

# **Developing Linux-based Embedded Networking Gateways**

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## **Agenda (What can you expect?)**

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- **Short introduction of the author and the experiences ...**
- **The basic idea behind Ethernet ...**
- **The basic idea behind gateways ...**
- **Some gateway sample applications ...**
- **... Reverse Router, Reverse Proxy, Remote Access ...**
- **... IP Packet Filter, Com Port Redirector ...**
- **Web-based user interface ...**
- **Sample platform for embedded gateway applications ...**

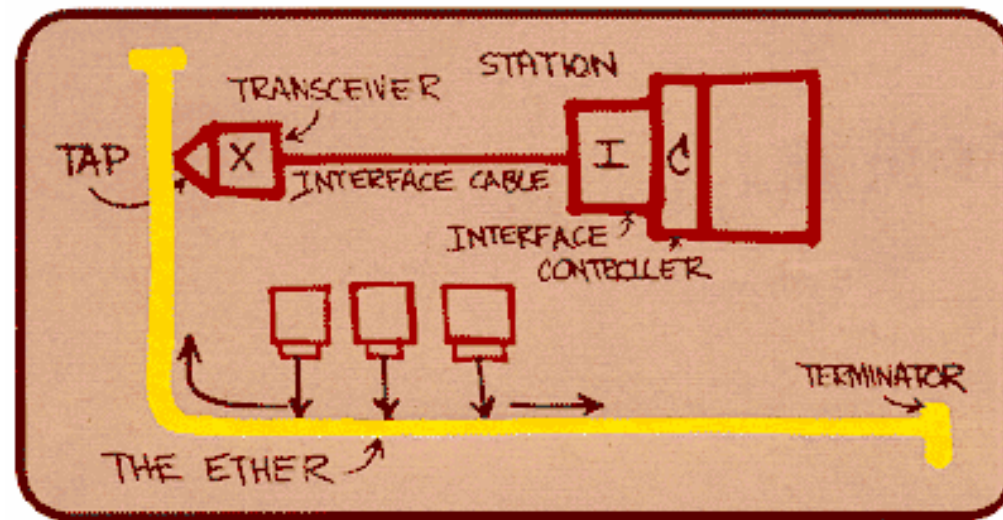
## Who is SSV Embedded Systems?

- „SSV Embedded Systems” is a scope of business of SSV Software Systems GmbH. In this business unit the product lines Single Board Computers, Industrial Terminals and Gateways are summarized.



## Ethernet Basics

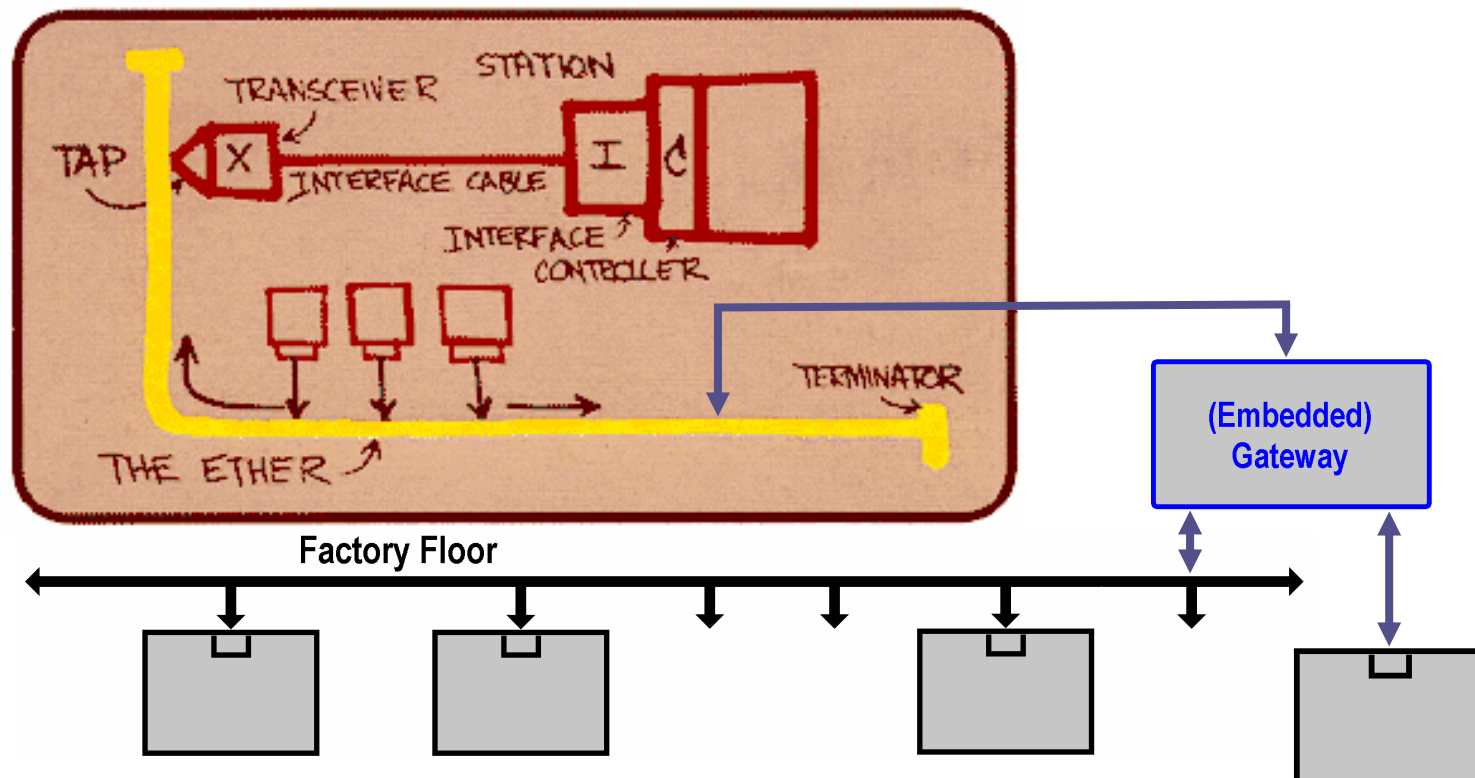
- The basic idea for Ethernet is to connect computers and peripherals within a local area (office and industrial environment).



- Ethernet started as a bus-based technology. Today, Ethernet uses a star topology with infrastructure components.
- Ethernet is very fast (100 Mbps, 1 Gbps, 10 Gbps) ...

## The Basic Idea Behind Gateways ...

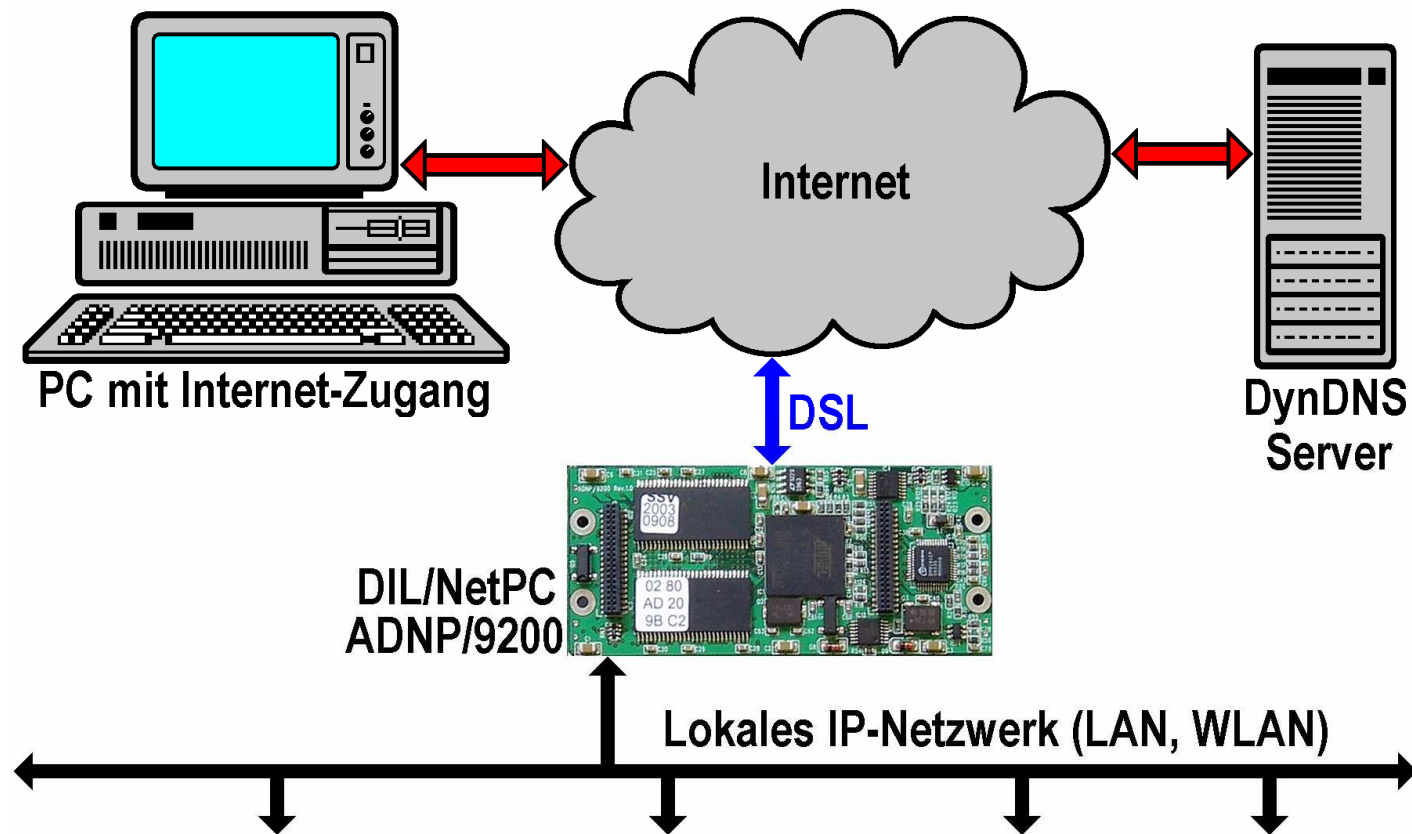
- In the industrial environment, not everything is Ethernet-ready. There are special field bus systems, RS232-based point-to-point ...



- There are also some special wireless technologies (i.e. WSNs) ...

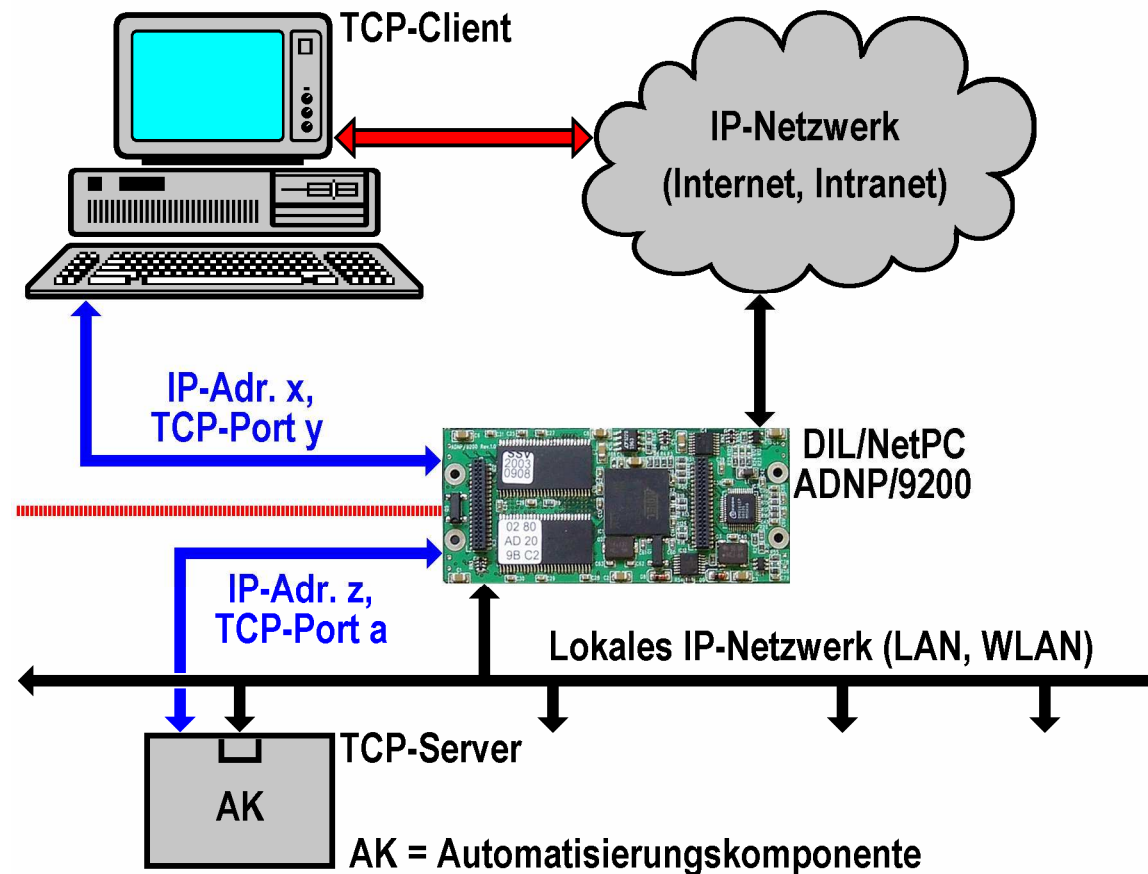
## Embedded Gateway Application ...

- **Reverse Router:** The reverse router allows access from the Internet to networked embedded devices ...



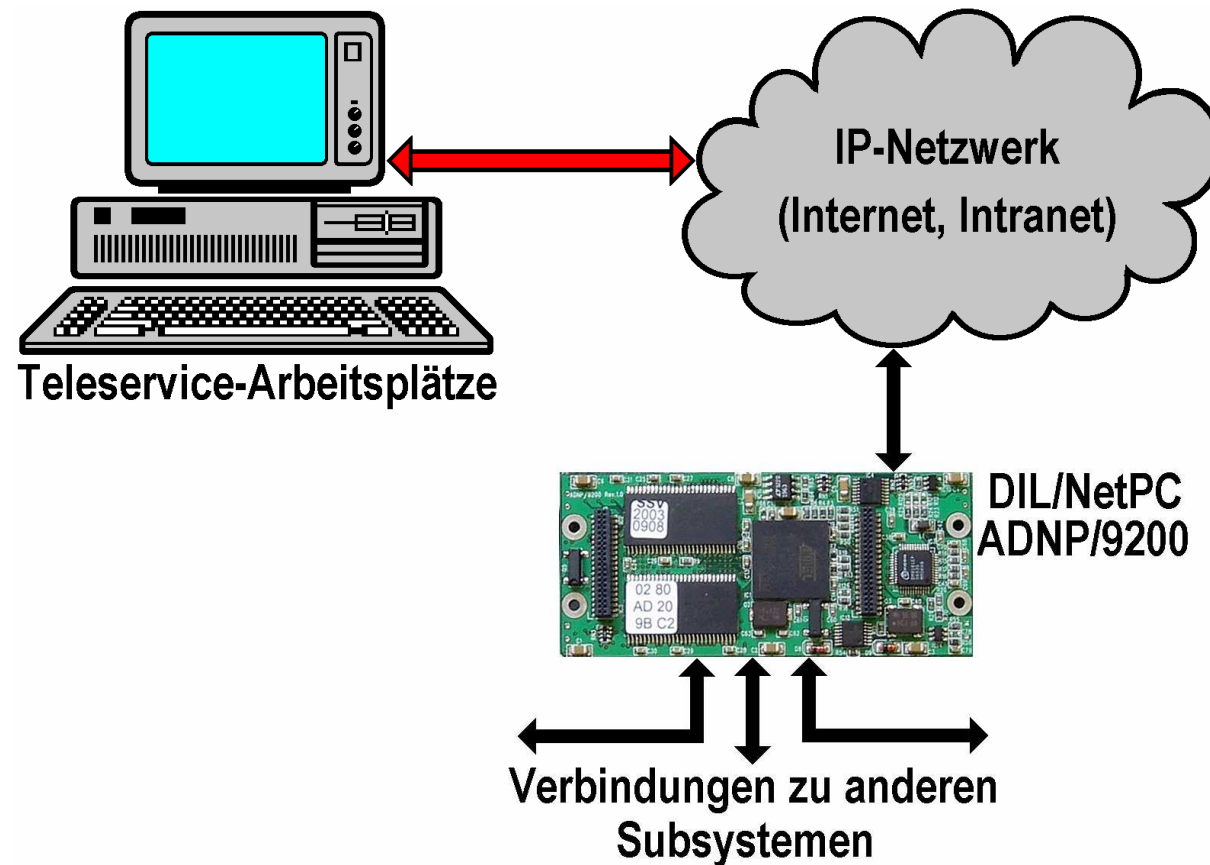
## Embedded Gateway Application ...

- **Reverse Proxy:** The reverse proxy server protect networked devices against unauthorized access and usages ...



## Embedded Gateway Application ...

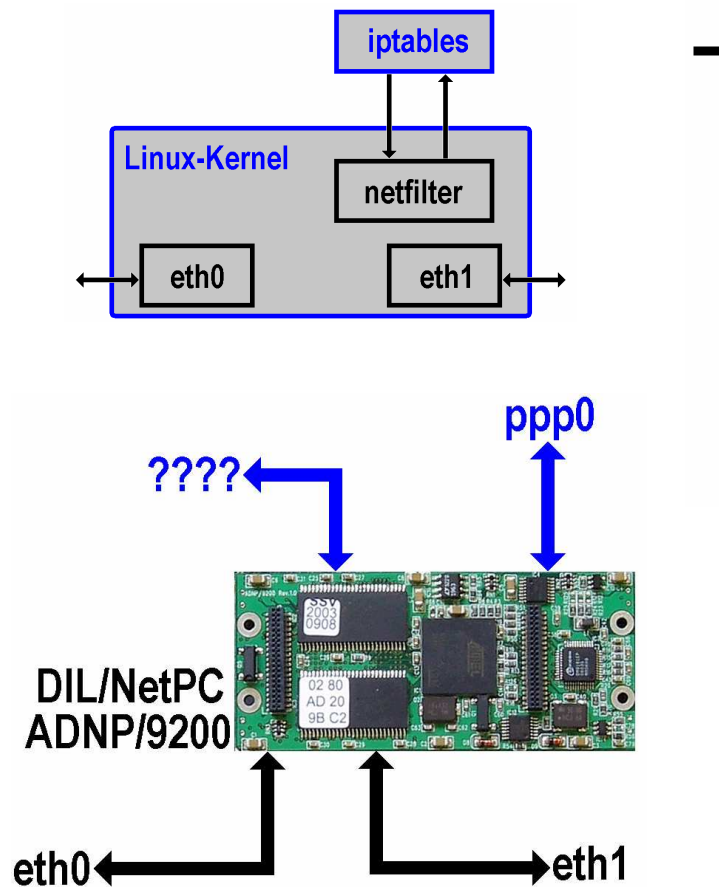
- **Remote Access:** Remote access allows the usages of the hardware and software resources (i.e. the Linux command line) ...



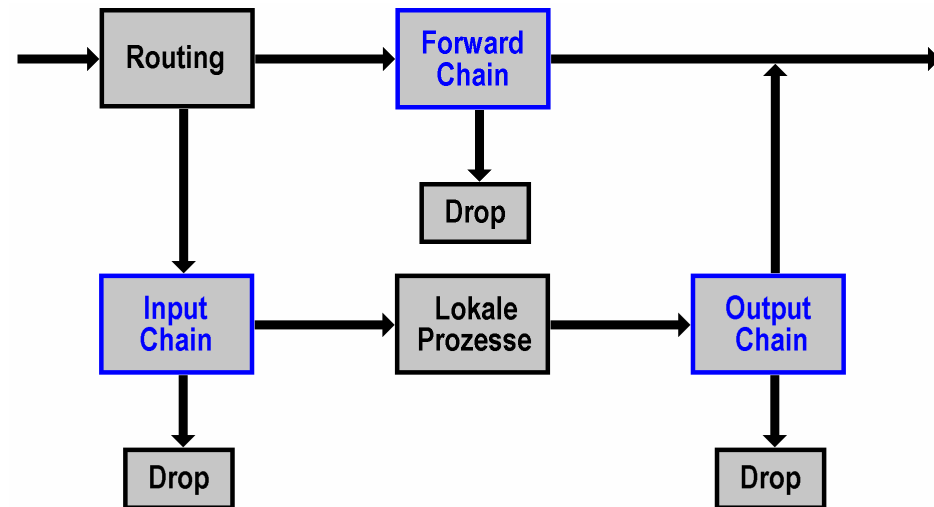


## Embedded Gateway Application ...

- **IP Packet Filter:** Packet filtering is fire walling. This feature allows to filter each packet before forwarding to other IP-based interfaces ...



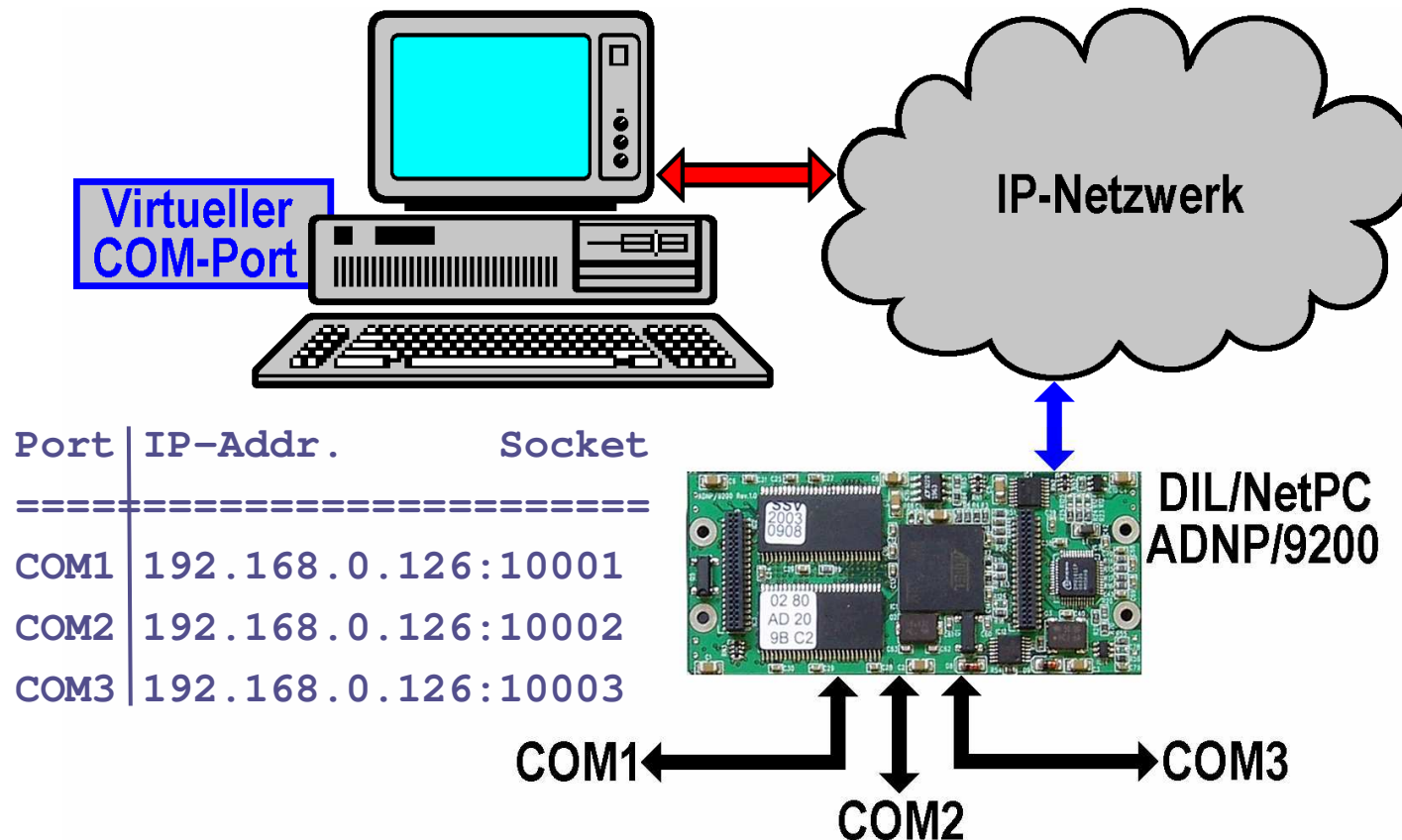
Linux-based Embedded Networking Gateways



- \* Ethernet Packet
- \* IP Packet
- \* TCP/UDP Packet
- \* Application Layer Packet

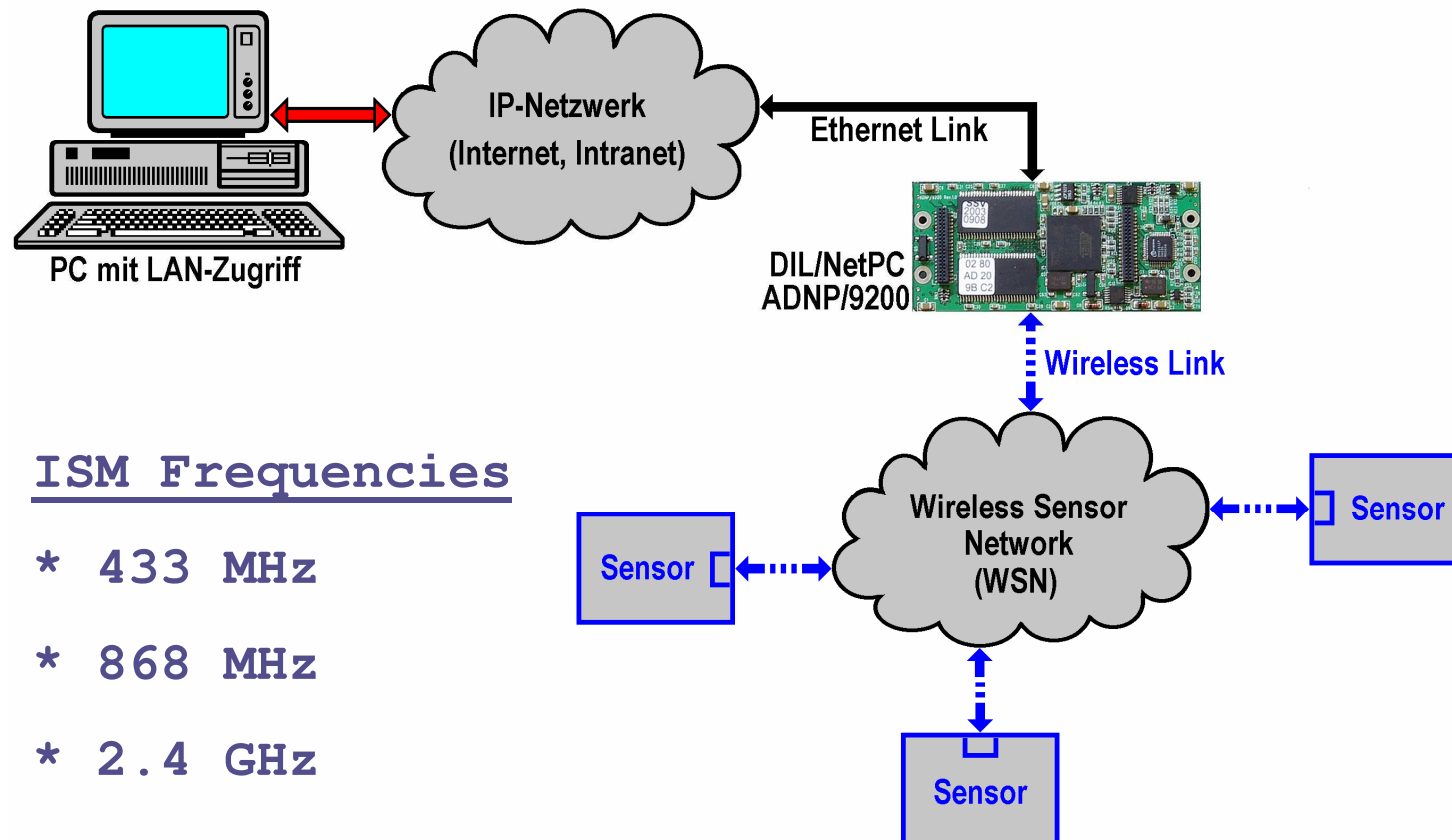
## Embedded Gateway Application ...

- **Com Port Redirector:** A com port redirector connects a UART with a TCP socket. This is the basic for “serial-over-IP” ...



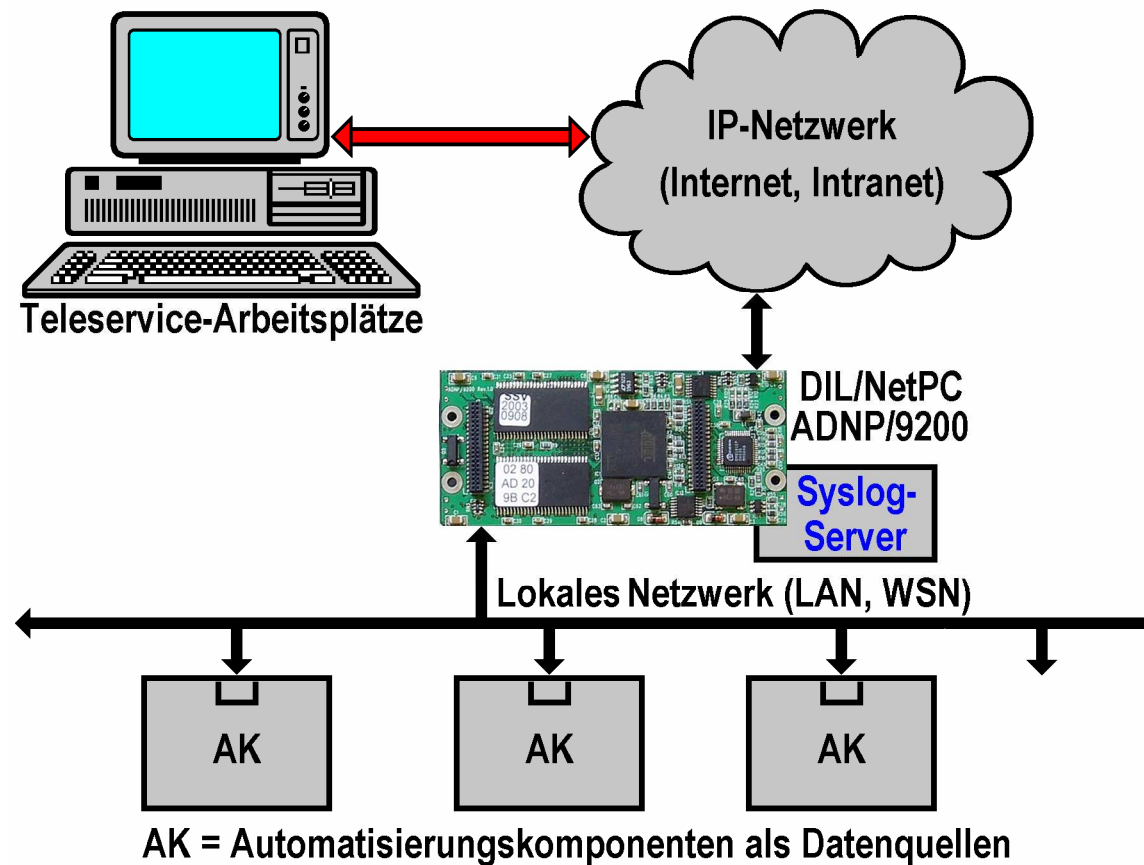
## Embedded Gateway Application ...

- **WSN Gateway:** Wireless Sensor Networks (WSNs) are the base for metering, condition monitoring and many other tasks ...



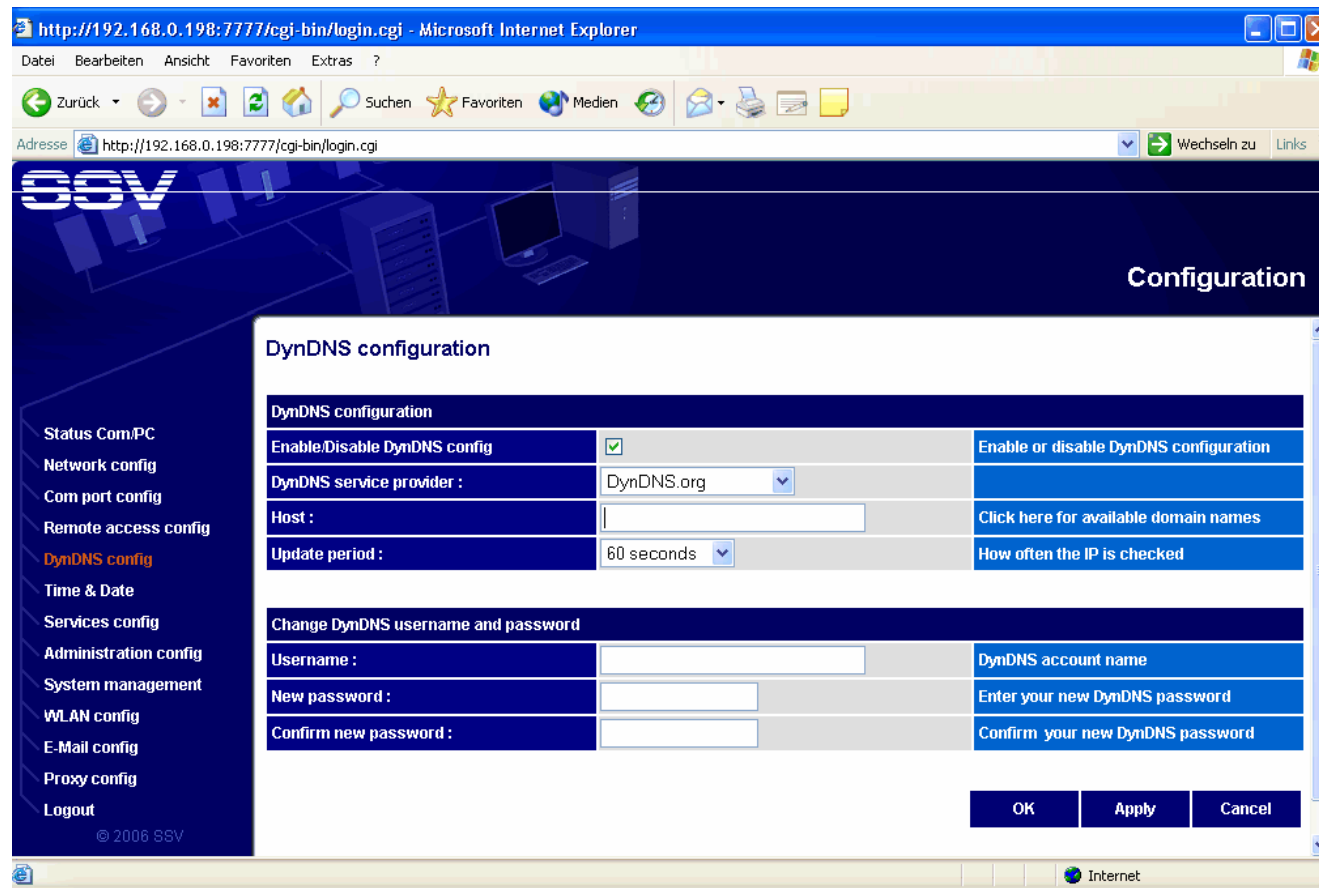
## Embedded Gateway Application ...

- **Data Logger:** Data logging is not a real gateway application. This standard Linux feature is very helpful for many applications ...



## Web-based User Interface ...

- The DynDNS configuration supports the reverse router. The setup defines the DNS name for your gateway and some other data ...



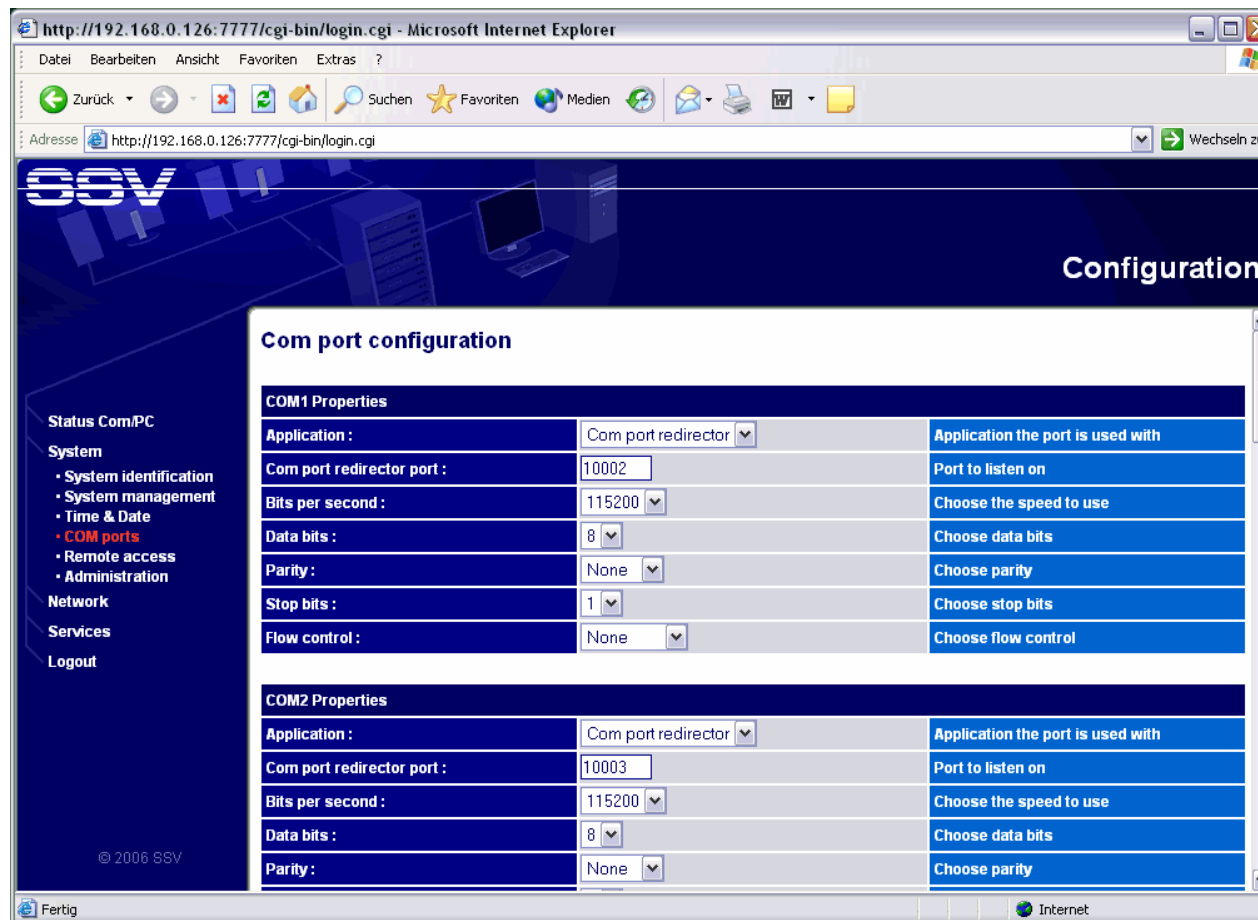
The screenshot shows a web browser window displaying the SSV web-based user interface. The browser address bar shows the URL `http://192.168.0.198:7777/cgi-bin/login.cgi`. The page title is "Configuration". The main content area is titled "DynDNS configuration" and contains the following fields:

DynDNS configuration	
Enable/Disable DynDNS config	<input checked="" type="checkbox"/> Enable or disable DynDNS configuration
DynDNS service provider :	DynDNS.org
Host :	<input type="text"/> <a href="#">Click here for available domain names</a>
Update period :	60 seconds <input type="button" value="How often the IP is checked"/>
Change DynDNS username and password	
Username :	<input type="text"/> DynDNS account name
New password :	<input type="text"/> Enter your new DynDNS password
Confirm new password :	<input type="text"/> Confirm your new DynDNS password

At the bottom right of the form, there are three buttons: "OK", "Apply", and "Cancel".

## Web-based User Interface ...

- The com port redirector setup connect the UART with a user-specific TCP socket number ...



The screenshot shows a web browser window displaying the SSV Configuration page. The page title is "Configuration" and the URL is "http://192.168.0.126:7777/cgi-bin/login.cgi". The main content area is titled "Com port configuration" and contains two sections: "COM1 Properties" and "COM2 Properties". Each section has a table of configuration options.

COM1 Properties		
Application :	Com port redirector	Application the port is used with
Com port redirector port :	10002	Port to listen on
Bits per second :	115200	Choose the speed to use
Data bits :	8	Choose data bits
Parity :	None	Choose parity
Stop bits :	1	Choose stop bits
Flow control :	None	Choose flow control

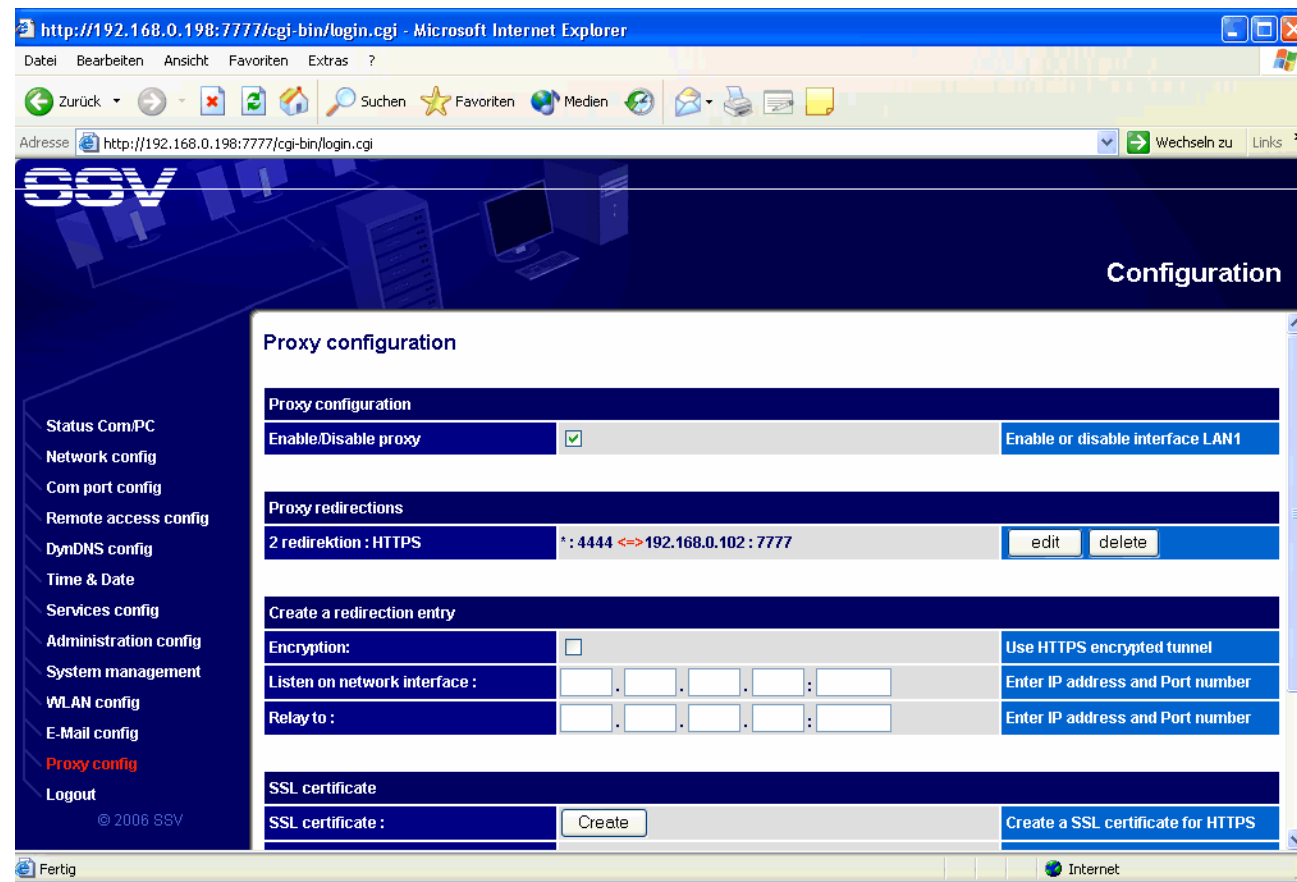
  

COM2 Properties		
Application :	Com port redirector	Application the port is used with
Com port redirector port :	10003	Port to listen on
Bits per second :	115200	Choose the speed to use
Data bits :	8	Choose data bits
Parity :	None	Choose parity

The left sidebar contains a navigation menu with the following items: Status Com/PC, System (System identification, System management, Time & Date, COM ports, Remote access, Administration), Network, Services, and Logout. The footer of the page shows "© 2006 SSV" and "Fertig".

## Web-based User Interface ...

- The reverse proxy setup defines a HTTP(S) to HTTP proxy server to protect the internal embedded web servers ...



## DIL/NetPC ADNP/9200

- DIL/NetPC with QIL-128 pinout and ESL 1.0 (Expansion Sandwich Layer) connector for wireless sensor network interfaces.



- Atmel AT91RM9200 32-bit MCU
- 180 MHz CPU clock
- 64 MBytes SDRAM
- 32 MBytes Flash (with ISP support)
- 2 x 10/100 Mbps Ethernet interfaces
- 20-bit parallel I/O, 2 x UART
- 1 x USB host / 1 x USB device
- 80-pin ESL 1.0 expansion connector
- 16-bit ISA-like expansion bus
- QIL-128 form factor



## Evaluation Board DNP/EVA11

- The new evaluation board DNP/EVA11 allows the usage of the all ADNP/9200 features.



- 1 x QIL-128 socket for ADNP/9200
- 2 x RS232 Sub-D connectors
- 1 x 10/100 Mbps RJ-45 for LAN1
- 1 x 10/100 Mbps RJ-45 for LAN2
- LAN2 fiber optic option 100Base-FX
- 1 x CompactFlash socket
- 1 x SD/MMC socket
- 1 x USB host connector
- 1 x USB device connector
- 1 x small graphic LCD 128 x 64 Dots

**That's all ...**

**Embedded Linux Gateways  
in Action ...**



**Thank you for your attention.  
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