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Proactive algorithm dynamic mobile structure of Routing protocols of ad hoc networks

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Abstract
This paper mainly studies process of dynamic routing in a multi-level perspective the mobile radio network based on the new generation of radio .enhance the mobility of Computer networks a new and higher quality of service is required for different types of traffics, which in turn is displayed on the routing protocols. Routing protocol in data networks will understand a formal set of rules and agreements on sharing network information between routers to determine the route of data transmission that satisfies a given quality of service requirements and provides a balanced load across the mobile computer network as a whole. Organization and formation of mobile computer networks, including routing issues, devoted to the work of scientists, For modern computer networks of large dimension is typical multilevel routing in which computer network in some way divided into a subnet (routing domains), with at the most efficient protocol subnets group IGP, EGP group and protocols between networks. The work process of dynamic routing in a multi-level perspective the mobile radio network based on the new generation of radio. It is proposed to use a well-known pro-active routing protocol OLSR multipoint handoff service packages as part of a hybrid protocol (HWMP).The description, the algorithm and the features of implementation of proactive protocol(OLSR).

Key word:
Proactive algorithm, mobile structure, Routing protocols, hoc networks

1. Introduction

In the introduction, formulated goals and main tasks of research, defined area and the object of research are scientific novelty and practical value of obtained results. The data on the implementation of the work, personal contribution the applicant, publication of the results ,the basis of the analysis of known routing algorithms shows that the most effective for mobile networks are algorithms DART, DDR, based routing protocols are implemented CBRP, FSR, GSR, HARP, ZRP. Determined the effectiveness of these algorithms for solving the problem of information transfer provide the required level of quality of service in mobile computing networks [1,2].

The large computer networks using multi-dimensional routing in which the network using the algorithms DDR ZHLS or divided into separate subnet (routing domains). Typically, routing algorithms within the domain (implemented in the protocols RIP, IS-IS level 1, OSPF, IGRP, EIGRP) differ from the routing algorithms between domains (implemented in the protocols BGP, BGP-4, IDRP, Shown that the efficiency of routing methods is directly dependent on network topology and its size. We also found that the multilevel routing largely depends on the optimal partitioning of computer network routing domains. Thus, one of the main problems of the functioning of a mobile computer network is a reasonable choice of the number and size of the routing domain. To ensure maximum efficiency of a mobile computer network, routing procedures should take into account
changes in network topology. However, most routing protocols, namely CBRP, CGSR, DSRP, FSR, GSR, HSLS, HSR, WRP, ZRP does not provide procedures for changing the structure of routing domains. develop a new method and routing protocol, which due to dynamic reconfiguration of routing domains will improve the efficiency of information transmission in mobile computer networks of large dimension. It should be borne in mind that reconfiguring associated with increased volume of traffic service, in this connection to determine if considered appropriate.
On the basis of the promising radio networks can consist from several hundred to several thousand radio stations depending on the level (village-city-region) of all kinds, algorithms only with reactive or proactive routing will be ineffective because of the rapid growth of the share of traffic service [3,4,5]. The Protocol routing of traffic in mobile distributed the prospects of the radio network, it is advisable to use a hybrid routing protocol HWMP (Hybrid Wireless Mesh Protocol), the idea of which splitting the entire network into multiple sub networks, within each of which is proactive protocol, while the interaction between subnets is reactive manner, that is, to build ways uses two modes:

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The reactive mode in which the building the routing tables of the nodes of the distributed network is on request (before passing the packets);
Proactive mode, which is the procedure for updating the Routing tables in all the nodes of the network.
In view of the selection of the hybrid routing protocol in HWMP, using the step method of IP addressing, it is proposed that:

- in a distributed environment directly between the subscribers use a proactive routing mode OLSR (Optimized Link State routing:
- Proactive mode, which is the procedure for updating the routing Tables in all nodes of the networks In view of the selection of the hybrid routing protocol in HWMP, using the step method of IP addressing, it is proposed that:

a) In a distributed environment directly between the subscribers use a pro-active routing mode OLSR (Optimized Link State routing:
b) Subnets and networks use a reactive routing mode AODV (Ad-hoc On-demand Distance Vector)

In proactive or table-driven routing protocols, each node continuously maintains up-to-date routing information to reach.

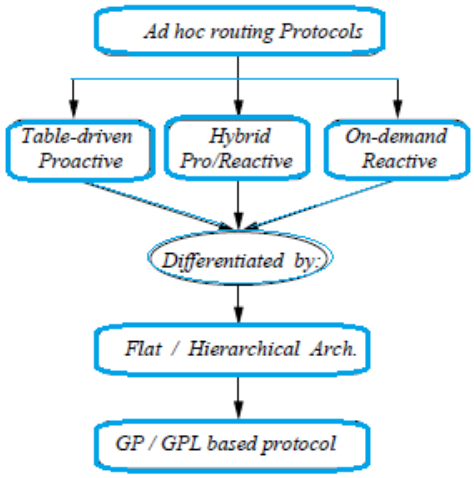

Fig. 1 Classification of ad hoc routing protocols

Each node in the network routing table updates, periodically transmitted across the network in order to save the table to match. Thus, the route, quickly, without delay. However, for highly dynamic network topology, the active diagram requires a significant amount of resources to maintain routing information, modern and reliable. In contrast to the active approach, reactive or on-demand protocols, the host initiates a search on the entire network, only when he wants to send packets to a destination. In the reactive Schemes, nodes maintain routes, directions. The route search is required for each new destination. Thus, communication costs are reduced by delay due to the route. In addition, the rapidly changing network topology can break an active route and then finding a path [6, 7, 8, 9]. And, finally, in hybrid protocols, each node supports both the network topology information within area (coverage area), as well as information about neighboring zones. In a hierarchical architecture, combining nodes in the clusters and clusters in the super-clusters hides information network. Some of the sites, such as cluster heads and nodes have a higher load calculation for communications, than other sites. Thus, the mobility management becomes complex.

2. Proactive OLSR protocol

Optimized as the channel with the aim of reducing the number of transmission, uses the WAVE algorithm of the waypoints list messages, based on the principle of multi-torch MPR (Multi Point Relay). In accordance with the algorithm of this relay races, at the beginning of each network node m are determined by the neighboring nodes NBR (m), with whom he is connected, and then selects some of the nodes from the set of neighboring nodes - a set of MPR (m). Moreover, the MPR set (m)is formed in such a way that all nodes that are within a radius of 2-steps from the node (m) the neighbors of neighbors), will have symmetrical channels with the MPR(m). It turns out that the MPR nodes connected to all nodes within a radius of 2-steps. Therefore, the MPR sets are selected when there is a change in the radius of 1 or 2-steps from the node (m).For each node in the set of MPR is formed by an individual list of neighboring nodes that have selected it as MPR, - a list of MPR Selectors (MPRS), abbreviated as MS. Information about MS is transferred to the special bonus HELLO messages (T) packets). These messages are sent between the two neighboring nodes [10]. By TC packets in the network is passed only the information about the status of the connections MPR and MS. The process of routing with OLSR let's look at the fragment distribution radio network (figure 2), consisting of 7 radio stations (nodes).
In the beginning, after the deployment of the network, each node in accordance with the table patch of being broadcast HELLO messages and is determined by a set of neighboring nodes NBR(m). Then each node m sends hello messages with the NBR(m) some
Roma adjacent to the root node (in this example, the Node 4): NBR(1) = {2};
NBR(3) = {2, 5}; NBR(5) = {3, 6}; NBR(6) = {3, 5}.

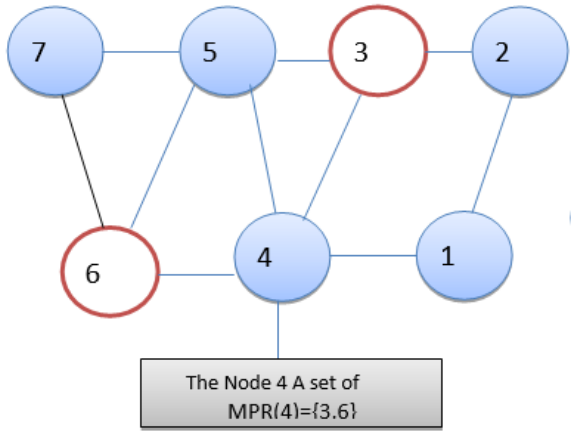

Fig. 2 fragment of a distributed radio network

The exchange of messages on the host sets NBR(m), determine the list of Nodes for multi Token Ring MPR transfer(m). For the node 4:
MPR(4) = {3, 6}. Then the selected sites MPR(m) of the TC send packets with information about the topology of the network, which is:
- The number of the list is being circulated to avoid the use of outdated information.
Taking into account the list of nodes of the MPR Mailing List(m) for the example we get the following lists MS(m):
MPR(3) = {4} ~ MS(3) = {2, 4, 5}
MPR;(4) = {3, 6} ~ MS(4) = {1, 3, 5, 6}
MPR;(6) = {4} ~ MS(6) = {4, 5, 7}.
The MPR nodes create mailbox TC only for nodes in its recruitment of MS and treat all messages received T, but then send only those send which belongs to their sets of MS (TC messages disseminated only hosts (MPR). So, Node 3 creates the message T (figure 2), announcing, {2, 4, 5} in MS(3). Node 4 sends the next message T Host3 as the host 3 belongs to MS(4) = {1, 5, 6}. Node 6 sends the next message T (3) as the host4 belongs to the MS(6).

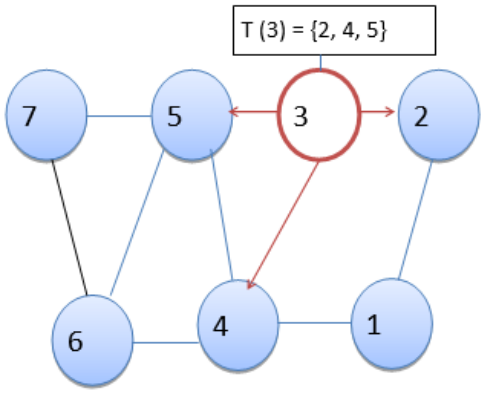

Fig. 3 Sending a message to the T, created by the host 3

Similar to the Assembly 4 creates the message TC, announcing, {1, 3, 5, 6} in MS(4). Hosts 3 and 6 send further message T(4), as the assembly 4 belongs to the MS(3) and MS(6).
The Assembly 6 creates the message TC (figure 3), announcing nodes in the ms (6) = {4, 5, 7}. Node 4 sends a message to the TC(6) from the host 6 and Host 3 directs the T(6) from node 4. After the sites 3,4 and 6 have created T message, all sites have information for routing on the status of the channels in any site.

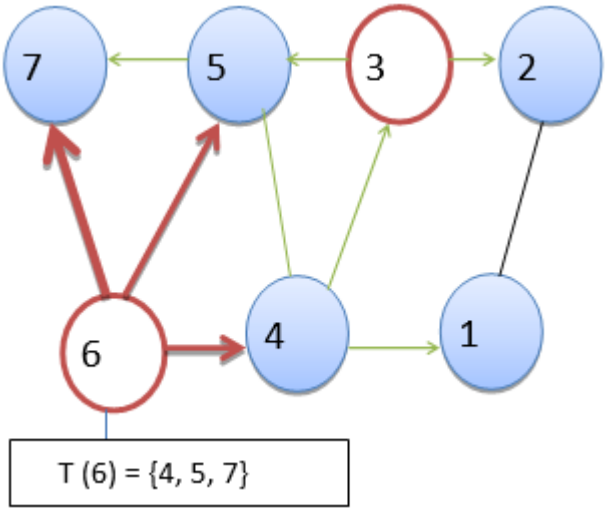

Fig. 4 Sending a message to the TC, created by the Node 6

Information Resaved, the (T) messages, each node forms a topological Structure (figure 5).

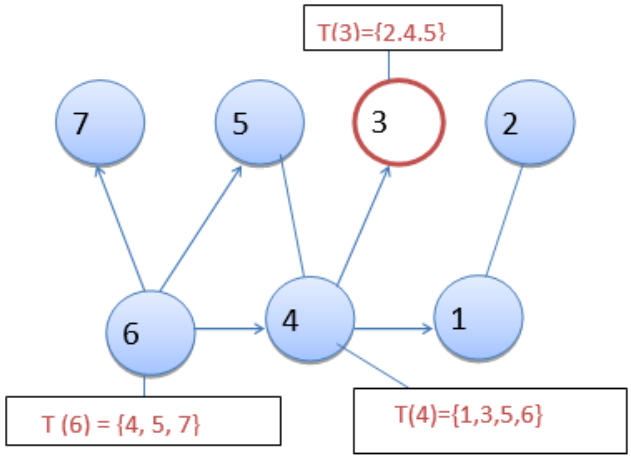

Fig. 5 The structure topological of the network

For the stable operation of the algorithm of proactive OLSR protocol must specify the frequency list T-packets

from the network nodes (time T) which can be calculated according to the Function

$$T = \frac{C_{ri} + B_{tp}}{r(1-P}$$

Where $C_{ri...}$ - Redundant information (constant, determined by the amount of the performance
Information);
B_{tp} - the amount of the test package (8192 bits);
r - The speed of the channel (9600),
P is the probability of an error in the packet length of the FTE (measured experimentally).

3. Distributed Dynamic Routing Algorithm

The routing algorithms can be divided into two large groups: static non-adaptive and adaptive dynamic. In the case of static algorithms for selecting routes is carried out beforehand and displays manually in a routing table that stores information about which interface to send the packet with the corresponding address information. In the case of dynamic algorithms for routing table changes automatically when the network topology or traffic in it [11].
The dynamic algorithms differ on how to obtain information (for example, from neighboring routers, from all routers in the network. time changes routes at regular intervals when the topology changes and used the metric distance, the number of transit nodes . Two of the most popular routing algorithms are distance vector algorithm and the status of the channel.
When the algorithm of distance vector each router maintains a table. a vector indicating the shortest distance and output line for each destination. The metric can be used as the number of transit nodes, the time delay, the total length of the queues and others. The table contains information about all the routers in the network. Periodically, each router sends its neighbors table. One of the main disadvantages of this algorithm is the slow dissemination of information about the unavailability of one or another line or outlet of a router failure. This algorithm is used in the protocols, such as RIP, IGRP, etc, show The definition of the shortest path (figure 5).
In the case of the algorithm of the router gathers information about its immediate neighbors, by measuring the delay (throughput). Instead of routing tables, he broadcast the information only about their immediate neighbors, the newsletter is initiated only when a change of information. When changes to the router determines anew the shortest path to all destinations using the Algorithm. The algorithm of the channel status is the basis of routing protocols such as OSPF and IS-IS.

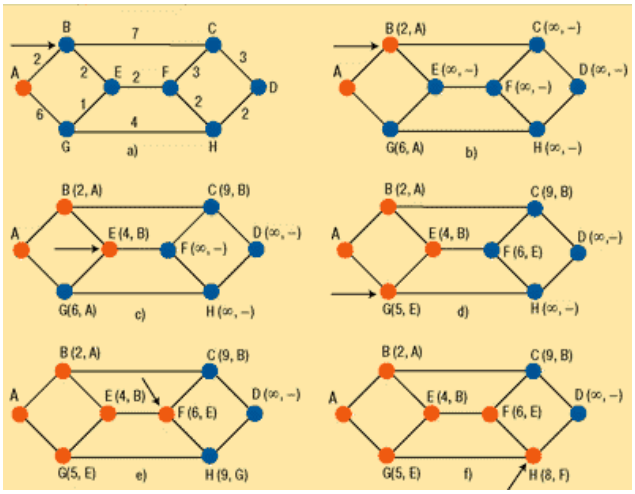

Fig. 6 The definition of the shortest path

To determine the shortest path from one host to another proposed the following algorithm. The topology is represented in the form of the graph with the specified for each rib metric values, the distance between two adjacent nodes. Initially, the path is unknown, therefore all vertices the graph get tags with the infinite value of the distance to the sender. The marks can be temporary or permanent.
Even if you want to find the shortest path from A to Z. first and the node receives a permanent label and is the current node. We will then review all the neighboring nodes (with which the peak and is connected to the rib) and note the distance to A. After all the neighboring nodes, the node with the lowest mark is selected as the current when it receives a permanent mark. Let this be the host B. we now review all neighboring nodes, and if the sum of the distances from B to A and from this node to B is less than the value of the marks this node, he gets a new label, we point out that the path in a lies through B, following the completion of the procedure can be restored route. After a brute-force attack on all the neighboring nodes we are once again looking around the box top with the lowest timestamp and choose this site as your current when it receives a constant tag[12,13].

4. The routing tables

In the quality of the example we consider the definition of the table on the router company Morning Star with three interfaces: one Ethernet, serial port connected to an external modem, and an interface of the global frame relay network (see table 1). The modem is used for the connection to the server at the main office of PPP, the IP address of 137.175.2.7. The name and address of the WAN interface - 131.187.2.2, and the address of the router Internet operator 131.187.2.3. For the local network operator highlighted the Class C addresses in the range

from 199.18.210.1 up to 199.18.210.254. The router interfaces we refer to as follows: ed0 - the Ethernet interface, du0 - serial interface, and the tt0 - the WAN interface. All packets that are sent to the local network main office are sent to the router on the serial port. All packets that are destined for our local area network (LAN), are sent to the Ethernet interface with the address of 199.18.210.1. The address 127.0.0.1 is the so-called address, and it is used by the router for him. All other packets are routed to the WAN interface. The flag of the U (Up) means that the connection is active, and the flag G (Gateway) means that the gateway (as was originally called the routers) really is a gateway to another network, whereas the flag of H (Host) means that the router is connected to the final destination.

Tabel 1: example of the simplest Routing Tables

The recipient.	The Gateway.	Flags.	The interface.
default	137.187.2.3	UG	tt0
127.0.0.1	127.0.0.1	UH	lo0
199.18.210.0	199.18.210.1	UG	ed0
137.175.2.7	199.18.210.1	UH	du0
137.187.2.3	131.187.2.2	UH	tt0
137.175.2	137.175.2.7	UG	du0

Routers perform many of the functions with which the switches to cope, as a rule, is not in a position as they operate on another level. For example, routers allow you to resolve the typical problem with connection networks using bridges, as storms broadcast packets. In addition, routers are often used as firewalls (Shields) between the corporate network and the Internet. They act as a packet filters, viewing the address information packet header and comparing it with the access control list. Further, routers can be used for filtering traffic through a global network, passing through the only elected traffic that, in particular, allows reducing the fee for the use of these channels. Thanks largely to the listed functions of routers, rather than bridges, in time preference

5. Conclusion

Thus, as a result of the proactive OLSR protocol automatically Received routes table for Node 3, which this node will transmit the information to a destination host, The construction of the routing table and the rest of the nodes of the distributed network.

Based on an analysis of the means of routing protocols and identified key factors that influence the efficiency of routing in mobile networks of large dimension and their interaction with each other.

Developed and investigated how the distributed routing based on agent technology of network resources, providing a minimum amount of service traffic in mobile computing networks through dynamic reconfiguration of routing domains. Proposed and justified method of determining the number of domain routing, optimal in terms of required volume of service information for solving the problem of routing.

Proposed and justified method of forming the most stable of virtual channels of information regarding the frequency of reconfiguration associated with the change of topology of a mobile computer network.

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