

Network Analysis

Demo shows how ArcGIS Network Analyst is used to solve a location-allocation problem for a city's health care service. The goal is to limit patient's travel time to 6 minutes and determine the impact of the addition of new clinic locations. Also see how new ArcLogistics Online is used to create optimal routes for a fleet of vans, and how ArcLogistics Navigator provides drivers with in-vehicle route directions.

<http://video.esri.com/watch/41/network-analysis>

Video Transcription

00:01 Let's say you're a commercial organization, and you want to locate a new warehouse.

00:04 Where's the best place in the whole city to put the warehouse? Well it's going to be a combination of a number of factors...

00:10 ...but one of those important ones is...

00:12 ...what's the minimum travel time and distance and fuel costs between your warehouse and all your customers?

00:18 So that's a location-allocation problem to help the software figure out where's the best place.

00:24 There's other variations of this. For example, you're a local government, and you want to site a public library.

00:31 For a public library, it's not about the minimum travel time, but it's about equitable service for everyone.

00:37 Everyone on average should have an equal capability to go to the library.

00:41 So you want that average minimum distance but that's balanced across all of the public and all of the citizens.

00:48 There's a whole lot more that you can do with network analysis...

00:51 ...but let's take a look at some of these new capabilities and introduce someone from our software development team, Matt Crowder.

00:58 Thanks, John.

01:01 I'd like to show Network Analyst and how it can be used by public health to solve some challenging problems...

01:08 ...like site selection when finding the best placement for new health centers or logistics for determining home health care delivery.

01:19 So to start, I'd like to focus on Cleveland, Ohio.

01:23 Now, while they might have lost Lebron James, they certainly still have public health.

01:30 So here we have the 11 federally qualified health centers that I downloaded from the Health Resources and Services Administration...

01:40 ...and here in green are the patients that are potentially served by these health centers.

01:45 Now, how do we know how well these health centers are covering the potential demand of these patients?

01:52 And more importantly, what can we do to add or remove health centers to better cover this demand?

01:58 I'd like to show a new tool we added to Network Analyst called Location Allocation that helps solve this problem.

02:06 So here I have a location-allocation layer added to map with those same health centers and patients.

02:14 I've also specified that a patient's only willing to travel six minutes to get to the closest health center.

02:22 When I allocate those patients to the health centers, we see green lines showing which health center they'll travel to.

02:30 You can see down in the southwest, these yellow points representing areas where patients can't reach a health center in under six minutes.

02:40 Well it's actually a little more complicated than that too, because we know in Cleveland, there's typically bad snowstorms.

02:47 So I want to do is load an area where we're going to slow down the traffic by 50 percent, representing the bad weather conditions.

02:59 So now this is a problem. We have underserved areas in the southwest, and we have horrible weather in the northeast.

03:06 How can we make sure we have good health care accessibility to these areas? We need to add coverage.

03:13 So I'm going to start by adding some candidate facilities that we could use to place new health centers.

03:22 Once these are located in, I'm also going to tell Location Allocation to choose from all those different health centers...

03:31 ...and find the best amount to add to cover 97 percent of all the patients.

03:40 When the analysis is performed, we find out that we can add three new health centers...

03:46 ...two to the southwest and one up in the northeast...to cover 97 percent of these patients, which is great.

03:54 But we can do even better.

03:56 What if we didn't just augment the existing health centers by adding new ones, but we could start over from scratch.

04:03 And essentially say, okay, let's figure out where to place the best health centers to cover...

04:10 ...use the minimum set of health centers to cover the most people.

04:15 So in this case...

04:20 ...we find when the analysis is complete, that we can use eight health centers...

04:27 ...three in existing locations and five in new locations...to cover 100 percent of the population, which is great.

04:35 So you can see Location Allocation is great not only for siting health centers...

04:41 ...but it can really be used anytime you have a lot of demand and you need to figure out the best way to cover it.

04:48 Now I'm going to switch gears a little bit and talk about logistics.

04:52 So every day, home health care companies need to figure out which customers to travel to and the best way to get there.

05:00 This is a perfect opportunity to use logistics.

05:04 Now a lot of people in the past have seen ArcLogistics on desktop, but what I want to show today is something brand new.

05:11 It's the same analytics that have saved companies tons of money in the past but with a new online version.

05:18 So, ArcLogistics Online is a great tool for companies that want to save money...

05:24 ...improve customer service using an online service where the maps and the apps are hosted up in the cloud.

05:31 So to start, Shalem Medical, who's a user of ArcLogistics Online, has provided some customer data to show the power of the solution.

05:40 I've already uploaded the main location, the five vehicles, and the drivers, each of these with their unique characteristics.

05:50 I've also input the customers I need to visit today...

05:54 ...and built routes which have assigned those customers to the various vans and optimized those vans' routes.

06:01 Now I can identify information about each one of those customers just in the map...

06:07 ...or I can look in the time view to see which customers will be delivered to and on which time by which vehicle.

06:15 Well, figuring out the optimum route is really only solving part of the problem.

06:19 I also need to effectively get this out to my drivers in the vehicles.

06:24 Now, I could of course choose any of these predefined templates here and just print driving directions and hand them to the driver...

06:31 ...but then I'd have to leave Starbucks.

06:33 So a better way is, I can send these routes directly to a mobile device in a van running ArcLogistics Navigator.

06:42 So with this solution, I can send the routes, and they get sent automatically to the mobile device in the van.

06:51 And here you can see the drivers have just been notified they have a new route.

06:56 ArcLogistics Navigator uses the GPS device to know its current position, and it provides turn-by-turn directions along the route...

07:06 ...calculating the estimated arrival time as it's going, and you'll even reroute the driver back to the optimal route if the driver has to make a detour.

07:16 So as you can see, we have a great solution of an online route optimization...

07:20 ...sending the information directly to a device in the van for turn-by-turn directions. John.

07:27 Thanks, Matt.

07:32 Thanks, Matt. Network analysis can mean lots of many different things.

07:37 It's point-to-point routing; it's traveling salesman problems; it's logistics when you have a fleet of vehicle.

07:44 It's location-allocation, site selection; we can even make it more complicated with gravity modeling that can work in competition...

07:51 ...and how the competition will change things.

07:54 But I think you also saw the continued story that you can do this on the desktop...

07:59 ...you can do it out in the field with your onboard navigation system, as well as Software as a Service in the cloud.