Eradication of hurdles in dynamic structure of Routing protocols of ad hoc networks

Mohammad al Ansari

Abstract— **In this research on computer networks, we will find solutions to address defects through routing protocols and to ensure the movement of computer networks. We will need high-quality attacks and types of transactions. These are the roles of routing. Routing protocol protocols on data networks on official rule groups. Between routers such as access and the time when the data meets the specified QoS requirements.**

The formation and operation of laptop networks is carried out by organizing the steering issues that are related to scientists' work on modern, large-scale computer networks. This guidance is the typical multi-level guidance that divides computer networks into subnets (routing bands) . with at the most efficient protocol subnets group IGP, EGP group and protocols between networks.

Most of the known methods and routing protocols in mobile networks are designed for networks with homogeneous (flat) structure (protocols DSDV, WRP) or on a network with fixed structure domains (protocols CBRP, CGSR,), which is not effective for large mobile networks dimension. Constant movement of mobile computer network leads to a change in its topology, composition and number of routing domains that affect the efficiency of routing procedures. Need in the design and analysis of new intelligent routing protocols that ensure the transfer of data with parameters of quality of service with a minimum volume of service traffic regardless of network reconfiguration. Methods of the mobile computer networks of large dimension, is relevant is a scientific. Network infrastructure in terms of time and volume of service routing traffic required to update routing information. Development of a distributed multi-mode routing through the use of agent technology that provides the minimum amount of service traffic in mobile networks of large dimension by self-organization of network structure.

Development of methods of organizing over subnet routing agents, which has the most stable structure, provides the minimum amount of service traffic at network reconfiguration. Develop ways to determine the location of agents routing optimal in terms of volume of service (route) information transferred in the networks of large dimension, which is dynamically reconfigurable. Development of algorithm of dynamic reconfiguration and routing domains based on agent technology in mobile computer networks of large dimension. The process of routing in mobile computer networks of large dimension

developing the mathematical model of the routing procedure used methods of integer and dynamic programming.

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Index Terms—**Routing, DSDV, WRP, CBRP, CGSR, IGP, EGP.**

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I. PROBLEM STATEMENT:

To solve the problem of decomposition of network routing domains used graph theory and set theory. Analysis of ways and means of forming virtual connections based on the use of the general theory of computing systems and probability theory. Evaluating the effectiveness of routing algorithms implemented by simulation

II. 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.
In 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.

III. WORKS REVIEW

The reconfiguration process domains to do with the distributed system of intelligent agents of the routing that based on specified criteria themselves forms the structure of the domain. Structure and agents of the routing should be such that at a minimum volume of service traffic transmission of information was provided with the set parameters of quality of service. Analyze the structure and choice of routing domains the mathematical formulation of the problem of optimal routing, which is reduced to the problem of minimizing the cost of information transfer

$$C(x_l) = \sum_{l \in L} C_l(y_l) \to \min$$

l ; the intensity of traffic on the channel x_l

$$y_l = \sum_{k \in K} x_l^k, \ \forall l \in L$$

channel load

the intensity of traffic on the channel x_l^k

k, l

Nodes input-output $k \in K$

function (1) is convex, which allows use to determine the optimum value of methods of discrete programming, - the gradient projection method

. Value channel load should be positive:

$$x_l^k \geq 0, \ \forall l \in L, \ \forall k \in K.$$

The value of bandwidth couples should not exceed the channel capacity

$$\sum_{k \in K} x_l^k \leq b_l, \ \forall l \in L$$

incoming traffic in the node must meet the traffic from the source node

$\forall \ k \in K \ Ax^k = R^k$,bandwidth.. Save stream

(incoming traffic in

mobile networks the most important parameter is the data transmission channel, the average value is determined by the following formula

$$k = \frac{n}{n_d},$$

$$C_\Sigma = kC_{out} + nK_{zv}C_{in},$$

n -diameter of the network;

n_d - Average diameter of the domain;

C_Σ - The average cost of data transmission channels, bit / s;

cout - The average cost of data transmission channel between domains, bit;

cin - Average cost of bandwidth in the middle domain, bit / s;

kzv - Average load factor of the channel, which depends on the connectivity

assess the workload of data channels using the following expression

$$K_{zv} = \frac{Q_{ï} + Q_{cë}}{C_{ï}} > 1,$$

Transmitted useful data bits/S

$Q_{ï}$

_Volume of service (route) information bits / s; $Q_{cë}$

Bandwidth, bits / sec C_n

As a the criterion of efficiency of the mobile network to adopt the following relation

$$K_{ef} = \frac{Q_n}{Q_n + Q_{ñë}}$$

Found that by using known routing protocols within the domain of network topology change leads to an increase in service traffic for non-linear law.

show how dynamic reconfiguring domain routing in the network topology changes helps to reduce the volume of traffic and service time data forming affecting the increase in volume of service traffic in the process of reconfiguring the network.

First, the volume of service traffic is a function of the number of service information, transmitted by one node at the time of reconfiguration, the number of nodes in the domain and frequency domain reconfiguration:

$$Q_{ñë} = f(F_r, N_{Vi}, V_0)$$

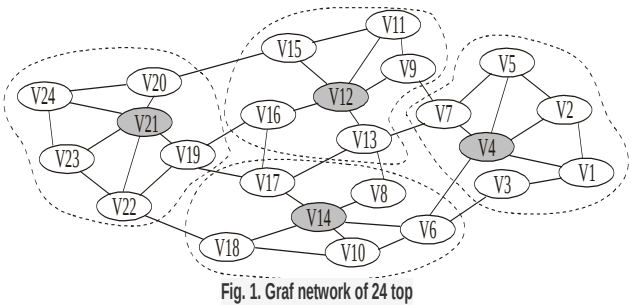


Fig. 1. Graf network of 24 top

With increasing frequency rekonfihuratsiy domain service traffic volume in the domain increases, thereby dramatically decreasing the efficiency of data transmission. It is shown that the sharply increased volume of service traffic, leading to unstable operation of the network, where - recovery time routing information. Total time spent on the restoration routing information depends on the frequency of routing procedures and its time complexity. Therefore, to reduce the volume of traffic service in the frequency domain routing rekonfihuratsiy on a defined period of time and number of nodes domain should be close to the minimum: at. Thus, the optimal size of the routing domain can be characterized by the coefficient: , the volume of service traffic depends on the number of nodes in the routing domain, domain routing diameter and degree of connectivity of mobile nodes domain: Shown that the main parameters that affect the choice of domain size and structure are: number of nodes in the domain, the number rekonfihuratsiy domain, domain diameter, Based on formulas can be argued that the effectiveness of multilevel routing is largely dependent on the choice of the optimal structure of routing domains. For computer networks of large dimension problem of optimal routing belongs to a class-full of problems to solve that use heuristic algorithms. A procedure to perform routing using a distributed system routing agents, provided that the routing within the domain agent, which belong to this domain, and routing between domains is done at the level of interaction between agents of the routing. Due to the fact that the exchange of official information in a mobile network is carried out by the same channels as the transmission of useful information, decreases the effectiveness of routing procedures.

To improve the efficiency of routing procedures in the proposed share information and control flows. For this purpose, a set of agents of the routing and virtual channels between them are organized as overleynoyi service subnet, which is presented in the original sub graph as a mobile computer network graph, where - the set of vertices sub graph, which are agents of the routing - the set of edges that create virtual channels overleynoyi service subnet. For a comparative analysis of the ways of overlain networks as a basic structure of the method of minimal K-skeleton trees (KMST), which provides the minimum amount of service traffic between routing domains. and dynamic reconfiguration of routing domains, allowing more effective procedures for routing mobile computer network. Formation and dynamic reconfiguring domains by using a distributed system routing agents, whose main functions are: determining the number and location of agents routing updates routing information and choose a path that meets the requirements of stability and minimum time delay. Consider the way of forming a distributed system routing agents on the example network in Fig. 1, represented as a graph that includes 24 peaks. To solve the problem of partitioning a graph routing domains incidence matrix, which is determined on the basis of maximum? Degree vertices, and determines whether one of these peaks agent routing. The paper defines the following terms of Subscriber selection of agent routing: -

Probability of node removal that can cause changes structure graph. p_i The paper noted that the choice of location routing agent only on the basis of degree of a vertex does not give the optimal solution. Based on an analysis of the ways to determine the location of the agent routing shown that to achieve the most stable structure of the routing domain as a location routing agent should choose the top, given the density of its network and $K_1 = K_S \cdot \delta_k(v_m) + K_a \cdot a_i$:

$$\delta_k(v_m) = \frac{S(v_m) + \sum_{v_i, v_j \in \Gamma^{-k}(v_m)} e_{i,j}}{S(v_m)}$$

$$S_{n,m} = \prod_{\forall e_{i,j} \in Z_{n,m}} (1 - p_{i,j})$$

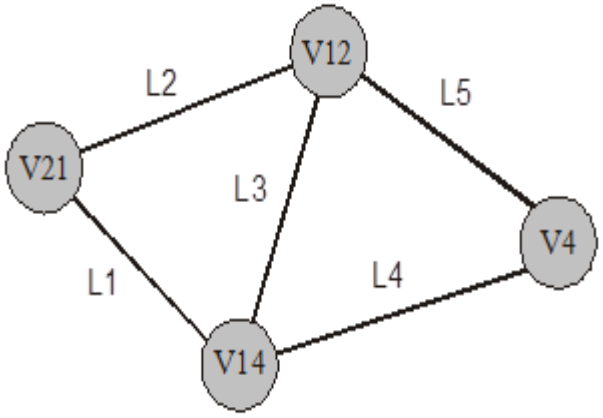


Fig. 2. Graph overleynoyi

Thus a structure is most stable sub graph. Presents the method of forming the network structure based on self-organization, which consists of the following

$$L1 = \{v_{21}; v_{19}; v_{17}; v_{14}\}, \quad L2 = \{v_{21}; v_{20}; v_{15}; v_{12}\},$$
$$L3 = \{v_{12}; v_{13}; v_8; v_{14}\}, \quad L4 = \{v_{14}; v_{10}; v_6; v_4\},$$
$$L5 = \{v_{12}; v_9; v_7; v_4\}$$

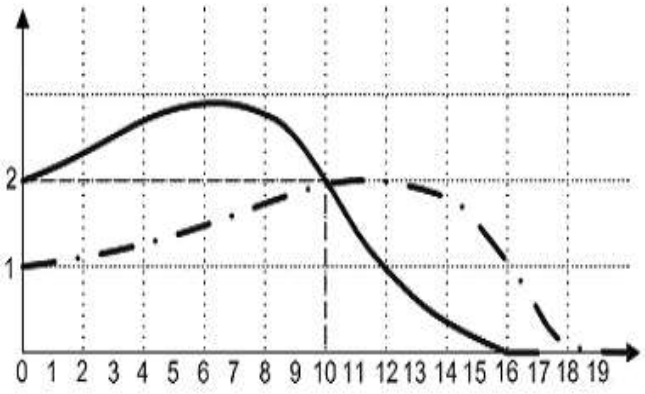
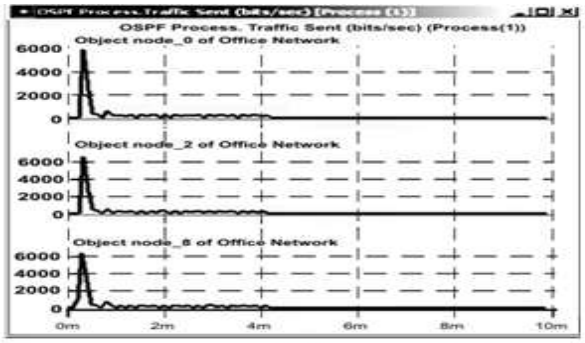
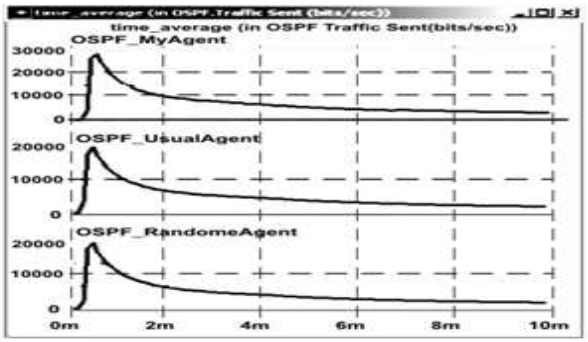


Fig. 3. Dependence of density network



level loading assemblies elected agen ts under a proposed domain algorithm,the algorithm determining the degree of connectivitv and randomlv selected



Results loading across the network during

1. An initial step is installing the network, based on the number and location of the subscriber systems taking into account formulas, with a centralized method to determine the number of domains, their composition and location routing agents.
2. Based on data obtained on the network structure, formed routing table on which route is the choice of communication channels including sustainability.
3. In the process of reconfiguring the network can be modified density network environment, and change of the routing domain by moving nodes. Based on the difference between the new values of the density of network environment and the domain controller domain decision about reconfiguration of the network.
4. In the process of reconfiguration of network routing agents are sharing information on the density of network environment and subscriber systems in a domain based on what the redistribution of subscriber systems between domains, merger or separation of domains. The latter formed two new network management agent.

This method of formation of structure is highly resistant, as evidenced by the results. The efficiency of the process of forming a dynamic structure. An evaluation of the effectiveness of the location routing agent and the analysis of changes in the distribution network environment. As a result of simulation based graphics, which show that agents of the routing should not only choose the top with a maximum degree of connectivity, as well as the top, where the density of network environment. We show that the change in density network environment vertex, chosen as an agent routing, increases the volume of service traffic.

It is important to note that the proposed method showed better results than other methods, which makes it possible to conclude that the proposed method is more efficient compared to existing ones Also analyzed according to the amount of service information on the location of agents in routing between routing domains, which used a protocol BGP. We show that the routing between domains choice of location routing agents do not affect the amount of service Information.

IV. CONCLUSIONS

1.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.

2.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.

3.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.

4.Proposed and justified method of determining the location of agents routing based on the density of network environment, which in comparison with other known ways to determine the location of domain controllers, allows for 15-20% lower volume of service traffic required to update the routing information associated reconfiguration of the mobile network.

5.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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