Intelligent Transport System for Innovative Intermodal Freight Transport

Experience from the TelliSys Project and current ITS Projects

60th Working Party on Intermodal Transport and Logistics
Geneva, Switzerland, 23 November 2017

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Organigram
Research Areas

- Robotics and Automation
- Artificial Intelligence
- Human-Machine Interaction
- Internet of Things
- Agile Development
- Knowledge Management

Research Fields
Cybernetics Lab Aachen
Partners from Industry, Research and Development

UNECE 60th Working Party on Intermodal Transport and Logistics
Geneva | 24 November 2017
“Information is the oil of the 21st century, and analytics is the combustion engine” - Peter Sondergaard, senior vice president at Gartner
“At the end of the day, it's not about how much data you have, it's about how well you use it.” - Tjeerd Brenninkmeijer, CMSWire, 2013

“Data about data, or metadata, is growing twice as fast as the digital universe as a whole” - Gantz and Reinsel 2011
“Challenges occur along the multiple distinct phases of the analysis of Big Data” [Agrawal et al. 2012]

Challenges that underlie many of these phases

- **Scale**
- **Heterogeneity**
- **Timeliness**
- **Privacy**
- **Human Collaboration**
Content

I. Short Presentation

II. TelliSys Project

III. Trends and Conclusions
Intelligent Transport System for Innovative Intermodal Freight Transport

- Collaborative project funded by the 7th Framework Programme of the European Commission
- **Project Start**: 1st of December 2012
- **Project Duration**: 3 years
- **Total project budget**: 4,287,231 € (funded)
- Follow-up Project of Intelligent MegaSwapBoxes for advanced Intermodal Transport (TelliBox)
TelliSys Project
From TelliBox to TelliSys

- **Project aim TelliBox:**
  - Combining the advantages of existing loading units in one MegaSwapBox

- **Project aim TelliSys:**
  - Development of an intelligent intermodal freight transport system
TelliSys Project
Consortium and Advisory Board

Freight Forwarder
- GEFCO
  France

Research Facility
- RWTH Aachen University, IMA/ZLW & IfU
  Germany

Consultant
- Heiko Sennewald, Intermodal Consultant
  Germany

Manufacturer
- Wecon GmbH
  Germany
- Wesob Sp.z.o.o.
  Poland
- DAF Trucks N.V.
  Netherlands
- Goodyear
  Luxembourg

Association
- European Intermodal Association
  Belgium

Advisory Board
Objectives:

- Development of a complete volume optimized intermodal combination satisfying current market demands
- Enhance the performance of intermodal logistic chains and contribute to a more efficient transport by easing the transition between different transport modes

Innovation highlights of TelliSys:

- **Product-family of MegaSwapBoxes** for different use cases
- Next level **Super Low-Deck tractor** unit with 850 mm fifth wheel height
- **Low profile tyres** enabling the significant lower truck chassis height
- Lightweight **Trailer Chassis** to carry the MSBs
- Up to 100 m³ cargo volume while keeping the total system at 4 m height on the road
TelliSys Project
Concept Requirements

- A total of **21 interviews with companies from manufacturer, transport and logistic sector** have been performed, including terminal operators and port authorities.

- Desired characteristics of an intermodal loading unit:
  - 3 times stackable
  - 24 t min. payload
  - Flexibility
  - Automation of loading processes
  - Height 2.95-2.98 m
  - Different sizes: 20 ft, 40 ft and 45 ft.
  - Theft proof
  - Max. vehicle height 4m
  - Cargo security
SHARING THOUGHTS: HOW TO REDUCE CO$_2$ BY MAXIMIZING INTERNAL LOADING VOLUME WITHIN OUR CURRENT (INTERMODAL) TRANSPORT SYSTEM
**TelliSys Project**

**Challenge - Maximum Volume Transport Concept**

- **LEGAL MAX.** | 4000 MM
- **LOADING HEIGHT** 3000 MM
- **LOADING HEIGHT INCL. CONSTRUCTION HEIGHT** FOR ROLLER TRACKS OR CONTAINER FRAME
- **SUPER LD** | 850 MM
- **GROUND CLEARANCE** GROUND | 0 MM
- **GROUND** | 0 MM
- **LOW DECK** | 960 MM
- **NEW LD** | 910 MM
- **LEGAL MAX.** | 4000 MM
- **NORMAL** | 1100 MM
- **GROUND** | 0 MM
- **LOW DECK** | 960 MM
- **SUPER LD** | 850 MM
- **LEGAL MAX.** | 4000 MM
- **NORMAL** | 1100 MM
- **GROUND** | 0 MM
## TelliSys Project
### Family of Intermodal Loading Units

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Continental MSB</th>
<th>Intercontinental MSB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stackable MSB</td>
<td>Automotive Box</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>40 ft / 45 ft</td>
<td>45 ft</td>
</tr>
<tr>
<td><strong>Height (internal)</strong></td>
<td>2940 mm</td>
<td>2970 mm</td>
</tr>
<tr>
<td><strong>Width (internal)</strong></td>
<td>Euro-pallet</td>
<td>Euro-pallet</td>
</tr>
<tr>
<td><strong>Long sides</strong></td>
<td>One open</td>
<td>Two open</td>
</tr>
<tr>
<td><strong>Pay load</strong></td>
<td>Min. 24t</td>
<td>Min. 24t</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>Hinged</td>
<td>Hinged</td>
</tr>
<tr>
<td><strong>Handling</strong></td>
<td>Corner castings</td>
<td>Corner castings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grappler pockets</td>
</tr>
<tr>
<td><strong>Stackability</strong></td>
<td>2 times (1+1)</td>
<td>Stackable (empty)</td>
</tr>
</tbody>
</table>
TelliSys Project
Prototypes of Loading Units

Continental MSB

- Internal height of 2940 mm
- EU Pallet wide
- Liftable Roof
- One openable long side

Automotive MSB

- Internal height of 2970 mm
- 3 metre trays stackable
- Liftable Roof
- Two openable long sides
**Main specifications Super Low Deck**

- **Vehicle type**: 6x2, Euro VI
- **Wheelbase**: 3.300 mm
- **Fifth wheel**: 850 mm
- **Axle front**: 8.0t, air
- **Axle rear**: 11.5t, air, sr13.44
- **Tag axle**: 4.0t, air
- **GCW**: 44t
- **Vehicle weight target**: 8.000 kg
TelliSys Project
Performance Evaluation

Real intermodal scenario from PL to GB for:
- Economic evaluation
- Life cycle assessment

Comparing TelliSys with Mega-trailer for the reference scenario
- Up to 25% reduced CO₂ emission
- Up to 15% cost savings
The superior volume and efficient use of intermodal transport systems let TelliSys outperform the leading transport solution.
TelliSys Project
Stakeholder Roadshow
TelliSys Project
Learnings

- TelliSys is able to serve market demands, but infrastructure has to develop along the chain of combined transport in equal dimensions → Currently just 10% out of 100 terminals in Europe are able to handle all members of the TelliSys – family*.

- Benefits:
  - Maximised transport volume
  - Good system behaviour
  - Flexibility during loading and unloading processes
  - Suitable for combined transport (Point - Point Traffic)

The market reactions were very positive and promising. “If we manage to eliminate the described restrictions, there are good chances for a successful market launch.” – H. Herz, Resp. Intermodal Transport by GEFCO

* According research by TelliSys
TelliSys Project

Summary

- Complete volume optimized intermodal combination
- Family of new intermodal loading units addressing different use cases
- More environmentally friendly and costs efficient.
- Open new market possibilities for the intermodal transport
Content

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Trends

4.0 Design principles

Network
- Vertical and horizontal supply chain collaboration on a full connected network
- New services and business models

Information transparency
- Continuous information flow
- Virtually
- Context sensitivity
- Big Data analysis

Decentralized decisions
- Artificial Intelligent
- Learning Systems
- Multi-agent Systems

Technical assistance
- Decision support systems
- (Partial-)autonomous systems
Definition of logistics 4.0 along two different time scales:

1. **Short-term**: data-driven, highly networked processes between heterogeneous players (optimization, efficiency, transparency of processes, …)

2. **Medium-term**: autonomous systems and self-organization of systems of systems
Trends

Logistics 4.0 main competences and actions fields

Digitalization

Service level extension

Network collaboration

Automatization

Sustainable transport
Conclusions

The impact of IoT and Big Data on the ITS:

- Logistics and transport are going to change on all levels in the context of a 4th industrial revolution:
  - Interconnection of everything with everything in real-time
  - Context and user sensitive system using semantic technologies
  - Distributed artificial intelligent systems of systems
  - Automated systems

- In addition to the development and adoption of new technologies, organizational and social change are the key challenges in a rapidly changing market:
  - New, data driven services and business models
  - Formation of new cross-company networks
  - Emergence of new stakeholders
Thank you very much for your attention

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