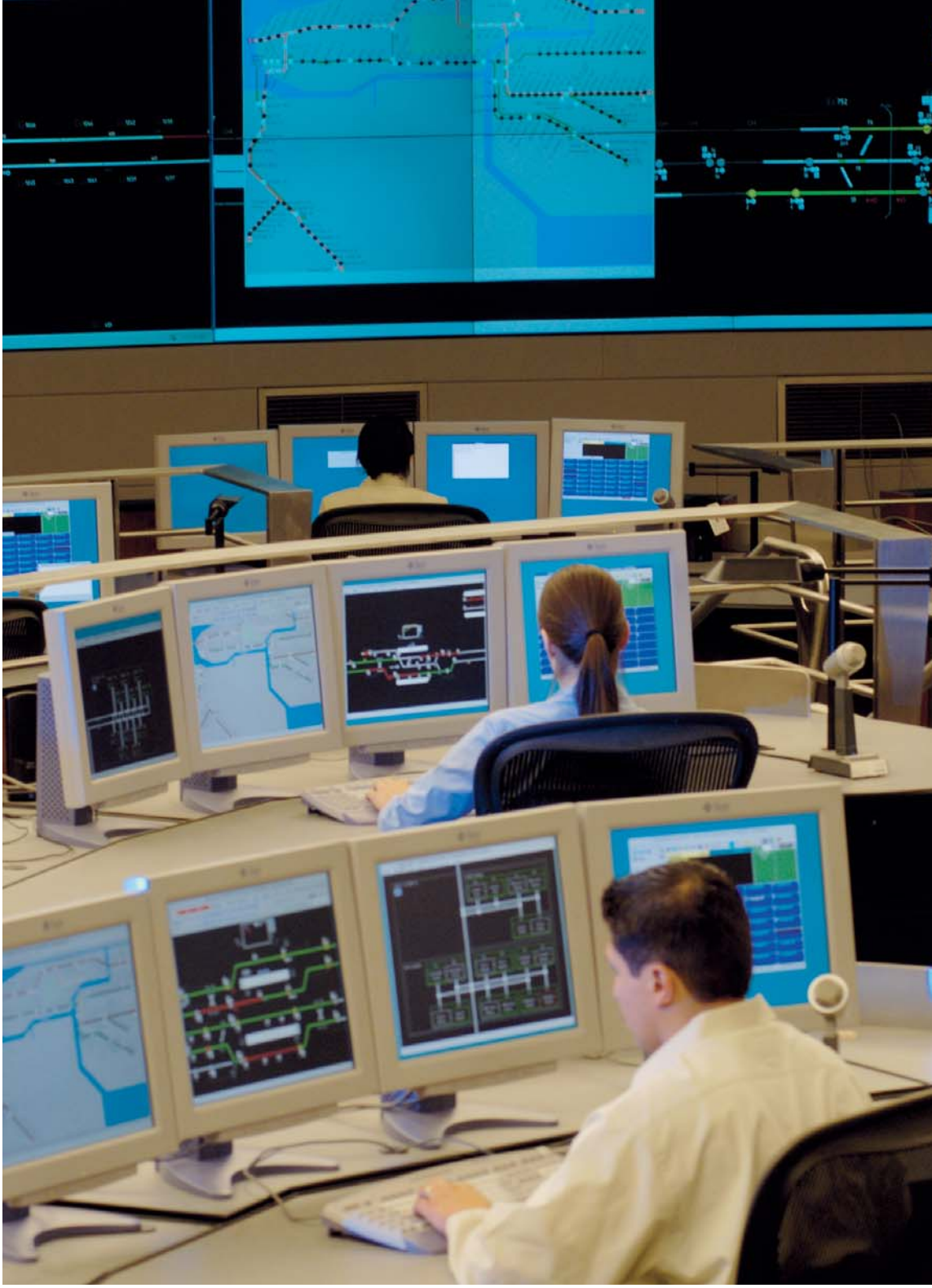


Efficient rail transport with the Vicos OC operations control system family

Cost-effective operations management

www.siemens.com/mobility

SIEMENS

Cost-effective operations management

Future-proof rail transport with the Vicos OC operations control system family

Ensuring mobility is one of the big challenges in our society. To ensure our mobility in future, we need networked transportation and information systems. And we will only meet these mobility requirements through efficient coordination and perfect meshing of all modes of transportation. This is why Siemens – with its "Complete mobility" approach – is offering integrated transportation and logistics solutions for safe, cost-effective and environmentally friendly passenger and freight services.

For Siemens has the necessary competence to provide everything from infrastructure systems for railways and roads to solutions for rolling stock, airport logistics and postal automation. More and more railway operators are turning to intelligent operations control systems made by Siemens to control and monitor their increasingly complex infrastructures.

Made-to-measure automation

The operations control systems of the Vicos® OC (*Vehicle and Infrastructure Control and Operating System*) product family with their numerous modular automation functions, adaptable user interfaces and maximum availability enable train operations to be controlled, monitored and optimized cost-effectively.

The Vicos OC operations control system family can be matched to both the individual needs of railway operators and their requirements. From individual operator consoles to large control centers with the most sophisticated automation functions, Siemens has successfully implemented a wide variety of configurations.

The future-oriented solution

In the Vicos OC product family, the functions are structured in accordance with their degree of automation and dependencies and mapped to modules which can be freely combined. With growing line network size and the demand for increasing automation or more operator consoles, Vicos OC can be expanded by adding hardware or software components. This means that performance and functionality can be adjusted to customer requirements even years after initial commissioning.

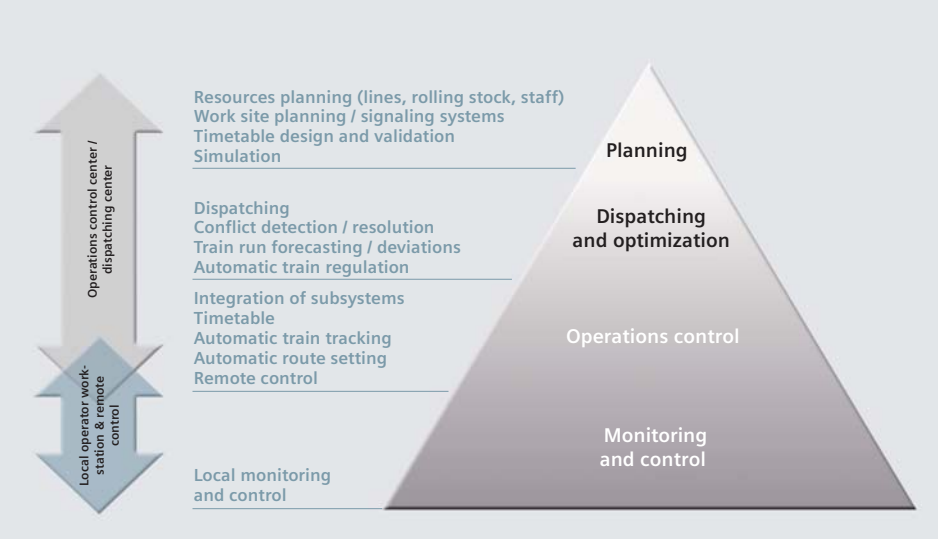
Thanks to its open-interface concept, Vicos OC can be used to integrate a wide range of different external systems. Furthermore, the operations control system enables future connection of new system components or adjoining transport infrastructures.

Benefits of Vicos OC

	Customer requirements	Solution with Vicos OC
Scalability	> Easy tailoring to growing system size > Functional upgrades > Cost-effective, low-risk integration of external systems	> Modular software > Open-interface concept
Adaptability	> Individual user-friendliness for each customer > Flexible adaptation to a wide range of requirements due to unique configurability	> Adaptable user interfaces (design, language) > Open-interface concept
Availability and performance	> Smooth operations > High performance > Minimized downtimes > Uninterruptible switchover in event of faults	> Reliable hardware > Distributed processes / multi-server processing > Hot-standby concept > Redundancy of all components

Successful application – worldwide

Vicos OC – performance and flexibility



With its performance and adaptability, the Vicos OC operations control system family has proven itself in daily use in rail transport worldwide

Maximum availability and performance
Reliable hardware and a tried-and-tested multi-server processing system ensure smooth operations. The unique hot-standby concept of Vicos OC with redundancy of all components required for operations permits uninterruptible switchover in the event of faults. Maintenance and repair are possible without any operational restrictions. Thus, downtimes are minimized and customers profit from more reliability and service.

The use of standard hardware means that Vicos OC is already adapted for future computer generations.

Adaptable and international in service
Of course, Vicos OC complies with internationally recognized standards such as those of CENELEC or the ISO. For all continents, the following applies: the user-friendly user interface can be tailored to the regional particularities of operations with regard to design, language and lettering with a minimum of effort.

Thanks to clear visualization and needs-based automation, railway systems can be controlled and monitored both efficiently and safely. Thus, for example, relay and electronic interlockings can be operated in a standard and convenient manner irrespective of the manufacturer involved.

The open interfaces of the Vicos OC operations control system family permit very different applications to be integrated cost-effectively and with a low level of risk. Existing installations and external systems (for example, SCADA systems, passenger information systems, CCTV, communication systems, large-screen monitors, etc.) can be connected flexibly.

From switch machine to state-of-the-art operations control center

For some 30 years now, Siemens has come to represent trend-setting concepts and innovative products of computer-aided rail automation, and equally long for successfully completed projects and short execution times. From the renewal of individual components to the realization of a new transport system, Siemens offers customized turnkey solutions from a single source. Our mix of experience and future orientation and of technology and service competence has made us the market leader and won over customers throughout the world. That customers' confidence is justified has been demonstrated in numerous projects.

High performance in complex line networks

Integrated mass transit with Vicos OC

Mass transit places special demands on operations control systems. Passengers expect short headways and interchange times, many stops and up-to-date information at all times. Other transport, information and dispatching systems are thus frequently linked to rail transport and have to be integrated into operations control systems.

Relief of operating staff
Due to the automation of all principal processes thanks to Vicos OC, staff is relieved of routine tasks. Hence, the risk of errors in control and monitoring is reduced and staff can fully concentrate on a trouble-free flow of transport.

Efficient timetable management
Vicos OC can be used for compiling, validating and optimizing timetables both online and offline. Shorter intervals and harmonized interchange times are ensured by means of an efficient, event- and timetable-orientated route setting system, and optionally also by an automatic train regulation system.

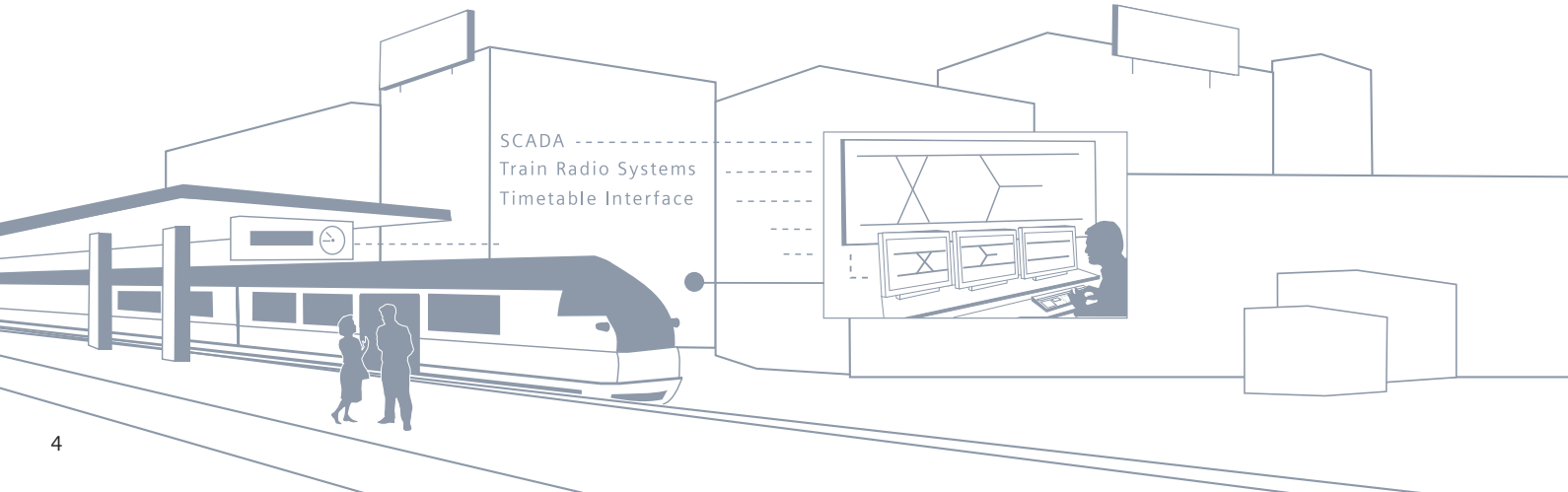
Train regulation
The use of a train regulation system enables traveling and stopping times or speed profiles to be adjusted entirely automatically in order to compensate for deviations from the timetable both quickly and efficiently. The effects of disruptions are taken into account in the train run forecast.

Interlocking operator control and connection of train control systems
In addition to interlocking control, very different train control systems can also be integrated with Vicos OC. Even moving-block and driverless systems can be controlled.

Clear and safe operator control
All current train and line data is displayed with the easy-to-understand and optionally procedure-protected control and display unit of Vicos OC.

Simple integration of other systems
Interfaces to external systems such as SCADA systems, train radio and passenger information systems (or their complete integration) ensure efficient staff deployment, standard operator control and a high level of transparency even in complex systems. The possibility of connecting CCTV systems ensures more security on platforms.

**Vicos OC –
cost-effective automation
for mass transit**



Smooth operations – centrally controlled

Reliable mainline services with Vicos OC

In mainline services, passengers wish to reach their destination both on time and safely. Convenient connections to mass transit and air links are just as important as reliable, trouble-free operations in the mainline network itself.

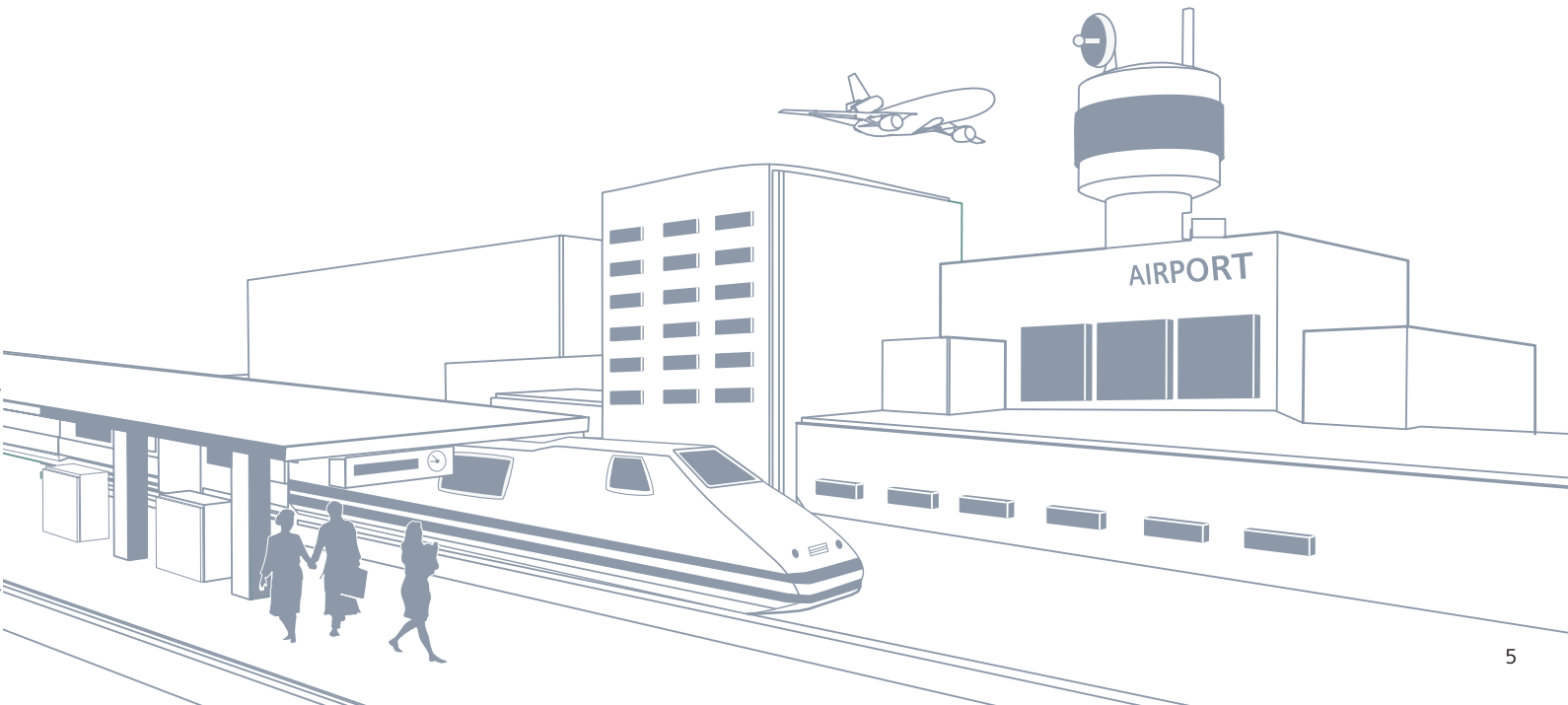
Centralization of monitoring and control tasks
Vicos OC displays all up-to-the-minute train and line data and status indications of the overall system. A large-screen monitor can be connected as an option. This enables network-wide dispatching and central junction management and thus smooth operations. Signalers and dispatchers are provided with an up-to-the-minute overview of operations. Different functions and user-specific rights can be allocated to individual workplaces.

Operator control of interlockings
With Vicos OC, all interlockings, from relay interlockings to electronic interlockings, can be connected and controlled in both new and existing installations.

Automated conflict resolution and dispatching
Conflicts possibly resulting, for example, from the mixed operation of fast long-distance trains and slower regional trains are detected by the system, represented in the train graph and resolved automatically at an early stage by the online timetable management system. In line with operational priorities, the flow of transport, timetable adherence and connection assurance are optimized. The train graph can be edited for dispatching purposes.

High-speed traffic with ETCS and GSM-R
Vicos OC can also be used in connection with GSM-R and ETCS (*European Train Control System*) Levels 1 and 2. This combination is suitable for regional trains as well as for international high-speed traffic.

Vicos OC – higher-level dispatching for mainline services



Optimum transport performance through flexible dispatching

Needs-based freight transport with Vicos OC

Freight transport must be planned and executed to take account of material and production requirements. It is therefore directly integrated into the operational processes. High levels of availability and needs-based transport capacity are imperative – a variety of goods from different locations have to arrive at their destination "just in time" and with the right priority.

Integration of freight transport into current production control
Based on all operationally relevant factors, Vicos OC can be used to generate timetable-based speed profiles. This permits the cost-effective simulation and optimization of operations. The speed profiles can then be sent directly to the vehicle via an interface.

An adjusted timetable can be generated daily on the basis of the current production situation and infrastructure capacities. The current train movements, forecasts and possible conflicts are represented in a train graph in which current and future maintenance activities can also be entered. Moreover, trains can be dispatched online by the signaler who is also provided with automatic conflict solutions.

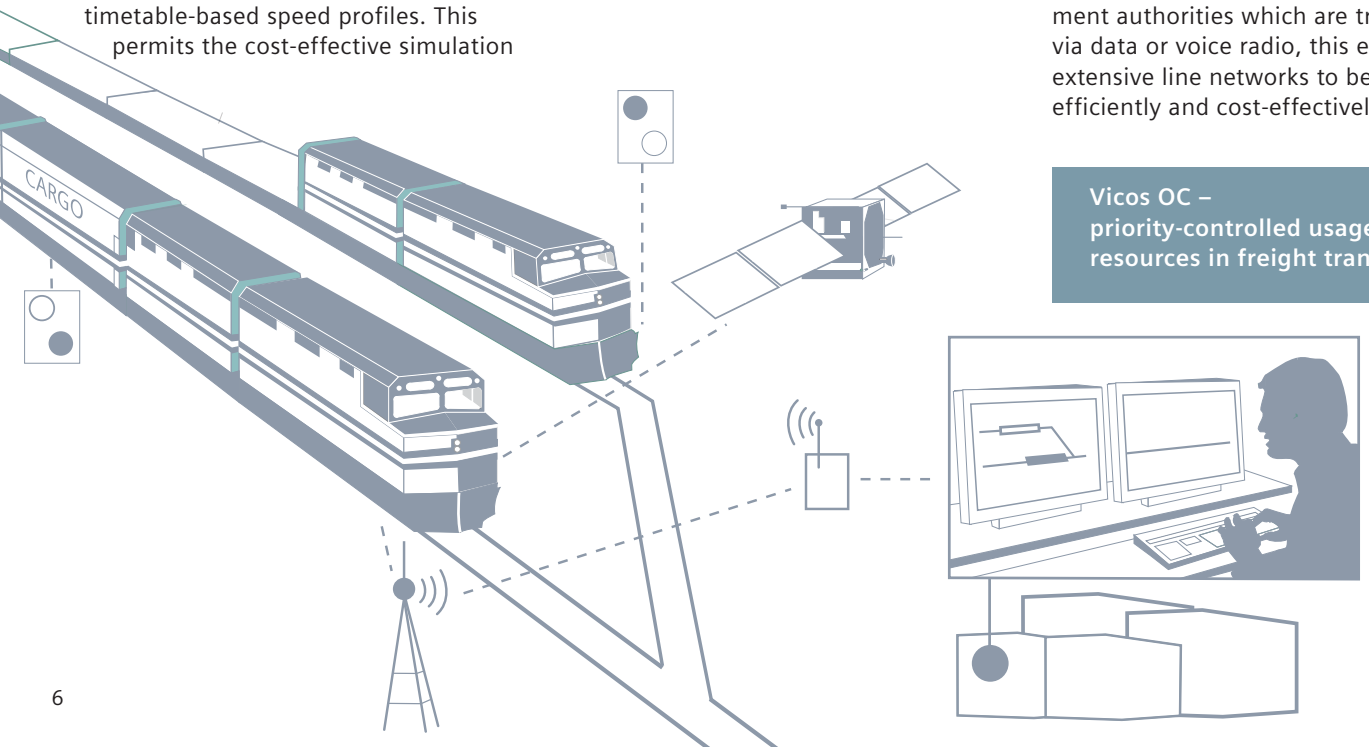
An optional link-up of databases / data warehouse systems and archive computers permits the comprehensive statistical evaluation of operations and the generation of reports.

Operator control and monitoring adjusted to logistics
The operator is relieved of routine tasks and supported, for example, when performing coupling and shunting movements. All current data, for example train numbers, delays, the load and weight of trains as well as vehicle diagnostic and line data, is arranged in an easy-to-understand, efficient manner on the operator console.

Monitoring of freight movements
In very extensive systems, Vicos OC can be used for the straightforward integration of GPS position-finding and other processes so that all train and freight movements within the network can be monitored in real time.

Route setting in "dark territories"
Vicos OC can be used to monitor and control not only signaled areas but also "dark territories" (areas where no signaling systems are installed). Using movement authorities which are transmitted via data or voice radio, this enables very extensive line networks to be monitored efficiently and cost-effectively.

**Vicos OC –
priority-controlled usage of resources in freight transport**



Vicos OC worldwide

Selected references

Mass transit		Mainline services		Freight transport	
Austria	Vienna	China	Beijing–Tianjin	Australia	Port Hedland
China	Hong Kong, Guangzhou, Nanjing, Beijing, Shanghai, Shenzhen	Denmark	Grenå Line, Århus–Odder	Egypt	Bahariya Line
		Estonia	Narva	Canada	Edmonton, Montreal, Toronto
		Finland	Tampere, Helsinki		
Denmark	Copenhagen	Greece	Athens–Corinth–Kiato, Athens–Piraeus	Germany	Cologne, Senftenberg
Germany	Berlin, Bonn, Dortmund, Hamburg, Cologne, Nuremberg, etc.	Lithuania	Šiauliai – Klaipeda		
		Netherlands	HSL Zuid		
Greece	Athens	Norway	Oslo, Drammen, Lillestrøm		
Hungary	Budapest				
India	New Delhi	Romania	Ploesiti		
Italy	Milan	Saudi Arabia	Dammam–Riyadh		
Mexico	Monterrey	Syria	Deir Ezzor–Abou Kama Tartous–Lattakia		
Philippines	Manila				
Portugal	Lisbon	UK	Bournemouth, Portsmouth		
Puerto Rico	San Juan				
Spain	Madrid				
Sweden	Stockholm				
Taiwan	Kaohsiung				
Thailand	Bangkok				
Turkey	Bursa				
USA	New York City, Houston				
Venezuela	Maracaibo, Valencia				

Siemens AG
Industry Sector
Mobility Division
P.O. Box 3327
D-38023 Braunschweig, Germany

Phone: (+49) (5 31) 2 26-28 88
Fax: (+49) (5 31) 2 26-48 88

Printed in Germany
PPG144 312110 PA08081.5
Order No.: A19100-V100-B874-V1-7600

www.siemens.com

Upper Lusatia – integrated industrial railway operations

Vattenfall Europe Mining AG's railway system transports crude lignite from four open-cast mining sites to surrounding power stations and processing plants at Schwarze Pumpe in Upper Lusatia, Eastern Germany. Connecting lines carry lignite products to other customers. The operations area covers 2,500 km² and a line network of more than 400 km.

In 1995, Siemens was contracted by the then LAUBAG to install an operations control center at Schwarze Pumpe.

The challenge
Instead of 16 control points for 29 old interlockings, control was to be concentrated at a new control center, permitting load-dependent control and monitoring of the entire scope of operations – trains were to be operated on a demand-controlled basis and not in line with a fixed timetable.

In addition to upgrading older interlockings to electronic operation, existing relay interlockings were to be controlled via the control center. Maximum availability and commissioning without involving major downtimes had to be ensured.

The solution from Siemens
Using one to seven operator consoles, an operations control center based on Vicos® OC enables control of the entire system flexibly adjusted to transportation demand. A display panel visualizes the entire scope of operations on an up-to-the-minute basis and at a glance. Route setting is automatic – even without a static timetable.

The consoles are equivalent to each other from a technical point of view, i.e. functional rights are linked to the respective user. Operating areas are freely selectable and can be combined in off-peak periods.

All interlocking types are controlled via a standard interface. Relay interlockings of different design can also be controlled on a centralized and fail-safe basis. A SCADA system is also integrated, permitting central control and monitoring of the contact line system and other systems (e.g. switch heaters).

Vicos OC features different logging and archiving options and interfaces to the surrounding logistic systems. Hence, for example, color representation of the respective train number indicates the train's load status. Link-up of a database supports statistic evaluations, performance-related vehicle maintenance and the automatic weighing and accounting of all transported goods.

A special redundancy concept (hot stand-by) ensures maximum availability. As a fall-back level, there are also three regional control centers which can be used to control the interlockings in the event of maintenance, for example. In addition, the system offers an operator console for training purposes.

Project data

- Railway operator / customer: Vattenfall Europe Mining AG
- more than 400 line kilometers
- 20 interlockings of different design
- up to 7,000 trains per day
- Transport capacity: approx. 1 billion tonne-km per year
- Commissioning date: 1997 to 2001

Optimum transport capacity through flexible dispatching

Needs-based freight traffic with Vicos OC

www.siemens.com/mobility

SIEMENS

North Rhine-Westphalia – efficient modernization

The industrial railway system of RWE Power AG in North Rhine-Westphalia transports about 60 million tonnes of lignite per year. Against the background of a changing transportation situation, the entire railway operations system was to be adapted as from the mid-1990s. With a view to efficient handling of the changed transportation functions, the signaling and control systems, in some cases up to 45 years old, were to be modernized.

The challenge

Within the context of the "Bahn 2000" project, the objective was to enable central cost-effective control and monitoring of operations with a gradual phase-out of the old train tracking, train number management and train describer systems. In future, all interlockings of different design were to be capable of being controlled and monitored on a centralized and fail-safe basis.

The solution from Siemens

The operations control center at Auenheim provided considerably better dispatching potential with centralized operator control, route setting and train tracking and a simultaneously major increase in the level of automation. Electronic interlockings and relay interlockings which continue to be used are controlled on a centralized and fail-safe basis.

A new train describer computer permits train describer operator actions in interaction with material dispatching and route automation. This meant that the old separate control and display computers and the independent train describer system could be replaced.

The Vicos OC operations control system offers procedure-protected control and display for all interlockings and, using three display levels (full area overview, area overviews and detail views), enables the entire system to be clearly controlled and monitored. The operator can use the mouse to move between the different levels of detail in representation and between different displays.

The archiving function of Vicos OC serves to save data for later evaluation. Indications of the connected interlockings are recorded using the record and playback module. This means that operations can be played back on an operator console at a later point in time for purposes of simulation and evaluation.

The Vicos OC service and diagnostic system provides specific information about fault causes on a status-dependent basis and, using its online help feature, permits efficient maintenance.

Further expansion of the level of automation with Vicos OC is intended (train run optimization, calculation of routes depending on the supply capacity of open-cast mining sites).

Project data

- > Railway operator / customer: RWE Power AG
- > Transport capacity: approx. 60 million tonnes of lignite per year
- > 320 line kilometers
- > 11 interlockings of different design
- > Commissioning date: 1998 to 2006

Siemens AG
Industry Sector
Mobility Division
P.O. Box 3327
D-38023 Braunschweig, Germany

Phone: (+49) (5 31) 2 26-28 88
Fax: (+49) (5 31) 2 26-48 88

www.siemens.com

Printed in Germany / PPG151 312151 PA08081.5 / Order No.: A19100-V100-B874-V1-7600

Guangzhou – real-time train supervision in a modern metropolis

Guangzhou is one of the ancient cities of South China and nowadays the political, economic and cultural center of Guangdong Province. After the successful commissioning of Metro Lines 1 and 2, Siemens has been awarded follow-up orders for Lines 4 and 5.

The Vicos® OC scope of supply comprises operations control centers for the two lines and depots, service and diagnostic workstations, and training and simulation facilities.

The challenge
The system has had to meet the comprehensive requirements of a modern mass transit control system including online and offline timetable management, interfaces with communication, GPS clock and radio and such features as hot-standby redundancy, synchronization with train and platform screen doors and real-time monitoring of floodgates.

However, the particular challenge involving Guangzhou Lines 4 and 5 has been to provide automatic, continuous real-time supervision in combination with moving-block operation.

The Siemens solution
Based on subsections of logical track sections, Vicos OC performs a quasi-continuous calculation and representation of all moving trains. The actual train position information is updated and displayed every 500 ms.

The Vicos OC timetable management module comprises the compilation, validation and comparison of operative timetables as well as automatic train regulation and automatic route setting according to timetable data.

The operability of timetables with respect to technical and operational constraints (e.g. the dynamic behavior of trains, switches and signals) can be verified. The system can also simulate operational situations resulting from disturbances or temporary speed restrictions.

Automatic train regulation is performed according to either deviations from the timetable or headway requirements. The latter is applicable, for example, in case an additional new train is inserted during operation due to a current rush of passengers. Vicos OC then automatically proposes realistic headways to be chosen and set by the user.

It provides expected arrival and dwell times to the passenger information system and indicators in the stations. Timetable deviations and other data are archived in the report system for statistical evaluation purposes.

Real-time synchronization is achieved through a GPS master clock. Thus, Vicos OC itself serves as a time synchronization base for the automatic train control system.

The control centers include rear projection screens displaying system overviews as well as bilingual message, alarm and command lists and an operations diary.

In September 2006, Siemens was awarded the order for an extension of the existing Line 2 and a new Line 8.

Project features

- Railway authority / customer: Guangzhou Metro Corporation
- 38 / 31 track kilometers Lines 4 / 5
- 10 / 21 stations
- 30 / 45 trains
- 90 s headway
- Commissioning date: 2006 / 2009

High performance in complex line networks

Integrated mass transit with Vicos OC

www.siemens.com/mobility

SIEMENS

New York – seamless integration with utmost complexity

With 1.3 billion passengers a year and 4.4 million passengers a day, the New York subway is the fourth largest metro system in the world. In the past, the operators relied on a static track view and radio communications to receive and assess information from the field. Train schedules were provided in paper form.

The New York City Transit Authority (NYCT) assigned Siemens the task to upgrade and modernize a major division of New York subway's operations control system covering about one third of the total network.

- > connection of existing interlockings of varying types and ages
- > improvement of on-time performance and generation of a more regular headway
- > automatic route setting including rerouting and conflict management
- > integration of various subsystems (e.g. scheduling, crew management, process connection via field code units, etc.)
- > integration of the voice communication system
- > coordination of emergency response activities and integrated alarm and report management

The challenge

The system for NYCT would have to be significantly larger than most of the regular mass transit control systems, and the complexity involved as well as the requirements imposed on subsystem integration placed stringent demands on system performance. However, smooth migration from the old to the new system, without any interruption to services, was a key requirement. The following technical requirements particularly challenged the project:

The Siemens solution

The control center fully automatically handles all the functions of the previously decentralized control towers. Subway operations at more than 150 stations (and 92 interlockings) are controlled, monitored and dispatched by a total of 82 Vicos® OC operator consoles. A large-sized screen, measuring 45 m x 1.5 m, provides a further overview of the lines.

The key functionality of the Vicos OC system includes real-time automatic train tracking on the basis of automatic vehicle identification and automatic routing and dispatching. Integrated voice and data communications provide timetables, possible deviations and train position information to various other systems, e.g. for automated customer information messaging.

The operations control system features the simulation, recording and playback of operational behavior. Moreover, it allows for report generation, online documentation and logging (information storage and retrieval, voice recording) and provides information for all departments involved in operations (e.g. automatic calculation and provision of car mileage data for the car maintenance department).

A detailed migration and commissioning plan has been developed to ensure the seamless integration of all interfaces and subsystems.

Project features

- > Railway authority / customer: New York City Transit Authority
- > 150 stations
- > 91 interlockings
- > 6,000 cars
- > 370 km track kilometers
- > Maximum speed: 80 kph
- > Commissioning date: 2005 – 2006

Siemens AG
Industry Sector
Mobility Division
P.O. Box 3327
D-38023 Braunschweig, Germany

Phone: (+49) (5 31) 2 26-28 88
Fax: (+49) (5 31) 2 26-48 88

www.siemens.com

Printed in Germany / PPG151 312151 PA08081.5 / Order No.: A19100-V100-B874-V1-7600

Norway – centralization of railway traffic

At Oslo Main Station – the center of Norway's rail transport, an integrated "Airport Express Train Terminal" is to be found. Starting from here, passengers travel only 19 minutes to the new airport on the first Norwegian high-speed line.

The integration of two high-performance transport systems and the centralization of Norway's mainline rail traffic control has been jointly executed by the customer and Siemens in three phases, comprising several extension and upgrade projects, some of which are still being implemented.

The challenge

It was a prerequisite that Norway's huge regional rail networks could be supervised via operations control centers in Oslo and Drammen, thus centralizing traffic control for more than 80% of Norway's mainline railway networks.

The Vicos® OC system would be the first and biggest timetable-based automatic train supervision and control system on mainline railways with more than 150 controlled railway stations per control centre. With trains in service at a maximum speed of 160 km/h at ten-minute intervals, this truly challenges not only the signaling system but also the traffic control infrastructure.

The Siemens solution

All rail traffic is controlled, monitored and coordinated from Oslo and Drammen. If necessary, both serve as a backup for each other – the whole network can be controlled from either Oslo or Drammen while remaining fully operational. Apart from the operations control centers, no staff are required on site during regular operation. A large-screen LCD monitor in Oslo with a width of 26 m and a height of 2.25 m provides the necessary overview.

The Vicos OC system comprises a wide range of automation functions, including conflict detection, interactive electronic train graph and semi-automatic (preprogrammed) command sequences for conflict solutions.

A data warehouse solution interfaces with various subsystems. From this data warehouse, solution reports and statistical analyses can be freely configured and extracted by the user, depending on the information currently needed.

The system is designed to control and monitor various interlocking types from different manufacturers. In addition, various subsystems such as power control system, GSM-R, trackside block telephones and passenger information system have been integrated.

Today, Vicos OC is the leading operations control system in the Scandinavian market.

Project features

- Railway authority / customer: NSB Gardermobanen and Jernbaneverket (JBV)
- 2,000 track kilometers
- 1,000 to 1,500 trains per day
- Control and monitoring of various interlocking types
- LCD large-screen monitor (26 x 2.25 m) in Oslo
- Commissioning dates:
  - Phase 1 (Oslo control center) 1996 – 2001
  - Phase 2 (line and interlocking extensions) 2002 – 2006
  - Phase 3 (upgrade of automation functions) 2006 – 2008

Great Britain – a relationship of trust with the customer

The high density of the UK's rail network leads to high demands on safety and reliability for the signaling systems. With this comes the need for extensive ongoing upgrading measures. After privatization of the rail system, the network, lines, interlockings (signal boxes) and communications equipment are today owned by Network Rail. Using modernization programs, Network Rail aims to increase the safety, availability and reliability of the infrastructure.

The challenge

The introduction of new technology was expressly requested by the customer. However, within a highly complex infrastructure, Siemens had to prove the adaptability of its technology. New and conventional systems must function side by side, while fulfilling the complex British operating requirements and approval procedures.

The signaling system had to be designed to set a new benchmark in reliability, availability and low maintenance requirements for future extensions and system migrations.

The Siemens solution

The custom-made Vicos® OC system has fit seamlessly into the existing infrastructure. The whole Siemens solution has gained Network Rail's approval and has been controlling trains along the Dorset Coast Line on England's south coast since 2003. The user interfaces have been easily adapted to the British standards and the whole Vicos OC system has been tested in several human factor studies and proved to fulfil all ergonomic regulations.

The operations control center at Bournemouth monitors and controls the Siemens interlocking at Bournemouth and another interlocking at Hinton Admiral as well as 160 other points with signaling and communications equipment along the line.

The Vicos OC operations control center comprises signaler and technician's workstations. While compatible to the British train tracking system, the Vicos OC train describer module has been one of the first to implement the SPAD (signal passed at danger) function according to Network Rail's safety regulations.

Vicos OC service and diagnostics workstations have replaced the former technician terminals. They provide specific information about the causes of faults and offer instructional text on fault elimination. A back projection system gives an overview of the controlled area. The Vicos OC record and playback module stores data and allows subsequent playback for simulation and evaluation purposes.

Cooperation between Siemens and Network Rail has proved to be groundbreaking. Siemens has become an accepted partner of Network Rail and received the Railtrack Partnering Award in recognition of successful cooperation in 300 partnering projects in the summer of 2001.

Project features

- > Railway authority / customer: Network Rail
- > Vicos OC 111
- > 26 track kilometers
- > 7 stations
- > Maximum speed: 144 kph (90 mph)
- > Commissioning date: 2003

Siemens AG
Industry Sector
Mobility Division
P.O. Box 3327
D-38023 Braunschweig, Germany

Phone: (+49) (5 31) 2 26-28 88
Fax: (+49) (5 31) 2 26-48 88

www.siemens.com

Printed in Germany / PPG151 312151 PA08081.5 / Order No.: A19100-V100-B874-V1-7600

Australia – global demand and challenging iron ore rail freight operations

The world's largest diversified resources company, BHP Billiton, ships millions of tonnes of ore to steel mills around the world. However, the railway link between mines and port used to be a bottleneck limiting the iron ore transport capacity.

Siemens has been awarded a contract to design, build and deliver an advanced operations control system for BHP Billiton to optimize existing iron ore rail freight operations at Port Hedland, Western Australia.

The challenge
The strong worldwide demand for iron ore is creating opportunities for BHP Billiton to increase sales and is stimulating increased requirements for capacity throughput from several mine sites in Western Australia.

The particular challenge for BHP Billiton has been to
> increase rail transport capacity and throughput
> integrate the complete mine-rail-port supply chain system
> effectively manage and control rail freight operations
> make efficient use of existing infrastructure and resources

The Siemens solution
The Vicos® OC system provided by Siemens links with BHP Billiton's mine and port operations and supply chain management systems to provide real-time control of rail freight movements.

The system comprises three integrated elements – the traffic control system, the online train scheduling system, and the train information management system. The traffic control system allows operators real-time control of rail freight movement throughout the entire system. It offers standard traffic control functions such as train tracking, monitoring, manual and automatic route setting and blocking as well as alarm management facilities.

Furthermore, the system features typical freight-related functions. A GPS positioning system refines the data received by the up to 5 km track circuits and an electronics-based train order function substitutes manual control of the non-signaled network.

The intelligent train scheduling system interfaces with other BHP Billiton systems to assess iron ore capacity requirements. The requirements will be matched with the availability of infrastructure and rolling stock to generate a daily master timetable. Moreover, additional functions are available to generate editable electronic train graphs and provide for online scheduling.

The train information management system database collects operational data from internal and external sources, including data from trackside-mounted hot-box equipment, which allows BHP Billiton to make user queries and create detailed reports.

Siemens has developed a two-stage, step-by-step introduction of the Vicos OC system to minimize the risk of interruptions to daily business, while still delivering substantial modification and modernization of the railway system within the shortest timeframe.

Project features

> Railway authority / customer: BHP Billiton
> 650 track kilometers
> 37 sidings
> 3,500 wagons per day
> Commissioning date: 2007

Optimum transport performance through flexible dispatching

Needs-based freight transport with Vicos OC

www.siemens.com/mobility

SIEMENS

Canada – reliable scheduling across “dark territories”

With approx. 20,000 track kilometers, Canadian National Railway (CN) is the biggest freight rail operator in Canada and one of the most important in North America. CN is the only railway to span the continent from east to west and north to south.

The challenge
The existing operations control centers for the Canadian part of the CN rail network in Edmonton, Montreal and Toronto caused increasing maintenance expenses and had to be modernized. Thus, CN decided to change over to a modern, integrated traffic control solution.

One particular challenge of the Canadian line are the so-called “dark territories”, large areas (approx. 40%) without any signaling. Some switches are operated manually and the operating concept requires a dispatcher at the control center to issue driving instructions (movement authorities) by radio.

The Siemens solution
The Vicos® OC system offers train tracking and optimized routing functionality, train sheet functions, movement authority functionality, web-based trackline views and playback. All components in the control system are duplicated. The system features contingency capabilities to permit the instantaneous business resumption of dispatching at alternate sites, if necessary.

The new system provides greater scheduling reliability to control with precision the more than 400 trains CN operates daily across 20,000 kilometers of track in Canada. The fully integrated system, providing network-wide scheduling control, meets the customer’s exacting safety standards.

The new control system is linked directly to CN's service reliability strategy system with its industry-leading scheduling and planning capabilities. Each dispatcher works with six TFT monitors (four providing an overview over the dispatcher's territory and two for operations).

The operating procedures have been considerably simplified to improve the train dispatcher's efficiency. Before completing the user interface, CN and Siemens analyzed the most frequently used operations. With only two mouse clicks, multiple types of routes can be set. Inputs via the keyboard are only required for text entry. This approach enables the user to concentrate on operations rather than on how to operate the system.

The system has bilingual capabilities (English and French) and seamless transfer between signaled and non-signaled (dark) territories. There is a mutual fallback capability between the control centers. In the event that one control center site should become unavailable, the other control center site can take over operations seamlessly (business resumption).

The Siemens solution allows CN’s maintenance of way forces to significantly improve efficiency for both dispatchers and maintenance staff by exchanging information with the new dispatching system through optimized and secure wireless communications.

Project features

- > Railway authority / customer: Canadian National Railway
- > 20,000 track kilometers
- > 400 trains per day
- > Operations control centers in Edmonton, Montreal and Toronto
- > 46 traffic control workstations
- > Commissioning date: 2005 – 2006

Photos reproduced with kind permission of BHP Billiton and Canadian National

Siemens AG
Industry Sector
Mobility Division
P.O. Box 3327
D-38023 Braunschweig, Germany

Phone: (+49) (5 31) 2 26-28 88
Fax: (+49) (5 31) 2 26-48 88

www.siemens.com

Printed in Germany / PPG151 312151 PA08081.5 / Order No.: A19100-V100-B874-V1-7600