• An overview of the analysis capabilities across ArcGIS

• Modeling transportation networks

• Not utility networks
ArcGIS Network Analyst Extension does transportation analysis.
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.
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

- License
- Data
- No credits
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
ArcGIS Online Network Services can perform analysis in the cloud

- Published by Esri
- Run in an Esri-administered cloud infrastructure
ArcGIS Online Network Services can perform analysis in the cloud

- Requires no Network Analyst specific software/licenses/data
- Requires no maintenance of servers, services, or network data
- Provides excellent uptime and reliability
ArcGIS Online Network Services provide high quality, global coverage.
• Generate directions
• Create drive-time areas
• Find nearest
• Plan routes

ArcGIS.com Map Viewer can perform analysis from a browser
ArcGIS.com
Map Viewer
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
Ready-to-Use Services
Network Analyst in ArcGIS for Desktop
Specialized layers
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

- New Route
- New Service Area
- New Closest Facility
- New OD Cost Matrix
- New Vehicle Routing Problem
- New Location-Allocation
- Options...
Network Analyst controls in ArcMap

Network Analyst Window

- Route
- Stops (3)
  - Order 1
  - Order 2
  - Order 3
- Routes (1)
  - My Deliveries
- Point Barriers (0)
  - Restriction (0)
  - Added Cost (0)
- Line Barriers (0)
  - Restriction (0)
  - Scaled Cost (0)
- Polygon Barriers (1)
  - Restriction (1)
  - Road Closure
  - Scaled Cost (0)
Network Analyst controls in ArcMap

Geoprocessing tools
Network Analyst in ArcGIS for Desktop
Types of network 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

Service Area solver performs coverage analysis
Fire Coverage

Use the Service Area solver to find coverage for fire stations
• 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

Location-Allocation solver performs site optimization
Site selection

Use the Location-Allocation solver to select sites for Flu shot clinics
Vehicle Routing Problem solver is valuable across private and public sectors

- Inspection
- Repair
- Service
- Delivery
- Paratransit
• 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

Vehicle Routing Problem solver performs fleet routing
Fleet routing

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

Find the nearest emergency vehicle to an incident

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

<table>
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<th>Stores</th>
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<th>24.2</th>
<th>31.3</th>
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<td>5.67</td>
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Modeling transportation networks
Where can you get street data?

Free data

- Your own data
- Data and maps media
- 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.
Turns can be restricted
Specific turns
- Generic turns

Turns can have added costs

Total Time: 20 Seconds
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
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
• 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?
What’s new

- Ready-to-Use Services
  - Location-Allocation
  - Find routes
- More coverage for online services
- ArcGIS.com Map Viewer
  - Plan routes
  - Travel modes
-Disconnected mobile routing
Support and Resources

- Network Analyst tutorial
- Network Analyst in the ArcGIS Resources
- ArcGIS Network Analyst Extension Discussion Forum
- Creating network datasets video
Understanding our world.