

GeoQuery Tool to Pose Spatial Queries over the Web

<http://geoquery.cs.jmu.edu/geoquery/>

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Querying Linked Data (RDF)

Information is Stored as Triples

Subject (Karmy's Airport)
Predicate is a type of
Object airport

Subject (Karmy's Airport)
Predicate has label
Object "Karmy's Airport"
etc.

RDF is queried using the W3C query language called SPARQL. GeoSPARQL adds spatial operators.

Uniform Resource Identifiers (URIs)

Subject <http://cegis.usgs.gov/rdf/gnis/Features/1498860>
Predicate <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
Object <http://cegis.usgs.gov/rdf/trans/airportPoint>

Subject <http://cegis.usgs.gov/rdf/gnis/Features/1498860>
Predicate <http://www.w3.org/2000/01/rdf-schema#label>
Object “Karmy’s Airport”
etc.

GeoSPARQL

- Query language for geospatial RDF systems
- Specification approved by Open Geospatial Consortium (OGC) Technical Committee

```
SELECT ?m                                (? Denotes a variable)
WHERE {
    ?p  a  ex:Park;
        geo:hasGeometry ?pgeo .
    ?m  a  ex:Monument;
        geo:hasGeometry ?mgeo .
    ?mgeo geo:sfWithin ?pgeo .
}
```

GeoSPARQL queries
allow spatial processing
and indexing over
Semantic Web datasets
(Dave Kolas)

*Find all Monuments
within Parks.*

Developed by Professor Ralph Grove at James Madison University with funds from our NSF INTEROP Grant (idea from Professor James Wilson, JMU)

GeoQuery Project - Mozilla Firefox

File Edit View History Bookmarks Tools Help

GeoQuery Project

http://geoquery.cs.jmu.edu/geoquery/

geoquery.cs.jmu.edu/geoquery/

GeoSparql Query Tool

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GeoQuery V1.1
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GeoQuery is an interactive tool for accessing a geographical database stored as an RDF triple store, using GeoSparql queries.

The following videos illustrate some sample queries executed with GeoQuery.

[Query 1](#): Find all airports within Augusta County.
[Query 2](#): Find the area within 5000m of the city of Waynesboro that also lies within the borders of Augusta County.

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Videos

Tool for posing
GeoSPARQL queries
Can perform spatial
operations over the Web

Uses Parliament's implementation of GeoSPARQL (triple store)

GeoSparql Query Tool

<http://geoquery.cs.jmu.edu/geoquery/>

Feature 1: ?

--Select Feature Type--

--Select Property--

Search

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results: +/-

...No search results yet...

Feature 2: ?

--Select Feature Type--

--Select Property--

Search

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results: +/-

...No search results yet...

Spatial Relationship: Go ?

Select: --

with relationship: --Select Relation--

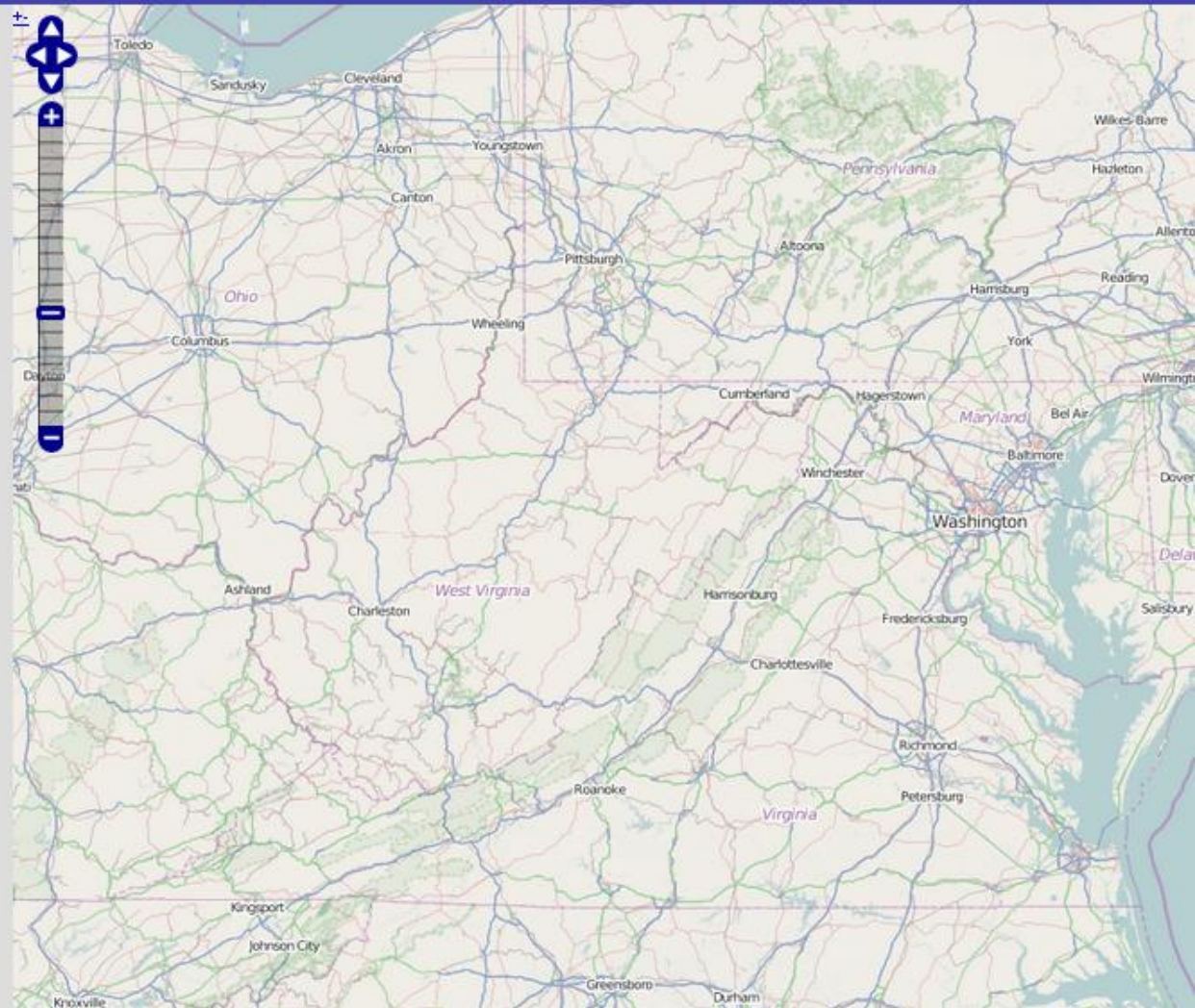
to: --

Search Results: +/-

...No search results yet...

Binary Spatial Operation: Go ?

--Select Operation--



Spatial Relationships

GeoSparql Query Tool <http://geoquery.cs.jmu.edu/geoquery/>

Feature 1: ?

--Select Feature Type--

--Select Property--

Search

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results: +/-

...No search results yet...

Feature 2: ?

--Select Feature Type--

--Select Property--

Search

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results: +/-

...No search results yet...

Spatial Relationship: Go ?

Select: --

with relationship: --Select Relation--

to: --

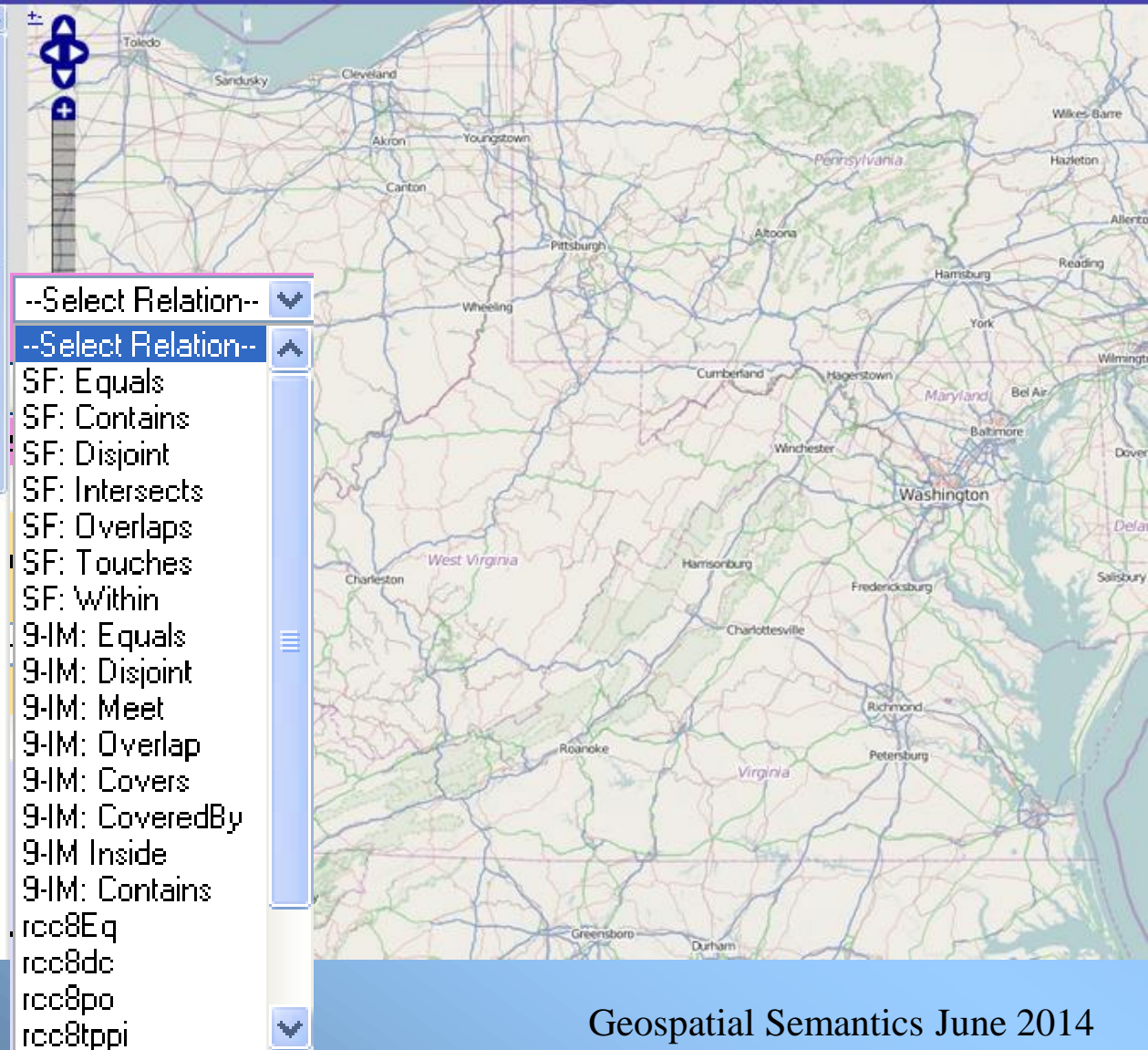
Search Results: +/-

...No search results yet...

Binary Spatial Operation: Go ?

--Select Operation--

--



--Select Relation--

--Select Relation--

- SF: Equals
- SF: Contains
- SF: Disjoint
- SF: Intersects
- SF: Overlaps
- SF: Touches
- SF: Within
- 9-IM: Equals
- 9-IM: Disjoint
- 9-IM: Meet
- 9-IM: Overlap
- 9-IM: Covers
- 9-IM: CoveredBy
- 9-IM: Inside
- 9-IM: Contains
- rcc8Eq
- rcc8dc
- rcc8po
- rcc8tppi

A query with one feature

Find all airports

Select Feature Type

GeoSparql Query Tool

Feature 1: [?](#)

--Select Feature Type--

--Select Property--

[?](#)

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m) [?](#)

Search Results:

...No search results yet...

Feature 2: [?](#)

--Select Feature Type--

--Select Property--

No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results:

...No search results yet...

Spatial Relationship: [?](#)

Select:

with relationship: --Select Relation--

to:

Search Results:

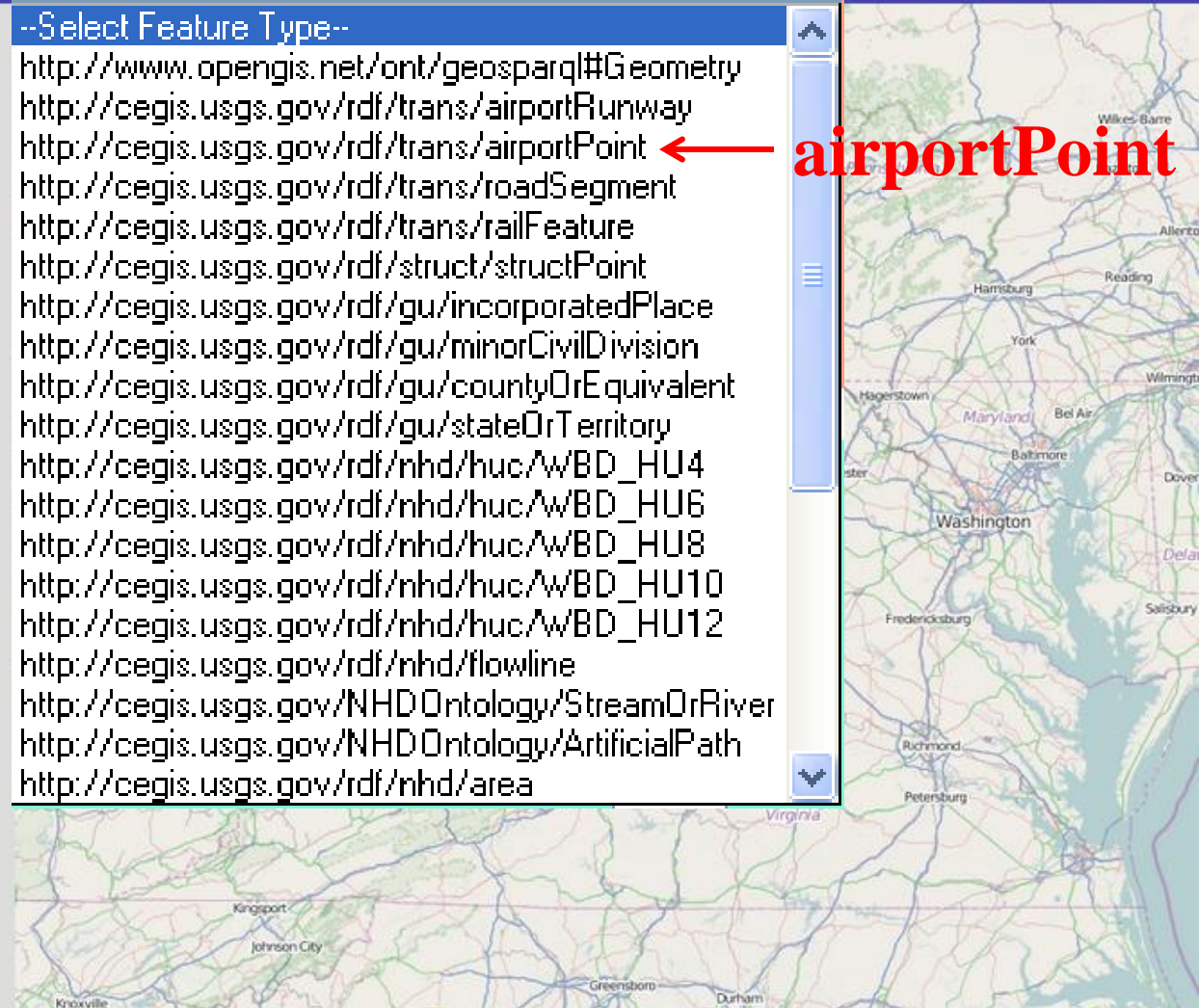
...No search results yet...

Binary Spatial Operation: [?](#)

--Select Operation--

- Select Feature Type--
- Select Feature Type--
 - <http://www.opengis.net/ont/geosparql#Geometry>
 - <http://cegis.usgs.gov/rdf/trans/airportRunway>
 - <http://cegis.usgs.gov/rdf/trans/airportPoint> ←
 - <http://cegis.usgs.gov/rdf/trans/roadSegment>
 - <http://cegis.usgs.gov/rdf/trans/railFeature>
 - <http://cegis.usgs.gov/rdf/struct/structPoint>
 - <http://cegis.usgs.gov/rdf/gu/incorporatedPlace>
 - <http://cegis.usgs.gov/rdf/gu/minorCivilDivision>
 - <http://cegis.usgs.gov/rdf/gu/countyOrEquivalent>
 - <http://cegis.usgs.gov/rdf/gu/stateOrTerritory>
 - http://cegis.usgs.gov/rdf/nhd/huc/wBD_HU4
 - http://cegis.usgs.gov/rdf/nhd/huc/wBD_HU6
 - http://cegis.usgs.gov/rdf/nhd/huc/wBD_HU8
 - http://cegis.usgs.gov/rdf/nhd/huc/wBD_HU10
 - http://cegis.usgs.gov/rdf/nhd/huc/wBD_HU12
 - <http://cegis.usgs.gov/rdf/nhd/flowline>
 - <http://cegis.usgs.gov/NHDOntology/StreamOrRiver>
 - <http://cegis.usgs.gov/NHDOntology/ArtificialPath>
 - <http://cegis.usgs.gov/rdf/nhd/area>

airportPoint



Select Property for airportPoint

The screenshot shows the GeoSparql Query Tool interface. On the left, there are three panels for Feature 1, Feature 2, and Spatial Relationship. Feature 1 has a URL field set to `http://cegis.usgs.gov/rdf/trans/airportPoint` and a dropdown menu for selecting a property. The dropdown menu is open, showing a list of properties. Feature 2 and Spatial Relationship panels also have similar dropdown menus. On the right, a map of the area around Dayton, Ohio, is visible. The dropdown menu for Feature 1 contains the following properties:

- `http://www.w3.org/2000/01/rdf-schema#label`
- Select Property--
- `http://www.w3.org/2000/01/rdf-schema#label`
- `http://www.w3.org/1999/02/22-rdf-syntax-ns#type`
- `http://www.opengis.net/ont/geosparql#hasGeometry`
- `http://cegis.usgs.gov/rdf/trans/sourceOriginator`
- `http://cegis.usgs.gov/rdf/trans/sourceDatasetID`
- `http://cegis.usgs.gov/rdf/trans/sourceDataDesc`
- `http://cegis.usgs.gov/rdf/trans/loadDate`
- `http://cegis.usgs.gov/rdf/trans/faaAirportCode`
- `http://cegis.usgs.gov/rdf/trans/fType`
- `http://cegis.usgs.gov/rdf/trans/fCode`
- `http://cegis.usgs.gov/rdf/trans/distributionPolicy`
- `http://cegis.usgs.gov/rdf/trans/dataSecurity`
- `http://cegis.usgs.gov/rdf/trans/airportClass`
- `http://cegis.usgs.gov/rdf/gnis/id`
- `http://cegis.usgs.gov/rdf/trans/stCoFIPSCode`
- `http://cegis.usgs.gov/rdf/trans/shapeLength`
- `http://cegis.usgs.gov/rdf/trans/roadClass`
- `http://cegis.usgs.gov/rdf/trans/interstate`
- `http://cegis.usgs.gov/rdf/trans/fullStreetName`

Type in 'airport'

List of airports

Spatial results

Feature 1: ALL Feature 1

<http://cegis.usgs.gov/rdf/trans/airportPoint>

<http://www.w3.org/2000/01/rdf-schema#label>

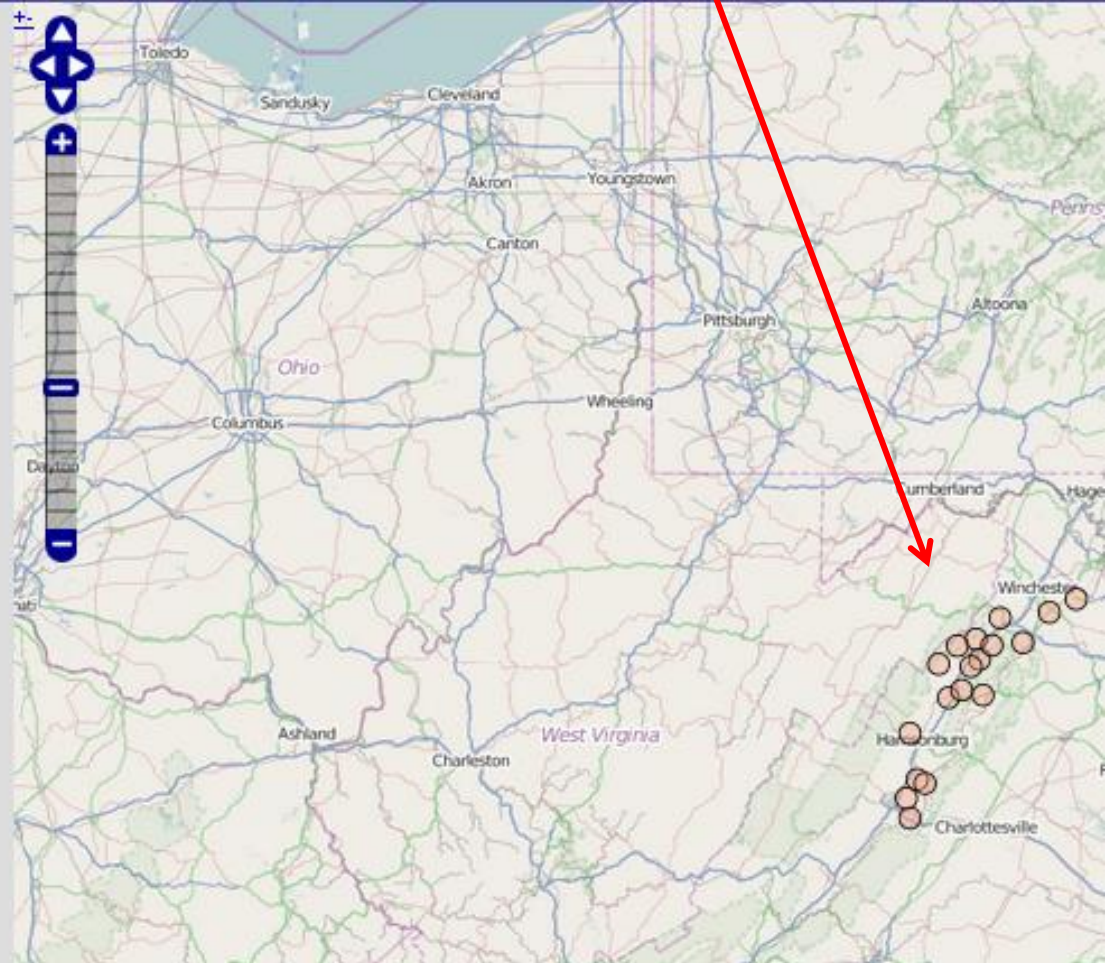
No Spatial Operation Boundary

Convex Hull Envelope Buffer 1000 (m)

Search Results: +/-

(Click to select; Double-click for attributes)

1. Hepner Airport
2. Karmy's Airport
3. White Post Airport
4. Eagle's Nest Airport
5. Root Field Airport
6. Mulberry Run Airport
7. Shenandoah Valley Regional Airport
8. New Market Airport
9. Franwood Farms Inc. Airport
10. River Bend Airport
11. Luray Caverns Airport
12. Frank Field Airport
13. Mount Horeb Field Airport
14. Front Royal-Warren County Airport
15. Longs Airport
16. Ayers Airport
17. Pickles Airport
18. Sky Bryce Airport



Click on Karmy's Airport to select it, Choose Buffer, See result

GeoSparql Query Tool

Feature 1: Karmy's Airport

<http://cegis.usgs.gov/rdf/trans/airportPoint>

<http://www.w3.org/2000/01/rdf-schema#label>

airport Search

No Spatial Operation Boundary

Convex Hull Envelope Buffer 80000 (m)

Search Results: +/-

(Click to select; Double-click for attributes)

1. Hepner Airport
2. Karmy's Airport
3. White Post Airport
4. Eagle's Nest Airport
5. Root Field Airport
6. Mulberry Run Airport
7. Shenandoah Valley Regional Airport
8. New Market Airport
9. Franwood Farms Inc. Airport

A query with two features

Find the county Karmy's Airport is in

Find the county Karmy's Airport is in

The screenshot displays a GIS application interface. On the left, a search panel titled "Feature 1: ALL Feature 1" contains a search bar with the URL `http://cegis.usgs.gov/rdf/gu/countyOrEquivalent` and a dropdown menu with `http://www.w3.org/2000/01/rdf-schema#label`. Below the search bar is a "Search" button and a list of spatial operations: "No Spatial Operation" (selected), "Boundary", "Convex Hull", "Envelope", and "Buffer 1000 (m)". A "Search Results: +/-" section lists 23 counties: 1. Staunton, 2. Hampshire, 3. Hardy, 4. Washington, 5. Clarke, 6. Albemarle, 7. Warren, 8. Rappahannock, 9. Shenandoah, 10. Highland, 11. Pendleton, 12. Jefferson, 13. Nelson, 14. Page, 15. Harrisonburg, 16. Waynesboro, 17. Madison, 18. Rockingham, 19. Loudoun, 20. Greene, 21. Frederick, 22. Fauquier, 23. Augusta. On the right, a map shows the region with county boundaries highlighted in orange. Major cities like Cleveland, Akron, Youngstown, Columbus, Pittsburgh, and Wheeling are labeled. State boundaries for Ohio, Pennsylvania, West Virginia, and Virginia are also visible. A navigation toolbar with a compass and a vertical scale bar is located on the left side of the map.

For Feature 2, Find Karmy's Airport

The screenshot shows a GIS application interface. On the left, a list of counties is visible: 17. Madison, 18. Rockingham, 19. Loudoun, 20. Greene, 21. Frederick, 22. Fauquier, 23. Augusta. Below this, a search interface for 'Feature 2' is shown. It includes a dropdown menu with the URL 'http://cegis.usgs.gov/rdf/trans/airportPoint', another dropdown with 'http://www.w3.org/2000/01/rdf-schema#label', and a text input field containing 'Kar'. A 'Search' button is next to the input. Below the search box, there are radio buttons for 'No Spatial Operation' (selected), 'Boundary', 'Convex Hull', 'Envelope', and 'Buffer 1000 (m)'. Underneath, it says 'Search Results: +/-' and '(Click to select; Double-click for attributes)'. A single result is listed: '1. Karmy's Airport'. A red arrow points from this result to a map on the right. The map shows a region of West Virginia with county boundaries. A red arrow points to a specific location in the eastern part of the state, near the border with Pennsylvania, which is highlighted with a light blue circle.

Typing just 'Kar' in the text box finds Karmy's Airport

Choose SF:Contains to get county containing Karmy's Airport

(Click to select; Double-click for attributes)
1. Karmy's Airport

Spatial Relationship:

Select: ALL Feature 1
with relationship: SF: Contains
to: Karmy's Airport

Search Results:

(Click to select; Double-click for attributes)
1. Shenandoah

The screenshot shows a GIS application interface. On the left, a search panel is open, displaying the search criteria: 'Karmy's Airport' with the spatial relationship 'SF: Contains'. The search results list 'Shenandoah' as the first result. On the right, a map of West Virginia is shown, with the county of Shenandoah highlighted in a light purple color. A red arrow points from the 'Shenandoah' result in the search panel to the highlighted county on the map.

Shenandoah is listed and turns a different color on the map

GeoSPARQL Query

Find the county name for Karmy's airport:

(? Denotes a variable)

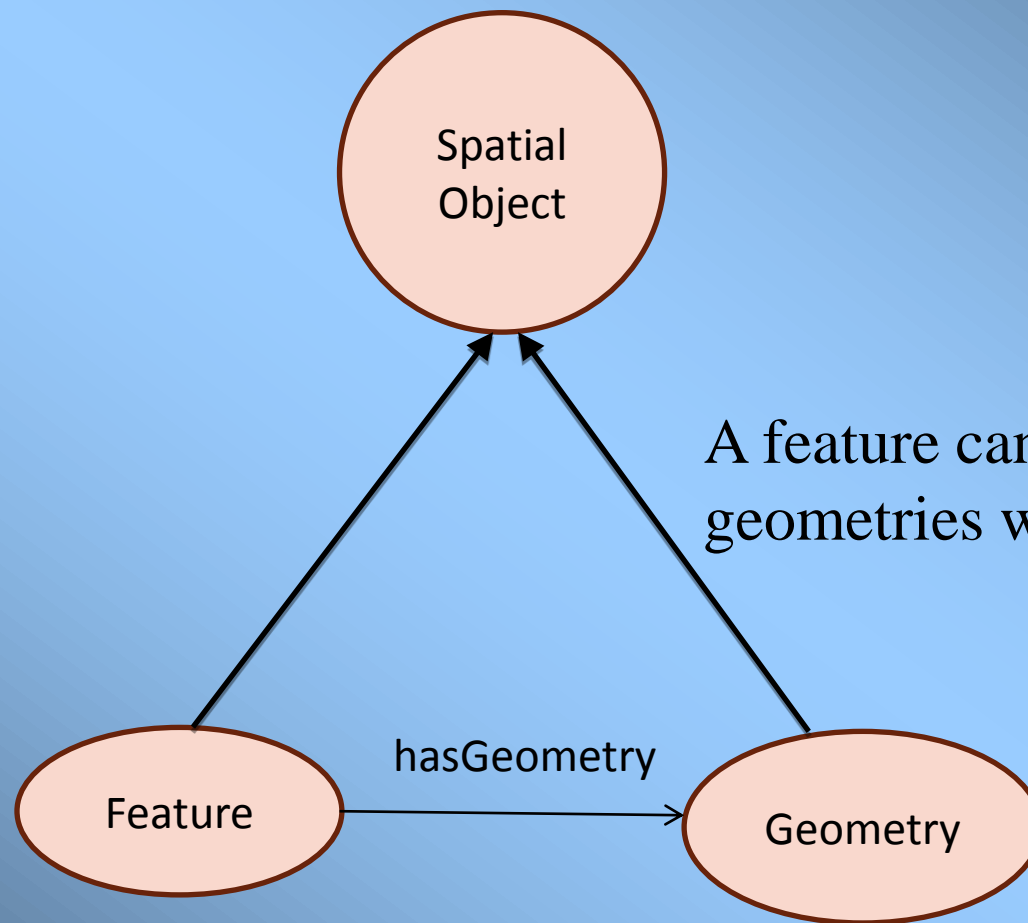
```
SELECT ?countyName
WHERE {
  ?county rdf:type      cegis:countyOrEquivalent .
  ?county rdfs:label    ?countyName .
  ?county geo:hasGeometry ?countyGeometry .
  ?countyGeometry geo:asWKT ?countyWKT .

  ?airport rdf:type      cegis:airportPoint .
  ?airport rdfs:label    "Karmy's Airport" .
  ?airport hasGeometry   ?airportGeometry .
  ?airportGeometry geo:asWKT ?airportWKT .

  FILTER (geof:sfContains(?countyWKT, ?airportWKT)) .
}
```

From the GeoSPARQL User Guide

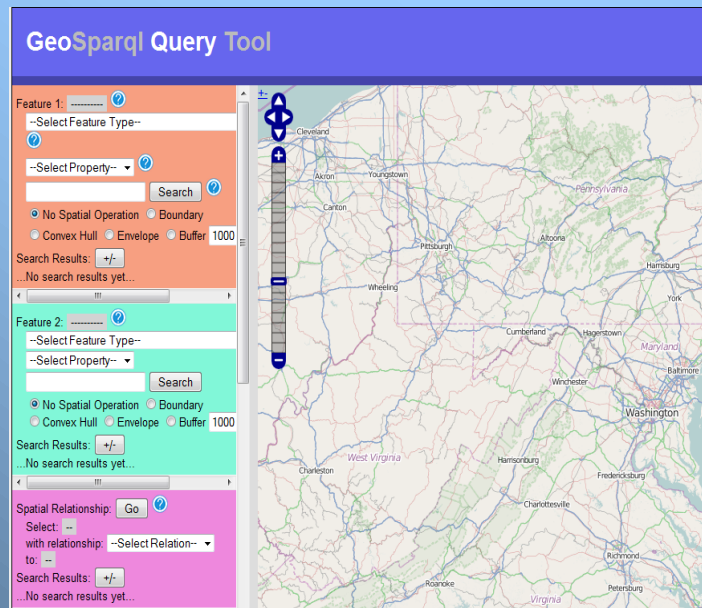
Dave Kolas and Robert Battle



A feature can have multiple geometries with this model.

Summary: GeoQuery Tool

- Allows easy querying over the Web for spatial data in RDF format because SPARQL/GeoSPARQL syntax is avoided



Geospatial Semantic Web

Land Use Code Demo

<http://www.ssec.wisc.edu/landuse/main>

With much appreciation to Tommy Jasmin (SSEC)!
(who helped REU students Alec Anderson and Coda
Phillips)

Landuse Demo



[Home](#)

[Products](#)



Residential Code

Areas

- All
- Bay Lakes RPC
- Eau Claire County
- Madison(city)
- SEWRPC
- Dane County
- ECWRPC
- NCWRPC

Run Query



Residential Code

Group Quarters

Areas

- All
- Bay Lakes RPC
- Eau Claire County
- Madison(city)
- SEWRPC
- Dane County
- ECWRPC
- NCWRPC

Run Query

Results

Bay Lakes RPC [170]: Group Quarters
Dane County [129]: Group Quarters
Eau Claire County [R]: Residential, superclass of Group Quarters
ECWRPC [942]: Group Quarters
Madison(city) [12]: Group Quarters
NCWRPC [5]: Residential, superclass of Group Quarters
SEWRPC [662]: Regional Group Quarters, subclass of Group Quarters
SEWRPC [661]: Local Group Quarters, subclass of Group Quarters

Thank you!

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