Topology Based Routing Protocols (TBRPs) for Ad Hoc Networks

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Abstract – A selection of routing protocols explicitly tailored to this area has been developed and several output tests are made on the amount of routing protocols. FANET has the specific characteristics of mobile ad hoc networks (MANETs) and their subclasses, such as ad hoc vehicular area networks (VANETs) and sea ad hoc networks (SANETs). Details of the grouping, explanations and comparative analyses of relevant FANET routing protocols based on topology are given. The significance of this study is its value in offering a thorough overview of the existing routing protocols based on topology and objectively contrasting them according to various restrictions depending on main criteria and in this particular field of research, the presentation of the state of the art improved.

Keywords – MANET, VANET, FANET, WSN, Routing Protocols

I. INTRODUCTION

With advances in networking technology, handheld (portable devices) wireless systems became part of our everyday activities. With the wide-ranging deployment of virtual ad hoc networks, more and more focus has been paid to flying ad hoc networks (FANETs). Routing infrastructure is a crucial application for ad hoc networks. High-speed accessibility of nodes is a big obstacle for FANET routing systems.

Routing protocols have long been the central technologies for different forms of wired networks and wireless networks, and they are also testing hotspots [1-6]. Such ad hoc routing protocols can be classified into four categories: static, proactive, reactive and hybrid protocols as described in section III below.

II. DIFFERENT ROUTING PROTOCOLS

The architecture of the FANET network layer is one of the most important challenges [7]. There are various design constraints in ad hoc network such as mentioned below:

a) Scalability, and high dynamic topology,

b) Security and bandwidth etc.

III. TOPOLOGY BASED ROUTING PROTOCOLS

Such protocols are based on connection details by leveraging internet protocol addresses of portable nodes to share packets between the nodes of links. Here, it has been further categorized into four categories: (i) Static TBRPs, (ii) Proactive TBRPs, (iii) Reactive TBRPs and (iv) Hybrid TBRPs.

1) Static Topology Based Routing Protocols (STBRPs)

STBRP is suitable for a network with a persistent topology, which renders it inappropriate for FANETs. However, to connect, each table is pre calculated and loaded and placed in each and every UAV. Hence, it should be noted that no need to change the routing tables to enable UAVs to connect with UAVs placed on the field. Static protocols do not operate normally in case of connection failures, thereby affecting the whole network.
a) **DCR**: It stands for Data Centric Routing. It is a multi-static mechanism for routing. This can be achieved by demanding a data packet from a variety of UAVs by utilizing a reactive technology. In many applications, it is implemented in FANETs based on cluster scenario to spread specific data for a given task region.

b) **MLHR**: It stands for Multi-Level Hierarchical Routing. It is a static protocol for routing the request of network scalability [8]. For this reason, FANETs are organized in clusters, of which each cluster has own head that reflects the complete cluster. Each head of a cluster has numerous contacts beyond the cluster and within UAVs.

c) **LCAD**: It stands for Load CArry and Deliver. It is an entirely for FANETs static routing protocol [9]. Until UAVs begins, LCAD configures the ground routing router. By gathering packets, assigning them and delivers them to the destination, UAV’s must be considered as a connection between a pair of sender and receiver.

2) **Proactive Topology Based Routing Protocols (PTBRPs)**

This division stores specifics regarding all connections in routing tables between each mobile node pair. At a change in topology such tables are connected.

a) **OLSR**: It stands for Optimized Link State Routing Protocol. In recent studies [10-16], OLSR was used in FANETs in different design scenarios. OLSR focuses on a state routing strategy link in order to achieve a global understanding of all existing interactions between UAVs.

b) **D-OLSR**: It stands for Directional Optimized Link State Routing Protocol. It is an OLSR extension where UAVs are designed to improve the transmission by directional antennas [17]. The size of UAVs is greatly decreased to further mitigate the overhead. In addition, the UAV source measure the distance from the UAV target.

c) **DSDV**: It stands for Destination-Sequenced Distance Vector. This protocol is based on the Bellman Ford algorithm [18]. There are two types of metrics are used to prevent routing loops as well as to refresh information on local topology variations.
The first metric is the number of sequences and second metric is the incremental parameters.

d) **TBRPF**: It stands for Topology Broadcast based on Reverse-Path Forwarding. It is a proactive protocol for routing, taking advantage of the shortest paths given by the Dijkstra algorithm [19].

**3) Reactive/On Demand Topology Based Routing Protocols (RTBRPs)**

In this situation a UAV needs to create a communication where determined routing paths are discovered, established and sustained. These routing protocols are called as On-Demand protocols.

a) **DSR**: It stands for Dynamic Source Routing. It is the type of reactive protocol. DSR permits the network to be mobile and autonomous without depending on any infrastructure [20]. Since of the reactive aspects of DSR, only a link is included in the development process.

b) **AODV**: It stands for Ad hoc On demand Distance Vector. It incorporates DSR and DSDV protocols, in which hop-by-hop routing is inherited and routing tables are regularly modified [21]. AODV initiates a discovery mechanism for monitoring the routing path through the less number of hops in each links.

c) **TS-AODV**: It stands for Time-Slotted Ad hoc On demand Distance Vector. It is sub category of AODV protocol that implements the TS concept [22]. This creates a trade-off between colliding risk and bandwidth usage, to manage the network congestion, particularly in networks such as FANETs.
d) M-AODV: It stands for Multicast Ad hoc On demand Distance Vector. The prototype of AODV has been updated to take the multi-cast principle of linking a number of nodes into account [23]. By designing multicast trees using a reactive approach, Multicast AODV can be conveniently applied to FANETs.

4) Hybrid Topology Based Routing Protocols (HTBRPs)
Hybrid protocols incorporate the benefits of each and overcome the drawbacks of mixture of proactive and reactive protocols. Proactive and reactive protocols do require a significant to keep the network and resources for the optimal paths. It adopts the concept of areas in which the proactive strategy is implemented in the zones as a conventional solution, thus limiting the overhead.

a) HWMP: It stands for Hybrid Wireless Mesh Protocol. This is especially for wireless LANs, used in FANETs [24]. It is a routing protocol. HWMP incorporates reactive and proactive approaches to determine a routing route on demand and to build a tree proactively.

Figure 4: Hybrid topology based routing protocols

b) ZRP: It stands for Zone Routing Protocol. It is the type of hybrid protocol that brings together two types of routing; one is reactive and other is proactive. ZRP is based on the zoning principle, which includes a number of nodes in each location. The distance between nodes using a predefined radius is used to identify each region. The nodes in this same area are communicated with proactive approach based on the concept of internal-zone routing.

c) SHARP: It stands for Sharp Hybrid Adaptive Routing Protocol. It aims to create a balance between constructive and reactive routing by continuously adjusting the amount of proactive exchanged routing control packets [25]. A sequence of UAVs is specified by the distance at which the control packets should be exchanged.

d) TORA: It stands for Temporarily Ordered Routing Algorithm. It is a hierarchical hybrid routing scheme that is ideal for extremely complex networks such as FANETs [26]. Even TORA monitors and manages adjacent UAV communication links. TORA’s primary goal in the event of topology adjustments is to rise the sharing of control packets. A Directed Acyclic Graph is created and preserved between the UAVs in which there are many routes between them.

IV. CONCLUSION
In this paper, there is a description of topology based routing protocols for Ad-hoc Networks, which has been further categorised into four protocols that are static, proactive, reactive and hybrid. Every routing table is computed and filled in in advance in each UAV in a static protocol. Proactive protocols store details about all fresh
connections inside the routing tables for each pair of mobile nodes. A route exploration phase is implemented in reactive protocols only when a UAV intends to create a message that identifies, determines, and preserves the most routing routes. Hybrid protocol is the mixture of constructive and reactive protocols that allow a large overhead to support the entire network and enough flexibility to identify the right routes. In the future, it would be important to evaluate the realistic application of the ad hoc network protocols for accuracy.

V. REFERENCES


