

For a smart environment, smart survey monuments

—by **Bill Rushing**, Vice-President of Product Development, Berntsen International, Inc.

Ubiquitous Cartography, the *ACSM Bulletin's* October, 2009, article by Georg Gartner, has sparked much conversation at Berntsen on how survey monuments—and surveyors—fit into the “smart environment” which Gartner had outlined. It may come as little surprise that we think monuments and surveyors fit into smart environments very well indeed... but we also think that monuments will themselves have to get smarter for that to happen.

Monuments, of course, are really good at staying put. That is, they hold position well, and position is invariably extremely important in any mapping scenario—after all, maps are useless if they do not accurately reference real-world positions. But even though monuments are stable, the world around them changes constantly. An obvious example are lot corners. Even though surveyors try very hard to keep them in one place, lot ownership may change dozens of times in the life time of a monument.

Stable monuments, dynamic world

To be genuinely useful in the ubiquitous cartography paradigm, survey monuments will have to do more than just hold position. They will also have to *store information*, and that information will have to be *dynamic*, i.e., *readable* and *updatable* by available technology. Put simply, ideal survey monumentation will have to find a way of combining stable real-world position with dynamic digital data.

We think Radio Frequency Identification (RFID) technology is perfectly suited to this task. Typically, RFID technology uses small, unpowered chips to store information in such items as library books (in checkout systems nationwide), new clothing (to prevent shoplifting), manufactured goods (to enable tracking during shipment, and inventory management), and passports (as part of security measures).



The chips can be read using widely available technology, they don't need batteries, and they can be updated remotely by authorized individuals. They're also tough; they can withstand a range of temperatures and moisture associated with monument use. They can serve as links (via unique ID numbers) to extensive databases and are flexible enough to augment existing asset maintenance schemes.

Durable, environment-proof, and updatable RFID chips attached to stable, world-class, magnetically detectable



The Smart Environment is Here



Bluetooth
Or Direct Connective



RF energy sends / receives
data / information from the
RFID Memory Chip



RFID Memory Chip and
Antenna are hidden inside



Typical RFID Enabled
Magnetic Survey Monument
Patent Pending

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monumentation is a game-changing technology enabling a great variety of exciting applications. Here are a few ideas we've come up with, along with some thoughts on smart environments.

- Boundary corners and geodetic survey points can be updated with datum information, lot and block information, last visit dates, and other information that one might find on, say, an NGS data sheet. This creates, in effect, a widely dispersed, Internet-independent GIS which enables realtors, emergency personnel, contractors, and other interested parties to obtain information they need without having to do prior research. Since RFID readers can, theoretically, be implemented in smart phones and other handheld devices, access to this information could be enhanced by incorporating it into ubiquitous cartography schemes.
- Asset management is one of the most obvious opportunities for RFID-enabled monuments. For example, utility companies, cemeteries, mines, and other businesses which track and maintain underground installations can easily augment existing schemes with unique, relatively immovable asset identification numbers.
- Monuments could be routinely tagged by authorized parties with personal readers—effectively, signing a virtual logbook which lets others know that they have been to particular locations. The tagging could be done for practical reasons, such as updating maintenance, utility, and easement records, or for geocaching or benchmark hunting. Since the information stored is digital, it can be controlled with the same encryption or security schemes routinely used in any programming.
- The storage capacity of RFID chips continues to expand, and there is no reason why the chips should not eventually be used to store documents, pictures, audio, and video. This would dramatically enhance the educational and safety information about built environments. Brent Jones of ESRI has pointed out (in the April 2009 issue of *POB Magazine*)

that 75 percent of a building's lifetime costs occur *after* construction, and managing RFID data is one way surveyors can be involved in that income stream.

- Information-storing monuments could play important roles in agriculture and construction as machine control and other automated methods become more common.
- Abundant monumentation with storage capacity will serve as dispersed backups to conventional databases. This could range from tags as simple as license plates (tags which point to information stored elsewhere) to complex data stored at a particular coordinate.

It seems clear that the basic idea—positive identification of a stable position plus dynamic information—must inevitably be part of the ubiquitous cartography paradigm. For if an environment is to be truly “smart,” it must surely contain a variety of useful information, and that information must be tied to particular coordinates.

Where do surveyors fit in?

The last decade or two have been filled with opportunity for surveyors; GIS, GPS, laser scanning, machine control, and other surveying and mapping technologies have spread rapidly, forcing the adoption of new work flows and business models. The two constants in this forward hurtling technological world are the importance of boundary and the need for precise positioning. In fact, new technology typically *reinforces* the need for experts who can put monuments precisely in the right place. We believe that this will be true in any smart environment as well—surveyors will be needed not only to place monuments, but also to update them accurately.

Realistically, those surveyors who have been the quickest to embrace new technology, have also profited the most from it. As the world around us becomes increasingly intelligent and contains more and more data, positioning experts who can manage complex information—which is to say, surveyors—will likely do very well. The “smart environment” is here now... and it's just waiting for smart surveyors to take full advantage of its potential. Just imagine the possibilities RFID-enabled monuments offer to surveyors and mappers as they begin to complement efforts to build more information into the world around us via GIS enhanced with precise boundary data! 