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NETWORK MOBILITY APPROACH IN HETEROGENEOUS NETWORKS

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ABSTRACT
Heterogeneous networks is an emerging technologies they deserve attention recently of the industry and as well as institution. The main characteristic of the heterogeneous network is absence of the infrastructure such as Access Point or base station existing in the WIFI, WIMAX GSM or UMTS. Due to adjective cost of implementation most research in heterogeneous network relies on simulation for evolution. However most of Mobility model are currently used are very simple. In this paper we will study about the Network Mobility Approach in heterogeneous network; this model will describe an increasing level of the detail in movement of the Mobile node from one network to another network. In this paper we will study about the wired cum wireless Scenario.

KEYWORDS: Heterogeneous Networks, Modeling and simulation, Mobility Model.

INTRODUCTION

Heterogeneous Network Communication is the wide area of research topic for wireless technologies as well as industry. Today mostly used mobility model are basically based on the simple random patterns model that cannot describe the heterogeneous Networks in the realistic way.Node to Node (n2n) communication is the efficient due to various reasons like that short range, cheapest communication and better bandwidth. Heterogeneous Network that is collection of the different types of Networks and Communicating with each other without the fixed infrastructure this is big benefit of the heterogeneous Network that it is not required any fixed infrastructure. We can also characterized heterogeneous Network on some other important basis i.e. high mobile node, potential large scale network and variable network Density. heterogeneous Network also provide facility for wide variety of applications for internet access and multimedia.Node to Node communication also exchange data between node over direct (Single Hop) and indirect link (Multi-Hop).In NEMO(Network Mobility) there ate multihop communication is not supported as they designed for the direct communication (Single Hop) with the Access Point.In this paper we present a Network Mobility Model for heterogeneous Network this model is basically wired cum Wireless Scenario.

RELATED WORK

Before this schema there are many schema are introduced to reduce the latency and packet also loss due to movement of the architecture over heterogeneous network.This architecture also has some drawback in implementation that must be considered. These proposed mechanisms are designed for the assumption that sufficient overlapping coverage area between the networks otherwise the Mobile Routers will lose connectivity and will also some packet during handover. In Mobile Router and Access Router functionality to allow the bi-casting over two wireless link to reduce packet loss and to avoid multiple copies into the nodes when both packet are delivered successfully. They are not allowed to provide connectivity when a mobile network is provided with mobility through different Internet Server Protocol (ISPs) and considers multiple Home Agents (HAs) where each Home Agent belongs to the different ISPs.

Proposed Model

In this section we describe a Wired cum wireless Scenario model for the Network Mobility Approach in heterogeneous Network.In this architecture we can add multiple number of Mobile Router (MR's) those can be configured with the Access Router through a wired Scenario . In this model we can simulation of the two model one of them is wired Scenario and another one is the wireless Scenario. In the wireless model there are node to node communication. This architecture can support the number of Mobile Router in this architecture we can take two Mobile Routers MR1 & MR2 those are spatially separated. With MR2 in the front of MR1 is rear part for nodes.When the node move from the Subnet AR1 to AR2 MR2 leaves the AR1 earlier then AR1 resulting in the connectivity of the internet through MR1 until MR2 complete its handover process. During MR2 handover period the traffic address of the MR2 transported by the MR1.After the node get Internet Connection through the different Access Routers (AR1& AR2) via MR1 and MR2 respectively for some times until MR1 leaves AR1. During MR1 handover process the traffic addressed to the MR1 transported by MR2.To minimize packet loss during handover Process we use the tunneling process. Three parameter are critical during handover process of mobile network distance between two mobile routers the overlapping distance between two ARs (d2) and let node speed (v).The time duration td during Which MR1 remains connected to AR1 after MR2 leaves the AR1

$$[Td= (d1+d2) / v]$$

The objective of the proposed schema is to redirect the traffic flow to MRs to one another via different HAs during handover process. When Mobile routers moves and MR2 detects that it is moved from subnet of AR1 its loss connectivity to the global internet. The traffic of MR2 should be transported through the HA1-MR1 bidirectional tunneling until it completes handover to AR2.

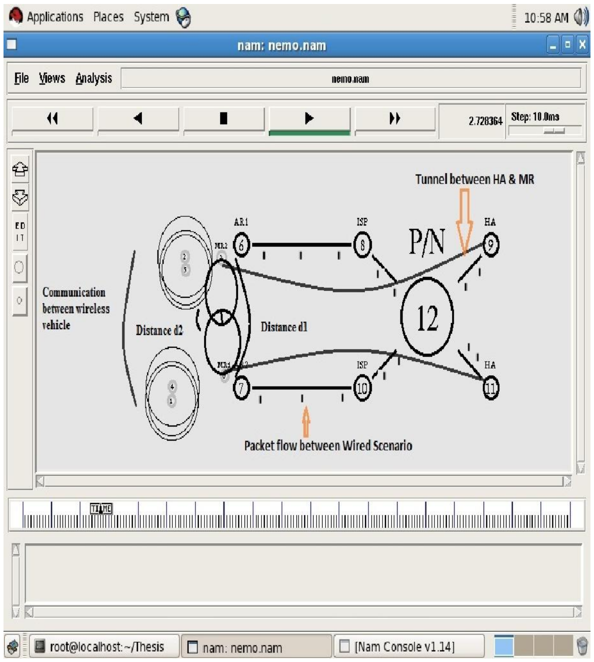

Fig: 1

SIMULATIONS

The most reliable and authenticated tools used and preferred by most of the researchers for these kinds of simulations are: NS-2 for real looking simulations according to their parameter precisions. . The movement and traffic files are generated and compiled separately before associating with NS-2 simulation, which would then be in the receiving format for NS2 to amalgamate with the body of actual TCL.The network simulator (NS2), as its name suggests, is a simulation tool for replicating real life networking environment and their working and adjoining standards respectively. It works with the combinations of different development tools and languages because of its environment of open source possessiveness. Mainly by default, the back end object oriented and scripting languages used by this simulator are the “C++”and “TCL”. The previous is used for the development and implementation of low level operations and algorithms, whereas, the latter is used for the actual scripting codes for the simulations output scenarios. There are some associated tools with NS, like Network Animator (NAM) and Ad-Hockey; these associates are majorly used for visualization purposes.

There are some very basic and generic components used by NS -2 to establish various special and diverse simulation scenarios. The most common (but not limited) are the Nodes, Agents, and Links. The nodes are the participating objects within the simulation environment. Nodes are the appropriate example in case of simulation scene for Network. These nodes can further be classified with the attributes of source and sink depending on their traffic generator and/or receptor functions respectively. Agents on the other hand are the dependent elements. They rely on nodes for specifying the traffic type between their communication processes. And finally, links are used to specify the medium of connection i.e. wired or wireless between the participating nodes.The simulation operations performed by the NS-2 after employing the components (mentioned above) can be broadly categorized as follow:

Creating the event scheduler: in this operation different event related activities being done. For example: create scheduler, schedule event(s) and start scheduler.

Creating network in this operation the required nodes with their linkage and queuing operations are created.

Creating connection in this operation the actual connection scheme e.g. TCP or UDP is given (this work deals with TCP connection).

Creating traffic in this operation traffic flow is being mentioned i.e. how much traffic is needed for the simulated network. The common traffic creation criterion is Constant Bit Rate (CBR) where constantly bits of traffic are supplied to the network.

Tracing this is the crucial operation which reads the NS-2 simulation generated output file and shows different output results in the form of text or graph. The Tool Command Language (TCL) file is the scripting representation for coding and developing the desired networking scenarios (wired/wireless) – in this particular case, ad hoc vehicular network flow on the road is scripted for generating and associating relevant file. These scenarios are based on various parameters and their settings of generated traffics along with their mobility, reliability. Initializing the routing protocol within a TCL file as inputs in association of particular traffic and movement files, the NS-2 simulates accordingly. Ultimately, as a result, it generates two files i.e. Network Animator File (*.nam) and a Trace files (*.tr) as the outputs.The NAM file consists of all the operations to be performed at the time of simulation with all the positioning and graphical information and their defined parameters. This NAM file then can be called or executed by its built-in “nam”. Command from the operation component of NS itself .On the other hand, the trace file contains all of the data e.g. how many packets are sent, received, dropped and with what sequence number, type, size, etc. The trace file is simply available in a text format and could be called as a log file of the simulation with all the information logged in columns format .

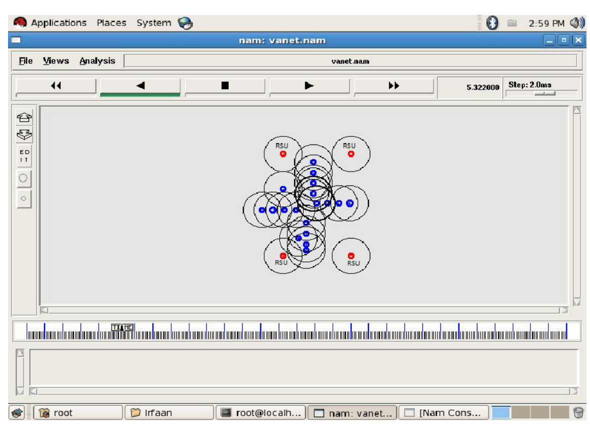

Fig2-A Simulation Environment

```
s 0.190151362 _2_ RTR  --- 0 message 32 [0 0 0 0] ------- [2:255 -1:255 32 0]
s 0.190446362 _2_ MAC  --- 0 message 90 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191166862 _1_ MAC  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191166862 _3_ MAC  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191167107 _17_ MAC  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191191862 _1_ RTR  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191191862 _3_ RTR  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
r 0.191192107 _17_ RTR  --- 0 message 32 [0 ffffffff 2 800] ------- [2:255 -1:255 32 0]
s 0.219517257 _19_ RTR  --- 1 message 32 [0 0 0 0] ------- [19:255 -1:255 32 0]
s 0.219712257 _19_ MAC  --- 1 message 90 [0 ffffffff 13 800] ------- [19:255 -1:255 32 0]
r 0.220432944 _0_ MAC  --- 1 message 32 [0 ffffffff 13 800] ------- [19:255 -1:255 32 0]
r 0.220433082 _1_ MAC  --- 1 message 32 [0 ffffffff 13 800] ------- [19:255 -1:255 32 0]
r 0.220457944 _0_ RTR  --- 1 message 32 [0 ffffffff 13 800] ------- [19:255 -1:255 32 0]
r 0.220458082 _1_ RTR  --- 1 message 32 [0 ffffffff 13 800] ------- [19:255 -1:255 32 0]
s 0.352967135 _1_ RTR  --- 2 message 32 [0 0 0 0] ------- [1:255 -1:255 32 0]
s 0.353222135 _1_ MAC  --- 2 message 90 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353942635 _0_ MAC  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353942635 _2_ MAC  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353942881 _19_ MAC  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353967635 _0_ RTR  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353967635 _2_ RTR  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
r 0.353967881 _19_ RTR  --- 2 message 32 [0 ffffffff 1 800] ------- [1:255 -1:255 32 0]
s 0.441305651 _12_ RTR  --- 3 message 32 [0 0 0 0] ------- [12:255 -1:255 32 0]
s 0.441600651 _12_ MAC  --- 3 message 90 [0 ffffffff c 800] ------- [12:255 -1:255 32 0]
r 0.442321151 _13_ MAC  --- 3 message 32 [0 ffffffff c 800] ------- [12:255 -1:255 32 0]
r 0.442321252 _18_ MAC  --- 3 message 32 [0 ffffffff c 800] ------- [12:255 -1:255 32 0]
r 0.442346151 _13_ RTR  --- 3 message 32 [0 ffffffff c 800] ------- [12:255 -1:255 32 0]
r 0.442346252 _18_ RTR  --- 3 message 32 [0 ffffffff c 800] ------- [12:255 -1:255 32 0]
s 0.487999653 _13_ RTR  --- 4 message 32 [0 0 0 0] ------- [13:255 -1:255 32 0]
s 0.488154653 _13_ MAC  --- 4 message 90 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
r 0.488874986 _18_ MAC  --- 4 message 32 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
r 0.488875153 _12_ MAC  --- 4 message 32 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
r 0.488875153 _14_ MAC  --- 4 message 32 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
r 0.488899986 _18_ RTR  --- 4 message 32 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
r 0.488900153 _12_ RTR  --- 4 message 32 [0 ffffffff d 800] ------- [13:255 -1:255 32 0]
```

Fig- 2 Trace file output

The next task is to analyze the trace file(s). This could be done by mean of various analyzing methods and scripting codes, for example: PERL (Practical Extraction and Reporting Language), AWK (named after their writers, Alfred Aho, Peter Weinberger, and Brian Kernighan) and some other third parties text search software. For this study, AWA is used to extract meaningful values from the generated trace files. The main observation factors are related with the calculations of particular routing metrics. They identify the accumulated results from the output trace files which are generated by the simulator upon their specified inputs from mobility and traffic files.

RESULT

Handover latency

Fig3 show the handover latency between the proposed architecture and compared with NEMO BS. Handover latency we can define for a mobile network as the complete handover time one Access Router (AR1) to another Access Router (AR2).Basically NEMO BS has lower handover latency and it does not involve any local signaling before performing.However the latency of our proposed schema is less then FMIPV6 because FMIPV6 require a number of signaling message before performing Home Agent –BU.

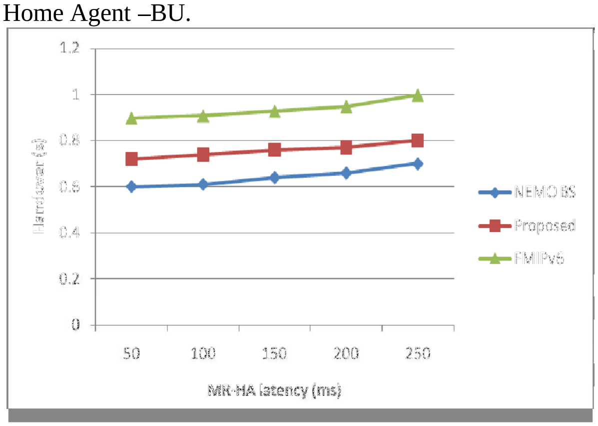

Fig-3 Handover latency

Service Description Time

Service description time in NEMO BS, service description time during handover can be defined as time between receipts of last packet from AR1 until the first packet is received from AR2. Fig2 compares the service disruption time between the proposed architecture. In the proposed architecture service disruption time during handover can be defined as the time between the receipt of last packet through the MR which is about the undergo handover process until the first packet is received through another MR of the mobile network.

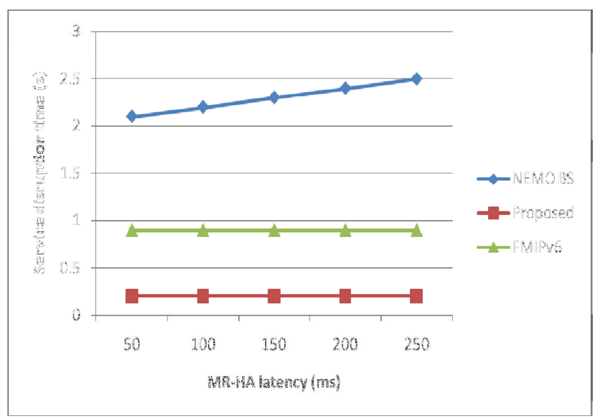

Fig 4- Service Description Time

Packet Loss

Fig.5 shows the packet loss during the handover process from AR1 to AR2.The lowest number of packet loss that is show in the graph in the case of proposed architecture because co operative packet reception of Mobile Routers. The packet addressed to the MR which is undergoing handover process is received via another MR by re establishing the bi-directional tunneling and packet loss is independent of the distance between MR and it's HA. However the NMEOBS has the highest packet loss as it received packet only after performing HA-BU and the packet loss is linearly increase as the distance between MR and HA increase.

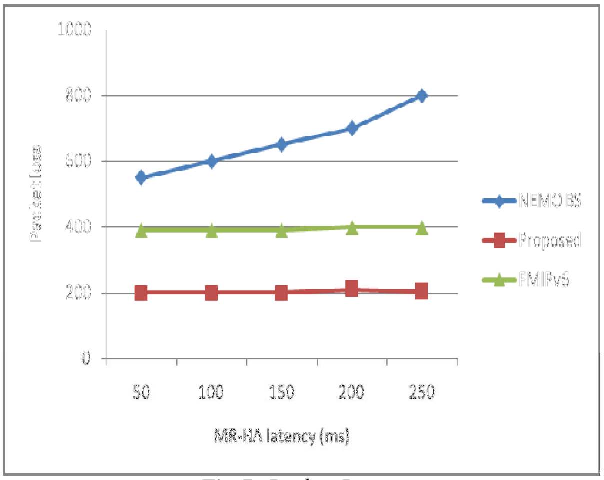

Fig 5- Packet Loss

Signaling Overhead

Fig.6 compares the signaling overhead ratio of NEMO ,BS, FMIPV6 and the proposed architecture in multiple MRs based mobile network. Signaling overhead involve the exchange of signaling message to manage handover effectively, such as message required re-establishing the bi-directional tunnel for flow redirection. The proposed architecture has some overhead in comparison to NEMO BS that involves the cost to maintain additional signaling message of MRs.

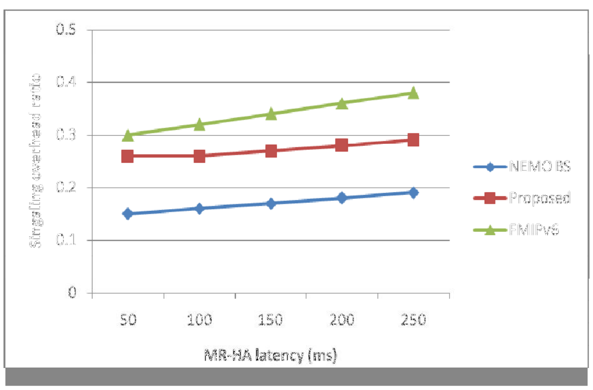

Fig 6- signaling Overhead

Impact of Node Speed and Overlapping Distance of ARs:

The architecture study is carried out on the impact of node speed (v) and overlapping distance of ARs(d2) on the packet loss during handover process. The prepositions do not consider the distance between MRs(d1) as it is very small for vehicles such as car and bus.Fig.7 show the threshold speed for no packet loess is 20 m/s for a fixed overlapping distance of 60m. This is between the MR1 can not exactly being performing handover at the edge of overlapping coverage Zone. Fig.6 show for a fixed node speed of 30 m/s there is still packet loss even if we increase overlapping distance to 50m.

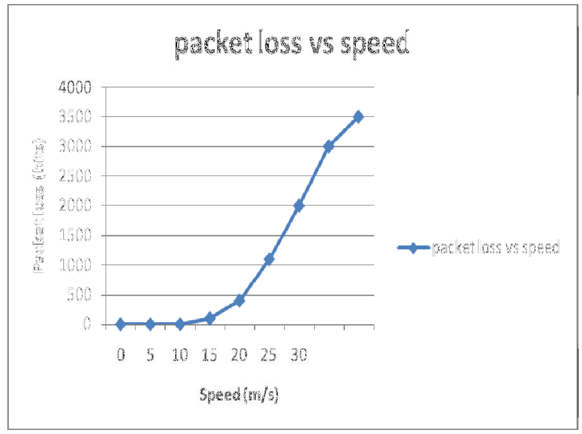

Fig5- Impact of node Speed On Packet Loss

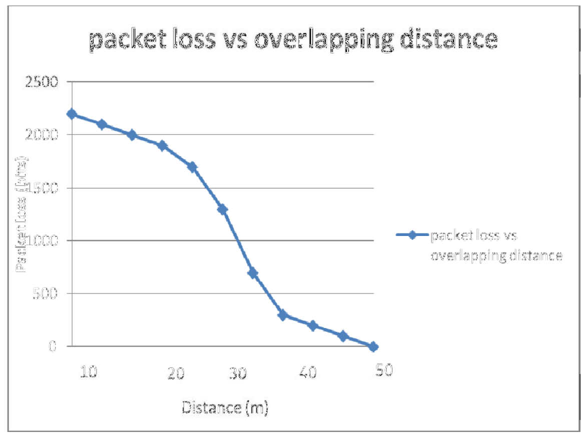

Fig7- Impact of overlapping distance on packet loss

CONCLUSION AND FUTURE WORK

This paper presents architecture that support seamless mobility of mobile network across the heterogeneous networks. A heterogeneous scenario is considered where a node provided with mobility through different ISPs and proposes to use multiple mobile router based handover scheme in node. The multiple routers based handover schema where Mobile router cooperative receive packet destined for each other, can provide no significantly reduced packet loss during handover. It also makes the packet loss independent of handover latency.More ever multiple MRs Architecture is extended to include multiple Has, where each Ham belongs to different administrative domains. An extensive simulation study is carried out to show the comparative performance evolution of the proposed handover schema with respect to UDP and TCP throughput.

The study reveals that for long vehicles the overlapping distance of the ARs may be reduced. However for small vehicles the overlapping distance of ARs is necessary to achieve very low packet loss during handover. The Simulation result show that the proposed schema provides a network with seamless mobility across heterogeneous network. This paper proposed a route optimization techniques and a handover mechanism for mobile network in heterogeneous environment .Finally a fast handover schema for high speed node is developed that a based on mixed Adhoc and infrastructure Communications.

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