

The Information Age: *Chapter 2*

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Looking back over the last century, there is no clear consensus as far as man's greatest achievement, but a number of accomplishments stand out. One could persuasively argue that the development of the computer was the century's greatest feat, while reasonable contentions certainly can be made for advances in science that include the developments of antibiotics and harnessing the power of the atom. In the case of the computer, the substantive impact lies largely in the processing and distribution of information, however the latter is truly noteworthy as part of man's ongoing interest to exert control over his physical environment. Looking forward into the 21st century, these vectors are on a path of convergence, bringing the promise of real-time information processing married with the capability to positively change the physical environment. Although this confluence is clearly dependent on the precedent technologies, the reagent for this volatile compound is the proliferation of low cost sensing and Automated Information Data Collection (AIDC) technologies. The consequences of the melding of technologies such as RFID, wireless communications, MEMS sensors and PLCs offer the business world transformative possibilities and the promise of the 'smart enterprise', offering a substantial, if not profound enhancement to the way companies operate in almost every major industry.

Passive RFID: Necessary but not Sufficient

In terms of importance, passive RFID is clearly a cornerstone of this transformation. Within a relatively short time, the technology has gone from an obscure component of security and animal tracking systems to a mainstream IT, ensconced at the forefront of retail supply chain automation. Clearly the watershed moment came when Wal-Mart mandated its use by suppliers, which when coupled with widely held presumption of a \$.05 tag, has compelled almost every retailer of any size to consider the impact of real-time tracking and automated data collection between their network of suppliers. Un-

fortunately, the resulting hype has now eclipsed the actual value of this single technology to change operations, and the effect of these shortcomings may be to temper the blind adoption of this particular technology, and AIDC technology in general, over the short term. However, the longer term effect will be to fan the desire for greater automation and enterprise visibility, leading adopters to examine a wide range of emerging and complimentary technologies and to the creation of an amalgamated system of application appropriate technologies that best match the specific functional requirements.

Through such an examination, users will find that a layered approach to building such a system offers several key benefits and creates a logical process for implementation, evaluating, refining and expanding the project in question. Among the foremost concerns with passive RFID are its range and read performance characteristics, which are clearly an improvement of bar codes, but are a far cry from 100% accuracy at reasonable distance that are required for the level of automation desired.



These shortcomings will increasingly be addressed with low cost active RFID technology that can encapsulate lower level, more granular passive or bar code information while supporting complimentary field information from sensors and instrumentation measurements. In the retail supply chain, even a price point

under \$5 would make active transponders prohibitively expensive for use at any lower granularity. On the other hand, low cost active RFID has tremendous upside for its ability to combine the item-level data collection with environmental or external data from any number of sensors or devices, thereby establishing and demonstrating the necessary breadth of application that is essential to build the adaptive, closed loop communication that can be truly

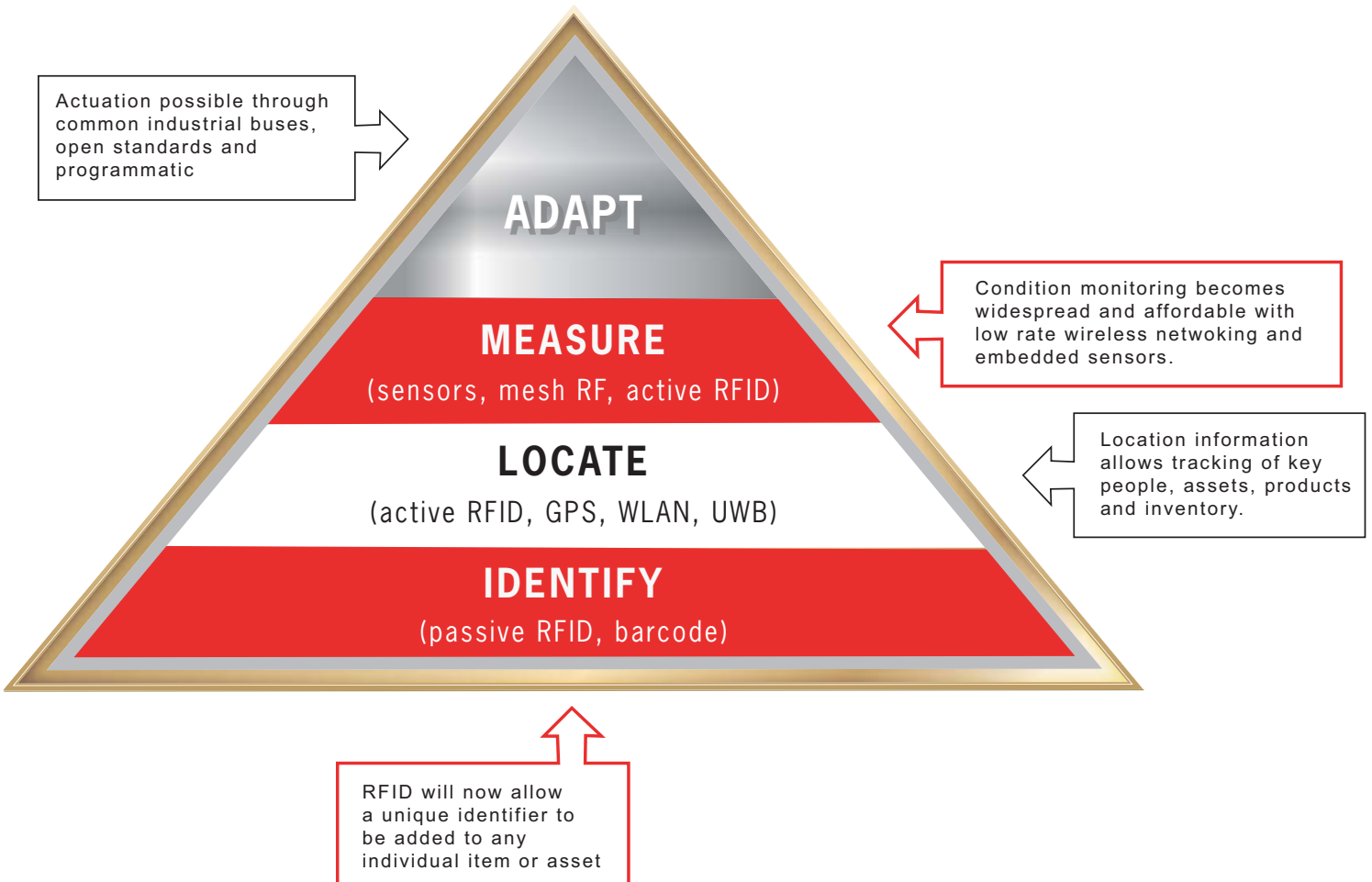
transformational.

Above this RFID communications layer there may in fact be wireless networks dedicated to sensing and control, using more robust mesh architectures or more optimized radio performance capabilities, which could exist as a separate communications plane in some instances. One only need look as far as the standards road map from EPCglobal to recognize that these layers will more than likely converge as Class 5 EPC tags at some time in the next 3 to 5 years, giving active RFID vendors a decided advantage in long term market positioning. Even with this convergence likely, vendors must strive to extend their capabilities in order to maintain a robust and highly accurate system given the increasing reliance on wireless in these settings, which when coupled with a lack of common standards insures a contentious RF environment.

The integration of the information collection and actuation

communication planes is an important development for the creation of the smart enterprise, however the challenges of a real-time data environment increase the need for data processing capabilities and point to the need for data collection to be coupled with data processing. For vendors of AIDC technology this means more than just flexible middleware. An effective closed loop actuation system must also have distributed system intelligence coupled with the bi directional communication with field devices to facilitate the local processing of core information and low latency actuation where necessary.

Toward these ends there are a number of standards efforts that address some part of the overall system requirements. These include the various RFID standards from EPCglobal, ISO and ANSI, as well as applicable standards ranging from ZigBee or UWB in the RF world to sensor interface and data structure standards from the IEEE's 802 and 1451 working groups. Ultimately the point of entry for most



adopters will be at the system level, driven by the desire to improve core business processes without significant disruption to legacy systems. For this reason it is critical that the vendors vying for these opportunities understand their roles in an overall solution in the near term, which places greater emphasis on integration of disparate components, and be able to articulate a strategy that clearly maps out the interconnection of a cohesive yet flexible system.

Towards an Integrated Future

There are many steps between the present and the realization of an integrated information and physical world. Beyond the necessary technologies are the processes and interconnections that must be established in order for such a melding to take place. The key to establishing the necessary framework lies in the development of a rich information platform capable of supporting real-time data from disparate sources in order to support multiple upstream applications. By focusing on the information validation, normalization and distribution, companies can align their development roadmap to their business priorities with some reasonable assurance of flexibility over time to capitalize on the incremental development of technology without sacrificing near term need for return on investment.

For the vendor community, the rewards for facilitating the successful automation of information and control system promises tremendous opportunity and a broad market customer base. The competition will be come from many angles, increasing the noise in the channel and unsettling customers who are not resolute in their convictions or priorities. The key to the brass ring lies in offering a solution that effectively couples the relevant technologies in AIDC as well as measurement and actuation over the long term. In the near term companies can take a leadership position by demonstrating a solid understanding of the impact that large volumes of data can have on a distributed information system through

the development of intelligent data collection devices that allow local filtering and high level processing to minimize the overhead on the network, while tightly coupling the performance of the network with the underlying collection devices. By combining the attractive TCO features of wireless communications with the ROI drivers from an integrated information management platform companies can solidify their customer relationships and position themselves as the primary option to extend the solution to the closed loop communications.

A Parallel Universe

Despite the apparent serial hierarchy of the solution development in an integrated physical control environment the processes and iterations that create the smart enterprise are very often parallel development, encompassing process automation initiatives in places like shop floors and production lines while different parts of the organization work on streamlining the supply chain. The challenge here then is

to leverage as much of those efforts toward a common goal as is feasible, and at the very least not preclude the confluence of those initiatives with poor planning and technology selection. The overarching priority should be on selecting the proper partners that can paint a distinct vision and road map to enable the smart enterprise while at the same time insuring that efficiency gains and operational improvements pay significant dividends all along the way. Such a partner must demonstrate a commitment to offering a solid information platform as the basis to

drive value across the organization while embracing a suite of technologies that deliver the optimal cost-performance at each layer of the system. The bottom line is that finding the right solution technology is important but finding the right solution partner is essential. Adopters would be wise to choose one that has the vision for tomorrow's transformation but the technology for today's challenges.

