





MULTI SKILLED

Despite restricted budgets, it seems that traffic software is still the must-have tool in an engineer's armory. **Nick Bradley** hears how these time- and cost-saving programs are being put to use in the ITS sector

Illustration courtesy of Magictorch

Doing more with less is something that DOT staff have had to adjust to in recent times, leading to many a sleepless night as they decide where and on what to spend their scarce budgets. Under pressure, it's perhaps easy to cut arbitrarily, or maybe hone spending on measures visible to the public gaze.

Suppliers and consultants in the traffic software field are pleased that the axe has rarely fallen on their necks. "The forward-thinking central government departments at least recognize that in this current climate there is perhaps even more of a need for simulation," says the Edinburgh-based Richard Braidwood of Braidwood Associates. "Modeling may be perceived as costly but given the long-term nature of large infrastructure projects it's a small outlay to be 100% sure you're getting the best return on investment," he adds. "The

visionary governments understand this and I think we'll see an increased demand for simulation as a result."

John Albeck, lead traffic engineer with Texas-based Trafficware, agrees. The company develops several software packages for traffic engineers, the most widely used of which are Synchro and TrafficSim. The former is designed to help engineering staff when considering the system-wide impacts created on an individual intersection and the network as a whole. "Signal timing is often overlooked," Albeck believes, "but through signal optimization, traffic engineers can reduce congestion, save time, and make intersections safer."

According to the FHWA, two-thirds of all miles driven annually in the USA are on signalized intersections, 75% of which could be improved simply by adjusting timing plans and better coordinating

signals. "You can have a really big bang for your buck," Albeck insists, with a benefit-to-cost ratio upward of 40:1 and beyond. Using Synchro, analysts can look at the many alternatives quickly and avoid the risk, cost, and disruption associated with field experimentation.

"Other models require a file for every signalized intersection, but with Synchro you can enter data into a single file, and with everything in one file, capacity analytics such as measure of delays, queues, etc. can be performed based on equations. Signals can also be optimized in networks. You're basically looking at minimizing delays and stops and that's what Synchro allows you to do."

Albeck also concurs with Braidwood about the ROI from such software. "Based on an average investment of around US\$160,000 over three years, using Synchro plus SimTraffic can pay for itself

in an average of 53.8 days, equating to an ROI of 1,628%. Making engineering staff more productive results in direct savings. When developing signal timing plans, they know that Synchro is at worst a very good start. Ultimately, though, they'll rely on gut engineering to implement and fine-tune and adjust timings accordingly."

GLOBAL PRESENCE

If there is such a thing as a stalwart in the software field, few would argue against it being TRI's TRANSYT (Traffic Network Study Tool). First developed around 40 years ago, it is now on its 13th incarnation. Similar to Synchro, it allows users to study and optimize traffic signal timings, but unlike Synchro – which for the moment is right-hand drive only – TRANSYT can be used globally (it's also metric and imperial). "Version 13 has been massive for us," says TRI's Gavin Jackman, head of software, who feels the new GUI deserves special mention. "It's a much more intuitive way of entering data, managing files and visualizing results," he says. "TRANSYT is most commonly used as a network tool, but totally adequate for isolated junctions, too. It's also very good at signalization of roundabouts, which I'm sure the USA will move on to following its roundabout revolution. Most, if not all, consultants in the UK have it or have used it – in fact, very few do not." The software is being used and sold all around the world, from Malta and Korea to Australia and Canada. "We've also established educational programs for it to be taught in Denmark, Iran, Sweden and Poland, to name a few."

THE GREAT ESCAPE

Another software package from the USA is Cube from Citililabs, Version 5.1 of which was recently launched. Further details are provided by the company's regional director, Keith Hangland. "The important



SimTraffic simulates signalized intersections, unsignalized intersections (including roundabouts) and the interaction that occurs



"The cost of modeling is a small outlay to be sure that you're going to be getting the best return on your investment"

Richard Braidwood, managing director, Braidwood Associates, Scotland

thing to understand about Cube is that it's a modeling framework," he says, "so it allows you to plug in lots of different types of models and integrate them. It then provides you with an easy-to-use interface for the planner to create test scenarios."

Cube feeds off – and feeds data back into – a central GIS repository, which Hangland says has really been a central theme to its development. "As a traffic engineer, you can have other people develop the data so you typically have a GIS group that's maintaining the current conditions of the roads in the network. Transport modeling groups tend to be one or two people, while GIS groups will be six to 12 people. Being able to leverage these resources allows the modeler to focus on the model, and not worry about aspects such as the base case network being up to

date, and so on – the types of administrative minutiae that go on in terms of simulation."


Avenue is one of several tools within the Cube software suite, and brings dynamic traffic assignment to the package, allowing for the analysis of a wide range of traffic management and traffic operations improvements, such as vehicle information systems and other ITS technologies. "It's a solution for regional traffic simulation; the big difference is microscopic versus mesoscopic," Hangland explains. "With regional traffic simulation, we don't have the data requirements of a micro model. You can literally develop these models in as little as a few days and for an entire city. The model itself is capacity-restrained, allowing traffic to dynamically react to delays that develop on the network. For instance, if you're checking out at the grocery store and you see a queue building up in one line, you can move to another line. It's doing this on a regional scale, so if you're driving into work and suddenly you see a back-up, you would probably deviate from your original route – and that's what Cube Avenue allows agents and the modeler to do. Some

A model-based approach

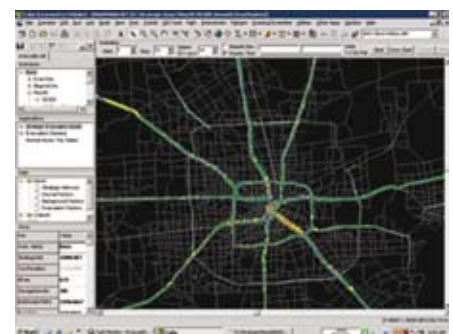
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ttendees at the TRB Annual Meeting in Washington in January had the opportunity to experience the added value of PTV's model-based approach for enhancing real-time and predictive traffic information. The Karlsruhe, Germany-based company reported its development of a large-scale transportation model for the greater Chicago/Milwaukee area. The PTV TrafficPlatform uses this model, combined with online data, for the calculation of traffic volumes and forecasts. The experience gained from the Validate traffic model implemented in Germany has been key in this instance.

Another novelty is the use of the simulation software VISSIM as traffic management laboratory, which is used to generate traffic data normally provided by



a TMC. As a result of this, it is possible to provide online processes with genuine input data for data completion and forecast, which enables analysis all kinds of traffic scenarios. The results of the procedure are immediately compared with the simulation data calculated in VISSIM.



Citilabs evacuation model can be applied to compare the relative system and evacuation corridor performance of alternative policy scenarios



↑ Trafficware's 3D Viewer 7 allows you to create 3D scenes directly from SimTraffic, creating realistic views of traffic environments



↑ Synchro 7 adds a list of new features such as the ability to visualize full geometric layouts within the software package

models don't have that kind of capability, especially at a regional scale. So, we're looking at every facility, every intersection, every junction across the region, and all the people traveling within it have their assigned destinations that they're trying to reach, either maximizing utility or minimizing the cost of getting to that location. And it's taking place dynamically, so the agents in the model are changing their behavior based on the network conditions."

Avenue was recently utilized by the Houston-Galveston Area Council, the Texas Transportation Institute and Citilabs to develop an evacuation model for the Greater Houston area, in part as a response to the evacuation experience of Hurricane Rita. The focus of the simulation was on queue phenomena, so the algorithm is especially suitable for analysis of evacuation events

such as Rita, in which large portions of the transportation system experienced excessive, near parking-lot, density levels and queues.

"The Houston model was interesting for two reasons," Hangland continues. "Firstly it's an enormous city and secondly it had an actual dynamic network, the reversible HOV lanes." In reality, he adds, there's not really a lot of evacuation planning that looks at an operational level – in fact, to his knowledge, this is one of the first case studies where it's been done on this kind of scale.

The Citilabs man also observes the GIS community looking at models more and more. "We've actually sold software to folk over in Silicon Valley so they can model earthquake scenarios. I guess it's pretty likely that in the next 20 years there's going to be a catastrophic one, so people are starting to seriously consider how long it will take



"Our task is to bring all the players to the table – not just the modeler, or the GIS person – but also the operations planner"

Keith Hangland, regional director, Citilabs, USA

More links for TRANSYT

TRANSYT 13, TRL's offline program for determining and studying optimum fixed-time coordinated traffic signal timings, now has a link to TSS's Aimsun as well as PTV's VISSIM. The addition of the TRANSYT-Aimsun link brings similar benefits to that of the existing VISSIM link, providing an efficient way to optimize the signal settings in an Aimsun area-wide microscopic model using TRANSYT 13. "By automatically communicating the signal settings between the two programs, the new link removes costly data input time and reduces substantially the chances of inputting rogue data," says Gavin Jackman, TRL's head of software. With these links, is TRL therefore bringing yet more functionality to the products of PTV and TSS? "We're aiming to improve the results that

microsimulation will give you," Jackman says. "Most microsimulations are built at the moment for future planning scenarios, and therefore the volumes of traffic are forecasted volumes and approximations, or possibly based on real life. But your model is only as good or accurate as you make it, so you have to do all the calibration, the validation, and everything else. All we're trying to do is ensure models take a step up in the level of accuracy by making sure that you can have the best signal timings ever, relevant to the volume of traffic and amount of congestion you've got in your microsimulation.

"We've got a very strong relationship with PTV and TSS," Jackman concludes. "We actually sell our software around the world, but we also sell through TSS and PTV resellers, so it works nicely."

to get back to an operational level so folk can actually go back to work. It's not just how to react in the immediate aftermath, but also how the whole area functions if, for instance, I-80 (which carries 200,000 vehicles a day) doesn't exist anymore. Our task here as a technology provider is to bring all of the different players to the table and deliver a solution that supports all of them, not just the modeler, not just the GIS person – but also the operations planner."

CALIFORNIA SCHEMING

California is where a great deal of Richard Braidwood's attention has been focused in recent years. Working with Caltrans, for example, he has developed a freeway model of a section of the I-205/580 corridor and also a microsimulation traffic model for I-880. "We've been working on a number of CSMPs (Corridor System Management Plans) for Caltrans, which are being used to assess planned and proposed projects," he reveals. "We're now an established brand; it's five years since we were founded and we're firmly positioned in the USA, as well as in Europe." The company even scooped the British Chamber of Commerce Award for International Business, which Braidwood feels is a "benchmark of excellence".

In his day-to-day work, the Scotsman gets to grips with several of the leading software products, and having also worked for a few of the suppliers in the past he is in a special position to be able to provide an honest assessment of the state of play. "As experienced microsimulation modelers, we appreciate and recognize the need for new functionality in products, particularly as the use of ITS and the need to model it increases on the street, but ultimately there are some enhancements that could be made to existing functionalities. In most of the products, I could suggest something that could model a particular situation better." However, he says that's not necessarily a criticism – more of an acknowledgement that there is always room for improvement.

"The more you give users, the more they want," suggests Dr Alexandre Torday, technical director at Spain's TSS – Transport Simulation Systems. "We see this as a positive. We experienced this three years ago when Aimsun was just a microscopic simulator. We spent a lot of time working with user groups discussing microsimulation, but when we opened the box to macro, meso as well as integration between the three, customers' eyes were opened to a new world of possibilities."

VISUALIZE THIS

According to Brendan Hafferty from Forum8 Europe, the visualization functionality in some packages could be improved, so it's no surprise to hear him suggest his UC-win/Road can fill the void. "You can model any conceivable scenario you can think of that can happen out on the road, and then you can interact with it," he says.



"It's extremely photorealistic so you get a sense of being there, plus of course it's spatially accurate." Hafferty was recently contacted by Ourston Traffic Solutions, one of North America's leading roundabout design teams. "They were approached by the Wisconsin Transportation Authority with a view to seeing how roundabouts could be introduced within the state," he details. "Ourston designs roundabouts – they're highway engineers – and they could produce the drawings in AutoCAD format, but what they couldn't do was visualize them."

This was seen as key to allow Wisconsin's citizens to experience roundabouts within a simulated environment. "The average US driver cannot understand them, let alone navigate one," Hafferty says. "UC-win/Road not only provided this virtual reality experience, but also helped Ourston develop a range of training videos to show you how to negotiate them – long before they were even built! You can be standing on the sidewalk looking at it, looking at it from a building, looking at it from an aerial view, and of course in a car driving through it."

"Roundabout design has historically been a highly iterative process," suggests Simon Ayers from Savoy Computing Services, which recently collaborated with TRL Software to develop AutoTrack Junctions. "By linking TRL's ARCADY software with our AutoTrack, we've created a single interactive environment within which all the relevant design parameters are constantly updated, allowing the engineer to see immediately the effects of changes made to the geometry," he says. As a result, the iterative nature of the task has been removed, in doing so reducing the design time, improving efficiency and ultimately reducing cost.

"There's one good thing that's come from funding cutbacks," concludes TSS's Torday. "It's got people to start thinking a bit more intelligently about what they're doing. Instead of launching 20, 30 traffic simulation studies everywhere, they're just doing 10, maybe across a larger area with more consistency and perhaps better oriented to what they really want. This is really fortunate for us because people really start to consider the true potential of the tools. They're not just doing simulation for simulation's sake." ■

 **UC-win/Road is a tool for project visualization and consensus building for almost any type of road construction project**

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