PTOLEMUS Consulting Group

Performing a high level analysis of non-OBU GNSS+DSRC solutions

PTOLEMUS report for the Ministerie van Infrastructuur en Waterstaat

The Hague, Brussels - 22nd July 2020

The report builds off of previous work performed by PTOLEMUS for I&W on the EETS provisioning market

Ministerie van Infrastructuur en Waterstaat

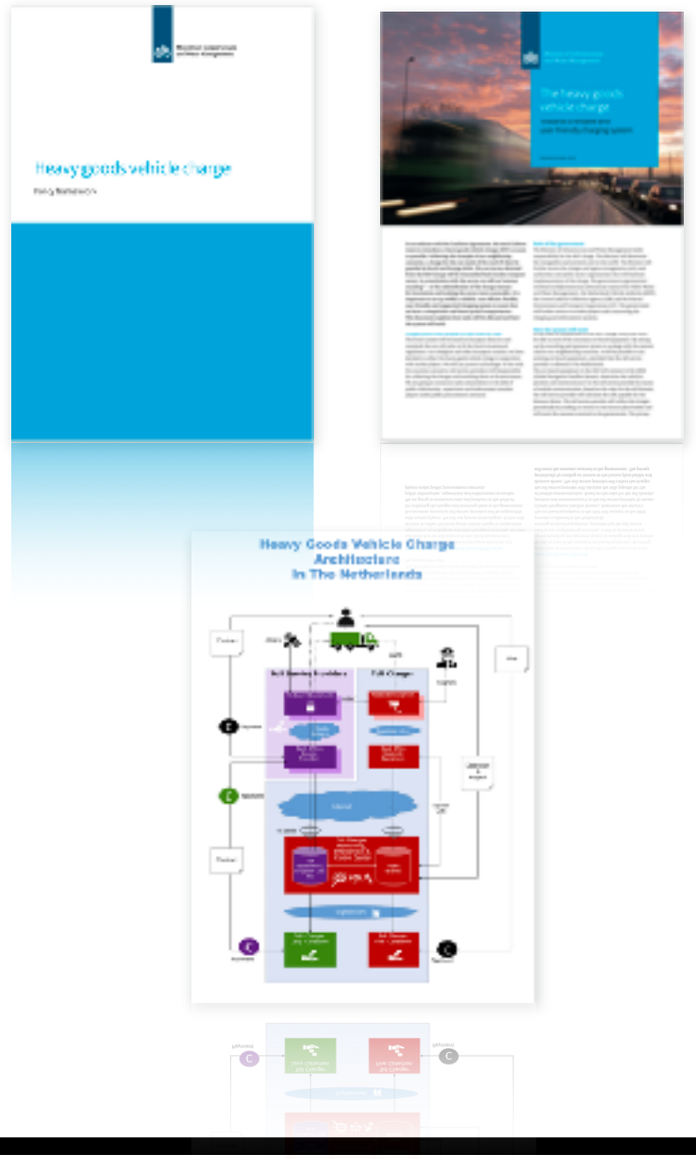
- To fully benefit from this research, it is assumed that the reader understands the main mechanisms of the EETS market
- Thus we recommend the reader to refer to our PTOLEMUS' previous report to I&W *"Understanding the EETS provisioning market."*
- This report offers:
  - A look at the role of a National Service Provider (NSP), including examples across multiple live tolling domains
  - A look at the role of EETS providers, including use of data, typical contractural conditions with fleets and distribution of on board equipment
  - An examination of ETC value chains across 8 tolling domains with significant HGV derived revenues
  - An examination of the EETS provider business model, including typical revenue streams and commercial objectives
  - PTOLEMUS' view on the evolution of the EETS market

Source: PTOLEMUS

Our work has relied on currently available information

Main sources used for this analysis

I&W information on its envisaged system



European regulatory information

Previous PTOLEMUS research

Source: PTOLEMUS

Our findings leverage our expertise in usage-based charging

Strategy consulting services

Strategy definition	**Investment assistance**	**Procurement strategy**
Innovation management	**Business development**	**Project management**

Market research services

Off-the-shelf reports	**Subscription services**	**Custom market research**

Fields of expertise

Mobility services	Car pooling Car sharing MAAS	Micro-mobility Ride hailing Shared mobility	Smart parking Tax refund
Vehicle services	bCall eCall FMS SVT / SVR	Tracking VRM In-car Wi-Fi Parking	Navigation Speed cameras Traffic information
New energies	BEV EV charging Fuel cards	Fuel cells Hydrogen PHEV	Vehicle-to-grid
Usage-based charging	**Car As A Service** **Electronic Toll Collection**	**Mobility-as-a-Service** **Road charging**	**UBI / PAYD** **Vehicle rental** **Vehicle leasing**
Vehicle data & analytics	AI CAN-bus Crowd-sourcing Data protection	Driving behaviour OBD Predictive analytics	Remote diagnostics xFCD
Vehicle automation	ADAS Autonomous cars	Autonomous trucks	Robo-taxis Shuttles
Enabling technologies	Positioning (GNSS / WiFi / cellular) M2M / connectivity	Smartphones Sensors	Telematics devices V2X

Source: PTOLEMUS

We have used our experience of assisting MNOs, app providers, automotive OEMs and fleet service providers

Analytics, maps & applications providers

Automotive manufacturers & suppliers

Mobile network operators

Telematics solution providers

Fleet & fuel, ITS & regulators

Device & location suppliers

Insurers, aggregators & assistance providers

Banks & private equity investors

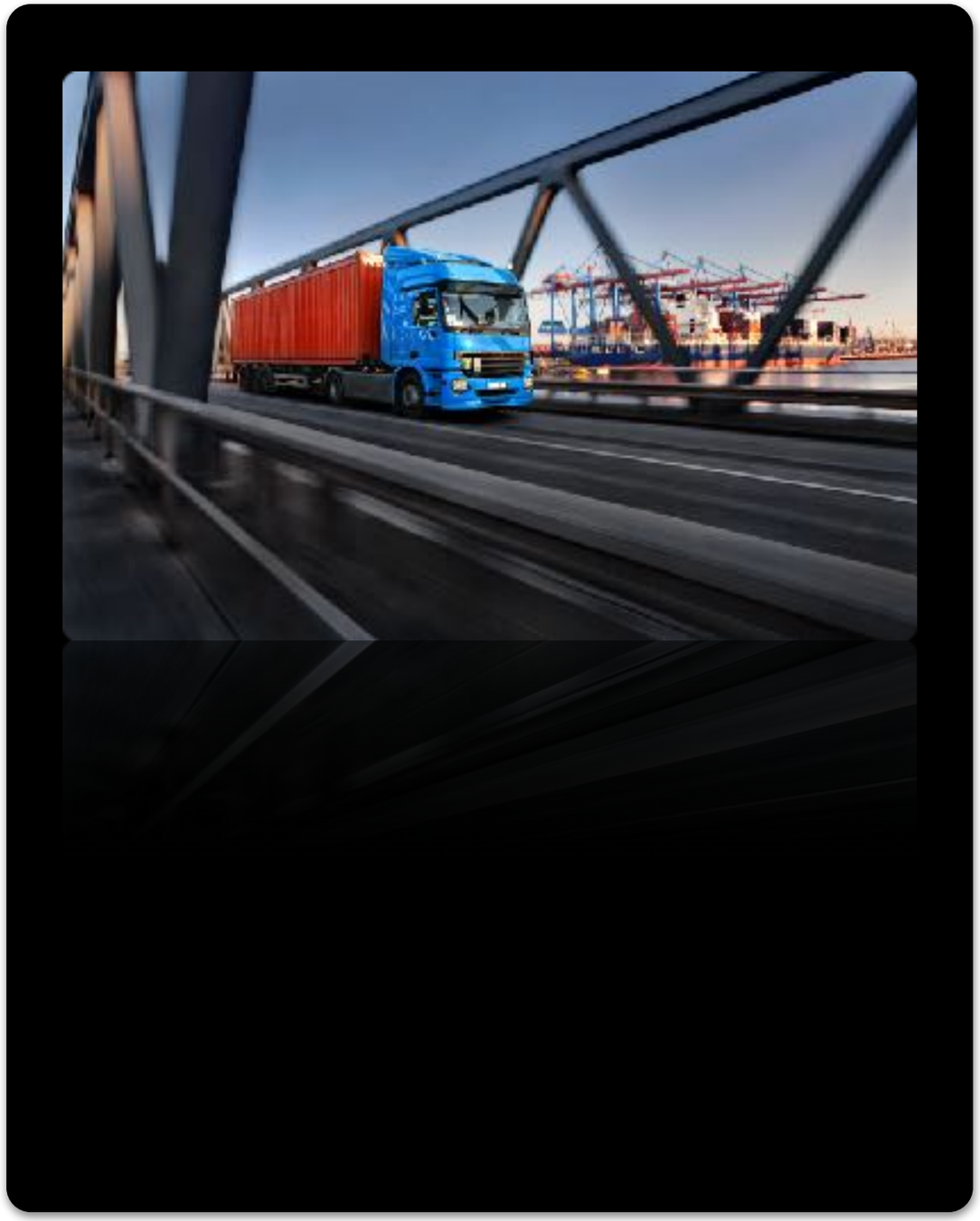
This report is based on secondary research and publicly available information

Rights and disclaimer

- This report is the result of market research and analysis of information available to PTOLEMUS based on its experience and accumulated intellectual capital, conducted between June - July 2020
- Under the guidelines agreed by both parties, **this report did not include a thorough market consultation**, nor has it been reviewed by any third party
- **The views and opinions expressed in this report are solely those of PTOLEMUS** and do not represent the views of the EETS providers or any other toll service provider
- PTOLEMUS has exercised its independent professional skill and judgment in the performance of this assignment with due care and diligence and believes it has delivered the full and complete benefit of its experience and expertise
- This report and all PTOLEMUS deliverables remain PTOLEMUS' intellectual property
- PTOLEMUS grants to the Ministerie van Infrastructuur en Waterstaat a licence to use its deliverables within the limits of the mutually signed agreement
- Any third party that wishes to quote this report should quote PTOLEMUS Consulting Group as its author and I&W as its recipient

Every electronic tolling system has 5 key components

- **A tolling system is the combination of:**
  1. An access mechanism
  2. A payment / billing function
  3. A user interface
  4. An enforcement system
  5. A charging / measuring mechanism (distance based, time-based)
- We will **assess the potential technologies** on these aspects in **relation to existing technologies**



We will use the following acronyms in this document

AET	All electronic tolling, i.e. tolling is applied to all vehicles
DSRC	Dedicated short-range communication, one of the standard microwave technologies used in ETC
EETS	Europe Electronic Toll Service
ETC	Electronic toll collection
FFT	Free flow tolling (allowing automated opening of toll gates)
FTSP	Fleet telematics service provider
GNSS	Global Navigation Satellite System including all satellite positioning systems (GPS, Galileo, etc.)
GPS	Global positioning system
HGVs	Heavy goods vehicles
HVs	Heavy vehicles (trucks, buses and coaches)
LVs	Light vehicles (passenger car, light commercial vehicle, motorbike, etc.)
MSP	Main Service Provider
NSP	National Service Provider
OBD	On-board diagnostics port, used for vehicles' emissions monitoring, but also diagnostics and telematics
OBE	On-board equipment, i.e. tolling device
OBU	On-board unit, i.e. tolling device
OEM	Original equipment manufacturer, i.e. vehicle manufacturer
ORT	Open road tolling (no toll plazas required)
RUC	Road usage charging, i.e. pricing of the road use by vehicles based on actual distance driven
TDO	Toll declaration operator
TSP	Toll service provider
VDH	Vehicle data hub, i.e. connected vehicle market place

Source: PTOLEMUS

Analysing non-OBU GNSS+DSRC solutions

1 Current technological state of OBE solutions

2 Smartphone tolling solutions

3 In-vehicle tolling solutions

4 Fleet telematics solutions

5 Issues, impact and effect

6 Recommendations

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GNSS + DSRC OBE solutions are in development for several new types of technologies

- Due to their growing success or their upcoming development, **3 technologies are increasingly being considered for ETC or road tax levies**, in addition to current, stand-alone OBUs

- **Smartphone tolling solutions utilise apps and satellite technology to geolocate drivers and facilitate toll payment**
  - There are currently several smartphone solutions on the market that utilise GNSS for tolling applications
  - Handsets are not equipped with DSRC, but with Bluetooth and sometimes RFID
  - When used in toll schemes, they utilise the vehicle geolocation to determine when a vehicle passes a toll gantry and applies the toll payment

- **Two types of in-vehicle solutions can be embedded into the vehicle itself by OEMs**
  - **Connected vehicle solutions** in development are line-fitted into the vehicle
    - ✓ Can deliver ETC, both as a payment mechanism and through GNSS-based distance measuring
    - ✓ Can also be used for other payments (e.g. for fuel or parking)
  - The **smart digital tachograph** is a GNSS-enabled device mandated in the EU to monitor HGV drivers' working hours
    - ✓ Also uses DSRC microwave technology for enforcement

- **Fleet telematics solutions are aftermarket devices used by fleet managers for fleet management services**
  - Fleet telematic solutions are GNSS-enabled, but do not usually have DSRC
  - Currently, they are primarily used for fleet management services such as remote diagnostics, geo-fencing, and geolocation

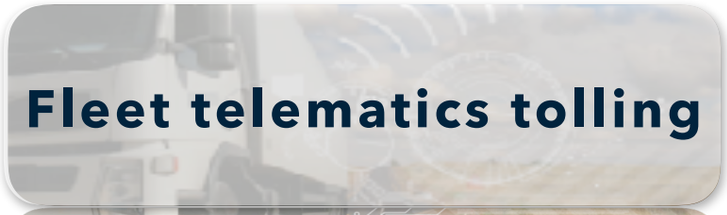
These new tolling models are primarily driven by toll chargers, OEMs, and FTSPs

Smartphone tolling

- **Toll chargers (government, state agencies and road operators)** are creating apps suitable for use on their dedicated roads, mainly for passenger vehicles
  - For example, Satellise is a mobile tolling app for use on specific roads operated by parent company Cintra in Spain
- A number of toll service providers that already have mobile payment apps, e.g. Telepass could also offer such a solution
- We could see **a number of mobile app-based navigation apps providers** such as Citymapper, Google/Waze or **mobility operators** such as BlaBlaCar and Uber include toll payment

In-vehicle tolling

- **OEMs** are the main drivers for connected vehicle tolling solutions
  - In the last few years, they have increasingly chosen to build in-vehicle payment platforms such as *Mercedes Pay* or *Volkswagen Pay*
  - In partnership with OEMs, a number of connected vehicle platform providers such as SiriusXM or Xevo are developing in-vehicle tolling and payment solutions
- **The EU market for smart digital tachographs is dominated by Continental and Stoneridge,** which are selling their devices both to OEMs and in the aftermarket



Fleet telematics tolling

- **Fleet telematics service provider (FTSPs)** already provide tolling-capable solutions to HGV fleets utilising integrated GNSS devices
  - Certain countries such as Hungary have created systems allowing the use of their devices for RUC
  - Certain fleet telematic service providers already integrate ETC e.g. Frotcom, Webfleet, etc.

✳ **Truck OEMs** have also launched embedded fleet telematics value propositions
  - Scania offer telematics included with the purchase of a new truck
  - Volvo offers its *Dynafleet* services embedded at the factory, or retro-fitted

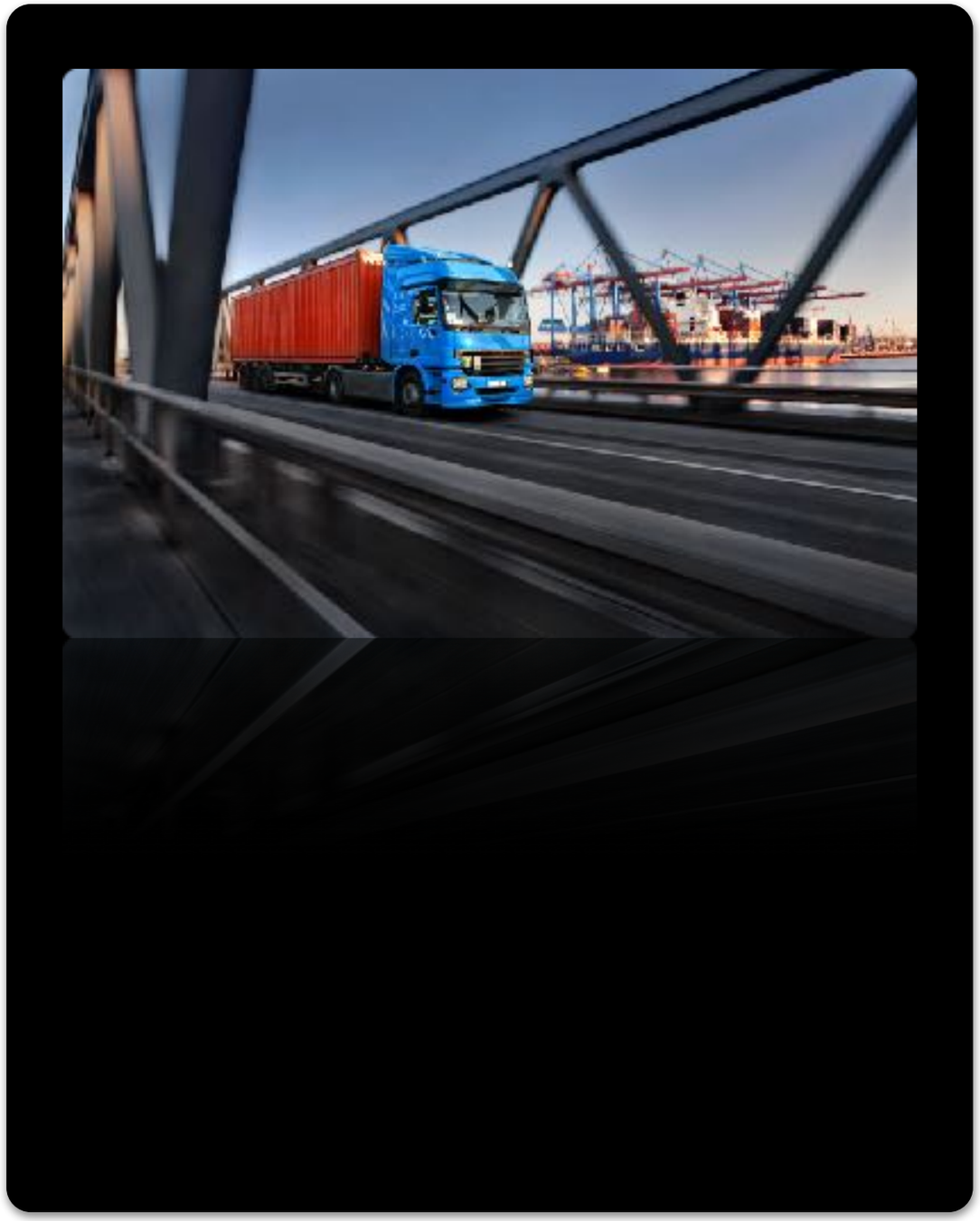
Source: PTOLEMUS

EETS providers are forming partnerships indicating they are exploring the new technologies

- These new ETC technologies have the potential to align well with the EETS service provision market, if their suppliers are EETS providers or become EETS-registered
- As tolling apps emerge, certain toll solution providers have begun to indicate interest in the **development of their own mobile solutions**
  - Kapsch, a key provider of ETC OBUs has been developing a mobile tolling solution that could be **sold to its partner EETS providers**
- In the fleet telematics industry, we are already seeing **investment from the EETS providers** in the market
  - Telepass has purchased Italian FTSP KMaster to offer additional services to its HV customers
- We also see **EETS providers beginning to explore in-vehicle solutions**
  - **Telepass has formed a partnership with Jeep** to embed DSRC into new vehicles in Italy giving access to the toll network
  - **Daimler is also the main shareholder in Toll4Europe**
- We are also beginning to see the **same players who are operating as National Service Providers (NSPs) make moves into the new tolling technologies**
  - T-Systems, which is in the consortia tasked with operating both the German and Belgian HGV schemes, is also a major shareholder of Toll4Europe

As a consequence, toll service providers could lose ownership of the customer

- We believe that there is the possibility that current **toll service providers could be relegated to back office functions** with the implementation of the new toll technologies
- New solutions could undermine existing TSPs' business models built around OBU-enabled payments (driven by the low rates of toll commissions) **if they are not the driving force**
- **In addition, in many situations the customer may be owned by the fuel card provider (FCI), who provides toll service provision through resold devices as part of a service package**
  - There is the opportunity for conflict between the FCI and the OEM for customer ownership
- However, smartphone tolling could be also deployed by TSPs, which could then **maintain ownership of the customer**
  - Telepass and Via Verde could be the first examples
  - We predict that we will also see device vendors offer white-label solutions to TSP partners
- With in-vehicle and fleet telematics tolling, toll provision will be offered as a value-added service as part of a greater payments offering
  - **In such a scenario, OEMs and FTSPs are likely to control the customer relationship**



Customer ownership for each of the technologies will determine who is liable for the toll payment

Most likely roles of key stakeholders and consequences

	Solution provider	Customer relationship owner	Data manager	Payment provider	Toll liability carrier	Consequences
Smartphone tolling	• **Toll service providers** • **Mobility operators** • **Navigation providers** • **Smartphone vendors**	• Toll service providers • Mobility operators • Navigation providers	• Toll service providers • Mobility operators • Navigation providers	• Toll service providers • Mobility operators • Navigation providers • Smartphone vendors	• Toll service providers • Mobility operators	**App providers will maintain the liability for the toll collected**
In-vehicle connected solutions	**Connected vehicle platform providers**	OEMs	• OEMs • VDHs • Toll service providers	• OEMs • VDHs • Toll service providers	• OEMs • Toll service providers	**The OEM maintains the liability for the toll collected**
	Tachograph device providers	• OEMs • Working time service provider (e.g. Continental)	• OEMs • VDHs • Toll service providers	OEMs	• OEMs • Toll service providers	**The OEM maintains the liability for the toll collected**
Fleet telematics solutions	**FTSPs**	**FTSPs**	• FTSPs • Toll service providers	Toll service provider	Toll service providers	**The toll service provider maintains liability for the toll collected - the FTSPs is liable for the operation of the device**

Source: PTOLEMUS

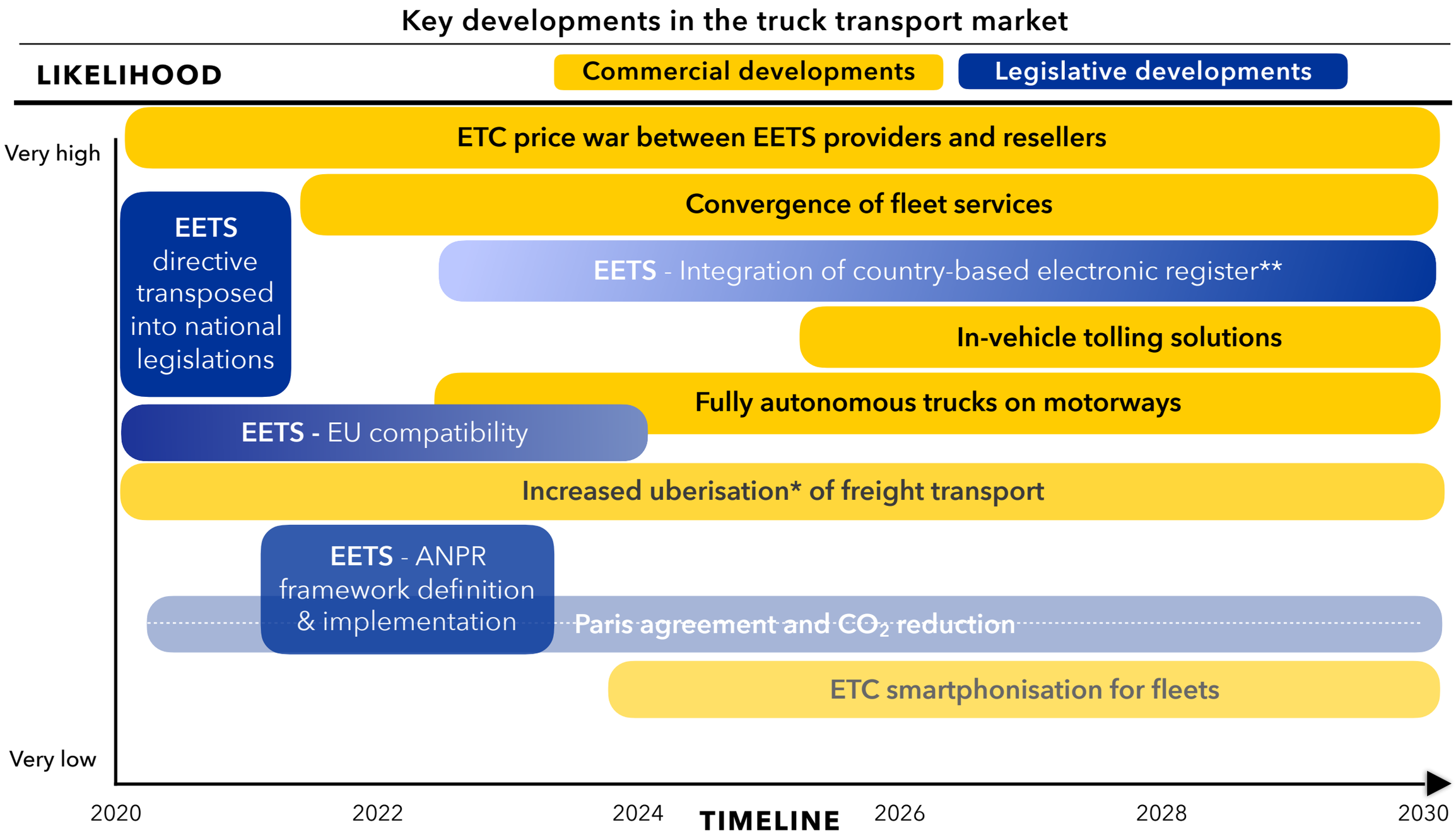
The implementation of new technologies by an MSP could influence neighbouring toll domains

Likely impact on the European ETC / EETS market

	Positive	Neutral	Negative
Direct consequences	• Brings new players into the ETC value chain, increasing supply and competition • Forces traditional EETS providers to remain innovative and competitive	• Pushes new players involved in the value chains of each of these solutions to be involved in tolling (e.g. OEMs, FTSPs, smartphone vendors, etc.)	• Creates challenges for interoperability with neighbouring countries, as these suppliers are not EETS-registered yet • Creates more complexity for the operation of the toll collection • Creates more challenges for existing EETS providers, potentially pushing some of them in bankruptcy*
Indirect consequences	• Creates more competition to existing suppliers in the market • Gives government more ways to introduce ETC and RUC, opening it to other vehicle segments • Pushes other countries to also launch (new) RUC schemes • Could remove cost of OBE for truck fleets	• ETC becomes part of a wider set of payments and fleet applications • Changes the nature of the fleet manager role due to the need to manage toll payments	• Shifts FTSP market to those who are large enough to maintain toll liability, pushing out smaller players • Complexity might create confusion at a relatively early stage of the RUC market

Source: PTOLEMUS - Note: In most countries, national transport represents 80-90% of truck traffic. Thus a dual system where EETS providers only serve international transport fleets

ETC price war and the consolidation of services could be the most impactful commercial developments on the market



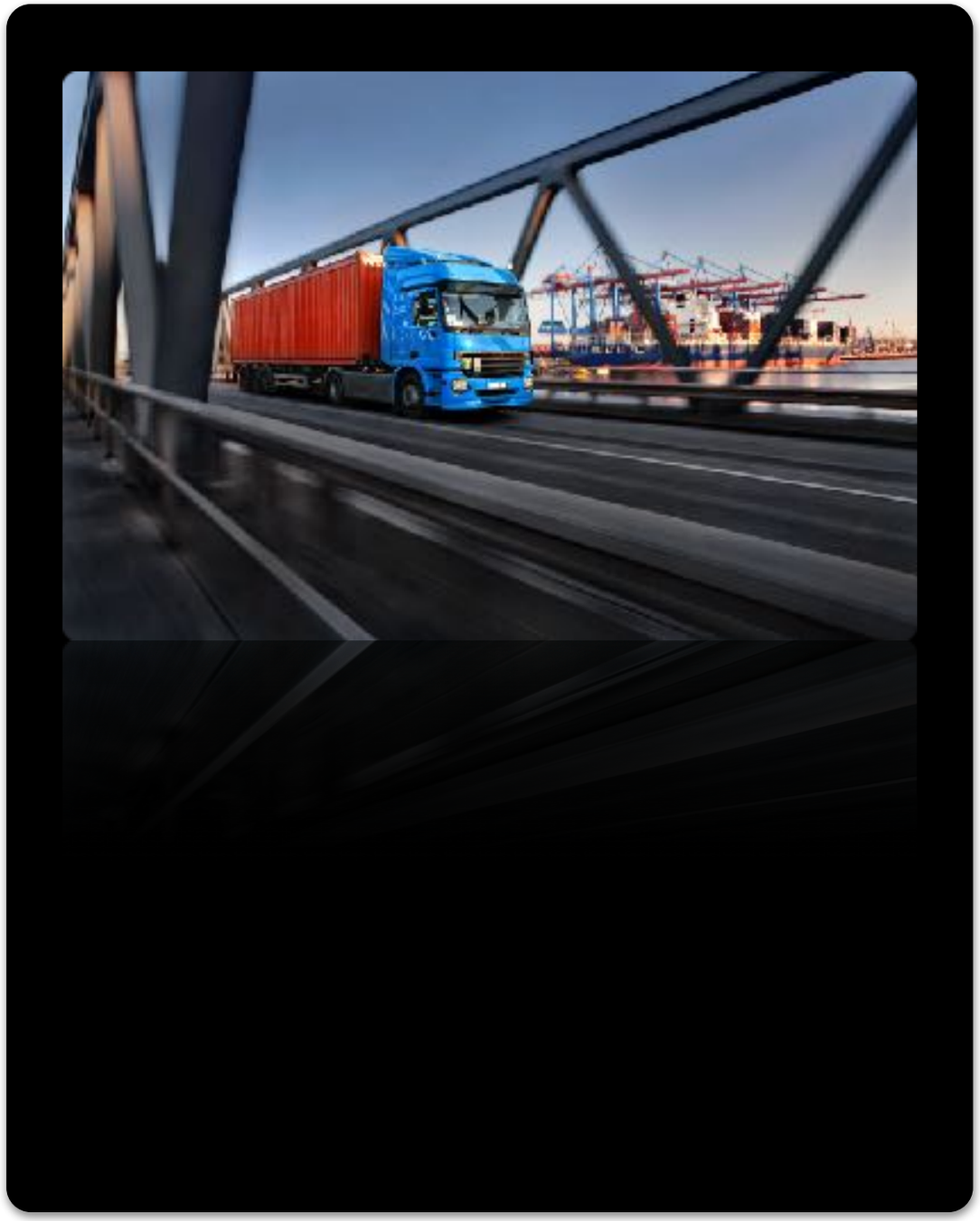
Source: PTOLEMUS - Note: * Growing use of drivers as third party contractors by fleets leveraging systems such as Uber Freight
**For enforcement of non-payment of toll fees

The need to be EETS-compliant is a major driver as the number of schemes throughout Europe grows

- **It is unlikely that smartphone solutions or in-vehicle tolling will be mature solutions** on the fleet market for the launch of the Dutch HGV scheme
- **On the other hand, telematic solutions are already available** and should be taken into consideration as a potential future solution to be included, given that they become EETS-compliant
- New GNSS-enabled HGV schemes are being launched in Europe **increasing the impetus on interoperability and EETS compliance**
  - Poland has announced that it will be moving towards a GNSS scheme
  - Other countries in the North and Eastern part of Europe are also looking at the development of new schemes
- Mobile solutions for the Dutch HGV scheme will only be possible if the **responsibility of the technology and the toll payment liability falls on the app provider**
  - EETS providers currently carry the financial burden if there is a failure in the device; the model should remain the same to remove the burden from the toll charger
  - It means that the app provider would need to be EETS-certified
- The **accreditation of all of the new technologies will be complex** given the large variety of solutions being developed
  - Smartphone accreditation will depend on several factors which are discussed later in this document
  - Connected in-vehicle solutions are different with each truck OEM and could have different datasets, increasing the difficulty of processing the toll transaction data
  - Smart digital tachographs will be less variable given the few providers and could pass accreditation more easily

Technologies requirements for new solutions could affect the remuneration from the toll charger

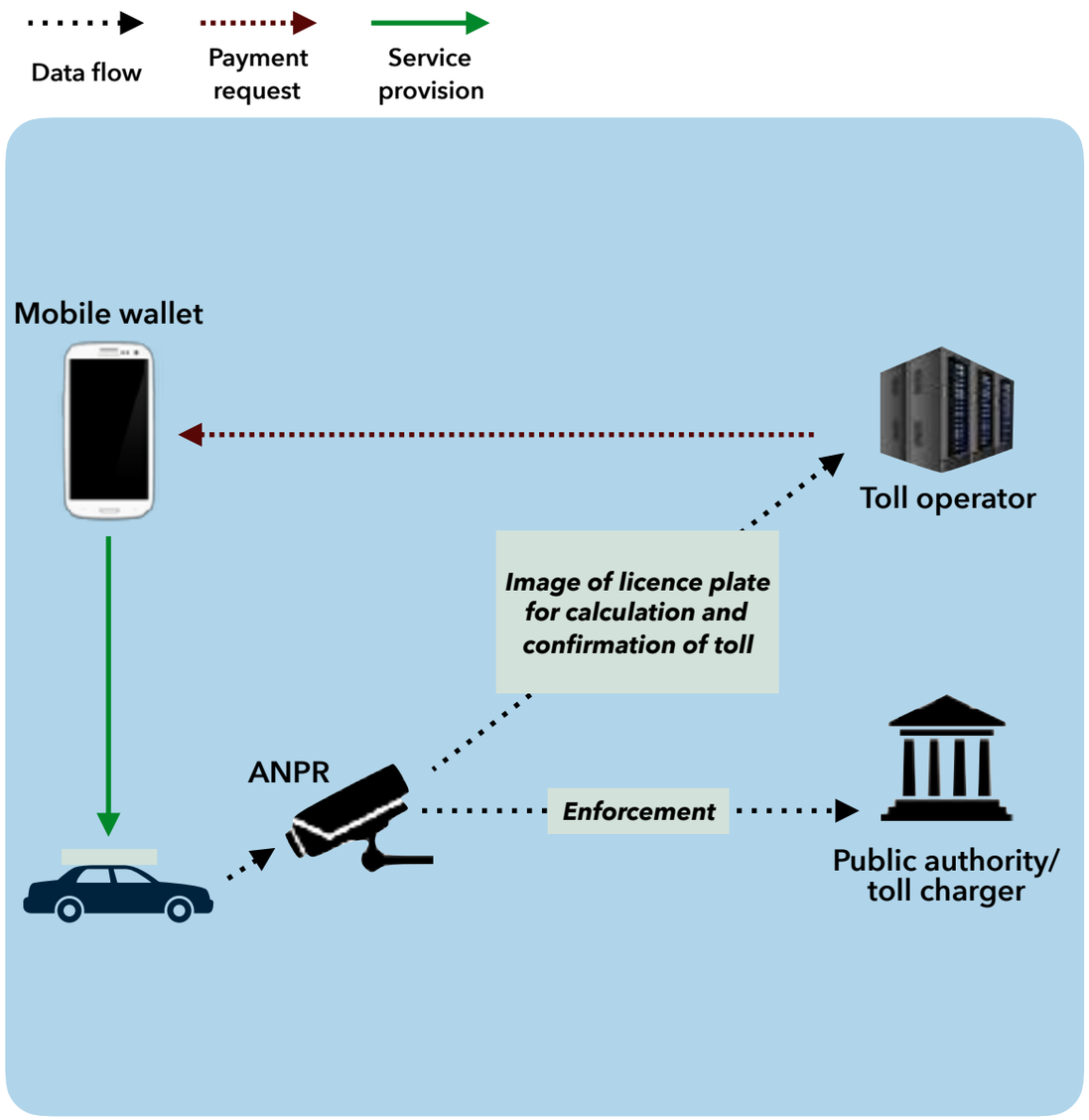
- The additional weight of research and development, plus continual updates, could impact the required remuneration rates of the TSP for the toll charger
  - Each new handset would need to be certified potentially
  - Similarly, new vehicle platforms would require certification
- The maintenance and updating of smartphone apps and embedded solutions - in addition to existing OBUs - could require significant investment from TSPs
- This could result in:
  - EETS providers losing device-based fees as a source of revenues
  - The TSP market consolidating faster than expected
- In such a scenario, TSPs could require a higher rate of remuneration to cover the cost of facilitating the toll charge



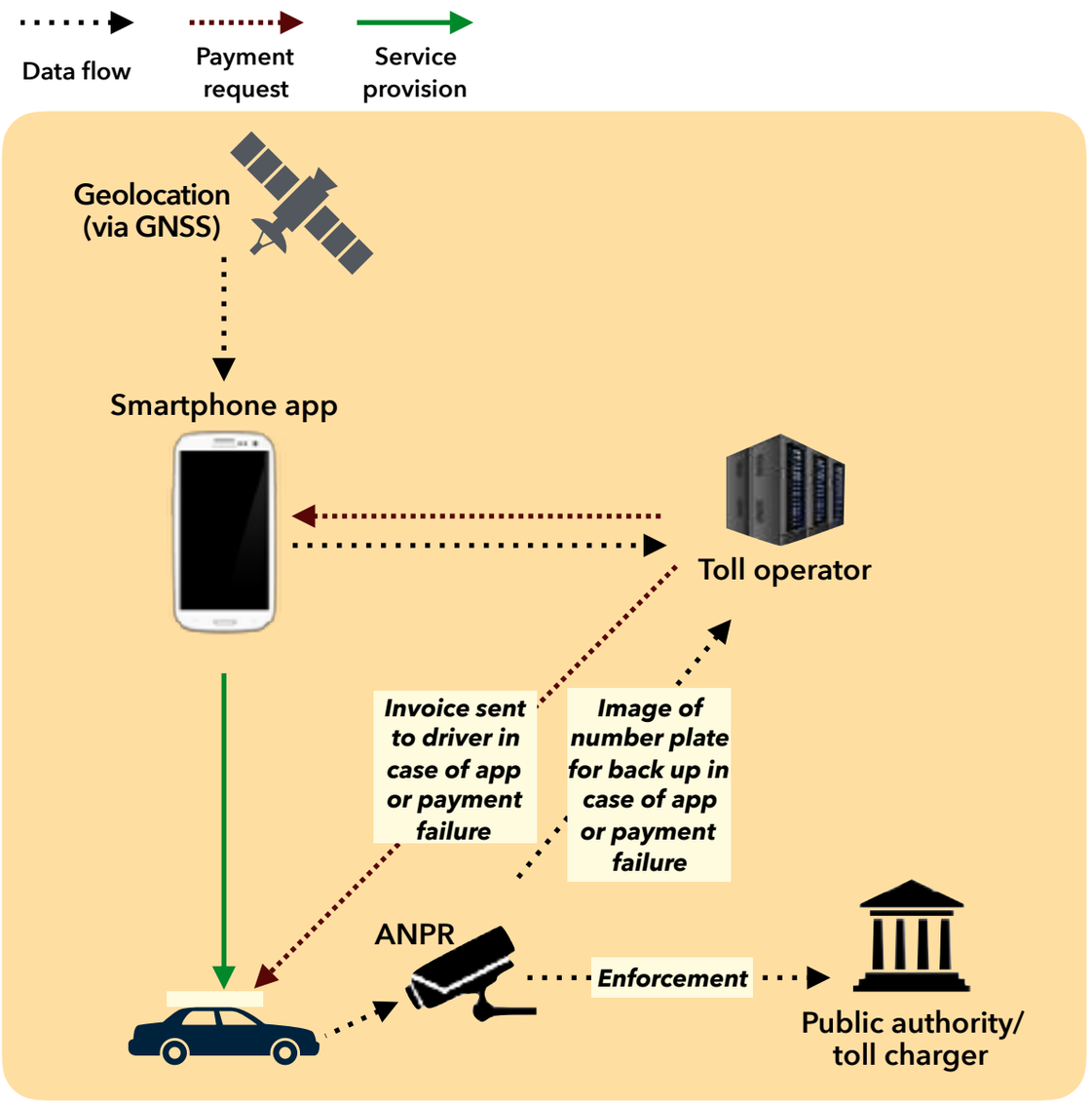
Analysing non-OBU GNSS+DSRC solutions

Toll service providers can use smartphones in 2 ways*

The smartphone as a payment mechanism



The smartphone as a charging technology



Source: PTOLEMUS Electronic Tolling Global Study - Note: * Those 2 methods can be used simultaneously in the mobile app

Smartphones do not meet all of the current requirements of the Dutch HV scheme

What smartphones bring to RUC

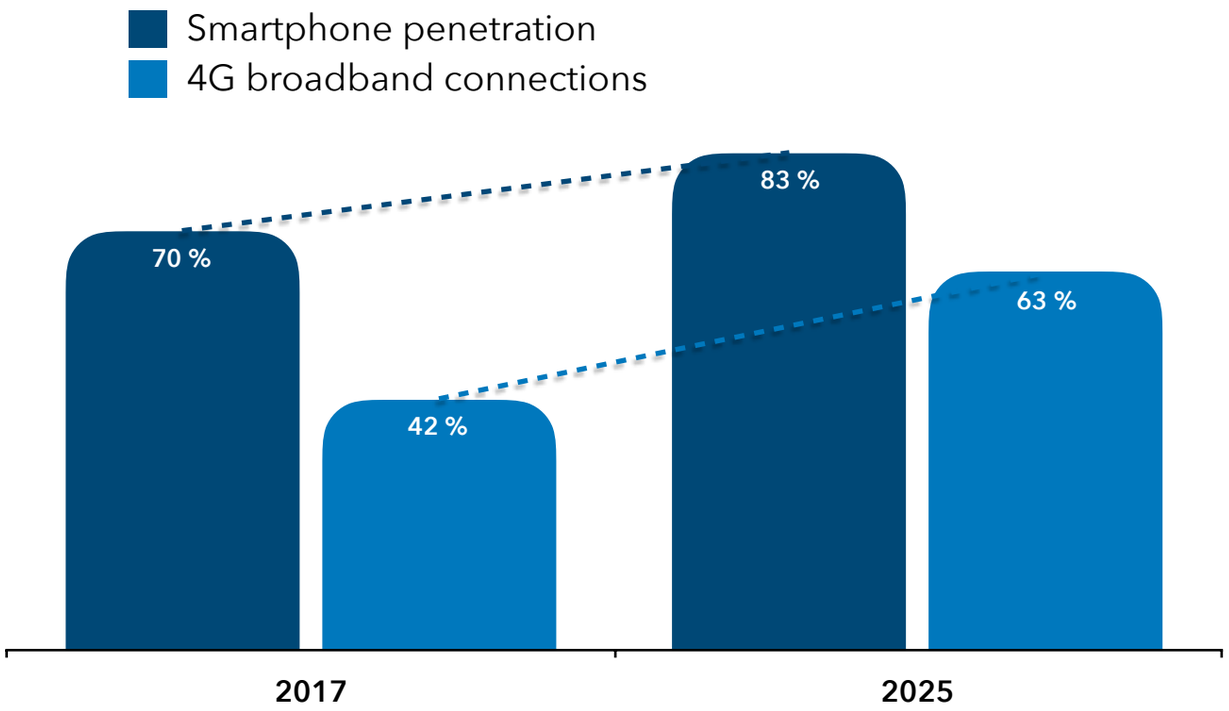
Key building blocks for a solution compatible with Dutch HV scheme		What smartphones bring	Rationale
General components of ETC/RUC solutions	Free flow access mechanism	Yes (only if Bluetooth is used)	Would work in an ORT environment (no gates) such as the Dutch HV scheme
	Payment billing mechanism	Yes	Smartphones can provide both through e-wallets and account management apps (1)
	User interface	Yes	App-based user interface
	Enforcement system	Only using ANPR	Smartphones do not support enforcement with DSRC, unless a DSRC tag is provided in addition (2)
	Charging / measuring mechanism (distance based, time-based)	Yes, utilising GNSS and real-time connectivity*	Capable of accurate, multi-technology positioning
Additional components required in the EU	Interoperability with EETS providers	Not today	Cellphones are not DSRC-enabled, making them inoperable in standard DSRC schemes
	Road safety	Not today	Phones are not designed for driving conditions and truck dashboards do not integrate them well today
	Data privacy (GDPR)	Questionable	Access from non-EU tech giants and/or intelligence agencies to driver locations and tax information is expected on these platforms (3)
	Security	Questionable	While smartphones are used to support financial apps, they are not used for tax collection today

Source: PTOLEMUS - Note: (1) Assuming that drivers' phones can be used and that they have a data plan across the EU - (2) Certain suppliers are already developing such a solution 3) This was confirmed by the European Court of Justice's ruling on 16th July 2020

The proliferation of mobility and payment apps could trigger the emergence of mobile tolling models

The use of smartphones as charging and payment devices could flourish, as large companies integrate payments and transport mobility services

New technology penetration in Europe (%)

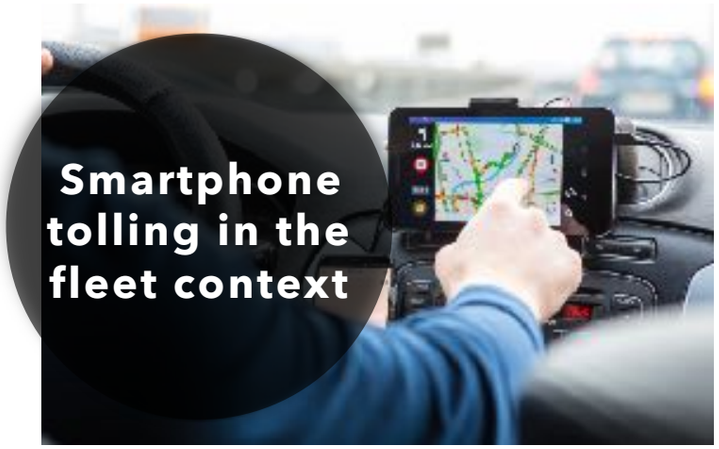


Key drivers

- The European Commission's **roaming data tariffs regulation removed a high cost barrier for international truck drivers** to use their phone data connection in the EU
- 4G networks offering increased data bundles **are now covering the EU with high connection quality**
- **The 2019 revised EETS directive authorises the use of ANPR for ETC in Europe**
- **The ease of use of apps could represent an alternative to historical systems, e.g.**
  - **Paperless by Masternaut** transfers paper-based processes to a mobile app
  - **TransFollow offers consignment note digitalisation with eCMR**, leading to fewer mistakes, losses or time wasted, and enabling administrative savings, quicker invoicing and payments

Source: PTOLEMUS, GSMA (2018)

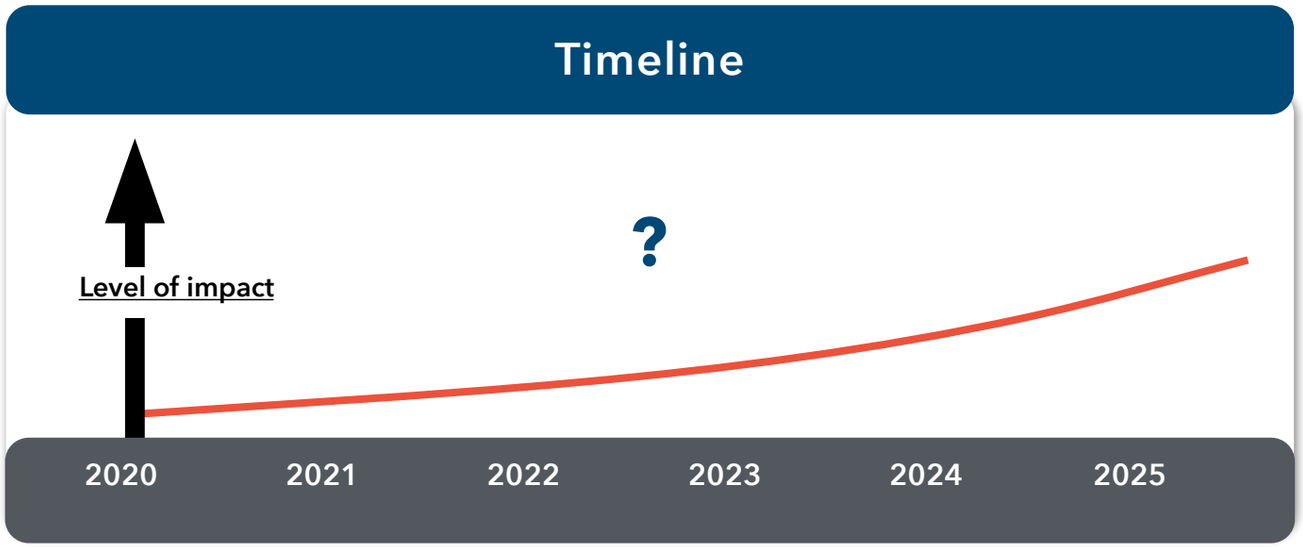
Toll service provider could become back-office providers to new mobile solution players



The use of smartphones as charging and payment devices could flourish, as large companies integrate payments and transport mobility services

Potential scenario

1. Toll chargers authorise **inclusion of mobile and ANPR based on revised EETS directive as valid options**
2. Payment and mobility companies enter as disruptive new players and **partner with toll service providers**
3. These new apps, combined with a Bluetooth beacon, include other fleet management services such as traffic and location-based information, and driver management
4. Stand-alone OBUs are gradually phased out due to the affordability of mobile solutions and the end of the OBUs' lifetime
5. Remuneration from toll chargers increases to cover increased certification costs
6. Pure-play toll service providers are **relegated to back-office platforms for the new players**



Source: PTOLEMUS

We could see the first interoperable mobile tolling handsets in the next 5 years

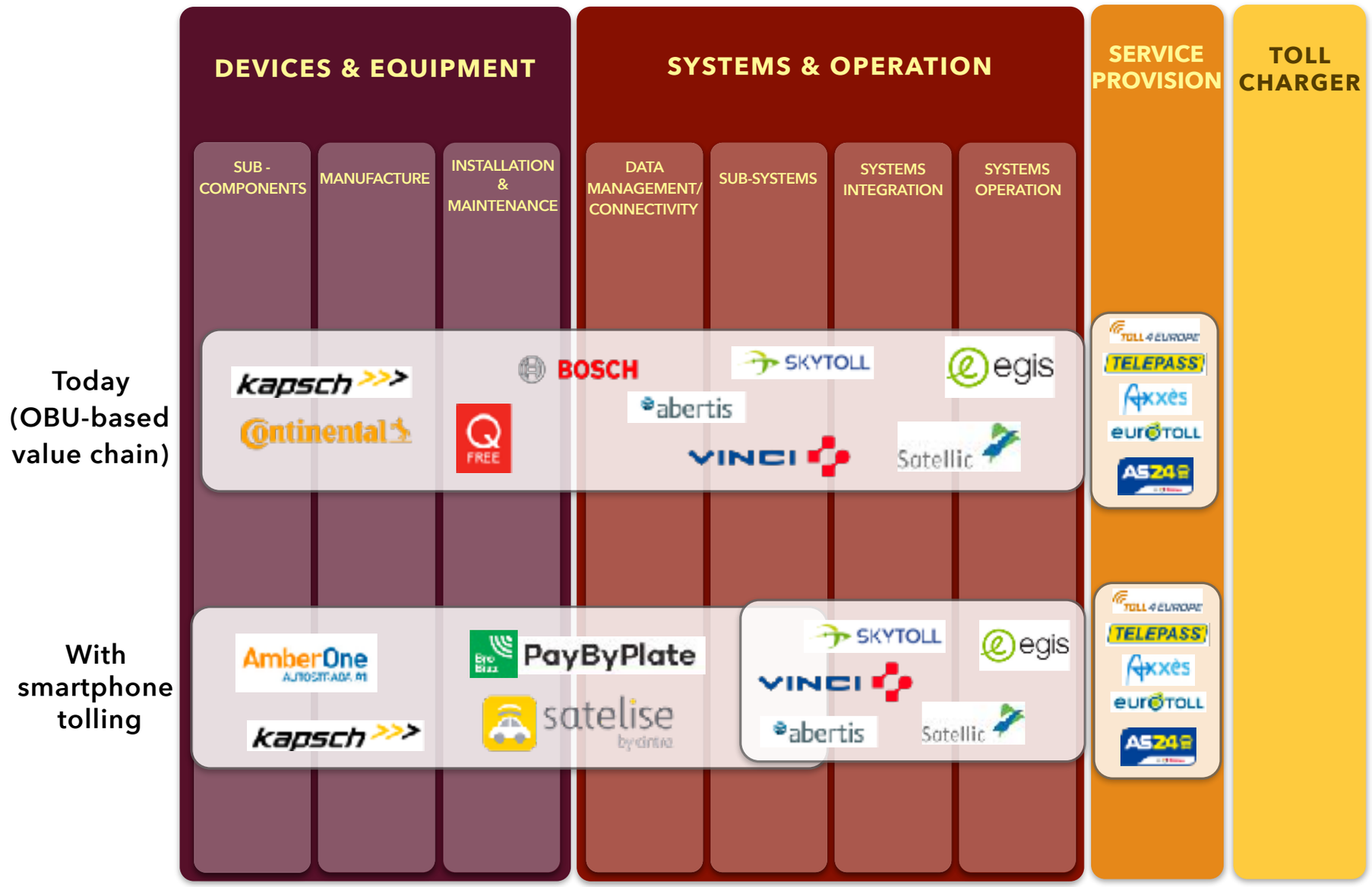
Potential timeline for an interoperable mobile tolling solution

Steps	2020	2021	2022	2023	2024	2025	Rationale
Operationally functional							Currently, there are several operationally functional apps in use by road operators but not interoperable in the EU
Negotiation of interoperability contracts							Due to the number of providers, forming the acceptance network will be a major hurdle
Technically suitable for interoperability							Options will need to pass a suitability for use test for each partner toll domain
Legally certified by the toll charger							Device certification can take between 12-18 months after certification standards are developed
Further regulated by the EC							Though allowed in the EU, additional regulation and enforcement framework are likely to be required for implementation
Delivered to the market							Fully interoperable devices will need to be certified before they are on the market

Source: PTOLEMUS

Smartphones could lessen the reliance on traditional devices

Possible changes in the ETC value chain due to smartphone tolling



- Smartphone tolling could take market share from traditional device providers
- To combat this, some device providers, e.g. Kapsch, are looking to provide their own solutions
- For light vehicles, there are already a few options on the market*:
  - In Poland, **AmberOne** has released the AmberGo app for use on the Autostrada 1 segment
  - In Spain, **Cintra** has launched Satelise, a mobile toll payment app for use

Source: PTOLEMUS - Note: * Used on only one road operator's network

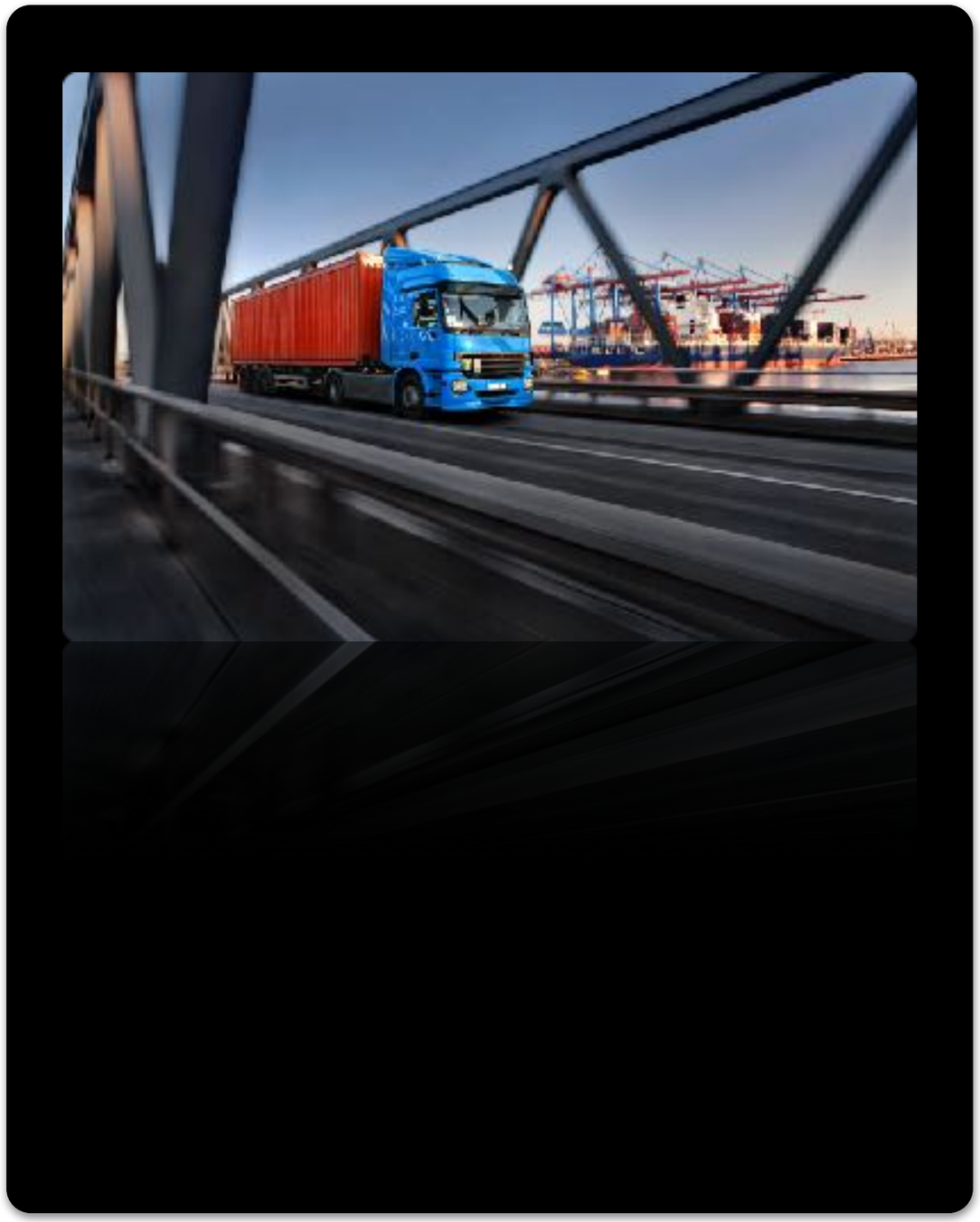
Smartphone payment has been applied in Poland on Autostrada A1

- Initiated in 2019, it is the **first automatic toll collection system** for the autostrada A1 motorway gates in **Poland**
- The system uses **ANPR** to identify the user by its **registration number** and to charge the toll to its respective account
- The payment is done **using a smartphone** with either one of the 3 applications: **SkyCash**, **Autopay** and the **Bank Millennium application**
- The estimated **gate capacity of 600 vehicles/ hour** is assumed to be **3 times higher** than with the traditional ticketing system
- In February 2020, the number of **registered vehicles** was counted to **194,000**
- The service has an **accuracy level of 98%** in which it correctly reads the registration numbers of vehicles entering and leaving the AmberOne A1 Motorway.

Source: PTOLEMUS - Note: Manual toll booths coexist with the AmberGo system

DSRC enforcement could be replaced with ANPR once number plate databases are shared for foreign traffic

- The use of **ANPR for enforcement is common** in **open road tolling (ORT)** schemes for all-vehicle tolling
  - Examples of usage are evident particularly in Ireland and the United States
- The main barrier to ANPR enforcement in Europe is the **lack of real-time number plate data exchanges for foreign vehicles**
- However, the new EETS directive aims at creating a data hub that would give toll chargers **access to foreign licence information** for the purposes of cross border enforcement



Smartphone tolling could reduce the initial investment of the MSP related to device provision

Potential positive impacts on the Dutch HGV scheme

★ Privacy concerns related to legislative design of scheme as a tax scheme

★ **Reduces costs of initial investment related to device provision for the TSP/MSP, assuming that**

- Drivers' phones can be used by fleets
- All drivers have a working data connection in the Netherlands

★ **Faster take-off of ETC in the vehicle population**

- Easier user take-up due to the high penetration of smartphones

★ Creates a permanent touch point between the service provider and the user

- Can enable both pre- and post-pay services
- Provides clarity to the user of expected toll charges over a given route
- Able to offer additional services to the users, such as safety notifications

★ **Tolling becoming part of a complete mobility payment solution alongside fuel, secured parking**

★ Can be deployed across AET, FFT or ORT networks

★ Offers toll chargers a far **greater degree of flexibility** concerning the location of charging points

★ Can be enforced with ANPR technology that may be already deployed in certain networks

Source: PTOLEMUS - Note: AET: All Electronic Tolling, FFT: Free Flow Tolling, ORT: Open Road Tolling

Privacy and user concerns are the greatest hurdles to smartphone tolling

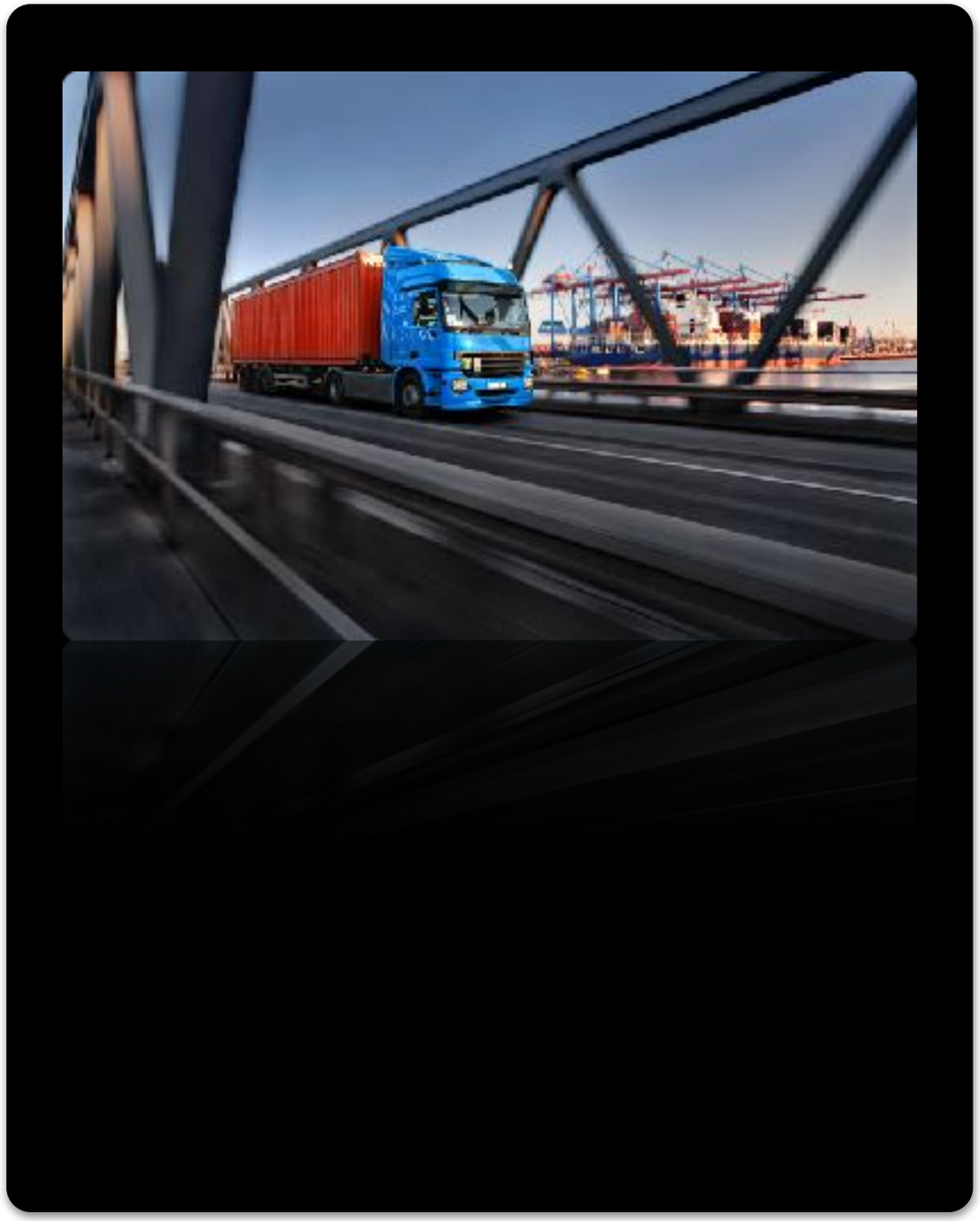
Potential negative impacts on the Dutch HGV scheme

- Privacy concerns related to legislative design of scheme as a tax scheme
- **Large number of handsets with disparate positioning performance**, requiring a certification process in a fast moving phone market
- **Remuneration for smartphone tolling might be higher if the solution requires greater R&D and a high cost of maintenance**
- **Would require the costly installation of ANPR for enforcement as smartphones aren't operable in DSRC solutions**
- **Dependency on smartphone and app being functional**
  - Phone could be defective (battery, phone lost, phone changed)
  - App could be not usable: app deleted, credentials lost
- Would require an additional backup scheme in case of smartphone failure
  - For example, physical route tickets or OBU rental
- **Devices potentially more open to fraud** as not controlled by toll service provider
- **No end-to-end control on the system by I&W**, opening fraud risks
- **Systemic privacy and security risks created as a result of** mobility data for the complete tolled vehicle fleet likely to become accessible to tech giants and US / Chinese intelligence agencies
- **Potentially significantly increases the burden of certification**
  - Significantly increases the number of devices to be certified, due to the very large number of handsets
  - Potentially requires a new certification for each new version of Android and iOS
- Move towards phone apps could be slowed by the need and willingness to maintain interoperability agreements with foreign users

Source: PTOLEMUS

Smartphone app accreditation procedures will need to be developed as the market grows

- Compliance will need to be **managed at an app level** and **new certification procedures** will need to be developed
  - Legislation may require a smartphone of a specific model for compliance
  - The tolling app itself could verify that the model and operating system meet the guidelines
- Given the infancy of the market, the **accreditation procedures are still unclear:**
  - Would each new handset require a certification?
  - Would each new phone OS imply a re-certification?
  - Would it be possible to require drivers to have only a few phone models?
  - However, we estimate that non-compliance devices will be revoked from access to the system, in a similar fashion to non-suitable EETS devices
- In the US, **mobile tolling solution provider GeoToll** is working with **tolling / ITS trade consortium OmniAir on certification procedures**
- Currently, **most mobile solutions in Europe are owned by the road operators** for the relevant roads and thus, are tested internally by them on their own networks **and have not been submitted to interoperability tests**



Analysing non-OBU GNSS+DSRC solutions

1 Introduction to the project

2 Smartphone tolling solutions

3 **In-vehicle tolling solutions**

4 Fleet telematics solutions

5 Next steps

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In-vehicle tolling solutions could occur in at least 2 ways

1. Embedded connected vehicle payments solution

Embedded connected payments using the vehicle's payment platform and a line-fitted ETC OBU

For example, Daimler Europe has announced the development of TruckWallet and TruckID for embedded payments, including toll payments

2. GNSS/DSRC-enabled smart digital tachograph

Recent legislation requires that HGVs in Europe are fitted with a smart digital tachograph to implement driver controls.

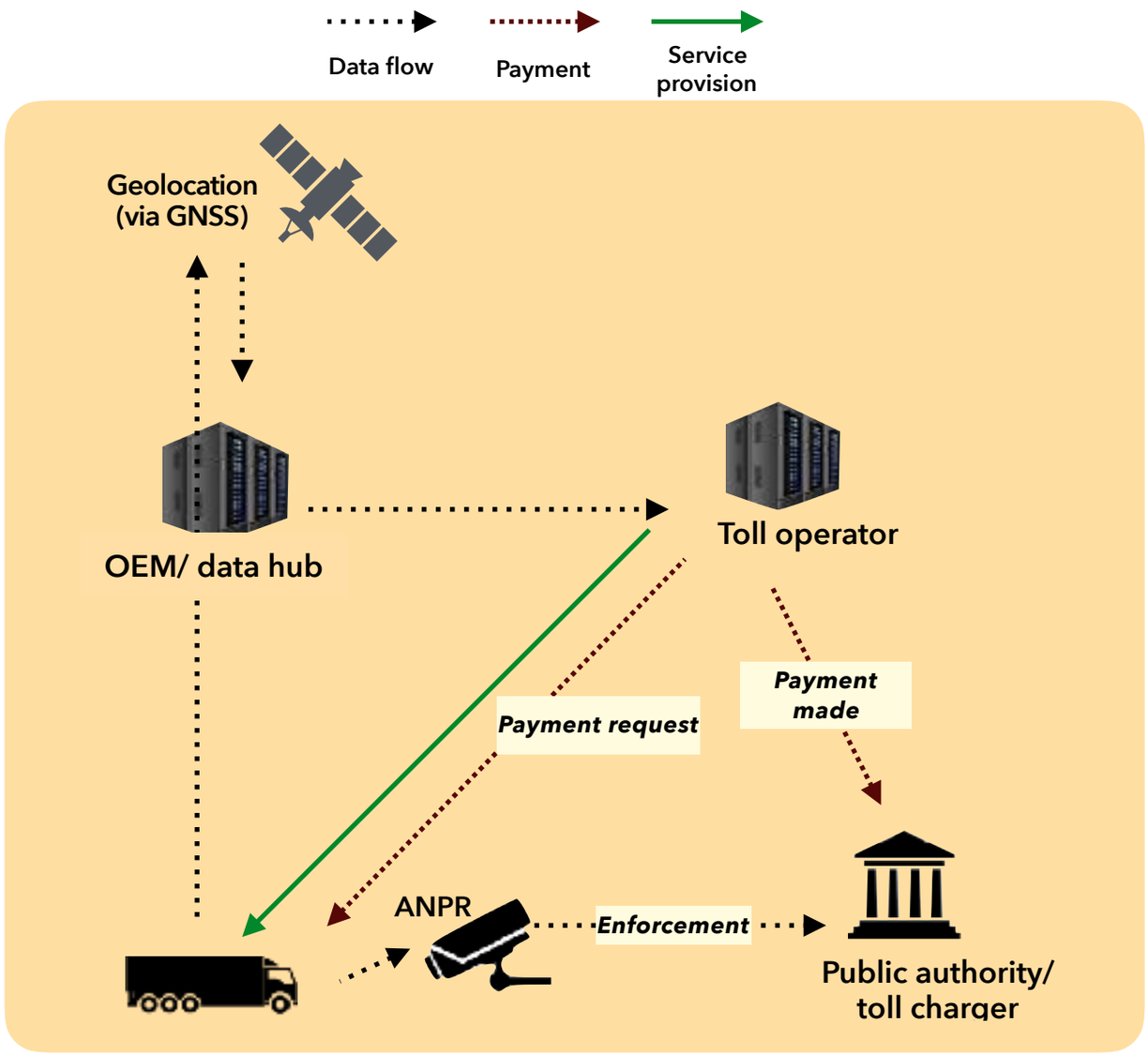
The tachographs must be GNSS- and DSRC-enabled. DSRC is used for enforcement.

We understand that the revised EETS directive allows the use of embedded devices, such as smart tachographs, for HV ETC / RUC. Any supplier could provide such solutions and would need toll chargers' certifications.

Stonebridge's smart tachograph

The toll service provider could act as the middle man between the OEM and the toll charger

Potential architecture for in-vehicle payments



Source: PTOLEMUS

In-vehicle tolling could meet the requirements of the HGV scheme but would require EETS certification

What in-vehicle solutions bring to RUC

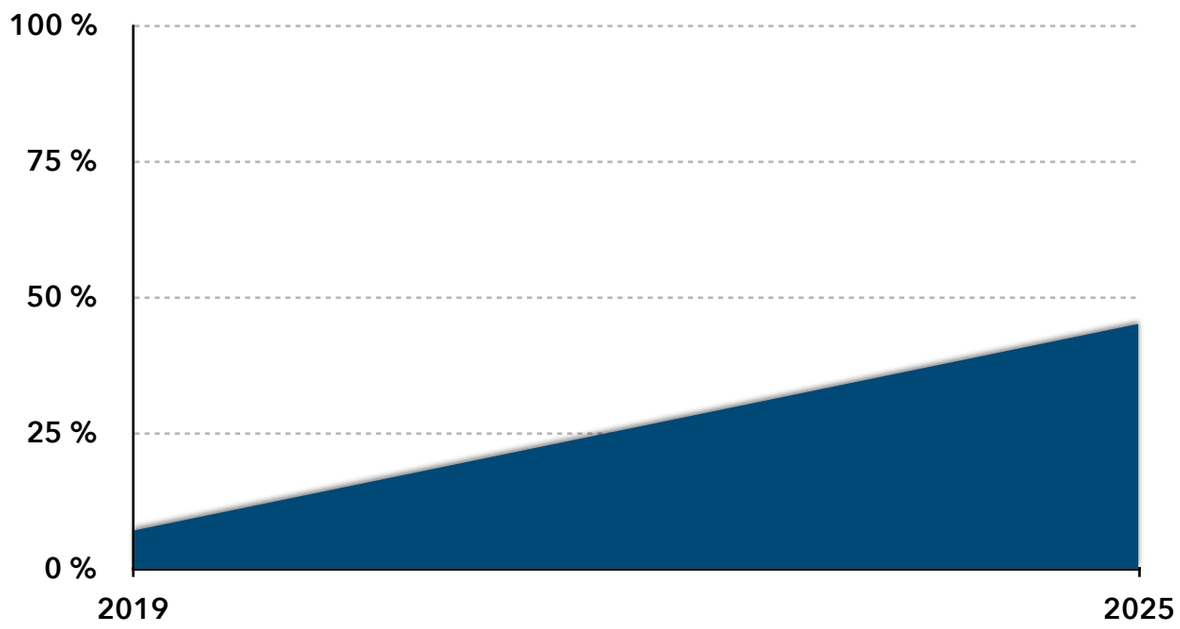
Key building blocks for a solution compatible with Dutch HV scheme		What in-vehicle solutions bring	Rationale
General components of ETC/RUC solutions	Free flow access mechanism	Yes but only through tachograph's embedded DSRC	Only for tachograph solutions. Would also work in an ORT environment (no gates)
	Payment billing mechanism	Yes	Vehicles can provide billing both through e-wallets and account management apps
	User interface	Yes	App-based user interface
	Enforcement system	Yes	Capable of DSRC and ANPR enforcement
	Charging / measuring mechanism (distance based, time-based)	Yes	Capable of precise geo-location
Additional components required in the EU	Interoperability with EETS providers	Potentially	Possible if the solution becomes EETS compliant
	Road safety	Yes	OEMs are used to build systems with very high safety requirements
	Data privacy (GDPR)	Yes	Privacy is a main focus in the development of in-vehicle solutions
	Security	Potentially	Connected in-vehicle solutions are potentially more vulnerable to hacking due to their complex architecture and multiple entry points

Source: PTOLEMUS

OEMs' growing investment in payment platforms could find a key application in tolling

The possibility of in-vehicle tolling increases as the penetration of embedded devices grows

Smart tachograph penetration in Europe (%)



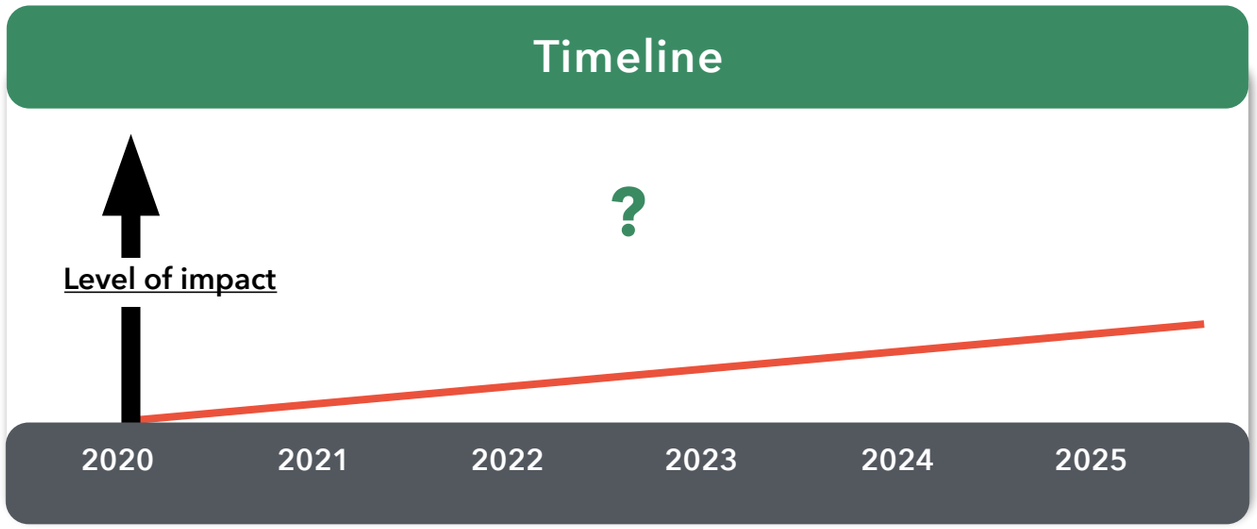
Drivers

- **Increasing number of countries that run HV RUC schemes in Europe** (accelerated by the possible removal of the Eurovignette)
- **Revised EETS directive allows for embedded devices**
- **Gradual embedding of GNSS into trucks by OEMs** for remote diagnostics and fleet management purposes
- **Increased penetration of newly regulated smart tachographs** (enabled with GNSS and DSRC technology) **in the EU**
- **Continental, leader of the tachograph market, also produces ETC OBUs**

Source: PTOLEMUS' Connected Vehicle Payment Global Study - European Commission study regarding measures fostering the implementation of the Smart Tachograph Draft Final Report – 2nd version

OEMs will take over as the main provider with vehicle data hubs and toll service providers playing back-office roles

The possibility of in-vehicle tolling increases as the penetration of embedded devices grows



Possible scenario*

1. OEMs utilise either the smart digital tachograph or their embedded connected platform to **facilitate toll payments**
2. These in-vehicle solutions are gradually **certified for use with the toll chargers**
3. **OEMs select vehicle data hubs for the management of vehicle data**
4. Vehicle data hubs form **relationships with toll service providers** for the facilitation of the toll payment
5. EETS providers who do not form partnerships with OEMs lose market share
6. Stand-alone OBUs are phased out due to the affordability of OEM solutions
7. Most independent service providers are **replaced by OEMs and the remainder become tolling platform suppliers to OEMs**

Source: PTOLEMUS - Note: * Other scenarios are possible

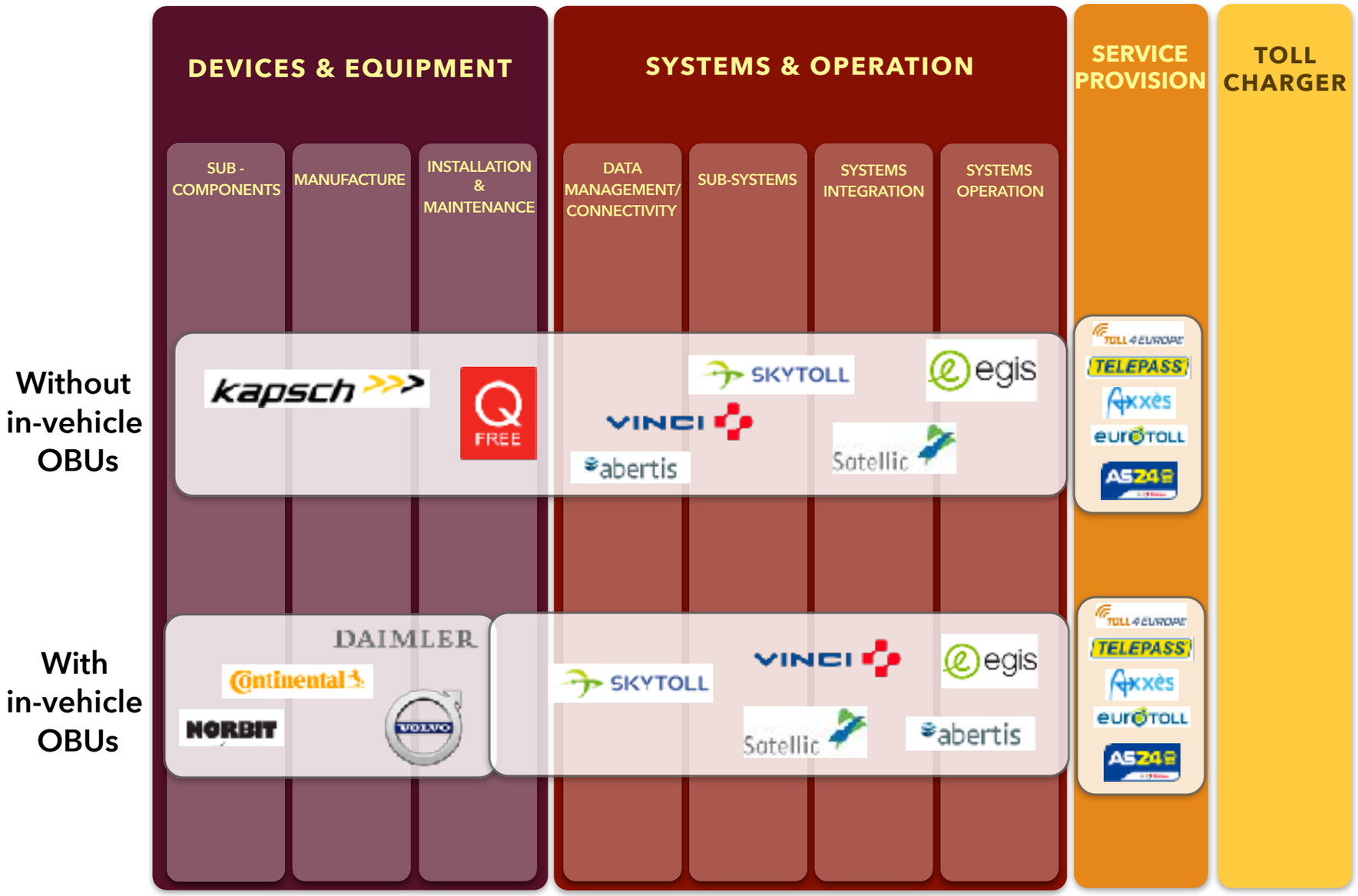
It will be several years before in-vehicle tolling solutions are operational for toll payment

Potential timeline for an interoperable in-vehicle tolling solution

Steps	2020	2021	2022	2023	2024	2025	2026	2027	Rationale
Operationally functional									There are currently no in-vehicle solutions that are functional for HV toll payment in Europe
Negotiation of interoperability contracts									Due to the number of providers, forming the acceptance network will be a major hurdle
Technically suitable for interoperability									OEMs will need to pass a suitability for use test for each parter toll domain
Legally certified by the toll charger									Device certification can take between 12-18 months after certification standards are developed
Regulated by the EC									Though allowed in the EU, additional regulation and enforcement framework could be required for implementation
Delivered to the market									Fully interoperable devices will need to be certified before they become standard

In-vehicle solutions will still rely on toll service providers to aggregate domains for interoperability

Possible changes in the ETC value chain due to embedded tolling



- There are **2 types of players involved in the creation of in-vehicle tolling solutions**
- OEMs are exploring the creation of **vehicle IDs and embedded wallets** capable of using vehicle GPS for payments
- They are also looking at partnerships with FTSPs; in 2017, Volkswagen purchased LogPay Transport Services, a fuelling and toll payment service
- **Smart tachographs** embed the 2 key technologies for ETC
- In either case, we see a scenario in which EETS providers remain the toll service providers and have the in-vehicle OBU EETS-certified
  - We are seeing investment by OEMs into EETS providers already with Daimler and Toll4Europe

Source: PTOLEMUS

In-vehicle solutions could increase the penetration of ETC in the total HGV park

Potential positive impacts on the Dutch HGV scheme

★**Reduces costs of initial investment related to device provision**

- To the fleet by removing the need to purchase an additional device (or rent / lease it)
- To the toll charger by removing the requirement to the MSP for the device provision, given a pre-existing tachograph or OEM solution

★**Could facilitate the penetration of ETC/RUC in the HGV park in the long term**

★**Could facilitate the extension of ETC/RUC to light vehicles in the long term**

★**Creates a pipeline of communication between the OEM and the user**

- Able to offer additional services to the users, such as other payments

★**Ability to integrate payment for fuel and secure parking, leading to easier accounting management of fleet costs**

★Can be deployed across AET, FFT or ORT networks

★Can be enforced with ANPR technology that may be already deployed in certain networks

The main challenge of an OEM solution will be its certification and potentially re-certification

Potential negative impacts on the Dutch HGV scheme

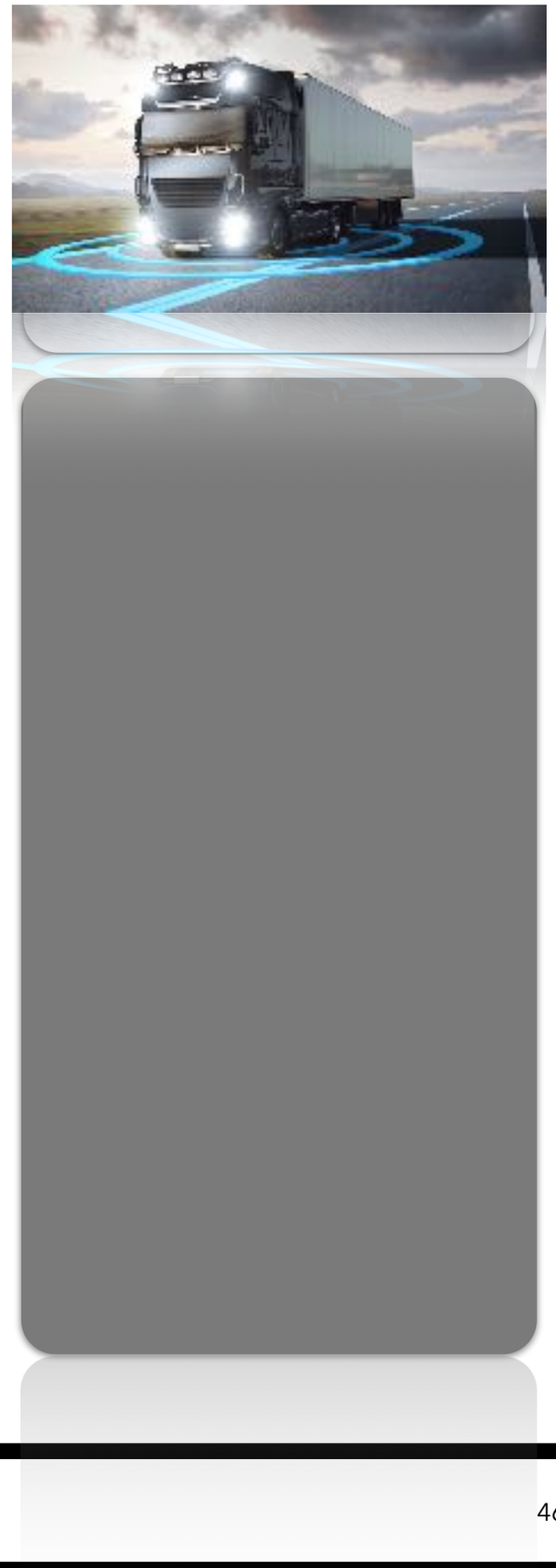
- **Account management layers between the OEM and the toll charger will be a complicated challenge**
  - Could lead to account management issues due to the complexity of the data management for the vehicle data hub
- **Each OEM will need to have its tolling platform certified**, unless they rely on an existing EETS-certified TSP
- **Requires ANPR for enforcement,** which has a higher running cost than DSRC and has a lower collection rate
- **Embedded devices are potentially more open to fraud** unless controlled / certified by toll service provider or toll charger
  - Would require strong enforcement processes from the toll charger to reduce leakage
- **Undermines existing toll service provider business models** built around OBU-enabled payments
- **Certification of embedded solutions will be complicated** and could affect interoperability
- **Technology issues may require updating the embedded systems once implemented,** which might involve taking the truck off the road, creating pain points for fleets
- **A platform update will likely require re-certification**, which may be a particular challenge for an in-vehicle system

The tachograph DSRC enforcement function might be restricted to avoid interference with tolling enforcement

- The enforcement equipment allocated to the detection of the smart digital tachograph **could interfere with the detection of DSRC used for ETC enforcement**
  - According to the ECC*, "the Commission Implementing Regulation 2016/799 [4] foresees that **the remote interrogation of vehicles should not be done when closer than 200 m to a 5.8 GHz DSRC gantry (e.g. road tolling)****"
  - As per the report, there is risk that the tachograph receiver could interfere with the DSRC receiver or the OBU itself, and vice versa
  - Developments in this technology could affect the design of the enforcement installation to ensure no interference
- This implies that the location of working time regulation enforcement activities shall be restricted to areas far enough from ETC infrastructure (gantries or plazas)

Source: PTOLEMUS Note: * Electronic Communications Committee; ** Compatibility studies between smart tachograph, weight & dimension applications and systems operating in the 5795-5815 MHz band and the adjacent bands

The emergence of fully autonomous trucks will increase the pressure for automated toll payments in Europe



- **We expect level 4 autonomous trucks to be commercially available in Europe within 3-4 years**
  - This could start being authorised on motorways, which are increasingly tolled networks
- **While these HGVs are planned to have drivers inside, it will be expected that they do not have to stop at toll plazas**
  - In theory, they could accommodate free flow tolling
  - However, the risks related to them hitting toll plazas exist, creating incentives to move to a full open road tolling (ORT) architecture across the EU
- **This will make the adoption of RUC ORT systems even more likely**:
  - All these vehicles will have native connectivity and high accuracy positioning, making toll charging possible
  - This will make the case for integrated payment / ETC platforms even more compelling

Analysing non-OBU GNSS+DSRC solutions

1 Introduction to the project

2 Smartphone tolling solutions

3 In-vehicle tolling solutions

4 Fleet telematics solutions

5 Conclusions & recommendations

Fleet telematics solutions are GNSS-enabled OBUs that provide fleet management services

Several EU countries already implement fleet telematics for tolling

- **Hungary created a model for fleet telematics-based tolling with the launch of *Hu-Go* in July 2013**
  - Hu-Go allows for the certification and use of any certified GNSS-enabled device to collect tolls
  - To date, **more than 20 different devices are certified to collect tolls across the Hu-Go network**
- **Bulgaria's recently launched scheme includes the usage of existing fleet telematics devices** alongside a dedicated device, called TollPass
- Working in tandem with the World Bank, **Ukraine** has repeatedly vowed to introduce nationwide tolling for HGVs and appears to favour a similar procurement and technology model
- While there appears to be no concrete plans in place, discussions have already taken place in **Sweden** concerning a potential national HGV levy and - despite no firm decisions - Hungary's open device model was openly discussed as a potential option

Fleet telematics devices could meet the requirements of the Dutch toll scheme but would need alignment

What fleet telematics solutions bring to RUC

Key building blocks for a solution compatible with Dutch HV scheme		What telematics bring	Rationale
General components of ETC/RUC solutions	Free flow access mechanism	No but not required in envisaged scheme	Would work in an ORT environment (no gates) such as the Dutch HV scheme
	Payment billing mechanism	Yes	Payment through account management from TDO
	User interface	Yes	App-based user interface
	Enforcement system	Only using ANPR	Telematics black boxes / OBD dongles do not support enforcement with DSRC
	Charging / measuring mechanism (distance based, time-based)	Potentially	Capable of accurate geo-location but map-matching algorithms may differ between vendors, potentially leading to (small) discrepancies
Additional components required in the EU	Interoperability with EETS providers	Potentially	Current systems in place are not EETS-compatible and do not allow EETS providers
	Road safety	Yes	These devices do not require driver intervention and have proven to be safe
	Data privacy (GDPR)	Yes	FTSPs are required to be GDPR-compliant
	Data security	Potentially	Fleet telematics devices may be more susceptible to hacking as some FTSPs are small entities*

Source: PTOLEMUS - Note: * Increasing the risks of them not meeting their obligations and becoming insolvent

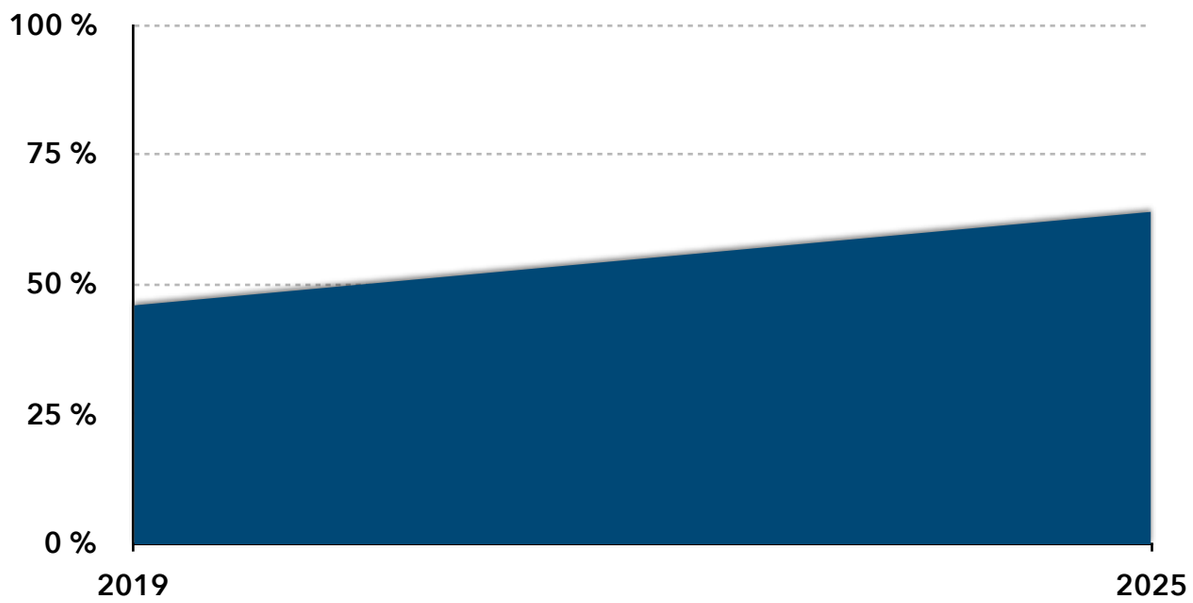
We expect fleet telematics management applications to be available in all trucks in the long term

Fleet telematics solutions all integrate GNSS and are already utilised in schemes in Hungary and Bulgaria

Key drivers

- Fast decreasing cost of fleet telematics devices and services has driven their penetration in HGV fleets
- Most international fleets are already equipped
- Successful low cost deployment of a fleet telematics RUC system in Hungary is proving that it can be achieved
- Convergence of fleet services (ETC, fuel, telematics, diagnostics, UBI, etc.) into a single management dashboard
- No need for new OBUs, enabling cost savings

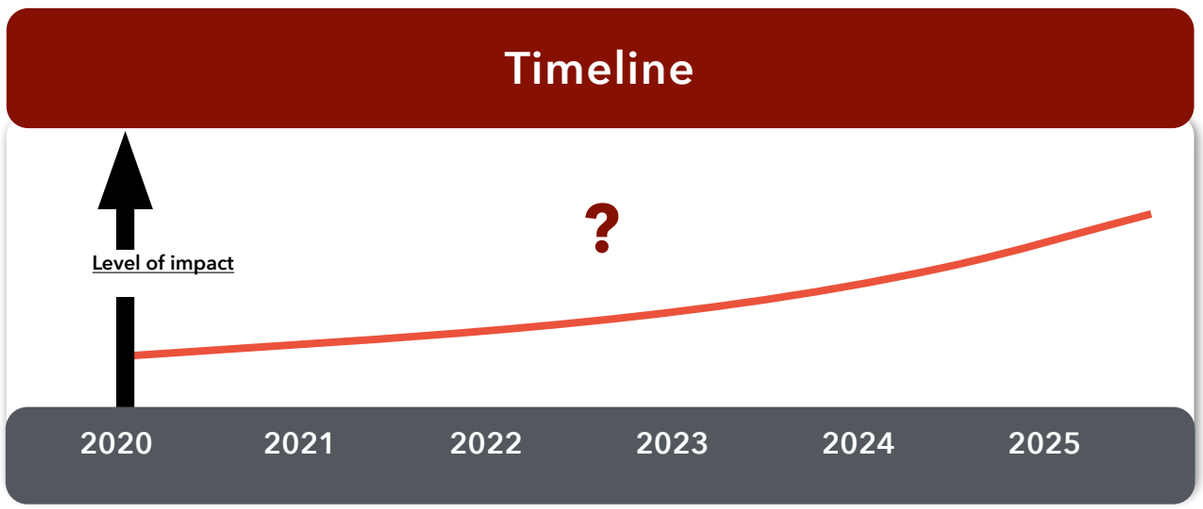
Fleet telematics penetration in Europe in HGVs (%)



Source: PTOLEMUS' Connected Fleet Services Global Study

FTSPs could offer toll provision at a lower cost than the current EETS providers, affecting interoperability

Fleet telematics solutions all integrate GNSS and are already utilised in schemes in Hungary and Bulgaria



Possible scenario

1. Increasing number of implementations of open schemes allowing all GNSS OBUs including fleet telematics devices
2. FTSPs are gradually involved in the measurement and declaration of truck tolls in each country
3. The market is becoming less attractive to EETS providers due to decreasing market share
4. FTSPs start offering tolling as a value-added service driving down prices
5. Main service provider (MSP) duties are relegated to oversight of FTSPs and EETS providers, and the provision of an alternate form of toll payment (for example, route ticket)
6. FTSPs accept lower commission from the Dutch toll charger to control the market
7. Limited profitability for EETS providers leads them to exit certain markets

Fleet telematics devices are already in use as ETC devices but EETS interoperability will push back the timeline

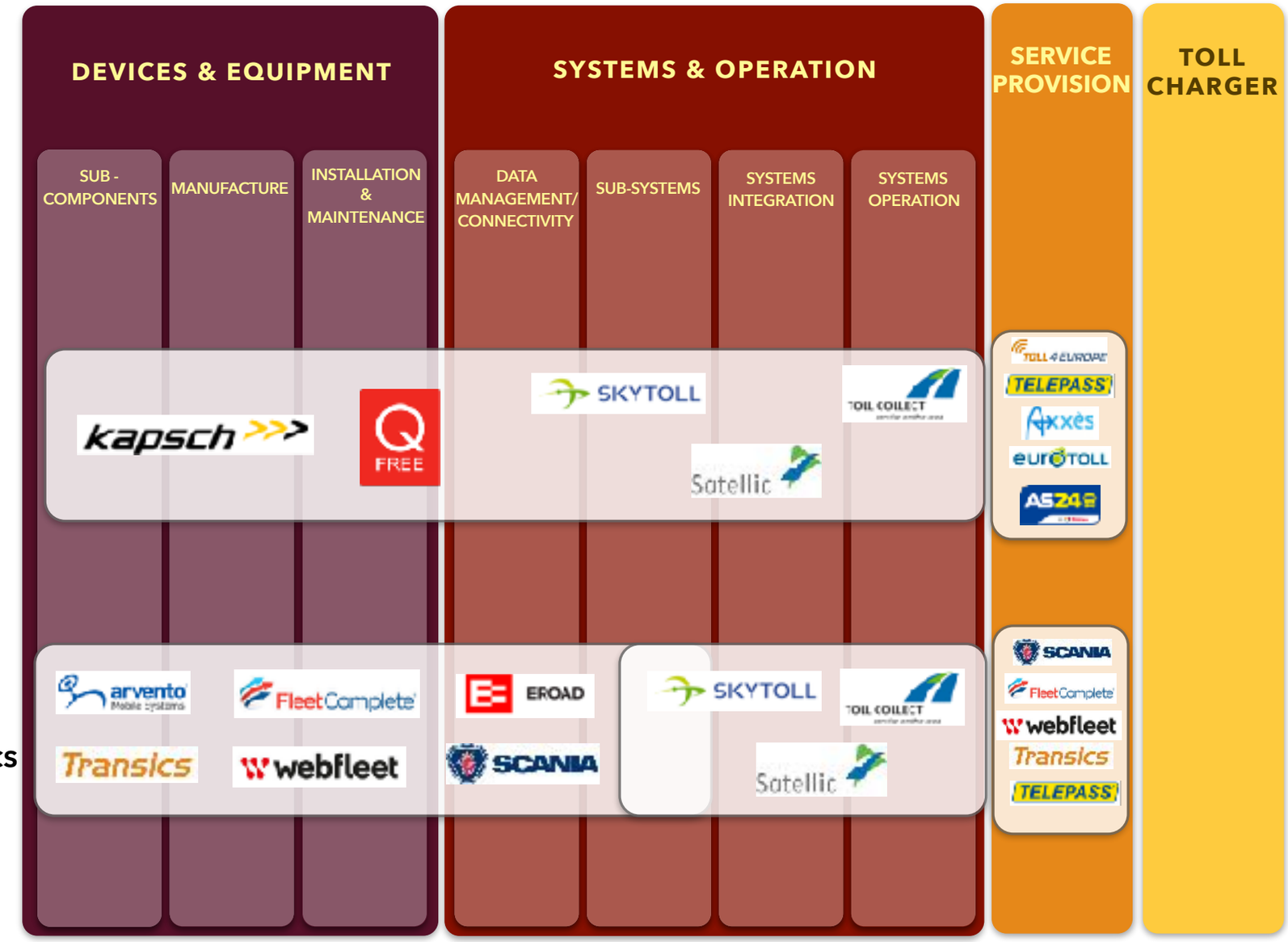
Potential timeline for an interoperable fleet telematics tolling solution

Steps	2020	2021	2022	2023	2024	2025	Rationale
Operationally functional							FTSPs are already in use as tolling devices
Negotiation of interoperability contracts							Due to the number of toll chargers and FTSPs, forming the acceptance network will be a major hurdle
Technically suitable for interoperability							FTSPs will need to pass a suitability for use test for each parter toll domain
Legally certified by the toll charger							Device certification can take between 12-18 months
Registered as an EETS device							A telematics solution should be EETS-compliant to ensure interoperability
Regulated by the EC							Legislation already permits the use of telematics but interoperability procedures might require regulation
Delivered to the market							Fully interoperable devices will need to be certified before they become standard

Source: PTOLEMUS

We expect fleet telematics service providers to continue to grow their influence over the value chain

Possible changes in the ETC value chain due to fleet telematics tolling



- **FTSPs already offer ETC services to HV fleets:**
  - Certain FTSPs already integrate ETC from third parties e.g. Frotcom, Webfleet, etc.
  - It creates an additional revenue stream for them with marginal costs involved as the device already exists
  - New regulation around cabotage, driving & rest times and compliance will increase fleet telematics penetration, which could push fleets to go for a one-stop-shop solution
- **In the future value chain, service provision could be provided by the FTSPs or by EETS providers that have converged with fleet management services**

Source: PTOLEMUS

Utilising fleet telematics reduces device-related costs for the fleet and the toll charger

Potential positive impacts on the Dutch HGV scheme

★ **Reduces costs of initial investment related to device provision,** at least for fleets that are subscribed to a fleet management service today

- To the fleet by removing the need to purchase (or rent/lease) a new device
- To the toll charger by removing the requirement for the MSP to provision a new ETC device

★ **Facilitates a faster take-off of ETC in the vehicle population**

- To the toll charger by removing the requirement for the MSP to provision a new ETC device

★ **Creates additional income opportunities for local providers of fleet telematics solutions, increasing scheme support**

★ **Easier management of the fleet costs thanks to the integration of tolls into a single dashboard**

★ **Simplified account management for the MSP**

- Less need to manage the intake and outtake of devices and the re-use of devices

★ **Can be deployed across FFT or ORT networks**, assuming a good quality of the European number plate database

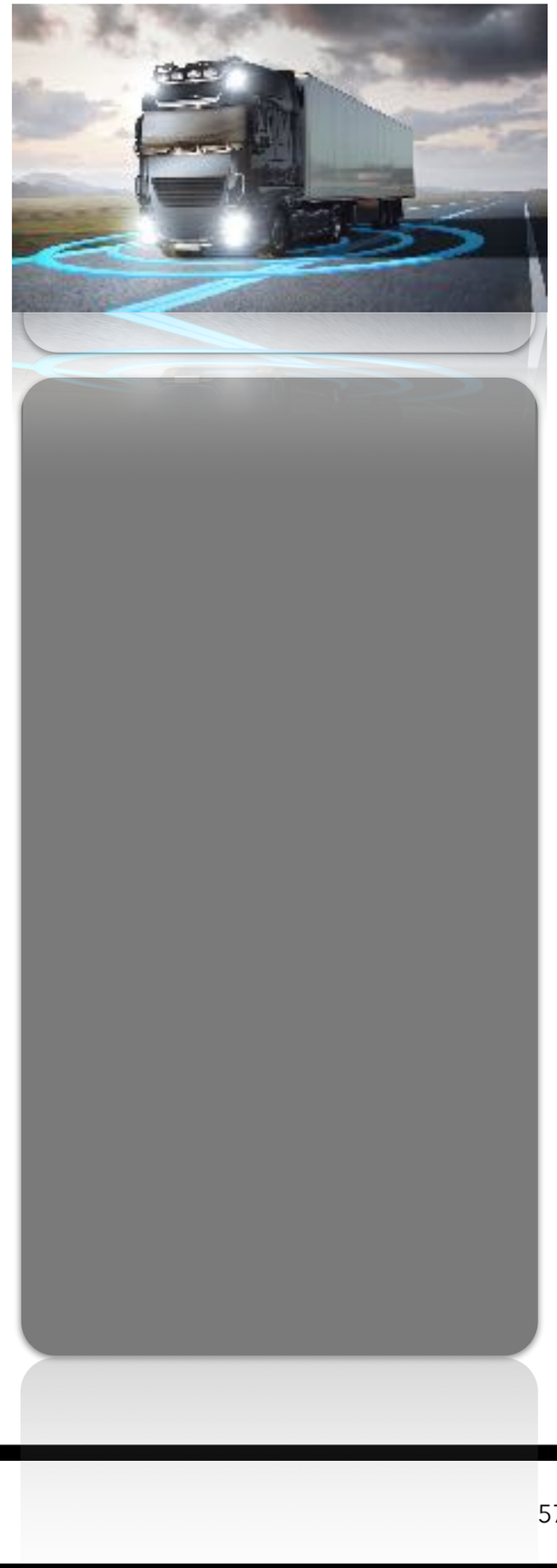
★ **Can be enforced with ANPR technology** that may be already deployed in certain networks

Higher fraud and leakage levels are potential risks of utilising fleet telematics devices

Potential negative impacts on the Dutch HGV scheme

- **Not currently EETS-compliant**
  - No FTSPs have registered devices as EETS devices and they usually lack the DSRC required
- **Requires high level of enforcement and oversight from the MSP (if tasked with monitoring FTSPs)**
- **Privacy concerns related to legislative design of scheme as a tax scheme**
- **Would require the installation of ANPR for enforcement as devices are not operable in DSRC solutions**
- **Requires the development of standards for certified FTSPs** to become certified to make toll declarations in each toll domain
  - Need to develop uniform map matching algorithms
- **Undermines the economic conditions of EETS providers** who are the only ones to ensure EU-wide interoperability
  - Their business model is generally derived from OBU-enabled subscriptions
  - Existing schemes only allow local companies to operate as toll declaration operators limiting foreign competition
- **Might require transnational trucks to keep an EETS device** for provision in neighbouring countries, therefore removing the cost advantage
- **Multiple devices result in different data formats, requiring higher effort to process the toll charge**
- **Higher risks of fraud / leakage exist**
  - Lower reading rate with ANPR than with DSRC, requiring costly manual post-processing
  - The quality of the number plate database may not be as good in all countries
  - Increases risks of temporary or permanent falsification of the number plates
  - Creates risks of voluntary or involuntary fraud caused by the FTSP (device, connectivity, cloud solutions not end-to-end specified)
- **Increases the risk of hacking into the system**, as FTSPs typically have less financial means to create secure systems

We expect actual truck emissions to be monitored in the future and potentially connected to RUC systems



- As envisaged in Germany, **HV tolls are increasingly likely to take into account actual pollution levels**
  - Most HV tolls already include the EURO emissions class
  - In the future, actual vehicle emissions could be measured thanks to specific devices, this to avoid fraudulent systems or dysfunctional engines / exhaust systems
  - FTSPs would be well placed to integrate those in their telematics solutions
- A newly revised Eurovignette directive could require actual vehicle emissions to be included in the calculation of the toll/tax

With the gradual take-off of embedded telematics systems, OEMs could play a greater role in fleet management

- OEMs are beginning to offer **embedded telematics standard with the purchase of a new HGV**
  - This will increase the penetration of telematics in the car park
  - Furthermore, it would allow OEMs to offer fleet managers the opportunities to use vehicle platforms to merge expense management platforms with fleet telematics service
- **This trend would be accelerated by a possible HGV eCall mandate in the EU**
  - As in the LV mandate, this would fasten the penetration of embedded black boxes in trucks

Finally, usage-based insurance (UBI) and road user charging (RUC) could also converge through aftermarket solutions

- **In the car market, certain toll service providers have launched insurance or UBI schemes**
  - Telepass in Italy
  - Via Verde in Portugal
- **Similarly certain telematics service providers** such as IMS and Azuga **are using the same devices for RUC as for fleet management and UBI**
  - In the US, OBD dongles have been very successful for UBI applications and increasingly in fleet management
  - In the last 2-3 years, they have also been used in multiple states' RUC pilots, leveraging their GNSS-cellular capabilities
- **As the European Commission recently confirmed the open access to the OBD port in the EU, we expect possible updates to force OEMs to ensure free access in driving conditions**
- **This could push towards a single aftermarket device for the 3 services**

Analysing non-OBU GNSS+DSRC solutions

To implement these 3 new ETC models, the industry needs to solve many problems

Smartphone tolling

- Recurring need for new handset certifications and potentially re-certifications
- Use of drivers' smartphones for fleet applications
- Need for functional and updated phone of an appropriate model and operating system
- Uniform map matching algorithms
- Suitability standards for several types of models
- Data protection risks
- Need for high quality European number plate database
- Need for ANPR enforcement infrastructure and post-processing activities

In-vehicle tolling

- Operational functionality for embedded solutions
- Standardisation of datasets for use across several toll domains for interoperability
- Penetration within the HGV park
- Systems and security hurdles
- Uniform map matching algorithms
- Interference concerns between the tachograph and tolling receivers
- Suitability standards for several types of models
- Need for high quality European number plate database
- Need for ANPR enforcement infrastructure and post-processing activities*

Fleet telematics tolling

- Standardisation of datasets for use across several toll domains for interoperability
- Uniform map matching algorithms
- Ability to cover liability for toll payment to the toll charger
- Issues related to systems and security of some models
- Need for high quality European number plate database
- Need for ANPR enforcement infrastructure and post-processing activities

Source: PTOLEMUS - Note: List not exhaustive; * In the case of the use of OEM embedded platforms

These 3 new tolling models share several hurdles

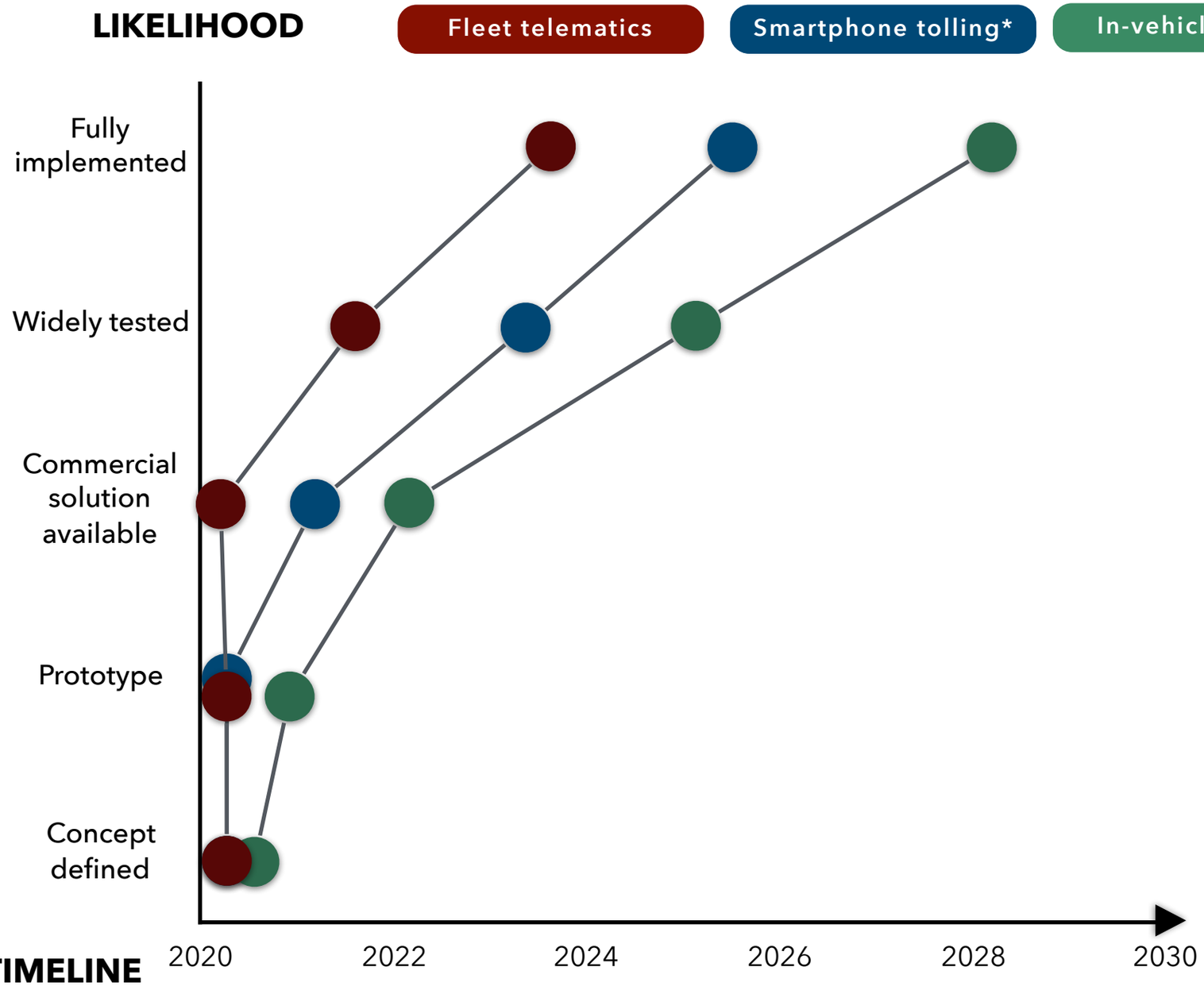
Key challenges to implement an interoperable RUC solution

	Smartphone tolling	In-vehicle tolling	Fleet telematics tolling
Privacy			
Data protection risks	■	■	■
Use of drivers' smartphones for fleet applications	■		
Security			
Systems and security hurdles	■	■	■
High potential for leakage	■		■
Cost			
High R&D costs	■	■	
Ability to cover liability for toll payment to the toll charger			■
Technical			
Re-certification requirements for product updates	■	■	■
Uniform map matching algorithms	■	■	■
Suitability standards for several types of models	■	■	■
Interference concerns between tachograph and tolling		■	
Standardisation of datasets for use across toll domains	■	■	■

Source: PTOLEMUS Note: List not exhaustive

Fleet telematics systems are the closest to represent a valid implementation solution for I&W

Timeline of impactful developments for interoperable systems



- We expect that smartphone solutions and in-vehicle solutions will be **not fully implemented as EETS-compatible solutions on the market for HGVs before 2025**
- Smart digital tachographs are not estimated to be in **100% of the HGV park until 2035;** other in-vehicle solutions could take longer due to vehicle churn rates
- Fleet telematic solutions capable of making toll payment are already present on the market and penetration is increasing
- **These timelines could be accelerated if toll chargers introduce them as national systems first** (in addition to EETS devices)
- This timeline also assumes that solutions are deployed as interoperable systems

Source: PTOLEMUS estimates - Note: * In the case of smartphone tolling, personal data protection and fleet/driver issues would still remain and would require EU-wide intervention to be solved

I&W should weight the pros and cons of each model

Summary advantages & inconveniences for I&W

New tolling models	Key advantages	Key inconveniences	Enforcement
Smartphone solutions	★ No device costs for the toll charger (provided employees agree to use their personal phones) ★ Ease of delivering the solution (app download)	✳ Privacy and security concerns ✳ Certification concerns regarding models and operating systems ✳ Harmonised distance measurement challenges ✳ Potentially negative impact on EETS providers' economics ✳ Requires ANPR system Capex and recurring Opex	ANPR
In-vehicle solutions	★ No device costs for the toll charger or fleet ★ Tachograph mandated by 2035 ★ High level of penetration ★ Ease for drivers ★ Integration of HV charge with other vehicle payments (fuel, tolls, parking, etc.)	✳ Privacy and security concerns ✳ Not currently operable for tolling ✳ Potentially negative impact on EETS providers' economics ✳ Harmonised distance measurement challenges ✳ Requires ANPR system Capex and recurring Opex (except for a tachograph solution)	ANPR (embedded payment platforms) DSRC (tachograph)
Fleet telematics solutions	★ No device costs for the toll charger ★ Increasing penetration in fleets ★ Ease of implementation for drivers and fleet managers ★ Integration of HV charge in existing fleet management dashboard	✳ Privacy and security concerns ✳ Fragmented market ✳ Potential for leakage ✳ Potentially negative impact on EETS providers' economics ✳ Harmonised distance measurement challenges ✳ Requires ANPR system Capex and recurring Opex	ANPR

Source: PTOLEMUS

The 3 new delivery models are valid ETC technologies but need to be adapted to the EU interoperability context

- It is important to note that these conclusions are the **result of PTOLEMUS' existing market knowledge and high level work, without consultation of the different stakeholders involved**
- Therefore they should be considered as **preliminary findings**, which could be later validated with market stakeholders
- **The 3 new ETC delivery models considered can all be seen as valid options for ETC** as
  - They provide accurate enough GNSS positioning
  - They are natively connected
  - Smartphone and embedded solutions will have high penetration rates
  - In-vehicle solutions in particular with have high penetration with the introduction of autonomous vehicles
  - Enforcement can be delivered through ANPR, which is now authorised by the revised EETS directive
- **They have significant merits for the fleets:**
  - They integrate tolling with other payments and fleet services
  - They can potentially further reduce / eliminate device costs
  - Thus they could accelerate the take-off of ETC in fleets
- However **none of them has been deployed as an interoperable solution in Europe so far**
  - They do not offer uniform distance measurement solutions due to heterogeneous map matching algorithms
  - They have not been certified by any third party road operator* so far in Europe
  - They can be deployed in multiple ways, which could create fragmentation risks and go against the interoperability objectives
- **Smartphone tolling for HVs raises a number of specific issues**:
  - The protection of personal and tax data from third parties
  - The use of the drivers' personal phones for a company application
  - Recurring certification activities to allow new phone models
- **We believe that they require an in-depth impact assessment to identify how to make them aligned with EETS interoperability processes:**
  - How to adapt the certification process?
  - How to align distance measurement methods with existing OBUs?
  - How to solve other issues (privacy, security, etc.)?

Source: PTOLEMUS - Note: * I.e. a road operator that does not control the solution itself

An hybrid option could be possible using fleet telematics systems in addition to traditional OBUs

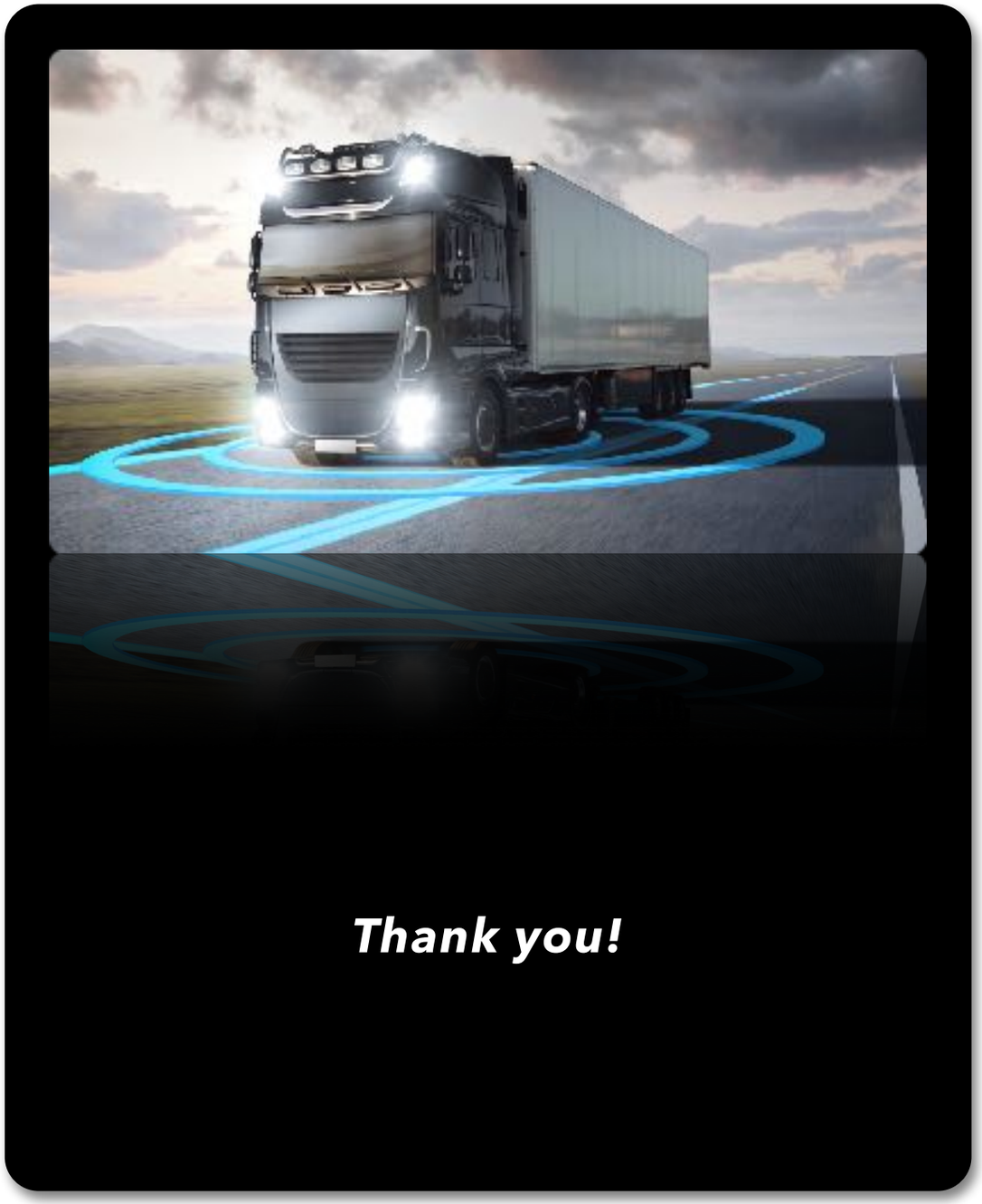
- None of these has been developed as an EETS-compatible solution
- **Thus they could be launched by the MSP for Dutch trucks that do not have international traveling patterns**
  - **The fleet telematics option appears as the most mature and adapted to the HV market**
  - This system should then be launched in addition to the currently envisaged architecture
  - A specific cost benefit analysis (CBA) as well as a feasibility analysis should be made to confirm this
- However such a system would not apply to foreign HGVs or Dutch fleets involved in international transport which would require the currently planned EETS-compatible solution
- **Otherwise, integrating these new models would require a full re-design of the Dutch HV system** to accommodate them (or one of them)
- EETS does not prevent the implementation of these new technologies, but the method of implementation could potentially create complications for providers and I&W
  - We believe that each of these technologies will present opportunities for a hybrid solution
- **The cost-benefit analysis would also need to investigate 2 key aspects:**
  - The side-effects of such a decision on the economics of the EETS provider business
  - The certification process to ensure that all fleets pay the same charges, whichever the device used

We suggest I&W to focus on the launch of the currently envisaged system while preparing for the future

- **I&W has already invested several years in the design of the currently planned HV charging system, which has in our view matured into an open, state-of-the-art architecture**
- **We believe that the scheme should not be delayed in anticipation of new technologies**
  - Deploying a new RUC scheme is a balancing act…
  - … that must be designed & implemented step-by-step to succeed
- The legal designation of the scheme as a tax (vs. a toll) puts additional pressure on the Dutch government to have a robust system
  - A tax system might be more difficult to change and thus must be entirely reliable from the start
- **However, I&W should not propose in the law anything that would prevent the implementation of these new models in the future:**
  - The law should be technology-agnostic and rely primarily on functional specifications
  - In accordance with the revised EETS directive
- **To make the MSP contract future-proof**, we suggest:
  - **Selecting a maximum 10-year duration** vs. 20 years or more so that a new contract can be drafted for the following 10-year period to include new technologies as they become ready
  - **Adding a clause related to the experimentation of new technologies**
- **Indeed the implementation of new solutions will be facilitated if the MSP plays a coordinating role** in its initial design and the scheme relies mainly on EETS providers
  - This will allow the implementation of new technologies to align from an account management perspective to the EETS model
  - Toll charger remuneration rates to EETS providers should remain technology-agnostic*
- EETS providers should also be allowed to utilise the new technologies to create a competitive balance
- **We also recommend I&W to launch further evaluations of the implementation of a fleet telematics solution for Dutch fleets but without delaying the overall process**

Source: PTOLEMUS - Note: * I.e. the rates should be the same, whichever the technology used

We recommend I&W to create 2 separate tracks



- **The main - delivery - track should focus on the deployment of the currently envisaged system**
  - **Not delaying the launch of a mature, EETS-compatible scheme**
  - Preparing the future in the MSP contract
- **A second - evaluation - track could investigate the possibility of new models**
  - A fleet telematics concept for Dutch HV fleets* could be further analysed and designed as an experimental system in parallel to the main one
  - The investigation of smartphone and in-vehicle solutions should be considered as a medium term task

Note: * Only for trucks that travel only inside the Netherlands

PTOLEMUS Consulting Group

Strategies for Mobile Companies

contact@ptolemus.com

www.ptolemus.com

@PTOLEMUS

For further questions or clarifications, please contact:

Frederic Bruneteau
Managing Director
fbruneteau@ptolemus.com
+32 487 96 19 02

Marissa Burkett
Consultant
mburkett@ptolemus.com
+33 6 63 37 45 51