The INTRANS Concept
– Intelligent goods in transport systems

KMB Intrans

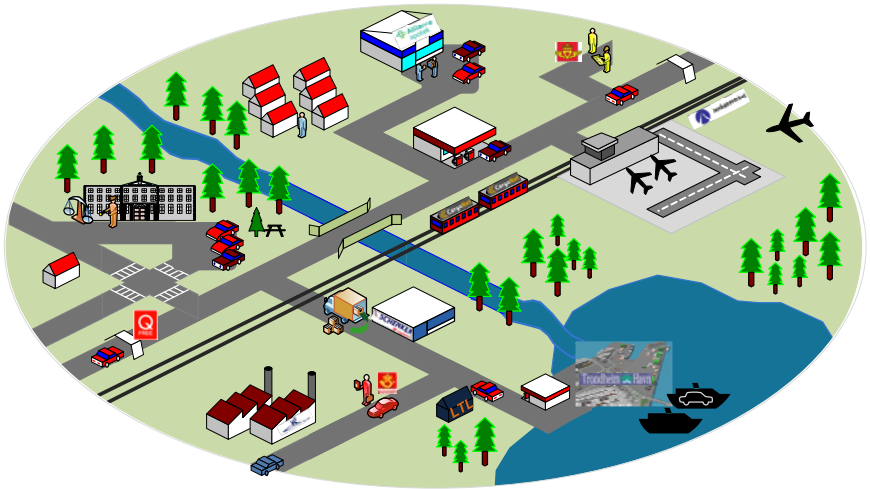
July 2008

Content

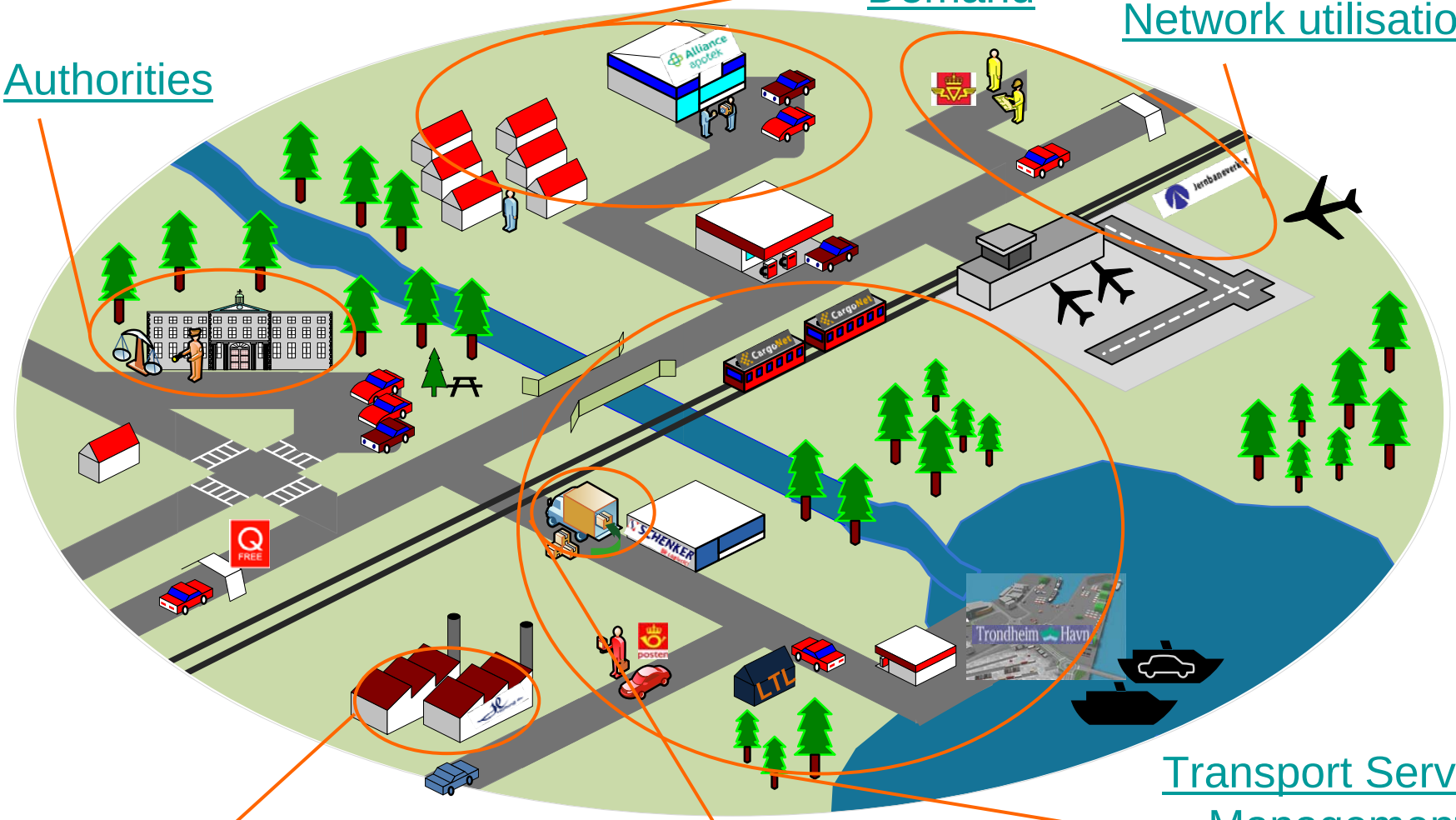
- The Intrans Vision
- The Intrans Concept
  - Key elements
  - Enabling elements
  - Results
- The Intrans Project
  - Key stakeholders in Intrans
  - Actors - Project participant’s roles/stakes

The INTRANS Vision

To enable a fully automated, multimodal and environmentally friendly freight transport system, where the goods find their most efficient way through the Supply Chain, based on information and communication technology, and advanced control models and decision support.



Intrans system and roles



Click on the different roles in the picture to see a more detailed description.

INTRANS in the Supply Chain

INTRANS Concept

The concept consists of the three areas shown below.

Key elements

Developing new solutions in these areas is the key to achieving the Intrans vision

Enabling elements

New solutions that need to be developed in order to exploit the opportunities of the key elements

Results

The results of employing the new solutions will be found in these areas

INTRANS Concept

Key elements

1) Intelligent and integrated goods and systems
2) Automated analysis and decision support
3) Unified and intelligent control models

Enabling elements

4) New processes
5) New cooperation models
6) New public information systems

Results

7) New services and business models
   → New value creation
8) Improved value chain performance
   → Efficiency
   → Environment
   → Risk reduction
9) Improved safety and efficiency in transport syst.
10) Improved public sector decisions

Key element – No 1

Intelligent and integrated goods and systems

The intelligence embedded in the goods, i.e. the data storing capacity and the processing capabilities, will enable a seamless exchange of data between the goods, the Supply Chains and the Transport systems, and allow for automated decisions.

- Self-monitoring intelligent goods
  - Sensor technology for environmental monitoring, e.g. temperature or humidity
  - Sensor technology for time and place (location) monitoring
  - Sensor technology for physical impacts, e.g. shocks
  - Alarms and warning messages from the intelligent goods

- Seamless exchange of data between the intelligent goods, the Supply Chain and the Transport system
  - Mobile and wireless communication
  - Open and standardized interfaces
  - Plug and play solutions
  - Read/write solutions for information stored on the goods

Key element – No 2

Automated analysis and decision support

Automated analysis and decision support will enable the goods to redirect themselves, take other actions when unpredicted situations arise, or send alerts and warnings when a human decision needs to be taken. The ultimate level of automated decision support is developing self-learning systems.

- Level 1 Online-operative
  - Online, automated decision making and support based on embedded mathematical/statistical processing
  - Alerts and warnings based on advanced surveillance and performance analysis
- Level 2 Tactical and strategic
  - Online, operative control integrated with tactical and strategic decision support through automatic data collection and model generation
  - Trend studies and development of new solutions
- Level 3 Self learning
  - Self learning systems that develop new decision rules based on analysis and trend studies

Key element – No 3

Unified and intelligent control models

Control models, in this case also including traffic and transport management, are the formal principles and rules for where and how to efficiently move goods and information through the supply chain. Advanced control principles and information technology will allow intelligent decision making in the transport system both for the stakeholders in the supply chain and in the transport system.

- Unified control models including traffic and transport management
  - Control models that are aligned across the supply chain and transport system
  - Control models that are described, visualized and communicated to all actors involved
  - Control models that are based on demand driven control principles

- Intelligent control models for better decisions
  - Automated control (decision making) based on embedded mathematical/statistical processing
  - Differentiated control based on characteristics such as product, demand profile and variability, customer etc.
  - Real time information
  - Lead and lag (“footprint”) performance indicators
  - Visual information display
  - Dynamic and ‘self-learning’ control

New processes

New technology enables improvements and changes in physical and information processes. The Intrans concept requires a change in existing processes, and a set of new processes in the transport system.

- New and improved physical processes
  - Process automation
  - Automatic replenishment
  - Fail-safe technologies based on sensor systems
- New and improved information processes
  - Improved and easy access to information carried by intelligent goods moving in the transport system
  - Track and trace: Transparent real–time track and detailed footprint trace
  - Real - time interventions between parties

New cooperation models

The merging of goods, technology and electronics in the transport system will enable and require a new set of collaboration and cooperation models between the actors in the chain.

- Possible new actors, providing services enabled by intelligent goods
- Changed roles and responsibility between the existing actors
- Coordination and orchestration of flows and processes in non-hierarchical networks
- A shift in contract types and new set of incentive mechanisms and motivation

New public information systems

The Intrans concept will enable improvements in the public information systems related to transport and supply chains.

- For the authorities and infrastructure owners: national and global transport volumes and needs estimated more accurately, enabled through
  - Track and trace
  - Open and standardized interfaces
- For the actors: Integrated and shared information (historic and predicted) available to all actors in the value chain.
- For the public: Real time information on traffic flows, queues, etc. of general interest to the public (e.g.. private car drivers, passengers, etc.)

New services and business models

Information technology enables innovation of new services and business models allowing value creation as availability, accessibility, speed, standardisation, etc.

- Services offering information access, visibility and visualization to consumers and supply chain participants
- Flexible and customer specific services not depending on human resources
- E-based business models where information and ICT will be used to replace traditional processes
- New business models and new functionalities will call for development of new roles in the supply chain and the transport system

Improved supply chain performance

Intelligent goods and systems will result in improved supply chain performance, through efficiency and effectiveness improvements on several areas.

- Reduced environmental impact
- Reduced costs, through optimised utilisation of equipment, improved supply chain control and reduced human involvement
- Reduced risk and increased flexibility
- Increased capability to deliver products and services with short lead times
- Improved safety

Improved public sector decisions

Based on the improved insight in actual flow of goods and future demands, the public sector will improve its decision making regarding investment, upgrading and downgrading as well as maintenance of infrastructure

- Access to new and more accurate information, will lead to more informed and improved decisions on infrastructure development
- Better information will form a coherent picture of the transport network consisting of the different transport modalities and their interdependencies.

Key element – No 1 **Intelligent and integrated goods and systems**

Detailed description

The intelligent goods will be moving objects in the Supply Chain and the Transport systems. The goods intelligence, i.e. the data storing capacity and the processing capabilities, will enable a seamless exchange of data between the goods, the SCM systems and Transport systems. The communication will be based on wireless communication technologies, e.g. Dedicated Short Range Communication (DSRC) or Near Field Communication (NFC). The communication will take place both when the goods are stored, and when they are being moved. It is of major importance that the interfaces are open and based on international or European standards (ISO and CEN), or global industry standards, e.g. the EPC global standards. The open and standardized interfaces will enable interoperability as well as plug and play solutions for the equipment fixed to the goods and the external equipment communicating with the intelligent goods.

The intelligent goods equipment will probably be a family of different types, providing different levels of functionality, different types of internal and external sensors, different types of communication and different levels of security. As a minimum the intelligent goods should provide for reading and writing information in a secure way.

One of the main features of the intelligent goods will be to monitor itself. The monitoring will be based on information stored in the intelligent goods, the information received from internal and external sensors and information received from external equipment communicating with the goods. Different types of sensors being connected to the intelligent goods equipment are foreseen. Examples are sensors measuring environmental attributes like temperature and humidity, sensors measuring location, e.g. a GPS sensor and sensors measuring physical impacts like an unintended drop of a pallet. It is foreseen that the intelligent goods equipment will be able to send alarms and messages either automatically or on request.

Back to main presentation

Key element – No 2 **Automated analysis and decision support**

Detailed description

Automatically directed goods, or self controlled goods on the path to its destination, could be seen in the future. Automatic decision making could enable the goods to follow a pre-set path, and also to decide to be redirected onto a new path when certain situations arise. Such situations could be the goods accidentally being located off its original route, delayed according to its original schedule, or damaged in some way. In addition to the goods being able to redirect itself in unplanned situations, automatic decisions could be made for other goods to be set into movement if needed, e.g. as replacement.

Also real-time information and automated analysis of the conditions in the surroundings of the goods, like the traffic situation or inventory demand situation elsewhere, could aid the automatic decision making en route. When appropriate, early warning alerts could be automatically emitted based on deviating situations regarding the goods' position and condition, supporting the operators in their strive towards taking the appropriate actions.

The new available footprint information, in combination with decision support tools, could also aid on a tactical level through automated, optimized routing and scheduling of goods through a network, as well as aiding the planning of the capacity of the network including terminals. This would require automatic data collection and generation of models in order to speed up the decision making process.

The ultimate level of the decision support is to develop self-learning systems. This implies that data regarding decisions and their effects are collected continuously, and monitored in such a way that future decisions might be improved from today's.

Back to main presentation

Key element – No 3 **Unified and intelligent control models**

Detailed description

For the supply chain to be able to exploit the opportunities provided by the new technologies, a unified control model that is described, visualized and communicated to all the actors in the transport system is needed.

In order to meet customer expectations, efficient demand driven supply chains are required. This implies that real-time point of sales data, combined with forecasts on demand from end-customers, are shared with all echelons upstream the supply chain.

By applying automated control (mathematical/statistical processing) based on these data, more optimal decisions will be made, provided that the set criteria and rules are valid. In addition human resources will be freed to make better decisions on a strategic level, or to take decisions that are too complex or too rare for automation. More complex calculations, relating to for instance risk management, can also be applied in the automated control system, and should be differentiated based on characteristics such as product (critical, high value etc.), customer (strategic importance), and demand profile and variation (seasons, volume etc.).

By using self-learning control systems (described under Key element - No 2) decision improvements will be made without human influence, through a quantitative manner that not easily can be achieved by individuals.

Back to main presentation

Enabling element – No 4 **New processes**

Detailed description

There will be an new set of processes enabled and required by Intrans. On the one hand Intrans will transform physical processes of goods handling, and on the other hand it will develop new information handling processes.

The goods intelligence will make it possible to move and place goods at any time, and without human decision making. This will allow for a higher degree of automation, but also requires physical handling systems allowing automation of previously manual processes.

Intrans will also enable logistics flows that, to a much higher degree, are following the concept of automatic replenishment, including allowing failsafe mechanisms based on sensor technology integrated as a part of the intelligent goods.

The information processes will be accessible along the value chain, allowing for real-time access, and enabling real-time interventions between actors in the value chain.

Back to main presentation

Enabling element – No 5 **New cooperation models**

Detailed description

The Intrans concept will enable and require a new set of collaboration and cooperation models between the actors in the transport system. These changes can involve the existing partner, but might also introduce new actors, providing the service enabled by intelligent goods. This is of course also linked to the new business models that might emerge.

Examples of new actors can be information service providers. Services provided for existing actors, for the public, or for customers.

The roles of existing actors might change. An obvious example is transport providers differentiating on fixed or flexible routes. Another possible change would be providing enhanced infrastructure related services.

Intelligent goods will require more real-time information on status, capability and capacity of the infrastructure, transport routes, transport facilities, customer requirements etc. This leads to a much tighter coordination and orchestration of the flow of goods and information, as well as controlling the processes. An additional challenge is the fact that this must be performed between actors mainly in a non-hierarchical set of networks.

The on-line decision making of Intrans requires a new set of contract types. These contracts should be based on a set of incentive mechanisms, and not require real-time contract negotiations. It is crucial that these incentive mechanisms reflect customer value more than internal aspects of the transport system.

Back to main presentation

Enabling element – No 6 **New public information systems**

Detailed description

Intrans will enable a new set of public information systems, to the benefit of different groups of the public sector.

For authorities and all infrastructure owner information service will be available about historic and future transport flow and demands, as they can be based on actually counting the flow of goods, and not counting the number or trucks or other transport units.

Intrans will also enable the authorities to provide an enhanced infrastructure information system. Through this the general public, like private car drivers, passengers in all public transport etc, will be able to access real-time information. Thus, shifting of routes, change of transport means etc. will be applicable to a much higher degree.

All actors in the transport system and supply chain, will gain insight in traffic load, demand, road situations etc. based on real-time information, allowing improved decision making, offering delivery guarantees etc.

Back to main presentation

Result – No 7 **New services and business models**

Detailed description

Electronic information captured from the goods moving in the transport system, and the associated systems supporting Intrans, will allow new services and business models. The core element in these innovations will be the utilization of information and ICT to introduce services as advanced search and monitoring solutions, complex combinations of products and services requiring a large network of actors, intelligent information and processing services. Value for the user of the services is created through the 24 hour availability, world wide accessibility, immediate response and high speed solutions.

The functionality of Intrans with access to advanced information and ICT solutions, makes it possible to invent new and more dynamic business models. More online and direct business models that will reduce the distance between the service user and the provider/supplier. Electronic call centers and virtual working environments are examples of more real time and direct business models.

Back to main presentation

Result – No 8 **Improved supply chain performance**

Detailed description

Intrans implementation will lead to improved performance in the supply chain as the solutions will influence all major criteria's

- Reduced environmental impact through
  - improved utilization of infrastructure
  - improved utilization of equipment
  - more demand oriented supply
  - less waste and lost goods
- Reduced costs through
  - optimized utilization of equipment
  - improved supply chain control
  - reduced manual processes
  - reduced human information handling
- Reduced risk and increased flexibility through
  - improved information visibility
  - improved supply chain coordination
- Increased capability to deliver products and services with short lead times
- Improved safety through
  - improved control of dangerous goods and traffic situations

Back to main presentation