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FleetONE® - Product Description

Technical Note **Document No:** 51R-07-0027-TNT-799919-0

1. FleetONE SYSTEM OVERVIEW

1.1. OVERVIEW

The FleetONE system is an advanced data management system that integrates condition monitoring data from a range of wayside and on-board measurement devices. As a data integration platform, FleetONE is able to provide views of vehicles or components (e.g. a wheel, bearing or bogie/truck) that show all relevant measurements in one place.

Backed by a powerful data warehousing "back-end", FleetONE provides the ability to trend and graph any measurement parameter over time and to compose searches to retrieve condition information. Once composed, a search can be re-run at any time and emailed out as a scheduled report or alert.

As such, identifying defective components within FleetONE is as simple as clicking a button or receiving an email.

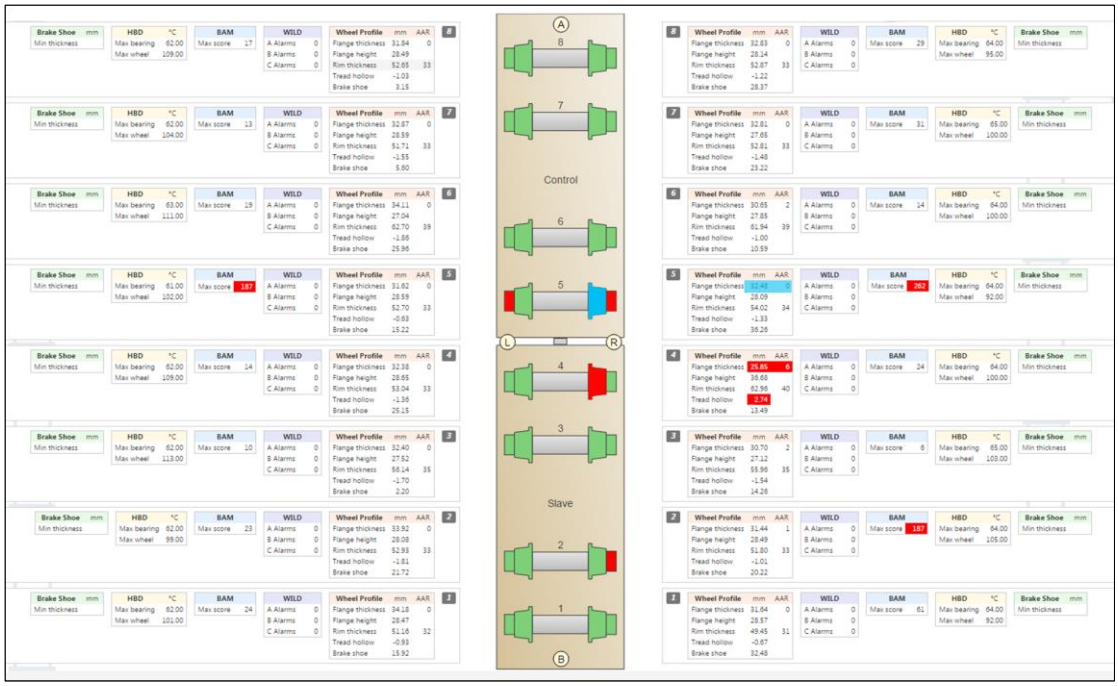

Figure 1: FleetONE unified data view of an 8 axle "coupled pair" wagon showing data from RailBAM, WCM, Wheel Profile, Hot Box Detector and Brake shoe imaging systems.

2. BENEFITS AND KEY FEATURES OF FleetONE

The benefits of using FleetONE as a data integration platform stem from its ability to integrate data from multiple sensor devices. These benefits are:

2.1. PRODUCTIVITY: UNIFIES WAYSIDE SENSOR DATA INTO A SINGLE POINT OF ACCESS

- Typically sensor devices will be supplied by a vendor with its own data access software.
- Instead of having to manage, support and be trained in using multiple systems, users of FleetONE have only one interface to work with to view all data.

Figure 2: Track IQ RailBAM

Figure 3: Track IQ WCM

2.2. FLEXIBILITY: FleetONE PROVIDES THE "SEARCH ENGINE"

- The search engine is an "ad-hoc" search builder that lets users create searches for any criteria (time range, measurement value, vehicle class, etc.) that is required.
- The search engine provides advanced capabilities that allow searches to trend data for a component (identified by vehicle AVI tag or train consist) over time, by providing "count", "average", "min" and "max" operators.
- Rules that are used to identify defective components may change over time. To manage this, the search engine allows users to save, load and edit searches within the system.
- Searches can then be approved by an administrator. This allows searches to be shared with all users of the system and to be scheduled to be run as reports that are sent via email.

2.3. AUTOMATION: MAINTENANCE SYSTEM INTEGRATION

- FleetONE integrates with maintenance systems (e.g. SAP, Maximo, Mincom, etc.).
- Work orders to replace defective components can be automatically output at the click of a button.
- Furthermore, completed work is input into FleetONE for display and serviced components are excluded from future search results.

2.4. DETAILS: TREND GRAPHS AND ANALYSIS

- For those users who perform deeper analysis of the measurement data within FleetONE, there are a number of tools available to examine the data in detail.
- All sensor systems provide trend graphs to visually examine data.

- The measurement history of any component can be viewed with a single click.
- All screens allow data to be easily exported to Excel.
- The vehicle mimic (see Overview) provides a holistic view of a single vehicle.

Figure 4: FleetONE trend graphs (clockwise): RailBAM, Hot Box temperature, Wheel Impact, Wheel Profile.

2.5. DATA PROTECTION: ROLE BASED RESTRICTIONS AND "RINGFENCING"

- FleetONE provides the ability to protect data by allowing administrators to configure which users have access to which data and features.
- User profiles can be configured to restrict accounts to view data by:
    - Site (restrict by system installation location).
    - Sensor Type (restrict by data type, e.g. HBD, RailBAM, etc.).
    - Organization (restrict by which organization owns/operates a vehicle).
    - This functionality is called "ring fencing". When enabled, it ensures that in situations where sensors measure vehicles that are owned and/or operated by different organizations, users are prevented from viewing data for competitor vehicles.
- User profiles can also be configured by an administrator to allocate "roles" that enable and disable access to screens and functionality within FleetONE.

2.6. DATA HEALTH: SENSOR STATUS

- At the time of data import into FleetONE, data is analysed for appropriate data quality.
- This information is summarized on the "data health" views within FleetONE. These views show the current status of sensor health as well as providing indicators if the sensors are "down" and not producing data.
- This information is also available as an automated email report.

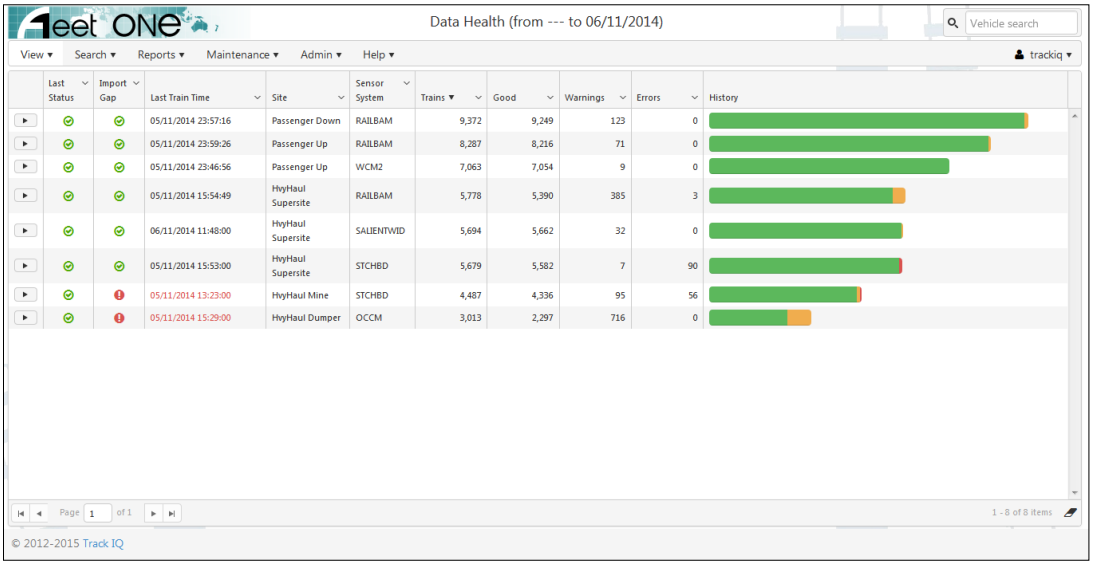

Figure 5: FleetONE data health

2.7. EXTENSIBILITY AND ADAPTABILITY

- Searches, screens and modules can be plugged in to the "core" system platform on a per-customer basis.
- FleetONE uses a service based and modular architecture. This separates the functionality of the system into logical components and allows optional "plug-ins" to be easily added.

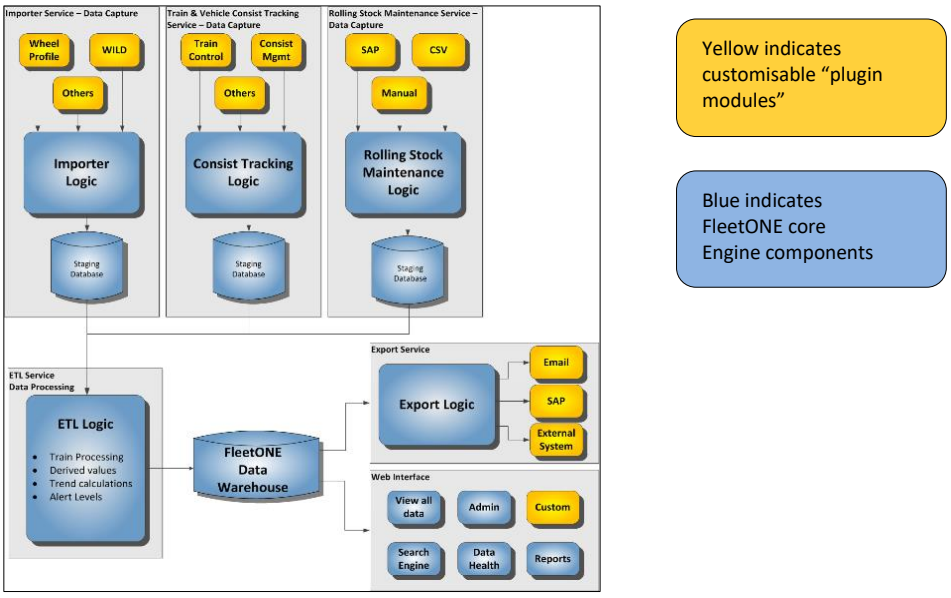

Figure 6: FleetONE system architecture – yellow represents optional "plug-ins".

3. SUPPORTED SYSTEMS

FleetONE currently provides support for the following systems:

System	Type
Track IQ RailBAM	Bearing Acoustic Monitor
Track IQ WCM2	Wheel Impact + Weigh in Motion
Track IQ BIM	Brake Inspection Monitor
Track IQ WPM	Wheel Condition Monitor
Track IQ BGM	Bogie Geometry Monitor
Track IQ Train Noise Monitor	Train Noise Monitor
Salient WID	Wheel Impact
Tbogi	Bogie/Truck Geometry
KLD Wheel Profile	Laser Wheel Profile
MRX OCCM Wheel Profile	Laser Wheel Profile
Beena Vision WheelView	Laser Wheel Profile
Beena Vision BrakeView	Brake Shoe Imaging
Beena Vision TreadView	Full wheel surface laser scan
STC Sentry & NG HBWD	Hot Bearing and Hot Wheel Detector
Progress Rail HBWD	Hot Bearing and Hot Wheel Detector
Voestalpine Atlas FO	Wheel Impact Detector
Voestalpine Phoenix HBWD	Hot Bearing and Hot Wheel Detector

Note: Support for new systems can be added as required.

4. SYSTEM DESCRIPTION

FleetONE is a web based application – it can be made available on the internet or on a company intranet. As such, the FleetONE application is installed on a server and accessed using your browser. FleetONE supports Internet Explorer 11, Edge, Firefox (latest) and Chrome (latest).

FleetONE is comprised of the following elements:

- MS-SQL Server Database
- Application Services
- Web Browser User Interface

These all need to be installed on the server.

4.1. DATA FLOW

The following diagram illustrates the flow of data from remote sensor systems to FleetONE. Typically this works as follows:

- Data is measured by the remote system.
- That data is pushed (typically via FTP) to a network share.
- The data is picked up by FleetONE importer and imported into FleetONE.

Alternatively FleetONE can source data from other locations, such as an existing SQL database.

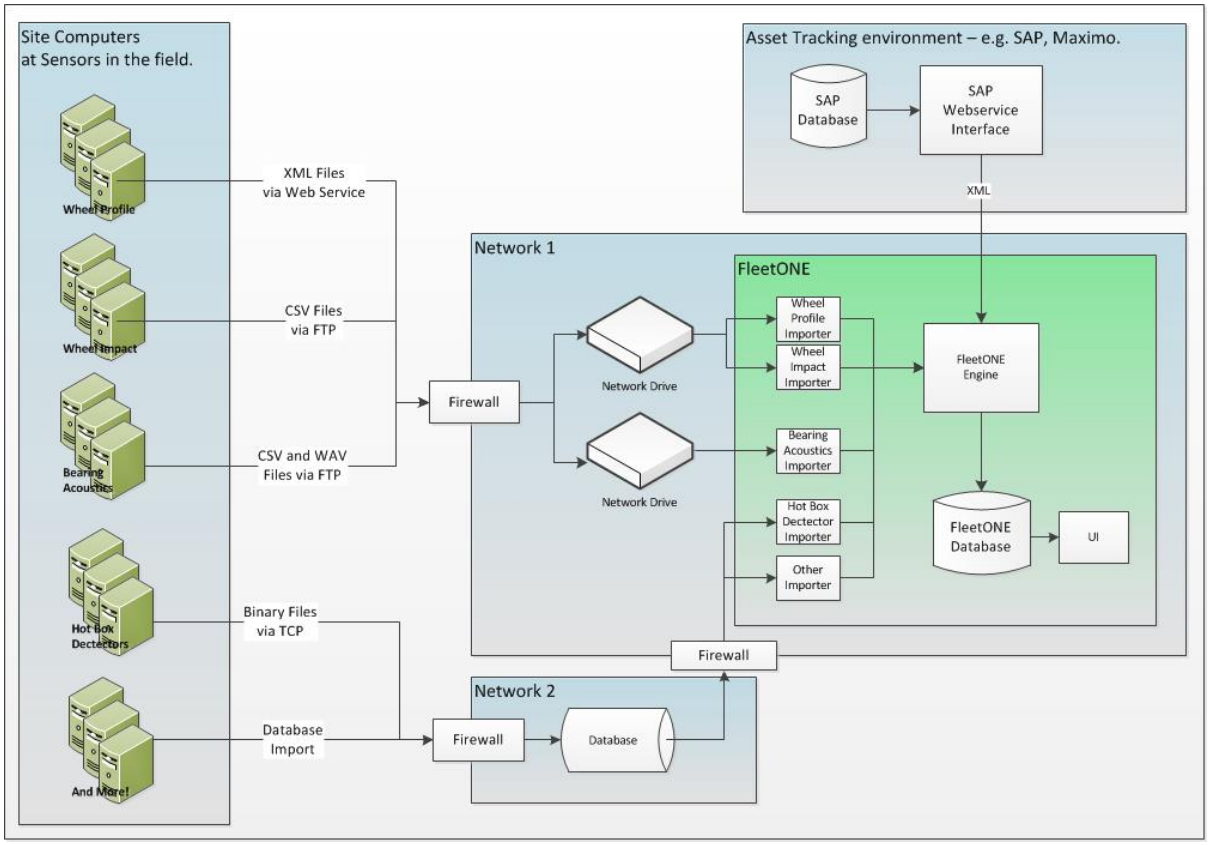

Figure 6: FleetONE data flow diagram.

4.2. HARDWARE SERVER REQUIREMENTS

FleetONE requires the following server infrastructure to be installed:

4.2.1. Application Server

Recommended:

- 32 GB of RAM
- Quad core processor
- Separate physical disk drives required for FleetONE:
  - App Drive (C:\) - for Windows and FleetONE install (Can be small, 40GB).
  - Scratch drive (D:\) - for raw data files and data file transfer (500GB).

4.2.2. Database Server

Recommended:

- 32 GB of RAM
- Quad core processor
- Separate physical disk drives required for FleetONE:
    - App Drive (C:) - for Windows Installation (Can be small, 40GB).
    - SQL Database drive (E:) - for SQL database storage (1TB)
    - SQL Log drive (F:) - for SQL log storage (1TB)

4.3. SOFTWARE SERVER REQUIREMENTS

4.3.1. Application Server

The following is required for the **Application server**:

- Windows Server (2016 or newer).
- Access to an SMTP server + account to send emails.
- Microsoft .Net Framework 4.7 or above on the Web Server tier(s).
- Microsoft Internet Information Services (IIS 7.5 or above – available as part of windows server).
- Microsoft Native Client

Permissions

- Administrator privileges are required on the Application server to perform the installation.

4.3.2. Database Server

The following software and configuration need to be set up correctly on the **Database Server**:

- Microsoft SQL server (2016 or newer).