BIM for Railway Signaling
from Laser Scanning to 3D Model and Gamification

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Claudia Zeh works as a Senior Implementation Consultant with Autodesk Consulting, based in Germany. With over 15 years working in the geospatial domain, she brings extensive experience from working on different types of infrastructure projects with customers in the area of AEC, construction, rail industry and utilities. With her broad technological background from designing and developing solutions, database management, requirements specifications, she provides consulting services to customers around BIM 360 and the Autodesk Infrastructure portfolio covering workflow assessment, customization and solution implementation.
Siemens Mobility GmbH developed a whole workflow from digital track capturing using laser scanner technique to the creation of an infrastructure 3D model containing all relevant signaling assets. One of the main businesses for Siemens Mobility is the design, construction, and installation of signaling systems. The solution shows how automated data-preparation processes and interfaces help to combine different data sets in a way that helps cross-project teams understand and make use of the information easier and quicker. The focus of this class is based on demonstrating the benefits and added value arising from this solution, as well as a high-level overview of the processes supporting the different required use cases: digital track capturing, 3D visualization of the rail track with all assets, documentation, and train driver simulation. These processes make use of AutoCAD Civil 3D software, InfraWorks software, BIM 360 Field software, BIM 360 Document Management software, Maya software, Unity, and Forge.
Key Learning Objectives

• Recognize how **connected information** can help to reduce the time it takes to gather relevant data from different systems

• Learn how to better judge the different areas that need to be considered when building **large-scale solutions for infrastructure projects**

• Discover how BIM 360 and Forge can be used to **connect multiple data and share information** within the extended team

• Learn how far **automation** could go to help efficiency
Siemens Mobility organizational structure

**Business Units**

- **Mobility Management**
  - Products, solutions and turnkey systems for rail and road automation and optimization

- **Turnkey Projects and Electrification**
  - Complete rail and road solutions and rail and road electrification solutions

- **Rolling Stock**
  - Short-distance, regional and long-distance rolling stock, and product and system solutions for passenger and freight transport

- **Customer Services**
  - Innovative services for rolling stock and infrastructure throughout the entire lifecycle

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**Mainline (ML) Rail Automation**

**Mass Transit (MT) Rail Automation**
Background Information

• Motivation
  o New Solutions as part of overall Digitization Initiative

• Main Focus Area
  o Design and Installation of Signaling Systems
    ▪ ETCS - European Train Control Systems
      • Stringent safety requirements
      • High operational reliability

➢ Accurate design and small installation tolerances required
Background Information

- Traditional Way of Working
  - **Schematic plans** based on mileage
  - Onsite work:
    - **Paper based workflows** for installation tasks
    - **Verification** of designed positions
    - Compile information stored in **different systems**
    - **Reporting** after work execution
Two Clear Goals

Creation of a **3D model** of the **existing rail track**

Replace the existing paper-based workflows for **Onsite activities** by a digital workflow
Building Information Modeling @ Mobility Management

Autodesk tools and our use cases

From LiDAR scan …
➔ Point Cloud …
➔ 3D Model …
➔ Paperless On-Site activities …
➔ Augmented Reality …
➔ Gamification
Our main activities regarding BIM

3D Model # Track

Collaborate
Design
Analyze

Main goals:
> Less On-Site activities

Paperless On-Site activities

Design
Commissioning
Software Configuration
Installation
Surveys
Maintenance
BIM360 Field Management

> Improve quality

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ModelBuilder
- Terrain data
- Aerial pictures
- Infrastructure
- Buildings

Updated Content
- LiDAR scan
- Existing equipment

Track Details

Basic model

Data exchange
... to update the model with design and engineering data

Data exchange
... to update the model with design and engineering data

Documentation
- e.g. drawings (AutoCAD Civil) ➔ "SDLTL"

Design and Engineering
Entegro / COMOS / and others

On-Site activities
BIM360 Field Management

Link with drawings

ModelBuilder vs. Updated Content

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Building Information Modeling @ Mobility Management ➔ Paperless On-Site activities

Design and Engineering
- COMOS / and others

Design
- 3D Model data

Data exchange
- Design and Engineering
- Maintenance
- Design
- Commissioning
- Installation
- Surveys

BIM360 Field Management
- Equipment Life-Circle

User Interface
- Tablet-App (OnSite / offline)
- Web-Interface (Office / online)

User Interface functionalities
- Equipments (Main data set)
- Check lists
- Reporting
- Issues
- Dashboard
- Tasks

- Sync tablet (download)
- Perform work
- Fill out checklist
- Close checklist
- Sync tablet (upload)

Ready for...
- done
Building Information Modeling @ Mobility Management

Standardized process “DTC2BIMdata”

Digital Track Capturing

Siemens MO CS (LiDAR Team)
- Output:
  - Point cloud
  - 360° Pictures

Siemens MO MM (BIM Team)
- Digital Site Survey
- Create 3D-Model
- Generate drawings
- Export/Import data

Released Basis

Design & Engineering
Entegro / COMOS / and others

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Building Information Modeling @ Mobility Management ➔ Our additional activities regarding BIM

3D Model # Room

- Better design coordination

Gamification

- ... make the most out of it!
Building Information Modeling @ Mobility Management ➔ … make the most out of it!

Basic BIM modules (Basic data)

Connected Digital Twin systems

Design & Engineering

Simulation & Test

Proof of Concepts

VR # Track

AR # Room

AR on site

AR in Train

Live data

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Building Information Modeling @ Mobility Management ➔ The Project Information Viewer > built with Forge

Siemens Web-Server > on AWS

Autodesk Web-Server > on AWS

Siemens „in-house“ IT

FORGE

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Summary

• Digital Model reduces time spent Onsite

• Data Automation processes reduce error prone manual steps and improve efficiency

• Connecting data from different systems saves time for gathering relevant information with keeping it in its expert system avoiding data silos

• BIM enabling an expert system accomplishes integration into the complete solution
Q&A