A Review Paper on Routing Protocols for Aeronautical Ad hoc Network

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Abstract

AANET-Aeronautical Ad hoc Networks are large scale multi hop wireless network of aircraft which provides direct air-to-air communication without ground infrastructure. AANETs aim is building communication link among aircraft. Routing is one of the main challenge that Aeronautical ad hoc networks(AANET) are dealing with. In this paper I am focusing on several routing protocol have already been propose in AANET, classification of routing protocol and performance analysis of some these routing protocol are outlined and comparative studies of the simulation result for different parameters for different protocols have been reported.

INTRODUCTION

AANET [1] is a form of MANET and similar VANET due to high mobility and dynamic topology . AANET is a large scale multi hop wireless network of aircraft which provide direct air-to-air communication without ground
infrastructure. AANET is define as a selforganized network where airplanes work as a node and Each node has a certain range of communication.
Routing is one of the main challenge that AANET is dealing with because of i) mobility of node ii) Geographical size of network and ii) number of nodes.Find appropriate path between sender and receiver in the network is one of major challenge in AANET .Routing protocol is set of methods are used to solve this problem.

In AANET , airplanes are work as a node and communicates with ground infrastructure and other aircrafts. In this network information becomes available through in-aircraft, aircraft- to-ground and aircraft- to-aircraft communications.

With the help of these networks, traffic between aircraft can be distributed and is regarded to have improved reliability and scalability. Based on this property, the need of aircraft ad hoc networks increases due to an unpredictable increase in air traffic, fuel cost and environmental pollution.

FEACTURES OF AANET

1) Most of AANETs are heterogeneous networks, of which different types of links are stringent and the air spectrum resources are limited
2) In AANET nodes move continuously but predictably
3) The notational environment and node communication radius are
   large
4) Nodes move fast ,the topology is highly dynamic
5) Nodes have a strong processing ability
6) Design of network routing protocol is effectively supported by a large amount of airborne equipment.

In response to these features, a corresponding routing protocol needs to be designed to maximize the performance of AANET. In this paper AANET routing protocols

CLASSIFICATION OF ROUTING   PERFORMANCE OF ROUTING PROTOCOL

In paper [3], author presented various routing protocols specifically designed for ad hoc routing networks like MANET,VANET and AANET. Wireless ad hoc networks made up of wireless mobile nodes which dynamically form networks when required without using any fix ground infrastructure. Each indivual node in wireless ad hoc network act as a router, which send and receive data.

Another type of mobile ad hoc network is vehicular ad hoc networks(VANET) for VANET many different protocols are proposed because all standard protocols cannot be used due to high mobility,topology. Some of VANET routing protocol are discuss in this paper are

1)Adhoc routing
2)cluster base routing
3)Geographical routing
4)Position base routing
5)Broadcast routing

An aircraft ad hoc network[4] is type of
AANET in which communication happened amongst remote aircraft without any fix infrastructure. AANET routing protocol classification is based upon network structure of protocol design into two part :

1)Topological based routing further devided into Proactive, Reactive and Hybrid
2)Ge ographic protocols required
In this work, All these routing protocols are evaluated the performances in terms of Packet Delivery Ratio (PDR), packet delay, throughput, and signalling rate of well-known routing protocols.
1)GRAA
2)AeroRP
3)GLSR

are defined and study conclude that various routing protocol can be used, depending upon the ad hoc network utilization ,communication installation and mission objectives. And this study is useful for the secure transmission of data from source to destination in multi hop network.

In [5] this paper author introduce the term Aeronautical Ad hoc networks and which kind of routing system is suitable is proposed. Communication among the plane can be done in three layers 1)Top layer is the satellite layer 2) Middle layer is the aircraft layer and 3) the bottom layer is ground station layer. In this paper focus is on the middle layer because of plane high mobility, network topology of airplane nodes are taken into account so that durable links are identified and established between nodes in order for the successful transmission and reception of data.

PROTOCOLS IN AANET/FANET [2]
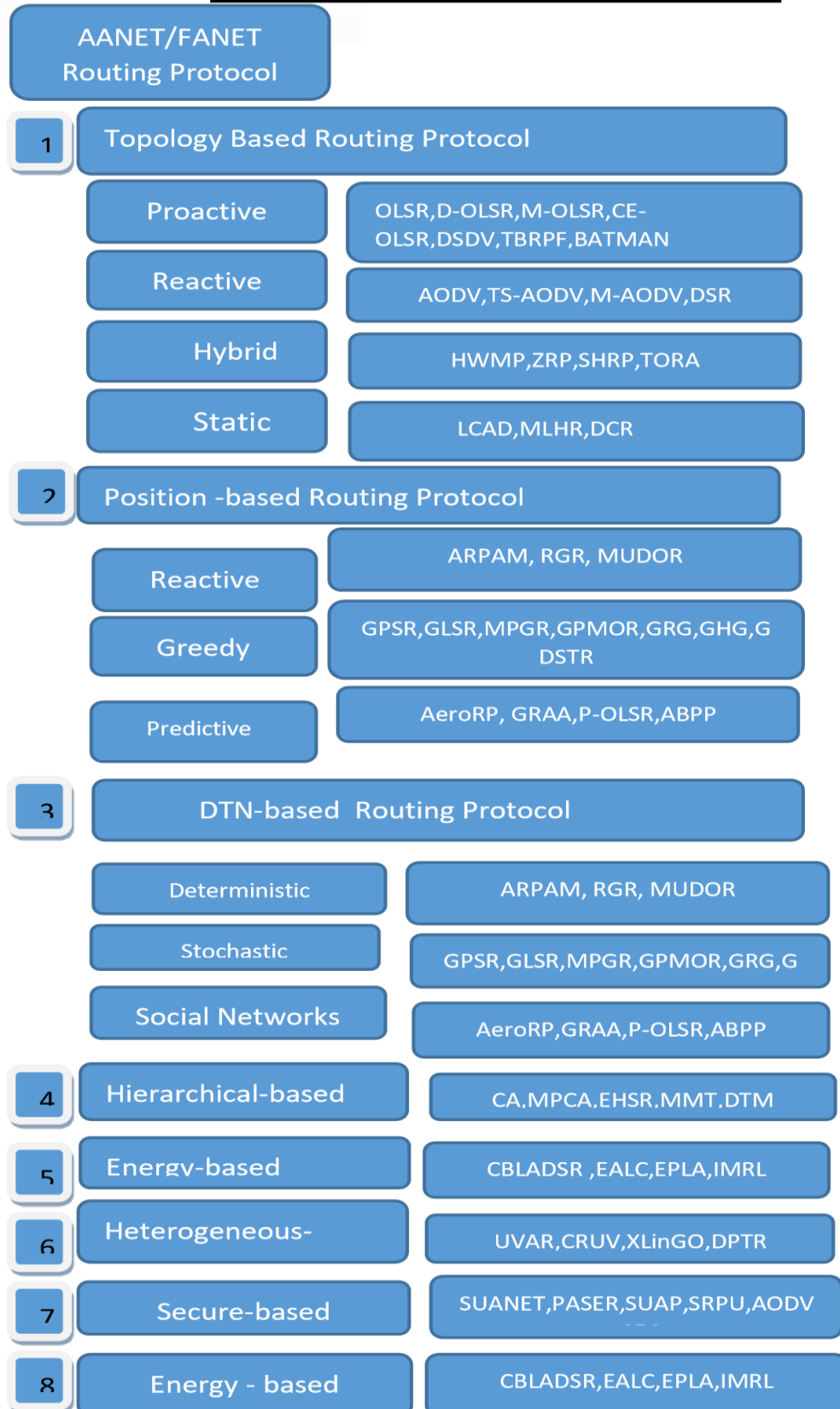
In this paper, Ad hoc routing among planes are define in terms of

1) Aeronautical mobility and routing model

2) Aeronautical Routing and Define best Path (in multi hop scenario, nodes on the path have velocities very close to each other hence is a most stable path)

3) Doppler shift of packets (Each packet is subjected to Doppler shift [6,7] which depend on the relative velocity of the replying aircraft to the receiving aircraft)

4) Multipath Doppler routing algorithm (MUDOR)

In this paper two set of simulation are performed
a)Simulation for single-hop in relation to node density

b)simulation for multi-hop with regard to communication range for a Real World Scenario

In this set of simulation author had concluded that MUDOR outperforms DSR in terms of number of handoffs during the whole simulation time.

In [6] paper , researcher presented a study for performance evolution of existing typical routing protocols for aircraft ad hoc networks using simulator.
This evolution study figure out what is the impact of high speed movement and spare deployment over well known routing protocols with new mobility pattern for aircraft ad hoc networks.

In this paper, 3 most popular routing protocols are considered 1)AODV 2)DSDV and 3)GPSR. Author demonstrate the suitability of these protocols in AANET in terms of packet delivery ratio, end to end delay and control overhead using simulator.

For this performance analysis author propose how to generate realistic mobility scenarios for each simulator, and how to develop software which makes use of commercial flight simulator, Microsoft Flight simulator.

For this simulator model researcher consider following component
1) Topology component
2) Object Creation
3) Data Record
4) Movement Display
5) Data Parsing

Using this component and own software along with NS-2 simulator and other parameter for scenarios are describes as follows :
MAC Protocol : IEEE 802.11
Propagation Model : Two ray model
Aircraft Type : F-18
Initial Position : Uniform Distribution Traffic : CBR over UDP

Simulation Results are generated by evaluating three routing protocols by measuring the packet delivery ratio, end to end delay with no of nodes (10,20,50 and 100) and realistic mobility model.

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--GPSR shows the better performance than other two protocols in terms of packet delivery ratio. AODV better performance than DSDV.

--GPSR shows the shortest end to end delay and AODV shows the longest end to end delay because it needs to establish the path on demand way.

Finally author conclude that it is necessary to develop new routing protocol based on DTN for aircraft ad hoc networks.

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