Distributed Mobility Management (DMM) X. Wei
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Consideration of Routing Optimization for DMM network
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Abstract

Distributed Mobility Management (DMM) is designed to be a distributed and scalable mobility management solution, and providing optimal route for traffics is one of DMM's aims. There have been several proposals on DMM framework, and this document provides discussion on how to optimize traffic routes, and aims to provide suggestioins on how to avoid long route in DMM network.

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1. Introduction

The new network service scenarios such as network traffic offloading and mobility service in local Content Delivery Networks (CDNs) impose new requirements on network mobility management, and a more flat mobility management system with fewer levels of routing hierarchy introduced into the data path is more preferred. So Distributed Mobility Management (DMM) is proposed to satisfy these new network mobility management requirements, and DMM aims to solve the problems such as non-optimal routes, poor network scalability, and single point of failure and attack which are widely faced by existing centralized mobility management protocols [4].

Currently several solutions on DMM framework are being discussed, some of the solutions are based on existing IP mobility management protocols [5] [6], and others provide new solutions [7] [8]. These solutions provide their own DMM frameworks, and in order to transport traffic through an optimal path the basic idea of these solutions is placing mobility anchors in a distributed way.

Routing redundancy is a common problem in mobile IP network. In mobile IP network, Mobility Anchor (MA) acts as topological anchor of IP address, and due to the existing of mobility anchors, the packets sent from MN's Correspondent Node (CN) are always firstly routed to MN's mobility anchor and then forwarded to MN. In order to reduce routing redundancy problem existing in mobile IP network, some routing optimization methods could be implemented. Because mobility anchor will be existed in DMM network, so routing optimization method(s) would also be taken into consideration in the design of DMM network.

This document provides some considerations of routing optimization related issues for the design of DMM network, several routing optimization methods and their impacts on traffic will be discussed.

2. Terminology and Abbreviation

2.1. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT","SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in thisdocument are to be interpreted as described in [1].

3. Impacts of routing optimization

This section analyzes the impacts of routing optimization on network traffic. Several routing optimization methods, including tunneling, changing the IP address and local routing, are discussed here.

3.1. Tunneling

In IP network, tunnel could be used to hide the network topology, and it is a method of changing the route of traffic. Because tunnel can let traffic travel in network without constrain of network topology, so it is often used as a tool for changing the route of network traffics.

In DMM network, MAs are distributed deployed and towards to access network, it is likely for MN to attach to different MAs when MN moves in the network. In order to keep service continuity, DMM network would keep MN's IP address for IP session, and routes the packets through the anchor of IP address. The change of MA would bring about routing redundancy, so tunnel based routing optimization could be used to reduce the routing redundancy.

For DMM network, When MN moves to a new MA, the tunnel for routing optimization could be set up between MN's MA and CN's MA (Figure 1), or between MN and CN (Figure 2).

```
            +--+
            |CN|
            +-|+
              |
              |
            +-|-+
            |MA3|=========||
          .'+---+         ||
         ,'               || RO tunnel
        /                 ||
       /                  ||
    +-`-+              +---+
    |MA1|--------------|MA2|
    +-|-+              +-|-+
      |                  |
      |                  |
      |                  |
     +|-+               +|-+
     |MN|  ---------->  |MN|
     +--+     move      +--+
```


Figure1: tunnel based routing optimization 1

```
                       +--+
             +---------+|CN|=========||
             |          +--+         ||
             |                       ||
             |                       || RO tunnel
             |                       ||
             |                       ||
             |                       ||
   +---------+------------+   +-----||-------------+
   |        ++--+          |   |     ||             |
   |        |MA1|          |   |     ||             |
   |        +-+-+          |   |     ||             |
```

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

   network of MA1                           network of MA2
```

Figure2: tunnel based routing optimization 2

3.2. IP changing

In mobile IP network, the reason of non-optimal route is that in order to provide service continuity for MN, network always guarantees the consistency of MN's IP address when MN moves in network. But in today's network there are a lot of applications that don't need service continuity, e.g. web service, DNS; and for the applications which though need service continuity, but they deal with service continuity in other layers, e.g. application layer, transport layer etc, and not depends on network layer. So for these applications, the consistency of IP address will cause unnecessary non-optimal route for them.

But for some other applications, they need mobility support from network layer, and in order to keep service continuity the IP address of MN must not be changed during the whole service session.

So in order to provide optimal path for service traffics from applications that don't require IP address consistency, when MN moves to a new MA, DMM network could assign new IP address for MN, and then

MN could use current MA's IP address for these applications; for the applications that require IP address consistency, when MN moves to a new MA, DMM network should allow MN to use the IP address assigned by previous MA to make sure the address for these applications not change.

For the traffic that requires the consistency of IP address, other routing optimization methods such as tunneling and local routing

could be implemented.

3.3. Local Routing

Local routing is another routing optimization method that could be used in the situation that MN and CN are in the same network region. In the same region means MN and CN are under control of the same mobility management entity, e.g. mobility anchor.

When MN and CN are in the same region, their traffic path might be shortened significantly by local routing. For example, there is a local routing function in PMIPv6 [2] protocol as shown in Figure 3. When MN and CN are under the control of the same MAG, the local routing path could be set up between MN and CN through the MAG, and then packets will transported along the path of MN--MAG--CN without passing through LMA.

```
                   +-----------+
                   |    LMA    |
                   +-----------+



                    +----------+
         |------->|    MAG    |<-----|
         |          +----------+      |
         |                            |
         |                            |
         |                            |
         |                            |
     +--V-------+             +----V----+
     |    MN    |             |    CN    |
     +----------+             +----------+
```

Figure3: Local Routing in PMIPv6

Because in DMM network, MA would be deployed towards to the access network, so when MN and CN are under the same MA, local routing method would provide a optimal path for packets between MN and CN.

An example of local routing for DMM network is shown in Figure 4.

```
                    +---------+
           |------->|   MA    |<-----|
           |        +---------+      |
           |                         |
           |                         |
           |                         |
           |                         |
        +--V------+             +----V----+
        |   MN    |             |   CN    |
        +---------+             +---------+
```

Figure4: Local Routing for DMM

4. Conclusions

This document discusses three kinds of method for routing optimization in DMM network, these methods aims to provide optimal traffic route in DMM network, and they would be suitable for different situations and different traffics.

5. Security Considerations

Security related issues are not considered in current document.

6. IANA Considerations

There have been no IANA considerations so far in this document.

7. References

7.1. Normative References

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

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

[3] Perkins, C., Johnson, D., and J. Arkko, "Mobility Support in IPv6", RFC 6275, July 2011.

7.2. Informative References

[4] Chan (Ed.) et al., "Requirements for Distributed Mobility Management", draft-ietf-dmm-requirements-12 (work in progress), Dec 2013.

[5] CJ. Bernardos et al,, "PMIPv6-based distributed anchoring", draft-bernardos-dmm-distributed-anchoring-03 (work in progress), Oct 2013.

[6] W. Luo, J. Liu,, "PMIP Based DMM Approaches", draft-luo-dmm-pmip-based-dmm-approach-02 (work in progress),

July 2013.

[7] H. Chan, P. Seite, K. Pentikousis, A. Dutta,, "Distributed Mobility Management Framework", draft-chan-dmm-framework-03 (work in progress), Oct 2013.

[8] M. Liebsch, P. Seite, G. Karagiannis,, "Distributed Mobility Management - Framework & Analysis", draft-liebsch-dmm-framework-analysis-02 (work in progress), Oct 2013.

[9] D. Liu et al,, "Distributed Mobility Management: Current practices and gap analysis", draft-ietf-dmm-best-practices-gap-analysis-02 (work in progress) (work in progress), Oct 2013.

Author's Address

Xinpeng Wei
Huawei Technologies

Email: weixinpeng@huawei.com