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May 2012

Oracle Spatial User Conference

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May 23, 2012
Ronald Reagan Building and International Trade Center
Washington, DC USA

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LJ Qian

Director, Software Development, Oracle

Steve Pierce

CEO, Think Huddle

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MapViewer

Deep Dive

Program Agenda

- Editing spatial data with redline tool
- Tuning
- Using binding variables in themes
- Importing and displaying CAD data
- Using Bing mashups
- Generating heat maps

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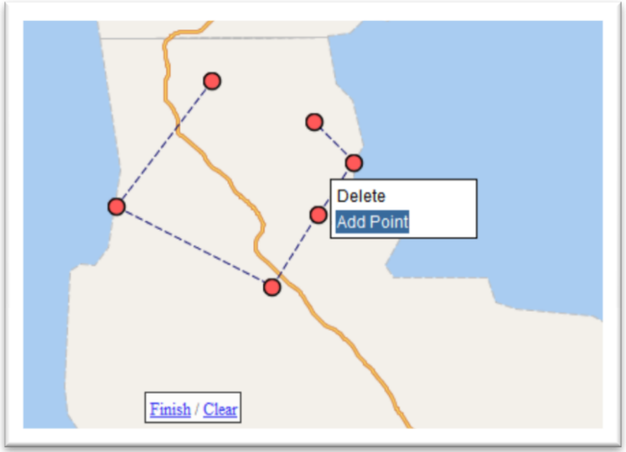
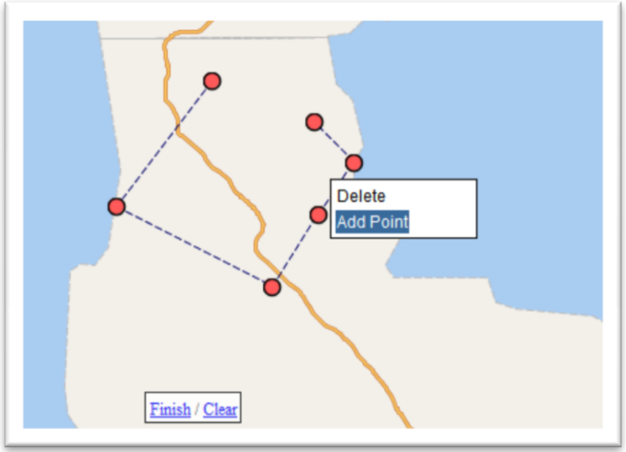
Editing Spatial Data w/ Redline Tool

- Redline tool used to create geometries in MapViewer applications
  - Create circles, rectangles, and polygons
- Why use the redline tool?
  - Simple changes to geometries can be made without desktop tools
  - Changes are persisted to database; improves:
    - Transaction control
    - History retention
    - Security



Editing Spatial Data w/ Redline Tool

- MVRedlineTool
  - Key methods
    - addVertex
    - attachEventListener
    - getPolygon
    - init
- MVFOI
  - new MVFOI
  - setVisible



Editing Spatial Data w/ Redline Tool

```
function startEditing(point, foiData) {

    currentEditingRowid = foiData.id;

    // Get the real geometry from the database
    var jsonObject = JSON.parse(getGeom(foiData.id));

    var jsonGeom = jsonObject.geom;
    var geom = new MVSdoGeometry(jsonGeom.gType, jsonGeom.srid,
jsonGeom.sdo_elem_info, jsonGeom.sdo_ordinates);
    var ordinates = geom.getOrdinates();

    // Initialize the redline tool
    redline.init();
    redline.attachEventListener(MVEvent.CLEAR, clearEdit);
    redline.attachEventListener(MVEvent.FINISH, finishEdit);

    // Populate the redline tool with data from the geometry
    for (var i=0;i < ordinates.length-2;i=i+2) {
      redline.addVertex(i/2, ordinates[i],ordinates[i+1]);
    }

    // Make sure user's don't try clicking on other features
    buildingTheme.setClickable(false);
}
```

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Editing Spatial Data With the Redline Tool

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Tuning

General Tips

- Monitor MapViewer logs and look at loading times
  - Long load times might mean the DB is getting saturated
- Monitor JVM behavior, especially GC activities
  - Use tools such as Jconsole, Jrockit Mission Control
  - Excessive GC will dramatically reduce MapViewer performance
- Completely disabling in-memory spatial data cache might help for large data sets
- Tune the number of mappers (more mappers = more concurrent requests handled, but may flood CPU and DB)
- Use /mapviewer/admin.html for quick health monitoring

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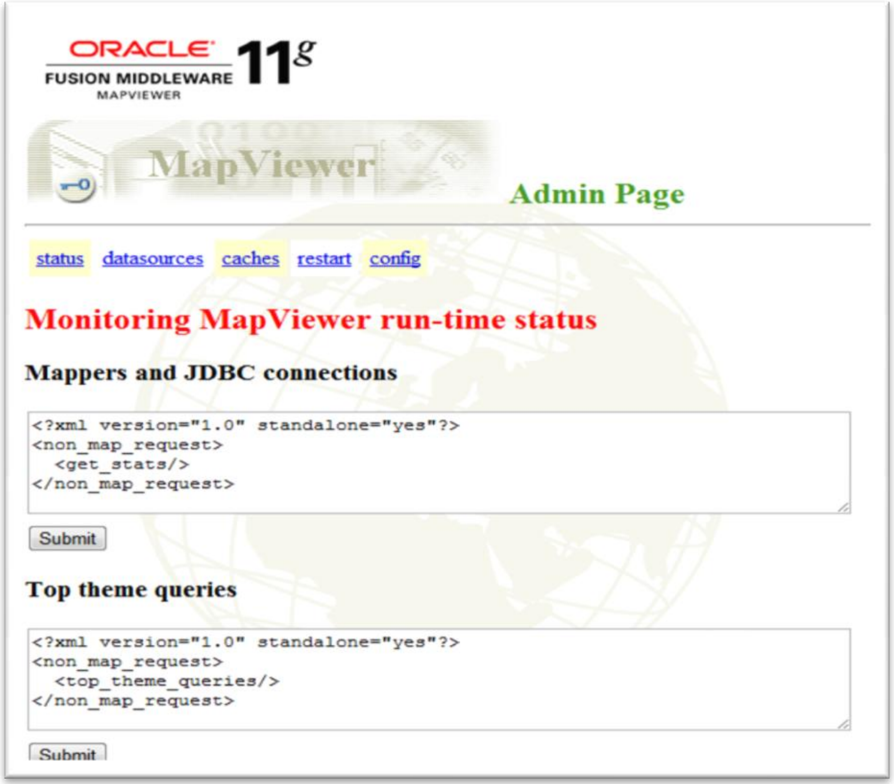
Tuning

/mapviewer/admin.html

- Provides overall JVM status and JDBC connection usages per data source
- Lists top 10 most time-consuming theme queries



Monitoring MapViewer run-time status

Mappers and JDBC connections

```
<?xml version="1.0" standalone="yes"?>
<non_map_request>
  <get_stats/>
</non_map_request>
```

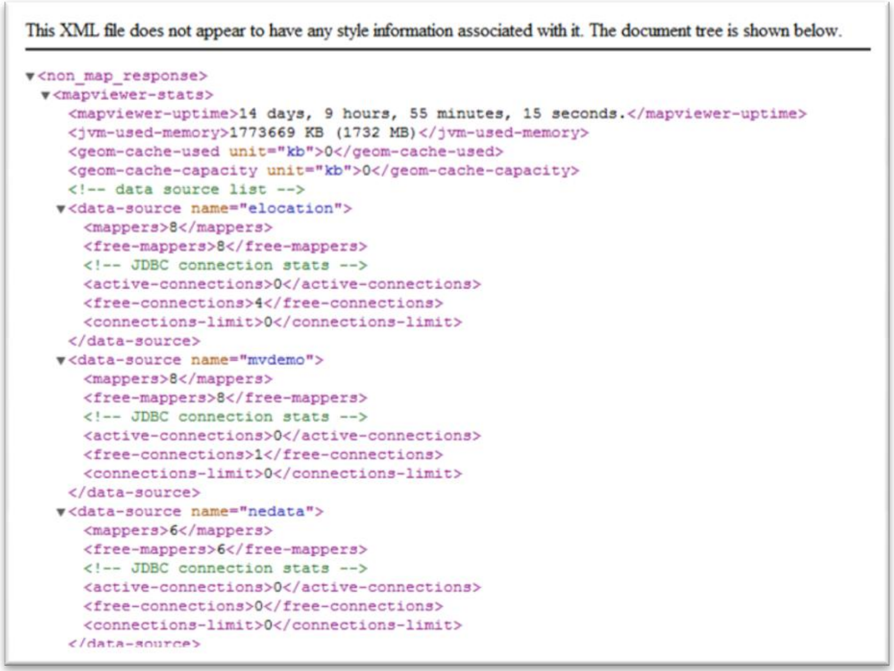
Top theme queries

```
<?xml version="1.0" standalone="yes"?>
<non_map_request>
  <top_theme_queries/>
</non_map_request>
```

Tuning

/mapviewer/admin.html

- Provides overall status, JVM heap, and DB connection usages



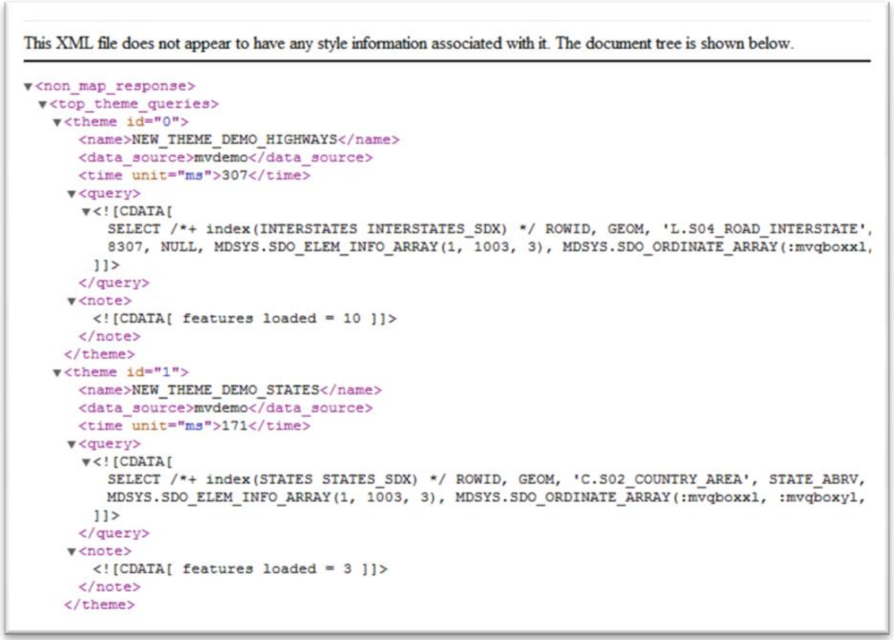
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
▼<non_map_response>
  ▼<mapviewer-stats>
     <mapviewer-uptime>14 days, 9 hours, 55 minutes, 15 seconds.</mapviewer-uptime>
     <jvm-used-memory>1773669 KB (1732 MB)</jvm-used-memory>
     <geom-cache-used unit="kb">0</geom-cache-used>
     <geom-cache-capacity unit="kb">0</geom-cache-capacity>
     <!-- data source list -->
   ▼<data-source name="elocation">
       <mappers>8</mappers>
       <free-mappers>8</free-mappers>
       <!-- JDBC connection stats -->
       <active-connections>0</active-connections>
       <free-connections>4</free-connections>
       <connections-limit>0</connections-limit>
     </data-source>
   ▼<data-source name="mvdemo">
       <mappers>8</mappers>
       <free-mappers>8</free-mappers>
       <!-- JDBC connection stats -->
       <active-connections>0</active-connections>
       <free-connections>1</free-connections>
       <connections-limit>0</connections-limit>
     </data-source>
   ▼<data-source name="nedata">
       <mappers>6</mappers>
       <free-mappers>6</free-mappers>
       <!-- JDBC connection stats -->
       <active-connections>0</active-connections>
       <free-connections>0</free-connections>
       <connections-limit>0</connections-limit>
     </data-source>
```

Tuning

/mapviewer/admin.html

- Provides top theme queries (time spent and number of features loaded)



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
▼<non_map_response>
  ▼<top_theme_queries>
    ▼<theme id="0">
      <name>NEW_THEME_DEMO_HIGHWAYS</name>
      <data_source>mvdemo</data_source>
      <time unit="ms">307</time>
     ▼<query>
       ▼<![CDATA[
          SELECT /*+ index(INTERSTATES INTERSTATES_SDX) */ ROWID, GEOM, 'L.S04_ROAD_INTERSTATE',
          8307, NULL, MDSYS.SDO_ELEM_INFO_ARRAY(1, 1003, 3), MDSYS.SDO_ORDINATE_ARRAY(:mvqboxxl,
        ]]>
      </query>
     ▼<note>
        <![CDATA[ features loaded = 10 ]]>
      </note>
    </theme>
    ▼<theme id="1">
      <name>NEW_THEME_DEMO_STATES</name>
      <data_source>mvdemo</data_source>
      <time unit="ms">171</time>
     ▼<query>
       ▼<![CDATA[
          SELECT /*+ index(STATES STATES_SDX) */ ROWID, GEOM, 'C.S02_COUNTRY_AREA', STATE_ABRV,
          MDSYS.SDO_ELEM_INFO_ARRAY(1, 1003, 3), MDSYS.SDO_ORDINATE_ARRAY(:mvqboxxl, :mvqboxyl,
        ]]>
      </query>
     ▼<note>
        <![CDATA[ features loaded = 3 ]]>
      </note>
    </theme>
```

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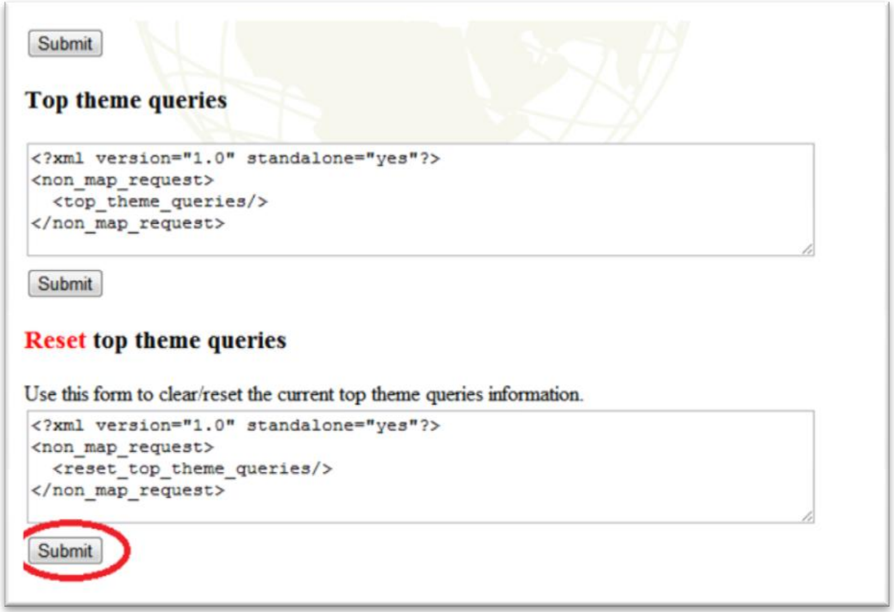
Tuning

/mapviewer/admin.html

- You can reset top theme query statistics easily:



Top theme queries

```
<?xml version="1.0" standalone="yes"?>
<non_map_request>
  <top_theme_queries/>
</non_map_request>
```

Reset top theme queries

Use this form to clear/reset the current top theme queries information.

```
<?xml version="1.0" standalone="yes"?>
<non_map_request>
  <reset_top_theme_queries/>
</non_map_request>
```

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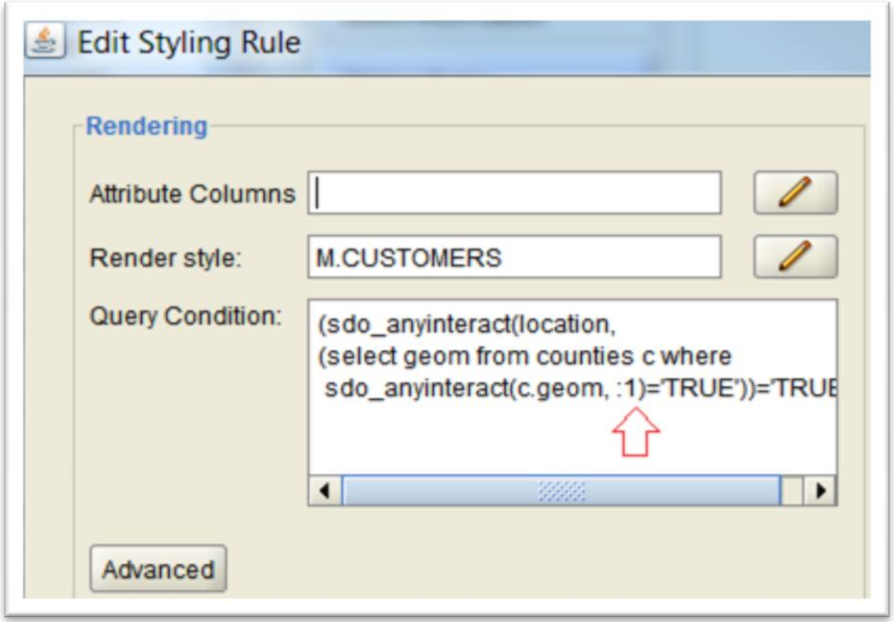
Tuning

Using Binding Variables in Themes

- Provides easy filtering of a theme's feature set
- Promotes reuse of theme definitions; reduces clutter
- Eases database tuning
- More secure; always prefer pre-defined themes with binding variables



Edit Styling Rule

Rendering

Attribute Columns:

Render style: M.CUSTOMERS

Query Condition:

```
(sdo_anyinteract(location,
(select geom from counties c where
 sdo_anyinteract(c.geom, :1)='TRUE'))='TRU
```

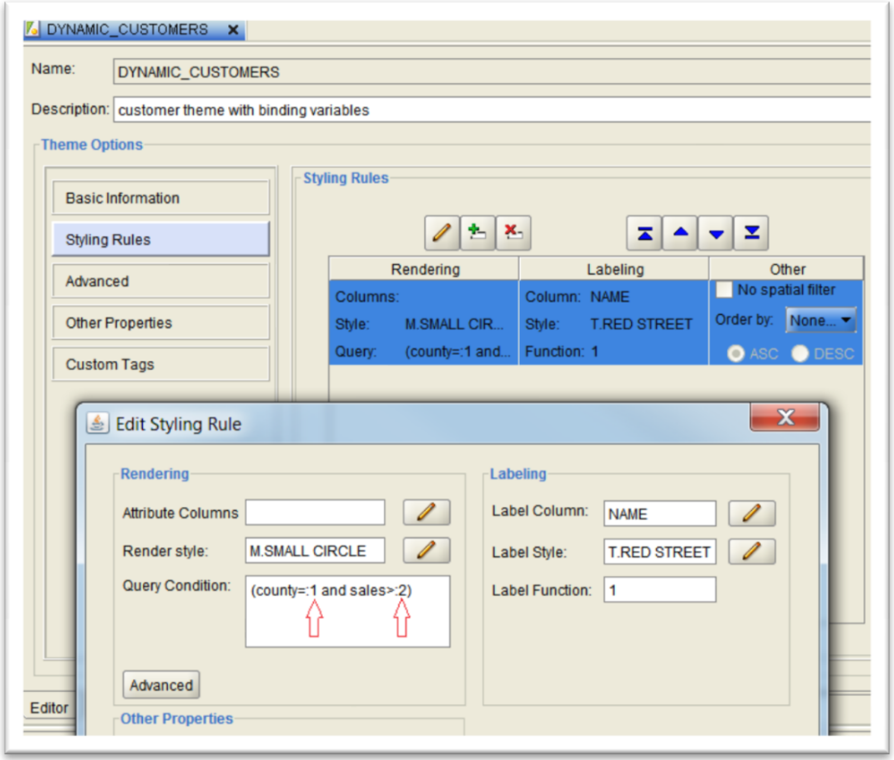
Using Binding Variables in Themes

- Pre-defined theme can also have a full-query string in its definition
- Can bind a list of values to a variable
- Can also bind a geometry to a variable

Using Binding Variables in Themes

- Step 1: Create a pre-defined theme and set binding variable(s) in the query condition

Note that this theme has two binding variables



DYNAMIC_CUSTOMERS

Name: DYNAMIC_CUSTOMERS

Description: customer theme with binding variables

Theme Options

Styling Rules

Rendering	Labeling	Other
Columns:	Column: NAME	□ No spatial filter
Style: M.SMALL CIR...	Style: T.RED STREET	Order by: None...
Query: (county=:1 and...	Function: 1	○ ASC ○ DESC

Edit Styling Rule

Rendering

Attribute Columns:

Render style: M.SMALL CIRCLE

Query Condition: (county=:1 and sales>:2)

Labeling

Label Column: NAME

Label Style: T.RED STREET

Label Function: 1

Using Binding Variables in Themes

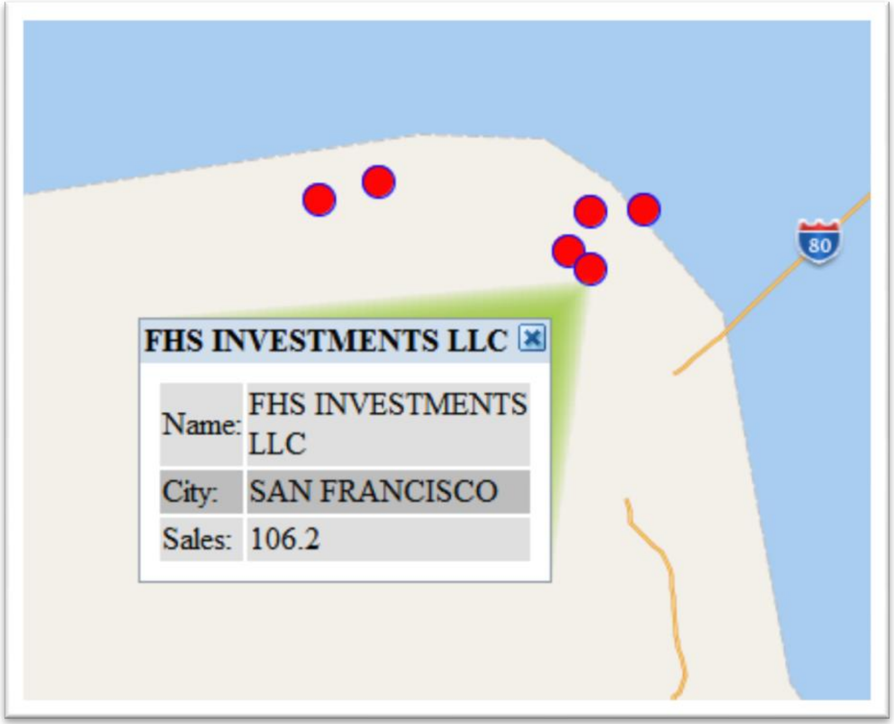
- Step 2: At runtime, set the value(s) for the binding variable(s)

```
var layer = new MVThemeBasedFOI(themefoi1',
'mvdemo.dynamic_customers');

 layer.setQueryParameters('SAN FRANCISCO', '100');

mapview.addThemeBasedFOI(layer);
```

Note that two values—SAN FRANCISCO and 100—were passed into the setQueryParameters() call



FHS INVESTMENTS LLC

Name:	FHS INVESTMENTS LLC
City:	SAN FRANCISCO
Sales:	106.2

Using Binding Variables in Themes

- An example of advanced use of binding variables

What if you enter the following in the theme's definition?

(county=? or 1=?) and **(sales>? or 1=?)**

- Two query conditions (red, green); more can be used
- Application can dynamically short-circuit any or all of the query conditions
- Red is ignored if the 2nd binding variable is set to 1; green is ignored if the 4th binding variable is set to 1
- Provides great flexibility in filtering a theme's data set

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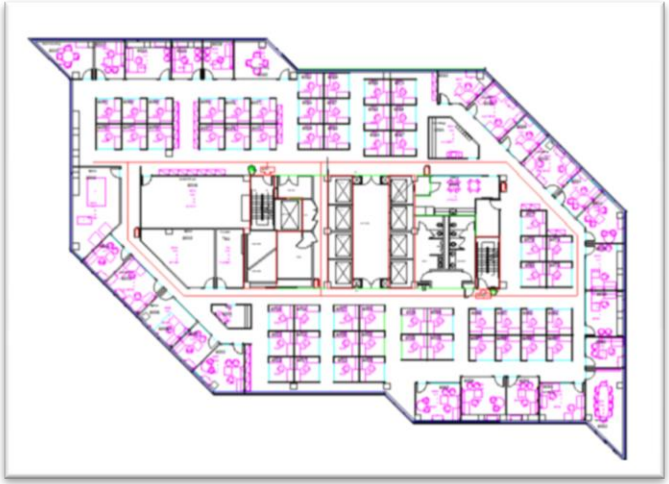
Using Binding Variables in Themes

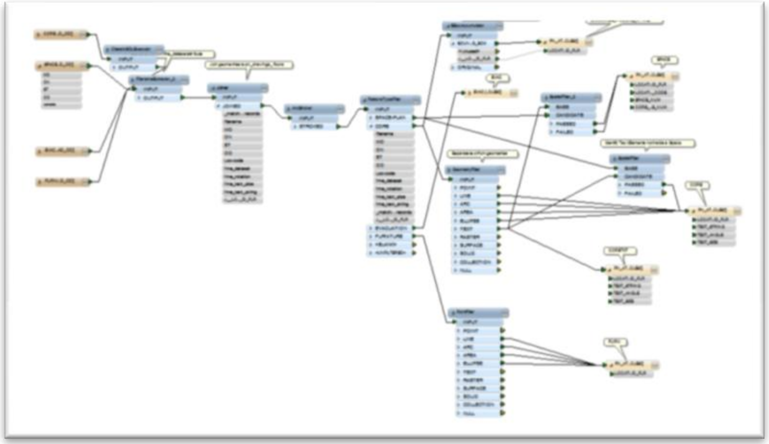
Importing & Displaying CAD Data

- Why CAD in Oracle Spatial?
  - Drives organizations toward standardization of CAD layers
  - Provides an easy way for non-CAD users to view data
  - Object data can be materialized into a database and made queryable



Importing & Displaying CAD Data

- Challenges
  - CAD layers might not be standard across all drawings
  - Precision of data may be high
  - Object data may be missing
  - If there is no object data, text may not be on poly layer
  - Font size ranges
  - Out-of-view objects – temporary layers



- Implementation
  - FME for data cleansing and import
  - Oracle MapViewer for rendering

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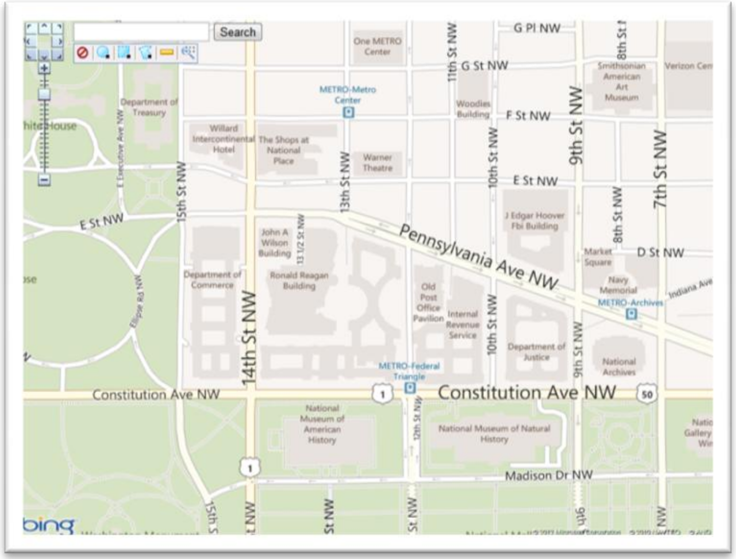
Importing and Displaying CAD Data

Using Bing Mashups

- I thought this was a MapViewer presentation!
- Oracle MapViewer supports Bing and Google maps; WMS
- MapViewer uses Bing API to retrieve tiles
- The Bing API is already loaded, so use it



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Using Bing Mashups

- To get to the underlying Bing API, see example
- Find method
  - Can be used to return one or more lookup results
  - Returns the name, center, and MBR of the search result
  - Only works with Bing v6
  - For Bing v7 use SearchManager

```
var bingMap = new MVBingTileLayerV6();
bingMap.setKey(“your key");

mapview.addMapTileLayer(bingMap);

var realBingMap = bingMap.map;
```

Using Bing Mashups

- Simplest example
  - Search form with a button
  - Returns only first result
  - Map zooms to the MBR of the first result

```
function bingSearch() {

    // Get the search text from the input box
    var queryTerm = document.getElementById('queryTerm').value;

    // Grab a handle to the bing map api
    var veMap = mapview.getMapTileLayers()[0].map;

    // Invoke find with a callback to center/zoom
    veMap.Find(null, queryTerm, null, null, null, 1, null,
        false, false, false,
        function(layer, resultsArray, places, hasMore, veErrorMessage) {
            if (places) {
                var place = places[0];
                var bboxMinX = place.LatLongRect.TopLeftLatLong.Longitude;
                var bboxMinY = place.LatLongRect.BottomRightLatLong.Latitude;
                var bboxMaxX = place.LatLongRect.BottomRightLatLong.Longitude;
                var bboxMaxY = place.LatLongRect.TopLeftLatLong.Latitude;
                var bbox = MVSdoGeometry.createRectangle(bboxMinX, bboxMinY,
bboxMaxX, bboxMaxY, 8307);
                mapview.zoomToRectangle(bbox);
            }
        }
    );
    return false;
}
```

Using Bing Mashups

- MVCustomTileLayer
  - Loading the Bing API cost client CPU cycles
  - If you don’t need the API
    - MVCustomTileLayer
      - Faster
      - Fewer client CPU cycles
      - Easier to print
  - Also works for ESRI base maps

```
function getBingTileURL(tx, ty, tw, th, zoomLevel) {
    var tileX = Math.abs(((-20037508 - tx)/tw));
    var tileY = Math.abs(((20037508 - ty)/th) - 1);
    var quadKey = TileXYToQuadKey(tileX, tileY, 
zoomLevel);
    return “http://ecn.t0.tiles.virtualearth.net/tiles/r" 
+ quadKey + ".png?g=563&mkt=en-us&lbl=l1&n=z";
}


// Converts tile XY coordinates into a QuadKey at a 
specified level of detail.
function TileXYToQuadKey(tileX, tileY, zoomLevel){
    var quadKey = "";
    var msZoomLevel = zoomLevel+1;
    for (var i = msZoomLevel; i > 0; i--) {
        var digit = 0;
        var mask = 1 << (i - 1);
        if ((tileX & mask) != 0) {
            digit++;
        }
        if ((tileY & mask) != 0) {
            digit++;
            digit++;
        }
        quadKey+= digit;
    }
    return quadKey;
}
```

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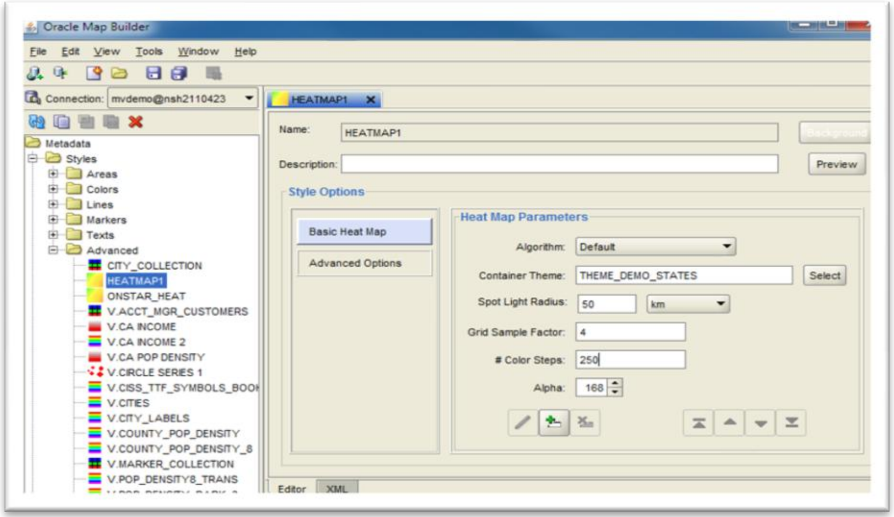
Using Bing Mashups

Generating Heat Maps

- A heat map is:
  - A continuous probability surface
  - A theme with a heat-map style
- Any point data set can be rendered as heat map



Connection: mvdemo@nsh2110423

Name: HEATMAP1

Description:

Algorithm: Default

Container Theme: THEME_DEMO_STATES

Spot Light Radius: 50 km

Grid Sample Factor: 4

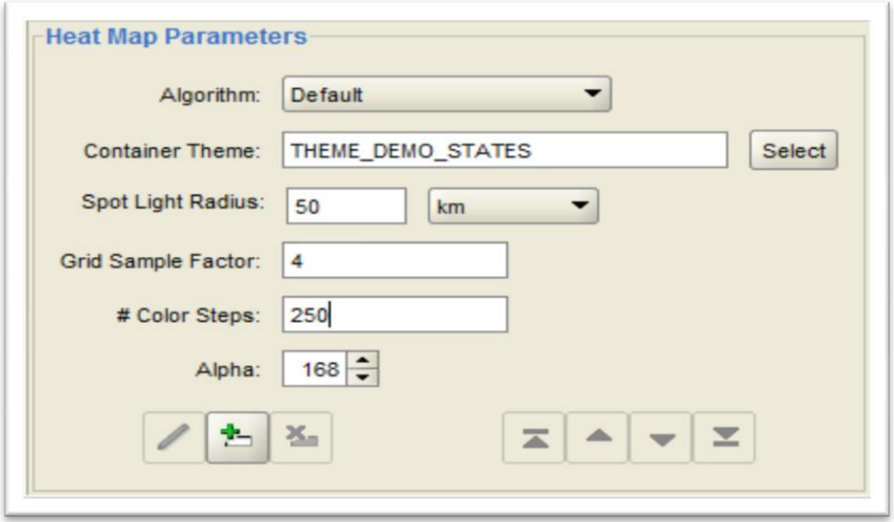
Color Steps: 250

Alpha: 168

Generating Heat Maps

A heat-map style defines:

- **Algorithm:** default is kernel based; IDW is inverse distance weighted plus a designated attribute whose values at known points also contribute to the final result
- **A container theme:** defines the boundary of the heat map rendering (so the heat does not extend into the ocean, for instance)
- **A spotlight radius:** for any target location on the map, only point data within this radius contribute to the intensity of the target location
- **A grid sample factor:** the probability grid surface is scaled down by this factor from the actual map window size; determines granularity of computation
- **# of color steps:** number of steps between probability 0 to 1
- **Alpha:** the overall transparency of the heat map surface (so that underlying features can still be seen)



Heat Map Parameters

Algorithm: Default

Container Theme: THEME_DEMO_STATES

Spot Light Radius: 50 km

Grid Sample Factor: 4

Color Steps: 250

Alpha: 168

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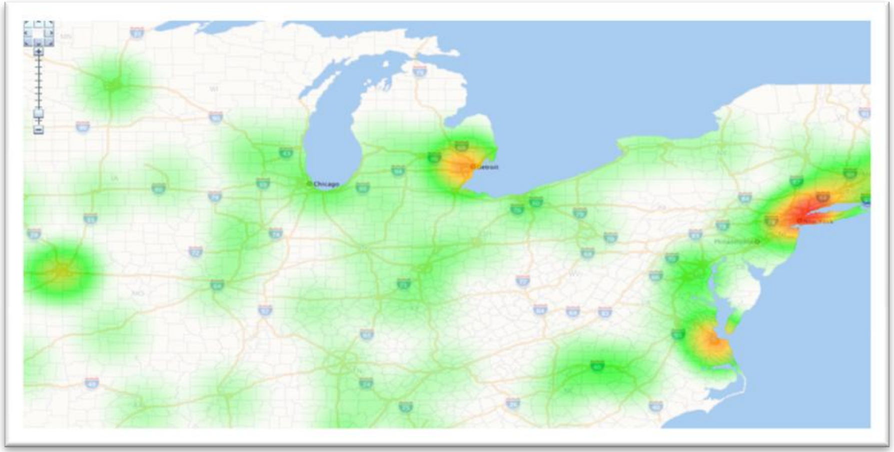
Generating Heat Maps

- After a heat-map style is defined, assign it to a theme
  - Theme's geometries must be point type
- Benefits:
  - Can handle millions of points when generating a heat map
  - Can be used as a FOI layer on a slippy map
  - Takes advantage of much-improved performance in the new 12c development builds



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Generating Heat Maps

Q&A