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Case studies for traffic solutions

Modern concepts and technologies help improve efficiency

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Editorial

Year on year – in fact almost day by day – the megatrends of the age are increasing the pressures on our mobile society. Urbanization, globalization and demographic change represent the biggest challenges to mobility, both today and in the future. More and more people and goods have to be brought to their destination safely and in the shortest time possible. This massive task can only be carried out with top-class solutions – but they must also be affordable and help protect the environment. This is exactly what Siemens is pushing hard to achieve every day, using all the resources available to a global company. We are working on comprehensive solutions that cover all the bases – safety, efficiency and environmental friendliness – no matter if they are designed for large cities, small villages or on the motorway system.

We are the only company in the world to offer proven components for all transport scenarios, informed by our experience in projects across every continent. With Siemens, you have a global partner. In our “Infrastructure and Cities” organization, we have brought together all the expertise and skills needed for traffic, transportation and logistics management. The combination of both international and local know-how means your project is always in safe and competent hands. Our interdisciplinary line-up enables us to offer you a tailor-made solution for every task and goal. And we are rather proud of the fact that we focus on a sustainable system design in our products right from the beginning. Already during the development process, we look at the entire product lifecycle. We take our responsibility for sustainable and innovative environmental management seriously, using recyclable materials.

The following scenarios give an insight into our solutions for the entire spectrum of road traffic engineering – today, tomorrow and beyond. We hope you enjoy the read.

Sincerely



Hauke Jürgensen
General Manager



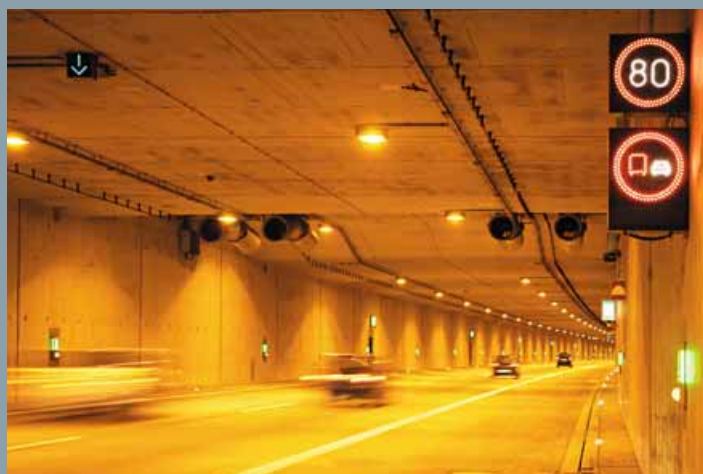
Thilo Jourdan
Vice President Sales

Intro

Solutions for the future

There terms of our virtual contract with future generations are clear. Climate change and urbanization require the use of environmentally friendly technologies – not only, but especially, in the area of mobility. At Siemens we have made fulfilling this contract our responsibility and provide you, the mobility managers around the world, with sustainable and innovative solutions for your transportation infrastructure. Our systems are helping to guide traffic in the right direction, not just today, but also tomorrow and the day after. We are constantly expanding our technological leadership, also in terms of quality and reliability, so that we can always offer you the latest and most efficient solutions available. The synergies available within Siemens global corporation are among the key factors guaranteeing you worldwide support and continued security.





Part 1

Solutions for the future



1.1 Mobility

1.1.1 Reduction of parking-related traffic

Progress in spite of standstill

How optimized parking can help improve traffic flow on urban streets

The challenge

The numbers are alarming: In 2030, about 61 percent of the global population – roughly five billion people – will be living in cities, according to UNO estimates. The impact that the continued trend towards urbanization has on urban traffic density is widely talked about. Another factor that regularly adds to urban mobility problems, however, is often neglected:

Already today, drivers looking for a parking space account for over 40 percent of all inner-city traffic, and that on perfectly ordinary days. On Saturdays just before Christmas, for instance, the proportion may even rise to up to 90 percent. By their very nature, inner city areas offer only limited space for the creation of additional parking facilities, be it above ground or underground.



The combination of existing parking garages and pay-and-display machines with on-street parking guidance systems is an especially efficient solution for channeling parking-related traffic

If authorities want to keep urban traffic flowing and congestion-related pollutant emissions below the statutory thresholds, they need to include stationary traffic into their considerations. Considerable improvements in the use and occupancy of existing parking space must be achieved in future – with the clear goal of reducing the number of cars driving around in search for a parking space. These improvements will also positively impact the profitability of parking space management.

The solution

Information is the key to rapid improvement. If motorists are informed on the current occupancy levels of parking garages and car parks while still on their way to the city center, they can choose their route accordingly and arrive at the most conveniently located free parking spot on the shortest route. Innovative parking guidance systems can provide exactly the required information and use dynamic signs to guide motorists to the nearest free parking space. Municipalities stand to profit from such systems in multiple ways: Visits to the city center become more attractive and the occupancy of usually less frequented parking facilities is increased.

The systems are even able to monitor the occupancy of on-street parking facilities and pass the information on to the motorists, either for each individual parking space (by means of ground sensors) or on the basis of the number of parking permits sold. In either case, the system guides the drivers directly to available parking spaces, preventing street overcrowding and the resulting traffic congestion.

An especially efficient solution is the combination of existing parking garages and pay-and-display machines with on-street parking guidance systems and their integration in an area-wide traffic management system. This makes it possible to use the parking data as the basis for providing motorists with routing recommendations already at the main entry points at the city limits. The integration of all traffic systems on the data processing level and the use of Web technology enable the development of completely novel applications and services, for instance the reservation of a specific parking space on short notice.

Your partner

Siemens offers a comprehensive system and product portfolio covering all areas of parking space management and organization. Our Sitraffic Guide parking guidance system allows the seamless integration of different car park systems and their link-up to the Siemens traffic management center. For the creation of such integrated systems it doesn't matter which component is installed first – the systems are open to expansion in any direction. The management and information systems are ideally complemented by the Siemens range of advanced on-street pay-and-display machines.

1.1.2 Shorter travel times and less congestion on motorways

Increased capacity – reduced emissions

How active traffic management and advanced control systems can help improve efficiency and effectiveness of motorway use

The challenge

Particularly, but not exclusively, in conurbations and metropolitan areas, constantly increasing traffic volumes are leading to more and more congestion on freeways and expressways. During peak times in particular, this has extremely negative impacts on travel times, traffic safety and traffic-related pollutant emissions. Consequently, the responsible authorities are looking for maximally sustainable ways of improving traffic flows without expensive construction measures to expand the motorway network.

The solution

Using current traffic data as input, active traffic management approaches and dedicated control systems can manage high traffic volumes dynamically to counteract impending congestion. Active traffic management improves vehicle throughput and generates incident warnings – for added safety on the road. Innovative technologies help achieve this goal. Automated processes avoid the risk of delayed reaction that would be present with manual control. This so-called congestion management is based on a combination of strategies that help optimize infrastructure use and generate measurable added value for the transport network.

Active traffic management includes for instance:

- Speed harmonization
- Temporary shoulder use
- Ramp metering
- Network control/diversions
- Congestion warning
- Environmental information

Successes

In the scope of different projects, the effectiveness of modular traffic management systems was assessed using before-after comparisons. The studies showed the most significant results in terms of accident reduction and prevention. But also in terms of speed harmonization and congestion or bottleneck prevention, the traffic systems have impressive effects.

Here are some striking results of current studies:

- 35 percent fewer accidents¹
- 31 percent fewer injuries to road users²
- 20 percent reduction in congestion hours³
- Enhanced road capacity
- Improved traffic synchronization and higher capacity during peak hours

¹Source: Highway authority South Bavaria, Germany

²Source: Highway authority South Bavaria, Germany

³Source: ASFINAG, Austria

Your partner

Siemens can look back on 25 years of experience in supplying and installing traffic control systems, from design, engineering, installation and commissioning right up to user training, system maintenance and related services. The key component of our solutions is our Sitraffic Conduct+ system, using algorithms for automated and semi-automated control designed for optimizing traffic flow and providing the motorists with timely warnings on all kinds of accidents. The highly reliable system is operational 24 hours a day, 7 days a week.

Speed harmonization is one of many options in active traffic management aimed at reducing congestion and accident numbers



1.1.3 Shorter travel times and less congestion in the city

The perfect wave

It really does exist – the “green wave” longed for by traffic authorities and motorists alike. It is achieved thanks to intelligent traffic light control algorithms that enable entire blocks of vehicles to cross several intersections in one smooth go

The challenge

Usually, urban arteries and through roads are the especially prone to traffic disruptions and slow-downs. Major causes are inefficient traffic infrastructure and equipment or inadequate dimensioning, programming or control of local traffic light installations or traffic guidance systems. The negative effects are known: Enormous time losses and increased fuel consumption are not only a nuisance to the individual motorist, but also cause substantial costs for the entire economy, not to forget their negative impact on the environment.

The solution

As studies have shown, suitable synchronized phasing of traffic on main arteries leads to substantial energy savings. A very efficient traffic control solution in this respect is the so-called “dynamic green wave,” enabling entire blocks of vehicles to cross several intersections in one smooth go. This prevents long waiting times and reduces traffic density and the resulting risk of congestion on the street sections concerned. Even the effects of unexpected incidents can be easily mastered by means of intelligent traffic-actuated control mechanisms.



In general, traffic light installations are controlled “top-down” by a predefined control cycle designed for optimizing the traffic throughput expected for each phase of the day. However, extraordinary variations in traffic density, changing weather conditions, accidents or other incidents may lead to strong fluctuations in the number of vehicles approaching any of the traffic lights from one direction or the other. In this case, a traffic control algorithm exclusively based on fixed-time signal plans may prove to be quite inadequate. To master this challenge, the central traffic computer collects measured traffic data, carries out cyclical analyses of the traffic situation for different sections of the street, and adapts the duration of the red-green phases as well as the timing of the green wave accordingly. The result: Traffic flows more smoothly with fewer stops, and drivers benefit from a reduction in waiting times by up to 30 percent. The environment benefits as well because smooth traffic flows mean lower fuel consumption and hence reduced exhaust emissions.

Your partner

More than 30 years of experience in adaptive traffic control systems plus leading technologies and constantly enhanced, innovative systems – these are only some of the strengths that Siemens brings to designing and implementing complete traffic control solutions tailored to the specific requirements of each individual city.

So-called “dynamic green waves” enable entire blocks of vehicles to cross several intersections in one smooth go, and reduce waiting times by up to 30 percent

1.1.4 Multimodal transport information

Combination produces efficiency gains

Real-time information covering different transport modes supports intermodality and thus contributes to a more balanced use of the various mobility options

The challenge

When people take mobility decisions, they tend to follow their individual preferences, but usually take more than one factor into account. In general they choose the means of transport that they expect to take them to their destination especially fast, safely and cost-efficiently – but for many people, environmental considerations do play a certain role. The best basis for mobility decisions is real-time information on the current transport situation. This information, however, is mostly still restricted to a limited area or to a specific transport mode, for instance private road traffic on the one hand and/or public transport on the other hand. Even if up-to-date information on all potential mobility options is available, the comparative evaluation of the options is quite difficult and time-consuming for individuals.

The solution

Using data collected by various traffic monitoring systems as well as additional traffic-related information on road-works, incidents or other disruptive situations, modern traffic management systems are able to calculate the current traffic situation for the entire network. Multimodal traffic information systems can then be used to efficiently supply all transport users with the relevant information. The provision of combined data on all transport systems supports mobility decisions in favor of public transport modes and thus helps prevent congestion and reduce emissions. In the ideal case, people will have access to real-time information on the available transport modes before setting out on their journey, and not only when they are already en route. Possible “early” information sources are, for instance, dedicated Internet portals, offering information on the current traffic situation of

the road network or the planned route as well as on the parking situation at the destination. To check alternatives, the users must also have access to public transport data, such as the nearest bus stop or the departure times for buses or trams.

The main aspects to be covered by multimodal transport information are:

- Real-time transport information for people traveling individually as well as for public transport users
- Dynamic (and multimodal) routing information
- Additional travel-related services such as sightseeing information made available via PDAs/Smartphones or on-board systems

All these types of information help the road users choose the mode(s) of transport that best suit their purposes in the given situation.

Your partner

Siemens has already implemented travel information centers covering different types of areas: metropolitan areas like Berlin or Southampton, regions like Bavaria (VIB), or conurbations like the German Ruhrgebiet. Our experience enables us to offer ready-for-use complete solutions covering all aspects, from the collection of relevant data right up to the presentation of multimodal transport information at the roadside or via the Internet or mobile devices.

Modern travel information centers facilitate the choice of the transport mode best suited to the user's current situation and target



1.1.5 Managing parking space demand

A truly multi-talented traffic application

Why professional parking space management systems can do much more than just optimize the occupancy of existing parking slots

The challenge

There are numerous studies analyzing the effects of parking space management on retail turnover in the neighborhood, but a much more interesting aspect goes largely unnoticed: Inadequate parking space management leads to excessive parking-related traffic – one of the main reasons for congestion in high-density urban areas.

Their versatility turns modern pay-and-display machines into a valuable tool for the systematic control of urban traffic flows

The solution

The immediate purpose of parking space management systems is obvious: They are an efficient means of optimizing the occupancy of existing parking facilities and support the motorists by guiding them directly to the nearest available parking space. But these systems also provide a large range of additional benefits. Professional parking space management can help reduce parking-related traffic, for instance, a major factor in urban congestion. Moreover, parking space management and parking tariffs can be used to steer traffic flows in the desired way. For example, the fees for on-street parking in specific zones like the city center can be set much higher than the parking costs in off-street car parks close to the main arteries. As this will encourage drivers to use Park & Ride facilities more frequently, traffic flows are efficiently redistributed. When combined with parking guidance systems, an even stronger effect can be achieved.

Since pay-and-display machines allow the definition of differentiated tariff structures, traffic management measures can even be tailored to different vehicle classes. A special selection button, for example, can serve to charge higher parking fees for trucks or delivery vans than for vehicles with lower emissions or for electric vehicles. It is also possible to define special privileges for certain groups of users, let's say identical fees for on-street and off-street parking for the handicapped. This means that a parking space management system planned and implemented with a special focus on optimizing traffic management can have a similar effect on inner-city traffic as a city congestion charge.

In residential areas too, parking space management can be used to control traffic. Reserving specific parking slots for residents and charging higher parking fees for non-residents are efficient levers for reducing the number of vehicles traveling and parking in these areas. In some cities, parking space managers have even gone one step further and set up pilot projects for evaluating the effects and effectiveness of dynamic parking fees modified according to the current occupancy level.

Your partner

Siemens offers a wide range of systems for efficient parking space management, including pay-and-display machines and parking guidance systems. Besides, we are your reliable partner for traffic planning and consulting services regarding city-wide parking space management. You can benefit from our many years of international experience in this field.



1.1.6 Strategy management

Perfect interplay between components

Only the complete integration of the different subsystems at play in a city will allow the implementation of mobility strategies that feature all options for traffic control and management

The challenge

Urban mobility only works if the different transport modes and of course the various subsystems for their control are intelligently connected with each other. In addition to conventional traffic control systems, some cities use strategic traffic flow monitoring, variable message signs providing motorists with updated information, parking guidance systems and/or modern video surveillance cameras linked up to traffic monitoring centers. There are also systems for controlling and guiding public transport, monitoring air quality and managing motorway traffic. As all these systems have an impact on mobility in a city, they should be closely coordinated in the scope of a holistic mobility strategy. In many cases, however, a lack of integration prevents just that.

The solution

Our strategy management module integrates the functions provided by several traffic and transport systems on a single platform, enabling the traffic managers to outline various scenarios with typical characteristics and define the reactions required from each subsystem. A suddenly occurring traffic jam caused by an accident, for instance, is localized immediately by the strategic detection system, and reported automatically to the operator in the traffic management center. At the same time, the video surveillance system points the nearest camera to the location of the accident respectively the traffic jam to supply a visual overview of the situation. Variable message signs provide motorists with information about the congestion situation and, if necessary, with directions for a diversion route or public transport alternatives. The switching routines for the traffic lights on the recommended alternative route can be adapted to cope with the increased traffic volumes caused by the diversion. All this minimizes the accident's negative effects on traffic flow and improves the safety of the road users at the same time.

Key benefits

- The strategy management module controls and coordinates all systems linked up via a free and open interface
- The operator can develop flexible action plans, either using a graphical tool or the integrated script language
- Every piece of information in the system can be used as trigger or controlling method
- The implementation of a user interaction routine enables the operator to have all or selected actions confirmed



Close coordination of public and private transport systems allows the implementation of efficient mobility strategies

Your partner

The Siemens-developed Sitraffic Concert system has proven its practical worth in a large number of applications around the world. With Sitraffic Concert as their central platform, traffic management centers can achieve in a most efficient way what they were established for – the practical implementation of a holistic transport strategy.

1.1.7 Modern traffic detection eases congestion

A true economic miracle

By increasing the transparency of the current situation in the road or street network, modern technologies for traffic data detection support the right decisions

The challenge

If the existing road network is to accommodate the future demand for mobility and the resulting increase in traffic volumes, its efficient use will be more important than ever. Efficient use presupposes effective traffic control, which in turn requires detailed traffic data. In the past, the latter were usually collected using inductive loop detectors installed in the pavement – a time-tested, but at times quite complicated and expensive method.

The solution

Today, innovative detection technologies not only enable the collection of a much wider range of data, but the easy-to-install equipment also helps minimize installation costs, which used to make up a large part of overall traffic system costs.

Modern battery-driven magnetic sensors, for example, are quick and easy to install in the pavement because their radio link-up eliminates the need to lay cables to the nearest control point. This technology can achieve especially high savings if used as approach detectors placed at some distance from the stop line. Moreover, their location in the pavement right below the vehicles to be detected leads to higher data accuracy than with above-ground detectors.

For all applications requiring video surveillance in addition to traffic data collection, modern video cameras are the solution of choice. These multi-talented devices provide the traffic control system with the required traffic data and at the same time transmit video images of the junction or motorway section under surveillance to a processing center as a detailed information source on the current local traffic conditions.

Your partner

Besides the Sitraffic Wimag wireless magnetic detectors and the newest generation of video detectors, the Siemens Sitraffic product family covers the complete range of detection solutions for all road traffic applications, from presence detection for motor vehicles, bicycles and pedestrians right up to highly accurate vehicle classification. The high-precision data delivered by the Sitraffic detectors are the basis for defining measures aimed at improving traffic flow – for less congestion, reduced air pollution, and shorter travel times.



Innovative easy-to-install detection technologies reduce overall installation costs and provide precise information for targeted traffic control

1.1.8 Intermodal solutions for port to hinterland transport

More powerful infrastructure

How intelligent traffic control can channel incoming and outgoing traffic better and increase port capacity in the process

The challenge

A port and its surrounding roads form a fine-tuned system. Today a single large cargo ship may carry more than 10,000 containers, which can be unloaded in just a few hours. With about 65 percent of goods continuing their journey by truck, around 5,000 vehicles are soon clogging the road. So-called static traffic control cannot solve this problem, because the capacity of the infrastructure is simply too limited to cope with peak loads. As a result, incoming and outgoing traffic often becomes the port's limiting factor, and no one wants capacity limitations. Increasing capacity by constructing new facilities is usually too costly in terms of both time and money.

The solution

An affordable alternative is the implementation of an intelligent traffic control system, which minimizes traffic congestion and increases port capacity by optimizing the use existing infrastructure. An especially high level of efficiency can be achieved with an intermodal solution, working with reliable data from the port's own information systems to predict the traffic load and calculate the optimum method to control port to hinterland traffic. That means faster removal of containers from the port, with minimal impact on other traffic.

Key benefits

On the motorway, an intelligent control system can increase capacity by up to 40 percent, for example by temporarily opening the emergency lane for general use. This is how peaks in port traffic are quickly channeled away and the infrastructure used as efficiently as possible. In addition to selectively releasing lanes to absorb peak loads, other options are available such as selective diversions or variable speed limits for harmonizing traffic flow.

Using data provided by existing information systems belonging to the port or operator is a particularly cost-effective way of forecasting traffic volumes. Alternatively, the data can be gathered with sensors that are part of the intelligent control system.

Your partner

Siemens is the only provider who combines road traffic and port management, making it possible to take effective action quickly because many cases require no costly construction work. Thanks to its holistic nature, our approach, involving the port, city streets, motorways and other entities involved, opens up a significant potential for synergistic benefits. Siemens offers everything under one roof, from advanced technology and project-driven contracts tailored to the customer's needs right up to customized financing. Our large number of successful references from our partners both in Germany and abroad assure our customers of the security of their investment.



Intelligent intermodal traffic control is a cost-efficient way of increasing a port's capacity through the optimum use of the existing infrastructure

1.1.9 ELV controllers

Low voltage – big effect

Enhanced safety, lower energy consumption, smaller CO₂ footprint are three of the benefits brought about by the use of extra-low voltage (ELV) controllers

The challenge

Using conventional low voltage equipment for traffic applications typically presents a whole range of drawbacks, for instance in terms of safety, because accidents involving vehicles and signal poles or controllers are quite common. While cases involving electric shock are rare, when they actually do occur, the danger is enormous. The same applies of course also if the equipment is damaged by other events, for example vandalism.

Another disadvantage is the high energy consumption level of low-voltage controller, especially if combined with traffic lights equipped with traditional tungsten halogen light sources. Against the background of the ever more heated discussion about the CO₂ footprint of cities, this aspect is drawing increased attention, and that not only in terms of its ecological impact, but also in terms of economic costs, as pointed out by Steve Farrell explains, Senior Traffic Signal Manager for Newcastle City Council and as such the lead authority for the entire North East of the UK. The reason: There is now a requirement for all new signaled junctions using more than 500 W to be equipped with electricity meters, at costs running into thousands of pounds per installation.

The solution

All these drawbacks can be overcome with extra-low voltage (ELV) controllers, as proven by extensive tests in Newcastle. For one, there is no risk of dangerous electric shocks anymore. As Steve Farrell explains, "When you get the voltage down to 48 V you can touch the cable and

not even feel it, so the public are perfectly safe in case of an accident or vandalism."

Secondly, in combination with LED signal heads, the extra-low voltage controllers open up a huge energy savings potential. In Newcastle, extensive tests under real-life conditions revealed a 72 percent reduction in energy usage. This does not only positively impact the city's CO₂ footprint, but also eliminates the need for the very expensive equipment of every junction with an electricity meter. Because the electricity usage of an LED traffic signal installation fed via an ELV controller will always remain far below the 500 W threshold defined by the Newcastle City Council.

And of course there are also all the other benefits offered by signal heads based on modern LED technology. LEDs have a much longer service life than conventional filament lamps, resulting in fewer lamp failures, fewer inspections and much reduced maintenance costs.

Your partner

Environmental compatibility, cost-effectiveness and safety are three of the central innovation goals that Siemens is pursuing in the area of traffic engineering. Besides ELV controllers, which are now also available for pedestrian lights, our portfolio includes complete solutions for upgrading traffic lights to energy-saving LED technology.



The installation of extra-low voltage controllers minimizes the risk of serious electric shocks and opens up an enormous energy savings potential at the same time

1.2 Environmental protection

1.2.1 LED signal heads

Up to 90 percent lower energy usage

Green light for new signal heads:

Highly efficient LED signal heads go easy on public coffers and the environment

The challenge

Over the past 25 years, many old traffic signal heads with conventional filament lamps (75 or 100 W) have still been in use nearly everywhere in Germany. Upgrades, though urgently required, have often been postponed for reasons of cost. Because of their many operating hours, numerous traffic signal installations are badly in need of renewal and their operating costs are much too high. It would be much more cost-efficient to replace them with energy-saving and environmentally friendly systems.

The solution

Modern Light Emitting Diode (LED) signal heads need up to 90 percent less energy than conventional signal heads with filament lamps. Their use leads to substantial reductions in overall energy consumption and costs. At the same time, the extended service life of the LEDs minimizes the operating and maintenance costs for the systems because, in contrast to conventional light sources, LEDs do not need to be replaced at regular intervals.

But there are more advantages to LED signal heads than economic and ecological savings. Modern LED optics ensures maximum visibility under all weather and lighting conditions, during the day as well as by night. LED signal

Modern LED signal heads do not only offer many ecological and economic benefits, but also increase traffic safety thanks to their optimum visibility

heads are maximally reliable and their colorless diffusing lenses prevent the occurrence of phantom light.

Key benefits

- LED light sources save up to 90 percent of energy and have a much longer service life: As experience shows, conventional filament lamps have to be replaced after 4 to 6 months of service while LEDs work reliably for several years, maximizing signal availability and minimizing maintenance costs.
- Enhanced traffic safety: LED signal heads offer better visibility, even in direct sunlight and from the side, and a more homogeneous luminous field.
- High degree of availability and flexibility: The SILUX product family includes signal heads equipped with a redundant, separately controlled second LED chain as well as signal heads with optical brightness monitoring.

Your partner

Siemens is your complete solutions provider:

- You will immediately benefit from cost savings because we are able to realize projects at short notice.
- Our holistic planning approach integrates all related requirements of your city, from traffic management and traffic optimization to budgetary constraints and savings.
- Siemens is your one-stop partner for all aspects: Contracts, financing and technologies can be tailored to the project and the customer's requirements.
- Our solutions are prepared for compatibility with future innovative technologies and thus absolutely future-proof.
- As proven in countless reference projects in Germany and abroad, our products stand for highest reliability.



1.2.2 Emission-free (urban) traffic

Clever ideas to protect the climate

**Combining parking and charging offers
gets the era of the electric vehicle off to a good start**

The challenge

If the experts' predictions are correct, by 2020 there will be between two and four million electric vehicles in Germany alone, and up to 19 million worldwide. But these ambitious goals may not be achieved without rapid and far-reaching changes in the traffic and power infrastructure, because the pioneers of emission-free, climate-neutral transport naturally need to be sure that they can charge their batteries at convenient locations.

For electric cars and electric scooters alike, convenient Park & Charge service stations make recharging electric vehicle as easy as buying a parking ticket

Given current technology, it is likely that for the foreseeable time, electric vehicles will have a substantially shorter range than that of vehicles with an internal combustion engine. Hence a dense network of charging stations is needed. The construction of such a system can only be achieved at reasonable expenditures if engineers develop highly intelligent, cost-efficient electrical charging systems that can be installed anywhere.

The solution

At the moment, it takes much longer to recharge an electric vehicle than to refuel a conventional car. Therefore it is important to charge the vehicle at times when it would be stationary anyway, perhaps while the owner is shopping, at the theater, or has an official appointment. In the future, "Park & Charge" service stations will be



needed that make charging the vehicle as simple for the driver as paying for parking. The fees for parking and for "refueling" with electric energy are simply paid with cash or credit card at the same time.

The tariffs for parking and charging can be based on the time and/or the location, depending on the business model. For example:

- Normal parking space: € 2 per hour with a maximum parking time of 2 hours
- eCharging parking space: 3 € per hour with a maximum parking time of 4 hours
- Scooter parking space: € 1 per hour; alternatively, a flat rate of € 2 to include charging

For the drivers of an electric vehicle, it is of vital importance to know where they can recharge their vehicles next time. In cities using dynamic parking guidance systems, vehicles in search of parking spaces no longer present a problem because drivers can find out in advance which "electric" parking spaces and parking garages are currently available. This information enables drivers to plan their route accordingly and reach their destination in the shortest possible time.

The networking of all transport systems at the data processing level together with the use of Internet technology makes it possible to create completely new applications. More and more local authorities provide up-to-the-minute traffic information on the Internet. Of particular practical value is a system function that provides efficient support to modern parking systems: Via the Internet, drivers can reserve an electric parking space in a specific car park, and, if the car park is equipped with an individual parking space monitoring system, customers can even select a particular electric parking space. Such convenient applications are only made possible by the full integrating of all the different data streams. Information really is everything – especially when it comes to electric vehicles.

Your partner

Relying on the wide range of expertise within the company and on many years of practical project experience in all the relevant areas, Siemens offers unique, future-proof solutions for all the challenges posed by electric mobility. The Siemens specialists' unparalleled expertise ranges from comprehensive solutions for power generation and distribution through to intelligent industrial and IT concepts and integrated systems for all aspects of mobility.



1.2.3 Dynamic traffic control that protects the environment

Sustainability has the right of way

How our mobile society goes green:

Intelligent systems influencing traffic according the situation and environmentally sensitive way to keep mobility and air quality under control

The challenge

In many cities, air pollution levels frequently exceed the limits laid down by the European Commission for particulate matter and nitrogen oxides. Traffic contributes significantly to this type of air pollution. External factors e.g. weather could influence the situation in such a way that the critical limit is exceeded. To keep emissions under control without excessive restricting urban mobility, the correct action at the right time is necessary.

The solution

Situation-dependent traffic control provides an astonishingly effective lever. Comprehensive traffic data are used to calculate the emission levels in each section of the road network in real time. Together with current weather information or weather forecasts, traffic-related pollution can be easily predicted across the entire road network. This overview forms the basis for targeted and proactive environmentally oriented traffic control. As conditions change daily, selecting the optimum strategy for the current situation is essential. Often “soft” measures, such as adaptive traffic light control for improving traffic flow, bring a significant reduction in air pollution.

In particular in conurbations, environmentally sensitive traffic control can help keep traffic-related pollutant emissions under control

Key benefits

- Continuous calculation of current emission levels and air quality data across the entire street network
- Collection and display of online measurement data from meteorological and air quality monitoring stations
- Use of traffic, meteorological and air pollution data as trigger criteria for manual or automatic strategy selection
- Variety of actions: from improving traffic flow and intelligently shifting emission loads into less critical areas through to establishing dynamic environmental zones
- Success measured by separate reporting of the traffic-induced share of overall pollution
- Network-wide view of the traffic and environmental situation promotes the acquisition of long-term experience and insights, such as the detection of shifting effects

Your partner

The traffic management centers installed by Siemens integrate diverse aspects of urban mobility in one central system. This supports holistic decision-making and enables the implementation of strategies across different modes of transport. Open interfaces to existing sub-systems and the integration of proven emission and air quality models ensure smooth and gapless integration, from both a technical and an organizational point of view.

Experience gained with more than 1,000 traffic control centers planned and implemented by Siemens during the company's long history of road traffic engineering is reflected in well-established and sophisticated mobility solutions, taking into account all factors from safety to the environment.



1.2.4 Shorter travel times and less congestion on motorways

Increased capacity – reduced emissions

How active traffic management and advanced control systems can help improve efficiency and effectiveness of motorway use

The challenge

Particularly, but not exclusively, in conurbations and metropolitan areas, constantly increasing traffic volumes are leading to more and more congestion on freeways and expressways. During peak times in particular, this has extremely negative impacts on travel times, traffic safety and traffic-related pollutant emissions. Consequently, the responsible authorities are looking for maximally sustainable ways of improving traffic flows without expensive construction measures to expand the motorway network.

The solution

Using current traffic data as input, active traffic management approaches and dedicated control systems can manage high traffic volumes dynamically to counteract impending congestion. Active traffic management improves vehicle throughput and generates incident warnings – for added safety on the road. Innovative technologies help achieve this goal. Automated processes avoid the risk of delayed reaction that would be present with manual control. This so-called congestion management is based on a combination of strategies that help optimize infrastructure use and generate measurable added value for the transport network.

Active traffic management includes for instance:

- Speed harmonization
- Temporary shoulder use
- Ramp metering
- Network control/diversions
- Congestion warning
- Environmental information

Successes

In the scope of different projects, the effectiveness of modular traffic management systems was assessed using before-after comparisons. The studies showed the most significant results in terms of accident reduction and prevention. But also in terms of speed harmonization and congestion or bottleneck prevention, the traffic systems have impressive effects.

Here are some striking results of current studies:

- 35 percent fewer accidents¹
- 31 percent fewer injuries to road users²
- 20 percent reduction in congestion hours³
- Enhanced road capacity
- Improved traffic synchronization and higher capacity during peak hours

Your partner

Siemens can look back on 25 years of experience in supplying and installing traffic control systems, from design, engineering, installation and commissioning right up to user training, system maintenance and related services. The key component of our solutions is our Sitraffic Conduct+ system, using algorithms for automated and semi-automated control designed for optimizing traffic flow and providing the motorists with timely warnings on all kinds of accidents. The highly reliable system is operational 24 hours a day, 7 days a week.

Speed harmonization is one of many options in active traffic management aimed at reducing congestion and accident numbers



¹Source: Highway authority South Bavaria, Germany

²Source: Highway authority South Bavaria, Germany

³Source: ASFINAG, Austria

1.3 Security

1.3.1 Enhanced tunnel safety

Safe underground passage

In road tunnels, thanks to modern technologies, the risk of being involved in an accident is lower than on “normal” road sections

The challenge

Not only etymologically, anxiety has to do with the feeling and fear of constriction and hence is not an uncommon sensation for motorists driving through a tunnel. That's easy to understand: The lanes are generally narrow, the ceiling rather low, and daylight can only be hoped for as a more or less far-away relief. And in case of an imminent collision with other vehicles, there is just no room for evasive maneuvers. So even people not prone to claustrophobia may feel queasy while driving through a tunnel.

Advanced safety systems in modern road tunnels help ease the fears not only of travelers, but also of tunnel operators

The horrible images of accidents such as the ones in the Mont Blanc, Tauern or Gotthard tunnels may only be the one second away that a driver needs to react – a danger that the authorities responsible for tunnel safety are naturally well aware of.

The solution

Fortunately, over the past years, a whole range of safety systems for tunnels have been brought to perfection, calming the nerves of tunnel users and tunnel operators alike. A few examples:

Height control: If a vehicle is too high, it may rip down parts of the technical tunnel infrastructure, putting other tunnel users in jeopardy. Using light beams, radar or other technologies, height control systems measure the height of all vehicles and, in case of excessive dimensions, activate variable message signs requesting the driver to stop before the tunnel.



Dangerous goods detection: Knowing beforehand which kinds of hazardous materials are currently being transported through the tunnel makes it easier for emergency forces to assess the situation in case of an incident. Modern technologies read the Kemler code on the truck's hazardous material sign upon entry and exit, so that the control center is always fully and accurately informed on the number of trucks with various kinds of dangerous goods in the tunnel.

Modern smoke and fire detectors: A variety of systems can be used to defuse the most dangerous situations in tunnels as soon as possible. Video systems and smoke detectors enable the early detection of smoke formation, which is usually the first sign of a fire. Copper and fiber optic cables can be used to sense heat build-up. Based on this information, a computer system locates the origin of a fire within a few meters. Depending on the actual location of the fire, the tunnel operator can then trigger one of several predefined evacuation scenarios and tell the fire brigade how best to reach the fire source.

Wrong-way driver detection: As tunnels generally offer hardly any room for getting out of the way, wrong-way drivers present an even higher risk than on the open road. Traffic detectors can be installed upstream of the tunnel entrance to identify vehicles driving in the wrong direction. Automated or semi-automated scenarios enable fast and effective responses such as closing the passing line or blocking the tunnel completely.

Incident warning: In a tunnel, even minor incidents may present a safety hazard for road users. For this reason, tunnels can be equipped with several surveillance systems such as video cameras. Automated incident detection systems support the operator in monitoring tunnel traffic and selecting the appropriate control measures.

Environmental information: Modern sensors constantly monitor safety-critical values in the tunnel, for instance nitrogen oxide level, visibility range and wind velocity. An algorithm calculates which and how many ventilators or jet fans have to be activated.

Your partner

All tunnels equipped with modern Siemens technology taken together would stretch for an impressive 500 kilometers. One of the first tunnel projects carried out by Siemens was the main tunnel through the Arlberg in Tyrol/Austria in 1978, more than 30 years ago. Our performances have always been as customized as the tunnel projects, no matter if we were involved as general contractor or as supplier of individual components. The key element of the Siemens tunnel technology portfolio is our Sitraffic ITCC (International Tunnel Control Center), an integrated tunnel control system that allows 24/7 tunnel operation and reliably controls both tunnel traffic and the entire operations technology (mechanical and electrical). A wide range of sophisticated algorithms for automated and semi-automated control help keep the tunnel users safe.



1.3.2 Fast response times help prevent secondary accidents

Optimum preparation for the worst case

Fast, effective and reliable responses to any incident are among the special strengths of modern traffic control systems

The challenge

Incident handling systems have to meet two key requirements: They have to be able to quickly detect and identify any deviation from normal operation so that a maximum number of road users can be warned in time, emergency services can be called in, if required, and the situation resolved as soon as possible. On the other hand, the information must be reliable so as to prevent false alarms.

The solution

One of the key functions of modern traffic control centers is the accurate analysis of traffic situations and the fast and reliable detection and localization of traffic incidents. Based on measured values and their subsequent analysis, the system automatically provides drivers with the relevant information and the system operator can issue warnings.

For the analyses, local or integrated algorithms as well as traffic models can be used. A convenient medium for providing drivers with information on congestion, accidents or other incidents are variable message signs, displaying speed limits or passing bans, for instance. Ideally, drivers receive information not only about the incidents on the route ahead, but also on available diversions and alternatives.

Key benefits

The fast and accurate analysis of traffic situations and the reliable identification of traffic incidents helps prevent secondary incidents and reduce average travel time. Moreover, emergency services can be alerted earlier and directed to the scene of the accident.

All this increases overall network capacity and helps avoid premature structural capacity extensions, with roadworks that would put additional strains on the traffic situation. Studies evaluating various traffic control systems currently in use in terms of their effects on the number of injuries, fatalities and secondary accidents revealed that incident analysis and incident management make an important contribution to the socioeconomic benefits of systems providing active traffic control.

Your partner

For several decades already, Siemens has been installing powerful incident analysis systems for motorways and tunnels around the world. These systems have proven their ability to deliver fast and appropriate responses to incident-related changes in the traffic situation, with only a minimum rate of false alarms. Sophisticated traffic analysis with a range of ways to inform the system operator in the control center in conjunction with various traffic intervention options allows situation-tailored traffic control, which in turn leads to higher acceptance rates, higher efficiency and ultimately a higher return on investment.



Timely warnings for motorists made possible by fast and reliable incident detection contribute to preventing accidents and improving capacity

1.3.3 Intersection control

Zero compromise on operational safety

Intersection control is one of those areas where equipment certified according to the strictest norms provides the highest benefits

The challenge

Safety has the highest priority when it comes to selecting the right control systems for intersections. System malfunctions leading to erroneous traffic signalization strongly increase the risk for accidents, with potentially fatal consequences. Consequently, decision-makers have to be able to completely trust the technologies chosen.

The solution

In Europe, several standards govern the safety and security requirements for technical equipment. The European standard EN 61508, for instance, describes the different safety classes. In Germany, the HD638 standard and the associated DIN VDE 0832-100 directive define the mandatory safety requirements for traffic signals. Traffic light systems at intersections have to meet the requirements of the second highest class, SIL-3. Using controllers certified according to the strictest safety standards guarantees a maximum level of safety in this area.

Your partner

Siemens controllers are certified according to the new DIN EN 61508 standard, which stipulates the safety requirements for electric, electronic and programmable electronic systems. This certification ensures that the systems are intrinsically safe, and malfunctions causing traffic hazards are virtually excluded.

Ever since their introduction to the market, our controllers have been designed and certified for highest safety, as confirmed by various independent TÜV studies. Making our products as safe as possible requires high investments, which we gladly continue to make – because with us, there is no compromising on safety.



For intersection control, highest safety standards are of utmost importance because faulty signal switching routines can drastically increase the risk of accidents

1.3.4 Bright and energy-efficient – street lighting from Siemens

Good news for public coffers and the environment

Clever replacement and upgrading projects for street lighting make it easy to strike the difficult balance between economy and ecology

The challenge

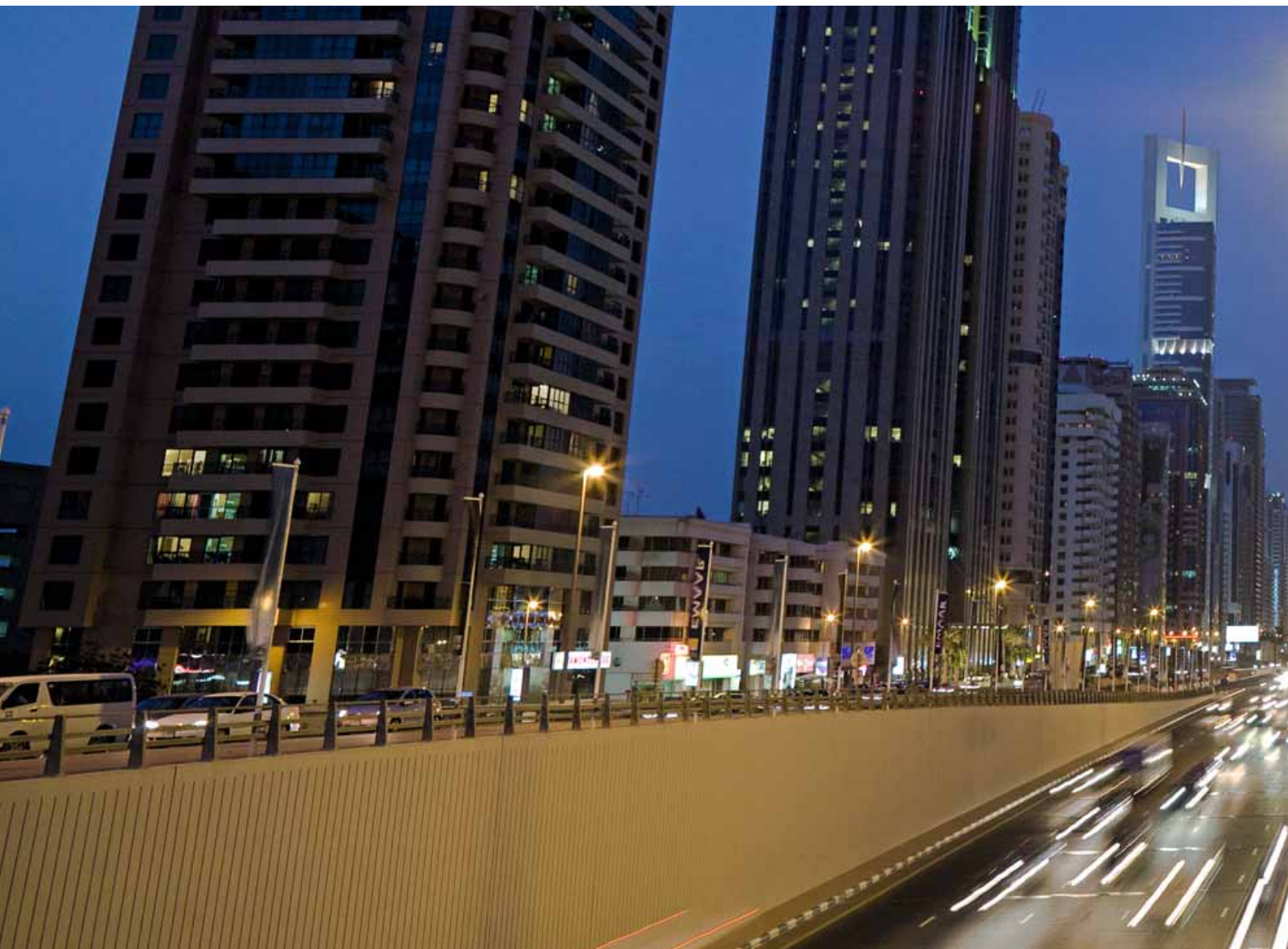
Limited public funds, stricter regulations and the ever more important aspect of environmental protection constantly increase the pressure on the authorities responsible for street lighting.

They have to meet the multiple goals of reducing energy costs and minimizing the environmental impact while ensuring optimum traffic safety and maximum system availability. Yet energy prices, and consequently operation costs, continue to rise. Programs aimed at reducing CO₂ emissions oblige cities to lower their overall power usage.

Add to this new laws such as the EU-wide ban on mercury vapor lamps as of 2015, and it becomes clear why municipal street lighting systems are currently under general scrutiny.

The solution

A key lever for striking the difficult balance between economy and ecology is a systematic increase in efficiency, which can best be achieved through intelligent replacement and upgrade projects. They help reduce costs and meet current and future legal requirements at the same time. This is the only way to ensure that the cities' street



lighting equipment as an integral part of city infrastructure will continue to contribute to public safety and security on streets and sidewalks.

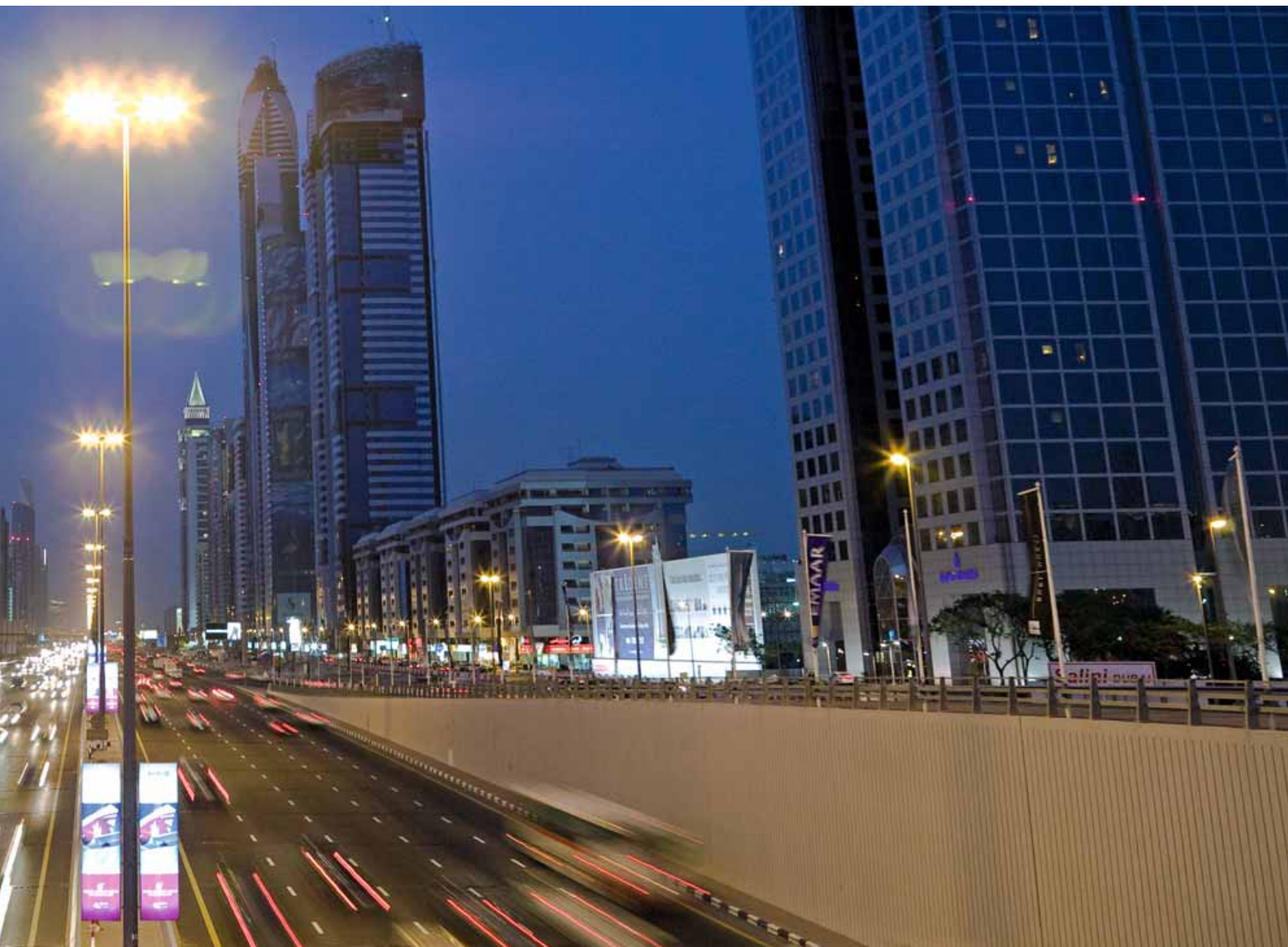
In the past, we generally took the existence of these facilities for granted and only became aware of their actual importance when they were lacking or not properly working for once. Street lighting facilitates navigation and makes intersections and pedestrian crossings easier to perceive and safer to cross. This helps reduce the risk of accidents on roadways, cycle paths and sidewalks. Well-lit public spaces are also more secure at night. Pedestrians feel safer because they can see where they are going and recognize all kinds of hazards earlier and more easily. Ultimately, street lighting makes a city more attractive, improves the quality of life for its citizens and supports tourism and city marketing by putting important cityscape elements such as monuments, bridges and city halls in the right light.

Your partner

If it comes to making street lighting more efficient and thus future-proof, Siemens is the right partner. Our customized solutions based on innovative technologies

and processes support the responsible municipal authorities in achieving their goals (safety, energy savings and high availability) at affordable costs. We also offer maintenance services for street lighting systems, from regular inspection and lamp or light source replacement right up to on-call service, and installation and operation of management centers for street lighting. For cities planning to modernize their existing street lighting, we can do an inventory survey based on Geographic Information System (GIS) technology, develop optimization measures and carry out the actual upgrading project. On request, we even take over the complete operation of the street lighting system based on defined performance criteria and within a fixed budget.

Improved efficiency is key to keeping urban city lighting up to its important tasks in the future





Part 2

Efficient workflow for optimum results



2.1 Data security

2.1.1 Secure system access

So far and yet so close

How remote services can significantly increase the availability and reliability of transport systems in the future

The challenge

In transport systems, availability and reliability are becoming more important than ever and the demand for fast responses in case of shutdown keeps growing, not least to avoid increases in the cost of providing services. At the same time, traffic managers' are increasingly looking for proactive services that will help them prevent or remedy problems before they lead to network shutdowns and costly response action.

The solution

All this will give remote services even more weight in the future. The new technical capabilities of modern products and the shift in focus away from mechanical and electrical product characteristics to software and IT keeps changing the composition of product maintenance and service portfolios. Today, IT-related and knowledge-intensive professional services are an ever more central part of service provision. In addition, the increasing networking of products and IT solutions along with advanced communication technologies enable the development of new remote services. It is often more efficient, and faster, to first determine the cause of the problem by remote access and resolve it remotely, if possible. But even in cases where the problem cannot be resolved using remote access, the information gained "remotely" can be very useful

for service staff on site. Furthermore, it makes it possible to remotely monitor technical parameters and diagnose incipient faults at an early stage.

However, there are a number of vital conditions governing the practical applicability of remote solutions in traffic engineering:

- Protection of the intranet systems against threats and attacks
- Strictly regulated authentication and authorization of persons granted access to the system
- Permanent access monitoring using time stamps a logbooks
- Secure broadband connections over a virtual private network (VPN)

Your partner

All this and more is offered by the remote solution developed by Siemens and deployed internationally, where it has proven its reliability and high degree of efficiency. Its many benefits include for instance:

- Easy, user-friendly application
- Ubiquitous access to the customer's system via the Internet
- Common remote service platform certified under both CERT and ISO 27001 and meeting the requirements of all relevant safety standards and legislation
- High availability through redundant availability of essential components worldwide (Fürth, Singapore, Malvern)
- Future-proof thanks to continuous development
- 24/7 service
- Minimal administration effort for the customer



The trend towards realizing functions mainly on the software and IT level has a strong impact on the product maintenance and services portfolio for traffic systems

2.2 Cost reduction

2.2.1 LED signal heads

Up to 90 percent lower energy usage

Green light for new signal heads:

Highly efficient LED signal heads go easy on public coffers and the environment

The challenge

Over the past 25 years, many old traffic signal heads with conventional filament lamps (75 or 100 W) have still been in use nearly everywhere in Germany. Upgrades, though urgently required, have often been postponed for reasons of cost. Because of their many operating hours, numerous traffic signal installations are badly in need of renewal and their operating costs are much too high. It would be much more cost-efficient to replace them with energy-saving and environmentally friendly systems.

The solution

Modern Light Emitting Diode (LED) signal heads need up to 90 percent less energy than conventional signal heads with filament lamps. Their use leads to substantial reductions in overall energy consumption and costs. At the same time, the extended service life of the LEDs minimizes the operating and maintenance costs for the systems because, in contrast to conventional light sources, LEDs do not need to be replaced at regular intervals.

But there are more advantages to LED signal heads than economic and ecological savings. Modern LED optics ensures maximum visibility under all weather and lighting conditions, during the day as well as by night. LED signal

Modern LED signal heads do not only offer many ecological and economic benefits, but also increase traffic safety thanks to their optimum visibility

heads are maximally reliable and their colorless diffusing lenses prevent the occurrence of phantom light.

Key benefits

- LED light sources save up to 90 percent of energy and have a much longer service life: As experience shows, conventional filament lamps have to be replaced after 4 to 6 month of service while LEDs work reliably for several years, maximizing signal availability and minimizing maintenance costs.
- Enhanced traffic safety: LED signal heads offer better visibility, even in direct sunlight and from the side, and a more homogeneous luminous field.
- High degree of availability and flexibility: The SILUX product family includes signal heads equipped with a redundant, separately controlled second LED chain as well as signal heads with optical brightness monitoring.

Your partner

Siemens is your complete solutions provider:

- You will immediately benefit from cost savings because we are able to realize projects at short notice.
- Our holistic planning approach integrates all related requirements of your city, from traffic management and traffic optimization to budgetary constraints and savings.
- Siemens is your one-stop partner for all aspects: Contracts, financing and technologies can be tailored to the project and the customer's requirements.
- Our solutions are prepared for compatibility with future innovative technologies and thus absolutely future-proof.
- As proven in countless reference projects in Germany and abroad, our products stand for highest reliability.



2.2.2 Acceleration of local public transport (PT)

Through the city faster and cleaner

More and more local transport managers are bringing their cities up to speed by optimizing their PT services. They are being helped by technically sophisticated modules for prioritizing public transport

The challenge

It's hardly a new insight to say that there are widely differing burdens on the various modes of transport. In cities in particular, the relentless rise of motorized private transport leads to significant traffic disruption and hence to increased environmental pollution. By shifting mobility demand in appropriate ways to public transport, many things could be demonstrably improved. To make that happen, however, the attractiveness of PT services needs a boost. At present, acceptance is still rather low in many places, especially because of long journey times and poor timekeeping.

The prioritization of public transport benefits everybody involved: operators, passengers, the environment – and ultimately also the motorists

The solution

The installation of a module for prioritizing PT at signal-controlled intersections makes it possible to kill two birds with one stone. An appropriately equipped guidance system not only increases travel speeds and improves punctuality on public transport services with minimal impact on private vehicles, it also allows PT operators to economize on use of vehicles, or alternatively to improve services using the same number of vehicles. The bottom line is that all stakeholders benefit: operators, passengers, the environment and – because transport demand is increasingly shifted to public services – even motorists.

Guaranteed right of way for public transport is usually managed locally. The bus or tram determines its position (using markers or GPS technology) and, as it approaches the stop line, relays its position to the local controller. This adjusts the signaling by extending or shortening of a green phase or even by inserting a new phase, so that on reaching the stop line, the bus or tram receives a green light. On the one hand, the task of the guaranteed-right-of-way system for public transport is to dispatch the



vehicle over the intersection without stops and loss of time – on the other hand however, it is of course desirable to keep the impact on private transport as small as possible.

Key benefits

According to a study by Nürnberger Verkehrsbetriebe VAG, buses and trams waste up to 27 percent of their total travel time in waiting at intersections. For public transport, this proportion of time can be drastically reduced using guaranteed right of way. If it is deemed politically desirable, the UTC (Urban Traffic Control) system can be programmed in such a way that PT waiting times at intersections are cut to zero. However, this kind of solution requires the availability of a dedicated bus or tram lane, which in turn may have a massively impact on private transport.

A reduction of just 10 percent in the total travel time on a given public transport route (provided that the service intervals are kept the same) offers the opportunity to cut the number of vehicles required to cover the PT demand by about 9 percent, bringing with it an enormous savings potential in terms of equipment, staff and maintenance.

Guaranteed right of way for public transport will also influence the traveling public's decisions on whether or not to use buses or trams. The attractiveness of public transport is largely dictated by travel times and the punctuality of buses and trams, two of the very aspects that are addressed by the guaranteed right of way for public transport vehicles.

The extent to which the attractiveness of public transport can be boosted is directly dependent on the degree to which the modal split changes. A split that is more heavily biased towards public transport offers advantages with respect to environmental impact (fewer private vehicles in the cities) and traffic density (fewer traffic disruptions and hence less damage to the environment).

Guaranteed right of way for public transport not only offers advantages in terms of travel times, it also cuts the number of involuntary stops for buses. Scientific analyses have shown that in terms of exhaust emissions, a stop is the equivalent of 60 seconds waiting with a running engine. The implication is that a reduction in the number of buses stopping at intersections has a very positive impact on exhaust emissions.

Your partner

For a long time, public transport priority has been a major part of the Siemens "Complete Mobility" concept, which forms the basis for the development of holistic, intermodal solutions for the transport of the future. Over that time, the company has implemented numerous projects for bus and tram acceleration in cities around the world.



2.2.3 Energy contracting

Extended scope for decision-making

Why the timely modernization of traffic signals and street lighting pays off even in times of tight public budgets

The challenge

The growing public pressure to save energy and reduce emissions has pushed measures for modernizing traffic lights and street lighting to the top of the to-do list in many cities. These plans, however, are often not realized due to tight municipal budgets. What options do local authorities have to overcome this dilemma?

The solution

Numerous cities have already benefitted from innovative financing solutions such as leasing or hire-purchase contracts for modern traffic lights and street lighting systems. These financial tools enable municipal entities to invest in modernization without their budget plunging into the red.

The leasing rates are covered by the savings in energy and maintenance costs generated by the new technology. Moreover, fixed rates across the entire contract duration provide the transparency needed for solid budgetary planning. Upon expiry of the contract, the city can take over the equipment at no additional cost.

Numerous cities are already benefitting from innovative financing solutions for their modernization projects in the area of traffic lights and street lighting

As a practical alternative to direct purchase, these so-called “Energy contracting” schemes offer extra flexibility, cost-effectiveness and transparency, easing the strains on both the city’s budget and the environment. Some German cities, including Freiburg, have already adopted this innovative path and are benefitting now from modern traffic light systems and the resultant savings.

Key benefits

- Reduced investment risk
- Modernization generates added value and improves operation reliability
- Lower energy and operational costs
- Positive environmental effects such as reduced CO₂ footprint

Your partner

Innovative financing solutions for modern traffic light systems and street lighting are one of the areas of expertise of Siemens Finance & Leasing. Instead of limiting their financial scope through huge one-time investments, local authorities can lessen the strain on their budgets by distributing the costs over a longer period with leasing or hire-purchase contracts. Another advantage: As the contract period can be agreed on an individual basis, the rates can be completely paid for by the savings achieved through the modernization. What could be better than a complete package including consulting, installation and financing – paid for entirely by energy savings?



2.2.4 Outsourcing

Good prospects despite tight budgets

A modern business model is a great first step and a sure way to beat tight budgets and move successfully towards the future

The challenge

For cities and local authorities there is no escaping the complex topics and tasks of the 21st century. Multiple challenges are facing the public sector in the shape of demographic change, growing urbanization, legislative reforms and technological progress. While citizens come to expect more and demand higher levels of service from the authorities, resources and funds are shrinking, or remain constant at best. This calls for innovative solutions that guarantee long-term planning security despite all problems.

The solution

Given the strains of scarce resources and tight finances, a situation that is likely to grow even worse in future, the public sector too is looking for new models and revised structures and processes in order to remain capable of action. One model that offers significant advantages is the outsourcing, for instance entrusting private partners with public tasks concerning traffic and street lighting systems.

Key benefits

- A broad spectrum of financing models is available to match budget constraints and overcome investment backlogs.
- The performance of traffic and street lighting systems becomes more transparent.
- Fully defined services (Service Level Agreements) ensure planning reliability and cost transparency.
- Long term cost-efficient operation at higher levels of quality and availability can be secured.
- In addition, local entities benefit from technical innovations and the modernization of their traffic or street lighting systems.

Your partner

With comprehensive knowledge and many years of experience in the public sector, Siemens can make valuable contributions to addressing the tasks of cities and local authorities. As a strategic partner, respected corporate citizen and global employer, Siemens is constantly innovating the field of road transport. Throughout the world, many cities that care for better protection and support of their inhabitants are already reaping the benefits.

The outsourcing of certain tasks in the operation and maintenance of traffic lights and street lighting equipment offers substantial benefits, for instance long-term planning security

In these fields, Siemens expertise delivers the following advantages:

- No need to expand in-house resources to cover service peaks; reduced labor and administrative costs and greater efficiency
- Broad range of services for enhanced planning reliability and cost transparency
- Continuous modernization of infrastructure and benefits from technological developments at predefined costs
- Outsourced Asset Management leads to reduction of capital costs and greater planning reliability



2.2.5 Application Service Providing (ASP)

Virtual control – real savings

Using innovative ASP (Application Service Providing) models, local authorities and highways agencies can take advantage of efficient traffic management without having to invest in hardware

The challenge

Even in small or mid-size cities and the outlying areas of larger population centers, the demands on efficient traffic management are growing steadily. These are typical places where the necessary investment in the appropriate hardware for classic, locally-implemented systems is often difficult to push through.

The solution

In many industries, modern communications options using the Internet have long since established the practice to lease applications rather than buy them. ASP is now an intelligent option in the field of traffic management too.

Customers can log in from any office-based or mobile computer – under maximum security conditions – and access a central traffic control system suitable for cities of any size, operated by a professional provider. An optimized graphical user interface displays the various systems of the network in question, including all relevant data on their condition and operating status. In case of device failure, the responsible service staff can be notified automatically. This gives small cities, regional highways agencies or for districts within larger cities rapid access to all the relevant functionality of a traffic computer, without the need for dedicated infrastructure or specialized staff at the transport authority.

Key benefits

- Traffic control functionality without the capital expenditure for a central system
- Excellent security standards
- Fast commissioning
- Flexible communication standards
- Easy scalability of all system components in terms of size and function range
- Proactive services, including regular system updates
- Automated maintenance notifications
- No operating risks as presented by central systems
- No need to employ specialized manpower or other resources for IT system operation
- Use of existing desktop PC's, no need for additional hardware or software

Your partner

With the proven skills of the market leader, Siemens undertakes professional operation of control centers (for traffic control and management) using tried and tested transport applications, combined with extremely high standards of security and reliability – all at a reasonable price. In future, besides selected functions featured in our Sitraffic Scala central traffic control system for the control of traffic signals, many functions of the Sitraffic Concert traffic management center will also be available as part of ASP model.



In the age of modern communication, entrusting traffic control to a professionally operated external system is the clever alternative

2.3 Availability and reliability

2.3.1 LED signal heads

Up to 90 percent lower energy usage

Green light for new signal heads:

Highly efficient LED signal heads go easy on public coffers and the environment

The challenge

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Modern LED signal heads do not only offer many ecological and economic benefits, but also increase traffic safety thanks to their optimum visibility

heads are maximally reliable and their colorless diffusing lenses prevent the occurrence of phantom light.

Key benefits

- LED light sources save up to 90 percent of energy and have a much longer service life: As experience shows, conventional filament lamps have to be replaced after 4 to 6 months of service while LEDs work reliably for several years, maximizing signal availability and minimizing maintenance costs.
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Your partner

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- Our solutions are prepared for compatibility with future innovative technologies and thus absolutely future-proof.
- As proven in countless reference projects in Germany and abroad, our products stand for highest reliability.



2.3.2 Service contracts

24/7 service for guaranteed system availability

Customized service contracts ensure reliable system operation at low and predictable costs

The challenge

Only absolute reliability in traffic systems can ensure traffic safety and minimize the risk of accidents. Operators must be able to rely on the quality and availability of these systems. However, whenever systems are in continuous operation over a long period, hardware components may fail, existing software may not correspond to the technical state of the art anymore, and new operating staff may not be properly trained. All this can considerably compromise the performance of the systems. Consequently, traffic managers everywhere are looking to outsource certain tasks to expert service providers so that they can focus on their core responsibilities.

The solution

A custom-tailored service contract with a reliable partner helps prevent system failures and guarantees that the systems comply with all applicable laws and regulations, minimizing the liability risks for the operator. Moreover, the more even distribution of maintenance costs over time protects the investment. The scope of the service contract can be defined as needed, including for instance a response time guarantee, extended working hours or 24/7 on-call service.

Your partner

As your reliable service partner, Siemens offers all these benefits and more. With our services, we always go the extra mile. For instance, in case a system stops working we are there rapidly to repair or provide replacement

equipment – for optimized system efficiency and reduced probability of malfunctions or failures.

We offer a custom-tailored service portfolio that helps protect our customers' investments and optimize their systems along the entire life-cycle.

Key benefits

- Consistently high level of service quality across the entire life-cycle of the system
- Investment protection and guaranteed constant system optimization
- Highly qualified and experienced staff; 24/7 accessibility of one single contact partner for all service issues
- If a component fails or needs repair, certified specialists immediately initiate the required measures, provide spare parts or restore lost data
- Guaranteed performances and response times
- Guaranteed availability and delivery of spare parts (express delivery, if necessary)
- Substantially reduced risk of operational failures
- Predictable life-cycle costs
- Risk minimization in all areas

Service agreements with a reliable partner allow local traffic managers to concentrate on their core tasks



2.3.3 Quality management

Everything under control

Continuous quality management not only ensures the full operability of intelligent traffic systems, but also supports the selection of the best management strategies for minimizing the negative impact of traffic on the environment and on people's quality of life

The challenge

Effective and targeted traffic control and guidance functions as well as detailed analyses of traffic processes are the basis of intelligent traffic systems. In order to ensure a constant high level of efficiency, the operability of certain system components has to be permanently monitored and any deviation from the norm has to be reported immediately.

Traffic lights, for instance, are an important traffic management tool for handling high traffic volumes at intersections safely and efficiently. They can also take over certain strategic traffic management functions. If they don't work correctly, high economic damages due to traffic disruptions, long waiting times or accidents may result. Not to forget the negative environmental effects of increased pollutant and noise emissions.

The high complexity of the traffic signal switching process, even when considered in isolation, is demonstrated by a simple look at the multitude of factors playing a role, from planning parameters and targets, traffic requirements and street layout, control processes and the installed technology right through to the individual know-how of the traffic engineers involved. Hence the effective and reliable design of these processes is one of the biggest challenges in traffic engineering.

The solution

Continuous quality management is the tool of choice for executing this difficult task in a systematic way. The most important condition for the systems to sustainably meet all quality targets is faultless operation of traffic guidance technology at all times. To begin with, functions and performance must be entirely documented; secondly they need to be maintenance-friendly and easy to adapt to changing requirements and technological improvements and innovations; and thirdly they must be so robust that maximum system availability is assured.

Moreover, quality management facilitates the achievement of process optimization targets, supports the efficient use of resources for effective measurements and prevents unproductive error costs. The documentation

of quality performance makes communication with political decision-makers and the public easier, contributes to creating a positive quality image and improves legal protection for liability issues. Quality management is even more important in all cases where private companies are contracted to operate intelligent traffic systems.

Major requirements in the development of quality management methods are efficiency and fitness for practical use. These are easier to meet when established concepts such as regular traffic equipment inspection or safety audits of roadways are integrated. An important factor for success is the extensive application of automated processes in quality analysis, using the data bases of modern traffic management systems. A quality management system helps the traffic engineers understand the implications of the registered values and figures and select the most useful management strategies when it comes to reducing the negative impacts of traffic on people and the environment.

Your partner

Local transport managers stand to benefit most from a quality management system set up in collaboration with an experienced system supplier offering service, planning and software tools under one roof. For this purpose, Siemens has expanded its portfolio to include special services for the smooth introduction of a quality management system during ongoing operation. It goes without saying that all previously contracted services can be supplemented with the new contract contents at any time and with zero disruption.



Comprehensive process automation is an important success factor in quality management



Part 3

General



3.1 Financing concepts

3.1.1 Financing options

Customized financing models for any needs

How attractive financing programs can help initiate urgent modernization projects in spite of limited financial means

The challenge

There is one thing that the world's rapidly growing metropolises have in common. They all need modern traffic management systems that will ensure safe and efficient transport and minimize the environmental impact of mobility. For years, however, governments and the private sector have often neglected the necessary investments so that the transport infrastructure is lacking in Europe and on other continents. Many public transport systems simply do not meet today's requirements.

Everywhere the call for better and safer transport solutions keeps getting louder, but frequently the realization of urgently needed modernization projects is thwarted by empty public coffers. So the responsible public entities

are asking themselves how to ensure the constant inflow of the necessary financial means for covering demand.

The solution

In fact, there is the need to totally rethink the available ways of financing public projects. The private sector has long since begun to offer attractive alternative models for financing, building and operating public infrastructure projects – meeting with increasingly positive response from public authorities. Why should models such as leasing or hire-purchase contracts, which have been working well in the private sector for decades, not be drawn on profitably by the public sector, too? These financing models help prevent investment backlogs and enable the timely, risk-free implementation of urgent projects for the benefit of all citizens.

Your partner

In cooperation with Siemens Financial Services, we offer public authorities a range of customized financing solutions that have already enabled the implementation and operation of state-of-the-art traffic management systems all around the globe.

In Berlin, for instance, Siemens operates a traffic management center, while other cities benefit from Siemens energy contracting to finance the costs for modernizing outdated equipment through the savings achieved. A prime example is Freiburg, a Southern German city with a strong tradition of ecology-minded policies. Here the latest in LED technology from Siemens makes the urban traffic light systems maximally reliable. The modernization investment is being refinanced over 15 years on the basis of a financing model specially developed by Siemens Financial Services.

The best thing about the project is that the rates are completely paid for by the energy savings achieved with the new LED technology. Savings that do not only cut Freiburg's energy costs, but also help reduce the city's CO₂ footprint.

When it comes to realizing vital traffic infrastructure projects, custom-tailored financing models create maximum scope for action – to the benefit of all citizens



3.1.2 Public Private Partnership

Overcoming the investment backlog

Together with private partners, the public sector can realize solutions that will benefit everybody

The challenge

The capital expenditures for keeping public infrastructure up to its tasks are bound to rise further over the coming years. These investment needs must somehow be covered, which cannot be done with traditional financing models alone, as everybody involved is well aware. Problems call for technically effective and economically efficient solutions. This is the double challenge that public decision-makers are facing every day.

The solution

The concepts developed in the 1990s for the provision of public services with the support of private partners – so-called Public Private Partnerships – are more important than ever. Public Private Partnerships are long-term cooperation agreements entrusting private partners with the provision of selected public services. This enables the public authorities to focus on their core tasks. On the

basis of this concept, public services such as traffic management systems can be financed entirely or in part with private funds.

Key benefits

- The project's positive cash flow serves to repay the investment funds
- The partners establish a so-called Special Purpose Company (SPC)
- The risks are adequately distributed between the partners
- The involvement of many consultants and experts ensures a detailed documentation
- The problem of severely limited public funds is solved

Your partner

Siemens is a reliable partner in Public Private Partnerships in the area of traffic infrastructure. As system and solution provider for traffic management systems, Siemens closely cooperates with the customer in developing a tailored blueprint for urban or intra-urban traffic infrastructure.

Efficient cooperation of public and private partners is playing an ever more important role nearly everywhere in the world when it comes to solving pressing traffic problems

A Public Private Partnership makes it also possible to arrange one regular payment rate covering the costs for several components, for instance:

- Supply, modernization and replacement of equipment
- Installation, commissioning and infrastructure
- Consulting services
- Maintenance services
- System management and availability



3.2 Urban attraction

3.2.1 Making public transport more attractive

Phenomenal intermodality

Experts have agreed since long time that the urban mobility of the future must necessarily be intermodal. The good news: We already have the technologies for efficiently networking the most important traffic modes

The challenge

Urbanization, demographic change, climate change, scarce resources – public authorities in conurbations and densely populated areas in particular have to face up to a whole range of huge challenges. In the eyes of most transport scientists, the solution is quite obvious: The complex interaction between the current megatrends requires a close interplay between different transport modes. But in order to convince drivers to leave their cars in favor of other transport types, public transport systems have to become much more attractive.

The solution

Of course there is no cure-all that will induce all road users to distribute their trips over the available transport modes in ideal proportions. But there are quite a few concepts and technological options for gradually nudging the modal split in the right direction in a city. The three most important approaches are:

Giving priority to public transport

These days, local public transport does not really score well with many citizens when compared with private transport. Public transport is less flexible and the journey often takes longer. Journey times, however, are one parameter that cities can easily improve to increase the attractiveness of public transport. All that's needed are systems giving priority to public transport at intersections. When these systems detect an approaching bus or tram,

they adapt the traffic light switching routine in such a way that the lights are green for the public transport vehicle, if possible.

Public transport prioritization has many and far-reaching advantages:

- The average speed of public transport vehicles rises, leading to shorter travel times in buses/trams so that passengers lose less time, especially during peak hours.
- Public transport schedules become more reliable.
- Accelerated public transport services attract additional passengers so that there are fewer private vehicles on the streets within the same period of time.
- The emissions level of public transport vehicles is reduced because they spend less time in congestion an overall traffic flow is improved.

Creation of buses-only lanes

Another way of reducing travel times and improving punctuality is the creation of lanes reserved for buses and trams, so that these can progress on their route largely separate from other traffic. Dedicated bus lanes clear the way for buses and trams, so to speak, allowing them to proceed speedily even on street sections and across junctions with high traffic volumes. Besides buses and trams, other types of vehicles such as taxis or emergency vehicles can be authorized to take these dedicated lanes.



In order to prevent “ordinary” motorists from using the bus lanes, buses and trams and/or bus lanes can be equipped with surveillance cameras for registering the number plates of any unauthorized vehicles. Punishing such infractions consistently with sizeable fines will soon convince motorists to keep off bus-only lanes.

Intermodal transport information

A new era of information is dawning in the world of urban transport. A city’s attractiveness depends on numerous fundamental factors, a growing number of which are transport- and traffic-related, such as: the efficiency of the available infrastructure, in particular public transport and street network; the traffic situation in general; air quality, traffic safety and the availability of up-to-the-minute traffic and transport information. As the attractiveness of a city counts as one of the key indicators for its future successful economic development, there is generally an urgent need for action in this context.

In conjunction with sophisticated traffic guidance systems, real-time traffic information services can help municipal authorities improve transport management and make their cities more attractive.

The range of traffic guidance options includes the following:

- Supply and integration of dynamic information on motorized private traffic as well as on local public traffic
- Information on available P&R sites and their current occupancy status; information on points of interest
- Information on traffic-relevant incidents and events, for instance road works

The most efficient way of publishing traffic information is to offer it via all available communication media. A practical means for reaching a large public, besides broadcasts on radio channels, is to host Internet sites with constantly updated traffic and transport information. In combination with apps for mobile devices, such services enable end users to access exactly the information pertinent to their current situation and destination. On the road and street network, variable message signs are

the medium of choice for providing information to all road users and efficiently implementing the defined traffic guidance strategies.

These measures lead to significant behavior shifts of the road users in their choice of transport mode – away from private motorized traffic towards a more frequent use of buses and trains and other means of public transport.

This shift in turn brings with it several important benefits:

- Less congestion and smoother traffic flows
- Lower air pollution levels
- Improved traffic safety

Your partner

As proven is numerous studies and surveys, the combination of effective acceleration of buses and trams and the systematic provision of intermodal transport information strongly increases the acceptance and use of public transport. In many cities, public transport prioritization systems, installed by Siemens in line with local standards and requirements, are already working successfully. In Berlin, in the German Ruhrgebiet and in Southampton, traffic information systems providing intermodal transport information have been implemented in addition. The valuable experience gathered in these projects is one of the strengths that make Siemens the partner of choice for the realization of high-quality solutions that are monitoring their own performance thanks to integrated quality management systems.

The complex interaction between long-term megatrends such as urbanization and climate change requires the seamless integration of the different transport modes



3.3 Political aspects

3.3.1 City congestion charges

Reducing the economic costs of congestion

A whole range of problems facing today's cities can be addressed with a single solution

The challenge

The development of modern cities is following ever more complex patterns, and balancing the effects and requirements of suburban spread, financial instability and pressing environmental problems has become a difficult challenge. To maintain the delicate balance, several factors are needed. One of the most important is a smooth-running transport network, because without that, a city is heading for chaos and standstill.

Transport is one of those areas where cities have to address a number of challenges of varying types and intensity. Rising traffic volumes and growing congestion lead to high losses in terms of quality of life, time and money – with the corresponding negative impact on the growth opportunities of a city. Another difficult to combat issue is traffic-related air pollution, because the continued rise in vehicle numbers offsets the sizeable

Their successful implementation in London and Stockholm proves that intelligent congestion charging schemes can solve many urban problems simultaneously

technological improvements achieved. So the long-active causal chain is as valid as ever: more vehicles cause more congestion, which in turn causes even more air pollution. The conventional way out of this dilemma is often no option, if simply because shrinking municipal budgets severely limit the cities' financial scope for expanding and optimizing their traffic infrastructure.

The solution

Well-designed congestion charging schemes are an efficient tool for reducing traffic volume in the city and consequently the level and frequency of congestion. What is more, the environment too stands to benefit from the resulting smoother traffic flow. The rules for the scheme can be refined to create incentives for purchasing low-emission vehicles, which will help reduce overall air pollution even further.

At the same time, a congestion charging scheme generates additional municipal income, allowing the city to initiate targeted measures for improving its traffic infrastructure as well as for modernizing and expanding the public transport system.

In many cases there may still be considerable political obstacles to the implementation of congestion charges. On the other hand, the need for action is growing rapidly and the success stories of the schemes set up in London, Stockholm and elsewhere speak for themselves. The measurable effects achieved in these cities are an impressive demonstration of the fact that intelligent congestion charging schemes can help to solve a whole range of urban problems simultaneously.

Your partner

The efficient implementation of the London Congestion Charge is only one example for the comprehensive expertise that Siemens has to offer in terms of toll technologies. We can realize complete, customized solutions, including the required outdoor equipment, advanced backoffice systems, system integration, 24/7 operation and maintenance. On request, our company also offers made-to-measure financing concepts. Our market-leading technologies and needs-based innovative solutions are the ideal foundation for Siemens to provide complete congestion charging solutions that will help every city to master the challenges of today and tomorrow.



3.3.2 Parking space management

Stressless parking in revived city centers

How clever parking space management can give cities a grip on the old problem of organizing inner city parking

The challenge

Rising vehicle numbers and growing expectations of convenience and comfort when shopping keep the issue of parking at the top of the local authorities' agenda. Drivers desperately searching for a place to park often leave their car on public street space, driveways or bus stops in disregard of the needs of others. In other cases, the expected parking stress keeps potential customers from doing their shopping in the city center, with the corresponding negative effects on inner-urban retail and city life, especially in small and mid-size towns. As experience tells us, pay-and-display machines are generally well accepted and clearly contribute to preventing parking offenses on public street space. In order to increase user numbers and reduce parking-related traffic, these pay-and-display machines have to be managed intelligently through the integration in an overall traffic concept.

The solution

Parking space management provides a lever for steering inner-city traffic and keep it flowing, facilitating the potential customers' access to retail and office locations, in particular to small or medium businesses that can't provide their own parking space. In many cities, this will stimulate the private sector, create opportunities for growth and help revive city centers.

Modern technology makes pay-and-display machines easy to manage and allows their flexible set-up. Different locations and types of parking facilities, parking times (short-, medium-, long-term), special permits or rates and a range of payment modes can be controlled and

operated by a single system. A very efficient way of managing parking space, and one that turns motorists into satisfied customers of and in their cities.

Your partner

On-street parking solutions from Siemens offer exactly this efficient, flexible and reliable way of managing the available parking space in a city. The street-side basis are our pay-and-display machines, which are available in different designs and with a flexible range of high-quality features. Our backoffice system allows the convenient modification of parking tariffs, parking ticket design and other parameters. The state-of-the-art Siemens parking space management system is modularly designed and can be tailored to the needs of small towns and big cities alike. The choice of modules includes such valued components as parking space detection, various payment options and an intelligent parking space surveillance system.

Flexibly programmed pay-and-display machines allow efficient parking space management and make city centers more attractive shopping destinations for motorists



3.3.3 Nation-wide toll systems

The fine art of keeping it simple

The combination of satellite navigation and mobile communications technology allows road pricing without elaborate roadside infrastructure

The challenge

Lots of expensive recording stations, countless kilometers of cable, and, just to be sure, tightly spaced rows of video cameras – until recently, the deployment of a toll system was anything but a simple project. And for every new route section added to the tolled zone at a later point of time, the laborious process had to be started all over again.

The solution

These days, this all too earthbound method seems to be appropriate only for tolled road networks with a very simple topological layout. In most other cases, all good things will probably come from above in the future. With global navigation satellite systems (GNSS), the position of every vehicle can be determined accurately, so any road or street on earth can be included in a road pricing system without the need for local infrastructure.

Hence the new technology allows the implementation of those extremely efficient systems for user financing of road infrastructure that economists have been requesting for years. Moreover, electronic toll solutions offer the operators a range of opportunities to develop attractive value-added services.

Key benefits

- GPS technology and data transfer via mobile radio networks form the flexible basis of a wide spectrum of applications.
- Electronic free-flow tolling allows the internalization of external costs, as increasingly demanded. Motorists using the roads more frequently than others bear a larger share of the costs.
- The tolled zone can be modified at any time since no roadside infrastructure is required and the system can be updated “over the air” during operation.
- Toll fee definition is very flexible, allowing tariffs to vary with the time of day, the vehicle’s emissions standard, the distance traveled or the road category.
- The system can also be used for enforcing compliance with environmental zones. Truck drivers traveling on a “forbidden” road or in a “forbidden” zone can be given a warning or imposed a fine.
- Tariffs can also vary depending on the regional transport infrastructure: In regions with a well-developed rail transport system, toll fees can be relatively high, while rural areas without sufficient public transport alternatives are subject to lower toll fees.
- Intelligently designed tariff structures allow the local authorities to influence the traffic flows in both cargo transport and private transport.

Your partner

As an experienced provider of electronic toll solutions, Siemens does not only offer individual components such as high-quality software and hardware or infrastructure elements, but can also integrate all the different parts to design and build complete tolling systems. We definitely have the required system integration competence and the comprehensive experience gathered in many successful projects, not matter if for toll solutions or other modern traffic engineering systems.



Advanced technologies for electronic tolling solutions make it easy to implement user financing of traffic infrastructure, as has been requested for years

3.4 Mobility Consulting

3.4.1 Strategic roadmaps for sustainable mobility and logistics

Expert consulting

Practice-driven know-how for practical applications creates sustainable solutions to the huge challenges of urban mobility in the 21st century

The challenge

As a result of globalization, national governments as well as regional or local authorities find themselves exposed to intensified competition. Moreover, politicians and mayors are facing increasing political and public pressures to create sustainable urban infrastructures with special focus on efficiency of transport solutions. Efficient mobility infrastructure is among the key success factors for promoting sustainability as well as the future competitiveness of a city.

This is easier said than done because municipal leaders and public decision makers have to tackle the double task of defining and prioritizing the most suitable projects for urban mobility development while putting their limited public funds to the most efficient and effective use. At the same time, they have to think into the future and identify the requirements that urban mobility systems will have to meet in tomorrow's cities. Which mobility solutions will increase the city's competitiveness and the inhabitants' quality of life while using up a minimum of resources? Which mobility concepts are already successfully applied in other, comparable communities? Which business models will provide the required financial and organizational scope for putting these solutions into practice? And ultimately, how can modern technologies be used to make a city more attractive and allow sustainable growth?

The solution

Highly qualified and experienced mobility consultants specializing in urban transport support municipalities in meeting the wide variety of their requirements and goals. For this purpose, consulting teams and technology experts have developed strategies for the sustainable expansion of the transport infrastructure in various cities.

With most impressive results: The average CO₂ reduction potential achievable with nothing but the introduction of an efficient traffic management system based on suitable measures and technologies may reach about 30 percent – and that at a positive cost-benefit ratio. Analyses carried out in e.g. Vienna have demonstrated the different ways in which inclusive mobility concepts contribute to improving the quality of life and the competitiveness of a city and protecting the environment at the same time.

Municipal decision makers should profit from this holistic mobility consulting approach in as early a planning phase as possible. A well-structured approach focusing on the

effects that different solutions have on resource efficiency and the competitiveness of the city while also maintaining or even improving the citizens' quality of life provide them with important insights into sustainable urban mobility development.

Your partner

Siemens' specialized Mobility Consulting department offers comprehensive advisory services covering everything from analytics over strategic concepts to drafts of implementation roadmaps. In our team, specialists from various fields, such as engineers, urban infrastructure experts and finance specialists, are working closely together. Their combined expertise includes inside-out knowledge of the most modern systems and technologies, transport and traffic management processes as well as a wealth of experience from national and international reference projects and best practice examples for all aspects of urban mobility.

As leading supplier of sustainable technical solutions, Siemens is able to go far beyond academic concepts. In line with our motto of providing practice-driven consulting expertise for practical applications, our urban mobility consultants are incorporating real-life experiences from practical applications as well as detailed insights into the actual effects of implemented solutions into their consulting approach. This solid basis is complemented by the results of numerous urban development workshops, city evaluation surveys and relevant international studies. What is more, cooperation with a range of urban and technology partners enables us to draw a detailed picture of urban mobility and provide best practices for virtually all and any mobility requirement.



Highly qualified and experienced mobility consultants specializing in urban transport support municipal decision-makers in meeting the wide variety of their requirements and targets

Our traffic engineering portfolio

Siemens is one of the world's most successful suppliers of innovative technical traffic infrastructure – and the company with the largest portfolio by far. Around the globe, people are using facilities for which we have provided the technical equipment. Sometimes we even take responsibility for the entire construction project, acting as consortium leader. Trains, trams, subways, airports, toll roads, tunnels and bridges, roads equipped with control technology and traffic lights... When you are looking for a reliable partner for a road traffic engineering project and want to be sure that the solution will be a success in both technical and economic terms – we are your partner of choice.

Interurban traffic

- Highway control centers
- Detector systems for traffic data acquisition
- Dynamic traffic information and control systems
- Emergency call systems
- Traffic control systems
- Traffic forecasts
- Environmental data acquisition
- Weather data logging
- Ramp metering systems for highway access control
- Solutions for variable message sign, lane closure, opening of hard shoulder lane, etc.

Urban traffic

- Traffic control systems and centers
- Traffic management systems and centers
- Detectors and detector systems for traffic data acquisition
- Intersection controllers and traffic light installations
- Traffic-actuated controls
- Public transport priority systems for buses and streetcars
- Environmental monitoring

Parking	Tunnel systems	Electronic toll systems	Services
<ul style="list-style-type: none"> • Pay stations • Mobile phone ticketing • Car park guidance systems • Parking space management systems • Pay-and-display machines 	<ul style="list-style-type: none"> • Modular tunnel control centers • Automatic incident detection • Detection of NO₂, CO₂ and reduced visibility • Lighting • Ventilation • Fire alarm and fire fighting systems • Power supply • Traffic control • Vehicle height control • Emergency call systems • Safety and security technology • Video monitoring 	<ul style="list-style-type: none"> • Control centers • Toll systems in free traffic flow • Satellite-based area-wide toll systems • Lane-based toll systems • City toll zones based on video, DSRC or GPS/GSM technology • Systems for charge collection and administration 	<ul style="list-style-type: none"> • Operator models • Financing models • Planning • Construction • Installation • Training • Maintenance • Turnkey projects • Consortium leadership • Mobility Consulting

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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.