AN IMPROVED SCHEME TOWARDS FAST HANDOVER IN A HIERARCHICAL MOBILE NETWORK

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Abstract

Network mobility support is a matter of great concern in mobile IPv6. The authors have proposed an innovative scheme for handling the delay due to handover. The proposed scheme aims to free Mobility Anchor Point (MAP) from overload, while guaranteeing low latency due to handoff.

1. Introduction

A mobile network is a network segment or subnet that moves as a unit and dynamically changes its point of attachment to the internet and reachability in the topology. Network mobility support should not only concern with mobile networks, but also with mobile nodes. Once a mobile node enters another domain, a registration process between the mobile node (MN) and its home agent (HA) is required. This process is called handover. The mobile IPv6 supports packet routing for hosts moving on the Internet, but lacks support for networks moving through the Internet. The Internet engineering task force (IETF) Network Mobility (NEMO) working group proposed [2] a NEMO support protocol to ensure network mobility. The hierarchical Mobile IPv6 (HMIPv6) protocol has been proposed as an extension of basic MIPv6 to solve this problem by splitting the handover management into macro-mobility and micro-mobility schemes. HMIPv6 introduced a new protocol agent called Mobility Anchor Point (MAP) to manage mobility and serve as a local entity to aid in mobile handover. In the paper "Analysis of Handover Mechanisms for Hierarchical Mobile IPv6 Network Mobility" [3] NEMO moving patterns has used FHMIPv6 handover protocol. The current techniques tend to increase the overload on MAP. In this paper, an innovative scheme has been proposed to reduce the over load from the MAP.

2. Review of previous works

The paper "Architecture and Mobile IPv6 Extensions Supporting Mobile Network In Mobile Communications" [1] proposes an architecture and Mobile IPv6 extensions that support packet routing for mobile networks. MIPv6 only defines means of managing global (macro)-mobility but does not address micro-mobility separately. Instead, it uses the same mechanism in both cases. This involves long handover delay and signaling load. In the paper "Macro/micro-mobility fast handover in hierarchical mobile IPv6" [2], the hierarchical Mobile IPv6 (HMIPv6) protocol has been proposed as an extension of basic MIPv6 to solve this problem by splitting the handover management into macro- mobility and micro-mobility schemes. The paper "IEEE 802.11-based Mobile IP Fast Handoff Latency Analysis"[3] focuses on the analysis modeling of handoff latency for the two Mobile IPv6 fast handoff protocols, FMIPv6 and HMIPv6, using IEEE 802.11-based wireless local area networks as the wireless access networks. When a mobile network dynamically changes its point of attachment to the Internet, the various types of movements by a mobile router require handovers, and network mobility (NEMO) is concerned with the management of this movement of mobile networks. Accordingly, this paper investigates the mobile router movement patterns in NEMO network environments, and defines fast hierarchical NEMO handover scenarios based on classified movement patterns. The Fast Handover scheme for Hierarchical Mobile IPv6 (F-HMIPv6) reduce the delay of fast handover procedure. However, in practice the handover delay is still very high for time-sensitive services. An improved scheme for the F-HMIPv6 is proposed in the paper "Improved Fast Handover Scheme for Hierarchical Mobile IPv6" [5], which helps to settle the existing problem of F-HMIPv6.The paper "Efficient Mac Layer Handoff Management Scheme for Wireless Mesh Networks" [6] proposes efficient Mac Layer handoff management scheme for WMNs. First this paper describes a new approach to reduce discovery delay based on handoff Prediction when MSs roam across different Wireless Mesh Routers (WMRs). Then it develops a new algorithm to select the optimal target WMR using the minimum air time cost as metric. The paper, "SASHA—A

978-1-4244-6051-9/11/$26.00 ©2011 IEEE

Quality-Oriented Handover Algorithm for Multimedia Content Delivery to Mobile Users"[7], proposes the Smooth Adaptive Soft Handover Algorithm (SASHA), a novel quality-aware approach to handover based on load balancing among different networks using a comprehensive, Quality of Multimedia Streaming (QMS), function for decision making. To meet the increasing communication requirement for people in ubiquitous environments, some handover schemes and improvements were proposed by the IETF in order to support mobility effectively. FHMIPv6 combines the advantages of FMIPv6 and HMIPv6. The paper, "Fast Handover in Hierarchical Mobile IPv6 Based on Motion Pattern Detection of Mobile Node" [8], proposes an improved scheme based on FHMIPv6 which mainly implements a combined-detection function between Mobile Node (MN) and Mobile Anchor Point (MAP) and calculate the Normalized Edit Distance to analyze the motion trail and estimate the motion pattern of MN.

3. Proposed scheme

In our proposed scheme, Modification has been done in some moving patterns which are within same MAP in NEMO. By applying the proposed modification there is a chance of reduction of overload from MAP (mobility anchor point). Figure 1 illustrates the handover procedure in which MR enters another MR domain under the same AR.

Initially, the Mobile Router MR2 sends RtSolPr and FBU message to Access Router AR1. AR1 then generate the NCoA. AR1 sends an HI message to MR1 to check whether the NCoA is already exists or not. After that AR1 sends PrRtAdv message as an acknowledgement to MR2. MR1 sends a Hack message to AR1 as a response of HI message. After getting Hack message AR1 sends Update message to MAP1 to give the update information. Then AR1 sends FBack message to MR1 and MR2.

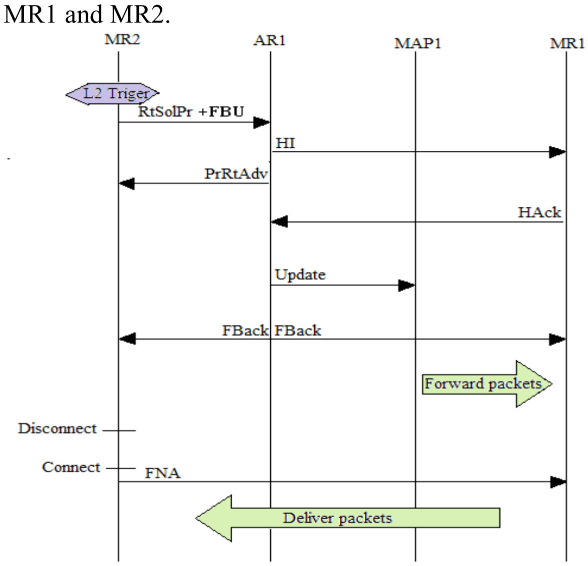

Fig. 1 MR enters another MR domain under the same AR

3.1 Proposed Algorithm

New_COA_generate

```
{
  While (1)
   {
        Send (RtSolPr+FBU) to AR1
        Delay (TCoA)                              /*Time delay for care of address generation*/
        Receive PrRtAdv and counter1 from AR1     /* receiving acknowledgement from AR1*/
        If (counter1! =0)
          {
               Counter1=0
```

```
              Break
          }
        T1= T_detect +T_FBU
        Delay (T1)
        Receive FBack and counter2 from AR1         /* receiving acknowledgement from AR1*/
        If (counter2! =0)
          {
              Counter2=0
              Break
          }
        }
    }
```

New_CoA_Search

```
{
  NCoA = AR1_NCoA+1  /* NCoA generation*/
  Send H1 message to MR1    /* sending HI message to check whether the NCoA is already exist or not*/
  Counter1=1
  Send PrRtAdv and counter1 to MR2   /* sending acknowledgement to MR2*/
 While (T_detect! =0)                           /* T_detect - Time delay of Duplicate Address Detection*/
 {
     Receive Hack and value of counter3 from MR1
      If (counter3! =0)
          {
             Counter3=0
             Break
          }
   Decrease the value of T_detect by 1
   If (T_detect==0 && counter3==0)          /* if NCoA is already exists*/
   {
      Send an ERROR message to MR1 and MR2 through FBack message.
      Terminate.
  }
  Send update message to MAP1.
  Send FBack message and counter2 to MR1 and MR2… }
```

New_CoA_Verify

```
{
  Receive HI message from AR1
/*matching the NCoA with each NCoA of database of MR1*/
  While (MR1_NCoA! =0)
   {
      If (NCoA ==MR1_NCoA)
       {
         Send "Address already exist" message through Hack message.
         Reset 1st bit of NCoA
         Break
       }
      Increment MR_pointer.
 }
If (1st bit of NCoA is set)                /* if NCoA does not exist in the database of MR1*/
      {
         Counter3=1.
         Send Hack and value of counter3 to AR1.
         While (T_FBU! =0)          /*T_FBU- Time delay of Fast Binding update*/
```

```
        {
                Receive FBack and counter2 from AR1
                 If (counter2! =0)
                {
                        Counter2=0
                        Break
                 }
                Decrease the value of T_FBU by 1.
        }
    }
}
```

4. Conclusion

Network mobility support involves taking care of handover delays. Many schemes for handling the delay due to handover had been proposed. In order to improve performance in the face of high rate of mobility, these schemes tend to increase the overload on MAP. Taking this in consideration, improved handover logic has been proposed for hierarchical mobile IPv6, in this paper. Modification has been done in some moving patterns which are within same MAP in NEMO. Theoretical verification has led to the conclusion that by applying the proposed scheme the MAP is free from overload. Research in now on to compare the performance of the proposed scheme with the existing schemes.

5. References

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