



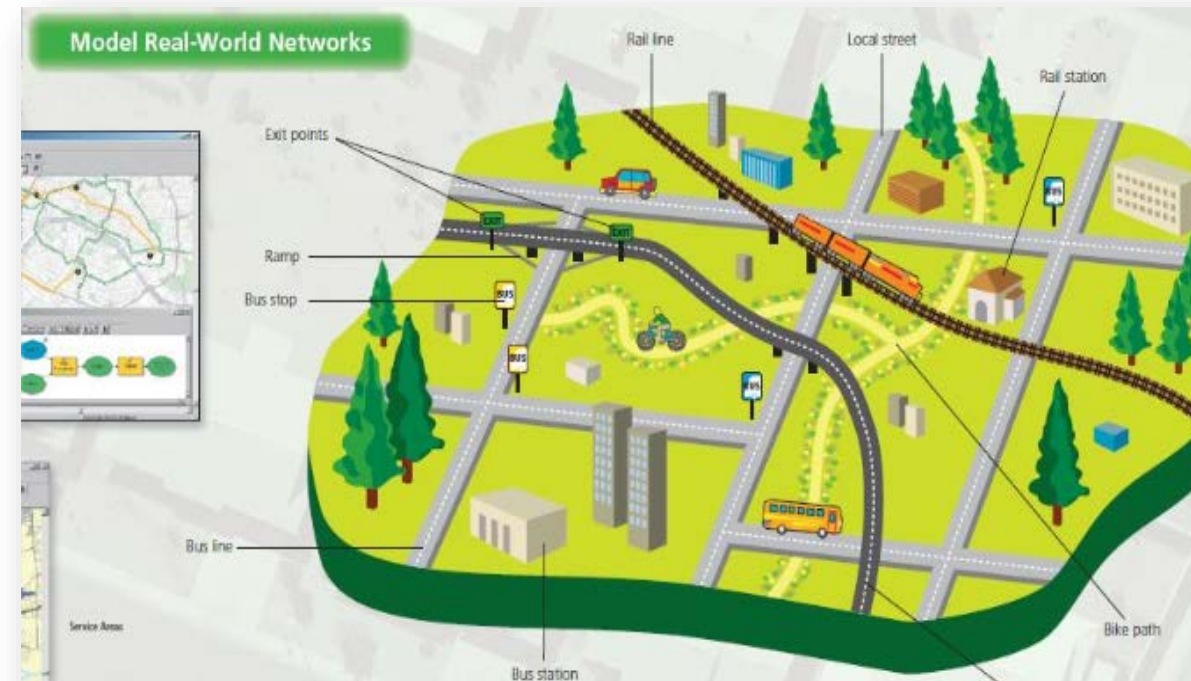
Introduction to Network Analysis

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Network Analysis

- Models transportation – flow along streets
- Topics covered:
 - Types of Analysis, Optimization
 - Software
 - Data
 - Street networks
- Optimized fleet & travel along streets
 - Better routes
 - Accurate coverage estimations
 - Better resource allocation

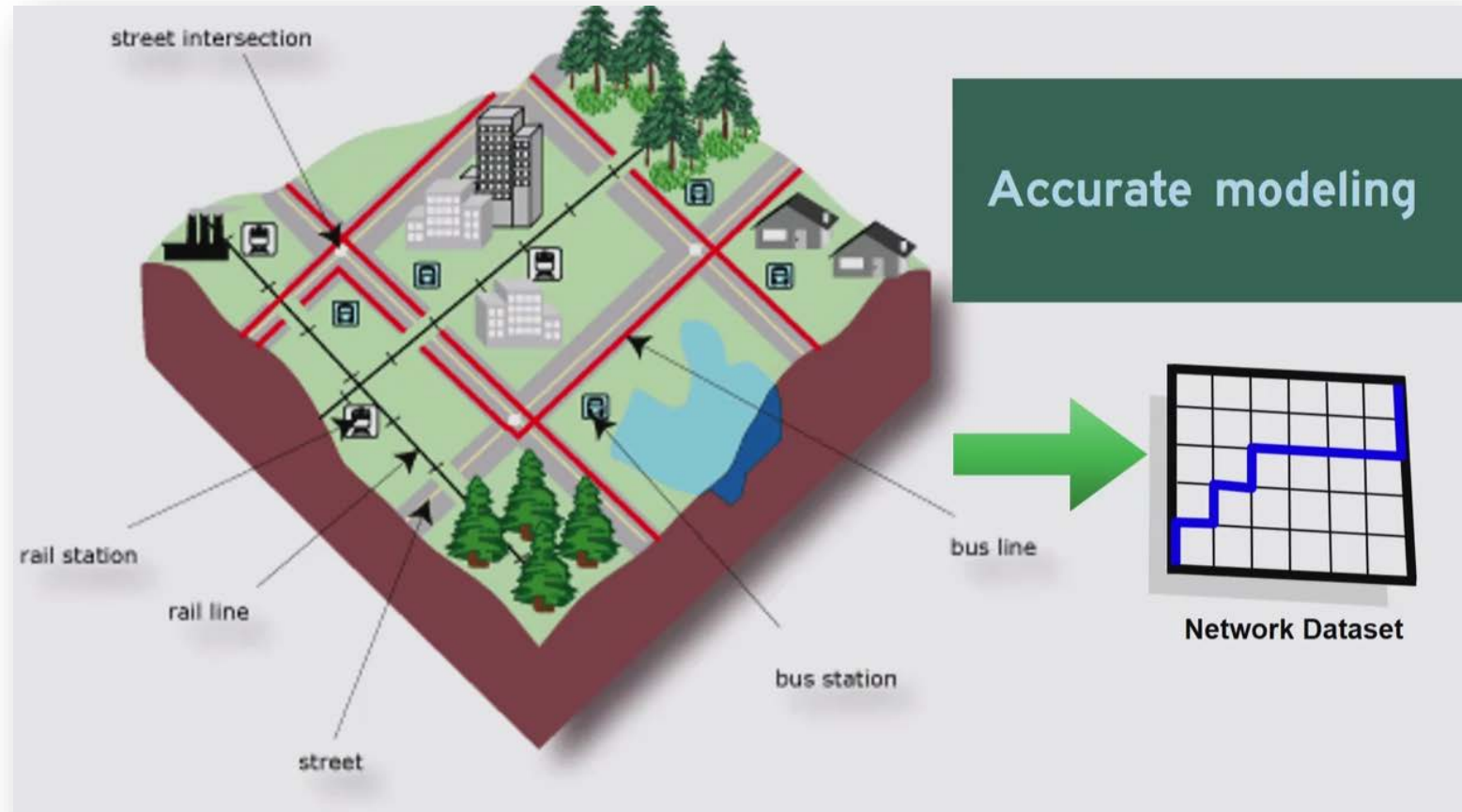


Network Datasets vs. Geometric Networks

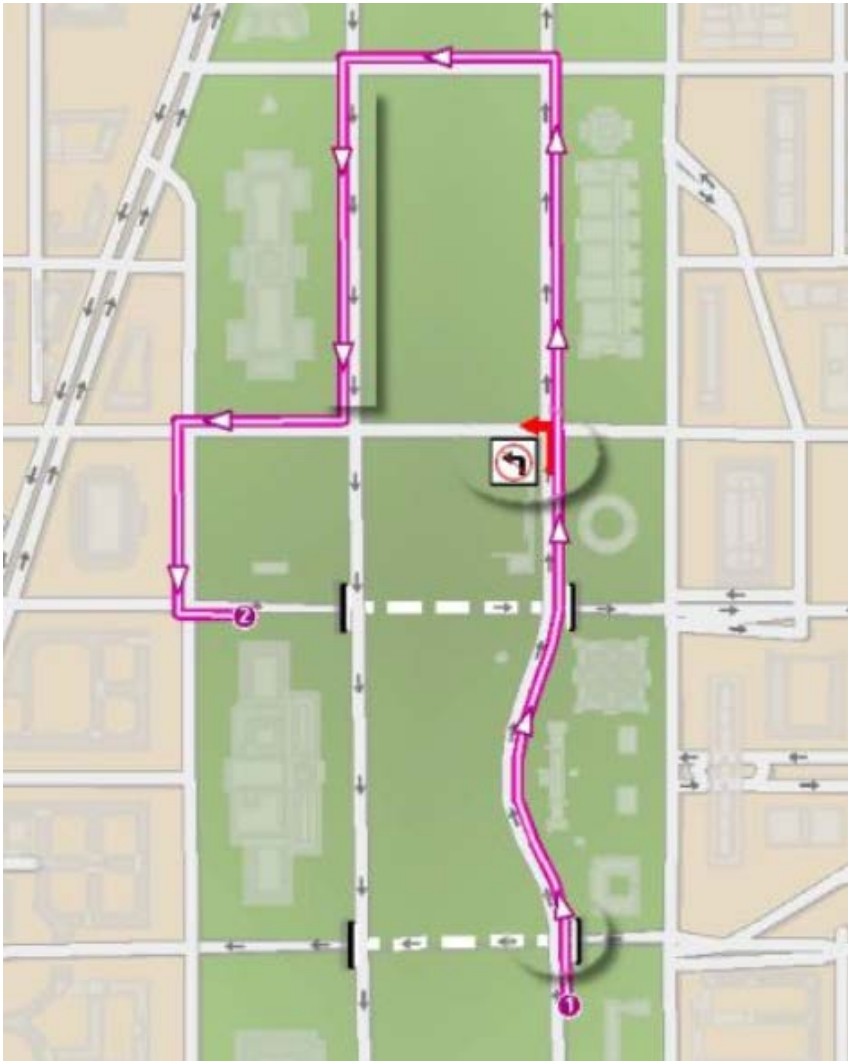
	Network datasets	Geometric networks
Usage	Transportation	Electric, Gas, Rivers
Flow Type	Undirected	Directed
Network Elements	Network elements: Edges, junctions, and turns	Network features: Edges and junctions
Source Data	GDB feature classes, shapefiles, or StreetMap data	GDB feature classes only
Connectivity	User controls when connectivity is built	System manages connectivity
Attribute model	More robust attribute (weight) model	Weights based on feature attribute fields

Data

- Network Dataset
- Travel modes:
 - Car
 - Truck
 - Pedestrian
 - Fire truck
 - Bike
 - Transit: rural, trucking



Connectivity



Types of Network Attributes

- **Cost**
- **Restriction**
- **Hierarchy**
- **Descriptor**

Distance = 1000 m
Drivetime = 5 min
Walktime = 20 min



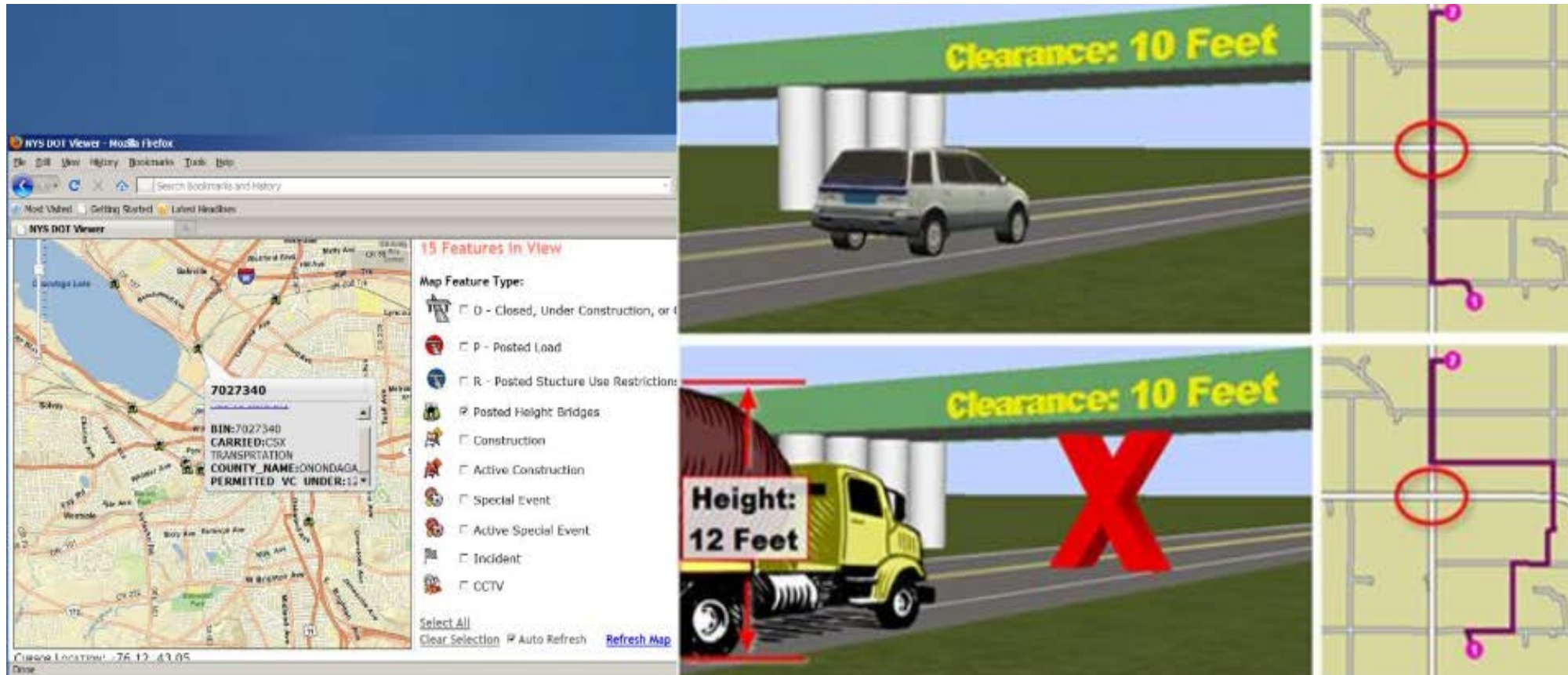
1 = Highway —
2 = Major Road —
3 = Local Street —



Parameters on restriction attributes

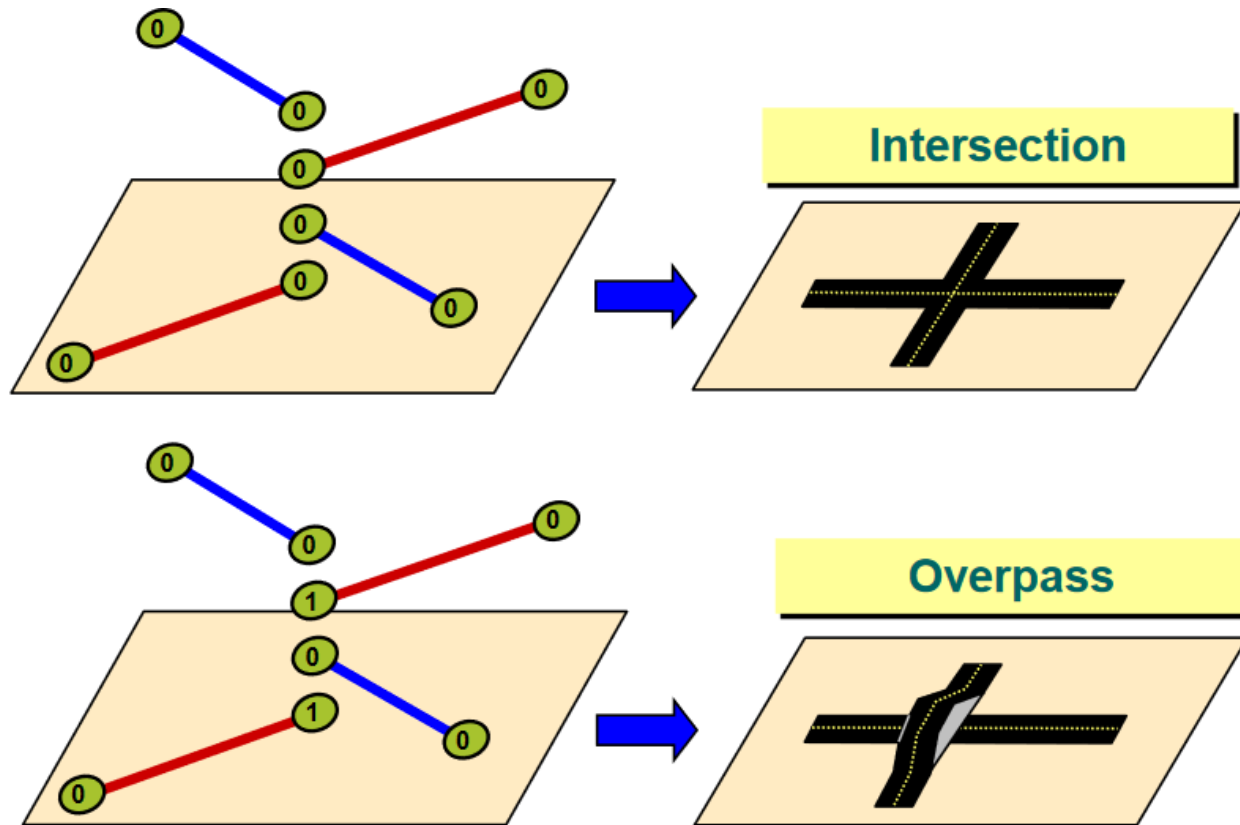
Add parameters on restriction attributes

Determine which network elements can be used by a vehicle

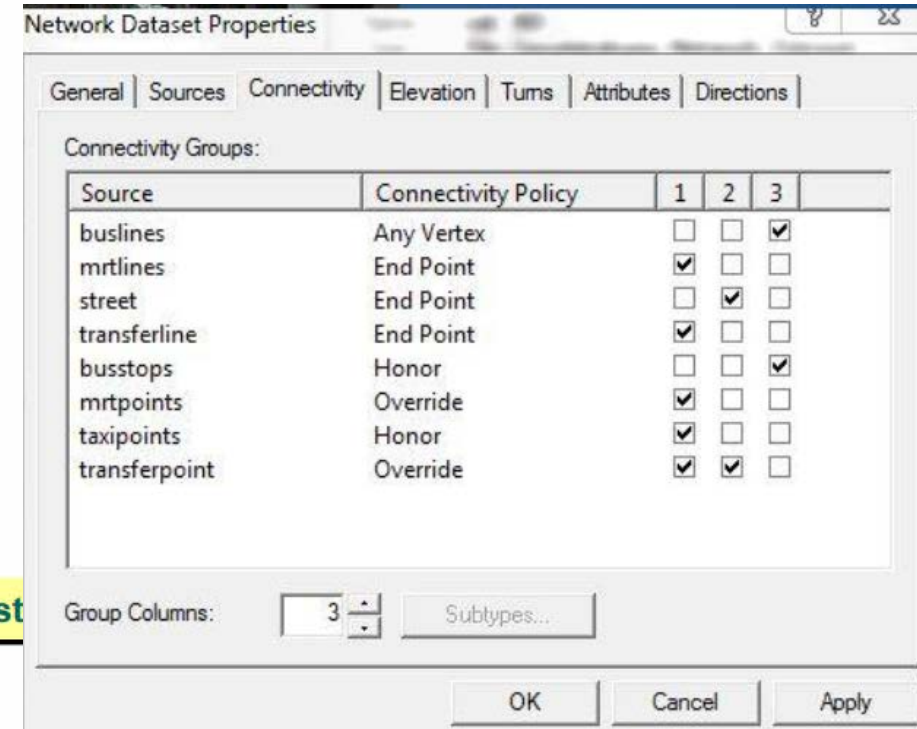
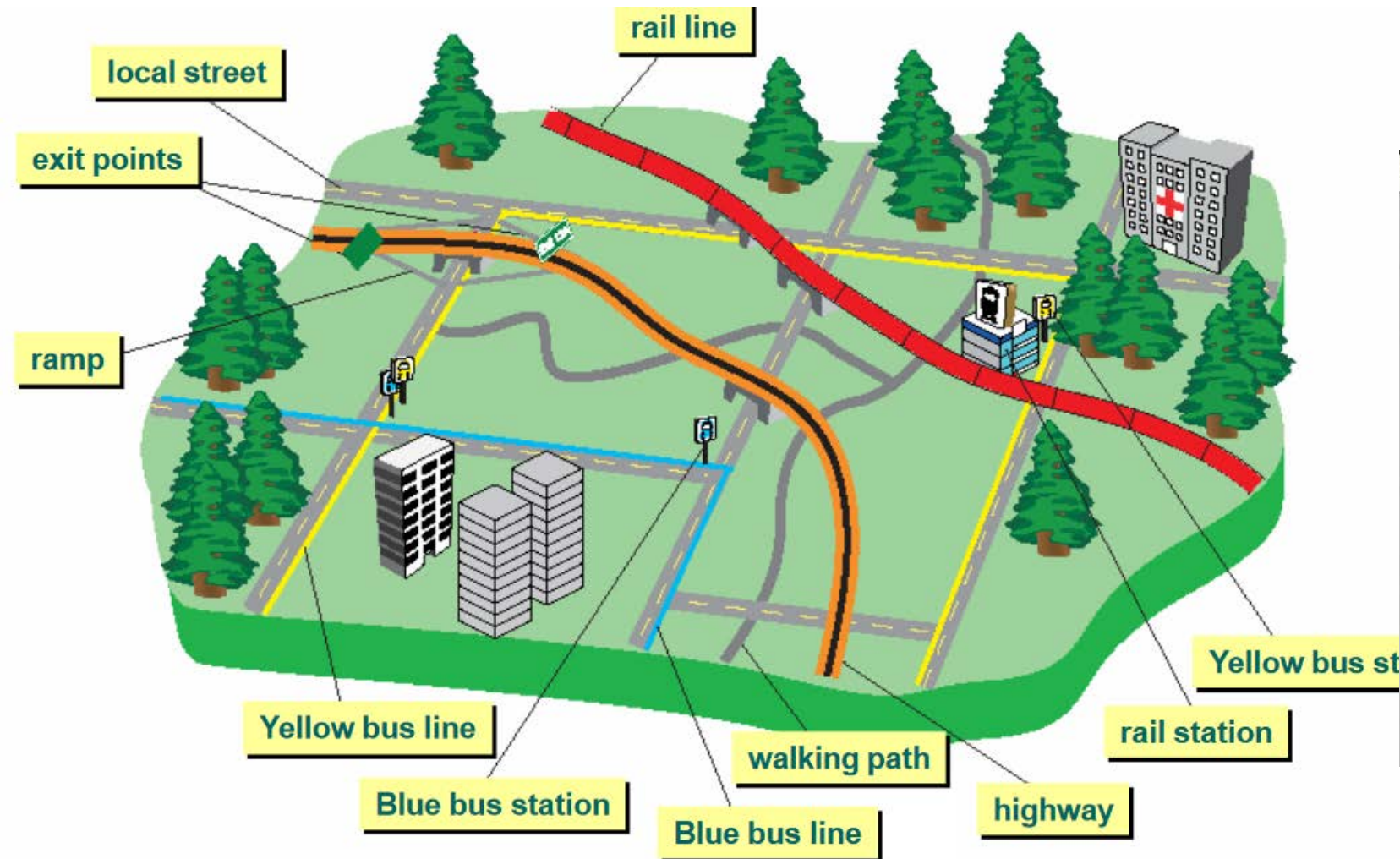


Elevation fields (Z levels)

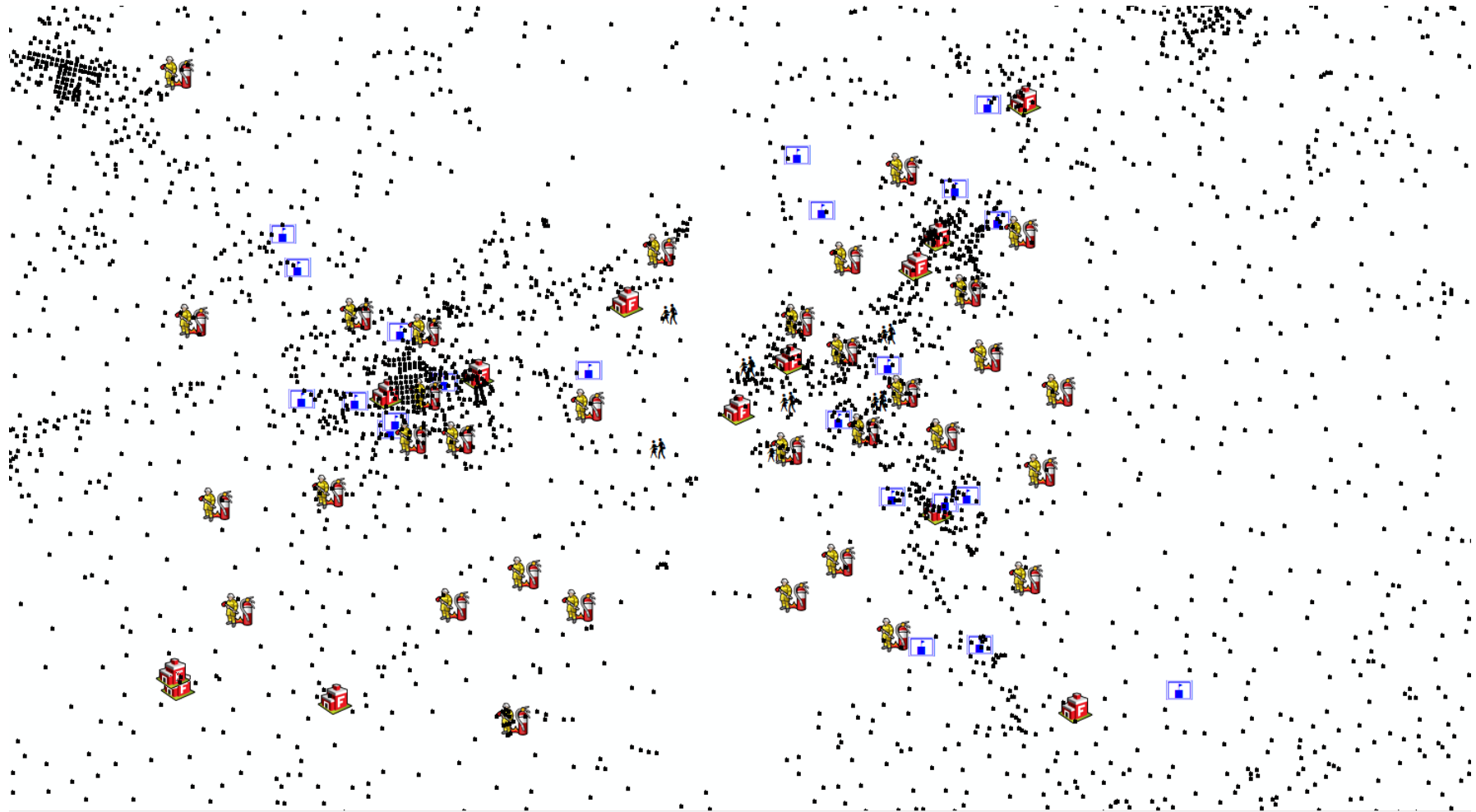
- Attributes that specify the “level” at endpoints
- Applied to line features with coincident endpoints



Multimodal connectivity

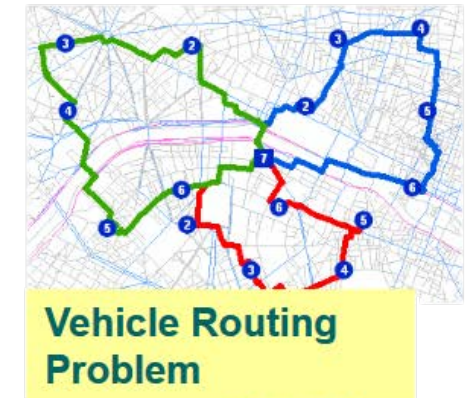


Demo: Point-to-point routes



What is network analyst?

- Extension for analyzing transportation networks
 - Uses network datasets
 - Solvers



Analysis Types

- **Routing**

- Point-to-point routes, optimize a fleet

- **Service Areas**

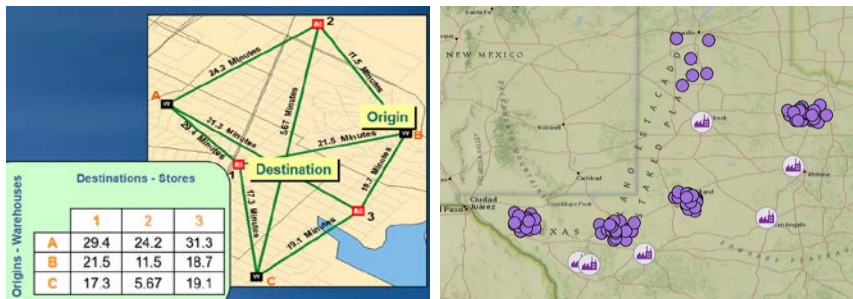
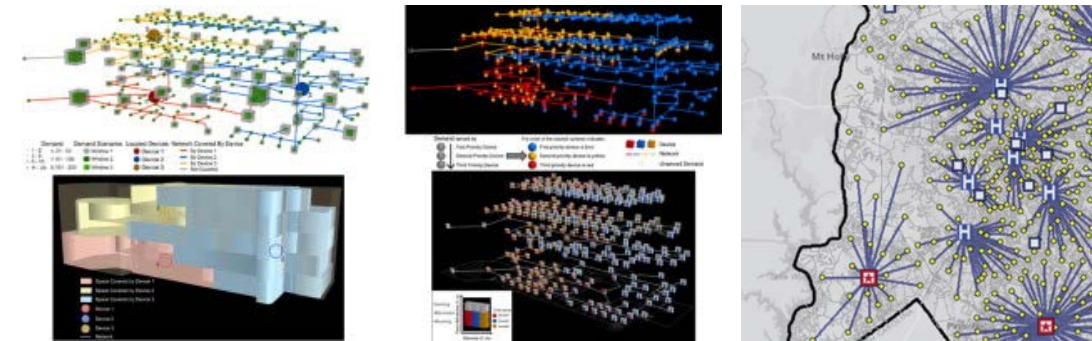
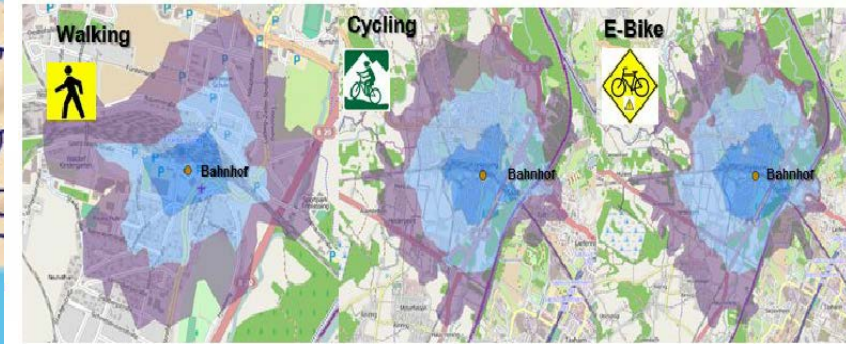
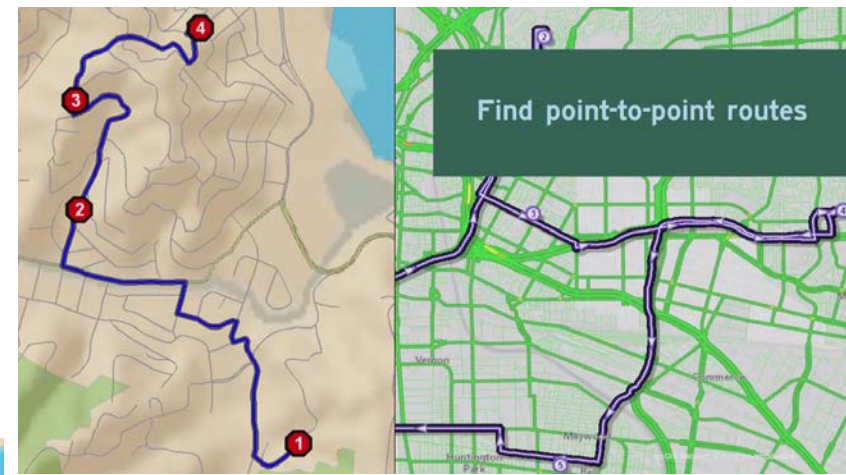
- Find coverage
- Determine gaps
- Set up territories

- **Optimal Site Allocation**

Best place to locate or remove one or more facilities from a set of possible facility locations

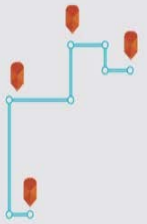
- **Origin-Destination Cost Matrix**

Generates a OD matrix of the cost from each origin to each destination. Can have multiple origins to multiple destinations. Ex. incidents to fire stations, finding nearest urgent cares to a set of patients

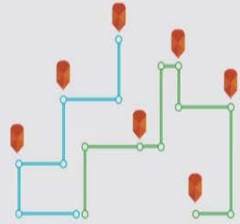


Software

Network services (and credit cost)



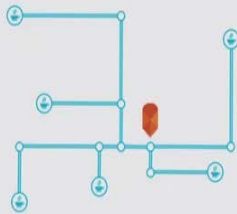
Simple route (0.04 per route)
Optimized route (0.5 per route)



Vehicle routing problem (1 per route)



Service area (0.5 per area)



Closest facility (0.5 per route)



Location-allocation (0.1 per demand point route)

No license

No street data

Credits



- ArcMap
- ArcGIS Pro

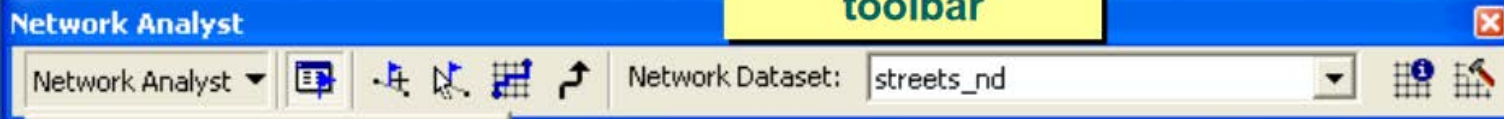
Biggest Challenge: Street connectivity

Resources

- Network Analyst Tutorial
 - [ArcMap](#)
 - [ArcGIS Pro](#)
 - [ArcGIS Online](#)
- [Network Analyst documentation](#)
- [ArcGIS Network Analyst Extension Discussion Forum](#)
- [Creating network datasets video](#)

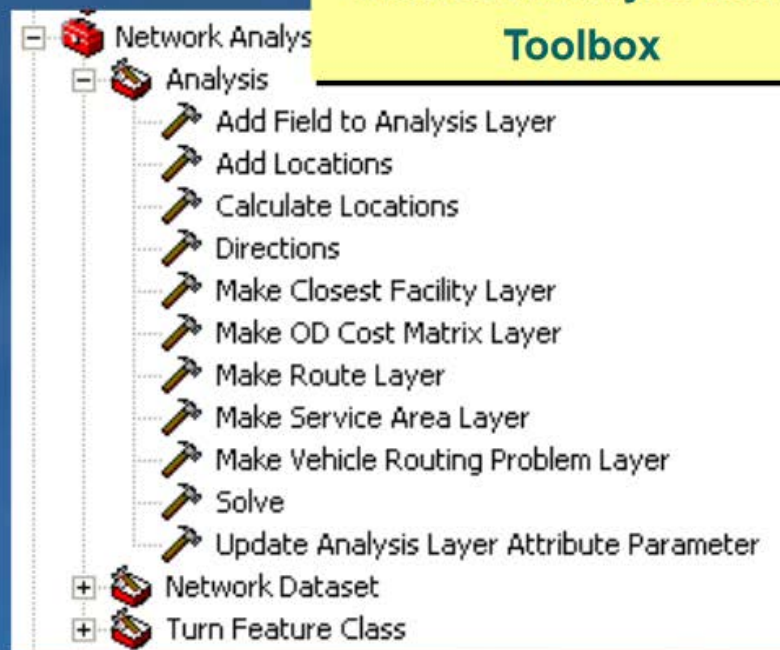
Network Analyst in ArcMap

Network Analyst toolbar



- New Route
- New Service Area
- New Closest Facility
- New OD Cost Matrix
- New Vehicle Routing Problem
- Options...

Network Analyst Tools Toolbox



Network Analyst Window



Network Analyst Window