

Smart Freight Transport in Urban Areas

*Demonstration handout 13-14th –
OCTOBER 2010*

Introduction

The SMARTFREIGHT demonstration is a part of the SMARTFREIGHT Final Conference, held in Trondheim on 13-14th October 2010. The demonstration will show some of the new traffic and freight management solutions developed in the SMARTFREIGHT project. The demonstrated applications are:

- **Access control:** Based on the city policy and the vehicle properties (including its goods), vehicles are admitted or denied access to controlled areas in the city.
- **Tunnel management:** The tunnel is a controlled area with admission restrictions. Demonstrated here is the restriction on the maximum amount of dangerous goods allowed into the city tunnel at once. Approaching vehicles will either be directed through the tunnel, to a holding area, or around the tunnel. The Urban Traffic Management Centre (UTMC) can monitor the amount and type for e.g. emergency purposes.
- **Vehicle tracking:** The vehicles are communicating their position, making them traceable. The Freight Distribution Management Centre (FDMC) is also able to check which goods, and the goods properties, the vehicles are carrying at any moment.
- **Goods monitoring:** The status of the goods will be monitored through the communication between the goods (On-Goods Equipment, OGE) and the vehicle (On-Board Equipment, OBE). Any events will be sent to the FDMC.

The Trondheim test site

The applications are developed on top of the CVIS service platform, which is available in the ICT infrastructure provided in Trondheim. Trondheim provides a 2.5 km long road section with full coverage of CVIS equipped roadside stations with communication over CALM M5. The larger Trondheim area provides additional communication and ITS

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services. It serves thus as an attractive site for traffic and freight cooperative applications tests in a real environment.

Demonstration

Scenario

The demonstration starts at the conference facility in downtown Trondheim. The transport task is to move cargo containing ice-cream to the SINTEF premises, and then reload with new cargo containing dynamite before returning. Along the way, the vehicle must monitor its goods, pass a tunnel with restrictions, and otherwise obey to the city policies. Figure 1 shows the major events that will happen during the demonstration.

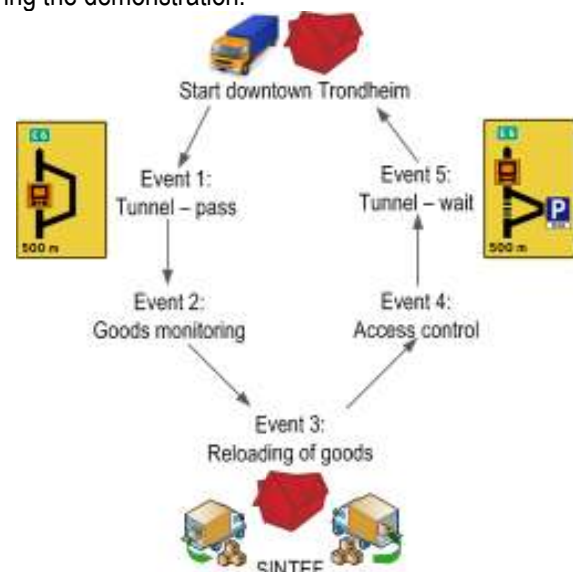


Figure 1: Demonstration events

Event 1: Tunnel – pass

After the vehicle leaves its origin it approaches a tunnel. Since the UTMC wants to restrict the amount of dangerous goods in the tunnel, the tunnel is restricted for a maximum amount of dangerous goods at a time. As our vehicle carries ice-cream, it gets no restrictions in the tunnel, and the local

tunnel controller (roadside station in front of the tunnel) allows our vehicle entrance.



Figure 2: Vehicle can pass through the tunnel

Event 2: Goods monitoring

Attached to the goods is hardware and software (OGE) for monitoring the goods condition, and communication with the vehicle's OBE. At this point, our ice-cream is experiencing a higher temperature, which is sensed by the attached temperature sensor. It alerts the OBE, which further will notify the FDMC. Any action can thus be taken for lowering the temperature.



Figure 3: OBE-view for detailed cargo information

Event 3: Reloading of goods

Reaching the SINTEF premises, the ice-cream has reached its final destination. Our vehicle will unload the ice-cream, which notifies the OBE since the OGE moves out of range. When loading new goods with OGE, the OBE automatically updates its cargo information. The new loaded cargo is

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dynamite, which is classified as dangerous goods and needs special attention. The vehicle will then continue to the dynamite's destination, which is back at the conference premises.

Event 4: Access control

The city of Trondheim has deployed a city wide access control, which informs vehicles where they can go and not based on their properties (including cargo). Controlled areas like green zones will have special requirements to e.g. emission, physical characteristics and cargo on board. In this case our vehicle carries dangerous goods, and will thus not be able to enter all controlled areas in Trondheim.



Figure 4: Restrictions for the controlled area Downtown

Distributed computation of the downloaded policy by the OBE gives all allowed and denied areas covered by the policy. The areas are marked on the driver's map with different colors.

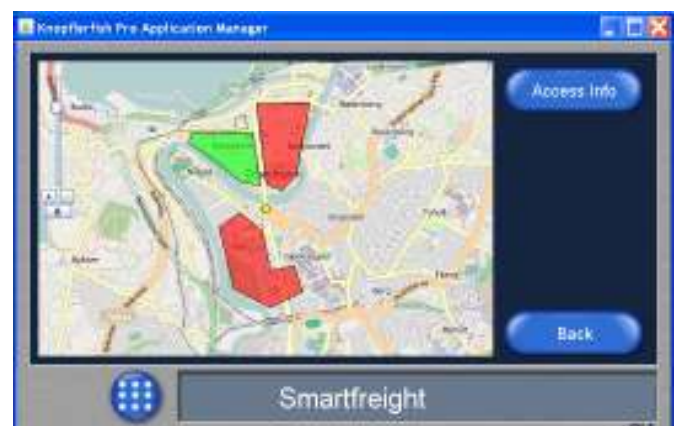


Figure 5: Map showing the driver the controlled areas

Event 5: Tunnel – wait

As our vehicle approaches the tunnel on its way back to downtown Trondheim, it downloads a tunnel management application which installs and starts on the OBE. This application communicates with the local tunnel controller about any dangerous goods currently present in the tunnel. Since there in our case is no room for our vehicle's dangerous goods, our vehicle must wait at the holding area in front of the tunnel. Its direction will be shown to the driver, which then will be notified again when the tunnel is available for entrance.

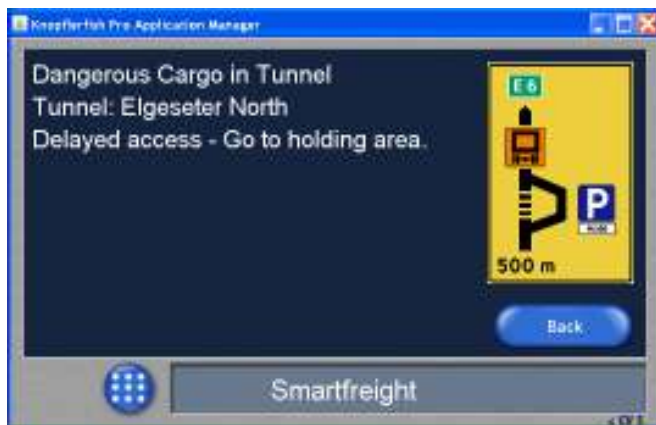


Figure 6: Vehicle must on holding area wait before entering the tunnel

The FDMC and UTMC view

While our vehicle drives from and back to downtown Trondheim, the back offices of the FDMC and UTMC can monitor any activity and events happening. In the demonstration, the views of the FDMC and UTMC are combined into a single view with information like:

- Vehicle information and position
- Goods information and condition
- Any dangerous goods present in the tunnel
- Controlled areas
- Event log

The back office will in addition show simulated vehicles moving and events happening to illustrate how multiple vehicle instances are handled.

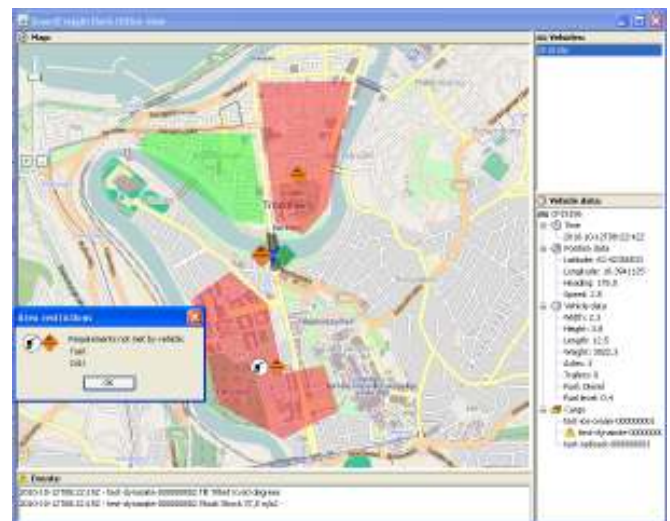


Figure 7: FDMC/UTMC view of vehicles, cargo and events

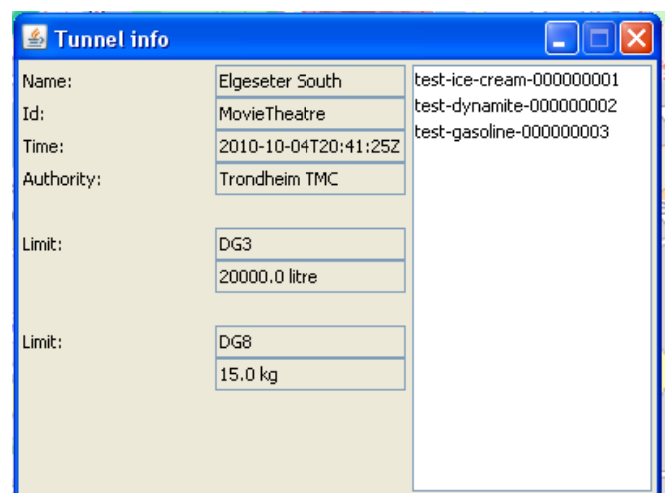


Figure 8: Tunnel information about DG present

Contact information

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