FME Training for Esri Utility Network Migration Electric Migration Workspace



Safe Software training team: Ryan Cragg Trent Kading Mark Stoakes Nampreet Singh (Q&A) Jovita Chan (Q&A)

Thanks also to John Long and John Alsup from Esri

ArcGIS Licensing

ESU291378785 ArcGIS Pro Advanced ESU015674076 ArcGIS Pro Data Interoperability

ESU603624567 ArcGIS Desktop Advanced ESU479175011 Data Interoperability

Thanks to Esri for supplying the training licenses

AGENDA

Schedule is 8:00 - 11:00 PST with a break

Day 1 (Monday)

Introduction to FME Workbench

Day 2 (Tuesday)

Ryan

Dive into transformation tools and other workbench functionality used in the Esri UN migration workspaces

Day 3 (Wednesday) Trent n' Mark

Deep dive into water migration and the schema mapping

Day 4 (Thursday) Mark n' Trent

Deeper dive into electric migration and the schema mapping

TODAY'S GOALS



- Review the primary transformation tools used in the migration workspaces
- Deep dive into Water migration workspace (Simple migration)
- Deeper dive into Electric migration workspace (Basic migration)
 - $\circ~$ Schema mapping specific to Electric Migration
 - Topology issues
 - Creating Assemblies
 - Assembly definition XML
 - Exercises

By the end of today you should have a good understanding of the electric migration workspace. You should be able to edit the key parts of the electric migration workspace.

More Resources

FME Training for Utility Networks

https://knowledge.safe.com/articles/72048/utility-network-migration-tools.html

Esri ArcGIS Pro Utility Network Migration

Tools

https://knowledge.safe.com/articles/72048/utility-network-migration-tools.html

Esri GeoNet - Utility Network Migration Status

Page

https://community.esri.com/thread/214206-esri-utility-network-configuration-andmigration-tool-status

What is Esri Utility Network

http://pro.arcgis.com/en/pro-app/help/data/utility-network/what-is-a-utility-netwo rk-.htm

Introduction to Esri Asset Package

http://solutions.arcqis.com/utilities/help/utility-network-automation/asset-package -reference/an-overview-of-the-asset-package.htm

Documentation

Electric Distribution Utility Network Migration Tools Documentation.pdf Esri Utility Network_ Assembly XML Doc.pdf



Electric Migration Pattern



Basic Migration

Schema Mapping Network topology

- Geometric Network (lines & junctions)
- Explicit network (associations between junctions & devices)

Devices

• More complex objects (devices). An ArcGIS device (point geometry) becomes multiple assets:



Electric Migration

ArcGIS Device



UN Assembly / Support Structure





Run the Electric Migration

- Find the folder: .. \EsriUNTraining\Basic
- Open the workspace: Electric Migration beta.fmw
- Set Enable Feature Caching: Off

Navigator

*Electric Migration 2018 (2) Dropbox (Safe Software Inc.)\Esri Utility N File Edit View Readers In Sormers Writers Run Tools

A SALA A LICEODATADACE FUEL

Enable Feature Caching

- Run the workspace & check the parameters
- Check the results in Data Inspector Find Fuse: {1494283B-C6F1-4C27-8513-4E06B33A088C}
- Isolate the data with Test Data & Feature Caching : On Fuse: {1494283B-C6F1-4C27-8513-4E06B33A088C}
 Switch Facility: 9AE1E625-D88C-423F-8539-907C8C75E4D8

Step 1: Run a Migration

Run the Electric Migration

- Find the folder: .. \EsriUNTraining\Basic
- Open the workspace: Electric Migration beta.fmw
- Set Enable Feature Caching: Off

Navigator

*Electric Migration 2018 CADropbox (Safe Software Inc.)\Esri Utility N
File Edit View Readers In Sormers Writers Run Tools

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Enable Feature Caching

- Run the workspace & check the parameters
- Check the results in Data Inspector Find Fuse: {EDCADCC6-A8D5-4348-91CE-268766799D85}
- Isolate the data with Test Data & Feature Caching : On Fuse: {EDCADCC6-A8D5-4348-91CE-268766799D85} Switch Facility: {0FE54F47-E32D-441A-ADBB-01167E789028}

Step 1: Run a Migration

ි Source ArcGIS (මූ	♥ <u> Schema</u> Mapping	۲ <u>۵</u>	≂Topology	
Line Feature Classes	Clean-up source attribut	tes (AttributeManager)	Topology: Lines • Line cleaning • calculate line end and	les (for device rotation)
Device Feature Classes + Unit tables	Set uppercase (BulkAtt	ributerenamer)	Line / Device connect Line / Device connect Line Clipping (to acco Merge complex edge	tivity modate assemblies) s
Structure Feature Classes	Asset Group Description (AttrbuteCreator)	a & Asset Type Description mapping	Topology: Devices • Junction connectivity • Junction Asset type I Linetalunction sheet	logic ookups (DatabaseJoiner ->
	Merge Device & Unit tal	bles (FeatureMerger)	Validate Unit tables (and assembly phase expansion)
Testing filters	Asset Group & Asset Ty (DatabaseJoiner -> Asse	/pe code lookup etType sheet)	Topology: Structures • Create Attachment J • Offset structures • create structure / att	unction
	Domain Mapping (Scher	maMapper -> Domains sheet)		Ø
	Attribute Mapping (Sch sheets)	emaMapper -> Line/Device/etc.		
ssembly Builder	¢	♥ Output: Staging Asset Package Databa	ාන (බූ	The second secon
Merge Structures to Assembly (Feature	Merger)	Final lookups: • asset group and asset type c	odes - junctions &	Errors & Warnings: • lines
Create Assemblies, associations, internal (AssemblyBuilder + XML)	assets	association type lookup (Dat	abseJoiner -> B_rules)	• junctions • assemblies • devices
Special Cases • facility associations (i.e. Switch Figure 1	acility)	Change case - upper or lower case (BulkAttirbuteRenamer)	
create switch facility & busbar as create UG Pad Mounted XFR jun	sociations ctions and	Geodb Writer: Asset Package Featur	re Classes	



▼ <u>∩</u> Source ArcGIS 🔅	▼ <u>@</u> Schema Mapping	©	▼ Top ology		٢
Line Feature Classes	Clean-up source attribu	utes (AttributeManager)	Scheman		
Device Feature Classes + Unit tables	Set uppercase (BulkAt	tributerenam <mark>er)</mark>	Clean	^{Aapping} Tine	
Structure Feature Classes	Asset Group Descriptio (AttrbuteCreator)	n & Asset Type Description mapping	• Know	Your source	
	Merge Device & Unit ta	ables (FeatureMerger)	 Unders 	tand	
Testing filters	Asset Group & Asset T (DatabaseJoiner -> As	ype code lookup setType sheet)	model -	asset ~	get IIN
	Domain Mapping (Sche	maMapper -> Domains sheet)	• Cross	sergroups	& asset
	Attribute Mapping (Sc sheets)	hemaMapper -> Line/Device/etc.	Manni	Well define .	
▼Asæmbly Builder	ŵ	▼ Output: Staging Asset P	Spreadsha	or cross-wall	ichema
Merge Structures to Assembly (Feature	eMerger)	Final lookups:	Workbench	et before you	0.0.
Create Assemblies, associations, interna (AssemblyBuilder + XML)	al assets	Devices. (SchemaMapper • association type lookup (I	<pre>>> AssetType sheet) DatabseJoiner -> B_rules)</pre>	• • Uerne	open
Special Cases • facility associations (i.e. Switch • create tap junctions	Facility)	Change case - upper or lower cas	e (BulkAttirbuteRenamer)		
 create switch facility & busbar a create UG Pad Mounted XFR ju associations 	ssociations inctions and	Geodb Writer: Asset Package Fea	ture Classes		

Schema Mapping: Setting Asset Group & Asset Type

More complex conditionals

	Α	Y	Z
1	ElectricDistribution		
2	Device	Switch	
3	FieldName	Attribute or Value	Filter
4	ASSETGROUP	14 - Switch	
5	ASSETTYPE	485 - Overhead Medium Voltage Single Phase Disconnect	subtype = 1 and phasedesignation <> 7
6	ASSETTYPE	493 - Underground Medium Voltage Three Phase Disconnect	Subtype = 2 and Phasedesignation = 7
7	ASSETTYPE		
8	ASSETTYPE	487 - Overhead Medium Voltage Three Phase Disconnect	subtype = 1 and phasedesignation = 7

Tip: Accurate mapping to asset group & asset type for both device (assembly) and unit tables (devices) really helps

AttributeCreator

*tra	nsfo	rmer	
Condition	statement		

	Test Condition	Attribute Value		
lf	@Value(_AGDevice_SUBTYPECD) = 1 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(PHASEDESIGNATION) = 7	Overhead Medium Voltage Three Phase Disconnect		
Else If	@Value(_AGDevice_SUBTYPECD) = 1 AND @Value(_AGDevice_PHASEDESIGNATION) IN 1,2,4,7	Overhead Medium Voltage Single Phase Disconnect		
Else If	@Value(_AGDevice_SUBTYPECD) = 2 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(PHASEDESIGNATION) = 7	Overhead Medium Voltage Three Phase Load Breaking		
Else If	@Value(_AGDevice_SUBTYPECD) = 2 AND @Value(_AGDevice_PHASEDESIGNATION) IN 1,2,4,7	Overhead Medium Voltage Single Phase Load Breaking		
Else If	@Value(_AGDevice_SUBTYPECD) = 3 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(PHASEDESIGNATION) = 7	Underground Medium Voltage Three Phase Disconnect		
Else If	@Value(_AGDevice_SUBTYPECD) = 3 AND @Value(_AGDevice_PHASEDESIGNATION) IN 1,2,4,7	Underground Medium Voltage Single Phase Disconnect		
Else If	@Value(_AGDevice_SUBTYPECD) = 4 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(PHASEDESIGNATION) = 7	Underground Medium Voltage Three Phase Load Breaking		
Else If	@Value(_AGDevice_SUBTYPECD) = 4 AND @Value(_AGDevice_PHASEDESIGNATION) IN 1,2,4,7	Underground Medium Voltage Single Phase Load Breaking		
Else If	@Value(_AGDevice_SUBTYPECD) = 5 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(_AGDevice_CONSTRUCTIONTYPE) = Overhead AND @Value(PHASEDESIGNATION) = 7	Overhead Medium Voltage Three Phase Load Breaking		
<mark>Else If</mark>	@Value(_AGDevice_SUBTYPECD) = 5 AND @Value(_AGDevice_PHASEDESIGNATION) = 7 AND @Value(_AGDevice_CONSTRUCTIONTYPE) = Underground	Underground Medium Voltage Three Phase Load Breaking		
Else If				
El.	<all conditions="" other=""></all>	Unknown		

Schema Mapping: AG Device & Unit Table





What Topology?

Devices

- Device Attributes
 - AssetGroupDesc / AssetTypeDesc
 - GlobalID
 - _AG<original attrs>
 - o _unit_table{}.<attrs>
 - Junction<n>AssetGroupDesc
 - STRCT_<attrs>
- Connected Lines
 - _lines{}.AssetGroupDesc / AssetTypeDesc
 - _lines{}.GlobalID
 - _lines{}._assembly_rotation
 - _lines{}._clip_flag

Topology

	Device / Line Topology How many conductors are attached to this device and their details
All Devices	Here we have the device with the _lines{} list of conductor info. We can use this list to help identify the type of device if needed lines : add the device{} details & split complex edges
	PointOnLineOverlayer

What Topology?

Lines

- Line Attributes
 - AssetGroupDesc / AssetTypeDesc Ο
 - GlobalID \bigcirc
 - PhasesNormal Ο
 - 0 _ohug / _voltagelevel
- **Connected Devises**
 - _devices{}.AssetGroupDesc / AssetTypeDesc Ο
 - _devices{}.GlobalID Ο

Line Clipping

Clip appropriate lines for assembly *Warning* - very short lines (<0.1 ft) can cause assembly placement errors

Topology

Transformer		
Transformer Name:	PointOnLineOverlayer	
Group By:	No items selected.	11
Parallel Processing:	No Parallelism 👻	
Input Ordered:	No][
Parameters		
Overlap Count Attribute:	_linecount][
Point Tolerance:	0.1	
Aggregate Handling:	Deaggregate 🔻	
 Attribute Accumulation 		
Accumulation Mode:	Merge Incoming -][
Conflict Resolution:	Use Original 🔻	
Prefix:		11
Ƴ 🗹 Generate List On O	utput 'Point'	
'Point' List Name	: _lines	•
Add To 'Point' List	: Selected Attributes	•
Selected Attributes	SNORMAL SHAPE_LENGTH _assembly_rotation0	•
✓ 🗹 Generate List On O	utput 'Line'	
'Line' List Name	: _devices	-
Add To 'Line' List	: Selected Attributes 👻	•
Selected Attributes	ESC ASSETTYPEDESC GLOBALID _clip_type_flag	•



Assembly Builder

Merges:

- **Device Features**
- XML Assembly Definitions

Keys:

ASSETGROUPDESC	<assemblygroupdesc></assemblygroupdesc>
ASSETTYPEDESC	<assemblytypedesc></assemblytypedesc>
assemblyKey2	<assemblykey2></assemblykey2>
cabinetKey	<assemblycabinetkey></assemblycabinetkey>

Documentation:

Esri Utility Network Assembly XML Doc.pdf



Output:

- Device
- Assembly / StructureJunction •
- Associations
- Junctions
- AssemblyCenterPoint
- Error / Inform

Assembly scale parameter...







Exercise - Fuse data error Open workspace: "..\Basic\1.Fuse_Exercise\Begin_Fuse.fmw"

Configure to test a single Fuse: Fuse Global ID: {DA309538-67AA-4CC2-8185-145D75E2DA8E}

Run workbench with Feature Caching ON + Test Data only

Check error Excel - note error transformer: TestFilter_21

Open original ArcGIS data and check the data:

ArcGIS feature class list for easy viewing in Data Inspector: BusBar Fuse PriOHElectricLineSegment PriUGElectricLineSegment SecOHElectricLineSegment SecUGElectricLineSegment SupportStructure SurfaceStructure Switch SwitchingFacility Transformer UndergroundStructure DynamicProtectiveDevice FuseUnit Just copy this list into the Table List of the GeoDB reader

Re-Run with corrected data

SubtypeCD: 1 PhaseDesignation: 7 ConstructionType = Overhead

Exercise - DynamicProtectiveDevice missing source Feature Class

Open workspace:

"..Basic\2.DynamicProtectiveDevice_Exercise\DynamicProtectiveDevice - Begin.fmw"

Import Feature Types: DynamicProtectiveDevice RecloserUnit SectionalizerUnit Connect them.

Copy transformers from similar objects - switches?

Exercise cont... - DynamicProtectiveDevice missing source Feature Class

Add tests:

Recloser GlobalID: {CD229437-CEA2-4225-85F6-CBFB0A272C35} Support Structure: {D406A179-64C5-42F9-B991-AB4390C0CA5F}

Check TestFilter_21

(like Area 51 -strange things happen here...)

1	Left Value	POURDESC	Operator	Right Value	Negate	Mode Case Incon-iti
2	AGEeat		Contains Regex			Case Insensitiv
3	GANGO	PERATED	=			Automatic
4	GANGO	PERATED	=			Automatic
5	GANGO	PERATED	Attribute has a value	<unused></unused>		Automatic
	Pass criteria;	composite rest				
		(1 OR 2) AND (3)	OR 4 OR 5)			
Co	mposite Test:	(1 0112) 1110 (0				
Coi	mposite Test: tput Port	(1 0.12) 1.10 (0				

Exercise - Updating Assembly XML Definitions

Open workspace:

"..\EsriUN\Basic\2.DynamicProtectiveDevice_Exercise\Begin_Recloser.fmw"

Set-up for testing with the Test Filter Recloser GlobalID: {320E0040-04E4-4E0D-B5BA-09253A19E3C3} Switch Gear GlobalID: {B732B5E5-3D7D-478D-A795-774CFF49F32B}

Check results and error reports.

Update XML definitions - check documentation Open XML definition in NotePad++ & search for "Recloser" PadMountRecloser_definition - Begin.xml Create new assembly definition Re-run with either fixed XML or PadMountRecloser_definition - End.xml

SubtypeCD = 7 PhaseDesignation = 7 Unit tables = 3 i.e. one per phase GangOperated = NA





Thanks for attending...

Editing the migration workspaces

- If you make *changes*, please share them with us
- *Need help* feel free to contact us

Next steps:

- Release the Electric migration workspace
- Esri UN <u>Reader/Writer</u> Feature Service
- Validation Workspace

That's all folks!

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Thanks also to John Long & John Alsup at Esri