SAP INFO

THE SAP MAGAZINE

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Sincerely,

Your SAP INFO Team

The latest developments at SAP Research

Get Smart

Real-world objects equipped with RFID technology – known as "smart items" – will soon deliver the intelligence businesses need to know which products and goods they have on hand, their condition, and location – all in real time. SAP Research is influencing sensor technology and smart embedded systems in ways that will provide new and improved, integrated business solutions for SAP customers.

German Chancellor Gerhard Schröder was genuinely intrigued by this latest innovation for the office: a digital paperclip – the "DigiClip" – to make handling paper files more efficient? Henning Kagermann, CEO of SAP, knew how to get the chancellor, a qualified lawyer, interested in this technology at the CeBIT computer fair in Hanover, Germany this spring. The credit-card size "intelligent paperclip," equipped with a sensor tag, can be attached to documents that are to be distributed throughout several departments – for example, in a public administration office. If you want to know where the document is at any point in time – in whose in- or outbox the document is pending – you can trace it with the DigiClip. If the person authorized to sign the document also uses a second DigiClip for identification, the document can even be signed digitally, at the push of a button.

At SAP Research, the DigiClips, with their tiny memories and limited computing power, are designed with only one purpose in mind – as stepping stones toward more complex systems, such as sensor networks or collaborative business items that can acquire environmental data from their surroundings and apply business logic on the spot. This next generation of RFID technology, limitless in its business potential, is expected to surge onto the market in the next five years, as more and more intelligent capabilities are put into smart items and the costs of RFID manufacturing decrease to the point that an individual sensory tag will be only a few cents. SAP Research, partnered with key businesses through its Smart Items Research Program, is taking a leading role in exploring creative industrial applications that make this technology meaningful for businesses that need a real-time method for monitoring goods and products in the physical world.

Transferring knowledge into products

While SAP product teams are in the process of delivering to the market the ramp-up release version of SAP Auto-ID Infrastructure (AII), the new SAP NetWeaver component that integrates RFID technology with supply chain processes, researchers at SAP Research are already working on driving this technology further. Whereas in RFID, the tag – an antenna fitted with a microchip – communicates with the central server via a reader, the next generation of smart items will be enhanced with more storage, microprocessor capacity, or sensors, thus having much higher communications, sensing, and calculation abilities. These new devices will "talk" to each other directly via radio waves from their own network and can be dynamically reprogrammed. For example, in tracking a pallet of soda crates, the server load would be too high if each bottle of a pallet contacted the server individually. Instead, these next-generation smart items collaborate by first collating and processing their data locally. Data is transferred to the central server only when further processing is needed – if a pallet is delivered incomplete or is damaged, for example. This represents a paradigm shift in software technology from client/server structures to peer-to-peer (P2P) computing – a scalable solution that avoids data overload by performing as much processing as possible at local level and that also makes it possible to push business logic to the periphery of the information system, business logic that is generated in SAP's enterprise service architecture and downloaded to the smart items.

SAP researchers see promise in the networking of embedded smart systems, minicomputers capable of taking in sensory data from their environment and reprogramming the sensor devices in the sensor network. These sensor devices can be placed in numerous technology products, such as cars, airplane parts, and manufacturing equipment. While embedded systems are often specialized for one specific application and are at present generally not designed for communication with central systems, the future connectivity of these systems offers a new dimension for efficiency and scalability. For example, expensive industrial machinery can be monitored by continuously taking into consideration environmental data about the equipment's condition and operation. This data can be used to forecast an impending defect (by identifying, for example, an unusual vibration in the machinery), which upon detection can lead to an early warning alert being sent to the company's SAP system. This preemptive alert allows service personnel

Henning Kagermann explains the DigiClip to German Chancellor Gerhard Schröder.

"Today's data in information systems does not reflect the reality; it is only close to reality.... Today's information systems are designed to interact with people. But in the future 'smart,' intelligent chips attached to real-world objects will deliver real, 'real-time' data about the state of any object, as well as the state of its surrounding environment, to the information system. This brings us very close to the concept of the real-time enterprise..."

Henning Kagermann, SAPPHIRE '04 Keynote, New Orleans, United States

to respond immediately, thereby preventing a costly malfunction when it is least convenient.

Partnering for real-world applications

Having recognized the value of RFID technology in industrial scenarios early on, SAP Research has focused intensively on applied research with smart items. The driving goal of this research is to enable the collection of real-time data on goods and products to be ported into SAP software and to generate valuable business knowledge from this data, as well as allow new business logic to be "loaded" onto the device – thereby making the device itself, at the periphery of the network, an "SAP user." To support the investigative work of SAP Research and its partners in academia and industry, the European Union (EU) has recently approved two project proposals that will allow SAP to apply smart items technology and sensor networks to scenarios that may offer immediate business benefits to its customers.

One such project soon to be underway at SAP Research is the Collaborative Business Items (CoBIs) Project. This project will focus on the development and application of CoBIs to collect and respond to environmental data in industrial settings, where safety requirements demand constant monitoring at the local level. For example, CoBIs can monitor for safe storage conditions, such as temperature and capacity. Materials that are tagged with CoBIs can even "recognize" one another – generating an alert when hazardous materials that cannot be stored together come in close contact.

In this project, SAP Research's collaboration partners are BP from the oil and gas industry, Infineon as the technology provider, and the Universities of Karlsruhe (Germany), Twente (Netherlands), and Lancaster (Great Britain), as well as the Dutch-based company Ambient Systems.

Product Lifecycle Management and Information Tracking Using Smart Embedded Systems (PROMISE) is the second EU-funded project. With more than twenty partners participating, this project focuses its research efforts on applying RFID technology and embedded smart items to the product's entire life cycle – from the product's design to its use and recycling. The goal of PROMISE is not only the successful implementation of maintenance and diagnosis scenarios, but also resource optimization during production and efficient recycling. An example is in the case of monitoring replacement parts for heavy-load vehicles: Smart items will capture usage data of individual parts, data that can later facilitate the recycling process and lead to the adaptive production of new parts.

Both EU projects are being conducted at SAP Research in Karlsruhe and Dresden with the support of university researchers in both locations. In these collaborative research efforts, SAP provides sophisticated software research, while project partners contribute the hardware components to meet project requirements. An intensive exchange with SAP Research colleagues at SAP Labs North America in Palo Alto, California, assures the global approach of the Smart Items Research Program and lays the best foundation for the technology transfer into the SAP product suite.

Countless applications

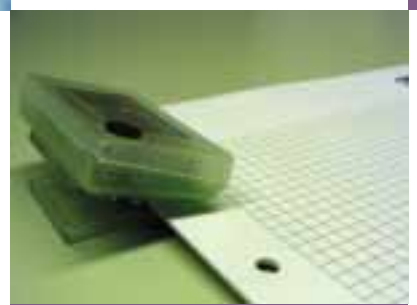
And who will benefit from smart items and sensor networks in the future? Indeed, the technology has a very wide range of applications that extends beyond monitoring goods along the traditional supply chain.

In the area of safety and security, for instance, sensor networks will also mean a huge step forward. With data acquisition capabilities, enhanced smart items can be used for monitoring environmental conditions and hazardous materials. The SAP Research team in Palo Alto recently submitted project proposals to U.S. government programs to further explore the use of sensor technology to secure and track shipping containers. Seamless observation will allow port authorities to put such "smart" containers on a "fast track," thus achieving a 100-percent inspection rate and allowing other involved parties, such as cargo owners, border control agents, and retailers, to benefit from this technology.

However, other uses, like enabling heating units to "communicate" with the ventilation system or high-performance sportspeople to make sure their bodies are running in top condition, are of secondary importance to the researchers at SAP. Such uses of smart items in the private sphere are out of scope for their projects. With concerns about the protection of personal data and the cost of RFID technology still too high to be fitted to daily consumer products, many applications in the private sphere are still a long way off.

Envisioning the "real-time enterprise" through seamless integration of real-world data, SAP Research continues its research of applied industrial applications that enable businesses to further close the gap between the real-world condition and its reflection in the digital world, as shown in information systems. By developing ways to aggregate, interpret, and apply this real-time data to useful business applications, SAP Research extends its leading role beyond RFID technology toward sensor technology research and helps SAP customers gain competitive advantages.

Henning Belle, journalist, Heidelberg, Germany ■



The DigiClip: on the paper trail

The DigiClip attaches neatly to documents and binders to eliminate the guesswork from document tracking. Rather than imagining what may have happened to a contract that is pending signature, an administrator can check on the document's physical location and status to see that t has made it to the right person and is not lost or delayed. When that person signs the document, the DigiClip confirms the action at the push of a button. A second DigiClip can be used to verify authorization. Through the employee portal, administrators can track their documents' progress, so that they know at any given moment where the document is in the workflow.