Machine-to-Machine communication knows no limits

By Alexander Bufalino, Telit **and Rainer Rothmund,** CEP

Ten years ago, Machine-to-Machine (M2M) communication was still a niche topic. Today, it is regarded as the key technology of a networked, mobile future. Typical applications include real-time monitoring and control that takes into account a raft of different requirements.

Figure 1. The HT-910 terminal features a particularly fast upload speed and is suited for areas of application that require the sending of large volumes of data, such as video surveillance. (Source: CEP AG)

■ M2M technology allows wireless, automatic communication between devices, between vehicles or systems and service centers, but also between individuals or vehicles and devices. When implementing an M2M solution, a wide variety of modules and services need to be taken into account, including hardware components and mobile radio networks, as well as system integration and consultancy services.

Essentially, M2M solutions build on three central components: at the heart of every M2M application is a communications module, and with it an embedded system which, as the central communications interface, also contains the sensors for recording measurement values. Added to this is a component that allows sensor values to be transmitted, via radio signal for example, to a central point. This evaluation system completes an M2M solution. It receives and checks the values for range violations, for instance in the context of an application logic, alerting any downstream systems and managing the terminal devices. These modules allow applications to be created for real-time monitoring and control that enable companies to increase their efficiency, reduce costs and offer better service. For the transfer of data via mobile radio, the communications modules are equipped with a SIM card. This card is used to identify the device on the network, in a similar way to the SIM cards familiar from cell phones and smart phones and other mobile devices. The SIM chip used in M2M applications is specifically designed to deliver a long service life and be capable of operation even in harsh conditions and during extreme fluctuations in temperature. An important feature for companies that want to implement an M2M application: communications modules should support the entire bandwidth of mobile radio technologies, starting with GSM/GPRS via EDGE and UMTS/WEDGE/HSDPA/HSPA all the way through to CDMA and LTE. This gives users access to global and demand-specific deployment.

The demands on M2M solutions can be explained using specific products by way of example, such as those offered by CEP AG in Oberhaching, near Munich, a company that acts as a center of expertise for implementing M2M applications. One of these products is the HT910 UMTS terminal from CEP. In view of its technical design and interface options, it offers a highly flexible range of possible uses, can be used globally in the penta-band version (HT910 G), and is specifically targeted at systems integrators connecting the terminal to their system environment. During the upload, it supports HSPA+ upload data rates of up to 5.76 Mbps and a HSPA+ download data rate of up to 21 Mbps. The fast uplink speed is ideal for areas of application that require large volumes of data to be sent, such as with digital signage applications. The terminal supports a voltage range from 5 to 32 volts DC and can be supplied with power in a USB host-powered version directly via the USB interface. This means that no separate power pack is needed, offering truly flexible possibilities for use. The HT910 supports also an ultra-low power mode, drawing ~11mA when no active data transmission is required. Applications for this feature include solar energy or battery-powered equipment with online payment transactions or road traffic panels.

The data terminal features both a USB 2.0 and a RS232 interface. Systems integrators are able to use USB drivers for popular operating systems such as Win CE, Linux and Windows (2000, XP, Vista, 7) so that the terminal can be integrated quickly and easily into existing application landscapes. It is also possible to custom-program the terminal using Python scripts. At the heart of the terminal is the small (28.2x28.2x2.2mm) and compact HT910 M2M module from Telit, one of the leading suppliers of M2M modules, in the land grid array (LGA) form factor. Compared to the previous ball grid array (BGA) form factor, the modules can now be integrated even more easily into an extensive range of solutions. As

Figure 2. Telic Picotrack is currently the smallest GSM/GPS location device for telematics projects. (Source: Telit)

with all Telit modules, the firmware of the HE910 can also be updated (FOTA, firmware over the air management). This is a particular advantage in the case of applications that are used globally. Neither an on-site update is required nor does the equipment have to be collected to update the firmware. The HE910 module is part of the Telit xE910 family, which supports the GSM/GPRS, UMTS/HSPA and CDMA/EV-DO technologies. All models are based on the same LGA form factor. Solutions providers can therefore use the most suitable module for their requirements with just one hardware design.

M2M modules have been in use for many years, in ticket machines, vehicles or electricity meters for example. A new application is their use to control truck parking management systems at freeway service stations. Traffic experts all agree that freeways in Germany lack many truck parking spaces. One of the reasons for this is that the transportation of goods on the freeway has again increased considerably in recent years, and not enough new truck parking facilities have been created to cope with the demand for them. At the same time, drivers are required by law to take a break after driving non-stop for 4.5 hours.

In a pilot project in the German-speaking region, one of the CEP partners is developing a solution to inform the truck driver in good time ahead of his departure how many free parking spaces are currently available. The communication in this solution is based on the HT910 terminal from CEP. In this project, the drive-in and drive-out area of the parking space is scanned by special sensors, which are connected to industrial PCs. The industry PC then transfers the data via the HT910 terminal to a central server.

The video cameras set up also transmit their images of the current parking lot situation via a HT910 terminal to the server. The determined number of free parking spaces is displayed on notice boards set up especially for truck drivers several kilometers before the rest area. The system is therefore able to guide the parking space search completely automatically, without any manual intervention. Another possible application for HT910 terminals is in parking ticket machines, which are used to monitor parked traffic in city centers or on unrestricted parking lots. Numerous established suppliers of such machines are already testing and using the HT910 in their equipment. The terminal transfers information about faults and early warnings such as if there is no paper or the money hopper is full. Card payment transactions are also authorized online via the terminal.

In the latest generation of parking ticket machines, up-to-date information and advertising are also displayed in graphic displays. The content for this can be downloaded quickly from the Internet via the broadband connection using the HT910 terminal. Crucial for the use of the HT910 in parking ticket machines is the ultra-low current consumption, since the parking ticket machines are normally powered by solar energy or battery. As a result, the option of displaying advertising also provides an additional source of revenue for operators alongside boosting the machine efficiency through remote data transfer.

To finish, a short example from the world of telematics that is also suitable for small solutions from the domains of fleet management and vehicle location. At the heart of this application is Picotrack, a fully-functioning GSM/GPS location device weighing just 35 grams and measuring 57x38x15mm produced by Telic in Oberhaching, near Munich. The settings for event signals (depending on time, distance, change of direction) in Picotrack can be configured at will. The integrated accelerometer, which is used as motion sensor, can also be configured as an anti-theft device. The device also contains an integrated geo-fencing function. It generates a warning message as soon as the device enters or exist a pre-defined area.

In view of the low current consumption, Picotrack has a very long battery life. If data is retrieved every 15 seconds, for example, it can remain operational for around seven hours. At five-minute intervals, this operating time increases to around 12 hours, and at five-hour intervals it is around a month. In sleep mode with the wake-up option, it can operate for around six months. At the core of the Telic Picotrack is the Telit GE865 quad band GSM/GPRS module. Thanks to its compact size (22x22x3mm) and extended temperature range, it represents an excellent solution for M2M applications and mobile data devices. With BGA technology, product costs are reduced considerably, since no additional system connectors are needed. ■