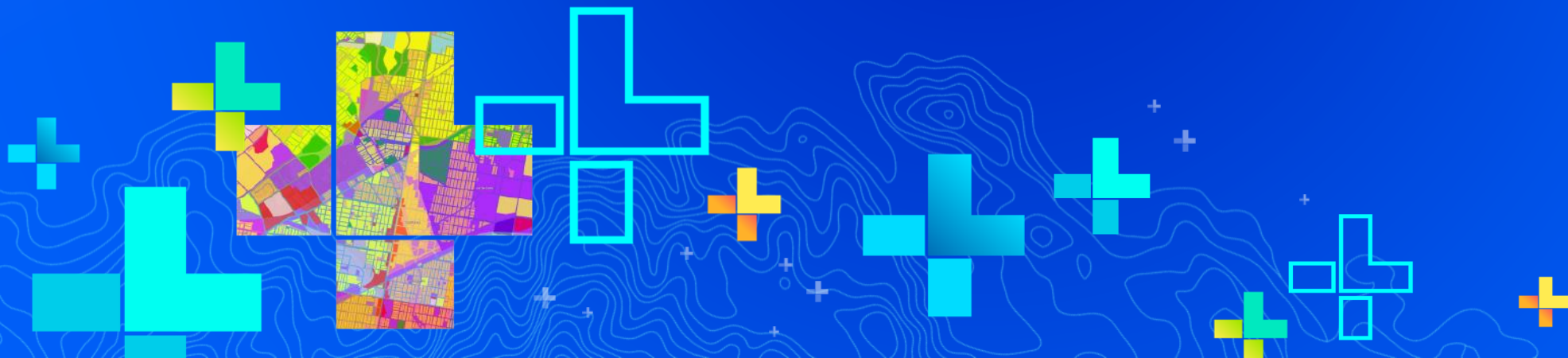




Geodatabase: An Overview

David Crawford

Shannon Shields

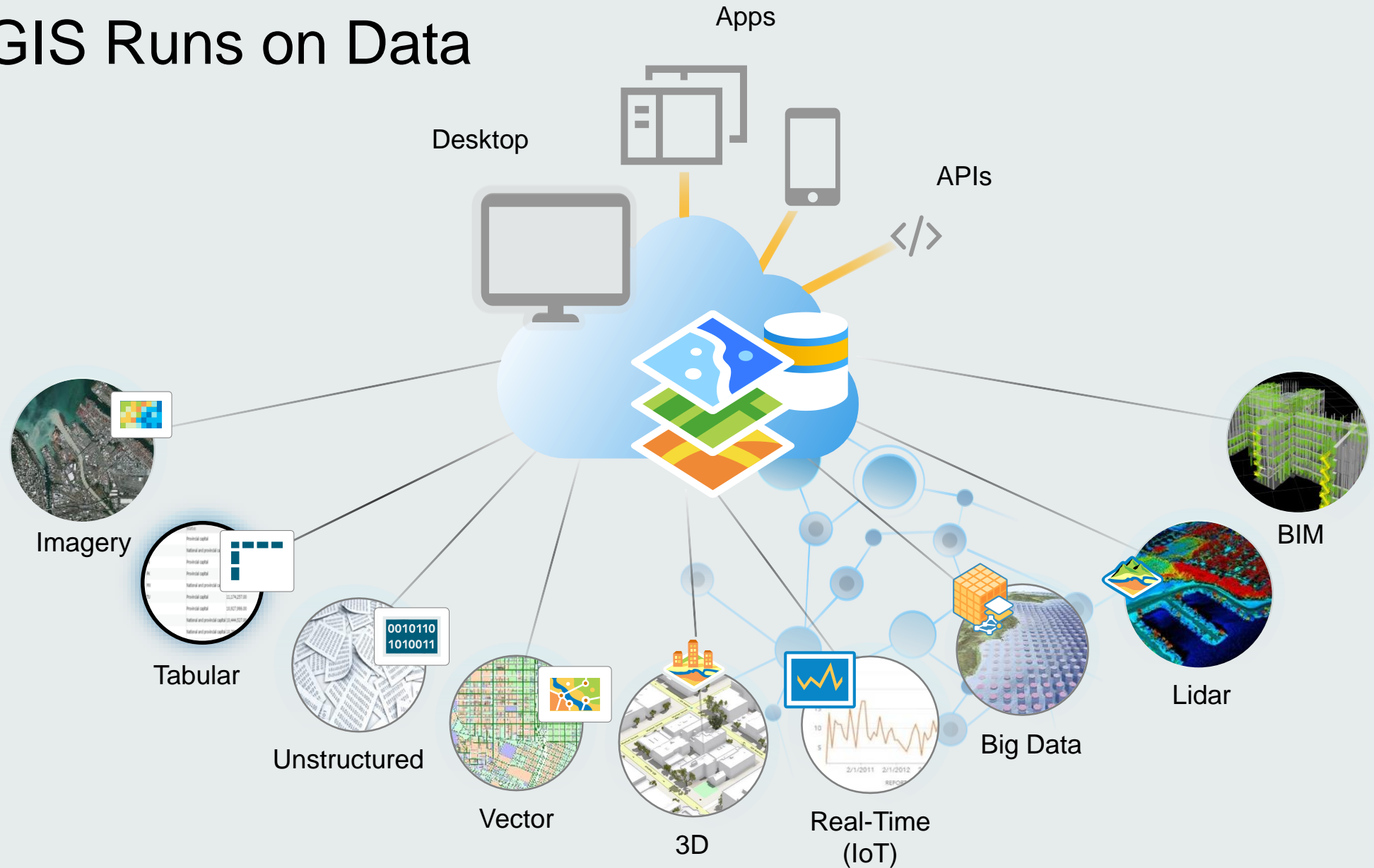


SEE
WHAT
OTHERS
CAN'T

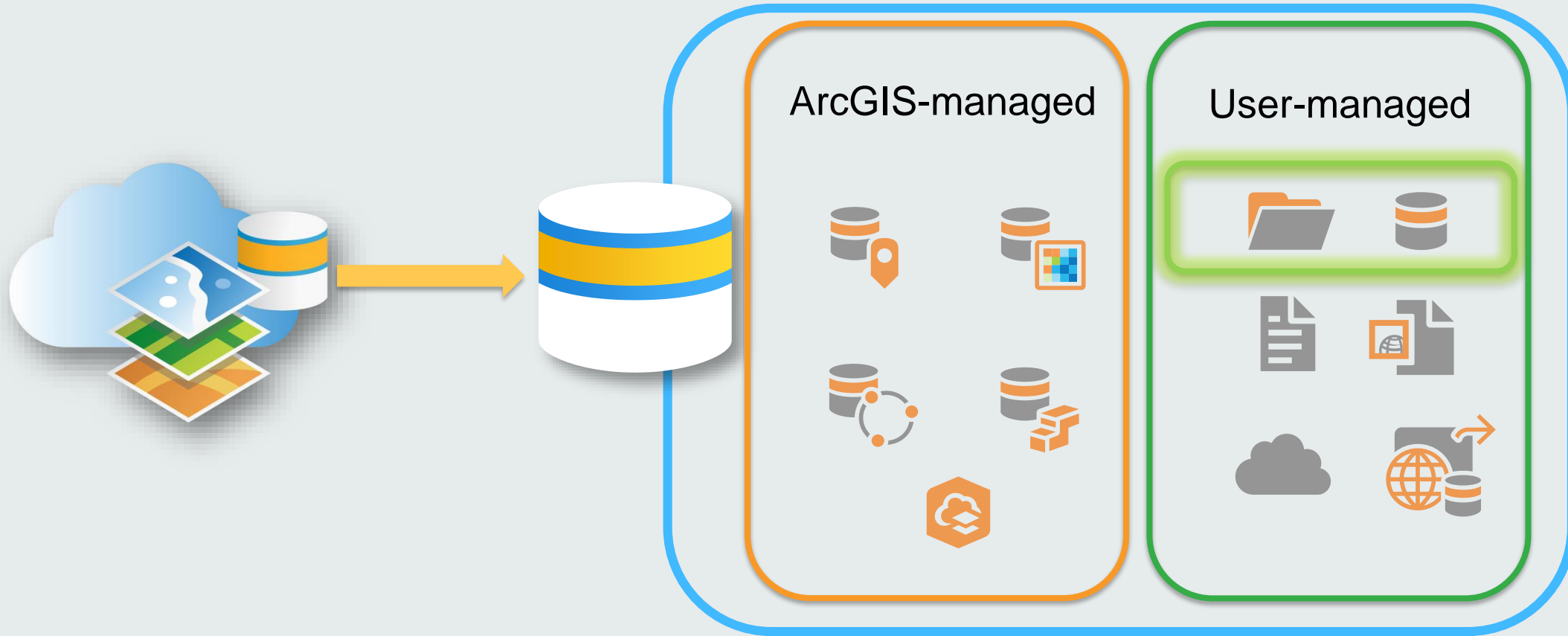
Contents

- ArcGIS runs on data
- Geodatabase building blocks
- Rules for your data
 - Attribute
 - Spatial
- Advanced models

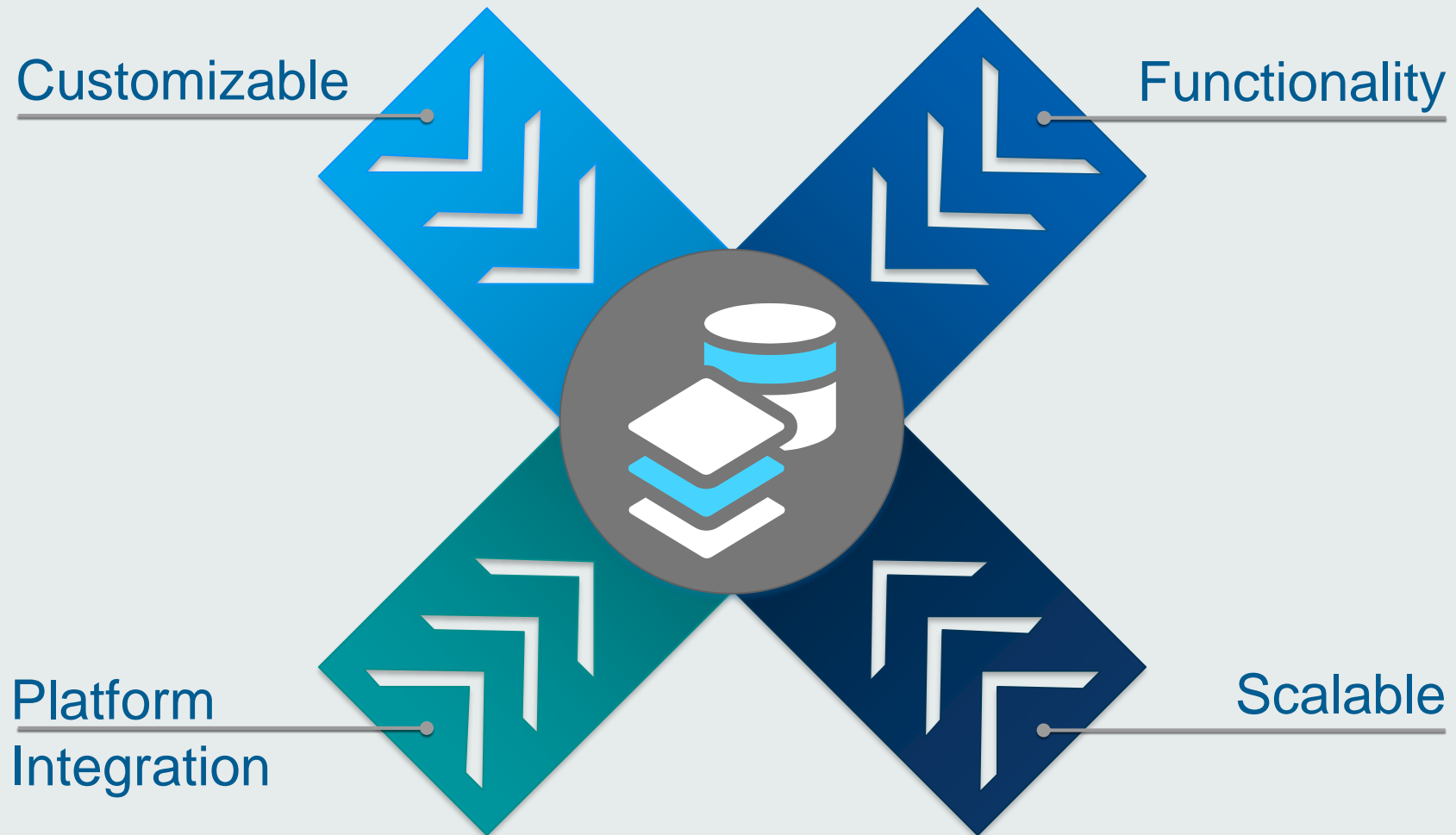
ArcGIS Runs on Data



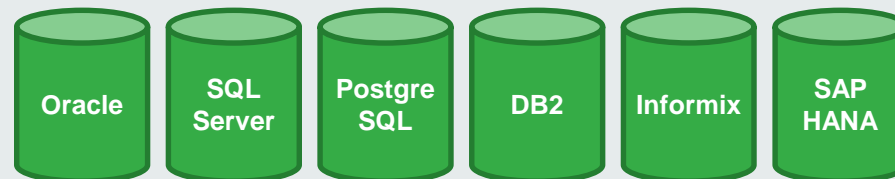
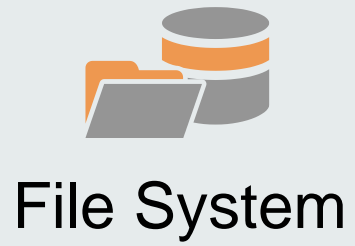
Many data stores, many choices

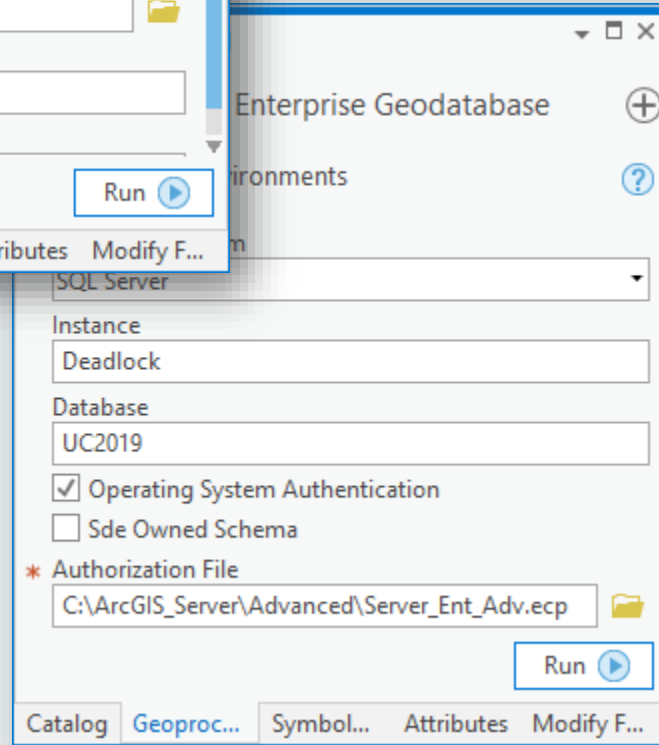
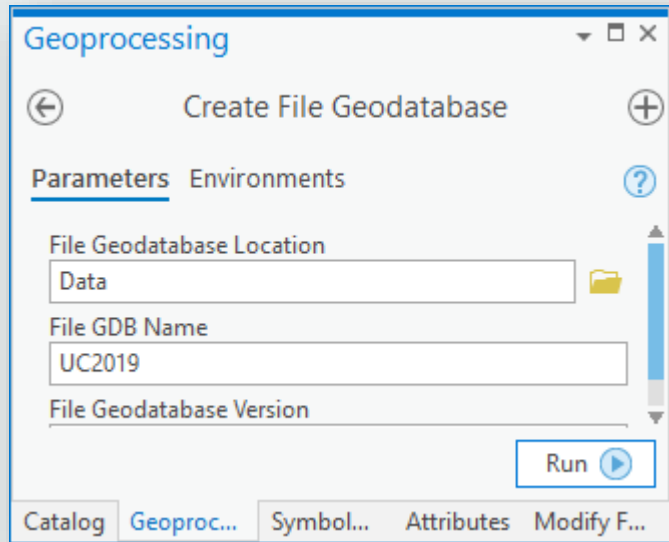


Why use a geodatabase?



Two flavors





Creating a geodatabase Demonstration

Geodatabase Building Blocks



Table

Geodatabase building blocks

- Each row is a unique object
- Rows have same fields
- No spatial field

ArcGIS-defined ObjectID

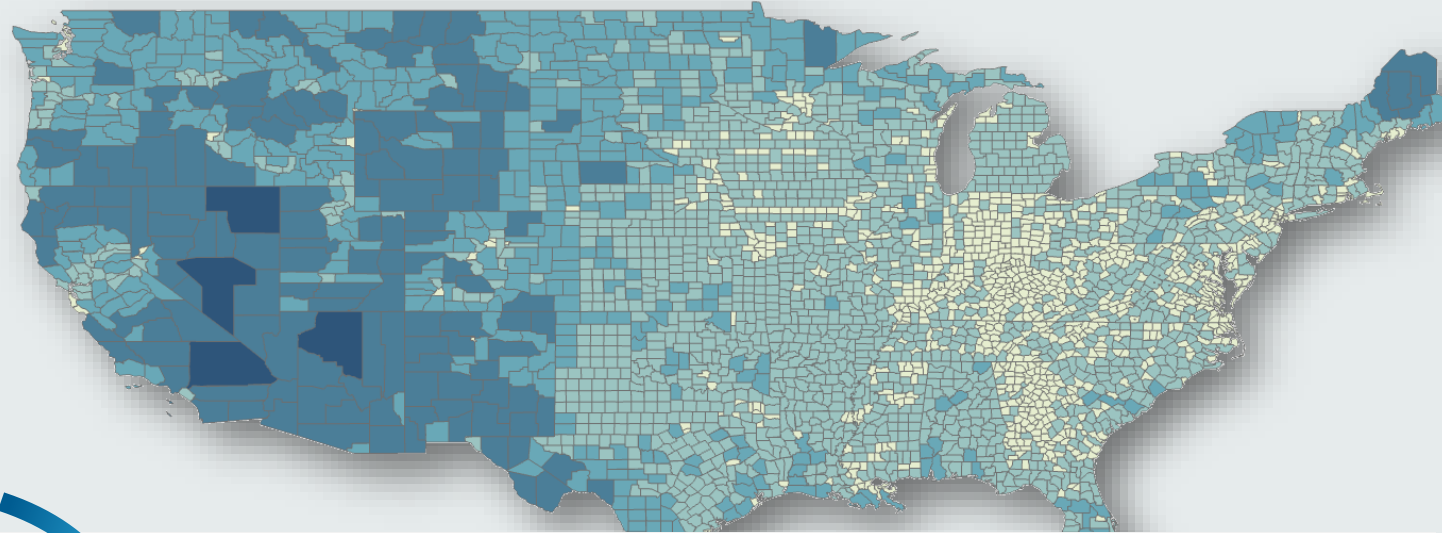
OBJECTID *	NAME	CNTY_FIPS	FIPS	POP2014	POP14_SQ	POP2010	POP10_SQ	WHI	BLA	AMERI	ASIA	HAWN	HISPA	OTH	MUL
455	Dawson	115	48115	13877	15.4	13833	15.3	1060	905	99	49	7	7387	1854	3
478	Deaf Smith	117	48117	19181	12.8	19372	12.9	1507	242	176	61	2	13039	3352	4
596	Delta	119	48119	5524	19.9	5231	18.8	4461	380	72	30	0	288	141	1
548	Denton	121	48121	726316	762	662614	695.1	4972	5553	4551	4347	462	12083	4191	194
301	DeWitt	123	48123	20758	22.8	20097	22.1	1520	1876	88	44	0	6502	2414	4
456	Dickens	125	48125	2411	2.7	2444	2.7	2052	99	38	22	0	708	192	1
265	Dimmit	127	48127	10949	8.2	9996	7.5	8860	99	34	56	0	8616	785	1
499	Donley	129	48129	3653	3.9	3677	3.9	3307	164	18	9	2	309	111	1
279	Duval	131	48131	11698	6.5	11782	6.6	1024	110	45	22	5	10424	1152	2
525	Eastland	133	48133	19025	20.4	18583	19.9	1669	335	124	62	9	2673	1062	2
425	Ector	135	48135	147873	164	137130	152.1	1046	6141	1351	1080	119	72331	2038	34
271	Edwards	137	48137	1989	0.9	2002	0.9	1739	11	26	7	0	1027	197	1
141	El Paso	141	48141	849863	837.3	800647	788.8	6569	2486	6007	8284	999	65813	8379	197
564	Ellis	139	48139	158717	166.8	149610	157.2	1176	1348	893	851	95	35161	1334	32
532	Erath	143	48143	39803	36.5	37890	34.8	3244	451	291	257	13	7279	3796	6
558	Falls	145	48145	18045	23.3	17866	23.1	1083	4524	101	46	10	3716	2010	3

User-defined fields

Feature class

Geodatabase building blocks

- Collection of features
 - Same geometry type
 - Same spatial reference
 - Same attribute fields
- Extended functionality
 - Multi-part features
 - Z and M values
 - Annotation / Dimension



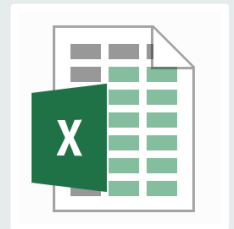
Stores geometry

OBJECTID	Shape	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS	AREA	POP1990	POP2000	POP2010
1	Polygon	Lake of the Woods	Minnesota	27	077	27077	1784.0634	4076	4651	
2	Polygon	Ferry	Washington	53	019	53019	2280.2319	6295	7199	
3	Polygon	Stevens	Washington	53	065	53065	2529.9794	30948	40652	
4	Polygon	Okanogan	Washington	53	047	53047	5306.18	33350	38640	
5	Polygon	Pend Oreille	Washington	53	051	53051	1445.0286	8915	11752	
6	Polygon	Boundary	Idaho	16	021	16021	1279.2987	8332	10068	
7	Polygon	Lincoln	Montana	30	053	30053	3746.0908	17481	18859	
8	Polygon	Flathead	Montana	30	029	30029	5232.0306	59218	73438	
9	Polygon	Glacier	Montana	30	035	30035	3124.4572	12121	12626	
10	Polygon	Toole	Montana	30	101	30101	1943.2598	5046	4556	

Attachments

Geodatabase building blocks

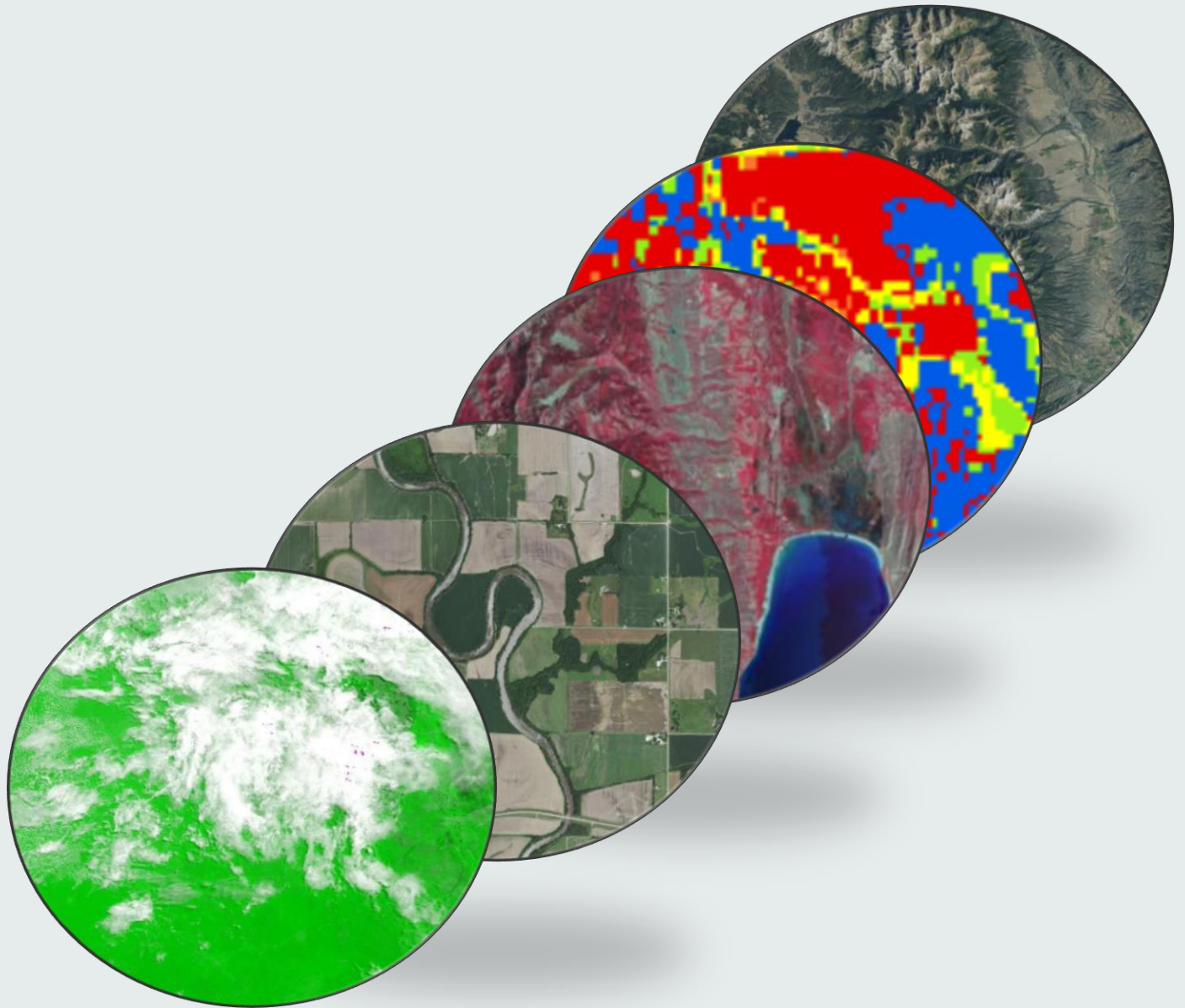
- Associate 1 or more files with a geographic feature
 - Stored within the geodatabase
- Accessible throughout the ArcGIS platform
 - Open files types recognized by OS
 - Download others
- Specialized implementation of a relationship class



Raster

Geodatabase building blocks

- Cell / Pixel-based data
 - Discrete / Continuous data
 - Multiple formats
- Geodatabase
 - Mosaic Dataset
 - Manage multiple rasters
 - Store as a catalog, view as a mosaic
 - Advanced querying and processing
 - Raster dataset
 - Manage single raster



Rules for your data



Rules for your data

AreaRule

Calculation

Rule Name: AreaRule

Description: Arcade calculate area in ha

Subtype: <All>

Field: AREA_HECTARE

Editable

Expression: Area(Geometry(\$feature), 'ha')

> Error

> Triggers

Insert Update

> Execution

Tags

Field Group: Landuse

Search Filter

LANDUSE_CODE	ZONING_CODE
FOREST PRESERVE	COLLEGE/UNIVERSITY
FOREST PRESERVE	MEDIUM DENSITY ESTATE DISTRICT
FOREST PRESERVE	TRANSITIONAL USE
FOREST PRESERVE	ESTATE TRANSITION DISTRICT
FOREST PRESERVE	RESEARCH/DEVELOPMENT DISTRICT
OFFICE	GENERAL COMMERCIAL DISTRICT
	INDUSTRIAL DISTRICT

Domains: County

Subtypes: TaxParcels

Subtype Name	Field Name	Data Type
	SHAPE	Geometry
	SHAPE_Length	Double
	SHAPE_Area	Double
*Zoning		Short
	BusinessOccupancy	Short
	AssesmesStatus	Short
	OwnershipType	Short
	GlobalID	Global ID

Domain Name	Description	Field Type	Domain Type	Split Policy	Merge Policy
AssessmetType	Types of property assessments	Short	Coded Value Domain	Default	Default
BusinessType	Type of Business	Short	Coded Value Domain	Default	Default
EnabledDomain		Short	Coded Value Domain	Default	Default
OwnershipType	Types of property ownership	Short	Coded Value Domain	Default	Default
ServiceArea	Service Area	Long	Coded Value Domain	Default	Default

	0	1	2	3
BusinessOccupancy	BusinessType Single-Family Dwelling	BusinessType Unknown	BusinessType Unknown	BusinessType Unknown
AssesmesStatus	AssesmetType Unassessed	AssesmetType Unassessed	AssesmetType Unassessed	AssesmetType Unassessed
OwnershipType	OwnershipType No Owner Assigned	OwnershipType No Owner Assigned	OwnershipType No Owner Assigned	OwnershipType No Owner Assigned
GlobalID				

Error Inspector: Map8

Source: Topology (Geodatab) Validate Filter Selection

Shape	Feature 1	Rule	Feature 2
	Streets_geocode 8122	Must Not Have Dangles	Not Applicable
	Parcels 4301	Must Be Covered By Feature Class Of	ctylmtpy
	Parcels 4300	Must Be Covered By Feature Class Of	ctylmtpy
	Parcels 4297	Must Be Covered By Feature Class Of	ctylmtpy
	Parcels 4297	Must Be Covered By	ctylmtpy

Preview Details Fix

Contingent Values: Parcel Zoning

- Owners
- TaxParcels
- TaxParcels_Owners

Relationship Class Properties: TaxParcels_Owners

General Rules

Relationship

Relationship Class	TaxParcels_Owners
Type	Simple
Cardinality	Many to many
Notification	None (no messages propagated)
Origin Name	TaxParcels
Origin Primary Key	OID
Origin Foreign Key	ParcelOID
Destination Name	Owners
Destination Primary Key	OBJECTID
Destination Foreign Key	OwnerID
Forward Path Label	Owners

Cancel

Code	Description
0	Unassessed
1	Out of date Assessment
2	Assessment Up to Date
3	Assessment Needed

Rules for maintaining attribute data quality

Subtypes

Domains

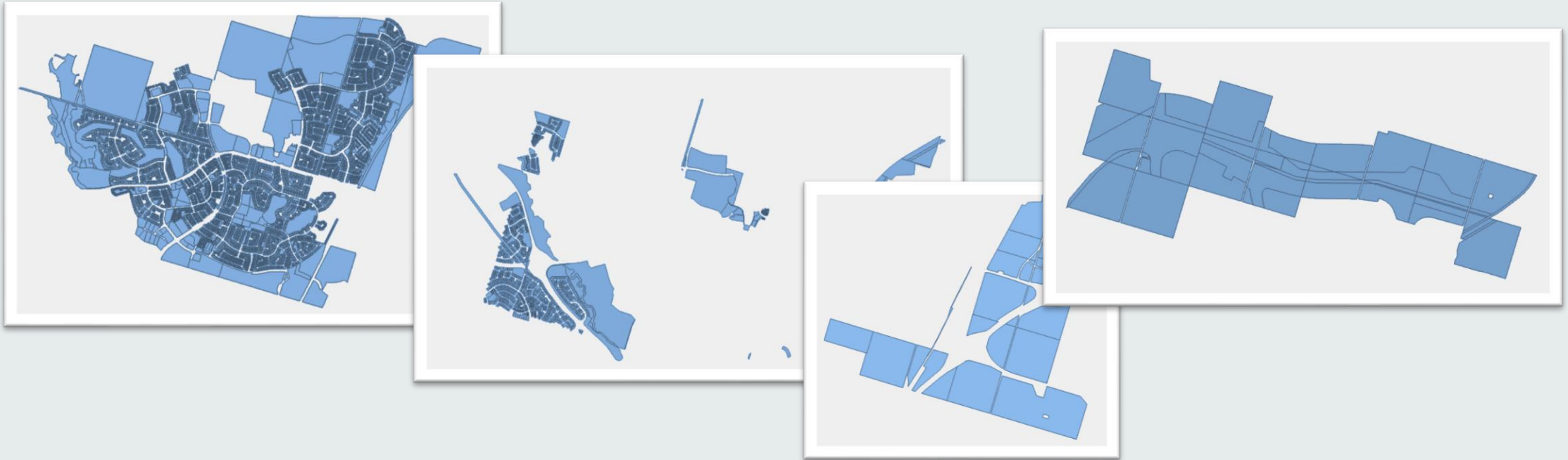
Contingent Values

Relationship classes

Attribute Rules

The problem

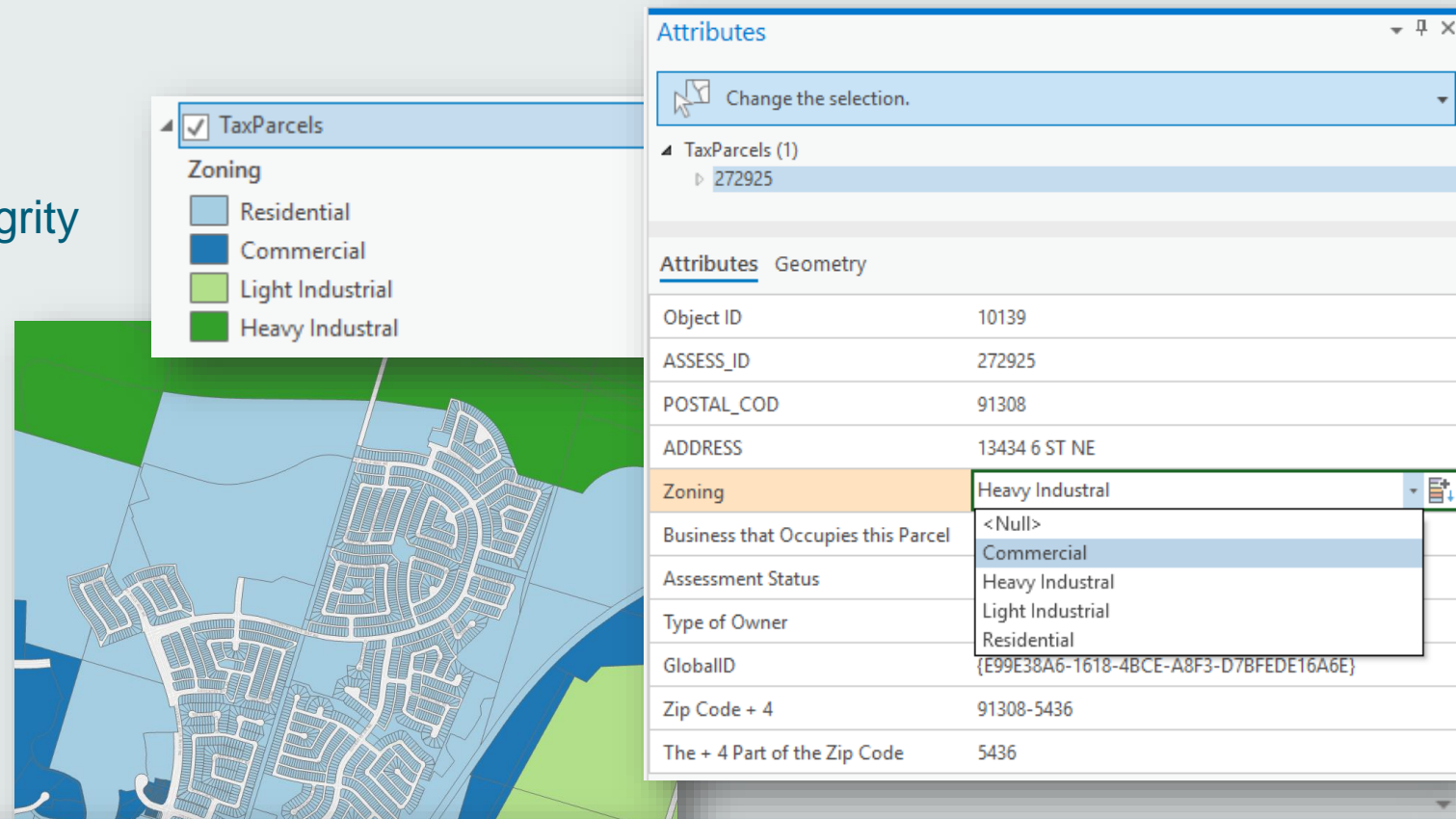
- Maintaining equivalent data in multiple files



Solution: Subtype

Geodatabase functionality – attribute integrity

- Define categories / classes
 - Default values
 - Domains
 - Behaviors
- Property of table or feature class



Subtypes: TaxParcels

Subtype Name >		Residential		Commercial		Light Industrial		Heavy Industrial	
Field Name	Data Type	Domain	Default Value	Domain	Default Value	Domain	Default Value	Domain	Default Value
SHAPE	Geometry								
SHAPE_Length	Double								
SHAPE_Area	Double								
*Zoning	Short		0		1		2		3
BusinessOccupancy	Short	BusinessType	Single-Family Dwelling	BusinessType	Unknown	BusinessType	Unknown	BusinessType	Unknown
AssessmesStatus	Short	AssessmetType	Unassessed	AssessmetType	Unassessed	AssessmetType	Unassessed	AssessmetType	Unassessed
OwnershipType	Short	OwnershipType	No Owner Assigned	OwnershipType	No Owner Assigned	OwnershipType	No Owner Assigned	OwnershipType	No Owner Assigned
GlobalID	Global ID								

Subtype Field

Subtype description

Subtype code (Integer)

The problem

- Editors want to be more efficient
- Editors make mistakes
 - Values out of range or invalid
 - Data entry errors



Solution: Domain

Geodatabase functionality – attribute integrity

- Specify valid values
 - List of valid values
 - Min and max value
- Apply to multiple attribute fields
- Property of geodatabase

Coded Value Domain
BusinessOccupancy in
("Single-Family Dwelling", "School", "Warehouse"...)

Fields: TaxParcels (Map5) X

Current Layer: TaxParcels (Map5)

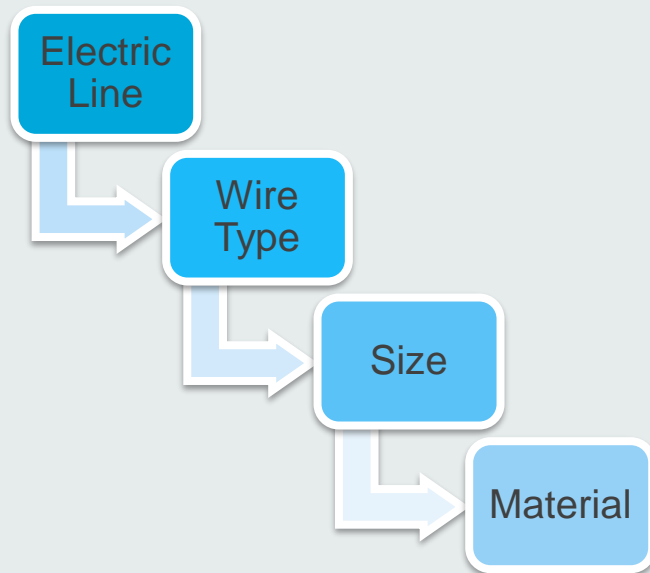
Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OID	Object ID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ASSESS_ID	ASSESS_ID	Long	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	POSTAL_COD	POSTAL_COD	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ADDRESS	ADDRESS	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	SHAPE	Shape	Geometry	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input checked="" type="checkbox"/>	SHAPE_Length	SHAPE_Length	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	SHAPE_Area	SHAPE_Area	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	*Zoning	Zoning	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		0	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	BusinessOccupancy	Business that Occupies this Parcel	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	BusinessType		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	AssessmesStatus	Assessment Status	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	AssessmetType		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	OwnershipType	Type of Owner	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	OwnershipType		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	GlobalID	GlobalID	Global ID	<input type="checkbox"/>	<input type="checkbox"/>				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ZipCode_Plus4	Zip Code + 4	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	FurtherZipCode	The + 4 Part of the Zip Code	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	PercentValued	Land Valuation Complete	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	PercentRange		

Range Domain -
PercentValued between 1 & 100

Contingent Values

Geodatabase functionality – attribute integrity

- Extends the subtype/domain restrictions for valid input
 - Attribute value in one field is dependent on values from other attributes



Create Contingent Values

Field Group: Group 1

Subtype: LocationCD_O

<input type="checkbox"/>	WIRE TYPE	<input type="checkbox"/>	WIRE SIZE	<input type="checkbox"/>	WIRE MATERIAL
<input checked="" type="checkbox"/>	B	<input type="checkbox"/>	738	<input checked="" type="checkbox"/>	CO
<input checked="" type="checkbox"/>	UC	<input type="checkbox"/>	350	<input type="checkbox"/>	AA
<input checked="" type="checkbox"/>	WSN	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>	CW
<input checked="" type="checkbox"/>	SA	<input checked="" type="checkbox"/>	2	<input type="checkbox"/>	AL
<input type="checkbox"/>	RF			<input type="checkbox"/>	ACSR
<input type="checkbox"/>	PLR			<input type="checkbox"/>	RU
<input type="checkbox"/>				<input type="checkbox"/>	PO

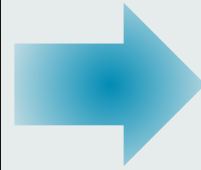
Contingent Values: 8

WIRE TYPE	WIRE SIZE	WIRE MATERIAL
B	4	CO
B	2	CO
UC	4	CO
UC	2	CO
WSN	4	CO
WSN	2	CO
SA	4	CO

OK Cancel

The problem

- Owners and parcels are isolated in different tables
 - Need to relate owners to parcels, parcels to owner
 - A parcel can have many owners, an owner can own many parcels



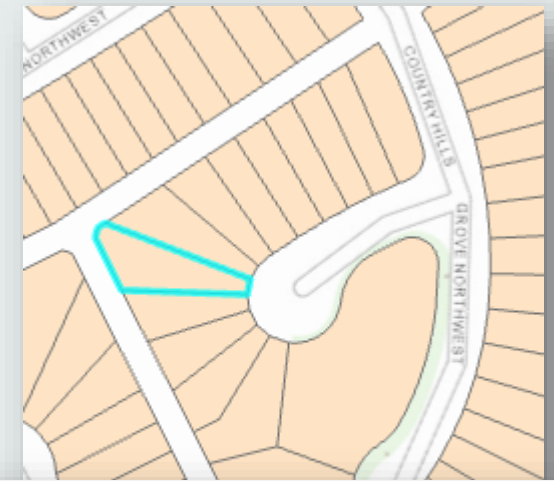
m:m



The solution: relationship class

Geodatabase functionality – attribute integrity

- Define association between geodatabase objects
- 1:1, 1:M, M:N cardinalities
- Simple or composite
- Apply rules and attributes
- Edit across relationship

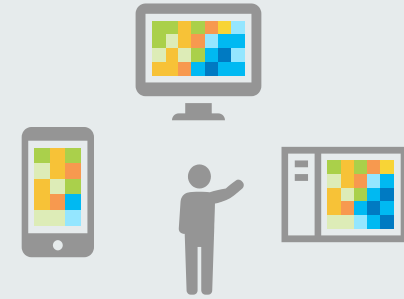


Object ID	ASSESS_ID	POSTAL_COD	ADDRESS	Shape	SHAPE_L
4	65128	91203	14 SANDPIPER LI NW	Polygon	81
5	106758	91203	104 SANDPIPER CI NW	Polygon	90
6	125946	91203	321 SANTANA BA NW	Polygon	91
7	65047	91203	155 SANDERLING PL NW	Polygon	75
8	90706	91203	180 SANDPIPER CI NW	Polygon	11
9	114070	91203	229 SANDARAC DR NW	Polygon	89
10	65069	91203	55 SANDERLING RI NW	Polygon	92
11	369354	91203	150 SANDSTONE DR NW	Polygon	80
12	145514	91203	10 SANDPIPER LI NW	Polygon	81

OBJECTID	Name	Address	OwnershipType	GlobalID
36	FREWIN, HAROLD G	16 SANDPIPER WY NW	Single Owner	{0D2DA321-023C-4000-8000-000000000000}
8	TOBY, PETER	180 SANDPIPER CI NW	Single Owner	{F8D78EC0-9988-4000-8000-000000000000}
2	GRAVELLE, RONALD G	184 SANDPIPER CI NW	Single Owner	{96D824C7-F4AF-4000-8000-000000000000}
9	YEUNG, SIU-YIK	233 SANDARAC DR NW	Multiple Owners	{CD989905-DD32-4000-8000-000000000000}
28	TSUI, ESTHER	233 SANDARAC DR NW	Multiple Owners	{D16A6FAE-0973-4000-8000-000000000000}
31	CAMERON, JOHN A	301 SANTANA BA NW	Single Owner	{FFC294CA-C99A-4000-8000-000000000000}
35	ENG, SUSAN	313 SANTANA BA NW	Single Owner	{42655985-A893-4000-8000-000000000000}
21	LIEU, VINH-NHU	317 SANTANA BA NW	Single Owner	{06707843-0BD1-4000-8000-000000000000}
6	BARONE, MARCELLO	321 SANTANA BA NW	Single Owner	{B2052FE6-6EF7-4000-8000-000000000000}

The problem

- Automatically calculate values for new records
 - Editors using ArcGIS Pro, web & mobile apps
- Validate new business rules on existing data
- Return errors for invalid values



	Zoning Variance	Area in Hectares	Area Value Measured	Lot Number	PLANNING_S	Comprehensive	Is Incc
PUD	N	27	ACT	124	H	EAST SECTOR	Y
PUD	N	0	ACT	18	C	EAST SECTOR	Y
MF PUD	N	1	ACT	5	E	EAST SECTOR	Y
	U	2	ACT	9	H	EAST SECTOR	N
	N	0	EST	pt1&pt4		EAST SECTOR	Y
	U	1	ACT	168	D	EAST SECTOR	N
SF PUD	N	0	EST	37	H	EAST SECTOR	Y
DISTRICT	N	1	ACT	76	G	SECTOR G	Y
MF PUD	N	1	EST	70	E	EAST SECTOR	Y
		0	EST				
DISTRICT	N	2	ACT	28	F	EAST SECTOR	Y

The solution: attribute rules

Geodatabase functionality – attribute integrity

- Automatically populating/controlling field values for features on edit
- Arcade scripting language is cross-platform
 - edits performed anywhere (desktop, mobile, web)
- Attribute rule types:
 - **Calculation rules** – calculates value of field based on expression
 - Immediate – rule runs on edit
 - Batch – runs at specific time on all data
 - **Constraint rules** – controls data entry, raises error for invalid data
 - **Validation rules** – highlights errors on existing data

OBJECTID	Name	Address	BuyDate	BuyAmount	OwnershipType
38	DAVE CRAWFORD	235 SANDARAC DR NW	7/6/2019 6:14:55 PM	1000000	Single Owner

Today's Date

Calculation

Rule Name: Today's Date

Description: Rule to add today's date

Subtype: <All>

Field: BuyDate

Editable


Expression: Now()

....

> Error

▼ Triggers

Insert Update Delete



Rules for maintaining spatial data quality



Feature
datasets

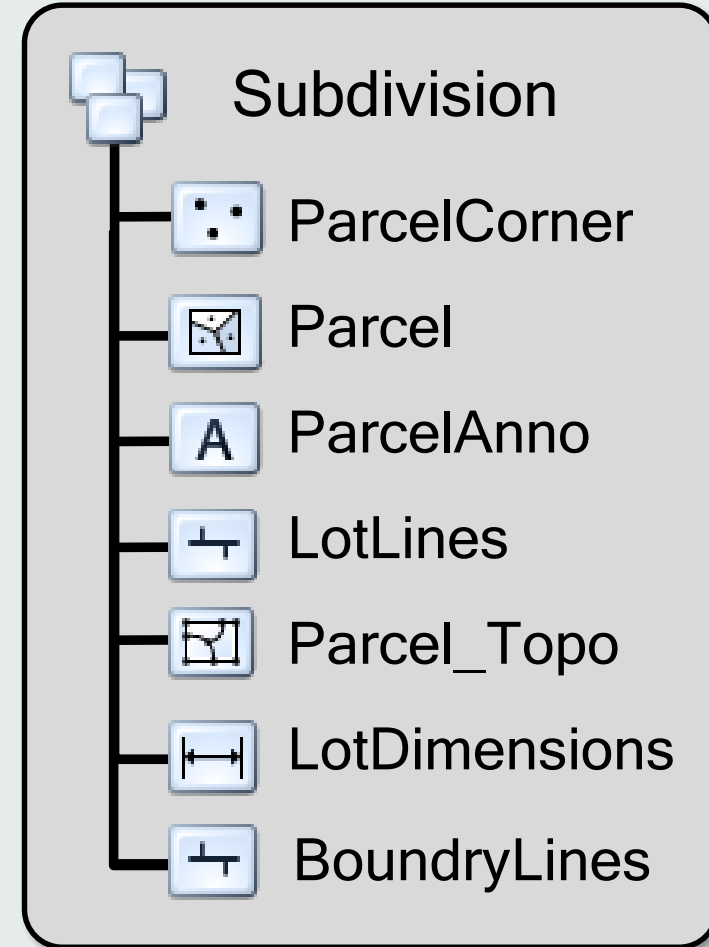
Topology

Advanced
features

Feature dataset

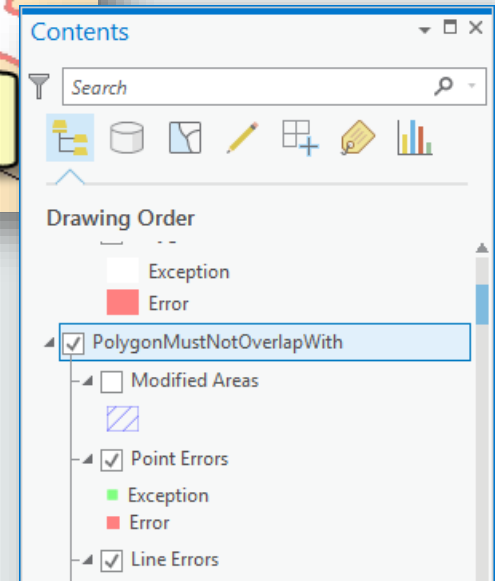
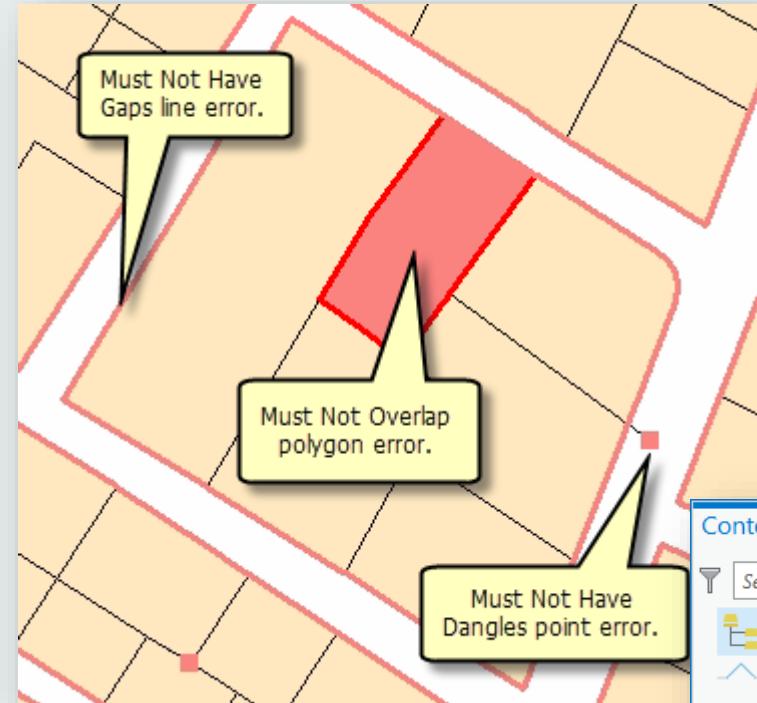
Geodatabase functionality – spatial data integrity

- Container for advanced datasets
 - Topologies
 - Networks
 - Parcels
- Single spatial reference
- Not a folder
 - Treated as a single object



The problem

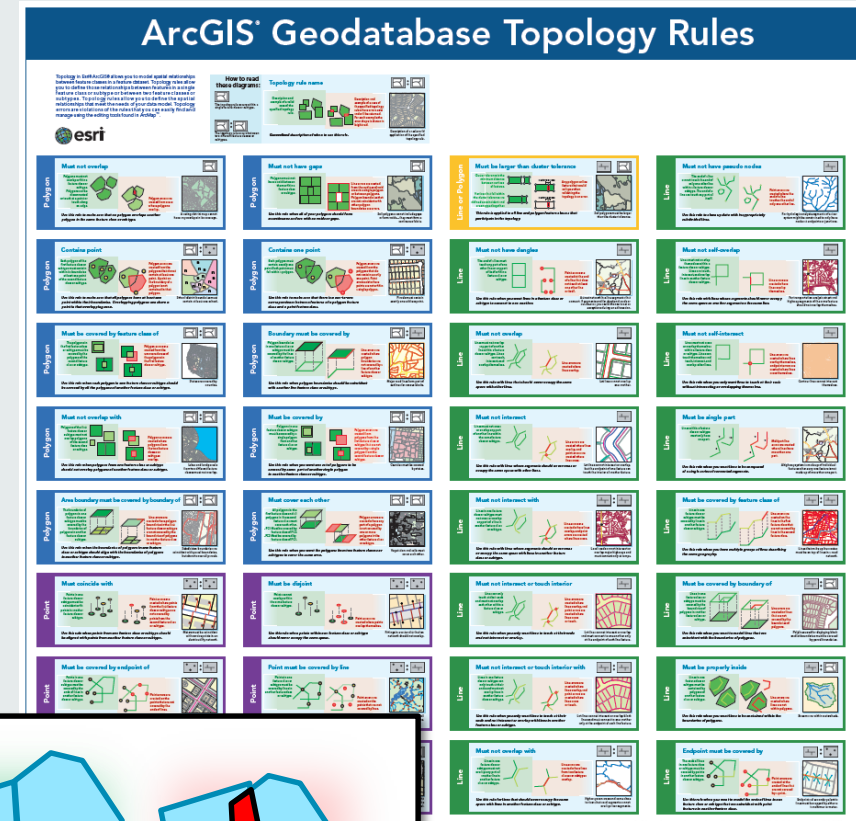
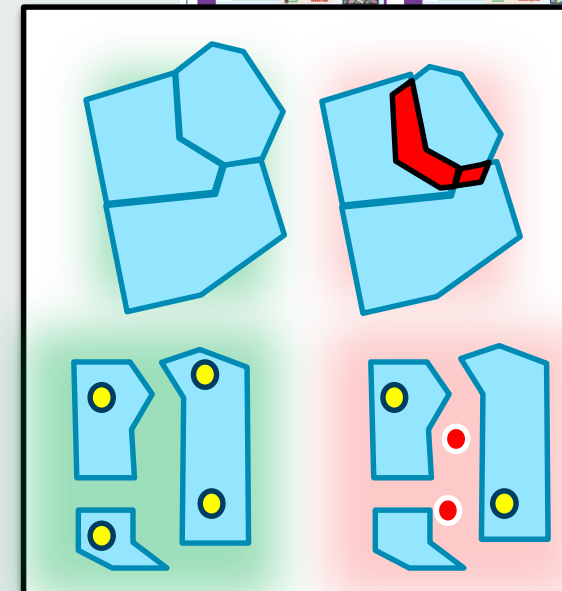
- Need to easily identify spatial errors
- Need a series of rules to make sure that our parcels are accurate



The Solution: Geodatabase topology

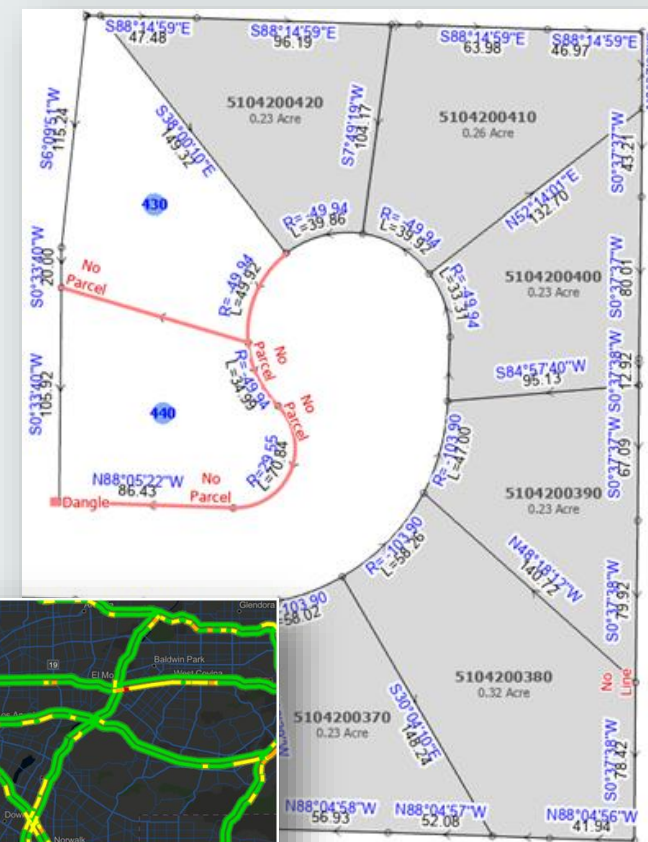
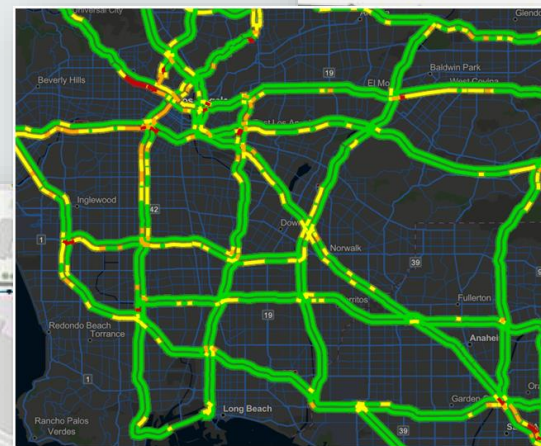
Geodatabase functionality – spatial data integrity

- Manage shared geometry
 - Within a feature class
 - Between feature classes
- Rules-based
 - Select rules based on spatial relationships
 - Apply rules by validating data
 - Make corrections or mark exceptions



Advanced Models

- Advanced capabilities
- Industry-specific rules & models
 - Utility networks
 - Transportation networks
 - Parcel management



In conclusion

- ArcGIS runs on data
- Lots of data stores, lots of choices
- Geodatabase
 - Unique functionality
 - Data integrity rules
 - Advanced models

To learn more...

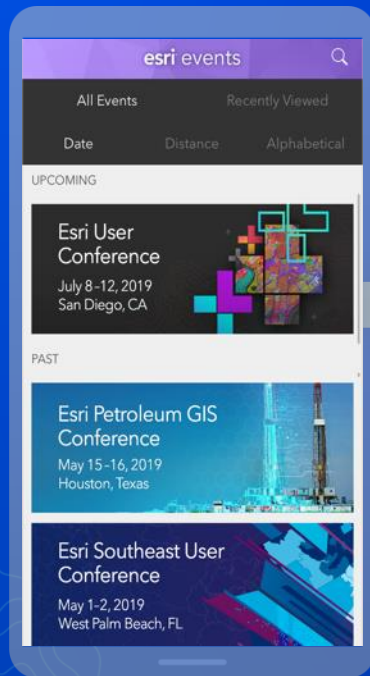
- Attribute data integrity:
 - [Geodatabase: Setting Up Your Geodata Schema in ArcGIS Pro](#)
 - [Geodatabase: Leveraging Relationship Classes](#)
 - [Geodatabase: Ensuring Data Quality with Attribute Rules and Contingent Values](#)
- Multi-user geodatabases:
 - [Enterprise Geodatabase: Introduction to Multi-User Geodatabases](#)
 - [Enterprise Geodatabase: Introduction to Multi-User Editing](#)
- Spatial data integrity
 - [Geodatabase: Ensuring Data Quality with Topology](#)
 - [ArcGIS Pro Editing: Data Alignment and Management](#)
- Networks
 - [Utility Network Management in ArcGIS: Introduction to the Utility Network](#)
 - [Network Analyst: An Introduction](#)
- Parcels
 - [Parcel Editing: Managing Parcels with ArcGIS Pro](#)

Questions?

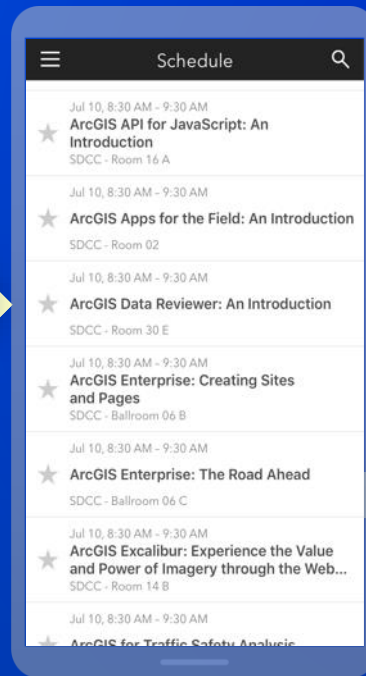


Please Share Your Feedback in the App

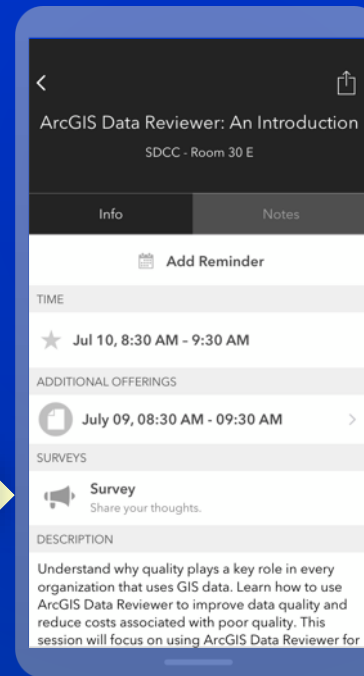
Download the Esri Events app and find your event



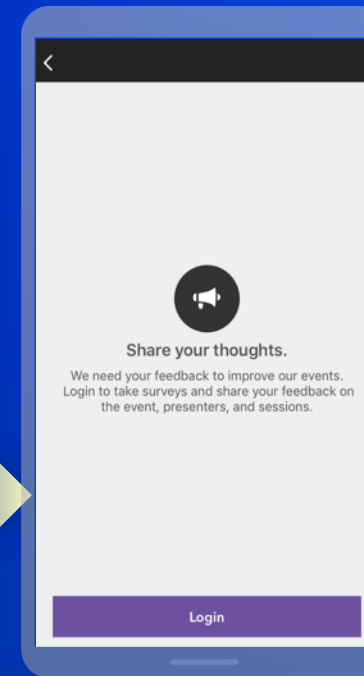
Select the session you attended



Scroll down to "Survey"



Log in to access the survey



Complete the survey and select "Submit"

