

# Technical Innovation Circle for Rail Freight Transport (TIS) Implementation of Innovations for Rail Freight Wagons

## Speakers:

Jürgen Hüllen	Spokesman of TIS Consultant c/o VTG AG
Jens-Erik Galdiks	Head of Rolling Stock Technology SBB Cargo AG
Dr. Miroslav Obrenovic	Vice President Asset Strategy & Programs DB Cargo AG
Dr. Josef Buczynski	Managing Director Cognid Telematik GmbH representing Industry Platform Telematics and Sensors (ITSS)

*Berlin | 21st of September 2016*

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# Agenda

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**A**

## Introduction TIS – Intermediate Results of TIS



**Jürgen Hüllen**

Spokesman of TIS



# State of play: The development and implementation of basic innovations for European rail freight are still totally inadequate

Reasons for this **lack of innovative power** in the sector include:

- The European **market** for new rail freight cars is **small** and **volatile**  
→ **small volume market /high development costs.**
- Innovations must not restrict **compatibility of freight car deployment.**
- Basic innovation **requirements of wagon keepers are insufficiently defined.**
- **Slow implementation** of basic innovations.
- Innovations must generate **economic gains for wagon keepers.**
- Economic **benefit** of a freight wagon innovation is **not** necessarily reaped by **wagon keepers.**



**This calls for a new approach to innovation across the whole industry.**

Source: White Paper on Innovative Rail Freight Wagon 2030, presented at Innotrans, Berlin, on 20/09/2012

**Weissbuch Innovativer Eisenbahngüterwagen 2030**

Zukunftsinitiative „5 L“ als Grundlage für Wachstum im Schienengüterverkehr

Eine gemeinschaftliche Initiative von

# Growth Factors for Rail Freight Traffics - Initiative „5L“

## Technical Innovation Committee for Rail Freight Traffic

(TIS = Technischer Innovationskreis Schienengüterverkehr)

**FUTURE-ORIENTED INITIATIVE** The key features of a competitive rail freight wagon:

**5L**  
**LOW-NOISE**  
**LIGHTWEIGHT**  
**LASTING THE COURSE**  
**LOGISTICS-CAPABLE**  
**LIFE CYCLE-COST-BASED**

**Life-cycle-cost-based**  
Ensuring the profitability of an investment over the life cycle



**Lightweight** Higher load volume due to lower wagon tare weight



**Lasting the Course**  
Reduction of downtimes and standing times, increase in annual mileage



**Logistics-capable**  
Integration into supply chains, high level of operability



**Low-noise**  
Significant reduction of rail freight wagon noise emissions



# Participants of the Technical Innovation Circle for Rail Freight Transport



## Wagon keepers



## Railway undertakings



## Shippers



## Wagon/Component manufacturers



## Academic support



## Project management



# In 2016 TIS has entered a new stage of operations

## Stage 1: Definition of requirements for innovations in the following segments



## Stage 2: Implementation of Innovations

R&D-Project Switzerland  
„5L“-Demonstrator of  
SBB Cargo / TIS



## In 2016 TIS has initiated new innovation activities

### Previous topics and working groups



Transition into new topics / working groups



- Innovative bogies and brake systems will be tested in "5L"-demonstrator
- Support of industry in R&D of innovative disc brakes

- Works on standardisation of data exchange will be continued together with ITSS

- New project; integration of project "innovative coupling systems"
- Investigation of implementation of power supply line and data bus

- Aggregation of working group innovative constructional systems and light weight construction into one project
- Objective: Standardized, light weight underframe with variable innovative constructional systems

- LCC-model for bogies and brake systems available
- Perspectively further components will be integrated into LCC-model

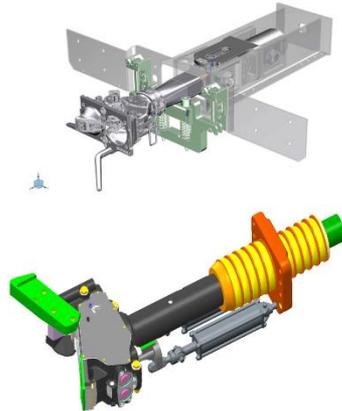
\*Automated operational processes, e.g. automated break tests, automated support in technical wagon inspection, support in train integrity, train composition,...

# In project „Automated Operational Processes“ innovations shall be identified and migrated on a short and middle term scale

## Power Supply Line / Data Bus



## Innovative Coupling Systems



## Electronic Brake



## Digitalisation – new use cases



## Adjustment of Rules and Standards

- Identification of rules and standards which restrict the implementation of innovations
- Re-Assessment of suitability of identified rules and standards
- Petition of need for changes through official channels (e.g. associations, committees, ...)

Sources: (1) UIC-Kabel aus Wikipedia; (2) Datenbus aus Wikipedia; (3) Automat. Kupplung von Voith, (4) Automat. Kupplung von Faively, (5) Komponenten zur elektronischen Bremssteuerung von Kes GmbH, Sensorik-Schaubilder von DB Cargo AG

## TIS also campaigns for the development of innovative disc brakes for rail freight wagons

- TIS sees high potential for disc brakes as the future standard braking systems for freight rail cars in Europe. Disc brakes reduce noise emission as well as wear and tear of wheelsets in comparison to block brakes.
- But today disc brakes for freight rail cars show two major disadvantages: disc brakes are heavier than block brakes which leads to reduced payload and therefore reduced profitability. Furthermore prices for disc brakes are too high for an economical application in all rail cars.
- Today disc brakes are only in use in rail cars with a high yearly mileage of more than 80.000 km p.a. and with no need for full payload capacities.



Source: VTG AG

- TIS is convinced that with reduced weight and reduced price (under the assumption of high quantities and serial production) disc brakes can be operated economically also in rail cars with lower yearly mileage.
- Therefore TIS is in dialogue with the suppliers for brake systems in order to reinforce their R&D-activities for the developments of a brake disc for rail freight cars.
- Perspectively TIS sees potential that appr. 80% of all new builds in the European market could be equipped with disc brakes (estimated amount of new builds in Europe p.a. appr. 7.000 freight rail cars).

**B**

## „5L“-Demonstrator Freight Train of SBB Cargo AG / TIS



**Jens-Erik Galdiks**  
Head of Rolling  
Stock Technology



# The „5L Demonstrator“ is a project supported by numerous actors of the sector in order to test and implement innovative rail freight ´cars

## Introduction of project „5L Demonstrator“

**Growth Factors“ 5L“**

<b>Low Noise</b>	<ul style="list-style-type: none"> <li>Significant reduction of noise emissions</li> </ul>
<b>Light Weight</b>	<ul style="list-style-type: none"> <li>Lower net wagon weight means greater payloads</li> </ul>
<b>Long-running</b>	<ul style="list-style-type: none"> <li>Less downtime, fewer outages, greater annual mileage</li> </ul>
<b>Logistics enabled</b>	<ul style="list-style-type: none"> <li>Integrated into supply chains, enhanced service quality</li> </ul>
<b>Life Cycle Cost - oriented</b>	<ul style="list-style-type: none"> <li>Rapid paybacks on investments, savings on operating and maintenance costs</li> </ul>

## TIS and „Future Initiative 5L“

**TIS**

- Technical Innovation Circle for Rail Freight Transport (TIS): european practice group for introduction of innovations in freight rail cars
- Objective of Future initiative „5L“: Development and migration of innovative rail freight cars

## Project 5L Demonstrator

**Leadership**  SBB CFF FFS Cargo

**Suppliers**

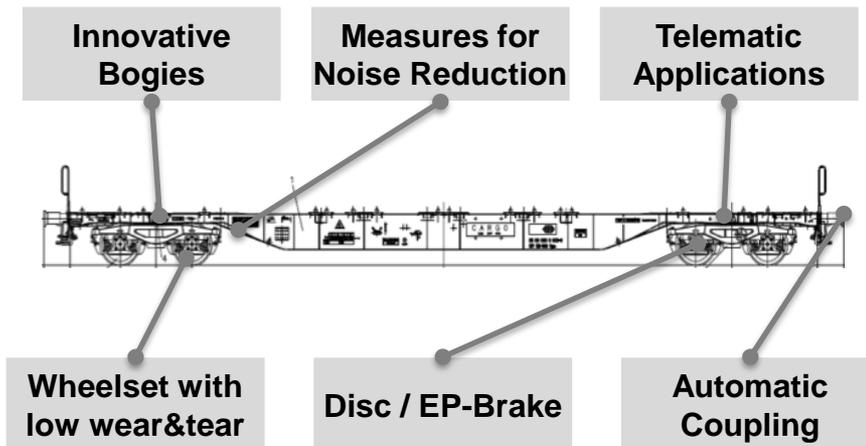
**Project management**  

**Supported by**  Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

# The R&D-project „5L-Demonstrator“ aims at testing of innovative, but already available technologies in real operations

## Basic idea of the project

### Innovative components



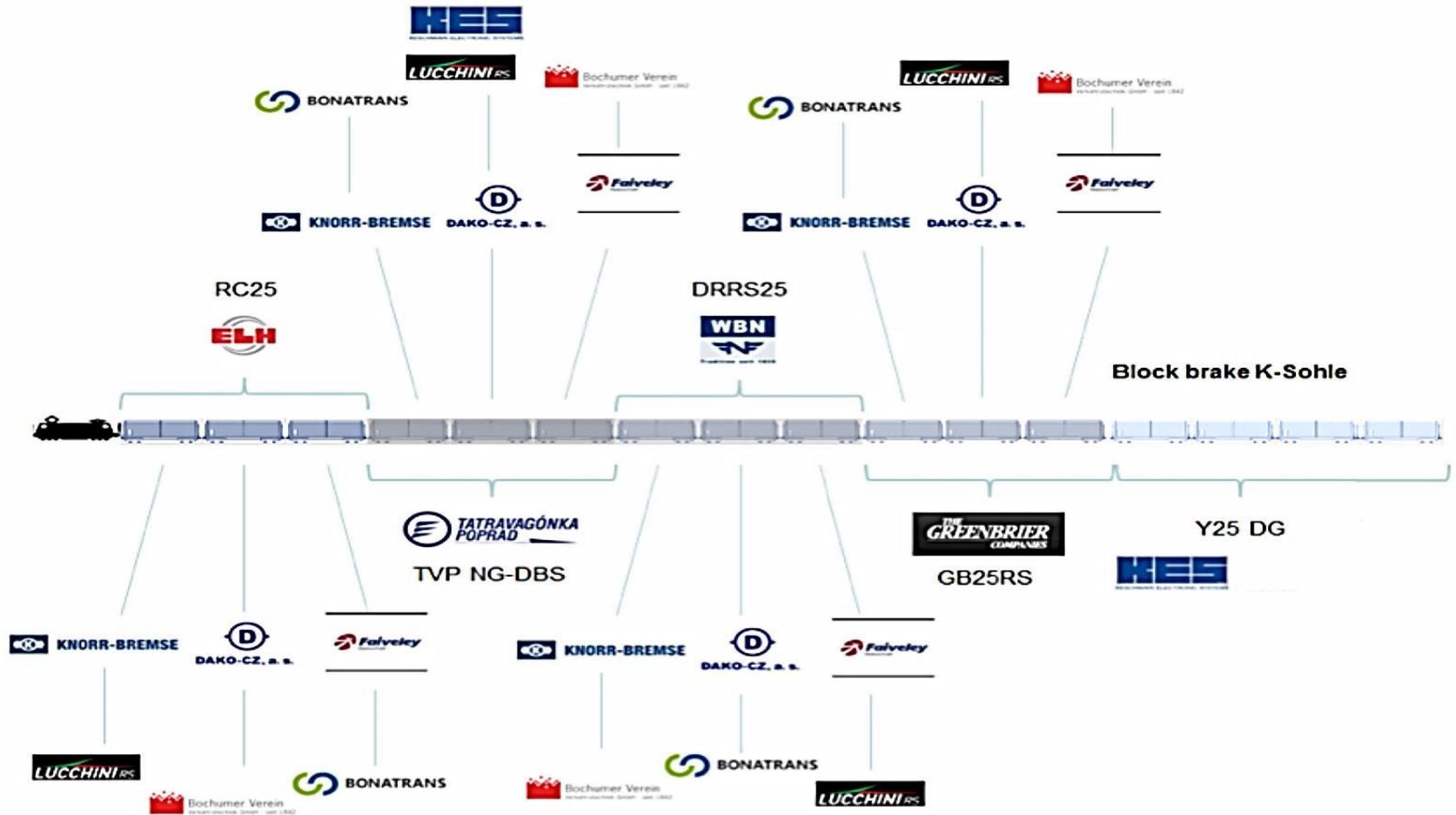
## Basic idea of the project

- 1** Test of **innovative components in 4-year long operations (real traffics)**
- 2** The industry partners supply innovative components for sustainable freight rail cars
- 3** **Leadership by SBB Cargo**, which takes care about assembly, approval process and operation of „5L“-demonstrator
- 4** **Reduction of noise emissions by 5 dB to 10 dB** in comparison to conventional rail freight wagon with block brakes (noise remediated)
- 5** **Operation of the demonstrator trains beginning in 2017**, initially in Switzerland, from middle of 2018 operations aboard is planned

# Together with numerous partners of the sector a demonstrator train for operations in customer traffics shall be assembled



## Structure of the demonstrator train



# Altogether six different modules will be tested in the 5L-demonstrator in respect to function and characteristics

## Components in 5L-demonstrator

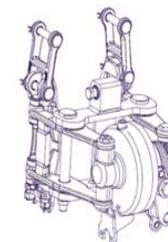
### Bogies

- Low wear and tear
- Radial steering
- Low noise emissions



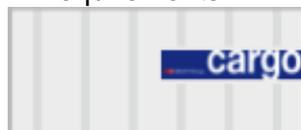
### Disc Brakes

- Low noise
- Low wear and tear



### Plattform

- 60' Container with sliding door
- Isolated / non-isolated
- Further types according to customer requirements



## Sgnss SBB Cargo



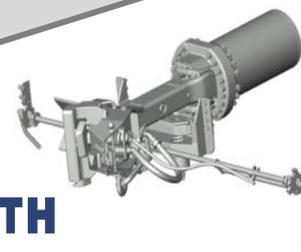
### Intelligence

- Generation and processing of data
- Systems from SP Automation



### Wheelset

- Low noise
- Low wear&tear

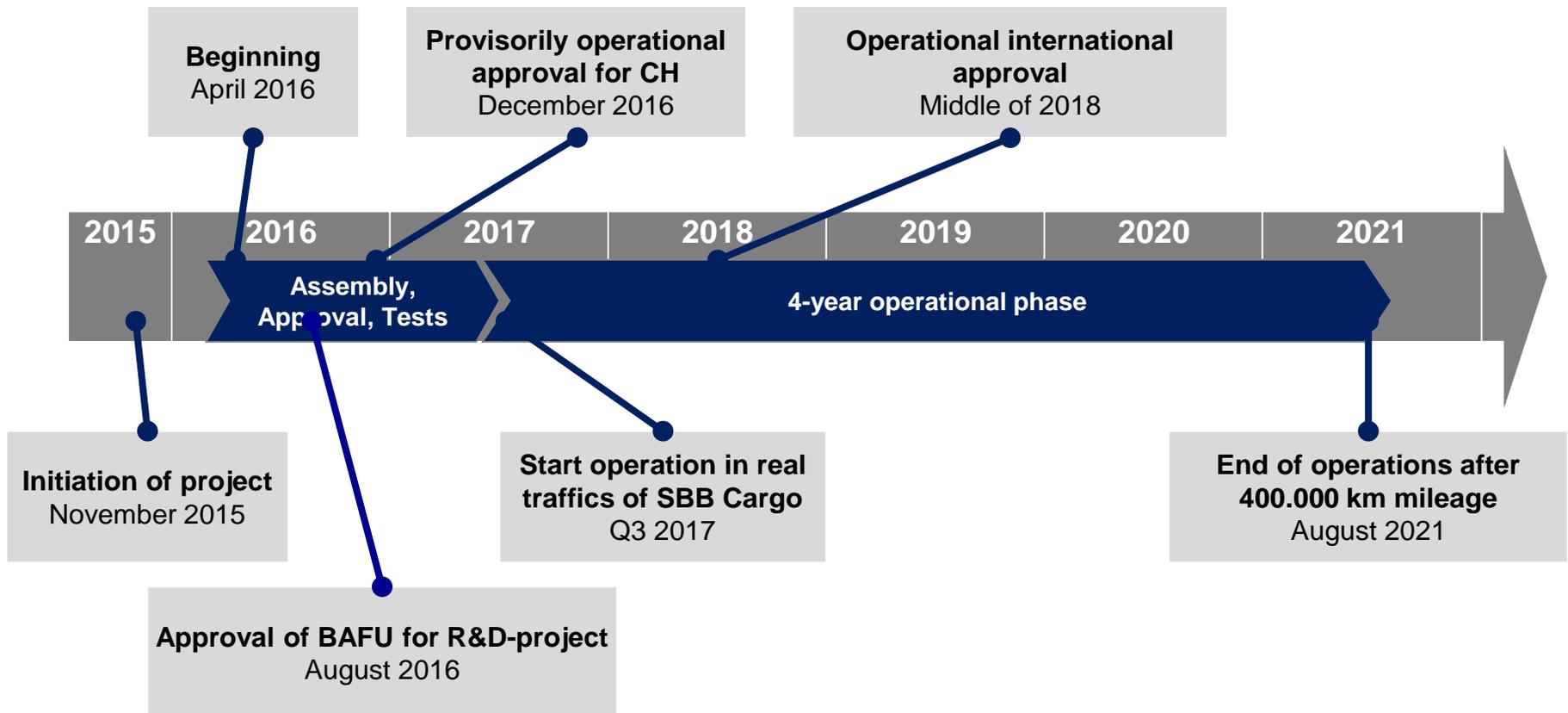


### Automatic Coupling

- Optimized production
- Basis for new underframe concepts
- Based on technology used in passenger trains

# From middle of 2017 the demonstrator train shall be operational in real customer traffics

## Time schedule R&D-project «5L-Demonstrator»



# The „5L Demonstrator“ train is only a first step into badly needed innovations for the rail freight sector



## Next steps and prospects

### Next steps 5L Demonstrator

- **Start of operations** by SBB Cargo beginning from middle of **2017**
- **Generation and processing of data about condition of innovative components**, identification of further areas for innovations
- **Test of automatic coupling system in real operations in Switzerland**

### Prospects

- The sector has to speed up in order to generate **completely new components and wagon designs**
- This integrates amongst others the **use of new materials** (e.g. CFK), the further **implementation of automatised processes as well as the additional use of telematic applications**
- Objective is to **reduce investment costs** for wagons and components as well as the **operational costs** (focus on TCO, investment and Life-Cycle-Costs)

# The „5L Demonstrator“ train is only a first step into badly needed innovations for the rail freight sector



- 1 The „5L Demonstrator“ project is the **first innovation approach of the whole sector** together with numerous actors of the industry
- 2 The reduction of **noise emissions by 5dB up to 10dB** in comparison to a block braked freight rail car is a big step and badly needed in order to **sustain the acceptance of the public**
- 3 The „5L Demonstrator“ can only be **the first step** towards an **innovation-driven improvement process** for the rail freight sector in **order to stay competitive**
- 4 A **common approach of the sector** is essential in order to **implement innovations** for the rail freight sector

**We thank all the participants of the project „5L-Demonstrator“ and wish us all a successful progression of the project!**

# „5L Demonstrator“ – a common sector approach for the development of a sustainable rail freight car



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**C**

## Wagon Intelligence



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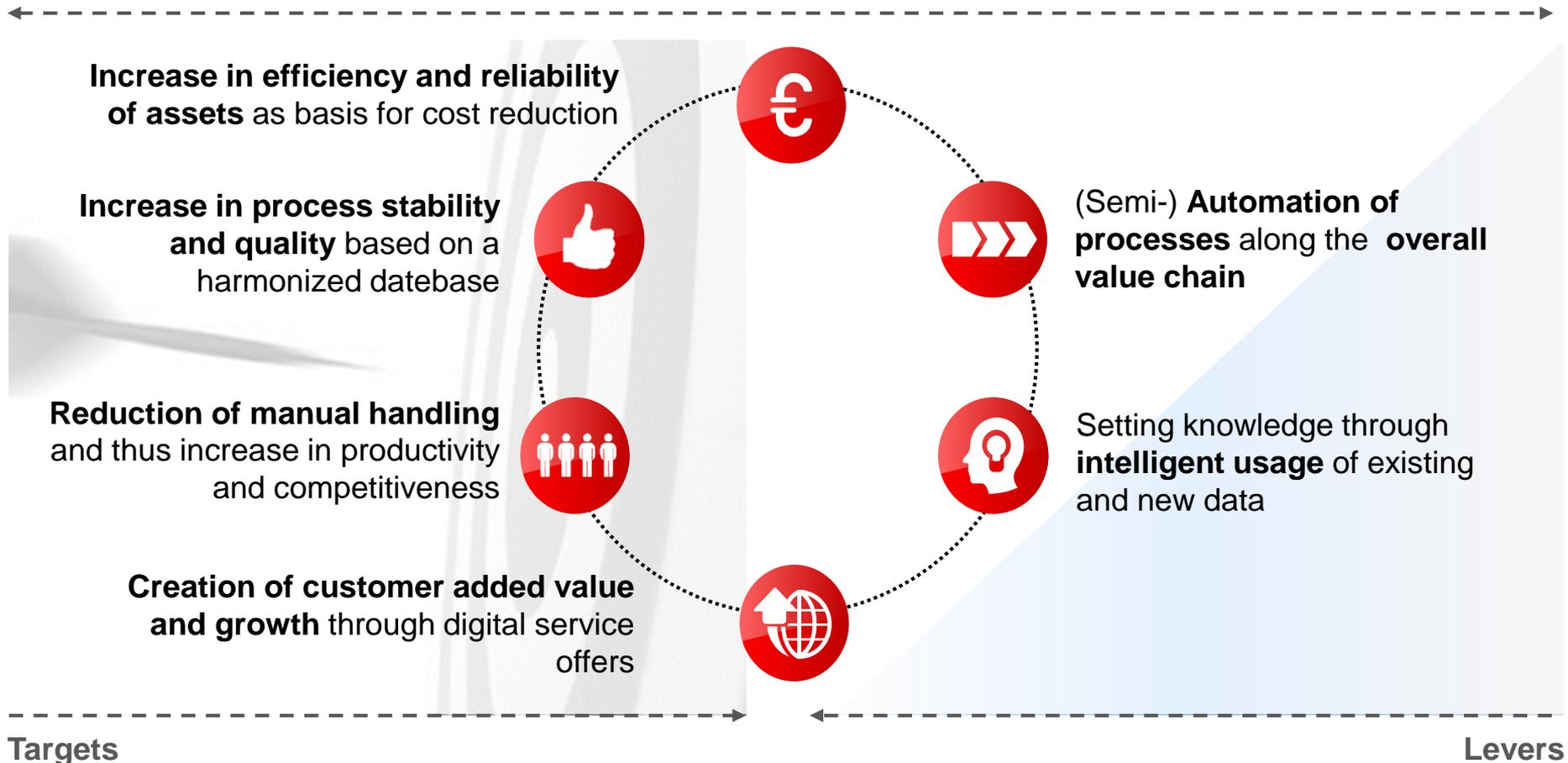


**Dr. Josef Buczynski**  
Managing Director



# Asset digitization is a key lever for an increase in productivity and efficiency as well as added customer value within the rail freight business

## Targets and levers of asset digitization

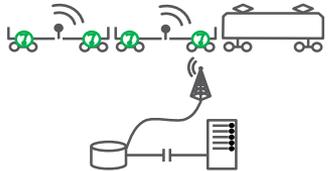


# Applying sensor technology intelligent wagons optimize operations and maintenance and generate new markets

## Vision and potential of „Wagon Intelligence“

**Wagons are**

- Equipped with **sensor technology**
- Integrated **element of a digital value chain**



**Fields of optimization**



**Increase efficiency in operations**

- Automated operational processes and reduction of manual handling
- Increase in wagon availability



**Optimization of maintenance**

- Avoidance of overloading damages
- Consideration of information on wear and component condition in operations



**Improvement in competitiveness**

- Creation of new additional services according to customer needs
- Growth and shift to rail through better quality

- 1**

**Equipment hardware**


- 2**

**Realization of IT-landside**


- 3**

**Business process re-engineering**



**Change Management**



# Wagon keepers in Europe are busy in migrating the technology into their wagon fleet - examples



Deutsche Bahn Gruppe

Pilot project with 500 wagons and 50 tank containers and different suppliers



Equipping of all rail cars with telematics and sensor technology

Examples of activities in telematics and sensor technology in European Rail Freight Sector



Pilot project with different types of wagons and different suppliers



Equipping of intermodal fleet with telematics and sensor technology until 2017



Pilot project with different types of wagons and different suppliers

# Example DB Cargo – steps realized and ongoing activities within the field test phase

## Goals

- Test of maturity of different technologies
- Definition and implementation of **interfaces**
- Transfer new functionalities into the **value chain**
- **Business Case validation**



1. Stage	2. Stage	3. Stage
<ul style="list-style-type: none"> <li>■ <b>120 Wagons</b></li> <li>■ 11 Types</li> <li>■ Market Unit Steel and Coal</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>380 Wagons</b></li> <li>■ 19 Types</li> <li>■ Market Units Intermodal, Automotive and Industry Goods</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>50 Wagons + 50 Containers</b></li> <li>■ 2 Types</li> <li>■ Market Unit Chemicals</li> <li>■ ATEX-Protection</li> </ul>
Position		
Mileage per GPS		
Shock		
Humidity		Temperatur
Weighing (exact, full/empty, overload)		
<b>Status:</b> realized	<b>Status:</b> realized	<b>Status:</b> Ongoing action

# There are a many suppliers and all have (had) a different approach for data communication

## Mission for telematics suppliers: Development of standardised interfaces

- Initially - compatibility of telematic units and sensors of different suppliers was not guaranteed as there has been no standardisation of data exchange
- TIS has defined the requirement for the implementation of telematics and sensor technology
- Suppliers have accepted this mission and are generating standards for data exchange between application servers and CRM-servers in the backoffice (interface 1) and between device level and agents (interface 2)
- Only with a common standard for the different interfaces of telematics and sensor technology devices of different suppliers can communicate with each other and a widely spread migration into the European wagon fleet seems possible.



## Industrieplattform Telematik und Sensorik (ITSS)



Siemens AG

## Who ist the ITSS practice group?

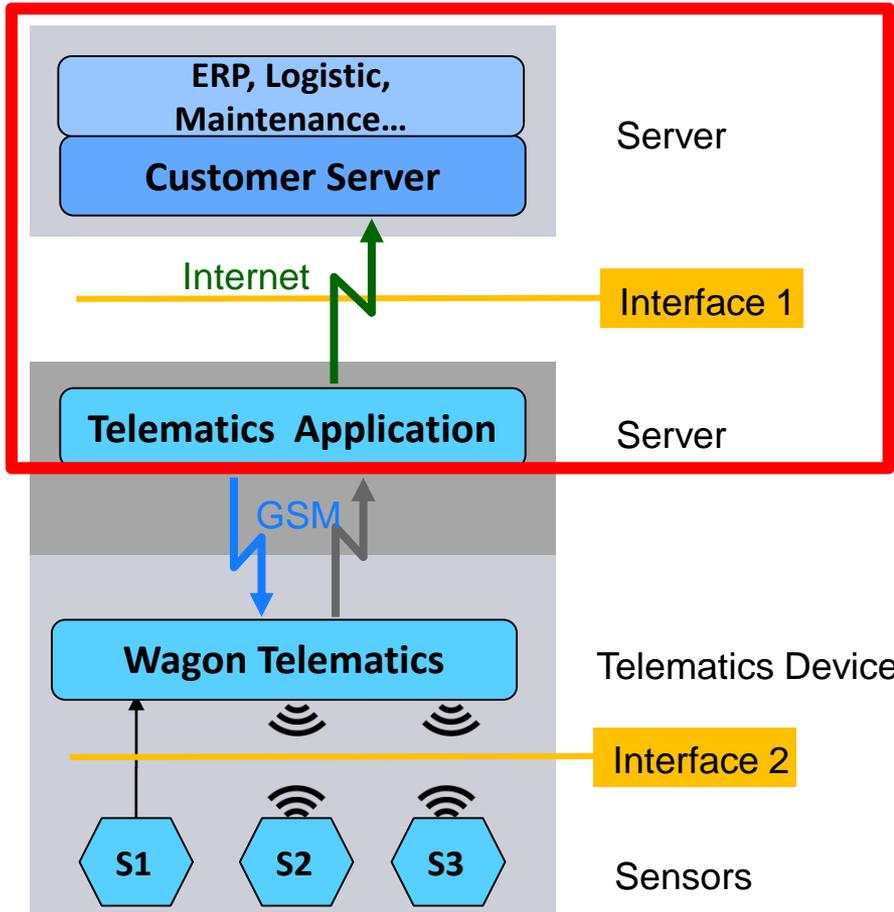
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- Initiated by the dialogue between the TIS members and telematics system suppliers
- Association of telematics solution partners in December, 2014, to create better conditions for the use of telematics systems in rail freight transport.

# „Industrieplattform Telematik und Sensorik im Schienengüterverkehr ITSS practice group“

Industry platform telematics and sensors in the rail freight sector

# Standardisation of interfaces for telematic data exchange



## Standardized ITSS Interface 1

Data exchange between the servers of the telematics providers and ERP systems of customers.

## ITSS Interface 2

Data exchange between the telematic device and sensors which are attached to the transport unit.

## What was the procedure of ITSS ?

- 12/2014 Determining principles and objectives (Statute) ✓
- 01/2015 System architecture & interfaces prioritization ✓
- 02/2015 Detection and classification of relevant standards ✓
- 03/2015 Definition of the 7 basic applications in accordance with TIS-Report ✓
- 04/2015 Confirmation of cases of application by the TIS ✓
- 05/2015 Complete the specification of the interface ✓
- 06/2015 Confirmation of the specification concept by TIS ✓
- 12/2015 Start reference implementation at TIS-members ✓
- 03/2016 Reference implementation done by the Telematics provider ✓
- 04/2016 Complete implementation by reference users with success ✓
- 09/2016 Publication of the interface at the InnoTrans 2016 ✓

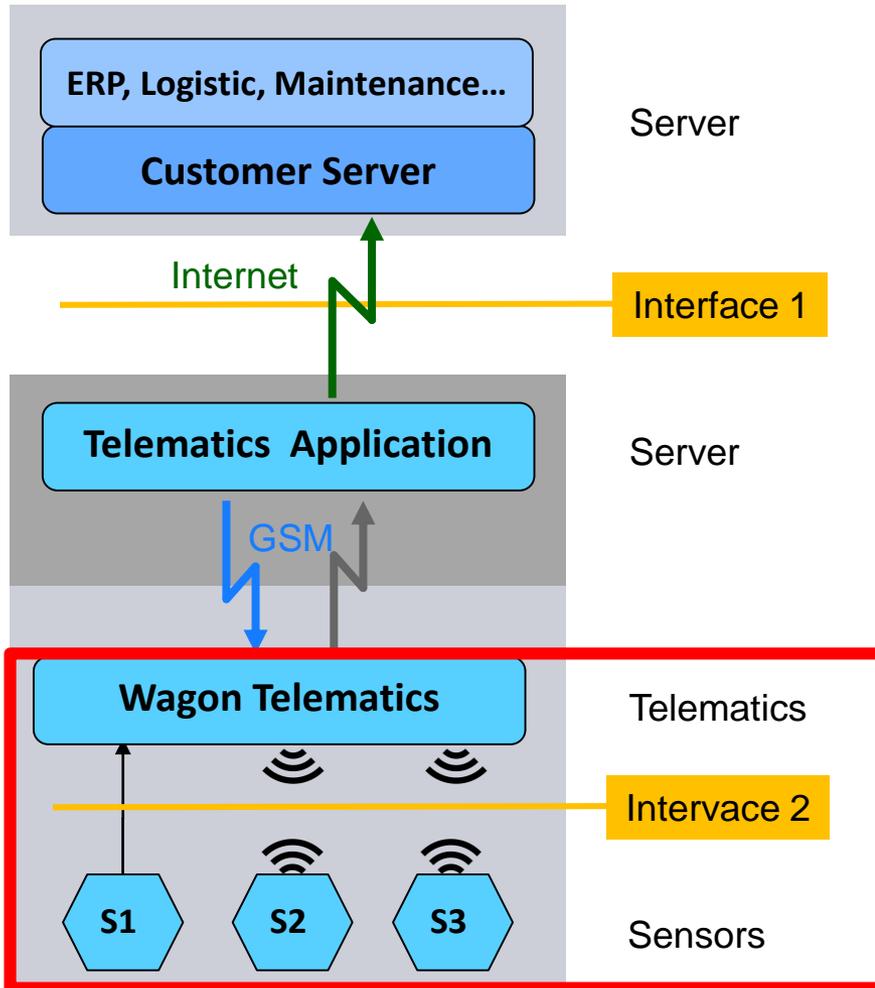
## What are the advantages of ITSS-interface 1 ?

- The ITSS - interface is consistently supported by renowned telematics system providers and further maintained.
- The ITSS - Interface is an open, freely available standard.
- Systems from the telematics providers can be integrated via standardized ITSS data interface.
- The ITSS standard enables customized solutions and provides all required data transparently.
- ITSS – Interface to download



<http://www.innovative-freight-wagon.de> download area

## What happens next in the ITSS practice group ?



Experience from implementations assume in the further development of ITSS interface 1

### Standardization ITSS Interface 2

Components different suppliers can be used together.

Connections of sensors:

- cable connection
- radio link

## Interface No. 2 (Sensors)

### What has been achieved so far?

- 11/2015 Use cases have been defined and prioritized ✓
- 01/2016 Relevant technologies are examined, evaluation criterias are recognized ✓
- 02/2016 Evaluation criterias are agreed ✓
- 06/2016 Wireless technology to connect radio based sensor and telemtics system is defined ✓
- ...
- 11/2016 Definition of communication structure is ongoing

# Industrieplattform Telematik und Sensorik im Schienengüterverkehr (ITSS)

Industry platform telematics and sensors in the rail freight sector

## Thank you for your interest!

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## Conclusion and Prospects



**Jürgen Hüllen**  
Consultant  
Spokesman of TIS



## Conclusion

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- During the **last two years TIS has defined technical, operational and economical requirements** for innovative components like **bogies, wheelsets, disc brakes, telematics and sensor technology as well as innovative coupling systems**. These requirements have been discussed and evaluated with the suppliers.
- **In 2016 TIS has entered a new stage of activities**. In the “5L”-project of SBB Cargo AG supported by TIS innovative technologies are tested in a demonstrator train which will be in action by Spring 2017.
- In the field **of telematics and sensor technology TIS** together with a **group of suppliers (ITSS) establish standards for data exchange**. A first specification for the interface between the application servers of the suppliers and the servers of the users (e.g. ERP-systems) is published today. The specification for a second interface for data exchange between sensors and telematics units of different suppliers is in development and will be published in 2017.

## Prospects

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- TIS has shown a lot of **activities in innovations for rail freight wagons**. Many of those innovations are going to be tested in the **demonstrator train of SBB Cargo AG/ TIS**. Furthermore TIS will of course continue to enable migration of innovative technologies in rail freight wagons.
- Nevertheless TIS stands for Innovation Circle for Rail Freight Transport and not only for innovations in rail cars. Therefore TIS has decided to **broaden their scope** into more operational topics and has initiated a **new working group “Automated operational processes”**. Scope is to reduce the efforts for technical train inspections as well as for other operational processes e.g. automated break test, detection of train composition.
- TIS is willing to **actively develop further innovation topics**. As there exist various ideas and topics for innovations in rail freight traffic and resources of the TIS-participants are limited, **TIS is seeking for support. New participants - also from other countries besides Germany/Switzerland - are cordially welcome**. Participants of TIS should be either shippers, forwarding companies, wagon keepers, railway undertakings or railway infrastructure undertakings, suppliers of the railway industry.

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# Thank you very much for your attention.

For further information about TIS please view our homepage:  
[www.innovative-freight-wagon.eu](http://www.innovative-freight-wagon.eu)

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