A new era in rail automation

More than 150 years of success
From ingenious inventions to advanced railway solutions

Mainline, freight and urban railways
The milestone projects in rail transport and automation

Special issue:
Invensys Rail and Siemens Rail Automation merge to form a new global player

Facts, Trends and Stories on Integrated Mobility

2013 | www.siemens.com/mobility
Our world is quickly changing. The global population has grown to around 7.1 billion, and by 2050 it will be 9.3 billion. Seven out of ten people will live, work and be on the go in cities. At the same time, goods movements will increase even further as a result of globalisation. From 2000 to 2012 alone, worldwide exports increased by 70 percent. These developments represent a challenge for transport, commerce and logistics.

“Public transport not only supports mobility and economic growth, but also addresses environmental problems and promotes livability.”

Alain Flausch, Secretary General, International Association of Public Transport (UITP)
Urban population and urbanisation: According to UN prognoses, the world population will grow to 9.3 billion by 2050 – and 70 percent of those people will live in cities.
Studies on economic development and infrastructure show that rail’s importance will continue to grow. And rail automation will play a decisive role with its market growing by 3 percent yearly until 2016 to around €12.4 billion.

The reason is relatively simple: Not only is the demand for efficient transport solutions rapidly growing, particularly in cities, but there is also need for more capacity. This additional capacity is best delivered not through track expansion but through optimised use of existing infrastructure, higher energy efficiency and green technology with low operating costs. Further measures include integrated information and security systems for stations, lines and passengers, and solutions that optimise fleet and crew management.

Providers with the experience, know-how and a comprehensive portfolio of solutions will be in the best position to meet differing customer requirements both now and in the future. This is why Siemens and Invensys Rail have joined forces to form a new global player in rail automation.
“We are investing billions in improving the transport network and easing the burden for millions of commuters. And the whole purpose of that investment is making public transport better and easier for people to use.”

Boris Johnson, Mayor of London

“Rapid economic development and industrial growth is driving urbanisation, changing the landscape of major cities around the world. Rail automation will help increase efficiency without compromising on safety.”

Franck Leveque, Vice President and Head of Transportation Practice Frost & Sullivan

Global investment in rail and road infrastructure of €300 billion annually will triple by 2050.

€900,000,000,000

Global market for rail safety and signal technology: market volumes in 2010 and growth until 2016

Source: UNIFE/Siemens prognoses
We make the most of rail

“Siemens Rail Automation is much more than the simple combination of two companies steeped in tradition. What’s more, the combination of the two successful organisations has created a true global player in rail automation. The proven products and solutions of both companies, which have again and again set new standards, complement one another perfectly. Local expertise and well-established business relations are being preserved.”

Dr Jürgen Brandes

Dr Jürgen Brandes (*1961)  
Chief Executive Officer (CEO) of the Business Unit Rail Automation, Siemens AG, Infrastructure & Cities Sector  
Studied electrical engineering at the Leibniz University of Hanover and finished with a PhD. From 1989 onward at Siemens AG in different positions and functions. Since October 2012 at the business unit Rail Automation in Berlin.
“Quality first, safety always – two competitors are becoming partners, which holds many advantages for our customers: On the one hand through worldwide presence and competent project teams on location, and on the other through the established business principles and values of well-trained and motivated employees.”

Pierre Bauer

Pierre Bauer (*1965)
Chief Financial Officer (CFO) of the Business Unit Rail Automation, Siemens AG, Infrastructure & Cities Sector
Studied Business Administration at the University of Cooperative Education in Mannheim, Germany. Starting in 1988, different positions at companies in Germany and Sweden. Since 1998 at Siemens AG in different functions, and since 2009 at the business unit Rail Automation in Berlin.
Successful and from the best of homes

A family tree to be proud of: Invensys Rail descends from Invensys Group, which has a long and successful history in rail automation. The Siemens business unit Rail Automation has been a technical pioneer in rail security and control since the company’s founding.

Invensys plc, headquartered in London, employs almost 21,000 people. The Invensys Operations Management Division specialises in industrial automation and does business in over 180 countries all over the world. Invensys Controls concentrates on control technologies for domestic appliances. Until the integration with Siemens, rail automation was carried out by Invensys Rail. The unit employs 3,200 people, with around 700 at headquarters in Chippenham. London, the capital of the United Kingdom and a major cultural and financial centre, has one of the world’s longest metro networks. More than 8.2 million people live in Greater London. Chippenham, around 160 km west of London in the county of Wiltshire, is a market town with around 35,000 inhabitants. Founded in 600, Chippenham obtained city status in 1554.

Siemens AG with headquarters in Berlin and Munich is one of the largest electronics and electrical engineering companies in the world. Siemens comprises the four sectors Energy, Healthcare, Industry and Infrastructure & Cities, is active in 190 countries worldwide and employs around 370,000 people. The business unit Rail Automation, which currently has 6,500 employees, is a traditional core business for Siemens. Rail Automation is part of the Mobility and Logistics Division. Germany’s capital Berlin has a population of 3.5 million, which makes it the country’s most populated city. Werner von Siemens founded his company in Berlin. Today around 10,000 Siemens employees work in Berlin, and 700 of them at Rail Automation’s headquarters. Munich, with a population of approximately 1.4 million, is the state-capital of Bavaria. A number of national and international businesses call the city home — including Siemens and the company’s Mobility and Logistics Division.

“We decided to seek out a partner that would be able to put the full value to good use. It was an easy choice to partner with Siemens, the clear leader in rail signalling and a company that appreciated the value of the Invensys assets.”

Wayne Edmunds, CEO, Invensys plc

“Evermore growth and prosperity necessitate safe, secure and comfortable transportation. That’s why rail automation is essential for our customers: It is the most important precondition for successful integrated mobility.”

Dr Sami Atiya, CEO, Siemens Division Mobility and Logistics
Facts and figures for fiscal year 2012

Turnover according to portfolio segment and region

_Invensys Rail_
- New orders: €1,135 million
- Revenue: €888 million
- Employees: ca. 3,200

_Siemens Rail Automation_
- New orders: €5,382 million
- Revenue: €5,969 million
- Employees: ca. 24,000

Siemens Transportation & Logistics
(Rail Systems/Mobility and Logistics Divisions)
- New orders: €5,382 million
- Revenue: €5,969 million
- Employees: ca. 24,000

Worldwide Siemens holds 57,300 patents. In fiscal 2012 alone, Siemens employees registered 8,900 inventions – that equates to 41 inventions for every business day.

Siemens Rail Automation – main locations worldwide

1. Ankara, Turkey
2. Ashby, UK
3. Bangalore, India
4. Bangkok, Thailand
5. Beijing, China
6. Berlin, Germany
7. Brisbane, Australia
8. Brunswick, Germany
9. Caracas, Venezuela
10. Chippenham, UK
11. Dubai, UAE
12. Jacksonville, USA
13. Lisbon, Portugal
14. London, UK
15. Louisville, USA
16. Madrid, Spain
17. Marion, USA
18. Melbourne, Australia
19. Midrand, South Africa
20. Mumbai, India
21. New York, USA
22. Paris, France
23. Pittsburgh, USA
24. Roiha, Algeria
25. Sao Paulo, Brazil
26. Singapore, Singapore
27. Vienna, Austria
28. Wallisellen, Switzerland
It all started almost 150 years ago. In the early days of the railway, ingenious inventors like Werner von Siemens, John Saxby and George Westinghouse did everything in their power to make rail travel more efficient and, above all, safer. They set the foundation for the train automation of today – and for the joint history of Siemens and Invensys Rail.
1847
Werner von Siemens and Johann Georg Halske construct the first electromechanical signal bell

1856
Saxby registers the first patent for interlocking of points and signals in UK

1856
Braunschweiger Bahnen (Brunswick Railway Company) places an order for Germany’s first centralised control centre according to the Saxby patent for the Börßum station

1860
Saxby & Farmer become the world’s first signalling manufacturer
Saxby & Farmer install “Hole-in-wall” signalbox, the world’s first control centre

1866
Werner von Siemens discovers the dynamo-electric principle

1869
George Westinghouse patents the air brake and establishes the Westinghouse Air Brake Company in USA

1870
First electric block to switch on signals for protecting lines between stations

1873
Max Jüdel & Co. emerges from Braunschweiger Eisenbahn-signal-Bauanstalt (Brunswick Railway Signal Construction Company). Heinrich Büssing’s further development of the central control centre gives rise to the Rüppell mechanical signal box system for which Büssing is the patent holder

1879
First factory established on Chippenham site

1891
Siemens Vienna installs the first electromechanically driven point machine in Vienna’s Western Station

1894
First electromechanical interlocking, points can be electrically remote-controlled

1901
Siemens & Halske revolutionises signalling and interlocking technology with the world’s first installation of a three-row interlocking lever frame in Dresden Railway Station

1905
First signalling company established in India

1912
Electromechanical signalling box type Siemens 1912 becomes the standard in German-speaking countries
1920
RACO (Railroad Accessories Company), founded in USA

1926
First rectifiers installed in UK on Great Western Railway

1928
Vereinigten Eisenbahnsignalwerke (VES) founded through the merger of Siemens Blockwerk with the AEG signalling department and the Max Jüdel-Stahmer-Bruchsal signal manufacturer

1932
With the three-row interlocking lever frame as a forerunner, for the first time a four-row interlocking lever frame was put into operation in Dortmund

1940
Inductive train control (Indusi), developed starting in 1926, leads to considerable improvements in rail travel safety

1948
First geographical-circuitry interlocking on the Düsseldorf-Derendorf route

1953
Dimetal S.A. founded in Spain

1956
First geographical-circuitry interlocking with updated technology in Kreiensen

1957
First transistors manufactured in Chippenham

1962
Siemens introduces the first electromechanical switch drive to the market

1963
Dimetal and Westinghouse Brake & Signals (Spain) merge

1964
First process switchbox with electrical staging yard, electrical counting of axles and direction display as well as speed-independent, electronically controlled track brakes in the Seelze switchyard
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1968</td>
<td>Victoria Line on London Underground becomes the world's first in service automatic railway thanks to Westinghouse technology</td>
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<td>1974</td>
<td>RACO changes its name to Safetran Systems Corp.</td>
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<td>1976</td>
<td>Delivery of the complete communications technology for Hong Kong’s first underground line</td>
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<td>1978</td>
<td>Dimetronic S.A. is formed responsible for railway signalling business in Spain</td>
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<td>1979</td>
<td>Westinghouse installs world’s first digital ATO on Hong Kong Metro</td>
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<td>1982</td>
<td>Hawker Siddeley Group buys Westinghouse Signals</td>
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<td>1984</td>
<td>Westinghouse selected for Singapore Metro</td>
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<tr>
<td>1985</td>
<td>Westinghouse installs the world’s first electronic interlocking system, the SSI, at Leamington Spa in the UK</td>
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<td>1988</td>
<td>Westinghouse Brake &amp; Signals (Hawker Siddeley Group) acquires Dimetronic S.A.</td>
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<td>1989</td>
<td>As one of the first electronic signal boxes in Switzerland, the microprocess-based SIMIS C signal boxes are operated via keyboard and workstation</td>
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<td>1990</td>
<td>First Westrace Interlocking installed in Australia</td>
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<td>1991</td>
<td>BTR acquires Hawker Siddeley, BTR Rail Group is formed</td>
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<tr>
<td>1995</td>
<td>First metro contract won in China</td>
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<td>1996</td>
<td>One of the world’s largest electrical signal boxes is commissioned in Hanover in only 16.5 hours</td>
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<td>1998</td>
<td>World’s first Integrated Control Centre System (ICCS) enters service on East Rail line in Hong Kong</td>
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<td>1999</td>
<td>BTR and Siebe merge to create Invensys</td>
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<td>2001</td>
<td>Invensys Rail created</td>
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<tr>
<td>2001</td>
<td>Commissioning of the largest electrical signal box at Frankfurt Central Station</td>
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2002
Siemens becomes one of the first suppliers of operating and indicating panels for the new interoperable train control system ETCS

2003
Invensys wins its first ERTMS contract for Spain’s high speed network system. Dimetronic responsible for the signalling upgrade on nine lines of Madrid Metro

2004
Signalling and control system for the Transrapid in Shanghai, China

2006
Operating licence for the European Train Control System (ETCS) on the Berlin–Halle/Leipzig route

2008
Automatic train control via WLAN technology

2009
Invensys Rail business units, Westinghouse Rail Systems, Safetran Corp. and Dimetronic Signals rebrand as Invensys Rail
Invensys wins its first major Brazilian contract to install CBTC on Sao Paulo Commuter Network

2011
170 km of Copenhagen’s commuter rail network equipped with energy-efficient technical solutions

2011
Invensys Rail wins contract for world’s first CBTC/ERTMS signalling solution for Bosphorus Crossing

2012
Trackguard SInet realises a new communications architecture for connecting outdoor elements to interlockings

2012
Victoria Line upgrade completed in time for 2012 London Olympics

2013
Invensys Rail and Siemens Rail Automation merge to form a new global player for rail automation
what we do

Availability, capacity and safety are the main ways in which rail automation can help make the most of rail. Our comprehensive portfolio, available to rail operators worldwide, includes innovative products and systems, and leading edge IT solutions – as well as a range of services that maintain value.
"As a business, in addition to our absolute focus on safety, we strive to achieve excellence in technology, innovation, delivery and value."

Nick Crossfield, President, Invensys Rail Northern Europe
Rail automation in concrete terms

A great portfolio – from products to complete systems integration: We offer best-in-class solutions to provide efficient and competitive mass transit and mainline rail services for passenger and freight transportation.

Rail IT products and applications

Modern rail control systems continuously monitor movements of the trains on lines and at stations, make high speeds possible and enable the network resources to be utilised to maximum capacity. But high-performance rail transport also requires intelligent IT-based information and management solutions to handle an increasing quantity of data and information – and significantly enhance passenger convenience. As a matter of fact, our solutions are used with great success throughout the world and demonstrate our expertise in this field.

- Telecoms for railways
- Passenger information systems
- Fleet & crew management
- Asset & maintenance management
- Operations & control systems

Rail safety systems

Because safety is the prime consideration for every public transport system, rail safety solutions – from interlockings to trackside and onboard devices, and train control and protection systems – are crucial for the availability of the entire railway system. While reliable signalling and operational information can make railway services efficient, a wide range of different automatic functions assist the driver or even provide driverless operations. Our systems are designed to all required railway safety standards and not only ensure maximum safety, but also improve efficiency.

- Interlockings
- Level crossings
- Conventional Automatic Train Protection (ATP)
- ETCS – Trackside and onboard
- CBTC – Trackside and onboard
- PTC – Trackside and onboard
- Freight, yard and hump control

Products

We supply for a complete range of electrical and mechanical components, for both new or existing installations. We develop and deliver proven and robust equipment for a wide range of applications. And in all these areas, we provide not only the equipment itself, but the design, testing, installation and commissioning, including liaising with third-party contractors. This is why customers can be sure to get proven quality and safe, innovative, environmentally friendly solutions for maximum availability and operational effectiveness.

- Point machines
- Track circuits
- Axle counters
- Incandescent and LED signals
- Relays
- Locomotive related products
what we’ve
With many years of experience in the implementation of projects in close partnership with our customers, we have optimised rail operations all over the world – from North America to South Africa, from Western Europe to the Far East.
Our projects set standards on all continents: Our mass transit solutions make urban environments more attractive, livable and competitive. Solutions for long-distance rail transport offer an environmentally friendly alternative to air and road travel, providing fast and comfortable links between cities and countries.

A world of experience
Urban transport at its best

Selected projects in which our automation solutions make metro systems fit for the future.

USA
Through a comprehensive modernisation of the trackside and wayside equipment, the on-board system and the control centre, by 2017 we will update the over 100-year-old metro connection between New York and New Jersey operated by the Port Authority Trans-Hudson Corporation (PATH). Automatic Train Control (ATC), which uses radio-based Communications-Based Train Control (CBTC) technology, will enable shorter intervals between trains, increase capacity by 20 percent and shore up the metro system to accommodate up to 290,000 passengers per day.

Implementing a new integrated rail-control centre for the A Division of New York City Transit’s (NYCT) subway network was the largest Automatic Train Supervision system (ATS) project in the world: controlling 172 stations, 45 interlockings, 46 central instrument rooms (CIRs), 175 km of track, 1,758 controlled devices and 4,811 indicated devices with about 200 simultaneous trains in rush-hour periods. Controlguide Vicos OC 501 is used as the central control system and has been in operation since 2008.

“Modernising our rail system has been one of the Port Authority’s top priorities in recent years to help bolster our region’s economic future. Replacing the century-old signal system with 21st century technology will enhance passenger safety, boost capacity and improve reliability.”

Anthony Coscia, Chairman, Port Authority Trans-Hudson Corporation

The metro system between New York and New Jersey is being upgraded during regular operation.
**United Kingdom**

For the automation of the 21-km-long Crossrail tunnel – which by the end of 2018 will connect the current terminus station Paddington in the west of London with Stratford station in the east – we will employ interlocking and CBTC, ATS and trackside equipment to connect the new local transportation line with the long-distance service of the British network operator Network Rail. A special feature: On the westward long-distance route the European Train Control System (ETCS) Level 2 will be installed; the eastward direction will feature the local Train Protection Warning System (TPWS). In the Crossrail tunnel the trains will be controlled with radio-based Communications-Based Train Control (CBTC). Dynamic switchover between the three control systems will ensure smooth integration of the different lines. As of 2018, up to 24 trains per hour are scheduled to travel along the core network. The Victoria Line, built between 1968 and 1972, has already been completely modernised. The new ATO system with Distance to Go-Radio (DTG-R) trackside equipment was able to run with the new radio messages and legacy track circuit codes. In the transition phase, mixed operation of the original 1968 fleet and new rolling stock was possible. The WESTRACE solution now controls the entire 13-mile-long Victoria Line, operating a 33 trains per hour timetable.

**China**

The longest CBTC-drive metro line in the world is Line 10 in Beijing. Equipped with the Trainguard MT train protection system, the line links the north-west part of the city to the south-east. The first section was opened in time for the 2008 Olympic Games. The CBTC system controls the trains according to the moving block principle within absolute braking distances. Thanks to integrated, automatic running and braking control ATO, the train runs energy-efficiently and stops precisely in front of the platform doors, with synchronous opening of the platform screen doors.

Beijing’s Line 8 was also automated in the same fashion. In 2008 the route served as a branchline to the Olympic Park and after completion it created the important north-south connection in China’s capital city.

“We are proud to be at the centre of London’s two most prestigious infrastructure programmes. Key to our successful bid was not only the proven technology that Invensys Rail and Siemens plc will supply, but also our successful track record in delivering projects of this scale and complexity.”

Will Wilson, Vice President Commercial and Business Development, Invensys Rail Northern Europe
Brazil
For the modernisation of Metro Lines 8, 10 and 11 in São Paulo, the CBTC system SIRIUS together with WESTRACE electronic interlockings, point machines and LED signals are being employed. The design and planning of the new system are such that it can operate alongside the existing signalling system until it is completely installed and operational, minimising the impact on the service for passengers. The three suburban lines operated by the Companhia Paulista de Trens Metropolitano (CPTM) provide a service of 136 trains plus maintenance vehicles for more than one million passengers per weekday.

We are also an automation partner for the new Line 4, which is operated by Via-Quatro since 2010. Equipped with Trainguard MT it is São Paulo’s first driverless metro.

Spain
In Spain’s capital city of Madrid, a total of nine metro lines and associated rolling stock are being upgraded. WESTRACE electronic interlocking, FS3000 Jointless Track Circuits and point machines were installed, along with Distance to Go ATC systems to reduce the interval between trains and increase transport capacity. The TBS5000 ATC system installed in over 140 trains allows the trains to run in both Distance to Go and Speed Code ATP, depending on the equipment installed track-side. Line 7B already operates with the CBTC solution SIRIUS. In the case of a failure, SIRIUS is able to continue operating based on a “Speed Codes” ATP system using the existing line infrastructure.

Spain’s first fully automated metro line – Line 9 in Barcelona – is equipped with the Trainguard MT system, which enables driverless operation. Controlguide Vicos OC was installed for automatic traffic supervision, as well as the Clearguard FTGS track circuit solution for track vacancy detection and WESTRACE relay interlocking.

India
The Airport Metro Express Line in New Delhi establishes a link between New Delhi Railway Station, Indira Gandhi International Airport and the city district of Dwarka. We equipped the line with the LZB 700 M continuous automatic train control system, Trackguard Sicas ECC type electronic interlockings, Controlguide Vicos OC 501 operations control system as well as LED signals and switch machines. ATP and ATO ensure safe and smooth operation even when running at short headways. All six stations are fitted with platform doors that will open and close automatically when the trains arrive and depart. Air passengers can check in at two of the city airport terminal stations; their baggage is taken...
directly to the airport onboard the metro and then merged with the airport baggage handling system. We are also installing the new metro line to the Gurgaon Cyber City district, around 30 km south of downtown New Delhi – the first complete rail project in India on a turnkey basis. The project will include the same automation technology for a capacity of 30,000 people per hour.

Singapore
The new Downtown Line of Singapore Metro – being built in three stages completed from 2013 to 2016 – will enhance connectivity and facilitate direct travel from the north-western and eastern areas of the island to the Central Business District and the Marina Bay. We are delivering the signalling system and platform screen doors, including ATP and ATS. The system will include the SIRIUS CBTC solution for automatic train control, WESTRACE electronic interlocking and ATS from a centralised control centre.

This new line is part of the major mass transit project to double the network of the Rapid Transit System from today’s 138 km to 278 km by 2020. By then commuters will be within five minutes’ walk (or on average 400 m) to an RTS station within the central area.

Turkey
The Gebze-Halkali Commuter Rail line in Turkey, known as the CR3 Marmaray Project with a tunnel under the Bosphorus, will be the first line in the world to be equipped with both ERTMS (European Rail Traffic Management System) and the CBTC system. The existing double track network will be replaced by a two-way triple track system. The double track will be equipped both with a SIRIUS CBTC system for mass transit commuter trains and FUTUR 1300 ERTMS Level 1 for freight transportation. A new third track used for operating Main Line Intercity trains will be equipped with an ERTMS Level 1 system. The Marmaray project is a core element of Turkey’s rail expansion plan in the metropolitan regions on both sides of the Istanbul Strait.

In Istanbul itself, the existing Metro Line 1 is equipped with a new ATC System Trainguard MT as well as Sicas ECC electronic interlockings, Vicos OC 100 operations control system, and Airlink train control radio. Work was performed on both the route and the trains during running operations.

“We efficient transport systems are the lifeblood of modern cities. When complete, this project will not only significantly improve the day-to-day journeys of millions of people, it will also play a pivotal role in the economic development of the city of Istanbul and the Republic of Turkey in general.”

Kevin Riddett, CEO & President, Invensys Rail
Heavy freight and fast trains

Faster long-distance connections, optimised freight transport. Have a look at some outstanding projects.

MSR 32 classification control system controls the radio-operated locomotives, the routing of cars and their speed in upper and lower main retarders, and retarders in 88 classification tracks. Plus it controls the route of switches for all cuts from the hump down to the classification tracks. The modernisation will be carried out while normal operation continues. During this phase, the control system has to be capable of controlling both the old and new marshalling installations.

Switzerland
In Switzerland we are equipping most of the approximately 3,000 km route of the Swiss Federal Railways (SBB) network with the European Train Control System (ETCS) of type Trainguard 100. Project completion is scheduled for 2017. This entails the adaptation work to the roughly 430 existing mechanical, electromechanical and electronic interlockings in the network. The backbone of the Swiss ETCS system will be formed by 5,300 solar-powered lineside electronic units.

"The modernisation of 88 classification tracks at Europe’s largest marshalling yard during running operations is only possible with a committed, competent project team and excellent technology, such as the scalable process control system MSR 32."

Werner Bublitz, Project Head, Siemens Rail Automation

Germany
Since 1977, Maschen marshalling yard near Hamburg has served as the central junction for cargo traffic bound for the ports of Hamburg and Bremerhaven and for Scandinavia. It covers a surface equivalent to 380 football fields and is Europe’s largest facility. The control system is now being modernised. The Trackguard MSR 32 classification control system controls the radio-operated locomotives, the routing of cars and their speed in upper and lower main retarders, and retarders in 88 classification tracks. Plus it controls the route of switches for all cuts from the hump down to the classification tracks. The modernisation will be carried out while normal operation continues. During this phase, the control system has to be capable of controlling both the old and new marshalling installations.

With its 88 classification tracks, Maschen is the largest marshalling yard in Europe.
“Retrofitting an average of nine signals each workday during regular rail service is only possible because all project members work hand in hand. And also because over the years we have established a relationship with the customer built on trust and cooperation.”

Frank Hess, Project Head, Siemens Rail Automation

(LEU) type Trainguard MiniLEU S11 for intermittent data transmission, and 1,200 lineside electronic units type Trainguard LEU S21 MS for continuous data transmission. The trackside signals will be connected to the interlockings via 1,400 signal operating modules type MSTT. Beyond that over 20,000 contactless radio beacons – known as Eurobalises – to transmit data between the line and rail vehicle will be installed. In addition, 230 SBB traction units will be equipped with Trainguard-200 On-Board-Units, compatible both with the European Train Control System (ETCS) Levels 1 and 2 and the national train protection system ZUB 121 to cover all systems deployed in Switzerland.

Spain
For the high-speed Cordoba – Malaga line, the interlockings, train protection systems, telecommunications, GSM-R moving radio system and associated elements were planned and realised in three construction phases. Also in the scope of delivery were LED wayside signals, FS3000 audio-frequency Jointless Track Circuits, the ERTMS train protection system for Levels 1 and 2, and the national solution Announcement of Signals and Automatic Braking (ASFA). The high-speed route Ourense – Santiago de Compostela, which is part of the future high-speed connection from Madrid to Galicia, was also equipped in the same fashion. For the high-speed line sections Lérida – Barcelona, La Sagra – Toledo, and Segovia – Valladolid, with a length of more than 300 km in total, we supplied Trainguard ETCS Level 1 and 2 track-side and on-board systems equipment.

Best-in-class automation technologies are being integrated during the expansion of Spain’s high-speed railway system.
Saudi Arabia
The rail network in Saudi Arabia currently consists of two main lines operating on two separate routes for cargo transport and for passenger traffic connecting the port city of Dammam on the Persian Gulf with the capital Riyadh. Both lines have cutting-edge signalling and telecommunications technology. Saudi Arabia is the first in the Arab world to use the European Train Control System (ETCS), controlled by Trainguard 100. Additional safety and security is provided by ten Trackguard Simis electronic interlockings and a Controlguide Vicos control centre, as well as a GSM-Railway communications network for voice communication for railway personnel. Grade crossings are secured by 15 Simis level-crossing systems in combination with a CCTV video surveillance system. The ETCS system’s Eurobalise transceivers were given special sun shields to protect them from sandstorms and exposure to extreme radiation and temperatures.

“The specialists in the field of signalling and transport solutions bring to the project a wealth of experience and expertise. The partnerships formed with QR National have proven successful in the past and I’m confident they will continue to be a success on GAP.”

Michael Carter, Executive General Manager, QR National

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Michael Carter, Executive General Manager, QR National

Australia
The Goonyella to Abbot Point Expansion Project (GAP) in Queensland, Australia, arose from the need of several coal companies in the coal mining area of the Bowen Basin to increase rail capacity. The solution: to provide a narrow gauge link between the Goonyella and Newlands coal systems with the capacity to run 106-tonne trains. The project included 69 km of new line, 44 km of existing track upgrades, 15 bridges and 6 passing loops.

The BHP Billiton Iron Ore railway connects numerous mines in Western Australia with Port Hedland. Part of the almost 2,000 km long route is single track, which means that the trains with more than 200 wagons can pass each other only on a few sections.

We installed an integrated supply chain system that – regardless of load processes at the mines and the occupancy of the port – handles the optimal line occupancy, coupling and decoupling of the trains and management of the vehicle fleet.
United Kingdom
In several construction phases between 2008 and 2010, we installed all signalling and telecommunications elements on the Airdrie – Bathgate route. Stage 1 of this work involved the conversion of the existing single-track railway from Newbridge Junction to Bathgate station into double track, as well as a new double-lead junction with the main Edinburgh to Glasgow line. In a further phase, 24 km of new electrified double track railway from Airdrie to Bathgate were constructed, together with the installation of new signalling equipment at Newbridge Junction, alterations of existing and the provision of new Solid State Interlockings. The project went on to win a number of major industry awards in 2011.

USA
We are a major supplier to the North American freight market where signalling products and systems are most frequently sold directly to the major railroads on competitively-bid, multi-year, product contracts. We also provide design and engineering services for specific projects and installations where required.

Our state-of-the-art manufacturing facilities assemble products for applications ranging from individual pieces to complete wayside signal or grade crossing sites. We also supply a comprehensive portfolio of products: from a single track circuit or crossing control unit to a complete, wired crossing package including the enclosure, electronic control systems, flashing lights, gate mechanisms and bells – all of which are often delivered directly to the customer’s installation site in a single container, making installation simple, quick and efficient. This efficiency continues in operation with a range of remote monitoring tools which allow railroads to check operational effectiveness centrally without the need for costly site visits.

“Invensys has had a really good year, delivering everything we look for in a great supplier and partner. We wish them every success for the many years of business together yet to come.”

Simon Kirby, Managing Director
Investment Projects, Network Rail