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Z. Yan  
CNNIC  
J. Lee  
Sangmyung University  
H. Chan  
Huawei Technologies  
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**Mobility Capability Negotiation and Protocol Selection**  
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**Abstract**

Based on IPv6, multiple mobility management protocols have been developed and generally they can be classified into two types: network-based and host-based. Different protocols have different functional requirements on the network element or the terminal and then a scheme should be used in order to support the negotiation and selection of adopted mobility management protocol when a terminal accesses to a new network. In this draft, this issue is considered and analyzed.

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## [1.](#) Introduction

Based on Mobile IPv6 (MIPv6) [[RFC6275](#)], there are multiple extension protocols have been standardized. These protocols can be classified into two categories: protocols for the function extension and protocols for the performance enhancement. The protocols for the function extension are proposed to support some specific scenarios or functions, such as Dual-stack Mobile IPv6 (DSMIPv6) [[RFC5555](#)] for mobility of the dual-stack nodes, Multiple Care-of-address (MCoA) [[RFC5648](#)] for mobile nodes with multiple access interfaces and Network Mobility (NEMO) [[RFC3963](#)] for mobility of sub-network. The other category is proposed to enhance the performance of the mobility management, such as Fast Mobile IPv6 (FMIPv6) [[RFC5268](#)] for fast handover, Hierarchical Mobile IPv6 (HMIPv6) [[RFC5380](#)] for hierarchical mobility optimization. MIPv6 and these extensions are classified in the host-based mobility management protocol suite because the location update is initiated by the terminal and the tunnel is also terminated at the terminal.

In order to reduce the protocol cost and enhance the handover performance further, the network-based mobility management protocols were proposed and Proxy Mobile IPv6 (PMIPv6) [[RFC5213](#)] was standardized as a basis. Based on PMIPv6, a series of its extensions were proposed, such as Dual-stack Proxy Mobile IPv6 (DS-PMIPv6) [[RFC5844](#)], Distributed Mobility Management Proxy Mobile IPv6 (DMM-PMIPv6) [[RFC7333](#)] as the network-based mobility management protocol suite. Be different from the host-based suite, the location update in network-based suite is triggered by the network entity and the



tunnel is established between network entities. Then the terminal needs to do nothing about the signaling exchange during the movement, particularly, the mobility is transparent to the IP layer of the terminal.

In reality, these protocols will be co-existing and multiple protocol daemons will be configured on the network entities or terminal. That means a scheme is needed to support the negotiation and selection of mobility management protocol when the terminal accesses into a new access network initially or handover happens

[[Paper-CombiningMobilityStandards](#)].

This document tries to present the principles for the protocol selection and analyze the possible scenarios which should be supported by the further solution.

## **2. Motivations**

As illustrated above, these protocols may co-exist in reality and simultaneously be used in an access network or even the same entity. Due to their different requirements on the network entity or terminal, a scheme is needed to support the negotiation and selection of adopted mobility management protocol when the terminal accesses to a new network.

Generally, two problems should be solved:

- o What principles should be followed for the protocol negotiation and selection?
- o What procedure should be adopted for the protocol negotiation and selection?

This scheme is needed because different entity and terminal will have different capabilities and preferences (may be decided by the capability and mobility pattern of the mobile node). This scheme can guarantee that the optimum and most suitable protocol will be used.

## **3. Scenarios**

In order to illustrate the necessity of the mobility capability negotiation and protocol selection, the following scenarios are taken as typical examples:

- 1) Network supports MIPv6, host supports only PMIPv6

In this case, the network supports only host-based protocol, while the host does not have any mobility management function. Then only the PMIPv6 can be used to support the mobility management of the



host, but the network does not deploy the PMIPv6 protocol and this will cause the mobility failure because no available protocol can be used.

2) Network supports both MIPv6 and PMIPv6, host supports only PMIPv6

In this case, the network deploys both host-based and network-based protocols, while the host supports only PMIPv6. When the host accesses to the network, PMIPv6 will be used. Actually, PMIPv6 should be adopted as a default mobility management scheme considering its optimized performance. Once the PMIPv6 can be supported by the network, it will be adopted as the default one.

3) Network supports both MIPv6 and PMIPv6, host supports MIPv6

In this case, the network deploys both host-based and network-based protocols, and the host also supports MIPv6. Because PMIPv6 has no requirement on the host, both PMIPv6 and MIPv6 can be used in this case. Then the host can use PMIPv6 as default, and use MIPv6 for the global mobility.

4) Network and host support multiple extension protocols

In this case, the network has deployed multiple extensions to support more complex requirements, so does the host. And then the host and network can negotiate a protocol for the optimized performance or other special requirement, for example, FMIPv6 may be selected in order to support fast handover, HMIPv6 may be selected in order to reduce the signaling cost, NEMO may be selected in order to support the subnet mobility.

However, there are more complex scenarios considering the different abilities of network entities and terminal.

#### **4. Principles and possible solution**

Two different schemes may be used for the protocol negotiation and selection: MN-initiated and Network-initiated. Within the MIP/PMIP protocols, the priority of the function-extension protocols should be higher than the performance-enhancement protocols. Generally, the following principles should be followed:

- o Priority 1: Follow network ability
- o Priority 2: Follow host preference
- o Priority 3: Support the functional extensions
- o Priority 4: Support the performance enhancements
- o In default: network based scheme if it can be supported



And the general procedure for the protocol selection should be:

- o During initiation, network-based protocol may be used as a default mobility management protocol once the network supports it.
- o If the host prefers host-based protocols, a negotiation is executed to handover from network-based protocol to host-based protocol.
- o After initial attachment, a profile will be generated in the management store to record the selected or preferred protocol of this host.
- o When the handover happens, the network will check the selected or preferred protocol during the authentication process. But the network also needs to notify the host if the selected protocol cannot be supported herein.

In order to fulfill the above principles, some extensions should be supported, for example:

#### 1) Extended negotiation messages

The protocol negotiation may be included in the MN\_ATTACH Function [[MN-AR.IF](#)] and the implementation may be based on a new signaling message or extended messages (e.g., ICMPv6, Diameter, and RADIUS). Besides these, some other protocols may also be used in some specified scenarios, such as extended IEEE 802.21 primitives.

#### 2) Extended management store

When the terminal accesses to the network, an authentication should be executed before the mobility management service is provided. In order to support the mobility management protocol selection, a new information should be recorded by the network after the successful authentication during the initial attachment. The newly introduced information shows the selected mobility management protocol and should be updated when the used protocol changes.

### **5. Security Considerations**

Generally, this function will not incur additional security issues. The detailed influence should be analyzed in the future.

### **6. IANA Considerations**

A new ICMP option or authentication option or other signaling message may be used with a new code number.





## 7. References

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### Authors' Addresses

Zhiwei Yan  
CNNIC  
No.4 South 4th Street, Zhongguancun  
Beijing 100190  
China

Email: yan@cnnic.cn

Jong-Hyouk Lee  
Sangmyung University  
31, Sangmyeongdae-gil, Dongnam-gu  
Cheonan  
Republic of Korea

Email: jonghyouk@smu.ac.kr

H. Anthony Chan  
Huawei Technologies  
5340 Legacy Dr. Building 3  
Plano, TX 75024  
USA

Email: h.a.chan@ieee.org

