

position

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inside ▶



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Murray-Darling



Mining skills

The geospatial
industry's contribution



Pos minerals

Satellites in the
search for ores



The Leica LocataLite trailer contains the electronics and power supplies; the mast is a simple structure that is easily carried to the edge of the pit, and connected to the trailer.

Local Positioning System: GPS without the satellites

Locata promises to do away with the unreliability of GPS, by creating land-based 'local constellations'.

SIMON CHESTER

Over the last 20 years, GPS has gone from a fledgling technology used only in government and highly profitable commercial applications, to becoming practically ubiquitous. In the commercial realm, it is used to track vehicles, automate machinery, survey land, and many other tasks, whilst in the consumer domain it helps people locate their friends, give them directions, and other countless uses.

Yet, despite this growing dependence, GPS is unreliable. GPS jammers although illegal, are available for around the \$40 mark, and have the power to disrupt many mission-critical systems. Even without the threat of GPS jammers, the comparatively weak GPS signals are susceptible to space weather, radio interference, and won't work if you have a roof over your head or can't see the horizon. Just look at the trouble the new Lightsquared telephone network is having in the US, for an example of how easy it is to unintentionally knock out GPS signals.

With these types of problems in mind, Nunzio Gambale and David Small, two entrepreneurial Australians with contagious enthusiasm and a great passion for their product, set out 16 years ago to create a better solution.

"The company started when we went inside with a GPS systems and it just stopped working. That was not something anyone was talking about in the mid-1990s. In fact, we were reading that GPS could find your child in downtown NYC, inside a building. When we went inside,

however, we saw the disconnect between fact and fantasy, and that's what started us on the path to fix it. It proved to be a life-defining quest, but we've done it. This year we launch the technology globally."

The 'fix' was Locata. The Australian-developed technology doesn't require satellites to work, can change its frequency and broadcast power to suit the environment, and works indoors, in jammed environments, and in places where traditional GPS reception is flaky, unreliable or simply not available.

"It is literally a paradigm shift – take everything you know about location technology and throw it out the window: every book and every lecture says you require extremely accurate time to achieve good positioning. Locata breaks that paradigm; we just don't need it. Before Locata, it was only satellites and it was atomic clocks; we've changed that forever."

Nunzio calls it an LPS – a local positioning system. The technology uses ground-based beacons in place of satellites to create a 'local constellation.' The base stations sync to each other to within several nanoseconds to form a local 'replica of GPS', and, interestingly, they don't need atomic clocks to do this.

The technology can be deployed across an area of almost any size, from a room to an emergency site or warehouse, to a site spanning thousands of square kilometres. In fact, Locata is currently in a 'sole source' contract with the US Air Force to install its tech over a 6,500 square kilometre area at the White Sands Missile Range in New Mexico.

Moving to market

Locata is bringing the technology to market in 2011 through integrators. Its first major partner is Leica Geosystems, which has taken the technology to the mining industry through its Jigsaw high-precision guidance system. The technology will eventually reach its traditionally low-precision fleet management systems, too, because of the improved reliability compared to GPS.

"Our fleet management and machine guidance systems rely heavily on positioning, and with GPS, down time is inevitable. With Locata, 100 per cent availability is possible," says Leica Geosystem's Geoff Roberts.

"By integrating with Locata, it gives a mine its own network coverage that remains with the mine, no matter where it moves. This greatly reduces downtime, and therefore increases productivity, by providing constant location accuracy – especially in those mines that are deep or have steep walls.

"Currently, it's about increasing accuracy and availability of signals in existing systems. In the future, 100% coverage will become critical when fully autonomous machines and collision avoidance become commonplace on mine sites."

There are applications beyond the mining industry, too. On 19 May 2011, AirServices Australia and CASA (Civil Aviation Safety Authority) presented Locata to ICAO (International Civil Aviation Organisation) as a potential 'standardisation candidate' for Alternate Position, Navigation and Time – APNT, i.e. a backup to GPS for aircraft approach and landing systems.

This presentation has been accepted, and ICAO will begin to study Locata as a potential solution towards the end of the year.

Indoors and in urban areas

So how does it work so well indoors and in urban areas, where radio signals have to fight a constant battle against brutal multipath interference? It took the development of a new type of antenna – what Locata calls a 'TimeTenna'.

Currently these antennas are about the size of a soccer ball, and they are designed to work with forklift-sized machines. However, Locata says it is on a development roadmap that will eventually see the antennas fit within a smartphone. In fact, a company is already working under NDA on integrating the technology into a chip that will be able to use GPS, GLONASS, and Locata positioning technologies interchangeably, where appropriate.

And that's key with this technology: although it doesn't use GPS in any way, in real-world applications it will work alongside GPS and other positioning technologies.

"This isn't a replacement for GPS – that would be crazy talk," says Nunzio. "This is simply giving GPS a terrestrial partner for all those places where it can't reach."

Nunzio likens the current stage of Locata's development to that of GPS circa 1990 – meaning that applications have not yet been fully realised, and the technology is still to shrink in size.

"Personally, I think we'll start to see it in consumer devices in about five years," says Nunzio. "Phone positioning will be so accurate it will potentially be able to tell what chair someone is sitting at in an office."

Pocket devices having indoor location accurate to a couple of centimetres opens the world up to many possibilities, many not yet imagined. For example, you could quickly find where you are in your local labyrinthine mega-mall – and mark just where you parked your car. A city-wide Locata network could provide automatic parking meters, public transport billing, or, on a more serious note, help-beacons for the elderly, the blind or the mentally ill, no matter where they wander.

What's interesting about the technology is that it makes accurate location

constellations available to companies and smaller governments, not just the wealthiest nations. Previously it took an entire constellation of at least 24 satellites to create a positioning network. Now it only takes the purchase of a number of ground stations.

"I believe Locata will change everything when it comes to positioning in the future. Currently, two countries have working satellite systems – 190+ don't. This is a classic disruptive technology," Nunzio says with the pride of a man whose 16 years of his and his team's work has finally come to fruition, "Locata removes the need to rely on infrastructure owned by a foreign government."

Clearly, Nunzio has high hopes for his company. His confidence is clear, and his manner charming, but most importantly, his technology is compelling. It's great to see Australian technology being able to compete on a global scale, and I hope to follow his story closely – at least I know that, no matter where he may travel, I'll always be able to find him. ■

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