Overview

What is Geocoding?

Geocoding is the process of assigning geographic coordinates (e.g., latitude and longitude) to data records such as street addresses. With geographic coordinates, data records can be mapped and entered into a Geographic Information System (GIS).

What is a Geocoder?

A geocoder is an application or service that facilitates geocoding. Some geocoders exist solely online in the form of geocoding services while some can be used locally or on an internal server. The foundation of a geocoder is one or more layers of geospatial data such as roads or other reference features. A user enters a street address and is returned a set of coordinates (a point) for use in a GIS or GIS-related application. In an ESRI environment, geocoders rely on locator files to store latitude and longitude of features based on inquiry.
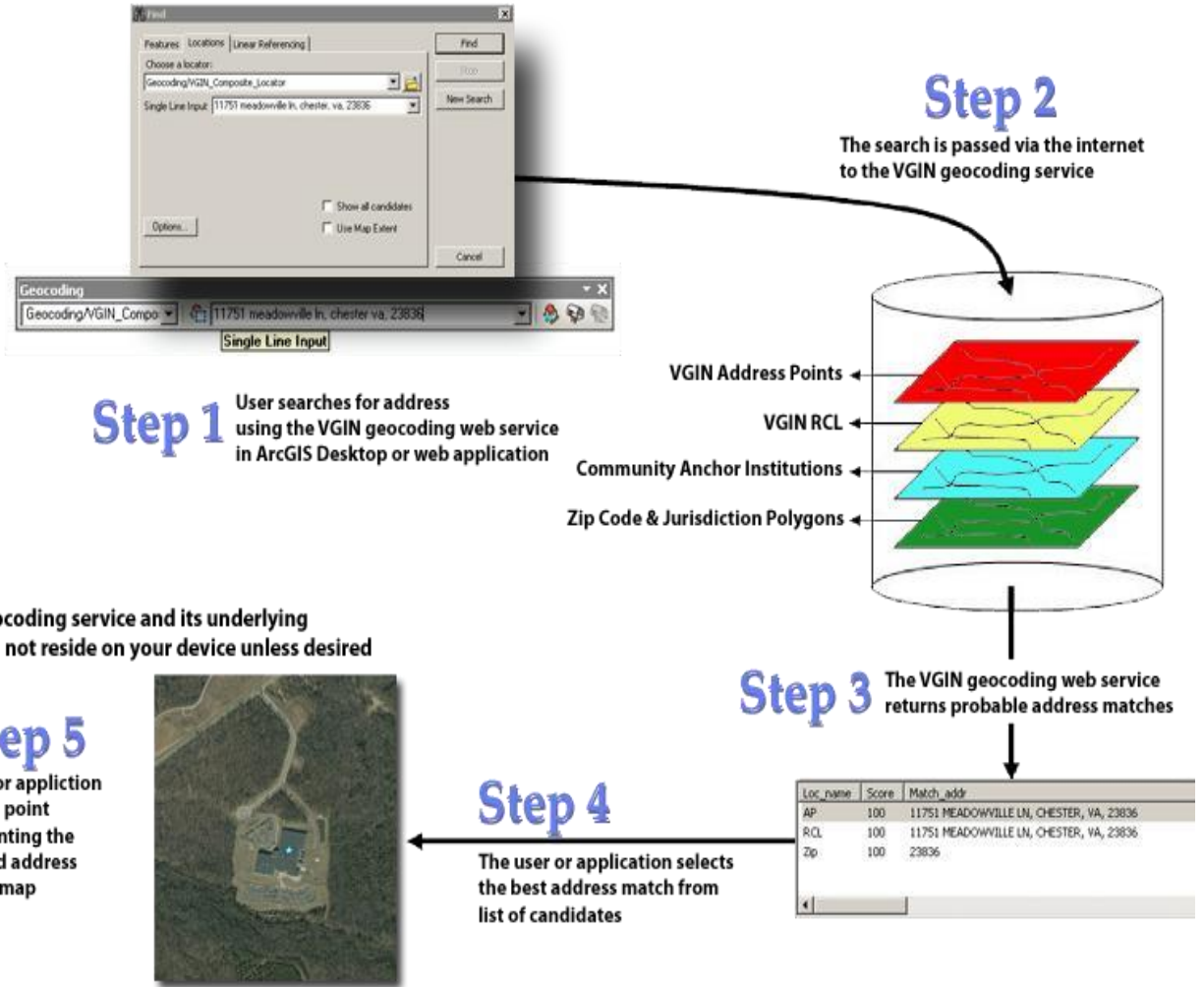
Why Geocode?

Geocoding has many applications, including, but not limited to:

- Mapping databases which use street addresses as point features o Mapping calls for service to a utility company or governmental agency o Crime mapping
- Mapping historical and cultural information

Why Use VGIN's Geocoding Service?

VGIN's Geocoding Service is a web service so no files are necessary for updating routinely on a local machine. VGIN's Geocoding Service also offers several distinct advantages over many commercial geocoders:

- VGIN's Geocoding Service is a *composite* geolocator, which means that it uses multiple sources of geographic information in addition to the Virginia RCL (including commercially available data) to ensure an accurate address match.
- VGIN's Service is updated quarterly and uses VGIN's Road Centerline (RCL) data and Virginia locality Address Points to supply query match results. The RCL dataset is the most current and accurate source of statewide road data in Virginia, especially in rural areas. This means that the results produced by VGIN's geocoder are often more accurate than geocoders that rely on less accurate and less current roads. The address point data used in the geocoding service is the most granular form of address level information and is supplied to VGIN by localities across Virginia.
- VGIN's Service uses points of interest for State assets so a user can search for a specific community anchor by name for Universities, Airports, Libraries, Public Schools, and more.
- VGIN's Geocoding Service is ESRI based and allows batch geocoding. Batch geocoding is the idea of receiving results of more than one address at a time and outputting the data to a geospatial data set. This can be very helpful if a user needs to geocode hundreds or even thousands of addresses and perform analysis and quality control to the results based on additional geospatial resources.

Step 2

The search is passed via the internet to the VGIN geocoding service

Step 1

User searches for address using the VGIN geocoding web service in ArcGIS Desktop or web application

VGIN Address Points

VGIN RCL

Community Anchor Institutions

Zip Code & Jurisdiction Polygons

The geocoding service and its underlying data do not reside on your device unless desired

Step 5

ArcGIS or appliction places a point representing the matched address on basemap

Step 4

The user or application selects the best address match from list of candidates

Step 3

The VGIN geocoding web service returns probable address matches

Each layer used in the VGIN Geocoding Service is an individual ArcGIS locator file (.loc) and has a specific priority over other locators in the composite service based on input parameters on the ArcGIS server. The locators act as cascading services as results are returned based on matching score. The following are the order of layer based on priority and basic properties of each locator participating in the composite:

1   AddressPoints
Layer: VGIN Address Points
Minimum Match Score: 75
Input Field Mapping: Address, City, State, Zip
Suggestions Enabled: Y

2   RCL
Layer: VGIN RCL
Minimum Match Score: 60
Input Field Mapping: Address, City, State, Zip
Suggestions Enabled: Y

3   VA_Zip5
Layer: ESRI Postal Boundaries
Minimum Match Score: 60
Input Field Mapping: Zip
Search: Zip code number
Suggestions Enabled: N/A

4   Jurisdictions FIPS
Layer: VA_Jurisdictions
Minimum Match Score: 10
Input Field Mapping: Keyfield
Search: Locality Name
Suggestions Enabled: N/A

5   Jurisdictions Name
Layer: VA_Jurisdictions
Minimum Match Score: 10
Input Field Mapping: Keyfield
Search: Locality Name
Suggestions Enabled: N/A

6   Community Anchor Institutions
Layer: CAI_MOD
Minimum Match Score: 80
Input Field Mapping: Keyfield
Search: Locality Name
Suggestions Enabled: Y

Setting up VGIN services in ArcGIS Pro

The VGIN Geocoding web service is readily accessible with ArcGIS Pro and ArcGIS Explorer along with several other web services. The service is also designed to be readily accessible in ArcGIS Server web applications. It can be consumed by ArcIMS applications, but modifications to the ArcIMS application code are required.

To add the VGIN ArcGIS Server, open ArcGIS Pro and find the **Connections** button under the Insert tab. Click on the icon and select New ArcGIS Server

 In the popup window, enter the Server URL as https://gismaps.vdem.virginia.gov/arcgis/rest/services. A username and password are not necessary to access the service. Then click **OK**.

Add VGIN Geocoding Service to Project

In the catalog pane, expand the Servers Folder. Expand the server you just added and expand the Geocoding folder within. Right click on **VGIN_Composite_Locator** and Add to Project.
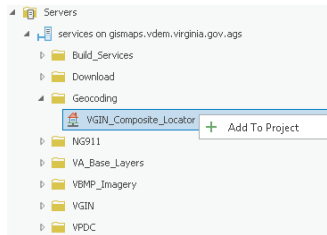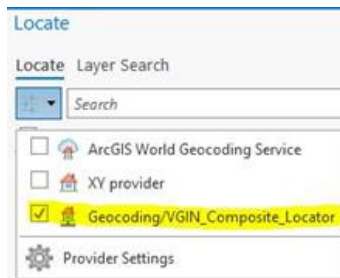
Locating an individual address

Under the Map tab, find the Locate icon and click on Search
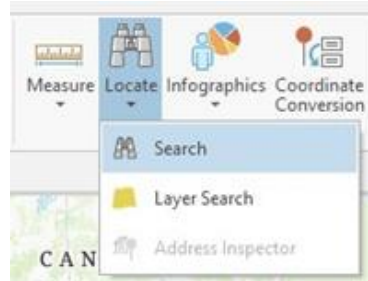
In the Locate pane that pops up, only select Geocoding/VGIN_Composite_Locator under Options.


ArcGIS Pro uses a single line input for the VGIN Geocoding service. Suggestions have been enabled to several of the locators and ArcGIS Pro functionality enables the search. Now search for an address using this example input in the search bar:

1000 Bank St, Richmond, VA, 23219

You will notice ArcGIS Pro provides several suggestions as the address is typed.
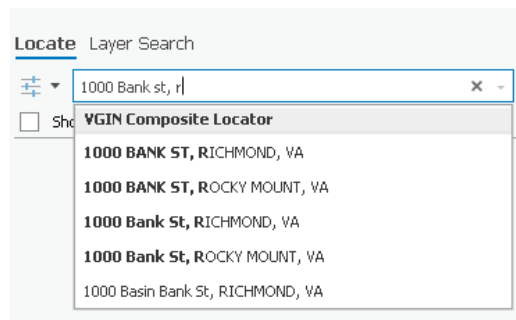
To receive the most accurate results place commas between each input parameter for address, city, state, and zip code.   After hitting enter, notice the point now shows up on the map and is listed in the Locate pane.
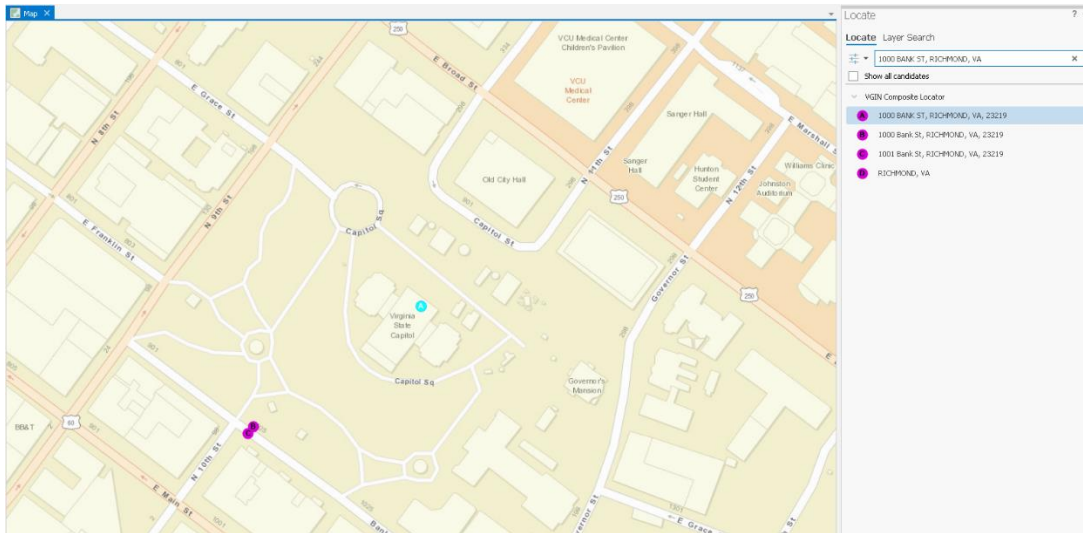
Batch Geocoding in ArcGIS Pro

NOTE: When batch geocoding, be sure to have your input data prepped for use in the locator by having the information listing broken down into individual fields for Address, City, State, and Zip.

 For the Address field, combine the Building number, Street Prefix, Street Name, Street Type, and Street Suffix.   This would be the physical address of the facility you are trying to locate as opposed to PO Box/rural route. Also be sure to calculate the City, State, and Zip Fields entirely. This will provide a more accurate geocoding result when using the VGIN geocoding web service.

To batch geocode a table of addresses, add spreadsheet or table of addresses to ArcGIS Pro. The best file format for this is a .csv table. Use the Add Data button under the Map tab and navigate to your addresses table. Select the file and click OK. The Table now appears in the Contents Pane.

 Right click on the table and select Geocode Table. A Geocode Table pane will pop up outlining the steps to geocode. Click **Start** in the bottom right corner.

Step 1: Make sure your addresses table is selected under Input Table. Select "More than one field" for the second drop down menu. Click Next.

Step 2: Select the VGIN Composite Locator as the input locator. Click Next.

Step 3: Mapping the field in your table. Select the correct data fields that correspond to those requested. It will automatically fill itself out, but double check for accuracy. Click Next.

Step 4: Choose an output name and location for your feature class. The default is your project geodatabase. Check "Add output to map after completion" if you would like to see the results in your project immediately. Click Finish to see a summary of what you have entered in the tool. Click Run.

Rematch Addresses

After your feature class is create, you have the option to rematch addresses. This allows you to have more control as to where the final points are placed. To rematch, click yes in the pop-up window.
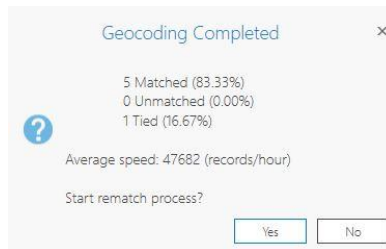
OR right click on the feature layer and click **Data → Rematch.**

The **Rematch Addresses** pane and the attribute table for your geocoded feature class appear. This tool lists all the records in the geocoded feature class singly in the pane in three categories: Matched, Unmatched, and Tied. You can browse through each record individually, and as you match or unmatch addresses, the records update and move to the appropriate category. The pane opens to Unmatched addresses by default. Sometimes an address is not matched because a perfect match cannot be found but there are close match candidates. The candidates display in list format on the lower portion of the Rematch Addresses pane for the active record being examined. The candidates also appear as points on the map.

Setting up VGIN services in ArcGIS Desktop

The VGIN Geocoding web service is readily accessible with ArcGIS Desktop products. The service is also designed to be readily accessible in ArcGIS Server and ArcGIS online web mapping applications.
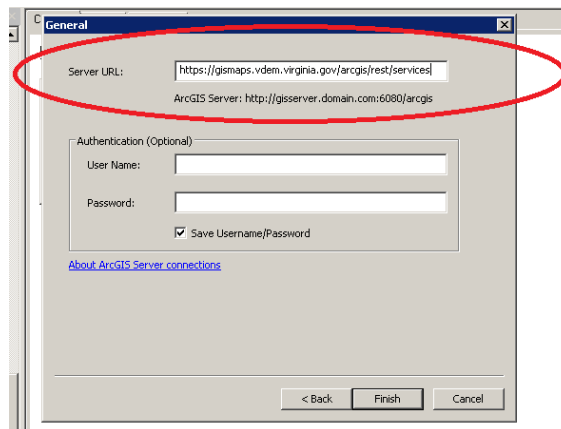
To add the VGIN ArcGIS Server for use within ArcGIS Desktop, open ArcCatalog and navigate to GIS Servers. Click "Add ArcGIS Server".

Select "Use GIS Services" then click Next.
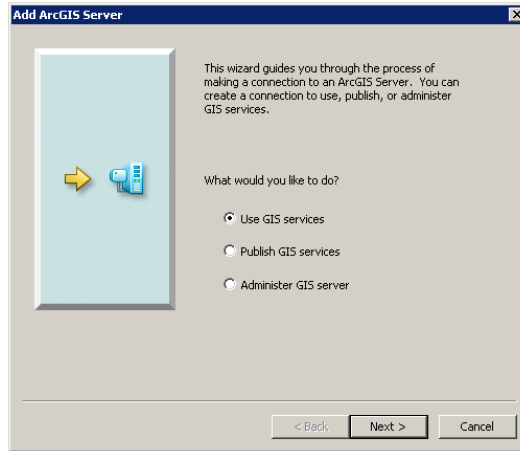
Enter the Server URL as https://gismaps.vdem.virginia.gov/arcgis/rest/services. A username and password are not necessary to access the service as VGIN REST services are open to the public.


Hit the finish button and rename new connection in ArcGIS if desired.

Locating Individual Addresses In ArcMap

Open up a new ArcMap session and under the tools toolbar, hit the find Icon

Under the "Locations" tab, click the Open folder icon. Navigate to the newly created connection file you have established in the prior step. In the Geocoding folder, the VGIN_Composite_Locator is present. Double click to add to your project for use.
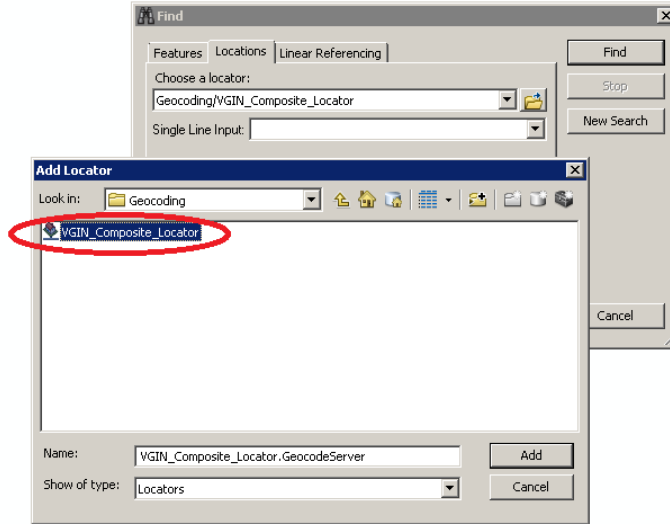
A single locator is inside the folder. As prompted, enter the address you are trying to locate and then click "Find". Enter address information using parsed or full string examples below.

Parsed Input
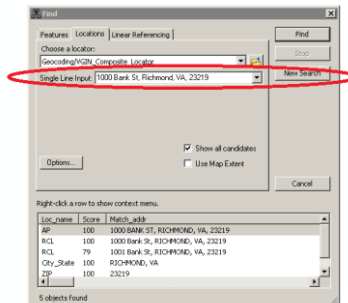*Street or Intersection: "1000 Bank St"*
City: "Richmond"
State Abbreviation: "VA"
Zip: "23219"

Full String Input
*"1000 Bank St, Richmond, VA, 23219"*

Hit the find button and you should see multiple results from multiple locators.


ArcGIS Desktop Geocoding Toolbar

In ArcGIS Desktop, within ArcMap a Geocoding toolbar can be utilized which stores the individual locator properties within an MXD. Within this toolbar a user can either search an individual address in a single line or batch geocode addresses based on individual needs. This can be a helpful resource when working on projects which require querying or exporting addresses many different times.

To configure the Geocoding toolbar in ArcMap, right click on the GUI and enable the Geocoding toolbar.
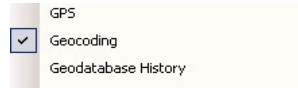

On the Geocoding toolbar dropdown, select <Manage Address Locators…>. Then add the VGIN Composite Locator from the previously established ArcGIS server connection.
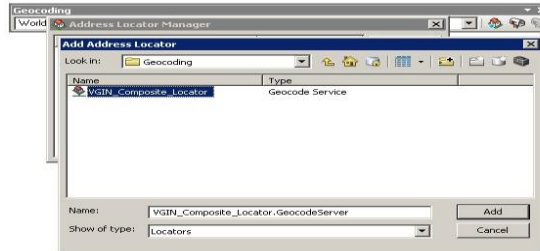
Addresses can either be searched from the toolbar or batch geocoded based on the "Geocode Addresses" mailbox icon. Searching a single address is the same as using the single line search in the "Find" dialogue in ArcMap using commas between each input parameter for address, city, state, and zip code.

 Full String Example Input:
"1000 Bank St, Richmond, VA, 23219"
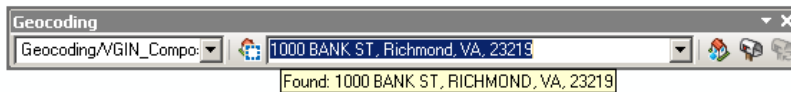
A nice feature within Geocoding toolbar is the the address inspector functionality which allows the users the ability to see hypothetical address result lookups based on the input. This is especially helpful when looking at Road Centerline locators to determine address ranges and how hypothetical points on the line will result. It is very similar to Fishbone Line functionality for actual address points and existing ranges. For more information on the Geocoding Toolbar, see ESRI documentation:

https://desktop.arcgis.com/en/arcmap/10.3/guide-books/geocoding/a-quick-tour-of-geocoding.htm#ESRI_SECTION1_FE3FEBFB4CD940DEAD8DC30DDD25B086

Batch Geocoding in ArcMap

NOTE: When batch geocoding, be sure to have your input data prepped for use in the locator by having the information listing broken down into individual fields for Address, City, State, and Zip.

For the Address field, combine the Building number, Street Prefix, Street Name, Street Type, and Street Suffix.   This would be the physical address of the facility you are trying to locate as opposed to PO Box/rural route. Also be sure to calculate the City, State, and Zip Fields entirely. This will provide a more accurate geocoding result when using the VGIN geocoding web service.

To batch geocode a table of addresses, add spreadsheet or table of addresses to ArcMap. Under the table of contents, right click on the table and select Geocode Addresses.

Hit the "Add" button and Navigate to your ArcGIS server connection, using the Geocoding Folder.

Once the VGIN Composite Locator has been added to ArcMap, select it as the service to use when geocoding. Match appropriate fields in source data to locator and output a file name. Hit ok to create new feature class.
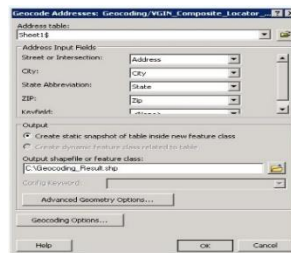
Setting VGIN Geocoding Service As Default ArcGIS Locator

To avoid excess scrolling through windows for power users, the VGIN geocoding service can be added to the locators default config file and stored on the input parameters. This allows easy default access to the service in the ArcMap geocoding toolbar or basic searches. To add the VGIN geocoding service as your default service, scroll to your defaultlocators.xml file located at C:**your program files folder** \ArcGIS**your desktop software version**\Locators\ and paste the following information **ABOVE** the <!-- ArcGIS 10 Online North America geocode service --> locator:

<!—VGIN Geocoding Service -->

 <locator_ref>

  <name>Geocoding/VGIN_Composite_Locator</name>

  <display_name> VGIN Geocoding Service (Subscription) </display_name>

  <workspace_properties>

   <factory_progid>esriGISClient.AGSServerConnectionFactory</factory_progid>

   <ags_connection_properties>

```
    <url>http://gismaps.dem.virginia.gov/arcgis/services</url>

  </ags_connection_properties>

 </workspace_properties>

</locator_ref>
```

Note* you may need a username and password IF provided to you from VGIN and use it instead of the text highlighted in red above. To read more about customizing the default xml locator file, please visit:

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#//002500000040000000.htm
For more general information on geocoding, visit ArcGIS Desktop Help.