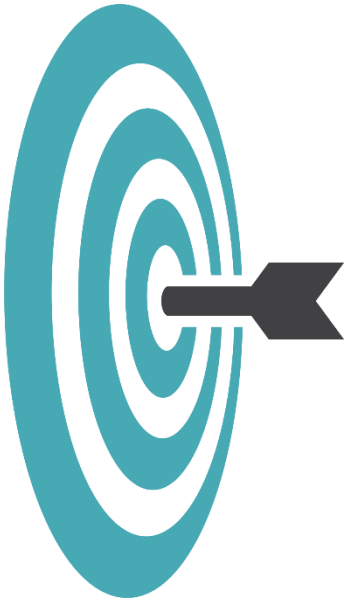
INTERNATIONAL UNION
OF RAILWAYS

Unified Braking Scheme –
A common initiative of Xrail and UIC

07 April 2022

Alliance members:

In line with the 4th railway package, RUs are creating a proposal for common braking rules



1. Develop one single European braking scheme

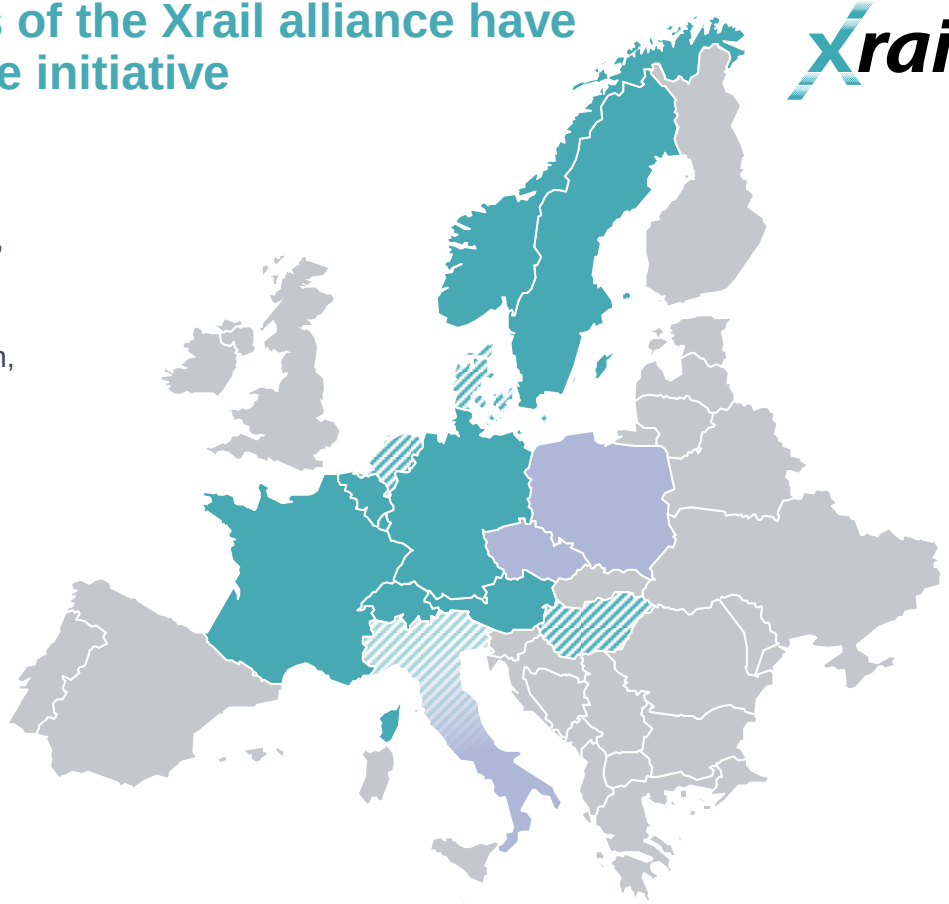
2. Align (& if possible, simplify) existing national / RU-specific braking rule sets, including:
   - Agreement on a unified braking sheet
   - Braked weight calculation
   - Train composition / brake position rules

3. Reduce retardation of trains and administration efforts at borders while keeping same level of safety

Source: Xrail

Further RUs beyond the members of the Xrail alliance have joined the Unified Braking Scheme initiative

- Xrail members CFLC, DBC, Green Cargo, Lineas, RCG, SBBC, & Fret SNCF participating
- Non-Xrail RUs Mercitalia, TX Logistik, Lokomotion, PKP Cargo, & CD Cargo participating
- Xrail RU subsidiaries involved

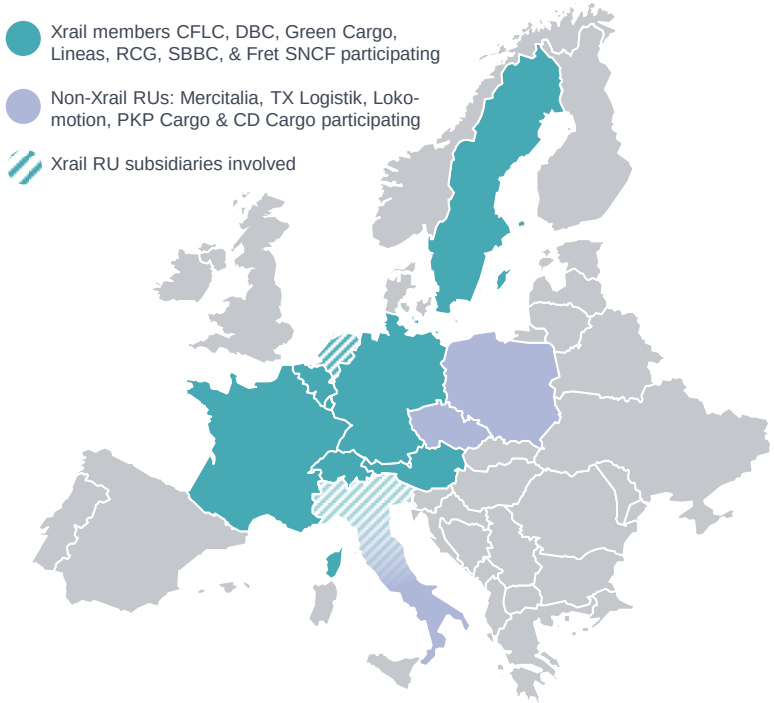


Source: Xrail

Brake sheet and brake positions successfully aligned since 2019 – enabling reduced border times & complexity in train preparations

RECAP

- The 4th railway package allowed RUs to define own braking rules → enabling them to commonly set internationally harmonized rules
- As of March 2019, Xrail took over the lead of the Unified Braking Scheme (UBS) project
- The project involves RU experts of 17 different RUs / RU subsidiaries and is executed with UIC support in close alignment with DG Move & ERA
- Current achievements to be finalized 2022



Source: Xrail

Based on recent study results, heavier / faster SWL trains possible now as empty wagons are no longer excluded from P-trains >1600t

BRAKE POSITION RULES

- Basic ruleset aligned & reflected in ERA AMOC & UIC IRS 40421*
- 2nd TrainDY study results allow rule simplification for P-trains > 1600 t*
- Potential 3rd study on articulated wagons in discussion

BRAKE SHEET / WAGON LIST

- “Int. brake sheet / wagon list” aligned and published within ERA AMOC*, publication in IRS 472 in progress at UIC
- Available in multiple languages and ready for RU implementation (e.g. at DBC NL by May 2022)

BRAKE % CALCULATION

- Harmonization only possible with ETCS, but IMs currently misuse correction factors to align with legacy system logic - causing interoperability barriers
- Potential DMI** change needs on locomotives are under discussion with RUs

* P-trains >1600 tons not yet covered in UIC IRS 40421; simplified rules based on 2nd TrainDY not yet in UIC IRS nor ERA AMOC (= Acceptable Means of Compliance)
** DMI = the driver-machine interface of ETCS installed on locomotives

Source: Xrail

Aligned brake sheet / wagon list published in ERA AMOC:
https://www.era.europa.eu/activities/technical-specifications-interoperability_en

Xrail

International brake sheet and wagon list

1. Issuing RU	2. Train number	3. Departure date	6. Train profile:	5. Country code					
4a. Valid from station	4b. Valid to station		7. V_{max}, km/h:						

Train parameters

8. Remarks during the journey	9. Special features of the train

- ☐ 10. Dangerous goods in train
- ☐ 11. Exceptional consignment in train
- ☐ 12. Additional documents about restrictions added
- ☐ 13. Waste shipments in train

	16a. Valid from station		16b. Valid to station	16c. Valid from station		16d. Valid to station
	17a. # of first wagon	18a. # of last wagon		17c. # of first wagon	18c. # of last wagon	
	a Active locomotives	b Wagons and inactive locomotives	a+b Total	c Active locomotives	d Wagons and inactive locomotives	c+d Total
19. Count, pcs						
20. Length, m						
21. Hand brake holding force, t / kN						
22. Braked weight after deduction, t						
23. Gross weight, t						

14. Required line classification	15. Brake setting		
	○ G ○ P ○ P+LL ○ R	24. Available brake %:	24. Available brake %:
		25. Required brake %:	25. Required brake %:
		26. Missing brake %:	26. Missing brake %:
		27. % of braked weight braked by cast iron blocks:	27. % of braked weight braked by cast iron blocks:

Active locomotives in train

28. Seq.	29. Number	30. Class	31. # of axles	32. Length over buffers, m	33. Gross weight, kg	34. Brake block type	35. Brake position	36. Braked weight, t	37. Remarks
1									
2									
3									
4									
5									

38. Date of issue	39. Time of issue	40. Issued by (name, signature)	
41. Date of review	42. Time of review	43. Reviewed by (name, signature)	44.Remark

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v1.1, October 2020 – created by Xrail / UIC Unified Braking Scheme workgroup – feedback at operations@xrail.eu

Wagon list (wagons and inactive locomotives)

45. Seq.	46. Number	47. # of axles	48. Length over buffers, m	49. Weight of load, kg	50. Gross weight, kg	51. Brake block type	52. Braked weight, t P	52. G	53. Hand brake holding force, t / kN	54. RID UN No	54. Hazard No	54. Danger Label	55. Exceptional consignment	56. Destination	57. V_{max}, km/h	58. Required line classification	59. Remarks
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60. Date of issue	61. Time of issue	62. Issued by (name, signature)	
63. Date of review	64. Time of review	65. Reviewed by (name, signature)	66. Remark

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Source: Xrail

National differences in rules are not justified, unless it can be proven that local circumstances lead to higher in-train forces

	P-braked trains				G-braked trains		
Wagon rake weight (excl. active locos)	Brake position of leading active locomotives	Brake position of the first vehicles thereafter and their count	Brake position of all following vehicles	What if required brake position not possible?	Brake position of all vehicles	Maximum allowance of brake position P	Allowance of unbraked vehicles
0...800 t	P	P	P	Turn brakes off	G	12 axles, for the rest brakes are to be turned off if brake position G is not possible	Any train may have up to 3 consecutive unbraked wagons, but the first and last wagon of the wagon rake must have active brakes
801...1200 t	G	P	P				
1201...1600 t	G	5 x G	P				
1601...2300 t	G	7 x G*	P				
2301...4000 t	No harmonization**						

* Articulated vehicles not allowed
** Harmonization not possible due to lack of evidence that can prove acceptable safety levels. Individual countries may still apply their own rules to allow such trains.

The proposal is currently being reviewed by UIC working group in order to publish the rules in IRS 40421 (former leaflet 421), update of the TSI OPE AMOC also planned

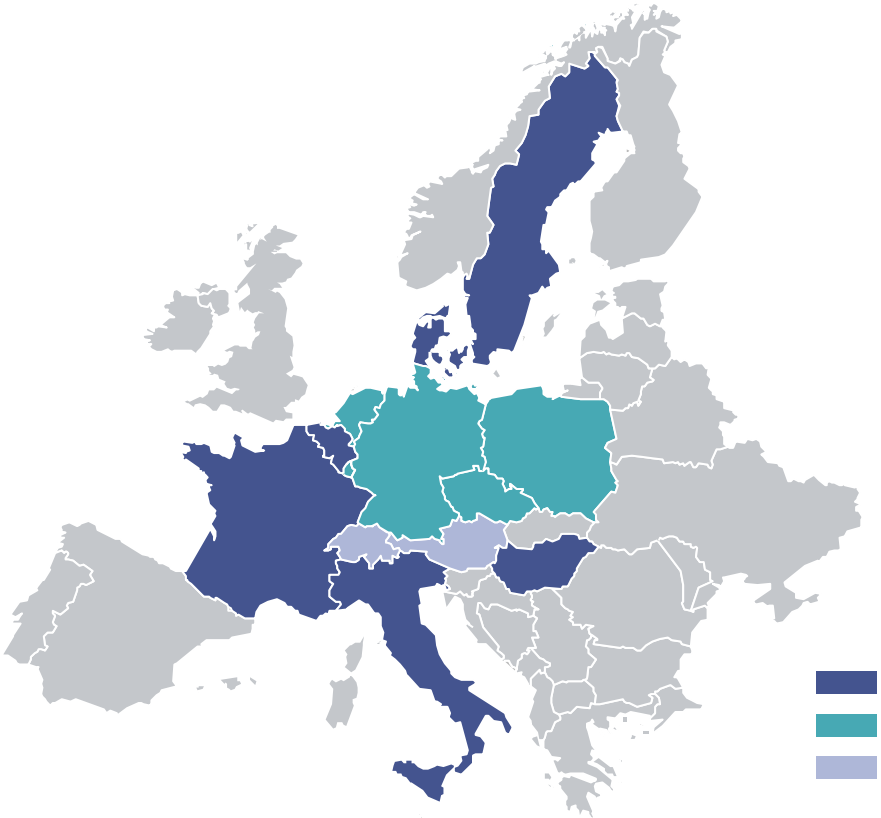
Source: Xrail

Harmonization of braked weight calculation cannot be achieved by RUs alone – ERA / DG Move were asked to take the lead

1. Brake performance cannot be evaluated RU-individually based on RINF data as brake % is an input value for signalling systems
2. Harmonization is only achievable if IMs and NSAs agree to adjust regulations and related signalling systems
3. Harmonization of brake calculation by introducing ETCS is only possible if IMs refrain from misusing the configuration factors – currently a common practice to ensure ETCS matches with legacy signalling rules
4. As harmonization is oriented towards international traffic, it is still possible to nationally apply (less restrictive) rules

Source: Xrail

European signalling systems do not consider brake application delays in a uniform manner – three major philosophies exist



Please note!

The braked weight calculation methods within clusters are not fully harmonized but the effort to do so is assumed to be low.

- Cluster A: no train length-based deductions from braked weight
- Cluster B: length-based deductions from braked weight apply
- Cluster C: length-based deductions from braked weight apply, additional deductions for intermodal and G-braked trains

Source: Xrail

What still needs to be done to reach harmonization?

1. Finalize publication of harmonized brake sheet (IRS 40472) and brake position rules that are already aligned (TSI OPE AMOC and IRS 40421 update)
2. Analyse how to enable P-trains >2300 t and how to ease restrictions on articulated wagons in the common rule-set
3. Fully harmonize within clusters A and B, merge cluster C to cluster B
4. Align internationally on ETCS Train Categories that must be used for freight trains
5. Raise awareness at RUs that ETCS OBU DMI installations must support individual brake % input for ETCS and class B systems – the STM enables that
6. Raise awareness at IMs that the current misuse of correction factors to align ETCS with legacy signalling hampers interoperability and should be revised

Source: Xrail