THE MAIN INDICATORS USED IN THE TELECOMMUNICATIONS INFRASTRUCTURE DESIGN BASED ON WEB MAPPING

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Introduction

Telecom operators around the world trying to maximize their territorial presence in the zones of their states, so their main goal is to reduce the unit costs of access networks design and reconstraction. [1]. To solve this problem, operators are exploring promising solutions for network architecture that would easily scale depending on the consumers density and traffic volumes while improving the quality of customer service [2-5].

The construction of engineering and line-cable objects requires the experience and broad engineering intuition of personnel, based on ready-made solutions from manufacturers of telecommunication switching equipment.

Due to the accelerated development of broadband access networks, there is a tendency to re-equip information transmission systems, both on active and passive equipment, and therefore redundancy leads to inefficient use of telephone sewerage, the appearance of inefficiently used equipment from various operators and providers in multi-storey residential and administrative buildings.

For optimal network planning on the specified territory, it is necessary accurately predict in which places and at what point in time new information sources and receivers will appear. During predict process it is necessary taking into account a huge amount of statistical data and pre-project materials, such as, the administrative object significance, telephone density, population density and population growth in the near future, generated traffic to the network, broadband services demand, etc.

The study of the access networks designing and operating shows that, as a result, of the greatest miscalculations in determining the scope of work on the optimal choice of installation sites for active and passive equipment, errors arise in forecasts and expected places of load intensity relative to the generated network traffic.

The main indicators used in the planning and design of telecommunications infrastructure

It is known, that increasing requirements for the bitrate characteristics of transport networks require new rules for the design of linear cable structures and the choice of equipment for intermediate and terminal communication nodes [6].

The key indicators influencing the way modern design of access networks for a particular locality are its socio-economic and geographical parameters such as [7-9]:

- "geographical" parametres are area type, design space;
- "building" parametres are the building density, the percentage of private sector buildings, low-rise apartment buildings and multi-storey apartment buildings, the average number of floors in a low-rise and multi-storey building, etc.

– "infrastructural" parametres are the availability of cable sewerage, supports for hanging cables and the possibility of wireless/mobile access using, the availability of cable channels in residential buildings, the infrastructure availability for power supply of intermediate nodes, the quality of power supply;
– "population" parametres are the number of residents who live in this area on a permanent basis, the number of additional people living at the same time in this area during the tourist period, the percentage of the population of the younger, middle and older age groups who are interested in services;

We propose structurally to combine all the parameters at the general parameters level completely characterizing the object. At the same time, the parameters can be determined both centrally (refer simultaneously to a specific object list) and calculated for each specific object separately. Object can classify according to the profile, which is a dynamic factor and can complement by additional parameters for conducting survey work on the localities.

In order to eliminate the impact of negative factors, which affecting to the design methods of modern access networks, as well as to create an automatic calculation system, it is proposed to use centralized information storage in a single Data center using cloud technology elements to create a web mapping tool. In this regard, the classification according to the object profile and optical communication consumers, depending on their purpose and connection type, the data speed requirements for digital services is a key factor.

Classification of telecommunication objects and optical communication consumers

Let is discuss classification of telecommunication objects and optical communication consumers.

Taking into account the requirements of building codes and regulations with the the our task, the separation of broadband consumers according to classifications, which provides for their dependence on the profile requirements for high-speed resource, traffic flow and of the installed equipment capacity, the solution is one of the optimal ones for today [10]. Here we provide a link to a document of our state of the Republic of Uzbekistan [10], but it is clear to specialists that each state has similar regulatory documents [7-9].

So, the objects are classified into the following groups such as:

1. Telecommunications objects (active equipment location is base station, Wi-Fi access point, Wi-MAX access point, RLL, OLT, Switch, MSAN, passive equipment is splitter, ODF, optical coupling, etc.).

2. Multi–storey residential buildings (location area is city, district, neighborhood or quarter, street, house number, number of consumers and the requirements for broadband services).

3. Non–residential buildings (location region is city, district, microdistrict or block, street, house number, number of consumers, purpose of the building indicating the type of activity and the need for broadband services, etc.).

4. Private residential buildings (location region is city, district, street, area of settlement of private households needs in broadband services, etc.).

All survey work to prepare for the optical network design carried out taking into account the norms [10] and national standards [11], and the following on-site surveys are provided for object-oriented design:

a. clarification of the building characteristics is the house number, number of floors, number of entrances and sides of the entrance to the entrances, the number of apartments and

other rented premises;

b. clarification of the apartment distribution by entrances and floors (development of sketches of floor and interstory plans);
c. determination of the presence and number of existing risers (interstory channels) in the entrance;
d. determination of the location of the optical distribution cabinet ODC and optical distribution box ODB.

For private sector houses, on-site surveys provide for follows:

a. clarification of the settlement geographical configuration according to their distance from telecommunication switching nodes;
b. determination of the number of houses (subscribers) in a cottage settlement according to built standard projects or individual projects, cadastral plan of land plots;
c. clarification of street location data with the development of sketches of street plans and photography indicating the number of streets, their configuration (circular/linear), the number of alleys;
d. clarification of the existing infrastructure on the availability and ownership of installed overhead line supports and laid cable sewerage.

Some special activities is perfprmed regarding location selecting of the main elements of the configured network. Its include switching scheme choosing of the optical distribution (single-level or cascade), the total branch coefficient, choosing the locations of the distribution cabinet ODC, choosing the ODC types and their installation locations. At the same time, the OLT location choice on the PBX building based on the decisions of the optimal distance from the optical cross, optimal connection to the interfaces of the data transmission network and to the power supply and grounding system, convenience of maintenance by personnel.

When allocating the projected territories, we are guided by the following requirements of the project teams [12-13]:

– defining the boundaries of the projected territories, indicating natural barriers;
– availability of rivers, gardens, boulevards, ravines, railways, large gaps in the city's buildings, etc.;
– in case of the the natural gaps absence, the boundaries of the cabinet areas should pass through the intra-block territory;
– wide streets with improved road surfaces, motorways, etc. may also be the boundaries of the cabinet areas;
– the number of street crossings by the distribution network should be minimal.

Conclusions

As a result of the research, it was revealed that in order to achieve optimal planning when designing an optical access network, first of all, a very large degree of abstraction is required, relative to the topological conditions of the area, which require a deep engineering and technical analysis of solutions with a real ratio of the existing telecommunications network.

The analysis of the main indicators of the access network necessary for the creation of web maps in the design of rural and urban telecommunications networks is carry out.

The main four classification objects are proposed, according to which preliminary calculations can be made for planning an optical broadband network such as a

telecommunications switching objects, multi-storey residential buildings, non-residential buildings, and the private sector.

It is revealed, that the optimal territories distribution (division on areas) is achieved by a comprehensive analysis of settlements with an indication on a web map of its exact location and their boundaries of connection to the locations of active and passive equipment. This method allows you significantly optimize the network.

It is established, that when calculating certain network parts according to the classification, it is required to process a large amount of initial data and carry out appropriate calculations based on digital web maps. Theese calculations required geographical mapping of network elements in real time with the formation of zones of nodal areas with their total required load for territorial planning of the network as a whole.

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