INCONTROL ENTERPRISE DYNAMICS®

EDition

Enterprise Dynamics simulation news

This years WSC theme: Simulation: New Horizons

Agrotechnology & Food Sciences Group

Heidelberger Druckmaschinen AG

Enterprise Dynamics Business Partners

Nacco Materials Handling Group

Winter Simulation Conference'06

Special WSC EDition

Introduction

A word from the CEO

New Horizons

New Horizons is indeed a well-chosen theme for this year's event. Many new developments take place in the field of simulation. As software manufacturer we experience new areas of application both in industry and education.

In transportation for example we developed for Dutch Railroad a simulation based real time planning system integrated with the train management system of On-Air from Italy.
This brings simulation on board of every Dutch train!
At Schiphol Airport simulation is widely used in passenger flow, baggage handling, gate planning, security and border control, as well as in ground traffic management. Being separate applications, last year all applications are integrated in to one system SAMANTA, connected to the operational data base systems. Simulation evolved into an operational planning system, supporting many employees in their job to maintain and improve airport services.

In industry we see simulation in new areas such as sales. Heidelberger Druckmaschine AG, a world leader in printing machines, developed BizModel for their worldwide sales staff. BizModel reduces the elapsed time for proposal dramatically and automatically calculates the clients return on investment.
Nacco Materials Handling Corporation ordered one hundred licenses of a support system for their sales people in the Hyster lift trucks division.

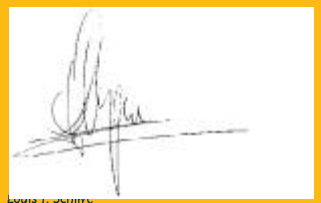
In education our youngest users today are 12 to 14 years old. In cooperation with the Dutch Ministry of Education we started pilot projects with high schools to use simulation as creative tool to stimulate children to choose more technical studies. This project runs under the challenging name KidsInControl.

All these and many other projects show that Enterprise Dynamics has become a generic -simulation based- software platform for the development of integrated business applications. Here we step away from most other simulation software vendors.

We see great potential for Enterprise Dynamics based applications, for our customers, for our partners and for our software.

Creating new horizons for all!

Kind regards,



CEO, Incontrol Enterprise Dynamics

Nacco Materials Handling Group

On November 13, Incontrol Enterprise Dynamics has been awarded the contract by Nacco Materials Handling Group (NMHG) for the development of the so called "NMHG Warehouse Manager".
This NMHG WM is a simulation based sales support application that will assist the sales managers in selecting the best mix of logistics transport equipment in a warehouse environment.

The NMHG WM reflects the layout of a warehouse, the processes in the warehouse and the movements of trucks in the warehouse with 3D animation.

Therefore the NMHG WM has the ability to:

- Create a warehouse layout
- Define racks with attributes length, width and height and section assignments
- Define trucks in accordance with NMHG specifications and routing networks
- Define personnel using NMHG data
- Define specified financial NMHG data
- Assign different pallets types and dimensions
- Define order structures, load and case specifications

The NMHG WM is used to analyze scenarios and will specifically focus on congestion areas. The tool calculates utilization and status distributions of trucks and personnel, the utilization of staging and racking areas, docks and other components of the facility, the movements of in and outgoing loads per day, cycle times, stock rotation and equipment cost.

The NMHG WM and Support Materials will be prepared in Hyster® and Yale® branded versions in both metric and imperial versions.

For more information about the **NMHG WM**, contact Jan Thiermann at jan.thiermann@enterprisedynamics.com

Content

Kids In Control as Creative Designers

Incontrol is already active in the educational sector for a long time. Universities and Colleges use the Educational Suite to educate students in simulation. But can ED also be used by children in the age of 10-14 years old?

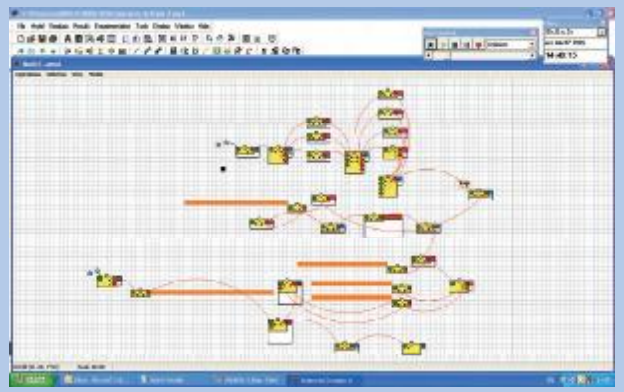
Job

Marlotte

To determine if simulation can be used by children in the age of 10-14 years old Incontrol has started a pilot project with two children. The children, Job and Marlotte, were asked to build a chocolate factory in ED. Goal of this project was to investigate if ED could be the right tool to stimulate the exact reasoning of children in the age of 10-14 years old. While exact subjects are not very popular at schools, exact subjects can stimulate the logic reasoning of children and at the same time it can help to create solutions for a wide range of questions. Simulation can be a stimulating educational tool for children to develop their exact thinking methods and a pleasant way to get to know logistical processes.

Job and Marlotte are both 12 years old and had no experience with ED until this project. They were asked to collect information about the processes in the chocolate factory before starting to work with ED. After a short introduction into ED and building a simple model, Job and Marlotte started building their own factories. With their experience in gaming and other computer programs the children got to know ED very quickly. During the process of building the model the children were discussing the processes in the factory. But they also encountered some mathematical problems while building the model.

At the end of two sessions of two hours they were both expected to have a working chocolate factory. In the factories all of the subsequent processes should be implemented; drying, burning and fermenting of the chocolate beans, mixing the ingredients, etc. Both Job and Marlotte had a working chocolate factory in ED after the two sessions. After finishing the building of the factory itself Marlotte started to work on enhancing the appearance of her model and Job started on improving the performance of his model.



Both children enjoyed working with ED. They were using ED without any child-friendly interface and had no problem working with the program for 2 hours. It was astonishing to see how they brought their knowledge into practice and did mathematics while working on their model. Incontrol will continue to see if ED can be implemented on schools to stimulate children in their exact reasoning.

For more information about **Kids In Control as Creative Designers** contact Jan Thiermann at jan.thiermann@enterprisedynamics.com

Agrotechnology & Food Sciences Group

ALADIN

ALADIN (Agro Logistic Analysis and Design INstrument) is a visual interactive simulation environment building on the Logistics Suite of the (object oriented) simulation package Enterprise Dynamics (ED). The application, developed by Wageningen UR, concerns a library of generic building blocks for modelling Fresh Supply Chains and Networks. Quality models for a range of fresh products are embedded in this library. These models describe quality behaviour, for example botrytis in strawberries or weight loss of bell peppers, under specified conditions (temperature, relative humidity, modified atmosphere, etc.). They incorporate parameters that reflect stochastic biological variations in product quality decay and are developed by experts in lab-experiments under controlled conditions. ALADIN adds the indicator product quality or product freshness (keeping quality and product waste) to classical performance indicators such as transportation costs, stock levels, and delivery reliability. In this way, ALADIN helps the decision maker, to trade off logistics costs and service (product quality and availability), when assessing specific (re)designs of the supply chain.

Figure 1: Screenshot of a model of a fresh salad supply chain.

Applications

- Redesigning supply chains. Comparing alternative distribution systems (e.g. new chain actors, different transport modes, warehouses, cross docking, shorter lead times, and different environmental conditions) for the export of fresh products such as peppers and tomatoes. ALADIN visualizes and quantifies the consequences of design choices for the remaining keeping quality of the product at the customer.
- Decreasing fresh product waste. Most outlets have significant amounts of product losses, caused either by passing product's best before date or by crossing other acceptance limits of customers, e.g. colouring, or loss of firmness. Product waste can be reduced in several ways. For example, by increasing the initial product quality, by applying chilled conditions at the store, or by changing ordering behaviour. ALADIN helps to analyze which type of improvement has maximum benefits (bottleneck analysis).
- Improving ordering policies for fresh produce. Because of its limited keeping quality ordering fresh produce means finding a balance between stock-outs and shrinkage. ALADIN makes the trade off transparent by estimating stock-outs and shrinkage on a daily basis from point of sale data and replenishment data. These results can help to find better ordering policies.

AGROTECHNOLOGY & FOOD SCIENCES GROUP
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Heidelberger Druckmaschinen AG

Sometimes it's obvious what investments have to be made in your company to improve quality, increase production or decrease costs. However, when there are many different options and when you're talking about an investment of hundreds of thousands of euros for a new machine, it would be nice to know in advance what the best option is for you so you can make the right investment decision. And when you can show well-founded return on investment figures to the bank, it is a lot easier to convince them of investing in you as well.

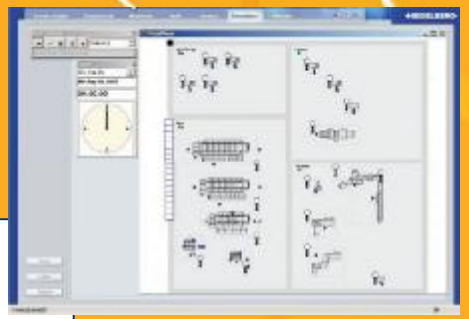
To help their sales representatives give the best advice to new or existing customers, the systemservice department of Heidelberger Druckmaschinen AG has developed a simulation tool for print shop planning called BizModel.

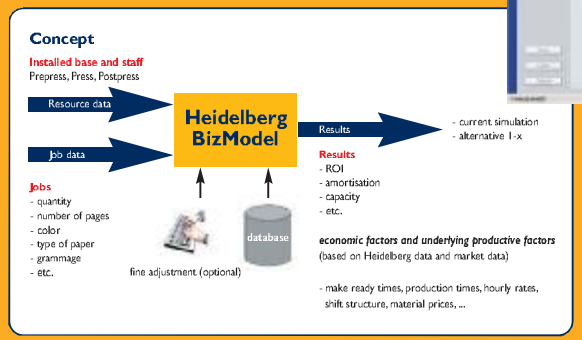
BizModel consists of an ED atom library and a front-end database. The atom library contains the resources (staff, buffers, machines) used in the different steps in the printing process, from layout design to finished products like folders or books. The integrated database features data such as make-ready and execution times for different types of machines, hourly wages of staff, shift plans, material costs and fundamental operating data such as costs for use of premises, heating and energy supply. Of course the more customer-specific all this data is, the more exact and valuable the results of the simulation will be.

The tool takes the actual situation within a customer as its starting point and delivers options for optimized print shop development with regard to technical and business-management aspects. It is capable of calculating business-related aspects such as return on investment and the payback time for an investment alongside technical values such as capacity and speed.

Simulation project in practice

As mentioned before, simulations typically start off by creating a model of the plant in its existing state on a scale plan of the building. Resources are added by drag and drop from the atom library. Data for staff (hourly rates and shift plans) and machine data such as make-ready, execution and maintenance times, downtimes and hourly rates are retrieved from the database.
Once the existing production environment is captured, customer-specific jobs can be simulated, e.g. for a month or a whole year, in several minutes. This first step is used to show the customer that the simulation represents the real situation accurately and it will give an impression of potential optimizations.
Depending on the results, following simulations can be done with a different (more efficient) way of using the current machine park or with the replacement of some of the machines by machines better suited for the job. The simulation shows the effect on total make-ready and execution times, maximum job capacity, operating costs, profitability of jobs, return on investment and payback time for the investment.
With this information from the BizModel team, the sales representative can show the customer the best solution and the customer can make the right investment decision. In addition, if the results of the simulation are positive, this can significantly improve a print shop's rating and therefore its bargaining position with banks when it comes to financing forthcoming investments.





For more information about **BizModel** contact Erwin Jongerden at erwin.jongerden@enterprisedynamics.com

Evaluation of pedestrian flows with PLATO

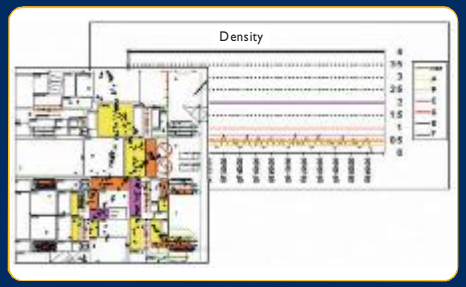
How long does it take to evacuate the building? Are the stairs wide enough to deal with the number of passengers? Where must we situate the ticket machines?
This kind of questions can be answered by modeling and analyzing pedestrian flows with simulation.

Simulation of pedestrian flows in large buildings such as airport terminals, train stations, sports arenas and exhibition halls in not new, but has gained more interest in recent years. The most important reason for this increase is the enormous attention for safety and security in these environments. Another ground why simulation of pedestrian flows rises is the comfort for the pedestrian and the awareness that the shape and layout of large buildings have a big impact on the efficiency of the flow. A third reason is that computers are getting more powerful. This computation power enables modeling of complex environment with many thousands of people on a sufficient detailed level.

PLATO

Incontrol Enterprise Dynamics developed the Pedestrian Logistics Analysis Tool (PLATO) to simulate and analyze pedestrian flows, crowding and congestion. PLATO is an entity based pedestrian simulation tool, based on the software Enterprise Dynamics. Each individual pedestrian is modeled as a single entity that flows through a queuing system and has its own characteristics such as origin, destination, preferred walking speed and routing.

The goal of PLATO is to provide information about densities in areas (persons per square meter), flow volumes (persons per width per minute) and transfer times, both in normal operation and during evacuation scenarios. These performance indicators are influenced by the flow of the pedestrians: where do they go, which route do they take and how fast do they walk. Destinations, routing and speeds are influenced by the densities in the building. Pedestrians make routing decisions to avoid crowded areas - if possible - and individual walking speeds are reduced in crowded spaces according to speed-density relations.



PLATO has a two-layer concept for the routing:

- The facilities in the layout (such as desks, ticket machines, shops and exits) are in the Functions layer. In this layer, high level routing, pedestrians decide what will be the next destination.
- The Transfer layer consists of the transfer network, containing elements such as walking areas, stairs, elevators and passages. At this level pedestrians take low level routing decisions: how to go to the next destination.

The resulting densities in the building are directly visible in the model animation: color indicators show the degree of occupation in each area of the building. For analysis PLATO collects data about areas, screenlines and queues during simulation runs. This data is used for graphical representation and comparison with standards and service levels.

Results of PLATO are used to evaluate existing infrastructures and new designs and to analyze whether investing in new equipment, redesign or rerouting (for example by signposting) is necessary to meet the requirements. PLATO has been applied already with success in:

- Railway Stations
- Airport Terminals
- Exhibition buildings

For more information about **PLATO** contact Simon van der Weij at Simon.van.der.Weij@enterprisedynamics.com

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We provide software products, support and training in close cooperation with our Partners.
Our services also include project development and implementations on a global scale.

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How to manage gate capacity at Amsterdam Airport Schiphol

Amsterdam Airport Schiphol is one of the largest European hubs. Currently, Amsterdam Airport Schiphol handles over 40 million passengers annually. For the next years, the airport foresees a further increase in traffic. To accommodate this traffic, Amsterdam Airport Schiphol capacity managers are using Samanta to assess bottlenecks, to optimise available capacity and to determine the capacity requirements in the future.

Contact information

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Marlies van Leeuwen
(marlies.van.leeuwen@enterprisedynamics.com) is consultant at Incontrol Enterprise Dynamics. She is co-developer of the Samanta modules GateCapacityManager, PaxSim and PaxBaxGenerator. She also implemented several passenger flow models and the Gate Planning Manager at Amsterdam Airport Schiphol.

1.1 Simulating Airports

Airports have experienced a rapid growth over the last decades with yearly increases in number of flights, passengers and traffic. As a result, airports become more and more congested and from time to time capacities may seem to be insufficient.

At terminal level this may lead to passenger dissatisfaction due to delays and waiting times at check in counters, passport control and security checks. Outside the terminal, aircraft punctuality can become lower, due to delays at airports.

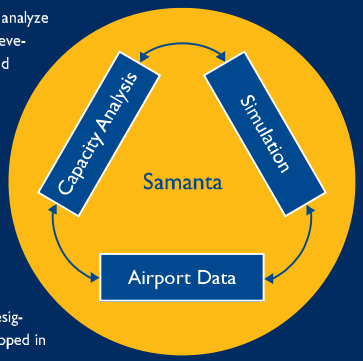
Accordingly, long term investments in airport expansions or improvements have to be made. These in turn require a solid support to determine the required capacities, such as the number of check in counters and security controls, the sorting capacity of a baggage handling system, and the number of gates and remote aircraft stands.

At the same time, the daily operations have to be controlled and anticipated for in the best possible way to account for peaks and bottlenecks. Insights in and quantitative support for operational improvements are thus required. Samanta is being developed with exactly this in mind: a powerful airport simulation and capacity management tool, that can analyse parts of an airport, but if necessary even entire airports.

1.2 Samanta

Samanta - Simulation Application for Modeling and ANalysis of a Total Airport - provides quantitative insight in the current and future capacity requirements, while maintaining a high service level and minimizing the cost. Samanta can evaluate individual airport processes, but also the relation between different processes.

Samanta can be used to validate and analyze long-term developments, and assess bottlenecks, capacity allocation and personnel planning issues in day-to-day operation.



Samanta is designed and developed in close cooperation between Incontrol Enterprise Dynamics and Amsterdam Airport Schiphol.
Samanta contains a database with airport data including a flow generator for passengers and baggage. The data can be analyzed used for capacity management purposes, for instance to compare the available capacity with expected flows. The same data can also be used in simulation models. The results of simulations are often more detailed than static analyses and provide a better understanding of interacting processes. The results of simulations can be stored again in the airport data, and exported to graphs for further analysis and presentation purposes.

1.3 Samanta GateCapacityManager

Is today's infrastructure sufficient to facilitate tomorrow's flights? Is it possible to use the existing infrastructure in a more efficient way? These and more questions can be answered with the latest developed module within Samanta: the GateCapacityManager. The tool is not a day-to-day gate planning tool, but is used for analysis of current and future gate capacity.

Joyce Groot, capacity manager at Amsterdam Airport Schiphol, started in the Summer of 2006 with the GateCapacityManager. The operational Gate Planning system is too complex to quickly evaluate changes in planning rules. The Samanta GateCapacityManager is an easy to use gate allocation tool that gives insight in the required number of gates and remote positions, now and in the future.

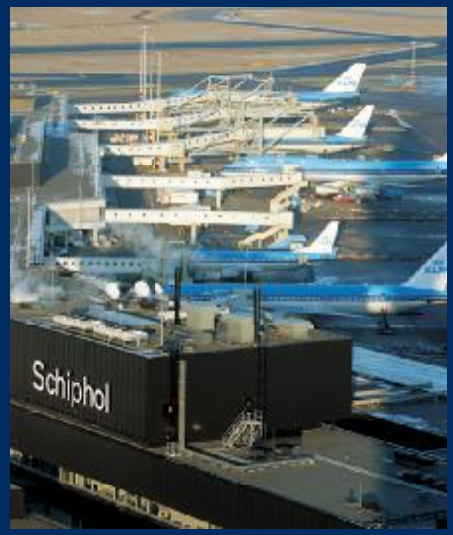
1.3.1 Objective

The GateCapacityManager has been developed in close cooperation with Amsterdam Airport Schiphol. The GateCapacityManager supports Amsterdam Airport Schiphol in decisions about the capacity of gates and remote aircraft position (stands) and the use in daily operation. Decisions about extensions, adjustments and other use of stands can be supported at different levels:

- Strategic decision making on the long term (5-20 years), for example decisions about new piers and platforms, allocation of carrier segments in certain areas.
- Tactical decision making on mid term (1-5 years), for example decisions about investments in extensions or adjustments within the current infrastructure. Or analyzing the impact of changes in allocation rules.
- Operational decision making on the short term (0-1 years), for example a quick analysis of the season forecasts, influence of work on the platforms and of disturbances in the operation.

1.3.2 Benefits for Amsterdam Airport Schiphol

- Optimization of internal processes without expensive investments in capacity extension.



- Possibility to decide about just-in-time investments in capacity. Investments can be done when it is really required, this will keep the visit costs as low as possible.
- Possibility of integral analysis by using the GateCapacityManager in combination with already existing baggage and passenger simulation models.

To realize reduction of visit costs, Amsterdam Airport Schiphol wants to accommodate a growing number of aircraft movements while minimizing the investments in gate capacity. This requires an efficient management of airport processes. Design and use of infrastructure is an important issue! The GateCapacityManager makes it possible to analyze these capacity issues in a quick and easy way.

1.3.3 How the GateCapacityManager works

The GateCapacityManager makes use of a flight schedule for a certain day and the available capacity of stands. Based on a user defined rule set, the GateCapacityManager assigns the flights to the available stands. It evaluates all rules in priority order (requirement, preference, avoidance) and assigns flights to stands with the highest possible score. The resulting gate planning can be represented in a Gantt Chart or in Excel graphs. The GateCapacityManager works together with other Samanta modules like the PaxBaxGenerator and the passenger simulator PaxSim. This makes is possible to evaluate the influence of a certain gate planning on passenger and baggage flows. ▶

1.4 Other Samanta Modules

Samanta is an airport simulation and capacity management application. The GateCapacityManager is one of the Samanta modules. Amsterdam Airport Schiphol is also using other modules. The modules can be used independently, but also in combination with each other. This means that the results of the GateCapacityManager can be used directly by - for example - the passenger flow models (Paxsim module) and the baggage system and process models (Baxsim module).

Samanta will be developed continuously. The next generation will be based on the current concept. Current modules will be enhanced, and new modules will be developed. This will lead to a total airport simulation and analysis tool where all the conceivable processes can be investigated.

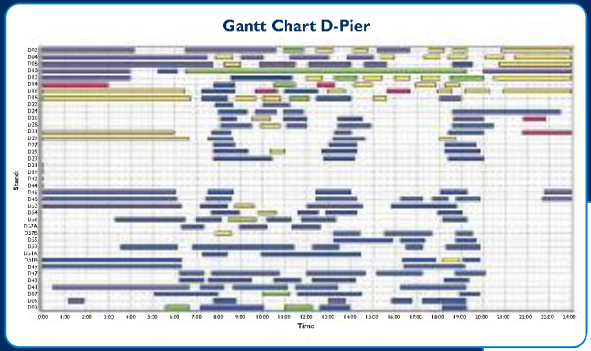


Figure 1 Gantt Chart

Figure 2 Simulation overview (2d animation plotted on airport map)

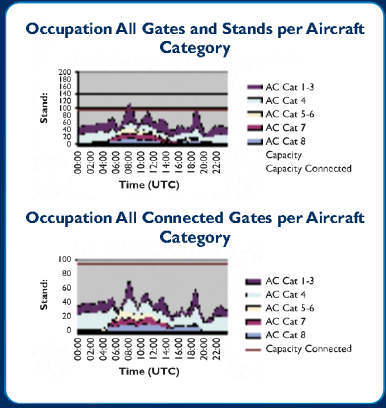


Figure 3 Graphical overview of results in Excel

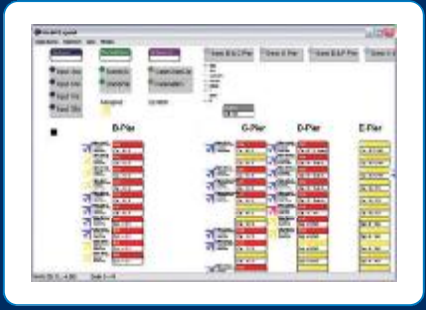


Figure 4 Simulation overview (simple 2d animation)

Showflow

It's all in the box

2006 has brought several new applications to benefit from ShowFlow. Early in the year we developed a comprehensive model for an insurance company contact centre. They wanted to merge two centres and needed to determine what level and skill grade of staff would be needed at the conclusion of the re-organisation. The model produced the answers needed. Later in the year, we did more work for the same company, this time modelling the flow of clerical work in an off shore back office operation.

The rest of the year seems to have been taken up by conveyors of one sort or another. At the beginning of the year we produced a model of an overhead conveyor for a US paint shop, then since then we have modelled five conveyor systems used in the manufacture of corrugated board for packaging. This work was carried out for the conveyor supplier, who freely admits that he has more than doubled his order book as a result of showing his proposals in a model.

In one instance, a completely new model was produced in less than 8 hours, to the astonishment of one of his customers. They have now purchased a ShowFlow licence, a great compliment to ShowFlow's ease of use and rapid model building!

We continue to be impressed, not to say astonished at the quality and ingenuity our customers have demonstrated in using ShowFlow, and we will be showing some of the results at WinterSim 06.

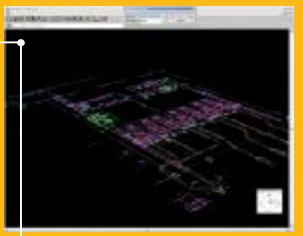
Another recently completed task has been the production of a book "Get the Best from ShowFlow" which is a compilation of all the tips and tricks we have learned since the release of Taylor II in the early nineties. This book will be available before the end of the year – it has over 260 pages of useful information and over 80 really hot tips for the ShowFlow user.

ShowFlow continues to be the product choice for ease of use, intuitive model development and fantastic value for money. Its co-parentage with Enterprise Dynamics makes it an ideal introduction for companies who want a low cost introduction to simulation, but want to be able to deploy the experience gained to a more powerful product in due course without having to learn a completely new and different mindset.

You may be led by the low cost of ownership to assume that ShowFlow has limited capabilities, but this is simply not the case. We have used ShowFlow to model engineering production lines making almost every product under the sun, warehouses and distribution centres, car parks, food manufacturing, financial services branches and back office processing. In many cases the development time has been extraordinary fast, measured in days rather months.

While not making claims for virtual reality, ShowFlow's visualisation is superior to many other products with 2D with (or without) an imported background CAD drawing, isometric projection, also against a CAD background and full shadowed 3D animation.
ShowFlow has no optional extras – it is all in the box.

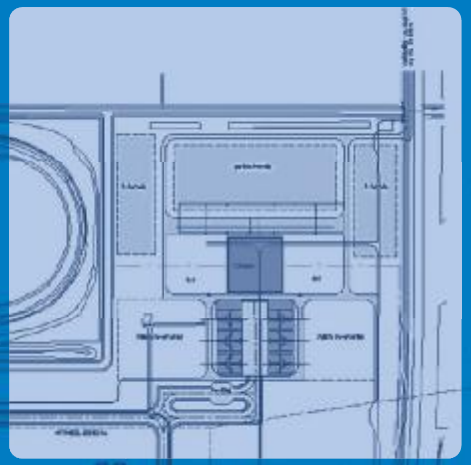
We are too modest to quote some of the things said of our support service, but let's say we are very happy that we are able to respond to customer modelling queries both fully and quickly, usually well within 24 hours.
As our customer base is on five continents that is no mean achievement.



For more information about **Showflow** contact Stephen Webb at SW@webbsystems.ltd.uk

Lelystad 'Simulated'

A simulation study of Lelystad Airport, The Netherlands, of future 2.5 and 4 million passenger scenario's.



Incontrol Enterprise Dynamics, in close cooperation with Dutch companies Frontier and ADECS, has built a simulation model of Lelystad Airport, member of the Schiphol Group. The simulation model includes all infrastructure like runway, taxiways, terminal, aprons and carparking.

The simulation was used to investigate the future 2,5 million (2010) and 4 million (2015) passenger scenario's and to determine possible congestion points on the airport, given the future layout of the airport.

The final results, a 'live' simulation of a busy day in the holiday season and the generated noise zone contour as a total year-result of the airtraffic within these scenario's, were presented during the Dutch Aviation Group Symposium held at Noordwijk (NL) on November 15, 2006.

Entirely new in the simulation was the use of the dashboard on which the 'running results' like waiting times at check-in & border control, apron-, runway- and carparking capacity were displayed during the simulation run.

For further information about **Lelystad 'simulated'** contact Jan Thiermann at jan.thiermann@enterprisedynamics.com

Dashboard

Lelystad Airport
member of
Schiphol Group

Simulation of traffic management with FRISO

Introduction

Due to the high occupancy rate of the Dutch rail network it is difficult to handle future transport demand by the introduction of more trains. It is a big challenge to design a feasible timetable and at the same time meet performance criteria e.g. punctuality and train delays. Possible solutions for capacity and/or quality bottlenecks are the extension of infrastructure capacity and/or the adjustment of the timetable structure. Besides those more common measures there is a third option that focuses on dynamic traffic management. These measures concern operational and planning issues such as increasing the level of flexibility in daily operation, e.g. by better decision support systems, and decreasing the level of detail in the planning stage. In order to quantify the potential benefits of these solutions, Dutch rail infra manager ProRail uses simulation on two levels of detail. To investigate performance countrywide, ProRail started testing the stability of timetables using the simulation model SIMONE (SImulation MOdel for large-scale rail NEtworks), a tool developed by Incontrol Enterprise Dynamics (see figure 1). For more local and more detailed cases (mainly concerning dynamic traffic management), ProRail asked Incontrol to develop FRISO.

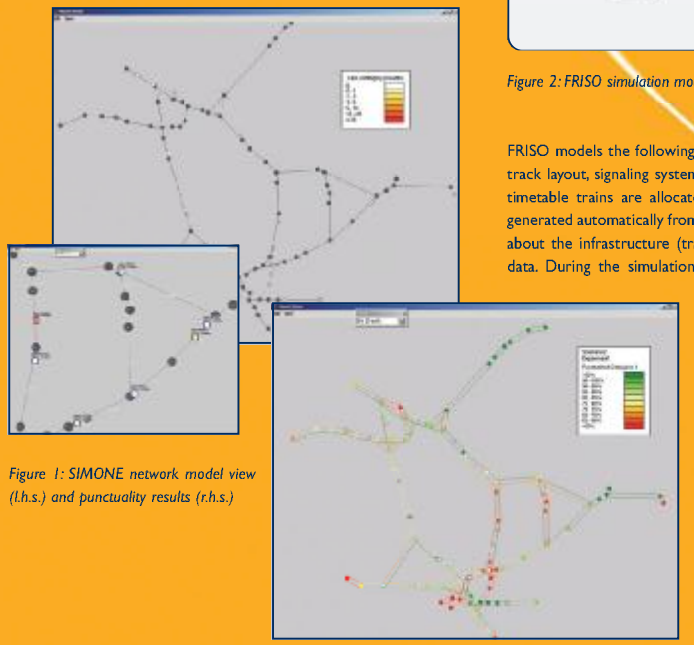


Figure 1: SIMONE network model view (l.h.s.) and punctuality results (r.h.s.)

FRISO

FRISO (Flexible Rail Infra Simulation of Operations) is a simulation tool that is used to perform simulation studies on a local and detailed level that quantify the potential benefits of solutions such as described in the introduction.

FRISO can be used to analyze the following research questions:

- Assess the robustness of timetables locally
- Analyze cause-effect relationships of delays in the area
- Compare and improve local timetables
- Detect and quantify bottlenecks in the study area
- Compare infra solutions
- Compare different types of control

Figure 2: FRISO simulation model of 's Hertogenbosch, the Netherlands

FRISO models the following elements of the railway infrastructure: track layout, signaling system, route setting, and interlocking. In the timetable trains are allocated to routes. The simulation model is generated automatically from a database, which contains information about the infrastructure (track layout), timetable and rolling stock data. During the simulation the trains run on the infrastructure, accelerating and decelerating when speed limits change. The execution of timetables can be disturbed by delaying starting trains, extending dwell times with an extra delay and varying acceleration and deceleration. The internal train management system handles the requests and setting of routes for trains. During the simulation a visualization of the simulation model can be viewed real-time. After performing a simulation experiment, the results can be viewed for instance as time-distance diagrams, histogram of arrival delays and train punctuality. ▶

The key feature of FRISO is its flexibility:

- FRISO is based on a general simulation language/tool called Enterprise Dynamics, which is used in a lot of industries. On top of the simulation engine Incontrol and ProRail developed a library of railway components. This allows for the extension of the FRISO with other (more) specific libraries.
- FRISO is build using object oriented programming. This makes it relatively easy to introduce properties of new other railway systems or to change existing properties, e.g. regarding the way the signaling is modeled.
- FRISO generates simulation models based on input from company databases, which, in combination with smart editors for making timetable and infrastructure variants, can reduce the time effort significantly. This allows users to spend most of their time on the definition of simulation experiments and the analysis of the results rather than on building (often manually) and validating the simulation model of a situation.
- FRISO has a number of edit functions, to change infrastructure, timetable and traffic control options (see figure 3). These functions will be enhanced in future versions with smart generators for signaling and interlocking elements and route definition.
- FRISO has the possibility to connect to other applications that may take over parts of the functionality

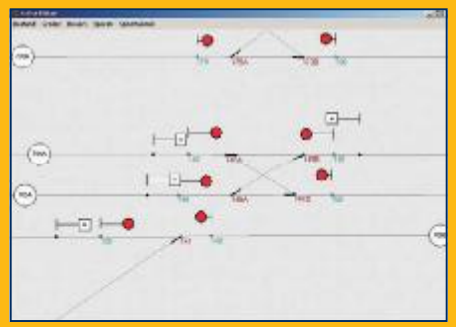


Figure 3: FRISO infrastructure editor

FRISO-TMS connection

A special feature of FRISO is the possibility to connect to an existing external traffic management system (TMS). TMS is designed to improve traffic control in a local area by means of advisory speeds, routes and order of trains. The general idea is that the TMS will improve the traffic performance by optimizing the situation on punctuality, energy consumption and/or throughput. Therefore it must be able take over internal FRISO train dispatching tasks and exchange information on the actual position and status of the trains with the simulator. The FRISO-TMS connection allows the effects of TMS-variants to be quantified.

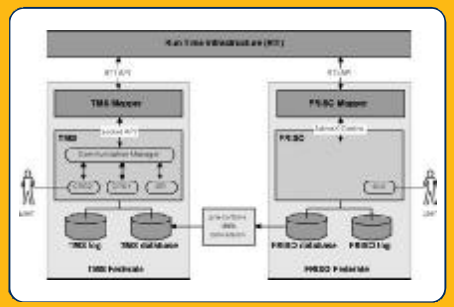


Figure 4: High Level Architecture of the FRISO-TMS federation

Connecting an existing functionality as the TMS to the simulator is a form of distributed simulation. The need for a control mechanism is high, due to the several components the simulation scenario contains. The most important issue here is Time Management. The FRISO-TMS connection uses an architecture (see figure 4) that enables the re-use and interoperability of simulation models, the so-called High Level Architecture (HLA). The HLA standard specifies interfaces between components and defines the steps for the development and execution of a simulation scenario. HLA contains synchronization mechanisms that allow consistent time management and interaction between the simulator FRISO and TMS or other applications. The applications in such a scenario are also known as federates. They form a federation and have to cooperate, communicate and synchronize mutual information. In the simulation FRISO informs the TMS about location and status of the trains, occupation of the infrastructure, allowed speed profile restricted by the signaling system and allocation of routes. The TMS returns advisory speeds, booking of routes and (later also) change of track allocation.

To translate messages of FRISO and TMS to HLA, mappers are used. These are connected to the so-called Run Time Infrastructure (RTI) based on HLA principles. HLA takes care of time synchronization, saving and restoring simulations and updating information. By using the mappers and HLA it becomes very easy to replace the TMS with another traffic management system or to replace FRISO with real life trains. The only modification needed then is to implement a mapper for the newly connected system, translating messages into HLA-messages.

Contact information

For more information about FRISO, the FRISO-TMS connection, or SIMONE, or if you want to know how we can help you with your challenge, please contact:

Joris Steneker
(joris.steneker@enterprisedynamics.com) is consultant and account manager Railways at Incontrol Enterprise Dynamics. He has been working in the field of railway simulation since 2005. His main focus is on the development of FRISO, FRISO-TMS and SIMONE.

Rogier Erdbrink
(rogier.erdbrink@enterprisedynamics.com) is consultant / simulation engineer at Incontrol Enterprise Dynamics. He has been working in the fields of railway, airport, pedestrian flow and call centre simulation.

For more general information about dynamic traffic management or the application of simulation in Railways please contact:

Dick Middelkoop
(dick.middelkoop@prorail.nl) is program manager modeling at ProRail Railway Development, The Netherlands.

New at IED

Incontrol welcomes new employees

Rogier Lezer studied Logistics and Economics at INHolland University in Haarlem. After he graduated, he started to work at Buena Vista Home Entertainment. At Incontrol, Rogier recently joined the Sales & Marketing department as Junior Sales Executive. Events where he has been working on are the Enterprise Dynamics Business Partner Days and the WSC'06.

Janis Britals has been appointed as **Head of Development.** Janis is an experienced IT manager & developer. Janis is responsible for the further development of ED into a new generic simulation based platform. His main focus will be on future developments, product extensions and renewal of our IT infrastructure. His team includes Markus Heukelom (lead engineer new platform), Matthijs Jongboer (Product & Partner Support) and Fred Jansma (ED & Showflow development)

Simulation model of 'Iran Khodro paint shop'

Iran Khodro (the biggest car factory in the Middle East) has a paint shop for repairing minor transport damages on the manufactured cars. The need for increase of production and services required better knowledge of the present capacity and capabilities of the paint shop.
A simulation model, build by Incontrol Enterprise Dynamics partner Simaron, proved to be very effective for a study of the complicated work and repair methods at the paint shop.

The simulation model was used to determine and optimize the service level of the paint shop and to determine and optimize the required number of human resources. Secondary, a number of workflow alternatives for the paint shop were generated in order to facilitate Iran Khodro's decision making process.

For more information contact: Soheil Mardani, R&D Manager Simaron Pardaz Co., s.mardani@simaron.com

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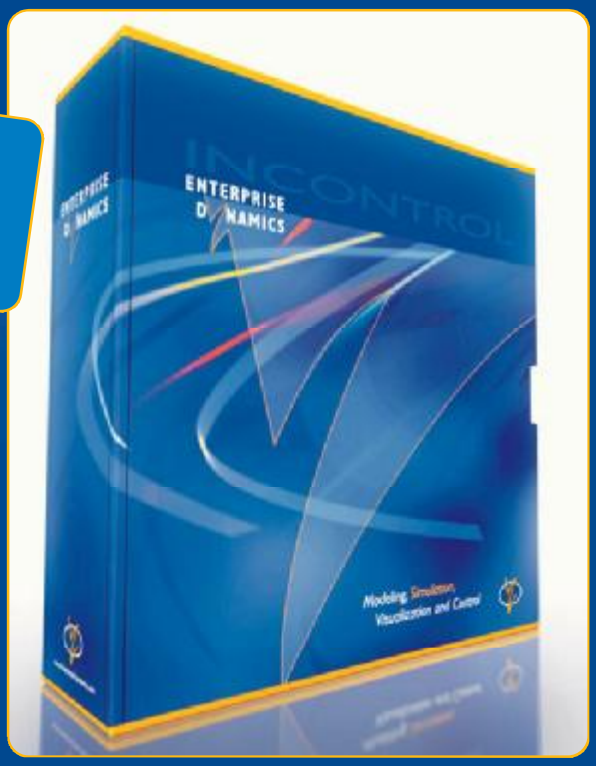

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