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The *geodatabase* supports a model of topologically integrated *feature classes*, similar to the *coverage* model. It also extends the coverage model with support for complex networks, *relationships* among feature classes, and other object-oriented *features*. The ESRI® ArcGIS™ applications (ArcMap™, ArcCatalog™, and ArcToolbox™) work with geodatabases as well as with coverages.

The ArcInfo geodatabase model is implemented on standard relational databases with the ArcSDE™ application server. ArcSDE defines an open interface to database systems for our users. It allows ArcInfo to manage geographic information on a variety of different database platforms including Oracle®, Microsoft® SQL Server™, IBM® DB2®, and Informix®.

The geodatabase model defines a generic model for geographic information. This generic model can be used to define and work with a wide variety of different user- or application-specific models. By defining and implementing a wide variety of *behavior* on a generic geographic model, we provide a robust platform for the definition of a variety of user data models.

The geodatabase model supports an object-oriented vector data model. In this model, entities are represented as *objects* with properties, behavior, and relationships. Support for a variety of different geographic object types is built into the system. These object types include simple objects, geographic features (objects with location), network features (objects with geometric integration with other features), *annotation* features, and other more specialized feature types. The model allows you to define relationships between objects, together with rules for maintaining the referential integrity between objects.
This book describes how to take your geodatabase design and implement it with ArcInfo 8. ArcCatalog has various tools for creating and modifying your geodatabase schema, while ArcMap has tools for analyzing and editing the contents of your geodatabase.

Successfully implementing a multiuser GIS system with ArcInfo and ArcSDE starts with a good data model design and database tuning. How the data is stored in the database, the applications that access it, and the client and server hardware configurations are all key factors to a successful multiuser GIS system. Designing a geodatabase is a critical process that requires planning and revision until you reach a design that meets your requirements and performs well. Throughout this book, guidelines for good data modeling of each aspect of the geodatabase are discussed to help you implement a successful multiuser GIS system with ArcInfo, either with ArcSDE or with a personal geodatabase.

A critical part of a well-performing geodatabase is the tuning of the database management system (DBMS) in which it is stored. This tuning is not required for personal geodatabases; however, it is critical for ArcSDE geodatabases. For more information on tuning your database for ArcSDE and the geodatabase, see the Configuration and Tuning Guide for <DBMS> PDF file.

Once you have a design, you can create the geodatabase and its schema by loading existing shapefile and coverage data, creating new database items with ArcCatalog, using Unified Modeling Language (UML) and Computer-Aided Software Engineering (CASE) tools, or a combination of all three.
Before you create your geodatabase

One of the most important steps in creating an effective database is designing its schema. The same is true for any geodatabase. When designing a geodatabase, you should consider questions like:

- What kind of data will be stored in the database?
- In what projection do you want your data stored?
- Do you want to establish rules about how the data can be modified?
- How do you want to organize your object classes and subtypes?
- Do you want to maintain special relationships between objects of different types?
- Will your database contain networks?
- Will your database store custom objects?

Once you have answered these and other questions, you are ready to begin creating your geodatabase design. You can use the data modeling guidelines in this book to help you design a geodatabase which both meets your requirements and also performs well. This book will then guide you through the process of physically implementing your geodatabase design.
Three ways to create a geodatabase

Once you have designed your geodatabase, you can employ any of three methods to create a new geodatabase. The method you choose will depend on what the source of your geodatabase data is, whether you will store custom objects in the geodatabase, or whether you intend to create a new geodatabase from scratch. In practice, you will often use a combination of all or some of the methods outlined.

The three methods of creating a geodatabase are discussed briefly here. Subsequent chapters will outline how each task is performed.

Three Methods to Create a Geodatabase

1. Create schema with ArcCatalog

2. Import existing data
   - Shapefiles
   - Coverages
   - Build geometric networks
   - Define subtypes and attribute domains

3. Use CASE tools

   - Define connectivity rules
   - Define relationships
   - Load data into schema

   - Geodatabase
The first step is always to design the geodatabase. This book and the book *Modeling Our World* are guides to help you design your geodatabase. Once this design is complete, you can proceed with the method that best suits your situation.

**Migrating existing data into the geodatabase**

It is very likely that you already have data in various formats—shapefiles, coverages, INFO™ tables, and dBASE® tables—that you want to store in a geodatabase. You may also have your data stored in other multiuser geographic information system (GIS) data formats such as ArcStorm™, Map LIBRARIAN, and ArcSDE.

Through ArcCatalog, you can convert data stored in one of these formats to a geodatabase by importing it. A series of dialog boxes will guide you through the conversion process. Once you have become familiar with this process, more advanced batch data converters can be used to perform these operations more efficiently.

When converting data from one of these formats into the geodatabase, both the spatial and nonspatial component of each object is translated. For example, when converting a shapefile to a feature class, both the shapes (geometry) and attributes are stored in the geodatabase. Attributes can be left out or renamed. Shapefiles of the same spatial extent can be imported into the same feature dataset. All or some of the feature classes from a coverage can be imported into an integrated feature dataset.

Converting ArcStorm and Map LIBRARIAN data is done using tools that are similar to those used for importing coverages. However, you must use ArcSDE for Coverages before ArcCatalog or ArcToolbox can access and display ArcStorm and Map LIBRARIAN data.

---

**Design your geodatabase**

- What data?
- Location and projection?
- Feature classes and subtypes?
- Geometric networks?
- Rules?
- Relationships?

---

**Creating a new geodatabase from scratch**

In some cases, you may not yet have any data that you want to load into a geodatabase, or the data you have to load only accounts for part of your database design. In this case, you can use the tools provided in ArcCatalog to create the schema for feature datasets, tables, geometric networks, and other items inside the database.

ArcCatalog provides a complete set of tools for designing and managing items you will store in the geodatabase.
If you already have your data in an SDE® 3.x database, you do not need to reload your data. ArcCatalog contains tools that allow you to register the existing data with the geodatabase. Once registered, you can also use ArcCatalog to reorganize that data into feature datasets.

ArcInfo 8 and geodatabases do not support multiple feature types in a single feature class (for example, points and lines in the same feature class). If any of your SDE 3.x layers contain multiple-entity types, those must be reorganized into single feature type layers before you can view them in ArcInfo or register them with the geodatabase.

Annotation stored with SDE 3.x is read only in ArcInfo 8. If you want to use ArcMap to edit this annotation, you must convert it to geodatabase annotation. See Chapter 7, ‘Managing annotation’, for more information on converting SDE 3.x annotation to geodatabase annotation.

Once you have imported your data into the geodatabase, you can then use ArcCatalog to further define your geodatabase. ArcCatalog contains tools for building geometric networks and for establishing subtypes, attribute domains, and so on.

To learn how to move your existing data into the geodatabase, see Chapter 4, ‘Migrating existing data into a geodatabase’.

Building geodatabases with CASE tools

Computer-Aided Software Engineering (CASE) consists of tools and techniques that automate the process of developing software systems and database design. You can use CASE tools to create new custom objects and generate a geodatabase schema from a UML diagram.

Object-oriented design tools can be used to create object models that represent the design of your custom objects. Based on these models, the CASE tools’ Code Generation Wizard will help you create a component object model (COM) object that implements the behavior of the custom object and the database schema where these custom objects are created and managed.

The steps for creating custom objects are:

1. Design the object model using UML.
2. Export the model to the Microsoft repository.
3. Generate stub-code and implement behavior.
4. Create a geodatabase schema for the custom object.

For details on steps 1 and 3, see Modeling Our World and the Creating custom behavior with the UML PDF file. Step 4 will be discussed in more detail in Chapter 11, ‘Building geodatabases with CASE tools’. 
INTRODUCTION

Further refining the geodatabase

Whether you load data manually or use ArcCatalog to create the geodatabase schema, you can continue to define your geodatabase by establishing how objects in the database relate to one another.

Using ArcCatalog, you can establish relationships between objects in different object classes and connectivity rules for objects participating in geometric networks. These relationships and rules may be part of the schema that CASE tools generate, but often you will want to further refine what is generated by CASE to meet your geodatabase design. You can continue to use the geodatabase management tools in ArcCatalog to refine or extend a mature database throughout its life.

Loading data into a geodatabase schema

Once you have generated your schema using one of the methods described, you will want to insert data into that schema. This is a different process than importing data. You can do this by editing the database in ArcMap to create new objects, or you can load objects from existing shapefiles, coverages, CAD feature classes, INFO tables, dBASE tables, ArcStorm, or Map LIBRARIAN.

Data creation and maintenance may involve managing version and topology information. ArcCatalog and ArcToolbox have wizards to help you with this—Simple Data Loader and Object Loader—that will be discussed in Chapter 4, ‘Migrating existing data into a geodatabase’.
Geodatabases and ArcCatalog

ArcCatalog is the manager for your geodatabase. With ArcCatalog, you can easily view and modify the contents of your geodatabase. ArcCatalog contains a full suite of utilities to create and manage a geodatabase.

Accessing geodatabases in ArcCatalog

In ArcCatalog, you can automatically access data in several formats such as shapefiles and ArcInfo coverages. You can also automatically access any personal geodatabase that is stored on a disk.

You can access remote ArcSDE geodatabases by creating a connection to the database. Database connections to remote geodatabases behave in a similar way as personal geodatabases, with one important difference: when you delete a personal geodatabase, the database itself is deleted from the disk. When you delete a remote geodatabase connection, however, only the connection is deleted—the geodatabase and its data are unaffected.

Spatial database connections

Using data stored in a DBMS such as Oracle requires a database connection. There are two methods for connecting to a spatial database from ArcInfo. One method is to connect to an ArcSDE service that spawns a process on the server to broker the connection between ArcInfo and the database instance.

The second method is to use a direct connection to the database. In this case, ArcInfo connects directly to the database server. The functionality that is managed by the server process in the first connection method is transferred to the client, thus eliminating the middle tier. The direct connect method is a two-tiered architecture, rather than three tiered.

You can use the direct connect method to connect to your geodatabase if it is stored in Oracle8™ or SQL Server. If connecting to SQL Server, you do not require any additional software to connect to the database. If direct connecting to Oracle8i, the Oracle client software needs to be installed on your machine, and you need to provide an Oracle service name for your server.

For more information about direct connect, see ArcSDE Configuration and Tuning Guide for <RDBMS> PDF file.

When you add a new connection to an ArcSDE geodatabase service, or a direct database connection in ArcCatalog, it creates a connection file on disk. This file contains the information needed to establish a connection. The username and password can be included in the connection file and are encrypted for security.

You can set up connection files for your organization and distribute these such that end users will not require any information about the geodatabase server to which they are connecting.
The first step: creating your database

The first step in creating your geodatabase is to create the database itself using ArcCatalog.

There are two kinds of geodatabases: personal geodatabases and ArcSDE geodatabases. Creating a new personal geodatabase involves creating a new .mdb file on disk.

Before you can create data in an ArcSDE geodatabase, you must do some setup first. Setting up the database for use as an ArcSDE geodatabase is described in Managing ArcSDE services and in the ArcSDE installation guide PDF file, located in the documentation folder of the CD–ROM installation media. For direct connections only, please see the ArcInfo installation guide for setup instructions.

Several versions of an ArcSDE geodatabase can exist, although not every table or feature class in the geodatabase must be versioned. Feature editing in ArcMap requires a versioned feature class in a geodatabase.

New connections will automatically access the page 9.

Creating a new personal geodatabase

1. In the ArcCatalog tree, right-click on the location where you want to create the new personal geodatabase.
2. Point to New.
3. Click Personal Geodatabase.
   ArcCatalog creates a new personal geodatabase in the location you selected and sets its name to edit mode.
4. Type a new name for this personal geodatabase.
5. Press Enter.

INTRODUCTION
**Tip**

**Testing the connection**

Clicking OK in the Spatial Database Connection dialog box does not actually connect to the database but creates the connection file on disk. To make sure that the connection parameters you entered are correct, you can click Test Connection.

**See Also**

For more information on how to use ArcCatalog to browse your filesystem, see Using ArcCatalog.

---

**Adding a connection to an ArcSDE geodatabase service in ArcCatalog**

1. Double-click Database Connections.
2. Double-click Add Spatial Database Connection.
3. Type either the name or the IP Address of the server to which you want to connect.
4. Type either the name or the TCP/IP port number of the ArcSDE service to which you want to connect.
5. Type the name of the database to which you want to connect if your DBMS supports it; otherwise, skip to step 6.
6. Type the username and password with which you will connect to the ArcSDE geodatabase.
7. Check the check box to save the username and password in the connection file so that you can connect to the database without being prompted to log in.
8. Click OK.
9. Type a new name for the spatial database connection.
10. Press Enter.
Adding a direct connection to an Oracle8i geodatabase in ArcCatalog

1. Double-click Database Connections.
2. Double-click Add Spatial Database Connection.
3. Type “sde:oracle”.
4. Type the username.
5. Type the password followed by “@<oracle servicename>”.
6. Check the check box to save the username and password in the connection file so that you can connect to the database without being prompted to log in.
7. Click OK.
8. Type a new name for the spatial database connection.

Tip
Oracle service name
You must create an Oracle service name on your client machine before you can create a direct connection to an Oracle database.
Adding a direct connection to an SQL Server geodatabase in ArcCatalog

1. Double-click Database Connections.
2. Double-click Add Spatial Database Connection.
3. Type "sde:sqlserver:<name or the IP Address of the server>". In this example, the server name is “fabio”.
4. Type the name of the database you want to connect to.
5. Type the username and password.
6. Check the check box to save the username and password in the connection file so that you can connect to the database without being prompted to log in.
7. Click OK.
8. Type a new name for the spatial database connection.
Connecting to an alternative version of the database

1. Follow steps 1 through 7 for adding a connection to a spatial database geodatabase service or direct connect in ArcCatalog.
2. Click Change.
3. Click the Version dropdown arrow and click the version you want to access.
4. Click OK.
5. Click OK in the Spatial Database Connection dialog box.
6. Type a new name for the spatial database connection.
7. Press Enter.

See Also
For more information on geodatabase versions, see Chapter 13, ‘Working with a versioned geodatabase’.
Tips on learning how to build geodatabases

If you’re new to GIS, remember that you don’t have to know everything about ArcCatalog and geodatabases, or know how to extend the ESRI data model, to get immediate results. To learn how easy it is to import data and create geodatabases with a variety of behavior, see Chapter 2, ‘Quick-start tutorial’. ArcGIS™ comes with the data used in the tutorial, so you can follow along step by step at your computer. You can also read the tutorial without using your computer.

Finding answers to questions

If you are like most people, your goal is to complete your tasks while investing a minimum amount of time and effort on learning how to use the software. You want intuitive, easy-to-use software that gives you immediate results without having to read pages of documentation. However, when you do have a question, you want to be able to find the answer quickly so that you can complete your task. That’s what this book is all about—getting you the answers you need when you need them.

This book describes how to get your existing data into a geodatabase; how to create new items in your geodatabase; and then, once created, how to add a variety of behavior to that data. Although you can read this book from start to finish, you will likely use it more as a reference. When you want to know how to do a particular task, such as creating a geometric network, just look it up in the table of contents or index.

What you will find is a concise, step-by-step description of how to complete tasks. Some chapters also include detailed information if you want to learn more about the concepts behind the tasks. Refer to the glossary if you come across any unfamiliar GIS terms or need to refresh your memory.

About this book

This book is designed to introduce how to build a geodatabase using existing data or by using a schema implemented with ArcCatalog or CASE tools. While this book does have some conceptual content about the different aspects of the geodatabase, it assumes that you already have a schema design that you are trying to implement. If you have not yet designed your schema or need more information on how to make the best schema design decisions, please take some time to read Modeling Our World, which you received with ArcGIS.

Getting help on your computer

In addition to this book, the ArcGIS online Help system is a valuable resource for learning how to use the software.

Contacting ESRI

If you need to contact ESRI for technical support, see the product registration and support card you received with ArcGIS or refer to ‘Contacting Technical Support’ in the ‘Getting more help’ book of the ArcGIS Desktop Help system. You can also visit ESRI on the Web at www.esri.com and www.arconline.esri.com for more information on the geodatabase and ArcGIS.

ESRI education solutions

ESRI provides educational opportunities related to geographic information science, GIS applications, and technology. You can choose among instructor-led courses, Web-based courses, and self-study workbooks to find education solutions that fit your learning style and pocketbook. For more information, go to www.esri.com.
Quick-start tutorial

IN THIS CHAPTER

• Exercise 1: Organizing your data in ArcCatalog
• Exercise 2: Importing data into your geodatabase
• Exercise 3: Creating subtypes and attribute domains
• Exercise 4: Creating relationships between objects
• Exercise 5: Building a geometric network
• Exercise 6: Creating annotation for your data
• Exercise 7: Creating layers for your geodatabase data
• Exercise 8: Editing your geodatabase

It is easy to create a geodatabase and add behavior to it, and it requires no programming when you use the data management tools in ArcCatalog—the application for browsing, storing, organizing, and distributing data. When querying and editing the geodatabase in ArcMap—the application for editing, analyzing, and creating maps from your data—you can easily take advantage of the data and behavior in your geodatabase without any customization.

In this tutorial, you will use ArcCatalog to create a geodatabase that models a water utility network. You will add behavior to the geodatabase by creating subtypes, validation rules, relationships, and a geometric network. You will use ArcMap to take advantage of the behavior by editing some of the existing features in the geodatabase and adding some additional features.

The study area is a portion of the City of Montgomery, Alabama. A geodatabase that contains most of the data, a coverage representing water laterals, and an INFO table representing parcel owner data are provided with the software. You will import the coverage and INFO table into the geodatabase and then modify its properties to give it behavior.

This tutorial lets you explore the capabilities of the geodatabase using ArcCatalog and ArcMap. You can complete this tutorial at your own pace without the need for additional assistance. This tutorial includes eight exercises. Each exercise takes between 10 and 20 minutes to complete.
You will use several *datasets* throughout this tutorial. The following tables provide descriptions of these datasets:

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral</td>
<td>Water laterals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFO table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner.dat</td>
<td>Parcel owners</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geodatabase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montgomery</td>
<td>Database that contains most of the City of Montgomery data you will use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature datasets</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landbase</td>
<td>Land base data</td>
</tr>
<tr>
<td>Water</td>
<td>Water network data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature classes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcels</td>
<td>Parcel polygons</td>
</tr>
<tr>
<td>Road_cl</td>
<td>Road centerlines</td>
</tr>
<tr>
<td>Road_cop</td>
<td>Road edge of pavement</td>
</tr>
<tr>
<td>RoadNames</td>
<td>Annotation for Road_cl</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Dimension features</td>
</tr>
<tr>
<td>Distbains</td>
<td>Water distribution mains</td>
</tr>
<tr>
<td>DistmainDiam</td>
<td>Annotation for Distbains</td>
</tr>
<tr>
<td>Fittings</td>
<td>Water network fittings</td>
</tr>
<tr>
<td>Gatevalves</td>
<td>Water gate valves</td>
</tr>
<tr>
<td>Hydrants</td>
<td>Water hydrants</td>
</tr>
<tr>
<td>Pipencasement</td>
<td>Water pipe encasements</td>
</tr>
<tr>
<td>Prodwell1</td>
<td>Production wells (polygon)</td>
</tr>
<tr>
<td>Prodwell2</td>
<td>Production wells (point)</td>
</tr>
<tr>
<td>Pumpstat</td>
<td>Pump stations</td>
</tr>
<tr>
<td>Sysvalves</td>
<td>Water system valves</td>
</tr>
<tr>
<td>Tanks</td>
<td>Water tanks</td>
</tr>
<tr>
<td>Transmains</td>
<td>Water transmission mains</td>
</tr>
<tr>
<td>TransmainsDiam</td>
<td>Annotation for Transmains</td>
</tr>
<tr>
<td>Triplant</td>
<td>Water treatment plant</td>
</tr>
<tr>
<td>Vaults</td>
<td>Water meter vaults</td>
</tr>
</tbody>
</table>
The datasets were provided courtesy of The Water Works & Sanitary Sewer Board of the City of Montgomery, Alabama. They have been simplified by ESRI. The City of Montgomery cannot guarantee the reliability or suitability of this information. Original data was compiled from various sources, and the spatial information may not be accurate. This information may be updated, corrected, or otherwise modified without notification.
Exercise 1: Organizing your data in ArcCatalog

Before you begin the tutorial, you must first find and organize the data that you will need. This can be done using ArcCatalog.

Connecting to data

In ArcCatalog, data is accessed through folder connections. When you look in a folder connection, you can quickly see the folders and data sources it contains. You will now begin organizing your data by creating a folder connection to it.

1. Start ArcCatalog by either double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.

2. Click the Connect To Folder button and navigate to the BuildingaGeodatabase folder on the local drive where you installed the tutorial data (the default installation path is C:\arcgis\ArcTutor\BuildingaGeodatabase). Click OK to establish a folder connection.

Your new folder connection—C:\arcgis\ArcTutor\BuildingaGeodatabase—is now listed in the Catalog tree. You will now be able to access all of the data needed for the tutorial through that connection.

Exploring your data

Before you begin modifying the geodatabase, explore the datasets provided for the tutorial.

1. Click the plus sign next to the C:\arcgis\ArcTutor\BuildingaGeodatabase folder connection to see the datasets contained in the folder. Click the Preview tab and click the laterals coverage to see its geometry.
2. Click the plus sign next to the Montgomery geodatabase and double-click each feature dataset to see the feature classes and relationship classes it contains. Click each feature class to preview its geometry.

3. Click the owner.dat INFO table. Notice how the Preview Type automatically changes to Table and displays the table’s records. This table contains the owner information for the Parcels feature class in the Montgomery geodatabase. In the next part of this exercise, you will import this table into the geodatabase and create relationships between the parcels and their owners.

You will perform most of the tasks for modifying the Montgomery geodatabase schema with ArcCatalog. Later, you will use ArcMap to create annotation and edit the geodatabase.

Now that you have found and organized your data in ArcCatalog, you are ready to start the first task in the tutorial: importing data into the geodatabase.
Exercise 2: Importing data into your geodatabase

Before you can start adding behavior to your data, you must get it into a geodatabase. You will import two datasets into the Montgomery geodatabase—laterals and owner.dat. The laterals coverage contains water laterals for the Montgomery water dataset, and the owner.dat INFO table contains owner information for the parcel features already in the geodatabase.

Importing the coverage

1. In ArcCatalog, right-click the Water feature dataset in the Montgomery geodatabase, point to Import, and click Coverage to Geodatabase.

   ![Coverage to Geodatabase tool](image)

   You will use the Coverage to Geodatabase tool to import the arcs in the laterals coverage into the Water feature dataset.

   This tool is used to specify your input coverage, input feature class, and output feature class. Because you opened this tool by right-clicking a feature dataset, the output geodatabase, Montgomery, and feature dataset, Water, are already filled in for you.

   There are several ways to set the input and output datasets. You can also drag a dataset or datasets from the ArcCatalog tree or Contents tab and drop them on the text box. Alternatively, you can click the Browse button to open the ArcCatalog minibrowser and navigate to your dataset, or you can type the full pathname to the dataset in the text box.

   Tutorial instructions will simply ask you to type dataset names and their paths into the appropriate text boxes. However, feel free to use any of the techniques just described to make the entry.
2. Type “C:\arcgis\ArcTutor\BuildingaGeodatabase\laterals” for the input coverage.

3. The default input feature class is arc, indicating that the arcs from the coverage will be imported. You can accept the defaults. Type “Laterals” for the name of the new feature class.

4. Click OK.

   A message appears showing the progress of your data import operation. All geodatabase data importing tools and wizards display such a message or a progress indicator. When the tool or wizard is finished, the message disappears, indicating that all of the features have been imported.

   Your new Laterals feature class is now in the Montgomery geodatabase in the Water feature dataset.

5. In the ArcCatalog tree, navigate to and click the Laterals feature class. Click the Preview tab to see the features.

6. Right-click Laterals and click Properties.

   The names of feature classes and tables in a geodatabase are the same as the names of the physical tables in the relational database management system (RDBMS) in which they are stored. When you store data in an RDBMS, the names for tables and fields are often very unclear, and you need a detailed data dictionary to keep track of what data each table stores and what each field in those tables represents.

   The geodatabase lets you create aliases for fields, tables, and feature classes. An alias is an alternative name to refer to those items. Unlike true names, aliases can contain special characters such as spaces because they don’t have to adhere to the database’s limitations.

   When you use data with aliases in ArcMap, the alias name is automatically used for feature classes, tables, and fields. However, in ArcCatalog these items are always represented by their true names.

   You will now create aliases for your new feature class and its fields.

7. Click the General tab.

8. Type “Water laterals” for the alias for this feature class.
9. Click the Fields tab. Click the OBJECTID field and type “Feature identifier” for its alias.

10. Repeat step 8 for the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Alias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape</td>
<td>Geometry field</td>
</tr>
<tr>
<td>DEPTH_BURI</td>
<td>Depth buried</td>
</tr>
<tr>
<td>RECORDED_L</td>
<td>Recorded length</td>
</tr>
<tr>
<td>FACILITY_I</td>
<td>Facility identifier</td>
</tr>
<tr>
<td>DATE_INSTA</td>
<td>Installation date</td>
</tr>
<tr>
<td>TYPECODE</td>
<td>Subtype code</td>
</tr>
</tbody>
</table>

11. Click OK.
Now that you have imported your Laterals feature class into the geodatabase and added some aliases, you are ready to import the owner.dat INFO table.

**Importing the INFO table**

The owner.dat INFO table contains owner information for the parcels in the Parcels feature class in the Montgomery geodatabase. To be able to create relationships between the parcels and their owners, the owner information must be imported into the Montgomery geodatabase. You will use the Table to Geodatabase tool to import the owner.dat
INFO table into the Montgomery geodatabase. You will then create aliases for the table.

1. Right-click the Montgomery geodatabase, point to Import, then click Table to Geodatabase. You’ll use the Table to Geodatabase tool to import the owner.dat INFO table into the Montgomery geodatabase.

2. Type “C:\arcgis\ArcTutor\BuildingaGeodatabase\owner.dat” for the input table.

3. Type “Owners” for the name of the output table.

4. Click OK. A message informs you of the progress of the operation.

5. In the ArcCatalog tree, click the Owners table in the Montgomery geodatabase. Click the Preview tab to see its rows.

6. Right-click the Owner table and click Properties to see the table’s properties.

7. Type “Parcel owners” for the alias for this table.

8. Click the Fields tab and type the following field aliases:

<table>
<thead>
<tr>
<th>Field</th>
<th>Alias</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTID</td>
<td>Object identifier</td>
</tr>
<tr>
<td>OWNER_NAME</td>
<td>Owner name</td>
</tr>
<tr>
<td>OWNER_PERCENT</td>
<td>Percentage ownership</td>
</tr>
<tr>
<td>DEED_DATE</td>
<td>Date of deed</td>
</tr>
</tbody>
</table>

9. Click OK.

The data in the laterals coverage and owners.dat INFO table is now in the Montgomery geodatabase. Now you can take advantage of the geodatabase by applying behavior to your data. You will begin this task by creating subtypes and attribute domains.
Exercise 3: Creating subtypes and attribute domains

One of the advantages of storing your data in a geodatabase is that you can define rules about how the data can be edited. In Exercise 2, you will define these rules by creating a new attribute domain for lateral diameters; creating subtypes for the Laterals feature class; and associating the new domain, existing domains, and default values with fields for each subtype.

Attribute domains are rules that describe the legal values of a field type. Multiple feature classes and tables can share attribute domains stored in the database. However, not all the objects in a feature class or table need to share the same attribute domains.

For example, in a water network, suppose that only hydrant water laterals can have a pressure of between 40 and 100 psi, while service water laterals can have a pressure of between 50 and 75 psi. You would use an attribute domain to enforce this restriction. To implement this kind of validation rule, you do not have to create separate feature classes for hydrant and service water laterals, but you would want to distinguish these types of water laterals from each other to establish a separate set of domains and default values. You can do this using subtypes.

To learn more about subtypes and attribute domains, see Chapter 5, ‘Subtypes and attribute domains’.

Creating an attribute domain

You will use ArcCatalog to create a new coded value attribute domain. This new domain will describe a set of valid pipe diameters for your new Laterals feature class.

1. Right-click the Montgomery geodatabase and click Properties.
2. Click the first empty field under Domain Name and type “LatDiameter” for the name of the new domain. In the description field, type “Valid diameters for water laterals” for the domain’s description.

You will now specify the properties of the domain. These properties include what type of field this domain can be associated with, what type of domain it is (range or coded value), the split and merge policies, and what the valid values for the domain are.
A range domain describes a valid range of numeric values, while a coded value domain describes a set of valid values. In this case, you will create a new coded value domain.

All domains also have split and merge policies. When a feature is split or merged, the ArcInfo system looks to these policies to determine what values the resulting feature(s) have for a particular attribute.

3. Click the Field Type to get a dropdown list and click Float for the field type for this domain.

4. Click the Domain Type to get a dropdown list and click Coded Values for the domain type.

5. Click the Split policy to get a dropdown list and click Duplicate for the split policy for the domain. The Merge policy will default to Default Value.

You’ll type the valid values, or codes for the coded value domain, and for each code you will provide a user-friendly description. As you will see later in the tutorial, ArcMap uses the user-friendly description, not the code, for values of fields that have coded value domains associated with them.

6. Click the first empty field under Code and type “13” for the code; then click the Description field beside it and type “13” for the code’s description.

7. Add the following coded values to the list:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10&quot;</td>
</tr>
<tr>
<td>8</td>
<td>8&quot;</td>
</tr>
<tr>
<td>6</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4</td>
<td>4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2.25</td>
<td>2 1/4&quot;</td>
</tr>
<tr>
<td>2</td>
<td>2&quot;</td>
</tr>
<tr>
<td>1.5</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>1.25</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>1</td>
<td>1&quot;</td>
</tr>
<tr>
<td>0.75</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>-9</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
8. Click OK to add the domain to the geodatabase.

Your attribute domain is now part of your geodatabase. In the next part of the tutorial, you will associate this domain with a field in a feature class.

Creating subtypes and associating default values and domains

Using the properties of the Laterals feature class, you will create subtypes and associate default values and domains with the fields for each subtype. By creating subtypes for the Laterals feature class, not all of the water lateral feature need have the same domains, default values and, as you will see later in the tutorial, connectivity rules.

1. Right-click the Laterals feature class and click Properties.

2. Click the Subtypes tab.
   You will now specify the subtype field for the Laterals feature class. The subtype field contains the values that identify to which subtype a particular feature belongs.

3. Click the Subtype Field dropdown arrow and click TYPECODE.
   You will now add subtype codes and their descriptions. When you add a new subtype, you will assign default values and domains to some of its fields.

4. Click the Description field next to subtype code 0 and type “Unknown” for its description.
5. Click the Default Value field next to H_CONFID and type "0" for its default value. Do the same for DEPTH_BURI and RECORDED_L. For the WNM_TYPE, PWTYPE fields, type "WUNKNOWN" as the default values.

6. Click the Default Value field next to DIAMETER and type "8" for the default value. Click the Domain dropdown list and click LatDiameter to set it as this field’s attribute domain for the Unknown subtype.

7. Repeat step 6 for the MATERIAL field, typing “DI” for the default value. Click Material in the Domain dropdown list.

8. Add the following additional subtypes and set the default values and domains the same as for the Unknown subtype, except for the WNM_TYPE and PWTYPE field default values.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydrant laterals</td>
</tr>
<tr>
<td>WNM_TYPE, PWTYPE</td>
<td></td>
</tr>
<tr>
<td>default value = WHYDLIN</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fire laterals</td>
</tr>
<tr>
<td>WNM_TYPE, PWTYPE</td>
<td></td>
</tr>
<tr>
<td>default value = WFiRELIN</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Service laterals</td>
</tr>
<tr>
<td>WNM_TYPE, PWTYPE</td>
<td></td>
</tr>
<tr>
<td>default value = WSERVICE</td>
<td></td>
</tr>
</tbody>
</table>
When adding new features to a feature class with subtypes in the ArcMap editing environment, if you don’t specify a particular subtype, the new feature will be assigned the default subtype. Once you have added all the subtypes for this feature class, you can set the default subtype from those you just entered.

9. Click the Default Subtype dropdown arrow and click Service laterals to set it as the default subtype.

10. Click OK.

You have now added behavior to the geodatabase by adding domains and creating subtypes. In Exercise 8, you will see how ArcMap behaves with subtypes and domains. First, though, you will add some additional behavior to the geodatabase by creating relationships.
Exercise 4: Creating relationships between objects

In Exercise 2, you imported an INFO table containing owner objects into the Montgomery geodatabase. The geodatabase already has a feature class called Parcels that contains parcel objects. You will now create a relationship class between the parcels and the owners so that when you use the data in ArcMap you can easily find out which owners own which parcels.

1. Right-click the Landbase feature dataset, point to New, then click Relationship Class.

The New Relationship Class wizard should now be open. The first panel of the wizard is used to specify the name, the origin, and the destination feature class or table for the new relationship class.

2. Type “ParcelOwners” as the name of this relationship class.

3. Click Owners for the origin table.

4. Double-click Landbase and click Parcels for the destination feature class. Click Next.

This next panel is used to specify the type of relationship class you are creating. You are creating a simple relationship class since owners and parcels can exist in the database independent of each other. You can therefore accept the default type—simple relationship class.

5. Click Next.

You must now specify the path labels and the message notification direction. The forward path label describes the relationship as it is navigated from the origin class to the destination class—in this case, from Owners to Parcels. The backward path label describes the relationship when navigated in the other direction—from Parcels to Owners.
The message notification direction describes how messages are passed between related objects. Message notification is not required for this relationship class, so accept the default of None.

The next step is to specify the primary key in the origin table (Owners) and the embedded foreign key field in the destination feature class (Parcels). Owners and Parcels that have the same value in these fields will be related to each other.

9. Click the first dropdown arrow and click PROPERTY_ID for the origin table primary key.

10. Click the second dropdown arrow and click PROPERTY_ID for the embedded foreign key in the destination feature class.

6. Type “owns” for the forward path label and type “is owned by” for the backward path label. Click Next.

You will now specify the cardinality of the relationship. The cardinality describes the possible number of objects in the destination feature class or table that can be related to an object in the origin feature class or table.

7. Click 1-M (one-to-many) to specify that one owner may own many parcels. Click Next.

You must now specify whether or not your new relationship class will have attributes. In this example, the ParcelOwners relationship class does not require attributes, which is the default.

8. Click Next.

11. Click Next. A summary page appears. Once you have reviewed the summary, click Finish.

You have now added a second kind of behavior to the geodatabase—relationships. In exercise 8, you will see how ArcMap behaves when editing relationships, but first you will continue to add behavior to the geodatabase by creating a geometric network and defining connectivity rules.
Exercise 5: Building a geometric network

Feature classes stored in the same feature dataset can participate in a geometric network. Geometric networks model network systems such as water networks. In this part of the tutorial, you will build a geometric network from the feature classes in the Water feature dataset in the Montgomery geodatabase. You will then create connectivity rules to define which features can connect to each other in the network.

Creating the water network

1. Right-click the Water feature dataset in the Montgomery geodatabase, point to New, then click Geometric Network.

   The Build Geometric Network Wizard should now be open. You can use this wizard to either build a geometric network from existing feature classes or to create an empty geometric network. In this case, you will be building a network from the existing feature classes in the Water feature dataset.

2. Click Next.

   The second panel is used to specify whether to build a network from existing feature classes or to create an empty one. You want the default—Build a geometric network from existing features.

3. Click Next.

   You must now select which feature classes in the feature dataset will participate in the geometric network and what the name of the network will be.

4. Check all of the feature classes in the list.

5. Type “WaterNet” for the name of the geometric network. Click Next.
You must now specify which line feature classes will become complex edge feature classes in the geometric network. By default, all line feature classes become simple edge feature classes.

6. Click Yes to specify that some of the line feature classes will become complex edges.

7. Check Distribmains and Transmains to make the water distribution and transmission mains complex edges.

8. Click Next.

Features in a geometric network must be precisely connected to one another. The feature's geometry in the input feature classes can be adjusted to make the connectivity through snapping. You must now specify whether these features need to be adjusted to snap to one another in the network-building process.

9. Click Yes to specify that some of the features need to be adjusted. Type “1.0” for the snapping tolerance.

10. Check all of the feature classes to indicate that the features stored in each one can be adjusted.

11. Click Next.

You must specify which, if any, of the junction feature classes can act as sources and sinks in the network. ArcInfo uses these sources and sinks to determine the flow direction in the network.

12. Click Yes to indicate that some of the junction feature classes will act as sources or sinks.

13. Check the Tanks feature class to indicate that tanks can be sources or sinks in the network.
14. Click Next.

Now you can assign network weights. A network weight describes the cost of traversing an element in the logical network such as the drop in pressure as water flows through a pipe. This geometric network does not require weights, which is the default.

15. Click Next. A summary page appears. Once you have reviewed the summary, click Finish.

A progress indicator appears, displaying the progress for each stage of the network-building process.

Your new geometric network, WaterNet, has been created in the Montgomery geodatabase. Next, you’ll establish connectivity rules for your water network.

**Creating connectivity rules**

Network connectivity rules constrain the type of network features that may be connected to one another and the number of features of any particular type that can be connected to features of another type. By establishing these rules, you can maintain the integrity of the network connectivity in the database.

1. Right-click WaterNet and click Properties.

   The Geometric Network Properties dialog box should now be open. The dialog box provides information about feature classes participating in the network and a list of the network weights. You can also add, delete, and modify connectivity rules using this dialog box.

2. Click the Connectivity tab.

   This tab lets you add and modify connectivity rules for the geometric network. You will first create a new edge–junction rule, which states that hydrants can connect to hydrant laterals; it also indicates that when a hydrant lateral is created, a hydrant junction feature should be placed at its free end.

3. Click the dropdown arrow and click Laterals.

4. In the list of subtypes in the feature class, click Hydrant laterals.
You will now click the types of junctions that hydrant laterals can connect to in the network. For purposes of simplicity, hydrant laterals can only connect to hydrants.

5. Check Hydrants in the list of subtypes in the network.

You should also specify that when you create a hydrant lateral, if an end of the lateral is not connected to another edge or junction, then a hydrant is placed at that end.

6. Click the plus sign next to Hydrants, right-click Hydrants under it, then click Set as Default. A blue “D” will appear next to the hydrant subtype, indicating that it is the default junction for this edge subtype.

You will now create a new edge–edge rule that states that hydrant laterals can connect to distribution mains through taps, tees, and saddles. The default junction for connections between hydrant laterals and distribution mains will be taps.
7. In the network subtypes list, click the plus sign next to Distribmains and check Distribmains under it. Because you have checked an edge in the network subtypes list, the list of junction subtypes in the network becomes active. In this list, you can specify which junction types hydrant laterals and distribution mains can connect through.

8. In the junction subtypes list, click the plus sign next to Fittings and check Tap, Tee, and Saddle in that order. Notice that Tap has a blue “D” next to it; this means that Tap is the default junction. Check WaterNet_Junctions, which is the generic, or default network junction type.

9. Click OK.

You have now added additional behavior to your geodatabase by defining connectivity rules. You would normally define many more connectivity rules for a network. However, for the editing section of this tutorial, you only need to define the connectivity rules specified here. In the next part of the tutorial, you will create feature-linked annotation for your new hydrant lateral feature class.
Exercise 6: Creating annotation

In Exercise 1, you browsed through the existing feature classes in the Montgomery geodatabase. Some of these feature classes contained annotation that was linked to features in the Distbmins and Transmains feature classes. You then imported the water laterals from a coverage into the Water feature dataset. Now, you will create an annotation class to store feature-linked annotation for the water laterals.

Creating the annotation class

You’ll create the annotation class in the Water feature dataset in the Montgomery geodatabase.

1. Right-click the Water feature dataset, point to New, then click Feature Class.

The New Feature Class Wizard should now be open. This wizard can be used to create new simple, network, custom, or—as in this case—annotation feature classes in a geodatabase. The first panel lets you specify the name of the new feature class and its alias. It also gives you the option of storing nonsimple features in the feature class (network, annotation, etc).

2. Type “LateralDiam” in the Name text box.

3. Type “Water lateral diameter annotation” in the Alias text box.

4. Click the second Type option to store annotation objects. Click the first dropdown arrow and click ESRI Annotation Feature.

5. Check Link the annotation to the following feature class.

The New Feature Class Wizard should now be open. This wizard can be used to create new simple, network, custom, or—as in this case—annotation feature classes in a geodatabase. The first panel lets you specify the name of the new feature class and its alias. It also gives you the option of storing nonsimple features in the feature class (network, annotation, etc).
6. Click the second dropdown arrow and click Laterals to link the annotation to the water laterals.

7. Click Next.
   Use this panel to specify how the features to which this annotation class is linked will be annotated. You can choose a field in the linked feature class or a combination of fields. You can also specify some advanced symbology and placement options.
   You’ll specify an expression involving a number of fields on the Laterals feature class to derive the annotation.

8. Click the Label Field dropdown arrow and click DIAMETER.

9. Click Expression to specify an annotation expression.

   The Expression Properties dialog box should now be open. Using this dialog box, you can derive labels from multiple fields in the linked feature class and use logic to derive labels from those fields. In this case, you will specify that all laterals greater than 200 feet in length must be annotated with their diameter and their material type; those that are less than 200 feet in length should be annotated with their diameter only.

10. Drag Shape_Length and MATERIAL from the Label Fields list and drop them on the Expression text box.

11. Check Advanced and modify the expression to make it the following:

        Function FindLabel ( [Shape_Length], [DIAMETER], [MATERIAL] )
            if [Shape_Length] > 200 then
                FindLabel = [DIAMETER] & " " & [MATERIAL]
            else
                FindLabel = [DIAMETER]
            end if
        End Function
12. Click the Verify button to ensure that you typed the expression correctly. If you get an error, try retyping the expression.
13. Click OK.
14. Click Symbol.

The Symbol Selector dialog box lets you set the font, color, and size of the text used to annotate your features.
15. Click the Bold and Italic buttons.
16. Click OK.
17. Click Label Placement Options.

The Placement Options dialog box opens. Here you will specify the default placement of the annotation relative to its feature.
18. Click the second option to specify that a single annotation feature is created for each lateral feature.
19. Click OK.

20. Click Next on the wizard.

Use this panel to specify at what scale your annotation will be displayed with the font size you specified in the Symbol Selector dialog box. If you zoom in to a larger scale, the annotation will appear larger, and if you zoom out to a smaller scale, the annotation will appear smaller.
21. Type “1000” for the reference scale.
22. Click the Map Units dropdown arrow and click Feet for the map units. When a new feature is created in the linked feature class, you want a new annotation feature to also be created. Be sure the box is checked to include this default. Click Next.

This panel is used to specify storage parameters for the database to store this feature class. No special storage parameters are required, which is the default.

23. Click Next.

This panel lets you add additional fields to those required fields that already appear in the panel. This feature class does not require any additional fields.

24. Click Finish.

You have created a new annotation class that is linked to the Laterals feature class. This new annotation class does not yet contain any annotation features. You will now use ArcMap to create the annotation features for all of the features in the Laterals feature class.

**Generating the annotation features**

To create annotation for the laterals features and store them in the feature-linked annotation class that you just created, you will need to use ArcMap.

1. Start ArcMap by clicking the Launch ArcMap button in ArcCatalog. You can also start ArcMap by either double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.

2. Click the Add Data button to add the Laterals feature class and the LateralDiam annotation class to the map. The Add Data dialog box appears.

3. Navigate to the Water feature dataset, select the Laterals and LateralDiam feature classes, and click Add.
The data is added to your map. You will now annotate the annotation features.

4. Click the Select Features button on the ArcMap Tools toolbar.

5. Select all of the laterals by dragging a box around them on the map.

6. In the ArcMap table of contents, right-click the Laterals layer, point to Selection, then click Annotate Selected Features.

The Annotate selected features dialog box appears. Use the defaults for this operation.

7. Click OK.

8. Close ArcMap.

You have populated the annotation class by deriving text from fields in the linked feature class. The links, stored in the geodatabase as relationships, are automatically created between the features and their annotation. In Exercise 8, you will see how annotation responds to changes in the feature it is linked to. First, however, you will create new layer files for the Laterals and the LateralDiam feature classes.
Exercise 7: Creating layers for your geodatabase data

To make browsing for and symbolizing data more convenient, you can create layers from your geodatabase data and use these layers in ArcMap. Most of the layers you will need have been created for you; they are stored in the Layers folder in your tutorial directory. In this exercise, you will create new layers for the Laterals and the LateralDiam feature classes.

Creating the Laterals layer

1. In ArcCatalog, right-click the Laterals feature class and click Create Layer.

2. Browse to the Layers folder under your tutorial directory and type “Water laterals” for the name of the new layer.

3. Click Save.

The new layer is created. You will modify the properties of the layer to add symbology.
4. In the ArcCatalog tree, open the Layers folder, right-click the Water laterals layer, then click Properties. You can use the Layer Properties dialog box to modify many aspects of a layer, such as its visible scale and its transparency. In this case, you will modify its symbology.

5. Click the Symbology tab.

6. Click Categories.

By default, the Unique values classification based on the subtype field is used to symbolize the layer. This is the setting you want, but you must modify the symbology of each subtype.
7. Double-click the colored line next to Hydrant laterals. The Symbol Selector dialog box appears. You will use this dialog box to set the symbol properties for the laterals.

8. Click the Color dropdown arrow and click purple to make the line color purple.

9. Type “1.5” in the width text box to give the line a width of 1.5.

10. Click OK.

11. Repeat steps 7 through 10 for the Fire laterals, making the symbol a red line with a width of 1.5.

12. Repeat steps 7 through 10 for the Service laterals, making the symbol a dark blue line with a width of 1.5.

13. Click OK to close the Properties dialog box.

Your Water Laterals layer is complete. You can now create the annotation layer for the water laterals.

Creating the LateralDiam layer

1. Right-click the LateralDiam feature class and click Create Layer.

2. Navigate to the Layers folder and type “Water lateral diameter annotation” for the name of the new layer.

3. Click Save.

The new annotation layer is created. Since this layer points to an annotation feature class, the symbology is a property of the annotation and therefore does not have to be set in the layer.
Exercise 8: Editing your geodatabase

The previous exercises have guided you through the process of importing data into your geodatabase. Using that imported data, you created rules about how the data could be edited, related objects in the imported table to objects in a feature class, created a geometric network, and created feature-linked annotation. You will now learn how easy it is to edit your geodatabase.

In this exercise, you will add all of the layers from the tutorial directory to your map. Once the data is on your map, you will perform the following edits:

- Update the owner information for a parcel.
- Move an existing fire hydrant 50 feet further back from the edge of the road.
- Create a new hydrant lateral.

**Updating the owner information for a parcel**

1. Start ArcMap by either double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.
2. Click the Add Data button to add the geodatabase layers to the map.
3. Navigate to the Layers folder, select all the layers, and click Add.
4. Notice that the Editor toolbar is still displayed from the last time you used ArcMap.
5. Click the Editor menu and click Start Editing.

The data is added to your map. You’re ready to begin editing.
6. Click the Zoom In button and drag a box around an area with some distribution mains and parcels. You can now see the features more clearly.

You will begin by editing the parcels. To make it easier to select only parcel features, you’ll set the parcels as the only selectable layer.

7. Click Selection and point to Set Selectable Layers. This will open the Set Selectable Layers dialog box. Uncheck all layers except the Parcels layer, then click Close to close the Set Selectable Layers dialog box.

8. Click the Edit tool.
9. Select a group of parcels by dragging a box around them.

10. Click the Attributes button on the Editor toolbar.

The Attributes dialog box now appears with a list of the selected parcel’s PARCEL_ID values. The attribute values of the first selected parcel are displayed on the right panel. Each parcel has a plus sign next to it; click it to get the related owner objects.

11. Click the plus sign next to the first parcel.

The backward path label—“is owned by”—that you typed when you created this relationship class, is visible under the parcel in the Attributes dialog box.

12. Click the plus sign next to “is owned by”.

The identifier of the owner object (presented by a number) that is related to (owns) this parcel is displayed under the relationship path label.

13. Click the owner identifier value.

The attributes of the owner of this parcel are listed on the right panel. Notice that the field name aliases you entered earlier for the owner table are displayed instead of the true field names. You can edit the values for this owner’s attributes easily using the aliases.

14. Click the value for Percentage ownership and type “100”.

15. Press Enter.

16. Click the Close button to close the Attributes dialog box.
You have used the ParcelOwners relationship class that you created to find the owner for a parcel and edit its attributes. To see how network connectivity is automatically maintained during the editing of network features, you are now going to edit some network features.

**Moving an existing fire hydrant**

Your first edit will be to move a fire hydrant away from a street edge of pavement. Fire hydrants are network features and participate in the network with the water lateral features. You will see that network connectivity is maintained when the hydrant feature is moved.

1. Click the Selection menu and click Clear Selected Features to deselect the parcels you selected in the previous task.
2. Click Selection, point to Set Selectable Layers, uncheck the Parcels layer, check the Hydrants layer, and close the window.
3. Zoom in to an area with a fire hydrant.
4. Click the Edit tool and drag a box around the fire hydrant you want to move. The fire hydrant should now be selected.
5. Click and drag the selected hydrant away from the distribution main. Notice that the lateral between the hydrant and the valve stretches as the hydrant is moved.
6. Drop the hydrant into its new position. Notice that when the hydrant was moved, the lateral rubber-banded to maintain its connectivity with both the hydrant and the valve. This is an example of how ArcGIS 8 maintains network topology during interactive editing.

**Creating a new hydrant lateral**

In this exercise, you will use a combination of network editing, connectivity rules, attribute rules, and feature-linked annotation to add a new hydrant lateral off a distribution main in your water network.

1. Click the Selection menu and click Clear Selected Features to deselect the hydrant you selected in the last part of the tutorial.
2. Click the Selection menu and point to Set Selectable Layers. Uncheck the Hydrants layer, check the Distribmains, Water laterals, and Fittings layers, and close the window.
3. Zoom to an area with a distribution main.
4. Click the Task dropdown arrow and click Create New Feature.
5. Click the Target dropdown arrow. You will see a list of the layers currently on your map. The Water laterals layer has a plus sign next to it. The plus sign indicates that this layer has subtypes. Click the plus sign to see the list of subtypes that you added after you imported the laterals coverage.

6. Click Hydrant laterals. The new feature will be created in the Water laterals layer and will be assigned the Hydrant Lateral subtype.

In order to establish network connectivity when you add your new hydrant lateral, you must snap it precisely to the distribution main.

7. Click the Editor menu and click Snapping.

The Snapping Environment window appears. When you add the hydrant lateral, you will add it to some point along a distribution main. So, you must set snapping to the edge of distribution mains.

8. Check the Edge check box next to Distb mains and close the Snapping Environment window.

9. Click the Sketch tool.

10. Move the pointer over one of the distribution mains. The pointer snaps to the edge of the distribution main.
11. With the pointer snapped to the main, click once to start the new hydrant lateral. You have just started an *edit sketch*.

   In this example, you want to constrain the hydrant lateral to be perpendicular to the distribution main.

12. While the edit sketch is still active, right-click the distribution main. On the Sketch tool context menu, click Perpendicular.

   As you move the pointer, you can see that your sketch of the hydrant lateral is constrained to be perpendicular to the distribution main. You will now create a lateral 65 feet long.

13. Right-click on the sketch and click Length. Type “65” and press Enter.

   A new vertex is added to the lateral, perpendicular to the distribution main and 65 feet away.

14. Right-click and click Finish Sketch to finish the edit sketch and create the new hydrant lateral.

   When the new hydrant lateral is created, a number of things happen. First, a junction between the distribution main and the hydrant lateral is created and they are topologically connected in the network. Since you established a connectivity rule between these feature types with a default junction when you created the network, the junction type is the default junction—tap.
A junction is also added to the other end of the new hydrant lateral. Since you created a connectivity rule between water laterals and hydrants where hydrants were the default junction, the junction created is a hydrant.

Now drag the hydrant lateral; you will see that the distribution main rubber-bands to stay connected with the lateral. Click the Undo button to undo the move. If you click the distribution main, you will see that it remains as one complete feature. This is a complex edge—it is split in the logical network but remains a single feature in the geometric network.

When the new hydrant lateral was added, its annotation was also added. Since this lateral is less than 200 feet in length and the default value for diameter is 8 inches, the annotation text is “8”.

To see how the annotation feature responds to changes in the hydrant lateral, you will change the value for the diameter of the lateral.

15. Click the Edit tool and select the new hydrant lateral if it is not already selected.

16. Click the Attributes button.

The new hydrant lateral’s attributes are displayed in the right panel of the dialog box. Notice the default values you entered earlier in the tutorial appear in the attributes table, while other fields have null values.

17. Click the Diameter value.

You created a coded value domain and associated it with the diameter field for hydrant laterals. Notice that you are given a dropdown list of the values’ description to choose from.

18. Click 6”.

Since the annotation for laterals is derived in part from the value of the Diameter field, when you clicked the new value for the diameter the annotation was automatically updated to reflect that change.
Creating a new dimension feature

In this part of the exercise, you will create a new dimension feature to display the distance between two fire hydrants in your water network. You will create this new dimension feature in the Dimensions feature class in your geodatabase.

1. Zoom to an area with two or more hydrants.

   When creating dimension features, a special toolbar called Dimensioning is required that contains a set of dimensioning construction methods and the list of styles that can be applied to your new dimension features.

2. Right-click one of the toolbars displayed in the ArcMap window. A dropdown list of all the toolbars available to you is listed. Those that have already been added to your map have check boxes next to them. Click Dimensioning and the Dimensioning toolbar will appear.

3. Click the Target layer dropdown arrow on the Editor toolbar and click Dimensions. The Dimensioning toolbar will become active.

   You will use the Aligned construction method to construct an aligned dimension feature, which is the default. Since you are dimensioning features in your water network, you will use the Water dimensions dimension style.
4. Click the Style dropdown arrow; a list of the dimension styles in the Dimensions feature class is listed. Click the Water dimensions style.

5. Click the Editor menu and click Snapping.
   The snapping environment window appears. Since you are creating a dimension feature to display the length between two hydrants, you need to set your snapping to the vertices of hydrants.

6. Check Vertex next to Hydrants, then close the Snapping Environment window.

7. Click the Sketch tool.

8. Move the pointer over one of the hydrants. The pointer snaps to the hydrant.

9. With the pointer snapped to the hydrant, click once to start an edit sketch.

10. Move the pointer over the other hydrant.
    As you move the pointer, you will notice that the edit sketch dynamically draws a preview of the first part of the dimension feature and updates its length.
11. With the pointer snapped to the second hydrant, click once.
12. Move the pointer away from the hydrant.
   As you move the pointer, you will notice that the edit sketch dynamically shows how the dimension feature's height changes as you move the pointer.
13. When you have the dimension at the height you want for your dimension feature, click once.
   Since you are using the Aligned construction method, the sketch is automatically finished after the three points are input and your dimension feature appears as it was previewed in the edit sketch.

   Congratulations! You have just performed edits on your geodatabase.

   Using ArcCatalog, you created a geodatabase and added behavior to your features. Using ArcMap editing functions, you took advantage of the geodatabase’s behavior to make your editing tasks easier. Experiment with some of your own edits to this geodatabase and try to create your own geodatabase with behavior that meets your needs.

   There are many features of the geodatabase yet to discover and tools in ArcInfo to create, manage, and query it. In the next few chapters, you will learn about the features that make the geodatabase a complete, smart way to store and manage your GIS data.