



Managing Imagery using Mosaic Datasets and Image Services

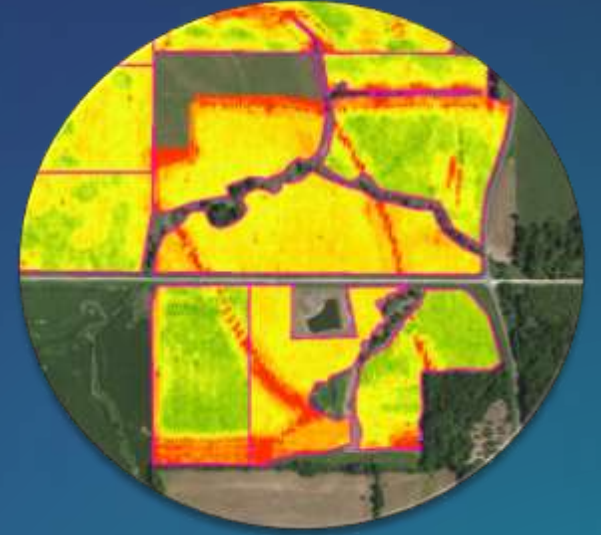
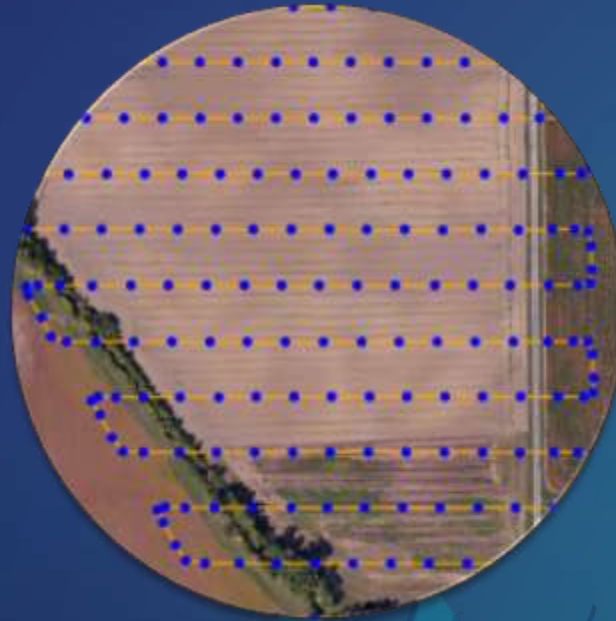
Prashant Mangtani, Rohan Ganapathy

An abstract 3D architectural graphic is positioned on the right side of the slide. It features several overlapping, semi-transparent planes in shades of blue, orange, green, and yellow. The planes are oriented at various angles, creating a sense of depth and perspective. Some planes contain faint, stylized patterns or textures, such as a topographic map or a grid. The overall composition is dynamic and modern, set against a dark blue background with subtle light gradients.

GIS
INSPIRING
WHAT'S
NEXT

Agenda

- Introduction
- Managing Imagery
- Sharing Imagery
- Imagery in the cloud
- Summary
- Questions



ArcGIS Provides a Comprehensive Imagery Platform

Seamless integration and analysis of imagery with all spatial data

A scalable platform for working with all forms of imagery (drone, aerial, and satellite) to create valuable information products, integrated with GIS.



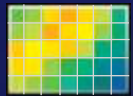


Imagery content on the Living Atlas

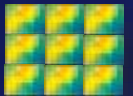
Rohan Ganapathy

Image Modalities

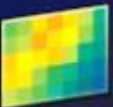
- **Platforms** : Satellite, Aerial, Drone, Terrestrial
- **Sensors** : Camera (Pan, Multispectral, Hyperspectral), Lidar, Radar, Bathymetric..
- **Levels of Imagery**



Static Cache (Backdrop)



Preprocessed (GIS Ready) – Orthos, Elevation, Categorical, Scientific, ..



Raw (Unprocessed) – Directly from Sensor

- **Data Structure**: Bands, Bits, Tiling, Pyramids, NoData
- **Format**: TIF, NITF, HDR, GRIB, MrSID, IMG, JP2, ...
- **Compression**: Lossless, Lossy, Limited Error
- **Georeferencing**: Extent, SRS, RPC, Orientation Angles, ...
- **Metadata**: Acquisition Data, Color Map, Source, Copyright, ...

Managing Imagery

Mosaic Dataset

What is a Mosaic Dataset?

ArcGIS Imagery Information Model

- Catalog of
 - Imagery
 - Associated metadata
 - Processing to be applied
- Stored in Geodatabase
- Authored using ArcGIS for Desktop
- Enables
 - Dynamic Mosaicking
 - On-the-fly processing

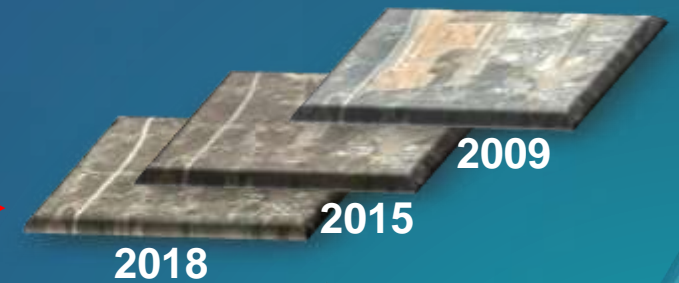
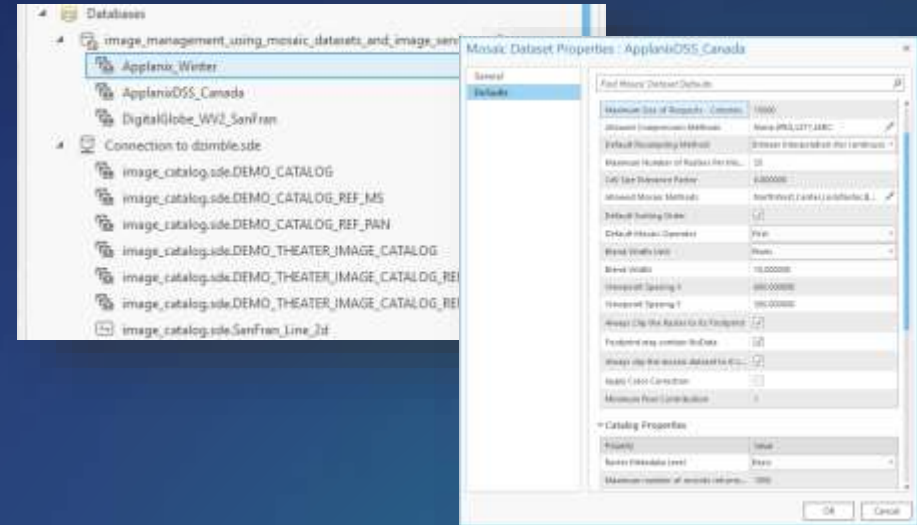

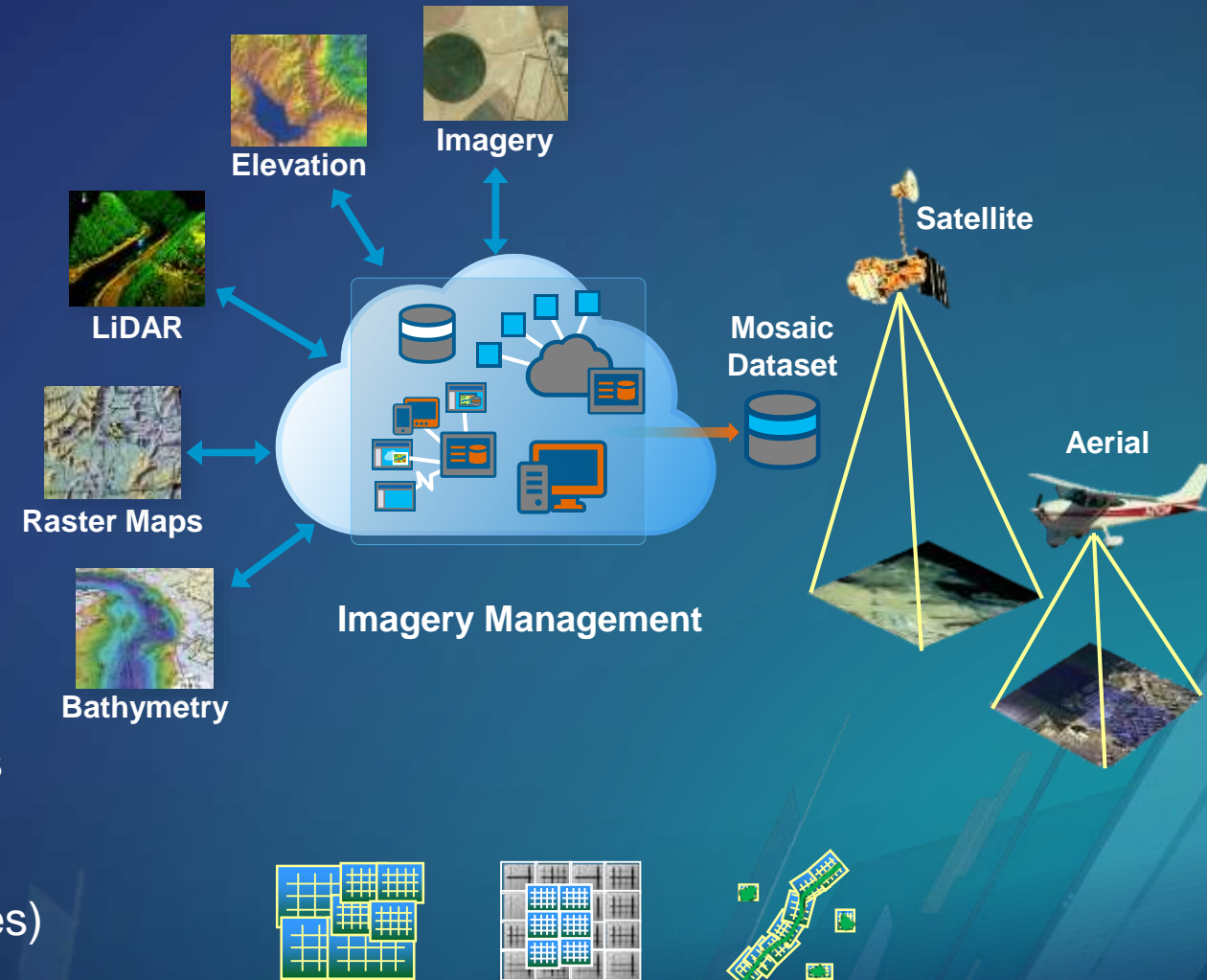


Image Management Using Mosaic Datasets

The optimum model for managing large image and raster collections

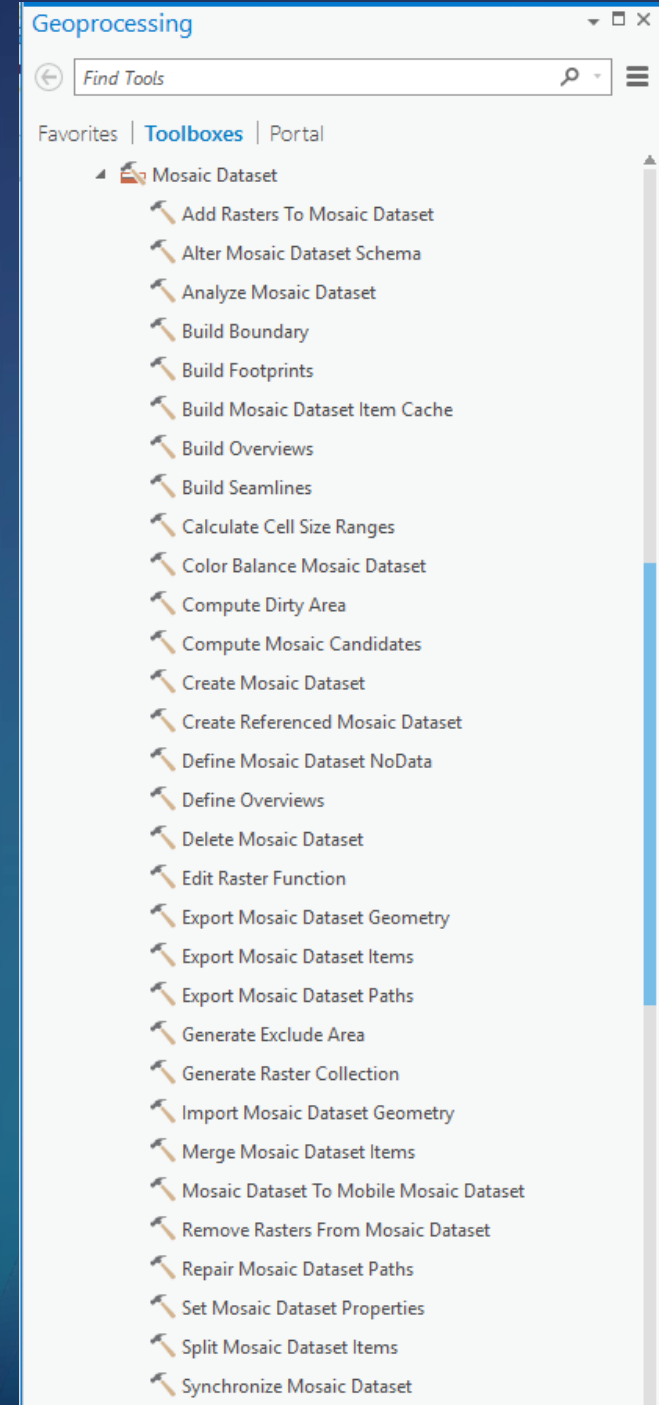
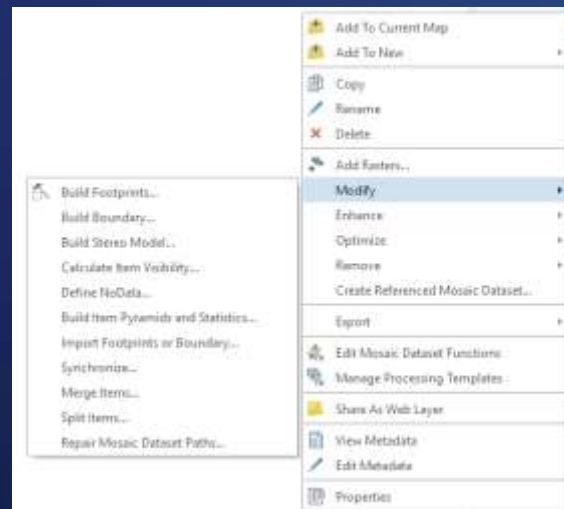
 Mosaic Datasets – the primary information model

- Support multiple sources and modalities
- Support multiple metadata formats
- Support multiple formats
- Maintain Image quality
- Handle overlapping and disparate datasets
- Support over 50 Raster (Sensor) Types
- Support Rich Web services (Image Services)



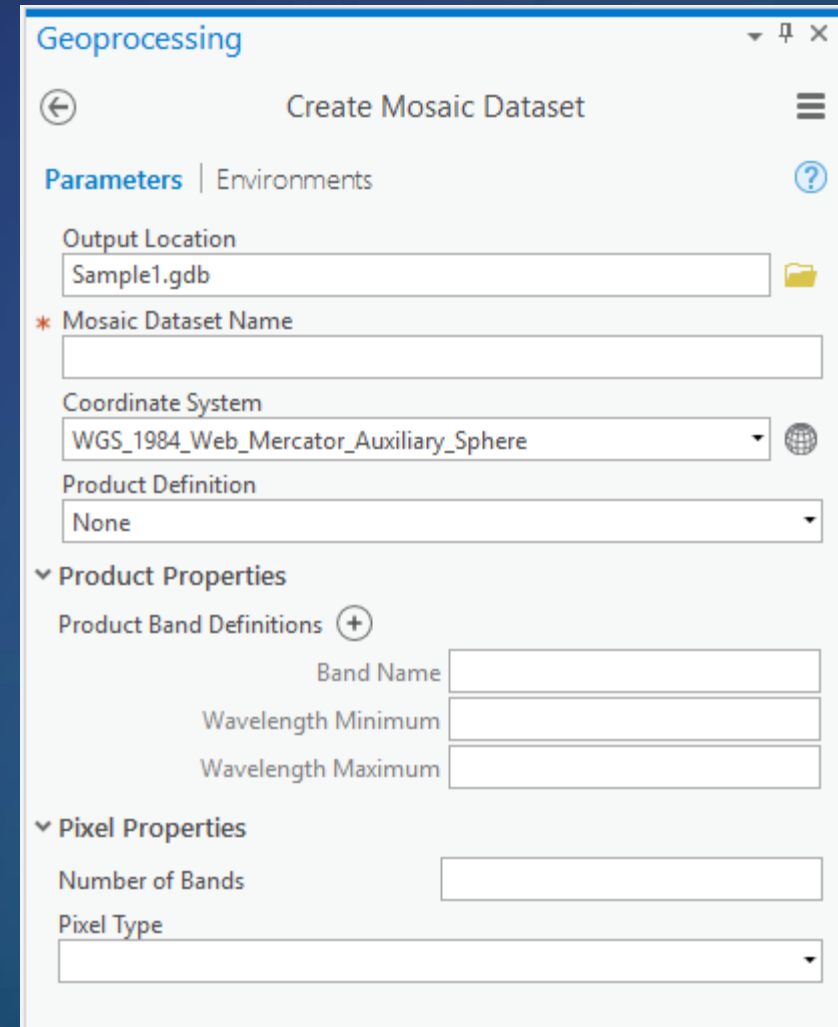
Ways to Create Mosaic Datasets

- Context Menu
- Geoprocessing Tools
 - Data Management Tools / Raster / Mosaic Dataset
- Model Builder
- Ortho Mapping
- Imagery Workflows
- MDCS



Creating Mosaic Dataset In ArcGIS Pro

- Create GeoDatabase (File or Enterprise)
- Create Mosaic Dataset
- Add Rasters
 - Define Raster Type
- Set Properties
- Enhance
- Build Overviews



The screenshot shows the 'Create Mosaic Dataset' tool in the ArcGIS Pro Geoprocessing environment. The interface includes a title bar with the window name 'Geoprocessing' and standard window controls. Below the title bar, there is a navigation arrow, the tool name 'Create Mosaic Dataset', and a help icon. The main area is divided into 'Parameters' and 'Environments' tabs. The 'Parameters' tab is active and contains the following fields:

- Output Location:** A text box containing 'Sample1.gdb' with a folder icon to its right.
- Mosaic Dataset Name:** A text box with a red asterisk indicating it is a required field.
- Coordinate System:** A dropdown menu showing 'WGS_1984_Web_Mercator_Auxiliary_Sphere' with a globe icon to its right.
- Product Definition:** A dropdown menu showing 'None'.
- Product Properties:** A section with a collapse arrow and a plus icon. It contains a 'Product Band Definitions' section with a plus icon and three input fields: 'Band Name', 'Wavelength Minimum', and 'Wavelength Maximum'.
- Pixel Properties:** A section with a collapse arrow containing two input fields: 'Number of Bands' and 'Pixel Type'.

Add Rasters

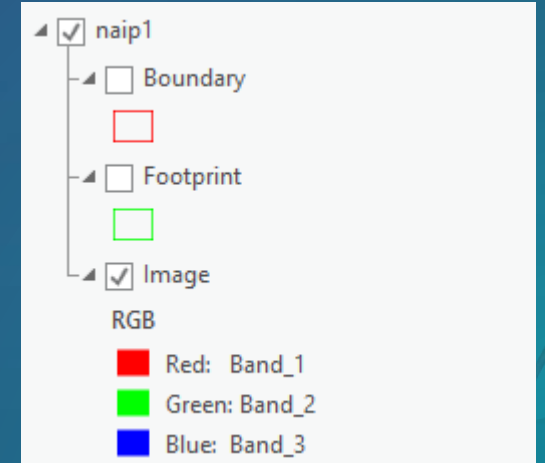
- Crawls for specific images
- Out of the box Raster Types
 - Python Raster Types

The screenshot shows the 'Add Rasters To Mosaic Dataset' tool interface. The 'Raster Type' dropdown menu is open, displaying a list of satellite and sensor types. The 'Raster Dataset' option is highlighted in blue.

Raster Type	
Raster Dataset	
ADS	
Applanix	HJ 1A/1B CCD
ASTER	HRE
CADRG/ECRG	IKONOS
CIB	Image Service NCDRD
DEIMOS-2	Image Service I NetCDF
DMCii	Image Service F NITF
DTED	ISAT Pleiades-1
DubaiSat-2	Jilin-1 QuickBird
FORMOSAT-2	KOMPSAT-2 RADARSAT-2 TeLEOS-1
Frame Camera	KOMPSAT-3 RapidEye Terrain
GeoEye-1	Landsat 1-5 MS Raster Dataset TH-01
GF-1 PMS	Landsat 4-5 TM Raster Process UAV/UAS
GF-1 WFV	Landsat 7 ETM+ Scanned Aerial WCS
GF-2 PMS	Landsat 8 Sentinel-1 WMS
GF-4 PMI	LAS Sentinel-2 WorldView-1
GRIB	LAS Dataset SkySat WorldView-2
HDF	Map Service SO CET SET WorldView-3
	Match-AT SPOT 5 WorldView-4
	SPOT 6 ZY1-02C HRC
	SPOT 7 ZY1-02C PMS
	Table / Raster C ZY3-CRESDA
	ZY3-SASMAC

Structure of a Mosaic Dataset

- **Group Layer with:**
 - **Footprint** – Extent of each raster + Key Properties + Metadata as attributes
 - **Boundary** – Extent of mosaic dataset
 - **Image** – Rendering of data after applying processing and mosaicking
 - **Seamlines** – Optional, geometry for more advanced blending



Mosaic Dataset Properties

- General
 - General properties
- Defaults
 - Direct use of Mosaic Dataset
 - When Published
 - Sets some limits on Publishing

Mosaic Dataset Properties : naip1

Find data source properties

▼ Data Source

Property	Value
Raster	naip1
Data Type	Mosaic Dataset
Database	m:\Data\NAIP0_MD\Sample1.gdb
Is Referenced	No
Has Boundary	Yes
Has Seamline	No
Supports Stereo	No

▼ Raster Information

Property	Value
Columns	42537
Rows	17611
Number of Bands	4
Cell Size X	1.000000
Cell Size Y	1.000000
Uncompressed Size	2.79 GB
Format	AMD
Source Type	Generic
Pixel Type	unsigned char
Pixel Depth	8 Bit
NoData Value	
Mensuration Capabilities	Basic
Product Definition	NONE
Geodata Transform	Defined

> Band Metadata
> Extent
> Spatial Reference
> Statistics

OK Cancel

Find Mosaic Dataset Defaults

▼ Image Properties

Property	Value
Maximum Size of Requests - Rows	4100
Maximum Size of Requests - Columns	15000
Allowed Compression Methods	None, JPEG, LZ77, LERC
Default Resampling Method	Bilinear Interpolation (for continuous
Maximum Number of Rasters Per Mos...	20
Cell Size Tolerance Factor	0.800000
Allowed Mosaic Methods	NorthWest, Center, LockRaster, By...
Default Sorting Order	<input checked="" type="checkbox"/>
Default Mosaic Operator	First
Blend Width Unit	Pixels
Blend Width	10.000000
Viewpoint Spacing X	600.000000
Viewpoint Spacing Y	300.000000
Always Clip the Raster to its Footprint	<input type="checkbox"/>
Always Clip Overview to its Footprint	<input type="checkbox"/>
Footprint may contain NoData	<input checked="" type="checkbox"/>
Always clip the mosaic dataset to it's...	<input checked="" type="checkbox"/>
Apply Color Correction	<input type="checkbox"/>
Minimum Pixel Contribution	1

▼ Catalog Properties

Property	Value
Raster Metadata Level	Basic
Maximum number of records returned...	1000
Allowed Fields	Name, MinPS, MaxPS, LowPS, HighP...
Geographic Coordinate System Transf...	None

▼ Time Properties

Use Time

Property	Value
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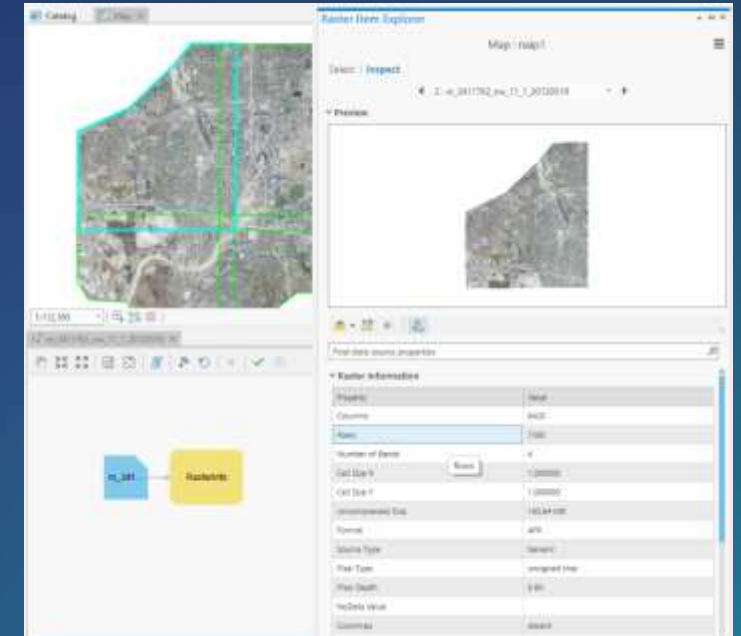
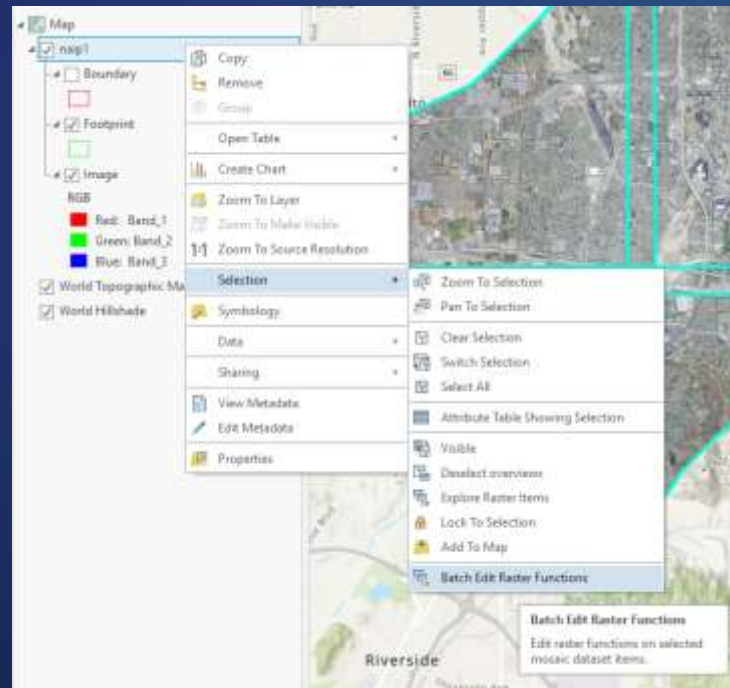
OK Cancel

Overviews

- Like pyramids for the Mosaic Dataset
- Used for faster access at small scales
- Optional - If not created blank at small scales
- Consider adding smaller scale imagery instead

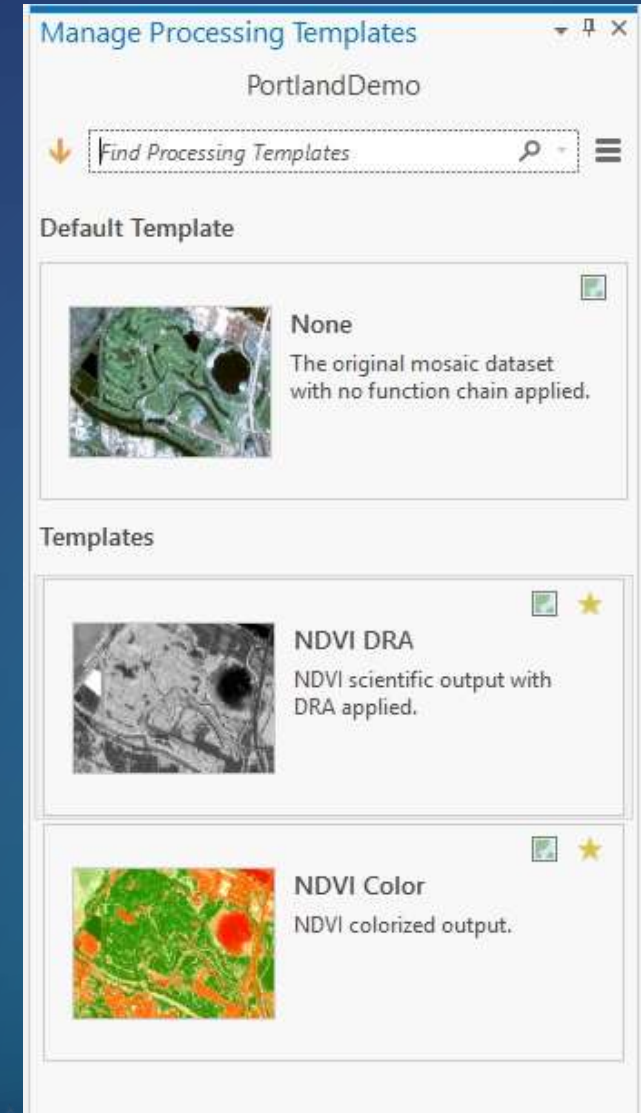
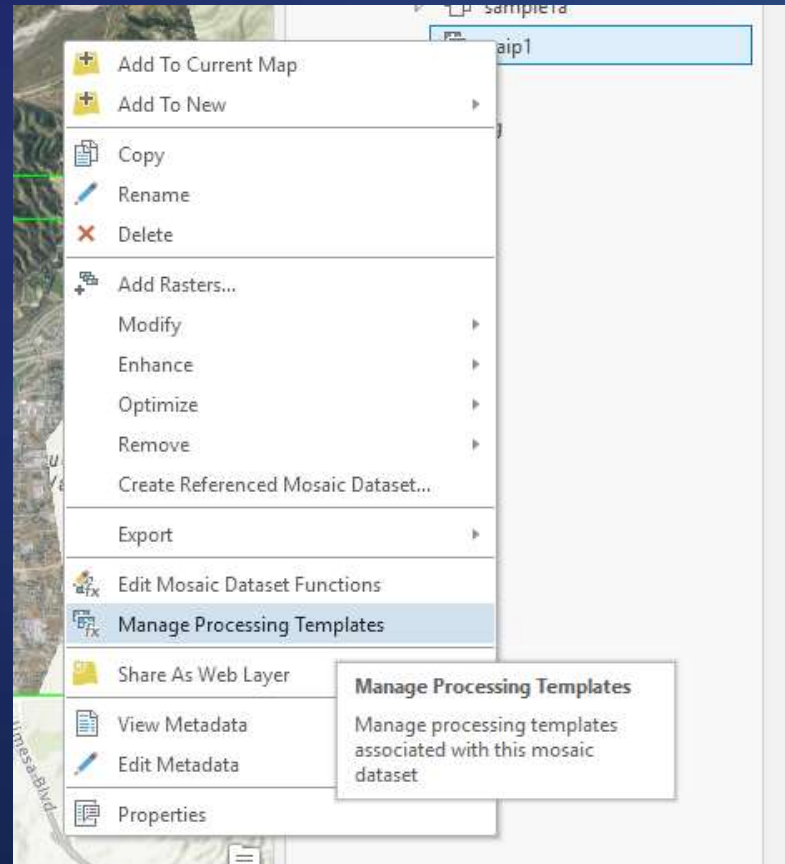
Mosaic Dataset – Processing items

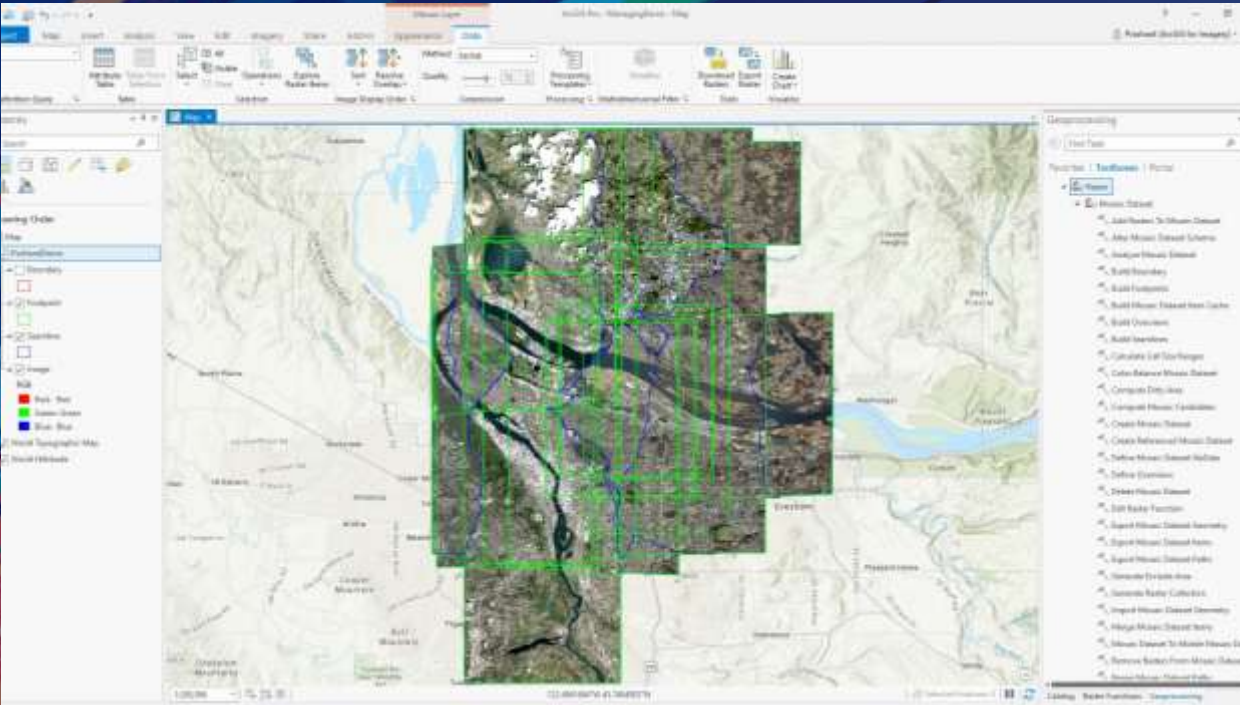
- Initial Raster Function Chain defined by Raster Type
- Function can be applied differently to each raster
- Use
 - Raster Item Explorer
 - Batch Edit Raster Functions



Mosaic Dataset – Processing mosaic

- Apply functions on mosaic dataset
 - Changes mosaic dataset
- Attach functions
 - On demand
 - Many

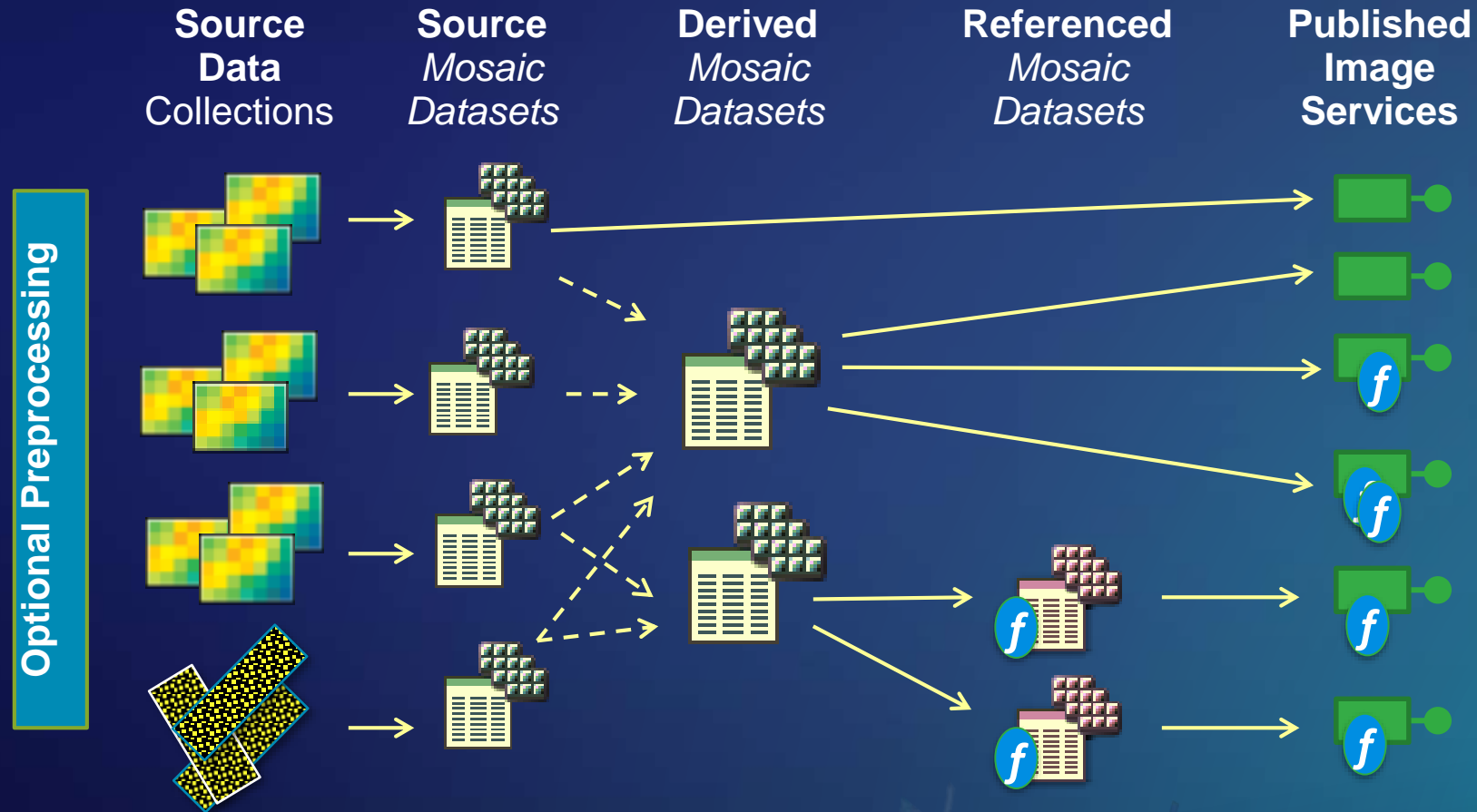




Create a Mosaic Dataset

Rohan Ganapathy

Source and Derived Mosaic Datasets



Sharing Imagery

Image Service

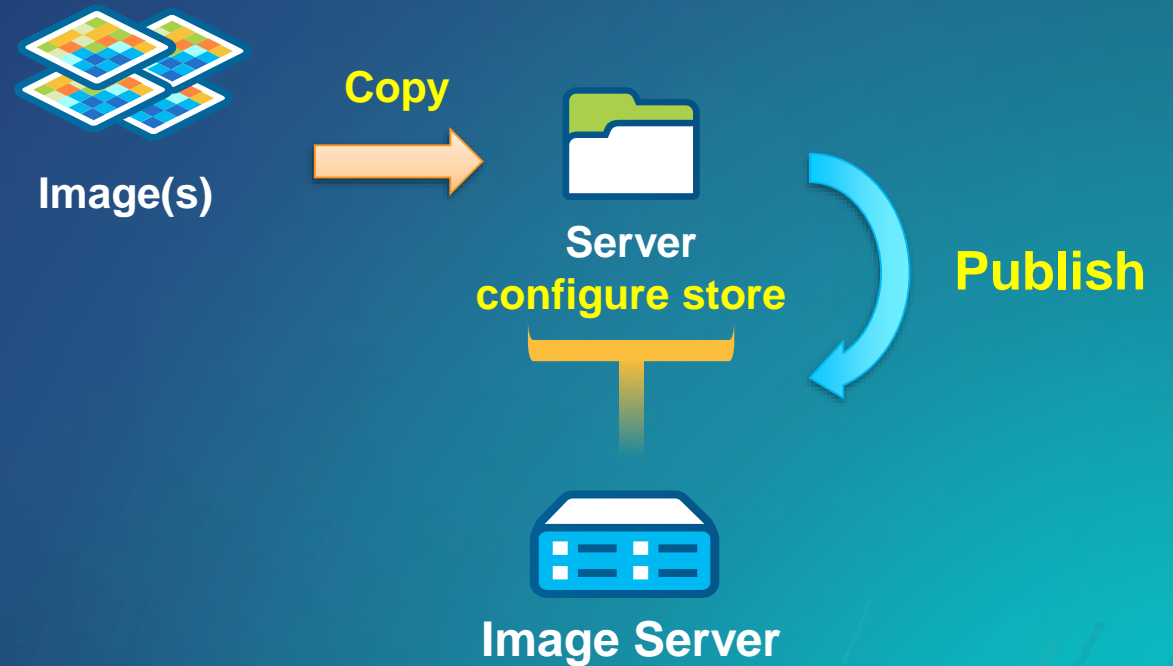
Sharing Imagery in ArcGIS

- **Share a Single Raster as Image Service**
- **Share a Mosaic Dataset as Image Service**
- **Generate and Share a Tile Cache on Enterprise**
- **Generate and Share a Tile Cache on ArcGIS Online**
- **Run Raster Analytics and create a persisted product**

Sharing Imagery

- Share by Value

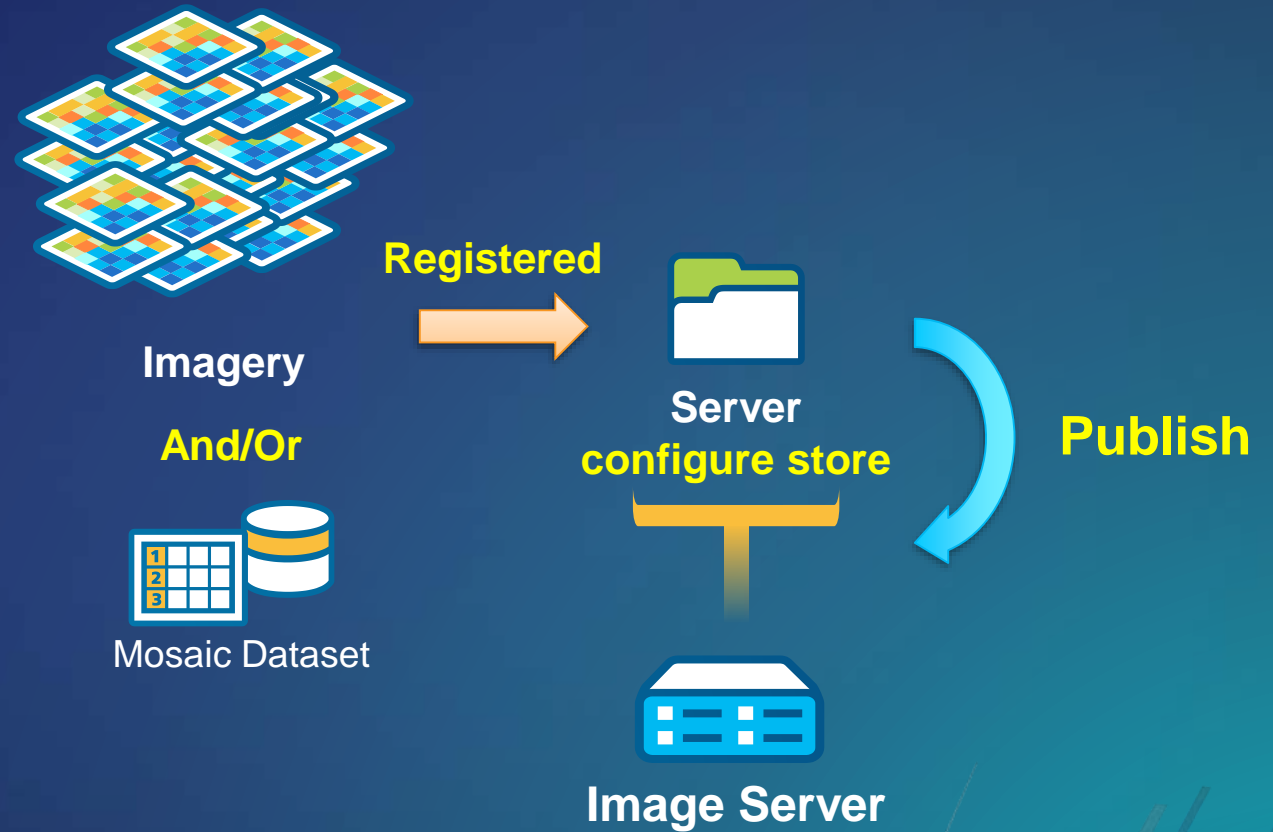
- Imagery is copied to the ArcGIS Server configuration store
- Data will be converted into File Geodatabase
- **NOT** recommended for large image collections



Sharing Imagery

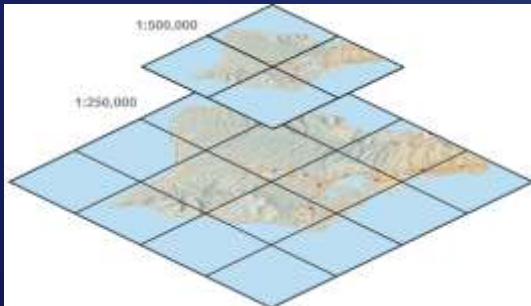
- Share by reference

- Register a file share and/or enterprise geodatabase(s) with the server data store
- Data is **not moved**
- Recommended for publishing mosaic dataset or large single images or large single raster data



Tile Layers

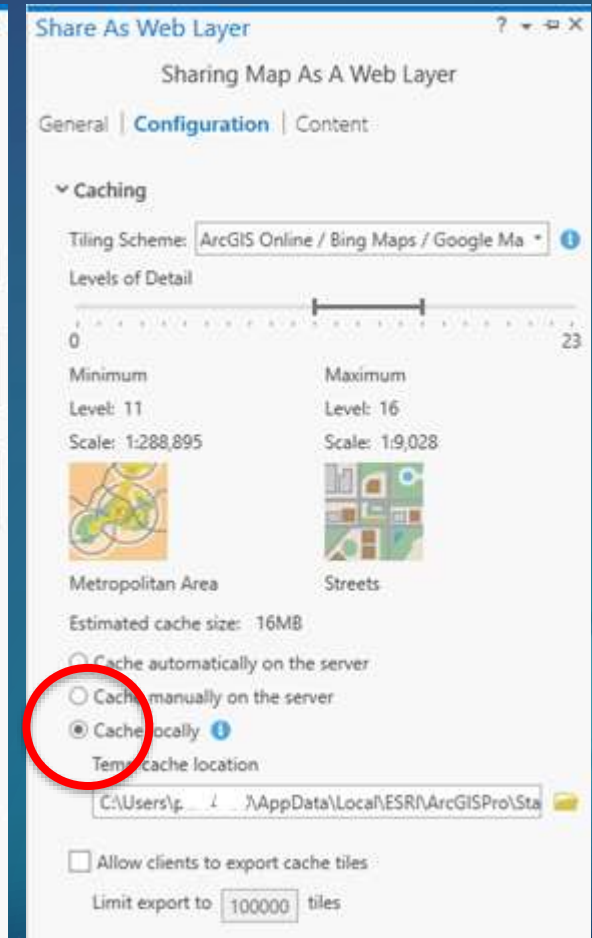
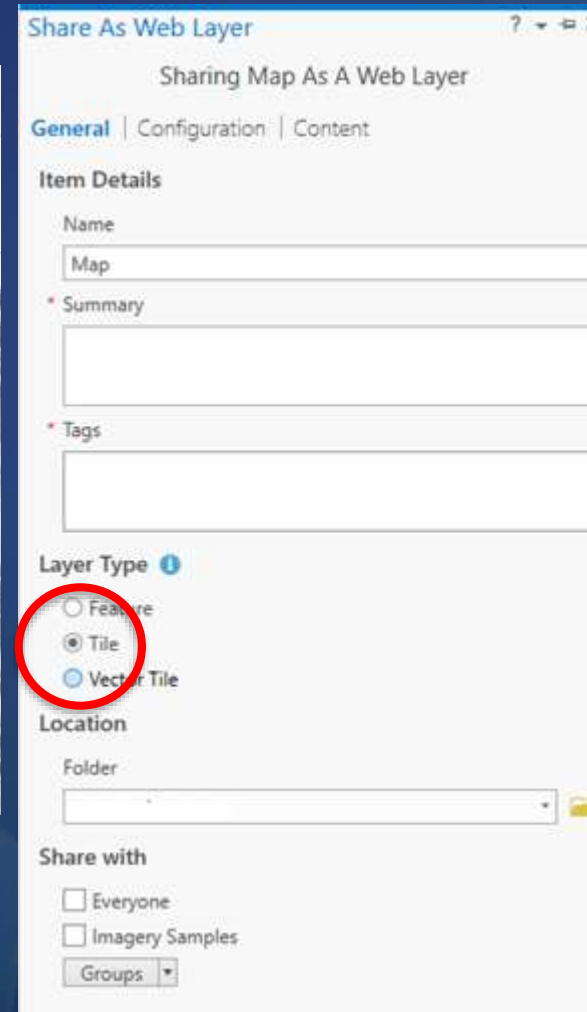
- **Simple Background for Visualization**
 - **Only RGB 3Band**
 - **Single mosaicked image**
 - **No Enhancement, No Processing,**

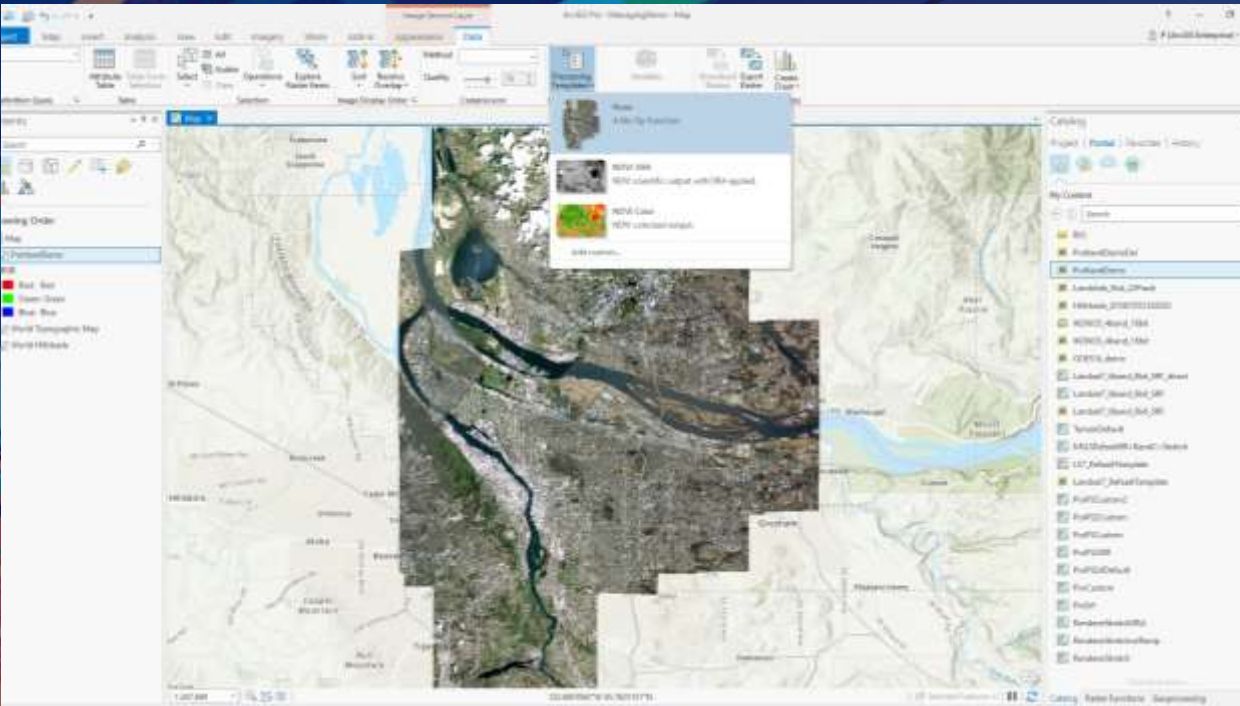


Cuts image into very large number of small tiles
Each tile 256x256 pixels
Multiple Levels, factor 2
Compressed as JPEG and or PNG
JPEG compression quality
In Defined projection (Mostly WebMercator Aux Sphere)
No Size Limit
Stored as Compact Cache format

Create and Publish Tile Cache from ArcGIS Pro

From Contents Pane





Sharing Mosaic Datasets

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Imagery in the Cloud

The background is a dark teal gradient. On the left, there are several overlapping, semi-transparent geometric shapes in shades of teal, orange, and blue, creating a layered, digital effect. On the right, there are more abstract shapes, including a prominent orange and red diagonal band, and various teal and blue lines and rectangles, suggesting a data visualization or network structure.

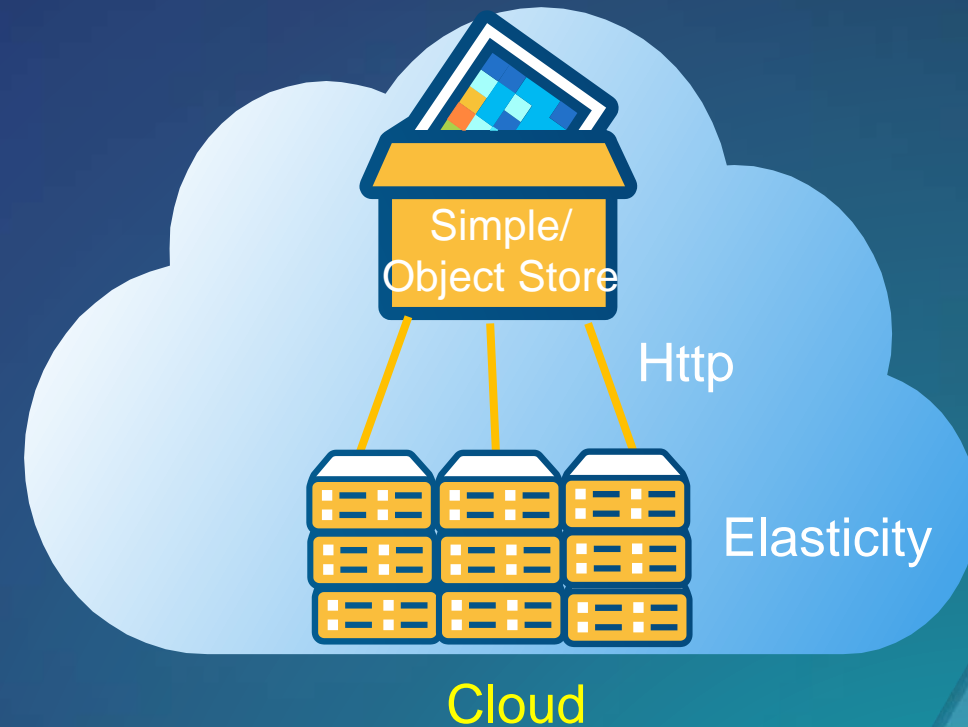
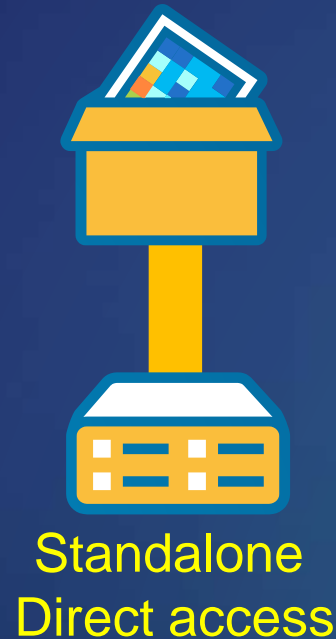
ArcGIS Image Server in the Cloud

- **Advantages**

- Lower cost resilient storage
- Lower cost enterprise compute
- Simpler install
- Simpler scalability

- **Disadvantages**

- Data needs to be uploaded
- Different storage types
- Infrastructure changes
- Potential security concerns
- Potential for complex data access policies



Scaling to the Cloud

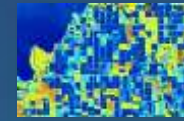
- Difference of the Cloud
- Data Formats / Structure - Consider
 - Tiling – Enable faster random access
 - Pyramids (Overviews or RRDs) – Enable faster access a lower resolutions
 - Compression – Reduces storage and transmission
 - Metadata access



Summary

- Introduction
- Managing Imagery
- Sharing Imagery
- Imagery in the cloud

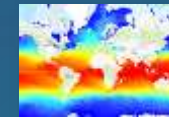
Image Services



Landsat



Sentinel-2



SST



Airbus Global
Elevation



NAIP



Change Analysis

DigitalGlobe
Imagery+Analytics

... Fully Integrated with the Platform

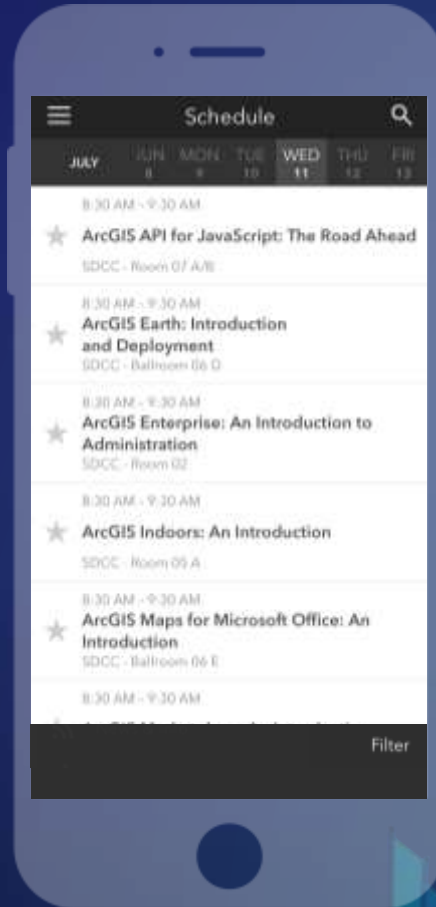
Questions

Please Take Our Survey on the App

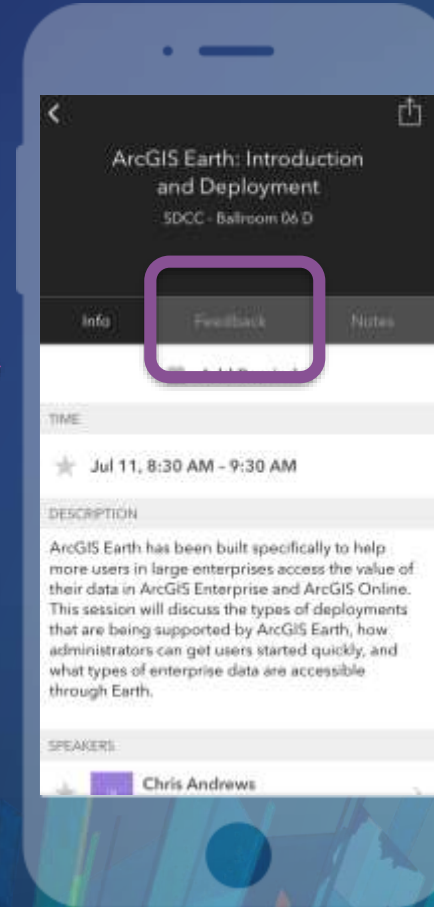
Download the Esri Events app and find your event



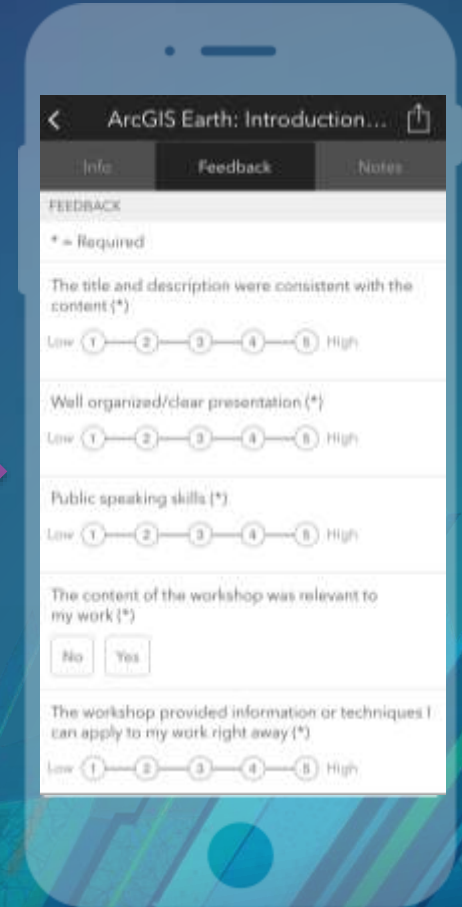
Select the session you attended



Scroll down to find the feedback section



Complete answers and select "Submit"





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