

# Custom Software Development

Case studies



## Table of contents

- Abstract..... 3**
- 1. Case study 1: Power supply management software ..... 5**
  - 1.1. Project..... 5
  - 1.2. Business case..... 5
  - 1.3. Scope of services..... 5
  - 1.4. Project management ..... 6
  - 1.5. Challenges..... 6
  - 1.6. Technology ..... 6
  - 1.7. Testing and acceptance ..... 6
  - 1.8. Summary ..... 6
- 2. Case study 2: VoIP provisioning server..... 7**
  - 2.1. Project..... 7
  - 2.2. Business case..... 7
  - 2.3. Scope of services..... 7
  - 2.4. Project management..... 7
  - 2.5. Challenges..... 8
  - 2.6. Technology ..... 8
  - 2.7. Summary ..... 8
- 3. Case study 3: Change of front-end technology ..... 9**
  - 3.1. Project..... 9
  - 3.2. Project scope..... 9
  - 3.3. Challenges..... 9
  - 3.4. Testing and acceptance ..... 9
  - 3.5. Infrastructure and technology..... 9
  - 3.6. Summary ..... 9
- 4. Case study 4: Account information cleansing application ..... 10**
  - 4.1. Project..... 10
  - 4.2. Business case..... 10
  - 4.3. Project scope..... 10
  - 4.4. Infrastructure and technology..... 10
  - 4.5. Project management and testing ..... 10
  - 4.6. Challenges..... 11
  - 4.7. Summary ..... 11
- 5. Summary ..... 12**

### Abstract

Verax Systems is a software house, consultancy provider and systems integrator specializing mainly in advanced and innovative IT solutions for the telecommunications, finance and enterprise markets. Since its incorporation, Verax Systems has successfully provided services and delivered numerous projects on five continents.

Verax Systems provides a wide range of **services** including:

- Technical consulting.
- Software design and development.
- Software Quality Assurance (SQA).

This paper presents a few case studies illustrating critical aspects of successful **software development projects** delivered by Verax Systems. A brief summary of the cases presented in the document is provided in the table below.

	POWER SUPPLY MANAGEMENT SOFTWARE	VOIP PROVISIONING SERVER	CHANGE OF FRONT-END TECHNOLOGY	ACCOUNT INFORMATION CLEANSING APPLICATION
Project duration	6 months	6 months	9 months	6 months
Staff involved	Project Manager, Project Leader, Technical Leader, 2 Developers	Project Manager, Project Leader, Technical Leader, 3 Developers	Project Manager, Project Leader, Technical Leader, 3 Developers, 2 Testers	Project Manager, Project Leader, Developers, 2 Testers
Tools used	Eclipse, MS Visual Studio, GNU C/C++ development tools, InstallAware, IBM Rational Purify, USB protocol sniffer, Wireshark	Eclipse, Maven, VoIP configuration compilers	Adobe Live Cycle Data Services, Java, Adobe Flex, Oracle DB, IBM WebSphere, Cruise Control	SQL Server Analysis Services, SQL Server Reporting Services, Microsoft C#, Microsoft .NET 2.0
Infrastructure	Physical UPSes, UPS communication links (USB, RS232C, Ethernet)	Development and production environments on site, VPN connection, local environments, physical VoIP Gates	Virtual development machine to provide an identical set of tools, VPN connection, audio-visual communication system	Virtual machines, VPN connection

**Table1 : Case study summary.**

All the described projects have been delivered at **fixed price**. Such an approach is beneficial for Customers as it guarantees:

- Clear scope and timing.
- Up-front price estimation, useful for budgeting.
- No financial risk.
- Lower functional risk.
- The defined, planned and sequential project flow gives the customers full control of the project.

On the other hand, in order to be delivered on time, on budget and on quality, fixed price projects require careful planning and management, and generally are considered to be high-risk. Verax Systems addresses these risks by tight control over deliverables, schedule and budget as well as good **customer communication**. Processes, procedures and project management techniques applied by Verax Systems on fixed-price engagements are described in detail in the subsequent sections of this document.

The benefits of using Verax Systems professional services for software project delivery included:

- Ability to use a team of managers, developers and quality assurance engineers with proven delivery track record.
- Reduced development time.
- Shortened development cycles.

For more information on Verax Systems' professional services portfolio please visit us at <http://www.veraxsystems.com/en/services>.

### 1. Case study 1: Power supply management software

#### 1.1. Project

The project embraced re-development, extension and numerous portation of Uninterruptible Power Supply (UPS) management software for a leading European vendor. Before outsourcing the work, the Customer invested a few years in the development of the software in-house. However, the growing number of supported operating systems, versions and distributions (especially Linux ones) coupled with a broad palette of devices and short time-to-market requirements made in-house costs of development unacceptable.

#### 1.2. Business case

Verax Systems was chosen due to a number of reasons:

- Experience in communications software development (serial ports, USB, communications protocols, etc.).
- Portable, proven and tested **Cavera** libraries for most of the operating systems in question (Linux, FreeBSD, Windows) which would cover about 50-60% of required functionality.
- Team size large enough to deliver the project quickly (three versions of software: lite, personal and professional), fifteen different operating system editions and twenty devices, and sufficient test labs.
- Mature Quality Assurance organization and facilities to automatically update software build – this aspect was important in the case of low-end UPS devices sold in thousands per month.
- Established software development process and experience.

According to the Customer, building such an organization in-house would cost much more than development and maintenance services, therefore the business value was obvious. Savings were directed to Customer's core business – manufacturing and hardware research and development. The key business benefits included:

- Time-to-market – Verax Systems guaranteed the ability to bring software with new UPS support to market fast, which was not achievable using in-house development.
- Quality – Verax Systems as a company specialized in software development and Software Quality Assurance (SQA) services and so was able to deliver high quality software.
- CAPEX/OPEX – both factors were lower as compared to building the software in-house.

#### 1.3. Scope of services

Verax Systems provided the following services for phase 1 of the project:

- Re-design and re-write of the software without using the legacy code.
- Delivery of all three editions of the software on requested platforms.
- Testing of the software.
- Implementation of communication protocols for new UPS models.
- Certification of drivers.
- Building update services.

Maintenance and tier-2 support services have been provided after final acceptance.

### 1.4. Project management

The project was run using the waterfall model with multiple cycles, a phased development approach for software that requires milestones, products, and reviews at each phase transition. The project started with defining of technical specification and ended with test plan acceptance. The specificity of the project required multiple workshops with the Customer (e.g. project management workshop). The project was run with the use of change request and project status report documents.

The project team on Verax Systems' side consisted of Account Manager, Project Manager, Lead Engineer and four developers. For testing, two Quality Assurance engineers were engaged. On the client side Product Manager and Head of Marketing were extensively involved.

### 1.5. Challenges

Challenges of the project included both technical and project management issues:

- Multiple 32- and 64-bit platforms (Windows, Linux, FreeBSD).
- Large number of supported devices.
- Portability of GUI on distinct operating systems (Windows, OS).
- Massive target client base with automatic upgrades.
- USB HID driver certification required for Windows.

Verax Systems' staff had to liaise and educate non-technical Customer personnel – common understanding of management processes, milestones and deliverables was achieved with a series of workshops.

### 1.6. Technology

Due to many low-level communication requirements, C++ was chosen as the implementation language. A standard Verax Systems' Eclipse/CDT environment was used along with Cruise Control providing continuous integration on different platforms. Virtual machines and VM\*Ware Server were extensively used to develop/test simultaneously in different OS environments. The wxWidgets toolkit was selected to ensure GUI portability.

### 1.7. Testing and acceptance

Entire unit testing and system testing were automated by the QA team (with a few exceptions on the system testing side, mostly relating to installation). The system test plan was entered into the test runner and approved by the customer as acceptance.

### 1.8. Summary

The system was a success – the software was delivered to specification and within assumed timeframes. During development the plan was changed to release a Windows version first. Many change requests were introduced as the project went on, as it was nearly impossible to scope the project correctly up-front.

A key factor for success was close cooperation with the Customer based on calls, workshops and frequent meetings.

### 2. Case study 2: VoIP provisioning server

#### 2.1. Project

The project was delivered for a customer who is one of the leading ISPs in Europe. The Customer was beginning not only to offer broadband internet access, but also started entering triple-play on owned links. In addition to new services, the Customer was also expanding from corporate to individual subscriber market, which required new sets of tools and services capable of executing new business logic.

Verax Systems was responsible for delivering a VoIP provisioning server, a central part of a VoIP system integrating:

- Providing a web-services interface for provisioning requests from the customer care system.
- Pushing configuration changes onto CP devices (mainly DSL modems and VoIP gateways).
- Populating customer care data into the billing systems.

On top of these functionalities, a payment gateway extension was developed in the billing system for an unsupported Internet clearing house, chosen by the Customer.

#### 2.2. Business case

Verax Systems was awarded the project due to a number of reasons, including:

- Prior experience with application integration, billing and provisioning systems.
- Thorough understanding of network management aspects and device configuration.
- Proven track record in developing carrier grade software.
- Demonstrated ability to address technical complexity of the project as well as software development skills in many disparate technologies.

The winning point was the ability to deliver the software in a very short time frame – as the service was already marketed and sold by the business.

#### 2.3. Scope of services

The project consisted of the following key phases:

- Design of WSDL interface between customer care and provisioning.
- Implementation of provisioning to CP.
- Implementation of provisioning to the billing system.
- Payment gateway development (using billing system's framework).
- On-site installation and live deployment.
- Service and maintenance.

#### 2.4. Project management

The project was run using the waterfall model with just one cycle starting with a high technical specification (the only detailed design was the interface specification in WSDL). The acceptance test plan was fully automated, except for payment gateway integration. Even though the waterfall model was used, many XP elements were also used – many details were agreed on with the Customer during the course of implementation.

Verax Systems' team consisted of up to seven engineers lead by a Lead Engineer and an Account Manager. The QA team was not involved as the project requirements were mostly technical and test cases were fully automated.

### 2.5. Challenges

The key challenges in the project included:

- Multiple target platforms (two editions of Linux and FreeBSD) – this problem was overcome by extensive use of VM\*Ware and virtual machines.
- Multiple types of VoIP gates requiring different methods of communication such as command line and SNMP. The documentation was often incomplete or ambiguous and behavior had to be tested in the lab.
- Since the customer care system evolved during the project, changes to the web interface had to be made.
- Operator security procedures – during deployment unblocking firewall ports turned out to be a time consuming operation.

### 2.6. Technology

The project was very complex from a technological standpoint as it involved many programming languages such as Java, Perl, Unix scripting and WSDL. In addition, a lot of billing system functionality had to be replicated in Java to populate the database correctly. Oracle and MySQL were used as database systems.

### 2.7. Summary

The project was finished slightly ahead of schedule. Project acceptance was based on an approved test plan; the test cases were run on-site, at the Customer's premises. Minor issues were discovered during the first few weeks of system operation, which were quickly fixed on warranty.

### 3. Case study 3: Change of front-end technology

#### 3.1. Project

The project in the following case study embraced porting of a three-tier, billing-related application from legacy HTML/AJAX/Struts technology onto a Rich Client Platform (RCP). The reason for using RCP was to minimize the load on the server-side (as the application had to serve thousands of concurrent sessions) by moving part of processing to the client side. Other expected benefits included:

- Lower cost of future development and maintenance of the software.
- Improved user experience via an advanced GUI providing a very professional look and feel.
- Standard client-to-server data architecture using RCP data services.
- Shortened development of new features.

Verax Systems was awarded the project due to several reasons:

- Verax Systems staff experience in RCP technologies and billing.
- Not enough resources on Client side to deliver the project in-house.
- Positive, prior project experience.

#### 3.2. Project scope

Project scope embraced all activities from high level design to testing. Client standards ranging from project management methodology to document templates were used. Changes and risks were carefully managed – status reports were sent to the Customer every week; video conference calls were also conducted on a weekly basis.

The elements of agile software development were extensively used for day-to-day management such as: stand up meetings, workshops, reviews, etc.

#### 3.3. Challenges

There were some important challenges in the project including:

- Getting familiar with the Customer system architecture and source code.
- Providing a local build environment.
- Mapping non existent GUI elements (such as custom controls) to RCP primitives, some of which had to be developed.

#### 3.4. Testing and acceptance

Project acceptance was based on a formal test plan, containing cases for legacy and RCP versions of the application working on an identical database. Code reviews (according to the Customer's standard process) as well as test plan approval were conducted before entering the test phase.

#### 3.5. Infrastructure and technology

Database and tools were delivered by the Customer. Source code was imported from the Customer repository to Verax Systems CVS, and exported back after the project. Before development began, a virtual machine containing all software required for development (WebSphere, WSAD, Eclipse, Flex, Oracle client) was created in order to ensure that all of the developers were working with an identical set of tools. The Customer's database was used, accessed via a VPN connection.

#### 3.6. Summary

Verax Systems finished the project with success. All the work was done on-time according to the plan with no slippage. Timeliness was achieved mostly through interaction with the Customer such as: calls, workshops, meetings and dedication of Verax Systems personnel. The budget of the project was overrun slightly as both sides underestimated the scope of the project.

### 4. Case study 4: Account information cleansing application

#### 4.1. Project

The project embraced development of an application for a large European postal bank. The project's key objective was to unify client data from all the sources into a master database. In the process, human operators were presented partial matches and allowed to decide which pieces of information are correct and fit together. The business rationale was to reduce costs of maintenance of a number of various data sources and paper records (some of them going tens of years back).

Verax Systems was chosen as a software development partner by a systems integrator (SI) due to the vast domain knowledge in large enterprises and banking sectors.

#### 4.2. Business case

Over the years, the bank has accumulated client account information in various branches and forms such as databases, document scans and others. The bank's system stores each account's data, whereas one client usually has a number of unrelated, independent records. To allow operators for linking accounts that belong to one client, eliminating redundant account records and providing missing information (e.g. date of birth) an appropriate application was required.

#### 4.3. Project scope

The bank's databases are used to prepare packages including lists of potential client accounts that fit together. The operation is multi-staged and consists of three phases:

- Records extracting and initial matching,
- Comparison of similar records and final matching,
- Quality control of records set.

The operator using the account linkage application will be able to process the records' package. The application displays form scan previews and allows the operator to select suitable pieces of information, consisting for example of the client's signature and date of birth. The extracted information is compared on the summary screen, which helps the operator in detecting accounts that belong to a particular client. As a result, the output files return to the bank, where they are processed and linked with a common client ID.

#### 4.4. Infrastructure and technology

The solution is a client-server application. The client is a Windows Presentation Foundation desktop application implemented using Microsoft C#, Microsoft .NET 2.0 and running on several operator stations. The server side was a Windows service communicating via Windows Communications Foundation classes. SQL Server Analysis Services and SQL Server Reporting Services were used to prepare and deliver a variety of interactive, printed reports and to track the processing progress.

#### 4.5. Project management and testing

All the work was done according to the specification and functional models. The project team consisted of developers, testers, a Project Leader and a Project Manager responsible for Customer communication and overall for the timeliness and quality of the deliverables. For testing, the Quality Assurance engineers from Verax Systems and Customer side were engaged. Initial unit tests as well as system and performance tests were carried out by the Verax Quality Assurance team. User Acceptance Tests and final performance tests were performed by the Customer's team. Comprehensive weekly tests allowed for successive implementation of working pieces of functionality. The progress was discussed between analysts on a daily basis and supported by weekly project status reports and conference calls to ensure continuous progress tracking and issue resolution.

### 4.6. Challenges

The key challenges in the project included:

- Building a client that would allow operators to work on records quickly (e.g. implementing keyboard shortcuts and efficient image processing).
- Achieving short response times for a number of concurrent operators (50-100).

### 4.7. Summary

The project processes were based on a formal project management framework and lasted for about 6 months. All the work was completed on time according to the agreed plan with no slippage. The timeliness and quality of the deliverables were achieved mostly through interaction between Verax Systems and the Customer teams such as daily calls and weekly project status reports and meetings.

### 5. Summary

Verax Systems is an experienced software development partner capable of delivering projects on-time, on-budget and on-quality. This is achieved mostly by a mature project management methodology as well as technical skills and abilities.

The techniques of project management used by Verax Systems guarantee:

- Clear definition of work with cross functional teams.
- Establishment of clear project objectives and milestones.
- Creation of effective and deliverable project plans.
- Monitoring of project management risk.
- Analytical approach to project planning and control.
- Dealing with changes and deviations from the plan.

Verax Systems can provide the following key advantages:

- **Experience** – Verax Systems is a spin off from a public US company (Vertel, formerly Retix) established in 2003 (core team from 1998).
- **Availability** – offices in The United Kingdom, Ireland, Poland and Germany, good transport connections worldwide.
- **Stable, skilled team of engineers and consultants** – experienced and skilled team assures higher quality of services.
- **Adherence to standards** – the team of professionals are aware of the Customer's standards and procedures, which ensures adherence to them.
- **Advanced communication facilities** – video-conferencing, dedicated leased lines, VPN connections.

To learn more please contact one of our offices or visit us on the Internet at:  
<http://www.veraxsystems.com/en>.