Abstract

of attestation master's degree work

subject:

"Semantic Grid infrastructure for applications in biomedicine"

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The purpose of work

The purpose of the given work is to research and analyze existing semantic Grid infrastructures in the biomedical field.

Urgency of spent researches

Computer technologies are becoming more widely used in medicine. Biomedicine - one of the fields selected in Europe to develop and deploy Grid - technology. Primarily, this concerns problems of creating databases of hereditary diseases of patients. In addition, biomedical Grid have to compile a database of various clinics for the organization of a virtual hospital.

Trying to solve the problems of medical care, health care is increasingly truing to use information technology, which will help in managing resources, reducing queues, eliminate errors and ensure the current level of treatment of people living in remote regions. However, progress in modernizing the health care is hampered by a number of such factors as: the passing and an understanding of the patient's records between organizations within and between countries, uncertainty about information protection and monitoring of data access, identifying reliable sources of information for comparison; managing large volumes of data, especially in the field of medical genetics, the use of traditional information networks and technologies in health care. However, Grid technology will enable clinicians to overcome many of these difficulties.

Expanding knowledge base of biomedical domains is reflected in growing volumes and complexity of clinical data generated and utilized in contemporary health services. Development of software for interpreting the medical data goes forward together with the development of systems for storing and retrieving the data. Whereas the medical information systems are widely utilized for managing hospital data and basic communication between public health service subjects, the development of systems, which are capable of complex data evaluation in medicine, meets serious methodological and computational difficulties. Some of the difficulties can be overcome by applying semantic grid technologies.

Biomedical research requires integrated access and management of various information sources, analysis methods and applications. Research work also requires to investigate, characterize and obtain access to new sources of information. To ensure the integration, access, and research an appropriate Grid infrastructure is needed to create, which would better respond to the specifics of biomedical data and all biomedicine.

Tasks solved in work

The work presents theoretical information on the existing Grid infrastructure for biomedicine, considered various options for architecture and the various methods of building infrastructure, different functions of Grid infrastructure services.

An analysis of existing Grid infrastructures, taking into account the purpose of each and a list of tasks that they perform in accordance with the requirements of complex, modular nature of biomedicine are represented in this work.

The achieved results

Results of the carried out research is to identify infrastructure requirements for biomedical Grid, taking into account the needs of the area that is rapidly changing, evolving and growing, as well as compliance with current standards of the world of biomedicine and existing infrastructures Grid for biomedical, analysis

of the last, including: Grid Infrastructure for Research in biomedicine, caGrid, Semantic Grid infrastructure for integrated access and analysis of multilevel biomedical data for cancer research, ACGT, Semantic Grid infrastructure, SEAGRIN and project MIAKT (Medical Imaging with Advanced Knowledge Technologies).

Scientific novelty

The innovation of the executed work consists in use of the Semantic Grid for building the infrastructure for biomedicine. In the theoretical plan work presents a model for Grid infrastructure for biomedicine based on existing Grid infrastructures such as caGrid, ACGT, SEAGRIN, MIAKT, considering the specific structure and purpose of each of them, as well as the tasks for which they were created.

The practical value

The practical value of the work is to obtain a theoretical basis for the construction of Grid infrastructure for applications in biomedicine. The results can be used as a recommendation to build Ukrainian Grid infrastructure for applications in biomedicine.

Conclusions and recommendations

The work analyzed the main problems faced by modern medicine, adapting to new standards and requirements of their foreign counterparts, which are developing rapidly. In solving these issues and to derive biomedicine on a new, modern living, technologies of Semantic Grid are suited best.

The work gives a detailed theoretical description of the four options for biomedical Grid infrastructure: caGrid, ACGT, SEAGRIN and MIAKT. Each of these projects is aimed to solve the problems of biomedicine, facilitating the work of geographically distributed specialists in co-operation, dissemination of new research between remote medical facilities, working with large volumes of data,

creation the security service. However, each of the models covers only part of biomedicine.

This work was focused on cancer, on solving cancer problems caGrid, ACGT and MIAKT were aimed. Infrastructure of caGrid, however, analyzing characteristics of its architecture and services, the realization of a framework that can benefit the entire biomedical community. Infrastructure SEAGRIN is a universal infrastructure, without some concrete range of issues to be resolved and a focus on solving the problems of a specific disease. That is why infrastructure SEAGRIN and caGrid can be used as an example to build Ukrainian Grid infrastructure for applications in biomedicine.

This work can not be considered solid in the development of infrastructure for Grid applications in biomedicine and do not claim to absolute completeness, because studies were based on analysis of four existing infrastructures Grid for biomedicine, which were created to address certain specific range of issues related to the disease of cancer. It is therefore recommended to conduct more detailed studies for each specific issue of biomedicine and the tasks that must be addressed. Also, the universality of caGrid infrastructure and SEAGRIN does not guarantee the success of these infrastructures for solving specific problems of biomedicine. Detailed study is required, based on existing projects and their analysis, applied to a specific problem.

Work on 144 sheets contains 13 illustrations. By preparation of work the literature from 15 different sources was used.

The list of keywords:

Semantic Grid, Semantic Web, Ontology, Biomedical Grid, metadata, postgenomic clinical trials, the semantic integration of heterogeneous biomedical databases, service-oriented architecture, Wrappers, Workflows, Basic Formal Ontology, caGrid, caBIG.