**Lab Assignment 5 – ArcGIS Server**

Due Date: 01/26/2012

## Overview

This lab assignment is designed to help you create web-based geoprocessing and geocoding services with ArcGIS Server.

Specifically, this assignment is divided into six parts:

- Part I: Overview
- Part II: Author a Map Document
- Part III: Test and Run a Geoprocessing Model
- Part IV: Publish Map and Geoprocessing Services
- Part V: Create an Address Locator and Publish a Geocoding Service
- Part VI: Create a Web Mapping Application and Configure Functionality

# Part I: Overview

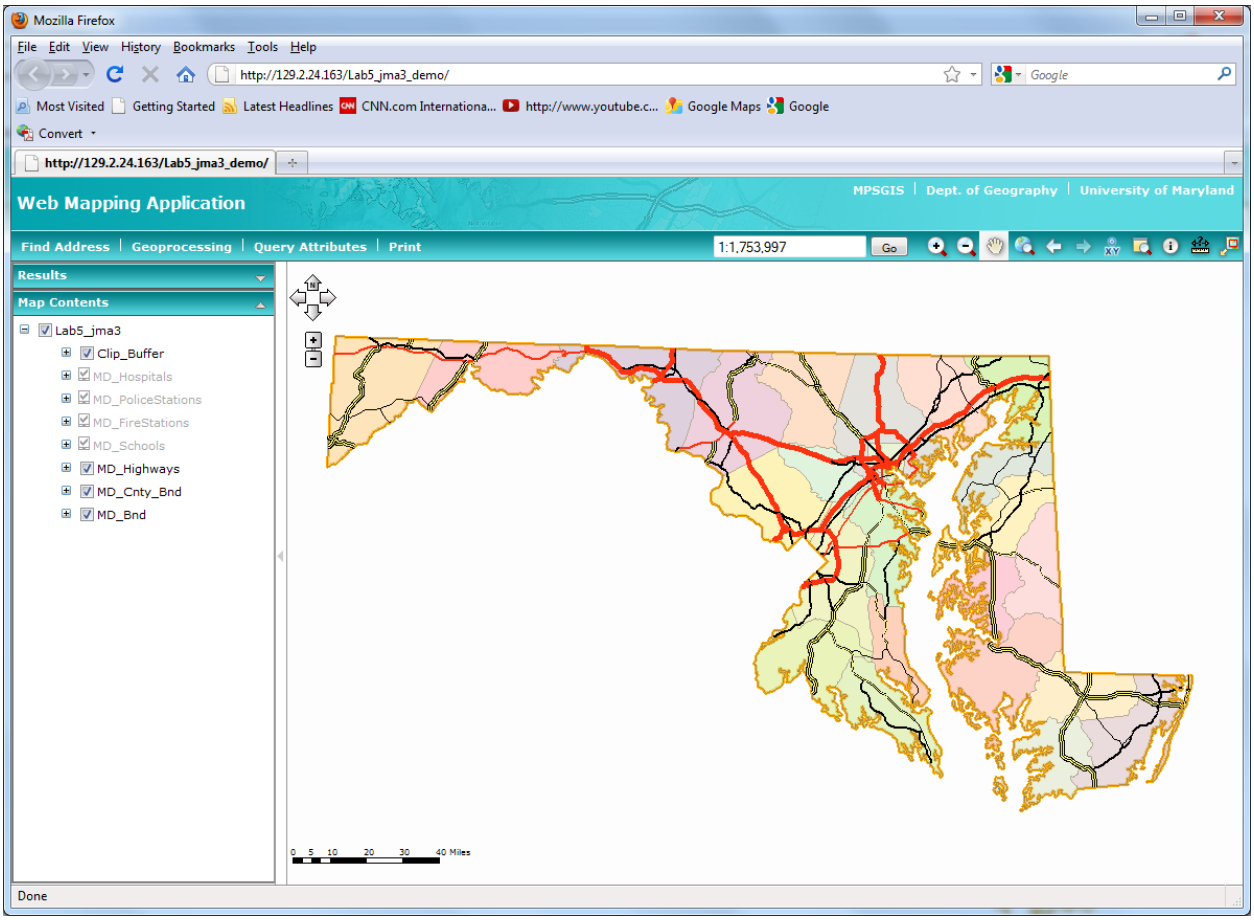
In Lab4, you have designed a rather simple Web mapping application with ArcGIS Server. You are probably interested in a much more sophisticated application with advanced and dynamic functionality. For example, the users should be able to submit requests to the server and get back a set of modeling results. The server accesses and runs a model, which makes it possible to provide geoprocessing capabilities to users without any GIS background. ArcGIS Server also offers a comprehensive and flexible capability to support server-side geocoding.

Furthermore, if you have multiple locations that need to perform routing analysis, you can create a map document with a network analysis layer and publish the map with the Network Analysis capability. Similarly, if you have a large collection of raster data that you want to make available through the Web, you can publish it as an image service. Ideally, ArcGIS Server should be able to help you develop a Web application that can provide as many capabilities as in a desktop GIS.

In this lab assignment, you are going to focus on geoprocessing and geocoding.

In Part I, an example of Web mapping application with geoprocessing and geocoding capabilities is described so that you can get a big picture. Then, from Part II to VI, I will illustrate how this application was developed. There are a lot of details that need your attention because the procedures are complicated. Your task will be creating a similar application with the exactly same data.

Here is the example that demonstrates what you expect to accomplish in this lab assignment: http://129.2.24.163/Lab5_jma3_demo/



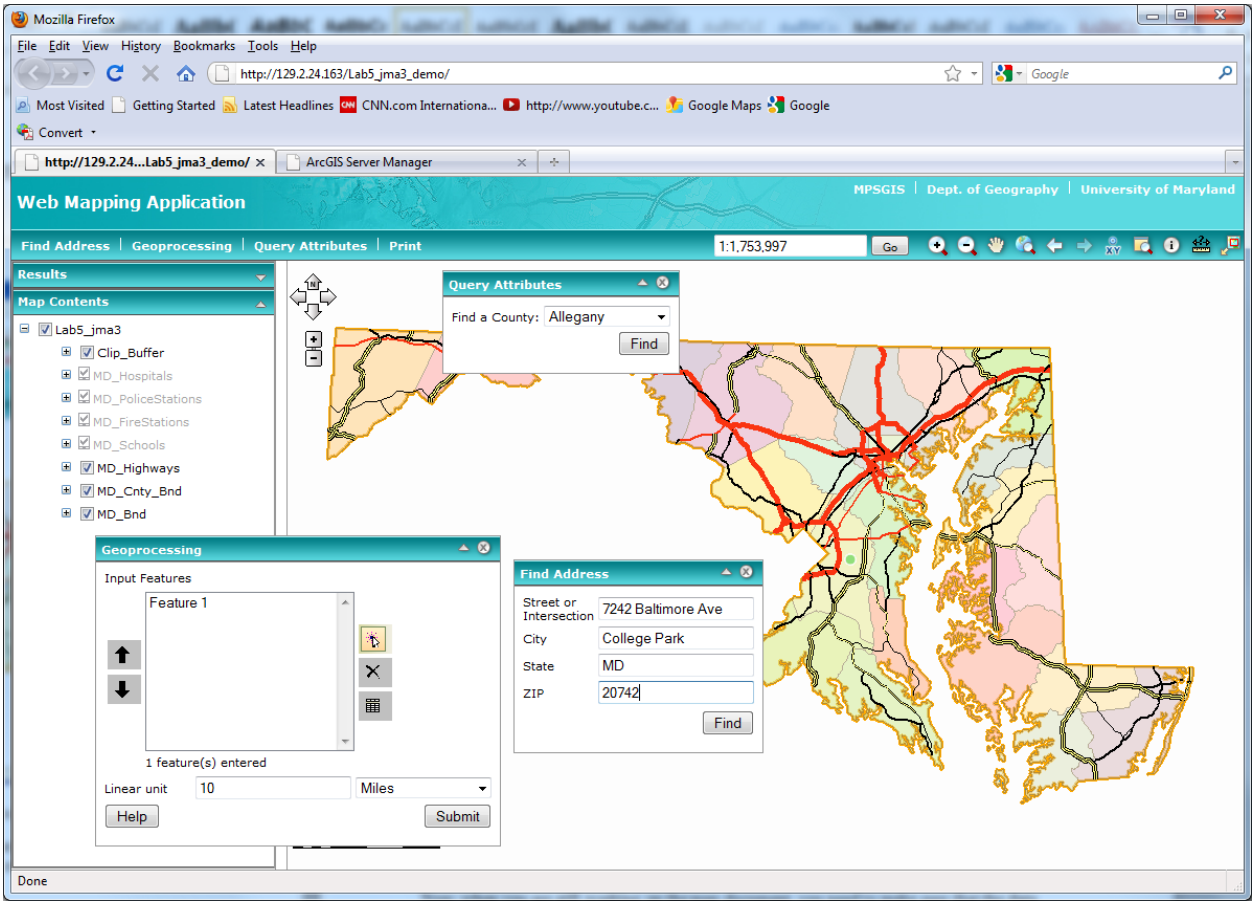

The geoprocesing tool enables the users to:

- Draw a point at any location on the map.
- Buffer the point by any specified distance (the default is 10-mile radius).
- Clip the Maryland Hospitals data layer using the buffer.
- Display the results, i.e. those hospitals that are located within a specified distance from the point that you draw.

The gecoding tool allows the users to:

- Enter any address that is within USA.
- An icon (a pin) is created and placed on the map as the result.

It can be particularly useful if you use these tools together. For example, suppose you have identified the location of your home on the map first by using the geocoding tool. Then, you can draw a point on the top of the geocoding result. With the geoprocessing tool, now you will be able to find out all those hospitals located within a certain distance from your home.




When the geoprocesing tool is activated, to draw a point, you need to click on the interactive pointer tool -  first and then click anywhere on the map. You may want to change the buffer distance and/or unit. You can also draw multiple points first before creating the buffers all at once.

This model is rather simple. Of course, you can always create much more sophisticated models to address your project needs.

The geocoding sometime may not return a result to certain address. This can be caused by a variety of reasons:

- The spelling of an address is not correct.
- The address is rather new and the reference data has not been updated to keep up.
- Not enough information provided.
    - Ideally, you should fill all information (street, city, state, and zip code).

# Part II: Author a Map Document

**Note:**

- It is important that you follow the procedures below carefully. Otherwise, after you transfer your files/folders to the server, it will take more time to fix the file path of both the map document and the geoprocessing model. When you start to work on the final project and transfer files on your own, you will realize this is a good practice.

**Steps:**

- On the C: drive of your computer, you need to create a folder like this – "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Lab5_userID\" (replace userID with your own).
- Unzip and save the data in this folder – "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\". Notice that this folder is one level up. A new subfolder – "Lab5_data" should be automatically created during the unzip process. So, eventually the data should be listed in this folder – "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Lab5_data\". I have already created a similar folder on the server where the lab data is saved. So, all of you can share the same dataset without duplicating it on the server.
- You must save the map document in the folder - "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Lab5_userID" (replace userID with your own).
- Create a new subfolder – "Temp". So, the path should be: "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Lab5_userID\Temp". This is the folder where the temporary files from geoprocessing will be saved later on.
- Unzip and save the geoprocessing file downloaded from Bb so that the path should be: "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Lab5_userID\Geoprocessing\Geoprocessing_Model.tbx".

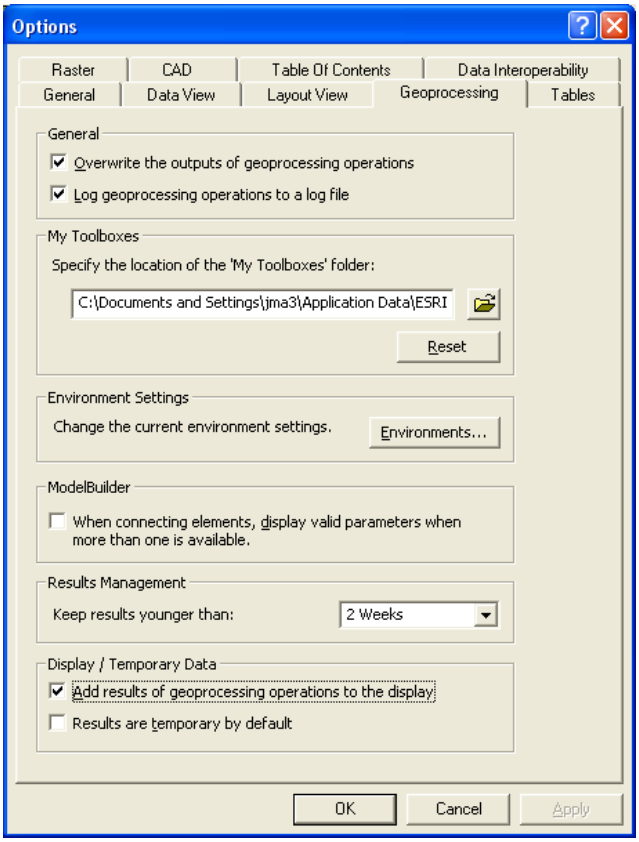
Now, when you are still working on the map document, you need to make sure that the data sources are defined by relative path.

Click File and then choose Document Properties. Then click on the button – Data Source Options…

Check the small box in front of "Store relative path names to data sources". I would also recommend you to make it the default practice.

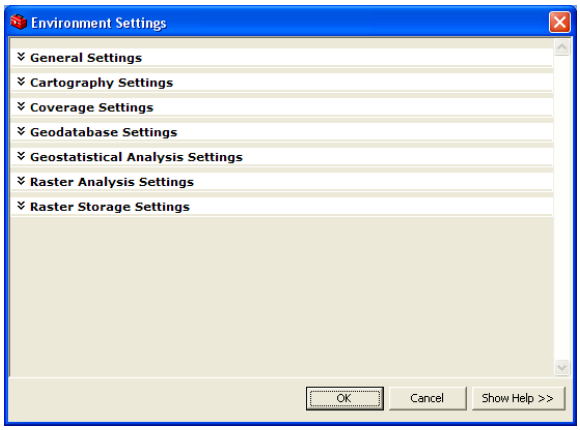
You can be creative when designing the map and I don't have any specific requirements.

While the map document is opened in ArcMap, click on Tools > Options…




Click on Geoprocessing tab. Make sure you check the small boxes under "General". Also make sure to check the small box in front of "Add results of geoprocessing operations to the display".

Now, click on Environments on the same dialog window above.




Then click on General Settings.

To better organize temporary files from geoprocessing, make sure to set the Scratch Workspace as "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Temp".

# Part III: Test and Run a Geoprocessing Model

While the map document is opened in ArcMap, launch ArcToolbox.

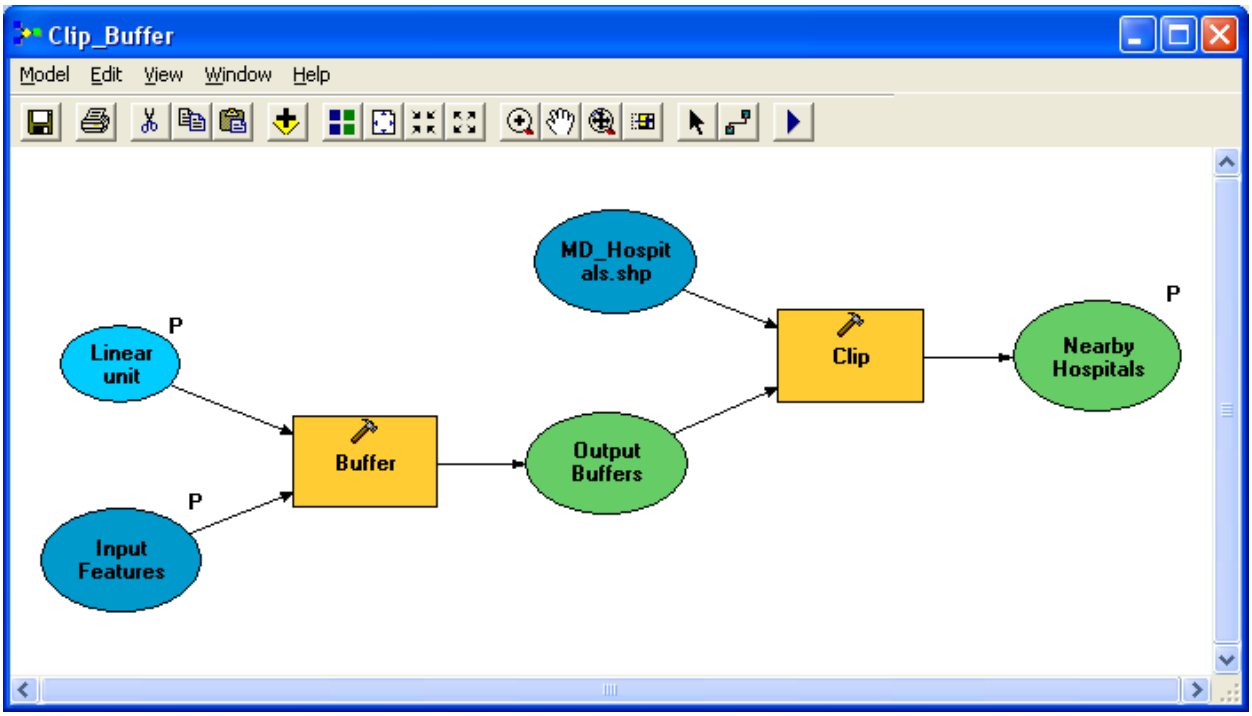
In ArcToolbox, right-click anywhere in the white space and choose Add Toolbox.

Navigate to the folder where you saved the model - "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Geoprocessing\Geoprocessing_Model.tbx". Select the model file and add.

In ArcToolbox, expand the newly added toolbox.

**Note:** This model is provided to you so that you can directly use. It is possible that you can create your own model and publish it on the Web. However, it will be very difficult for me to track or manage those. And I will not be able to help you on the model. So, I would recommend you to use the model I provided in this lab assignment. You can be exercise more freedom when working on the final project.

Right-click on the model and choose Edit.

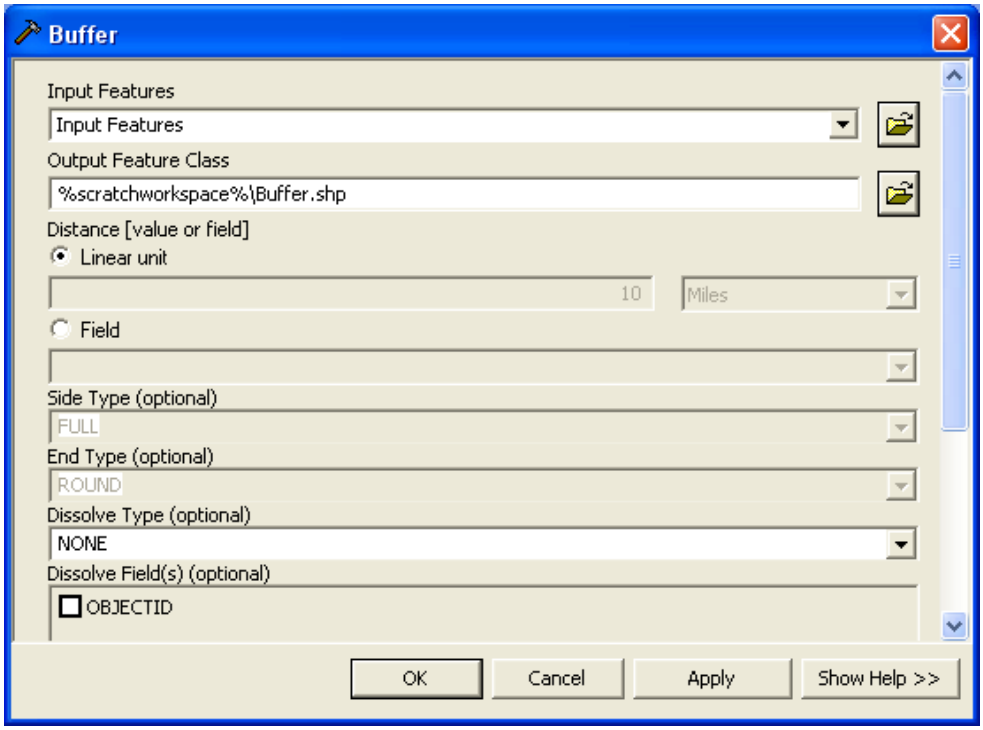



This model enables the users to:

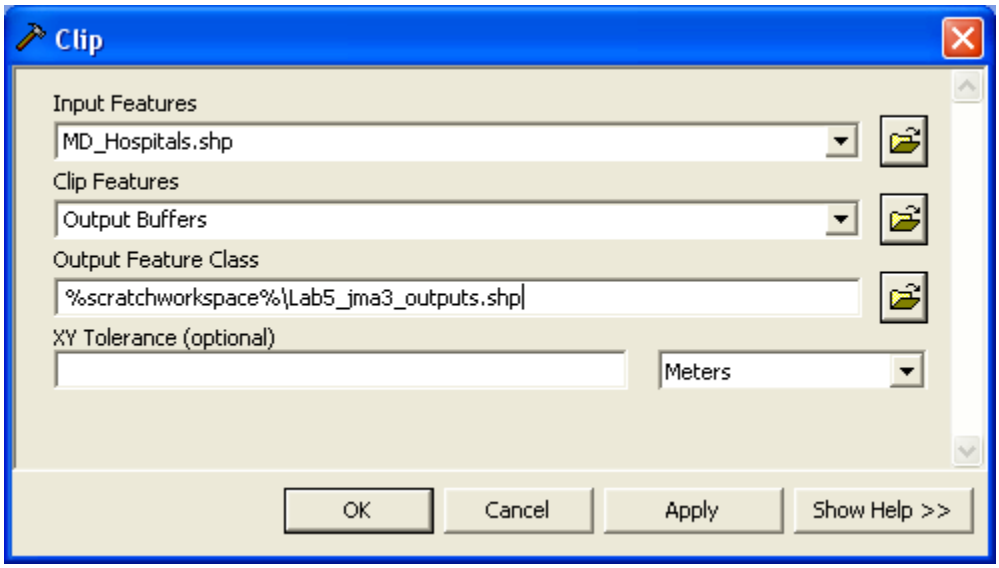
- Draw a point at any location on the map.
- Buffer the point by any specified distance (the default is 10-mile radius).
- Clip the Maryland Hospitals data layer using the buffer.

- Display the results, i.e. those hospitals that are located within a specified distance from the point that you draw.

Double-click on the Buffer tool. Make sure the Output Feature Class folder is set as "%scratchworkspace%\Buffer.shp". Here "%scratchworkspace%\" refers to the temporary working folder - "C:\WorkSpace\Geog677\Winter2012\Labs\Lab5\Temp".




Double-click on the Clip tool and make sure the settings are the same as shown below.

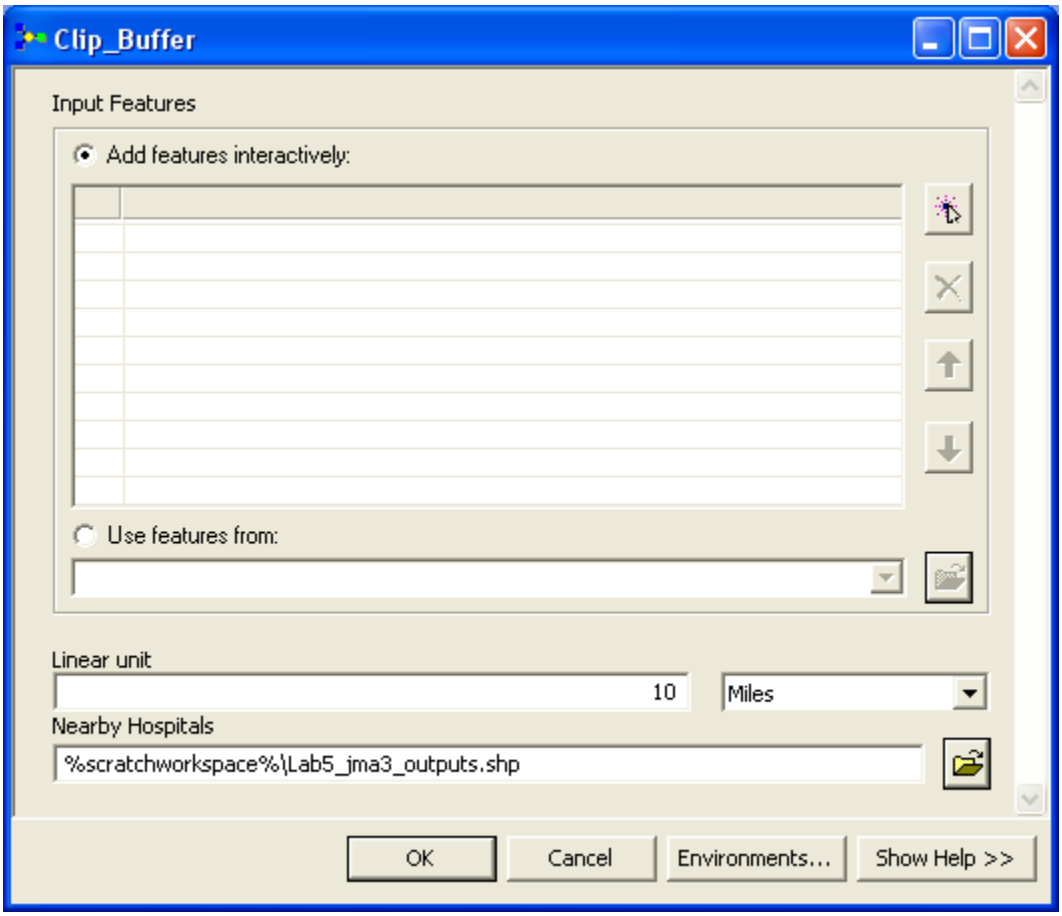



Now, click OK and save the model.

Now, the model is ready to run for a test.

**Important:** To use your model as a tool layer, you must run it at least once.

In ArcToolbox, double-click the model.

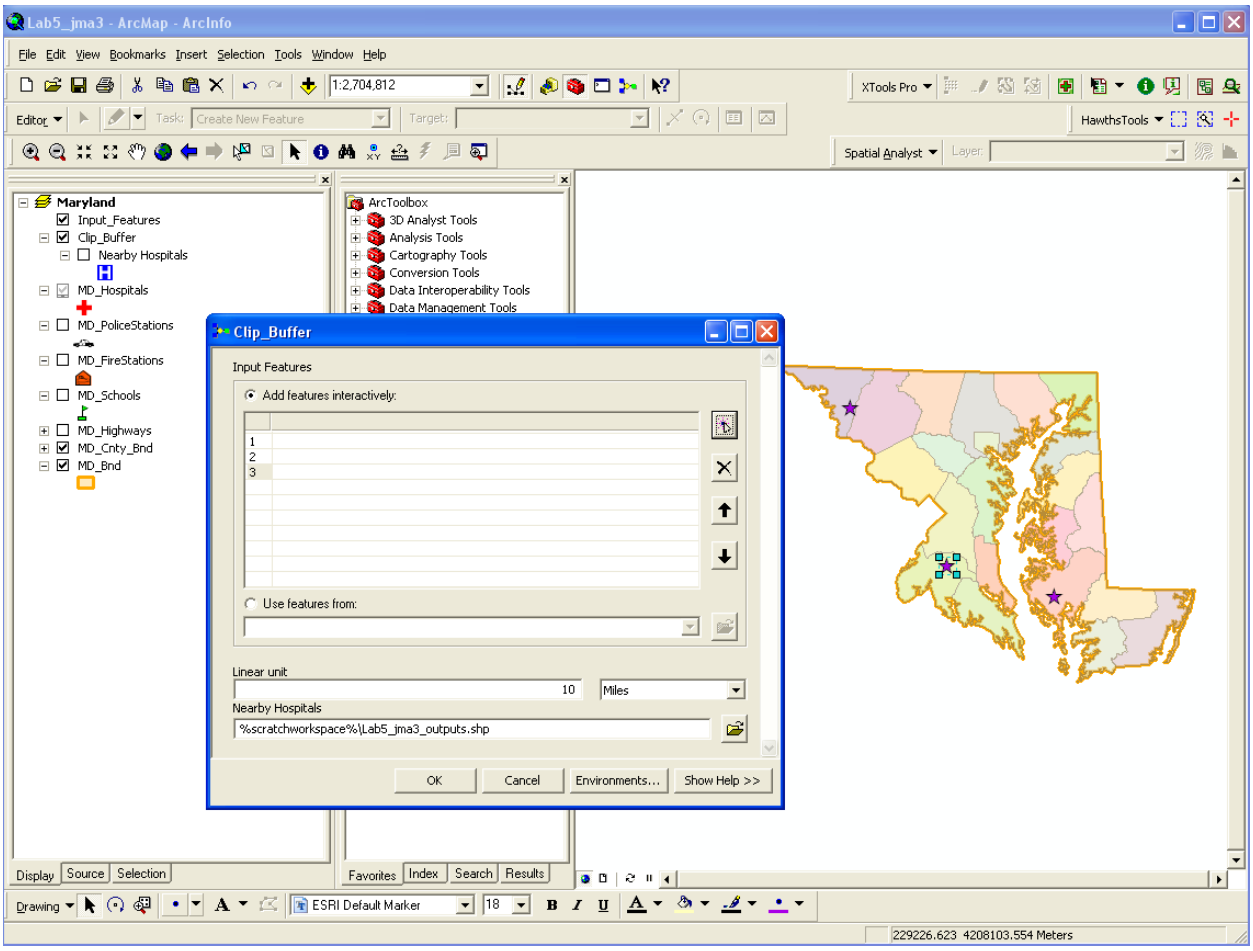



The dialog box allows you to specify the inputs, output, buffer distance and unit.

Use the Add Feature tool -  to place once or a few input points on the map.

**Note:**

- You need to click the Add Feature tool once every time after you draw a point.
- You can change the default buffer distance and/or unit.



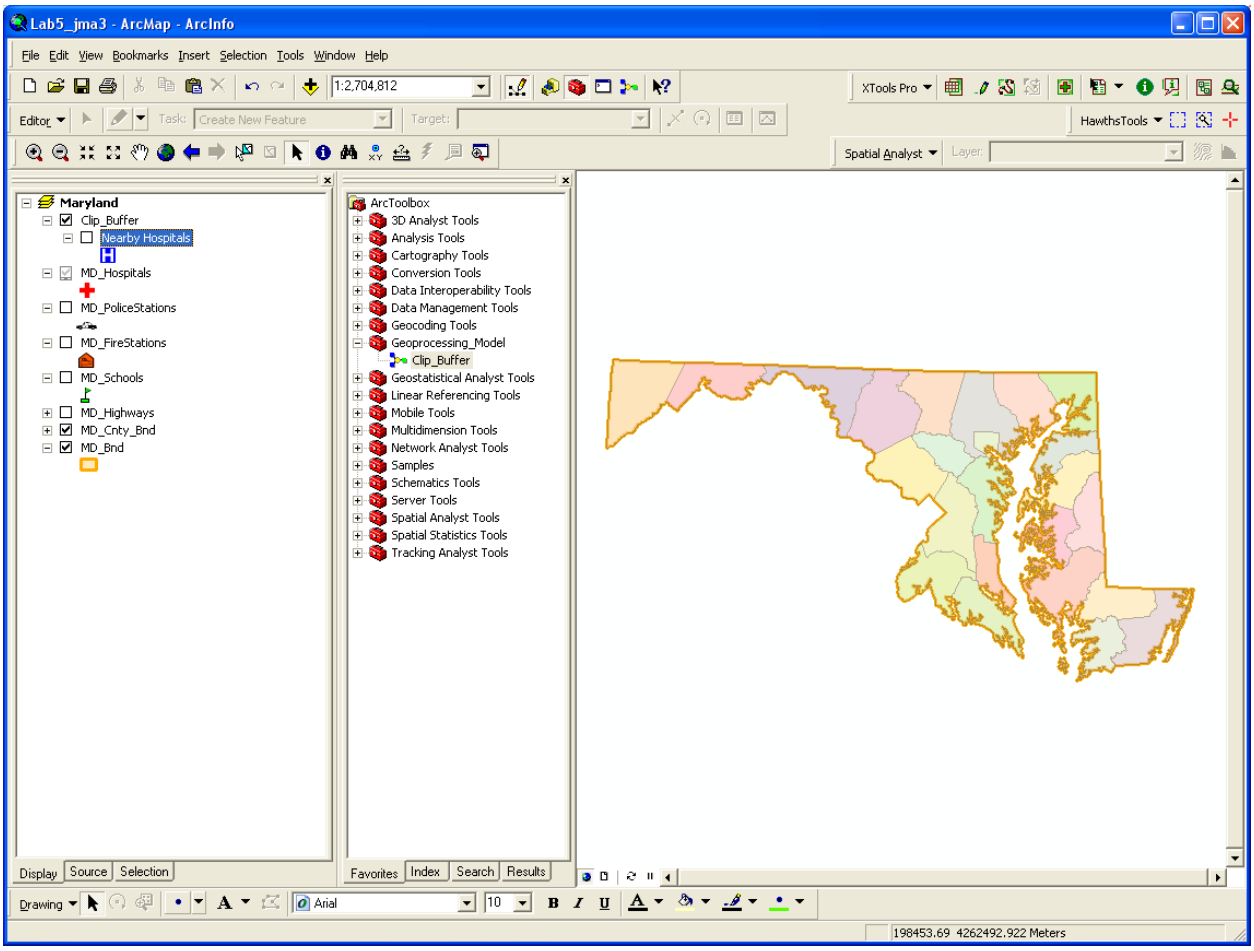

Click OK to run the tool. The clipped hospitals should appear on the map.

You've now completed the requirement to run the model once. Now you can remove this layer. In fact, you must remove this layer before publishing the map document. Otherwise, the users will always see this geoprocessing result on the Web mapping application.

Now, you need to add the model to the map document as a tool layer.

Drag the model from ArcToolbox and drop it into the table of contents with the rest of the layers. You need to put it on the top.

Having a tool layer in your map is the key to getting a geoprocessing service that will work with your map service.




**Note:**

- Make sure that you turn off visibility for the Nearby Hospitals layer. See the screen shot above.
- Don't remove it. Otherwise, the geoprocessing service will not display the results.

Now, save the map document and close it.

# Part IV: Publish Map and Geoprocessing Services

Now that the map document is created, you can publish it as map and geoprocessing services by using ArcGIS Server Manager.

Login from this link: http://129.2.24.163/ArcGIS/Manager

Publish GIS Resource.

Navigate and find your own map document which I should have uploaded to there for you.

**Note:**

- By publishing a map document that has enabled geoprocessing capability; you will create two services during this process: a map service and a geoprocessing service.

Make sure that the name of service is "Lab5_userID" (replace userID with your own). This should be the default and you don't need to do anything.

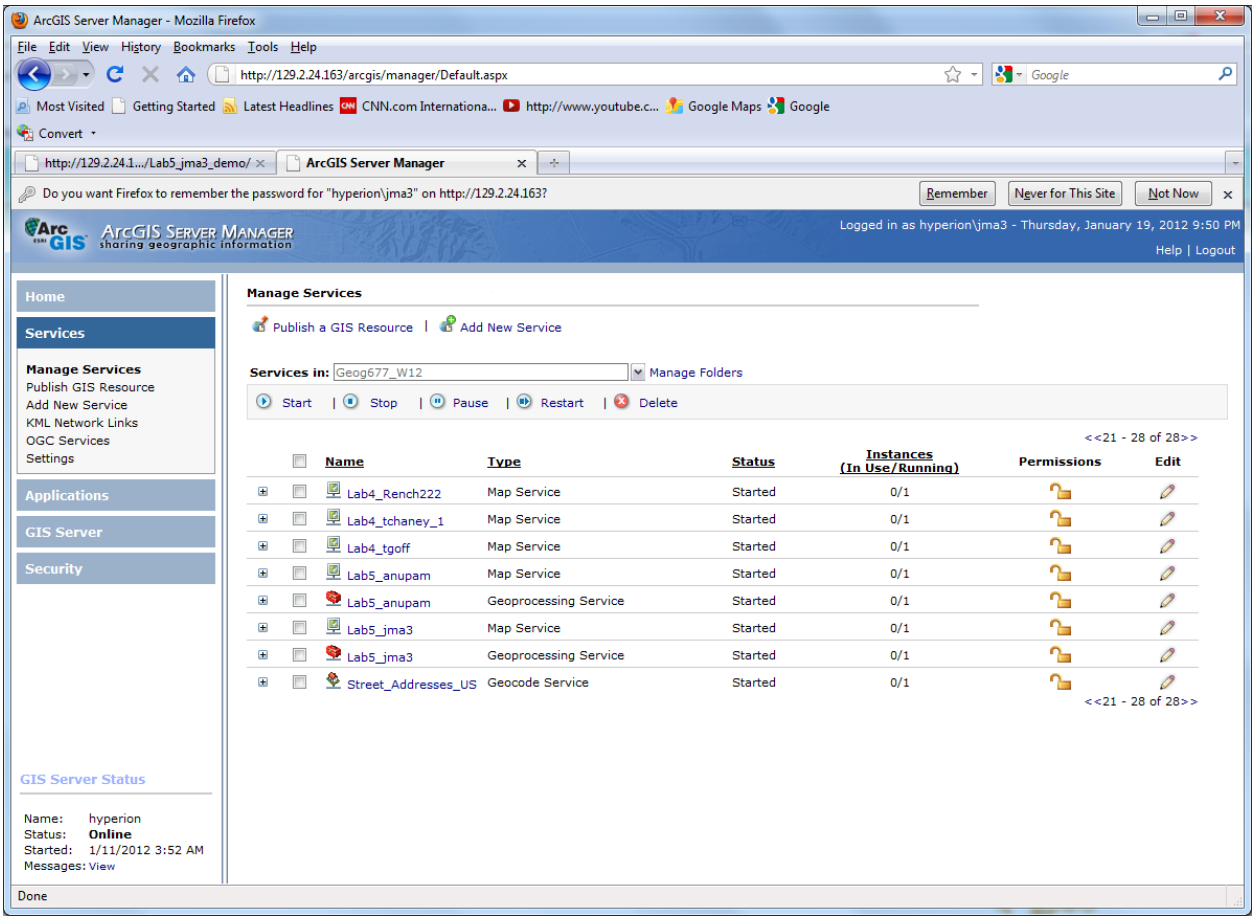
Click Next. In the list of capabilities, make sure the box for Geoprocessing is checked.

**Note:**

- If the Geoprocessing capability is disabled, that means ArcGIS does not recognize the map as having a valid tool layer. Very often, it caused by the fact that the tool has to be run at least once and that the tool layer is in the table of contents before the map document is saved.

Click Next and then Finish.

Now, you should see there are two newly created services that have the same name. However, one is a map service and the other is a geoprocessing service.




## Part V: Create an Address Locator and Publish a Geocoding Service

**Note:** You don't need to do anything for this part except to read and understand the procedures.

Because the reference data (USA_StreetMap) that we are going to use for geocoding is very large in file size (>5GB), it is impossible to post the data on Blackboard for you to download. Meanwhile, there is also license issue. So, I have saved the data on the server. However, I still would like to provide the description on how to create an address locator and then publish a geocoding service. This is for your reference in case you need to do it by yourself at work.

Before publishing a geocoding service, you need to create an address locator.

The address locator is the main tool for geocoding in ArcGIS and contains all the data necessary to perform address matching. The locator should reside in a shared network directory so that all server object container (SOC) machines can access it. Additionally, the SOC account must have appropriate permissions to access the directory where the locator is stored.

**Note**:

- In this case, the address locator has already created. It is saved in the folder – "C:\WorkSpace\Geog677\Data\USA_StreetMap\data\".

Now that you have an address locator, you can publish it as GIS service for use in the Web mapping application.

You can use either ArcCatalog or ArcGIS Server Manager to publish.

Below is a screen shot when using ArcCatalog to publish an address locator as a geocoding service. I used ArcCatalog on the server.

Right-click the address locator (in this case, it is "Street_Addresses_US" that is provided in the USA STreetMap dataset).

Choose Publish to ArcGIS Server.

Follow the instructions in the wizard. Leave the settings as default.

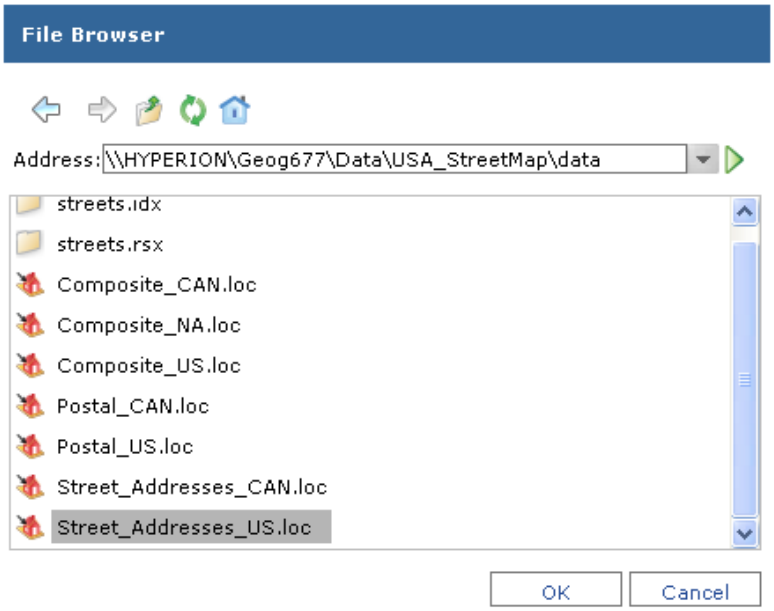
On the last panel, click Finish.

Now, in the catalog, you should be able to see the newly created gecoding service based on the address locator.

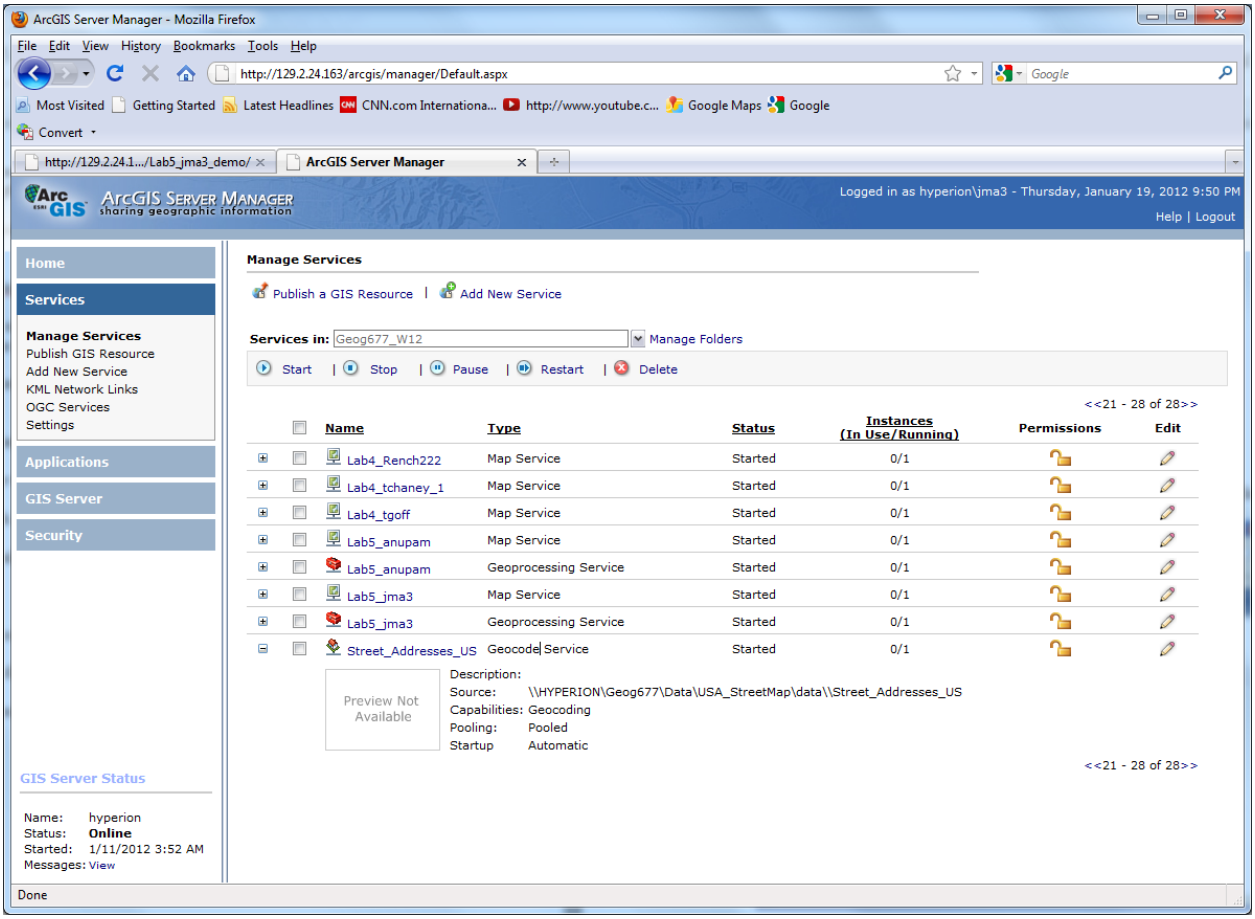
You can also create this geocoding service with ArcGIS Server Manager.

In ArcGIS Server Manager, click on Publish a GIS Resource.

Navigate Resource to Address Locator file as shown in the screen shot below.




Click OK and then Finish. You will see the newly created geocoding service in the list.



## Part VI: Create a Web Mapping Application and Configure Functionality

So far, there are three services created: a map service, a geoprocessing service, and a geocoding service. All of them are running on the GIS server. Now all you need to do is to create a web mapping application and configure the functionality.

Log in to the ArcGIS Server Manager.

Using the skills you learned in Lab4, you can start to create a web application.

Assuming you have gone through the first few steps, now it's time to add tasks.

Click on the Add Task link.

In the Available Tasks list, select Find Address and click OK.

Repeat to add Query Attributes and Geoprocessing.

Now, you should have added three tasks.

Some tasks (such as geoprocessing and geocoding) require supporting GIS service in order to function.

First, highlight Geoprocessing.

Then click Supporting Services.

In the Selected Services dialog box, click Add.

Using the Internet connection to the server, in the Available services dialog box, navigate to the folder where your geoprocessing service is saved.

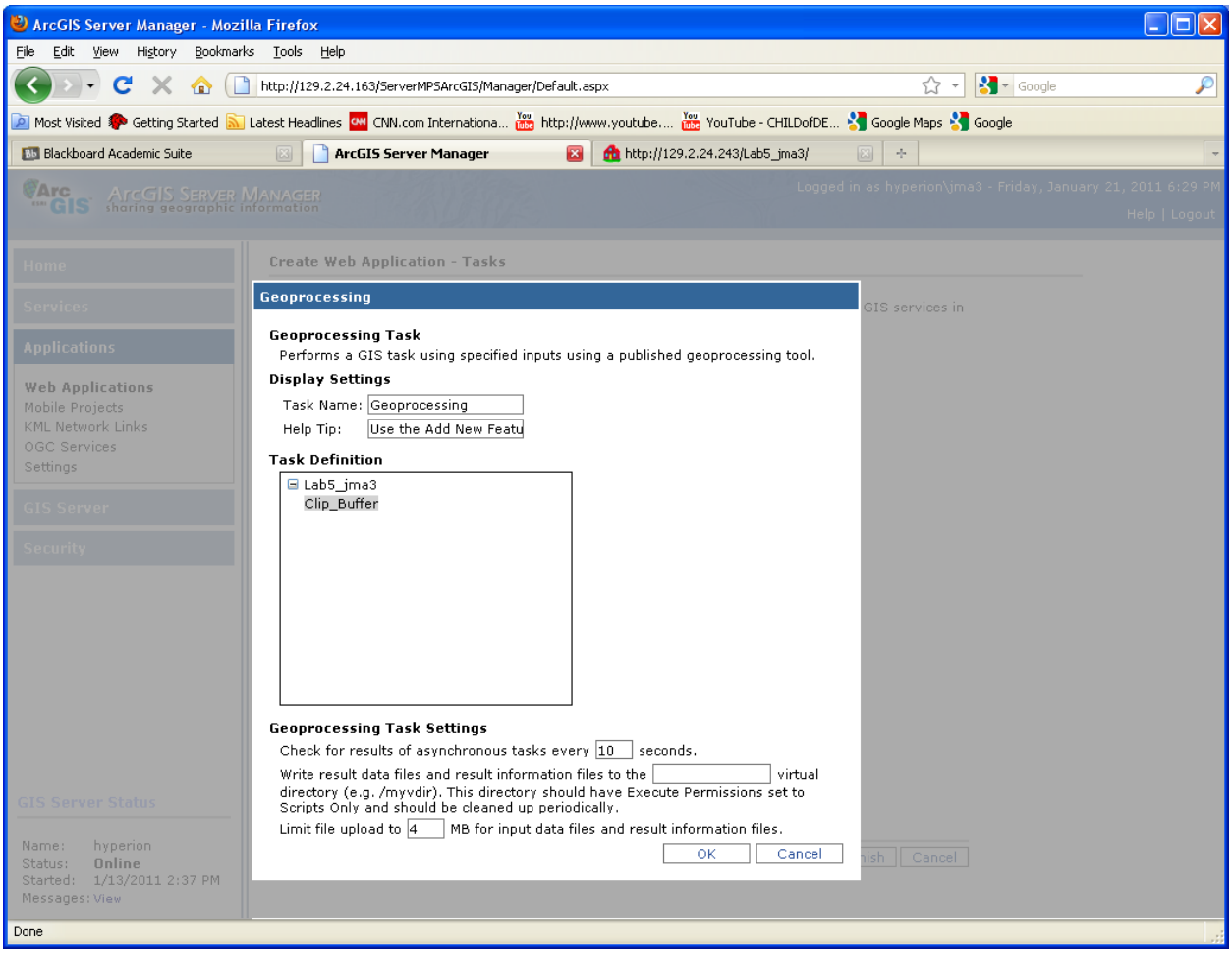
Select the geoprocessing service (Lab5_userID) and then click Add.

Click OK.

Now that you have identified the supporting service for the Geoprocessing task, you need to define the geoprocessing functionality.

Still highlighting Geoprocessing, you will click Configure.

On the Configuration dialog box, you can specify the geoprocessing functionality the task will provide, the name and help tip that will display for the task, and how results will be handled.




Name the task "Geoporcessing" or anything you prefer.

You might want to type some text to provide tips on how to use this tool.

Review the settings in the Geoprocessing Task Settings area.

Notice that you can specify how often the application will check to see if an asynchronous task is complete. The default is 10 seconds.

**Note:**

- An asynchronous geoprocessing tsk runs on the server while the user is free to continue working. The Web mapping application checks the server periodically to determine whether processing is complete.

You can also specify the location for any data or files generated when the task is run, as well as set a size limit on the data that can be uploaded to the server.
Leave the settings as default. Click OK.

Now, let's work on the geocoding task. The procedures are very similar.

Highlight Find Address in the list.

Then click Supporting Services.

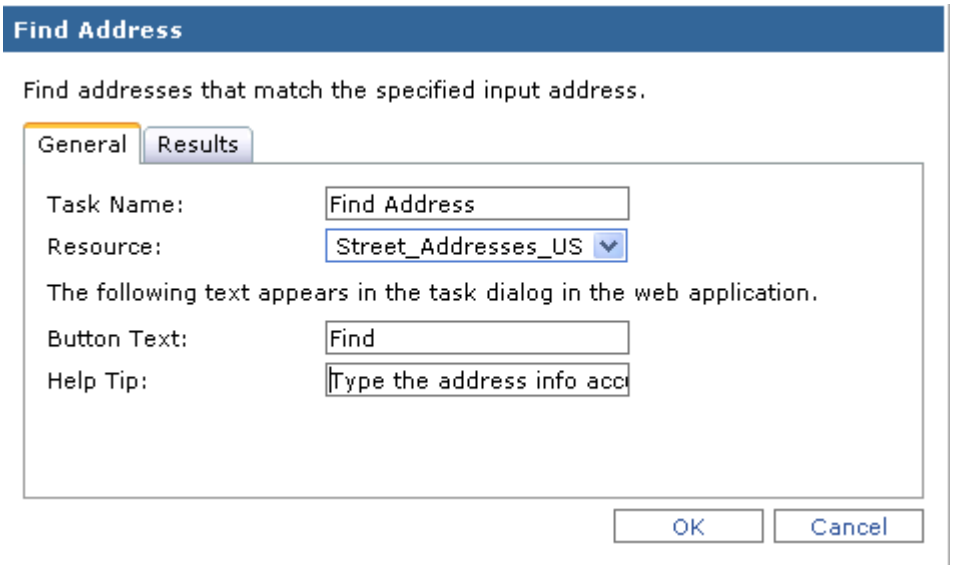
In the Selected Services dialog box, click Add.

Using the Internet connection to the server, in the Available services dialog box, navigate to the folder where your geocoding service is saved.

Select the geocoding service (Street_Addresses_US) and then click Add.

Now, you need to configure Find Address task.

Still highlighting Find Address, you will click on Configure.

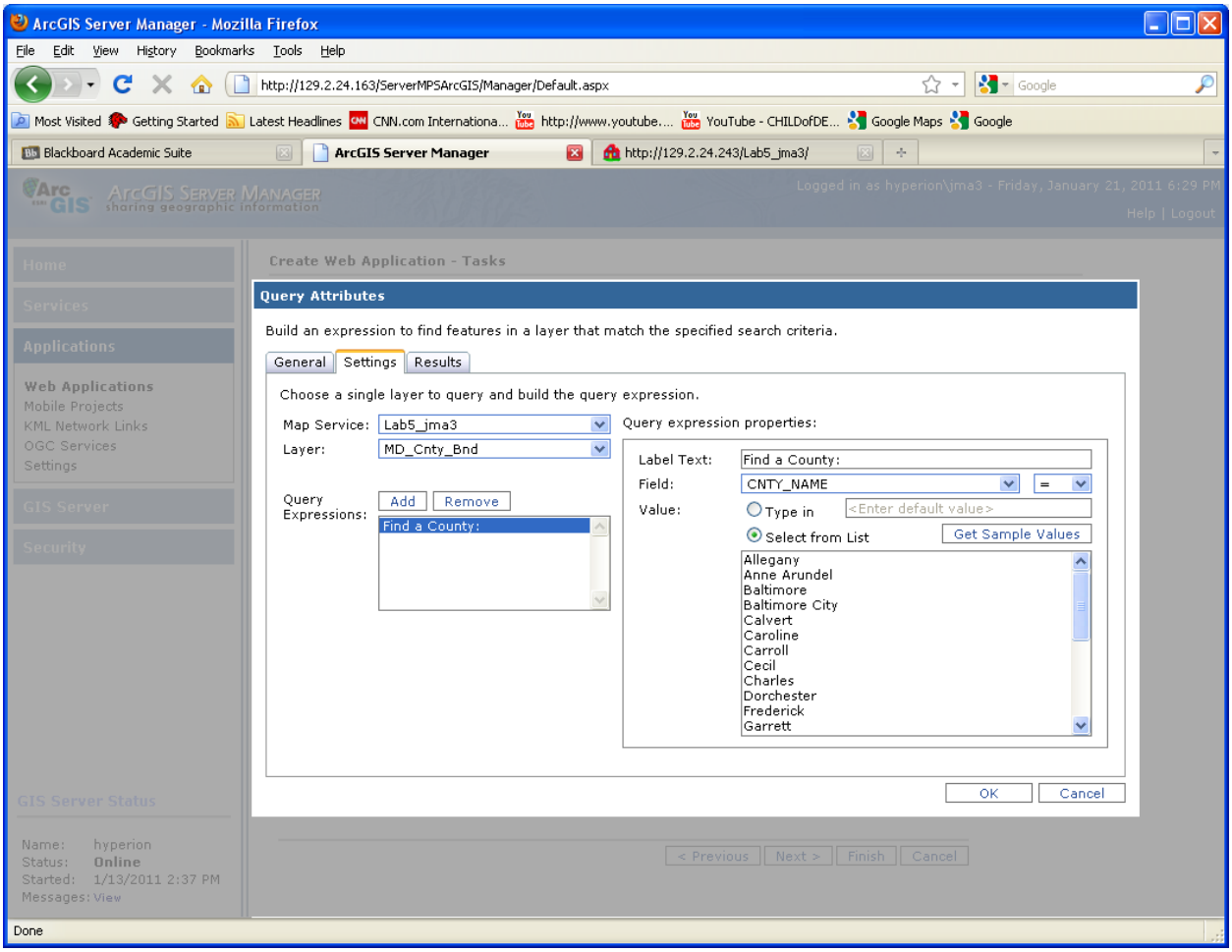



Rename the Task Name as "Find Address".
Leave all other settings as default. Click OK.
Now, it's time to Configure Query Attributes ask.

Highlight Query Attributes in the list.

Then click on Configure.

In the Query Attributes dialog box, you need to define which layer to query on. You also need to create a query expression by selecting a field and value. You can allow users to type in a value to query. Or, you can provide the users with a list of pre-defined values to choose from when querying. Lastly, you need to create a label for the query tool.




You can be creative when defining this query in terms of the layer and field. The screen shot above is just an example to demonstrate how you can do it.

Click OK. You are done with configuring the task – Query Attributes.

Now that you have configured all three tasks, you can move on and finish the rest procedures of creating the Web mapping application. You will use the skills that you practiced in Lab4.

The URL of this new web application is: http://129.2.24.163/Lab5_jma3_demo/

Your application should be http://129.2.24.163/Lab5_userID (replace the userID with your own.)

Now, you can test the web site and the functionality, especially geoprocessing and geocoding.

When the server finishes processing the task, results and messages generated by the task will appear in the window.

For the geoprocessing, because the task is executing asynchronously, the user can continue to interact with the map while the task is running.

**Specifically, your tasks and the requirements are:**

- Go through this document and follow the procedures to finish all tasks that are specified in pages above.
    - You need to pay attention to the details. Otherwise, it will be easy to get various errors.

- Once you finish creating the web application, you need to create a Word document in which you should write down the URLs of the web page and then a few screen shots.
    - Your application should have similar appearance and functionality as the example: http://129.2.24.163/Lab5_jma3_demo/
    - The URLof your application should be like this: http://129.2.24.163/Lab5_userID (replace the userID with your own.)

**Again, as a reminder, you can be creative as long as your product meets the minimum requirements specified in this lab assignment.**

**----- THE END -----**