Paper Review (EE-499 Helmy, Spring 02)

Paper Title: Efficient Micro-Mobility using Intra-domain Multicast-based Mechanisms (M&M)
Authors: A. Helmy, M. Jaseemuddin

review number:1 (Jan.25)

- Summary:

  The authors proposed a novel intra-domain multicast-based architecture for providing efficient and smooth handover, which not only be able to co-exist with existing technologies, but also re-uses many multicast mechanisms. By incremental deployment, the proposed architecture greatly outperforms other micro-mobility schemes in handover latency. A proactive path setup approach also contributes to reduce handover delay and packet loss. Moreover, a novel algorithmic mapping scheme provides non-duplicate and scalable address allocation, and avoids specific server crash problem. A simple, yet efficient state aggregation also helps for scalability of IP multicast.

- Strengths and weaknesses of the paper: (at least 2 strengths and 2 weaknesses. Write about 2 lines for each)

  Strengths:
  1. The approach the authors used in assigning a multicast address while MN moves within a domain is really smart and optimized. It obviously outperforms the old MIP and Hierarchical MIP which updates the MN address all the long way to the HA or FA_{domian} . Moreover, it is even better than AR_{new} to AR_{old} which I "thought" the only best approach for multicast assignment. (Apparently, I was wrong.)
  2. Proactive path setup brings in the concepts of real cellular deployment. It no wonder radically improves the handover performance.

  Weakness:
  1. Although sending messages to the nearest point of the existing multicast tree is an efficient approach for multicast assignment, for two MNs connected to the same wireless network (or even in the same subnet) sending packets to each other, this type of traffic still need to be directed to the HA of the destination and vice versa.
  2. With a micro-mobility protocol, the network is not aware of the users movements inside a particular domain, as well as frequent changes of point of attachment make it difficult to support Quality of Service for mobile users.

- Points and suggestions of improvement:

  1. For weakness #1, a visitor list could be maintained in routers. However, scalability problem could be aroused.
  2. The deployment of ARs is still on network concern, while geographical information should be took into account for router placement.
  3. QOS mechanism could be integrated in this scheme. A mechanism works on the top of IP may be introduced for QOS.

- Exam-like question on this paper/topic (not more than 4 lines) and its answer (not more than 10 lines)

  Q: In A. Helmy and M. Jaseemuddin's paper "Efficient Micro-Mobility using Intra-domain Multicast-based Mechanisms (M&M)", handover delay is the evaluation metric used in evaluating the handover performance for the three micro-mobility approaches, say, Hierarchical Mobile IP approach, Seamless Handover approach, and Multicast-based approach the authors proposed.
  For each scheme, describe the detail and give example(s) about how the handover delay is related to a function of the number of links needed when re-establishing data reception during handover.

  A:

  Hierarchical MIP:
  When a MN moves within a subnet, it contacts its domain FA (FA_{domain}), thus localizing the registration to the current domain. Therefore, handover delay in such scheme is a function of number of links from the new FA to FA_{domain}

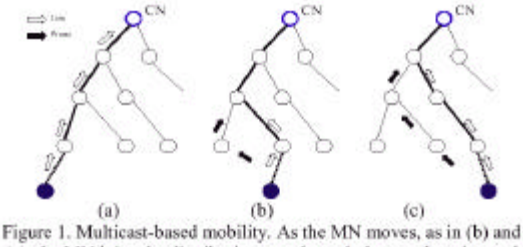


Figure 1. Multicast-based mobility. As the MN moves, as in (b) and (c), the MN joins the distribution tree through the new location and

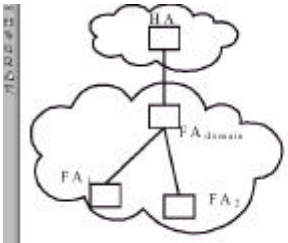
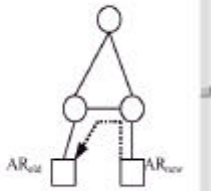


Figure 9 (a) Hierarchical MIP


(b) Seamless handover

  Seamless Handover:
  As shown in above figure 9(b), AR_{new} contacts AR_{old} to update the location of the mobile node. Pcakets are then sent/tunneled from AR_{new} to AR_{old}. The handover performance is a function of the number of links from AR_{new} to AR_{old}

  Multi-cast Handover:
  As shown in Figure 1, AR_{new} sends JOIN message to the nearest point of the existing multicast tree. Hence, the handover latency is a function of the number of added links (L) from AR_{new} to the nearest point of multicast tree. For example, in Figure 1(b) L=2, and in (c) L=3.

  In conclusion,
  Hierarchical MIP: a function of number of links from the new FA to $FA_{domain.}$
  Seamless Handover: a function of the number of links from AR_{new} to $AR_{old.}$
  Multi-cast Handover: a function of the number of added links from AR_{new} to the nearest point of multicast tree.