AUTODESK UNIVERSITY

Advanced visualization to improve communication for transportation design

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About the Speaker

Claudia Zeh

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Claudia's Profile

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 the Autodesk Infrastructure and Autodesk Construction portfolio covering workflow assessment, customization and solution implementation.

About the Speaker

Mantas Smidtas

Senior Implementation Consultant, Autodesk EMEA

Location Kristiansand, Norway

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Mantas's Profile

Mantas Smidtas is an expert in GIS, BIM and 3D design technologies with more than 19 years' experience in the design space. In his current role as an implementation consultant, Mantas specializes in helping customers build workflows that integrate GIS, BIM, 3D modelling and visualization around tools including Civil3D, Revit, and 3ds Max. Mantas has worked across diverse industries throughout his career, including road, rail, and airport infrastructure, urban design, buildings, and media and entertainment. He brings an extensive cross-industry knowledge to all his engagements, allowing him to connect inter-industry components of major projects and cross-pollinate solutions from other industries.

Class Objectives

Class Description

Max Bögl, a German construction and infrastructure company designed a fully automated urban mobility solution: **Transport System Bögl (TSB).** It is based on **magnetic levitation technology** and designed to provide a **future-proof public transport for densely populated cities**. Max Bögl approached Autodesk Consulting to help finding a quick design solution for their urban mobility systems and build **3D visualization models to communicate the proposed tracks more easily and convincingly**. One of the key aspects of the whole design is the light-weight construction of elevated tracks, InfraWorks Bridge Design capabilities with its parametric modelling approach was the perfect answer. This class will highlight the main steps of the solution, the creation of the track and 3D visualization models using Inventor and InfraWorks, including animated parts, generated in 3ds Max to **better demonstrate the TSB in action**.

Key Learning Objectives

- **Create** an **elevated transportation track** using Civil 3D and InfraWorks.
- **Animate parts** of the visualization model using 3ds Max for better communication.
- **Identify the main topics** to consider **for** creating **a convincing visualization**.
- Export and **use data for a high-end visualization** through 3ds Max, use 3D model for VR/AR solutions.

New Transport System

Max Bögl TSB

Transport System Bögl

- TSB development started in 2010
  - Magnetic Levitation (maglev) Technology
- All-from-one-source
  - Design, Fabrication, Construction, Operation
  - Track, Vehicle and Operating Technology package
- Designed to provide future-proof public transport for densely populated cities

Courtesy of Firmengruppe Max Bögl

Max Bögl TSB

Transport System Bögl

- Light weight, sustainable solution; elevated, at-ground or underground
- Speed of 150km/h, short distance tracks (~50km)
- First demo track (3.5km) was built in China, Chengdu (construction started 2019)
- 2020 German Federal Railway Authority gives green light for TSB

Courtesy of Firmengruppe Max Bögl

Early Design Visualization

TSB Track - Early Design Visualization

Key Objectives

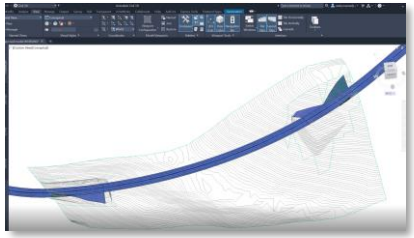
- **Quick way** to generate the **TSB Track Design in Context** of the Existing Environment
- Near **realistic visualization** of TSB track
- Emphasis on **Lightweight Track visualization**

TSB Track - Early Design Visualization

TSB Track Design in Context

InfraWorks Civil Structure Design

Detailed Track Design



AUTODESK® CIVIL 3D®

Bridge Design in Context

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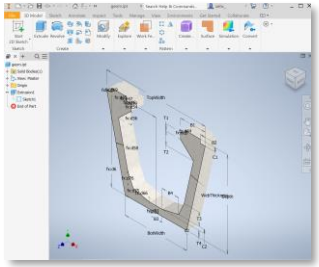
Parametric Bridge Components



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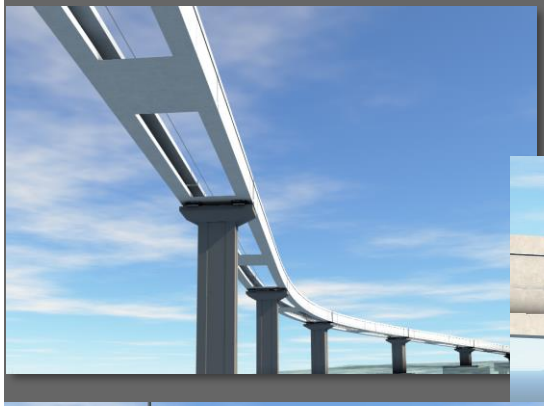
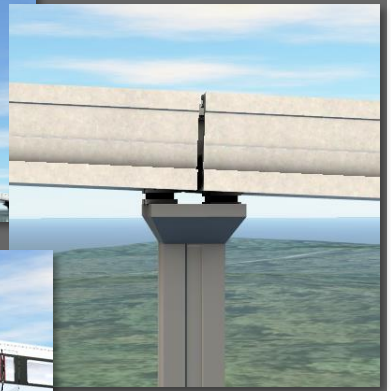
3D Visualization of an elevated TSB Track

Near realistic visualization of TSB track

Pictures of TSB Test Track

Sample Images from InfraWorks Model





3D Visualization of an elevated TSB Track

In Context of Existing Environment

Sample Images from InfraWorks Model

Enhanced Visualization with animations

TSB Cargo

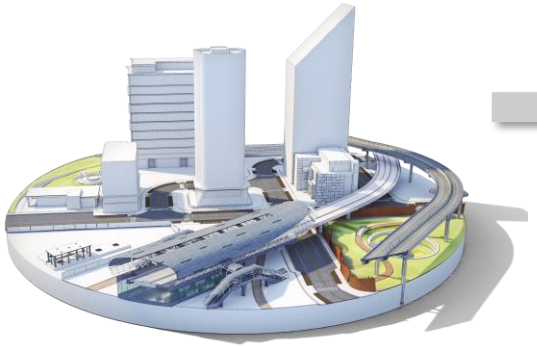
Levitating Logistics

- Sustainable, low-emission, reliable system for moving containers
- Individual and unique transport of single container units
- Speed up to 150 km/h, acceleration 1.3 m/s^2, headway 20 s
- Elevated, at ground level or in tunnels

Courtesy of Norddeutscher Rundfunk

Courtesy of Firmengruppe Max Bögl

Different Levels of Visualization



Coordination Model

High-end Visualization

Gamification / VR / AR

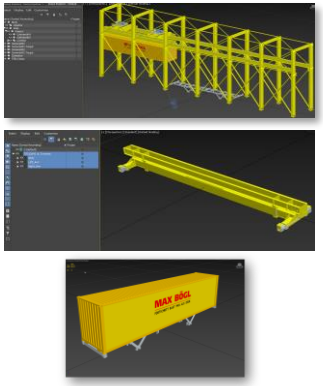
Building a workflow

1

EXISTING ENVIRONMENT

Build better existing project environment for early phase design

2



TECHNICAL ANIMATION

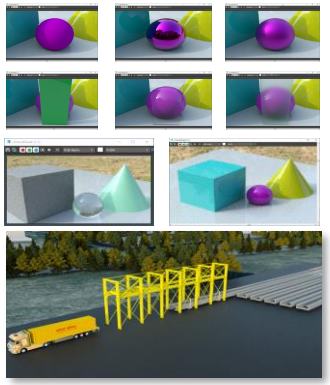
Best practices on how to animate 3D objects in 3ds Max

3

CAMERA WORKFLOWS

Animated objects and camera animation workflows in InfraWorks

4



HIGHER VISUAL QUALITY

Techniques on how to increase LOD and create high end visualizations

5

VR / AR INTEGRATION

Quick ways to generate more value by using InfraWorks and 3DsMax models

Model Authoring for Higher visualization

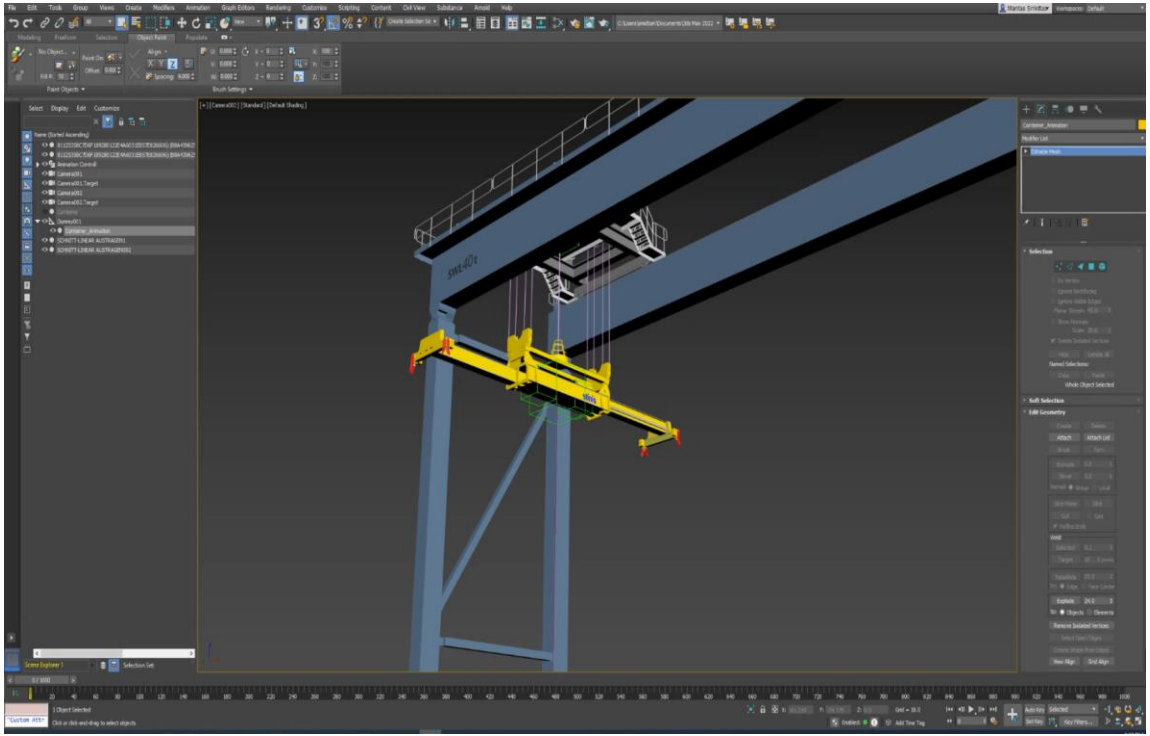
Existing project environment and early phase design

- Data input (Existing conditions)
  - What data sources do I have / what do I need to purchase to increase LOD?
- Level of Detail
  - What detail do I expect to see in the final visualization?
- Size / Model setup
  - Which areas do I want to see with higher LOD?
  - Think about model performance and size
- Project / Design Data
  - Track alignment – is it available in the right format?
  - Additional structures to be imported?
  - Animated objects to be included?

Model Animation and Animation Automation

Best practice on how to animate 3D objects in 3ds Max

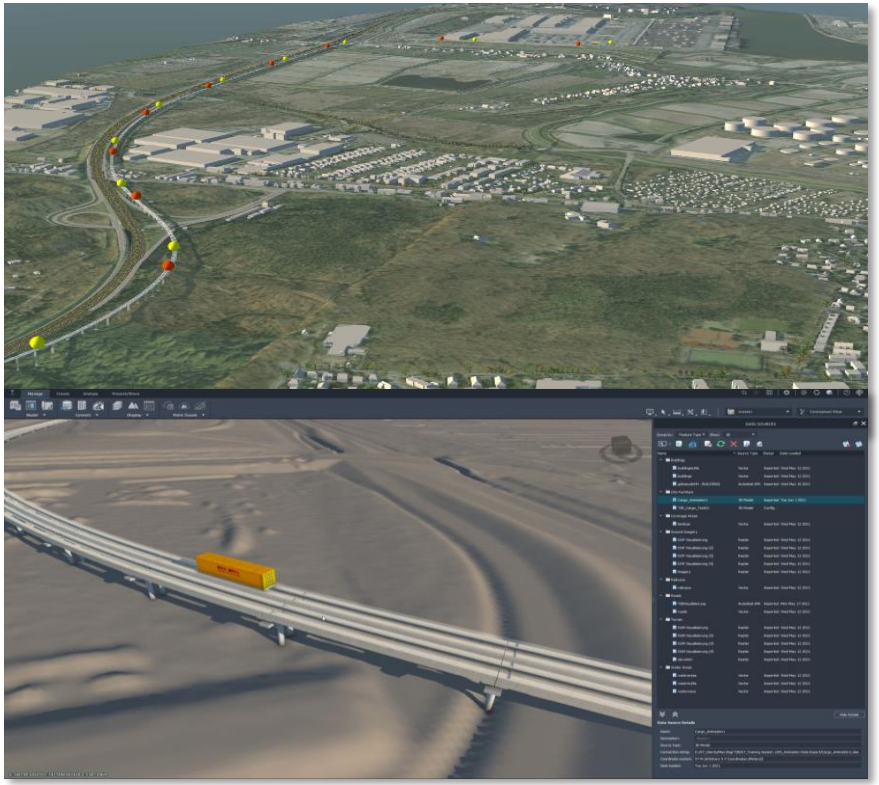
- Structure of input models
  - Detailing should fit the desired animation
- Simplification of models
  - Combine 3D elements
  - Work with layers and create model hierarchy
- General Best Practice Steps
  - Point of Origin / Axis / Pivot point
  - Assign materials
  - Add standard objects to custom content library
  - Work with Attributes for animation processes

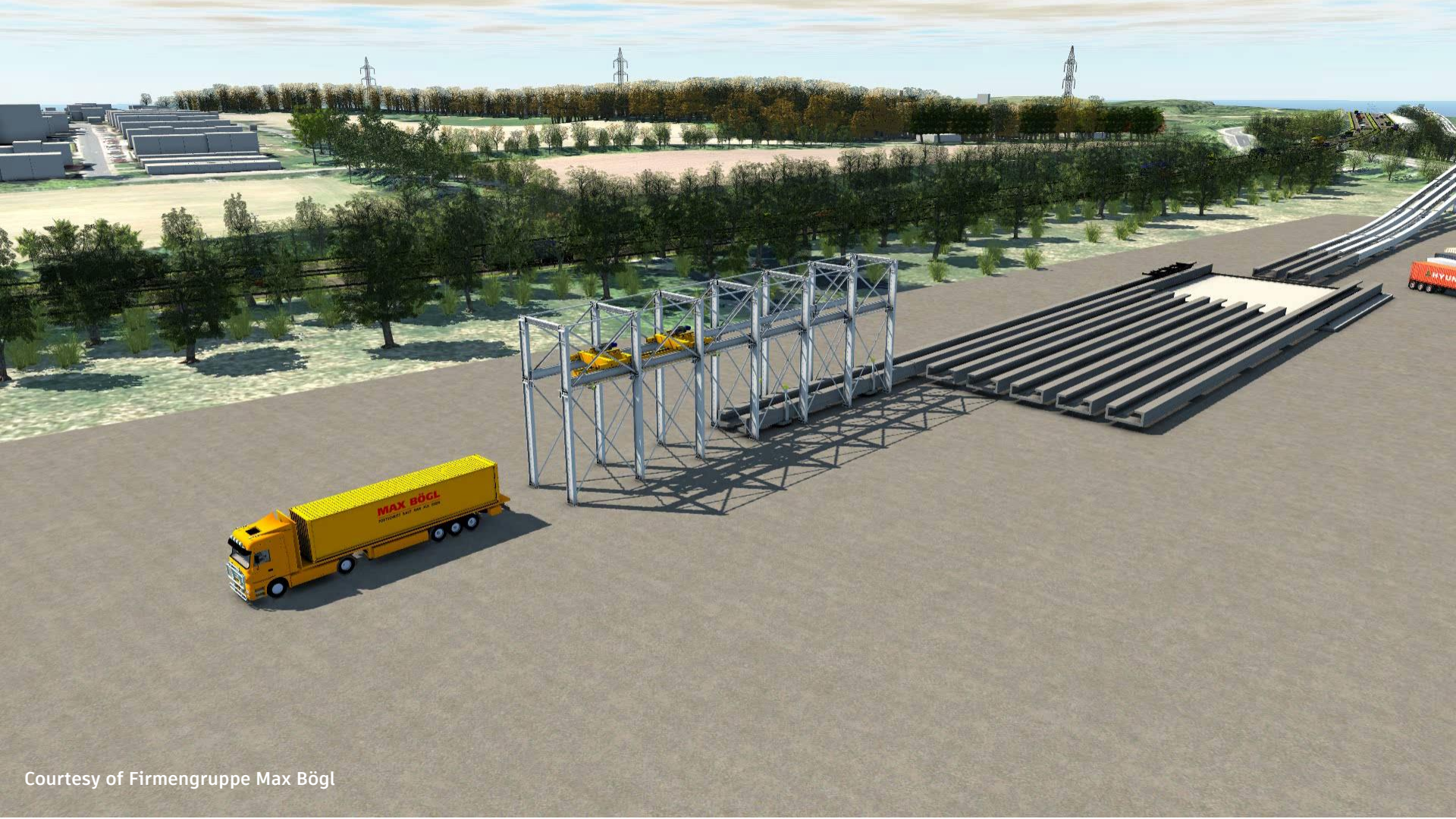


Animation Techniques in InfraWorks

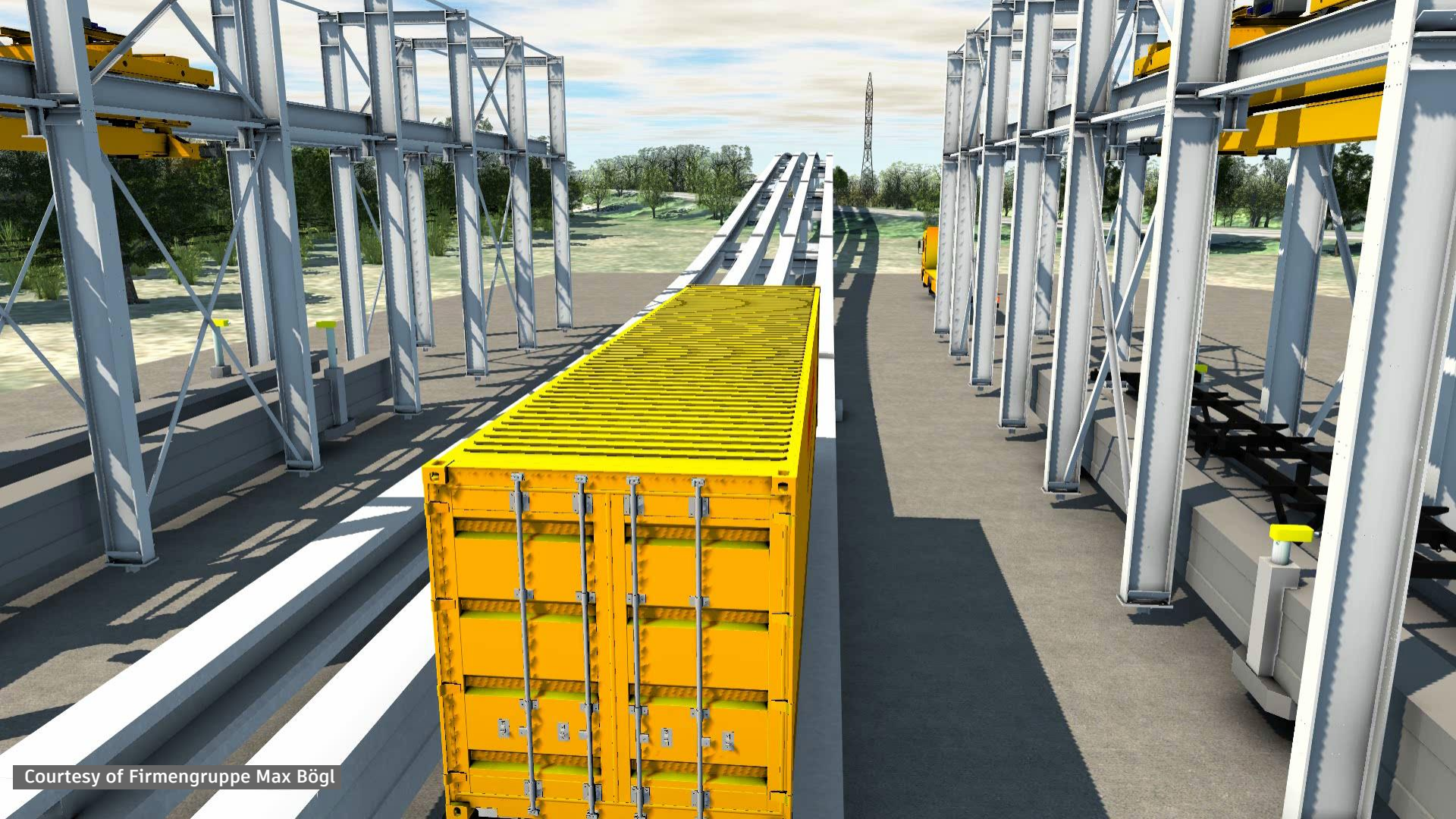
Animated objects and camera animation workflows in InfraWorks

- Automated animation
  - Quick result with Civil View
  - Good for large overview animations
- Manual animation
  - Requires more steps
  - Highly customizable
- Export / Import animated object
- Camera movement techniques in InfraWorks
  - Creating camera shots through Storyboard creator
  - Best practice to get best quality while rendering movie in InfraWorks



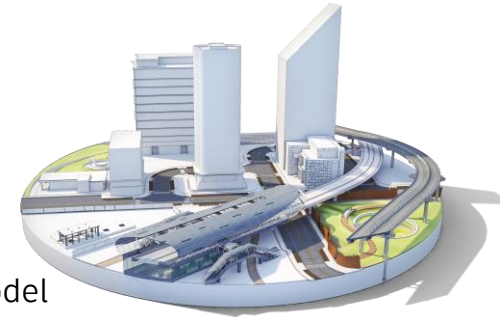


Courtesy of Firmengruppe Max Bögl



Courtesy of Firmengruppe Max Bögl

Higher Visual Quality



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Coordination Model

Gaming, VR and AR possibilities

3DS MAX®

High-end Visualization

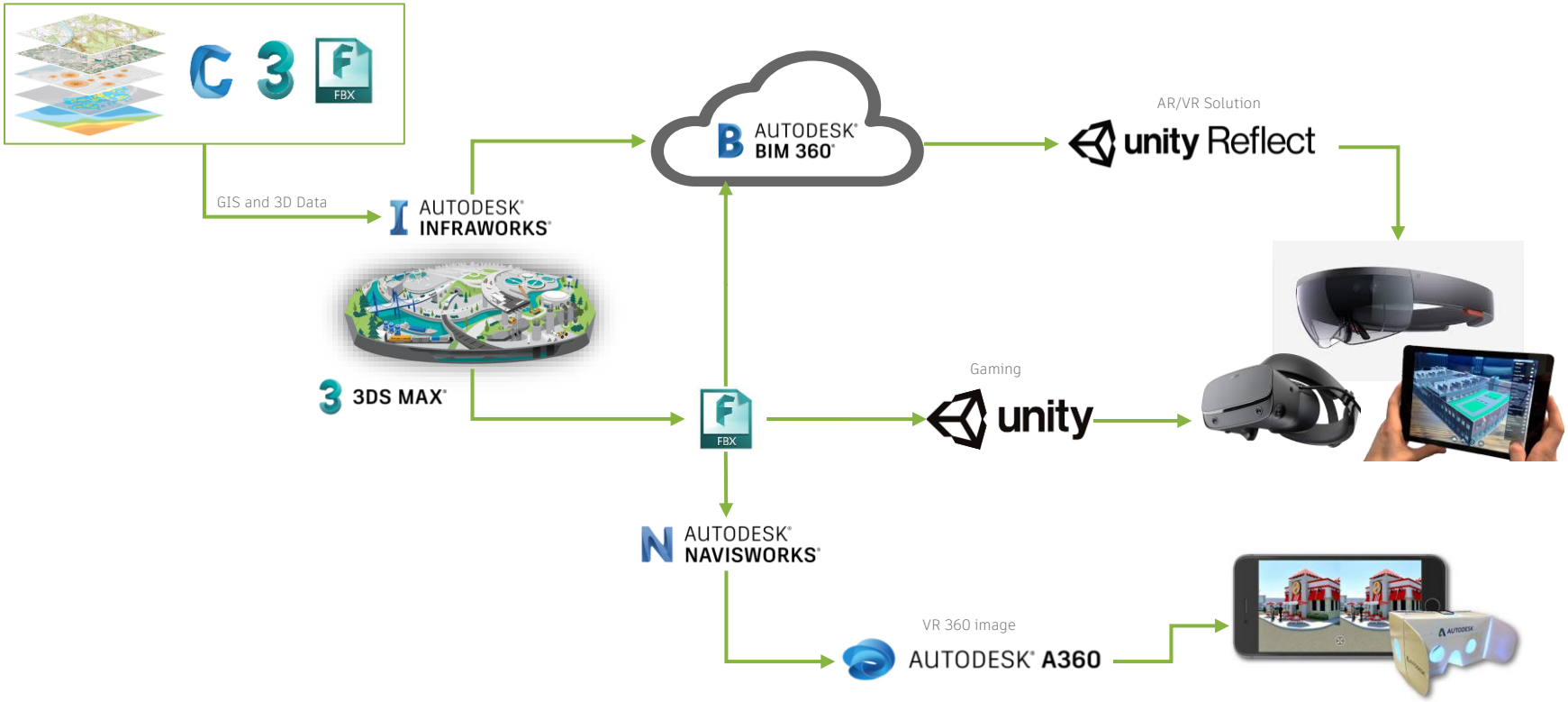
Higher Visual Quality

Techniques on how to increase LOD and create high end visualization

- Setup render scene in 3ds Max
  - Environment and effects
  - Render Setup
- Understanding materials
  - Base Color and Reflections
  - Transparency
  - Adding Textures
- Import InfraWorks model 3DsMax
  - Import as FBX
- Increase LOD
  - Adding new elements

VR / AR Integration

Quick way to generate more value by using InfraWorks and 3ds Max models



VR / AR integration

Live link to the BIM360 environment

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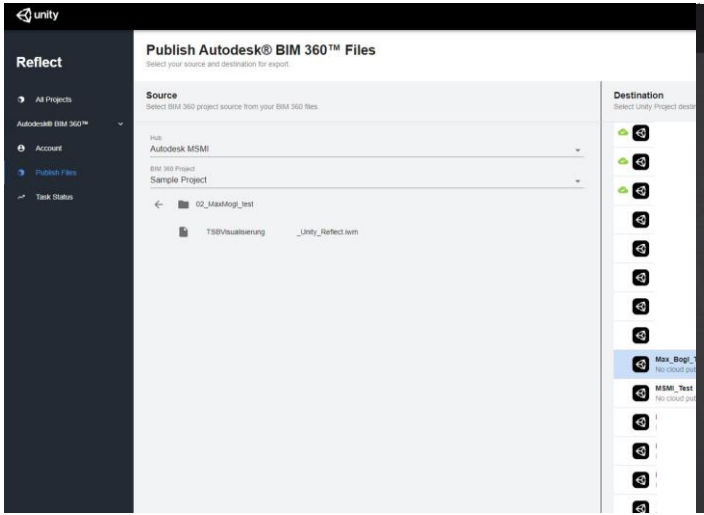
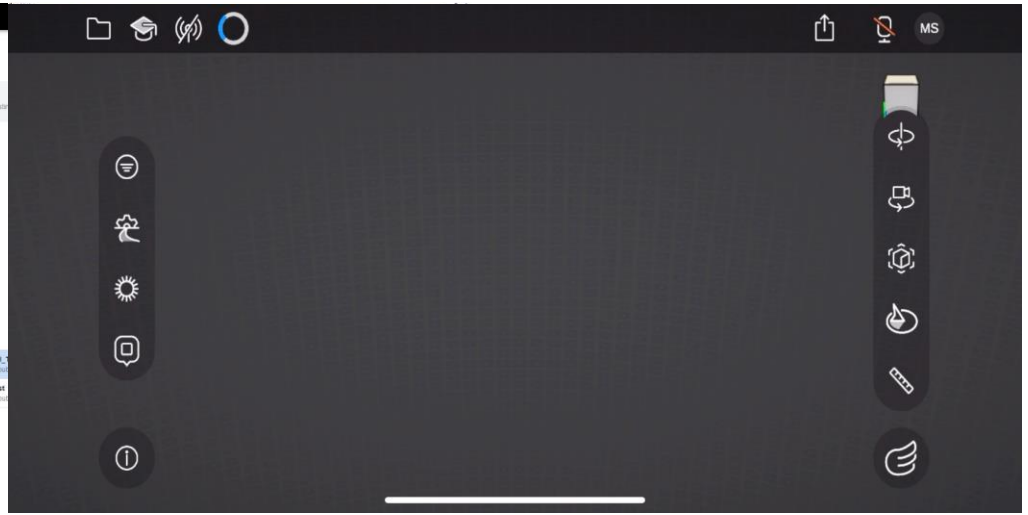
3DS MAX®

AUTODESK® BIM 360®

unity Reflect





Conclusion

Summary

- **Overview of Different levels of Visualization**
  - Early design visualization for the Existing condition model and the track design
  - Adding animated parts to the InfraWorks model to better communicate the system in action
  - Enhancing the visualization by adding more details and lighting effects to the model
  - Generate VR / AR solutions to provide interactive solutions

- **Re-use the same models** for different levels of Visualization

- **Desired level of Visualization guides** the required **level of detail** for the model generation and its components

Benefits of using advanced visualization techniques

- **Minimize** the **time** needed to explain a solution
- **Reduce** the potential **misinterpretation** when communicating a design
- Make use of animations to **explain technical details**
- **Attract bigger audience** by sharing more appealing visualizations on social media

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