ODOT's Future with 3D Models

Leveraging Custom Automation to Generate 3D Transportation Models
Information + Automation = Value
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Think of Information as Energy.

Potential In

Energy Transfers

Kinetic Out

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Information + Automation = Value

...use automation for transforming information to deliver value!

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Presentation Roadmap

Products Delivered
- Stakeholder Communication
- Models and Tools

Processes Demonstrated
- Proposed Roadway
- Existing Ground
- Existing Materials
- Existing Vegetation

Assets Maintained
- Learning from History
- ODOT’s Example
- Fundamental Platforms

Conclusions
- Change is Constant
- Use the Right Tools
- Interoperability is Foundational

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Stakeholder Communications:
Fly-Through Animation

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3D Models and Tools

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Information + Automation = Value

- Information
  - Available Data

- Automation
  - Accessible Tools

- Value
  - Output Data
3D Roadway Model

Available Data:

• Alignments (3D) [GEOPAK/InRoads]

• Cross Sections (2D) [MicroStation]
  • Source Attributes
3D Roadway Model

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3D Roadway Model

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3D Roadway Model

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3D Roadway Model

- 3D Alignments
- 2D XS Graphics
- Attributes
  - VBA “Trace”
  - 2D Graphics
  - MetaData
- VBA “Align”
- 3D Graphics
- MetaData
- VBA “Mesh”
- 3D Roadway Model

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3D Roadway Model

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3D Ground Model

Available Data:
- Project Terrain/Survey
- Public LiDAR/Imagery
  - OGRIP
  - USGS NED

Accessible Tools:
- GeoExpress CLUs (open-source)
- LAStools (open-source)
- ImageMagik (open-source)
- CreateDTMsForLandXML (custom VBA)
- CreateDTMsForTrees (custom VBA)
- MeshTriangulationFromPointFiles (custom VBA)
3D Ground Model

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3D Ground Model

3D Survey
3D LiDAR
MetaData

LAStools “las2txt”
LAStools “lasthin”

3D Data

InRoads
VBA “Mesh”

3D Graphics
3D Data

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3D Ground Model

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3D Ground Model

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3D Ground Model

```bash
REM "Converting Source LiDAR LAS Data to Reduced, Class-Filtered LAS Data"
lasthin -i OGRIP-Source.las -step 25 -keep_class 2 -o OGRIP-Class2_Step25.las -random
REM "Converting Reduced, Class-Filtered LAS Data to ASCII TXT Data"
las2txt -i OGRIP-Class2_Step25.las -parse xyz -sep comma
```

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3D Ground Model

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Imagery Material

Available Data:
- Public Imagery
  - OGRIP
  - USGS NED

Accessible Tools:
- MicroStation “Elevation Drape” Material
- GeoExpress CLUs (open-source)
- LAStools (open-source)
- ImageMagik (open-source)

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Imagery Material

http://www.christopheredwinjohnson.com/otec2015
Imagery Material

```
REM "Converting Source OGRIP SID Image to Reduced 4-Foot Pixel 'Near' JGP Image"
mrsidgeodecode -i OGRIP-Source.sid -o OGRIP-output_4ft.jpg -of jpg -wf -s 3
REM "Converting Source OGRIP SID Image to Reduced 8-Foot Pixel 'Mid' JGP Image"
mrsidgeodecode -i OGRIP-Source.sid -o OGRIP-output_8ft.jpg -of jpg -wf -s 4
REM "Converting Reduced 4-Foot Pixel 'Near' JGP Image to Cropped 'Near' Portion for Material"
convert OGRIP-output_4ft.jpg -crop 2500x2500+27500+23750 OGRIP-Output-Cropped_4ft.jpg
REM "Converting Reduced 8-Foot Pixel 'Mid' JGP Image to Cropped 'Mid' Portion for Material"
convert OGRIP-output_8ft.jpg -crop 2500x2500+12813+10938 OGRIP-Output-Cropped_8ft.jpg
```

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Imagery Material

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Imagery Material

2D Imagery

GeoExpress "mrsidgeodecode"

ImageMagik "convert"

2D Imagery

MicroStation

Material

3D Graphics

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Imagery Material

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Imagery Material

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3D Vegetation Model

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Unexpected Value

MetaData

• aka Attributes
• aka Object Property Handlers
• “Connected” directly to the Graphic Elements through native, application-supported functionality
  = clean, robust, flexible, stable

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Unexpected Value

Sent: Thursday, June 11, 2015 3:29 PM

Subject: RE: Bypass 3D video

I would like to make the following adjustments.

I need a budget number of hours from you to accomplish this.

3. Can we reduce the “tree” height by 25%?

— Project Manager
Unexpected Value
Unexpected Value
Unexpected Value

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Unexpected Value
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- **Conclusions**
  - Change is Constant
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Conclusions: Change is Constant. Use the Right Tools. Interoperability is Foundational.
The Asset Pipeline:
*Do You Treat Information Like Valuable Oil or Disposable Waste?*

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A Common Story

- Products Delivered
  - Comm.
  - Assets
- Processes Demonstrated
  - Roadway
  - Ground
  - Materials
  - Vegetation
- Assets Maintained
  - History
  - ODOT
  - Platforms
- Conclusions
  - Change
  - Right Tool
  - Interop.

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Not All Standards Are Equal

- Zoo Interchange

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April 17, 2015

101.1 Software

ODOT operates internally using MicroStation and GEOPAK CADD Software only.

**ODOT will accept electronic and printed deliverables generated from Autodesk tools.**

The design software to be used on a project shall be mutually agreed upon by the district and shall be explicitly stated in the project’s scope. Once the decision has been made to use MicroStation/GEOPAK or Autodesk, there shall be no deviation from the agreed upon design software. The same one shall be used until the project’s completion.

This document is specific to ODOT’s use of MicroStation and GEOPAK software. ODOT provides support, standards, documentation, or guidance of any kind with respect to design and delivery using Autodesk tools. All CADD related documentation, training, supporting files, and customization provided by ODOT shall be MicroStation/GEOPAK based only.

**Autodesk provides a Civil3D State Kit for use with Autodesk software. A link is provided on the ODOT website to download the State Kit at the following Web page:**

http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD_Services/Support/Pages/Links.aspx
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Conclusions

• The Only Constant is Change: Expect the Unexpected
• One-Size-Does-Not-Fit-All
• All Software is Not Created Equal
Custom Automation

...Use it to Fix Your Asset Pipeline Leaks

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Custom Automation

At Worst, It’s Like Duct Tape:

Quick and Easy One-Time Fixes

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Custom Automation

At Best, It’s Like Gold:

Reusable, Appreciating Assets Themselves

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Thank You

Leveraging Custom Automation to Generate 3D Transportation Models

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