Show Me How! - Manage Design Data and Update Assets in GIS

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Safe Harbor

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Class summary

In this session, we'll explore workflows and tools to support migration between disparate data systems and discuss the challenges faced.

We'll focus on the *AcClassify* tool, developed by Autodesk Consulting, as a means of overcoming some of these challenges.

Key learning objectives

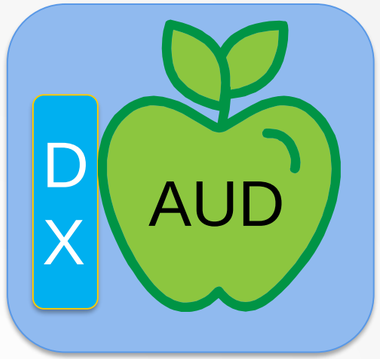
At the end of this class, you will be able to:

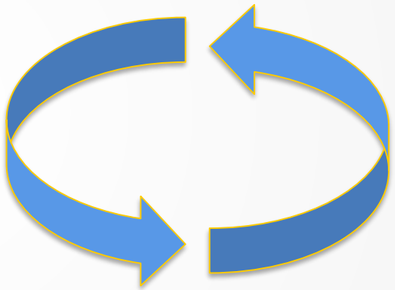
- Learn how to prepare for data model transformation between disparate systems
- Explore and learn how to configure and deploy the AcClassify tool
- Learn to identify the principles of data exchange between systems
- Learn how to streamline the workflow between design and geographic information system

The Big Problem: Mapping Apples to Oranges

Working with Apples when you're given Oranges

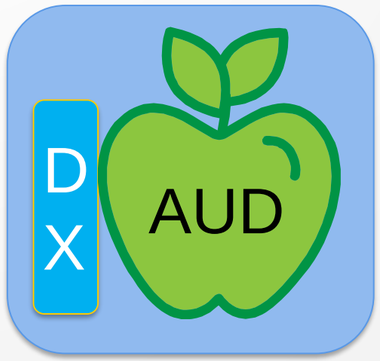
GIS -> AUD Transform





(Work Session Edits / Updates)

AUD - >Back to GIS Transform

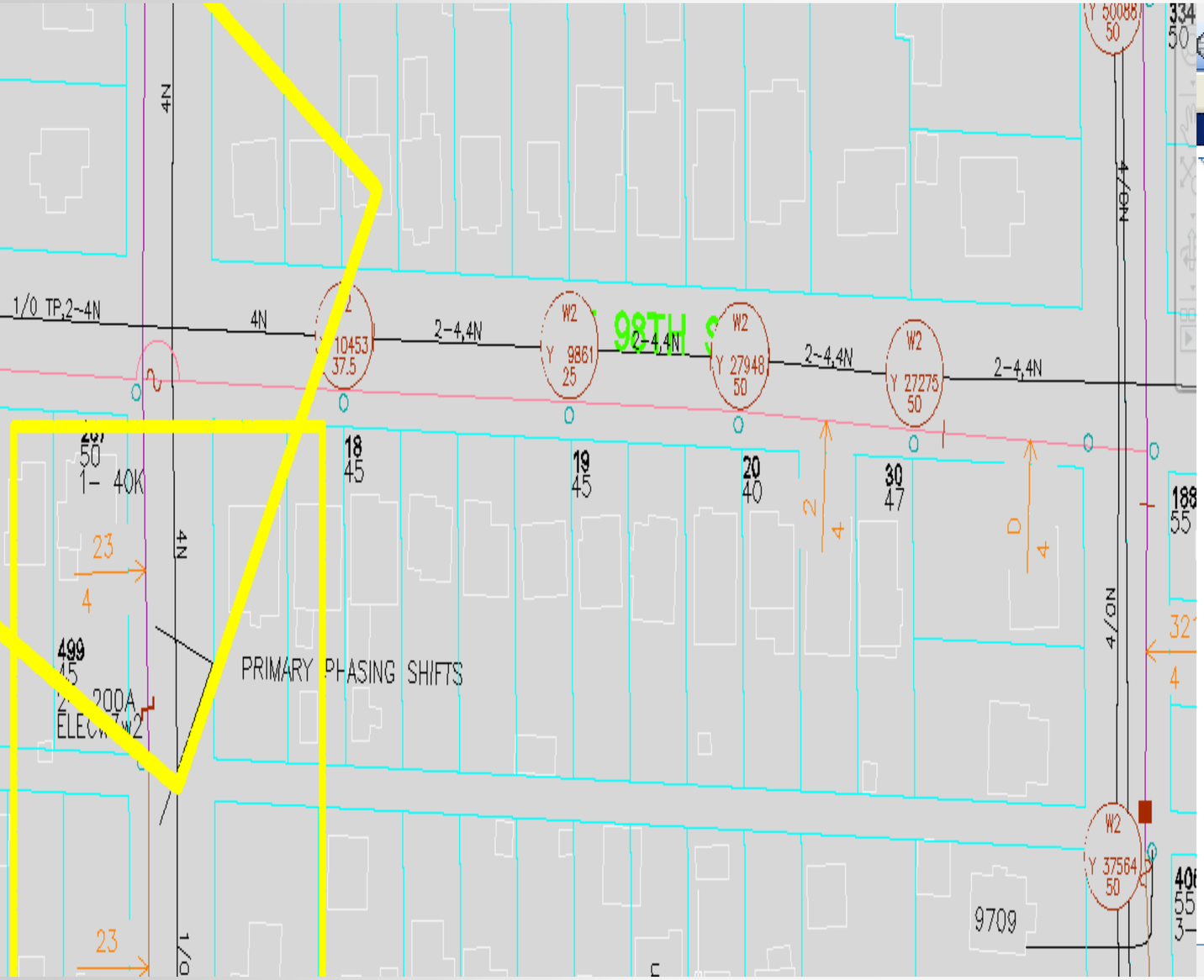


The Big Problem in Summary – Apples to Oranges

- Mapping between schemas is akin to language translation
  - Attributes in each system represent values within domains
    - Mapping of the entire domain may be required
  - Round tripping can incur entropic data loss
    - E.g. Required attributes in source GIS may not have a place to live in AUD!
- Connectivity API may be different
  - E.g. ADO vs. FDO
- Geometry is difficult
  - Representation may (and probably will!) change
  - Connectivity may employ different forms
    - E.g. Topology vs. explicit feature reference

Example Mapping Scenarios…

GIS Model – Scenario 1 - ESRI ®



Edit Coordinate Systems | Refresh

Schema	Coordinate System
Default	
ElectricDataset	
WhiteSpan	HARN/WO.WA-NF
CapacitorTie	HARN/WO.WA-NF
MiscLineGraphics	HARN/WO.WA-NF
ANOMALY_POINT	HARN/WO.WA-NF
Riser	HARN/WO.WA-NF
SupportStructure	HARN/WO.WA-NF
SurfaceStructure	HARN/WO.WA-NF
ElectricStation	HARN/WO.WA-NF
SwitchingCabinet	HARN/WO.WA-NF
AnchorGuy	HARN/WO.WA-NF
FeatureLabelPoint	HARN/WO.WA-NF
ElectricInsetFrameSource	HARN/WO.WA-NF
UGTransmissionLine	HARN/WO.WA-NF
MiscPointGraphics	HARN/WO.WA-NF
PhaseFlag	HARN/WO.WA-NF
AbandonedElectricLineSe...	HARN/WO.WA-NF
UGHazards	HARN/WO.WA-NF
Neutral	HARN/WO.WA-NF
ServicePoint	HARN/WO.WA-NF
ANOMALY_LINE	HARN/WO.WA-NF
PriUGElectricLineSegment	HARN/WO.WA-NF
SecUGElectricLineSegment	HARN/WO.WA-NF
PriOHElectricLineSegment	HARN/WO.WA-NF

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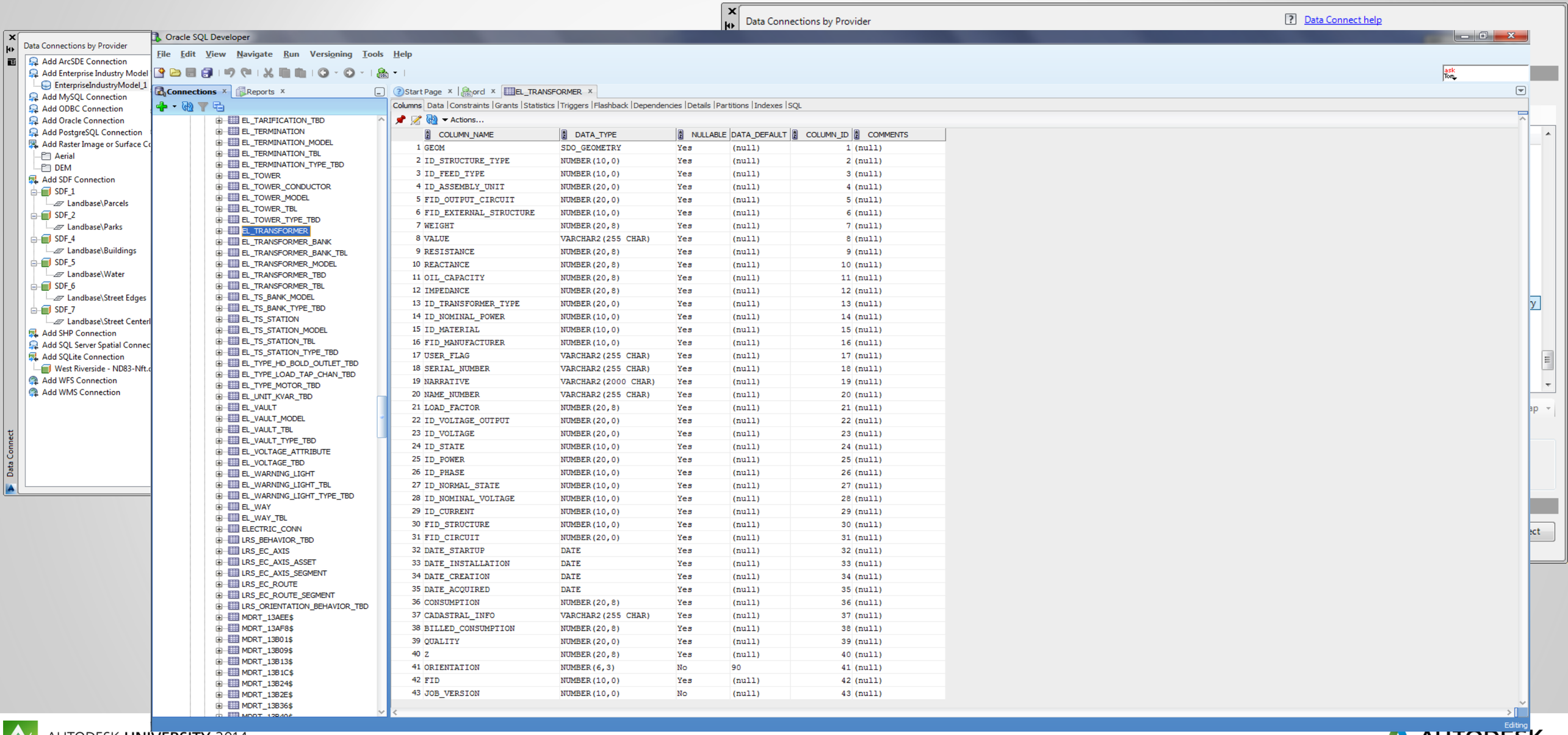
GIS Model - Scenario 2 – AutoCAD Map 3D®



	COLUMN_NAME	DATA_TYPE	NULLABLE	DATA_DEFAULT	COLUMN_ID	COMMENTS
1	GEOM	SDO_GEOMETRY	Yes	(null)	1	(null)
2	ID_STRUCTURE_TYPE	NUMBER(10,0)	Yes	(null)	2	(null)
3	ID_FEED_TYPE	NUMBER(10,0)	Yes	(null)	3	(null)
4	ID_ASSEMBLY_UNIT	NUMBER(20,0)	Yes	(null)	4	(null)
5	FID_OUTPUT_CIRCUIT	NUMBER(20,0)	Yes	(null)	5	(null)
6	FID_EXTERNAL_STRUCTURE	NUMBER(10,0)	Yes	(null)	6	(null)
7	WEIGHT	NUMBER(20,8)	Yes	(null)	7	(null)
8	VALUE	VARCHAR2(255 CHAR)	Yes	(null)	8	(null)
9	RESISTANCE	NUMBER(20,8)	Yes	(null)	9	(null)
10	REACTANCE	NUMBER(20,8)	Yes	(null)	10	(null)
11	OIL_CAPACITY	NUMBER(20,8)	Yes	(null)	11	(null)
12	IMPEDANCE	NUMBER(20,8)	Yes	(null)	12	(null)
13	ID_TRANSFORMER_TYPE	NUMBER(20,0)	Yes	(null)	13	(null)
14	ID_NOMINAL_POWER	NUMBER(10,0)	Yes	(null)	14	(null)
15	ID_MATERIAL	NUMBER(10,0)	Yes	(null)	15	(null)
16	FID_MANUFACTURER	NUMBER(10,0)	Yes	(null)	16	(null)
17	USER_FLAG	VARCHAR2(255 CHAR)	Yes	(null)	17	(null)
18	SERIAL_NUMBER	VARCHAR2(255 CHAR)	Yes	(null)	18	(null)
19	NARRATIVE	VARCHAR2(2000 CHAR)	Yes	(null)	19	(null)
20	NAME_NUMBER	VARCHAR2(255 CHAR)	Yes	(null)	20	(null)
21	LOAD_FACTOR	NUMBER(20,8)	Yes	(null)	21	(null)
22	ID_VOLTAGE_OUTPUT	NUMBER(20,0)	Yes	(null)	22	(null)
23	ID_VOLTAGE	NUMBER(20,0)	Yes	(null)	23	(null)
24	ID_STATE	NUMBER(10,0)	Yes	(null)	24	(null)
25	ID_POWER	NUMBER(20,0)	Yes	(null)	25	(null)
26	ID_PHASE	NUMBER(10,0)	Yes	(null)	26	(null)
27	ID_NORMAL_STATE	NUMBER(10,0)	Yes	(null)	27	(null)
28	ID_NOMINAL_VOLTAGE	NUMBER(10,0)	Yes	(null)	28	(null)
29	ID_CURRENT	NUMBER(10,0)	Yes	(null)	29	(null)
30	FID_STRUCTURE	NUMBER(10,0)	Yes	(null)	30	(null)
31	FID_CIRCUIT	NUMBER(20,0)	Yes	(null)	31	(null)
32	DATE_STARTUP	DATE	Yes	(null)	32	(null)
33	DATE_INSTALLATION	DATE	Yes	(null)	33	(null)
34	DATE_CREATION	DATE	Yes	(null)	34	(null)
35	DATE_ACQUIRED	DATE	Yes	(null)	35	(null)
36	CONSUMPTION	NUMBER(20,8)	Yes	(null)	36	(null)
37	CADASTRAL_INFO	VARCHAR2(255 CHAR)	Yes	(null)	37	(null)
38	BILLED_CONSUMPTION	NUMBER(20,8)	Yes	(null)	38	(null)
39	QUALITY	NUMBER(20,0)	Yes	(null)	39	(null)
40	Z	NUMBER(20,8)	Yes	(null)	40	(null)
41	ORIENTATION	NUMBER(6,3)	No	90	41	(null)
42	FID	NUMBER(10,0)	Yes	(null)	42	(null)
43	JOB_VERSION	NUMBER(10,0)	No	(null)	43	(null)

GIS Model – Scenario 3 – GE Smallworld®

Edit Coordinate Systems | Refresh

Schema

- Regulator--Location
- Regulator--Primary_Location
- Riser--Location
- Secondary_Conductor--Route
- Secondary_Open--Location
- Service_Area--Extent
- Simple_Conductor_Path--Route
- Street_Light--Annotation
- Street_Light--Location
- Street_Light--Secondary_Location
- Structure_Reference_Table
- Substation--Annotation
- Substation--Coverage
- Switch--Annotation
- Switch--Internal_Annotation
- Switch--Location
- Switch--Primary_Location
- Transformer_Unit
- Transformer--Location
- Transformer--Primary_Location
- Transformer--Secondary_Location
- Transmission_Tower--Annotation
- Transmission_Tower--Location
- Trench--Route

Schema

- Fuse--Primary_Location
- Handhole--Annotation
- Handhole--Location
- Hypernode--External_Location
- Hypernode--Internal_Location
- int!capacitor_capacitor_uni
- int!elec!substati_elec!circuit_
- int!elec!transfor_elec!secondar
- int!primary_condu_primary_annot
- int!primary_condu_primary_wire
- int!recloser_recloser_unit
- int!regulator_regulator_uni
- int!simple_conduc_primary_condu
- int!simple_conduc_secondary_con
- int!transformer_service_point
- int!transformer_street_light
- int!transformer_transformer_u
- Junction--Annotation
- Junction--Location
- Manhole--Annotation
- Manhole--Location
- Pad--Annotation
- Pad--Location
- Pole_Attachment_Table

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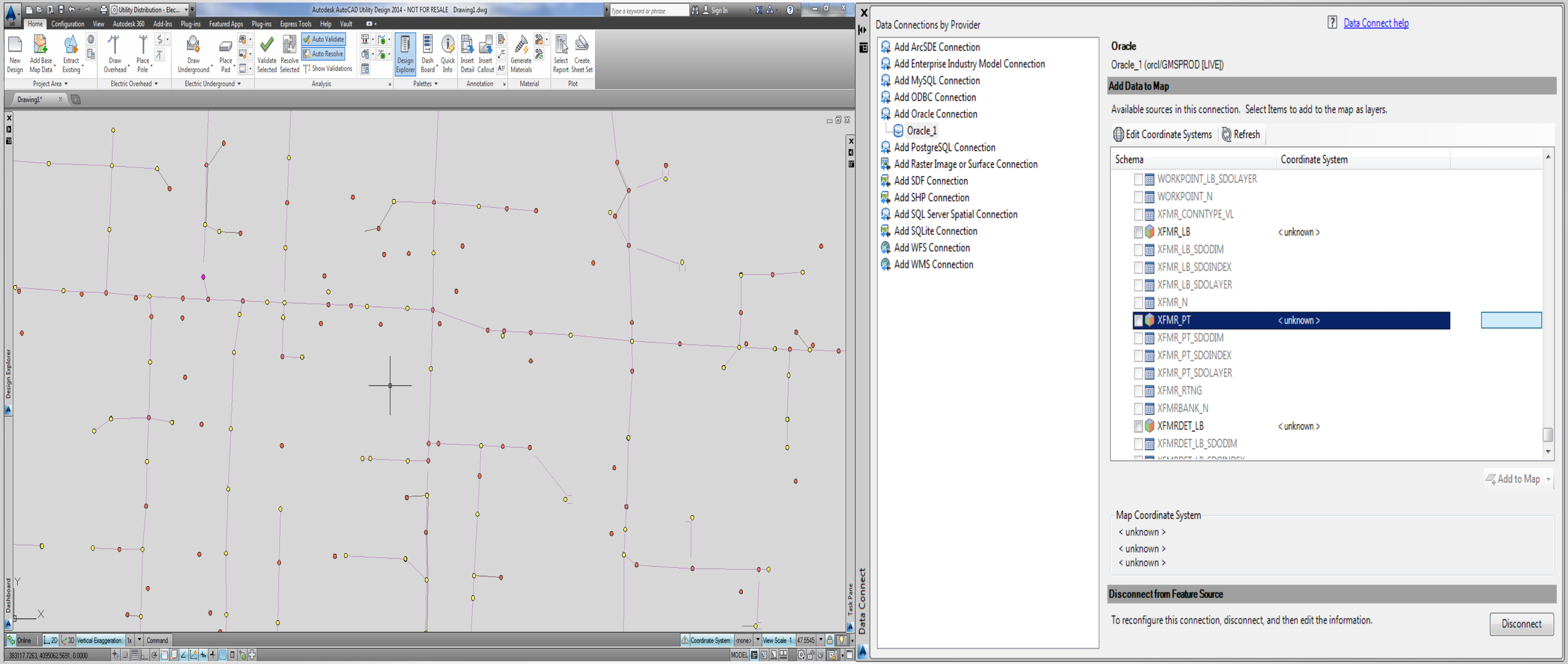
GIS Model – Scenario 4 – Intergraph G/Tech®

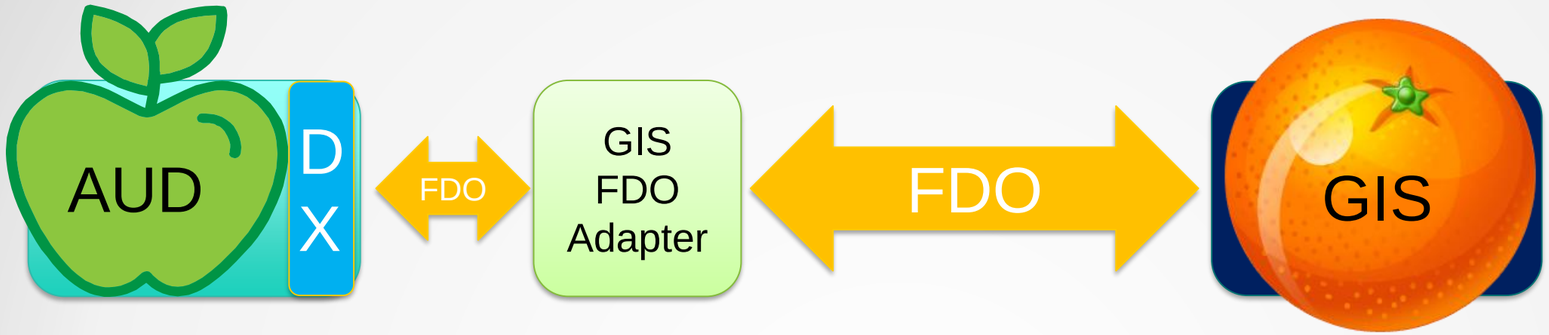


Review of Existing AUD Tools…DX

AUD = Autodesk Utility Design

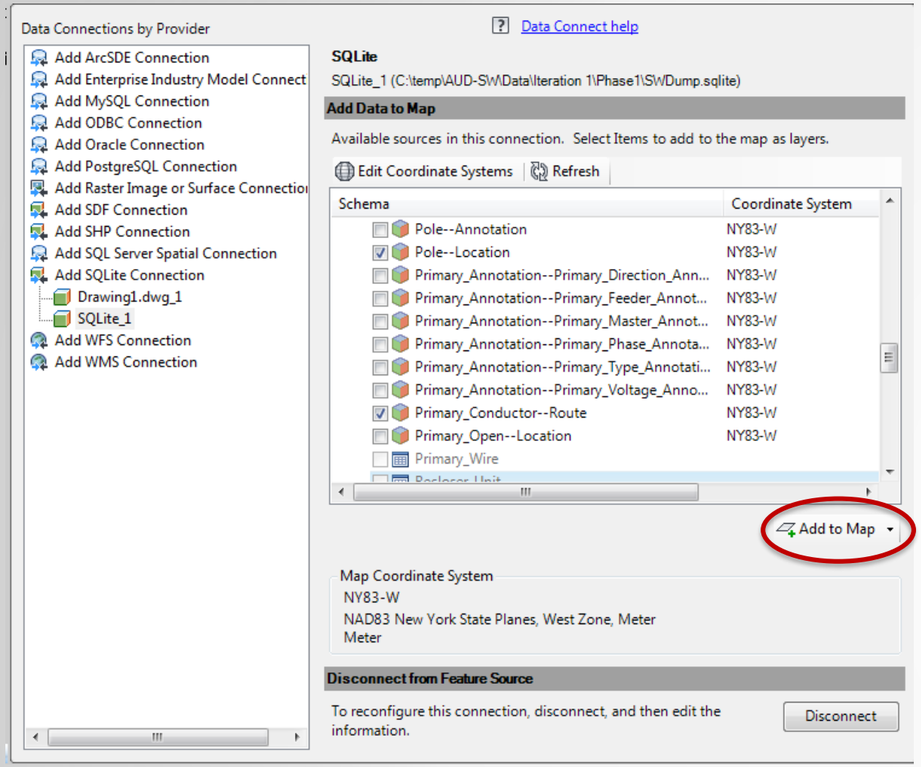
DX = Data eXchange (AUD product feature)

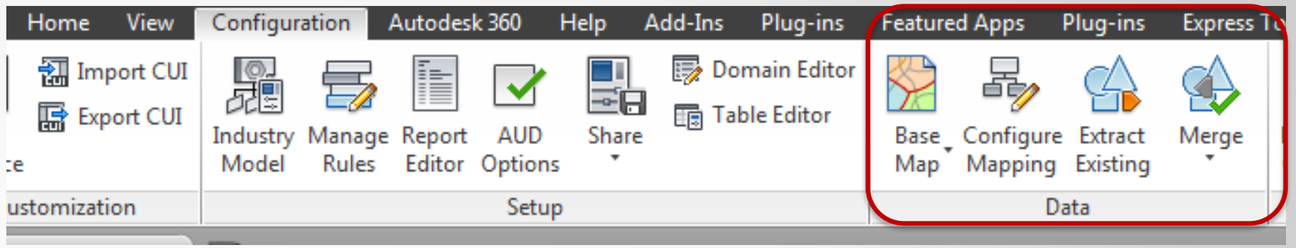
What is Data Exchange(DX) in AUD?

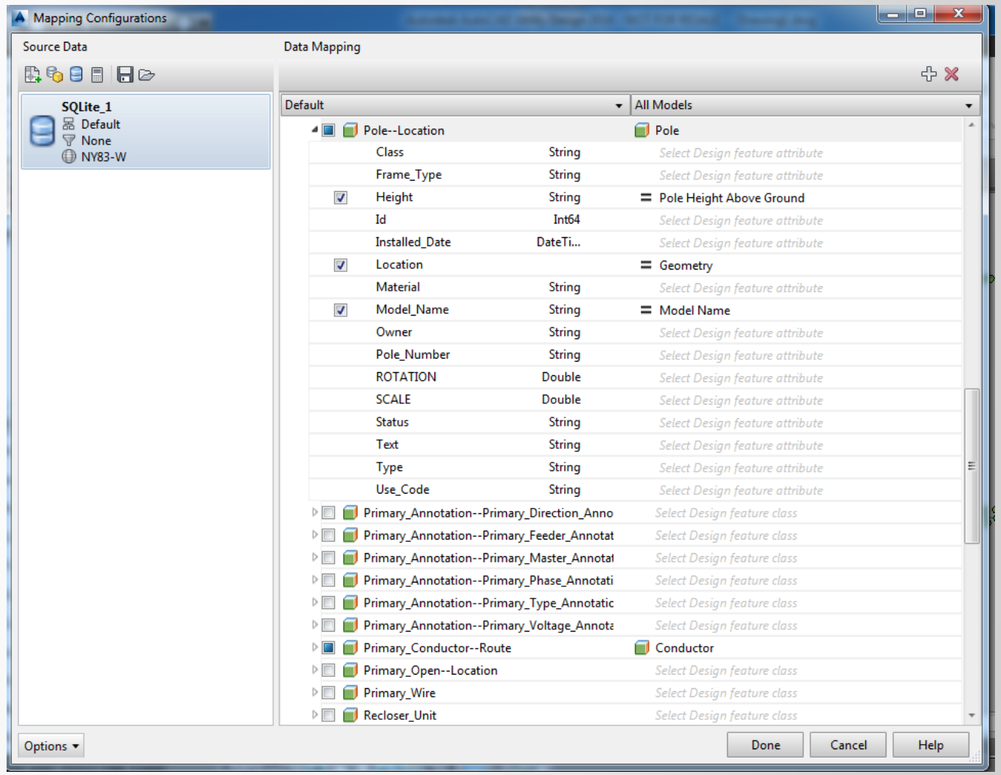


- Data Exchange (DX) component is built-in to AUD 2014+
- GIS FDO Adaptors are available as plug-in components
- Feature Data Objects (FDO) Technology is fundamentally baked into all Infrastructure products.
- GIS to AUD schema mapping is done using DX mapping UI inside AUD
- Built-in data exchange capability is for moving data from GIS schema to AUD (vice-versa), but minimal model transformation capabilities are available out of the box
- Traditional effort to exchange data between systems involve,
    - Analyzing & Mapping schemas
    - Modifying source schema to fit target
    - Applying transformation rules in source and/or target
    - Audit Tracking changes and feedback to users

DX - Steps







1. Open Design Drawing
2. Connect to GIS using FDO
3. Map GIS features to AUD features (including attributes)

Data Fidelity Matrix

GIS Schema Compatibility	Level 1 (OOTB)	Level 2 (Schema Change)	Level 3 (Pre-processor)
Native recognized (Map IM)	95%*		
Closely Matched	80%	95%*	
Incompatible & Foreign	50%	80%	95%*

- * - Some source GIS features may still be a gap (e.g.: Hypernodes, Annotation)
- Need a Assessment Pilot effort to determine where your GIS schema fits

Going Forward: Tackling Data Mapping Issues…

Mapping Issues: The Simple Case

A single feature / class in the source is mapped directly to a single target table*

…Though units and domains still need to be mapped

Single source table with records and attributes…

ArcFM: TRANSFORMERBANK

Shape	ObjectID	Date Created	Symbol Rotation	…
<point>	123	12/12/2010	0	…
<point>	124	7/17/1934	45	…
<point>	125	5/14/1996	90	…

Mapping logic

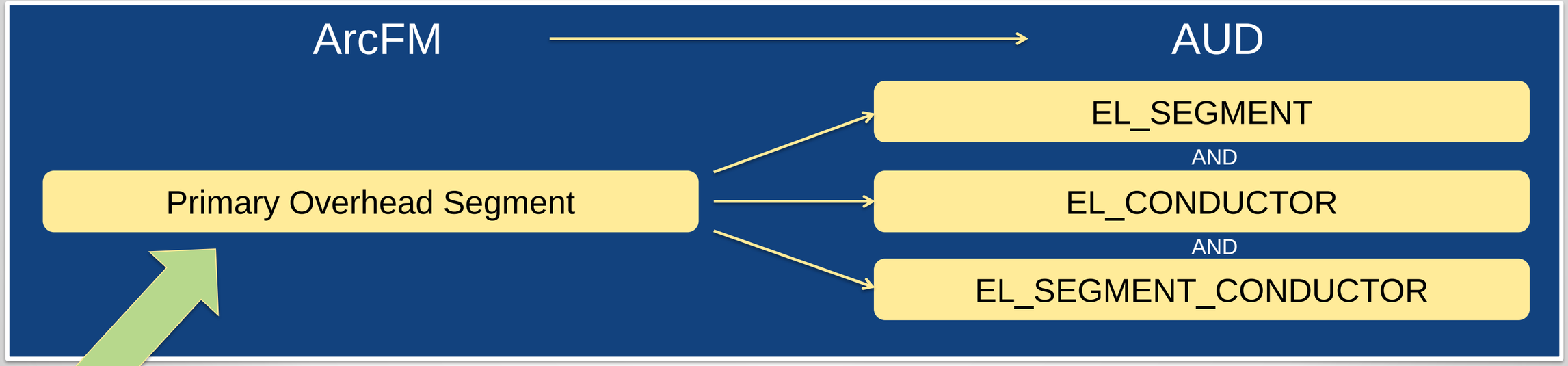
AUD: EL_TRANSFORMER

GEOM	FID	Date Created	Orientation	…
<point>	133245324	12/12/2010	0	…
<point>	133245325	7/17/1934	0.7854	…
<point>	133245326	5/14/1996	1.5707	…

* Note – The terms *Feature* and *Table Row* are used interchangeably

Mapping Issues: One to Many

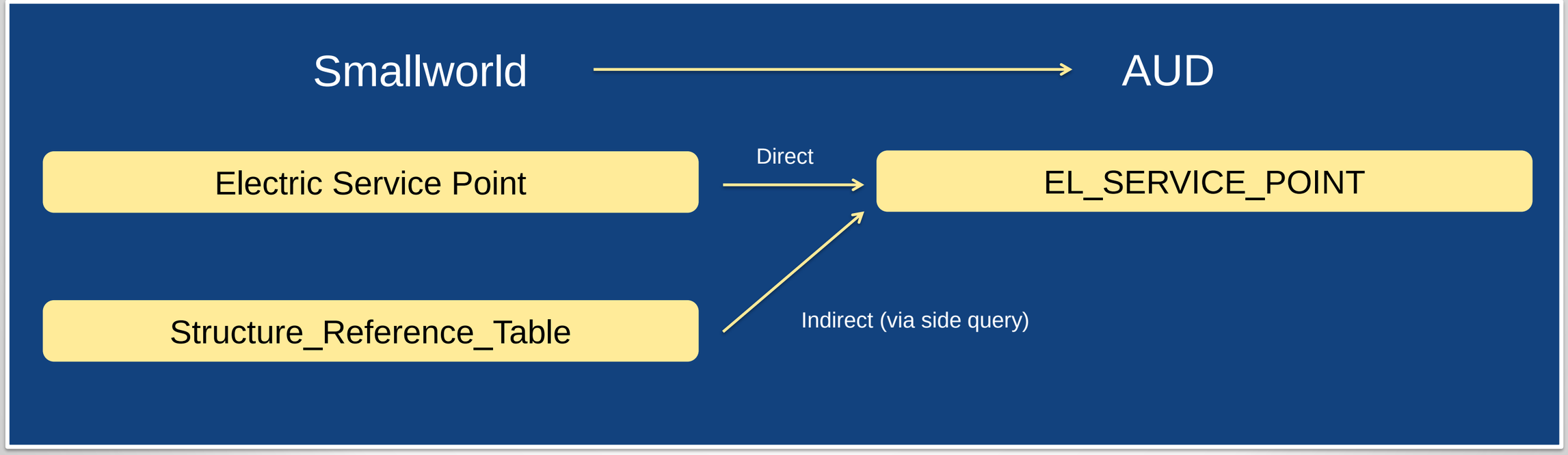
In many cases, a single feature in source must be mapped to several target tables. Most often these tables are interconnected via a *join* table.



Note – Table (attributes not shown)

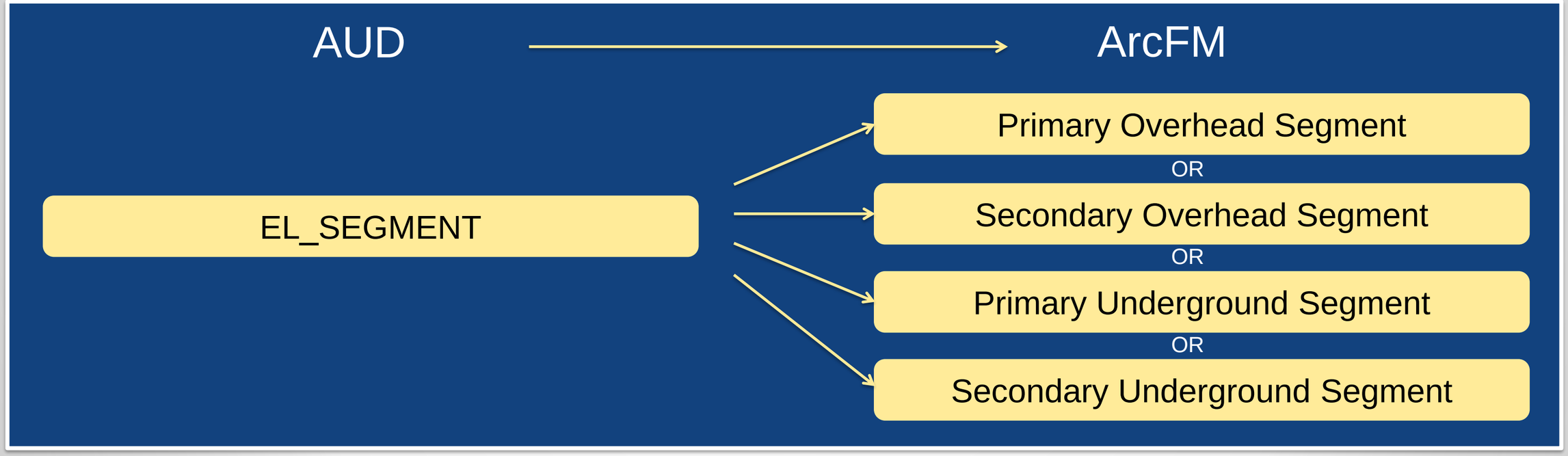
Mapping Scenarios: Many to One

In other cases, attributes from multiple source tables must be mapped to attributes in a single target table.



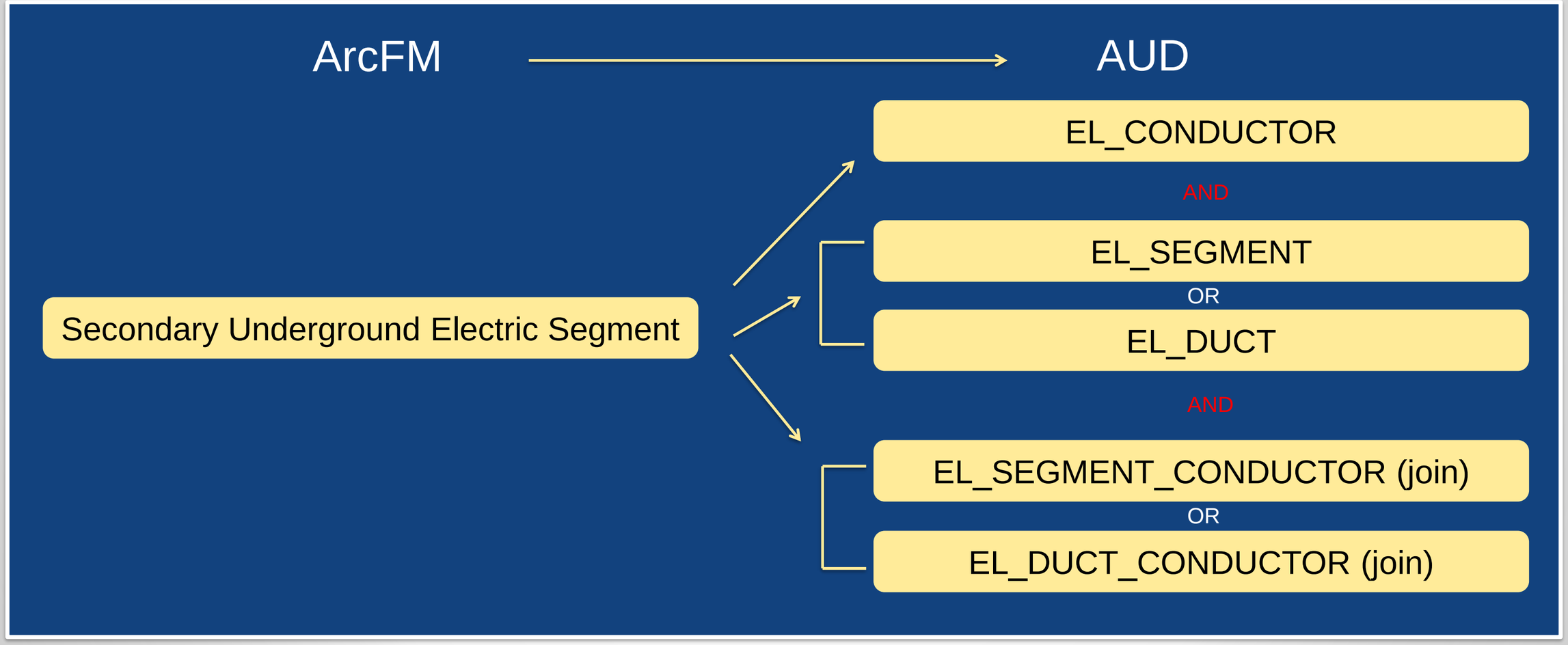
Mapping Scenarios: One to One-of-Many

Sometimes an input feature must be *conditionally* mapped to one of a set of different target tables.



Mapping Scenarios: One to Many-of-Many

Sometimes an input feature must be *conditionally* mapped to several within a set of different target tables.



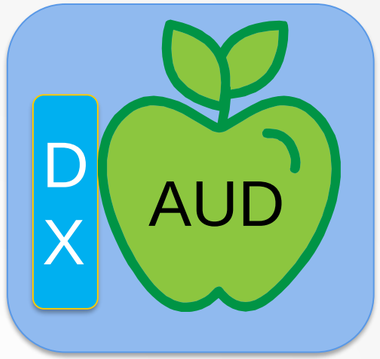
Mapping Scenarios and Solutions using AcClassify

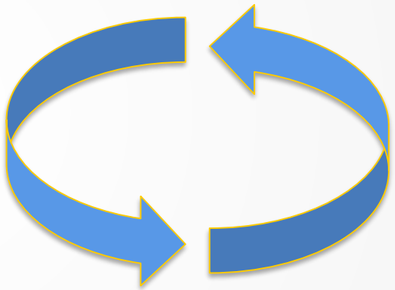
Working with Apples when you're given Oranges

GIS -> AUD Transform

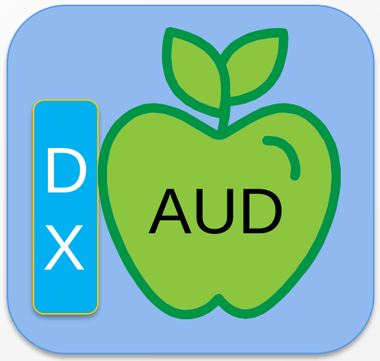
AcClassify

AUD - > Back to GIS Transform

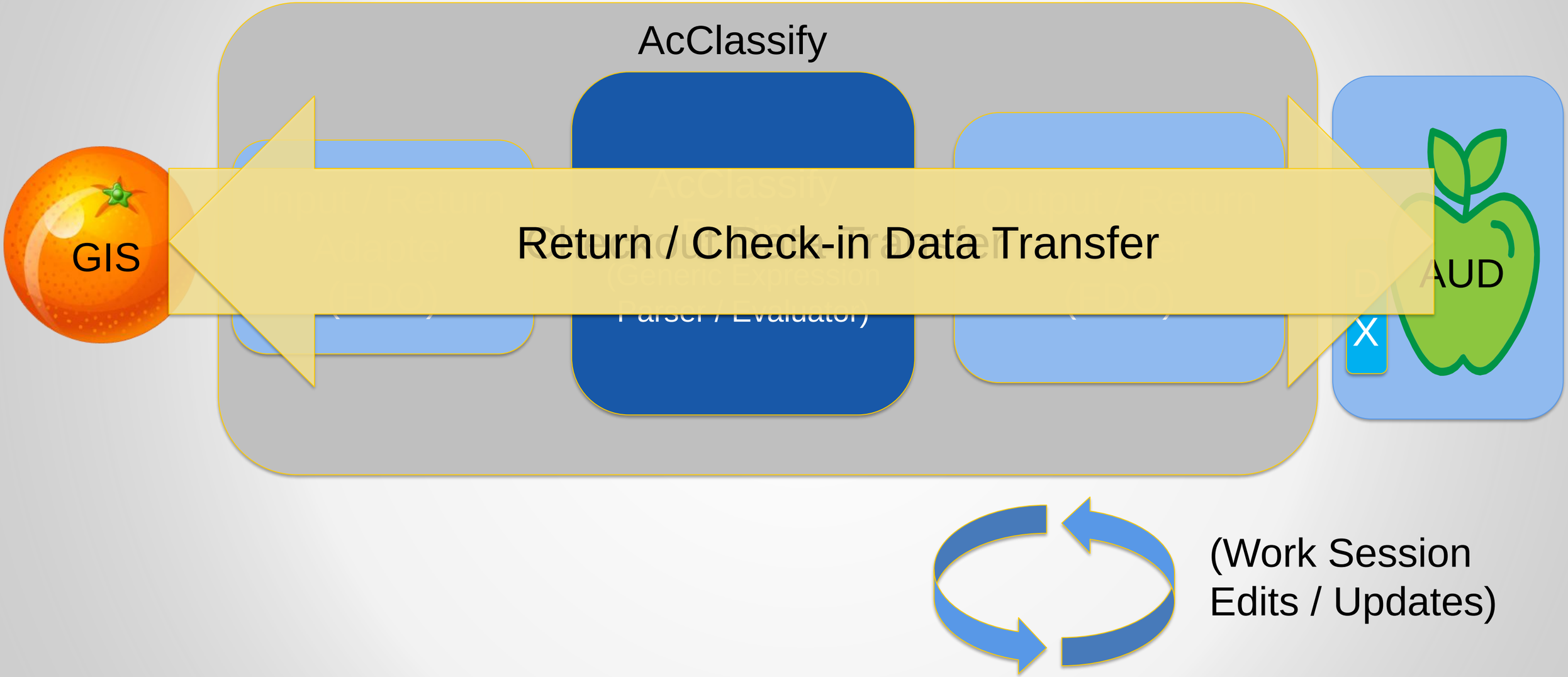




(Work Session
Edits / Updates)



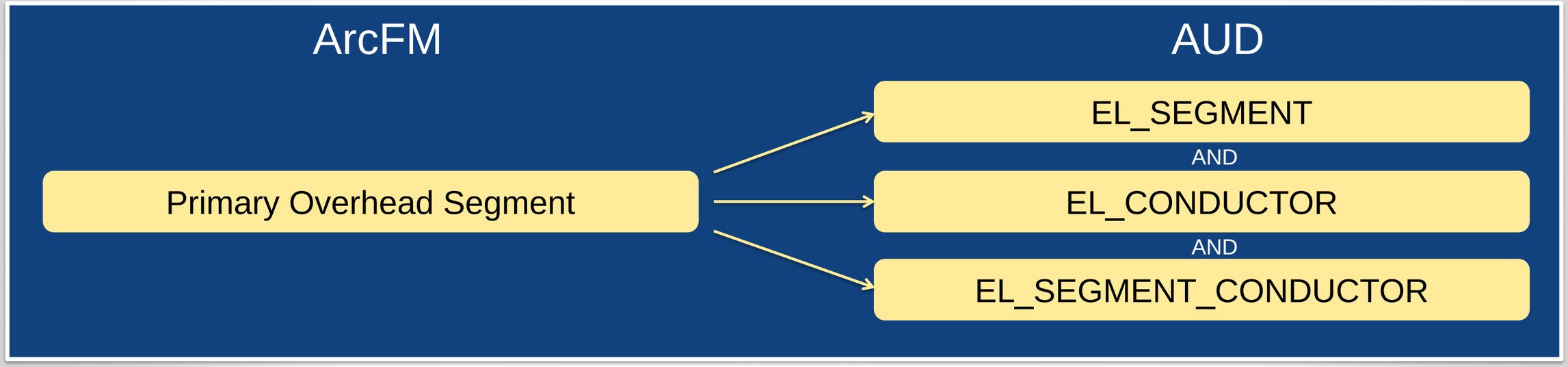
AcClassify Functional Diagram



Quick Intro Demo of AcClassify *Profile Definition* UI…

Mapping Issues: One to Many

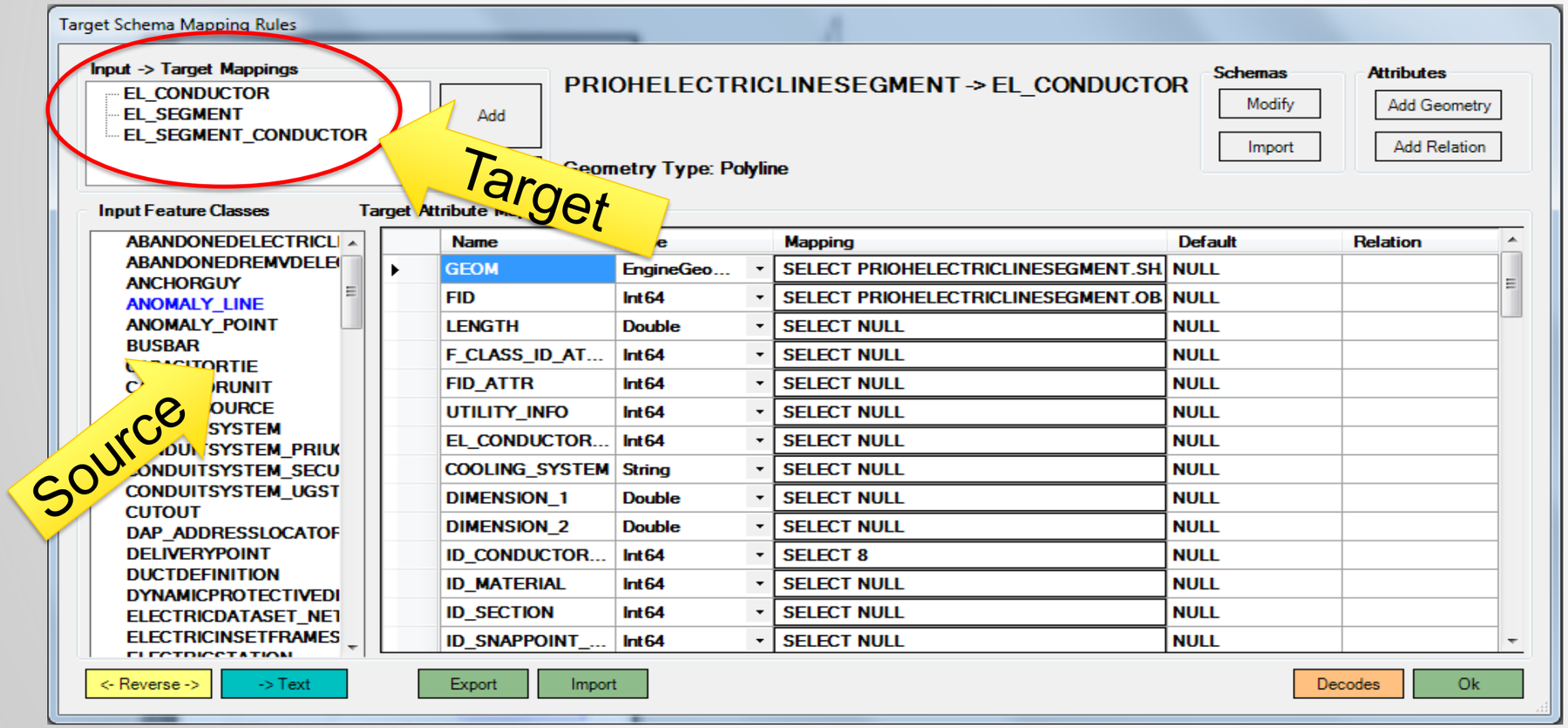
In many cases, a single feature in source must be mapped to several target tables. Most often these tables are interconnected via a *join* table.



Mapping issues One to Many

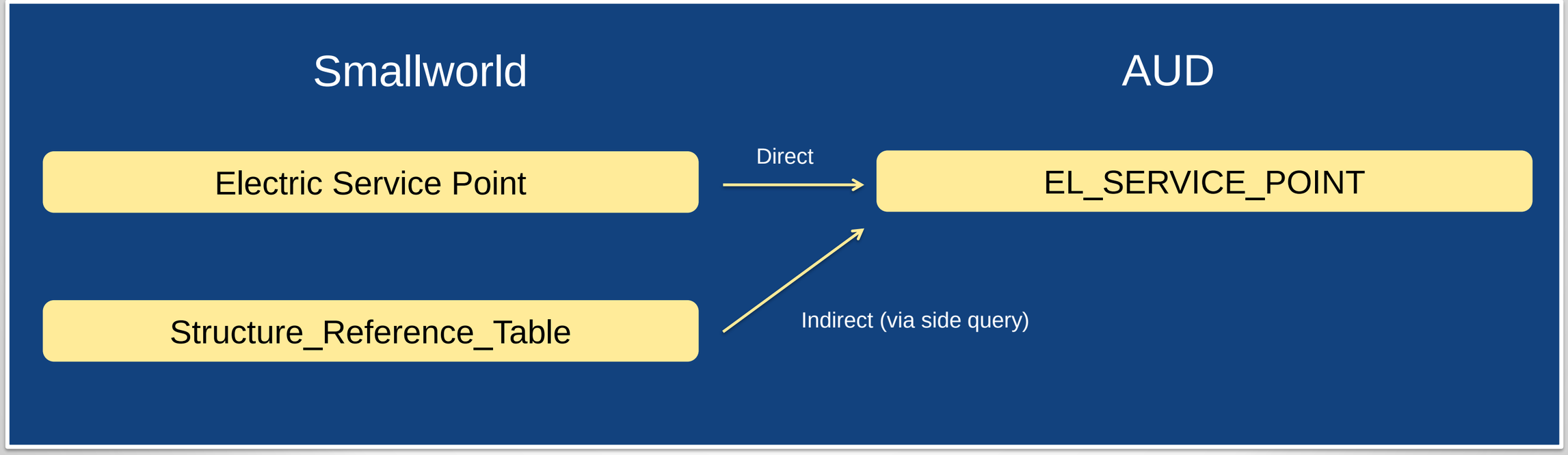
To support one-to-many, AcClassify supports multiple targets per input feature class.

- Each target has an independent set of mapping rules
- A separate feature instance, and ID is created upon output for each mapping



Mapping Scenarios: Many to One

In other cases, multiple source features must be mapped to a single target feature.

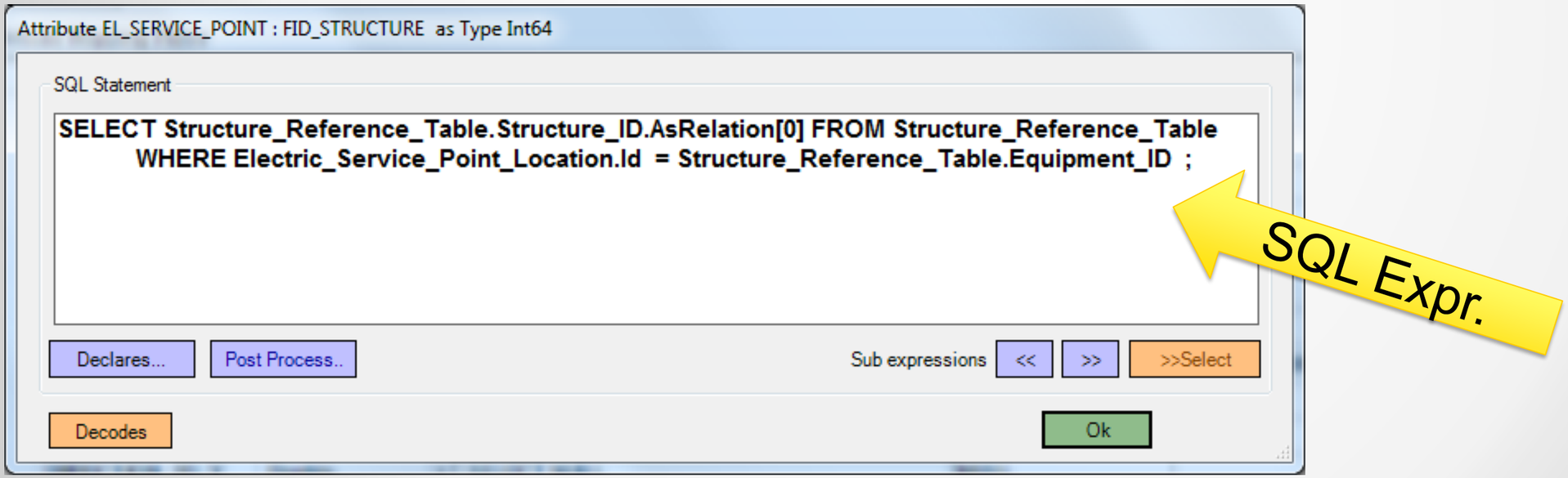


Mapping Scenarios: Many to One

To support many to one, we must aggregate data from multiple source tables in a single mapping expression.

AcClassify supports independent side queries against source tables.

Example below: To fill the FID_STRUCTURE value, AcClassify queries against the Structure_Reference_Table.

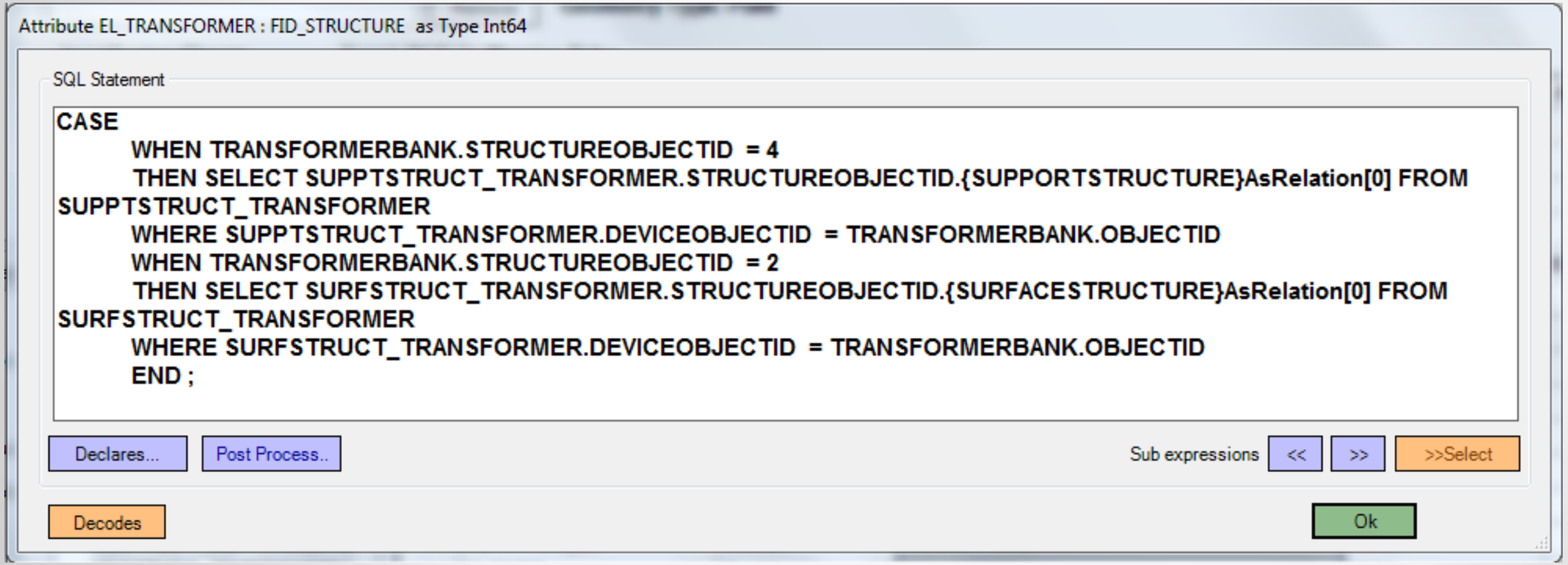


Mapping Scenarios: Complex Mapping Expressions

Many times, it is not a simple translation to obtain the correct target attribute value, but is dependent on several factors.

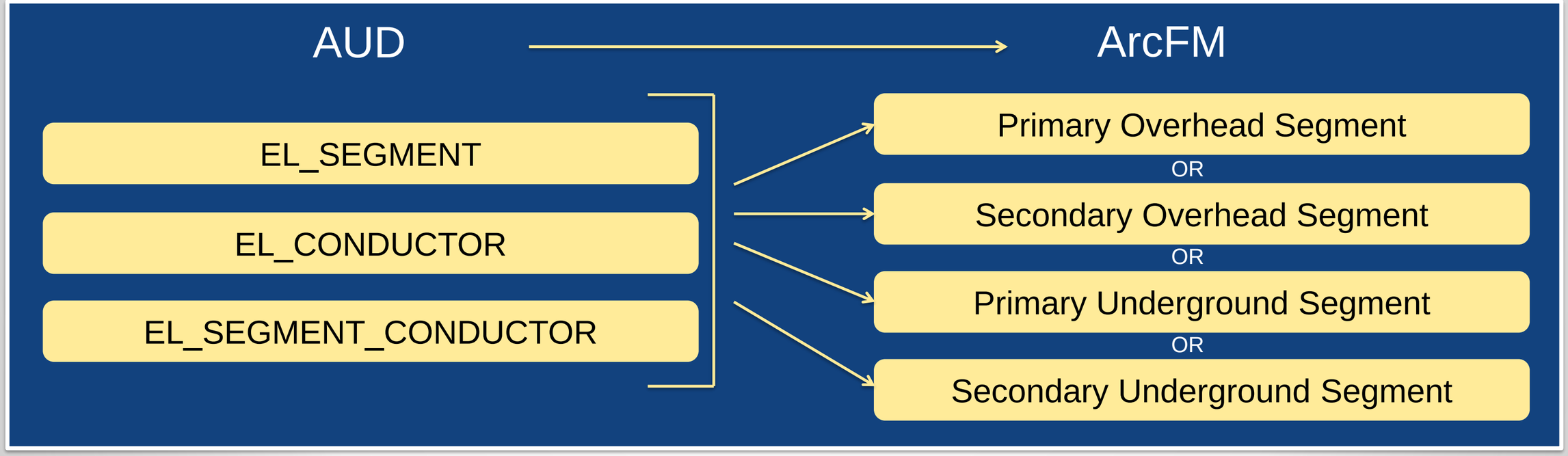
AcClassify supports conditional CASE statements for each individual attribute.

Example: FID_STRUCTURE is mapped to either a *support* or *surface* structure ID.



Mapping Issues: Mapping Qualification Expression

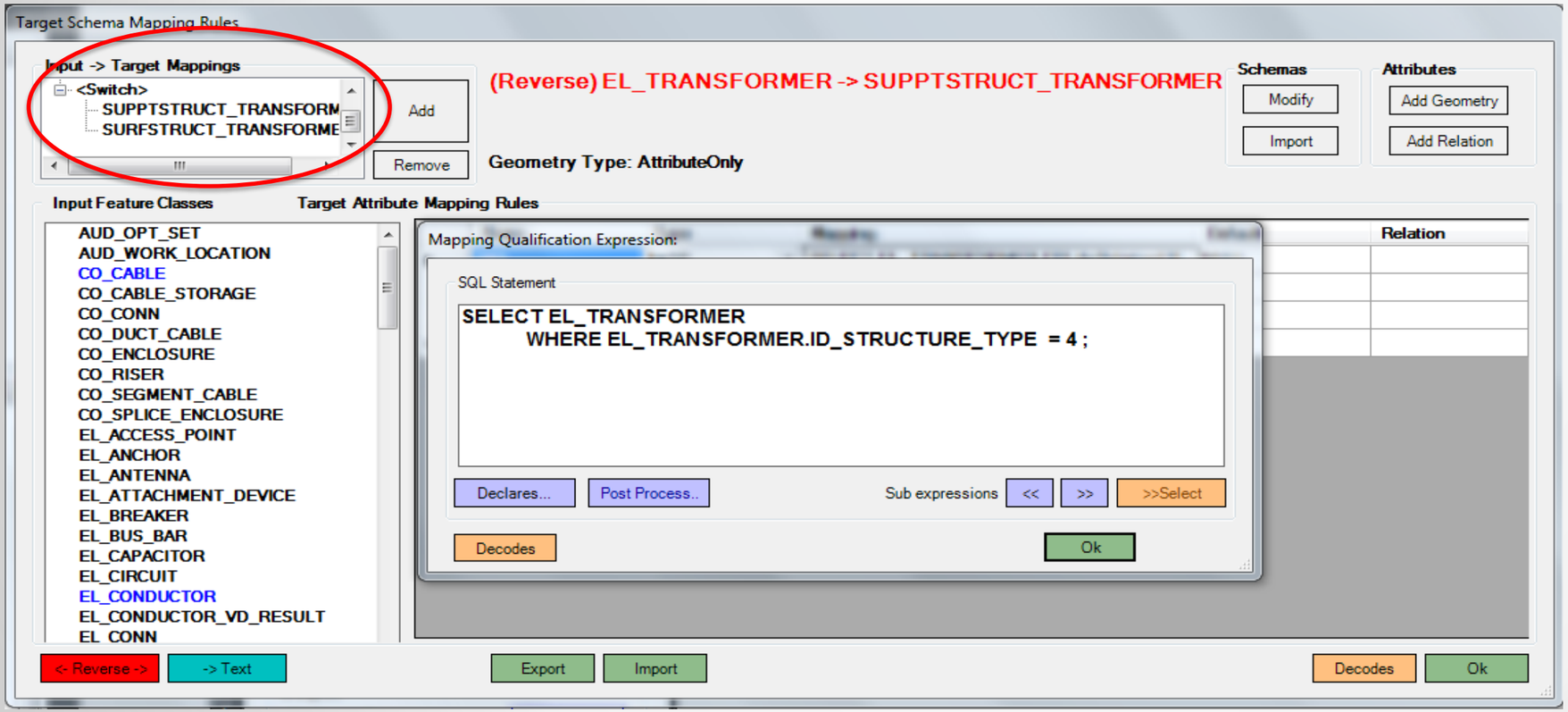
Sometimes an input feature must be *conditionally* mapped to entirely different target tables.



Mapping Qualification Expression

Sometimes an input feature must be conditionally mapped to entirely different target tables.

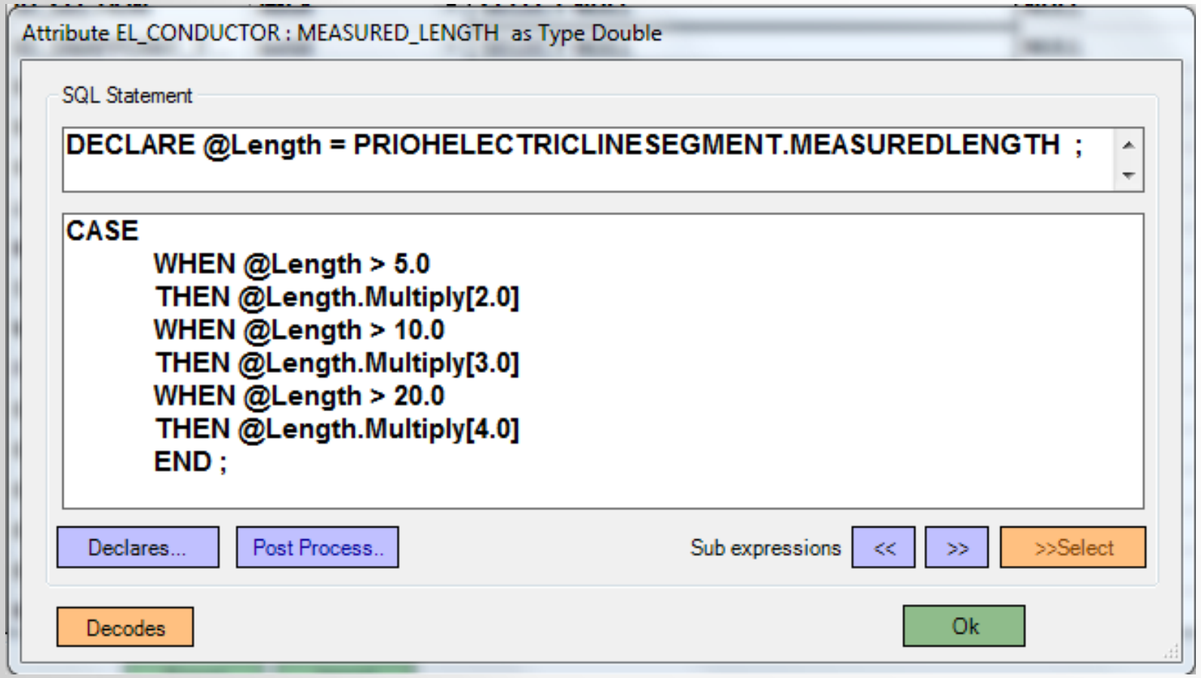
A mapping classification qualifier may be used to decide *before* the target row is instantiated.



Complex Mapping – Attribute Transforms

Attribute values must sometimes be transformed by mathematical function

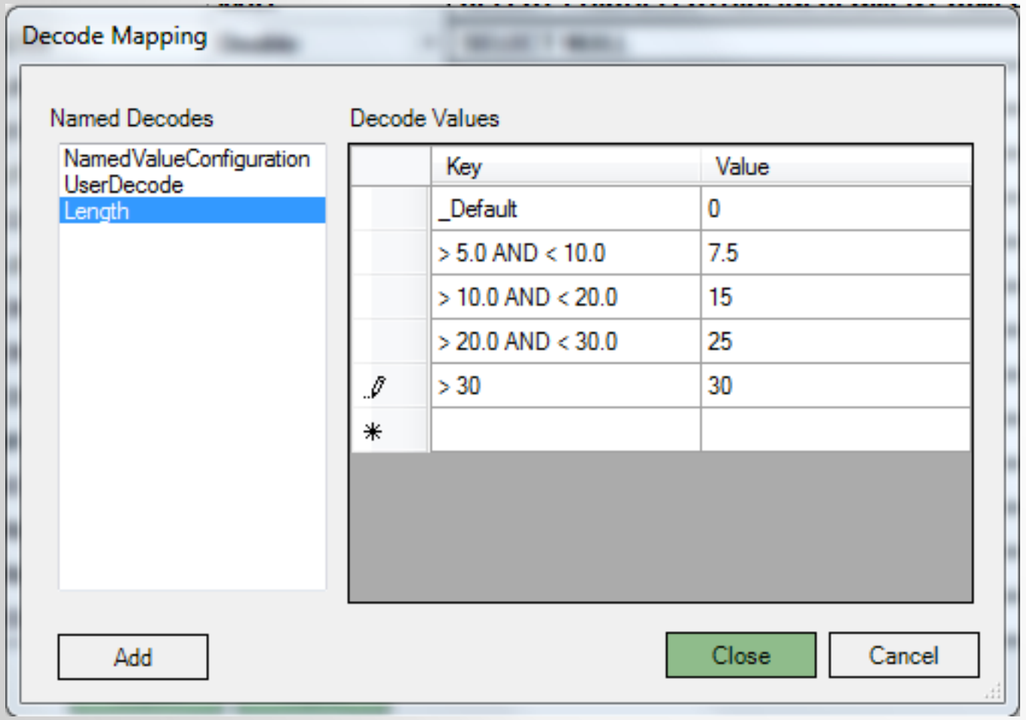
An AcClassify query can arbitrarily modify the result inline as part of the query expression

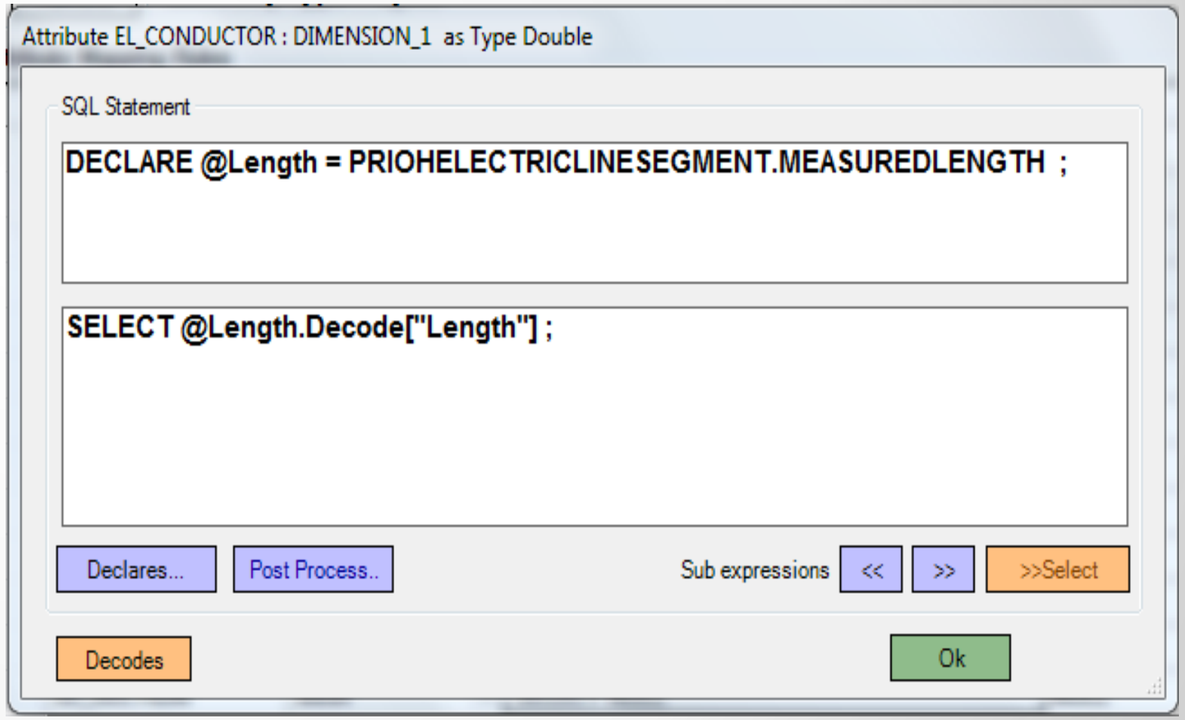


Complex Mapping – Attribute Mappings

Attribute values must sometimes be transformed by some lookup

An AcClassify query can arbitrarily map the result inline as part of the query expression

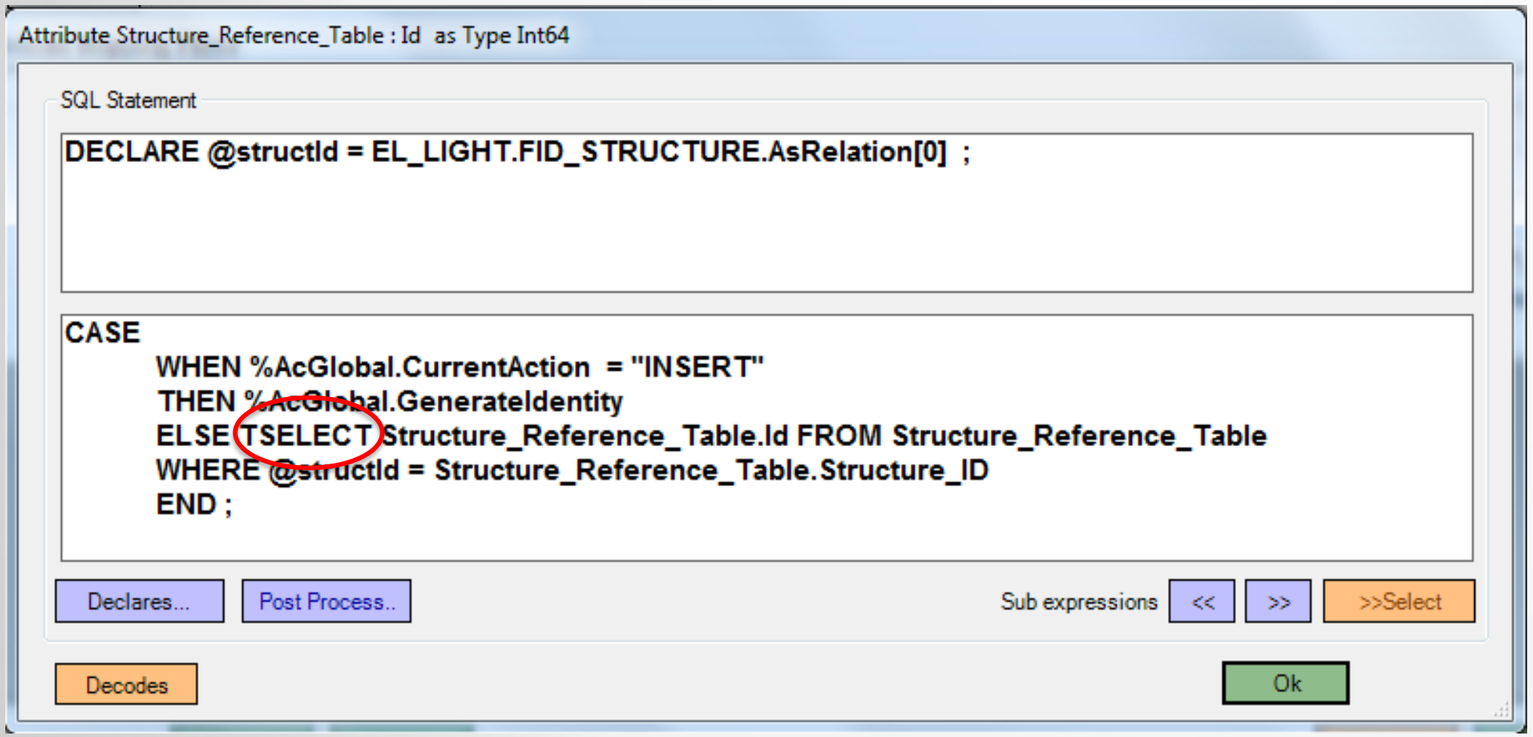




Complex Mapping – Target Schema Selection (TSELECT)

Sometimes the information we need is not available in the source…but *is* available in the target.

TSELECT allows us to make a side query against a *target* table!



Live Demo of AcClassify / Questions

Thank You!

Session Feedback – GS6593

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time

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