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Diameter Support for Proxy Mobile IPv6 Localized Routing
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Abstract

In Proxy Mobile IPv6, packets received from a Mobile Node (MN) by the Mobile Access Gateway (MAG) to which it is attached are typically tunneled to a Local Mobility Anchor (LMA) for routing. The term "localized routing" refers to a method by which packets are routed directly by the MAG without involving the LMA. In order to establish a localized routing session between two Mobile Access Gateways in a Proxy Mobile IPv6 domain, two tasks must be accomplished:

1. The usage of local routing must be authorized for both MAGs and

2. The address of the MAG to which the Correspondent Node (CN) is attached must be ascertained

This document specifies how to accomplish these tasks using the Diameter protocol.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on November 26, 2010.

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1. Introduction

Proxy Mobile IPv6 (PMIPv6) [RFC5213] allows the Mobility Access Gateway to optimize media delivery by locally routing packets within itself, avoiding tunneling them to the Mobile Node's Local Mobility Anchor. This is referred to as "local routing" in RFC 5213. However, this mechanism is not applicable to the typical scenario in which the MN and CN are connected to different MAGs and are registered to different LMAs. In this scenario (as described in [I-D.ietf-netext-pmip6-lr-ps]), the relevant information needed to set up a localized routing path (e.g., the addresses of the Mobile Access Gateways to which the MN and CN are respectively attached) is distributed between their respective Local Mobility Anchors. This may complicate the setup and maintenance of localized routing.

Therefore, in order to establish a localized routing path between the two Mobile Access Gateways, the Mobile Node's MAG must identify the LMA that is managing the Correspondent Node's traffic and then obtain the address of the Correspondent Node's MAG from that LMA. In Proxy Mobile IPv6, the LMA to be assigned to the CN may be maintained as a configured entry in the Correspondent Node's policy profile located on an Authentication, Authorization and Accounting (AAA) server. However, there is no relevant work discussing how AAA-based mechanisms can be used by the Mobile Node's MAG to discover the address of the Correspondent Node's LMA during the setup of localized routing, The method by which the Mobile Node's MAG interacts with the Correspondent Node's LMA to identify the Correspondent Node's MAG is also unspecified.

This document describes AAA support for the authorization and discovery of PMIPv6 mobility entities during localized routing. In LMA discovery, Diameter [RFC3588] is used to authorize the localized routing service and provide the Mobile Node's MAG/LMA with information regarding the Correspondent Node's LMA. In MAG discovery, AAA is used to determine whether Mobile Node's MAG is allowed to fetch the address of the Correspondent Node's MAG from the Correspondent Node's LMA. If MAG discovery is successful, the Correspondent Node's LMA will respond to the Mobile Node's MAG with the address of the Correspondent Node's MAG.

2. Solution Overview

MAG/LMA resolution is a prerequisite to the establishment of a direct routing path between MAG1 and MAG2 (associated with MN1 and MN2 respectively). This document addresses how to resolve the destination MN's MAG by means of interaction between the LMA and the AAA server. Figure 1 shows the reference architecture for Local

Routing Service Authorization. This reference architecture assumes

- o MN1 and MN2 belong to different LMAs
- o the MAG and LMA support Diameter client functionality

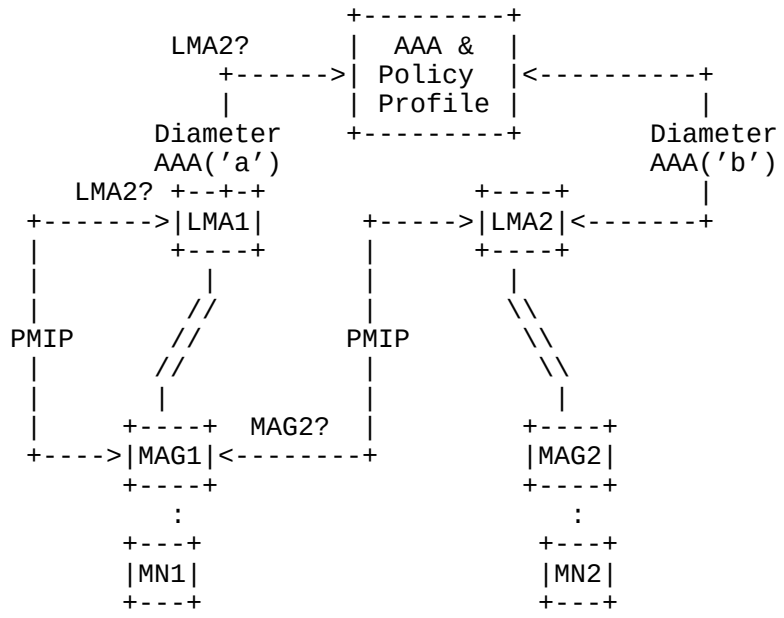

Figure 1: Local Routing Service Authorization Reference Architecture

The interaction of the MAG and LMA with the AAA server according to the extension specified in this document considers the follows features:

a. The LMA1 interaction with the AAA server is used to authorize the localized routing service and fetch the IP address of LMA2 from the AAA server ('a' in (Figure 1))

b. LMA2 interaction with the AAA server is used to determine whether MAG1 is allowed to obtain the IP address of MAG2 ('b' in (Figure 1))

3. Localized Routing Service Authorization

Figure 2 shows a scenario where MAG1 acts as a Diameter client, processing the data packet from MN1 to MN2 and requesting

authorization of localized routing. In this scenario, MN1 and MN2 are anchored to LMA1 and LMA2 respectively. In order to setup a localized routing path with MAG2, MAG1 must first locate the entity that maintains the data required to setup the path (i.e., LMA2) by sending a Local Routing Optimization Request message ([I-D.wu-netext-local-ro]) to LMA1. Note that the discovery of LMA2 is only done once; upon LMA1 know LMA2 address from AAA serer, LMA1 may associate LMA2 address with MN's data for future use (e.g., handover case). The Diameter client in LMA1 sends an AA-Request (AAR) message to the Diameter server. The message contains an instance of the MIP6-Feature-Vector (MFV) AVP ([RFC5447], Section 4.2.5) with the INTER_MAG_ROUTING_SUPPORTED bit Section 7 set and an instance of the MIP6-Home-Link-Prefix AVP ([RFC5447], Section 4.2.4) containing the IP address of MN2.

The Diameter server checks if localized routing is allowed between MAG1 and MAG2 and if so, responds with an AA-Answer (AAA) message encapsulating an instance of the MIP6-Agent-Info AVP [RFC5779] containing the IP address and/or Fully Qualified Domain Name (FQDN) of LMA2. LMA1 then determines the IP address of LMA2 using the data returned in the MIP6-Agent-Info and responds to MAG1 with the address of LMA2. MAG1 then requests the address of MAG2 from LMA2 and uses that address to setup the localized routing path between itself and MAG2 via a Proxy Binding Update (PBU)/Proxy Binding Acknowledgement (PBA) message exchange [RFC5213].

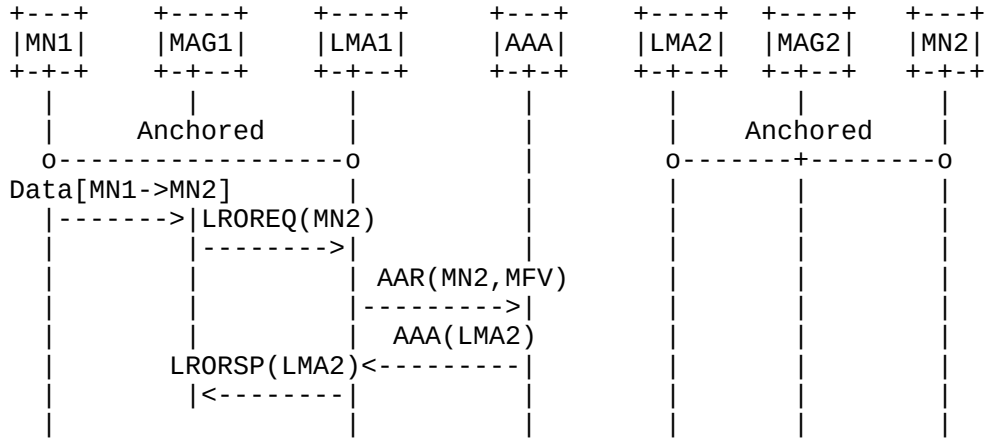

Figure 2: MAG-initiated Localized Routing Authorization

Figure 3 shows another scenario, in which the LMA1 acts as a Diameter client, processing the data packet from MN1 to MN2 and requesting the authorization of localized routing. In this scenario, MN1 and MN2 are anchored to LMA1 and LMA2 respectively. In contrast with the

signaling flow of Figure 2, the difference is that it is LMA1 instead of MAG1 which initiates the setup of the localized routing path.

The Diameter client in LMA1 sends an AA-Request (AAR) message to the Diameter server. The message contains an instance of the MIP6-Feature-Vector AVP ([RFC5447], Section 4.2.5) with the INTER_MAG_ROUTING_SUPPORTED bit set and an instance of the MIP6-Home-Link-Prefix AVP ([RFC5447], Section 4.2.4) containing the IP address of MN2. The Diameter server checks if localized routing is allowed between MAG1 and MAG2 and if so, responds with an AA-Answer (AAA) message encapsulating an instance of the MIP6-Agent-Info AVP [RFC5779] containing the IP address and/or Fully Qualified Domain Name (FQDN) of LMA2. LMA1 then determines the IP address of LMA2 using the data returned in the MIP6-Agent-Info AVP and forwards it to MAG1 in the Local Routing Optimization message ([I-D.wu-netext-local-ro]).

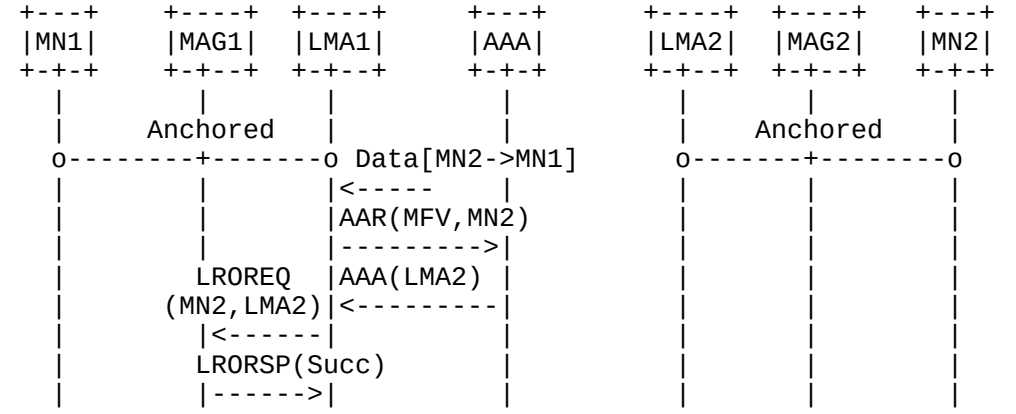

Figure 3: LMA-initiated Localized Routing Authorization

Figure 4 shows another scenario, similar to the scenario of Figure 3, the LMA1 does not respond to MAG1 with LMA2 address, instead,setup localized routing path directly between itself and LMA2 via localized routing signaling.

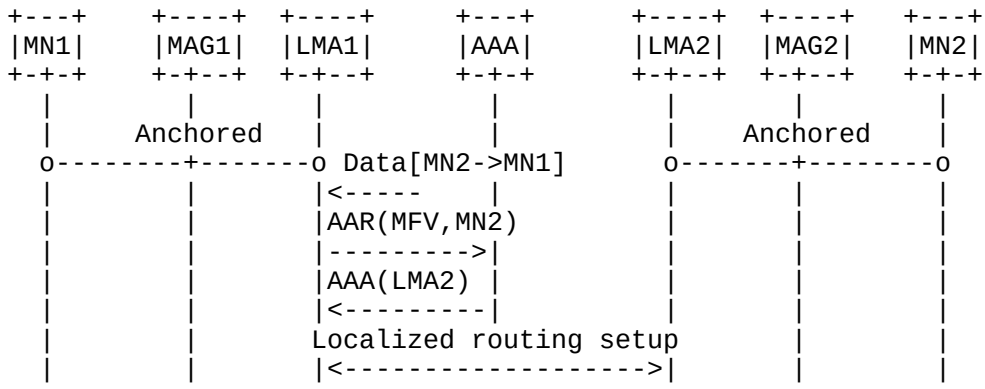

Figure 4: LMA-initiated Localized Routing Authorization

4. Diameter Server Authorizes MAG Location Query

Figure 5 shows a scenario in which LMA2 acts as a Diameter client, receiving location request and requesting authorization for MAG location lookup. In this scenario, MN1 and MN2 are anchored to LMA1 and LMA2 respectively. Upon receiving an upstream data packet, MAG1 needs to determine the recipient of localized routing, i.e., LMA2. And then MAG1 solicits LMA2 to look up the IP address of the MAG to which MN2 is currently attached (in this case, MAG2) by sending a Local Routing Optimization Request message containing the IP addresses/HNPs of MN1 and MN2. LMA2 validates the request from MAG1 by sending an AAR to the AAA server containing the IP address/HNP of MN1 (encapsulated in an instance of the MIP6-Home-Link-Prefix AVP) and an instance of the MIP6-Feature-Vector AVP ([RFC5447], Section 4.2.5) with the INTER_MAG_ROUTING_SUPPORTED bit set. If the authorization is successful, LMA2 then looks up the IP address of MAG2 based on the IP address/HNP of MN2 and responds to MAG1 with the IP address of MAG2.

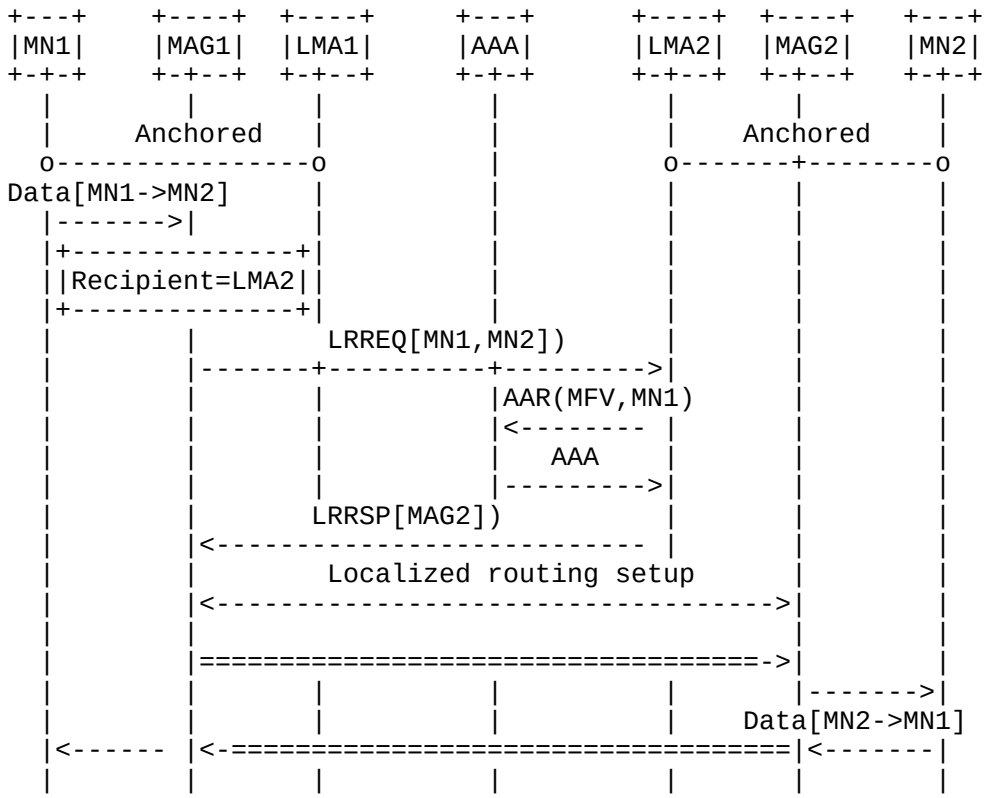

Figure 5: Diameter Server Authorizes MAG Location Query

5. Local Routing Service Authorization in Networks with Multiple AAA Servers

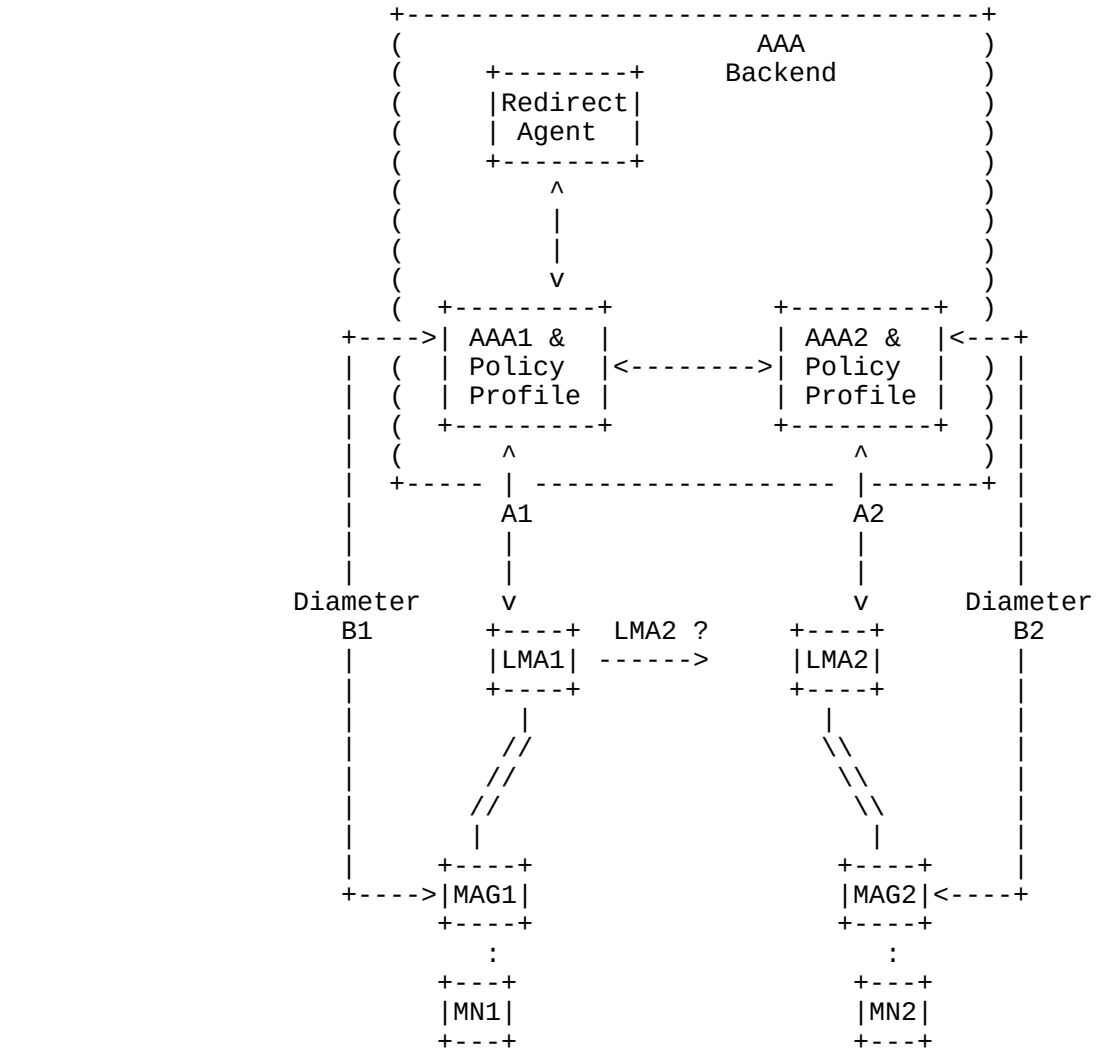

Figure 6: Use of a Diameter Redirect Agent to Support Local Routing Service Authorization in Networks with Multiple AAA servers

Referring to an architecture with multiple AAA servers (as illustrated in Figure 6), AAA1 may not maintain the LMA to be assigned to MN2 as a configured entry in the Correspondent Node's Policy profile, as AAA2 holds this information in its policy store. In such a case, AAA1 contacts a Diameter redirect agent [RFC3588] to

request the AAA server being responsible for maintaining MN2's policy profile. AAA2 checks if localized routing is allowed between MAG1 and MAG2 and if so, responds with the IP address of LMA2 corresponding to MN2 and sends the results back to LMA1 via AAA1. Details about the use of redirect agents in this context are beyond scope of this document.

6. Security Considerations

The security considerations for the Diameter NASREQ [RFC4005] and Diameter Proxy Mobile IPv6 [RFC5779] applications are also applicable to this document.

The service authorization solicited by the MAG or the LMA relies upon the existing trust relationship between the MAG/LMA and the AAA server.

7. IANA Considerations

This specification specifies a new value in the Mobility Capability registry [RFC5447] for use with the MIP6-Feature-Vector AVP: INTER_MAG_ROUTING_SUPPORTED (0x0000080000000000).

8. Contributors

Paulo Loureiro, Jinwei Xia and Yungui Wang all contributed to early versions of this document.

9. References

9.1. Normative References

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9.2. Informative References

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