CHAPTER THREE

METHODOLOGY AND EVALUATION

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Methodology and Evaluation

3.1 Introduction:

This chapter introduces full explanations of standard handover MIPv6 and Global MIPv6 scenarios.

3.2 Methodology:

A handover consists of a Link Layer handover and of a Network Layer handover. The Link Layer handover includes a Discovery phase (scanning the channels to discover an available Access Point), an Authentication phase, and a Re-association phase, whereas the Network Layer handover is concerned by a Router Discovery phase, a Detection Address Duplication (DAD) phase, a Binding Update phase and a Binding Acknowledgement phase respectively. The standard MIPv6 handover latency has been estimated to a maximum value of 1290 ms. This long latency is not acceptable for real time applications such as video and audio. If analyze each phase during the Network Layer handover in table (4.1) (Router Discovery, DAD, Binding Update and Binding Acknowledgement), Can note that the DAD latency costs almost 1000 ms and has a heavy weight on the global handover latency. As a result, in order to reduce the total handover latency, now a new procedure is developed to avoid any DAD operation during handover procedure. A new process is suggested to reduce this long latency, which uses a constant IP in MN.

Table (3.1): Handover Standard Delay Time

Parameter	Latency
Layer 2	50ms
Router discover	100ms
Detection Address Duplication (DAD)	1000ms
Binding Update	70ms
Binding Acknowledge	70ms

The IPV6 network is composed by four WLAN each have an AR which have a Global IPV6 connected through IP cloud in the core of the network. Each access router serves number of MNs which have a constant or Global IPV6. This makes easier to note the effects of the different MIPV6 mechanisms over the application delay.

MN-A and MN-B communicate to each other by a running a light video application. Initially the mobiles are placed at their corresponding home networks. Then MN-A is served by home agent HA-A and MN-B is served by home agent HA-B. Both mobiles used MIPV6 to roam among the various accesses points without changing their IPs. The movement performed by the nodes can be described as following:

- MN-A:

(1A)- MN-A moves in a counterclockwise trajectory roaming through all four access points in the network.

- MN-B:

(1B)-MN-B moves, first in a counterclockwise trajectory roaming through all four access points in the network.

(2B)-then it moves counterclockwise revisiting all access points again.

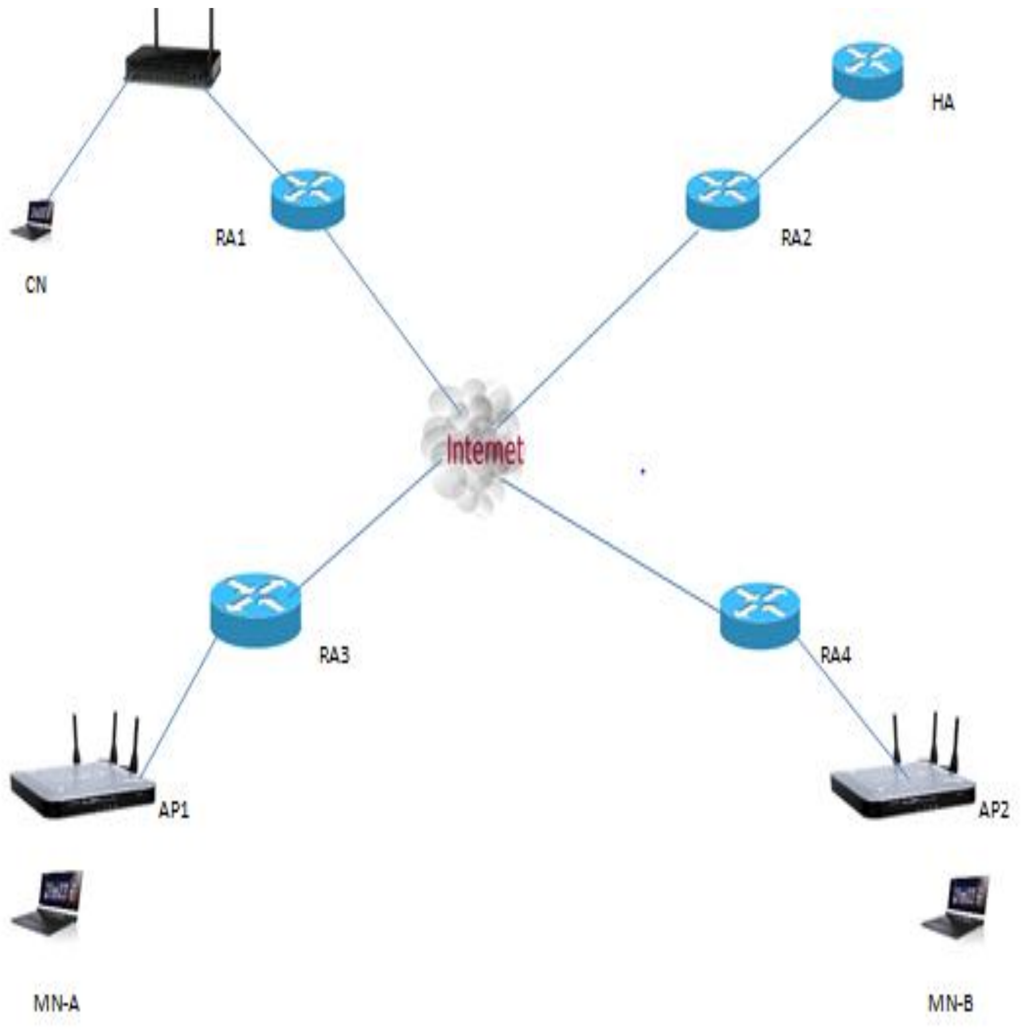

Figure (3.1): Network Model

In this project there is two scenarios, the first one explaining traffic of MN through the networks with MIPv6 and the second one explain traffic of MN through the networks with Global-MIPv6 (GMIPV6).

3.2.1 MIPv6:

For the MIPv6 protocol and IEEE 802.11/802.16 networks context, a MN surveys periodically the received signal strength. When the signal strength drops below a predefined threshold, the MN must discover and connect itself to a new available AR for granting its communication with its correspondence the router decides which AR, the MN shall associate with and notifies the MN about the new AR information, such as AR interface address, a sub-network prefix and an IP address. Consequently, the MN can configure its new Care-of-Address (CoA) and can take care of the Binding Update process even if it is still attached with its previous AR.

The procedure of a handover is composed of the following steps:

1. Moving in the network, if the threshold of the received signal strength is overstepped, the MN begins to probe the neighbor AR/AP's information, including the signal strength, some IP addresses, AR interface addresses and the sub-network prefix. Then the MN sends a mobile node request (MNReq) message to its original router (via its AR/AP) to report this information.
2. Receiving the MNReq message, the AR stops to forward all the packets sent to the MN.
3. Receiving the MNReq message, the original router decides to which AR/AP the MN will be associated. The choice of the AR/AP is mostly based on database obtained with periodic exchange messages between ARs/APs/MNs. the original router sends to the MN a MNRep message which consists of a new AR interface address, a sub-network prefix and a new IP address.
4. With the mobile node reply (MNRep) message, the MN can obtain its new CoA and configure it automatically.

5. The MN sends a Connection Established Information (CEInf) message to its original router to confirm its new attachment.

6. After receiving the CEInf message, the original router transfers the buffered packets to the MN’s new CoA. Then, the original router sends a Handover Finished Confirmation (HFCon) message to end the handover procedure.

7. The MN can then exchange Binding Update (BU) and Binding Acknowledgement (BA) messages with its home agent and its correspondent node.

This process take a long time about 1290ms, causes long delay and drop of packets, thus weakness the QOS.

The following figure (3.2) illustrate the process of handover procedures in MIPV6.

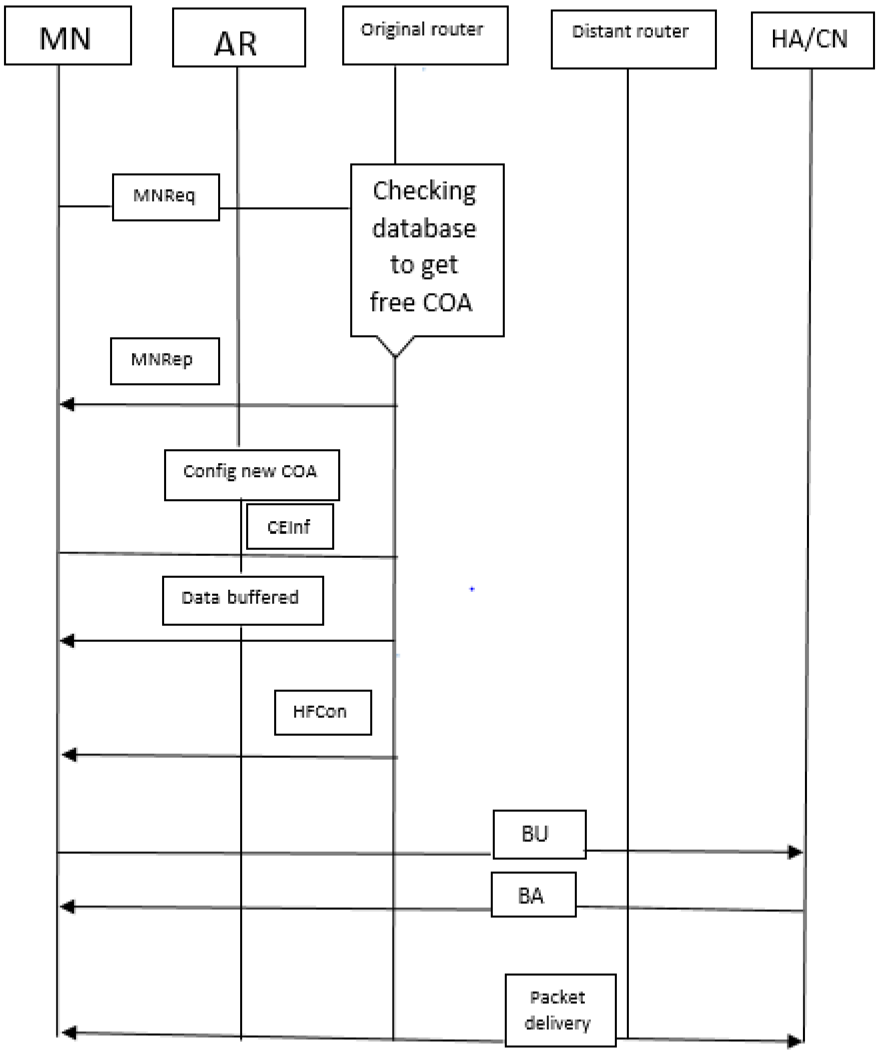

Figure (3.2):MIPV6 handover procedure

3.2.2 Global MIPV6:

In the other hand when each node in the network has a constant MIPV6, the MN-A communicating with the MN-B through a video application. Note that when each MN use a constant MIPV6 we have no need to search about another IP in the other network we just focus about finding a free channel to path through it. When we focus about finding just a channel we reduce searching time from the case of searching about an IP and free channel. In this case there is no need to detection address duplication (DAD), Binding update and Binding acknowledgment time when the MN move through the networks.

Each router doesn't need a new IP configuration in order to adapt for MN movements without the DAD, Binding update and Binding acknowledgment phase during a handover.

The procedure is composed of the following steps:

1. Moving in the network, if the threshold of the received signal strength is overstepped, the MN begins to probe the neighbor AR/AP's information, including the signal strength and the sub-network prefix. Then the MN sends a MNReq message to its original router (via its AR/AP) to report this information and find a free channel to path through it.
2. Receiving the MNReq message, the AR stops to forward all the packets sent to the MN.
3. Receiving the MNReq message, the original router decides to which AR/AP the MN will be associated. The choice of the AR/AP is mostly based on database obtained with periodic exchange messages between ARs. The original router sends to the MN a MNRep message which consists of a new sub-network prefix with free channel.
4. With the MNRep message, the MN connects to new AR without changing IP and configures it automatically.
5. The MN sends a CEInf message to its original router to confirm its new attachment.
6. After receiving the CEInf message, the original router transfers the buffered packets to the MN. Then, the original router sends an HFCon message to end the handover procedure.
7. By this process the MN don't need Binding Update (BU) and Binding Acknowledgement (BA) messages with its home agent and its correspondent node.

In this scenario, all the (1140ms) of detection address duplication (DAD), Binding Update (BU) and Binding

Acknowledgement (BA) have been layoff. The achievable result of this process contribute in reducing the time of the handoff effectively, thus improve the QOS. and the following figure (3.3) illustrate the process of handover procedures in GMIPV6.

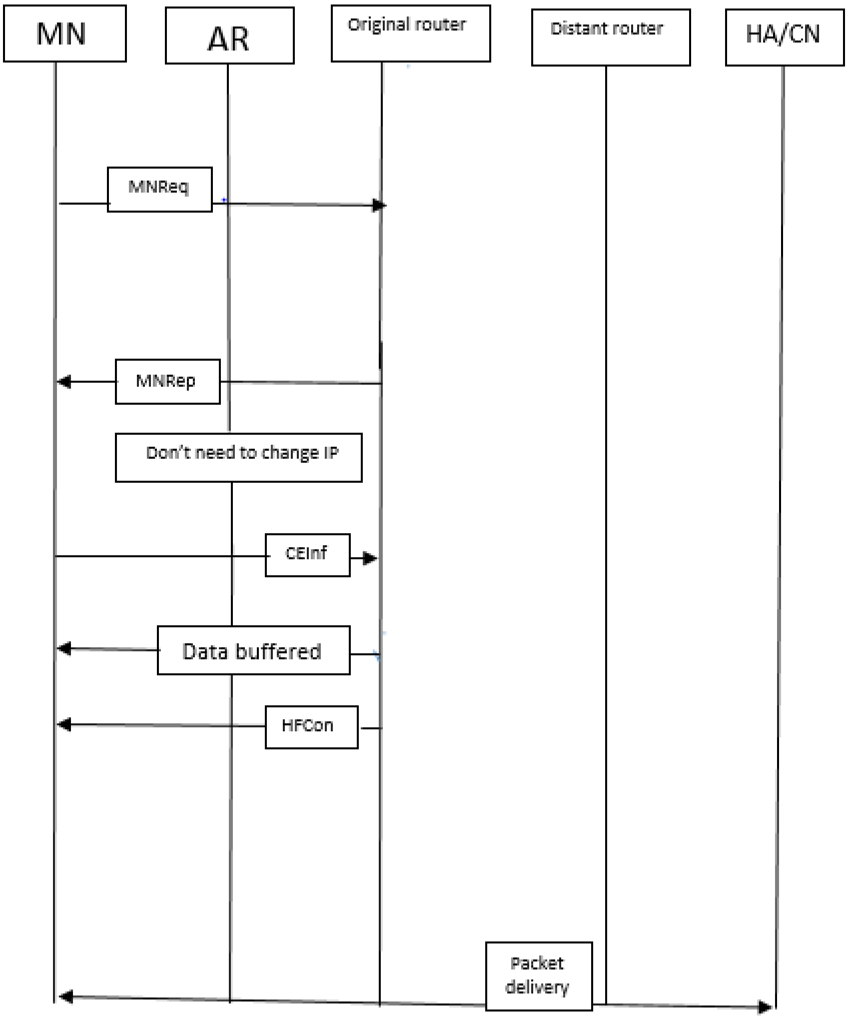

Figure (3.3): Global MIPV6 handover procedure

3.3 Evaluation of Global MIPV6:

The Global MIPV6 performance estimation has been evaluated in terms of the total handover latency and of the packet loss with an analytical model in figure (3.1) using OPNET simulation. This model allowed comparing GMIPV6 handover with the standard handover of the MIPv6 protocol.

The average of the GMIPV6 handover latency is about 150 ms, this value of 150 ms will validated by our simulation results on OPNET.

Although the latency will reduction from 1290 ms to 150 ms is significant, the value of 150 ms is still too long to support a real time application in wireless networks. This is due to the number of channel scans.