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**SPECIFIC OF LAYERED ARCHITECTURE IMPLEMENTATION
FOR INFORMATION SYSTEMS AND ITS USE
IN TEXTILE INDUSTRY ENTERPRISES**

V.I. MONAKHOV, A.V. MILITEYEV

(Moscow State Textile University "A.N. Kosygin")

E-mail: office@msta.ac.ru

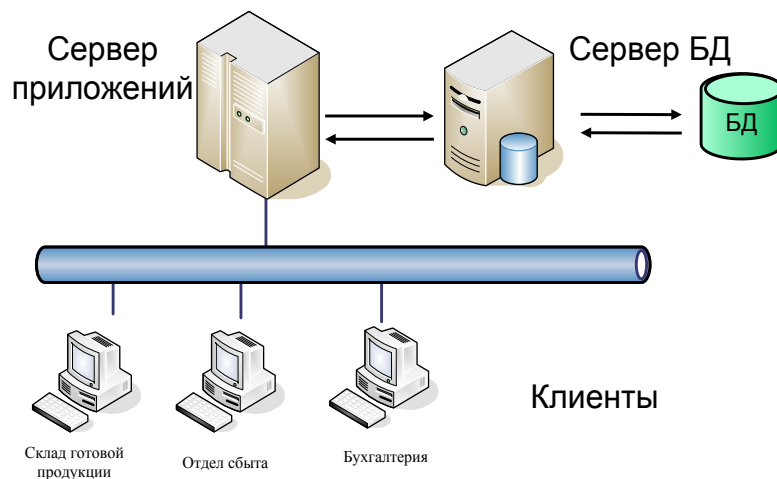
Multi-layer client-server architectures are the most common in the development of automated information systems. The article concentrates on the distinctive features of construction of such systems, their advantages, disadvantages and possibilities for usage at the enterprises of textile industry. The approaches to implementing such systems are considered. To design an interface of client tier, it is suggested to use Java language, Application Server - Apache Tomcat Servlet container, a database server - Oracle Database.

Keywords: client-server, business logic, client, application server, servlet, http, ssl, database, DBMS, caching, navigation tree.

Modern information systems are based on layered architectures, providing an efficient and reliable processing of company's information. Most common among the multi-layer architectures are the two-tier [2], [3] and three-tier architecture client / server (three-tier architecture) [1], [4]. The three-tier applications assume the availability of the following components: client, application server, database server. The article concentrates on the construction of such systems, and possibilities for their usage at the enterprises of textile industry.

The three-tier architecture for the management tasks to sell finished products can be

schematically presented in such a way, like it is shown in Picture 1. The client in such architecture – this is an interface application component which represents the first layer, application of end user. The first level has no direct connection to the database in compliance with the requirements of security, scalability and reliability. Usually, simple business application logic is placed at the first level: authorization interface, information input and output functions, check of input values for validity and compliance with the format, simple operations with the data already loaded into memory of a client computer (sorting and grouping of data, calculation of values).



Picture 1. Multi-tier sales management application

Application Server is located at the second tier. Major part of business logic of application is concentrated at this tier. Outside of this server remain the rules that have been delegated to clients (simple logical checks) as well as to the database server (in the form of stored procedures and triggers). All commands to work with data coming from the keyboard of client station, the received commands are compiled and transmitted to the database server, and information received from the database is returned to be displayed on the client screen, are transmitted to the server applications via TCP / IP protocol. For each user a separate module unit is used. Several modules, each of which is arranged as a separate service that provides some services to all types of client programs (such as sales management functions, can be implemented as part of the application server: transfer of goods from production to storage, shipment of products to buyers, settlements with buyers in the accounting, etc.) . Start of modules and their communication with customers are implemented through the program, the Server Manager.

Database server provides data storage and is placed to the third tier. Usually, this is a standard relational DBMS. The third level represents the database as a schema describing an application in terms of the relational model, while the second level is constructed as a software interface that connects the client components to the application logic of database. The database server must meet certain requirements for functionality and for him

there must be JDBC driver (Java Database Connectivity) needed to work with application data. The most popular products, such as Oracle, Microsoft SQL, and open source PostgreSQL can be used as DBMS. High requirements to performance of database server are imposed, when working with large volumes of data, in view of a large diversity of the range of products manufactured at a textile plant and fine detailing of a consignment (piece-by-piece records). Oracle database version 10.11 meets these requirements more complete.

The advantages of three-tier architecture are [3], [4]: no problems in the deployment and customer service, scalability and highly configurable application, high safety and reliability of data storage, low requirements for the client hardware specifications and speed of communication channels between client and server applications. Among the disadvantages are: complexity of implementing and administering of the server, a more complex design of applications, high requirements for hardware server specifications.

We shall note some features of the proposed implementation of multi-tiered application. Client interfaces and server applications modules are written in Java, which provides a cross-platform bias for applications to be developed (i.e. they can be operated on any hardware platforms, Intel, AMD, Sun and operating systems, Microsoft Windows, Linux, FreeBSD). To be able to work, clients must install the freely available library of Sun JRE. Modules on the application server are de-

signed in the form of servlets. A servlet is a Java-program that runs on the server side and extends the functionality of the server. The servlet communicates with clients using the principle of a request-response over HTTP. To run the servlet, application server must be used that can serve as a servlet container. The most common today is Apache Tomcat free-ware version 6 [5]. Built on J2EE technology the product is a cross-platform application server. Of the application software on the server, you must install libraries Sun JDK, which are also freely available.

To maintain confidentiality in sharing information with the client over HTTP on the server, a secure connection, utilizing the application server encrypted communication protocol SSL / TLS (Security Socket Layer / Transport Layer Security) must be used. In order to enable Tomcat to handle requests for SSL / TLS-connections, configuration settings are to be carried out (adjust the file "web.xml", describing the configuration of application server) and the keys are to be generated that will be used for encryption. Using the application with the ability to access data from the Internet is allowed only when configuring a secure connection using SSL and restrictions, provided with the aid of a network filter, deployed on the border of the local and open network.

To increase productivity both of application server and client sites, data caching (received from the database server) is carried out, on the application server, as well as on client computers. Caching options are set in the configuration files of the application server. To provide flexibility of client-side, business logic of processes for data input according to standard procedures (acceptance of products, preparation of a batch of products for shipment) is stored in a database as a transition tree. Chains of tree form the business logic of a defined process, such as forming an order for shipment, control of debt from the buyer, selection of products and the formation of a consignment consisting of fabric pieces, control of availability of products in stock, etc. Process chains for a particular operation control the sequence of changing data entry forms displayed on the customer's screen.

Each tree node contains information about the called entry form and options for extension, depending on the result of the end of the previous step. Since the business logic of the navigation tree is stored in the database, it can be freely readjusted and configured without changing the client programs.

CONCLUSIONS

1. The best option for constructing information systems for the textile industry is the use of multi-tier client-server architecture. This option provides application scalability, security and reliability of data storage, low requirements for technical specifications of the client sites and the speed of communication channels.

2. The principles of constructing a layered architecture have been considered by an example of a textile company.

3. Techniques for implementing the elements of multi-tiered application have been proposed.

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