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The impact of IPv4 to IPv6 conversion on the routing protocol of AODV VANET and MANET

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Abstract

The switch from IPv4 to IPv6 is now both necessary and urgent. Because of this, it is essential to research and evaluate the effects of this shift on all network protocols, particularly in mobile ad hoc networks (MANETs) and VANETs, which they are a component of. In these networks, node mobility can cause abrupt and drastic changes in the network's topology. Different contexts require different ways for routing systems to function. As such, it is imperative to examine how various routing protocols behave in various settings. Using OPNET Modeler as a simulation tool, research has been done on the performance observation of the AODV routing protocol of MANET under IPv4 and IPv6 environments. We have examined how the AODV routing protocol behaves in terms of routing traffic, performance, and WLAN delay.
Keywords: *IPv4, IPv6, MANET, Routing Protocols, AODV, OPNET.*

1. Introduction

A MANET is a network made up of numerous nodes that can communicate with one another without the need for a central authority. In a mobile ad hoc network, resources like electricity, bandwidth, physical security, and other things are few. Every mobile node functions as both a host and a router in a mobile ad hoc network. Ad hoc networks are often utilized in emergency scenarios without infrastructure, such as disaster relief efforts and combat zones. The main limitation of ad-hoc systems is the Availability of power. In addition to running the onboard electronics, power consumption is governed by the number of processes and overheads required to maintain connectivity [1]. There is always a need in mobile ad hoc network to search a good path for the routing of data packets from source to destination.. Every mobile node functions as both a host and a router in a mobile ad hoc network. Multi-hops are required to transmit data packets between a source and a destination inside a network due to the restricted transmission range of wireless networks. In a mobile ad hoc network, resources like electricity, bandwidth, physical security, and other things are few. The limited bandwidth of mobile ad hoc networks can cause congestion in networks, so it's important to prevent this issue through efficient routing in mobile nodes [2]. It's also important to have enough IP addresses to meet the demand from mobile devices and enable flexible communications without the need for infrastructure.. The next-generation IP, Internet Protocol version 6 (IPv6) [3], [4], the primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Therefore, nodes are required to relay packets on behalf of other nodes in order to deliver data across the network. A significant feature of ad hoc networks is that changes in connectivity and link characteristics are introduced due to node mobility and power control practices.

Reactive routing protocol is a type of routing protocol in which route is established when it is needed by source node to send data packets to the destination node. In reactive routing protocol flooding technique is used for route discovery. Once routes are discovered the routes are stored and maintained in route cache. The main advantage of this type of routing protocols is to save precious bandwidth of ad hoc network, AODV is a type of reactive protocol in which route is created when it is needed [2].

1.1 AODV

The AODV (Ad-Hoc On-Demand Distance Vector) routing protocol is a reactive routing protocol that uses some characteristics of proactive routing protocols. Routes are established on-demand, as they are needed. However, once established a route is maintained as long as it is needed. Reactive (or on-demand) routing protocols find a path between the source and the destination only when the path is needed (i.e., if there are data to be exchanged between the source and the destination). [5].

2. Methodology

In this paper we used discrete event simulation software known as OPNET (Optimized Network Engineering Tool) Modeler version 14.5. It is one of the most widely used commercial simulators based on Microsoft Windows platform and incorporates more MANET routing parameter as compared to other commercial simulator available. It not only supports MANET routing but also provides a parallel kernel to support the increase in stability and mobility in the network. [6] The simulations focused on the impact of the transition from IPv4 to IPv6 on the performance of AODV routing protocol. For our study there are two simulation scenarios consisting of 4 nodes in the first scenario used IPv4 as addressing protocol and the second scenario used IPv6 , fig.1 illustrate the 4 nodes in OPNET :

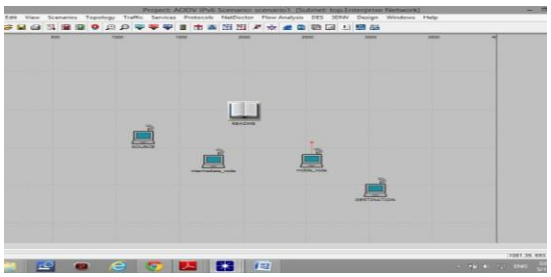

Fig.1 illustrate the 4 nodes in MANET in OPNET modeler

Simple four node scenario to show the features of AODV, SOURCE starts exponential traffic at 100 sec, and continues till end of simulation (600 sec). We run the simulation for ten minute and get the results for both scenarios

3. Results and Discussion

On the basis of four parameters we evaluate the performance of one of the MANET routing protocols (AODV) under IPv4 and IPv6 environments, that is, WLAN delay,throughput , routing traffic recieved and total packets drops the results shown below:

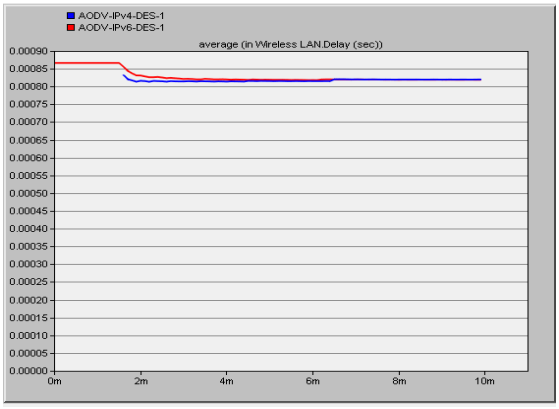

Fig.2 Illustrate the Average WLAN Delay(sec)

In fig.2 we observe that the delay in IPv4 is less than the delay when using IPv6

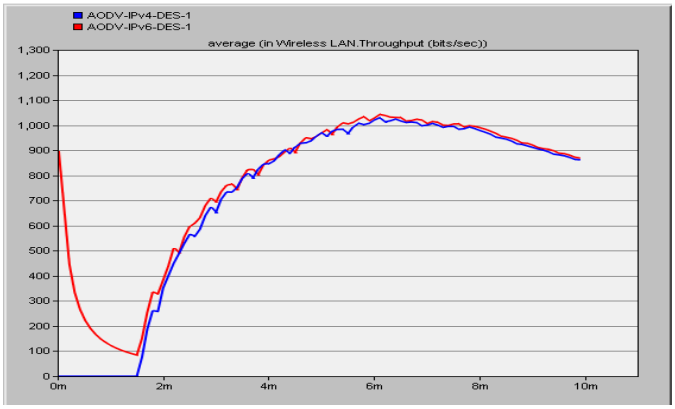

Fig.3 illustrate the average WLAN throughput (bit/sec)

in fig.3 we observe that the transion from IPv4 to IPv6 enhance the perfomenance by increasing throughput in WLAN

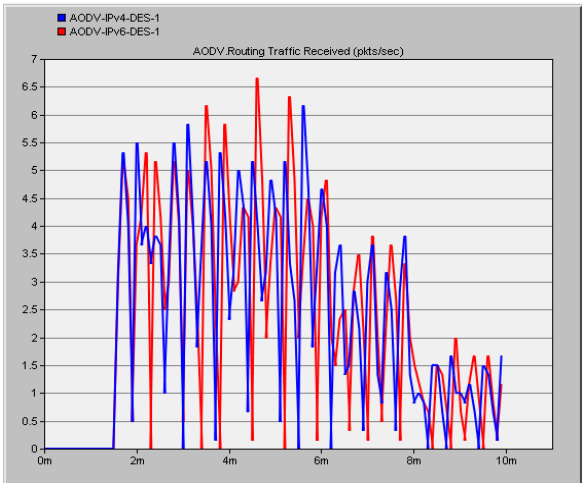

Fig.4 illustrate AODV routing traffic reciecved (pkts/sec)

In fig 4 we observe that AODV in IPv4 is better than the ipv6 in term of routing traffic received

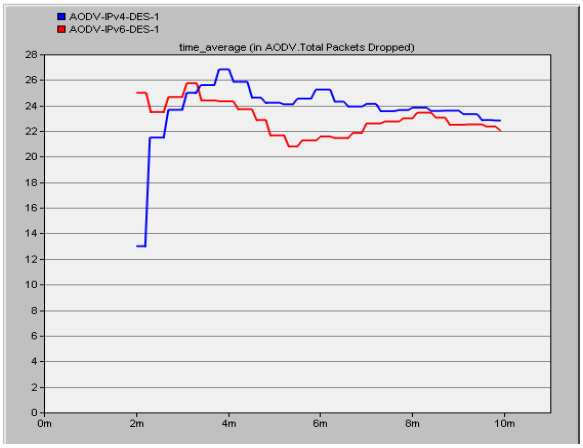

Fig.5 illustrate the total packets dropped (pkts)

In fig 5 we observe that AODV in IPv6 has less number of packet drops.

Tabel.1 AODVin IPv4 &IPv6

AODV	IPv4	IPv6
Wireless LAN delay(sec)	$0.686x10^{-3}$	$0.828x10^{-3}$
Wireless LAN throughput(bit/sec)	710	765
Routing traffic received (packet/sec)	2.58	2.56
Total packet dropped	23.72	22.95

4. Conclusions

In this study we tested the impact of transition from IPv4 to IPv6 in AODV VANET, MANET routing protocol using OPNET. On the basis of observation, we say that AODV in IPV6 performs better than IPv4 in terms of throughput and total pakets dropped but in terms of delay and routng traffic received we found IPv4 is better , table.1 presents results summary.

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