Data on wheels and in the cloud

If the focus is increasingly on digitalization in road logistics, the hardware bundling, sorting, and transmitting information bears an important responsibility. It is necessary to bring fleet management to the driver cabin and the data regarding the vehicle configuration to the head office.

The freight traffic industry has linked itself to the data traffic: time pressure and intense traffic have digitalized logistics in the age of the Internet of Things (IoT). And that’s just the start as the future of mobility offers further data-based visions whose possibilities are nowhere near exhausted. In the future, the completely networked truck shall represent a redefinition of transport making road transport more efficient for drivers, freight forwarders, vehicle manufacturers, and the whole of society.

According to Daimler, around half a billion euros shall be invested in online technology until 2020 in order to link trucks among each other or with the infrastructure. This is to reduce incorrect deliveries, empty trips, and planning difficulties. In the course of increasing density of the road freight transport, an optimal use of a truck can only be achieved by a highly effective connectivity as well as transparent and up-to-date data.

For data management, telematic systems, and networked trucks need platforms and devices supporting this communication and taking responsibility for it. The example of temperature-controlled transportation vehicles illustrates the scenario: as for quality control, the cooling chain of the cargo must not be interrupted and shall be documented. Fleet and order administration can be optimized by a fusion of logistics and digitalization. Connection with the ERP system provides information about the order situation and route. For security reasons, in transportation, a theft prevention system as well as GPS monitoring and a door safety mechanism have to be provided.
Robust controllers for body builders

B-Plus offers suitable devices and system solutions meeting the more and more complex requirements of specialized equipment control in utility vehicles. The b-CANCubeMini robust compact controller allows onboard control of e.g. the data on a monitoring function. Bus interfaces to the truck and I/Os for sensors and actuators as well as communication with the IoT Gateway via CAN are the responsibility of this flexibly adaptable controller.

Utility vehicles are subject to unfavorable factors such as temperature changes, dust, and vibrations. This requires extremely robust mobile controllers that detect various parameters of the device, take over control functions and simplify many processes in the utility vehicle.

The b-CANCubeMini multi-functional compact controller has been tested in practice, e.g. for the reading-out of door sensors, monitoring of temperature sensors, and control of the cargo hold lighting. This device acts as a gateway to the vehicle via the CAN-based J1939 interface of the bodybuilder control device. Thus, warnings indicating an open door or a too low temperature can be displayed in the original instrument cluster of the truck and lighting can be controlled e.g. from the cockpit. The high-current carrying capacity of the outputs allows a direct control of the cargo hold lighting. The outputs can be charged with up to 4 A. The individual outputs can be individually parameterized.

The two CAN interfaces provided on the b-CANCubeMini can be used for connection to the IoT gateway as well as for communication with further CAN-connectable devices on the vehicle body network or for communication with the truck or industrial engines. The control device based on a 32-bit micro-controller comes with C-libraries for various trucks and industrial engines.

Smart gateways for IoT applications

Gateways provide connectivity. Such devices link the commercial vehicle to the infrastructure and ensures the data flow between the device and the cloud. As a flexible platform for IoT applications, the Gatebox 100 performs the Fog Computing. Furthermore, it locally stores operational data, thus, not requiring a permanent access to the Internet. In addition to this “operational data logger” function, the gateway takes on Edge Analytics features allowing an analysis directly on the vehicle, wherein errors are pre-analyzed and reported to the head office. This function is implemented in an industrial computer, in order to defy all challenges of outdoor use maintenance-free. The temperature tolerance up to -40°C ensures reliable operation even at extreme operating temperatures as e.g. required by an overnight outside vehicle fleet. In order to meet the special requirements of industrial outdoor use,
a 24-hours, 7-days running device has been provided. Therefore, the industrial computer does not have a cooling fan nor a battery and no moving parts. Instead, the use of passive cooling, Supercaps and SSDs ensure reliable operation, thus reducing operating and service costs of the gateway.

In order to interconnect the data with the cloud, the gateway offers WWAN, WLAN, or LTE as well as CAN interfaces or digital I/Os for interconnection with sensors and mobile controllers. The modularly configured industrial computer has a size of 15 cm in width, 5,8 cm in height, and 9,5 cm in depth. The standard version offers two Gigabit-Ethernet interfaces, so that two physically separated networks for firewall applications can be implemented. Furthermore, the standard version includes two USB 2.0 ports, one HDMI connector as well as four 9-pin D-sub connectors, which can be used for CAN, EIA 232, or EIA 485 interfaces.

For customer-specific adaptations, the gateway has a specifically flexible Smart I/O Driver Interface (SIODI) shield. This concept allows integration of further interfaces. No matter if analog or digital I/O ports, serial bus systems such as CAN, audio or customized I/O cards are concerned, customers will find pre-defined options scalable as to their variety of interfaces and CPU performance.

By means of this gateway, also the status of other devices in addition to a connection to the cloud can be monitored. It is for example able to initiate a restart or an update without being on location. For collecting data, a customized complete solution is required including an IoT framework, which can, subsequently, also take on analysis and long-term documentation. This framework also allows a direct transmission of orders to the vehicle by using CAN or general purpose I/O ports. It supports administration,
Autonomous mobile work machines need the capability of sensing and mapping the surrounding area. Finnish researchers developed 3D Lidar, based on a 2D laser scanner and electric motor drive that rotates the scanner.