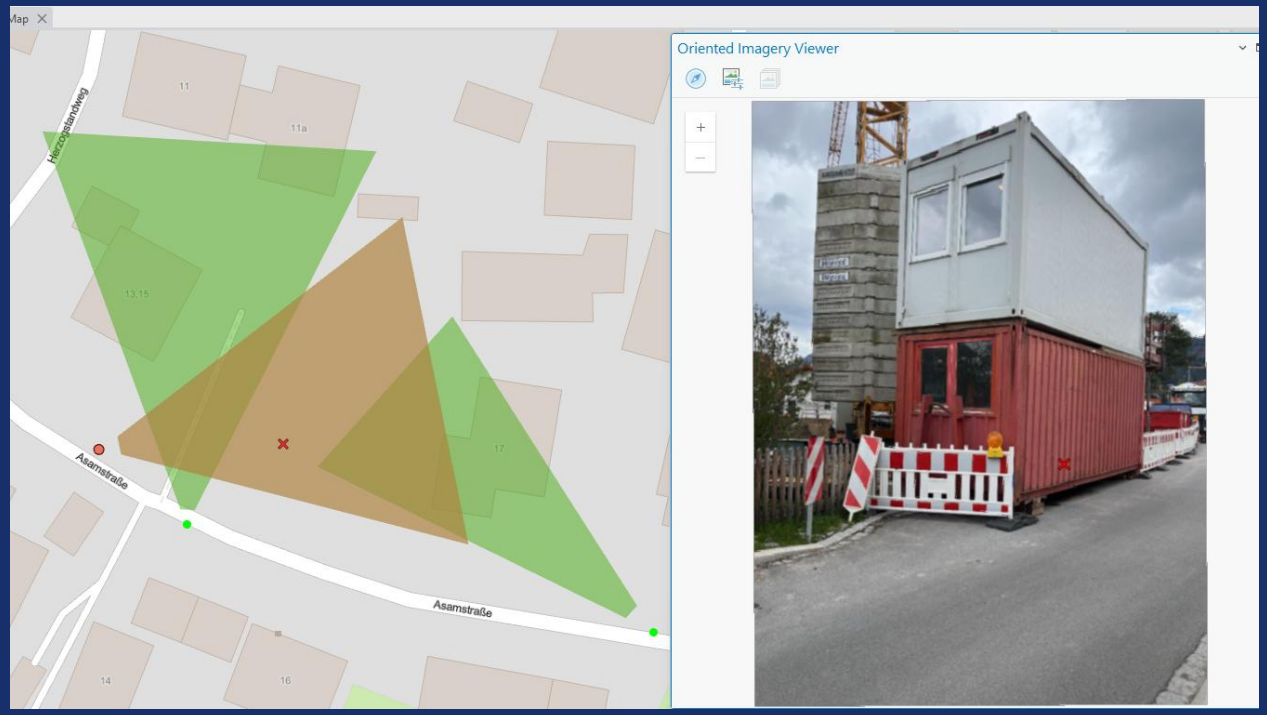


The Oriented Imagery Data Model

Guenter Doerffel

ArcGIS is a comprehensive Imagery System

Integrating all aspects of imagery within ArcGIS

Reality Mapping

Creating Foundation Content

- Drone, Aerial & Satellite
- True Ortho
- DSM & DTM
- 3D Mesh & Point Cloud

Analysis

Extracting Information & Scalable Analytics

- GeoAI
- Classification
- Change Detection
- Feature Extraction

Visualization

Enabling Human Understanding

- Apps
- Image Interpretation
- Map & Image Space
- **Oriented Imagery**
- Stereo, Video

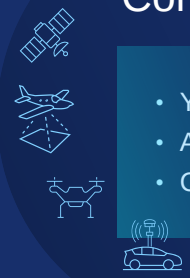
Data Management

Providing Access to Imagery

- All Formats & Types
- Tiled and Dynamic Services
- Open Standards

Desktop, Enterprise, SaaS & Managed SaaS

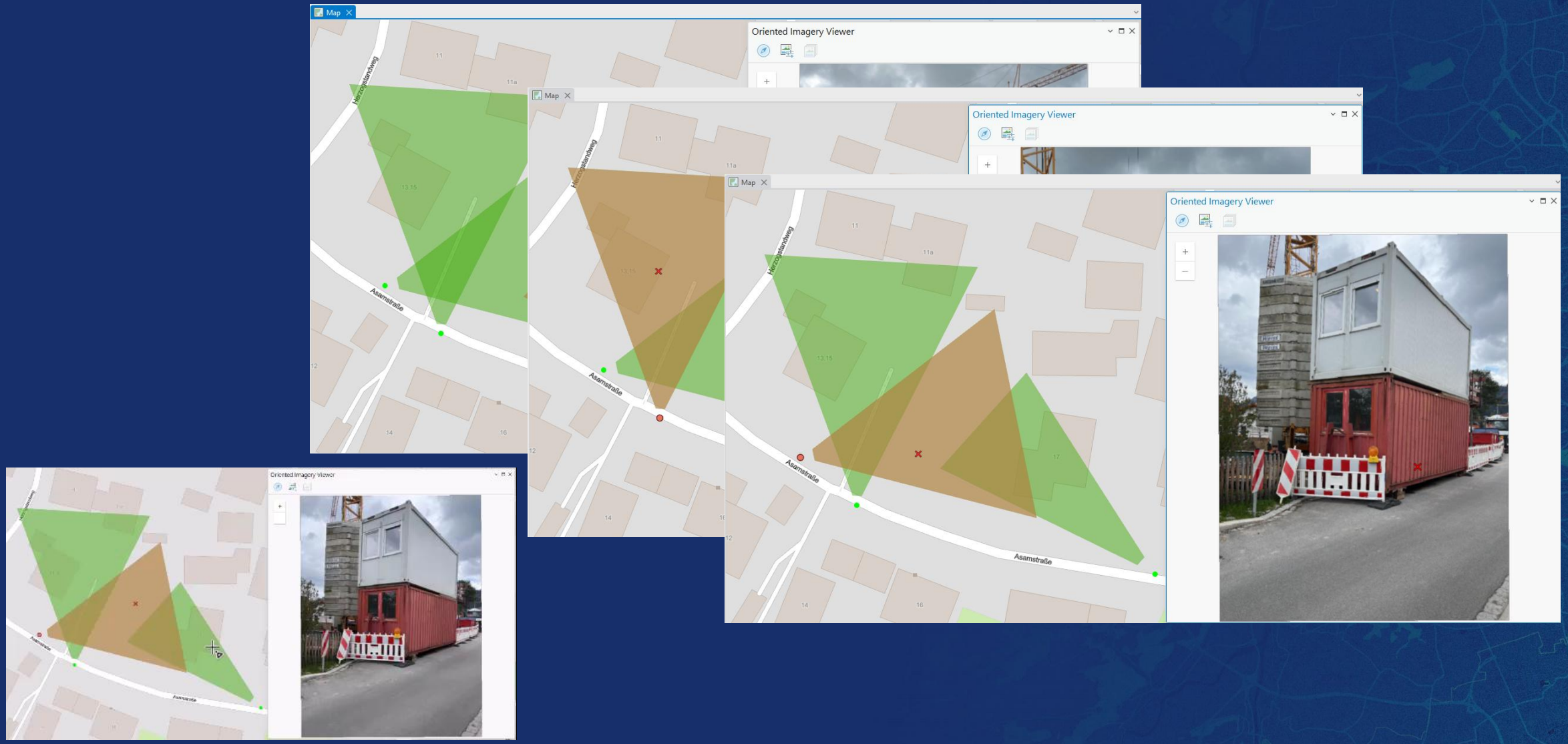
Content



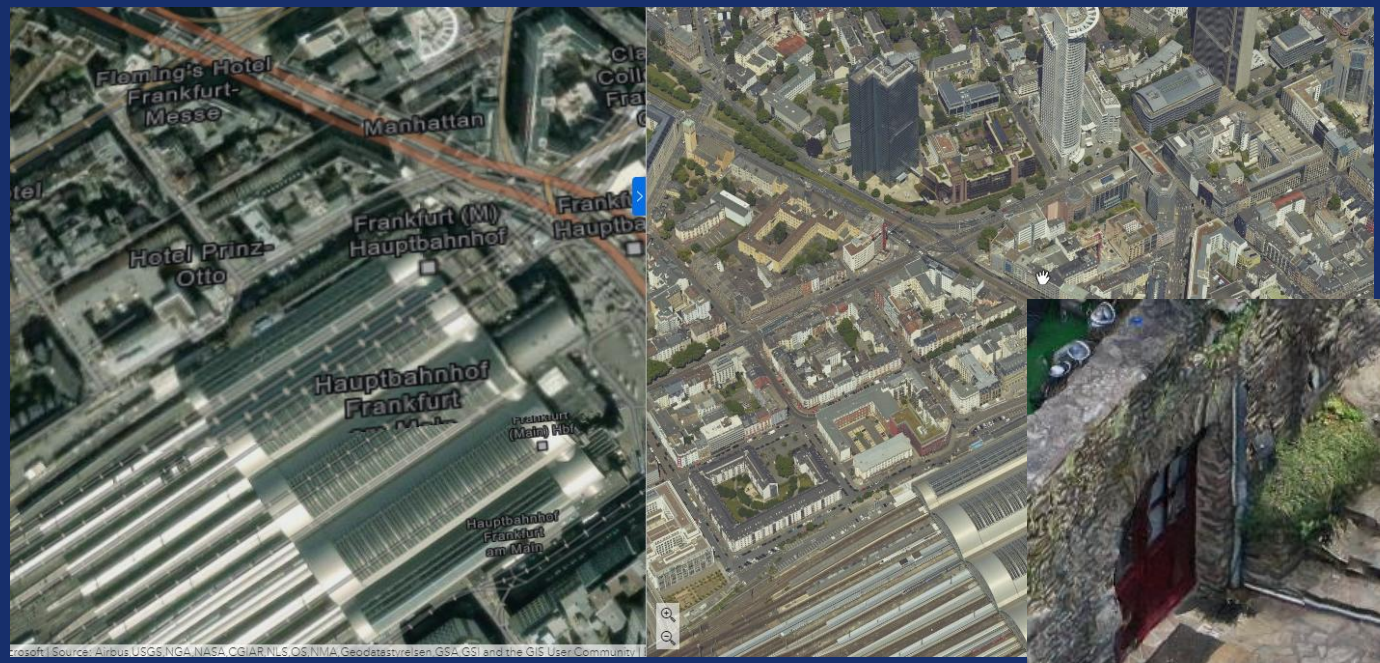
- Your data
- ArcGIS Living Atlas
- Content Providers

Integrating geospatial imagery and rasters…
… to accelerate informed decision making

Need ad-hoc Documentation?



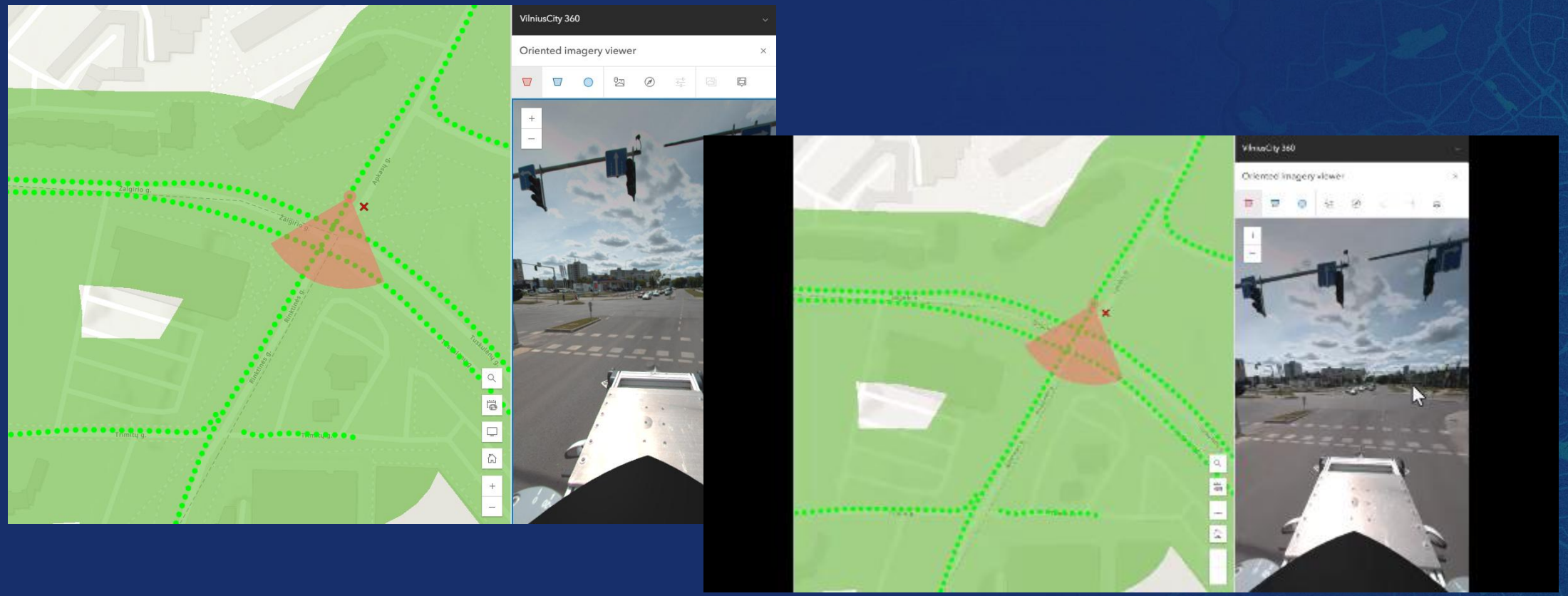
Is there more Detail?



Add a „new Perspective“

Mesh resolution vs. Source resolution

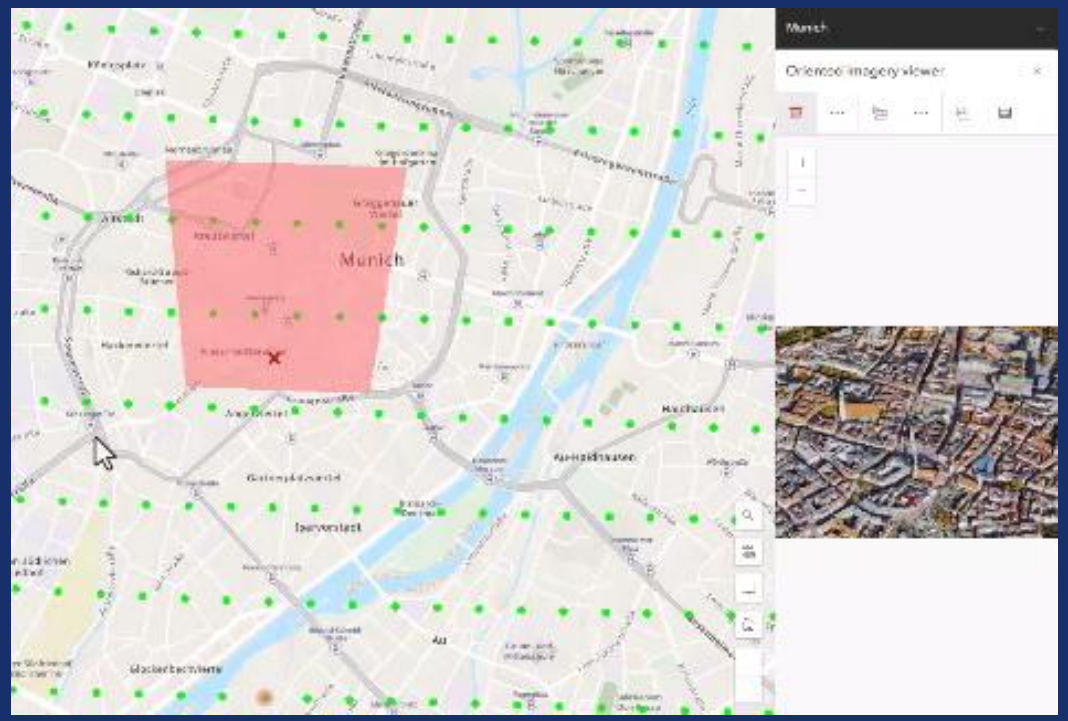
What about data that cant be made „map-accurate“?



- See sample oriented imagery layers
  - esriurl.com/SampleOrientedImageryLayers

An alternative to photogrammetry (data access)

Oriented imagery uses image and camera metadata to connect each pixel in an image to a location on a map, which allows you to…



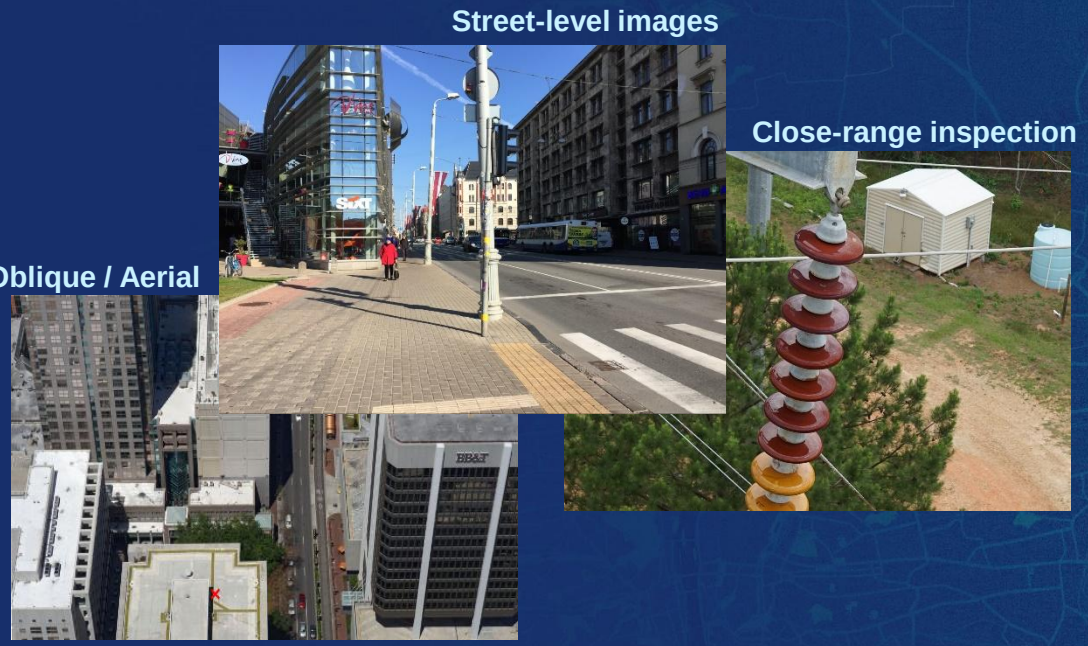
- Visualize a full-resolution image from an intuitive perspective
- See coverage dynamically update on the map
- Incorporate difficult-to-map image modalities into your GIS, like 360 images or terrestrial images
- Explore images of the same asset from multiple directions

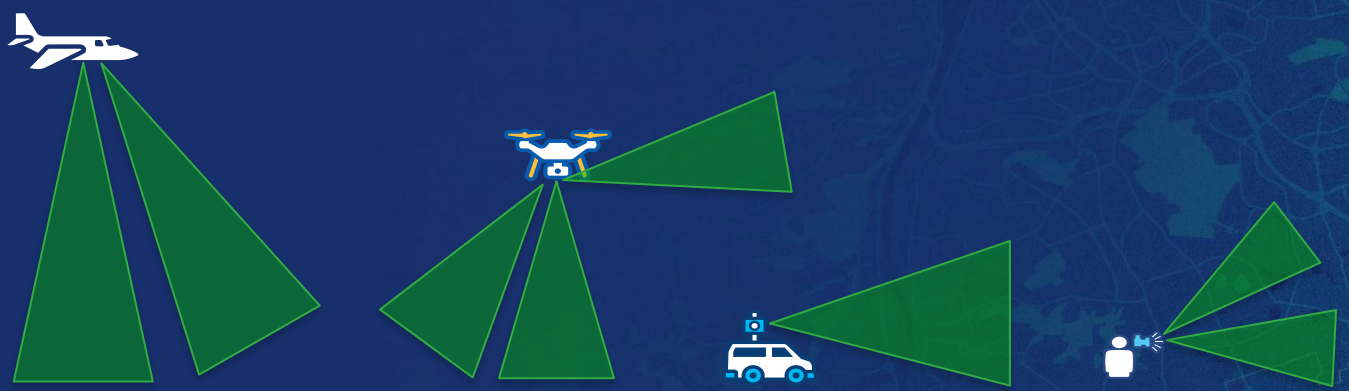
And eventually…

- *Overlay vector data in an image*
- *Digitize features in an image, and project them onto a map*
- *Perform measurement in an image*
- *Superimpose an image into a 3D scene*

What are “oriented images”?

- Images with associated location, orientation, and camera metadata used to relate pixels in an image to locations on a map
- Imagery that can’t be rectified…
  - Street-level images
  - Mobile devices
  - Close-range inspection images
  - 360 images (jpeg)
- …plus nadir and low oblique images
- Support for many collection platforms





Oriented Imagery Capability of ArcGIS - Features

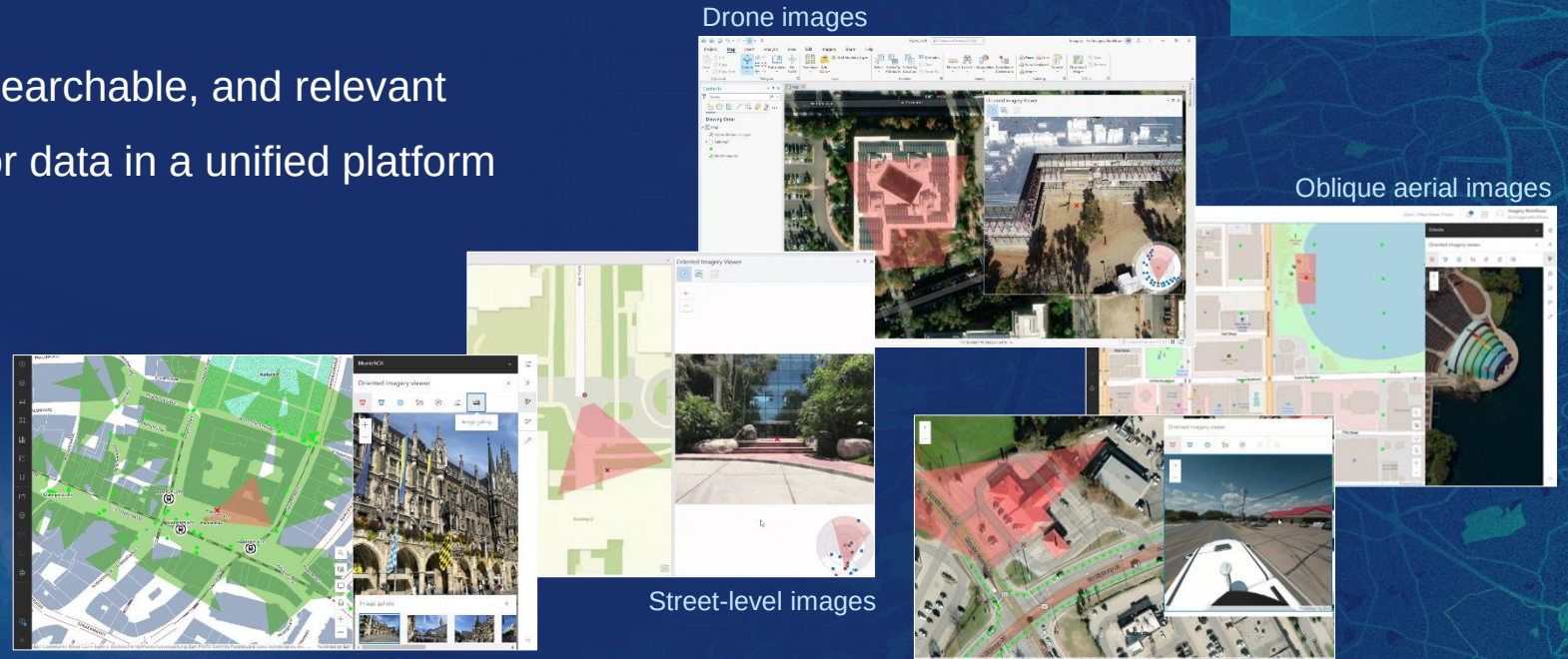
Enhance your GIS with imagery taken from multiple perspectives

- Turn any image into a geospatial asset
- Discover insights from any angle
- Make archives of images accessible, searchable, and relevant
- Manage & visualize imagery and vector data in a unified platform

Visualize oriented imagery with other GIS layers

- Asset locations
- Streets
- Land cover
- Building footprints

Leverage valuable collections of street-level images, oblique images, 360 images, and more...



Drone images

Oblique aerial images

Street-level images

Images from cell phones and tablets

360-degree images

Manage, explore, and visualize imagery taken from any angle in the context of a map

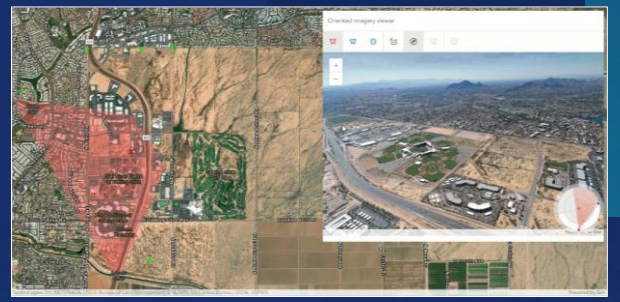
Oriented Imagery capability of ArcGIS - technically

Gain situational awareness, inspect assets, & improve decision-making

Manage

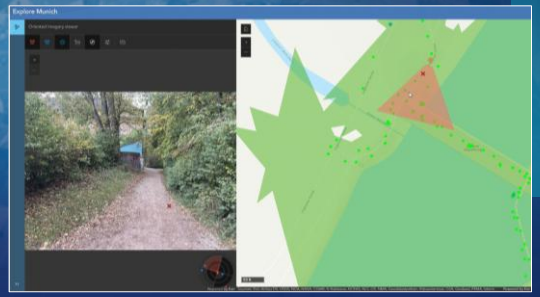
- Manage images and metadata using an oriented imagery dataset
- Specialized workflow for phone and tablet photos
- Custom data type support through Python

Visualize & Explore



- 360 images, panoramic images, & frame images
- View in ArcGIS Pro, Map Viewer, ArcGIS Excalibur, or a custom Sidebar app
- Search & discover all images of a point of interest
- See assets from multiple angles
- Understand the geographic context of your images
- Adjust brightness, contrast, and sharpness on the fly

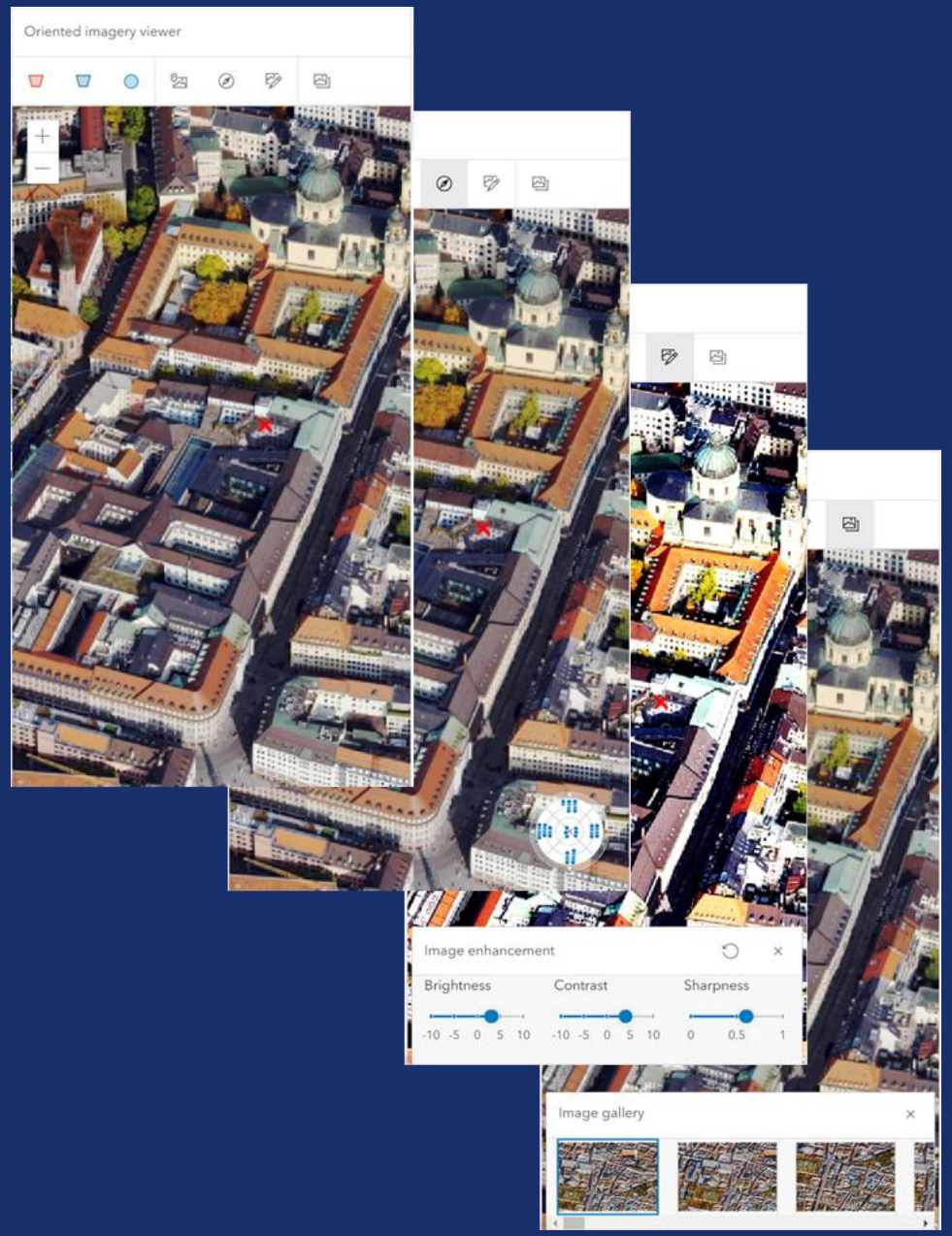
Publish & Share



- Publish oriented imagery layers to the web
- Create and share oriented imagery web apps

…On the desktop, in the cloud, and in your enterprise

Oriented imagery across the ArcGIS system



Oriented Imagery Data Model

Oriented imagery data model

Manage collections of images

Point geometry

camera location when the photo was taken (X,Y, and optional Z)

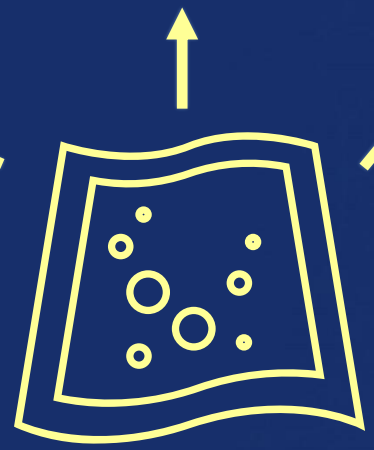
Attributes

- Key image metadata
- Path to the image

Attribute Fields
Image Path
Acquisition Date
Camera Heading
Camera Pitch
Camera Roll
Camera Height
Horizontal Field Of View
Vertical Field Of View
Near Distance
Far Distance
Oriented Imagery Type
Camera Rotation
(Camera Orientation)
Elevation Source

Changes with 3.4: Now Intrinsic parameter fields

+ optional additional / custom fields



Oriented imagery layer

Properties

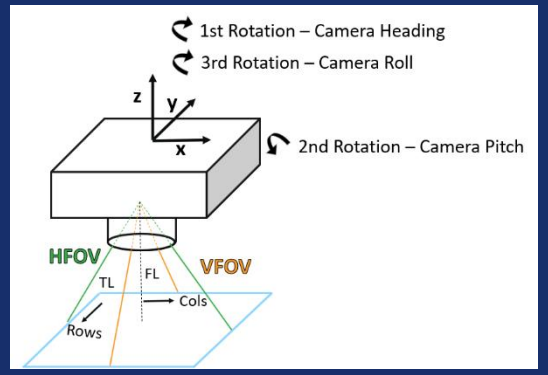
- Layer-wide properties
- Default attributes
- path prefixes/suffixes

Properties
Maximum Distance
Coverage Percentage
Footprint Item
Elevation Source
Vertical Measurement Unit
Time Interval Unit
Default values for key attributes
Path prefixes & suffixes

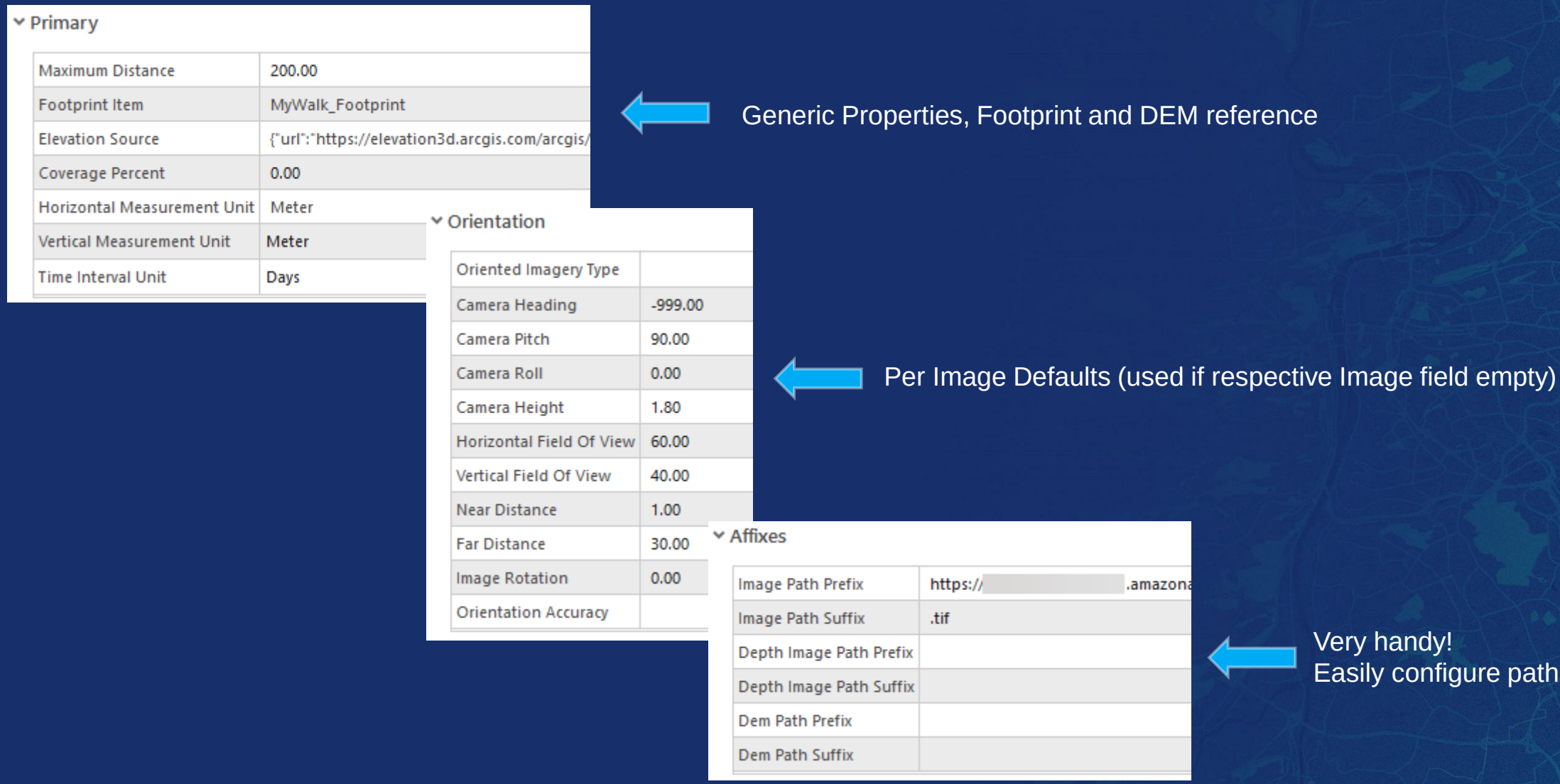
Oriented imagery footprint layer (optional)

Image Coverage Area

How we relate pixels to locations on the ground



Oriented Imagery Dataset Properties



Generic Properties, Footprint and DEM reference

Per Image Defaults (used if respective Image field empty)

Very handy!
Easily configure paths and suffixes

Single Image Properties

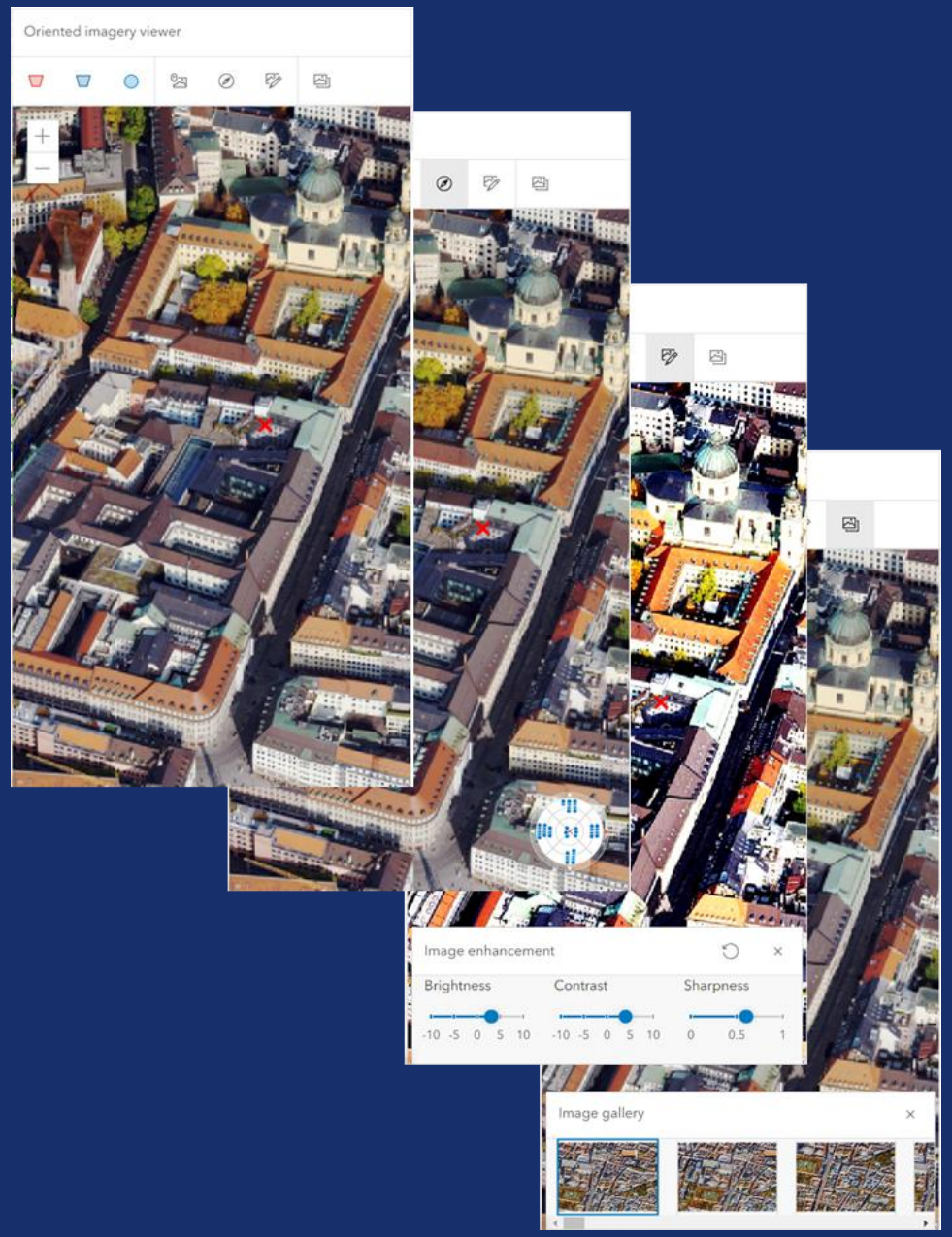
This is what the Feature Table contains

	OBJECTID *	SHAPE *	Name	Image Path	Acquisition Date	Camera Heading	Camera Pitch	Camera Roll	HFOV	VFOV	Near Distance	Far Distance	OI Type	Image Rotation
1	1	Point	IMG_1237	https://mrftest.s3.us-east-	10/26/2024 12:52:00 PM	59.9	90	<Null>	70	50	3	30	Horizontal	90
2	2	Point	IMG_1238	https://mrftest.s3.us-east-	10/26/2024 12:52:00 PM	20	90	<Null>	70	50	3	30	Horizontal	90
3	3	Point	IMG_1239	https://mrftest.s3.us-east-	10/26/2024 12:52:00 PM	352.8	90	<Null>	70	50	3	30	Horizontal	90
4	4	Point	IMG_1240	https://mrftest.s3.us-east-	10/26/2024 12:52:00 PM	324.8	90	<Null>	70	50	3	30	Horizontal	90
5	5	Point	IMG_1241	https://mrftest.s3.us-east-	10/26/2024 12:52:00 PM	293.3	90	<Null>	70	50	3	30	Horizontal	90
6	6	Point	IMG_1242	https://mrftest.s3.us-east-	10/26/2024 12:53:00 PM	223.7	90	<Null>	70	50	3	30	Horizontal	90
7	7	Point	IMG_1243	https://mrftest.s3.us-east-	10/26/2024 12:54:00 PM	197.5	90	<Null>	70	50	3	30	Horizontal	90
8	8	Point	IMG_1244	https://mrftest.s3.us-east-	10/26/2024 12:54:00 PM	162.5	90	<Null>	70	50	3	30	Horizontal	90
9	9	Point	IMG_1246	https://mrftest.s3.us-east-	10/26/2024 12:54:00 PM	252.3	90	<Null>	70	50	3	30	Horizontal	90

Notes:

- Properties set „per Item“ have priority over Properties set on the Oriented Imagery Dataset Level
- Custom fields can be added only in the/this table (not in the Dataset Properties)
- Since version 3.4: Use optional intrinsic camera parameter fields as to the described table schema

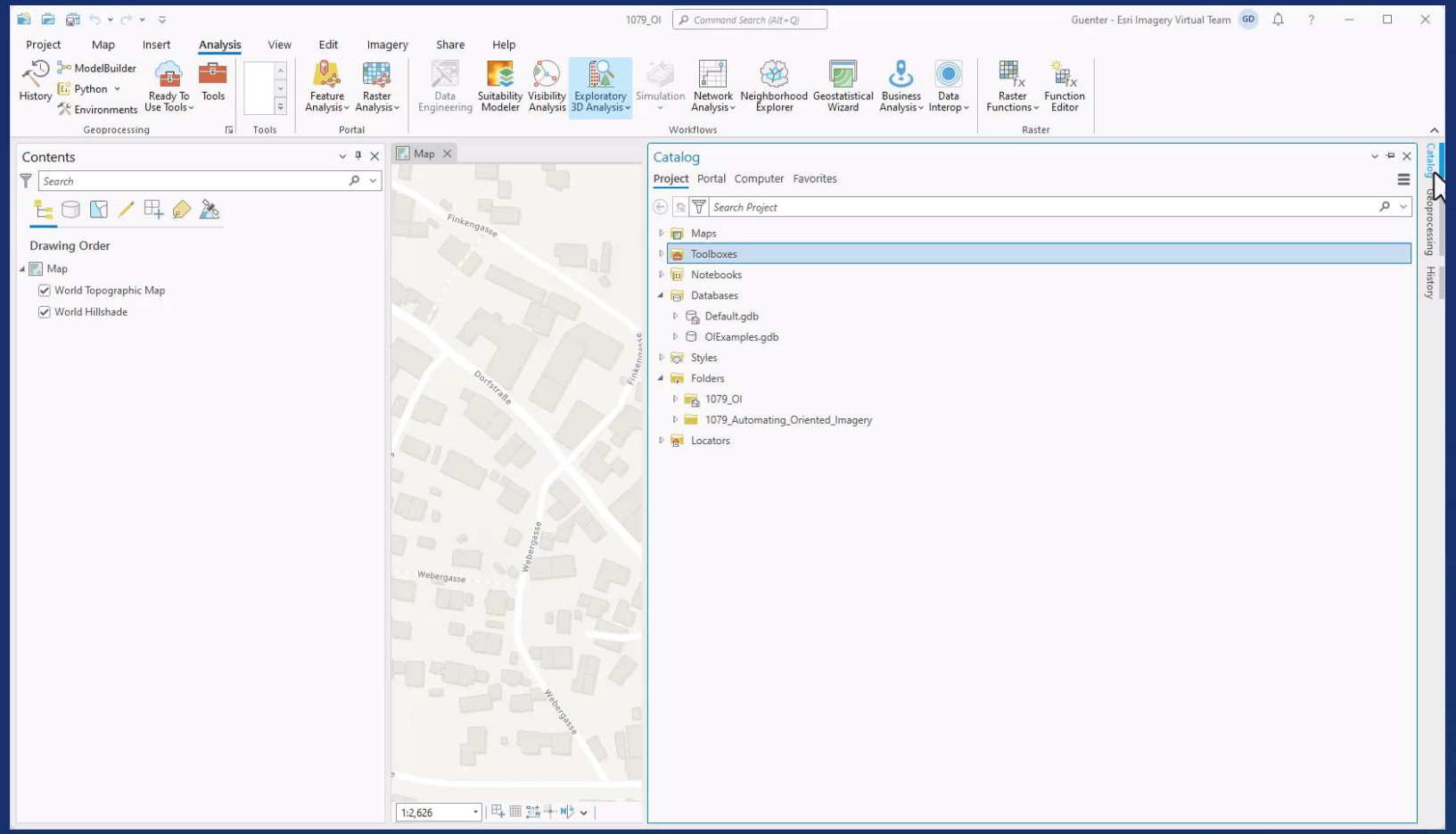
https://pro.arcgis.com/en/pro-app/latest/help/data/imagery/oriented-imagery-table.htm

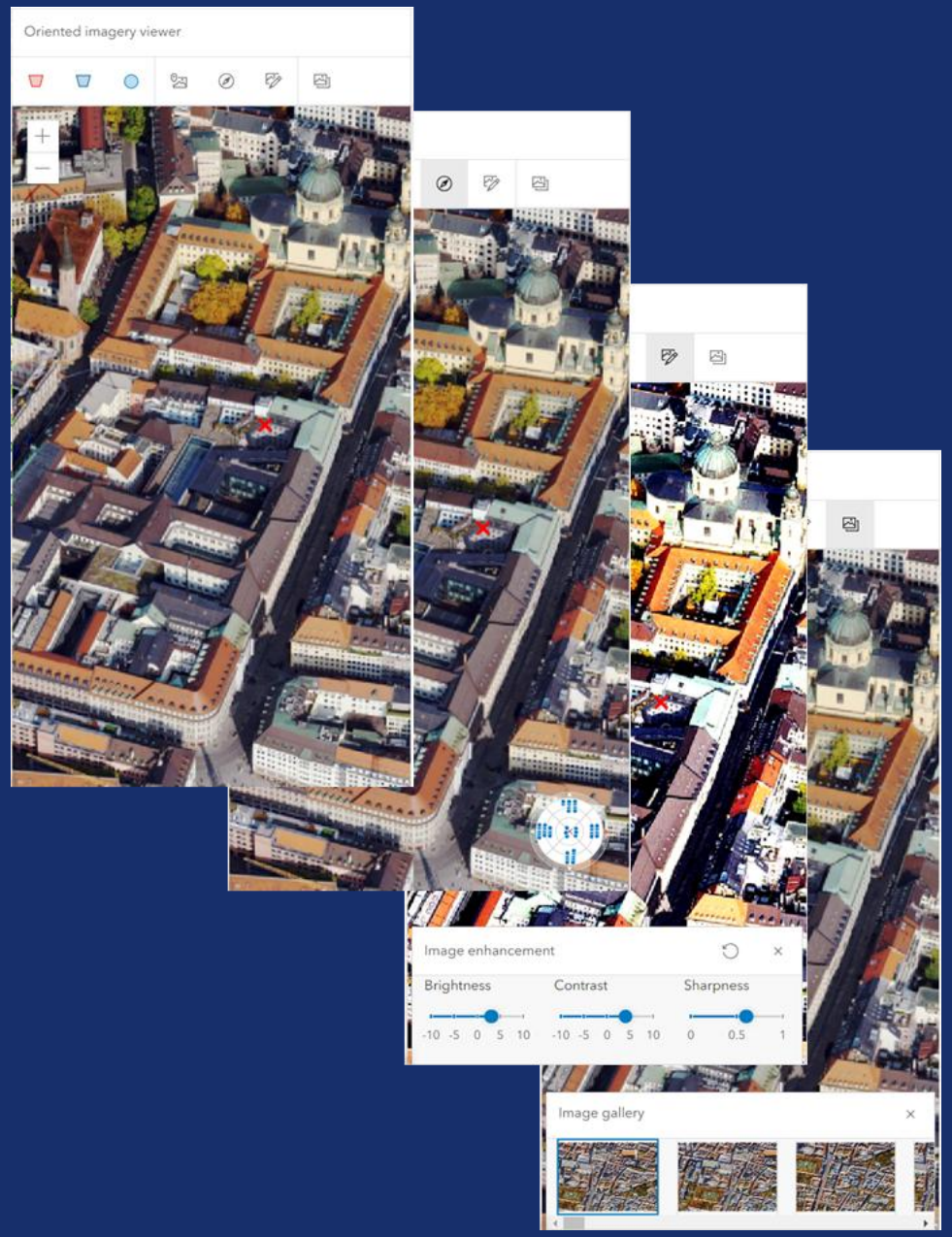


UI Authoring of Oriented Imagery Dataset

Data used is in this Demo has been captured by me, does not show any people or license plates and is free of any additional copyrights

ArcGIS Pro UI: Create OI Dataset





Scripted Authoring of Oriented Imagery Dataset

Data used is in this Demo has been captured by me, does not show any people or license plates and is free of any additional copyrights

Klick Icon for html-Slideshow of Oriented Imagery Jupyter Notebook

Helpful hints (ArcGIS Pro 3.4, arcpy 3.4)

- Oriented Imagery Catalog Describe Object (here from dataset, not from layer)
  - .featureType: = "OrientedImageryDatasetItem“
  - .catalogPath: returns catalog-path of “Point FC”
  - .fields returns list of fields …

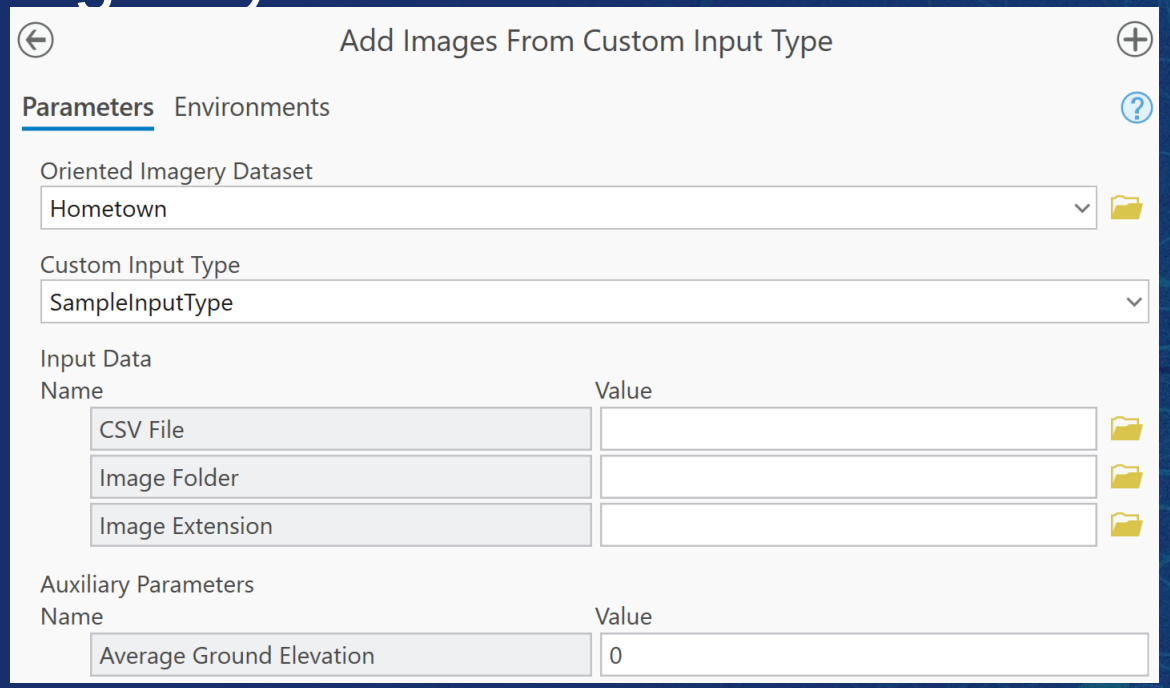
  similar other generic FC describe properties

  - More properties in desc.extensionProperties:
    - .footprintItem returns name of associated footprint FC
    - .imagePathPrefix returns Image Prefix used
    - .imagePathSuffix returns Image Suffix used
    - .elevationSource returns dict with Elevation Source and level
    - .camerapitch returns Pitch …

    similar other Oriented Imagery Dataset parameters

Custom data type support through Python

- See documentation:
  - Add Images from custom input type



- Learn from a sample input type:
  - (Omega/Phi/Kappa, likely from a CityMapper 2 dataset)
  - `[Pro-Inst-Dir]\Resources\OrientedImagery\CustomInputTypes`

Summary: Why oriented imagery?

You want to…

- Inspect assets
- Gain situational awareness
- Manage physical infrastructure
- Catalog and query archives of non-rectified images
- Provide “human eye friendly” context

Industries

Utilities
AEC
State & local governments
Emergency management
Commercial
Oil & natural gas
Imagery data providers

Whats new (3.4 and 3.5)

Data Management

- Improved schema for camera orientation (Pro)
- Enhanced performance for Add Images tool (Pro)
- Local MRF support (Pro)
- Parameterized image path support (Online)
- Support for elevation in feet (Pro)

Visualization

- Visualize 360 imagery (Pro & Online)
- Feature layer overlays in the oriented imagery viewer (Online)(Pro)
- Floor filter support (Pro & Online)
- View popup for current image (Pro & Online)
- Highlight additional footprint (Online)
- Scene View support for oriented imagery layers & viewer (Online)
- Oriented imagery added to web scene spec (Online)
- 3D Viewer template support (ArcGIS Instant Apps – Online)
- Measurements (Online)(Pro)

Oriented Imagery

Resources

- Blogs
  - esriurl.com/OrientedImageryIntroBlog
  - esriurl.com/OrientedImageryFAQ (with guidance for Oriented Imagery Classic users)
  - esriurl.com/QuickCaptureOrientedImageryLayers (QuickCapture support for oriented imagery layers)
- Product documentation
  - esriurl.com/OrientedImageryArcGISProDoc
  - esriurl.com/OrientedImageryArcGISOnlineDoc
  - esriurl.com/OrientedImageryJavaScriptDoc
- Sample oriented imagery layers
  - esriurl.com/SampleOrientedImageryLayers