



NeST has been working in the area of automotive systems for many years. We have developed Bluetooth wireless Systems, Entertainment Systems, In-Vehicle Electronics Systems & Telematics Solutions for automotive OEM customers. Our exposure in this area has given us considerable amount of expertise in automotive related technologies like CAN, J1850, MOST etc. On the other hand our customers could establish a software development partner who could provide high quality cost effective software solutions on time.

EXPERTISE

The summary of our skill sets in this domain are outlined in the table below

Area	Technology / Platforms / Standards	Skills
Automotive Networks	CAN, J1850, LIN, MOST, GM Class 2 and GM LAN	Familiarity and hands on experience with all standards. Implementation in C language. Experience with Tools like CAN Analyzer, GRYPHON etc
Automotive Modules	Body Control Modules, Lighting Control Modules,	Door and Window Control. CAN – Bluetooth Gateway, MOST Bluetooth Gateway. PWM, Anti Pinch Control and other techniques.
Infotainment Systems	AMIC, MOST	Developed Gateways for AMIC and MOST
Applications	Hands Free Mobile applications, Automotive diagnostic applications, Bluetooth Gateways	Successful implementation and demonstration at several prestigious shows



Supporting Technologies

Wireless	Bluetooth Wireless Networking, 802.11 WLAN, GSM, GPS	In depth Expertise ranging from Chip Sets and Drivers to Full-fledged product development. Implemented Bluetooth stack, 802.11i MAC layers and vehicle tracking system based on GSM / GPS
Multimedia	MPEG, WMA, Multimedia Streaming, Voice and Video over IP	Implemented MPEG 1 / 2 / 4 and WMA encoders and decoders. Developed video streaming applications
Processors	Mitsubishi 32 bit series, ST9 family, Hitachi H8S family, Hitachi SH series, Intel XSCALE, Motorola PPC	Experience and in house availability of Emulators
Operating Systems	OSEK compliant OSes, OSGI, QNX, uCOSII, WinCE, Embedded Linux, VxWorks	Hands on experience
Tools and Development Platforms	Metrowerks Code Warrior, Tornado for Vxworks, Montavista Linux, CANoe – CAN Analyzer, Ghryphon – CAN analyzer. Emulators for different processors	Hands on experience

PROJECT SNAPSHOTS

BLUETOOTH – CAN GATEWAY

The Controller Area Network (CAN) is a serial data communications bus for real-time applications. The CAN - Bluetooth Gateway module allows Bluetooth devices to communicate with automobile in-vehicle modules like Engine Control Unit, Body Control Unit etc which are usually connected through a CAN network. The Gateway Firmware interfaces to the HCI layer through an USB transport layer. The scope of the project includes development of the firmware for the Gateway module and a Remote Base Station Diagnostic Application running on a portable computer which connects to the Gateway through Bluetooth. The application can be used to view the status of various devices connected to CAN bus and also vehicle parameters like



engine speed, oil temperature etc. This project was demonstrated at the Convergence Show in Detroit during October 2000.

Hardware Platform	Hitachi H8S2623
OS	Proprietary
Bluetooth Module	Ericsson ROK 101 008
Transport	USB
Bluetooth Stack	Developed by NeST

BLUETOOTH – MOST GATEWAY

MOST (Media Oriented System Transport) network is a cost-effective, high performance solution where the primary data types to be networked are multimedia (digitized audio, voice and compressed video) and control. MOST technology provides complex DSP based devices with all of the control and multimedia information necessary to fully utilize their capabilities, which in turn maximizes the flexibility of the overall system.

The Bluetooth – MOST Gateway module provides an interface between the Entertainment and Navigation system in the vehicle with the outside world through wireless paving the way for futuristic applications like remote Navigation and Guidance information.

Hardware Platform	Hitachi H8S2623
OS	Proprietary
Bluetooth Module	Ericsson ROK 101 008
Transport	USB
Bluetooth Stack	Developed by NeST

JSR – 82 BLUETOOTH JAVA API IMPLEMENTATION FOR TELEMATICS PLATFORM

NeST has implemented Java APIs as per JSR-82 specification for a computation platform aimed at automotive applications. The target hardware is based on Intel XSCALE processor running QNX operating system. Communication with the target hardware is through JNI (Java Native Interface).

Hardware Platform	Intel XSCALE
OS	QNX 6.2
Bluetooth Module	Infineon PMB 8760
Transport	USB / RS232
Bluetooth Stack	Extended Systems Blue API

REMOTE BLUETOOTH MONITORING STATION USING IPAQ POCKET PC

The Compaq iPAQ is one of the latest PDAs having built in Bluetooth function. The scope of the project was to develop a automotive diagnostic application which communicates to the CAN network in the automobile using Bluetooth. The connectivity is achieved through a gateway module. The application makes use of the Bluetooth services provide by iPAQ

Hardware Platform	ARM9
OS	Microsoft Pocket PC 2002
Bluetooth Module	built - in
Transport	USB (built-in)
Bluetooth Stack	built - in

HANDS FREE UNIT FOR MOBILE PHONE

This project was aimed at demonstrating hands free operation of a mobile phone in an automobile environment. The application uses Voice Recognition techniques to dial out voice calls to the mobile phone using the AT command set. The Bluetooth enabled control module uses RFCOMM protocol for sending the AT commands and a SCO link for transferring voice. The gateway also controls the conventional audio



system in the car to multiplex voice signals from the phone and synthesized Voice prompts for the hands free application. The scope of the project included implementation of the Hands Free Profile (Version 0.96) on a Hitachi Microcontroller based Hands – Free Unit.

Hardware Platform	Hitachi H8S2148
OS	Proprietary
Bluetooth Module	Ericsson ROK 101 008
Transport	RS232. (Audio Directly through PCM codec)
Bluetooth Stack	Extended Systems Blue API

CAN BASED BODY CONTROL NETWORK

A CAN (Controller Area Network) based network was designed, implemented and tested for controlling body control functions of a vehicle. The network nodes were designed based on the device concentration and power requirements of devices in the vehicle. Apart from implementing the functional modules, diagnostics functions for the loads were also designed and implemented. Functional nodes were designed to control body control functions like Door Locks, Power windows, Lights, Wiper, Washer Motor, Mirror, HVAC motors, Courtesy Lamps. Diagnostics module provided over current protection for the loads. CAN driver module handled CAN message filtering, CAN msg transmit and receive functions.

Hardware Platform	ST9 Micro controller
OS	uCOSII
CAN Controller	ST9 BUILT in CAN CONTROLLER
Transport	CAN V2.0
Tools	CANoe, Gryphon

LIN BASED BODY CONTROL NETWORK

A LIN (Local Interconnect Network) based prototype network was designed to control the Door Locks, Power Windows, Mirror and Courtesy Lamp functions of a vehicle. In this prototype, Class 2 and LIN nodes controlled the body controls of the vehicle. The LIN Master node, LIN Slave nodes and LIN- Class2 Gateway node were designed and implemented. LIN Description File (LDF) was used to configure the LIN nodes. LIN Master driver and LIN Slave driver implemented the LIN V1.3 specification requirements. LIN API was also developed as per LIN V1.3 specification. Configurable and portable functional modules were developed for each node.

Hardware Platform	Motorola HC08 family
OS	OSEK OS
LIN	MC33399 LIN controller
Transport	LIN V1.3 and Class 2
Tools	CANoe.LIN, LabView, Gryphon

For more information on NeST's service offerings, please contact:

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