“Electrophysics” Academic Environment

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Abstract. The recent results of the work carried out by the laboratory of charged particle accelerators information systems in Department of Electrophysical facilities NRNU MEPhI are considered. The researches are connected with the creation of the data-processing support center and remote access of the main educational cycles (within the department). The creation process of the virtual electrophysics laboratories, which can simulate the operation of the main accelerators subsystems and the related research work, is also considered.

1. Introduction
Academic environment (AE) “Electrophysics” is an open modular data-processing system based on the computing laboratory local network of the Electrophysical Facilities Department (EFD) in NRNU MEPhI with user access via a global network of Internet.

Figure 1. The structure of AE “Electrophysics”
The structure of AE “Electrophysics” shown at figure 1. Local network consists of a main server, computer room with workstations, network switch and a gateway to the Internet. Windows and GNU/Linux, selected as the gradual replacement of Windows, are used as working operating systems.

OS Windows uses domain access authorization to home directories. The user can get access to all workstations of AE and to his home directory through a single account. In addition, it is possible to access securely the user’s home directory from the Internet through the use of standard GNU/Linux system differentiation of access rights. Besides the authorization and the file storage, the main server provides access to e-mail, Web-server and network printers. E-mail provides authorized sending and receiving emails.

Web-server runs under Apache software and provides the operation of EFD information website (www.accel.ru) and the distance learning portal (edu.accel.ru).

2. Structure and operation
AE “Electrophysics” is aimed to achieve the following goals through the education cycles of EFD:

- Information and methodical support of the department laboratories;
- Provide the work of student groups in computer classes;
- Support of the educational tasks remote execution;
- Provide the information security of educational process.

The open modular data-processing system (work environment) provides the operating of education cycles:

![Figure 2. The information site of EFD (www.accel.ru).](image)
In the information site (it is shown in figure 2) we place the public education materials for students to make laboratory works.

- Charged particle accelerators;
- Vacuum facilities and physical electronics;
- Facilities and power microwave engineering;
- Accelerators Electronic Systems;
- Accelerators Information Systems.

AE “Electrophysics” can operate autonomously from the computer classes EFD network and can also be accessed from the computer networks of different levels – from the training computer classes of the university and computer campus network to the corporate NRBU MEPhI network and Internet. The remote learning tools are the universal cross-platform Web-applications.

3. The portal of remote learning
The core of the distance learning system in AE “Electrophysics” is a set of virtual laboratories:

- Virtual laboratory of vacuum facilities;
- Virtual laboratory of high-power pulsed facilities;
- Virtual laboratory of accelerators electronic systems (since 2000);
- Transportation channels of high-energy particles.

![Figure 3. The authorization to the portal of remote learning (edu.accel.ru).](image)

The portal of remote learning (figure 3) is based on the virtual learning system Moodle, which was chosen because of its Web-application openness, accessibility, flexibility and completeness. The work of different categories of users is strictly regulated, the access rights to various system resources are
determined by the authorization. In the future Moodle is supposed to be the basis of all of the interaction forms between the department education cycles.

All virtual labs are implemented in a common concept, which provides a visual circuit assembly of the studied devices, installation parameters of the elements and the visualization of circuit operation in the graph form of the studied characteristics. Depending on the obtained results, the circuit and the parameters are corrected.

In the remote learning server hosts the individual and group files of student works are always updated and also store various guidelines, individual tasks, e-books and scientific literature. Protecting educational information resources from accidental and deliberate factors is provided by restricting access to information resources for students, teachers and researchers.

Remote learning is an important additional way to empower students’ self-study work. The introduction of the remote learning system has allowed to increase the handling and the efficiency of the educational process.

4. Conclusion

The development of an open modular system of academic environment (AE) "Electrophysics" was carried out using standard technical solutions:

- LAN access provides with authorization and control of access rights, as well as access to the global Internet;
- Windows and GNU/Linux used on as a working operating systems. The web server is running the Apache software.

Specialized Internet resources have been developed to support learning process of education cycles AE “Electrophysics”: information website www.accel.ru and portal of distance learning edu.accel.ru.

A distance learning tools are universal cross-platform Web-based applications and available from computer networks at various levels and can operate autonomously from the network computer classes EFD.

All virtual lab implemented a total concept, which enables the visualization of the electrical and vacuum systems in an interactive graphical mode.

Distance learning is an important additional way to empower students’ independent work. The introduction of the distance learning system has allowed to increase handling and efficiency of the educational process. In the future, Moodle needs to be the basis for all forms of cooperation between the cycles of the Department of Education.

5. References

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