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**FORMATION OF APPROACHES TO THE CREATION OF SCIENTIFIC AND ANALYTICAL APPARATUS TO ENHANCE THE FUNCTIONING SBS TELECOMMUNICATIONS SYSTEM**

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*There is analysis of a telecommunication system of the State Border Guard Service of Ukraine. Existing methods of rational structure of telecommunication systems for special purposes do not include specific operational and service actions of SBS. Established approaches to the creation of scientific-methodical apparatus, which would have allowed us to evaluate and improve the effectiveness of SBS telecommunication systems functioning. Was defined a number of requirements to the traditional performance indicators telecommunication system, as well as the ways to improve the system of performance indicators for TCS special purpose.*

**Keywords:** State Border Service of Ukraine, telecommunications systems, scientific and methodological apparatus, the assessment of effectiveness.

*Проведено аналіз телекомунікаційної системи Державної прикордонної служби України. Існуючі методи вибору раціональної будови телекомунікаційних систем спеціального призначення не враховують специфіку оперативно-службових дій ДПСУ. Саме з погляду на це сформовані підходи до створення науково-методичного апарату, який дозволив би оцінити та підвищити ефективність функціонування ТКС ДПСУ. Визначено ряд вимог до значень традиційних показників ефективності телекомунікаційної системи, а також запропоновано шляхи вдосконалення системи показників ефективності ТКС спеціального призначення.*

**Ключові слова:** Державної прикордонної служби України, телекомунікаційна система, науково-методичний апарат, оцінка ефективності.

**Introduction**

The functioning of the modern model of the State border is provided by the border management system, which what comes true in scaled by the special subjects — organs of government. Each of these subjects products, passes, perceives, converts regulative influences Most of these impacts have an informational character, because the process of management of the State border guard is, mainly, the process of evaluation and analysis information [1].

The material basis of the State Border Guard Service of Ukraine (SBS), as one of the components of the information provision, is Integrated information-telecommunication system “Gart” (IITS “Gart”), which is an important element of Intranet network.

The basis for the deployment of corporate LAN Intranet, in which information is provided by the interaction between all the components of the IITS “Gart”, is digital telecommunication system (DTS).

Analysis of operational performance SBS indicates that under current conditions, considerable attention is paid to improving the efficiency of information of the process of the state border. Per-

formance information of operational performance is directly related to the efficiency of the construction and operation of information and telecommunications systems (ITS) SBS. In turn, the effectiveness of ITS functioning depends on the features of the building, protocols and technologies that are used in the deployment of SBS telecommunication system.

Existing methods of the rational structure of telecommunication systems for special purposes not include specific operational and business activities (OBA) SBS.

**The purpose of the article** is the formation of approaches to the creation of scientific-methodical apparatus, which would have allowed us to evaluate and improve the effectiveness of the functioning of the SBS TCS due to the effectiveness of OBA units and in conditions of uncertainty of individual indicators.

**The results of the research**

IITS “Gart” is intended for creating unique information space and electronic control system of the State border guard service of Ukraine, the implementation of tasks to enhance the effectiveness of

the management organs of the State border guard service of Ukraine during the protection of the State border. [2].

IITS “Gart” provides the implementation of the following functions:

- Addition of information resources according to the functional tasks in a processing mode;
- Provision to users of information from information resources in a mode of the message and/or request-response;
- Maintenance of one-sided and/or bilateral information and telecommunication ties between subjects, users of IITS “Gart”, information exchange in between, operational informing;
- Implementation of electronic document circulation between the subjects IITS “Gart”.

IITS SBS “Gart” by its architecture is structurally-hierarchical system and consists of a set of interacting and linked horizontally and hierarchically laid out vertically functional components.

The basis for the deployment of IITS “Gart” is a digital TCS. Deploying SBS TCS is based on the introduction of modern means of communications, routers, switches, advanced technology and IP protocols. It is constructed by the principle of the reference network “Star” to which organs of protection and subdividing of different levels are connected.

Proceeding from above explained the digital telecommunication network of the Public border service of Ukraine is constructed in such a way that digital flows are organized directly from GPSU Administration in subdividings of protection of boundary and provide a simultaneous data interchange, voice and video information on the basis of the IP protocol, and also support functions of remote control by the network and condition monitoring.

The analysis of the scientific researches [3–4] devoted to an assessment of efficiency of functioning of TKS showed that more often for an assessment of efficiency of functioning of TKS are using the following indicators:

- Productivity;
- Stability;
- The reliability of the transmission;
- Data safety.

The list of indexes given above gives the chance to evaluate efficiency of functioning of TKS from the point of view of efficiency of the technical solutions implemented in specific telecommunication system. At the same time TKS SBS is system of a special purpose which is used for support of operational and service activity of SBS. Therefore you must enter the percentage that would assess the impact of the efficiency coefficient of operational activities.

The analysis of researches on ITS use in SBS [5; 6] shows that the greatest role in operational activities is played today by ITS of border control and a border service. The automation of operational activities carried out with the use of program-technical complexes (PTC) automate border control “Garth-1/P”, which are deployed at crossing points on the State border of Ukraine and are part of ITS border controls “Garth-1”, and PTC of border service automation PTK “Garth-3/P”, deployed in the border guard divisions and are part of the ITS ITC border guard service “Garth-3” [2].

Structurally these ITS represent the separate information components united by telecommunication means. From the point of view of the general structure, in ITS “Garth-1” and ITS “Garth-3” there are information centers — central servers of data transmission (CSDT) which are placed in SBS Administration.

Means of system of the data transmission based on use of modern network telecommunication technologies, CSDT information combined with the corresponding PTC which are developed in divisions of border protection.

Data exchange is carried out using space communication stations (PES-7000 and PES-5000), equipment of which deployed in the border guard units. Analysis of efficiency of space communications stations deployed in the border guard units, and data transfer systems ASBS, indicates that, in general, they can provide reliable communication and data transfer.

The analysis of network failures equipment shows that on the average only 2 % of ITS total operating time the system is disabled, which has a negative effect on the operational activity of the State Border Service and can lead to crossing the border, which is not allowed.

According to [7] for an assessment of reliability of modern networks functioning, network availability can be used as an indicator.

High availability (HA) — it is a method of system design which allows to receive high level of system availability during a certain period. System availability (network) means the allow users to use it. If they have no such opportunity, the system is considered inaccessible.

For numerical determination of availability used the uptime percent per a year.

$$D = \frac{MTBF}{MTBF + MTTR} \cdot 100, \quad (1)$$

where MTBF — mean time for which the network was operational;

MTTR — mean time of recovery (for which the network was untenable.)

To determine the availability, you can use a different approach:

$$D = \frac{(Tr - MTTR)}{Tr} \cdot 100, \quad (2)$$

where  $Tr = (MTBF + MTTR)$  — number of minutes in one year;  $t$  — the time during which the network was unworkable (in minutes).

It should be noted that for modern corporate networks availability has to be not less 99.999 % [4], according to modern international requirements, that corresponds to about 5 minutes of disability within a year.

Values of availability and values of an idle time of a network corresponding to them are given in table.

Availability %	Downtime per year
90% ("one nine")	36.5 days
95%	18.25 days
99% ("two nine")	3.65 days
99.9% ("three nine")	8.76 hours
99.99% ("four nine")	52.56 minutes
99.999% ("five nine")	5.26 minutes

The preliminary analysis of Intranet availability of the SBS network showed that on this indicator this network doesn't conform to requirements to modern corporate networks.

One of the main approaches which use for ensuring high availability consists in creation of redundancy of communication channels.

Then refusal of one element of a network won't lead to considerable decrease in availability.

For ensuring high availability use a network reservation of channels at physical and channel level of the OSI model.

Creation of a network with full reservation I received the name Full Mesh.

Unfortunately because of construction complexity and considerable cost in world practice of creation of highly effective networks such approach practically isn't used.

In the majority of modern corporate networks use Partial Mesh topology — with partial reservation of channels.

Realization of channels reservation at switching level demands use of the network equipment which realizes the mechanism of elimination of "loops" in the Spanning Tree network.

Such network switch-boards are used in SBS network Intranet, however due to the lack of channels reservation, their possibility of Spanning Tree support of aren't used.

Support of dynamic change of routes in routers is necessary for ensuring functioning of reserve channels at network level.

At creation of highly effective networks with partial reservation of channels (Partial Mesh) has to be used dynamic routing which allows to redefine automatically information transfer routes at failure of certain canals at physical and channel level.

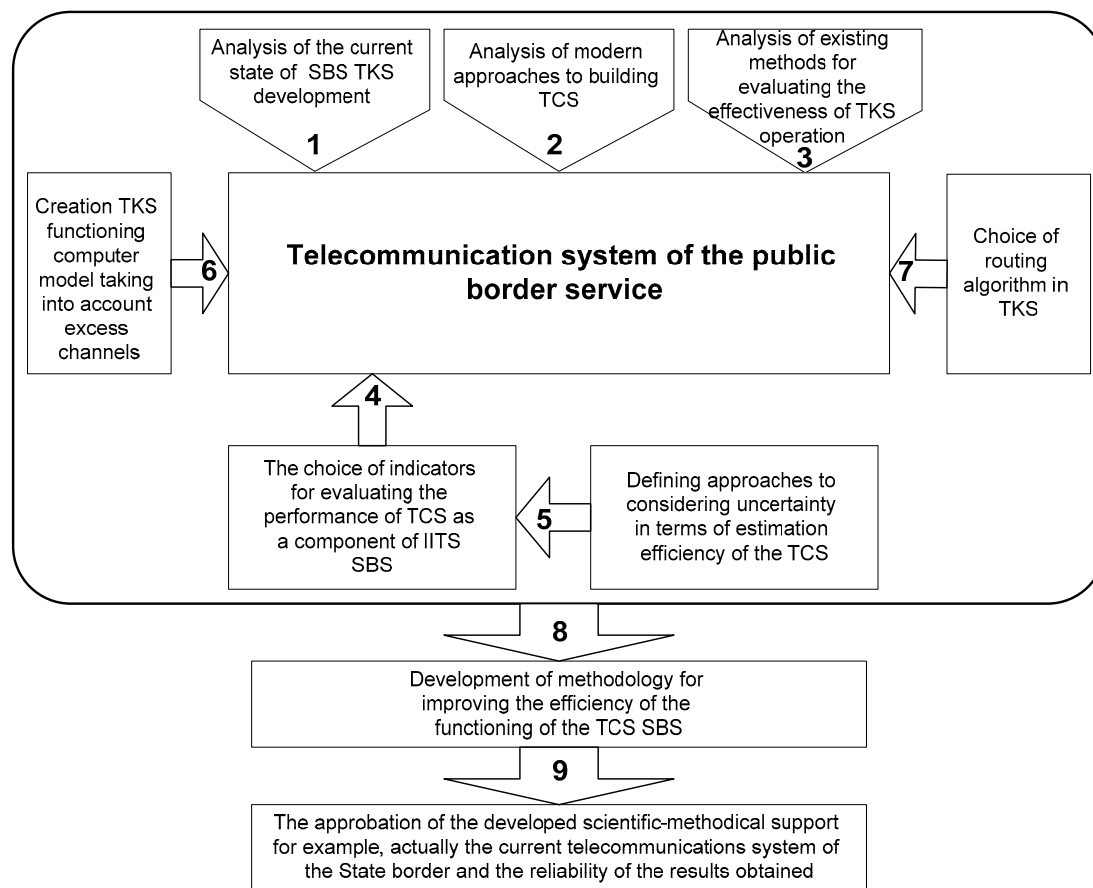
However, the SBS network currently uses static routing, which does not allow to realize this.

Therefore even at formation of additional channels in the SBS network when using static routing, they will not be use.

Proceeding from the analysis of a condition of SBS TKS, system of efficiency indicators of modern TKS and existing world's methods of increase of digital networks functioning efficiency was created the concept of scientific creation and methodical device of increase of efficiency SBS telecommunication system functioning (see figure).

## Conclusion

Lack of the scientific and methodical device of rational creation of a network component of the integrated information and telecommunication system DOES actual development of the corresponding technique. The analysis carried out in work showed that it is necessary to consider a number of requirements to values of traditional indicators of TKS special purpose efficiency and to enter additional indicators by means of which it is possible to consider features of OPERATIONAL ACTIVITIES. Therefore to meet the challenge of improving the functioning of telecommunication system SBS performance needs to be improved TKS special purpose by introducing a measure which determined the dependence of the OPERATIONAL ACTIVITIES efficiency and TKS in view of uncertainty of source information.



General concept of scientific research

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