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ANALYSIS OF THE FEATURES OF THE USE OF VIDEOCONFERENCE COMMUNICATION FOR THE BENEFIT OF THE PROFILE BODIES OF STATE ADMINISTRATION

Paper analyses basic directions of development and introduction videoconference connection (VCC) in behalf of profile structure government administration. The levels of organization VCC are considered, and also the division of equipment is executed for VCC on a category by criterion of variants use. It is shown that during organization of VCC in modern terms there is a disbalance between time of transmission videodata and required time on a transmission and treatment, which results in violation of categories informative safety – availability and integrity. In accordance with it are estimated: the time of transmission, volume of informative stream, volume of video information during organization of VCC depending on the required spatial permission of video pictures and frequency of shots.

Keywords: *videoconference connection, control system, video information resource, availability, integrity.*

Introduction

Modern processes of the introduction of the new information technologies, the formation of information society reinforce the importance of such a part of national security, such as an information security. According to the Art. 17 of the Constitution of Ukraine, information security is on a par with the protection of the sovereignty and territorial integrity of the country, its economic security.

In the bodies of the state administration, in the profile of force ministries and departments of the State (Armed Forces, the Ministry of Interior, the Ministry of Emergency Situations, etc), special purpose systems are implemented. These systems are organized hierarchically and are the remote regional subsystems and components (objects and installations), which use the information processing and transmission technologies.

The practical application of information systems and technologies in public management touches upon the issues of management quality, in particular timeliness and communication solutions and has an impact on the national security as well. As a model of profile system we should consider the management control system of the Armed Forces.

Videoconferencing systems (VCS) are currently widespread in the system of management of Armed Forces. One of the basic components of the videoconferencing technologies are the processing and transmission of video data (video). The aim of the research discussed in this paper is an analysis of the main directions of the development and implementation of the complex systems in the control system of aircraft, as well as the requirements to the videoinformational resource.

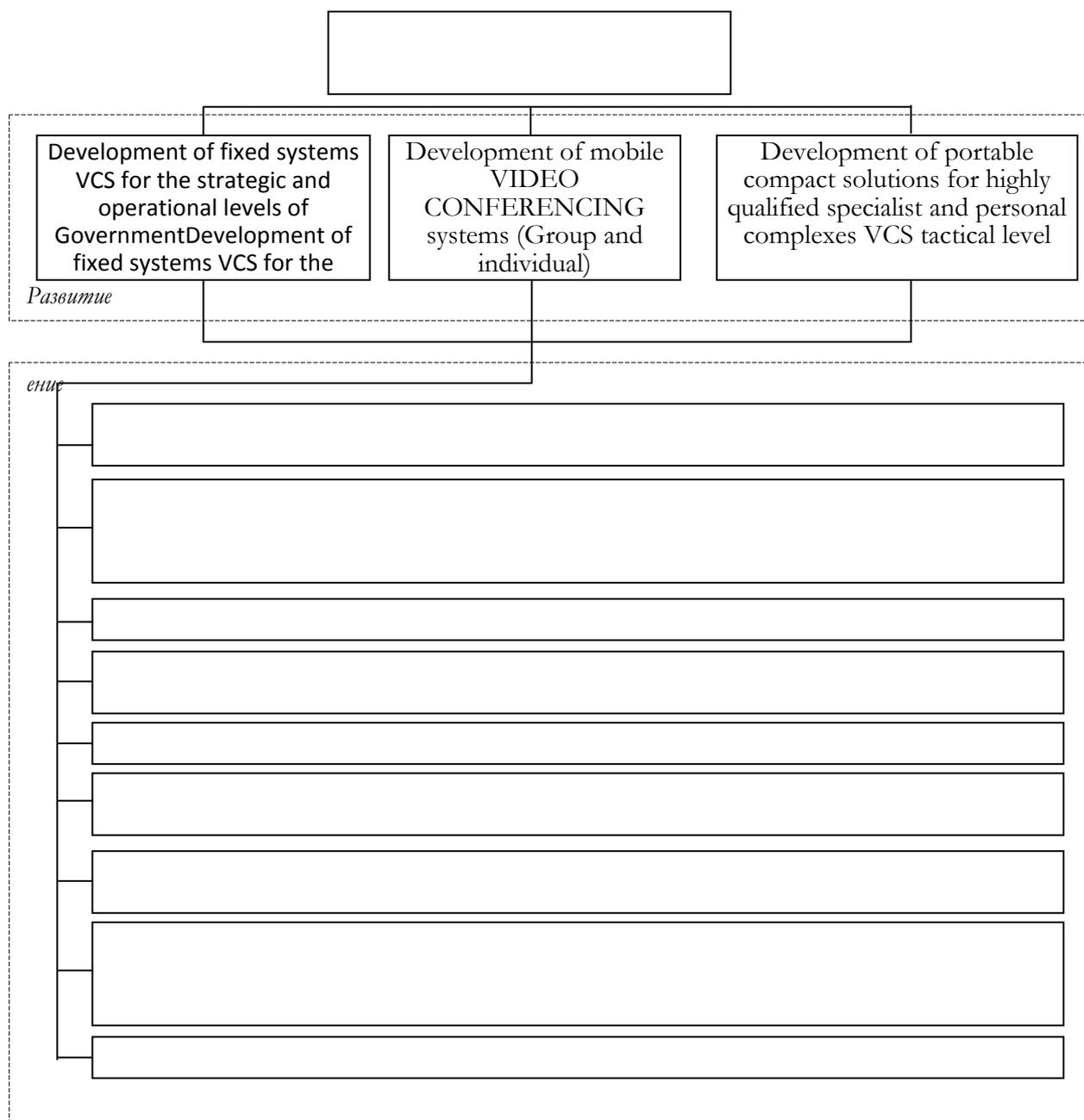
Main Part

To consider the VCS we should select the following elements of the control system: control organs, management and control objects. In general case management process is based on the videodata receiving from the objects of management and control objects about the current situation on which basis a decision is formed and orders are issued. In the Armed Forces according to the accepted decisions [1, 2] in command and control systems are now being introduced VCS for the systems of training and everyday life.

The VCS in the systems of the Armed Forces are applied by performing the following tasks [3–5]: – continuous and periodic assessment of the state of objects control and management; – gathering, reception, transmission, processing, compiling, storing, analyzing, and displaying status information objects control and management; – prompt displays on the visualization of processes and tasks in real time; – identification and recognition of objects (processes), an assessment of their condition; – forecasting of the processes of engagement; – issuing policy information and reference services; – data preparation and the organization of an exchange between adjacent (neighboring) and by higher levels of administration.

The main directions of development and introduction of VCS for the Armed Forces are shown in Fig. 1. Introduction of the Armed Forces systems, VCS increases the dynamism and flexibility of command and control, optimization of management processes at all levels of the current management system. The use of videoconferencing in the Armed Forces will allow: – speed up decision-making processes and gives you the ability to make better decisions (especially in emergency situations); – to increase the effect of perception information up to 90% (during the session, the participants can not only see and hear each other, but also to communicate and process them in real time); – introduce remote training of troops; – efficient allocation of resources (specifically the troops and they need logistics); – save time management (remote control); – save money (reducing the amount of travel and related expenses for operational activities training and monitoring

of the current status).



At the strategic level are used the complexes of VCS for the organization and realization of the functions of the Office and in the chain of the Ministry of Defence, General Staff of the Armed Forces – Chief Command Center – the logistics of the Armed Forces, the operational support of the Command of the Armed Forces, and the command of the highly mobile amphibious forces in the formation of orders, orders, pointing systems for both the strategic level and hierarchically subordinate to the operational and tactical levels. At this level is largely a stationary segment of VCS with the most productive elements based on high-speed channels of information exchange (fiber optic, satellite links), and high-performance group and desktop of VCS.

At the operational level management system of the Armed Forces is a combination of

the fixed and mobile video conferencing segment (field) complexes. Stationary segment of VCS is used for the exchange of videoinformational resource at the operational level in the operational directorates, component commands, Army Air Corps, in the command of the Navy and between them. Mobile (field) segment of VCS requires from the authorities to perform the tasks. For the orders, orders to the level below are pointing systems for wireless data transmission technology. Operational level of the management system of the Armed Forces while processing and transmitting of videodata uses less high-speed communication channels and less productive computing resources, especially in mobile (field) segment of the VCS.

At the tactical level of the system of management the VCS segment has been implemented on the basis of mobile video conferencing systems. For the exchange of video data using digital radio are used national and commercial channels of data transmission based on wireless data transmission technologies (UMTS, WCDMA, CDMA, CDMA2000, HSPA, LTE, WiMAX, HiperN, Wi-Fi, etc.) and trunking mobile digital radio (EDACS, Tetra, APCO 25, Tetrapol PAS, iDEN, DIMRS, Geotek, etc.). This level of control has the most stringent and critical requirement to the use of VCS.

All the equipment of the complexes VCS in the Armed Forces can be divided into four categories based on results of its use: groups of VCS; compact solutions for video conferencing; desktop of VCS; personal highly qualified specialist.

Group of VCS (fig. 1) are being introduced at the strategic and operational level of the control system in the hospital segment. The hallmark of group systems is the support for multiple devices for the display of an information (collective boards, monitors, projection devices) that allows you to organize the videoconferencing sessions with the maximum convenience for the large number of participants. A group of the compact solutions for VC that enable you to deploy a subscription in a matter of minutes, using any means of



a) command centre



b) commutator



c) terminal

Fig. 1 Elements of a group system VCS for the strategic level of a control system



Fig.2. Variants of table complexes of VCS for an operative level of a control system



Fig. 3 Variants of personal complexes of VCS for a tactical level of a control system information display (projection devices, monitor). Data sets for VCS are embedded in the field (mobile) versions of the strategic and operational levels of Government VC.

The Armed Forces use the table complexes for the videoconferencing by the company Polycom Systems (personal video PVX) using specialized software (Fig. 2). At the operational and tactical level of the management system of the Armed Forces are applied personal systems, which are the specialized telephones (Fig. 2.3). They are equipped with a compact camera, LCD screen, and are intended for visual communication subscribers. This is a kind of desktop for videoconferencing systems in mobile design.

At the present time to the process of the visual information in the complexes control system of VCS of the Armed Forces are used the codecs taken on recommendations of the ITU-T-261, 262, 263 and to the 264, are part of a family of protocols x 32 h "Visual Telephone Systems and Terminal Equipment for Local Area Networks which Provide a Non-Guaranteed Quality of Service" and do not provide a guaranteed quality of the service of videoconferencing [8–10]. Summary table of H 32 x. family protocols are presented in the Table 1. In modern conditions the use of videoconferencing in real-time control systems in the first ranks of the user's

requirements to the quality of the video.

The heterogeneity of the structure of an information and communication systems used at the different levels of profile control systems (including the Armed Forces), limited performance characteristics of video information processing and transmission technologies in the complexes of VCS, increased requirements to the quality of the video (frame rate and resolution) will naturally lead to distortions and violations of the processed video [6, 8–10].

Table 1. Time of video transmission (sec.) depending on the speed of data transmission and data level

speed of data transmission, kilobit/sec	data level			
	11 megabit (800x600)	19 megabit(1024x768)	75 megabit (2048x1536)	301 megabit (4096x3072)
57	193	329	1316	5266
1024	11	18,8	75,4	302
2048	5,5	9,4	37,7	151

Modern requirements to the preparation and the conduct of hostilities, namely, the requirement for the transfer and processing of information in real time (high quality) necessitated the increased amounts of video data processing, increase the speed of processing and transmission of video data (Table 2), as well as the form of the largest information flow requirements (Table 3).

Table 2. Data level (Mbit/sec.) depending on framing size and depth digitization of pixels; (frame frequency 50 frames / sec.)

Frame size	Size of information flow, Mbit/sec.
800x600	11
1024x768	19
2048x1536	75
4096x3072	301

The results of the evaluation of the average flow rate of the uncompressed video data depending on the quality of video data (spatial resolution and frame rate) are presented in the Table 3.

Table 4. Characteristics of the values of an average flow rate of the uncompressed video data based on spatial resolution and frame rate for VCS in departmental management systems

Levels of the quality of video images	Format CIF	Normal (SD)	Heightened (ED)	High (HD)	Advanced (Full HD)	Advantage HD
Number of rows	320 – 352	640	720	1280	1280 – 1920	1920 – 2048
Vertical resolution	240 – 288	480 – 576	480 – 576	720	720 – 1080	1080
Frame rate/sec	24 – 30	24 – 30	50	50	24 – 30; 50	48; 60
Average speed (Mbps)	66	252	500	1105	1500; 2500	2548; 3180

The assessments (tables 1, 2, 3) are made on the basis of an analysis of the main characteristics of the technologies used in the command and control system VCS and assessments required to the resource videoinformational system depending on the spatial resolution of video images and the frame rate. With the trend of increasing amounts of video data and does not provide adequate data volumes performance video processing and transmission technologies in the complexes of VCS are conditions of security categories videoinformational VCS-resource availability and integrity of [8].

Thus, for guaranteed transfer of video data in the management system of the Armed Forces with the required entities (users) values of the spatial resolution, not exceeding the allowed values for the loss of information and time delays, and consequently the security of resource of videoinformational system (categories of availability and integrity), peering at the VCS must have the following properties: 1 videoinformational speed to ensure flow of not less than: –100 Mbit/s video stream format of high quality (ED); – 1 GB/s video stream format, high quality (HD); 2) delay transmission of a single frame from one object (the object) to another must not exceed a few hundreds or even tens of milliseconds.

Therefore, there is a need to improve the efficiency of the processing of video data when VCS special-purpose control systems, namely, the reduction of processing time and the transfer of video data, reducing the rate of transmission of video stream, which is the task of follow-up studies.

SUMMARY

1. Analysis of the main directions of the development and implementation of complex systems for specialized bodies of public administration on the example of the Armed Forces shows that VCS have a significant influence on the formation and quality of management decision support system in crisis situations, and thus has a significant impact on military security as a component of national security. Feature of the implementation of VCS in

specialized control systems is a division of the equipment complexes VCS according to the parameter options of use depending on the level of an application of the complex management systems (strategic, operational and tactical).

2. H. 32 x, used in the complexes of VCS by foreign producer, according to the requirements of ITU-T, does not provide a guaranteed quality of service systems.

3. When implementing and using VCS for departmental management systems, there is an imbalance between the time frame of video images and time required for the transmission and processing, as a result there are packet loss and delays, resulting in the violation of security categories videoinformational resource of VCS availability and integrity.

4. As a result of the estimation of the parameters of video processing and transmission technologies implemented in the complexes of VCS, modern requirements of an access to videoinformational resource management systems in profile, it is proposed as a the further research to consider the objectives: the improvement of the processing of video images with high resolution given the availability and integrity of video data and reduce the intensity of a video stream for a given resource of VCS integrity.

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