

Sample Script

Building Dynamic Web Geomashups

MicroImages has prepared a demonstration of an automated, regularly-scheduled geomashup application that downloads updated geospatial data from the Internet, processes and combines the data with other geospatial data, and posts the result on a web page for viewing in the Google Earth browser plug-in (see the Technical Guide entitled *Geomedia Publishing: Today's Earthquakes in California and Nevada*). The key component of this application is a custom processing script written in the TNT Geospatial Scripting Language (SML) that is run hourly by the TNTmips Pro Job Processing System.

The data in this example are global earthquake epicenter locations and associated attributes. These data are posted and continuously updated as a comma-separated text file by the U.S. Geological Survey Earthquake Hazards Program (at <http://earthquakes.usgs.gov/eqcenter/catalogs/>). This sample SML script (`canvquakes.sml`, excerpted on the reverse of this page) takes advantage of the many capabilities in SML:

- the `HTTP_CLIENT` class for connecting to web servers and downloading data;
- the MIE classes for importing data; and
- the KML class, which allows a script to render a layout containing various geospatial layers into a KML file that anyone can then view in the Google Earth desktop application or in a browser with the Google Earth plug-in.



Google Earth plug-in displaying KML earthquake overlay produced by the sample script and the native Google global imagery. The feature balloon information shown when an earthquake epicenter marker is clicked is transferred to the KML file from the TNT DataTip settings.

The box above right summarizes the script processing steps, from downloading the text file to rendering a layout with styled earthquake points and reference fault lines to a finished KML file. The earthquake epicenter points in the TNT layout are converted to placemarks in the KML file. The script takes advantage of several automated features of the KML rendering procedure in SML. First, any vector element attribute information that is set for viewing in a DataTip in the TNT products is automatically converted to a “description” for the resulting placemark in the KML file. Google Earth shows this description in a pop-up “fea-

Processing Steps in SML Script to Create a Google Earth Geomashup with Earthquake Data (`canvquakes.sml`)

- 1 Connect to USGS web site and download current 24-hour global earthquake epicenter file (comma-separated text).
- 2 Import point data in text file to a temporary TNT vector object and store earthquake magnitude, depth, and other parameters in a database table with 1 record per point.
- 3 Extract epicenter points and records for the specified range of latitude and longitude to a new temporary vector object.
- 4 Add string expression field to the point database table and assign expression to create a multiline string listing earthquake attributes for each point for use as a DataTip.
- 5 Add extracted epicenter vector object to an existing page layout containing a vector layer with major active fault lines.
- 6 Modify settings for earthquake epicenter vector layer to specify the database field for point DataTips.
- 7 Set earthquake epicenter point styles by script; symbol size is based on magnitude, color based on depth.
- 8 Render the modified layout to a KML file referenced by the sample web page.
- 9 Create text file with date and time the KML file was created (text to be shown on web page).

ture balloon” when each placemark is clicked. The sample script therefore sets up a DataTip for each earthquake epicenter point using a string expression field it creates in the vector point database table. The expression for this field creates a listing of multiple earthquake attributes that are read from various other fields in the table.

The KML rendering procedure in the SML script also automatically assigns 3D marker symbols (sphere or cube) from the Google Earth marker library to any TNT vector points that are styled using the TNT predefined point symbols (circle or box). The sample script therefore assigns epicenter point symbols using a query that references preset styles in a style object stored in a reference TNT Project File. Marker size is set to vary with earthquake magnitude, and the marker color is determined by the depth of the earthquake below the ground surface.

Automated running of this sample script on a repeating schedule in the TNTmips Pro Job Processing System is discussed in the TechGuide entitled *System: Scheduling Automatically Repeating Jobs*. (over)

Many sample scripts have been prepared to illustrate how you might use the features of the TNT products' scripting language for scripts and queries. These scripts can be downloaded from www.microimages.com/downloads/scripts.htm.

Script Excerpts for `canvquakes.sml`

1 Download USGS daily global earthquake summary

```
class STRING address$ = "earthquakes.usgs.gov";
class STRING url$ =
    "http://earthquakes.usgs.gov/eqcenter/catalogs/eqs1day-M1.txt";
class STRING textfile$ = _context.ScriptDir + "/Download/eqs1day-M1.txt";
class HTTP_CLIENT http;
clear();

http.SetTimeout(15);
err = http.Connect(address$, 80);

http.DownloadFile(url$, textfile$);
```

connect to the web server

download the text file

2 Import the comma-delimited text file of earthquake epicenters to points in a vector object

```
class RVC_OBJECT tempfile;
tempfile.MakeTempFile(1);

class RVC_OBJITEM fqObjItem;
class RVC_DESCRIPTOR fqDescriptor;
fqDescriptor.SetName("GlobalQuakes");
fqDescriptor.SetDescription("");

fqObjItem.CreateNew(tempfile.GetObjItem(), "VECTOR", fqDescriptor);

class MIE_VECTOR mieTV;

class STRING formatFilename$ =
    "_context.ScriptDir + "/resources/eqFormat.fmt";
mieTV.FormatFilename = formatFilename$;

err = mieTV.ImportObject(textfile$, fqObjItem);
printf("mie ImportObject returned %d\n", err);
```

set up new vector object in tempfile

object item for vector with global daily earthquake epicenters

set up class for import/export of vector from/to text; the class method to import the object takes an RVC_OBJITEM rather than an RVC_VECTOR class

instance

set existing format file that records all import settings including additional database fields and the coordinate reference system for the earthquake data

3 Copy epicenter points within the specified latitude/longitude range to a new temporary vector object

```
class RVC_VECTOR CaNv_Quakes;
CreateTempVector(CaNv_Quakes, "Planar");

class STRING ptQry;
ptQry = "if (CLASS.Lat > 32.5 && CLASS.Lat < 42.0 && CLASS.Lon > -124.75 && CLASS.Lon < -114.0) return true;";

class RVC_VECTOR GlobalQuakes;

GlobalQuakes.OpenByName(fqObjItem.GetFilePath(),
    fqObjItem.GetObjectPath(), "Read");

err = VectorCopyElements(GlobalQuakes, CaNv_Quakes,
    "RemExRecords", ptQry);
printf("VectorCopyElements returned %d\n", err);

GlobalQuakes.Close();
```

create new temporary vector object for the California-Nevada epicenter points

query string to select epicenter points within desired latitude-longitude range

class instance for the global earthquake vector object, needed for the VectorCopy Elements function

open the global earthquake vector object

use query to copy epicenters from global earthquake vector to temporary California-Nevada epicenter vector object

close the global earthquake vector object

5 Read page layout with major fault lines and add the earthquake epicenter vector to it.

```
class STRING layoutfile$ = _context.ScriptDir +
    "/resources/QuakeResources.rvc";
class GRE_LAYOUT layout;
layout.Read(layoutfile$, "FaultLayout");

class GRE_GROUP group;
group = layout.FirstGroup();

class GRE_LAYER_VECTOR quakeLayer;
quakeLayer = GroupQuickAddVectorVar(group, CaNv_Quakes);
```

filename for the layout

get handle for the single group in the layout

add the earthquake epicenter vector to the group in the layout

7 Set the earthquake epicenter point styles by script using a previously saved style script file that uses point styles already created and saved in a style object in a reference Project File. These styles use the predefined filled circle symbol with different colors assigned by earthquake depth; Render to KML automatically converts these predefined circle symbols into a shaded sphere symbol in Google Earth.

```
class STRING styleFile$ = _context.ScriptDir +
    "/resources/QuakeResources.rvc";
class FILEPATH styleFilepath(styleFile$);
class RVC_STYLE ptStyles;
ptStyles.OpenByName(styleFilepath, "PtStyles.STYLE", "Read");
quakeLayer.StyleObject = ptStyles;

class STRING ptStyleQry;
ptStyleQry = TextFileReadFull( sprintf("%s/resources/QuakeStyle.qry",
    _context.ScriptDir) );

quakeLayer.Point.StyleMode = "ByScript";
quakeLayer.Point.Script = ptStyleQry;
```

set previously-created style object with point styles to use

set up earthquake point styling by script; read style script from saved file to avoid syntax check problems with Table.Field references in the query

8 Render the layout to a KML file.

```
print("Rendering updated layout to KML.");
class DATETIME dt;
dt.SetCurrent();
dt.ConvertToUTC();

class STRING datetime$;
datetime$ = dt.GetString();
datetime$ += " UTC";
printf("update datetime: \n", datetime$);

class STRING dtFilename$ = _context.ScriptDir + "/datetime.txt";
class FILE dtFile = fopen(dtFilename$, "w");
fwritestring(dtFile, datetime$);
fclose(dtFile);

class STRING kmlName$ = _context.ScriptDir + "/eqs1day_canv.kml";
class FILEPATH kmlPath(kmlName$);

class KML kml;
kml.SetPath(kmlPath);
kml.SetLayout(layout);
kml.SetResolution(450);
kml.Write();

CaNv_Quakes.Close();
tempfile.Close();
```

get current datetime and convert to UTC

string with datetime for web page

open text file and write datetime string (overwrite)

KML file information

render the modified layout to KML

target resolution 450 m

close temporary objects