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Enhanced Mobility Anchoring in Distributed Mobility Management
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Abstract

This document presents a new perspective for the solution design of enhanced mobility anchoring in a distributed mobility management deployment. Based on the definition of anchor function, location management function, and forwarding management function in RFC7429, we propose four cases of distributed deployment models and enhanced anchoring models over them.

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1. Introduction

This document presents a new perspective for the solution design of enhanced mobility anchoring in a distributed mobility management deployment.

[RFC7333] defines the requirements for distributed mobility management (DMM), in order to fundamentally address the scalability issues derived from a centralized mobility management (CMM) deployment. Based on the given requirements, there may have diverse design solutions for enhancing mobility anchoring, depending on a view point looking at mobility anchor function.

[RFC7429] specifies mobility management functions with three roles: anchoring functions (AF), internetwork location management (LM) function, and forwarding management (FM) function.

Based on the given definitions of mobility management functions, a mobility anchor node can be considered. Basically, a mobility router needs to have the FM function for data distribution over a mobile network, while deployment of the other functions such as AF and LM can be considered with combinatorial cases. That is, FM is distributed while AF and LM can be distributed or centralized. Taking those deployment combinations, we provide four deployment models for anchor switching.

2. Conventions and Terminology

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].

Mobility router (MR) denotes a network entity, which has mobility access and anchor functionality. Specifically, the entity is split into following functions, defined in [RFC7429].

Anchoring Function (AF) is a control-plane function, which allocates an IP address, i.e., Home Address (HoA), or prefix, i.e., Home Network Prefix (HNP) a mobile node, topologically anchored by the advertising node. That is, the anchor node is able to advertise a connected route into the routing infrastructure for the allocated IP prefixes.

Internetwork Location Management (LM) is a control-plane function, which manages and keeps track of the internetwork location of an MN. The location information may be a binding of the advertised IP address/prefix, e.g., HoA or HNP, to the IP routing address of the MN, or it may be a binding of a node that can forward packets destined to the MN.

Forwarding Management (FM) function performs packet interception and forwarding to/from the IP address/prefix assigned to the MN, based on the internetwork location information, either to the destination or to some other network element that knows how to forward the packets to their destination.

3. Enhanced Anchoring Models

FM is distributed over MRs deployed at the edges while AM and LM are distributed or centralized. Taking into consideration the deployment of the mobility management functions, four cases of the function deployment for anchor switching are given.

3.1. Case 1: Distributed AM, LM, and FM functions (All-in-One)

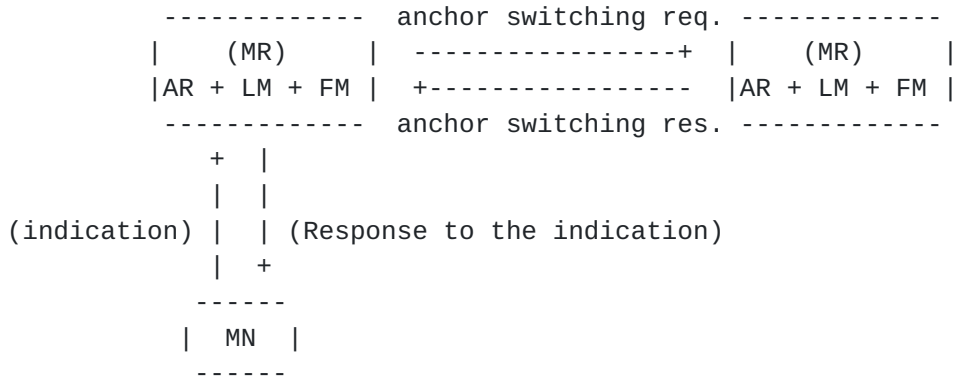

Figure 1 Distributed AM, LM, and FM functions

In this case, LM and FM functions are co-located at MRs. When an MN is attached at an MR, the MR should be able to assign IP address or prefix on its address pool by AR and manage binding cache associated with the assigned IP prefix by LM. When anchor switching is needed (for load-balancing or optimal routing after the MN's handover), the MR (left) initiates an anchor switching procedure, sending anchor switching request message including the binding context associated with the MN's flow to another MR (right) as shown in Figure 1. If the target MR is available to accept the anchor switching request, it sends back anchor switching response message to the request MR. Employed signaling message can be implemented through extension of existing mobility signaling message such as Proxy Binding Update (PBU) and Proxy Binding Acknowledgment (PBA) messages in PMIPv6.

In this case, each MR should be involved in negotiation for anchor switching and have a target MR selection algorithm, which leads to more signaling and complex processing.

3.2. Case 2: Distributed LM and FM functions with centralized AF

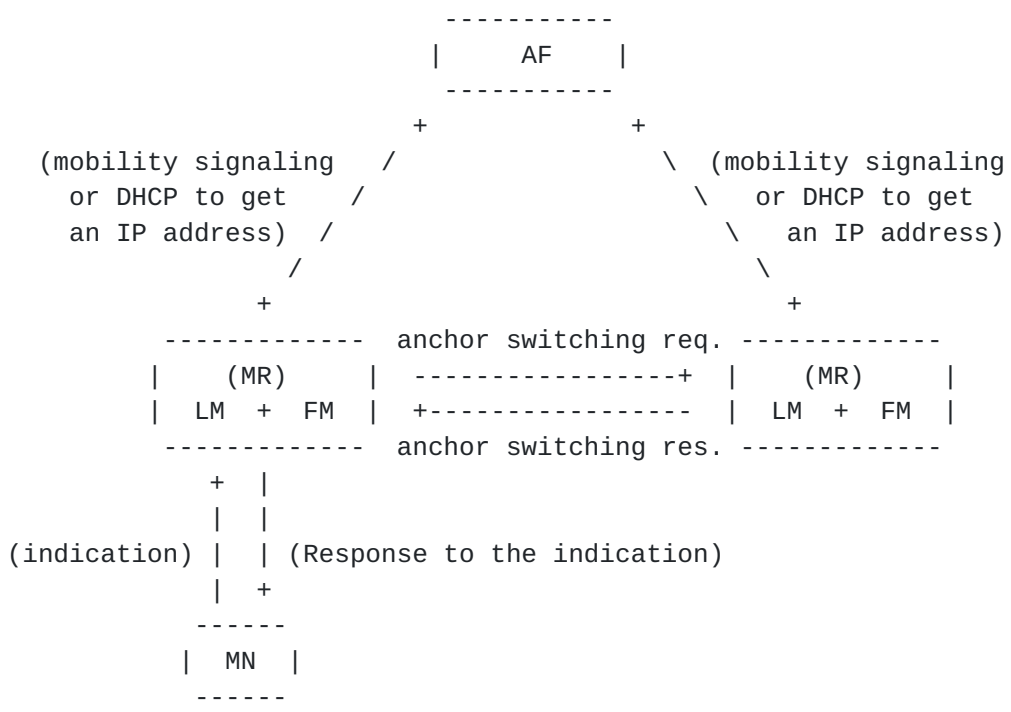

Figure 2 Distributed LM and FM functions with centralized AF

In this case, LM and FM functions are co-located at MRs while AF is deployed in the form of centralization. When an MN is attached at an MR, the MR needs to get an IP address or prefix from the AF. For this operation, an extended binding update signaling from IP mobility protocols or DHCP can be used. The rest of functions and operations follow the same procedures described in Case 1.

3.3. Case 3: Distributed AF and FM functions with centralized LM

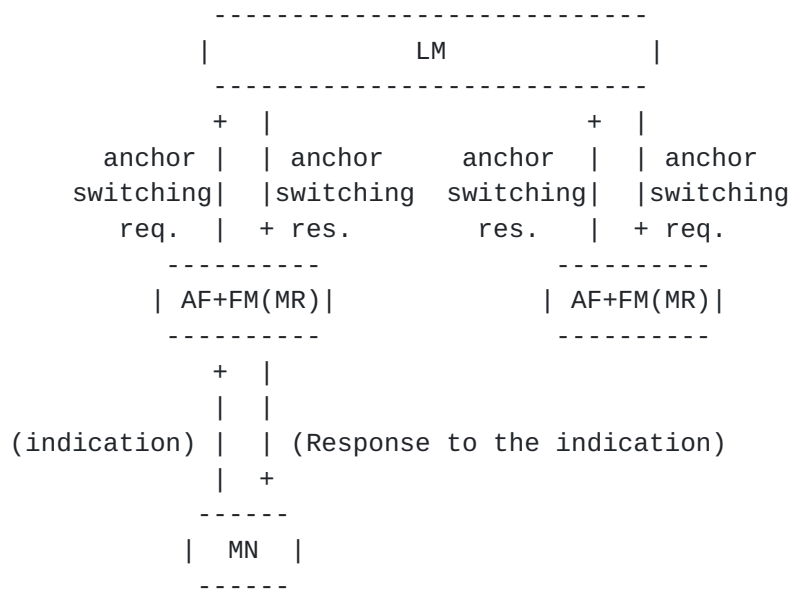

Figure 3 Distributed AF and FM with centralized LM

In this case, MRs have the AF and FM functions. There is a dedicated and centralized network entity working as a controller for anchor switching, as well as being in charge of IP or prefix assignment and management of binding cache entry.

When an MN enters a distributed mobility management domain, it gets a new IP or prefix from an AF. The assigned IP or prefix is delivered to the requested MR, and the MR then applies the received IP or prefix to the forwarding table in the FM.

When anchor switching is needed, there are no signaling interactions between the former MR and new MR but between the related MRs and controller, since the controller is in charge of the anchor switching operation. As shown in Figure 3, the requesting MR (left) sends an anchor switching request message, defined in [RFC5213], including the binding context associated with the MN to controller. The controller then checks an available MR (or based on a designated MR received from the requesting MR), and delivers the binding context to an MR (right). The MR (right) applies the forwarding rule between the MRs by sending the anchor switching request message and sends back the anchor switching response message through the reverse path.

For smooth path transition during the anchor switching, a transient tunneling could be established between the two MRs until a new routing path is established. When the routing path is made, the forwarding table applied in the previous MR is deleted.

Such deployment makes MRs lightweight for anchor switching, controlled by a central entity managing forwarding state and monitoring load status at each MR.

3.4. Case 4: Distributed FM function with centralized AF and LM

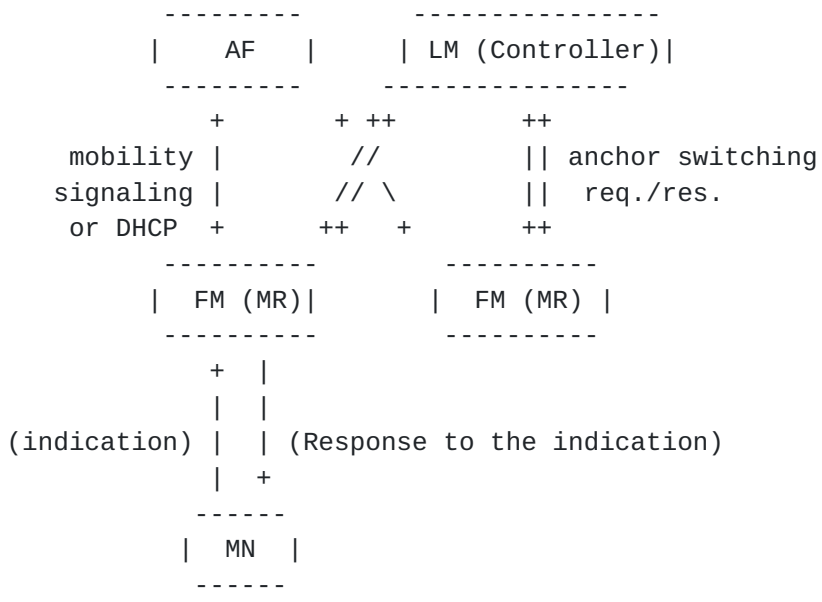

Figure 4 Distributed FM with centralized AF and LM

In this case, MRs have the forwarding path management function only. AF and LM are deployed in a centralized form.

When an MN enters a distributed mobility management domain, it gets a new IP or prefix from the AF, which can be determined based on attached location of the MR. The assigned IP or prefix is delivered to the requested MR, and the MR then applies the received IP or prefix to the forwarding table in FM. When anchor switching is needed, it follows the same procedures described in case 3.

4. Security Considerations

T.B.D.

5. IANA Considerations

T.B.D.

6. References

6.1. Normative References

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