

Creating processes and tools to ensure data quality in the Utility Industry

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About Connexus

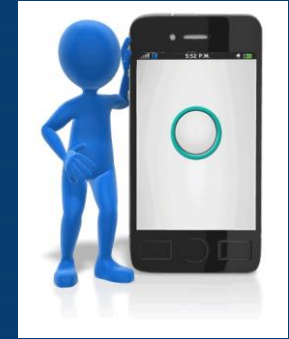
- Minnesota's largest electric distribution cooperative
- Serving over 120,000 customers
- Service area includes portions of Anoka, Chisago, Hennepin, Isanti, Ramsey, Sherburne, and Washington Counties.



About POWER Engineers



- 2300+ Employees
- Average over 20 years experience
- Esri Foundation Partner of the Year
- Industry leading independent consulting group
- Deep domain expertise in electric, gas, water, wastewater, municipal utilities, cities, communications, & other industries



QA, What does it mean?

- Assurance: giving confidence, the state of being certain or the act of making certain.
- Quality Assurance: The planned and systematic activities implemented so that data quality will be fulfilled.

QC, What does it mean?

- Control: An evaluation to indicate needed data correction; the act of a process in which variability is attributable to a constant system of chance causes.
- Quality Control: The observation techniques and activities used to fulfill requirements for quality

Types of QA/QC

- QA
 - Quality Assurance plan
 - QA Rules (Core and Custom)
- QC
 - SQL and ST_GEOMETRY
 - Geo-Processing Tools
 - Models

QA Rules

- Required fields – Core
- Allow Null Values – Core
- Domains – Core
 - Valid values

Validate Features

Validate the selected geodatabase features for subtypes, attribute domains, geometric network connectivity rules, relationship rules, and custom rules.

Properties	
Field	
(Name)	WORKORDERID
AliasName	Work Order ID
DefaultValue	
Domain	(None)
DomainFixed	False
Editable	True
FieldType	esriFieldTypeString
GeometryDef	(None)
IsNullable	True
Length	20
ModelName	WorkOrderID
Precision	0
RasterDef	(None)
Required	False
Scale	0

Field Properties

Alias	Work Order ID
Allow NULL values	Yes
Default Value	No
Length	Yes

QA Rules

- Cardinality – Core and Custom

Relationship Class Properties - Relationship Class

General Rules

Origin Table/Feature Class subtypes:

Code	Description
1	Wood
2	Steel
3	H Frame

Origin Cardinality

☒ Specify the range of associated origin objects

Min: 1 Max: 1

Destination Table/Feature Class subtypes:

Code	Description
<input checked="" type="checkbox"/> 1	OH XFR
<input type="checkbox"/> 2	UG XFR

Destination Cardinality

☒ Specify the range of associated destination objects

Min: 0 Max: 3

OK Cancel Apply

Relationship Class Properties - Relationship Class

General Rules

Origin Table/Feature Class subtypes:

Code	Description
1	Wood
2	Steel
3	H Frame

Origin Cardinality

☒ Specify the range of associated origin objects

Min: 0 Max: 0

Destination Table/Feature Class subtypes:

Code	Description
<input checked="" type="checkbox"/> 1	OH XFR
<input checked="" type="checkbox"/> 2	UG XFR

Destination Cardinality

☒ Specify the range of associated destination objects

Min: 0 Max: 0

OK Cancel Apply



QA Rules

- Connectivity – Core
 - Which network features can connect to another network feature
 - Default features

The screenshot shows the 'Geometric Network Properties' dialog box with the 'Connectivity' tab selected. The 'General' tab is also visible. The 'Weights' tab is not selected.

Connectivity rules for (feature class):
PriOHElectricLineSegment

Subtypes in this feature class:

Description	Code
Single Phase	1
Three Phase	3
Two Phase	2

Cardinality

☐ Specify number of edges a junction can connect to

Min: 0 Max: 0

☐ Specify the number of junctions an edge can connect to

Min: 0 Max: 0

Subtypes in the Network:

- ☒ Transformer
- ☐ MiscNetworkFeature
- ☐ PriOHElectricLineSegment
- ☐ SecOHElectricLineSegment
- ☒ Single Phase
- ☐ Streetlight Conductor
- ☐ Three Phase
- ☐ PriUGEElectricLineSegment
- ☐ SecUGEElectricLineSegment
- ☐ ElectricNetwork Junction

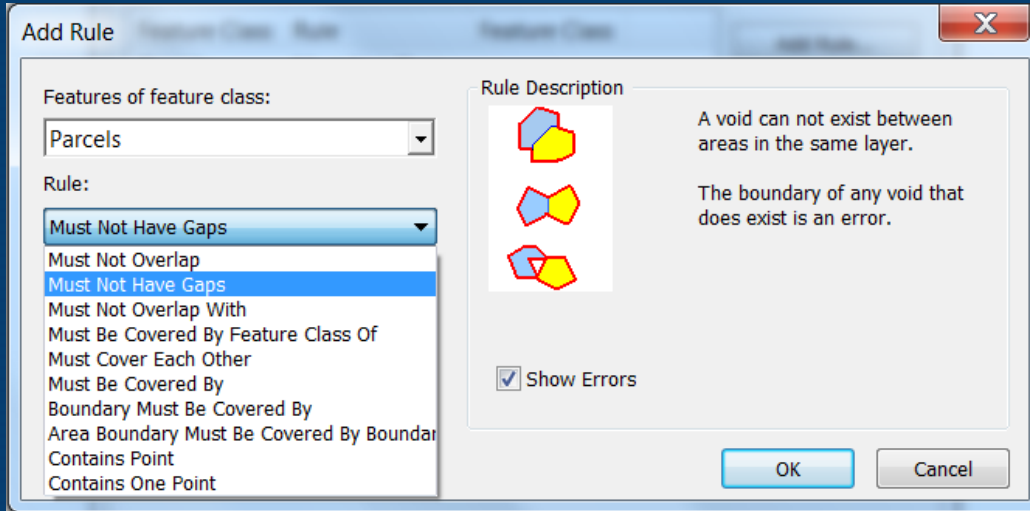
Junction subtypes:

- ☒ Transformer
- ☐ Network
- ☐ Open Delta
- ☐ Open Wye
- ☐ Power Transformer
- ☒ Single Phase Overhead
- ☐ Single Phase Underground
- ☐ Step
- ☐ Three Phase Overhead
- ☐ Three Phase Underground

Buttons: OK, Cancel, Apply

QA Rules

- Topology – Core



ArcFM QA Rules

- Core Rules
- Custom Rules

Field Display | Object Info | Field Info | Model Names | Field Model Names | Abandon Info

Subtype: <All>

Fields

Select a field to view its properties.

Field Name	Field Alias
OBJECTID	Object ID
SUBTYPECD	SubtypeCD
FACILITYID	Facility ID
PHASEDESIGNATION	Phase Designation
RATEDKVA	Rated KVA
HIGHSIDERATEDVOLTAGE	High Side Rated Voltage
LOWSIDERATEDVOLTAGE	Low Side Rated Voltage
HIGHSIDEBIL	High Side BIL
LOWSIDEBIL	Low Side BIL

Field Properties

Visible	Yes
Editable	Yes
Allow NULL Values	Yes
Allow Mass Attribute Update	Yes
Reset After Create	No
On Feature Create	<None>
On Feature Update	<None>
Custom Field Editor	<None>
Validation Rules	Phase of Bank Unit
	<None>
	Phase of Bank Unit

OK Cancel Apply

Field Display | Object Info | Field Info | Model Names | Field Model Names | Abandon Info

Subtype: <All>

Feature Properties

Create Edit Task	<None>
On Feature Create	<Multiple...>
On Feature Update	<Multiple...>
On Feature Delete	<Multiple...>
On Mobile Feature Create	<None>
On Mobile Feature Update	<None>
On Mobile Feature Delete	<None>
Split On Edit	Yes

Rules

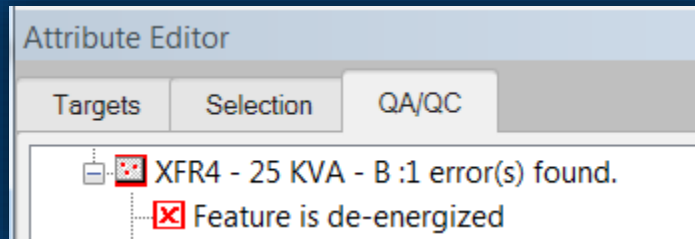
- ☒ ESRI Field Rules
- ☒ ESRI Rules
- ☐ Check Required Fields
- ☐ De-Energized Feature
- ☐ Duplicate Feature

Select All Unselect All

OK Cancel Apply

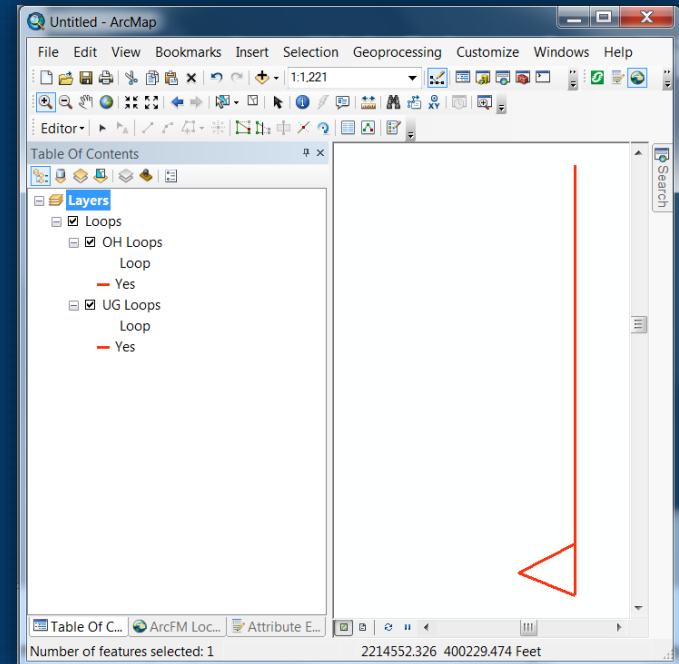
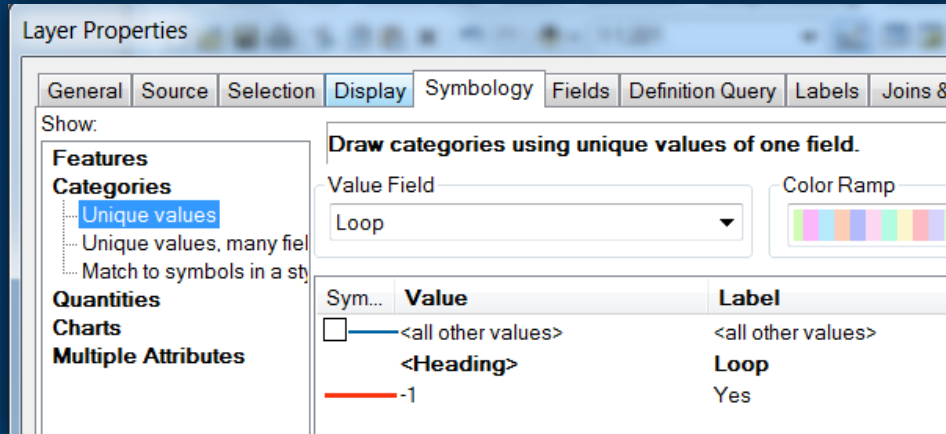
ArcFM QA Rules

- Feeder Manager 2.0 – Core
 - Loops
 - Multifeeds
 - De-Energized Features



ArcFM QA using Display

- Feeder Manager 2.0 –
Core
– Loops



SQL and ST_GEOMETRY

- Operating Number and Quarter Section

```
select xfr.OPERATINGNUMBER, p.TOWNSHIP, p.RANGE, p.SECTION,  
p.QUARTERSECTION, p.LASTDATEMODIFIED from ARCFM.Transformer xfr,  
arcfm.plssquartersection p where (sde.st_intersects ( xfr.shape, p.shape)=1);
```

- Phasing mismatch for device or lines

```
select xfr.objectid from secondaryorservice sec, transformer xfr where  
(sde.st_intersects (xfr.shape, sec.shape)=1) and xfr.phasedesignation <>  
sec.phasedesignation;
```

SQL and ST_GEOMETRY

- Short length line segments

```
select objectid from distribution where sde.st_length(shape) < .01;
```

- Business rules

```
select distinct(bw.switchingcabinetobjectid)  
SWITCHINGCABINETOBJECTID from buswork bw, ugprimary ug  
where ug.phasedesignation in (3,5,6,7) and  
sde.st_intersects(bw.shape, ug.shape) = 1;
```

SQL and ST_GEOMETRY

- Normal and current status of Switchable devices

```
select sw.operatingnumber from switch sw where sw.phasedesignation = 7 and  
sw.currentstatusphasea <> sw.normalstatus and sw.currentstatusphaseb <>  
sw.normalstatus and sw.currentstatusphasec <> sw.normalstatus;
```

- Operating Number missing or invalid

```
select xfr.objectid, xfr.operatingnumber from  
transformer xfr where REGEXP_LIKE  
(xfr.operatingnumber, '[`~!@#$%^&*()+=}{;:><?,-]');
```



SQL and ST_GEOMETRY

- XFR and XFR unit mismatch – object missing or orphan records

```
select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase in ('A', 'B', 'C', 'ABC', 'AB', 'AC', 'BC') and a.phasespresent = 'D'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('A', 'B', 'AB', 'D') and a.phasespresent = 'AB'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('A', 'C', 'AC', 'D') and a.phasespresent = 'AC'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('B', 'C', 'BC', 'D') and a.phasespresent = 'BC'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('A', 'B', 'C', 'ABC', 'AB', 'AC', 'BC', 'D') and a.phasespresent = 'ABC'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('A', 'D') and a.phasespresent = 'A'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('B', 'D') and a.phasespresent = 'B'
union select a.objectid from transformer_eww a, transformerunit_eww b where a.objectid = b.transformerobjectid and b.phase not in ('C', 'D') and a.phasespresent = 'C';
```

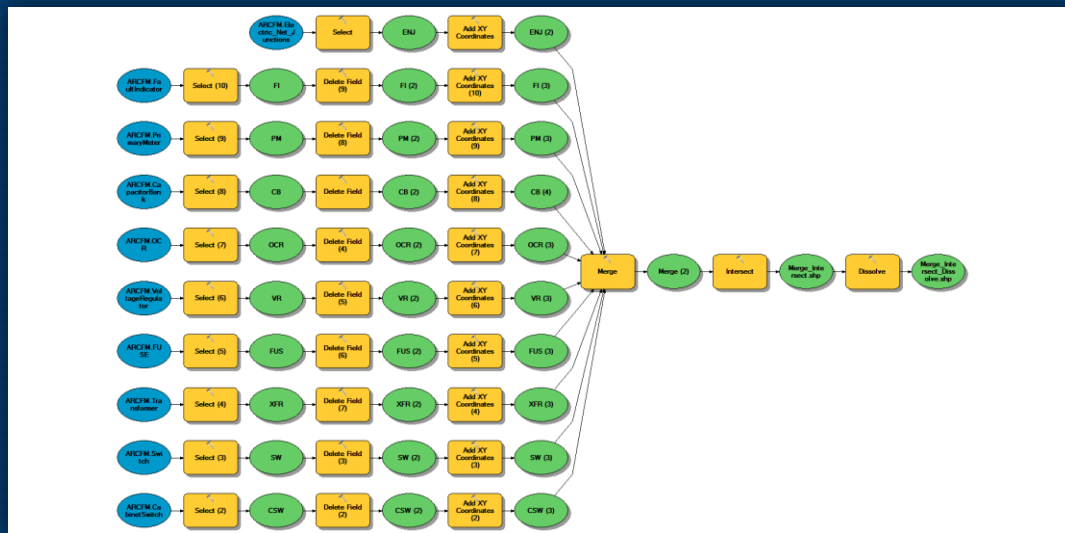
Geo-Processing Tools

- Invalid Geometry
- Pre-Built Data Reviewer Jobs



Models

- Coincidental Network Devices
- Asset Locations Compare



Esri Data Reviewer

- Spatial Checks
- Attribute Checks
- Feature Integrity Checks
- Metadata Checks
- Managed Data Reviews



Esri Data Reviewer

- Interactive Analysis Tools
- Batch Data Checks
- Data Checks Based on Sample size (For Larger Datasets)
- Data Check Reporting

**Reconcile,
Reconcile,
Reconcile!!!**



Questions?

