ABSTRACTS

Kopiyka O. V., Derevyannykh O. Ye. Analysis of algorithms efficiency of radioplanning new generations 3G/4G f mobile communication // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 5-17.

The problem of mobile network radio planning of new generations of 3G/4G with input from the secondary components of the scattered field of statistical non-homogeneities and shadowing on the rough surface. An algorithm for optimal allocation of base stations in the coverage area by the minimum number of base stations with restrictions on the minimum acceptable quality of service was developed. The comparative evaluation of the effectiveness of the algorithms classic taboo search and taboo search with local posteriori optimization are given. Some results of numerical simulation are represented.

A scientific novelty consists in development of new approach to creation of electro dynamic models of distribution of waves on a city landscape, above buildings and buildings. The method of account of the geometrical shadowing and diffraction components at distribution of electromagnetic waves above a statistically rough surface is new. He gives higher exactness for the frequency ranges of mobile networks of the third/fourth generation. As input information on the stage of planning of cellular networks such information on space of service is usually needed: 1) set of possible points of establishment of the base stations; 2) distributing of traffic, which is estimated by application of empiric models with the prediction; 3) description of models of distribution, being based on approximation of models of radio channels or on the methods of construction of trajectories of rays.

The primary purpose of planning is the choice of places for setting of the base stations taking into account different aspects, such as cost, quality of signal, area of coverage. There are the combined models of distribution of radio waves and method of radio planning of positions of object – base station – with necessary exactness in space of the base stations of mobile communication network. The practical recommendations from the methods of programmatic realization of the synthesized algorithms with the use of meta-heuristic algorithms of optimization are made.

The improvement of exactness of calculation of spatial position of the base stations is led to. The middle number of the base stations is reduced in the area of action of the ground mobile communication network of the common use of the third generation and higher due to the optimum choice of positions of the base stations and grant of recommendations on the choice of parameters of equipment, in particular, inclination of aerials.

Keywords: mobile network, radio planning, the correlation of surface heights, taboo search, Voronoi diagram, local posteriori optimization

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Vinogradov Nick A., Lukashenko Victoria V. Energy-Efficient Routing in Delay/Disruption-Tolerant Networks // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 18-27.

The tasks of choice of the best route of delivery in DTN in general are difficult and ambiguous, and we have to take into account criticality of application of DTN-networks and hard resources constraints, above all on energetic resources, possibility of functioning of DTN-network depends on

quality of decision of these tasks. It is shown that the decreasing of energy consumption in the modern information and communication systems, especially in delay/disruption tolerant networks (DTN networks) is one of basic impact factors of the improvement of their efficiency and reliability. The model of energy-aware routing problem as resource allocation problem formally developed, and we established that it's complexity is NP-hard (non-polynomial). We developed various kinds of objective functions for multi-criteria optimisation problem of energy-efficient DTN routing. Then a heuristic routing algorithm of taboo search is proposed to achieve our design goal. Represented results are preliminary but they show that the problem of optimal energy-aware routing in DTN is promising. Using these results we can choose optimal period of delivery of routing information in DTN.

***Keywords*:** infocommunication system, delay/disruption tolerant network, DTN routing, multi-criteria optimisation, non-polynomial hardness, energy-efficient DTN routing, heuristic routing algorithm, resource allocation problem

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Kozelkov S. V. , Korshun N. V., Zaika V. F., Pavlovska O. E. Analysis of the settlement of coherent objects of point slot aperture for minimum weighted energy side maxima // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 28-31.

In a compact analytic form obtained by filing a solution to minimize the weighted energy flux of the diffraction diagrams of maxima at a resolution of a slit aperture of two coherent objects by Sparrow. Identified the optimal energy-efficient diffraction diagram with a maximum suppression of the first side maximum. For evaluation of aperture energy efficiency next ratio is suggested to use: energy concentration ratio, aperture area (Strehl ratio), luminosity in the center of diffraction diagram, aperture total energies ratio. In Sparrow criterion two point object are fragmented when in the resulting picture of both objects there is a local reduction of the luminosity in the central point. For symmetric diffraction diagram Sparrow criterion becomes simple analytic form. In certain point of the second derivative on the slope of the main petal single diffraction diagram should be zero. Among normalized diffraction diagrams found the optimum that minimizes the weighted energy flux of electromagnetic (light) energy in the side maxima and corresponding aperture function for a given value of resolution for Sparrow criterion of two coherent point objects.

***Keywords*:** side maximum, diffraction diagram, slit aperture, Fourier transform, Sparrow criterion, Strehl ratio, weighted energy, luminous flux

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Klymash M. M., Kaydan M. V., Beshley M. I., Red'ka A. V. Diacoptic method for optization of transport networks based on IP/MPLS/DWDM technology // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 32-42.

In this paper the problem of optimizing transport networks based on IP/MPLS/DWDM technology is analyzed.An approach that minimizes total delay time in the network and eliminates the shortcomings of existing methods has been proposed. A mathematical tool for optimizing multi-layered transport network based on technology of IP/MPLS/DWDM using the method of diakoptics has been introduced. The multi-layer transport network is presented here as a set of isolated subnets

which are interconnected.. The total end-to-end delay for MPLS networks has been calculated and the obtained results, which take into account the interaction between optimal ways, have been analyzed. The approbation of optimization of suggested model of multi-layer structure with proviting required quality of service was performed simultaneously at all levels of researched network using diacoptics method. The delay value of aggregated traffic transmission in transport network nodes and paths has been analyzed. The path which provides minimal end-to-end delay has been deternied for connecting two nodes with the highest transmission delay between them. Theproposed method allows to balance traffic over all paths to avoid idle time and overload of the network.

Keywords: IP/MPLS/DWDM network, transport network, diacoptic, multilayer structure, aggregated traffic, overload of the network

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Skubak O. M, Onyshchenko V. V., Man'ko O. O., Nikolov K. O. Reliability of optical cable using new types of optical fiber // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 43-49.

The paper discusses the requirements for the reliability of fiber-optic communication lines using transfer technology with wavelength division multiplexing. It is shown that the use of such technology makes high demands on the reliability of the optical fiber included in an optical cable. The reason is the significant increase of line capacity and consequently loss of information in case of emergencies. The calculation results, which confirm the lifetime of the optical fiber from the tension after installation are shown. Recommendations in accordance with that offered by laying fiber optic cable to use the method of blowing cable in polyethylene pipe are given. This will to reduce the load on the cable during installation and to avoid a large load on the fiber. A study of the dependence of the optical fibre lifetime on the bend is produced. A method for calculating the elongation of the optical fibre depending on the bending radius is proposed. Recommendations on the bending radius choice of the fibre in the design of optical networks to increase their reliability are given. A study of the bending radius of the optical fibre according to the design parameters of the optical cable with the core of strip type was conducted.

***Keywords*:** optical fibre, tension, bends radius, reliability, lifetime

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Stanko P. O. Methods and technologies of organization of collective software development // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 50-58.

The analysis of efficiency of the polling system, which it is expedient to use for maintenance of processes of current data exchange under organisation of collective development of software and transfer through virtual private network (VPN), is conducted in this work. On results the analysis of processes of query it is set in the polling system that the choice of the most acceptable order of questioning of elements of VPN depends on the volume of the inquired data packet, i.e. from length of queue of queries. This choice is determined by the type of data distribution on the concrete elements of VPN.

We propose to use a complex indicator – function of length of queue and speed of its variations as informative parameters for the choice of kind of polling and intensity of service of concrete queue it is suggested to use.

There are outlined the ways of further researches, directed on the estimation of statistical dependence of the developed software quality from quality of services of the virtual private network with the use of the polling systems.

Keywords: virtual private network, VPN, polling system, software, queue, dynamics of change of length of queue

Modenov S. Yu. Analysis of the specialized computer networks by the methods of queuing theory // Наукові записки Українського науково-дослідного інституту зв'язку (Scientific proceeding of Ukrainian research institute of communication). – 2015. – №3(37). – P. 59-66.

In this work the features of application of methods of queuing theory of to the specialized networks of the real time applications with a heterogeneous traffic are considered. The conclusion about the appropriate implementation of combination of theoretic methods such as queue theory and computer modelling and simulation is made. The most important parameters concerned with the models of queue systems are analysed. The calculations of growth of queues are done at presence of overload of network commutation nodes at different degrees of self-similarity of traffic. It is shown that for the observance of high level of coefficient of the using (loading coefficient) of network, it is needed to apply the methods of smoothing statistical non-stationarity and non-uniformity of intensity of a self-similar traffic due to implementation of the methods of policing and shaping. Also we should repress the activity of sources, which overload a network, and to elect the sizes of buffers more than it appears from the results of classic queuing analysis. But it's necessary to support the balance between size of buffer memory and additional latencies through waiting in buffer queues.

Keywords: computer network, queuing theory, heterogeneous traffic, self-similarity, Hurst parameter, buffer size, delivery latency, queuing analysis