excellence in train control

ATLAS
European Rail Traffic Management System (ERTMS)
Proven Interoperability

a Balfour Beatty and Alstom company
Railway infrastructure owners benefit from increased line throughput, operators want increased speed, safety, and passenger satisfaction. Both seek to improve business profitability.

There is a major drive to deliver such improvements to infrastructure owners and operators through the benefits gained by replacing conventional signalling technology with the European Rail Traffic Management System/European Train Control System (ERTMS/ETCS).

Signalling Solutions offers the ATLAS™ range of ERTMS/ETCS equipment, as developed by Alstom Transport. ATLAS is a proven compatible system capable of delivering interoperability as defined by the ERTMS/ETCS specifications.

The ATLAS delivery experience is unchallenged; the ability to migrate to ERTMS/ETCS technology according to customer needs places the system at the epicentre of the economic development of the railway industry.
European Rail Traffic Management System (ERTMS):

The European Union ERTMS initiative allows trains to cross international borders safely, without the need to switch locomotives or install several different national systems in fleet driver cabs.

The nerve centre of ERTMS/ETCS monitors and transmits movement authority that conveys both speed and distance limits to a driver. An onboard computer compares the train’s location and speed with authorised speed limits, automatically applying the train’s brakes when necessary.

A full ERTMS solution delivers:
- Higher capacity improved performance
- Interoperability
- Increased safety
- Multi-supplier base

The ERTMS/ETCS Incentive: Level 1, Level 2, Level 3

ETCS

Level 1:
Designed as an overlay to your current system, Level 1 provides continuous supervision through “spot transmission” using Eurobalise beacons (transponders installed in the track). Level 1 cab-signalling technology provides a simple way of reading signals in the cab and facilitates the driver’s job.

Level 2:
Using bi-directional transmission delivered by GSM-R (the dedicated radio standard for railway operations), Level 2 provides complete supervision through “continuous transmission”. Trains operate within the “fixed block” principle as in Level 1. However, continuous transmission in Level 2 permits higher line throughput (more trains per hour). It also enables a reduction in the number of track balises and therefore a reduction in maintenance costs throughout the life of the equipment.

Level 3:
Although specifications are yet set, the intention is to further reduce trackside equipment and to allow trains to operate in individual ‘moving block’ mode as is the case in advanced mass transit systems. Level three implementation will increase throughput and further reduce maintenance costs.
ATLAS is a scalable range of railway signalling systems: ATLAS 100, 200 & 300. Each one integrates modular subsystems (trainborne and trackside ETCS-compliant ATC, Interlocking, Train Supervision and conventional signalling products) through train-to-track communication and a backbone network with open interfaces.

ATLAS Modularity Benefits Train Operators
The Alstom designed ADVANTIK™ trainborne equipment offer is a fully integrated sub-system of ATLAS ERTMS/ETCS. ADVANTIK consists of less equipment than alternative systems and thereby contributes to higher train availability and lower fleet maintenance costs.

ATLAS 100:
Integrated level 1 ETCS ADVANTIK trainborne + trackside communication, or ADVANTIK communication with other suppliers of ETCS train or track equipment via standard train antennas and in-track balises.

ATLAS 200:
Integrated level 2 ETCS ADVANTIK trainborne + trackside communication, or ADVANTIK communication with other suppliers of ETCS train or track equipment using bi-directional GSM-R transmission.

ATLAS 300:
Delivers full Level 3 functionality using a GPS-based fail-safe localisation function that permits the suppression of track circuits and balises.
ADVANTIK Automatic Train Control

ADVANTIK trainborne and trackside subsystems deliver full ATC functions with cross-border and inter-supplier interoperability in complete conformity with ETCS specifications.

ATLAS Open Interfaces

Through interconnectivity, and to extend interoperability beyond ETCS functions, Signalling Solutions integrates all the critical modules on the ATLAS network: those that comply with ERTMS specifications and those published by Signalling Solutions for each major subsystem.

ATLAS Network

ATLAS systems integrate all critical subsystems and equipment through an SDH railway backbone and permit communication with trains via the GSM-R Radio network (Level 2). Trains may also be equipped with a trainborne ETHERNET network that allows easy integration of functions, such as security, passenger information, and monitoring of mission-critical train functions.

ABBREVIATIONS

PIS    PASSENGER INFORMATION SYSTEM
MSS   MAINTENANCE SUPERVISION SYSTEM
LEU  LINESIDE ELECTRONIC UNIT (ENCODER)
ATS  AUTOMATIC TRAIN SUPERVISION
I/O   INPUT/OUTPUT

ATLAS NETWORKS AND INTERFACES

- RAILWAY BACKBONE NETWORK
- TRAINBORNE NETWORK
- RADIO NETWORK (GSM-R)
- STANDARD OPEN INTERFACE
SMARTLOCK™ Interlocking

Smartlock 400 System (SML400) is a computer-based interlocking (CBI) system designed specifically as a successor to Solid State Interlocking (SSI) for all signalling applications in the United Kingdom, and interfaces with ADVANTI® products. Compared to SSI, Smartlock 400 offers:

- Reduction in number of cross-boundary communications required due to increase in potential size of interlocking coverage
- A reduction in the physical size of central interlocking equipment
- Compatibility with current communications technology
- Updated facilities for the maintainer: graphical interface, improved fault analysis
- Improved application engineering tools for test and incident analysis

ICONIS™ Network Control

ICONIS is the ATLAS subsystem that integrates information, supervision, and control for an entire railway network – from simple and small to large and complex. The ICONIS server monitors the configurations that ensure safe and efficient operation of the rail network, via traffic management (Automatic Train Supervision (ATS) & Centralised Traffic Control (CTC)) working with Interlocking and Automatic Train Control (ATC) sub-systems.

- Manual Control; enables network operators to track trains and control railway signals
- Automatic Control; matches trains against timetables and provides tools to set routes automatically
- Optimisation & Decision-Making; monitor train traffic continuously, optimising routes and the allocation of station platforms. Moreover, this utility detects potential conflicts and suggests ways to resolve them

ICONIS Optional Functions:

- The Passenger Information Systems (PIS), through visual displays and/or by voice over the PA equipment, is the supervisory and management function used to coordinate announcements to the passengers in trains and on platforms
- The Supervisory Control and Data Acquisition (SCADA) system monitors all fixed equipment and the electrical power supplies to the railway line and to stations (platform equipment, escalators, ventilation, etc.). It can monitor crosswind at tunnel exits and on viaducts
- Provisions for train, platform and tunnel security are built into ICONIS, to support the integration of applications configured to supervise video cameras, access control, anti-intrusion, fire detection and other security equipment
- The Maintenance Supervision System (MSS) centralises detection of failures in trackside equipment. It provides remote diagnostics, to pre-empt train stopping with swift and efficient replacement of faulty equipment
A number of European railways are benefiting from ATLAS and ERTMS/ETCS implementation.

**LUXEMBOURG Level 1 Interoperability**

Luxembourg’s mainline railway required an Automatic Train Control System (ATC) that would be fully compatible with another supplier’s trackside equipment. In the heart of Europe, this small country also needed to manage a high percentage of trains crossing borders. It has adopted the ATLAS 100 ERTMS/ETCS Level 1 solution for its rolling stock.

The entire network and fleet of “Chemins de Fer Luxembourgeois” will benefit from ATLAS 100 ATC and cab-signalling equipment. Its value-added technology sets the stage for fluid Level 2 upgrading, to meet future capacity and speed requirements, higher throughputs, and improved services.

**SWITZERLAND Mattstetten-Rothrist Line 200km/h Every Two Minutes**

The Swiss Federal Railways ordered ATLAS Systems Level 1 and Level 2 equipment for its Mattstetten-Rothrist portion of the high-density Bern-Zurich line: a strategic bottleneck for traffic between Bern, Basel, Zurich, and Lucerne.

Alstom equipped over 500 locomotives with ERTMS/ETCS Level 2 equipment. To date: 700 units are in operation, more rolling stock than the rest of the competition combined.

ATLAS equipment and applications deployed on this line will enable trains to operate at 200km/h every two minutes on 45kms of geared up line (an estimable improvement over the current speed of 160km/h) and reduce the journey from Bern to Zurich from 70 to 55 minutes.
ITALY Rome-Naples High Speed Line

As part of the Saturno Consortium, Alstom put into service the very first ERTMS/ETCS Level 2 controlled high-speed line - at 300km/h - with no other backup signalling system. The Rome-Naples line became the first section in the High-Speed/High-Capacity network of the Italian Railways. The new line extends over 204kms crossing 61 municipalities. It joins the existing network via three interconnections.

By connecting cities much faster from north to south, the new line is due to change the face of the nation, influencing travelling habits and lifestyles in Italy.

THE NETHERLANDS Betuwe Route Freight Line

This route links Rotterdam with its hinterland further into Europe. As part of the Rotterdam-Milan-Genoa freight corridor, it is the first dedicated freight line to be equipped with ERTMS, thereby making it possible for trains from other countries that have implemented the system to use the Betuwe route.

Developed by Alstom for ProRail/BB21 Dutch Rail Infrastructure Manager, the new system has been implemented on the Betuwe Route by a consortium consisting of Alstom and Movares. Other ERTMS-compliant Dutch lines include the Amsterdam-Utrecht line and the high-speed line.
Migration to the ERTMS/ETCS standards will take a number of years through the EU and will require an estimated 5 billion Euros to complete. At present, at least 50% of the funding is provided by the EU.

Support for Railway Infrastructure Owners

- ATLAS provides proven railway safety through resourceful in-service ETCS applications
- ATLAS delivers open interfaces. This interoperability between equipment from different suppliers is not limited to the ETCS-specified subsystem. It also concerns interoperability between a wide range of other subsystems and equipment essential to a complete railway traffic control system
- ATLAS makes available a genuine system migration path and a more efficient way to address the obsolescence of existing equipment. Signalling Solutions customers may purchase ATLAS equipment and subsystems and integrate them into their existing non-interoperable signalling system as an overlay, with the assurance that they are ERTMS-compatible in the context of future system upgrades

Benefits for Train Operators

- More than any other solution, ATLAS provide proven cross-border interoperability by equipping more trains with ADVANTIK ETCS technology, including the interoperability of the driver interface
- Within a multi-supplier strategy, ATLAS offers an effective solution for train fleet upgrade to ETCS, to run on interoperable corridor lines and on lines with national signalling standards
- ATLAS includes a proven Maintenance Subsystem (MSS) option that permits detection of real or potential breakdowns of both trainborne and trackside equipment; i.e., whenever trains are equipped with a corresponding onboard module and facilities that permit communication continuously via radio transmission or intermittently via download from trains in the depot
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