

Navigating SAS Mapping Technologies

Darrell Massengill, SAS Institute

Every organization has location-based data. The difficulty is in effectively transforming that data into useful information or intelligence. SAS has numerous powerful mapping technologies and tools to transform with your location data. This handout gives a brief overview of these technologies and tools. The mapping technologies include all of the methods of viewing maps and the mapping tools include some new and important tools for dealing with spatial data.

MAPPING TECHNOLOGIES

Some of the mapping technologies use ESRI's ArcGIS software to display the maps. Other technologies are self contained in SAS. The mapping technologies have been divided into several groups. These include those that use ArcGIS desktop software, ESRI's ArcGIS server software, SAS/GIS software and SAS/Graph mapping software.

ESRI ARCGIS DESKTOP MAPPING

ESRI's ArcGIS Desktop software interfaces with SAS through the SAS Bridge for ESRI product.

SAS Bridge for ESRI

SAS Bridge for ESRI allows the ArcGIS desktop user to read SAS data, write SAS data and run SAS programs from within the ArcGIS software. Figure 1 shows the results of viewing SAS data on an ArcGIS map, selecting some of the data on the map and then running a SAS program on the selected data to generating the resulting barchart.

For more information, see: <http://www.sas.com/products/bridgeforesri/>

ESRI ARCGIS SERVER MAPPING

ESRI's ArcGIS Server is used with SAS Web OLAP Viewer, SAS Web Report Studio and Enterprise Guide. The ESRI Map component communicates with SAS and ArcGIS Server in order to deliver ArcGIS maps with SAS OLAP data.

SAS Web OLAP Viewer

An ESRI Map component was added to SAS Web OLAP Viewer with SAS 9.1.3SP2. Figure 2 shows a report with OLAP data in the table and on the ESRI Map component. SAS Web OLAP Viewer delivers information through a web browser with zero download. For more information, see: http://www.sas.com/technologies/bi/query_reporting/webolapviewer/

SAS Web Report Studio

The ESRI Map component was added to SAS Web Report Studio with 3.1 (post 9.1.3SP4). Figure 3 shows OLAP data in a table and on the ESRI Map component. SAS Web OLAP Viewer delivers information through a web browser with zero download. For more information, see: http://www.sas.com/technologies/bi/query_reporting/webreportstudio/

Enterprise Guide

The ERI map component was added to Enterprise Guide in 4.1 (post 9.1.3SP4). Figure 4 illustrates a table and an ESRI Map. For more information, see: http://www.sas.com/technologies/bi/query_reporting/guide/

SAS/GIS

SAS/GIS software provides an interactive Geographic Information System (GIS) within the SAS System. SAS/GIS software provides a variety of tools, features, and capabilities that are specific to the business geographics market and can be used to build powerful decision support systems. Figure 5 shows the SAS/GIS desktop interface. For more information, see:

<http://www.sas.com/products/gis/>

SAS/GRAPH MAPPING

The SAS/Graph mapping functionality allows you to create choropleth, prism, block and surface maps within the SAS System. Proc GMAP and the SAS/AF Map component are 2 commonly used mapping technologies. For product information, see:

http://www.sas.com/technologies/bi/query_reporting/graph/index.html

Proc GMAP

The SUGI presentations in the Resources section below contain more information on SAS/GRAPH mapping. Figure 6 below illustrates an elevation map created with Proc GMAP and Annotate.

SAS/AF Map Control

The SAS/AF Map control is used within SAS/AF but is part of SAS/GRAPH. Figure 7 shows a simple election map created with this component.

MAPPING TOOLS

SAS has many mapping tools for working with your location data. Only a few will be illustrated here. These tools were chosen because they are new, important or coming in a future release.

Map Data and MapsOnline

The proper map data is critical for creating your maps. The MapsOnline website contains current maps, sample programs and other tools. The website continues to evolve and change, so check it periodically. It is located at: <http://support.sas.com/mapsonline>. Other sources of map data and examples of creating your own maps can be found in the SUGI presentations listed in the Resources section below.

ZIP Codes and ZCTAs

ZIP Codes are postal delivery routes. Technically, there isn't actually a polygon that defines this delivery area. This map must be manually created and is usually very expensive. SAS ships a ZIP Code centroid (the weighted center of that delivery area) dataset in the SASHELP library. This data is updated on a regular basis and updates are available on the MapsOnline website.

ZCTAs are similar to ZIP Code polygons. ZCTA stands for ZIP Code Tabulation Areas and are used by the U.S. Census Bureau. (See: <http://www.census.gov/geo/ZCTA/zcta.html>). These may be useful for your purposes, but there are some limitations. First, not all ZIP Codes are represented. Second, some ZIP Codes may be combined into a larger block that ends with HH or XX. Finally, you may not be able to use the ZCTA or ZIP Code value as the 'id' value on a map because it may not be unique for a single polygon. For more information on ZIP Codes and ZCTAs, see Louise Hadden's SUGI 31 paper listed in the Resources below. In addition, ZIP Codes are used throughout the Tips and Tricks papers listed below.

Proc MAPIMPORT

Proc MAPIMPORT was added to allow you to import ESRI Shapefile data into a SAS Map dataset.

```
PROC MAPIMPORT OUT=sasuser.newmap DATAFILE='e:\nc.shp'; run;
```

Proc GINSIDE

Proc GINSIDE will be new in SAS 9.2. The procedure will compare a dataset with point data to a map dataset and identify which polygon contains each point.

```
PROC GINSIDE MAP=map DATA=points OUT=output ;  
  ID idvar idvar2;
```

MAP= Contains the map polygons.

DATA= Contains a list of points.

OUT= Returns the point data with the 'ID' of the polygon.

Geocoding

"Geocoding" is the process of transforming addresses into map coordinates. SAS can do ZIP Code centroid geocoding and Street-level geocoding. The details of this are explained in the paper "Cheap Geocoding: SAS/GIS and Free Tiger Data" listed in the Resources section.

ZIPCITYDISTANCE Function

The ZIPCITYDISTANCE function will be new in SAS 9.2 and allow the user to get a straight-line distance between two ZIP

Codes. The ZIP Code distance will be calculated using the coordinates from the ZIP Code centroid file that ships in SASHELP.

```
distance = ZIPCITYDISTANCE(zip1, zip2);
```

GEODIST Function

The GEODIST function will be added in SAS 9.2 and allow the user to get a straight-line distance between any two coordinate pairs.

```
distance = GEODIST(lat1,long1,lat2,long2 [,options])
```

Options:

D - lat/long are in degrees (default)

R - lat/long are in radians

M - distance given is in miles (default)

K - distance given is in kilometers

ZIPCITY Function

The ZIPCITY function will be added in SAS 9.2 and returns the city for a given zipcode. The returned information is based on the zipcode dataset shipped in SASHELP.

```
city = ZIPCITY(zipcode);
```

RESOURCES

SAS Mapping: Technologies, Techniques, Tips and Tricks. SUGI 28 SAS Presents Handout and Example Source Code Download. SAS Institute Inc. <http://support.sas.com/rnd/papers/>

Tips and Tricks II: Getting the most from your SAS/GRAPH maps. SUGI 29 SAS Presents Handout and Example Source Code Download. SAS Institute Inc. <http://support.sas.com/rnd/papers/>

Tips and Tricks III: More Unique SAS/GRAPH Maps. SUGI 30 SAS Presents Handout and Example Source Code Download. SAS Institute Inc. <http://support.sas.com/rnd/papers/>

Cheap Geocoding: SAS/GIS and Free Tiger Data. SUGI 30 SAS Presents Handout and Example Source Code Download. <http://support.sas.com/rnd/papers/>

Hadden, Louise. 2006. "ZIP Code 411: A Well-Kept SAS Secret". *Proceedings of the Thirty-First Annual SAS® Users Group International Conference*. <http://support.sas.com/usergroups/sugi/proceedings/index.html>.

SUGI Proceedings. <http://support.sas.com/usergroups/sugi/proceedings/index.html>

SAS Customer Support. <http://support.sas.com/>

SAS 8 Online Doc Version Eight. <http://v8doc.sas.com>

SAS Online Doc 9. <http://v9doc.sas.com/sasdoc/>

SAS Technical Support Downloads. <http://support.sas.com/techsup/ftp/download.html>

SAS/GRAPH Software Example Downloads. <http://support.sas.com/download>

SAS/GRAPH Product Information. <http://www.sas.com/technologies/bi/visualization/index.html>

Code Samples and Technical Tips (<http://support.sas.com/sassamples/index.html>).

Maps OnLine. <http://support.sas.com/maponline>

SAS Bridge for ESRI documentation: <http://support.sas.com/rnd/datavisualization/BridgeForESRI/V2/>

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brand and product names are trademarks of their respective companies.

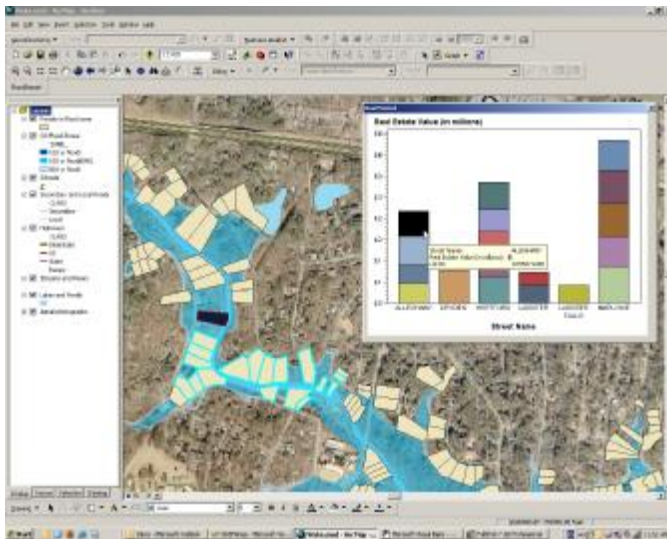


Figure 1 – SAS Bridge for ESRI

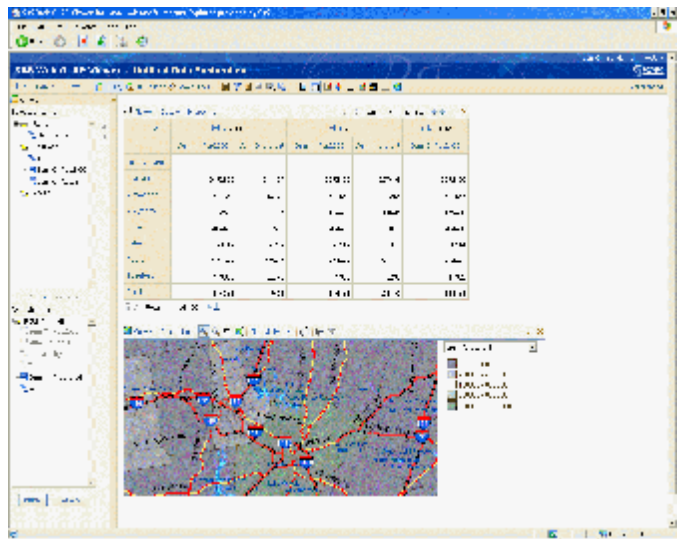


Figure 2 – SAS Web OLAP Viewer

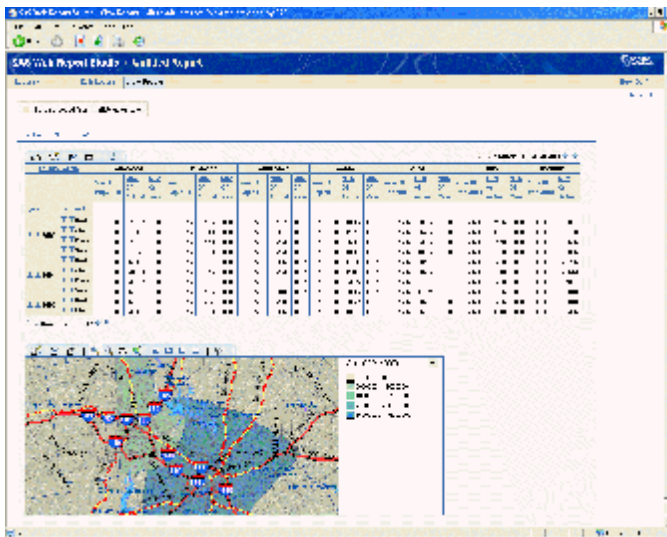


Figure 3 – Web Report Studio

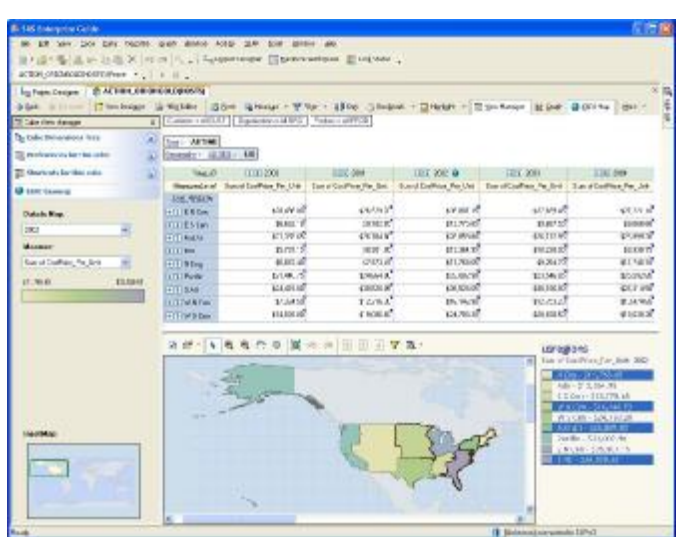


Figure 4 – Enterprise Guide

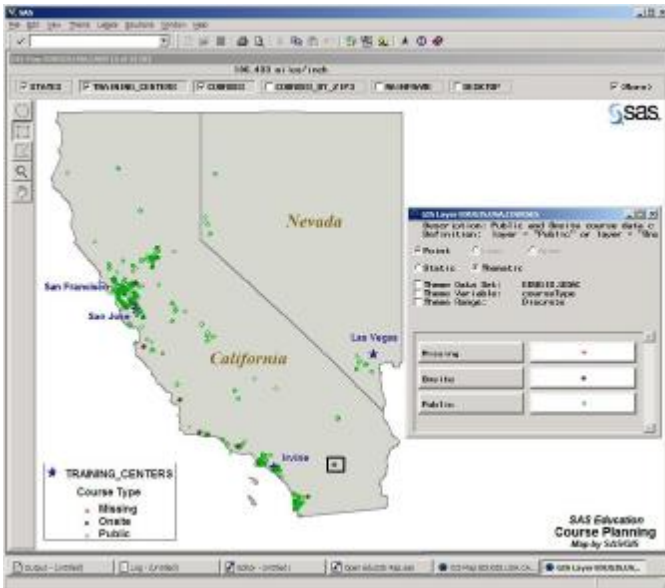


Figure 5 – SAS/GIS

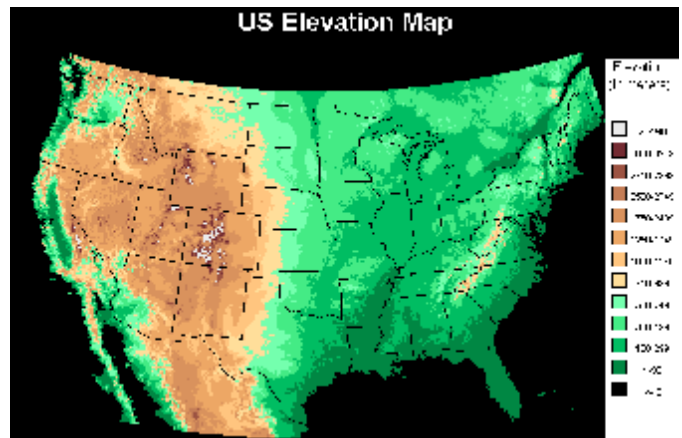


Figure 6 – Proc GMAP in SAS/GRAPH

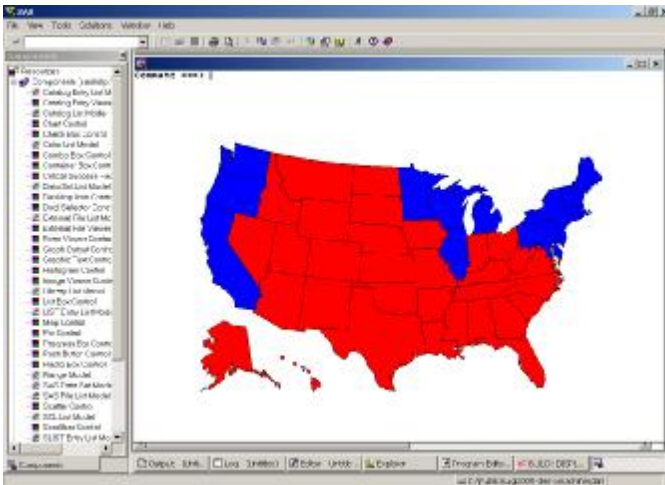


Figure 7 – SAS/AF Map Component