Basic Spatial Data Visualization

Adding maps to reports

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Overview

- Spatial Data Types
- Points, Lines, and Polygons
- Map Wizard

Spatial Data Types

- **Geography**
  - Latitude and longitude angles
- **Geometry**
 - Coordinates in two-dimensional plane

AdventureWorks2008R2

```
select top 5 * from Person.Address
```

	AddressID	AddressLine1	AddressLine2	City	StateProvinceID	PostalCode	SpatialLocation
1	1	1970 Napa Ct.	NULL	Bothell	79	98011	0xE6100000010CAE8BFC28BCE4474067A89189898A5EC0
2	2	9833 Mt. Dias Blv.	NULL	Bothell	79	98011	0xE6100000010CD6FA851AE6D74740BC262A0A03905EC0
3	3	7484 Roundtree Drive	NULL	Bothell	79	98011	0xE6100000010C18E304C4ADE14740DA930C7893915EC0
4	4	9539 Glenside Dr	NULL	Bothell	79	98011	0xE6100000010C813A0D5F9FDE474011A5C28A7C955EC0
5	5	1226 Shoe St.	NULL	Bothell	79	98011	0xE6100000010C61C64D8ABBD94740C460EA3FD8855EC0

Geography data type

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Points

- **Use (X,Y) coordinate to represent location**
  - Street location
  - City
- **Link analytical data to point to change marker color, size, or type**

Sales Volume
○ 140 - 2,600
○ 2,600 - 52,000
● 52,000 - 210,000
● 210,000 - 580,000
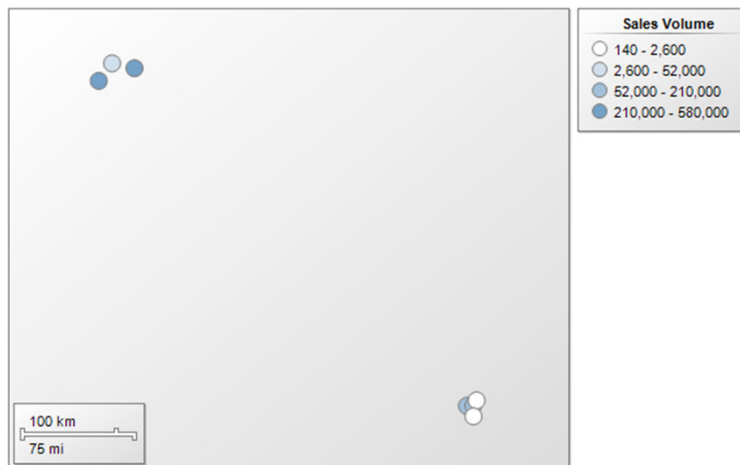
Points do not convey context about location when used alone

100 km
75 mi

Bing Maps Integration

- Adds context to points automatically
- Analyzes spatial locations to link to Bing Maps coordinates
- Matches zoom level and resolution
- Requires report server access to Bing Maps Web Service

Bing Maps Integration

- Supports adjustment of resolution for greater detail
- Allows run-time adjustment of resolution and centering of map
- Includes directional indicators for one-way streets at highest resolution

Lines

- Display pairs of points or coordinates
- Use to display routes between points
- Link analytical data to line to vary color or width of lines
- Use Bing Maps or polygon layer to add context

Polygons

- **Display set of four or more coordinates**
    - Define boundaries of closed area
    - First and last points are same coordinate
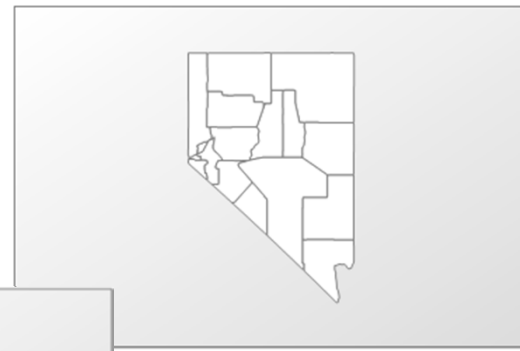- **Provide structure for point or line spatial data**
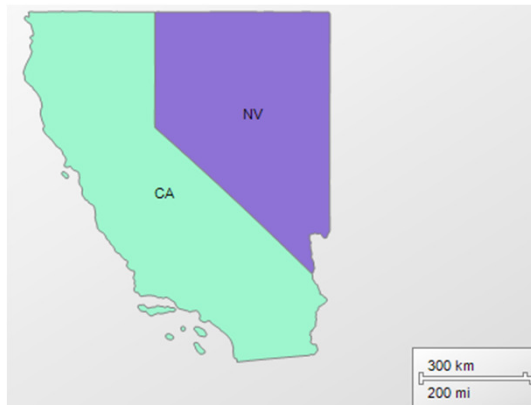
Spatial Data Sources

- **Spatial data embedded in report**
  - United States country and state spatial data provided in Map Gallery
  - Other regions can be added as custom reports to Map Gallery

United States
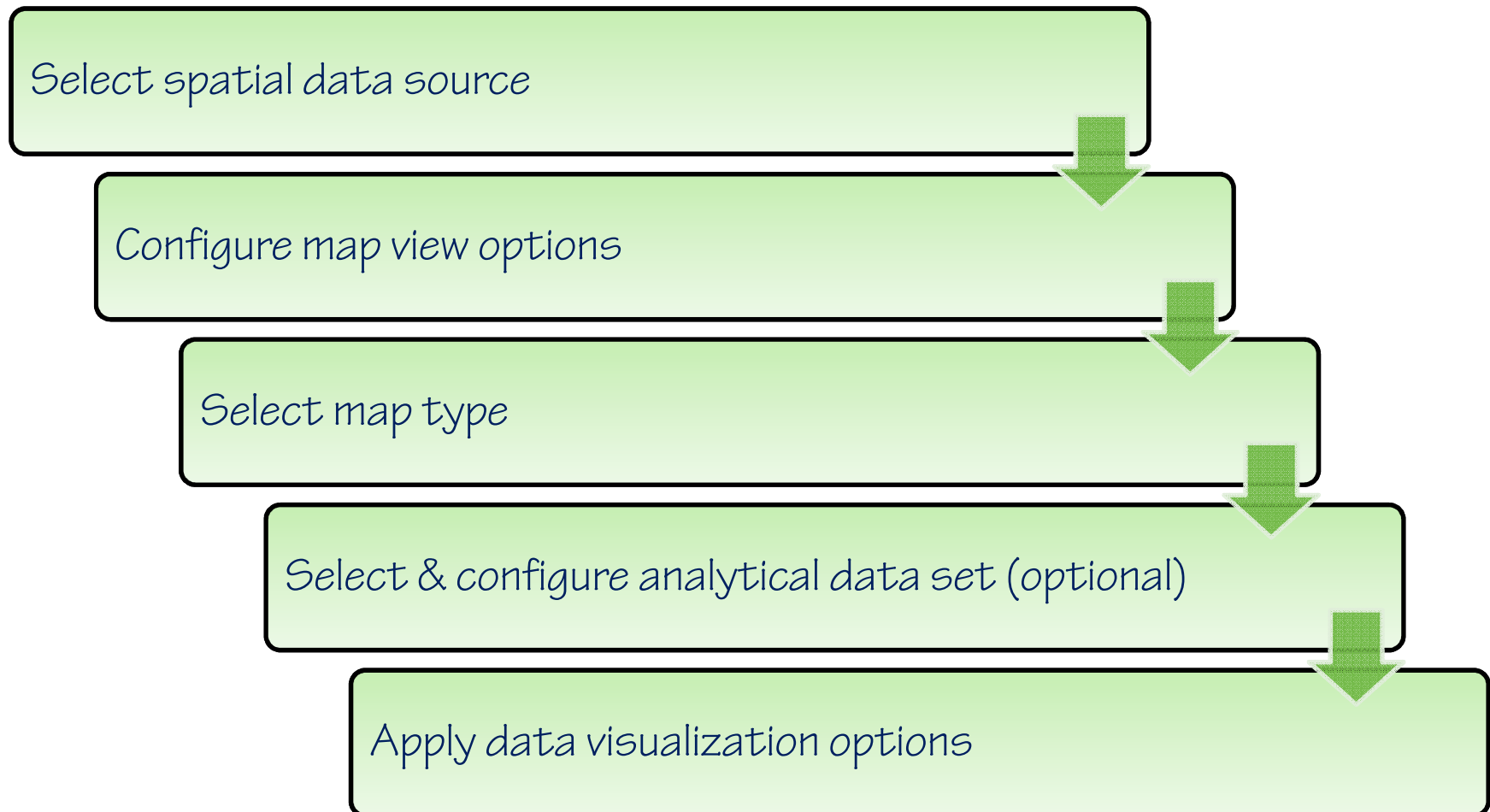
France

Nevada

Spatial Data Sources

- **ESRI Shapefile**   *Environmental Systems Research Institute*
  - SHP file describes geographical or geometrical data
  - DBF file must be available in same location as SHP file
- **SQL Server spatial data**
  - Report dataset includes a spatial data column
  - Each row in dataset becomes a separate map element

Spatial data column

	AddressID	AddressLine1	AddressLine2	City	StateProvinceID	PostalCode	SpatialLocation
1	1	1970 Napa Ct.	NULL	Bothell	79	98011	0xE6100000010CAE8BFC28BCE4474067A89189898A5EC0
2	2	9833 Mt. Dias Blv.	NULL	Bothell	79	98011	0xE6100000010CD6FA851AE6D74740BC262A0A03905EC0
3	3	7484 Roundtree Drive	NULL	Bothell	79	98011	0xE6100000010C18E304C4ADE14740DA930C7893915EC0
4	4	9539 Glenside Dr	NULL	Bothell	79	98011	0xE6100000010C813A0D5F9FDE474011A5C28A7C955EC0
5	5	1226 Shoe St.	NULL	Bothell	79	98011	0xE6100000010C61C64D8ABBD94740C460EA3FD8855EC0

Each row is separate map element

Map Wizard

Select spatial data source

Configure map view options

Select map type

Select & configure analytical data set (optional)

Apply data visualization options

Select a Spatial Data Source

- **Map Gallery**
  - Preview available shapes
  - United States only unless custom reports added to gallery
- **ESRI Shapefile**
  - Provide path to shapefile
- **Spatial data**
  - Specify embedded or shared dataset
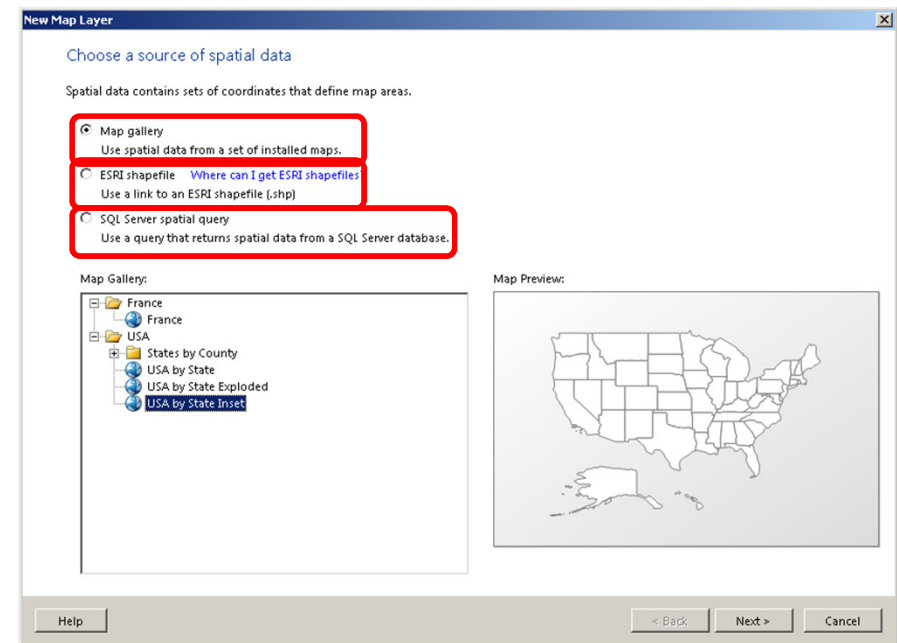
Configure Map View Options

- **Adjust zoom level**
- **Change center point**
- **Crop map**
- **Add Bing Maps layer**
- **Embed map data**
  (ESRI and spatial data sources only)
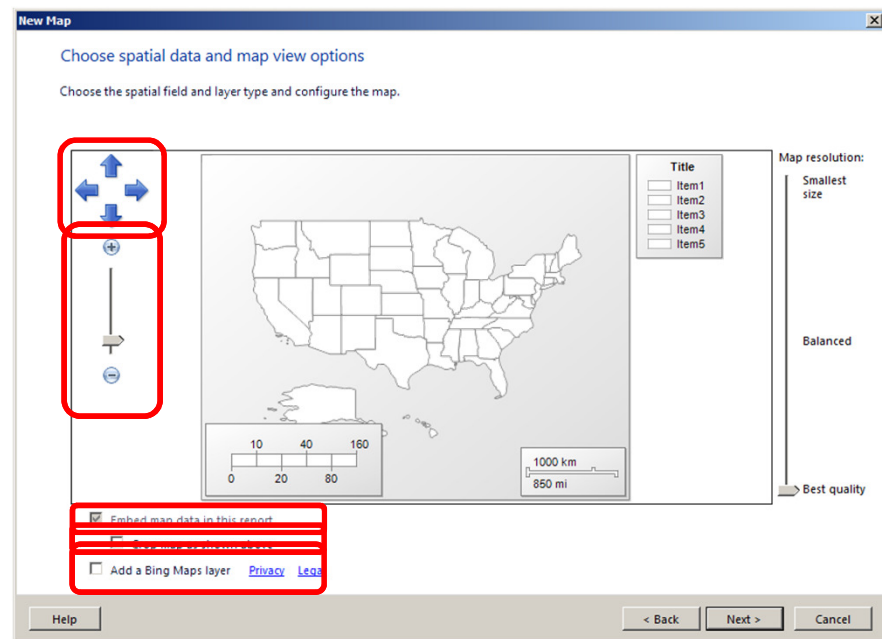
Map Types – Point Data

Map Type	Description	Example
Basic marker	Single marker type with no link to analytical data	
Bubble marker	Bubble marker type with varying bubble size according to single analytical data value	
Analytical marker	Marker style, size, and color based on multiple values in analytical data set	

Map Types – Line Data

Map Type	Description	Example
Basic map	Single line color and width with no link to analytical data	
Analytical map	Line color and width based on multiple values in analytical data set	

Map Types – Polygon Data

Map Type	Description	Example
Basic map	Single color polygon or randomly assigned colors from palette with no link to analytical data	
Color analytical map	Polygon color based on single analytical data value	
Bubble map	Bubbles at polygon's center point and sized according to single data value in analytical data set	

Analytical Dataset

- **Additional dataset associated with map**
- **One or more fields uniquely identify row in spatial dataset**
- **Matching fields must have same data type and formatting**
- **One or more analytical fields provide numeric data for aggregation**
  - Or you can derive a count from non-numeric data

	StateProvinceCode	StateProvinceName	CountryRegionName	ResellerCount
1	AL	Alabama	United States	6
2	AZ	Arizona	United States	12
3	CA	California	United States	78
4	CO	Colorado	United States	9

Matches column in
spatial dataset

Data to
aggregate for
color, marker, etc.

Spatial and Analytical Dataset Matching

- **Match spatial data fields between datasets**

Data Visualization Options

- **Apply theme for predefined formatting options**
- **Select value to visualize in map**
  - Sum of numeric fields in analytical dataset
  - Count of non-numeric fields in either dataset
  - Explicit field in either dataset
- **Assign color rule**
  - Two or three color palette for spectrum
  - First color identifies lowest values
  - Last color identifies highest values
- **Optionally display labels on map**

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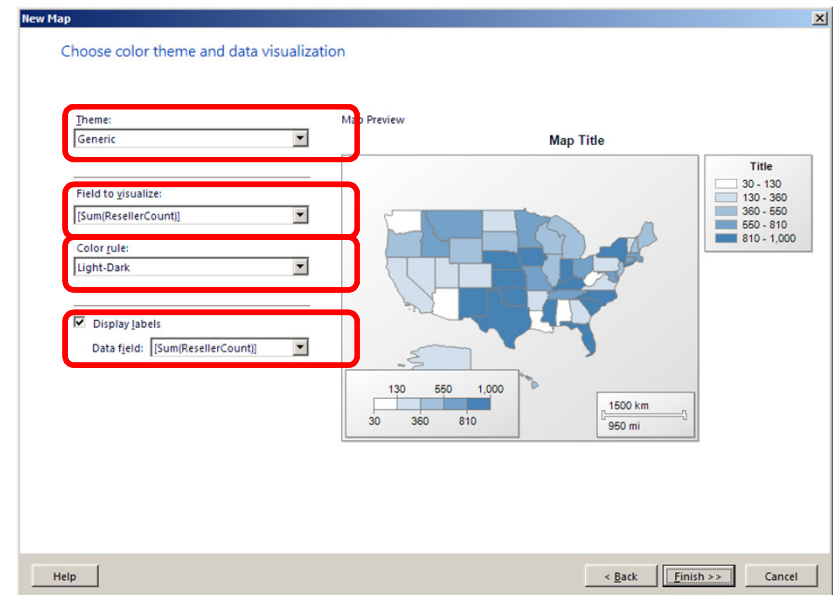
Summary

- **Spatial Data Types**
  - SQL Server 2008 and higher
  - Geometry, geography
- **Points**
  - (X,Y) coordinates for location
- **Lines**
  - Pairs of points linked together
- **Polygons**
  - Set of four or more coordinates enclosing a space
- **Map Wizard**
  - Select spatial data source, configure map view, select map type, define analytical data set, apply data visualization options

References

- **Working with Map Report Items**
  - http://msdn.microsoft.com/en-us/library/ee210581.aspx
- **RSReportServer Configuration File (*MapTileServerConfiguration*)**
  - http://msdn.microsoft.com/en-us/library/ms157273.aspx
- **US Census Bureau**
  - http://www.census.gov/geo/www/tiger/
- **Global Administrative Areas Spatial Database**
  - http://biogeo.berkeley.edu/gadm/
- **Digital Chart of the World Data Server**
  - http://www.maproom.psu.edu/dcw/
- **"Address Geocoding with SQL Server 2008 Spatial" by Ed Katibah**
  - http://blogs.msdn.com/b/edkatibah/archive/2009/03/10/address-geocoding-with-sql-server-2008-spatial.aspx