students on behalf of the students and teaching staff of the Japanese university. In response the students showed a Japanese folk song and dance, causing a storm of applause.

With regard to the important results obtained there appeared to be a necessity to set up a joint Centre, uniting scientific, technical and cultural directions. In 2012 an agreement was concluded between PSTU SHAI and Japanese MIT industrial and engineering Centre on setting up «New functional materials and technologies of their creation and strengthening» scientific innovation Centre, which will be based at PSTU SHEI, Mariupol. The Centre's activities presume participation of scientists from PSTU and MIT in developing new grades of steel, cast iron and other modern functional alloys, technologies of their manufacturing and strengthening treatments. The Centre's objectives also include delivery of lectures and reports at exchange at scientific exchange between the partner-universities, involvement of students into scientific and research work, compilation of term and master works , exchanges of post graduate students and students, preparing for master degrees for training and research work. Enterprises of Japan and Ukraine can be interested in the results of the planned research work. An important task of the centre is the search of potential partners-enterprises, capable of financing the proposed products. At present the question of getting patents for the developed products in Japan and Ukraine. In the Centre's plans some cultural and educational activities are specified, particularly teaching of the Japanese language in Ukraine (and Russian is to be taught in Japan) and also learning and popularization of the cultural legacy of both countries.

Thus, the initiative and active work of the scientists of MS & HM department, supported by administration of PSTU SHEI allows successful and effective international cooperation with a higher educational institution from Japan, which is bringing wonderful results and opening new perspectives of its further development.

To the problems of successful development of collaboration with Institutions of higher learning and scientific establishments of Japan it is necessary to take insufficiency of financing of projects through different agencies and funds, for example state agency on questions of science, innovations and informatization, SFFR of Ukraine of and other. Unsuffices initiative of faculties and departments in adjusting of direct contacts with the scientists of the indicated countries, the search of potential partners and under backs is poorly conducted on scientific researches. The interaction with industrial enterprises in the domain of transfer of developed products and the search of would-be locations of their implementation and financing still remains far from being satisfactory.

On the whole a dynamics and accumulated experience allow expecting on an acceleration and increase of efficiency of development of collaboration with this perspective direction.

IN THE FIELD OF NEXT GENERATION NETWORKS BUILDING

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There is provided an overview of the number of innovative technological solutions created by the scientists of A.S.Popov ONAT in the field of NGN building. In particular we consider the new telecommunication technologies (UA-ITT and EX) that can fully replace the TCP/IP stack, and also the mechanism of organization of ad-hoc networks, and the concept of the System of restriction access to inappropriate Internet content.

The rapid growth of volume of the information exchange forces the owners of telecommunications networks to be in the process of permanent optimization of telecommunication mechanisms which are used as a platform for providing telecommunication services. Among the basic directions of such

optimization it can be noted: increase of the transmission velocity of useful information, conditions creation for the telecommunication services functioning in conditions of telecommunication infrastructure absence and increase of trust in the information and communication technologies (ICT) application.

In order to increase the transmission rate of useful information there were created two radically new high-performance, telecommunication technologies (UA-ITT and EX) of building the next generation converged multimedia networks invariant by the types of traffic, which may fully replace the main protocols stack of the Internet network — TCP/IP, which was originally not designed for the information transmission in real time and has an extremely low efficiency of such transmission at not assured quality of services.

To ensure conditions for the functioning of telecommunication services in case of telecommunication infrastructure absence Academy's scientists proposed a fundamentally new way of building networks with an independent organization which allows simultaneous use of different types of network interfaces on the subscribers terminals and, in addition, notably simplify the process of sharing service messages while maintaining routing tables up to date.

In our turn, an important step on the way of trust strengthening in the ICTs use worldwide there was the System of restriction access to inappropriate Internet content created in A.S. Popov ONAT. The main advantages of this system is scalability easiness, reliable and adaptive negative content filtration, a significant reduction of the overall network load (reducing the exploitation cost of access channels to the Internet), adaptation to the emergence of new, non-earmarked resources.

Let's consider these innovative technological solutions more detailed.

UA-ITT technology. Existing approaches of building next-generation networks are mainly focused on the gradual replacement of IPv4 by IPv6, which has much larger address space resource, and also additional options for flow control and service quality management. This approach is a reasonable compromise between the existing global information and communication infrastructure and new challenges of time in the nearest future. However, short packages traffic transfer (for example, voice traffic) over an IP network is economically inexpedient due to the low use of the potential resources of network equipment and communication channels [1]. Therefore, development of new, more flexible and effective ways to transmit different types of traffic on the basis of a batch principle of commutation is an essential scientific and technical problem.

A group of researchers from A.S.Popov ONAT, carried out a comprehensive research with the purpose of proving the main principles of building integrated telecommunications technology (Integrated Telecommunication Technology — ITT), as a unified platform for the creation of advanced telecommunication networks of the future generation.

The basis of this technology is the new model of open systems and multidisciplinary network meta-Protocol (Multipurpose Network meta-Protocol — MNP) interaction using dynamic digital streams control method (Dynamic Flow Control — DFC). Method DFC combines the advantages of circuit-switched networks and networks with packet switching; it is adapted for transferring various types of traffic from conventional telephony and batch file-sharing to multimedia messages with the highest quality of service requirements implementation.

Model of ITT open systems interaction provides three levels. The lower (physical) level of ITT model includes the physical and partially channel level of the seven-level model of open systems OSI interaction. The second (network) level of ITT model combines three layers of the OSI model (network, transport, session), and partially link layer of the OSI. Upper (application) level of ITT model combines the executive and applied levels of the OSI model. Technology UA-ITT is positioned as the first and second levels of the three-leveled model of open systems ITT interaction.

Realization of the principles of ITT dynamic flow control technology suppose building of a specialized network adapters of physical layer (that provide the interaction of two adjacent nodes of the ITT network) and also digital streams switchboards. Experimental samples of two ITT adapters that are connected to standard tires USB2 created in A.S. Popov ONAT and have successfully passed the preliminary test.

EX technology. Long and difficult way of the telecommunication technologies evolution which is used in telecommunication networks today has led to the official information excessiveness problem emergence. This can be explained as the necessity to synchronize protocols work at various levels of the OSI model with each other. Such need aroused at the dawn of the modern telecommunication infrastructure formation, when information could pass through dozens of segments, built on different technologies, between the sender and receiver. Nowadays, however, in particular due to the growing popularity of Ethernet technologies, a service part, corporate or even operators networks it is

noted that there is some technologies unification, which leads inventors to the concept of combining part-layer in OSI model (Open System Interconnection) to simplify the implementation and increase the efficiency of the networks [2, 3].

A number of currently famous addressing systems with variable size of the network address, which are supposed to use of Ethernet networks for transporting the load, is used to identify hosts «MAC address receiver» field and «MAC address sender» standard Ethernet frame. This is possible because a MAC address while the frame is transferred through network using switchboards are not analyzed (if such a mode is not used specially), and only can be checked for matches with the records in the routing.

Exactly this principle is put into the basis of EX technology developed by specialists of A.S. Popov ONAT, which is based on a Ethernet modification and assumes the use of protocols official information of the transport, network and data link layers within a single header with variable size [4].

The length of the address in EX technology can be of two types: dynamically variable or fixed and is divided into three classes (in terms of the actual implementation) in accordance with its size — is less than, equal to or greater than 6 bytes. It should also be noted that the ability to use EX technology without replacement of network equipment determined by addresses width and existing equipment configuration.

Examples of typical areas of use for the EX technologies alternative network is the data center network, the core of the operator network, corporate networks, which are characterized by the transfer of large amounts of data or a large intensity of network requests. Translation of such networks by using EX technology allows to reduce time of the payload between nodes in the network, which in other turn reduces the total time of network nodes work in active state and, as a result, reduces the network devices power consumption, their heat, electricity consumption by the conditioning devices. By reducing the time of data transmission the part of the communication channel is released, and it is the product of commercialization, so the number of resources increases and you can rent out them [5].

Among the main methods of making changes to the network nodes software with the purpose of practical implementation of the EX technology it should be noted:

— development of the driver virtual network adapter software that accepts classical IP packets and forwards them in the form of modified Ethernet frames in which the sender address is filled with useful data;

— development of a software library that allows you to generate modified Ethernet frames for data transmission in which the sender address is filled with useful data;

— development of a software gateway and/or tunnel, which allows you to convert the classic IP packets into the modified Ethernet frames (and vice versa) or make their transparent tunneling through classical IP network.

Organization of ad-hoc networks. Nowadays, a large part of the population of developed and developing countries, own mobile phones, and the part of subscriber terminals, which are supporting multiple network interfaces continues to grow. At the same time, as a result of serious disasters the failure of main utility networks and communications occur, including communications systems. As a result, affected by the disaster subscribers with mobile terminals in working condition, cannot communicate with the outside world.

Especially critical in this case is the ability of sending as fast signal as it is possible about the location of the victim and his physical condition. Such a possibility would be the most effective in the first hours after the catastrophe occurred. Obviously, the use of mobile terminals for the formation of ad hoc networks in emergency situations can help to find sufferers. However, the use of standard tools of the formation of ad hoc networks is made more complicated by the necessity of preliminary preparation of mobile terminals to unite a network, for example, through the necessity of the preliminary allocation of the address space.

The mechanism for the organization of ad hoc networks [6...8] was established in A.S. Popov ONAT, and it is a technology of the construction of ad hoc networks with the following features:

— automatic addressing of network interfaces and unique identification of subscriber terminals through the use of the MAC addresses of the network adapters (with the rejection of the IP Protocol at the network level);

— to provide user with the list of subscriber terminals and ways to each of them which was established on its own routing Protocol, which is based on protocols such as OADV and LAR;

— the process of management of information resources inside the situational network partially integrated with routing Protocol, which allowed significantly reduce the utility load on the formed network.

The main area of application of the developed mechanism is the information exchange organization in case of external telecommunications infrastructure absence: users motion using the public transport; location of the users in the same building, a camping, recreation base, finding a group of people in one camp as a group of travelers etc. However, the proposed mechanism in principle of spontaneous (unprepared) forming a network with an unknown number of terminals can be used for information exchange between subscribers ' terminals of victims and terminals of people who organize assistance.

System of restriction access to inappropriate Internet content. System to restriction access to inappropriate Internet content have being created and operates on the basis of A.S. Popov Odessa national Academy of telecommunication [9]. The establishment principle basis is that in each educational institution (school, university, etc) there is its own system of content filtering (SCF), which, depending on the requirements and characteristics of the institution may have one or more filtering tools (proxy-server, DNS server, firewall etc) in its structure [10].

Computer network users of the educational institutions have access to the Internet only through SCF (direct access to the network completely blocked at the router). At each attempt to access a particular resource, SCF checks whether if it is not in the list of non-earmarked. In case the resource is placed in the database of banned access to it is blocked, and the user is presented with a message on the screen followed by redirecting a user in the catalogue of useful web resources.

Updating the database of non-earmarked resources is carried out in the automated mode through centralized processing service journals that come from all of the servers that are connected to the system. On the basis of a single information centre experts group it is carried out a daily analysis of the most visited resources with the subsequent addition to the database and its mailing to all installed SCF.

Project «Building safer internet for educational institutions,» in which was presented the concept of the System to restricted access to inappropriate resources was recognized as the best project in the category «C5. Confidence Building and security in the use of ICTs» in the contest, which was organized in the framework of the Forum the world summit on the information society 2012 (Geneva, 14...18 may 2012) and found ITU Secretary-General as one of the major achievements in establishing a connection in the world in May 2012

By the end of October 2013 about 130 organizations, among which more than 100 educational institutions subordinate to the Ministry of education and science of Ukraine (upon agreement with the relevant regional offices) in Dnipropetrovsk, Donetsk, Zaporizhia, Kyiv, Luhansk, Lviv, Mykolayiv, Odesa, Sumy, Kharkiv, Kherson, Cherkasy, Chernihiv, AR of Crimea, cities of Kyiv and Sevastopol were connected to the system and successfully employed.

Conclusions and results

— Long and difficult way of the telecommunication technologies evolution used in telecommunication networks today, and also avalanche growth of the information resources number, set a number of new challenges in front of the international community. Scientists are facing new challenges, such as increasing the efficiency of telecommunication networks use, to ensure the functioning of telecommunication services in the conditions of centralized infrastructure absence, protection of children online etc.

— Considered innovative technologies in work are presented in the form of more than ten contributions to the International Telecommunication Union. Copyrights, novelty and competitiveness of the technical solutions protected by copyright certificates on the work, patents for inventions and useful models.

— Economic effect from implementation of these developments justified by the specialized techniques and the technologies themselves can be the basis of the development of information and communication technologies strategy for the next decades.

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PHOTOREFRACTIVE CRYSTAL OF $Sn_2P_2S_6$ TYPE: GROWTH AND PERSPECTIVES OF APPLICATIONS

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The results of the works on the growth, studies and applications of the photorefractive crystals of $Sn_2P_2S_6$ type are presented. It is shown that these materials are efficient media for dynamic holography for the visible and near infrared and can be used in the modern systems of laser beam corrections, telecommunications and optical biomedical diagnostics.

The studies directed on growth technology and wide studies of novel semiconductor materials, partially tin thiohypodiphosphate ($Sn_2P_2S_6$) single crystals, are developing during last years in Uzhgorod National University. These crystals represent itself efficient non-linear optical media which can be used for efficient manipulation and registration of the coherent optical irradiation of visible and near infrared spectral range by methods of dynamic holography. On the combination of the basic parameters these crystals have no competing materials, and the technology of their growth is a priority of Uzhgorod University for today.

The main peculiarities of the $Sn_2P_2S_6$ crystals are: rather wide range of their transparency in red and near infrared spectral range, photoconductivity and high values of the linear electro-optic (Pockels) coefficients. A combination of these properties defines the presence in this material the light-induced variations of the optical parameters, i.e. the photorefractive effect, that opens a possibility of their applications in the devices based on the dynamic holography principles.

Photosensitivity of these crystals in red and near infrared spectral range, and relatively fast response of the formation the photorefractive gratings in the holographic schemes (the typical value of the response time is in order of 10^{-3} s), makes these materials especially attractive for applications in telecommunications and biomedical diagnostics.