



#### ZONE (limited entry area + reserved parking area)

Vehicles are registered in the system using an ANPR camera with OCR (date, time).



#### Method of payment

with LPN registration – parking meter



#### Barrier system

with LPN recognition (license plate number) using an ANPR camera

#### CENTRAL SYSTEM



All data is processed and evaluated using the Central System



#### CALL CENTER

Customer service center 24/7



#### MEV – mobile enforcement

using an ANPR camera with OCR



#### POLICE

City Council Office

## TECHNICAL SOLUTION

### Central System

The basis for the solutions described in this document is a central information system keeping a database of registered vehicles, database of parking-fee payments, database of virtual parking permits and others.

The most important functions of the central systems are:

- Vehicle registration at municipal administration counters, a web portal and other contact points,
- An electronic process for issuing of virtual parking permits,
- Parking-fee calculation depending on place, time, vehicle category, parking duration and others,
- Collection and registration of payments,
- Checking of vehicles entering restricted entry zones,
- Support for automatic and manual parking enforcement,
- Support for offence penalisation procedures at municipal police and municipal administration.

A central system further provides information services where drivers can obtain information about municipal parking rules or check their parking-fee payments.

Other important parts of a central system are also a control centre, responsible for system supervision, supplementary vehicle registration and decision making about ambiguous incidents detected at automatic parking enforcement, and a back-office responsible for system management and work with clients.

Data collected by a central system can be processed statistically and thus the municipal authorities can acquire data for traffic planning and parking zone development.

### Payment Channels

There are available several options for entry-fee and parking-fee payment:

- Parking pay stations.
- Smartphone applications,
- Web page for drivers,
- Web page for proxies (e.g. hotels or restaurants),
- SMS payments (as provided by mobile operators and/or mobile payment aggregators).

Electronic (cashless) payment is then available by bank/credit card or city card; parking pay stations may additionally also accept cash. As an option, our solution allows the creation of personal prepaid parking accounts linked with a smartphone application that can be used for parking-fee or entry-fee payment or for saving unspent parking fees in case of earlier departures from parking zone.

In general, the solution does not work with traditional parking tickets; the driver obtains only a receipt for the paid parking fee – either as a paper slip (at parking pay stations only) or as an electronic document to registered e-mail address.

To reduce administrative work related to penalisation of offences, our solution offers a favourable option – late payments can be accepted either without any penalty (for example, when the delay is less than 12 hours) or with a reduced penalty (for example, when the delay is less than 3 days).

### ANPR Camera System

An ANPR camera system is used for the registration of vehicles entering or leaving an area where parking and/or entry regulation rules are applied. ANPR cameras in our solution can also be configured to support the registration of motorcycles. No special poles or gantries need to be built to support camera installation. The cameras can be attached to existing objects such as street light poles. The architectural character of the city is then not disturbed.

### Parking Enforcement

Three mutually complementary options are available for parking enforcement:

- Personal cars equipped by ANPR cameras as mobile enforcement vehicles,
- Mobile enforcement motorcycles with ANPR cameras capable of passing jammed streets in daily traffic,
- Hand terminals for municipal police officers or traffic wardens (smart phones, PDA).

Detected incidents are processed automatically at the central system (with all possible options mentioned above) and confirmed offences are passed to municipal police or municipal administration for standard administrative procedure.

## CONCLUSION

Our solution briefly introduced in this document constitutes an interesting option for resolution of traffic-related and parking-related problems in a single project. Proposed solutions enable efficient collection of fees for entry and parking and thus guarantee new revenue sources for the municipal budget, which can be utilised for parking zone development financing.

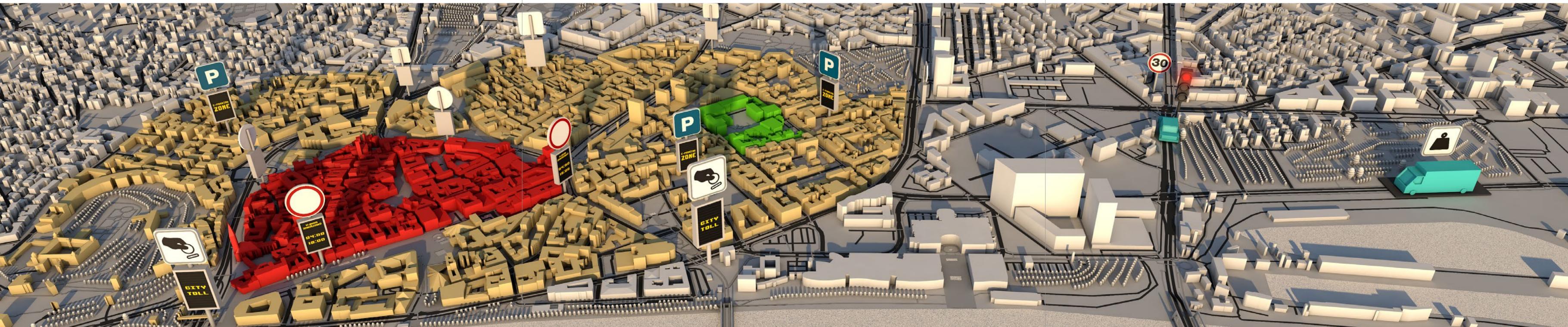
Last but not least, together with our solution we are ready to provide municipal authorities with elaborate consulting during the analysis of the present state of affairs, specification of desired target state, and formulation of strategy to achieve set objectives. The overall solution could also be offered as a service delivery, where we would take responsibility for financing, build-up and operation, if there was interest at municipal authorities' side.



# COMPLEX PARKING SOLUTION



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RESTRICTED-ENTRY AREAS



PARKING ZONES



CITY TOLL



RED LIGHT ENFORCEMENT AND SPEED CONTROL



WEIGHT IN MOTION

Today's cities can be characterised as living organisms struggling to cope with road traffic that's continuously getting heavier, traffic jams that seldom abate, and, in an ever-increasing problem, roads that cannot be driven on because they are obstructed by parked cars. Cars are ubiquitous and they park not only at obvious places but also at places where they cause most trouble – in the historic centres of cities.

These centres, however, cannot only be characterised as marvellous places attracting crowds of visitors but also as places that originated in past times when nobody could even think about the tremendous rise in road traffic we have been experiencing in the last century. Municipal authorities are trying to handle the situation by employing various measures in pursuit of the reduction of greenhouse gas emissions and particulate matter pollution, the reduction of noise pollution and the creation of green spaces without cars as relaxation places of residents as well as visitors.

We at the SkyToll, a.s. company have focused on one particular phenomenon of today's cities – roads overflowing with cars – driving and parked. Our approach offers a solution in two areas – city centre entry control and complex control of city parking. Both of these areas can be

managed by one information system and everything can be implemented with one project following rules set by municipal authorities.

#### SUPPORTED MEASURES

Basic measures for improvement of the organisation of transport and parking, which would be supported by our solution, are:

- RESTRICTED-ENTRY AREAS,
- CITY TOLL (paid-entry zones),
- PARKING ZONES (paid-parking zones).

Individual measures can be combined or overlap and so, for example, a restricted-entry area can be found within a large parking zone.

#### Restricted-Entry Areas

Restricted-entry areas are usually delineated in historic city centres or in tourist areas, like sea or mountain resorts, in order to radically limit road traffic in these areas. Only eligible vehicles are allowed to enter these areas. The vehicles shall either be registered in advance or afterwards by municipal administration or entrusted proxies, like hotels, restaurants or municipal utility services administration. Blue-light vehicles (i.e. police, ambulance or fire brigade vehicles) are exempted from the entry restrictions. Vehicles entering the area are registered by ANPR camera system and their registration numbers are checked in a database of registered vehicles. Each entry of an unregistered vehicle is treated as a driving offence and penalised by municipal police or municipal administration.

Automatic vehicle-entry registration by stationary ANPR cameras can additionally be augmented by automatic entry-

restriction enforcement by mobile enforcement vehicles or manual entry-restriction enforcement by municipal police officers or traffic wardens.

#### City Toll

As city toll is a suitable measure for achieving overall traffic reduction in a delineated area. It differs from the restricted-entry area by the fact that it does not limit traffic by imposing a restriction but it introduces an entry fee to discourage drivers from entering the delineated area. The fee is usually good for one day and covers all entries of a vehicle; the rate can depend on time or the duration of a vehicle's stay within the area. A city toll can further be combined with parking zones. Vehicles entering the area are registered by an ANPR camera system. Drivers are usually required to register their vehicles in advance, or within a day after the entry at the latest, and pay the entry fee, based on the rules. A central

system is responsible for the assessment and collection of fees. Failure to pay an entry fee is treated as an offence and penalised by municipal police or municipal administration.

#### Parking Zones

Parking zones constitute a solution for parking management in a delineated area. Parking permission can be gained either by a parking-fee payment or by procuring a virtual parking permit – residential or subscription – for a time period, e.g. a year. A virtual parking permit represents a record about parking rights in the database of a central system. From a technological point of view, parking zones can be built in two ways:

- **Basic solution** (a.k.a. light solution) does not require building an ANPR camera system.

Vehicles without parking permits are registered upon payment of the parking fee. This solution, however, requires intensive parking enforcement so drivers are motivated to obey parking rules.

- **Extended solution** (a.k.a. full solution) employs an ANPR camera system for vehicle registration in a central system database; due registration is checked (and if needed also supplemented) upon payment of the parking fee. Enforcement role in this solution is more or less supplementary and motivational. The extended solution can favourably be combined with city toll.

Partial parking zones with specific rules can be organised within the parking zones like, for example, purely residential parking zones, combined residential parking zones where paid parking is allowed during day, park-and-ride parking lots and others.