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.

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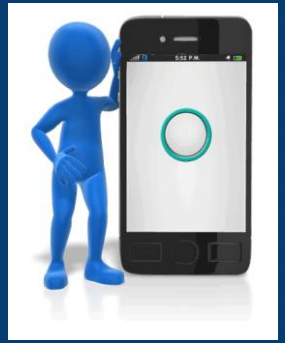
About POWER Engineers

- 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.

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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

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Types of QA/QC

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

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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

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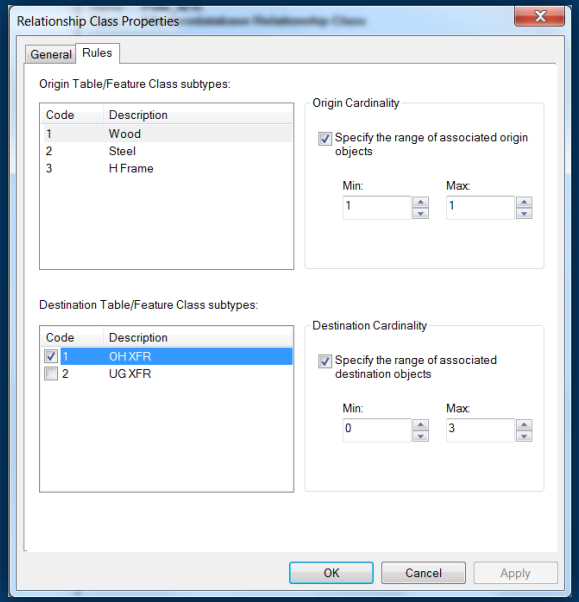
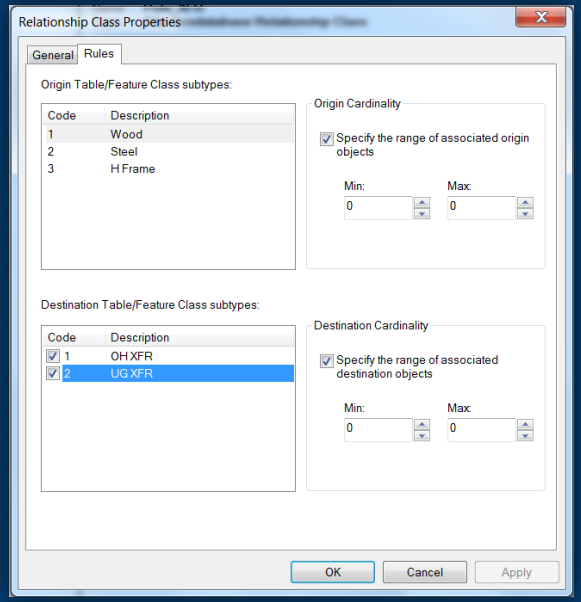
QA Rules

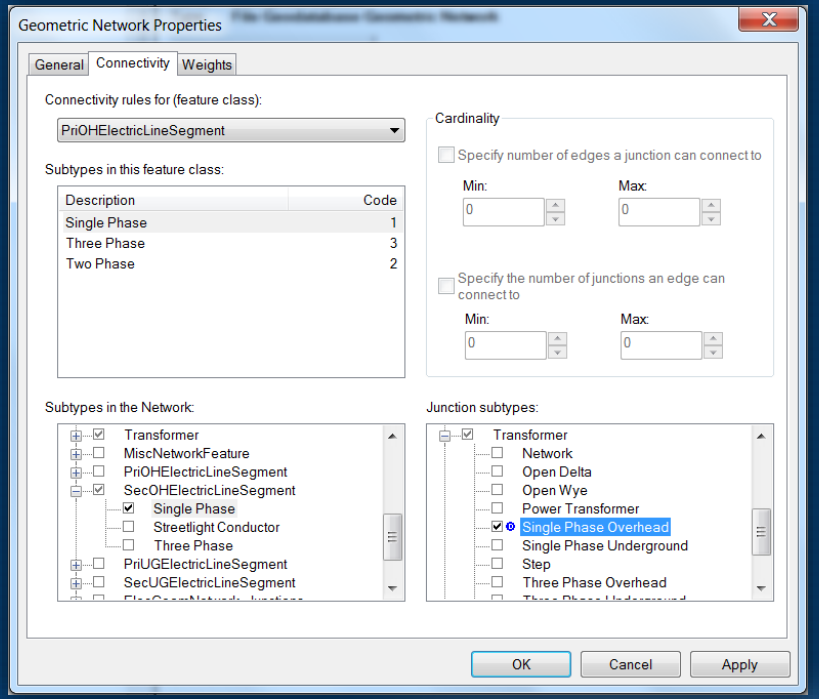
- Cardinality – Core and Custom





QA Rules

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



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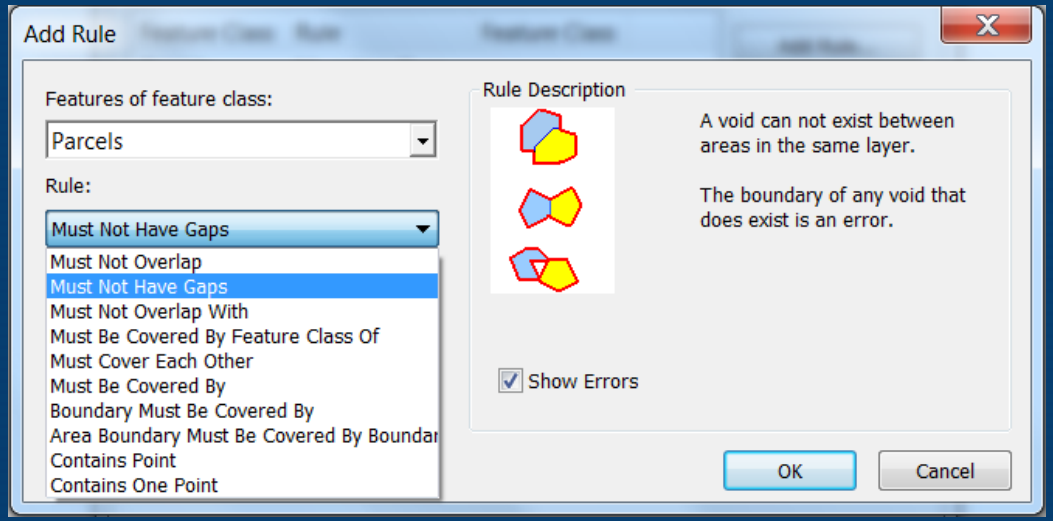
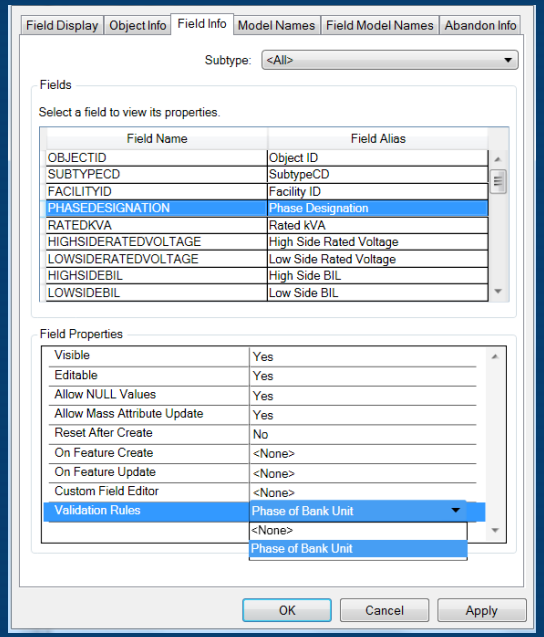
QA Rules

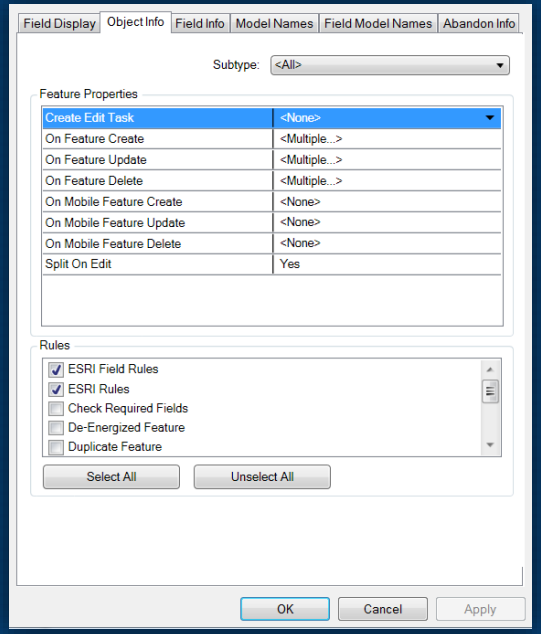
- Topology – Core



ArcFM QA Rules

- Core Rules
- Custom Rules





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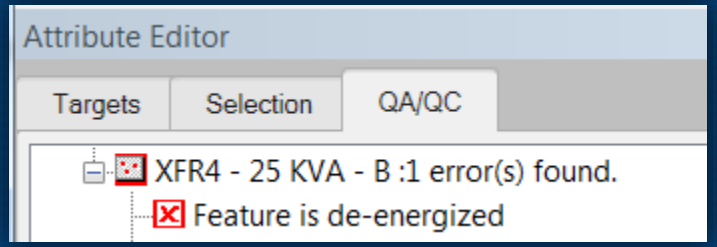
ArcFM QA Rules

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



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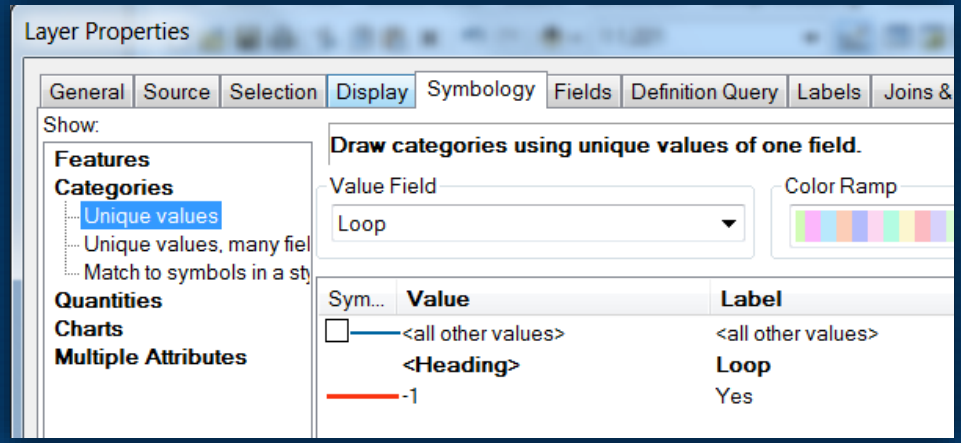
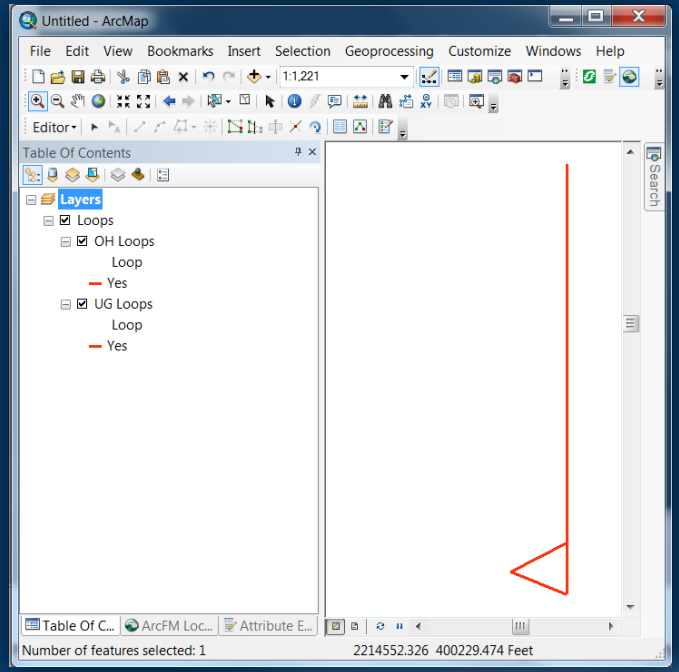
ArcFM QA using Display

- Feeder Manager 2.0 – Core
  - Loops





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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;
```

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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;
```

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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, '[ `~!@#$%^&*()+=}{;:><?,-]');
```

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SQL and ST_GEOMETRY

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

```
select a.objectid from transformer_evw a, transformerunit_evw 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_evw a, transformerunit_evw 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_evw a, transformerunit_evw 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_evw a, transformerunit_evw 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_evw a, transformerunit_evw 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_evw a, transformerunit_evw b where a.objectid = b.transformerobjectid and b.phase not in ('A', 'D') and a.phasespresent = 'A'
union select a.objectid from transformer_evw a, transformerunit_evw b where a.objectid = b.transformerobjectid and b.phase not in ('B', 'D') and a.phasespresent = 'B'
union select a.objectid from transformer_evw a, transformerunit_evw b where a.objectid = b.transformerobjectid and b.phase not in ('C', 'D') and a.phasespresent = 'C';
```

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Geo-Processing Tools

- Invalid Geometry
- Pre-Built Data Reviewer Jobs

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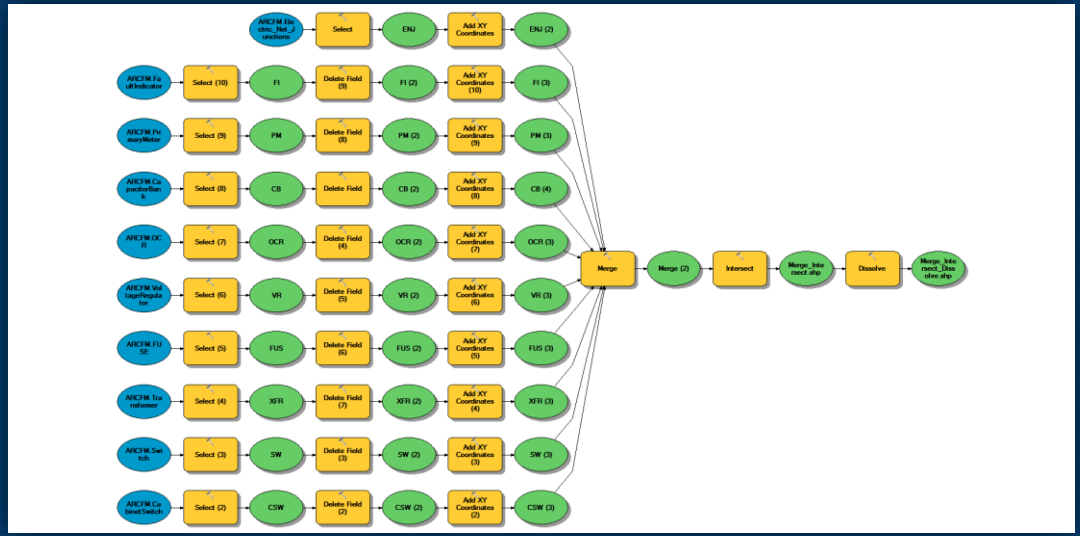
Models

- Coincidental Network Devices
- Asset Locations Compare



Esri Data Reviewer

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

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Esri Data Reviewer

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

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Reconcile, Reconcile, Reconcile!!!

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Questions?

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