THE INTERNET OF THINGS UNDER CONTROL
Beck IPC – your Embedded Technology Partner

Beck IPC GmbH is the supplier in the embedded market for comprehensive technologies in the fields of control, communication and visualization for your automation requirements.

The base technology – the IPC@CHIP® – together with add-on technologies provides a wide range of effective solution approaches, whether as a module for user developments or through development services.

The com.tom Gateway products are available for you as a technology carrier in all the above areas as an “off the shelf” solution.

Both in the embedded field as well as in the M2M business, at Beck you will always find the right support.

Since 2010 the focus of Beck is to realize industrial portal communication solutions based on the Beck hardware and software components.
**IoT building blocks in hard- and software**

Based on the IIoT reference model Beck provides components in Hard and Software to set up private company cloud solutions in an easy and quick way:

1. **Physical Devices & Controllers**
   - (The “Things” in IoT)

2. **Connectivity**
   - (Communication & Processing Units)

3. **Edge Computing**
   - (Data Element Analysis & Transformation)

4. **Data Accumulation**
   - (Storage)

5. **Data Abstraction**
   - (Aggregation & Access)

6. **Application**
   - (Reporting, Analytics, Control)

7. **Collaboration & Processes**
   - (Involving People & Business Processes)

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**Customer application**

- Cloud service, APPs and Service
- Hardware and embedded software components
- Cloud components

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The basic building blocks for IoT

The following components are the basic elements to set up an IoT application:

1 – the Cloud Broker: Handles all the necessary actions to manage the incoming and outgoing data including all configuration and security aspects.

2 – The Kolibri Protocol: The Kolibri protocol is a secure WEB based protocol to transfer data from the filed into the internet and vice versa. It is designed for high speed, low latency and low traffic due to the demands of industrial communication.

3 – The com.tom devices: The com.tom devices are ready to use Internet Gateways especially designed for automation and high connectivity.

4 – The IPC@CHIP®: The IPC@CHIP® is an embedded hardware component which fulfills especially the needs of an industrial controller. It is easy and ready to use as well as cost optimized for decentralized plc devices.

5 – The RTOS-LNX: Is the embedded OS based on Linux for the IPC@CHIP®. It includes a lot of communication, hmi and plc functions as well as real-time capabilities for embedded IIoT.
com.tom Cloud Server in a nutshell

Process and configuration data are represented as hierarchical trees of nodes both on the com.tom devices and the com.tom PORTAL server.

Consumers (users, applications) can subscribe nodes on the PORTAL server.

When process data changes the devices send the new values to the PORTAL server which stores it and immediately forwards it to all subscribed consumers.

Consumers can control devices by sending configuration data to the PORTAL server which sends it to the respective devices.

All this works fast, secure, configurable and scalable.
com.tom Cloud Server Features 1

- Platform for secure transmission, visualization and storage of process and configuration data

Communication
- Firewall/proxy friendly protocol (TCP port 443)
- Full-duplex communication channel (WebSockets based)
- Keep-alive mechanism with offline detection
- Low traffic (optimized for mobile networks)
- Low latency (event-driven data transmission)
- Remote procedure call (RPC) support

Security
- End-to-end encryption (TLS) of the complete communication
- Authentication: mandatory
- Password policy (Length, complexity, black list)
- Authorization: fine-grained permission system for data access
com.tom Cloud Server Features 2

Data model
- Data types: boolean, integer (8/16/32/64 bit, signed/unsigned), floating point (32/64 bit), string (UTF-8), byte array
- Flexible event-trigger configuration
- QoS levels (at most once, at least once, exactly once, data log)
- Scaling and formatting of values
- Storage of historical data

Operation
- Professional hosting in a state-of-the-art data center
- Located in Germany, operated by a German company
- Scalable virtual data center (private cloud)
- High availability
- Permanent monitoring of service availability and quality
- Service level agreement
- Emergency hotline (24/7)
com.tom Cloud Server options

Automation Features

- The com.tom cloud server can be optionally equipped with an IEC61131 runtime system. This allows you to operate your application central in the cloud environment.
- In addition the com.tom cloud server has an OPC UA Interface to connect to all state of the art scada and third party tools.
- An optional SAP HANA Platform interface is under development.

Benefits

- High performance data processing
- IEC cloud application can handle your complete machine park
- Easy software collaboration and maintenance in intrinsic in the design
- No roll out process anymore needed
- No remote debugging is anymore needed
- You can stay with your existing scada with brand new features
Kolibri Client Library

The Kolibri library allows the implementation of a producer client application for the com.tom PORTAL Services. It implements the Kolibri protocol for communication with the com.tom PORTAL broker component and offers an API (Application Programming Interface) for configuration as well as for data transmission. The API offers the following functions:

- Determine the library’s version
- Library initialization and de-initialization
- Priority configuration of internal tasks
- watchdog manager configuration
- Connection parameters configuration
  - Project name
  - Broker hostname
  - Producer scope
  - User name
  - Password hash
  - TCP port number and timeout
  - Proxy server (host, port, user name, password)
  - Keep-alive interval and timeout
  - SSL/TLS deactivation
Kolibri Client Library

- Size of internal queue configuration
- Acquisition of a valid time
- Various callback functions (get broker time, event log, data points publishing, traffic)
- Data transmission or Data record registration and de-registration
  - Initiate data exchange between the application and the library for a registered data record
  - Forced data transmission of a registered data record
- Status report, as well as the library’s last error
- Statistics data query
- Query a list of all nodes
- Configuration of broker nodes (create node, delete node, change node properties)
Kolibri Client Library

Besides the data exchange between the application and the library, which is initiated from the application, the library carries out the following activities in an internal task:

- Establish a WebSocket connection to the broker (HTTP upgrade mechanism)
- Execution of the Kolibri protocol
- Logging in to the broker
- Query of the broker existing nodes
- Data transmission from the registered data record with respect to the configured trigger mode and Quality-of-Service level
- Data receiving for the registered data record in consideration of the configured Quality-of-Service-Levels
- Synchronization of data communication with the broker and with the application
com.tom Cloud Solution

The com.tom product series combines telemetry with telecontrol and includes in the package a cloud solution to enable worldwide data access. This makes it possible to respond quickly to the collected data and influence the local process.
com.tom Gateways and Graphic

**com.tom BASIC**
- Ethernet 10/100Base-T
- Serial interface (RS232/RS485)
- SD card slot

Optional:
- 4 digital inputs & 4 digital outputs
- Additional RS232
- CAN interface

**com.tom RADIO**
- Ethernet 10/100Base-T
- Serial interface (RS232/RS485)
- SD card slot
- GSM/GPRS modem (also as UMTS variant), SIM card slot

Optional:
- 4 digital inputs & 4 digital outputs
- Additional RS232
- CAN interface

**Other variants**
- M-Bus master
- Integrated switch
- PROFINET
- PROFIBUS
- CAN
- Ethernet IP
- Bacnet

**com.tom GRAPHIC**
- Ethernet 10/100Base-T
- 4.3” TFT touch
- 7” TFT touch from Q4

Optional:
- MicroBrowser
com.tom WEB-PLC Programming and Configuration

All com.tom devices come with a local web server that is used for parameterization and is also used for programming logic and alarm functions for the WEB-PLC. This enables all devices to be commissioned and the status monitored locally without the need for additional software.
com.tom Functions

com.tom WEB-PLC Programming and Configuration

The WEB-PLC offers the following functions for programming:

- Logic operations
- Counters
- Comparators
- FlipFlop
- Timer, pulse generator
- Send SMS message
- Resv Msg, receive SMS
- VPN Start/Stop
- and much more

All configured I/O from all bus systems (Modbus, M-Bus, IEC) are available, including local inputs/outputs and portal variables.

This enables the implementation of gateway functions by mapping data and the creation of a local logic.

An online view for testing and commissioning is naturally also provided - and all of this is browser based, without external tooling.
com.tom WEB-PLC Programming and Configuration

Alternatively to WEB-PLC programming you can with the same configuration setting use a browser to select the CODESYS variant for creating programs.

Everything else stays the same – however, you have the large range of possibilities of this powerful IEC software.

The com.tom devices also provide the WEB visualization integrated in CODESYS. Your communication interface is thus turned into a PLC with integrated HMI in no time at all!
IOT@CHIP embedded platform

The com.tom IoT@CHIP embedded platform is a highspeed, highdensity SOM within all the com.tom features. It fulfils all your needs in the area of:

- Industry 4.0 Applications
- IoT PLC
- IoT HMI
- IoT Gateway

Option: LCD/TFT/GPIO
IOT@CHIP embedded platform features

- **Processor:** Freescale i.MX 6UltraLite 2 (MCIMX6G2)
- **Clock frequency:** 528 MHz
- **MMU:** Yes
- **FPU:** Yes
- **Working memory (RAM):** 128MByte DDR3
- **Flash memory (Disk):** 64 MByte (NOR-Flash; QSPI)
- **F-RAM**
- **Ethernet:** 2 x 10/100 Mbps (1 x external PHY required)
- **UART:** min. 3 x TTL
- **USB:** 2 x USB (1 x OTG)
- **CAN:** 2 x CAN
- **I/O:** GPIO / ADC / PWM / TFT
- **SDIO/MMC:** Yes (1 x 4bit)
- **SPI:** min. 1 x SPI (exclusive, not internal used)
- **I2C:** up to 2 x I2C
- **Operating temperature:** -25°C to +85°C
- **Power supply/consumption:** single supply of 3,3 V
- **Form Factor:** SMT- castellation Form Factor (25,5 x 25,5 mm)
@CHIP-RTOS-Linux

@CHIP-RTOS-Linux is the real-time multitasking operating system adapted for the IPC@CHIP® SoC based on Linux and @CHIP-RTOS extensions. The benefits of both solutions are available.

The “Linux Flavor” and “@CHIP-RTOS Flavor” make the software offers of the open source community available as well as the existing software solutions from the @CHIP RTOS environment.

With the sandbox in the “@CHIP-RTOS Flavor”:

- complete separation from GPL restrictions,
- full copyright protection guaranteed
Functions and Explanations

The RTOS-Linux operating system is the OS of the next IPC@CHIP® generation. The new system is based on the mainline Linux kernel. The kernel is available for the different hardware platforms. This provides a high degree of flexibility in hardware selection and for porting to new platforms. At the same time the operating system meets the real-time requirements and compatibility requirements with the existing RTOS-x86 and RTOS-PPC operating systems as well as its “usability”.

Features:
- Extensive hardware independence, little effort required for porting to new platforms
- Real-time behavior (context change and interrupts), the latency times are comparable with those of the IPC@CHIP® that run on RTOS-x86 and RTOS-PPC
- Small memory footprint for RAM and Flash
- Same functionality of services (web server, SSH, FTP etc.) as with RTOS-x86 and RTOS-PPC
- Extensive compatibility with the API of RTOS-x86 and RTOS-PPC
Functions and Explanations

✔ The Linux kernel abstracts the hardware and provides services such as memory management, multitasking, TCP/IP stack and a file system. Above the kernel, the @CHIP-RTOS C library provides a largely compatible API. Moreover, the standard C-Library (glibc or uclib) is available for the C99 standard functions. The following user applications as well as the integrated services run above the kernel and the API: FTP server, TFTP server, SSH server, HTTP server, PPP server and Telnet server.

✔ For real time capabilities the Linux kernel has been extended with Preempt RT patch. Processing of interrupts is managed by real time scheduler. Interrupt threads and application threads could be prioritized to each other, which allows to enforce applications threads against driver or system threads.

✔ The @CHIP-RTOS' specific RTX-API adds missing typical real time functionality like killing and canceling of threads, prioritized semaphores and disabling of task scheduler. The RTX-API is compatible over all current and future variants of @CHIP-RTOS.
ONE – Workbench

- Integrated development environment (IDE) for SC2x3
- Based on Eclipse
  - Open source
  - Very widespread use
  - Expandable framework (Plug-Ins)
- GNU compiler collection
  - Open source
  - Compiler, Linker, Assembler, Debugger
- ONE is a recursive acronym:
  - ONE is Not Eclipse

ONE Workbench
for IPC@CHIP®
Add Ons

The add-ons are ready-to-use function modules. They contain all the hardware and software components required for simple operation with the IPC@CHIP® processors.

**WL0x**
Wireless module
802.11 a/b/g/n

**BT0x**
Bluetooth module
Class 2

**GM0x**
GSM/GPRS module
Quadband

**GC-touch**
TFT touch controller
Summary of USP

The IoT@CHIP® technology supports you in many respects with your intended product. This provides you with all the benefits of modern embedded system technology:

- same performance as an embedded RTOS
- Familiarization required considerably shorter than in a standard Linux system
- simple and very short migration of existing RTOS projects
- simple system configuration in an INI file
- small footprint: 32MB RAM/Flash platform/2MB kernel
- Latency time under 40us
- Jitter 60us
- Everything from a single source: Hardware, operating system, tooling
- Tooling based on Windows, no Linux installation required
- Commissioned in 15 minutes
- Real-time programs and Linux standard can run on one system
- PLC (CODESYS), motion control as well as real time communication possible
- Automatic system test and 14 years API compatibility offer maximum investment protection
- sensational performance, unbeatable range of functions, unbelievable time-to-market, IEC 61131, IEC 61850, IEC870-5-104 and Kolibri integrated
… let's your application fly