



Embedding

Ideas

## **Detail Project Description of some of the projects**

Crystalline Infotek Pvt. Ltd.  
Crystal House,  
235, Navi Peth,  
Pune – 411 030.  
INDIA.  
Telefax – 91 – 020 - 4339634 – 35.  
[www.crystalindia.com](http://www.crystalindia.com)



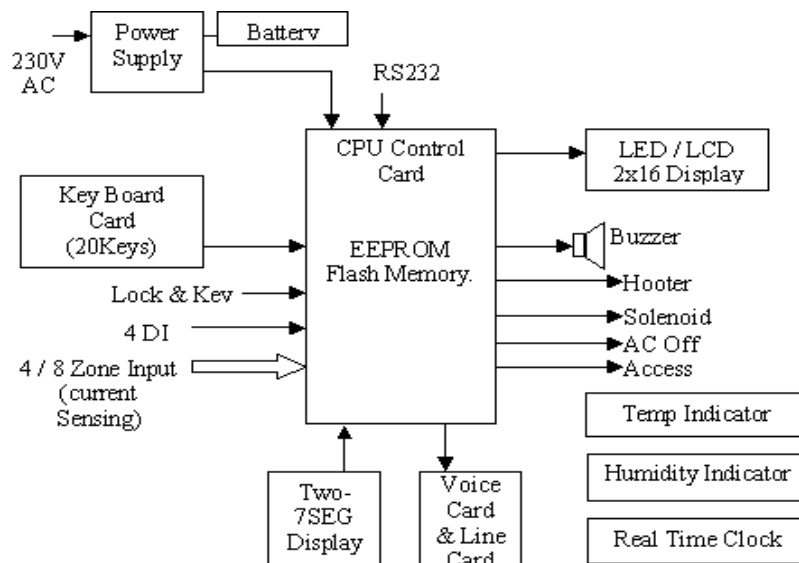
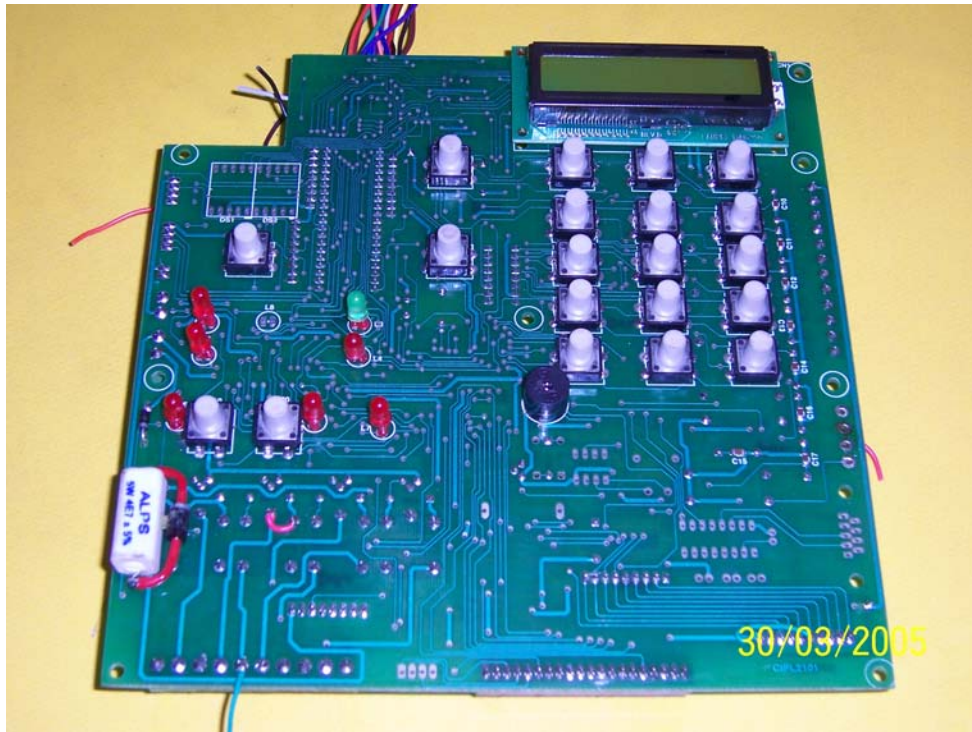
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## Application wise Projects details

### 1 Security and Surveillance

#### 1.1 8 Zone fire panel for conventional smoke detectors (Type of work: - Hardware and Firmware)



**Objective:**



- To design and develop the hardware for the fire panel which will detect the fire and blow the alarm.
- To develop the firmware for the 8 zone fire panel.

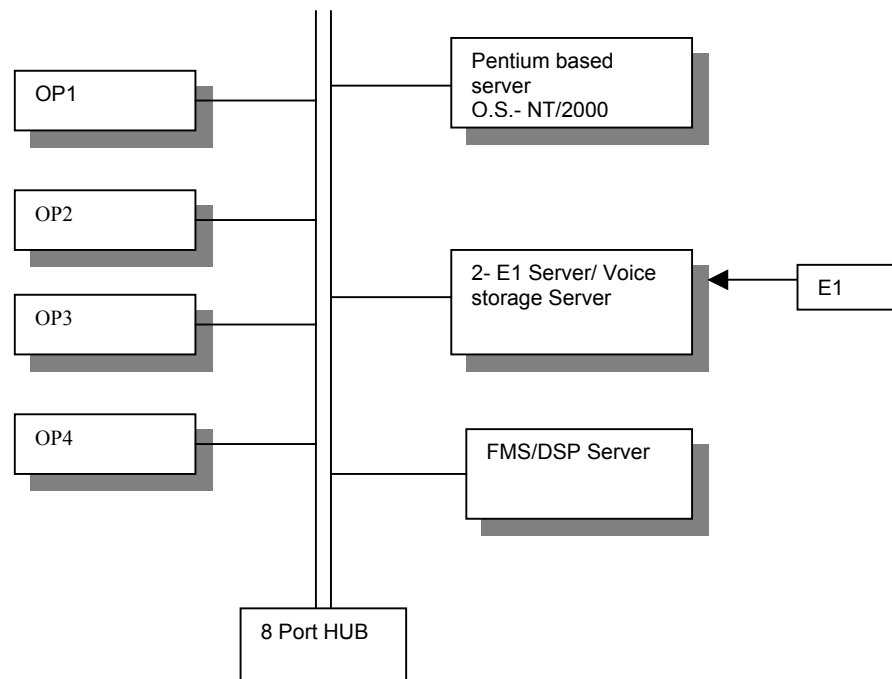
### Solution

Crystaline developed hardware & software for 8-Zone Fire Panel. Each Zone is capable of driving 20 conventional type photoelectric/ionization/heat detectors. These detectors increase the current level whenever smoke/heat is detected. This is sensed and alarm condition is set. In case of an alarm condition the panel can perform following actions. Relay outputs can be used to drive Siren or indicate to BMS (Building Management System). This can also drive the solenoid valve to release FM200 gas. Inbuilt telephone dialer with 20 Sec Voice message can dial multiple nos. Inbuilt communicator can connect to Central Monitoring Station. RS232/RS485 or Ethernet interface can signal other equipment. MODBUS Support to talk to BMS. The unit has 16\*2 backlit LCD display and keyboard for settings. The firmware also has ability to customize the functioning of the unit e.g. cross zoning. Time delayed discharge of gas.

### Our contribution:

- Development of the hardware.
- Development of the firmware.
- Development of the enclosure.

### 1.2 Audio / Fax Monitoring system (Type of work: - Hardware and Firmware)



### Objective



- To design & develop a system for PSTN telephone calls monitoring & FAX monitoring.
- To design networked system for multiple channels (type 24 tel. lines.)
- To develop various modules of the software for voice logging, voice editing, time stamping fax logging, fax viewing etc on the central server.
- To provide intelligence like automatic recording, event based logging etc.
- To develop required hardware circuits.
- The system operation should be user friendly.

### **Solution**

Various government agencies, embassies, corporate etc need recording/logging of information flowing in/out of the organization. Voice communication and Faxes are commonly used media. The system developed by us enables customers to record voice & faxes from up to 24 telephone lines. The system consists of rack-mounted boxes, each catering to four telephone lines. Each box has Ethernet port, which is used to network with other boxes and a central database server. The voice or fax (which is essentially voice coded data) are digitized and stored in the database. The information is time stamped.

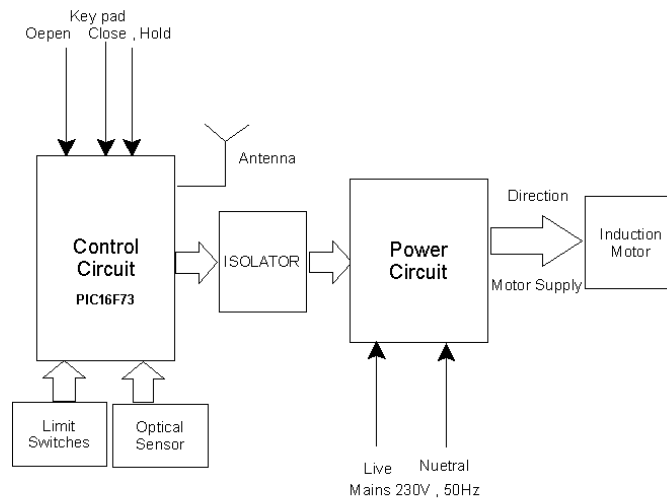
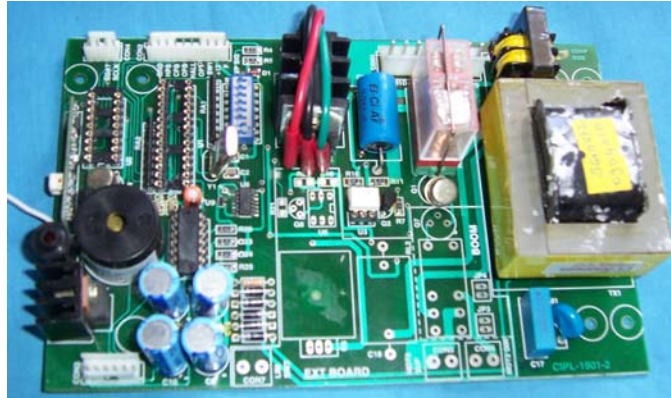
The information could be retrieved according to user requirements. Voice files could be played and edited so that unwanted the authorized user could delete information. Faxes can be viewed and printed.

### **Our contribution**

#### **Features**

- Powerful Graphical User Interface.
- Design & implementation of Connexant DSP based hardware for voice/fax capture.
- Development of interface card based on ISA bus for single board computer (SBC).
- Detection of telephony tones MFR1 and DTMF signaling.
- Automatic recognition of FAX protocols and converting analog FAX info into image file (.BMP).
- Voice logging and processing including conversion of raw voice data to .wav format.
- Interpretation of the data and storage into the database.

### 1.3 Controller for Sliding Gate Operator and Boom Barrier (Type of work: - Hardware and Firmware)



#### Objective

- To design and develop Microprocessor based controller for Sliding Gate Operator and Boom Barriers.
- To provide interface to various types of Access Control Systems.
- To provide ease of operation to users & maintain high level of reliability & ruggedness.

#### Solution

Niraj Industries manufactures Entry Systems. Sliding Gate Operators and Boom Barriers are part of their product range. Both of them are used to restrict / Control access of vehicles on roads, premises (e.g. industries, residential blocks, gated communities, bungalows etc.), railroad crossings etc. The product developed has to be rugged in



construction and highly reliable. It is supposed to work in extreme atmospheric/weather conditions. Lifetime for such products is typically few decades.

The developed electronic controller controls the single/three phase induction motor. Typically the user operates the gate from a vehicle by a coded remote control. Access Control Systems like Numeric Keypad Control, Swipe Card Control or RFID Control are also used.

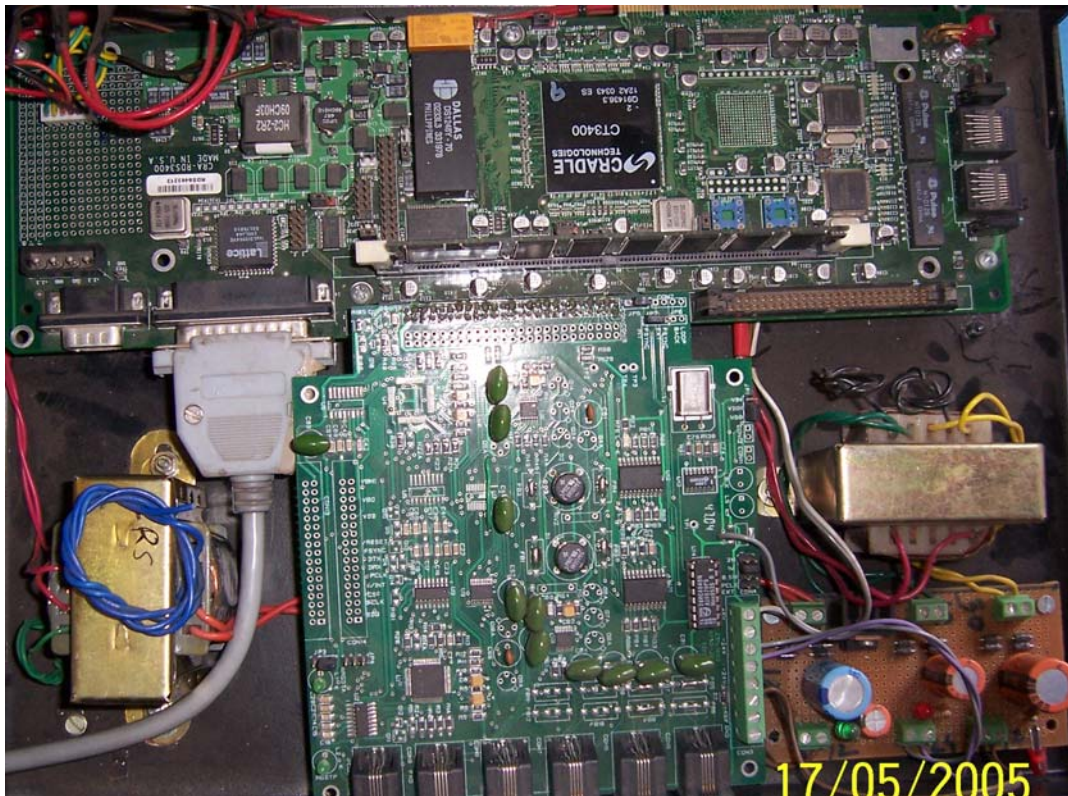
## Our contribution

### Features

- 1/3 Phase Induction Motor Control with Soft Start & Soft Stop facility.
- Direction Control of the motor.
- Taking inputs from various sensors like limit switches, proximity sensors, remote controls, photoelectric sensors etc. etc.). Browser based monitoring of key machine parameters in customizable format
- Taking action on above inputs as per the inbuilt firmware logic.
- Wireless Remote Control Range : 100mtrs in open air.

## 2 Telecommunication

### 2.1 VS16 – 16 Channel Soft-Configurable VoIP Subsystem





### **Objective:**

To build a VOIP subsystem so conventional voice and fax can be integrated into conventional Data network

### **Solution:**

VS16 is a 16 channel VoIP Subsystem for SME users built using Cradle Multiprocessor DSP Platform. The VOIP Subsystem provides toll-free voice and fax communications over the Internet or Intranet. By integrating voice and fax into a converged data network, businesses can avail features of converged data networks along with substantial savings on inter-office long distance toll charges.

### **Configurable Soft Module Support**

The subsystem is based around Cradle CT3400, multiprocessing DSP platform. This allows soft configuration of the subsystem to build any real life application. Possible configurations are –

- IO interfaces such as FXS, FXO, T1, E1, ISDN, Ethernet, IDE, Video if necessary.
- Per port configuration for Audio Codec, Jitter buffer, AEC, VAD / CNG.
- Network Protocol Stack
- Voice processing, Storage, Routing.
- IVR systems

### **Features**

- Available in three models VS16-6 (4 FXS/2 FXO), VS16-12 (8 FXS/4 FXO), VS16-16 (12 FXS/4 FXO)
- FXS/FXO interface on each channel for direct analog connection to phones, key telephones, PBX extensions, PSTN lines or PBX trunks.
- 10Base-T/100Base-TX auto negotiating port for IP connection.
- Configurable Voice compression using industry standard multiple algorithms including ITU-T G.711, G.726, G.723.1 and G.729. Support for VAD/CNG features.
- Acoustic echo canceller compliant to ITU-T G.167 (AEC) standard.
- Dynamic Jitter Buffer management.
- Packet loss error concealment.
- DTMF detection and generation.
- T.38 real-time Fax detection and relay.
- RTP, RTCP, RTSP, SIP, SDP, TCP/IP and UDP/IP network protocol stack
- RS232C interface for control and configuration.
- Control and Configuration through System Console and Web Browser.
- IDE disk interface for voice mail storage and retrievals, music-on-hold etc.

## 2.2 Telephony Interface for Cradle Platform (Type of work: - Hardware and Firmware)

### Objective

To develop a FXS / FXO / PSTN interface board around Cradle's RDS 3400 board, for the systems with VOIP applications.

### Solution

Cradle manufactures a high-end SoC class processor - CRA3400, with multiple Computing elements, Digital signal processors and programmable IO interface. This Chip can be reconfigured with the software for use in multiple applications. The Telephony interface board was developed to create a VoIP gateway around the Cradle processor. This Gateway can support software selection of multiple types of Audio codecs such as G.721, G.723, and G.729 at the same time on different channels and they can be software selectable.

### Our contribution

- To design and develop a daughter interface board with PSTN / FXS / FXO
- interface for multiple channels. Lines To write firmware for the device driver using programmable IO features of Chip.
- To provide the base level hardware API for any upper level VoIP applications.

### Features

- 4 / 16 channel support, with each channel can be FXS / FXO or PSTN.
- Based on Industry standard G.711 compliant Codec
- Confirming to Q.552 standards
- Provision for Ring relay circuit and G.729 at the same time on different channels and they can be software selectable.

## 2.3 Protocol Gateway (Type of work: - Hardware and Firmware)



## Objective

To connect tow different systems running on two different protocols.

## Solution

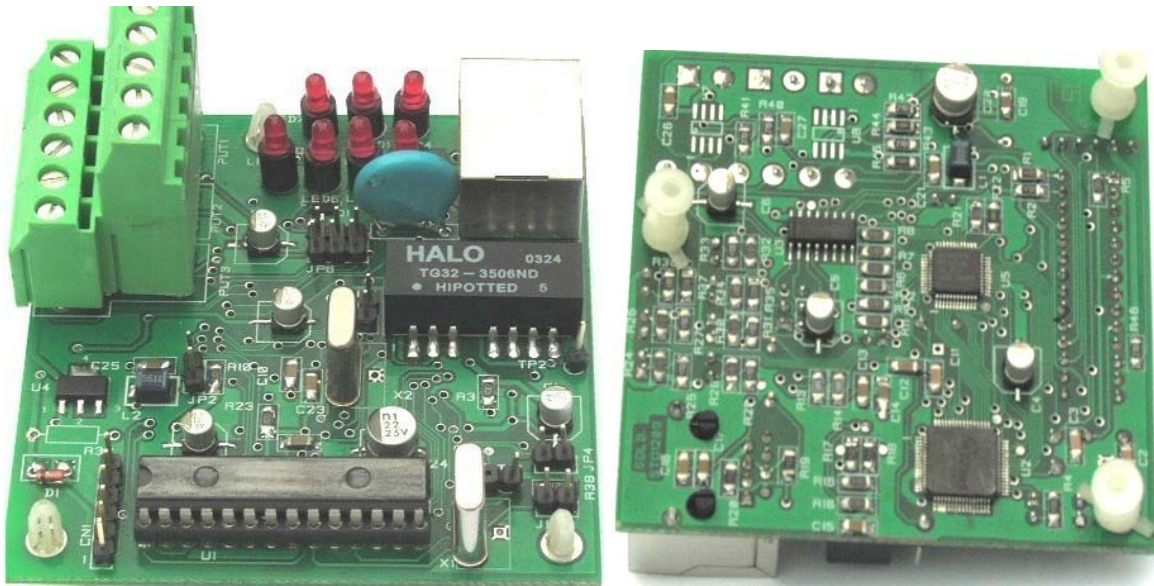
The Gateway is an intelligent box with memory and three serial ports. This has applications in Industrial automation segment and is used to connect two different systems with different protocols. Multiple models with combinations of protocols were developed. Protocols handled are – MODBUS RTU, ASCII, Honeywell ABC, IEC60870-5-103 and Proprietary OE specific. Third port is used to configure and diagnose the traffic information. The development was done as a turnkey product development and is an ongoing contract.

## Our contribution

- Design and development of the basic hardware.
- Development of the firmware.
- Successful communication between two different systems.

## 3 Industrial automation

### 3.1 Serial to Ethernet converter (Type of work: - Hardware and Firmware)



## Objective

- To be able to convert RS232 to Ethernet.
- To be able to use the legacy instrument on RS232 on Ethernet.
- To design and develop the Hardware for the converter.
- To design the firmware.



## **Solution**

This converter allows existing legacy instruments and equipments on serial interface with RS232 or RS485 to be connected to Network. The development was done as a turnkey product development for an OE customer. Support for various serial and networking parameter configuration was provided. This can support TCP, UDP, ICMP and ARP network protocols and acts as a pass through converter from TCP/IP. The network socket connection could be initiated from the converter or from the external network device. Another models with support for additional protocols support such as MODBUS TCP was also developed around same core firmware.

## **Our Contribution**

- Right from concept design to final productization.
- Design and development of the hardware.
- Development of firmware.

### **3.2 Remote monitoring Gateway (Type of work: - Hardware and Firmware)**

#### **Objective**

- To design the hardware for the remote monitoring gateway.
- To design the server program to establish communication with the remote monitoring hardware.

#### **Solution**

For remotely tracking run time parameters in factory plant, it was required to send periodic information from the equipment to the central web server. This gateway was developed to provide such a solution. It had one serial interface to collect the information from the controller, had built in modem for Telephone dial up interface and also PPP stack chip. The gateway would dial out to local ISP and connect to web server application waiting for the information. Once the information was sent, the gateway would disconnect. The gateway had few digital IO lines as well. The web server application would then assimilate the information and present in HTML format for global access.

#### **Our contribution**

- Design and development of the hardware
- Development of server side software

### **3.3 SmartIcon. (Type of work: - Hardware and Firmware)**

The SMART-Comm HS80 is a connectivity and protocol-converting product used by OEMs and End User Fabs to integrate SMIF I/O's, SECS devices, and Auto ID technologies. The SMART-Comm improves communication speeds and efficiency by combining protocol conversion and multiplexing in a single device. The SMART-Comm provides a common



interface from the CIM system to semiconductor equipment, auto ID components, and serial devices.

## **4 Medical electronics.**

### **4.1 PCR Analyzer Software System**

#### **Objective**

- To design & develop user friendly GUI.
- To show the result graphically provided by the hardware card.
- To measure the intensity thrown by DNA substance.
- To heat and cool the DNA substance by controlling the valves.

#### **Solution**

PCRjet project is mainly used in DNA related research. There are two types of hardware one is Kithley card and another one is the Otion optics Kithley card is used for heating or cooling. It is basically based on electrical signal, which are converted to thermocouple signal. Otion optics hardware is typically a sensor, which senses the intensity and gives the according output.

There are two parts in the applications

- 1) Heating the DNA substance
- 2) Finding and measuring intensity the Melting curve of that DNA substance.

There are 4 types of physical valve used for heating that valves are controlled by the software.

In first part through software we give the instruction to heat or cool the substance by a definite ramp rate that rate is controlled by us through software.

In second part when we give the instructions to heat or cool the substance the DNA substance emits a typical amount of intensity that intensity is measured and shown on the graph.

#### **Our contribution**

#### **Features**

- Powerful Graphical User Interface.
- Easy interaction with the instrument.



#### **4.2 Embedded GUI for gastrointestinal disorders treatment equipment (Type of work: - application software)**

##### **Objective**

- To develop the GUI.
- To provide the communication with the hardware devices that the user has.
- To measure monitor and display the different parameters required to user.

##### **Solution**

The customer develops innovative products for the treatment of gastrointestinal disorders. They have two products used for the treatment of Gastro esophageal Reflux Disease (GERD) and Fecal Incontinence. Both systems use Radio Frequency Thermal Ablation (RFTA) as a surgical method to create targeted tissue ablation resulting in tissue volume reduction.

The project involved development of GUI on a dedicated display processor. GUI application provides complete control on the functioning of the equipment to the user. It also acquires information such as temperature, power and other control parameters from RF generator and presents in the form of trends, charts and graphical animation. Patient records and data logs are also maintained.

##### **Our Contribution**

- Development of the GUI.
- Establishing of the communication between the hardware devices

#### **4.3 Automated Testing of a catheter navigation system (Type of work: - Verification and validation)**

##### **Objective**

- Design a test strategy test plan for testing the device.
- Design of test cases, which will take care of all the possible stages.

##### **Solution**

The customer is the world's largest medical device company dedicated to less-invasive therapies. The project involved testing of equipment used for real-time position monitoring of catheters. The equipment determines in real-time, the 3D position of catheters within the heart. A 3D computer display provides a method for catheter navigation and documentation of mapping and therapy locations.

Objective of the project was to develop complete test strategy, test plans and automated test suites for functionality, performance and stress testing of the equipment. Entire testing is carried out using a command interface provided to operate the equipment from a remote location. The test suite provides complete flexibility of selection, configuration and pre-scheduled execution of test cases for a test run. Test results are recorded and reported in a format suitable for the company's standards compliance requirements.



### **Our contribution**

- Testing of the device

## **5 Semiconductors**

### **5.1 Microcontroller Programmer Upgrade**

**(Type of work: - Hardware, firmware and Verification and validation.)**

#### **Objective**

- To Upgrade the Programmer software to support the newer and newer versions of chips.
- Testing of the newer versions of chips.

#### **Solution**

This customer is a leading semiconductor manufacturer of Microcontrollers. Their Microcontrollers address embedded control market space. We are their software and hardware development partners. We have successfully executed various projects like: Upgrading programmer and developing algorithms for new microcontroller families This development helped in protecting end customers' investment in existing programmers in a cost effective way. Newly developed feature of on-site firmware upgrade facilitates programming support for their future Microcontrollers as well.  
V & V for next generation programmer

#### **Our contribution**

- Development of the software for the programmer hardware.
- Testing of the chips

### **5.2 Industrial Data Communication Server**

**(Type of work: - Hardware and Firmware)**

This project was executed for a manufacturing major in the US who is a provider of equipments for semiconductor fabrication industry. Primary objective of this project was to interface a host of silicon equipments supporting various SEMI standard communication protocols.

We provided a solution in the form of a gateway that communicates with these equipments on one side and with a PC on the other. The gateway is realized using SBC supporting PC104 expansion, communication module having 8 serial ports and an Ethernet interface.



## **6 Automotive electronics**

### **6.1 Vehicle Data Logger (Type of work: - Hardware and Firmware)**

#### **Objective**

- To monitor the driver's habits.
- To monitor the vehicle statistics.
- To design and develop the hardware required for monitoring the hardware.

#### **Solution**

For a fleet owner company, it was required to monitor the Driver's habits with respect to vehicle parameters for better utilization of fuel and maintenance of vehicle. A flow sensor for fuel consumption and speed sensor were used along with Engine RPM measurement. The three inputs were given to the on board data logger unit. The unit had 6-digit 7-segment display and had features of capturing various parameters such as Total distance traveled, Total fuel consumed, over speeding hours, Night driving hours, Engine On time, Engine Fail time etc. The logger would save about 30 days data in its EPROM memory. A hand held data collector unit was also developed to down load the data from multiple such vehicle units and send it over to PC. Software to generate & print trip reports was also developed.

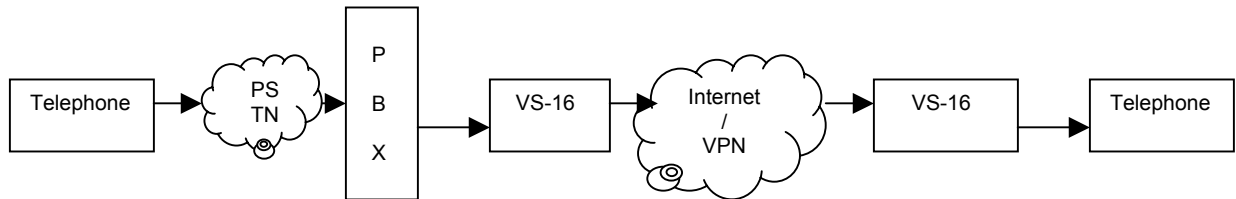
#### **Our contribution**

- Development of the hardware.
- Development of the firmware.

## Domain wise Projects details

### 7 Hardware and Firmware

#### 7.1 RTOS Components on Cradle Platform for Network Camera and VOIP Gateway Application Area: Telecommunication and Security surveillance.



#### Objective

- To design and develop TCP/IP HTTP, FTP, RTCP, SMTP, SIP server components.
- To implement these components on Cradle's RDS3400 platform

#### Solution

Cradle is US based innovative soft silicon company making CRA3400 SoC ideal for streaming applications in Audio and Video domain. The chip has reconfigurable architecture and has Multiple of computing elements, Digital signal processing elements and programmable IO interface on single chip. The evaluation platform for this chip is developed by Cradle. This platform is general purpose and can be used for any system such as Network Camera, VOIP gateway, Video Conferencing equipment etc. Basic platform with UDP and TCP/IP implemented was available from Cradle.

#### Our contribution

- Development of Application level Protocols as HTTP, FTP, SMTP, RTCP, SIP for eCos RTOS on Cradle platform..
- Memory based file system
- Integration of these components onto RDS3400 based hardware for system integration for a demo application of Network Camera.

#### Features

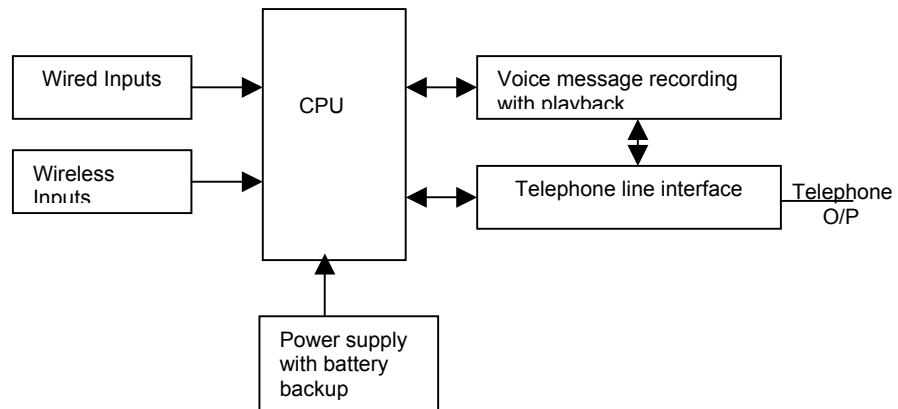
- HTTP Server is used for starting/stopping/configuring video and audio streams.
- FTP Server is used for Firmware uploading to RDS3400 board.
- SMTP Client is required to send messages generated as logs by RDS3400.
- RTCP is needed in conjunction with RTP to control Video & Audio encoded Traffic.

## Keywords

HTTP Server, FTP Server, SMTP Client, RTP, TCP/IP, eCos, M-JPEG, MPEG4, H.264, Multiprocessor, CCD, Network Camera.

## 7.2 Wireless Intrusion Control Panel

Application area: Security surveillance



## Objective

- To design and develop Microprocessor based Intrusion Control Panel.
- To take inputs from wired and wireless sensors of various types.
- To provide ease of operation and highest reliability.
- To provide indication of emergency on the panel and to remote Crisis Management Center (CMS).

## Solution

E-Call Signals provides end-to-end security and safety solution to their clients. System consists of this Intrusion Panel to sense the emergency and contact Receiving Unit connected to Computer running emergency management software. Various types of sensors like Magnetic Contacts, PIRs, Smoke/LPG Detectors, Vibration Sensors;



Emergency/Panic Switches etc. can connect to Intrusion Panel. Sensors are of either wired type or equipped with wireless transmitters.

Intrusion Panel consists of Microprocessor based circuit, which can accept signals over RF link or wires. Depending upon user programming it resolves sensor inputs and activates Siren. It also has inbuilt autodialer facility which dials automatically over PSTN. Five-telephone nos. could be stored. First number connects it to the CMS. Other nos. can call on either mobile or landline and play pre-recorded voice message. The user as per requirement can record this message.

Intrusion Panel provides several other features like programmable entry/exit delay, audio indications, digital display etc.

### **Our contribution**

- Design of the hardware
- Development of the Hardware
- Development of the firmware

### **Features**

- 4 wired zone (2 delayed and 2 panic).
- Keypad based arming/disarming.
- 7 Wireless Sensor Zones (Uses Microchip Keeloq technology to secure).
- Battery Backup with battery charger.
- Telephone dialer with multiple voice messages.
- Other features like: Tamper Switch, Telephone line sensing.
- Seven Segment LED indication.
- Design & development of tamperproof enclosure.

### **Benefits**

- Guard premises like residential bungalows, flats, offices, shops, industrial establishments etc.
- Signal the emergency to CMS and individuals by phone.

### **Keywords**

Intrusion Control Panel, Sensors, PIR (Passive Infrared Motion Sensors), PSTN (Public Switched Telephone Network), LPG, RF (Radio Frequency), CMS, Battery Backup, Entry/Exit Delay.

## 8 Application Software

### 8.1 QUANSOFT (Bio-Informatics Software) Application area: Medical electronics



#### Objective

- To design & develop software, which would work as a PC, based user interface for Thermal Cycler Unit.
- To develop various modules of the software like Layout Editor, Program Editor, Experiment Editor etc.
- To analyze results provided by the Thermal Cycler.
- To design & develop user friendly GUI.
- To develop database independent software.
- User should able to send program, layout, experiment, results files created using the software by mail and open those files by just double clicking in respective editors.
- Software should be able to detect and update the instrument status on connection and disconnection of respective instrument.

#### Solution

Thermal Cycler is the instrument, mainly used in Bio-Informatics laboratories for research purpose. This instrument is having a tray, which consists of 96 test tubes in which you can place DNA samples. Program is created in a way that, instrument will heat or cool the samples at particular temperatures and readings of each DNA sample at the respective temperatures are taken and returned in the XML format.

With the help of the software you are able to create complex programs and experiments & download to the instrument on just one click. You can set, reset the analysis methods and properties with the help of self explanatory wizard. Software will detect the connected and disconnected state of the instruments and update the status accordingly. With the help of software, Program, Layout, Experiment and Result files are generated in XML format. User is able to change the Instrument settings very easily without knowing the internal details of the instrument. Software will show the details of the currently running program with the help



of run module. If there is power failure or system shutdown, software is powerful enough to gather the lost readings of the instrument.

### Our contribution

- Development of the GUI based software

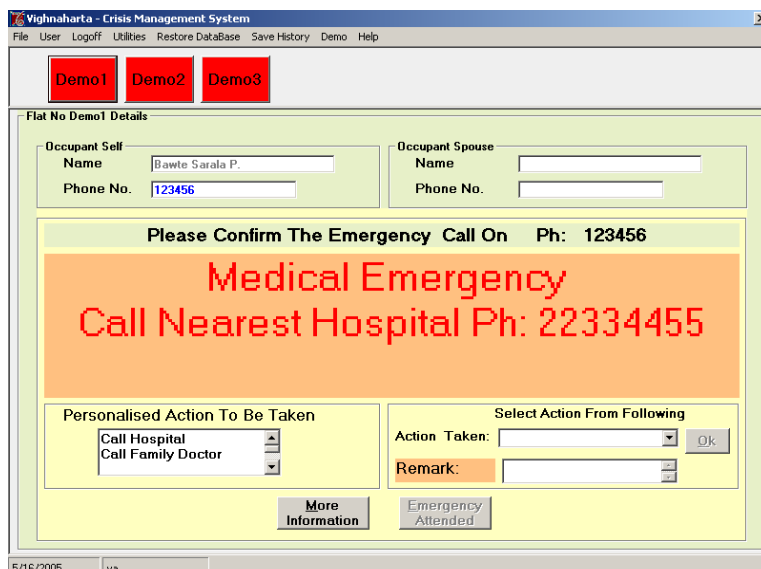
### Features

- Powerful Graphical User Interface.
- Easy interaction with the instrument.
- Able to connect four Thermal Cyclers at a time to a PC through USB ports.
- Run experiments simultaneously on all four Thermal Cyclers.
- Ability to retrieve lost readings from the instrument in case of power failures or disconnection of instrument during experiment run.
- Ability to retrieve the experiment file from the results file.
- Wizard based analysis methods selection and assignment.
- Instant results calculation with graphical display on change of analysis method or property.

### Keywords

DNA Thermal Cycler, Experiments, Programs, Layouts, Results, DNA Samples, Cartridges, Readings, Analysis Methods.

## 8.2 Product Name: Central Monitoring Software (CMS). Application Area: Security surveillance.





## Objective

- To design & develop user friendly GUI.
- TO design software which will communicate with the receiving unit and shows us the type of alarms.

## Solution

This Software is basically used in large townships. In each flat there is a instrument called communicator. There are 4 types of emergency alarms, which user can give or system itself can generate it. These alarm are reported in the communicator and there after it sends those alarms to a central unit called as receiving unit. This Receiving unit is connected to the PC through the serial port. Depending upon the type of alarm PC side software first pop ups the flat number and which type of emergency alarms it is. There will de all details of the flat owners stored in the database. When we click the flat number, which has popup, then it will show the details of the flat owners.

## Our contribution

- Development of the CMS software

## Features

- Powerful Graphical User Interface.
- Easy interaction with the receiving unit.
- Full-fledged database of the flat owners.

## Keywords

Communicator, Receiving unit, emergency alarm.

## 9 Verification and validation

### 9.1 Blood Chemistry Analyzer

**Application Area: Medical electronics.**

#### Objective

- To maintain all earlier versions of the firmware.
- To modify the code to add new features to the instrument.
- To optimize the old firmware to occupy lower code space.
- To generate documents as per validation criterion provided by FDA guidelines.

#### Solution

A leading US based company manufactures Blood Chemistry Analyzers. These analyzers use disposable disk with radial cavities. The blood sample is put at the center of the disk. The disk is then loaded into the analyzer tray. Disk is rotated at high speed so that blood sample is carried to cavities. Each cavity is heated up to required temperature. Readings are taken by using photometry techniques. The data is collected & computed using various biochemistry algorithms. Results are printed on built-in-printer. The equipment uses 16bit Intel microprocessor.



### **Our contribution**

- Upgradation of firmware
- QA and validation for compatibility with earlier versions.

### **Features**

- Reverse engineering of the code was done.
- Maintenance of the firmware for 1.5 years.
- Restructuring of the code was carried out.
- Memory optimization of the code was carried out.
- New computation algorithms were included.
- Following documents were generated.
  - Design documents
  - Test Plan

### **Keywords**

Blood Chemistry Analyser, Disposable Disk, Photometry, Firmware, Microprocessor, Data, Blood Sample.

## **9.2 Intelligent Multiplexer**

**Application Area: Semiconductor and telecommunication.**

### **Objective**

- To maintain and fix the reported bugs for the software.
- To carry out QA tests on the modified software.
- To generate reports acceptance reports.

### **Solution**

A leading US based company manufactures Intelligent Multiplexer for Semiconductor Equipment Industry. This multiplexer interface with multiple SECS protocol devices and allows single point communication of field devices with central PC. The multiplexer was based on Pentium processor and supported 8 such serial ports and also had Ethernet interface for host communication. The product was developed by customer and we took on the ownership of development after the product was installed in substantial numbers in field.

### **Our contribution**

Operational problems were reported from various installations regarding software bugs. Our role was to understand the entire code base, fix the bug for any reported problem and repeat the QA tests after bug fixing.

### **Features**

- Reverse engineering of the code was done.

## Detailed Project Description



- Maintenance of the product code for 2 years.
- Validation report for Test Plan
- On line support for installed products.
- High turnaround time

### **Keywords**

SECS I and SECS II protocols, HSMS host communication, TCP/IP stack on Embedded platform