

CREATING & CUSTOMIZING SUBYPES & DOMAINS FOR YOUR GIS

Robert Borchert

GIS Technician II

Great River Energy





What do you do for a living

- What do you do for a living?
- I am a GIS Analyst
- Oh!
- What does a GIS Analyst do?
- I design, develop, and maintain GIS databases and systems. I am a member of the ESRI User Community and data combination. I use ArcGIS, Maximo Data Integration, and other GIS software.
- Oh!
- I make maps and reports.
- OH!



...e geo-
...n systems for
...d tabular
...with links to a



CREATING & CUSTOMIZING Subtypes & DOMAINS FOR YOUR GIS

- **TODAYS DISCUSSION**

- HELP <F1>
- TERMINOLOGY
- Subtypes
 - BASICS OF SUBTPYES
 - PARTS OF A Subtype
 - CREATING AND MODIFYING
 - CATALOG, TOOLBOX, ARCMAP
- DOMAINS
 - BASICS OF DOMAINS
 - PARTS OF A DOMAIN
 - CREATING AND MODIFYING
 - CATALOG
 - TOOLBOX

- NON GIS PRODUCTS

- » EXCEL, TEXT FILE

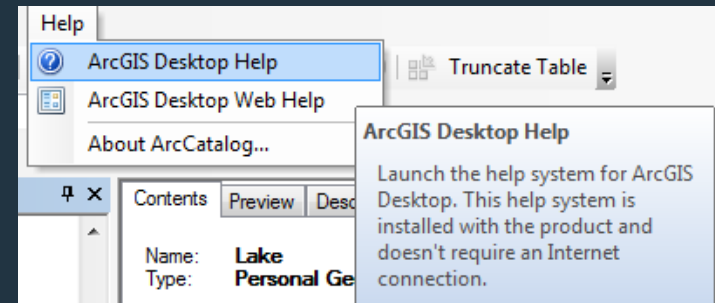
- ASSIGNING

- Demonstration: Creating and modifying Subtypes and Domains
 - Catalog
 - Toolbox
 - MS Excel and text
- **BEST PRACTICES**
 - THROUGHOUT THE PRESENTATION



HELP!

- Extensive help files found for almost every tool and topic for ArcGIS products and services.
- From an ArcGIS product
 - Help drop down menu
 - Press the F1 key
 - From a dialog window
- Online
 - support.esri.com
 - geonet.esri.com 😊
 - Create a user account





TERMINOLOGY

- Feature Class – A grouping of features that are of similar nature but may have multiple attributes.
 - Example: Primary OH is a Feature Class but has different phases and can have multiple Subtypes
- Feature – A single point, line or polygon in a Feature Class
- Field – A column of data in a feature class table.
- Attribute – The specific information entered in the cell under a field that defines one thing about a feature.
- Subtype – A grouping of features in a feature class based on attributes in a single field.
- Domain – Specifies pre-made entries for an attribute
 - A field that is Subtyped will override an assigned Domain



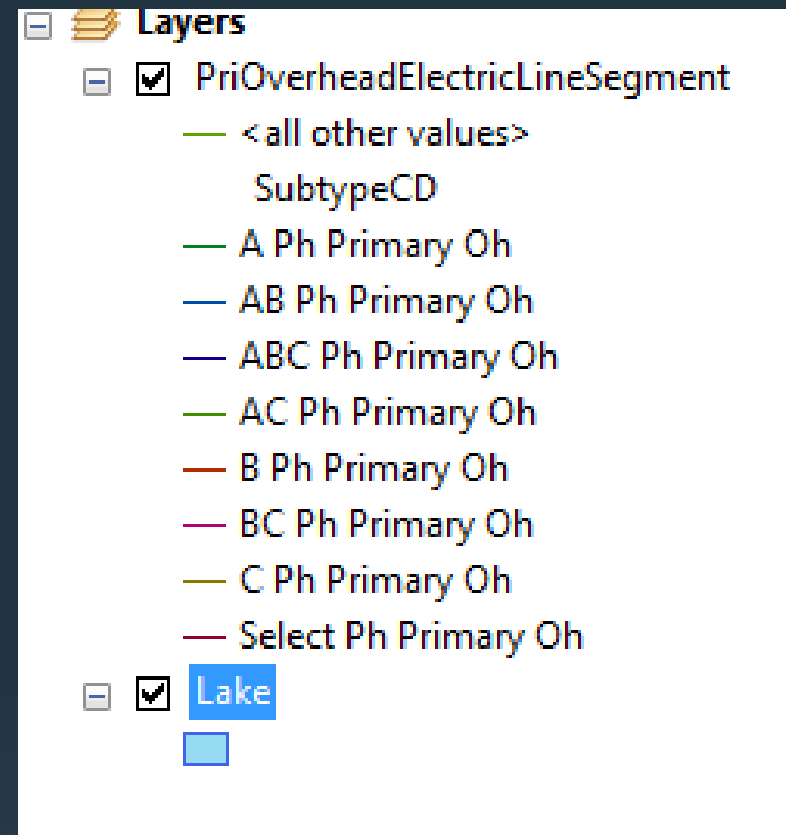
Subtypes - Basics

- A grouping in a feature class that specifies distinct classifications in a feature
 - Overhead Primary – AØ, BØ, CØ etc
 - Reclosers – Single Phase, Two Phase, Three Phase
- Best used when you have significant differences in features of the same type (like Primary Conductor)
- Grouped on a single field
 - Only on SHORT OR LONG INTEGER
- Each attribute can have its own domain in each Subtype
- Allows for automatic symbol classification



Subtypes and Symbols

- Subtyped Feature Class's are automatically separated in to different features





Subtypes and Symbols

- Adds Symbols by Label
- Right Click Value and select Reset Sorting

Layer Properties

General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates Time HTML Popup

Show:

Features

Categories

Unique values

Unique values, many

Match to symbols in a

Quantities

Charts

Multiple Attributes

Draw categories using unique values of one field. Import...

Value Field: SubtypeCD

Color Ramp: Unique values

Symbol	Value	Label	Count
<input checked="" type="checkbox"/>	<all other values>	<all other values>	
	<Heading>	SubtypeCD	
—	1	A Ph Primary Oh	?
—	4	AB Ph Primary Oh	?
—	7	ABC Ph Primary Oh	?
—	5	AC Ph Primary Oh	?
—	2	B Ph Primary Oh	?
—	6	BC Ph Primary Oh	?
—	3	C Ph Primary Oh	?
—	0	Select Ph Primary Oh	?

Add All Values Add Values... Remove Remove All Advanced

OK Cancel Apply



Subtypes and Symbols

- Adds Symbols by Label
- Right Click Value and select Reset Sorting

Layer Properties

General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates Time HTML Popup

Show:

Features

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Multiple Attributes

Draw categories using unique values of one field. Import...

Value Field: SubtypeCD

Color Ramp

Symbol	Value	Label	Count
<input checked="" type="checkbox"/>	<all other values>	<all other values>	
	<Heading>	SubtypeCD	
1	1	?	?
4	4	?	?
7	7	?	?
5	5	?	?
2	2	?	?
6	6	?	?
3	3	?	?
0	0	?	?

Context Menu:

- Group Values
- Ungroup Values
- Reverse Sorting
- Reset Sorting
- Remove Value(s)
- Flip Symbols
- Properties for Selected Symbol(s)...
- Properties for All Symbols...
- Apply Color Scheme
- Edit Description...

Buttons: Add All Values, All, Advanced, OK, Cancel, Apply



Subtypes and Symbols

- Can alternatively sort symbols based on Label as well

Layer Properties

General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates Time HTML Popup

Show:

Features

Categories

Unique values

Unique values, many

Match to symbols in a

Quantities

Charts

Multiple Attributes

Draw categories using unique values of one field. Import...

Value Field: SubtypeCD

Color Ramp

Symbol	Value	Label	Count
<input checked="" type="checkbox"/>	<all other values>	<all other values>	
<Heading>			
SubtypeCD			
	0	Select Ph Primary Oh	?
	1	A Ph Primary Oh	?
	2	B Ph Primary Oh	?
	3	C Ph Primary Oh	?
	4	AB Ph Primary Oh	?
	5	AC Ph Primary Oh	?
	6	BC Ph Primary Oh	?
	7	ABC Ph Primary Oh	?

Add All Values Add Values... Remove Remove All Advanced

OK Cancel Apply



Subtypes - Parts

- Parts of a Subtype
 - Subtype Field
 - Specify which field your features will be Subtyped on
 - Must be integer
 - Default Subtype
 - You specify what the default Subtype is when you create a new feature
 - The default default is the first Subtype you create

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance
Fields Indexes Subtypes Feature Extent Relationships Representations

Subtype Field: <None>

Default Subtype:

Subtypes:

Code	Description

Default Values and Domains:

Field Name	Default Value	Domain
SubtypeCD		
SHAPE_Length		

Use Defaults Domains...

OK Cancel Apply



Subtypes - Parts

- Parts of a Subtype
 - Code
 - An integer that is associated with the Subtype
 - Description
 - A short description of the Subtyped Feature
 - Best Practice – Keep it short

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance
Fields Indexes Subtypes Feature Extent Relationships Representations

Subtype Field: <None>

Default Subtype:

Subtypes:

Code	Description

Default Values and Domains:

Field Name	Default Value	Domain
SubtypeCD		
SHAPE_Length		

Use Defaults Dgains...

OK Cancel Apply



Subtypes - Parts

- Parts of a Subtype
 - Default Value
 - Default value for a specific Subtype
 - Domain
 - This is where can assign a specific Domain for a Subtyped Field

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance
Fields Indexes Subtypes Feature Extent Relationships Representations

Subtype Field: <None>

Default Subtype:

Subtypes:

Code	Description

Default Values and Domains:

Field Name	Default Value	Domain
SubtypeCD		
SHAPE_Length		

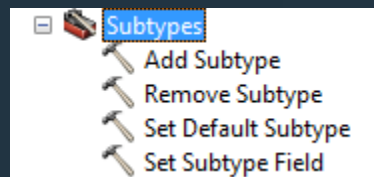
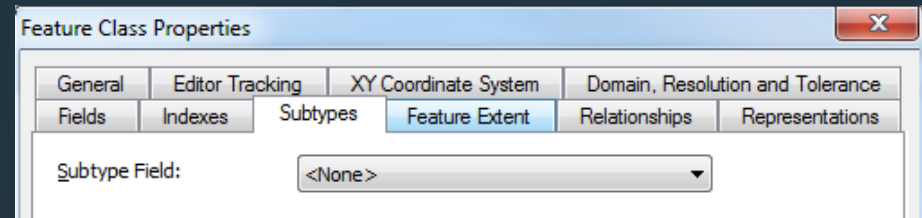
Use Defaults Dgains...

OK Cancel Apply



Subtypes - Creating & Modifying

- Where
 - ArcCatalog
 - ArcMAP
 - ArcGIS Pro (not to be discussed in this session)
- How
 - ArcCatalog
 - ArcToolbox tools





Subtypes – Best Practices

- Best practices
 - Only Subtype for small distinct groupings such as phase
 - Don't Subtype based on broad attributes such as wire type
 - If using NISC for modeling substation devices should have a sub bay designation
 - If you don't need to use a Subtype then don't
 - Lake, streams, sections, etc.



Subtypes – Best Practices

- Field typically called SubtypeCD or SubtypeCode
 - However, you may use any field that makes sense
- Keep the Descriptions short
 - Long descriptions may not be fully visible in the attributes window with out making the display wider
 - More critical for web mapping applications
- Too many Subtypes can get cumbersome.
Consider breaking it into different feature classes



Subtype's that frustrate

ORIGIN DATA MODEL FOR PRIMARY

MULTISPEAK FOR SECTIONALIZING

Feature Class Properties

General | XY Coordinate System | Domain, Resolution and Tolerance | Fields

Indexes | Subtypes | Feature Extent | Relationships | Weight Association

Subtype Field: Placement

Default Subtype: OHPrimary

Subtypes:

Code	Description
0	OHPrimary
1	UGPrimary

Default Values and Domains:

Field Name	Default Value	Domain
Enabled	1	EnabledDomain
ParentID		
ExistingSection		
ConductorA	Unk	OHPrimaryConductor
ConductorB	Unk	OHPrimaryConductor
ConductorC	Unk	OHPrimaryConductor

Use Defaults Domains...

OK Cancel Apply

Feature Class Properties

General | Editor Tracking | XY Coordinate System | Domain, Resolution and Tolerance

Fields | Indexes | Subtypes | Feature Extent | Relationships | Representations

Subtype Field: subtypeCode

Default Subtype: Fuse Bank

Subtypes:

Code	Description
1	Fuse Bank
2	Recloser Bank
3	Sectionalizer Bank
4	Breaker Bank
5	Combined Overcurrent Bank

Default Values and Domains:

Field Name	Default Value	Domain
phaseCode		eDomainPhase
Detail		
AncillaryRole	0	AncillaryRoleDomain
Enabled	1	EnabledDomain
objectGUID		
comments		

Use Defaults Domains...

OK Cancel Apply



Domains - Basics

- Specified values that define acceptable values for an attribute in a field.
 - Specific wire sizes
 - Specific fuse sizes
 - Specific pole attachments
- Field Type must match the field type.
 - Short Integer
 - Long Integer
 - Float
 - Double
 - Text
 - Date



Domains - Basics

- Assignment
 - One domain can be applied to any number of fields and any number of feature classes
- Domain Types
 - Coded Values
 - Specified Values
 - Can be used in all Field Types
 - Range
 - Allows entry of a value between a minimum and maximum value
 - Can be used on all field types except TEXT



Domains - Basics

- Complexity
 - Can be as basic as a simple Yes or No
 - Can be as complicated as a complete list of pole attachments, fuse sizes, or wire types
 - A domain can be created to match any list of attributes
 - RUS Specs - 398 entries
 - Maximum Length - ???
- Updating a domain will update it in all Fields that use it in all Feature Classes



Domain - Parts

- Parts of a Subtype
 - Domain Name
 - Name of Domain
 - Description
 - Basic description of the domain
 - Not required

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



Domain - Parts

- Parts of a Subtype
 - Field Type
 - Must match the Field type you are going to associate the Domain to
 - Domain type
 - Coded Values
 - Range

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



Domain - Parts

- Parts of a Subtype
 - Field Type
 - Must match the Field type you are going to associate the Domain to
 - Domain type
 - Coded Values
 - Range

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



Domain - Parts

- Parts of a Subtype
 - Minimum/Maximum Values
 - Not with Text values
 - Range Domains only
 - Min and Max values

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



Domain - Parts

- Parts of a Subtype
 - Split Policy
 - Duplicate
 - Duplicates value when pasted or split
 - Default Value
 - Uses default value when pasted or split
 - Merge Policy
 - Can sum Integer values on Merge
 - Default only on Text

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



Domain - Parts

- Parts of a Subtype
 - Code
 - Short value used to define the attribute
 - Can be sorted Alpha Numerically
 - Description
 - Description of the specific attribute
 - This is what you will see

Database Properties

General Domains

Domain Name	Description

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

OK Cancel Apply



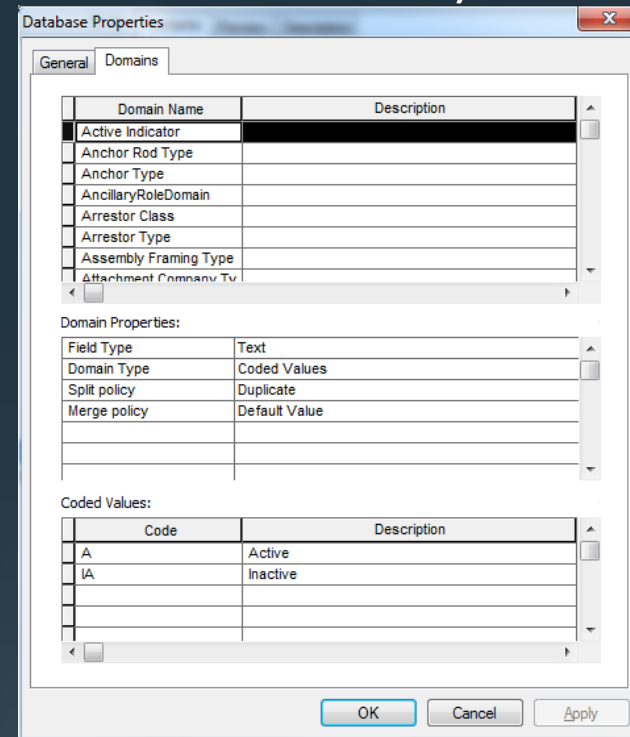
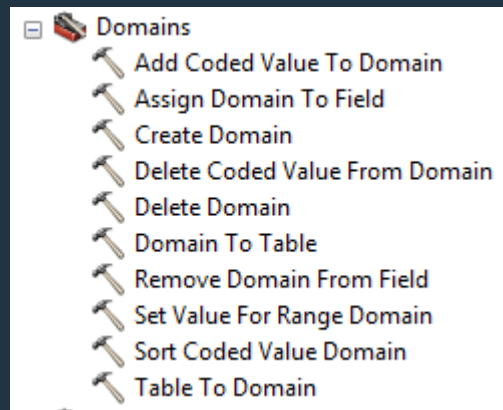
Domains – Creating and Modifying

- Where

- ArcCatalog
- ArcMAP
- ArcGIS Pro (not to be discussed in this session)

- How

- ArcCatalog
- ArcToolbox tools





Domains – Best Practices

- Integer vs Text
 - Smaller database size
 - 38903 Conductor features
 - 8772 kB with Integer domain
 - 1296 kB larger with Text domain
 - Faster speeds
 - System can read integer values faster than text
 - When using Field Calculator you can simply enter the number if you know it.
 - Keep descriptions short for view purposes



Domains that frustrate

Database Properties

General Domains

Domain Name	Description
AncillaryRoleDomain	
Detail	
eDomainAssemblyAction	
eDomainAssemblySpanT	
eDomainBooleanYesNo	
eDomainConnectionType	
eDomainConnectionType	
eDomainDeviceMounting	

Domain Properties:

Field Type	Long Integer
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
1	Yes
0	No

OK Cancel Apply

Database Properties

General Domains

Domain Name	Description
eDomainSinglePhase	
eDomainSoftStartTypeCo	
eDomainSourceSideConf	
eDomainSwitchStatus	
eDomainSwitchType	
eDomainTransformerWin	
eDomainYesNo	
EnabledDomain	

Domain Properties:

Field Type	Text
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
Yes	Yes
No	No

OK Cancel Apply



Before you begin – Plan it out

- PLAN IT OUT

- Determine how many Subtypes you need
- Determine which fields you want to use
- Determine which fields will use a domain
- Determine the Attributes you want to use in each Domain
- Write out your Domains?
- Create Domains first
 - Automatically assigned when creating Subtypes



Plan it out

- Primary Overhead Conductor
 - Subtypes
 - 0 Select Phase
 - 1 A Phase
 - 2 B Phase
 - 3 C Phase
 - 4 AB Phase
 - 5 AC Phase
 - 6 BC Phase
 - 7 ABC Phase



Plan it out

- Primary Overhead Conductor

- Domain

- Phase – Coded Values, short integer

- Code Description

- 1 A \emptyset

- 2 B \emptyset

- 3 C Phase Primary Overhead Conductor



Plan it out

- Primary Overhead Conductor
 - Domain
 - WireType OH – Coded Values, Text

Code	Description
#1 ACSR	#1 ACSR
#2 ACSR	#2 ACSR
#4 ACSR	#4 ACSR
Etc...	

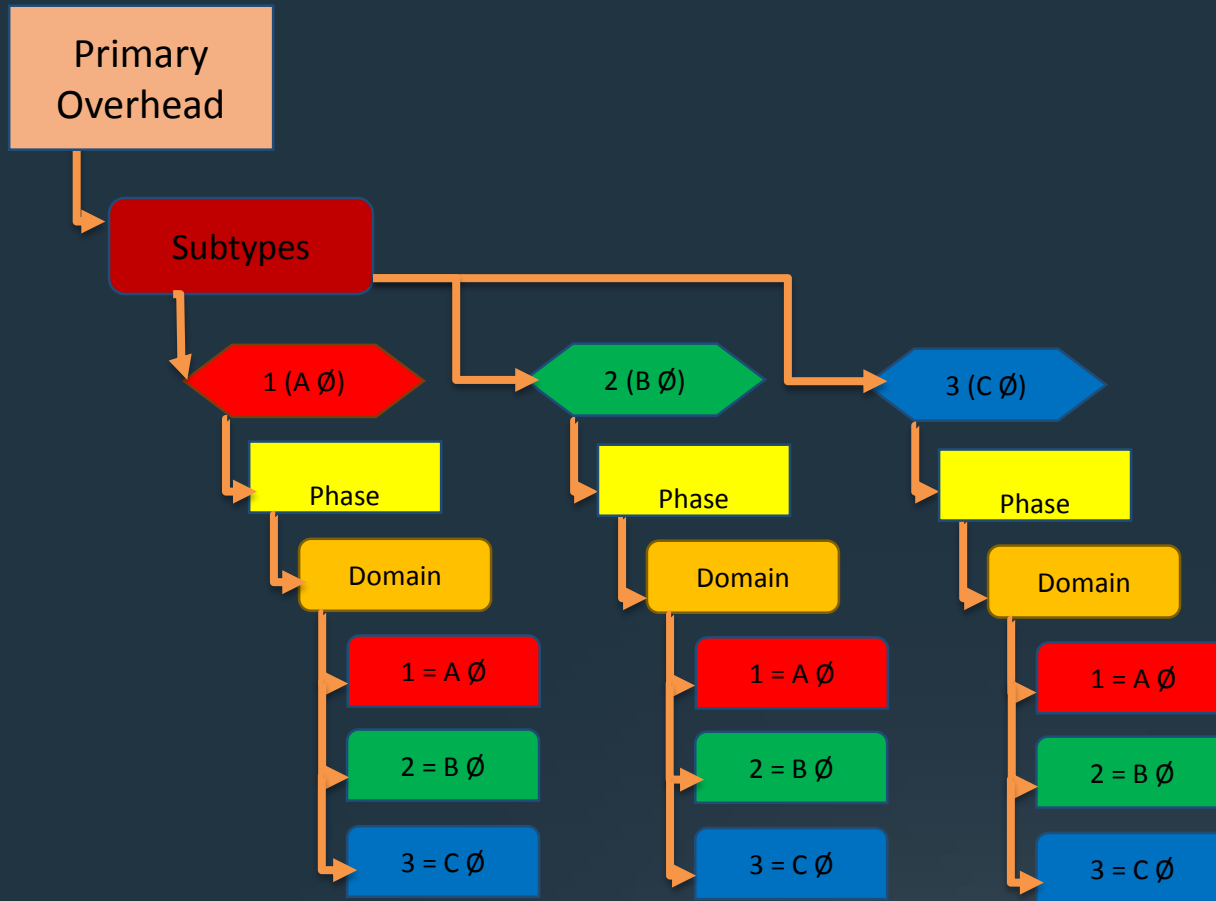


Plan it out

- Misc Features
 - Domain
 - RUSSpecs – Coded Values, Text
 - RUS Units
 - 386 Unique Values



Flow chart of a feature





Demonstration

- Feature Class Primary Overhead Conductor
- Create a PHASE Domain
 - Create in ArcCatalog
- Create Subtypes
 - Create in ArcCatalog
- Import a WireType Domain
 - Import from existing feature
 - Assign using ArcToolbox Tools



Demonstration

- Feature Class MiscFeatures
- Create RUS Units Domain
 - Create using a document and ArcToolbox tools
 - Documents
 - MS Access
 - Excell
 - Text
 - » Tab
 - » Csv
 - Assign in ArcMap



Questions

- Any Questions so far?



Demonstration

- Switching to demonstration mode.
- In case of epic demonstration failure the following slides are the demonstration



Create first Domain

- Open Feature Class Properties in ArcCatalog
- There is no field for domain in the phase
- Observe that Phase is Long Integer

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance

Fields Indexes Subtypes Feature Extent Relationships Representations

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
SHAPE_Length	Double
SubtypeCode	Long Integer
Phase	Long Integer
WireType	Text

Click any field to see its properties.

Field Properties

Alias	Phase	
Allow NULL values	Yes	
Default Value		

Import...

To add a new field, type the name into an empty row in the Field Name column, click in the Data Type column to choose the data type, then edit the Field Properties.

OK Cancel Apply



Create first Domain

- Open Database Properties
- Click on Domains Tab
- Enter Domain Name
- Enter Description
 - Optional
- Change Domain Type to Coded Value
- Enter Coded Values

The screenshot shows the 'Database Properties' dialog box with the 'Domains' tab selected. The dialog has two tabs: 'General' and 'Domains'. The 'Domains' tab contains a table with two columns: 'Domain Name' and 'Description'. Below the table is a section for 'Domain Properties' with the following values:

Field Type	Value
Field Type	Long Integer
Domain Type	Range
Minimum value	0
Maximum value	0
Split policy	Default Value
Merge policy	Default Value

Below the 'Domain Properties' section is a section for 'Coded Values' with a table with two columns: 'Code' and 'Description'.

Code	Description

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.



Create first Domain

- Open Database Properties
- Click on Domains Tab
- Enter Domain Name
- Enter Description
 - Optional
- Change Domain Type to Coded Value
- Enter Coded Values

Database Properties

General Domains

Domain Name	Description
Phase	Phase Designation

Domain Properties:

Field Type	Long Integer
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
0	Select Phase
1	A Ø
2	B Ø
3	C Ø
4	AR Ø

OK Cancel Apply



Assign Domain

- Open Feature Properties
- Click on Fields Tab
- Click on the Field you wish to Domain
- Select Domain from drop down menu
- Default value
 - Best practice to leave default as nothing

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance

Fields Indexes Subtypes Feature Extent Relationships Representations

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
SHAPE_Length	Double
SubtypeCode	Long Integer
Phase	Long Integer
WireType	Text

Click any field to see its properties.

Field Properties

Alias	Phase	
Allow NULL values	Yes	
Default Value		
Domain		

Import...

To add a new field, type the name into an empty row in the Field Name column, click in the Data Type column to choose the data type, then edit the Field Properties.

OK Cancel Apply



Assign Domain

- Open Feature Properties
- Click on Fields Tab
- Click on the Field you wish to Domain
- Select Domain from drop down menu
- Default value
 - Best practice to leave default as nothing

Feature Class Properties

General Editor Tracking XY Coordinate System Domain, Resolution and Tolerance

Fields Indexes Subtypes Feature Extent Relationships Representations

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
SHAPE_Length	Double
SubtypeCode	Long Integer
Phase	Long Integer
WireType	Text

Click any field to see its properties.

Field Properties

Alias	Phase	
Allow NULL values	Yes	
Default Value		
Domain	Phase	

Import...

To add a new field, type the name into an empty row in the Field Name column, click in the Data Type column to choose the data type, then edit the Field Properties.

OK Cancel Apply



Create Subtypes

- Close the Feature Class Properties Window
- Open the Feature Class Properties Window
- Click Subtypes tab
- Phase Domain assigned

The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' is set to '<None>' and the 'Default Subtype' is empty. The 'Subtypes' table is empty. The 'Default Values and Domains' table shows the following data:

Field Name	Default Value	Domain
SHAPE_Length		
SubtypeCode	0	
Phase		Phase
WireType		

Buttons at the bottom include 'Use Defaults', 'Domains...', 'OK', 'Cancel', and 'Apply'.



Create Subtypes

- From Subtype Field drop down select you Field you want to Subtype from
- First Subtype is automatically created

The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' dropdown is set to '<None>'. The 'Default Subtype' dropdown is empty. Below these are two tables: 'Subtypes' and 'Default Values and Domains'.

Code	Description

Field Name	Default Value	Domain
SHAPE_Length		
SubtypeCode	0	
Phase		Phase
WireType		

Buttons at the bottom: Use Defaults, Dgains..., OK, Cancel, Apply.



Create Subtypes

- From Subtype Field drop down select you Field you want to Subtype from
- First Subtype is automatically created
- Assign Domain
- You can change the description

The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' is set to 'SubtypeCode' and the 'Default Subtype' is 'New Subtype'. A table lists the subtypes, with the first one having a code of '0' and a description of 'New Subtype'. Below this, a table for 'Default Values and Domains' lists fields like 'SHAPE_Length', 'Phase', and 'WireType'.

Code	Description
0	New Subtype

Field Name	Default Value	Domain
SHAPE_Length		
Phase		
WireType		



Create Subtypes

- Create the rest of your Subtypes
- Domain is automatically filled out for new Subtypes
- **Set Default Value**

The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' is set to 'SubtypeCode' and the 'Default Subtype' is 'Select Phase'. The 'Subtypes' table lists codes 0 through 3 with descriptions 'Select Phase', 'A Ø', 'B Ø', and 'C Ø'. The 'Default Values and Domains' table shows 'Phase' with a default value of '3' and a domain of 'Phase'. Buttons for 'Use Defaults' and 'Dgains...' are visible at the bottom.

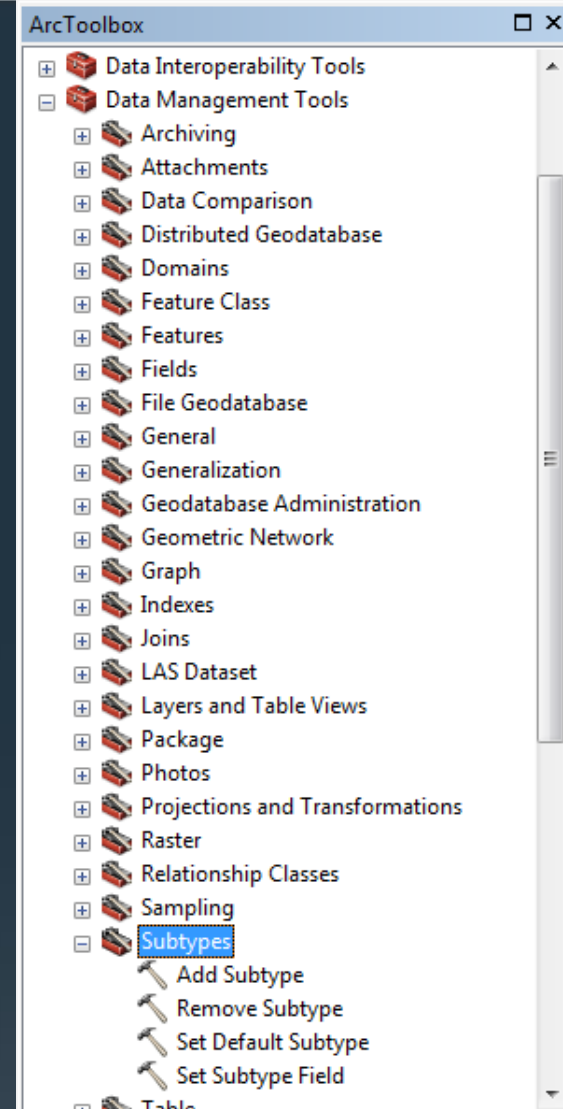
Code	Description
0	Select Phase
1	A Ø
2	B Ø
3	C Ø

Field Name	Default Value	Domain
SHAPE_Length		
Phase	3	Phase
WireType		



Create Additional Subtypes

- Open Feature Class Properties and simply add them in using the same methods
- **ArcToolbox Tools**
 - Good for ModelBuilder
- **Best practice: Do it direct in ArcCatalog**
- **May not resort**





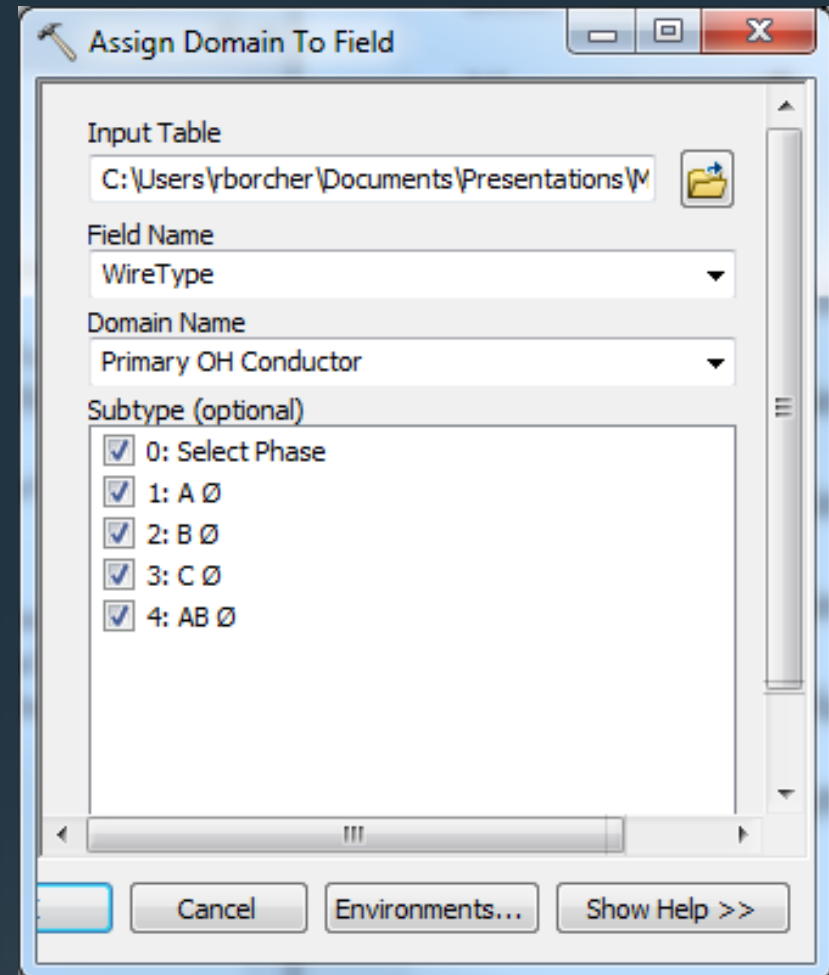
Create WireType Domain

- Rather than manually entering a Domain you can import a feature that already uses it to port the Domain directly to your database simply by copying the feature class or importing it.
- Beware of duplicate Domains



Assign New Domain

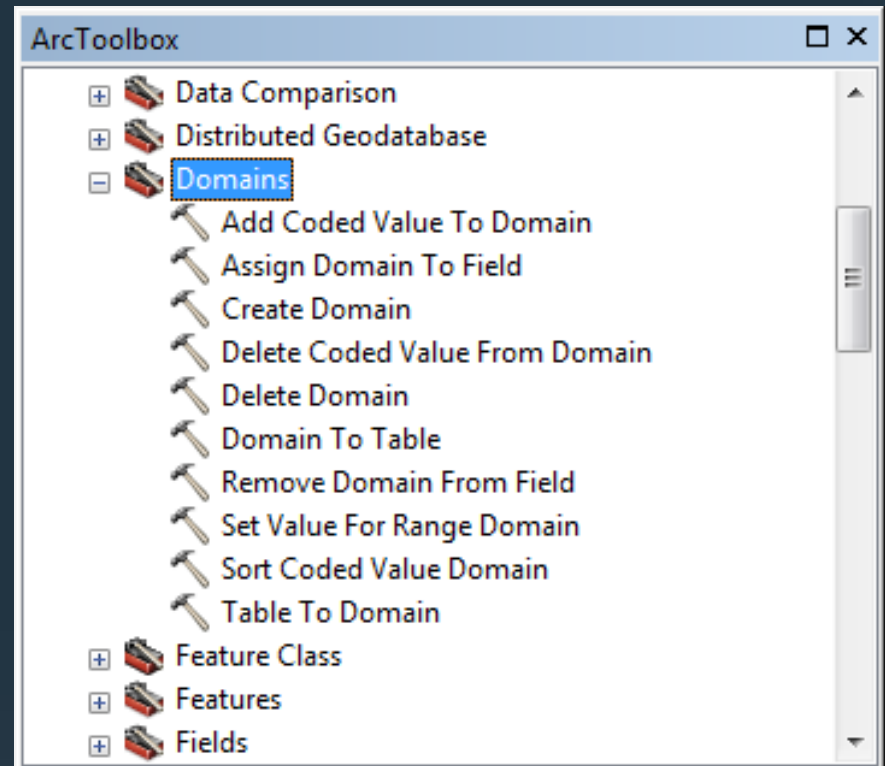
- You can assign new Domains in ArcCatalog or ArcToolBox
- ArcCatalog you need to update all requisite fields one at a time
- Using Assign Domain To Field in ArcToolbox can assign it to each subtype





Create RUS Specs Domain

- You can create Domains from very long text files if formatted correctly using Table To Domain





Create RUS Specs Domain

- Input table is the text file
- Select Code
- Select Description
- Input Workspace is your database
- Enter Domain Name
- Update as Append
- Assign it to the fields

Table To Domain

Input Table
C:\Users\yborcher\Documents\Ppresentations\MWEUUG2017\RUSSpecs.txt

Code Field
RUSSpecs

Description Field
description

Input Workspace
C:\Users\yborcher\Documents\Ppresentations\MWEUUG2017\MWEUUG2017.m

Domain Name
RUSSpecs

Domain Description (optional)
description

Update Option (optional)
APPEND

OK Cancel Environments... Show Help >>