Live, Remote Access to Dynamic Weather Forecasts from Geospatial Clients

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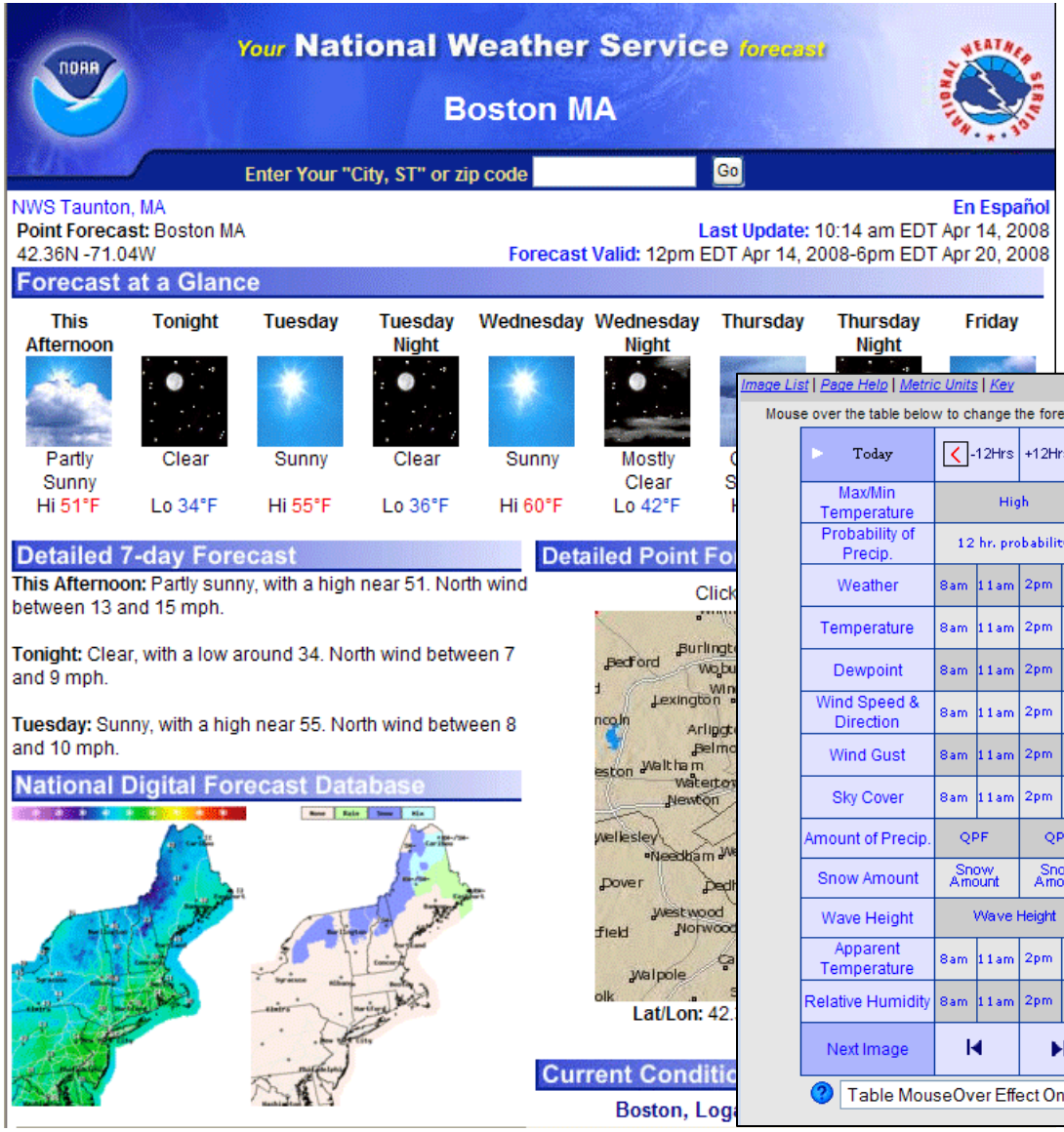
The Pennsylvania State University

Association of American Geographers
Annual Meeting – Boston, Massachusetts
April 18, 2008

Overview

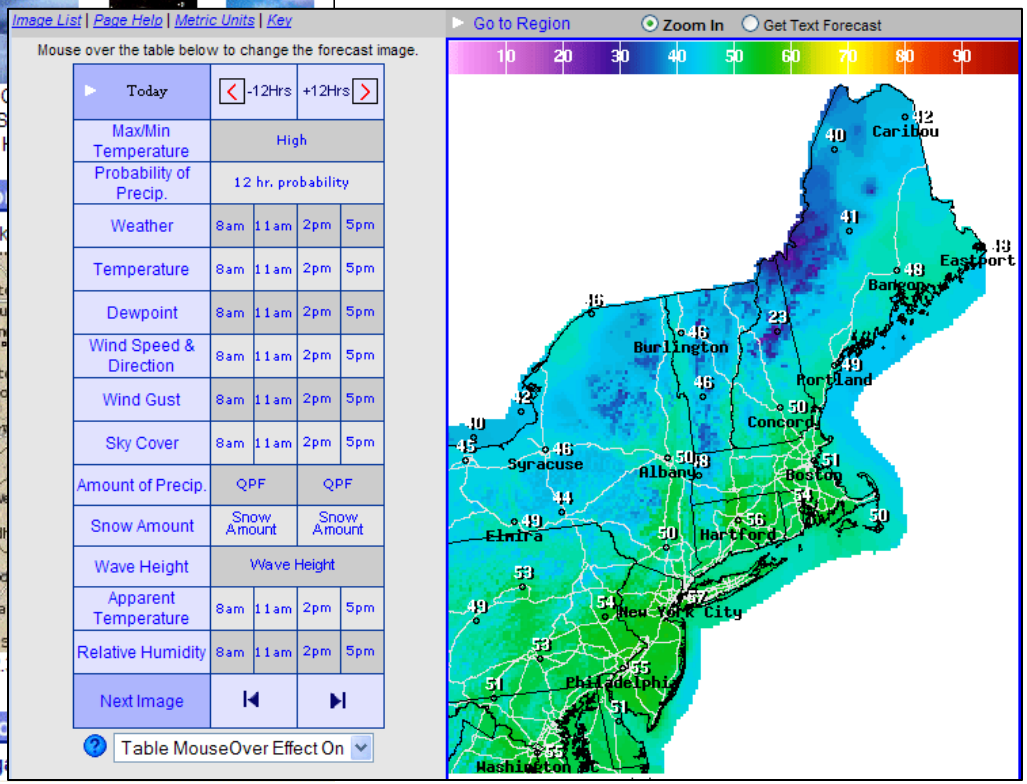
- Description of Data
- Description of problem
  - Real-time weather for GIS Clients?
- Architecture of solution
  - Access interface
  - Data update procedure
  - Data structure & performance
- Conclusions & Future Work

National Digital Forecast Database



www.weather.gov/ndfd

Online Viewing
FTP Download



National Digital Forecast Database

Elements	No. of Grids	Projections
Maximum Temperature	7	Every 24 hours, out to 168 hours
Minimum Temperature	7	Every 24 hours, out to 168 hours
12-hour Probability of Precipitation (PoP12)	14	Every 12 hours, out to 168 hours
Sky Cover	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours
Temperature	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours
Dew Point	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours
Wind Direction	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours
Wind Speed	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours
Weather	40	Every 3 hours out to 72 hours; every 6 hours out to 168 hours

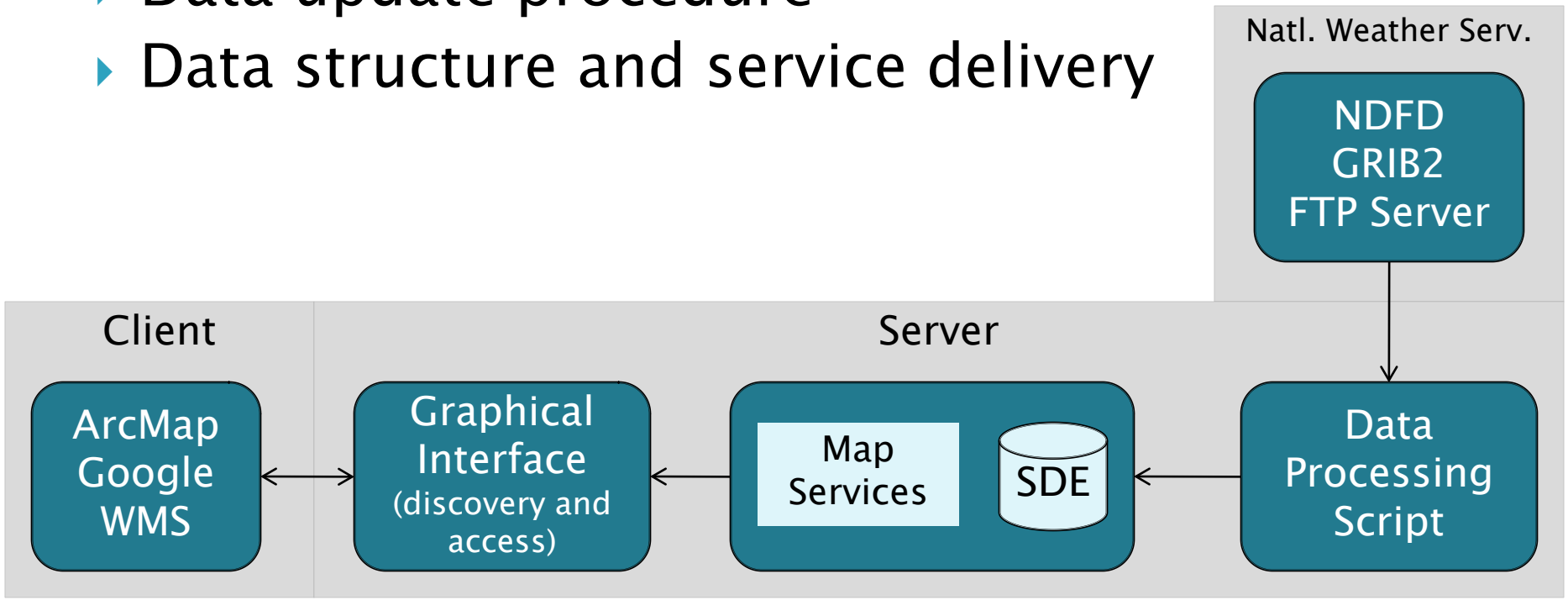
- Over 400 individual data grids
- NDFD updates every hour

Description of Problem

- National Digital Forecast Database (NDFD)
  - Non-GIS compatible format
    - Gridded Binary (GRIB2)
  - Hundreds of layers updated hourly
    - Temp, precip, wind, snow, dew point, etc.
  - Lengthly process to convert to GIS ShapeFile
    - DeGRIB software needed to convert every layer
- How can we facilitate access to NDFD data?

Architecture of Solution

- Client access interface (GUI)
- Data update procedure
- Data structure and service delivery



Access Interface

- Extension of clearinghouse functionality
  - Pennsylvania Spatial Data Access (PASDA)
  - Seamless, unified interface to spatial data
- Data search options
  - Keyword, data provider, data theme
- Data access options
  - Download, ArcMap, Google Earth, WMS, Web preview

Data Search Go

PASDA

PENNSYLVANIA SPATIAL DATA ACCESS

The Pennsylvania Geospatial Data Clearinghouse

Data Shortcuts


Aerial Photography


Topographic Maps


State-wide Data


Browse FTP

Download New Data

PAMAP Imagery
Imagery now available in Mapservices and for download **Quick Link>>**

DVRPC Imagery
Imagery now available in Mapservices and for download
Quick Link>>

Pennsylvania Spatial Data Access (PASDA) is the official public access geospatial information clearinghouse for the **Commonwealth of Pennsylvania** and has served for twelve years as Pennsylvania's node on the **National Spatial Data Infrastructure**, **Geospatial One-Stop**, and the **National Biological Information Infrastructure**.

PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, **Geospatial Technologies Office** and the **Penn State Institutes of Energy and the Environment** of the **Pennsylvania State University**. Funding and support is provided by the Pennsylvania Office for Information Technology, **Geospatial Technologies Office**. In addition, PASDA also receives substantial support from the Pennsylvania State University.

Upcoming Events

DCNR PAMAP LiDAR Workshop
Penn State Harrisburg
Capitol Union Building
May 13, 2008

Pennsylvania GIS Conference 2008
Radisson Penn Harris Hotel, Camp Hill, PA
May 14-15, 2008

2008 ESRI International User Conference (ESRI UC)
San Diego Convention Center, San Diego, California
August 4-8, 2008

PASDA

PENNSYLVANIA SPATIAL DATA ACCESS

The Pennsylvania Geospatial Data Clearinghouse

Download Data

The Data Access Wizard combines a search engine with powerful web-based geoprocessing and visualization capabilities to provide users with improved access to PASDA's data resources.

Data Access Wizard

Search Options:

View Your Data Cart

Search by Keyword(s):

AND OR Submit

Search by Theme:

Submit

Search by Data Provider:

Submit

Search by County:

Submit

OR you can browse **Online MapServices** or browse **All Data**

Pennsylvania Spatial Data Access
Penn State Institutes of Energy and the Environment
E-Mail: pasda@psu.edu

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PASDA

PENNSYLVANIA SPATIAL DATA ACCESS

The Pennsylvania Geospatial Data Clearinghouse

Filter Results

22 Total Results

View All

Filter by Category

- Addresses & Places (0)
- Atmosphere (22)
- Biology (0)
- Boundaries (0)
- Economy (0)
- Elevation (0)
- Environ. Resources (21)
- Farming (0)
- Geology(0)
- Health (0)
- Imagery & Base Maps (0)
- Inland Waters (0)
- Man-Made Structures (0)
- Military Intel. (0)
- Oceans (0)
- Planning & Landuse (0)
- Society & Culture (0)
- Transportation (0)
- Utilities (0)

Filter by Access Type

Search Results

View Your Data Cart

Return to Search Page

FTP Download -
Data Applications & Viewers -
Add To Your Data Cart For Download -
MapServices (ArcMap/GoogleEarth/WMS) -

Title	Originator	Date		
Latest National Infrared Satellite Image	National Weather Service (NOAA/NWS)	2006		
Latest National Radar Image	National Weather Service (NOAA/NWS)	2006		
Latest National Visible Satellite Image	National Weather Service (NOAA/NWS)	2006		
National Average Ozone Concentration 08="8 hr	National Weather Service (NOAA/NWS)	2007		
National Apparent Temperature Forecasts	National Weather Service (NOAA/NWS)	2006		
National Average Ozone Concentration 01="1 hr	National Weather Service (NOAA/NWS)	2007		
National Average vertical column smoke from fires Forecasts	National Weather Service (NOAA/NWS)	2007		
National Dew Point Temperature Forecasts	National Weather Service (NOAA/NWS)	2006		
National Maximum Temperature Forecasts	National Weather Service (NOAA/NWS)	2006		

Map Service

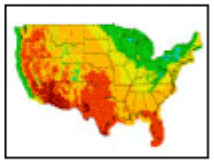
The links on this page provide access to the dataset via a dynamic MapService.

This allows you to use the data without the need to download anything.

You may add the data to ArcMap, view it in Google Earth, or connect using a WMS client.

Map Service Details

Title: National Maximum Temperature Forecasts
Originator: National Weather Service (NOAA/NWS)
Date: 2006



Preview Data

View in Google Earth

WMS Service:

Map Server

URL: http://gis1.pasda.psu.edu/servlet/com.esri.ogc.wms.WMSServlet?Servicename=National_MaximumTemperature_Forecasts

Add to ArcMap:

ArcIMS Image Service:

Click Here to Add Data

Click Here for Technical Support

Server Name: gis1.pasda.psu.edu

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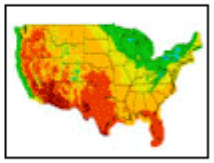

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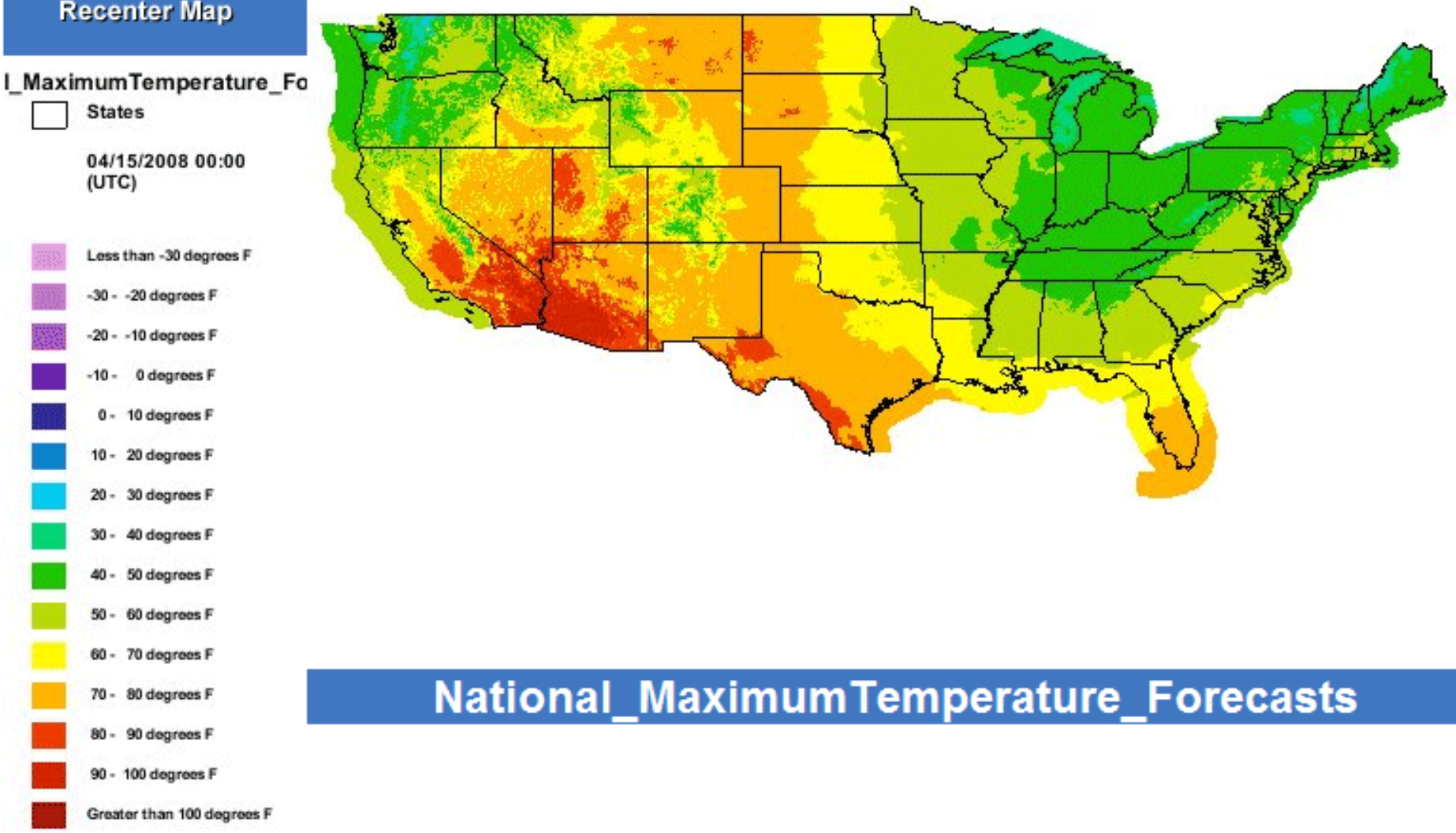
Data Preview

Zoom In
Zoom Out
Full Extent
Recenter Map



National_MaximumTemperature_Forecasts

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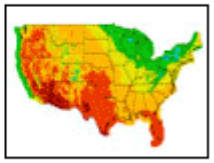

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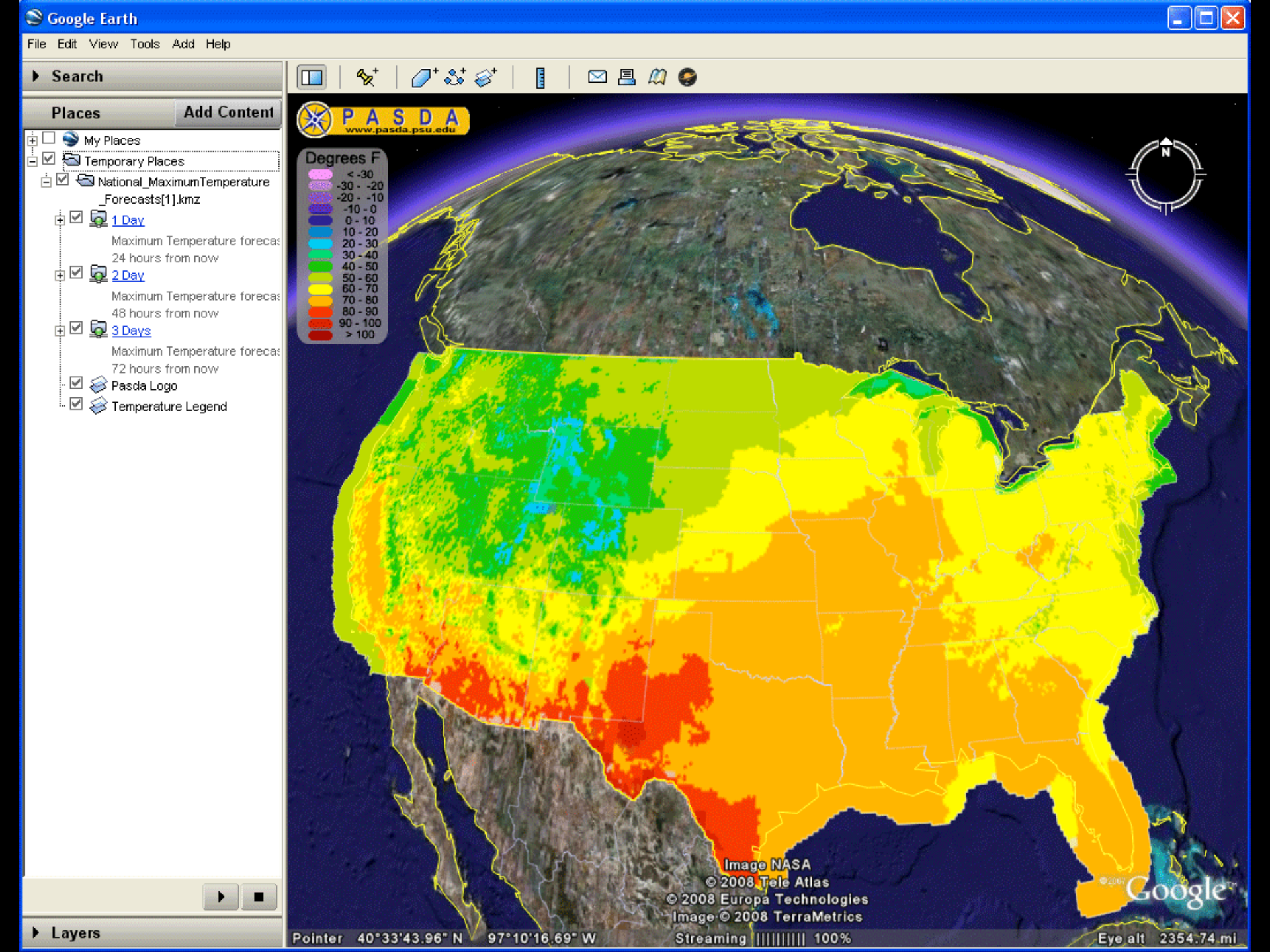
Google Earth
File Edit View Tools Add Help
Search
Places
Add Content
My Places
Temporary Places
National_MaximumTemperature
_Forecasts[1].kmz
1 Day
Maximum Temperature forecas
24 hours from now
2 Day
Maximum Temperature forecas
48 hours from now
3 Days
Maximum Temperature forecas
72 hours from now
Pasda Logo
Temperature Legend
Layers
PASDA
www.pasda.psu.edu
Degrees F
< -30
-30 - -20
-20 - -10
-10 - 0
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100
> 100
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Image NASA
© 2008 Tele Atlas
© 2008 Europa Technologies
Image © 2008 TerraMetrics
Google
Pointer 40°33'43.96" N 97°10'16.69" W
Streaming 100%
Eye alt 2354.74 mi

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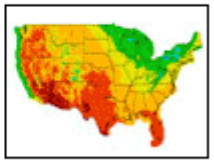

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Add to ArcMap:

~~**ArcIMS Image Service:**~~

Click Here to Add Data

~~Click Here for Technical Support~~

Server Name: gis1.pasda.psu.edu

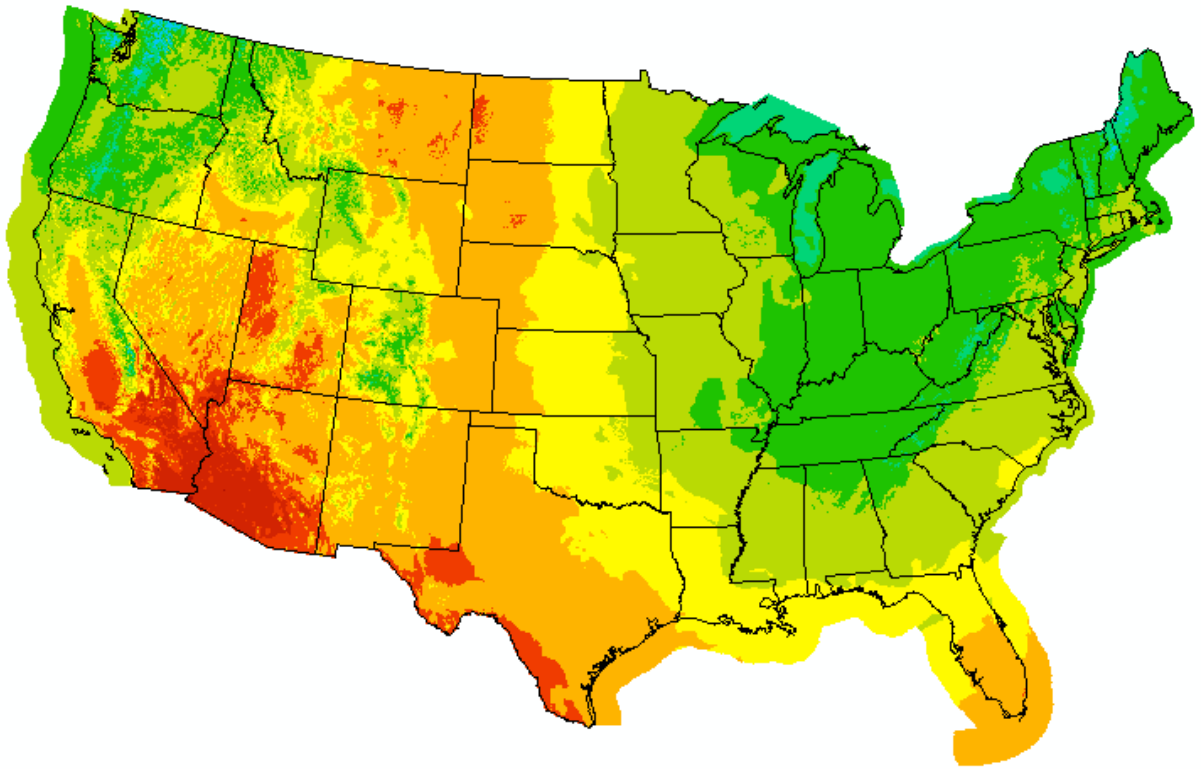
Untitled - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:25,357,109

Layers

- National_MaximumTemperature_Forecasts
  - States
  - 04/15/2008 00:00 (UTC)
    - SDE.SDE.national_MAXT01.MAXT
    - Less than -30 degrees F
    - -30 - -20 degrees F
    - -20 - -10 degrees F
    - -10 - 0 degrees F
    - 0 - 10 degrees F
    - 10 - 20 degrees F
    - 20 - 30 degrees F
    - 30 - 40 degrees F
    - 40 - 50 degrees F
    - 50 - 60 degrees F
    - 60 - 70 degrees F
    - 70 - 80 degrees F
    - 80 - 90 degrees F
    - 90 - 100 degrees F
    - Greater than 100 degrees F
  - 04/16/2008 00:00 (UTC)
  - 04/17/2008 00:00 (UTC)
  - 04/19/2008 00:00 (UTC)
  - 04/18/2008 00:00 (UTC)
  - 04/19/2008 00:00 (UTC)
  - 04/20/2008 00:00 (UTC)
  - 04/21/2008 00:00 (UTC)



Display Source Selection

-1365462.721 2432285.838 Meters

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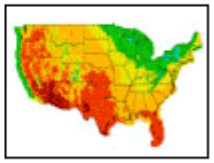

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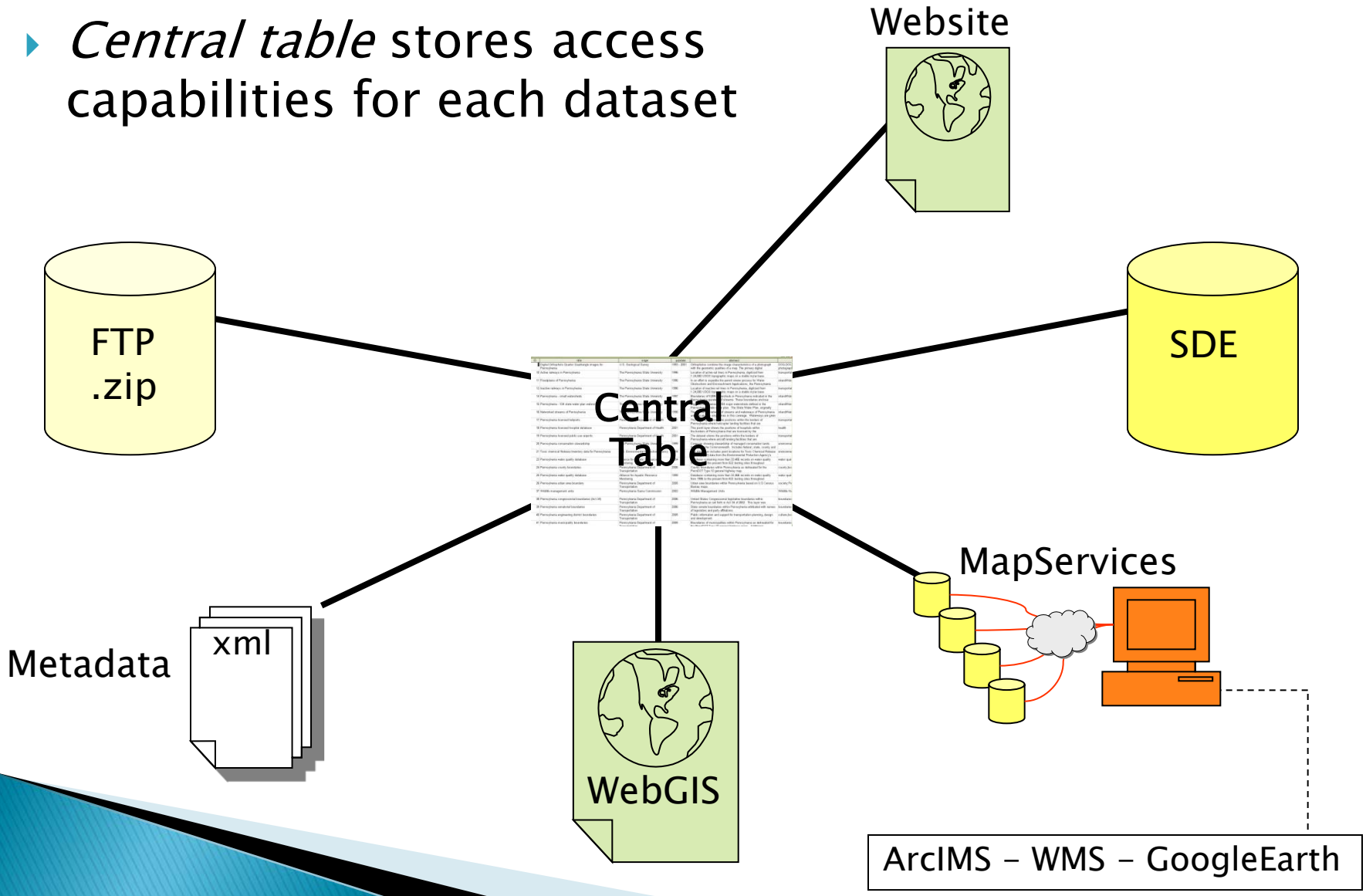
Access Interface Architecture

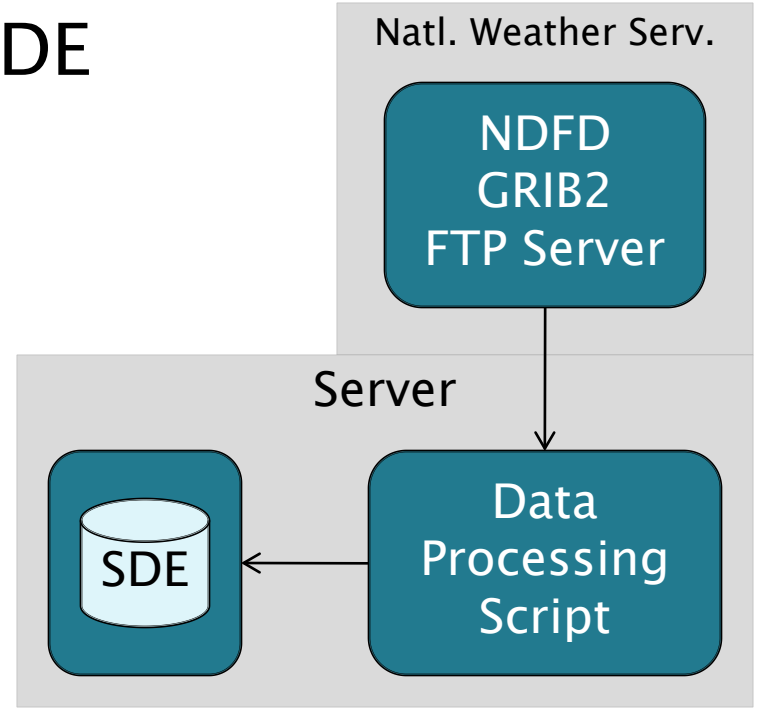
- *Central table* stores access capabilities for each dataset



Data Update Procedure (part 1)

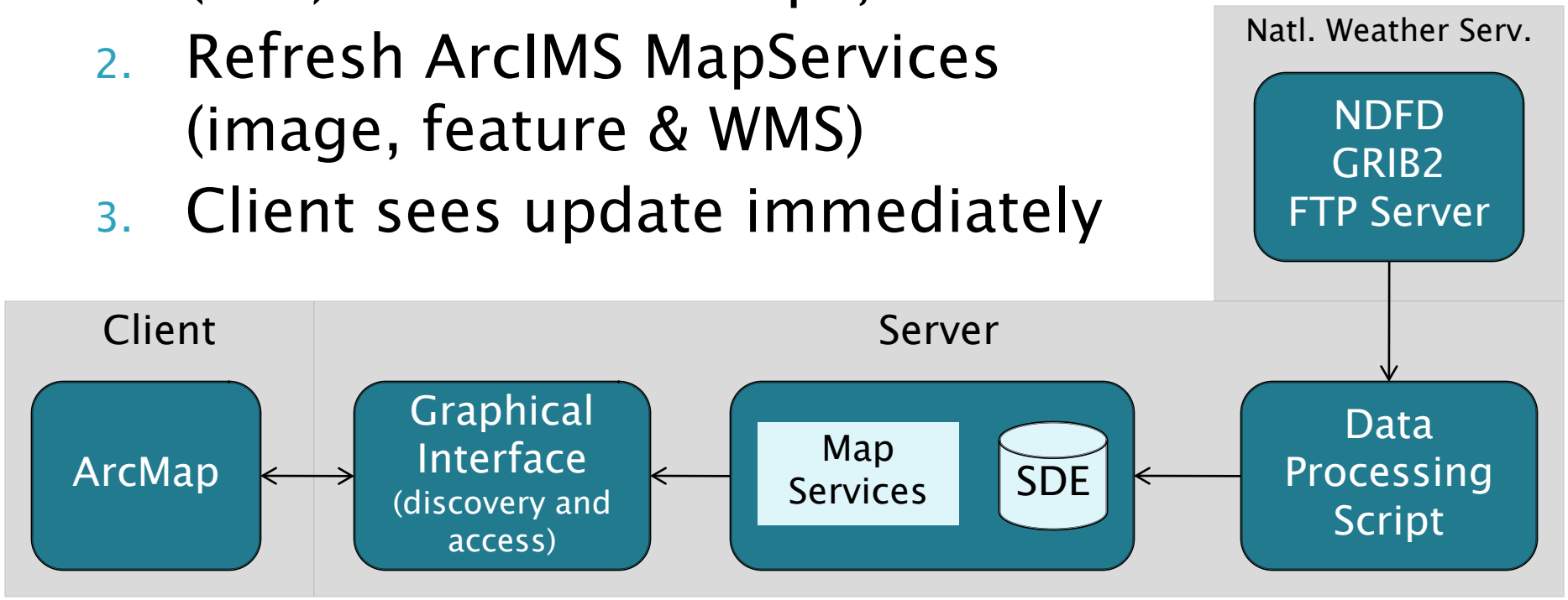
1. Download NDFD data via FTP every 1-3 hours
2. Checked data for completeness
3. Convert GRIB2 to ShapeFiles
4. Load Shapefiles into an SDE database

Entire process is automated and requires no manual intervention

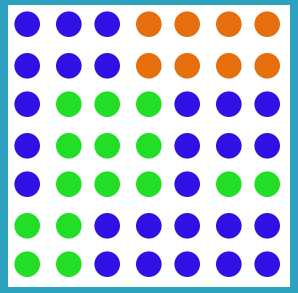
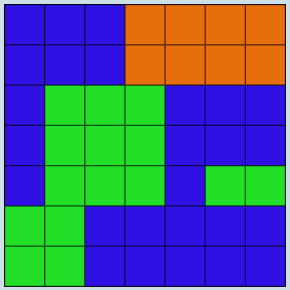
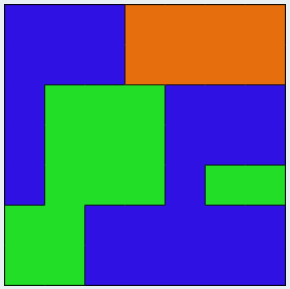


Data Update Procedure (part 2)

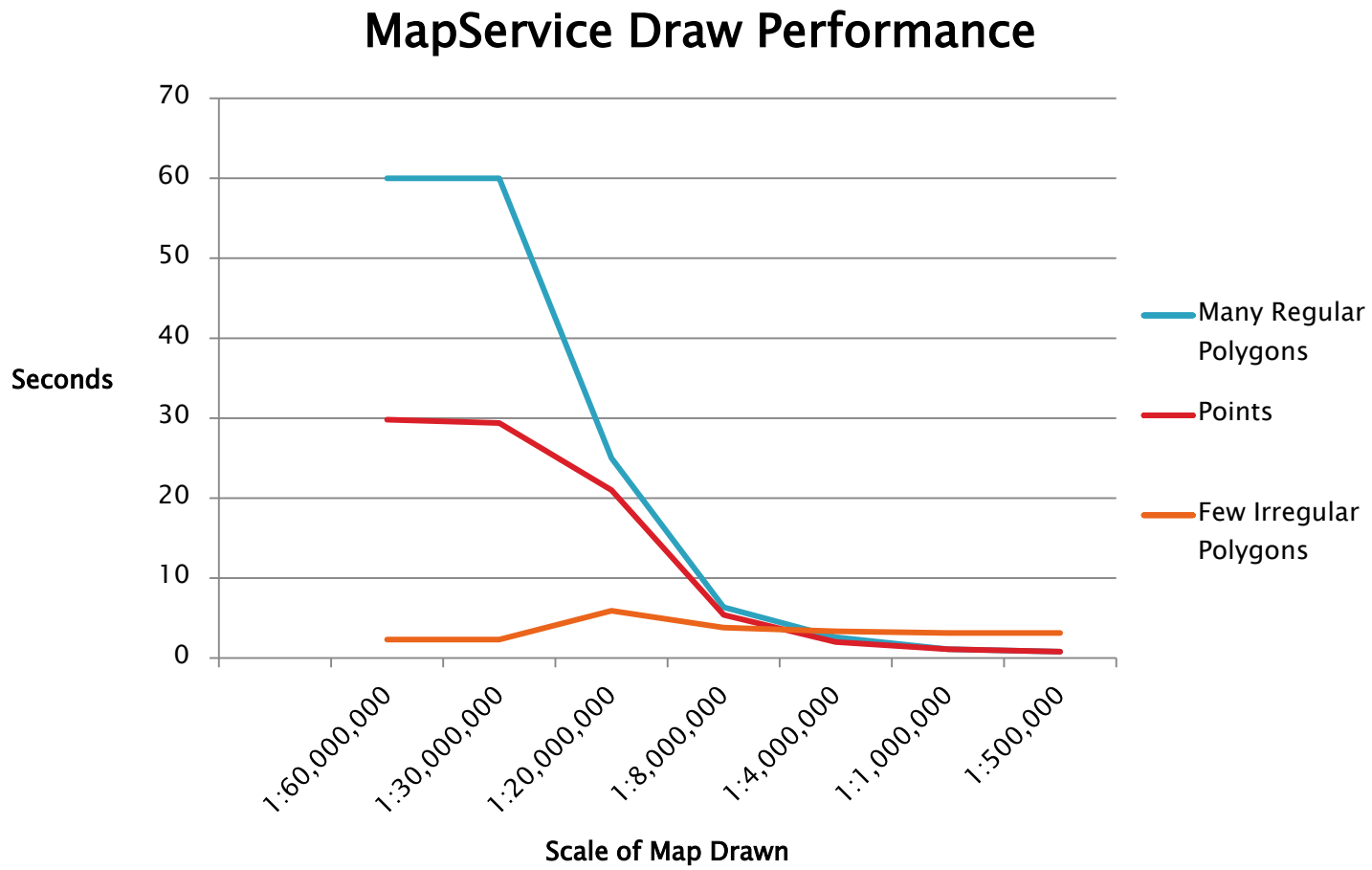
1. Update MapService config. Files (.axl) with time stamps, etc.
2. Refresh ArcIMS MapServices (image, feature & WMS)
3. Client sees update immediately



DeGRIB ShapeFile Options

Points	GRIB2 grid cells are represented as individual, regularly spaced points	
Many Regular Polygons	GRIB2 grid cells are represented as individual, regularly spaced rectangular polygons	
Fewer Irregular Polygons	Adjacent GRIB2 grid cells that share the same value are merged into irregularly shaped polygons	

Data Structure Performance



Conclusions & Future Work

- GIS users can easily consume near-real time NDFD weather forecast data
  - Automated data processing
  - Automated Internet MapService deployment
  - Seamless access from GIS clients w/ no downloads
- Data structure consisting of few irregular polygons optimizes client performance

- Test the performance impact of upgraded hardware
- Test the performance impact and capabilities of ArcGIS Server

Thank you

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