Topic 7:
Network Analysis
(and the raster equivalent)

» A network is a special type of vector dataset made up of line features and points

» Lines describe the routes along which things move
  > Also called edges or links

» Points join all the edges that make up a network
  > Also called nodes
  > Describe how the network is connected

What is a Network?

» Edges and nodes have:
  > Rules
    + Directions
    + Restrictions
  > Impedance values
    + Time
    + Distance
    + Cost

» These variables can changes from edge to edge, node to node, or over time

How Networks Work
> Built from linear features
  - Existing roads, pipelines, power lines, water lines, etc.
> Topology should be created and rules established, errors identified and resolved
> Attribute values added to indicated distance, time, cost, and/or direction
> Create a “turn” feature class (optional)
> Run “New Network Dataset” wizard
> Edit/modify network characteristics

How Networks are Created

> Network datasets are created to solve problems
> Once a network dataset is created 6 different “solvers” can be used to answer questions like:

> What is the shortest path/best route?
> Where is the closest facility?
> What is the service area of those facilities?
> What is the best allocation of services?

Types of Network Analysis

Quickest vs. Shortest Path

Route Solver
» Uses raster data
» The cost raster defines “cost” of moving across each cell
  » Cost may refer to effort, impact, monetary cost, or other impedances
  » Usually a combination of raster datasets each representing a “cost”
  » Can be rescaled and weighted, ranked values or real data values

Also requires a source raster
  » Defines the source cell(s) (aka origin)
  » All other cells are nodata

Red area in figure below indicates source area
Result is an accumulated cost raster

Each output cell is assigned value that represents least accumulated cost of reaching that cell from source area (nearest source cell)

Because many paths are possible, this is an iterative process that spreads outward from source area(s)

Accumulated cost raster can be used to produce the following outputs using distance analysis toolset (and others)

1. Direction raster – direction to source cell
2. Allocation raster – which source cell
3. Least Cost raster - path from source to destination