Geodatabases and ArcCatalog

Prepared by Francisco Olivera, Ph.D. and Srikanth Koka
Department of Civil Engineering
Texas A&M University
February 2004

Contents
Brief Overview of Geodatabases
Goals of the Exercise
Computer and Data Requirements
Procedure
1. Creating a geodatabase
2. Creating a feature class
3. Creating a feature dataset
4. Exporting a shapefile into geodatabase
5. Exporting a coverage into geodatabase
6. Exporting a table into geodatabase
7. Exporting a Geodatabase feature class into another geodatabase
8. Creating relationship classes

Brief Overview of Geodatabases

A geodatabase is a relational database containing objects that can be spatial or non-spatial. The elements of a geodatabase include object classes, which can be feature classes (i.e., contain geographic information) or tables (i.e., do not contain geographic information), annotation classes and relationship classes. Feature classes that share their extent and map projection can be grouped in feature datasets. Tables, on the other hand, cannot be contained in a feature dataset. When spatial datasets, such as shapefiles or coverages, are exported into a geodatabase, they get converted into feature classes.

A relationship class relates two objects in a geodatabase. Relationships can have one-to-one, one-to-many, many-to-one and many-to-many cardinalities. Relationships are established through keys: an origin key and a foreign key, corresponding to the origin class and the destination class, respectively.
Goals of the Exercise

To introduce you to the creation of geodatabases, feature classes and feature datasets, the migration of data of different formats into geodatabases, and the creation of relationship classes in geodatabases.

Computer and Data Requirements

This exercise has been successfully completed using ArcGIS 8.3. Subsections 1 to 7 just need ArcView, whereas subsection 8, which deals with the creation of relationship classes, requires ArcInfo.

You will be working with the following spatial datasets: A geodatabase called montgomery.mdb, a polygon shapefile of parcels called parcels.shp, a coverage called laterals, a polygon shapefile containing county polygons of Texas called texas_counties.shp, and a table called owner.dat. The geodatabase has two feature datasets called landbase and water, which contain several feature classes. Download the ArcCatalogGeodatabases.zip file containing the data. Unzip it and save the files to a working directory in your computer.

Procedure

1. Creating a geodatabase

Before creating a geodatabase, create a folder on your computer that will be your working folder. Using ArcCatalog, browse down to your working folder, right click on it, and then click on New/Personal Geodatabase. A new geodatabase will be created in your working folder. A default name would be given to the geodatabase. To change the name right click on it, then click on Rename, and rename it Texas. Now that you have created a geodatabase, the next step is to load data into it.
2. Creating a feature class

Using ArcCatalog, browse down to the geodatabase you have previously created, right click on the geodatabase, and then click on New/Feature Class. A wizard titled New Feature Class will pop up. In this wizard, enter TXCounties for both Name and Alias. Under the Type frame, select the first option. Click Next twice. The wizard will show the information of the fields. In the Data type column, click on Geometry to define the feature type for the feature class. In the Field Properties frame, select Polygon for the Geometry Type. Do not click finish yet because you will have to define the spatial reference properties of the feature class. To define the spatial reference, in the wizard, click on the square located for Spatial Reference. In the Spatial Reference Properties wizard, click Import to import the spatial reference properties from an existing shapefile. In the browse window that pops up, browse to the shapefile named texas_counties.shp, click on the shapefile and then on the Add button. In the next wizard, click Apply and OK. Finally, in the next wizard, click Finish.

You have created a feature class that can store feature objects of polygon shape type. As it is empty, let us load features from an existing shapefile. To load features, right click on the newly created feature class, and then click Load Data. In the Simple Data Loader wizard that pops up, click Next, then click on the folder icon located for Input data, which will open the Open Geodatabase wizard. Using this wizard, browse down to the shapefile named texas_counties.shp, select it and click Open. The shapefile’s path will be added in the wizard. Add this shapefile to the list of source data by clicking on Add. Click Next several times accepting the default options. Finally take a look at the Summary and click Finish. You can now see the features loaded in the map display of ArcCatalog, by changing the view type to Preview and preview type to Geography.
3. Creating a feature dataset

In this part of the exercise, you are going to define a feature dataset in which you are going to store the feature class you have just created.

To create a new feature dataset, right click on the geodatabase and then click on New/Feature Dataset. In the wizard that pops up, enter TXFD as the name for feature dataset and define the spatial reference properties of the feature dataset by clicking on Edit. In the Spatial Reference Properties wizard, click Import to import the spatial reference properties from the feature class you have created and populated previously. In the browse window that pops up, browse to the feature class named TXCounties, click on it and then on the Add button. In the wizard, click Apply and OK. Finally in the Feature Dataset wizard, click OK. A new feature dataset would now be added to the geodatabase.

To load the feature class TxCounties inside the feature dataset, right click on the feature class and click on Export/Geodatabase to Geodatabase. In the wizard that pops up, click on the folder icon for selecting the Output Geodatabase. In the resulting wizard, browse down to the feature dataset and double click on it to select it. You can now change the name of the feature class from the default one by entering a new name in the bottom most text box in the wizard. Finally, click OK to populate the feature dataset with a feature class.
You will now work on loading datasets of different formats into an existing geodatabase called Montgomery.

4. Exporting a shapefile into geodatabase

You will learn how to export shapefiles into geodatabases. When exporting shapefiles (and coverages), the spatial extent is reset to that of the feature dataset.

Using ArcCatalog, browse to the folder where Parcels.shp is located. Right click on the Parcels.shp shapefile, point to Export in the dropdown list, and then click on Shapefile to Geodatabase in the next dropdown list. In the Shapefile to Geodatabase wizard, click on the folder icon located next to the second text box that says Output Geodatabase. Navigate to locate the geodatabase Montgomery and double click it to see the feature datasets inside it. Double click on the LandBase feature dataset. The browser will disappear and the Shapefile to Geodatabase wizard will reappear. In the Select an existing feature dataset or enter a new one, you can see that the dropdown list is populated with the names of both feature datasets, but the LandBase name appears as you have selected it. If you want to change the feature dataset name to another one, you may do so, but it is not suggested in this case because there may be a conflict in the spatial reference. After selecting the feature dataset, you can enter a name for the imported feature class in the bottom most text box of the wizard. Click OK on the wizard. A dialog pops up showing the progress. To view the feature class you have just imported into the geodatabase, you can use ArcCatalog.
5. Exporting coverages into a feature dataset in a geodatabase

Coverages can be exported to geodatabases at once or individually. When exporting coverages to geodatabases, their spatial extent is reset to that of the feature dataset.

Browse to your working folder where the Laterals coverage is located. Right click on the coverage, point to Export in the dropdown list, and click on Coverage to Geodatabase Wizard in the next dropdown list. In the Coverage to Geodatabase wizard, check both arc and tic feature classes, and click the Next button. Click on the browse icon located next to text box that says Output Geodatabase. Navigate to locate the geodatabase Montgomery and double click it to see the feature datasets. Double click on the LandBase feature dataset. In the wizard, you can see three options: export the items to an existing feature dataset or into a new feature dataset or as stand-alone feature classes. Leave the Landbase feature dataset selected and click the Next button. The wizard now gives you two options for spatial parameters, choose the default option and click Next button. The wizard now presents you with a summary report, take a look at it and click Finish to complete exporting coverage to a geodatabase.

Note that you get the error message Some features did not convert because of error messages …. The reason for this error is that the Laterals coverage has an Unknown Coordinate System. You can see this by right clicking on the coverage, pointing at Properties, and clicking on the Projection tab. Since the data in a feature dataset share the same spatial reference, data with unknown projection system cannot be converted to that of the feature dataset.
6. Exporting tables into geodatabases

The tables in a geodatabase can be only stand-alone classes, as they cannot exist inside a feature dataset. In this part of the exercise you are going to export a table into geodatabase as a personal geodatabase table.

Using ArcCatalog, browse to your working folder, where the Owner.dbf table is located. Right click on the table, point to Export in the dropdown list, and then click on Table to Geodatabase in the next dropdown list. The Table to Geodatabase wizard appears. Click on the folder icon located next to the second text box that says Output Geodatabase. Navigate to locate the geodatabase Montgomery, and click on it to specify the geodatabase. You can change the name of the table in the text box titled Output geodatabase table name. Change the name to ‘Owner’ and click the OK button. The table is now exported to the geodatabase. To view the table, use ArcCatalog.

7. Exporting Geodatabase Feature Classes as Shapefiles

Feature classes in a geodatabase can be exported as shapefiles or as personal geodatabase feature classes of another geodatabase. In this part you are going export feature classes belonging to a geodatabase as shapefiles.

Using ArcCatalog, browse down to the geodatabase Montgomery, double click the geodatabase to see the feature datasets, and double click on the LandBase feature dataset. Right click on the Road-1 feature class, point to Export in the dropdown list, and click on the Geodatabase to shapefile in the next dropdown list. In the Geodatabase to shapefile wizard, click on the folder icon located next to the second text box that says Output shapefile. Navigate to locate the working folder, where the shapefile will be stored and enter the name for the shapefile. Click the Save button and click OK. The feature class is now exported as shapefile.
If the geodatabase feature class is to be exported to another geodatabase instead of locating the folder you will have to locate the geodatabase.

8. Creating relationship classes

As creating and editing relationship classes require either ArcInfo or ArcEditor, ArcView users will not be able to continue with the exercise.

A relationship class is an association between two tables, or between a table and a feature class or between two feature classes. Relationship classes in a geodatabase can be inside or outside a feature dataset. There are two types of relationship classes: simple relationship classes, and composite relationship classes. Suppose object A and object B have a simple relationship between them, then if object A is deleted from the database, object B continues to exist. Simple relationships can be 1-1 or 1-many or many – many. On the other hand, if there is a composite relationship between the two objects, the lifetime one object controls the lifetime of the other. Composite relationships are always 1-many, but can also be 1-1.

In this example, we are going to create a relationship class between features in the Parcels feature class with ownership information stored in the table called Owner. The relationship would be based on two fields. One from the Parcels feature class called PROPERTY_I and the other from owner table called PROPERTY_ID. Take a look at these fields using ArcCatalog. You can see them in the map display by clicking Preview tab and selecting table preview type.

Using ArcCatalog, browse to the location where the Montgomery geodatabase is located, and double click it to access the feature datasets. Right click on the LandBase feature dataset, and point to New/Relationship Class. In the New Relationship Class wizard, enter the name for the relationship as ParcelOwner. In the Origin table/feature class box, select Parcels. In the Destination table/feature class, select the Owner table and click Next. In the next wizard, select the Simple (peer-to-peer) relationship option, and click the Next button. In the next wizard that asks for the direction of message propagation, leave the selected option that says none, and click the Next button. In the next wizard that asks for cardinality, select 1-1 (one to one), and click Next. In the next wizard that asks if a new table has to be created to store the attributes, select the second option, that says No, I do not want to add attributes to this relationship class and click the Next button. In the next wizard, select primary key as PROPERTY_I and the foreign key as PROPERTY_ID, and click Next. Before the relationship class is created, a summary report appears. Read the information provided and click Finish. You can now see that a relationship class has been added to the LandBase feature dataset in the geodatabase. To see the properties of the relationship class, in ArcCatalog, click on Metadata tab first and then click Attributes tab located for the map display.