SWARCO’s leading idea is to improve quality of life by making the travel experience safer, quicker, more convenient and environmentally sound.

For this purpose, the Austrian traffic technology corporation produces and provides a large range of products, systems, services, and turnkey solutions in road marking, urban and interurban traffic control, parking, and public transport. Cooperative systems, infrastructure-to-vehicle communication, electromobility, and integrated software solutions for the Livable City are latest fields in the group’s portfolio.

Our 3800 traffic experts are keen to shape together with you the transition from conventional traffic management to value-added services fit for the traveller in the digital age.

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SWARCO Traffic Solutions.

SWARCO smart mobility solutions respond to the needs of society in the digital age and make the travel experience quicker, safer, more convenient and environmentally sound. With integrated and value added services derived from analytical methods based on high quality and trusted data sources: WE IMPROVE QUALITY OF LIFE...

SWARCO urban traffic management solutions

...by managing traffic as an integrated part of the city’s transportation system to keep travelling convenient and hassle-free. With integrated systems for harmonizing traffic flows, prioritizing means of public transport, and with a special focus on bicycles and pedestrians.

SWARCO road marking solutions

...by showing the way worldwide and saving lives every day. With our high quality systems and services, we safely direct traffic from A to B, day and night. On all roads, in any weather. Today, SWARCO has grown into the world’s largest system provider for road markings. Jump in and drive with us.

SWARCO e-mobility solutions

...by providing fast and reliable charging solutions. With an easy-to-use charging infrastructure, convenient payment solutions, status information and route planning.

SWARCO public transport solutions

...by helping passengers find the best connection in a convenient and hassle-free manner. With integrated systems for public transport priority, fleet monitoring, ticketing and real-time passenger information.

SWARCO highway and tunnel solutions

...by making highway traffic safer, more fluid, and more environmentally friendly. With integrated systems that quickly provide accurate, easy to understand and real-time information to travellers and operators.

SWARCO parking solutions

...by making parking a convenient and hassle-free experience. With integrated parking services, parking guidance systems, and an open platform to help people plan their travel, find alternative transport advice and inform them during the trip.
SWARCO is very much connected in the industry and cooperates with various partners and institutions to create the next generation of mobility management. New technologies, ranging from traffic light assistance systems to building more efficient and more reliable intersections, allow us to actively shape the future of mobility.

Modern traffic management solutions improve our quality of life. They help keep traffic in motion, reduce emissions and personal stress, foster inter-modality and support the travellers in getting safe and sound to their destinations.
The capital of the United Arab Emirates is growing rapidly and one of the most modern cities in the world. The infrastructure of the island metropolis is also state-of-the-art and has reached a new level in terms of traffic management with SWARCO. Impressive skyscrapers in combination with Arab buildings and generously developed streets characterize the pulsating cityscape of Abu Dhabi. Tourism and the economy are booming. In the course of the general growth, the Mohammed Bin Zayed (MBZ) district is also expanding more and more as a popular residential area. In the morning, the commuters stream into the center, in the evening they stream out again. Traffic jams and slow-moving traffic during rush hours were the order of the day. Until the Abu Dhabi Department of Transport wanted to break new ground in traffic management and brought SWARCO on board.

SIGNPOST FOR THE FUTURE
Together with the local project partner, TAMASPRO, an intelligent traffic control system was implemented in MBZ. The result: Significantly improved traffic flow and safe traffic light management at the umpteen intersections of the city network. “The particular challenge was to find a solution that would do justice to the rapid pace of urban development and the extremely dynamic volume of traffic,” says Gianni Canepari, project manager at SWARCO. A solution that SWARCO has found. Mohammed Bin Zayed's advanced infrastructure serves as a pilot project and benchmark for future applications of the Abu Dhabi Department of Transport.

EVERYTHING FLOWS IN MBZ
SWARCO UTOPIA control software is already in use at 40 intersections. Traffic lights thus react in real time to the respective traffic situation. This means that all system components permanently monitor the traffic situation and react at lightning speed with a control strategy based on defined criteria. The UTOPIA advantages for network control in the area of the MBZ are clear: the previously often congested roads are a thing of the past. In addition to the local control strategy, the system also ensures that traffic flows better over corridors at neighboring intersections, thus reducing the number of stops and minimizing waiting times for all road users.

THE COUNTDOWN IS RUNNING
SWARCO’s installed infrastructure includes over 1,000 signaling devices, 486 pedestrian push-buttons, approximately 100 km of fibre optic communication lines, 80 CCTV cameras, 40 control units, traffic light masts and other hardware. To further increase safety for all road users, the pedestrian traffic lights have a FUTURLED countdown module that counts down the time to the next green phase: 3, 2, 1 ... go! The countdown function is precisely adapted to the adaptive switching cycles of the traffic lights and the changing lengths of the signal phases of all intersections in the area. No wonder that the innovative traffic management concept for MBZ will soon also be applied to the other boom regions of Abu Dhabi, Al Falah Town and Khalifa City - for greater safety and comfort for all road users.
The large redevelopment project was planned for the central business district of Allentown including the PPL Center, a 235,000 square foot multi-use arena and a 100,000 square foot events center in the City of Allentown. A comprehensive traffic analysis conducted by Traffic Planning and Design, Inc. (TPD) was submitted to Allentown Economic Development Corporation. The trip generation rates for the proposed development were based upon data published by the Institute of Transportation Engineers (ITE), Urban Land Institute (ULI), and other available data for the proposed land uses. Based upon this, the Traffic Analysis, TPD offered the following signal recommendation to the City of Allentown: evaluate and update the coordinated signal system to optimize signal timings in conjunction with the anticipated increase in traffic volumes. Signal timing within the study area were optimized for all future conditions - Base Conditions and Projected Conditions - in accordance with PennDOT policy. For analysis of intersections, level of service (LOS) is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time.

To solve these problems, the city of Allentown selected McCain, a SWARCO company, to address their large event traffic management needs. McCain solutions included providing timing conversion, analyzing and adjusting dynamic traffic response and adaptive systems with Transparity TMS traffic management system, traffic signal controllers running Omni eX software and Transparity Adaptive software to collectively improve the driver experience.

The project team also provided assistance in integrating the controllers into the City’s “Peer-to-Peer” P2P radio communications structure adding another level to the communications infrastructure.
“Talking Traffic” is a nationwide program on the order of the Ministry of Infrastructure and is currently one of the largest projects in the Netherlands regarding autonomous driving. Through this project, the Government has defined a system to connect the traffic lights to the cloud and further to devices used by all kinds of travelers, from trucks and buses to cyclists and pedestrians. The APIs and devices provide both helpful and necessary information from the signaling, as a service to the travelers using it. This is currently rolled out at 200 intersections, and by the end of 2020 it will be implemented at about 700 intersections. There are plans to do the same for approximately another 1000 intersections from 2021 to 2023.

**INNOVATIVE FEATURES FOR DRIVERS IN THE CITY CENTERS**

At intersections, users of the devices and apps are now able to digitally communicate with the traffic lights, allowing for several smart functionalities. By receiving information about their cars’ distance to the signaling, the system can predict and recommend optimal speed to the driver. For larger vehicles such as trucks and buses automatic weight registration for advanced services can also be provided, e.g. higher prioritization to heavily loaded buses at intersections. In addition, supporting large trucks with speed advice towards the intersections will help them avoid stopping, which reduces pollution, increases safety and improves the travel experience.

**TRAFFIC LIGHTS IN THE POCKET**

Pedestrians with visual impairments have the possibility to download an app for crossing the road at intersections. It tells them via vibration if the signal light is red or green. There is also a school app available, helping students to get to school faster and safer.

Another creative and helpful solution added is the extra priority of cyclists during bad weather. The cyclists activate the app that communicates with the traffic signal system and helps avoiding stops to get faster and less wet to the destination.

With digitalization, the traffic signal data are now open via APIs, creating new features for all kinds of travelers and purposes.

**KEY FACTS**

**THE CHALLENGE**
Digitalize traffic signal data in order to connect and communicate directly with end users (cars & travellers) and to improve everyday traffic

**SERVICES**
SWARCO provides ITF (Intersection To- pology Files) for MAPs and smart Traffic Light Controllers (iTLC) to connect and interact with the data broker for about 65 intersections

**TECHNOLOGY**
SWARCO ITC2, C_ITS_HUB and ITF

**PROJECT DURATION**
2017 - 2021

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Amsterdam
The Netherlands
In the capital Bucharest as well as in Cluj-Napoca, SWARCO was able to make traffic fit for the 21st century. In other words: Optimize urban traffic through intelligent traffic management, reducing fuel consumption and CO₂ emissions, shortening travel times, minimizing traffic jams and increasing traffic safety. Read more about the two flagship projects here.

**BUCHAREST: 600 TONS LESS CO₂**

In order to meet these requirements, a new traffic center was installed in Bucharest. Also 194 intersections including fully adaptive traffic control with SPOT/UTOPIA (expandable to 1,000 intersections) and 194 ITC-2 controllers. In addition, the FLASH management system is used in 370 public transport vehicles. The particular challenge was to integrate the various systems such as video surveillance (CCTV), fault management (FMS), network management (LMS), performance monitoring (PM), traffic information interface (TTII) into the new traffic concept.

The result of the project carried out between 2007 and 2008: 20 % less daily travel time.

**CLUJ: FORESIGHTED TRAFFIC MANAGEMENT**

Similar results were achieved in Cluj-Napoca a few months later with SWARCO’s trusted and reliable products and innovative concepts. Here, however, GSM was chosen because networking and communication via optical fibre was not possible. SWARCO's solution: 41 intersections with ITC-2 traffic controllers and LED traffic lights, OMNIA traffic monitoring system and traffic data acquisition (video and loop detection). Just recently (2018), traffic management was upgraded with UTOPIA, enabling the 300,000-inhabitant city to benefit from SWARCO's fully integrated adaptive traffic control system. Future extensions to other intelligent systems can therefore be implemented at any time: e.g. public transport management system FLASH, passenger information at bus stops COMPASS, infomobility platform MISTIC, video surveillance systems, etc. In short: 2 comprehensive projects - 1 clever solution: SWARCO.
With products such as Greenwave, the “green wave” for cyclists, SWARCO is promoting the extension and safety of the cycling network in large cities. Best example: Copenhagen, the most bike-friendly city in the world. The bicycle is becoming increasingly important as a means of transport in large cities for transport and environmental reasons. Today, 9 out of 10 Danes already own a bicycle, but only 4 out of 10 own a car. And in Copenhagen, the capital of Denmark, cycling has reached a new record in 2016: more bikes than cars in the city centre - 265,700 to 252,600! At the same time, however, there is still great potential to make bike lanes safer and to expand them in order to make cycling even more attractive for commuters.

THE TECHNOLOGY GETS ROLLING

As a supplier of cycle path markings, SWARCO would like to drive this development forward with pioneering technologies and products. That is why we are particularly proud of supporting cities such as Copenhagen in extending their two-wheeled infrastructure. One example of these innovative products is the Cyclemeter. This informs cyclists about speed, temperature, time, passing bikes on that day/year, public announcements, train/bus times, events, etc. By installing the device, a city can motivate cyclists, thank them for their contribution to the environment or show statistics. At the same time, the responsible traffic officers can get a detailed picture of bicycle traffic - as is already common practice in many cities today for car traffic.

GREENWAVE: FOR FLUID, SAFE TRAFFIC

A particularly interesting proprietary development is Greenwave: In-road LED lights or on posts visualize a “green wave”. This tells the cyclist whether he or she can cross the next traffic light at the speed he or she has selected when the lights are green. Countdown signals are also used. If a cyclist remains on the green wave, he is given the green light at the next intersection and at the subsequent ones. The system is connected to the adjacent intersections and traffic signals to ensure perfect coordination with other road users to generate an ideal traffic flow. You can find out more about Greenwave in the video on our website.

BLIND SPOT WARNING DEVICE

In order to prevent the high risk of accidents with right-turning cars, Denmark is also investing in warning signs that draw the attention of drivers to cyclists. LEDs in the asphalt or LED variable message signs (VMS) warn motorists of bicycles driving on the cycle path parallel to the road course. These are often difficult to see in the side mirror - the keyword is “blind spot”. When a cyclist is detected, the VMS light up with a speed reduction message or a warning message. If there are no more cyclists in the critical area, they switch off automatically. You see: much can be done to protect cyclists in road traffic, and SWARCO is always working on new developments in this sector.
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SWARCO as a builder of smooth traffic flows in and around the Tuscan metropolis. A challenging job with outstanding perspectives for the people and the region. The city, characterized by masterpieces of art and architecture, recognized the need of technically expanding and rebuilding its transport system. The desired innovations: A traffic monitoring system and an infomobility service platform for the integrated mobility management of the city of Florence, the surrounding province and the motorway section Florence-Pisa. SWARCO won the tender for this comprehensive project. As a specialist in traffic management, public transport systems and travel information services, we can rely on long-standing experience and technical know-how.

FLEXIBILITY AS FOUNDATION

In order to best meet Florence’s needs and make traffic more controllable and predictable, we designed and implemented an ITS integrated platform for mobility monitoring and infomobility information provision. The platform integrates various external systems (such as UTC, road sensors, video detection, VMS, environmental data assessment, parking system, construction zone information system, ZTL system, AVM) and information provided by different suppliers to ensure coordinated operation of the entire system. All traffic data from different sources is collected, merged, harmonized and elaborated - with the aim of seamlessly monitoring and presenting the current traffic situation. This also includes the integration of parking systems and parking information as well as the creation of an intelligent traffic model with online services (including traffic forecasts).

In addition, the calculation and application of high-level control strategies for the entire urban network and the provision of user information via web and variable message signs (VMS) are ensured.

CHALLENGES - BUT NO BARRIERS

However, our tasks also included comprehensive and precise project coordination. This included, for example, developing a detailed project plan, managing all resources (including third-party companies), not exceeding time and budget limits, measuring project performance with appropriate systems, tools and technologies, and establishing and maintaining relationships with third parties and suppliers.

BE AT HOME IN TRAFFIC

The result of the six-year cooperation: Emergency situations of various magnitudes can be dealt with more quickly and accurately, inter-institutional coordination is ensured, a growing and updated database is built up and, above all, more comfort and safety in road traffic for the inhabitants of the metropolitan area.
When the Hamburg police wanted to move the traffic control centre of the Hanseatic city from the 1990s into the new millennium, the project was officially put out to tender. With its innovative concept, SWARCO prevailed against seven competitors.

What exactly was it about? Germany's port metropolis Hamburg was to be given a modern, intelligent traffic management system that would always provide a comprehensive overview of the traffic situation and an integrated operating system for all connected systems.

Put plainly: It must be possible to intervene in traffic at any time, to influence current developments and to guarantee maximum safety. Not least, the Hamburg system should continue to steer and control Hamburg safely in the future. This is also about a reliable power supply in order to avoid technical failures. It was also the customer's wish that the new traffic control centre should play all the parts ergonomically.

**THE PARTICULAR CHALLENGE OF THE PROJECT**
You guessed it: Just because Hamburg's traffic management is being adapted to the state of the art, the traffic in the Hanseatic city will not stop! Quite the opposite: As a tourist magnet, the North German port city enjoys great popularity all year round, which is also evident on Hamburg's streets. Thus, the particular challenge of the project was to guarantee 100 percent availability of the traffic control center during the construction phase and to provide an interim solution for the operator workstations. SWARCO's solution: All workstations were moved to five compartments, the computers to a separate technical room. The control and switching of the systems was guaranteed from beginning to end - without interruption.

**EYE-CATCHER LED VIDIWALL**
As a long-standing partner of the City of Hamburg, SWARCO also impressed with its professionalism, innovation and reliability in this project, which was implemented by the general contractor SWARCO TRAFFIC SYSTEMS. Let's talk about some technical facts and figures: The eye-catcher of the new TCC is the 4 x 6 m LED wall, consisting of 24 LED cubes, for displaying and controlling the approx. 80 cameras installed in the entire city area. But all connected systems are also controlled via the integrated user interface: the traffic computer system with approx. 1,800 signal programs, the network and traffic control systems (NBA and VBA), a total of 16 LED display panels in the port area, and the tunnel systems in the city of Hamburg. Of course, all operator workstations are interconnected. This so-called multiconsoling means that any computer can intervene at any time: securely and quickly.
Along a route comprising more than 70 traffic light controllers (TLC), motorists in Hamburg / Germany can now see individual forecasts inside their vehicles. For example the speed at which they will surf the Green Wave at the next traffic light.

June 20, 2018: In preparation for the ITS World Congress 2021, a traffic light phase assistant is used for the first time in the city of Hamburg to generate individual forecasts for each individual vehicle. This is made possible by SWARCO's cooperation with HERE, LSBG and Audi. The aim of these partnerships is to jointly shape the urban mobility of the future and to develop Hamburg as a model city for future, sustainable and integrated mobility.

UNTIL NOW, GREEN WAVES WERE STATIC
The speed limits recommended on the stationary displays were based on assumed average speeds of all vehicles. This often resulted in red phases, which led to unnecessary deceleration, stopping and acceleration. Increased fuel consumption and pollutant emissions were the result. The intelligent Green Wave, which has now been implemented in Hamburg for the first time in real operation, is thus a valuable contribution to economical, fuel-saving driving, improved traffic flow, reduced travel times and less stress for drivers - as studies on traffic light forecast services have also shown.

And since starting and stopping processes account for the largest share of NOx pollution, the individual traffic light assistant is not only a precursor to autonomous driving in the future, but also an effective measure for reducing NOx emissions in the present.

COOPERATION WITH THE FUTURE
In a joint project, the City of Hamburg provided the raw data for traffic signal timing and detection at intersections via a newly created interface. On this basis, SWARCO created individual forecasts for each vehicle, which HERE then transmits via its communication interface with the navigation devices to Audi vehicles equipped with a special traffic light phase assistant or app.

THE CHALLENGE
Generate precise forecasts for each individual vehicle and ensure compatibility with legacy systems

SERVICES
Development, execution

TECHNOLOGY
Individual prediction algorithm based on real-time online analysis of current signaling and detection data via SWARCO Central Traffic Light Forecast (TLF) system

PROJECT DURATION
2017 - 2018

KEY FACTS

THE CHALLENGE
Generate precise forecasts for each individual vehicle and ensure compatibility with legacy systems

SERVICES
Development, execution

TECHNOLOGY
Individual prediction algorithm based on real-time online analysis of current signaling and detection data via SWARCO Central Traffic Light Forecast (TLF) system

PROJECT DURATION
2017 - 2018

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THIS IS WHAT MAKES THE SWARCO FORECAST SO SPECIAL
The forecast used here can process all types of intersections and controls without having to know exactly what the individual intersection looks like or how it is programmed. It is therefore universal and transferable. The SWARCO forecast is a self-learning system and also evaluates itself. We and our project partners know about the potential of this technology - now we only hope for many more cities to give green light for the Green Wave.
The city of Kazan is the capital and largest city of the Republic of Tatarstan, Russia. Being the host of the “Universiade (World University Games) 2013”, the city of Kazan demanded smart traffic technology and a comprehensive transport strategy. To avoid possible traffic related problems, SWARCO implemented a modern urban traffic control and traffic monitoring system for the city.

**PROJECT CONTENT**

SWARCO implemented an advanced Traffic Management System integrating fully adaptive traffic control, real-time traffic modeling and forecast for traffic strategic control, VMS based traffic re-routing, public transport priority, and CCTV based traffic surveillance.

- The central OMNIA platform provides a uniform interface to access a variety of traffic control and transport management systems which are plugged in, incl. user-friendly access and a homogeneous "look and feel" of all the functionalities and objects of the connected systems.
- UTOPIA fully adaptive control strategies for 98 intersections and UTOPIA fully adaptive control strategies on 11 interchange nodes between urban network and expressways.
- UTOPIA control strategies to assign selective priority to buses at 15 intersections, via functional integration with a third Party AVL system.
- MISTIC Supervisor System to collect dynamic data coming from different external systems, harmonize the data, assign traffic in quasi real time to the city graph, forecast traffic evolution and calculate real-time strategies aimed to optimize traffic conditions in the network.
- MISTIC Variable Message Sign management module for 21 VMS to give collective information to drivers via automatic and semi-automatic messages / OMNIA Open Integration Platform.

The system for Kazan has been operational since May 2013 and is ready to cover the entire city with 300 intersections.

**THE CHALLENGE**

Implement an intelligent traffic control system for Kazan before the beginning of the 2013 Summer Universiade to improve traffic flow and safety

**SERVICES**

Design, supply, installation, testing, commissioning and maintenance

**TECHNOLOGY**

OMNIA ITS integration platform featured with UTOPIA adaptive traffic control strategy, MISTIC infomobility platform and VMS management

**PROJECT DURATION**

October 2011 - May 2013
Kuwait City is the economic, political and cultural center of the state of Kuwait, holding approx. 10% of the world’s oil reserves. Kuwait City is considered a global city (4.1 million inhabitants within the metropolitan area), counting for approx. 340 cars / 1,000 inhabitants. To avoid traffic related problems (e.g. traffic jams and accidents, environmental pollution) and to increase the safety and convenience of the driving public (e.g. reduction of travel time), SWARCO implemented a modern adaptive urban traffic management and control system within the city of Kuwait.

After its completion, the operation system was the largest adaptive urban traffic management system for SWARCO worldwide and the biggest and most advanced one in the Middle East.

Due to the open architecture of SWARCO’s adaptive traffic control software, the end client, the Ministry of Interior, is not limited to the current structure. Based on their needs, the Ministry can extend the number of intersections or integrate any traffic related sub-system, like public transport management, parking concepts or street lighting.
On August 24, 2018, Kreis Kleve Bauverwaltungs-GmbH, together with the manufacturer SWARCO, put a novel traffic light control system into operation, setting new standards in terms of environmental friendliness. It is based on the intelligent SWARCO X-LINE platform.

The new traffic light control system regulates traffic at the intersection "Lindenallee / Merowingerstraße - Römerstraße". Compared to the predecessor system, the total energy consumption of the system can be significantly reduced.

When the modernization of the traffic light control system "Lindenallee / Merowingerstraße - Römerstraße" was due, the Kreis Kleve Bauverwaltungs-GmbH decided to take a big step. The aged bulbs in the signals were supposed to be replaced by LEDs. The choice fell on the latest generation of signals efficiently generating the necessary light: The former light bulbs were replaced by intelligent LED units that monitor themselves. This enables signal lights with a power consumption in the range of only 1 Watt.

The environmental friendliness results not only from the energy savings but also from the possibility of saving cables and copper. Both effects result from the concept of distributed intelligence that underlies SWARCO X-LINE. The control technology of a traffic light control system is no longer located exclusively in a control cabinet at the roadside, but distributed to control cabinet, pole and signal head.

Another advantage of this intelligent platform is the easy expandability of "SWARCO X-LINE" systems and the associated future-proofing.
In an emergency, every second counts: Firefighters and other rescue teams have to get to their place of work as quickly as possible. In a pilot project, the city of Ludwigsburg and SWARCO have successfully introduced the prioritization of fire engines at traffic lights. In contrast to previous systems, Ludwigsburg uses V2X communication (V2X = Vehicle to Everything). The fire engines communicate directly with the traffic lights by standardized short-range radio to provide free travel on the way to use. Overall, Ludwigsburg set the basis for intelligent traffic lights and digital traffic control technology to make traffic flow smoother and to reduce emissions.

Three firefighting vehicles are currently equipped with transmitters: the operations management vehicle, the firefighting vehicle and the environmental equipment vehicle. All three vehicles are usually involved in a service case. The traffic lights along the B 27 were equipped from the junction “Markgröninger Straße” to the “Forum” building with the necessary antennas. They are able to receive the encrypted radio signals of the fire brigade.

Every second, the emergency vehicles send their position and speed directly to the traffic light controller. There, the signals are processed and compared with the scenarios stored in the programming. If the system detects an approaching emergency vehicle, the programmed signal sequence is started: The traffic light controller switches to the prioritization program. Once the firefighters have passed the intersection, the traffic light controller switches back to normal as quickly as possible to minimize traffic disturbance. As a result, the “green wave” for the firefighters is established fully autonomously, using the SWARCO C-ITS Emergency Pre-emption.

For many years, SWARCO has been driving the roll-out of intelligent transport infrastructure for connected, cooperative and automated driving. The fire department prioritization is a first practical application of the underlying V2X technology.

SWARCO is a partner of the innovation network “Living Lab”, in which the city as well as partners from business, industry and research institutions work together in a unique and cooperative manner. Innovative technologies can be tested and developed under real conditions. This benefits the city of Ludwigsburg, its citizens and its network partners.

KEY FACTS

THE CHALLENGE
Ensure that rescue services can pass intersections fast and safe with minimum impact on traffic

SERVICES
Integration of Roadside Unit (RSU) for each intersection and Onboard Unit (OBU) for each of the fire engines; Add a prioritization program to the intersection; Installation and maintenance service

TECHNOLOGY
ACTROS Traffic Light Controller with C-ITS/V2X extension

PROJECT DURATION
September 2018 - April 2019

GREEN WAVE FOR RESCUE SERVICES

FAST AND PROTECTED TRAVEL ACROSS INTERSECTIONS WITH C-ITS

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The contract with the City of Los Angeles Department of Transportation (LADOT) is to replace existing traffic control cabinets with new, Advanced Transportation Controller (ATC) cabinets. Over the duration of the agreement, McCain expects to deliver more than 1,500 cabinets, by far the largest ATC cabinet deployment anywhere in the world to date.

McCain, a SWARCO company, leads the North American intelligent transportation industry in ATC cabinet deployments. Traffic control cabinets house the computers and sensors which control traffic signal timing to facilitate the efficient and safe movement of vehicles, people and goods. Cabinets meeting ATC standards increase safety and efficiency allowing for much greater flexibility and modularity than older cabinet types. The advantages include up to 32-channel operation, doubling the previous capacity, increased safety enhancements for installers, and real-time benefits for traffic engineers. These operational improvements use “lamp out detection” to send immediate notifications when signal lights fail. They also have fail-safe flashing red alerts when the intersection backup system needs to be repaired.

McCain’s ATC cabinets also provide future-proof technology and are delivered connected vehicle ready, equipped to embrace emerging connected and autonomous vehicle requirements. The company has pioneered the development of ATC cabinets and its engineers have worked closely with standards developers to assure sustained benefit for traffic departments and the communities they serve. Reza Roozitalab, P.E., McCain’s vice president of hardware engineering, credits Los Angeles traffic engineers for their leadership in embracing the new technology. “They are a unique agency, writing and deploying their own software,” he said. “The Los Angeles DOT personnel are very progressive and incredibly knowledgeable and that made things easier for us. At the end of the day they wanted to deploy the best product and we wanted to provide it. We shared the same dream.”

Los Angeles is the nation’s second largest traffic market with incredibly complex traffic management issues. The agreement calls for the deployment of 4 different McCain ATC Cabinet footprints, each configured to fit the specific requirements of each intersection.

The McCain ATC cabinets will be phased in over the duration of the project with the final number to be deployed based upon LADOT budget considerations. Said Roozitalab, “Being part of the McCain ATC cabinet development team and seeing our technology being adopted by one of the most progressive DOTs in the nation is a monumental achievement for all of us.”
The Hessian State Agency for Nature Conservation, Environment and Geology (HLNUG) would like to analyze the relationship between pollution and actual traffic volume. SWARCO offers the right networked technology for this: the Gecko2Traffic traffic monitoring station in conjunction with the SWARCO Cloud. Limburg an der Lahn is a city with one of the highest nitrogen dioxide concentrations in Germany. The objective was to measure the volume of traffic responsible for the high pollution levels both in and out of the city by quantity and type. For this purpose, three Gecko2Traffic traffic monitoring stations were set up in the immediate vicinity of an existing HLNUG environmental monitoring station. The collected traffic data (8+1 classification according to TLS BASt) will be compared with those of the environmental monitoring station.

The result: A direct relation between the measured values of the environmental measuring station (pollutant load) and the actual traffic volume (quantity & type) could be established and analyzed.

However, for traffic data to be comparable with environmental data, the data must be provided at a certain aggregation and time interval. This is managed by our partner company A-I-P (Ambient Information Processing GmbH) from Vienna. The operators of the HLNUG’s environmental data evaluation platform simply collect the traffic data from the SWARCO Cloud and transfer it to the HLNUG’s environmental measurement system.

For example through automatic evaluation and analysis. Using web-based access via a browser, traffic data can be retrieved at any time from a PC/notebook or mobile device. In addition, Gecko2Traffic has an autonomous power supply (rechargeable battery, solar) and data transmission via mobile radio, eliminating the need for time-consuming cabling and connection work. Gecko2Traffic counters can also be used very flexibly and can be moved to another location without great effort. And there is no need for time-consuming commissioning. The device is simply registered in the SWARCO Cloud using a mobile phone (QR code) and is immediately ready for operation. The result is low costs for maintenance and operation. With Gecko2Traffic, SWARCO was able to quickly offer its customers a concept meeting all requirements with regard to the connection and compatibility of data output to the HLNUG’s environmental measurement system. After all, our customers, their work flow and their data should never be held up pointlessly.
In order to gain better control over the traffic in the 1.3 million-inhabitant metropolis, the city of Montevideo was in desperate need of a new traffic management center. SWARCO and the local construction and infrastructure service specialist CIEMSA collaborated to meet the requirements of the city’s wish list.

The project to implement an integrated mobility management center (CGM) was completed within the given timeframe of 12 months, and already in an early phase of the implementation it became obvious that the required performance was met with improvements in mobility and traffic safety. This first phase included: OMNIA ITS integration platform and web-based graphical user interface; central and intersection level UTOPIA UTC software modules for implementing the UTOPIA fully adaptive traffic control strategies at 133 intersections; SWARCO ITC-2 traffic controllers, modems; MISTIC Infomobility platform for the management of four LED variable message signs which are strategically positioned within the city to provide guidance and information to the motorists; Integration of the CCTV based traffic surveillance system with 46 cameras; Integration of speed and red light enforcement subsystems.

The before/after study shows the hard evidence that the SWARCO solution delivers real benefits which justify the investment: a 12% reduction in travel time and a 20% reduction in waiting times at intersections. The CGM system has been operational since June 2016 and is being extended through new phases to the whole city.

Today, the number of intersections integrated under the CGM sums up to 450. SWARCO provided the new software licenses and is currently supporting by seamless warranty extension and technical assistance services.

KEY FACTS

THE CHALLENGE
Making traffic flow better in Montevideo by reducing travel and waiting time at intersections

SERVICES
Supply, installation, configuration and commissioning + software warranty and technical assistance services

TECHNOLOGY
OMNIA ITS integration platform featured with UTOPIA adaptive traffic control strategies, MISTIC Infomobility platform & VMS management, ITC-2 traffic controllers, LED VMS

PROJECT DURATION
December 2015 - March 2017 since 2018: ongoing extensions to the whole city
Medina
Kingdom of Saudi Arabia

SWARCO equips the main traffic arteries of the city with intelligent, variable and economical traffic control technology. An important step into the future.

Medina: After Mecca, the second most important holy city in Islam and one of Saudi Arabia's largest cities with around 1,300,000 inhabitants. The metropolis, also known as the "enlightened city", is not only a cultural hot spot, but also a traffic junction that is to be made fit for tomorrow. Thanks to the high quality of our message signs, SWARCO received the "Go" in 2018 for the production of an intelligent traffic system for Medina's Al-Hajra Gate. This should enable the detection of cars and trucks as well as the control of vehicle speed and traffic.

The solution implemented by SWARCO SAUDIA: gantries with 6 lane control signs, 6 variable speed signs and 2 variable message signs. The signs are controlled by SWARCO Hermes software and characterized by a high contrast level, a very low power consumption, low maintenance costs and extended service life thanks to LEDs. This first installation is the starting point to equip further arterial roads of Medina with our LED-VMS technology.

In short: A modernization boost that will help the historic city in the future to make its traffic fluid and environmentally friendly.

**KEY FACTS**

**THE CHALLENGE**
Implement an intelligent, efficient traffic control & traffic management

**SERVICES**
Planning, execution, logistics

**TECHNOLOGY**
gantries with LCS, VSS & VMS, SWARCO Hermes Software

**PROJECT DURATION**

PHASE 1: 2018 - 2019
PHASE 2: starting 2019
The City of North Vancouver chose McCain ITS Cabinets, the McCain transportation management system Transparity TMS, McCain Controllers with Omni eX software and McCain Transparity Adaptive solutions during their traffic system upgrade. The city's deployment of McCain ITS Cabinets replaced their old NOVAX cabinets, and the centralized traffic management system problem was solved with the installation of McCain’s Transparity TMS and McCain Controllers with Omni eX. Together these addressed the city’s need for remote monitoring and control of traffic signal equipment and ITS devices plus the city was able to migrate from their outdated closed-loop system and copper wire communications to a more modern web-based central traffic management system and IP communications infrastructure utilizing a mix of fiber and wireless radio.

Finally, McCain ensured that both the city and the maintenance contractor received ample training on software and hardware solutions.

Looking to the future and implementing continued traffic management solutions for the City of North Vancouver, all McCain controllers, with NTCIP-compliant Omni eX local software, have upgrade capability with optional local controller software for applications including intersection control, ramp metering, arterial master, or reversible lane control.

**KEY FACTS**

**THE CHALLENGE**
The City of North Vancouver needed an upgrade to their outdated traffic system and wanted a modern web-based Traffic Management System (TMS) and communication infrastructure along with remote monitoring and control of traffic signals and adaptive signal control performance features.

**SERVICES**
Provide traffic signal control cabinet and controller hardware, local and central traffic management system software solutions, adaptive signal control solutions, hardware and software training, maintenance agreement and ongoing technical support.

**TECHNOLOGY**

**SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS**

**DRIVER EXPERIENCE IMPROVED WITH INTELLIGENT TRANSPORTATION SOLUTIONS**

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The city of Oberhausen in the Ruhr area already had a well-developed network of cycle paths, which has now been decisively optimized. With SWARCO’s so-called “Radwelle Oberhausen”, cyclists can now reach their destination even faster and safer. Well-marked cycle paths meander through the entire urban area of Oberhausen so that every corner can be easily reached on two wheels. Nevertheless, the people of Oberhausen preferred to get into their cars or use public transport. Why? The traffic lights were mainly optimized for public transport - so cyclists had to wait a long time. In order to make cycling more attractive and to increase the proportion of cyclists, waiting times had to be significantly reduced. As one of the most important customers of SWARCO Traffic Systems, Oberhausen also relied on the expertise of SWARCO in this case. As all the traffic light systems came from SWARCO anyway, they could be converted at low cost.

The main advantage of the Green Wave is a significant increase in the attractiveness of the cycling network. This results in a reduction of CO2 emissions, which in turn benefits the environment and quality of life. Not to forget: The shortened waiting times also led to a reduction of the number of red light violations and thus improved general road safety. In Oberhausen, SWARCO not only impressed with its extensive technical know-how, but also supplied the complete PR package: 80 posters, 10,000 flyers, 1,000 stickers, 3 PVC banners, 1,000 saddle covers, 2 displays, 2 beach flags and above all the name and logo of “Radwelle Oberhausen”.

SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

BICYCLE WAVE FOR OBERHAUSEN

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Cyclists see green

The main cycling route network of the city of Oberhausen covers 67 km with a total of 191 traffic light systems. The aim now was to significantly improve the switching at the individual junctions for cyclists and thus increase comfort.

The SWARCO solution: With the help of automatic detection - consisting of 8 thermal imaging cameras and 11 induction loops - cycle traffic is accelerated by cyclist pre-detection. Detectors enable intelligent control of signaling systems. This means that as soon as the cyclist approaches the traffic light, it switches to green or - if it was already green - the green phase is extended. This keeps the cyclists in the flow, making them faster and bringing them more comfortably and safely to their destination. They don’t have to press any buttons at the traffic lights and don’t have to stop and start all the time.

PR for a wave of enthusiasm

The main advantage of the Green Wave is a significant increase in the attractiveness of the cycling network.
Every day, more than 50,000 citizens travel across Odense for work or education - and due to the city's growth, the pressure on the infrastructure will increase in the coming years. Odense Tramway, a double-track light rail transit system, is being developed to provide safe and efficient transportation while reducing traffic congestion and life cycle costs.

The project will be implemented in two phases, and the first phase connecting Tarup Center in the North to Hjallese in the South is scheduled to be completed in 2020. The new tramway is expected to reduce noise pollution and carbon emissions from public transport and reduce the number of car rides by 3,900 per day.

The project has been ongoing for a while, and SWARCO has been involved in various aspects of the project. SWARCO has delivered new traffic controllers, but also reused existing ITC-2 controllers with new programs for the tramway. While working on the tramway, it was important to minimize the effect on the daily traffic flow and keep the traffic in motion. To solve this, SWARCO provides temporary traffic lights and programs - and our traffic engineers adjust the time intervals to the roadblocks – reducing congestion in the construction areas. SWARCO also delivered NEDAL poles, steel poles and Alustar traffic lights in special colors, and developed terminal blocks and pedestrian push-buttons which meet all safety requirements. For the project, 130 radars and 125 thermal cameras for detection were used.
In a sweeping agreement to upgrade traffic management software in Canada’s most populated province, the Ministry of Transportation of Ontario (MTO) has approved a plan to install McCain Transparity TMS to control more than 500 signalized intersections. Rollout of the new software is expected to begin in the second quarter of 2019.

Transparity TMS has a successful track record in Canada, including a similarly-sized deployment in Winnipeg, Manitoba. Transparity TMS is a centralized system that proactively manages traffic flow and promotes mobility with real-time traffic data collection and management tools. The flexibility of Transparity TMS plays perfectly into Ontario’s unique traffic management needs. With approximately 13 million residents, more than a third of Canada’s total population, Ontario covers a land mass 1.5 times the size of Texas. While much of the population is centered around major cities in the GTA (Greater Toronto Area and Hamilton), Ottawa, and Windsor, the province also includes sparsely populated regions, all of which will be controlled by Transparity TMS.

The MTO is a forward-thinking agency and we’re excited to be working with them on this project,” said Frank Rao, President of Innovative Traffic Solutions Inc., who secured the agreement. “Upgrading their current traffic management software will allow the MTO to continue to support their legacy controllers and transition to the new ATC controllers they are deploying, while future-proofing the agency for additional smart city functions as well as connected and autonomous vehicles.”

McCaun Chief Operating Officer Greg McKhann says the Ontario package showcases the best of Transparity TMS. “In designing the Transparity platform, we recognized that adaptability to dynamic environments is critical to our customers,” he said. “With the pace of technological innovation in traffic management, we are committed to creating products that not only outlive the current cycle but thrive well into the future.”
As many other capital cities in the world, Oslo is the largest and fastest growing one in the country. This puts pressure on the traffic network, and if it breaks it may affect production, businesses and thousands of travelers. To keep traffic in motion, they are dependent on a trusted and experienced partner who has the routines, knowledge, reliability and ability to act fast when something happens. This does not just depend on one man, but a team of people who react fast.

**WHAT WE DO**

We currently provide service and maintenance for all different kinds of electrical installations along the road in addition to 309 signaling installations and 15 barriers in Oslo. Maintenance of the equipment can be both urgent or it could be a part of a long-term planning. To keep track of all the service missions, we are in close and daily contact with the client and we also run our own service system to be sure everything is handled professionally.

**ENVIRONMENTALLY FRIENDLY SERVICE**

As a serious service and maintenance partner fit for the future, we handle the environment with care making sure that waste is handled properly and that we use the most environmentally friendly solutions, gear and chemicals in our daily work. We also run internal campaigns to raise the environmental awareness and work to reduce pollution.
The Municipality of Stockholm and Trafikverket (Swedish Transport Administration), as public entities, must carry out procurement for their service and maintenance contracts. The Municipality of Stockholm used to have their own service technicians for traffic solutions, but in 2010 SWARCO was selected as partner. SWARCO was chosen because of their knowledge, organization and, of course, price. SWARCO has been responsible for the service and maintenance in Stockholm between 2010 and 2015 and then again in 2019. For the Swedish Transport Administration, SWARCO offers both checks and maintenance of their traffic signals. The inspections are carried out every month to make sure that everything works. SWARCO can evaluate the information from these checks and suggest changes or new features and systems that could be added to the solution.

Swarco performs service and maintenance for both the Swedish Transport Administration and the Municipality of Stockholm. This maintenance is carried out as the results of inspections by SWARCO or by an error report from the customer or by an individual. SWARCO then sends a technician to the site, who performs a troubleshooting followed by maintenance and a reporting. After an error report has been received, the target is to have the problem solved within 4 hours.

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SWARCO commits to having several service technicians and a good range of different skills to match the necessary competences. Newly employed technicians take 8 to 9 different courses in the span of 6 months and are given basic training in electricity and safety.
In February 2014, the sporting world was focused on Sochi, the venue of the 22nd Winter Olympic Games. The Russian port city faced major transport challenges, and mastered them with the help of SWARCO.

With around 350,000 inhabitants, Sochi is located directly on the shores of the Black Sea in Russia - also known as the Russian Riviera. Located on the same latitude as the Côte d’Azur, the former spa town combines beach, sea, mountains and a pleasant, mild climate. An estimated 35 billion euros were invested to make Sochi fit for the 2014 Olympics, the first ever Winter Games in a subtropical city and the second Olympic Games in Russia after the 1980 Summer Games in Moscow.

HIGHEST DEMANDS ON TRAFFIC

In order to be perfectly prepared for the huge tourism boom in the course of the mega sports event, new roads, bridges, tunnels and state-of-the-art infrastructure were needed. One of the biggest challenges proved to be the almost 50 km long main artery of Sochi, through which all of the people flowed into the city. Here in particular, the highest technical standards in terms of traffic planning, management and safety were required. SWARCO played a key role in implementing a state-of-the-art traffic management and information system that captures all data in real time, enabling continuous traffic regulation. It is possible to react immediately to disruptions.

OPTIMIZATION OF CONTROL SERVICES

What do SWARCO solutions look like in detail? A total of 123 variable message signs (VMS) guide traffic and keep drivers on track. Each VMS consists of 160,000 individual LEDs and was manufactured and installed within a few months. The dynamic signage - consisting of 118 VMS - warns of dangers and always provides an up-to-date overview of traffic developments. State-of-the-art surveillance systems, cameras and radar systems keep traffic flowing and ensure maximum safety on Sochi’s main artery - still today, many years after the Olympic Games.
The City of Skopje decided to extend and upgrade the overall traffic management system and applied for a loan from the EBRD. The funding enables to create a new Automated Traffic Management System (ATM) for more than 90 intersections in the city with the aims of optimizing individual trip times, improving traffic safety and reducing emissions and fuel consumption.

To support this sustainable urban mobility plan, SWARCO implemented a fully adaptive system (OMNIA/UTOPIA) that monitors and manages traffic signals at 94 intersections across the city of Skopje.

The project was successfully implemented and the system harmonizes traffic conditions on real-time basis. The winner is the city of Skopje, benefitting from reduced emissions and better traffic flows.

**KEY FACTS**

**THE CHALLENGE**
Enlarge the automated traffic management system to more than 90 intersections including implementation of a CCTV and VMS system

**SERVICES**
Design, supply, installation and maintenance of a fully adaptive urban traffic management system

**TECHNOLOGY**
OMNIA ITS integration platform featured with UTOPIA adaptive traffic control strategies; MISTIC infomobility platform & VMS management; ITC-2 traffic controllers

**PROJECT DURATION**
2012 - 2014

**PROJECT SCOPE**
The SWARCO solution utilizes e.g. up to 80 ITC-2 traffic light controllers, 850 inductive loop vehicle detectors, a fiber optic cable network of approximately 50 km, a closed-circuit television (CCTV) traffic monitoring system with 51 cameras and five overhead variable message signs (VMS).
The Romanian city of Timisoara opted for SWARCO’s integrated traffic control and video surveillance system to manage 134 intersections in the city in order to sustainably improve not only road safety and security, but also traffic efficiency.

Between April 2015 and October 2016, SWARCO brought traffic management in the 300,000-inhabitant city of Timisoara to the state-of-the-art. In addition to the civil engineering work and the technical upgrade, several software modules for the entire information and mobility system as well as for video surveillance were integrated. Everything from a single source - from SWARCO.

These are the subsystems SWARCO delivered for the new traffic control and monitoring center in Timisoara:

1. Adaptive Traffic Control System;
2. LED Variable Message Signs;
3. CCTV and Video Surveillance System;
4. Public Transport Management System;
5. Communication network;
6. Civil works;
7. Traffic Control Center.

HIGHLY COMPLEX, BUT SMART AND SIMPLE

Mobility — adapted to today’s needs. Highly complex traffic systems, which are used daily by countless road users, entail great risks for bottlenecks, weak points or reduced traffic flow. This is where SWARCO comes in - with innovative Smart Mobility solutions and safe traffic management that ensures a smooth flow of traffic. Networked information platforms ensure maximum transparency and now keep all road users in Timisoara up to date.
SWARCO’s dynamic guidance systems help keep traffic in motion on highways and expressways, providing orientation and timely warnings, avoiding congestion, reducing emissions and informing about alternative routings and speed limits. Safety is particularly important when it comes to tunnels. SWARCO offers integrated systems that manage both the operation of tunnels and the traffic passing through them.

Modern traffic management solutions improve our quality of life. They help keep traffic in motion, reduce emissions and personal stress, foster inter-modality and support the travellers in getting safe and sound to their destinations.
The Federal Office for Goods Transport (German: BAG) is making an important contribution to traffic safety, environmental protection and tax collection by conducting road, tolling and operational inspections on German motorways and highways. In these inspections, individual trucks are prompted to leave the motorway by being flagged down manually by BAG employees on site to the parking lots used for this purpose. This not only requires a high number of staff, but also represents a serious safety risk. Automating the process can reduce personnel and, above all, ensure safer working conditions for those involved.

**Automated System with Number Plate Recognition (ANPR), Software and Programmable VMS**

The BAG pilot systems are being implemented in 5 lots at different times. With one check-point on each of the Federal motorways, the A1 (Schleswig-Holstein), A2 (North Rhine-Westphalia), A3 (Hesse), A9 (Bavaria) and A10 (Brandenburg). At four locations ahead of the checkpoints, ANPR cameras capture the license plate and country code of vehicles as they drive by. A video camera shows the detected vehicles in their lane.

The data is transmitted to the intelligent outstation on the parking lot of the BAG checkpoints using wireless technology or fiber optic cables. This information is forwarded by W-LAN to the BAG employee's laptop and displayed in the browser-based software. The software helps the BAG employee to select the vehicle that has to be diverted for inspection - in advance and at a safe distance. The corresponding license plate number will automatically be transmitted to the freely programmable LED sign, prompting the driver to exit to the checkpoint. As well as prompting individual vehicles, other vehicle types such as trucks, buses or cars with trailers can also be requested to exit. Another video camera at the LED sign monitors the procedure.

The whole system does not require powerful servers, but simply runs on an industrial PC with a touch panel and integrated browser and a standard communication & controller module.
SWARCO equipped the Carmel Tunnels of Israel’s 3rd largest city with new hardware and software – now travel times are reduced and better safety for road users is ensured.

The old part of Haifa with port and major business districts is located on a narrow strip beneath the 550 m high Mount Carmel. To relieve traffic-congested downtown Haifa and to provide an alternative to driving up and across Mount Carmel and so the Carmel Tunnels Project was started. SWARCO acted, together with Partner Menorah Izu Aharon in Israel, as system integrator and coordinator.

**PROJECT SCOPE, CHALLENGES AND GOALS**

The project consists of two sets of twin tunnels, the 3.5 km long western and the 1.6 km long eastern set, with two lanes of traffic in each tunnel and four portals. The entire project is 6.5 km long and includes 5 conventional bridges, 6 segmental bridges and 11 km of roads. Using the tunnels, which require a paying toll, cuts the current travel time from the Haifa South interchange in the west to the check post interchange in the east from 30-50 minutes down to 6.

**CENTRAL SYSTEM FOR CENTRAL MANAGEMENT**

The project includes the complete tunnel management system with a central software and 27 outstations. The central software allows control of all tunnel systems by means of a visualization screen. All information is available all the time in one overview. The tunnels are monitored from the tunnel control center in Krayot. Furthermore, the system is connected with the facility management system (FMS) including fire detection, electrical control, light control and ventilation control. This safety feature reacts in case of an alarm e.g. fire with predefined measures such as tunnel closure.

**KEY FACTS**

**THE CHALLENGE**
Reduce traffic congestion for downtown Haifa, optimize travel time for road users

**SERVICES**
Project coordination, system integration

**TECHNOLOGY**
PRIMOS® central system software for common MMI; variable routing signs in prism technology; VMS / lane control signs in LED technology

**PROJECT DURATION**
2009 - 2010

**PROJECT SCOPE:**
central control software; 27 outstations; 4 internal variable message signs (LED); 73 lane control signs; 4 prism openers for variable routing; 46 double induction loops; 84 traffic detection cameras; 8 PTZ cameras; 18 corridor motion detection cameras; 9 routing and blocking barriers; 2 overheight controls; 144 emergency roadside telephones.
SWARCO has installed an intelligent flood warning system to divert drivers away from a busy, low-lying section of road near Aberystwyth, Powys that is affected by flooding. The A44 Trunk Road to the east of Aberystwyth is prone to flooding several times a year, both as a result of adverse weather conditions and its close proximity to the Afon Rheidol River.

Working closely with Ymgyrhyforydd Gwynedd Consultancy (YGC) Gwynedd Council’s engineering consultancy and in conjunction with both the Welsh Government (Client) and the North and Mid Wales Trunk Road Agent (NMWTRA), SWARCO has designed, supplied and installed a set of four warning signs on the approach roads advising drivers of the flooded road ahead and subsequent diversion route.

The solution is based around SWARCO’s bespoke hazard warning signs and an intelligent flood sensor which sends warning messages directly to NMWTRA’s traffic monitoring center in Conwy, informing them when the system has activated and warn the appropriate teams as soon as water levels have risen above a normal level.

John Lister, Senior Project Engineer for YGC, says the new system has significant benefits:

“The previous ‘bad weather’ procedure of regular inspections and then manually erecting warning signs was far too time consuming. Automated warning signage provides an immediate response to a flood situation.”

KEY FACTS

THE CHALLENGE
Development and installation of intelligent flood warning system

SERVICES
Developing the monitoring required, complete testing and installation; designed, supplied and installed a set of hazard warning signs;

TECHNOLOGY
4 hazard warning signs, intelligent flood sensor sending information directly to the traffic monitoring center

PROJECT COMPLETION
January - October 2018
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SWARCO equipped the Gotthard road tunnel (motorway A2) with new hardware and software – efficiency increased with EffiGo integration into the operational management level and a new operating concept are included. The Gotthard Road Tunnel in the Swiss Alps is one of the narrowest arteries on the transit corridor between North and South Europe. 17km long, it is also among the world’s longest road tunnels with bi-directional traffic. The tunnel traffic control had been completely renovated between 2003 and 2005 by SWARCO’s former subsidiary Weiss-Electronic GmbH. In the course of several extension works the traffic control system was prepared for an integration into the operational management level (BLE TINWUR) of the cantons of Tessin (TI), Nidwalden (NW) and Uri (UR) with subsequent BLE network integration of all traffic computers.

OBJECTIVES, CHALLENGES AND TO-DOS

As the operators were very satisfied with the functionalities and reliability of the traffic management system, they chose SWARCO again in 2014 to increase the efficiency by integrating the Gotthard system into the superior BLE. This required the simplification and adaption of the software architecture to cope with the other devices of the BLE. Further action points: Cancel the separation of the northern ramp so that the separate master computers are no longer needed. Their functionality is then handled by the tunnel master computers, creating a redundancy set-up. Moreover the outdated computer hardware had to be replaced and the entire group level of redundant servers reshaped to redundant KRI2B.

INNOVATIVE AND RELIABLE MMI SOLUTION

The heart of the traffic control system was not modified since it had been working fine. However, there was improvement potential for the user interface. The original one was developed with Java applets, which were no longer viable due to the number of possible different versions. Therefore a completely new MMI (Man Machine Interface) was developed, exclusively based on HTML and Java Script and adapted to the „Look and Feel“ of the other BLE components. Moreover the following hardware was installed within the project: 2 master computer systems incl. web server, 2 emergency computer systems incl. web server, 10 group computers with 20 servers, 83 substations to control some 500 traffic.

KEY FACTS

THE CHALLENGE

Improve efficiency of 24-hour operated tunnel traffic management

SERVICES

Planning and execution

TECHNOLOGY

PRIMOS® central control system software with customized innovative features for future-ready tunnel traffic management

PROJECT DURATION

2014 - 2015

Gotthard Tunnel

Switzerland

SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS

EFFICIENCY UPDATE FOR ONE OF THE LONGEST ROAD TUNNELS IN THE ALPS

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FIRST TO DEVELOP AND INSTALL THE NEXT GENERATION OF SIGNS

Highways England, a government-owned company, has launched several projects to modernize the strategic road network in the UK. SWARCO and Costain, a smart infrastructure company, have collaborated to develop and install the next generation of Variable Message Signs. On behalf of Highways England, the two companies pioneered the technology behind the new signs with Costain delivering the roadside controller and SWARCO delivering the signs. This next generation of signs is able to get messages to road users more quickly, thereby improving road safety and the journey experience for travellers.

THE CHALLENGE
Improve road safety and the journey experience on the UK's strategic road network

SERVICES
Supply, installation and commissioning

TECHNOLOGY
LED full colour matrix motorway variable message signs

PROJECT DURATION
2015 - 2019

PROJECT SCOPE
SWARCO has supplied more than 260 full colour matrix signs for different schemes on the motorways including installation and commissioning. The new signs use unique high-resolution colour optical technology components which enable clearer messages and graphics to be displayed in all weather conditions, providing reliable and easy-to-understand information to keep road users continually informed about road conditions.

Innovative approaches to design and production also mean the signs are more cost effective and easier to maintain. For example, less materials and cabling have been used, minimizing maintenance requirements and the time engineers spend at the roadside. The signs also have the capability to display live video pictures of congestion on the road ahead. Such information could be provided to road users in the future.

Costain and SWARCO will be installing more of these next generation signs throughout the remainder of 2019 and into 2020 on the smart motorway programme including the M20, M23 and the M1.
Under the lead of SWARCO Saudi and specialists from SWARCO Germany, the first SWARCO WiM application for the Middle East was successfully implemented, with our local system integrator Al Shamlan International, in Kuwait.

The Sheikh Jaber Al-Ahmad Al-Sabah Causeway is a mega bridge project with an estimated construction value of approximately US$3 billion that spans the Bay of Kuwait in two directions and comprises of two projects: Main Link, which connects Kuwait City with the future Silk City; and Doha Link, which connects Kuwait City with Doha and the Kuwait Entertainment City. The project forms part of the Kuwait National Development Plan 2035.

SWARCO’s WiM system is used for preselecting vehicles with overloads. Two stations are located on the Main Link and one is located at the Doha Link.

The WiM system is used for preselecting vehicles with overloads on 3 lanes plus emergency lane in 3 different locations. The vehicles are detected, programmable VMS display the according license number and the vehicles are prompted to exit the causeway. On the checkpoint they are weighed by calibrated truck scales. The system’s accuracy is according to COAST B+(10).

The project proved to be a great success combining the knowledge and technological resources from within and outside the SWARCO group.
KEY FACTS

The Challenge
Keep traffic in motion during construction work, wide re-use and refurbishment of existing motorway guidance system components

Services
Design, supply, installation, commissioning, maintenance

Technology
PRIMOS® road station TLS 2012, traffic guidance panels (prism and LED)

Project Duration
2014 - 2016

SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS

A 99 MUNICH RINGROAD SMOOTHLY RUNNING MOTORWAY TRAFFIC

The A99 motorway, also known as the Munich motorway ring, is Bavaria’s busiest motorway. To prevent traffic from coming to a standstill during the expansion, SWARCO was commissioned to carry out the adaption of the traffic control facilities. An average of 160,000 vehicles per day - with an upward trend: a good reason to expand the Aschheim/Ismaning junction and, at the same time, to adapt signposts, sections with flexible release of the hard shoulder and the associated video components. The aim of the project was to prepare and re-use traffic system components wherever possible and to maintain the hard shoulder use during road construction and facility conversion works.

A ROUND-UP OF THE SWARCO SOLUTION

The affected section of the motorway guidance system comprised of a bi-directional carriageway, each with three lanes, and the hard shoulder, which was also used during the construction work for temporary release during peak traffic hours. In the course of the work, the overhead signs of the Aschheim/Ismaning junction were dismantled and rebuilt in line with the relocated junction. The gantries were also adapted to the changed requirements. The release runs for use of the hard shoulder also had to be adapted to the new location in cooperation with the traffic computer center. In addition, the video cross-sections were also adapted to the changed locations and visibility conditions.

OUR SCOPE OF WORK

1. Dismantling, building and if necessary interim storage, refurbishment and re-installation of:
   - 10 new gantries, 2 refurbished cantilevers, 5 over-head routing signs (refurbished), 1 new overhead routing sign, 28 new variable message signs in LED technology, 4 traffic rerouting panels (rotating prism and LED technology), 8 video cameras (refurbished)

2. Delivery and installation of:
   - 11 new outstation in line with TLS 2012, 11 control cabinets

3. Installation of all set-up devices

Thanks to SWARCO’s solution traffic was largely running smoothly, taking away stress from the motorists and reducing costs for our customer.
Norra Länken
Sweden

Norra Länken ("the Northern Link") is one of the largest infrastructure projects in Sweden consisting of a 13 km long motorway and tunnel system built in two separate tubes with three lanes each beneath the city center of Stockholm. Trafikverket, the Swedish Road Administration, is SWARCO SVERIGE's largest customer, with numerous traffic solutions delivered and continuous business relations in place. The bid for Norra Länken was won by the TUNNELENTREPRENAD SVENSKA consortium, where SWARCO was responsible for delivering the traffic technology and communication equipment for the tunnel system. Already in the first decade of the new millennium SWARCO had been involved in equipping Södra Länken, the southern motorway link in Stockholm.

ASSETS: THE MOST COMPETITIVE SOLUTION AND ORGANIZATION

The project was carried out in by the joint-venture company Tunnelentreprenad Svenska AB consisting 50% each of SWARCO and Rolf Tannergård AB (former EIAB). Tunnelentreprenad was in charge of the design, installation and commissioning of all electrical and safety systems inside the tunnel. Many different suppliers and subcontractors were involved. The JV was selected because it was able to offer the most competitive solution within the framework of a great project organization.

SOLUTIONS IN THE TUNNEL

Several SWARCO companies contributed with their know-how and technology to bring this large project to a successful end, and this well ahead of the original project schedule.

500 variable message signs, 200 lane lights, barriers, controllers, prism signs and the project management were directly provided by SWARCO to Norra Länken. Through the consortium, SWARCO was also responsible for delivering electrical installations, safety systems and environmental and quality assurance. SWARCO is also in charge of a 5-year maintenance contract for the tunnel system.

In addition to this, SWARCO was given the task to deliver a 4.5 by 6.3m RGB VMS used for artistic design. The Swedish Road Administration had put several Swedish artists in charge to convey Stockholm's nature and landscape by means of mood lighting and motifs of grassland, water, woods etc. Its objective was to break up the monotony of underground driving.

KEY FACTS

THE CHALLENGE
Complete installation of an underground motorway tunnel system

SERVICES
Planning and implementation of traffic related components of tunnel system

TECHNOLOGY
VMS, outstation, detectors, barriers

PROJECT DURATION
2010 - 2015
Stable, secure and with advanced and user-friendly Graphical User Interface (GUI). This is how SWARCO’s central interurban traffic management system presents itself. A first-class example of how it makes motorway and tunnel control easier and safer is the Öresund connection. The Öresund, the strait between Denmark and Sweden, can easily be crossed by car and train since the opening of the Öresund connection (Öresund bridge - island Peberholm - Drogdentunnel) in 2000. A new control system (PCMS - Plan Control Monitoring System) was to be installed in 2012 to control and monitor all systems, including the transport network. The companies that came up with the best solution: On the one hand AcobiaFlux as the project leader, and on the other hand SWARCO as the supplier of the innovative PRIMOS® central system software.

KEY FACTS

**THE CHALLENGE**
Interurban traffic management for highway and tunnel, interfacing with SCADA system from AcobiaFlux

**SERVICES**
Development, planning and execution

**TECHNOLOGY**
PRIMOS® Central software to control and monitor all traffic guidance systems, 145 VMS, barriers, weather stations, on the bridge and in the tunnel

**PROJECT DURATION**
2012 - 2015

SWARCO SOFTWARE CONNECTS DENMARK AND SWEDEN

A SYSTEM THAT DOES THE JOB
The central software is used for the integrated control of traffic control systems, hard shoulder releases, ramp meterings, road weather information systems (RWIS) and Weigh-in-Motion systems (WIM) as well as traffic control in and ahead of the tunnel. It collects and processes data from various sensors and data sources in different areas. The scope of services includes comprehensive data management with recording, archiving and a wide range of evaluation options, as well as a graphical user interface with an integrated operating concept. The modular design guarantees flexible adaptation to a wide range of requirements and environmental conditions.

GRADE A FOR USABILITY
With SWARCO’s solution, a stable and secure system with an advanced and user-friendly Graphical User Interface (GUI) is now in use at Öresund. A high-quality, future-oriented solution, perfectly matched to the existing infrastructure.
Premiered in the „Ostwestfalentunnel“ in Bielefeld, North-Rhine Westfalia, operations control and traffic control were combined on a redundant computer system. When developing the PRIMOS® TUNNEL CONTROL system, SWARCO took care of the following requirements: Browser-independent web visualization and international language selection; Tailor-made customized solutions with scalable modular system architecture and open interfaces and SPS solutions independent of the supplier; Easy integration of objects by text-based description of logical process chains, i.e. no binary content or cryptic abbreviations; High degree of availability by failover systems and redundancy (hot standby); No dependency on licenses from other suppliers; Adaption of the look and feel of the visualization in line with customer wish. The system fulfills the highest data security standards.

SWARCO replaced an existing SCADA system with its object-orientated system handling and controlling operations and traffic. This includes the traffic installations, emergency systems such as fire alarm, fire-fighting water supply, emergency call, escape route identification, communication equipment such as tunnel radio, loudspeakers, videosystem as well as general operating devices such as lighting, ventilation, de-watering, energy supply, building technology, IT communication with network and router. The integration of the sub-systems was done by means of a central SPS. SWARCO’s responsibility was to implement a data point server, an interface application with own data management to connect to external systems, such as SPS’s, cameras, and emergency telephones. The application can be easily expanded through plug-ins (clients), whereas each plug-in represents the connection of an interface. In Bielefeld the existing facility was replaced in several stages, still allowing the operation via the old system and the new SWARCO technology. This was very helpful in testing and in making the operators getting used to the new situation. The old operating technology was finally switched off in December 2017, when the new control computer of the firebrigade’s coordination center was up and running. SWARCO PRIMOS® TUNNEL CONTROL is considered as an innovative milestone and important extension of the group’s portfolio, allowing the complex management of traffic control and operational control in a single system.
Better signage, increased efficiency and less congestion. By using 15 Variable Message Signs, SWARCO controls the entire truck traffic at the British port, the largest project of its kind. The port of Dover (GB) is one of the most important passenger and commercial ports in Europe. More than 2.5 million units of freight with a value of over 15.5 billion pounds are shipped here every year. This corresponds to a turnover of 119 billion pounds and no less than 17 per cent of total British trade. Impressive figures with impressive logistics behind it. To further optimise, SWARCO was brought on board.

THE GOAL: 0 WAITING TIME INSTEAD OF 4 KM OF TRAFFIC JAM

After record sales of 2.53 million freight units in 2015, an increase of 5%, an investment programme was launched to adapt the infrastructure to the growing traffic. Part of this is to increase capacity for trucks waiting to be transported across the English Channel. The plan: the construction of 13 stops for 220 trucks. These are designed to help contain 4 km of queues and the associated congestion during busy periods and reduce emissions. It also needed a system that automatically guides arriving vehicles to the right ferry service.

VMS - THE VARIABLE SOLUTION

SWARCO installed a total of 15 Variable Message Signs (VMS), signaling devices and barriers, and provided the lanes with vehicle recognition. Depending on the traffic, two VMS are used to direct trucks directly through customs or onto the site. The other 13 are overhead panels of the entry lanes in the 57.5 metre long portal of the holding facility. These VMS guide the driver directly into the lane that leads him to his ferry service. Each VMS consists of 160,000 individual LEDs and was manufactured and installed within three months. Another challenge was that the LEDs had to meet the port’s light emission standards to minimise light pollution and disturbance to local residents during 24/7 operation.

THE SOFTWARE BEHIND IT

The SWARCO management software allows operators to change and adapt 12 different settings at any time, day or night. For example: default setting 1 directs traffic past the holding device and directly through customs. Preset 2, on the other hand, directs traffic into the system, but limits the number of lanes opened to 3. Each setting takes into account a different scenario to allow operators maximum flexibility to direct traffic and redirect it if necessary for smooth traffic handling. A good example of how road and shipping traffic can be steered and controlled with intelligent hardware and software.
SWARCO installs the largest variable message sign (VMS) in the southern hemisphere at Sydney Airport - with brilliant and economical LED technology from Austria. Highest information quality with low overall costs - according to the briefing from Sydney Airport Corporation Ltd. (SACL), which in March 2017 awarded SWARCO's Australian partner company BRAUMS the contract for the major variable message sign project. Eleven months later, the first four of 13 panels impress right down the line: up to 22 m wide, almost 4 m high and with more than 750,000 LEDs, at a pixel pitch of 16 mm, to display pin-sharp, high-resolution graphics.

RICH IN DETAIL AND LOW IN CONSUMPTION

With high, uniform luminous intensity, brilliant colors thanks to optimum contrast values and low power consumption at a beam angle of more than 60°, the systems set new standards in LED technology for such large information boards. A display area of 65 m² with an average power consumption of only 2,000 W was previously unthinkable in this order of magnitude. Even more impressive - also for us: the huge, full-color LED panels consume only slightly more electricity than a hair dryer and can simply be connected to a 230 V socket! Even the emergency operation of the panels with full functionality via a battery operated UPS (uninterruptible power supply) is no problem. The LEDs are operated well below 10% of their rated capacity, which significantly reduces the failure rate and further increases system availability. This in turn leads to considerable savings in maintenance and spare parts.

COST-EFFICIENT COMPLETE SOLUTION

In the Traffic Control Centre at Sydney Airport, all boards are controlled and monitored by the new SWARCO software for up to 20 VMS. Each VMS is directly connected to a central server via NTCIP (IP) - without relays or remote stations. The self-explanatory graphical user interface (GUI) enables intuitive operation without time-consuming training. Particularly practical: With a suitable browser (MS Internet Explorer, Google Chrome or Mozilla Firefox) you can control the web-based user interface for monitoring and changing the status at any time. "SWARCO’s control software is a cost-effective solution for controlling a limited number of LED devices in “island mode”, e.g. at customs or toll stations.

KEY FACTS

THE CHALLENGE
Deliver very large, high-resolution, highly energy-efficient LED variable message signs and a user-friendly operating and control system

SERVICES
Planning, design, production, logistics and installation

TECHNOLOGY
LED VMS, up to 22m wide, with 750,000 LEDs, for high resolution graphics at lowest energy consumption; intuitive control software

PROJECT DURATION
2016 - 2018
The conversion of Värtahamnen Harbour in central Stockholm is a wonderful illustration of how the SWARCO Port Control System can not only increase the efficiency of a port, but also enlarge the living space of an entire city. The networked port becomes reality - at just the right time. After all, ports are still travel hubs and logistics centres for global trade. Capacity requirements and the desire for more advanced services are constantly increasing. The central role that the SWARCO Port Control System (SPCS) can play in the ongoing digital transformation of ports is demonstrated by the Värtahamnen Port in Stockholm, which was rebuilt between 2013 and 2016. The goal was clear: the SPCS should optimize the entire port area - from logistics and work processes to ship, truck and visitor traffic. Further SPCS-installations in other ports around Stockholm are: Kapellskär (2016), Värtahamnen (2016), Masthamn (2019) and Norviks hamn (ongoing).

**KEY FACTS**

**THE CHALLENGE**
Create highly efficient and safer port logistics

**SERVICES**
Planning and implementation of a smart port control system

**TECHNOLOGY**
- Smart Port Control System
- Automated Vehicle Management
- ANPR
- Gates for length and height measurements
- VMS
- Automated damage control for trucks

**PROJECT DURATION**
2013 - 2016

**MORE WORKFLOW MEANS LESS WORK**

The SWARCO Port Control System installed at the Värtahamnen Port Terminal is a modern, intelligent transport system that makes traffic management more economical and all workflows more flexible. The basic concept is to create a large logistical flow without compromising the strict safety requirements. This was achieved for example by: Automated vehicle management, ANPR (Automatic Number Plate Recognition), Gates for length and height measurements, VMS (Variable Message Signs) or automatic damage control for trucks. The SPCS continuously determines where the vehicles or goods are located. The system can also notify internal and external partners at the site and allows port personnel to control traffic lights with handheld devices. As all these gears mesh seamlessly, all processes become simpler, safer and more efficient - for ships, trucks and everyone involved. And the effect on the city is even more impressive.

**LESS PORT MEANS MORE CITY**

By improving the traffic flow for ships and trucks, the entire port operation is now much more efficient. The environmentally friendly port of Värtahamnen, with its five bays and modern passenger terminal, can now simultaneously handle more ships and more traffic in a smaller area. The city of Stockholm has thus regained large parts of the area occupied by the port. Which in turn means more space for the city to develop new homes, open spaces and jobs.
The MiTra smart warning trailer communicates current information to road users in real time to make travelling safer, more predictable and more pleasant. The Austrian motorway operator ASFINAG (Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft) was looking for an intelligent trailer that could be used for driver information via variable message signs (VMS), travel time estimation, speed reduction detection, traffic monitoring and vehicle communication.

THE MOBILE INTELLIGENT TRAILER

SWARCO’s LED variable message signs are known worldwide for their optical top performance with minimum energy consumption and are also used on warning trailers for mobile use on motorways. In the course of the project, these were further developed over three years in cooperation with ASFINAG and other industrial partners in order to be able to transmit traffic information directly from the trailer to the vehicles. The result: a new generation of warning trailers called MiTra (Mobile Intelligent Trailer), perfectly equipped for real-time communication between infrastructure and vehicle (cooperative ITS) on motorways.

THE MAIN COMPONENTS

- Full-colour LED matrix display of the highest performance class with lowest energy consumption, ITS-G5 interface transmitting display information to vehicles, Bluetooth sensors to determine the travel time - enable the expected loss of time due to construction site sections to be displayed in real time, Radar sensor as collision protection against trucks, Communication and control of the trailer directly at the location or via a traffic control centre, Radar sensor for speed reduction detection.

THIS IS HOW MITRA “SPEAKS”

The trailer is equipped with sensors and connected to a traffic control centre in order to be able to react to the current traffic conditions on the motorway. The operator sends traffic information directly to the vehicles via a 12V radio module. At the same time, the information is displayed as text or image on the energy-efficient RGB-VMS on the mobile trailer. A typical application example are temporary construction site areas, in which drivers are informed by symbols and graphics about changed speed limits, the course of the lanes and the expected loss of time.

KEY FACTS

THE CHALLENGE
Create a self-sufficient, intelligent, mobile VMS system for I2V communication

SERVICES
Development, production and implementation

TECHNOLOGY
Full-colour LED matrix display, ITS-G5 interface, Bluetooth sensors to determine driving time, radar sensor for collision protection, variable control software

PROJECT DURATION
2015 - 2017

AN INNOVATION THAT MAKES YOU SIT UP AND TAKE NOTICE

The fully networked warning trailer has a modular design so that the sensors can be adapted to the customer and the application.

The trailer’s communication module complies with future international standards and harmonised data profiles at the radio and data level. The motorway operator ASFINAG has meanwhile introduced this technology for its road network, so that the users of the Austrian motorways will soon meet MiTra more frequently. In addition, the “talking” warning trailer has already become a topic of conversation in the industry: namely it has already been recognised by public institutions, awarded the Burgenland Innovation Award 2017 and nominated for the Austrian State Award for Innovation.

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PUBLIC TRANSPORT SOLUTIONS

Public Transport Management is a suite of solutions that help make Public Transport Services more efficient for operators, drivers and passengers. Major components include fleet and terminal management and real-time passenger and driver information. In addition, automated fare collection and security systems as well as solutions that improve cost-efficiency and reduce the environmental impact are part of public transport management. Solutions also include public transport priority, which provides bus priority at traffic lights, better integrates bus services into the city's transportation system and helps to make Public Transport more attractive.

With more than 50 systems installed across the globe, 15,000 connected vehicles, 5.5 million passengers per day and 500 million monitored kilometers per year, we know our business. Our competence in public transport management is accompanied by long-standing experience in traffic management and planning, parking and road safety. This makes us an ideal partner for implementing your public transport and general mobility strategies.
Transports Metropolitans de Barcelona (TMB) is responsible for bus services in Catalonia’s capital. In order to keep up with the times with the fleet management system, it was necessary to upgrade the mobile services. This was where market leader SWARCO came into play.

The Spanish metropolis of Barcelona not only offers its approximately 1.6 million inhabitants a high quality of life right by the sea, but is also one of the world’s most popular travel destinations. What a challenge for public transport! Innovative fleet management is needed to ensure that all travelers arrive safely at their destination and that the 1,200 buses reach their 2,500 stops on time. And here we are at the heart of the bus fleet: the SAE - Système d’Aide à l’Exploitation.

SAE enables precise localization of buses and real-time fleet and information management. Public screens and monitors in the buses keep passengers up to date - in addition, the TMB App provides a mobile service. The TMB control center always has an eye on the traffic, can react immediately to delays and timetable changes and communicate directly with the drivers in the buses. But where is the problem?

The daily management of the bus lines is carried out not only via the control center, but also mobile on the road. And these mobile control services should be further developed and expanded with SAE Mobile. A modern software solution was needed to provide the right tools for regulating traffic on mobile devices and to make optimum use of networked technologies. Said, done! SWARCO adapted its FLASHNET management system specifically to the needs of TMB SAE and fully integrated the individualized solution into the TMB corporate management. Via the web-based user interface in the control center with over 20 operating stations, the vehicles are mapped in real time and the always up-to-date information is displayed in simple graphics, plans and diagrams.

KEY FACTS

THE CHALLENGE
Future developments of fleet management system for new mobile services to manage 1,200 buses on 102 lines with 2,500 stops, plus sightseeing buses

SERVICES
Adaptation of FLASHNET in line with the requirements of TMB SAE and full integration into the whole corporate management software

TECHNOLOGY
FLASH Automated Vehicle Management System; FLASHNET vehicle fleet diagnosis, maintenance planning, onboard information services; Interfaces and graphical user interface for operating center

PROJECT DURATION
2000 - 2002

A SUCCESSFUL LONG-TERM PARTNERSHIP
SWARCO company MIZAR started the cooperation with TMB already in the 1990s. Still today the Public Transport Management in Barcelona is handled with SWARCO technology and continuous service support on site. A reliable cooperation for more than a quarter of a century.
The year 2011 saw the start of a major project in Haifa, Israel: public transport was to be equipped with a state-of-the-art management and information system. Only one company was considered for the implementation: SWARCO - thanks to its unique real-time fleet management system.

About 300,000 people live in Haifa, the third largest city in Israel, after Jerusalem and Tel Aviv. In the greater Haifa area there are even 600,000 inhabitants. How can the public transport network be made as safe and comfortable as possible? This was the challenge at the end of 2011, when the contract was awarded to SWARCO MIZAR.

The innovative SWARCO systems increase safety and quality of life by always providing passengers with the best connection: up-to-date, accurate and stress-free.

SIGNIFICANT PUNCTUALITY IMPROVEMENT

The integrated solutions that SWARCO offers for modern fleet management make all local public transport more efficient and pleasant. This includes vehicle tracking and localization as well as the reliable provision of all passenger information and services in real time. Drivers are also kept up to date and informed about current traffic situations in good time. Traffic lights can be prioritized according to the traffic situation, making it easy to get in for a few minutes. FLASHNET is the name of this high-precision management system that connects GPS with other positioning systems and makes public transport clearer and more punctual than ever. In fact, the punctuality of buses and trams increases by 30%!

DYNAMIC, TRANSPARENT AND CLEAR

If FLASHNET is linked to UTOPIA, the traffic control system from SWARCO MIZAR, buses or trams can be monitored and controlled individually or in combination. All information is available to passengers in simple graphics, plans and diagrams. Which station will be served? Is the bus delayed? All relevant information about public transport is displayed in real time. This is what SWARCO understands by a dynamic passenger information system. Optimized fleet management results in perfect utilization of buses and trams. Last but not least, the data enables precise fault diagnostics, performance statistics and maintenance planning for the operator of public transport in Haifa.
In just two years, Kazakhstan’s capital Nur-Sultan (formerly Astana) has implemented an ultra-modern smart mobility system for public transport that quickly and comfortably transports the more than one million inhabitants from A to B. The system is designed to meet the needs of the city’s population. The operator Astana ALRT has invested almost 7 million euros. When it comes to intelligent traffic solutions in the digital age, SWARCO is a must. The “Pearl of the Great Steppes”, as Nur-Sultan likes to be called, now also has state-of-the-art traffic management - with integrated systems for prioritizing public transport, fleet monitoring, ticketing and real-time passenger information. Designed and implemented by SWARCO MIZAR in collaboration with ticketing provider AEP Italia.

TRANSPARENT AND CONVENIENT ELECTRONIC PAYMENT

A uniform e-ticketing system was a very important element in the modernization plan of Nur-Sultan’s public transport system to make public transport more attractive for all travelers. The advantages of electronic payment are obvious: no cash, no coins – smart cards are the money of the 21st century! And if an individual card is lost or stolen, it can be replaced easily and immediately. In addition, there is a significant expansion in the range of tickets on offer and the possibility of flexible pricing. For example, cheaper tariffs apply to monthly or annual tickets. Electronic payment greatly improves the quality of service and makes the entire payment process more transparent, secure, convenient and faster. Last but not least, fare evaders can be exposed more easily.

BEING INFORMED ON THE MOVE

For Nur-Sultan’s new e-ticketing system to take off, it needed the complete equipment: 750 buses, 390 on-board ticket counters, 1,570 contactless on-board ticket validators, 750 driver counters, 30 ticket vending machines, and more. Plus: SWARCO’s automated traffic management system includes modern, networked information platforms for real-time timetable information and travel times. Displays at railway stations and stops as well as in buses, trams and trains provide travelers with a constantly updated overview of traffic and facilitate overall travel planning. Thanks to SWARCO’s innovative mobility systems, Nur-Sultan ALRT always keeps an eye on the development of passenger flows and can react immediately to weak points. In short, all public transport is designed to be effective and comfortable for everyone involved. Today, tomorrow and the day after tomorrow.
The city of Riga was looking for a solution to increase security and monitor and manage their fleet of around 700 public transport vehicles consisting of buses, trams and trolley buses. In 2014, SWARCO was tasked with delivering a system designed and customized in accordance with the customers’ requirements.

SWARCO implemented a complete traffic management system for the public transport vehicles of Riga. The system receives and displays traffic telemetry parameters like deviations from planned timetables, predictions of arrival time and allows real-time control of intervals between vehicles as well as archiving such data in a data warehouse for statistical purposes, all to help optimize traffic in the city. In addition, the SWARCO system also includes security measures, such as alcometers, video surveillance and distress alarms, as well as an advanced content management system (CMS) to inform passengers.

**SAFETY ON BOARD**

The vehicles are equipped with the SWARCO graphical driver terminal RoadRunner Box where drivers log in and get their daily assignments. The RoadRunner is fully integrated with an on-board breath analyzer and renewed periodical checks during the day. A positive breath analysis generates an alarm to the traffic management center and stops any further movement of the vehicle until confirmation by a center operator. All the vehicles have also been outfitted with interior and exterior video surveillance. The cameras are connected to a display next to the driver to help them spot if something happens on board. The cameras can also be accessed by the traffic management center for live streaming. All video is recorded and stored so that in case of an accident it will be possible to go back to evaluate what happened. There is also a distress button next to the driver which triggers a silent alarm and is connected to the traffic management center. In the video recordings one can trace what was happening on board when the button was pressed. There are distress buttons for the passengers as well that will alert the driver. The distress button for the driver can be connected to external bodies such as security services or the police. The breath analyser and video surveillance ensure a higher level of security and safety for the passengers on board as well as for the driver.

**DATA DRIVEN TRANSPORT**

The CMS SWARCO delivered allows displays to show content related to time, route, etc. Specific media can be presented in certain areas and even certain stops. Proof-of-play makes it possible to track the number of times a certain type of content has been showed. The SWARCO system includes APC counters to collect the number of passengers on board which can be saved for statistical purposes. Over the displays on board, the passengers are informed about the next stop, any traffic incidents and possible connections. This makes it easier for the travelers to plan their trip and have a smoother journey.

**THE CHALLENGE**

Supervising and monitoring fleets with up to 700 vehicles with high degree of complexity; Integration of several systems with different technology to ensure a frictionless infomobility service for the city of Riga

**SERVICES**

Delivery, execution and operation of ITS solution designed and customized in accordance with PT operator and customer requirements

**TECHNOLOGY**

FLASH/FLASHNET public transport management and real-time information system

**PROJECT DURATION**

2014 - 2018

**KEY FACTS**

**MANAGING AND MONITORING PUBLIC TRANSPORT**

The city of Riga was looking for a solution to increase security and monitor and manage their fleet of around 700 public transport vehicles consisting of buses, trams and trolley buses. In 2014, SWARCO was tasked with delivering a system designed and customized in accordance with the customers’ requirements. SWARCO implemented a complete traffic management system for the public transport vehicles of Riga. The system receives and displays traffic telemetry parameters like deviations from planned timetables, predictions of arrival time and allows real-time control of intervals between vehicles as well as archiving such data in a data warehouse for statistical purposes, all to help optimize traffic in the city. In addition, the SWARCO system also includes security measures, such as alcometers, video surveillance and distress alarms, as well as an advanced content management system (CMS) to inform passengers.
Sardinia
Italy

This regional monitoring central platform, settled in Cagliari headquarter, centralizes 3 automatic vehicle monitoring subsystems supplied by different providers and based on different hardware technologies. A reliable passenger information system is ensured by a process of data collection and harmonization. Public transport users benefit from this information via bus stop signs, web and mobile applications. Together with the Italian company AEP Ticketing Solutions we provided also a regional e-ticketing solution ensuring an efficient service of the public transport operator.

The ambitious scope of the project included the design, supply, installation, testing and commissioning of the system and training for Public Transport company operators and drivers covering the following:

- On-board subsystem: 194 driver consoles (CDB6), 194 on-board computers RRBox, 222 on-board contactless/magnetic validators
- Central subsystem: Company Centre of Monitoring (CMA) equipped with central AVM software FLASH/FLASHNET
- E-Ticketing Centre (CBE) equipped with central AFCS software:
  - 42 contactless/magnetic validators placed in ARST stations, 316 POS reseller devices, 75 portable terminals for ticket control, 16 depot concentrators, 21 devices of station concentrators.

60,000 passengers per day – 21 million passengers per year, 15,000 km of the network, 3,500 trips per day, 35 million km per year.
In Timisoara, SWARCO in a joint venture with Avitech were awarded the contract on “Video Surveillance and Traffic Management System” for the Romanian 300,000-inhabitant city. The scope of the project comprises the supply of fully adaptive traffic control for 134 intersections, 215 signal heads, 312 pedestrian signal heads, 260 on-board units, 230 CCTV monitoring systems, 17 LED signs, 50 speed radar detectors and red-light violation detectors.

Public transport plays a crucial role in solving nations’ economic, energetic and environmental challenges and thus helps to improve the quality of life of citizens. SWARCO invested in building up the next generation portfolio for public transport solutions. Its core is the on-board architecture. Its evolution is based on the integration of portable communication devices (Android based tablets), with a black box to connect bus equipment. The installed on-board unit is modular and expandable to fit customer’s needs and compatible with existing systems. The fleet management (FLASH) allows to give real-time information to passengers and regulates the Public Transport service for Timisoara.

KEY FACTS

THE CHALLENGE
Improve road safety & security and traffic efficiency; Reduce accidents, travel time and congestion on the major roads of Timisoara

SERVICES
Design, supply, installation, system integration, commissioning and maintenance of a new automated traffic management system

TECHNOLOGY
OMNIA ITS integration platform featured with UTOPIA adaptive traffic control strategies, MISTIC infomobility platform & VMS management, FLASH public transport management system

PROJECT DURATION
April 2015 - October 2016
The project objective was to provide Örebro Municipality with a completely new system for prioritizing buses and emergency vehicles at traffic lights. Örebro tested a demo of Smart Priority in 2015 and were happy with the results. After this, SWARCO developed a fully functional priority system open to add further features.

In October 2018, SWARCO signed a contract with Örebro Municipality. SWARCO was also ordered to replace the old monitoring system OmniVue with Omnia.

The technical development of advanced traffic information and positioning systems has led to a significant reduction in the cost of supplementing traffic lights with bus priority systems in recent years.

HOW IT WORKS

The system permits the prioritization of specific buses or other vehicles, such as emergency vehicles, based on their position and other requirements (e.g., bus timetable). The solution sends priority requests based on the position and uses virtual detector points which can be positioned and repositioned on a digital map. The system also monitors traffic signal functions and presents statistics on travel times and performance. In Smart Priority’s map view, the administrator of the system can see the bus priority in real-time. When the bus is given priority, the detector zones light up green on the map. In the web interface, the administrator can set, change or deactivate detector zones.

- Over 45 intersections are configured and tested in the Smart Priority system
- Program 20 intersections so they can handle buses and emergency vehicles
- By the end of 2019 all controllers and functions should work together.

The fire department and ambulance have been testing the Smart Priority mobile app, claiming priority along their emergency routes.

ALREADY AN INSTALLED BASE IN SKÅNE, SOUTHERN SWEDEN

The system is already in operation for Skånetrafiken (Public Transport operator in Sweden), where about 1000 buses get priority at about 40 intersections, mainly in Malmö, but expansion is ongoing for other cities in Skåne. Buses send their GPS positions to Smart Priority which controls the positions in relation to the locations of the traffic lights. When a bus approaches an intersection, the priority request is sent to Omnia which passes it to the current traffic controller.
No matter how our vehicles will be powered in the future, the car will remain a form of personal transportation that offers its owner the freedom to travel when and where they want, in a way that public transport finds it almost impossible to rival. While in the future cars may be shared and able to carry out quite complex tasks autonomously, they will still need to be stored safely.

We at SWARCO understand parking management as the implementation of different policies, programs and strategies, which result in a more efficient use of scarce parking resources. SWARCO’s integrated parking solutions give car park service providers the tools to protect parking assets, manage traffic flows, support modal shift policy with dynamic tariffing and retailers with extensive discount scheme.
The United Arab Emirates, being a federation of 7 emirates, owns oil reserves and natural gas reserves ranked as 7th largest in the world. In 2013, the construction works for one of the world’s largest entertainment, leisure and retail destinations – the Yas Mall – started. Yas Mall is directly connected to Ferrari World. SWARCO’s scope in this project was to deliver a new parking management system to help drivers find parking facilities quickly and conveniently and thus shorten the search times for parking spaces. The parking management system also optimizes traffic flow, reduces unnecessary congestion and brings more efficiency to Yas Mall’s parking facilities.

KEY FACTS

THE CHALLENGE
The first installation of a Parking Guidance System with On-Street LED Displays from SWARCO in the Middle East

SERVICES
Supply, installation and configuration of Parking Guidance System with integration of INDECT Parking Guidance System

TECHNOLOGY
LED display for available parking spaces incorporated with static signs which are integrated with INDECT System

PROJECT DURATION
2013 - 2015

SWARCO PARKING SOLUTIONS

PARKING GUIDANCE SYSTEM - YAS MALL / FERRARI WORLD

The United Arab Emirates, being a federation of 7 emirates, owns oil reserves and natural gas reserves ranked as 7th largest in the world. In 2013, the construction works for one of the world’s largest entertainment, leisure and retail destinations – the Yas Mall – started. Yas Mall is directly connected to Ferrari World. SWARCO’s scope in this project was to deliver a new parking management system to help drivers find parking facilities quickly and conveniently and thus shorten the search times for parking spaces. The parking management system also optimizes traffic flow, reduces unnecessary congestion and brings more efficiency to Yas Mall’s parking facilities.

PROJECT CONTENT
Parking management system; Installation of 30 static signs with LED modules; VMS signs; Delivery and installation of a central computer control system
Abdul Rahman Saad Al-Rashid Co. is a diversified investment holding company with main activities spanning construction, real estate, and investment management. Leveraging its accumulated years of expertise and intelligent business ventures locally and regionally and has attained a leading market position.

The objective of this project is to provide an Indoor Parking Guidance System for the newly constructed mall called “AL RASHID MALL,” located in Abha (in South East Saudi Arabia). Through this system, the drivers can easily find the available parking spaces inside the parking area which will allow them to spend less time on finding a parking spot and reduce harmful emissions.

The control center software has a capacity for future expansion for another 1000 parking bays and for a facility to integrate with parking management systems.

AL RASHID MALL is the first mall in Abha with a Parking Guidance System facility.

PROJECT CONTENT
Parking Guidance System; Installation of 783 parking sensors and indicator lights; 70 Indoor LED signs; LED display units; delivery and installation of a central computer system

KEY FACTS
THE CHALLENGE
Implement a new Parking Guidance System in the biggest and most traffic challenged shopping mall in the southern region of the Kingdom

SERVICES
Supply, Installation and configuration of Parking Guidance System equipment (Sensors/LED Displays and Control Center Software)

TECHNOLOGY
Single Space Parking Guidance System consisting of Ultrasonic Parking Sensors, LED Indicator lights, Indoor and Outdoor LED Displays, Parking Management Server with Software

PROJECT DURATION
2016 - 2017
Bergisch Gladbach
Germany

KEY FACTS

THE CHALLENGE
Create a modern parking guidance system for efficient use of existing parking spaces

SERVICES
Planning and execution

TECHNOLOGY
29 dynamic LED parking guidance signs, VMS at 5 different locations for special announcements, data transmission via GPRS, no on-site computer necessary due to SWARCO solution with virtual parking guidance by software as a service

PROJECT DURATION
April - September 2014

Bergisch Gladbach - not only is the city itself highly worth seeing, but also the new parking guidance system from SWARCO. Thanks to variable message signs, the search for a parking space is very clear and simple.

"Welcome to Bergisch Gladbach" is displayed in yellow text on the LED display as you drive into the pretty district town about 10km from Cologne. The variable message signage is part of SWARCO’s modern parking guidance system - with the aim of making better and more efficient use of existing parking facilities.

A total of 29 VMS permanently show the current status of available parking spaces. These VMS also include 5 variants with two-line information on the display. Here you can also get information about local events, news and much more.

THE EASE OF PARKING
A CASE FOR SOFTWARE AS A SERVICE

The new dynamic parking guidance system from SWARCO integrates 8 parking facilities. A special feature is the public car park “Schnabelsmühle”, in which entering and exiting vehicles are recorded with video technology.

DYNAMIC AND UP-TO-DATE INFORMATION

SWARCO PARKING SOLUTIONS

THE CHALLENGE
Create a modern parking guidance system for efficient use of existing parking spaces

SERVICES
Planning and execution

TECHNOLOGY
29 dynamic LED parking guidance signs, VMS at 5 different locations for special announcements, data transmission via GPRS, no on-site computer necessary due to SWARCO solution with virtual parking guidance by software as a service

PROJECT DURATION
April - September 2014
SWARCO always leads the way when it comes to innovation and solution competence - including parking solutions. In Budapest, Hungary’s capital, three highlights bear SWARCO’s handwriting.

SHOPPING & "REFUELING" IN THE ASIA CENTER MALL

Based on environmentally friendly technologies and renewable energy sources, electromobility holds great potential for the future - especially in urban areas. SWARCO offers high-performance e-charging stations for all garage types and parking systems and is working intensively to further expand its e-charging network. In the Asia Center Budapest you can also "fill up" your e-vehicle with electricity while strolling comfortably through the shopping paradise. The main features of the SWARCO charging station: 3 Smart Wallbox and 3 Smart Post AC chargers with double sockets, integrated charging management, MID certified meters, 3G mains connection and safety protection.

CASHLESS PARKING

The MÜPA is a popular cultural location in Budapest as is the market Várkert Bazar in the first district of the Hungarian metropolis which attracts a large number of people. The fact that drivers can park their cars comfortably and safely also goes without saying thanks to SWARCO. Three entrances and exits with ticket counters line the MÜPA parking garage which has 550 parking spaces on 3 floors. Entrance is possible with a parking ticket, season ticket or a valid MÜPA day ticket. At 7 machines you can pay cashlessly, quickly and conveniently with your EC card. The innovative SWARCO solution also includes a license plate recognition system. This is an advantage for all those who may lose their parking ticket, as they won’t be penalised and have to pay the entire daily flat rate. All these features can also be found in the Várkert Bazar parking garage. Space occupancy detected by ultrasonic sensors is displayed on LED signs.

BELOW PARKING BUDAPEST

SWARCO PROMOTES MOBILITY

KEY FACTS

THE CHALLENGE
Implement a comfortable and complete parking and e-mobility solution with innovative payment and parking guidance system

SERVICES
Planning, development, installation, commissioning, after sales service, maintenance

TECHNOLOGY
SWARCO SignelPark parking payment and guidance software, data capture, over 300 ultrasonic sensors, 8 dynamic parking guidance signs (full-matrix LED technology)

PROJECT DURATION
2014 - 2015
With innovative parking guidance systems, SWARCO is helping to save time when drivers are looking for a parking space. One example of this is in Bedford, England where dynamic signage was installed to display real-time information to create a an efficient parking experience. The capital of the English county of Bedfordshire faced the following challenge: Due to a new bypass, the traffic flow and routes into the city centre of Bedford had changed dramatically. As road users could no longer take their usual routes, this could have created chaos. To prevent this, Bedford Council turned to SWARCO, a leader in the provision of traffic information to supply a new signage and parking guidance system.

FLEXIBLE PARKING MANAGEMENT WITH ZEPHYR

The main focus of the innovative solution from SWARCO is on 6 dynamic signs, which can be used to display current car park occupancy, directions to the car parks and any other information required. This flexible parking management is made possible by SWARCO’s newly developed web-based Zephyr guidance system. Zephyr manages all relevant data and can be programmed to automatically change the content of the signs. In addition, even the graphics of the displays can be individually designed. A new counting system has also been installed at key locations to ensure that the number of spaces still available is always as accurate as possible.

CONCLUSION: LESS STRESS & LOWER EMISSIONS

Clear directions to the nearest car park and information about available parking spaces on the street and in multi-storey car parks are key factors in shortening the annoying search for a parking space and, as a result, reduce congestion and emissions.

SWARCO was able to complete the new parking guidance system for Bedford’s most important car parks on time for a stress-free Christmas shopping season.
Back in 2006, having undertaken detailed modelling of Nitrogen and Particulate matter concentrations, Dundee City Council declared the entire local authority as an ‘Air Quality Management Area’ (AQMA). Following on from this declaration the council prepared an Air Quality Action Plan (AQAP), which set out a series of measures that the authority intended to introduce in pursuit of the Air Quality Standards objectives. The primary aim of Dundee’s AQAP being to minimise the effects of air pollution on health.

SETTING THE PLAN IN MOTION

Since 2010 Dundee City Council and SWARCO have been working in partnership to deliver first class electric vehicle (EV) charging infrastructure. With careful consideration given to both site location and appropriate infrastructure, Dundee now has in excess of 310 EV Charge Points installed, the majority of which are available for public use.

In 2018 Dundee opened its first three charging hubs, strategically placed to offer charging facilities around the city. Princes Street, located near the city centre, incorporates six SWARCO eVolt 50kW Rapid Chargers and four 22kW Fast Chargers. The first of its kind in the UK, the Princes Street hub is also equipped with solar panels and an innovative battery storage system that can save the power generated by the solar panels for use at a later time. Hubs at Aimer Square in Lochee and Queen Street in Broughty Ferry both offer six 50kW Rapid Chargers and four 22kW Fast Chargers. The first multi-storey hub situated at the top of Greenmarket car park was opened in the summer of 2019, with 20 charging bays equipped with 7kW chargers, as well as solar canopies providing up to 41kW of energy and a battery storage system. With plans in place for an additional two multi-storey hubs, they will in total provide an extra 60 charging points across the city.

By 2027, the target is for 20% of all vehicles in Dundee to be electric. In support of this goal an ambitious project has been launched to ensure enough facilities exist to support such a large-scale switch. Dundee is certainly leading the way in making the change from fossil fuel to electric powered vehicles, investing intelligently in infrastructure that is putting the city at the forefront of EV charging technology, not only in the UK but also across Europe.
With SWARCO's innovative parking guidance systems, the eternal search for a parking space is a thing of the past. Simply follow the dynamic signs - as is now the case in Kaiserslautern.

The university city of Kaiserslautern with approximately 100,000 inhabitants invested in the attractiveness of its city centre and increased shopping variety. The new shopping centre "K in Lautern" now attracts visitors with a vibrant business world under one roof. As a part of the centre upgrades, the existing car park needed to be renewed and modernised. A simple task for SWARCO.

STATE-OF-THE-ART TECHNOLOGY

SWARCO updated all existing parking data controllers to the latest technology. The central server of the parking guidance system was completely updated - both in terms of hardware and software. In addition to the central PGS server, SWARCO set up 3 additional operator stations. Existing parking guidance signs were replaced by 10 new dynamic and static signs.
Signs will help tourists and citizens of Karlstad to easily and comfortably find a place to park. As Karlstad is a regional capital, signposting visitors and tourists efficiently is quite important, and an essential part in this is making navigation and parking more convenient and stress-free. Karlstad wanted visitors to be welcomed to their city with helpful service and guidance.

Citizens and retailers will also benefit since the system shows that there ARE available parking spots which people normally would not find. Instead of people driving around in frustration, they can use their valuable time doing what they came for.

**HOW IT WORKS FOR END USERS**
At home, users can see on an app, whether their preferred parking is available. During their journey information is provided by more than 50 digital signs in 31 locations all over the city. 19 of these signs are showing guidance to the available spots directly from the highway and the main roads. These signs show directions to multiple locations where drivers can park and the number of spots available. As the driver gets closer to the preferred area, they also get more details on the signs showing the names of parking areas and if they have available parking or not. The digital signs are updated live information. The whole solution lets drivers choose the most suitable parking area at a much earlier stage, preventing unnecessary driving in search for a parking spot.

**EASY TO ADMINISTRATE**
The system is connected to local counters such as single space detectors and loops. These devices register the cars and send the data to the system which counts, systemizes and generates data and statistics. In the web-based operator interface, the signs can be easily monitored, updated or have the text changed if needed. The city can also get valuable data reports from their parking and the possibility to compare different parking areas over time to improve their facilities. The system was delivered as a turn key solution with detectors, signs, communications and a web-based system that can be easily managed from your phone.

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**KEY FACTS**

**THE CHALLENGE**
Karlstad municipality had a lot of vacant parking spots, but they were not easily found by visitors. This led to unnecessary driving in the city center

**SERVICES**
Improve traffic and easily guide visitors to the nearest available parking bay, SWARCO has delivered a guidance system that shows where people can find available parking

**TECHNOLOGY**
Web-based interface for updating signs and installation of digital signs, sensors, detectors and counters

**PROJECT DURATION**
2018 - 2019
Swedavia AB was looking for a complete parking solution for Arlanda Airport in Stockholm. SWARCO was chosen because of its long partnership and, above all, its overall competence. A parking guidance system helps road users to find a free parking space stress-free and comfortable. The fact that you can fly away at Arlanda Airport in a relaxed manner is also due to SWARCO’s innovative complete parking solution, which combines barriers, parking guidance systems, parking space detection and parking reservation. This means that the system guides the user to the next free parking space via static and dynamic displays. And the corresponding software enables practical services such as online payment or parking reservation.

USABILITY, SECURITY AND COMFORT
With SWARCO, signs and signalling systems were implemented. The products are not only reliable and of high quality but also easy to operate. Usability is always at the forefront at SWARCO when it comes to new developments. Through modern engineering and years of experience in the development and production of LED-based signal technology, SWARCO sets the tone for signs and displays. The implemented parking systems make the overall solution in Arlanda perfect. Intelligent and secure access systems provide maximum convenience for users and professional data management and control for operators as the entire system can be easily controlled via software.
The city of Thun has a population of around 45,000 and is the gateway to the Bernese Oberland. The city centre experiences traffic problems due to intensive parking search traffic. In order to tackle this problem, SWARCO designed a flexible parking and traffic control system, one that is ready for future extensions. In the first step it serves as a pure parking guidance and information system. In later steps the system will be expanded to a traffic management system for the city of Thun.

In order to guarantee this flexibility, all displays are designed as fully graphic and full-colour LED matrix displays. In addition to the parking information the displays can also be used to indicate for example traffic disruptions and events.

**PARKING DATA CAPTURE**

The data from the existing 7 multi-storey car parks in the city centre as well as 5 further parking facilities are captured by the existing counting devices and fed into the parking control computer via a web interface. In the future, all major parking facilities in and around Thun will be connected to the system.

**CENTRAL COMPUTER**

The parking master computer is implemented as a virtual server at the premises of an IT service provider. The system can be operated from any workstation computer in the city of Thun via a user interface accessed via web browser. Authorization for this is username and password protected.

**LED MATRIX DISPLAYS**

All displays are fully graphical, full-colour LED matrix displays from SWARCO. The displays offer the greatest possible flexibility for changing traffic applications (parking guidance system, traffic information, event displays...). The displays are controlled by the parking control centre via 4G LTE telecommunication.

**GETTING EMISSIONS UNDER CONTROL**

Often a parking guidance system is the first cornerstone for an integrated citywide traffic guidance and information system, taking into consideration particular traffic situations such as events, traffic incidents or construction works. C-ITS ready, modern parking guidance systems will be a great help for communities to tackle congestion and emission impact.
Dr.-Ing. h.c. F. Porsche AG operates its development centre in Weissach, 30 km west of Stuttgart, with around 6,500 employees. There is an ongoing search for parking spaces by employees in the company’s own parking garages and parking lots, particularly at the start of the working day. Timely information about available parking spaces reduces search traffic and stress in the morning. SWARCO successfully implemented more than 20 parking guidance systems in Germany during 2017. New installations, maintenance of existing systems with signage and computer upgrades and numerous extensions fell to the experienced team based in Gaggenau near Karlsruhe.

**BETTER ORIENTATION FOR THE EMPLOYEES**

Sports car manufacturer, Porsche AG is a prominent customer who ordered dynamic parking guidance systems for their development center in Weissach and the headquarters in Zuffenhausen. The expansion of the main factory also led to an increased need for parking spaces. In a first phase, new car parks were built and equipped with eleven dynamic parking guidance signs at the entrances informing about the current occupancy. Meanwhile a second construction phase started, putting up signs in the city area of Stuttgart to inform Porsche employees at an early stage which road to take to the next free parking house in Zuffenhausen.

**A COMPLETE PACKAGE**

In Weissach seven sign posts indicate the availability of free parking spaces. This is either assessed by counting the difference between cars entering and cars leaving or by a single space monitoring system. SWARCO was responsible for the entire parking system including civil engineering work, production of dynamic signs, installation, commissioning and data transmission via GPRS. There are new, extended requirements for parking guidance systems such as:

- Hosted parking guidance centre (Software as a Service)
- Integration of parking spaces with charging stations for e-vehicles
- Parking space reservation option before starting the trip
- Personnel number related single space monitoring for employees
- Integration of single space monitoring systems of car parks into citywide parking guidance systems
- Communication of car park occupancy data on the internet and as smartphone app
- Integration of full matrix LED information boards
- Control of bollards to restrict parking spaces and sensitive city areas
- Connected mobility integrating public transport and park & ride facilities.

**THE CHALLENGE**

Design and implementation of a modern parking guidance system for a large automobile manufacturer

**SERVICES**

Development, planning and execution including civil works and cabling

**TECHNOLOGY**

Parking guidance central computer, data collection at 6 parking facilities by means of energy-autonomous ParkHere sensors, data processing of single-space monitoring equipment, 7 dynamic parking guidance boards

**PROJECT DURATION**

2017
A small town with many commuters and tourists: SWARCO was brought on board to prevent the search for a parking space from becoming a search for a needle in a haystack. The Canton capital city of Zug, has 28,000 inhabitants but over 31,000 jobs. As a result, the city attracts a large number of commuters every day, and everyone is looking for a parking space. As the city is beautifully situated on Lake Zug, it also attracts tourists all year round, also looking for available parking spaces. In order to make it easier for everyone to find a parking space, Zug has opted for an innovative parking guidance system from SWARCO.

CONTROL CENTER IN THE OLD TOWN
A total of 22 parking facilities are connected to Zug’s SWARCO Parking Guidance System, which includes the detection and display of individual off-street and outdoor parking spaces using magnetometer sensors which were included as a special feature. The main computer is located in the parking garage “Altstadt/Casino” - from where the entire system is controlled and monitored. Particular attention had to be paid to the historic old town, where the signaling was implemented in a compact form.

PARKING GUIDANCE SOLUTIONS
Being able to find and navigate your way to a suitable vacant parking space in today’s crowded urban landscape can be stressful and takes too much time when you just want to get to where you want to be. Providing data and clear signage to the nearest car park and information on the number of available parking spaces on-street and off-street are key to reducing search time for vacant spaces which consequently leads to a reduction in traffic volumes, emissions and helps to reduce noise and sound pollution.
Our 3800 employees around the world are people on a mission: They support our customers in delivering safe, modern and environmentally sound mobility to the roads.

LED light sources in SWARCO traffic lights consume up to 95 percent less energy than conventional incandescent bulbs, thus reducing CO2 emissions and saving operating costs.

One of the major challenges in modern electromobility is charging time. The charge points in the SWARCO EVOLT DC Raption series can charge e-cars up to 80 percent of their capacity within 15 minutes.

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Our annual road marking materials production suffices to equip over a million kilometers of roads, which is equivalent to a journey 25 times around the globe. That was the figure in 2016, and it grows larger every year.

Our history began in 1969 with the production of reflective glass beads. Half a century later, SWARCO is among the world leaders in road marking and intelligent traffic management.