Finishing Tool Suite v9.8.7

by Nat Cagle

An ArcGIS toolbox containing a suite of script tools
designed to automate many of the data preparation and
repair steps necessary for the Finishing process.

Contents

About The Project

DO NOT TRY TO RUN THIS ON SDE!!!

This is a suite of tools designed to automate some of the data preprocessing, preparation, conditioning, repair, geoprocessing, and analysis workflows that are used regularly in Finishing. It is necessary to prepare a local geodatabase before running GAIT or Attribution Oversight. The tools drastically reduce the amount of GAIT and AO errors that would occur in an unprocessed geodatabase. The repairs done by the tools can reduce GAIT errors up to 40-50% and AO errors up to 80%.

All tools run sequentially on each feature class that contains features in the dataset.

The standard Finishing process is checked by default.

Finishing Tool Suite v9.8.7   —   □   ✕

● TDS   (The standard Finishing process is checked by default)

[   ] 📂

For Top-Secret Finishing Version, what is the name of our leader? (optional)

[   ]

Scale to run tools: ZI026_CTUU >=

[50000   ⌄]

Partition Cores for Integration

[9   ⌄]

Options (optional)

☐ Use 25k_LOC feature classes only
☑ Disable Editor Tracking
☐ Skip Buildings

[Select All]   [Unselect All]   [Add Value]

⌃ 1 Finishing Tools

Finishing (optional)

☑ Repair All NULL Geometries
☑ Populate F_Codes
☑ Calculate Default Values
☑ Calculate Metrics
☑ Update UFI Values
☑ Integrate Hydrography Features
☑ Integrate Transportation Features
☑ Integrate Utility Features
☐ Default Bridge/Tunnel WID Updater
☐ Default Pylon HGT Updater
☐ Default Dam WOC Updater
☑ Hypernova Burst Multipart Features
☑ Delete Identical Features

[Select All]   [Unselect All]   [Add Value]

⌃ 2 Preprocessing Tools

Preprocessing (optional)

☐ All Bridge/Tunnel WID Updater
☐ All Pylon HGT Updater
☐ All Dam WOC Updater
☐ Building in BUA Scaler
☐ Database Feature Report
☐ Source Analysis Report

[Select All]   [Unselect All]   [Add Value]

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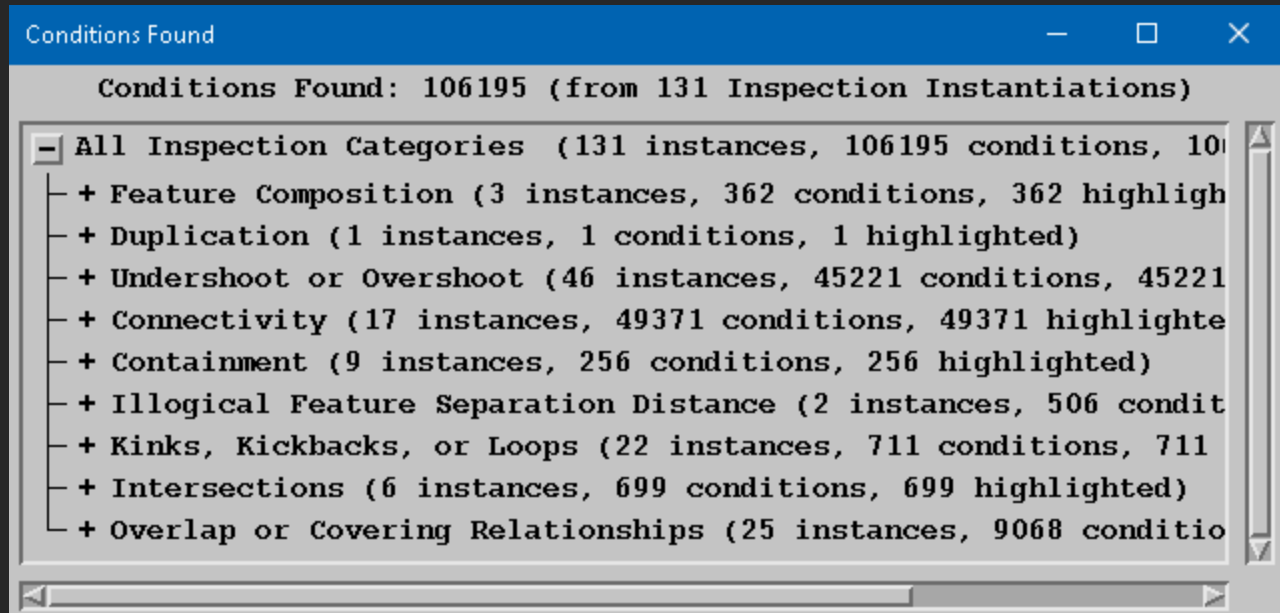
DO NOT TRY TO RUN THIS ON SDE!!!

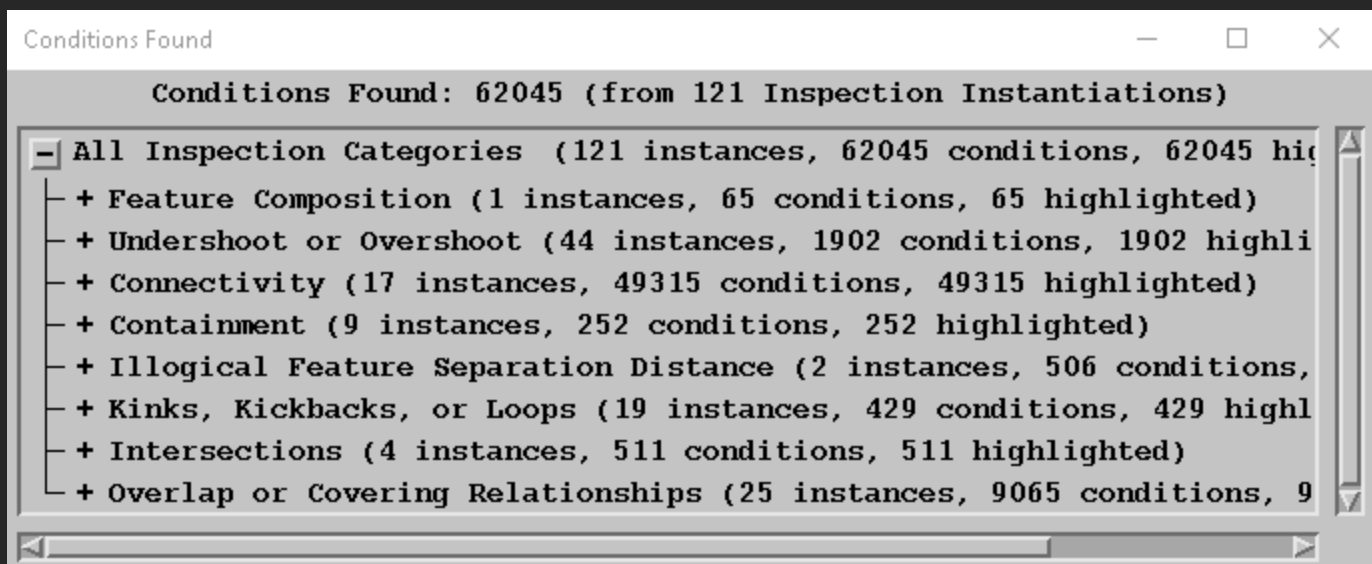[OK]   [Cancel]   [Environments...]   [<< Hide Help]   [Tool Help]

GAIT results **without** the Finishing Tool Suite:

```
Conditions Found                                        —    □    ✕

       Conditions Found: 106195 (from 131 Inspection Instantiations)

  ⊟ All Inspection Categories  (131 instances, 106195 conditions, 10
    + Feature Composition (3 instances, 362 conditions, 362 highligh
    + Duplication (1 instances, 1 conditions, 1 highlighted)
    + Undershoot or Overshoot (46 instances, 45221 conditions, 45221
    + Connectivity (17 instances, 49371 conditions, 49371 highlighte
    + Containment (9 instances, 256 conditions, 256 highlighted)
    + Illogical Feature Separation Distance (2 instances, 506 condit
    + Kinks, Kickbacks, or Loops (22 instances, 711 conditions, 711
    + Intersections (6 instances, 699 conditions, 699 highlighted)
    + Overlap or Covering Relationships (25 instances, 9068 conditio
```

GAIT results **with** the Finishing Tool Suite:

```
Conditions Found                                        —    □    ✕

       Conditions Found: 62045 (from 121 Inspection Instantiations)

  ⊟ All Inspection Categories  (121 instances, 62045 conditions, 62045 hi
    + Feature Composition (1 instances, 65 conditions, 65 highlighted)
    + Undershoot or Overshoot (44 instances, 1902 conditions, 1902 highli
    + Connectivity (17 instances, 49315 conditions, 49315 highlighted)
    + Containment (9 instances, 252 conditions, 252 highlighted)
    + Illogical Feature Separation Distance (2 instances, 506 conditions,
    + Kinks, Kickbacks, or Loops (19 instances, 429 conditions, 429 highl
    + Intersections (4 instances, 511 conditions, 511 highlighted)
    + Overlap or Covering Relationships (25 instances, 9065 conditions, 9
```

#	Condition Error	Before	After	Difference	Improvement
1	Part Of Multi-part Point	0	0		
2	Part Of Multi-part Line	28	0	-28	100%
3	Part Of Multi-part Area	269	0	-269	100%
4	Sliver Area	65	65		
5	Duplicate Vertices	0	0		
6	Complete Duplicates	1	0	-1	100%
7	Any Two Features With The Same Identifier	0	0		
8	Area - Area Undershoot (Gap)	717	717		
9	Area - Area Overshoot (Sliver)	455	455		
10	Line - Line Undershoot	27110	426	-26684	98%
11	Line - Line Overshoot	16603	98	-16505	99%
12	Line - Area Perimeter Undershoot	74	11	-63	85%
13	Interior Line Vertex - Line Undershoot	194	187	-7	4%
14	Interior Line Vertex - Line Overshoot	10	6	-4	40%
15	Line - Area Perimeter Overshoot	58	2	-56	97%
16	Line Not Cut At Coincidence With Another Line End Node	2268	2213	-55	2%
17	Line Feature Merge Failure - 1/4 Degree Boundaries Excluded	46816	46815	-1	0%
18	Area Feature Merge Failure - 1/4 Degree Boundaries Excluded	5	5		
19	Feature Connectivity Failure	282	282		
20	Point Inside Or On Area Perimeter	201	201		
21	Area Not Containing Any Part Of Another Feature	0	0		
22	Line Inside Area	46	42	-4	9%
23	Line End Node Inside Area	9	9		
24	Point To Feature Coincidence Failure	326	326		
25	Point - Feature Intersection Coincidence Failure	180	180		
26	Line Kink	290	10	-280	97%
27	'Z' Shaped Line Kink	2	2		
28	Line Kink (Single Feature)	48	47	-1	2%
29	Line Feature Join Kink	32	30	-2	6%
30	Line Kickback	3	4	1	33%
31	Loop (Self-intersecting Area Or Line Feature)	26	26		
32	Area Kink Or Kickback	310	310		
33	Feature - Feature Intersection Not At Connecting Node	188	0	-188	100%
34	Line - Line Intersection With Exception	511	511		
35	Line Not Covered By Area Or Line	126	127	1	1%
36	Two Lines Overlap (Coincident Segments)	7572	7568	-4	0%
37	Illegal Shared Face	1370	1370		
	TOTAL	106195	62045	-44150	42%

Prerequisites

- ArcMap Desktop 10.5+
- Python 2.7

Tool Features

Roadmap

☐ Input TDS Dataset
☐ Top-Secret Finishing Version
☐ Scale to run tools
☐ Partition Cores for Integration
☐ Options
      ☐ Use 25k_LOC feature classes only
      ☐ Disable Editor Tracking
      ☐ Skip Buildings
☐ Finishing Tools
      ☐ Repair All NULL Geometries
      ☐ Populate F_Codes
      ☐ Calculate Default Values
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      ☐ Update UFI Values
      ☐ Integrate Hydrography Features
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      ☐ Database Feature Report
      ☐ Source Analysis Report

Usage

TDS

> Add the TDS dataset here. The tools all use this main path.

Top-Secret Finishing Version

> ¯_(ツ)_/¯

Scale to run tools

> Using the dropdown menu, choose the scale of data that will be processed by the tools. This will be used for querying data.
>
> ZI026_CTUU >= SCALE

Partition Cores for Integration

> The number of partitions that will be used to subdivide the Transportation, Hydrography, and Utility features during the Integration process. This allows for large scale geoprocessing on limited computer resources.
>
> Use more partition cores for larger datasets.

Use 25k_LOC feature classes only
Options

> With this option checked, tools will only run on the specific 25k_LOC features.

Disable Editor Tracking
Options

> This disables Editor Tracking on all feature classes in the dataset. If Editor Tracking is not disabled, the current user will be marked as Last Edited on any features the tools edit.
>
> ~Note~ This can be skipped for interim runs, but it needs to be checked for final finishing.

Skip Buildings
Options

> This will automatically skip the StructureSrf and StructurePnt feature classes for all tools. This option exists because the databases we work on can have upwards of 10-20 million Building features. Our computers cannot handle this.

Repair All NULL Geometries
Finishing

Runs Repair Geometry and deletes features with NULL geometries.

Populate F_Codes
Finishing

Identifies features with mismatched F_Code/FCSubtype pairs and updates the F_Codes to match the FCSubtypes.

Original code by John Jackson. Refactored by Nat Cagle.

Calculate Default Values
Finishing

Identifies text and numeric feature class fields with NULL values. Populates the NULL fields with their schema defined default values.

Calculate Metrics
Finishing

Updates the spatial calculation of Length (LZN) fields for polyline features and Area (ARA) fields for polygons.

Update UFI Values
Finishing

Populates Unique Feature Identifier (UFI) fields containing NULL values. Finds and updates feature subtypes with duplicate UFI values within a given feature class. Identifies illegal UFI values that are not 36 alphanumeric characters with a format of {12345678-1234-1234-1234-123456789012}.

Note: Duplicate UFI values across multiple feature classes cannot be identified. To avoid this occurrence, analysts must not copy attributes between feature classes.

Note: Manually entered, legal UFI values that meet the formatting requirements will not be flagged. This means that the following UFI values are technically valid:

LEONARDO-EATS-FROG-EGGS-DISGUSTINGLY

Integrate Hydrography Features **
Finishing

Selects all Hydrography point, line, and polygon features with CTUU greater than or equal to the user defined scale. Repairs the geometry of the line and polygon features first. Runs the new integration process on each data partition. Repairs the geometry of the line and polygon features after processing. Clears the cached memory of selected features.

Integrate Transportation Features **
Finishing

Selects all Transportation point, line, and polygon features with CTUU greater than or equal to the user defined scale. Repairs the geometry of the line and polygon features first. Runs the

new integration process on each data partition. Repairs the geometry of the line and polygon features after processing. Clears the cached memory of selected features.

Integrate Utility Features **
Finishing

Selects all Pylon points, Cable lines, and Utility polygon features with CTUU greater than or equal to the user defined scale. Repairs the geometry of the line and polygon features first. Runs the new integration process on each data partition. Repairs the geometry of the line and polygon features after processing. Clears the cached memory of selected features.

** *Updated Integration Process*

The amount and complexity of features in our databases prevents normal processing due to insufficient computer resources. To combat this, the integration tools partition the features into smaller chunks to allow for processing. The integration process has been updated, and for each data partition, the new integration sequence is performed in descending order of geometric hierarchy.
The new logic works backwards through the geometry hierarchy to minimize feature shift or disjoint. Lines->Surfaces then Points->Lines.
    - Incorporated incremental snapping with 0.05m tolerance.
    - Snap lines to the nearest surface vertex within 0.05m.
    - Snap remaining lines to the nearest surface edge within 0.05m.
    - Integrate lines->surfaces with default domain tolerance (ESRI recommended) to create intersection vertices without morphing the features.
    - Snap points to the nearest line end node within 0.05m as priority over other vertices.
    - Snap remaining points to the nearest line vertex within 0.05m.
    - Snap remaining points to the nearest line edge within 0.05m.
    - Integrate points->lines with default domain tolerance (ESRI recommended) to create intersection vertices without morphing the features.

Default Bridge/Tunnel WID Updater
Finishing

Identifies Bridge and Tunnel lines with default (-999999) Width ONLY. Calculates the Bridge/Tunnel WID value based on coincident Transportation features and updates mismatched CTUU values. Transportation features include Roads, Railways, Railway Sidetracks, and Cart Tracks.

Default Pylon HGT Updater
Finishing

Identifies Pylons with default (-999999) Height ONLY. Updates the Pylon HGT value to match the intersecting Cable HGT value and updates mismatched CTUU values.

Default Dam WOC Updater
Finishing

Identifies Dam polygons with default (-999999) Width of Crest ONLY. Calculates the Dam WOC value based on the Lane Count or Gauge Width of any intersecting Transportation features and updates the Transportation System (TRS). Applies a standard value if the Dam

does not intersect any Transportation features. Transportation features include Roads, Cart Tracks, Railways, and Railway Sidetracks.

Original code by John Jackson. Refactored and updated by Nat Cagle.

Hypernova Burst Multipart Features
Finishing

Identifies all true multipart features within each feature class and explodes all the parts while maintaining original attribution.

Delete Identical Features
Finishing

Identifies features with identical geometry and PSG attribution and removes any duplicate features.

All Bridge/Tunnel WID Updater
Preprocessing

Identifies ALL Bridge and Tunnel lines with Width less than or equal to that of their coincident Transportation feature. Calculates a new Bridge/Tunnel WID value based on the coincident Transportation features and updates mismatched CTUU values. Transportation features include Roads, Cart Tracks, Railways, and Railway Sidetracks.

All Pylon HGT Updater
Preprocessing

Identifies ALL Pylons with Height less than or equal to that of their intersecting Cable. Updates the Pylon HGT value to match the intersecting Cable HGT value and updates mismatched CTUU values.

All Dam WOC Updater
Preprocessing

Identifies ALL Dam polygons with Width of Crest less than or equal to that of any intersecting Transportation features. Calculates a new Dam WOC value based on the Lane Count or Gauge Width of any intersecting Transportation features and updates the Transportation System (TRS). Applies a standard value if the Dam does not intersect any Transportation features. Transportation features include Roads, Railways, Railway Sidetracks, and Cart Tracks.

Original code by John Jackson. Refactored and updated by Nat Cagle.

Building in BUA Scaler
Preprocessing

Identifies and descales Building points and polygons within BUAs that meet ALL THREE of the following criteria:

- Have a Feature Function (FFN) value that is NOT on the current project Important Building FFNs list.

- Have a Height (HGT) value less than 46 meters.

- Have a Navigation Landmark (LMC) value of False.

Identified and scales up Building points and polygons within BUAs that meet ANY ONE of the following criteria:

- Have a Feature Function (FFN) value that IS on the current project Important Building FFNs list.

- Have a Height (HGT) value greater than OR equal to 46 meters.
- Have a Navigation Landmark (LMC) value of True.

Database Feature Report
Preprocessing

Scans the entire provided TDS dataset (not affected by the user defined scale). Creates a text file reporting the breakdown of feature classes and feature counts. Includes the following information:

- Total Points, Curves, and Surfaces

- Total Hydrography, Transportation, Utility, Building, and Landcover features

- Total features per feature class and a count of each subtype

- Empty feature classes

Original code by John Jackson. Refactored by Nat Cagle.

Source Analysis Report
Preprocessing

Scans the entire provided TDS dataset (not affected by the user defined scale). Creates a text file and CSV file reporting the breakdown of source types for each feature class. Includes the following information for each feature class:

- Version

- Source Description (ZI001_SDP)

- Source Date (ZI001_SDV)

- A count for each unique combination of values.

Original code by John Jackson. Refactored by Nat Cagle.

Acknowledgments

- John Jackson

- Logo Source: La Maison Commune de la Décroissance
  ladecroissance.xyz
  Artwork by Robin Guinin Dessin

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