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SOFTWARE FOR ELECTRONIC DOCUMENT MANAGEMENT SYSTEM OF TECHNICAL DOCUMENTATION ON RAILWAY AUTOMATION AND TELEMECHANICS

ASTANALIEV ELMUROD TURSUNALI OGLI
"Department of Automation and Telemechanics of Tashkent State Transport University" Master's Student, Tashkent State Transport University
elmurod1246@mail.ru

ABSTRACT:

The article describe in more detail these necessary features of the program. Let us proceed to the consideration of the functional features of the client part of the system. Functioning of the client of the automated system of accounting and control of signaling systems. For quick access to information stored in a single database of documents, a search procedure with different parameters is necessary. formal models of electronic document management system for technical documentation (EDTD) are implemented in the software module automated system of accounting and control of railway automation and telemechanics devices.

KEYWORDS: client, server, control of document execution, control of signaling systems, information window.

INTRODUCTION:

The transition to new automated control technologies necessitates the development of electronic document management systems that provide effective support for decision-making at all stages of development, implementation and operation of systems and train traffic control.

The introduction of electronic document management is one of the most important tasks of railway transport and the program for the transition to electronic operation. Uzbekistan railways currently stores huge volumes of technical documentation, which are created, processed and analyzed "manually". At the same time, the same stages of input of primary data are performed repeatedly by different services and organizations, increasing the costs of unproductive labor and the number of "operator errors".

Electronic document management systems are a powerful means of increasing labor productivity and the quality of work performed in the creation and design of new equipment. They play an important role in the development and implementation of systems of railway automation and telemechanics (SRAT), both existing and new generations.

Transport processes, especially from the point of view of analyzing the functioning of automated technological complexes, including the management and control of systems and devices of railway automation and telemechanics, are naturally formalized using queuing schemes. For example, the continuous process of train movement in the systems of railway automation and telemechanics (SRAT) is represented as a sequence of discrete events - the occupation and release of track circuits.

The creation of such a complex and voluminous system as electronic document management of technical documentation (EDTD) SRAT is a continuous process. EDTD is developed and implemented in stages, over a long period of time, and already implemented subsystems and processes are being improved on the basis of new information technologies and technical means. The development of new classes of compressed gas, for example, microprocessor-based ones, also requires the improvement and development of EDTD. These factors determine

the continuity of the process of creating EDTD SRAT, and, consequently, the constant need to make new systemic solutions. It is also obvious that there is a need for a quantitative substantiation of system engineering solutions, which, in turn, implies the development of appropriate tools and their support for the creation and operation of EDTD systems.

The formal model is determined by a pair of unordered sets: a) a set of variable parameters; b) a set of relations connecting the values of these variables. Providing the means for creating formal models is the most important task of mathematics, and this is what makes it the foundation of applied sciences. It is the model that represents the object of research or calculations and determines the nature of the formal apparatus used to describe the problem and perform the necessary calculations.

The technological level of the formal model of the TD document flow is based on the automatic model of EDTD.

The proposed formal models of EDTD are implemented in the software module "Automated system of accounting and control of railway automation and telemechanics devices" (ASA-CRAT), which is registered in the state register.

To save all EDTD data, MS SQL Server 2008 DBMS is used. Many DBMSs divide their work into two levels according to the "Client-Server" system. From the point of view of execution, the program is divided into two parts - client and server.

In the two-level system "Client-Server": Client is a processing program, i.e. custom application program. It usually deals with the user interface, and the server database does all the actual work with the database.

Database Server - Basis is the core of the database. Sends the information selected from the database via the intercrosses channel to the client.

The solution to the problem of creating a document-oriented program was carried out using the C# language using the Visual Studio 2010 programming environment.

The integrated environment of the C# programming system, including an editor, a debugger, a programming language, object-oriented programming, built-in powerful graphical procedures, the ability to use modules and procedures written in other languages in the Microsoft standard, is an effective tool for creating software, including and high professional level.

The main results of the work of the authors are implemented in the software "Automated system of accounting and control of railway automation and telemechanics devices" (ASA-CRAT).

ASA-CRAT is intended for automation of accounting and control of railway automation and telemechanics devices, as well as for planning the work of the repair and technological section.

From a technological point of view, ASA-CRAT is an integration system that covers office work, control and accounting of railway automation and telemechanics devices, and connects them with the external environment of electronic exchange.

When describing classes, the general purpose of methods and data is given, using the content of the classes introduced in the EDTD model. Table 1 shows a description of the main classes of the ASA-CRAT program with a description of the implemented methods.

Table. 1. Description of the main classes of ASA-CRAT

Name	Class description	Implemented methods
Program	The main entry point for the application	Main()
MainForm	Main form for application	readProperties() Form1_Load(object sender, EventArgs e) loadTree() addRazdelToParent(TreeNode node1, TreeNode node2, object p) createElement() int[] getChildIDRazdel(object id) int[] getChildIDShch(object id) DataTable Otchet1(int id) DataTable Otchet2(int[] ids) DataTable Otchet3(int id) DataTable Otchet4(int[] ids) DataTable Otchet5(int id, string priznak) DataTable Otchet6(int[] ids, string priznak) DataTable Otchet7(int id) DataTable Otchet8(int[] ids)
FmCreate	Form for adding new equipment	loadRazdelniyPunktComb() loadMarkComb() loadTipReleComb() loadRele() saveToDB()
FmSelect	Form for displaying a table of all equipment with the term of the selected section, station or ShCh	loadDataTo(string query, DataGridView dgv) loadAllPribor() loadOsnovPribor() loadZamenPribor() isBeforeReplase(object datatime)
FmEdit	Editing form for selected equipment	LoadValue(int id_pribor) loadRazdelniyPunktComb() loadMarkComb() loadTipReleComb() loadRele() saveEditingToDB()
Oborodovaniya	Class for saving the property of the equipment object	setNarx(string zavod, double narx) double getNarx(string zavod) setXarajat(string zavod, double xarajat) double getXarajat(string zavod) double getResult(string zavod)
FmReport	Form for generating various reports	pdBeginPrint(object sender, PrintEventArgs e) pdEndPrint(object sender, PrintEventArgs e) pdPrintPage(object sender, PrintPageEventArgs e) DrawNextPage(PrintPageEventArgs e) string getChartFileName() DataTable correcting(DataTable table)

Thus, in this program, the creation, editing and deletion of fixtures and a list of equipment is viewed. The program allows you to provide local and network interaction between document flow processes.

Practical implementation of the EDTD system

To test the obtained theoretical base of the OFS, an automated system for accounting and control of railway automation and telemechanics devices has been developed. The automated system is being tested at the Tashkent signaling and communication distance ShCh-1.

The server is used with the Windows operating system. Computer configuration requirement:

– processor frequency - at least 2.52 GHz;
– RAM volume - not less than 512MB;
– Free disk space - at least 16 GB.

The following additional software must be installed on the server in the form:

– MS SQL Server 2008;
– MS Visual Studio 2010.

Considering that the server will host and process a large number of materials as text, the recommended resource parameters are as follows:

– Processor frequency - 2 GHz;
– The amount of RAM - 3GB;
– Hard disk capacity - 80GB.
– The server must be equipped with a network adapter (with a data transfer rate of 100 Mbps) for networking.

In modern conditions, the following trends are observed in the development of electronic document management of SRAT: expansion of functionality, increased requirements for information security, reduction of time for processing technical documentation, etc. These new qualities of electronic document management systems can be achieved through the use of modern techniques and information systems.

The use of information and communication technologies allows to significantly expand the channels of interaction of the automation and telemechanics service with the involved organizations, thereby contributing to the strengthening of cooperation between enterprises based on mutual understanding, taking into account the interests of each.

ASA-CRAT is, on the one hand, an extensive database that stores complete information about the installed equipment, including its history. On the other hand, ASA-CRAT is a client part that works with this database and implements the needs of various services.

Figure 1 shows a diagram of the architecture of the ASA-CRAT software package. This system complex will be distributed through the Repair and Technological Sections (RTS) of the signaling and communication distance of Uzbekistan railways using the ASA-CRAT servers and the database.

It is proposed to use ASA-CRAT in the general structure of the electronic document management system for technical documentation.

The proposed technological structure takes into account the possibilities of existing communication lines, data transmission technologies. The database for monitoring and accounting of railway automation and telemechanics devices is organized on the ASA-CRAT server. In turn, the ASA-CRAT server interacts with the database.

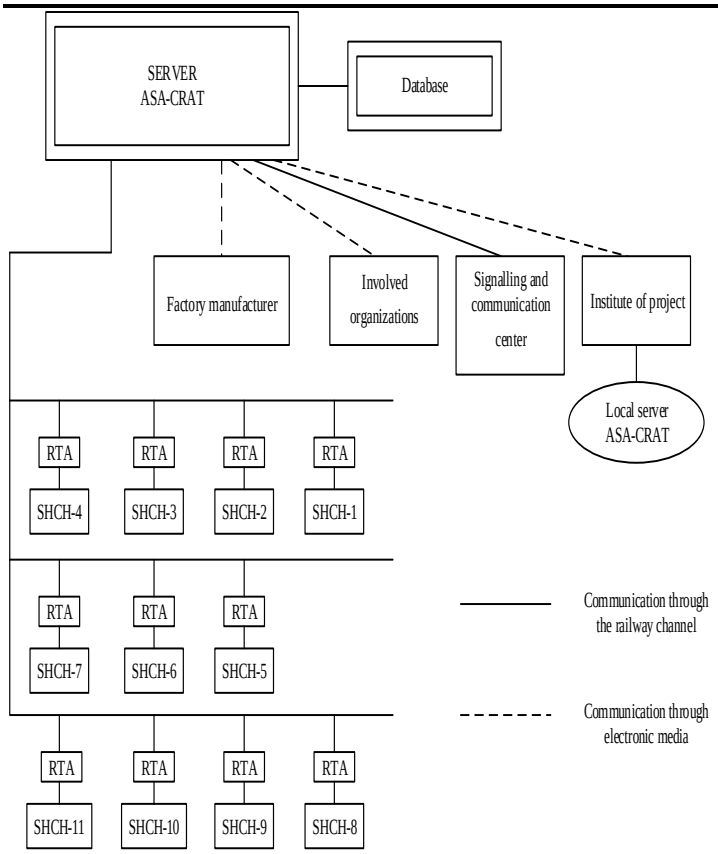

Fig.1. Architecture diagram of the ASA-CRAT program

It should be borne in mind that the traditional paper flow of control and accounting of railway automation and telemechanics devices will not soon lose its importance - in the coming years, important documents will still be published, approved and delivered in paper form.

Nevertheless, there are (and a number of organizations are already operating) integrated paper and electronic technologies, in which the control and accounting of railway automation and telemechanics devices is carried out in electronic form, and it is with the electronic copy that work is going on, and the paper copy is transmitted in the usual way.

Experience shows that the modern volume of work on the construction and repair of railways is no longer conceivable without the use of information technology. Paper carriers do not allow fast data exchange, accumulation, processing and analysis of information. It is quite obvious that most of the work (especially well-algorithmic) performed by a person can be transferred to a computer. Currently, in connection with the organization of an association of factories that produce signaling, centralization and blocking (SCB) equipment for railway transport, the task of allocating resources to ensure timely and high-quality execution of plans for overhaul, capital construction and operation of signaling devices becomes especially urgent. Such a task can be performed on the basis of databases of technical documentation generated in the distances of automation and telemechanics in electronic form using a set of tasks "Automated system of accounting and control of railway automation and telemechanics devices".

ASA-CRAT is intended for automation of accounting and control of devices for railway automation and telemechanics, as well as for planning the work of a repair and technological section and forming various options for replacement cards for devices.

The program is used in the distances of railway automation and telemechanics.

The main functions of the program:

- Creation and maintenance of a database, including passports of specific devices and information about the place of their installation;
- Tracking the movement of devices in connection with periodic replacements, write-offs, receipts, etc.;
- Planning the replacement of devices with the issuance of technologically necessary information;
- Monitoring the implementation of plans for replacing devices;
- Analysis of failures of devices for alarm, centralization and blocking devices
- Planning the work of repair and technological areas;

- Issuance of output documents, the ability to search for devices in the database for arbitrary requests.

The purpose of the ASA-CRAT is to improve the efficiency of the processes of maintaining a database for monitoring and accounting for railway automation and telemechanics devices, maintaining signaling, centralization and blocking at the station and remote level of management of the economy through the use of computer technologies for its receipt, storage and processing.

Electronic document flow for control and accounting of railway automation and telemechanics devices in the form of ASA-CRAT can significantly increase the efficiency of the automation and telemechanics service, and enterprises associated with this document flow.

This article presents the theoretical foundations for constructing a formal model of EDTD SRAT. In accordance with the theoretical results, the EDTD process is formally presented in a mathematical model. The logical level of the formal model EDTD is implemented using the apparatus of graph theory. The main theoretical results are implemented in the software “Automated system of accounting and control of railway automation and telemechanics devices” (ASA-CRAT).

The description of the main classes of the program is shown. The software architecture and the requirements for the used server and client parts are presented.

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