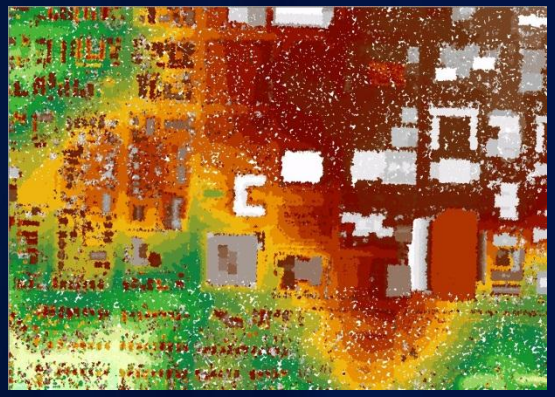
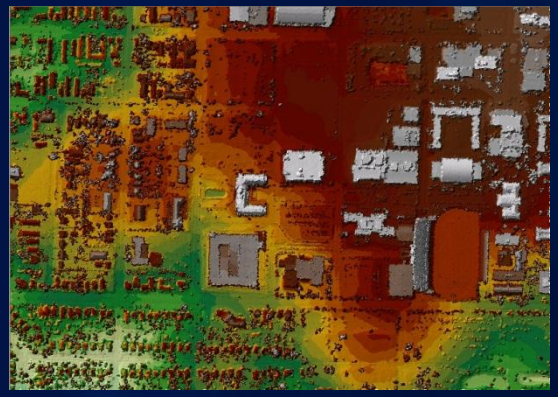
Using LiDAR Data in ArcGIS 10.1

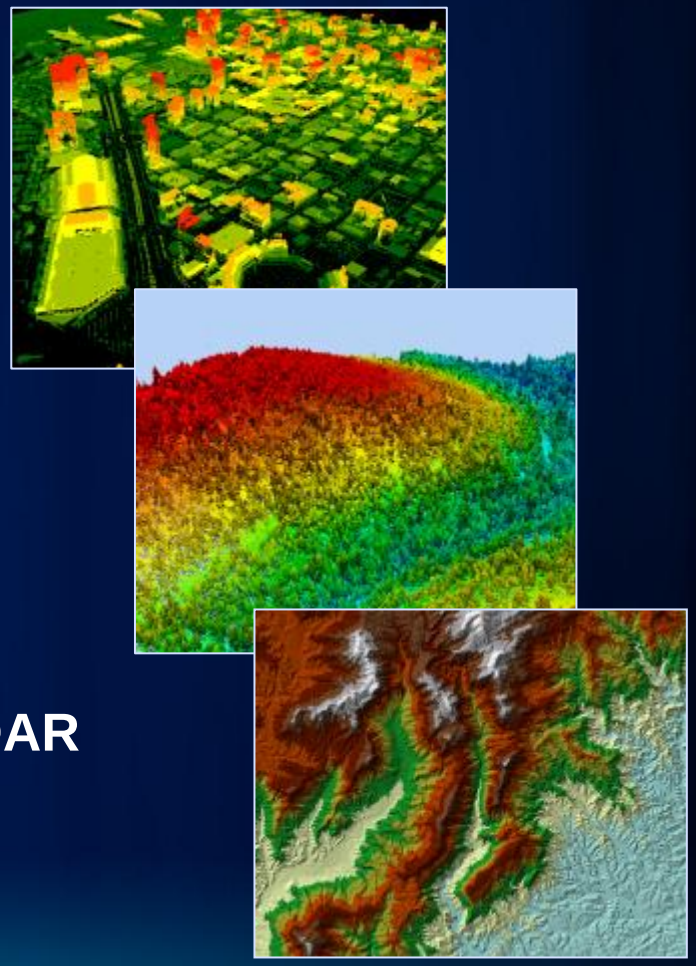




esri

Outline

- **LiDAR Overview**
  - What is it?
  - Why is it important to GIS?
  - LiDAR in 10.1
- **Demo – LiDAR as a pointcloud**
- **Serving LiDAR**
  - Managing large datasets
  - Serving elevation data
- **Demo – Serving county-wide LiDAR**



Lidar – Light Detection And Ranging

- Optical remote sensing technology that can measure the distance to, or other properties of a target by illuminating the target with light
- LAS—Binary file format for Lidar storage developed by the ASPRS in conjunction with private and government stakeholders
- Lidar data (LAS) is increasingly available and affordable, and many users want to leverage this data in their GIS

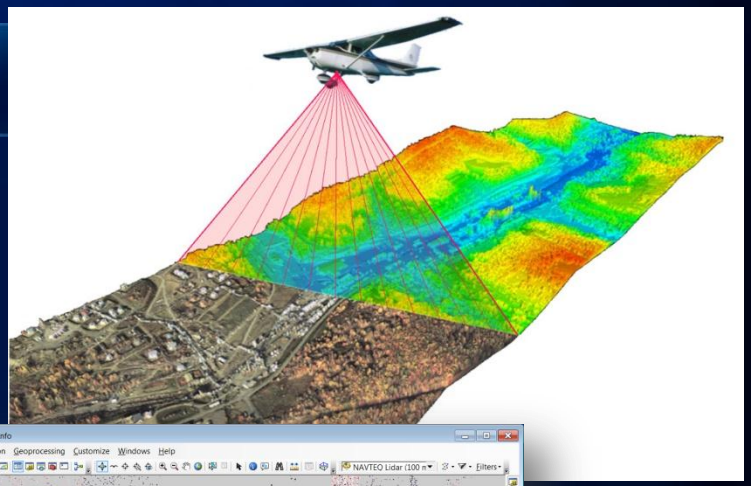
LiDAR – Light Detection And Ranging

Optical remote sensing technology that measures the distance from the sensor to a target

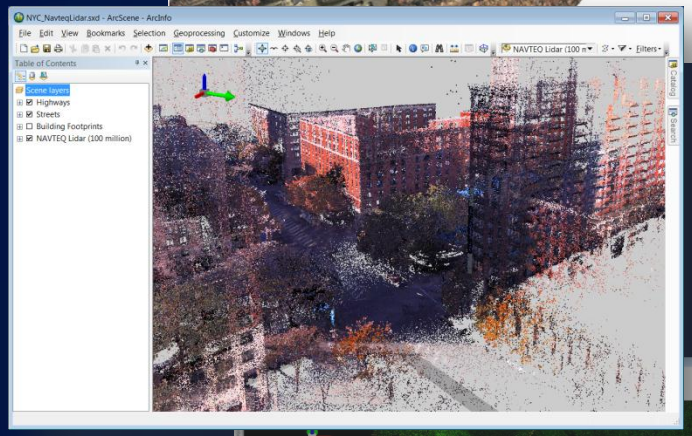
LAS: Binary file format for LiDAR data storage developed by the ASPRS in conjunction with private and government stakeholders

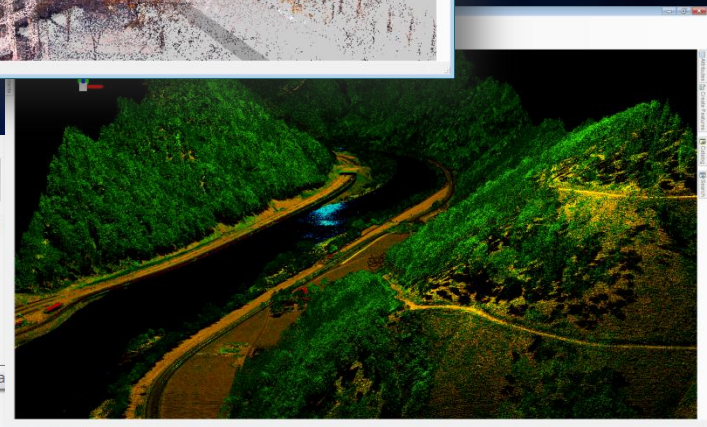
Types of LiDAR

- **Airborne**
  - Captured from aircraft



- **Terrestrial and Mobile**
  - Captured from the surface



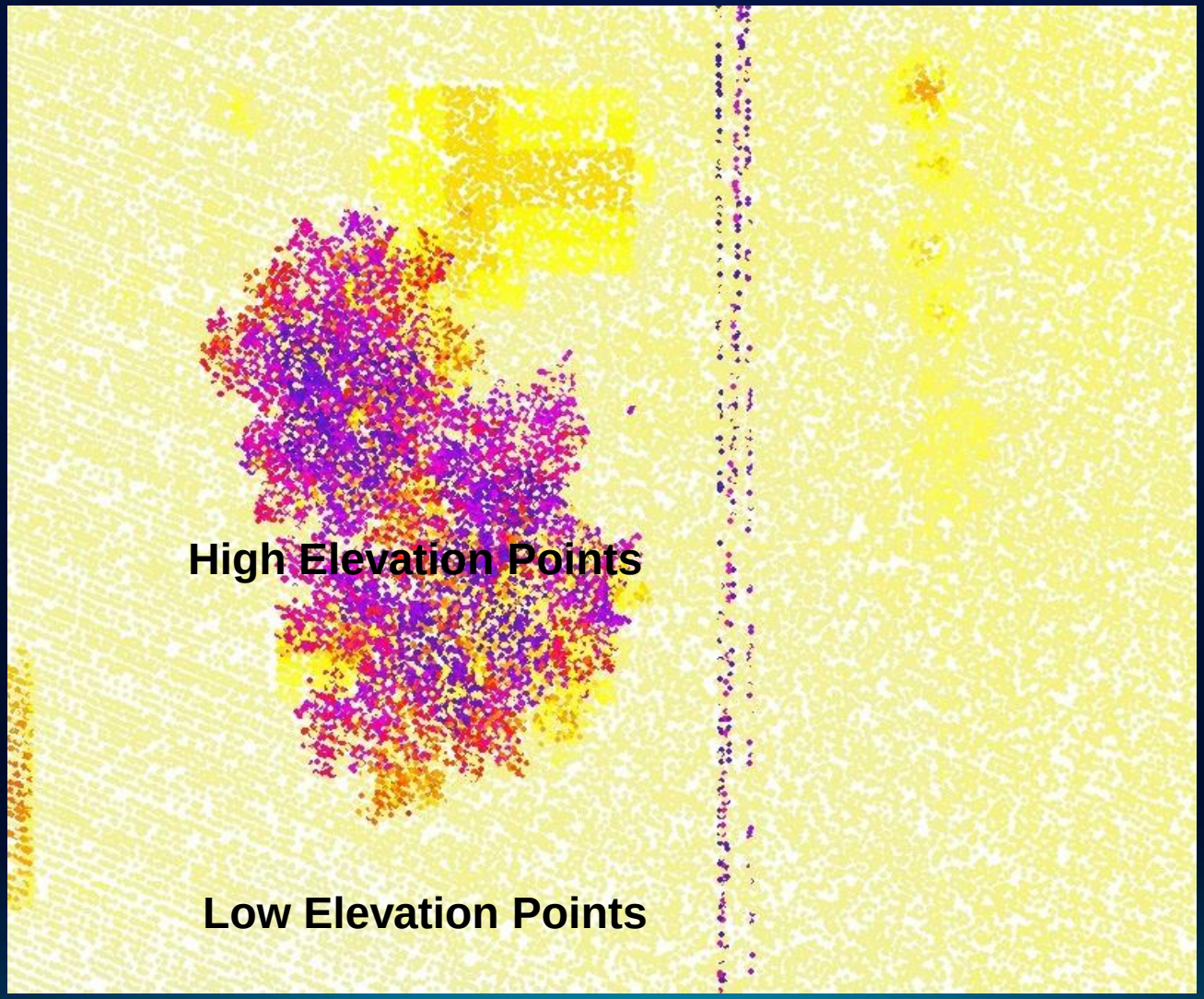


Why is LiDAR Important to GIS?

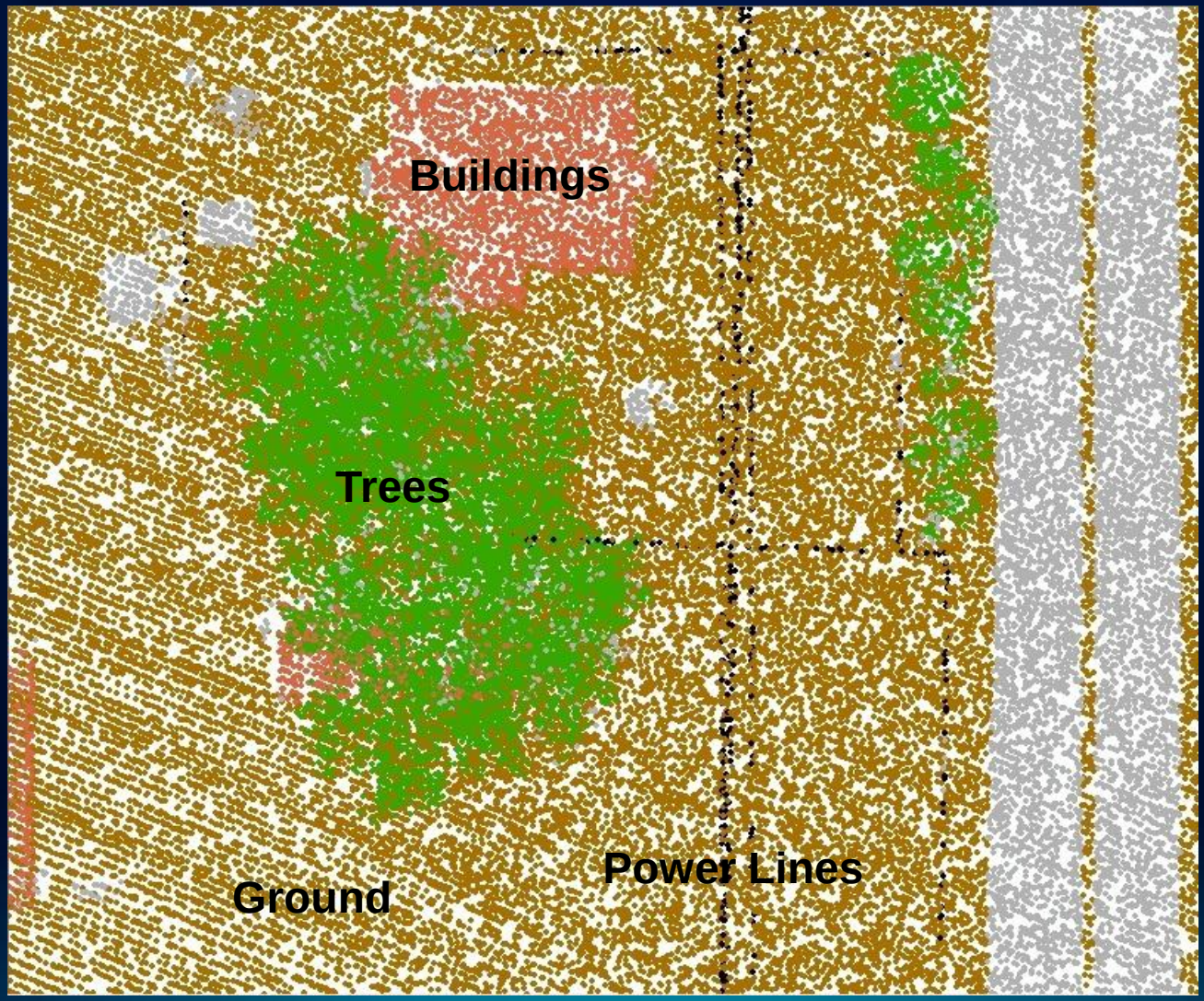
- **Rich source of geospatial information**
  - **Used to build elevation models**
  - **Contains information about the objects in a scene**
    - Points classified as building, low vegetation, high vegetation, water, etc.
    - Is an object solid or is it permeable?
  - **Points contain color information**
    - LiDAR merged with imagery

Reference Image

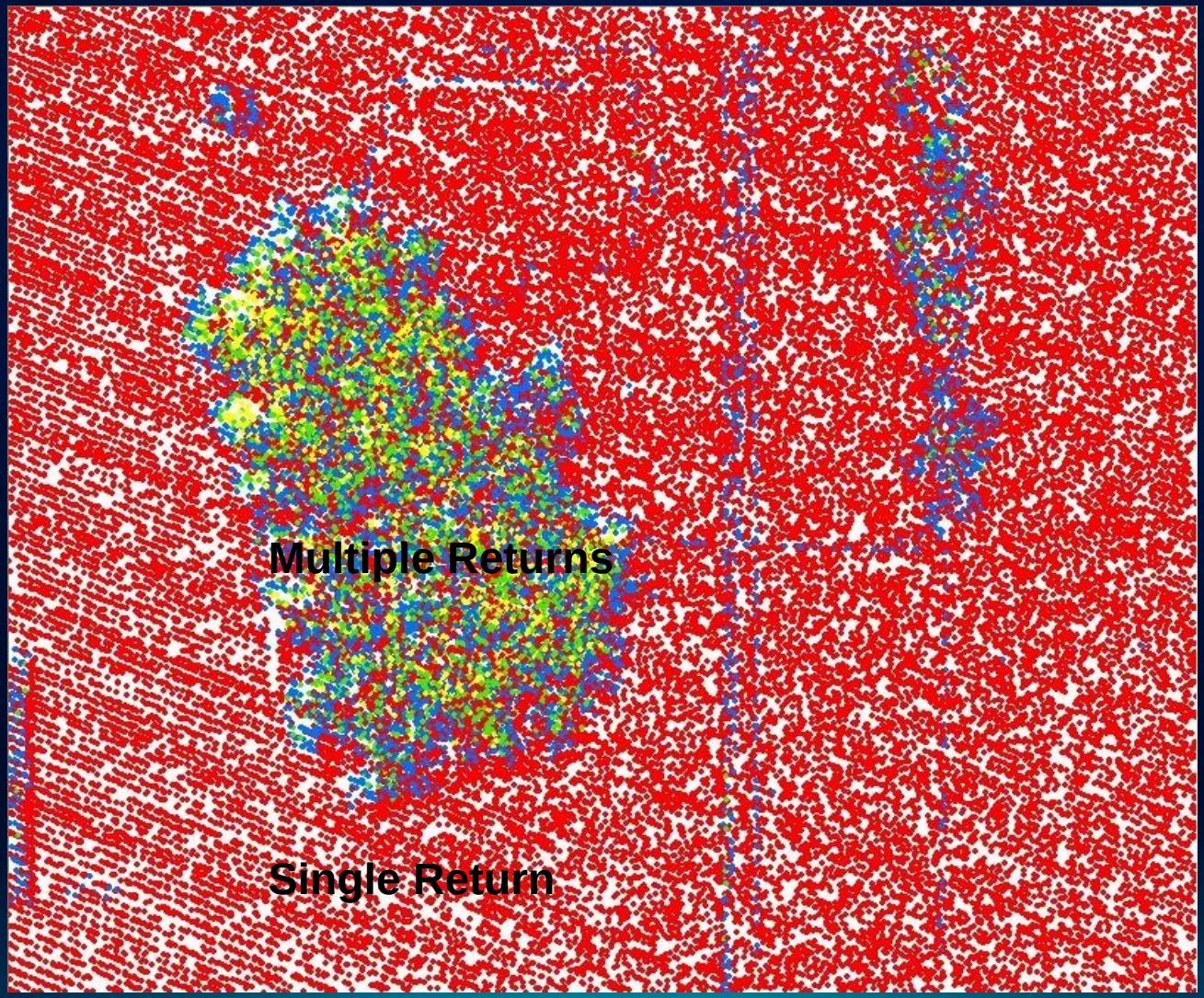
Elevation



Classification

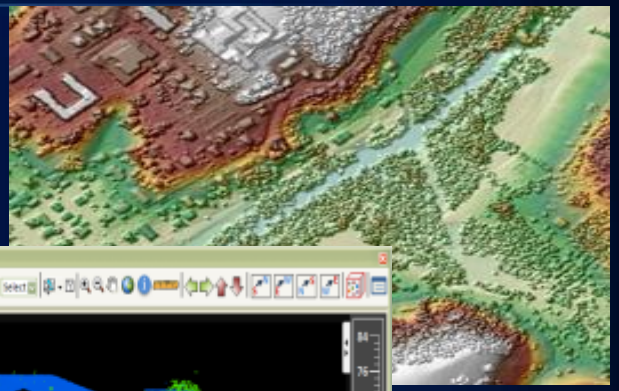


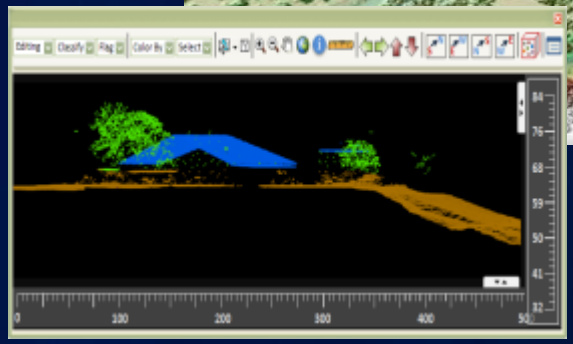
Return Number



LiDAR in ArcGIS Desktop 10.1

- 3D visualization and analysis
- Reclassification of LiDAR
- Dynamic mosaicking
- Image Service Publishing





Licensing

- Standard, 3D, or Spatial Analyst Extension
  - Create LAS dataset
  - Modify LAS dataset schema
  - Include in Mosaic dataset
    - Publishing requires Image extension for Server
  - View in 2D
  - Rasterize
- 3D Analyst Extension
  - Edit class codes
  - View in 3D
  - TIN based surface analysis

Lidar Industry Usage

Just to name a few

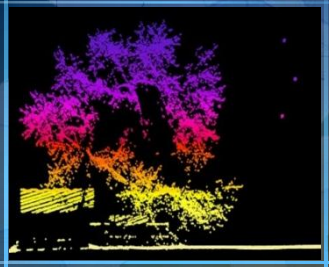
LiDAR Pointcloud Analysis

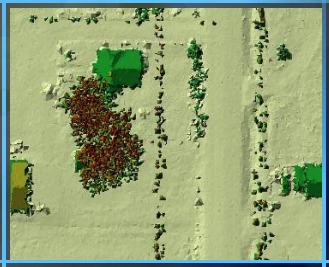
- **LiDAR and imagery of corridors, power lines, and power stations**

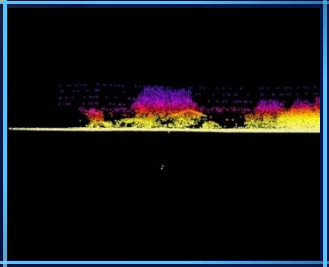
- **Customers have many questions:**
  - How do they visualize the LiDAR data?
  - Are the data points classified?
  - What is the LiDAR point spacing?
  - Can we see structures?

- **3D Viewing in ArcScene**

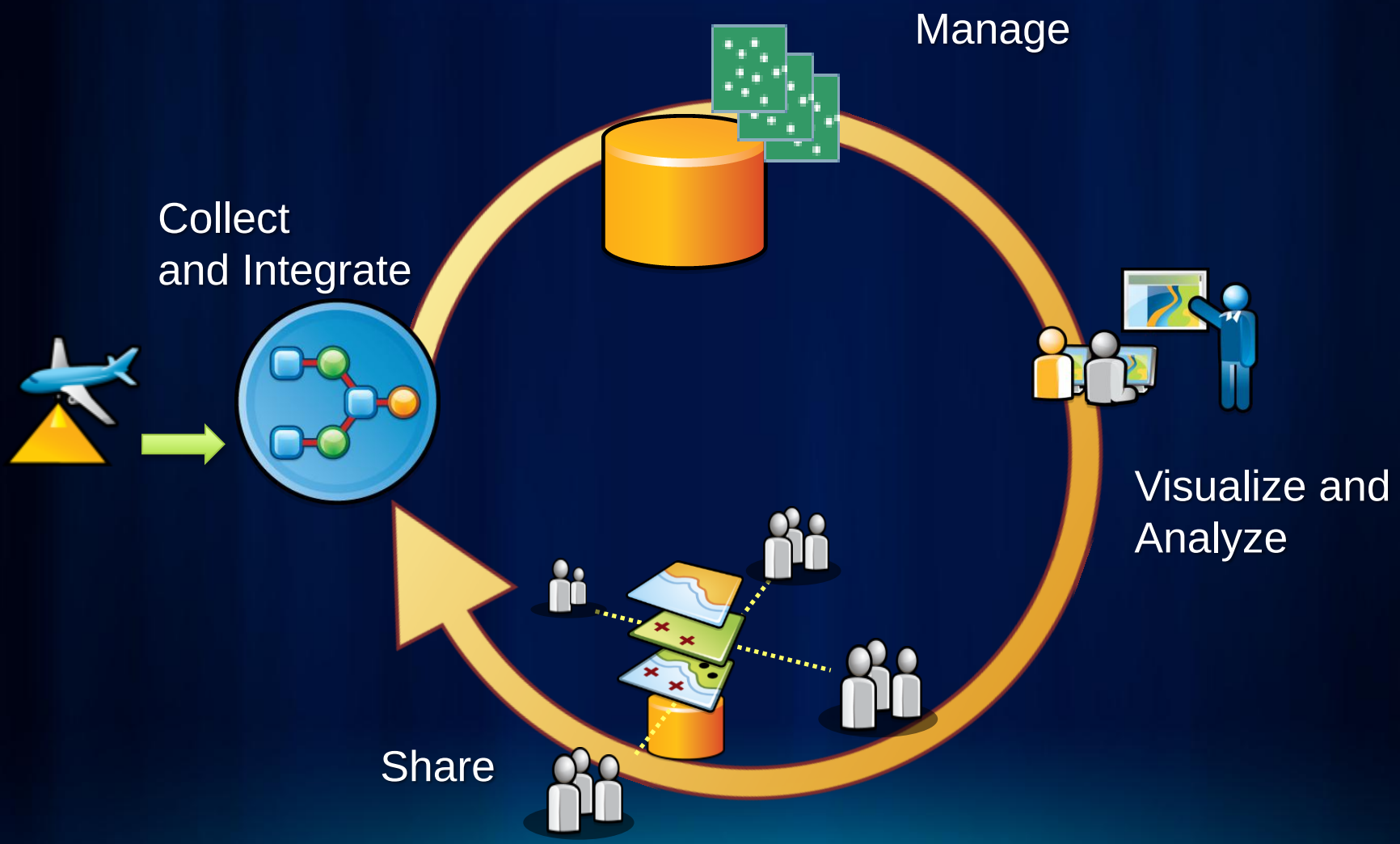
Demo





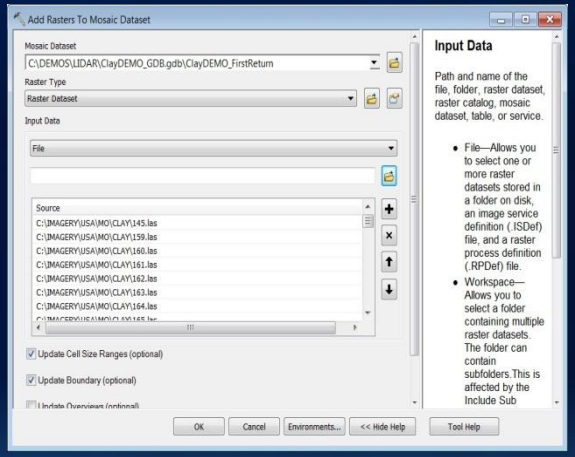


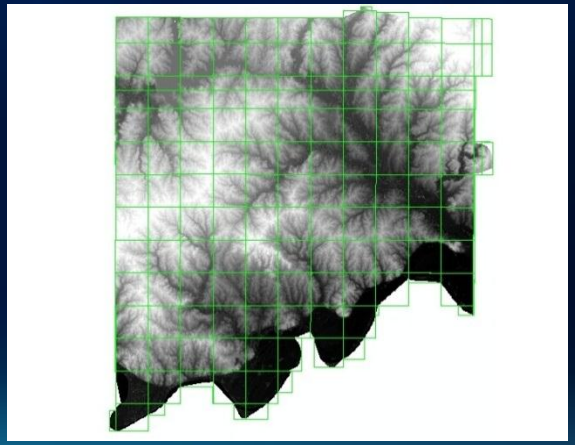
The Lidar Workflow



Managing Large Amounts of LiDAR

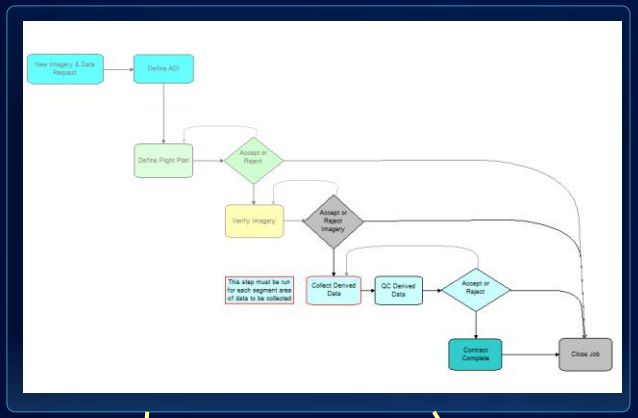
- **Managing Workflows**
  - **Esri Production Mapping**
- **Catalog the data**
  - **Different dates**
  - **Different vendors**
- **Access the data**
  - **As image service**
    - Across the organization
    - From Web
    - On mobile device



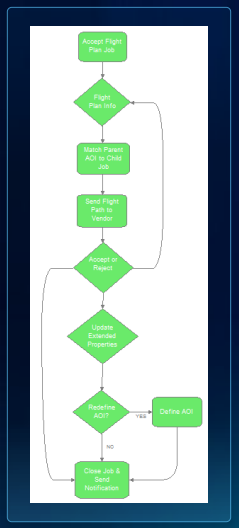


LiDAR Production Management

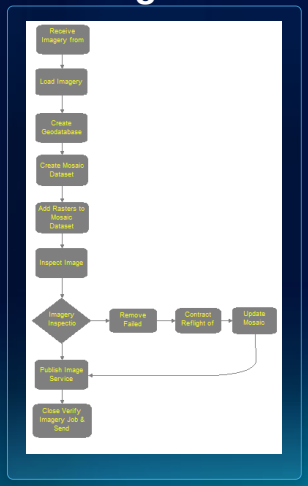
Management



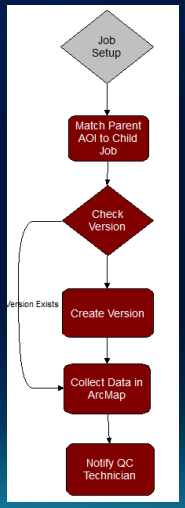
Collection



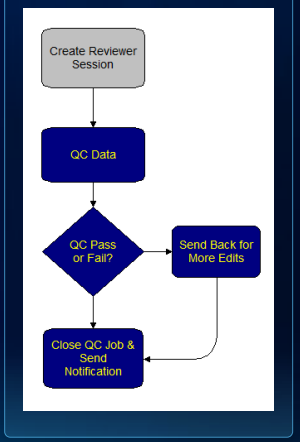
Management



Analysis

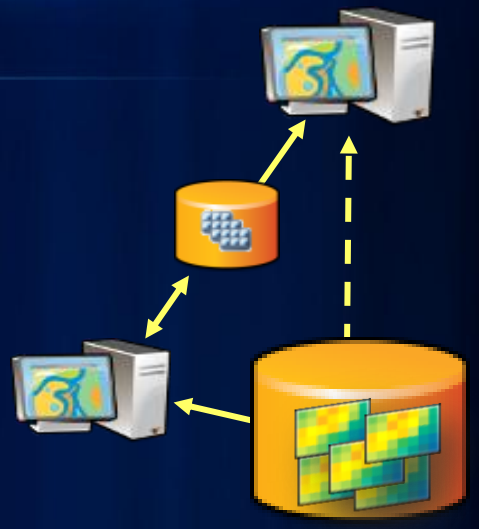


QC



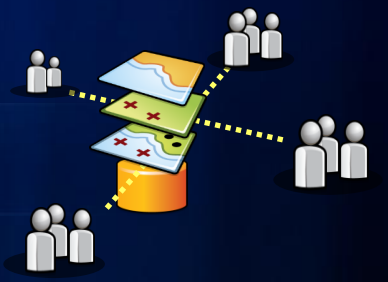
Mosaic Dataset

Optimum Model for Image Data Management

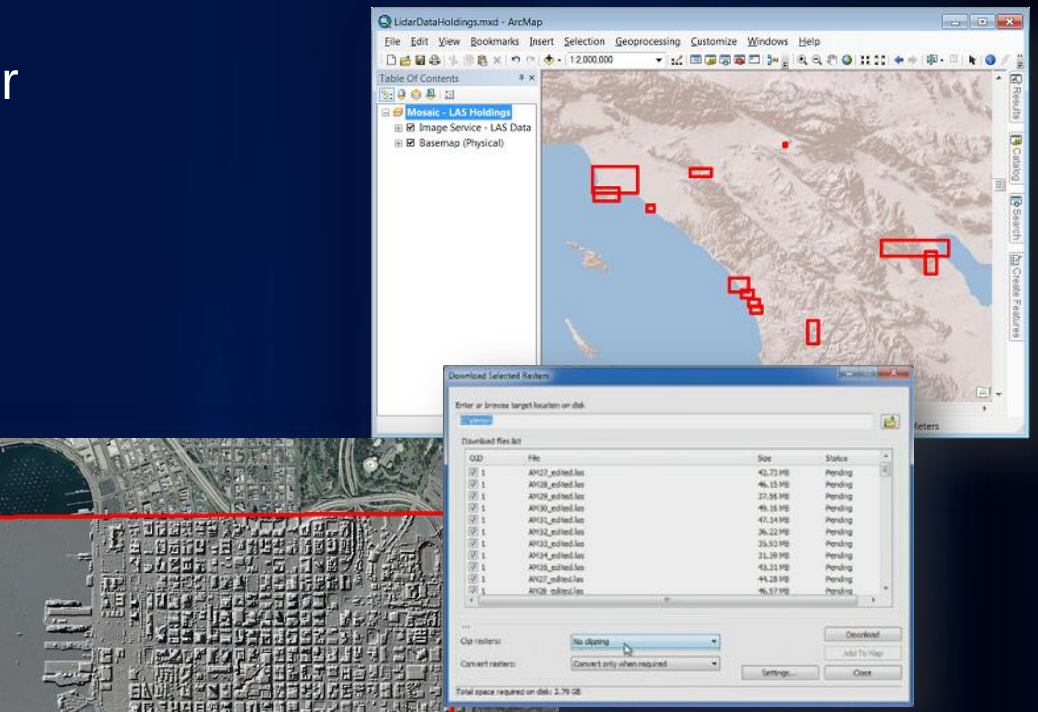


- Manage
  - Multiple projects as single dataset
  - Metadata
- Visualize
  - On the fly representation as surface or point cloud
  - View as 2D or 3D
- Share
  - As a single dataset
  - As Image Service
  - WMS/WCS

Sharing Lidar Data

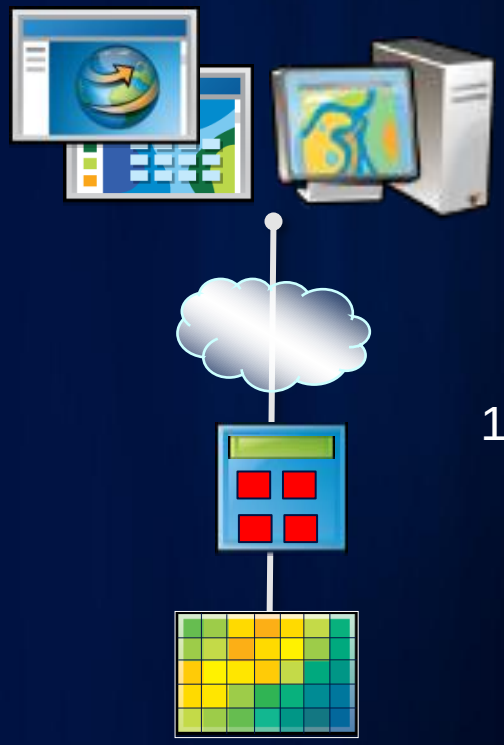


- Share via ArcGIS Server
- An image service
  - Access
  - Discover
  - Download
- A map service



Serving LiDAR Data

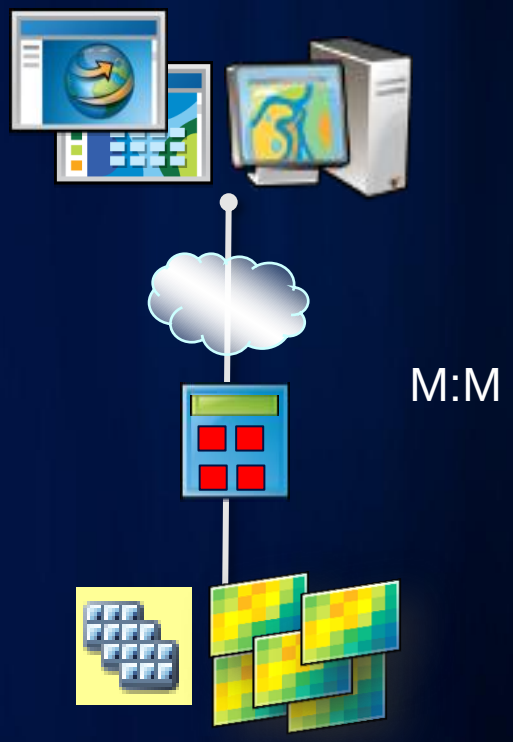
- **Publish LiDAR as Image Service**
  - Directly from LAS files
- **Multiple products from a dataset:**
  - First return elevation
  - Last return elevation
  - Ground Elevation
  - Intensity



1:M

ArcGIS for Server + Image Extension

- **Extends Image Services**
  - **Serve large collections of imagery and LiDAR**
  - **Dynamically create and serve mosaics on-the-fly from LiDAR**
  - **Serve Multiple Views of LiDAR**
  - **Allows download, measurement, and editing**



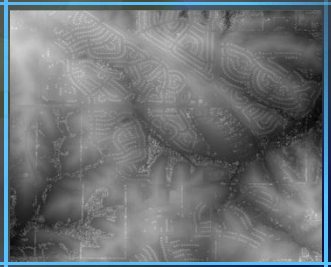
Imagery/Map Publishing Options

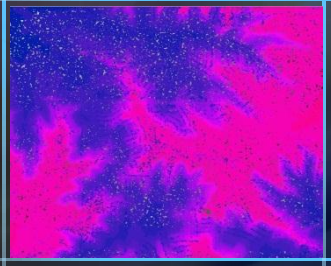
- **Publish to Local Servers**
  - ArcGIS Server on user premise
  - Use Own hardware
- **Managed Services**
  - Full Service
  - Customizable packages
  - Available now
- **ArcGIS Online**
  - Self Service Hosting
  - Shared Cloud Servers
  - New with 10.1

Serving County-Wide LiDAR Coverage

- **Ingham County, MI**
  - Has LiDAR coverage of entire county
  - ~750 LAS files, 50+ GB for the county
  - For demo, I'm using ~300 files (~22 GB)
  - Thanks to Robert Goodwin and Justin Booth at MSU for sharing the data
- **Want it accessible as image service**
  - Publish through ArcGIS for Server
- **Want to publish to ArcGIS.com**

Demo





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

Summary

- **New with 10.1**
  - View and edit LiDAR data in its native form
  - Share LiDAR as an image service
    - As Image Service with Server + Image Extension
    - As Map Service

- **Additional Resources**
  - What's new in 10.1 on Esri.com
  - 10.1 Beta Resource Center: http://resourcesbeta.arcgis.com

Questions?