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Analysis of Handoff Latency in Advanced Wireless Networks

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Strictly as per the compliance and regulations of:

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I. Introduction

The federation of different wireless communication technologies on the way to 4G wireless networks had better face some anticipated challenges in advance representative practice implementation. One of the major challenges is the mobile station mobility managing by dissimilar wireless technologies in mandate to acquire the mobile station linked to the unsurpassed available wireless network. To amalgamate these perpendicular wireless networks in one network as a triggered network that can be acquiesce an improved service at lower cost to the manipulator, as well as progress the overall networks resource consumption. However, accomplishing these two goals needs an elegant mobility management system that can be achieved the trade-off flanked by efficient resource utilization and mobile station grasped QoS. Mobility management excludes two parts, handoff and location management. As soon as a mobile station moving across the boundary of dualistic neighbour cells, the MSC prepares a innovative twofold channels in the fresh cell to conserve the call commencing dropping, this operation is called a Handoff Management (HM). The location management (LM) is pursuing the active mobile station (powered on MS) while roaming without a call. Despite the fact the location of a MS essential be known accurately during a call, LM habitually means in what way to trackan active mobile station between two sequential phone calls. The peak important issues in mobility management are seamless roaming (integration among different 4G wireless networks, QoS assurance, operational costs buoyed features and a good utilization of the wireless links (utilizing the wireless acquaintances represented by inhabiting the rheostat channels in the bleeping and location apprise operations). Additionally, perpendicular handoff flanked by radio admittance networks consuming poles apart technologies entail additional adjournment for relinking the mobile terminal to the innovative wireless access network, which may foundation packet losses and degrade the QoS for concurrent traffic. The habitation of bandwidth, entirely computational processes in substructure of the network, power ingestion in MS, plus power consumption in the network are form the cost and all of this is a commercial cost. Therefore the cost bargain is a appropriate important issue in LM. The intentions of this paper are to single-mindedness on handoff management (HM), which is an vital component of mobility management, in aiding seamless mobility across heterogeneous network infrastructures. Correspondingly focusing on the altered protocols in handoff management and equate those protocols for audio, video & FTP (file transfer protocol) transmission.

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II. Mipv6Protocol

When the surroundings change, the Mobile IPv6 protocol permits mobile nodes to access IP address sub network to continue communications with the communication on the side. Mobile IPv6 (C. Perkins *et al.,* 2004) architecture is contained of three key elements: a Mobile node (MN), Home Agent (HA), Correspondent Node (CN). The main processes of Mobile IPv6 are:

1. The regular route of communication is followed by the Mobile Node when it is linked to its home agent link.
2. The neighbour discovery (ND) device to discover whether itself has roaming on a foreign agent link via the Mobile Node.
3. It will obtain Care of Address (CoA) on the foreign agent connection through the address auto configuration procedure, when the Mobile Node has found itself to travel to the field on the link, on the base of the access router declaration facts.
4. It can retain the earlier CoA, and login on the home agent CoA recognized as the primary Care of

Address, and the Mobile Node to its CoA through the binding update information logs on to the home agent.

5. This Mobile Node informs its communicating on the client its CoA to the basis of make sure the protection.
6. When the mobile node side does not know its CoA, its HA link will interrupt these packets and then use method to forward those packets to the Mobile Node. It will send the information packet from its home network clearance to its home address.
7. It uses IPv6 routing header to direct packets to the Mobile Node, when the announcement to the client recognizes the Mobile Node CoA.
8. When the Mobile Node obtains the packet and recognizes it to be forwarded by the Home Agent link, it informs the CoA to the source node of this packet so that the source node can afterwards be under the CoA packets sent directly to the Mobile Node, and the home agent(HA) link no longer shall forward.
9. It forwards the packet via the Mobile Node through the tunnel, as per the binding update information which is identified by it, when the Mobile Node is on the connection, where the earlier default router obtains a packet which is sent to the Mobile Node. In this point the role of the default router is related to the Mobile Node's Home Agent, when the Mobile Node to communicate with other nodes in the other direction. The message packet uses a special method to be routed directly to the destination. If there is a robust security requirement the Mobile Node uses the tunnel to send the information to the Home Agent, and then sent by the Home Agent to the primary address of the tunnel for the Mobile Node's Care of Address.

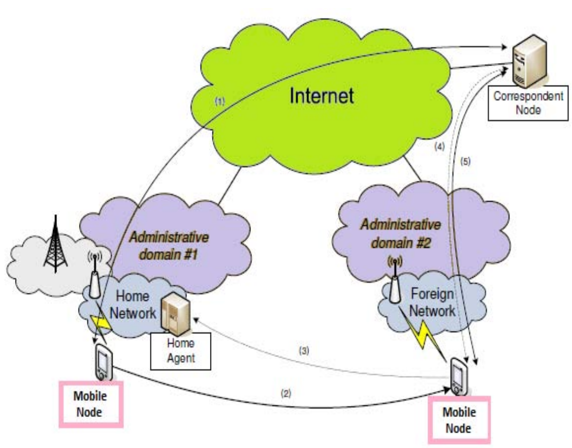

Figure 1 : Mobile IPv6

III. Hmipv6 Protcol

The modification of the basic MIPv6 protocol in the binding registration procedure in the Hierarchical Management is shown through the introduction of location management mechanism, and decrease the registration frequency of the Mobile Node to the remote CN and HA for decreasing HO latency. Now a days the level switch system Hierarchical MIPv6 (Soliman.H *et al.*,2005) becomes a standard hierarchical management class switch program. Compared to Fast Handover for MIPv6 (FMIPv6) the entire performance is better in Hierarchical MIPv6. Different kinds of methods are proposed based on different features. For the case in point Care of Address (CoA) group established on Hierarchical Mobile IPv6 HO system, the foremost idea of this system is to introduce address pool in the access router and MAP (Mobile Anchor Point), the address used in this wireless network is kept in the address group, removing the essential for Care of Address (CoA) of the Duplicate Address Detection (DAD) process.

This arrangement expands MAP protocol of the Hierarchical MIPv6 in Mobile Anchor Point discovery protocol in Hierarchical management, completes the function that the Mobile Node takes the Mobile Anchor Point agency logically and chooses the Mobile Anchor Point discovery protocol on the router to create apparent, which is easy to support. The Mobile Anchor Point discovery protocol's benefits over Mobile Anchor Point discovery protocol in Hierarchical MIPv6 is that the mobile node can wisely choose the Mobile Anchor Point support and create Mobile Anchor Point discovery protocol apparent to the router, so that the protocol is easy to uphold. The disadvantage that the mutual swapping information between Mobile Anchor Point agents is desirable to preserve Mobile Anchor Point topology table.

The mobile node needs to use the new algorithm for finding the nearby Mobile Anchor Point agent. It increases the interface load of the region signalling and the design complexity of Mobile Anchor Point agent and mobile node. The Hierarchical MIPv6 is using the sorting management programs of Mobile Anchor Point discovery protocol; it's similar to MIPv6, but it is complex than MIPv6.

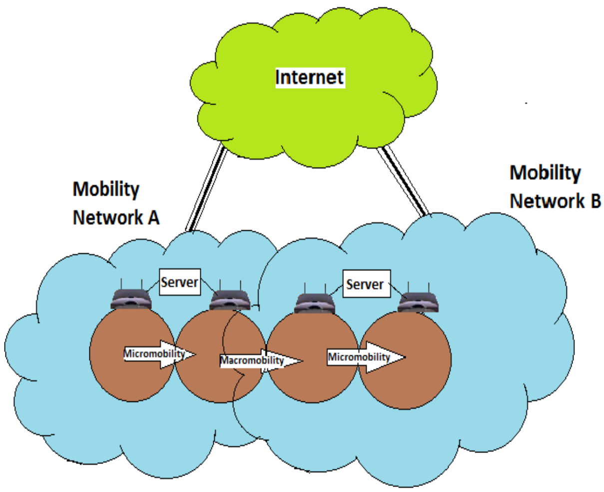

Figure 2 : Hierarchical MIPv6

IV. Pmipv6 Protocol

Proxy Mobile IPv6 (or PMIPv6, or PMIP) is a network-based mobility management protocol homogenous by IETF is a protocol for edifice a common and entree technology sovereign of mobile core networks, accommodating various entree technologies such as WiMAX, 3GPP, 3GPP2 and WLAN based access architectures. Proxy Mobile IPv6 is the merely network-based mobility management protocol standardized by IETF.

Advantages

- Handover performance optimization: PMIPv6 can condense the latency in IP handovers by preventive the mobility management within the PMIPv6 domain. Therefore, it can largely avoid remote service which not only cause long service delays but consume more network resource.
- Reduction in handover-related signaling overhead. The handover-related signaling overhead can be aggravated inPMIPv6 since it avoids tunnelling overhead over the air and as well as the remote Binding Updates either to the Home Agent (HA) or to the Correspondent Node (CN).
- Location privacy. Keeping the mobile node's Home Address (MN-HoA) unchanged over the PMIPv6 domain dramatically condenses the chance that the attacker can construe the precise location of the mobile node.

Applications

- Selective IP Traffic Offload Support with Proxy Mobile IPv6.
- Network-based Mobility Management in a local domain (Single Access Technology Domain).
- Inter-technology handoff across access technology domains (Ex: LTE to WLAN, eHRPD to LTE, WiMAX to LTE).
- Access Aggregation replacing L2TP, Static GRE, CAPWAP based architectures, for 3G/4G integration and mobility.

Network based mobility management enables the same functionality as MIP, wihout any changes in the host TCP/IP protocol stack by PMIPV6 the host can change its point of attachment to the Internet without changing its IP address.

PMIPv6 is transparent to mobile nodes, PMIPv6 is used in localized networks with limited topology where handover signalling delays are minimal.

V. Fmipv6 Protocol

The advantage of some programs is that FMIPv6 efficiently decreases HO latency and Packet loss of the performance is improved in Fast handover scheme (Rajeev Koodli 2004), such as presenting link layer mobility calculation or link layer trigger methods, new CoA configuration, and duplicate address detection (DAD) procedure.

The old router will obtain a request broker news RtSol from the NAR, the necessity to go into a new subnetwork, when the Mobile Node as the second level activate being conscious. The NAR well along proceeds cut start news Handoff Initiate (HI) obtains from the old router. Then it sends a verification message HACK after receiving the message from NAR. The old access router sends a Router Advertisement (RtAdv) message to MN as an agent on a router solicitation message reply, and Mobile Node gets the CoA.

Router Advertisement message directed by the old router is received by the Mobile Node and Mobile Node gets a F-BACK (fast binding acknowledgment message), and to the network in which the old router is positioned and to the (NAR) NAR network through the tunnel. It has worked with a new subnetwork conventional after the second layer link. When the Mobile Node gets to a new sub network, a fast neighbour advertisement message F-NA is issued by the Mobile Node, and then (NAR) new access router can forward message to Mobile Node. It can be found that in feature of handoff delay after thorough investigation of the handoff process, the mobile monitoring. The Fast Handover for MIPv6 (FMIPv6) protocol eliminates the basic mobile IPv6 HO procedure, the duplicate address detection (DAD) delay and new Care of Address (CoA) configuration.

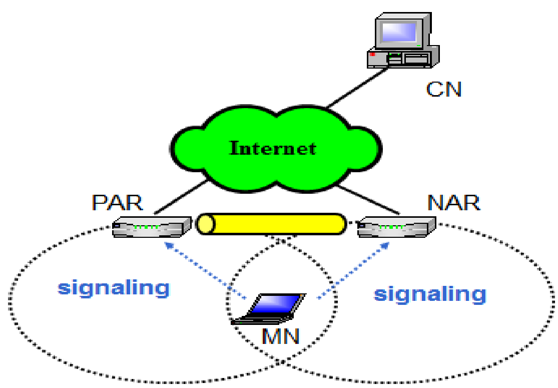

Figure 3 : FMIPv6

VI. FHIMPV6 PROTOCOL

The important handoff management parameters are to enhance and achieve the HO delay and packet loss. Present days , its more broad application of such programs, MIPv6 application layer management structure use the fast handoff system, which effectually links the fast handoff scheme and hierarchical management program that Fast Handover Support in Hierarchical Mobile IPv6 (H. Y. Jung *et al.,* 2005) (FHMIPv6), and shows good handoff presentation.

The FMIPv6 and HMIPv6 is applied the both in the main principle of FHMIPv6, the Mobile IPv6 (MIPv6) protocol at the same time is not a simple arrangement of the two, it will cause triangular routing problem. The previous access router (PAR) through MAP agent that the data packet sent to Mobile Node will be carried. Then convey the packet to NAR to the previous access router (PAR), in the hierarchical network topologies, forming a triangle routing, the data packet will go through the Mobile Anchor Point agent once more.

The optimization of data flow is realized in Fast Handover Support when Hierarchical Mobile IPv6 (H. Y. Jung *et al.,* 2005) selects Mobile Anchor Point agent as an alternative to Previous access router. In other than pass the previous access router, which the data packet sent to the Mobile Node, is sent to new access router (NAR) openly through Mobile Anchor Point agent, for escape the triangle routing. The request message to Mobile Anchor Point is to get the new forward address from the Mobile Node sending a router agent. Mobile Anchor Point will coming back a router agent declaration to Mobile Node as soon as it obtains the message then Mobile Node will form a new transfer address and direct bring up-to-date information about the fast binding to Mobile Anchor Point.

The Mobile Anchor Point starts the handoff procedure between the access routers through a primary message to the new access router after receiving it. The handoff initial message is obtained by the new access router, notices proficiency of the new forward address, and Mobile Anchor Point is getting the acknowledged information. The NAR and the Mobile Anchor Point are set up to make the two-way tunnel between them. Mobile Anchor Point sends an acknowledged message of fast binding to Mobile Node, after getting the information. It sends efficient fast binding information to the NAR, as soon as Mobile Node knows the link information. The NAR then transports data to Mobile Node from the above handoff procedure.

The features of reducing the HO delay, and Packet loss, also evades the triangle routing problem, that the fact that Fast Handover Support in Hierarchical Mobile IPv6 links the advantages of Fast Handover for MIPv6 and Hierarchical MIPv6 works very well. But growths the complexity of designing a Mobile Anchor Point agent and the problem of Mobile Anchor Point agent.

VII. FHMIPV6– MIH PROPOSED INTEGRATED SOLUTION

The network based mobility management solution in the simulation of mobility across coinciding wireless access networks in micro mobility domain in the simulation setup was implemented. The integrated solution proposed setup is the same as the FHMIPV6 and integrates IEEE802.21 functionality in the MN and the ARs.

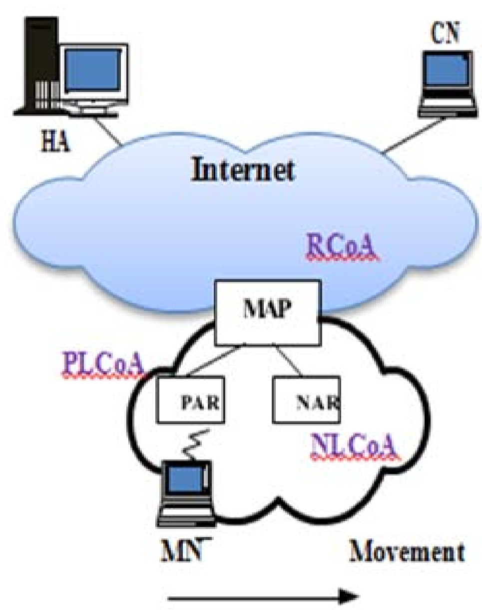

Figure 4 : FHMIPV6 – MIH Proposed integrated solution

VIII. Simulation Setup

This simulation shows that the PAR and NAR are in isolated sub networks. The two ARs have both Data Link Layer and Network Layer abilities that grips HOs. They are organized in a hierarchical tree structure of point-to-point wired links, and the router is interrelated to the MAP by a series of agents.

The MN to the CN using my UDP to the stream of video traffic is simulated and transmitted. The video packet size is established at 1028 B while the break among successive packets is also stable at 1ms.

Thus the Figure 5 shows simulation setup FHMIPV6-MIH Proposed integrated solution of using NS-2 Simulation Setup.

Both CN and HA are connected to an intermediate node (AR1) with 2ms link delay and 100 Mbps links. The link between AR1 and the MAP is a 100 Mbps link with 50 msec link delay. The MAP is further connected to the intermediate nodes AR2 and AR3 with 2 msec link delay over 10 Mbps links. AR1 and AR2 are connected to PAR and NAR with 2 msec link delay over 1 Mbps links.

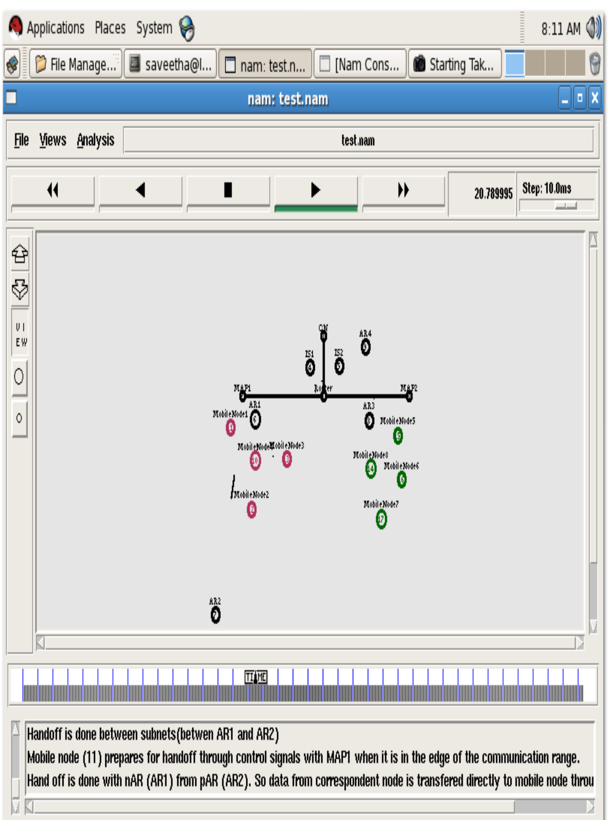

Figure 5: FHMIPV6-MIH Proposed integrated solution of using NS-2 Simulation Setup

IX. Results and Discussion

Simulation results are obtained as follows:

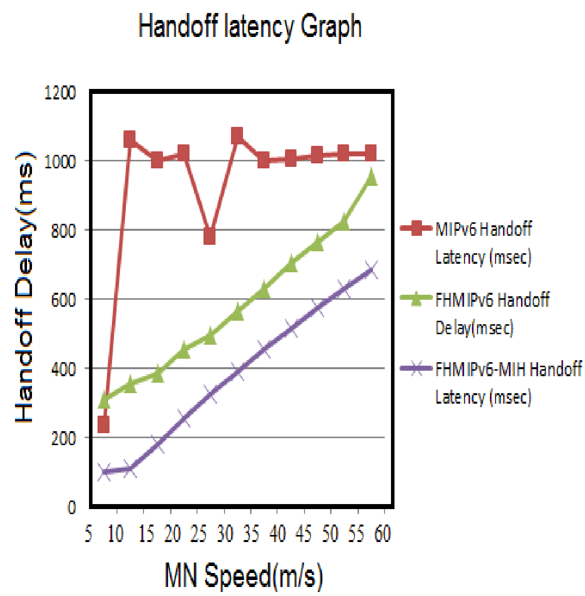

Figure 6 : HO latency Graph

Figure 6 shows the Handoff delay for MIPv6, FHMIPv6 and FHMIPv6-MIH scenarios gained during the Simulation. It shows handoff delay for MIPv6 is red line and the green line specifies delay produced with FHMIPv6 and the blue line shows the proposed method of FHMIPv6-MIH is blue line. Three seconds into the simulation, when the Mobile Node starts moving, MIPv6's handoff delay arises to increase peaking at 8 seconds with 1000 msec. The delay remains at 1000 msec up to the end of the simulation except at twenty one seconds when delay decreases to 790 msec. In contrast, FHMIPv6's delay is at average 586msec. But this delay made the interruption between the Mobile nodes. Then the proposed method, average handoff latency is at 384 msec when horizontal handover takes place. Figure 6 proves that FHMIPv6-MIH practices less latency than MIPv6 and FHMIPv6. Less latency shows that communication between the Mobile Node and the Correspondence Node will have an improved quality in communication.

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Comparative Analysis of different protocols of Handoff Latency tabulation 1:

MN Speed(m/s)	MIPv6 Handoff Latency (msec)	FHMIPv6 Handoff Delay(msec)	FHMIPv6 MIH Handoff Latency (msec)
5	236.25	310.24	102.45
10	1062.38	355.57	109.02
15	1000.87	388.14	183.05
20	1020.95	455.36	254.60
25	780.85	495.79	323.64
30	1070.23	564.84	390.20
35	1000.57	632.12	454.25
40	1005.14	708.08	515.82
45	1015.12	763.78	574.88
50	1020.32	824.83	631.46
55	1022.65	956.11	685.53

Comparative Analysis of different protocols of Handoff Latency in FTP, Audio and Video tabulation 2:

PROTOCOL	HANDOFF LATENCY (msec)		
	FTP	AUDIO	VIDEO
MIPV6	5487	(50-250)	(100-300)
HMIPV6	739	400	(300-500)
FMIPV6	532	-	200
FHMIPV6	301	-	(200-400)
PMIPV6	-	-	406
FHMIPV6& MIH	-	-	120

X. Conclusion

In this paper mobility management has been enhanced in 4G especially in Handoff Management. On compression with the results using various Network layer protocols such MIPV6, HMIPV6, FMIPV6, FHMIPV6, PMIPV6, & FHMIPV6-MIH. The proposed FHMIPV6-MIH protocol yields better results. Due to the tendency of fast mobile user having the coverage area is high. The velocity is increased and also the cost is reduced due to the handoff latency while transmission of signal from one mobile user to another. By the comparative analysis of different protocols, the handoff latency of video is drastically reduced in FHMIPV6-MIH to 120msec, which can be used for future applications. These simulation results show that as the velocity increases, the number of handoff will also increases. This scenario happened because of the tendency of fast mobile user to leave the coverage area is high compared to slow mobile user. Therefore, the number of handoff is increasing with reverence to the velocity of the mobile user. The cost is also be decreased due to the handoff latency while transmitting the signal from one mobile user to another mobile user.

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