Tolling interoperability in Western Balkans

Executive summary

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In 2022, Transport Community has commissioned 4icom Group to carry out a study entitled Baseline Assessment and financial implication to e-tolling interoperability in Western Balkans. The objective of the study was to draw up an overview of electronic toll collection in the Western Balkans region and to assess the opportunity of setting up an interoperable scheme among the six regional partners, namely Albania, Bosnia and Herzegovina, Kosovo[1], Northern Macedonia, Montenegro and Serbia, so preparing for the implementation of regional interoperability.

In details:

- Provide an assessment of the tolling systems (namely e-tolling ones) currently deployed in the different Regional Partners.
- Develop a gap analysis with regards to the European Directives requirements linked to the implementation of e-tolling interoperability.
- Highlight the key impacts of e-tolling interoperability on the road network, as well as the impact related to the type of system deployed (classic toll plaza or free-flow).
- Draw up a multidimensional costs and benefits analysis related to the implementation of an interoperable system.

This note summarizes the main outcomes of the study and the associated recommendations. Among other things, it outlines a tentative implementation plan enabling the Western Balkans to achieve electronic toll collection interoperability, first at the regional level and then at the European Union level, ensuring consistency with the current systems and taking into account the evolutions necessary to make the scheme compliant with the European Union directives.

State of the art of e-tolling in the Western Balkans region

E-tolling interoperability is a priority for the Western Balkans regional partners which are aiming at their development and at the future integration of the region within the European Union.
The figure below provides an outline of the current development of the e-tolling market in the Western Balkans region, specifies the respective toll operators (acting as toll chargers), details the extent of their toll domains and the size of the existing e-tolling schemes.

[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

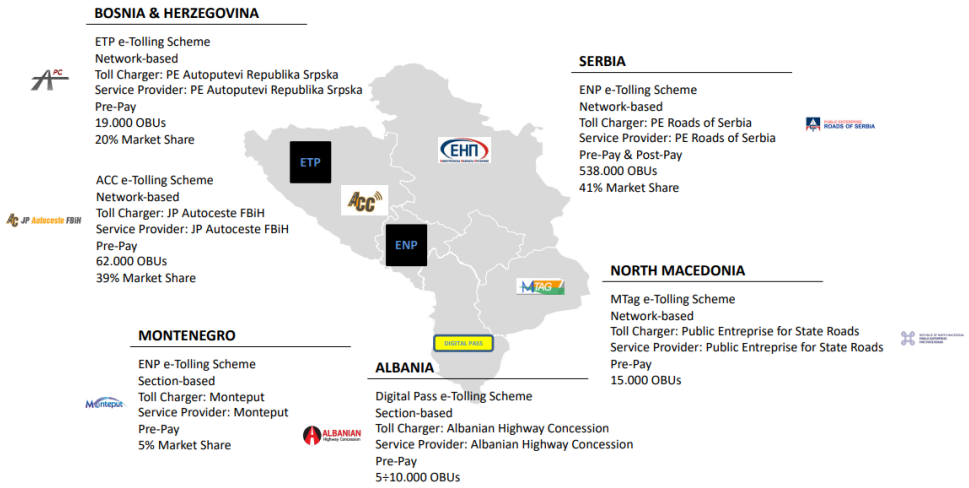

Figure 1: State of the art of toll operators in the Western Balkans (September 2022)

It shows how the development of e-tolling schemes in the region is characterized by two different levels:

- On one hand, Bosnia and Herzegovina, North Macedonia and Serbia all have a significant toll motorway network and operate several toll plazas throughout the countries; over the past decade, e-tolling has been widely deployed and has started gaining significant penetration on the markets.
- On the other hand, Albania, Kosovo[1] and Montenegro have limited tolled motorways network, with either one or no toll plazas, and therefore toll collection market is still underdeveloped; nevertheless, Albania and Montenegro have also started to deploy 5.8 GHz DSRC e-tolling schemes, in compliance with the 2019/520 European Directive, and same technology might be adopted by Kosovo[1] when will start implementing tolling.

Regional Partner	Motorway network (2022)	Tolled network	Motorway network (2032)	Number of toll plazas	Toll revenues (2021)	E-tolling solution	E-tolling market share
Albania	190 km	120 km		1	Unknown	5.8 GHz DSRC	Unknown
Bosnia & Herzegovina	217 km	217 km	910 km	23	36 mio. EUR	5.8 GHz DSRC	30%
Kosovo[1]	190 km	N/A	337 km	N/A	N/A	N/A	N/A
North Macedonia	242 km	242 km		12	46.7 mio. EUR	5.8 GHz DSRC	130.000 users
Montenegro	41 km	46 km	264 km	2	6 mio. EUR[2]	5.8 GHz DSRC	Unknown
Serbia	830 km	830 km	1830 km	66	280.4 mio. EUR	5.8 GHz DSRC	45%

[2] This number is for 2019 and corresponds to the revenue generated at the toll plaza of the Sozina tunnel

All the existing e-tolling schemes have been promoted by the public companies in charge of the operation of the tolled motorway network or infrastructure, with them acting as both the toll charger (operating the road and charging road users according to the usage) and the toll service provider (setting up accounts and distributing on-board equipment OBE for e-tolling).

E-tolling OBE provided by these companies can be used to pay tolls along the respective tolled network; no interoperable e-tolling schemes have been established yet.

What is e-tolling interoperability?

Electronic toll collection schemes (e-tolling) have been introduced since the early 90s as a means to reduce congestion at the charging points and to provide road users with more effective payment services, mainly at the initiative of the (either private or public) operators of the toll road facilities.

In most cases toll operators have deployed e-tolling facilities and offered e-tolling services to their customer base, i.e. to the users driving along their respective road network, very much as happened so far in the Western Balkans. OBUs are distributed to the interested users and can be used on specific tolled road infrastructures managed by the entity issuing them; the same toll operator is managing the user accounts and periodically charge tolls to the users, without and with very limited intermediation from third parties.

The increase of the need for road users (mainly in the heavy goods vehicles sector but in some case also for the light vehicles sector) to travel at national and international level led to a growing interest from the market for interoperable e-tolling services along which a user can access – by means of a unique service provider – to a range of payment services and in particular can pay tolls across different facilities (operated by different players) by means of a unique OBU and a unique account, therefore without the need of entering into service agreements with all the operators of the different toll road facilities.

The same concept has been considered here as the basis for e-tolling interoperability within the Western Balkans' region. Whereas today the existing e-tolling schemes in the region are handled on the base of a "monopolistic" approach, with the OBUs being distributed only the respective Toll Charger and being used only for the payment of the toll within the toll domain operated by the same Toll Charger, the study has been developed aiming at setting up – at least within the region – a multi-player business model within which:

- OBUs are issued and distributed by a multiplicity of players, and not only by the different Toll Chargers operating the tolled road infrastructures.
- OBUs are accepted as payment means throughout the region and not only along the toll infrastructure operated by the respective Toll Service Provider.
- Toll Chargers register toll transactions along their own network and charge the corresponding amounts to the respective Toll Service Provider.

- each Toll Service Provider charge the toll amounts to each of its clients, according to the actual use of the road infrastructures.

Expected benefits from implementation of e-tolling interoperability

The development of the e-tolling interoperability would ensure benefits for the whole region and for the different stakeholders:

- As e-tolling penetration would increase (+5% for light vehicles and +10÷15% for heavy goods vehicles), Toll Chargers could expect a reduction of the operating expenses and in particular of the toll collection costs, thanks to a reduction of personnel (proportionally to the reduction in the number of transactions paid in cash) and to the reduced financial intermediation costs associated to e-tolling (with respect to cash and cards payments).
- Road users would have the possibility to access e-tolling services at a reduced cost, thanks to competition on the market as well as to the possibility of using the same OBU throughout the whole region (instead of being obliged to set up a contract for each of the different tolled network).
- The environment would finally benefit from the reduction of congestion and of pollution associated to the stop & go traffic across the toll plazas, benefits that may become even higher when moving to a multilane free-flow toll collection mode.

Interoperability will first contribute to increase the penetration of e-tolling, as some road users would consider as appealing interoperable services. As already experienced by some of the toll chargers in the Western Balkans, such an increase will lead to a reduction of the operational costs thanks to the reduction of the people charged of collecting toll at toll plazas (thanks to the shift from manual to electronic payments) and to the optimization of the collection costs as commissions to be paid to toll service providers are significantly lower (0,5 to 0,8 %) than those applied today by banks and credit cards' issuers.

Road users interested at interoperable e-tolling services will also have direct benefits. Whereas today these users are obliged to set-up accounts with as many toll chargers as the tolled infrastructures they are using (with a consequence in terms of OBU purchase/rent and possibly of subscription fees), setting-up interoperability across the region will allow them to access a cross-border service through a single service provider and possibly gaining from market competition.

Socio-economically speaking, e-tolling interoperability reduces the time to drive through a toll plaza, and therefore generates time savings for users. Considering the deceleration phase, the slowdown to drive through the toll lane and the acceleration phase, 80 seconds can be saved due to e-tolling (and up to 2 minutes for multilane free-flow toll solution) compared to a classic stop and pay at the toll plaza. As an example, the model applied to a Regional Partner such as

Bosnia and Herzegovina, 60 “man years” could be saved on one year, which accounts for 2.6 million EUR.

With regards to more environmental issues, it may also be proven that e-tolling interoperability (and by extension the introduction of multilane free-flow systems) pollute less than the classic toll lanes with manual and card-based payments. E-tolling lanes do not require vehicles to make a full-stop, only to slow down, while multilane free-flow allows vehicle to keep constant speed while crossing the charging point. Avoiding full stops for vehicles strongly reduces the gas consumption, especially for heavy goods vehicles; it therefore reduces CO_2 emissions. Both gas consumption and CO_2 emissions can be linked with financial savings as well: 0.46 EUR per let of gas and 80 EUR per ton of CO_2. In total, by taking again the example of Bosnia and Herzegovina, more than 2.5 million EUR (CO_2 equivalent) could be saved over a year.

The multilane free-flow tolling option must be fully integrated within the interoperability project as it represents the natural evolution of the currently implemented e-tolling schemes. No regional partners have yet implemented a multilane free-flow tolling solution and in some specific case transition towards such tolling scheme might be complicated within short term (in particular for large road networks operating according to the closed toll collection mode and where occasional users are a large majority); nevertheless, toll motorway greenfield projects could be already based on multilane free-flow which is a major trend in EU and for which technology does not represent a risk anymore.

Reduced land use, reduced congestion (meaning less CO_2 emission, gas consumption and working hours losses), higher security (toll plazas are accident prone), lower investment costs and lower operating costs are the main benefits associated to multilane free-flow tolling.

The introduction of multilane free flow tolling also entails an issue, related to the potential loss of revenues for both technical problems and violations. In fact, compared to more traditional e-tolling offered as alternative payment means within toll plazas, with multilane free-flow tolling the handling of exceptions and the recovery of the unpaid toll is more challenging as vehicles cannot be stopped while passing through the charging points.

Vehicles are slightly more difficult to be identified (whether they are equipped with an OBU or not) and this already implies some potential loss of revenues for unidentified vehicles. The main problem is though related to the difficulty of charging unregistered vehicles and in particular international vehicles for which toll charges have difficulties in obtaining the name and coordinates of the vehicle’s owner and for which unpaid toll cannot be legally enforced; in case no payment reminders can be issued for lack of coordinates and the vehicle’s owner does not want to pay, toll chargers may face a loss of revenue which can be significantly higher than what they currently experience with plaza-based tolling.

The actual loss of toll revenues depends on a series of factors such as the penetration rate of e-tolling services, the breakdown between light and heavy vehicles and between national and

international vehicles; to give orders of magnitude it can be said that the loss of collection can range from 5% for heavy vehicles to 10-15% for light vehicles.

To mitigate such risk, the Western Balkans' regional partners will have to introduce specific measures and to enhance their cooperation in matters of control/enforcement and toll recovery. The set-up of a common database (like the one established by EUCARIS in the EU) rather than the reciprocal access to national license plate registers will significantly improve the situation, providing toll chargers with the possibility of identifying the owners of the non-payers.

The increase of the number of vehicles using e-tolling services will also contribute to mitigate that risk, as toll service providers may support each other in identifying vehicles owners.

Considering the nature of the Western Balkans, characterized by a significant cross-border flow of heavy goods vehicles and – locally and on a seasonal basis – of light vehicles, it will be although decisive the possibility of setting up procedures allowing toll chargers to enforce vehicles owned by people and companies throughout the region.

The gap analysis

One of the key tasks to be completed in the frame of this study was the development of a gap analysis with respect to the applying EU regulations. The main results of the gap analyze to be compliant with EU directives (specifically with the Directive 2019/520/EC) can be summarized as follow:

LEGAL
Transpose the European Directive 2019/520/EC at national level and develop and implement a national legislation to meet the specific obligations. Designate or establish (depending on the local context) a Conciliation Body. Initiate a framework of collaboration for accessing to the license plates databases and the access protocol between the partners for enforcement purposes (agreements and protocols of collaboration to create a framework in which the sharing of personal data such as vehicle license plate number, vehicle owner's name and address owners in case of toll violation).
TECHNICAL
Deploy roadside equipment that fully supports DSRC communication based on the EN 15509:2014 technical standard. Implement the specified back-office interfaces between Toll Chargers and Toll Service Providers in accordance with the standard CEN/TS 16986:2016 "Electronic Fee Collection — Interoperable application profiles for information exchange between Service Provision and Toll Charging"

Define a harmonized protocol for the exchange of information on vehicle license plate number, vehicle owner's name and address owners in case of toll violation.
OPERATIONAL
Set-up a national electronic register gathering all the information that Toll Service Providers (including EETS Providers) need to plan and achieve their accreditation. Define and implement a specific procedure to manage the registration of the EETS Providers, i.e. of the Toll Service Providers aiming at providing an EETS service to their clients within the frame of the different toll domains in operation. Publish an EETS Domain Statement setting out the general conditions for EETS Providers for accepting the EETS domains of the different national Toll Chargers. Develop and publish onto the market the contractual terms upon which Toll Charger(s) and EETS Providers can formalize their agreement with regards to the provision of the EETS service. Establish a Conciliation Body. Introduce a procedure to define the process to be followed to achieve EETS Providers accreditation. and, to support deployment of multilane free-flow tolling Establish to provide national law enforcement agencies the ability to access the identity of license plate owners across all the members of this agreement, in a common objective to avoid important financial losses due to toll evasion.

Gaps with regards to the EU Directive on interoperability of electronic road toll systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union concern mainly legal and operational matters, whereas technical gaps are rather limited having the toll chargers in the Western Balkans region already deployed e-tolling equipment based on the 5.8 GHz DSRC technology.

The path towards e-tolling interoperability

The benefits linked to the transition towards an interoperable e-tolling scheme in the Western Balkans are proven. Indeed, the main challenge is to propose a reasonable and effective plan to implement it within the coming years.

A limited financial investment is required to migrate towards such a scheme, under the assumption that the same 5.8 GHz technology will be used across the region. Adaptation and implementation costs are estimated between 1 and 2 million EUR per toll operator (without considering any investments related to the installation of new road toll equipment). The technical investment covers:

- Design activities to define the characteristics of the service (inc. agreements).

- Upgrade of the back-office infrastructure (setting up a data exchange interface between toll chargers and toll service providers).
- Testing and compliance of all technical elements.

Additional costs would of course be required if one or more Regional Partners decide to migrate (even partially) to multilane free-flow tolling. We estimate that any multilane free-flow project would require an initial investment of 5 million EUR, mainly related to the setting-up of a back-office to support transactions though OBUs and through license plate accounts, as well as the installation of roadside equipment (0.5 million EUR for 2X2 lanes + emergency lanes).

The biggest effort to be made concerns contractual and operational issues, independently from the extent of the interoperable service. Setting-up e-tolling interoperability implies in fact that a set of technical, operational, and contractual rules are defined among the different stakeholders and that an agreement is formalized between:

- on one side the toll charger, i.e. the organizations in charge of the operation and maintenance of the toll roads and for the collection of a toll;
- on the other side the toll service providers interested in offering e-tolling payment services across the region (among which possibly some of the toll chargers).

The development and the implementation of such a framework would require a particular effort from all interested parties that will have to jointly define and negotiate terms along which the service shall be handled, also considering the different legislative frameworks applicable in the various regional partners.

Our recommendation: a staged approach for interoperability

To achieve e-tolling interoperability in the Western Balkans without provoking a brutal change that could alienate crucial stakeholders, the recommendation is to have a staged approach, along the two steps outlined here below.

A. The first (and intermediate) step

The intermediate step will require to set-up an interoperable e-tolling service limited to the Western Balkans' region, without merging it with the EU-wide interoperable services on the base of the EU Directive 2019/520. Its key principles would be the following:

- Toll operators will continue to act as toll service providers by issuing OBUs that can be used on the Western Balkans network.
- Each toll operator will accept the transactions generated by the OBUs of the other toll operators.
- Toll operators will consolidate all toll transactions registered across all tolling facilities with its own OBU and will charge the client accordingly.

- Toll operators will guarantee to all the other toll chargers the payment of the toll due to its clients (use of the corresponding toll charger's network).
- The Regional partners could also promote local e-tolling service provider who could take market shares and potentially become EETS themselves.

Optionally, at this stage third parties acting as independent toll service providers might be accepted to provide road users with e-tolling payment services across the region.

B. The second step

During this second step, e-tolling interoperability is extended at the scale of the European Union on the base of the EU Directive 2019/520/EC. The main challenge of this phase is to open-up the market to other third parties (EETS providers) from outside the region, but this can also be referred to as an advantage. Its main characteristics would be the following:

- Toll Service Providers from the region would offer to its clients e-tolling services for use across the European Union.
- EETS Providers from the European Union offer e-tolling services for the use within the Western Balkans as well.
- Parallelly local Toll Service Providers may continue to offer their clients local e-tolling services, not necessarily interoperable.

To summarize the vision of how the Western Balkans region could achieve e-tolling interoperability in the next decade, below is an indicative planning of the implementation of these different phases. It also includes the option of launching a first free flow project.

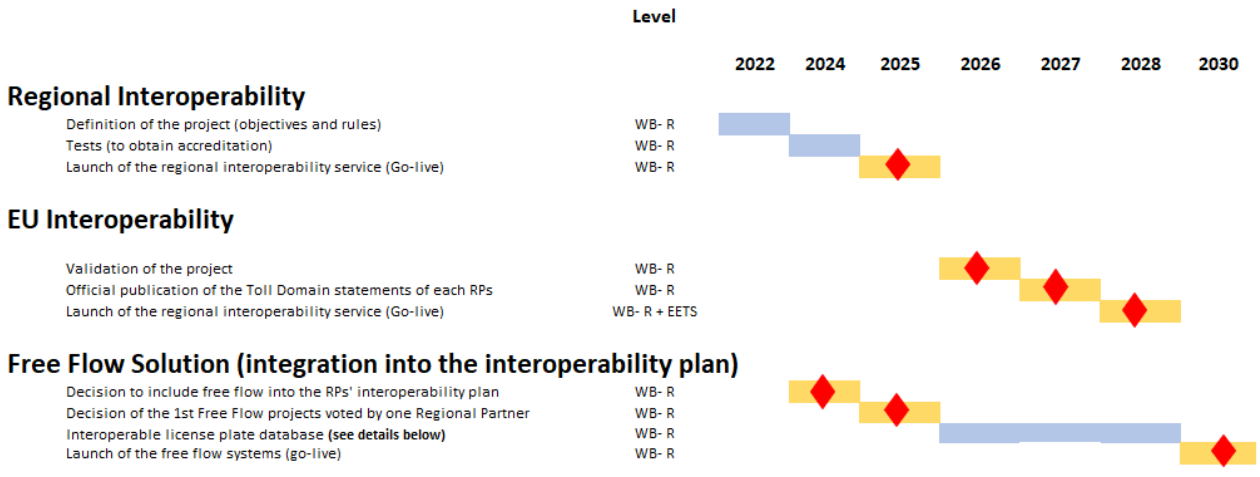

Figure 2 - The main milestones to achieve e-tolling interoperability in the Western Balkans