

## Taking sensor network technology to a smarter level

Barrels of chemicals that 'talk' to each other to improve safety and smart shelves that automatically log inventory changes are just some of the ways businesses stand to benefit from new sensor network technology currently being developed in Europe.



The IST-funded [CoBIs](#) project is going a step beyond existing Radio Frequency Identification (RFID) systems – the generally passive smart tags used to identify goods, pets and even people – to create Collaborative Business Items (CoBIs) that can shift a substantial part of business processes from resource-intensive back-end systems to systems embedded in the products themselves. With sensors, wireless communication and computing components attached, the goods or equipment become smart – chemical drums will warn operators when the storage limit in a warehouse is reached, if a leak occurs or if one is placed in the wrong location.

“What we are doing is making sensor network technology useful to businesses by creating a system that responds to the need for real-time information. It allows goods to act and react automatically to changes at the local level, and warn operators of the change,” CoBIs coordinator Stephan Haller at SAP Research in Germany explains.

### Targeting the petrochemical industry as likely early adopters

Though CoBIs has a potentially limitless number of usage scenarios, the project is concentrating on employing them in the petrochemical industry, which is likely to be an early adopter of the technology.

The system will be tested at a BP plant in Hull in the United Kingdom later this year where the sensor nodes will be attached to barrels of chemicals and used to monitor compliance with safety regulations on the storage of hazardous materials. If all goes well, Haller estimates that the full system – including middleware components and an application development environment – could be adopted commercially in the industry within three to five years.

In the chemical sector, where even the slightest mistake in managing an inventory of volatile materials could mean disaster, that will undoubtedly lead to increased safety. But CoBIs is also likely to increase the efficiency of business processes in many sectors, preventing, on the one hand, mistakes that cost time and money, while on the other adding a new level of automation that will alleviate the need for manual data collection and accelerate decision making.

Unlike most RFID systems – an emerging technology in its own right – that mainly work passively to distinguish between tagged objects with their own unique identifier, CoBIs-enabled objects work actively by incorporating embedded sensing, computing and wireless short-range communication. They can monitor the state and environmental conditions of the goods they are attached to, communicate peer-to-peer and collaborate to observe conditions that no single sensor would be able to detect, and they can feed the information into back-end systems automatically within the project’s service-oriented architecture.

In the usage scenario for BP, this will not only provide automatic inventory tracking of chemical drums but will set off visual and audio alarms embedded in the sensors and in the storage facility if too many drums are stored together or incorrectly. The sensors could also be used to monitor the environmental conditions chemicals are subjected to during transportation or storage, allowing companies to detect a shipment that may have lost its properties and discard it rather than inadvertently – and potentially dangerously – using it in a later production process.

### With potential for many other sectors

The same sensor network technology could be applied in other sectors, such as food, pharmaceuticals and healthcare, where monitoring the condition of a product is crucial.



In retail, where RFID is already being used to track inventory and prevent theft, CoBIs could help solve the RFID reader collision problem. RFID readers equipped with CoBIs nodes coordinate duty cycles and power levels autonomously with each other. This allows for a physical reorganisation of the shelves without the need for reconfiguring the RF parameters manually. The 'adaptive smart shelves' concept is due to be tested by the project partner Infineon in Austria later this year.

There is also the possibility to use CoBIs to create smart clothing that could be used to protect workers in hazardous environments.

"One idea is that sensors embedded in a suit could be used to check whether a person meets certain conditions to access an area of a factory where a gas leak has occurred, for example. The sensors nodes would communicate with other nodes in the building and in other people's clothing and equipment to determine access rights to ensure safety regulations are complied with. Only if all required workers with the correct training certificates, and all necessary safety and maintenance equipment are present, would the door open for them," Haller explains.



Perhaps most importantly for businesses, the CoBIs sensor network is designed to be easy to deploy, highly scalable to meet the needs of different companies and industries, and cost effective.

A spin-off company set up by the University of Karlsruhe and SAP to commercialise the project's results, Particle Computer GmbH, is currently selling the sensor nodes at prices between 20 and 200 euros each depending on the capabilities. The battery life of the reusable device is estimated at several months if employed to carry out communications every few seconds, although the project partners are studying ways to provide alternative power sources.

In recognition of its innovation, Particle Computer was awarded the CyberChampion Prize by the Research Center for Information Technologies (FZI) in Karlsruhe which was handed out by Minister Pfister of the German State of Baden-Württemberg. Additionally the High-Tech Gründerfonds, a German government-backed venture capital fund for young, high-opportunity technological companies implementing promising research results in an entrepreneurial manner, selected it as a flagship project. So far it has gained around 25 clients for its technology.

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