.

The PLMN selection procedures described later in the algorithm depend crucially on the WLAN-AN sending the PLMN list. If no PLMN list is returned from a particular SSID, that SSID (and hence associated WLAN-AN) is no longer involved in the PLMN selection procedure, since it supplies none of the available PLMNs from which the PLMN selection is made.

Hence if there are e.g. 20 available SSIDs and only one of them has been updated to support PLMN advertisement, in the proposed algorithm the WLAN UE is forced to select that SSID and it is left with no means to choose any of the other available SSIDs. Please, note the **heavy loss for operators** in terms of number of connections to their networks, specially regarding to **roaming** agreements and **first deployment** of the WLAN IW; since it cannot be guaranteed that all **legacy APs** and **legacy terminals** will be updated to support Network Discovery (which is turn is optional in 3GPP).

Therefore, the overall PLMN search procedure relies very heavily on the implementation of the network advertisement procedure in the WLAN-AN. The implementation of this procedure in WLAN AN is something 3GPP cannot mandate! Consequently, the reception of the PLMN lists is something that 3GPP shall not rely on when defining 3GPP procedures.

2.3. Use case not covered in the existing algorithm

Total reliance on network advertisement in the PLMN selection algorithms fails to cover the following use case in the PLMN selection:

Use case: NONE of the available WLAN-ANs has either (i) a direct connection to the HPLMN or (ii) implemented the network discovery procedure.

In this case, the WLAN-UE receives no supported PLMN list and hence cannot proceed with the algorithm as described below.

In this case the WLAN-UE should sequentially associate with each of the SSIDs in turn. At each SSID, the WLAN-UE, tries to connect via each VPLMN listed in its user and/or operator defined preferred PLMN list. If no connection can be made, the WLAN-UE should try another SSID and repeat the procedure. Clearly again at this stage, usage of a prioritised SSID list would be beneficial. It is further proposed as an optimisation that at this stage, the user could make a manual selection of which SSID he would prefer to use.

3 Conclusion

It is therefore proposed that the Network selection procedure as described in S1-040549 is modified as in the proposed revision under Tdoc SP-040423. This introduces SSID lists for both automatic and manual selection.