A Test-Bed for Power Consumption Performance Evaluation of AODV and DSDV Routing Protocols in Mobile Ad-hoc Networks

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Abstract:

Mobile Ad-Hoc networks or MANET networks are mobile wireless networks, capable of autonomous operation. Such networks operate without a base station infrastructure. The nodes cooperate to provide connectivity. Each mobile node in Ad Hoc network is capable of routing packets and assists neighboring nodes to do so. In this dynamically

changing topology environment the role of routing protocols are very significant.

There are several factors which affect the performance of Ad Hoc network routing protocols. For instance, network size and traffic load may cause congestion. Limited transmission range, bandwidth and battery power also make considerable impacts on network scalability. The objective of this paper is to evaluate the power consumption performance of two routing protocols; Ad-Hoc On Demand Distance Vector Protocol (AODV) and Destination Sequenced Distance Vector Routing Protocol (DSDV).

The evaluation of these two protocols was carried out using Network Simulator-2 (ns2).

Keywords: Ad-hoc Network, Power Aware Routing, Routing Protocols, AODV, DSDV.

1. introduction:

The interests of Mobile Ad-Hoc Networks (MANETs) have been widely expanded from environmental monitoring applications to infrastructure monitoring emergency medical response and military surveillance applications (Becker, 2007). In Mobile Ad-Hoc networks, routing mechanisms for reliable data communication with less power consumption is one of the most important aspects due to the limited power availability in each wireless node (Perkins, 2000). Since the communication between two Mobile Ad-Hoc nodes consumes more power, it is important to minimize the cost of power required for communication by exercising power aware routing strategy.

In this paper, the power metrics of AODV and DSDV are compared by measuring the power consumption in terms of variation in pause time.

2. Routing Protocols Classification in MANET:

Routing protocols for MANET can be classified into three main categories: Flat, hierarchical and geographic routing protocols see Figure (1).

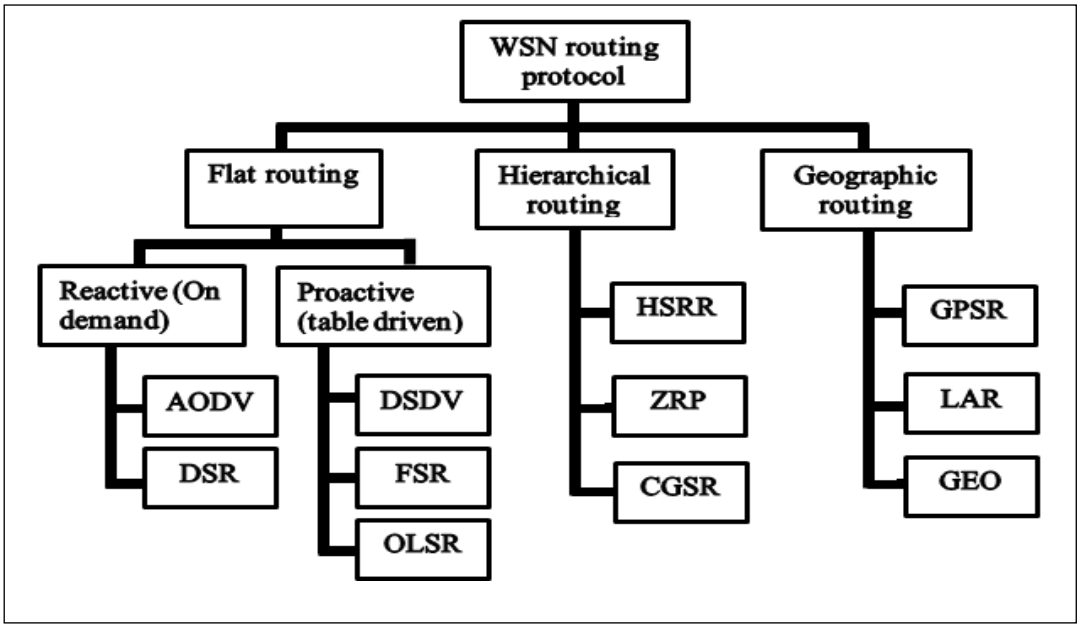

Figure 1: MANET Routing Protocols

These categories are described bellow:

2.1 Flat routing protocol :

The first category of routing protocols is the flat routing protocol. In flat networks, each node typically plays the same role where the ad hoc nodes collaborate together to perform the sensing task (Biradar, 2009).

Due to the large number of such nodes, the principal aim of flat routing is to reduce power consumption and routing cost of MANET nodes by making them within a cluster in order to perform aggregation and reduce the number of messages transmitted to the base station (Tarek, 2014).

2.2 Hierarchical routing protocol :

This protocol is adopted to allow the system to cover a wider area without degradation of service. (Kassim ,2011) This routing is based primarily on the gateway nodes. In fact, if the nodes know that the recipient is not in their immediate vicinity, they just send the request to the gateway. In turn, it will forward the request to the target node.

2.3 Geographic routing protocol :

Routing protocol uses location-based information service to discover the routing and data transmission (Rachit, 2011). This protocol allows the directional transmission of information to avoid the flooded data across the network. Therefore, the routing cost will be reduced and the routing algorithm will be more optimized. In addition, the use of network topology based on location information of nodes will provide easily control and management of network. The disadvantage of these routing protocols is that each node must know the locations of other nodes.

This paper is organized as follows: section 2, a description of the DSDV and AODV routing protocols. Section 3 is a related work . Section 4, metrics taken into consideration in the simulation. Section 5, results are presented . Section 6 conclusion and future work.

2.1.1 Destination-Sequenced Distance-Vector Routing (DSDV) :

(DSDV) is a table driven protocol, which is based on the classical Bellman-Ford routing mechanism (Tarek, 2014). Each node in the network has to maintain a routing table, which records all possible destinations within the network and the number of hops to them. A sequence number is marked in each entry, and it can be used to judge the route - whether it is too old or not. This will help to avoid the formation of routing loops (Becker, 2007).

2.1.2 Ad Hoc On-Demand Distance Vector (AODV) :

AODV discovers paths without source routing and maintains table instead of route cache, which uses destination sequence numbers and mobile nodes to respond to link breakages. changes in network topology in a timely manner. It maintains active routes while they are in use and delete unused routes (Kassim, 2011).

3. Related Work :

Many routing protocols for MANET have been proposed; but only some of them have been evaluated their performances in term of energy consumption. For instance (Rachit, 2011) presented some evaluations for routing protocols in Mobile Ad hoc Network in terms of routing overhead, throughput, packet loss, and delay but not energy consumption, (Kulik, 2009) evaluated DSDV and FSR in order to judge delay and packet delivery ratio. Moreover, (Sunil, 2010) analyzed these four routing protocol DSDV, AODV, DSR and TORA and showed that the energy consumption in small size network was same in this paper. But, in large and medium networks, they found a high efficiency for FSR and DSDV and a poor efficiency in terms of power for TORA protocol. According to (Tarek, 2014) the performance of DSDV and FSR routing protocols was compared with respect to packet delivery, end-to-end delay, route length,

and energy consumption. According to (Kassim, 2011). performance of two reactive routing protocols including Any cast Routing based FSR and Anycast routing protocol based on DSDV was evaluated with respect to fraction of packets delivered, end-to-end delay, routing load, and energy consumption for given traffic and mobility model. According to (Biradar, 2009) there is still a need to evaluate energy consumption of FSR and DSDV routing protocols in terms of routing energy consumption and average energy consumption through detailed simulation.

4. Simulation And Metrics:

4.1 Simulation Parameters :

The aim of these simulations is to compare AODV and DSDV routing protocols for its efficiency in power consumption. This has been made by measuring the power in terms of variation in Pause Time (PT) and taking into consideration the remaining battery power. The simulation tool that has been used in this study is ns2 (Sunil, 2010). The simulation parameters are presented in Table (1).

Table 1: Simulation Parameters

Parameters	Value
Routing Protocols	DSDV, AODV
Max. number of nodes (N)	20
MAC type	IEEE 802.11
Traffic type	Constant bit rate
Agent	UDP
Queue length	50 packets
Area	200m X 200m
Pause Time	50s,100s,150s pause time

4.2

NAM file output :

Network Animator (NAM) is an animation tool for viewing network simulation traces and real world packet traces (Rachit, 2011). A snapshot of the simulation topology in NAM for 20 mobile nodes is shown in Figure (2), visualized the traces of AODV routing protocol. and Figure (3) shows the a snapshot of the simulation topology of DSDV protocol.

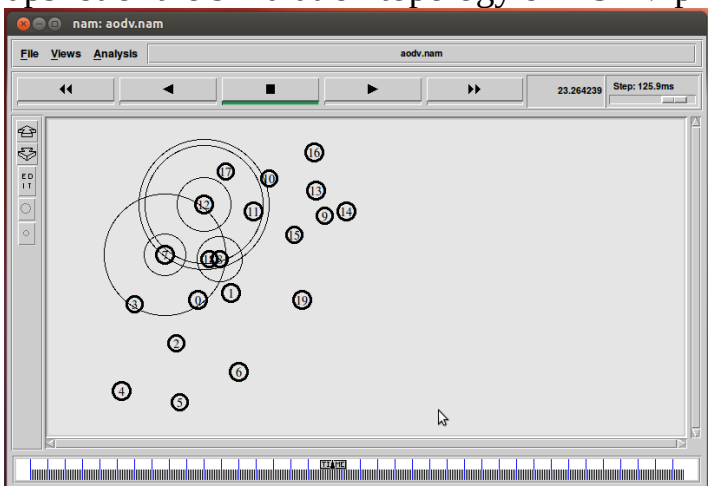

Figure 2: A snapshot of the simulation topology of AODV routing protocol.

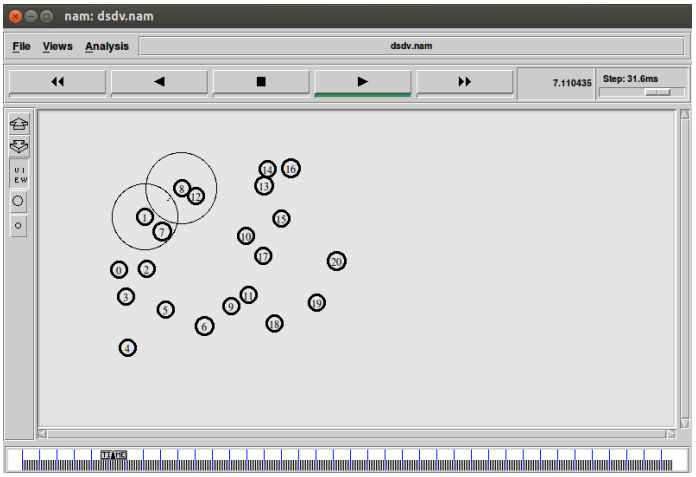

Figure 3: A snapshot of the simulation topology of DSDV routing protocol.

4.3. Metrics Analyzed for simulation :

Table (2) shows the Power Consumption values which are obtained from the simulations with the AODV and DSDV routing protocols for different Pause Time.

Table 2: Power Consumption of AODV and DSDV routing protocols.

Power Consumption simulation tests										
	(Pause Time) 50s		(Pause Time) 100s		(Pause Time) 150s		(Pause Time) 200s		(Pause Time) 250s	
	AODV	DSDV	AODV	DSDV	AODV	DSDV	AODV	DSDV	AODV	DSDV
1	4229	3902	4035	3729	4027	3820	4120	4112	4066	3928
2	4229	3929	4049	3893	4110	3665	4138	4114	4082	3651
3	4129	3702	4139	3846	4027	3830	4109	3743	4164	3658
4	4125	3716	4138	4007	4127	3812	4120	4049	4178	3906
5	4224	3650	4138	3867	4116	4006	4109	4024	4068	4115
6	3949	3632	4139	3576	4139	3650	4138	3944	4172	3545
7	4217	3475	4127	3893	4117	3641	4102	4057	4172	3821
8	4229	3621	4139	3936	4124	3754	4042	3927	4157	3751
9	4139	3722	4034	3917	4034	3843	4158	4103	4158	4103
10	4229	3745	4120	3802	4102	3727	4100	3950	4082	3660

5. Result And Performance Analysis:

The Simulation Results :

Figure (4) shows the results of power analysis. The simulation results are presented in this section in line graphs form. The graph shows comparison between the two protocols and between 20 nodes on the basis of the power consumption metrics as a function of pause time.

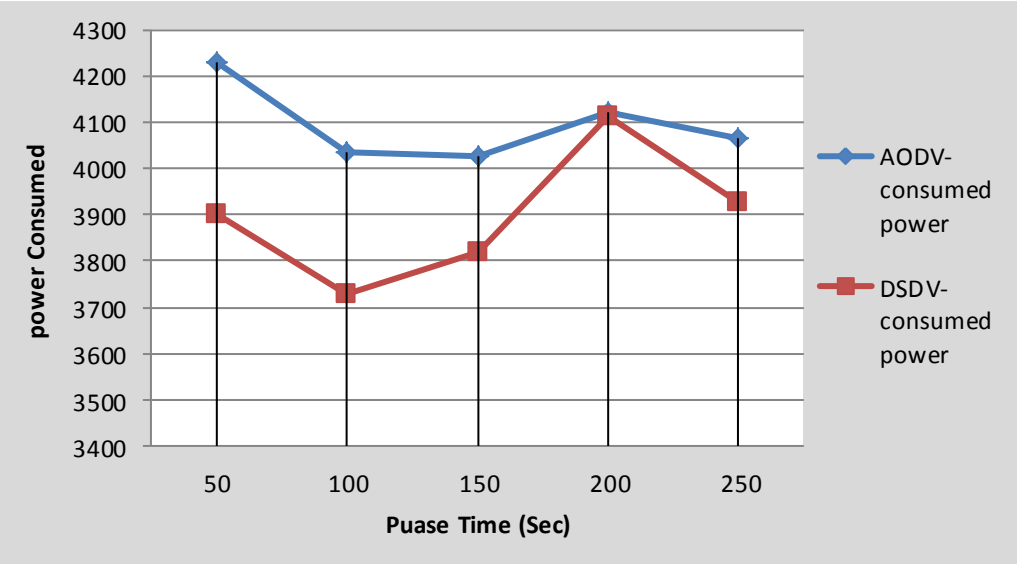

Figure 4: The average consumed power versus the number of Pause Time.

Figure (4) shows the power consumption and pause time for 20 nodes. Graph show that the power consumption for AODV is higher as compare to DSDV Protocol.

Power consumption for AODV is higher than DSDV, AODV is on-demand routing protocol , in AODV route discovery can be done by flooding route request message to all neighboring nodes.

Because DSDV uses caching , its performance is better . DSDV finds routes in its cache and keeps it in the routing table. When nodes are moving, AODV will consume less power than DSDV.

6.Conclusion and Future Work :

This paper discusses the performance comparison of proactive (DSDV) and reactive (AODV) Ad-hoc routing protocols based on

simulation Results with the network Simulator (NS-2), in terms of power consumption metrics used for the performance.

In this paper, the power consumption of AODV and DSDV are compared by simulating the variation in pause time, the simulation results obtained show that DSDV consumes less power than AODV.

In future, extensive complex simulations could be carried out, in order to gain a more in-depth performance analysis of the MANET routing protocols. Other new protocol performance could be studied too.

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