It’s all you need!

netX 90 – The Next Generation of Communication
“Our next-generation technology combines application and secured multiprotocol communication on the smallest footprint.”

Sebastian Hilscher
Manager of netX Technology

“We don’t know your business models of tomorrow, but we can already provide you with the technology you need for it today.”

Hans-Jürgen Hilscher
CEO

Hilscher Gesellschaft für Systemautomation mbH was founded in 1986. Today, the company has more than 260 employees at 10 locations worldwide. With the philosophy of continuous growth based on its own resources, the company is a reliable partner for its customers.

Hilscher offers netX technology for device manufacturers, including development services and customized module manufacturing. In this field, Hilscher is not only recognized as a system partner of major manufacturers. The customer base also includes a variety of engineering firms, solution providers and system integrators. In addition, Hilscher is represented in all Fieldbus and Real-Time Ethernet organizations.

The industry is facing a paradigm shift worldwide – and Hilscher has always been a pioneer of significant changes. For us, the Industrial Internet and Industry 4.0 are the fourth industrial revolution, one which requires end-to-end communication from the sensor into the cloud. We call this industrial cloud communication, and netIOT is our technology that complements it.

HILSCHER IS YOUR PARTNER FOR INDUSTRIAL COMMUNICATION AND IOT
WHAT YOU REALLY NEED...

Do you really need a chip, without software?
There are ASICs on the market as a target for communication, but they come without a matching and tested protocol stack.

Do you really need a protocol stack, without a chip?
There are software stacks available on the market, but they can not compete on performance. And they often require an oversized application CPU.

Do you really need to spend extra space and money for a FPGA?
FPGAs are often offered as a communication solution instead of a flexible multiprotocol chip. But the unit costs and the form factor do not fit to tight budgets and space requirements of embedded devices.

Do you really need different hardware for each protocol?
Specific communication ASICs are offered instead of a flexible multiprotocol chip, but they support just one protocol and each new system requires new hardware development.

What you really need:
One chip for all protocols from one supplier!
- Two CPU cores for communication and application
- Supports all RTE systems and IoT communication
- Platform-independent driver interface
- Intuitive configuration tool
- Harmonious hardware, software and services
- Proven technology – 2 million netX sold
- One-stop shop – all you need from one supplier

...IS ONE FOR ALL!

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MULTIPROTOCOL SOC FOR UNDREAMED-OF POSSIBILITIES
ALL YOU NEED…

Industrial communication SoC enabled for security

- First industrial Ethernet node in 10x10 mm with two ARM® Cortex® M4 processor cores, on-chip Flash, analog/mixed signal and integrated PHYs.
- Fulfills the highest demand on flexibility, determinism and performance in terms of multi-protocol capability and low latency for short cycle times.
- Simplified and BOM cost-saving product design with the smallest footprint.
- Enables developers to implement a profound secure-by-design concept compliant with the IEC 62443 series for industrial automation security.
- Improves the application design of highly reliable systems due to built-in diagnostics and enhanced data integrity for IIoT-enabled services.

...IS NETX 90

- 10X10 MM
- 144 PIN BGA
- 2X ARM® CORTEX® M4 100 MHZ
- 1.5 MB FLASH
- 640 KB RAM
- INTEGRATED PHYS
- < 1 WATT
- 3.3 V ONLY

One chip. All protocols. Your application.
ALL YOU NEED...

IOT READY

- BUILT-IN CRYPTOGRAPHIC ALGORITHMS FOR HIGHEST ENCRYPTION WITH DIFFERENT KEY LENGTHS.
- MORE THAN ENOUGH FLASH AND RAM FOR SOFTWARE COMBINATIONS OF IOT AND RTE STACKS.

...FOR YOUR COMMUNICATION

- Rich peripheral set for application designs
  - Advanced Peripherals
    - 8x IO-Link Master, diagnostic MAC
    - 4x SPI (up to 50 MHz), 2x UART (up to 10 Mbps), 2x CAN (2.0B, SJA1000)
    - 2x ADC 12 bit 2 Mbps, Brown-Out detection, temperature sensor
  - Encoder
    - 2x BISS, 2x Er-Dxt, 2x SSI
  - Serial
    - 4x SPI (up to 50 MHz), 2x UART (up to 10 Mbps), 2x I2C (up to 3.4 MHz)
  - Analog
    - 2x UART (16550), 2x SPI (up to 5 MHz)

- Host Interface
  - UART 0-1, SPI 0-3, I2C 0-1

- Memory Interface
  - SPI, SDRAM 16 Bit

- Interface
  - UART 0-1, SPI 0-3, I2C 0-1
  - CAN 0-1, IO-Link 0-7, BiSS 0-1, EnDat 0-1, SSI 0-1
  - GPIO 0-7 / Timer
  - MLED 0-7

- CPU
  - ARM® Cortex® M4, 100 MHz
  - xPic, 100 MHz

- Memory
  - QSPI, SRAM, SDRAM 16 Bit

- Application
  - Flash Memory

- Optional:
  - SD Card
  - FRAM

- Communication
  - LVDS PHY LED, LVDS PHY LED

- System / Timer
  - SysTime 0-1, System / Timer

- DMA
  - DMA 0-2

- Bus Interface
  - JTAG / SWD, POR, BOD, DCDC, PLL, RC-OSC
ALL YOU NEED…

Integrated IO-Link Master functionality

• Supports up to 8 IO-Link Master channels, with 4 digital control signals per channel: TX, TX_ENABLE, RX, WAKEUP.

• The low-level IO-Link stack running on the internal xPIC CPU for maximum flexibility and high deterministic stack operations.

• All components from one supplier:
  • IO-Link Master stack
  • netX 90 hardware
  • Real-Time Ethernet stack
  • Optional IoT stack

• The market’s choice for IO-Link gateways.

...FOR YOUR IO-LINK MASTER
ALL YOU NEED… FOR YOUR ENCODER

Integrated encoder IPs
• With its 10 x 10mm footprint, wide temperature range and integrated master IPs for BiSS, SSI and EnDat, the netX 90 is your choice for encoder applications.
• The netX 90, in combination with Hilscher protocol stacks, enables you to build up synchronous encoder devices with the lowest cycle times.

…FOR YOUR ENCODER

• Each encoder IP is available twice for dual-channel, redundancy or safety purposes.
• 2x2 parallel sampling ADCs, UART and GPIO for traditional mixed signal encoder interfaces.

Optional:
- SDRAM QSPI
- FRAM
- Integrated Ethernet PHYs
- Integrated DCDC and Power-On-Reset
- Integrated flash memory

Integrated encoder IPs
- BiSS, SSI, EnDat
- +3.3 V
- 25 MHz
- Fieldbus LEDs
- Level Shifter

Hilscher networX on chip
Hilscher networX on chip
Rich set of standard and advanced peripherals

- There are several SPI, UART, I2C and CAN interfaces to connect different kinds of ICs.
- In combination with our GPIO unit, which is equipped with three independent 10 ns timers, input capture and IRQ unit, it is the solution for your sensor application.
- Plus four 12 Bit 2 Msps ADC channels in which two can be sampled in parallel.

- You choose the valves, remote IO and sensor-specific ICs.
ALL YOU NEED…

Multiple host interface options

• For flexible high-end applications, the netX 9 can be equipped with an additional host CPU.

• Supports 8/16 Bit parallel interface or single / dual SPI with up to 125 MHz.

• Dual SPI for high-performance and deterministic cyclic data parallel to a huge amount of acyclic traffic.

• Additional raw Ethernet or socket interface for standard Ethernet communication on the same wire as the Real-Time Ethernet network.

• Sync and IRQ options for minimum cycle times.

...FOR YOUR COMPANION CHIP

[Diagram with netX 90 networking options and components]
Rich software ecosystem

- The netX 90 comes with a huge software environment, consisting of pre-compiled, pre-certified loadable firmware for the communication CPU. The netX Studio build environment is equipped with hardware configuration for the application CPU.
- Freely combinable software from different technology components:
- Ease of use, fast and hassle-free protocol stack implementation that enables application developers to set up a prototype in hours.

Blackbox with:
- Real-Time kernel
- Protocol stack
- Microcode (Switch, HUB etc.)
- Pre-compiled
- Pre-certified
- Configurable

Development with netX Studio:
- Eclipse-based development environment
- GNU C-Compiler
- WAF build system
- OpenOCD debugger support
- Hardware editor
- Utility tools

Application
- PROFINET
- EtherCAT
- PROFIBUS
- OPC UA
- MQTT
- Web server
- FTP
- TFTP
- IO-Link
- SNMP
- NTP
- netSCRIPT
- Marshaller
- Diagnostic MAC

ALL YOU NEED... IS SOFT- AND HARDWARE FROM ONE SUPPLIER

... IS SOFT- AND HARDWARE FROM ONE SUPPLIER
ALL YOU NEED...

Trustable partner for industrial communication
As one-stop shop, Hilscher is a supplier for matching hardware and software.

We want to make your development as comfortable as possible. With Hilscher development trainings you will be able to cut down development times significantly.

Our pre-certification process provides the possibility to check your device if whether is ready for certification. And even the certification itself can be arranged by us.

Want more?
We also offer hardware design, software development and production services.

...IS TRUSTABLE DEVELOPMENT SERVICE

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Over 10 years of multiprotocol ASICs
With this experience and the third generation of slave chips, the netX 90 sets new standards in the industrial communication market.

The combination of hardware and software offers a technology package which is unique.

Hilscher is the technology leader of multiprotocol ASICs and your trustable partner for communication.

netX 90 at a glance
• Two independent Cortex M4 CPUs, one for application, one with loadable firmware for communication.
• Equipped with a built-in security core for the highest data integrity.
• Flexible CPU subsystem for multiprotocol devices.
• Rich set of standard and advanced peripherals.
• BOM cost-saving design with integrated DCDC, PowerOn Reset, PHYs and Flash.
• High-performant protocol stacks with additional IoT functionality.
• Gives you an unmatched flexibility and a future-proof solution for your device.

ALL YOU NEED ...
2 Million netX chips sold

...FOR YOUR EMBEDDED SOLUTION...

...IS A READY-TO-USE DESIGN!
EMBEDDED PLATFORM FOR IT & OT COMMUNICATION

halfsize netRAPID

Hilscher
Requirements for the next generation

- Flexibility of netX 90 regarding MMIO mapping and different sets of signals
- Different memory options for complex use cases (QSPI, SDRAM or NVRAM)
- Additional functionality for future requirements, e.g. OPC UA, cloud interfaces, integrated PLC or TSN
- Built-in security
- Usage with host CPU or as stand-alone solution
- Low cost, leveraging synergy effects and fast time to market
- Shipment with "customer-specific" content
- Firmware according to the latest technology standards

Ready-to-solder chip carrier based on netX 90

- Smallest design in different "flavors"
  - QSPI Flash extension | SDRAM extension | FRAM extension (64 kbit) | LVDS Backplane
- Multifunctional platform
  - Real-Time Ethernet, LED & Boot-UART | GPIO, encoder, IO-Link & more | I2C, SPI | PIO, host interface or LVDS
  - Function will be defined by software
- I4.0 solution for the field level
  - Can be enabled with IoT communication
  - Shipment as customized solutions in "lot size 1"
Modular software configuration process
- Different host interfaces:
  • CIFX API: Protocol-specific I/O image
  • netPROXY: Generic object interface
- Separate CPUs for application and communication
- Select your software and functionality:
  • Monolithic firmware with CIFX API and fixed functionality
  • Specific firmware with customer application and functionality
  • Specific firmware with netPROXY, customized pinout and functionality

- Application development using netX Studio
- Network-independent object engineering and pinout definition using netX Studio

HALFSIZE NETRAPID...

...AND ITS FLEXIBLE SOFTWARE
HALFSIZE NETRAPID...

Industry 4.0 production process & netRAPID cloud application

For halfsize netRAPID, Hilscher has established an Industry 4.0 production process. With this new process, device manufacturers have full flexibility and gain control of their netRAPID software.

First device manufacturers design their product-specific software package for netRAPID. Via a web interface, this product package will be passed to a cloud application, which triggers the automatic order and production process.

Automatic order processing & Autonomous robot cell

After receipt of the customer product package, the ERP system will coordinate the SMD production. In an autonomous robot cell, the halfsize netRAPID will be tested and the customer-specific software package will be loaded. Afterwards the robot automatically packs them into trays for in-time delivery.

Means the customer receives netRAPID preloaded and ready to use with its own content.

...IN LOT SIZE 1
HALFSIZE NETRAPID...

Technology inside
- Multiprotocol platform for extended temperature range
- One compact hardware (32 x 15 x 4 mm) for all Real-Time Ethernet protocols
- Host interface via 50MHz SPI
- Diagnostic interface via Ethernet or UART
- Integrated BiSS, EnDat2.2, IO-Link and LVDS interfaces
- Memory options: 4–32 MB QSPI Flash, 8/16 MB SDRAM, 64 kbit FRAM
- 2 x ARM® Cortex® M4 each for communication and application
- Built-in security functionality for IoT applications
  - Hardware support for cryptographic operations
  - Mask ROM code assured secure boot level
- Integrated BiSS, EnDat2.2, IO-Link and LVDS interfaces

Modular software structure for RTE & IOT applications
- Predefined or customer defined software packages
- Configurable pin assignment by the OEM
- Integrated web server, OPC UA or MQTT functionality

AND YOUR BENEFITS
- Reduced footprint & reduced costs due to half size and packed with extra features
- Reduced maintenance costs & reduced reaction time due to modular software configuration process
- Engineering & production advantages for device families due to same form factor with different assembly options
- Future-proof for the next generation of communication due to integrated IoT, security and TSN capabilities
Real-Time Ethernet interface with IoT extension
• netPROXY-based firmware with protocol-independent object interface to the host
• Product engineering using netX Studio
• Easy-to-integrate SPI host interface
• One design for all Real-Time Ethernet slave protocols
• Integrated MQTT client and OPC UA server
• “Secure boot” based on built-in security functionality

Low cost Real-Time Ethernet interface
• Predefined firmware with dual-port memory access
• Easy-to-integrate SPI host interface
• Ethernet diagnostic interface
• One design supporting all Real-Time Ethernet slave protocols
• SYNC 0/1 access
• Firmware update via integrated web server
Simple Real-Time Ethernet interface for I/O only with IoT extension
- netPROXY-based firmware with protocol-independent object interface to the host
- Product engineering using netX Studio
- I/O data collection via external SPI shift register
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- Secure boot based on built-in security functionality

NETRAPID...

Simple Real-Time Ethernet interface for I/O only
- Predefined firmware without host interface
- I/O data collection via external SPI shift register
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- SYNC 0/1 access
- Firmware update via integrated web server

...AS STAND-ALONE SOLUTION
HALFSIZE NETRAPID...

Development with netX Studio
- Eclipse-based development environment
- GNU C-Compiler
- WAF build system
- OpenOCD debugger support
- Hardware editor
- Utility tools

...AS STAND-ALONE SOLUTION

Real-Time Ethernet interface with own application
- Full usage of both internal processors of netX 90
- Communication CPU
  - Loadable Real-Time Ethernet firmware
  - Ethernet diagnostic interface
  - One design supporting all Real-Time Ethernet slave protocols
- Application CPU
  - Customer-specific application
  - Definition and usage of PIO and MMIO dependent on desired application
  - Development with netX Studio
BiSS / EnDat interface for encoder with IoT extension

- netPROXY-based firmware with protocol-independent object interface to the host
- Product engineering using netX Studio
- Two-channel BiSS / EnDat interface
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- "Secure boot" based on built-in security functionality

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HALFSIZE NETRAPID...

BiSS / EnDat interface for encoder with IoT extension

- netPROXY-based firmware with protocol-independent object interface to the host
- Product engineering using netX Studio
- Two-channel BiSS / EnDat interface
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- "Secure boot" based on built-in security functionality

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...FOR SPECIAL USE CASES

BiSS / EnDat interface for encoder

- Predefined firmware with BiSS & EnDat 2.2 interface
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- Firmware update via integrated web server

- Product engineering using netX Studio
- Two-channel BiSS / EnDat interface
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- "Secure boot" based on built-in security functionality

...FOR SPECIAL USE CASES
Real-Time Ethernet interface with integrated IO-Link Master
- Predefined firmware with dual channel IO-Link
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- Firmware update via integrated web server

HALFSIZE NETRAPID...

Real-Time Ethernet interface with integrated CODESYS
- Full usage of both internal processors of netX 90
- Communication CPU
  - Loadable Real-Time Ethernet firmware
  - One design supporting all Real-Time Ethernet slave protocols
- Application CPU
  - Predefined CODESYS
  - Fixed peripherals

...FOR SPECIAL USE CASES
Build your device in 6 simple steps
1. Define your object library
2. Specify your application
3. Set your communication protocol and parameters
4. Add product & vendor information
5. Create your web pages & define your users
6. Define the netRAPID-specific hardware configuration

Result:
Free configurable Real-Time Ethernet interface
- netProxy-based firmware with protocol-independent object interface to the host
- Product engineering using netX Studio
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- Pinout and associated functionality with very high configurability
- "Secure boot" based on built-in security functionality

HALFSIZE NETRAPID... FOR SPECIAL USE CASES
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IT’S ALL YOU NEED!

SDRAM
8/16 MB

QSPI
Flash
4-32 MB

FRAM
64 Kbit

netX 90
NETX 90
networX on chip

Hilscher
HEADQUARTERS

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