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Connecting the Web Pages to Databases

In this paper, it tried to make a presentation of the concepts underlying the operation of the Internet, how to transfer information, and interfaces client - server. The concepts presented in this paper have not only a teaching purpose, but they refer both to the advantages of using technologies to connect the Web pages to databases and the problems that can occur in implementing these technologies.

Keywords: *Web pages, databases, client-server architecture, MySQL*

1. Introduction

The Internet started as a network of four computers between the University of Utah, Santa Barbara, Los Angeles and Stanford Research Institute. Relatively quickly, the technology has become interesting for researchers from other state institutions. In the '60s - '70s there was a network of about 50 computers using FTP protocol to transfer files. Emergence of Web technology was inevitable, because it demanded work interfaces ever developed with multiple features.

The challenges posed by the possibility of transferring data over the Internet had only to give a strong impetus to new ways of programming and lead to a rapid maturation of some concepts and technologies, which will integrate to a unitary concept, known today as the web applications. Therefore, in June 1993 there were 130 registered web servers and in 1994 were already 11 500 servers. A few years later, came the notion of E-Commerce which introduced items such as catalogs and order forms online.

Simultaneously with Web technologies have evolved greatly and the database management systems. Oracle, PostgreSQL, MySQL, MS SQL Server, Progress are just a few names of database management systems used today as servers that store and provide data for Internet applications.

Chapter 2 describes in detail the client - server architecture, presenting how to connect the client to a database via a web server. Also described the TCP/IP protocol, to make known the way of transmitting information between the client

and server and highlight problems that may occur in interconnection using this protocol.

Chapter 3 describes the MySQL database management systems, presenting a history of this database management system, the key management commands and the visual management tools.

Chapter 4 is a practical synthesis of the theories listed in previous chapters. This chapter presents the practical operation of a Web 2.0 application, with applications in industry.

2. Client-Server Architecture

The client-server architecture describes the relationship between two computer programs, where is the distinction between client and server when they communicate through a computer network.

A client/server application is a distributed system that includes both the client and the server software. The software installed on the client machine initiates a communication session, while the server waiting for a request from the client. Usually, more clients can connect simultaneously [1].

The server processes are divided into two types: iterative and concurrent servers. When a server process treats each request individually, then the type of server is iterative. In other words, the server treats the requests as they arrive. In order to be effective, the iterative servers must provide services that are not resource intensive, in other words, providing information to be made in a short time. An iterative server example, is such that providing the exact time.

When the necessary time to fulfill a request is unknown or unpredictable, the server processes usually work as competitive servers. A competitive server creates one separate process for each client, In other words, it manages multiple parallel service requests. A competitive server requires an operating system that can handle multiple processes simultaneously. Time to meet a specific service launched by a client is variable, depending on the operations and size of files generated to resolve a request from the client [1].

A classical client/server architecture, which is composed of a Web server and database server, is shown in Figure 1.

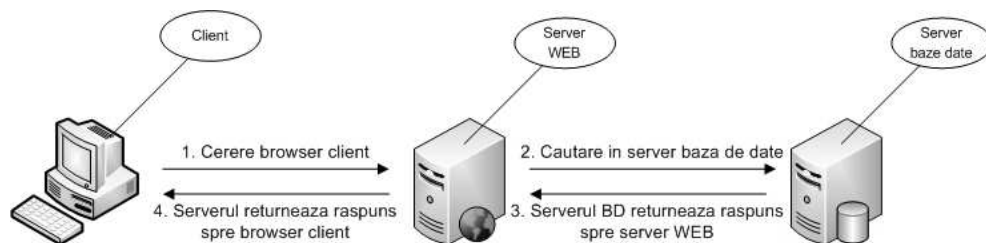


Figure 1. Classical client/server architecture.

For Web browsing, the browser is client software that addresses a request to the server identified by IP address or by DNS (Domain Name System) domain name. To exchange data between them, the communication protocols are made through ports. Ports have integers between 0 and 65535. The combination of IP address and port is a socket or a communication channel. The socket creates facilities for I/O flows which allow data exchange between client and server [1].

When a client socket sends a packet to a socket server, the package contains both the port number and address of the client machine. With the information received, the server knows which client to send the reply.

When using sockets, must determine which type of protocol will be used to transport data over network. From this point of view, you can use connection-oriented protocols such as TCP/IP (*Transmission Control Protocol/Internet Protocol*) or connectionless protocols such as UDP/IP (User Datagram Protocol/Internet Protocol) or RTP (Real Time Protocol). In case of connection-oriented protocol, a client socket establishes a connection to a server socket when this one is created. Once the connection is done, is checking if the data were transmitted surely, ie [3]:

- Each packet is sent. If the client socket receives no response within a specified time, continues to send packets until the transmission is successful or until the TCP/IP protocol considers that transmission is impossible;
- Packets are read to destination socket in the same order they were sent. Connection-oriented protocol can restore order in which packets were sent;

A connectionless protocol is a protocol that enables faster transmission of packets. It is usually used for packages that are used to video or audio transmissions. The gain speed towards connection-oriented protocol comes from the fact that the order in which packets arrive is not checked. If TCP/IP uses seven control packets to transmit a single packet, UDP/IP protocol uses only one seven control packet. In addition, the recipient program may not be available for receiving data. Check if packets have arrived in full [1].

To connect the web pages to databases use only TCP/IP protocol, given the importance of full and accurate transmission of data from client to server and vice versa.

3. The MySQL database management system

MySQL is a relational management system RDBMS (relational database management system) running as a server, providing opportunities for multi-user access to a number of databases [2].

MySQL is popular in Web applications and it is part of the applications such as LAMP, BAMP, MAMP and WAMP on Linux/BSD/Mac/Windows - Apache-MySQL - PHP / Perl / Python. MySQL's popularity was closely related to the PHP, so most

times the two applications being used "package". MySQL's stability is proven that many sites use its database engine, such as Flickr, Facebook, Wikipedia, Google, Nokia, YouTube, etc. Large corporations such as NASA also use MySQL [5].

MySQL code is written in C and C++. The SQL parser uses Yacc (Yet another compiler compiler) formal grammar, and the lexical analyzer Lex which aims to provide chips for Yacc, but it will go through the command line inputs and analyze them in terms of syntax.

MySQL can be embedded in a variety of applications such as management applications, indexed search, redundant systems, and on-line transactions. Storage engine which manages queries and interfaces between users and the database is very critical software for any management system of database system. MySQL offers several storage engines with different advantages [2].

For understanding the functioning of the MySQL database server, the figure 2 presents the basic components that constitute the structure of the MySQL server.

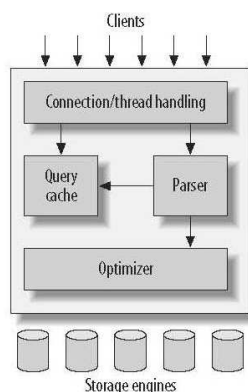


Figure 2. The overall structure of the MySQL server.

Layer at the top contains services that do not belong only to MySQL. In principle, these services are network services and are shared by the client and server, such as: context connection, authentication, security, etc. The second layer contains the MySQL core (queries' parser, syntax analyzer, optimizations, joins and all implemented functions). Any functionality provided is found in this layer: stored procedures, triggers, views, etc.

The third layer contains storage machines that are responsible for storage and delivery of stored data. The server communicates with these machines through storage engine API (program interfaces with other applications). These interfaces hide the differences between storage machines and provide a transparent working for user with the query console. This API contains several functions at the bottom level performing operations such as starting a transaction, the scroll lines, etc. SQL storage machines do not analyze nor communicate with each other, but respond to requests coming from the server [4].

To manage the database system, can be used written commands in command line mode, of which the most used are *mysql*, *mysqlaccess*, *mysqladmin*, *mysqldump* and *mysqlshow*.

4. The practical application

To illustrate the theory presented in previous chapters, it presents a practical application involving management technologies in a large company.

The application was designed with the idea that this organization is composed of several production units, connected to each other through intranet. The work technology is the activity to develop the documentation needed to manufacture a product. In general, in production use so-called technological sheets containing a normalization of labor (hours worked on each operation), an information about the necessary materials for production and processing operations faced by these materials to produce finished product.

It was assumed that the application will be managed centrally, to ensure data consistency and to facilitate easy application management by a single network and database administrator, thus reducing the staff costs. However, the possibility of viewing real-time reports enable high-speed response from decision makers and a small paper consumption, which at a large organization leads to much lower costs.

The application will be additionally secured using security manager. The reports will be generated using servlets and the introduction and modification forms of data entry will use Java Server Pages pages, where written modules will be implemented in JavaScript and Ajax, to allow dynamic modification of forms, without requiring additional data from the server, for decongestion of traffic.

As a database server it will use MySQL, and as the application server will be used Apache Tomcat 6.0.18. The Web server and the database will be located on the same computer. To update the forms remotely, an FTP server was used. Outline application on the network level is given in Figure 3.

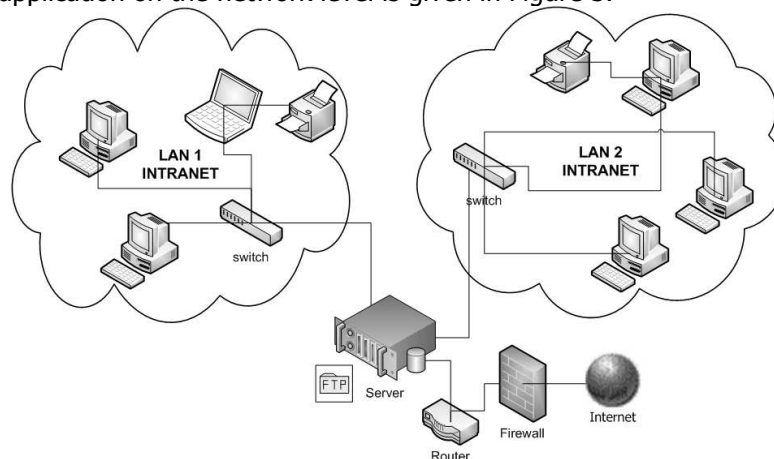


Figure 3. The work requirements of the application.

As you can see there are two intranets, whose computers will access the server, sending requests and getting as response the work forms or specific reports according to passed parameters. The server can be accessed from outside via the Internet, which requires increased security measures.

In this case, application implementation consists of installing the operating systems on server, installation and setup of Apache Tomcat server, installing MySQL server and Java environment.

The application is composed of several work forms. The forms have a dual role: receiving data from the database and input data in the database. Because, the requirements for achieving required that the application to be secure in terms of access, this required to activate the security manager from Apache Tomcat server, thus establishing access rights for users. Therefore, the global access to application is possible using a username and password.

Enabling security manager has made global for all application pages. Once stored combination of user - password in the password manager browser, to access other pages the authentication is not necessary to repeat. Authentication rights have been established in the *login* database, which contains two tables, called *roles* and *users*. The *roles* table has two fields, *user* and *role*, where the corresponding login data are stored.

After logging has been made, enter to a JSP page that accesses a menu written entirely in JavaScript, which refers to appropriate actions, depending on your selection, as shown in Figure 4.

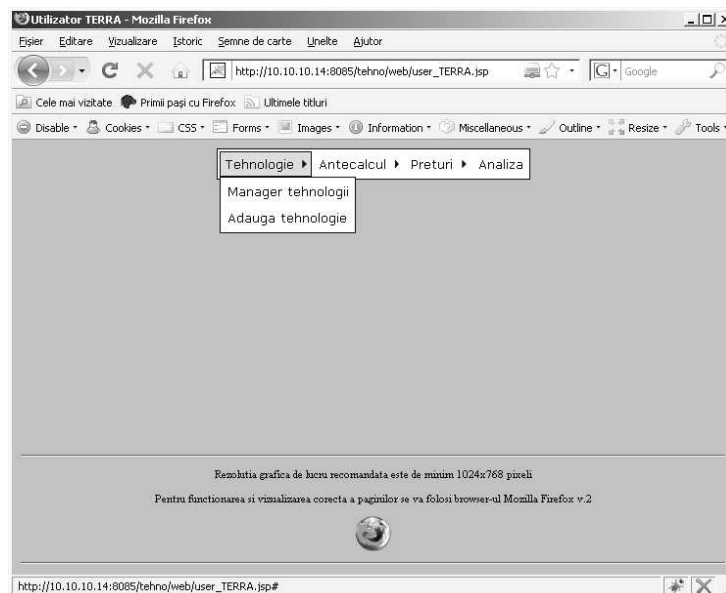


Figure 4. Accessing the web pages of the application.

http://10.10.14:8085/tehn/web/mod_tehnno.jsp?id=0001

Cele mai vizitate Primi pași cu Firefox Ultimele titluri

Disable Cookies CSS Forms Images Information Miscellaneous Outline Resize Tools View Source Options

Utilizator TERRA Proiectare tehnologie

Date identificare tehnologie nr 0001 din 19-08-2008

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| Beneficiar | COLMAR ITALIA | Proiect | 1370287320 | | |
| Intocmit | TEHNOLOG 1 | | | | |
| Verificat | VERIFICAT 1 | | | | |
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LISTA SUBANSAMBLE

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|--------------|--|--------|-------|------------|----|------|---------------|-----------------|-----------|------------------------|
| 11T80000083 | TABLA S355J2G3 20/2000X12000/3.1 EN 10025/EN 10029 | 2 | 3 | 1370287170 | MP | 1.00 | 730.0 825.0 | 725X820 | 60.06 | Sterge |
| 11T80000083 | TABLA S355J2G3 20/2000X12000/3.1 EN 10025/EN 10029 | 2 | 4 | 1370287180 | MP | 2.00 | 665.0 870.0 | 660X865 | 40.85 | Sterge |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 2 | 5 | 1370287220 | ML | 2.00 | 362.0 | 357 | 2.80 | Sterge |
| 11T80000052 | TABLA S355J2G3 10/2000X12000/3.1 EN 10025/EN 10029 | 2 | 6 | 1370287260 | MP | 4.00 | 105.0 135.0 | 100X130 | 0.59 | Sterge |
| 11T80000052 | TABLA S355J2G3 10/2000X12000/3.1 EN 10025/EN 10029 | 2 | 7 | 1370287270 | MP | 4.00 | 75.0 65.0 | 70X60 | 0.20 | Sterge |
| 11RL00000189 | OTEL ROTUND OLS2.2K 95/6000/3.1 STAS 500/STAS 333 | 2 | 8 | 1370287290 | ML | 2.00 | 108.0 | 103 | 3.59 | Sterge |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 2 | 9 | 1370287250 | ML | 1.00 | 405.0 | 400 | 3.14 | Sterge |
| 11RL00000189 | OTEL ROTUND OLS2.2K 95/6000/3.1 STAS 500/STAS 333 | 2 | 10 | 1370287300 | ML | 2.00 | 45.0 | 40 | 1.40 | Sterge |
| 11RL00000189 | OTEL ROTUND OLS2.2K 95/6000/3.1 STAS 500/STAS 333 | 2 | 11 | 1370287290 | ML | 2.00 | 52.0 | 47 | 1.52 | Sterge |
| 11RL00000189 | OTEL ROTUND OLS2.2K 95/6000/3.1 STAS 500/STAS 333 | 2 | 12 | 1370287310 | ML | 4.00 | 20.0 | 15 | 0.40 | Sterge |
| 11LT00000058 | OTEL LAT OLS2.2K 40X10/6000/3.1 STAS 500/STAS 395 | 2 | 13 | 1370287190 | ML | 1.00 | 925.0 | 920+DESEN | 2.85 | Sterge |
| 11LT00000058 | OTEL LAT OLS2.2K 40X10/6000/3.1 STAS 500/STAS 395 | 2 | 14 | 1370287200 | ML | 1.00 | 921.0 | 916+DESEN | 2.84 | Sterge |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 2 | 15 | 1370287230 | ML | 1.00 | 1127.0 | 1122 | 8.80 | Sterge |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 2 | 16 | 1370287240 | ML | 1.00 | 985.0 | 980 | 7.54 | Sterge |
| 11LT00000058 | OTEL LAT OLS2.2K 40X10/6000/3.1 STAS 500/STAS 395 | 2 | 17 | 1370287210 | ML | 2.00 | 912.0 | 907 | 2.83 | Sterge |
| 11RL00000013 | OTEL ROTUND OLS2.2K 20/6000/3.1 STAS 500/STAS 333 | 2 | 18 | 1370287350 | ML | 1.00 | 28.0 | 23 | 0.05 | Sterge |
| 11T80000030 | TABLA S355J2G3 8/1500X6000/3.1 EN 10025/EN 10029 | 2 | 19 | 1370287360 | MP | 1.00 | 25.0 316.0 | 20X311 | 0.38 | Sterge |
| 11T80000052 | TABLA S355J2G3 10/2000X12000/3.1 EN 10025/EN 10029 | 2 | 20 | 1370287370 | MP | 1.00 | 105.0 135.0 | 100X130+DESEN | 0.44 | Sterge |
| 12SVD0000005 | SARMA FILCORD C/1,2 AYS AS.18/ER 70S-6 EN 440/G3/S11 | 2 | 21 | | KG | 8.00 | | | 8.00 | Sterge |
| 12CE00000008 | EL SUPERBAZIJ,25 AYS AS.1/VE 7018 EN 489/E 42 4 B-42 H10 | 2 | 22 | | KG | 1.00 | | | 1.00 | Sterge |
| 13GR00000028 | GRUND ACRILIN //G577035//GRI KOBER | 2 | 23 | | KG | 0.50 | | | 0.50 | Sterge |

Figure 6. The form to entry data into a technology.

Data taken from these forms are used to generate PDF and XLS files. To produce these documents was used servlets. A major disadvantage of servlets is that we have written so much code to generate HTML pages, and in this case, it is recommended to use JSP pages.

To generate reports, were used Apache POI specific libraries. These libraries allow generations of reports which often cover the needs of customers. An example of report generated in Excel is shown in Figure 7.

| Cod material | Denumire material | Cong. T | Cong. KG | Coef util | Cod reper | Descriere reper | UM | Cant | Lungimi calc | Lung debit | Masa neta | Coef aprov | Traseu tehnel | |
|--------------|--|---------|----------|-----------|-----------|-----------------|----|-------|--------------|------------|---------------|------------|---------------|------------------|
| 11TB00000083 | TABLA S355J2G3 20/2000X1200/3.1 EN 10025/EN 10029 | 0.602 | 94.55 | 0.635 | 3 | 1370287170 | MP | 1.00 | 730.00 | 825.00 | 725X820 | 60.06 | 1.050 | 53X.061.040. |
| 11TB00000083 | TABLA S355J2G3 20/2000X1200/3.1 EN 10025/EN 10029 | 0.579 | 90.83 | 0.450 | 4 | 1370287180 | MP | 2.00 | 865.00 | 870.00 | 860X865 | 81.70 | 1.050 | 53X.061.040. |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 0.362 | 2.84 | 0.985 | 5 | 1370287220 | ML | 2.00 | 362.00 | 0.00 | 357 | 5.60 | 1.030 | 002.271.272.MAN. |
| 11TB00000052 | TABLA S355J2G3 10/2000X1200/3.1 EN 10025/EN 10029 | 0.014 | 1.11 | 0.530 | 6 | 1370287260 | MP | 4.00 | 105.00 | 135.00 | 100X130 | 2.36 | 1.050 | LAS.MAN. |
| 11TB00000052 | TABLA S355J2G3 10/2000X1200/3.1 EN 10025/EN 10029 | 0.005 | 0.38 | 0.523 | 7 | 1370287270 | MP | 4.00 | 75.00 | 65.00 | 70X60 | 0.80 | 1.050 | LAS.MAN. |
| 11RL00000189 | OTEL ROTUND OLS2 2K 95/6000/3.1 STAS 500/STAS 333 | 0.108 | 6.00 | 0.588 | 8 | 1370287280 | ML | 2.00 | 108.00 | 0.00 | 103 | 7.18 | 1.030 | 002.020. |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 0.405 | 3.18 | 0.988 | 9 | 1370287250 | ML | 1.00 | 405.00 | 0.00 | 400 | 3.14 | 1.030 | 002.271.MAN. |
| 11RL00000189 | OTEL ROTUND OLS2 2K 95/6000/3.1 STAS 500/STAS 333 | 0.045 | 2.50 | 0.660 | 10 | 1370287300 | ML | 2.00 | 45.00 | 0.00 | 40 | 2.80 | 1.030 | 002.020. |
| 11RL00000189 | OTEL ROTUND OLS2 2K 95/6000/3.1 STAS 500/STAS 333 | 0.052 | 2.89 | 0.526 | 11 | 1370287290 | ML | 2.00 | 52.00 | 0.00 | 47 | 3.04 | 1.030 | 002.020. |
| 11RL00000189 | OTEL ROTUND OLS2 2K 95/6000/3.1 STAS 500/STAS 333 | 0.020 | 1.11 | 0.360 | 12 | 1370287310 | ML | 4.00 | 20.00 | 0.00 | 15 | 1.60 | 1.030 | 002.020. |
| 11LT00000058 | OTEL LAT OLS2 2K 40X10/6000/3.1 STAS 500/STAS 395 | 0.925 | 2.90 | 0.981 | 13 | 1370287190 | ML | 1.00 | 925.00 | 0.00 | 920-DESEN | 2.85 | 1.030 | 002.271.272.MAN. |
| 11LT00000058 | OTEL LAT OLS2 2K 40X10/6000/3.1 STAS 500/STAS 395 | 0.921 | 2.89 | 0.982 | 14 | 1370287200 | ML | 1.00 | 921.00 | 0.00 | 916-DESEN | 2.84 | 1.030 | 002.271.272.MAN. |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 1.127 | 8.85 | 0.995 | 15 | 1370287230 | ML | 1.00 | 1127.00 | 0.00 | 1122 | 8.80 | 1.030 | 002.271.272.MAN. |
| 11LT00000036 | OTEL LAT S355J2G3 100X10/6000/3.1 EN 10025/STAS 395 | 0.965 | 7.58 | 0.995 | 16 | 1370287240 | ML | 1.00 | 965.00 | 0.00 | 960 | 7.54 | 1.030 | 002.271.272.MAN. |
| 11LT00000058 | OTEL LAT OLS2 2K 40X10/6000/3.1 STAS 500/STAS 395 | 0.912 | 2.86 | 0.980 | 17 | 1370287210 | ML | 2.00 | 912.00 | 0.00 | 907 | 5.66 | 1.030 | 002.271.MAN. |
| 11RL00000189 | OTEL ROTUND OLS2 2K 20/6000/3.1 STAS 500/STAS 333 | 0.028 | 0.07 | 0.724 | 18 | 1370287350 | ML | 1.00 | 28.00 | 0.00 | 23 | 0.05 | 1.030 | 002.020. |
| 11TB00000030 | TABLA S355J2G3 8/1500X8000/3.1 EN 10025/EN 10029 | 0.008 | 0.50 | 0.786 | 19 | 1370287360 | MP | 1.00 | 25.00 | 316.00 | 20X311 | 0.39 | 1.050 | LAS.271.272.MAN. |
| 11TB00000052 | TABLA S355J2G3 10/2000X1200/3.1 EN 10025/EN 10029 | 0.014 | 1.11 | 0.395 | 20 | 1370287370 | MP | 1.00 | 105.00 | 135.00 | 100X130-DESEN | 0.44 | 1.050 | LAS.MAN. |
| 12SV00000005 | SARMA FILCORD C1.2 AWS AS.18/ER 70S-6 EN 440/IGS11 | 8.000 | 8.00 | 1.000 | 21 | | KG | 8.00 | 0.00 | 0.00 | | 8.00 | 1.000 | |
| 12CE00000006 | EL SUPERBAZ3.25 AWS AS.1/IE 7018 EN 499/IE 42 4 B 42 H10 | 1.000 | 1.00 | 0.650 | 22 | | KG | 1.00 | 0.00 | 0.00 | | 1.00 | 1.000 | |
| 13GR00000028 | GRINDU ACRLIN /G577035/GRI/KOBER | 0.500 | 0.50 | 1.000 | 23 | | KG | 0.50 | 0.00 | 0.00 | | 0.50 | 1.000 | |
| 13DG00000046 | DLUJANT 02030-CHMTTAN | 0.100 | 0.10 | 1.000 | 24 | | KG | 0.10 | 0.00 | 0.00 | | 0.10 | 1.000 | |
| 12CG00000001 | AM ACTIV GAZ CORGON 18- -JL- SR EN 439/IM21 | 3.000 | 0.00 | 1.000 | 25 | | MC | 3.00 | 0.00 | 0.00 | | 0.00 | 1.000 | |
| 19AP00000034 | BOLT M726/31 505189 ZINCARE | 2.000 | 2.00 | 1.000 | 26 | | BC | 2.00 | 0.00 | 0.00 | | 2.00 | 1.000 | COLAB.MAN. |
| 19CD00000015 | TABLA 2 836.104.42 EXECUTE | 4.000 | 17.60 | 1.000 | 27 | | BC | 4.00 | 0.00 | 0.00 | | 17.60 | 1.000 | COLAB.MAN. |
| 14PD00000013 | PHLUTA M18 DN 439/2/STAS 4373 80/- | 20.000 | 0.40 | 1.000 | 28 | | BC | 20.00 | 0.00 | 0.00 | | 0.40 | 1.000 | MAN. |

Figure 7. Report generated in XLS format using servlet technology.

The data are taken from the database, so these reports can be modified depending on the updates made to the tables containing these data.

5. Conclusion

An advantage of using reports in .xls format is that you can check on the worksheet. Also, these files can be opened with OpenOffice, which eliminates the purchase of licenses for Microsoft Office. For large organizations with multiple workstations, it will lead to a lower cost to implement this type of application present in this paper.

Another advantage of implementing this type of application is that for cases in which reports must be protected from changes, it is possible to generate them in PDF format. Generating these reports is also possible via a servlet, to which the required parameters are passed.

To achieve a friendly working interface, and also to provide high functionality, given the considerable work of the technologist to ensure a coherent circuit of technological flow for obtaining a product, tried that this form to have the same functionality to that of a static application written for example in Swing or MS Access. For this reason it turned to writing code in JavaScript and to the server-side Ajax solutions. The advantage of using these technologies is that the application can be updated remotely, most often without the need of restarting server. There is also the great advantage that all workstations simultaneously accessing updated version, without the need for software updates on the client stations.

Another possibility would be using Adobe Flex technology, but in this case the data processing speed would be much less because accessing the database would be made through ODBC Bridge, and each station would have to install regular updates of the Adobe Flash Player module. It also would have created a resource intensive interface for workstation, server and network. When discussing about industrial applications, is obvious that speed is priority.

Regarding the design, was intentionally a maximum simplification of the working interface, and in this sense was used CSS (Cascading Style Sheets). Because browsers respond differently to CSS templates, was using Mozilla Firefox which is free and is very docile, and also appropriate to CCS standards.

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