Integrating N-PMIPv6 and Simultaneous Bindings Avoid Packet Loss in NEMO

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ABSTRACT
Nowadays, user needs to access internet everywhere through their handheld devices which are constantly moving. Vehicular networks maintain connectivity through mobile platform as well as through fixed networks. Therefore an integrated solution should be provided to these types of networks. Novell Architecture (N-PMIPV6) enables seamless and efficient integration of mobile networks. While accessing internet mostly multimedia data such as audio, videos, graphics, animation needs to be used for data transfer either for uploading or downloading. The above architecture degrades the performance in terms of data transfer due to packet loss. So, the quality of data is not up to the mark and it differs a lot from the original data. To overcome the data loss issue, the simultaneous binding technique can be integrated with the N-PMIPV6. With this packet loss and additional tunneling of packets can be avoided. With this solution the nodes are much easier to reach, so that the internet access to the vehicular networks will be provided with out any degraded performance.

Keywords
NEMO, PMIPv6, N-PMIPv6, Simultaneous binding.

1. INTRODUCTION
1.1 Mobile IP
Generally a user wants a continuous internet access regardless of point of attachment. Usually they need to transfer huge data like video, audio and some other multimedia based. Though the data size huge, we must avoid packet loss, so that the quality of the multimedia will not be affected. Mobile IP is designed to support the users when they move from one network to another without changing the IP address [1]. Mobile IPv6 is the IP mobility implementation of next generation of internet protocol. It allows location independent routing of IP datagram in the internet. Each mobile node is identified by its home address regardless of the current location while away from the internet mobile node is identified by its care-of-address. MIPv6 protocol specifies the way of registering mobile node as an individual or sub network with the home agent and during mobility the data transfer is done through tunneling. Home agent stores information about the permanent address of the mobile nodes belonging to it and the foreign networks advertises care-of-address for the visiting nodes in order to provide the connectivity to them. In applications like VPN or VOIP, there is a sudden change in the IP address and network connectivity can cause problems [2]. An authenticated routing procedure should be made so that the mobile node communicates its care-of-address to its home agent [3].

2. NETWORK MOBILITY (NEMO)
The IETF has been working for the problems in terminal mobility; the NEMO group in IETF comes up with IP layer solutions for both IPv4 and IPv6 that enable the movement of terminals without stopping their ongoing sessions. These solutions are even being completed with proposals that improve the efficiency of the base solution, particularly in micromobility environments. The issue of terminal mobility has been analyzed recently in [4]. The first step in adaptation of mobile networks is terminal mobility support in IP networks, but there exists also the need of supporting the movement of a complete network that changes its point of attachment to the fixed infrastructure, maintaining the sessions of every device of the network: what is known as network mobility in IP networks. In this case, the mobile network will have at least a router called as Mobile Router (MR) that connects to the fixed infrastructure, and the devices of the mobile network will obtain connectivity to the exterior through this MR. The IP terminal mobility solution does not support the movement of networks, because of that, the IETF NEMO WG [5] was created to specify a solution, at the IP layer, to enable network mobility in IPv6. The NEMO working group was developed the basic solution to the network mobility problem in IPv6 networks by modifying the IPv6 host mobility solution (MIPv6). But the solution has to be flexible to deal with different mobile networks configurations, in particular, networks containing different subnets and nested mobile networks.

3. PMIPV6 (PROXY MOBILE IPV6)
Proxy Mobile IPv6 [6] tries to offer mobility to IPv6 hosts thIat do not have Mobile IPv6 in their stack. It enables the mobile devices to roam with the same ip address in a particular domain. The support is totally from the network called Network based localized mobility domain. It provides mobility support without any dependency on software level and complex mobility related configuration in the terminals. IETF provide this functionality through PMIPV6 [7].

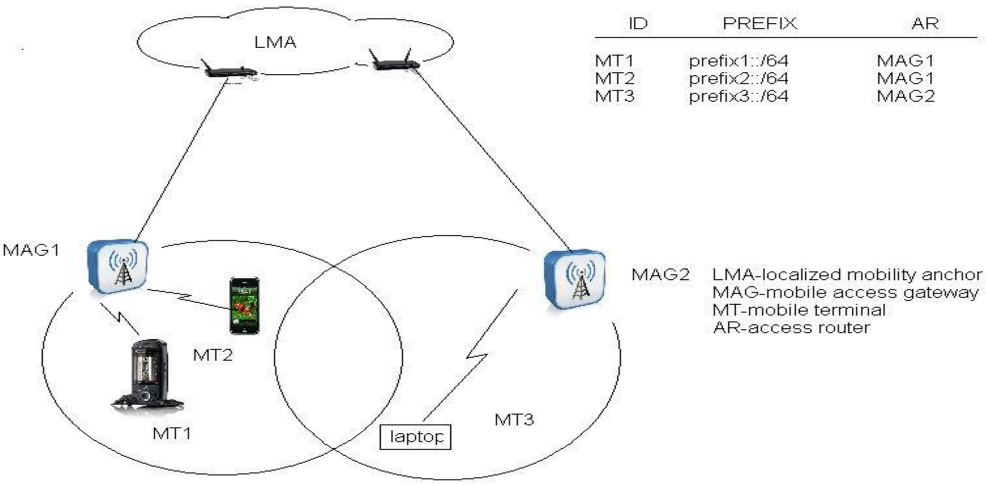

Figure 1 Proxy mobile domain

This concept is really helpful for the operators as it reduces the complexity for mobility. It can be implemented for large area by integrating it with the NEMO protocol. The implementation is shown in figure 1 and thus it is the existing approach for providing connectivity especially in the vehicular networks. As the mobility is high in these networks, connectivity is the biggest challenge and it can be overcome by the existing approach.

4. SIMULTANEOUS BINDING

Simultaneous Bindings [9] is an extention to FMIPv6. It tries to minimize the packet loss the MN experiences. It does this by bicasting traffic for the MN to both its current location and the location it is supposed to move to in the near future. This feature was built into Mobile IPv4 [10] but is not present in Mobile IPv6. In wireless network, it’s highly difficult to identify, from where the mobile node has detached and new point of attachment each time, which leads difficulty in determining when to start the packet transmission. A simple solution to this is bi-cast or n-cast the packet for the short period of time, from OAR (old access router) to one or more future locations before the mobile node reaches it. Duplicate packet delivery is also possible to the mobile node, so the packet replication and deletion should be followed by the mobile node by maintaining a simple table at each mobile node. The mobile node will discard the packet by setting the life time for the short period [9]. UDP is the best scheme for this method, as it does not work towards acknowledgement. The network will be flooded with packets and the services will be affected. Here the mobile node is reachable by sending the data to old, current and future access routers. The huge header information can be avoided by adopting this method

[11]. The results shows that the simultaneous binding with the high latency due to duplication of packets and also by the acknowledgement packets. If the network considers latency, we can use other methods like fast handover and HMIP, but to avoid packet loss, simultaneous binding is always a better solution [8]. The user can still roam any because the connectivity to the network has been guaranteed.

5. N-PMIPV6 ARCHITECTURE

This is a novel architecture called NEMO-enabled PMIPv6 (NPMIPv6), which fully integrates mobile networks in PMIPv6 (proxy mobile ipv6)-localized-mobility domains. With our approach, users can obtain connectivity either from fixed locations or mobile platforms (e.g., vehicles) and can move between them while keeping their ongoing sessions. N-PMIPv6 architecture exhibits two remarkable characteristics. First, N-PMIPv6 is totally network-based therefore no mobility support is required in the terminals and second, the handover performance is improved, both in terms of latency and signaling overhead.

Whereas the NEMO B.S. protocol requires MRs(mobile router) to manage their own mobility, this is not required in N-PMIPv6 in the same way that N-PMIPv6 does not require mobility related functionality in MTs. This is because the mobility of MRs and MTs (mobile terminal) in N-PMIPv6 is managed by the network.

This enables ip nodes to roam between fixed MAGs and MRs, without changing IPv6 address. The localized mobility anchor (LMA) adds the new binding cache entry associating the id of MT with prefix and mobile access gateway (MAG) ipv6 address to which it is attached. The MAG acts as a proxy for the mobile node, so only one control message is sent to the LMA or the home network which maintains the separate table. This architecture provides good the connectivity for the vehicular networks. Users can roam and get connection either from a fixed network or from the mobile routers. Nested tunneling is a demerit in this architecture, which leads to the packet loss. The quality of messages like audio and video are not up to the mark. There should be some mechanism to authenticate the mobile gateways which provides the information about the mobile node to avoid security issues.

6. PROPOSED ARCHITECTURE– INTEGRATION OF N-PMIPV6 WITH SIMULTANEOUS BINDING

When we integrate simultaneous binding approach with N-PMIPv6 the packet loss is reduced. When ever CN send a packet is sent to MT through LMA or HA, it’s always sent to the previous router, current router and the next router. All the routers will try to deliver the packets to the MN / MT, based on the availability the packets are delivered by one router and rest will be dropped. If any duplicate packets i.e. the same packets reaching the mobile node, it can be avoided by setting the life time to each packet. The mobile node can eliminate the packet with its id and lifetime to avoid duplication avoided. The problem of packet loss in N-PMIPV6 is eliminated that makes reception of good quality video, audio and other such files. As users always uses this type of file mostly in the internet for data transfer.

When the CN needs to send the packets to MT2, it will be routed first to the LMA. Then the LMA refers the table which contains the information of entire network such as IP address, access routers, terminals etc. By verifying the table, LMA identifies the current location of the mobile terminal and the access point to which it comes. According to the simultaneous binding technique, the packets are sent to the previous, current and the next AP or routers. So that even if the MT2 is in mobility the packets will be reached perfectly.

In Figure 2, MT2 is situated under MAG2 and hence the packets are sending to MAG1, MAG2 and MAG3. The packets reach all the three APs at the same time, so that even if the mobility of the node is faster it can be reached. The scenarios will be any of the following three,

MT2 in MAG2 with out heavy mobility, in this case MAG2 will be delivering the packets, MAG1 and MAG3 will be trying to deliver the packets. As MT2 are not in their coverage, both will discard the packets after certain period.

MAG3 will be delivering the packets if MT2 is under its control. MAG2 and MAG1 will be discarding the packets.

MAG1 will be delivering the packets if MT2 moves towards its old access router. MAG2 and MAG3 will be discarding the packets.

If MT2 stays in between any two MAG, it may be reachable by both. During this period the packets will replicated as it's delivered twice. The mobile terminal may maintain the table which contains the packet Id and lifetime. The MT2 should discard the duplicate packets by verifying its life time and packet ID with the previously received packets. Hence the duplicate packets will be discarded from the node.

The congestion may occur in the mobile node due to the duplicate acknowledgments and negative acknowledgements. Even this may be overcome by adding additional columns for ACKs and N-ACKs. Hence the table must contain the packet ID, lifetime, N-ACK and ACK. These tables must be maintained at the mobile node itself in order to overcome the congestion and duplicate packets at the mobile terminal. The entries in the table are made when the new packet arrives and the entries are deleted as soon as the life time of the packet expires. Mobile nodes can easily maintain its own table without disturbing its performance and other factors. Sample table is given in table 1.

Packet Life Time	Packet ID	Ack Status

Table 1 – Mobile Terminal Packet Verification Table

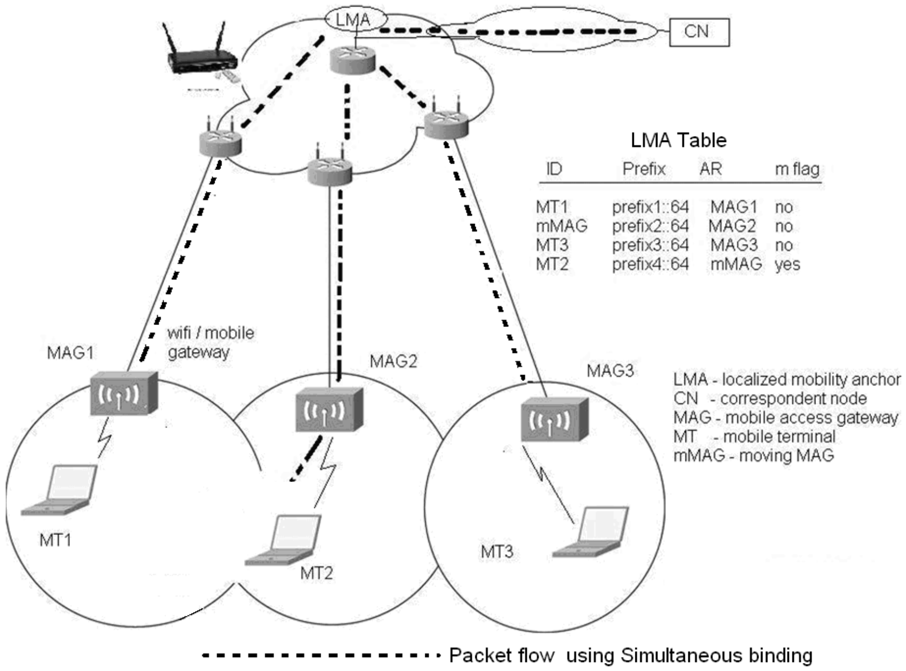

Figure 2 Proposed Architecture

7. CONCLUSION

The simultaneous binding protocol with the new technique of maintaining the tables by the mobile node with required parameters will increase the efficiency of data transfer. Also no packet loss will happen and any type of data can be transferred. The proposed system can enhance the performance of internet access in the vehicular network. Also guarantees the packet reception, so that the quality of the multimedia messages is improved. Packets are given a life time to avoid the duplication. The goal for our architecture is the provision of Internet access for urban public transportation systems, such as undergrounds, suburban trains, and city buses in an efficient or reliable way. In these systems, providing connectivity from vehicles and stations is not the only requirement because this connectivity also must be maintained while changing vehicles. When we consider less bandwidth networks, this solution may not be efficient. The future work can be done to avoid latency in the vehicular networks and also the security problems can be addressed. The traffic reduction or maintenance may be done accordingly.

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