

Integrated Control Technologies For Railway Automation Devices

Astanaliev Elmurod Tursunali ugli

Doctoral student of Tashkent state transport university

Baratov Dilshod Khamidullaevich

Professor of Tashkent state transport university

Sheripbayev Jovlanbek Zakirovich

Independent researcher of Tashkent state transport university

Abstract

Transport processes are naturally formalized through the use of mass service schemes, particularly when considering the study of automated technological complexes' operation, such as the administration and control of railway automation and telemechanics systems and devices. The allocation of the following elements forms the basis of the methodology used to describe the electronic document flow of technical documentation (EDMTD) in the automation and telemechanics economy: control levels, technological chains based on the chosen levels of hierarchy, and algorithms of technological processes (TP) of the EDMTD under study.

Keywords: railway automation and telemechanics, electronic document management, repair and technological section, signaling, centralization and blocking (SCB), database management.

The development of electronic document management systems for railway automation and telemechanics has shown the following tendencies in the modern era: greater information security requirements, shorter processing times for technical documents, and expanded functionality. By using contemporary methods and information systems, electronic document management systems can acquire these additional features.

Information and communication technology makes it possible to greatly increase the automation and telemechanics service's channels of interaction with the participating organizations. This helps to strengthen business-to-business cooperation based on mutual understanding and consideration of each party's interests. On the one hand, the automated system of accounting and control of railway automation and telemechanics (ASA-CRAT) is a comprehensive database that contains all of the installed equipment's details, including its history. However, ASA-CRAT is a client component that utilizes this database to implement different services' requirements [1-2].

An architecture diagram of the ASA-CRAT software package is displayed in figure 1. Using the database and the ASA-CRAT servers, this system complex will be dispersed via the repair and technological sections (RTS) of the Uzbekistan railways' signaling and communication distance.

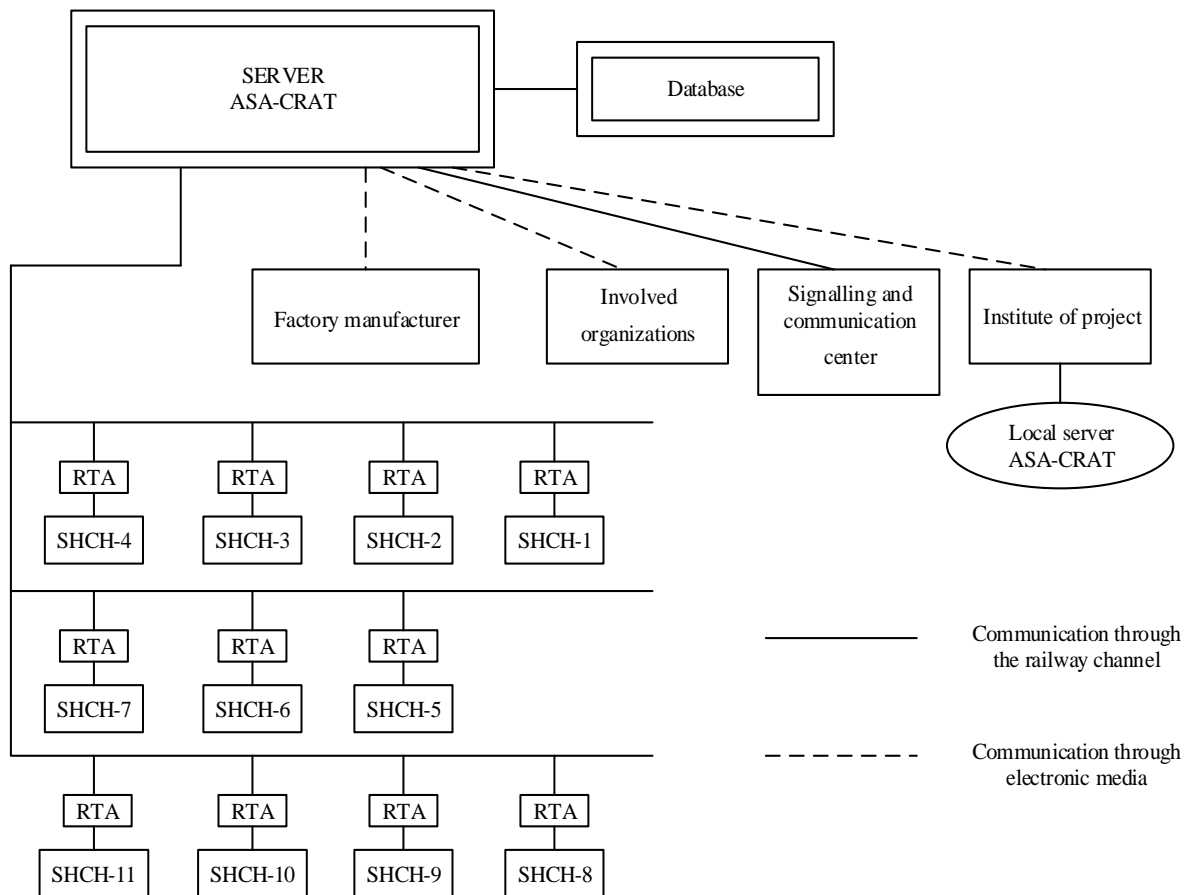


Fig.1. The ASA-CRAT program's architecture diagram

The general framework of the electronic document management system for technical documentation is suggested to employ ASA-CRAT.

The potential of current data transmission and communication lines are taken into consideration in the suggested technological structure. The ASA-CRAT server houses the database used for railway automation and telemechanics device accounting and monitoring. The database then communicates with the ASA-CRAT server [3].

In the upcoming years, significant documents will continue to be published, authorized, and distributed in paper form, indicating that the traditional paper flow of control and accounting of railway automation and telemechanics devices will not soon lose its significance. By combining both digital and traditional workflows, the system ensures continuity, flexibility, and adaptability during the transition phase. Over time, electronic documentation will enhance efficiency, reduce processing delays, and improve data accuracy across all service levels. Additionally, centralized storage and remote access capabilities will simplify long-term archiving and retrieval of technical records.

Experience has shown that without the use of information technology, the amount of effort involved in building and repairing railways today would be impossible. Fast data exchange, accumulation, processing, and analysis are not possible with paper carriers. It should go without saying that a computer can perform the majority of human labor, particularly well-algorithmic work. It is now particularly urgent to allocate resources to ensure the timely and high-quality execution of plans for overhaul, capital construction, and operation of signaling devices in connection with the establishment of an association of factories that produce signaling, centralization, and blocking (SCB) equipment for railway transport. This task can be carried out utilizing a set of tasks called "Automated system of accounting and control of railway automation and telemechanics devices" and databases of technical material created in the fields of automation and telemechanics in electronic form.

ASA-CRAT is designed to automate the accounting and control of railway automation and telemechanics devices. It also helps to organize the work of a technological and maintenance department and creates different alternatives for device replacement cards [4].

The application is utilized in the fields of telemechanics and railway automation. The program's primary features include:

- establishment and upkeep of a database that contains details on the location of a device's installation as well as the passports of particular gadgets;
- monitoring the movement of equipment in relation to write-offs, receipts, and periodic replacements;
- arranging for the replacement of gadgets while providing information that is required for technology;
- keeping an eye on how plans to replace equipment are being implemented;
- examination of centralization, blocking, and alarm device malfunctions;
- organizing the technology and repair work;
- issuing output documents and having the capability to look for devices in the database for arbitrary queries.

Furthermore, ASA-CRAT enables automated accounting for the replacement and relocation of equipment. On the one hand, ASA-CRAT is a comprehensive database that contains all of the installed equipment's details, including its history. The client component ASA-CRAT, on the other hand, uses this database to implement the requirements of different services.

Through the use of computer technologies for its receipt, storage, and processing, the ASA-CRAT aims to improve the efficiency of the processes necessary to maintain a database for the monitoring and accounting of railway automation and telemechanics devices, maintain signaling, centralization, and blocking at the station, and manage the economy remotely.

Automation and telemechanics services and the businesses connected to them can be made much more efficient by using electronic document flow for control and accounting of railway automation and telemechanics equipment in the form of ASA-CRAT.

The implementation of ASA-CRAT marks a key step toward modernizing railway automation and telemechanics documentation practices. Its integration enhances operational transparency, accuracy, and responsiveness across the entire maintenance and monitoring system. By combining centralized data storage with automated workflows, ASA-CRAT supports informed decision-making and long-term efficiency. Future developments should focus on expanding system capabilities, improving cybersecurity, and ensuring compatibility with emerging technologies.

References

- Guo, F., Jähren, C. T., & Turkan, Y. (2019). Electronic Document Management Systems for the Transportation Construction Industry. *International Journal of Construction Education and Research*, 1-16.
- Aripov N. M. About document management in the Department of automation and telemechanics and the introduction of paperless technology technical documentation management / Aripov N.M. Baratov D. K. // *Bulletin Of The Tashkent Railway Transport Engineering Institute (Вестник ТашИИТ)*. – 2015. – №2. – 2015. – Pp.77-81.
- Baratov, D. K., Aripov, N. M., & Ruziev, D. K. (2019, September). Formalized Methods of Analysis and Synthesis of Electronic Document Management of Technical Documentation. In *2019 IEEE East-West Design & Test Symposium (EWDTS)* (pp. 1-9). IEEE.
- Aripov, N., Aliyev, R., Baratov, D., & Ametova, E. (2016). Features of Construction of Systems of Railway Automatics and Telemechanics at the Organization of High-Speed Traffic in the Republic of Uzbekistan. *Procedia Engineering*, 134, 175-180.