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NETWORK SURVEILLANCE BASED DATA TRANSFERENCE IN COGNITIVE RADIO NETWORK WITH THE COMPARISON OF DIFFERENT ROUTING PROTOCOLS

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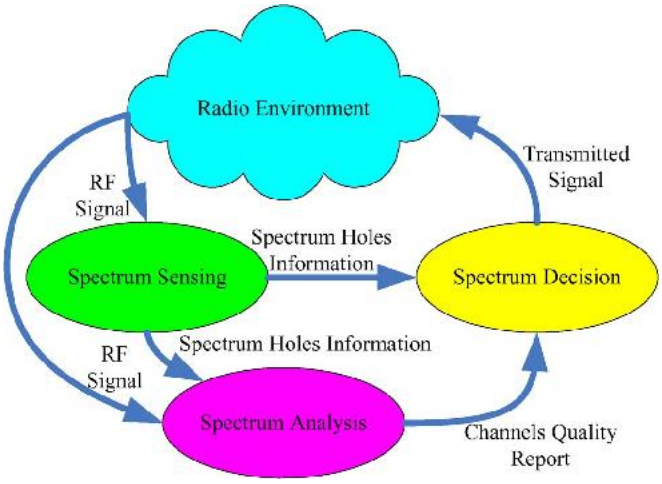
Abstract - *Creation of Energy-Efficient Cognitive Radio model is a challenging task. There are many traditional methods which are highly energy efficient, but it does not bother about network security. Hence in this paper we are comparing different wireless routing protocols and find best protocol to create energy efficient Cognitive Radio network (CRN) model having attacker nodes in it. Finally energy consumption comparison graph was generated between those routing protocols and finds the efficient model i.e. the creation of energy efficient CRN model.*

Key Words*: **Network Security,Energy Efficiency,Cognitive radio (CR), X Graph***

1. INTRODUCTION

Cognitive radio is a Software-defined radio that can able to access unused radio spectrum holes efficiently. The definition adopted by Federal Communications Commission (FCC):"Cognitive radio: A radio or system that senses its operational electromagnetic environment and can dynamically and autonomously adjust its radio operating parameters to modify system operation, such as maximize throughput, mitigate interference, facilitate interoperability, access secondary markets." Cognitive radio (CR) techniques provide the capability of detecting spectrum holes and sharing the spectrum in an opportunistic manner. DSA techniques can select the best available channel from the spectrum pool for CR devices to operate [4]. More specifically, CR enables secondary users (SUs) to perform a series of operations as follows: 1) spectrum sensing to predict what spectrum is available and recognize the presence of the primary user (PU) when a PU reoccupies the licensed channel; 2) spectrum management to select the best available channel from the spectrum pool for special services; 3) spectrum sharing to coordinate access to all available channels with other SUs; and 4) spectrum mobility to vacate the channel as soon as possible when a PU is detected [4]. Spectrum sensing is one of the most important components in the cognition cycle .Routing protocols plays an important role to choose an efficient CRN model. Hence in this paper we are going to compare the reactive, Proactive and Hybrid routing Protocols. The below figure 1.1 shows the basic cognition cycle [13].



2. WIRELESS ROUTING PROTOCOLS

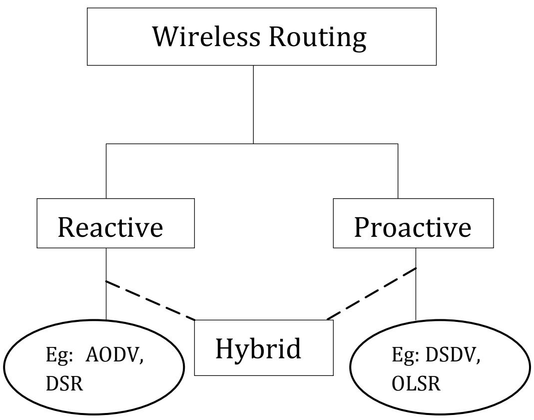


Figure 2.1 Routing Protocols Classification

- **Reactive** (AODV,DSR,TORA) on demand
- **Proactive** (DSDV,OLSR,WRP) table driven
- **Hybrid** (ZRP) combination of reactive and proactive.

In this paper we are going to compare three routing protocols to choose the best one.

2.1 Reactive Protocol

Reactive Protocol has lower overhead since routes are determined on demand. It employs flooding (global search) concept. Constantly updating of route tables with the latest route topology is not required in on demand concept. Reactive protocol searches for the route in an on-demand manner and set the link in order to send out and accept the packet from a source node to destination node. Route discovery process is used in on demand routing by flooding the route request (RREQ) packets throughout the network. Examples of reactive routing protocols are the dynamic source Routing (DSR), ad hoc on-demand distance vector routing (AODV).

2.1.1 AODV

Adhoc-**O**n demand–**D**istance-**V**ector is the algorithm used here it enables dynamic, multihop routing between the nodes.It allows the nodes to obtain the routes quickly and the operation is loop-free one and it has setup of reverse/forward pointers. The major advantage of this algorithm is it avoids link breakage, AODV causes affected set of nodes to be notified, so we can invalidate the route using lost link. Route Request (RREQ's), Route Replies (RREP's) and Route Errors (REER's) are the message types defined by AODV algorithm.

Advantages of AODV

Highly suitable for more number of nodes.Use of periodic indication messages to track neighbours the messages supporting the routes maintenance are range-limited, so they do not cause unnecessary overhead in the network. The connection setup delay is less. RERR (Route error) is defined so we can avoid link breakage.

2.1.2 DSR

DSR uses source routing concept. When packets are flooded by a source node, the sender node caches complete hop-by-hop route to the receiver node. These route lists are caches in a *route cach*e. The data packets carry the source route in the packet header. DSR uses Route Discovery process to send the data packets from sender to receiver node for which it does not already know the route; it uses a route discovery process to dynamically determine such a route. In Route discovery DSR works by flooding the data packets in network with route request (RREQ) packets. RREQ packets are received by every neighbor nodes and continue this flooding process by retransmissions of RREQ packets, unless it gets destination or its route cache consists a route for destination .Such a node replies to the RREQ with a route reply (RREP) packet that is routed back to real source node .source routing uses RREQ and RREP packets. The RREQ builds up the path traversed across the network. The RREP routes itself back to the source by traversing this path toward the back. The source caches backward route by RREP packets for upcoming use. If any connection on a source route is wrecked, a *route error* (RERR) packet is notified to the source node.

2.2 Proactive Protocol

Each node in the network has routing table for the broadcast of the data packets and want to establish connection to other nodes in the network. These nodes record for all the presented destinations, number of hops required to arrive at each destination in the routing table. The routing entry is tagged with a sequence number which is created by the destination node. To retain the stability, each station broadcasts and modifies its routing table from time to time. How many hops are required to arrive that particular node and which stations are accessible is result of broadcasting of packets between nodes. Each node that broadcasts data will contain its new sequence number. The proactive protocols are appropriate for less number of nodes in networks, as they need to update node entries for each and every node in the routing table of every node. It results more Routing overhead problem. There is consumption of more bandwidth in routing table. Example of Proactive Routing Protocol is Destination Sequenced Distance Vector (DSDV).

2.2.1 DSDV

The DSDV routing protocol is an enhanced version of the distributed Bellman-Ford algorithm where each node maintain a table that contain the shortest distance and the first node on the shortest path to every other node in the network. Each node, upon receiving an update, quickly disseminates it to its neighbors in order to propagate the broken-link information to the whole network. Thus a single link break leads to the propagation of table update information to the whole network.

Advantage

It can be applied to MANETs with few modifications. The updates are propagated throughout the network in order to maintain an up-to-date view of the network topology at all the nodes.

Disadvantages

(1) The DSDV suffers from excessive control overhead that is proportional to the number of nodes in the network and therefore is not scalable in MANETs, which have limited bandwidth and whose topologies are highly dynamic.

(2) In order to obtain information about a particular destination node, a node has to wait for a table update message initiated by the same destination node. This delay could result in stale routing information at nodes.

2.2.2 OLSR

Optimized Link State Protocol (OLSR) is a proactive routing protocol, so the routes are always immediately available when needed. OLSR is an optimization version of a pure link state protocol. So the topological changes cause the flooding of the topological information to all available hosts in the network. To reduce the possible overhead in the network protocol uses Multipoint Relays (MPR). The idea of MPR is to reduce flooding of broadcasts by reducing the same broadcast in some regions in the network, more details about MPR can be found later in this chapter. Another reduce is to provide the shortest path. The reducing the time interval for the control messages transmission can bring more reactivity to the topological changes.

Advantages

OLSR is also a flat routing protocol; it does not need central administrative system to handle its routing process. The proactive characteristic of the protocol provides that the protocol has all the routing information to all participated hosts in the network. However, as a drawback OLSR protocol needs that each host periodic sends the updated topology information throughout the entire network, this increase the protocols bandwidth usage. But the flooding is minimized by the MPRs, which are only allowed to forward the topological messages.

2.2.3 Hybrid Routing Protocol (HRP)

HRP is a hybrid protocol that separates the network into several zones, which makes a hierarchical protocol as the protocol ZHLS (zone-based hierarchical link state). HRP is based on GPS (Global positioning system), which allows each node to identify its physical position before mapping an area with table to identify it to which it belongs. The number of messages exchanged in high ZHLS is what influences the occupation of the bandwidth. Our protocol attempts to reduce the number of messages. Hence the network is zoned in HRP there is no need of periodic updates about the network's source and the bandwidth consumption and the number of reports exchanged is highly reduced.

Operation of the Protocol HRP

HRP is a protocol that is based on the concept of zones; each zone can contain multiple nodes

So we can define tree levels:

- Level node.
- Level Getaway.
- Level Cluster Head

Each node deploys a relocation method to find its physical location and determines its zone ID by mapping its physical location to the zone map. Equipped with this zone ID, the node can start the intrazone (level of node) clustering and then the interzone (level of getaway) clustering procedures to build its routing tables. Each asynchronously broadcast a link request. Nodes within its communication range in turn reply with link responses node ID, zone ID. After all link responses are received, the node generates its node LSP that contains the node ID of its neighbors of the same zone and the zone ID of its neighbors of different zones. Nodes may receive link responses from the nodes of their neighboring zones. After LSP receipt, cluster head communicates with the getaway that is sending a scope on the table containing the nodes belonging to the area. Their getaways change the tables received by the cluster head and update their routing table.

3. ANALYSIS SNAPSHOT

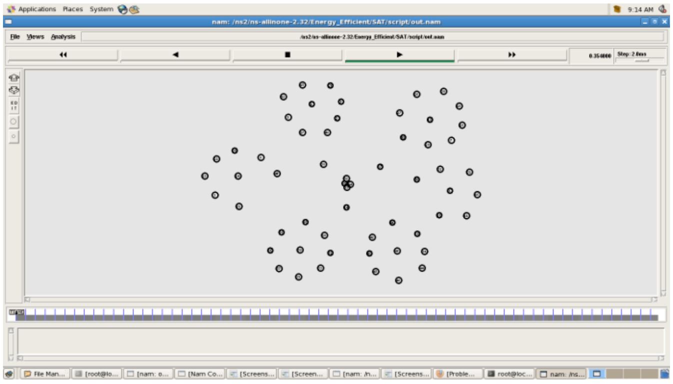


Figure 3.1 Working Snap of NS2

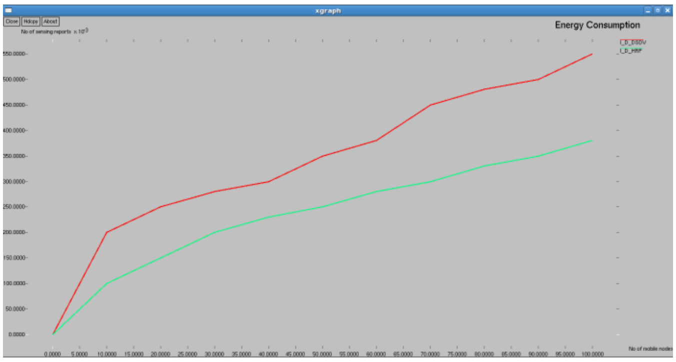


Figure 3.2 Energy Consumption Comparison of DSDV and HRP

In the Fig 3.2 Red strike shows DSDV output and green shows HRP

In the Below Figure 3.3 Red strike shows AODV and green shows DSR

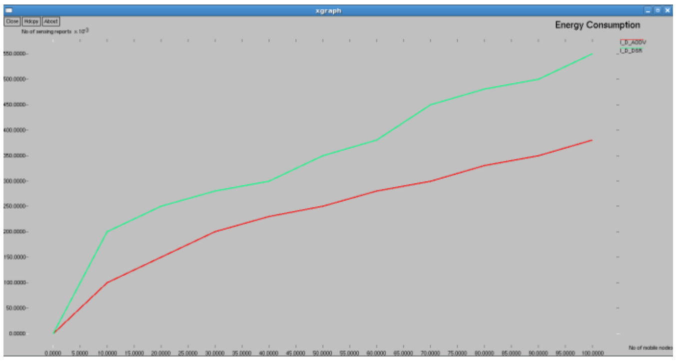


Figure 3.3 AODV and DSR Comparison

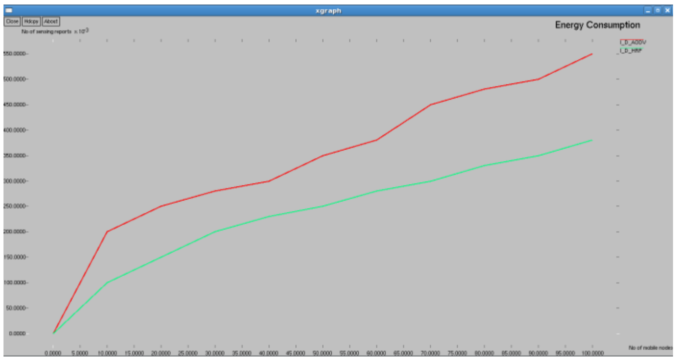


Figure 3.4 AODV and Hybrid Comparison

In the above figure 3.4 Red strike shows AODV and Green Strike Shows the Hybrid Protocol.This graph proves that our Hybrid routing protocol is more energy efficient than AODV.

4.CONCLUSION

Different Routing Protocols are applied in our proposed CRN model and Energy Consumption X graph was generated for all the protocols.Based on X graph result we Proves that AODV protocols Suits to the network having highest number of nodes and DSR is best for the network having less number of nodes and for Hybrid protocol there is no need of periodic HELLO messages. Hence for creating Energy Efficient model Hybrid routing protocol plays an important role i.e, Highly enrgy efficient which means it consumes very less energy When compared with other protocols.

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