

# VisualSoft Technologies – Embedded Software Development Division

## Digital Settop Box Development – A Case Study



## Services Overview

*We offer concurrent research and development services; provide product development/turnkey solutions in the area of embedded software catering to various segments of the market.*

The following is a brief case-study of our activities in the segment of consumer electronics and this describes the specific concurrent R&D services that we are offering to a leading multinational consumer electronics giant in the development of digital settop box for digital TV.

### Services

**Nature:** The exciting nature of our association with client is that we are offering concurrent R&D services to the client throughout the life cycle of the product-development. With this, the project-area at VisualSoft has become a virtual extension of the client's lab.

**Association:** We have been offering low-cost, high-quality and highly reliable services to the client and the result of the satisfaction of the client is in the form of making us long-term partners in their program of development of digital settop boxes and related R&D for many years to come.

**Range:** The range of concurrent services include research, analysis, design, implementation and full functional testing for the products which are currently under development; maintenance for the products, which are already in the market, in the form of feature-enhancements and optimisation of response-times.

**Areas of expertise:** The very nature of the product requires us to work in functional areas of the product like hardware-drivers for various devices like modem, infrared remote, OTR, audio & video decoders etc; API's for graphics and embedded databases. Then, major portion of the work is in the area of user-interfaces covering on-screen-displays (OSD), Program Guides, Viewer Interactive screens and various configuration screens at the output and handling various inputs like infrared remote, front panel and telephone modem etc. Similarly, another important area of expertise is embedded-image-conversions, which is a challenging task in that we need to implement these image-conversions from their base-algorithms (RFC's) in the most optimised way.

The development of these drivers, API's, user interfaces and then image-conversions is a lot different from development of similar things for traditional desktops. It is highly challenging and complex as they are part of embedded-system, which always imposes limits on the memory and other resources to be used by the software.

### Customer Profile

Our customer is a leading multinational consumer electronics company that has a major share in the Digital TV/Digital Set-top box business. It has a dedicated laboratory to carry out research and development in the areas of digital TV/digital set-top box and related consumer-electronics products / technologies.

### Business Situation

Our customer, as per well laid-out plans of 'To Market', is releasing into market in the near future, a High Definition Digital Set-top box with enhanced user interface features and cost reducing hardware components. This product also includes analog and digital closed-captioning, viewer interactive program navigation and integration with telephone services via embedded modem.

### Software

Custom RTOS  
Sun Solaris ® based Build tools, XTerm S/W, Rational Rose ® Enterprise Edition, Microsoft Visual Source Safe® 6.0 for Configuration Management, Internet Information Server for Project Intranet, VisualSoft FileSecure® 1.0 for Encryption, Linux OS for Mail Server.

### Hardware

Settop Boxes, BitStream Generator for simulation of NTSC digital signals, JEI boxes for Online Debugging, Sun SPARC® Servers for Builds, Intel® - Pentium III as Developer, Desktop NTSC compatible TVs

## **2. Technology**

The product is a multi-processor, multi-tasking system, working on high-profile functional processors, which have on-chip MPEG-decoder, which carries out online and real-time processing of incoming audio/video. These processors have integrated 2D/3D graphics.

The system requires many device-drivers for its operation: video, audio, modem, OTR, IRBlaster and smart card interface. Our services include design and development of drivers for all these devices/interfaces. The drivers for video, audio and infrared remote are the minimum functional requirements. The modem interface is used to link up the telephone connection to the settop box and through this interface, the system displays on the TV screen, the callerID of the incoming telephone call. The driver for OTR initiates recording of the programs onto external VCR/internal harddisk. The smart card interface allows the user to PayPerView of programs.

We are using the latest real-time design methodologies and techniques for the design of these drivers.

The services include development of API's for graphics required to control OSD (onscreen display) and API's required to interface the embedded database with the input video drivers, which store program-guide, program-information and various other digital information carried along with the digital TV signal.

The services include design and development of API for the decompression of PNG/JPEG images in real-time to the custom display format. This is a highly challenging design as the decompression is done in real-time and so it has to be very much optimized both in memory and time.

The services include design and development of user-interfaces for this embedded product using object orientation.

The services also include development of software to decode and display the closed-captioning information on the TV screen.

We are following distinct methodologies for analysis, design and development of various modules in the system. These methodologies include AWT for user-interfaces, object-oriented techniques for application development and real-time techniques like real-time UML for design of drivers.

## **3. Development Environment**

This is a multi-processor, multi-tasking embedded product centred around custom high-end, high profile processors with complex audio-video and graphics capabilities. The software is built on truly real-time and embedded OS and developed based on full-fledged object-orientation using OOC (Object Oriented 'C'). The cross-platform build tools running on Solaris (on Sparc) are used to build the final executable. The cross-tools also include on-line debugger that helps in downloading the executable into the target product via JEI box (JTAG I/F box) and then debugging the s/w in real-product environment.

## 4. Development Methodology

As mentioned, we are involved in all phases of SDLC and also the development is carried on as a concurrent development, both at onsite and offshore.

**Workflow:** The workflow models are clearly defined and they are work-definition flow and work-execution flow.

To have an easy co-ordination at the client's lab of all the issues related to offshore, there is a team of VisualSoft engineers located at client's lab.

The work definition flows from the module-level-teams at the client's lab to the module-level-teams at VS, through this onsite-team of VisualSoft and offshore manager, thereby the work-definitions are perfectly co-ordinated and tracked.

But, the execution of the work, be it analysis, design or implementation, is between module-level-team at client's lab and module-level-team at VisualSoft. That is, the module-level-team at VisualSoft is directly interacting with the guiding module-level-team at the client's lab for all the issues related to development, status-reporting and schedules etc.

**Process:** All the activities of the development – analysis, design, implementation and testing are constantly reviewed and monitored by the client on a daily-basis, thereby giving the client a 24 x 7 advantage and also minimizing risk.

At offshore, again all the activities are thoroughly reviewed and monitored as per the standard review procedures for design, coding and testing before submitting the work-products to client.

## 5. Infrastructure

**Dev.Env:** We have established a comprehensive, self-contained development environment. As the cross-build tools are available for SunSparc-Solaris, required SunSparc-Solaris servers are installed and the developer desktops are provided with XTerm Software to login to these servers for building the code.

- Configuration management is implemented through MS Visual Source Safe and all the configurable items like documents, source-code etc. are strictly under the control of VSS.
- The project management is through the use of in-house web-based project-management tool for planning and monitoring the schedules.
- A comprehensive backup management policy is designed and keeping sensitivity of project-data in view, a daily incremental and weekly full back up is done.
- The most important document management (reference documents, data sheets, specification documents etc.) is done through project-intranet. This way, all the reference documents are centrally maintained on the project-intranet and are referred to from the developer's browser over intranet (local to the project).

**Lab:** A full-fledged lab is setup with necessary hardware and software like JEI boxes, settop boxes, NTSC TVs etc for the developers to carry out testing and debugging of the software.

**Security:** Keeping in view, the commercial sensitivity of the product, we have undertaken several measures to maintain the secrecy and the confidentiality of the project. Some important of these are

- The project-area is protected by the access-control system allowing access to only the members of the project.
- The project computers are totally maintained in a separate network-domain without any trust established with any other domains in VisualSoft.
- An exclusive mail server is installed for communication with the client.
- All the work-products are encrypted in a predefined manner before delivering to the client.
- The client is provided with VPN connection to the project-net, here, to access status reports, updated schedules and project-intranet etc.

## **6. Communication**

- The first and the most important aspect, here, is each module-level-team directly interacts with the guiding module-level-team at the client's lab for all its work, status and schedules.
- The email-communication is the main channel and of course, security is maintained through encryption of data before transmitting it.
- Regular, periodical teleconferences between the design team at the client's lab and the team here over phone/video-teleconferencing are conducted to discuss major issues and status.
- One of the onsite-coordination-team members visits offshore (VisualSoft) teams, periodically to synchronise the offshore team with the client w.r.t. all issues.

## **7. Support**

As the project-area is established as a virtual-extension with comprehensive security measures, it needs support for other issues related to logistics. It gets full support from different departments of the company – human resources, import/exports, network and systems department etc.

## **8. Human Resources**

The most important resource in any activity is human resources. All the members are highly skilled in the area of embedded-systems with skills in the development of hardware drivers, ISR's, API's, user-interfaces and also skilled in the embedded-image-conversions and embedded-databases etc.

### **For More Information**

**For more information about VisualSoft Technologies products or services, please log on to [www.visualsoft-tech.com](http://www.visualsoft-tech.com)**

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