Applicability of IETF Mobility Solutions to the 3GPP All IP Network

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I. Motivation

3rd Generation Partnership Project (3GPP) is a standard development organization which defines the standard for an evolved 3rd Generation and beyond Mobile System based upon 3GPP core networks. 3GPP specifications for access network architecture (3GPP TS 36.300 [1]) and for core network architecture (3GPP TS 23.401 [2] for 3GPP access and 3GPP TS 23.402 [3] for non 3GPP access) applied the concept of "All IP Network" to the 3GPP system. Among the introduced novelties, the interaction of non-3GPP accesses has been defined in order to enable a user to access the same services both from a 3GPP access and from accesses which are not defined by 3GPP (e.g. WLAN), hence called non-3GPP accesses. The integration of non-3GPP accesses within the 3GPP core network is performed at the IP level and is based on IETF IP mobility protocols.

Further developments in the 3GPP core networks have seen the still on-going definition of solutions detailing IP local break-out (i.e., the introduction of the concept of IP flat architecture) and host multihoming (i.e., the capability of the UE to exchange different flows through WLAN access and 3GPP access concurrently). From the device point of view, the trend towards All IP flat architecture implies that the 3GPP access is seen as one of the possible accesses the device can attach to in order to access end services. The side effect of such point of view is that some requirements can be solved by introducing new additional functionalities to the device.

This presentation focuses on the mobility aspect and performs a survey of some IP based mobility solutions developed in IETF by comparing their characteristics against a list of requirements.

II. IETF mobility protocol survey

A. Definition of requirements

In this work, to evaluate the mobility solutions, the following requirements have been taken into consideration:

R1: Supported IP version: both IPv4 and IPv6 addressing schemes are supported by 3GPP architectures. Hence solutions shall enable both IPv4 and IPv6 addressing schemes.

R2: Double jump support: mobility solutions should support the scenario where both end points of the communication perform handover concurrently.

R3: Minimal impacts on the core network: current IP based mobility solutions adopted by 3GPP rely on the usage of a mobility anchor deployed in the network. No other functional entities should be required by the solutions.

R4: Packet loss: the possibility to enhance the considered protocols in order to minimize packet loss during handover should be taken into account.

B. Considered protocols

In this work, IP based mobility protocols already adopted by 3GPP as well as others are taken into consideration.

DS-MIPv6 [4] is one of the solutions adopted by 3GPP to manage the interworking with non-3GPP accesses. Its extensions to enable host-multihoming and the capability to seamlessly move IP flows within accesses are currently under specification in 3GPP.

PMIP [5] is the network-based mobility solution taken into consideration by 3GPP.

SHIM6 [6] is an IETF protocol initially developed for site-multihoming and is based on the usage of an additional layer managing the multiple IP addresses that the UE can use.

MPTCP [7] is a transport layer protocol defined as an enhancement of TCP in order to exploit the scenarios where several paths are available to the device. The IETF working group defining such extensions kept mobility out of scope but the protocol can be easily extended to support mobility.

III. Conclusions

This talk provides a survey of a set of IETF protocols that can be used to provide mobility to a device in the 3GPP All IP network and evaluates each protocol against the adopted requirements.

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V. References

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