

UC



Scientific and Multidimensional Raster Support in ArcGIS

Sudhir Raj Shrestha

sshrestha@esri.com

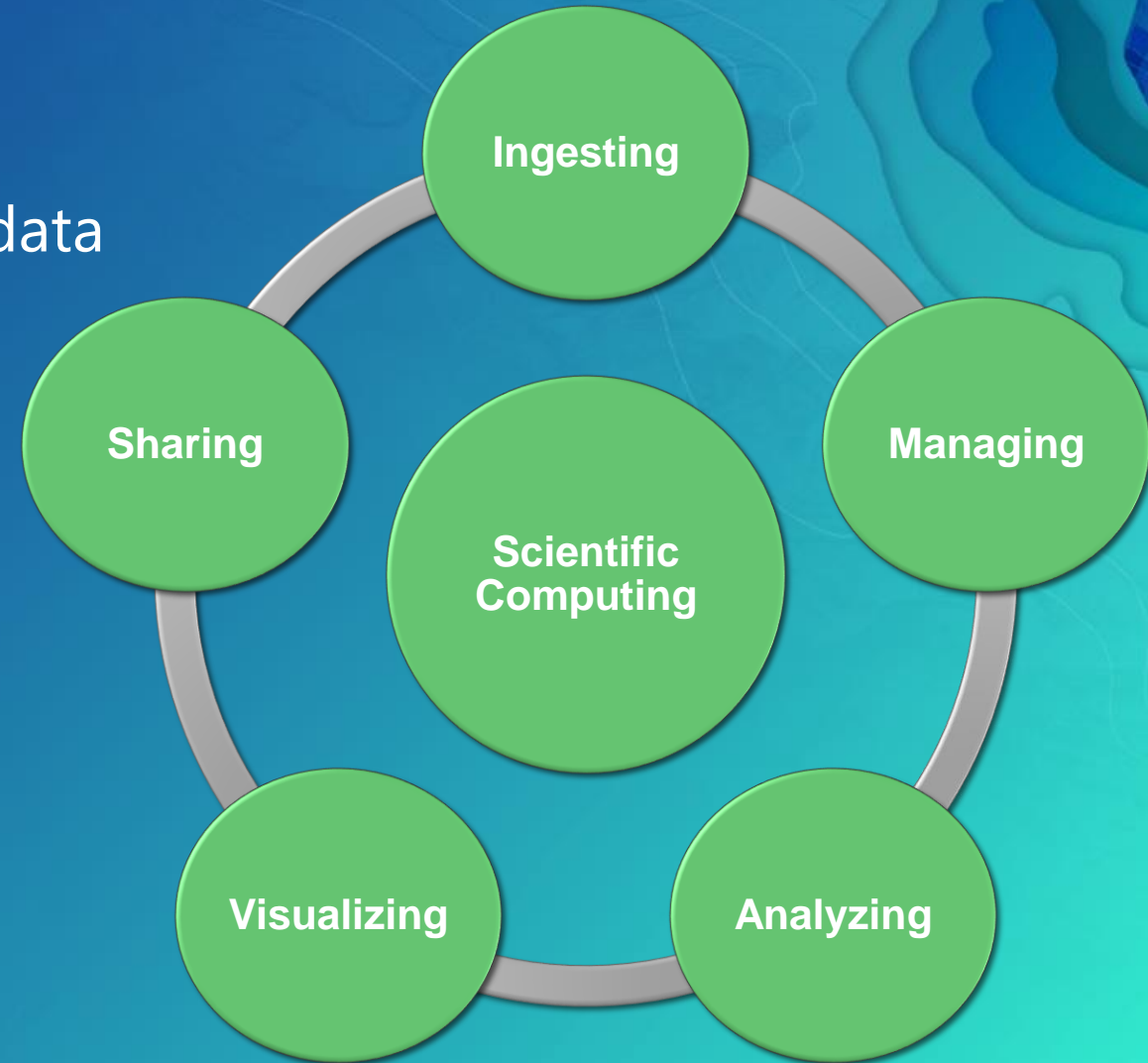
Hong Xu

hxu@esri.com

Esri User Conference. July 12, 2017

What we will cover today

- Scientific Multidimensional Raster data
- Using Scientific Data in ArcGIS
 - Ingesting and managing
 - Visualizing and analyzing
 - Disseminating and consuming
- Application(s) and use case



Scientific Multidimensional Data



Diverse Scientific Multidimensional Data



Oceanographic

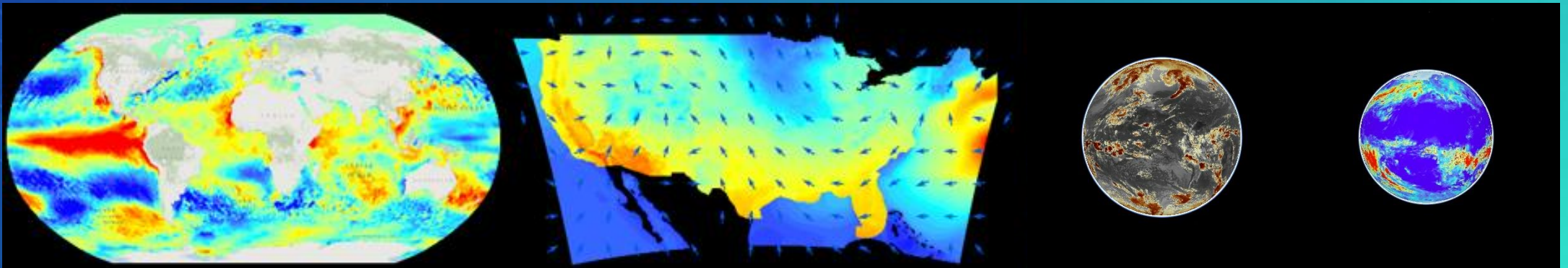
- Salinity
- Sea Temperature
- Ocean current

Meteorological

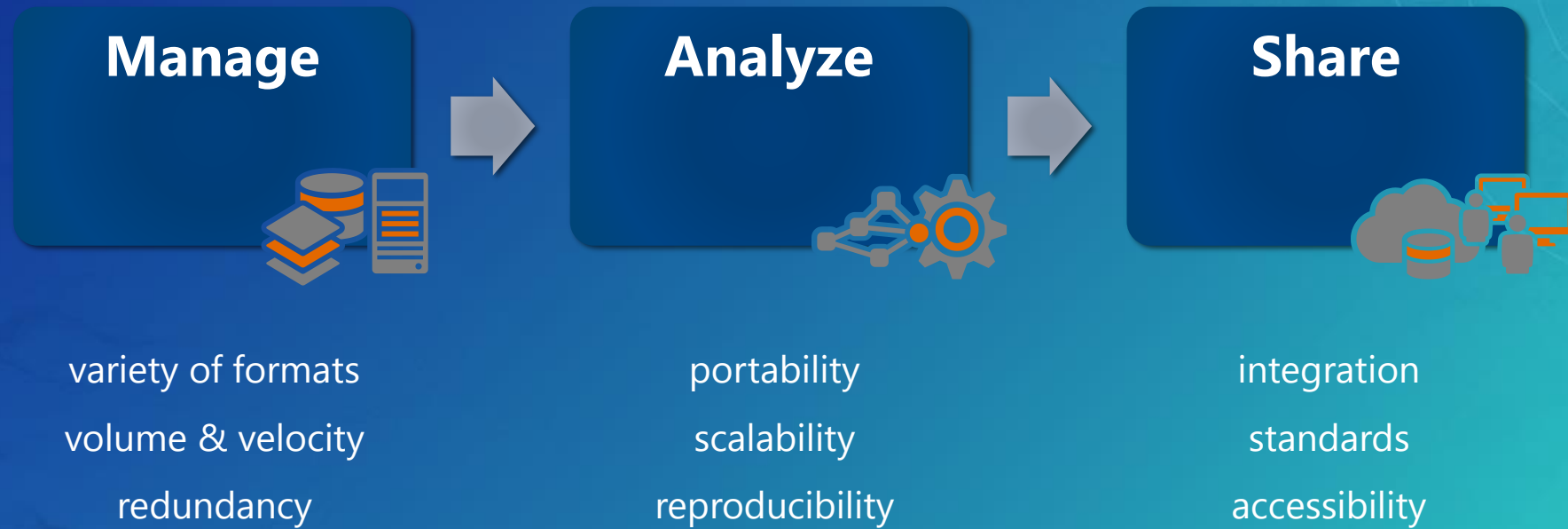
- Temperature
- Water Vapor/Precipitation
- Wind speed/direction

Terrestrial

- Soil moisture
- NDVI
- Land cover



Challenges



Multidimensional Rasters



netCDF, Grib, HDF

Gridded

Multidimensional

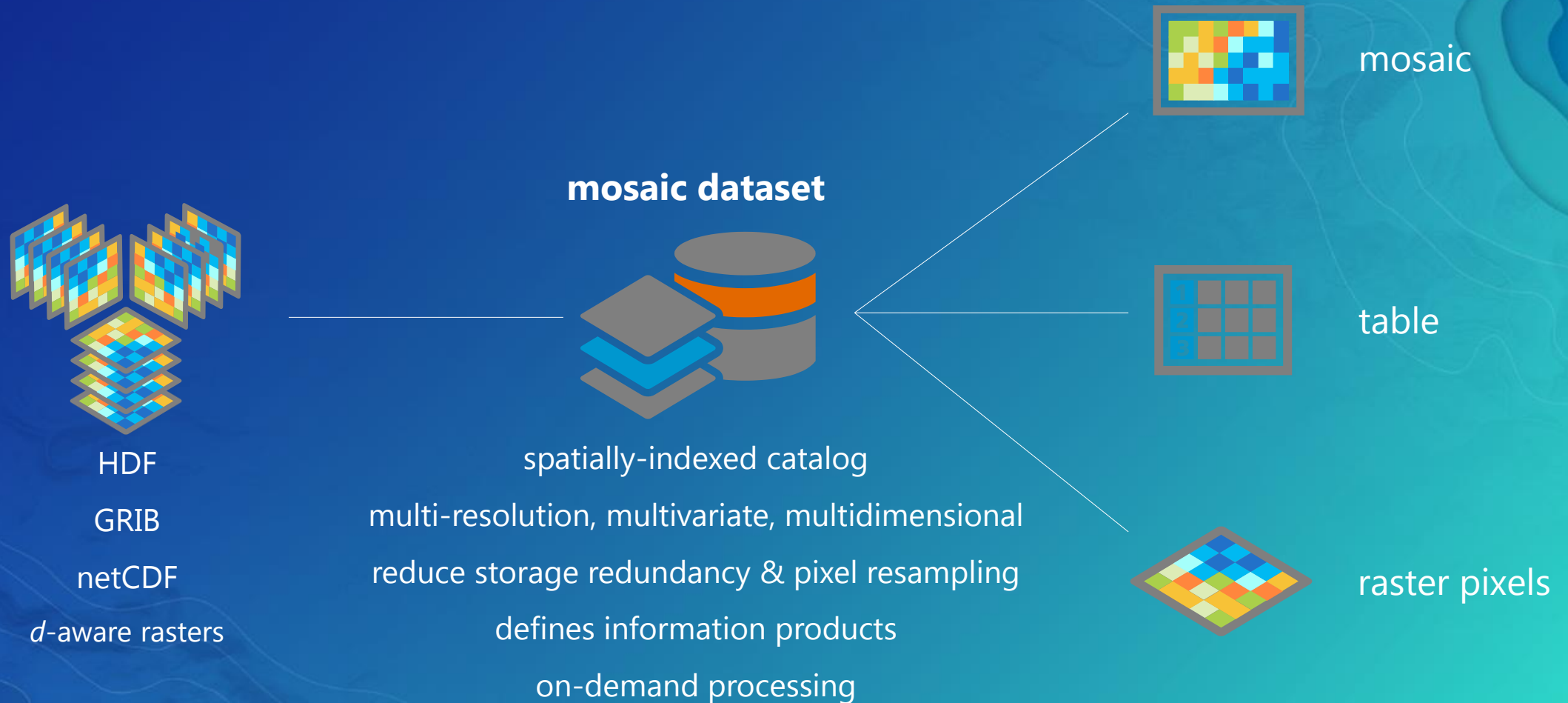
Multivariate



Ingesting and Managing Data



Multidimensional Mosaic Dataset

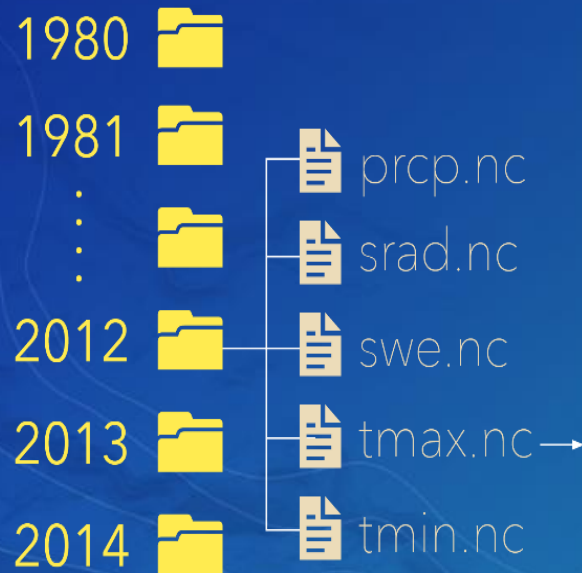


Representing multivariate collection of multidimensional rasters in ArcGIS

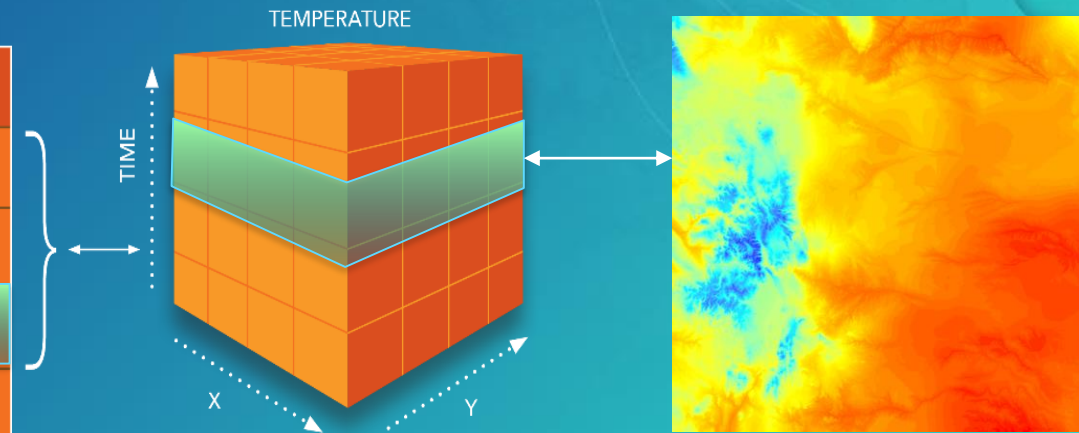
Multidimensional Data Model

Multidimensional Mosaic Dataset in Geodatabase

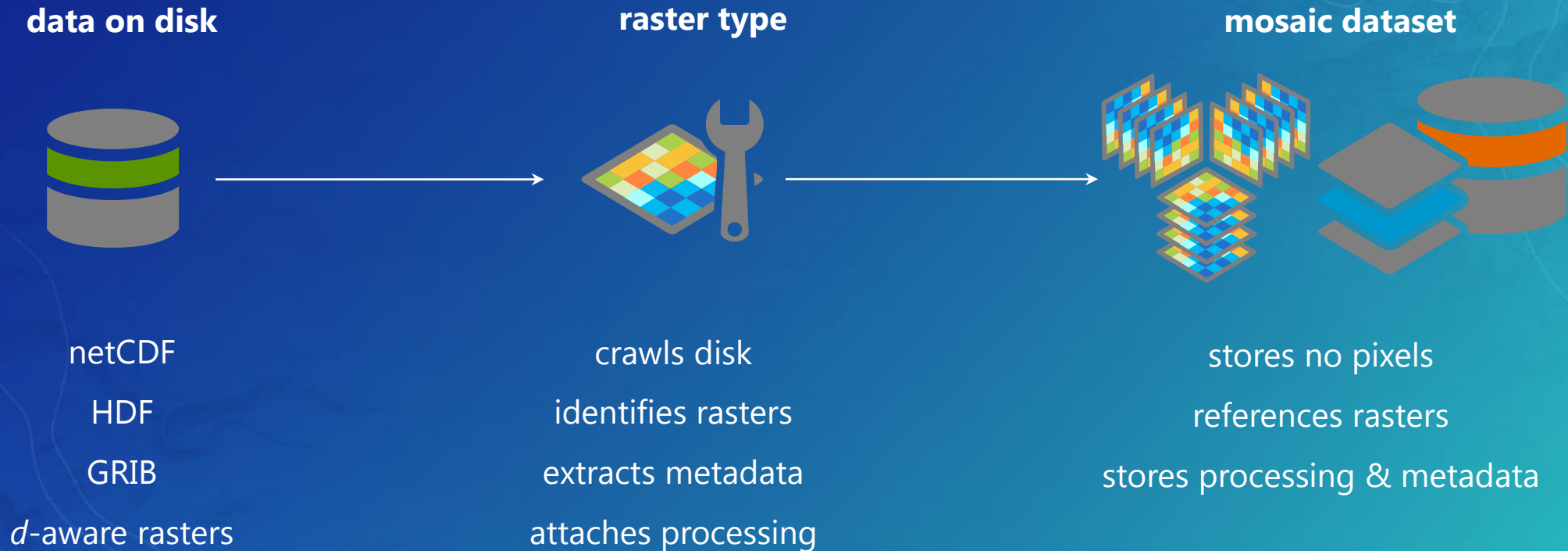
- Ingest variables from netCDF, HDF & GRIB using raster types
 - Aggregate multiple variables, multiple files
- Support on-the-fly processing



ID	RASTER	PRODUCT	VARIABLE	TIME	Z	...
1	<raster>	netCDF	temperature	T1	10	
2	<raster>	netCDF	temperature	T2	10	
3	<raster>	netCDF	temperature	T3	10	
4	<raster>	netCDF	temperature	T1	20	
5	<raster>	netCDF	temperature	T2	20	
6	<raster>	netCDF	temperature	T3	20	



Raster Types for Multidimensional data



Format-agnostic direct ingestion of rasters into a mosaic dataset

Creating a Multidimensional Mosaic Dataset



Using Geoprocessing Tools

- Create a empty mosaic dataset
- Add select variables

Geoprocessing

← Create Mosaic Dataset

Parameters | Environments

Output Location
Demo_IS.gdb

Mosaic Dataset Name
ncom

Coordinate System
GCS_WGS_1984

Product Definition
None

> Product Properties
> Pixel Properties

Run

Geoprocessing

← Add Rasters To Mosaic Dataset

Parameters | Environments

Mosaic Dataset
ncom

Raster Type
NetCDF

Input Data
Folder
D:\Data\Scientific\CFSR\sea-ice

Run

Raster Type Properties

General
Processing
Variables

<input type="checkbox"/>	Name	Type	Description
<input type="checkbox"/>	salinity		Salinity (depth=40, time=25)
<input type="checkbox"/>	surf_el		Water Surface Elevation (time=25)
<input checked="" type="checkbox"/>	water_temp		Water Temperature (depth=40, tim...
<input type="checkbox"/>	water_u		Eastward Water Velocity (depth=40,...
<input type="checkbox"/>	water_v		Northward Water Velocity (depth=4...

> Angle Reference System
> Interpolate irregular data
☐ Copy original dimension values

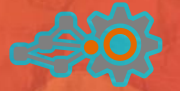
OK Cancel

Demo



Create multidimensional Mosaic Dataset using Raster types
Create Wind model using Vector Field Template

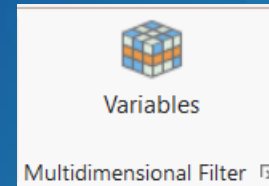
Visualizing and Analyzing



Slicing your data

- Slicing

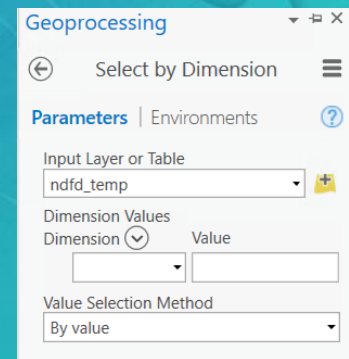
- By variable, using variable selector



- By dimension using Select by Dimension Geoprocessing tool

- Visualizing

- Time slider
 - Range slider
 - Vector field renderer



Demo



Visualize multidimensional data using time slider and range slider
Slicing your Mosaic dataset with Select by Dimension GP Tool
Visualize Wind data with vector field renderer

Raster Analysis

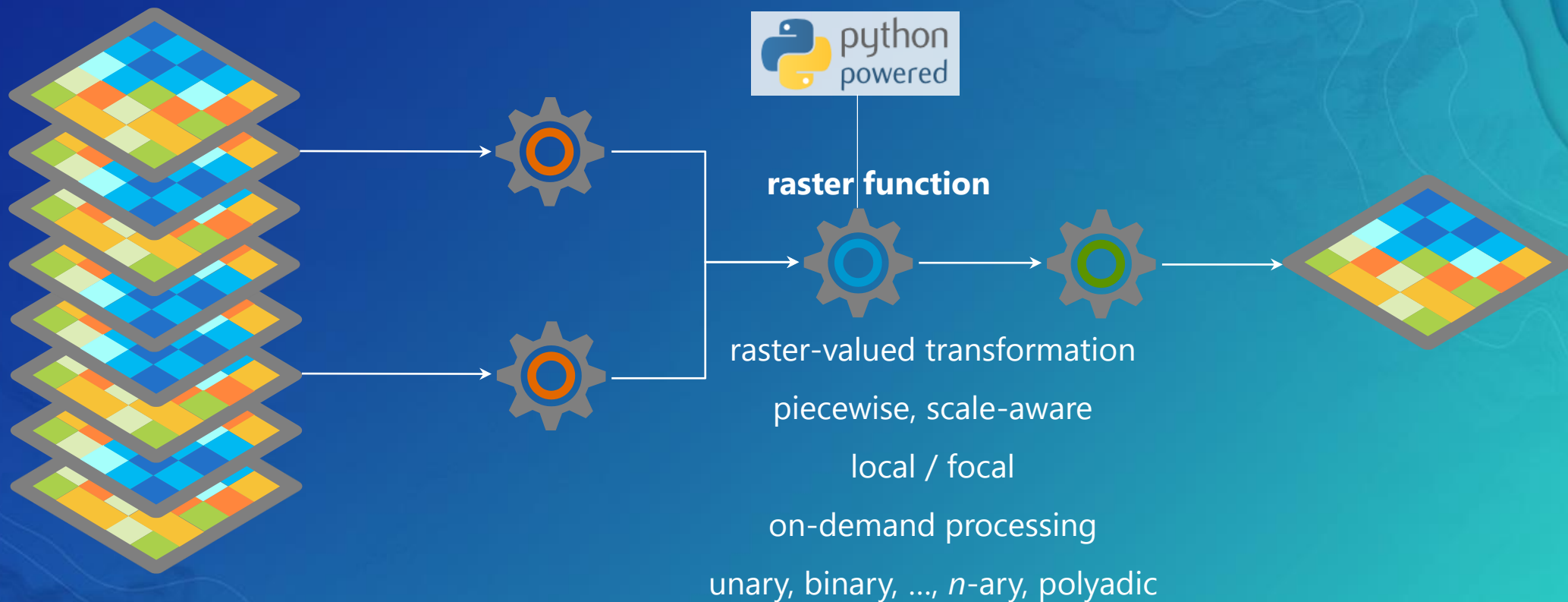
- **Geoprocessing Tools (GP)**

- Tons of GP tools
- GP tools, Python scripting and ModelBuilder → perfect automation of data management and analysis.

- **Dynamic On-the-Fly Processing using Raster Functions**

- Manage and analyze large collection of rasters on the fly as the data is accessed and viewed
- Quick and save time by not required to write the processed product to disk
- Functions can be applied to various rasters (images) including:
 - Raster dataset layers
 - Mosaic datasets
 - Image service layers

Raster Function: Transforming Raster Data



Learn more at: github.com/Esri/raster-functions

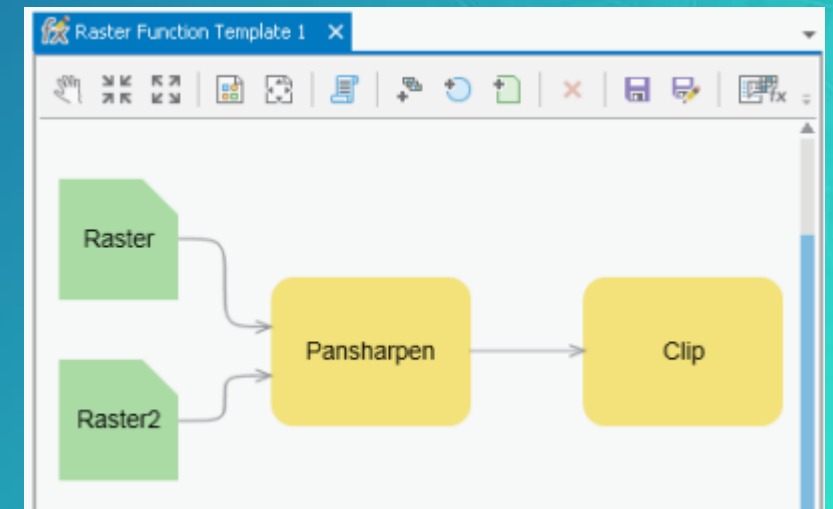
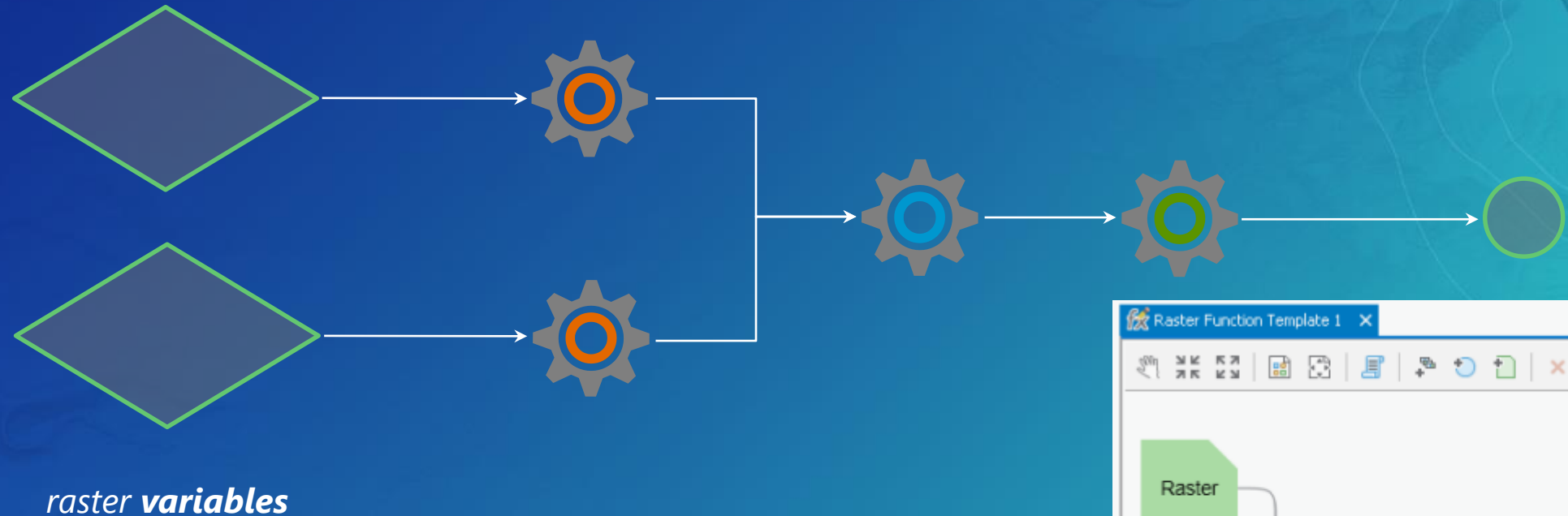
Choose from dozens of built-in functions or implement your own algorithm using Python

Chaining Raster Functions



... to compose a complex analytic model

Raster Function Templates

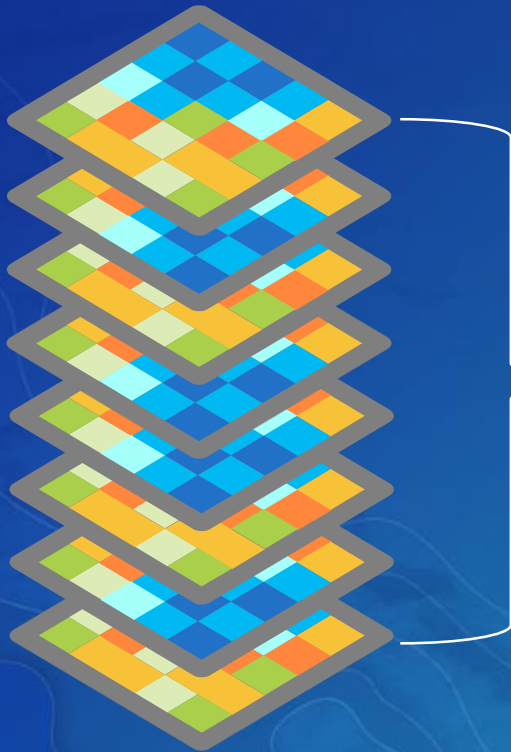


A portable & reusable chain of raster functions

Multidimensional Computing with Raster Functions

MultiDim Mosaic Dataset comes with:

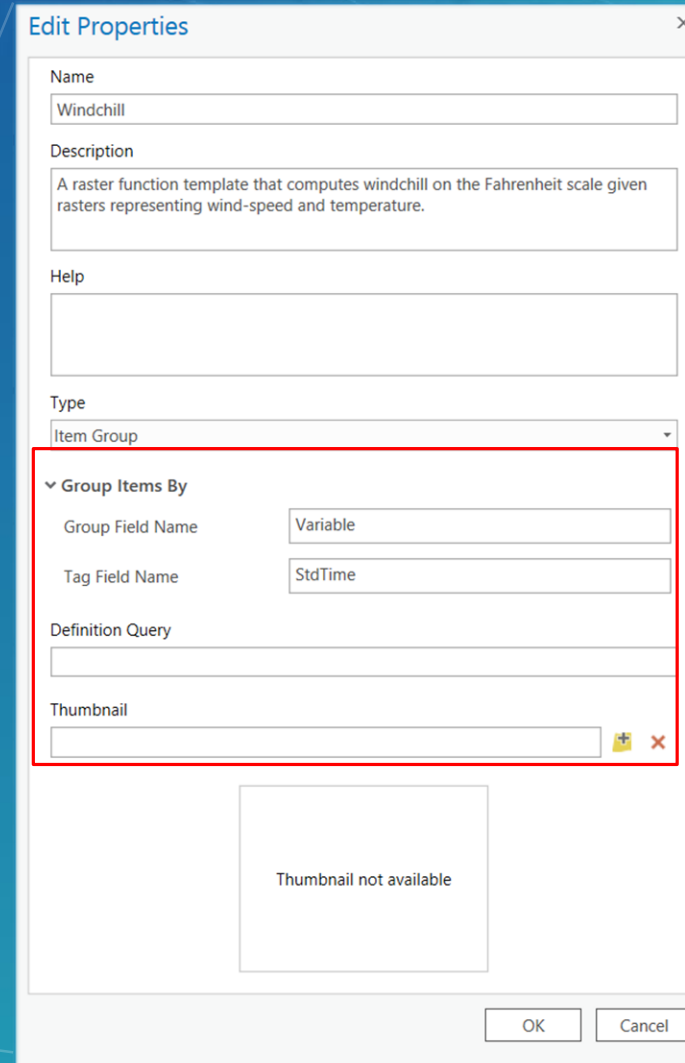
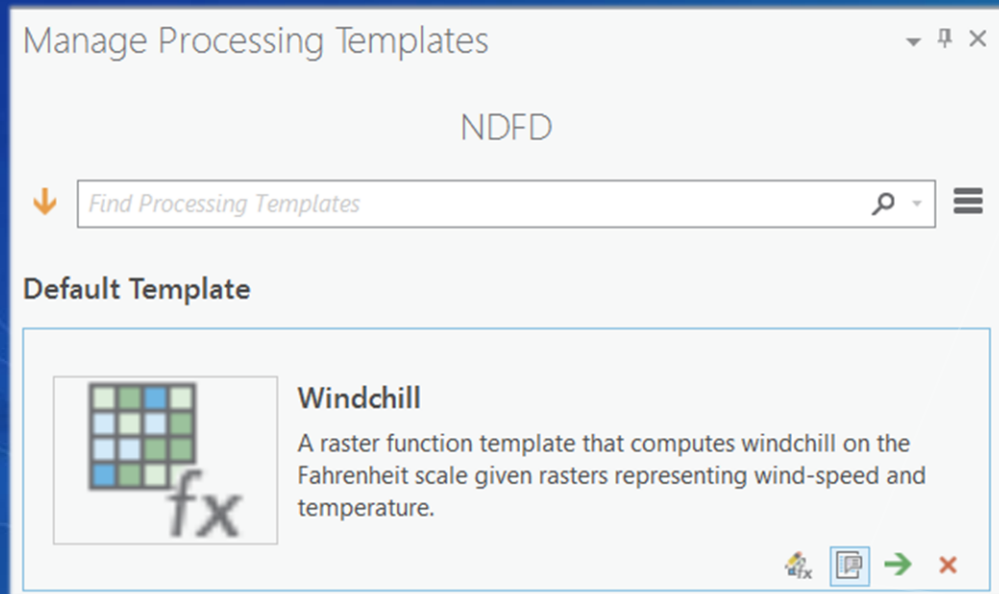
- Field stored with variable names (tag)
- Field defines groups(GroupName)



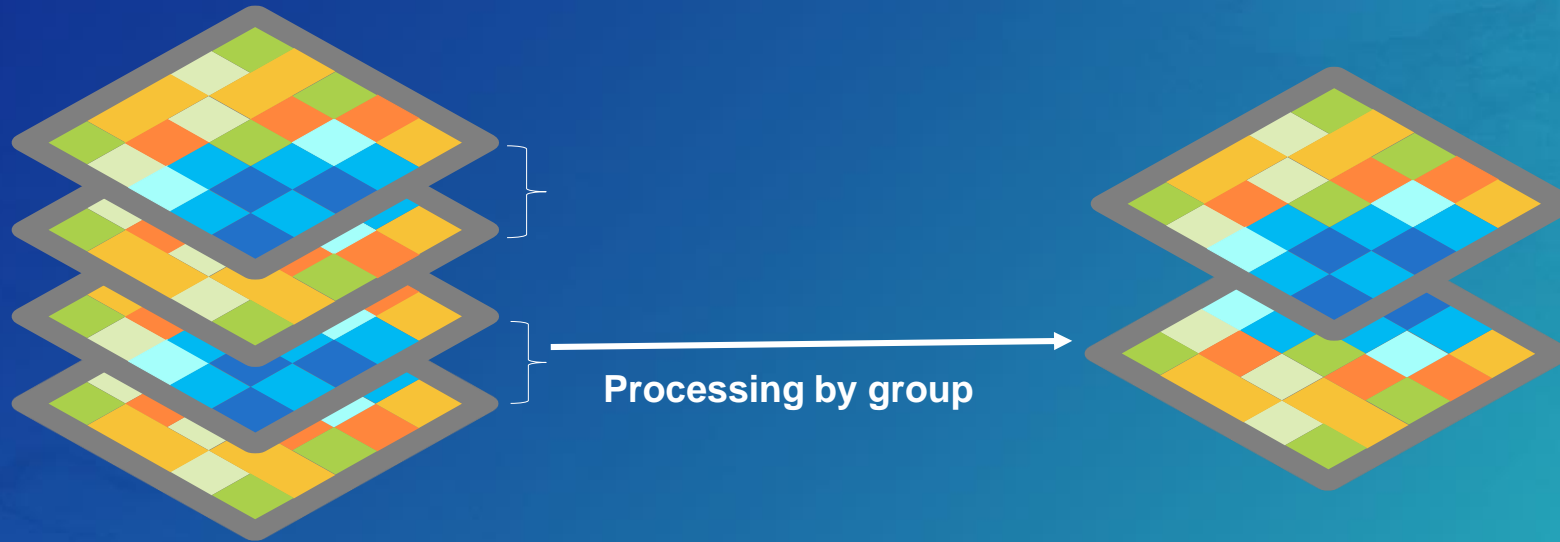
Raster	Tag	StdTime	GroupName
...	Temperature	t1	1
...	mean	t1	1
...	Temperature	t2	2
...	mean	t2	2
...	Temperature	t3	3
...	mean	t3	3
...	Temperature	t4	4
...	mean	t4	4



Raster Function/ Model: Grouping



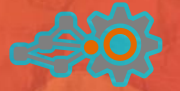
Applying a Raster Function Template to Mosaic Dataset



Apply RFT to Mosaic Dataset:

Process each row
Process each group

Demo

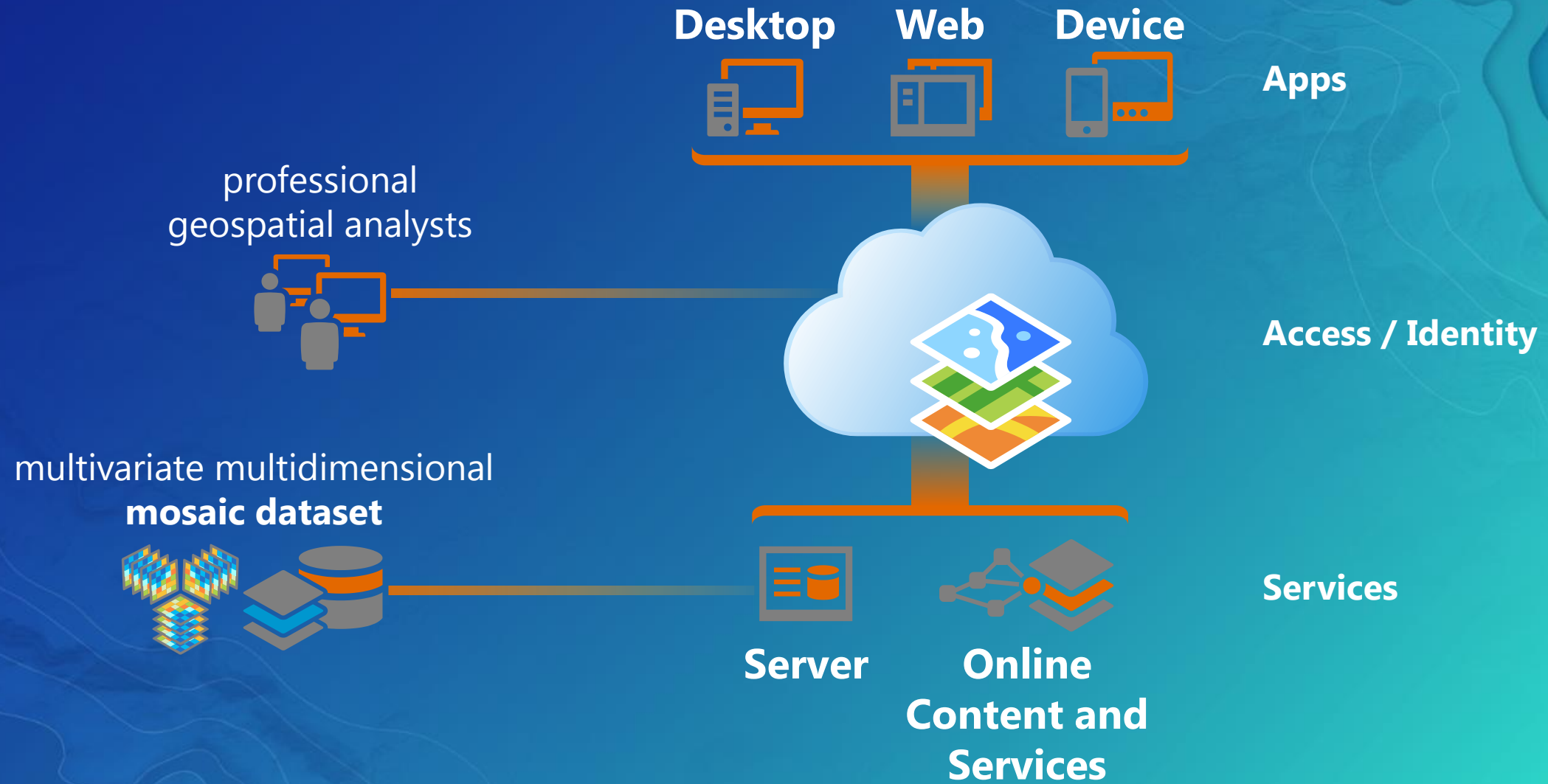


Create Function Template and use it for dynamic processing and analysis for MultiDim Data

Disseminating and Consuming

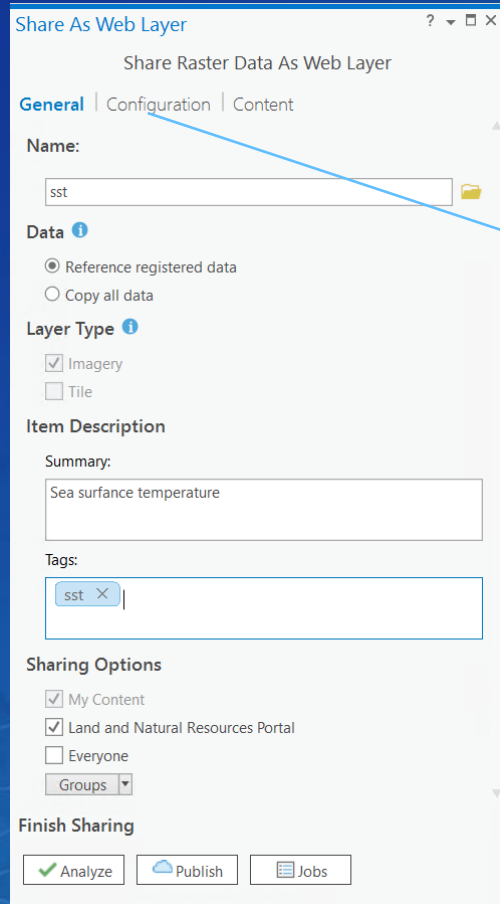


Disseminating



Sharing Scientific Data

- Mosaic Dataset ➤ **Share As Web Layer**



Share As Web Layer

Share Raster Data As Web Layer

General | Configuration | Content

Name:
sst

Data ⓘ
☒ Reference registered data
☐ Copy all data

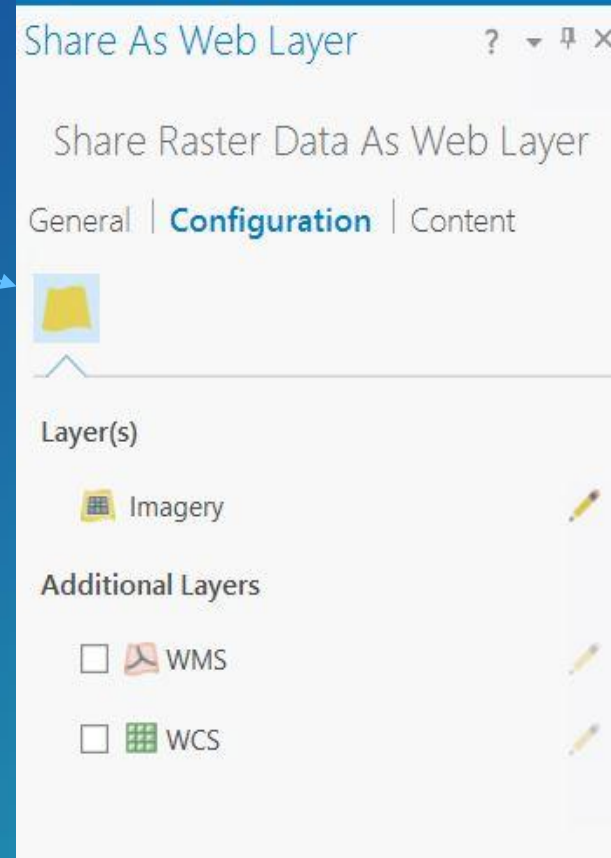
Layer Type ⓘ
☒ Imagery
☐ Tile

Item Description
Summary:
Sea surface temperature

Tags:
sst

Sharing Options
☒ My Content
☒ Land and Natural Resources Portal
☐ Everyone
Groups

Finish Sharing



Share As Web Layer

Share Raster Data As Web Layer



General | Configuration | Content

Layer(s)
Imagery

Additional Layers
☐ WMS
☐ WCS

Enable access to a dynamic representation of your information product as an image service

Consuming your services

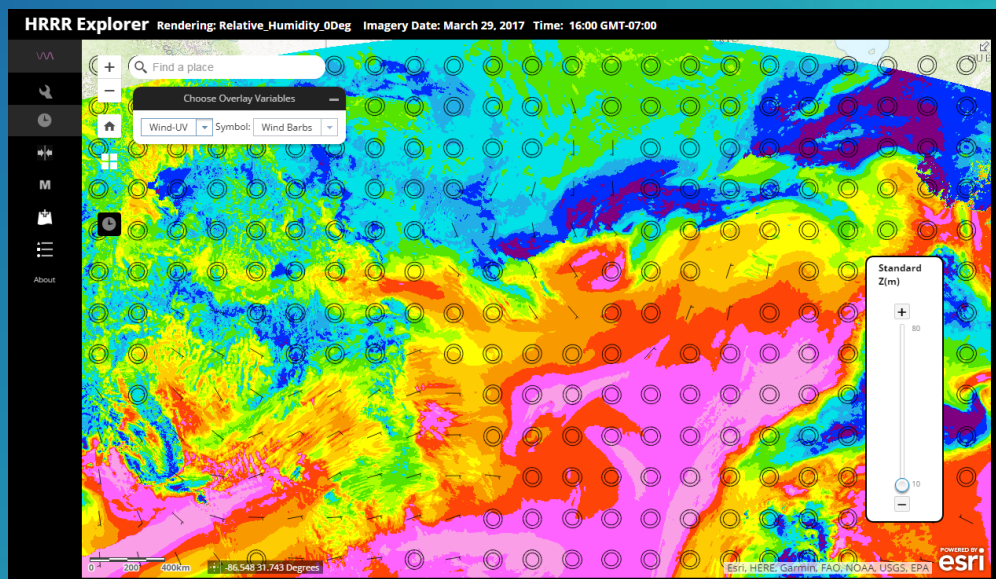
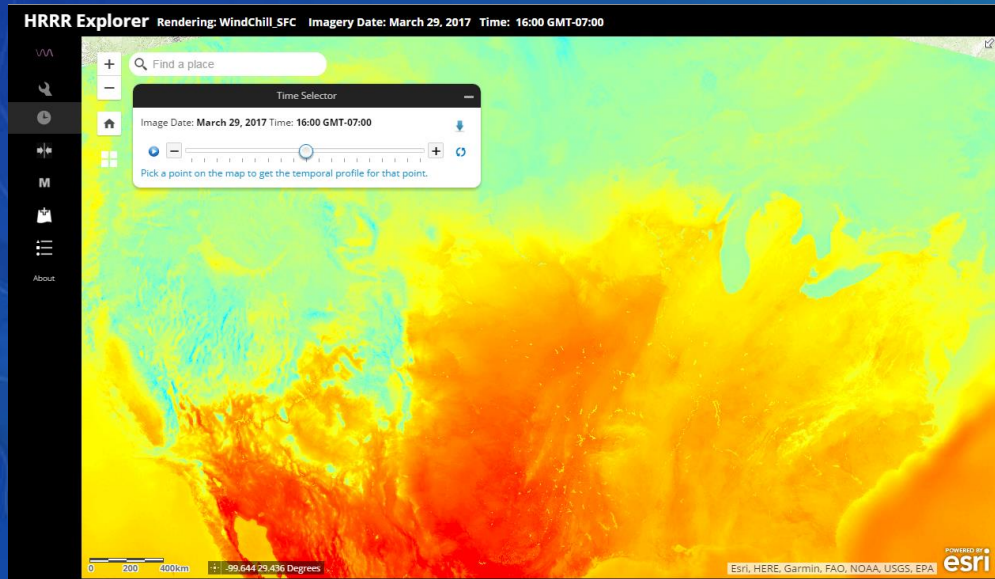
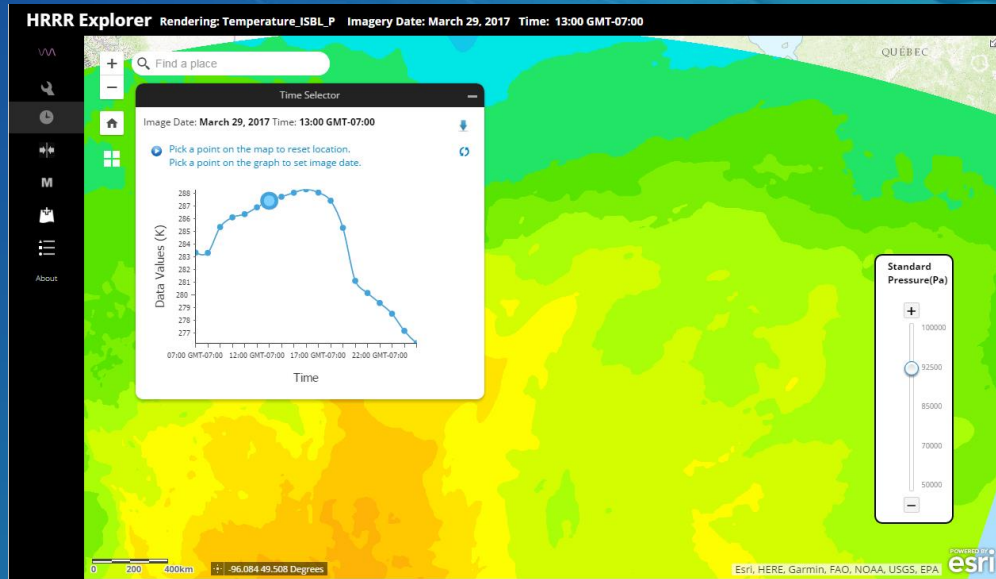
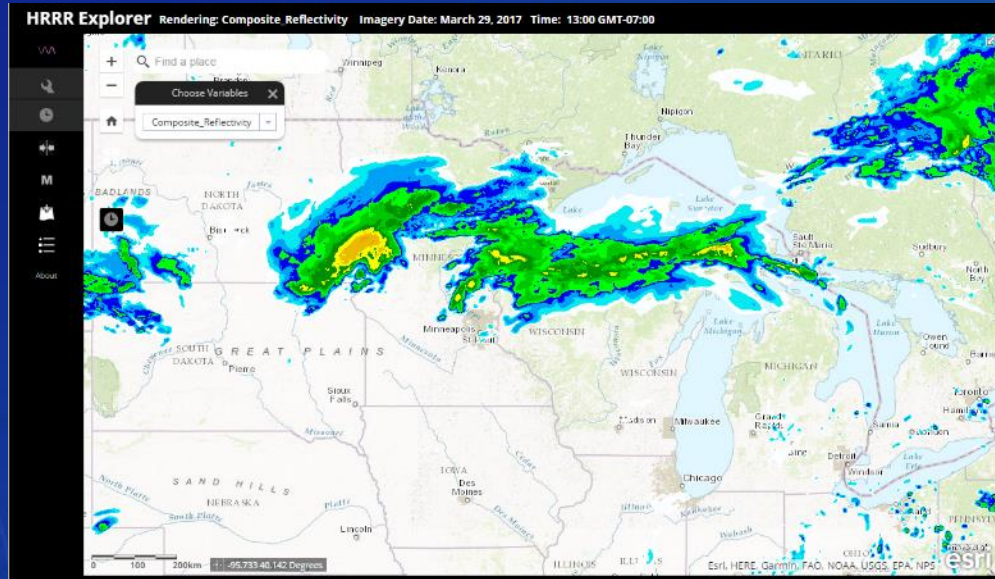
- In any ArcGIS application or any WMS client
- In a web map 
 - Identify web services driven by maps or datasets
 - Bring service layers into a web map
- In a map-based application 
 - Configurable apps
 - Story Maps
 - Web AppBuilder
 - Custom web apps using ArcGIS API for JavaScript

Demo



Publish the scientific data (Image, WCS, WMS capability)
Dynamic Scientific Computing in Web
Using Image Service layer in ArcGIS Online Map Viewer

Application(s):



Few Take Away

1. Mosaic Dataset is a robust data model that allows you to manage your large collections of scientific multidimensional data
2. Raster function(s) can help with your efficient on the fly computing that saves Time and Resources
3. Mosaic Dataset is a quick way to build the live web service
4. Make your scientific data and research output usable with repeatable workflow to your larger community

Want to learn more....please join these sessions:

Raster Analytics-Envision Center Presentation (SDCC: Envision Center 1)

When: July 12, 2017 2-3.30 PM

Image Management using Mosaic Datasets and Image Services (Room 3).

When: July 13, 2017 8:30-9:45 AM

Session 2084: Weather, Forecasting, and Radar Site-selection (Room 29 A/B)

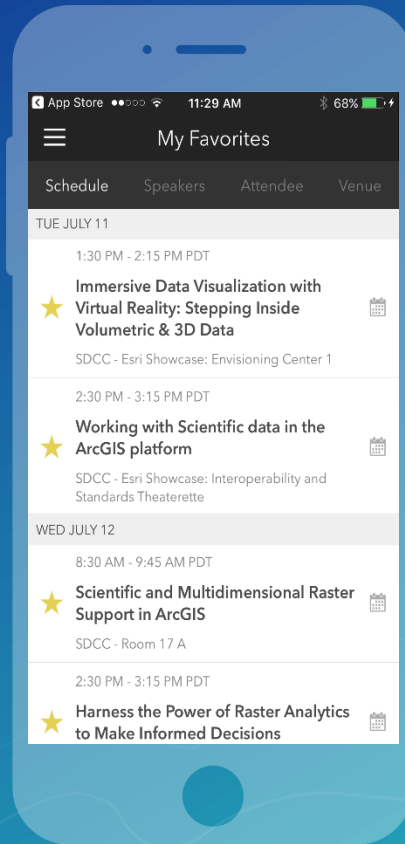
When: July 13, 2017 10-12PM.

Please Take Our Survey on the Esri Events App!

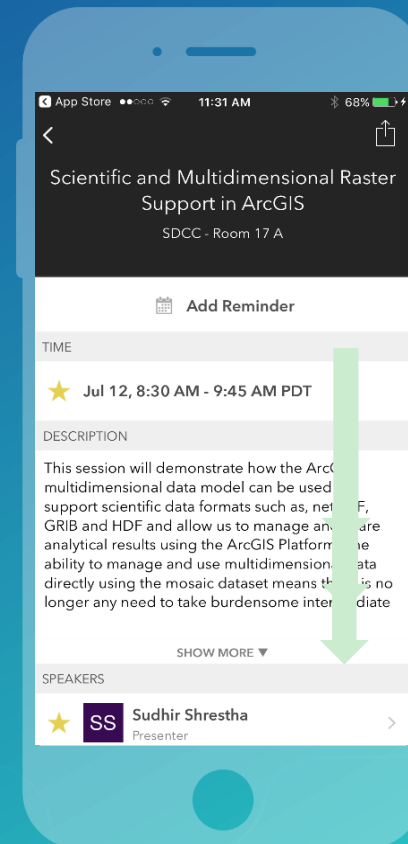
Download the Esri Events app and find your event



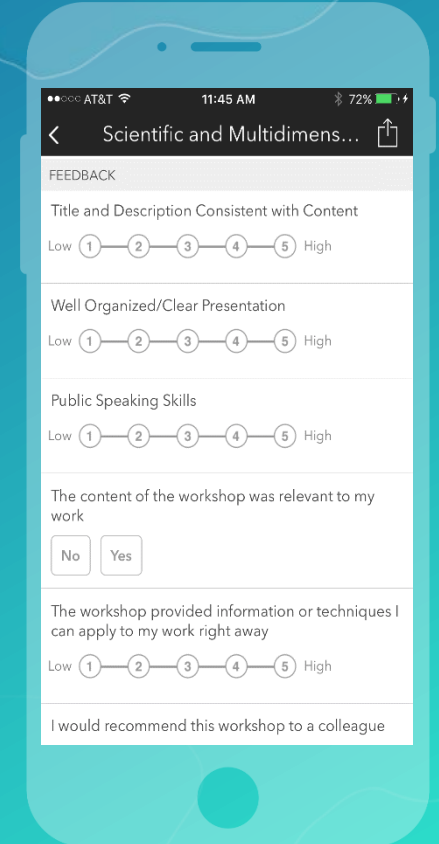
Select the session you attended



Scroll down to find the survey



Complete Answers and Select "Submit"





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OF
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