ViziRail Description
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ViziRail Train Scheduling Software

ViziRail is an integrated suite of software modules covering the rail operating business cycle from long term scheduling through to historical reporting on actual train performance. The ViziRail graphical user interface enables easy visualisation and maintenance of critical operational information, overlaying complex rail networks with train schedules, track possessions, speed restrictions and other relevant data.

Train schedules and train paths are easily maintained by simple point-and-click manipulation of time/distance graphs and track schematic diagrams. ViziRail Scheduling interfaces with Monitoring Systems to provide real-time train running data for delay attribution, incident recording and other train monitoring requirements.

ViziRail Administration functions provide the tools to support and maintain the day to day running of ViziRail including: maintenance of the Rail Network Geography, System Administration for Security and User Management and Reference Data

ViziRail Interfaces enable the import and export of industry standard XML documents for a number of key business transactions such as path requests; train timetables; train consist/manifest; and train service arrivals and departures.

ViziRail is an n-tier Client Server Service Orientated Architecture (SOA) .NET application using the feature rich DevXpress components with a Microsoft SQL Server database platform.
Timetabling and Trains

To enable the planning and scheduling of Trains, Train templates are created and scheduled over a defined Rail Network. ViziRail allows the Railway Network to be defined using a specialised Visual Geography Editor (see System Administration for more details).

A Timetable logically groups a set of Train templates that run on a scheduled basis such as the day of week, which are managed together for Scheduling, Graphing and Reporting. This allows the development and maintenance of Train templates that are relevant to the Planners that are responsible for them e.g. for a period of time, specific type of traffic, geographical region or control centres.

Ad hoc Train templates and schedules for special events such as public holidays and sporting events can also be included in a Timetable.

These Train templates are then generated to become Short Term Planning (STP) Trains for a given day of operation, using parameterised automatic generation processes. The STP Trains are generated for a parameterised window in advance to allow detailed planning to take place. The standard daily schedule may then be fine tuned to deal with track maintenance, ad hoc traffic, service cancellations, special events, re-pathing of services and other changes arising up to and during the Day of Operation.

These adjustments to the Timetabled Trains as part of the Short Term Planning horizon are tied together using Train Notices. A Train Notice collates all these changes from the standard Timetable and once published notifies all relevant personnel of these changes.

Once all Short Term Planning tasks have been completed the final Train plan can be printed on Train Control Diagrams (TCDs) to allow monitoring during the Day of Operation.
Both the Timetable Train templates and STP Trains use the same concepts and similar functionality to path Trains, graph Trains and manipulate Train schedules. These functions are now discussed in more detail.

Trains can be created based on a pre-defined path, termed a route, or can be pathed using a schematic view in the Visual Path Selector. The Operator for the Train, the Section Run Time Type which partly determine the trains schedule times, the departure or arrival time and the Weekdays that the Train template applies to, are specified.

The pre-defined Route can be modified using the Visual Path Selector if so desired or can be used to define the entire path of the Train. The Visual Path Selector is an interactive track selector using a point and click interface to select the required tracks for a Trains path. This allows tracks to be selected individually, to the next junction, or using pre-defined path tracksets to nominated locations, making pathing a train simple and intuitive.

Functions are also provided to:

- Change the Origin
• Change the Destination
• To divert the previously selected path between nominated Locations.

The Trains path is displayed on the right hand side of the Visual Path selector, this also provides the facility to zoom to a selected track on the Visual Path selector canvas.

For a Trains selected path, the Tracks are grouped into movements based on Locations of interest such as timing points and platforms visited. Times are automatically calculated for each movement and the resulting schedule is saved and able to be modified as required e.g. for dwells and section run time variances.
Each Train requires a Service Id. This is used to uniquely identify a Train for a given day. Other details such as the Train Number, Trains Operator, Gauge can be managed via the Train Details form.

Specialised functions to manage Dwells and Section Run Time Variances are provided e.g. to cater for passenger stops, crossing dwells and scheduling conflicts.
Comprehensive search facilities are provided to find specific Trains e.g. based on Geography, Control Board, Departure Locations/Times. The selected Trains can be worked on individually or together via the bulk process functions or Planning Graphs.

Trains within a Timetable can be managed via various functions to:

- Create a new Train
- Copy an existing Train
- Cancel or Delete a Train
- Re-path a Train
- Re-schedule a Train
- Replicate n Trains from a selected Train
- Link Trains together to form a Cycle.

This allows for complex Timetables to be constructed. These functions are available from traditional forms as well as an interactive Planning Graph.
Train Graphing

Planning Graphs are used by train planners to assist in the efficient planning of trains. The graph interface is a ‘line diagram’ representation of train movements for a Train for the course of its journey. The horizontal axis represents Time and the vertical axis represents one or more geographic locations at which the Train will visit.

A Planning Graph is essentially a different view of the Trains shown on the list forms. The same functions are available via a Planning Graph as per the list forms, however a graph displays each Trains journey over distance and time rather than in a tabular form.

Each Planning Graph is derived from a template that defines attributes such as the geography used by the graph, the ‘look and feel’, Trains Types that are to be presented and Operators that are to be presented. Each Operator and/or Train Type can have customised options for how Trains are displayed on the Planning Graph e.g. colour, style.

Track Maintenance (Possessions) and Speed Restrictions can be managed from the Planning Graph are also able to be displayed using customisable colours and styles.

A Planning Graph can contain multiple network branches to logically display the Trains journey for a specified time frame. Each Planning Graph can be printed to any suitable printer including large A0 size plotters.

The graph allows via a drag and drop interface, to manipulate a Trains schedule including dwells, section run times and departure times. The example below shows a dwell created by dragging the location for a movement using the mouse on the graph.
A Planning Graph can optionally display conflicts for Trains, which are calculated in real-time. There are several kinds of conflicts detected within ViziRail which can be turned on or off independently, including:

- Section (with or without Headway)
- Location Occupancy
- Loop Length
- Possessions.

Trains that are not displayed on the Planning Graph e.g. due to filtering, can also be included or excluded in the conflict detection parameters.
Each Location displayed on a Planning Graph can be expanded to show the platforms which show the detailed occupancy of platforms and any conflicts that exist.
Alternatively a tabular view of Location Occupancy can be invoked from the Planning Graph. This displays by arrival time the Trains that stop or pass through the nominated Location.

<table>
<thead>
<tr>
<th>Train No.</th>
<th>Location No.</th>
<th>Direction</th>
<th>Arrive Time</th>
<th>Depart Time</th>
<th>Origin</th>
<th>Destination</th>
<th>Train Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM01</td>
<td>M121</td>
<td>Up</td>
<td>05:09</td>
<td>05:09</td>
<td>CFW - Cleveland</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM02</td>
<td>M121</td>
<td>Up</td>
<td>06:20</td>
<td>06:20</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>CFW - Cleveland</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
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<td>M121</td>
<td>Down</td>
<td>05:38</td>
<td>05:38</td>
<td>CFW - Cleveland</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM22</td>
<td>M121</td>
<td>Up</td>
<td>06:53</td>
<td>06:53</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>CFW - Cleveland</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM15</td>
<td>M121</td>
<td>Up</td>
<td>06:08</td>
<td>06:08</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>CFW - Cleveland</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM13</td>
<td>M121</td>
<td>Down</td>
<td>06:09</td>
<td>06:09</td>
<td>CFW - Cleveland</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM10</td>
<td>M121</td>
<td>Up</td>
<td>06:19</td>
<td>06:19</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>TNS - Thrombosis</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM03</td>
<td>M121</td>
<td>Down</td>
<td>06:30</td>
<td>06:30</td>
<td>CFW - Cleveland</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM00</td>
<td>M121</td>
<td>Down</td>
<td>06:43</td>
<td>06:43</td>
<td>CFW - Cleveland</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM00</td>
<td>M121</td>
<td>Down</td>
<td>06:53</td>
<td>06:53</td>
<td>TNS - Thrombosis</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM01</td>
<td>M121</td>
<td>Down</td>
<td>06:53</td>
<td>06:53</td>
<td>TNS - Thrombosis</td>
<td>BHS - Bowen Hills</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM00</td>
<td>M121</td>
<td>Down</td>
<td>07:13</td>
<td>07:13</td>
<td>CFW - Cleveland</td>
<td>DRI - Doonmoran</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM02</td>
<td>M121</td>
<td>Down</td>
<td>07:17</td>
<td>07:17</td>
<td>LFT - Lota</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM21</td>
<td>M121</td>
<td>Down</td>
<td>07:39</td>
<td>07:39</td>
<td>LFT - Lota</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
<tr>
<td>IM01</td>
<td>M121</td>
<td>Down</td>
<td>07:42</td>
<td>07:42</td>
<td>CFW - Cleveland</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
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<td>Down</td>
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<td>07:56</td>
<td>CFW - Cleveland</td>
<td>ETR - Electric Train Depot Balloon</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
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<tr>
<td>IM05</td>
<td>M121</td>
<td>Down</td>
<td>07:57</td>
<td>07:57</td>
<td>PIG - Ferry Grove</td>
<td>CFW - Cleveland</td>
<td>0m</td>
<td>420 - Passenger Stop/Pass</td>
</tr>
</tbody>
</table>

A Train can be manipulated on an individual basis or along with other Train templates using the Bulk Process functionality. This allows the same change to be applied to many Trains at once.

Functions provided include:

- Re-pathing
- Adjusting departure times
- Change Train Numbers/Service Ids
- Replicating the Trains
- Changing Train Calendars
- Change Stopping Patterns and Run Times via Dwells/SRTVs
- Locking functions.

Each Train is processed as if the function was manually applied to that train with any warnings/errors displayed in the processing results for the Train.
Each Train is subject to ‘locking’. ViziRail is a multi-user application and it provides concurrency checking for changes made to all data items. The Train locking concept ensures that a User is aware that changes are being made to a Train before they attempt to modify it. It also protects the ‘in progress’ changes from being visible to other users until all of the required changes have been made. This allows a single user to have control over a Train they ‘unlock’ until they ‘lock’ the Train again from which time the modified Train is available to all users and processes.

If the changes made to a Train while ‘Unlocked’ are deemed incorrect, the Train can be reset back to the last ‘Locked’ version without interfering with other users or processes that refer to it.

Functionality is provided for administrators to override locks e.g. the user who has locked a Train is away on leave, to pass the lock to another nominated user.

Each time a Train is unlocked a new version of the Train is created. This keeps a history of the changes made to a Train over time, as well as who made the changes. These historical versions are available to view all the details for a Train when the version was created, as well as for reporting purposes e.g. to compare the original schedule versus the latest schedule.

Each Train template has a calendar for when it is scheduled to be generated to a Train for a specific day. Typically this is based on a 7 day calendar for each day of the week. Exceptions for specific days, such as public holidays, can also be scheduled to generate or not generate given Train Templates. This allows for future planning of special events as part of the Master Timetable. The example below shows the days this Train is scheduled to be generated (in black) as well as a day where it is scheduled not to be generated (in red).
Trains can be linked together to provide Cycles. This can be used to identify ‘runs’ where rollingstock leaves a yard, performs \(<\)n\> Train services and is later stabled at a yard.

Each Timetable can also be versioned to take into consideration scheduling changes and/or geography changes over time. Typically these changes are constructed using Planning Scenarios that are promoted for a specified date that the Timetable changes are to take effect. These changes also provide a history of the Train templates used over time.

The planning process for Trains also needs to take into account network availability, this includes planned maintenance and works or track conditions that require Trains to run at reduced speeds. These are catered for in ViziRail by Possessions and Speed Restrictions.

Train Notices are then used to collate all the variations from the standard Timetable to the Train in the detailed Short Term Plan. These Train Notices are published and issued to the relevant personnel.

Possessions

As part of the planning process, impacts on the rail network due to planned maintenance or emergency situations arising during Day of Operation are recorded as Track Possessions.

Possessions can affect the civil rail network or in electrified areas the overhead electrical network. Both kinds affect the Trains that can be scheduled over portions of the rail network for specific periods of time.
Possessions are defined against selected Geography. As with other ViziRail functions, the Visual Geography Selector enables the affected Geography to be clearly identified.

Each Possession has clearly defined dates/times for when the rail network is unavailable. These dates/times are displayed on Planning Graphs and TCDs to indicate to Planners to schedule Trains around the disruptions. The conflict detection model also takes Possessions into account and can display these conflicts on a Planning Graph.
There are many details that can be captured for a Possession including the type of work required, the resources needed to carry out the work, contingency plans, linking to related Speed Restrictions e.g. works alongside tracks may require network traffic to run at reduced speeds.

A process for requesting and approving Possessions is inbuilt to ViziRail, this allows groups of Users with specific security levels to agree and authorise how the rail network is affected by Possessions.

**Speed Restrictions**

In a similar manner to Possessions, Speed Restrictions can be created to allow a portion of the Rail Network to have different speeds defined for various types of Trains for a specified period of time. Speed Restrictions can occur for a variety of reasons including maintenance work being carried out on or alongside tracks or heat affecting the tracks.

A Speed Restriction is created with the anticipated dates that it will apply for. This includes the person/group that authorised the Speed Restriction to be raised.

When the Speed Restriction is in place it is termed 'Imposed'. Once a Speed Restriction has finished and is no longer in place it is termed 'Lifted'. Speed Restrictions can be cancelled or deleted prior to being imposed.
Related Speed Restrictions that impact the Rail Network over a period of time or various parts of the network at different times can be raised as a Major Project. A Major Project is a grouping of Speed Restrictions that can include Speed Restrictions that have been raised individually e.g. A Speed Restriction is raised and then a Major Project is created, the original Speed Restriction can be included in the Major Project.

Bulk Functions are provided to allow re-scheduling, imposing, and lifting of Speed Restrictions. These are accessible from the Speed Restrictions List and the Speed Restriction Major Project forms.

As with Possessions, Speed Restrictions are displayed on Planning Graphs and TCDs to indicate to Planners to take the Speed Restrictions into account. Functions exist within Train Scheduling functions to apply Speed Restrictions to Trains that travel over the affected Geography within the period/times that the Speed Restriction applies to. This results in adjustments to the Trains run times, based on the restricted speeds.

**Train Notices**

A Train Notice is used to notify personnel of changes to Train Schedules, track maintenance, ad hoc traffic, service cancellations, special events, re-pathing of services and other changes arising up to and during the day-of-operation.

Authorised users can create train notices based on the Short Term Plan for publication to specific users, or all system users.

Train Notices are created within specific Categories and Types and are issued within specific date ranges. Train Notice types include Maintenance Notices, Safety Notices and Possession Notices.
A Train Notice can be associated with one or more affected Train Services, this allows Train amendments to be incorporated into the body of the Train Notices via standard paragraphs.

Standard paragraphs are pre-defined commonly used snippets of text that can be easily added to a Train Notice. These standard paragraphs can also include tokens e.g. from associated Trains, to display information such as revised schedules on the Train Notice.
A comprehensive text editor is provided to allow full customisation of the body of the Train Notice, including Images and Standard Paragraphs.

Train Notices go through an approval process before being published. Once approved the Train Notice can be printed, emailed or faxed to relevant parties.
Train Control Diagrams

Once the Trains for a given day of Operation have been planned, taking into account all known activities on the network including schedule changes, Possessions and Speed Restrictions, the resulting Trains can be published and printed for day of operation monitoring.

Train Control Diagrams (TCD’s) are used by Train Controllers as a visual aid in managing day of operation activities. The TCD is a read-only time and distance ‘line diagram’ that represents the movements of trains over the course of their journey for a specific window of time.

The horizontal axis represents time, while the vertical axis represents one or more geographic locations at which the Train will travel through. Like Planning Graphs, TCD’s can be printed to any suitable printer including large A0 size plotters.

In a similar manner to Planning Graphs, a TCD is based on a template that defines the attributes of the diagram such as the geography and the ‘look and feel’ of the Diagram. There are many options to customise the look and feel, including background colours, headers, footers, margins, train styles, geography displayed. Graphics and Notes can be placed anywhere on the TCD template to allow highly customised diagrams to be created.
Planning Scenarios

Planning Scenarios allow ‘what if’ scenarios to be developed independently of the Timetables used for Train generation and management. They can use modified Geography via Geography Scenarios e.g. track upgrades, or can be based on existing Geography e.g. for schedule changes only.

The full suite of scheduling and graphing functions are available as for Timetables giving the Planner full control over the Trains in a scenario. Trains can be imported into a Planning Scenario from existing Timetables, other Planning Scenarios or based on Short Term Planning Trains.

Timetable Reports and Graphs can be printed for Planning Scenarios to allow approval by interested parties to take place prior to implementation of the Planning Scenario as a Timetable.

Once a suitable Planning Scenario has been developed it can be promoted to become a ‘real’ Timetable. This can be for a new Timetable or to create a new version of an existing Timetable.
ViziRail Train Monitoring Software

ViziRail provides tools to allow day of operation monitoring of train progress against timetable on the rail network.

Train Running

The ViziRail Train Running module is used by train controllers and other operational staff to collect and view information about trains running on the rail network. The daily train lists are automatically set up from the ViziRail Short Term Planning module. The Train Running Module is a pre-requisite for Train Consists.

The Train Running module provides an interface that enables the following:

- Record and/or show the actual running times for a selected train
- View or update the delay details for a selected train
- Cancel, reinstate or terminate a selected train
- Work with the train consist and load details
- Generate a range of on-time-running reports that summarise performance of trains against their schedules
- Print and/or publish the timetable for a selected train.
Train Consist

ViziRail provides tools to allow train consists to be created and managed.

The ViziRail Train Consist module includes a complete inventory of rolling-stock permitted to run on the railway and functionality to receive and view train consists (or vehicle lists).

The functionality provides the ability to search for rollingstock and view attaches and detaches on the current train. Train consists are automatically uploaded from operators systems via interfaces.

The ViziRail Train Consist module provides the following:

- Complete inventory of railway vehicles
- Maintenance and viewing of Summary Consists
- Record dangerous goods on vehicles
- Upload consists by electronic interface
- Print and report train consist
- Maintain history of vehicle movements.
Network Incidents

ViziRail provides tools to allow train and network incidents to be recorded and reported to management and regulatory authorities.

The ViziRail Train Incident module enables authorised users to report network incidents as they occur. Incidents are initially recorded including the services involved and all relevant details, and can later be updated, edited or deleted as appropriate.

The ViziRail Train Incidents module enables the following:

- Report network incidents as they occur
- Capture summary and detailed incident information
- Recall and edit information as it becomes known
- Distribute by email, SMS or as a printed report
- Retrieve incident report by unique report number
- Cross reference incidents with train delays.
System Administration

ViziRail provides tools to allow System Administrators to manage ViziRail including:

- Network Geography
- Security and User Management
- Reference Data
- Interfaces

These functions support the day to day running of ViziRail and allow customisation of its many parameters to suit each implementation.

Network Geography

The Visual Geography Editor allows for the construction and management of the Rail Network for use by the Timetabling and Scheduling functions.

Locations can be created to define control points along the network e.g. Platforms, Junctions, or Stopping Points

Tracks are drawn from Location to Location to represent the rail network. Tools are provided to be able to draw tracks using a variety of lines and curves. The rail network can be defined via a line diagram representation or a physical representation of the network. The defined Geography is used by the Visual Geography Selector and Visual Path Selector functions which are common to all modules within ViziRail e.g. selecting a path for a Train, choosing geography to include in a Track Possession or deciding what locations to include on a planning graph.
A track can be grouped into various hierarchical structures for ease of use e.g. tracksets, sections, line sections, paths, routes.

Each track is a member of a special type of trackset called a Section. Sections define the run times used to calculate Train schedules. For a Section, multiple Section Run Time Types can be defined, these identify the type of rail traffic that can traverse the rail network, along with the relevant run times. These times define the time it takes for the type of rail traffic to traverse the Section from/to a standing start or at speed. These times are then used to automatically calculate a Trains schedule for a given path along the rail network without requiring individual times per Train to be entered.

Paths and Routes can be used to provide pre-defined paths through the rail network. They allow Trains to be quickly created or re-pathed along known lengths of tracks using the various pathing functions available.

Each Location can be grouped into various hierarchical structures for ease of use in other functions e.g. time zones, network control centres, train control boards, reporting territories, and Yard complexes.

Time zones allow for different time offsets to be applied to Locations and in turn train schedules where a train traverses Time zone boundaries and/or daylights saving times come into operation. Trains can be scheduled to have their anchor time to be adjusted due to daylight savings time or to be anchored with the same time regardless of when daylight savings starts or ends e.g. a train X always departs at 9am or train Y departs at 9am outside of daylights saving and 10am during daylights saving (as the offset is taken into account).

ViziRail provides the ability to create Geography Scenarios that allow ‘what if’ scenarios to be modelled. This can include changes from major works such as track duplication, new sidings through to minor changes to Section Run Times. This allows the Geography to be validated and approved prior to being made available for general use throughout ViziRail.
A Geography Scenario can be utilised by Planning Scenarios to enable impact on the Long Term Planning Timetables to be assessed. Planning Graphs and Train Schedules can be amended using Geography and Planning Scenarios to model proposed changes before being promoted and made available for general use.

A Geography Scenario once approved can be validated and promoted to ‘Production’ as at a specified date, to make the Geography available for use by ‘live’ Timetables and Trains. This promotion can be performed in advance so that the Geography changes automatically become available as at the specified date. This ‘versioning’ of Geography also provides a history of the changes made to the rail network over time and allow historical Timetables and Planning Graphs to be displayed.
Security and User Management

Security can be set at a form and function level with read, update, insert and delete security levels. Security Groups are defined to give common security access to groups of Users. This enables simple management of security for large numbers of users.

A User can be assigned to many Security Groups giving flexible security access.

Data security can also be configured at an Operator level, restricting access for nominated Users, to Trains for specified Operator(s).

Every User can optionally save preferences for each form in ViziRail via a User Profile. This includes default values in search fields, the size and position of forms, the grid columns displayed and their size and order. Functions are also provided to manage these User Profiles at a System Administration level e.g. to reset User Profiles to the default.

Reference Data

ViziRail provides for customised Reference data to be entered and maintained. These values are used by the various functions within ViziRail to aid in data entry and provide consistency in the data recorded and allows the business to define the values that are relevant to their needs.

Reference data also provides for various options and business rules to be turned on or off and implemented without hard coding rules specific to an individual client.
Interfaces

ViziRail provides the ability to share information with external systems. ViziRail accepts and sends information in industry standard XML format.

These interfaces are managed via inbound and outbound message queues. Functionality is provided to view and manage these queues. Business errors that result from processing inbound messages can be actioned from the inbound message queue.

<table>
<thead>
<tr>
<th>Message Text</th>
<th>Response</th>
<th>Raw Message Text</th>
</tr>
</thead>
<tbody>
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<td>Consist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Train</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--- Serviceld : 855M</td>
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<tr>
<td>--- ServiceDate : 2009-06-02</td>
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<td>--- ConsistLocation : JCS</td>
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Standard interfaces include:

- Publishing of Timetables
- Publishing of Train Schedules
- Publishing Billing data
- Receiving Train Requests
- Receiving Consist Information.

Customised inbound and outbound interfaces can be constructed as required for interfacing with other business critical systems.