

```
<Presentation xmlns=http://2009.foss4g.org/>
  <Name>
    <Title>
      <Literal>Styled Layer Descriptor (SLD)</Literal>
    </Title>
    <Subtitle>
      <Literal>or How I Learned To Stop Worrying and Love XML</Literal>
    </Subtitle>
  </Name>
  <Presenter>
    <Literal>Mike Pumphrey</Literal>
  </Presenter>
  <Occasion>
    <Literal>FOSS4G, Sydney, Australia</Literal>
  </Occasion>
  <Date>
    <Literal>October 23, 2009</Literal>
  </Date>
</Presentation>
```



Geospatial data
has no inherent visualization

We are all designers now.
(Oh no.)

Style *(noun/verb)*:

1. The way in which something is said, done, expressed, or performed.
2. A customary manner of presenting material.
- 3. The missing piece that turns geospatial data into a completed map.**

Ways to style maps

- Mapfile
- AXL
- ArcGIS Style files
- etc...

Styled Layer Descriptor (SLD)



OGC standard

(and we do love standards)


```

<?xml version = '1.0' encoding = 'UTF-8'?>
<StyledLayerDescriptor version="1.0.0"
  xsi:schemaLocation="http://www.opengis.net/sld StyledLayerDescriptor.xsd"
  xmlns="http://www.opengis.net/sld" xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <NamedLayer xmlns="http://www.opengis.net/sld">
    <Name xmlns="http://www.opengis.net/sld">topp:street_centerline</Name>
    <UserStyle xmlns="http://www.opengis.net/sld">
      <!-- ++++++ Small paths - Outline -->
      <!-- Paths OL Start of 1890 Zoom covers 13 and below -->
      <FeatureTypeStyle xmlns="http://www.opengis.net/sld">
        <Rule xmlns="http://www.opengis.net/sld">
          <ogc:Filter xmlns:ogc="http://www.opengis.net/ogc">
            <ogc:PropertyIsLessThan xmlns:ogc="http://www.opengis.net/ogc">
              <ogc:PropertyName xmlns:ogc="http://www.opengis.net/ogc">feat_type</ogc:PropertyName>
              <ogc:Literal xmlns:ogc="http://www.opengis.net/ogc">0</ogc:Literal>
            </ogc:PropertyIsLessThan>
          </ogc:Filter>
          <MaxScaleDenominator xmlns="http://www.opengis.net/sld">1890</MaxScaleDenominator>
          <LineSymbolizer xmlns="http://www.opengis.net/sld">
            <Stroke xmlns="http://www.opengis.net/sld">

```

XML? Really?

XML: Computers v. Humans

Computer

“Ooh, this is easy to read and output. I like this. “

Human

“Oh dear, it looks like it was written by the Society for Far Too Much Verbosity and Redundancy Society.”

How to Get By

and also a preview of the
future of styling with SLD

What's in an SLD file?

1. Symbology (Symbolizers)

- Rules for drawing: Point/Line/Polygon/Text/Raster

2. Metadata

- Name/Title/Abstract

An SLD

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<StyledLayerDescriptor version="1.0.0" ... >
  <NamedLayer>
    <UserStyle>
      <FeatureTypeStyle>
        <Rule>
          ...
        </Rule>
      </FeatureTypeStyle>
    </UserStyle>
  </NamedLayer>
</StyledLayerDescriptor>
```

Map Information

<StyledLayerDescriptor>

<NamedLayer>

<UserStyle>

...

Metadata

```
<UserStyle>  
  <Name>town_street_1</Name>  
  <Title>Town Streets</Title>  
  <Abstract>If you want to know all about  
the streets in this town, this layer is  
for you.</Abstract>
```

Remember:

- Don't forget to call home
- Brush and floss twice a day
- Create metadata

Symbology

```
<FeatureTypeStyle>  
  <Rule>
```

```
...  
<FeatureTypeStyle>  
  <Rule>  
...  
</Rule>  
<Rule>  
...  
</Rule>  
</FeatureTypeStyle>  
...
```

Symbology: Points

Shape

```
<PointSymbolizer>  
  <Graphic>  
    <Mark>  
      <WellKnownName>  
        circle  
      </WellKnownName>  
    </Mark>  
  </Graphic>  
</PointSymbolizer>
```

Symbology: Points

Size

<Size>36</Size>



Symbology: Points

Inside (Fill)



```
<Fill>  
  <CssParameter name="fill">#FF0000</CssParameter>  
</Fill>
```

Symbology: Points

Graphic



```
<ExternalGraphic>  
  <OnlineResource xlink:type="simple"  
    link:href="smileyface.png" />  
  <Format>image/png</Format>  
</ExternalGraphic>
```

Symbology: Points

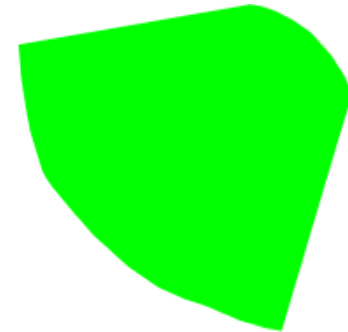
Outside (Stroke)



```
<Stroke>  
  <CssParameter name="stroke">#000000</CssParameter>  
  <CssParameter name="stroke-width">2</CssParameter>  
</Stroke>
```

Symbology: Polygons

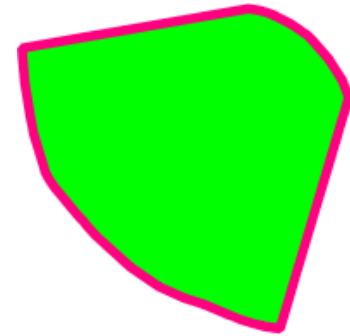
Inside (Fill)



```
<Fill>  
  <CssParameter name="fill">#00FF00</CssParameter>  
</Fill>
```

Symbology: Polygons

Outside (Stroke)



```
<Stroke>  
  <CssParameter name="stroke">#FF0080</CssParameter>  
  <CssParameter name="stroke-width">5</CssParameter>  
</Stroke>
```


Symbology: Lines

Q: <Stroke> and <Fill> for lines?

A: Fake it.

Symbology: Lines

Two lines = simulated fill/stroke

```
<Rule>
  <LineStyleSymbolizer>
    <Stroke>
      <CssParameter name="stroke">#000000</CssParameter>
      <CssParameter name="stroke-width">16</CssParameter>
    </Stroke>
  </LineStyleSymbolizer>
</Rule>
<Rule>
  <LineStyleSymbolizer>
    <Stroke>
      <CssParameter name="stroke">#0000FF</CssParameter>
      <CssParameter name="stroke-width">14</CssParameter>
    </Stroke>
  </LineStyleSymbolizer>
</Rule>
```

Symbology: Lines

Two lines = simulated fill/stroke



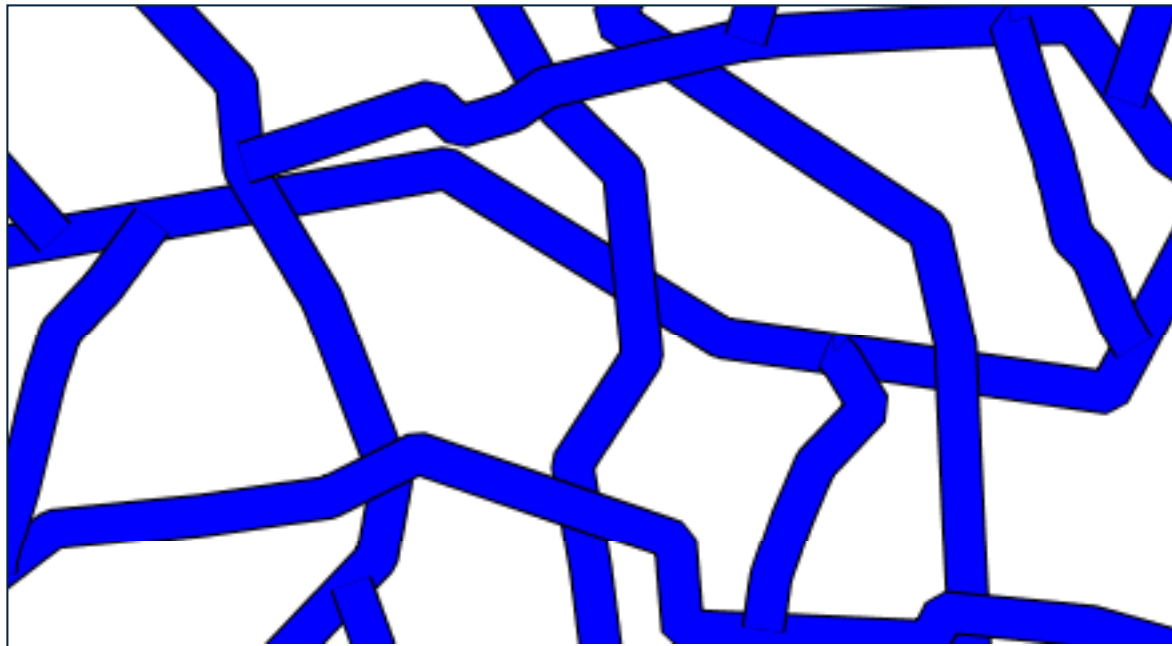
+

=



Symbology: Lines

Uh oh.

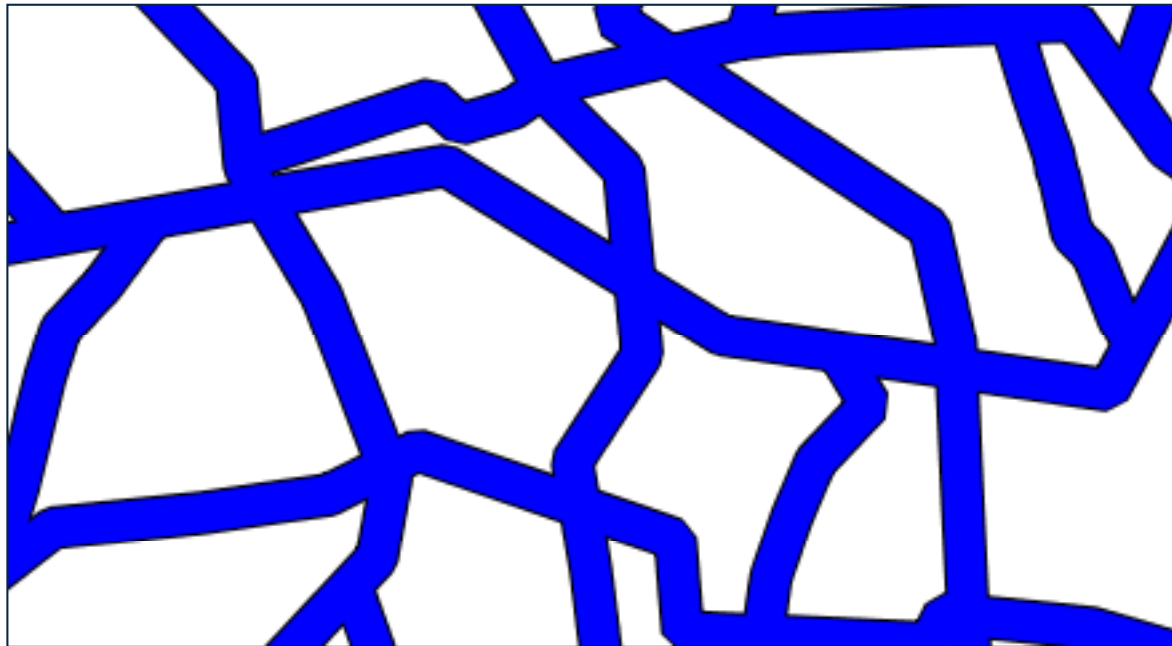


Symbology: Lines

```
<FeatureTypeStyle>
  <Rule>
    <LineSymbolizer>
      <Stroke>
        <CssParameter name="stroke">#000000</CssParameter>
        <CssParameter name="stroke-width">16</CssParameter>
      </Stroke>
    </LineSymbolizer>
  </Rule>
</FeatureTypeStyle>
<FeatureTypeStyle>
  <Rule>
    <LineSymbolizer>
      <Stroke>
        <CssParameter name="stroke">#0000FF</CssParameter>
        <CssParameter name="stroke-width">14</CssParameter>
      </Stroke>
    </LineSymbolizer>
  </Rule>
</FeatureTypeStyle>
```

Symbology: Lines

Ahhh.



Symbology: Text

FID	name	pop
point.1	Borfin	157860
point.2	Supox City	578231
point.3	Ruckis	98159
point.4	Thisland	34879
point.5	Synopolis	24567
point.6	San Glissando	76024
point.7	Detrainia	205609

Symbology: Text

Label content

```
<Label>  
  <ogc:PropertyName>name</ogc:PropertyName>  
</Label>
```


Symbology: Text

Font (size, color, weight)

```
<Font>  
  <CssParameter name="font-family">Arial</CssParameter>  
  <CssParameter name="font-size">12</CssParameter>  
  <CssParameter name="font-style">normal</CssParameter>  
  <CssParameter name="font-weight">bold</CssParameter>  
</Font>
```

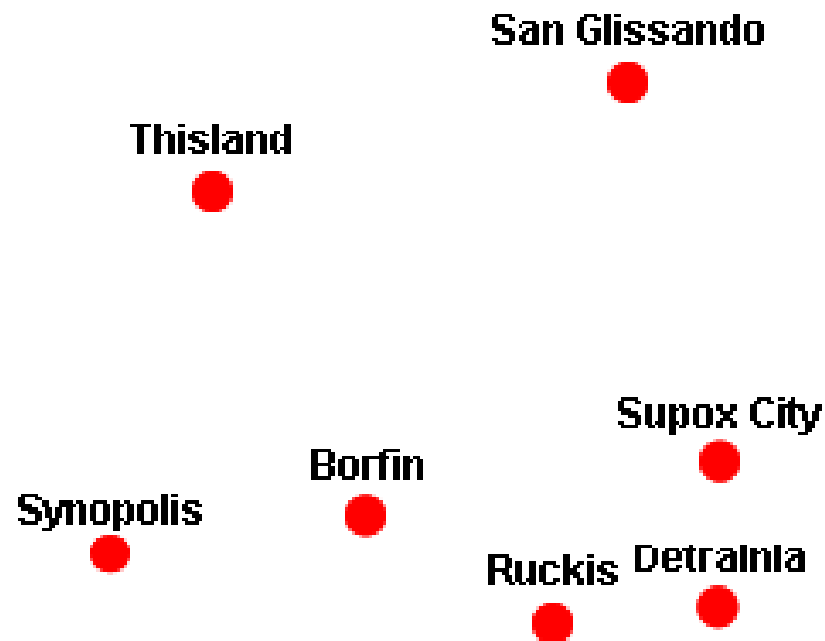
Symbology: Text

Placement

```
<LabelPlacement>  
  <PointPlacement>  
    <AnchorPoint>  
      <AnchorPointX>0.5</AnchorPointX>  
      <AnchorPointY>0.5</AnchorPointY>  
    </AnchorPoint>  
    <Displacement>  
      <DisplacementX>0</DisplacementX>  
      <DisplacementY>15</DisplacementX>  
    </Displacement>  
  </PointPlacement>  
</LabelPlacement>
```

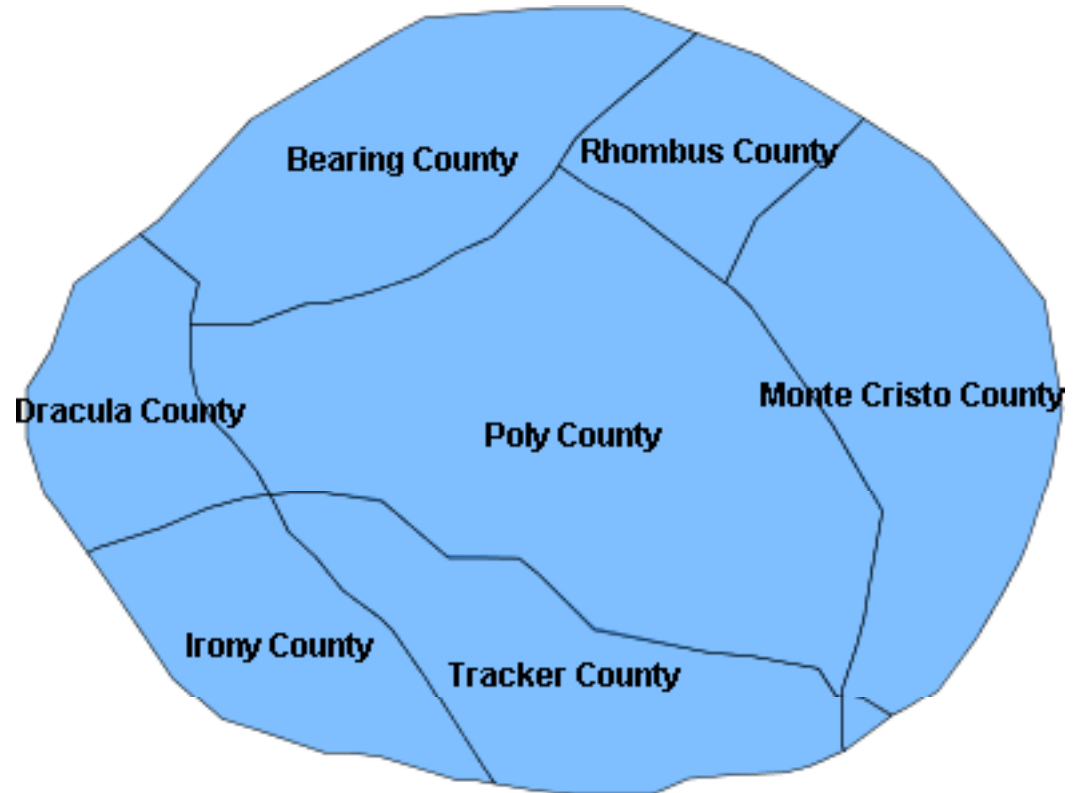
Symbology: Text

With points:



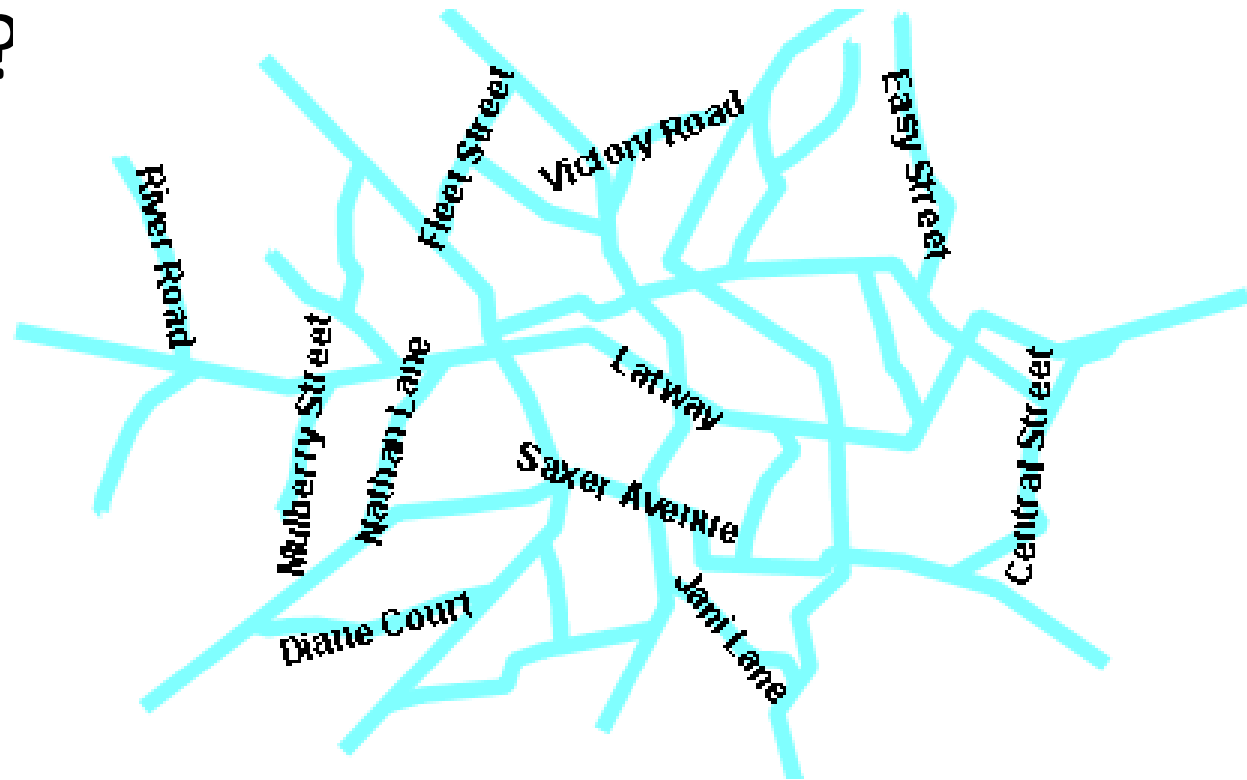
Symbology: Text

With polygons:



Symbology: Text

With lines?



Symbology: Text

Vendor Options!

```
<VendorOption name="followLine">true</VendorOption>
```



Symbology: Text

```
<VendorOption name="followLine">true</VendorOption>  
<VendorOption name="maxDisplacement">60</VendorOption>  
<VendorOption name="repeat">100</VendorOption>  
<VendorOption name="maxAngleDelta">30</VendorOption>  
<VendorOption name="autoWrap">50</VendorOption>  
etc...
```

Symbology: Raster

Digital Elevation Model

<ColorMap>

```
<ColorMapEntry color="#000000" quantity="-500" opacity="0.0" />
```

```
<ColorMapEntry color="#AAFFAA" quantity="0" />
```

```
<ColorMapEntry color="#00FF00" quantity="1000" />
```

```
<ColorMapEntry color="#FFFF00" quantity="1200" />
```

```
<ColorMapEntry color="#FF7F00" quantity="1400" />
```

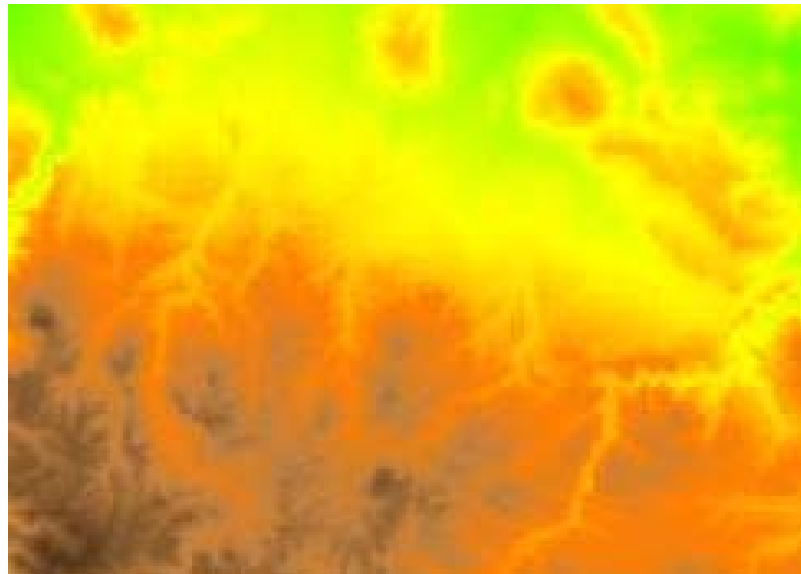
```
<ColorMapEntry color="#BF7F3F" quantity="1600" />
```

```
<ColorMapEntry color="#000000" quantity="2000" />
```

</ColorMap>

Symbology: Raster

Digital Elevation Model



Attribute-based styling

- Customize feature display
- Show only what you want to show

Attribute-based styling

<PropertyIsEqualTo>

<PropertyIsNotEqualTo>

<PropertyIsLessThan>

<PropertyIsGreaterThan>

<PropertyIsNull>

<PropertyIsLike>

Attribute-based styling

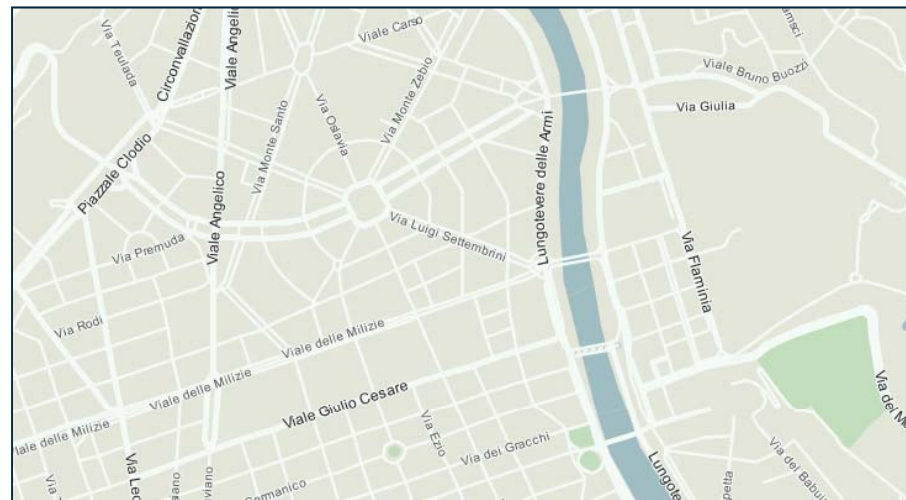
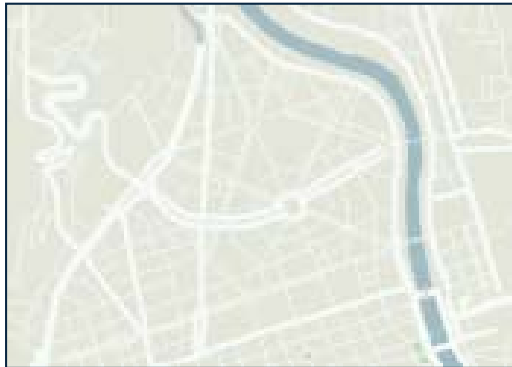
Filters apply to Rules, not individual symbolizers

```
<ogc:PropertyIsEqualTo>  
  <ogc:PropertyName>name</ogc:PropertyName>  
  <ogc:Literal>Thisland</ogc:Literal>  
</ogc:PropertyIsEqualTo>  
...
```

Zoom-based styling

Display at certain zoom levels

```
<sld:MinScaleDenominator>1000</sld:MinScaleDenominator>  
<sld:MaxScaleDenominator>10000</sld:MaxScaleDenominator>
```



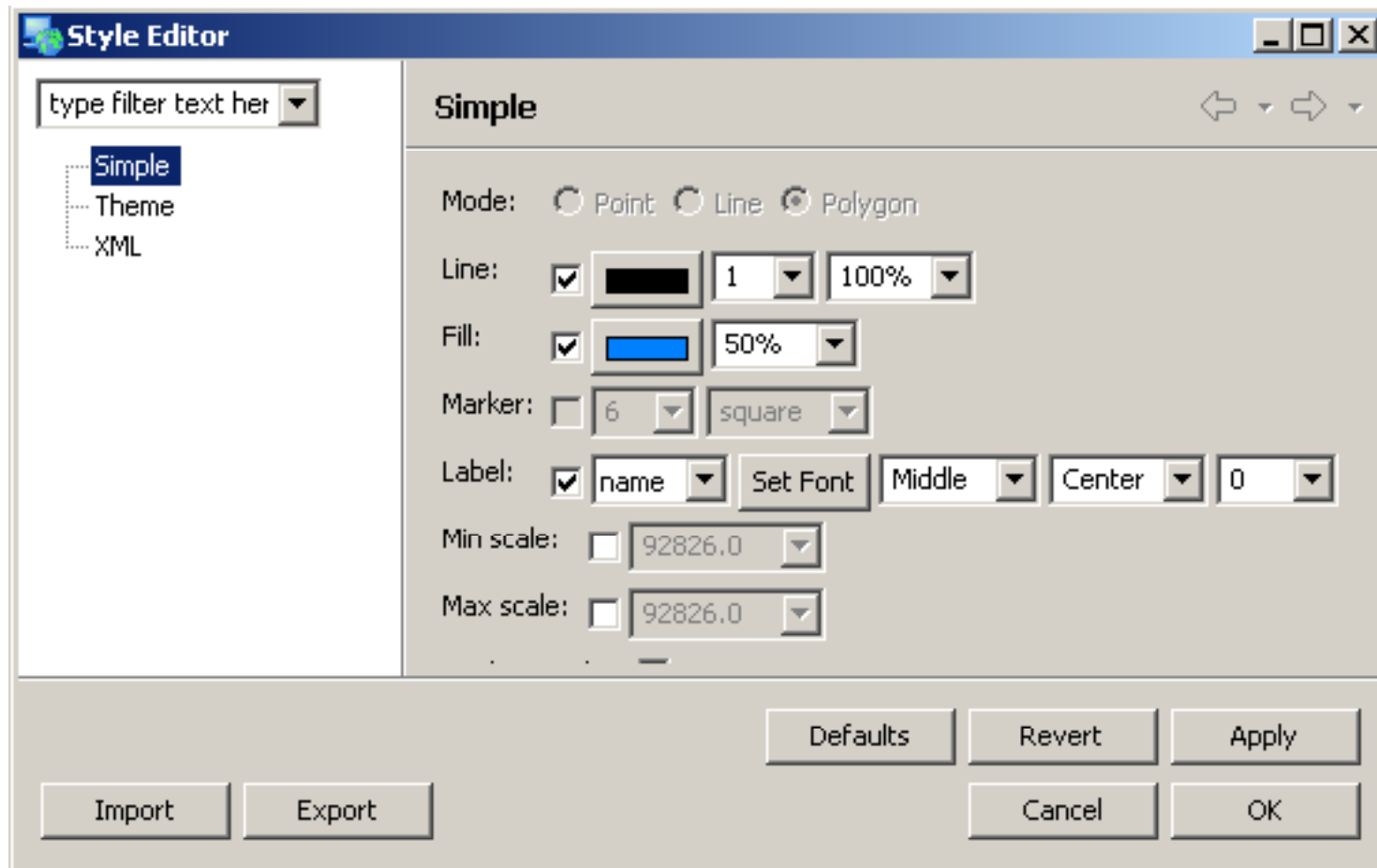
Zoom-and-attribute-based styling

This gets messy:

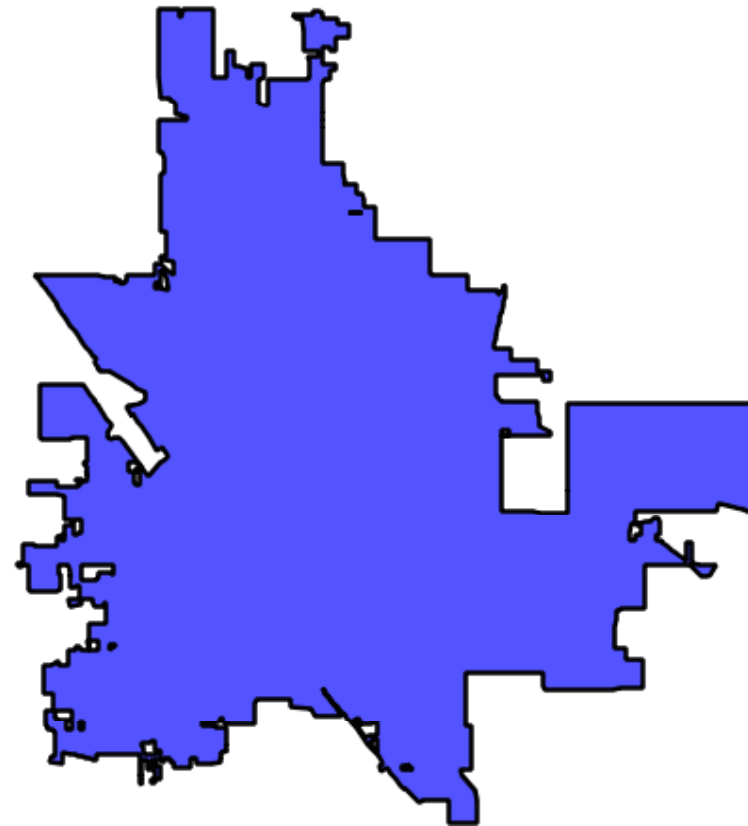
M filters at N zoom levels = M x N rules!

Alternatives to coding by hand (yay!)

uDig



Styler



CSS to SLD



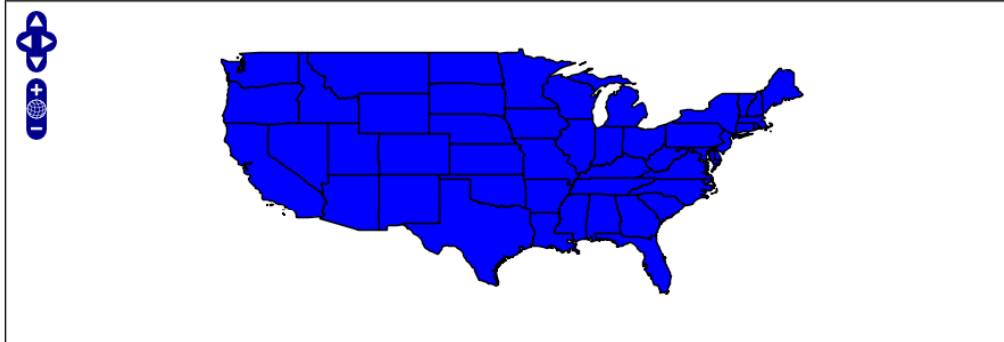
username password Remember me [Login](#)

- Server
 - About GeoServer
- Map CSS Demo
- Demos
- Layer Preview

Map CSS Demo

This page demos styling of maps using a CSS-like syntax.

Currently styling the layer. [Switch Layers](#)



The stylesheet for this map...

```
* {
  fill: blue;
  stroke: black;
}
```

```
<?xml version="1.0" encoding="UTF-8"?>
<slid:UserStyle xmlns="http://www.opengis.net/slid" xmlns:slid="http://www.op
<slid:Name>Default_Styles</slid:Name>
<slid:Title/>
<slid:FeatureTypeStyle>
  <slid:Name>name</slid:Name>
  <slid:FeatureTypeName>Feature</slid:FeatureTypeName>
  <slid:SemanticTypeInfo>SemanticTypeInfo[ANY]</slid:SemanticTypeInfo>
  <slid:Rule>
    <slid:Name>*</slid:Name>
    <slid:PolygonSymbolizer>
      <slid:Fill>
        <slid:CssParameter name="fill">
          <ogc:Literal>#0000ff</ogc:Literal>
        </slid:CssParameter>
        <slid:CssParameter name="fill-opacity">
          <ogc:Literal>1</ogc:Literal>
        </slid:CssParameter>
      </slid:Fill>
    </slid:PolygonSymbolizer>
    <slid:LineSymbolizer>
      <slid:Stroke>
        <slid:CssParameter name="stroke">
          <ogc:Literal>#000000</ogc:Literal>
        </slid:CssParameter>
        <slid:CssParameter name="stroke-width">
```

Questions?

```
<Presentation xmlns=http://2009.foss4g.org/>
  <Name>
    <Title>
      <Literal>Styled Layer Descriptor (SLD)</Literal>
    </Title>
    <Subtitle>
      <Literal>or How I Learned To Stop Worrying and Love XML</Literal>
    </Subtitle>
  </Name>
  <Presenter>
    <Name>
      <Literal>Mike Pumphrey</Literal>
    </Name>
    <Email>
      <Literal>mike@opengeo.org</Literal>
    </Email>
    <FinalWords>
      <Literal>Thanks!</Literal>
    </FinalWords>
  </Presenter>
</Presentation>
```