Sensor Telemetry

accenture

High performance. Delivered.

Tapping into the enormous potential of sensor technologies and two-way wireless communications
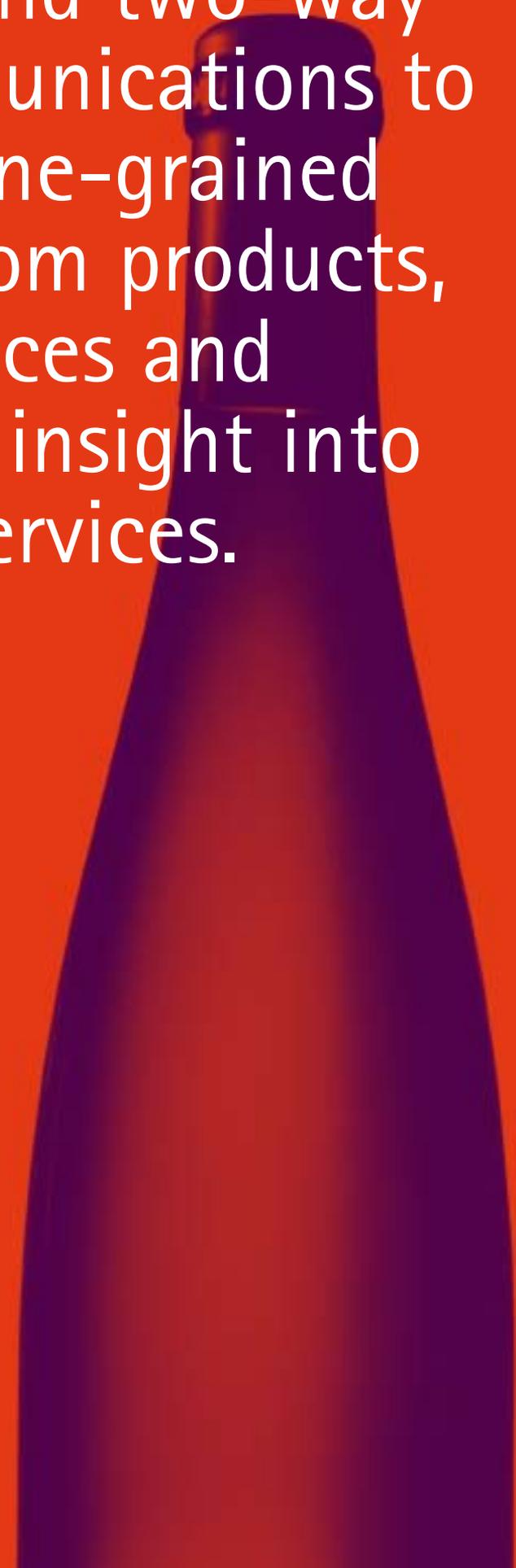
• Consulting • Technology • Outsourcing

Sensor Telemetry uses sensor technologies and two-way wireless communications to gather more fine-grained information from products, people and places and transform this insight into value-added services.

"The wine making process has always been very much an art form, but even there, technology has made quality dramatically better."

Cris Strotz, owner of the Pickberry vineyard, California.

"Sensor Telemetry offers organizations a means to increase focus on service and quality, to turn products into services and to respond immediately to market demand."

Joel Osman, Accenture Technology Labs

The emerging trend of Sensor Telemetry combines data—historical and current—with two-way wireless communications to offer unprecedented visibility into and management of equipment, products and interactions. It promises organizations more detailed, real-time views, not just of individual business transactions, but of physical state and operations, and human conditions. Sensor Telemetry will also enable organizations to respond faster and even predict incidents before they occur.

Accenture Technology Labs, the technology research and development organization within Accenture, believes that Sensor Telemetry will offer organizations the potential to improve performance by generating new revenue streams and improving their operational effectiveness. How? Imagine, for example, the goods in the back of the delivery truck being able to tell the truck driver that they have fallen over and are broken.[1] Or imagine if utility poles could alert city officials if harmful insects enter the city limits. Sensor Telemetry can help organizations across many industries develop new revenue-generating services.

Extrasensory perception

Today, sensors and wireless communications along with the business insight they generate are delivering measurable business benefit. But few organizations have tapped fully into the enormous potential they can offer. For example, automobiles have sensors but typically no communications. Wireless telecommunications networks provide communication but cannot sense, and manufacturing environments have sensors and basic control room communications, but no real insight.

In the future, it is likely that more and more automobiles will have wireless communications; newer telecommunications networks are adding location-sensing capabilities, while new generations of manufacturing equipment will be more tightly coupled into Enterprise Resource Planning (ERP) and business systems.

Why now?

A number of factors are now converging to make Sensor Telemetry ready for widespread adoption:

- **Cost**—sensor, tag and computing costs continue to drop. Data transmission through channels including satellite, cellular and wireless LANs is becoming easier and more affordable.

- **Technology advances**—recent advances in new types of sensors, sensor networks and new technologies that support ubiquitous wireless communication, along with software enabling enterprise integration, business intelligence and Web services, are broadening the scope of what can be sensed and monitored cost-effectively.

- **Need**—customers and citizens continue to demand better, cheaper and more personalized products and services, while businesses and governments need greater visibility of their operations and business processes in order to innovate and stay ahead.

1 Source: BusinessWeek, April 26, 2004, "A machine-to-machine 'internet of things.'"

Sensor Telemetry re-evolution

Accenture charted the course of Sensor Telemetry more than seven years ago, predicting the budding importance of Radio Frequency Identification (RFID)—a precursor to the Sensor Telemetry trend taking shape today. RFID is now picking up speed, due in part to standardization efforts by EPCglobal (formerly Auto-ID)[2] and mandates issued by organizations including Wal-Mart and the U.S. Department of Defense to their suppliers.

The evolution of a smarter object

Just as the Internet fundamentally transformed the way that we communicate and access information around the globe, Accenture believes that Sensor Telemetry will extend the Internet's reach to cover nearly every physical object on earth—in real time.

As a result, Sensor Telemetry will offer organizations the opportunity to improve performance and further differentiate themselves by driving operational effectiveness, improving customer relationships, creating new services and generating business insights.

To visualize the range of insight that can be attained by combining RFID and sensors, imagine an information pyramid with "Identity" as the starting point:

4. Context:
Making objects aware of their environment.

3. Status:
Helping objects communicate current state and properties.

2. Location:
Using technologies such as GPS to track where objects are located or have been.

1. Identity:
Enabling objects to uniquely identify themselves (using, for example, RFID tags).
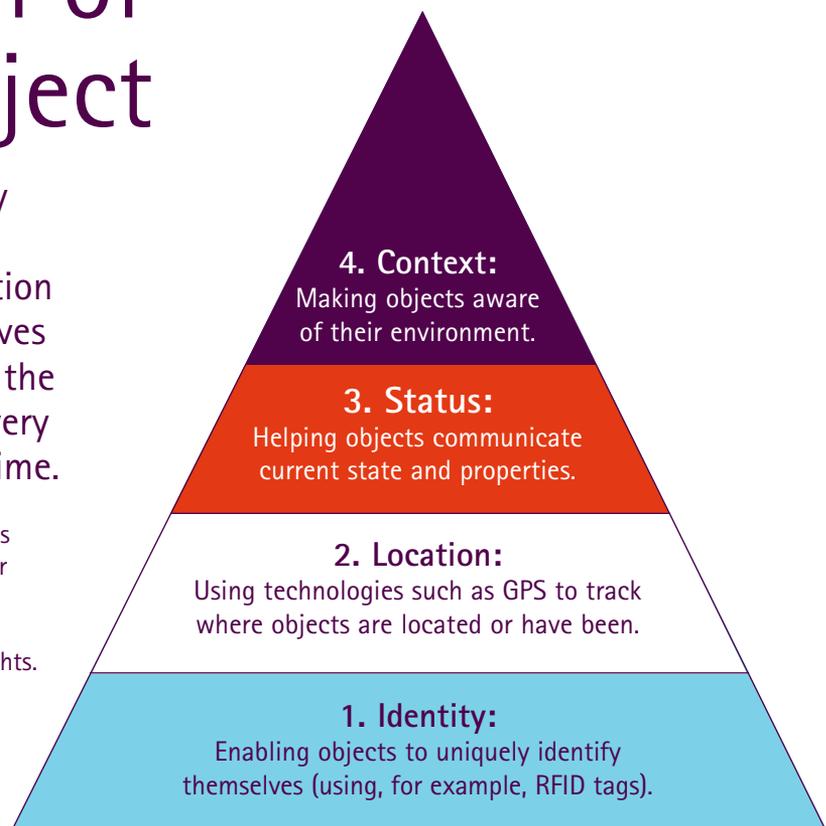
2 Auto-ID, now EPCglobal, is a consortium of academia and enterprise committed to achieving worldwide standards for EPC

Accenture is already helping organizations outperform their competition through the innovative use of Sensor Telemetry in the form of smart objects and sensor networks:

Smart objects

Smart objects are objects that have been embedded with sensors, memory, power supply and wireless networking capability.

- Accenture designed and integrated a Sensor Telemetry field test for a large class 8 truck manu-facturer to enable them to provide more valuable, innovative services to fleet companies, leasers and individual drivers. The solution comprises a Global Positioning System (GPS)-enabled "black box" connected to the engine and linked to satellite transceivers which enable users to monitor the trucks' locations and performance. This tracking helped to reduce costs associated with administration, fleet fuel and fuel tax reporting, while increasing driver performance by providing more accurate driver logs.

- A global resources company turned to Accenture to develop an asset tracking system using specialized sensors, Radio Frequency (RF) communications and satellite terminals. The system gives the client the ability to globally track all of its sensitive equipment and improve the efficiency of equipment utilization.

- A major chemical company called on Accenture to help improve the visibility into its rail car fleet and to monitor the state of chemicals during transport. Accenture built a portal that consolidates and displays rail car data feeds including GPS location, temperature, weight and impacts via satellite communications and data from RFID tags.

- For a medical supply company, the human body is the vessel for the equivalent of a "black box" capable of wireless communications between the patient and healthcare providers. Accenture worked jointly with various client research and development groups to generate designs for a patient data portal. We also designed the business and technical architectures for the new service. The benefits include improved patient care, lower patient support care costs and the creation of a new revenue stream for the supply company.

Sensor networks

Sensor networks enable organizations to sense and interact with environments.

This extraordinary ability can be likened to the human body, where the organs within the body all perform their individual functions but are also integrated with and interdependent on each other.

Accenture Technology Labs is currently using sensor network technology to help Pickberry—a California vineyard—grow better grapes. The Labs have created a sensor network that tracks various environmental factors and activities including soil and air temperature, soil moisture, leaf wetness and rain levels. Data gathered from a wireless mesh of sensor nodes is relayed via peer-to-peer wireless networking to a base station that transmits the data back to the Labs via a cellular uplink. Real-time sensor data is then captured in a Web portal where it can be aggregated and analyzed for decision support and information insight. The application enables Pickberry to access real-time information on specific blocks of the crop that can be applied to support decision-making in the field such as watering and fertilizer needs.

From the minutiae: a myriad of opportunities

Insight from sensor data can improve business performance by helping to predict equipment failures before they happen

While some industries are clearly more advanced than others in reaping the benefits Sensor Telemetry offers, there are potential applications for every industry.

Manufacturing

Manufacturers could use insight gained from sensors to predict mechanical failures and reduce costly downtime. They could even help move towards in-depth usage-based instead of time-based maintenance. Moreover, insight on product usage could be used to improve quality, generate new or additional products, or be sold to interested third parties.

The business benefits of Sensor Telemetry for any manufacturer include the ability to:

- Communicate with products after they have been shipped or used. This can help companies improve products or diversify product assortments and connect better with customers;

- Optimize operations in logistics, supply chain, manufacturing and transportation to turn increasingly commoditized products into services;

- Convert data by-products, such as shelf space, real-world product performance and environmental impact, into new revenue streams by providing insight to a wide range of stakeholders.

Aerospace

NASA plans to use more than 500 sensors on its jet engines to gather information about almost every aspect of flights. Project engineers say that the data will be vastly superior to information from wind tunnels and will show how engines work under real conditions.

Also, data gathered on the real-life operation of each unique engine can be used to create individualized models that can better predict and help avoid failures in the future.

Alert: Maintenance required in 26 hours

Date:	09.01.05
Time:	16.13
Location:	Heathrow London UK
Ambient temperature:	50°F
Exhaust gas temperature:	900°F
Core engine speed:	14,000rpm

Chemicals

The chemicals industry is currently investing in the development of fuel cells, but how can they price a product that might have a working life of, say, ten years? Sensors offer the capability to measure a chemical reaction or the number of energy units consumed, enabling the supplier to charge by consumption, rather than a single initial payment.

Energy and Mining

Sensor Telemetry also offers spectacular improvements in the field of physical safety. For example, oil rigs and mines are dangerous places, with a large number of people working in a physically challenging—and constantly changing—environment. Sensors in clothing can be linked to sensors monitoring environmental conditions and then used to warn workers whether they are properly equipped to work in certain areas and of other potential dangers.

Insurance

Insurance companies could tap into sensor data to provide new services in, for example, potentially dangerous manufacturing and processing environments. The data could be used to increase the accuracy around compliance of insured customers, to help assess and manage risk borne by the insurer and to prevent incidents from occurring in the first place.

Healthcare

Healthcare providers could use sensors to enable remote patient monitoring, especially in the area of telecardiology. Benefits include improved care (patients are monitored continuously and doctors can detect potential incidents before they happen) and long-term cost savings for both the healthcare provider and patient.

Sensors can also be used to help rescue personnel monitor each other during stressful and dangerous missions, improving their safety while they work.

And what next?

Accenture has been at the forefront of the "sensor revolution", developing Telematics and remote monitoring prototypes for over five years. From a Transport Security Services prototype that uses a variety of technologies—including RFID tags, sensors, GPS and biometrics—to ensure that hazardous products know where they are going and who can access them, to a field test that uses equipment sensors to detect potential mechanical failures before they occur, researchers at Accenture Technology Labs are exploring how organizations can use Sensor Telemetry to generate valuable business insights and outperform the competition.

The Labs have also been monitoring the work of researchers at the University of California at Berkeley who are developing Smart Dust—inexpensive, autonomous sensors so small that they will fit on the head of a pin. To showcase how organizations could manage and aggregate data coming from these potentially millions of sensors or Smart Dust, the Labs created Sensor Aggregation Models. This technology prototype receives data wirelessly from sensors and transforms individual data points into a cohesive, integrated view of the environment. It then uses insight generated from the back-end data to build visual models which help users to easily detect or investigate any changes in the object—or the environment—as they occur. For example, if the application senses a change in temperature along an area of pipeline, the user could zoom into that area remotely and check factors such as air quality, which could be used to detect a possible gas leak.

Encountering and overcoming obstacles

A key part of any new technology-driven evolution is managing the challenges along the way.

Information flood

Organizations will get even more real-time information about their world with Sensor Telemetry, including insight into their own physical environment and that of suppliers, competitors and markets. To derive value from this new breadth and depth of information, businesses will have to consider what to do with the data and then designate resources to assimilate, extract and apply the insight gained from it.

Data ownership

One of the burning questions will be: who owns or manages the data? Many Sensor Telemetry systems will create value chains with a number of potential stakeholders who will want to use the data. Across these chains, ownership, access, usage and revenue creation from the data must be agreed upon between parties. What roles should the product manufacturers, wireless companies or application service providers play? For example, many automobiles are equipped with Telematics devices with sensors that can sense a range of details from the state of the airbags to vehicle location to engine temperature. Insight from such data can then be distributed to all those linked to the car including the driver, manufacturer, parts suppliers, insurer, government bodies and even marketers and advertisers.

Privacy concerns

As data becomes shared, organizations will need to ensure that personal and proprietary data is managed in a way that does not compromise the privacy of individuals and business partners. Building trust will, over time, help generate opportunities to gather new business value from Sensor Telemetry data. For more on Accenture's Privacy Point of View, visit www.accenture.com/privacyandtrust.

Cost

While the cost of sensors and communications is still expensive for massive deployment by average organizations, overall cost of implementation will vary depending on existing infrastructures, location, types of sensor and types of application needed. Organizations that are already using RFID will be able to build on existing back-end infrastructures and platforms.

Sensors and sensibility

Improving economics, smaller form factors and ubiquitous communications allow Sensor Telemetry to deal with the world at an increasingly granular level—customer by customer, product by product, minute by minute.

Implementing a solution based on Sensor Telemetry is not a question of waiting for the technologies to emerge—rather it is a question of assessing what it will take to launch and manage for the long term. Organizations must ask themselves how much detail they require, what information they can assimilate and would like to act upon to achieve a particular business benefit.

Accenture can help turn sensor technology innovation into business results by helping organizations to:

- Identify new areas of opportunity for sensor technology through an Innovation Workshop.

- Conduct a business case analysis alone or with a proof of concept to evaluate technologies and vendors, and validate the business case benefits.

- Implement a pilot using assets developed through engagements with other clients.

- Assimilate and manage information gathered through sensors.

In addition, Accenture has developed the Sensor Telemetry Accelerator toolkit that incorporates lessons learned from various projects and provides a turnkey platform for launching basic wireless sensor projects.

For more information on Sensor Telemetry, visit our website at www.accenture.com/sensortelemetry

Accenture's technology vision
of Reality Online is getting closer.

RFID is picking up speed.

Sensor Telemetry is set
to make new inroads.

Fasten your seat belts and
keep your eyes on the road...

More on Sensor Telemetry at
www.accenture.com/sensortelemetry

About Accenture Technology Labs

Accenture Technology Labs, the dedicated technology research and development (R&D) organization within Accenture, has been turning technology innovation into business results for almost 20 years. The Labs create a vision of how technology will shape the future and invent the next wave of cutting-edge business solutions. Working closely with Accenture's global network of specialists, Accenture Technology Labs helps clients innovate to achieve high business performance. The Labs are located in Chicago, Illinois; Palo Alto, California; and Sophia Antipolis, France. For more information, please visit our website at www.accenture.com/accenturetechlabs.

About Accenture

Accenture is a global management consulting, technology services and outsourcing company. Committed to delivering innovation, Accenture collaborates with its clients to help them become high-performance businesses and governments. With deep industry and business process expertise, broad global resources and a proven track record, Accenture can mobilize the right people, skills, and technologies to help clients improve their performance. With more than 100,000 people in 48 countries, the company generated net revenues of US$13.67 billion for the fiscal year ended Aug. 31, 2004. Its home page is www.accenture.com.