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# Cable-free Kanban

**In conjunction with flexible product manufacturing, processing, storage and consignment, information flow needs to be equally flexible. This in turn has an impact on the sensors and switches used at shop floor level. Wireless networks have become increasingly popular here, for example for eKanban systems, due to their many advantages. steute has developed its very own wireless network precisely for such applications, and it managed to include pre-designed modules in time for the LogiMAT 2019.**

*01 In industrial production, and especially intralogistics, eKanban systems are becoming increasingly popular*

The Kanban principle has helped many manufacturing companies to reduce their stock, replenish supplies smoothly and switch over their material flow from the push principle to the pull principle. In the past, cardboard cards were used to convey the information. Today, communication is electronic and the signal to re-fill a Kanban rack is given by an electromechanical switch, a sensor or a manual remote control (Fig. 1).

## Wireless signal transmission is becoming increasingly popular

One current trend is the use of mobile eKanban racks. They create additional flexibility for internal materials replenishment, as well as facilitating new



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*02 Access Points receive wireless signals from individual switching devices and pass them on to the customer IT infrastructure via e.g. WiFi or Ethernet*

production concepts. Several automotive manufacturers are currently testing "smart factories": vehicles are produced on top of automated guided vehicles (AGV) which drive from one assembly point to another, depending on the vehicle model and extras. The materials required at the assembly points are also brought by (smaller) AGV.

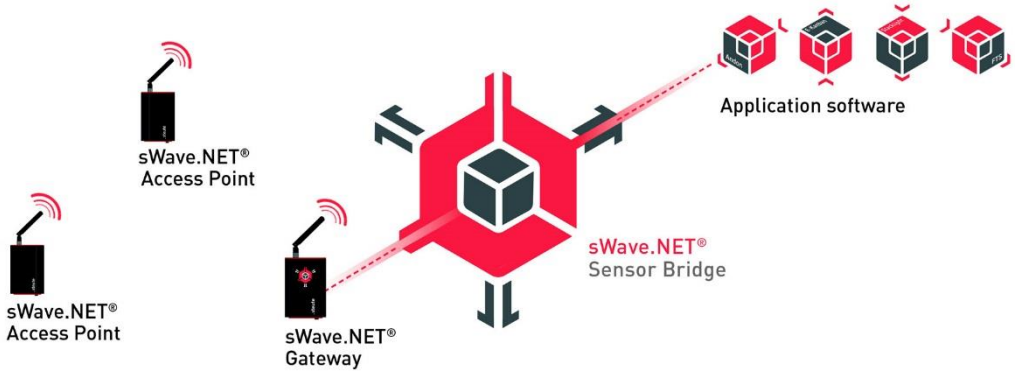
The information flow between mobile eKanban systems relies on wireless communication. But even in non-mobile eKanban systems, eliminating cables can be advantageous because the system is then more adaptable to changing circumstances in the future. In addition, there are no cable installation costs and no cable wear and tear.

Initially, such solutions were realised using conventional wireless switches and sensors. They communicated via point-to-point connections with a signal receiver unit. Then steute developed its own wireless network "sWave.NET" for such tasks, facilitating device interoperability and the rapid implementation of IoT applications, regardless of location.

The nodes or intersection points within this network are called Access Points (Fig. 2), and each one can connect up to around one hundred network-compatible terminal devices, such as position switches, foot switches or magnetic sensors. The signal range is up to 700 m outdoors and approx. 60 m indoors, and numerous Access Points can be integrated within one network. Configuration is web-based and performed via a central dashboard.

## Stable and low-energy wireless technology

The "sWave.NET" wireless technology belongs to the class of Low Power Wide Area Networks (LPWAN) and permits battery lifetimes for wireless switching devices and sensors of between several months and several years. The wireless protocol achieves high stability even in adverse conditions (proximity of other wireless networks, reflections, etc.). Data transmission frequencies are used which




*03 The infrastructure of the latest "sWave.NET" generation*



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are globally available and free of charge.

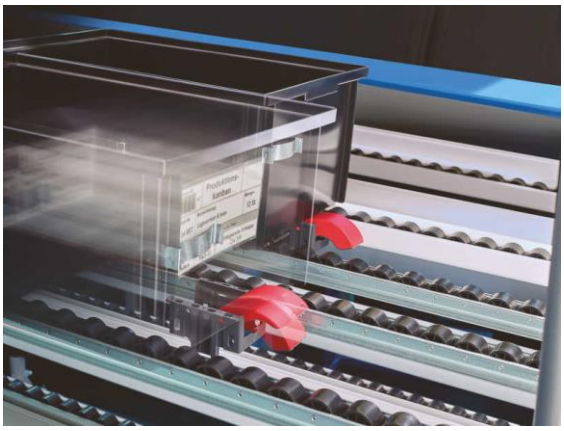
The low power functionality guarantees battery lifetimes of up to ten years. At the same time, transmission reliability is high. This is guaranteed, for example, by multiple transmission. If the first attempt at transmission to an Access Point should fail, the second Access Point is addressed, and so on.

## Service manager for wireless system

In the latest wireless network generation, a middleware named "Sensor Bridge" acts as an interface between the customer application and the "sWave.NET" hardware (Fig. 3). It manages the entire wireless system and comes installed in its standard version with an "sWave.NET" gateway. It can, however, also operate within the IT infrastructure on a different Linux system. This guarantees communication of data generated at the shop floor level to the customer IT infrastructure, for example PDA, ERP, WMS or MES, and if required also via web services to data services in other locations.

The middleware processes all messages which are received from the sensors via the Access Points and passes them on to pre-registered applications. A gateway with the pre-installed "sWave.NET Sensor Bridge" can be integrated in any shop floor environment. It is a service manager which can be flexibly configured and administered.

At the user interface (Web-UI) of the driver software, users can manage, configure and remove wireless sensors and Access Points from the system. If the sensors are to be used in a mobile application, the wireless system also assumes a roaming function and reassigns wireless sensors to their next Access Points during ongoing operations.



*04 Wireless sensors developed especially for eKanban systems manage materials replenishment in state-of-the-art factories*

## Pre-configured modules

For this wireless system, steute has developed an eKanban module which is easy to retrofit and which automates requests for materials. This simplifies the installation and initial operation of the wireless network for users, as well as any later changes such as the integration of additional sensors. In addition, precisely those functions which are relevant to eKanban systems are adaptable to the individual application.

Users can then, amongst other things, configure whether one sensor is installed per rack shelf, or whether the Kanban system should be a multiple one for fast-moving items. Manually (remote-)controlled eKanban systems are also easy to configure.

Users thus have at their disposal a complete solution for the management of eKanban systems which can be configured easily and without programming, and which requires just a short initialisation phase. Afterwards, users profit long-term from



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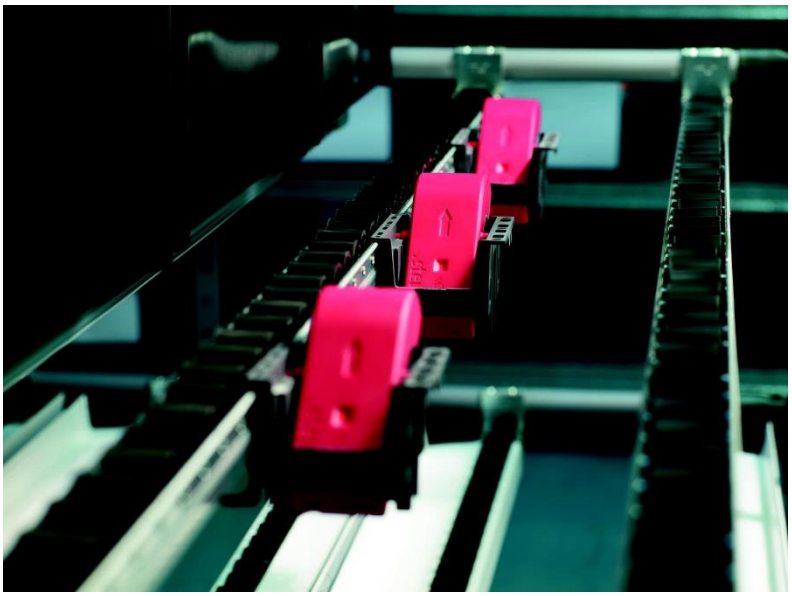

*05 Several wireless sensors in a row enable replenishment of fast-moving items to be managed in line with requirements, for example at assembly work stations. A plug-and-play solution is also available for this application*

the advantages of the wireless system: no signal cables, uninterrupted communication, robust data transmission, and simple adaptation to changing conditions, such as the integration of additional Kanban racks or sensors.

Configuration of wireless networks in eKanban systems is further simplified by a wireless sensor which steute developed especially for this application (Fig. 4). It detects via a rocker when a container or box is removed from a shelf and sends a corresponding (wireless) message to the next Access Point. These wireless sensors can be mounted in the rack systems of leading manufacturers without any need for tools and have been cost-optimised due to the fact that the intralogistics branch is price-sensitive and frequently requires them in large quantities (Fig. 5).

## Outlook

In a next step, steute is now planning further pre-defined software modules, for example for AGV applications. For potential users it is important to know that several different modules can be controlled via one wireless network. This is interesting for the realisation of eKanban systems, for example, because these systems will increasingly be combined with AGV fleets in the future. Here "sWave.NET" offers advantages like short wake-up times, immediately reactivating AGV from their low-energy sleep mode. Via a pre-configured communication interface to fleet managers of diverse AGV manufacturers, this wireless network solution can be easily installed and optimally adjusted to the application in question.

At the LogiMAT 2019, steute demonstrated various "sWave.NET" applications in material flow using a 3D model which includes mobile AGV. In addition, the new software functions were shown in a demonstration environment.



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