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Company History and Overview

PM&S Software is an offshore software development company. Our headquarters is located in Minsk, Belarus. We deliver our services since 1996, and since December 2000 we act as a joint venture with ProSieben Information Service GmbH.

As a matter of fact our services are near-shore. Nearshoring is offshoring in a neighbour country. Belarus is closely connected to the Western European countries. That fact gives some advantages: cultural proximity, great possibilities for establishing personal contacts, convenient time zones, etc.

After establishing a joint venture with ProSieben Information Service Ltd. we created a development center for our partner. This center is aimed to fulfill our partner´s tasks. During this long lasting cooperation we gained great experience in distributed project development.

At the same time we worked with other customers, and in this case we solved a wide band of tasks. Our cooperation was conducted in different ways: separate development of components, project maintenance, automatic tests development, etc.

Our company is a joint Belarusian-German venture. Our German partners can act as a contractor with other customers. Though, potential customers may take advantages (security, confidence, etc.) of cooperation with German contractor.

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| Why Belarus? |

Nearshore.

Geographically Belarus is very close to the Western Europe. This facilitates communication between customers and our specialists. It takes approximately 2 hours to get from Frankfurt to Minsk by plane, so it´s easy to arrange personal meetings (some complex problems need face-to-face communication). Belarus is situated in a convenient time zone (time difference is only 1 hour from Mid-European time), so it is easy to arrange Internet conferences, discuss urgent problems via phone, etc. Cultural proximity is also important. Moreover, English and German languages are widely studied here.

High level of education.

In order to run «assembly plant» and design bureaus, the state needed qualified personnel. That caused development of powerful educational system, aimed on training of high-tech specialists. In 1960s scientific schools closely connected to education as well as to industry had been created in Belarus. Belarusian universities founded new IT-specialties («Applied Mathematics» department at Belarusian State University, department of «Computer Science» at Belarusian State University of Informatics and Radio-engineering, etc.). Higher education is traditionally valuable here. After «revolutionary» period in early 1990s, social prestige and value of the higher education returned back. Many young people are willing to get University degrees now, which in turn forces further development of high-tech companies.

Mature IT-industry.

First radio-electronics enterprises in Belarus were founded in 1960. Till the end of 1960s industrial system of microelectronics, electro-engineering and software enterprises was formed here. Almost semi-centennial experience of high-tech industry became the basis for the modern success of Belarusian offshore. The last decade brought up experienced specialists in local offshore companies.

Cultural proximity.

Mutual understanding is one of the key factors for success in offshore. Cultural closeness promotes fruitful communication between customers and developers. Communication becomes effective; results of development correspond to expectations. Belarus is «culturally compatible» with EU-countries. Our long-term experience of communication with our partners shows that we didnt meet culturally conditioned ambiguities at all. Behavior is always mutually predictable, and it benefits communication of managers as well as technical specialists.

National assistance.

Belarusian IT-companies proved to be successful in offshore. This success is indicated by permanent growth of turnover and companies´ personnel. Last years government pays increasing attention to the development of national IT-industry. In 2005 national High Technologies Park has been established in Belarus. Residents of HTP get tax exemptions and other assistance. Stable political situation guarantees long life for the governmental program of IT-industry development.

Reasonable costs.

Belarusian IT-sector offers advantageous prices in comparison to onshore development. Of course, they are higher than similar offers of traditional Asian IT-offshore. But this is leveled by the described above advantages. It is a special value for small and medium companies, which are not interested in creation of a foreign branch office managed by the company´s specialists. Geographical and cultural proximity of Belarus together with its mature high-tech industry allows effective communication and project management, and as a result minimizes risks.

| Our aim |

Our aim is to deliver quality product, which conforms to customer´s needs in reasonable time. To achieve this goal we pay attention to the following key factors:

Individual approach to every customer.

During our work we met different tasks. Versatile response to individual features of the projects and prompt adaptation to rapid development of different IT-technologies guarantee our success. Very often, problem-free implementation of the first tasks led to the further cooperation with our customers. After learning personal demands of the customer, special peculiarities of the customer´s industry, we adjusted our management processes, which in turn sufficiently increased efficiency during long-lasting cooperation.

Partnership relations with every customer.

Very often we witnessed that informal relations between project managers intensified project development. Good personal relations are beneficial for quick and deep insight of project requirements. Frankness and flexibility in relations allows timely solving of arising problems and as a result minimizes development risks (problems are discussed easier and at more early stage). Such kind of relations confidently leads project to its successful completion. Long-lasting cooperation is extremely fruitful for creation of confident relations with customers. A number of problems at the level of managers through technical specialists can be solved more efficient in that case.

Effective communication.

Our goal is to create adequate communication starting with initial project discussion till final testing. Our model of communication allows in-time correctionof the project development workflow according to changing demands of the customer, gives the customer means to manage development process.

We take advantages of geographical location of Belarus to create personal contacts of managers as well as technical specialists in full. Our experience shows that regular personal meetings promote assured project start and coordinated activity during joint development.

High development quality.

We provide high quality by the following means: efficient processes of development and their permanent improvement; documentation of intermediate development phases during the whole project life cycle; monitoring of all development processes by our QC department on all phases of project. Another source of our development quality is our staff, which is able to adjust to different projects and new technologies.

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| Custom Software Product Development |

One of the main specializations of our company is custom software development. Last years brought new technologies to software industry, and new opportunities changed customers´ requirements and increased scale of projects. We have been always successful in following new trends, and adaptation to the new requirements is our strong point. Our employees are qualified in different software technologies and able to learn new ones. On the other hand, successful cooperation with some customers made them our permanent partners. Such long-lasting cooperation gave us special knowledge in several industry fields. At last but not the least, technical features of software that appeared from project to project made some our employees specialize in development of applications, which need specific technical solutions.

Software Development Workflow

During new software product development we usually follow the described below workflow:

Project requirements clarification and analysis.

Our project manager and business analyst study customer´s input information. During this iterative phase we develop Software Requirements Specification/Use Cases. Conversation via e-mail and phone usually is enough in case of common tasks. We recommend personal (onsite) discussion of complex projects.

Proposal package preparation.

On basis of Software Requirements Specification we prepare a batch of documents (proposal package) which usually includes software architectural document, technical vision of the project (architecture, technologies to be used), preliminary project plan, estimation of project costs, project resources, project risks. This batch of documents is our offer for the contract on application development.

Design.

Design of application architecture is based on Software Requirements Specification. In case of complex projects we recommend prototype implementation, which allows testing of the proposed architectural solutions.

Implementation.

Project implementation is based on developed Software Architectural Document and Software Requirements Specification. Implementation process is transparent for the customer; customer can monitor activity progress. In case of large project, it may be divided into several milestones with individual check and acceptance.

Testing.

Tests are designed on base of Software Requirements Specification. Our testers develop a detailed test plan, which is used for application´s testing.

Acceptance of the product.

The developed application is delivered to the customer for examination. In case of successful testing on customer´s side the product is considered to be released and accepted by the customer.

Maintenance.

Maintenance is performed in case of enhancement/modification of the application´s functionality.

Industry Experience

A lot of projects of different types have been successfully accomplished since our establishment. Here you can find description of our accomplished projects sorted by their field of use.

Our specialists are able to develop software products for a wide spectrum of applied fields. However experience of communication with experts in special industries allows deep insight in specific fields of knowledge and prompt estimation of needs. Ability to speak in professional slang improves mutual understanding and simplifies the phase of project requirements clarification.

- Television
- Thermography
- Tourism
- Logistics
- Testing

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ProSeco - TV-broadcasting planning

Customer: ProSiebenSat.1 Media AG
Technologies and tools: J2EE, EJB, Swing, WSAD, Informix
Workload: 50 man/months

Problem

ProSeco is intended for TV-broadcasting planning. It involves all planning tasks arising in broadcasting industry: from strategic program planning, through broadcasting planning up to broadcasting operations. ProSeco is a very large project, and it is being developed by two teams (in-house and offshore).

Solution

This project tried a new model of interaction of two development teams. In-house team designed the project, while offshore team performed programming. In-house team consisted of system analysts, architect and designer. Designer was responsible for communication with offshore team. He transformed specified by the design team requirements into technical solutions, documented them and than passed them to our team. At first, technical solution had been specified at a low level (in terms of classes and methods). But step-by-step while offshore team was gaining experience and knowledge of the system, tasks description became less detailed. Volume of communication decreased, while efficiency of work of our team grew.

That model proved its efficiency. Designer›s activity was crucial for the project development due to his responsibility for inter-team communication.

Our team implemented ProSeco server, and partially client side. There implemented several ProSeco clients (Java, WEB). Some of these clients were entirely implemented offshore.

Technical Overview

ProSeco is a client-sever application. Its architecture generally corresponds to J2EE-application architecture, but it also uses components developed at ProSiebenSat.1, for instance:

• Backbone, ORM developed by our customer;

• Juice, which is a Swing extension envelope intended for development of XML-driven GUI;

• DOTS (Data Object Transfer Service), universal persistence layer that uses different adapters to access data from different sources: file system through commercial RDBMS.

Our specialists had to study original components and employ them during development of a complicated server application. ProSeco contains complex data structures; their core consists of TV-broadcasting schedule, advertising pool and its distribution between different TV-channels.

ProNews Porting and Support

Customer:	ProSiebenSat.1 Media AG
Technologies and tools:	Java, CORBA, TopLink, Informix, Convera Rware, Castor
Workload:	200 man/months

Problem

ProNews is one of the ProSiebenSat.1 products. It represents a newsroom system for news editorial boards where journalists create TV-programs. ProNews consists of the following modules:

- Newsticker, collects and supplies reports of news agencies;

- Rundown, represents overview of TV-programs for a single day;

- Beitragspool, a text editor to compose news articles;

- Storyboard, searches and previews video materials.

Development of ProNews has been started in late 1990s. Since that time ProNews is being improved continually. During its existence new technologies appeared. In order to take advantages of new technologies the product has been updated several times by our offshore dedicated development team.

Solution

During its existence ProNews has underwent several global changes:

- Migrating from Java AWT controls to Java Swing. Initially AWT library contained a lot of errors (e.g. problems with focus, problems with multi-language support, etc.) and had very low performance, witch in turn caused visual artifacts (some control elements didn´t update, image blinked and flickered). Our team has redeveloped client modules of the system.

- Implementation of MDI architecture instead of set of Single Module Applications. We have developed a multipurpose MDI-container (referenced to as Organizer) for different applications. For the first time Organizer has been used in ProNews. Initially ProNews intended multi-module architecture of client. So, during that migration we´ve implemented changes of the client as well as server.

- Migration to Sun JDK 1.4.1 has been performed in order to utilize new facilities of JDK (e.g. mouse scrolling), minimize JDK faults, increase overall performance (garbage collector optimization, faster Swing controls). Some modules have been re-factored and totally re-developed. We›ve successfully solved problem of interface incompatibility, developed a new focus-management model. At the same time other our team have developed automatic testing scripts for ProNews that led to the higher level of application testing (see: ProNews Functional Testing)

- Migrating to Informix 9.4 due to Informix 7.3 lost official support. Simultaneously we›ve migrated to Convera RWare TextSearch Engine 7.0 for the same reason. Convera RWare TextSearch Engine 7.0 is (directly) incompatible with Informix 9.4. So we have developed special index daemon working via DocumentHandler mechanism. As a result aggregate performance of Informix 9.4/RWare7.0/IndexDaemon appeared 10+ times higher than one before migration.

- Server performance optimization. As a result of successful elimination of memory leaks (see: ProNews Load Testing), optimization of caches, optimization of garbage collector settings, duration of the «StopTheWorld» problem decreased from 20 minutes to 2 seconds, i.e. 600(!) times.
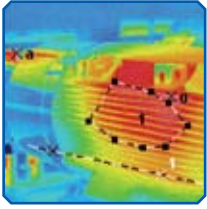
| **Termography** |

Kiln Monitor 4D

Customer:	Goratec Engineering GmbH
Technologies and tools:	C++, MFC, OpenGL, OPC
Workload:	48 man/months

Problem

Our customer proposed development of software application for automatic monitoring of cement production. Monitoring object is a rotary cement kiln. The rotary kiln consists of a steel tube, lined with firebrick (refractory). During production operation refractory burns out. It is necessary to monitor brickwork thickness, and set alarms when brick degrades down to specified critical thickness. Kiln surface temperature depends on refractory thickness. Infrared line scanners are used for kiln shell temperature monitoring. Scanners produce infrared images of the kiln›s surface. These images are used for further calculation of thickness.

Solution

The customer provided us with software requirements and GUI prototype. On the base of these requirements we performed object-oriented design and developed application architecture.
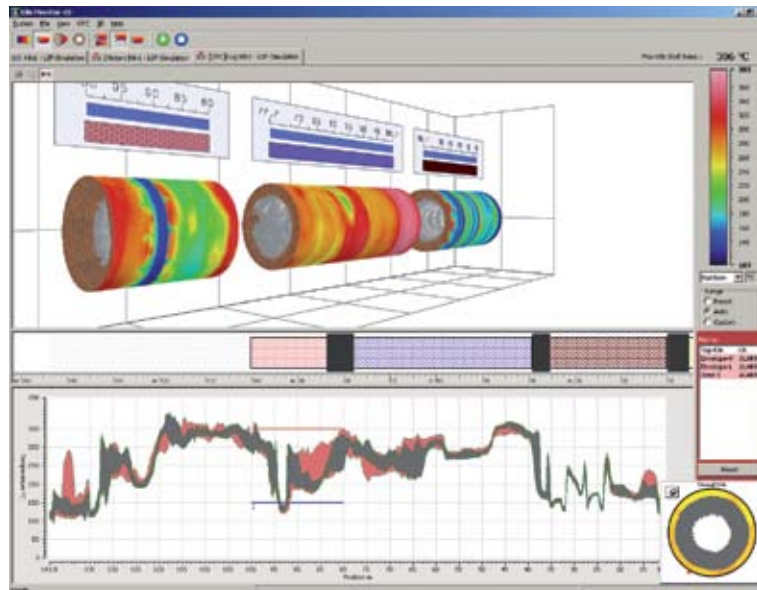
Graphical representation of the monitored objects caused the most difficulties for implementation. We decided to show 3D image of the kiln with infrared picture on its surface. User can monitor calculated thickness of bricks and coating also by the means of sections. We use OpenGL for 3D modeling.

Other problem is caused by infrared scanner features: scanner creates image line by line. It is necessary to process continuous data flow into infrared image of the surface, taking into account irregularity of kiln rotation. Moreover, it is necessary to compensate geometrical distortions.

The application is able to receive and process data from other sensors. For instance, during rotation the kiln may begin twisting. That process can be detected by corresponding group of sensors. When twisting angle exceeds specified threshold, alarm is set.

Alarm signals are displayed by the application; they can be output into different devices and transmitted to the Factory Management Program via OPC (OLE for Process Control).

Thermography InfoRoute

Customer:	Goratec Engineering GmbH
Technologies and tools:	C++, Windows Shell, COM, ActiveX, VBA
Workload:	50 man/months Windows version, 12 man/months PPC Version

Problem

At customer›s request we developed application for analysis of infrared images. The application is a helper tool for monitoring of industrial objects. Assigned personnel take images of the monitored objects according to a schedule. Infrared cameras allow taking conventional and infrared images. Besides it is possible to store a brief comment for each image (e.g., nature of object´s functioning). The application loads data from the infrared camera and stores it in a special repository. Then, application user can load images corresponding to different time periods and analyze them. The results of analysis can be saved as a report.

Solution

Our analyst interviewed the customer and potential consumers of the system. We created Software Requirements Specification. SRS was coordinated with all stakeholders that participated in project requirements clarification. We developed GUI design of the application. On the basis of object-oriented design we created Software Architectural Document.
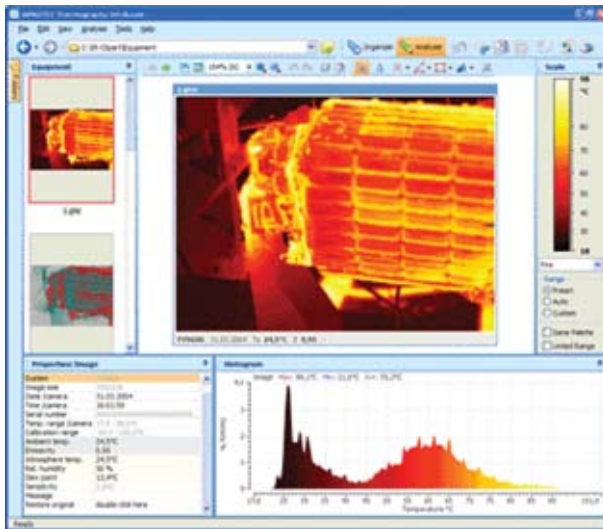
The system was developed with use of elements of extreme programming (XP). We developed the application within 2-week iterations. A set of most urgent tasks was selected before each of iterations and implemented for the next release. As a result, every two weeks our customer received functioning version of the product. We widely used unit testing (CppUnit) during project implementation.

Module for loading of images produced by infrared cameras appeared rather labor-consuming. Each camera creates images in its own unique format, sometimes very exotic. Now we gained know-how in that area.

Our specialists proposed and implemented Fusion technology. The technology allows combining two images (conventional and infrared) in a single snapshot. There are several modes of such combination. Application user can define temperature threshold; «hot» areas are displayed from infrared image, while «cold» use conventional image. It›s also possible to define portions that each image contributes into the resulting one, so infrared image is visible through the conventional one.

We developed an Add-In for MS Word for report generation. During report generation, application user selects document template and receives a report with filled-in images and text; there is a possibility to modify images without re-creation of the report.

We also developed application version for PocketPC. In order to reduce development time, some components are cross-platform (for instance, modules for loading and analysis of infrared images). Thus porting work was minimal.

Results

Thermography InfoRoute is widely used by plenty of consumers. Now the application is localized for the following languages: English, German, Italian and Russian.

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Sites with Travel Objects

Customer:	Sangat Systems AG
Technologies and tools:	.NET, ASP.NET, XML, XSLT
Workload:	50 man/months

Problem

Sangat is a German company specialized in development of software solutions for travel business.

Our customer has created «Travel Objects» framework for development of web sites of travel agencies (companies). Sites developed with that framework allow on-line booking of flights, transfers, hotels, etc. When visiting such a site, client can create his/her own trip. The framework contains core business objects specific for the travel industry and components for connection with fare databases and booking systems.

In order to deliver solution to customers (travel companies) it is necessary to adjust basic system for specific demands. It is necessary to implement required on-line functionality with a glance to corresponding design, enhance or modify business logic. Our customer experienced lack of personnel due to the great amount of orders. So, it was decided to outsource sites development.

Solution

We helped to solve customer´s personnel problem. Our task was to adjust basic system for the needs of several travel companies.

The main difficulties we met at first time while studying the framework. One of the reasons was partially missing documentation. We had to consult with framework developers. So, it was necessary to provide efficient communication with two teams of developers, which resided in two different countries.

We solved communication problem successfully. A joint team was created. Two specialists (in-house and offshore) managed it. Russian-speaking customer-side manager had participated in development of the framework. So he possessed all necessary information about the framework. Besides he provided prompt communication with German specialists and managers. Performer-side manager received tasks, estimated them and managed their implementation. In order to improve mutual understanding, our specialists visited customer for project discussion and at first for training also.

The first project was training one; tasks were small but produced a lot of communication between specialists and both managers. After having studied the framework, our specialists didn´t need consultations any more, and the most of communication concerned managers only. That led to improving work efficiency. Further projects used the same model for communication. That model proved to be efficient, and all the projects were accomplished successfully.

Cargo Load Planner

Customer:	Triatherm
Technologies and tools:	C#, ADO, OpenGL, Crystal Report, InstallShield, XML, MS Access
Workload:	7 man/months

Problem

Triatherm is a Belarusian-German joint venture specialized in cargo transportation. Our customer disposes several warehouses. Goods are regularly delivered from one/several warehouse(s) (source) to the other(s) (recipient). At the source warehouse goods are packed and placed on special pallets; pallets are freighted into hauler. After delivery to the recipient warehouse it is necessary to find and unload goods from the hauler (note that sometimes the hauler delivers goods to different recipients and it can not be unloaded fully at one facility). This problem is partially solved by the personnel of the source warehouse: they draw approximate plan of loading with description of pallets´ contents. But further problems arise: no rules exist for such kind of plans, detailing of description is unclear, plans are sketched, etc. All this brings problems when searching goods at recipient warehouse.

Solution

Our customer needed an application for automation of hauler loading/unloading planning.

It was decided to perform loading planning using 3D model of the hauler. Application must display 3D model, while operator was intended to place models of pallets manually. The main requirement to the application was clearness and ease of usage.

Initial information for loading planning is following: parameters of the hauler (dimensions, carrying capacity/tonnage), list of pallets to be loaded, parameters of each pallet (unique ID, contents, dimensions, weight, special placement conditions). After initial information is supplied to the application, operator places pallets inside virtual volume representing model of car-body. Information about haulers and types of pallets can be stored in database for further use.

When loading plan is developed, it becomes possible to create a unified report containing all information about the contents of the pallets and their placement. Loading of pallets at warehouse is performed according to this document. The same information is used at recipient warehouse during unloading the delivery.

Our analysts interviewed customer for several times to get into the problem domain. They suggested several versions of graphical frame. For the selected version we implemented application prototype. As a result of discussions with the customer, project specification was created; specification was refined several times during development.

Technical overview

After approval of project specification we developed application›s object model in Rational Rose. During modeling, main subsystems were extracted, and the most of classes was defined. For storage of information about haulers, pallets and goods a database was designed; due to its small volume we chose MS Access.

The most challengeable part of the project was definition of rules for pallets› placement. Pallets were to be placed according to the physics laws and specific properties of goods. The customer provided us with specific loading rules. If some rules were violated during pallet placement, such pallet was marked in the model and in report. In order to modify loading rules some architectural decisions were undertaken.

ProNews Functional Testing

Customer:	ProSiebenSat.1 Media AG
Technologies and tools:	Rational Robot
Workload:	50 man/months

Problem

ProNews is one of the ProSiebenSat.1 products. It represents a newsroom system for news editorial boards where journalists create TV-programs. ProNews consists of the following modules:

- Newsticker, collects and supplies reports of news agencies;

- Rundown, represents overview of TV-programs for a single day;

- Beitragspool, a text editor to compose news articles;

- Storyboard, searches and previews video materials.

ProNews is a very complex system being developed by two independent groups of programmers (on-shore and off-shore). Moreover, during development existing modules can be changed. So before a new version is shipped to production it is necessary to perform regression testing as well as testing of new functionality. Due to use of ProNews in on-air TV-broadcasting, quality requirements are very high. ProSiebenSat.1 committed to us development of automatic functional tests for ProNews.

Solution

Manual testing of ProNews is impossible due to the following reasons:

- Manual testing needs a lot of efforts;

- Testing has to be prompt; project is developed intensively, and needs regular regression testing of new releases.

The above reasons caused use of automatic testing. Rational Robot has been selected as a tool for functional testing.

We have created test plan for ProNews functional testing. According to the developed test plan we have implemented functional tests with the aid of Rational Robot. The architecture of the functional tests is following: at the higher level it reflects hierarchy of the modules of the application under test; at the lower level it implements a library of typical actions with multi-language support. During implementation of a single test, developers follow the rule: unify actions and add them to the library for their reuse during creation of new test.

After finishing the first phase, the product started being tested on regular basis. We perform complete testing approximately twice a month. Tests are developed for 4 roles, running the final version of a test for a single role takes approx. 5.5 hours (taking into account that we don›t have special equipment). Every new version of the system is tested in pre-productive environment in Munich by running all functional tests.

ProSa Load Testing

Customer:	ProSiebenSat.1 Media AG
Technologies and tools:	Java, Rational TestManager
Workload:	3 man/months

Problem

ProSa is one of products of ProSiebenSat.1. It is intended for selling of advertising time. This product fits all companies that deal with advertising marketing (sell advertising time): either publish any content (TV/radio-stations, website-providers, publishing houses, etc.), or distribute the content (cable TV/Internet-providers, etc.).

ProSa is a client-server application developed on EJB-technology. Server is intended to be used by 200 clients simultaneously. So, after finishing first phases of server implementation our customer wanted to check if the server met that requirement

Solution

ProSa client is a graphical frame developed in Java with use of Swing. So we proposed to develop special test clients for purposes of load testing. Those test clients directly accessed interface functions of the server, bypassing GUI. Rational TestManager had been selected as a tool for load testing.

A client, which tested functions for processing advertising blocks (particularly, creation and removal), has been developed. Tests provided synchronization points that allowed simultaneous requests to servers from a great amount of clients. In order to modify client›s behavior it accepted some parameters (e.g. number of ad-blocks added at a time, necessity of synchronization with other client, and ProSa-specific information that was necessary to create query). Transfer of test parameters and synchronization was performed by the means of the testing tool (Rational TestManager).

We´ve developed several test scenarios which emulated server load in different production modes, as well as ultimate load. As a result of testing the following parameters of the server under tests have been detected: request execution time/server load relation; utmost server load. According to the results we made some proposals on server optimization.

| Technology |

Operating systems
MS Windows, UNIX, Sun Solaris, Linux

Relational Database Management Systems (RDBMS)
Oracle, Microsoft SQL Server, Informix, MySQL, PostgreSQL, Microsoft Access

Rapid Application Development Systems (RAD)
MS Visual Studio, Borland CBuilder, Power Builder

Internet technologies
Java Server Pages (JSP), Active Server Pages (ASP), AJAX, PHP Hypertext Pre-processor, HTML/DHTML, JavaScript, XML/XSL/XSLT, Internet Server API (ISAPI)

Programming Languages
Java, C/C++ (including ANSI C), Visual Basic, Object Pascal, PHP, Perl

Programming technologies
J2EE (JDBC, JNI, EJB, JMS, Servlets), COM (including DCOM, COM+), OLE, ActiveX, OPC, Java Beans, WinAPI

Application Servers and Middleware
IBM WebSphere Application Server, BEA WebLogic Server, JBoss, Apache, Tomcat, CORBA, RMI, LDAP

Reporting Systems
Seagate Crystal Reports

Project Management Tools
MS Project, XPlanner

Modeling Methodologies
UML

Modeling Tools
ErWIN, Rational Rose

Building Tools
ANT

Security
PGP

Automated Testing
Rational Test Suite, Mercury LoadRunner, JTest, Rational Pure Coverage, Rational Purify, Rational Quantify, JProbe

Library
MFC, ATL, WTL, Swing, Stingray

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