



# Embedded Linux

The overall embedded market is undergoing a major transformation both in design and functionality. Networking technologies are becoming increasingly more important for embedded developers. Driven by the proliferation of the Internet and the increasing ubiquity of embedded computer systems, devices that can communicate with other devices are becoming dominant in the embedded market. Linux with its excellent networking support is slowly replacing the traditional Operating Systems and becoming the dominant OS in the embedded market.

NeST is a total solution provider with ISO and CMMI Level 5 certifications undertaking development of products including hardware, software and packaging. The core competency of NeST is in system development area with wide range of experience in multiple vertical domains.

## Overall Linux Capability

Our core competencies in Linux include:

- Device Driver Development
- Middleware and protocol development
- Embedded Linux
- Optimized solutions and Porting to custom platforms and hardware
- GUI development using Qt™
- Business Application Development

## Hardware Platforms

NeST has expertise in almost all the currently used processor architectures in the embedded market. The following table shows the NeST expertise in this regard:

Processor Architecture	Boards
<input type="checkbox"/> MIPS	<input type="checkbox"/> RBHMA4200 (MIPS)
<input type="checkbox"/> ARM	<input type="checkbox"/> WBC 7000(Strong ARM)
<input type="checkbox"/> OMAP	<input type="checkbox"/> MPC8246
<input type="checkbox"/> X86	
<input type="checkbox"/> Power PC	
<input type="checkbox"/> Intel XScale	
<input type="checkbox"/> Strong ARM	

## Development Environment & Tools

<p><b>Distributions</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Montavista Linux Professional Edition 3.1</li> <li><input type="checkbox"/> OpenRG from Jungo</li> </ul> <p><b>IDE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DevRocket from Montavista</li> <li><input type="checkbox"/> OpenDEV from Jungo</li> <li><input type="checkbox"/> KDevelop</li> </ul>	<p><b>Debugging</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> gdb</li> <li><input type="checkbox"/> BDA 2000</li> <li><input type="checkbox"/> Multi ICE</li> <li><input type="checkbox"/> <b>Qt</b> for GUI Development</li> <li><input type="checkbox"/> <b>CVS</b> for configuration management</li> </ul>
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## Embedded Linux Competency Areas

### Linux porting and customization

- Porting Linux to custom development boards
- Customization of BSP and Boot Loader for custom development boards

### Protocol Implementation

NeST has very strong expertise in protocol implementation in diverse domains and technologies. The following table summaries the NeST capabilities in this area:

<p><b>Networking</b></p> <ul style="list-style-type: none"> <li>□ IPv4, IPv6, DHCP, DNS</li> <li>□ Routing RIP, BGP, OSPF</li> <li>□ Tunneling GRE, PPTP</li> <li>□ IEEE 802.11ab/b/g drivers</li> </ul> <p><b>Security</b></p> <ul style="list-style-type: none"> <li>□ Kerberos/PKINIT</li> <li>□ IPSec</li> <li>□ AES</li> </ul> <p><b>Telecom</b></p> <ul style="list-style-type: none"> <li>□ MGCP/NCS</li> <li>□ RADIUS</li> <li>□ COPS</li> <li>□ SNMP</li> </ul>	<p><b>Multimedia Codec</b></p> <ul style="list-style-type: none"> <li>□ MPEG-4 encoder/decoder</li> <li>□ MP3 encoder/decoder</li> <li>□ JPEG encoder/decoder</li> </ul> <p><b>Consumer Electronics</b></p> <ul style="list-style-type: none"> <li>□ Bluetooth</li> <li>□ IEEE 1394,</li> <li>□ AV/C,</li> <li>□ HAVI</li> <li>□ Wireless 1394</li> </ul> <p><b>Streaming</b></p> <ul style="list-style-type: none"> <li>□ HTTP</li> <li>□ RTP/RTCP</li> <li>□ RTSP</li> </ul>
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### Application Development

NeST has strong presence in application development for embedded devices using Linux. The example projects include:

- GUI development using QT for a widely deployed kiosk solution
- Web based Management tools for Wireless Access Points and Gateways

### Device Driver Development & Porting

Wireless LAN IEEE 802.11a/b/g drivers with WPA and QoS support in MIPS and ARM platforms

Media reader and printer for custom devices developed for one of Japan's largest technology companies

## Project Snapshots

### IPv6/IPv4 Dual Stack Router

This project involves IPv6/IPv4 Dual Stack Router implementation on custom router hardware based on the **Intel IXP 425** processor. It involved:

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| <ul style="list-style-type: none"> <li>□ Customization of Mont vista Linux Professional Edition</li> <li>□ Porting of Redboot boot loader for the board</li> <li>□ Development of BSP for the board</li> </ul> | <ul style="list-style-type: none"> <li>□ IPv6 implementation based on USAGI and KAME projects</li> <li>□ Implementation of Routing and Tunneling Protocols</li> <li>□ Configuration and Management Modules based on SNMP, UPNP, CLI etc</li> </ul> |
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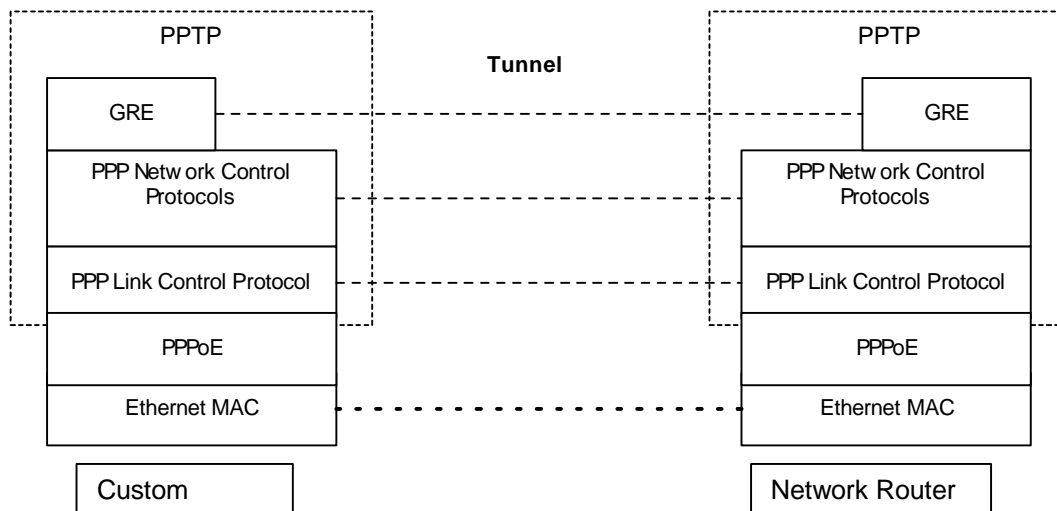
### GRE Tunnel Implementation

The project implements GRE tunneling support for a custom router. The features of the project are:

- Implement a PPTP tunnel between the LAN/WLAN managed by custom router to a managed LAN club network



- Implement GRE tunneling in the custom router hardware
- Development based on the OpenRG embedded Linux distribution
- Web based configuration support for the router to be provided



### Real Time Streaming in Wireless LAN and IEEE 1394 environments

NeST has extensive experience in developing protocol stacks and applications for streaming real time multimedia data in a home network using custom embedded hardware. The following are some of the work done and competencies achieved by NeST in this area:

- ❑ Embedded Home networking module supporting wireless LAN, IEEE 1394
- ❑ Toshiba TX4937 based boards acting as streaming client and Access Point
- ❑ Open source Prism GT based driver ported to Toshiba MIPS platform
- ❑ Implemented 802.11e based QoS support
- ❑ QoS support tested using industry standard Real Player with Real Media Streams
- ❑ Hardware decoder and jitter compensation buffer for MPEG-TS streaming
- ❑ Intelligent buffering and adaptive streaming support for streaming client
- ❑ Client Application to evolve as a test suite for different codecs and streaming technologies in a home network

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

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