

# MPO SURVEY OF NETWORK MANAGEMENT PRACTICES

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Jim Yin  
TPB Transportation Engineer

Travel Forecasting and Emission Analysis  
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# Presentation Outline

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- Background
- List of MPOs Targeted for the Survey
- Survey Questionnaires
- Summary of Survey Results
- COG/TPB's Network Management Practices
- Findings and Conclusions



# Background

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- Network management in support of COG/TPB's travel demand modeling processes
- Development of COG/TPB's Next-Generation (Gen3) Model



# List of MPOs Targeted for the Survey

Metropolitan Planning Organization	2010 Population
1. Southern California Association of Governments (SCAG)	18,051,203
2. New York Metropolitan Transportation Council (NYMTC)	12,367,508
3. The Chicago Metropolitan Agency for Planning (CMAP)	8,454,538
4. Metropolitan Transportation Commission (MTC)	7,150,828
5. North Jersey Transportation Planning Authority (NJTPA)	6,579,801
6. North Central Texas COG (NCTCOG)	6,417,630
7. Houston-Galveston Area Council (H-GAC)	5,892,002
8. Delaware Valley Regional Planning Commission (DVRPC)	5,626,318
9. <u>National Capital Region Transportation Planning Board (NCRTPB)</u>	<u>5,068,737</u>
10. Atlanta Regional Commission (ARC)	4,818,052
11. Southeast Michigan COG (SEMCOG)	4,703,593
12. Maricopa Association of Governments (MAG)	4,055,281
13. Puget Sound Regional Council (PSRC)	3,690,866
14. Boston Region MPO	3,159,512
15. San Diego Association of Governments (SANDAG)	3,095,271
16. Metropolitan Council	2,906,684
17. Denver Regional COG (DRCOG)	2,827,082
18. Baltimore Regional Transportation Board (BRTB)	2,684,661
19. Southwestern Pennsylvania Commission (SPC)	2,574,953
20. East-West Gateway Council of Government (EWGCOG)	2,571,327
21. Sacramento Area COG (SACOG)	2,274,557
22. Portland Area Comprehensive Transportation System (METRO)	1,499,844
23. Mid-Ohio Regional Planning Commission (MORPC)	1,436,334



# Survey Questions

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- The survey questionnaire contained 14 questions which were grouped into the following two categories:
  - Questions on travel demand forecasting software, such as:
    - What travel demand forecasting software do you use?
    - Do you also use the same software for managing your networks or do you use some other software?
  - Questions on network management software, such as:
    - Please provide a basic description of the processes and software that you use to manage your transportation networks.
    - Why did you choose the software that you use?
    - What are the strengths and weakness of the approach that you use to manage your transportation networks?



# Survey Procedure

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- Survey questions were sent out to the 23 MPOs in the list in May 2019
- TPB staff followed up with MPOs that did not respond to the survey in a three-week period by email or phone call
- 12 out of 23 MPOs took the survey by August 2019



# Summary of Survey Results

	Software		Frequency to Update		Multi-Year Network Editing?	Integrated Scenario Mgmt.	Topological Integrity (Highway/Transit)
	Travel Demand	Network Management	Model	Network			
SCAG	TransCAD	TransCAD	RTP/4 * FTIP/2**	On-going Process	N	N	Yes
NYMTC	TransCAD/ Customized	TransCAD/GIS DK	Yearly	Yearly	Y	Subnetworks Merger	No
CMAP	EMME	ArcGIS	N/A	Twice a Year	Y	Y	Yes
NJTPA	Cube	Cube	Two Year	Two Year	N	Y	Yes
NCTCOG	TransCAD	TransCAD	N/A	N/A	N	N	Yes
DVRPC	PTV VISUM	VISUM/ArcGIS	Five Year Cycle	Five Year Cycle	Y	Y	Yes
<i>MWCOG/ NC RTPB</i>	<i>Cube</i>	<i>ArcGIS</i>	<i>Yearly</i>	<i>On-Going Process</i>	<i>Y</i>	<i>Y</i>	<i>Yes</i>
SEMCOG	TransCAD	TransCAD	N/A	Whenever Needed	Y	N	No
Boston Region MPO	TransCAD	TransCAD	N/A	On-Going Process	Y	N	Yes
SANDAG	TransCAD > EMME	ESRI ArcInfo	N/A	On-Going Process	Y	N	Yes
BRTB	Cube	ArcGIS	Yearly	Yearly	N	Y	No
SPC	Cube	Cube	N/A	On-Going Process	N	N	No
EWGCOG	Cube	ArcGIS	Yearly	at least once a year	Y	N	Yes

\* RTP/4 = Regional Transportation Plan is updated every four years

Agenda Item #5: MPO Survey of Network Management Practices

\*\* FTIP/2 = Federal Transportation Improvement Program is updated every two years

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# Summary of Survey Results

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- Based on the travel demand modeling software, the 12 surveyed MPOs can be divided into four user groups; each user group uses different network management software and processes.
  - CUBE User Group
    - Five MPOs (NJTPA, BRTB, SPC, EWGCOG, COG/TPB)
    - Network management software split between ArcGIS and CUBE
  - TransCAD User Group
    - Six MPOs (SCAG, NYMTC, NCTOG, SEMCOG, Boston, SANDAG)
    - Network management software: TransCAD
  - EMME User Group
    - Two MPOs (CMAP, SANDAG)
    - Network management software: ArcGIS
  - VISUM User Group
    - One MPO (DVRPC)
    - Network management software: ArcGIS





# Three Network Management Approaches

	Operation		Database		Customized Tool
	Simple	Complex	Dedicated	Integrated	
Cube	X		X		
ArcGIS		X		X	X
TransCAD		X		X	X

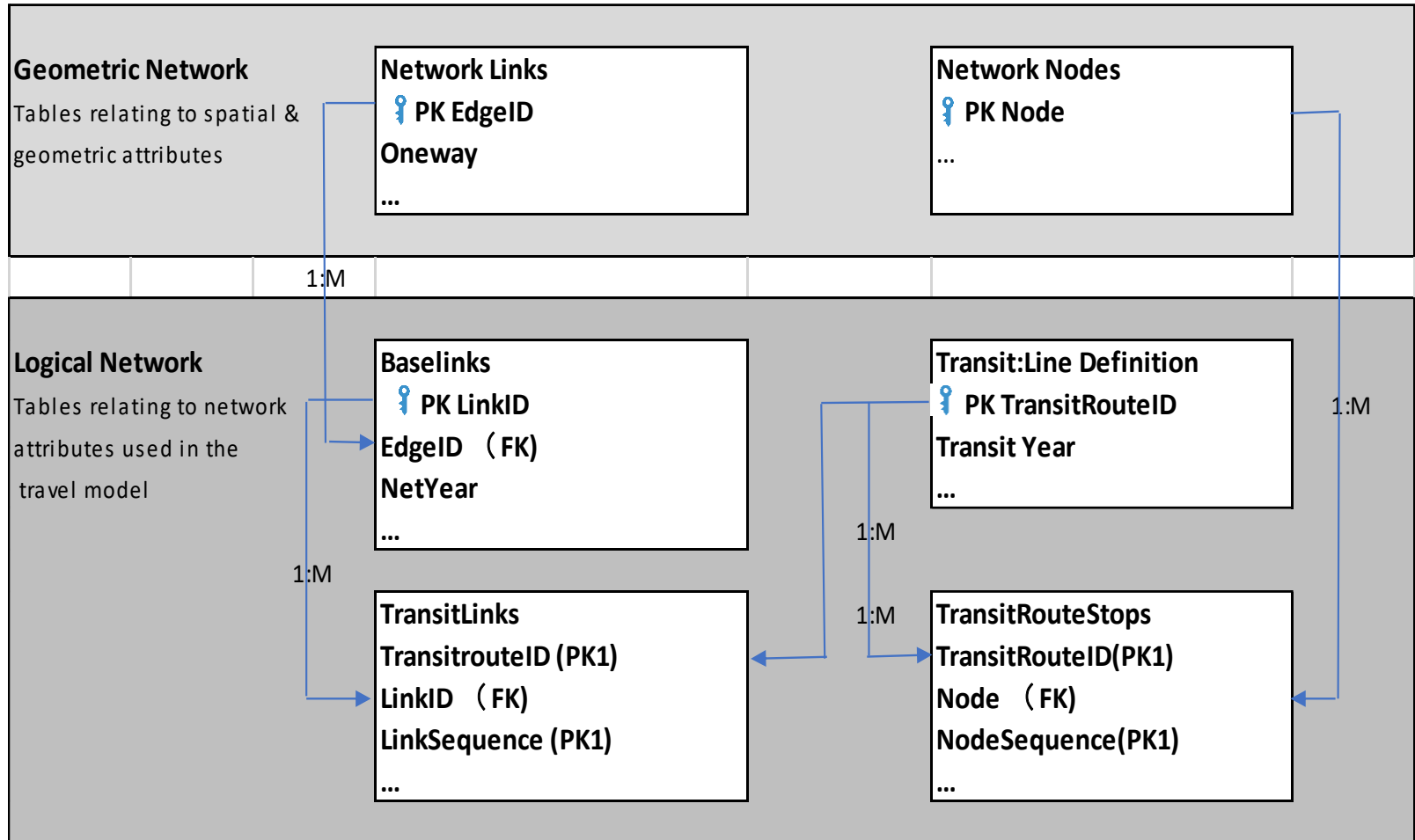


# COG Practice

- COGTools (COG Network Editing Tools) software is designed to facilitate network editing and network database management.
- Functions of COGTools could be classified into three categories:
  - Editing Networks
    - Highway Link Editing
      - Create New Link
      - Edit Link
      - Delete (Retire) Link
      - Split Link
      - ...
    - Transit Route Editing
      - Edit Transit Route
      - Extend Transit Route
      - Shrink Transit Route
      - Modify Running Time and Head Way
      - ...
  - Exporting Networks (Highway and Transit)
    - Cube Voyager Network File, with TRNBUILD-Format Transit Network
    - Personal GDB
    - Cube Voyager Network File, with Public Transport (PT)-Format Transit Network
  - Generating Dynamic Layers
    - Base Network
    - Travel Direction Network
    - Transit Network



# COG Practice: Geo-Database



# COG Practice: Geometric and Logical Networks

The screenshot displays the ArcMap COG Network Editor interface. The main map area shows a network of links and nodes. A red line highlights a path labeled 'Geometric Network', and a blue line highlights a path labeled 'Logical Network'. The Table of Contents on the left lists three link groups: Link 1 (20998 -> 21808 (2002)), Link 2 (21095 -> 20998 (2000), 20998 -> 21095 (2000), 21095 -> 20998 (2002), 20998 -> 21095 (2002)), and Link 3 (20998 -> 21809 (2002), 21809 -> 20998 (2002)).

The 'Attributes of Link 20998 -> 21809 (20)' table is open, showing the following data:

LinkID	NetYear	Distance	Status	TOLL	TollGp	FType	LType	AMLane	PMLane	OPLane
77704	2002	0.16635034231	Active	0	0	3	H	2	2	2

The 'BaseLinks' table is also open, showing a list of links with columns: LinkID, EdgeID, EdgeIDo, ANode, BNode, NDPR2, BaseYear, StreetName, TravelDirection, Distance, LinkType, Mode, TOLL, TollGrp, and FType. The table contains 18 rows of data, with the first row highlighted in blue.



# COG Practice: COGTools Components

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- There are two main Graphic User Interface (GUI) components in the COGTools
  - Toolbar
  - Network Editor Windows (Highway and Transit)
- Some other GUI components
  - COGTools Info Window
  - Export Network Dialog Window
  - Instructional Dialogs shown in editing operations



# COG Practice: COGTools Snapshot

The screenshot displays the ArcMap interface with the following components:

- Table Of Contents:** A list of network link types, with "Hwy to COMM KNR" highlighted in blue. A red oval encircles this list, and a red arrow points to the "Database Layers" label at the bottom.
- COG Network Editor Windows:** A central panel showing a tree view of links:
  - Link 1: 48022 -> 48087 (2000)
  - Link 2: 42509 -> 42510 (2001)
 Below this is a table of attributes for the selected link:
 

Attributes of Link 48022 -> 48087 (2000)	
LinkID	70042
NetYear	2000
Distance	2.34768201153773
Status	Active
TOLL	0
TollGrp	0
FType	3
LType	H
AMLane	1
PMLane	1
OPLane	1
- ToolBar:** A toolbar at the top right with a red oval highlighting the "COG Network Editor" section.
- COGTools Info Windows:** A window at the bottom right showing metadata:
  - 2020-02-25 11:53:28 [LOG] jyin login as jyin
  - Connection: Personal GeoDatabase
  - Database: C:\COGTOOL\_Develop\Database\Visualize
  - 2045 network july 2 FINAL.mdb



# COG Practice: COGTools Highway Editor Windows

The screenshot displays the COG Network Editor application. The main window shows a map with several highway links. A red circle highlights a specific link, labeled "Link 1" with the ID "26866 -> 26869 (2001)". Red arrows point from this link to labels: "Geometric Link" (pointing to the line on the map), "Logical Link" (pointing to the link ID in the list), and "Link Container" (pointing to a cyan circle around the link on the map). Below the map, an "Attribute Table" is open, showing the following data:

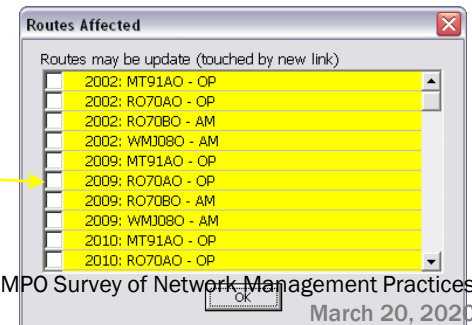
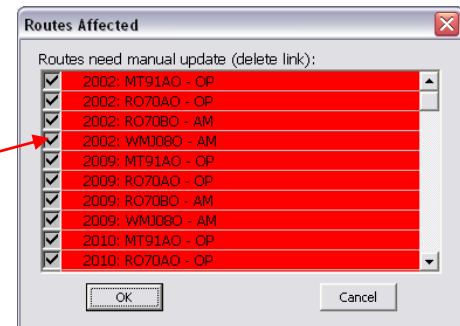
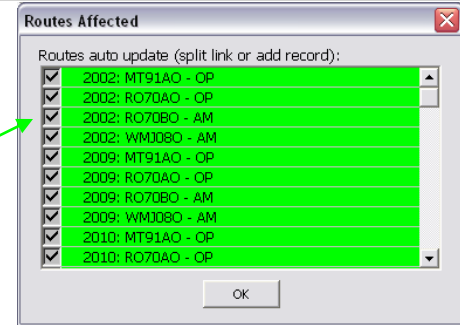
Attributes of Link 26866 -> 26869 (2001)	
LinkID	85373
NetYear	2001
Distance	0.0596263358079068
Status	Active
TOLL	0
TollGp	0
FType	6
LType	H
AMLane	2
PMLane	2
OPLane	2

At the bottom of the attribute table, there are buttons for "Save", "Reset", "Remove", "Clear", "Batch Update", "Add Record", "Copy Attribute", and "Exit". On the left side, a "Table Of Contents" pane shows a list of layers, including "Nav\_Street", "NetworkNodes", "NetworkLinks", and "Screenline".



# COG Practice: Transfer of Highway Link Edits to Transit Network

- When editing a link of a highway network (e.g. add and split link), if one or more transit routes are associated with the link, there will be a transfer of the edits to this link to associated transit routes
- Four editing operations could initiate this transfer:
  - Create New Link
  - Add Record
  - Delete Link
  - Split Link
- Before the transfer, a dialog will pop up to inform the user all the affected routes
- Color coded windows indicate different actions
  - **Green:** initiated by splitting a link (including links split by new link) or by adding a record; affected routes will be automatically updated, i.e., no manual transfer is needed
  - **Red:** initiated by deleting a link; affected transit routes have to be manually updated
  - **Yellow:** initiated by adding a link that reuses old node(s); affected routes have to be manually updated





# COG Practice: COGTools Transit Network Editor Windows

The screenshot displays the COG Network Editor software interface. The main window shows a map of a transit network with a blue highlighted route. The interface includes a menu bar (File, Edit, View, Bookmarks, Insert, Selection, Geoprocessing, Customize, Windows, Help), a toolbar, and a status bar. A 'Table Of Contents' window is open on the left, listing layers such as 'CurrTransitRoute', 'Year2019Links', and 'Year2019Nodes'. The 'COG Network Editor' window is the central focus, showing a 'Links' list for route 'ANNBRNI' and a 'Nodes' list. Below these are two 'Attributes of Transit Route ANNBRNI' windows, each displaying a table of route details. A 'COGTools Info' window is also visible in the bottom right corner.

**Links List:**

- 1: 45876 -> 45568
- 2: 45568 -> 45567
- 3: 45567 -> 45568
- 4: 45568 -> 45875
- 5: 45875 -> 45697
- 6: 45697 -> 45874
- 7: 45874 -> 45921
- 8: 45921 -> 45570
- 9: 45570 -> 45587
- 10: 45587 -> 45585
- 11: 45585 -> 45584

**Nodes List:**

- 1: 45876
- 2: 45568
- 3: 45567
- 4: 45568
- 5: 45875
- 6: 45697
- 7: 45874
- 8: 45921
- 9: 45570
- 10: 45587
- 11: 45585
- 12: 45584

**Attributes of Transit Route ANNBRNI (Left):**

TransitRouteID	8675
TransitRouteName	ANNBRNI
Operator	Annapolis
OriginNode	45876
DestinationNode	45584
OriginNodeName	Eastpoint Shop. Center
DestiNodeName	Westfield Mall
Mode	8
Headway	43
Runtime	38

**Attributes of Transit Route ANNBRNI (Right):**

TransitRouteID	8675
TransitRouteName	ANNBRNI
Operator	Annapolis
OriginNode	45876
DestinationNode	45584
OriginNodeName	Eastpoint Shop. Center
DestiNodeName	Westfield Mall
Mode	8
Headway	43
Runtime	38

**COGTools Info:**

- [16652] 2030: MT3351 - AM
- [16655] 2030: MT3450 - A
- [18191] 2040: WMA121 - A
- [18192] 2040: WMA121 - C
- [18628] 2040: MT3351 - AM
- [18631] 2040: MT3450 - A
- [20342] 2045: WMA121 - A
- [20343] 2045: WMA121 - C
- [20633] 2045: MT3351 - AM
- [20636] 2045: MT3450 - A



# Findings and Conclusions

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- Network management is a complex process
- 12 surveyed peer MPOs use three different network management software to serve different needs
- No universal network management tool is available to solve every MPO's problems
- Based on COG/TPB's network management practices, a reliable, customized tool is very useful to manage multi-year, multi-modal network database



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## Jim Yin

Transportation Engineer

(202) 962-3361

jyin@mwkog.org

[mwkog.org/TPB](http://mwkog.org/TPB)

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Metropolitan Washington Council of Governments

777 North Capitol Street NE, Suite 300

Washington, DC 20002

