



# case studies

customer success stories from the paramics community

## Project

Göteborg Tunnel Simulation, 2006

## Organization

Swedish Road Administration

## Sector

ITS

## Highlights

- ITS
- System Integration
- Simulation
- Staff Development
- Simulation

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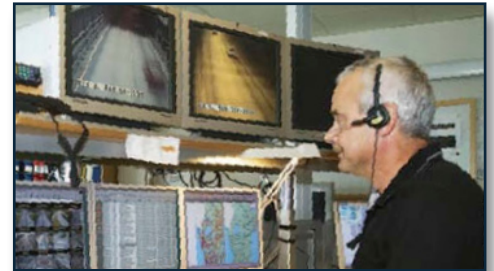
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## Göteborg Tunnel Simulation

The Swedish Road Administration currently has three major tunnel systems in operation in Göteborg; Gnistäng tunnel, Tingstad tunnel and Lundby tunnel. In 2006 the new Göta tunnel will also begin operation under large sections of central Göteborg. Some 300 000 vehicles will then pass through these systems every day. The Swedish Road Administration traffic information centre in Göteborg monitors the tunnel systems 24 hours a day. Training exercises are carried out continuously to ensure both staff competence and the operational security and stability of the technical system. One important element in this training is the tunnel simulator.



In 2003 the Swedish Road Administration carried out the first of a planned series of tunnel exercises. The exercise took place in the Lundby tunnel and aimed at studying what happens during the first 10 minutes of a car fire in the tunnel.



Experiences from the exercise clearly showed the importance of taking the correct measures during the first few minutes after an accident. These measures included steering smoke ventilation and barrier systems at the mouth of the tunnel and coordinating with the emergency services. Many behavioural science factors also play a part, such as leadership and decision-making, coping with stress and psychologist help offering support to colleagues after a serious accident.

The tunnel simulator, which has been in operation since summer 2004, is an important instrument to create realistic conditions to train these skills. A high level of staff competence can be maintained without causing disruptions in traffic that usually result from major exercises in tunnels, and routines for new objects can be developed and tested before they are introduced into the traffic environment.

The tunnel simulator technology is complex, with three computers co-operating to solve the task. A suite of specially developed applications, including Paramics, gives the operator the impression of real traffic and real events from all barriers, VMS signs and other hardware. Nevertheless, the tunnel simulator runs on off-the-shelf computer hardware. Even the intense heavy graphics are created using retail graphic cards.

The operator faces a graphical interface identical with the one used in everyday work. In this environment, the operator controls every aspect of the tunnel and training events, like re-routing traffic in case of an emergency or closing down parts of driving lanes due to maintenance.



The tunnel control system uses Intellution software. This application, the Central Steering System, is led to believe that real hardware exists, by the simulator core. The simulator monitors and records all events, which are immediately sent over the network to the next computer.

An event could be an operator setting a speed restriction or ordering a barrier to be lowered. The computer receiving these events controls the system's traffic network. In all, the tunnel simulation system uses three network-connected computers, using three monitors for displaying the traffic situation, just like in the operator's real work place.

To make the simulator fully interactive, vehicle traffic simulation is displayed on screen. The orders from the operator, such as speed restrictions, closed lanes etc, affecting the simulated traffic to the operator. The traffic is all generated using Paramics software from Quadstone. By using the Paramics API, SRA has embedded Paramics into it's own solution and by building of the tunnel and its vicinity in a 3D modelling tool a virtual version of the tunnel is created.