



INTERNATIONAL UNION  
OF RAILWAYS

## Unified Braking Scheme – A common initiative of Xrail and UIC

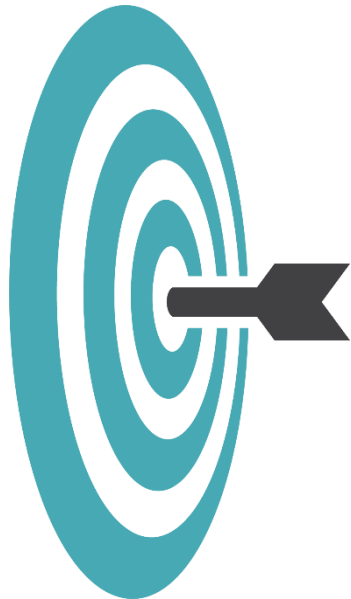
29 November 2022



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

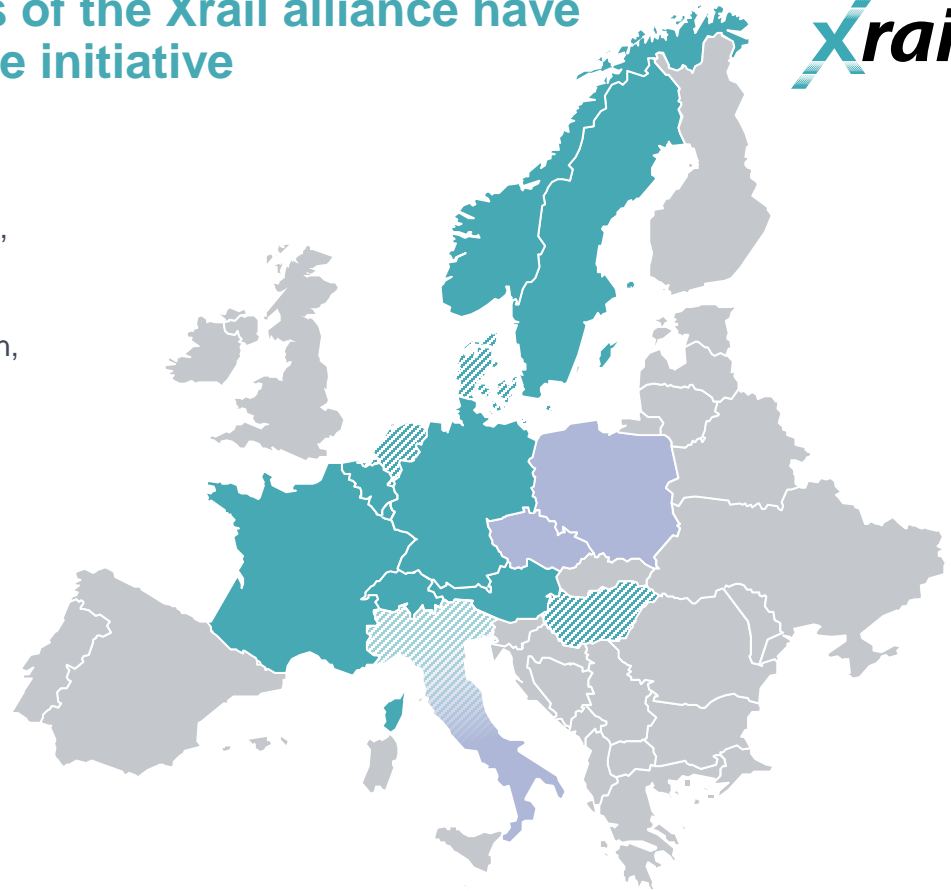
3

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

# 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

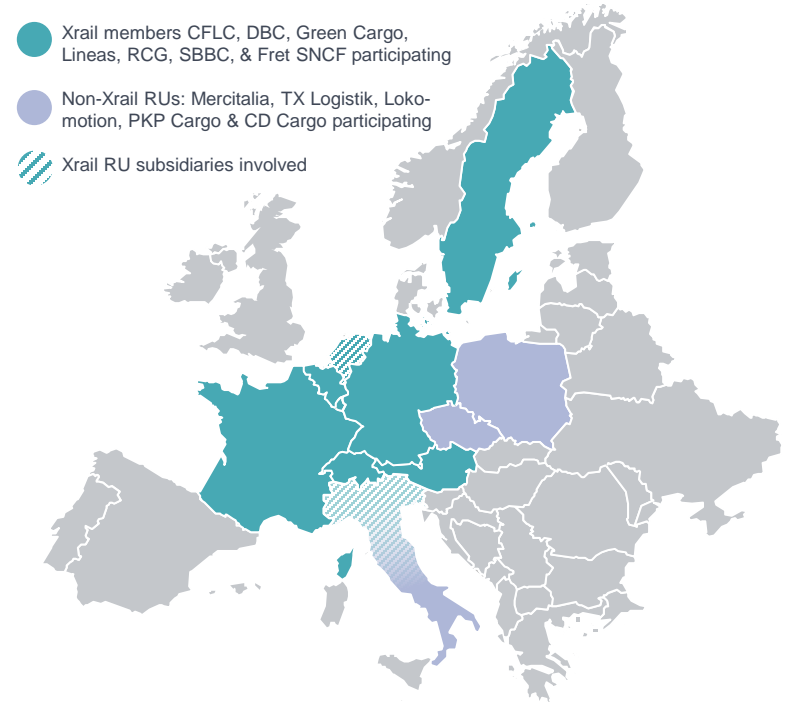


# Brake sheet and brake positions successfully aligned since 2019 – enabling reduced border times & complexity in train preparations



RECAP

- The 4<sup>th</sup> railway package allows 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 in 2022



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\*
- Rule simplification for unbraked wagons and P-trains > 1600 t\*
- 3<sup>rd</sup> study on articulated wagons ongoing



### BRAKE SHEET / WAGON LIST

- “Int. brake sheet / wagon list” aligned and published within ERA AMOC and IRS 40472
- Available in multiple languages and ready for RU implementation



### BRAKE % CALCULATION

- Harmonization only possible with ETCS, but IMs currently misuse correction factors to align with legacy system logic - causing interoperability barriers
- ETCS STM\*\* does support dual brake % input (one for class B and one for ETCS)

\* P-trains >1600 tons not yet covered in UIC IRS 40421 but already included in the AMOC (= Acceptable Means of Compliance)

\*\* DMI = Specific Transmission Module, which links ETCS and class B signalling systems with each other



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



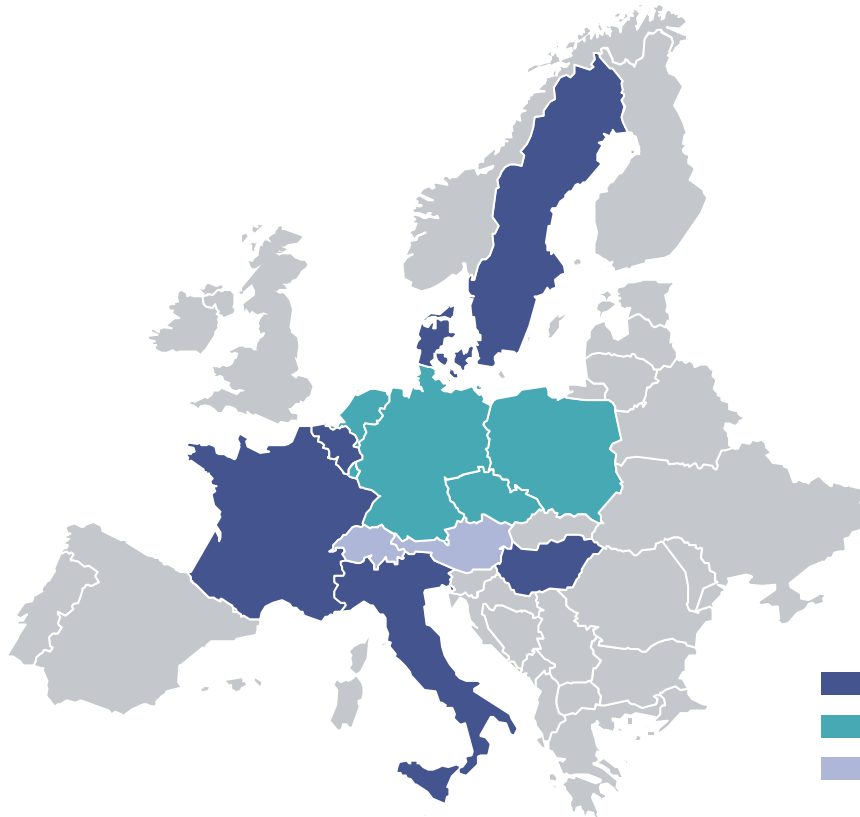
Wagon rake weight (excl. active locos)	P-braked trains				G-braked trains		Allowance of unbraked vehicles
	Brake position of leading active locomotives	Brake position of the first vehicles thereafter and their count	Brake position of all following vehicles	What if required brake position not possible?	Brake position of all vehicles	Maximum allowance of brake position P	
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 already done. Further amendments in pipeline as part of the third TrainDy study.

# 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



# The most practical way would be to harmonize into two clusters and allow parallel usage of both with the help of ETCS



## How to harmonize brake % calculation in Europe?

### Change cluster B/C

- Find ways to adjust class B and C systems to a harmonized logic of cluster A
- Issues:
  - Very challenging because of the anticipated transition to ETCS – sunk cost in legacy systems unjustified
  - No legislative support from EU – such adjustments must be undertaken voluntarily by the member states (which is unlikely)

### Two clusters coexisting under ETCS OB

- Merge clusters B and C (by resolving issues causing cluster C specialities)
- Use ETCS OB\* as an enabler to allow two brake % values to be calculated and also inserted to the OB DMI\* - the ETCS value (cluster A) & the cluster B value
- For each country / signalling system one and only one value is applicable
- Interoperability issues in ETCS context:
  - Current ETCS OB DMIs\* do not always support dual brake % values (not even for class B) – whenever there is a change, a train has to stop to change the input data
  - IMs currently misuse ETCS correction factors to align it with legacy signalling logic
  - Older ETCS trackside (TS) and OB versions do not support brake curve calculation based on train length
  - No common approach on ETCS Train Categories' usage

### Wait for ETCS full rollout

- There would be no harmonization before at least all major international routes or even complete networks are fully equipped with ETCS baseline 3
- Issues:
  - No harmonization in the foreseeable future due to a very long implementation perspective

# 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 The only realistic possibility to harmonize brake % calculation is by using ETCS as a master system
- 3 The approach of using ETCS is only possible if IMs refrain from misusing the correction factors – currently a common practice to ensure ETCS brake % matches with legacy signalling rules
- 4 As harmonization is oriented towards international traffic, it is still possible to nationally apply (less restrictive) rules

# What still needs to be done to reach harmonization?



- 1 Finalize publication of brake position rules that are already aligned (IRS 40421 update)
- 2 Finalize 3<sup>rd</sup> TrainDY study that seeks possibilities to ease restrictions on articulated wagons in the common rule-set
- 3 For braked weight calculation, 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