

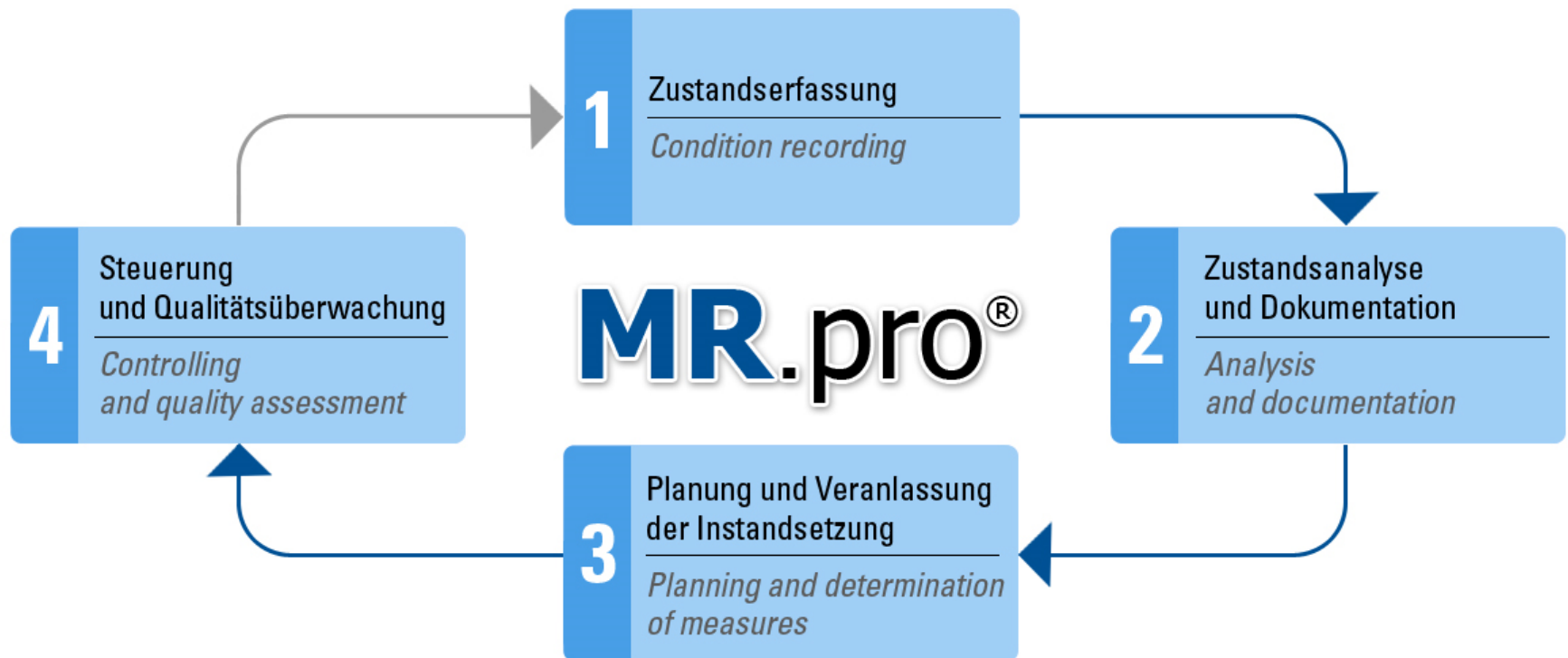
MR.pro[®]

*Logiciel de gestion de la durée de vie
des installations fixes de la Voie ferrée*

*Expert system & Asset-Lifecycle-
Management software for railways*

Maintenance de l'infrastructure de workflow

Workflow infrastructur maintenance



Hybride de système expert et de gestion de la maintenance

Hybrid of expert system & maintenance management system

expert system

- **data interpretation**
data analysis, objekt assignment, linkage of measured & visual control
- **monitoring**
action triggering of warranty cases just in time
- **diagnosis**
interpretation of data with need of an explanation (cause)
- **therapie**
development of measures for correction of faulty or wear conditions and elimination of causes
- **planning**
generate and rate action
- **forecast**
predict & prevent, evaluation of achievable states

maintenance system

- **technical object database**
inventory data,
condition data, condition development,
maintenance history, warranty tracking,
weak point analysis, life span management,
substance quality index, traffic data
- **2D rail network data model**
GIS Viewer
- **decision support**
graphically processed and located
- **requirements planning**
prioritized measures
- **planning & commissioning**
SAP-integration
- **execution controlling**
- **planning & control preventive measures**
type, scope, intervals

GIS Viewer - Entrée dans le logiciel

GIS Viewer - entry into the software

Identification rapide des objets et centre de contrôle pour le cycle de maintenance.

Fast identification of objects and control center for the maintenance cycle.

The screenshot shows the GIS Viewer application window. The title bar reads "GIS Viewer V:\Sicherung XPSM1330\WMK\II MR.pro INFRA NRW\SWM\MRGIS". The menu bar includes "Datei", "Bearbeiten", "Ansicht", "Zoom", and "Visualisierung". The main map area displays a street layout with "Schwere-Reiter-Straße" and "Ackermannstraße" visible. A red dashed line highlights a specific object on the map. A tooltip for "Fehlerklasse 2" is displayed over the object, containing the following information:

- 783 - 795 :
- Mangel: Asphalt überhöht <= 2 cm
- Lage: links
- Umfang: 2
- Mengeneinheit: cm
- Instandsetzungshinweis: Asphalt instandsetzen/ abfräsen

On the right side, there are two panels:

- Eigenschaften** (Properties): A table with columns "Funktion" and "Bezeichnung". The "MAP-ID" is highlighted in blue.

Funktion	Bezeichnung
MAP-ID	0
Po-ID	2002184
ID	2000593
Typ	Gleis
Gleisbezeichnung	05.1.01
Bezir	Bezik 05
Stellwerk	Nordbad/Petuel...
Ort	München
Startpunkt Bezi...	WA 286
Endpunkt Bezi...	WA 302
Startpunkt [m]	0
Endpunkt [m]	1532.7
Gleislänge [m]	1532.7
Leistungslänge	0
Messfile	137
Datei	05.1.01 (137).xls
Befahrung	Falsch
Linienbelegung	1
Prüfintervall	12
Anlagenklasse	1
KundenID	
Passbild	
- Legende** (Legend): A table with columns "zeige", "Fehlerklasse", and "Farbcode".

zeige	Fehlerklasse	Farbcode
<input checked="" type="checkbox"/>	FK1	Red
<input checked="" type="checkbox"/>	FK2	Yellow
<input checked="" type="checkbox"/>	FK3	Green
<input checked="" type="checkbox"/>	FK4	Blue

At the bottom, there is a status bar with a scale from 0 m to 1532.7 m and a status indicator.

Types d'objets

Types of objects

Outre les éléments de ligne tels que voie et caténaire, les objets ponctuels peuvent être gérés dans MR.pro®: aiguillages, croisement, arrêts, passages à niveau, mâts, signaux, structures, bâtiments, butoir, etc.

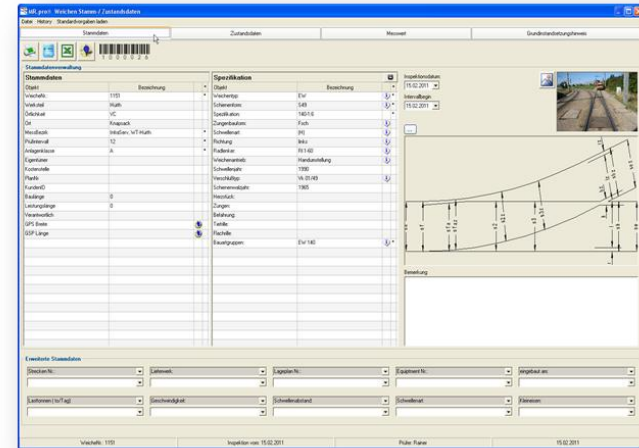
In addition to line elements such as track and catenary, point objects can be managed in MR.pro®: turnouts, intersections, stops, level crossing, masts, signals, structures, buildings, buffer stop, etc.

The screenshot shows the 'Objekttypen verwalten' window in MR.pro. The table lists various object types with their counts and icons. A circular magnifying glass highlights the following data:

Bezeichnung	Anzahl	Icon
Weiche	87	
Gleis	155	
HST	0	
Bahnübergang	0	
Mast	0	
Signal	0	
Tunnel	0	
Brücke	0	
Gleisabschluss	0	
Stellwerk	0	

Inspection visuelle des aiguillages et voies

Visual inspection of turnouts and tracks



MR.pro est également utilisé sur les appareils mobiles (Windows).
 MR.pro® is also used on mobile devices (Windows).

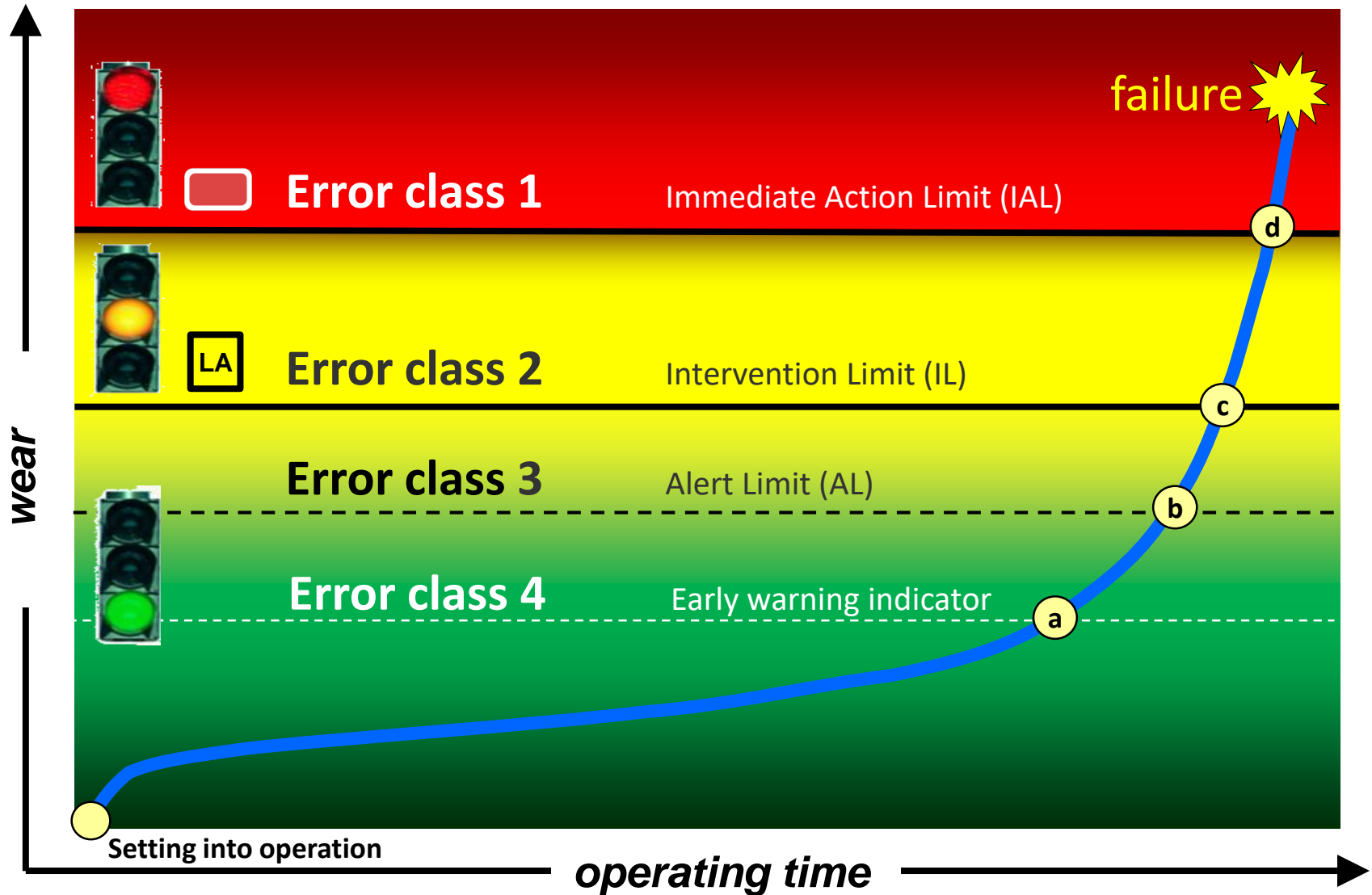
MR.pro® avec des listes de contrôle basées sur une base de données permet:

- des contrôles de points complets, rapides et clairs
- codage précis et objectif des défauts et des réparations, ainsi que
- classification uniforme des défauts.

MR.pro® with database-based checklists allows :

- comprehensive turnout checks, fast and clear
- precise and objective defect and repair coding, as well as the
- uniform classification of defects.

Classification of defaults measurements & visual controls



Scale / benchmark for condition assessment

TSI & DIN EN 13848-5

4 categories (graded tolerance ranges) are used to evaluate the measured data:

DB Ril		DIN EN ¹⁰ /TSI ¹¹	classification MR.pro®
a = SR _A	early warning	{optional}	Error class 4
b = SR ₁₀₀	economic	AL Alert Limit	Error class 3
c = SR _{lim}	safety tolerance	IL Intervention Limit	Error class 2
d = SR _G	Grenzwert	IAL Immediate Action Limit	Error class 1

- **Immediate Action Limit (IAL):** refers to the value which, if exceeded, requires taking measures to reduce the risk of derailment to an acceptable level. This can be done either by closing the line, reducing speed or by correction of track geometry;
- **Intervention Limit (IL):** refers to the value which, if exceeded, requires corrective maintenance in order that the immediate action limit shall not be reached before the next inspection;
- **Alert Limit (AL):** refers to the value which, if exceeded, requires that the track geometry condition is analysed and considered in the regularly planned maintenance operations.

Classes d'erreurs – exemples


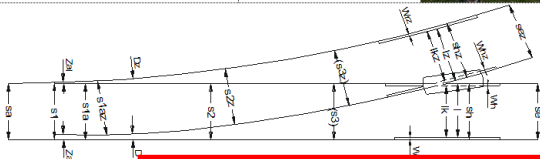
Classification in the documentation

Définition des priorités de manque jusqu'à l'analyse qualitative du manque (contrôle visuel) pour les voies et les aiguillages. Les résultats de la vérification visuelle sont divisés en classes d'erreurs(1-4) et déterminent la priorité de la réparation.


Definition of the failure priorities until the qualitative analysis (visual control) for tracks and points. The results of the visual verification are divided into error classes (1-4) and determine the priority of the repair.

Schreck-Mieves Switch Inspection (SI)

Client		importance: volume of traffic	A
Switch No.:	17	switch mechanism: switch blade	signal box manganese flexible switch
Standard turnout	GP35-100/75-1:6- left-hand	crossing over points check rail	facing points / trailing points
Project No.:	72 xxxxx xxxxx	lock:	check rail border
Date:	11.08.2003	low groove: remark:	spring control operation completely switch points heating

state, function and integrity	ok	n	defectNo.	position	description of defects	Priority
track gauge			1	sa, s3, sh, shz, se, sez	narrowing of the gauge	1
guard rail gauge	x					
track guiding distance			2	L	narrowing track guiding distance	2
flange groove	x					
switch flangeway	x					
switch opening	x					
lengthwise height	x					
direction	x					
race	x					
reversing device	x					
set of switches with flexible switch heel			3	set of switches with flexible switch heel	contaminated (leaves)	2
switch blade	x					
rail		x	4	switch blade R	outbreak	1
			4.1	straight left a. right	grooved contaminated (leaves)	3
common crossing		x	5	wing rail a. common crossing	burring	2
check rail	x					
welding joints	x					



defectNo.	position	description of defects	Priority
1	sa, s3, sh, shz, se, sez	narrowing of the gauge	1
2	L	guidance far narrowing	2
3	set of switches with flexible switch heel	contaminated (leaves)	2

Gestion à vie

Lifespan management

La base de données MR.pro® contient toutes les informations pour la planification à long terme > 5 ans, par exemple type d'objet, charge d'exploitation, configuration, évolution du condition dans le temps.

The MR.pro® database contains all information for long-term planning > 5 years, e.g. Object type, operating load, configuration, condition development over time.

Sur la base de l'expérience opérationnelle, des valeurs moyennes de la durée de vie économique des objets peuvent être dérivées en tant qu'intrants pour une gestion de la durée de vie pratique.

Based on operational experience, average values of the economic life of the objects can be derived as input for a practicable lifespan management.

UpdateNutzungsdauer	UpdateErneuerungsjahr	UpdateGrund	User	Status
25	2025		Rainer	05.11.2008 08:34:59

Durée de vie supposée, suivi et mise à jour pour un objet de classe d'actif A.

Assumed service life and its tracking and updating for an asset class A object.

Planification du renouvellement à long terme

Long-term renewal planning

Le contenu de la planification à court terme (t_0 à t_5) correspond à la demande des inspections.

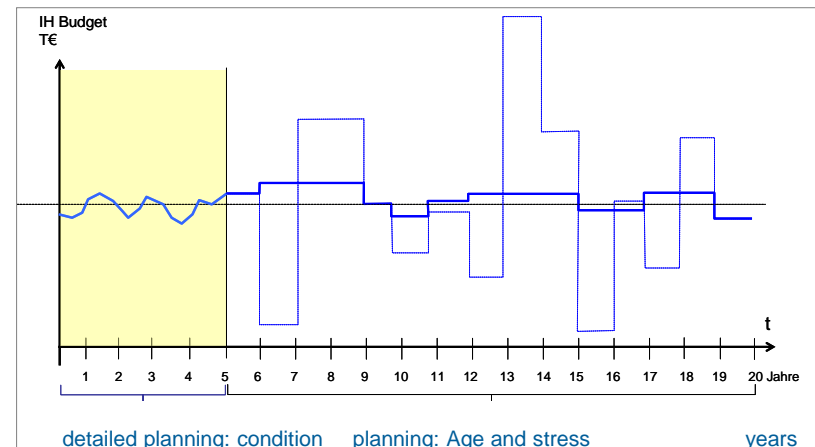
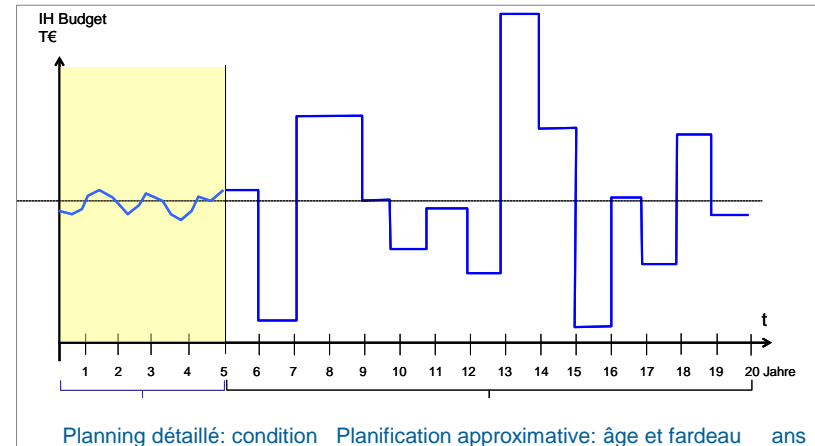
La planification à long terme (t_6 à t_{20}) est basée sur des hypothèses et le réserve de mesure KAV mis à jour.

- Détection et nivellement des fluctuations de la demande dues à un décalage dans le temps
- **éviter les surprises!**

The content of the short-term planning (t_0 to t_5) is the demand from the inspections.

Long-term planning (t_6 to t_{20}) is based on assumptions and the updated wear stock KAV.

- *Detection and leveling of fluctuations in demand due to a time shift*
- ***avoid surprises!***



Aperçu idéal de tous les objets

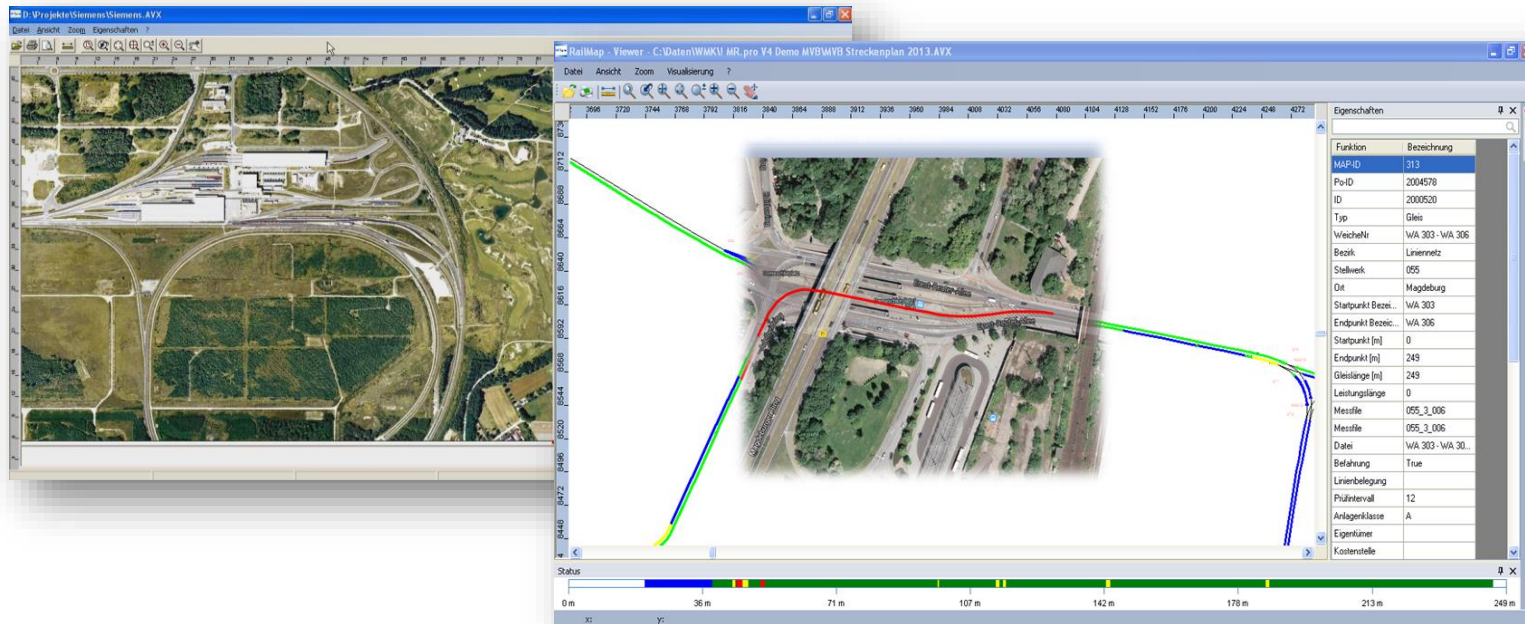
Overall view of tracks

Les cartes numériques jouent un rôle important chez MR.pro

- Identification et accès aux objets
- Visualisation de tout le contenu de la base de données

Digital maps have an important role at MR.pro

- Identification and access to the objects
- Visualization of all database contents

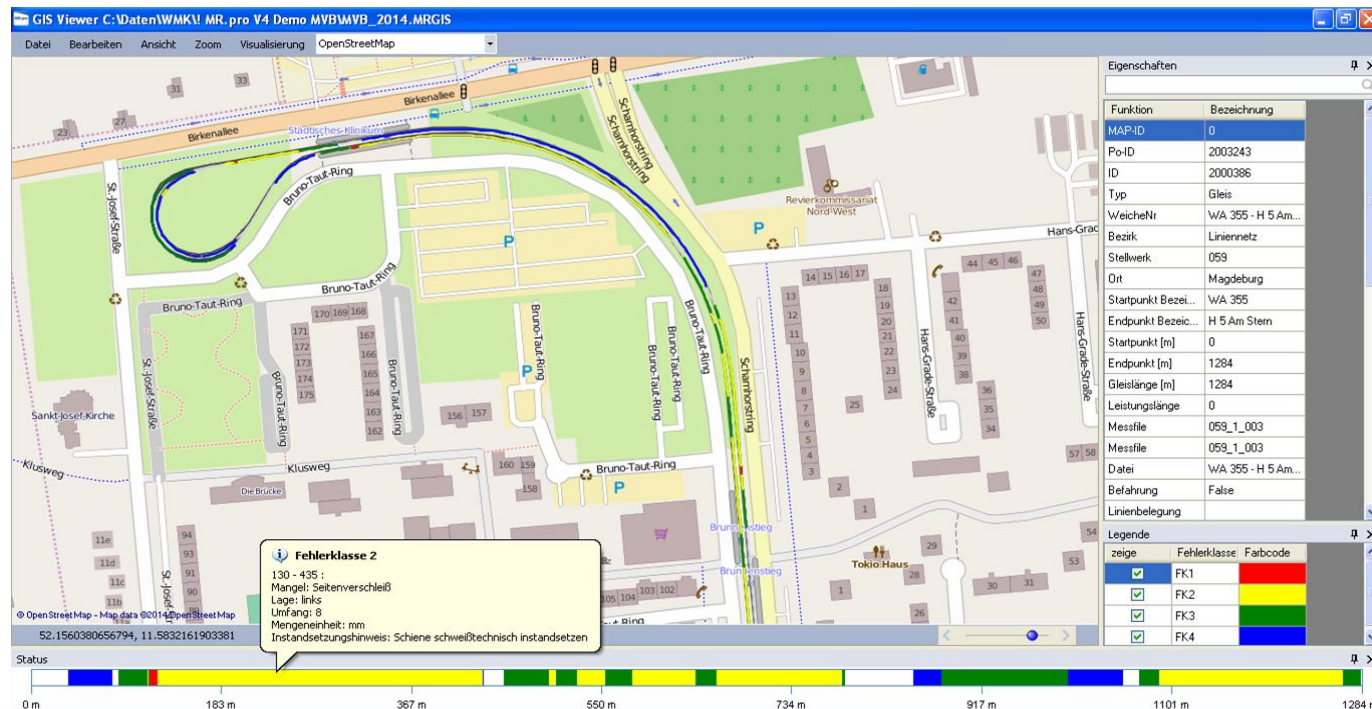


GIS Viewer - RailMap avec couche de carte

GIS Viewer - RailMap with map background

Tous les contenus de la base de données seront visualisés de manière conviviale, par ex. comme aperçu de l'état codé par couleur avec barre d'état, basé ici sur des cartes gratuites d'OpenStreetMap.

All database contents will be visualized in a user-friendly way, e.g. as color-coded condition overview with status bar, here based on free maps of OpenStreetMap.



OpenStreetMap.org est un projet international fondé en 2004 dans le but de créer une carte du monde libre.

OpenStreetMap.org is an international project founded in 2004 with the goal of creating a free world map.

Contrôle des délais et maintenance

Control of deadlines and maintenance

Chaque objet peut être affecté * n travaux de maintenance. Selon le type et l'importance, différents intervalles peuvent être définis pour chaque objet et pour chaque modèle.

*Each object can be assigned *n maintenance work templates. Depending on the type and the importance of the object, different intervals can be defined for each object and for each template.*

The screenshot displays the MR.pro software interface. The main window shows a list of maintenance work templates (Weichen Nr.) and their associated tasks (Wartungsarbeiten). The tasks listed are: Feststz aller Teile prüfen, Überprüfung der Schmierstellen, and Gehäusekasten innen auf Verschmutzung prüfen. The interval is set to 122 days, and the responsible team is 'Wartungsteam 1'.

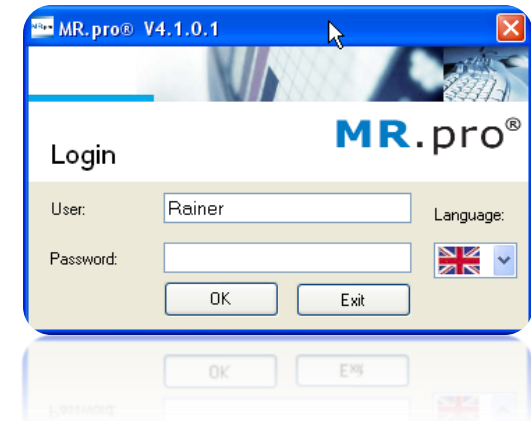
A secondary window titled 'Wartung vom 28.04.2008' shows a detailed view of a maintenance task. It includes a table with columns for 'Geprüft', 'IO', 'Messwert', 'Nacharbeit', 'Priorität', 'Umlang', and 'ME'. The table contains three rows of data, all with checked boxes in the 'Geprüft' and 'IO' columns.

Wartungsarbeiten	Geprüft	IO	Messwert	Nacharbeit	Priorität	Umlang	ME
Feststz aller Teile prüfen	<input checked="" type="checkbox"/>	<input type="checkbox"/>		lose Teile festziehen			
Überprüfung der Schmierstellen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
Gehäusekasten innen auf Verschmutzung prüfen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					

Accès et autorisation

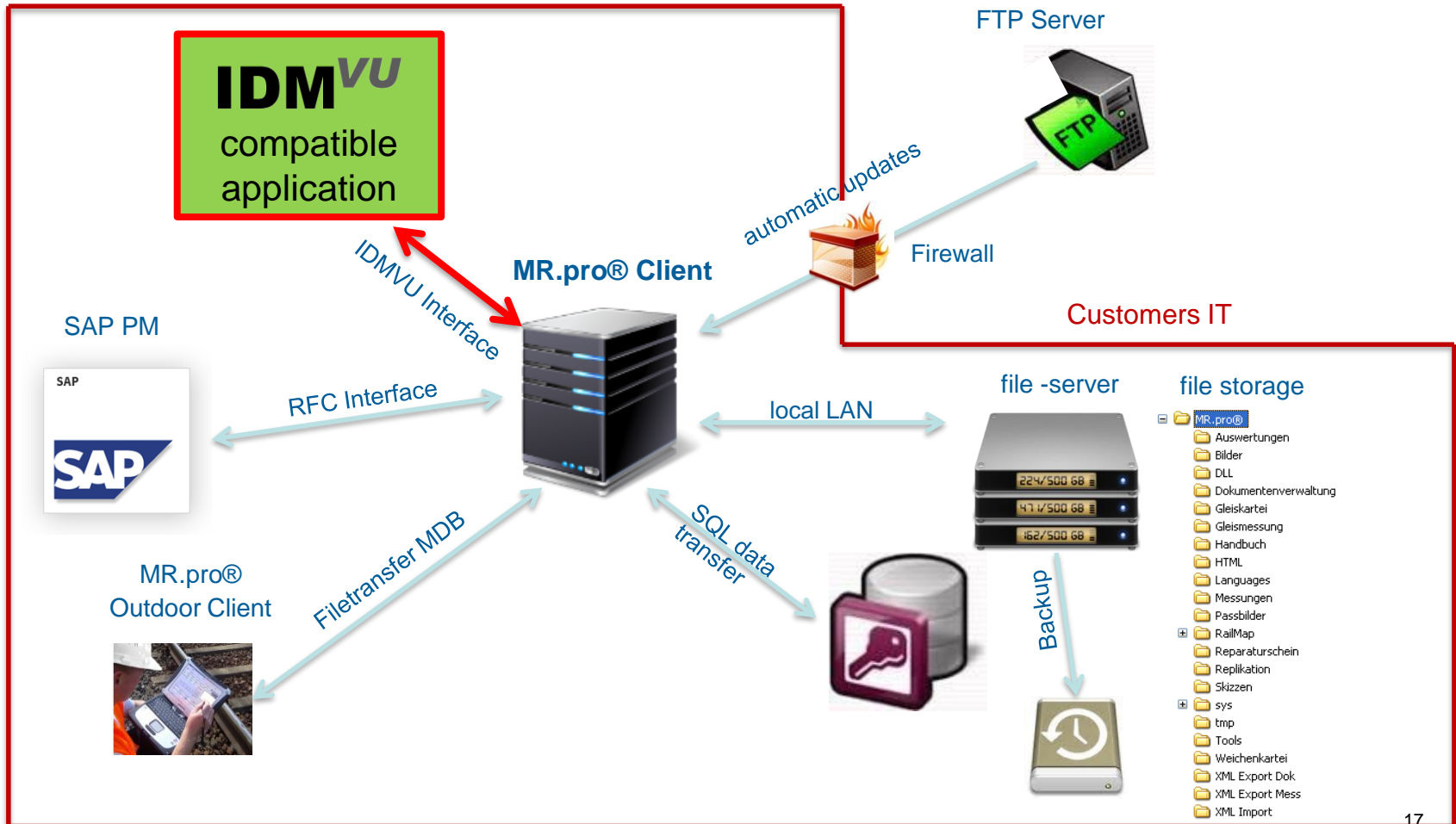
Access and Authorization

- ▶ **Application multi-utilisateur**
Multi-user-application
- ▶ **Compatible en réseau**
Network-compatible
- ▶ **Gestion et autorisation des accès**
Permission management and access authorization
- ▶ **Multilingue**
Multilingual
 - *German* allemand
 - *English* anglais
 - *French* français
 - *Italian* italien
 - *Dutch* flamand



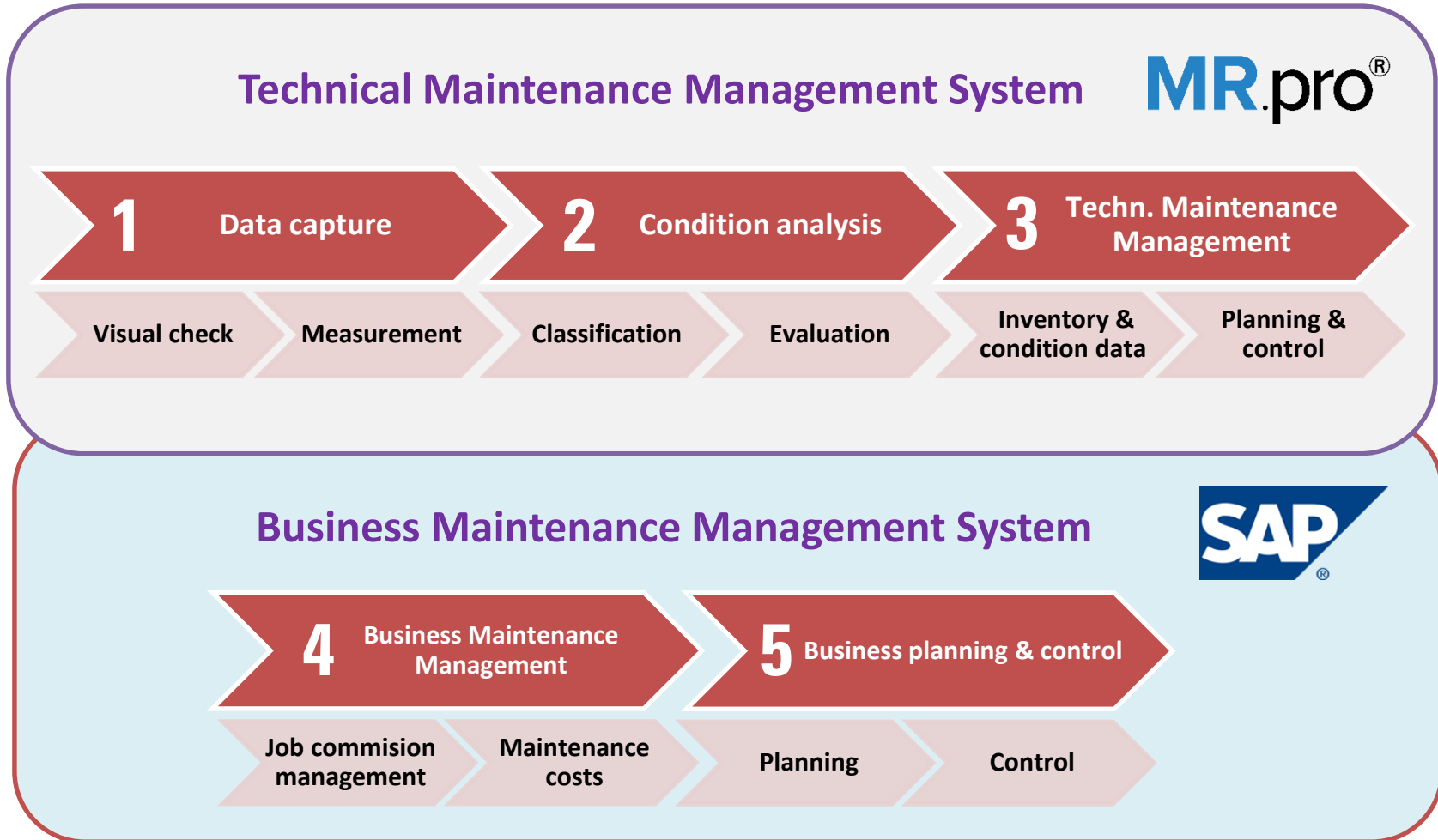
Structure client MR.pro®

Clientstruktur MR.pro®



L'interaction de MR.pro® & SAP®

Interaction of MR.pro® & SAP®



Two software systems for all functions of maintenance management: Technical management = MR.pro®, Business management = SAP/PM. Further geographic information systems (GIS) offer a useful supplement.

Références MR.pro®



Stand: 01.12.2018

- Bremenports
- Degussa AG, Marl
- Hamburg Port Authority AöR
- InfraServ GmbH & Co. Knapsack KG
- Kölner Verkehrs-Betriebe AG
- Kasseler Verkehrs-Gesellschaft AG
- Verkehrsbetriebe Karlsruhe GmbH
- VAG Verkehrs-Aktiengesellschaft Nürnberg
- Rhein-Neckar-Verkehr GmbH
- Verkehrsbetriebe Zürich (CH)
- Magdeburger Verkehrsbetriebe GmbH
- IFTEC GmbH & Co. KG Leipzig (LVB)
- Basler Verkehrs-Betriebe (CH)
- Stadtbahn Saar GmbH
- Münchner Verkehrsgesellschaft mbH
- Stadtwerke Krefeld AG SWK
- Azienda Trasporti Milanese, Mailand (I)
- Dresdner Verkehrsbetriebe AG
- HEAG Mobilo, Darmstadt
- DB Regio RheinNeckar
- Rheinhafen Krefeld
- Keolis, Lyon (F)
- Braunschweiger Verkehrs AG
- Bern Mobil (CH)
- ThyssenKrupp Logistics Services, Duisburg
- OMV Aktiengesellschaft Wien u. Burghausen (A)
- Eisenbahnen u. Verkehrsbetriebe Elbe-Weser
- Schweizerische Rheinhäfen, Basel (CH)
- De Lijn Antwerpen, Gent und Küstenlinie (B)
- DIVIA LeTram Grand Dijon (F)
- CFL Luxembourg (L)
- CTS Strabourg (F)



Vidéos

MR.pro[®]

<https://youtu.be/8D76mMAJB2I>

MR.pro.cloud

<https://youtu.be/KrSpKReDxYI>

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Merci pour votre intérêt
Thank you for your interest

Vielen Dank für Ihr Interesse