CAMBRIDGE SYSTEMATICS

Think Forward

TransCAD Training 2

presented to

Caltrans Districts 8 and 12

presented by

Cambridge Systematics, Inc.

& Caliper Corporation

February 22, 2016

Roadway Network Basics

Key Fields in the SCAG Model

- See Documentation for Field Definitions

Appendix A: Highway Network Coding Conventions

Facility Type

1 – Freeways

10 – Freeway

2 – HOV

20 – HOV 2
21 – HOV 3+
22 – HOV – HOV Connector

3 - Expressway/Parkway

30 – Undivided
31 – Divided, Interrupted
32 – Divided, Uninterrupted

4 - Principal Arterial

40 – Undivided
41 – Divided
42 – Continuous Left Turn

5 - Minor Arterial

50 – Undivided
51 – Divided
52 – Continuous Left Turn

6 – Major Collector

60 – Undivided
61 – Divided
62 – Continuous Left Turn

7 - Minor Collector

70 – Undivided
71 – Divided
72 – Continuous Left Turn
73 – Posted Speed 25
74 – Posted Speed 15

CAMBRIDGE SYSTEMATICS

User Variables

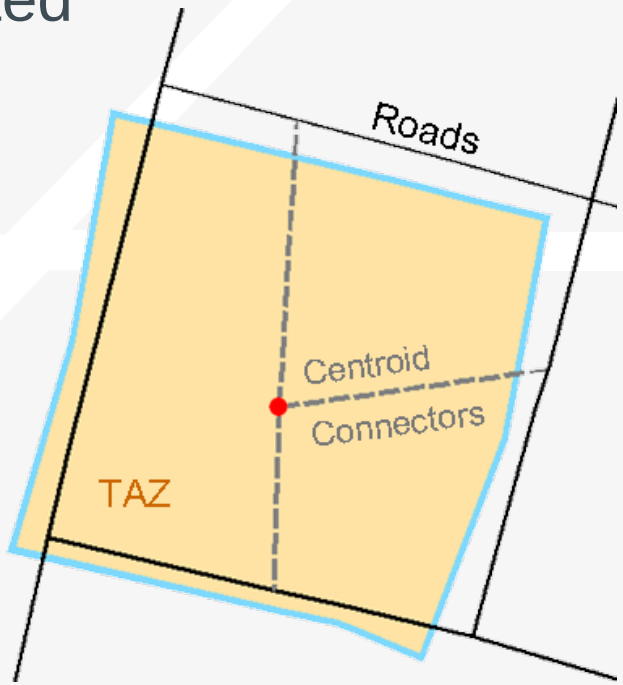
- Creating your own variables
  - Additional fields can be added to links and nodes
  - Field names can contain spaces and numbers, and do not have a practical limit to the number of characters
  - HOWEVER…

User Variables

- Creating your own variables
  - It is preferable to:
    - Limit field names to 10 characters
    - Avoid using spaces
    - Avoid starting a field name with a number
  - If these guidelines are followed, compatibility with other GIS programs will be improved
    - Field names that do not follow these guidelines will have truncated or confusing names when exported to a shapefile

Centroids

- Centroids are special nodes that are linked to socioeconomic data
  - If data is added for new zones, new centroids and centroid connectors must be created
  - New nodes are created by adding a link that has one end that is not located on an existing node
  - TAZ numbers are entered in the ZONE field
  - The network update macros update the “ID” field to match the TAZ number



Centroids

- Nodes are identified as centroids using the following rules:

Field Name	Contents
Tier1TAZ	User friendly nested TAZ ID numbers (sequenced by county, type, etc)
Tier2TAZ	
ZoneType_Tier1	Internal, External, Airport, or Seaport
ZoneType_Tier2	
Internal_sequence_id_T1	TAZ numbers used internally by TransCAD – but important to model users
Internal_sequence_id_T2	

Tiered TAZ Structure

- Tier 1 Zones
  4,192
  - Used in traffic assignment
  - Results in 17.5 ***million*** cells per matrix

- Tier 2 Zones
  11,350
  - Used in trip generation, distribution, and mode choice
  - Results in 128.9 ***million*** cells per matrix

Fun with Math:

Why these models take so long

$$\frac{4,192}{11,350} = 2.7 \qquad \frac{17.5\,m}{128.9\,m} = 7.3$$

$$2.7^2 = 7.3$$

Roadway Network Editing

Network Editing

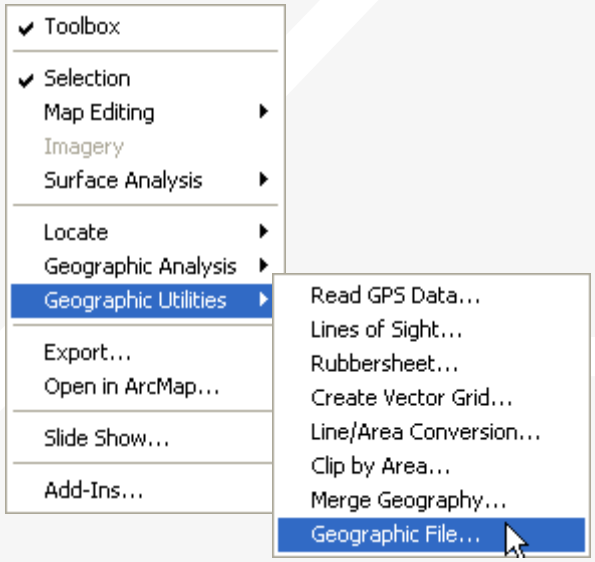
The Undo function in TransCAD 5+ makes network editing less risky

- Warning: Make a backup copy first!
  - There is an “Undo” function in TransCAD
  - Edits are made directly to the network file: You can’t close without saving to discard changes
  - Network files sometimes become corrupt

CAMBRIDGE SYSTEMATICS

Network Editing

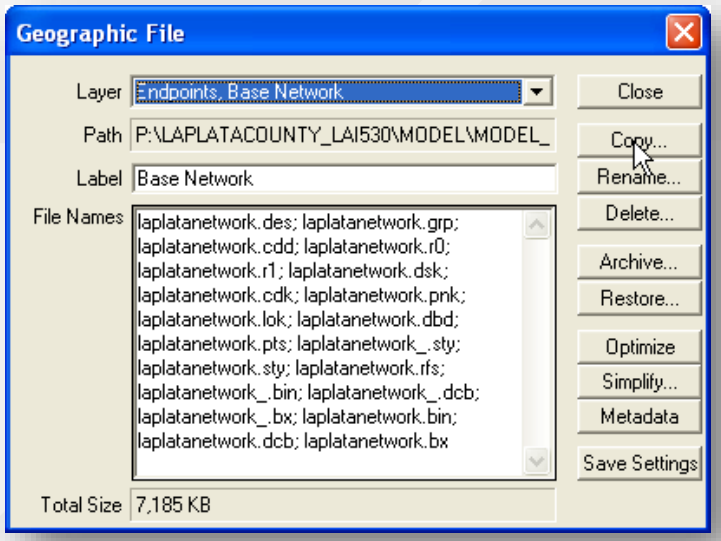
- Backing up the Roadway Network
- **Method 1:**
  - Close all files in TransCAD
  - Create a zip file with the line layer and route system files
  - Make sure to get all related files
- **Method 2:**
  - Open the network in TransCAD
  - Use Tools → Geographic Utilities → Geographic File to access the Geographic File dialog box



CAMBRIDGE SYSTEMATICS

Network Editing

- **Method 2 (Continued):**
- Backing up the Roadway Network
  - Click the “Copy…” button to save a copy of the network file
  - Choose a location to save the backup
  - You are still working in the original file.
  - *Or, use **Archive** to save in a zip file*



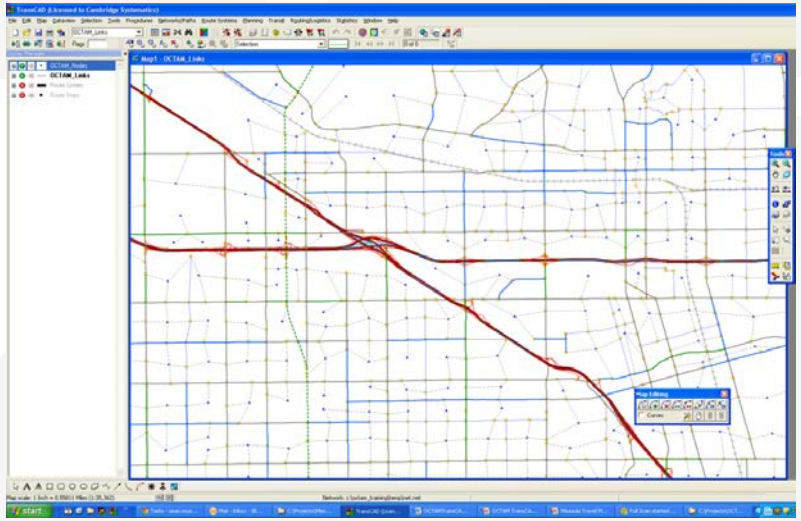
CAMBRIDGE SYSTEMATICS

Network Editing

- Once you have made a backup, you can:
  - Edit attributes of existing links
  - Change data for a specific year or for multiple years and alternatives
  - Add new links, delete existing links, or realign existing links
  - Add data for a year not yet included in the network

Network Editing

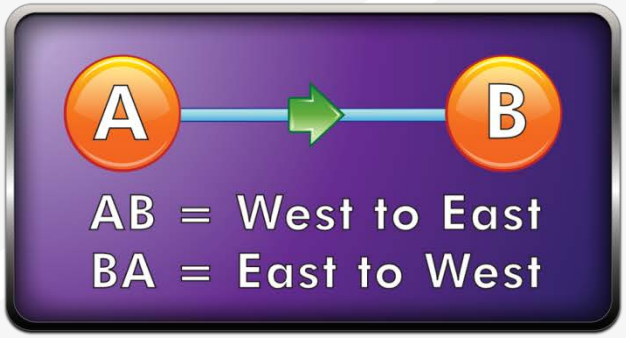
- Edit attributes of existing links
  - » Display settings can assist with editing
- Additional labels and/or themes can be useful
  - » Label # of lanes or other values
  - » Show Topology () to see AB vs. BA

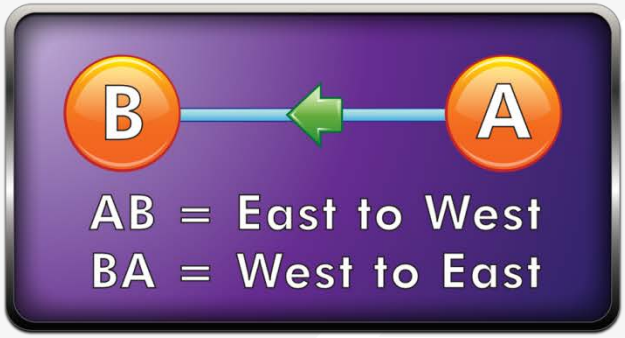


CAMBRIDGE SYSTEMATICS

Network Topology

- Show topology to identify AB and BA directions



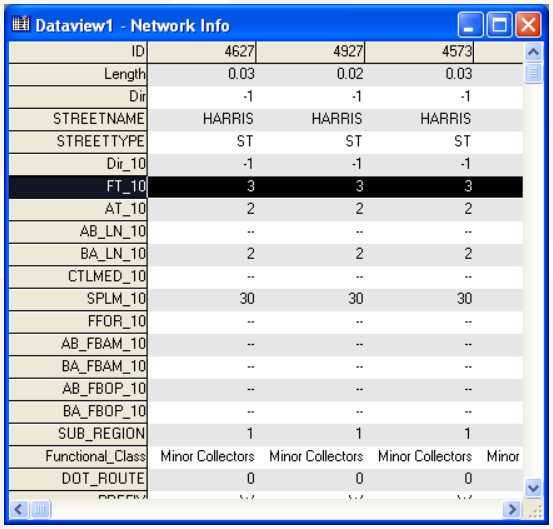


- To identify one-way roads, use the DIR field:
  - 0: Two-way travel
  - 1: A → B travel
  - -1: B → A travel

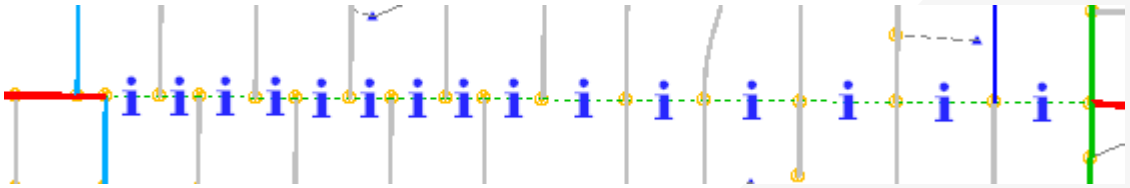
CAMBRIDGE SYSTEMATICS

Network Editing

- Edit attributes of existing links – Method 1
  - To make most edits, use the information tool () and edit text in the form that appears
  - Changes can be undone
    - Each edit action creates an undo point
  - You can select and fill multiple links with the information tool
    - Multiple values can be filled by right-clicking on row names



ID	4627	4927	4573	
Length	0.03	0.02	0.03	
Dir	-1	-1	-1	
STREETNAME	HARRIS	HARRIS	HARRIS	
STREETTYPE	ST	ST	ST	
Dir_10	-1	-1	-1	
FT_10	3	3	3	
AT_10	2	2	2	
AB_LN_10	--	--	--	
BA_LN_10	2	2	2	
CTLMED_10	--	--	--	
SPLM_10	30	30	30	
FFOR_10	--	--	--	
AB_FBAM_10	--	--	--	
BA_FBAM_10	--	--	--	
AB_FBOP_10	--	--	--	
BA_FBOP_10	--	--	--	
SUB_REGION	1	1	1	
Functional_Class	Minor Collectors	Minor Collectors	Minor Collectors	Minor
DOT_ROUTE	0	0	0	



CAMBRIDGE SYSTEMATICS

Network Editing
Alternate Method

- Edit attributes of existing links *Alternate Method*
  - Use the map editing toolbox ( )
  - Use the Edit Line Attributes ( ) button
    - Operation of this tool is similar to using the information button
  - Edits are saved when the green light ( ) is clicked
  - Use the red ( ) light to cancel all unsaved edits
  - The Undo function will undo all edits that are saved at once with the green light

CAMBRIDGE SYSTEMATICS

Network Editing

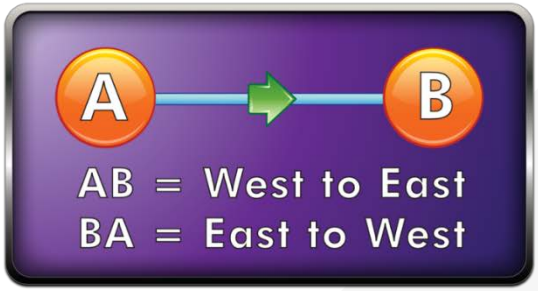
- What Fields do I Edit???
  - **[AB/BA]_Facility_Type**
    - 2 or 3-digit facility type identifier
  - **[AB/BA]_[AM/PM/MD/EVE/NT]LANES**
    - Directional number of lanes
  - **FWY_[Main/Aux/Acc_Dec]_Lane**
    - Identifies number of each type of lane
    - Present on freeways only

Practice: Network Editing

- Open the input network file
- Make a backup copy of this network in a folder called “Backup”
  - Use Tools → Geographic Utilities → Geographic File (or make a zip file)
  - Add the date to the backup filename
  - Edit the original network file
- Try using the different editing approaches to:
  - Change the facility type
  - Widen a Road

Practice: Network Editing

- Show Topology on the network
- Change a roadway to represent a different number of lanes in each direction
- Change a different roadway to a one-way road
  - 0 = Two-Way
  - 1 = A to B
  - -1 = to A



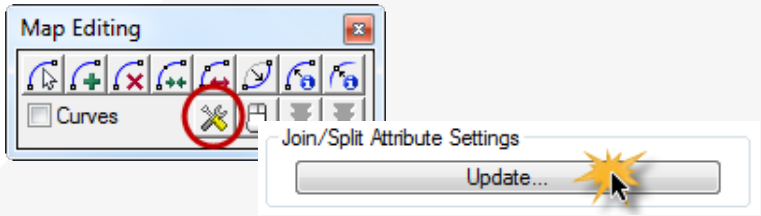
CAMBRIDGE SYSTEMATICS

Network Editing

- Adding new links
  - Use the map editing toolbox ()
  - Add links using Add Line ()
    - To work properly, links must be connected at nodes
    - Existing links may need to be split
    - Avoid splitting links if possible
  - Make sure that links are connected by:
    - Saving edits
    - Moving a node around – do all of the attached links move with it?
    - Canceling the edit

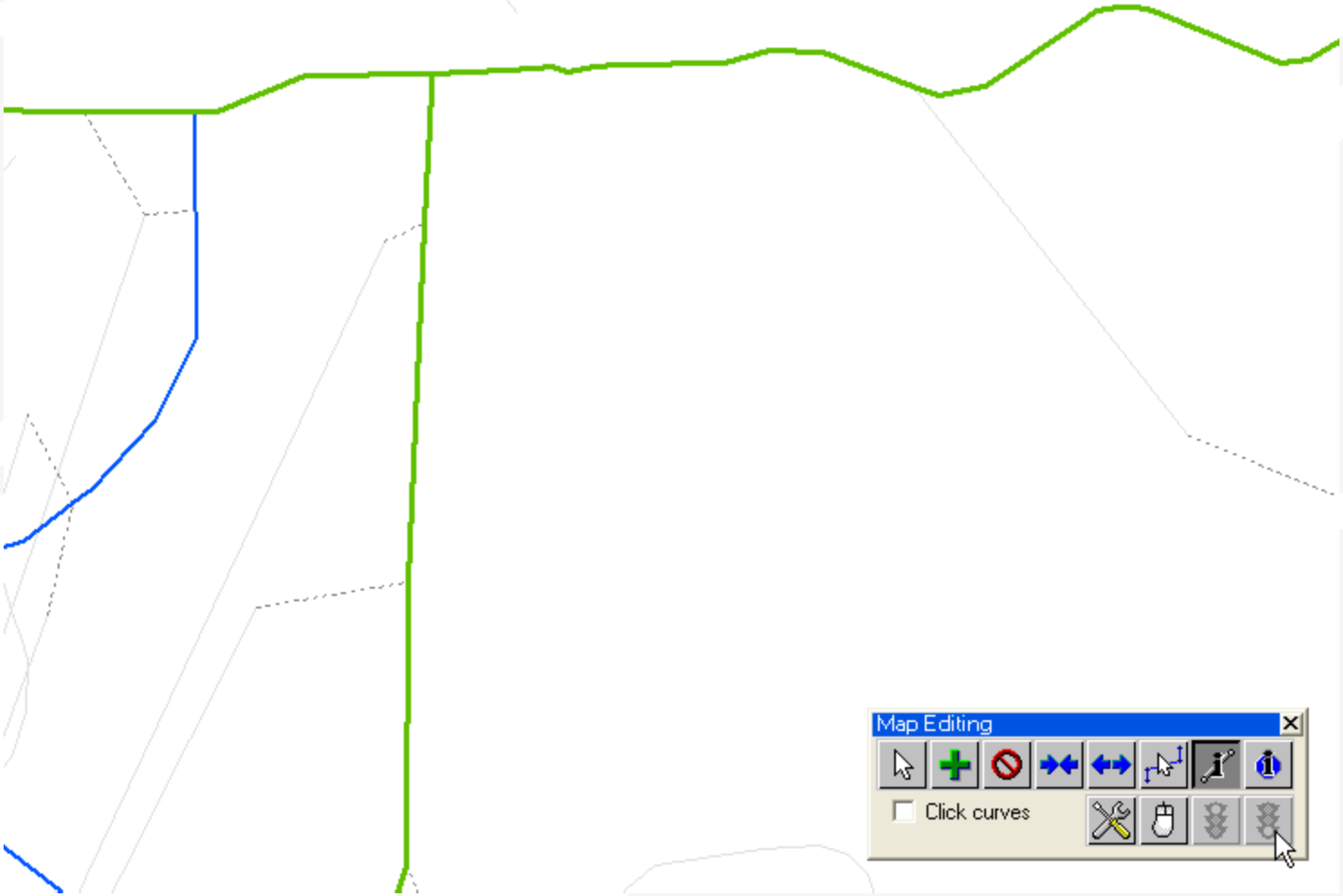
Network Editing

- Adding New Links
  - New links need new data!
  - Copy data from an existing link with similar characteristics
    - Use the Edit Link Attributes ( ) button
    - Click/shift-click on the new link(s)
    - Shift-click on the similar old link
    - Right-click on the data for the “old” link and choose “Copy Values”
  - Splitting/Joining Links
    - Check the split/join settings
    - Use the split/join tools ( )
    - New/moved links may be connected at new nodes
    - Check data on split/joined links



CAMBRIDGE SYSTEMATICS

Network Editing



CAMBRIDGE SYSTEMATICS

Practice: Network Editing

- Continue editing the input network
- Add, delete, and realign some links
  - » Show topology: Note that the way a new link is created defines its AB direction
- Copy link values from an old road to newly created links
- Split and join links
  - » look at the data that appears on each half
  - » Look at the network editor settings ()

Practice: Network Editing

- Try adding a new centroid
  - Assign a new zone number
  - Copy centroid connector values from an existing connector
- In practice, we would also need to add data to the TAZ data table
- Splitting zones in the SCAG model is difficult. We may work through examples individually during model application

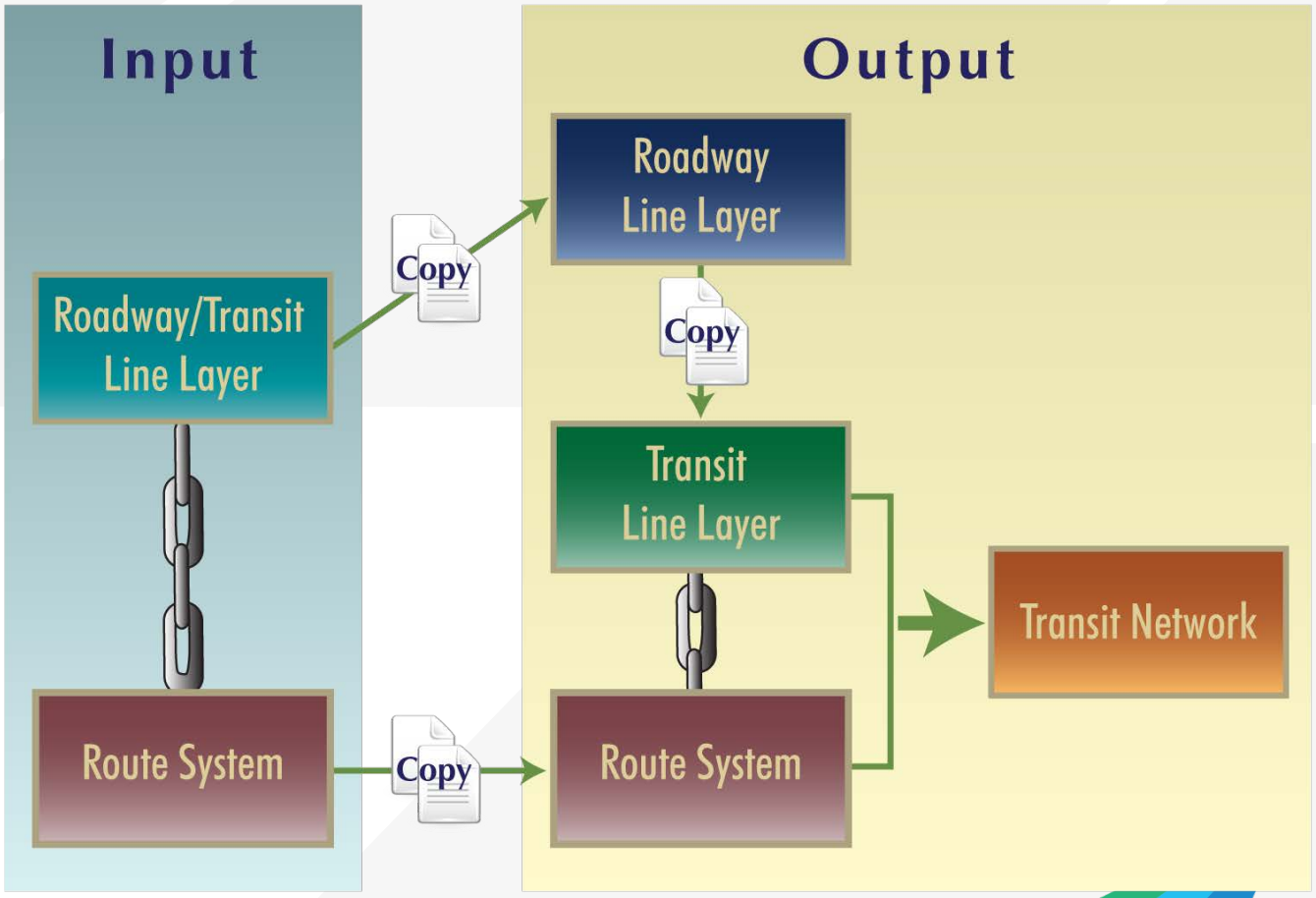
Network Editing

- Things to keep in mind:
  - When splitting links, make sure the data on both pieces still makes sense
  - When adding new roadways, adjust centroid connectors if necessary
    - Centroid connectors can be specific to a year
  - Keep the data for all years up to date

Route Systems

Route System Components

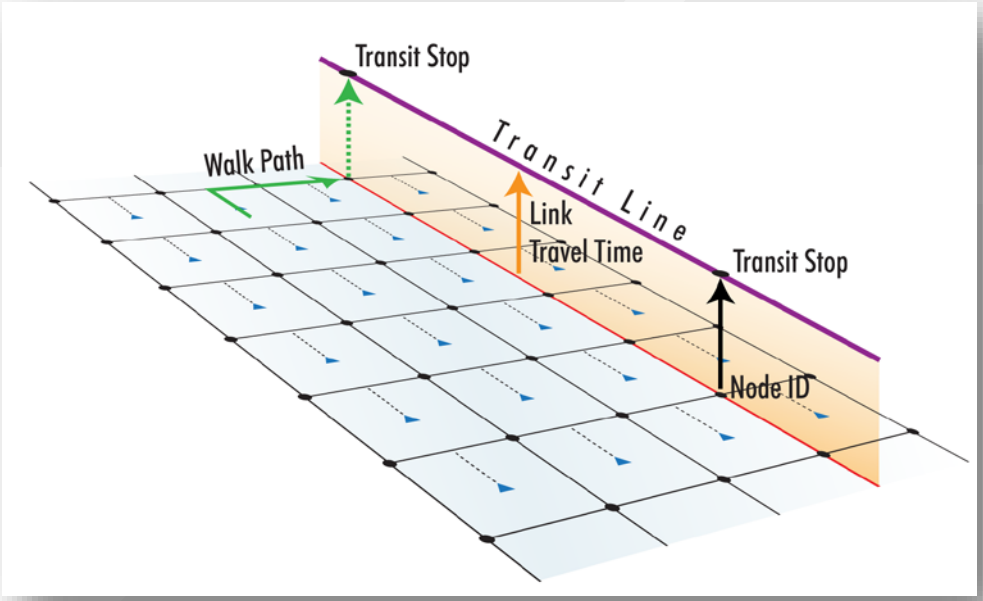
- Roadway Links
- Roadway Nodes
- Routes (Lines)
- Route Stops



Route System

- **Roadway Links**
- **Roadway Nodes**
- **Routes (Lines)**
- **Route Stops**

- Travel Time and Distance
- Walk and Drive Access

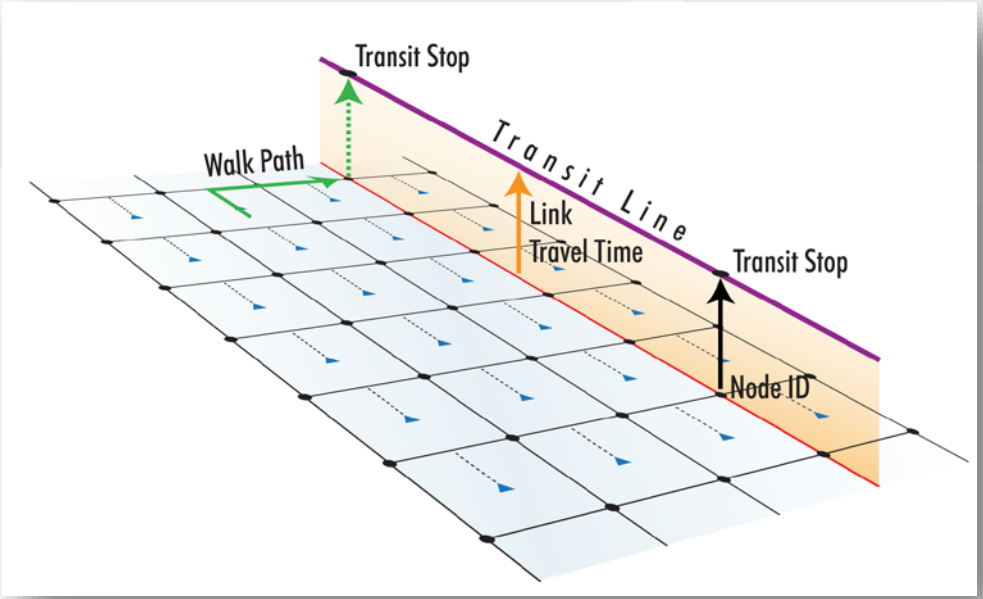


CAMBRIDGE SYSTEMATICS

Route System

- **Roadway Links**
- **Roadway Nodes**
- **Routes (Lines)**
- **Route Stops**

- Centroids linked to Trip Data
- Nodes linked to Stops
- Nodes identified as Park and Rides



CAMBRIDGE SYSTEMATICS

Route System

Roadway Links

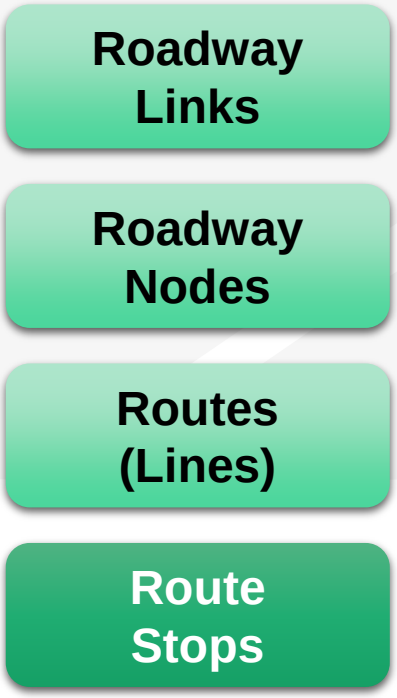
Roadway Nodes

Routes (Lines)

Route Stops

- Routes follow roadway links
  - Roadways
  - Centroid Connectors (possible, not recommended)
  - Transit only links (e.g., rail, BRT)
- Routes use link data
  - Travel Time
  - Distance
- Routes are stored in a ".rts" file

Route System



- Route Stops are stored in a pair of geographic files
  - » managed from the route system
  - » Physical Stops are common to all routes crossing a node
    - One required for each direction
  - » Route Stops are specific to one and only one route
    - Must be associated with a physical stop

CAMBRIDGE SYSTEMATICS

Route/Network Link

- The Route System is linked directly to the Roadway Network by *Complete Filenames*
- If the network is moved or renamed, The Route System will fail to open unless:
  - The roadway network is opened first, or
  - The route system is re-linked to the roadway network

Route/Network Link

- Re-establishing a Link:
  - Route Systems → Utilities → Move
    - Open the dbd file, choose this menu item, then choose a route system
- Checking the Link
  - Close all files
  - Open the route system in TransCAD
  - Verify that the expected network has been loaded

Route System Editing

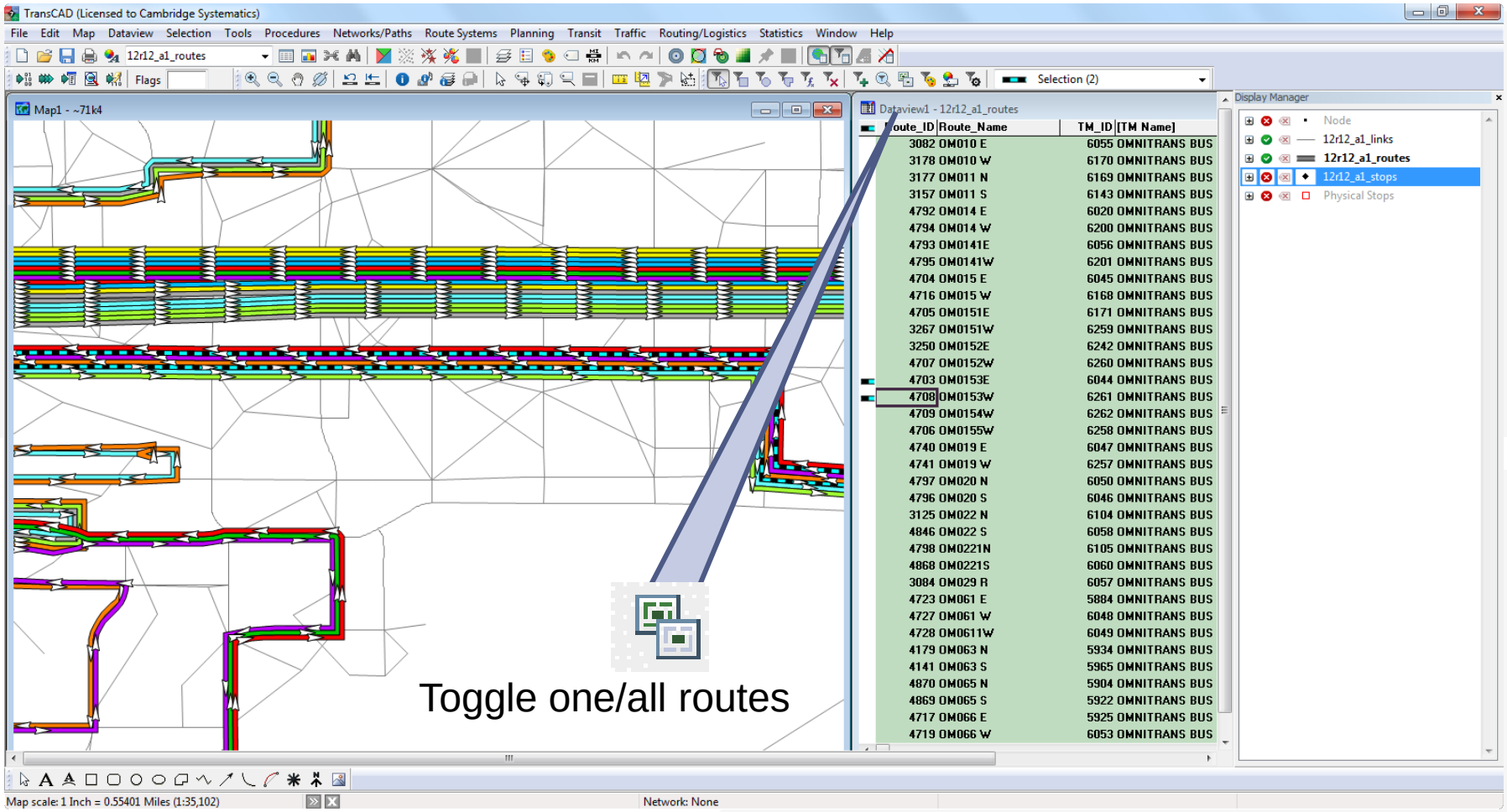
- Start by opening the **input** route system
  - Make sure the correct line layer has been opened
- Create a working ".net" network
  - Use default settings
  - Save this in the input directory
  - Use a temporary filename (e.g., net.net)
- Start the Route Editing Toolbox
  - Route Systems → Editing Toolbox

Note – Check the active layer as you try each step

Route System Display

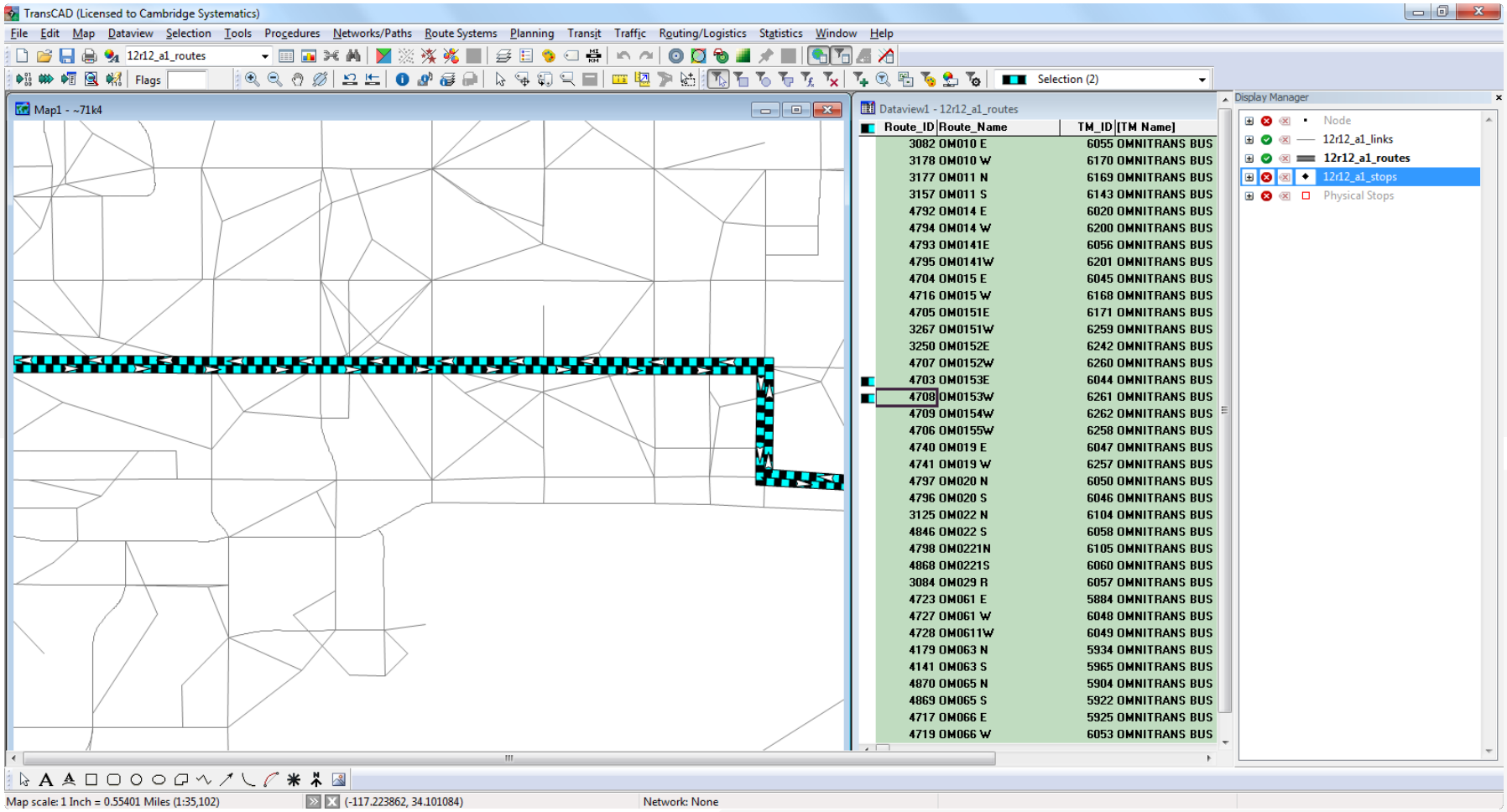
- Many routes can use the same corridor
- Edit route styles () to
  - Show Side by side
  - Show Topology
- Use selection sets to show only a set of routes
- Use screen real estate wisely

Example Editing Workspace



CAMBRIDGE SYSTEMATICS

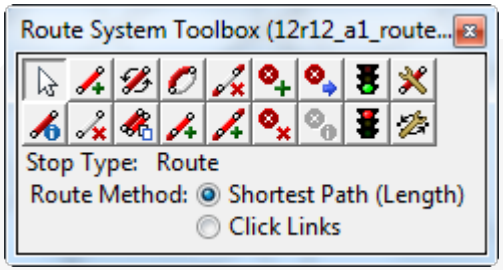
Example Editing Workspace



CAMBRIDGE SYSTEMATICS

Route System Editing

- Select a route to edit
- Edit route name
  - other route info can be edited with the standard info tool
- Add or delete a route
- Copy a route or add the reverse of a route
- Realign a route
- Extend a route or fill in a gap
- Delete a section of a route
- Add, delete, or move route stops
- Save or cancel changes



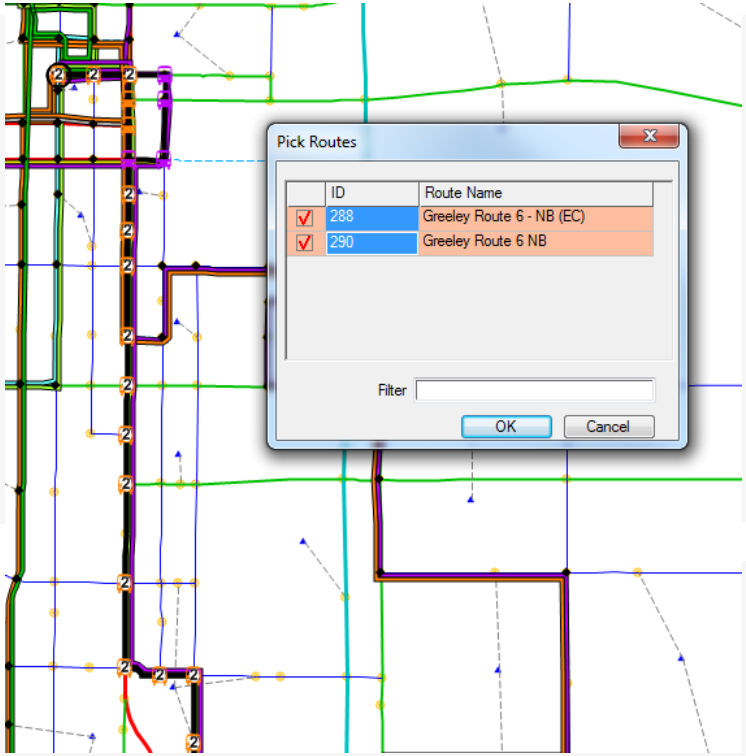
CAMBRIDGE SYSTEMATICS

Route System Editing

- Routes are usually edited by drawing paths
  - Click from node to node along a route
  - Only a few nodes along the route must be selected
- Potential Problem: A route does not take the shortest path between two nodes:
  - Change from **Shortest Path** to **Click Links**
  - Link mode can be especially helpful on freeways

Route System Editing

- Add stops to each route
  - » Manage both physical and route stops
- Stops must be adjacent to a node
- Be consistent
  - » Multiple routes with identical service should have identical stop placement



CAMBRIDGE SYSTEMATICS

Practice: Route Editing

- Use **Route Systems → Utilities → Move** to link the route system and network
- Verify the link
- Make some Changes:
  - Adjust a route headway
  - Add a new route
  - Add and/or remove route stops
  - Add a new Park and Ride

Transit Networks

Transit Networks

- Contain all mode and pathbuilder settings
  - Mode.bin table contains mode-specific information
  - Modexfer.bin contains mode-to-mode values
  - Connection between link/node layers
    - Stops tagged to node
- In-program:
  - Create a new transit network
  - Review transit network settings
    - New network
    - Batch-created network

Transit Networks

- Pathbuilding
  - Build transit paths based on network settings
    - Interactive: Test specific paths and try various pathbuilder settings
    - Skim: Build zone-to-zone paths

Practice: Transit Networks

- Create a new transit network based on the route system
  - Review settings
  - Build a few paths interactively
- Change the transit network to a generated file
  - Build similar paths – how are they different?
  - Try changing network settings and observe how paths change
    - Combination factor
    - IVTT/OVTT weights