Digitalisation in the operational maintenance of rail vehicles - Communication between RU and ECM

The introduction of modern IT processes in workshops for the maintenance of rail vehicles has led to a large amount of data being recorded. This, in turn, has increased administrative costs and paper consumption. Instead of working completely paperless, questions arose about the storage and archiving of paper documents.

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1. Inroduction

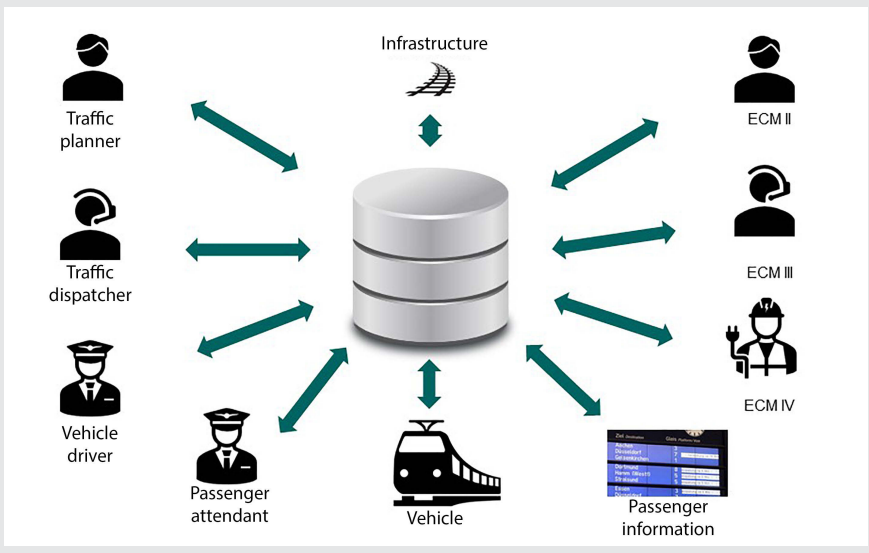
NETINERA Germany GmbH, a subsidiary of Italian State Railways, has been active in passenger rail transport and local public transport throughout Germany for twelve years. The company operates 429 trains and twelve workshops for rail vehicles. For this reason, NETINERA is driving forward the further development of IT processes in two main areas:

1. the digitisation of communication between railway operations and maintenance
2. the immediate digital documentation of maintenance work in the workshops.

ZEDAS' asset management software has played a crucial role in this for around ten years.

2. Digitisation of communication between railway operations and vehicle maintenance

From an operational perspective, the ideal scenario is consistent, seamless, digital data management. All operational business transactions are represented as data records that are made available through a single database. All stakeholders have access and can enter data. In addition, data is automatically collected via sensors, e.g. in vehicles and infrastructure.

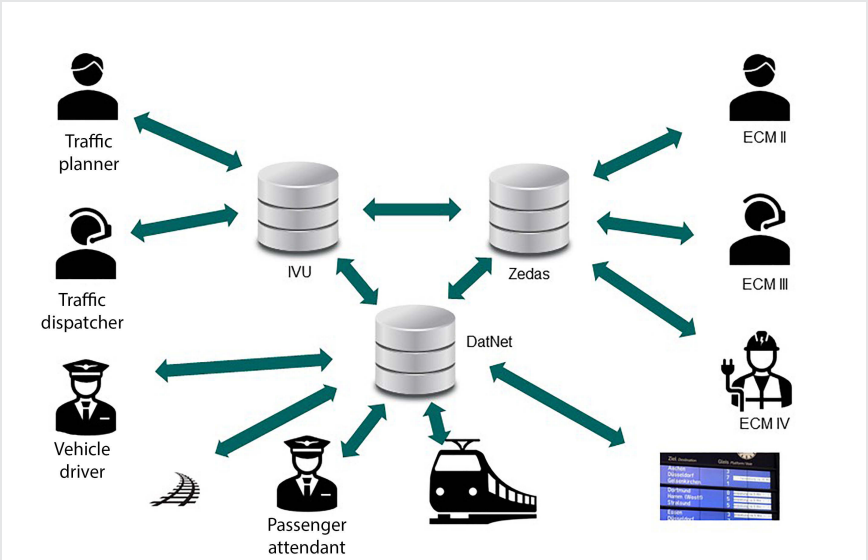


1: Idealpicture: consistent, seamless and digital data storage

In practice, however, railway undertakings (RUs) often use different specialised IT systems for:

- Maintenance management
- Operational planning and scheduling
- Internal communication (ITCS) and passenger information

Communication between energy suppliers and vehicle maintenance departments (the department responsible for maintenance, known as ECM IV) requires high-quality data to be exchanged bilaterally and in real time. This applies not only to assessing the operational readiness of vehicles for safe operation, but also to the information provided for planning efficient operations.



2: Real image: Several systems connected via real-time interfaces

NETINERA's main objective is to digitise communication between railway undertakings and ECMs and replace conventional methods such as fax, PDF document delivery and telephone calls.

The systems used to digitise these communication processes must meet certain requirements in order to continuously and automatically assess the operational readiness of vehicles. These include:

- Complete, up-to-date documentation and evaluation of existing deviations between the actual condition of the vehicle and its target condition (vehicle malfunctions)
- Complete, up-to-date documentation of maintenance activities performed
- Recording of relevant operational loads
- Calculation of the due dates for all maintenance intervals relevant to operational safety in accordance with the valid maintenance plan
- Introduction of a status system sufficient for assessing vehicle operational readiness

As vehicle status is relevant to safety, the associated data must be documented in zedas®asset in an audit-proof format. This audit-proof documentation is recognised by auditors. To coordinate the smooth operation and maintenance of vehicles Relevant data must be exchanged between both parties. This is important both when planning vehicle deployment and for maintenance planning. We must bear in mind that both maintenance and vehicle operation are subject to unforeseen disruptions that require rapid changes to be made.

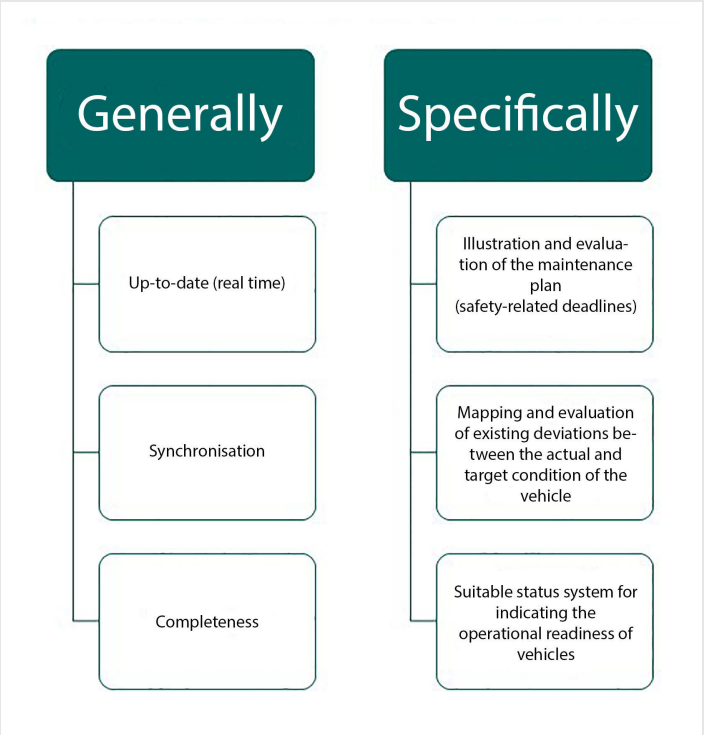
One of the challenges of digitalisation is making the necessary information available in real time. It is also crucial that the data in different systems is consistent and complete. Communication between railway undertakings (RUs) and the entity in charge of maintenance (ECM) particularly concerns fleet management (ECM III), dispatching and train drivers.

One key to success is the provision of user-friendly interfaces that are specifically tailored to the needs of the individual roles. This requires the exchange of relevant data between the systems via various interfaces.

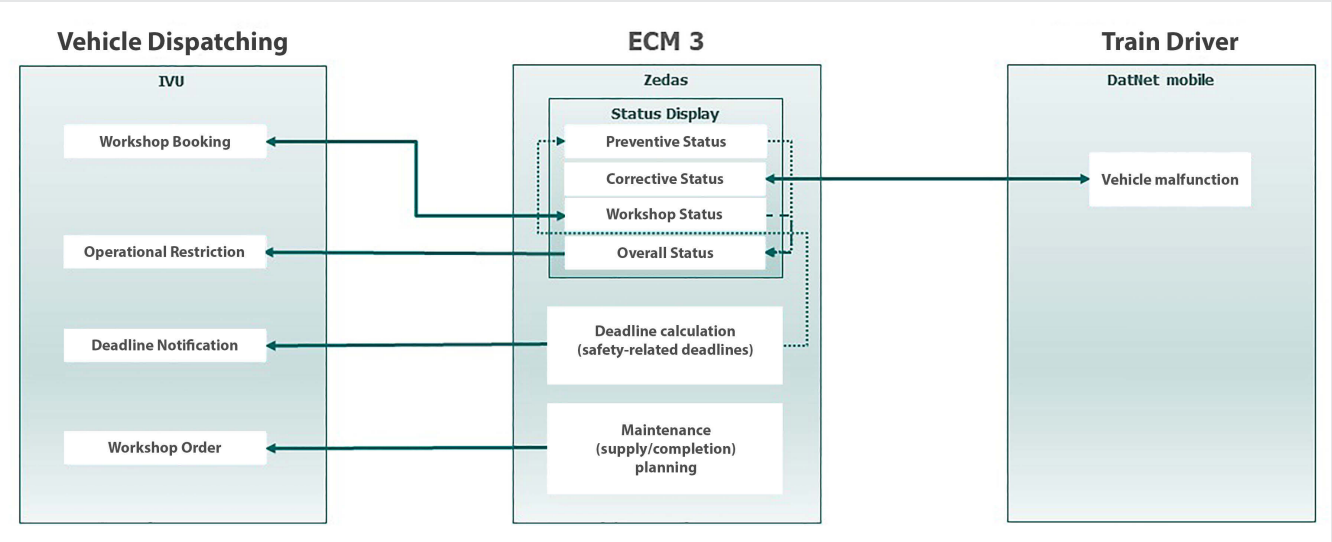
3. Everything at a glance – status display

zedas®asset offers a status system that enables the automated evaluation of operational vehicle availability in real time. The availability of the vehicle – referred to here as the overall status – is determined from these individual statuses:

- **Preventive status,** based on deadline calculation
- **Corrective status**, indicates the presence and assessment of safety-related faults on the vehicle
- **Workshop status** assigns dispositive authority over the vehicle to the ECM or the railway undertaking. This status can be used to map a possible transfer of risk if necessary.



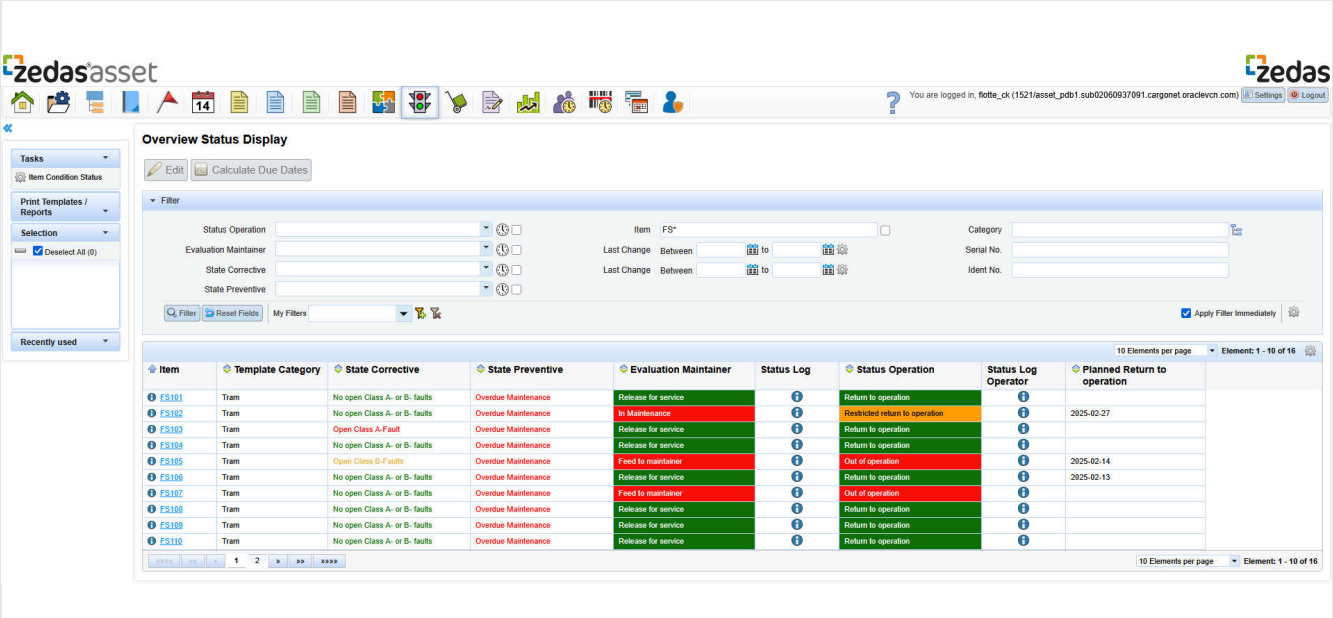
3: Requirements for systems for digitising communication processes between ECM and RU



4: Implementation with zedas®asset

The various statuses of the vehicles are shown in a clear status display, which can be configured and sorted by the user according to their needs. If required, additional information can be displayed via tool tips or linked to other modules of zedas®asset.

zedas®asset also transfers the status of the vehicles to the dispatching system via interfaces in order to provide the vehicle dispatcher with all maintenance-related information for his dispatching. This means that the dispatcher has all the necessary information at a glance without having to access additional systems. For example, the dispatcher is shown the due date of performance-related vehicle deadlines depending on their schedule, as well as the planned completion date of maintenance work. The status display is generally used to recommission a vehicle. It clearly shows the workshop employee all the necessary information. Once all the necessary repairs have been carried out, the authorised employee can declare the vehicle ready for recommissioning and hand it over to the operating department.



5: Status Display

To do this, the preventive status must be 'green' and the corrective status must be at least 'yellow'. In this case, the vehicle can be put back into service with a usage restriction. The vehicle is put back into service by changing the workshop status.
The vehicle is always handed over in push mode by the workshop status. The operator actively transfers the vehicle to the workshop, which means that the vehicle is no longer operational for the railway undertaking. The workshop actively returns the vehicle to the operator as part of the recommissioning process, so that the vehicle can be scheduled again.
This fully digitalised transfer process is also used for maintenance work outside the workshop, such as mobile maintenance. This means that no special replacement processes are required for mobile maintenance.

4. Recording of faults – corrective status

A vehicle fault refers to any deviation of the actual condition of a vehicle from its target condition.

Vehicle operators can record and report faults on smartphones or tablets. This enables This enables transparent documentation of fault histories.

The recording of faults is supported by individual fault tree systems for each vehicle type to facilitate recording. Mandatory fields, such as the 'installation location', refine the fault recording and reduce the time required to rectify faults.

When recording a fault, the vehicle operator also makes an initial operational assessment by rating the severity of the fault using the standard categories A, B, C or D. If a category A or B fault is recorded, the vehicle automatically changes the corrective status in the systems.

5. Integration of an external ECM

ECMs from outside the group can also be connected to the railway company's operational systems via interfaces. The aim is to provide employees with a uniform user interface and programme access. zedas®asset acts as a relay server, enabling the successful implementation of such interfaces, including the necessary data conversions.

6. Conclusion

The introduction of a fully digitalised interface between ECM and EVU, which meets all the requirements of DUVO (EU) 2019/779, has significantly simplified communication processes and made them more reliable. At the same time, the quality and performance of vehicle dispatching has been improved. Plans, certificates, references and similar documents sent by email or in paper form have become completely superfluous.●

Summary

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The introduction of a fully digitalised interface between ECM and EVU, which meets all the requirements of DUVO (EU) 2019/779, has significantly simplified communication processes and made them more reliable. At the same time, the quality and performance of vehicle dispatching has been improved. Plans, certificates, reports and similar documents sent by email or in paper form have become redundant.