

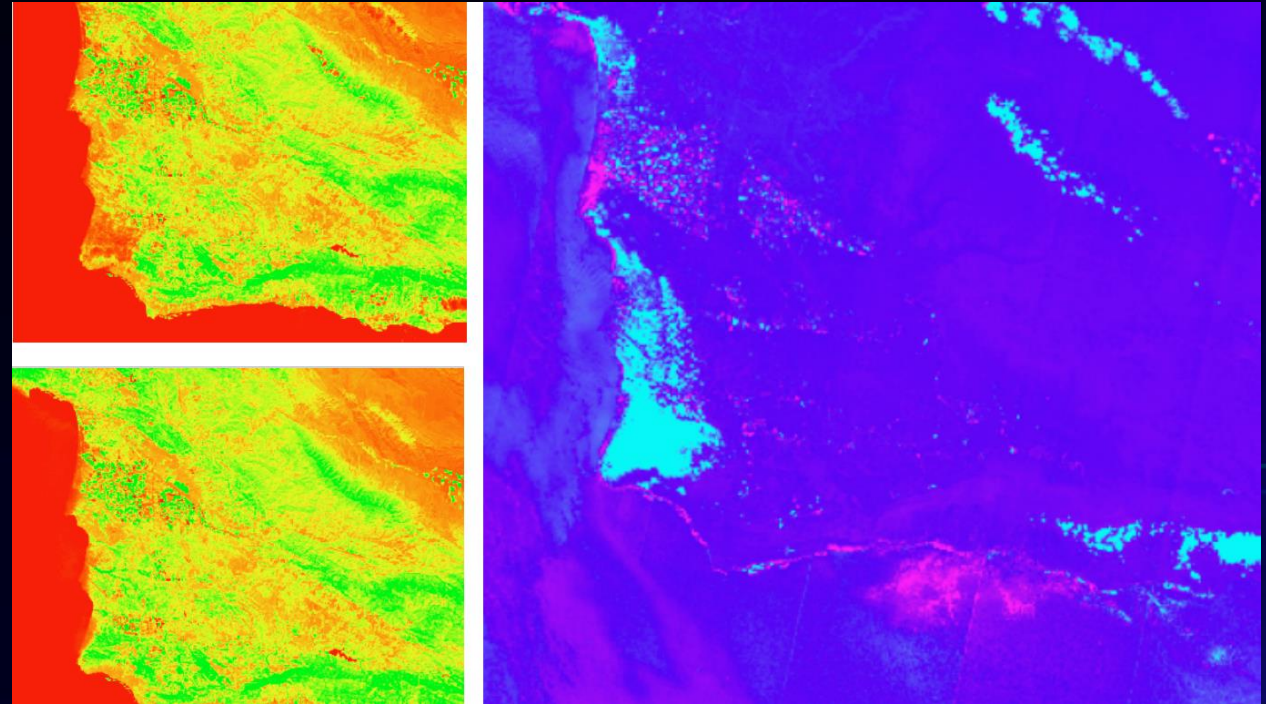
Automate Change Monitoring with ArcGIS and Sentinel-2

Dave Wright



Overview

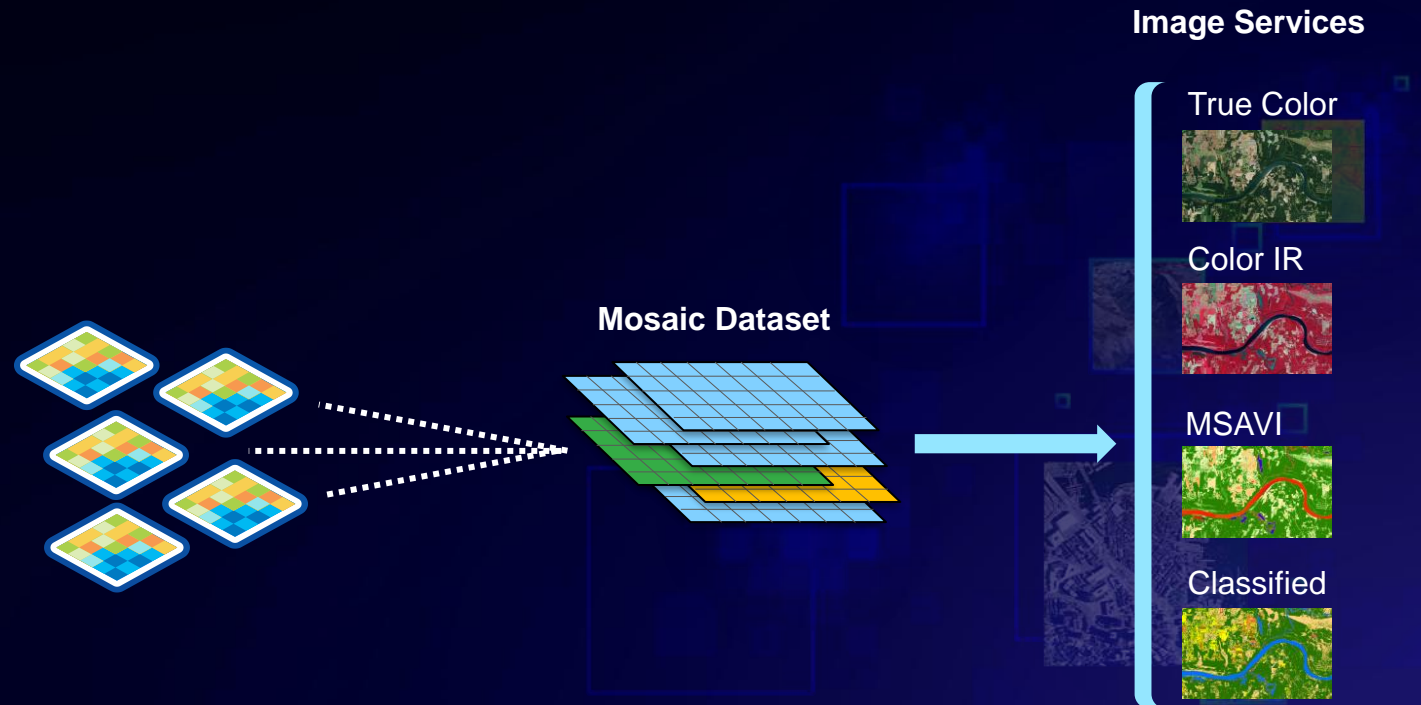
- Demand
- Technology
- Use Cases
- Workflow stages
 - 01-manage-mosaic-datasets
 - 02-manage-image-services
 - 03-analyze-change
- Results
- Invitation



Demand

Trends in customer projects and applications

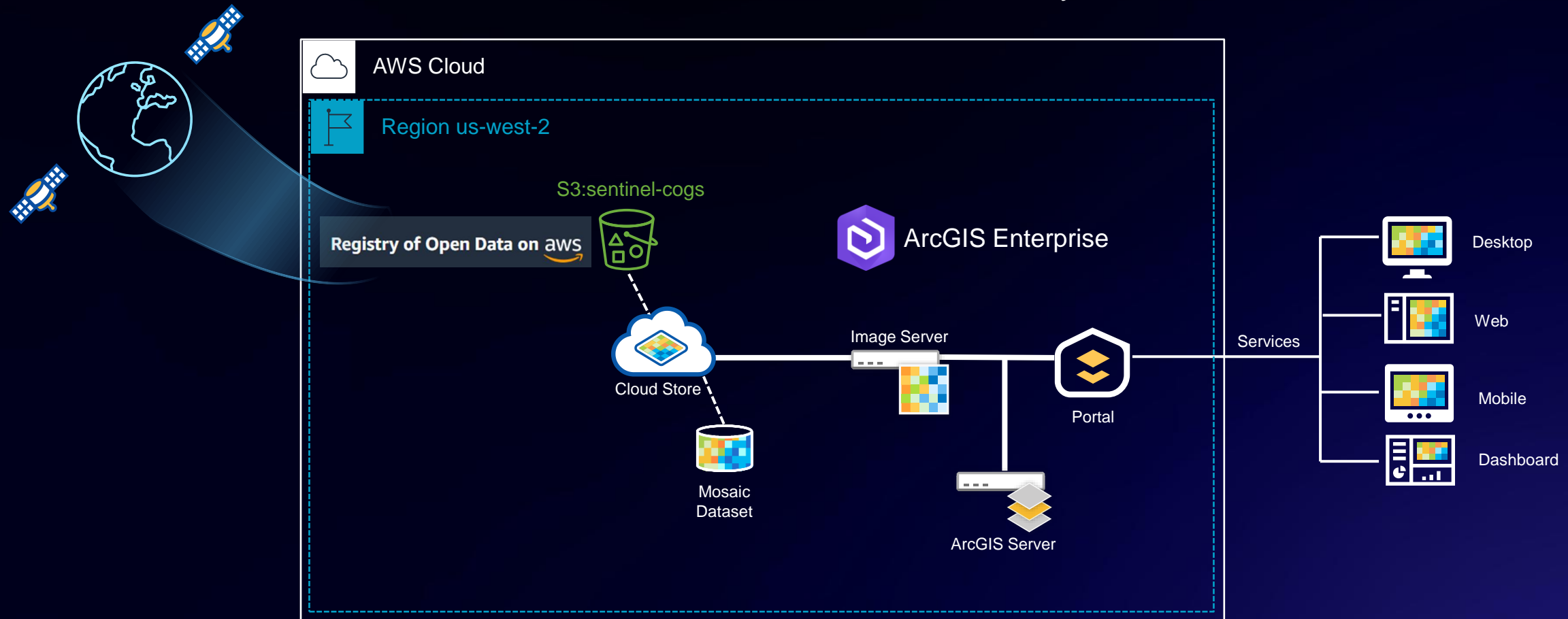
- Inform acquisition strategy
- Deep Learning
 - Creating training samples
 - Exporting image chips
- Accessing the right images
 - Spatial
 - Temporal
- Automation
 - Creating / updating Mosaic Dataset
 - Creating / updating Image Services



Technology

Connecting the stages with COTS components

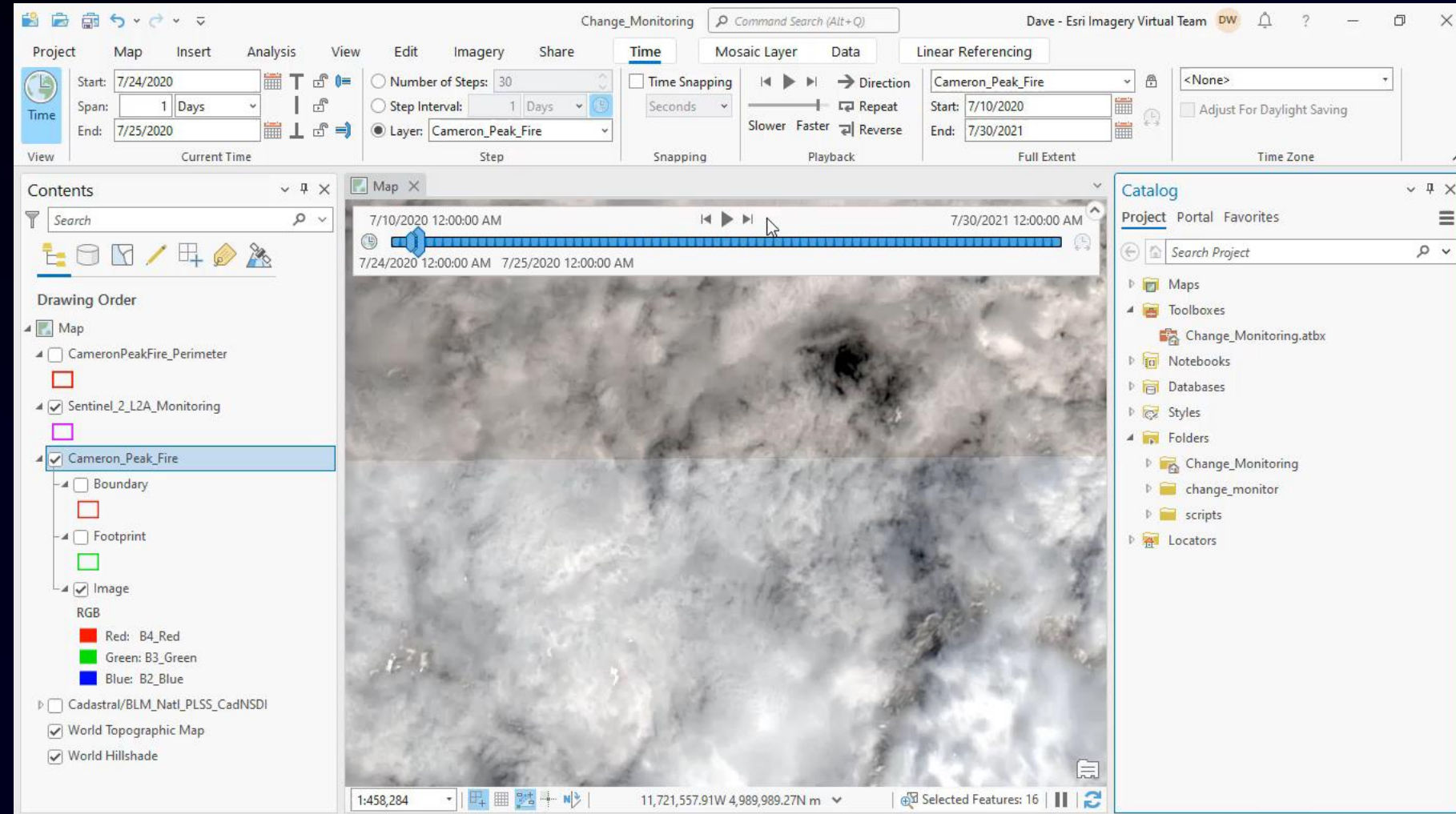
- ArcGIS Enterprise / ArcGIS Image Server
- Mosaic Dataset Configuration Script (MDCS)
 - Arcpy
 - Digital Earth Africa project
- ArcGIS API for Python



Use Case 1

Natural Disaster Assessments – In Webmaps, Webapps, ArcGIS Pro...

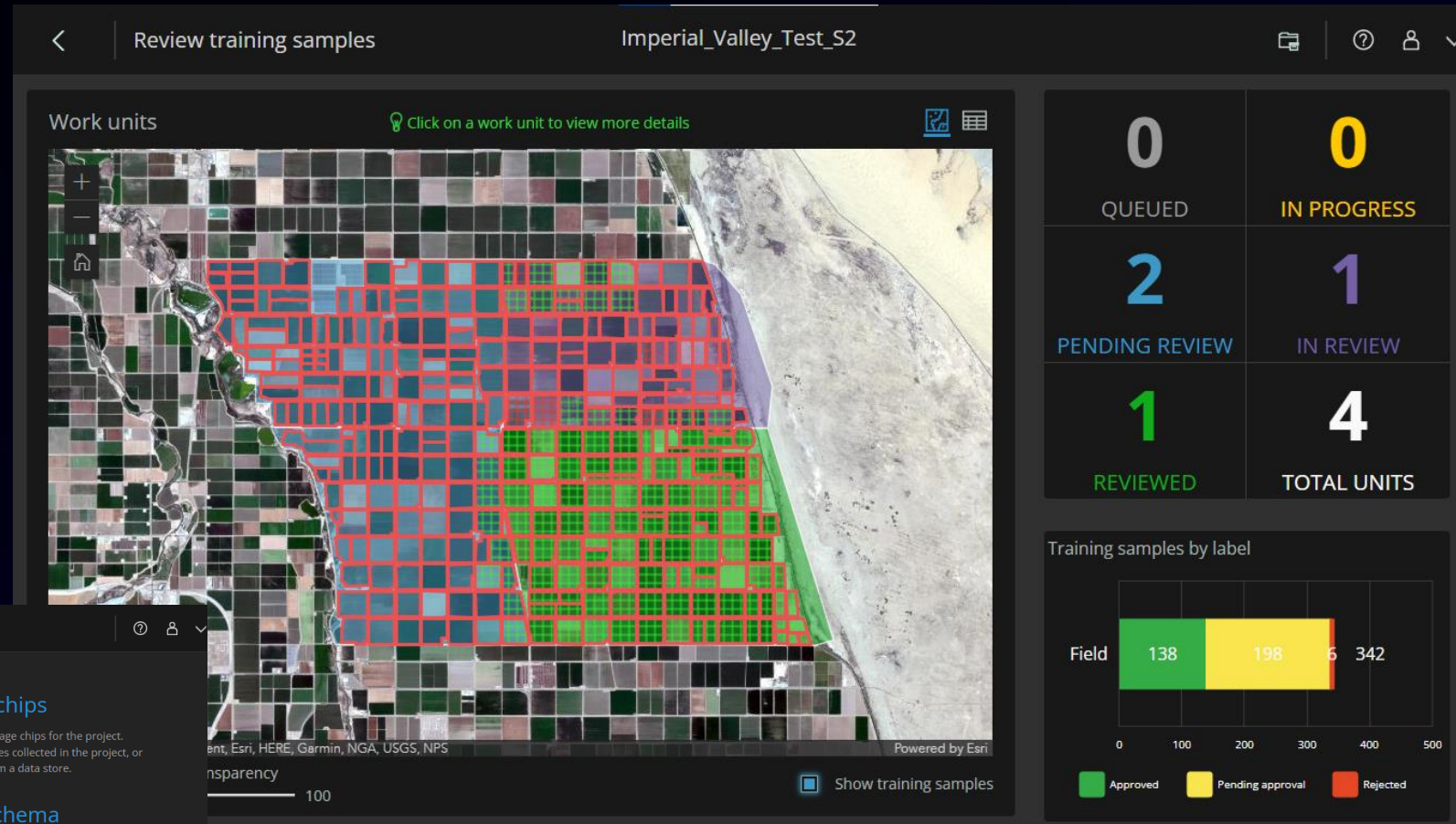
- Pre and post
 - Inspect to select best images
- Analysis to explore
 - Impacts
 - Secondary disaster risks



Use Case 2

Training models for deep learning

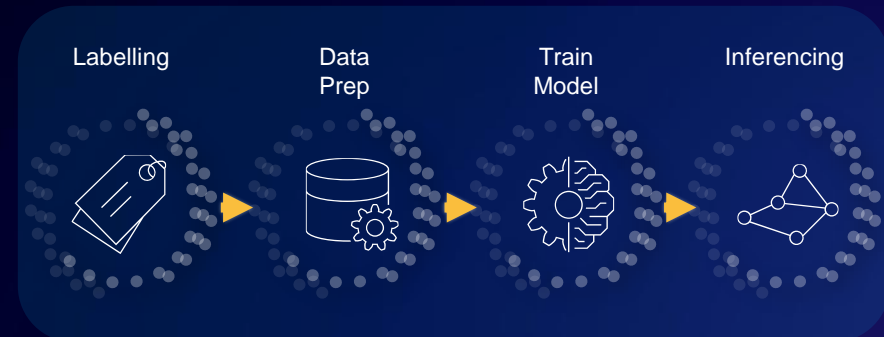
- Full control of imagery
- Team-source sample creation
- Create image chips
- Train models (and tune)



Prepare training data

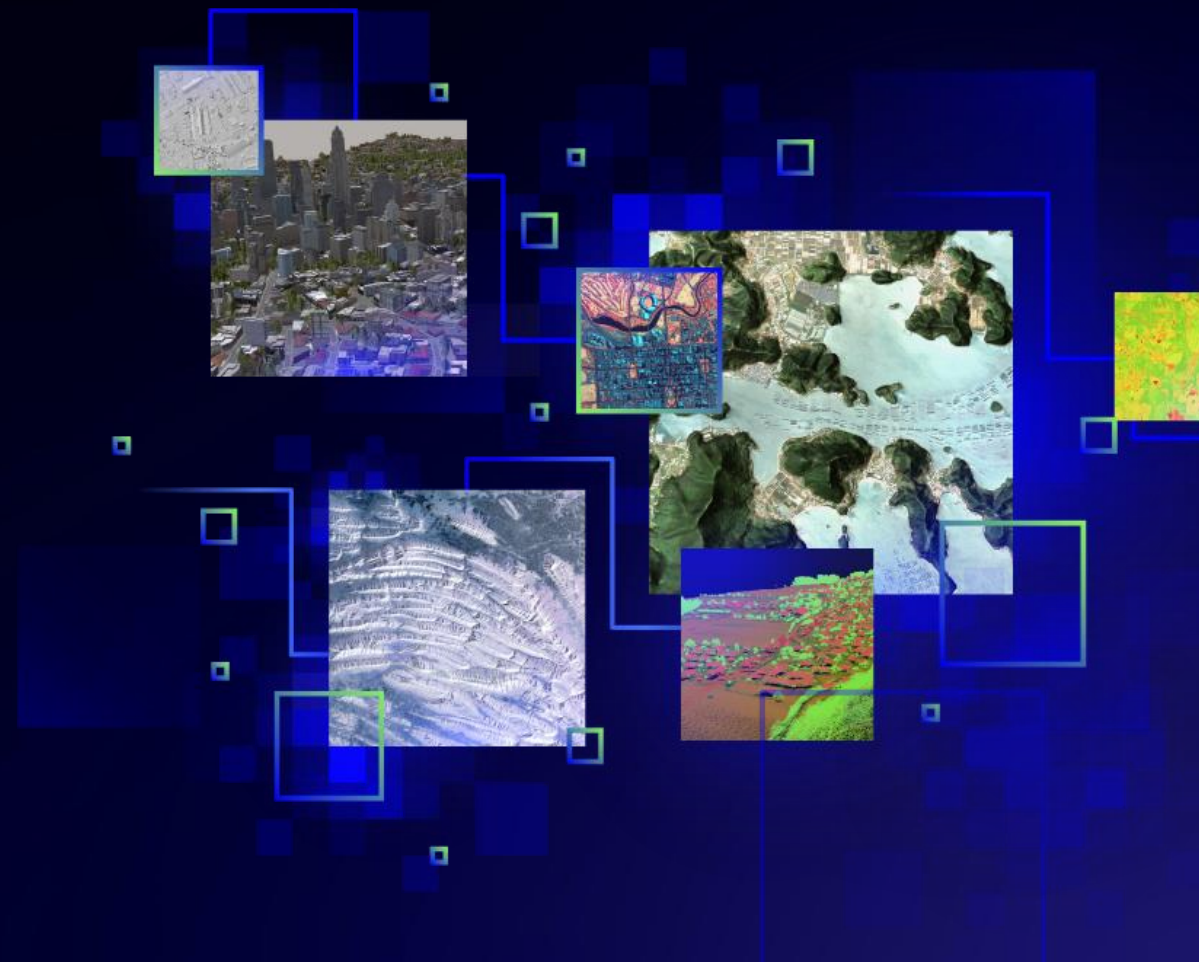
Imperial_Valley_Test_S2

- Collect training samples**
Use the digitizing tools to collect representative training samples of the objects of interest for each class identified in the schema.
- Manage image chips**
Manage one or more sets of image chips for the project. Export image chips from samples collected in the project, or register sets of image chips from a data store.
- Import training samples**
Import existing training samples from a feature layer into the project, with the option to import values as class values.
- Manage label schema**
Add, Edit, and Delete labels in the class labeling schema. You can also import/export labels from/to Esri Classification Schema items.
- Edit training sample labels**
Review and optionally update class value for each training sample by work unit.
- Edit instructions URL**
Provide or edit a URL to a document that includes detailed instructions for collecting training samples. The link is available as a reference guide when collecting samples.
- Review training samples**
Review training samples by work unit, and view training sample collection progress.



Workflow Stages

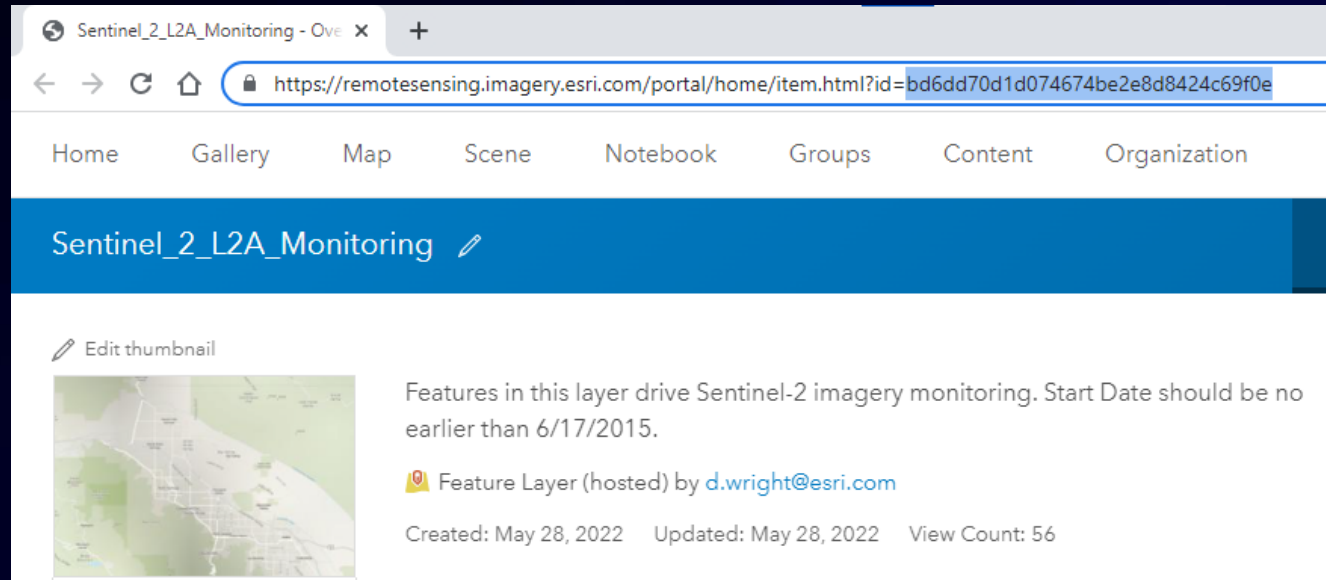
Section Subhead



Create Feature Service

ArcGIS Enterprise

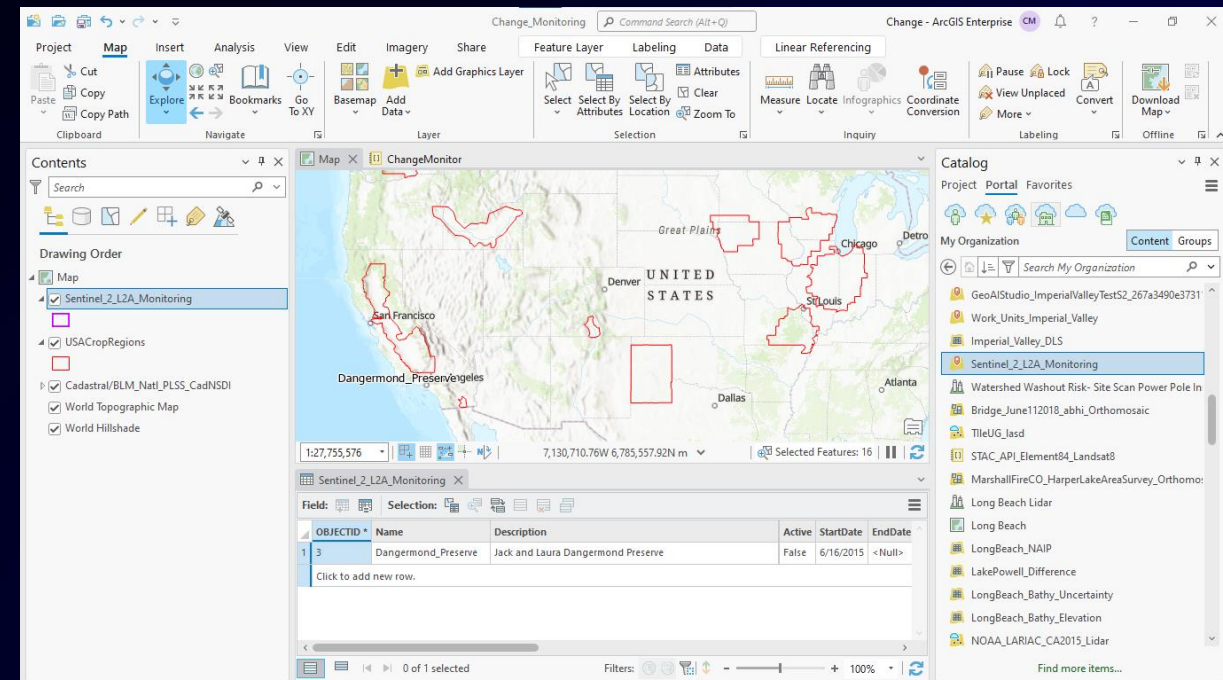
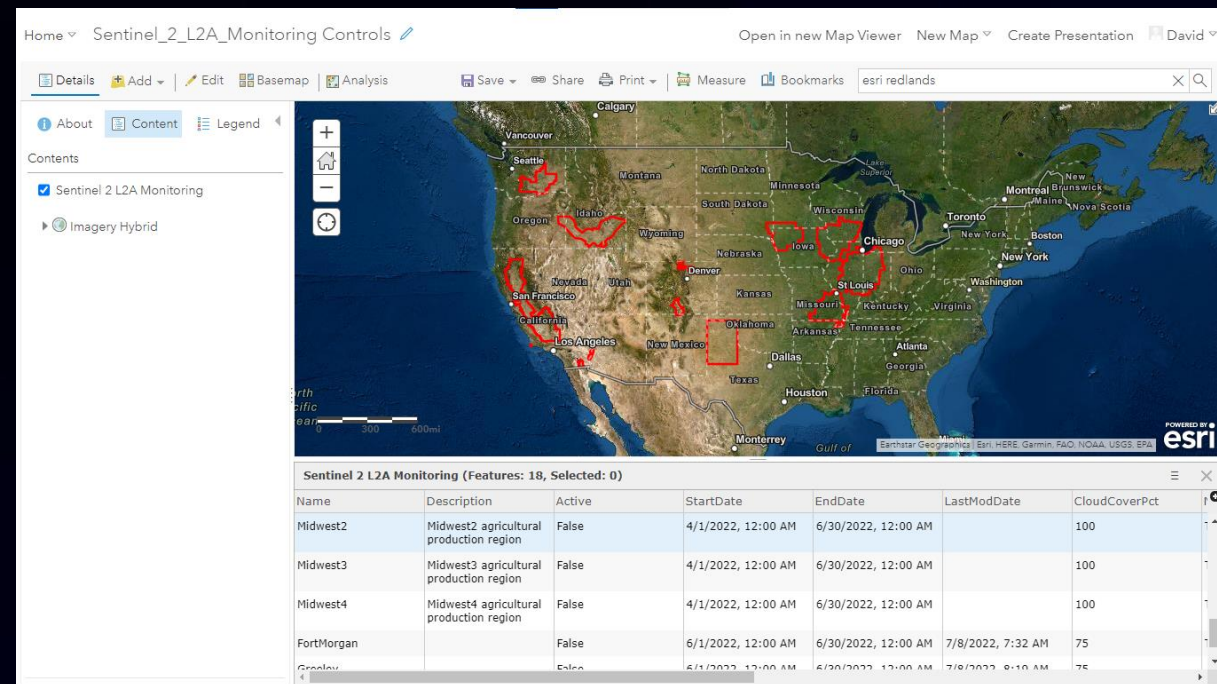
- Repo includes File GeoDataBase
../ChangeMonitoringControls_FC/Sentinel_2_L2A_Monitoring.gdb
- Publish as editable Feature Service to your ArcGIS Enterprise Portal
 - Share with collaborators (Editor user type)
- Record the guid
 - bd6dd70d1d074674be2e8d8424c69f0e



Setup monitoring areas

Worldwide - using a Map!

- Load Feature Service
 - In a Webmap, or ArcGIS Pro
- Create polygon
- Set attributes
 - Name
 - Active
 - StartDate
 - CloudCover
 - EndDate (if null will run into future)



Open notebooks

Jupyter

- 01-manage-mosaic-datasets
- 02-manage-image-services

- Organization URL
- Username
- Password

- Run cells
- Shutdown kernel

- 03-analyze-change

The top screenshot shows a Jupyter notebook titled "ChangeMonitor" with the following code and output:

```
2 monitoring_aois_item = gis.content.get("bd6dd70d1d074674be2e8d8424c69f0e") #IRS Enterprise
3 monitoring_aois_item
```

Out[2]:

Sentinel_2_L2A_Monitoring
Features in this layer drive Sentinel-2 imagery monitoring. Start Date should be no earlier than 6/17/2015.
Feature Layer Collection by d.wright@esri.com
Last Modified: May 28, 2022
0 comments, 52 views

Access the layer and query it for the active AOIs

```
In [3]: 1 monitoring_aois_layers = monitoring_aois_item.layers
2 monitoring_aois_layer = monitoring_aois_layers[0]
3
4 active_aois = monitoring_aois_layer.query(where="Active='True'",
5 out_fields='name,description,active,startdate,enddate,la
6 active_aois.sdf
```

Out[3]:

The bottom screenshot shows a Jupyter notebook titled "01-manage-mosaic-datasets" with the following code and output:

```
In [1]: 1 from arcgis import GIS
2 from arcgis.features import FeatureLayerCollection
3 import getpass
4 from arcgis.raster.analytics import copy_raster
5
6 org_url = "https://remotesensing.imagery.esri.com/portal" #IRS Enterprise
7 username = "changemon_remotesensing"
8 pw = getpass.getpass('Enter password: ')
9 gis = GIS(org_url, username, pw, verify_cert=False)

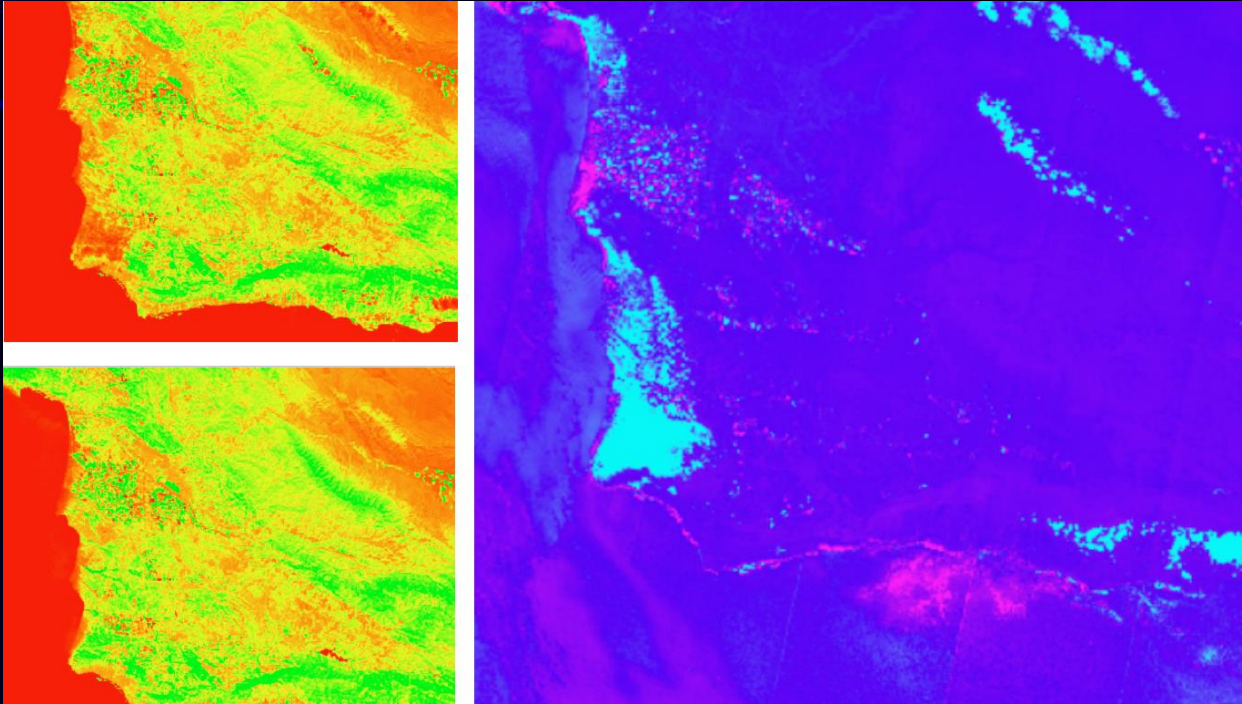
Enter password: .....
```

Automated Change Monitoring with Sentinel-2 L2A

Connect to the ArcGIS Online organization

```
In [2]: 1 monitoring_aois_item = gis.content.get("bd6dd70d1d074674be2e8d8424c69f0e") #IRS Enterprise
2 monitoring_aois_item
```

Out[2]:



Automate Change Monitoring with ArcGIS and Sentinel-2



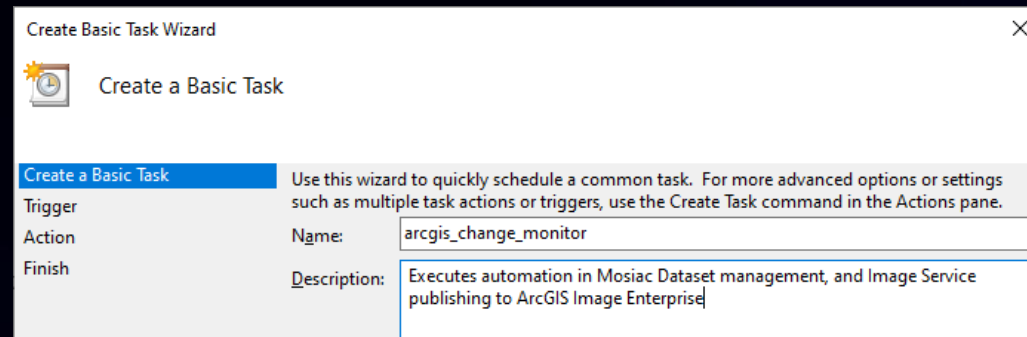
Scheduling

Automate the processing

- Script form of notebook code
- Windows Scheduled Task
- Linux cron job
- At specified interval
- At specified time

```
scripts > change-monitor-windows-task.bat
```

```
1 REM ***** Set Variable Values *****
2 set pPath="C:\Program Files\ArcGIS\Pro\bin\Python\envs\arcgispro-py3\python.exe"
3 set mdcsPath=C:\Image_Mgmt_Workflows\MDCS\arcgis-sentinel-2-change-monitor
4
5 echo Creating MDs...
6 %pPath% "%mdcsPath%\scripts\01-manage-mosaic-datasets.py"
7 echo Mosaic Dataset management script is finished.
8
9 echo Copying MDs to Image Hosting fileserver...
10 %pPath% "%mdcsPath%\scripts\02-manage-image-services.py"
11 echo Image Service management script is finished.
```



Create Basic Task Wizard

Create a Basic Task

Use this wizard to quickly schedule a common task. For more advanced options or settings such as multiple task actions or triggers, use the Create Task command in the Actions pane.

Create a Basic Task

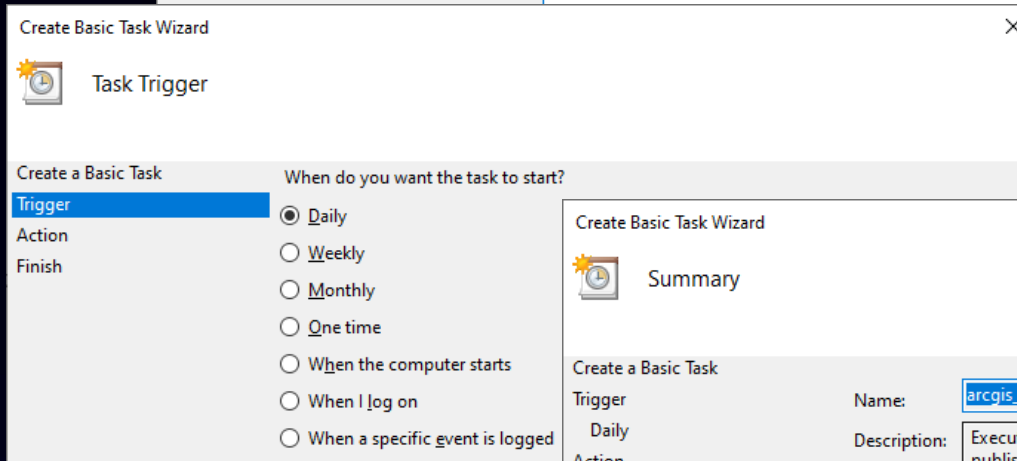
Trigger

Action

Finish

Name: arcgis_change_monitor

Description: Executes automation in Mosaic Dataset management, and Image Service publishing to ArcGIS Image Enterprise



Create Basic Task Wizard

Task Trigger

Create a Basic Task

Trigger

Action

Finish

When do you want the task to start?

☒ Daily

☐ Weekly

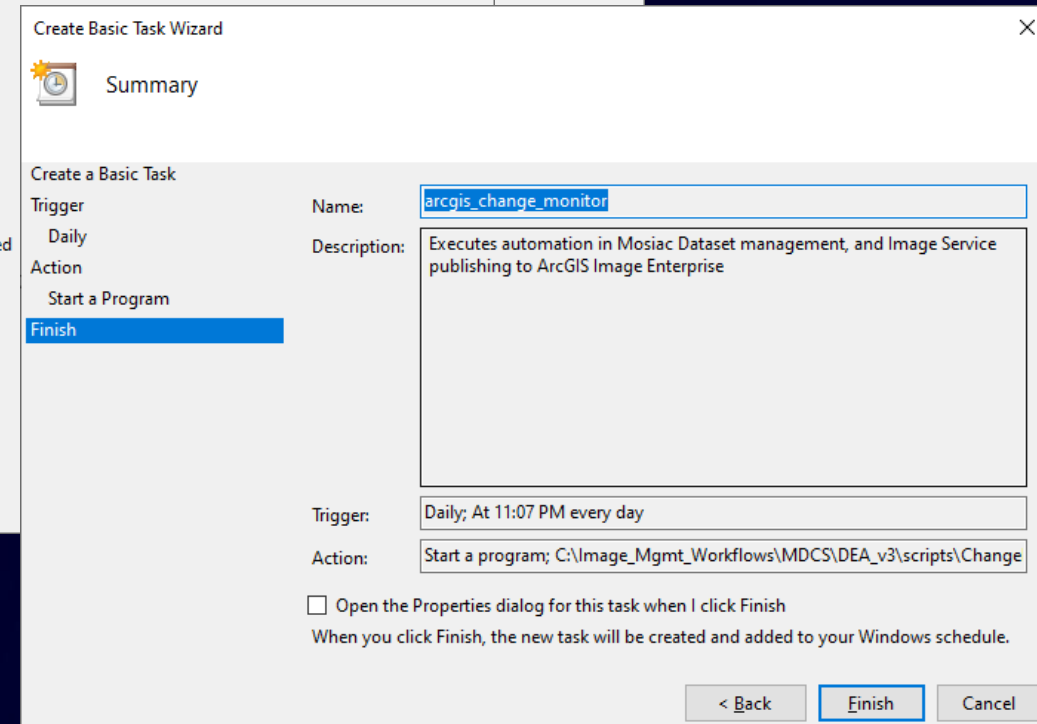
☐ Monthly

☐ One time

☐ When the computer starts

☐ When I log on

☐ When a specific event is logged



Create Basic Task Wizard

Summary

Create a Basic Task

Trigger

Action

Start a Program

Finish

Name: arcgis_change_monitor

Description: Executes automation in Mosaic Dataset management, and Image Service publishing to ArcGIS Image Enterprise

Trigger: Daily; At 11:07 PM every day

Action: Start a program; C:\Image_Mgmt_Workflows\MDCS\DEA_v3\scripts\Change

☐ Open the Properties dialog for this task when I click Finish

When you click Finish, the new task will be created and added to your Windows schedule.

< Back Finish Cancel

Resources and invitation

Automate Change Monitoring with ArcGIS and Sentinel-2

- Code from demonstration – <https://github.com/dkwright/arcgis-sentinel-2-change-monitor>
 - Download, use, extend and contribute
 - Additional sensors
 - Commercial API connections
 - Customize analyses
 - Persisting analyses as additional services
 - Notifications
- Mosaic Dataset Configuration Script (MDCS) – <https://github.com/Esri/mdcs-py>
- ArcGIS API for Python - <https://developers.arcgis.com/python/>



