ArcGIS Online
Routing and Network Analysis

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Introductions

• Who are we?
  - Members of the Network Analyst development team

• Who are you?
  - Network Analyst users?
  - ArcGIS Online users?
  - Trying to figure out what is ArcGIS Online?
Topics

- What are the ArcGIS Online network analysis services
- Accessing the services using out-of-the-box apps
- Service capabilities
- Managing credits
- Support and resources
- Questions
ArcGIS Online services

- Ready-to-use services hosted by Esri
- Provides mapping and spatial analysis capabilities
Network Analysis Services
Solve transportation problems

Route
Closest Facility
Service Area
Traffic
Origin Destination
Cost Matrix
Location-Allocation
Vehicle Routing Problem
What you need to use online services

• ArcGIS Online subscription with service credits

• Your analysis inputs

• Mapping apps
  - ArcMap
  - ArcGIS Pro
  - Map Viewer
  - Business Analyst Online
What you do **NOT** need for online services

- ArcGIS Network Analyst extension license
- Your own street data
- Your own ArcGIS Server software
- Hardware to host the server
- Staff to manage the IT infrastructure
Data coverage

• Global coverage*
• Uses high quality street data
  - Predictive and real time traffic where available
  - Support for vehicle weight, width and height restrictions
  - Can use preferred truck routes or avoid toll roads
• Driving, Walking, Trucking, or your own travel modes

[Map of global coverage]

View web map

Network Analysis with ArcGIS Online
Accessing the services
Organization subscription required

- All services are secured and require ArcGIS Online organization subscription with service credits

- Existing ArcGIS Desktop users get a free organization subscription

- Sign up for a 60 day free trial at www.arcgis.com
  - Comes with 200 service credits
Ways to access the services

• Out-of-the-box apps
  - ArcGIS Pro
  - ArcMap
  - Directions and Analysis tools in Map Viewer

• Some services are supported in other ArcGIS apps
  - Insights for ArcGIS
  - GeoPlanner for ArcGIS
  - Business Analyst Online
  - Collector for ArcGIS

• ArcGIS web and runtime SDKs
  - https://developers.arcgis.com/features/directions/
Using services with ArcGIS Desktop (ArcGIS Pro)

1. Ready-To-Use tools
   - GP Services
   - ArcGIS Pro 1.3 or later

2. Network Analysis gallery
   - Network Analysis Layers
   - ArcGIS Pro 1.2 or later
Using services with ArcGIS Desktop (ArcMap)

- Ready-To-Use Services node in ArcMap 10.2 and later
Using services in Map Viewer

- **Directions button**

- **Analysis tools**
  - Use Proximity
    - Most tools
  - Find Locations
    - Choose Best Facilities tool
  - Enrichment
    - Enrich Layer tool
  - Summarize Data
    - Summarize Nearby tool

Network Analysis with ArcGIS Online
Using services with Map Viewer

• Need to add your inputs to ArcGIS Online

• Layers and data you can analyze
  - Feature service
  - Map service
  - Comma-separated values (CSV) file (.csv)
  - Route layers
  - GPS exchange format file (.gpx)
  - Shapefile (.zip)
  - File Geodatabase (.zip)
  - Map notes

• Cannot use network dataset created from your own street data
Service capabilities
Traffic service

• Visualize traffic speeds
  - Support for live, historical and predictive traffic conditions

• Traffic Incidents

• Background layer to display results from network analysis services

• Data updated every five minutes
Using Traffic service

Add from the Living Atlas on the Project pane in ArcGIS Pro

Use Traffic map service from Ready-to-Use Services in ArcMap

Use the **World Traffic web map** or add Traffic layer from Living Atlas Layers to your own web map

Network Analysis with ArcGIS Online
Route Service

- Simple Route – Point-to-point routing between stops in the given sequence
- Optimized Route – Find the best route and sequence for visiting a series of stops
- Use live traffic conditions
- Driving directions in many languages
Using the Route service from Desktop

Use Route analysis layer in ArcGIS Pro

Use Find Routes geoprocessing tool from Ready-to-Use Services in ArcMap

Use Find Route button on the Tools toolbar in ArcMap
Using the Route service from Map Viewer

Use Directions in Map Viewer

Use Connect Origins to Destinations analysis tool in Map Viewer
Directions with custom travel modes

Find best route for a truck that requires 5 meter clearance
Closest Facility service

• Find the closest facilities from each incident
• Generate routes and driving directions
• You can also...
  - Use live traffic conditions
  - Limit the search distance
  - Limit the number of facilities to find
  - Travel from the facility to the incident
Using the Closest Facility service

Use Closest Facility analysis layer in ArcGIS Pro

Use Find Nearest analysis tool in Map Viewer

Use FindClosestFacilities geoprocessing tool from Ready-to-Use Services in ArcMap
Service Areas (Drive Times) service

- Find the area you can reach from a location in a given time period

- You can also…
  - Solve for many locations
  - Use multiple drive time values
  - Analyze for different times of the day
  - Specify the direction of travel
Using the Service Areas service

Use Service Area analysis layer in ArcGIS Pro

Use GenerateServiceAreas geoprocessing tool from Ready-to-Use Services in ArcMap

Use Create Drive Time Areas, Summarize Nearby or Enrich Layer analysis tools in Map Viewer
Determine accessibility to health centers

Use Service Area analysis to count the number of health centers within certain drive times.
Vehicle Routing Problem (Fleet Routing) service

• Route a fleet of vehicles to service a set of orders

• You can also specify…
  - Vehicle capacities
  - Driver specialties
  - Work breaks
  - Time windows on orders
Using the Vehicle Routing Problem service

Use Solve Vehicle Routing Problem Ready-To-Use tool in ArcGIS Pro

Use SolveVehicleRoutingProblem geoprocessing tool from Ready-to-Use Services in ArcMap
Using the Vehicle Routing Problem service

Use Plan Routes analysis tool in Map Viewer

Download and use the free Route Planner developer sample
Origin Destination Cost Matrix service

• Generates a table containing travel times and travel distances between all origins and all destinations.

• You can also…
  - Specify a cutoff
  - Limit the number of destinations to find
  - Analyze for different times of the day
Using the Origin Destination Cost Matrix service

Use Origin-Destination Cost Matrix analysis layer in ArcGIS Pro

Use GenerateOriginDestinationCostMatrix geoprocessing tool from Ready-to-Use Services in ArcMap

*No analysis tool currently available in Map Viewer*
Location-Allocation service

- 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

Network Analysis with ArcGIS Online
Using the Location-Allocation service

Use Location-Allocation analysis layer in ArcGIS Pro

Use SolveLocationAllocation geoprocessing tool from Ready-to-Use Services in ArcMap

Use Choose Best Facilities analysis tool in Map Viewer
Site Flu Clinics

Use Choose Best Facilities tool to site mobile health clinics for providing immunizations
## Summary - Network Analysis Services

<table>
<thead>
<tr>
<th></th>
<th>Route</th>
<th>Closest Facility</th>
<th>Service Area</th>
<th>Vehicle Route</th>
<th>Location Allocation</th>
<th>OD Cost Matrix</th>
<th>Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ArcGIS Online Map Viewer</strong></td>
<td><img src="" alt="Arrows" /> Connect Origins to Destinations</td>
<td><img src="" alt="Distance" /> Find Nearest</td>
<td><img src="" alt="Timeline" /> Create Drive-Time Areas</td>
<td><img src="" alt="Map" /> Plan Routes</td>
<td><img src="" alt="Facilities" /> Choose Best Facilities</td>
<td>Not Available</td>
<td><img src="" alt="Traffic" /></td>
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<td><strong>ArcGIS Pro</strong></td>
<td><img src="" alt="Directions" /></td>
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Managing credits
Service Credits

- Every successful request deducts credits from your organization
- How many service credits does network analysis services use?
  - **Credits explained**

<table>
<thead>
<tr>
<th>Network Analysis</th>
<th>Credits Used</th>
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</thead>
<tbody>
<tr>
<td>Simple Routes</td>
<td>0.04 credits per route</td>
</tr>
<tr>
<td>Optimized Routes</td>
<td>0.5 credits per optimized route</td>
</tr>
<tr>
<td>Drive Time (Service Areas)</td>
<td>0.5 credits per drive time</td>
</tr>
<tr>
<td>Closest Facilities</td>
<td>0.5 credits per closest facility route</td>
</tr>
<tr>
<td>Multi-Vehicle Routes (VRP)</td>
<td>1 credits per route</td>
</tr>
<tr>
<td>Location-Allocation</td>
<td>0.1 credit per allocated demand point</td>
</tr>
<tr>
<td>Origin Destination Cost Matrix</td>
<td>0.0005 credits per input origin and destination pair</td>
</tr>
<tr>
<td>Traffic</td>
<td>0 credits</td>
</tr>
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</table>
Monitor service credits used by your organization

- Reports can be accessed by the administrators in your ArcGIS Online organization
- Monitor usage by individual users
Credit Budgeting and Allocation

- Control the amount of credits that can be used by a user
Network Analysis privilege

- Control which users can run network analysis services using custom roles and the network analysis privilege.
Support and Resources

- **Developers**: [https://developers.arcgis.com/features/directions](https://developers.arcgis.com/features/directions)
<table>
<thead>
<tr>
<th>Time</th>
<th>Tuesday July 10</th>
<th>Wednesday July 11</th>
<th>Thursday July 12</th>
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<td>8A</td>
<td>Network Analyst: Creating Network Datasets - Room 30 C</td>
<td>Network Analyst: Solving Large Transportation Analysis Problems - Room 29 D</td>
<td>Public Transit Data: Spatial and Network Analysis - Room 07 A/B</td>
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<td>StreetMap Premium: Adding Custom Roads - Room 16 A</td>
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<td>Building Routing Applications with ArcGIS Online or ArcGIS Enterprise - Demo Theater 10</td>
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<td>11A</td>
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<td>Navigator for ArcGIS: Connecting to Preplanned Routes - Demo Theater 05</td>
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<td>GeoAI Deep Dive: Implementing Machine Learning Solutions with ArcGIS - Room 05 B</td>
<td>Navigator for ArcGIS: Connecting to Preplanned Routes - Demo Theater 09</td>
<td>Navigator for ArcGIS: Connecting to Preplanned Routes - Demo Theater 05</td>
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<td>2P</td>
<td>ArcGIS API for Python Integrating Machine Learning and Deep Learning - Demo Theater 08</td>
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<td>Network Analyst: An Introduction - Room 30 C</td>
<td>Network Analyst: Creating Network Datasets - Room 33 C</td>
<td>Network Analyst: Automating Workflows with Geoprocessing - Room 31 A</td>
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Download the Esri Events app and find your event

Select the session you attended

Scroll down to find the feedback section

Complete answers and select “Submit”
http://esriurl.com/uc18nawago

Questions?