

Development of Testing Model and Testing of Complex Telecoms Operator Automation System

"A1QA is for me first of all the successful experience of co-operation on different projects and a solid guarantee of high quality of performance on all tasks. I am very happy with the professionalism of the workers, there care for the customer's concerns and the proactive management. More to that, A1QA has the best quality to price ratio of all contractors we have worked with."

Vladimir Shepetov
Project Manager

Customer

The customer is a leading provider of solutions in the telecommunications and information technologies fields in the markets of Russia, CIS, Central Europe, South-Eastern Europe and some countries in Africa and Middle East.

Company	<i>SITRONIKS Telecom Solutions</i>
Country	<i>Russia</i>
Business Domain	<i>Telecom Systems</i>
Services Used	<ul style="list-style-type: none"> ✓ <i>Development and updating of testing models</i> ✓ <i>Development of a programme and methods for the acceptance testing.</i> ✓ <i>Functional testing</i> ✓ <i>Development of requirements for individual functional units.</i> ✓ <i>Quality control</i>
Cooperation Model	<i>Providing quality assurance services to a third-party software development company</i>
Duration	<i>9 months so far (the cooperation is in progress)</i>
Labour Efforts	<i>6 man-years</i>

Project

The objective of the project is development and software support of the FORIS OSS complex information system aimed at the automation of business and production processes for the processing of billing data, network maintenance, invoicing and collecting payments for mobile service providers, such as MTS, MGTS, Skylink and Comstar of Russia and UMC Ukraina of the Ukraine.

Challenge

The work was to start in the context of deficit in both resources and time, with an outdated and incomplete testing model and out-of-date documentation. To work out a turn-key solution, a team of test analysts was given the following key tasks from the customer's point of view:

- To create a testing model of for the FORIS OSS complex telecoms operator automation system.
- To update the available testing model.
- To develop specific test scripts based on the results of the analysis of the scope of the current functionality tests coverage.
- To execute the functional testing.
- To develop a programme and methods for the acceptance testing..
- To develop the technical requirements.
- To pursue general quality control.

Solution

These are the tasks that can be pointed out as the most successfully accomplished ones:

- **Development of New Testing Model.** Testing models with script-assisted structured data retrieval were made by improving the old testing methods and by means of direct investigation of the business processes.
- **Updating of Existing Testing Model.** The existing model was edited and improved for the following reasons: insufficiency of the functionality coverage, system updates and defects of the testing model.
- **Development of Specific Test Scripts.** It was necessary to develop specific test scripts for stress and load testing based on the results of the analysis of the scope of the current functionality tests coverage with the existing testing model.
- **Execution of Functional Testing.** Functional testing of the FORIS OSS complex telecoms operator automation system used for MTS, UMC Ukraine and MGTS was implemented.
- **Development of Acceptance Testing Programmes and Methods.** The programmes and methods of acceptance tests were developed based on the functional and development requirements given that the full functionality was not developed yet.
- **Development of Requirements Specification.** The work comprised investigation of the possibility to present individual business processes with emulators was held. Requirements for these emulators and their use in the testing process were developed.

Cooperation with Remote Development Team

The Cooperation with the customer was maintained in several ways:

- **Work on Customer Side.** To increase Cooperation efficiency, the whole team of test analysts started work on the project on the customer side. At the end of the first stage (3 months of work), a VPN tunnel was organized by mutual agreement. As a result, a part of the team stayed on the customer side for a closer Cooperation and for ensuring timely feedback. The rest of the team began to work remotely.
- **Systems Deployed for Testing Management on Customer Side.** The team prepared testing models and managed tasks, defects and requirements using such systems as Mercury Quality System and Microsoft Team Foundation Server.
- **Accuracy and Efficiency of Test Scripts Acceptance Process.** After each stage, the customer examined the results of work and made necessary corrections.
- **All-Inclusive Reporting System.** The reporting system was all-inclusive. The customer got the necessary progress information, the results of defect tracking and the accomplished tasks on a weekly basis.

Used Technologies

Planning System: MS Project

Defect-Tracking System: Mercury Quality System and Microsoft Team Foundation Server (deployed on the customer side)

Structured Queries Language: SQL

Results

Our team of professionals managed to achieve the following results:

- A full and up-to-date testing model based on structured queries for test data retrieval was developed (nearly 1,000 tests).
- The existing testing model was updated to match the actual system functionality.
- After the analysis of the existing testing model, specific test scripts not concerned with individual business processes were developed on the customer side.
- The testing revealed the defects and the malfunctioning subsystems which caused the instability of the system.
- A package of about 50 documents was prepared for acceptance and approved with the customer for the acceptance of the functionality in the future.

- Some of the existing business processes required testing on the hardware in the real-time mode, which was unacceptable during system development. For these cases, the team developed several requirements specifications for creation and further use of emulators for these processes.
- The customer highly appreciated our abilities to analyze requirements, get into work promptly under conditions of time lack and timely respond to changes in task priorities.
- The Cooperation with the customer continues on a permanent basis. The team has been engaged into for projects. A start of a new project is planned for December 2008. (The latest project has been launched in December 2008).

Subject Area Expertise

Below is a general description of the tested systems that required step-by-step test scripts and acceptance certificates.

1. Automated Billing System. The system is used for keeping subscribers' accounts and payments and their control. The system has a number of subsystems that perform the following main functions:

- Collect and analyse payment data
- Generate payment bills for subscribers according to the billing period and the service plan
- Register payments, make payment adjustments and process the results of these adjustments
- Process payments (registering, transferring, recalling of payments; binding/unbinding payments to and from individual accounts)
- Process advice payments

The system provides other systems with:

- Financial information of subscribers
- Data for printing payment documents
- Data for financial reports

2. Customer Relationship Management System. The system is designed for processing subscriber data and automating processes related to subscriber services (sales, customer care, financial services and automated subscriber services) and internal workflows related to subscriber services.

The system comprises the following parts:

- Common means of managing the document workflow and the business processes of the telecoms operator
- A module for the automation of sales and customer care business processes
- Automated subscriber service modules for work through the Internet, IVR, USSD and SMS
- A module for the automation of reselling of the telecoms operator's services
- A module for the management of the data of customers, contracts, accounts and service applications
- A module for managing customer claims and feedback
- A module for work with debtors
- A module for marketing actions

3. Cash Payments Collection System. This system is designed for the automation of the payments with cash and banking cards through cash registers and the sales of top-up cards at cash registers.

4. Routing System. The system is designed for the routing of messages between the global composite automation system of the telecoms operator and the balance storage. The system provides other systems with an interface for managing the subscriber's account balance and the storage counters of the service application.

5. Information Storage System. This system is used to keep the data of banking card authentication and payments (through automated subscriber services; through cash registers; by direct debit payment).

6. Document Generation System. This system is designed for the automation of the workflow of the email messages and the documents provided by the telecoms operator to their subscribers upon the contract start and for customer care and financial purposes.

The system is used to:

- Manage email message, SMS and document templates
- Generate and print financial documents
- Manage mass generation and printing of documents
- Manage generation of electronic documents sent through email
- Generate documents (bills and other external print documents) by request from other systems.

7. Delivered Services Data Processing System. The system is designed for data acquisition, data transfer to service costs evaluation system for evaluation and permanent storage of data on rendered services.

Besides request processing, the system actualizes the balance and sends requests to the billing system for generation of bills (or advance accounts) for one-time services.

8. System of control of account balance, states and storage counters of service applications. The system controls the management processes for the balance, states and storage counters in response to such subscriber actions as payments, service use events and creation or deletion of accounts.

The system provides reliable storage for the information of object states and fast access to it. The system performs the following functions:

- Loads stored object presets; updates objects according to the billing period and makes changes necessary after migration
- Makes changes based on data from other systems on service use and registration of payments processed in these systems
- Generates notifications for other systems after values of stored objects reach triggering levels.

9. Costs evaluation system. This system is designed for real-time calculation of prices for services and goods, values of discounts and taxes. These calculations are based on the data from the system directories and other systems.

The system supports the creation of new service rating schemes (new services) using plug-in options with no need to modify the service costs evaluation module.

The system performs the following functions:

- Automation of support and use of pricing plans and services, rate directories, rates and other objects available in the system and necessary for rating
- Calculation of costs
- Management of rate directories
- Management of services, groups of services and types of groups of services
- Management of rate plans, groups of rate plans and types of groups of rate plans
- Support of plug-in options for rating
- Setup of parameters for rate plan changing
- Management of discounts
- Management of technical prefixes
- Management of shares
- Management of services in the rates directory and its rate plans
- Management of time schemes
- Management of prefixes and groups of prefixes
- Management of rate schemes
- Management of rate scheme rules and their creation
- Management of rate rules
- Management of price lists of network and non-network services

- Management of plug-in options
- Audit of changes

10. Delivered Services Information Storage System (storage of unified records on delivered services)

The system performs the following functions:

- Archiving of CDR records
- Control of transfer of processed data on delivered services to the storage in automatic and automated modes
- Keeping of information on delivered services in UMR records that can be accessed instantly (for a set latest period of time) and through an archive storage
- Analysis and processing of the results of data filtering (for non-rated records and records not sent to the archive)
- Provision of data to external systems for analytical tasks
- Provision of services delivery information
- Provision of means for viewing services delivery data from the online storage for set periods of time

11. Service Management System. The system is designed for the automation of the management of services delivered using the network equipment of the telecoms operator (SIM activation and blocking, adding, deleting, activating and blocking of services). The system controls services on the business process level. It configures network equipment for the delivery of the necessary services and provides means for service configuration setup.

The system performs the following functions:

- Execution of service management requests
- Control of the subscriber state on network elements
- System objects administration
- Creation and modification of business processes
- Logging, keeping of system objects state data and statistics
- Support for testing of network elements

12. Warehousing System. The system is designed for automation of warehousing processes for the telecoms operator, is used to register equipment (SIMs, КЭО) accepted and supplied by the storekeeper.

The system performs the following functions:

- Management of warehouses and warehouse groups
- Management of equipment
- Generation of warehouse operations documents
- Closure of documents
- Generation and printing of mandatory reports
- Automated storage life control
- Distribution of rights for managing warehouses, groups of warehouses, documents and reports

13. Resource Management System. The system is designed for keeping and providing information on the telecoms operator's network resources. It supports the logical description of the operator's network.

The system keeps and provides information on:

- Numbering capacity
- SIM ranges
- Network equipment
- Rating regions
- All network resources involved into business processes

The resource management system provides this information to other systems and allows for correct configuring and rating and:

- keeps logs of changes in the stored network resources;
- sets the "home" rating region;
- is used to store subscribers' balances.

14. Reporting System. The system is designed for the collection of data and generation of reports necessary for business processes support.

The system performs the following functions:

- Keeping report templates
- Generation of reports based on predefined forms or predefined parameters set manually
- Viewing reports
- Saving reports to files in a number of formats (HTML, PDF, RTF and XLS);
- Printing reports
- Scheduled generation of reports
- Keeping ready reports

15. Global User Access, Authentication and Audit Subsystem. This subsystem is designed for managing users' access to the automation system resources based on predefined user roles or their sets.

The subsystem performs the following functions:

- Management of user accounts, roles and rights for access to the automated system of the telecoms operator
- Export and import actions for security settings
- Keeping of a global user database (to be able to synchronize users across systems)
- Generation of audit reports