# Korenix Embedded Systems

## *White Paper: Industrial Router Firewall and VPN Platform*

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## *Building Scalable and Secure Networks*

For today's Industrial Control and communications applications, the networks allowing these systems to be controlled and communicate are growing larger and more complex. Designing a network built on embedded systems technology requires that the embedded platform be robust, secure and manageable as commercial and management networks converge with industrial control and communications systems.

The purpose of this white paper is to give an overview of the hardware features of the Korenix JetBox 9500 series, and how it can be implemented as an industrial embedded platform to facilitate the requirements of complex networks that require industrial grade routers, firewalls and VPN servers

## *Why Industrial and When to Use*

Environmental conditions, reliability and available power are the key consideration in whether to use an industrial grade network device over a commercial grade. Some key considerations in the selection are as follows:

- **Temperature control :** Commercial grade equipment typically needs to be housed in a clean, temperature controlled environment. The JetBox 9500 series is designed with extended temperature components, no moving parts or fans, allowing them to operate under harsher conditions than a commercial grade device. Another important consideration is in many application power outages can effect the temperature control of the devices operating environment, in this situation an industrial grade device is a better option than one which is commercial grade
- **Air quality and circulation :** Since the JetBox 9500 series is fanless, air flow is not circulation in or around the electronic components inside the device. In the case of an environment where there is dust or high humidity, an industrial platform is ideal as the electronics components will not be exposed to dust or condensation that might effect the performance over time
- **Project Lifecycle and long MTBF:** since the JetBox series has an ingress protection rating of IP31 and no moving parts, the MTBF is much higher than a commercial grade device. This in turn makes it ideal for a project requiring a longer lifecycle, such as 3 – 5 years, in which case a commercial grade device MTBF would be exceeded.
- **Wide operating voltage:** the wide operating voltage of the JetBox series means that in some applications where a power system is already installed the JetBox series devices can be easily installed and implemented into the system. The low power consumption of these devices also makes them ideal for solar applications.

# *Why Jetbox 9500 series*

All of the JetBox 9500 series use the Intel RISC IXP430 processor. For extreme temperature applications there is an extended operating temperature model using the Intel RISC IXP435 processor. The hardware specification at a glance is as follows:

**JetBox 9562**

4-Port Serial & 5-Port PoE Embedded Networking Platform

- Ideal for in-vehicle applications
- Linux ready Intel IXP430 processor
- 4-port PoE with 12~24V input voltage
- 4 serial ports
- Linux, JavaVM computing
- Optional wireless connection

**JetBox 9530**

5-Port PoE Embedded Networking Platform

- Ideal for Industrial applications - Rugged, compact with DIN rail mounting
- Linux ready Intel IXP430 processor
- 4-port PoE
- Linux, JavaVM computing
- PCI-104 scalable board design and enclosure expansion available
- Optional WLAN, WiMax

**JetBox 9535**

9-Port PoE Embedded Networking Platform

- Ideal for Industrial applications - Rugged, compact with DIN rail mounting
- Linux ready Intel IXP430 processor
- 8-port PoE
- Linux, JavaVM computing
- PCI-104 scalable board design and enclosure expansion available
- Optional WLAN, WiMax

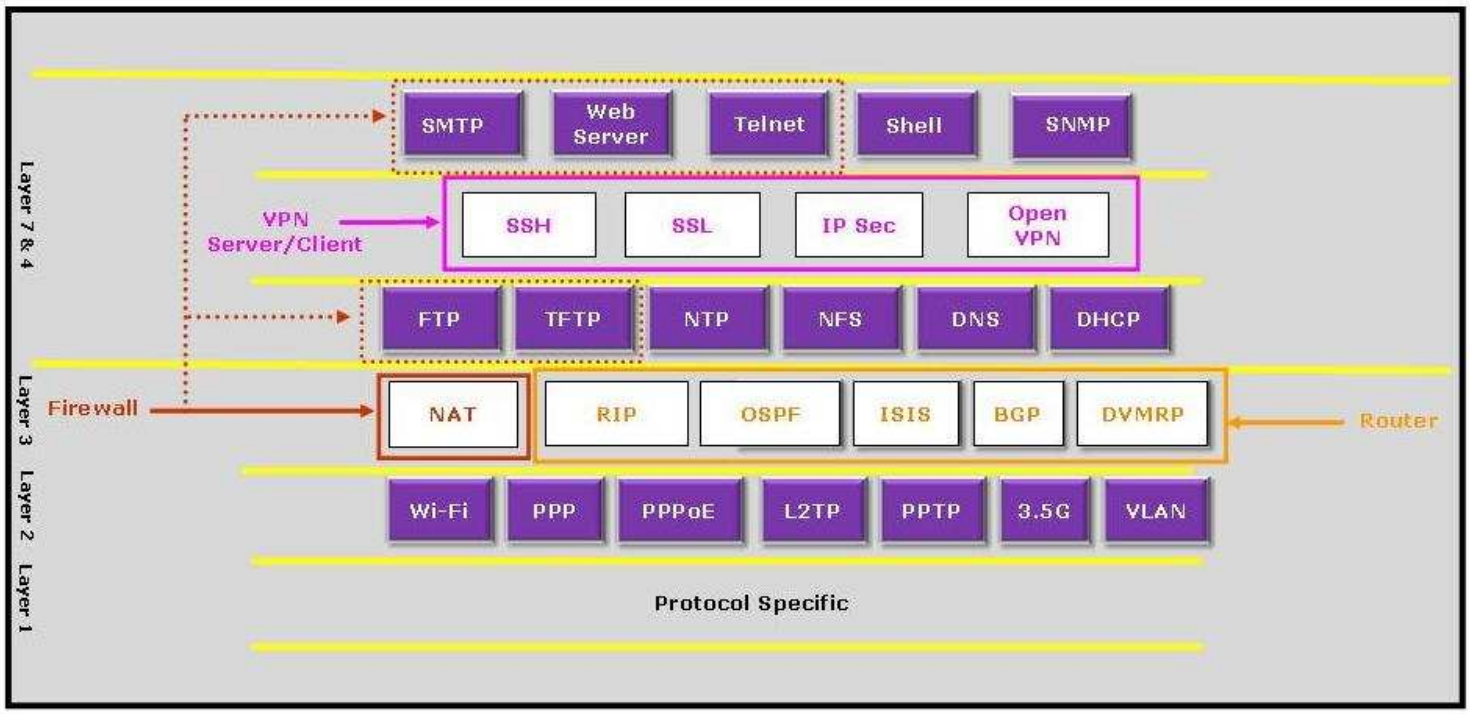
**JetBox 9560**

5-Port Vehicle PoE Embedded Networking Platform

- Ideal for in-vehicle applications
- Linux ready Intel IXP430 processor
- 4-port 12~24V vehicle PoE
- Linux, JavaVM computing
- Optional wireless connection

# *Network Appliance Applications*

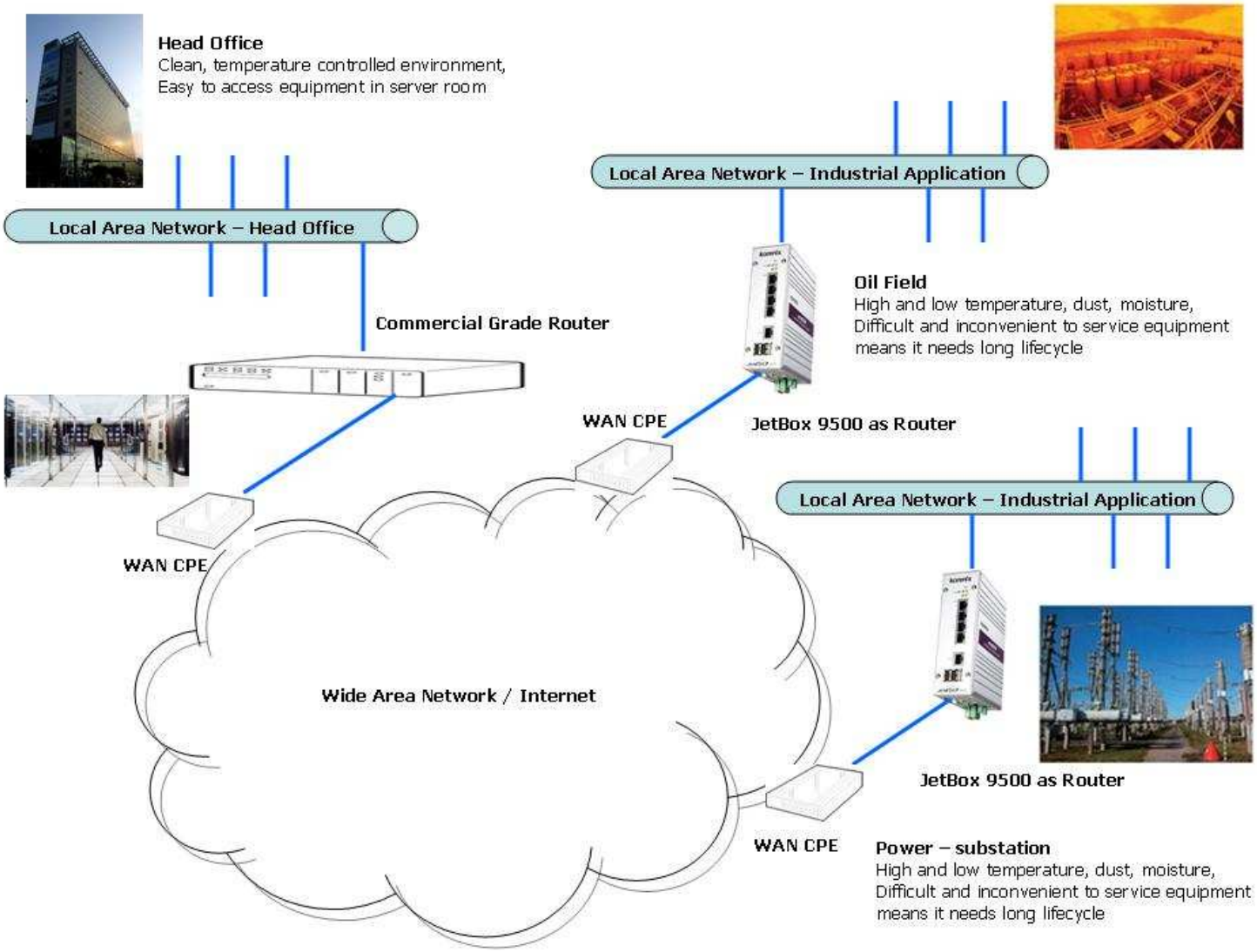
**OSI Layer 3 Breakdown**



**Router**

Routers are used for interconnecting subnets through WANs or the internet allowing departments, field sites and offices to be bridged. This could be to interface management and process automation data system or even VoIP services. Depending on network topology WAN interface of the JetBox 9500 series could connect to Wifi, WiMax, ADSL, E1/T1, Metro Ethernet, SDH/SONET CPE.

The diagram below illustrates how multiple sites with different subnets can be networked via a WAN or the Internet. For this example we have suggested that in the case of an oil field or electrical substation, the environmental conditions would require that an industrial grade router such as the JetBox 9500 series be used.




By default, the JetBox 9500 series come with open source embedded Linux installed that includes the open source Linux router application. Linux router can be configured through a pre-installed web interface (Webmin see below) to support layer 3 routing protocol such as RIP, OSPF, ISIS, BGP, DVMRP

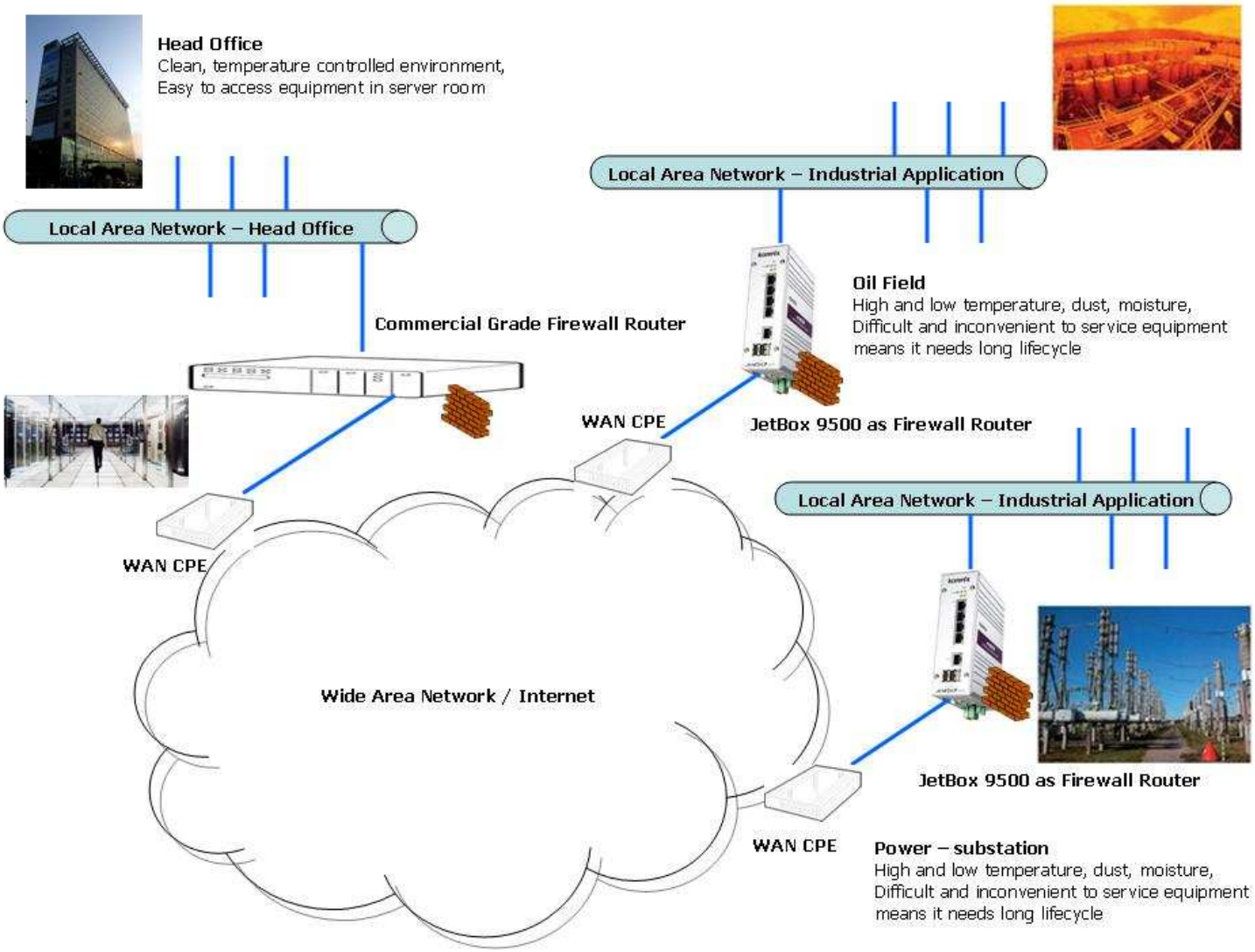
Alternatively a router application could be designed that could run on Linux. The JetBox 95xx comes pre-installed with Java VM

(Virtual Machine) allowing a Java based routing application to also be used.

On the LAN facing side of the JetBox 9530 there are 4 PoE (Power over Ethernet ports), and on the JetBox 9535 there are 8 PoE (Power over Ethernet) ports. Using PCI-104 additional Ethernet ports can be added, along with RS232/422/485 ports on expansion cards allowing networking over different physical layers.

**Firewall**

In today's industrial networking environments for both private and public sector applications, security threats from inside and outside networks present a problem the functioning of the network. While a small degree of security is introduced by sub netting the networks, the best way to protect each subnet from malicious attacks is to install a firewall to analyze and control incoming and outgoing data.

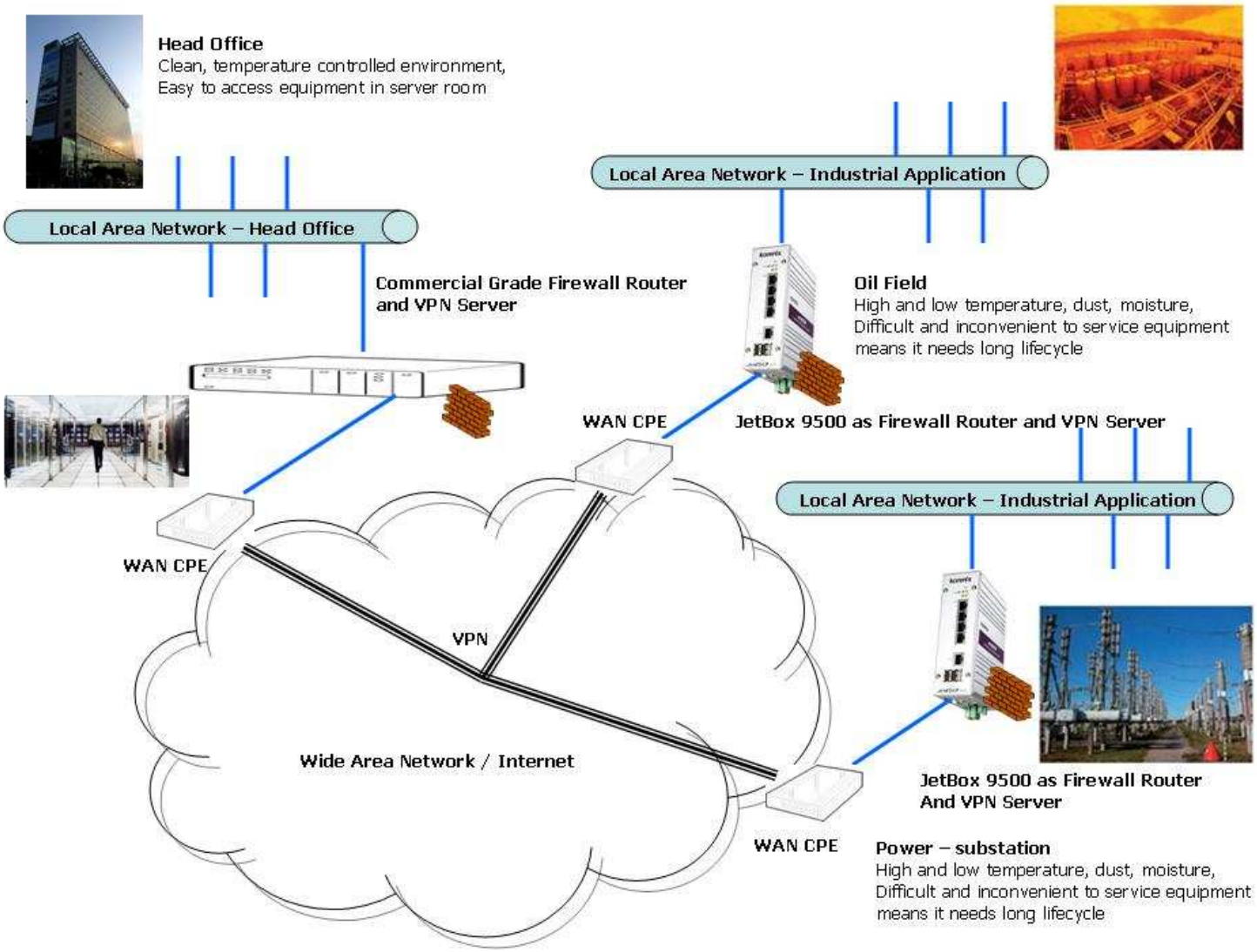



The JetBox 9500 series is the ideal platform for building an industrial firewall. The firewall functionality can run along side the router functionality, while providing additional security to the network. By default the JetBox 9500 has Linux installed which includes the IPTABLES firewall application, alternatively a custom Linux based firewall application can be used. The JetBox 9500 also support Java VM (virtual machine) allowing for easy development of a java based firewall application.

On the LAN facing side of the JetBox 9530 there are 4 PoE (Power over Ethernet ports), and on the JetBox 9335 there are 8 PoE (Power over Ethernet) ports. Using PCI-104 additional Ethernet ports can be added, along with RS232/422/485 ports on expansion cards allowing networking over different physical layers.

**VPN Server**

In a situation where multiple subnets or devices on a network that a separated by a WAN/Internet, the ideal technology to use is VPN (Virtual Private Networking). This allows secures tunnels to be opened across the WAN that can be configured to be only access to particular subnets or particular devices on a subnet. The diagram below shows a VPN architecture:




The JetBox 9500 series is the ideal platform for building an industrial VPN Server. The VPN Server functionality can run along side the router and firewall functionality, while providing VPN tunnelling to WAN/LAN separated devices, subnets, or particular devices on a subnet that are part of a virtual private network. By default the JetBox 9500 has Linux installed which includes the OPENVPN VPN server application, alternatively a custom Linux based VPN Server application can be used. The JetBox 9500 also support Java VM (virtual machine) allowing for easy development of a java based VPN server application.

On the LAN facing side of the JetBox 9530 there are 4 PoE (Power over Ethernet ports), and on the JetBox 9335 there are 8 PoE (Power over Ethernet) ports. Using PCI-104 additional Ethernet ports can be added, along with RS232/422/485 ports on expansion cards allowing networking over different physical layers.

# *Operating System and Software Specification*

**Embedded Linux**

Bootloader: JetBox bootloader
Linux Kernel: 2.6.20
Shell: GNU ash
File system: jffs2, NFS, Ext2, Ext3, VFAT, FAT
Device drivers: SD card, CF card, USB, Watchdog timer, UART, Ethernet, DIO
Protocol: ARP, PPP, CHAP, IPv4, IPv6, PAP, ICMP, TCP, UDP, NFS, RIP, RIP-II, OSPF, ISIS, BGP, DVMRP, L2TP, PPTP, SLIP, VLAN, IPsec, OpenVPN
Software packages: busybox (telnetd, inetd, udhcp), e2fsprongs, i2c-tools, ltp-testsuite, microcom, mtd, pciutils, setserial, usbmount,usbutils, bridge-utils, ethtool, iptables, net-snmp, ntp, openssh, openssl,openVPN, openSWAN, pppd, pptp-linux, proftpd, samba, smtpclient, bind, l2tp, mrouted, quagga, wireless-tools, jamvm, syslogd, udhcp, goahead web server
JavaVM
Korenix Linux auto-run function
Customized configuration
Process monitoring

**SDK**

Linux tool chain: Gcc (C/C++ PC cross compiler), uClibc
Linux sample code

*Note: Please check products page, for datasheets and latest OS support information*

# Ordering Information

JetBox 9530 Intel IXP430 667MHz, 48V DC, 128MB DDR2 RAM

JetBox 9530-w Intel IXP435 667MHz, 48V DC, 128MB DDR2 RAM, -40~80oC

JetBox 9535 Intel IXP430 667MHz, 48V DC, 128MB SDRAM

JetBox 9535-w Intel IXP435 667MHz, 48V DC, 128MB DDR2 RAM, -40~80oC

JetBox 9560 Intel IXP430 667MHz, 12~24V DC, 128MB DDR2 RAM

JetBox 9560-w Intel IXP435 667MHz, 12~24V DC, 128MB DDR2 RAM, -40~80□

JetBox 9562 Intel IXP430 667MHz, 12~24V DC, 128MB DDR2 RAM, 4 RS232/422/485

JetBox 9562-w Intel IXP435 667MHz, 12~24V DC, 128MB DDR2 RAM, -40~80□, 4 RS232/422/485

# External Links

| | |
|---|---|
| Webmin | http://www.webmin.com/ |
| Linux Router | http://www.linuxrouter.org/ |
| IPTABLES | http://www.netfilter.org/ |
| OpenVPN | http://www.openvpn.net/ |

**About Korenix**

Korenix Embedded Solutions offers the feature rich JetBox range that are the ideal platform for industrial networking and communications using super reliable RISC processors, with our embedded systems designed by industrial electronics experts for deployment in the harshest environments. Our products are designed and manufactured with the highest quality, offering platforms that meet the requirements beyond those of commercial off the shelf Industrial Networking Equipment.