

Federal GIS Conference

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Network Analysis with ArcGIS Online

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Topics

- **Online versus on-premise network analysis services**
- **How to access online services**
- **How to use online services**
- **On-premise services**
- **When to use online and on-premise services**
- **Support and resources**

Types of Network Analysis Services

Online versus on-premise

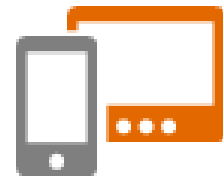
Desktop



Web



Device



Web GIS

Portal



Server



Online Content and Services

Online services

- Ready to use
- Published by Esri
- Run on Esri-administered cloud infrastructure



On-premise services

- Create with ArcGIS software
- Published by you
- Run on your IT infrastructure



What you need for on-premise services

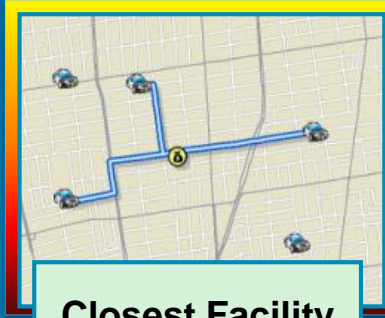
- ArcGIS software
- Hardware and IT infrastructure
- Staff
- Data modeled as a network dataset
- ~~ArcGIS Online subscription~~
- Analysis inputs
- Apps to consume services

What you need for online services

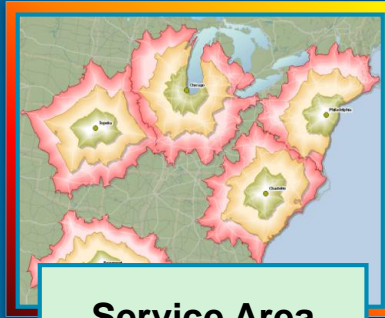
- ~~ArcGIS software~~
- ~~Hardware and IT infrastructure~~
- ~~Staff~~
- ~~Data modeled as a network dataset~~
- ArcGIS Online subscription
- Analysis inputs
- Apps to consume services



Route



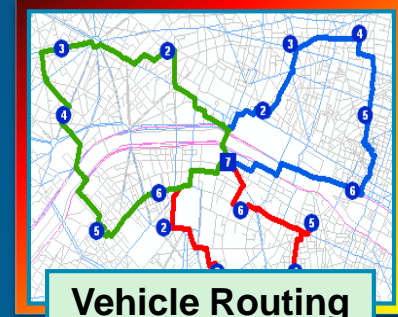
Closest Facility



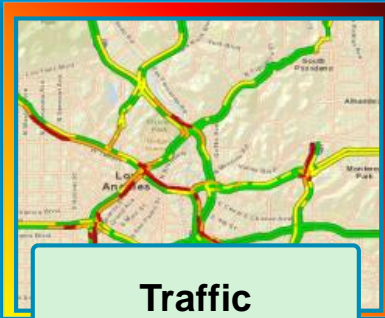
Service Area

Network Analysis Services

Solve transportation problems



Vehicle Routing Problem

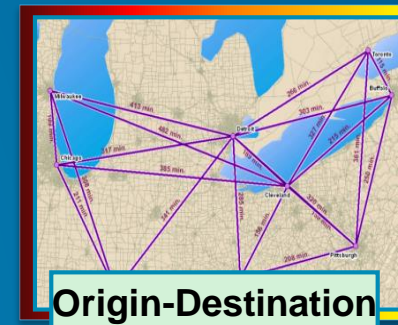


Traffic



Available in beta

Location-Allocation



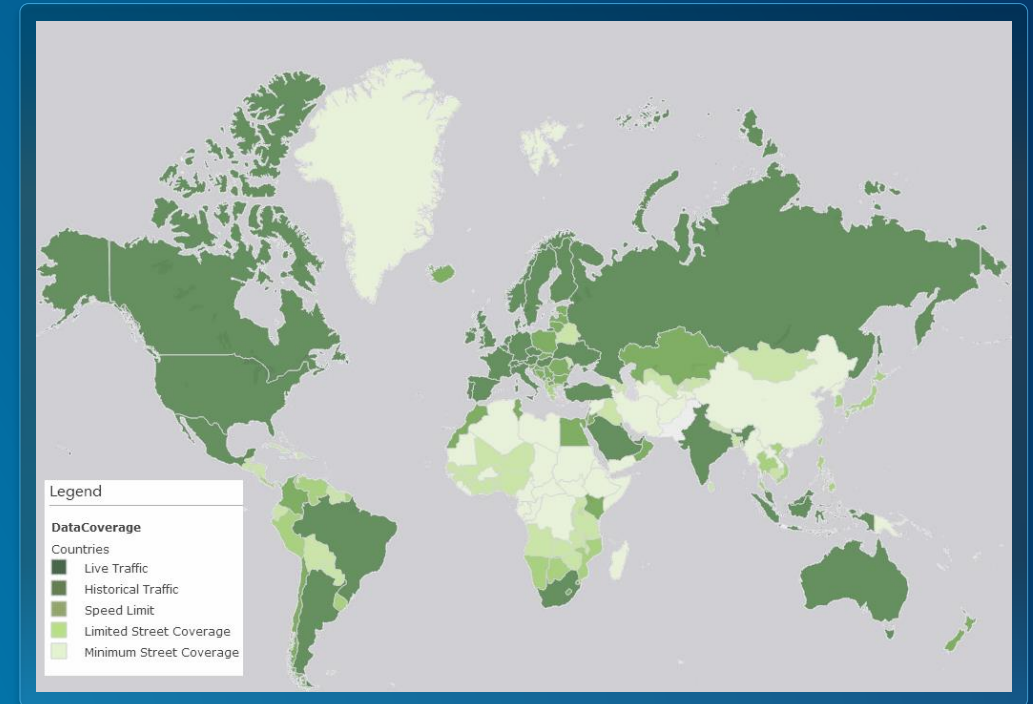
Origin-Destination Cost Matrix

Online services



Data coverage

- Work globally
 - Currently 238 countries
- Use high quality street data
 - Real time traffic where available
 - Weight, width, and height restrictions
 - Preferred truck routes
 - Avoid toll roads
- Driving, **Walking**, and **Trucking** mode



[View web map](#)

Accessing services

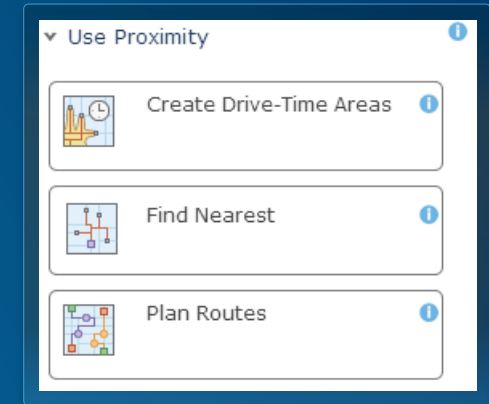
- All services are secured and require ArcGIS Online organization subscription
- Existing ArcGIS Desktop users get a free organization subscription
- Sign up for a 30 day free trial at www.arcgis.com



Using services

- **Out of the box clients**

- ArcGIS for Desktop
- ArcGIS.com map viewer



- **Some services supported in other ArcGIS apps**

- Collector for ArcGIS
- Operations Dashboard for ArcGIS
- Route Planner

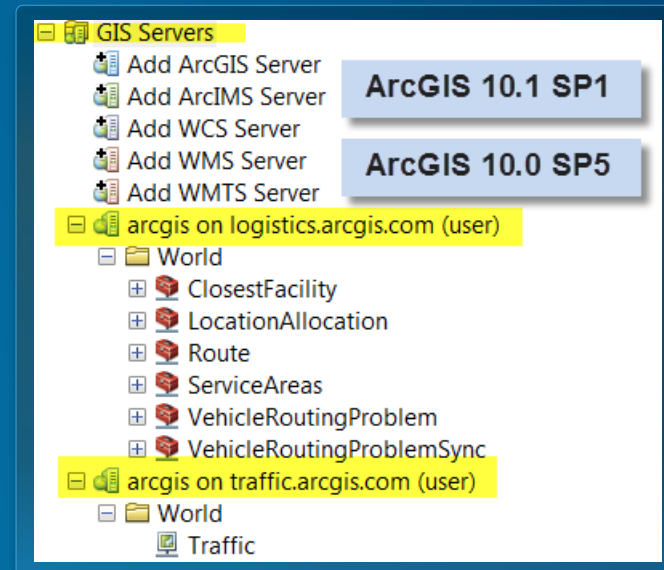
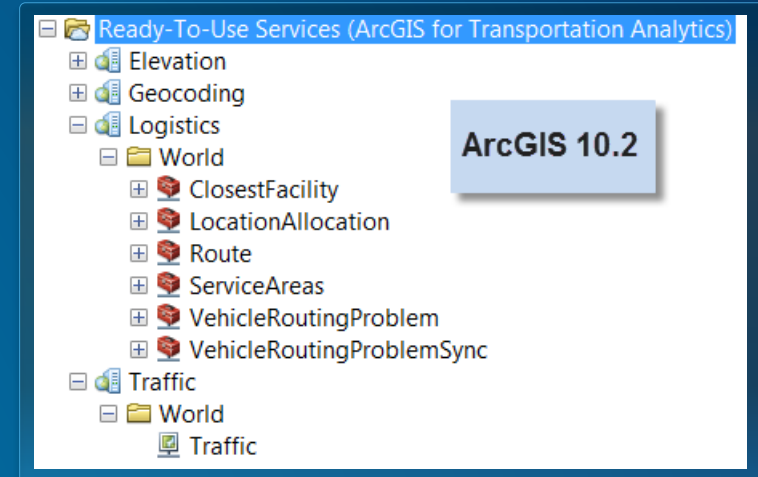


- **ArcGIS web and runtime SDKs**

- <http://developers.arcgis.com>

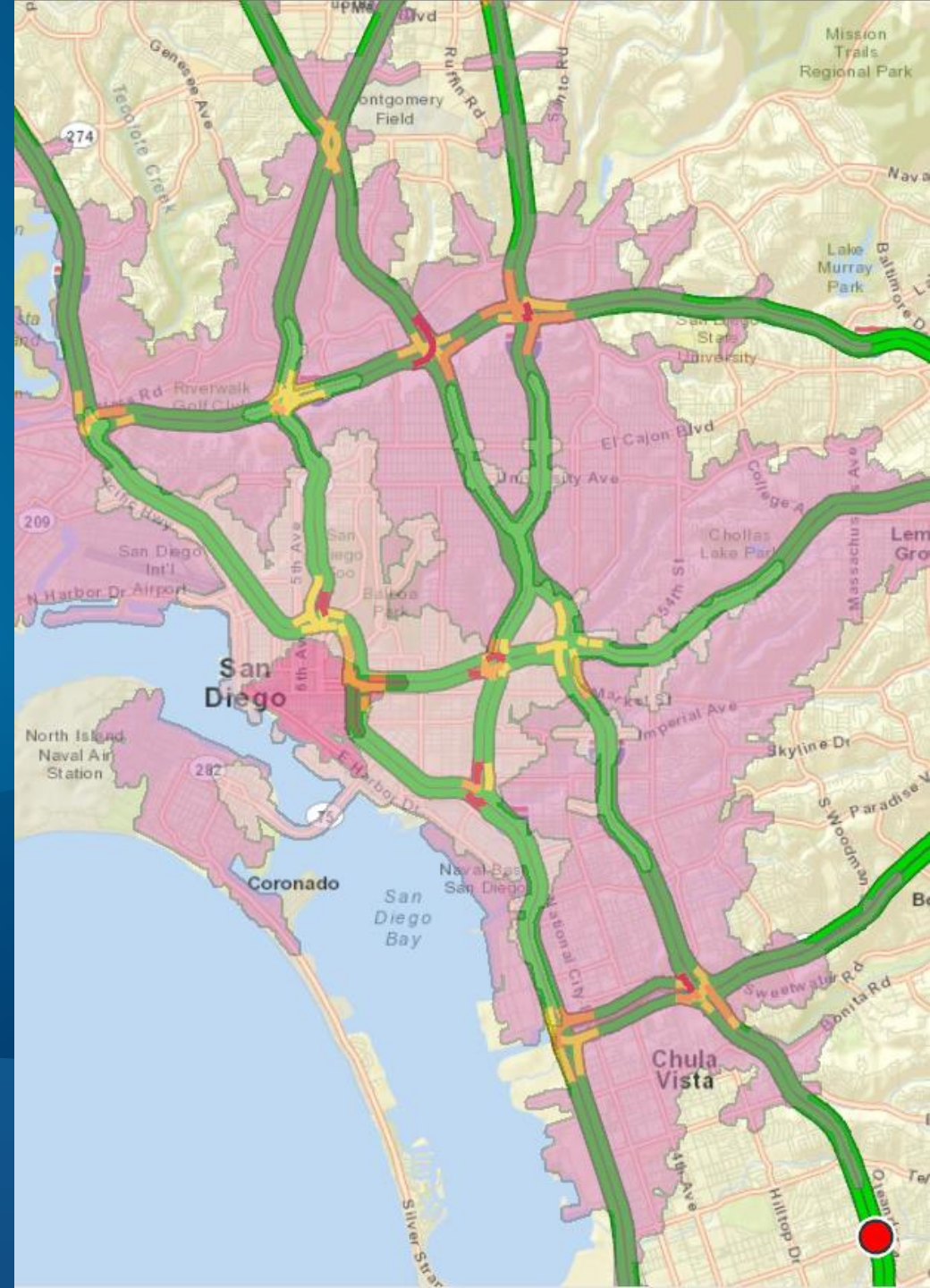
Using services with ArcGIS for Desktop

- Supported with ArcGIS for Desktop version
 - 10.0 SP5
 - 10.1 SP1 (**10.1 final is not supported**)
 - 10.2
- Single sign-on support with 10.2
- Need to create ArcGIS server connections with 10.1 SP1 and 10.0 SP5



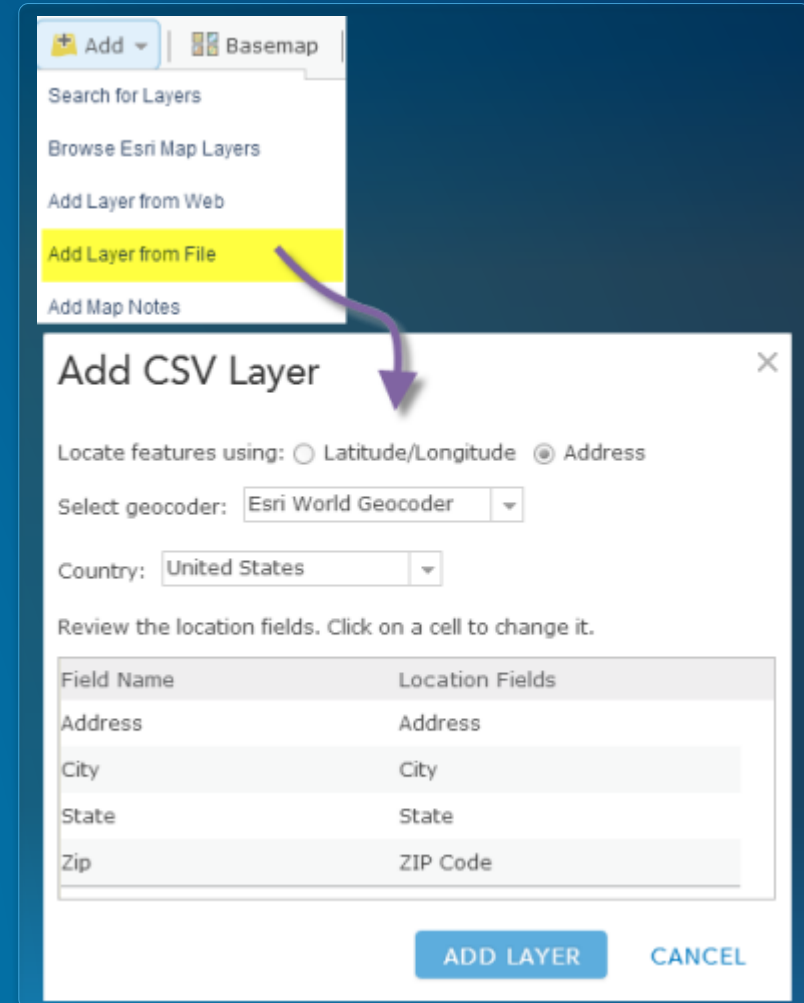
Demo

Connecting to online services in ArcGIS for Desktop



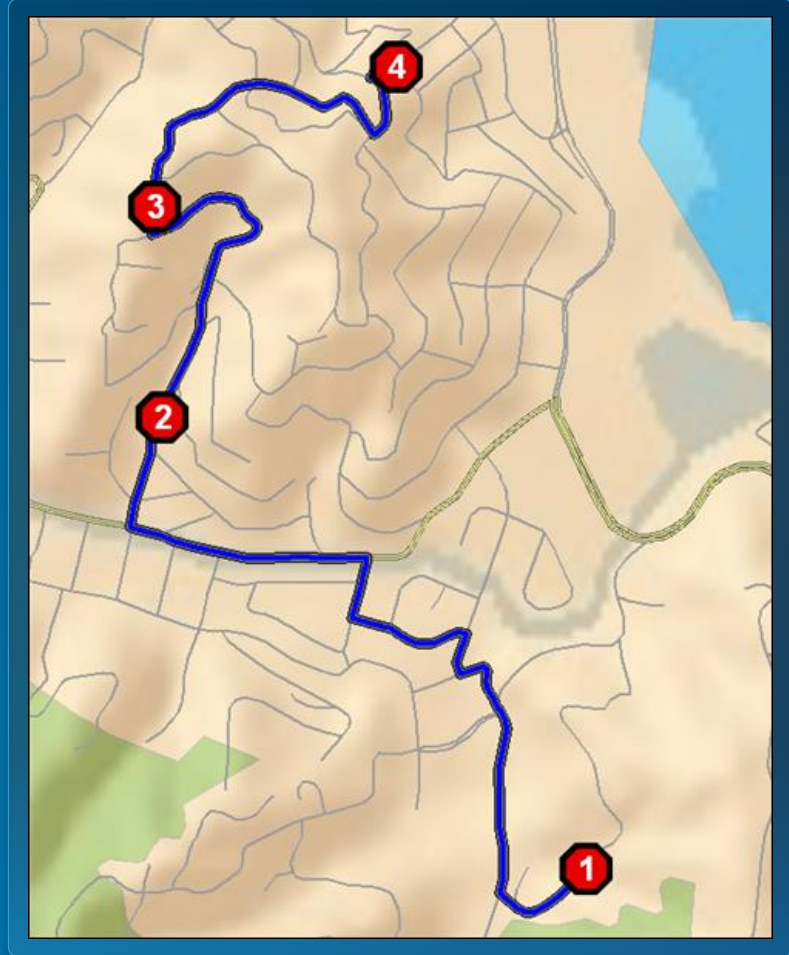
Using services with ArcGIS.com map viewer

- Need to add your inputs to ArcGIS Online
- Layers and data you can analyze
 - Feature service
 - Map service
 - Comma-separated values (CSV) file (.csv)
 - GPS exchange format file (.gpx)
 - Shapefile (.zip)
 - File Geodatabase (.zip)
 - GeoRSS
 - KML
 - Map notes
 - Route layers



Directions (Route) Service

- Point-to-point routing – Simple Route
- Find the best route for visiting a series of stops that minimizes travel time or travel distance – Optimized route
- Use live traffic conditions
- Driving directions in many languages



Demo

Mileage summary by state

Find best route and determine the miles covered by the route in each state



Summarize Within



For Features within **StateBoundaries - states**

1. Choose layer to summarize i

Los Angeles International Air... ▼

2. Add statistics from **Los Angeles International Airport - Chicago O'Hare International Airport_Route** i

Length of lines in Miles ▼

Field ▼

Statistic ▼

3. Choose field to group by (optional) i

Field ▼

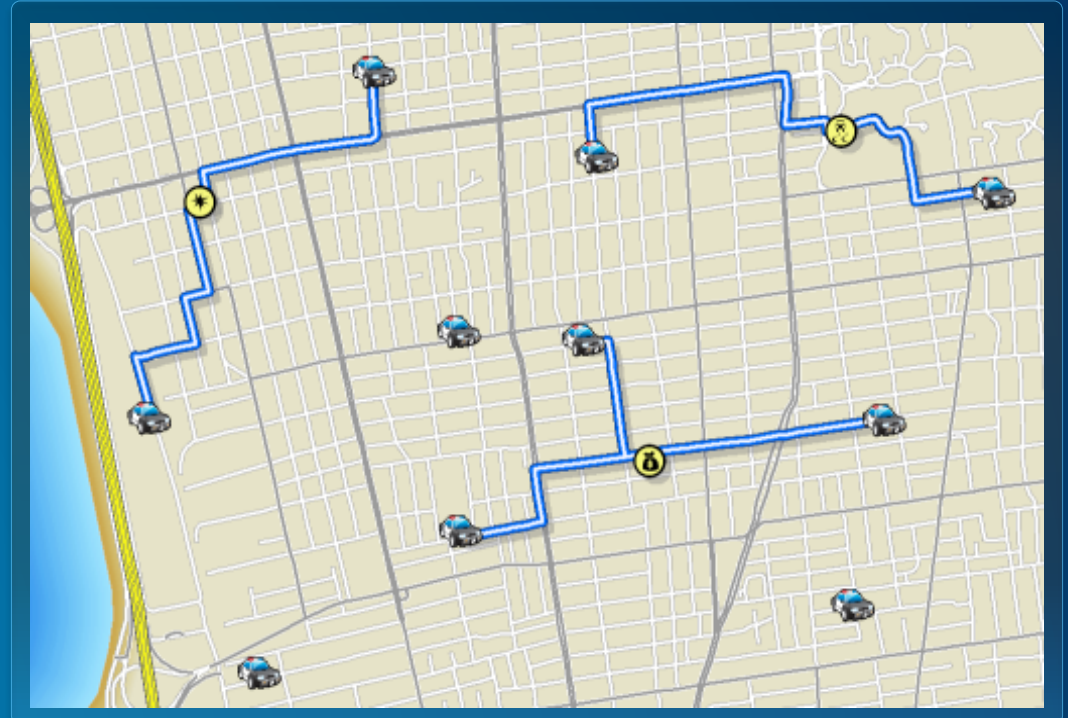
4. Result layer name i

Route Mileage by State

Save result in dmandloi ▼

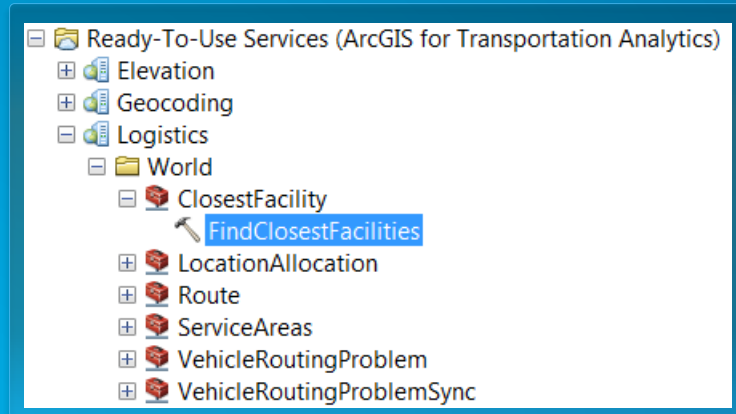
Closest Facility service

- 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 Closest Facility service

- Use Find Nearest analysis tool in ArcGIS.com map viewer
- Use FindClosestFacilities geoprocessing tool from Ready-to-Use Services



A screenshot of the "Find Nearest" tool interface in ArcGIS.com. The interface is titled "Find Nearest" and includes a help icon and a back arrow. The main instruction reads: "For each location in **Current Location_Points**, find its nearest locations."

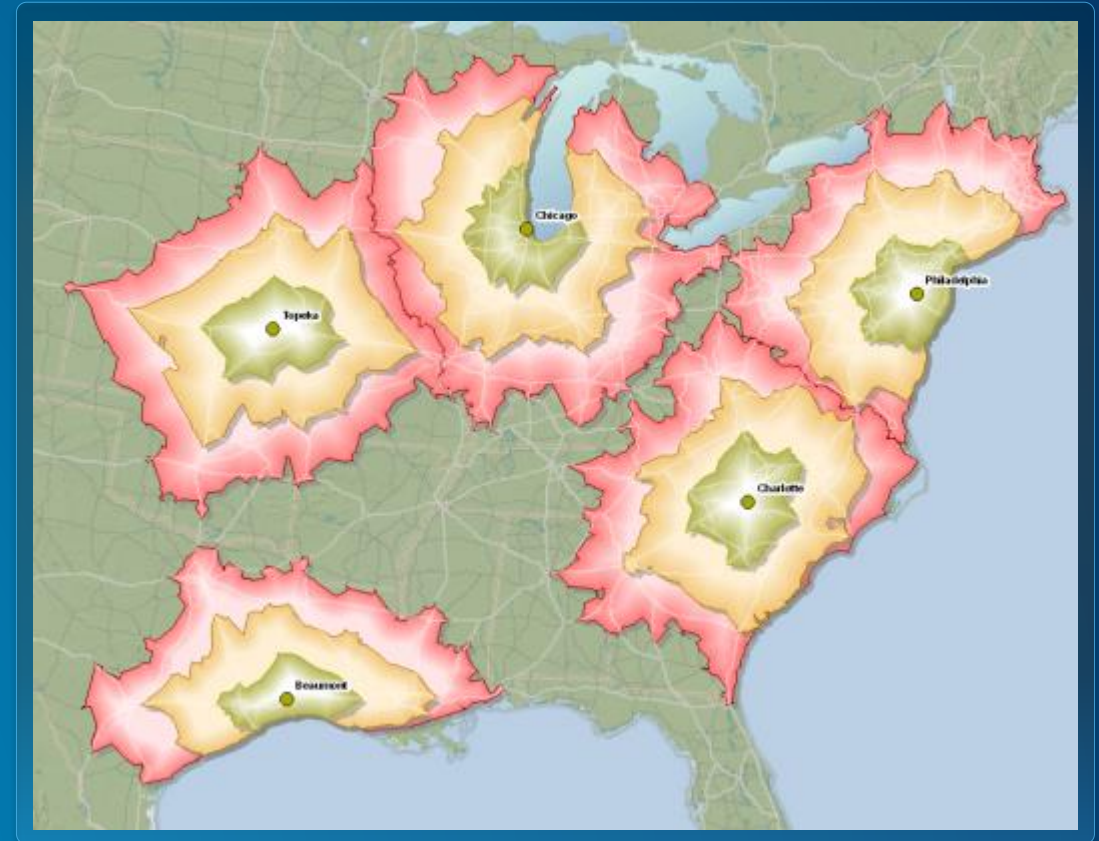
The tool is configured with the following settings:

- 1. Find the nearest locations in:** A dropdown menu set to "customers".
- 2. Measure:** Three radio buttons are present: "Line distance", "Driving Distance", and "Driving Time". "Driving Time" is selected.
- Use traffic:** A sub-section with "Live traffic" selected and a time slider ranging from "Now" to "+12 hr".
- Traffic based on typical conditions for:** A dropdown menu set to "Monday" and a time dropdown set to "12:00 PM". A link "See availability." is visible below.
- 3. For each location in **Current Location_Points****
 - Limit the number of nearest locations to:** A spinner box set to "1".
 - Limit the search range to:** Input boxes for "1" hr, "0" min, and "0" sec.
- 4. Result layer name:** A text box containing "Nearest customers to Current Location_Points".
- Save result in:** A dropdown menu set to "dmandloi".
- Use current map extent** (with a "Show credits" link).

A blue "RUN ANALYSIS" button is located at the bottom of the interface.

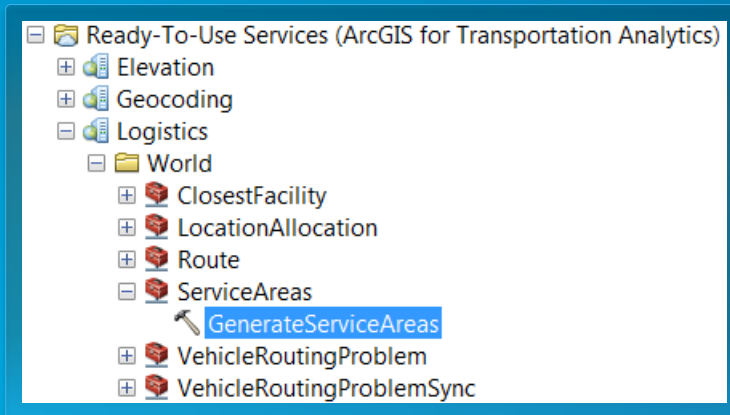
Service Areas (Drive Times) service

- 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 Service Areas service

- Use Create Drive Time Areas, Summarize Nearby or Enrich Layer analysis tool in ArcGIS.com map viewer
- Use GenerateServiceAreas geoprocessing tool from Ready-to-Use Services



A screenshot of the 'Create Drive-Time Areas' tool configuration interface. The title is 'Create Drive-Time Areas'. Below the title, it says 'Create areas around customers'. The configuration is divided into three sections:

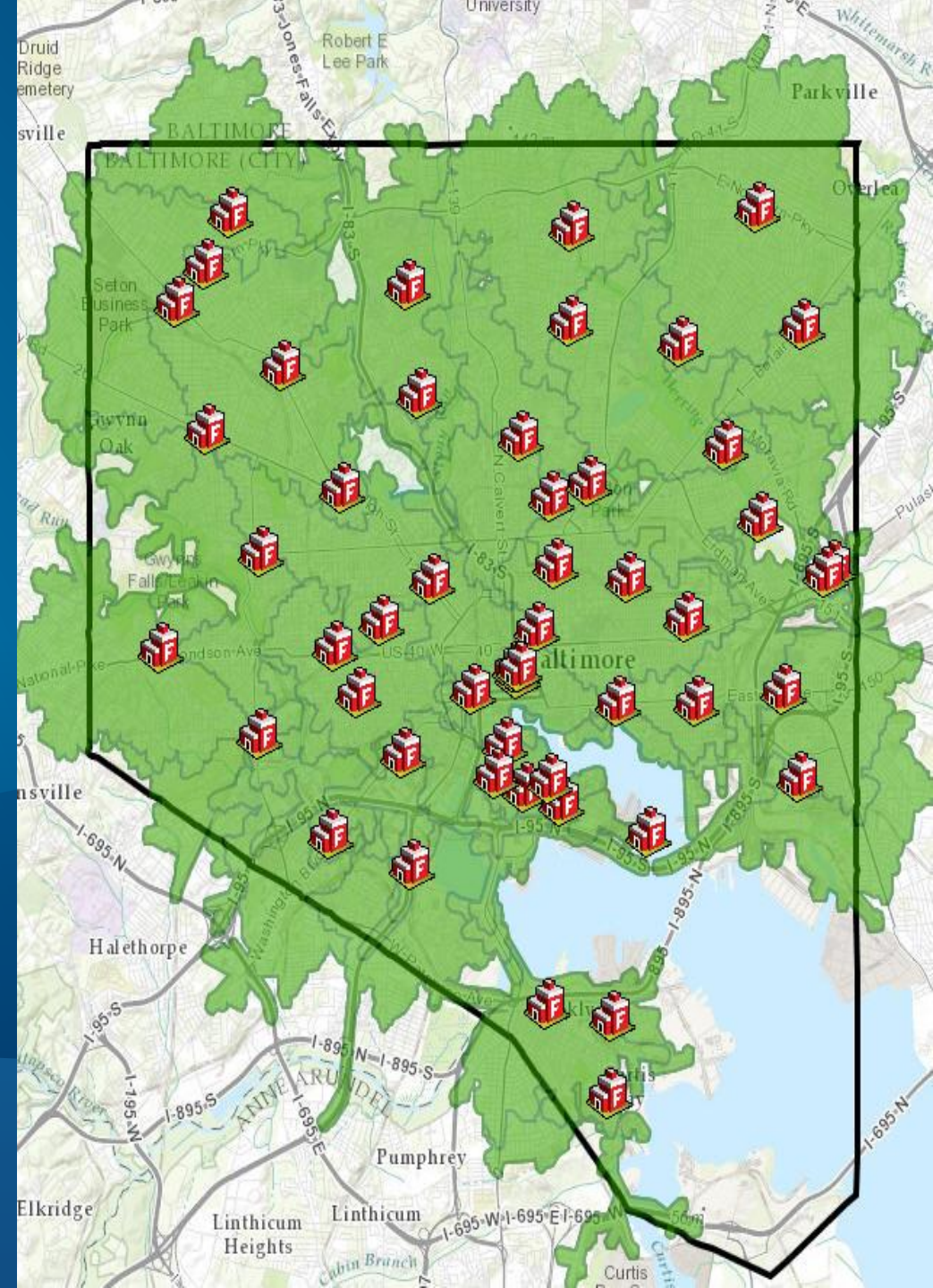
- 1. Measure**: Includes a dropdown menu for 'Driving Time', a text input field containing '5 10 15', and a dropdown menu for 'Minutes'. A note states: 'To output multiple areas for each point, type sizes separated by spaces (2 3.5 5)'. There are checkboxes for 'Use traffic' (unchecked) and 'Live traffic' (checked). A time slider is set to 'Now' with markers at +3, +6, +9, and +12 hr. There is also an option for 'Traffic based on typical conditions for' with a dropdown for 'Monday' and a time dropdown for '12:00 PM'. A link 'See availability.' is present.
- 2. Areas from different points**: Includes three icons for 'Overlap', 'Dissolve', and 'Split'.
- 3. Result layer name**: Includes a text input field containing 'Drive from customers (5 10 15 Minutes)' and a dropdown menu for 'Save result in' set to 'dmandloi'.

At the bottom, there is a checked checkbox for 'Use current map extent' and a 'Show credits' link. A large blue button labeled 'RUN ANALYSIS' is at the bottom right.

Demo

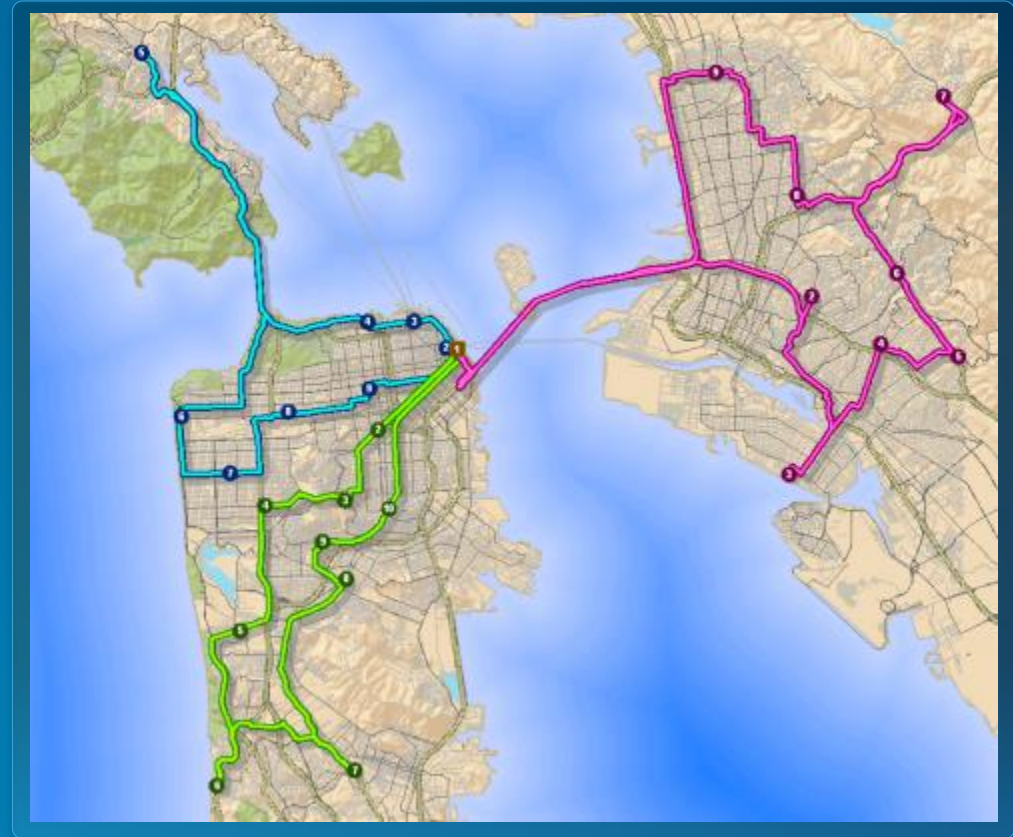
Service Area Analysis

Determine where emergency vehicles can reach in 4 minutes



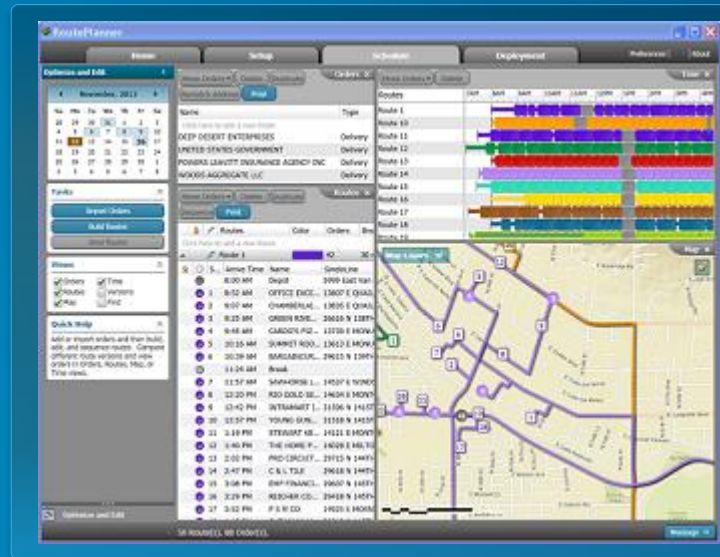
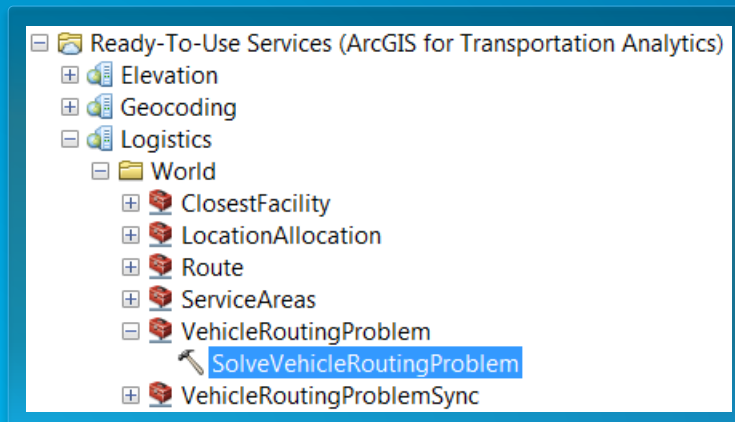
Vehicle Routing Problem (Fleet Routing) service

- 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 Vehicle Routing Problem service

- Use Plan Routes analysis tool in ArcGIS.com map viewer
- Download the free [Route Planner application](#)
- Use SolveVehicleRoutingProblem geoprocessing tool from Ready-to-Use Services



Plan Routes

Route vehicles to stop in **customers**

- Routes begin at
 - Add point to map
 - Start time for all routes: 7/14/2014 10:34 AM
- Routes end at
 - Return to start
 - Add point to map
- Maximum number of vehicles to route: 3 Vehicles
- Maximum number of stops per vehicle: 10 Stops
 - Your layer has 49 stops. The current map extent shows 48 stops.
- Time spent at each stop: 30 min 0 sec
- Limit the total route time per vehicle: 8 hr 0 min
- Result layer name: Routes to customers
 - Save result in: dmandloi

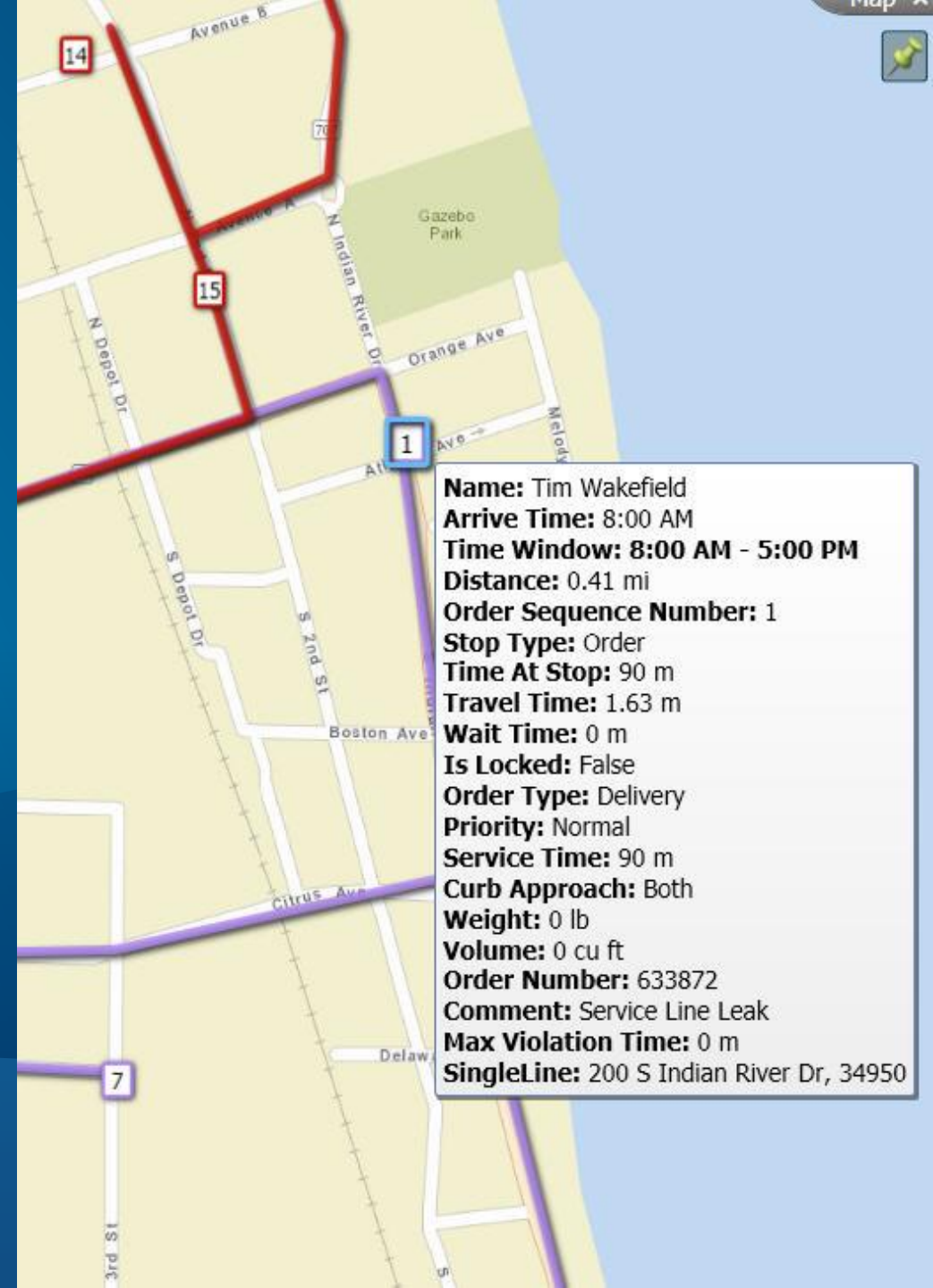
Use current map extent [Show credits](#)

RUN ANALYSIS

Demo

Schedule Field Work

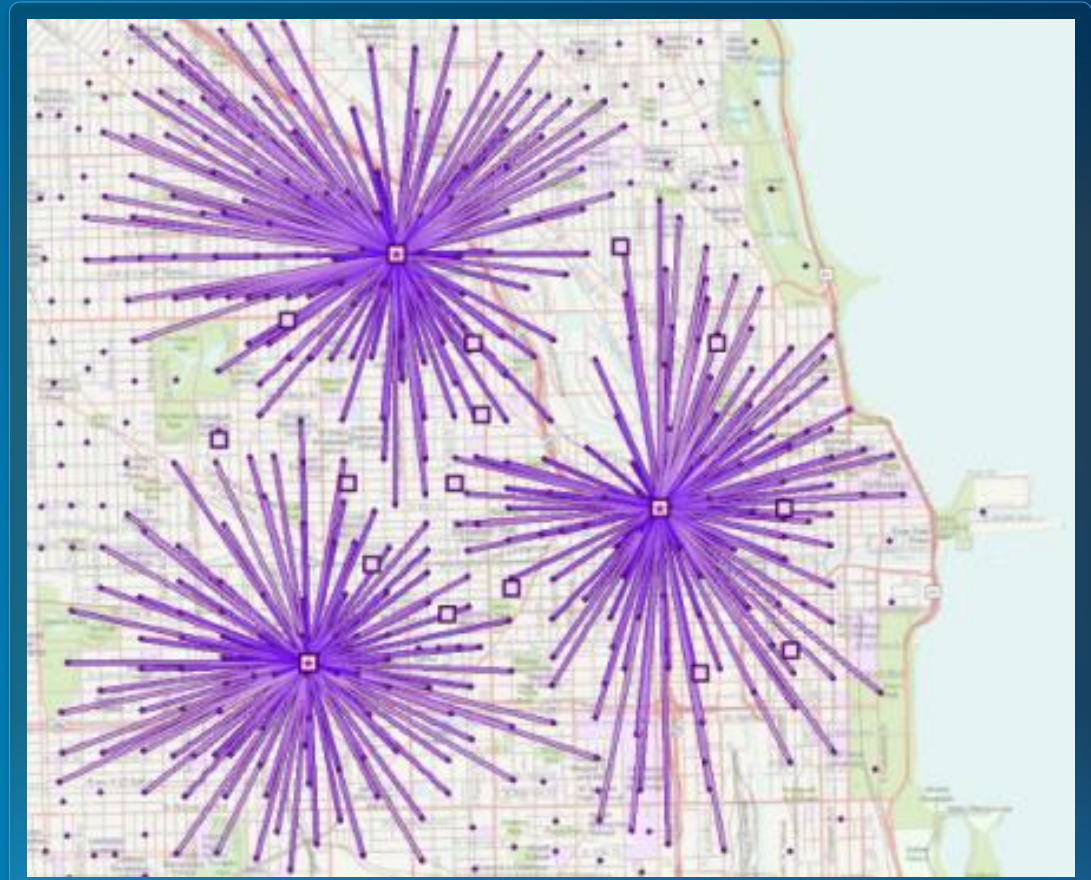
Workorders using a fleet of vehicles



Name: Tim Wakefield
Arrive Time: 8:00 AM
Time Window: 8:00 AM - 5:00 PM
Distance: 0.41 mi
Order Sequence Number: 1
Stop Type: Order
Time At Stop: 90 m
Travel Time: 1.63 m
Wait Time: 0 m
Is Locked: False
Order Type: Delivery
Priority: Normal
Service Time: 90 m
Curb Approach: Both
Weight: 0 lb
Volume: 0 cu ft
Order Number: 633872
Comment: Service Line Leak
Max Violation Time: 0 m
SingleLine: 200 S Indian River Dr, 34950

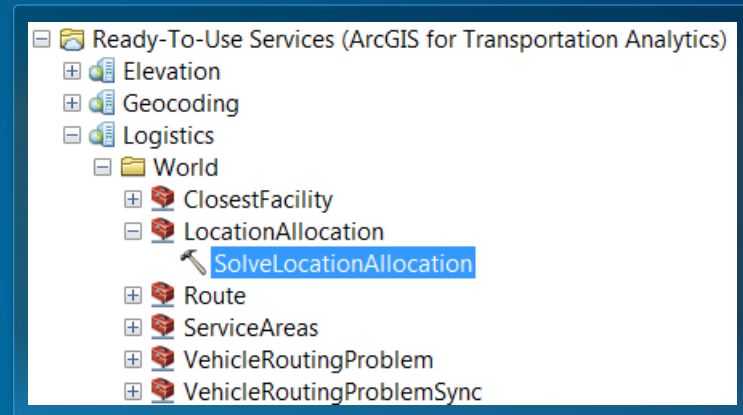
Location-Allocation service (beta)

- 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



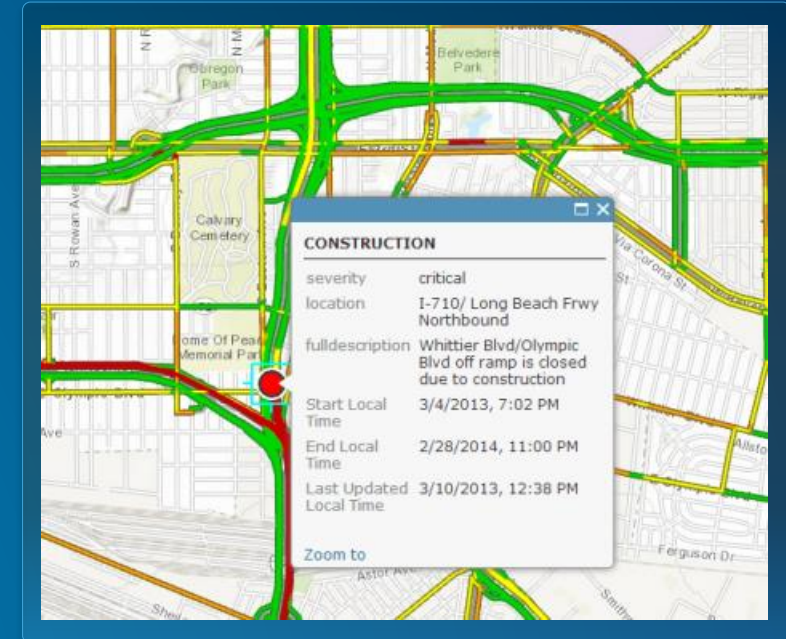
Using Location-Allocation service

- Currently not available as an analysis tool in ArcGIS.com map viewer
- Use `SolveLocationAllocation` geoprocessing tool from Ready-to-Use Services



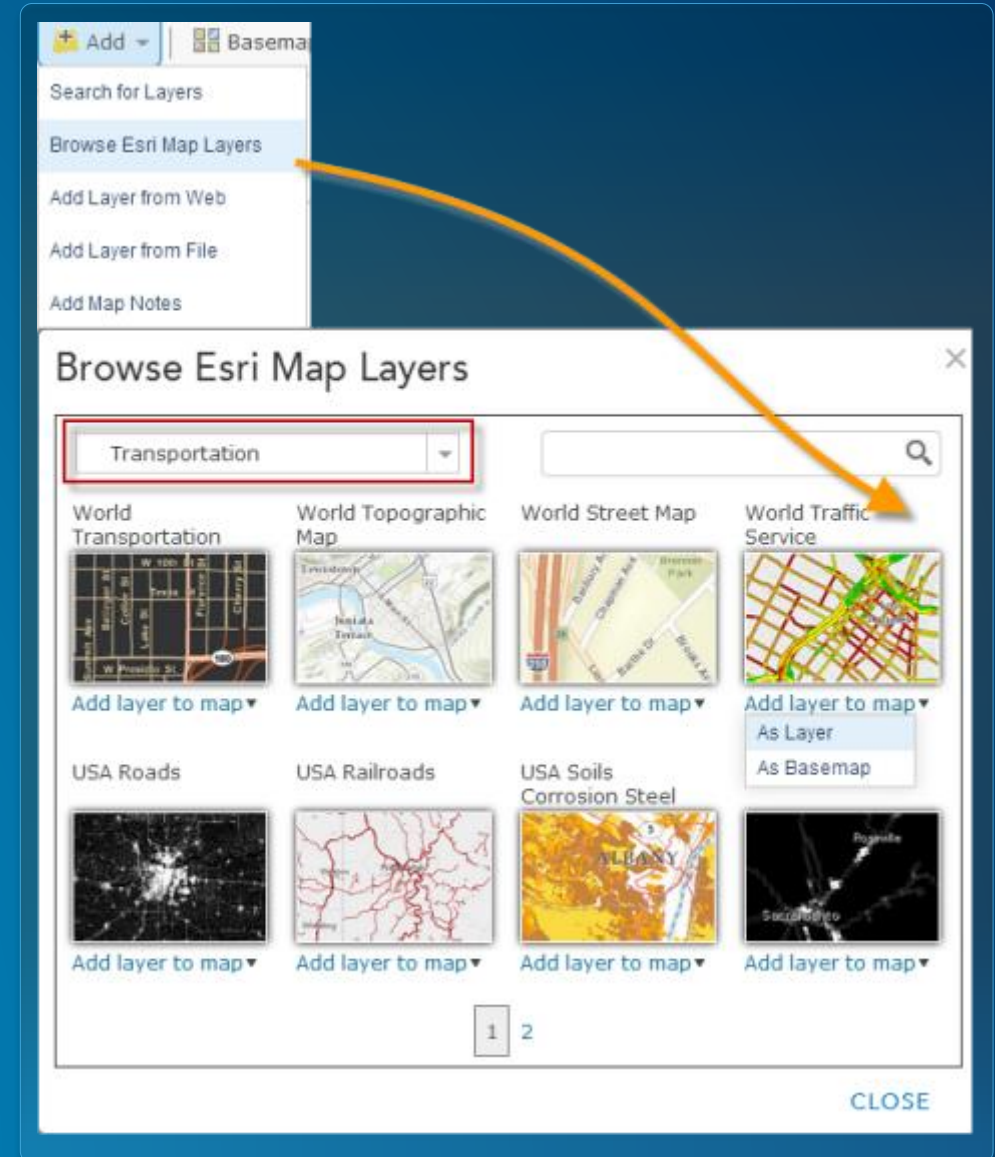
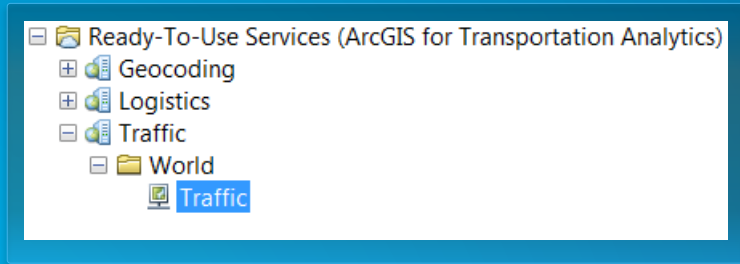
Traffic service

- 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

- Use the [World Traffic web map](#) or add Traffic layer to your own web map
- Use traffic map service in ArcGIS for Desktop



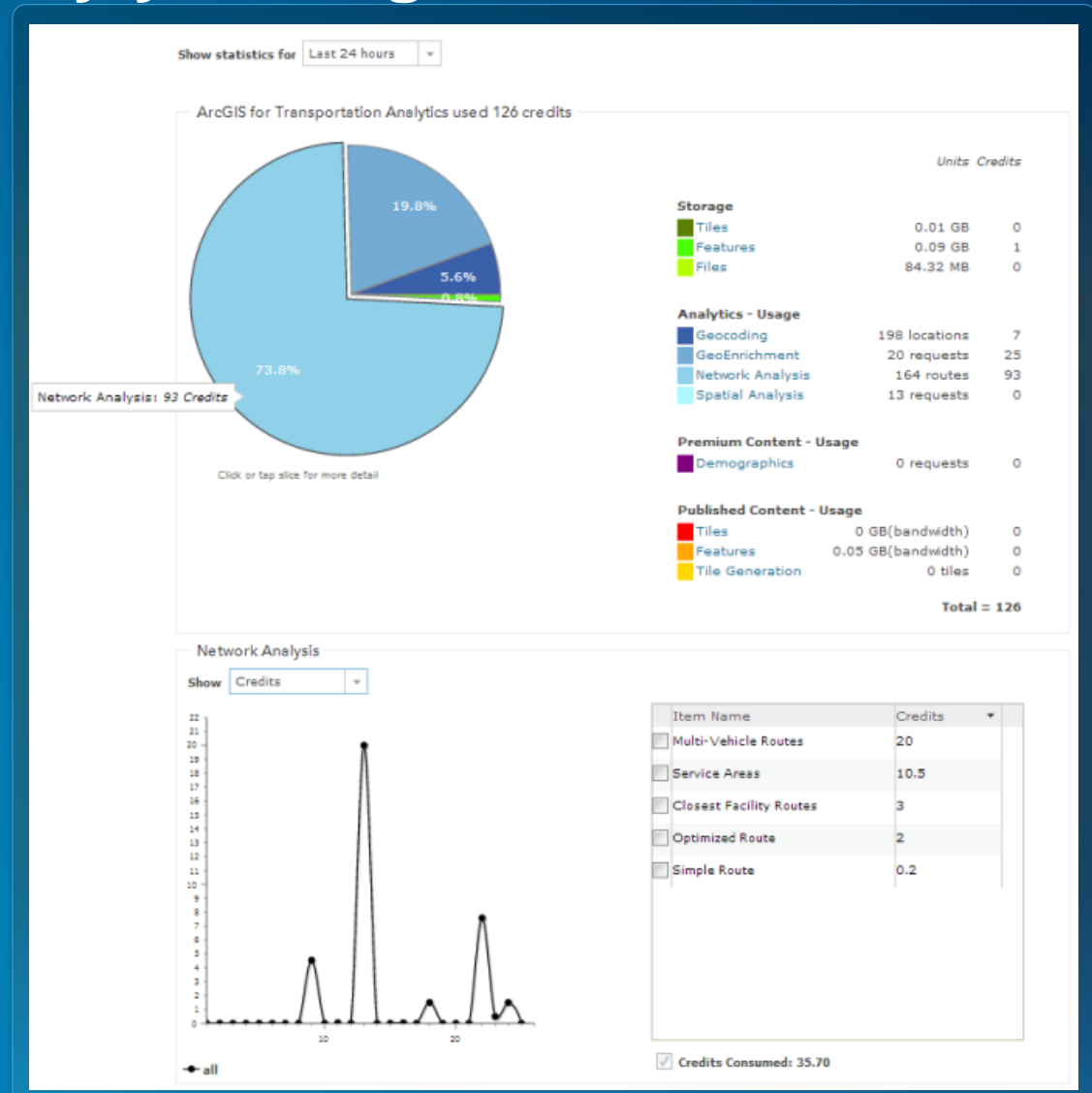
Understanding Your Bill – Service Credits

- Every successful request deducts credits from your organization
- How many service credits does network analysis use?
- Credits Explained
- Service Credits Estimator

Network Analysis	Credits Used
Simple Routes	0.04 credits per route
Optimized Routes	0.5 credits per optimized route
Drive Time (Service Areas)	0.5 credits per drive time
Closest Facilities	0.5 credits per closest facility route
Multi-Vehicle Routes(VRP)	1 credits per route
Location-Allocation (while in beta)	0 Credits
Traffic	0 credits

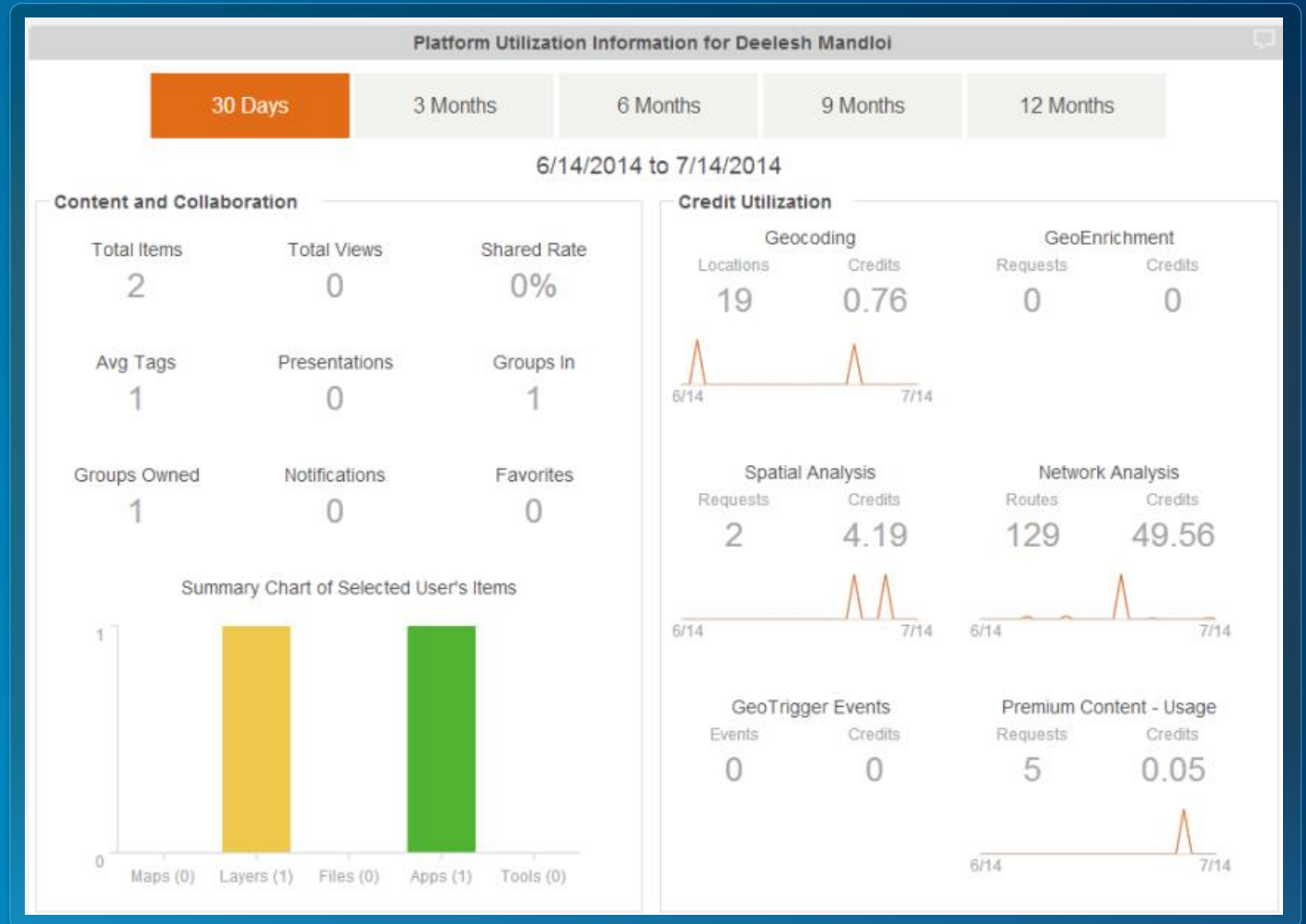
Monitor service credits used by your organization

- Reports can be accessed by the administrators in your ArcGIS Online organization



Monitor service credits used by named users in your organization

- Access user level credit usage reports using [Activity Dashboard for ArcGIS](#)



Online services in your own apps

Directions and Routing

The directions service allows you to generate routes between any number of places. Generate optimal routes to the nearest one of several places. Calculate areas accessible in a given amount of time.

Key Features

- Get directions from A to B
- Optimize routes to multiple locations
- Calculate how far you can drive in a given time period
- Determine the closest place from a set of places
- Optimize deliveries for vehicles and destinations

JavaScript

[Using Directions](#)
[Sample Code](#)
[API Reference](#)

iOS

[Tutorial](#)
[Sample Code](#)
[API Reference](#)

Android

[Tutorial](#)
[Sample Code](#)
[API Reference](#)

REST

[Directions](#)
[Service Areas](#)
[Nearest Facility](#)
[Fleet Routing](#)
[Traffic](#)

Building apps using network analysis services

- Use ArcGIS web APIs and runtime SDKs
- If using the JavaScript API
 - Use the directions widget
 - Use the analysis widgets
- <http://developers.arcgis.com>
- Additional samples at
 - <http://nadev.arcgis.com/arcgis/samples>

SDKs and APIs

Android

Flex

iOS

Java

JavaScript

Mac OS X

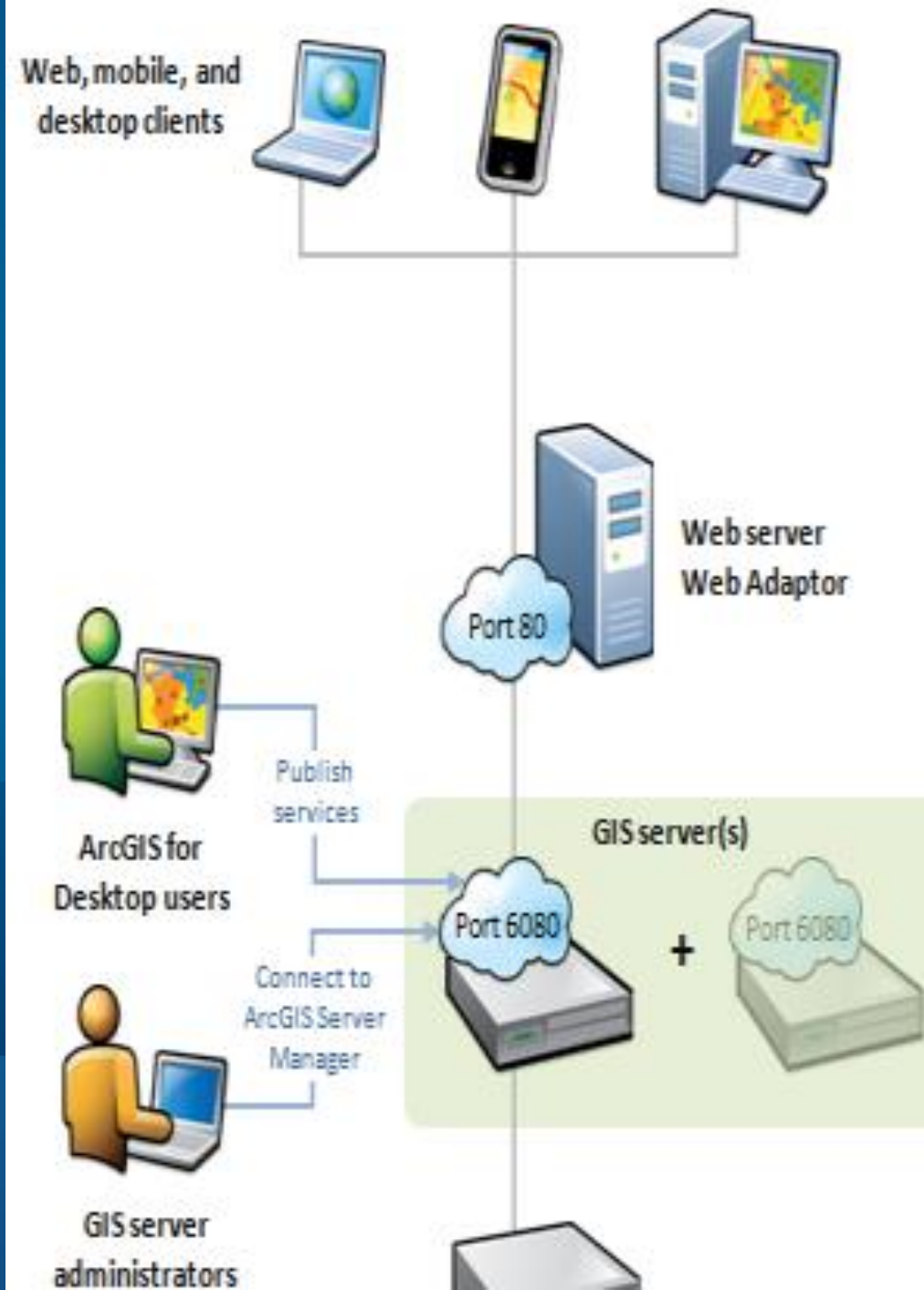
.Net

Qt

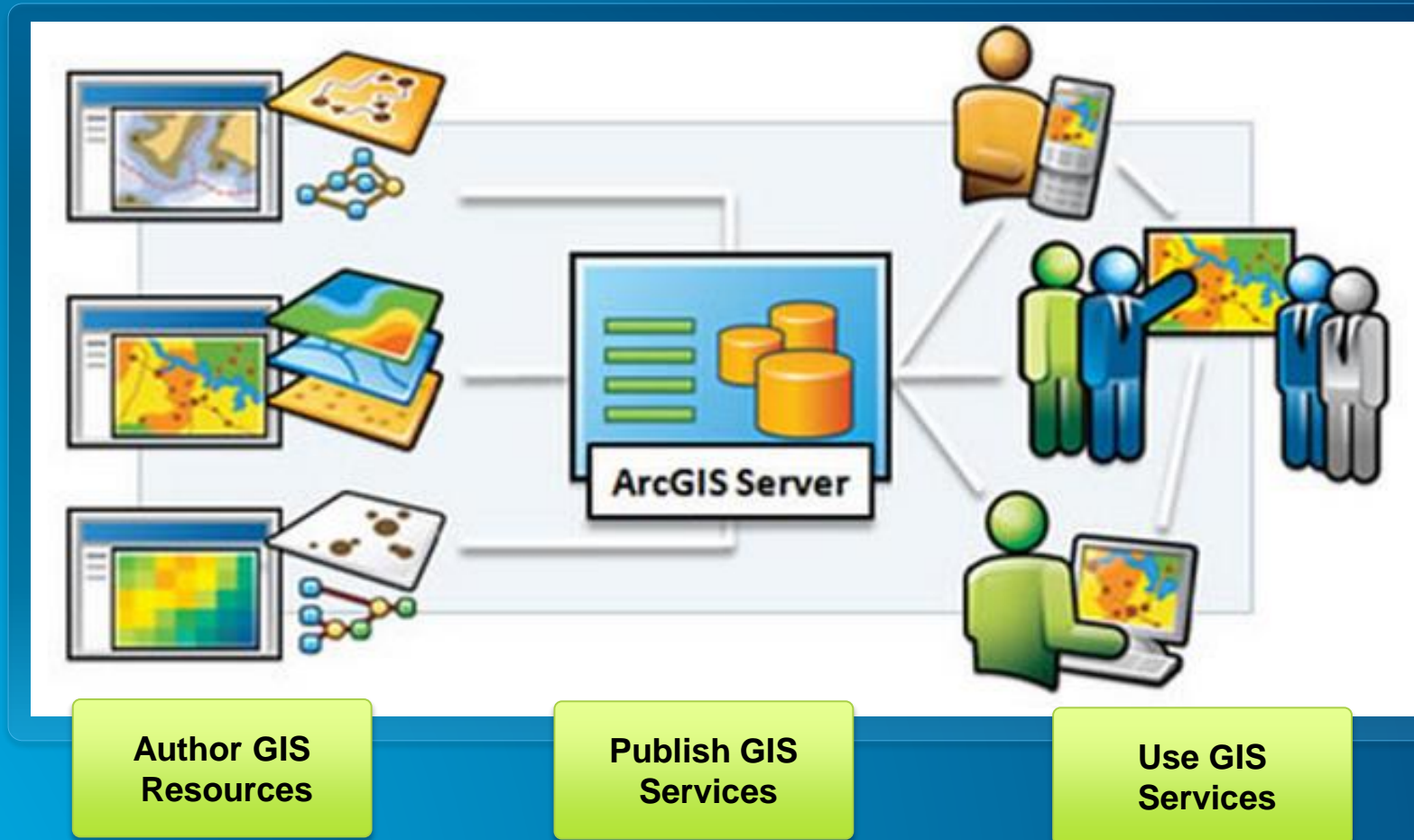
Silverlight

WPF

On-premise services



On-premise service workflow



Network analysis using on-premise services

ArcGIS for Server

```
graph TD; A[ArcGIS for Server] --> B[Geoprocessing Service]; A --> C[Network Analysis Service];
```

Geoprocessing Service

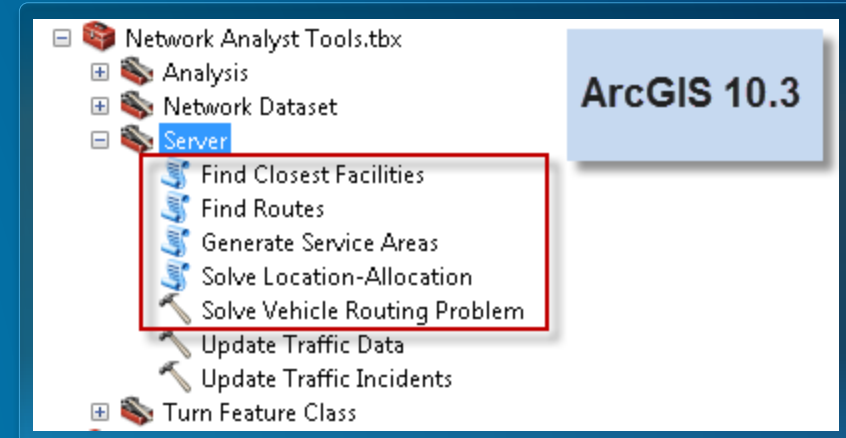
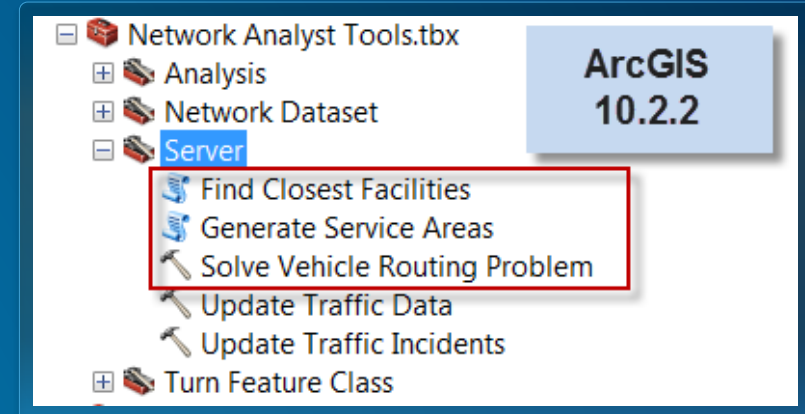
- A toolbox with geoprocessing tools
- Full use of the geoprocessing framework
- Synchronous and Asynchronous execution
- SOAP and REST endpoints for all solvers
- Out-of-the-box clients

Network Analysis Service

- Map document with network analysis layers
- Synchronous execution
- SOAP endpoints for all solvers
- REST endpoint for Route, Closest Facility, and Service Area solvers
- Few out-of-the-box clients

On-premise geoprocessing services

- Use the tools in the Server toolset within Network Analyst Tools toolbox to publish geoprocessing services that perform network analysis
- New tools to publish route and location-allocation geoprocessing services will be available in ArcGIS 10.3



On-premise services

- More details about authoring, publishing and using on-premise network analysis services are available in technical workshop titled **Performing Network Analysis with ArcGIS for Server** from 2012 user conference
 - [Workshop presentation](#)
 - [Workshop video](#)
- Applicable for ArcGIS for Server 10.1 and 10.2

Need to use on-premise services if

- **Perform analysis on the network dataset managed by you**
- **Overcome the problem size limits enforced by the online services**
- **You cannot connect to the internet due to your organizational policies**
- **You need to use other transportation modes such as transit**

Summary



Summary

- **Online services**

- Ready-to-use services provided by Esri
- Requires internet connection
- Requires ArcGIS Online subscription
- Cannot use your own street data

- **On-premise services**

- Requires hardware and ArcGIS software
- Have to use your own street data modeled as a network dataset

Resources



Support and Resources

- <http://logistics.arcgis.com>
- <http://route.arcgis.com>
- <http://traffic.arcgis.com>
- <http://developers.arcgis.com>
- [Sample applications](#)
- [ArcGIS Online services in the Network Analyst help](#)

Thank you...

- **Please fill out the session survey:**

Session: 75

Offering ID: 232

Thank you...

- **Please fill out the session survey:**

Session: 75

Offering ID: 233



Understanding our world.