Performance Analysis of Ad Hoc Routing Protocols for Various Battery Model in VANET using QUALNET

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ABSTRACT

VANET (Vehicular Ad-hoc Network) is a technology that uses moving objects as nodes in a network to create a mobile or cellular network. VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. In this paper we review different Ad-hoc routing Protocol, Reactive, Proactive and Hybrid Protocol in to consideration different VANET constraint like height, speed, etc. in genuine traffic scenario and measurement under various battery models for energy conservation. Reactive (AODV) and Proactive (OLSR) and Hybrid (ZRP) Protocols are evaluated for battery models such as, Duracell AA (MX-1500), Duracell AAA (MN-2400), Duracell AAA (MX-2400), Panasonic AA, and Panasonic AAA, using Qualnet Simulator. Energy Consumption and conservation are hot topics for research these days under the category of WSN and VANET. On the basis of our simulations, we analyze the residual battery charge and these results can be taken for the selection of optimum battery and routing protocol for VANET.

Keywords: VANET, Ad hoc Routing, battery models, Qualnet 5.2.

I. INTRODUCTION

A new communication prototype that enables the commutating between vehicles moving at locomotion speed is known as Vehicular Ad hoc Network (VANET). Many vehicles like buses, car trains are fast moving vehicles. It has been found out that mobile terminals are frequent signal go down as compared to pedestrians in these vehicles. It is also found out that so many functions like gaming, internet etc has been added leading to fast C.P.U. clock speed hence more battery consumption in the last decade. In order several lightweight routing protocols needed to be review in physical and data link layer for improving the QoS and energy conservation in the fast moving vehicles. So that correct choice of the protocol can be built. There are main routing protocols having different criteria for designing and classifying for wireless adhoc network are (1) Reactive, (2) Proactive, (3) Hybrid. The Mobile Ad hoc Network (MANET) working group of the Internet Engineering Task Force (IETF)[2] are develop group of standards for routing in dynamic network of both mobile and static nodes. The protocols in the focus in now days are Hybrid protocols [7]. It is work in the background of VANET’s along with Reactive and Proactive has forever been under investigation. The Routing protocols are always determined in the fast moving nodes because their performance demeans and such type of communication network is unmanageable to handle as fast handoff, signal character, intervene maximizes on with other geographical components.

In these work, feasibleness, the functioning, and the boundary of ad hoc communication network apply in three routing protocol is measure in battery models Duracell AA (MX-1500), Duracell AAA (MN-2400), Duracell AAA (MX-2400)[11], Panasonic AA, and Panasonic AAA[12] and possible for optimizing the use transportation and routing communication Protocols is inquiring. In the allow realistic scenarios of both network usage and road traffic this is achieved by simulation tool Qualnet5.2[6]. The very small simulation environment for road traffic supplied vehicle movement information, which was then fed in to an event-driven network simulation that configured and managed VANET model based on this mobility data. The protocols and their various parameters of the transport, network, data link, and physical layers were provided by well-tested implementations for the networks simulation tool, while VANET mobility is performed by our own implementation.
II. AD HOC ROUTING PROTOCOLS

The routing protocols is a set and its control to nodes that establish how inflowing packets are routed among devices in wireless network and further differentiated in many types networks. There are mainly three types of Adhoc routing protocols. 1.Reactive Protocols is on demand routing protocols examples are AODV (Adhoc On Demand vector routing protocols), DSR (Dynamic Source Routing) and DYM0 (Dynamic MANET On Demand). 2.Proactive protocols is table based routing protocols examples are OLSR (Optimized Link State Routing) and FSR (Fisheye state routing). 3. Hybrid routing protocols is the combination of both reactive and proactive routing protocols examples are TORA (Temporary Ordered Routing Algorithm), ZRP(Zone Routing Protocol), HSLS (Hazy Sighted Link State) and OOPR (Orderone Routing Protocol). In this paper the select protocols are AODV, OLSR and ZRP.

2.1 AODV (Ad hoc on Demand Vector)
The AODV [6, 8] is a reactive protocol and well known is distance vector routing protocol and works on on-demand mechanism of Route Discovery and Route Maintenance from DSR. AODV then request the route when needed. Its usual routing table, one entry per destination. Whenever a node wants to start communication with another node, it looks for an available path to the destination node, in its local routing table. If there is no path available, then it broadcasts a route request (RREQ) message to its neighborhood. Any node that receives this message looks for a path leading to the destination node. If there is no path then, it re-broadcasts the RREQ message and sets up a path leading to RREQ originating node. This helps in establishing the end to end path when the same node receives route reply (RREP) message. Every node follows this process until this RREQ message reaches to a node which has a valid path to the destination node or RREQ message reaches to the destination node itself AODV find out a route to a destination only when a node wants to send a packet to that destination. Routes are maintained as long as they are needed by the source. The sequence numbers uses by AODV ensure the freshness of routes and assurance the loop-free routing.

2.2 OLSR (Optimized Link State Routing)
OLSR [9] is a proactive routing protocol. Mainly OLSR are optimization of the classical link state algorithm use in the wireless ad hoc networks. OLSR gets in three levels of optimization. First, some nodes are chosen as Multipoint Relay (MPRs) to transmit the messages in flooding process. This is convention to what is performed to classical flooding mechanism. Where each node transmits the messages and reduces overhead traffic. Second level of optimization is achieved by using only MPRs to generate link state information.

2.3 ZRP (Zone Routing Protocols)
Zone Routing Protocol (ZRP) [10] are first hybrid routing protocols. This is combination of reactive and proactive protocols to makes more scalable and efficient. ZRP is the zone based protocol that is means nodes divided into different zones to make route discovery and maintenance more reliable to MANET. ZRP defines a zone around each node consisting of its k-neighborhood (e.g. k=3). In ZRP, the distance and a node, all nodes within hop distance from node belong to the routing zone of node. ZRP is produced to two sub protocols, Intra-zone Routing Protocol (IARP) is a proactive protocol that is used in inside of routing zone and Inter-zone Routing Protocol (IERP) is a reactive protocol that is used in between routing zones. The main characteristic of ZRP is that to a reduce the network overhead that is caused by proactive protocol (table-driven) routing and it also deals the network delay that is caused by reactive routing (on-demand) protocols and execute route discovery more efficient. These networks routing protocols ought to be more active so it’s rapidly reply to topological modify. There is a lot of work done on measuring performance of some MANET routing protocols for fixed CBR traffic.

III. BATTERY MODELS

The zinc manganese dioxide (Zn/MnO₂) and zinc potassium hydroxide cells, commonly called alkaline or alkaline-manganese dioxide cells [11, 7], have higher energy productivity than zinc-carbon or zinc chloride (Leclanché) cells. Other main advantages are longer shelf life, with same voltage and advance leakage resistance, and higher low temperature performance. In compare to the zinc-carbon cell, the alkaline cell resign up to ten times the ampere-hour potential at high and nonstop drain conditions, with its performance at low temperatures as well being higher to early formal aqueous electrolyte primary cells. Its more efficient, secure seal provide superb resistance to leakage and corrosion.

The use of an alkaline electrolyte, electrolytic ally prepared manganese dioxide, and superior reactive zinc powder circulated to a higher initial price than zinc-carbon cells. However due to longer service life the alkaline cell is really more cost effective depend upon cost-per-hour usage, especially with nonstop discharge and high drains. The high-rate, energy-rich substantial composing the cathode and anode, in colligation with the more conductive alkaline electrolyte, yield more energy than could be storage in zinc carbon cell sizes. The comparability between the zinc-carbon cell and alkaline cell delivers more than ten times the ampere-hour capacity at high and continuous drain prerequisite, and its performance at low temperatures as well being super ordinate to other formal aqueous electrolyte primary cells. Its more efficient, secure seal allows excellent resistance to corrosion and leakage. The product test data and information are including in this division symbolizes Duracell’s most newfangled alkaline battery products.

IV. SIMULATION SETUP

This paper designed scenario in real traffic condition. We have taken 20 vanet nodes, terrain size in 1500 × 1500 meter. The mobility model chose in random way point and pause time is 0 sec. Vehicles speeds are taken min 1 m/s and max speed 20 m/s. Wireless nodes are connected in few CBR application program. Altitude is the scenario 1500 meter and data interval 250 ms. Routing protocol AODV, OLSR, ZRP used in the scenario. The Weather mobility time interval is 100 ms. Pathloss model is two rays on max propagation length of 100 m and Mac protocols Transmission power is 150 dbm.
Table 1. Battery Models

<table>
<thead>
<tr>
<th></th>
<th>Duracell AA (MX-1500)</th>
<th>Duracell AAA (MX-2400)</th>
<th>Duracell AAA (MN-2400)</th>
<th>Panasonic AA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nominal Voltage</strong></td>
<td>1.5 V</td>
<td>1.5 V</td>
<td>1.5 V</td>
<td>1.5 V</td>
</tr>
<tr>
<td><strong>Operating Voltage</strong></td>
<td>1.6 - 0.75V</td>
<td>1.6 - 0.75V</td>
<td>1.6 - 0.75V</td>
<td>1.6 - 0.75V</td>
</tr>
<tr>
<td><strong>Impedance</strong></td>
<td>81 m-ohm @ 1kHz</td>
<td>114m-ohm@ 1kHz</td>
<td>250m-ohm@ 1kHz</td>
<td>136 m-ohm @ 1kHz</td>
</tr>
<tr>
<td><strong>Typical Weight</strong></td>
<td>24 gm (0.8 oz.)</td>
<td>11 gm (0.4 oz.)</td>
<td>23 gm (0.8oz.)</td>
<td>11.0 gm (.38oz.)</td>
</tr>
<tr>
<td><strong>Typical Volume</strong></td>
<td>8.4 cm³ (0.5 in³)</td>
<td>3.5 cm³ (0.2 in³)</td>
<td>8.1 cm³ (0.5 in³)</td>
<td>3.8 cm³ (0.2 in³)</td>
</tr>
<tr>
<td><strong>Operating Temperature Range</strong></td>
<td>-20 to 35 (degree celsius)</td>
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<td>-20 to 35 (degree celsius)</td>
</tr>
<tr>
<td><strong>Storage Temperature Range</strong></td>
<td>-30 to 60 (degree celsius)</td>
<td>-20 to 35 (degree celsius)</td>
<td>-20 to 35 (degree celsius)</td>
<td>-20 to 35 (degree celsius)</td>
</tr>
<tr>
<td><strong>Terminals</strong></td>
<td>Flat</td>
<td>Flat</td>
<td>Flat</td>
<td>Cap and base</td>
</tr>
<tr>
<td><strong>ANSI</strong></td>
<td>15A</td>
<td>24A</td>
<td>24A</td>
<td>24A</td>
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<tr>
<td><strong>IEC</strong></td>
<td>LR6</td>
<td>LR03</td>
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E. Panasonic AAA

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V. RESULTS AND DISCUSSION

In Figure 1, it is observed that the AODV routing protocols Duracell AAA (MX-2400) battery residual battery capacity high with respect another's battery models. Panasonic AA residual capacity in second numbers in AODV protocols and Duracell AA (MX-1500) better than Duracell AAA (MN-2400) and Panasonic AAA.

In Figure 2, it is observed that the ZRP routing protocols Panasonic AA battery residual battery capacity high with respect to another's battery models. Duracell AA (MX-1500) residual battery capacity in second numbers in ZRP protocols and Panasonic AAA better than Duracell AAA (MN-2400) and Duracell AA (MX-2400).

In Figure 3, it is observed that the OLSR routing protocols Duracell AA (MX-1500), Duracell AAA (MN-2400) and Duracell AAA (MX-2400) battery models residual battery capacities are equal in OLSR routing protocols and Panasonic AA better than Panasonic AAA.
Fig. 1. Battery model Performance for AODV

Fig. 2. Battery model Performance for ZRP

Fig. 3. Battery model Performance for OLSR
VI. CONCLUSION

In this paper, performance of battery models, such as Duracell AA (MX-1500), Duracell AAA (MN-2400), Duracell AAA (MX-2400), Panasonic AA and Panasonic AAA is analyzed for routing protocols AODV, ZRP, OLSR. Battery models such as Panasonic AA and Duracell AA (MX-1500) performs well for all routing protocols, while Duracell AAA (MX-2400) is best for AODV, Panasonic AAA is for ZRP and for OLSR Duracell batteries are better. Because OLSR is a proactive protocol and it pre determines the route in well-defined manner. Proactive routing protocols best for energy conservation.

REFERENCES