# Geocoding Tutorial

GIS by ESRI™

Geocoding tutorial

This tutorial introduces you to geocoding with ESRI® ArcGIS™ 8.1. It will show you the basic techniques for creating geocoding services and performing address geocoding with ArcGIS. Complete exercises 2 and 3 to learn about some advanced features—using alternate names and place name aliases and creating a dynamic feature class that is related to the address table.

This tutorial assumes that you are already familiar with using ArcCatalog™ and ArcMap™. You should know how to copy data to a new location and add data to a map. You should also have a basic understanding about what a geodatabase is and the objects they can contain. If you're new to GIS or feel you need to refresh your knowledge, please take some time to read *Getting Started with ArcGIS*. You might also work though the quick-start tutorials in *Using ArcCatalog* and *Using ArcMap*.

Exercise 1: Locating and rematching addresses

In the first part of this tutorial you'll learn how to create a new geocoding service, how to locate an address on a map, and how to create a set of point features representing street addresses stored in a table such as customer locations.

Before you begin, you must make a copy of the data used in this tutorial so the original tutorial data will remain unmodified. Copy the Atlanta folder to a new location on your computer such as the C:\ disk; you'll find it in the ArcTutor\Geocoding folder on the local disk where the tutorial data was installed—for example, at C:\ArcGIS. You'll need 5 MB of free disk space to store the Atlanta folder.
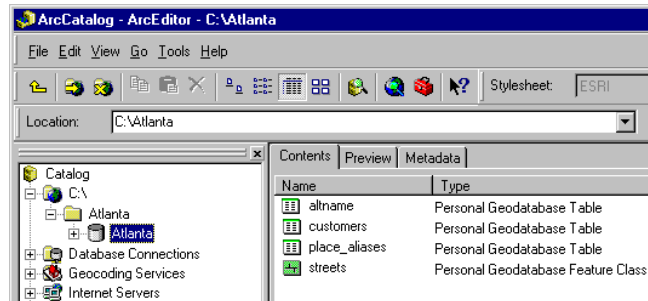

The Atlanta folder contains a personal geodatabase named Atlanta.

Creating a new geocoding service

A *geocoding service* lets you convert textual descriptions of locations into geographic features. The *Geocoding Services folder* at the top level of the Catalog tree lets you manage existing and create new geocoding services on

your computer. The first thing you'll do is create a geocoding service based on your copy of the Atlanta personal geodatabase.

1. Start ArcCatalog.

2. In the Geocoding Services folder at the top level in the Catalog tree, double-click Create New Geocoding Service.
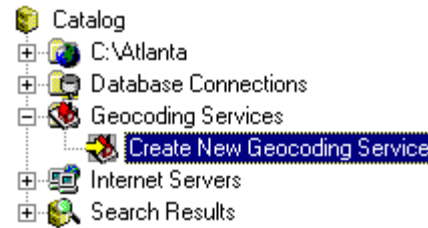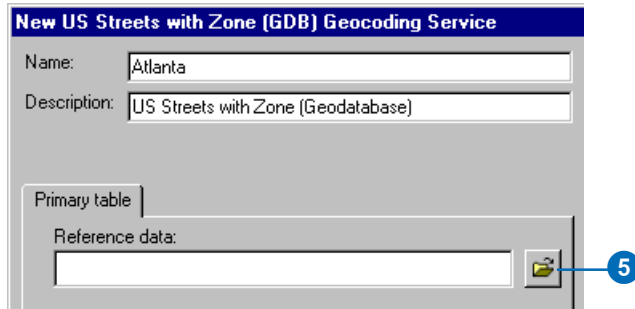

The Create New Geocoding Service dialog box appears.

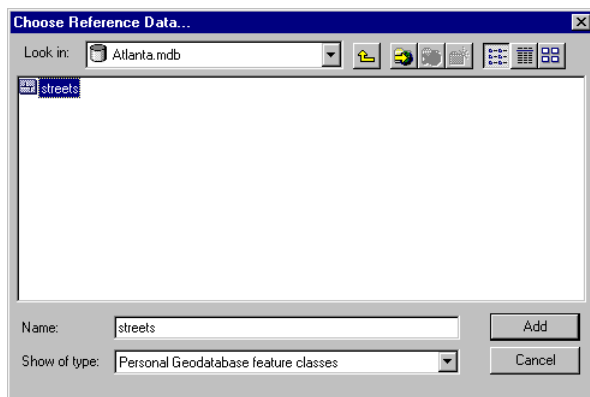3. Click the geocoding style US Streets with Zone (GDB), then click OK.
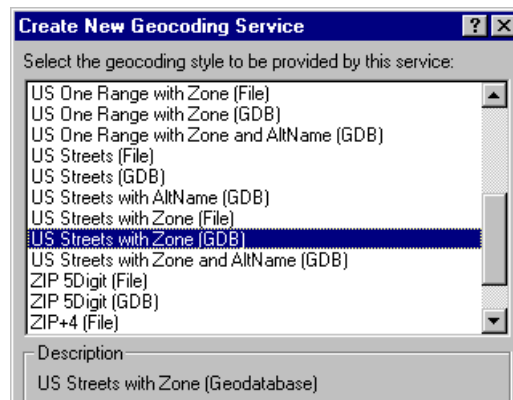
The New US Streets with Zone (GDB) Geocoding Service dialog box appears.

4. In the Name text box, replace the default name "New Geocoding Service" with the name "Atlanta".

5. In the Primary table tab, click the Browse button next to the Reference data text box.

6. In the Choose Reference Data dialog box, navigate to the folder containing your copy of the Atlanta personal geodatabase. Double-click the personal geodatabase, click the streets feature class, then click Add.

7. Click OK in the New US Streets with Zone (GDB) Geocoding Service dialog box. The new geocoding service appears in the Geocoding Services folder.


You'll notice that the name of the geocoding service is prefaced by your login name. If your login name is "ssmith", the geocoding service would appear in the Catalog as "ssmith.Atlanta". New geocoding services are private; other users who log in to the same computer won't have access to your geocoding services.

When the new geocoding service is created, a geocoding index is built for the streets feature class within the Atlanta geodatabase. The index is stored in a new table named GC_SZS1 in the Atlanta geodatabase. With this index, the street features can be quickly matched to the addresses you want to geocode.

You can modify a geocoding service's properties after it has been created.

8. Right-click the yourLogin.Atlanta geocoding service and click Properties. The Geocoding Service Properties dialog box appears.

9. On the right under Matching Options, you can see that the default Minimum candidate score is 10. Change this value to 30.
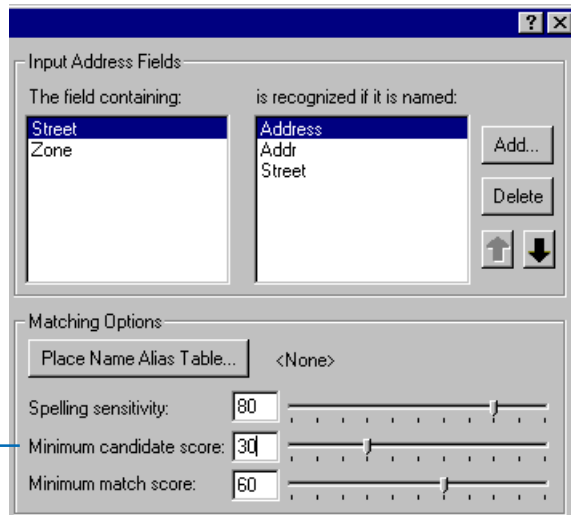
10. Click OK.

Your changes are saved in the geocoding service. Now you can use this geocoding service to find out where addresses are located on a map.

Finding an address interactively

You can use geocoding services to locate addresses while your are working in ArcMap.

1. Start ArcMap and click OK to create a new, empty map.

2. Add the streets feature class in the Atlanta geodatabase to the map.

3. Click the Find button on the Tools toolbar.

Find

4. In the Find dialog box, click the Addresses tab.

Before you can locate an address on your map, you must identify the geocoding service you want to use.

5. Click the Browse button to choose a geocoding service. Navigate to the Geocoding Services folder, click the yourLogin.Atlanta geocoding service, and click Add.

6. Type "150 Linden Ave NE" in the Street or Intersection text box. Type "30308" in the Zone text box.
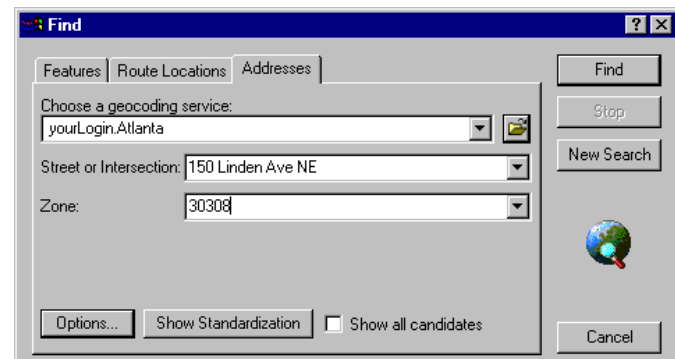
7. Click Find.

One candidate address appears in the list at the bottom of the Find dialog box.

8. Right-click the candidate and click Add as Graphic(s) to Map.
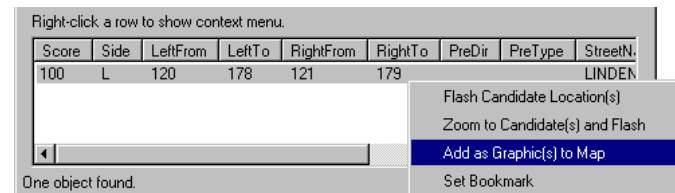
A graphic point representing the address's location appears on the map.
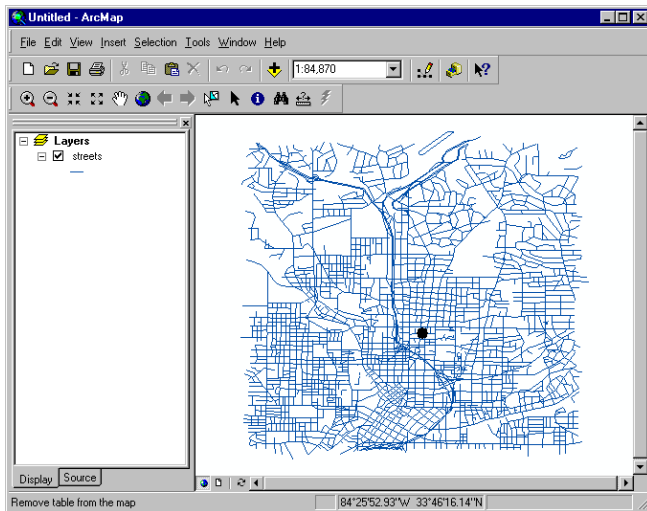
9. Check Show all candidates in the Find dialog box and click Find again.

This time you'll see several candidates in the list. All candidates whose score is above the minimum candidate score as defined in the geocoding service will appear in the list. When Show all candidates is not checked, only candidates whose score is above the minimum match score will be listed. For this geocoding service the minimum candidate score is 30 and the minimum match score is 60.

10. Click the Close button in the upper right corner of the Find dialog box.

The list of candidates is generated by breaking the address into its individual components, then comparing each component to the reference data. The score indicates how closely each candidate feature in the reference data matches the address that you are geocoding. A score will be lower if the street number doesn't fall within the address range for the candidate or if the street name is misspelled, for example.

Geocoding addresses in a table

If you have a table that contains address information, you can geocode all of its addresses at once. This can show you where your customers are located.
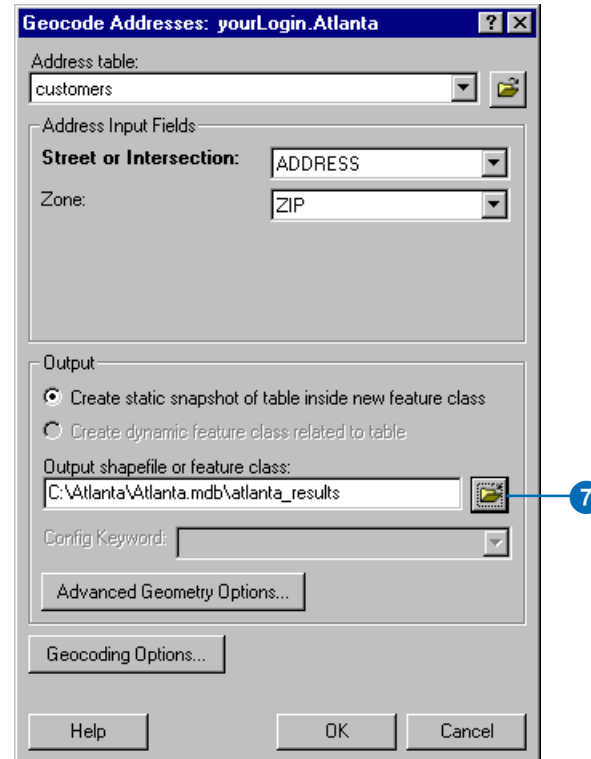
1. Open a new map document in ArcMap. Don't save the map you created in the previous task.

2. Add the streets feature class and the customers table from the Atlanta geodatabase to your map.

3. Click the Tools menu, point to Geocoding, then click Geocode Addresses. Or right-click the customers table in the Source tab of the map's table of contents and click Geocode Addresses.

4. Click Add.

5. In the Add Geocoding Service dialog box, navigate to the Geocoding Services folder, click the yourLogin.Atlanta geocoding service, then click Add.

6. Click yourLogin.Atlanta in the Choose a geocoding service to use dialog box, then click OK.

Choose a geocoding service to use...

Name	Description
yourLogin.Atlanta	US Streets with Zone (Geodatabase)

Add...

OK

Cancel
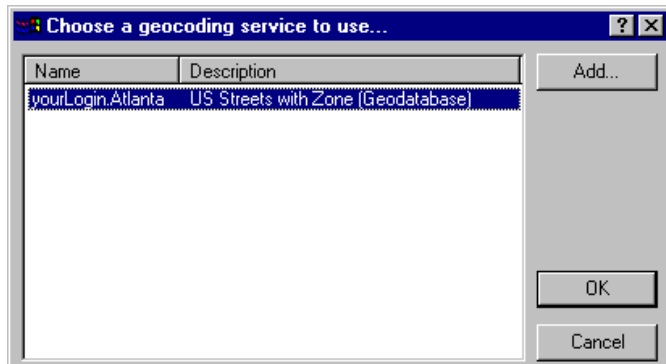
7. In the Geocode Addresses: yourLogin.Atlanta dialog box, click the Browse button to define the Output shapefile or feature class.

8. In the Saving Data dialog box, navigate to the Atlanta personal geodatabase, then double-click the personal geodatabase. Click the Save as type dropdown arrow, then click Personal Geodatabase feature classes. In the Name text box, type "atlanta_results". Click Save.

Saving Data

Look in: Atlanta.mdb

streets

Name: atlanta_results

Save as type: Personal Geodatabase feature classes

Save

Cancel
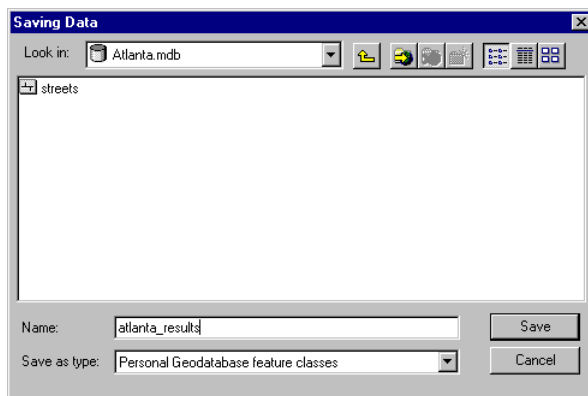
A new point feature class named atlanta_results will be created in the Atlanta geodatabase. The point features generated by the geocoding process will be saved in that feature class.

Geocode Addresses: yourLogin.Atlanta

Address table:

customers

Address Input Fields

Street or Intersection: ADDRESS

Zone: ZIP

Output

⊙ Create static snapshot of table inside new feature class

○ Create dynamic feature class related to table

Output shapefile or feature class:

C:\Atlanta\Atlanta.mdb\atlanta_results

7

Config Keyword:

Advanced Geometry Options...

Geocoding Options...

Help   OK   Cancel

9. Click OK to start geocoding.

When the geocoding process is finished, the Review/ Rematch Addresses dialog box appears. It shows the statistics of the addresses that were matched or not matched. You'll rematch the unmatched addresses later in the tutorial.

10. Click Done.
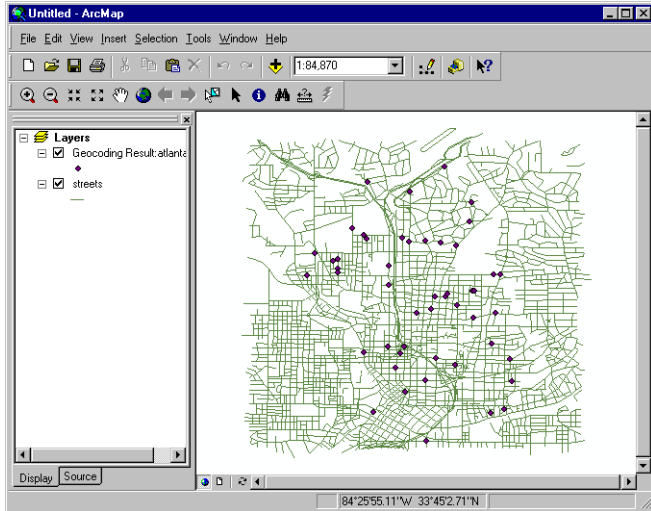
A Geocoding Result layer is added to the map. It shows the points that were added to the atlanta_results feature class.

You can geocode a table of addresses in ArcCatalog as well as ArcMap. To do so, you would right-click the customers table in the Atlanta geodatabase and click Geocode Addresses. In the Select Geocoding Service dialog box, you would click yourLogin.Atlanta and click OK. Then, you would follow steps 8 through 10 in the task above to match the addresses. When you geocode a table of addresses in ArcCatalog, the resulting feature class will not be added to ArcMap automatically.
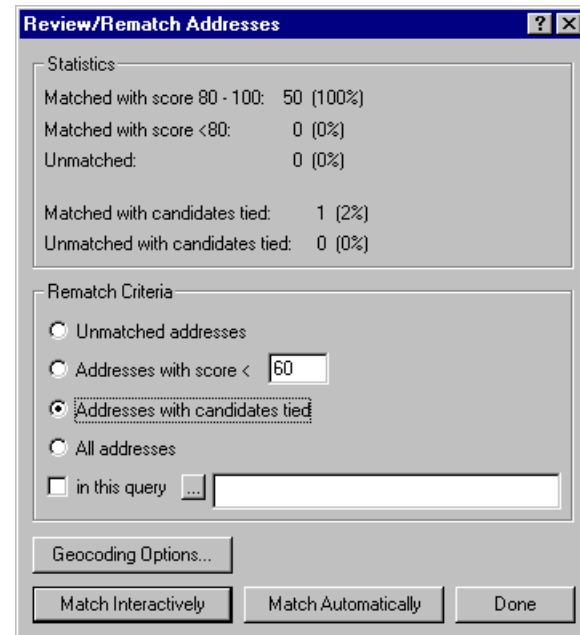
Rematch addresses

1. In ArcMap, click the Geocoding Result: atlanta_results layer in the table of contents.

2. Click the Tools menu, point to Geocoding, point to Review/Rematch Addresses, then click Geocoding Result: atlanta_results. Or right-click the Geocoding Result: atlanta_results layer, point to Data, then click Review/Rematch Addresses.

3. The message "This operation requires that you be editing this workspace. Would you like to start editing?" appears. Click Yes.

   The Review/Rematch Addresses dialog box appears.

4. In the Rematch Criteria, click Addresses with candidates tied.

5. Click Match Interactively.

The Interactive Review dialog box appears. The address records that you have chosen to rematch are listed at the top of the dialog box. In this exercise there is one record in the feature class that has candidates that are tied for the highest match score. The tied candidates are listed at the bottom of the dialog box.
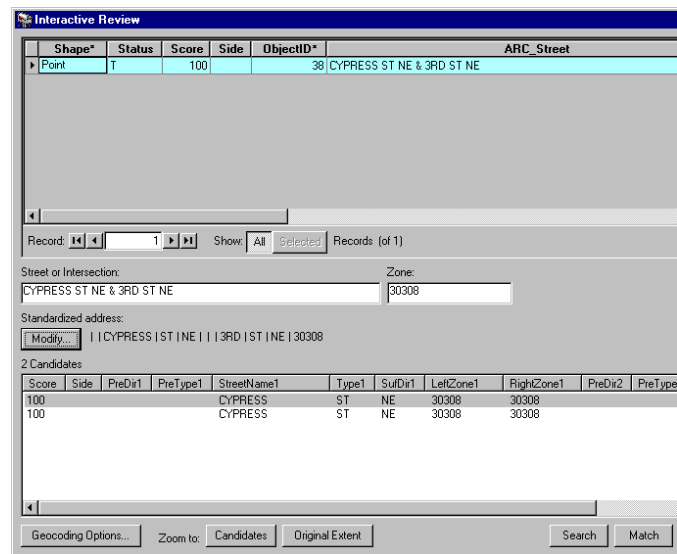
6. Arrange the ArcMap window and the Interactive Review dialog box so you can see the map. The location of the selected candidate is highlighted on the map.

7. Click the second candidate in the candidate list. The location of the highlighted candidate changes on the map.

8. In the bottom right-hand corner of the Interactive Review dialog box, click Match. The selected address in the list at the top of the dialog box is now associated with the second candidate in the list at the bottom.

9. Click Close.

10. Click Done in the Review/Rematch Addresses dialog box.

As with geocoding, you can also rematch addresses with ArcCatalog. To do so, refresh the contents of the Atlanta geodatabase if you don't see the atlanta_results feature class listed in the Contents tab. Right-click the atlanta_results feature class, then click Review/Rematch Addresses. Follow steps 4 through 8 above to rematch the addresses. When you rematch addresses with ArcCatalog, the locations of the candidates will not appear on a map.

11. On the Editor toolbar, click the Editor menu and click Stop Editing. Click Yes to save your changes.

Exercise 2: Using alternate names and place name aliases

A geocoding service has the option to use alternate names and place name aliases. Place name aliases let you associate names of well-known places with street addresses—for example, the names of museums, hospitals, or landmarks. When geocoding an address, the place name alias table is consulted first. If found, the street address from the place name alias table is geocoded instead. Similarly, alternate names can be defined for features in the reference data. When geocoding an address, the alternate street name table is also searched to find potential candidates.

Creating a geocoding service that uses alternate names and place name aliases

In this task you'll create a new geocoding service that uses alternate names and place name aliases, then use that service in ArcMap to find addresses.

1. In ArcCatalog, click the Geocoding Services folder at the top level in the Catalog tree, then double-click Create New Geocoding Service.

2. Click the geocoding style US Streets with AltName (GDB), then click OK.
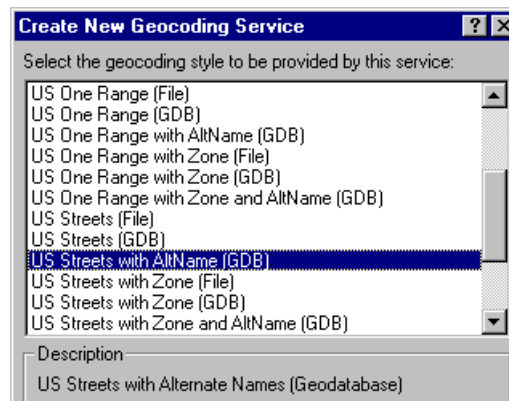
The New US Streets with AltName (GDB) Geocoding Service dialog box appears.

3. In the Name text box, replace the default name "New Geocoding Service" with the name "Atlanta_AltName".

4. In the Primary table tab, click the Browse button next to the Reference data text box.
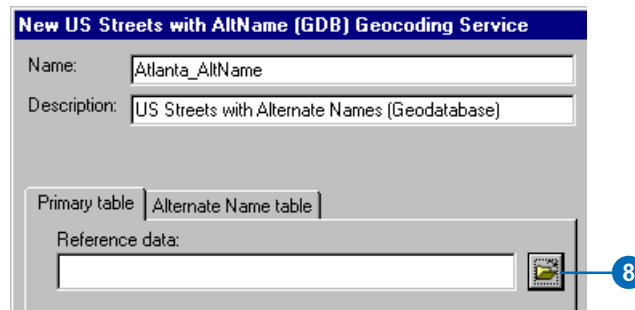
5. In the Choose Reference Data dialog box, navigate to the Atlanta personal geodatabase. Double-click the personal geodatabase, click the streets feature class, then click Add.

6. In the New US Streets with AltName (GDB) Geocoding Service dialog box, click the Alternate Name table tab.

7. Click the Browse button next to the Reference data text box.

8. In the Choose Reference Data dialog box, navigate to the Atlanta personal geodatabase. Double-click the personal geodatabase, click the altname table, then click Add.

9. In the Alternate Name table tab, click the Join ID dropdown list, then click ALTNAME_ID.

The ALTNAME_ID column in the altname table and the OBJECTID column in the streets feature class are used to join the table and the feature class together.

10. On the right under Matching Options, click Place Name Alias Table.

The Alias Table dialog box appears.

11. Click the Browse button, then navigate to the Atlanta geodatabase. Double-click the personal geodatabase, click the place_aliases table in the Atlanta geodatabase, then click Add.

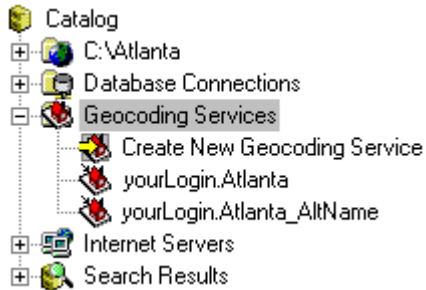12. Click the Alias field dropdown arrow, then click NAME.

13. Click OK.

14. Click OK in the New US Streets with AltName (GDB) Geocoding Service dialog box. The new yourLogin.Atlanta_AltName geocoding service appears in the Geocoding Services folder.


15. Click the File menu and click Exit to close ArcCatalog.

Now you can use this geocoding service to find out where an address is located on a map.

Finding locations using alternate names and place name aliases

1. Open a new map document in ArcMap. Don't save the map you created in the previous task.

2. Add the streets feature class from the Atlanta geodatabase to your map.

3. Click the Find button on the Tools toolbar.

4. In the Find dialog box, click the Addresses tab.

5. Click the Browse button to choose a geocoding service. Navigate to the Geocoding Services folder, click the yourLogin.Atlanta_AltName geocoding service, and click Add.

A street may have more than one name. For example, "Atlanta Blvd" is defined as an alternate name for "Old 10th St NE". With the yourLogin.Atlanta_AltName geocoding service, "30 Old 10th St NE" and "30 Atlanta Blvd" will both find the same location.

6. Type "30 Old 10th St NE" in the Street or Intersection text box, then click Find.
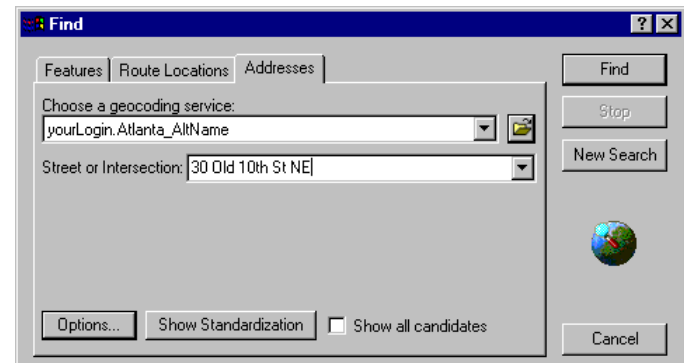
7. Right-click the candidate and click Add as Graphic(s) to Map.

A graphic point representing the address's location appears on the map.

8. Type "30 Atlanta Blvd" in the Street or Intersection text box, then click Find.

9. Right-click the candidate and click Flash Candidate Location(s). You can see that both addresses are matched to the same location on the map.

In addition to geocoding addresses, you can also geocode place names that have been defined in the place_aliases table.

10. Type "Children's Hospital" in the Street or Intersection text box, then click Find.

11. Right-click the first candidate in the candidates list, which has a score of 100, and click Add as Graphic(s) to Map.
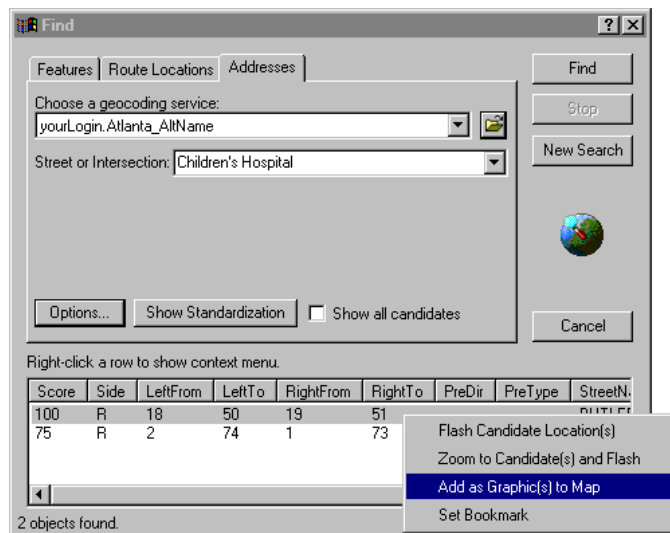
The location of the hospital appears on the map as if you had typed its complete address.

12. Click Cancel to close the Find dialog box.
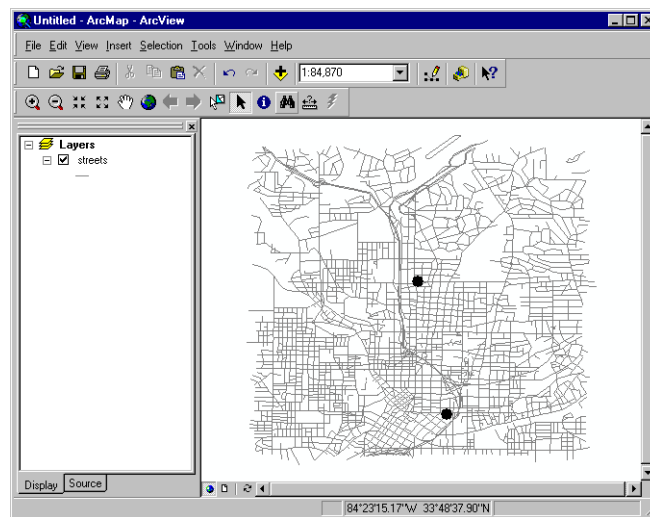
Creating geocoding services that use alternate names and place name aliases is beneficial for people who know a landmark's name but not its address. It will also help in situations where a street has more than one name.

Exercise 3: Creating a dynamic feature class

With ArcInfo™ and ArcEditor™ your geocoding results can be dynamically linked to the original addresses if the address table and the result feature class are stored in the same geodatabase. With dynamic results, modifications to the primary address table will cause the result feature class to be updated automatically. ArcView® users will not be able to complete this exercise.

1. Open a new map document in ArcMap.

2. Add the customers table in the Atlanta geodatabase to your map.

3. Click the Tools menu, point to Geocoding, then click Geocode Addresses. Or right-click the customers table in the Source tab of the map's table of contents and click Geocode Addresses.

4. Click Add in the Choose a geocoding service to use dialog box.

5. In the Add Geocoding Service dialog box, navigate to the Geocoding Services folder, click the yourLogin.Atlanta geocoding service, then click Add.

6. Click yourLogin.Atlanta in the Choose a geocoding service to use dialog box, then click OK.
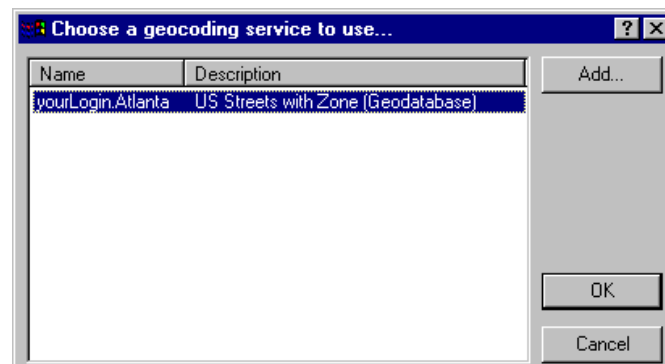
7. In the Geocode Addresses: yourLogin.Atlanta dialog box, click the Browse button to define the Output shapefile or feature class.

8. In the Saving Data dialog box, navigate to the Atlanta personal geodatabase, then double-click the personal geodatabase. Click the Save as type dropdown arrow, then click Personal Geodatabase feature classes. In the Name text box, type "dynamic_results". Click Save.
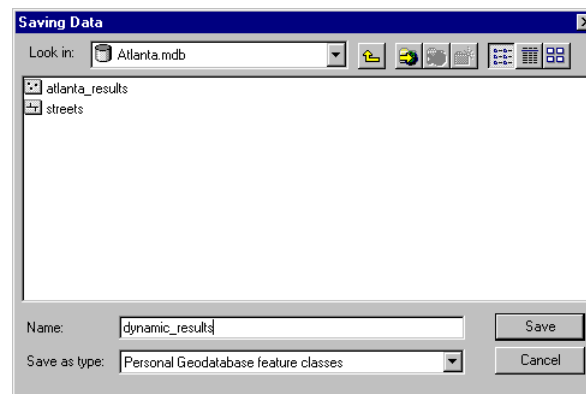
9. Click Create dynamic feature class related to table.
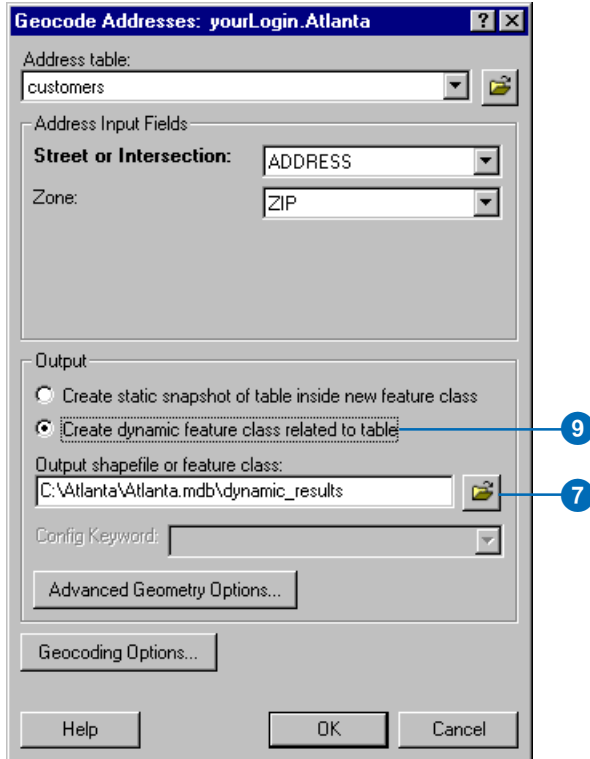
A new point feature class named dynamic_results will be created in the Atlanta geodatabase. The point features generated by the geocoding process will be saved in that feature class. A relationship between the table and feature class will be created.

10. Click OK to start geocoding.

When the geocoding process is finished, the Review/ Rematch Addresses dialog box appears.

11. Click Done.

A Geocoding Result layer is added to the map. It shows the points that were added to the dynamic_results feature class.

12. Right-click the Geocoding Result layer in the map's table of contents and click Open Attribute Table.

The first record in the table has the address 1171 PIEDMONT AVE NE in the Street or Intersection column. The Status, Score, and Side columns contain the values M, 100, and R, respectively. To see on the map where this customer is located, select this record in the table.

13. Minimize the Geocoding Result layer's attribute table.

14. Right-click the customers table in the map's table of contents and click Open.

The address that appears for the first customer in the table, Ace Market, is 1171 Piedmont Ave NE. That customer has moved to a new address, 30 12th St. Its ZIP Code remains the same. The customers table must be updated with this information.

15. Click the Editor Toolbar button to show the Editor toolbar.
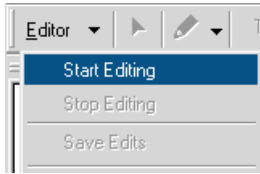
Editor Toolbar

16. On the Editor toolbar, click the Editor menu and click Start Editing.

17. Type "30 12TH ST" in the Address column next to Ace Market.

18. Click another record in the table.

19. Minimize the customers table and maximize the Geocoding Result layer's attribute table.

The new address was geocoded automatically, and the corresponding values have been updated in the layer's attribute table. The Status, Score, and Side columns now contain the values T, 81, and L, respectively. The value "T" in the Status field stands for tied; two or more candidates had the highest score. To see on the map where Ace Market is now located, select this record in the layer's attribute table.

Now you need to add a new customer to the customers table.

20. Minimize the Geocoding Result layer's attribute table and maximize the customers table.

21. Scroll down to the bottom of the customers table.

22. In the blank record after the last record in the table, click in the NAME column. Type "Vine Cafe".

A new blank record is added to the bottom of the table.

23. In the same record, click in the ADDRESS column, then type "379 VINE ST NW".

24. Click in the ZIP column, then type "30314".

25. Click in the TYPE column, then type "Cafe".

26. Click in the SALES column, then type "10000".

27. Close the customers table. Maximize the Geocoding Result layer's attribute table, then scroll to the bottom.

A new feature was automatically added to the result feature class representing the new address.

28. On the Editor toolbar, click the Editor menu and click Stop Editing. Click Yes to save your changes.

29. Click the File menu and click Exit. Click No to stop ArcMap without saving this map.

Geocoding addresses on an ArcSDE server

If ArcInfo or ArcEditor is installed on your computer, and if you have access to an ArcSDE™ geodatabase, you can do server-side geocoding. Instead of creating geocoding services on your computer, you create and store them on the server. Server-side geocoding services are easily shared by many users in an organization. When you use them, the server will do the work of matching addresses to geographic locations.

Once you have created a database connection that accesses the appropriate ArcSDE server, you can copy the streets feature class and the altname, customers, and place_aliases tables from the Atlanta personal geodatabase to the ArcSDE geodatabase. This tutorial could be completed by using data in the ArcSDE geodatabase instead of the Atlanta personal geodatabase.
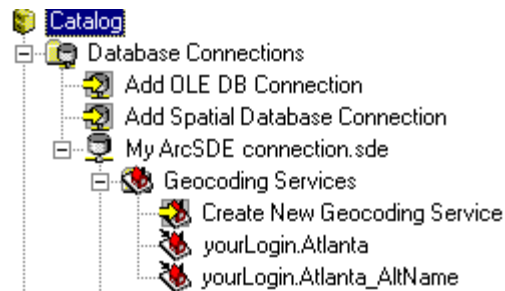
If you choose to do so, create your geocoding services in the Geocoding Services folder within the database connection and use the data located in the same database. The result feature classes created by the geocoding process can also be stored within the ArcSDE geodatabase. Aside from these differences, the geocoding process will be the same as what you experience when you use client-side data and geocoding services to complete this tutorial.