

Solutions

Toll & Road Pricing

Improve efficiency and reduce costs



ELECTRONIC
TOLL COLLECTION

 SKYTOLL

Toll & Road Pricing

Toll & road pricing is the practice of charging drivers a fee for using specific roads or highways. This fee is intended to cover the costs of road maintenance, construction, and other infrastructure-related expenses. Toll & road pricing can take various forms and is often implemented to manage traffic congestion, raise funds for transportation projects, and encourage more efficient use of road networks. The goal is to create a more sustainable and effective transportation system while also generating revenue to support ongoing infrastructure needs.

SCAN ME

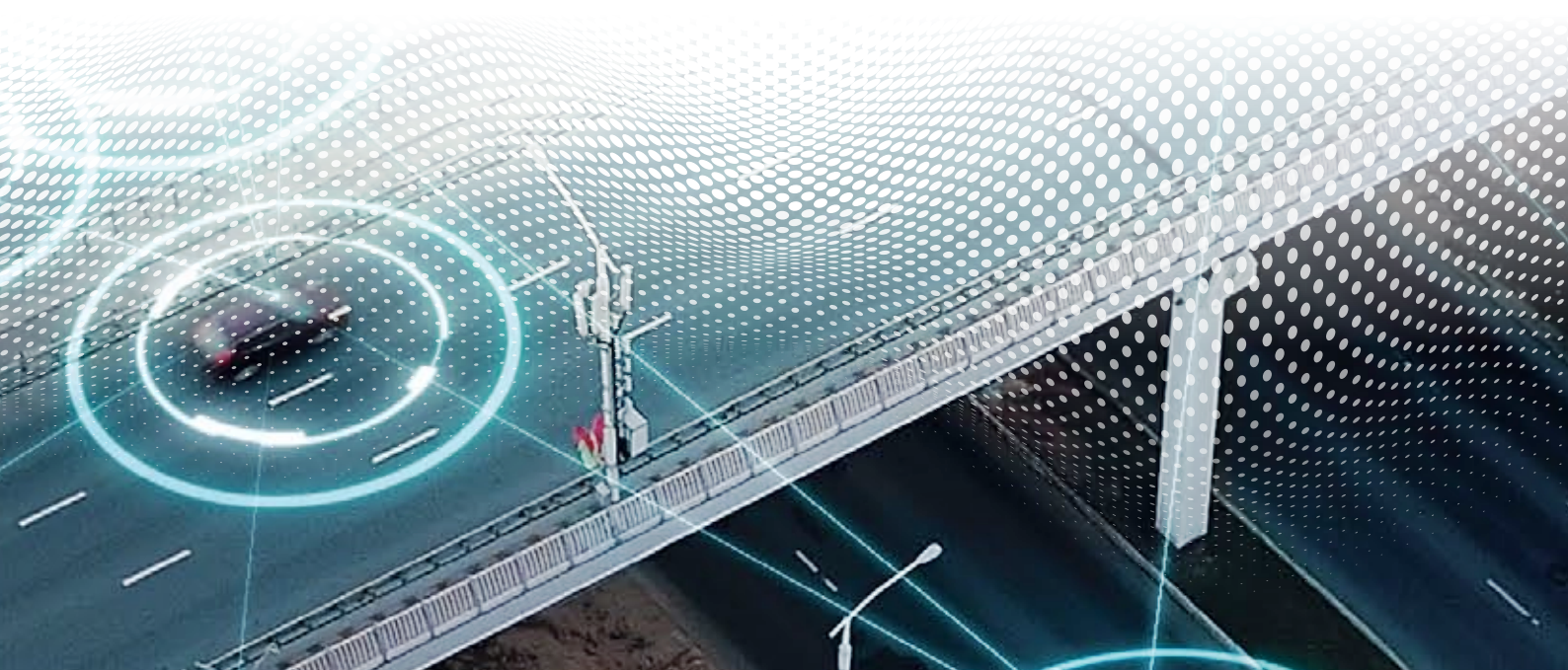


More information:
qrfy.com/p/2023_trc_p2

Solution:

Electronic Toll Collection

Electronic Toll Collection automates the process of collecting tolls on roads and bridges, allowing vehicles to use the transport infrastructure seamlessly, reducing congestion, and improving traffic flow.



Solution

Electronic Toll Collection

Electronic Toll Collection (ETC) is a smart solution for the collection of usage-based fees applicable for the usage of various kinds of transportation infrastructure by all kinds of vehicles. ETC solutions need to be tailored for the specific requirements of the environment in which they are implemented, but they always have to be robust and reliable.



Electronic Toll Collection, often referred to as Electronic Road Pricing (ERP), is a solution for automated toll collection on roads, bridges, and tunnels. It allows to collect the toll without the need to stop the vehicle, slow down or use a specific lane. The Multi Lane Free Flow (MLFF) allows drivers to use the tolled infrastructure seamlessly and efficiently. ETC solutions can utilize various technologies such as global navigation satellite systems (GNSS), automatic number plate recognition (ANPR), microwave (DSRC) or radio (RFID) communication, and their combinations to identify vehicles and deduct the toll by the payment method chosen by the road user.

The successful implementation of ETC requires careful planning, public consultation, and collaboration between government authorities, transportation agencies, and stakeholders. When designed and executed effectively, ETC can be a valuable tool for creating more efficient, sustainable, and liveable environments.

Main advantages

- **Congestion reduction**

ETC can help alleviate traffic congestion as it functions in a multi-lane free-flow system and allows for adjustment of toll rates for busy areas and peak hours

- **Funding for infrastructure**

Road charging through ETC generates revenue that can be earmarked for improving and maintaining transportation infrastructure

- **Traffic management**

ETC solutions can provide valuable data on traffic volumes and patterns, allowing transportation authorities to make data-driven decisions to manage and optimize traffic, even in real-time

- **Promotion of sustainable transportation**

ETC can incentivize the use of greener transportation options like electric vehicles, public

transportation, or bicycles, as these options may be exempted from being charged or to be charged with lower rates

- **Equity and social benefits**

ETC can be designed with equity in mind, providing discounts or exemptions for low-income individuals or residents in specific areas to ensure fair access to transportation options

- **Customization and flexibility**

ETC systems can be easily adjusted to respond to changing traffic conditions, road maintenance, or special events, offering flexibility in management of road charging schemes

- **Future-proofing**

As technology advances, ETC systems can adapt to incorporate emerging technologies, paving the way for more sophisticated road charging mechanisms

Key benefits for road users

- **Seamless travel experience**

ETC enables non-stop tolling, allowing road users to travel without stopping, reducing travel time, and eliminating the need to wait in toll queues

- **Faster commutes**

With ETC, road users can experience quicker and smoother commutes, as toll transactions are processed electronically and efficiently, leading to reduced congestion at toll plazas

- **Fuel savings**

Without the need to stop at toll booths, road users save fuel, resulting in cost savings and reduced environmental impact

- **Convenient payment**

ETC eliminates the need for cash payments or searching for loose change at toll booths. Users can prepay their toll fees or have their toll amounts deducted electronically, providing a hassle-free payment process

- **No toll booth interaction**

Road users do not need to interact with toll booth operators, reducing

the risk of errors in toll collection and contributing to a contactless payment experience

- **Interoperability**

ETC systems can be interoperable, allowing a single transponder or user account to be used across multiple toll roads and facilities, making it more convenient for travellers who frequently use different tolled roads

- **Improved safety**

ETC contributes to enhanced safety on the roads by reducing potential traffic jams and congestion, which can lead to a decrease in accidents in these areas



Leveraging our experience and expertise in the toll industry, we have created products that utilize all different types of platforms and technologies used in ETC and can be customized according to the specific needs of our customers.

Platforms

- Satellite based electronic toll collection system (GNSS)
- Video based electronic toll collection system (ANPR)
- DSRC based electronic toll collection system
- RFID based electronic toll collection system
- Time and distance-based ticketing (eTicket)
- Combination of technologies tailored for the specific implementation (Hybrid)

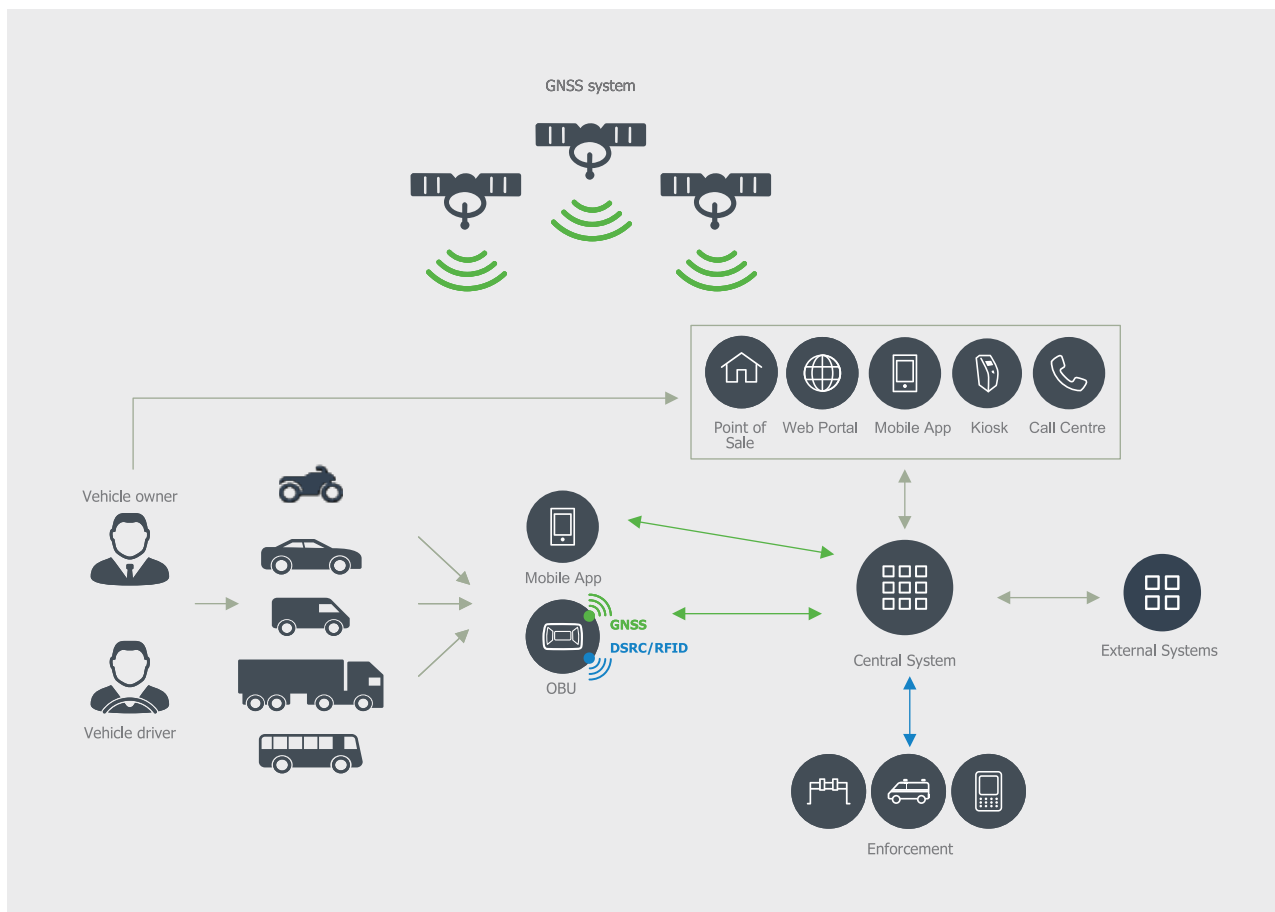


For each of our customers, we always create a unique personalized solution, taking into account the requirements, conditions, resources, and environment in which it is implemented. A particular solution may be a combination of several technologies, for example, the use of GNSS for trucks and ANPR for passenger vehicles, or even a combination of ETC and conventional tolling systems using toll booths. We are constantly innovating our products to keep them state-of-the-art, and we are using new technologies like Artificial Intelligence to make them more effective and efficient.

Platform

Satellite Based Electronic Toll Collection (GNSS)

The application of the satellite technology allows the toll collection during free flow of traffic in multiple lanes with no need to change the speed or the direction of driving vehicle. GNSS Tolling provides flexibility in implementing new system extensions, allowing the system to keep up with changing requirements without the burden of building a time and cost-demanding infrastructure.



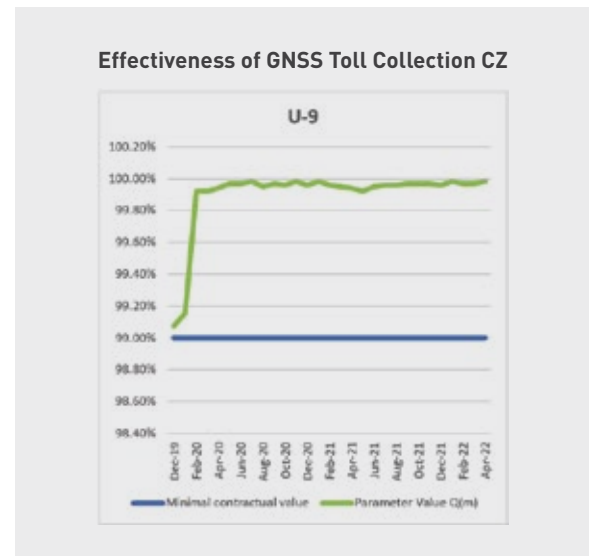
More information:
qrfy.com/p/2023_trc_p8

GNSS tolling, or Global Navigation Satellite System tolling, is a technology that utilizes satellite positioning to collect tolls from vehicles based on their geographic location. It enables precise and automated toll collection by accurately determining a vehicle's position and calculating toll charges accordingly.

The satellite-based technological solution does not require building toll gantries or toll plazas, which significantly reduces resources such as costs and time associated with building roadside objects or infrastructure of a non-satellite-based tolling system.

Furthermore, using a satellite-based tolling system provides a unique flexibility in changing the range of a toll road network, which helps to make changes in the toll road network quickly with no need for an additional cost-demanding and time-consuming road-side technology. Utilization of the satellite-based tolling is efficient in countries where development of new toll roads is planned.

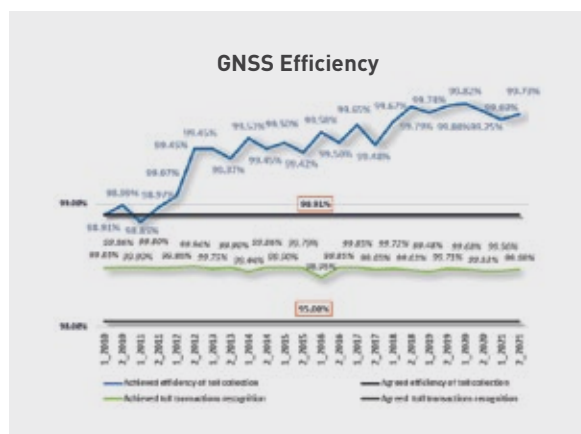
GNSS tolling is based on the cutting-edge, reliable and future-oriented technologies.



Key benefits

- **Efficient toll collection**
- **Non-discriminatory and quick access** for road users to meet the terms and conditions for usage of the toll road network
- **Permanent, error-free and continuous operation** of tolling infrastructure and systems resulting in increased comfort for users of the toll road network
- **Low investment and operating costs**
- **Cost and time-efficient** implementation of legislative changes related to toll roads
- **Efficient provision** of revenue from toll collection

Moreover, following the effective integration of the satellite-based tolling solution, additional advantages can be unlocked through a range of value-added services leveraging vehicle position data. This paves the way for numerous novel business prospects, including options like real-time traffic updates, automatic emergency notifications, and usage-based car insurance. GNSS tolling allows to flexibly define toll rates based on several parameters and combinations thereof.



Parameters for flexible toll

- Road type (highway, motorway, lower road classes)
- Vehicle category (the combination of vehicle type and vehicle weight)
- Vehicle emission class (such as EURO emission classes)
- Number of axles
- CO2 emissions
- Noise level (e.g. for night and day)
- Season, month, day of the week, hours during a day
- Current traffic intensity
- Current traffic speed

Utilizing GNSS for collection of data regarding the usage of the toll road network implies that every vehicle, which is liable to pay toll, is obliged to be equipped with an On-Board Unit (OBU) or mobile app before entering the toll road network. The installation of OBU is simple, allowing it to be performed by vehicle drivers.

From the technical point of view the GNSS tolling is a technological complex consisting of several information subsystems and specific applications that ensure all operational processes of toll collection and allow easy integration with external systems. The solution can be easily adapted to the national legislation concerning toll collection.

Components

- **Central Information System**

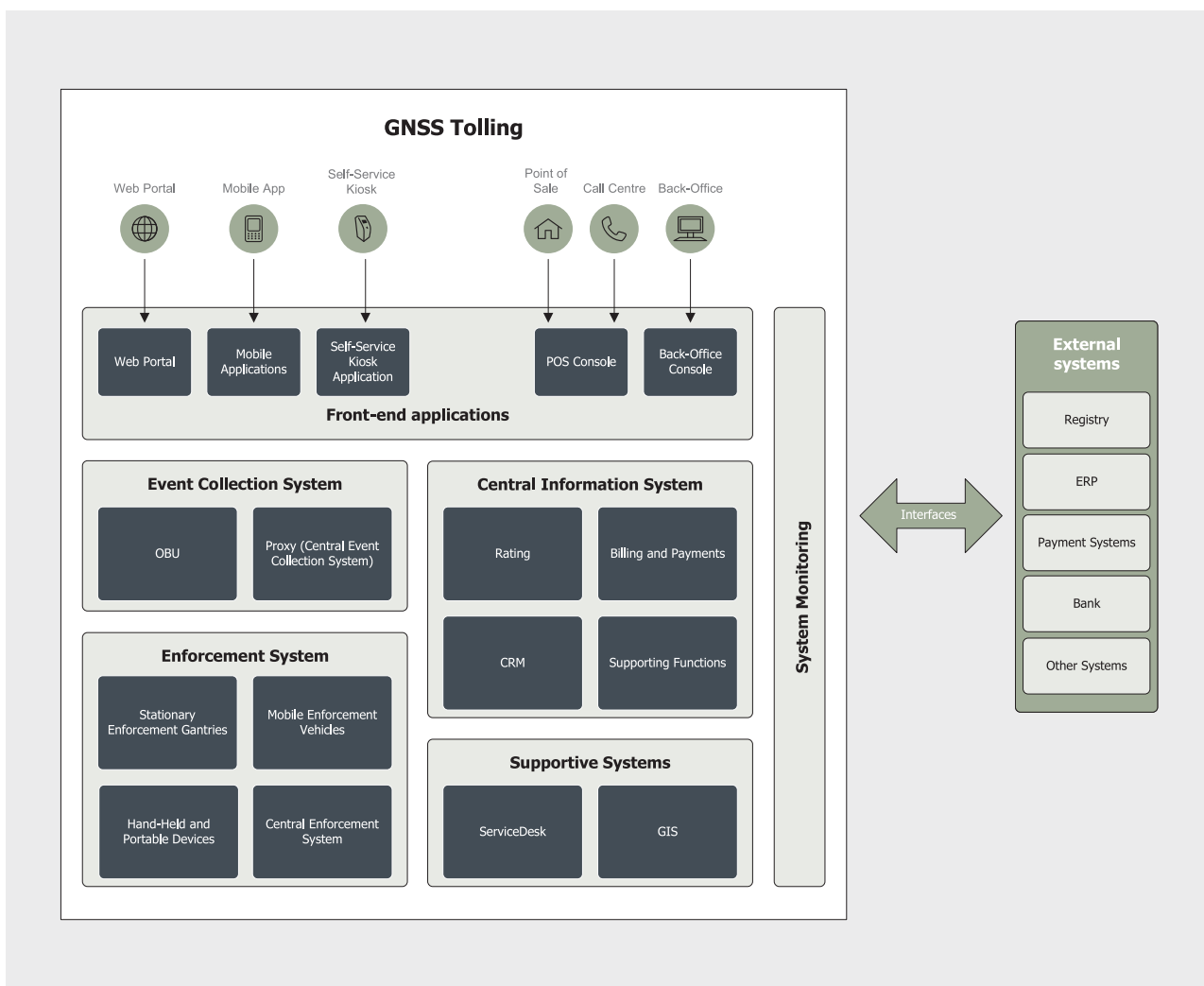
A complex IS supporting all business activities of a company involved in electronic toll collection (customer care, billing, payments processing, etc.)

- **Event Collection System**

System made up of OBU (OBU device or mobile app) and Proxy takes care of collection of information about usage of toll roads and delivery of the information to CIS

- **Enforcement System**

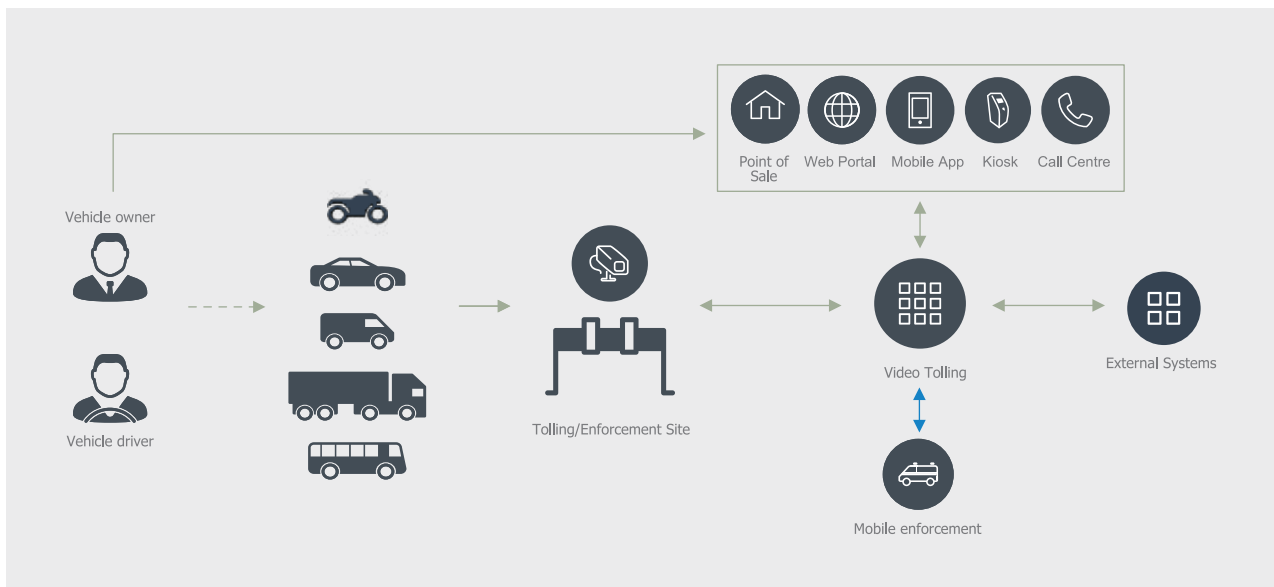
Carry out verification of the compliance with obligations given to vehicle owners and drivers in the context of electronic monitoring and identify non-compliance



Platform

Video Based Electronic Toll Collection (ANPR)

A great advantage of our Video Tolling System lies in the fact that no burden is put on the vehicle owners. The Video Tolling System does not require any vignettes, electronic tags, or on-board units to be installed in the vehicle, removing the need for complex logistical operations and the high financial costs they usually entail.



Our Video-based Electronic Toll Collection System is a flexible, state-of-the-art solution for free flow toll collection using video technology. It relies on cameras and computer and AI algorithms to identify and record vehicles passing through designated tolling points. Video Tolling System offers several benefits over traditional tolling methods.



More information:
qrfy.com/p/2023_trc_p12

Key benefits

- **Elimination of the need for physical toll booths** resulting in reduced congestion and improved traffic flow
- **Increased accuracy and efficiency in toll collection**, minimizing errors and the need for manual intervention
- **Convenience for drivers** by enabling seamless, contactless payments and reducing the need for stopping or slowing down at toll plazas

Our Video Tolling System is able to process large amounts of data at a time. The number-plate-reading ANPR technology is capable of reliably functioning with all models of vehicles, ranging from motorbikes to heavy goods vehicles. This makes it a suitable solution for a wide range of environments, including busy urban freeways, country-spanning highways, high-density expressways and car parks.

The cameras are equipped with advanced optical character recognition (OCR) technology that can read license plates and extract relevant vehicle information. The Video Tolling System can be customized for each

of the toll modes in regard to the manner of collecting toll data. It is also possible to implement a combination of those modes together.

Modes

- **Open Mode**

Is used in the case of charging for an entrance of a vehicle into the toll section. This mode has a wide range of applications, spanning from toll bridges and tunnels to isolated objects, such as rest areas. Financially effective, Open Mode is fit for use on long-spanning roads such as highways and expressways. Its use requires only a singular gantry at every entrance of the toll section.

- **Closed Mode**

The entry to and exit from the tolled area are recorded and the toll is calculated based on the length of the toll road the vehicle has passed between those two points. Closed mode can be used for charging for passages through cities or closed areas, where it is possible to reliably monitor all entry and exit points, such as paid parking lots. Due to the nature of this mode, it is also possible to reliably detect the amount of time the vehicle has spent in the area and then link the data to the relevant toll event.

Once the vehicle is identified, the central system calculates the appropriate toll fee based on factors such as distance travelled, vehicle category, and any applicable discounts or fees. The system allows for a full customization of the way vehicle passage data are rated, being able to be custom-tailored to the needs of the toll operator. Apart from calculating toll based solely on the collected vehicle information, toll operator can opt in to apply additional factors. These range from the current season all the way to a particular hour of the day or the type of the road. Toll operator can use these settings to influence flow of traffic within an area, as drivers might want to avoid higher tolls, lowering congestion even further.

Toll charges calculated based on gathered data can be paid by several payment methods and payment regimes. The main supported regimes are the Post-Pay Mode and Pre-Pay, differing mainly in the way and frequency of requiring payments for tolls.

In addition to the flexibility of the system, many different sales and communication channels can be involved. Popular options include smartphone applications, kiosks, or online self-care portals. Points of sale and call centres where vehicle

owners can personally interface can be also utilized. This makes the system accessible to all kinds of vehicle owners, who wish to stay informed about their toll transactions.

The check of compliance with toll obligations is executed by the enforcement part of the central system based on data about the real usage of the tolled roads captured by cameras and mobile enforcement vehicles.

The architecture of the Video Tolling System also allows for monitoring of traffic density or, from a long-term perspective, calculation of traffic trends once enough data has been collected. This data can be utilized for evaluating traffic trends and creating accurate predictions for future traffic development. These predictions can assist in future infrastructure development and with implementation of future changes in toll rates, allowing the entire toll system to evolve solely within itself without the need for additional external software.

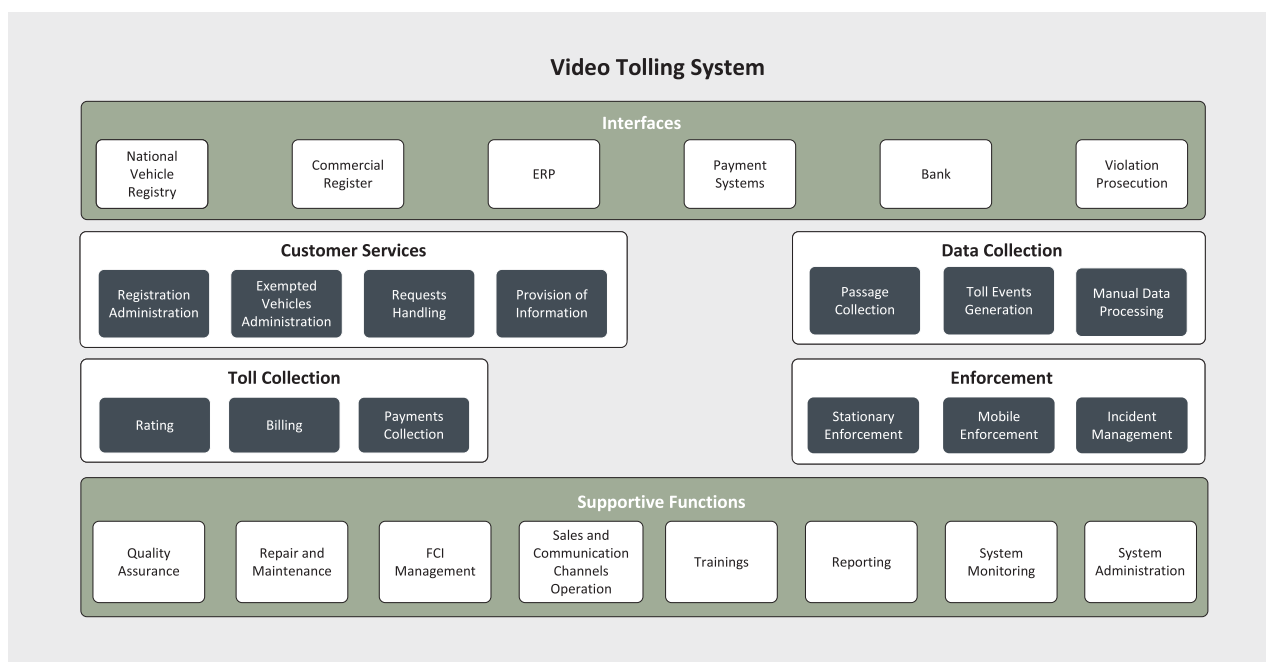
The Video Tolling System can operate through a datacentre or on a cloud, which is effective and flexible, providing a solution with an almost unlimited computing power and data storage.

Despite the versatility and wide scope of possible applications, the system remains accessible to toll operators as well as commuters and travellers. Although it is complex and sophisticated, the deployment and operation of this Video Tolling System can be carried out in an inexpensive manner without any cost to accuracy or reliability.

Overall, Video Tolling Systems streamlines the toll collection process, improving traffic management and enhancing the overall driving experience for commuters and travellers alike.

Components

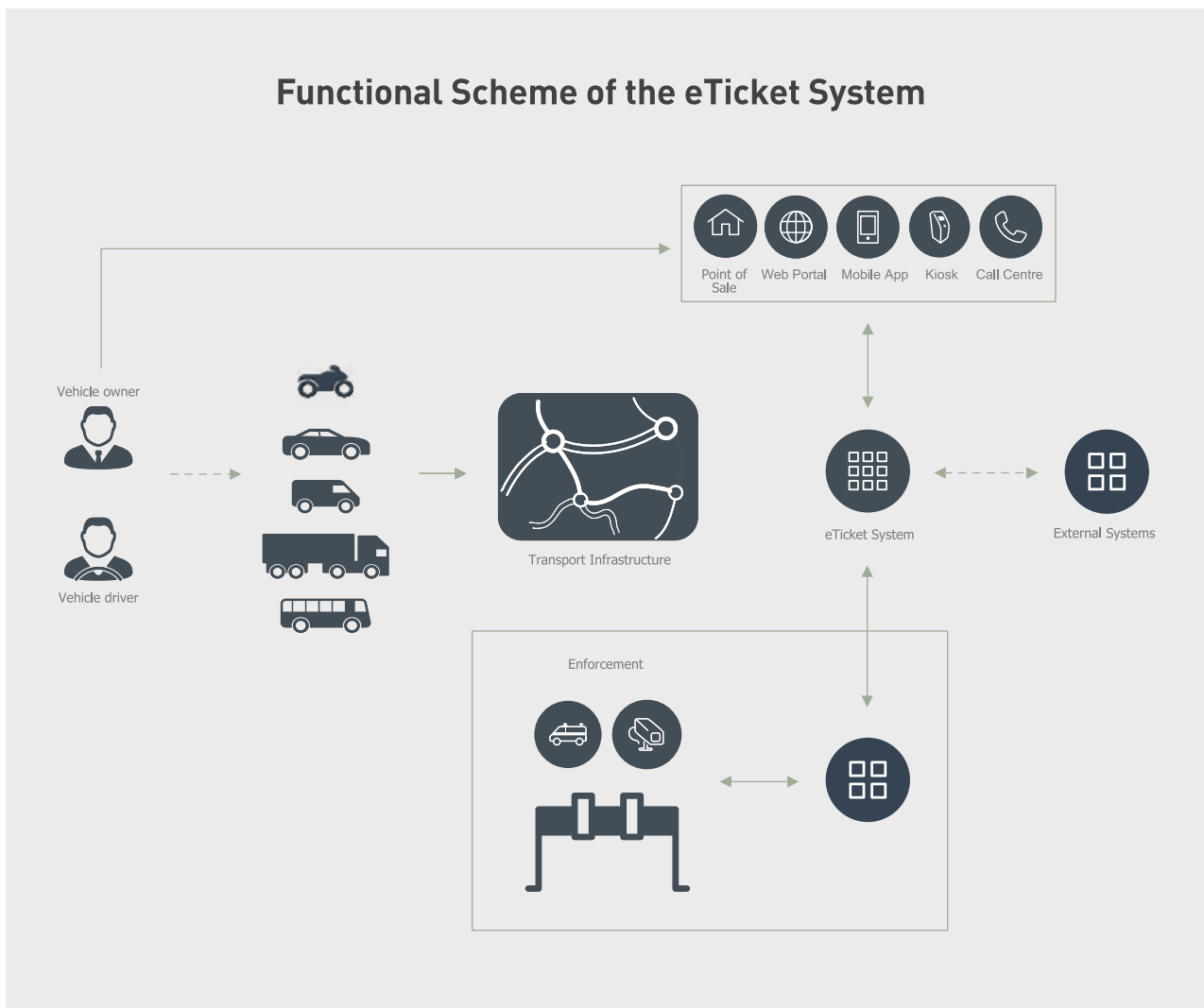
- Strategically placed **stationary gantries** that hoist cameras, capturing images and/or videos of vehicles as they enter and exit tolling zones
- **Central system** processing the data from cameras, matching them with the vehicles registered in the system, calculating and collecting the toll fees as well as evaluating the toll violations
- Sales and communication channels for providing customer services
- **Mobile enforcement vehicles** evaluating toll violations the toll area



Platform

eTicket System

eTicket is a free flow system for electronic toll collection, enabling charging for the use of transport infrastructure on the principle of time or route, as well as their combination for all categories of vehicles without the need to stop or slow down a vehicle.



More information:
qrfy.com/p/2023_trc_p16

eTicket is used to charge toll fees for the use of transport infrastructure without the need to equip the charged vehicle with an additional device or tag. This removes the financial burden from both the customer and the service provider, making the system more affordable. Paired with its flexibility, eTicket can be a seamless option for long-distance travel as well as short local routes thanks to its architecture being designed to process large amounts of data.

Suitable for different kinds of transport infrastructure:

- Roads
- Parking lots
- Bridges
- Tunnels

The price list for the eTicket service is always configurable at the road operator's behest. eTicket enables to charge for transport infrastructure on the basis of time or route, a combination of the two.

eTicket excels at charging for the use of motorways and expressway, where it can become the substitute for the popular "motorway vignettes" seen across many countries.

In such a case, the implementation of our eTicket system replaces the motorway vignette sticker with an electronic customer account. In addition of comfort for road users in the form of not "scraping" old vignettes from the window to replace them, it provides additional benefits for road operators.

Main benefits



- **Cost savings** for the procurement and logistics of vignettes stickers
- **Low initial investment** and operating costs
- **Immediate availability** (never out of stock)
- **Flexible possibilities for change**
- **Better enforcement capabilities** and efficiency

Buying an eTicket is very simple, clear and understandable for the customer. The customer can make a purchase through various sales and communication channels.

eTicket types

- **Time eTicket**

(on the principle of time) eTicket authorises the vehicle to use the relevant transport infrastructure for the period of the eTicket's validity. Alongside providing the vehicle license plate number, the customer must also provide the vehicle category of their vehicle and the start of the validity of the eTicket.

- **Kilometre eTicket**

(on the principle of a route) eTicket authorizes the vehicle to travel on the route specified on the eTicket. Routes can be precisely defined in advance or can be determined by the customer during the purchase of the eTicket. The customer determines the route by entering its start and end point and can additionally specify the route by entering several waypoints. In addition to the vehicle parameters, the price of the eTicket in this case also depends on the length of the route.

Sales and communication channels

- **Web portal**
- **Mobile app**
- **Point of Sale**
- **Self-service kiosk**
- **Call centre**

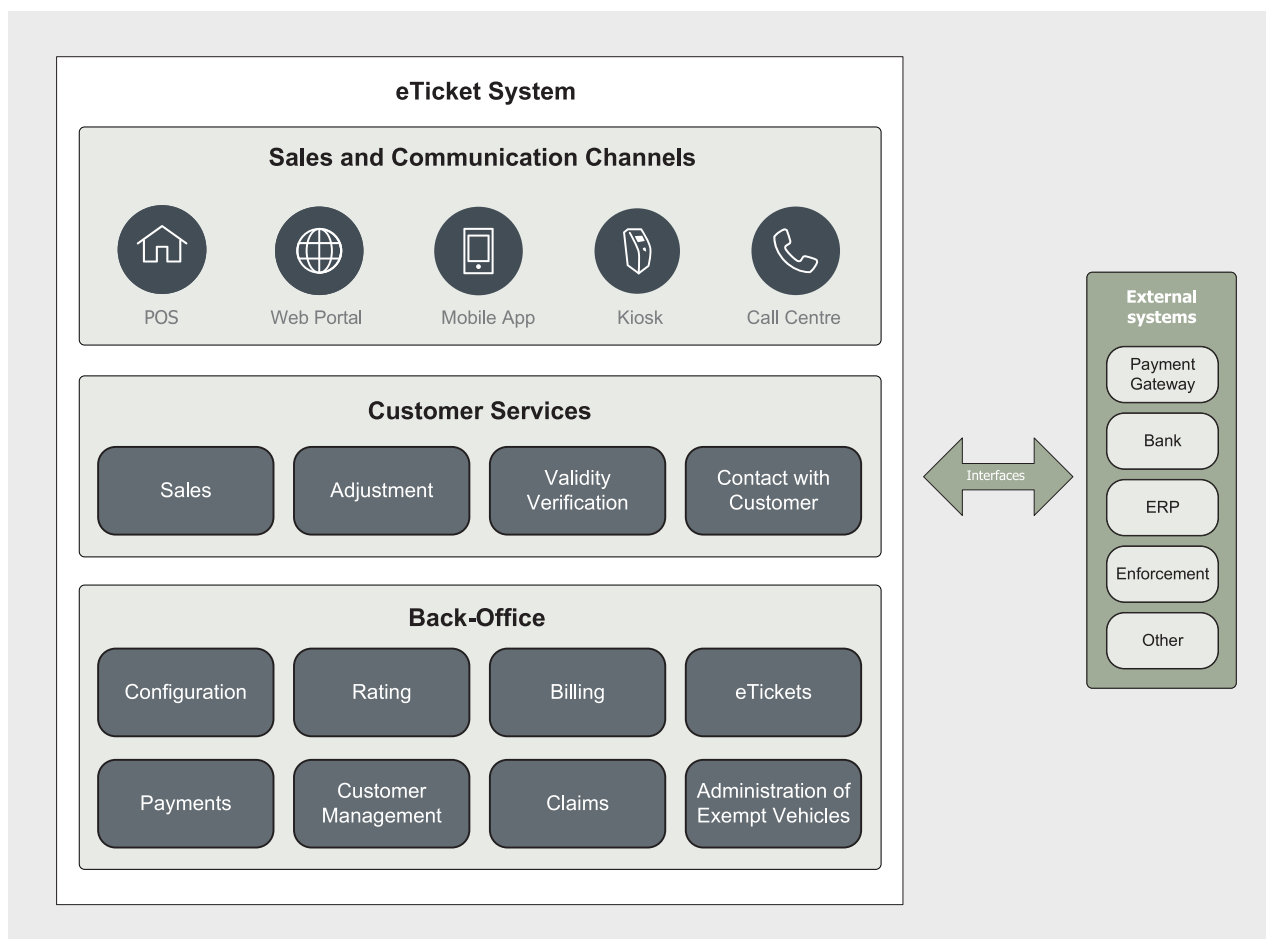
To maintain and develop the relationship with the road users, the eTicket system offers several offline and online services, where the road users can submit claims and inquiries. Customer services cover the key functionalities of the eTicket system designed for uninterrupted customer service performed through the same sales and communication channels as during the eTicket purchase.



When designing the eTicket system, we put the main focus on convenience. Should there be any reason to change data in the system, whether due to an incorrect input or the information changing, the road user can conveniently change those data through the web portal and call center, or they can visit one of the points of sale. To increase the comfort of customer services and service capacity, the self-service kiosk can be utilized.

Key domains

- Sales and communication channels
- Customer services
- Back-office



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