IoT-Bus®

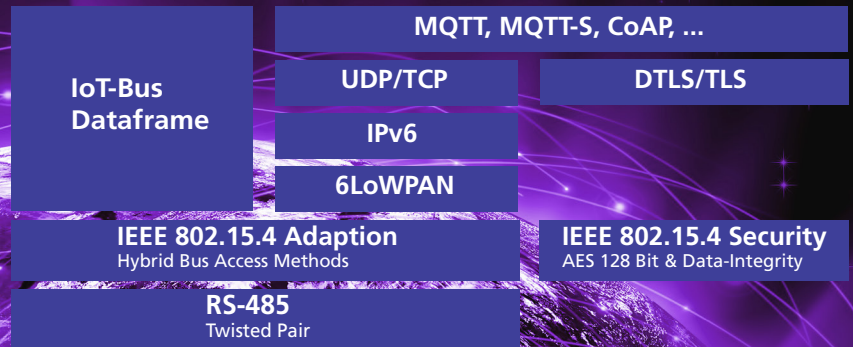| IoT-Bus Dataframe | MQTT, MQTT-S, CoAP, ... | |
	UDP/TCP	DTLS/TLS
	IPv6	
	6LoWPAN	
IEEE 802.15.4 Adaption Hybrid Bus Access Methods		IEEE 802.15.4 Security AES 128 Bit & Data-Integrity
RS-485 Twisted Pair		

IoT-Bus FOR INDUSTRY 4.0

A RELIABLE AND ROBUST COMMUNICATION BUS FOR THE INTERNET OF THINGS

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Secure Communication for IoT

In the context of the increasing networking and digitization in the fields of Industry 4.0, energy management, facility management and Internet of Things (IoT) Internet Protocol (IP) capability of each communication node is becoming more and more important. The IoT has specific requirements on data rate, range, reliability, cost, flexibility, interoperability and also in data security. Consistency of the protocols and seamless data-flow across different domains is essential to enable the IoT. Internet connectivity holds security risks in manners of data manipulation and cyber-attacks.

Fraunhofer IIS develops the IoT-Bus for a secure, wired and bus-capable communication. The IoT-Bus is the first fieldbus with native IPv6 support and an integrated security concept. It combines the advantages of native Internet Protocol support with the benefits of a fieldbus in terms of range, reliability, robustness and low latency. Furthermore it bridges the gap within the IoT communication portfolio between narrowband and broadband communication technologies and offers an easy to use wired solution to connect devices, sensors and actuators directly to the IoT.

Background and Motivation

Due to distributed production facilities in the digitized production, local or cloud-based facility management, energy management or in general IoT applications, a communication technology for the local communication in buildings and premises is needed that combines IP support, ranges of various hundreds of meters and sufficient data rates, low latencies, low energy consumption and reasonable costs.

The IoT-Bus has the ability to become the answer for a secure and affordable communication between existing objects and the IoT.
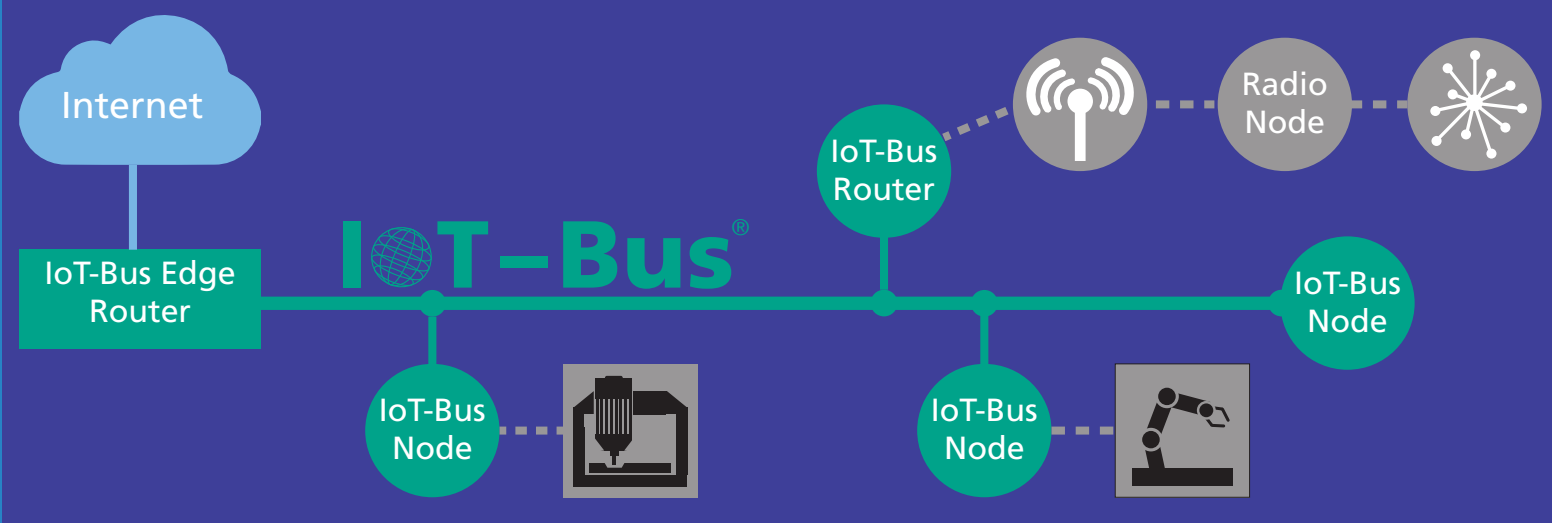
Functionality of the IoT-Bus

The IoT-Bus is a wired communication technology. It is based on an adaption of the technical standard IEEE 802.15.4 for Wireless Personal Area Networks (WPAN) and sensor networks for the use on a wired medium. Due to the use and adaption of the IEEE Std. 802.15.4, the IoT-Bus is prepared for a seamless cross-media communication between wired and wireless domains.

Thus, the IoT-Bus can be expanded by wireless IEEE Std. 802.15.4 nodes. In order to enable IPv6 capabilities the 6LoWPAN adaption layer is applied. Thereby the IoT-Bus is prepared to support standard protocols like OPC-UA, MQTT and CoAP. By using a token-based media access method, the IoT-Bus facilitates real-time communication.

The wired serial interface is currently based on the standard EIA-485 (RS-485), but further interfaces can be integrated on request. A communication over two-wire and four-wire cables is supported. In addition to the data communication, the four-wire solution also offers power supply to the communication nodes.

IoT-Bus as CAN-Range Extender

Industrial automation solution and control applications are often based on the CAN bus. The CAN bus has limitations in the combination of range and data-rate.

A bit rate of 1 Mbps for example is only possible at a network length below 40 meters. In a specific variant the IoT-Bus can be also used as a range extender for CAN by tunneling CAN messages over the IoT-Bus.

For that purpose, a data container concept was developed and implemented. With the help of these data container, the corresponding CAN messages are encapsulated and transported over the IoT-Bus and unpacked at the destination. By this solution an asynchronous link between individual CAN domains over a distance of several hundred meters at 1 Mbps can be established.

Unique Selling Propositions

– Prepared for OPC-UA, MQTT, MQTT-S and CoAP protocol support
– IPv6 support
– Real-time capability based on an optimized deterministic media access method
– Range extension of up to 500 meters with a 1 Mbps data rate
– Data-container model
– Scalability and modularity of the IoT-Bus
– Integrated power supply of the nodes for easy installation
– Low energy consumption
– Reasonable hardware costs
– Patent pending

Possible Fields of Application

– Industry 4.0
– IoT-applications
– Energy management
– Building automation
– Lighting management

Planned Features for the Future

The evolutionary concept allows the easy integration of other standard protocols into the protocol stack. The IoT-Bus provides the use of 6LoWPAN and hence realizes IPv6 capability of the nodes. Therefore, sensors, actuators and other »things« will be excellently equipped for the Internet of Things. If you have any customer-specific requests, please let us know and we can develop a suitable solution.

Your Benefits

– Sustainable due to IPv6 support
– Prepared for standard protocols
– Higher range with moderate data rate than competing technologies
– IP capability of existing production facilities
– Reliability
– Simple installation
– Cost-efficient