



esri

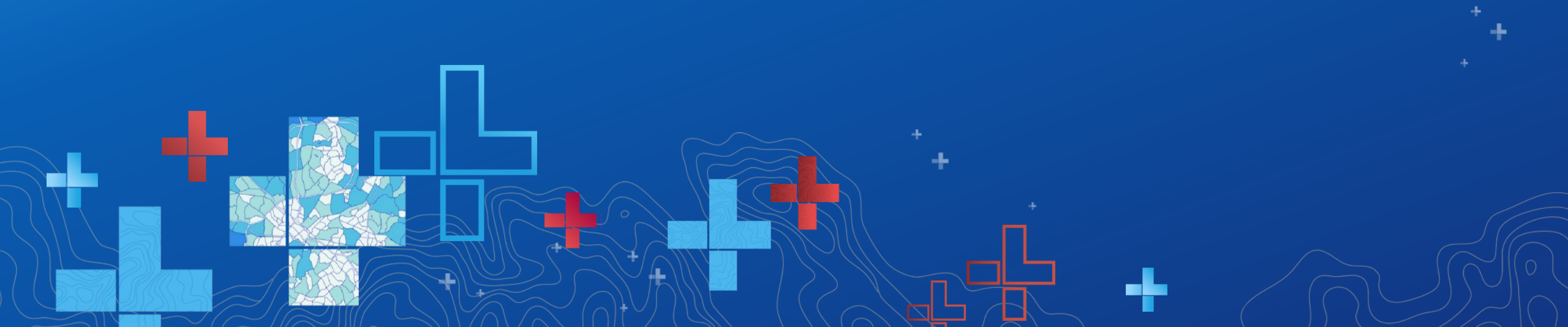
THE
SCIENCE
OF
WHERE™

Presented at the FIG Working Week 2020,
10-14 May 2020 in Amsterdam, the Netherlands

Valuing Unregistered Properties with GIS

Katherine Smyth

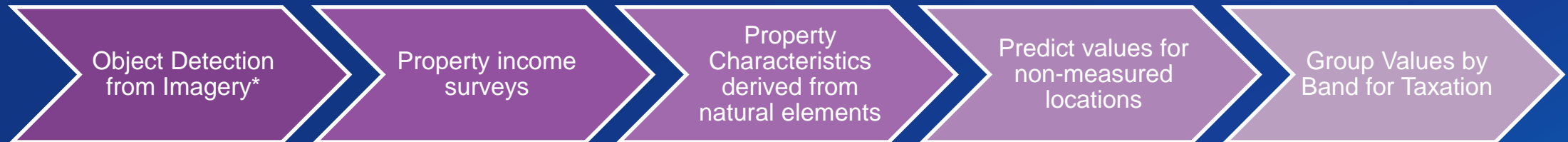
FIG Working Week 2020



“First Valuation” Challenges

- Collecting the data to begin with
- Availability of sales/rental data
- Managing the data once it comes in
- Understanding what characteristics drive value
- Interpreting the impact each characteristic has on value
- Grouping like values for banding
- Gaining and maintaining trust and confidence of the public
- Establishing a long term reassessment plan

ArcGIS Property Valuation Methodology Part I



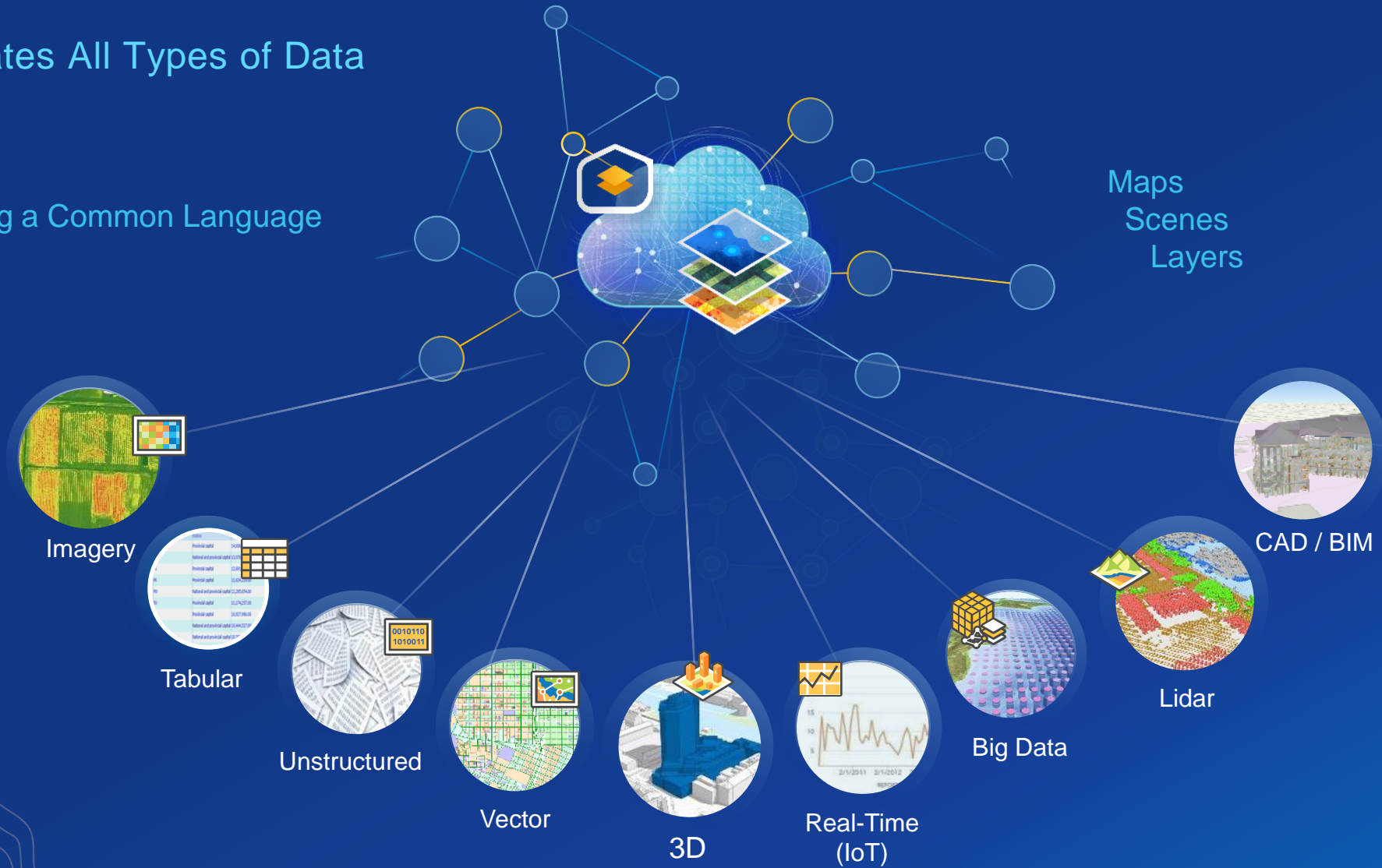
* Derived automatically or manually

GIS

Integrates All Types of Data

Creating a Common Language

Maps
Scenes
Layers



Web Apps

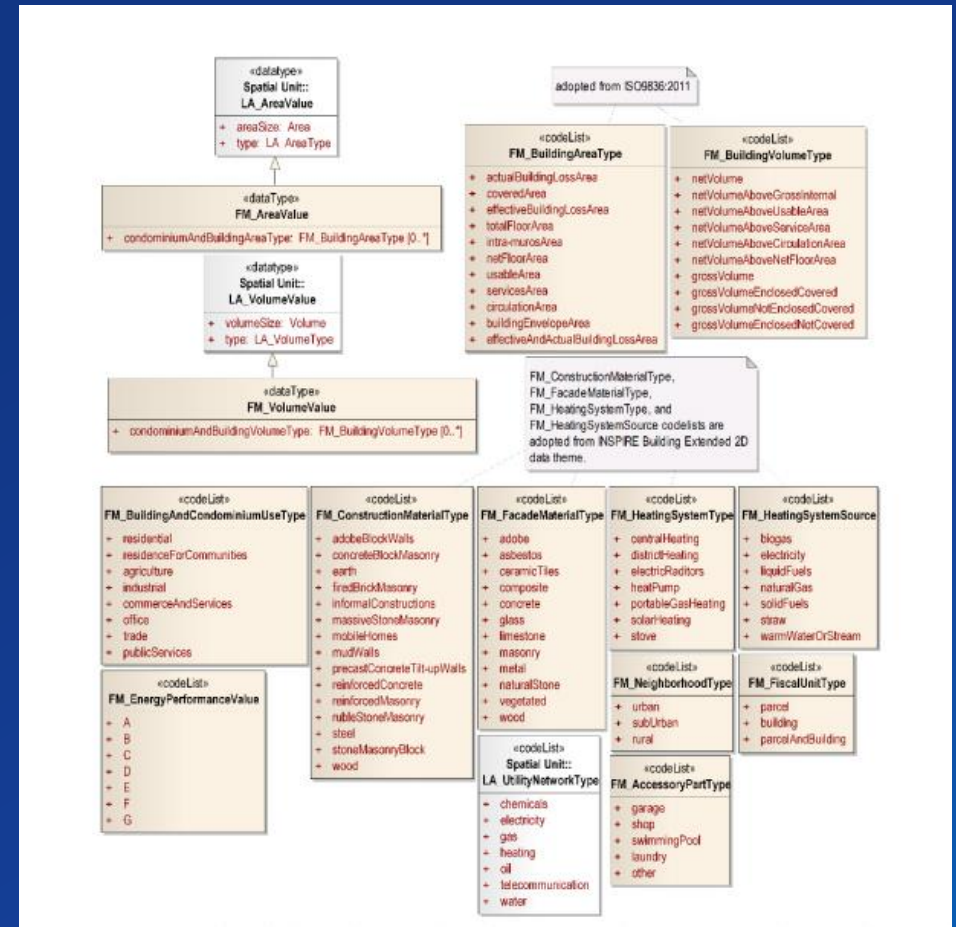
Leveraging the value of your data for everyone



Across Organizations and Beyond

LADM v2 Valuation Implementation in ArcGIS

- Answers the question, “What data should I be collecting to get started?”
- Streamlines data collection
- Provides a structure for data management
- Is supported by mobile survey based applications



Data types and code list classes for VM_Valuation Unit

Towards an International Information Standard for Immovable Property Valuation (8901) Abdullah Kara, Volkan Cagdas, Umit Isikdag (Turkey), Peter van Oosterom (Netherlands) and Erik Stubkjær (Denmark)

Data Requirements & Lessons Learned

- **At least 7 property characteristics are needed to understand value drivers**
 - Can be natural (ex. Slope) or physical (ex. Area)
- **More is more**
 - Some analytical processes such as prediction rely upon having at least 100 examples
- **Try to eliminate null values where possible**
 - The more complete the dataset, the more accurate your values will be
- **Take time to understand outliers through visualization once data is collected**



Feature Recognition and Change Detection

Locating Properties for First Valuation

Impervious Surface Classification



Palm Tree Detection



Building Footprint Extraction



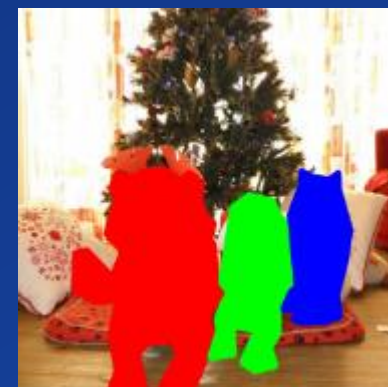
Damaged House Classification



Pixel Classification



Object Detection



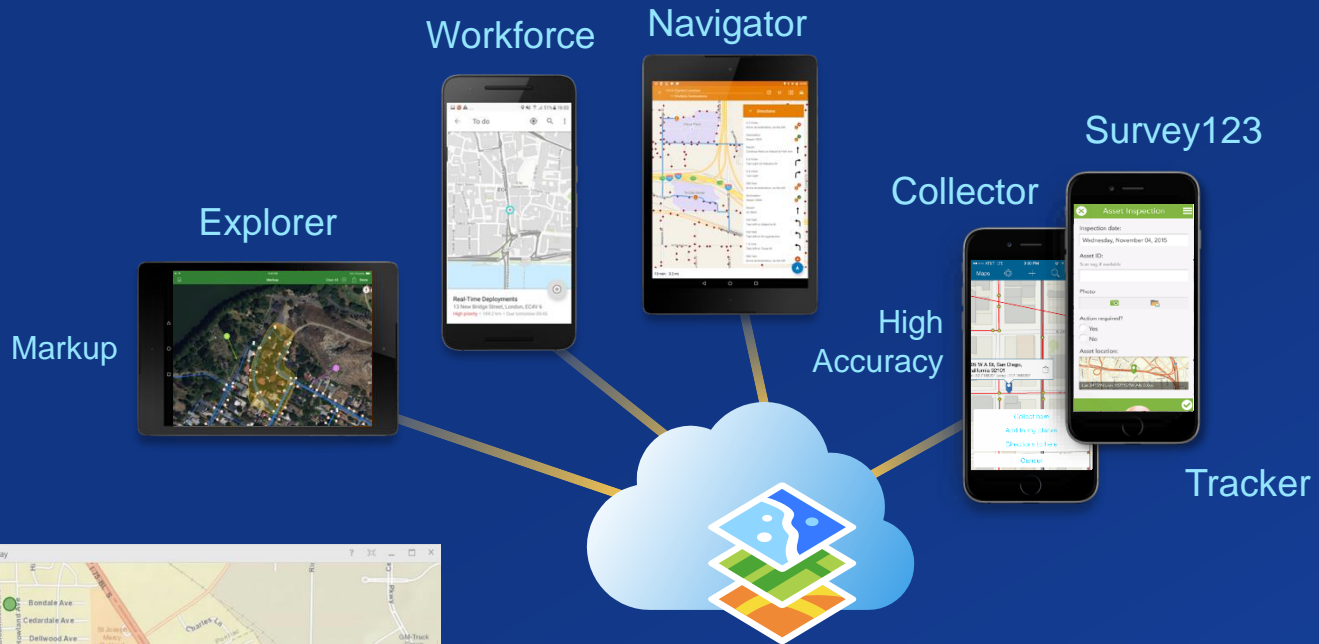
Instance Segmentation



Image Classification

Field GIS

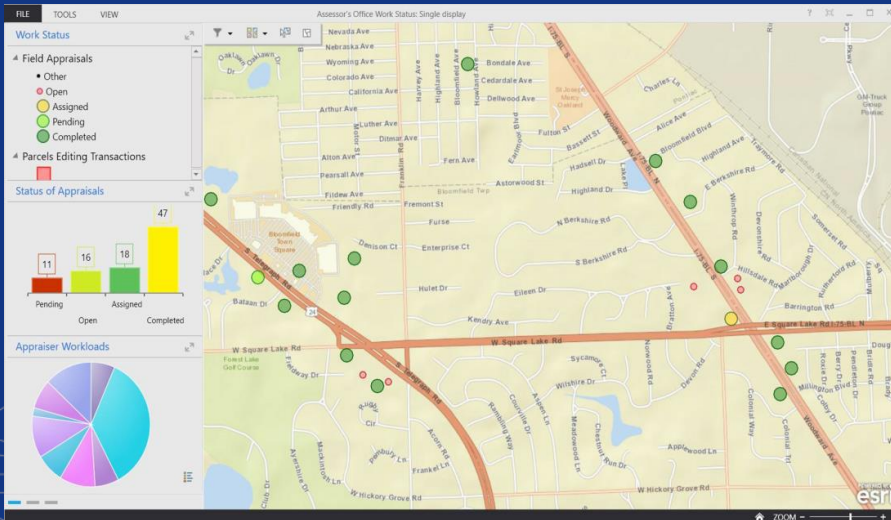
Collect Property Characteristics



- Collecting Data
- Optimizing Work
- Advanced Navigation
- Mapping and Markup

Connected and Disconnected

Connecting the Field with the Enterprise

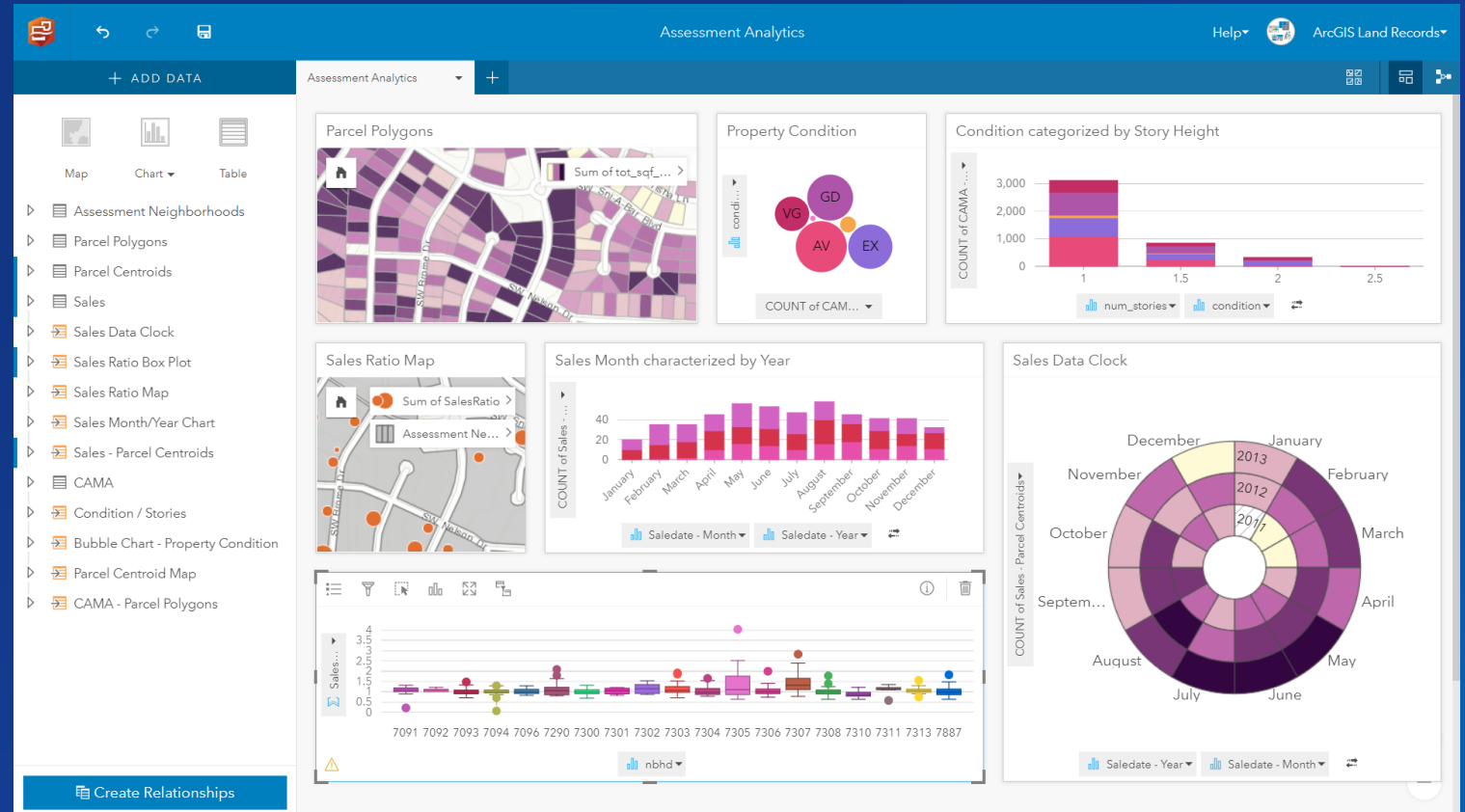


Data Quality Control

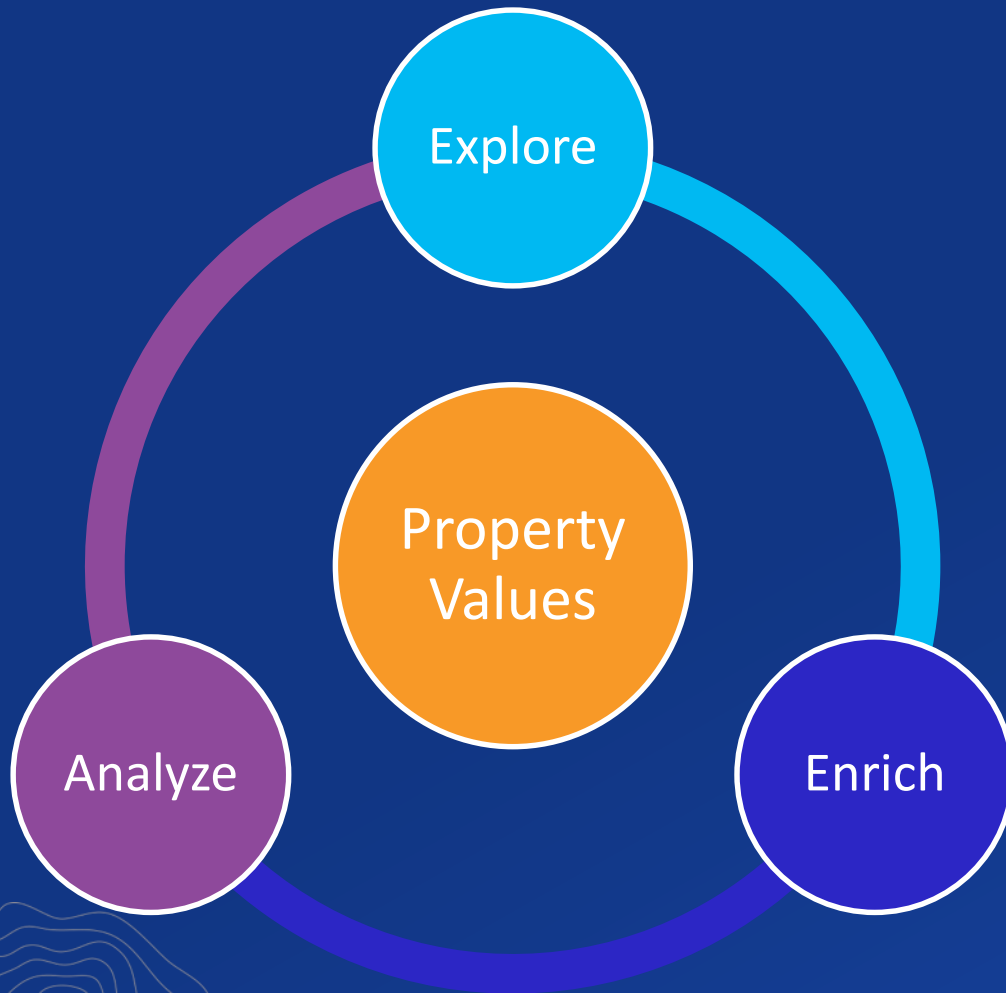
QA/QC Incoming Property Values and Characteristics

Visualize Analytics

- See trends and patterns
- Detect outliers and anomalies
- Vertical/horizontal equity
- QA/QC

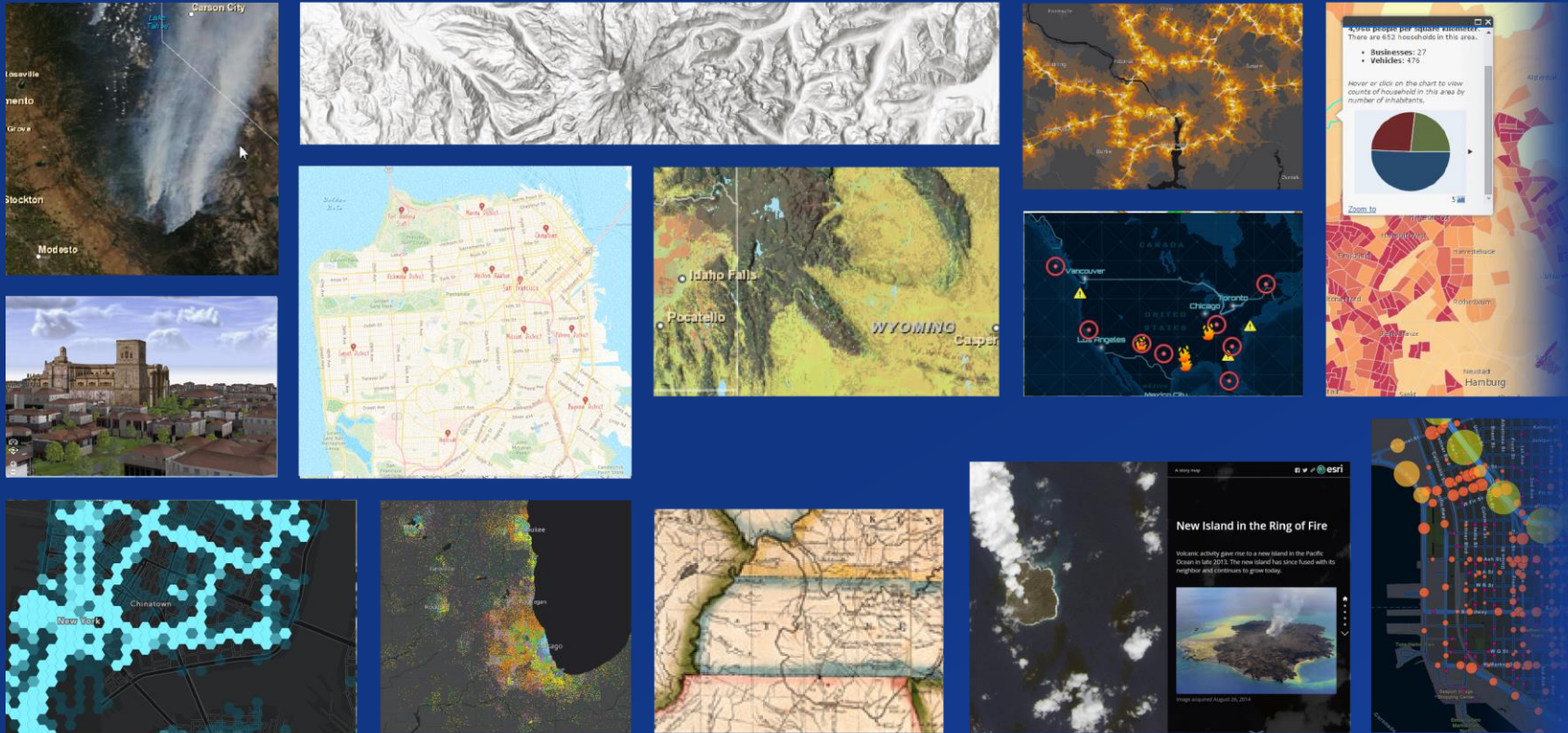


ArcGIS Valuation Methodology Part II



Data Enrichment with Living Atlas

Maps and Layers from Esri and Thousands of Contributors

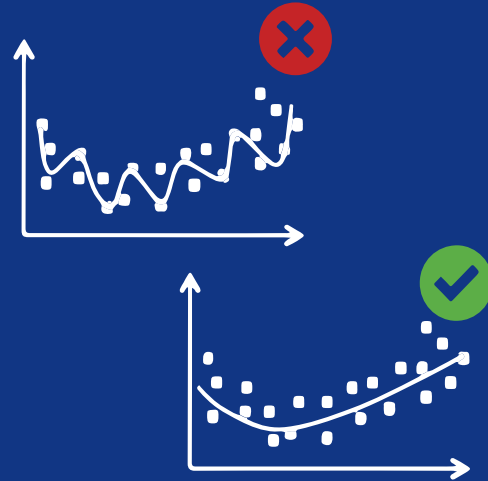


Trending
Transportation
Environment
Weather
Landscape
Infrastructure
Basemaps
Boundaries
Land Cover
Soils
Utilities
Traffic
Habitats
Elevation
Oceans
Historical
Imagery
Observations
People
Demographics
Hazards
Hydro

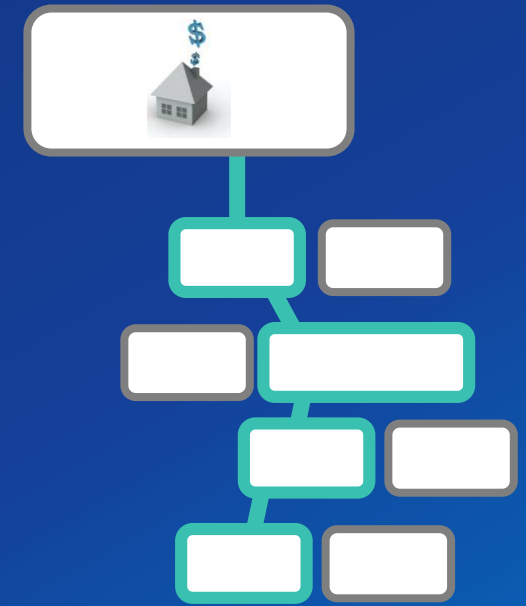
Terrain, Soils, 30 – 50cm Imagery, Census Data

Exploration and Analysis with ArcGIS

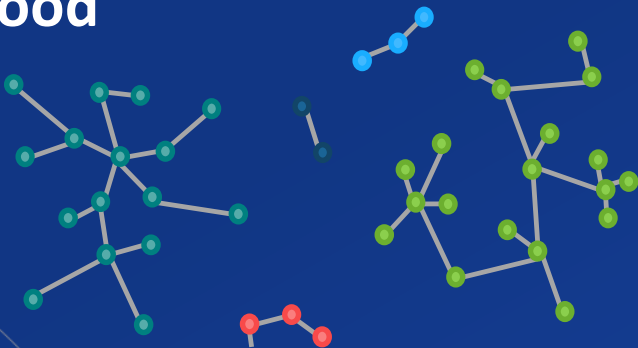
**Understanding
Which Property
Characteristics
Impact Price**
(Exploration)



**Predicting Price
and Other Values
for Non-
Measured
Locations**
(Prediction)



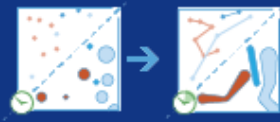
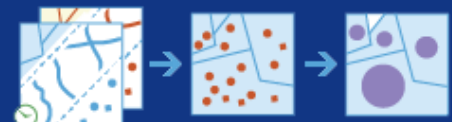
**Neighborhood
Creation**
(Clustering)



Spatial Stats Tools for Valuation in ArcGIS

Exploration

- Local Bivariate Relationships
- Colocation Analysis
- Ordinary Least Squares Regression
- Exploratory Regression



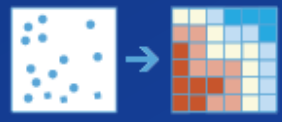
Clustering

- Spatially Constrained Multivariate Clustering
- Hot Spot Analysis
- Space Time Pattern Mining



Prediction

- Geographically Weighted Regression
- Forest Based Classification and Regression



The End Result

- **Initial Property Values**
- **An Understanding of Important Property Characteristics in Your Region**
- **Defendable Values**
- **A Way to Share Your Process**

