

# Unidata/ESRI Advances: Geoportal Server+THREDDS ArcGIS10+OPeNDAP

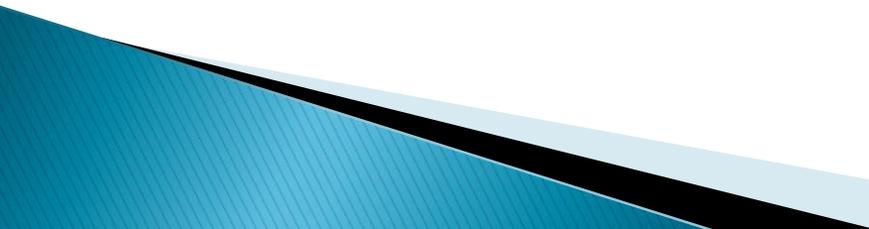
Rich Signell (USGS), Woods Hole, MA

With thanks to  
Christine White (ESRI), Christoph Gohlke (UCI),  
Curtis Price (USGS), Kevin O'Brien (NOAA)

# Why should we care about ESRI?

- ▶ Geoportal Server has been selected as a key tool by NOAA NODC, UAF, Geodata.gov=>data.gov to find data
- ▶ At the 2011 USGS Community for Data Integration Workshop, ArcGIS was polled as #1 tool used for scientific analysis (ArcGIS:65%, OpenSource GIS:12%, Python:8%, Matlab:5%, R:5%, Other:5%)
- ▶ Not just popular at USGS: 13,000 attendees last year at the Annual ESRI Users Conference!
- ▶ ESRI products commonly used by environmental planners and managers
- ▶ And we want to help Dan Sampson, Massachusetts Coastal Zone Manager

# 1. Geoportal Server & THREDDS

- ▶ Geoportal Server harvests metadata from OGC and other data services, and provides catalog services
  - ▶ Formerly \$\$\$ proprietary ESRI product, now free open source product!
  - ▶ With a small (\$2400) injection of end-of-FY11 funds to ESRI to get the ball rolling...
  - ▶ ...Geoportal Server now crawls THREDDS catalogs, reading nclSO service metadata!
- 

# Register the THREDDS resource

Geoportal

HOME SEARCH BROWSE ADMINISTRATION DOWNLOAD

[Manage](#) [Add](#)

## Register Resource

ID: *Value will be generated upon saving.*  
Resource UUID: *Value will be generated upon saving.*

Protocol Type:  URL  ArcGIS  Esri MS  OAI  WAF  CSW  THREDDS

**Host Url:**

Title:

Choose actions to be performed during synchronization:

- Update this resource description
- Copy the entire contents of this remote catalog into the local catalog
- Automatically approve newly acquired resources

How often do you want this resource so be revisited:

- Once every month
- Twice every month
- Once every week
- Once a day
- Once an hour
- Once only
- Manual synchronization only

# Confirm Synchronization

## Synchronization Report

Resource Name: [http://geoport.whoi.edu/thredds/WHOI\\_01.xml](http://geoport.whoi.edu/thredds/WHOI_01.xml)

Resource UUID: {60F7CF8B-E05C-4706-A651-7B673806594F}

Resource URL: [http://geoport.whoi.edu/thredds/WHOI\\_01.xml](http://geoport.whoi.edu/thredds/WHOI_01.xml)

Protocol: None

Report UUID: {7707A8BC-7DEC-449B-B63D-08441AA37F63}

### Summary

Parameter	Value
saveOutput	OFF
validate	OFF
publish	ON
harvestEnd	Fri Oct 21 13:21:01 PDT 2011
docsHarvested	530
docsPublished	530
docsAdded	530
docsUpdated	0
docsFailed	0
duration	4 minutes, 26 seconds, 68 milliseconds
average	119.5rec/min
Number of listed records limited to 70	

### Details

Source URI	Validation Status	Publish Status
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0007.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0007.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0008.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0008.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0014.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0014.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0015.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0015.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0070.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0070.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0072.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0072.cdf</a>	OK	OK
<a href="http://geoport.whoi.edu/thredds/iso/buoyGroupData/0111Y.cdf">http://geoport.whoi.edu/thredds/iso/buoyGroupData/0111Y.cdf</a>	OK	OK

# View Results

Geoportal

HOME

SEARCH

BROWSE

ADMINISTRATION

DOWNLOAD

## Search

DEM

Search

+ Records shown from: This Site

Click here to select different site or configure search.

### Additional Options

Clear

### WHERE

Anywhere  Intersecting  Fully within



### My Saved Searches

Results 11-20 of 22 record(s)

First

<

1

2

3

>

Last

Expand results

[Zoom To Results](#)

[Zoom To Searched Area](#)

[USGS Gulf of Maine DEM \(15 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[USGS Vineyard Sound DEM \(1 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[NOAA Coastal Relief Model DEM, Vol 10 \(3 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[NOAA Coastal Relief Model DEM, Vol 9 \(3 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[NOAA Coastal Relief Model DEM, Vol 8 \(3 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[NOAA Coastal Relief Model DEM, Vol 7 \(3 sec\)](#)

[Website](#)

[Details](#)

[Metadata](#)

[Zoom To](#)



[NOAA Coastal Relief Model DEM, Vol 6 \(3 sec\)](#)

# Drilling Down on the “Website” link

## OPeNDAP Dataset Access Form

Tested on Netscape 4.61 and Internet Explorer 5.00.

### Action:

### Data URL:

### Global Attributes:

```
DATA_ORIGIN: BUOY
MOORING: 0007
DESCRIPT:
start_time: 1962-10-04 14:32:00Z
stop_time: 1962-10-05 18:11:57Z
```

### Variables: lon: Array of 32 bit Reals [lon = 0..0]

lon:

```
long_name: Longitude
units: degree_east
FORTRAN_format: f10.
standard_name: longitude
```

### lat: Array of 32 bit Reals [lat = 0..0]

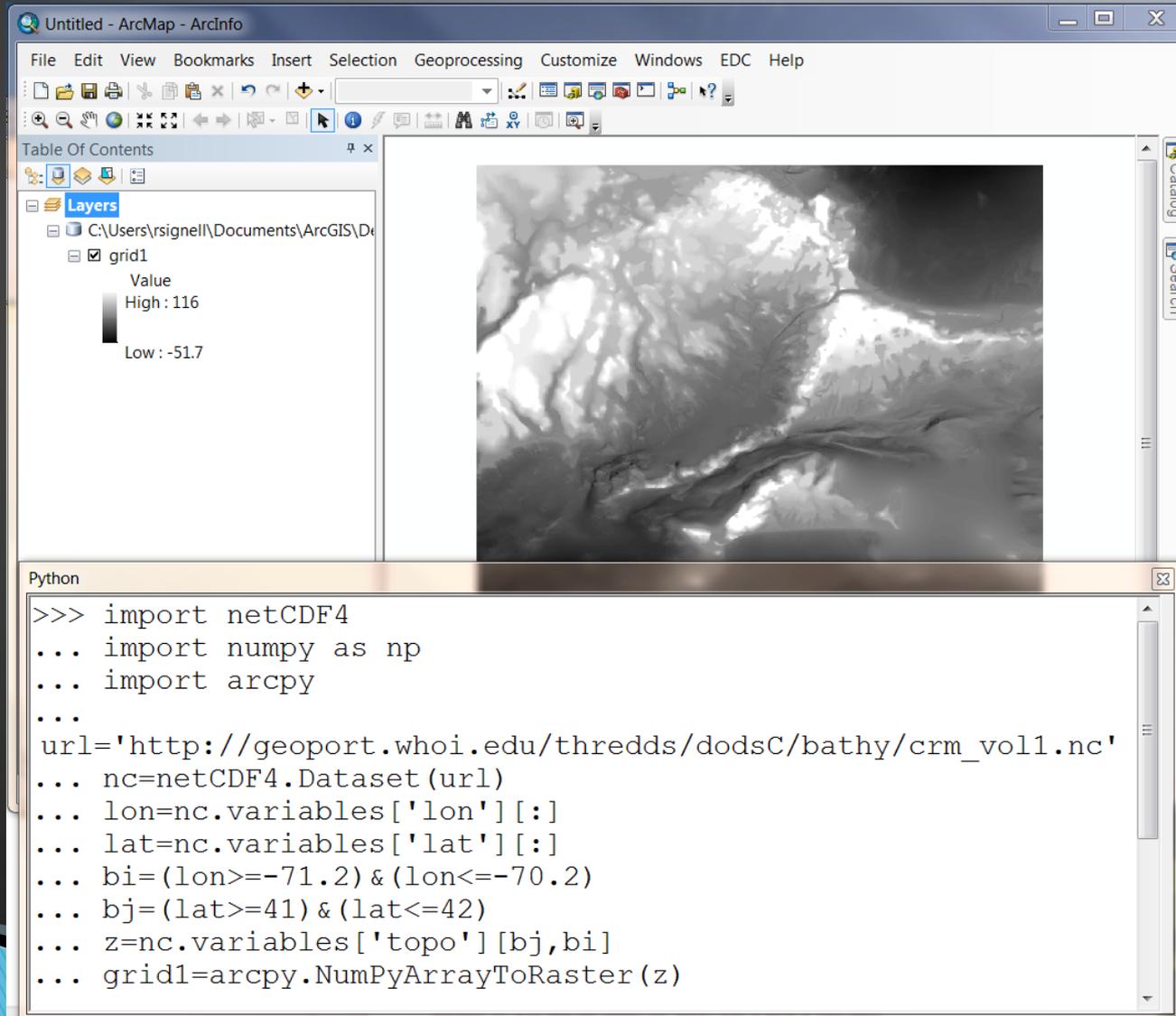
lat:

```
long_name: Latitude
FORTRAN_format: f9.5
units: degree_north
standard_name: latitude
```

## 2. OPeNDAP => ArcGIS10.0

- ▶ ArcGIS10.0 has strong Python integration
- ▶ There are several Python OPeNDAP modules
- ▶ PyDAP? NO!
- ▶ NetCDF4–Python? YES! Common interface for NetCDF files and OPeNDAP datasets!
- ▶ But a problem... NetCDF4–Python had not been built for Windows
- ▶ Python community's Christoph Gohlke (UCI) to the rescue!!! (Python 2.6/2.7/3.0 Win32/Win64 and special ArcGIS10.0 and ArcGIS10.1 builds)

# OPeNDAP GRID => ArcGIS Raster



The screenshot displays the ArcMap interface. The main window shows a grayscale raster grid visualization of a terrain. The 'Table Of Contents' pane on the left lists a layer named 'grid1' with a value range from -51.7 to 116. The 'Python' console at the bottom contains the following code:

```
>>> import netCDF4
... import numpy as np
... import arcpy
...
url='http://geoport.whoi.edu/thredds/dodsC/bathy/crm_vol1.nc'
... nc=netCDF4.Dataset(url)
... lon=nc.variables['lon'][:]
... lat=nc.variables['lat'][:]
... bi=(lon>=-71.2)&(lon<=-70.2)
... bj=(lat>=41)&(lat<=42)
... z=nc.variables['topo'][bj,bi]
... grid1=arcpy.NumPyArrayToRaster(z)
```

# OPeNDAP UGRID => ArcGIS Shapefile

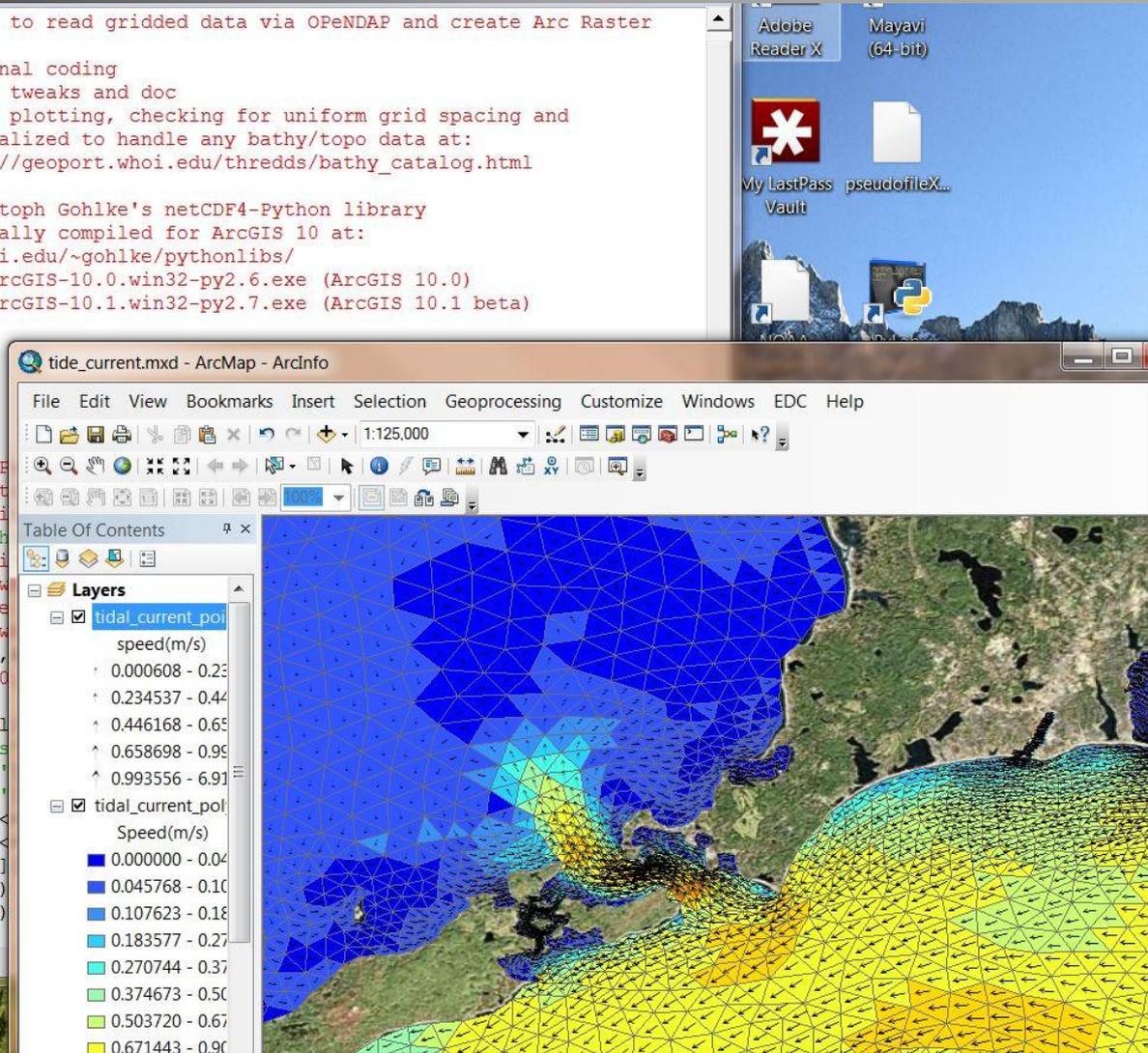
```
# NetCDF4-Python test to read gridded data via OPeNDAP and create Arc Raster
#
# Rich Signell, original coding
# Curtis Price, small tweaks and doc
# Rich Signell, added plotting, checking for uniform grid spacing and
# generalized to handle any bathy/topo data at:
# http://geoport.whoi.edu/thredds/bathy_catalog.html
#
# Prerequisite: Christoph Gohlke's netCDF4-Python library
# specially compiled for ArcGIS 10 at:
# http://www.lfd.uci.edu/~gohlke/pythonlibs/
# netCDF4-0.9.7-ArcGIS-10.0.win32-py2.6.exe (ArcGIS 10.0)
# netCDF4-0.9.7-ArcGIS-10.1.win32-py2.7.exe (ArcGIS 10.1 beta)
```

```
import os
import netCDF4
import numpy as np
import arcpy
```

```
# extract data from OPeNDAP
# url='c:/rps/python/t
# Test Latitude coordi
url='http://geoport.wh
# Test Latitude coordi
#url='http://geoport.w
# Test failure because
#url='http://geoport.w
box = [-71.4, 41, -70.2,
#box=[-71.0, 41.0, -67.0
```

```
nc=netCDF4.Dataset(url
print "Source name: %s
lon=nc.variables['lon'
lat=nc.variables['lat'
bi=(lon>=box[0]) & (lon<
bj=(lat>=box[1]) & (lat<
z=nc.variables['topo']
lonmin=np.min(lon[bi])
latmin=np.min(lat[bj])
dx=np.diff(lon)
```

Shortcut Firefox



# Leveraging of Unidata technology in other applications is the future, made easier by:

- ▶ NetCDF Java library development => Matlab
  - ▶ NetCDF C library development => Python, R
  - ▶ Convergence on a few OS: Redhat/CentOS, Ubuntu, Mac, Windows
  - ▶ Web services (e.g. OPeNDAP, ncISO)
- 

# What does the advances mean?

- ▶ It means that we can find THREDDS (and other) data easier, and can integrate THREDDS data into Geodata.gov => Data.gov
- ▶ It means ArcGIS folks can “help themselves” to the world of OPeNDAP data
- ▶ Dan Sampson, coastal zone manager in Massachusetts, working in ArcGIS, can locate relevant THREDDS data, and create his own products from OPeNDAP Data