5-9-2014

Analytical Efficiencies Through the Integration of Modeling and Simulation Tools

Steve Perone
PTV Group

PTV GROUP

the mind of movement

ANALYTICAL EFFICIENCIES THROUGH THE INTEGRATION OF MODELING AND SIMULATION TOOLS

PTV Vision Traffic Suite Software

Portland State University

Spring Transportation Seminar

May 9, 2014

Steve Perone, President

AGENDA

- Who is PTV Group?
- Modeling Resolutions
- Tools & Methods to Support Integrated Modeling
- The Next Frontier – Real Time Prediction

AGENDA

- **Who is PTV Group?**
- **Multi-Resolution Modeling – The PTV Way**
- **Methodologies and Tools for Multi-Resolution Modeling**
- **The Next Frontier – Real Time Technology**

PTV GROUP'S INTERNATIONAL FOOTPRINT:

600

EMPLOYEES ACROSS THE WORLD

12

SUBSIDIARIES

70

MILLION EUROS TURNOVER

ON 5 CONTINENTS

EUROPE ASIA AUSTRALIA NORTH/ LATIN AMERICA

TRAFFIC SOFTWARE PRODUCTS

PTV VISION – BEGIN WITH THE END IN MIND

AGENDA

- Who is PTV Group?
- **Modeling Resolutions**
- Tools & Methods to Support Integrated Modeling
- The Next Frontier – Real Time Technology

MULTI-RESOLUTION MODELING COMPONENTS

Macroscopic Modeling

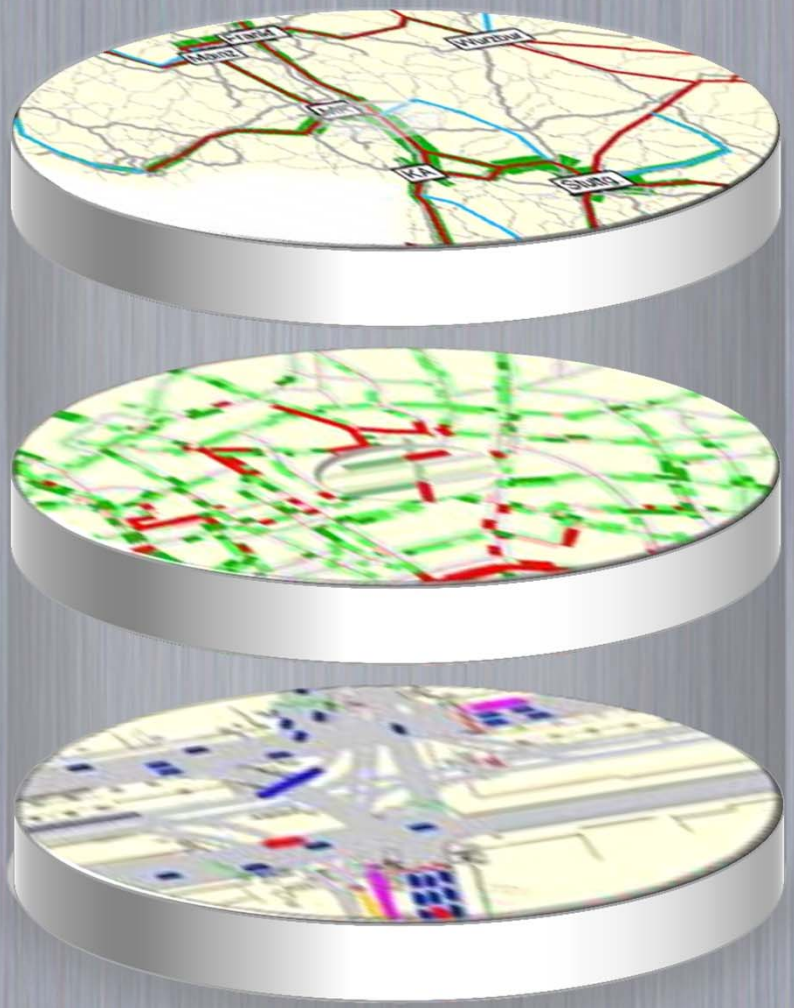
Regional Focus

Mesoscopic Modeling

Corridor Focus

Microscopic Modeling

Facility Focus



WHAT IS MULTI-RESOLUTION MODELING?

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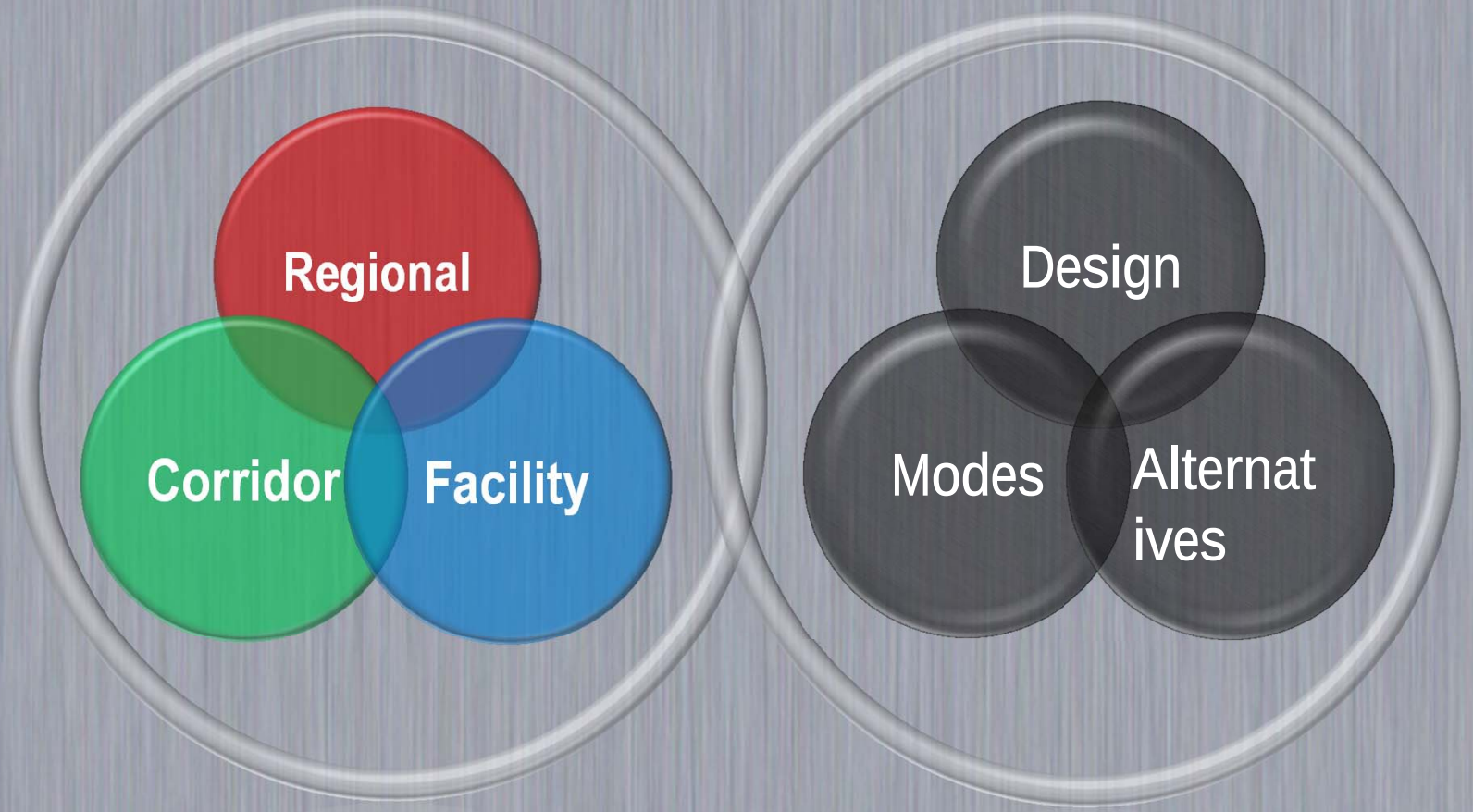


WHAT ARE THE BENEFITS?

1. Data Access

Networks, Performance Indicators

2. Consistency

Adopted Lane-Use &
Growth Patterns

3. Level of Details

Mode, Route, Lane Choice(s)

4. Resources (Data, Model, Staff)

Life-Cycle Analysis
Framework / Tools

WHAT ARE THE KEYS TO SUCCESS?

1. Robust & Well-defined Data Model

2. Support Correct Level of Detail

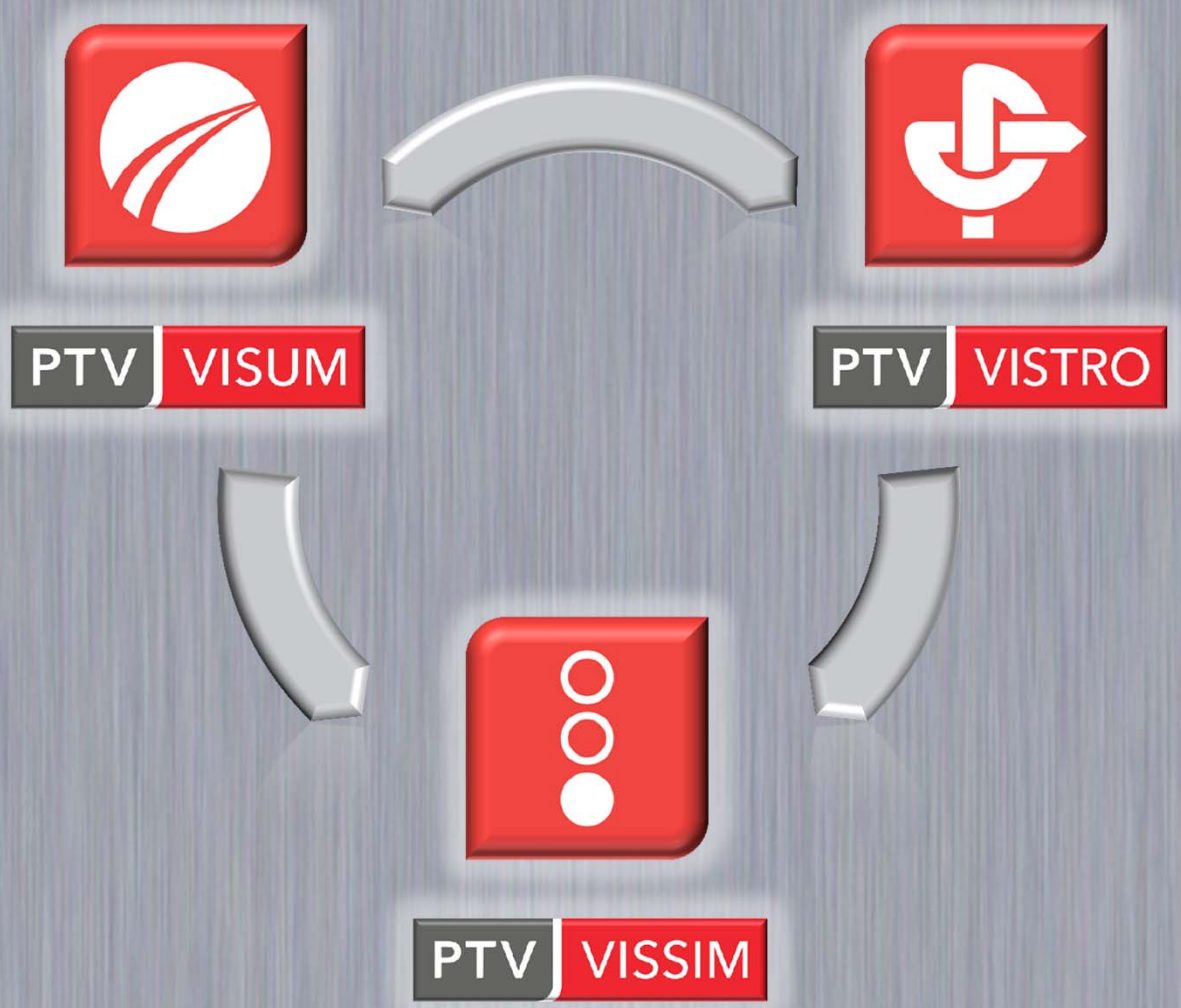
3. Vertical Consistency of Outputs

4. Ability of Cross-Validity

AGENDA

- Who is PTV Group?
- Multi-Resolution Modeling – The PTV Way
- **Methodologies and Tools for Multi-Resolution Modeling**
- The Next Frontier – Real Time Technology

MULTI-RESOLUTION MODELING COMPONENTS – PTV

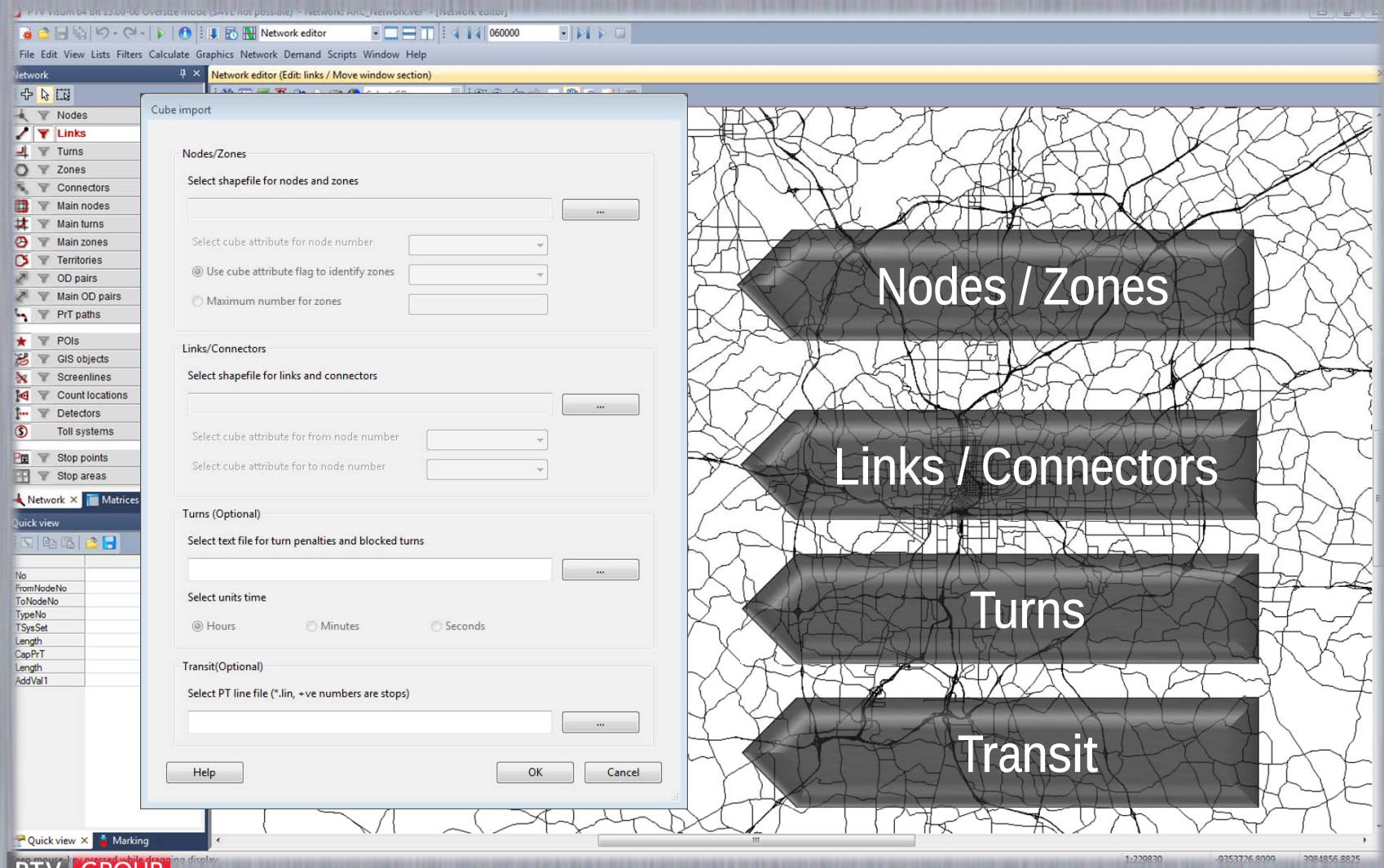


"LET PTV VISUM HELP - HOW CAN I....?"

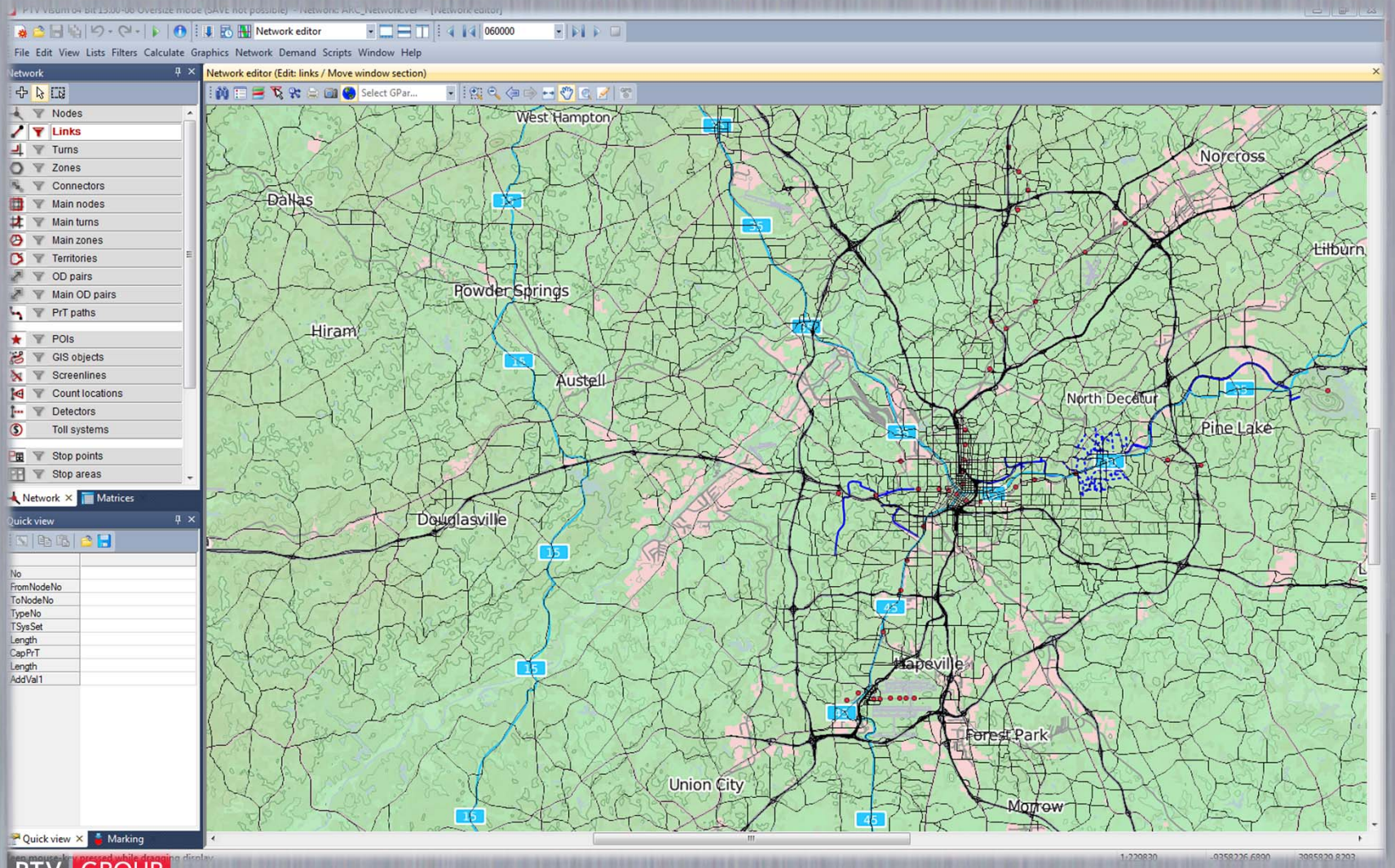
1. Work with Travel Demand Model Data?
2. Work with Big Data?
3. Work with Detailed Network Geometry & Control Data?
4. Model Time Dynamics?
5. Fuse Data Sources?
6. Can this help a Traffic Management Center?


Can I Work with Travel Demand
Travel Demand Model Data?

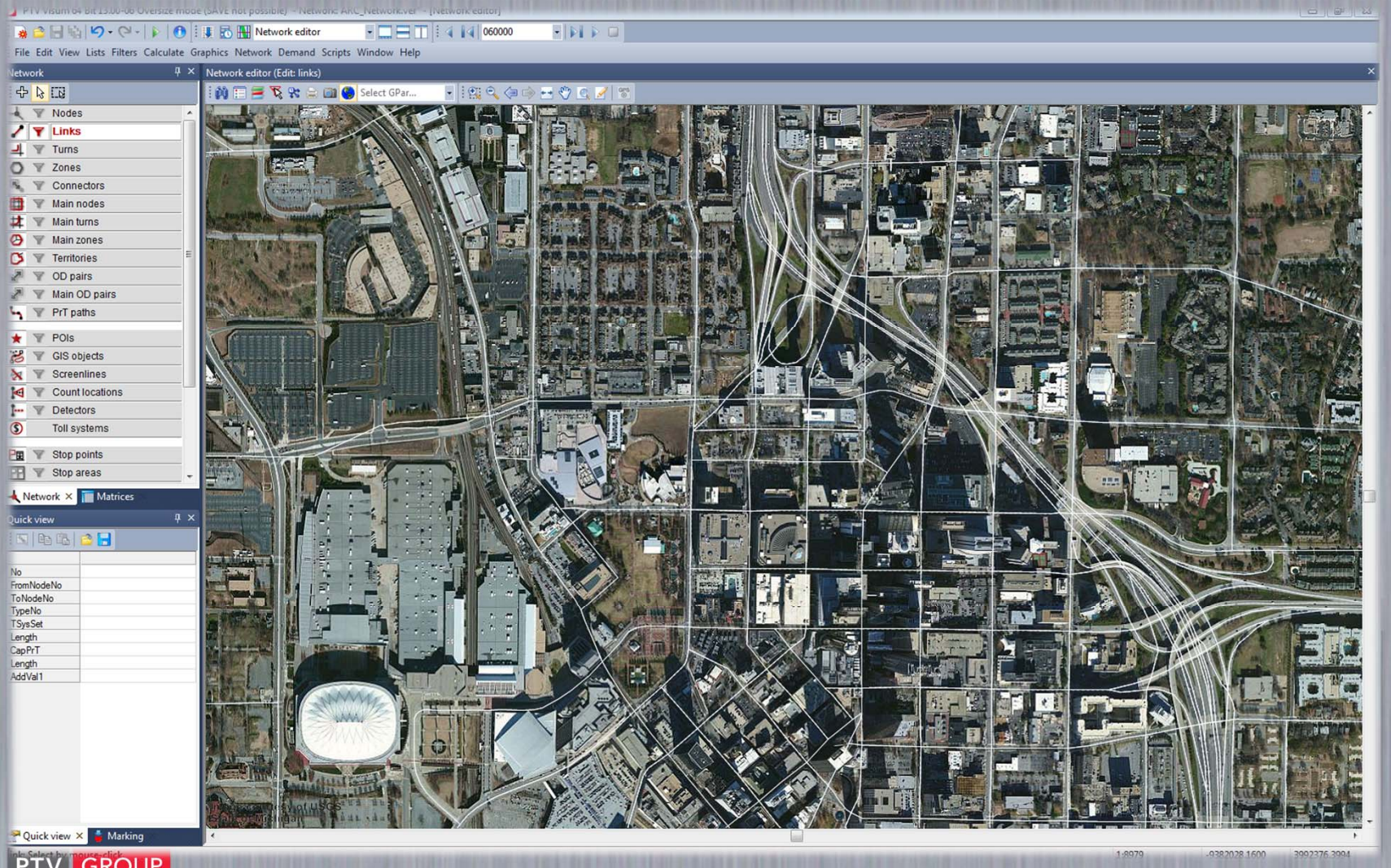
PTV VISUM – NATIVE & SECONDARY SUPPORT



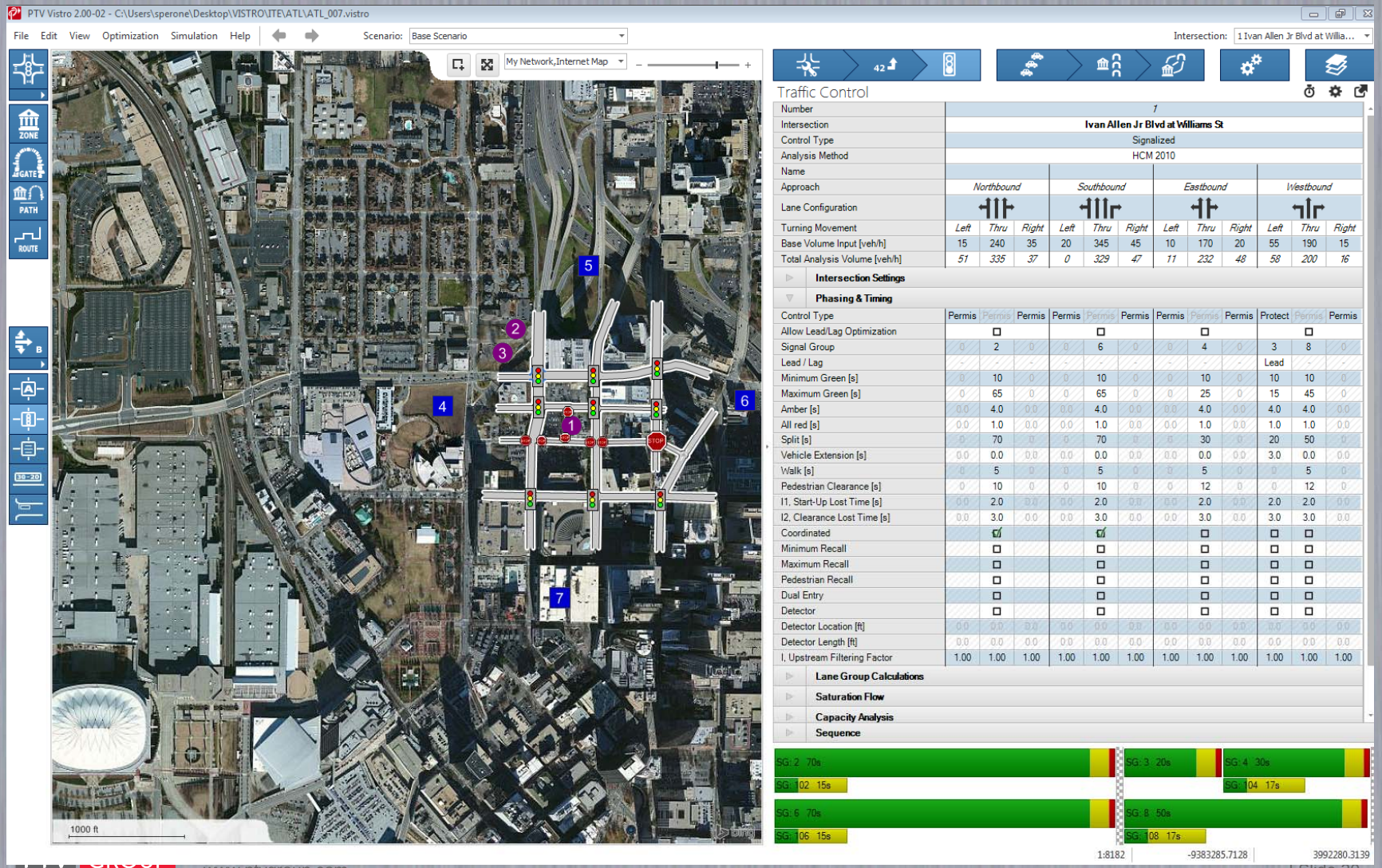
INTEGRATE WITH OPEN STREET MAP (OSM)



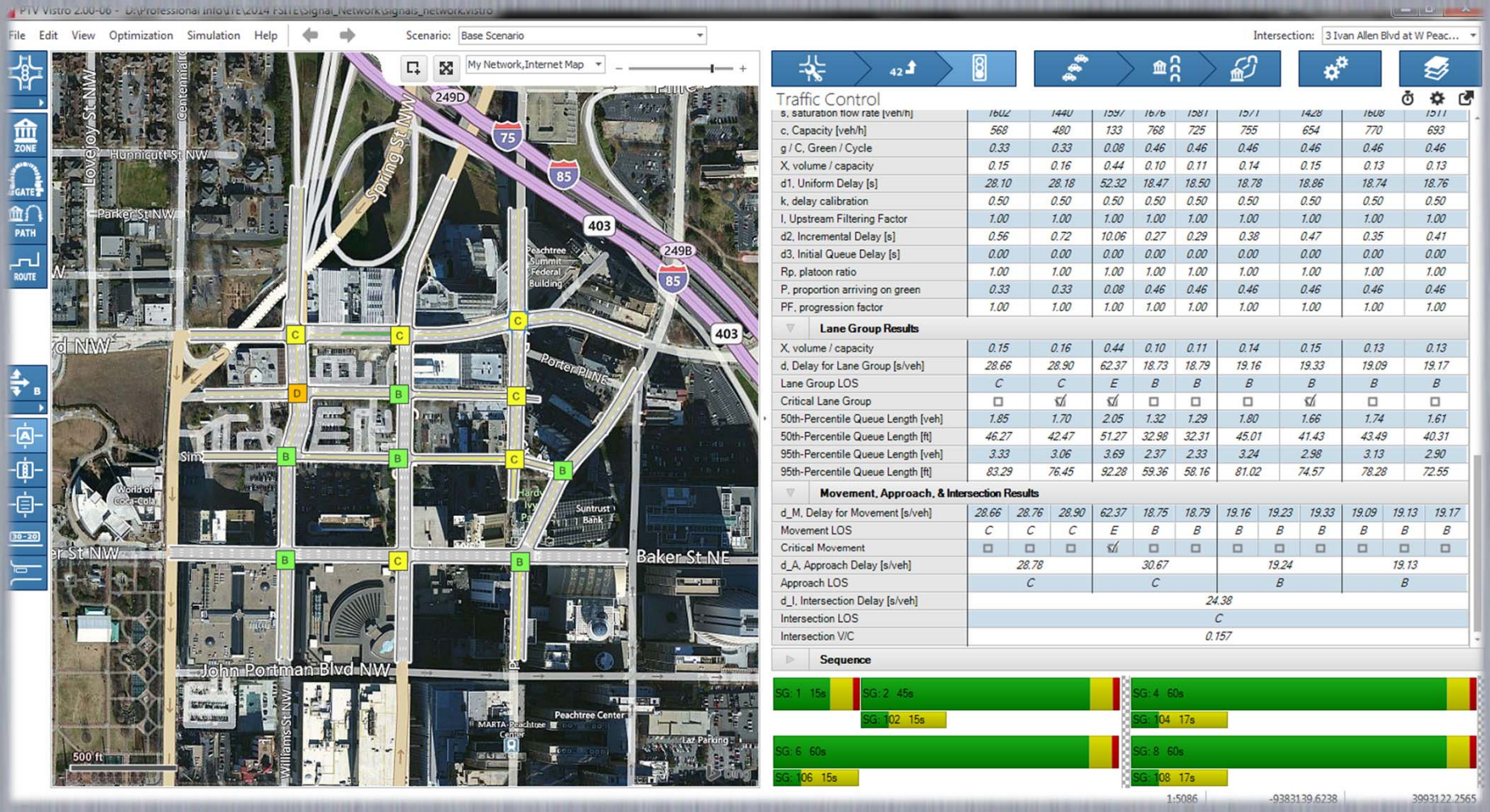
WORK DIRECTLY WITH BING AERIAL MAPS



SUBAREA EXTRACT WITH GEOMETRY / CONTROL



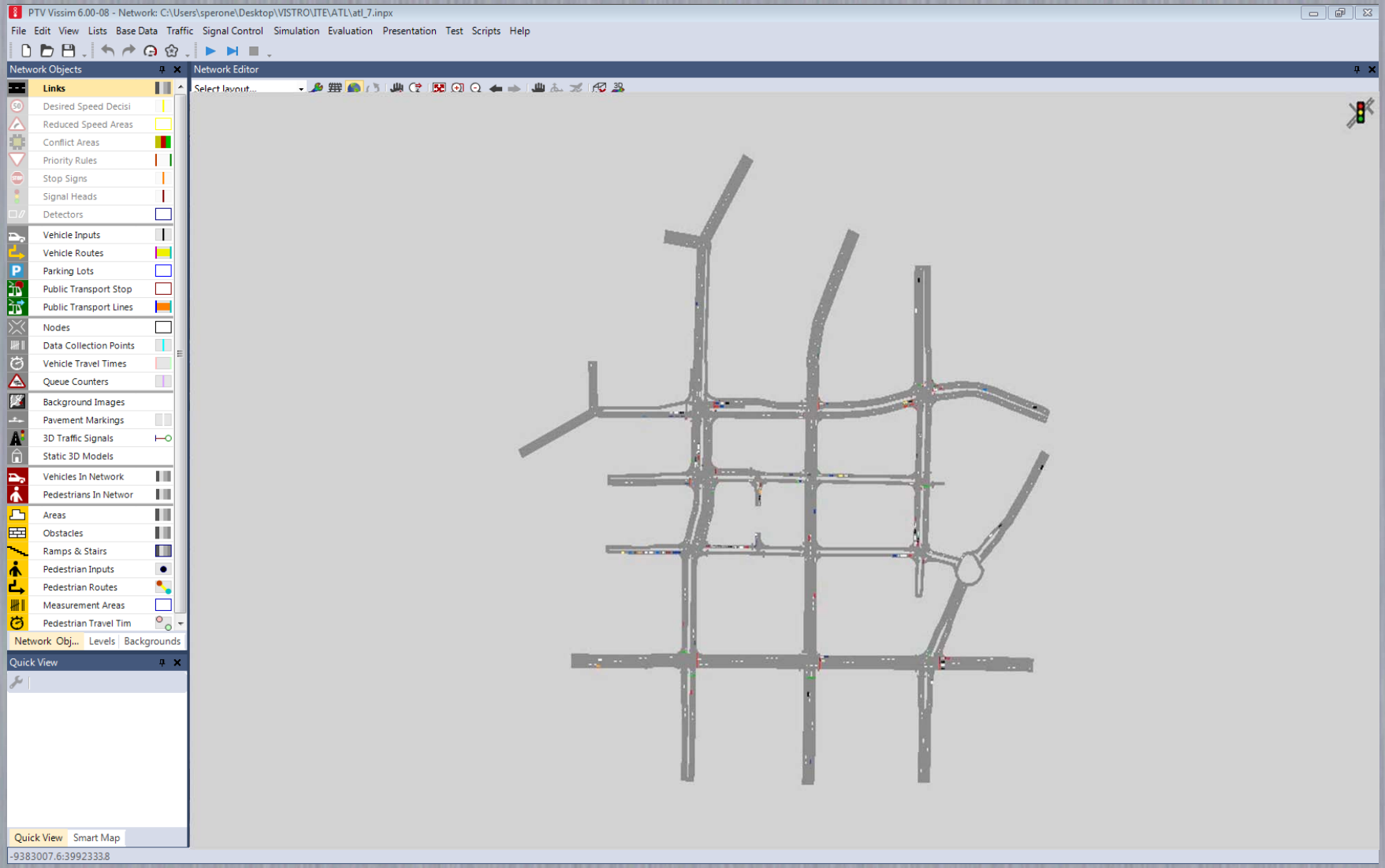
LEVEL OF SERVICE (LOS) RESULTS



s, saturation flow rate [veh/h]	1602	1440	1597	1676	1581	1571	1428	1608	1511
c, Capacity [veh/h]	568	480	133	768	725	755	654	770	693
g / C, Green / Cycle	0.33	0.33	0.08	0.46	0.46	0.46	0.46	0.46	0.46
X, volume / capacity	0.15	0.16	0.44	0.10	0.11	0.14	0.15	0.13	0.13
d1, Uniform Delay [s]	28.10	28.18	52.32	18.47	18.50	18.78	18.86	18.74	18.76
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.56	0.72	10.06	0.27	0.29	0.38	0.47	0.35	0.41
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P, proportion arriving on green	0.33	0.33	0.08	0.46	0.46	0.46	0.46	0.46	0.46
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Results									
X, volume / capacity	0.15	0.16	0.44	0.10	0.11	0.14	0.15	0.13	0.13
d, Delay for Lane Group [s/veh]	28.66	28.90	62.37	18.73	18.79	19.16	19.33	19.09	19.17
Lane Group LOS	C	C	E	B	B	B	B	B	B
Critical Lane Group	☐	☑	☑	☐	☐	☐	☑	☐	☐
50th-Percentile Queue Length [veh]	1.85	1.70	2.05	1.32	1.29	1.80	1.66	1.74	1.61
50th-Percentile Queue Length [ft]	46.27	42.47	51.27	32.98	32.31	45.01	41.43	43.49	40.31
95th-Percentile Queue Length [veh]	3.33	3.06	3.69	2.37	2.33	3.24	2.98	3.13	2.90
95th-Percentile Queue Length [ft]	83.29	76.45	92.28	59.36	58.16	81.02	74.57	78.28	72.55

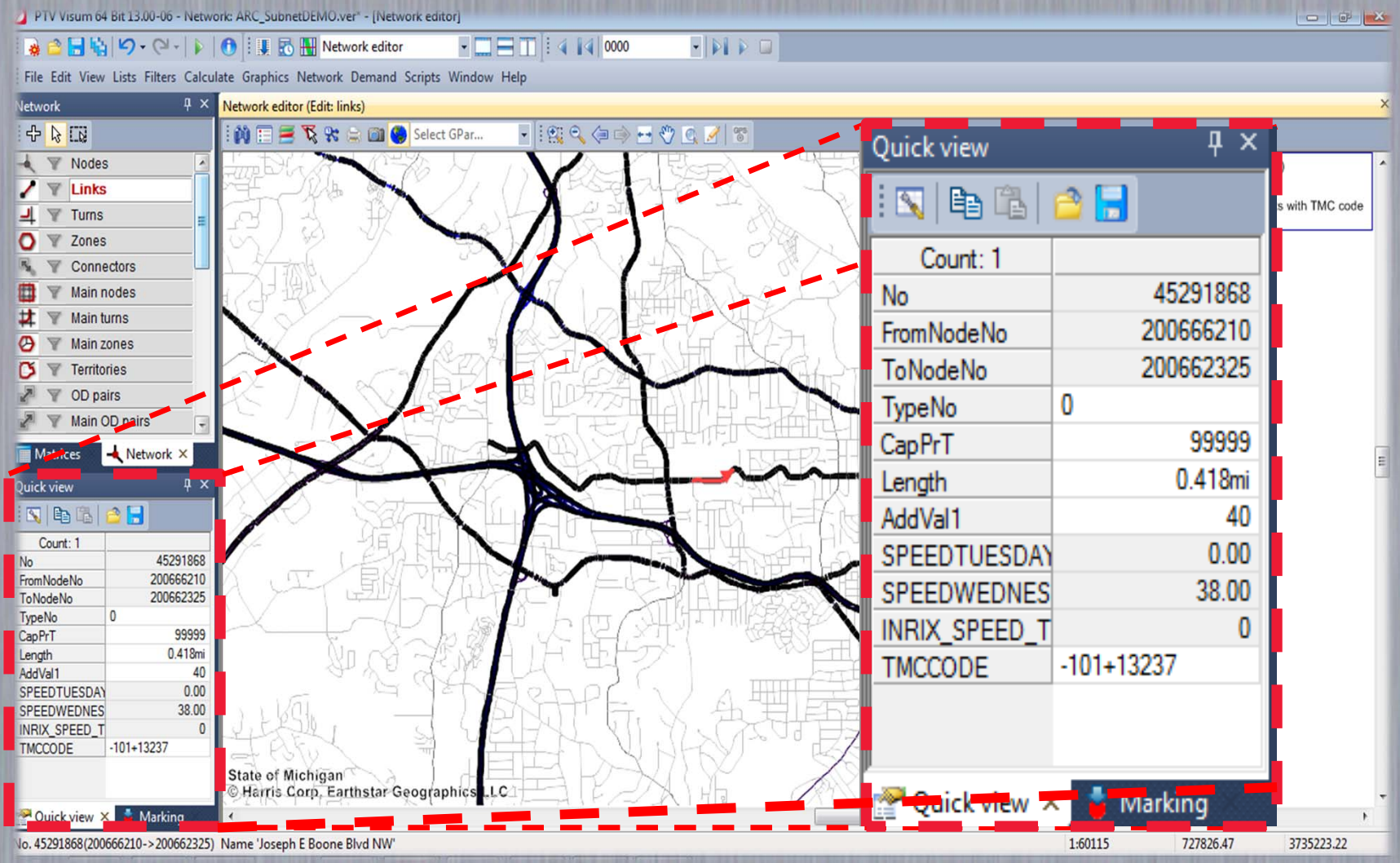
Movement, Approach, & Intersection Results												
d_M, Delay for Movement [s/veh]	28.66	28.76	28.90	62.37	18.75	18.79	19.16	19.23	19.33	19.09	19.13	19.17
Movement LOS	C	C	C	E	B	B	B	B	B	B	B	B
Critical Movement	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐
d_A, Approach Delay [s/veh]	28.78			30.67			19.24			19.13		
Approach LOS	C			C			B			B		
d_I, Intersection Delay [s/veh]	24.38											
Intersection LOS	C											
Intersection V/C	0.157											

EXAMINE DESIGN SOLUTIONS WITH SIMULATION

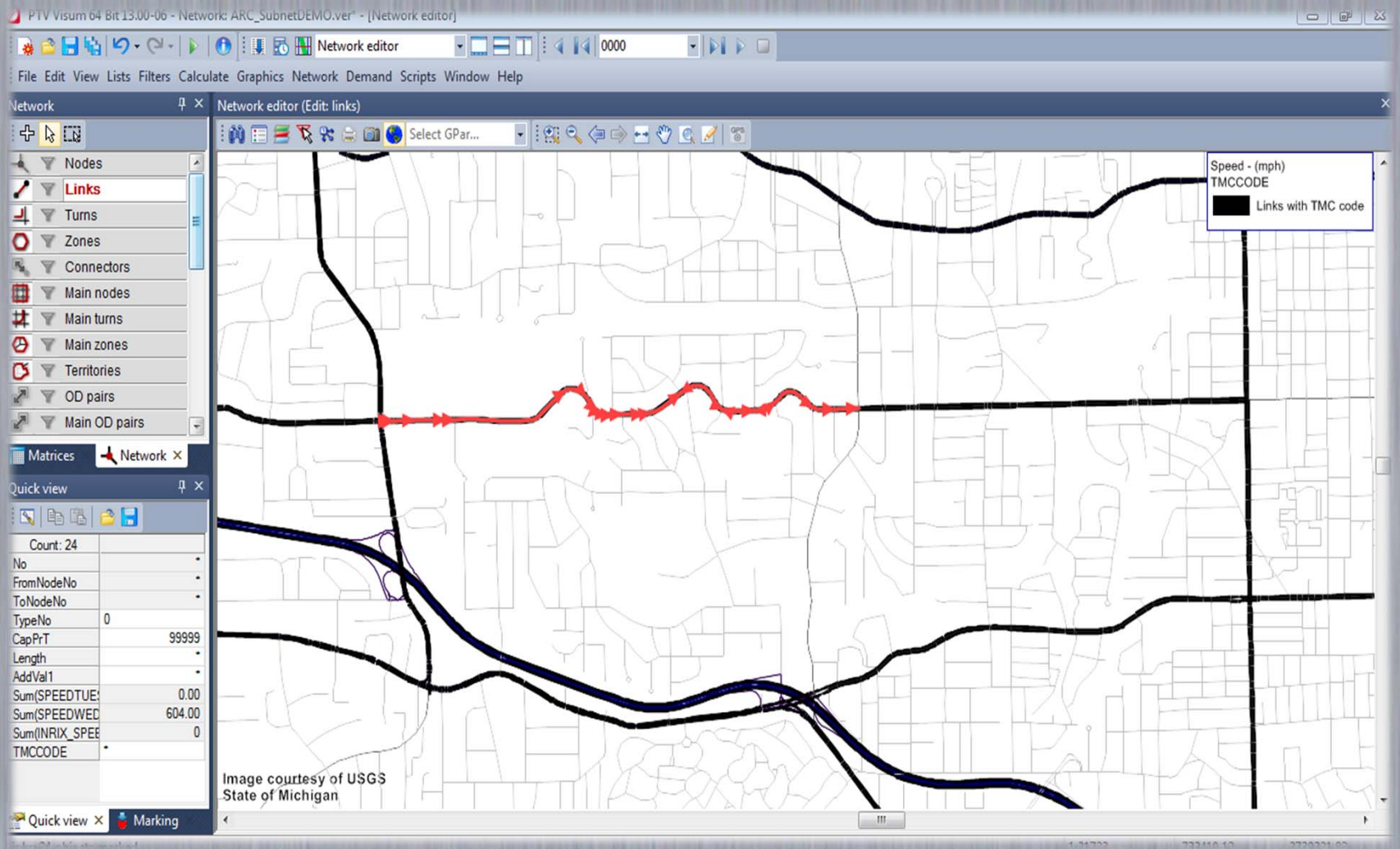



Can I Work with
'Big Data'?

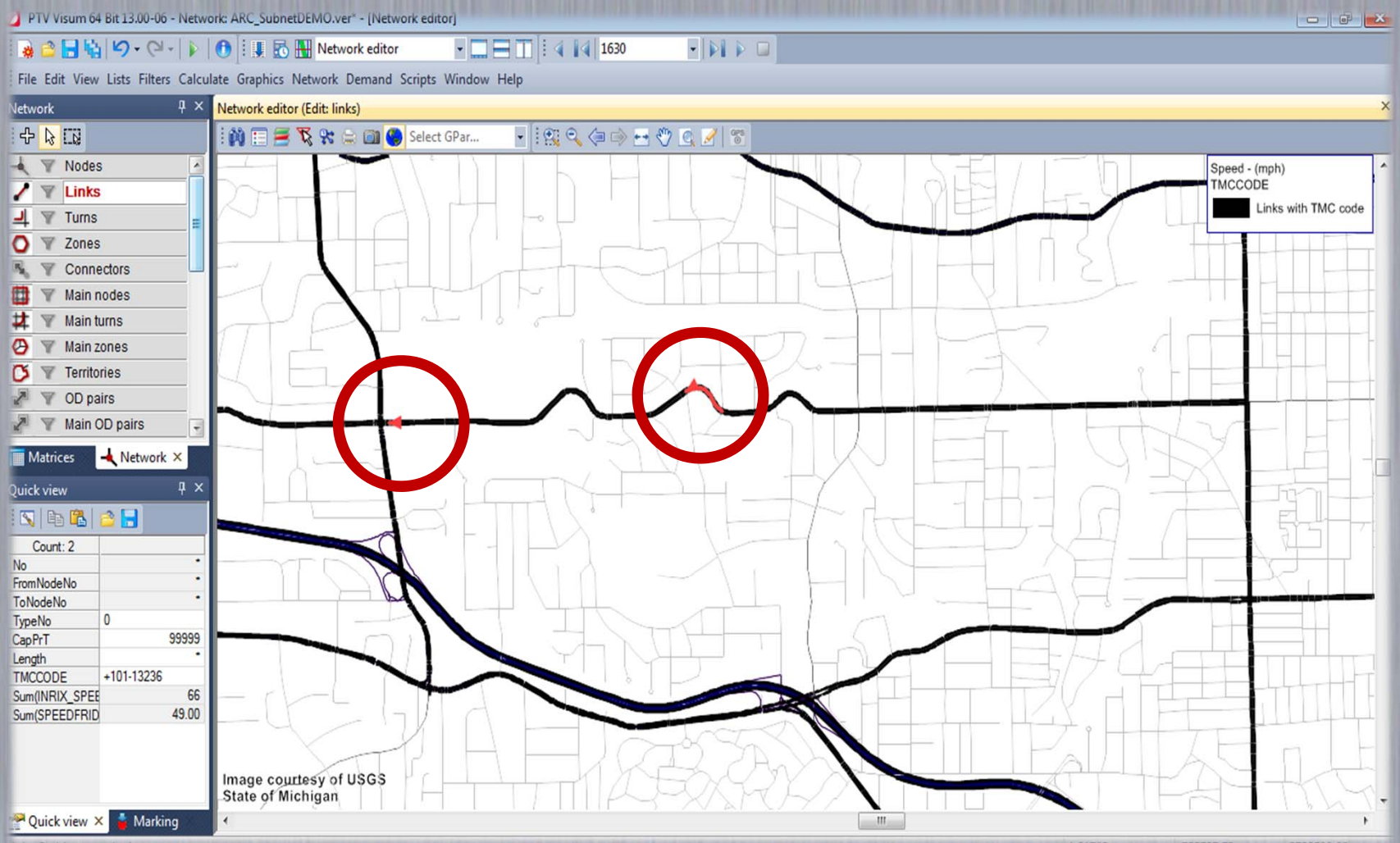
NAVIGATION NETWORKS WITH TMC CODES



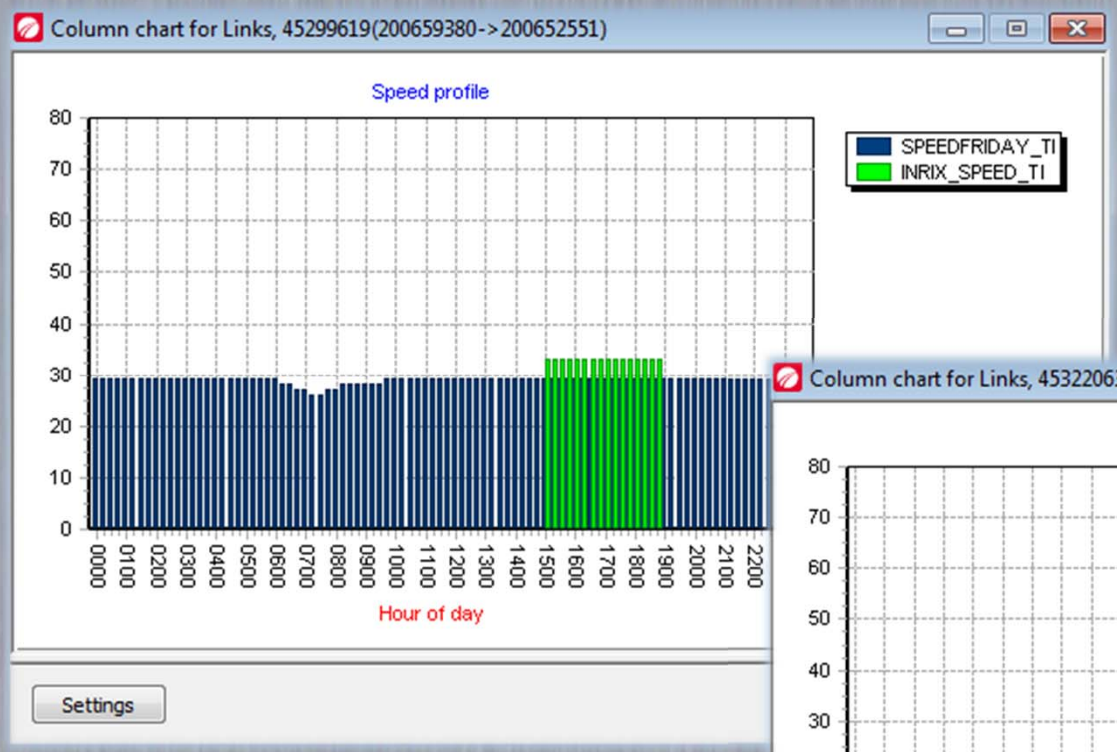
NAVIGATION NETWORKS WITH TMC CODES

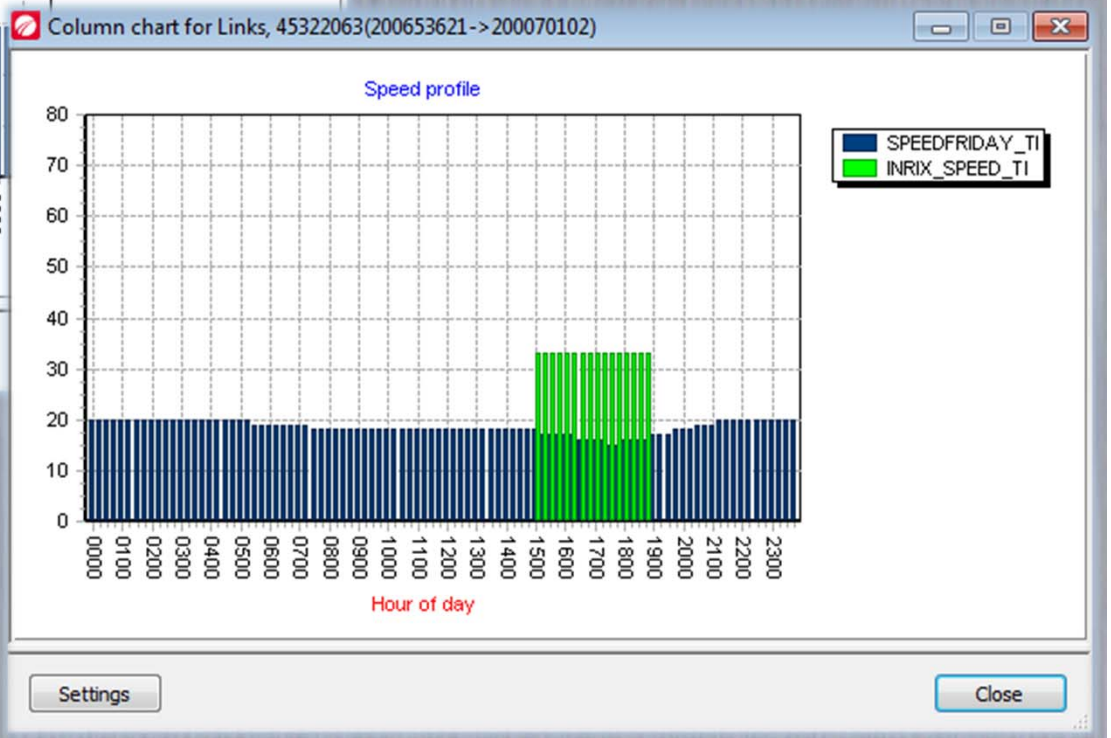


NAVIGATION NETWORKS WITH TMC CODES

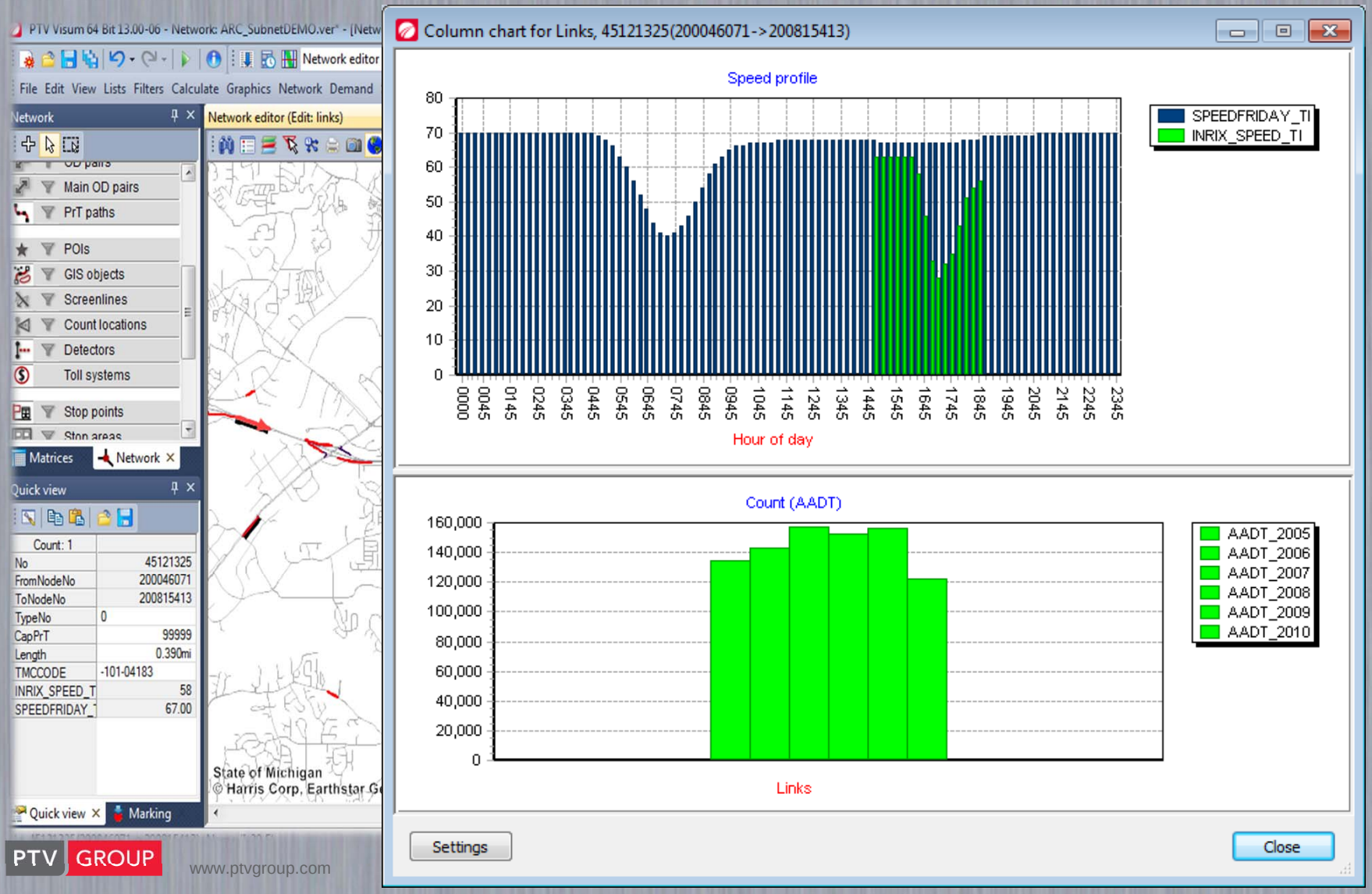


NAVIGATION NETWORK – SPEED PROFILES



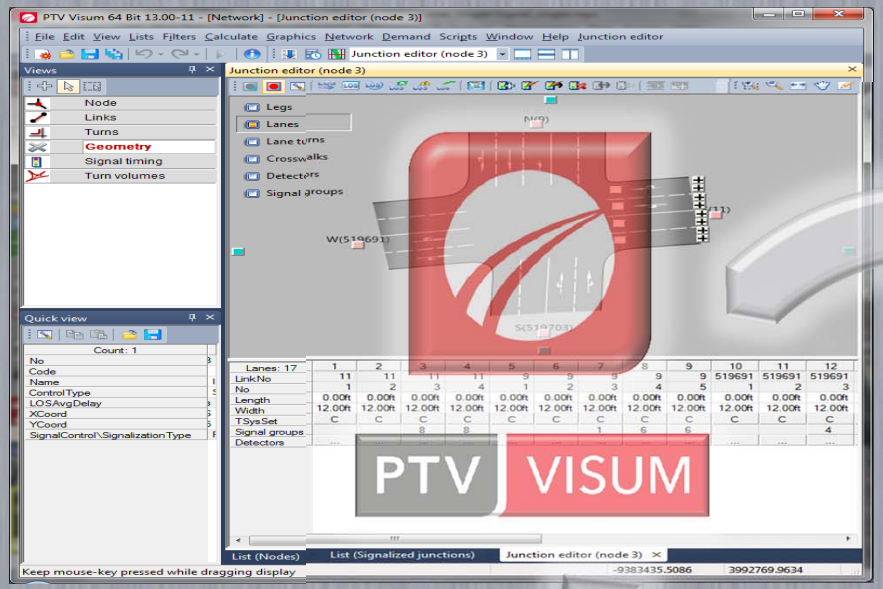


ACCESS COUNT & SPEED DATA WITH LINK COLUMN CHART

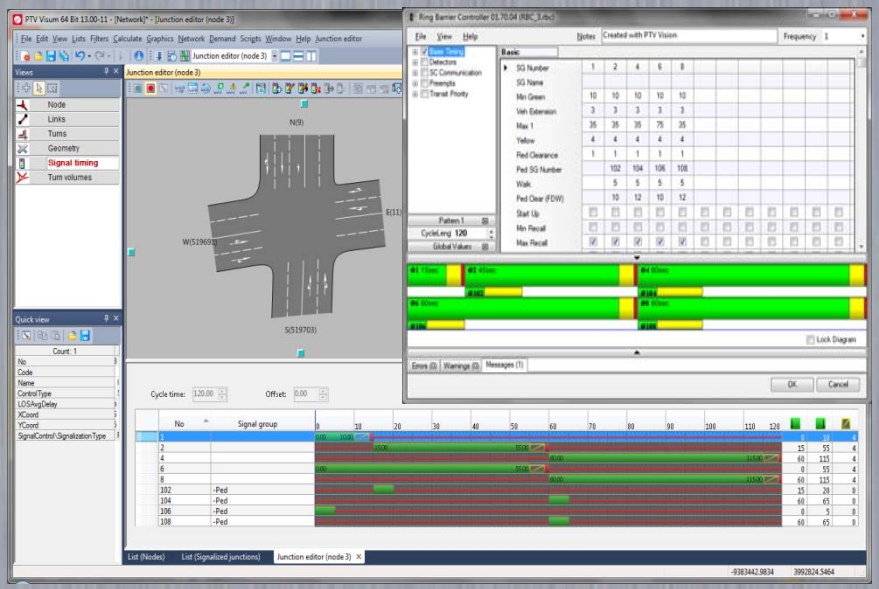


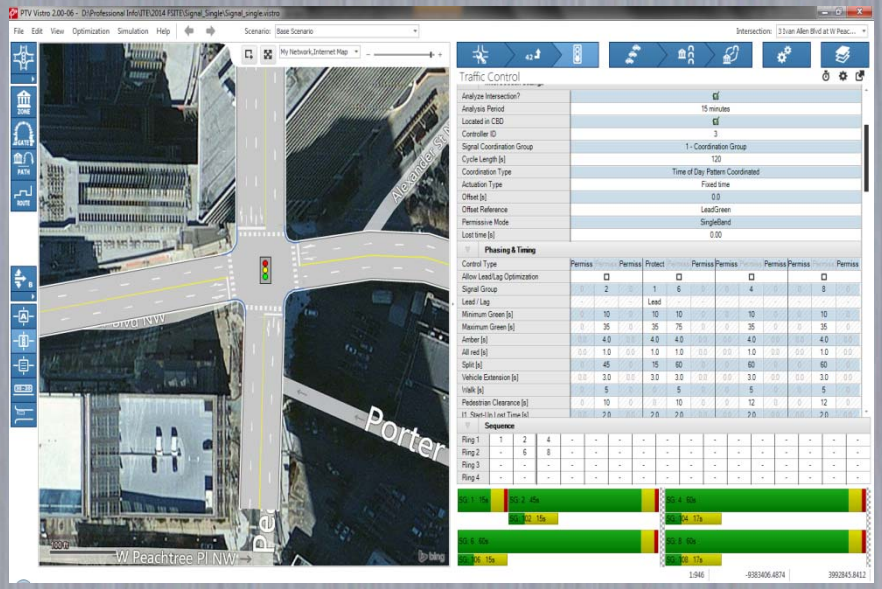

Can I Add Detailed Network
Geometry / Control Data?

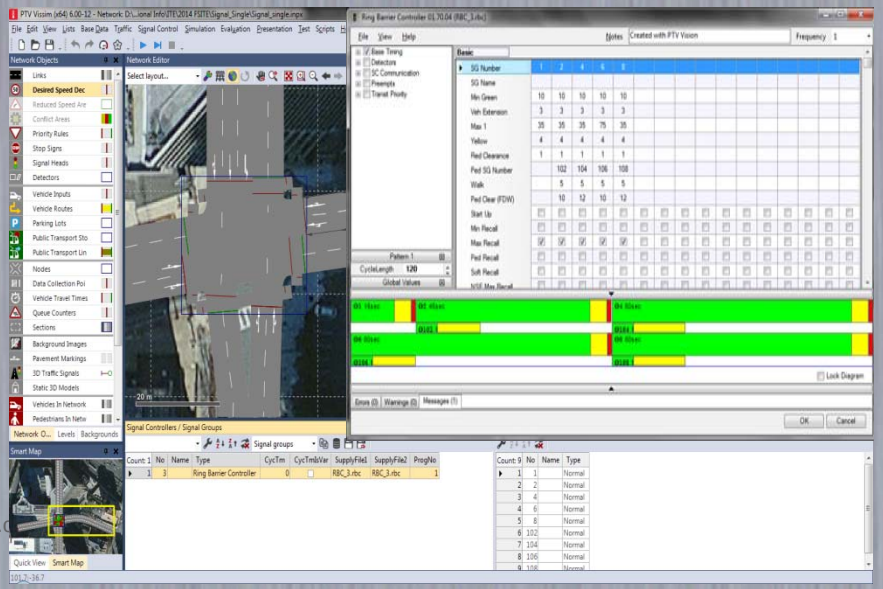
GEOMETRY DATA



SIGNAL TIMING DATA

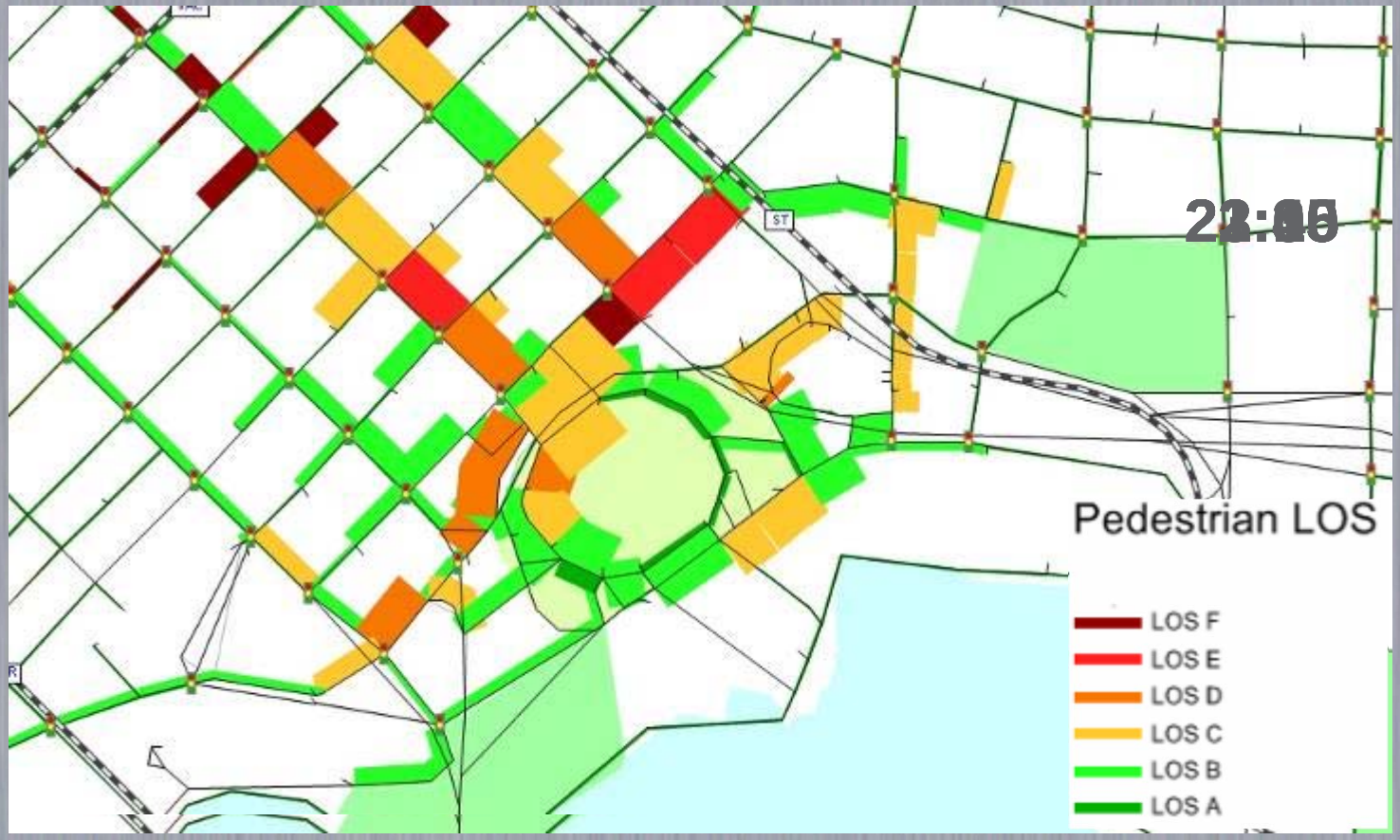







Can I Model
Time Dynamics?

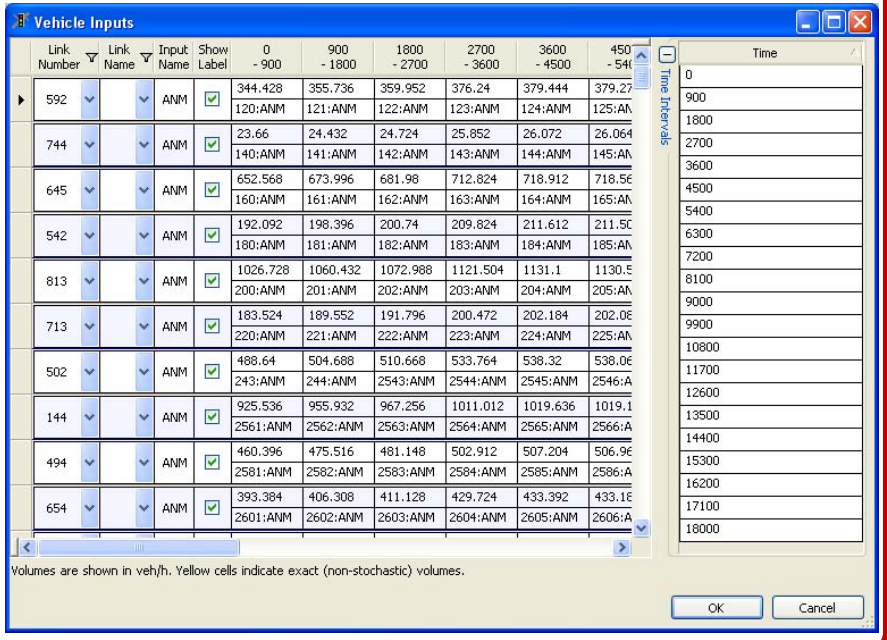
DYNAMIC USER EQUILIBRIUM (DUE) ASSIGNMENT



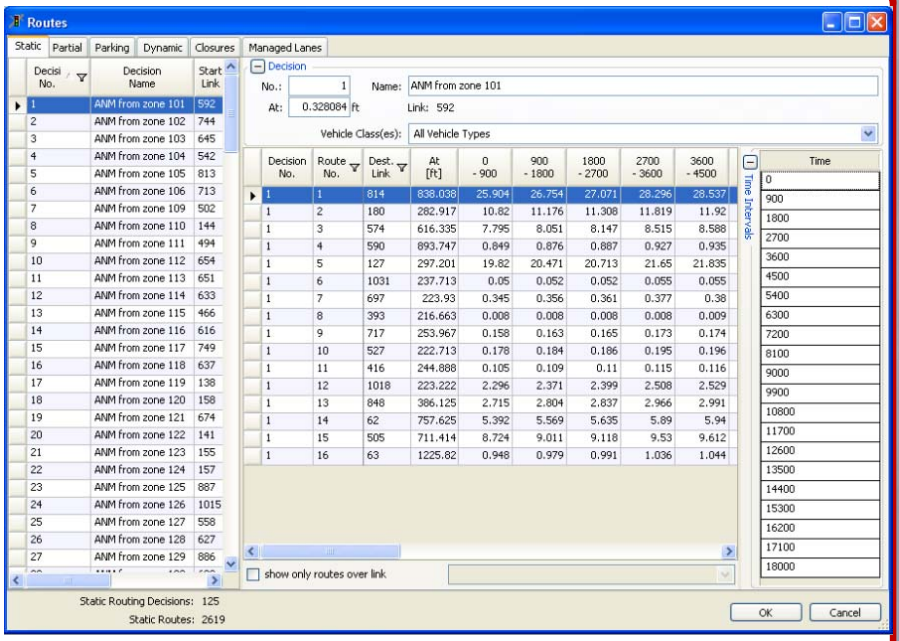
SIMULATE RESULTS

PTV VISSIM

Vehicle Inputs



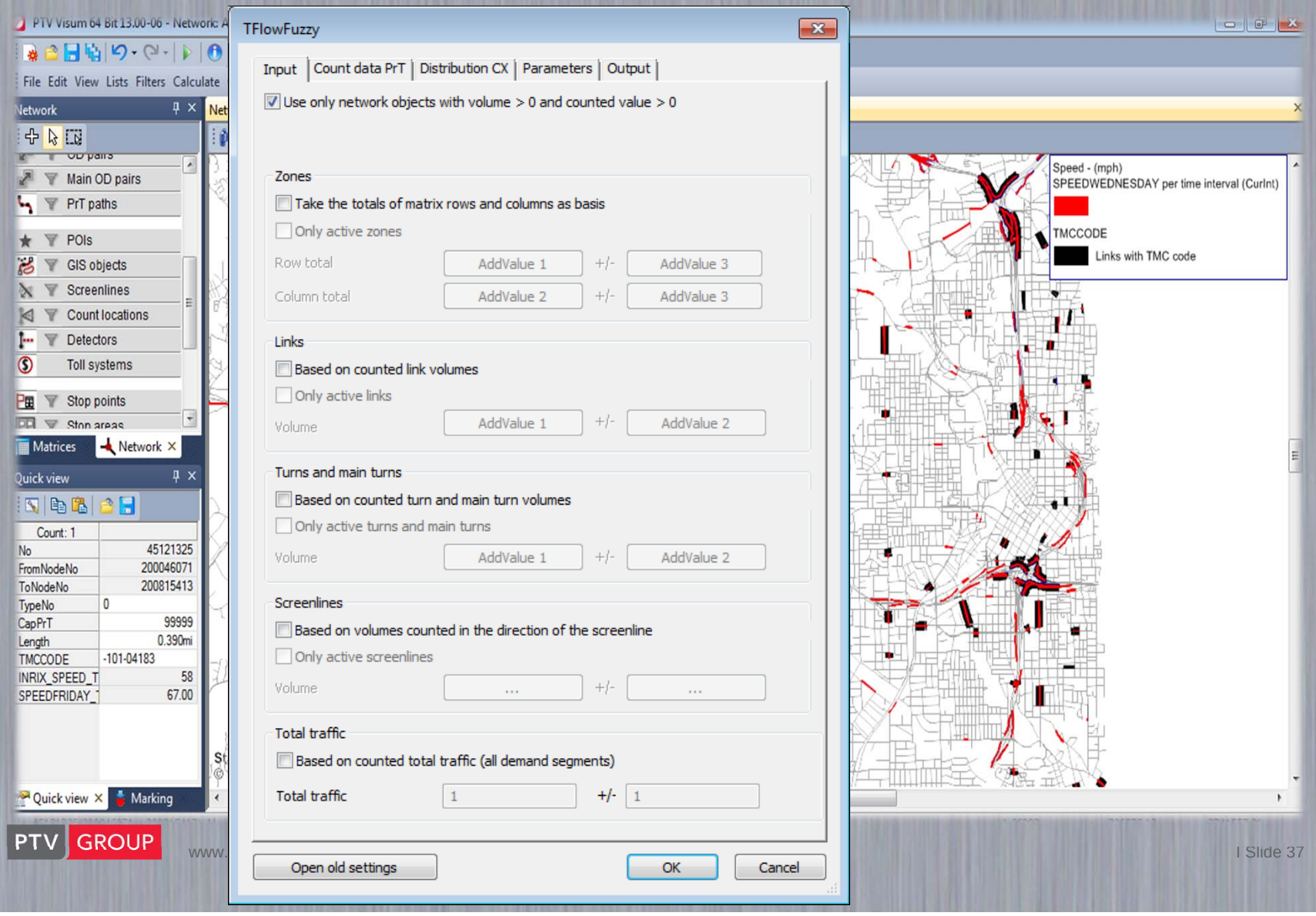
Routing Decision



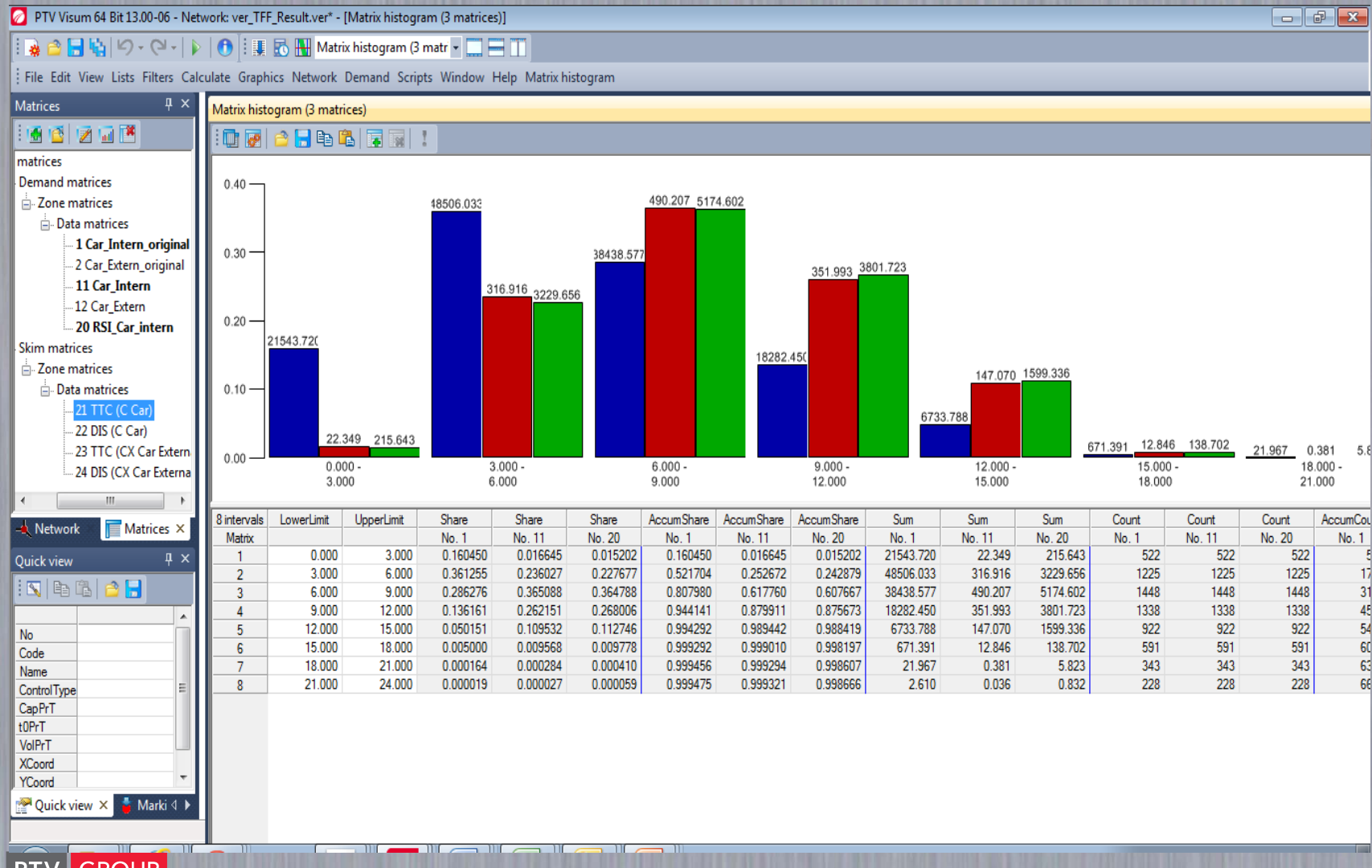

How Do I Fuse Data?

A SINGLE INTEGRATED MULTI-MODAL NETWORK

ORIGIN-DESTINATION MATRIX ESTIMATION (ODME)



ORIGIN-DESTINATION MATRIX ESTIMATION (ODME)



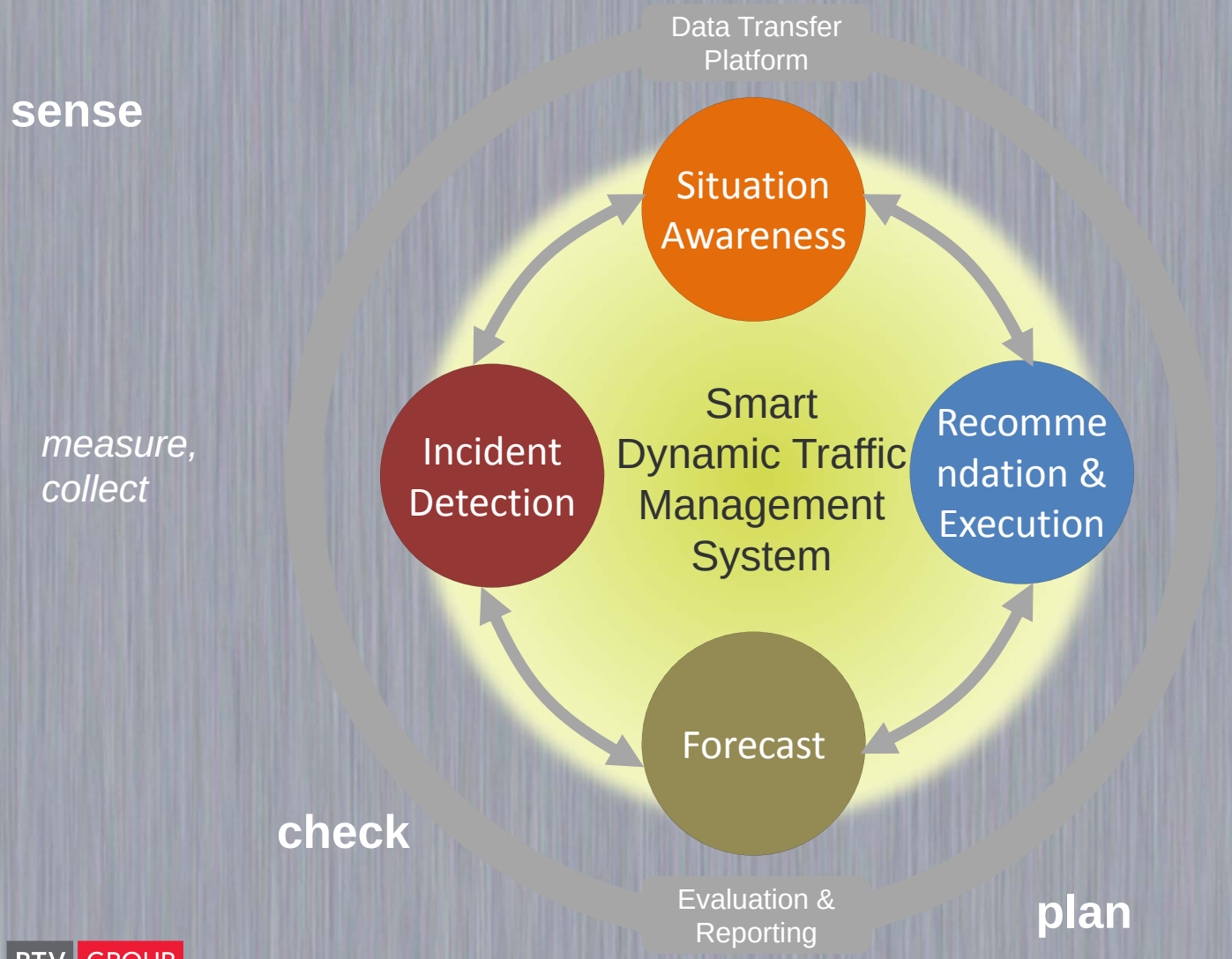
8 intervals	LowerLimit	UpperLimit	Share	Share	Share	AccumShare	AccumShare	AccumShare	Sum	Sum	Sum	Count	Count	Count	AccumCou
Matrix			No. 1	No. 11	No. 20	No. 1	No. 11	No. 20	No. 1	No. 11	No. 20	No. 1	No. 11	No. 20	No. 1
1	0.000	3.000	0.160450	0.016645	0.015202	0.160450	0.016645	0.015202	21543.720	22.349	215.643	522	522	522	5
2	3.000	6.000	0.361255	0.236027	0.227677	0.521704	0.252672	0.242879	48506.033	316.916	3229.656	1225	1225	1225	17
3	6.000	9.000	0.286276	0.365088	0.364788	0.807980	0.617760	0.607667	38438.577	490.207	5174.602	1448	1448	1448	31
4	9.000	12.000	0.136161	0.262151	0.268006	0.944141	0.879911	0.875673	18282.450	351.993	3801.723	1338	1338	1338	45
5	12.000	15.000	0.050151	0.109532	0.112746	0.994292	0.989442	0.988419	6733.788	147.070	1599.336	922	922	922	54
6	15.000	18.000	0.005000	0.009568	0.009778	0.999292	0.999010	0.998197	671.391	12.846	138.702	591	591	591	60
7	18.000	21.000	0.000164	0.000284	0.000410	0.999456	0.999294	0.998607	21.967	0.381	5.823	343	343	343	63
8	21.000	24.000	0.000019	0.000027	0.000059	0.999475	0.999321	0.998666	2.610	0.036	0.832	228	228	228	66

AGENDA

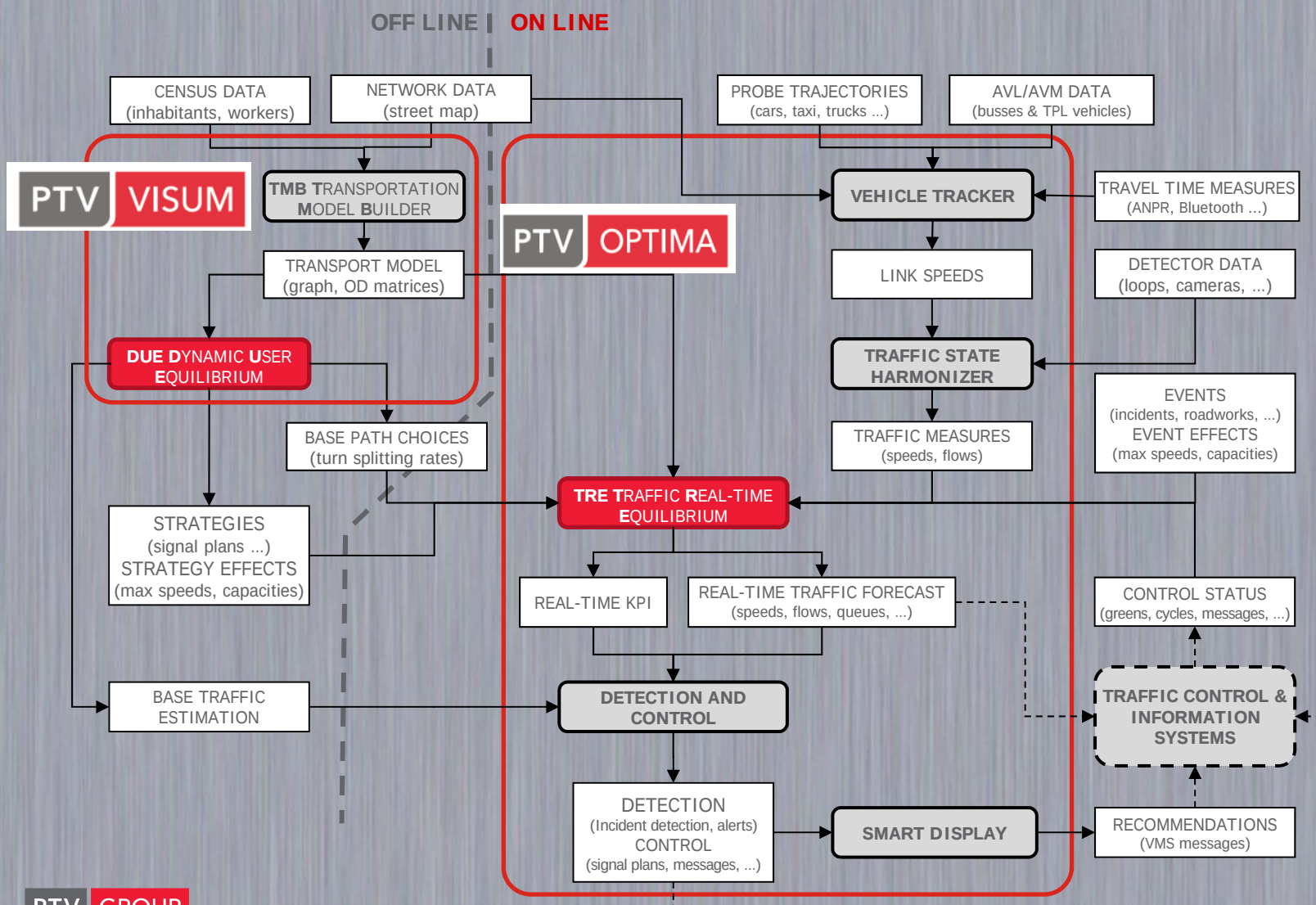
- Who is PTV Group?
- Multi-Resolution Modeling – The PTV Way
- Methodologies and Tools for Multi-Resolution Modeling
- **The Next Frontier – Real Time Technology**


9. Can this help a
Traffic Mangement Center?

PTV VISION – DYNAMIC TRAFFIC MANAGEMENT ELEMENTS

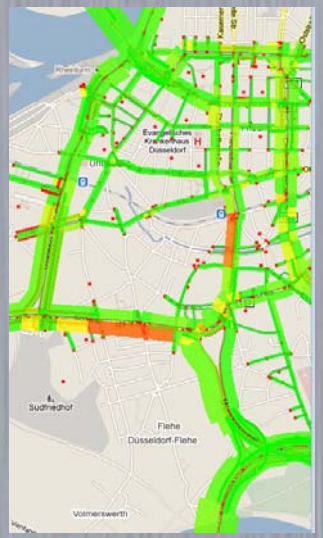


PTV OPTIMA – HOW DOES IT WORK



PTV OPTIMA – YOUR TRAFFIC DATA AMPLIFIER!

A traffic data AMPLIFIER



A traffic data HUB


PUTTING IT ALL TOGETHER
REALIZE THE BENEFITS

PTV VISION - REALIZE THE BENEFITS!

- Decision Support at Each Level
- Decision Support Across Levels

PTV GROUP

the mind of movement

ANALYTICAL EFFICIENCIES THROUGH THE INTEGRATION OF MODELING AND SIMULATION TOOLS

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Steve Perone, President