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Issues with network based inter-technology handovers
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Abstract

Proxy Mobile IPv6 (PMIPv6) is a network based mobility management protocol that enables IP mobility for a host without requiring its participation in any mobility-related signaling. While the PMIPv6 protocol itself supports handover across interfaces and between access types, there are several issues with effectively performing inter-technology handovers with network based mobility protocols. This document aims to enumerate some known issues with such handovers.

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1. Introduction

Proxy Mobile IPv6 (PMIPv6) [RFC5213] is a network based mobility management protocol enables IP mobility for a host without requiring its participation in any mobility-related signaling. While the PMIPv6 protocol itself supports handover across interfaces and between access types, there are several issues with effectively performing inter-technology handovers with network based mobility protocols. This document aims to enumerate some known issues with such handovers. On a high level these can be classified into those issues occurring on the MN and those issues occurring in the network.

1.1. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL","SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2. Issues occuring in the MN

2.1. Formation of interface identifier for SLAAC

The IPv6 address of the MN is composed of two parts, the prefix and the interface identifier. Even if the network correctly identified the handover and allocated the same prefix on the new interface, the MN might come up with a different interface identifier on the new interface than it was using on the old interface. This is usually in several link-layer technologies because the interface identifier is formed based on a unique identifier of the link-layer interface. E.g. the modified EUI-64 based interface identifiers based on the MAC address of the link-layer interface. If this is the case, the resulting address on the new interface is different than the address the MN was using prior to the handover and hence the applications bound to the earlier IPv6 address will lose connectivity.

2.2. Use of DHCP for address configuration

If the MN uses DHCP to configure the IP address and as long as it complies to recommendations highlighted in RFC 5213 the issue raised in the previous section does not apply.

2.3. Usage of the same address on multiple interfaces

Several MN operating system implementations do not allow the configuration of the same address on multiple interfaces. Even on those that do, the resulting behavior is usually not predictable. e.g. after a handover all the traffic might still be directed to the

old interface (hence getting dropped) because the default route was pointing towards that interface.

2.4. Limitations of interfaces

Certain types of point-to-point interfaces are tightly bound to the underlying interface and could be torn down even if there is another viable interface that can carry the traffic. For instance, some operating system dynamically creates a PPP interface with an IP address assigned to it when its connection is established and all transport sessions over that connection are maintained only while that PPP interface exists. This implies that the address should not be bound directly to an interface that can go down during handovers but something a bit more stable.

2.5. Interface between MN and MAG

The PMIPv6 protocol needs to receive the right information fro the MN to form the PBU message for the LMA. In particular the MN should indicate to the access network if the interface attachment corresponds to an initial attachment or to an handover. This information is contained in the Handover Indicator option in the PBU message. Conveying this information from the MN to the MAG implies discussing mobile node involvement in the mobility procedure.

The MN to MAG interface can be based upon L2 signalling or L3 signalling.

If L2 signalling is used it is necessary that each wireless access technology connected to the PMIPv6 domain supports transferring of such information (e.g. HI). Although no changes to the IP stack would be required, the main drawback is that each L2 technology will need to implement their own mechanisms.

If L3 signalling is used the MN can then include such info in IP based signalling being technology agnostic. Major drawback is the modification of the IP stack.

In any case to support inter-technology the MN needs to send the information required to fill the PBU message. Without this support, it might be hard to implement inter-hechnology handovers.

3. Issues occuring in the network

3.1. Access selection

The network nodes may not always be aware of the complete set of access technologies available to the MN. This is especially true if the multiple accesses are administered by different entities. Only the MN is guaranteed to have this information. The network may also not know about the characteristics that the MN desires from the selected access technology. Because of these reasons it is almost impossible for the network to perform access selection without some amount of co-operation from the MN.

3.2. Handover vs. multi-homing

The network nodes may not always be aware of the intent of the MN when it attaches to a new attachment point. The MN may be performing a handover, or may wish to be simultaneously connected. The access router at the new attachment point is unable to distinguish between these cases, but needs to communicate this information to the mobility anchor. The mobility anchor point needs this information to determine whether to handover an existing mobility session or to create a new one.

3.3. Predictive handovers

An MN that is capable of being attached to multiple accesses can perform a predictive handover attaching to the target access even before detaching from the previous access. This is done in order to reduce the handover latency and to reduce packet loss. Most of the time, the intent of the MN is to continue using the previous access until it explicitly signals to the network to start using the new access. The target access router cannot determine if this is the case and may end up prematurely moving the MNs binding over to the new access even while the MN is sending outgoing packets onto the old access.

4. Security Considerations

This document discusses issues with inter-technology handovers with network based mobility protocols, and does not raise any new security issues.

5. IANA Considerations

This document does not require any IANA action.

6. References

6.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC5213] Gundavelli, S., Leung, K., Devarapalli, V., Chowdhury, K., and B. Patil, "Proxy Mobile IPv6", RFC 5213, August 2008.

6.2. Informative References

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