Source: pilot project 360° MSP – BBG und DB E&C
point cloud aqcuired with approx. 40 km/h

360° Multisensor Platform

Track-bound surveying and as-built documentation with mobile acquisition of point clouds, image panoramas and georadar scans

Dresden | Berlin

A cooperation initiative of

DB Bahnbau Gruppe

DB Engineering & Consulting

Current challenges

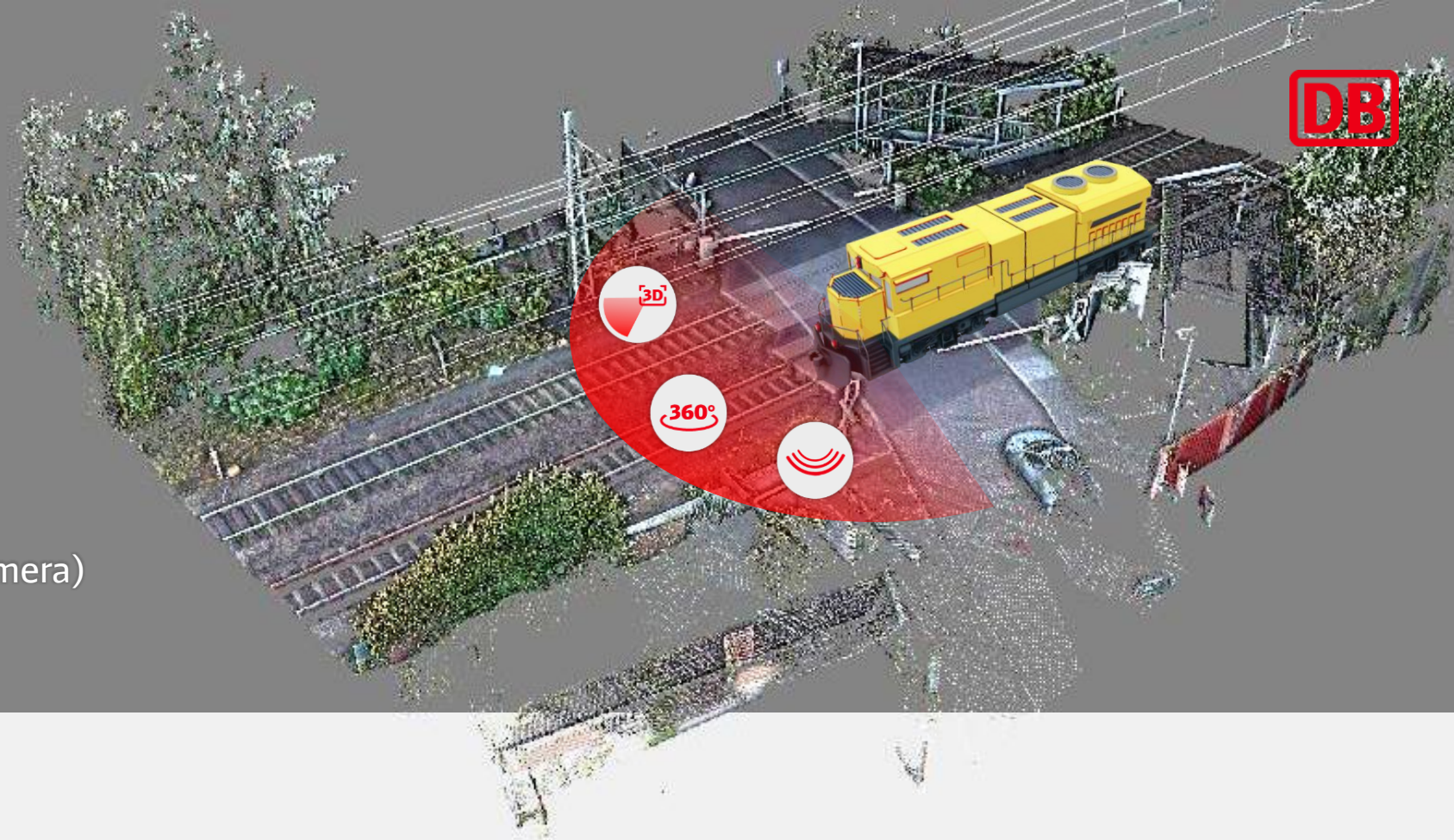
Problem

- Incomplete and outdated **as-built documentation**
- **Railroad-operational restrictions** on data acquisition for planning (safety, access)
- Mandatory use of **BIM methodology** in the DB Group **without current data basis**
- Obtaining **knowledge of the location and tracks** is time-consuming
- **Quantity determination** for gravel supplement at DUA **inaccurate**
- **Data sovereignty of safety-critical infrastructure**

Solution 360° MSP

- **Detailed** image of the ground surface / subsurface using point clouds, panoramic images and georadar scans as the **basis for as-built documents**
- Comprehensive as-built documentation **without disrupting the rail operations**
- **Uniform data basis** as a foundation for participating trades and different project phases
- **Detailed image** of local conditions through panoramic images and point clouds
- Combination of point cloud and georadar data allows more precise **quantity determination**
- **From the group for the group**

360° MSP



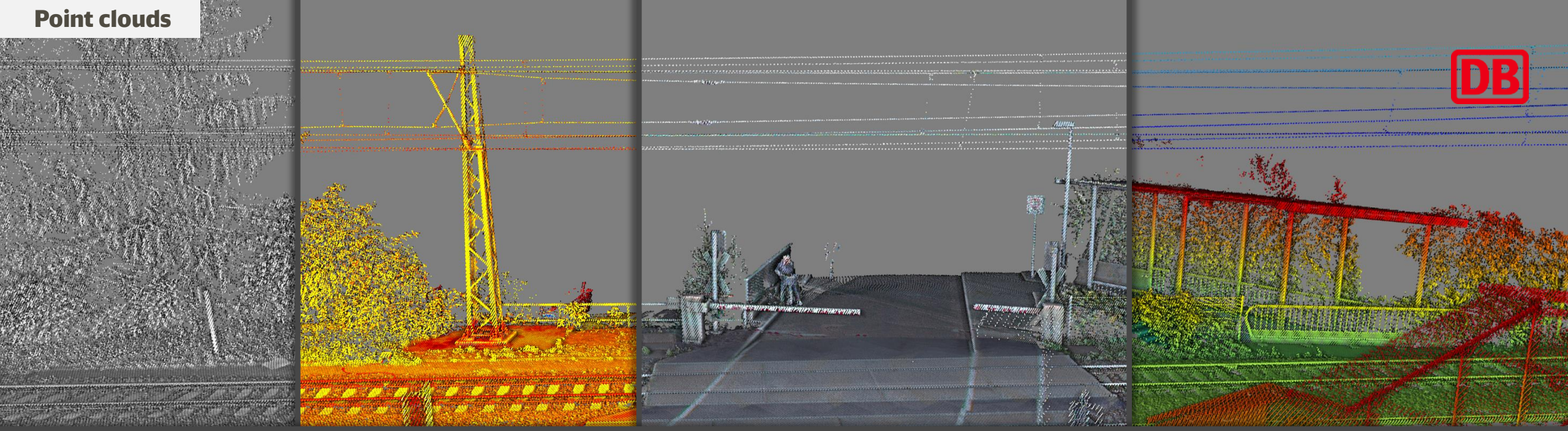
What do we use?

- **Track vehicle**
- **Mobile mapping system**
  (GNSS, laser scanner and panoramic camera)
- **Georadar** (optional)

What is the result?

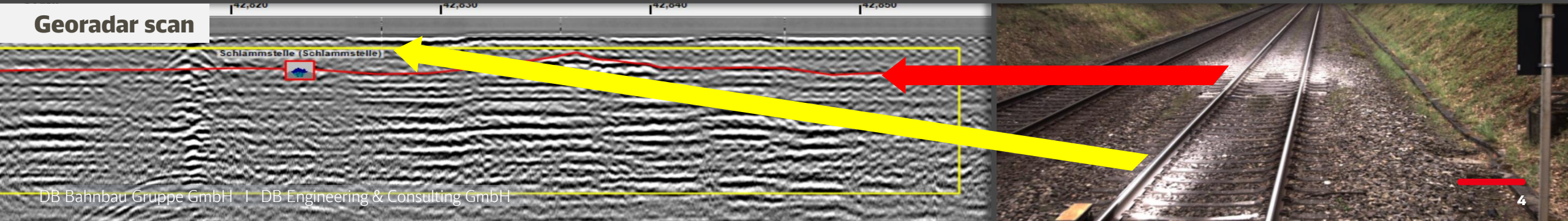
- **3D acquisition of the surface**
  (point cloud)
- **360° image capture of the environment**
  (high resolution panoramic images)
- **View under the rail**
  (ground scans of the georadar)

Point clouds



Panoramic image

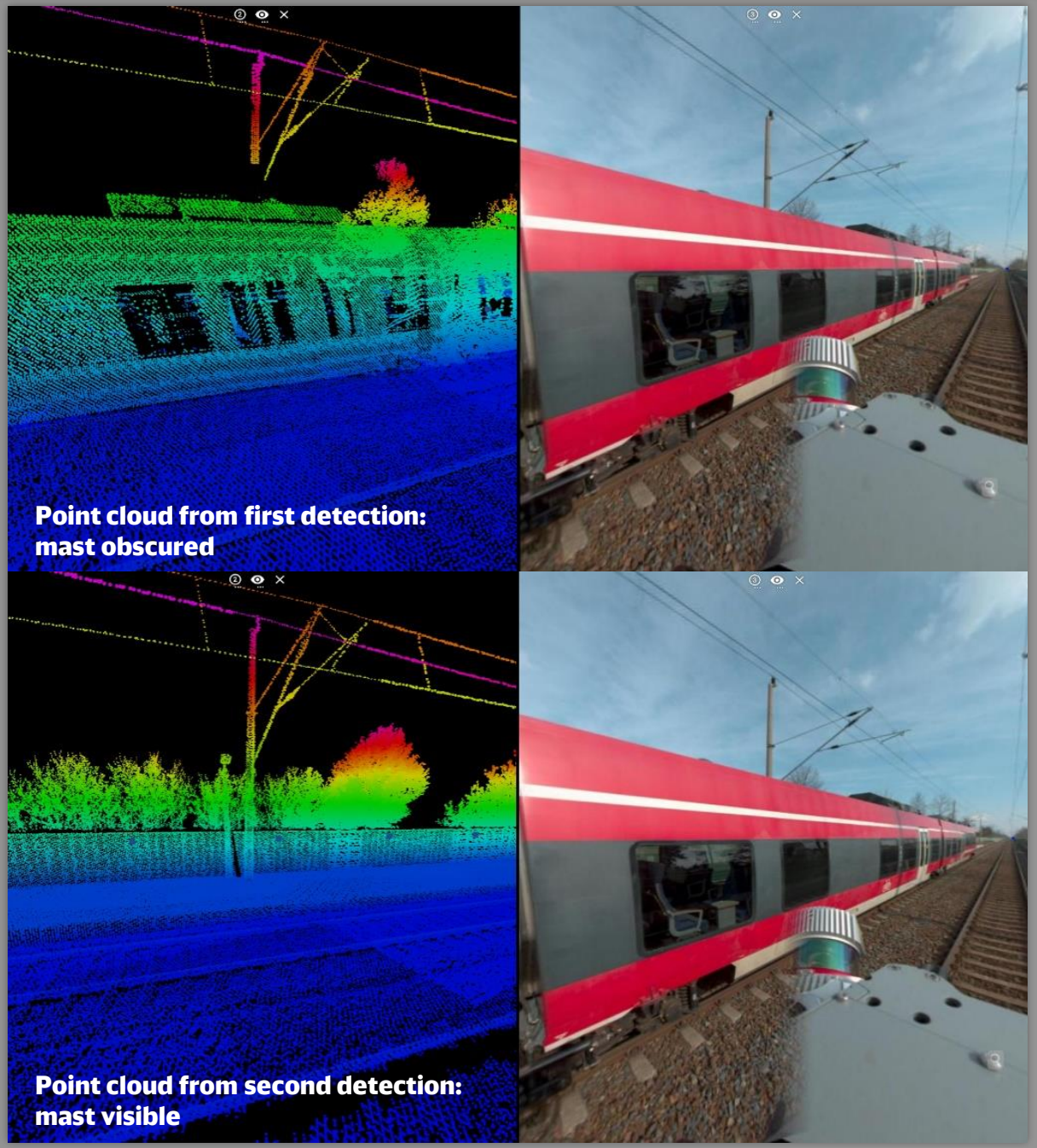
Georadar scan

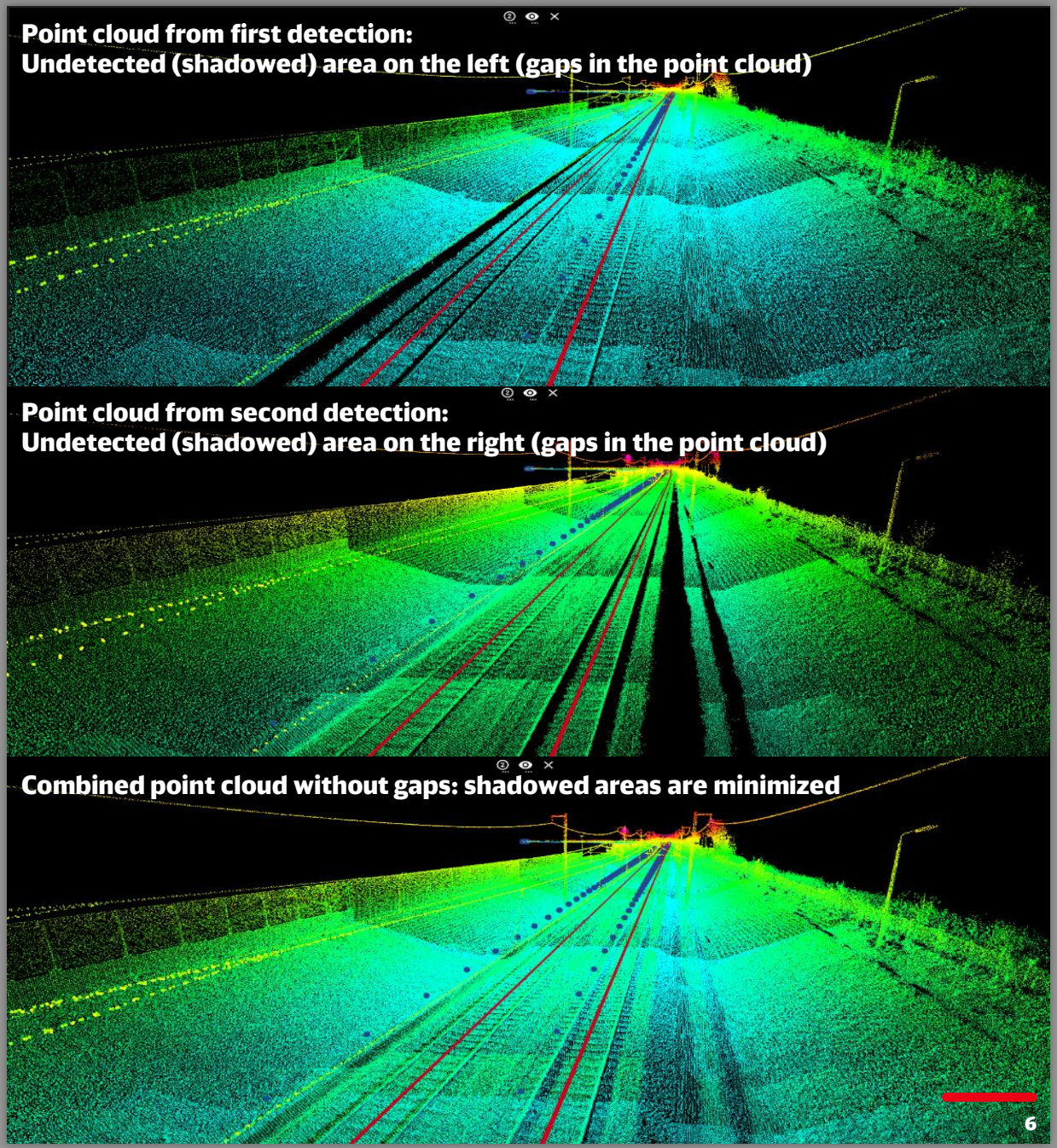


Impressions from eastern germany...

...and from the north (Hindenburgdamm)

Minimization of shaded and obscured areas by running on both tracks (for double-track lines)





Benefits of the 360° MSP–data

Base data collection

Preparation of DSTW (digital interlocking) technology, automated traffic control and automated driving

Planning basis

Use for BIM projects (as-built survey, route knowledge, model development)

DB inventory data archive

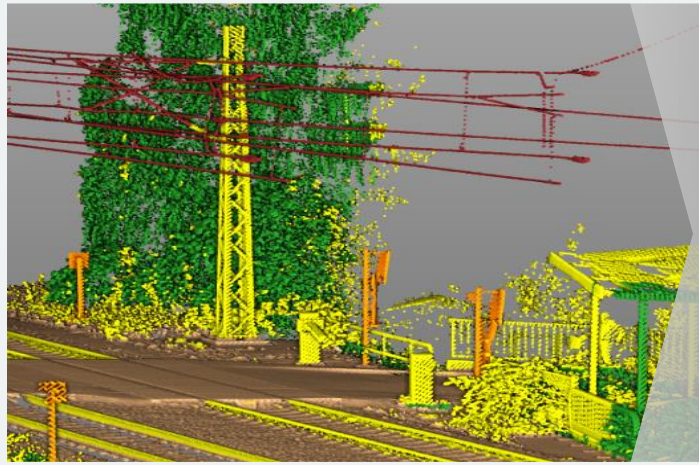
Establishment of a central archive of as-built data for all trades for 2D and 3D plans

Project communication

All work on one model

Individual utilization

- Detection for vegetation control
- Collision detection
- Visualizations
- Task management
- ...

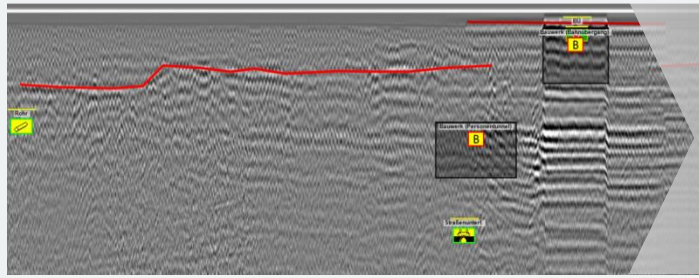


Use of point clouds

- **Spatial image** – digital capture of surfaces with reference to location or route
- **Modeling basis** – efficient creation of 3D models and as-built plans
- **Basic data model**
  - **Constantly up-to-date** – subsequent updating and expansion possible
  - **Can be used across all trades** – integration of all as-built planning documents in a common base data model
  - **BIM-ready** – optimal basis for BIM projects

Use of panoramic images

- **Virtual route inspection**
- **Identification of problem areas in advance** – efficient and demand-oriented route inspection
- **Support for planners** – better local knowledge
- **Supplementation of point clouds** – facilitated 3D modeling
- **Update of DB-VIS**



Use of the georadar scan data

- **Layer thickness measurement and cable detection** – detection of ballast bed and subgrade under the tracks (DUA)
- **Detection of irregularities** – facilitated 3D modeling
- **Optimized subsoil investigation** – identification and concentration on neuralgic areas

Potentials in performance phases

PP1 – Basic determination	Preliminary reconnaissance of the actual state IVL plan update Continuous recording of the subsurface (georadar)	360° MSP	**Data acquisition** (First detection)	**Data usage**
PP2 – Preliminary planning and cost estimation	Initial surveying (e.g. for traffic facilities) DTM modeling (BIM) Optimization of site/route surveys Route condition assessment for cost optimization	360° MSP	**Data acquisition** from first detection or optional **Data acquisition**	**Data usage** **Benefits:** 1. Extensive actual data 2. Reduction of track access and operat. interventions 3. Reduction of time needed for data acquisition 4. Multiple use of already recorded data in later PP
PP3 – Design planning and cost calculation	Data basis 4D construction phase planning/operations planning Validate cable and pipeline plans (georadar) Planning of detailed surveying operations Optimization of selective subsoil surveys			
PP4 – Approval planning	Creation of service specifications for expert services			
PP5 – Execution plan **PP6 – Preparation of allocation** **PP7 – Participation allocation**	Quantity takeoff from DTM (BIM) DTM as planning basis for specialized models e.g. equipment engineering (OLA, LST for cable civil engineering) Collision check e.g. existing foundations			
LP8 – Realization **LP9 – Commissioning**	Target/actual comparison (as-built model) Inventory documentation Quality control	360° MSP	**Data acquisition** (follow-up detection)	**Data usage**
Operation of the facility	Maintenance measures Vegetation control Periodic monitoring	360° MSP	**Data acquisition** (Data from previous PP)	**Data usage**

Data collection at an early stage of the project offers maximum benefit and cost efficiency

360° MSP – Benefits

of the data acquisition

Flexibility

Use in regular operation, no track closures required

Efficiency

High data acquisition speed (up to 80 km/h)

Economic efficiency

Simultaneous acquisition with different sensor systems in one measurement run (150-200 km/d)

Eco-friendly

Minimal effort despite large acquisition areas and data diversity

of the data usage

Flexibility

Cross-trade use of data, models and inventory data

Actuality

Continuous supplementation and updating of data

Automation

Benefited by high degree of standardization

Standardization

Planning basis with uniform quality level