ORBIFLO
Intelligent Wayside Solution

The Climate is Right for Trains
Double fleet efficiency with half the infrastructure and resources

Turning data into value-adding information

Market liberalization, increasingly international and complex spans of operation coupled with the continuous drive to reach new levels of cost-effectiveness, impact all railway industry players. Every stakeholder has specific targets regarding operational improvements. For instance, whilst the operator focuses on realizing reduced operational costs and better vehicle reliability, availability and punctuality, those involved with vehicle maintenance want to minimize costs through preventive measures and extension of periodic overhauls up to condition based maintenance.

Although every customer has different needs, the data and information needed to take the appropriate operational decisions as well as how the information is retrieved, is fundamentally the same. Hence, there is an intrinsic advantage in developing a common and standard approach to collect the data from the vehicles, whilst the analysis and reporting of the acquired data is tailored to the exact needs of each customer.

The market drivers, together with rapid advances in technology, present our sector with unprecedented opportunities to:

- Modernize the management of its asset base (both rolling stock and infrastructure)
- Play a full part in integrated, intelligent transport systems operating beyond historical and geographical boundaries
- Help familiarize passengers travelling on new routes by providing them with up-to-date journey information

One look, many benefits

The intelligent and integrated solution

The value of having a solution which integrates the needs of several parties is reinforced by the common look-and-feel of the ORBIFLO product suite. It is a welcome change to the navigation challenges of multiple heterogeneous systems. Via its single, user-friendly and easy-to-use application interface, the ORBIFLO suite enables operators and maintenance staff alike to instantaneously view interpreted data. The ORBIFLO solution is Internet Protocol (IP) integrated. Thus, with the right credentials and IP network connection from any fleet can be made. By enabling the exchange of business information across a growing number of applications and features, the ORBIFLO train-to-wayside suite securely integrates real-time data so that operators can remotely and rapidly make better informed decisions. In short, the ORBIFLO suite adds intelligence to the data.

Reduced complexity

With the rich spectrum of capabilities packaged together, customers benefit from the simplicity of a single application interface with a harmonized look-and-feel across the portfolio; customers are also shielded from the complexity of the train-to-wayside communications technology.

ORBIFLO increases operational Efficiency

The ability to remotely exchange real-time information is a common need across the rail industry. The push from operators, passengers, and maintenance personnel to stay securely connected to the information highway is tremendous. The BOMBARDIER® ORBIFLO® product suite is an integrated wayside solution to this growing global trend.

As a major rolling stock manufacturer and service provider with an installed base of over 100,000 vehicles worldwide and a forerunner in wayside management solutions, Bombardier Transportation is well positioned to integrate the solution that optimizes the operational performance and long-term cost-of-ownership of rolling stock fleets. Integral to its major role in the market, Bombardier is experienced in designing information technology systems that support many aspects within rolling stock design, entry into service, operations, maintenance and increased on-board security plus passenger comfort. In selecting the best technical and functional ideas as well as field experiences, Bombardier has developed an advanced modular framework that manages rail transportation even better. The result is a product suite of integrated wayside applications that enhances train capability.
By sharing telecom channels and data hosting, the ORBIFLO solution also reduces their operational costs. Organisational costs can also be reduced when remote expert centres are shared among multiple projects.

**Modular, flexible and scalable**
ORBIFLO provides integrated access to a number of rolling stock wayside applications that work in tandem with various associated on-board systems. The portfolio approach allows operators to select as many, or as few, applications and functions as required at any point, plus the option of easily adjusting the mix as and when needed.

The ORBIFLO architecture enables disparate applications to coexist as modules within a neutral, loosely-coupled environment. This enables full integration both with existing Bombardier applications, as well as those in customers’ and third parties’ environments. The ORBIFLO suite may, for example, be used to provide third parties (e.g. brake or door suppliers) access to detailed system information so that faults can be analysed to improve reliability.

Bombardier’s Managed Service Offering provides customers with secure access and broadband public internet connections to the data directly from their office computer. Alternatively, an ORBIFLO data server can be located at the customer’s own location which users then access through their local internal network. The flexibility does not stop here; customers can choose how they combine modules for today’s needs, safe in the knowledge that they can adapt to future needs.

**Standardized, reliable and obsolescence-free**
Standardization underpins reliability which inspires confidence across our customer base. Through successive ORBIFLO releases, individual customers benefit from the pooled knowledge and experience of the entire global user base (as opposed to being isolated, single users of bespoke solutions developed from scratch). Through the standards-based approach of the ORBIFLO solution, and the scheduled release of upgrades, customers can significantly reduce their obsolescence risk. This means fewer disruptions to service in the future due to expensive replacement of legacy systems.

**Unlock your fleet’s full potential**
Using the ORBIFLO platform leverages the capabilities of the BOMBARDIER MITRAC™ Train Control and on-board Management System that supports remote bidirectional communication. By integrating the ORBIFLO product suite with new and existing vehicles, greater potential in improving operational effectiveness and passenger service delivery is unleashed. Among the first customers integrating parts of the ORBIFLO suite are leading operators in France, Germany, Switzerland, UK, Canada and the USA.

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Built around five modular standards-based applications, the ORBIFLO product suite answers customers’ needs for an integrated, reliable and simplified train-to-wayside management system.
<Trains can talk – If you let them>

ORBIFLO Communications is the enabler. It collects and securely transmits data in both directions between the on-board train systems and wayside applications. It can be adapted to meet business demands regardless of underlying technologies or suppliers proprietary solutions.

In an increasingly international rail market network, the operator’s communications architecture needs to be capable of transmitting data from the rolling stock to the central data servers regardless of the journey or control room centre location. An operator may require data to be stored on their own servers or they may use a third party for data hosting. Furthermore, exchanging high amounts of data between the train and the wayside needs not only to be cost-effective, but also secure, reliable and executed with the right priority.

The demand intensifies as the drive to remain connected increases. ORBIFLO Communications enables these needs to be met; it is the central enabling gateway for the other application areas (Operations, Passengers, Security and Maintenance).

Dispatching data intelligently

Reliable and cost-effective

Typically today an array of technologies (satellite, GPRS, Wi-Fi, WiMAX, 3G, EDGE, HSDPA, plus more in the future) provide train-to-wayside communications. Depending on the local deployment of communication networks and communication capacity requirements, one or more technologies may be required, for instance WiMAX inside the tunnels and Wi-Fi in the depots.

Using modern telecommunication network facilities, ORBIFLO Communications reacts to any given context. It intelligently uses the optimal medium, to ensure that data is transmitted with the appropriate priority. A typical example is the video streaming of suspicious behaviour (see ORBIFLO Security) to the operator’s control room. For customers, this scenario clearly takes precedence over the download of non-critical diagnostics data which could be done more cost effectively via Wi-Fi, at night when the train is in the depot.

Reconfiguring data priorities in line with a train’s changing circumstances is one of the flexibilities offered by the ORBIFLO Communications module.

One single and secure channel

ORBIFLO Communications consolidates the information from the various key on-board systems into just one communications pipe. This removes the need for multiple communication devices and connection fees. By providing an intelligent module on the wayside, access is given to the train systems irrespective of the train’s physical location. The train effectively becomes available all the time (wherever and whenever there is a suitable telecoms connection) for engineers and maintenance specialists to perform their tasks.

Of course, not all tasks are allowed while a train is in active service and for this the necessary security is integrated. As data is sensitive and confidential, every unit of a train is assigned a unique address. The system enforces robust security which limits access to specific services only to authorized users.

ORBIFLO Communications enables a variety of business models

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ORBIFLO Operations is a highly informative application that enables train operators to make fast, accurate decisions based on real-time train information and, in the process, reduce operational costs. For field service personnel, the application is especially helpful for fine-tuning performance by remotely setting system parameters.

Ensuring punctuality

Remote train preparation
Integral to the daily needs of the operator and its passengers is punctuality. Operators need to fulfil their timetable obligations both to maintain customer satisfaction and, in many cases, to avoid heavy financial penalties. Daily train preparation of a fleet for operation takes significant time and resources. Thanks to the integrated remote train control capability of ORBIFLO, the process can be streamlined.

ORBIFLO Operations enables the remote monitoring and controlling of selected train systems in real-time. This dramatically reduces the need for conventional manual access of individual train systems, saving time and increasing efficiency.

Designated trains can be pre-initialized remotely allowing the control centre to identify and correct any issues before the driver undertakes the safety-related inspection. This allows a more efficient use of the driver’s time in bringing the train in-service with the minimum risk of delay.

Assisting drivers
The Bombardier Driver Assistance System (DAS) provides drivers information to meet the timetable schedule with minimal energy consumption. The dynamic nature of operations and traffic management requires the DAS system to be kept updated with timetable and route information – for example speed restrictions due to track maintenance. Drivers can receive real-time assistance from the support engineers that are online analyzing the vehicle’s data whilst in service.

As the train is in constant two-way communication with the wayside via the ORBIFLO platform, the driver assistance system is provided with real-time information on the track ahead so the driver is kept advised of optimal information to achieve timetable and minimize energy consumption. This also supports congestion free traffic management by allowing trains to enter congestion-free in the correct order and time. This results in trains running more smoothly with less wear on brakes, wheel-sets, propulsion equipment and tracks.
Optimizing energy consumption

In severe climates keeping trains powered up to keep passenger compartments warm or cool can be costly. Remote monitoring and start-up of heating or cooling systems means operators no longer need to waste energy by keeping their trains powered up continuously overnight to ensure a punctual start. In parallel, ORBIFLO Operations can also have a positive impact on energy consumption as the non-safety related parameters such as air-conditioning set-point temperatures can be adjusted remotely for seasonal conditions. This is a big benefit in instances of unexpected extreme temperatures.

Intelligent real-time monitoring

The true value of monitoring only becomes apparent once the necessary corrective action is completed. Train units are often separated and joined up in different compositions during their life cycle which makes monitoring complex. The ORBIFLO solution offers a standardized map design transparently showing the location and health status of individual train, cars, or units together with the train configuration. The Operations application enables a given unit or system to be automatically flagged, and the system configurations to be drawn up. This also means that in the event of critical events, such as wheel slip, queries can be made remotely online and in real time.

Alternatively, the detailed system state of a train, such as its current fuel level, can be monitored. This allows temporary fixes to be made remotely (e.g. disabling of faulty air-conditioning) or scheduled at a terminus, without disrupting the train service.

All optimizations made by the remote train control or a field service engineer are automatically logged. This saves time and avoids logs being inadvertently missed which might be crucial in reacting to future circumstances.
Integrated with a common gateway

Passengers can enjoy constantly updated traffic information, personalized entertainment (for example music, radio) and uninterrupted internet access (even in tunnels). A major benefit for the operator is that ORBIFLO Passengers uses common backbone components, and a shared wayside communications gateway (see ORBIFLO Communications).

Highly modular services

Additional revenue streams

Customers may not always allow free access to all their internal IT services. Therefore, access to some services may be restricted and passengers may have to pay to use them. Different payment methods are possible. For example, services may be included in first class ticket sections only or payment may be obtained by voucher, credit card, or membership account.

By opting for the ORBIFLO Passengers module, which can be seamlessly integrated with offerings from third-party service providers through standardized open interfaces, operators may also benefit from additional revenue channels such as location-specific advertising, internet and email access.

ORBIFLO Passengers brings real-time journey information and streamed entertainment to travellers. It can also collect connecting timetables from any system (such as flight connection information) for announcement to the passengers.

With suitable train-to-wayside communications bandwidth, passengers can surf in comfort with direct on-board internet access. Hence, additional revenue streams are possible.

Being online and in comfort

Attracting passengers to choose rail rather than other transport modes means offering an even higher level of service than before. Passengers typically expect their journey to be fast and punctual, and are pleased to be able to work or relax as if they were in the office or at home. The growing demand for more services that increase the comfort level of the passengers means operators have a keen interest in offering comprehensive, tailored packages. Real-time communication of information in harmony with the individual needs of the passenger on a given route is a key driver in increasing customer satisfaction. The passenger entertainment and infotainment system of the ORBIFLO Passengers application integrated with ORBIFLO Communications meets those needs.

Travelling means Recreation Time – with the Support of ORBIFLO

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Real-time journey information

Helping passengers plan and adjust their journey
During a trip, passengers expect to be informed about the progress of the journey, and appreciate being updated on local weather and the breaking news headlines. As passenger infotainment system messages and route databases can be updated remotely with real-time information, passengers are always informed in cases of unexpected circumstances, such as additional station stops or the need for rerouting.

In addition to some pre-recorded messages, emergency and other important information can also be triggered and provided by the wayside application. Furthermore, through the text-to-speech functionality the driver is not distracted by the need to interpret and announce incoming messages from the control centre. This means that audio messages for passengers are delivered clearly and without interruption. Train route planners can integrate information from multiple public services (train, metro, bus, etc) in one package and thus assist travellers in planning and optimizing their complete journey.

Dynamic seat reservation

For long-distance trains which are heavily occupied, seat reservation services further improve passenger comfort. Instead of paper slips, which are difficult to modify efficiently, on-board electronic displays show passengers the status of individual seat reservations. Through ORBIFLO Communications, the status of a particular seat is shown in real time so that boarding passengers without reservations know for how long they may occupy a seat.
Integrated monitoring system

Vehicle, event and infrastructure
The standards-based security application module enables the wireless uploading of digital video plus audio from on-board surveillance cameras, CCTV cameras, providing real-time remote monitoring to a laptop or Personal Digital Assistant.

The video upload feature can be supplemented by automatic alerts for alarming features such as suspicious packages left unattended, determined by sophisticated algorithms in the software application. High-priority alerts can be sent immediately to on-board personnel or can be integrated with the Passenger Information System (ORBIFLO Passengers) for emergency event notification, if needed across an entire fleet. In parallel, the driver can view from the cab any camera on-board or on the wayside. The real-time (or stored) security information in high resolution video imagery can be instantaneously played back or viewed in real time.

Sensor systems
Whether it is CCTV, any of driver access control systems, emergency handles, or the video content analytic systems, all sensor systems are seamlessly connected to the train-based and wayside broadband communication network. Inherent to the ORBIFLO Security module is an Integrated Security Event Management System. It allows policies to be pre-defined enabling actions to be automatically taken based on an event.

Security System Recording
The continuous recording of integrated digital information can be programmed to automatically download stored security content on a periodic basis to centralized, or off-site data storage facilities, for archiving.
The efficiency of any rail system hinges on the reliability and availability of its trains. Effective maintenance can directly help in those strategic areas. Train operators are constantly working to improve performances and enhance the quality of their services. The vehicle maintainer is focused on minimizing maintenance costs through preventive maintenance and extensions of periodic overhauls up to condition based maintenance.

Condition monitoring and alerting

Anticipating what needs troubleshooting and when

Condition monitoring equipment collects quantities of data about events and the environment on board each vehicle. ORBIFLO Maintenance has been designed to provide a powerful yet easy-to-use, intuitive interface for engineers, maintenance specialists and operational management personnel. The application is a common toolset that brings together disparate data flows from many different rolling stock fleets – and many more different vehicle subsystems and measurement technologies – into a single collaborative platform where the data can be visualized and queried. Conclusions drawn by experts using these tools can then be encoded to provide continuous, automated analysis on subsequent data feeds.

The ORBIFLO Maintenance application, combined with skilled resources and specific performance improving processes known as BOMBARDIER® ORBITA®, supports the delivery of an improved service by keeping downtime to a minimum; it also acts as a support mechanism for analysis by engineers.

ORBIFLO Maintenance provides features to allow for alerts to be created and managed. An automatic alert can be created that is triggered when a specific event or pattern of events is received from a vehicle or unit. An alert can also be created that is activated if a threshold for a specific environment variable is met.

The benefits of using remote condition monitoring in this way include:

- Significantly reducing the number of incidents occurring in-service
- Faster resolution of in-service incidents / engineering investigations on the spot rather than in depots
- Reducing maintenance costs, because planned maintenance can be scheduled for optimal convenience

Analyzing patterns and trends gives operators the ability to reduce incidents and anticipate breakdowns. This results in a significant improvement in availability of rolling stock, and more capacity being offered to passengers, especially at peak periods.

Intelligence and transparency

ORBIFLO Maintenance provides the control centre with rolling stock health status and alerts for vehicles that require attention before a fault occurs. This allows maintenance to be scheduled by issuing work orders via the seamless interface with the maintenance management system. Or should a fault be imminent, alerting mobile maintenance crews of the problem together with the vehicles location and route to ensure quick interception.

Health and performance

ORBIFLO Maintenance also integrates data from various discrete third-party sources to create a consolidated view of the health and performance of a system. Condition data collected from trackside vehicle monitoring systems such as brake pad thickness or wheel condition can also utilize the condition monitoring and alerting capabilities providing the control centre with standard user interface. In particular, making use of pattern matching and trending analysis tools can support system performance improvement.
Bombardier Transportation has an active set of environmental print guidelines, for further details click onto:
www.transportation.bombardier.com

Learn more about our commitment to sustainable mobility on:
www.theclimateisrightfortrains.com

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