

# Technical Disclosure Commons

---

Defensive Publications Series

---

20 Aug 2024

## REDIRECTION OF USER DEVICES TO ALTERNATIVE VPLMNS DURING CAPACITY OVERLOAD

Vimal Srivastava

Sri Gundavelli

Ravi Kiran Guntupalli

Follow this and additional works at: [https://www.tdcommons.org/dpubs\\_series](https://www.tdcommons.org/dpubs_series)

---

### Recommended Citation

Srivastava, Vimal; Gundavelli, Sri; and Guntupalli, Ravi Kiran, "REDIRECTION OF USER DEVICES TO ALTERNATIVE VPLMNS DURING CAPACITY OVERLOAD", Technical Disclosure Commons, (August 20, 2024)

[https://www.tdcommons.org/dpubs\\_series/7288](https://www.tdcommons.org/dpubs_series/7288)



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

This Article is brought to you for free and open access by Technical Disclosure Commons. It has been accepted for inclusion in Defensive Publications Series by an authorized administrator of Technical Disclosure Commons.

## REDIRECTION OF USER DEVICES TO ALTERNATIVE VPLMNS DURING CAPACITY OVERLOAD

### AUTHORS:

Vimal Srivastava  
Sri Gundavelli  
Ravi Kiran Guntupalli

### ABSTRACT

Techniques described herein provide for temporarily redirecting a user device to a partner VPLMN when a current serving VPLMN is congested. In particular, the serving network indicates to a Home Public Land Mobile Network (HPLMN) that a congestion condition has occurred so that the HPLMN can trigger redirection of UEs to a different VPLMN. In addition, a UE may inform the HPLMN about poor QoS so that the HPLMN can redirect the UE to different VPLMN. Furthermore, the HPLMN may redirect the UE to a desired VPLMN temporarily without modifying its Roaming Priority List (RPL) information in the Universal Subscriber Identity Module (USIM).

### DETAILED DESCRIPTION

In some scenarios, a home operator may want to temporarily move a user equipment (UE) to a different Visited Public Land Mobile Network (VPLMN) than a preferred VPLMN in that location based on a Roaming Priority List (RPL). The home operator may want to temporarily move the UE for several reasons. For example, the serving VPLMN may be congested, the UE may be experiencing problems in the current serving network, the home operator may want to distribute a load across multiple VPLMNs, or there may be another reason.

There are currently several tools that are available for an operator to achieve the above outcome. The first tool is an RPL update. In roaming scenarios, Home Public Land Mobile Networks (HPLMNs) have the capability to direct their subscribers to preferred partner networks by updating the Operator Controlled PLMN Selector list on the Universal Subscriber Identity Module (USIM). This can be accomplished through either Short Message Service (SMS) or SoR (Steering of Roaming) signaling. An RPL is static in nature and it is constructed based on inter-operator agreements. Operators maintain RPLs based

on location and based on pricing agreements. An RPL update cannot be done on a per-UE basis. Two UEs from the same home operator, in a given location, cannot have two different RPL lists. For the above scenario in which the operator is dealing with transient load conditions, updating the RPL table by writing to the USIM is not a good option because frequent USIM writes may destroy the USIM.

Alternatively, the home operator can reject the UE registration with some error code, with the goal to force the UE to try an alternative VPLMN from its RPL list. For example, the home operator may reject the UE registration by the use of two supported error codes, Error code #11 (“PLMN not allowed”) or #73 (“serving network not authorized”). However, while this approach may give the desired result, it also puts the rejected VPLMN on a forbidden list, which is not desirable. In this case, the most preferred VPLMN may end up in the forbidden list. Furthermore, using the rejection method to achieve the intended result may require several attempts based on the number of entries in the RPL list. This will result in a very poor experience for the UE.

As shown above, currently there are no proper mechanisms for temporarily moving UEs to a desired VPLMN based on the load conditions in that location. In particular, the existing mechanism does not address the temporary redirection of UEs to desired VPLMN, there is an absence of a mechanism to notify the HPLMN about the congested serving network, and there is an absence of a mechanism for the UE to notify the HPLMN about a poor experience or quality of service (QoS).

Techniques described herein provide for redirecting a user device to a partner VPLMN when a current serving VPLMN is congested.

Figure 1, below, is a diagram illustrating a method of temporarily steering a UE to a different VPLMN.

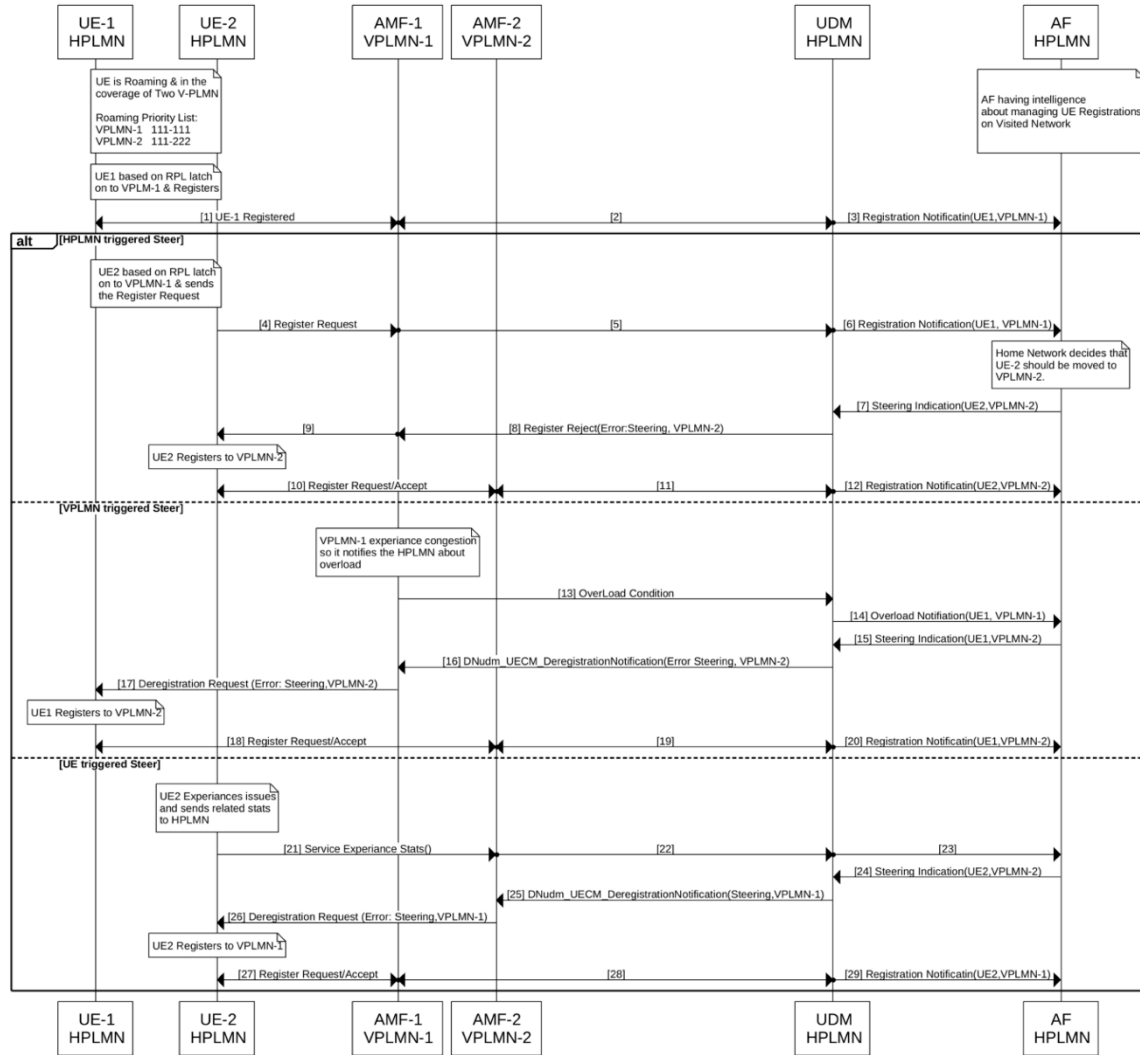


Figure 1: Example Method of Steering a UE to a Different VPLMN

According to techniques described herein, the serving network indicates to the HPLMN that a congestion condition has occurred so that the HPLMN can trigger redirection of UEs to a different VPLMN. In addition, the UE may inform the HPLMN about poor QoS so that the HPLMN can redirect the UE to different VPLMN. Furthermore, the HPLMN may redirect the UE to a desired VPLMN temporarily without modifying its RPL in the USIM.

In particular, at step 13 of Figure 1, an overload condition indication is transmitted to the HPLMN. While operators have traditionally avoided exchanging granular information associated with loads, being able to indicate that the VPLMN is unavailable

temporarily due to an overload situation can help the HPLMN know the reason for utilizing a secondary VPLMN. This helps avoid roaming mediation challenges, as the service providers have a priority list in the RPL based on pre-negotiated service level agreements and commercials. When the UE is forced to use a secondary VPLMN, receiving the conditions of the primary VPLMN (in this case, overloaded) helps to explain why the redirection was requested.

While existing mechanisms, such as error codes #12 (“tracking area not allowed”) and #13 (“roaming not allowed in this tracking area”) may cause a UE to try another VPLMN from the RPL without adding the VPLMN to the forbidden list, the error codes #12 and #13 are defined for a different purpose. Techniques described herein provide a load condition indication to the HPLMN to ensure that there is more reasoning behind the redirection. In addition, techniques described herein define three methods for HPLMN, VPLMN, and UE triggered steer.

In summary, the techniques described herein provide the reasoning behind the overload and allow the HPLMN to be in control of the redirection in such situations, rather than a simple RPL list.