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INTER-PUBLIC LAND MOBILE NETWORK MOBILITY IN 5G NETWORKS

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ABSTRACT

Third Generation Partnership Project (3GPP) standards have defined call flows for user equipment (UE) handover scenarios within a Radio Access Technology (RAT) and across RATs for roaming and non-roaming use cases. The standards-based call flows define how to handle intra-RAT and inter-RAT handovers once a UE is attached in a home network or when a UE is attached in a partner network. However, 3GPP standards do not define call flows for instances in which a UE is attached in a home network and moves to a partner network or when a UE is attached in a partner network and moves back to a home network while performing a call, generally referred to as Inter-Public Land Mobile Network (inter-PLMN) mobility. Such inter-PLMN mobility is typically involved when a subscriber moves between state borders. This proposal defines call flows to support inter-PLMN mobility for 5G mobile networks.

DETAILED DESCRIPTION

Some North American and European network operators desire to support inter-PLMN mobility as differentiating feature. However, current 3GPP standards have not defined call flows to support inter-PLMN mobility. Rather, 3GPP standards have left inter-PLMN mobility support to be provided via vendor-specific implementations. Some handover flows currently defined by standards cannot be directly extended to cover inter-PLMN mobility use cases and, thus, may involve changes on AMF and SMF network elements. Provided herein are various call flows that provide for the ability to support inter-PLMN mobility for 5G mobile networks

Consider various background definitions for various terminology illustrated/discussed for the call flows provided by solutions presented herein:

- H-EUTRAN - Home Network Evolved Universal Mobile Telecommunication System (UMTS) Terrestrial Radio Access Network
- MME - Home Network Mobility Management Entity (MME)

- H-SGW - Home Network Serving Gateway (SGW)
- HSMF - Home Network Session Management Function (SMF)
- HUPF - Home Network User Plane Function (UPF)
- R-NGRAN - Partner Network Next Generation (NG) Radio Access Network (RAN) (Roaming)
- R-AMF - Partner Network Access and Mobility Management Function (AMF)
- R-VSMF - Partner Network Visiting SMF
- R-VUPF - Partner Network Visiting UPF

Figures 1, 2, 3A–3B, 4, 5, and 6, shown below, illustrate example call flows that may be utilized in accordance with this proposal in order to facilitate inter-PLMN mobility for different use cases. In particular, Figures 1 are a call flow illustrating example details associated with inter-PLMN mobility for an example use case in which a UE connected to a 4G RAT within the UE's home network moves to an area that is within the coverage of a 5G RAT operated via a roaming partner's network. Conversely, Figure 2 is a call flow illustrating example details associated with inter-PLMN mobility for an example use case in which a UE connected to a 5G RAT within the UE's home network moves to an area that is within the coverage of a 4G RAT operated via a roaming partner's network.

Moving on, Figures 3A and 3B are a call flow illustrating example details associated with inter-PLMN mobility for an example use case in which a UE connected to a 5G RAT within the UE's home network moves to an area that is within the coverage of a 5G RAT operated via a roaming partner's network.

As illustrated in Figures 3A–3B, when the UE moves to the roaming partner's network from the home network, the H-AMF (in the home network) selects an R-AMF (in the partner network) based on serving network, slice, etc. and sends a `Namf_Communication_CreateUEContext` Request message to the R-AMF. The R-AMF then selects an R-VSMF in partner network based on the serving PLMN, serving Tracking Area Identity (TAI), Data Network Name (DNN), etc. Further, the R-AMF detects that the handover is an inter-PLMN visiting handover and initiates an N11 Create Request rather than an N11 Update Request to the partner R-VSMF. Thereafter, the partner R-

VSMF treats the N11 Create Request similar to an inter-RAT 4G to 5G intra-PLMN handover.

Next, Figure 4 is a call flow illustrating example details associated with inter-PLMN mobility for an example use case in which a UE connected in a roaming partner's 4G RAT moves back to the UE's 5G RAT home network and Figure 5 is a call flow illustrating a similar inter-PLMN mobility scenario for a UE involving 5G RAT roaming to 4G RAT home mobility. Finally, Figure 6 is a call flow illustrating example details associated with inter-PLMN mobility for an example use case that is the complement to the flow shown in Figure 3, such that the UE in Figure 6 is connected to a roaming partner's 5G RAT and moves to the 5G RAT of the UE's home network.

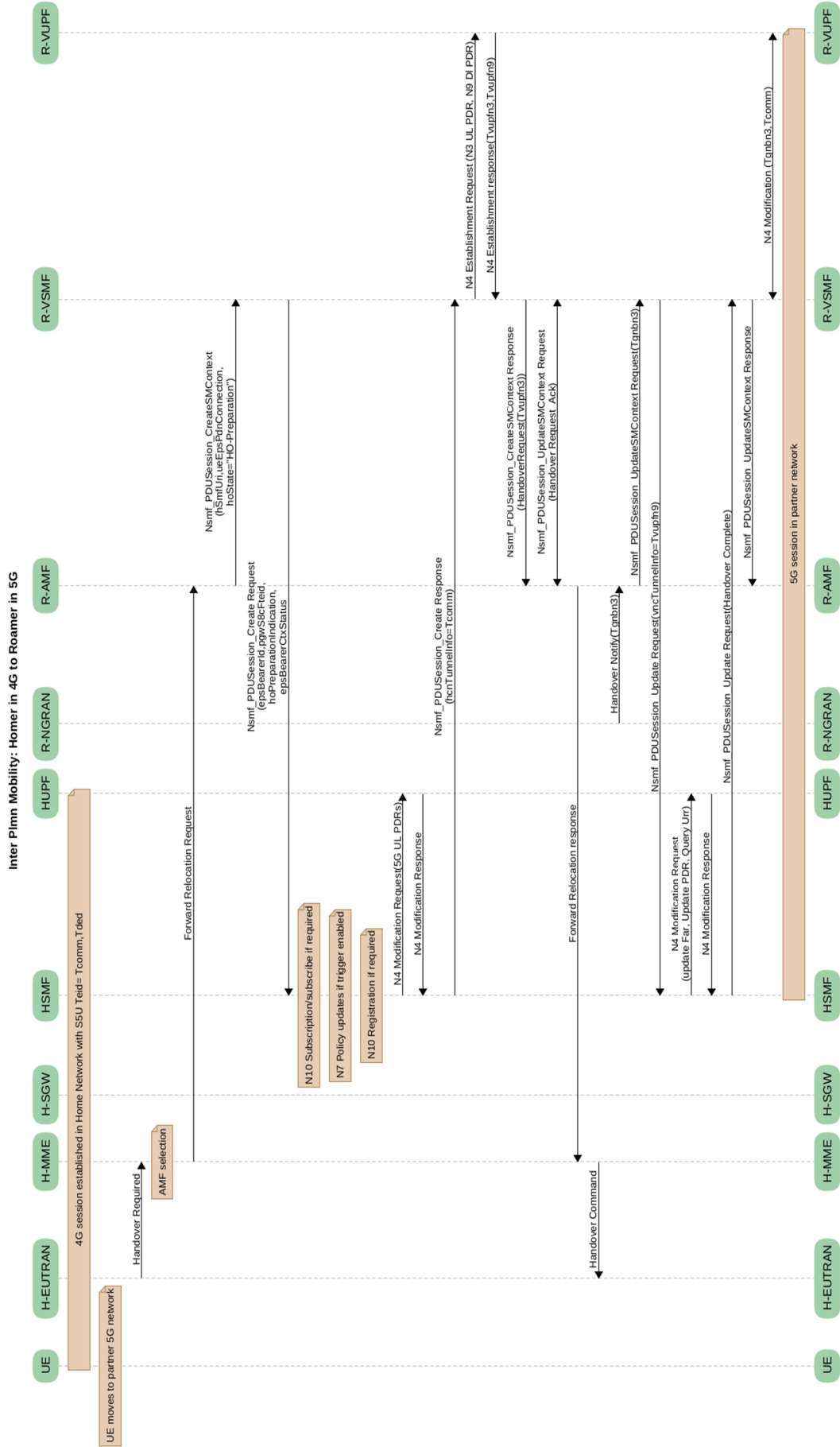


Figure 1: Inter-PLMN Mobility Involving 4G (Home) to 5G (Roaming) UE Mobility

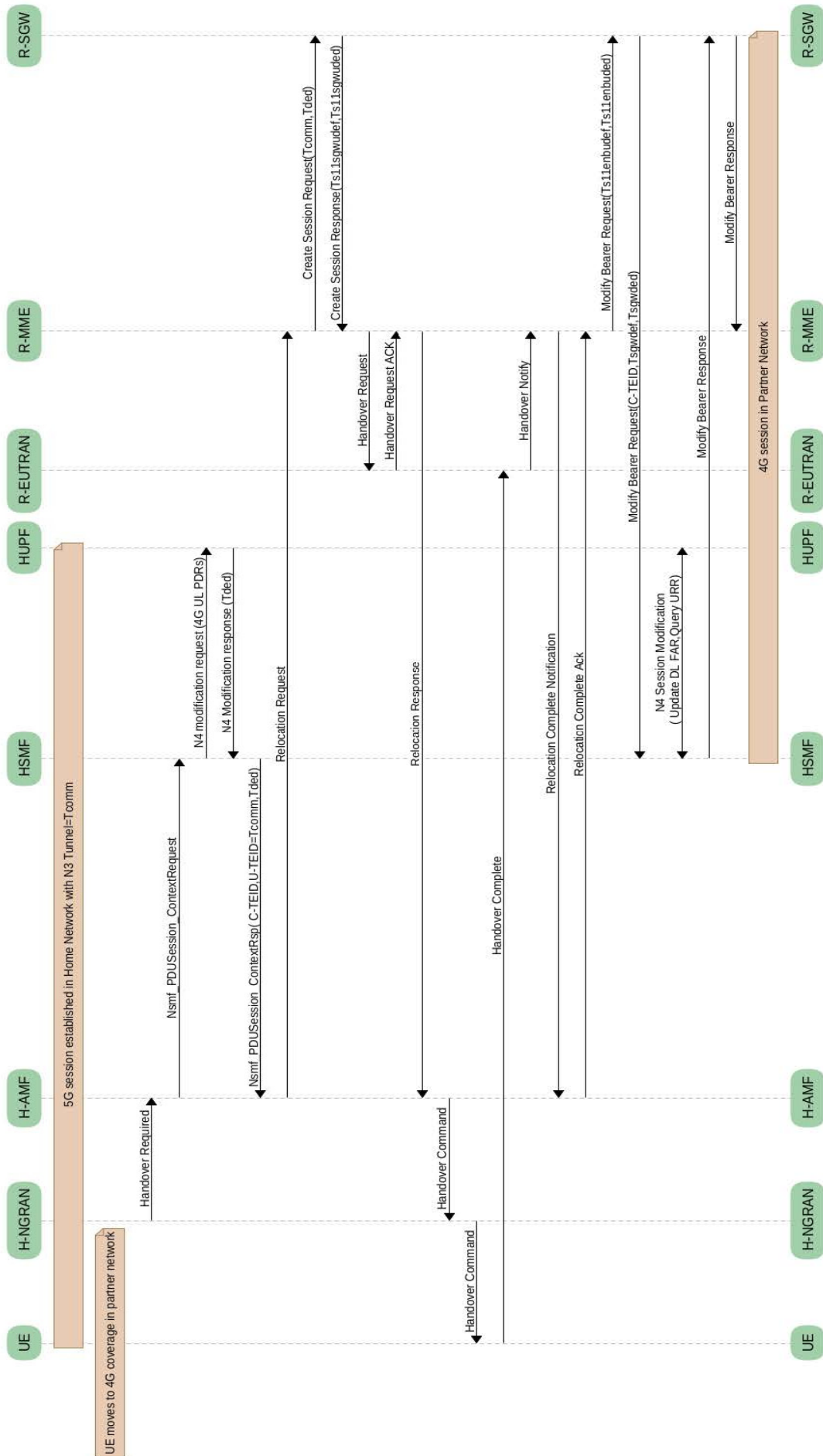


Figure 2: Inter-PLMN Mobility Involving 5G (Home) to 4G (Roaming) UE Mobility

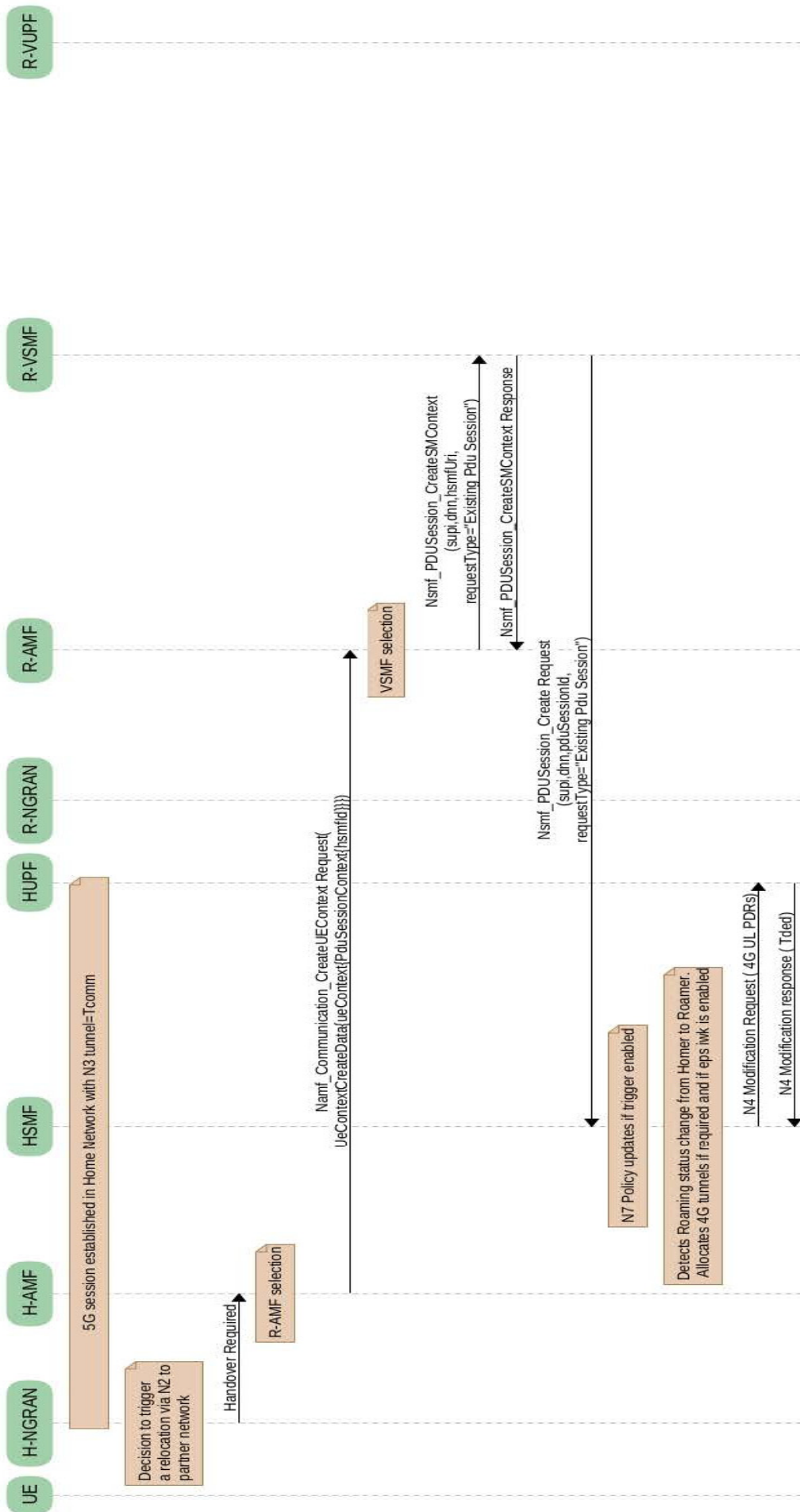


Figure 3A: Inter-PLMN Mobility Involving 5G (Home) to 5G (Roaming) UE Mobility

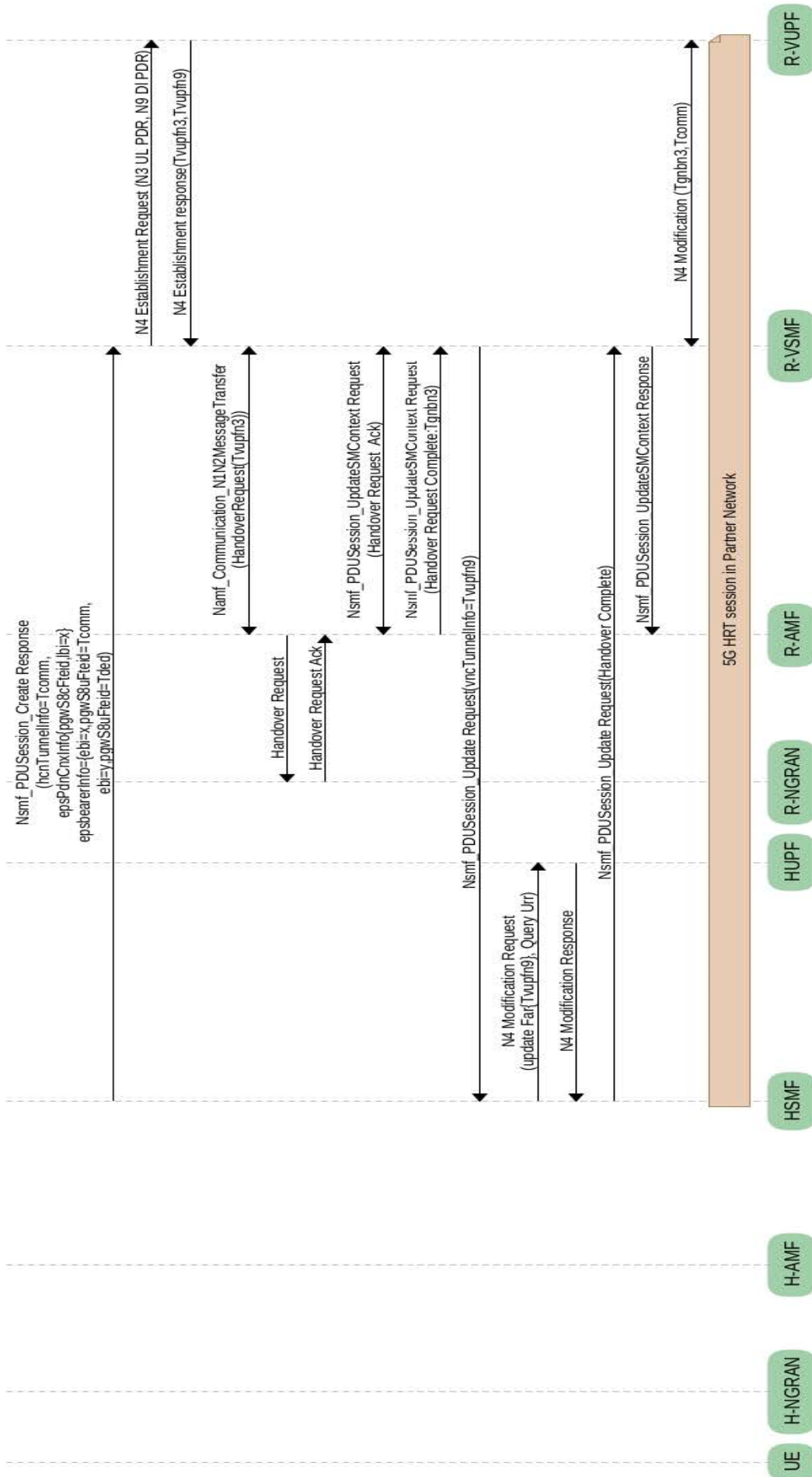


Figure 3B: Inter-PLMN Mobility Involving 5G (Home) to 5G (Roaming) UE Mobility

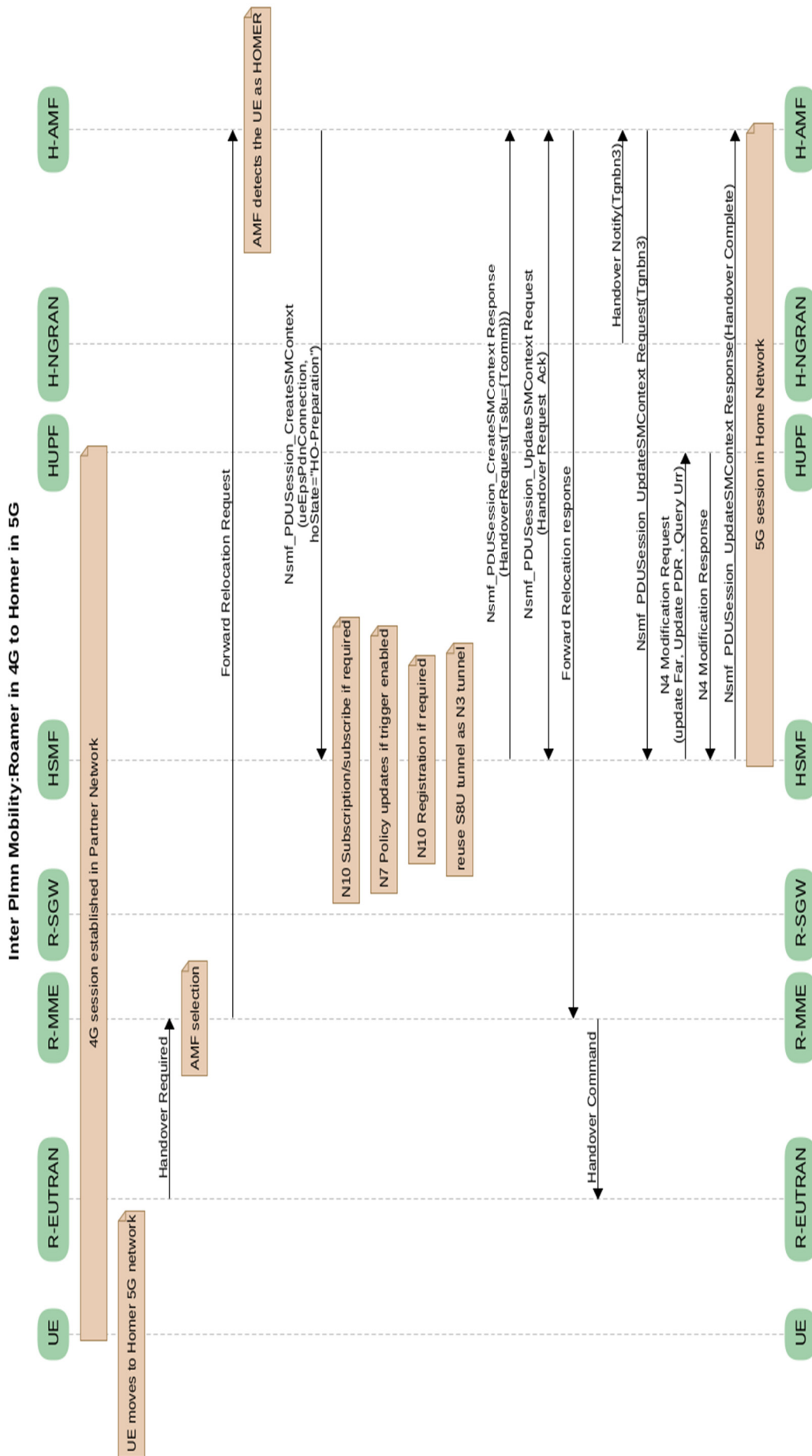


Figure 4: Inter-PLMN Mobility Involving 4G (Roaming) to 5G (Home) UE Mobility

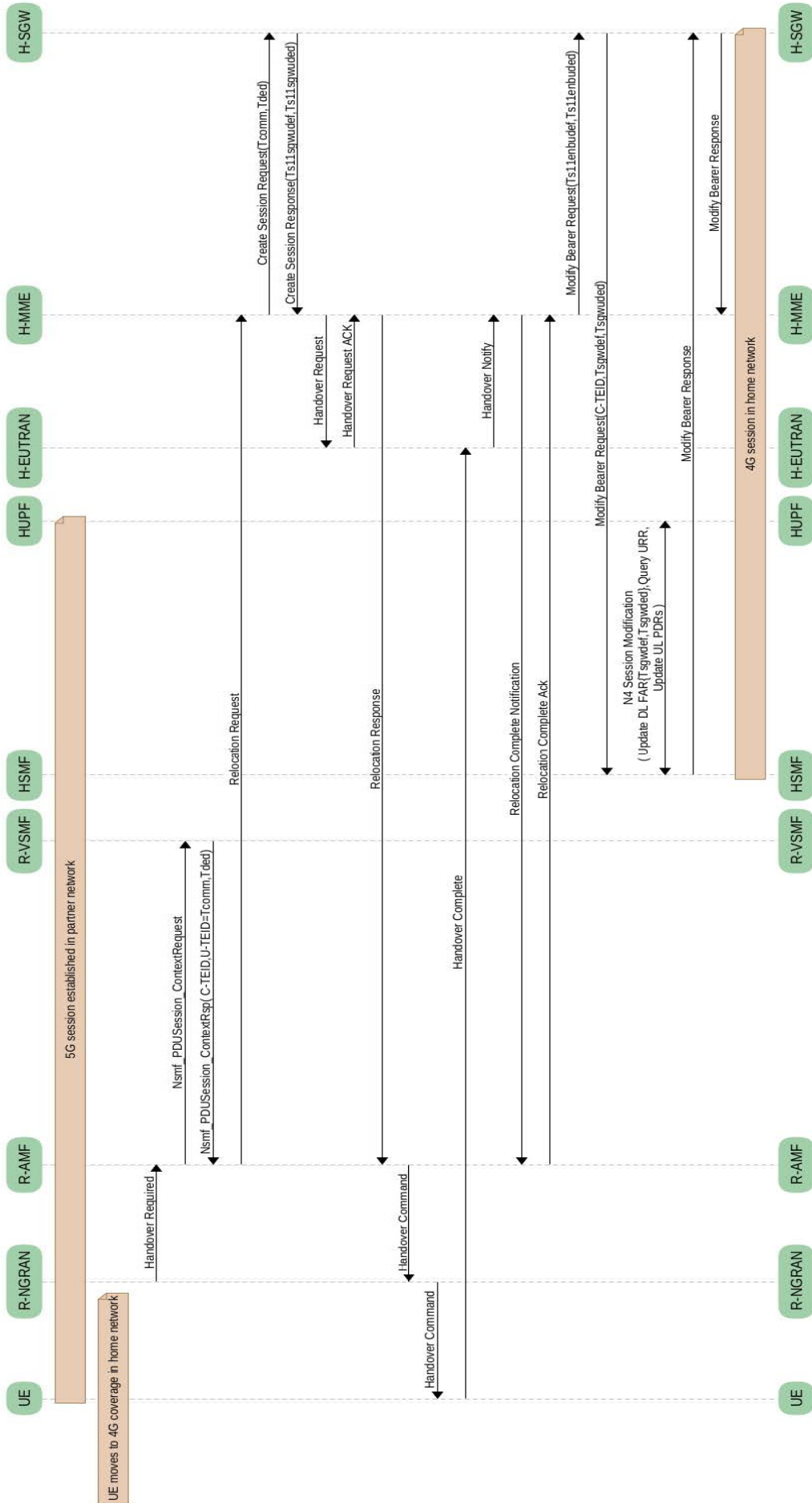


Figure 5: Inter-PLMN Mobility Involving 5G (Roaming) to 4G (Home) UE Mobility

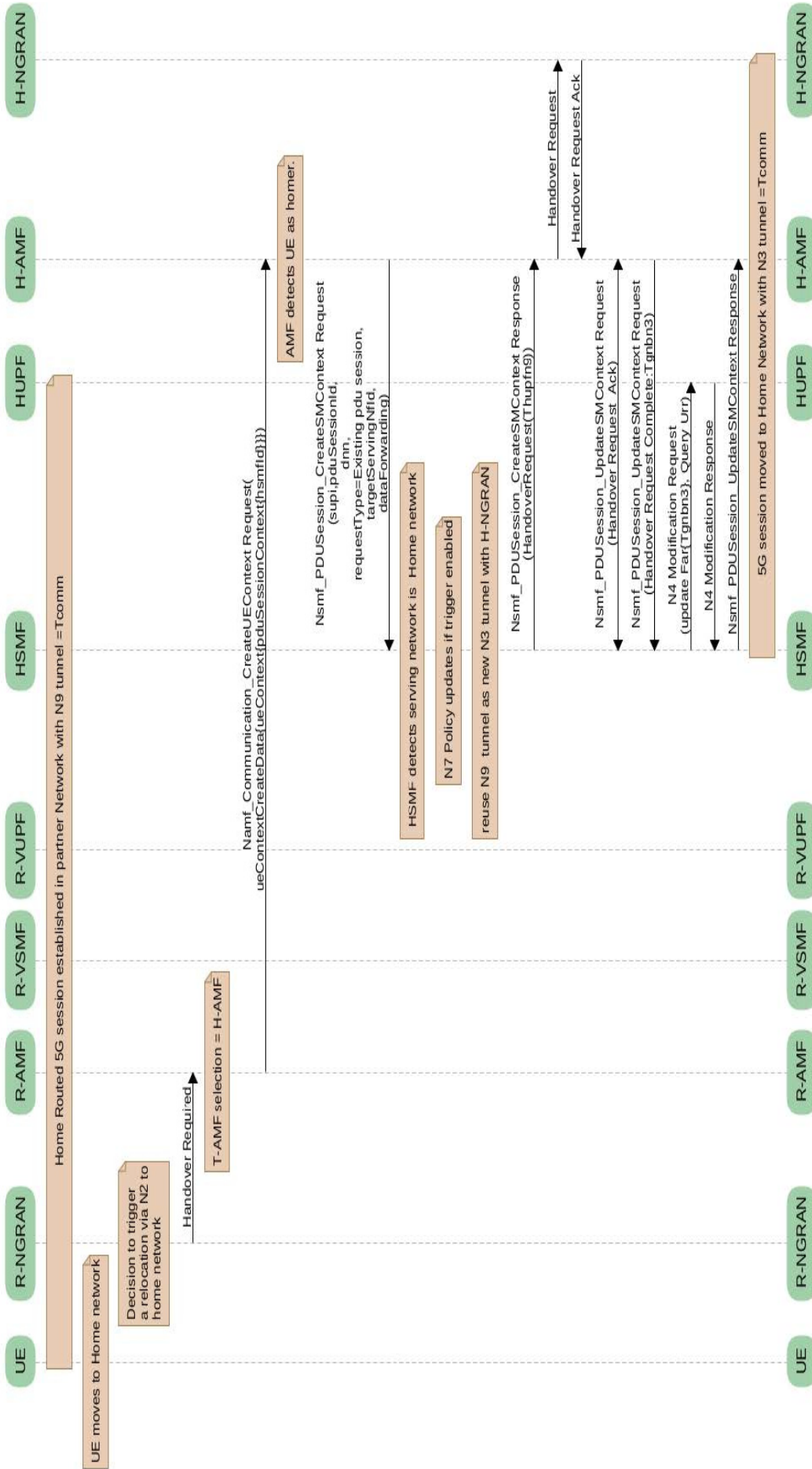


Figure 6: Inter-PLMN Mobility Involving 5G (Roaming) to 5G (Home) UE Mobility