

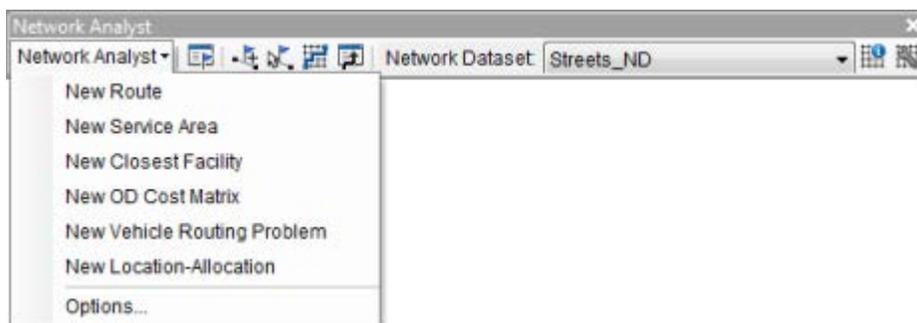
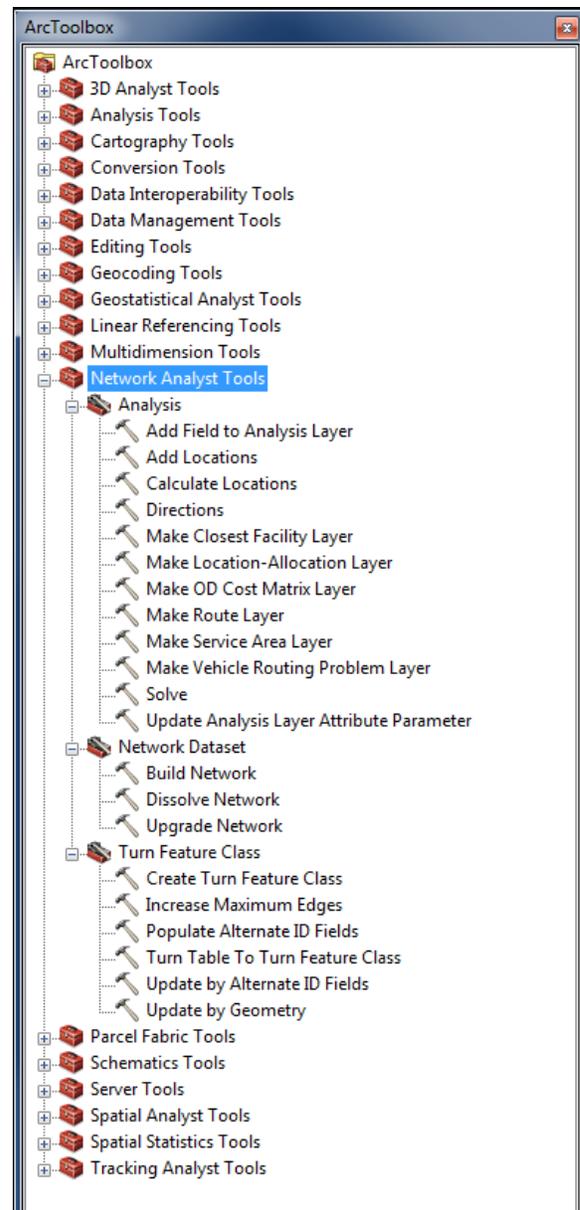
Cookbook 25 November 2013 *Network Analyst (Part 2)*

Overview

1. Resources!
2. Service Area Analysis
3. OD Cost Matrix
4. Closest Facility Analysis
5. Location-Allocation Analysis
6. Point Distance Tool
7. The Intersect Tool

You can run the Network Analyst Tools in a variety of ways:

- Using the Network Analyst toolbar.
- Using each tool individually from the Network Analyst toolbox.
- Chain several tools together in Model Builder.



1) Resources!

Sometimes you need to create your own network data set from existing street data – here’s how:

Part 1

<http://www.aubreyrhea.net/gis/index.php/2010/05/preparing-street-data-to-become-a-network-dataset/>

Part 2

<http://www.aubreyrhea.net/gis/index.php/2010/06/creating-a-network-dataset/>

Part 3

<http://www.aubreyrhea.net/gis/index.php/tag/service-area/>

ArcGIS Network Analyst data prep tutorial

http://faculty.unlv.edu/jensen/CEE_468/modules/NetworkAnalyst/pdf/ArcGISNetworkAnalystDataPrepTutorial.pdf

Network Analysis Workflow – Service Areas

<http://ocw.tufts.edu/data/54/639535.pdf>

Esri Video: ArcGIS Network Analyst—Creating Network Datasets

<http://video.esri.com/watch/1834/arcgis-network-analystcreating-network-datasets>

Introduction to ArcGIS Network Analyst

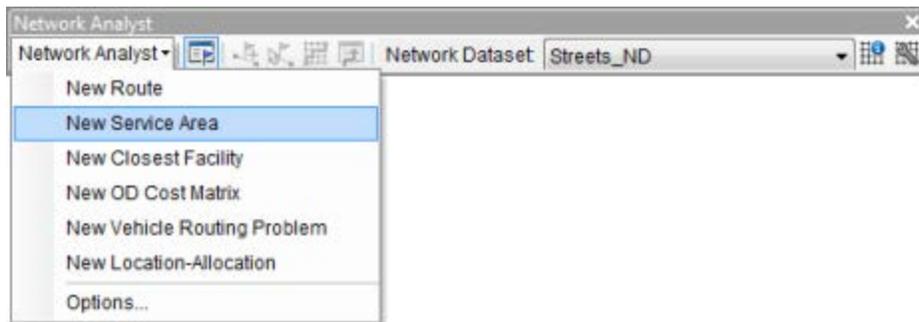
http://youtu.be/dPXAhB_BJDI

Creating Service Areas with ArcGIS Network Analyst

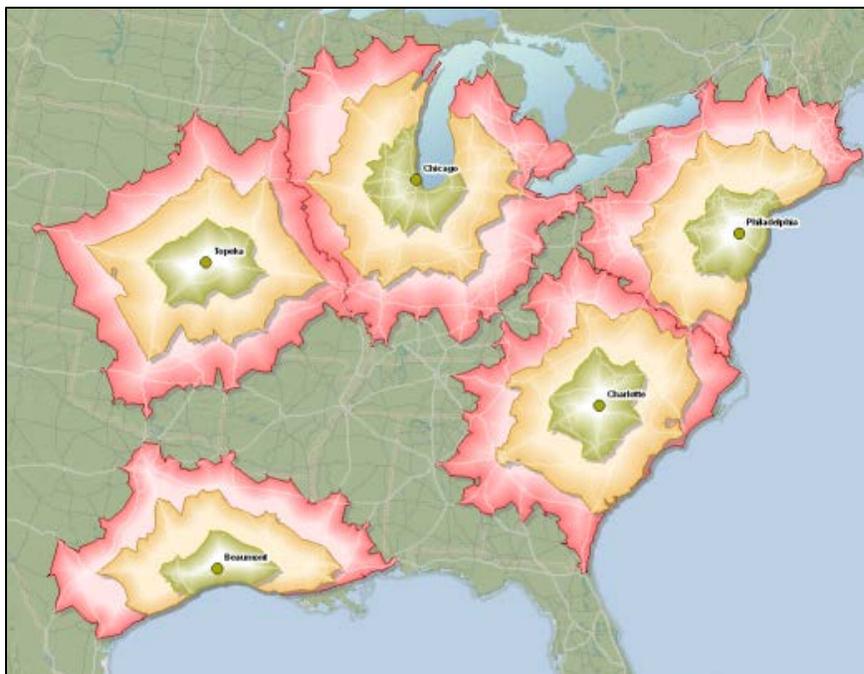
<http://youtu.be/10yAQNiDzNU>

2) Service Area Analysis

This analysis determines the region that encompasses all accessible streets (streets that lie within a specified impedance). For example, the 20-minute service area for a network location (such as a fire station) includes all the streets that can be reached within 20 minutes from that location.



Concentric service areas show how accessibility varies with impedance. Once service area polygons are created, you can use them to identify how many people, how much land, or quantities of anything else within the neighborhood or region.

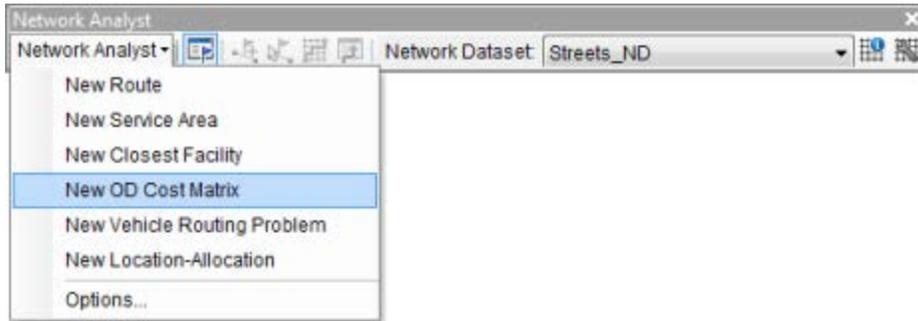


Service Area Analysis

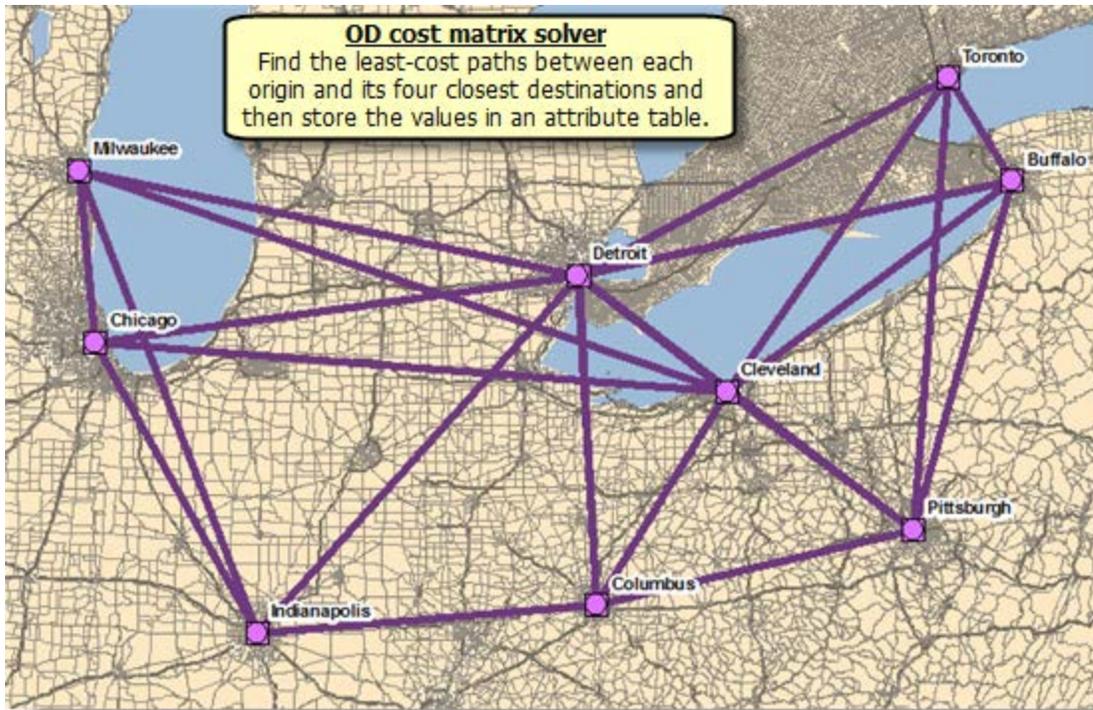
http://resources.arcgis.com/en/help/main/10.1/index.html#/Service_area_analysis/004700000048000000/

3) OD Cost Matrix

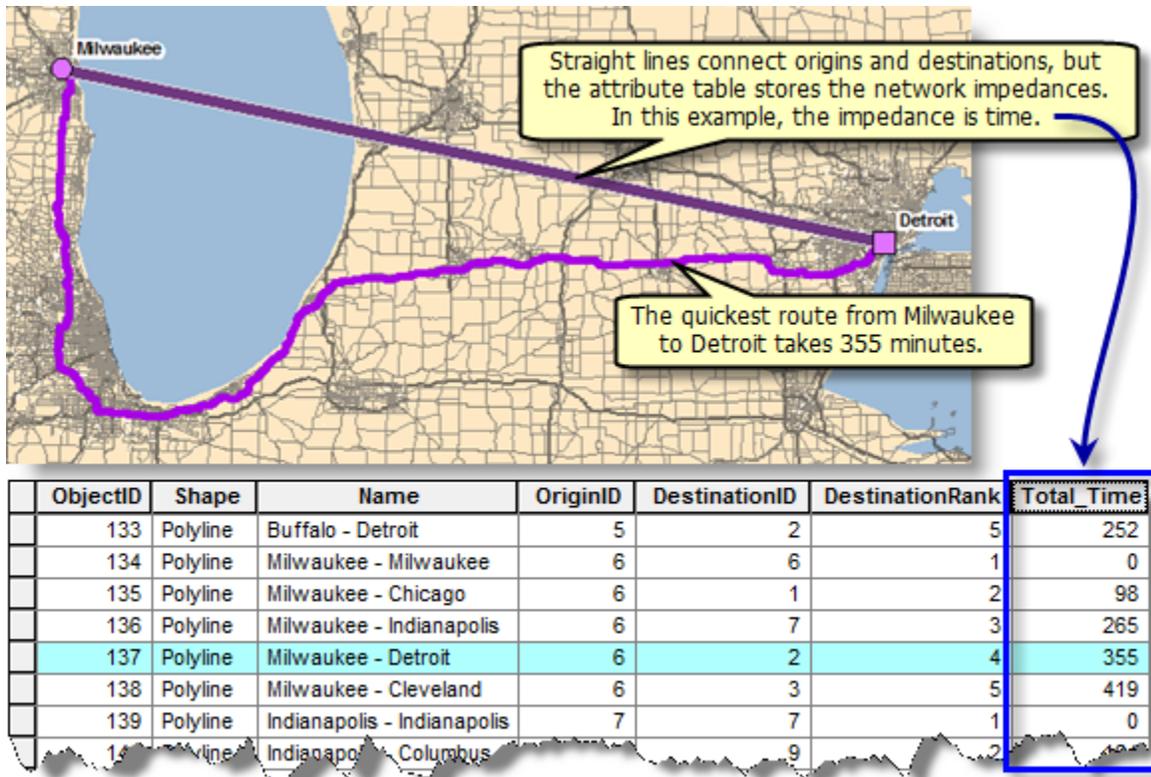
The OD cost matrix finds and measures the least-cost paths along the network from multiple origins to multiple destinations. When configuring an OD cost matrix analysis, you can specify the number of destinations to find and a maximum distance to search.



In the graphic below, the OD cost matrix found the least-cost paths from each origin to the four nearest destinations. The output shape type was set to produce straight lines.



Even though the OD cost matrix solver doesn't output lines that follow the network, the values stored in the Lines attribute table reflect the network distance, not the straight-line distance.



The closest facility and OD cost matrix solvers perform very similar analyses; the main difference, however, is in the output and the computation speed. OD cost matrix generates results more quickly but cannot return the true shapes of routes or their driving directions. It is designed to quickly solve large $M \times N$ problems and, as a result, does not internally contain the information required to generate route shapes and driving directions. Alternatively, the closest facility solver returns routes and directions but performs the analysis more slowly than the OD cost matrix solver. If you need driving directions or true shapes of routes, use the closest facility solver; otherwise, use the OD cost matrix solver to reduce the computation time.

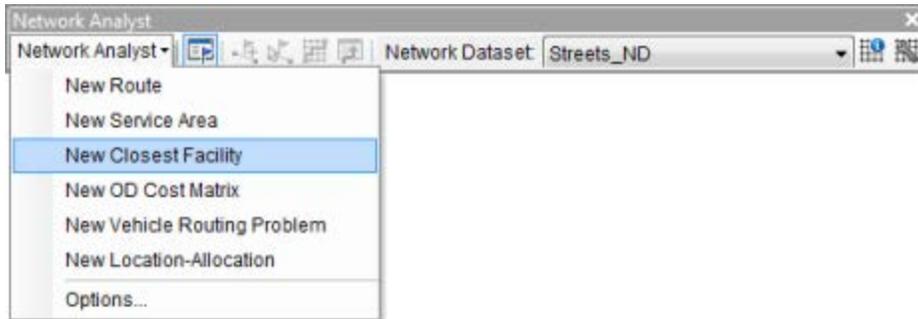
Consider using the Point Distance geoprocessing tool instead if finding the straight-line distances better fits your needs.

OD Cost Matrix

http://resources.arcgis.com/en/help/main/10.1/index.html#/OD_cost_matrix_analysis/004700000004r000000/

4) Closest Facility Analysis

The closest facility solver measures the cost of traveling between incidents and facilities and determines which are nearest to one other. When finding closest facilities, you can specify how many to find and whether the direction of travel is toward or away from them. The closest facility solver displays the best routes between incidents and facilities, reports their travel costs, and returns driving directions.



When finding the closest facility, you can specify constraints, like a cutoff cost beyond which ArcGIS Network Analyst will not search for facilities. For instance, you can set up a closest facility problem to search for hospitals within a 15-minute drive of the site of an accident. Any hospitals that take longer than 15 minutes to reach are not included in the results. In this example, the hospitals are facilities, and the accident is the incident. ArcGIS Network Analyst allows performing multiple closest facility analyses simultaneously. This means you can have multiple incidents and find the closest facility (or facilities) for each incident



Closest Facility Analysis

http://resources.arcgis.com/en/help/main/10.1/index.html#/Closest_facility_analysis/0047000004n000000/

5) Location-Allocation Analysis

Location is often considered the most important factor leading to the success of a private- or public-sector organization. Given facilities that provide goods and services and a set of demand points that consume them, the goal of location-allocation is to locate the facilities in a way that supplies the demand points most efficiently. As the name suggests, location-allocation is a twofold problem that simultaneously locates facilities and allocates demand points to the facilities.



Example: Locating a manufacturing plant

Many retail outlets receive their goods from manufacturing plants. Whether producing automobiles, appliances, or packaged food, a manufacturing plant can spend a large percentage of its budget on transportation. Location-allocation can answer the following question: Where should the manufacturing plant be located to minimize overall transportation costs?

Location-Allocation Analysis

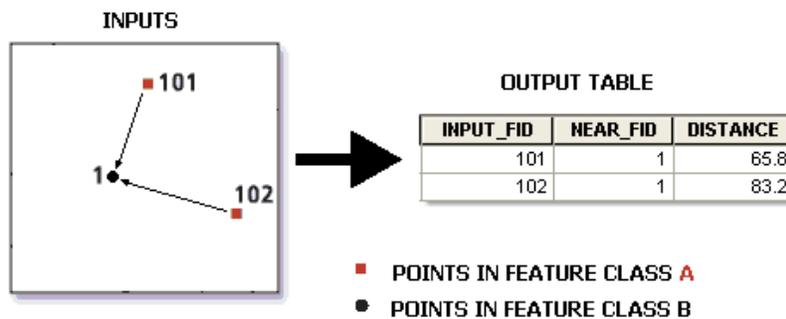
http://resources.arcgis.com/en/help/main/10.1/index.html#/Location_allocation_analysis/0047000005000000/

6) Point Distance Tool

Point Distance calculates the distance from each point in one feature class to all the points within a given search radius in another feature class. This table can be used for statistical analyses, or it can be joined to one of the feature classes to show the distance to points in the other feature class.

You can use the Point Distance tool to look at proximity relationships between two sets of things. For example, you might compare the distances between one set of points representing several types of businesses (such as theaters, fast food restaurants, engineering firms, and hardware stores) and another set of points representing the locations of community problems (litter, broken windows, spray-paint graffiti), limiting the search to one mile to look for local relationships. You could join the resulting table to the business and problem attribute tables and calculate summary statistics for the distances between types of business and problems. You might find a stronger correlation for some pairs than for others and use your results to target the placement of public trash cans or police patrols.

You might also use Point Distance to find the distance and direction to all the water wells within a given distance of a test well where you identified a contaminant.



The tool creates a distance matrix between two sets of points if the default search radius is used in which case distances from all input features to all near features are calculated.

The output table can be quite large. For example, if both input and near features have 1000 points each then the output table can contain one million records. Use a meaningful search radius to limit the size of the output.

Proximity Analysis

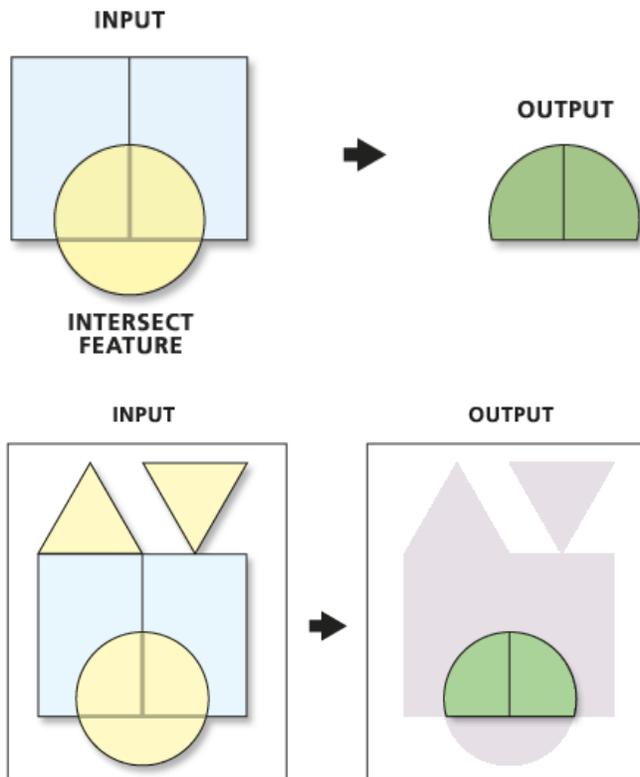
<http://resources.arcgis.com/en/help/main/10.1/index.html#//018p00000007000000>

Point Distance

<http://resources.arcgis.com/en/help/main/10.1/index.html#//00080000001r000000>

7) The Intersect Tool

This tool computes a geometric intersection of the input features. Features or portions of features which overlap in all layers and/or feature classes will be written to the output feature class.



Examples: Polygon inputs

Polygons can intersect in three ways:

- Overlap - Area of overlap can be produced by leaving the Output Type to its default value (LOWEST).
- Common boundary/touch at a line - This type of intersection can be produced by specifying LINE as the Output Type.
- Touch at a point - This type of intersection can be produced by specifying POINT as the Output Type.

Intersect (Analysis)

<http://resources.arcgis.com/en/help/main/10.1/index.html#//0008000000p000000>

How Intersect works

<http://resources.arcgis.com/en/help/main/10.1/index.html#//0008000000z000000>