

# REPORTING SYSTEM FOR MOBILE

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**Abstract** -The system described in this paper is a real time and interactive reporting system with information visualization. Currently and in the near future the services that are able to reach real time data, visualize it and offer a clear view of the presented information, are becoming more and more essential in the enterprise sector. These solutions are called “one button” solutions. The information needs to be available to the managers and company leaders from anywhere in the right format. The presented system is the core of a decision support system.

**Keywords**—security, information systems, reporting system, Future Internet

## 1. INTRODUCTION

The system described in this paper is a real time and interactive reporting system with information visualization. At first, an overview will be given about the system. In the overview section the outline of the software components will be presented and the processing workflow described. The fourth section offers the classification of the product, and the mentioning of the possibilities regarding further development. The fifth section contains the communication process between the system components. This description provides an overview of the process though it does not detail the exact protocol of the communication. A new generation framework name FIWARE[1] was used. In the sixth section the authors answer why it is important to use the Future Internet, which is a general term for research activities on new architectures for the Internet. Data security is described in the seventh section where details are given about the benefits of this system and specifications of the internal security solutions. At this point the disadvantage of the system will also be referred to. In the network security section focus will be on the communication security. The test section of the paper shows the response time according to the amount of records processed by the enterprise server. The final section provides a summary of the benefits and disadvantages of the present system and finally conclusions are drawn based on the experiences gained.

## 2. GOAL OF THIS RESEARCH

We think that the internet nowadays is very differ from the internet in the past, but we often use technologies that are based on the early internet. The bandwidth, reliability and other qualities made it possible to take the internet technology on higher level. For this reason we considered it important to satisfy the future internet concept. The main goal of the project was to design a safe model for the sensitive communication, data processing by

conventional means, join different data sources, visualize the results and try to save as much time as possible. First, we had to figure out a powerful system model for the communication. It is a three-component solution which is described in the fifth section.

## 3. OVERVIEW

The presented system satisfies the concept of the Future Internet through the FIWARE architecture that will be detailed in this paper. The system has three components: a public server, corporate server and a mobile client. The public server handles the connection between the corporate server and the mobile client. It has logging, user managing and subscription handling tasks, as well. The corporate server is private and every company that uses the system needs to install its own corporate server. It provides a web interface for administrators to build the charts and handle the user eligibilities. This is the source of the chart menu in the mobile client. The mobile client is a lightweight software. It needs to be, because it is very risky to store enterprise data on the client side. The mobile client has two main tasks: authentication and visualization. In this paper further details will be given of these components, highlighting the importance of the Future Internet and explaining how this present solution is implemented.

## 4. PRODUCT POSITIONING

Interactive software that promotes the effective functioning of the groups or communities in a form of business process podcast, tracking and other functionalities is a decision support system. The core task of the corporate decision-making system is the proper service of the information from the raw data. There is more than one type of the DSS, but the authors will not go into details because it is not the purpose of this paper. The following section will present a summary of the peculiarities of the DSS to facilitate the position of the created system.

Today there is no “big” corporation that could work without a DSS. The role of the corporate decision support systems to facilitate the decision taken by the conclusions from the data processed by them. The data-driven decision support system has six potential present levels are distinguished. The less valuable raw data towards the useful information the following processes belong to the order:

- management of databases
- management data warehouse
- data extraction and purification
- data mining
- reporting and visualization

- decision support functionalities

The data processing and visualization is located at the level directly below the intelligent decision-making, so in this case we can talk about a reporting system. The system is able to be improved by modules with decision support and in this way it can be a full valued DSS.

### 5. WORKFLOW

This chapter will outline the three component system so the reader is presented an overall picture of the operation of the system. Figure 1 below shows the system and how the components connected. This figure is detailed in this section of the paper. The public server, the corporation server and the client collaboration need to achieve the proper operation of all three elements and it is necessary to reach each other's network as well. The network access is not always clear, in any case, the SSL 3.0 standard is used according to the provisions. The following section describes the operation of the system by the use of sequence.

In the first step, the user can access the public server via the website where the private server can be downloaded. Before downloading, the new user is required to enter some personal information therefore the user can be identified later. The server generates a unique identifier and provides a download link. The corporate server installation requires Tomcat and MySQL server. The Tomcat helps not only carrying the administrative activities, but clients are communicating via this interface, as well. After the installation, the server is ready to be registered with the unique ID which the user received from the public server. After the product is registered the public server stores the IP address of the private (corporate) server, which then can be changed by the administrator. After the corporate server is registered, you can also register the clients. Following the downloading and filling out the registration formula with the unique key, an unlimited number of mobile clients can be registered on the public server and the corporate server. At first the registration request is received by the public server and if the unique id is valid it responds with the corporate servers IP address and makes some database updates to store the new client data. After this the client makes a registration request for the corporate server with the given username and password. Then the server permits the request and the new client is ready to use the service.

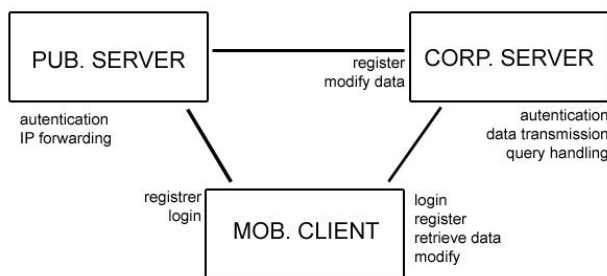


Figure 1. System communication

Once the client is registered, the system is ready for them to log in. Each time the client wants to log in to the server it performs a request to the public server. If the public server authenticates the client and identifies the IP address of the corresponding private server then sends it to the client who, in the second phase of the authentication, indicates a login request to its corporate server. Following the end of the authentication procedure, the public server does not play a role in communication anymore. It is a preferred solution mainly for security reasons, because sensitive corporate data is transmitted P2P bypassing the third party access.

### 6. FRAMEWORK

During the construction of the software design efforts were directed to satisfy the Future Internet intention. Future Internet is a general term for research activities on new architectures for the Internet. Non-technical aspects of a Future Internet span large areas such as socio-economics, [2] business and environmental issues. The Organisation for Economic Co-operation and Development held a conference called "Shaping Policies for a Digital World" in 2008. It proposed activities such as publishing recommendations for the future of the Internet economy.[3] Research areas that could be seen as components of a Future Internet include network management,[4][5][6] network virtualization, and treating any kind of information as objects, independent of their storage or location. Elements of cloud computing blended into the notion of Future Internet, leading to the concept of cloud networking.

The present goal was to take part in the spread of the Future Internet. One of the Future Internet projects is FIWARE, which is very popular in the European Union. FIWARE seeks to provide a truly open, public and royalty-free architecture and a set of open specifications that allow developers, service providers, enterprises and other organizations to develop products that satisfy their needs while still being open and innovative. FIWARE will dramatically increase Europe's Information and Communications Technology competitiveness by introducing an innovative infrastructure that enables cost-effective creation and delivery of versatile digital services, high-quality of service and security guarantees. The project offers open APIs that allow one to avoid coming tied to a specific vendor, therefore protecting one's investment. It provides a powerful foundation for the Future Internet and cultivating a sustainable ecosystem. The FIWARE project is under development and it will offer frameworks in different areas of development. The authors implemented the FIWARE security framework that provides the mechanisms which ensure that the delivery and usage of services is trustworthy and meets security and privacy requirements.

**7. DATA SECURITY**

The public server is available for everyone maintained by a third party and it has only a user management function. This means that the public server is never involved in meaningful communication between the client and the enterprise server, thereby ensuring the full independence of the data. Unfortunately, this decision comes at a price, because in addition to the minimal system requirements other background information about the hardware is not known. The cloud-based reporting systems can operate more efficiently because of their ability to provide distributed systems to process the data from the companies. They are able to process much faster thanks to the big data methods.

The data in the database is stored in encrypted form. This means that the data used during the tasks must be decrypted during the processing and encrypt when it was stored. The Mcrypt is a PHP library that implements a variety of data encryption algorithm and it was used for data encryption. After choosing the algorithm, the data is stored encrypted with the key that is constant.

If the client wants to read data or data line from the database, the encryption key and the encryption algorithm decoder pair decrypt the selected data. The data, which is stored only for coordination, typically passwords encrypted with hash algorithm. These algorithms cannot be decrypted programmatically; or at the very least, it takes irrationally long time to decrypt them. The hash functions' disadvantage is that collision generation can "decrypt" the data, which means that a given text's hash could be the same as the hash of another text. Therefore the hash function must be chosen very carefully. SHA-512 could be an appropriate choice, so user passwords were stored using this method [7] [8] [9]. User specific information like password and subscription data are stored on the client side, as well, which are not lost after the application is closed. The user specific information includes the username, password and product ID that is proved by the central public server each time when login is requested. There are more sensitive data storage solutions that can be used on the client side.

**8. NETWORK SECURITY**

From the network security point of view the flexibility of the system is a useful property. This means that the client server communication is fully customizable by the enterprise administrator of the service. Contrary to other products on the market it is not necessary to assign a priority gateway for the public server, because after the registration of the corporate server the administrator's decision, when connect to a public server. The private corporate client server communication allows the use of specific configuration settings. As already mentioned in the introduction, the communication will be used by default by SSL encryption. If the company is unable attach a direct public IP address to the server, the client provides a unique opportunity to enter a port number. In this way communication can be made compatible with

VPN[10]. After the port is set on the client side the corporate network administrator appoints the selected port on the server and creates an SSL tunnel for the corporate server which is only accessible in a specific VPN network[11][12][13]. In addition, each query sent to the server is preceded by an authentication method between the client and the corporate server.

**9. TESTS**

It is assumed that the security can be either very strong or weak, according to the client side implementation. Because of this fact, in the test phase the security part of the product was not tested. As mentioned earlier, the enterprise server side is the weak point of this system. It offsets the flexibility and because of this the enterprise server must be able to withstand the load. The following diagram shows the test results with different size of the data. The enterprise server runs on a Tomcat 7 server? with the default configuration and the processed payload stored in MySQL. The virtual server configuration used is AMD Phenom(tm) II X6 1090T Processor and 512MB of RAM. The network bandwidth between the mobile client and the enterprise server is roughly the same and it does not affect the processing time, so the results were not compensated for the current transmission rate.

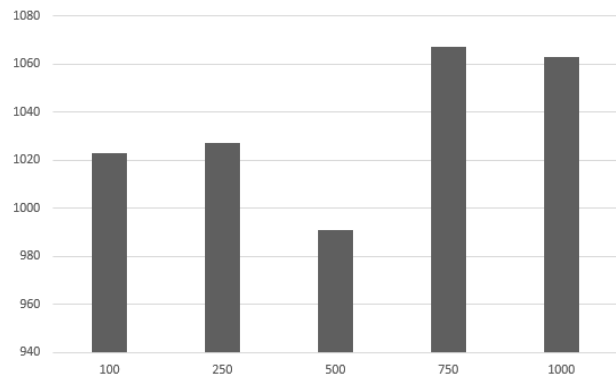


Figure 2. Response time in milliseconds according to the processed records

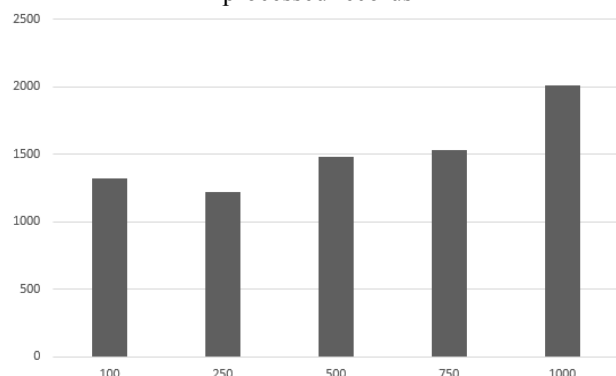


Figure 3. Response time in milliseconds according to the processed records with JOIN

The diagram (Figure 2) shows the processing time of a single SELECT SQL instruction without JOIN. The diagram (Figure 3) shows the processing time of a single SELECT SQL instruction with JOIN. The authors tried to model the general use of the product so query of sales

data in was made two different countries joined by ID. The enterprise server processes the requests (in this case the servers are on the same physical machine) and after the join it stores the result in the temporary local table. Because of bandwidth issues and the client side screen size the response contains only (a maximum of) 700 diagram points. The mobile app shows a large diagram from the response data and a small one which has two slide bars specifying which part one wants to see on the large chart. After setting an arbitrary part the client makes a query for the server to send the accurate points of the selected section. The following image shows the response time after the section is selected. The difference in response time may be caused by the network accuracy, in any case the processing time on the server side is roughly the same in case of the section selection where the result table is already in the server's temporary table.

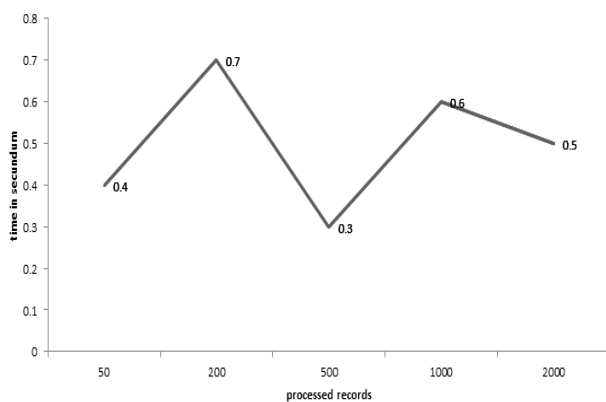


Figure 4. Chart section selection update time

## SUMMARY

In this paper the authors described a design that uses a new approach for reporting systems. This approach brings a large change from the ordinary. A clearly good change is the flexibility. The new design applies a flexible structure that accommodates the specific needs of the users. It allows versatility, which means that it is not only applicable in the corporate sector. For example, real time statistics in the sport industry is more and more important these days. The system design is invented to be as safe as possible. If the service apply is correct the security is better than the existing solutions, because the systems practical safety depends on the end-user security requirements and application. The distributed design is "power save" for the service provider because it could provide a full range of services even if in the case of little start-up capital. There is no need for large hardware investments to compute a large amount of data and satisfy the users.

In addition to the benefits there are also disadvantages. Different usage needs different resource utilization which makes the corporate server side resource management very important, and the users are often not aware of the requirements. They are responsible for their own security, therefore comprehensive and thorough examination must

be carried out before the use of the service. Each user should consider the possibilities and choose the product depending on that. Due to the system flexibility and integrated security the product based on this design can be a useful for the corporate users and it is definitely a good choice for the service providers because they do not need any significant resources to allocate for every client transaction. Obengo (what is available at [www.obengo.com](http://www.obengo.com)) is a new product that uses this design approach.

## LITERATURE

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