

Challenging conventional wisdom

NORBERT SCHINDLER's time in New York for the ITS World Congress was far from wasted. Not only did he get to revisit the town in which he grew up but a number of discussions he had while at the Javits Convention Center saw him head straight for his laptop upon his return. This just in...



I attended this year's ITS World Congress without many expectations, concentrating mostly on representing Siemens Electronic Tolling, part of the new Mobility Division.

The attendance in the exhibition hall exceeded expectations, and I had some interesting discussions with many familiar faces – as well as with a number of new faces. On Thursday afternoon, once we had everything packed up, I took the bus to Boonton, New Jersey, the town where I grew up. It's always an impressive sight, especially at night, to get out of the Lincoln Tunnel and look out across the Hudson River at the Manhattan skyline. At that moment I began to reflect on the many discussions I had during the Congress.

If you observe the market very generally, you might get the impression that the electronic tolling industry hasn't made any major breakthroughs over the past few years. In contrast to the telecommunications industry, where I originally came from, new technological approaches in the area of tolling are rarely embraced with any noticeable amount of enthusiasm.

It appears that many tolling industry leaders prefer to maintain the status quo. Key decision makers (usually within state-owned organizations) also have the obvious tendency to avoid risks and go with proven solutions rather than trying something new. A British consultant

proposed a curious thesis over a glass of beer on our stand: in the telecommunications industry, everyone struggles to be the first to deploy the newest technologies, while in the transportation sector, everyone wants to install only what has been done before.

In New York I encountered a number of common views on tolling technologies that I would like to challenge:

- Tag and beacon technology is the industry standard and is here to stay. At best, at least in the United

States, there is a choice of whether to increase the functionality of such microwave-based systems for more or less the same price (5.9 GHz), or to maintain the same (or slightly reduced) functionality with significantly reduced costs (i.e. by introducing sticker tags).

- Automatic Number Plate Recognition (ANPR) cameras don't get the best results and are only really useful to enforce tag and beacon systems.

- Satellite-based systems are far too complex and too costly to be implemented on a large scale and it will take

a long time until the technology matures enough for it to be deployed in nationwide tolling schemes.

Tag and beacon

In the United States, tag and beacon systems are enjoying increasing popularity as interstate standards, such as E-Z Pass, make electronic payment far more efficient

“US tag and beacon systems are increasing in popularity as interstate standards make electronic payment far more efficient”



than manual payment at toll plazas. Yet toll plazas still exist (and continue to be built) and, typically, there are still physical barriers at the E-Z Pass lanes which open automatically when you slow down to 5 mph and get your tag read successfully. There are a few cases of multi-lane free flow implementations in the US, but they are far and few between and not necessarily viewed as being very successful projects. In Europe, a few microwave-based systems supporting multi-lane free flow tolling have appeared in the last few years. As effective as some of these systems may be, there is nothing really revolutionary about the use of microwave technology any more. It will also take many years before you can drive throughout Europe with a single tag.

The technology is proven and is basically user-friendly and the tags are relatively cheap and easy to install. You just have to make sure the tag is changed after a few years when the battery power runs out. For occasional users, the whole business of registration and purchasing a tag is often not worth the trouble. The overhead involved in tag distribution, tag replacement, lost tags, or the phenomenon of users leaving the tags in their glove compartment (which can lead to an occasional read when passing a beacon) are issues which are not often spoken about. In other words, "bad reads" are probably not as infrequent as many would like to believe. That's why you have cameras placed next to many (or in some cases all) beacon installations at the roadside, for enforcement purposes.

Carrot and sticker

In the US, the industry struggles with the question about whether sticker-tags will eventually take over. They are much cheaper to produce and distribute, very easy to stick on windshields, and there are no batteries to worry about. Existing roadside infrastructure can easily be used for sticker tags. The other main alternative being discussed is the deployment of tags using the 5.9 GHz bandwidth. For the end-user, there isn't much difference

to the existing 915 MHz tags, but there are a number of added features that could, for example, improve road safety.

There have been significant investments made in the 5.9 GHz technology for the Vehicle Infrastructure Integration (VII) program. Yet nobody can realistically forecast when, if ever, VII will become readily available. There is a great deal of roadside infrastructure necessary to get this kind of system to work effectively, and this bears a huge price-tag. It's not clear who should pay for all of this, and 5.9 GHz would also have to operate in parallel to the existing 915 MHz technology for an extended transition period.

During the technical sessions in New York, there was even some speculation that satellite-based solutions could be deployed during a transition phase until there was enough 5.9 GHz equipment built up on the ground! Of course, once satellite technology is used to achieve VII functionality, it would be hard to argue the need to further invest in roadside equipment.

ANPR cameras

There is a significant revolution taking place at this very moment. ANPR cameras are being used to identify vehicles and levy a tolling fee on all vehicles liable to pay. This is typically set up in a multi-lane free flow environment. Existing toll plazas may eventually be torn down and replaced by high-quality cameras which catch every passing vehicle, making traffic delays for tolling a thing of the past.

The microwave advocates will claim that you will never get as many positive reads on license plates as you can with a tag and beacon system. Although this could be true, it is easy to forget that the installation of tags and beacons is a significant overhead that may, in many cases, exceed the benefits of deploying all this extra microwave hardware. What's more convenient than ordering a tag and installing it in your vehicle? The answer is simple: no tag at all! And since most roadside

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All photographs by Norbert Schindler



equipment includes cameras anyway (to enforce correct tag usage), why not rely on them completely?

There are video-based tolling solutions being established in Texas, for example, and other states will probably follow suit. Of course, you will never get 100 per cent “positive reads” on an ANPR camera, but you don’t get them with tags either. However, positive reads are typically well above 90 per cent by ANPR cameras being deployed for tolling and congestion charging schemes. Furthermore, with a camera, you always get a picture of potential violators that you can use for manual checking. With a bad tag read, there’s nothing you can do (unless you have a camera next to the beacon taking pictures, of course).

When the City of Stockholm decided to try out congestion charging for six months in 2006, it was decided to use both microwave and camera equipment at the roadside. After the trial, it was shown that the camera reads were so good that the microwave equipment, which was already paid for, yielded only marginally better identification of vehicles than cameras alone. It was decided to forego the use of tags altogether, since the added operational costs did not warrant their use. Once the system started permanent operation last year, tags have only been used to identify a limited number of vehicles which are exempt from the charge. Hundreds of thousands of unused tags are probably gathering dust somewhere in a warehouse in Stockholm.

Satellite-based tolling solutions

In the US, satellite-based solutions have been extensively tested in the states of Washington and Oregon.

In Baltimore, hundreds of volunteers have just been recruited to participate in a federally funded study on the use of satellite technology, and other urban areas around the country will follow.

Trials of satellite-based tolling systems are also very popular in Europe. Extensive trials have been conducted for several years in the United Kingdom (with no end in sight), and also the Netherlands started doing the same in mid-2007. Holland is preparing to build the most extensive road user pricing system in the world, involving over 8m vehicles on the entire Dutch road network of more than 130,000 kilometers. Singapore also completed a series of trials last year, a very challenging environment considering the numerous skyscrapers and the inevitable “urban canyons” which usually hamper good GPS reception. In each of these trials, up to a dozen technology suppliers were tested.

The outcome of these various trials is always the same: satellite-based technology works, it is suitable for automated electronic tolling, and the platform allows a level of flexibility that cannot be matched by any other technology to date. Nevertheless, more trials are being prepared at this very moment. In New York, I was asked whether Siemens would be interested in participating in trials in the Czech Republic and in Sweden. The Swedes sweetened their proposal with the prospect of being able to present the test results at the next ITS World Congress in Stockholm next year.

Now, don’t get me wrong, trials can be a lot of fun, and it’s nice to have an environment in which you can test your latest technological developments. Siemens has been working on satellite-based electronic tolling for

many years, and we don't hesitate to point out the advantages of this technology. We may be very partial on this subject, I will readily admit that. But by now it is absolutely undeniable that satellite-based tolling is more than mature.

For four years now, there has been a tolling system in operation right in the middle of Europe, using satellite technology. Over 700,000 vehicles have been equipped with GPS-based "On Board Units", the tolled motorway network exceeds 12,000 kilometers, and a very nice sum of money is generated by this scheme, year after year. In fact, I would say that €3 billion of annually generated revenue is a very handsome amount of cash.

Has the German truck tolling scheme ever failed in its four years of operation? No, it actually hasn't. Were there any problems getting the system up and running? Yes, there were. But considering the sheer magnitude and complexity of the system, and the fact that nothing like this was ever done before, I would think that the German and French companies involved (as well as many who were closely watching on the sidelines) learned some valuable lessons in process. In fact, I would dare to say that the initial problems in getting the system operational had little to do with the technology itself and it is highly unlikely that the kinds of problems faced in Germany would be repeated elsewhere.

Just this year, there was this great new airport terminal launched at Europe's busiest airport, with plenty of fanfare. This prestigious project was planned for nearly two decades. Such a project, costing US\$8.5 billion, is of course significantly larger than the tolling scheme in Germany.

I doubt that anyone would claim that the launch of Heathrow's Terminal 5 went smoothly but I have yet to hear anyone in the business of building airports say that the use of new technology was to blame for the problems. My guess is that the construction of modern airport terminals around the world will not come to a halt due to this unfortunate experience.

The future is now

The good news is that satellite-based tolling systems are finally starting to catch on. Not just trials, but real systems which generate real revenue. Next year, Slovakia will not only introduce the Euro as its currency, but will also start implementing a satellite-based scheme on its motorways and first-class roads to toll all trucks over 3.5 tons. The GPS-based On Board Units (OBUs) will be mandatory and much easier to install than their predecessors in Germany. These units will cost about half as much as the German ones and you can be sure that the cost of satellite-based units will reduce significantly over the next few years.

The Czech Republic introduced its microwave-based tolling scheme in 2007. Within months of launching the system, the Transportation Minister appointed an expert group to investigate how to best deploy satellite technology on its road network. It was found that the cost of building up microwave infrastructure for tolling the

first-class road network would hardly pay for itself, so the originally planned toll road network was cut in half.

Slovenia, the smallest country in the European Union, one with many years of tag and beacon experience on its motorways, is about to issue a tender for a nationwide truck tolling scheme. Rumour has it that they will join the ranks of Germany and Slovakia in building a satellite-based solution. In a month or two, France will announce a tender to introduce tolling on all trucks over 3.5 tons on its entire first-class road network. Even though France has Europe's most extensive tag and beacon system established on its motorways, there is no doubt that this new tolling scheme will be based on satellite technology. The Dutch are pressing forward with their ambitious nationwide scheme and their neighbors in Belgium are currently moving towards a very similar tolling scheme. You can guess which tolling technology is being considered in the home of the European Capital...

In the next few years, we will witness the complementary effect of a large installation of satellite-based OBUs

being produced for much less money than now. Most of us were able to witness how quickly mobile phones evolved since they were first commercially introduced in the 1980s. Almost everyone has a mobile phone now, and I doubt there are many people inhibited to use one due to the price of the phone itself. Before long, most vehicles

will be equipped with OBUs and eventually vehicle manufacturers will offer integrated satellite-based tolling equipment just as they offer built-in navigation systems today.

True, satellite-based units will probably never be as cheap as microwave tags. But we certainly can't expect the cost of building and maintaining roadside equipment to ever drop significantly. On the contrary, ambitious programs such as VII call for even more infrastructure than what is currently in place just for electronic tolling. With a satellite-based platform installed in the vehicles, you can have the benefit of value-added services without any significant increase in hardware costs. And since the underlying technologies, GPS (and later also Galileo) and GSM are standardized, interstate and international system interoperability will be much easier to deal with.

I am already looking forward to the next ITS World Congress in Stockholm. I'm particularly fond of that beautiful city which I got to know during my years in the telecommunications industry. But that alone is not the reason for my enthusiasm. I am confident that a year from now there will be much more talk about the paradigm shift currently underway in our electronic tolling industry. And I will recall that curious remark comparing the telecommunications industry to the transportation industry and smile. The electronic tolling market is indeed a very dynamic and fascinating area to be involved in. ■

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