# AN UPDATE ON THE
# Iowa Travel Analysis Model


**Presented to the**

## Midwest Travel Model User Group (MTMUG)

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**by**

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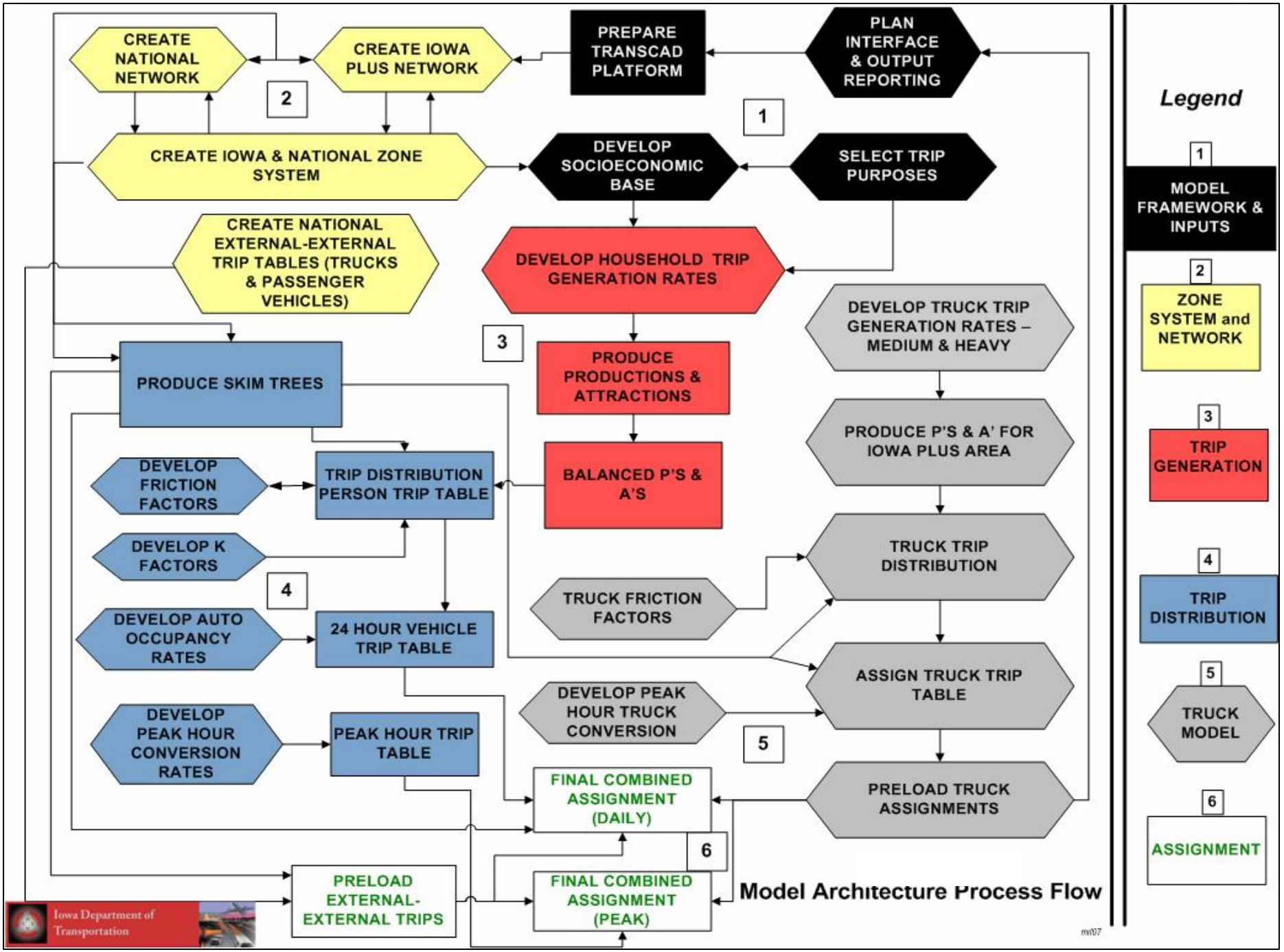
Iowa Department of Transportation

# Content

- Background on iTRAM
- Status Report
- Model Validation
- Model Implementation
  - Running iTRAM

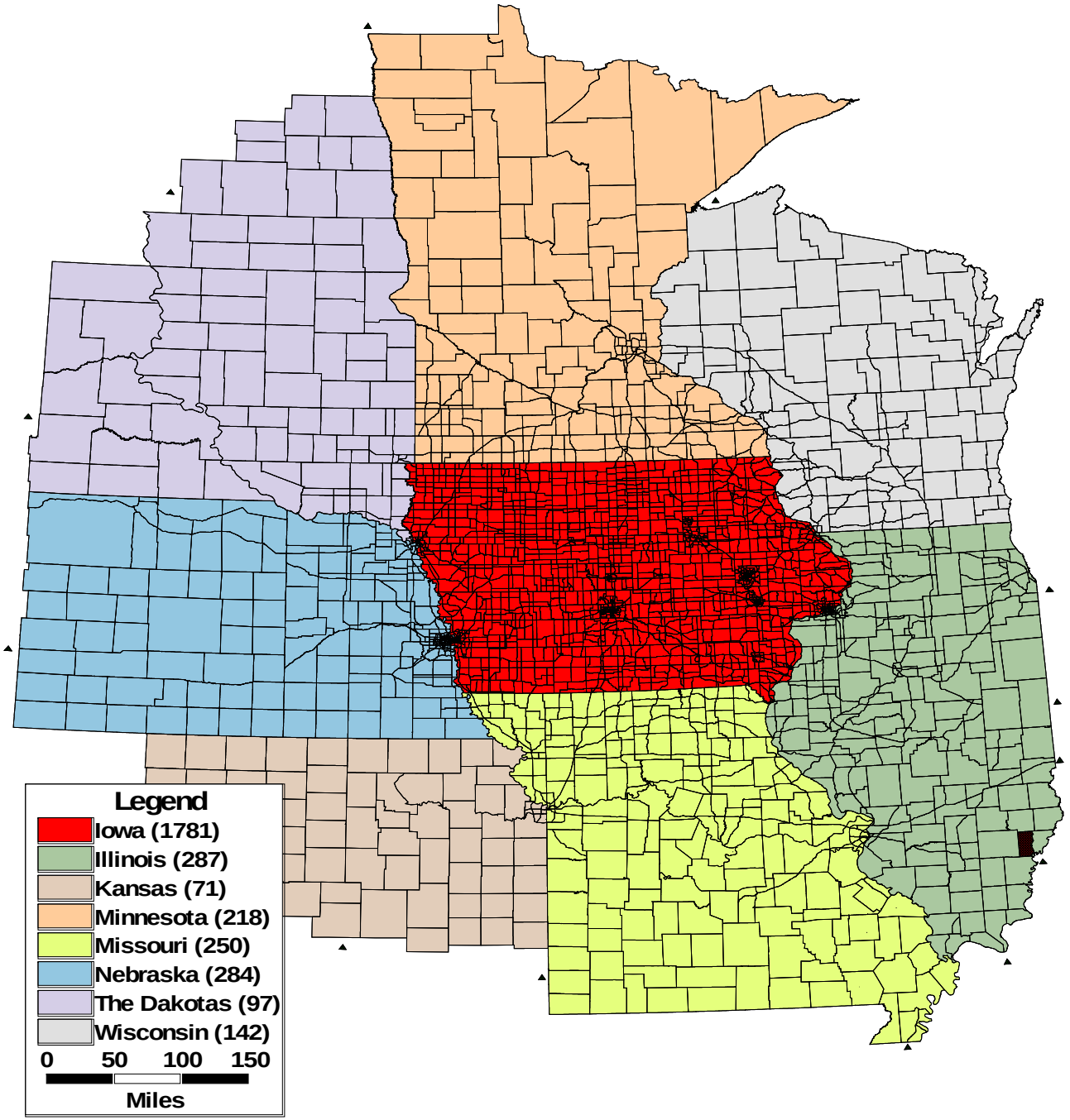
# iTRAM Timeline

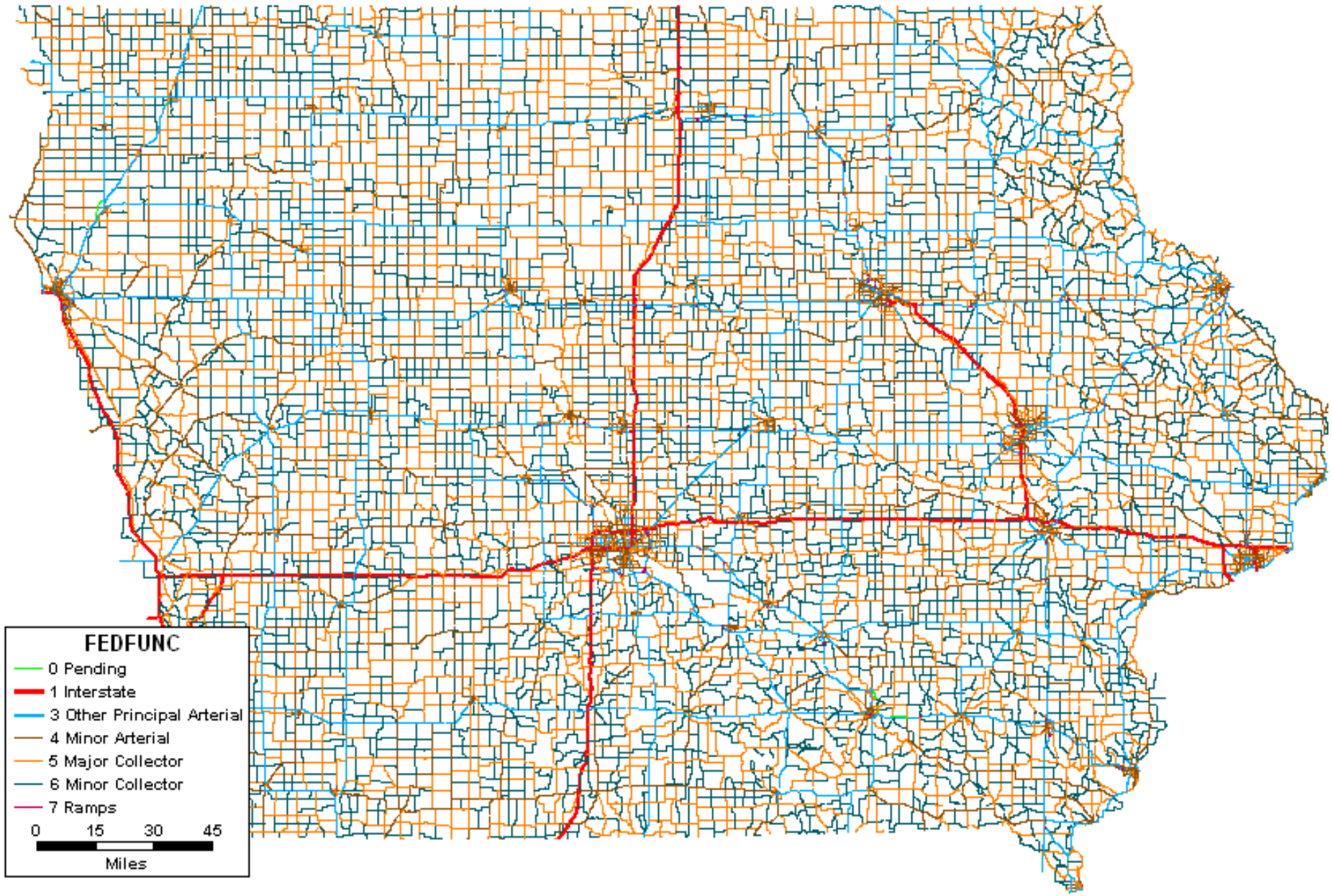
- Architecture Completed April 2007
- Trip Generation from 2001 National Household Travel Survey – Summer 2008
- Network Transformation (from Iowa GIMS) – Fall 2008
- Calibration Work – Winter 2009
- Validation July 2009


CREATE NATIONAL NETWORK
CREATE IOWA PLUS NETWORK
PREPARE TRANSCAD PLATFORM
PLAN INTERFACE & OUTPUT REPORTING
2
1
CREATE IOWA & NATIONAL ZONE SYSTEM
DEVELOP SOCIOECONOMIC BASE
SELECT TRIP PURPOSES
CREATE NATIONAL EXTERNAL-EXTERNAL TRIP TABLES (TRUCKS & PASSENGER VEHICLES)
DEVELOP HOUSEHOLD TRIP GENERATION RATES
DEVELOP TRUCK TRIP GENERATION RATES – MEDIUM & HEAVY
3
PRODUCE PRODUCTIONS & ATTRACTIONS
PRODUCE SKIM TREES
PRODUCE P'S & A' FOR IOWA PLUS AREA
DEVELOP FRICTION FACTORS
TRIP DISTRIBUTION PERSON TRIP TABLE
BALANCED P'S & A'S
DEVELOP K FACTORS
TRUCK TRIP DISTRIBUTION
4
TRUCK FRICTION FACTORS
DEVELOP AUTO OCCUPANCY RATES
24 HOUR VEHICLE TRIP TABLE
ASSIGN TRUCK TRIP TABLE
DEVELOP PEAK HOUR TRUCK CONVERSION
DEVELOP PEAK HOUR CONVERSION RATES
PEAK HOUR TRIP TABLE
5
FINAL COMBINED ASSIGNMENT (DAILY)
PRELOAD TRUCK ASSIGNMENTS
6
PRELOAD EXTERNAL-EXTERNAL TRIPS
FINAL COMBINED ASSIGNMENT (PEAK)
Model Architecture Process Flow
mvl07
Legend
1
MODEL FRAMEWORK & INPUTS
2
ZONE SYSTEM and NETWORK
3
TRIP GENERATION
4
TRIP DISTRIBUTION
5
TRUCK MODEL
6
ASSIGNMENT
Iowa Department of Transportation

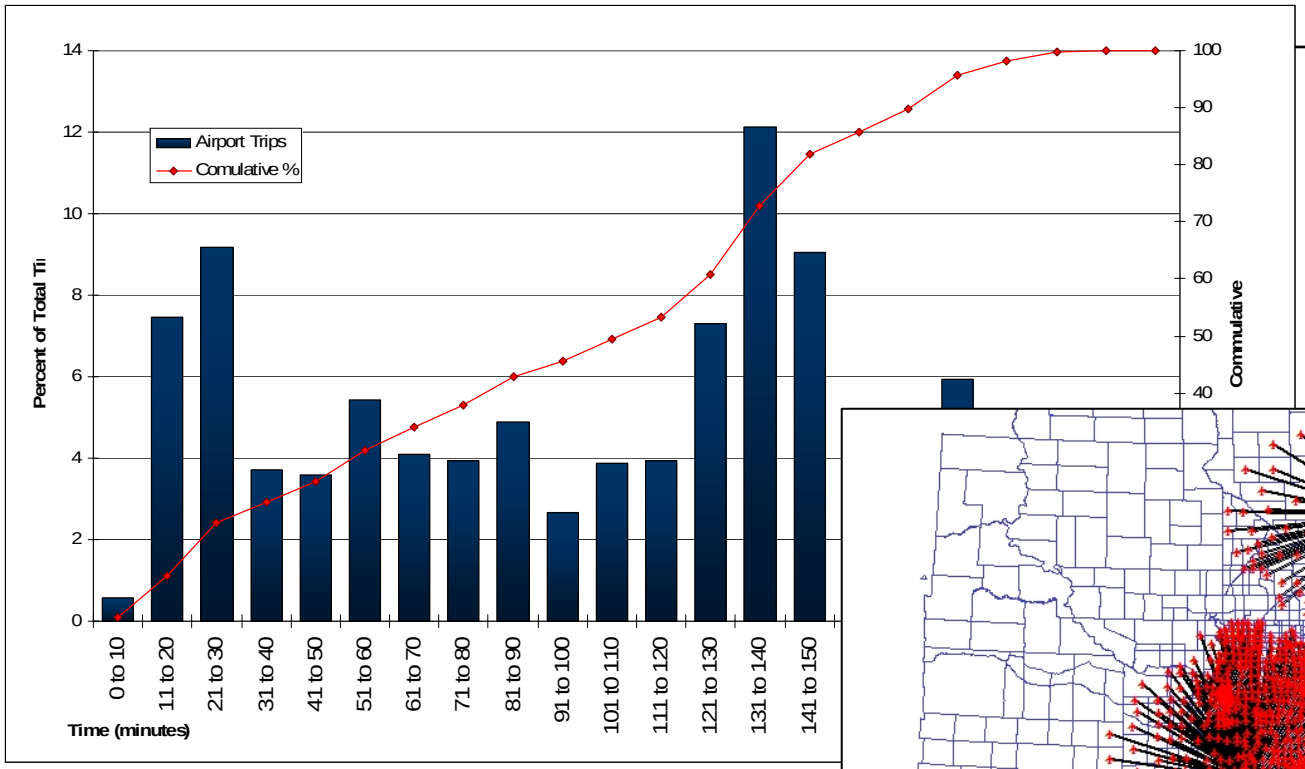
# Tasks

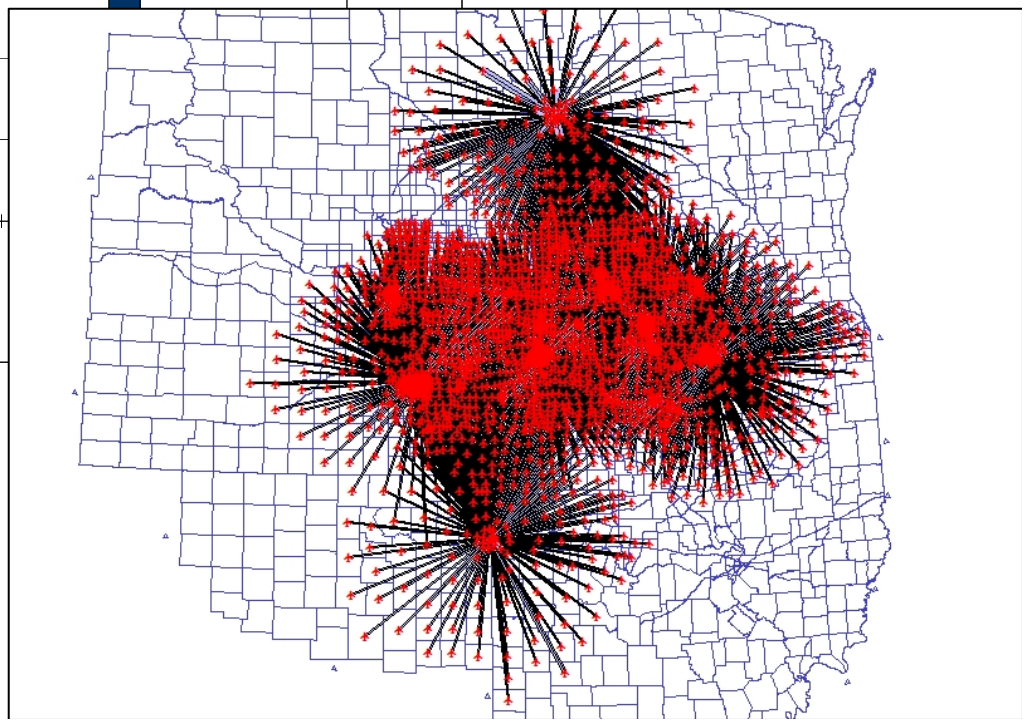
| Task | Description |
|---|---|
| 1 | Design the Iowa Travel Analysis Model Approach (Architecture) |
| 2 | Build traffic analysis zone (TAZ) structure. |
| 3 | Obtain 2005 LRS network from the Iowa DOT, develop/check network attributes: unique ID, length, direction, name, functional class, number of lanes, area type, capacity, speed, traffic (AADT), truck counts, screen lines and summary variables for reporting. |
| 4 | Work with Iowa DOT staff to collect/classify socioeconomic data by TAZ for base year and future years - Census block TAZ allocation for households, detailed employment information within Iowa, and more aggregated information in the buffer zones. |
| 5 | Develop a three-step truck submodel |
| 6 | Conduct trip generation for internal trips for three purposes. |
| 7 | Conduct gravity model evaluation and evaluate for both autos and trucks. |
| 8 | For both auto & truck: combine gravity model matrices, special generator trips and long distance periodic trips to get total trip tables. |
| 9 | Run truck and auto traffic assignments. |
| 10 | Tabulate state, county and corridor specific measurements of accuracy. Develop reporting mechanism appropriate for Iowa DOT needs. |
| 11 | Write GISDK to automate the traffic model at each step; include future years. |


Legend
Iowa (1781)
Illinois (287)
Kansas (71)
Minnesota (218)
Missouri (250)
Nebraska (284)
The Dakotas (97)
Wisconsin (142)
0 50 100 150
Miles


FEDFUNC
0 Pending
1 Interstate
3 Other Principal Arterial
4 Minor Arterial
5 Major Collector
6 Minor Collector
7 Ramps
0
15
30
45
Miles

# Air Passenger Model



# Area Type

- Three Area Types: Urban, Rural, Town/Suburban
- Used for Trip Rate Stratification
- Used for Link Speed & Capacity Lookup
- Use for Centroid Connector Speeds
- Used for Terminal Times

# Recent Activities

- Developed GUI (Baker)
- Calibration Workshops (NY + PA)
- Incorporated Iowa DOT Network (CC-check)
- Fine-Tune Calibration | Validation
- Developed Post-Process Mechanism

# Model Calibration (24 hr – ADT)

- By Functional Class and Area Type
- By Volume Groups
- Major Route's Statistics
- Truck Model

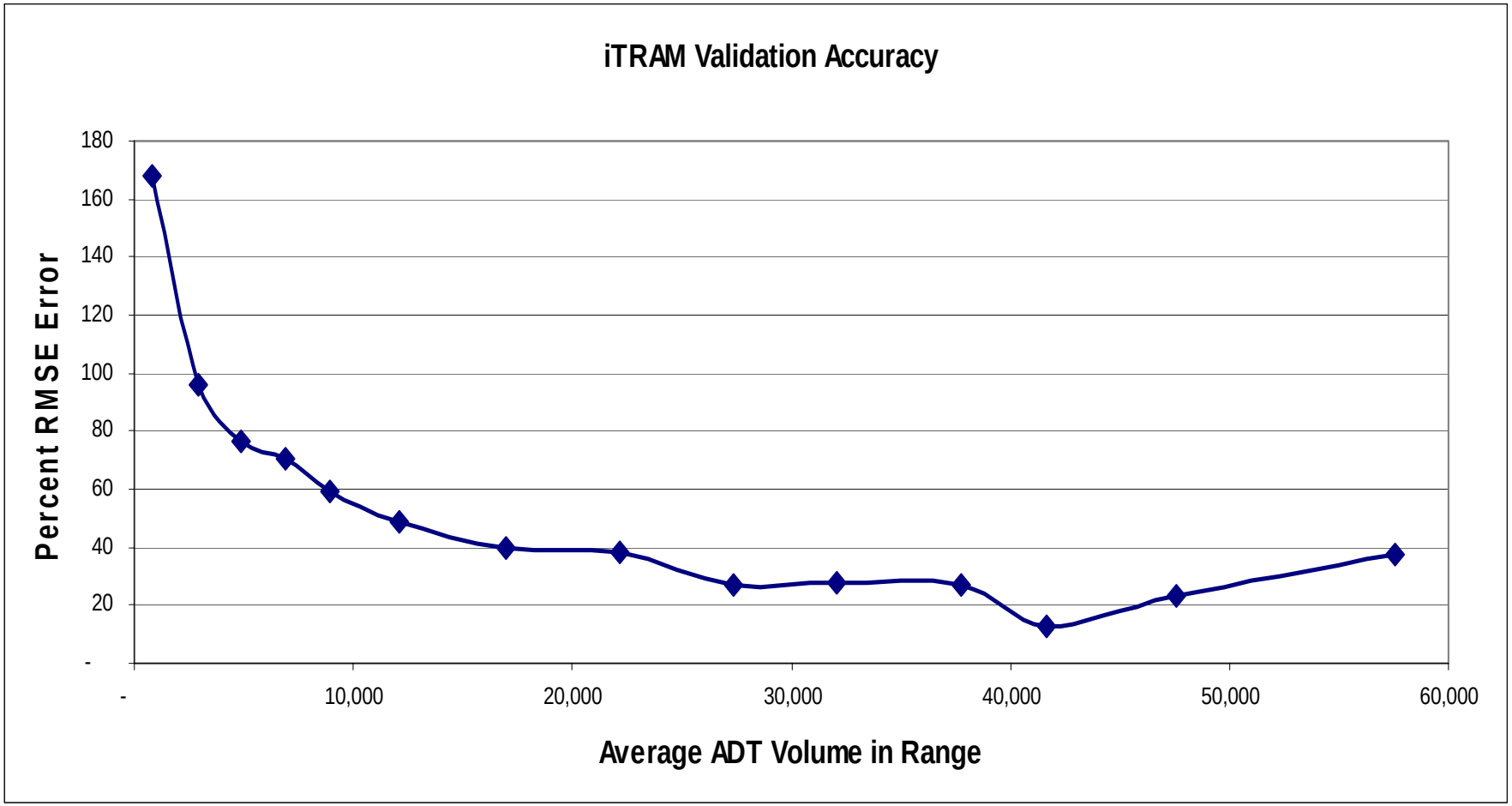
# By Functional Class and Area Type

| Selection | Observation | RMSE | % RMSE | Sum of Counts | Sum of Flows | % Flow / Counts |
|---|---|---|---|---|---|---|
| All Counts | 68,400 | 3,113 | 92 | 231,238,054 | 234,125,132 | 1.2 |
| Urban Interstate | 968 | 6,831 | 30 | 22,067,195 | 22,270,562 | 0.9 |
| Urban Principal Arterial | 6,408 | 5,047 | 58 | 55,915,184 | 55,795,749 | -0.2 |
| Urban Minor Arterial | 8,889 | 4,974 | 88 | 50,458,026 | 50,374,959 | -0.2 |
| Urban Major Collector | 7,935 | 3,609 | 144 | 19,828,785 | 18,872,122 | -4.8 |
| Rural Interstate | 1,214 | 2,298 | 26 | 10,697,701 | 11,211,113 | 4.8 |
| Rural Principal Arterial | 8,745 | 2,784 | 70 | 34,548,113 | 34,709,758 | 0.5 |
| Rural Minor Arterial | 9,751 | 1,572 | 77 | 19,809,601 | 19,412,779 | -2.0 |
| Rural Major Collector | 24,490 | 1,162 | 159 | 17,913,449 | 21,478,090 | 19.9 |

# By Volume Groups

| Selection | Observations | RMSE | % RMSE | Sum of Counts | Sum of Flows | % Flow / Counts |
|---|---|---|---|---|---|---|
| **All Features** | **68,402** | **3,113** | **92** | **231,238,259** | **234,125,132** | **1.2** |
| 0 - 2000 | 35,926 | 1,375 | 168 | 29,400,288 | 37,227,226 | **26.6** |
| 2000 - 4000 | 13,966 | 2,760 | 96 | 40,267,447 | 42,819,317 | 6.3 |
| 4000 - 6000 | 7,078 | 3,744 | 77 | 34,569,316 | 33,221,459 | -3.9 |
| 6000 - 8000 | 4,105 | 4,902 | 71 | 28,433,983 | 26,934,095 | -5.3 |
| 8000 - 10000 | 2,629 | 5,325 | 60 | 23,478,504 | 22,490,969 | -4.2 |
| 10000 - 15000 | 3,053 | 5,932 | 49 | 36,920,843 | 33,488,059 | -9.3 |
| 15000 - 20000 | 865 | 6,683 | 39 | 14,659,744 | 14,572,590 | -0.6 |
| 20000 - 25000 | 315 | 8,424 | 38 | 6,973,047 | 6,709,800 | -3.8 |
| 25000 - 30000 | 181 | 7,465 | 27 | 4,947,100 | 5,032,557 | 1.7 |
| 30000 - 35000 | 89 | 8,848 | 28 | 2,856,297 | 2,871,064 | 0.5 |
| 35000 - 40000 | 80 | 10,232 | 27 | 3,017,526 | 2,807,839 | -6.9 |
| 40000 - 45000 | 48 | 5,345 | 13 | 2,000,405 | 2,016,264 | 0.8 |
| 45000 - 50000 | 35 | 10,931 | 23 | 1,663,856 | 1,788,055 | 7.5 |
| 50000 + | 36 | 21,656 | 38 | 2,071,903 | 2,161,673 | 4.3 |

# Model Accuracy (24 hr – ADT)



# State's Major Routes Statistics

| Selection | Length (mi) | Observation | RMSE | % RMSE | Sum of Counts | Sum of Flows | % Flow / Counts |
|---|---|---|---|---|---|---|---|
| **All Screen lines** | **1,758** | **2,322** | **2,334** | **28** | **19,686,445** | **20,071,263** | **2.0** |
| US 6 | 42 | 52 | 1,559 | 45 | 178,263 | 195,839 | 9.9 |
| US 18 West | 58 | 83 | 2,344 | 50 | 387,852 | 307,520 | -20.7 |
| US 18 East | 47 | 62 | 1,143 | 29 | 248,585 | 221,080 | -11.1 |
| US 20 | 169 | 218 | 1,762 | 29 | 1,324,268 | 1,133,294 | -14.4 |
| US 30 West | 39 | 89 | 791 | 20 | 343,649 | 322,543 | -6.1 |
| US 30 East | 46 | 66 | 1,560 | 33 | 309,197 | 377,282 | 22.0 |
| I 35 North of 80 | 261 | 304 | 3,270 | **26** | 3,754,887 | 4,324,505 | 15.1 |
| I 35 South of 80 | 129 | 102 | 1,611 | **20** | 836,285 | 920,325 | 10.0 |
| I 80 East of 35 | 305 | 347 | 3,608 | **23** | 5,423,290 | 5,738,757 | 5.8 |
| I 80 West of 35 | 225 | 302 | 1,885 | **17** | 3,333,038 | 3,390,648 | 1.7 |
| US 61 | 94 | 164 | 907 | 23 | 645,390 | 549,868 | -14.8 |
| I 380 | 68 | 78 | 1,695 | **21** | 642,650 | 534,409 | -16.8 |
| US 71 | 106 | 105 | 1,219 | 36 | 355,919 | 341,867 | -3.9 |
| SR 60 | 33 | 62 | 2,326 | 52 | 278,811 | 195,913 | -29.7 |
| US 34 | 133 | 288 | 1,985 | 35 | 1,624,361 | 1,517,413 | -6.6 |

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# Truck Model Validation: By Functional Class and Area Type

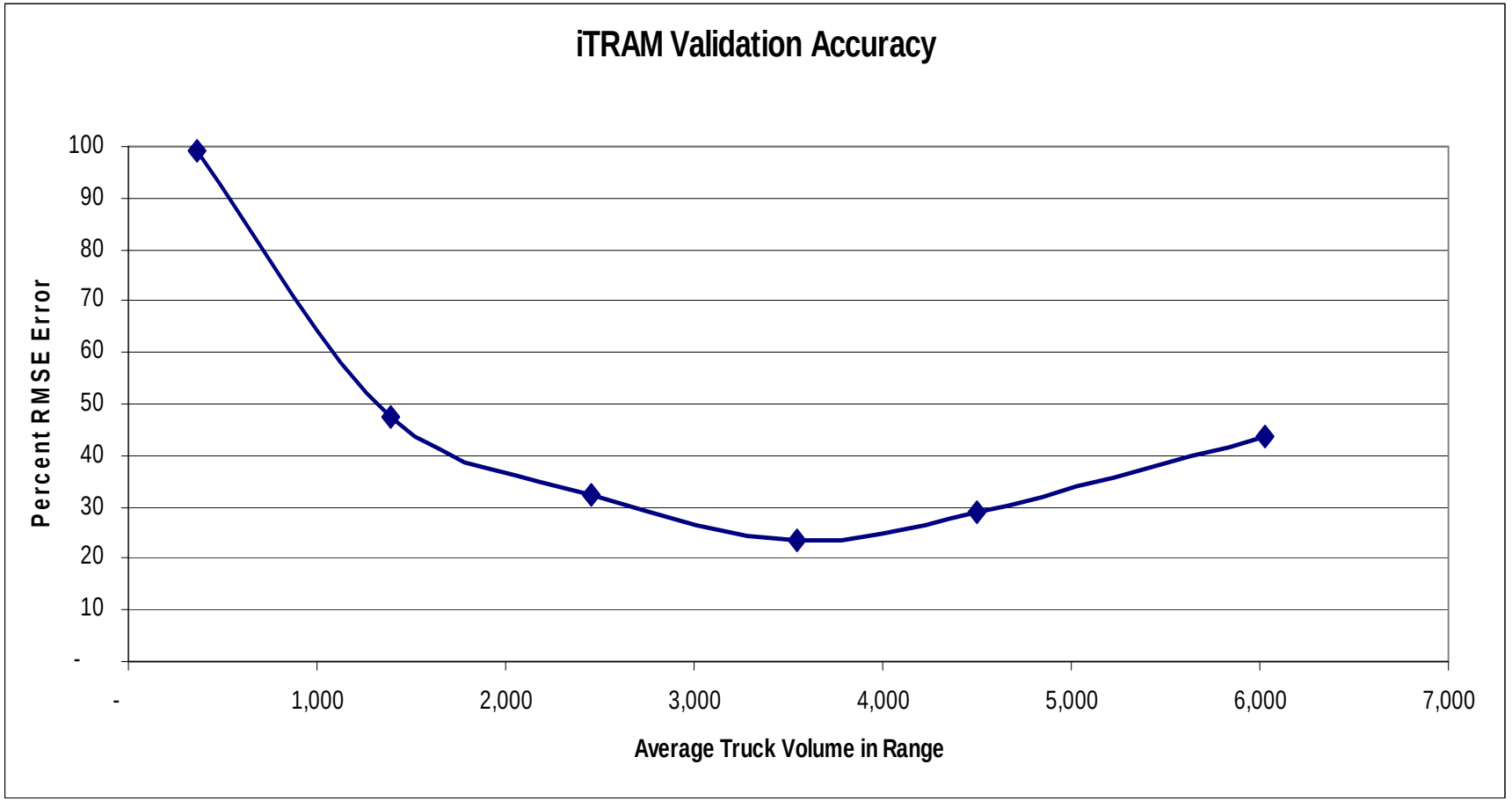
| Selection | Observation | RMSE | % RMSE | Sum of Counts | Sum of Flows | % Flow / Counts |
|---|---|---|---|---|---|---|
| **All Counts** | **27,237** | **460** | **78** | **16,064,326** | **16,465,568** | **2.5** |
| **Urban Interstate** | **968** | **1,261** | **42** | **2,912,043** | **2,654,148** | **-8.9** |
| Urban Principal Arterial | 6,027 | 469 | 91 | 3,119,590 | 3,247,690 | 4.1 |
| Urban Minor Arterial | 1,218 | 258 | 83 | 380,134 | 313,091 | **-17.6** |
| Urban Major Collector | 90 | 364 | 70 | 47,071 | 60,616 | **28.8** |
| **Rural Interstate** | **1,214** | **736** | **28** | **3,219,390** | **3,087,078** | **-4.1** |
| Rural Principal Arterial | 8,726 | 457 | 90 | 4,410,496 | 5,172,066 | **17.3** |
| Rural Minor Arterial | 8,631 | 178 | 80 | 1,926,517 | 1,840,696 | -4.5 |
| Rural Major Collector | 363 | 399 | 295 | 49,085 | 90,183 | **83.7** |

# Truck Model Validation: By Volume

| Selection | Observations | RMSE | % RMSE | Sum of Counts | Sum of Flows | % Flow / Counts |
|---|---|---|---|---|---|---|
| **All Features** | **27,851** | **484** | **81** | **16,649,174** | **16,958,687** | **1.9** |
| 0 to 1000 | 24,729 | 365 | 99 | 9,091,219 | 9,933,305 | 9.3 |
| 1000 to 2000 | 1,686 | 661 | 47 | 2,346,810 | 2,557,912 | 9.0 |
| 2000 to 3000 | 603 | 796 | 32 | 1,477,416 | 1,485,744 | 0.6 |
| 3000 to 4000 | 346 | 834 | 24 | 1,226,047 | 1,038,706 | -15.3 |
| 4000 to 5000 | 291 | 1,303 | 29 | 1,309,401 | 1,080,774 | -17.5 |
| 5000 + | 200 | 2,628 | 44 | 1,206,281 | 871,812 | -27.7 |

There are no standards for Truck Models in Statewide Models, however generally ~15% error is acceptable. The model could be greatly improve by obtaining information about special truck generators.

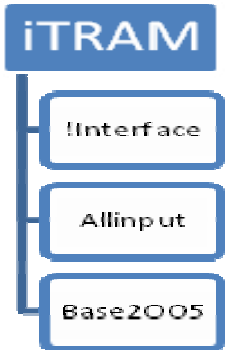
# Truck Model Accuracy



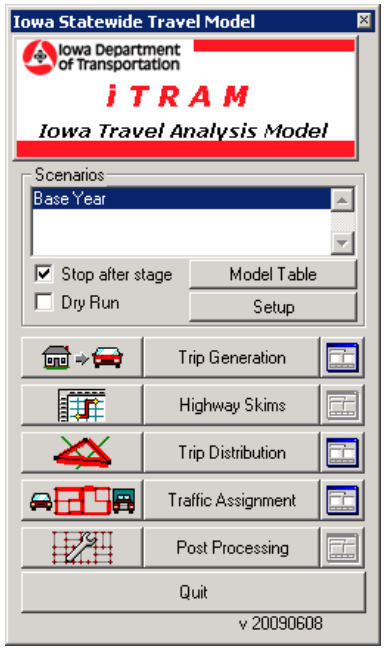
# Issues/Challenges with Validation

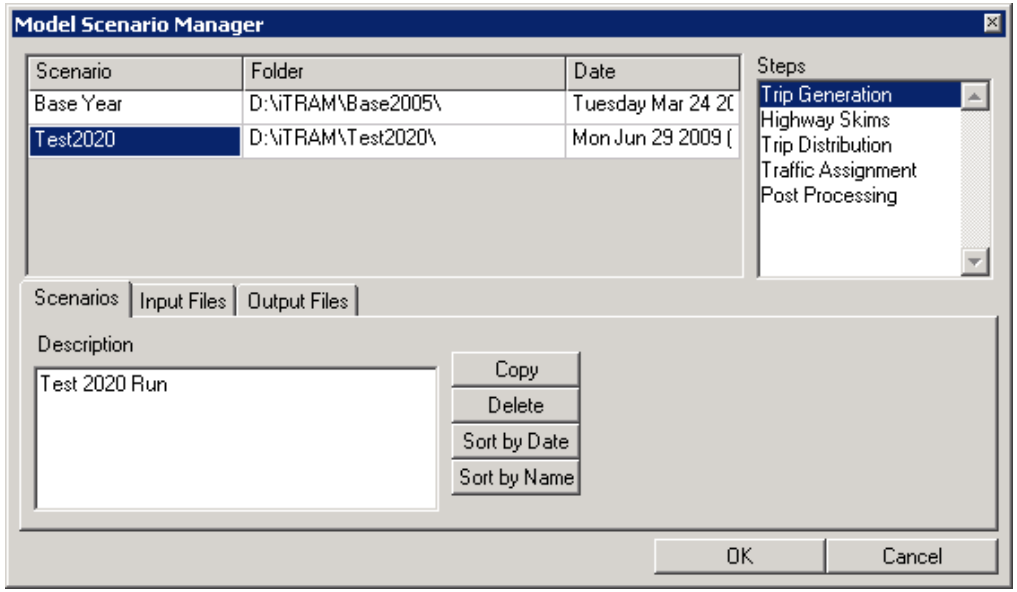
- Universal ADT Data – almost every link segment has an ADT
- Strong impact of buffer zones – though telescoping out in size from Iowa TAZ, they are larger than the Iowa TAZs
- Blending short and long household trips
- Blending internal (medium and heavy) and external truck trips

# Model Implementation

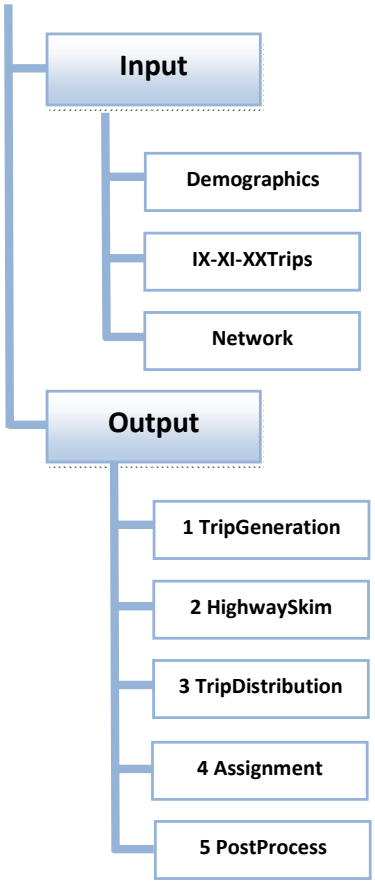



iTRAM requires **TransCAD Version 5.0 (Build 1705)**.



# Model Directory



Let’s look at iTRAM!!

# How Can MPOs Use the iTRAM?

- Truck and Car External-External Trips
- Truck and Car External-Internal and Internal-External Trips
- Potential Modeled Traffic Comparison
- Potential Source of Future SE Data

# Questions and Comments

- What elements from the iTRAM would best serve your group or agency's needs?
- What specific MPO effort are you involved with for 2009-2010?
- What technical concerns are most important to you?

# QUESTIONS?