INTELLIGENT ACCESS POLICY, E-WAYBILLS AND EFTI DEVELOPMENTS IN ESTONIA




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Abstract

The research and development motivation are more effective and greener road freight transport with HV's, without damaging aging road infra below. One of the best solutions in 21. century is to use all kinds of digital data (GNSS; OBW etc.) and road maps, to control the logistics in the most optimum way, depending on the used vehicle's load type. Hopefully Intelligent Access Policy (IAP) will be standardized by updated EC96/53 in coming years, like eFTI 2020/1056 is standardizing the freight data (efti4eu.eu). EU level standardization helps a lot the infra owners and logistic sector to get unified and effective service provided for handling freight and vehicle data. After standardization there will be many cross-border service providers and the service quality will expand and grow rapidly in the free EU market. Digitalization makes logistics very cost-effective, and IAP helps to protect the expensive aging infra at the same time in the most optimum way. Since the HVTT15, HVTT16, SRF10th and TRA2024 conferences, much work has been done in Estonia.

Keywords: Intelligent Access Policy (IAP, VELUB); EU eFTI regulation; Automated Mass Control Integration (OBW); Estonian e-waybill (eCMR) development.

1. Introduction

Since 2010, the Estonian Transport Agency (ETA) has been developing Intelligent Access (IA). Initially, it was intended only for transporting timber at 52 tonnes during winter, provided that the pavement was frozen to a minimum depth of 0.5 m. For that reason, digital vertical temperature sensors (up to 2.5 m deep) were installed across Estonia. [1] At the same time, the main infrastructure corridors were analyzed and mapped [2] (called SmartRoad – the green-colored digital road corridors, updated daily at 4 p.m.). In the VELUB system, it is possible to apply for a special vehicle permit valid for up to one year. [3]

As climate change progressed, the winter corridor window quickly shortened. Therefore, the ETA started to develop a year-round 52 t (the violet corridors) IA system [4], along with the necessary legislation. [5] IA has been used since 2015 by about 350 trucks per year, mostly timber trucks so far, with usage gradually expanding to others.

On 9 April 2020, the ETA signed a memorandum with nine other stakeholders to develop an e-waybill for bulk material transport in the road maintenance sector. Since then, there have been many pilot contracts, and the system became mandatory in road construction projects starting in 2024.

To prepare for the application of the Regulation on electronic freight transport information (eFTI), the Estonian Ministry of Climate developed and tested, between 2020 and 2023, a cross-border eCMR indexing prototype together with partners from the Nordic-Baltic region. In spring 2023, Estonia, as a lead partner with other EU Member States, also launched a new three-year project called eFTI4EU, co-funded by the Connecting Europe Facility (CEF). A major part of this project involves piloting the eFTI Gate solution.

In the following paragraphs, a brief overview of Estonia's different e-waybill developments (please see Figure 1) and research will be provided.

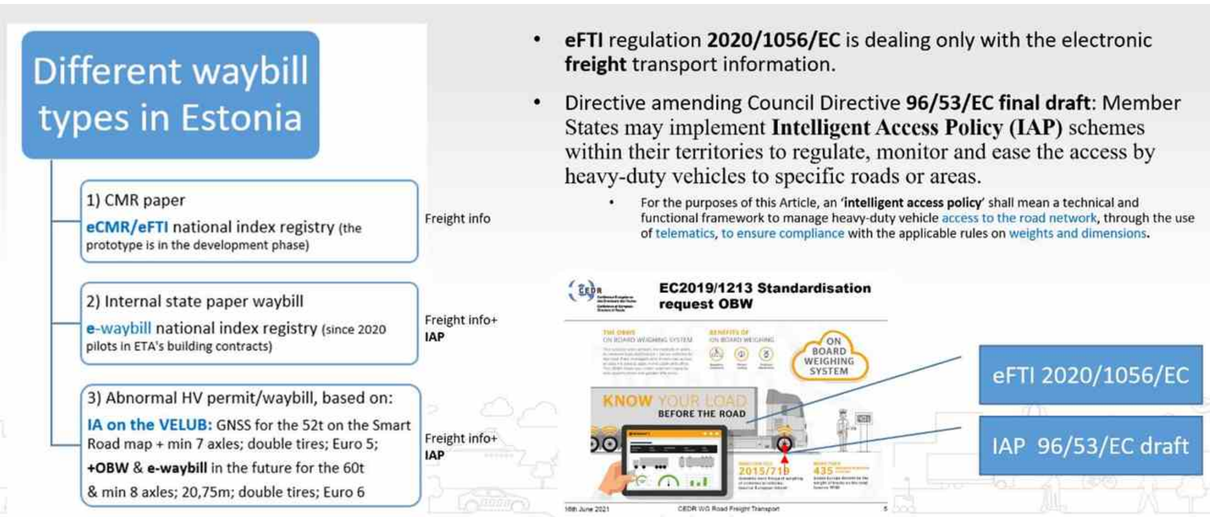

Figure 1. Intelligent Access, e-waybills and eFTI

2. VELUB Intelligent Access

Since the HVTT15 paper [6], considerable work has been carried out in Estonia in logistics digitalization. This work is briefly described below to facilitate a better understanding of the various cloud-based logistic systems and their common ground (see also HVTT16 paper [7]).

For example, if an HV (i.e., abnormal) travels along the wrong road corridor or if its total OBW (on board weights) mass exceeds the permitted limit, the cloud-based eCMR could mark the relevant cell red in the future and send a notification to monitoring organizations. On the Smart Road map, it could also appear as a blinking red dot. Eventually, direct automated enforcement could be introduced in the future, much like existing speed cameras.

The CEDR report *Intelligent Access (IA): Current NRA Practices* [8] provides a good overview of ongoing IA developments. In addition, the *Revision of the Weights and Dimensions Directive 96/53/EC* [9] references potential uses for eFTI and IAP. The proposal also suggests establishing technical and operational standards for information exchange in the transport of indivisible loads and for developing Intelligent Access Policies (IAP). Currently, a three-year CEDR research project on Intelligent Access is underway as part of the digital transformation of road freight transport. [10]

In Estonia we aim to increase permissible truck loads from 52 t up to 60 t. It is possible that for domestic trucks, we will require a minimum of eight axles, double tires, etc., and use IAP to access lower road classes. After some years, we will likely allow EMS 60 t vehicles on higher road classes, indicated on the Smart Road map's EMS layers (please see Figure 2).

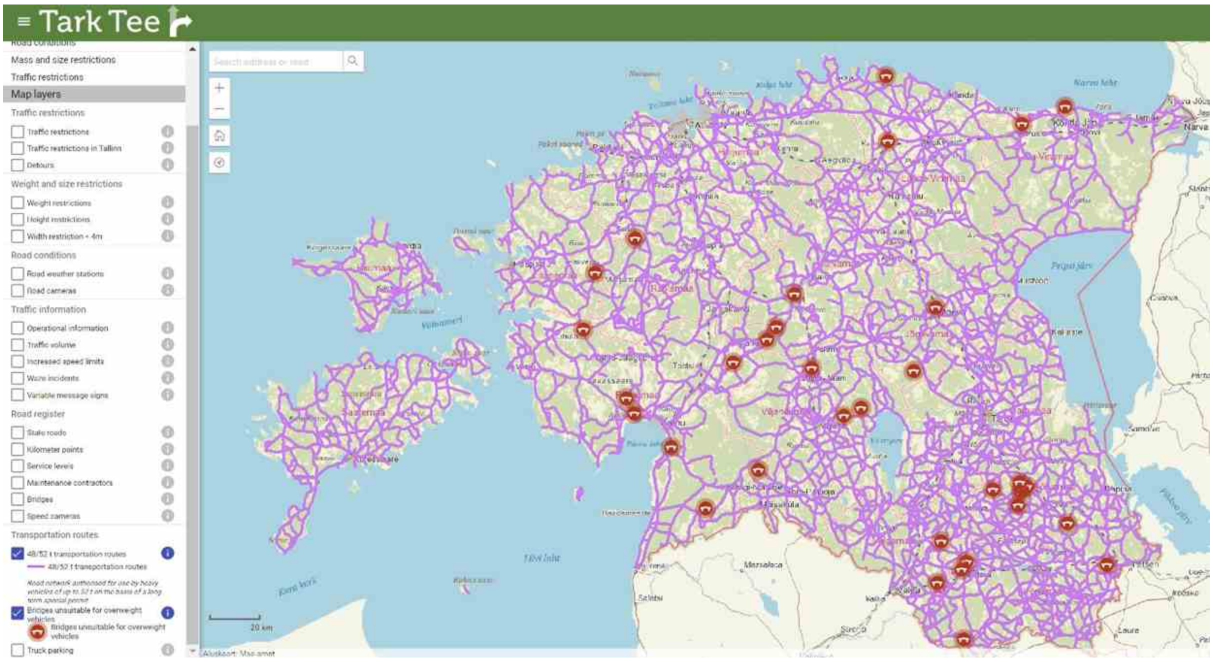

Figure 2 – Smart Road (Tark Tee) – for the 52 t corridors, marked in purple (dots indicate weaker bridges), 08.09.24

In 2020, OBW telemetry tests were completed with five different HVs. Good results were achieved, supporting continued research in the coming years. The OBW test report (please see Figure 3) showed that the total mass error for HVs was only about 1%, despite significant variation in single-axle masses. [11]

A study involving OBW tests on HVs was carried out to determine whether OBW equipment could reliably and accurately monitor HV weights.

		Axle load, t							The actual mass of the vehicle load-weights,	Actual mass from the OBW,	Tolerance, %
Vehicle	**Data source**	**Axle 1**	**Axle 2**	**Axle 3**	**Axle 4**	**Axle 5**	**Axle 6**	**Axle 7**			
Scania 04	Static scales, t	8.75	8.1	7.75	6.15	8.35	6.7	6.75	52.55		
	OBW, t	7.8	7.7	7.6	7.3	7.5	7.17	7.53		52.6	**0.1**
Volvo 02	Static scales, t	7.6	9.15	9.3	7.4	8.15	7.35	7.4	56.35		
	OBW, t	7.5	8.7	8.5	8	8.6	7.3	7.4		56	**-0.62**
Volvo 04	Static scales, t	7.8	9.05	8.85	6.8	8.25	7.2	7.25	55.2		
	OBW, t	7.4	8.9	9.2	6.4	8.2	7.3	7.2		54.6	**-1.09**
Scania 05	Static scales, t	7.7	9.3	9.05	6.85	5.55	8.05	8	54.5		
	OBW, t	6.8	8.6	8.9	7.6	7.4	7.27	7.37		53.93	**-1.04**
Volvo 02	Static scales, t	8.25	9.55	8.6	7.35	9	6.75	6.85	56.35		
	OBW, t	7.8	10.1	8.8	7.4	9.1	6.7	6.8		56.7	**0.62**

Figure 3 – The results of the vehicles control weightings [11]

For the purpose of this test, five trucks were selected, connected, and monitored through the FleetComplete fleet management platform. Additional hardware and software were developed to enable telematics devices to read the weighing data from the vehicles' CAN bus via the FMS interface and display the data through a web interface (Figures 4 and 5). For verification, fully loaded HGVs were weighed using portable scales.

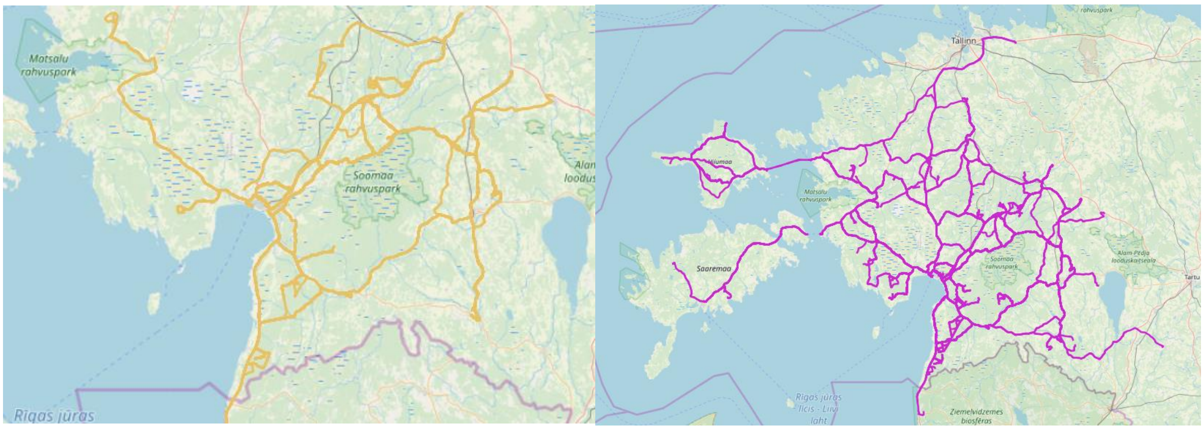

Figure 4– HV „Volvo 02 timber truck 4+" moving paths 10.09.2019 – 21.10.2019 (left) & 21.10.2019 – 15.01.2020. [11]

In addition to enforcement capabilities, OBW systems provide logistics managers with a robust way to optimize truck usage. Our analysis showed that fuel consumption per kilometer does not increase significantly at higher loads. Therefore, loading trucks to the maximum safe limit for roads can save fuel and reduce carbon dioxide emissions.

To determine safe limits, all data must be integrated with the road database. In this study, only pavement type and IRI were used, providing insight that pavement type does affect the measured values, while road roughness does not. In future studies, other road parameters can be incorporated using a similar methodology. Additionally, the current road networks for heavy vehicles (“green roads” for wintertime and “purple roads” for year-round use) can be linked to weight data, providing deeper insight for logistics management and, when necessary, enforcement. In terms of pavement management, more detailed information about actual on-road weights will yield more accurate predictions than current methods that rely on standardized axles and vehicles.

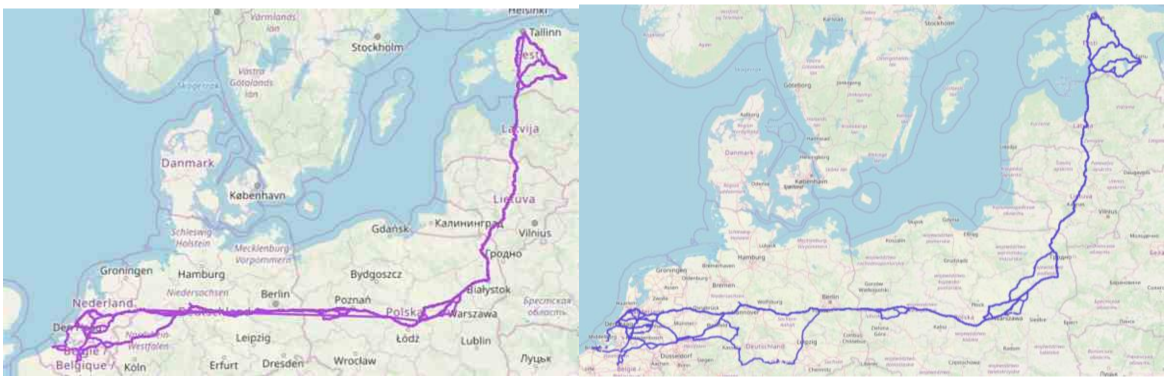

Figure 5 – HV „Scania 02 saddle 2+“ moving paths 02.09.2019 – 21.10.2019 (left) & 21.10.2019 – 15.01.2020. [11]

Integrating with the road tolling system offers road administrators an opportunity to promote logistics solutions that are better for road structures and the environment. This information is also valuable for procuring logistics services, allowing the selection of the most efficient provider with the smallest carbon footprint. To achieve this, a follow-up study with more vehicles is needed to better understand the relationships among fuel usage, road deterioration, and load weight.

3. eCMR Pilots and Ongoing Process

EU Regulation 2020/1056 (Electronic Freight Transport Information, eFTI) requires EU Member States to accept digital transport documents at the level of competent authorities starting on 9. July 2027. [12]

To prepare for eFTI, the Estonian Ministry of Economic Affairs and Communications (as of July 2023, the Ministry of Climate) developed and tested, between 2020 and 2023, a cross-border eCMR indexing prototype with Estonia, Latvia, Lithuania, and Poland as part of the DIGINNO-Proto, DINNOCAP, and *The NDPTL Goes Real-Time Economy: eCMR* projects.

During these pilot projects, technical development followed a concept where no eCMR documents were uploaded to a central database; instead, they were linked via national indexing schemes. A central access point, or connecting layer, enabling secure data exchange between economic operators and competent authorities (e.g., police or customs) was created and called the “index registry” (please see Figure 6). [13]

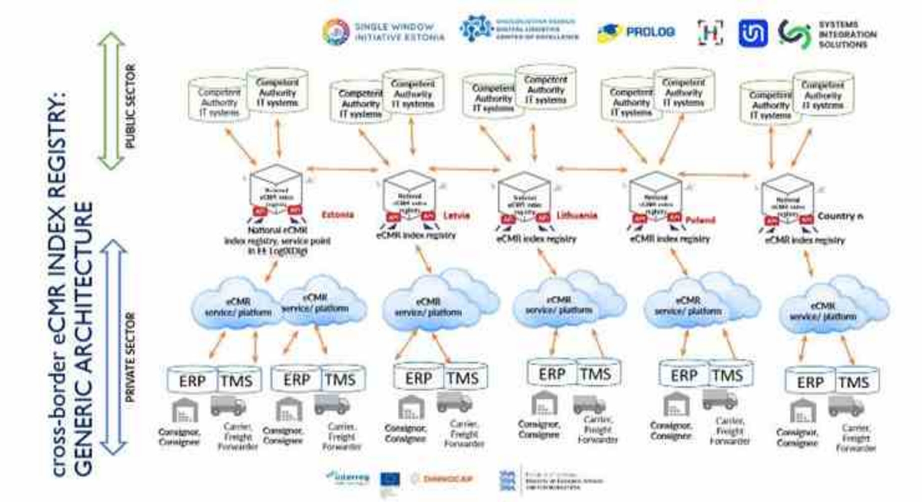

Figure 6 DINNOCAP Project eCMR and eFTI indexing architecture. [13]

The process of establishing implementing acts for eFTI is ongoing at the European Commission. Notably, the architecture tested in these pilot projects turned out to be the preferred option for the eFTI technical framework (chosen from eight different alternatives).

Findings from the pilot projects confirmed that a successful, distributed eCMR and eFTI architecture needs a middle layer – a National Access Point (NAP) in every Member State (please see Figure 7) – to enable cross-border data exchange.

In 2022, Estonia conducted an analysis of the Estonian National Access Point [14]. This work mapped out different options, solutions, risks, and threats related to the development, ownership, and location of the eFTI NAP (now called eFTI Gate), considering the legal and economic specifics of various sectors.

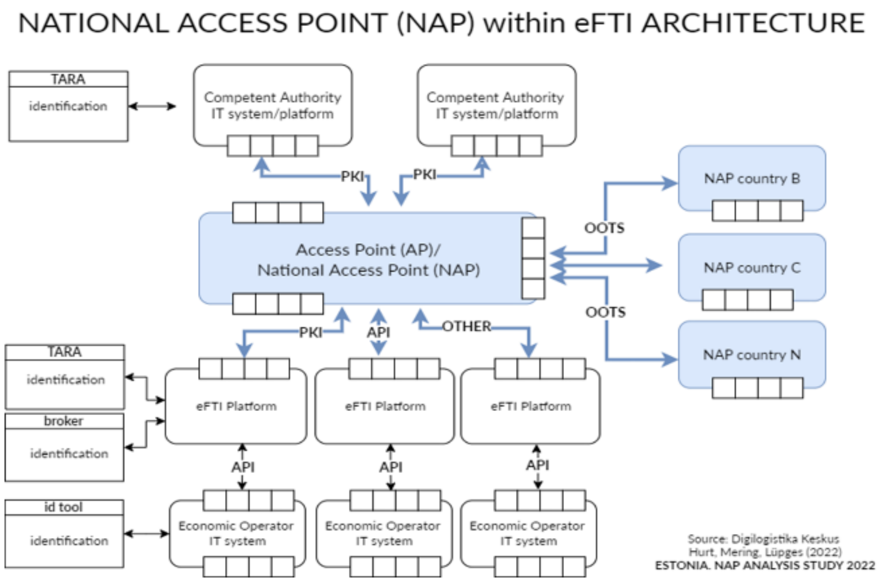

Figure 7. Estonian NAP Analysis Study 2022. [15]

From 2019 onward, Estonian experts from the aforementioned projects have intensively supported the European Commission and its expert group, the Digital Transport and Logistics Forum (DTLF), by gathering feedback and reflecting on architecture principles for eFTI and the structure of indexing and identifiers.

In 2023, Estonia led a consortium of partners from Finland, Lithuania, Germany, France, Italy, Portugal, Austria, and Belgium – with observers from Spain, Ireland, and the Netherlands – to obtain CEF funding for a project called eFTI4EU. The goal of eFTI4EU is to fully develop the eFTI Gate technical requirements and establish harmonized rules for trusted networks of eFTI Gate platforms and their components.

The project involves 22 different partners (both public and private) from the aforementioned countries. With a total budget of 28.3 million euros – 50% co-funded by the CEF – the project runs from 2023 to 2026. Work is being done in parallel to establish requirements for eFTI Platforms and Service Providers, which will manage and maintain transport data on behalf of economic operators.

A study on the economic impact of the real-time economy showed that, in 2020 prices, eCMR could provide a macroeconomic benefit of approximately 44 million EUR per year for Estonia (population 1.3 million). The CO_2 reduction was estimated to be 15,709 metric tons per year. [15]

A major milestone for the implementation of eFTI has been reached. On **9 January 2025**, the first **Implementing and Delegated Acts** under the eFTI Regulation **officially entered into force**. This marks a significant step forward in the path towards fully digital freight transport across the EU. **From 9 July 2027** full application of the eFTI Regulation begins. All EU Member States will be required to accept digital freight information via certified platforms. [12]

4. Internal State e-Waybill Using Experience

In 2020, the ETA carried out three procurements where it was mandatory to use an electronic waybill for transporting bulk materials for road construction. Special documentation requirements applied to both the contractor and the owner’s supervision. All consignment notes for the bulk materials, as well as the summary tables based on them, had to be prepared on an electronic data exchange platform. [16][17]

These pilot projects allowed for using Waybiller (an Estonian service provider) or another analogous electronic data exchange platform. The procurement stipulated that the digital platform should enable creating separate project sites and GNSS-based location tracking of each load. Vehicle and/or trailer registration data had to be automatically retrieved from the traffic register database and transferred to the e-waybill. If the truck had a 48 t or 52 t special cargo permit, its data, permit number, and validity period had to be included. Supervisors and subscribers required access to the same environment to monitor the information online.

Each e-waybill needed to contain at least the truck and/or trailer number, the number of axles, the permissible weight/load capacity of the truck, the mass and name of the material, the name of the driver, the hauler, the owner of the load, and the quarry location. If the transport took place on public roads, an e-waybill was required for moving materials from intermediate warehouses to the site (except for intermediate warehouses directly adjacent to the site). The e-waybill also needed to indicate whether the material originated from a quarry or an intermediate warehouse. A three-page building contract annex was prepared for contractors, containing detailed minimum technical requirements for the e-waybill. This annex facilitates market entry for new service providers and improves data traceability for all parties. [18]

As mentioned, the owner's supervision was also obligated to use the e-waybill platform. For example, supervision personnel had to verify e-waybills for bulk materials provided by the contractor and confirm receipt of the load in the digital environment. During asphalting work, the engineer used the data exchange platform to validate e-waybills for asphalt loads arriving at the site. Across the three smaller pilot contracts, more than 5,000 paper waybills were eliminated through e-waybill usage.

5. Conclusions

- Developing e-waybills in Estonian state road construction, abnormal transport IA, and related areas has already resulted in significant CO_2 emission reductions, while also making transport more efficient (e.g., single data entry to the cloud). There is still much to be done in the coming years to meet the EU's climate targets in the transport sector, using digitalization as a key enabler.
- Estonia, together with neighboring countries and other EU states, is working to achieve EU digitalization goals and make both cross-border and domestic freight transport more efficient.
- The ETA's bulk material e-waybill initiatives account for around 5% of internal transport, but they represent a major step toward digitizing all internal waybills (over two million per year) in cooperation with the Ministry of Climate, alongside international eCMR initiatives under the eFTI regulation.
- Starting in 2024, the ETA will require e-waybills in all new road construction contracts, and from 2025 onward in all new maintenance contracts. Already, many IT companies are eager to develop e-waybill solutions in Estonia, as modern technology makes this relatively straightforward.
- Digitized, cloud-based transport and road information systems will enable further development of IA, helping to protect road infrastructure and enhance traffic safety. At the same time, transport transparency will increase.
- Ideally, standardized IA data fields (vehicle data, see Section 2) will be fully compatible with eFTI data fields (freight data, see Section 3). In that case, EU road operators would have an excellent tool to protect aging infrastructure while still enabling more efficient and greener transport. Ongoing CEDR research on Intelligent Access – part of the digital transformation of road freight transport – could serve as a major leap forward.
- Standardizing freight and IA data fields enables service providers to offer the same services throughout the EU, promoting competition and encouraging better services. This opens the door to a more efficient and environmentally friendly heavy-vehicle transport system across the EU. Ultimately, it would be ideal if such a standard were adopted globally, allowing local and international service providers to work together more effectively on freight, vehicle, and road access control information exchanges – ensuring compliance with all relevant rules.

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