What’s New for Spatial Analysis and Geoprocessing in ArcGIS 10.1

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Overview

• Sharing Analysis

• New Analysis Capabilities

• Geoprocessing Developer Improvements

• New LiDAR Capabilities
Sharing Analysis

Analysis

Share as...

Package

GIS Professionals

Service

Everyone
Sharing Analysis and Workflows in 10.1

• Sharing a Package
  - GIS Professional to GIS Professional
  - Sharing corporate workflows and analytic methods

• Sharing a Service
  - GIS Professional to everyone
    - Use in Desktop
    - Use in web application
    - Use in mobile application
10.1 Publishing Geoprocessing Services

- Make publishing services easier
  - Analyze tools being published
  - Determine data needed for the service
    - Copy data that is not registered in the data store
    - Fix paths to data registered in the data store
  - Copy model and script tools and all dependent model and script tools
  - Modify intermediate and output paths to write to the scratch workspace so that the tool will work well as a service
  - Can publish selected tools from a toolbox instead of publishing an entire toolbox
  - Share the service with ArcGIS Online
10.1 Geoprocessing Service Result Map Service

- Generate Result Map service from result layers
- Fully functional Dynamic Map Service
  - Each job can have different legend
  - Client applications can change result map service
  - Create feature layer
  - Query
  - Time
10.1 Geoprocessing Services

- Asynchronous support on Amazon Cloud
  - ArcGIS Server Site Server/Cloud Builder

- Support for OGC WPS (Web Processing Service)
10.1 Geoprocessing

- 64bit OS
- Linux\Wine
- in_memory raster
- 255 character path limit for grids removed
Example Performance Improvement

**Viewshed service**

- 9.3 = 8 seconds
- 10 = 2 seconds
  - Spatial Analyst read of geodatabase raster
- 10.1 = 0.6 seconds
  - 25% faster because of 64bit
  - 25% faster because of using layer for elevation
  - 25% faster because of in-memory workspace
  - Faster REST handler
Sharing Online

- Share Geoprocessing Packages and Services through ArcGIS Online or your organizational site
Demo - Sharing Geoprocessing
New Analysis Capabilities
New and Improve Core Analysis Tools

- Tabulate Areas
- Polygon Neighbors
  - Summary table of contiguity statistics
- Buffer
  - Geodesic buffers of all feature types
- Spatial Join
  - New options including 3D distance
Interpolation Improvements

- Empirical Bayesian Kriging
- Areal Interpolation
- TopoToRaster updated to ANUDEMM 5.3
- Filled Contour sample tool
New Interpolation technique

Empirical Bayesian Kriging

- Spatial relationships are modeled automatically
  - Very easy to use (few parameters)
  - Available as a GP tool
- Results often better than traditional kriging
- Uses local models to capture small scale effects
  - Doesn’t assume one model fits the entire dataset
New Interpolation with polygon input

Areal Interpolation

- Geostatistical technique, provides error estimation
- Cast data to a different geometry
  - School zones to census tracts
  - Counties to watersheds
- Design your aggregation scheme to fit your analysis
- Model and fill-in missing data
Improved Spatial Statistics

- Identify space-time clusters
- Easily identify key explanatory variables for regression analysis

Foot and Mouth outbreaks in 2001

• Group similar features
• Find appropriate scale of analysis

Libya Ushahidi events in space and time

1 Mile Radius
¼ Mile Radius ½ Mile Radius

¼ Mile Radius ½ Mile Radius 1 Mile Radius
Analysis with 3-Dimensional Data

- 3D Selection now honored
- New analytic capabilities to answer spatial questions in 3 dimensions
  - What is close to what?
  - What is connected to what?
  - What is on top of (intersects) what?
New and Improved 3D Analysis Tools

For 3D Points, 3D Lines, and Multipatch geometries

• Intersect *
• Union
• Difference *
• Near
• 3D Buffer *
• Inside
• Is Closed
• Close Multipatch *

* New or improved tools in 10.1
Network Analysis

- New Capacity option for Location-Allocation
- Faster Service Area calculation
- Support for Live traffic data
- Python API for Network analysis and data mgmt
- New Geoprocessing tools
  - Generate Service Areas
  - Solve Vehicle Routing Problem
Geoprocessing Developer Improvements
Geoprocessing Developer Improvements

- Python Toolboxes
- Python Add Ins
- ArcPy Data Access Module
- ArcPy Network Module
- Geometry Class improvements
  - Topological operators
    - Buffer, Clip, Union, Intersect, etc.
  - Geodesic methods
    - getLength, getArea
Improved LiDAR Support
What’s new for LiDAR in ArcGIS 10.1?

- Direct read, use, and editing of LAS files in ArcGIS
- LAS Dataset
- Use in Terrains
- Use in Mosaics
- Interactive 3D editing
Terrain Dataset Strengths

- Spatially indexed
- Pyramided
  - Z-tolerance and windowsize based thinning
- High quality surface
- Supports breaklines
- Storage efficient
- I/O efficient
- Geodatabase
Relative Storage Cost – LAS vs. GDB

• One LAS file
  - LAS file (with attributes)  44MB
  - Shapefile (geom only)  52MB
  - PersonalGDB (geom only)  40MB
  - FileGDB (geom only)  7MB

• Project of many LAS files
  - 338 LAS files  12.5GB
  - Bare earth terrain
    with embedded data
    in FileGDB  1.3GB
  - 1st return terrain  2.2GB
LAS Dataset

- New data type
- File based
- Stores *references to LAS files on disk*
- Optionally reference breakline data
- Treats a collection of LAS files as one logical dataset
LAS Dataset - Creation

- Interactively via Catalog
  - File folder context menu pick

- Inside scripts and models with GP tools
LAS Dataset – Is a GeoDataset
LAS Dataset – Display and Query

- Quick Preview of point data in LAS format
- Display and query both as surface and as points
- Symbolize points by LAS attributes
- Support for breaklines
- Map and scene (2D and 3D)
Symbolizing LAS Datasets
Symbolizing LAS Datasets
Symbolizing LAS Datasets
Symbolizing LAS Datasets
LAS Dataset – Editing Class Codes

• **Manual**
  - Fixing data anomalies and misclassifications via point profile window

• **Automated (GP tools)**
  - Classify relative to feature data
  - Reclassify to standard LAS spec
Interactive Editing

Create a profile of LAS dataset points. Click a location in the map display to set a start point, and a second location to set an end point. Once an end point has been set, use the selection box to set a profile width. Use the SHIFT key to set straight vertical or horizontal lines. Press the ESC key to cancel. The LAS dataset profile window allows you to view and edit the classification of the raster points of the LAS dataset.
LAS Dataset - Analysis

- Derive surfaces
  - LAS Dataset As Raster
  - LAS Dataset As TIN

- Direct analysis
  - Interpolate Shape
  - Add Surface Information
  - Line Of Sight
  - Skyline
  - Locate Outliers

- Rasterize on point metrics
  - LAS Point Statistics As Raster
LiDAR Use in Mosaic Datasets

• Catalog and share lidar data
• Support for:
  - LAS files
  - LAS datasets
  - Terrain datasets
• Dynamic rasterization
• Can serve rasterized derivatives or source LAS files
LiDAR Use in Mosaic Datasets

- Lidar sources treated as raster type
Mosaic Dataset – LAS Type Properties

- **Input Properties**
  - **Return types:** Any
  - **Class types:**
    - 0: Never Classified
    - 1: Unclassified
    - 2: Ground
    - 3: Low Vegetation
    - 4: Medium Vegetation
    - 5: High Vegetation
    - 6: Building
    - 7: Mirv Low Point
  - **Data type:** Las Data 2

- **Output Properties**
  - **Pixel size (Required):** 10
  - **Binning**
    - **Cell aggregation type:** Maximum
    - **Void filling:** None
    - **Maximum width:** Blank or 0 - no limit
  - **Triangulation**
    - **2 factor:** 1
    - **Cache folder:** Dr: \Data\CA_Redlands\LAS_Redlands.C
    - **Number of cached surfaces:** 10
  - **Treat each folder as a dataset**
LiDAR as Image Services
Thank you...

Questions ?
### LAS Dataset Properties

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LAS Dataset Properties

- **Returns**
  - Return: First, Second, Last, Single, First of Many, Last of Many
  - Point Count: 23,186,358, 7,589,412, 23,168,198, 17,047,489, 6,139,809, 6,120,709
  - %: 75.34, 24.66, 75.28, 55.39, 19.95, 19.89
  - Z Min: 567.00, -178.50, 567.00, -178.50, 577.92, -178.50
  - Z Max: 2842.83, 868.33, 897.42, 864.50, 2842.03, 864.50

- **Attributes**
  - Name: Return No., Intensity, Class Code, Scan Angle, User Data, Point Source
  - Min: 1, 0, 1, 0, 0, 1
  - Max: 2, 255, 7, 0, 0, 11

- **Classification Codes**
  - Unclassified
    - Point Count: 14,581,112
    - %: 47.38
    - Z Min: 568.67
    - Z Max: 2842.83
    - Min Int: 0
    - Max Int: 255
    - Synth: 0
  - Ground
    - Point Count: 12,422,648
    - %: 40.37
    - Z Min: 567.00
    - Z Max: 785.17
    - Min Int: 0
    - Max Int: 255
    - Synth: 0
  - Low Point (noise)
    - Point Count: 3,772,010
    - %: 12.26
    - Z Min: -178.50
    - Z Max: 2297.42
    - Min Int: 0
    - Max Int: 255
    - Synth: 0

- **Classification Flags**
  - Point Count: 0

- **Status**
  - 0 file(s) have outdated or no statistics
Best Practices

- Tiled LAS, v1.1 or higher
- 1-2 million points per file
- Projected
- Keep file I/O local, avoid network
- Airborne
  - Classified (bare earth, non-ground)
  - Breaklines for hydro enforcement
  - Study area boundary included as constraint
- Terrestrial
  - RGB, intensity, or classified
Licensing

• Standard, 3D, or Spatial
  - Create LAS dataset
  - Modify LAS dataset schema
  - Include in Mosaic dataset
    - Publishing requires Image extension for Server
  - View in 2D
  - Rasterize

• 3D
  - Edit class codes
  - View in 3D
  - TIN based surface analysis