ІНФОРМАЦІЙНО-ВИМІРЮВАЛЬНІ ТА ОБЧИСЛЮВАЛЬНІ СИСТЕМИ І КОМПЛЕКСИ В ТЕХНОЛОГІЧНИХ ПРОЦЕСАХ

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INFORMATION TECHNOLOGY FOR DATA EXCHANGE BETWEEN PRODUCTION PURPOSE INTEGRATED AUTOMATED SYSTEMS

The architectural solutions and generic requirements for production data integrated information environment development have been proposed. This environment serves for data adding, editing, saving and deletion. The suggested mathematical model is able to transform and present production data in the unified intermediate format. The model uses templates for data transformation and establishes relations between objects of production like integrated automated systems.

Keywords: information technology, production data, data integration, integrated automated systems, enterprise unified consolidated environment.

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ИНФОРМАЦИОННАЯ ТЕХНОЛОГИЯ ОБМЕНА ДАННЫМИ МЕЖДУ ИНТЕГРИРОВАННЫМИ АВТОМАТИЗИРОВАННЫМИ СИСТЕМАМИ ПРОИЗВОДСТВЕННОГО НАЗНАЧЕНИЯ

В статье представлены архитектурные решения и общие требования к построению консолидированной информационной среды производственных данных, в которой происходит добавление, корректировка, сохранение и удаление данных. Предложена математическая модель преобразования и представления производственных данных в едином промежуточном формате, которая использует шаблоны преобразования данных и устанавливает связи между объектами в интегрированных автоматизированных системах производственного назначения.

Ключевые слова: информационная технология, производственные данные, интегрированные автоматизированные системы, единая консолидированная середа предприятия.

INTRODUCTION

Historically every enterprise has different automated information systems that usually work independently and solve particular range of tasks. Some production tasks are being solved not efficiently or not solved at all unless using consolidated data supplied by several systems. This highlights urgency of the information systems integration in data regards. Certainly, the urgency of such integration increases together with the level of users who utilize control system (e.g. for decision making on an enterprise scale it is most probably required to get data from different departments, domains and different automated systems correspondingly) [1–12].

Usually some partial solutions for data integrations that are intended to set-up data exchange between two particular automated systems are created by IT specialists or companies-contractors when data integrations issue is being solved. It should be admitted that such approach is highly efficient from the viewpoint of data exchange (due to own data exchange mechanism usage) as well as costs perspective. Nevertheless, there are some obvious drawbacks related to flexibility and scalability of such solutions. Ultimately, savings of mentioned above partial solutions may be even to significant expenses required for their support due to constant changes in information environment.

RESULTS

The objective is to represent the results of the production purpose integrated automated system (IAS) technology development on the data exchange layer between users in the enterprise integrated information environment.

The following tasks should be solved to achieve the objective:

- to develop architecture of enterprises unified consolidated information environment;
- to develop mathematical model for data transformation.

XML based data exchange format which allows describing data structure in the unified format common for an enterprise has been used. Any data package can be described and represented using XML. Modern programming tools (e.g. Microsoft.Net or Sun Microsystems Java) have been used and allow creating objects in random access memory based on XML description (known as deserialization procedure). Since in the given architecture central hub

is considered as passive element and doesn't contact other IASs immediately additional attention has been payed in order to organize feedback approach. All calls are being addressed with proper feedback and stored in the database. This allows implementing bilateral exchange between systems by using 'mediator' – central concentrator [1, 2].

A concept of 'data consolidation' is commonly used in the unified information environment development. Implementation of data consolidation implies development of the unified consolidated environment with a central link – a separate IAS. This IAS manages processes of data integration and exchange between different production systems. The logical relations of data transformations and information about data dislocation are being formed and stored along with data itself in data concentrator. In other words data concentrator is a separate IAS with its own database and can either store or process data in case no data output available. It should be mentioned that data concentrator serves as data storage system and has its own database and corresponding software tools that allow organizing unified consolidated data information environment. Detailed conceptual diagram of the unified consolidated data environment on the figure 1 is represented by the generalized data flow diagram.

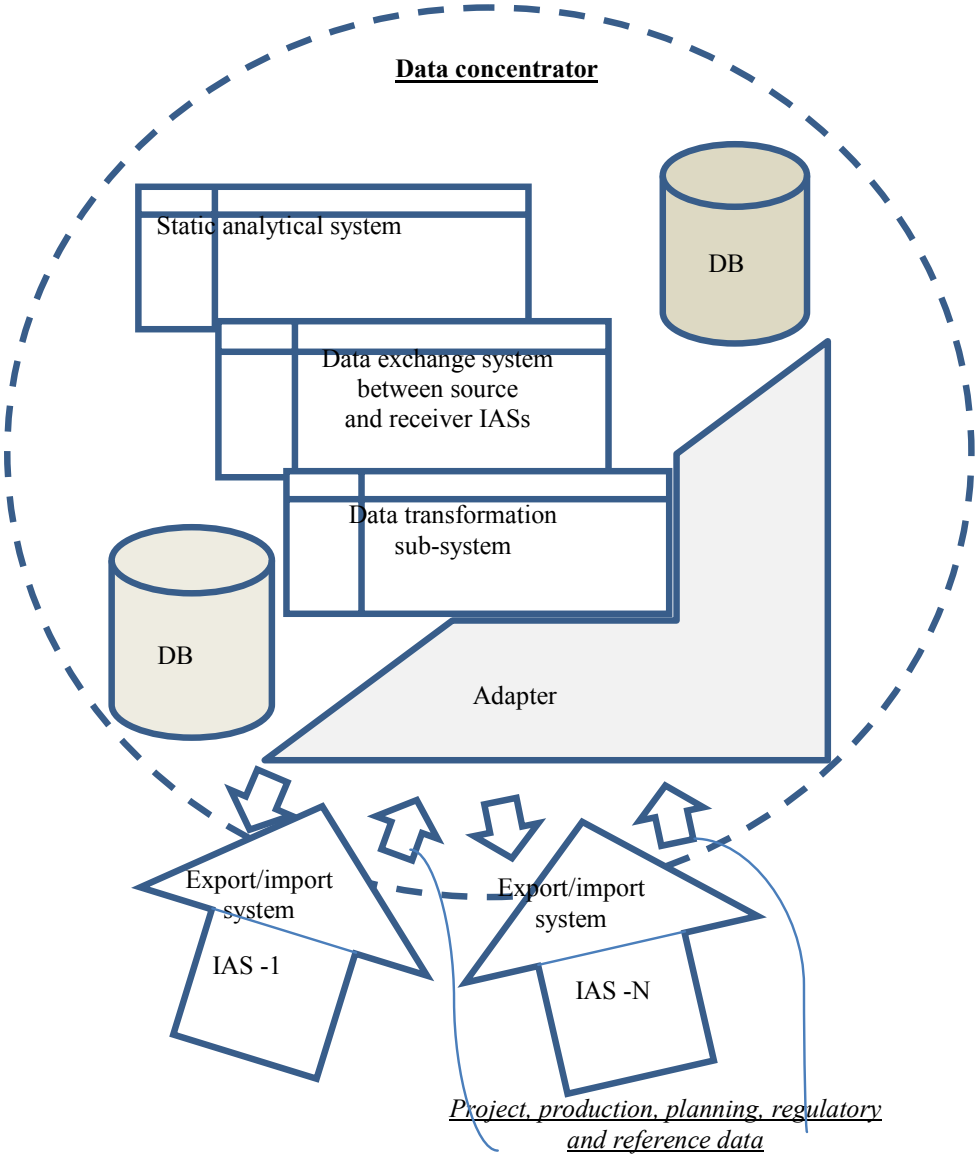

Fig. 1. Conceptual diagram of the unified consolidated information environment

The source IASs are placed on the lower level. They are filled with their own registries and directories in their own data structures and formats. Systems transfer data from their databases to the upper level. These IASs can be also considered as source IASs receiving data from higher levels.

It should be noted that data exchange with higher levels implies separate module introduction, namely export-import system of IAS. It can be either internal module of IAS or external module specially developed to create the unified consolidated environment [5].

The central part of diagram is IAS 'Data concentrator'. The diagram consists of central database and software modules that provide interaction between source data IASs (and with IAS 'data receiver') on the one hand, and on the other hand, process data from central database as well as any reporting required within outer counter of the unified consolidated information environment [3, 4].

As depicted on the diagram, it is required to create interaction adapter for each operational IAS (marked as

'adapter for IAS-i' where 'i' is a sequential number of operational IAS). In order to guarantee reasonable time for new IAS connection to the unified consolidated information environment, development costs reduction as well as further architecture support – adapter must be unified and customizable rather than be developed from scratch for each IAS.

To ensure the reliability of data presentation it is required to transform data from one format to another. Transformation issues can be solved in two ways:

1. To write direct data transformation functions from one structure to another.
2. To develop the unified data format which is able to transform any formats of IAS.

The first option is used more frequently due to its simplicity: it is required to set correspondence between fields of database and move data using several queries. This is an easy task when data should be transferred from one IAS with more full and certain structure to another simpler one. Though, some difficulties may occur in backward compatibility.

The second option is more versatile for integrating a massive information system which is the basis for information technology of production, regulatory and reference data consolidation and synchronization. The advantages of this option are the following:

1. It is possible to create data representation templates. In future, it may be decided to use this format as standard for existing IAS in case of some changes.
2. IAS's production data transformers can be developed regardless for what IAS data is represented. Data transferred to the template format can be further transformed to any production purpose IAS included into unified consolidated environment data exchange.

The central concentrator determines whether the prompt response required for the given data package. The prompt response is not sent in case a passive environment for data packages transferring has been used. The concentrator prepares response by processing the data package in case when web-sessions (or analogies) are used.

When identified that the response can't be sent in time, another system notification is sent mentioning that data package has been received for processing and will be sent later on. An IAS which is supposed to receive data gets data from the central concentrator in 2 ways: active and passive.

The active approach requests certain information. The request is organized in the unified data exchange and sent in the same format. If it were a block of data, the title would be marked correspondingly. If structure fields are filled, the data concentrator considers them as search parameters and uses them to query database. The response is formed in the unified data exchange and sent to requestor IAS.

In passive approach IAS is subscribed to data updates in data concentrator. In accordance to the schedule data concentrator checks data updates in the database depending on registers determined for the given IAS and sends updates package to IAS [6, 7].

CONCLUSION

As a result of research conducted, the architectural solutions and generic requirements for the consolidated information environment for production data have been developed. This environment is a unified repository where data can be added, modified, stored or removed. Production data comparison and exchange between systems are being performed in the central element, namely data concentrator.

Different IAS format data representation is performed through data transformation using the unifier of data exchange. Unlike other existing architectures the given one provides different production purpose IAS data processing as well as data exchange allowing the establishment of systems linkage by corresponding relations between their objects. In the article was formalized the task of integration of integrated automated system at the level of exchange by data between users.

Technology of exchange is offered by data, that is based on development and use of the integrated informative environment and unificator of exchange data. Researches are based on experience of development, introduction and use of the modern integrated automated system of the productive setting. Architectural decisions and general conditions of construction of the consolidated infomedia of productive data, that is single data base, are worked out, addition, editing, economy and moving away of data, comes in that true.

In a difference from existent architectures, in offer there is possibility of treatment of these different integrated automated systems of the productive setting and an exchange is provided by data between these integrated automated systems, that allows to "link" inter se the systems by creation of connections between objects in the systems. The presented technology of exchange passed experimental approbation data on base for research industrial enterprises of Ukraine.

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