DEVELOPMENT OF HIGH QUALITY REAL TIME SOFTWARE SOLUTIONS IN DEVELOPING COUNTRIES WITH THE AIM OF E-GOVERNMENT IMPROVEMENT

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ABSTRACT
Facing low developed communication infrastructure in developing countries we had to find a solution to support requirements of modern real time web-based information systems in order to be a part of greater e-Government system. This paper focuses on differences between web and fat client applications, especially caring about the optimization of traffic load in order to increase interactivity of end user and the system. Unpredictable number of end users forces us to build highly scalable and flexible system that would be very easy to use, even with the low end hardware and improperly educated end users. Paper also accents the idea of infrastructural independence, with the mean of the hardware and software that client runs. Practical implementation of the system in real time is the best possible way to present thesis mentioned above.
Keywords: e-Government, real time, software, scalability

1. INTRODUCTION
The informatics era shows its impact on business processes in developing countries, who recognize the need of e-Government systems as a way to centralize, control and optimize information flow in a country.
Bosnia and Herzegovina has launched a few e-Government-like projects, which can be described as initial parts of an upcoming, overall e-Government system.

a|Test™ is such a system, which centralizes the data of Technical Inspection Authority stations in Bosnia and Herzegovina. It represents an integral, fast, highly available, cost-effective and nevertheless secure information system.

Our task, in particular, is to improve the traffic security in our country by creating effective control instruments which can be used by government agencies.

2. MOTIVATION

With this ambition in sight we want to prove that it is possible to develop and maintain this kind of systems in developing countries, who deal with lots of drawbacks in comparison to industrial countries; We also have the chance to build a system from the very beginning as we would like it to be, so that it could potentially avoid mistakes which have been made by some other countries, who were pioneers in this branch.

We are willing to set a standard with this system for an overall e-Government system, which could be distributed over many government authorities, but yet centralized using fast and secure web services. A starting point has already been made with the implementation of the CIPS [The Citizen Identification Protection System] project and a proprietary, exclusive SDH 155 MBps link for government authorities use only.

3. DRAWBACKS

The mentioned drawbacks can be roughly divided in infrastructural, financial and personnel drawbacks.

Developing countries have problems with its infrastructure, especially in the telecommunications sector. Broadband internet access has not yet enough penetrated in homes and corporations. It is hard to get static IP addressing for customers. The sector is not liberated enough; therefore the competition level of service providers is not comparable to industrial countries. This leads us to communication problems which need to be solved in order to set up a highly-available, fast and centralized information system.

Another problem is the financial aspect of eventually purchasing some similar products and customizing them. Most of the developing countries need to build such systems on their own, trying to hold the development and implementation costs low. Yet, the hardware costs cannot be drastically sunken.

Personnel barriers are another key problem in this manner. Brain drain is a common problem in developing countries; scarcity of specialist workers is the result. Projects of this size and importance, like e-Government systems, need a critical mass of qualified specialists to succeed. Developing countries need to give them enough opportunities in order to engage these specialists in important projects which will even so cost less and eventually produce more (due to patriotic feelings) than engaging foreign specialists.

Poor education of decision makers and incompetent legislators represent another aspect of problems which are common in this case.

4. POSSIBLE SOLUTIONS

In order to solve the problem put before us in the described environment, we have isolated three possible models of solution, partially implemented them in different phases of the project and successfully drew the conclusions from the analysis of positive and negative experiences we had during the implementation.

4. 1. Standalone GUI application with periodical data synchronization

In the beginning phase of the project, an urgent solution was required in order to prevent costs of the TIA stations to apply the new country level laws. Since the time was short, the most logical solution was to choose the model with shortest estimated development time, which takes into consideration non-existent infrastructure necessary for any kind of centralization. We made a decision to create a standalone GUI application. After putting the software into production the model started to show it's negative sides. Standalone applications had to be configured for every TIA station differently. Users did not update their applications regularly and frequently had update problems caused by the unique software and hardware infrastructure. Data was meant to be synchronized periodically so it would be hard to achieve requirements of the real time systems.

After a while TIA stations requested partial centralization at the LAN level. Since the application was not designed for this functionality it was very hard to achieve it.

Supporting the application required a lot of resources, so it was highly impractical. Poor IT education of users lead to the problem of having to solve issues that are in no way connected with the application.

4.2. Web services based fat client application

It was developed during the same time as the third choice (web application). By using web services to communicate with the database it achieved the real-time requirement. The centralization problem was also solved so reports could be delivered in real time, and on the all data at once. However, the support and update problem remained. Although it was most responsive due to some communication speed optimizations, the development was abandoned.

4.3. Web application

In short: centralization, real time data exchange, ease of update and management – as seen in Figure 1. This proved to be the best way to solve our problem. From the human resources point of view, it required more experienced developers, but the support staff was minimized. The application itself needs only an internet conneciton, a regular web-browser and a pdf-viewer to be run on a client machine (see Figure 2).
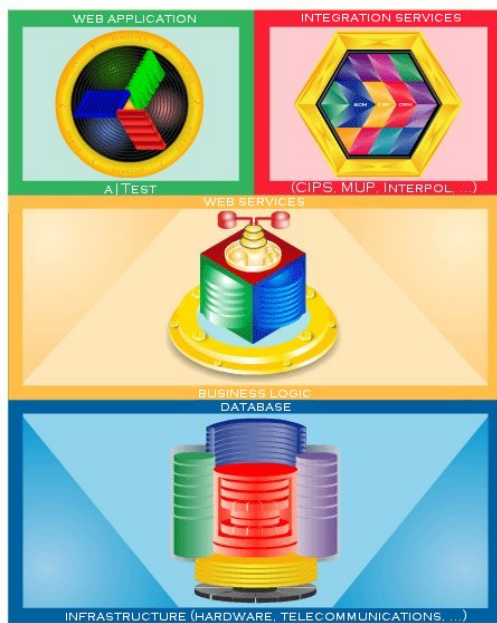

Figure 1. Layered development and depoloyment minimize intervention timeframes
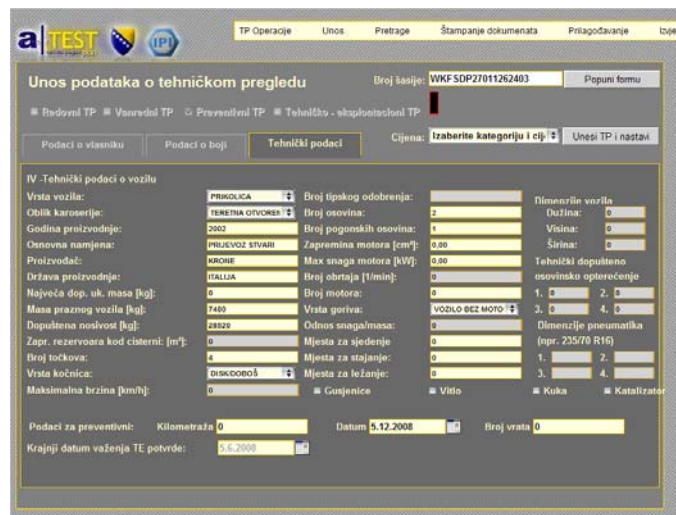
Figure 2. a/Test™ main screen as seen in a regular web-browser

By breaking application's dependency on the user's platform, the support problem was much easier to handle. Uniform interface and surrounding infrastructure made it easy to educate users. Since both data and application was centralized it was easy to implement an intra application notification system that informed users about planned downtimes, new features and user interface changes. Since the communication problems at the end of the development were for the most part gone, the overhead of sending the application along with data could be disregarded hence the main reason for developing fat client application (model no. 2) was gone and the final decision was to continue with development of web application exclusively.

5. CONCLUSION

At the 1st of April 2008. , after 3 months of highly monitored testing phase and a month of implementation phase a|Test web application was ready for production. According to the law, all of the 151 Technical Inspection Authority stations in Federation of Bosnia and Herzegovina were legally obliged to use it for their work. Corporations which own more than one TIA station, now have real time insight into the workings of all of their stations. Federal Ministry of Transport and Communications is able to extract accurate statistics and has a powerful tool against the misuse of the system.

The development of high quality information systems in developing countries is possible.

6. REFERENCES

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