SSV EMBEDDED SYSTEMS

Infrastructure Components for Wireless Sensor Networks

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Agenda (What can you expect?)

➢ **Short introduction of the author and the experiences …**

➢ **What is a Wireless Sensor Network (WSN)? …**

➢ **Who needs a WSN? …**

➢ **The WSN gateway …**

➢ **WSN gateway use cases …**

➢ **… Reverse Router, Remote Access …**

➢ **Web-based user interface …**

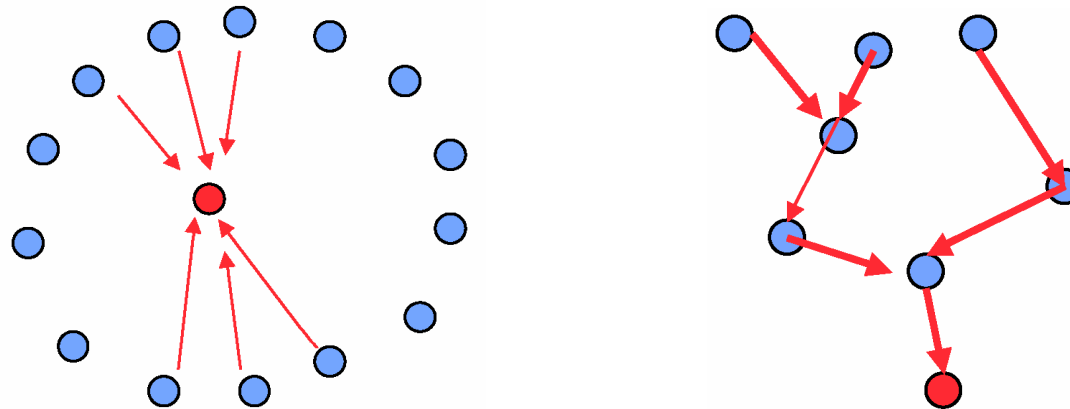➢ **Sample platform for WSN gateway applications ...**

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.
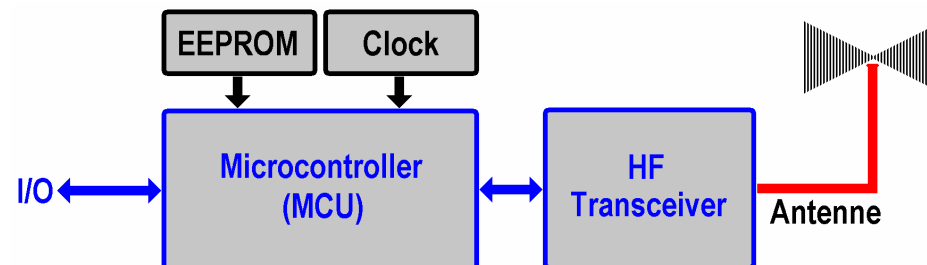
What is a Wireless Sensor Network?

➢ WSNs (Wireless Sensor Networks) are using different topologies. 1. star-based and 2. mesh-based …
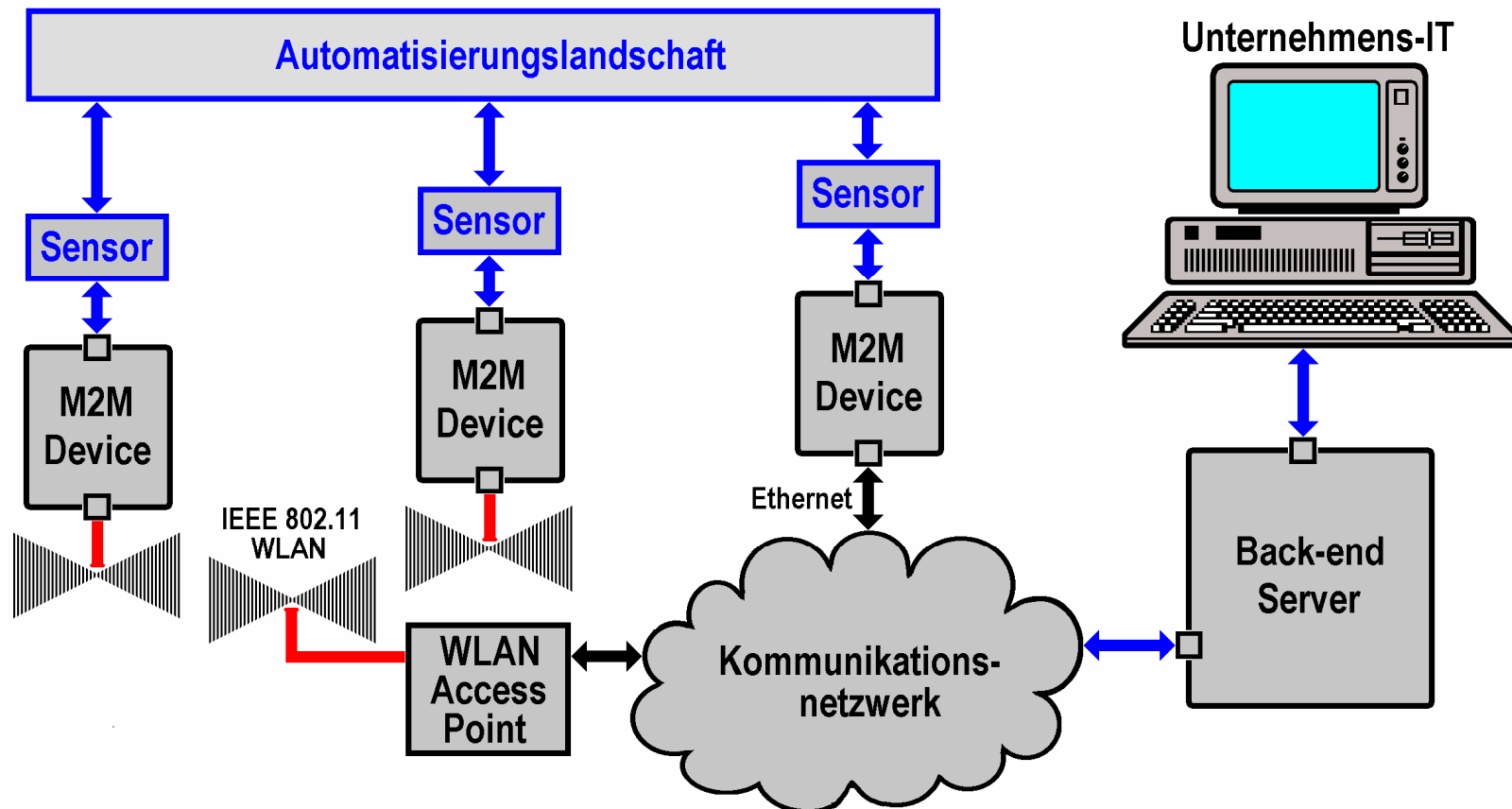
➢ The typical WSN sensor node consist of a MCU (with firmware), and, a HF transceiver circuit, antenna and a power supply …

EEPROM Clock

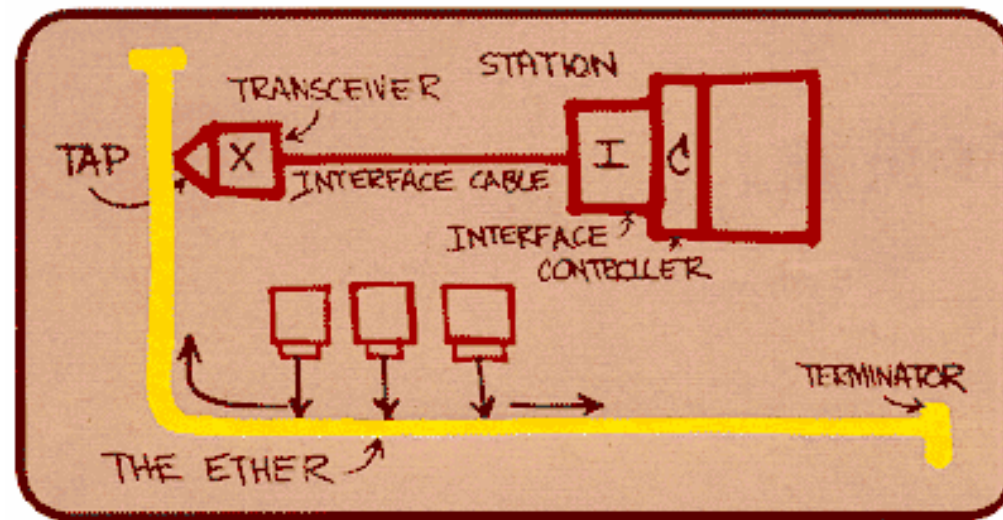I/O ⟷ Microcontroller (MCU) ⟷ HF Transceiver — Antenne

Who needs Wireless Sensor Networks?

➢ An application sample is M2M-based condition monitoring. Sensors monitor the factory floor and capture condition data …
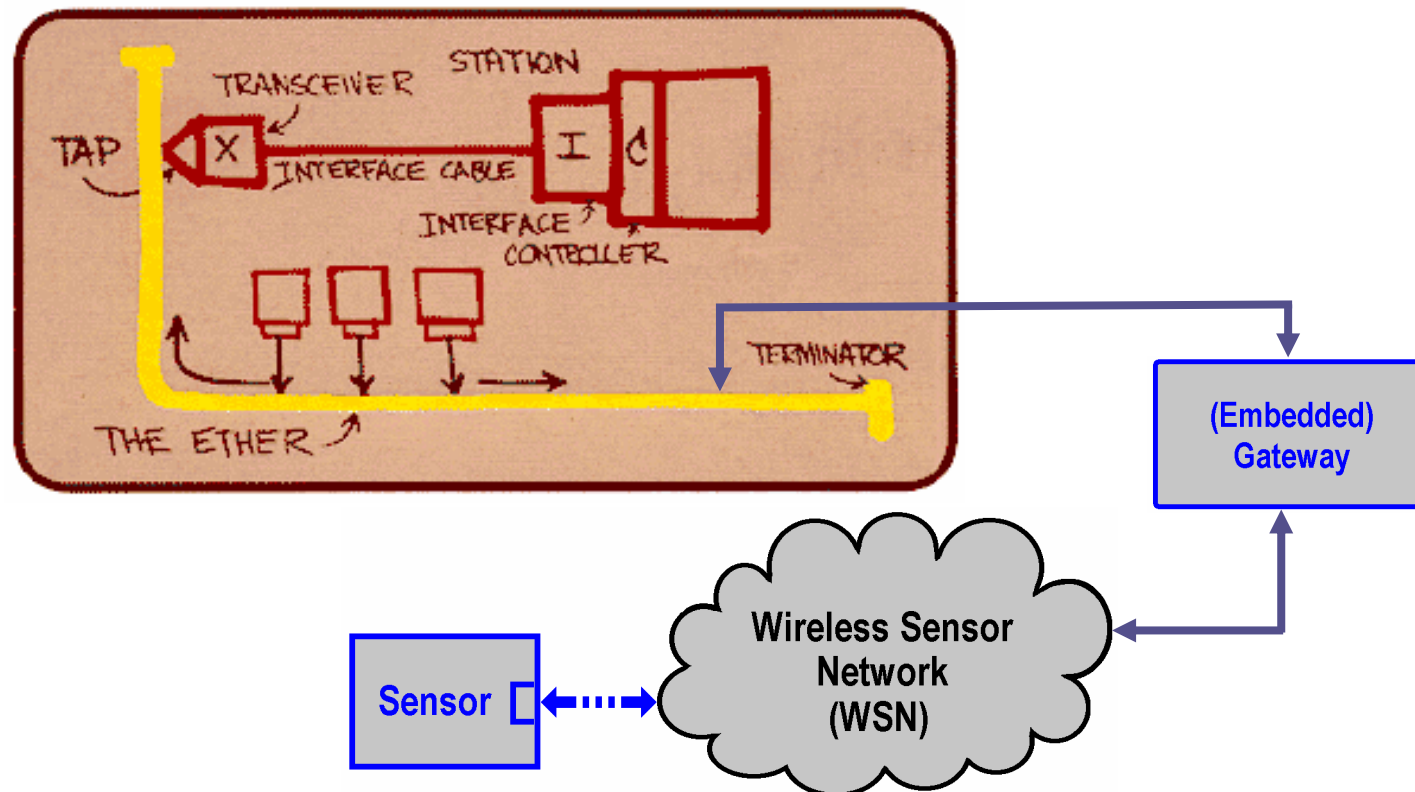
The Network World is Ethernet-centric

➢ 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) …
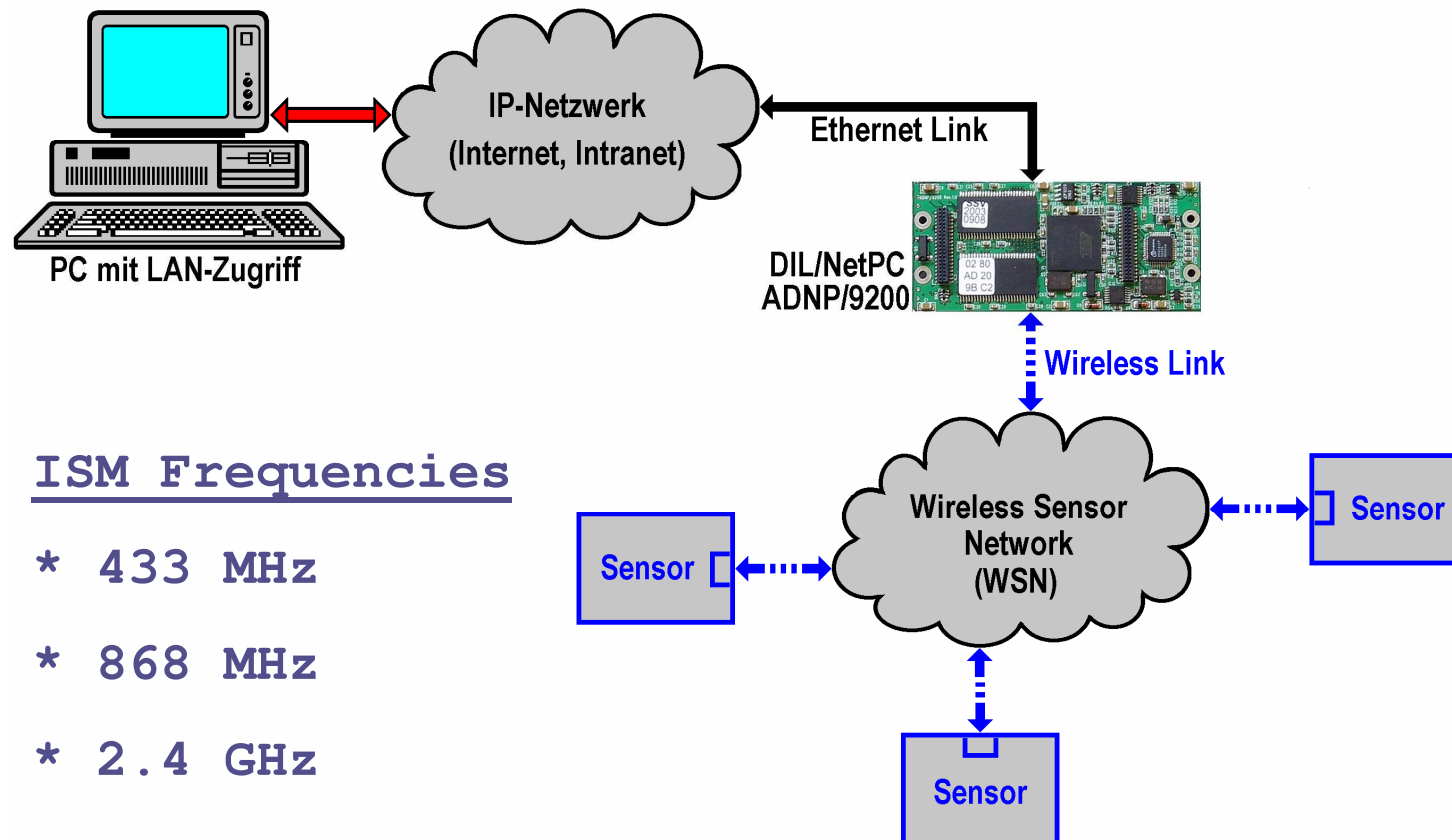
Gateways between LAN and WSN …

➢ In the industrial environment, sometimes it is necessary to connect an Ethernet-based LAN to a WSN …

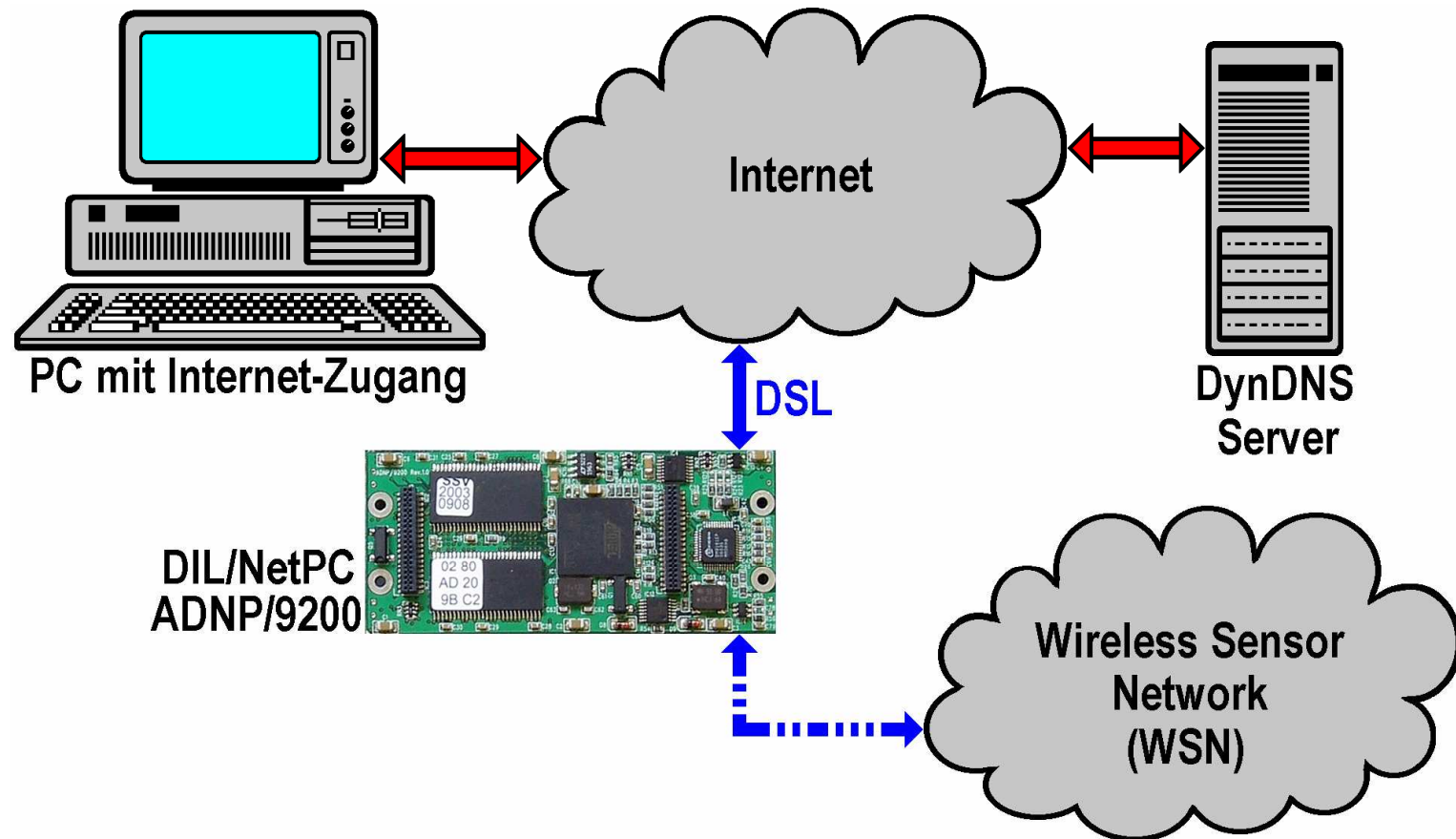➢ Most important is the Wireless Sensor Network Gateway …

The WSN Gateway …

➢ The Wireless Sensor Network Gateway offers an IP-based interface on one side and different wireless interfaces on the other side …
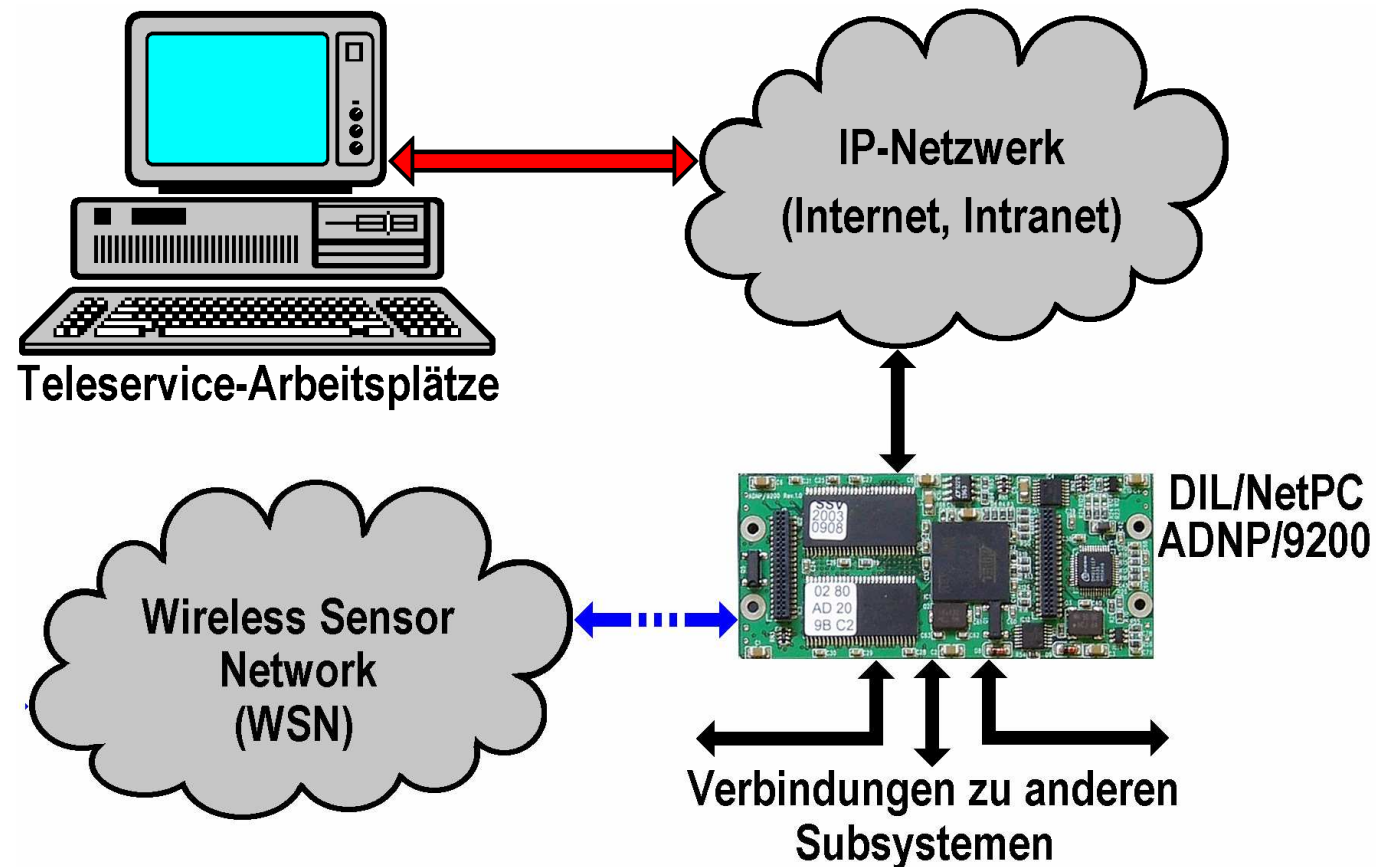

ISM Frequencies

* 433 MHz

* 868 MHz

* 2.4 GHz

WSN Gateway Use Cases …

➢ **Reverse Router**: The reverse router allows access from the Internet to the WSN gateway and the WSN devices …

PC mit Internet-Zugang

Internet

DSL

DynDNS Server

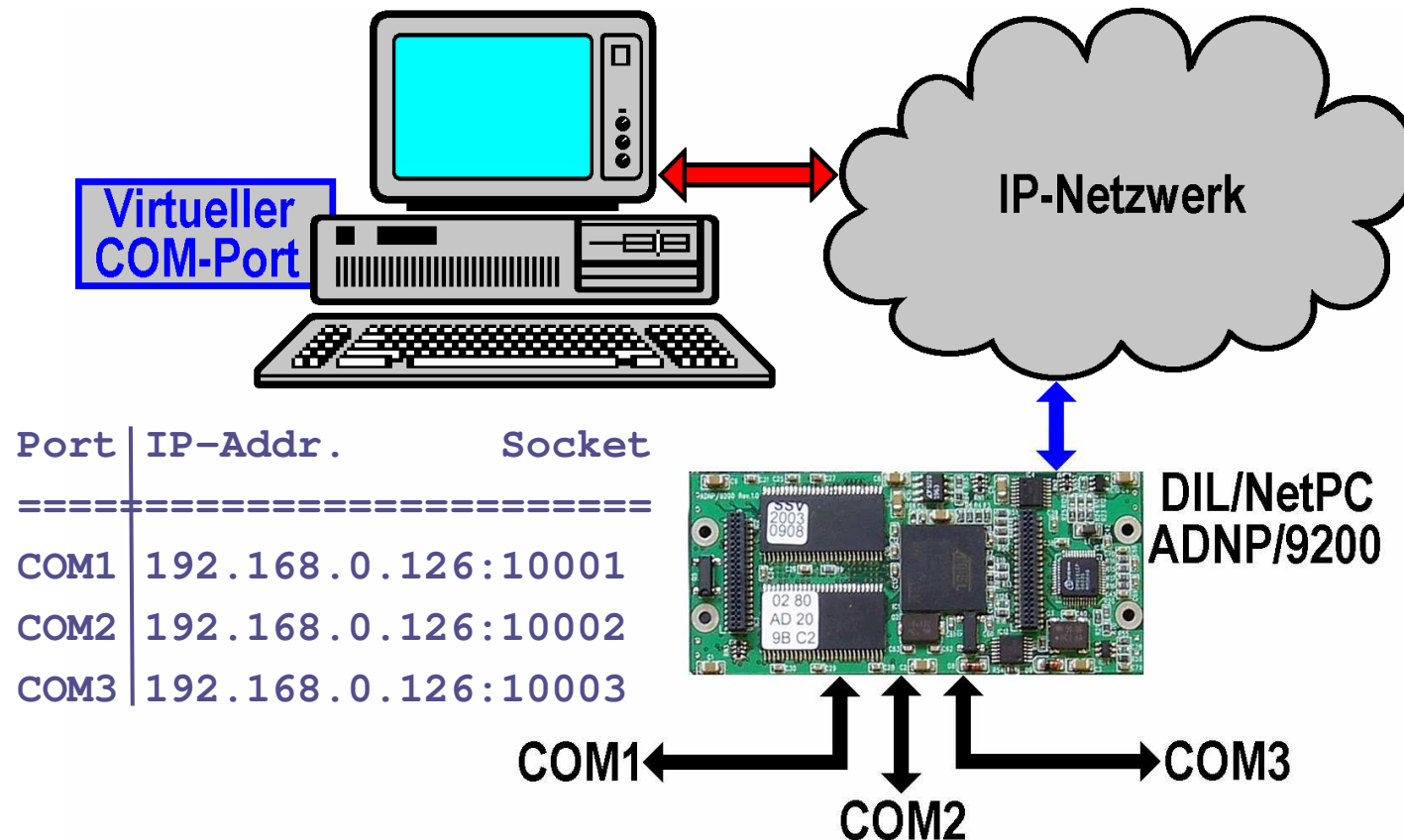**DIL/NetPC ADNP/9200**

Wireless Sensor Network (WSN)

WSN Gateway Use Cases …

➢ **Remote Access**: Remote access allows the usages of the hardware and software resources (i.e. the Linux command line) …
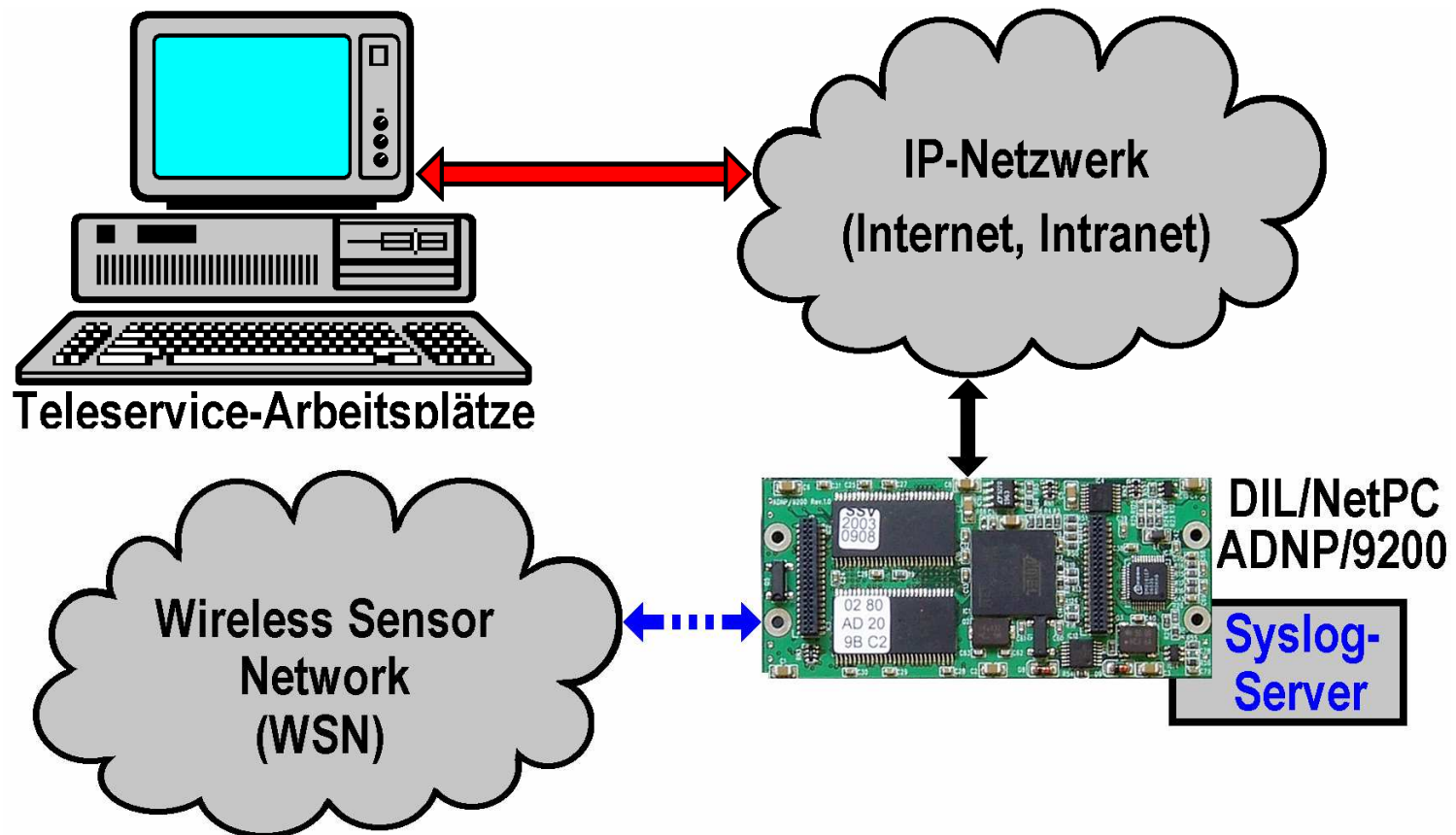
WSN Gateway Use Cases …

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


```
Port | IP-Addr.        Socket
==============================
COM1 | 192.168.0.126:10001
COM2 | 192.168.0.126:10002
COM3 | 192.168.0.126:10003
```

Virtueller COM-Port
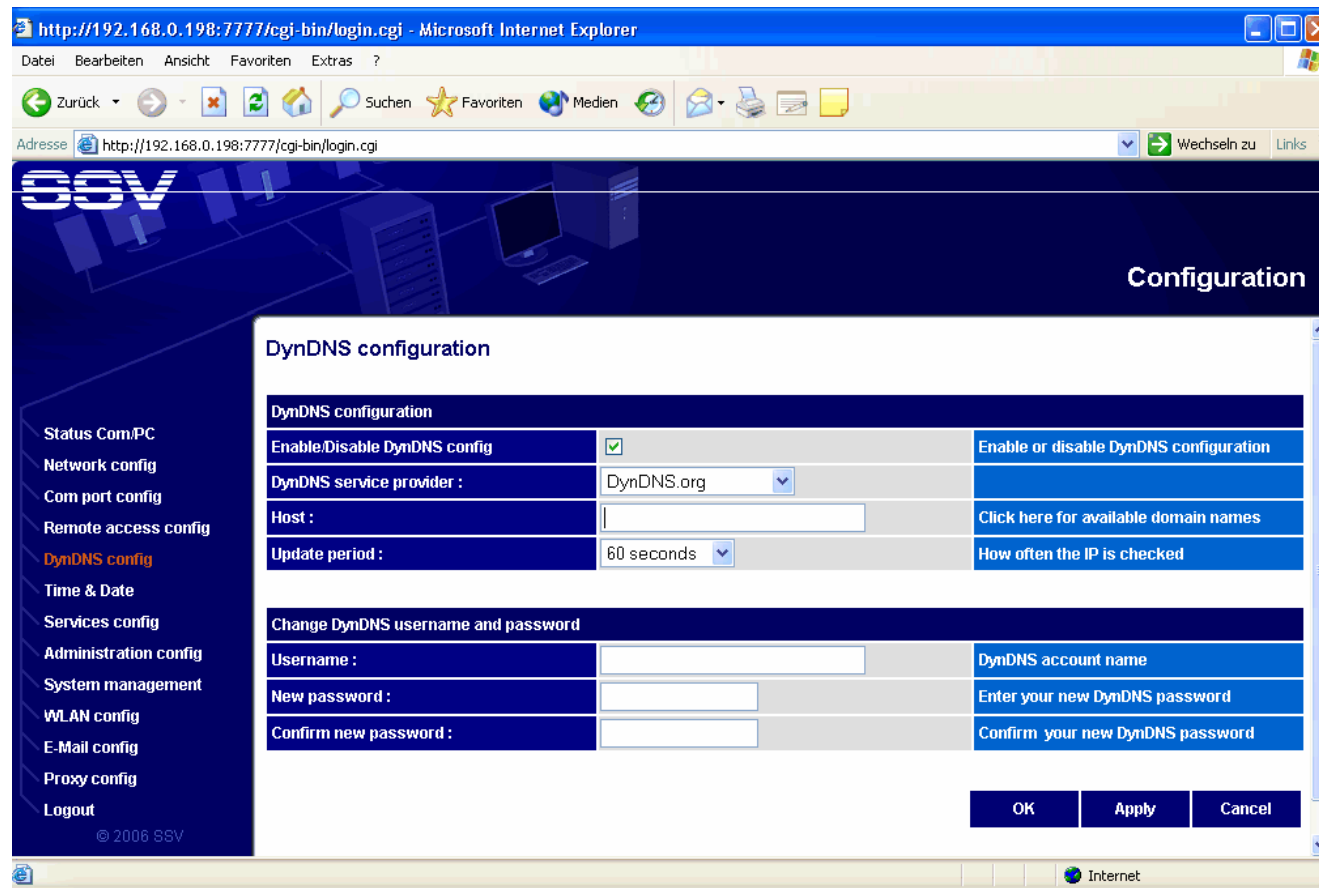
IP-Netzwerk

DIL/NetPC ADNP/9200

COM1   COM2   COM3

WSN Gateway Use Cases …

➢ **Data Logger**: Data logging with the help of Linux Syslog-NG Server. 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 …
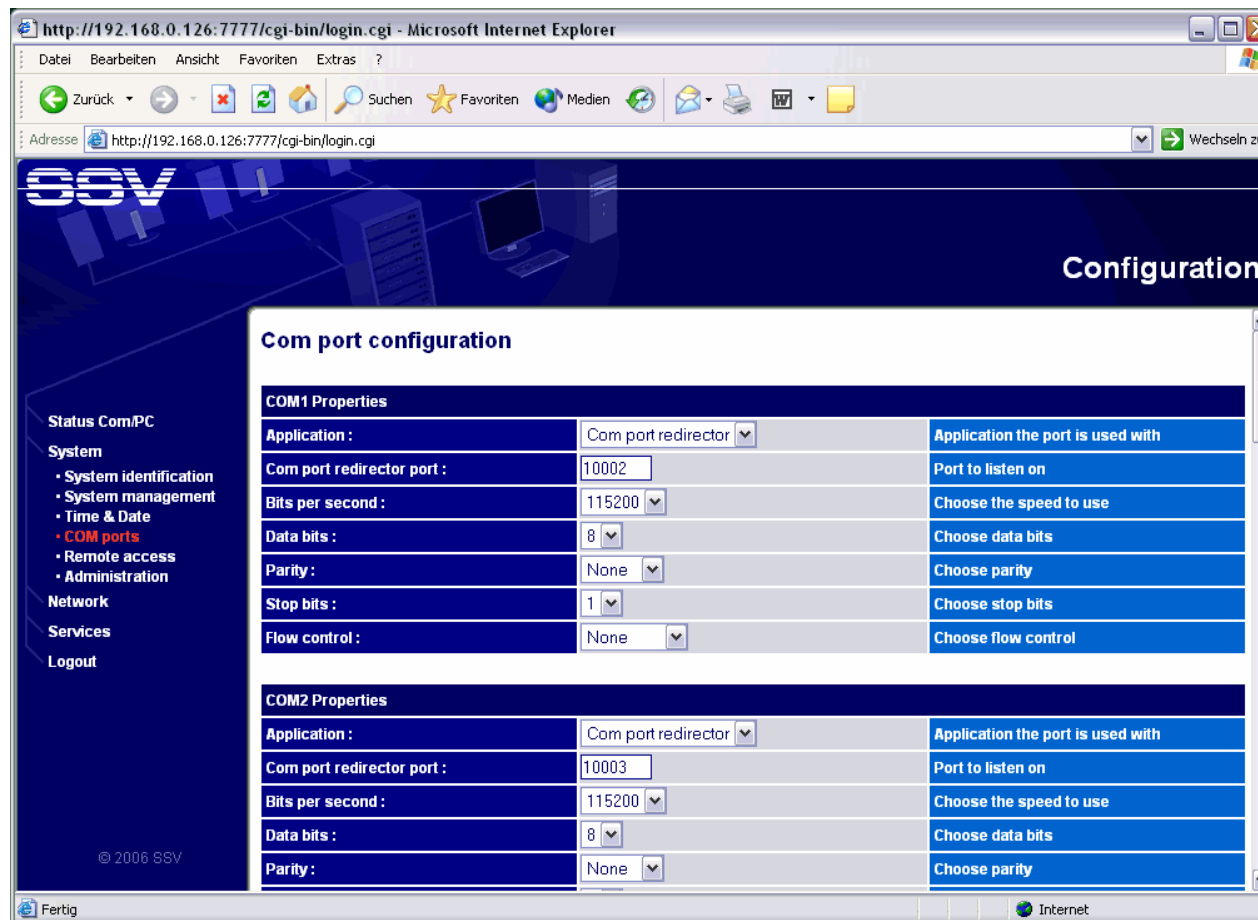
Web-based User Interface …

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

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

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Evaluation Board DNP/EVA11

➢ The evaluation board offers many different connectors and sockets and some prototyping space for own interface circuits.

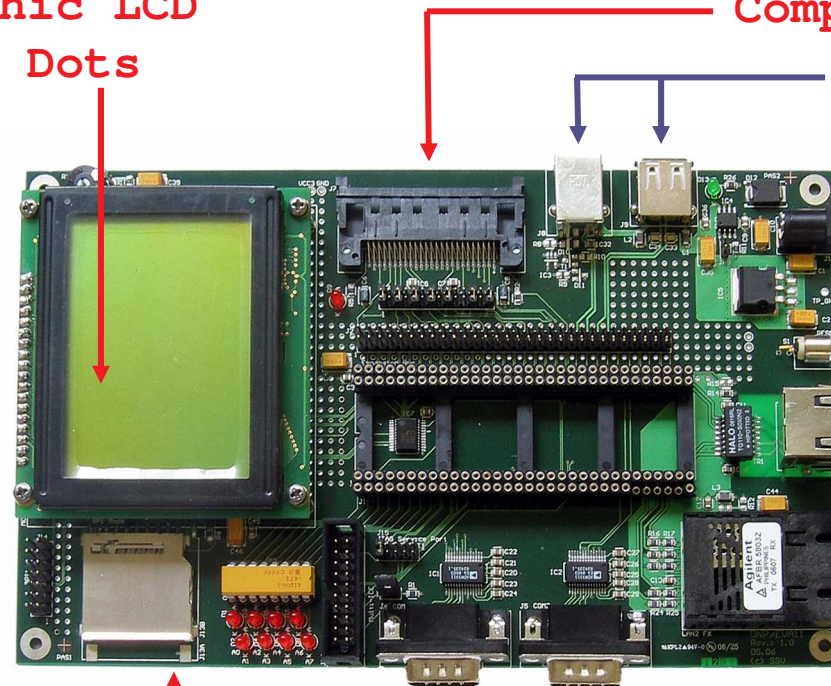**Small Graphic LCD 128 x 64 Dots**

CompactFlash Socket

USB Host/Device

LAN1 with 10/100Base-TX

SD/MMC Socket

2 x RS232 (COM1/COM2)

LAN2 with 10/100Base-FX Option
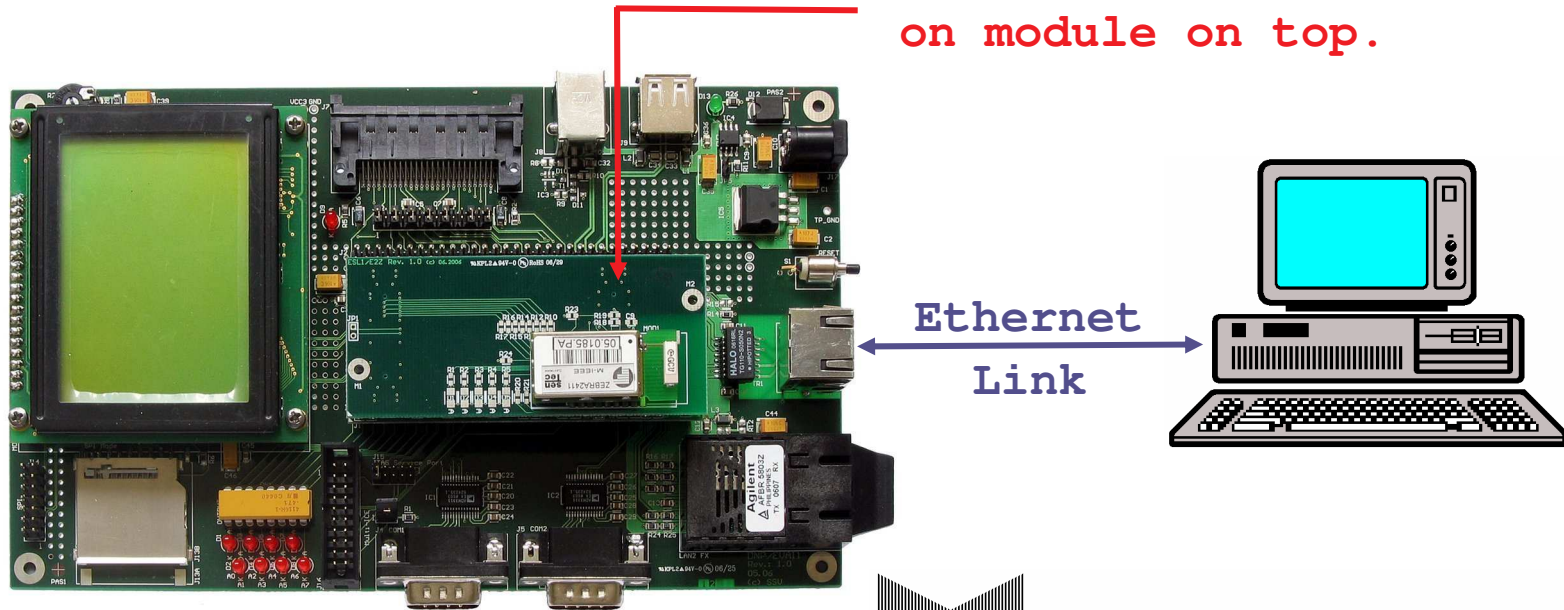
Starter Kit DNP/SK27 – WSN Expansion

➢ The ADNP/9200 starter kit offers also a ZigBee/IEEE802.15.4-based wireless sensor network (WSN) expansion kit for 2.4 GHz links.

ADNP/9200 with ESL1/E2Z add-on module on top.

Ethernet Link

The E2Z Base module transmits temperature sensor data via ZigBee/IEEE 802.15.4 to the ADNP/9200.

E2Z Base

* Sensor Interface via RS232
* ZigBee / IEEE 802.15.4 Wireless
* Battery Power Supply

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That's all ...

**WSN Gateways
in Action ...**

**Thank you for your attention.
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