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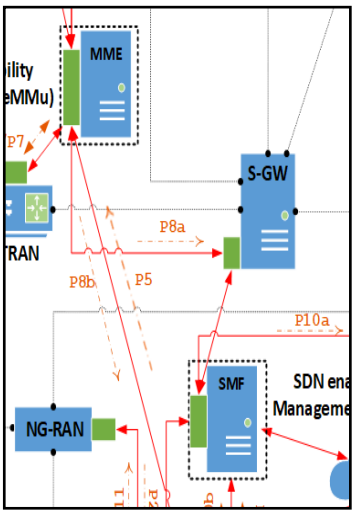
Handover System and Method for 4G/5G Networks

An innovative handover signaling method, that utilizes the Software Defined Networking (SDN) paradigm, parallel information transfer and elimination of duplicate information to reduce the signaling overhead during the handover preparation and rejection phases, which are critical for an efficient handover.

The Challenge

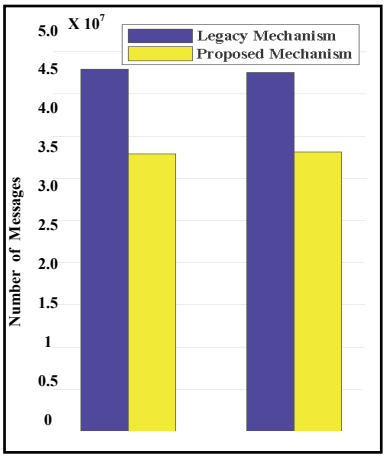
5G networks will be extremely dense and heterogeneous, not just in terms of number of users and the variety of applications that will be accessed by them, but also in terms of the number and type of access points that will be present to serve the users. During mobility, the present handover methods will be rendered inefficient since the time available to perform the preparation, execution and completion phase for handover is much shorter than in 4G. Further, the 5G requirements as specified by 3GPP and ITU specify that the end-to-end latency for certain services should be below 1 ms. Henceforth, the handover signaling involved during the preparation and rejection phase will be extremely critical, so as to ensure that the desired "next" access point is not missed due to delays created through the signaling process. Thus, designing low-latency and bandwidth efficient handover preparation and rejection phase signaling while ensuring 5G QoS is being met will be a challenge.



SDN enabled Mobility Management Unit in SDN-enabled 4G/5G core
***Green boxes are SDN agents**

The Technology

We introduce a novel SDN based and parallelized handover signaling methodology. The methodology utilizes the fact that current day networks perform multiple handshakes to prepare/reject for an impending handover/handover cancel phase. Thus, in our method we use the SDN paradigm to ensure that the unnecessary handshakes are removed and the Mobility Management entity (MME for 4G and SMF for 5G), interacting with SDN controller, is responsible for sharing the control information with the other core network entities. Such a reduction is obtained through parallelization (facilitated by the SDN) and reordering Information Elements (IEs).



Signaling Load Performance

Innovative advantages

1. Reduced number of repetitive IEs during handover signaling, thus reducing the amount of total control overhead for handover signaling.
2. Reduction in latency for handover preparation and rejection phases from 8.33% - 50.82% (dependent on the handover scenario).
3. Reduction in Transmission (occupation time on the network due to control overhead) and Processing cost (number of control messages processed) by 6.67% - 50% (dependent on the handover scenario).
4. Novel handover failure aware handover preparation mechanism has been developed, thus introducing further efficiency into the preparation and rejection phase signaling.
5. Functional for all the inter-RAT and intra-RAT HO scenarios as specified by 3GPP.

Current stage of development

The technology has been explored and verified through analysis based on operator data from Japan and Greece. Currently, a PCT has been filed with the EPO and, 2 conference and 1 journal papers have been published showing the aforementioned advantages quantitatively.

Applications and Target Market

1. Applicable in the upcoming 5G networks and all future 4G network upgrades.
2. Target market – 3GPP members, Equipment and technology vendors for Mobile Networks.

Business Opportunity

Technology available for licensing with technical cooperation

Patent Status

Priority application

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