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Valenciennes, 16th December 2022

Compliance Results – CEF Grant Agreement INEA/CEF/TRAN/M2018/1784160

To whom it may concern,

I confirm and certify herewith that according to Sub-activities 1.6 and 5.1 of the CEF Grant Agreement INEA/CEF/TRAN/M2018/1784160 the following functionalities have been implemented by ERMEWA SA:

Details of the Action:

Name of the Action:	Telematics Solutions for Safety & Maintenance Improvements in Digital Railfreight Transport - SaMiR
No. of the Action:	2018-EU-TM-0084-S
No. of the Grant Agreement:	INEA/CEF/TRAN/M2018/1784160
Duration of the Action:	01/11/2018 - 31/12/2021
Verified Activity:	Activity 1.6 M2M interface between KB and ERM ¹ Activity 5.1 Automatic wagons list
Verified Milestones:	6: M2M interface between KB and ERM 18: Development and testing of automatic wagons list

Table 1 Action details

¹ KB - Knorr Bremse, ERM - ERMEWA

The detailed results of the verification process are concluded as follows:

Sub-activity 1.6: M2M interface between KB and ERM

The sub-activity includes:

- definition and development of the communication interface between KB and ERM
- implementation and test of first customized applications.

Output: M2M interface between KB and ERM.

Main parameters to be checked: Safe and stable communication interface between KB and ERM.

ERM (IT department) is the leader of the sub-activity; KB supports in the sub-activity implementation.

The expected results from the implementation of Activity 1 are the development of:

- New brake control valve bracket with an interface for all pressures
 - *the beneficiary has provided the Excel file “Wagons.xlsx”, with the wagons which are all fully equipped (list of 82 Shimmns four-axle wagons with fixed cradles and removable roof with their unique 12-digit numbers). See Annex 1.*
- New extension, including pressure sensors and a central HUB
 - *the beneficiary has provided the Excel file “Wagons.xlsx”, with the wagons which are all fully equipped (list of 82 Shimmns four-axle wagons with fixed cradles and removable roof with their unique 12-digit numbers). See Annex 1.*
- KB CFCB unit with sensors including wireless connection attached
 - *the beneficiary has provided the Excel file “Wagons.xlsx”, with the wagons which are all fully equipped (list of 82 Shimmns four-axle wagons with fixed cradles and removable roof with their unique 12-digit numbers). See Annex 1.*
- Tablet application as internet hub connecting mesh network and IT backend
 - *the beneficiary has provided description from the tablet application user interface called “COMMANDER”. See also Annex 2. The beneficiary in this document states some technical and financial deviations.*
- IT backend with database, platform application and specific customized applications for ERM use cases
 - *The beneficiary has provided some Website Screenshots of this IT back end which can be seen in Annex 3. On top of that high level application use cases have been also provided. See Annex 4. The use cases with a green mark in the excel sheet can be monitored by the system, red ones could not be monitored because of the type of data gathered or the way it*

is gathered. In particular, the alert system can support most of these use cases. See attached a screenshot of the alert setup page – Annex 5.

The beneficiary also informed in writing that the brake tests took place outside Berlin (Wustermark, Elstal station of HVLE.)

To demonstrate a linkage to a database the beneficiary has provided some wagon event / positioning structured datasets exported from the database. See Annex 6.

- M2M interface between KB and ERM
 - *Evidence of applied Machine2Machine interface messages have been provided by the beneficiary. See Annex 7. The messages are compliant with the ITSS Standard Specification “ITSS Interface IF1 (Telematics Application – Customer System) Version 1.2 final”².*
- All applications can be used as tablet applications at the same time
 - *See findings above.*

Sub-activity 5.1: Automatic wagons list

The sub-activity includes:

- specification of a concept for an automated process for the creation of the wagon list
- implementation and pre-test of the concept
- evaluation of the pre-tests and refinement of the concept based on the test results.

The leader of the sub-activity is KB; ERM supports and reviews progress and the results of this sub-activity.

Expected Results of Activity 5:

- capability to create automatically the list of wagons contained from a train
- additional ability to define precisely the sequence and orientation of the wagons (reliable automation leading to decreased errors and improved safety).
 - *TrainCompositionMessage in TAF TSI compliant format has not been provided by the applicant, due to technical and financial deviations. This activity has some deviations resulting to manual process to input to the application, see “Milestone 18.docx”, Annex 2.*

² https://tis.ag/download/itss_standard_specification_interface1_v1-2_final-pdf/

The beneficiary will report about the achievement of the milestones of Activity 5 to the TAF TSI implementation reporting tool hosted at <http://taf-jsg.info>.

The beneficiary will liaise with the European Union Agency for Railways about the technical details and timing for this report.

- *The beneficiary has liaised on 02.05.2022 with the TAF Joint Sector Group implementation monitoring responsible person.*

Mickael VARGA
European Union Agency for Railways
Railway Systems Unit
Project Officer
Email: mickael.varga@era.europa.eu

Annex 1 - List of 82 Shimmns four-axle wagons

External Identifier	Object Type
378046776605	Shimmns
378046776613	Shimmns
378046776621	Shimmns
378046776639	Shimmns
378046776647	Shimmns
378046776654	Shimmns
378046776662	Shimmns
378046776670	Shimmns
378046776688	Shimmns
378046776696	Shimmns
378046776704	Shimmns
378046776712	Shimmns
...	...

Annex 2 – Milestone 18 report document

2.3.1. Activity 5 - Automatic wagons list (consist of the train)

Objective:

- a. *“completing the measures related to improvement of safety of train operation. Sensors equipped on wagons could be also used for the pre-departure checks performed by the railway undertakers. Pre-departure checks consist in checking the integrity of the brake performance of the train and each single wagon of the train. Objective is to use the sensors to do this check and make the data available to the train driver.”*

Expected results:

- A. *“capability to automatically create the list of wagons contained from a train - **Deviation***
- B. *additional benefit would to be able to precisely define the sequence and orientation of the wagons (reliable automation leading to decreased errors and improved safety).” – **Deviation***

Technical fulfilment: 100%

Financial fulfilment of activity: 80.9%

2.3.1.1. Milestone 18 (Sub-Activity 5.1) - Automatic wagons list (consist of the train)

Objective:

- b. *“specification of a concept for an automated process for the creation of the wagon list*
- c. *implementation and pre-test of the concept*
- d. *evaluation of the pre-tests and refinement of the concept based on the test results”*

Description:

As an extension of Section 2.3.2.4. – “Development of a first implementation of automatic brake test in freight train” to further provide time saving measures for the first / last mile processes of rail freight transport, automation of the wagon list creation process was identified (*objective b*).

Technical Achievements:

A native tablet application with the functionality below was developed (*output A,B*):

Function Train Composition (manual process, input to the Application) (see Figure 33)

- *Pool of available consists for preselecting the wagons for a specific train composition*
- *Adding additional consists with its configuration*
- *Definition of wagon list with wagon order and wagon number*
- *Train number and driving direction*

UIC-Number	Consist type	Parking brake	G/P	Loadswitch	Update Date
11 22 0001 002-0 BUD_TEST_wagon_...		installed	not available	manual	05/06/2022 09:13:21
11 22 0001 001-0 BUD_TEST_wagon_...		installed	not available	manual	05/06/2022 09:13:21
11 22 0001 003-0 KB BUD Lab Wagon...		not available	not available	manual	05/06/2022 09:13:21
11 22 0001 004-0 KB BUD Lab Wagon...		not available	not available	manual	05/06/2022 09:13:21
11 22 0001 005-0 KB BUD Lab Wagon...		not available	not available	manual	05/06/2022 09:13:21

1. Figure - Screenshot taken from the Train Composition page

Function Train Preparation (manual process, input to the Application) (see Figure 30)

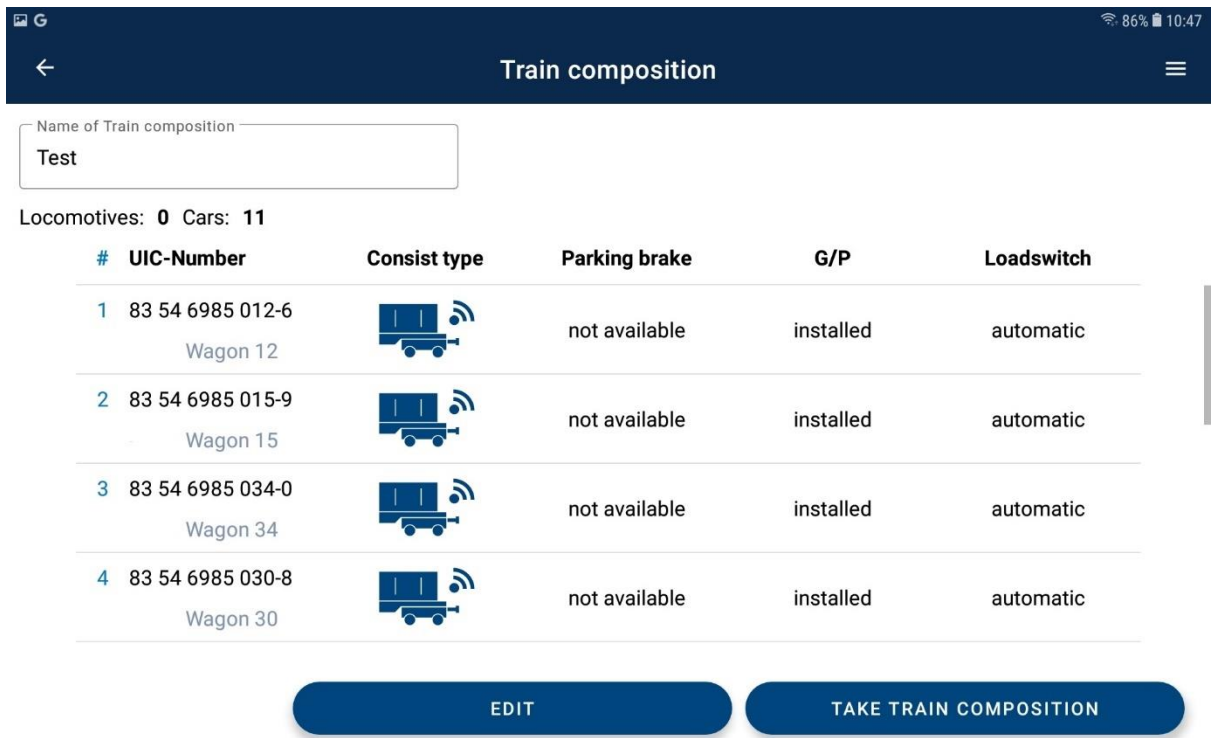
Based on the wagon list, the operator must add information from the train preparation process, like:

- G/P lever status
- Wagon Brake System active or deactivated
- Wagon Parking Brake applied/released
- Digital Freight Car system available on the specific wagon (installed, not installed, defective)

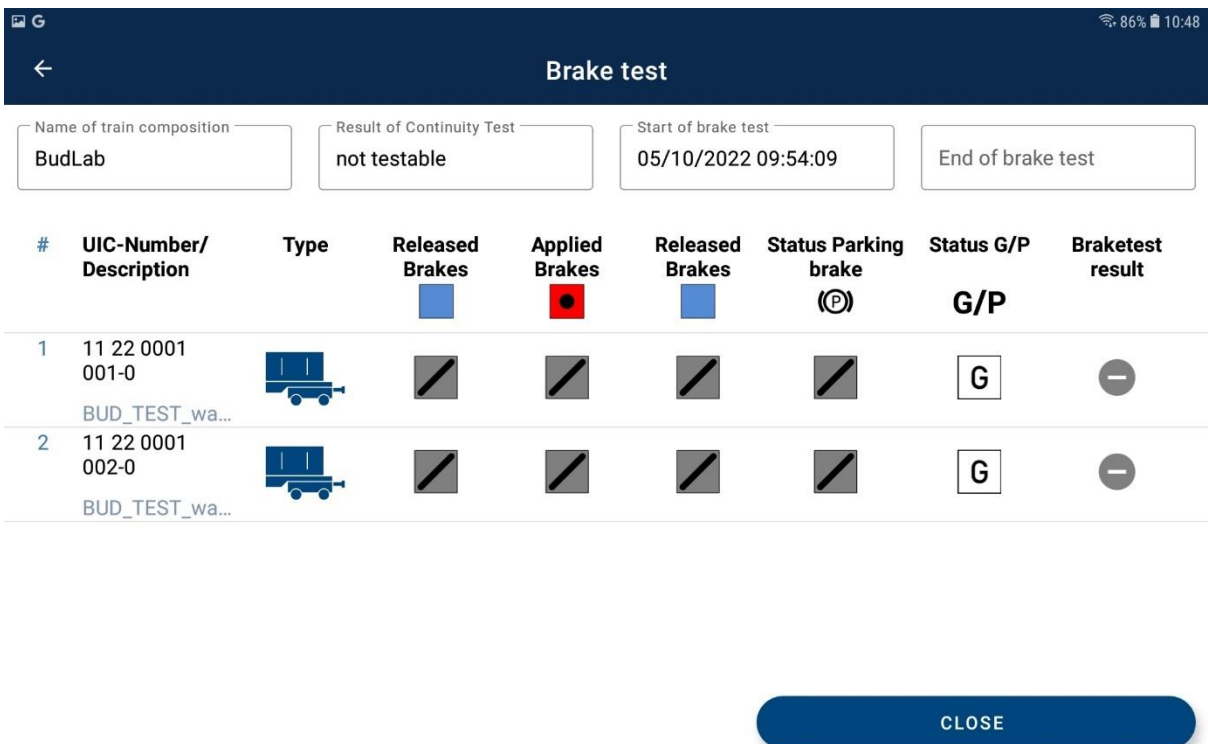
Function Automated Brake Test - Guide the operating personal through the brake test procedures (see Figure 31)

List of information and results

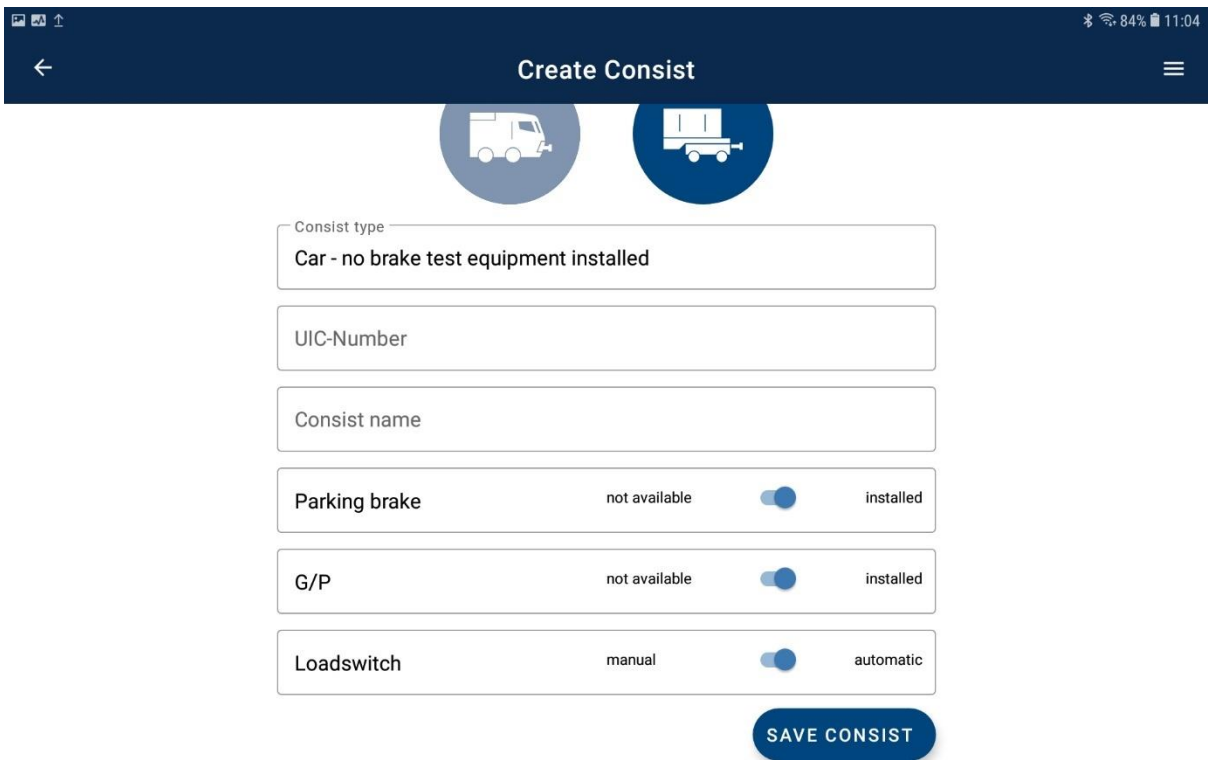
- Wagon order
- Wagon number
- Service brake status (applied/released, undefined, error, disabled)
- Parking brake status (applied/released, undefined, error, not available)
- G/P Lever status (G, P, undefined, error)
- Result of Brake Test incl. Timestamp (successful, partly failed, failed, undefined)



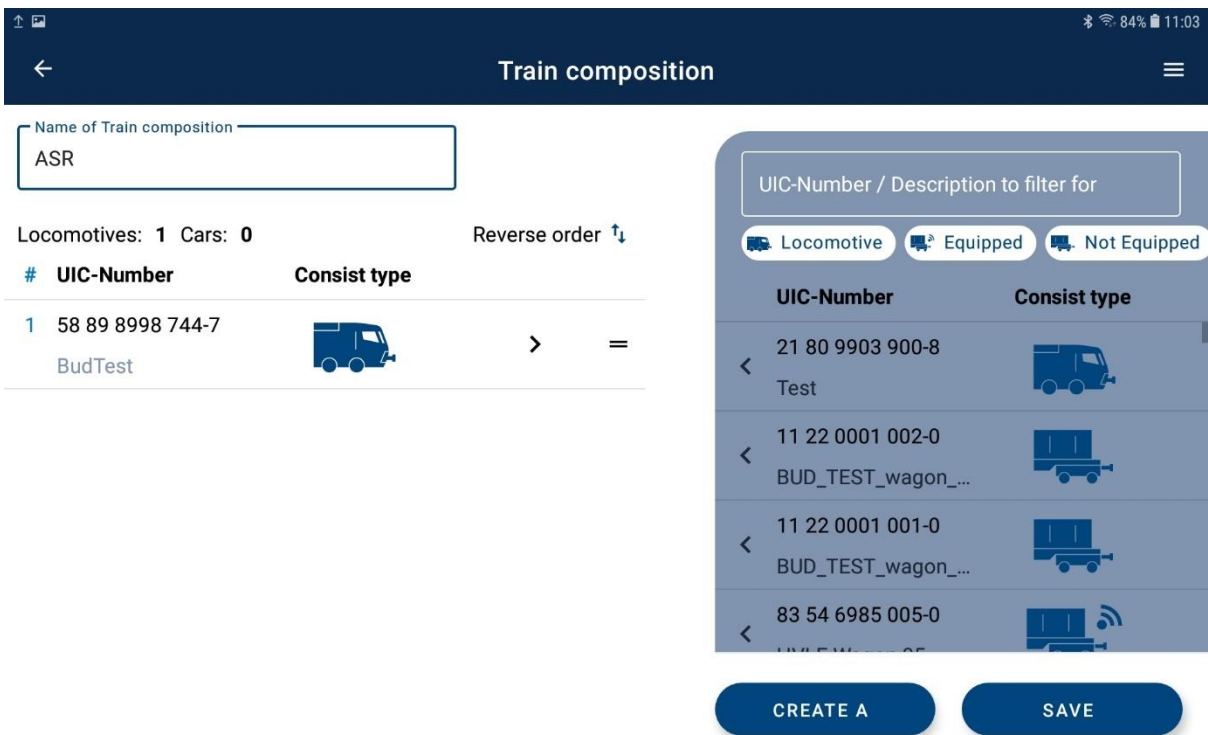
2. Figure Screensot taken from the 2022-05-03 brake test app field test



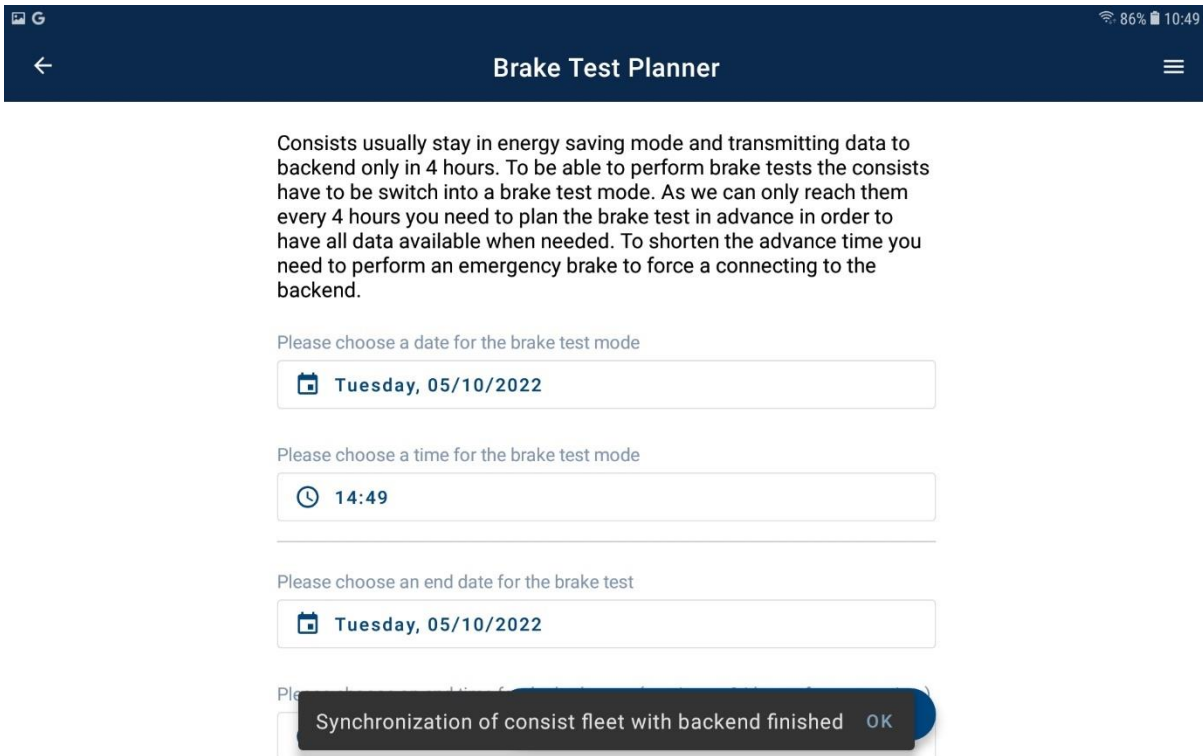
3. Figure - Brake test UI



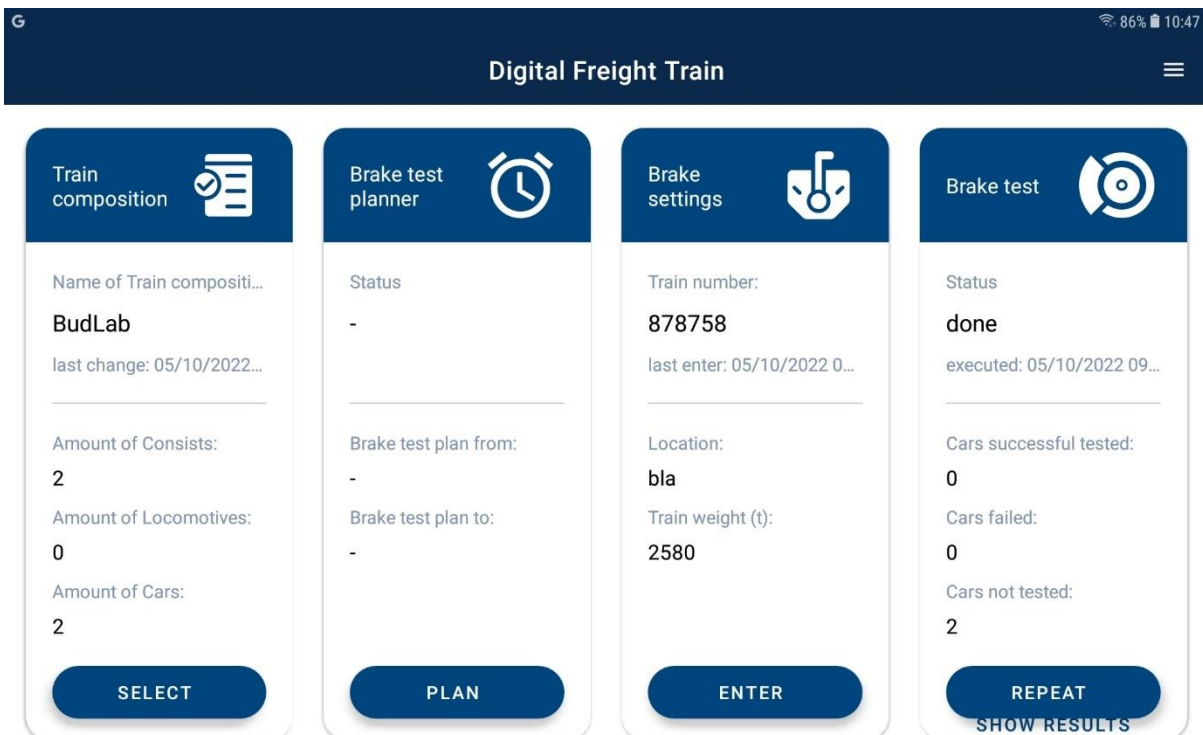
4. Figure - Wagon setup



5. Figure - Train setup



6. Figure - Synchronisation with backend confirmation (lower part of screenshot)



7. Figure - Main menu



8. Figure - Live demonstration of the brake test application (2022-05-03)

Technical fulfilment: 100%

Technical deviations:

Field testing was shifted outside the project timeline to 2022 Q2 and was performed on 2022-05-03 (see Figure 36)

Financial deviations:

Due to late fulfilment, till 2021-12-31 an estimated 62 000 EUR were not spent (app development, integration, field testing, etc.).

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2.3.2.4. Milestone 10 (Sub-Activity 2.4) - Development of a first implementation of automatic brake test in freight train

Objective:

- h. "development of concept for an automatic brake test based on the defined communication infrastructure in Activity 1*
- i. first implementation of the automatic brake test."*

Description:

Automatic Brake Test is one of the main driving forces of the industry as it provides the most benefit for rail freight transport's first mile – last mile problem, that the preparation and post activities takes up 2/3rd of the effort of a transport. To provide the first solution the Brake Test Assistant (BTA) feature set was developed. The first implementation should have minimal features but should provide solution to most of the problems: reduce walking time by a 600m long train by providing brake statuses of the train on a single screen.

Outputs:

C. "The possibility to automate different, previously defined, activities needed for an Automated Brake Test." – **Fulfilled**

Technical Achievements:

The minimal feature set was narrowed down to be able to provide brake applied and released status changes, recognize device faults, (not connected, other issues) measure and indicate leakage (*objective h*).

The BTA feature was lab tested and field tested on a 50-wagon train in 2021-02 (*objective i*).

The field test included a locomotive to supply air and initiate system wake up, application and release of the brakes. Starting from a system supposedly in 'sleep mode' the locomotive had to drop the brake pipe pressure below emergency braking level. The system acknowledged the event as a wake up and switched to "brake testing mode" having more frequent pressure measurements and instant data forwarding. All brake statuses (service and parking brake) were displayed on a tablet screen (Samsung A6, android, Commander UI running in a web browser) (see Figure 18-19). Once the brake test was simulated to *DB Rail 915* procedure description and brake statuses were acknowledged and (intentionally for test purposes) parking brakes left applied were released. Test was redone 3 times.

The brake test with Brake Test Assistant was reduced to roughly 5 minutes (without visual check and documentation). This time includes filling time from the loco and data forwarding through the cloud (around 1:30 minutes). Data forwarding times can be dramatically reduced (to tenth of a second) if using direct link to a future train mesh network.

Technical fulfilment: 100%

Technical deviations:

No problems, delays or errors were experienced.

Financial deviations:

Budget planning and use was sufficed for the current milestone.

Making the railway system
work better for society.

Annex 3 – Website screenshots

☰ **KNORR-BREMSE** MANAGE 🔔 ALERTS 📍 ZONES 📱 DEVICES ⓘ Charles-Antoin...
Ermeva

Devices 84 🔄

Product Name	Object Name	Object Enabled	Tracked Object Type	External Identifier	Serial Number	Purchase Date	Device State	Contract Expiration Date	📄	⚙️
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter		
Knorr Bremse DFC System	> DDSV Wagon 686	Enabled	Shimmns	-	10591797820479331097	19 mai 2020, 09:32:36	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 690	Enabled	Shimmns	-	10591797820479331381	17 juil. 2020, 10:33:13	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 719	Enabled	Shimmns	338746687197	10591797820479331100	17 juil. 2020, 11:03:27	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 712	Enabled	Shimmns	338746687122	10591797820479331080	17 juil. 2020, 11:03:26	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 700 **	Enabled	Shimmns	338746687007	10591797820479331346	17 juil. 2020, 11:03:25	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 727	Enabled	Shimmns	338746687270	10591797820479330467	17 juil. 2020, 11:03:24	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 701 *	Enabled	Shimmns	338746687015	10591797820479331334	17 juil. 2020, 11:03:24	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 718	Enabled	Shimmns	338746687189	10591797820479331343	17 juil. 2020, 11:03:24	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 742	Enabled	Shimmns	338746687429	10591797820479331332	17 juil. 2020, 11:03:24	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 734	Enabled	Shimmns	338746687346	10591797820479331384	17 juil. 2020, 11:03:23	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 710	Enabled	Shimmns	338746687106	10591797820479331342	17 juil. 2020, 11:03:23	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 739 *	Enabled	Shimmns	338746687395	10591797820479332491	17 juil. 2020, 11:03:22	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 716	Enabled	Shimmns	338746687163	10591797820479332490	17 juil. 2020, 11:03:22	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 704	Enabled	Shimmns	338746687049	10591797820479331337	17 juil. 2020, 11:03:22	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 714	Enabled	Shimmns	338746687148	10591797820479331336	17 juil. 2020, 11:03:21	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 721	Enabled	Shimmns	338746687213	10591797820479331362	17 juil. 2020, 11:03:21	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 702	Enabled	Shimmns	338746687023	10591797820479331355	17 juil. 2020, 11:03:21	Installed	-	📄	
Knorr Bremse DFC System	> DDSV Wagon 735	Enabled	Shimmns	338746687353	10591797820479331364	17 juil. 2020, 11:03:20	Installed	-	📄	

History Objects

DDSV Wagon 713 7094

From: To:

Object name	External Identifier	Date	Time	Mileage	Speed	Brakes Appli	Cargo Weight	Emergency E	Flat Wheel R	Hand Brake	Cargo Overl	Shock Direct	Peak Shock	Shock Trigg	Slack Adjust	Tags
Filter	Filter			9082,0 km	Max: 160,4 km/h	Filter	Filter	Filter	Filter	Filter	Filter				Filter	
★ DDSV Wagon 703	338746687031	1 févr. 2021	22:50:48	8995,5 km	68,2 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 704	338746687049	1 févr. 2021	22:49:07	8993,6 km	64,4 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 705	338746687056	1 févr. 2021	22:47:23	8991,7 km	73,8 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 706	338746687064	1 févr. 2021	22:45:38	8989,5 km	73,6 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 707	338746687072	1 févr. 2021	22:43:55	8987,4 km	76,6 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 708	338746687080	1 févr. 2021	22:42:04	8984,7 km	84,0 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 709 [depleted]	338746687098	1 févr. 2021	22:40:13	8982,2 km	79,7 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 710	338746687106	1 févr. 2021	22:38:31	8980,1 km	70,5 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 711 *	338746687114	1 févr. 2021	22:36:42	8977,9 km	63,7 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 712	338746687122	1 févr. 2021	22:35:01	8976,1 km	72,3 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 713	338746687130	1 févr. 2021	22:33:18	8973,8 km	91,0 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 714	338746687148	1 févr. 2021	22:31:33	8971,1 km	92,3 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 715 *	338746687155	1 févr. 2021	22:29:46	8968,8 km	73,6 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 716	338746687163	1 févr. 2021	22:28:01	8966,8 km	63,3 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 717 [depleted]	338746687171	1 févr. 2021	22:26:17	8964,9 km	45,0 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 718	338746687189	1 févr. 2021	22:24:34	8964,1 km	10,1 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 719	338746687197	1 févr. 2021	22:22:52	8963,9 km	2,9 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 720 [depleted]	338746687205	1 févr. 2021	22:21:11	8963,6 km	17,5 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 721	338746687213	1 févr. 2021	22:20:05	8962,9 km	34,7 km/h	●	62,2 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 722	338746687221	1 févr. 2021	22:19:45	8962,9 km	34,7 km/h	●	62,8 t	●	●	●	●	-	-	-	●	-
★ DDSV Wagon 723	338746687239															
★ DDSV Wagon 724 *	338746687247															

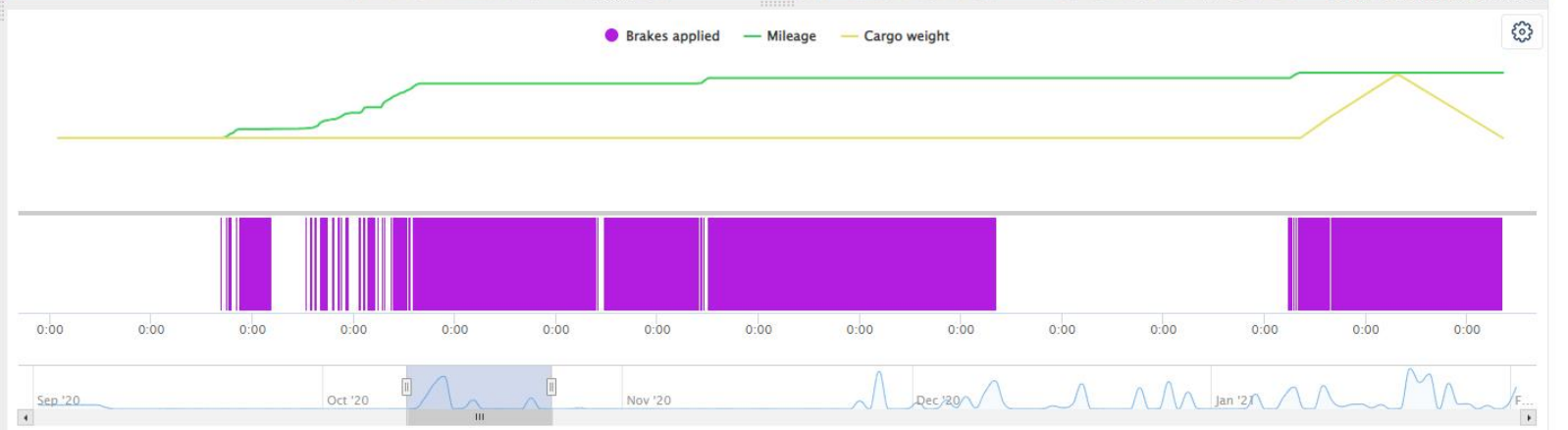
Items per page: 21 39 - 59 of 7094

History Objects

DDSV Wagon 713 7094

From: 01/09/2020 00:00 To: 01/02/2021 23:59

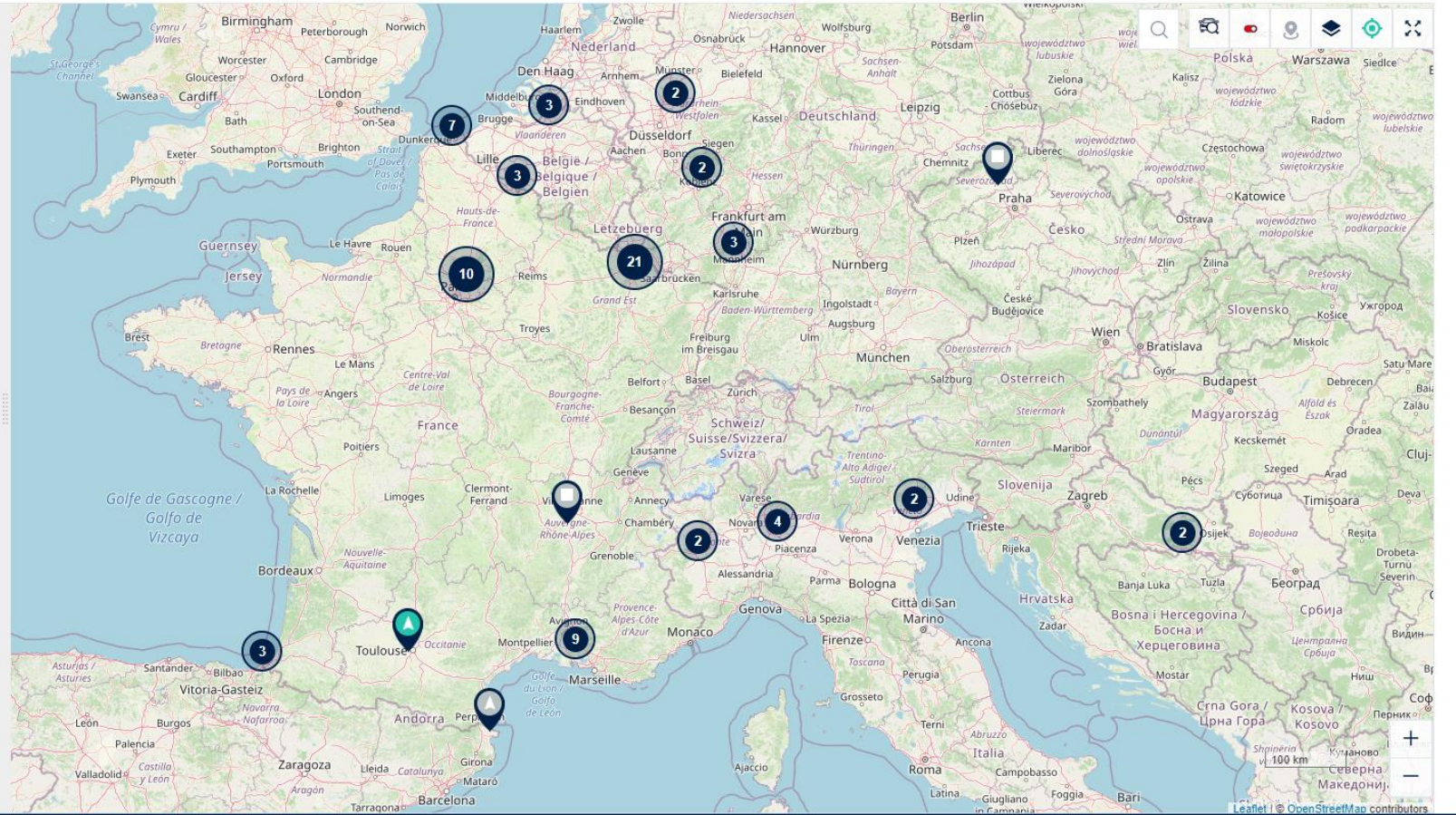
Object name	External Identifier	
Filter	Filter	
★ • 🚂 DDSV Wagon 703	338746687031	⋮
★ • 🚂 DDSV Wagon 704	338746687049	⋮
★ • 🚂 DDSV Wagon 705	338746687056	⋮
★ • 🚂 DDSV Wagon 706	338746687064	⋮
★ • 🚂 DDSV Wagon 707	338746687072	⋮
★ • 🚂 DDSV Wagon 708	338746687080	⋮
★ • 🚂 DDSV Wagon 709 [depleted]	338746687098	⋮
★ • 🚂 DDSV Wagon 710	338746687106	⋮
★ • 🚂 DDSV Wagon 711 *	338746687114	⋮
★ • 🚂 DDSV Wagon 712	338746687122	⋮
★ • 🚂 DDSV Wagon 713	338746687130	⋮
★ • 🚂 DDSV Wagon 714	338746687148	⋮
★ • 🚂 DDSV Wagon 715 *	338746687155	⋮
★ • 🚂 DDSV Wagon 716	338746687163	⋮
★ • 🚂 DDSV Wagon 717 [depleted]	338746687171	⋮
★ • 🚂 DDSV Wagon 718	338746687189	⋮
★ • 🚂 DDSV Wagon 719	338746687197	⋮
★ • 🚂 DDSV Wagon 720 [depleted]	338746687205	⋮
★ • 🚂 DDSV Wagon 721	338746687213	⋮
★ • 🚂 DDSV Wagon 722	338746687221	⋮
★ • 🚂 DDSV Wagon 723	338746687239	⋮
★ • 🚂 DDSV Wagon 724 *	338746687247	⋮



Live Objects

All for statistics 82

Object name	Filter
Favourites	65
All	82
All for statistics	82
• DSV Wagon 660 [depleted]	...
★ DSV Wagon 661	...
★ DSV Wagon 662	...
• DSV Wagon 663 [depleted]	...
★ DSV Wagon 664	...
★ DSV Wagon 665	...
★ DSV Wagon 666	...
★ DSV Wagon 667 *	...
• DSV Wagon 668 [depleted]	...
• DSV Wagon 669 [depleted]	...
★ DSV Wagon 670	...
• DSV Wagon 671	...
★ DSV Wagon 672	...
• DSV Wagon 673 [depleted]	...
★ DSV Wagon 674	...
★ DSV Wagon 675	...
★ DSV Wagon 676	...
★ DSV Wagon 677	...
• DSV Wagon 678 [depleted]	...



Annex 4 – Use cases

Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
EL1	Empty/load status	At train consist (during pressurization of brake pipe)	Each train consist	Each travel	Measurement of T pressure (weighing valve) when pressure in brake pipe is > 5 bar	Pressure	+/- 5t	<ul style="list-style-type: none"> Brake pipe Weighing valve (sensor on the pipe between WV and distributor) 	Wear laws (t.km)		The measurement needs to be done and consolidated during the trip to have a good accuracy. This will not be an issue for maintenance purpose	Covered by KB weight technical solution (pressures monitoring in the weighing valves) 3-5% of accuracy -/+ 5t to be checked
						Acceleration		<ul style="list-style-type: none"> Accelerometer 			The HUB accelerometer	



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
											is not usable for this use case	
						Distance	+/- 1m	• Spring length		Same solutions as EL2&3		
						Distance	+/- 0,5 mm	• Position of wheels et box Te				
						Bogie deformation		• Strain gauge on the bogie				
EL2	Weight measurement (Overloading)	At train consist (during pressurization of brake pipe)	Each train consist	Each travel Alert	Measurement of T pressure (weighing valve) when pressure in	Pressure	+/- 1t	<ul style="list-style-type: none"> • Brake pipe • Weighing valve (sensor on the pipe between 	Wear laws (t.km) Safety reasons	Precision of pressure sensor on WV less than 0,1b Specific cases (snad, wood chips,...)	See EL1 Alert system already integrated	



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
					brake pipe is > 5 bar			n WV and distributor)		not considered		
						Acceleration		• Accelerometer				
						Distance	+/- 1m	• Spring length				
						Distance	+/- 0,5 mm	• Position of wheels et box Te				
						Bogie deformation		• Strain gauge on the bogie				
EL3	Bad loading	At train consist (during pressurization of	Each train consist	Alert in case of 'important' difference between	• Measurement of T pressure (weighing	Pressure	+/- 1t ?	• Brake pipe • Weighing valves (2	Bad weight repartition	Allow to detect malfunctioning of the WV	Not possible because it need 2 relay valves	



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
		brake pipe)		weighing valves pressures	valve) when pressure in brake pipe is > 5 bar • 1 weighing valve per bogie (alert if difference between pressure of weighing valves)			sensor on the pipe between WV and distributor)			and the system is not setup for this use now	
						Distance	+/- 1m	• Spring length			Same solutions as EL1&2 but the threshold is different	
						Distance	+/- 0,5 mm	• Position of				

Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
								wheels et box Te				
						Bogie deformation		• Strain gauge on the bogie				
EL4 a	Flat wheel	During braking / At train consist (during pressurization of brake pipe)	Every braking	Alert	In case of malfunctioning of weighing valve	Pressure Loading (Wagon/Q/bogie deformation)		• Weighing valve	Flat wheel detection	Measure of risk of flat wheel/defect of weighing valve	Fleet wheel prevention is covered	
						Bogie deformation		• Strain gauge on the bogie	Misfunctioning of weighing valve			
EL4 b	Flat wheel	At train consist	Each train departure	Signal on wagon Alert	Switch-on and bogie deformation	Switch position and Bogie deformation		• Switch on Empty/load control	Detection of bad configuration of wagon	Anticipation of flat wheel risk	Fleet wheel prevention is covered	
	Frequency of		Each train	Batch		Switch position		• Switch-	Wear laws of			



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
EL5 or GL	use (superstructure)	At train consist	departure					on Empty/load control	open/close devices of			
						Bogie deformation		• Strain gauge on the bogie	superstructure			
					Measurement of T pressure (weighing valve) when pressure in brake pipe is > 5 bar	Pressure GPS & geofencing		• Weighing valve (sensor on the pipe between WV and distributor) or/and • GPS		Brake history and all info of wagon usage is covered		
BS1	Misfunctioning of brake	During braking	Every braking	Alert in case of non-compatibility	Pressure in cylinder not compatible with the	Pressure	0,2 bar ?	• Brake pipe • Brake cylinder • CR	Need to repair the wagon	TBC with calculation note / different brake configuration	Can be monitored. But not tested yet	



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
					pressure gap in the brake pipe/ CR			<ul style="list-style-type: none"> Weighting valve = T pressure 				
BS2	Wheel thermal overload (probability)	During braking	Every braking	Alert if conditions validated	<ul style="list-style-type: none"> Maximum pressure in brake cylinder (usually 3,8 bar) and braking time BB type (composite/cast iron) Wheels not able to withstand high 	Pressure Time Distance	0,2 bar ?	<ul style="list-style-type: none"> Brake cylinder Time Distance 	Maintenance of wheels et, safety		All is monitored by KB (only brake force can't be calculated)	






Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
					thermal stresses							
					<ul style="list-style-type: none"> • Maximum braking force and braking time • BB type (composite/cast iron) • Wheels not able to withstand high thermal stresses 	Brake force Time Distance		<ul style="list-style-type: none"> • Strain gauge on bogie • Time • Distance 				

Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
					<ul style="list-style-type: none"> • GPS location (mountain) & braking time and distance > (tbd) • Wheels not able to withstand high thermal stresses 	GPS (altitude OR location) (optional: RINF) Time		<ul style="list-style-type: none"> • GPS • Time 	Post event responsibility identification Inspection trigger Identification of risky routes/ RU			
						Coloring						
						Temperature						
BS3	Defect on wheels treads	During braking	Every braking	Batch (1/day)	None	Pressure Time Distance or Speed	0,2 bar ?	<ul style="list-style-type: none"> • Brake cylinder • Time • Distance or speed 	wear laws (t.km)	Measure of risk (instead of defect)	Not monitored, need more indirect measures to	



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
						Distances		<ul style="list-style-type: none"> • measurements on the wheel (defined in the project) 		Prediction	be done	
						Brake equipment deformation		<ul style="list-style-type: none"> • Strain gauge on bogie (brake) • Time • Distance or speed 				
BS4	Brake shoes wear	During braking	Every braking	Batch (1/week)	None	Pressure Time	0,2 bar ?	<ul style="list-style-type: none"> • Brake cylinder • Time 	wear laws (t.km)	Measure of risk (instead of defect)	Possible with the KB system, need a change of the	
						Distance	2m m	<ul style="list-style-type: none"> • adjuster output 				



Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
						Brake equipment deformation		<ul style="list-style-type: none"> Strain gauge on bogie (brake) Time 			hardware	
BS5	Hand break status	At train departure	Each train departure	Alert Batch	Switch on and wagon movement	Switch position		<ul style="list-style-type: none"> Switch on handbrake 	Post event responsibility identification	Possibility of non-functioning of brake in case of switch on	Monitored by KB	
BS6	Automatic brake test	At train consist (during pressurization of brake pipe)	Each train consist	Each travel	TBD	TBD		<ul style="list-style-type: none"> Brake pipe Brake cylinder 	Railways undertaking	Common sensors with M4.0 cf. EL1 / BS1 / (BS2) / BS5 Watch out for standardization	Monitored by KB	
GL1	Definition of risky routes	Post analysis based on localisation	update every 6 month	N/A	Number of WDR (with the same code) in a flow	GPS WDR	defined by the GPS	<ul style="list-style-type: none"> GPS 	Wear law (brake block, wheels, ...)	risky route : mountain, curved route, block length, rails	Possible with geofencing. Can be enhanced by a	

Use case	Objectives	When	Frequency	Transmission	Conditions	Data	Precision	Sensors needed	Use	Comments	Comments on KB solution	KB SAMIR Project
		and damages								quality, industrial site	map matching algorithm	
GL2	Identification of risky routes	Wagon in this area	Each travel	Batch (1/week)	None	GPS	defined by the GPS	<ul style="list-style-type: none"> • GPS 	Maintenance plan Impact on the asset location	risky route : mountain, curved route, block length, rails quality, industrial site		
A1	Identification of abnormal accelerations	In circulation	In circulation	Alert	Abnormal acceleration, limit tbd	Acceleration OR Noise	tbd tbd	<ul style="list-style-type: none"> • Accelerometer OR • Vibration OR • Noise 	Tread irregularity Heeling Roundness fault (hot box code) Derailment	Noise / vibration/acceleration	Monitored by KB	
Mileage	Already available in the system											



Annex 5 - Screenshot of the alert setup page

MANAGE

ALERTS
 ZONES
 DEVICES

Charles-Antoine RIVIERE
Ermewa

Alerts 8

+ ADD NEW ALERT CONFIGURATION

Alert Name <small>Filter</small>	Severity <small>Filter</small>	Created <small>Filter</small>	Active Violations	Enabled <small>Filter</small>	
Peak Shock	Information	28 oct. 2020, 11:30:59	0 Alerts	● Enabled	
BB thickness 60	● Critical	28 oct. 2020, 11:28:25	● > 11 Alerts	● Enabled	
Flat Wheel risk alert	Information	28 oct. 2020, 11:26:31	> 2 Alerts	● Disabled	
BB thickness bogie-2 below 20mm	Important	3 sept. 2020, 09:04:31	0 Alerts	● Enabled	
Emergency braking	Information	27 août 2020, 16:40:07	0 Alerts	● Enabled	
BB thickness bogie-1 below 20mm	Important	27 août 2020, 16:37:08	> 2 Alerts	● Enabled	
Over 5.000 Km	Information	27 août 2020, 16:34:24	> 69 Alerts	● Enabled	
Overload	Information	27 août 2020, 16:22:51	0 Alerts	● Enabled	

Items per page: 8
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Annex 6 - Wagon event / positioning structured datasets exported from the database

id	timestampreceived	protocolversion	meui64	firmwareversion	gpstimestamp	latitude	longitude	speed	pressurea	pressurebp	pressurecv	pressurer	pressuret	accumulatedcharge	voltage	temperature	control_state	motion_state	pneumatic_state	gps_time_to_first_fix	gps_signal_count	gps_retry_count	int_meas_ref_timesta
340	16/11/2021 10:55	0.18	1.06E+19	2.16E+08	1.64E+09	44.01925	4.87976	63	509	509	11	506	0	34409241	0	-274	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	8	6	68	1927350
341	22/01/2021 23:24	0.17	1.06E+19	1.91E+08	1.61E+09	44.58624	4.704246	96	500	500	00	508	0	53105379	5611	6	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	6	6	10	192075
344	19/08/2021 05:10	0.18	1.06E+19	2.16E+08	1.63E+09	51.68641	15.95609	37	491	490	01	481	0	54123585	5606	17	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	14	6	284	1610866
349	23/01/2021 08:29	0.17	1.06E+19	1.91E+08	1.61E+09	49.46874	16.01584	88	508	477	13	495	81	16843979	5963	7	CS_UNDEFINED	MS_UNDEFINED	UNKNOWN_PNEUMATIC_STATE	0	0	0	0
350	01/10/2021 14:26	0.18	1.47E+17	2.16E+08	1.63E+09	43.46846	4.894248	17	507	508	00	502	0	75918636	5765	24	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	4	3	15	396084
353	01/10/2021 16:04	0.18	1.47E+17	2.16E+08	1.63E+09	43.44897	4.905327	12	511	511	00	496	0	75926669	5766	25	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	5	9	15	401957
355	01/03/2021 00:56	0.17	1.47E+17	1.91E+08	0	50.99139	2.274997	0	492	329	37	492	0	56530353	6011	11	CS_SERVICERAKE	MS_STATIONARY	OPERATIONAL_BRAKE_APPLIED	4	15	271	2078089

id	timestampreceived	protocolversion	meui64	firmwareversion	gpstimestamp	latitude	longitude	speed	pressurea	pressurebp	pressurecv	pressurev	pressuret	accumulatedcharge	voltage	temperature	control_state	motion_state	pneumatic_state	gps_time_to_first_fix	gps_signal_count	gps_retry_count	int_meas_ref_timesta
360	01/10/2021 14:18	0.18	1.47E+17	2.16E+08	1.63E+09	43.47238	4.898275	22	499	499	0	520	0	75917335	5767	24	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	5	65	1	395983
364	02/07/2020 16:51	0.19	1.06E+19	0	1.59E+09	45.16611	18.01113	0	0	0	0	0	0	4417283	5990	31	CS_UNDEFINED	MS_UNDEFINED	UNKNOWN_PNEUMATIC_STATE	0	0	0	0
370	21/09/2021 07:03	0.18	1.06E+19	2.16E+08	1.63E+09	49.46475	2.860408	92	495	496	0	493	0	40249962	5932	13	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	39	60	1	1089417
373	02/03/2021 07:10	0.17	1.06E+19	1.91E+08	1.61E+09	49.75411	4.730869	59	499	499	1	516	0	26952292	5979	-1	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	4	63	3	361062
374	02/03/2021 07:15	0.17	1.06E+19	1.91E+08	1.61E+09	49.78173	4.665262	90	498	499	1	515	0	26953327	5972	-1	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	6	63	3	361379
376	29/12/2021 17:20	0.22	1.06E+19	53554173	1.64E+09	50.03167	15.75977	69	489	488	0	477	0	53841828	5564	5	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	7	69	1	1779143
377	25/09/2021 06:41	0.18	1.06E+19	2.16E+08	1.63E+09	44.4217	8.850948	24	544	544	0	549	0	37440323	5987	23	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	3	10	1	1797905
383	16/02/2021 08:38	0.17	1.47E+17	1.91E+08	1.61E+09	44.0302	-0.9	12	495	495	0	489	0	50596597	6018	8	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	27	61	5	897800

id	timestampreceived	protocolversion	meui64	firmwareversion	gpstimestamp	latitude	longitude	speed	pressurea	pressurebp	pressurecv	pressurer	pressuret	accumulatedcharge	voltage	temperature	control_state	motion_state	pneumatic_state	gps_time_to_first_fix	gps_signal_count	gps_retry_count	int_meas_ref_timesta
							0696																
384	02/07/2020 17:22	0.1	1.06E+19	0	1.59E+09	45.16611	18.01113	0	0	0	0	0	0	4435350	5991	31	CS_UNDEFIN	MS_UNDEFIN	UNKNOWN_PNEUMATIC_STATE	0	0	0	0
385	21/09/2021 06:36	0.18	1.06E+19	2.16E+08	1.63E+09	49.22257	2.854431	79	49	49	00	50	00	40244420	5931	14	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	6	6	100	1087818
391	21/09/2021 07:13	0.18	1.06E+19	2.16E+08	1.63E+09	49.5661	2.987626	28	49	49	10	47	07	40252324	5928	13	CS_BRAKING	MS_MOVEMENT	OPERATIONAL_BRAKE_APPLIED	15	6	100	109042
392	04/01/2021 21:02	0.17	1.47E+17	1.91E+08	1.61E+09	48.93217	2.492392	20	49	49	00	49	02	59562209	5958	3	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	6	6	0	364824
393	02/03/2021 07:11	0.17	1.06E+19	1.91E+08	1.61E+09	49.76679	4.716182	66	49	49	19	56	06	26952637	5970	-1	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	9	6	3	361163
394	18/08/2021 10:38	0.18	1.06E+19	2.16E+08	1.63E+09	51.30212	4.350219	21	50	50	10	52	02	26362888	0	-24	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	7	6	73	1143065
402	01/10/2021 15:28	0.18	1.47E+17	2.16E+08	1.63E+09	43.45781	4.900799	10	50	50	00	50	05	75922178	5772	25	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	5	8	15	400124

id	timestampreceived	protocolversion	meui64	firmwareversion	gpstimestamp	latitude	longitude	speed	pressurea	pressurebp	pressurecv	pressurer	pressuret	accumulatedcharge	voltage	temperature	control_state	motion_state	pneumatic_state	gps_time_to_first_fix	gps_signal_count	gps_retry_count	int_meas_ref_timesta
406	05/02/2021 04:33	0.15	1.06E+19	1.49E+08	1.61E+09	51.8	6.931543	9	516	507	79	48	0	16524233	59980	1	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	0	2	5	199502
412	21/09/2021 07:15	0.18	1.06E+19	2.16E+08	1.63E+09	49.9	2.992547	26	496	495	0	490	0	40252642	59283	1	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	9	6	10	1090153
413	18/08/2021 10:30	0.18	1.06E+19	2.16E+08	1.63E+09	51.28502	4.352537	9	507	506	1	502	0	26362862	0	-274	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	4	6	7	1142560
416	29/12/2021 17:16	0.2	1.06E+19	53554173	1.64E+09	50.0308	15.70134	89	486	488	0	482	0	53841139	5565	5	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	14	6	19	1778928
422	17/02/2021 06:20	0.17	1.47E+17	1.91E+08	1.61E+09	50.97732	9.69772	94	491	491	0	486	0	74662595	5793	5	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	38	4	1	113544
423	16/02/2021 08:30	0.17	1.47E+17	1.91E+08	1.61E+09	43.97996	-0.90207	85	495	495	0	489	0	50593517	6015	8	CS_TRAVEL	MS_MOVEMENT	OPERATIONAL_BRAKE_RELEASED	8	6	5	897592
...																							

Wagon	Date	Date	Time	Mileage [km]	Speed [km/h]	Brakes applied	Cargo weight [t]	Emergency braking	Flat wheel risk	Hand Brake	Cargo overload	Shock direction	Peak shock [m/s ²]
DDSV Wagon 715	31/12/2020	2020-12-31T00:43:36.289Z	2020-12-31T00:43:36.289Z	3729	83;0	400000019	On	57					
DDSV Wagon 715	30/12/2020	2020-12-30T16:32:12.166Z	2020-12-30T16:32:12.166Z	3729	813;0	800000038	On	57					
DDSV Wagon 715	30/12/2020	2020-12-30T14:59:31.168Z	2020-12-30T14:59:31.168Z	3729	813;0;On;57	9	Off	Off	Off	Off	-	-	-
DDSV Wagon 715	30/12/2020	2020-12-30T13:26:30.170Z	2020-12-30T13:26:30.170Z	3729	813;0;On;57	9	Off	Off	Off	Off	-	-	-
DDSV Wagon 715	30/12/2020	2020-12-30T07:18:22.668Z	2020-12-30T07:18:22.668Z	3729	74;2	95	On	57					
DDSV Wagon 715	30/12/2020	2020-12-30T06:47:35.667Z	2020-12-30T06:47:35.667Z	3729	74;0	100000005	On	57					
DDSV Wagon 715	30/12/2020	2020-12-30T05:50:18.552Z	2020-12-30T05:50:18.552Z	3729	74;0;On;57	9	Off	Off	Off	Off	-	-	-
DDSV Wagon 715	29/12/2020	2020-12-29T06:26:43.056Z	2020-12-29T06:26:43.056Z	3729	74;0	100000005	On	57					
DDSV Wagon 715	29/12/2020	2020-12-29T06:26:22.513Z	2020-12-29T06:26:22.513Z	3729	74;0	100000005	On	57					

Wagon	Date	Date	Time	Mileage [km]	Speed [km/h]	Brakes applied	Cargo weight [t]	Emergency braking	Flat wheel risk	Hand Brake	Cargo overload	Shock direction	Peak shock [m/s ²]
DDSV Wagon 715	29/12/2020	2020-12-29T06:25:42.007Z	2020-12-29T06:25:42.007Z	3729	73;0	400000019	On	56					
DDSV Wagon 715	29/12/2020	2020-12-29T06:25:00.014Z	2020-12-29T06:25:00.014Z	3729	656;10	40000015	On	56					
DDSV Wagon 715	29/12/2020	2020-12-29T06:24:45.162Z	2020-12-29T06:24:45.162Z	3729	645;11	61	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:23:11.166Z	2020-12-29T06:23:11.166Z	3729	192;11	90000061	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:21:30.165Z	2020-12-29T06:21:30.165Z	3728	824;9	800000381	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:19:50.668Z	2020-12-29T06:19:50.668Z	3728	646;12	99999985	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:18:12.666Z	2020-12-29T06:18:12.666Z	3728	201;7	2	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:17:03.557Z	2020-12-29T06:17:03.557Z	3728	162;4	599999962	Off	51					
DDSV Wagon 715	29/12/2020	2020-12-29T06:16:44.015Z	2020-12-29T06:16:44.015Z	3728	162;4	599999962	Off	52					

Wagon	Date	Date	Time	Mileage [km]	Speed [km/h]	Brakes applied	Cargo weight [t]	Emergency braking	Flat wheel risk	Hand Brake	Cargo overload	Shock direction	Peak shock [m/s ²]
DDSV Wagon 715	29/12/2020	2020-12-29T06:16:31.668Z	2020-12-29T06:16:31.668Z	3728	161,5	100000 114	On	56					
DDSV Wagon 715	29/12/2020	2020-12-29T06:15:51.558Z	2020-12-29T06:15:51.558Z	3728	096,15	46	On	56					
DDSV Wagon 715	29/12/2020	2020-12-29T06:15:32.013Z	2020-12-29T06:15:32.013Z	3728	096,15	46	On	55					
DDSV Wagon 715	29/12/2020	2020-12-29T06:14:50.172Z	2020-12-29T06:14:50.172Z	3727	933,19	400000 15	Off	56					
DDSV Wagon 715	29/12/2020	2020-12-29T06:13:09.169Z	2020-12-29T06:13:09.169Z	3727	677,8	500000 534	Off	56					
...													

Annex 7 - Applied Machine2Machine interface messages (Milestone 13 report)

Test for interface communication ERMEWA-Knorr

Testing of the interface communication between Knorr-Bremse (KB) and ERMEWA.

Test procedure:

- Creation of a test message with dummy data
- Emission a test messages from KB to ERMEWA at different times (various days and hours)
- Verification of the reception of a message
- Verification of the integrity of a message

Expected results:

- Message is emitted by KB and received by ERMEWA without errors in all tested configurations
- Message received match exactly with the emitted ones in all tested configurations

Creation of test messages

One test message created with dummy data:

```
{  
  
"GNSS_Position":  
  
  {  
  
    "GNSS_Latitude":52.13584,"GNSS_Longitude":5.225756,"GNSS_Speed_kmph":89,  
    "GNSS_UTCtimestamp":1598441163,"GNSS_Heading_deg":246,"GNSS_Altitude":15,  
    "ITSS_LocationInfo":  
  
      {  
  
        "Location_ZIP":"3722JC","Location_City":"De Bilt",  
        "Location_Street":"Paltzerweg","Location_Country":"Netherlands",  
        "Location_UIC_Code":"8400179","Location_GeoZone":"NL"  
  
      }  
  
    },  
  
"ITSS_TelematicsApplicationID":"knorr","ITSS_TransportDeviceID":"33 87 0692 240-2",  
  
"ITSS_TelematicsDeviceID":"KNORR-123456789"  
  
}
```

Emission of messages

The given message is emitted by Knorr 3 times:

- The 19 of November 2020 at 9 A.M.
- The 19 of November 2020 at 10 A.M.
- The 22 of November 2020 at 3 P.M.

Reception of the message

The given message is received by ERMEWA 3 times:

- The 19 of November 2020 at 9 A.M.:



```
{
  "GNSS_Position":
  {
    "GNSS_Latitude":52.13584,"GNSS_Longitude":5.225756,"GNSS_Speed_kmph":89,
    "GNSS_UTCtimestamp":1598441163,"GNSS_Heading_deg":246,"GNSS_Altitude":15,
    "ITSS_LocationInfo":
    {
      "Location_ZIP":"3722JC","Location_City":"De Bilt",
      "Location_Street":"Paltzerweg","Location_Country":"Netherlands",
      "Location_UIC_Code":"8400179","Location_GeoZone":"NL"
    }
  },
  "ITSS_TelematicsApplicationID":"knorr","ITSS_TransportDeviceID":"33 87 0692 240-2",
  "ITSS_TelematicsDeviceID":"KNORR-123456789"
}
```

- The 19 of November 2020 at 10 A.M.:



```
*20201119104022_ITSS_knorr_lastPosition_wllczsf.json - Bloc-notes
Fichier Edition Format Affichage Aide
{
  "GNSS_Position":
  {
    "GNSS_Latitude":52.13584,"GNSS_Longitude":5.225756,"GNSS_Speed_kmph":89,
    "GNSS_UTCTimestamp":1598441163,"GNSS_Heading_deg":246,"GNSS_Altitude":15,
    "ITSS_LocationInfo":
    {
      "Location_ZIP":"3722JC","Location_City":"De Bilt",
      "Location_Street":"Paltzerweg","Location_Country":"Netherlands",
      "Location_UIC_Code":"8400179","Location_GeoZone":"NL"
    }
  },
  "ITSS_TelematicsApplicationID":"knorr","ITSS_TransportDeviceID":"33 87 0692 240-2",
  "ITSS_TelematicsDeviceID":"KNORR-123456789"
}
```

- The 22 of November 2020 at 3 P.M.:



```
*20201122153740_ITSS_knorr_lastPosition_nrihydkqet.json - Bloc-notes
Fichier Edition Format Affichage Aide
{
  "GNSS_Position":
  {
    "GNSS_Latitude":52.13584,"GNSS_Longitude":5.225756,"GNSS_Speed_kmph":89,
    "GNSS_UTCTimestamp":1598441163,"GNSS_Heading_deg":246,"GNSS_Altitude":15,
    "ITSS_LocationInfo":
    {
      "Location_ZIP":"3722JC","Location_City":"De Bilt",
      "Location_Street":"Paltzerweg","Location_Country":"Netherlands",
      "Location_UIC_Code":"8400179","Location_GeoZone":"NL"
    }
  },
  "ITSS_TelematicsApplicationID":"knorr","ITSS_TransportDeviceID":"33 87 0692 240-2",
  "ITSS_TelematicsDeviceID":"KNORR-123456789"
}
```

The received message match with the emitted one in all 3 communications.

The message is stored by ERMEWA before treatment.

Further test:

Further testing of the data communication in the productive environment will be part of the Activity 3. (See below the report shared during the previous ASR submission)

*Sub-activity 3.3:**Test and ramp-up of communication interface development and deployment**Completion date 30/06/2021*

Main parameters checked: Reliability of the data received from the field

Reason:

The reliability of the data transmission and its integration in the operational environment need to be verified.

Method:

We compare data from the Commander website (KB backend) and the ERMEWA backend while all equipped wagons are sending messages.

Conclusion:

On the selected group of data, the content of all of them is compliant with the KB backend and there is no gap or missing data.

Making the railway system
work better for society.

File Name	Date received	Time received	Wagon	Date	Time	Latitude GPS	Longitude GPS	GPS	Latitude Dec	Longitude Dec	ITSS_TelematicsApplicationID	ITSS_TelematicsDeviceID
20210111174553_ITSS_knorr_lastPosition_dkpofnps.json	11/01/2021	17:45:53	37 80 4677 690-2	05/02/2021	00:00:06	N51°0'9	E2°18'33	N51°0'9 E2°18'33	51.00248717	2.30909800	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576
20210111174554_ITSS_knorr_lastPosition_ycotntgjzd.json	11/01/2021	17:45:54	37 80 4677 690-2	05/02/2021	00:00:51	N51°0'13	E2°18'49	N51°0'13 E2°18'49	51.00368117	2.31360500	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576
20210111174554_ITSS_knorr_lastPosition_xleqq.json	11/01/2021	17:45:54	37 80 4677 690-2	05/02/2021	00:01:40	N51°0'12	E2°18'45	N51°0'12 E2°18'45	51.00326917	2.31243083	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576
20210111174555_ITSS_knorr_lastPosition_lrjvhvjison	11/01/2021	17:45:55	37 80 4677 690-2	05/02/2021	00:01:54	N51°0'6	E2°18'30	N51°0'6 E2°18'30	51.00157917	2.30841467	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576
20210111174555_ITSS_knorr_lastPosition_xsrdohw.json	11/01/2021	17:45:55	37 80 4677 690-2	05/02/2021	00:01:26	N50°59'5	E2°18'10	N50°59' E2°18'10	50.99984350	2.30271783	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576
20210111174556_ITSS_knorr_lastPosition_nnpyyaur.json	11/01/2021	17:45:56	37 80 4677 690-2	05/02/2021	00:01:09	N50°59'5	E2°17'55	N50°59' E2°17'55	50.9953050	2.29853050	knorr	KNORR-7c187ad2-33c7-41d1-a597-fa0653246576

File Name	Date received	Time received	Wagon	Date	Time	Latitude GPS	Longitude GPS	GPS	Latitude Dec	Longitude Dec	ITSS_TelematicsApplicationID	ITSS_TelematicsDeviceID
									861133			
20210111174434_ITSS_knorr_lastPosition_hzsstrhbr.json	11/01/2021	17:44:34	33 87 4668 724-7	05/02/2021	01:01:58	N49°18'60	E6°8'41	N49°18'60E6°8'41	49.31664650	6.14476717	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174434_ITSS_knorr_lastPosition_pllmowl.json	11/01/2021	17:44:34	33 87 4668 724-7	05/02/2021	01:02:17	N49°18'60	E6°8'41	N49°18'60E6°8'41	49.31664650	6.14476717	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174435_ITSS_knorr_lastPosition_tnlejkcyp.json	11/01/2021	17:44:35	33 87 4668 724-7	05/02/2021	01:03:30	N49°18'58	E6°8'43	N49°18'58E6°8'43	49.31600950	6.14529417	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174435_ITSS_knorr_lastPosition_duigco.json	11/01/2021	17:44:35	33 87 4668 724-7	05/02/2021	01:03:49	N49°18'58	E6°8'43	N49°18'58E6°8'43	49.31600950	6.14529417	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174435_ITSS_knorr_lastPosition_mvihkftpo.json	11/01/2021	17:44:35	33 87 4668 724-7	05/02/2021	01:04:56	N49°18'57	E6°8'44	N49°18'57E6°8'44	49.31569667	6.14545917	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174436_ITSS_knorr_lastPosition_fjkfyiev.json	11/01/2021	17:44:36	33 87 4668 724-7	05/02/2021	01:06:36	N49°18'57	E6°8'59	N49°18'57E6°8'59	49.31577300	6.14965717	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174436_ITSS_knorr_lastPosition_kdbimbfdn.json	11/01/2021	17:44:36	33 87 4668 724-7	05/02/2021	01:07:02	N49°18'57	E6°8'60	N49°18'57E6°8'60	49.31573483	6.14995467	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0

File Name	Date received	Time received	Wagon	Date	Time	Latitude GPS	Longitude GPS	GPS	Latitude Dec	Longitude Dec	ITSS_TelematicsApplicationID	ITSS_TelematicsDeviceID
20210111174437_ITSS_knorr_lastPosition_wtkjyem.json	11/01/2021	17:44:37	33 87 4668 724-7	05/02/2021	01:07:06	N49°18'57	E6°8'60	N49°18'57E6°8'60	49.31574233	6.14987467	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174437_ITSS_knorr_lastPosition_feaiyp.json	11/01/2021	17:44:37	33 87 4668 724-7	05/02/2021	01:07:26	N49°18'57	E6°8'60	N49°18'57E6°8'60	49.31574233	6.14987467	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174438_ITSS_knorr_lastPosition_sgwgonm.json	11/01/2021	17:44:38	33 87 4668 724-7	05/02/2021	01:08:01	N49°18'55	E6°9'3	N49°18'55E6°9'3	49.31517783	6.15091833	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174438_ITSS_knorr_lastPosition_rfgqixk.json	11/01/2021	17:44:38	33 87 4668 724-7	05/02/2021	01:08:29	N49°18'55	E6°9'3	N49°18'55E6°9'3	49.31528083	6.15086883	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174439_ITSS_knorr_lastPosition_wywhfhea.json	11/01/2021	17:44:39	33 87 4668 724-7	05/02/2021	01:08:48	N49°18'55	E6°9'3	N49°18'55E6°9'3	49.31528083	6.15086883	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174439_ITSS_knorr_lastPosition_wjjohgduc.json	11/01/2021	17:44:39	33 87 4668 724-7	05/02/2021	01:09:10	N49°18'55	E6°9'3	N49°18'55E6°9'3	49.31526550	6.15089450	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174440_ITSS_knorr_lastPosition_zivbla.json	11/01/2021	17:44:40	33 87 4668 724-7	05/02/2021	01:10:51	N49°19'6	E6°8'53	N49°19'6E6°8'53	49.31819900	6.14797733	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174440_ITSS_knorr_lastPosition_pfrqapjtc.json	11/01/2021	17:44:40	33 87 4668 724-7	05/02/2021	01:12:31	N49°19'26	E6°8'52	N49°19'26E6°8'52	49.32266667	6.14783133	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0

File Name	Date received	Time received	Wagon	Date	Time	Latitude GPS	Longitude GPS	GPS	Latitude Dec	Longitude Dec	ITSS_TeleaticsApplicationID	ITSS_TelematicsDeviceID
									400500			
20210111174441_ITSS_knorr_lastPosition_lcjmfmtz.json	11/01/2021	17:44:41	33 87 4668 724-7	05/02/2021	01:13:43	N49°19'36	E6°8'53	N49°19'36E6°8'53	49.32672117	6.14797683	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174441_ITSS_knorr_lastPosition_sgtqtkj.json	11/01/2021	17:44:41	33 87 4668 724-7	05/02/2021	01:14:08	N49°19'40	E6°8'54	N49°19'40E6°8'54	49.32788467	6.14833017	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174442_ITSS_knorr_lastPosition_yclqrlbc.json	11/01/2021	17:44:42	33 87 4668 724-7	05/02/2021	01:14:09	N49°19'42	E6°8'55	N49°19'42E6°8'55	49.32840333	6.14848183	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174442_ITSS_knorr_lastPosition_wqdehyd.json	11/01/2021	17:44:42	33 87 4668 724-7	05/02/2021	01:14:27	N49°19'40	E6°8'54	N49°19'40E6°8'54	49.32788467	6.14833017	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174442_ITSS_knorr_lastPosition_tprrisn.json	11/01/2021	17:44:42	33 87 4668 724-7	05/02/2021	01:15:31	N49°19'52	E6°8'59	N49°19'52E6°8'59	49.33102417	6.14975967	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174443_ITSS_knorr_lastPosition_nqeoducvap.json	11/01/2021	17:44:43	33 87 4668 724-7	05/02/2021	01:15:48	N49°19'55	E6°9'01	N49°19'55E6°9'01	49.33193200	6.15021600	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174443_ITSS_knorr_lastPosition_zooqsqn.json	11/01/2021	17:44:43	33 87 4668 724-7	05/02/2021	01:15:54	N49°19'54	E6°9'00	N49°19'54E6°9'00	49.33168017	6.15008633	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0

File Name	Date received	Time received	Wagon	Date	Time	Latitude GPS	Longitude GPS	GPS	Latitude Dec	Longitude Dec	ITSS_TelematicsApplicationID	ITSS_TelematicsDeviceID
20210111174444_ITSS_knorr_lastPosition_fjeicajbzt.json	11/01/2021	17:44:44	33 87 4668 724-7	05/02/2021	01:16:14	N49°19'54	E6°9'0	N49°19'54E6°9'0	49.33168017	6.15008633	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174444_ITSS_knorr_lastPosition_gyvfwbjq.json	11/01/2021	17:44:44	33 87 4668 724-7	05/02/2021	01:17:29	N49°20'5	E6°9'7	N49°20'5E6°9'7	49.33460617	6.15197650	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174445_ITSS_knorr_lastPosition_qkuoyjjo.json	11/01/2021	17:44:45	33 87 4668 724-7	05/02/2021	01:18:09	N49°20'7	E6°9'9	N49°20'7E6°9'9	49.33540333	6.15254917	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174445_ITSS_knorr_lastPosition_lwicywoue.json	11/01/2021	17:44:45	33 87 4668 724-7	05/02/2021	01:18:51	N49°20'11	E6°9'11	N49°20'11E6°9'11	49.33631883	6.15304367	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
20210111174445_ITSS_knorr_lastPosition_ujfoju.json	11/01/2021	17:44:45	33 87 4668 724-7	05/02/2021	01:19:09	N49°20'12	E6°9'11	N49°20'12E6°9'11	49.33670417	6.15319333	knorr	KNORR-f3b5466b-0c6c-4014-a484-5c05a07b17b0
...												