

ANNUAL REPORT



optimising railways



2017

The photographs in this year's annual report show a journey through the five countries in which SMA worked most intensively in 2017. In addition to our traditional markets of Germany, France and Switzerland, the USA and Belgium also joined the group this year.

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Introduction

Dear Readers,

We are pleased to present a colourful and exciting annual report again this year for 2017.

Having taken a look into the past with SMA's 30th anniversary last year, we are once again moving full speed ahead into the future with this year's issue.

In addition to the traditional reports from a selection of projects in the areas of both our Consulting and IT groups, this year's two main articles concentrate on a topic that has long been a central focus for both segments of SMA's business.

The two articles explain how different aspects relating to the means by which the concept of "step appropriate precision" which lies at the heart of SMA's thinking can be implemented. The first describes a method of agile modelling related to the needs for strategic planning of the railway system, while the second concentrates on the implementation of the system architecture model known as "Microscopy on Demand".

We present both topics in detail at the beginning of this annual report in the hope that we can explain to the reader the benefits of these two complex and non-trivial concepts.

We hope that you enjoy reading our 2017 Annual Report.

Eric Cosandey
CEO, Head of Consulting

Thomas Bickel
Head of IT



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Agile models for strategic decisions

For a few years now, traditional transportation providers have been confronted with an environment which rather than dominating they seem to be more likely to have to accept conditions as they find them. In contrast, disruptive new players in the market are taking advantage of increasingly individualised mobility behaviours. Thanks to innovative technologies they offer more favourable products and prices in market areas that are currently only partially regulated, if at all. The constantly changing environment complicates the work of the traditional transportation providers and makes the planning and operation of their systems more complex than ever before.

Of course, the situation is not easy for many traditional organisations because they operate within a framework of public sector objectives whose purpose is to satisfy a wider societal interest. Indeed, while at the same time controlling the financial balance between revenue and expenditure, where this is appropriate it can require the subsidisation of public services, in order to deliver an efficient system.

In a recent study of the managers of Europe's main railway infrastructure and transportation companies conducted by Roland Berger, only 20% of respondents believed that today's business model will continue to exist in the future. However, most participants were convinced that the railway was capable of becoming the main integrator of personal mobility in this complex and multidimensional environment. This response raises the following questions:

- How will society and practices evolve?
- Which economic, environmental and spatial planning policies will be managed by the public sector?
- How will the private sector position itself?
- Which technological forms and orientations will prevail?

These questions are difficult to answer with the necessary certainty today and require a broad consideration of all possible strategies. The railway industry must therefore pursue a proactive strategy: Changes in the environment must be anticipated and possibly also influenced in favour of the railway's structural advantages. The aim will be to develop individual and collective competences, to use internal material and financial, but most importantly human and organisational resources to build the know-how through them. In other words, a competitive advantage can be gained over new entrants to the mobility market through the accumulation and use of capital and internal resources.

Due to the systemic nature of railways, the questions posed to the leadership of the authorities, infrastructure managers and railway companies are complex. Uncertainties, multiple dependencies, accelerating rates of change and organisational inertia mean that today's actions require deep reflections about the future as well as the development of potential solutions to the issues.

In this regard, railways must be able to rapidly develop their business model and build scenarios in order to confront the coming changes to their environment. These development activities include:

- Identifying the primary factors to examine through the identification of the dependencies between the system characteristics in a global model as the key variables
- Determining available resources, particularly related to the model's key variables
- Describing the development of strategies in the form of qualitative and quantitative scenario assessments, taking into consideration the likely changes to the key variables
- Assessing through the use of multi-criteria methods the consequences of any directions and strategies already adopted, and deriving additional actions to be taken

This scenario-based approach involves modelling work. In generic terms modelling can be considered as the rationalisation and reduction of the complexity of a system with the aim of better understanding it, and as a result of this modelling process it becomes possible to predict the behaviour of the system. To quote a famous (possible mis-) quote of Albert Einstein, "Everything should be as simple as possible, but not simpler". With this idea in mind, to enable an efficient and useful implementation of scenarios, any model itself must be simple and manageable. For the purposes of analysis (both strategic and operational) the model should be agile in terms of its clarity and abstraction of the underlying system. In this process, neither the use of aggregated and detailed data, nor macro- and microscopic models are mutually exclusive. Rather, they are to be used in a complementary approach and problems are addressed with a "step appropriate precision". This enables modelling to be undertaken that is sufficiently abstract for the purpose of analysis, while at the same time reproducing reality with sufficient accuracy. Of course, the results must always be interpreted according to the degree of abstraction of the model.

For planners and decision-makers the reduced model complexity as a result of the "step appropriate precision" has considerable advantages. Firstly, study scenarios can be quickly duplicated and the consequences of different potential strategies assessed. This makes it possible to take advantage of the principle that rather than by looking at a single solution in detail, the best result can be found by a comparative evaluating of a wide variety of solutions. Secondly, the spatial dimension in the analysis can be maintained as the effects of any local action must be considered and modelled in a wider global context in order to be able to assess its operational or financial consequences throughout the network. Thirdly, the time dimension can also be managed as the study of long-term scenarios can be undertaken with initially simple models that can later be supplemented with more detailed models depending on the needs of medium- and shorter-term planning if needed.

This approach corresponds exactly to the concept of "step appropriate precision" which SMA applies in its procedures and tools with the aim of adequately covering the needs and challenges of all players in the railway system, and enabling them to make strategic decisions about their future.

Microscopy on Demand

The best of all worlds Today, essentially two types of infrastructure models are used in the process steps from conceptual offer planning, through capacity management and onto path management: the macroscopic and the microscopic (utilising the exact route and interaction with signalling system). The specific advantages and disadvantages of the two models are now widely accepted and do not need to be discussed at this point.

The term “Microscopy on Demand” (MoD) refers to a conceptual software architecture that SMA has specified and developed over the last few years. This concept makes it possible to switch easily between the macroscopic and the microscopic model at all stages of the planning process.

The basic tasks of planning the offer, design, verification of the driveability (including running time, occupancy calculation and conflict detection) and analysis of an existing conceptual offer (i.e. stability, capacity utilisation, vehicle circulation, etc.) can now using MoD always be carried out with the most appropriate model. This optimally exploits the advantages of the respective infrastructure models, providing us with the best of all planning worlds.

The cost of switching between the macro and the microscopic model is decisive for the successful implementation of the MoD concept. Costs are to be understood in this context in a general way and can include issues such as a reduction in system performance, the cost of maintaining data, or even necessary manual steps to complete the task. In the best case, it is possible to implement the concept of switching between automatically synchronised macro- and microscopic models at the push of a button, i.e. without time delay and the requirement for additional manual post-processing.

Architectural Foundations The MoD concept can be implemented in a number of different ways in alternative system environments. The concept only requires the implementation of five architectural blocks and suitable interfaces that enable meaningful communication between them.

In the microscopic model, the first of these is a routing service, which determines an operationally possible route between suitable operating points, and a route catalogue which contains all the routes to be considered, including an identifying name. To check the drivability, a running time service, an occupancy calculation service and finally a conflict detection service must also be implemented.

On the macroscopic side, it is only necessary to complement the existing timetable model so that a microscopic track can be referenced from the track catalogue inside the train path. SMA calls this model extension “Named Routes”.

With these five modules it is possible to work on the basic tasks of offer planning (such as design, verification and analysis) by alternating between macroscopic and microscopic models. In the construction phase, the scenario capability of the macroscopic model comes into play. Through the automatic transformation of the timetable to the microscopic model, the travel time and occupancy calculation, as well as the conflict detection with microscopic accuracy, can be carried out at this early planning stage.

The clear separation of responsibilities into the five architectural building blocks, and their implementation as services available enterprise-wide, is a big step towards a true service-oriented architecture. This is particularly useful because the services required for routing and checking the driveability are also useful in many operational IT systems, e.g. in modern traffic management systems.

It would be an obvious step forward if the different implementations of these functionalities that already exist today could be brought together consistently in path management and timetabling systems.

Several European Infrastructure Managers have already made, or are currently making efforts to provide, such services across their enterprises. In implementing the MoD concept, they can therefore make use of these components.

Illustration In order to illustrate the concept, we will describe the method of working in the planning process, and its implementation within the framework of the MoD concept.

In the microscopic system, the routes are completely determined by automatic routing, or if needed by manual planning steps. Subsequently the references to these routes are stored as the “Named Routes” after they have been transferred via a suitable interface (for example based on railML) to the macroscopic system.

In the macroscopic system a running time calculation, based on the required data of the microscopic model, can be executed as follows: The train run is combined with the referenced routes and sent to the running time calculator service with information about the rolling stock to be used. This then uses the infrastructure catalogue in order to obtain within the microscopic model the corresponding information about the infrastructure used. Subsequently the results of the running time calculation, carried out microscopically, can be delivered to the macroscopic system which requested it.

This essentially allows the undertaking of a microscopic running time calculation from within the macroscopic system. It is then guaranteed that the macroscopic system's calculated running times, as typically used in capacity management processes, are fully consistent with the path management running times from the microscopic system. This overcomes a major obstacle to data flow between capacity and path management, resulting in greatly improved integration between the planning systems of these two process streams.

For the user of the macroscopic system, another advantage of this outsourcing of running time calculation is that geometric infrastructure data such as curve radii, gradients or speed profiles no longer need to be maintained redundantly. Now the infrastructure data of the macroscopic system only needs to be able to link the timetable data with microscopically defined infrastructure elements, which significantly reduces the costs in data management.

The procedures for occupancy calculation or conflict detection in the MoD process are analogous.

Implementation In the current planning process it is a major challenge to use macroscopic and microscopic systems together. There are requirements for the scenario planning capabilities of the macroscopic system, and the need for the accuracy of a microscopic system to verify the driveability. Conflicts detected late in the planning process cause many additional process iterations between the macroscopic and microscopic systems.

One goal of the MoD concept is to identify issues in the planning process as early as possible, thus massively reducing the number of iterations and process steps to be undertaken.

Together with its partners, SMA relies on an appropriate planning process for client projects, and is working with providers of microscopic systems to implement the entire MoD concept.

A selection of projects from 2017



Auvergne-Rhône-Alpes Region and République and Canton of Geneva: Leman Express service concept audit, support for project adjustment and robustness verification

When the CEVA project opens, a new crossborder railway service called Lémán Express (LEX), significantly improving the railway service in the France–Vaud–Geneva area will be commissioned. The organising authorities have laid down strict requirements in terms of intervals, connections and punctuality. With the evolution over the past few years of the international timetable context, punctuality targets and the refinement of the various infrastructure and rolling stock projects, the LEX timetable project has evolved into the “2017 adapted E1” timetable. The Lémán Express steering committee decided to entrust to SMA an audit of the studies leading to the 2017 adapted E1 timetable conducted by SNCF Réseau and CFF Infrastructure in partnership with SNCF Mobilités and CFF Voyageurs, and their joint subsidiary Lémanis.

The work of SMA consisted of expert assessment of all the planning steps. The crossborder timetable data was first incorporated into a single Viriato database and the consistency checked between the various elements of the timetable and between the two Swiss and French networks. After this audit, recommendations were made concerning the adaptation of the timetable to safeguard the project and its feasibility.

SMA then assisted the partners in the work to adapt the service, timetable and rolling stock rosters of the LEX project to implement the recommendations made in the audit. This work particularly took into account the challenges of freight traffic. Based on this adapted timetable, SMA then checked the robustness of the concept by conducting several crossborder tests to check the spread of disturbances injected into the network using the Viriato robustness module and making recommendations for the operational management of any operational instability.



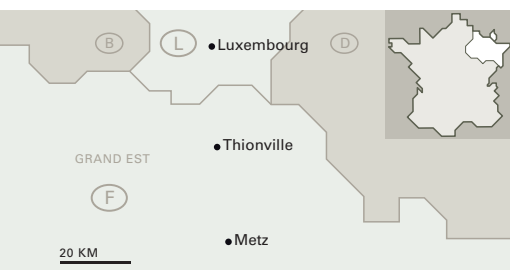
Lyria SAS: new 2020 service and related traffic potential Lyria SAS, a joint subsidiary of SNCF and CFF, is the railway operator in charge of TGV routes between France (Paris, Marseille) and Switzerland (Geneva, Lausanne, Basel and Zurich). TGV Lyria has been managing its own rolling stock since 2012. The company therefore plans fleet management and renewal strategies with the aim of maximising productivity.

In this context, Lyria entrusted SMA with two projects for the design and assessment of an optimised transport plan for the 2020 service.

The first mandate, concerning a study of the development of the service, was conducted by opening up the range of possible options to identify solutions which maximise fleet productivity. The results showed that it is possible to improve the service whilst considerably reducing the necessary rolling stock by simplifying and systematising the timetables on the routes between Paris and Switzerland.

For the second mandate, SMA joined forces with the EPFL Urban Sociology Laboratory and its spin-off Mobil'Homme to analyse the consequences on demand of the implementation of the transport plan designed as part of the first mandate. In particular, it involved checking the response of the clientele to a new systematised service between Paris and the Lake Geneva region. The results confirmed the relevance of the proposed solution.

The timetable designed by SMA is now being used as a reference for the development of the TGV Lyria 2020 service and path orders from infrastructure managers.



SNCF Réseau and CFL Voyageurs: Opportunity assessment of the long-term capacity increase on the Metz–Thionville–Luxembourg route and integration into the long-term French and Luxembourg planning

During 2016 and 2017, SMA was mandated by SNCF Réseau to assist it in defining the conditions for development of the network in Lorraine for 2022 and 2030. This study looked at the evolution of all types of traffic and identified infrastructure developments necessary for the different horizons.

It was supplemented in 2017 by a detailed capacity study on the Metz–Thionville–Luxembourg route, which is an important sector. This route is situated in a major European freight corridor, but also carries dense passenger traffic, particularly due to the strong increase in cross-border workers. Different infrastructure developments were identified, aiming to significantly increase the performance of this route.

This study, an opportunity assessment of the long-term capacity increase, was conducted under an SNCF Réseau mandate and with strong interaction between the French and Luxembourg networks. As part of this study, SMA was able to ensure international coherence over the different time horizons between the study conducted on the French side and that carried out on the Luxembourg side.

In 2017, SMA continued the assistance to CFL begun in 2016 to establish a service – timetable – infrastructure scenario with a long-term horizon on the Luxembourg network. This work required much iteration between the service targets (to respond to the very high predicted increase in passenger numbers) and the infrastructure projects already planned.

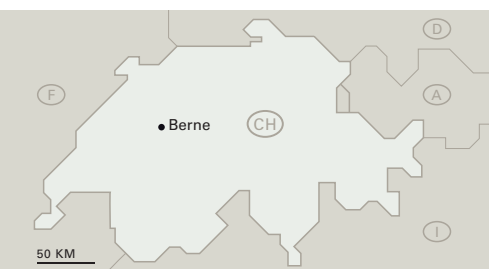


VOR: Vienna and Eastern Region 2040 Offer Concept With almost two million inhabitants, the city of Vienna is Austria's largest centre and, together with the surrounding areas one of the fastest growing metropolitan regions in Europe.

Although the public transport network in the city of Vienna and the neighbouring provinces of Lower Austria and Burgenland is already well developed, various S-Bahn corridors will reach their capacity limits in the foreseeable future. On behalf of the Planning Association East (Planungsgemeinschaft Ost, or PGO*), the VOR has commissioned SMA to examine possibilities at the conceptual level for redesigning transport on the new east-west and north-south axes in terms of supply planning with the planned infrastructure additions.

The second focus of the project is identifying development opportunities on the inner-city trunk line and the adjacent corridors. The planning focuses on a shorter train sequence for the medium-term horizon and fundamental conceptual considerations for infrastructure expansion in the city centre for the long-term horizon. The aim of the work is to support the VOR and the provinces of Vienna, Lower Austria, and Burgenland in making fundamental strategic decisions as to whether and where extensive infrastructure additions should be planned. The work will be continued in cooperation with Verracon, a local planning office in 2018.

* PGO is a joint organisation of the provincial administrations of Burgenland, Lower Austria, and Vienna for the harmonisation, coordination, and preparation of spatial-planning-relevant issues in the Austrian "eastern provincial region".

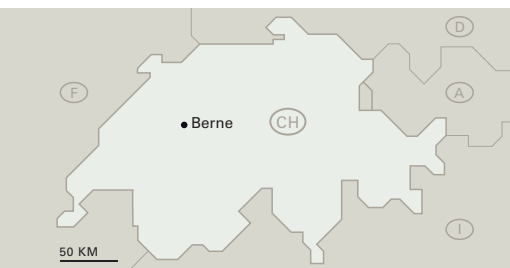


Various private railways in Switzerland: Support for development in STEP's

2030/35 expansion step Together with the infrastructure operators, transport companies, and cantons, the Swiss Federal Office of Transport (FOT) is developing the 2030/35 expansion step of the strategic development programme for railway infrastructure (STEP). SMA has supported numerous private railways in the development of service and infrastructure concepts and the evaluation basis. The following are worth mentioning: Matterhorn Gotthard Bahn (MGB), Regionalverkehr Bern Solothurn (RBS), BDWM Transport AG, Wynental- und Suhrentalbahn (WSB), Transports de Martigny et Régions SA (TMR), Transports de la Région Morges Bière Cossonay (MBC), Chemins de fer du Jura (CJ), Transports Publics du Chablais SA (TPC), Transports Publics Neuchâtelois (TransN) and the Einfache Gesellschaft Grimsel Tunnel.

Within the framework of expansion modules, the desired supply objectives (frequency, longer trains, changed stop policy, new stops, etc.) were implemented in terms of the timetable, the necessary infrastructure expansions derived, and the business and economic principles for evaluation by the FOT devised. The conceptual design was developed in an iterative process of overall system optimisation in cooperation with the railways, the FOT and the customers. The valuation input was derived from the effects on demand, income, and operating costs, and from overload reduction, operational stability, and rolling stock requirements.

From the selected modules of the normal gauge system network, the FOT developed two variants of the overall concept for the 2030/35 expansion step with SBB. For private railways, it was now necessary to check the connections, some of which had been modified, at the interfaces and if necessary include them in the private railway concepts. In addition, any selected private railway modules had to be specified and optimised. SMA also supported the private railways in these tasks with revised service and infrastructure concepts taking into account the changed framework conditions. Network graphics, line graphics, track occupancy, functional infrastructure requirements, travel time comparisons, data and fact sheets documented the results.



SBB AG: Support for SBB in optimising the overall concepts for STEP's 2030 expansion step

As part of the development of STEP's 2030/35 expansion step, SBB, under the leadership of the Swiss Federal Office of Transport (FOT), developed two versions of overall concepts in the first half of 2017. SMA then supported SBB in optimising the concepts in the intensive optimisation phase that lasted until the end of 2017. Numerous tests and adjustment requests from the cantons, the freight transport industry, the FOT, and SBB were examined, documented, and coordinated at regular intervals. Among other things it was necessary to improve offers, reduce the need for new infrastructure measures, and allow operational improvements in order to optimise the overall system.

The phase was completed with the documentation of the overall concept in the form of network graphics for passenger and freight traffic, infrastructure requirements, and infrastructure lists and an offer matrix. The overall concepts for the 2030/35 expansion step will be continuously developed and optimised in further phases.



Service development VBZ/Forch railway on the Stadelhofen–Rehalp–Forch section.

Today, both Tram Line 11 of the Zurich public transport authority (VBZ) and S-Bahn Line 18 of the Forch railway run on the Stadelhofen–Rehalp–Forch public transport corridor. Several major infrastructure projects are planned along this corridor in the coming years and decades, which will generate a large number of jobs in the area. These projects are expected to generate greater growth in demand, particularly along the inner-city section. Today's supply is only conditionally suitable for meeting the expected demand.

In order to meet future demand on the Forch corridor, VBZ has developed several approaches to consolidate supply on this corridor and make optimum use of Forch railway and VBZ-Tram transport capacities. SMA conducted a detailed study of these approaches within the context of an in-depth study and compared the approaches with respect to several technical, infrastructural, and scheduling considerations. The comparison resulted in a recommendation for the best variant to refine further.





Federal Ministry of Transport and Digital Infrastructure (BMVI): FTIP and German national clockface timetable consulting services The consulting services for the BMVI, which SMA provides as part of a joint venture with VIA-Con and Intraplan, were continued in 2017. A nationwide target timetable for 2030 has been drawn up on the basis of infrastructure measures to meet the urgent needs of passenger and freight traffic. This target timetable also includes the investigation of six major nodes and thus the derivation of possible infrastructure measures to eliminate bottlenecks in these node areas.

Another focus was the start of planning for the 2030 plus timetable (German clockface timetable). The results of the first draft of a nationwide long-distance service concept, which is based on the plans for 2030, have been presented to the federal government. The plans take into account numerous new elements which, from the point of view of the project sponsors, make sense for a national German clockface timetable. The long-distance service concept and the underlying infrastructure form the basis for the planning of the offer concepts for all federal states. These plans will be developed in the first half of 2018. In this planning step extensive attention will be given to the concerns of freight traffic.

In addition to offer planning, one objective is to derive the infrastructure from a timetable and thus create the basis for eliminating the identified bottlenecks in the medium to long term by means of suitable infrastructure expansions.



DB Netz AG: Support in drawing up medium- and long-term timetable concepts

In 2017, the successful cooperation with DB Netz AG in advising public transport providers continued. SMA typically supervises variant development and conceptual planning, while DB Netz AG is responsible for microscopic planning and testing. This cooperation is based on direct coordination with DB Netz AG and short iteration loops between macroscopic and microscopic planning steps.

In 2017, concepts for the federal states of Berlin/Brandenburg, Schleswig-Holstein, and Thuringia were developed as part of this cooperation, each for a medium-term horizon and a long-term horizon. The infrastructure measures planned for these time horizons were used as a basis for the assessments and, if necessary, supplemented by further measures derived from the offer concept. The work is carried out iteratively in close coordination between all parties involved, with the planning results generated using Viriato and continuously exchanged with DB Netz AG.

The end product is concepts for nationwide destination timetables as systematised regular timetables that cover all necessary operational and infrastructure measures. Freight traffic is also taken into account in these concepts in the form of system paths. These target concepts are intended to serve as a compass and guideline for planning in the coming years – e.g. for further infrastructure development and tenders for transport services.

Work on this project will continue in 2018.



DB Netz AG: Timetable digitalisation: Support for the RUT-K requirement design

Since 2017, SMA has been supporting a team for the agile refinement of the RUT-K route design system as part of the “Timetable digitalisation” future railway measure. The aim is to standardise the various software systems for timetable design in the area of DB Netz AG in order to obtain an overall view of the planned and available path capacity. The focus in 2017 was on the implementation of functionality known as “Change Mountain”, which makes order changes visible in the construction system and allows display of the ordered paths for each day without overlaps.

Another focus of his work was the visualisation of operational availability restrictions – in particular construction site-related restrictions – in the construction system. This is a prerequisite both for the future work of the construction timetable editors in RUT-K and for the connection of the planned online path booking (“click&ride”) to the manual path construction system.

Work will continue in 2018 with the aim of integrating the essential functionalities for the construction timetable in RUT-K.



DB Netz AG: Support in the preparation of construction timetable concepts

The increasing number of construction sites on the German rail network is leading to increased demands on coordination of time and space. In addition to coordinating the construction measures internally, DB Netz AG also endeavours to make the best possible use of the remaining capacity in the network. In many cases, this will require adjustments to the timetable for both passenger and freight traffic. By developing alternative solutions for different construction stages, the best possible concepts are developed and planned in dialogue with the transport companies and public transport providers.

As part of DB Netz AG’s support, the timetable concept for passenger and freight traffic was initially drawn up for various corridors in the central regional area without taking construction sites into account. The foundation for this effort was the basic DB Netz AG timetable. In the subsequent construction timetable, alternative solutions were developed and compared for the relevant construction stages. In particular the question of whether the capacity for freight traffic on the relevant diversionary routes is sufficient was addressed.

Various premises were defined and varied in a targeted manner as a framework for the development of the construction timetables. Examples include the requirements for the smallest possible adjustment of timetables outside the construction site area, for weighing travel time extensions against maintaining the links, for transport mode mix (long-distance, regional, and freight traffic), and for the possibility of diverting traffic. To determine the relevant construction stages along a corridor, SMA has developed an IT application for visualising construction measures in the form of a path-time diagram for each line for an entire timetable year in addition to the purely planning work.



Hessen Agentur GmbH: Feasibility study for the refuelling of fuel cell rail vehicles in Frankfurt's Industriepark Höchst In the Rhine-Main regional transport authority (RMV) area, the RB11, RB13, RB15, and RB16 lines in the Taunus network will be put out to tender again in the next few years, and the planned extension of the S5 to Usingen must be taken into account, something the current concept does not do. Instead of the diesel locomotives used today, fuel cell vehicles are to be used in the future. Fuel cell vehicles require more frequent refuelling processes than diesel-powered vehicles, and these refuelling operations are to take place in Industriepark Höchst.

Circulation plans were drawn up for the planned tender timetable for the use of diesel and fuel cell vehicles, taking into account the range to the next refuelling operation and the refuelling facility locations. This made it possible to evaluate the effects the conversion of the vehicle concept has on the number of vehicles or the number of empty runs. Furthermore, for the use of fuel cell vehicles the operational feasibility of refuelling trips to Frankfurt-Höchst area was examined, a rough refuelling facility dimensioning carried out, and the operational risks assessed.



KC ITF NRW: Consulting framework agreement for the ITF Competence Centre in North Rhine-Westphalia Following a successful Europe-wide invitation to tender, SMA entered a new framework contract period in 2017 and continued its many years of cooperation with the regional public transport providers and the NRW ITF Competence Centre. SMA has entered into a joint venture with VIA-Con from Aachen in order to deal even better with microscopic operational issues.

The contract to accompany the North Rhine-Westphalian Ministry of Transport and the NRW public transport providers had the following priorities in 2017:

- Timetable planning within the DB NRW Station Offensive
- Planning the RRX for the 2040 long-term horizon
- Re-planning tender networks
- Updating incident concepts in the Ruhr corridor
- Circulation planning for sub-networks
- Adaptation of local trains to refinement in long-distance services
- Operational quality analyses

The work is carried out in numerous variants, which are coordinated and prioritised with all parties involved. This approach allows broad-based statewide planning of offers and operations with the aim of optimally coordinating all participants in the state of North Rhine-Westphalia.

Work on this project will continue in 2018.



Munich S-Bahn Dimensioning of the Steinhausen facility for the timetable with the second S-Bahn trunk line With the commissioning of the second trunk line, the Bavarian Railway Company, the public transport provider responsible for local rail passenger transport in Bavaria, is planning to order a significantly expanded service concept from the Munich S-Bahn. This will require a renewed and enlarged fleet of vehicles, most of which will continue to be maintained at the Munich-Steinhausen facility.

The Munich S-Bahn commissioned SMA to supply an expert opinion on the question of whether the planned supply, vehicle handling, and parking concept can be implemented at the existing Steinhausen facility and the planned extensions with the quality required from the transport contract.

The feasibility in various areas of the depot and plant was to be analysed. This involved checking the timetable for reversing runs from the Leuchtenbergring to the depot, the capacity of the nearby track sections, and feasibility in the entry and exit area. A capacity utilisation forecast was also made for all existing and planned facility areas at the Steinhausen plant, including statements on the feasibility of activity at the plant.

These analyses made it possible to determine the utilisation of the various facility components (switches, tracks, track groups) and to identify the points critical to capacity. These results lay the foundations for the S-Bahn Munich to take further steps to specify future vehicle maintenance and treatment.



Lake Constance district: Demand potential, costs, and revenues for a third hourly cycle on the Lake Constance Belt Railway Today, the Lake Constance Belt Railway is a non-electrified railway line connecting Radolfzell on the northern shore of Lake Constance with Lindau via Friedrichshafen. It is used both for local access and for the superordinate connection of the Hochrhein with the Southern Railway and the Allgäu.

For the planned electrification of the line, the Lake Constance district has formulated its offer objectives and had the feasibility tested by SMA: The preferred variant provides for a half-hourly service with regional trains, and an accelerated hourly service which exceeds the Baden-Württemberg state standard (reference concept). The services above the state standard require municipal financing, which is why the Lake Constance district will have to share in the additional costs for the operation if its offer goals are implemented.

In this context, the Lake Constance district commissioned SMA to determine the demand potential and operating costs and revenues for the preferred variant and the reference concept for the Lake Constance Belt Railway. This information could be used to estimate the expected compensation expenses. Because the region also has to bear part of any additional infrastructure investment costs required, this expenditure was also to be determined.



The chosen procedure initially specified the district's supply objectives and made the main operational, infrastructural, and financial consequences transparent. For both timetable concepts, SMA determined the passenger kilometres, revenues, and operating costs of a fictitious train operating company and estimated the investment costs for the necessary infrastructure. The study provided the Lake Constance district with the necessary basis for a well-founded discussion and continuation of the project.



Munich S-Bahn: Internet-capable timetable information system for the start concept with a second trunk line

At the beginning of April 2017, the ground-breaking ceremony for the start of construction of the second trunk line of the Munich S-Bahn took place with a citizens' festival at Munich's Marienhof. At the same time, an information centre was opened at the same location. In addition to plans and models for the construction and technology of the second trunk line, information on the planned timetable is also available in the information centre for the first time. In this way, passengers can get an idea of the timetable improvements possible with the commissioning of the second trunk line (start concept) over the current timetable.

On behalf of DB Netz AG and the Bavarian State Ministry of the Interior's Supreme Building Authority, SMA has developed an internet-capable timetable information system for construction and transport that enables the comparison of several time horizons. After the user touches the start and destination points on the route map, the application displays the shortest travel times and the number of connections for the start concept with second trunk line and for the current timetable. The itinerary for each connection is also visualised on the route map. This gives the user concrete timetable information on future connections in the Munich rapid transit network.

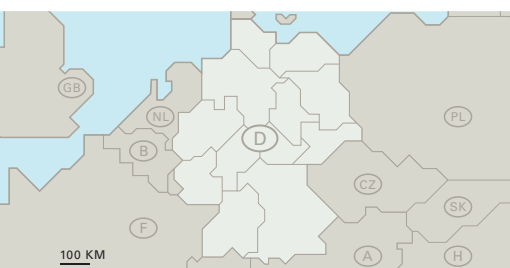
In the interests of transparent information to the public, the timetable information system is to be continuously adapted to the latest timetable planned. The software is also designed to display additional time horizons in addition to the current timetable and start concept. The timetable information system could also be used via the internet at a later date.



Munich S-Bahn: Offer and operational planning for the planned U9 The number of passengers on the Munich subway has been increasing steadily for years. The completed or planned conversion of the trunk lines of the U1/U2/U7 and the U3/U6 to a two-minute service during rush hour will bring only temporary relief. In the longer term a bypass for the Munich subway network is planned. It will relieve the two trunk lines with two additional lines – U9 and U29.

In addition to the feasibility studies for the necessary infrastructure, the Munich Transport Corporation (Münchner Verkehrsgesellschaft, MVG) commissioned SMA to prepare one service and operational study for the U9 and one for U29. The connection of this new line with the existing underground network north of Münchner Freiheit, south of Theresienstrasse, and on Implerstrasse depends strongly on the operating concept chosen. Clean-line operations imply requirements for the design of the interconnection structures that are different from those implied by mixed operation. Another alternative was to check the desirability of merging the Poccistrasse and Implerstrasse stops.

The first step was to model the various infrastructure variants in the OpenTrack microscopic operational simulation model and calculate the running times. This was the basis for developing timetables for the various service concepts. Timetables for event traffic to the football arena in Fröttmaning were also developed for all variants. This made it possible to derive initial infrastructure and vehicle requirements. The second step involved assessing the robustness of the developed timetables by means of operating simulations as a further basis for the variant decision.



Germany: Punctuality study in a local train network In a regional rail transport competition network encompassing local train services running over long distances, minimum values to be achieved by the public transport provider according to the tender documents of the rail transport company were defined for both the monthly and annual punctuality of all trains across all measuring points.

In the first year of operation of the transport implementation contract, both the monthly and annual punctuality values of the rail transport company were significantly below the target punctuality. The question arose as to whether the actual punctuality stipulated by the contract was realistic or whether it would permanently remain unattainable for the transport company. If the latter is the case, the contractual penalty cannot fulfil the incentive effect intended by the public transport provider to improve quality.

The parties concerned agreed that an external expert opinion must be obtained to assess the attainability of the punctuality requirements and they commissioned SMA to carry out the relevant analysis.

The purpose of the report was a detailed evaluation and analysis of the delay data and the causes of the delay. The data was evaluated on the basis of the timetable planned by the railway infrastructure company and the existing timetable structure. This also included a differentiation between primary and secondary delays. This finally made it possible to derive realistic monthly and annual target punctualities that are attainable and support the incentive effect intended by the public transport provider.



SNCF Réseau: 2018–2025 timetable studies in Normandy The evolution of the institutional organisation of mainline trains in France, excluding high-speed trains, led the Normandy region to take back responsibility for the entire passenger service in its region from 2020. It has ordered new equipment for this deadline and intends to conduct an in-depth review of the service overall. The SNCF group has set up a joint platform to study the response to the request from the region. Moreover, commissioning the extension of the RER E to the west in 2025 changes the situation with regards to routes between Normandy and Île-de-France which accounts for a large part of the regional railway flows. In this context, SMA was mandated to establish the framework of a new fixed-interval timetable and its structure over a 24-hour period for 2025, serving as a guiding principle for the timetable developments to be made by 2020.

Moreover, the ports on the Normandy coast have approached SNCF Réseau in order to have good quality train paths for access to their hinterland, taking into account constraints relating to large-scale modernisation work undertaken on the different access lines to these ports. SNCF Réseau contacted SMA to assist it in the development of this catalogue, in an approach taking into account the specifics of the works scheduled in each annual timetable and the evolution of the volume and timetable positioning of the request for paths.



Lisea: Study of scenarios for implementation of high-speed intercity services on the SEA high-speed line Commissioning of the South Europe Atlantic high-speed line (LGV SEA) in July 2017 between Tours and Bordeaux led to a major reduction in the trip time between the urban areas on the route. Beyond its main purpose of connecting local communities with Paris and other French regions, the new infrastructure also offers the opportunity to strengthen regional intercity routes and provide attractive trip times between the main cities in the Nouvelle-Aquitaine area.

The operator of this new infrastructure, Lisea mandated SMA to analyse the development prospects for high-speed intercity regional-type services in supplementing the current long-distance service provided by SNCF Voyages. Several service scenarios have thus been designed, assessed and compared according to a variety of operating modes based on comparable experiments conducted in France and other European countries. The most promising scenarios were then refined in terms of timetable positioning, rolling stock rosters and production costs estimation.



SNCF Réseau: High-speed timetable study as part of the increase in capacity of the Atlantic high-speed line The Atlantic high-speed line (or LN2) commissioned in 1989–1990, is characterised by a reverse Y configuration, connecting Paris to Le Mans via its “West” branch and to Tours via its “South-West” branch. The demand for paths on the LN2 is increasing, in particular due to the commissioning in 2017 of extensions to the two branches towards Rennes (LGV BPL) and Bordeaux (LGV SEA). Moreover, replacement (of the TVM 300 signalling system) is an issue in the medium to long term for reasons of capacity and technological obsolescence and also for reasons of continuity with the BPL and SEA lines. These lines are equipped with the ERTMS Level 2 European standard, thus allowing railway interoperability in a context where opening of the market to competition is imminent. The “High-Speed, High-Performance” (HPGV) programme was developed in response to these issues.

In this context, SMA was charged with designing the systematic timetable basis for the Atlantic sector for the various development horizons of the train path offer, and assessing them from the point of view of capacity needs and signalling technical requirements on LN2. The scope of the study covers all the High-Speed services in the Atlantic sector, i.e. routes between Île-de-France, north, east and south-east France on the one hand, and Rennes, Nantes, Tours, Poitiers, La Rochelle, Bordeaux and beyond on the other.

By using an integrated approach to design of the service and infrastructure, it was possible to define a target scenario satisfying the long-term path requirements and identifying the strict needs for developments to increase capacity. It was also possible to check the coherence of the intermediate stages of the HPGV project on LN2 with those of the HPGV project on LN1 (Paris–Lyon) and with the high-speed traffic planned in the medium term.



SNCF Réseau/SNCF Mobilités: Robustness and operation analysis of the Paris-Montparnasse railway complex The operational robustness after commissioning of the LGV SEA and BPL (in July 2017) is not satisfactory with regard to Paris-Montparnasse station. The increase in traffic volume resulted in a significant deterioration of train regularity routes approaching the station. Additional infrastructure developments were planned but the limited long-term operational data did not make it possible to determine their ability to improve station operation.

SMA produced a diagnosis of the station’s current operation, including the saturation of the access routes, the rolling stocks rosters, preparation of the track occupation diagram and the production processes. A closer look was taken at the exchanges of empty rolling stock with the maintenance location, which generates major disruption.

The study documented the management actions that can be improved with regard to exchanges of often very late empty rolling stock, and identified the saturation of one of the station access routes as amplifying these delays. It also observed that the new developments would be insufficient to solve these difficulties. Recommendations were made to increase the availability of tracks in the station and on the line to facilitate management of disruptions. These recommendations were applied for illustrative purposes in an evening peak systematic track occupation diagram to demonstrate their feasibility.

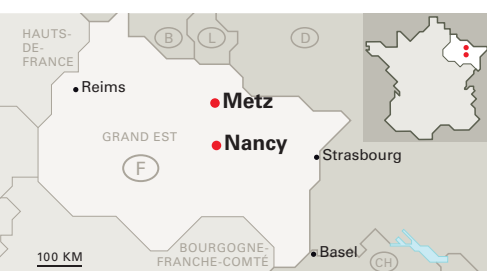


SNCF Mobilités: Optimisation of the rolling stock maintenance system and updating of the TER PACA fleet plan Coverage of specific service developments considered for the next ten years on the SNCF railway service in the Provence–Alpes–Côte d’Azur region (TER PACA) requires investment in rolling stock in a context of increasingly restricted regional funding. The CAP TER 2020 programme, currently being set up, aims to establish a structured action plan to improve technical and financial performances in the short and medium term. Therefore, one of the components concerns control of the cost of the equipment item per passenger-km.

In this context, the analysis conducted by SMA for SNCF TER allowed the 10-year master plan for the TER PACA fleet to be updated, incorporating the service developments, fleet expiries and its major upgrades. This master plan should make it possible to reduce the cost per passenger-km, the number of different series in operation and the number of maintenance, storage and cleaning sites.

Thanks to specific adaptations of the service and the technical train path alignment variants, SMA also put forward a concept making it possible to de-saturate the rolling stock maintenance site at Marseille Blancarde, the congestion of which is currently the source of regularity problems in the Marseilles railway node.

Finally, SMA coordinated the work of a specialised partner office on railway maintenance issues, among others. Its contributions enabled the development of an action plan to improve compliance with the weekly production schedule of the Technicentre PACA rolling stock maintenance centre.



SNCF Mobilités: Assistance to SNCF TER Grand Est for the adjustment of the fixed interval timetable in Lorraine In April 2016, a new fixed-interval timetable was set up in Lorraine. This timetable profoundly modified the service and operation, in particular for the Nancy and Metz nodes. SMA made an active contribution to this project by providing technical assistance to the project partners. Following the implementation of this timetable, the need for some adjustments was identified. This led to the TER Grand-Est management contacting SMA for assistance in this process.

The study started with an in-depth analysis of the timetable, production and punctuality of the service commenced in April 2016 in the Lorraine area. This analysis was conducted for both track sections and in stations. Following this analysis, proposals and recommendations were made to adjust the timetable and production to improve the situation. These proposals were summarised in a prioritised action plan according to the possible application horizon for the following year’s services.

One of the parts of the action plan concerns Nancy South. In this sector, the diagnosis was first studied in greater depth, seeking the most critical trains and stations or sections. Modifications to the service, timetable and operation were then proposed with a variable ramp-up according to the annual services and the scale of the modifications. The modifications are currently under analysis and subject to the approval of the elected

representatives. The aim was to have the first effects as quickly as possible (a priori from the start of the 2019 service), subsequently supplementing if necessary by a more far-reaching reworking of the timetable and operation of the sector, in particular with regard to the rolling stock roster.



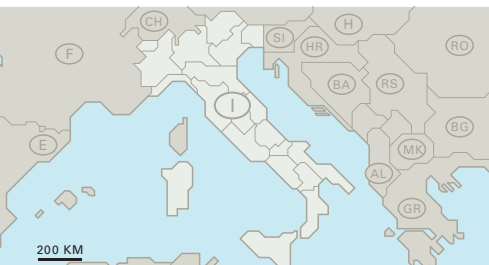
SNCF Réseau/GPMD: Study of long-term access capacity to the port of Dunkirk

The Dunkirk Major Sea Port (Grand Port Maritime de Dunkerque, GPMD) forecasts a development in the railway flows it generates as part of the CAP 2020 project. In view of the public debate relative to this project, the GPMD expressed the wish to have a study assessing the ability of the national rail network (RFN) to handle the future freight flows. To provide the public debate with tangible elements, SNCF Réseau offered to have a concrete analysis carried out for a future date.

The aim of the study was to establish the available capacity on the RFN to handle new freight paths resulting from the CAP 2020 project statement of need and assuming the TER and TGV service offer will be stable in the long term. For this purpose, SMA undertook to plan all the freight paths for the various sources / destinations concerned, taking into account the opportunities offered by the RFN rail network in the Hauts-de-France and also rules governing alternative routes and windows reserved for infrastructure work.

It was possible to plot all the additional paths in the available capacity and they were assessed using different analyses; departure and arrival times at the ports of Dunkirk and Calais allowing an analysis of the peak freight periods according to their destination and future evolution, and an analysis of trip times and therefore the quality of the proposed freight paths. The study was concluded by a brief assessment of the capacity hot spots on the network and the feasibility of extending the paths beyond the scope of the study (north of the Hauts-de-France region: e.g. Nord–Pas-de-Calais).





Arriva Italia: planning methodologies for railway tenders Arriva Group is one of the main actors in European passenger transportation. Arriva Italia has been consolidating their position in the last 15 years as leader in bus operation; with the establishment of Arriva Italia Rail (AIR), the group has been present in the Italian railway market as an operator since 2012, even if active only on limited services on the Brenner axis.

Considering the faint signals from some Authorities on invitations to tender for regional railway services, Arriva started to equip their team with tools and competences. SMA's Viriato has been selected as standard tool for timetable planning and evaluation; technical activities have been ordered from SMA for developing planning solutions; SMA's expertise has been chosen to support and consolidate internal competences on railway timetabling, fleet rostering and service quality evaluation.

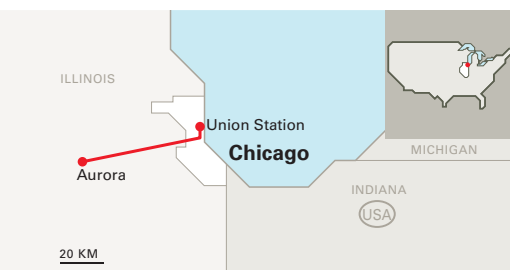
The ongoing activities are provided in coordination with a wider pool of technical advisors, covering the whole range of tender issues and assuring the optimal level of iteration and integration.



BART: Schedule Change BART, the San Francisco Bay Area Rapid Transit System, introduced new customer schedules in September 2017 and February 2018. BART's goal was to increase on-time performance and ensure that published train schedules better match the actual run times of the trains. This was necessary because over the years BART experienced a growing discrepancy between the current operating environment and the train schedule caused by aging infrastructure and large increases in peak commuting period crowding. SMA supported the analysis of data from actual train runs and developed scenarios based on different operating strategies to improve on-time performance. BART's evaluation of the success of the schedule change after implementation showed an improved ability to recover from delays and a 16% reduction of total lateness.



BNSF: Long-term concept for Los Angeles to Anaheim Corridor Southern California's Los Angeles to Anaheim rail corridor supports many different services, both now and in the future. It is BNSF's western end of the transcontinental railroad connecting the ports of Los Angeles and Long Beach; it supports frequent passenger intercity and regional rail service between downtown Los Angeles, San Diego and San Bernardino; and it will be part of California's high-speed rail system. SMA supported local agencies in exploring various concepts for the corridor to accommodate desired capacity growth for both freight and passenger rail service, including high-speed rail, through the years 2030 and 2040. A preferred concept was identified and handed over to BNSF, the infrastructure owner, for dynamic simulation. In January 2018, Governor Brown described the investments in the Anaheim corridor during his State of the State Address as one of many examples of the early benefits California's high-speed rail project will deliver.



Metra BNSF: Schedule Adjustment Chicago Metra's busiest line, the BNSF Line between Aurora and Chicago Union Station, will be the first Metra line to operate with the safety system Positive Train Control (PTC). The system integrates GPS, trackside sensors, on board computers and centralised dispatching systems to monitor a train's compliance with speed restrictions and signal indications. PTC needs to be initialised before every train run, increasing the turn time at terminal stations by a few minutes. SMA supported BNSF and Metra during the development of an adjusted schedule that takes not only the added time to turn trains at their terminal stations into account, but also relies on adjustments for other planning parameters based on an extensive analysis of current operations.

SMA: Works Planning Module Although the key reason for running a railway is moving passengers and goods, it should not be forgotten that there is the requirement to maintain and upgrade the infrastructure to allow operations to continue and grow. Without maintenance work, the condition of railway assets soon begins to degrade.

Although Infrastructure Managers try to minimise the effects of these engineering works on their customers, they often have consequences to planned trains which may require modification to allow them to run on days with the works. Train operators need to know which tracks are available between stations, within stations themselves, and will there be any additional running time due to speed restrictions?

A new add-on module for our timetabling system Viriato allows the creation of the engineering works, and the display of the interactions with planned trains. The engineering works can be collected together through the use of scenarios, allowing the user to group and filter subsets of the works based on their own criterion.

The engineering works can be visualised in the graphic timetable within Viriato, allowing an immediate overview of trains which are planned to run through track sections which are closed, or have a speed restriction planned. A report can be created that shows in detail exactly which trains are affected on each date during the timetable period, allowing the effected trains to be identified and replanned for the affected dates.

To allow the user to take a more strategic view of the engineering works, a second visualisation of the data in Viriato has also been developed which shows a summarised view of the works on a day-by-day basis. For each section in the network, the restriction is summarised as being full or partial, and day and/or night. This view allows the user to quickly identify the pattern of restrictions, to check whether alternative routes are available and to make decisions regarding their train timetable.

Already this works planning module has been used to help several customers to understand and manage their engineering works. In each case, we have developed interfaces allowing the importing of large quantities of data from their national works planning databases.

SMA : Viriato Passenger Demand Assignment Module For train operator's critical questions include how many passengers travel on my trains and are sufficient rolling stock units available to be assigned to these services?

Through the use of mathematical algorithms, the Demand Assignment module in Viriato is already helping to answer these questions. This module takes a demand matrix of the passengers wishing to travel between locations on the network, their pattern of travel during the day and a planned timetable under consideration to determine the number of passengers on each train. This allows different scenarios to be quickly and efficiently tested.

The module is fully integrated within Viriato, and allows the results of calculations to be displayed for each train. The results may also be exported from Viriato to a spreadsheet allowing the user to analyse the data further using their own tools and processes.

Until recently, this Viriato add-on module was mainly used by SMA's own team of internal consultants to evaluate the movement of passengers through the railway network of our clients. In 2017 the Finnish train operator VR purchased a licence for the Viriato passenger demand assignment module, to assist them in understanding the flow of passengers through their network. This acquisition of a licence by VR means that for the first time feedback from a large railway organisation has been received, allowing us to refine the internal working of the module to reflect the complex behaviours encountered during the creation and operation of a timetable.

The feedback received from users has allowed us to understand better the changes that occur during a day to passenger demand on the network. Originally the algorithm used only allowed a single daily distribution curve to be used. While this is sufficient for certain analysis cases, on a network with significant tidal flows during the day (for example commuters heading into a city in the morning, and returning home in the evening) there is the requirement to model the passenger flows in the two directions separately. The creation of these curves for each pair of stations in the network could potentially be a large task, and a tool to generate proposed distributions for each pair based on the number of passengers travelling in each direction has been implemented. These proposed distributions can of course be modified by the user if they have more specific information available.

DB long-distance services: Viriato.FF support of administrative processes

Sensible automation, further integration DB long-distance services has been using Viriato as its central planning tool since 1999. With Viriato.FF's go-live, the previous program, designed on conceptual planning, was replaced by a fully scalable and fail-safe production system. It is integrated into the production chain via interfaces and allows efficient planning work. The interface to the Trassenportal Netz (TPN) path ordering system plays a very important role. The timetable planners use it to handle the entire train path ordering process directly from Viriato, from the log-in to offer import to conclusion of path contracts.

In addition to further automation in the TPN interface, the development focus in 2017 was on archiving old timetable statuses and on DB Netz's new path pricing system.

The implementation of DB Netz AG's new path pricing system means that timetable concepts can be evaluated and compared directly in Viriato with regard to the expected path costs.

Due to the planning work for the last several years of the timetable, many older timetable versions are available in the database. This data is no longer directly required by the annual timetable processing system, but constitutes an important tool for comparing and evaluating data based on previous years. In order to increase the clarity of data in timetable processing, Viriato provides a function for moving old timetable statuses to another database. These statuses thus remain accessible with Viriato at any time as required.

The idea of automation will be continued with the expansions planned for 2018 in order to give the timetable planner the time he needs for the increasingly complex timetable business.

DB Netz AG – Development of the construction site calendar The prototype of the construction site calendar designed as part of the "Support in the creation of construction timetable concepts" project was integrated into the Viriato timetable software as part of the Viriato construction timetable module. This IT application visualises construction measures in the form of a path-time diagram for each line for a defined period of time.

As a starting point, SMA developed a special interface for importing construction site files from the various DB Netz AG systems. The imported construction sites can be viewed and managed in the Viriato construction timetable module. The construction measures are then exported for a defined period of time and, if required, with further filter criteria such as the period and the minimum duration of the construction measures.

The construction site calendar provides DB Netz AG with a better overview of the planned construction measures along a line. Within the construction site calendar, it is possible to navigate quickly between the different lines by linking relevant adjacent lines and potential diversionary lines. The IT-supported application therefore allows optimisation of the temporal and geographical pooling of construction measures. This allows synergy effects to be identified and construction sites to be handled more efficiently and with less impact on network capacity.

SBB AG – New functionalities in the area of run time calculation The train performance calculator is used for studies in various departments of the SBB infrastructure in the areas of “timetable”, “network design” and “energy”. In this context, SMA has combined the various evaluation functionalities into a software package (ZLR-Toolbox) and continuously refined them over the last few years in close and agile cooperation with SBB.

A batch processing component was added to ZLR-Toolbox in 2017. This refinement makes it possible to obtain the entire Swiss network from the central infrastructure database in a single automated program run and subsequently calculate travel times and train headway for all lines. This is done with different stopping policies and configurable parameters and for several standard trains at the same time.

SBB has thus been given a very flexible tool which they will use primarily to regularly verify the minimum train headway for the individual sections of the line on which the timetable is based. The modular program design also makes a number of other application cases conceivable, such as network-wide testing of the effects of various running time calculation parameters, energy consumption comparisons, rolling stock comparisons, and much more.

New Viriato Licenses

- KTMB, Malaysia
- KCW GmbH, Germany
- Arriva Italia Rail, Italy
- Otimon GmbH, Switzerland



Events, publications and presentations

NextRail17: International Rail and Mobility Conference in Lausanne The successful IT.rail conference series shone in 2017 under its new name: nextRail. The change follows five successful conferences held between 2005 and 2015 which have made the conference an international benchmark event. The first iteration of this international rail and mobility conference organised under its new name, nextRail17, took place in September 2017 at the École Polytechnique Fédérale de Lausanne (EPFL). Organised by the EPFL in collaboration with SMA and OpenTrack, the conference was entitled “Combining Strategic Planning and Flexibility”. More than 200 participants from 23 countries found their way to Lausanne on Lake Geneva.

As with previous events, the conference began on Thursday with a symposium entitled Combining Strategic Planning and Flexibility. In view of the increasing costs and complexity of the railway system, the symposium covered various aspects of the decision-making process of authorities and infrastructure and railway operators. The focus was on the tension between strategic planning and flexibility. Questions such as “What are the challenges?” and “How should the challenges be tackled?” were examined by experts from the railway industry and from politics.

Friday’s catchphrase was “Practice and Innovation”. SMA’s lecture series was entitled Advantages and Opportunities of Rail for the Mobility of the Future. The speakers invited by SMA were from Germany, Austria, Switzerland, France, the Netherlands, and Luxembourg and presented international best practices and innovative approaches to the topic.

As at the previous conferences, the excursion on Saturday marked the end of the event. Attendees were able to discover major urban and rail projects in the Lausanne–Geneva area. SBB Passenger Traffic provided an insight into the future of mobility in the Geneva metropolitan region, while SBB Infrastructure gave a guided tour of the Léman 2030 expansion program with Lausanne railway station at its heart. The excursion was rounded off with the Lausanne region’s transport companies introducing the players in the future of mobility in Lausanne.

With a view over Lake Geneva, the traditional conference dinner on Thursday evening was an opportunity to exchange experiences and make new contacts.

From the organisers point of view, the nextRail17 in Lausanne was a success. In future, the conference is planned to alternate between ETH Zurich and the EPFL in Lausanne.

Publications

Eisenbahntechnische Rundschau April 2017	Fahrplan- und Infrastrukturoptimierung bei der Forchbahn mittels Betriebssimulation Rafael Haas (SMA), Hanspeter Friedli and Urs Stucki
Eisenbahntechnische Rundschau July and August 2017	New-Rail-Deal, Big Mix oder AUTOonomie? – Szenarien für die Eisenbahn in Deutschland im Jahr 2040 Trutz von Olnhausen (SMA) and Simon Hofmann
Schweizer Eisenbahn-Revue, Eisenbahn-Revue International and Eisenbahn Österreich August 2017	Netzweite Angebotseffekte evaluieren und darstellen Gösta Niedderer, Georges Rey and Daniel Wipf
Schweizer Eisenbahn-Revue, Eisenbahn-Revue International and Eisenbahn Österreich November 2017	Kosten und Erlöse auf der Bodenseeegürtelbahn Michael Frei and Gösta Niedderer
Eisenbahntechnische Rundschau November 2017	2. Stammstrecke und Bahnausbau Region München Georges Rey (SMA) and Stefan Kutzner

Presentations

Aula Aberta Instituto Superior Técnico, Lisbon, and Aula Aberta Universidade de Coimbra March 2017	RAIL 2000 – More trains for Switzerland: A sustainable and comprehensive project to boost public transportation Hansruedi Akermann
ENTPE, Vaulx-en-Velin, Lyon January 2017 und EPFL, TRANSP-OR Lausanne November 2017	Le cadencement dans l'exploitation ferroviaire Luig Stähli
California Transportation Planning Conference, Walnut Creek, CA May 2017	Transit/Rail Connectivity and Accessibility Ulrich Leister
AASHTO SCORT Annual Meeting, Oakland September 2017	The Los Angeles-Anaheim Mass Transportation Corridor Ulrich Leister (SMA) and DJ Mitchell
International Railway Symposium Aachen (IRSA), Aachen November 2017	Stufengerechte Angebotskonzeption zwischen Detailgenauigkeit und Variantenvielfalt Frederik Ropelius

Key figures

SMA Group turnover rose again in 2017 compared to the previous year.

This positive trend is partly due to the slightly better Euro exchange rate, but mainly due to the development of our consulting activities in Germany and France. The strengthening of these traditional geographical and professional markets was continued thanks to our subsidiaries in Frankfurt and Paris. In addition, the increase in turnover in other European countries such as Belgium, Italy, Luxembourg, the Netherlands and Austria also helped to compensate for the slightly less favourable market conditions that were experienced in Switzerland and the USA compared with 2016.

Our IT department also shows a healthy and solid result. DB Long Distance, DB Regio and SBB Infrastructure remain by far the largest clients. We were able to win as a new customer KTMB, the national railway operator in Malaysia. The current product developments around Viriato Enterprise are increasingly focusing on infrastructure managers in addition to train operating companies.

Key Figures* in millions of Swiss francs

	2017	2016
Gross turnover	13,4	12,4
Full-time employees	65	67

*incl. subsidiaries

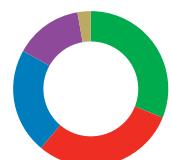
Turnover by country

- Germany
- France
- Switzerland
- USA
- Belgium
- Various



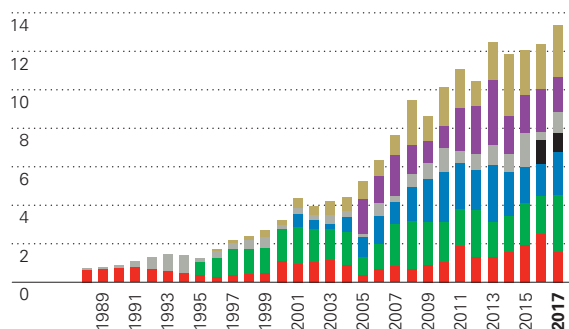
Turnover by client category

- Rail infrastructure managers
- Transport operators
- Public agencies
- Integrated railways
- Various



Development of turnover 1988 – 2017 (millions CHF)

- IT**
 - Viriato and ZLR
 - IT services
- Consulting**
 - Various
 - USA
 - France
 - Germany
 - Switzerland



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Lower: Jürgen Hamann

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Lower: Ina Buskens

Head Office

SMA und Partner AG
Gubelstrasse 28
8050 Zurich, Switzerland

Branch Office

SMA et associés SA
Avenue de la Gare 1
1003 Lausanne, Switzerland

Subsidiaries

SMA Rail Consulting+IT, Corp.
2677 North Main Street, Suite 825
Santa Ana, CA 92705, USA

SMA (Deutschland) GmbH
Stresemannallee 30
60596 Frankfurt, Germany

SMA (France) SAS
45/47 Rue d'Hauteville
75010 Paris, France

info@sma-partner.com
www.sma-partner.com