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# Controlguide Rail Resource Management

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# Controlguide Rail Resource Management

The planning and dispatching system for the efficient operation of shunting environments

Rail freight transport is an alternative to road transport whenever goods must reach their destination faster, more reliably and more cost-effectively. For railways, this means that transportation must be accelerated and transshipment times must be reduced.

The optimum interaction between the different parties involved in rail freight transport is an important prerequisite for making railways more attractive for our customers. Digitization offers great opportunities to increase the productivity and quality of rail freight transport significantly.

In particular, the successful management of internal and intercompany

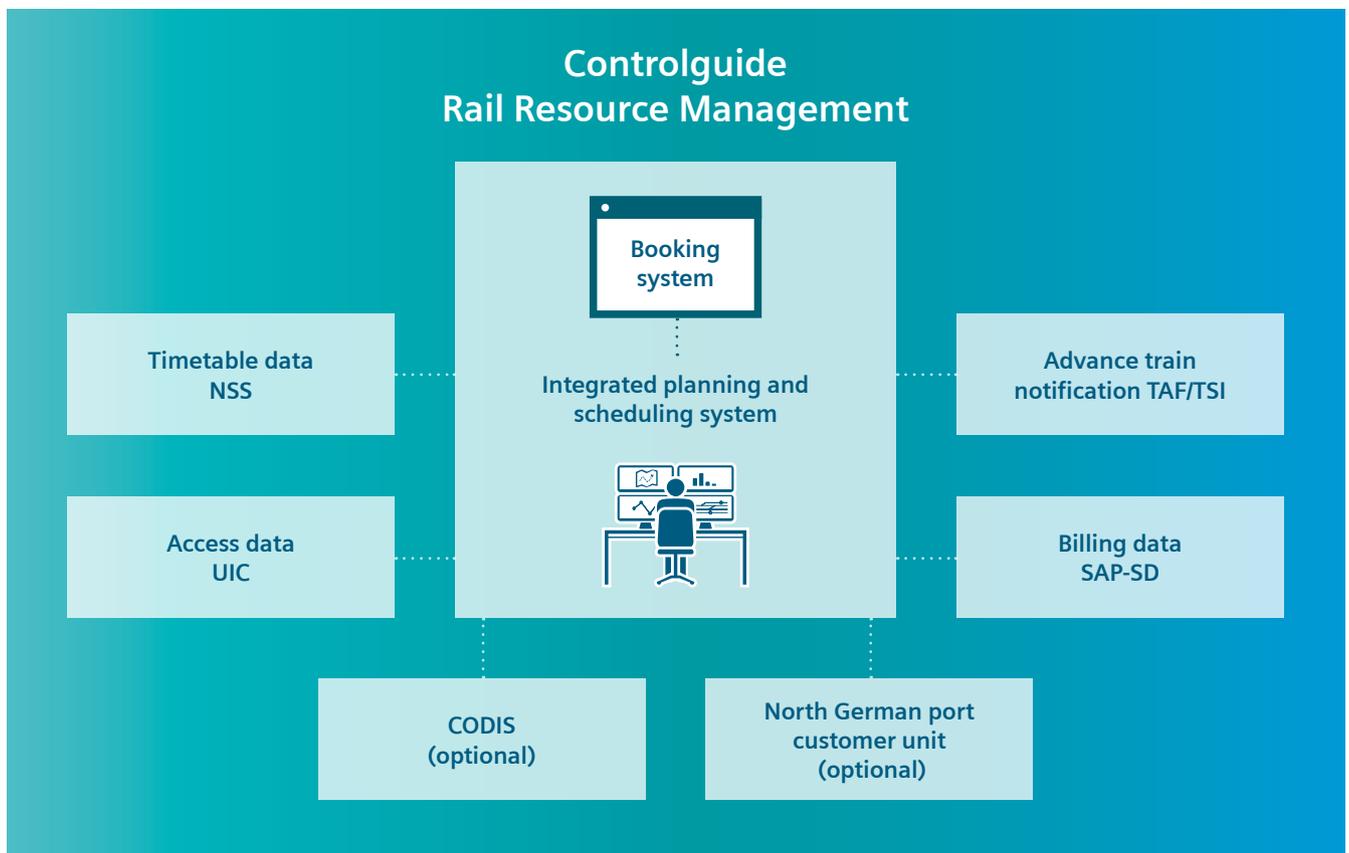
value processes, value chains and entire value networks is based on the strategic deployment of existing and refined methods and concepts of production and logistics management as well as operations research. The use of innovative information and communication technologies as well as interfaces to other systems in the context of shunting environments is essential in this process.

The Controlguide Rail Resource Management planning and dispatching system from Siemens' Mobility Division enables small to large service facilities to optimize their operations by the early detection of conflict situations and the flexible handling of timetable changes.

In this manner, Controlguide Rail Resource Management provides a solution for achieving the relevant objectives in state-of-the-art rail freight transport – quality and performance with high-level efficiency.

As a core component of the overall system for the automation of service facilities, the planning and dispatching system communicates with external systems such as train announcement or train running information systems as well as with the billing system.

The planning and dispatching system is designed for different shunting environments.

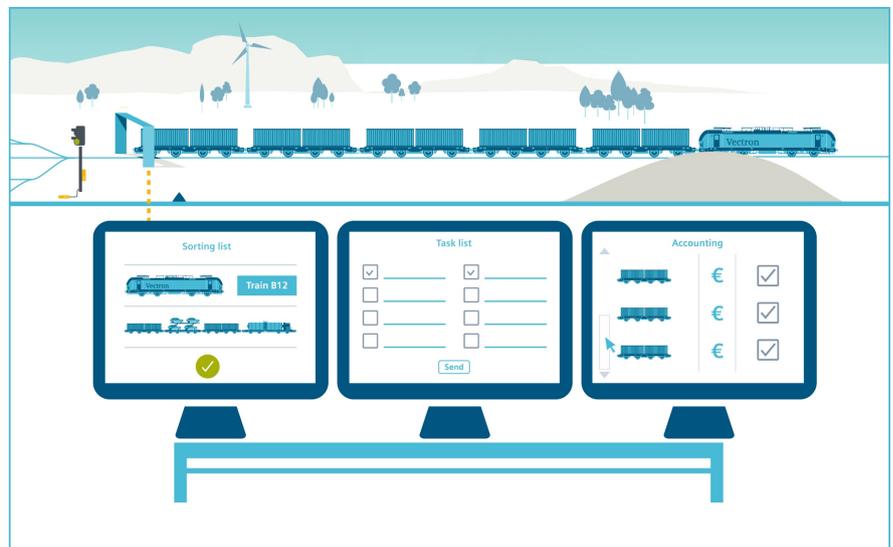


### Customer benefits

- Provides the contractual basis between the parties involved
- Enables a more efficient workflow and planning process with consistent operational transparency due to the easy-to-use planning functions
- Through the optimum utilization of all available resources, contributes to optimized and efficient shunting operations
- Visualizes any emerging conflicts at an early stage, thus avoiding follow-up costs incurred by wrong decisions
- Communication interface to the network-wide announcement system and to the network-wide train running information system (optional)
- Supports the reduction of processing and transit times
- Reduces manual and administrative work
- Ensures transparent billing
- Has an interface to the automatic composition checking system in order to align real data with train announcement data, thus avoiding errors and minimizing process costs
- Non-discriminatory access according to requirements by the EU to services and information, thus ensuring consistent, time-saving process execution



Context: Formation yard



Context: Marshaling yard



Context: Port

# Perfect solution

## The system components at a glance

In standard practice, the modular software product is based on the following components and can be easily adapted to meet national requirements. Train formation yards, marshaling yards and terminals are mapped as typical applications.

Sales	Planning	Dispatching		Production		Accounting	Evaluation
Functional blocks							
Order management	Operational planning	Service dispatching	Inbound train dispatching	Inbound train handling	Execution of services	Preparation of accounting	Recording
Offering	Service planning	Shunting movement dispatching	Outbound train dispatching	Outbound train handling	Shunting	Accounting management	Usage
Pre-auditing of accounts	Yard infrastructure	Locomotive dispatching	Transshipment handling	Implementation of transshipment		Invoice management	Statistics
	Infrastructure capabilities	Car dispatching	Marshalling Handling	Execute Marshalling			Reports
Components platform							
Process management	Resource optimization	Conflict detection	Forecasting	System monitoring	System configuration	Multitenant capability	User management
Interfaces							
	Timetable data of DB Netz (NSS)	Train running data of DB Netz (UIC)		Train data TAF/TSI		Accounting data SAP-SD	

Fig. Function blocks, components and interfaces

# Sales – visualization and organization of sales processes for partners

The system supports a number of functions for the efficient management of sales processes.

By defining service packages that are offered to customers and can be ordered by them, the processes in the train formation yard can be visualized and handled in a standardized manner. The conditions of use of the shunting environments can be defined and serve as the contractual basis for the range of services offered. The conditions of use and the range of services are published via a web portal.

The range of services can be requested by the customers of the train formation yard or the port railway. This applies to regular usage of the services offered for the train formation yard or port railway as well as to one-time or short-term services.

In the order management system, inquiries are processed in the form of a quotation for the customer via the web portal, either automatically or after confirmation by a member of the sales staff.

Once the customer has accepted the services offered, the reservation is made and utilization of the infrastructure is planned.

The processing status of orders can be tracked in the web portal. After the service has been provided, the charges are calculated and presented to the customer in the billing module.

## Functions

Inquiry about regular and one-time usage of services

Transmission of train data and documents

Display of the processing status

Tracking of the order status and any changes to orders

Confirmation of inquiries by e-mail

Offering and management of services

Publication of the price list

Customer management

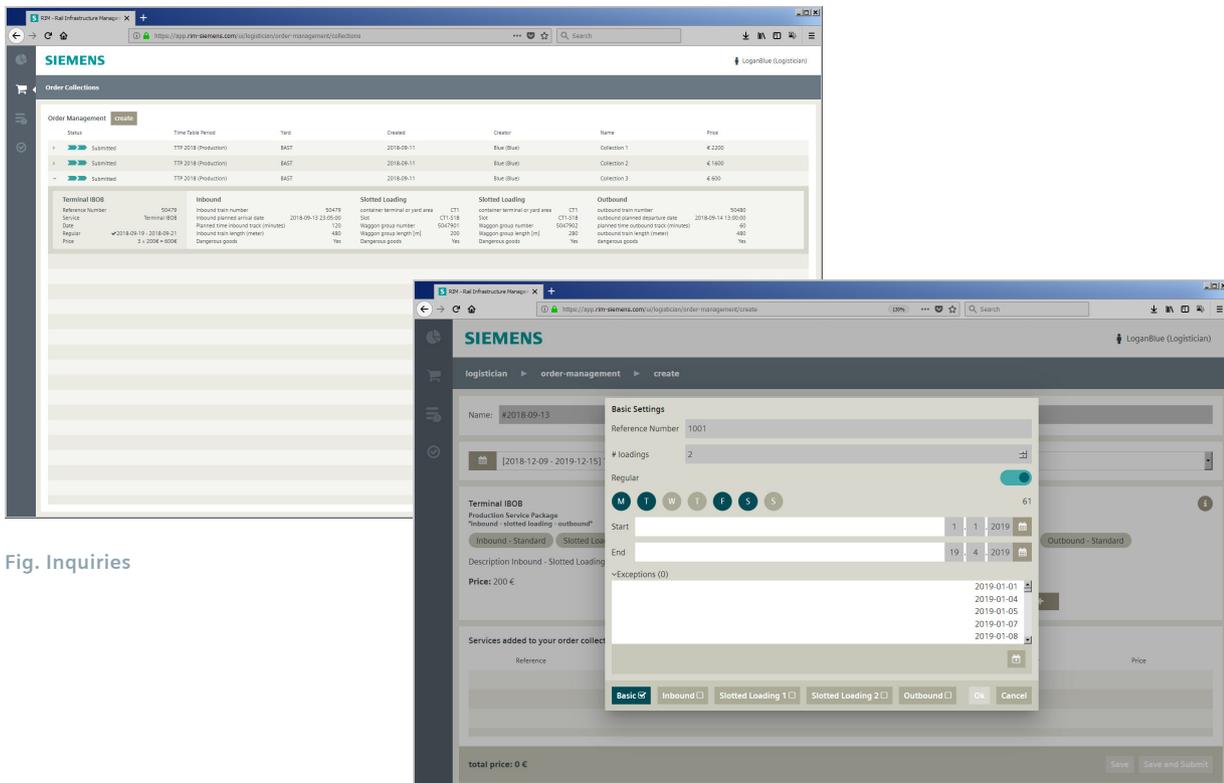


Fig. Inquiries

# Planning – planning of capacities and assurance of optimum utilization

Planning with Controlguide Rail Resource Management serves to ensure that the required track capacities for the usage data ordered by the customers are available for planning. This considers any linked dwell times of inbound and outbound trains, train sections, car cuts and individual cars on the respective tracks.

The capacity as well as individual services offered within the shunting environments form the basis for usage of the facility.

Disruptions as well as the lack of resources are among the main reasons for delays, budget overruns and quality issues. Such issues can be avoided in a timely manner with Controlguide Rail Resource Management.

Functions
Planning of inbound trains or inbound train series
Planning of operations at loading points
Planning of outbound trains or outbound train series
Optimization and conflict checking of planning activities
Management of infrastructure capacities and planned usage
Management of infrastructure restrictions (construction work, maintenance, failures)
Planning of infrastructure rentals

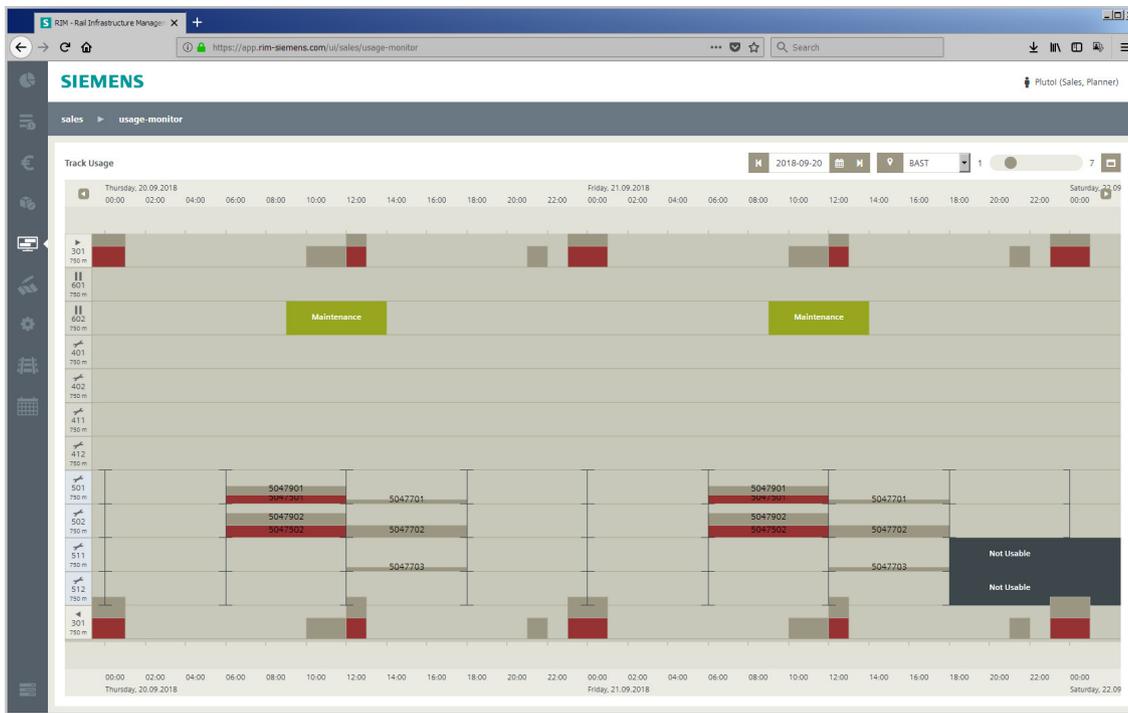


Fig. Track occupancy

# Dispatching

## Responding to unplanned events and minimization of adverse effects

Dispatching serves to provide a proactive response to short-term planning changes or changes to the operating workflow as a consequence of operational disruptions. It permits the efficient handling of trains, car cuts and individual cars as well as the optimization of workflows within the shunting environments.

Dispatching comprises the short-term, specific assignment of tracks for temporary usage by trains or car cuts. In this process, the dispatching functions rely on data that was generated during operational planning.

In order to avoid data redundancies and possible conflicts, a consistent data basis is essential for planning, dispatching and production.

A continuously updated view of future operations in the shunting environments is one of the main prerequisites in order to detect non-conformities in good time and to be able to take corrective measures if necessary.

For this purpose, Controlguide Rail Resource Management performs a continuous forecast of the expected operations.

On this basis, future conflict situations in operations are already identified at an early stage. This enables the dispatcher to initiate counteraction and influence operational workflows.

### Functions

Use of planning data at the car cut level

Adaptation of planned track usage in the inbound area, at loading points and in the outbound area

Dispatching at the car level via electronic train announcements and train compositions from rail transport companies for inbound and outbound trains

Dispatching of shunting movements

Involvement of transshipment companies via slot planning at loading points

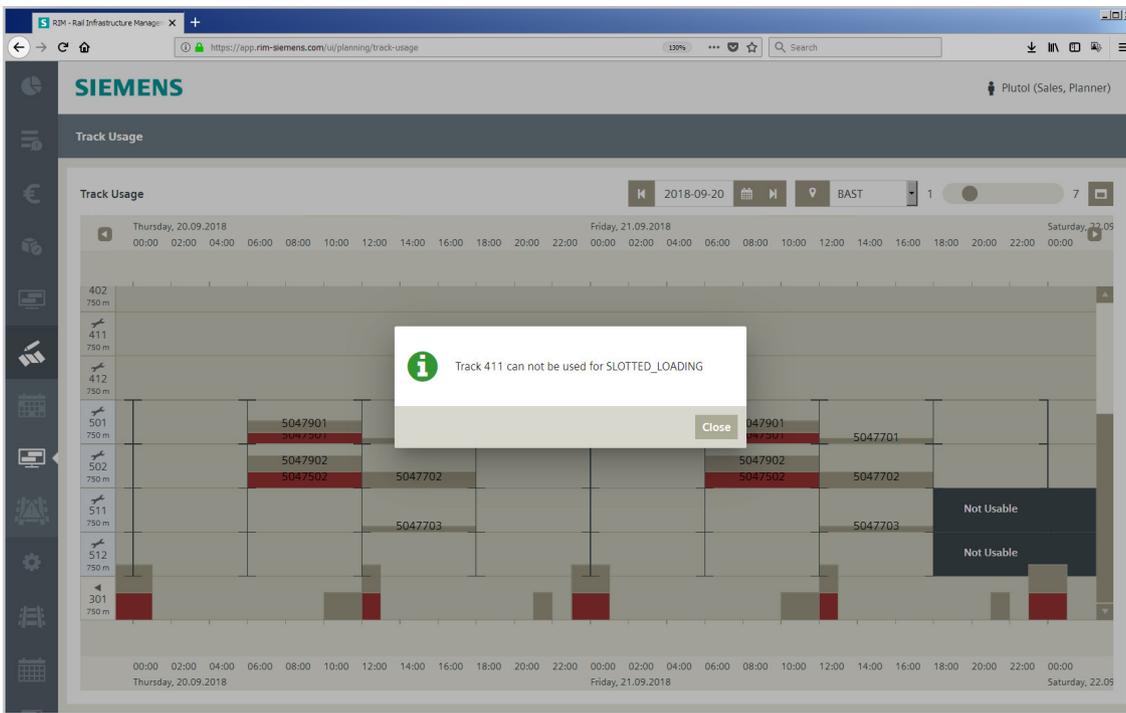


Fig. Conflict detection

# Production

## Operational transparency to ensure performance

Every party involved in production wants to map the real-life situation (actual status), i.e. the operating status of the shunting environment, in Controlguide Rail Resource Management in order to show any deviation from the planned desired status to all participating parties.

Correct and dynamic information is ensured by standardized interfaces to external systems.

In Controlguide Rail Resource Management, all changes to track occupancy (splitting over the hump, rearrangement by shunting movements) within the facility are tracked in a timely manner at the car level.

In a schematic track overview, all cars are visualized and automatically updated in the correct sequence and with associated status information.

### Functions

Inbound and Outbound handling

Visualization of car positions

Performance of shunting movements involving the signaler and the shunting foremen

Additions and removals at loading points at the car cut or individual car level involving shunting foremen, signalmen and transshipment companies

Execution of transshipment operations by transshipment companies at the car cut or individual car level

Type	Yard	Track	From	To
Maintenance	BAST	602	2018-09-13 09:00	2018-09-13 13:59
Maintenance	BAST			2018-09-14 13:59
Maintenance	BAST			2018-09-15 13:59
Maintenance	BAST			2018-09-16 13:59
Maintenance	BAST			2018-09-17 13:59
Maintenance	BAST			2018-09-18 13:59
Maintenance	BAST			2018-09-19 13:59
Maintenance	BAST			2018-09-20 13:59
Maintenance	BAST			2018-09-21 13:59
Maintenance	BAST			2018-09-22 13:59
Maintenance	BAST	602	2018-09-23 09:00	2018-09-23 13:59
Maintenance	BAST	602	2018-09-24 09:00	2018-09-24 13:59
Maintenance	BAST	602	2018-09-25 09:00	2018-09-25 13:59

Fig. Track overview diagram

# Billing

## Service- and dwell time-based billing

Charging for services is based on customer orders. For the billing of time-related charges, shunting and stabling operations are logged at the track and car level and made available as raw data, e.g. for the billing of infrastructure usage. For non-standard services, billing data records can also be recorded manually and at a later point in time.

In the web portal, the processed billing data is finalized with the customer. Bills can be printed out or exported in a standardized format for further processing in an accounting system.

### Functions

Generation of billing data records in line with the conditions of use for the infrastructure

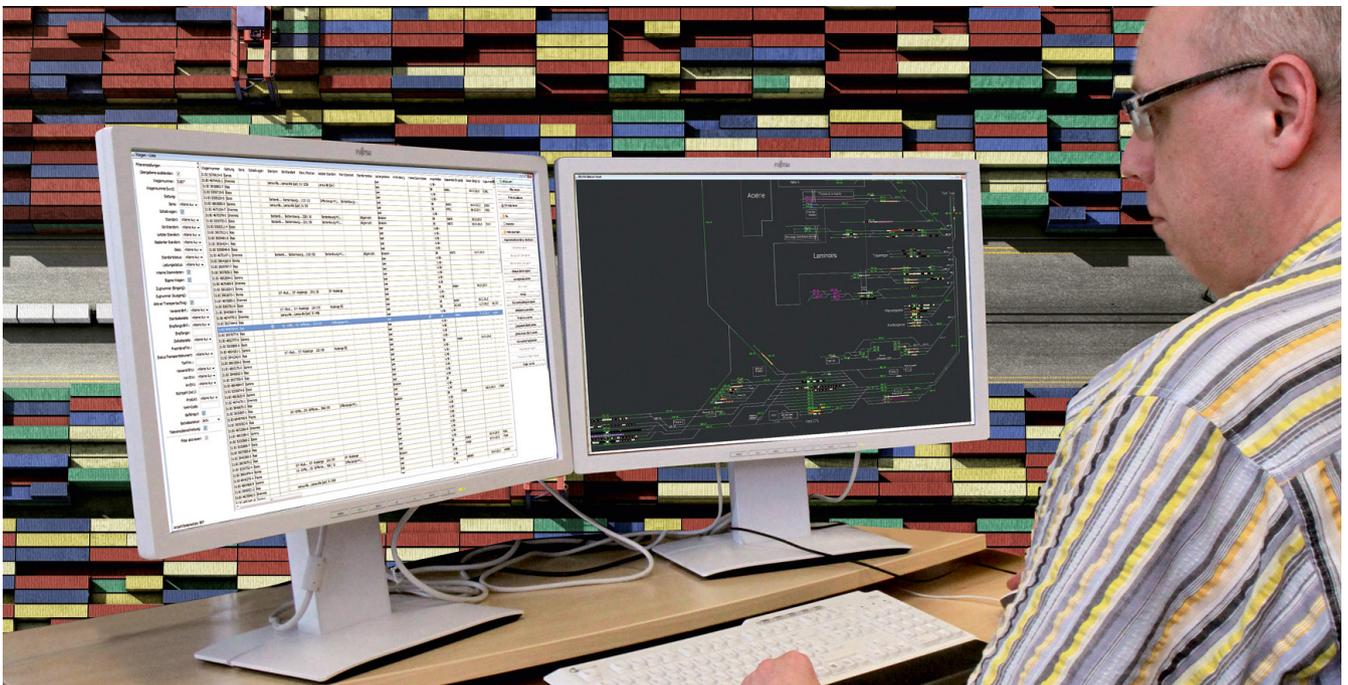
Use of the ordered services from order management

Car-related billing of dwell times based on the tracked car handling operations

Generation of billing data

Pre-checking of billing by the ordering party

Export of billing data



# Evaluation

## Conclusions about future services offered

The system provides up-to-date indicators about customer orders and production orders (status of operations).

Statistics about the usage of shunting environments, such as humping performance, utilization of inbound, outbound and classification tracks and orders per customer, can be aggregated for preconfigured periods (daily, weekly, monthly) and exported as reports.

A standard interface to all generated operational data is available and can be used for further detailed analysis of operating processes.

In addition, various administrative functions are available to configure the working environment of all parties.

### Functions

Provision of collected data for evaluation (e.g. for number of trains and cars, total dwell times, number of cancellations, annual utilization level per track)

Amendment and correction of logged usages

Usage of order statistics

Usage of inbound and outbound train statistics

Usage of car cut and individual car statistics

Configuration of standard reports for statistics

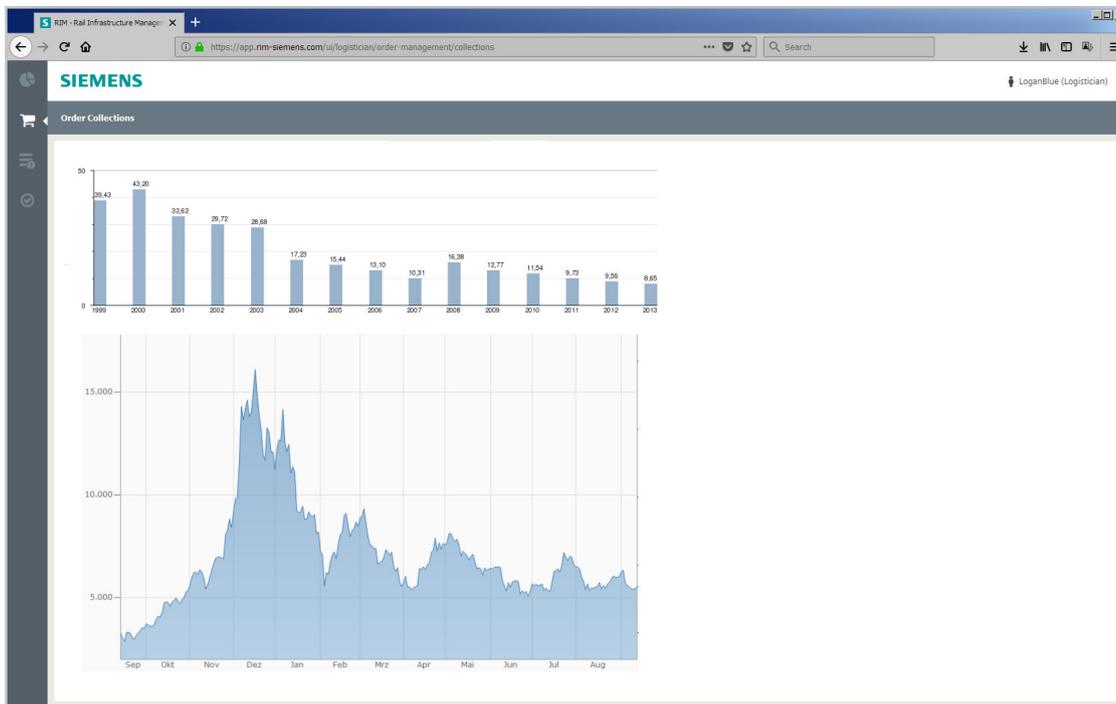
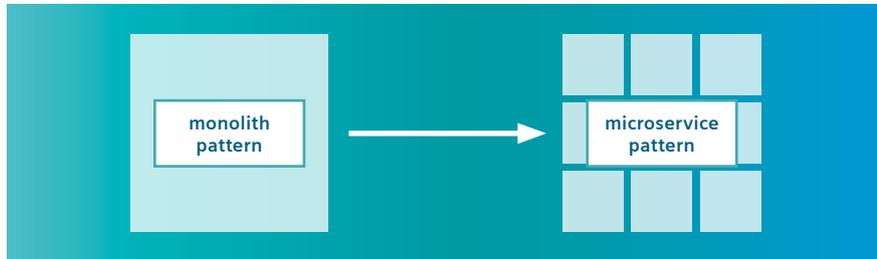


Fig. Evaluation

# System architecture

## State-of-the-art



The system architecture of the Controlguide Rail Resource Management system is based on the microservice pattern approach and on state-of-the-art cloud technology.

The microservice architectural pattern is a paradigm change in software development which has occurred over the past few years, primarily due to the avoidance of monolithic architectures and their scaling issues. With the microservice architecture, the overall system is composed of individual components that communicate with each

other via language-independent programming interfaces. This results in a modular structure in which the services are largely isolated from each other and can therefore be developed, distributed, scaled and also replaced separately.

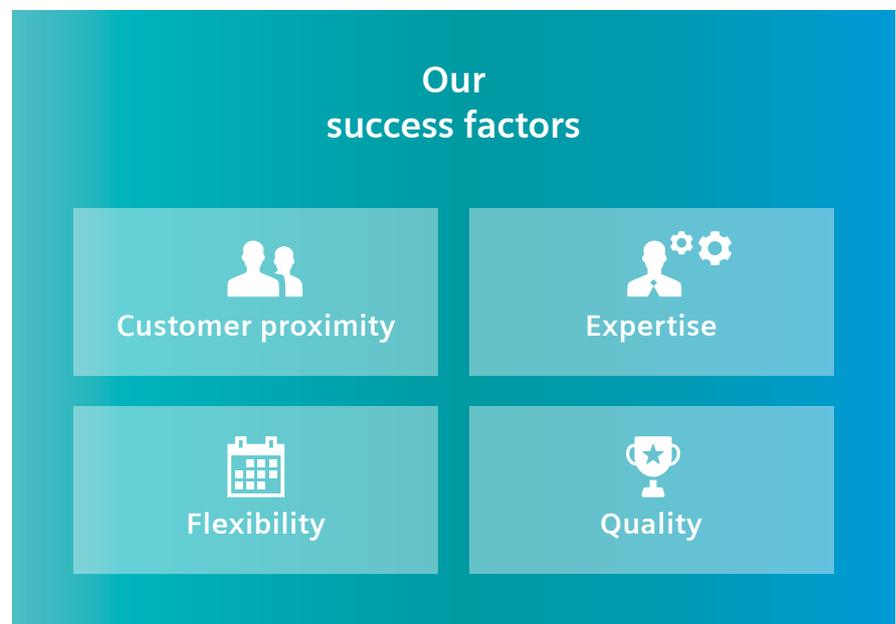
Any dependency on certain technologies is avoided because microservices are technology-neutral. Only this neutrality makes a software system futureproof since it can be gradually ported to future innovative technologies at any time.

Additional advantages of this approach are:

- **maintainability:**  
Because microservices are “small”, they are clearly structured and easy to maintain.
- **changeability:**  
Microservices can be replaced independently of each other.
- **continuous delivery:**  
Continuous delivery is made easier. The loading of is based on the microservices and is simple.
- **robustness:**  
The modular structure supports the robustness of the overall system.

High-level functionality and flexibility, superior quality, qualified service and a global presence are proof that we can leverage our portfolio to optimize and refine value chains in the context of marshaling yards.

The described functions of the Controlguide Rail Resource Management system are also perfectly suited for integration into more complex automation environments such as Trackguard Cargo MSR 32 where they can form the basis for the control of all operational processes and for dispatching and billing applications.



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