SENSYS Networks

by Louise Smyth

FOLLOWING A NUMBER OF SUCCESSES IN THE CELLULAR AND WIRELESS MARKETS, AMINE HAOUI IS NOW SETTING HIS SIGHTS ON IMPROVING HOW THE TRAFFIC INDUSTRY GATHERS ITS EVER-CHANGING DATA

When does a maverick businessman become a safe bet for venture capitalists? In Amine Haoui's case, it was when the division of TCSI that he was head of became instrumental in the development of the first generation of digital cell phones. The company eventually went 'public' in 1989, making Haoui a particularly attractive proposition to investors.

In 1993, Diva Communications was founded – a company involved in wireless local loop space – at a time before the cellular industry really took off. Haoui predicted the need to replace the landline network with wireless (fixed) phones. Instead of digging up the street and using wires to connect homes to central offices, the company did it all wirelessly – and did so on a large scale, worldwide.

You'd think that with such a track record, he would have the ego to match it, but Haoui downplays his vast store of success stories, describing his work almost as if it is a hobby: "That's what I like to do – identify major market needs and technology trends and marry the two to create companies that can help address big problems."

The most recent "market need" to have grabbed his attention was close to home for the Berkeley, California-based executive: "I'm a close friend of Professor Pravin Varaiya at the University of California. He was working alongside Caltrans to solve a data problem and I saw an opportunity to marry the market need for traffic data with the new technology that was emerging at the time – wireless sensor networking."

Sensys Networks was founded in 2003, with Haoui leading the company as CEO and co-founder Robert Kavaler in charge of technology development. The timing of this new venture was what the fashion industry would describe as 'on-trend' – it both anticipated the future of wireless technology and caught on to a movement right at its fledgling stage. "A new generation of chips emerged around five years ago," Haoui explains, "very low-power, sophisticated radio chips that made it possible to operate using batteries for many years without having to replace them. That was a critical requirement. If you're going to put sensors in the pavement, they need to survive for around 10 years without being touched. The key component was that the new technology was the perfect fit for this application."

CAPITAL IDEA

Sourcing the capital to kickstart Sensys Networks was not as troublesome for Haoui and his team as it can be for many start-ups: "One of the big weaknesses in the traffic industry has always been the lack of investment capital, because it's a public sector market and venture capital is not attracted to the public sector – it's very difficult to capitalize companies. The fact that I am close to the venture capital community, having started successful companies before, made it possible for us to raise the capital we needed."

How, then, does this advanced technology work? "It's actually a very simple concept," Haoui says. "We have three

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magnetic sensors housed within a small hardened plastic cube. A magnetometer then measures the earth's magnetic field: when a vehicle passes over the sensor, it forces a change in the magnetic field that the sensor can detect. We also know when the vehicle has left the sensor. The information itself is then transmitted (via a radio within the sensor) to the roadway over a wireless connection. At the side of the roadway there is something called the 'access point', which is a communication hub that collects the data from all of the sensors in the pavement before retransmitting it forward either to a traffic management center (TMC) or to the local controller for traffic applications."

There was an undeniable demand for such a system in the traffic market. In just a few years, Sensys has achieved huge penetration and today the company is present in 30 states in the USA. Customers tend to be those that have used inductive loops in the past and find the Sensys system to be an effective replacement.

Caltrans has been behind the movement from the start and has been testing the technology for more than two years, culminating recently in a contract worth over US$5 million: "Caltrans is deploying our detectors on a very large scale – on close to 1,000 lane-miles of freeways in the Bay Area. We installed the first systems on I-80 in 2005 and they've been up and running reliably, providing very accurate data with zero maintenance. For example, we have three sensors per lane on some of the lanes and after three years, they are still reading within 0.1% of each other in terms of accuracy. This is the kind of performance that Caltrans is looking for."

TESTING TIMES

As well as securing business in its own backyard, authorities elsewhere around the world are also reaping the rewards brought about by the Sensys systems: "At the same time that Caltrans was testing the product here, we were approached by VicRoads in Australia. They commissioned ARRB together with La Trobe University and conducted very exhaustive testing of the technology over a two-year period. All of this was done independently and unbeknown to us. A glowing report was published in late-2007, stating that we are 98% accurate under very difficult conditions. On the strength of that, we are seeing a very fast (and large-scale) adoption rate in Australia."

Closer to home, the city of Fort Collins in Colorado performed its own hand count of vehicles compared to a Sensys count and the system was found to be 99.8% accurate. Fort Collins used the technology for a travel-time system and the city has plans to award the company with another investment soon.

As well as accuracy and reliability, Sensys also likes to tout its systems on cost, but how is it possible to deploy such sophisticated technology at a truly competitive price? "Most of the costs of detection systems come from the labor associated with the installation," explains the 53 year old. "In our case, it takes two minutes to put a sensor in the pavement, whereas a loop could take you all night. Also, the maintenance cost is almost non-existent because once they're in the pavement they operate autonomously."

ON THE HORIZON

Haoui is at the stage now where he could simply sit back and watch the cash roll in, yet you sense that just isn't his style. Indeed, he is already hatching plans to launch a new product in 2009. "With traffic data systems, people collect count, speed, and occupancy (the density of the roadway – how close the cars are together). These are the three main measures – that's what loops give you, it's what radar gives you and so on – and we do all that. But we have developed a new technology that will provide far more data that's not available from any other current system: the ability to re-identify vehicles.

"Imagine a corridor. We will put arrays of sensors at intervals – say every quarter or half a mile. When a vehicle passes over the first array of sensors, a signature is recorded and when it goes over the next array we are able to identify that same vehicle was at that point and now is at this point – to re-identify it. That will give you a lot of additional information. First and foremost, travel-time information: you know how long it took for the vehicle to go from point A to point B, using totally anonymous reads – no ALPR, no cameras, so no privacy issue. We don't know who is in the car, what the car is – all we know is that it was there."

By comparison to existing methods for obtaining this data, this is a remarkably low-cost solution. The sensors are simply installed in the pavement and there is no power requirement. Similar to so many of Haoui's previous successes, there is also the advantage that nobody else is doing it. "It is extremely unique to our technology and once you are able to re-identify vehicles, you can then do a lot of things that have been desired by the industry although until now not achievable. For instance, with travel-time information, we can give you all the distributions of travel time for every single vehicle, as opposed to using GPS, where you maybe get it for one out of 10.

"We can also do a lot more with the data. We can measure the queue length at the traffic signal and we can measure turn-movement counts – that is how many people are going straight on, turning left or turning right at an intersection."

The value of such a technology is two-fold. First, data could be sent to TMCs for traffic managers to improve and optimize systems to achieve the best-possible traffic flows. Second, the effects of various high-tech solutions could be assessed. "If you've invested a few million dollars in a new ATMS system, you want to know how it is performing. We can tell you that exactly – and if it's not doing too well, we can tell you where the bottlenecks are, where queues are building up, and more."

For these type of applications, as well as going up against vendors of loops, radar and video solutions, Sensys could potentially be competing for business with ALPR suppliers, although according to Haoui there is one main differentiator: "What we offer is a genuine platform – we don't have a single product. It is a major technology trend that is leveraging wireless sensors into these traffic applications. Whereas video and radar are products, ours is a platform, which will do what video and radar can but also a lot more." To support such a claim, he reels off an array of applications in which his company's technology is currently deployed, including traffic signal control at the stopbar, advance detection, ramp metering, red light enforcement, parking detection, and more.

The overall impression is that while this is an exciting time for this breed of technology, the best is yet to come, as Haoui deduces: "We've only scratched the surface of what wireless sensing and wireless detection can bring to the traffic industry." ■