



ArcGIS Network Analyst: An Introduction

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ArcGIS Network Analyst Extension

makes sophisticated analysis easy

- Transportation analysis across ArcGIS
- Model transportation networks
- **IMPORTANT NOTE:** Network Analyst is not used for utility networks

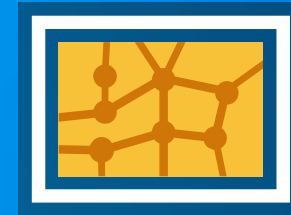


Topics to be covered

- **ArcGIS Network Analyst extension high-level concepts**
- **Network services**
- **ArcGIS for Desktop: ArcMap and ArcGIS Pro**
- **Types of network analysis**
- **Modeling transportation networks**
- **Support and resources**

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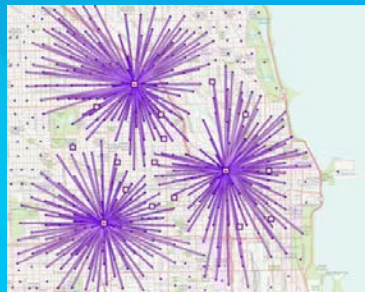
ArcGIS Network Analyst Extension does transportation analysis

Coverage

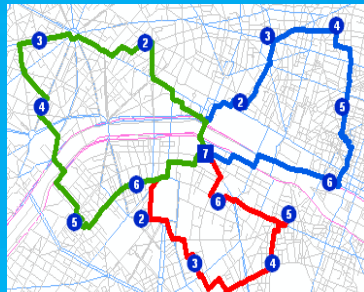


Service Area

Optimization

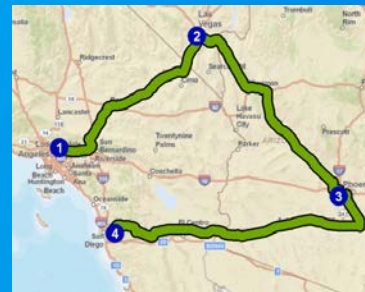


Location-Allocation

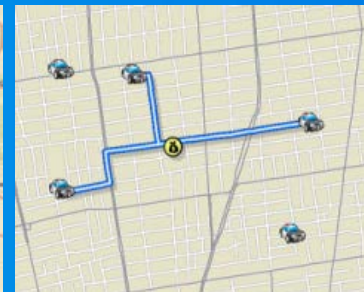


Vehicle Routing Problem

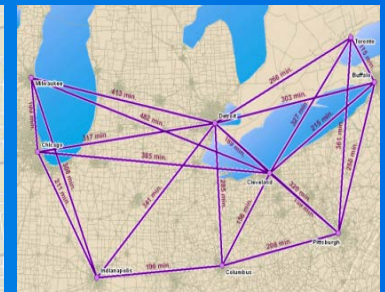
Point-to-point routing



Route



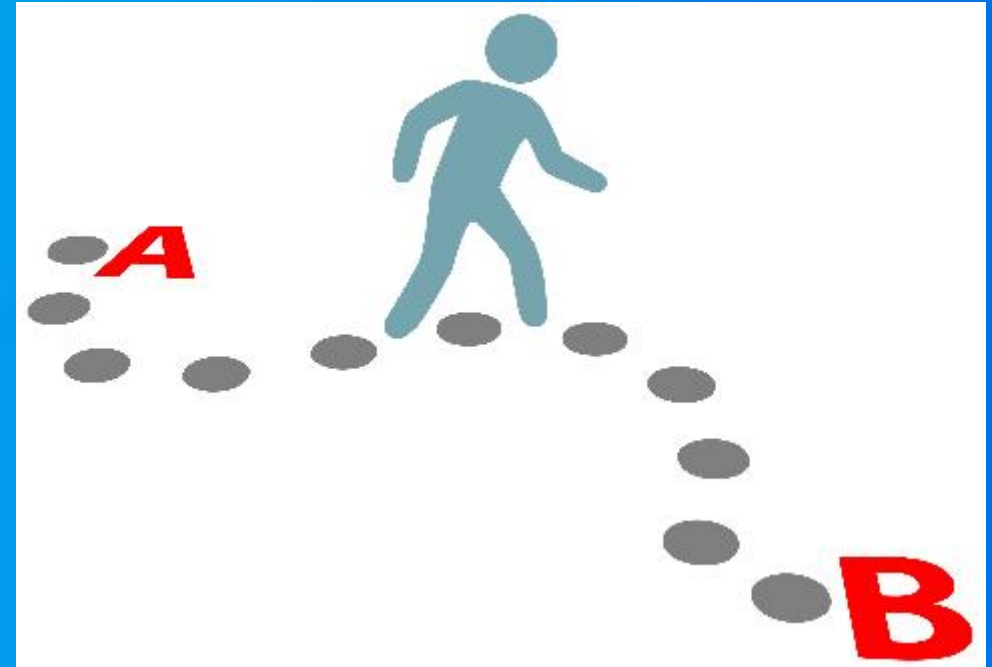
Closest Facility



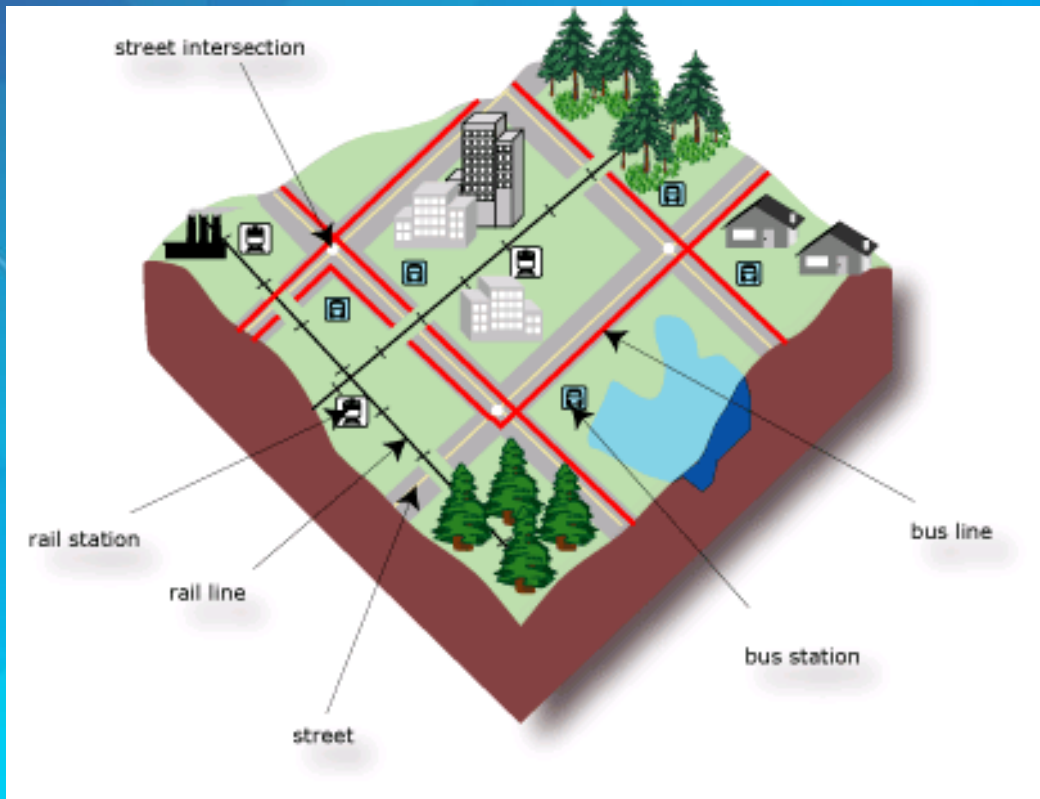
Origin-Destination Cost Matrix

ArcGIS Network Analyst Extension saves your organization money

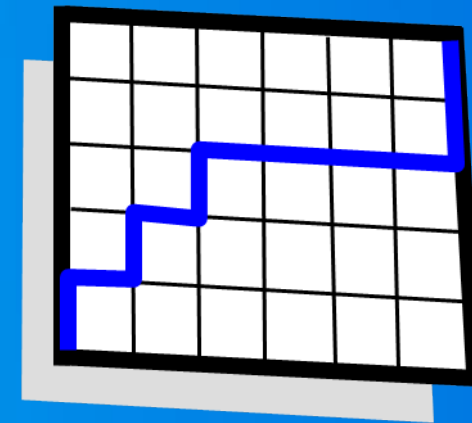
- Benefit from efficient routes
 - Less gas
 - Less maintenance
 - Less driver overtime
 - More customers serviced
- Find the optimal locations for facilities or remove redundant facilities



ArcGIS Network Analyst Extension uses an accurate model of a transportation network



Network Dataset



ArcGIS Network Analyst Extension is used across ArcGIS

- Credits
- No license
- No data

ArcGIS Online
Network Services



ArcGIS.com Map Viewer

Ready-to-Use Services



ArcGIS for Server



ArcGIS for Desktop



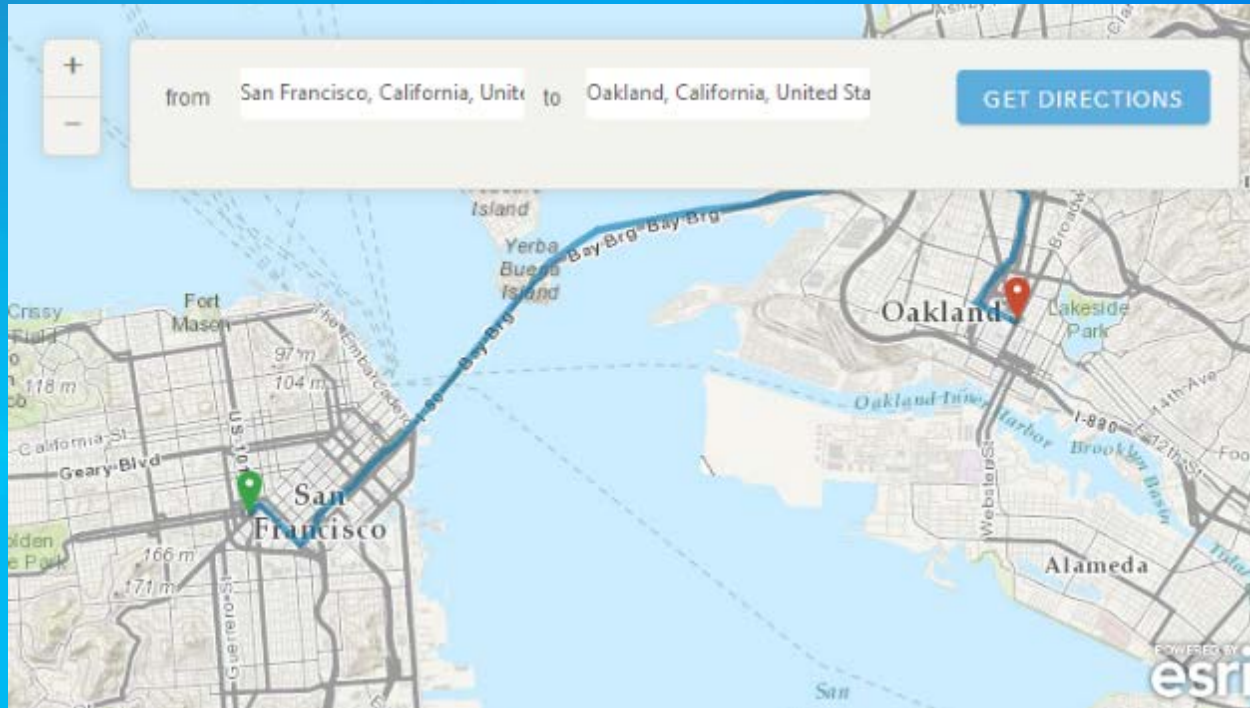
Geoprocessing



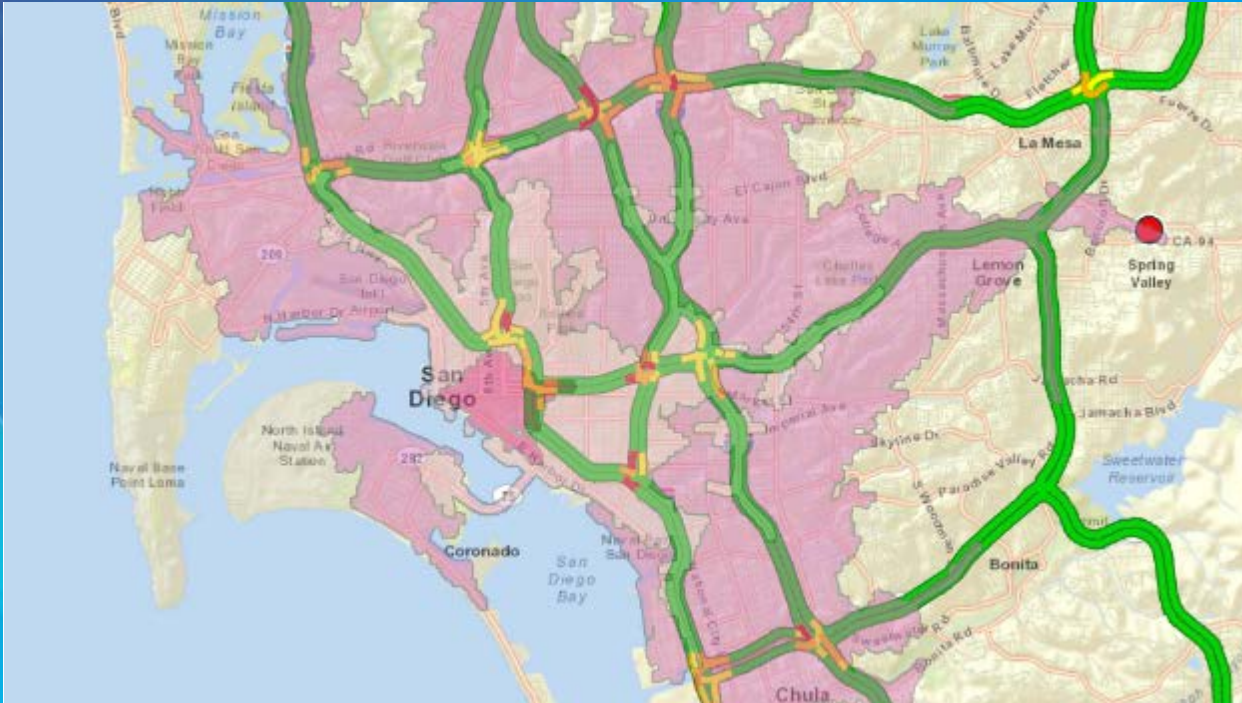
- No credits
- License
- Data

Network Analysis capabilities are available across Esri APIs and products

- ArcGIS for Desktop
- ArcGIS Online
- ArcGIS for Server
- Geoprocessing




- Python
- Android
- Flex
- iOS
- Java
- JavaScript
- Mac OS X
- .NET
- Qt
- Silverlight
- WPF



Network Services

Topics to be covered

- ArcGIS Network Analyst extension high-level concepts
- **Network services** 
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ArcGIS Online Network Services

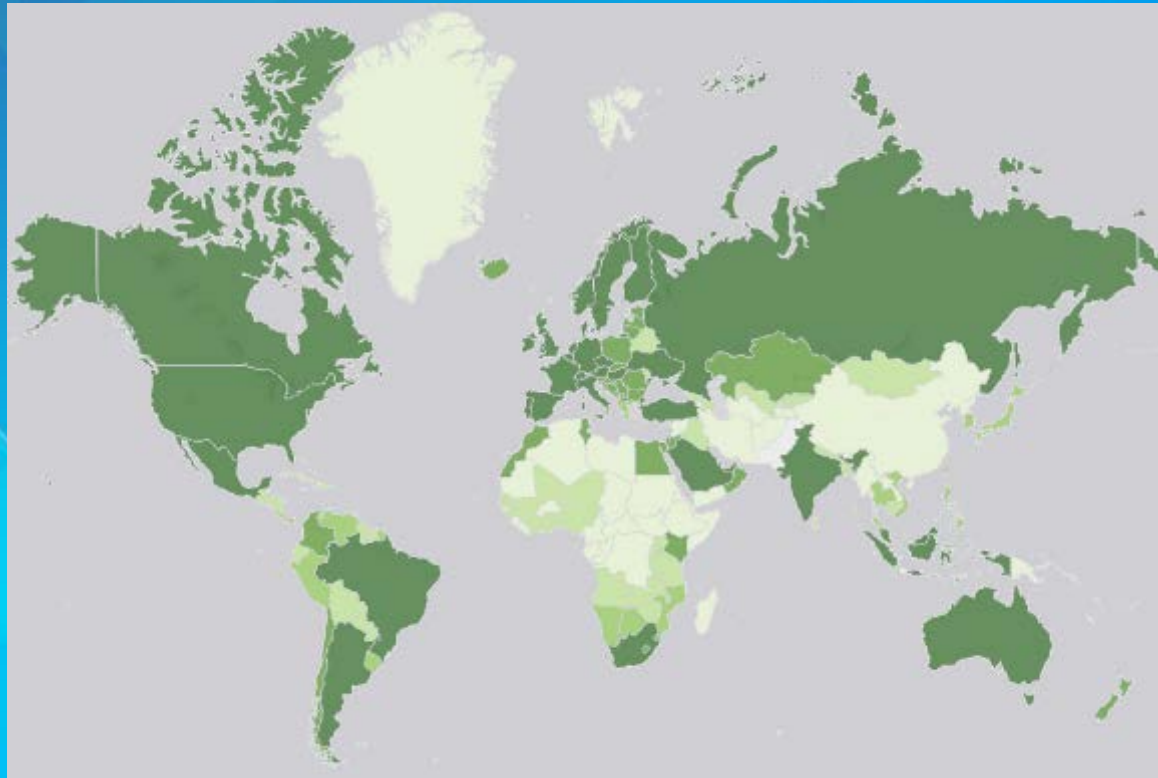
can perform analysis in the cloud

- **Managed by Esri**
 - No user maintenance of servers, services, or data
 - Excellent uptime and reliability
- **Requires no Network Analyst specific software/licenses/data**

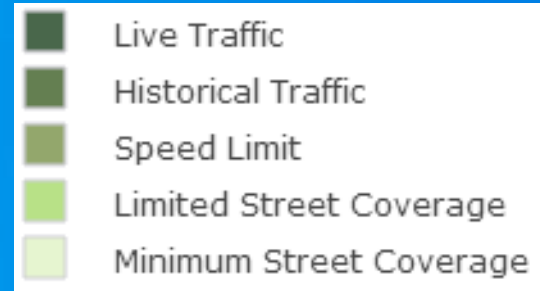


ArcGIS Online Network Services

provide high quality, global coverage

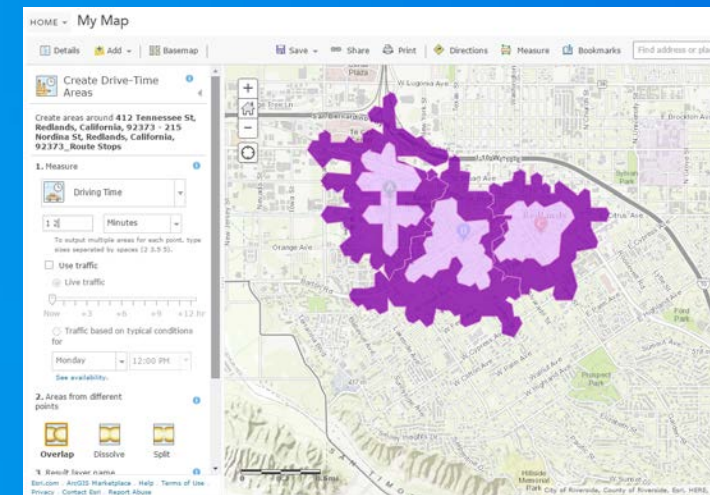
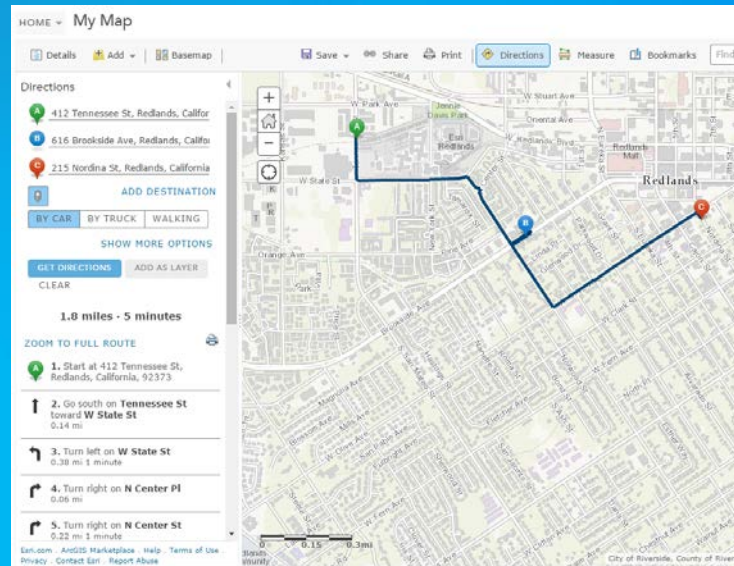


[ArcGIS Online Network Dataset Coverage map](#)



ArcGIS.com Map Viewer can perform analysis from a browser

- Generate directions
- Create drive-time areas
- Find nearest
- Plan routes



Demo

ArcGIS.com Map Viewer

HOME ▾ My Map

Details Add ▾ Basemap Save ▾ Share Print Directions Measure Bookmarks Find address or place

Create Drive-Time Areas

Create areas around **412 Tennessee St, Redlands, California, 92373 - 215 Nordina St, Redlands, California, 92373_Route Stops**

1. Measure

Driving Time

12 Minutes

To output multiple areas for each point, type sizes separated by spaces (2 3.5 5).

Use traffic

Live traffic

Now +3 +6 +9 +12 hr

Traffic based on typical conditions for

Monday 12:00 PM

See availability.

2. Areas from different points

Overlap Dissolve Split

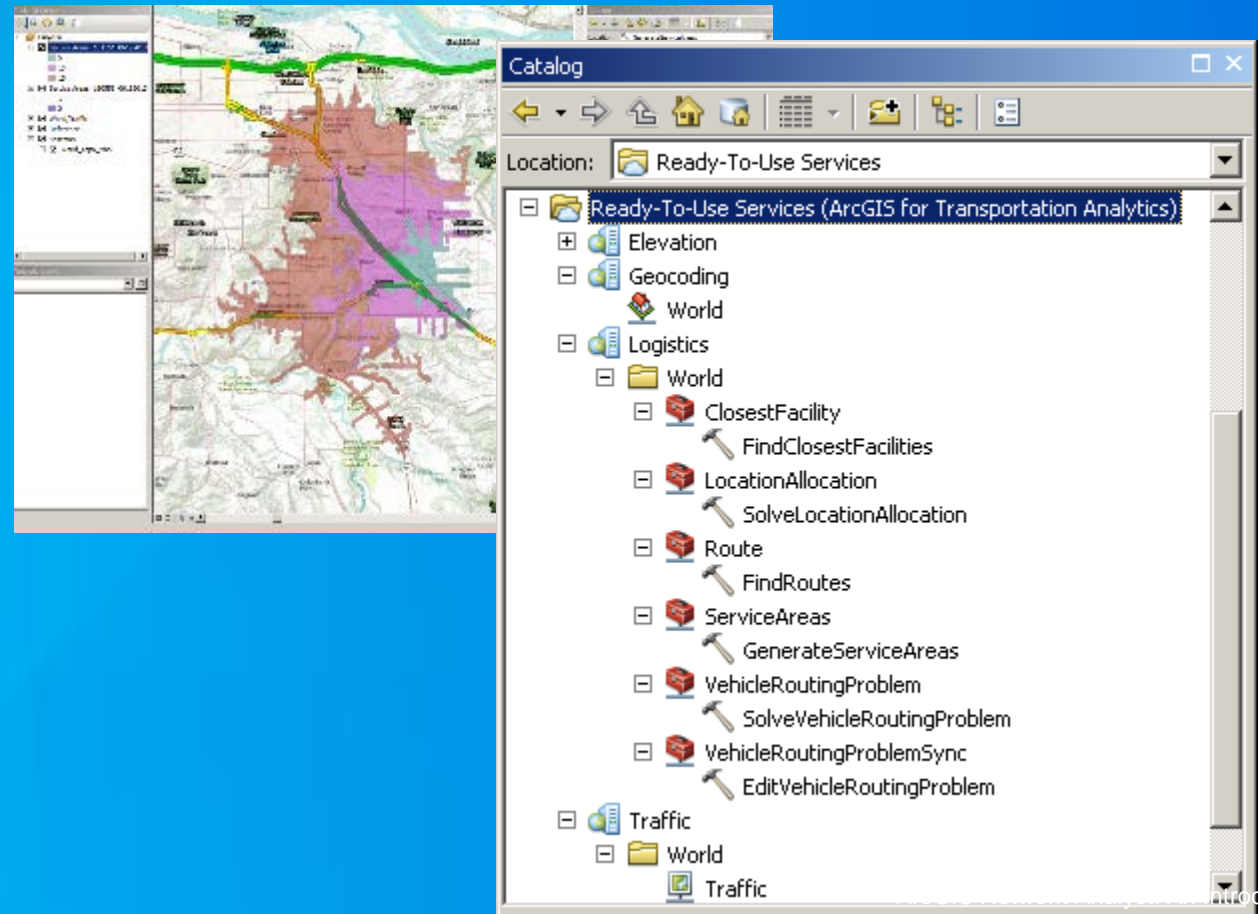
3. Result layer name

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The screenshot shows a map of Redlands, California, with several drive-time areas (isochrones) around a central point. The areas are colored in shades of purple and pink. The map includes street names, a scale bar, and a north arrow. The interface is clean and modern, with a blue header and a white sidebar.

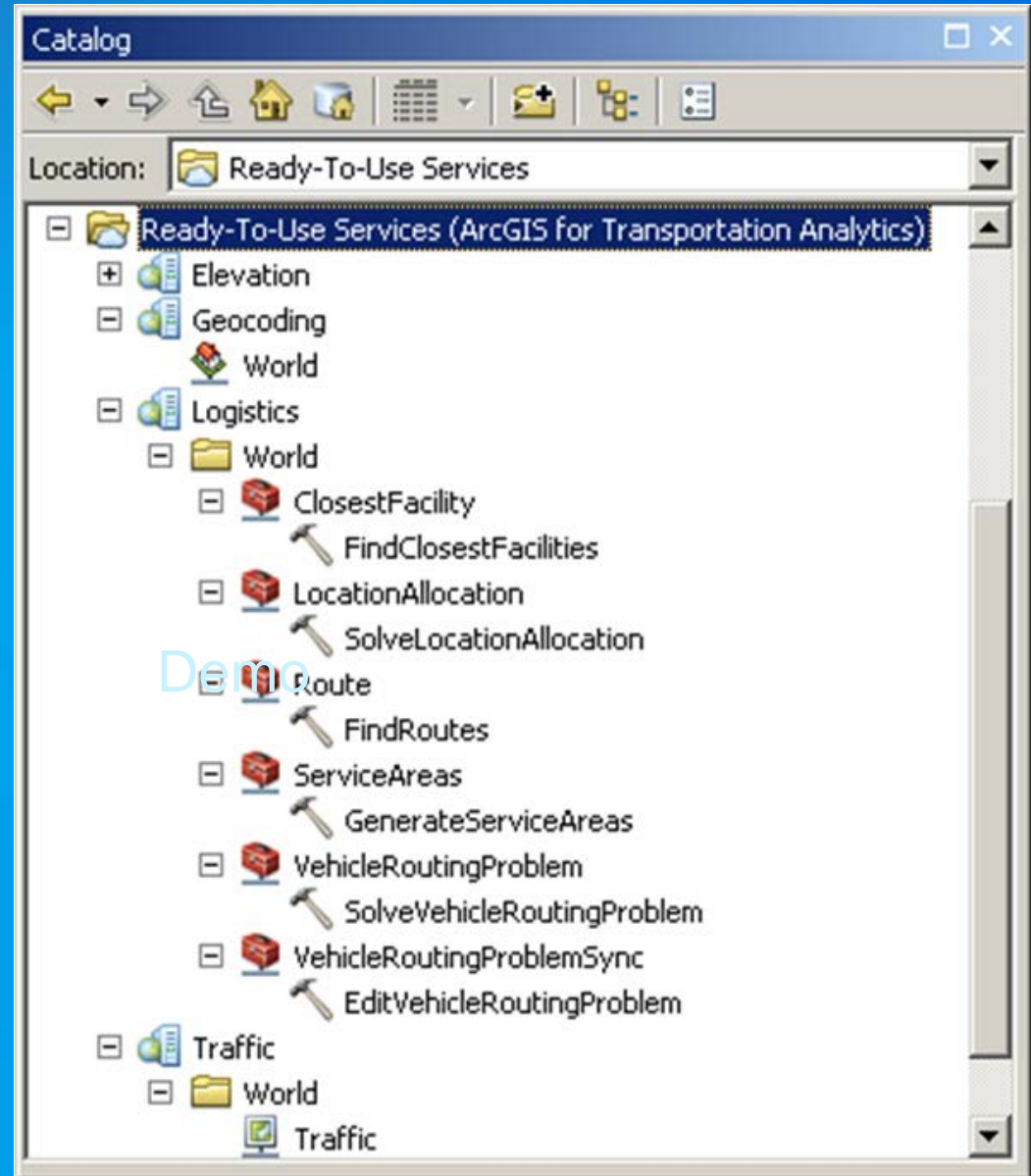
Ready-to-Use services do not require your network dataset

- Find Closest Facilities
- Solve Location-Allocation
- Find Routes
- Generate Service Areas
- Solve Vehicle Routing Problem
- View Traffic



Demo

Ready-to-Use Services





Network Analyst in ArcGIS for Desktop

Topics to be covered

- ArcGIS Network Analyst extension high-level concepts
- Network services
- **ArcGIS for Desktop: ArcMap and ArcGIS Pro**
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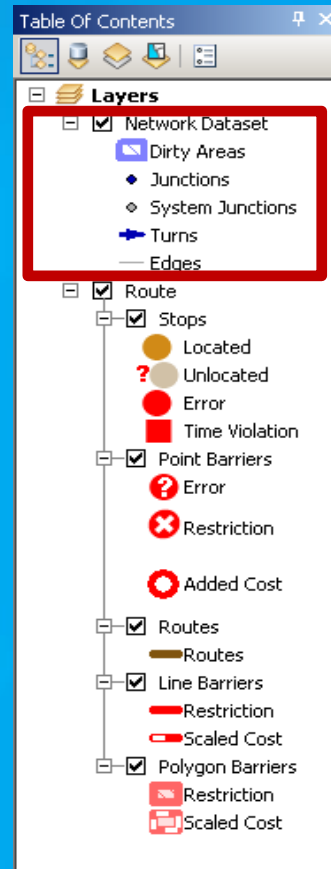
Specialized layers

Table Of Contents

- Layers
 - Network Dataset
 - Dirty Areas
 - Junctions
 - System Junctions
 - Turns
 - Edges
 - Route
 - Stops
 - Located
 - Unlocated
 - Error
 - Time Violation
 - Point Barriers
 - Error
 - Restriction
 - Added Cost
 - Routes
 - Routes
 - Line Barriers
 - Restriction
 - Scaled Cost
 - Polygon Barriers
 - Restriction
 - Scaled Cost

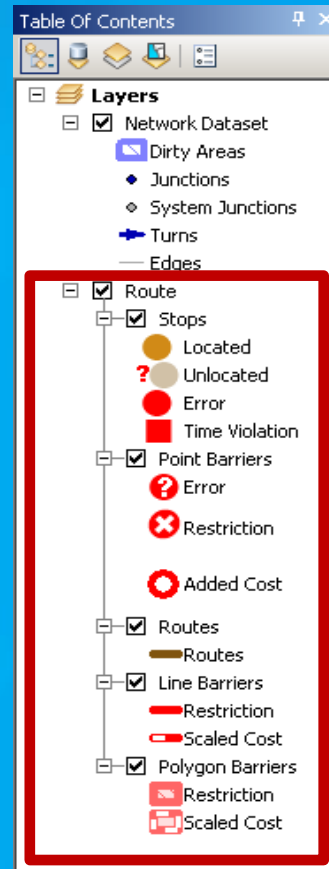
Network Layer

holds a reference to a network dataset



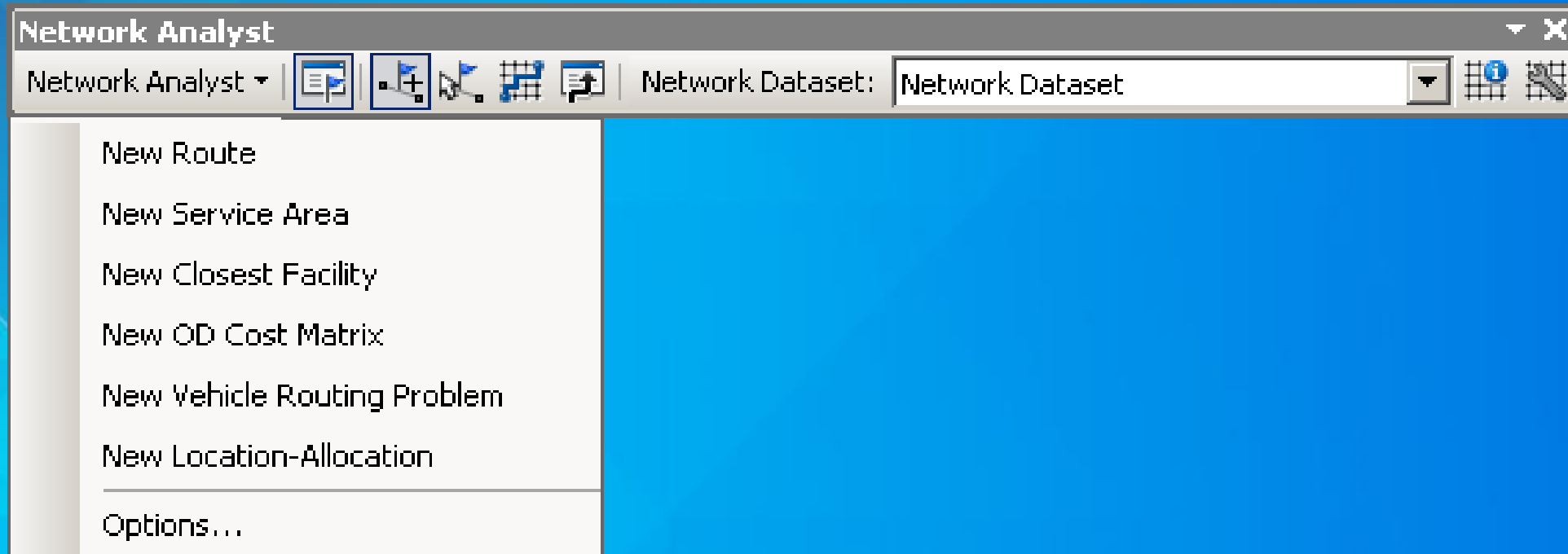
Network Analysis Layer is configured for a specific solver

- Composite layer
 - Inputs
 - Outputs
 - Analysis properties



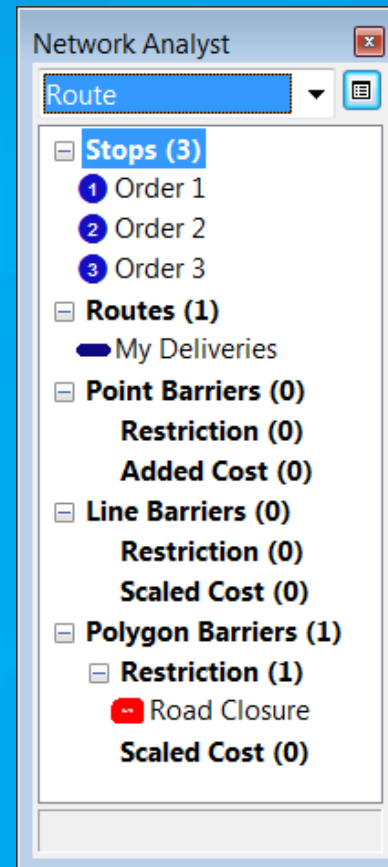
Network Analyst controls in ArcMap

Network Analyst toolbar

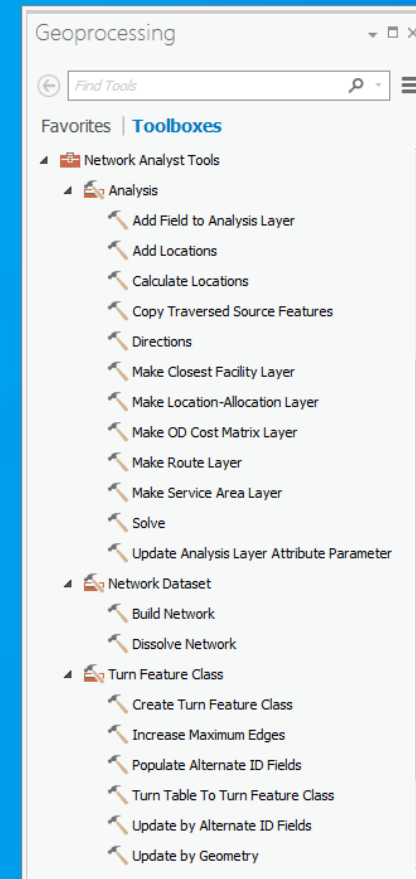
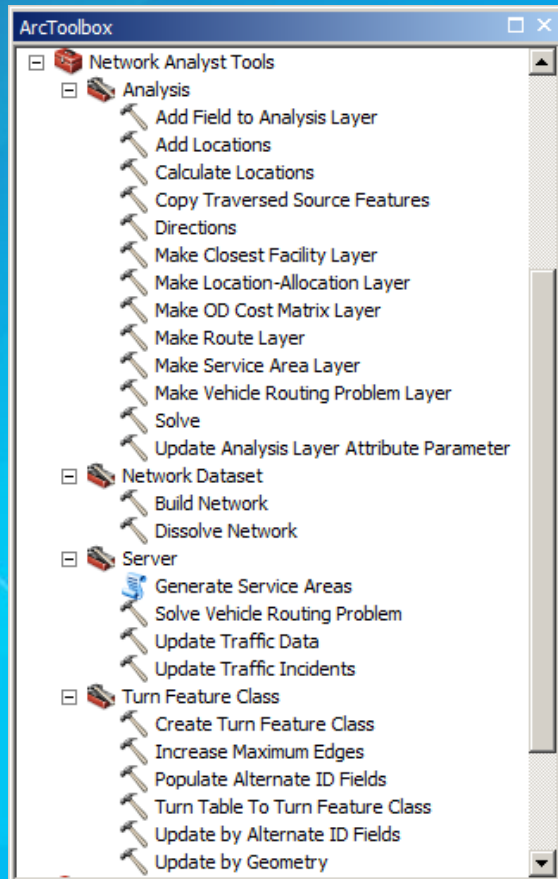


Network Analyst controls in ArcMap

Network Analyst Window

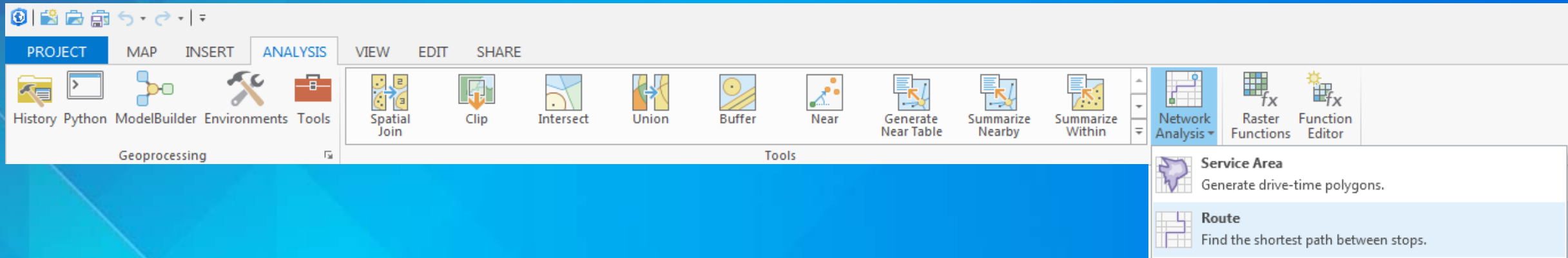


Network Analyst geoprocessing tools



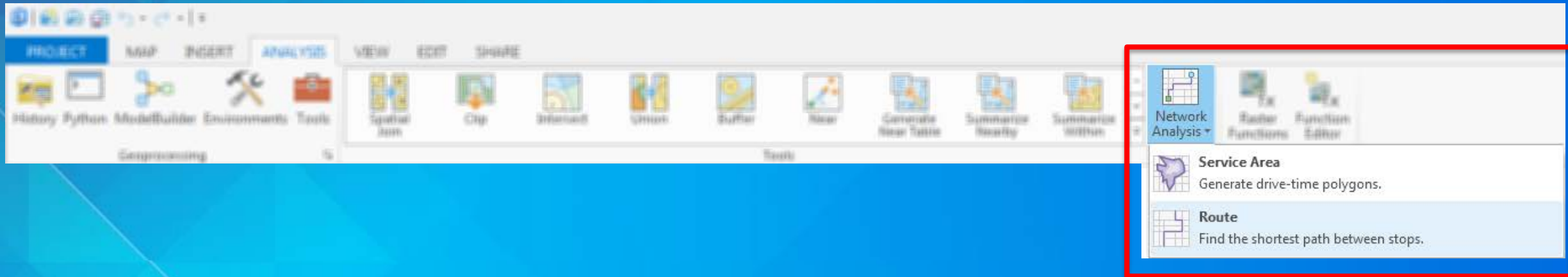
Network Analyst controls in ArcGIS Pro

Network Analyst in the ribbon



Network Analyst controls in ArcGIS Pro

Network Analyst in the ribbon



Network Analyst controls in ArcGIS Pro

Network Analyst in the ribbon

The screenshot shows the ArcGIS Pro ribbon with the NETWORK ANALYST tab selected. The ROUTE sub-tab is active. The ribbon contains the following controls:

- Run**: A play button icon.
- Import Stops**: A button with a list of blue circles and a dropdown arrow.
- Mode**: A dropdown menu set to "<Default>" with a unit of "min".
- Type**: A dropdown menu set to "Day of Week".
- Time**: A text box containing "8:00 AM".
- Date**: A dropdown menu set to "Thursday".
- Directions**: A button with a blue arrow icon and a dropdown arrow.
- Report**: A button with a document icon.

Labels below the controls indicate their categories: "Analysis" for Run, "Input Data" for Import Stops, "Travel Mode" for Mode, "Arrive/Depart Time" for Time and Date, and "Report" for Report.

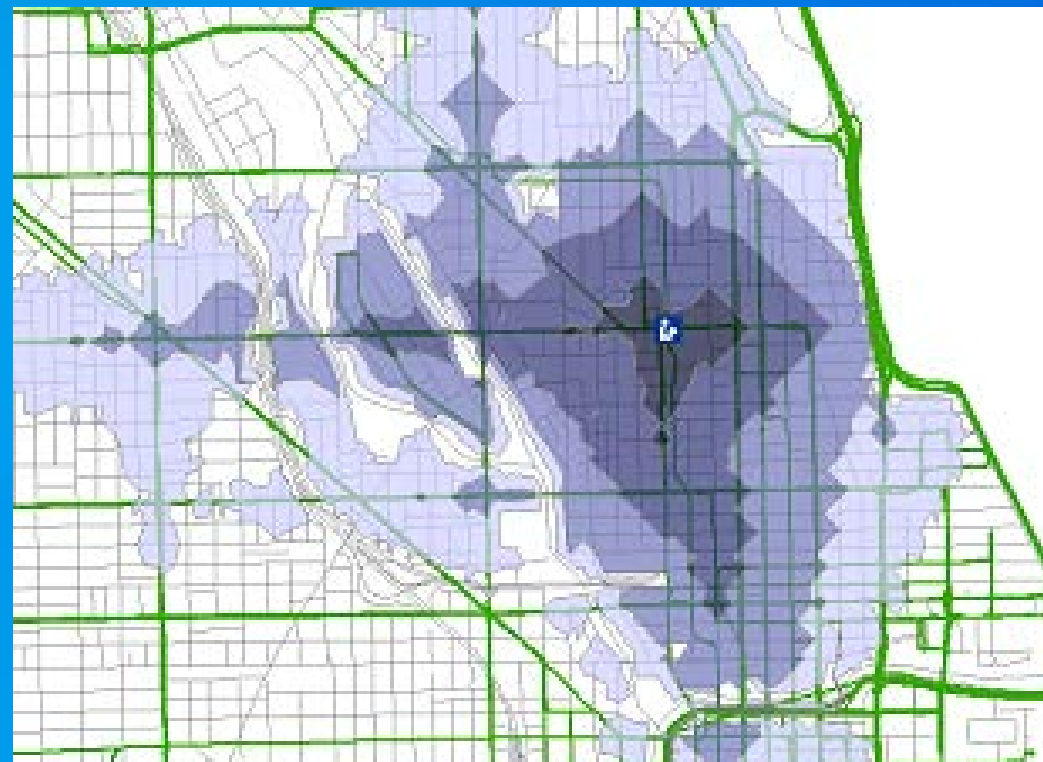
The screenshot shows the ArcGIS Pro ribbon with the NETWORK ANALYST tab selected. The SERVICE AREA sub-tab is active. The ribbon contains the following controls:

- Run**: A play button icon.
- Import Facilities**: A button with a list of green squares and a dropdown arrow.
- Mode**: A dropdown menu set to "<Default>" with a unit of "min".
- Direction**: A dropdown menu set to "Away from Facilities".
- Cutoffs**: A text box containing "5".
- Type**: A dropdown menu set to "Not Using Time".
- Time**: A text box that is currently empty.
- Date**: A text box that is currently empty.
- Polygons**: A button with an orange polygon icon and a dropdown arrow.
- Standard Precision**: A dropdown menu.
- Overlap**: A dropdown menu.
- Ring**: A dropdown menu.

Labels below the controls indicate their categories: "Analysis" for Run, "Input Data" for Import Facilities, "Travel Mode" for Mode, "Arrive/Depart Time" for Time and Date, and "Output Geometry" for Polygons, Standard Precision, Overlap, and Ring.

Demo

Network Analyst in ArcGIS for Desktop

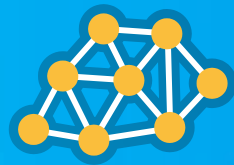




Types of network analysis

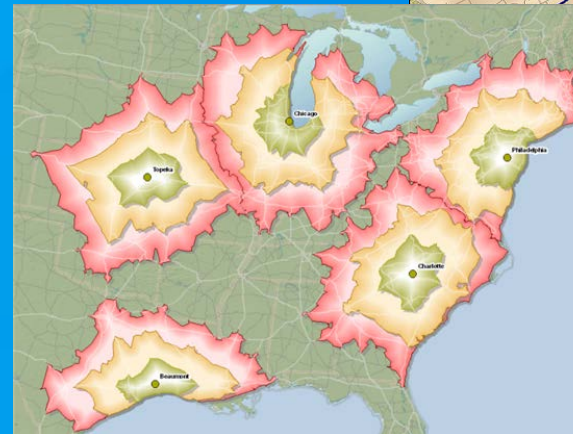
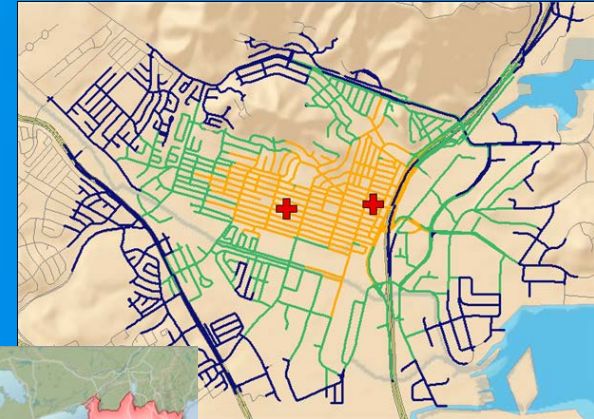
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Service Area solver performs coverage analysis

- Find the area you can reach from a facility
 - Solve for many facilities
 - Use multiple break values
 - Specify the direction of travel
 - Output lines or polygons
 - Analyze for different times of the day



Demo

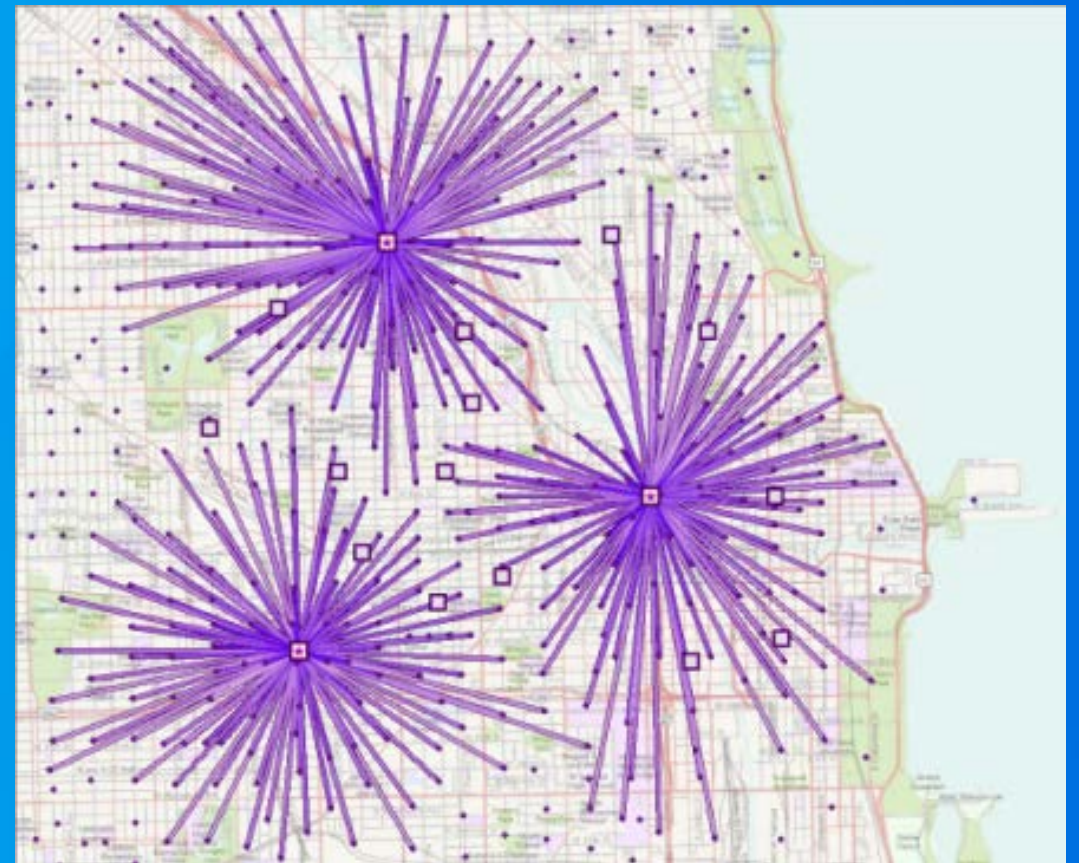
Fire Coverage

Use the Service Area solver to find coverage for fire stations



Location-Allocation solver performs site optimization

- Determine the best location for a facility, based on demand conditions
 - Choose from many different analysis types
 - Limit the capacity of facilities
 - Analyze for different times of day



Demo

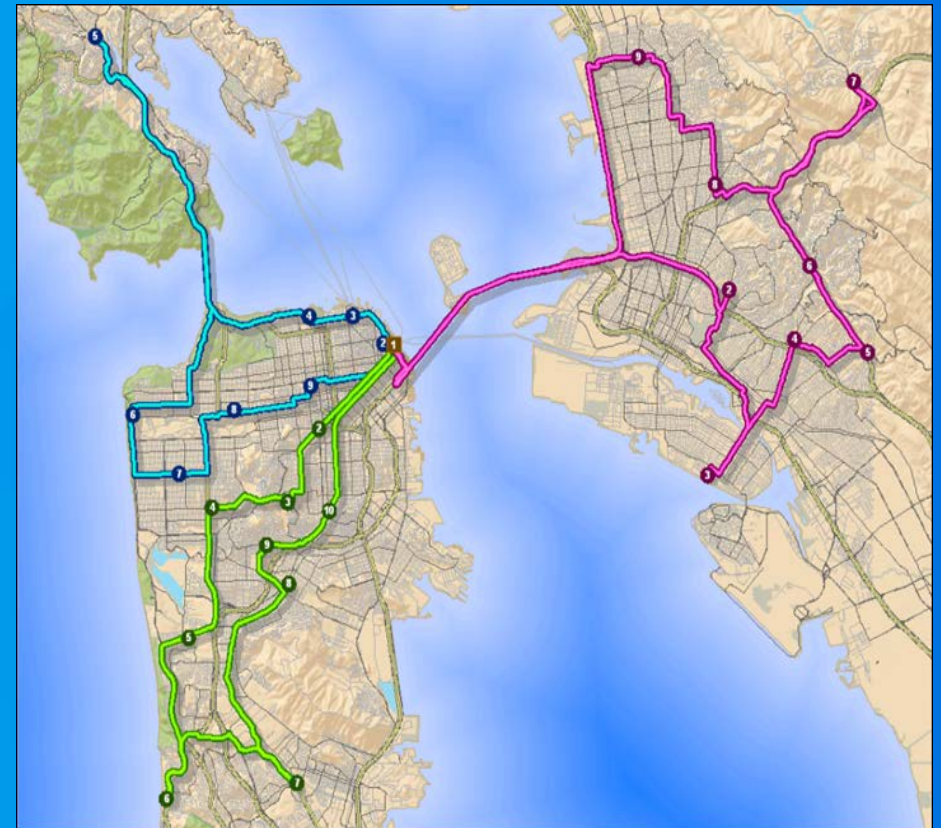
Site selection

Use the Location-Allocation solver to find the best site for a new fire station



Vehicle Routing Problem solver is valuable across private and public sectors

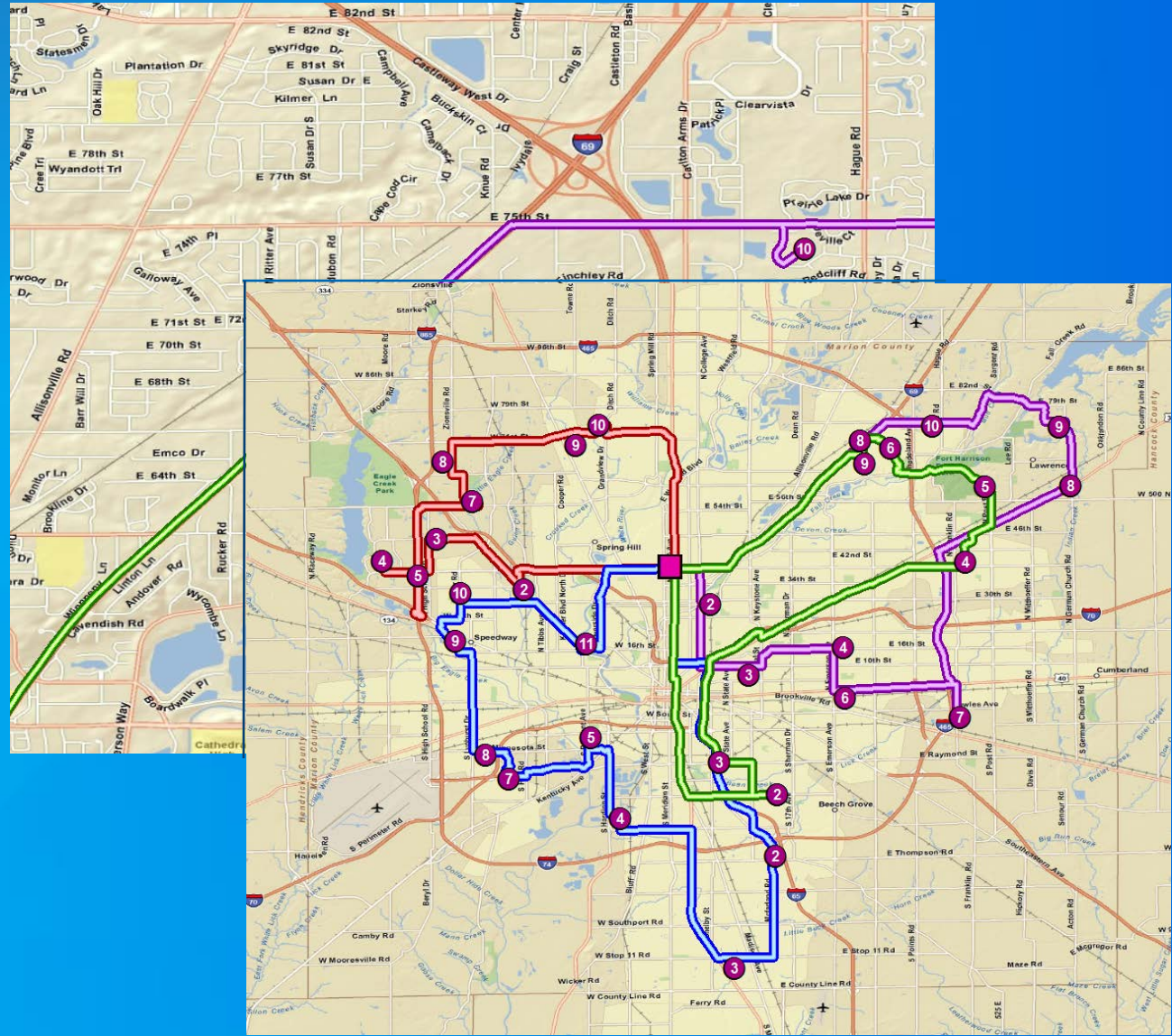
- Inspection
- Repair
- Service
- Delivery
- Paratransit



Demo

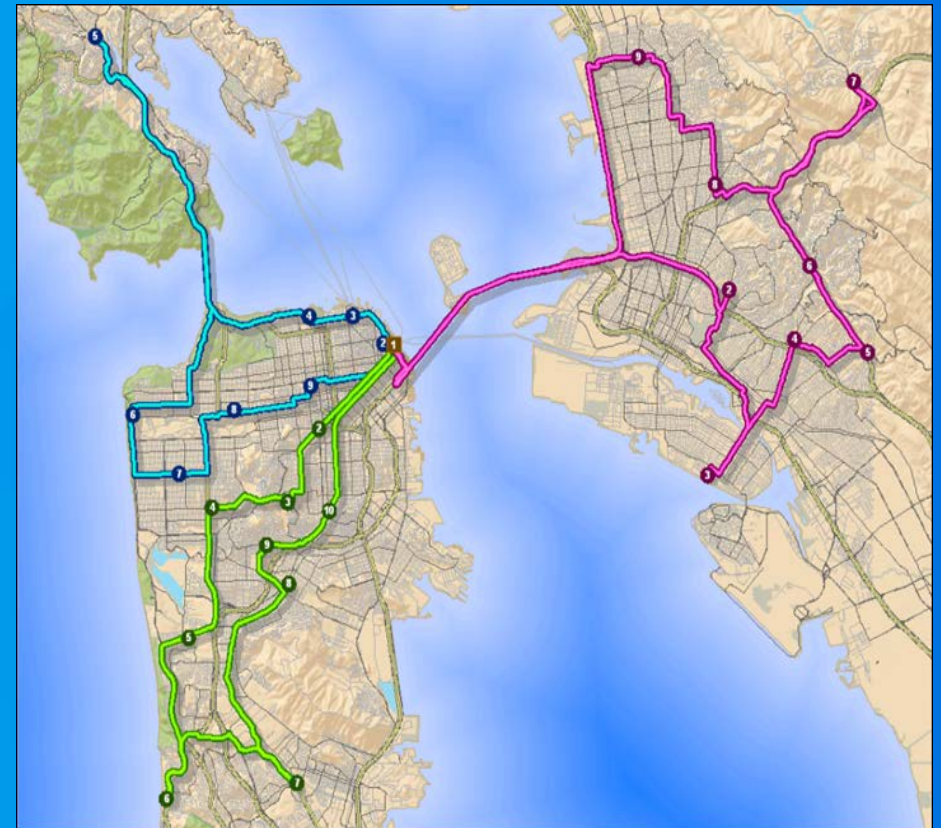
Fleet routing

Create optimal routes for multiple vehicles to deliver appliances to many customers



Vehicle Routing Problem solver performs fleet routing

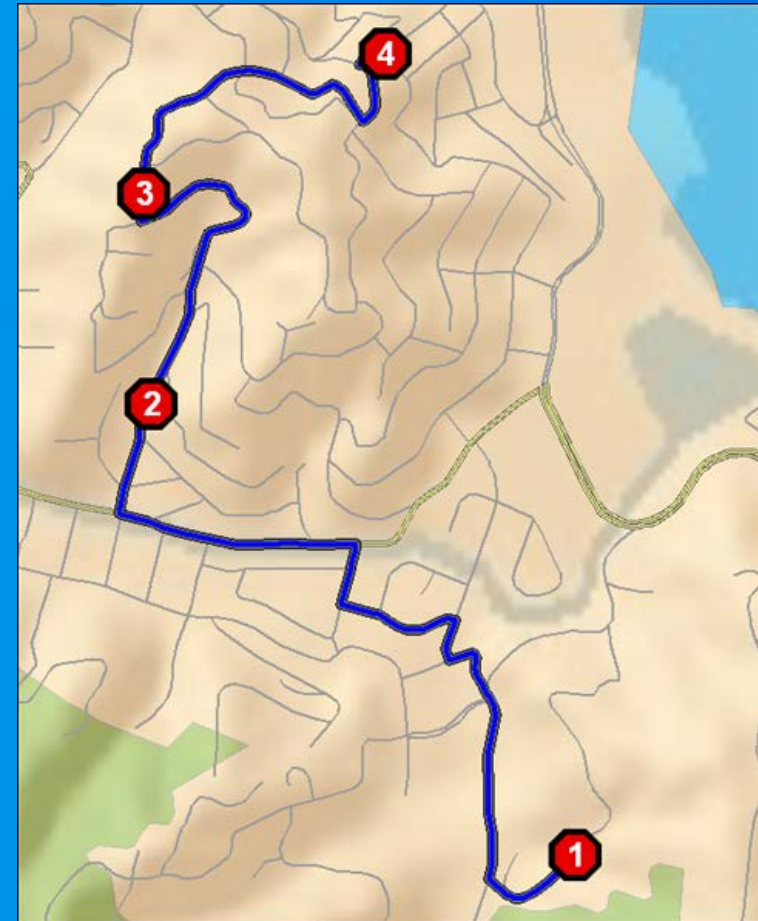
- Route a fleet of vehicles to service a set of orders
 - Vehicle capacities
 - Driver specialties
 - Work day rules
 - Breaks
 - Maximum hours
 - Time windows on orders



Route solver

performs point-to-point analysis

- Find the best route for visiting a series of stops with minimum cost
 - Specify time windows on stops
 - Find best sequence of stops
 - Analyze for different times of the day



Demo

Commute Analysis

Route solver to solve many routes at once



Closest Facility solver finds the nearest location

- Find the nearest facilities from each incident
 - Limit the search distance
 - Limit the number of facilities to find
 - Travel from the facility to the incident



Demo

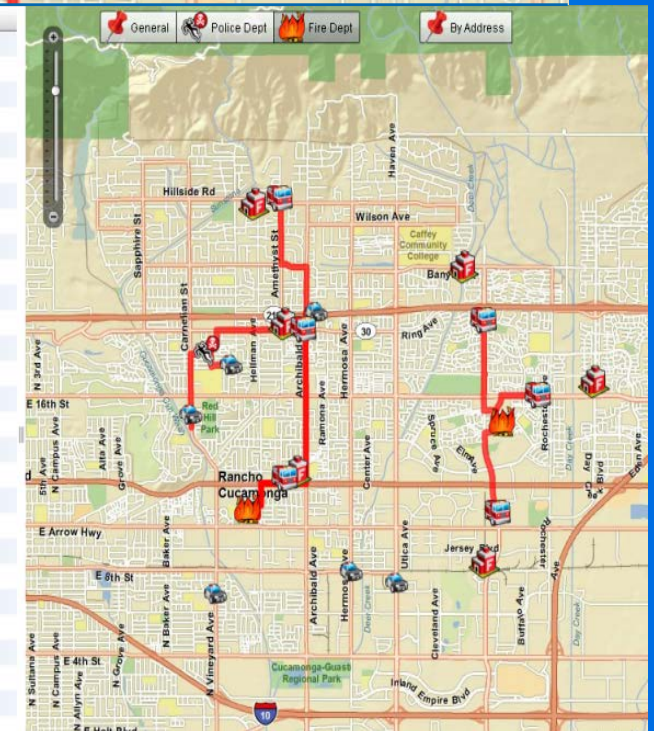
Dispatching

Find the nearest emergency vehicle to an incident

<http://nadev.arcgis.com/arcgis/samples>



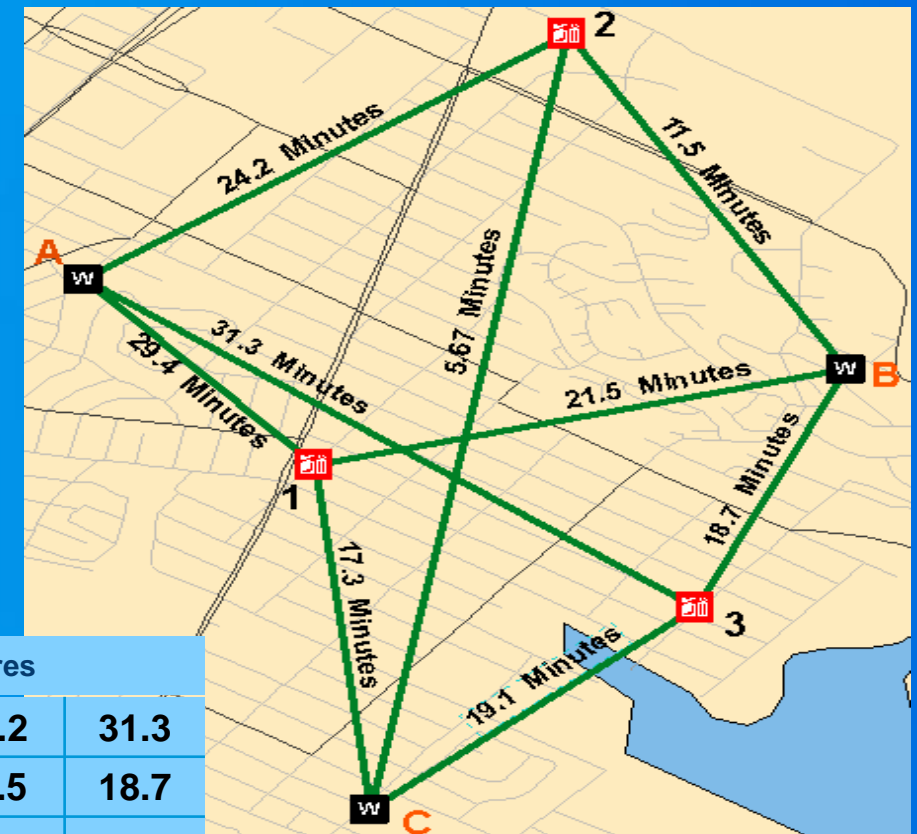
Vehicle	Status
Patrol Unit #1	Patrolling
Patrol Unit #2	Responding
Patrol Unit #3	Responding
Patrol Unit #4	Responding
Patrol Unit #5	Patrolling
Patrol Unit #6	Patrolling
Patrol Unit #7	Patrolling
Fire Truck #1	Responding
Fire Truck #2	Responding
Fire Truck #3	Responding
Fire Truck #4	Responding
Fire Truck #5	Responding
Fire Truck #6	Idle
Fire Truck #7	Responding



Origin-Destination Cost Matrix solver

routes multiple origins to multiple destinations

- Generate a matrix of the travel costs from origins to destinations
 - Limit the search distance
 - Limit the number of destinations to find
 - Analyze different times of day



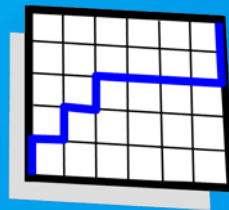
	Stores		
Warehouses	29.4	24.2	31.3
	21.5	11.5	18.7
	17.3	5.67	19.1

Modeling transportation networks



Topics to be covered

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Where can you get street data?

Free data

- Your own data
- Data and maps media (Prior to 10.3)
- TIGER (Census data)
- OpenStreetMap
 - OSM to NDS tools
 - ArcGIS Editor for OpenStreetMap



Where can you get street data?

Pay for premium data

- HERE or TomTom
 - Vendor street data processing tools
- StreetMap Premium for ArcGIS



Where can you get street data?

Pay for analysis

- ArcGIS.com Map Viewer
- ArcGIS Online Network Services



Streets are connected



Analyze many types of travel

- Car
- Truck
- Pedestrian
- Rail
- Bicycle
- Transit



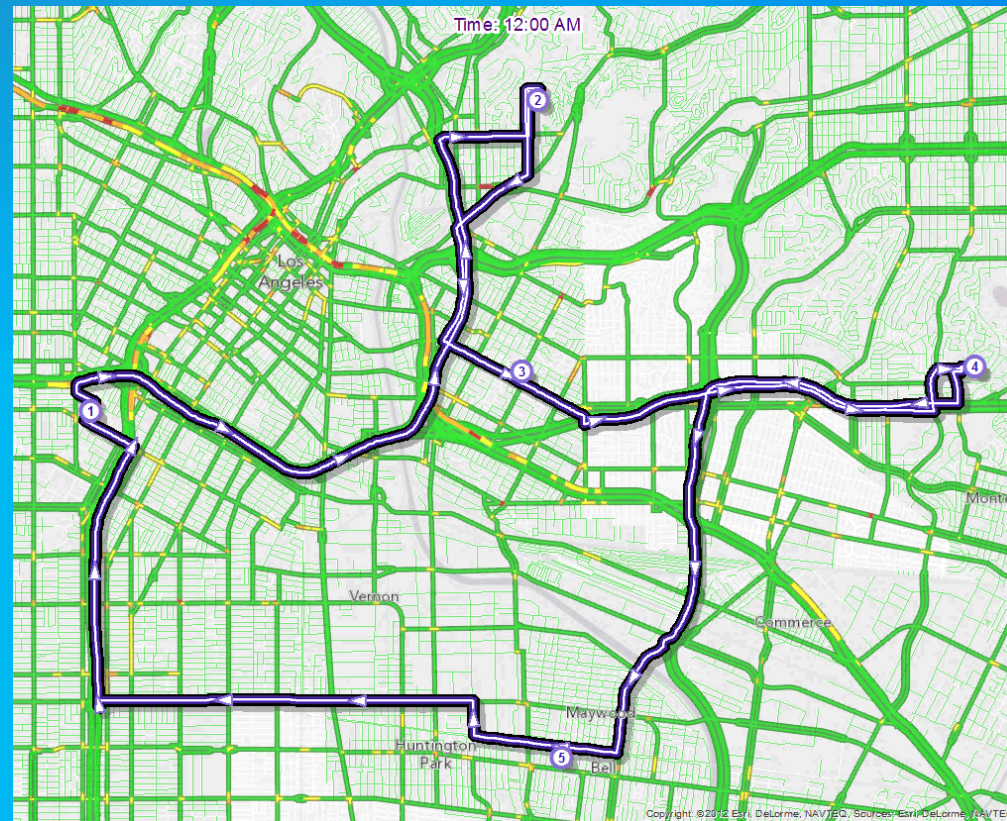
Restrictions can depend on street characteristics



Restrictions can depend on vehicle characteristics



Traffic

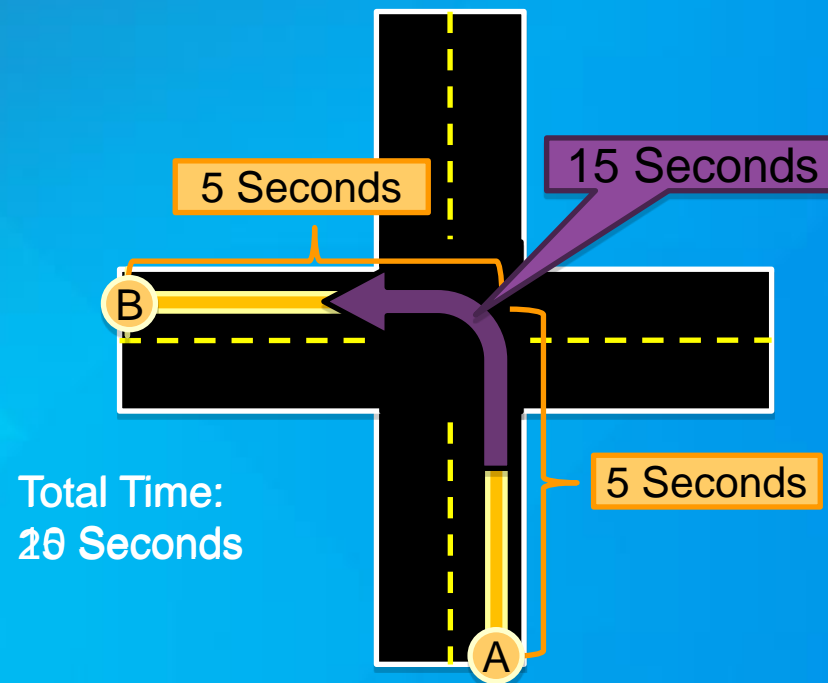


Turns can be restricted

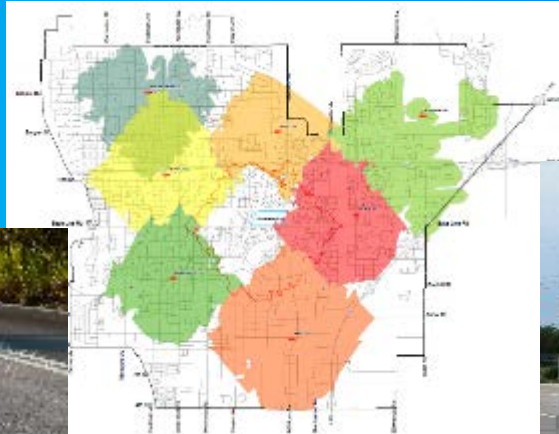


Turns can have added costs

- Specific turns
- Generic turns



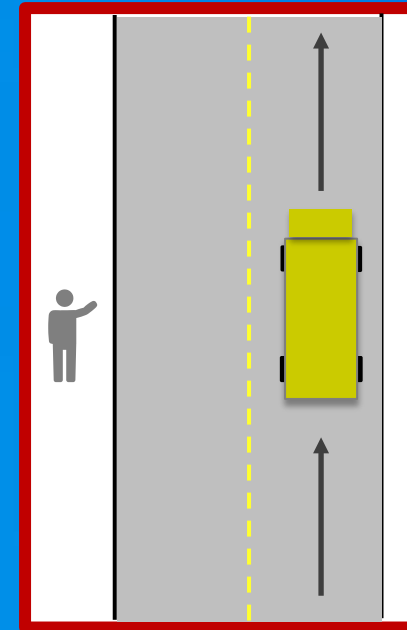
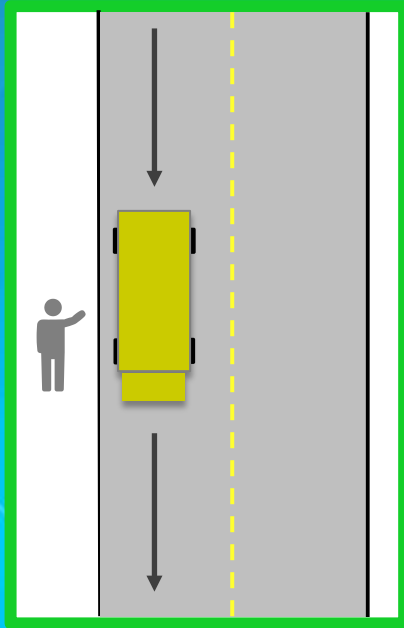
Barriers can be temporary restrictions



Barriers can be slowdowns

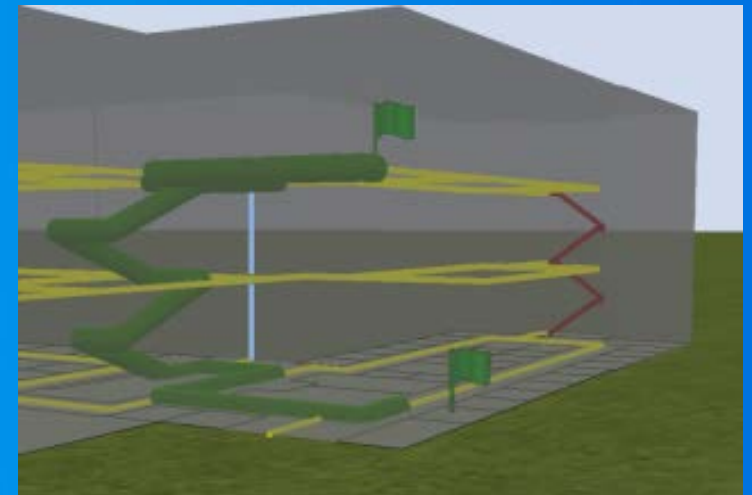
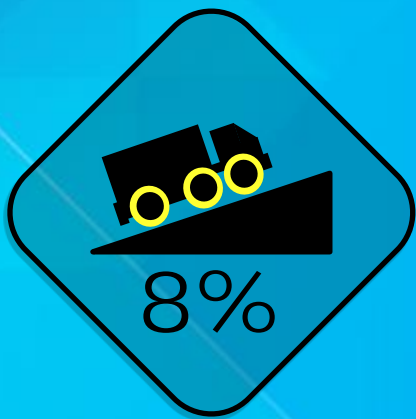


Arrive and depart from the correct side of the road



Model travel in 3D

- Buildings
- Subways
- Overpasses
- Slope



Demo

Modeling transportation networks





In summary

- **ArcGIS Network Analyst Extension...**
 - **Makes it easy to do sophisticated analysis**
 - **Offers many types of analysis**
 - **Works across products and skill levels**
 - **Models transportation networks accurately**

Mobile devices can perform network analysis

- **Connected**
 - All network analysis services
- **Disconnected**
 - Routes
 - Directions





Common questions

- How do I analyze my utility or natural resource networks?
- Does Network Analyst support high-density routing?
- Can I get alternate shortest paths?
- Can Network Analyst work with transit schedules?

Topics to be covered

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- **Support and resources**



Support and Resources

- [Network Analyst tutorial](#)
- [Network Analyst in the ArcGIS Resources](#)
- [ArcGIS Network Analyst Extension Discussion Forum](#)
- [Creating network datasets video](#)

Network Analyst presentations

Tuesday

Wednesday

Thursday

Time	Tuesday	Wednesday	Thursday
8:30 am		Network Analyst: An Introduction	
9 am			
10 am	Routing in Buildings with 3D Networks in ArcGIS Pro		
11 am		Network Analyst: Automating Workflows with Geoprocessing	Network Analyst: An Introduction
		Network Analysis with Python	
12 pm	Using Navigator for ArcGIS		Using GTFS Public Transit Data in ArcGIS
		Network Analyst: Network Analysis with ArcGIS Online	
1 pm			
2 pm	Navigator for ArcGIS: Technical Preview	Network Analyst: Creating Network Datasets	Network Analyst: Automating Workflows with Geoprocessing
3 pm	Performing Network Analysis	Network Analyst: Performing Network Analysis	Network Analyst: Creating Network Datasets
4 pm	Network Analysis with ArcGIS Online		

Room 15 A

Room 16 B

Demo Theater 10 Apps

Demo Theater 13 Spatial Analysis

Tech Theater 15 Exhibit Hall A

Tech Theater 17 Exhibit Hall A



Understanding our world.