

 **Trimble - Nexala**

Integrated Rail Asset Lifecycle Management

Real-time Remote Diagnostic
Monitoring



Engineering Maintenance
Management



In-Service
Performance Planning
& Management



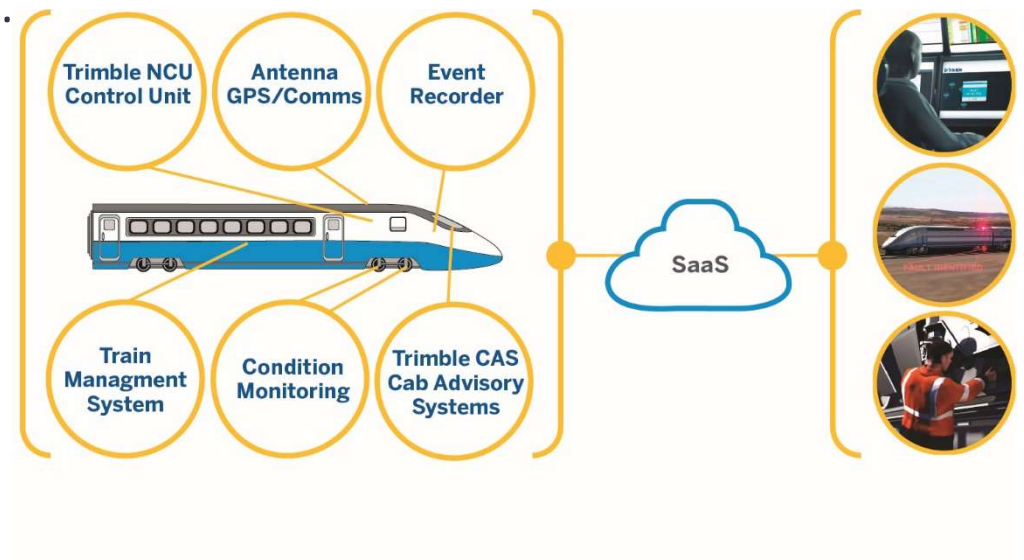
Component
Condition
Monitoring



Remote Diagnostics - R2M

UTILISES ON-TRAIN EQUIPMENT & SYSTEMS AND SHORE-BASED SOFTWARE TO DELIVER REAL-TIME REMOTE DIAGNOSTIC INFORMATION

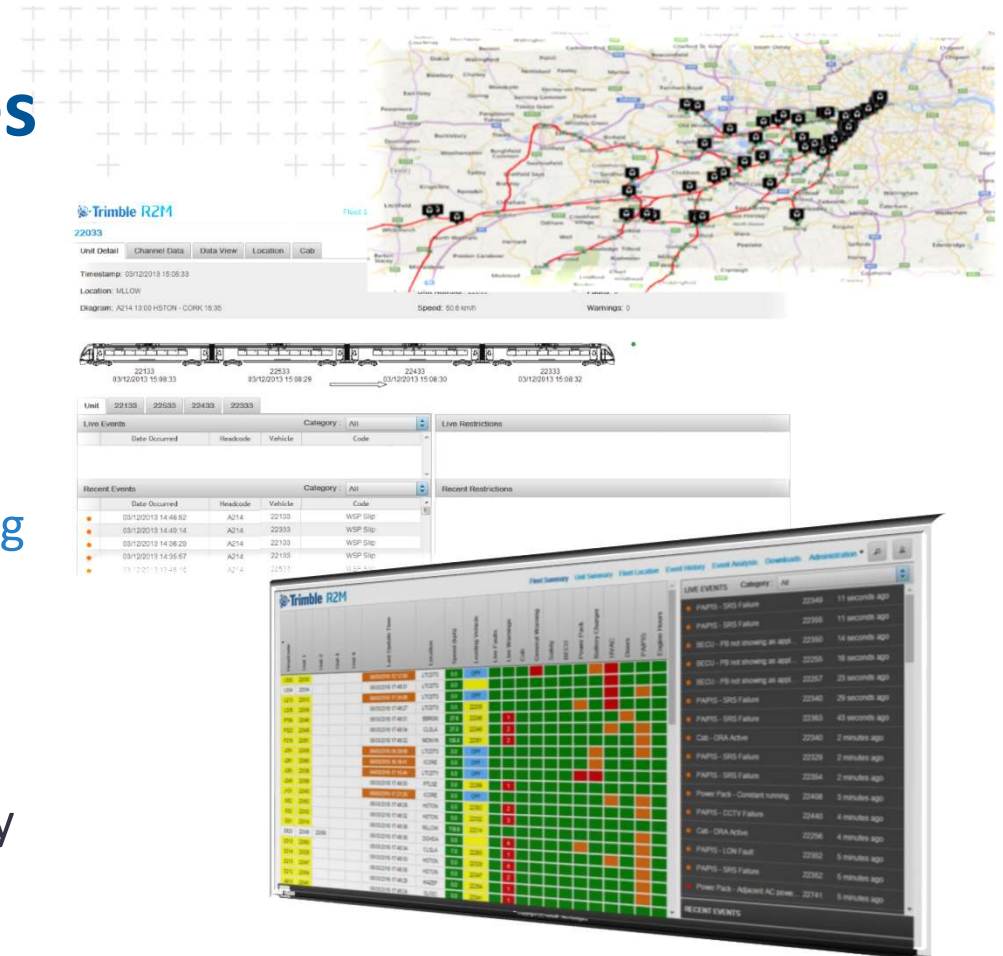
- Data (raw) from multi systems e.g. train management, event recorders and energy metering systems
- Provides status information of on-train systems and drivers controls
- Provides a view of overall fleet status (mixed fleets)





Trimble R2M: Features

- Interactive fault detection for control room/depot *(developed with operators)*
- Real-time cross and mixed fleet performance monitoring
- Vehicle and fleet location tracking and timetable adherence
- Data analytics
- View cab equipment in real-time
- Rules Engine fully configurable by customer



Trimble R2M: Benefits

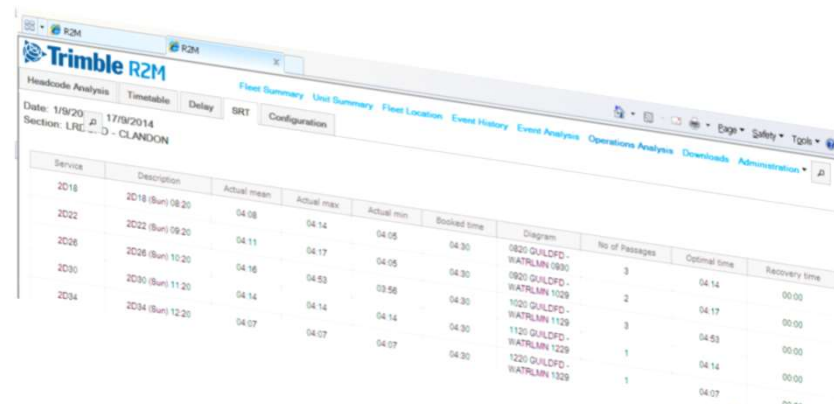
- Increases MTBF reducing maintenance costs
- Refines maintenance diagnosis and reduces “NFF” outcomes lowering maintenance costs
- Immediately identifies faults and prevents potential faults improving fleet safety
- Fleet specific or mixed fleet rules, seasonal, local, national rules or “rules on rules”.
- Fleet location tracking through mapping software
- Improved fleet reliability and availability



Service Planning & Performance Management – P2M

USES TIMETABLE, ACTUAL VEHICLE LOCATION AND REAL-TIME DIAGNOSTIC INFORMATION TO HELP IDENTIFY THE ROOT CAUSE OF DELAYS

- Data collected can be used:
 - To determine train performance issues & to understand causes of delays
 - To enable future improvements in service planning
- Provides operations team with in-service recommendations when fleet failures occur to reduce delays and penalties

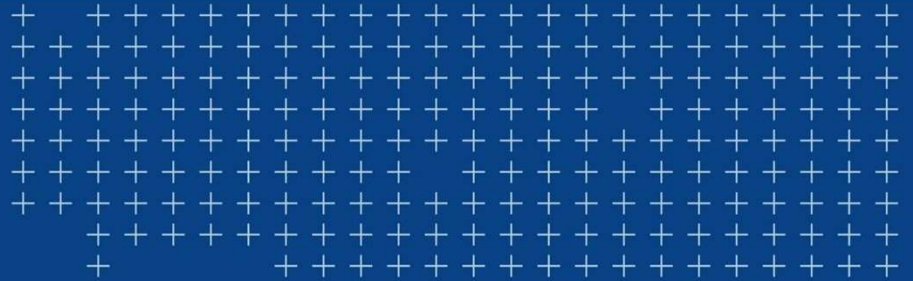




Trimble P2M: Features

- Real-time timetable fleet performance monitoring
- Route delay attribution analysis
- Real-time route delay information and the root causes
- Derivation of 'optimal run' for energy efficiencies
- Operational analysis by route, location, fleet, etc.
- Dwell time analysis





Overview of Trimble Projects and Benefits

High Quality Customer Base



greateranglia

southeastern



SIEMENS Go-Ahead



SOUTH WEST TRAINS



VR GROUP



ALSTOM

londonmidland



HITACHI
Inspire the Next



Metroline



TRANSFORMING THE WAY THE WORLD WORKS





Overview of some Key Projects

- Overview [SWT](#)
- Overview [Irish Rail](#)
- Overview [Abellio Greater Anglia](#)
- Overview [SJ](#)
- Overview [VR](#)
- Overview [Aurizon](#)

Overview of Project – South West Trains

- Long term collaboration: 2011 – 2017
- R2M, P2M, C2M, E2M and Beena Vision - WheelView
- Fleets Types: Class 450, 444, 158, 159, 455, 456 and 458
- Interfaces to [Event Recorders](#) and [TMS data](#)
- [R2M/P2M](#) heavily used in [Control Room](#) to manage fleets and operations and avoid delays
- Hundreds of R2M, P2M users daily





Overview of Project – Irish Rail

- Collaboration 2011 – 2017
- R2M – 1000 signals/vehicle/2-3 seconds
- Fleets Types: Hyundai Rotem, CAF and Locomotive 201 from
- R2M heavily used in depots
- Interfaces to Event Recorders and TMS via Trimble NCU and Wifi Systems





Irish Rail - Results



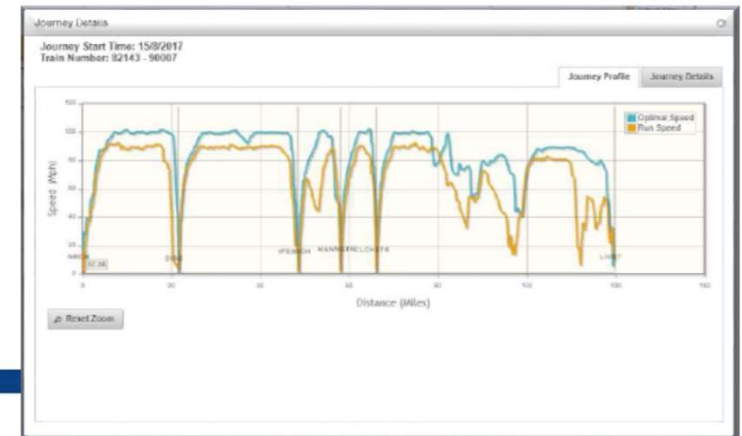
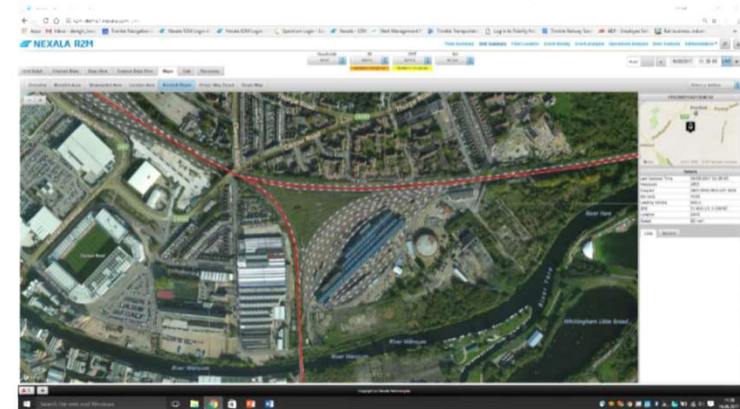
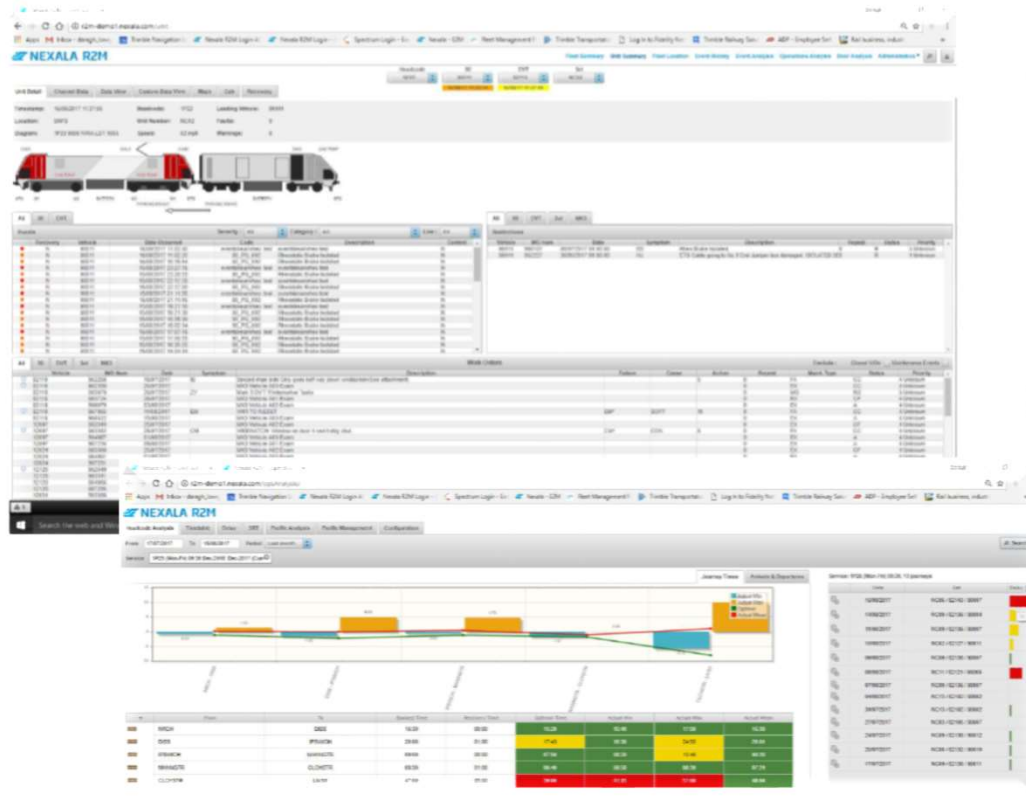
- Balanced maintenance 2 weekly exam now 5 weekly Km
- Engine hours tracked and balanced €€
- System supports distance based maintenance regime
- Service affecting failures down 50%+
- Huge increase in engine reliability
- Issues addressed without disruption
- Added benefits

Overview of Project – Abellio Greater Anglia

- Collaboration 2008 – 2017
- R2M, P2M, CAS
- Fleets Types: Class 15x, 31, 319 and Class 90s
- R2M heavily used in Control Room
- Interfaces to Event Recorders and sensors via Trimble NCUs
- Interface to Infor ERP System
- New Stadler and Bombardier fleets from 2019



Overview of Project – Abellio Greater Anglia



Customer Value | Greater Anglia

“Using Trimble’s R2M diagnostic system we are now able to bring real-time fault information into the control room and provide an intelligent decision and planning support system with GPS data to ensure effective and rapid fault recovery.”

Head of Fleet Engineering
Greater Anglia

greateranglia

Areas Addressed	Benefit
Distance between train failures causing delays	Improved by 60%
Delay minutes	Reduced by 40%
Maintenance investigation time	Reduced by 65%
Return on investment	< 9 months

Overview of Project – SJ Sweden/VR Finland

- SJ: Fleets Types: X2U (Stadler upgrade), X40s (Alstom) and X55 (Bombardier); VR: SR2 locomotives
- SJ: R2M and C2M – One condition monitoring platform taking real time data from the train and data from the infrastructure (*Trafikverket standard interface (i.e. wheel impact, data and hot axle box detection)*). NCUs being installed and interfaced to TMS on X40s
- VR: R2M - TMS data via MVB and NCUs for passenger vehicles via EKE TMS.





Key Areas Locomotives

(Collaboration with Aurizon)



- Focus both on in **service operations** and **maintenance optimisation**
- Blends locomotive, track side (BV) and **operational** (timetable, fuel, temp etc) data to bring full comprehensive picture of **operating environment in real-time** – and applying rules on all this related contextual data
- Works **cross fleet** (EMD, Siemens, GE, Bombardier etc) – both event recorder and control systems data
- **Links to Maintenance systems** (SAP, Maximo, Infor, E2M) for automation of work orders etc.
- Takes **driver swipe Id's** for identification for **performance / fuel savings**
- **Event Recorders** linked to (Hasler, Wabtec Q-tron, Faiveley and Arrowvale)