AUTODESK UNIVERSITY

Underground Utility GIS Features to Civil 3D Pipe Networks with Dynamo

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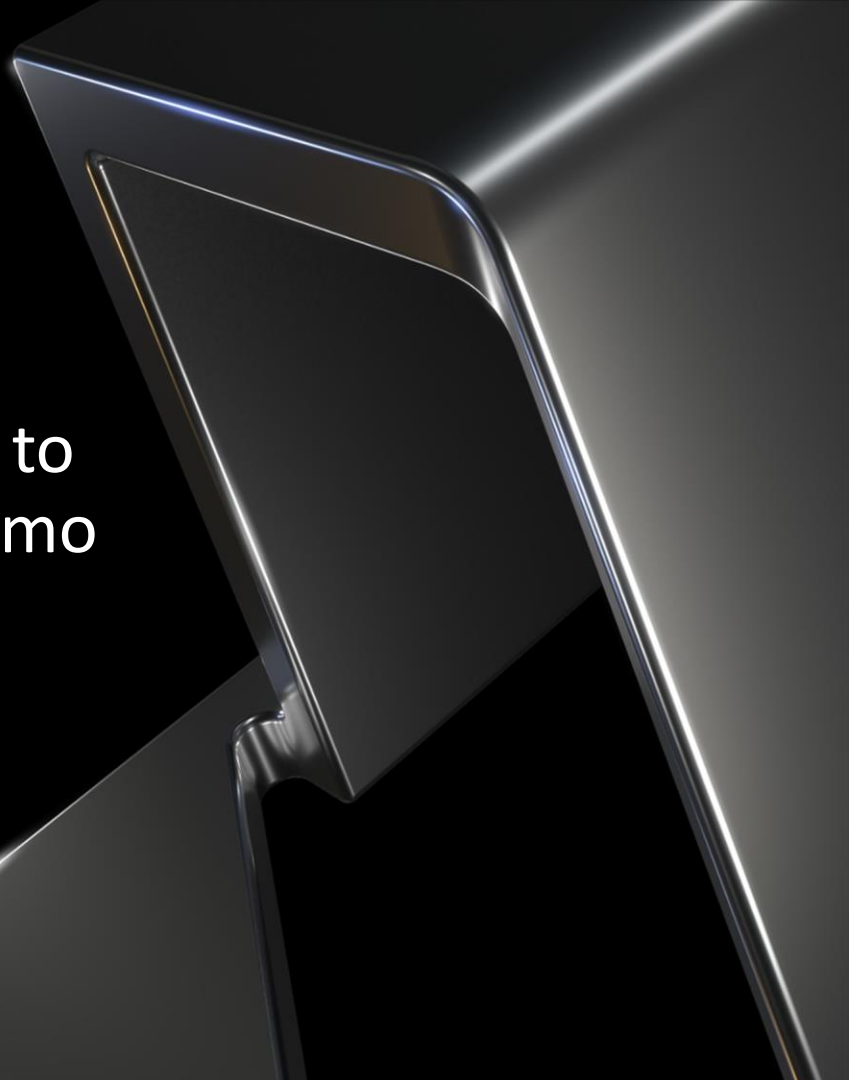
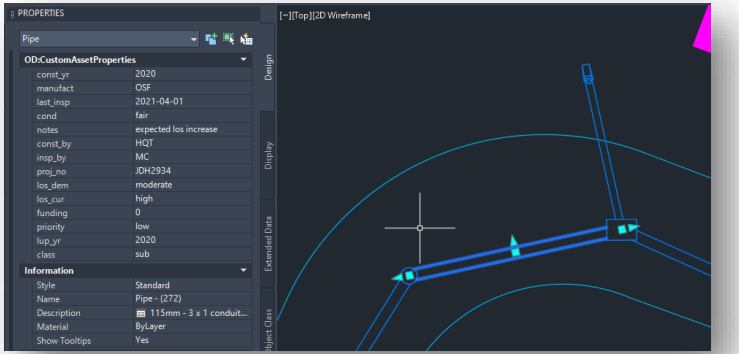


Overview

The Problem

Utility Design In Civil 3D

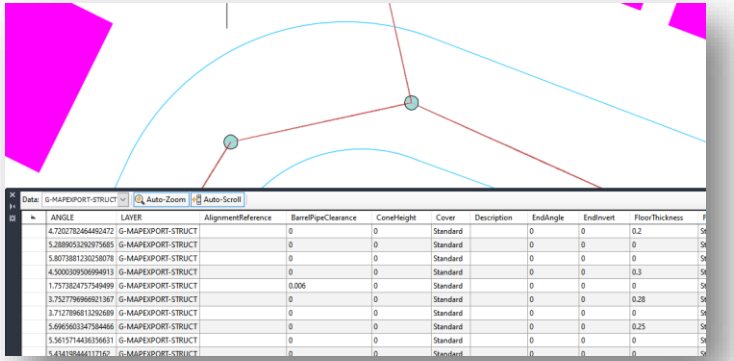


PIPE NETWORK

Pipes/Structures
Custom part catalog
Object data
Property sets

Barrier

GIS Utility Asset Inventory



MAP FEATURES

Line/Point Geometry
Data table

Overview

Why Dynamo?

Available Solutions

PRE-MADE	VISUAL SCRIPTING	CUSTOM CODING
Export to SDF ArcGIS connector	Dynamo for Civil 3D FME	Lisp VBA .NET

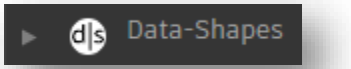
More customizable

Easier setup & maintenance

Overview

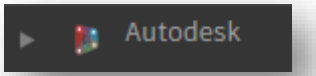
Packages Used

Packages



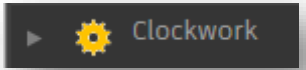
DATA-SHAPES
Mostafa El Ayoubi

UI



CIVIL 3D TOOLKIT
Paolo Serra/Safi Hage

Pipe network
GIS features
OD tables



CLOCKWORK
Andydandy

Passthrough
Lap time

Overview

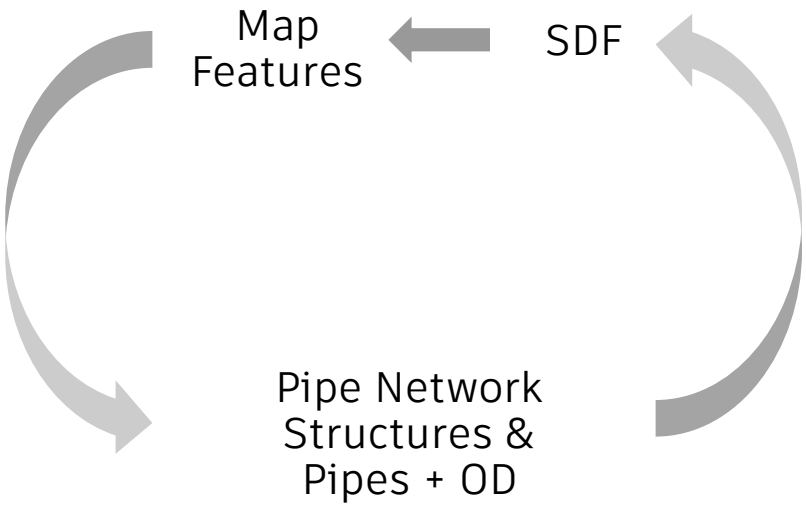
Agenda

GIS -> C3D (Jae)

- Feature layer -> pipe network
- table data -> object data table records

C3D -> GIS (Max)

- Pipe network -> lines/blocks
- Property set -> OD (within pipes/structures)
- Pipe network OD -> line/block OD
- Mapexport to SDF



Overview

Content

Data, Handout and Presentation

- All graphs will be made available
- Additional details in handout
- Presentation: a high level overview
- Comments and tips please!

GIS to Civil 3D

GIS to Civil 3D

SETUP

Map 3D Layer

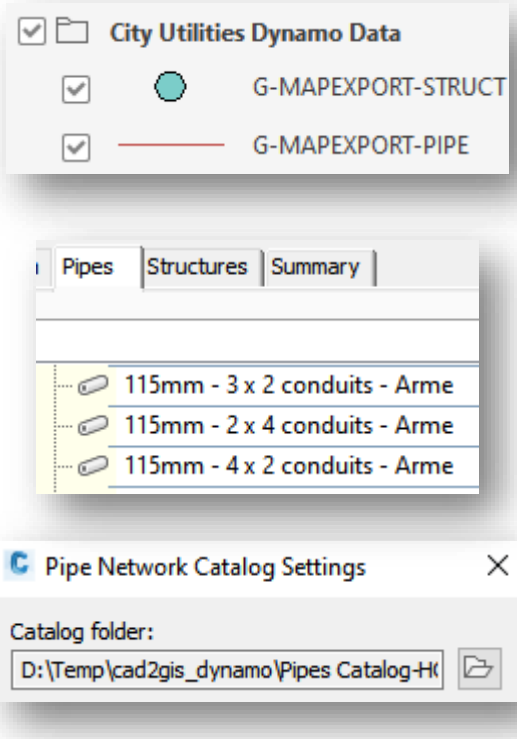
- Connect to GIS data source and add as feature layers
- Source can be SHP, SDF, WFS, etc.

Parts List

- Load all family and sizes required

Part Catalog

- Determines “part size name” – important for assigning correct part



GIS to Civil 3D

Schema Considerations

```
num13 = Structure.RimElevation(t1);
num14 = Structure.RimToSumpHeight(t1);
num17 = Structure.Rotation(t1);
str8 = Structure.Shape(t1);
num10 = Structure.Station(t1);
num16 = Structure.SumpDepth(t1);
num20 = Structure.SumpElevation(t1);
```

RimElevation	RimToSumpHeight	Rotation
160.11	1.75	4.7202782464492472
160.15284187406732	1.835	5.2889053292975685
160.81847603014248	1.835	5.8073881230258069
160.85307051445494	2.6	4.5000309506994913

aec_stru01	aec_stru02	aec_stru03	aec_stru04
163.491	<Null>	0	159.98031391888856
162.7703386986262	<Null>	0	160.11548429653047
162.11284370035472	<Null>	0	160.12420069677754
162	<Null>	0	160.47358307475224

NEW SCHEMA

- In our case, using new property names
- Simply used ones used by nodes
- Same names consistently used in both conversion directions

IMPORTING EXISTING DATA

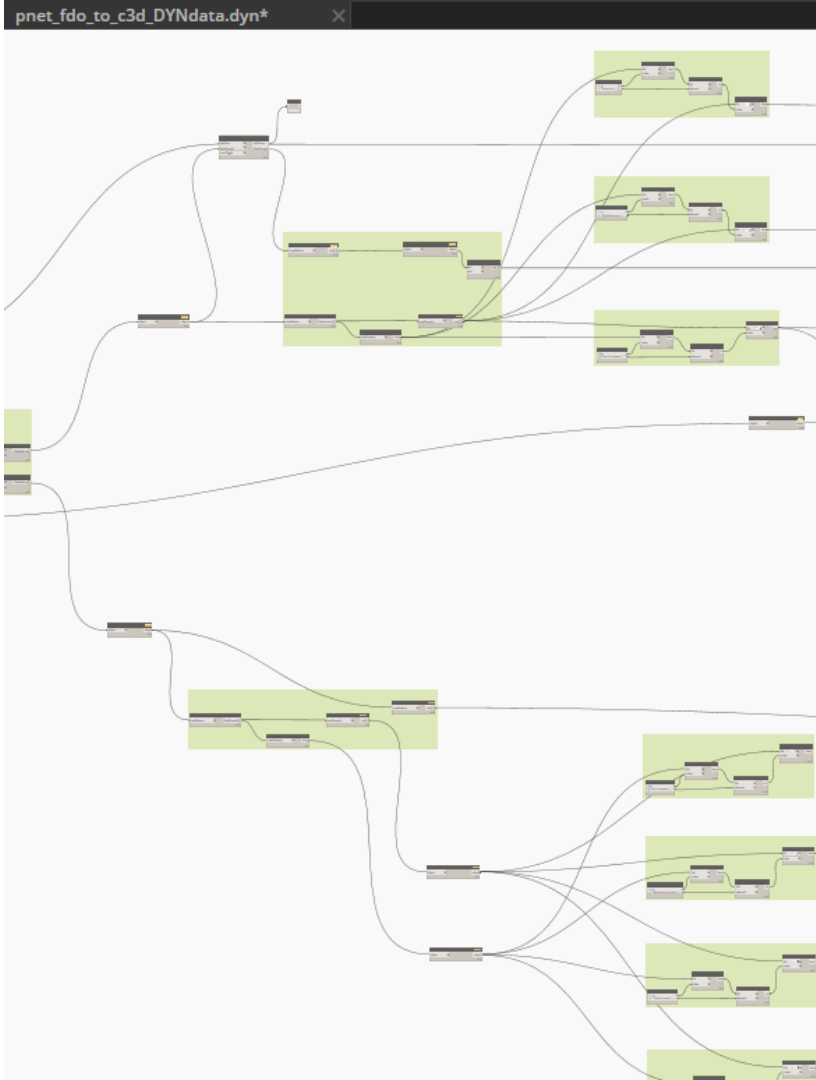
- Existing data in GIS file has a set of (poor) property names
- An import graph that translates to new property names

GIS to Civil 3D

Graph: FDO_TO_C3D

Graph Details

- Get inputs (data-shapes)
- Get map layers
- Get features (filter text)
- Get geometry/properties
- Get part size names
- Find family based on PSN (FN node not avail)
- Get part size from the names
- Create struct/pipe, add properties
- Connect pipes to structure

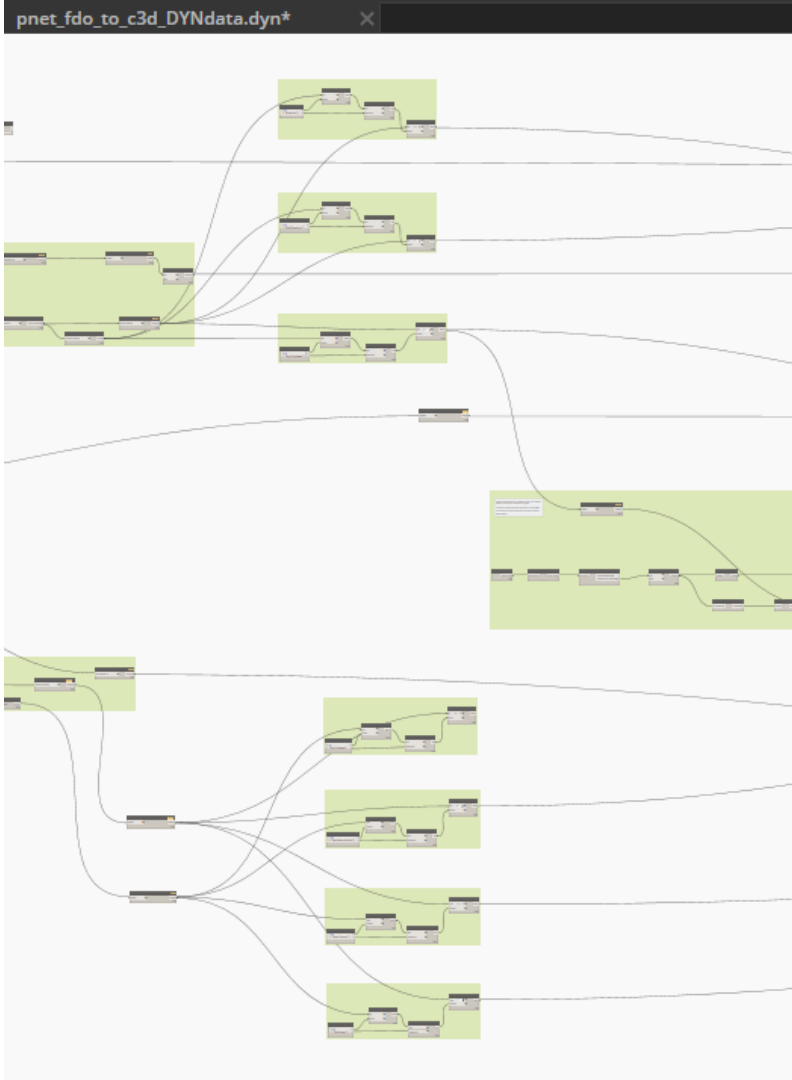


FDO Data - C3D Data

Graph: FDOData_TO_C3DData

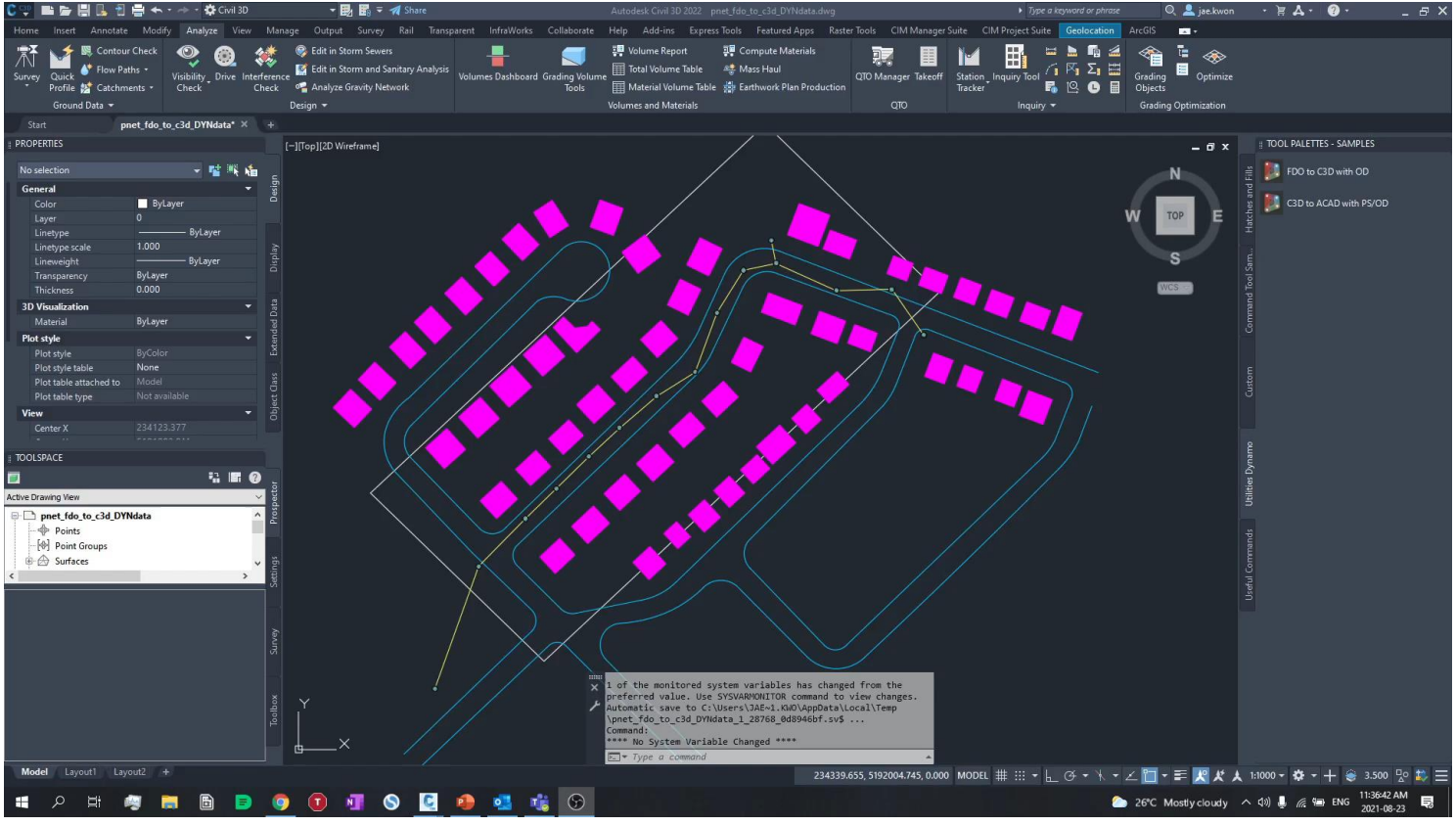
Graph Details

- Transfer additional data from features
- Fields stored in external file (json, csv, etc.)
- Define OD table from external file
- For each pipe/structure, add OD record to table
- Transfer values (map features->pipes/structures)



FDO Data - C3D Data

Both scripts run in a chain from tool palettes



Civil 3D to GIS

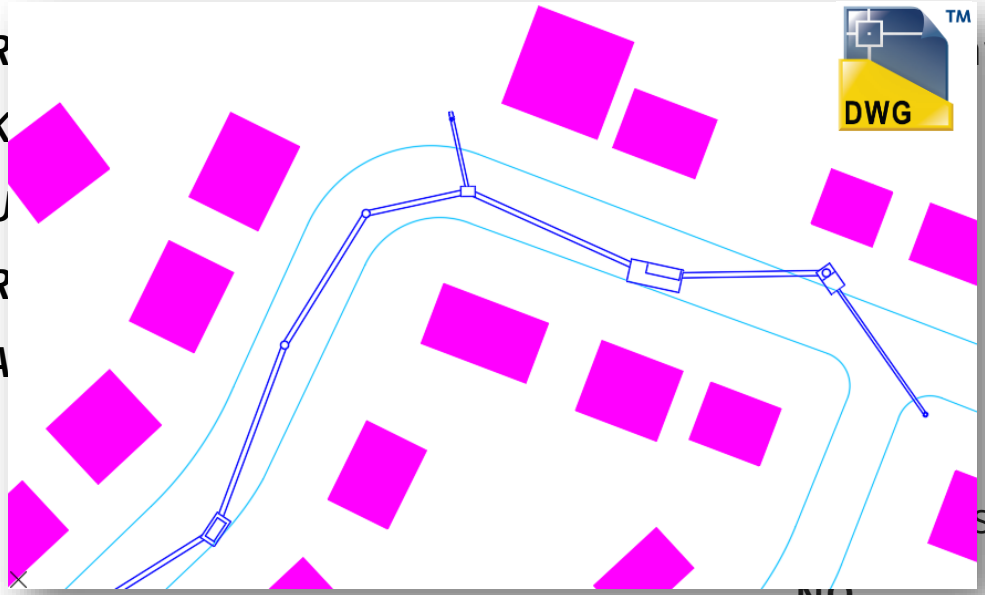
Part 2 - From Civil 3D to GIS

The journey back to a GIS database

Objective: Transfer back our final design or as-built DWG plan to a GIS database.

Actions to be done in the GIS database:

- ***R***
- ***K***
- ***U***
- ***R***
- ***A***



y metadata attached to it.

ss entirely?

NO

Part 2 - From Civil 3D to GIS

The limitations of Dynamo

Regarding Map 3D's FDO connector, **Dynamo can**:

- ✓ Read map features from a database
- ✓ Modify existing map features

It cannot:

- ✗ Create new map features
- ✗ Erase existing map features

Result: We need a workaround procedure that is "GIS approved"

Is it problematic?

Not at all!

Part 2 - From Civil 3D to GIS

What CAN be done with Dynamo for GIS users

Fact: Most GIS database administrators will implement data validations routines prior to add/erase/modify actions on their database, especially in a batch process.

Priority of GIS admins: Keep the GIS database standardized and the information in it relevant.

What can Dynamo provide to them:

- Transform Civil 3D objects to more "GIS friendly" AutoCAD objects
- Store all data needed to eventually recreate a Civil 3D pipe network
- Store any custom/additional metadata relevant to our utilities

New objective:

Create GIS-ready AutoCAD entities

Conclusion

Our objectives:

- Show you the new connectivity between *GIS* and *Civil 3D* through *Dynamo* scripts, using complex Civil 3D objects like pipe networks.
- Open the conversation to multiply those applications, through *Dynamo for Civil 3D*.

What else could we accomplish with ***Dynamo for Civil 3D***?

- Back-and-forth with surveyed points stored on a GIS database
- Adapt a similar workflow to pressure pipe networks, existing road feature lines, existing land lot parcels, existing roads centerlines as alignments and profile lines.
- Custom Quantity Take-Off reports

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