

IoT-Bus FOR AUTOMATION

A SMART AND ROBUST RANGE EXTENSION FOR CAN

Range Extender for CAN Communication

Fraunhofer IIS develops the IoT-Bus for a secure, wired and bus-capable communication. On the one hand it is designed for the communication within the Internet of Things and on the other hand for the range extension of existing networks (e.g. CAN). With its data container concept one has the possibility of a so-called tunneling of CAN messages and protocols. This functionality can be used for an increased range of coverage-limited fieldbuses.

Background

Due to distributed manufacturing plants in the digitized production, a communication technology is needed, that combines range of various hundreds of meters and high data rates with latencies of only a few milliseconds. Conventional fieldbuses have a gap to fulfill this combination of requirements.

The Controller Area Network (CAN) protocol for example only provides a data rate of 125 kbps at a distance of 500 meters, which is insufficient for many industrial applications. Ethernet-based solutions require additional repeaters. Furthermore, wireless solutions tend to suffer from a lack of reliability as well as insufficient coverage and high response times. These are the reasons why we thought it is time for a new communication bus.

Our goal is to establish a new communication solution that offers sufficient data rate and coverage and is energy efficient, cost effective, reliable and easy to install. A comprehensive technology research proved that there is no technology available that is able to fulfill the combination of these stringent requirements. Conventional building buses like KNX or LonWorks are technically out-of-date and inflexible. Moreover, bus systems in the industrial sector like Profibus or HART are too expensive. Most of the wireless solutions, like ZigBee, KNX-RF or Z-Wave, do not provide the required reliability.

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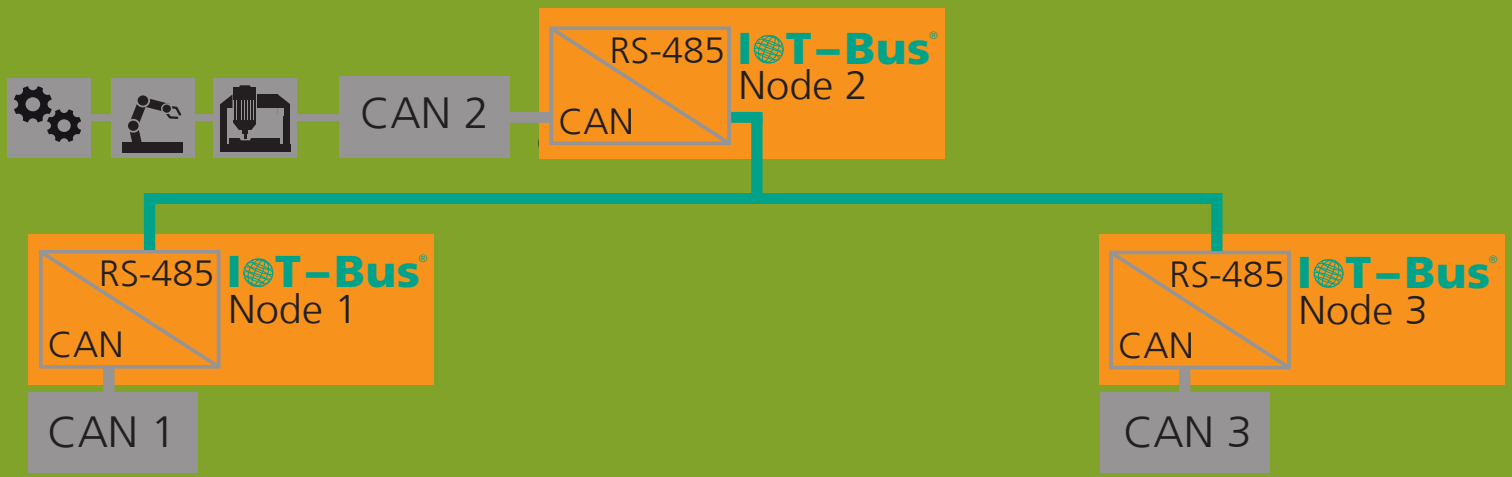
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Functionality of the IoT-Bus

The IoT-Bus is based on a wired adaption of the communication standard IEEE 802.15.4 for Wireless Personal Area Networks (WPAN) and sensor networks. In our concept, the communication over two- and four-wired lines is contemplated. In addition to the data communication, the four-wired solution also offers power supply of the communication nodes.

Due to the use and adaption of the IEEE Std. 802.15.4, the IoT-Bus forms a cross-media communication protocol. Thus, a continuous communication network can be realized that incorporates the wired IoT-Bus as well as wireless IEEE Std. 802.15.4 nodes. Using a special media access method, the IoT-Bus facilitates real-time communication. The serial interface is currently based on the standard EIA-485 (RS-485), but further interfaces can be integrated.

One of the main features of the IoT-Bus is the optimized deterministic bus access process that enables the required real-time capability for the communication of distributed control systems. This access method is based on the token bus method according to IEEE 802.15.4. With this optimization of the token passing and holding process, the IoT-Bus is perfectly equipped for industrial and IoT-based applications.

IoT-Bus as CAN-Range Expander

The communication within the area of automation and control applications often relies on the CAN protocol. However, it is well known that CAN suffers from limited coverage of approximately 40 meters at 1 Mbps. With the data container concept of the IoT-Bus, one has the possibility of tunneling CAN messages.

For that purpose, a data model for so-called data containers was developed. With the help of these data containers, the corresponding CAN messages are encapsulated. The data is then transported over the IoT-Bus and unpacked at the destination. By this solution it is now possible to asynchronously connect individual CAN subnetworks over a distance of several hundred meters.

Unique Selling Propositions

- Real-time capability with a self-developed optimized deterministic media access method
- Range extension of up to 500 meters
- 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
- Sustainability through IPv6 support

Possible Fields of Application

- Industrial operations
- Industrial machinery
- Automation engineering
- Automobile industry
- Building automation
- Energy management
- IoT-applications

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.

Your Benefits

- Higher range than competing technologies
- Moderate data rate
- Reliability
- Simple installation
- Cost-efficient
- Competitive through process optimization
- Adaption to your needs
- Well equipped for the future