ADVANCED DATA FLOWS AND VISUALIZATION THROUGH INFRAWORKS
MANTAS SMIDTAS
Technology Manager/ BIM Specialist

Working with innovation development and innovation integration into the Ramboll work process. Also leading for InfraWorks development team, working with data management and data flow, conceptualization and data visualization, also working in identification of value in innovative engineering opportunities or solutions. Chairing and driving innovation and digitalization workshops and meetings. I'm working with design reviews for both coordination and management parts. Working on production and management of the innovation program.
RAMBOLL IN BRIEF

• Independent engineering and design consultancy and provider of management consultancy
• Founded 1945 in Denmark
• 14,000 experts
• Close to 300 offices in 35 countries
• Particularly strong presence in the Nordics, the UK, North America, Continental Europe, Middle East and Asia Pacific
• EUR 1.4 billion revenue
• Owned by Ramboll Fonden
**GEOGRAPHICAL FOOTPRINT**

- **Germany:** 14 offices
- **Switzerland:** 1 office
- **Canada:** 3 offices
- **UAE:** 2 offices
- **India:** 10 offices
- **Denmark:** 13 offices
- **Norway:** 17 offices
- **Sweden:** 30 offices
- **UK:** 16 offices
- **US:** 45 offices
- **Qatar:** 1 office
- **Saudi Arabia:** 1 office
- **Spain:** 2 offices
- **France:** 4 offices
- **Finland:** 28 offices
- **Brazil:** 4 offices
- **Russia:** 1 office
- **Poland:** 3 offices
- **NL:** 2 offices
- **Belgium:** 3 offices
- **Italy:** 2 offices
- **Romania:** 1 office
- **Singapore:** 2 offices
- **South Africa:** 1 office
- **Malaysia:** 1 office
- **Mexico:** 1 office
- **Greenland:** 2 offices
- **Indonesia:** 1 office
- **China:** 4 offices
- **Cyprus:** 1 office
- **New Zealand:** 1 office
- **Australia:** 3 offices
- **Indonesia:** 1 office
### MARKETS

<table>
<thead>
<tr>
<th>BUILDINGS</th>
<th>TRANSPORT</th>
<th>WATER</th>
<th>ENVIRONMENT &amp; HEALTH</th>
<th>ENERGY</th>
<th>MANAGEMENT CONSULTING</th>
</tr>
</thead>
</table>

[Image of icons representing each market area]
ADVANCED DATA FLOWS AND VISUALIZATION THROUGH INFRAWORKS

• How to accelerate the transition to connected BIM for infrastructure with improved efficiency and project approvals through an end-to-end design approach using InfraWorks software as the aggregator and design data visualizer.

• We will walk through one of our road projects where I’ll try to demonstrate the data collection solutions we’re using in our daily data flow.

• What is our techniques and workflow include high-end existing modelling conditions, road design representations in InfraWorks combined with built-in road and bridge design tools, ArcGIS Data collection and presentation in InfraWorks, Ramboll Risk Management data representation in InfraWorks, BIM 360 as collaboration tool for InfraWorks, InfraWorks data flow for 3ds Max software or Forge in the future, advanced visualization—virtual reality (VR), augmented reality (AR)—and more.

• What is our leading practices using InfraWorks for data visualization and aggregation.
We Have The Tools

Concentration on PROBLEM
**DESIGN PHASE**

**VISUALIZATION**

**CONSTRUCTION PHASE**

**USE CASES**

**DESIGN REVIEW**

Visualize / Comment / Adjust / Share

**COMMUNICATION**

Client / Public

**DRAWINGS - DOCUMENTATION**

Client / Building Operations

**DESIGN DATA**

Various Types

- LAS
- LandXML
- IMX
- SDF
- SOSI
- DWG
- IFC
- FBX
- SHP
- OBJ
- RWT
- MAX

- CITYGML
- GEO DATA
- RASTER IMAGES
- ESRI DB
- Other....

**INFRAWORKS**

**BIM360**

Manage the entire project lifecycle with BIM 360

- Controlled Work-sharing
- Deliverable Coordination
- Design Review
- BIM Coordination
- Change Visualization
- Quality Management
- Construction Safety
- Issue Management
- RFIs Submittals

**CONSTRUCTION PHASE**

**DRAWINGS - DOCUMENTATION**

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**3DS MAX**
- Output ENGINE
  - 3DsMax interactive
  - Fuzor, Unity, Unreal

**Photo realistic imagery and movie**
- Tell the project Story

**InfraWorks**
- Real-time visualization
- VR/AR experience
EXISTING TERRAIN
EXISTING TERRAIN

- DTM Countours
- Lidar DATA
  - Raster Formats
    - LandXML / IMX / ASC

Existing Terrain
- INFRAWORKS
EXISTING TERRAIN
EXISTING TERRAIN
ARCGIS TOOL IN INFRAWORKS

BEFORE

DTM data (water contours)

*.*dgn or *.*dwg

DTM data (islands contours)

*.*dgn or *.*dwg

FME

*.*sdf

Infraworks

NOW

ArcGIS

IW ArcGIS tool

INFRAWORKS
ARCGIS TOOL IN INFRAWORKS
ARCGIS IN INFRAWORKS
EXISTING TREES

Lidar DATA

Tree Classification
*.dgn

FME tree type Classification
*.shp

INFRAWORKS
EXISTING TREES
EXISTING TREES
TREES CLASSIFICATION
IMPORT EXISTING TREES IN INFRAWORKS
EXISTING STRUCTURES
Earth Curvature Calculator

Accurately calculate the curvature you are supposed to see on the ball Earth.

Distance: 10 km

0.00785 km = 7.85 meters

<table>
<thead>
<tr>
<th>Distance</th>
<th>Curvature</th>
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<tbody>
<tr>
<td>1 km</td>
<td>0.00008 km - 0.08 meters</td>
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<tr>
<td>2 km</td>
<td>0.00031 km - 0.31 meters</td>
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<tr>
<td>5 km</td>
<td>0.00196 km - 1.96 meters</td>
</tr>
<tr>
<td>10 km</td>
<td>0.00785 km - 7.85 meters</td>
</tr>
</tbody>
</table>

Explanation:

The Earth’s radius (r) is 6,371 km or 3,959 miles, based on numbers from Wikipedia, which gives a circumference (c) of c = 2 * π * r = 40,030 km.

We wish to find the height (d), which is the drop in curvature over the distance (d).

Using the circumference we find that 1 kilometer has the angle 360° / 40,030 km = 0.009°. The angle (a) is then a = 0.009° * distance (d).

The derived formula h = r * (1 - cos a), is accurate for any distance (d).
EXISTING BUILDINGS

FBK Data

Lidar DATA

3D Model

*.dwg / *.3Ds

FME

*.CityGML

FME

*.IMX

INFRAWORKS
STRUCTURE

Data Collection in INFRAWORKS

Existing Dataset

New Design

Terrain

Ortho Photo

Existing Roads

Existing Buildings

Existing Trees

Other existing DTM

New terrain data

New roads

New tunnels

New railways

Other New design
NEW ROADS FROM THIRD PARTIES

- Road Model
  - *.LandXML
- Civil 3D Road Texture
  - *.Shp
- Civil 3D Road Geometry
  - *.IMX

INFRAWORKS
NEW ROADS FROM THIRD PARTIES
TEXTURE EXPORT
NEW ROAD GEOMETRY IN INFRAWORKS
MARKING LINE DATAFLOW

Marking lines as DWG, or SHP

Civil 3D

*.shp (Coverage)

INFRAWORKS
IMPORTING ANIMATED CARS

Road Model
LandXML / IMX

Civil 3D

*.vps3D

3DsMax

*.DEA (colada)

INFRAWORKS
RAMRISK TOOL IN INFRAWORKS

RAMRISK

Professional risk management tool, developed, hosted and fully supported by Ramboll
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<tr>
<th>Id</th>
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<th>Level</th>
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<td>Bremsbare materialer/Bygninger og fernkiler</td>
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<td>29</td>
<td>Trykk og maskiner</td>
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<td>Redskap material (ned eller uten montert) tilføringer ut av spor 6 når sporpesyre linger av</td>
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<td>Lofsfør, feilhvaerker, treningskilde på veien i spor 6 og kolliderer med hævet material</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
RAMRISK IN INFRAWORKS
VR/AR POSSIBILITIES IN INFRAWORKS

INFRAWORKS

*.fbx

3DsMax Interactive

Other Game engines

VR/AR model
VR/AR POSSIBILITIES IN INFRAWORKS
ROAD ALTERNATIVE TO THE WIND PARK
SMS MOSS RAILWAY PROJECT
WHY DO WE NEED THAT

ENGINEERING BENEFITS

• GIVES POSSIBILITY FOR A FASTER PARAMETRIC ROAD MODELING WITH MORE ACCURATE EXISTING SITUATION
• SIMPLIFIES THE WAY USER INTERACT WITH SPACES
• SIMPLIFIES COMMUNICATION BETWEEN DIFFERENT DISCIPLINES
• LEADS TO DESIGN OF ENGINEERING ASSEMBLY

COMMERCIAL BENEFITS

• FOR CLIENT FASTER DESIGN PROCESS MEANS LESS EXPENSES
• PARAMETRIC DESIGN PROCESS HELPS TO IDENTIFY AND ELIMINATE ERRORS IN EARLY FACE
• EARLY FACE OPERATIONS WITH LESS RECOURSE

OPERATIONAL BENEFITS

• EASY ACCESS TO THE DATA
• FULLY CONNECTED MANAGEMENT TEAM
• VR/AR SAFETY ANALYSIS OPTION
DESIGN PHASE

VISUALIZATION

CONSTRUCTION PHASE

USE CASES

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THANK YOU