AUTOMATED WORKPLACE FOR MANAGING MULTI-LEVEL ACCESS TO INFORMATION AND PROGRAM RESOURCES OF EDUCATIONAL ORGANIZATIONS

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Abstract

Educational institutions are increasingly faced with the fact that there are problems of violations of the protection parameters of information and software, they are determined by the influence of unauthorized actions of legal users – employees of the institution.

The need for comprehensive protection of information and software resources determines the development of an integrated system that is integrated into the main information environment of educational institutions, its main focus is related to the prevention of the maximum number of types of "insider" attacks.

The purpose of the work is related to the development of a methodology that allows for automated management of multi-level access to information and program resources of educational organizations to increase the level of protection.

The main tasks to be solved in the work: analysis of the characteristics of information processing in the system, development of a technique that allows for the design of an automated system aimed at distinguishing access to information and software, the development of a software module that allows you to manage the database of an automated system of an educational company to ensure

Areas of access to strategically important information are given. The algorithm of work of the administrator of educational institution with system is presented. The scheme of tables of the database of the institution is presented. Viewing the table of incidents of violation of the rules of work with information and software of the system is available only to employees of the Department of information security of educational institution and only in the reading mode.

Changing the data of the table is not available to the staff of the institution or the system itself. The system produces only "additional records" of new table tuples. When logging in, the employee must enter the appropriate identifier and authenticator (in the example provided, the authenticator is the password).

The interrelations between the structural units of the educational institution for the subsequent analysis of information flows are revealed. On the basis of the identified relationships, a structural model of automated information flow management based on the principles of information and software protection of the system is developed..

Keywords:

Information security, automated workplace.

ACM Computing Classification System:

Security services, Human computer interaction , Information storage systems

Introduction

Educational institutions are increasingly faced with the fact that there are problems of violations of the protection parameters of information and software, they are determined by the influence of unauthorized actions of legal users – employees of the institution.

At the moment, there is a set of systems to prevent unauthorized use of information and software, but none of them provides comprehensive protection of resources.

The need for comprehensive protection of information and software resources determines the development of an integrated system that is integrated into the main information environment of educational institutions, its main focus is related to the prevention of the maximum number of types of "insider" attacks.

The complexity in the structure of information and software leads to the fact that the developed automated system for the differentiation of access to information and software has a complex structure [1].

The purpose of the work is related to the development of a methodology that allows for automated management of multi-level access to information and program resources of educational organizations to increase the level of protection.

In the paper we consider these problems:

1. Implementation of analysis of information processing characteristics in the system.
2. Development of a methodology that allows for the design of an automated system aimed at the differentiation of access to information and software.
3. Development of a software module that allows you to manage the database of the automated system of the educational company to ensure the control of the reliability of its paper.

1 Analysis of the main functions of the automated system of differentiation of access to information and software of the educational institution according to the method of multi-level access management

The main focus of the developed system is related to the provision of automated control of multi-level access to information and software resources.

Information resources should be classified according to three criteria:

- Access level;
- Relation to a particular unit of the institution (developing units, secondary services, etc.));
- Presentation form (text, graphic documents, etc.).

Multi-level access management should be carried out taking into account all the criteria of classification of information resources, taking into account the study of information flows of educational institutions and the features of joint access of employees to information and program resources.

Functions of management of multilevel access to information resources are information and management.

The information function is a set of two mechanisms [2]:

1) the mechanism of control of the state of subjects of protection (information and program resources;
2) the mechanism of informing on incidents of violation of rules of work with information and software of educational institution.

The control function is the application of the basic algorithm of differentiation of access to information and software resources. Also the control functions include:

- accounting of information and software resources;
- Resource storage;
- The results of the requested staff resources;
- The results of media;
- Password issuance;
- Keys.

At the same time, the generation of passwords, keys, support of access control, as well as control over the process of processing of information resources is entrusted to the staff of information security units of the educational institution.

Also, management is necessary at all stages of implementation of the system, including at the stage of creation, at the stage of operation.

2 Development of a structured model for the company with the condition of protection of its information and software

To create a structural model of the educational institution management it is necessary to identify the relationships of the structural units of the institution in terms of information and software protection management [3, 4].

Figure 1 shows the areas of access to strategic information.

The upper level includes personal data of students, office management system and accounting programs, all this is designed to maintain records of students, their parents, teachers (employees) for the operational management of educational institutions.

The highest levels of access ("red") are those structural units of the educational institution, which are directly involved in the processing of information about students and staff of the institution, as well as the development of projects for the educational process.

The work of these units is connected, so it is quite difficult to define the border of their access to information about the project.

In order to achieve the main development goals, it is necessary that the area of access of research and development units involved in the same project is as much as possible coincided.

Figure 1 shows that the top level also includes the departments of standardization, quality control and technical documentation control.

These departments also have access to strategic information about the project being developed, so they need to be given special attention.

The staff of the General Department do not have access to any strategically important information resources of the educational institution system, so they belong to the "green" level of access.

Access Manager-is an additional module, which is used to organize the access of the participant to the protected information, the main purpose of this module is authorization and authentication of the employee.

To start the operation of this module, it is necessary to build a database of members of the organization, which will be entered all the names, information about access marks, biometric characteristics of the employee, password.

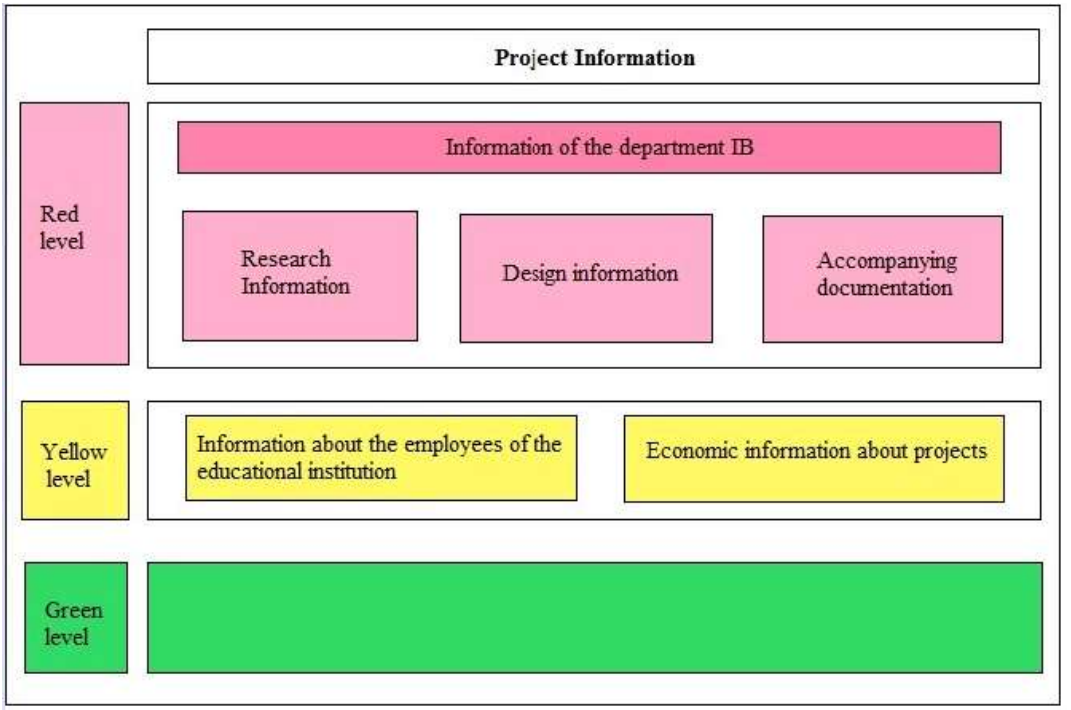

Fig.1. Project information with access areas

3 Algorithm of administrator work of educational institution with the automated system of differentiation of access to information and software

Figure 2 shows the algorithm of the administrator of the educational institution with the system. A member of the organization provides the following information as an identification, to choose from:

- Password;
- Material carrier;
- Employee biometric data.

Then the processes take place:

- Identification;
- Authentication;
- Authorization of employees.

Control is transferred to the beginning of the algorithm, if the process was unsuccessful, otherwise the participant of the organization is given a label L, which displays at what level of access is a particular employee. There are three levels of green, yellow and red access in the system.

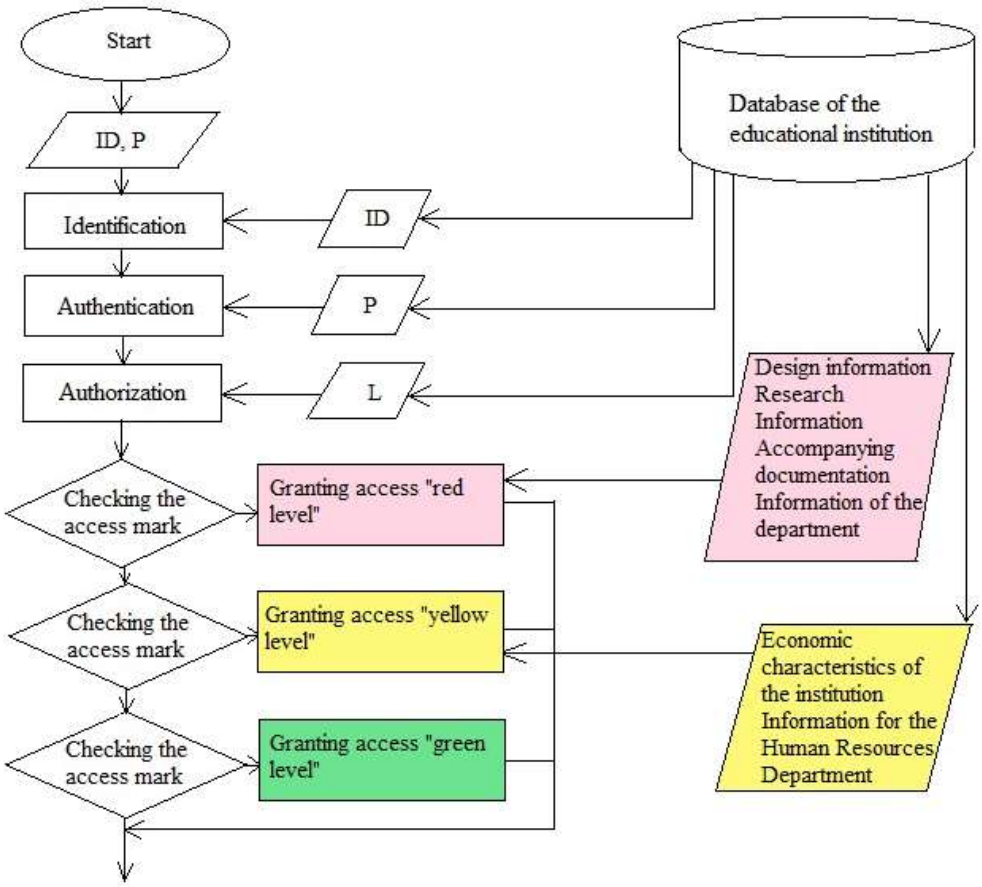

Fig.2. Algorithmic scheme of the organization participant's work with the system

4 The database structure of the organisation

To implement the above methodology, there is a need to create a database, which will provide information about both the subjects and the objects of protection. Figure 3 shows the schema of the institution's database tables.

5 The main components of the system

The main components of the system are shown in figure 4. The main task solved by this subsystem of differentiation of access of employees to information and software resources of the system is to ensure compliance with the differentiation of access through the use of organizational, legal, technical (hardware and software), physical protection measures [23].

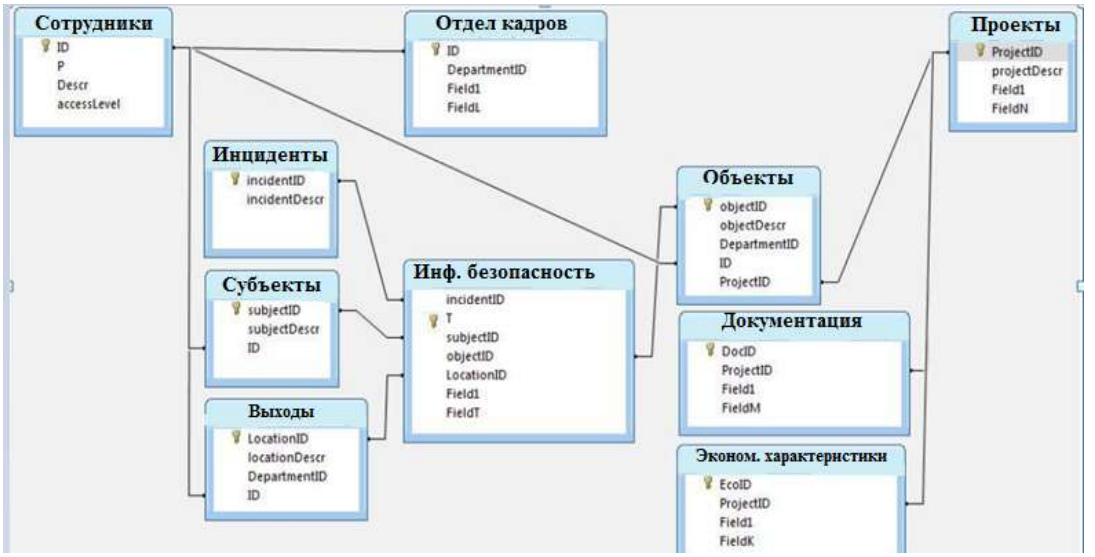

Fig.3. Diagram of database tables of an educational institution

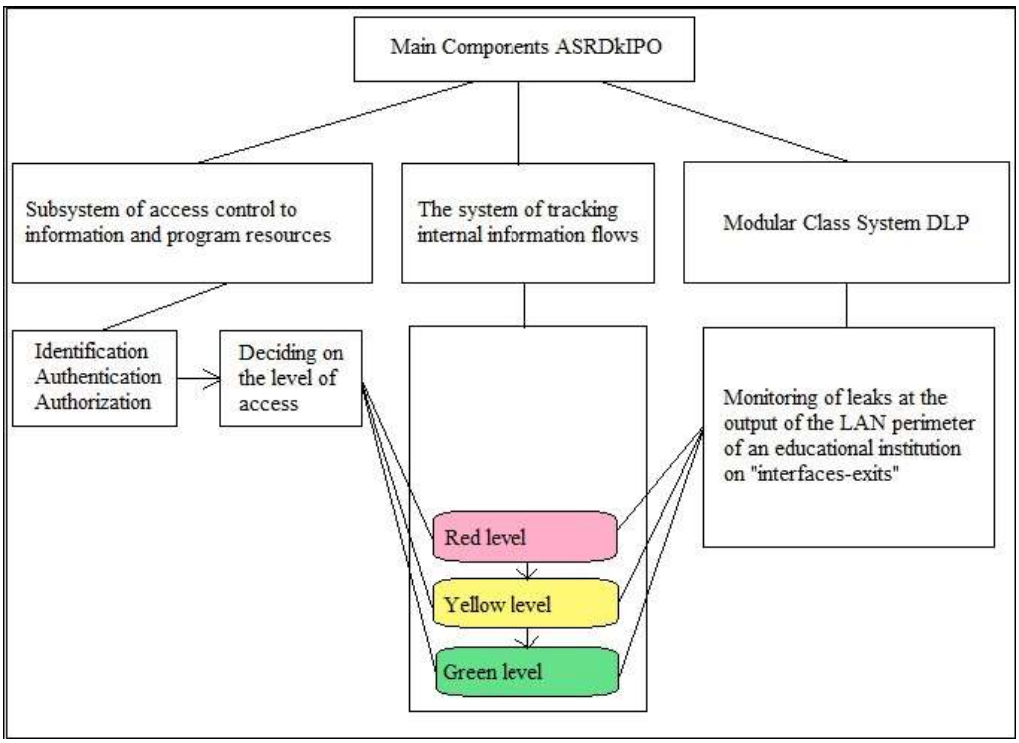

Fig.4. Main components of the system

6 Forms of automatic workplace of administrator of the educational institution designated

Form of work with audit log-table of incidents of violation of rules of work with information and software of the system. An example of the form of work with the audit log is shown in figure 5.

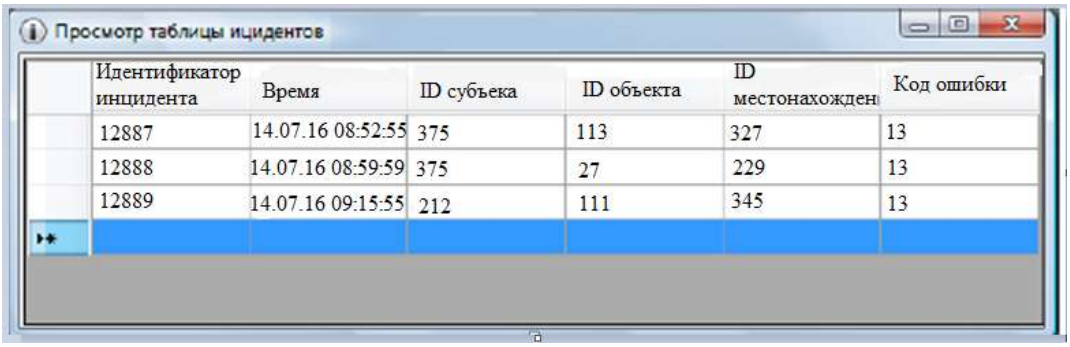

Fig.5. Example of the audit log form

All fields in the table are read-only. The system automatically writes to the table.

Viewing the table of incidents of violation of the rules of work with information and software of the system is available only to employees of the Department of information security of educational institution and only in the reading mode [5, 6].

Changing the data of the table is not available to the staff of the institution or the system itself. The system produces only "additional records" of new table tuples.

When logging in, the employee must enter the appropriate identifier and authenticator (in the example provided, the authenticator is the password). The method of password authentication can also be made customizable (to regulate the input set of characters, the number of characters, the waiting period after a failed authentication, etc.) menu Form of work with the database of the employee of the information security Department of the enterprise. An example of the form is shown in figure 6.

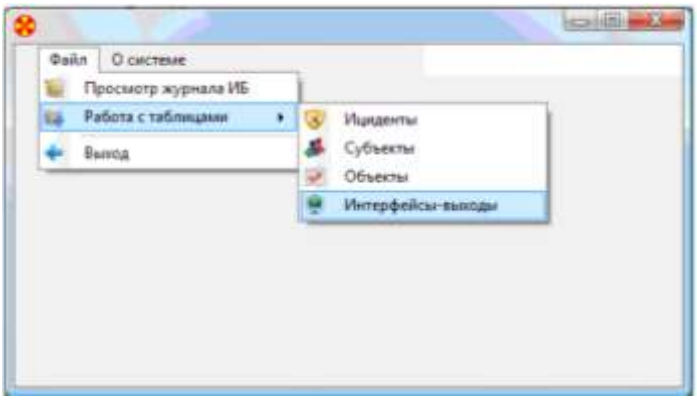

Fig.6. Example of the form of work of the information security Department employees

As shown in the figure, an employee of the information security Department of the educational institution can cause:

- The form of work with the audit log (File - view log IB);
- The form of a table of descriptions of incidents of information relations (File – table Incidents);
- Form of work with the table of description of subjects of information relations (File - work with tables-Subjects);
- The form of work with the table of objects of information relations (File - work with tables-Objects);
- The form of work with the table "Interfaces-inputs" (File – work with tables – Interfaces-outputs).

As shown in figure 7, the Agency's human resources staff can call:

Form of work with the table "personnel Department of educational institutions" (file Employees).

Types of forms of work of employees of the institution were designed as one basic form. For the necessary differentiation of the property "Visible" of the relevant fields in the menu equivalent to "false" figure 7 shows the properties window for the menu fields of the form.

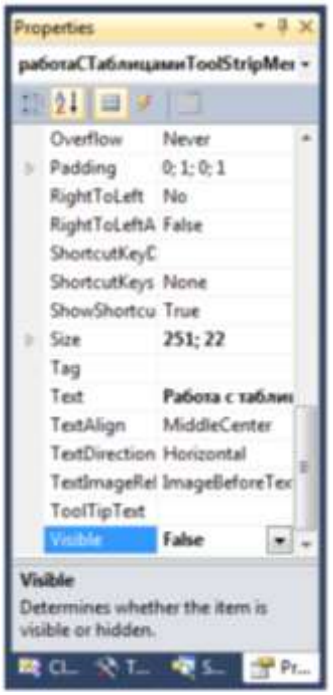

Fig.7. Properties of the fields of the menu of the form of work of employees of educational institution

The type of the basic form of work of employees of educational institution with information and program resources of system is presented in figure 8.

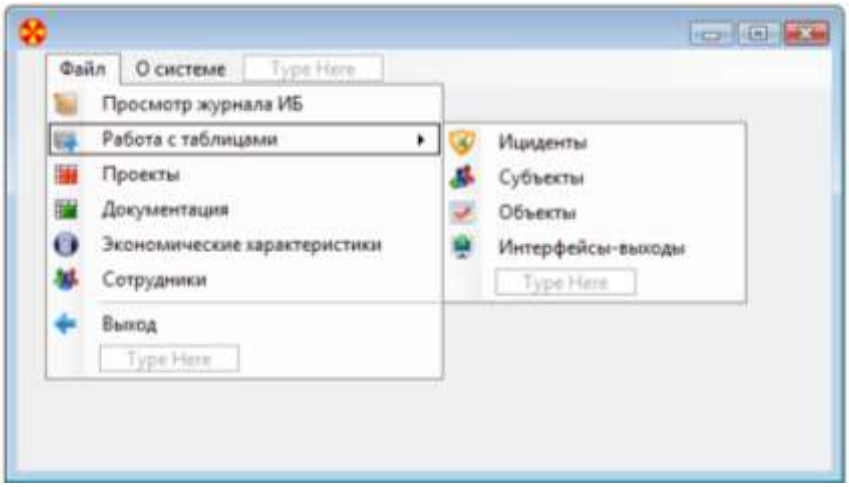

Fig.8. Form view when developing a project in the Microsoft Visual Studio 2010 programming environment

Conclusion

In order to ensure the proper level of protection of information and software systems of educational institutions developed a technique of automated management of access to strategic information and software resources for the administrator of the institution [7].

The interrelations between the structural units of the educational institution for the subsequent analysis of information flows are revealed. On the basis of the identified relationships, a structural model of automated information flow management based on the principles of information and software protection of the system is developed.

The basic modules of the automated system of differentiation of access to information and software are designed.

On the basis of the analysis in the design process developed methods to improve existing solutions, taking into account the identified main advantages and disadvantages of similar modules of domestic and foreign manufacturers.

The algorithm of management of differentiation of access of employees of educational institution to information structures including processes of identification, authentication and authorization of employees [7] is created.

According to the created algorithm, the database of the educational institution is designed, the variant of differentiation of access to the database tables for employees of structural units is presented.

The program complex of work of the administrator of the automated system with the database of employees of the institution is developed.

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