                    Routing Optimization with SDN
                    draft-yang-dmm-sdn-dmm-00.txt

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)

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.

```
        +------+
        |  CN  |////////////Optimization routing/////////////
        +------+                                          /
           * +                                           /
           * +                                          /
           * +                  +--------------+       /
           * +       ##########| DMM Service  |######### /
           * +       #          +--------------+       # /
           * +       #          +--------------+       # /
           * +       #          |SDN Controller|       # /
           * +       #          +--------------+       # /
           * +    flow table                   flow table /
           * +        #                               # /
           * +        #                               # /
        +--*-+-#######                         #----/-+
        |P-MAAR|++++++++++++++++data flow+++++++++++++|S-MAAR|
        +------+                                 +------+


          +----+
          | MN |----------------move---------------------->
          +----+
```

                  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.

```
   MN           P-MAAR          Controller         S-MAAR          CN
                               (with DMM service)
   |             |                 |                 |             |
   |             |---Packet in --->|                 |             |
   |             |    Message      |                 |             |
   |             |           BCE Creation            |             |
   |             |                 |                 |             |
   |             |<---Flow Modify--|                 |             |
   |             |<-Packet out-----|                 |             |
   |             |   Message       |                 |             |
   |             |                 |                 |             |
   |<----------->|<--------Flow 1 Data--------------------------->|
   |             |                 |                 |             |
   MN move       |                 |                 |             |
   to S-MAAR     |                 |                 |             |
   |             |                 |<-Packet in-----|             |
   |             |                 |  Message with  |             |
   |             |                 |(MN'sID,prefix1)|             |
   |             |                 | location)      |             |
   |             |                 |                 |             |
   |             |         BCE check / update        |             |
   |             |                 |                 |             |
   |             |<--Flow Modify --|--Flow Modify-->|             |
   |        Route update           |         Route update        |
   |             |                 |                 |             |
   |             |                 |--Packet Out--->|             |
   |             |                 |                 |             |
   |<-----------|---------Flow 1 Data------------->|             |
   |             |<--------Flow 1 Data------------->|             |
   |             |<---------------|----Flow 1 Data-|----------->|
```
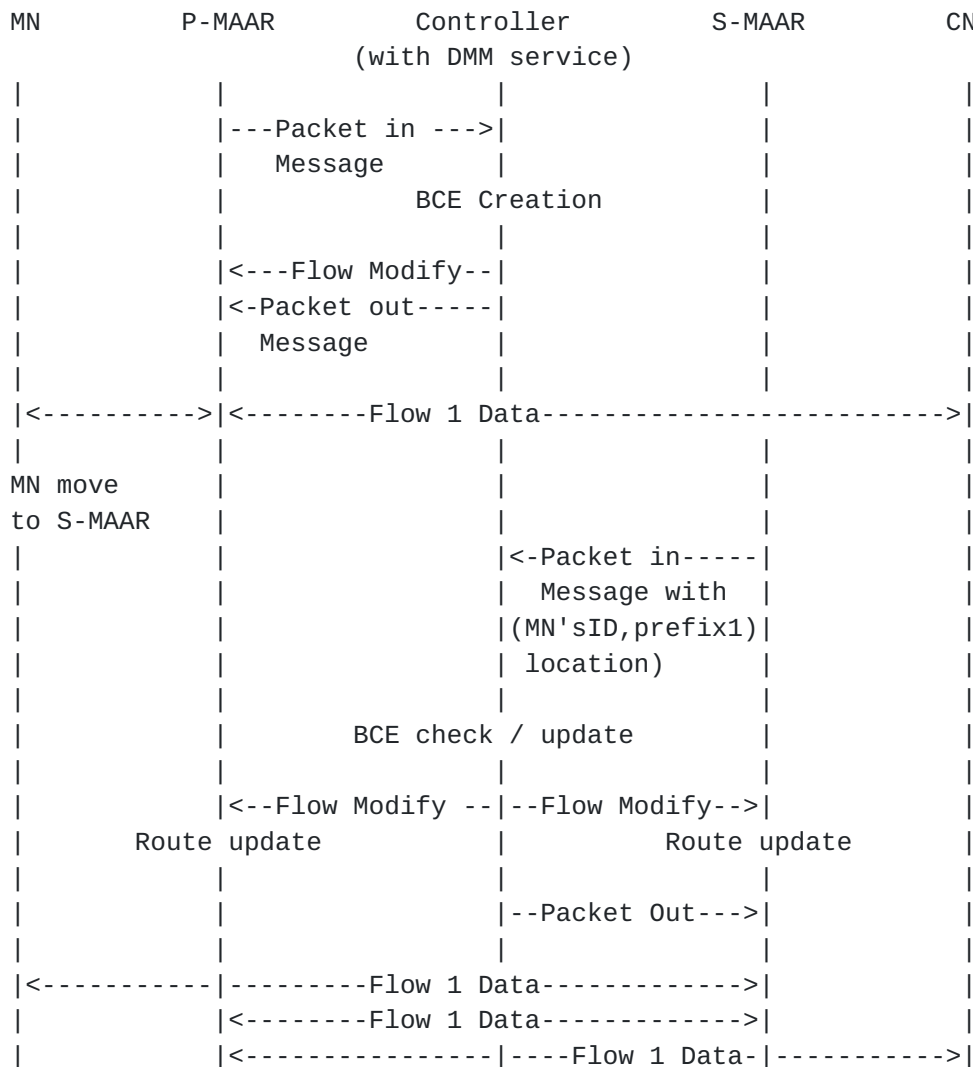
Figure 2. Procedure of DMM with SDN

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.

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

[draft-bernardos-dmm-pmip]

   CJ. Bernardos, A. de la Oliva, F. Giust, ''A PMIPv6-based solution
   for Distributed Mobility Management'', draft-bernardos-dmm-pmip-03
   (work in progress), July 2013.

 [SDN 2013]

   Sezer, S.; Scott-Hayward, S.; Chouhan, P.K.; Fraser, B.; Lake, D.;
   Finnegan, J.; Viljoen, N.; Miller, M.; Rao, N., "Are we ready for
   SDN? Implementation challenges for software-defined networks,"
   Communications Magazine, IEEE , vol.51, no.7, pp.36,43, July 2013.

Authors' Addresses

    Hyunsik Yang
    Soongsil University
    369, Sangdo-ro, Dongjak-gu,
    Seoul 156-743, Korea

    Email : yangun@dcn.ssu.ac.kr

    Younghan Kim
    Soongsil University
    369, Sangdo-ro, Dongjak-gu,
    Seoul 156-743, Korea

    Email: younghak@ssu.ac.kr