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Routing Optimization with SDN
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Abstract

DMM is a mobility protocol which has mobility functions to solve the existing problems in the current centralized ones. However, when a mobile node moves to another anchor, the previous flow is forwarded by the previous router. For this reason, the routing optimization could be an issue. This draft proposes a routing optimization method in distributed anchor architecture. In this draft, we applied the SDN concept to DMM architecture for routing optimization.

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1. Introduction

DMM is a technology for distributed network-based mobility management protocol, which has been proposed to solve the problems in the centralized mobility protocols such as PMIPv6 [RFC5213], MIPv6 [RFC6275]. In the current research of distributed mobility management, there are two methods for mobility management.

One is the fully distributed mobility management method. The other is the partially distributed mobility method.

In partially distributed method, it decouples the control plane and data plane. It uses a centralized method for control plane and uses a distributed method for data plane. In fully distributed method, it uses a distributed method for both control plane and data plane.

In Partially Distributed, there is one entity which that stores the BCEs allocated for the MNs in the mobility domain. In the current network, when mobile node moves to a new anchor, tunneling must be used between the P-MAAR and a new anchor and the previous flow is forwarded from the P-MAAR to the new anchor until the flow is finished. Therefore, routing may not be optimized in term of bandwidth overhead.

2. 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 RFC-2119 [RFC2119].

Software Defined Networking (SDN)

The following terms are defined and used in this document:

DMM service (distributed mobility management service)

Function that store the BCEs and support mobility management, it’s running on controller.

The following terms used in this document are defined in A PMIPv6-based solution for Distributed Mobility Management [draft-bernardos-dmm-pmip-03]

Mobility Anchor and Access Router (MAAR)

Central Mobility Database (CMD)

Previous MAAR (P-MAAR)

Serving MAAR (S-MAAR)

CN MAAR (CN-MAAR)

3. Motivation of DMM Optimization

In current distributed mobility management, mobile node is allocated IP from initiate anchor. if mobile node moves to another router, mobile node received data through the tunneling between P-MAAR and S-MAAR. that is, tunneling is necessary to receive data from previous router and this method has still optimization routing

problem. In this draft, we propose a routing optimization scheme that applied SDN concept to DMM architecture.

4. DMM architecture with SDN concept for routing Optimization

The purpose of this draft is to make optimized routing path from the DMM architecture. If data path is controlled by SDN controller in the DMM architecture with a DMM service that stored mobile node status, mobile node data path is possible to set up by optimized path. Moreover, tunneling is not necessary when receiving data from previous router. The architecture of proposed method is shown in the figure 1.

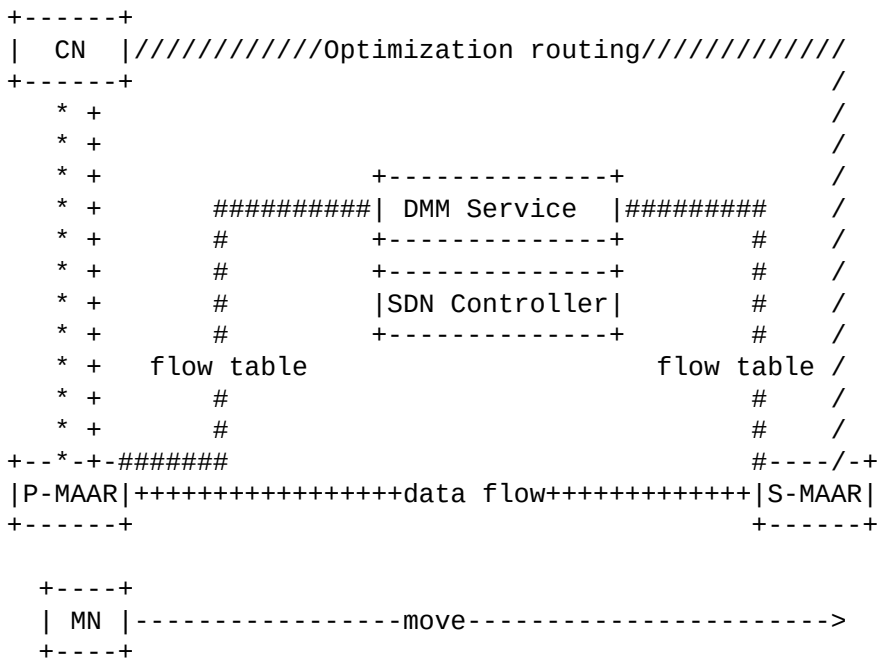

Figure 1. DMM architecture with SDN

In current distributed mobility management, Upon the MN’s attachment to initiate router, the binding update message is sent to CMD that stored mobile node status and session DB replies to initiate router with PBA including prefix. When the mobile node moves from its current router to new router, new router sends a binding update message to CMD. CMD sends to update information related to mobile node. The previous router that received update information from CMD establishes a tunnel with the new router to transmit data.

4.1. Handover process and potential optimization routing

In proposed architecture, mobile node is supported mobility management by binding update to controller with DMM service. Moreover, data path can be set up without data tunneling in our method. because data path is set up by flow table which made by SDN controller. That is, mobile node can be supported optimized path by flow table, without tunneling. There are several benefits and potential ways to support routing optimization.

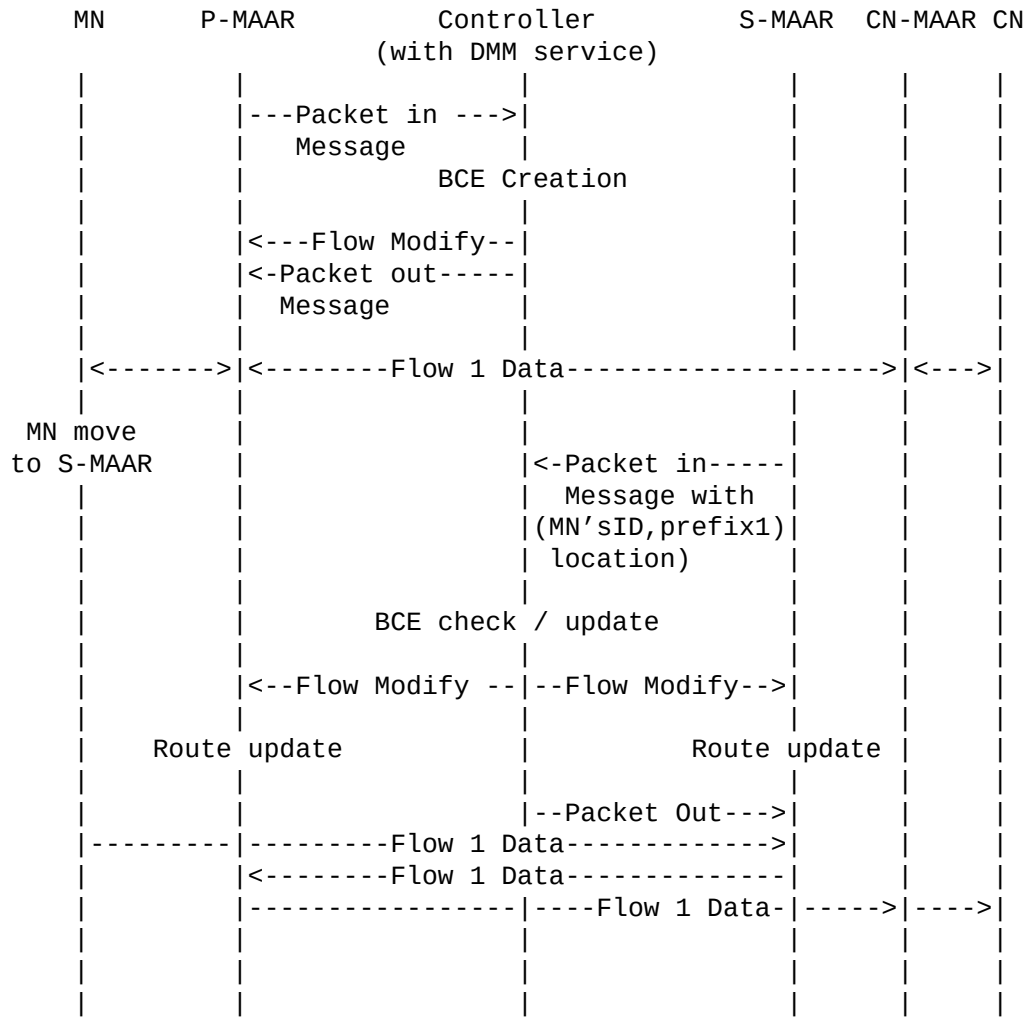

Figure 2. Procedure of DMM with SDN

As a Figure2, When mobile node attach initiate router , MAAR1 sends a Packet in Message with MN's ID, for registration to the controller. Upon accepting this Packet in Message, the controller sends a Packet out Message including the mobile node's prefix1 and controller stored mobile node information in Binding cache entry.
For set up the data path, the controller sends a Flow Modify message to set up the flow table in the P-MAAR.
If the mobile node moves to the S-MAAR, the S-MAAR sends a Packet in Message with mobile node's ID, prefix1, new location of mobile node(S-MAAR). The controller which receives packet in message will check and update BCE.
Upon receiving this Packet in Message, the Controller sends Flow Modify message to P-MAAR, S-MAAR to set up the new data path. On receiving flow modify messages, the S-MAAR and P-MAAR will update their routing tables. Then the data session will flow from P-MAAR to new S-MAAR and finally to the mobile node.

4.2. Advantage of DMM architecture with SDN

SDN which has a flexible way to set up data flow can provide a solution to support efficient route in the DMM architecture. If the mobile node moves to another router, this method can solve the routing optimization problem by modifying flow tables. Besides, the SDN doesn't only allow us to control the data path but also the other kinds of messages between routers.

4.3. Optimization routing

As a Figure2, When mobile node attach new router, the data session Will flow from P-MAAR to new S-MAAR. Even mobile node Move to another router, data path will be formed through the P-MAAR.
It will be occur delay and make the non-optimization path. However, In the SDN based DMM, the controller can modify flow table to make the optimization data path.

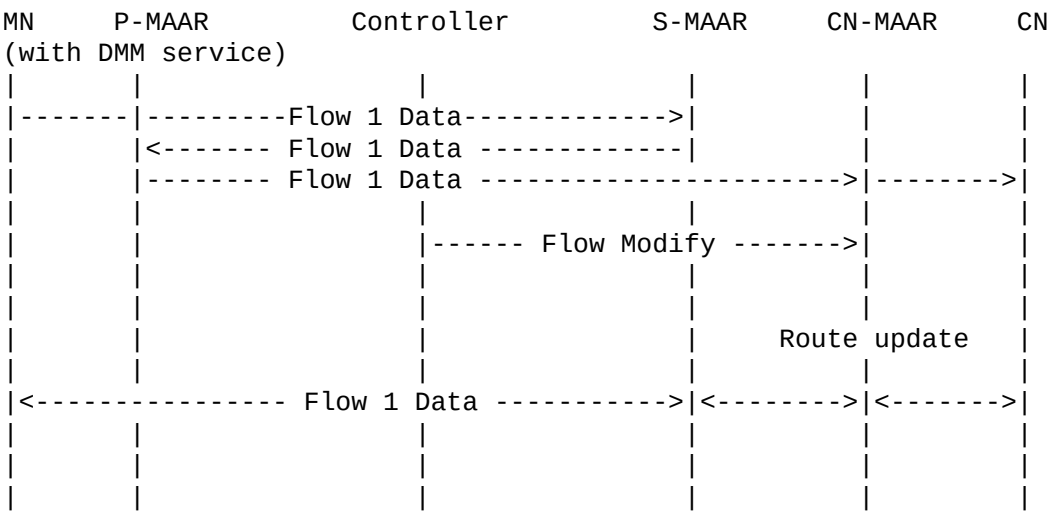

Figure 3.Procedure of path optimization

As a Figure3, After packet redirecting, controller send the flow Modify message to CN-MAAR for routing optimization. Flow modify Message has information that stored flow table between CN-MAAR and S-MAAR. After Receiving Flow modify message, CN-MAAR send packet to S-MAAR directly.

4.4. The Function of DMM Service

As a Figure3, When mobile node attach new router, Previous CMD can’t support optimization path since it has only Binding cache information and session information. However, DMM Service function can support optimization path since it can know all current network status and calculate optimization path with Binding cache information.

4.5. Mobility support for Multi domain

In this section, we describe mobility management for multi domain. it is required to support multi domain with mobility management. In the previous draft[I-D.ietf-dmm-distributed-anchoring],they describe the solution to support inter-domain operation for mobility management. However, tunneling and new entity(such as new LMA) are necessary to support mobility management for multi domain since CMD doesn’t have any information of other domain. In this draft, controllers can communicate via East/Westbound interfaces to make a path between edge routers in each different domain.

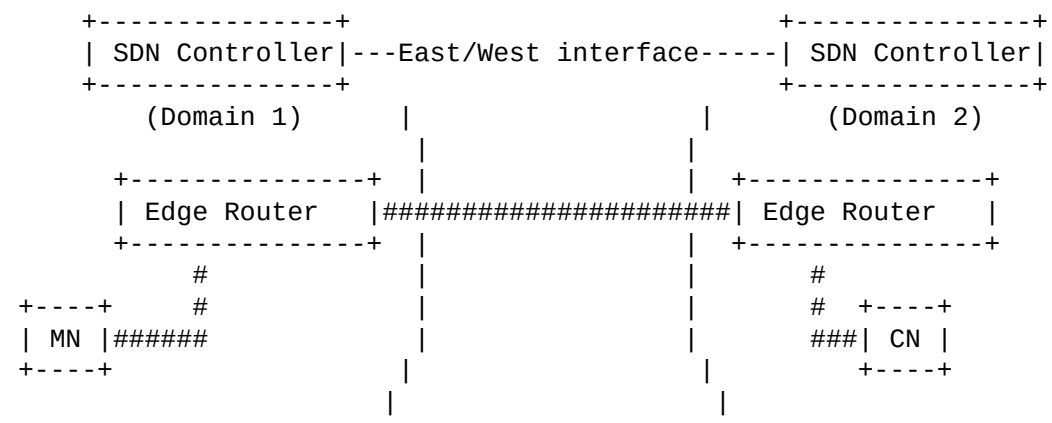

Figure 5.Data flow in Different Domains

As a figure5, data path is set up to send data packet from router in the domain1 to router in the domain2. Therefore, this architecture can support mobility management in multi domain.

5. Security Considerations

TBD

6. IANA Considerations

This document makes no request of IANA.

7. References

7.1. Normative References

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

[RFC6275] Perkins, C ,Johnson, D., and J. Arkko, "Mobility Support in IPv6", RFC 6275, June 2004.

7.2. Informative References

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