

Metacat Spatial Option

Extending Metacat for
Geographic Queries and Visualization
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Spatial properties in EML

EML can define a document's geographic coverage

```
<geographicCoverage scope="document">
  <geographicDescription>
    Serengeti National Park
  </geographicDescription>
  <boundingCoordinates>
    <westBoundingCoordinate>28.75</westBoundingCoordinate>
    <eastBoundingCoordinate>40.375</eastBoundingCoordinate>
    <northBoundingCoordinate>-3.75</northBoundingCoordinate>
    <southBoundingCoordinate>-10.875</southBoundingCoordinate>
  </boundingCoordinates>
</geographicCoverage>
```


Input from Morpho

Enter a description of the geographic coverage. Enter a general description of the geographic area in which the data were collected. This can be a simple place name (e.g., Santa Barbara) or a fuller description.

Description:

Set the geographic coordinates which bound the coverage: Latitude and longitude values are used to create a 'bounding box' containing the region of interest. Drag or click on the map and then edit the text boxes if necessary. [Default entries are in fractional degrees. To enter in degrees/minutes/seconds, simply type a space between the degrees, minutes, and seconds values]

Bounding Box:



Box Tool Point Tool

Named Regions:

- ACM Wilderness Field Station
- Adirondack Ecological Center
- Alice L. Kibbe Life Science Station
- Angelo Coast Range Reserve UCNRS
- Anheuser Busch Coastal Research Center
- Ano Nuevo Island Reserve UCNRS
- Appleton-Whittell Research Ranch

Click to add current selection to list.

Click to remove selected region from list.

Click to sort the list of locations.

Objectives

- Create a web-based interactive map to visualize the spatial distribution of the metadata documents stored in the metacat database.
- Provide a spatial query mechanism.

Fundamental Challenges

1. Pulling the geographic data out of the metacat database with xpath queries takes a long time.
2. Need to render the geographic coverages into a web-sized map image.
3. Need a client-side javascript application to provide interactivity.

“Harvesting” spatial data

Query MetaCat for spatial documents and create a *spatial data cache*

Use *geotools* (a Java GIS toolkit) to convert geographic coverages of documents into standard format (ESRI shapefiles)

Spatial cache is synced with metacat on every insert, update or delete.

Rendering Spatial Data

Geoserver allows us to take the shapefiles and generate map images.

Spatial data has no built in styling rules. To get a nice cartographic image, you use a **Styled Layer Descriptor (SLD)**.

```
...  
<Stroke>  
  <CssParameter name="stroke">  
    <ogc:Literal>#FFFFFF</ogc:Literal>  
  </CssParameter>  
  <CssParameter name="stroke-width">  
    <ogc:Literal>1.2</ogc:Literal>  
  </CssParameter>  
</Stroke>  
....
```

WMS

Geoserver uses the Web Mapping Services (WMS) standard for requesting images.

```
http://localhost/knb/wms?VERSION=1.1.1&REQUEST=GetMap&SERVICE=WMS  
&LAYERS=world_borders,data_points&SRS=EPSG:4326  
&BBOX=-180,-90,180,90&WIDTH=720&HEIGHT=360&FORMAT=image/gif  
&STYLES=&TRANSPARENT=TRUE
```



Spatial Queries

- “Which documents relate to a given geographic region?”
- Custom geotools-based solution, built into metacat servlet.

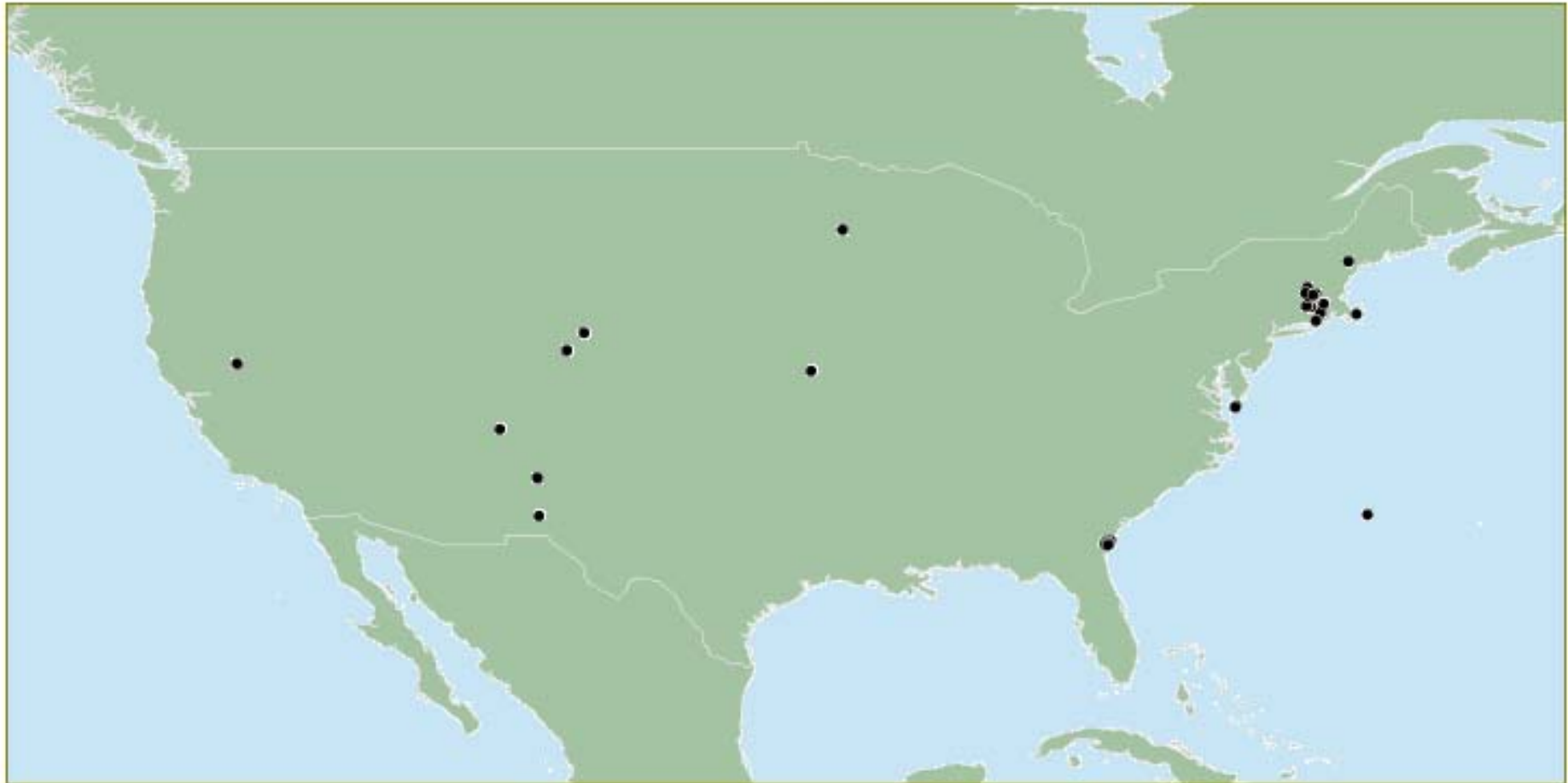
```
http://localhost/knb/metacat?action=spatial_query  
&xmin=-120&ymin=-30&xmax=-90&ymax=50&skin=nceas
```

Mapbuilder Javascript Client

- AJAX, XSLT, Model-View-Controller design pattern.
- Manages WMS requests, Spatial Queries
- Provides interactivity
- Configured through XML documents
- Only works on Firefox and IE

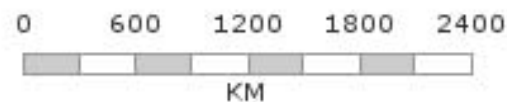
Put it all together

Data Catalog Map



- Dataset Points
- Dataset Bounds
- Satellite image
- Countries

lon: lat:



Select a Location ▼

[View in Google Earth \(kml\)](#)

Demo

- Interactive Map
- Adding / Updating / Deleting Docs
- Alternate clients:
 - KML (Google Earth)
 - WMS (Quantum GIS, Any WMS Client)

Future work

- Access, skin and query constraints
- Extending to support schemas beyond EML
- Admin interface
- Pulling in the actual spatial datasets
- OpenLayers interface (alt to Mapbuilder)

Architecture

Metacat Spatial

