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Distributed Mobility Management over IP based Mobile Networks

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***Abstract*- The rapid increase or the proliferation of multimedia mobile devices and the mobile applications are generating a wide range of data traffic over mobile networks. Mobile video is the main factor for the mobile traffic growth. Almost all mobile networks are evolving 4G system. IP mobility management is main threat in all-IP mobile networks, that permits mobile nodes to continue their communications, even when their point of attachment in the direction of IP network changes. In the existing networks a centralized mobility management scheme is employed. where all intelligence is wholly concentrated in to one end-point system. This cannot satisfactorily support mobile videos. It motivates distributed mobility management (DMM) solutions it can be very efficiently handle mobile video traffic. IETF: PMIPv6-based,MIPv6-based, and routing-based DMMs approaches that are currently considered here. We provide a qualitative analysis to make a comparison between the three DMM approaches and discuss which DMM approaches are more suitable for efficient video delivery over mobile networks.**

***Index Terms*—Centralized Mobility Management, Distributive Mobility Management, Mobile Internet protocol ,Proxy Mobile Internet Protocol, Routing Based Internet Protocol.**

I. INTRODUCTION

Over few years ago, multimedia mobile devices are rapidly proliferated. Mobile data traffic has increased dramatically along with this. Mobile video is the key driver of the explosive mobile traffic growth and this trend is expected to intensify in the near future, it has been reported that mobile video traffic was 52 percent of total mobile data traffic by the end of 2011, and it is forecasted that mobile video traffic will account for over 70 percent of total mobile data traffic by 2016. Despite the high demand for mobile data, telecom operators have been observing that their average revenue per user (ARPU) in mobile data is rapidly decreasing. To revert this, telecom operators are eagerly seeking to improve their net-work performance and efficiency, as well as to reduce the costs expended on network operation and maintenance. A major focus of such efforts is on solutions to efficiently handle a large volume of mobile video traffic. Mobile networks are currently evolving from the third generation (3G) to the fourth generation (4G) to meet the growing demand for the mobile broadband traffic with satisfactory user experiences. In the case of Third Generation Partnership Project1 (3GPP) Evolved Packet System (EPS), commonly referred to as the 4G Long Term Evolution (LTE), has a flatter architectural design and provides all-IP mobile broadband service,

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In all-IP mobile networks, as mobile nodes may frequently change their point of attachment to the IP network (i.e., the access router to which they are connected), IP mobility management is a key function to allow mobile nodes to continue their communications despite changing their access router.

II. NEED OF DMM APPROACH

Centralized approaches are normally used in the mobile networks. But these leads to mobile video traffic. Due to the many of disadvantages of this method the distributive mobility management is chosen as the better method.

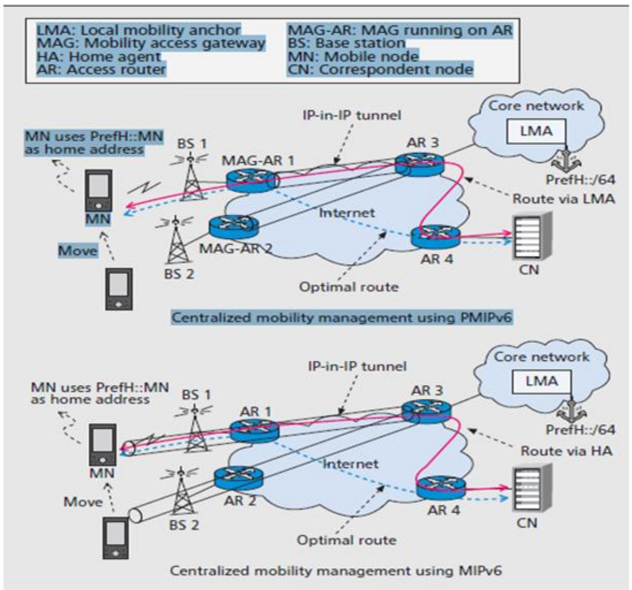

Fig: Centralized Mobility Management.

Lacks of dynamic mobility support is the problem associated with the centralized approaches. That is, it has to always support the IP mobility even when it is not required. When the MNs are stationary and stay attached to their initial serving AR, the centralized mobility anchor helps to still maintain their mobility contexts and also process their packets for tunneling. Due to this unnecessary IP mobility support, the centralized approach not only wastes the network resources but also suffer an additional delay in packet delivery. The centralized approach yields suboptimal routes via the centralized mobility anchor, it is notably increase the length of routes, especially when an MN and a correspondent node (CN) are close to each other but both of the communicating nodes are far from the centralized mobility anchor. It may also leads to inefficient use of network resources and packet delay. Third, the centralized approach is not scalable with a large number of MNs. Since the centralized approach requires all traffic to be routed via the centralized mobility anchor, the centralized mobility anchor has to maintain and manage the mobility contexts of a large number of MNs, and also to handle a large volume of data traffic. So that, this centralized mobility anchor and the backhaul routers around it will be overloaded, leading to a bottleneck.

A. Lack of dynamic mobility support

Current solutions define mobility support on a per user basis. That is, the service is provided to user's communications as a whole.

B. Suboptimal Routing

Data traffic always traverses the central anchor, regardless the current geographical position of the communication end-points . The use of a centralize mobility management approach would make user traffic to go first through the anchoring point, and then to the actual content location. With a distributed mobility architecture, the anchors are located at the very edge of the network, so data paths tend to be shorter, both when the endpoints are in the same domain.

C. *Low scalability*

In current mobility architectures, network links and nodes have to be provisioned to manage all the traffic traversing the vital anchors. This pose numerous scalability and network design problems, with the growing number of mobile users. A distributed approach is more scalable, as the tasks are shared among several network entities, and not delegated to a powerful central node.

D. vulnerability towards the attack and single point of failure

A centralized mobility anchoring architecture is generally more vulnerable towards the single point of attack, and it requiring replication and backups of the support functions. On the other hand, distributed mobility management architecture has fundamentally mitigated the problem to a local network which is then of a smaller scope.

III. TYPES OF DISTRIBUTIVE MOBILITYMANAGEMENT APPROCHES

Currently being three main approaches that are considered by the IETF DMM Working Groups are:

1. PMIPv6-based DMM.
2. MIPv6-based DMM.
3. Routing-based DMM.

1.PMIPv6-BASED DMM

The PMIPv6-based DMM decouples the role of the centralized LMA into three basic functions:

•Tunneling of data traffic.
•Allocation of home prefixes/addresses.
•Management of bindings of an MN's home address (HoA) and MAG's proxy care-of address (CoA).

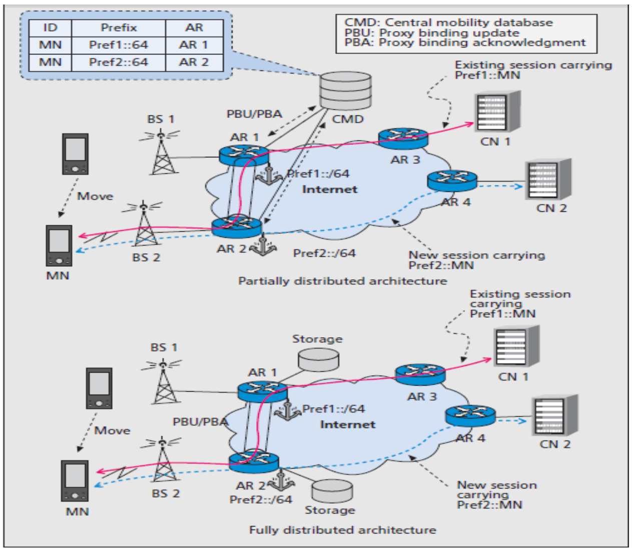

Fig: MIPV6- Based DMM.

Packets to the correspondent node (CN) are tunneled from the mobile node to the home agent ("reverse tunneled") and then routed normally from the home network to the correspondent node. In this mode, the home agent utilizes proxy Neighbor Discovery to intercept any IPv6 packets addressed to the mobile node's home address (or home addresses) on the home link. Here, each intercepted packet is tunneled to the mobile node's prime care-of address. This tunneling is perform using IPv6 encapsulation. The second mode, "route optimization" want to the mobile node will register their current binding at the correspondent node. The Packets beginning from the correspondent node can be routed unswervingly to the care-of address of the mobile node. When sending a packet to any IPv6 target, the correspondent node will checks its cached bindings for an entry for the packet's destination address.

2.ROUTING- BASED DMM

Routing-based DMM makes use of a routing protocol for prop up mobility, rather than a tunnel setup protocol as inPMIPv6- and MIPv6-based DMM. Thus, an optimal route can be used between two MNs. In this DMM approach, the network is structured in a hierarchy of three layers (core, aggregation, and access).

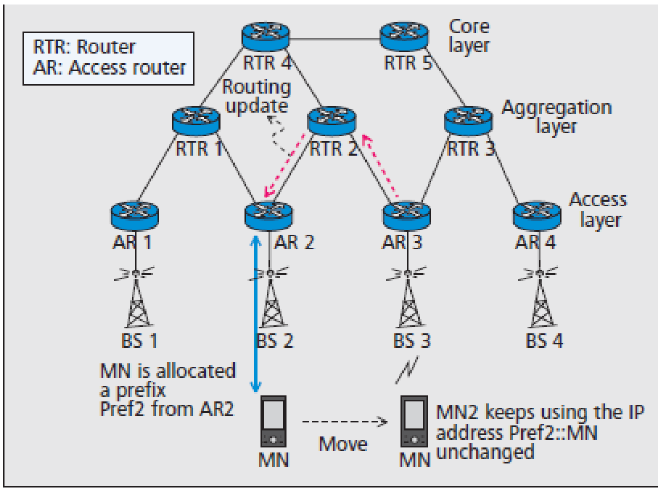

Fig: Routing Based DMM.

Each router is connected with more than one router in the upper layer, and it can even be connected directly to its peer routers in the same layer.The routers in the aggregation layer are configured as router reflectors for the ARs connected to them. That is, they aggregate the assigned prefixes advertised by ARs for the core routers in the upper layer and also reflect all sub prefixes advertised by any AR to all the other ARs in the cluster of which they are in charge

Upon initial attachment, an MN is allocated an IP address (or prefix) from the AR to which it is attached through a standard protocol (e.g., DHCP). Then the MN updates its Domain Name System (DNS) record to point its hostname to the IP address assigned, while the serving AR updates the reverse pointer in the in-addr. arpa (for IPv4) or ip6.arpa (for IPv6) space to point to the MN's hostname. That is, the mobile node and the serving AR control both the forward and reverse mappings disjointedly.

When a handover occurs, the new AR to which the MN moves first looks up an IP address using the MN's hostname obtained during the authentication. If found, the new AR performs a reverse lookup to confirm that some AR has actually assigned the IP address to the MN's hostname. If this is confirmed, a routing update is performed.

The new AR creates a Border Gateway Protocol (BGP) update message containing the MN's IP address and sends the message to its peers to announce the new route. If the MN moves to an AR in the same cluster where the MN's IP prefix was originally assigned by an AR, the BGP update message will be sent to the parent routers in the aggregation layer, by which the update will be reflected down to all the other routers in the same cluster. Otherwise, the aggregation router propagates the update up to the core layer, and it will reflects the updates downwards to all the other aggregation routers and then down to all the ARs in the access layer. With the route update, the packets destined to the MN can be routed to the new AR through an optimal path. In addition, to prevent the disruption of the MN's ongoing sessions during the handover process, after the MN moves, the previous AR should forward to the new AR the packets destined for the MN's IP addresses that it has received.

IV. COMPARATIVE ANALYSIS OF IETF DMM APPROACHES

This section, it first provides a qualitative analysis to compare the three IETF DMM approaches, in terms of three main characteristics used for the evaluation of mobility protocols they are data and signaling overhead handover latency and Packet delay.

V. CONCLUSION

Here it has surveyed different approaches for distributed mobility management in IETF, 3GPP, and the research domain, which can efficiently handle mobile video traffic. It has mainly focused on the three IETF DMM approaches: PMIPv6-based, MIPv6-based, and routing-based DMM. It have presented a qualitative analysis to compare them in terms of data and signalling overhead, handover latency, and packet delay. The qualitative analysis suggests that PMIPv6- and MIPv6-based DMM are more suitable for efficient mobile video delivery than routing based DMM, and can better support delay-sensitive and delay-tolerant video traffic, correspondingly.

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