kapsch
challenging limits

Kapsch TrafficCom

Questions and answers about modern traffic and demand management.

What can we do to avoid traffic collapse in urban areas?

By 2030, the global stock of vehicles will reach the 1.6 billion mark,while at the same time, the flow of traffic on our roads is coming to an increasingly frequent standstill.

Modern traffic management takes a multi-layered approach to counteract these specific developments. In addition to networked traffic signal control systems at neuralgic congestion points, modern, holistic solutions must also be implemented.

Kapsch has been working for years on the implementation of innovative traffic systems, which are already being implemented in several major cities (e.g., Vienna, Dallas, Madrid, Buenos Aires, etc.). The focus is increasingly on the direct optimization of traffic demand - Demand Management.

This includes actively influencing the mobility behaviour of citizens, ideally before they start driving, and can optimise the spatial and temporal distribution of traffic using smart phone apps with intelligent and multimodal navigation. This extends to dynamic pricing of road use (city tolls). However, the optimal design for a city or conurbation must be worked out in advance.

Systems implemented to date show positive effects. Significant improvements in traffic flow and accessibility as well as reductions in travel time have been achieved in several cities.

Cue intelligent traffic control: Which tools or cornerstones are necessary for this? And what is the technical innovation behind it?

Our philosophy is based on the extensive use of existing road infrastructure. This means that investments from the past, for example in traffic signals, IT systems, etc., are not devalued but continue to make their contribution to innovative traffic control.

As a key component, Kapsch is implementing a higher-level traffic management system that interacts with all existing road infrastructures in real time as far as possible and directly involves and guides road users in a targeted manner.

This enables traffic operators to get an up-to-date overview of the traffic situation and, if necessary, to intervene quickly and efficiently in the event of unforeseeable incidents (e.g., accidents).

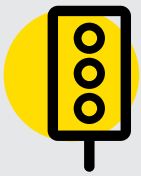
Building on each other, innovative function blocks can be implemented in a modular fashion depending on the requirements. This can range from smartphone apps that use intelligent and multimodal navigation to optimize traffic distribution to dynamic pricing of road use (city tolls).

A first convenience function that can be implemented quickly is GLOSA (Green Light Optimal Speed Advisory) - this can be used by road users either as a smartphone app or integrated into the vehicle navigation system while driving. This optimally adapts the driving speed to the traffic light control, avoids unnecessary acceleration and braking manoeuvres and influences the behaviour of other road users.

Cities are switching to intelligent traffic management.

According to your practical experience, what are the most important steps when operators of traffic systems want to switch to intelligent traffic control?

The most important steps in the changeover to intelligent traffic management.



Analysis of the existing traffic sensors in the city

The first step is always an analysis of the existing traffic signal and traffic computer infrastructure. The existing infrastructure must be able to interact with higher-level and background traffic management systems based on common communication standards. Traffic infrastructures that may have become outdated and are not capable of doing so can usually be upgraded to the latest state of the art with manageable investments.

Holistic traffic systems

At the same time, it should be determined to what extent traffic sensors already available in the city can provide an up-to-date overview of the traffic situation. A host of data sources can be used for this purpose, starting with induction loops in the roadway to determine the vehicle throughput, anonymous WIFI and Bluetooth trackers, video-based traffic monitoring with AI mechanisms working in the background for counting, classification and event recognition, through to floating and incident car data from various providers.

The more directly urban traffic management platforms can interact with road users in an anonymous way, e.g., via smartphone apps or vehicle navigation systems, and win them over as a supporting pillar of a holistic traffic system, and the more precisely any existing traffic situation information systems are able to provide an up-to-date overview, the more optimally state-of-the-art calculation algorithms can forecast the overall traffic situation in the background and thus also optimise it in advance.

GLOSA (Green Light Optimal Speed Advisory)

Through the networked world, we have become accustomed to being able to use any information immediately and in real time. A first convenience function that can be implemented quickly and that has proven to be very popular with road users is GLOSA (Green Light Optimal Speed Advisory). This can be used by road users as a smartphone app or integrated into the vehicle‘s NAVI to optimally adapt the driving speed to the traffic light control and thus avoid unnecessary acceleration and braking manoeuvres.

Developing direct interaction with road users

Direct interaction can be expanded if optimal routes for travel routes are calculated centrally, based on traffic situation forecasts, and these routes are suggested to road users. In this way, it is also possible to relieve neuralgic zones (residential areas, hospitals, school and university campuses, green and recreational areas, etc.).

Incentivize driving behavior

If necessary, urban transport policy can also provide special incentives to reward driving behaviour that has been adapted to requirements.

Possible solutions for central platforms.

For holistic traffic management, the question is who operates the central platform on which all the threads come together. What are the possible solutions here?

There are different models for this purpose.

Independent operation of traffic management centres

Large cities usually operate such state-of-the-art traffic management centres as the highest instance of their traffic system themselves and independently, starting with their own IT infrastructure up to their own operating staff (or also delegated within the city to executive institutions, such as the police).

Outsourcing of interregional traffic management operators

However, it is also possible to operate only the sensor technology and the light signal infrastructure as a city itself and to outsource the actual traffic management based on politically agreed key performance indicators (KPI) completely, e.g., to supraregional traffic management operators, and thus to obtain it as a purchased service.

Solutions for smaller council areas and cities

The traffic management platform and its software applications, including the user interfaces, do not necessarily have to run on the city‘s own IT infrastructure, but can be outsourced to external data centres or to an IT cloud.

This also enables smaller municipalities and cities to use the advantages of modern platforms without having to establish their own IT departments or hire and train their own operating personnel. Cooperation models between cities and regions are also conceivable.

In addition to careful contract and service management, it is always important to comply with the corresponding legal framework conditions regarding data protection and anonymization of personal data.

What is the experience regarding the costs of intelligent transport systems?

The traffic management of a large city - based on political guidelines regarding the modal split and the expectations of the citizens regarding accessibility and travel times - is first and foremost a service provided by the city to road users. The provision of this service naturally involves costs.

Greater efficiency.

The increasing centralisation of intelligent functions and direct interaction with traffic participants not only enables greater efficiency in the management of traffic volumes:

Low costs for roadside infrastructure systems

It also means that roadside infrastructure systems are becoming increasingly cheaper to procure and maintain, as they are easier to maintain and operate than in the past.

Stable total costs with greater efficiency and greater comfort

However, these medium and long-term savings on the infra-structural cost side are offset by additional expenditure on the central side. Ideally, the total costs can be kept stable even with greater efficiency and greater comfort for transport users.

What are the main safety risks of intelligent traffic control?

The direct interaction of the traffic authority with the road users means that personal data can also arise directly and indirectly. In any case, this must be anonymised and subjected to the highest possible level of data protection. It is advisable to work very closely with the respective data protection authorities when introducing these systems.

In times of increasingly tight budgets - where will the financial resources for this come from?

Increase in „user pays principles“ in the transport sector

Usually, the financial resources for transport tasks are obtained directly from the taxes paid by the citizens. However, international experience shows that the „user pays principle“ is also gaining ground in the transport sector. This means that the users or customers of the respective municipal services also participate directly in the associated costs.

Tolls and charges for the use of defined roadways or zones at certain times

One way of organising user-friendly charges are tolls and fees for the use of defined streets or zones at certain times. However, there must be demonstrable benefits for the user associated with the fee paid.

Experience has shown that it will not be possible to successfully negotiate a congestion charge with road users if travel times and accessibility are not noticeably improved after the introduction of tariff measures.

Connected vehicles in urban areas.

The topic of „networked vehicles“ is linked to the question of a central mobility platform. What are the best technical solutions here?

Vision of a central mobility platform

The vision of a central mobility platform is similar to what we as air travellers know from the world of air traffic control. Here, central authorities specify the route, flight speed and flight manoeuvres for networked aircraft in order to combine the greatest possible safety on tight traffic routes (airways) with optimal travel times.

Despite these central instances, however, both the pilots in the aircraft have the final decision in an emergency, just as the aircraft themselves are equipped with a lot of onboard electronics that keep track of the respective event radius.

Real-time assistance for drivers

In road transport, especially regarding autonomous vehicles, the vision is similar, although not quite as hierarchical and strict.

Central mobility platforms can provide real-time assistance to networked vehicles and drivers to optimise travel times, comfort and safety as far as possible.

Such central authorities will be responsible for different geographical areas (cities, districts, regions) and possibly also for different road types (such as high- or low-ranking road networks) based on political traffic specifications. The parameters of safety, ecology and driving comfort play an important role in this context.

Networking of vehicles with the road infrastructure

The prerequisite for this is the networking of the vehicles with the road infrastructure.

Classic mobile radio technologies, such as 5G and its successors, and smaller-scale CITS technologies (Cooperative Intelligent Transport Systems) with short latency times will be used on a large scale.

The central networking point is traffic management systems (in future mobility platforms), which will be expanded to include real-time communication with road users and vehicles.

Who should operate the mobility platform to manage the networked vehicles in urban areas?

Technically, mobility platforms can be operated both by the transport authorities themselves and by outsourced service providers at any level of service.

However, the specifications according to which the platforms are to be operated must always be politically coordinated and ordered by the authorities.

Transparent catalogues of key performance indicators (KPI) and service level agreements (SLA) help here.

What role does the smartphone play in modern traffic management?

Direct interaction of infrastructural traffic systems with road users is becoming increasingly important.

Smartphone apps will also play an increasingly important role in navigation.

The connected world has made us accustomed to having information instantly available in near real time

Smartphones as valuable data sources regarding events and movement data

However, smartphone apps do not only bring immediate benefits and convenience to the transport users themselves.

Smartphones and their built-in sensor technology are also valuable data sources themselves in terms of events and movement data.

Important with such smartphone apps is of course „Privacy by Design“, meaning serious and verifiable anonymization and data protection.

Vehicle manufacturers are increasingly turning to interfaces such as Android Auto and Apple CarPlay - both technologies for mirroring and using smartphone functions directly on vehicle screens.

Networking of applications with a modern traffic and demand management system

For example, navigation applications from smartphones can be used directly in the dashboard of the vehicle.

If such applications are networked with a modern traffic and demand management system, for example, traffic flows can be routed based on certain specifications and city rules (e.g., no routing in front of schools, etc.) can be followed.

In all of this, the data of the road users themselves plays a central role - and this of course brings the issue of data privacy into play. What can you tell us about this?

Movement and event data is one of the central sources that modern traffic management systems use to optimize overall traffic.

When collecting and processing such data, Kapsch provides the highest level of security through privacy-by-design. Movement and event data is collected anonymously, i.e. without any personal data, and is also processed in such a way that retroactive decryption is impossible.

This is done, for example, through the aggregation and anonymization of data, or the trimming of individual movement profiles, to no longer be able to determine the exact start and destination.

Kapsch ensures the highest level of security through privacy-by-design.

A central mobility platform makes the operator a monopolist of mobility data - how do you see the opportunities and risks here?

As Kapsch, we support the philosophy that mobility data should be made available by the platform operators transparently, anonymously and in a form that can be further processed by third parties in the sense of an „open governmental data policy“. Many of our government customers follow this approach in particular and even stipulate this as a condition in the respective public tenders. In most cases, the data is even passed on free of charge, although not always unconditionally.

What role does artificial intelligence play in intelligent traffic management concepts?

The modules used in modern traffic management employ a wide variety of algorithms that make use of all currently available technologies.

For example, artificial intelligence is used to generate GLOSA (Green Light Optimal Speed Advisory) information to calculate the most accurate prediction of signals for smartphone apps.

1

Artificial intelligence is important for forecasting traffic situations

Artificial intelligence also plays a major role in forecasting traffic situations. The fully automated analysis and recognition of common behavioral patterns of road users makes a major contribution to the prediction of congestion situations and their ex-ante elimination by influencing traffic signals.

2

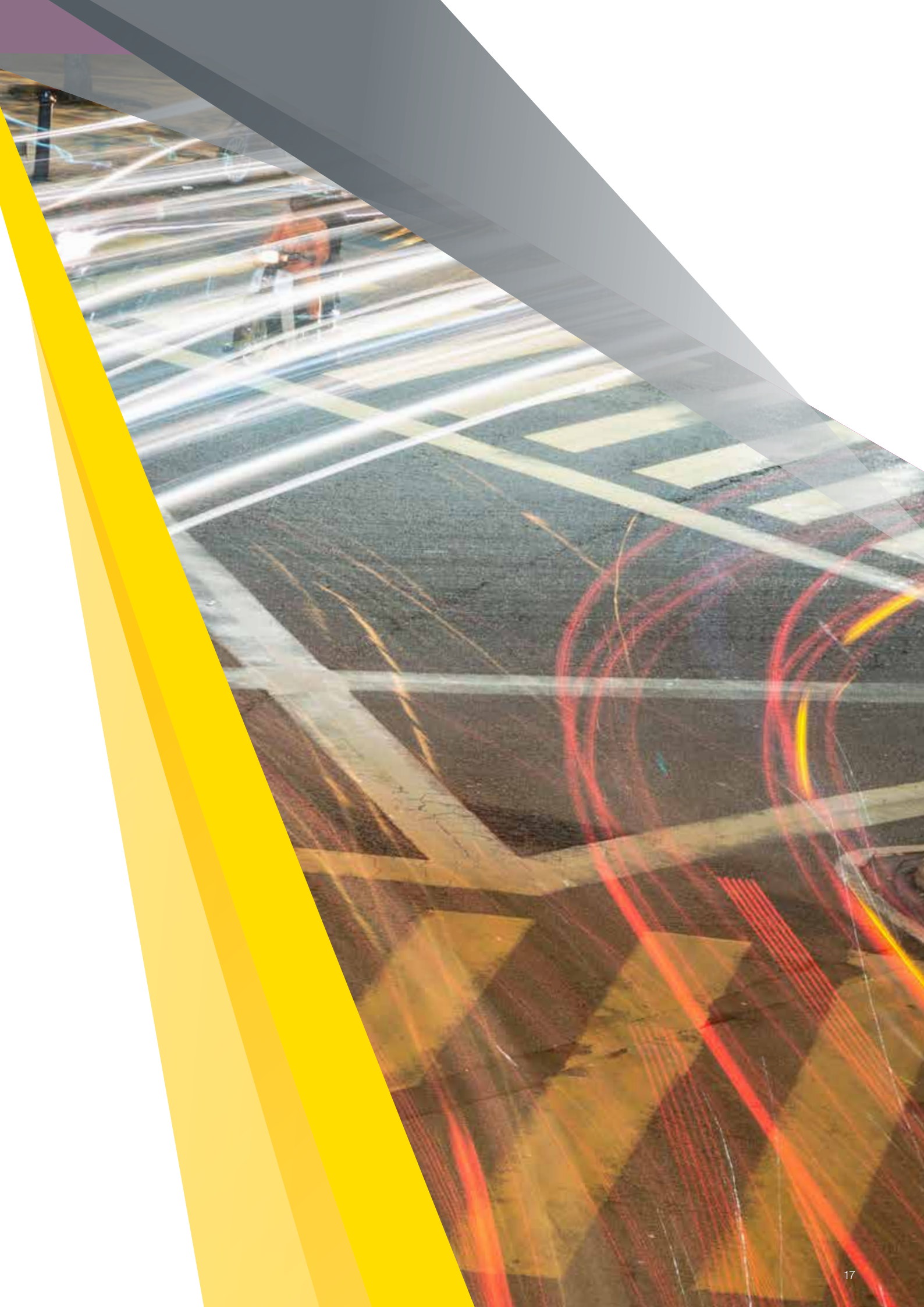
Solution development for unforeseeable events

Artificial intelligence can also help traffic operators to find solutions for unpredictable events (e.g., accidents at critical traffic points). Temporary events such as major events, demonstrations, or construction sites can also be supported with algorithms based on artificial intelligence.

3

Result - Improvement in the traffic flow

In any case, systems implemented to date show very positive effects. Significant improvements in traffic flow (reduction in travel time) and accessibility have been achieved in several cities.



What can planning for a new traffic management system learn from pilot projects in Europe, Asia and the USA?

Digitalisation, fully automated traffic management and networking of different traffic management centres.

The continents are very similar in terms of transport requirements in rural areas and cities.

Role of motorised individual transport in urban development

The difference lies mostly in the history of some cities, whether and to what extent streets are sometimes scarce or less scarce goods. Rather narrow streets in historically „old“ cities in Europe certainly have different basic conditions than, for example, young megacities in North America or Asia, where motorised individual transport has usually taken on a completely different role in urban development.

Digitalisation and fully automated management of high-level road networks

Modern megacities in Asia have a strong focus on public transport and its intermodal integration. In turn, metropolitan regions in the USA can certainly learn a lot from digitalization and the fully automated management of high-level road networks.
Another interesting development in the USA is the increasing networking of different traffic management centres with different geographical responsibilities.

What role do car manufacturers play in new solutions for traffic management?

The paradigm shift in modern traffic management means that vehicles are increasingly becoming an actively networked component of an overall traffic system.

Vehicles become part of a closed traffic management loop

Vehicles receive data from central instances that optimize safety, driving comfort, and travel time, and they deliver data to central instances that are permanently processed into a new overall optimum. What is new is that vehicles become part of a closed control loop consisting of traffic situation calculation, traffic control and driving instructions.

Extension of the event horizon of the vehicles for immediate driving decisions

Both the „ad hoc“ networking of vehicles with each other and the networking of vehicles with the infrastructure (using ITS-G5, C-V2X, 5/6G) aims to significantly expand the event horizon of vehicles for immediate driving decisions.

In addition to the event horizon of a few hundred meters, which results from the immediate built-in vehicle sensor technology (video, laser or radar), the virtual event horizon facilitates completely new, additional choice.

Active demand management

This massively expanded event horizon also includes the possibility of incorporating intermodal public hubs into the travel decision or causing temporal and spatial shifts in the use of routes. This is also commonly referred to as active demand management.

Since we see carmakers as generally very open to new comfort functions in their vehicles, we are convinced that they will seize the opportunity of Connected Cars very quickly to benefit from the new possibilities for their customers. Initiatives of the Volkswagen Group with VW (e.g., ITS-G5 in the new Golf class) and Audi (Traffic Signal Assistant & Highway Assistant in the navigation software) are heading in precisely this direction.

Google, Uber, Alibaba & Co. in traffic management.

What role do Google, Uber, Alibaba & Co. play in terms of new solutions in traffic management?

1
Partner for traffic management tasks

Large international platform manufacturers with their IT applications serve billions of end customers worldwide. However, they are not traffic managers and do not operate traffic or mobility management instances specifically geared to cities or traffic networks.
With their applications, the platform manufacturers provide customer-oriented human-machine interfaces that have established and proven themselves on the market.
They are therefore not competitors for traffic management tasks, but natural partners.

2
Become part of the overall traffic optimum

Google and co. can influence traffic, but without being networked with local traffic authorities and without becoming part of an overall traffic optimum. This gap should really be closed. Transport authorities are fundamentally interested in ensuring that vehicle fleets and road users who follow the instructions of higher-level navigation systems (estimates are as high as 30%) become part of their overall traffic optimum.

3
Making the use of data subject to conditions

Operators of traffic management or mobility platforms can, for example, provide interfaces, real-time and forecast data, traffic signal and interchange data, route resistances and travel time calculations for Google and Co free of charge, but they attach conditions to their use that the policy makers deem absolutely necessary in terms of achieving the targets.

4
End-customer services from large platform manufacturers through intelligent data exchange

Modern traffic management systems from Kapsch are designed to incorporate the end-customer services of major platform manufacturers through intelligent data exchange. Cities have data and calculate traffic forecasts that the platform manufacturers can use for the convenience of their customers. These can be offered in exchange for compliance with certain rules and policies.

Connected vehicles in traffic management.

Alongside connected cars, intelligent roads are one of the most important factors in modern traffic management. Why?

The term „intelligent road“ usually refers to its increasing digitalization.
In contrast to the road infrastructure, the digitization of vehicles is already well advanced. Modern sensor technology provides decision support for vehicle drivers in milliseconds within an event horizon of up to several 100 meters.

1

Driving forward the digitization of road infrastructure

For the road infrastructure to significantly expand this individual event horizon of vehicles, it must first be digitized. A „digital twin“ of the road is created, so to speak, which maps in real time what is currently taking place and can validly forecast what is most likely to happen in the next 10, 20 or 30 minutes. This is achieved with the help of sensor fusion of various technologies (induction loops, radar, laser, video, acoustics) and their rapid processing based on machine learning and artificial intelligence.

In contrast to the road infrastructure, the digitalization of vehicles is already well advanced. Modern sensor technology provides drivers with decision support in milliseconds within an event horizon of up to several 100 metres.

2

Connecting of intelligent roads with vehicles

At the same time, this „intelligent road“ is subsequently networked with the vehicles to be able to use them as driving event and movement data sensors and to provide them with a basis for decision-making for an extended event horizon. This also includes forecast data from traffic signals or variable message signs, which may not even be visible to the drivers, to adjust the driving speed in advance.

Discussions about congestion charges.

A frequently formulated criticism is that congestion charges primarily serve as a source of revenue and also primarily affect socially weaker road users. Can you understand this criticism and what concepts could be used to counteract it?

Congestion charges generate fiscal revenues which are used by the political decision-makers in almost all cities for investments in the area of local public transport and thus in turn serve the mobility of the inhabitants.

Different scheme design

The actual design of tariffs and any social differentiation ultimately always depend on the target pyramid of hoped-for transport and fiscal outcomes.

No uniform recipe

Cities in all parts of the world act differently in this respect. There is no patent remedy for this.

Added value for citizens

The most successful and widely accepted congestion charging projects have been in cities where urban policy makers have been able to successfully communicate that the congestion charges had a greater added value for the population than their actual contribution to it.

Access Management solutions in Italy.

Access management solutions are particularly widespread in Italy. Can you briefly describe this concept and what experience you have had with it?

In the case of city access concepts, a differentiation is made between authorised persons and non-authorised persons for the use of defined zones. The fiscal aspect is not the primary concern here.

Traffic restriction

It is about traffic restrictions in the true sense, mostly on those who inhabit such a zone, drive exclusively commercially or have to drive to a hotel car park. In Italy, such zones are usually the historic city centres, and in some rare cases also certain residential areas.

Citizens accepts the regulation

Our experience with Z.T.L. (zona traffico limitato) in Italy is very good, as the citizens have been used to these regulations for decades and is quite familiar with them. The fully electronic monitoring of these zones with optical sensors and license plate evaluation was a logical technical development and is already in use in the vast majority of council areass in Italy.

Private vehicle vs public transport.

As a car driver, I don‘t want to give up the convenience of my private vehicle. Will modern traffic management in cities be an alternative to switching everything to public transport?

Modern traffic management will provide optimal transport modes

The aim of modern traffic management is and will always be to provide the population with optimal modes of transport. This also includes the free choice of the means of transport. In the future, however, modern technologies and the expansion of the offer (see already Uber, Scooter, etc.) will offer all citizens the optimal means of transport and the optimal route for the destination.

In times of the coronavirus pandemic, travelling in a private vehicle is safer than in a public space. How can flexible traffic management take this into account?

Modern traffic management will cover all eventualities

A modern traffic management system should be flexible, so it must be possible to map all possible eventualities. The systems from Kapsch are so sophisticated that their tools can map any strategies and specifications from cities or the political clients. In pandemic times, a low density of people is conducive, but this can also be achieved by distributing people in public transport over time. Such aspects are also factored in by a holistic, modern and flexible traffic management system from Kapsch.

Balance of the tax burden in the use of transport modes

Due to the current imbalance in the burden of charges, the use of private motorised transport (MIV) is too convenient compared to public transport. It is therefore to be expected that in future the use of the private car (or generally of the private car) will be charged per distance travelled (distance-based).

I live in the city and don‘t own a car at all, because I use public transport, my bicycle and I walk. To what extent can I also benefit from intelligent traffic control?

Intelligent traffic control includes all road users

Intelligent traffic control is designed specifically to include all road users. This means that, in addition to car traffic, the focus of optimisation is also on cycling and public transport. Thus, green waves for cyclists can be set up as well as prioritisation for public transport, which ensures rapid progress in urban areas.

How does congestion charging work?

How exactly does a „payment system of the future“ work when a toll system for road use is introduced in a city?

All possible cashless payment channels

Modern urban toll systems or access systems will use all possible cashless payment channels that offer convenience for users. Smartphone apps, electronic wallets installed directly in the vehicles or voice control (e.g., with Alexa or Siri) will be main features here.

Since in urban zones it is usually only the access or exit routes that determine the mileage, stay- or time-based charging schemes will probably be preferred to distance-based ones for reasons of simplification.

Subsequent payment

If the zones defined for paid use are digitalized without gaps, it is also possible to implement payment systems that allow users to pay their outstanding bills later. This also makes it possible to enter and exit the zones without losing time.

Is it possible to use a payment system that also works outside my own city - for example for the use of tunnels, bridges or in other cities? Or can they even work across Europe - for example, for vacation trips across national borders?

As soon as toll operators enter into contracts with so-called Toll Service Providers, the latter can bill many different toll systems for their customers. Toll Tickets, a Kapsch Group company, has been managing this very successfully for years, especially for tourism customers. https://www.tolltickets.com/

I have a car that is not yet equipped with modern electronics. Can I still be included in the digital traffic management system?

The use of modern traffic management systems is designed specifically to include all road users. In addition to taking cars, bicycles and public transport into account, this also means that vehicles are integrated regardless of their age or make.

Digital traffic management does not mean that a new generation vehicle must be used. On the one hand, vehicle information (such as speed) can also be collected through infrastructure-based measuring points (induction loops, video, etc.). And on the other hand, drivers can be provided with new, rich information through information at the roadside (dynamic variable message signs) or smartphone apps. For example, many vehicle users already use smartphones as a navigation tool.

Reducing emissions and climate pollution through modern traffic management.

I want modern traffic management to reduce the emissions and climate impact of mobility. To what extent is this possible?

Reducing environmental pollution is one of the primary goals of our customers who are planning or already using modern traffic management. First and foremost, this can be achieved by making road traffic more fluid while maintaining the same volume of vehicles.

By optimizing the signal systems, both the number of stops and the general occurrence of traffic jams can be reduced.

With modern traffic and demand management, traffic flows can be directed based on certain specifications.

For example, navigation systems are linked to the traffic management system in order to follow city rules (e.g., no routing in front of schools, etc.).

Furthermore, the use of public transport and cycling can be made more attractive.

In this way, special green waves or priorities for certain road users can increase comfort on these transport routes. This automatically leads to a greater use of cycling and public transport.

Kapsch TrafficCom

Kapsch TrafficCom is a globally renowned provider of transportation solutions for sustainable mobility. Innovative solutions in the application fields of tolling, tolling services, traffic management and demand management contribute to a healthy world without congestioni.
Kapsch has brought projects to fruition in more than 50 countries around the globe. With one-stop solutions, the company covers the entire value chain of customers, from components to design and implementation to the operation of systems.
As part of the Kapsch Group and headquartered in Vienna, Kapsch TrafficCom has subsidiaries and branches in more than 25 countries. It has been listed in the Prime Market segment of the Vienna Stock Exchange since 2007 (ticker symbol: KTCG).
In its 2020/21 financial year, around 4,660 employees generated revenues of about EUR 500 million

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