Task 13 –
Review of Version 2.3 Travel Demand Forecasting Model Methods, Scripts, and Potential Enhancements

presented to

TPB Travel Forecasting Subcommittee

presented by

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Task 13
Review of Version 2.3 Methods, Scripts, and Enhancements

- Review the Version 2.3 scripts and provide feedback on the process and the script architecture
- Review the potential for using CUBE Cluster to enhance model run times
- Consider the implications of converting the current TP+ TRNBUILD scripts to Public Transport (PT) application scripts
- Review the existing tolling methodology and potential enhancements
- Provide additional validation as needed

Review of Version 2.3 Scripts

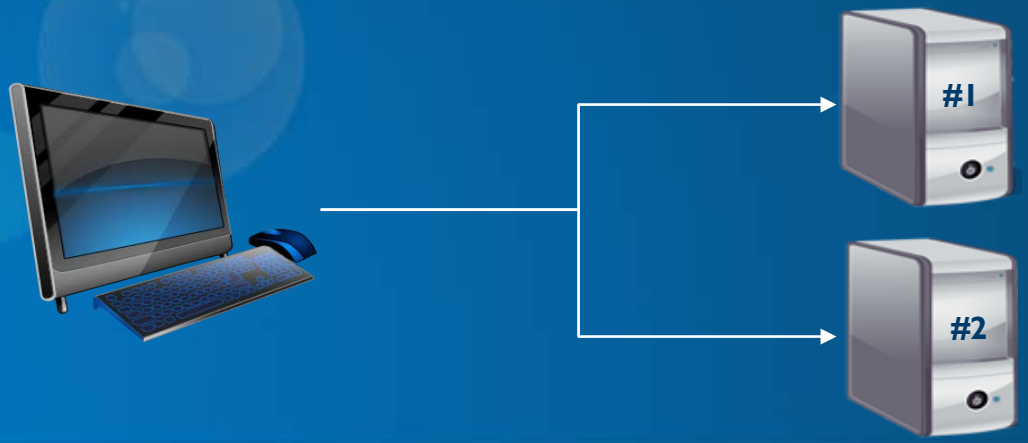
- Reviewed scripts for Version 2.3 build 9
- Focus on three main areas
  - » Traffic Assignment
  - » Highway and Transit Skimming Process
  - » Feedback Mechanism

Review of Version 2.3 Scripts

- Review Findings
  - » Overall, the model process is very solid
  - » "As good as you get with batch files"
  - » CUBE Scenario/Application Manager
    - Graphical User Interface
    - Not necessary, although preferred by some
- Results and recommendations include
  - » General error checking
  - » Small efficiency improvements in congested time calculations
  - » Removal of some submodels from the feedback loop such as repetitive skimming of nonbus transit modes

CUBE Cluster

- CUBE Cluster makes use of parallel processing by using multiple cores in two ways
  - » Intrastep distributed processing – splits a single step into groups for processing on multiple cores (i.e., zones 1-1000 on PC#1 and 1001-2000 on PC#2)
  - » Multistep distributed processing: splits independent model steps across multiple cores (i.e., trip generation on PC#1 and network skimming on PC#2)



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CUBE Cluster (continued)

- CUBE Cluster distributed processing can be added fairly simply to existing model scripts
  - » TPB has developed methods to easily comment out distributed processing for users without access to Cluster
- CUBE Cluster licenses are relatively inexpensive

CUBE Cluster Results

- Tests by multiple parties indicate very substantial time savings are possible
  - » Sample highway assignment tested by CS showed 80 percent improvement with 8 cores (from 70 to 14 minutes)
  - » TPB tests presented at the May TFS meeting showed 31 percent improvement in full model run time with 4 cores (from 45 to 31 hours)
  - » Citilabs tests show over 90 percent improvement in a single assignment iteration with 8 cores (from 2 minutes to 20 seconds)
- Diminishing returns with additional cores
- TPB tests have recently encountered some issues with stability
  - » Possible rounding issues with older file formats
  - » Additional tests are ongoing

Transit Application Scripts

- Public Transport (PT) is the new multipath building program in Cube Voyager for modeling public transit systems

- PT includes several improvements over TRNBUILD
  - » Allows for definition of multiple transit user classes
  - » More advanced transit network builder
  - » Advanced methods for calculating wait time at transit stops
  - » Incorporation of transit capacity to reflect discomfort of standing or traveling in crowded conditions
  - » Better representation of complex fare systems
  - » Allows for circular and linear transit routes
  - » On screen tracing of transit paths
  - » Additional tools for analyzing loaded transit networks

Transit Application Scripts

- Of the 11 large MPOs surveyed who are using Cube Voyager, only 3 report using PT and one uses both PT and TRNBUILD
  - » Houston-Galveston Area Council
  - » San Juan MPO
  - » Northeast Ohio Areawide Coordinating Agency
  - » SERPM in the Miami region uses both TRNBUILD and PT
    - PT for network coding and generating access connectors
    - TRNBUILD for path building, skimming, and assignment

Tolling Operations

- Existing tolling in the Washington Metropolitan region takes several forms
  - » Fixed price by vehicle type
  - » Variable price by time of day
  - » Tolling on all lanes
- Tolling operations may take different forms in the future
  - » Individual nonbarrier separated toll lanes
  - » Barrier separated toll lanes
  - » Reversible toll lanes

Tolling Policies

- Tolling policies can also take many forms, reflecting the needs and priorities of the region
  - » Flat/fixed toll rates
  - » Differential tolls by vehicle type
  - » Differential tolls by time of day
  - » Dynamic congestion pricing
  - » High Occupancy/Toll (HOT) tolling
  - » Mix-and-match

Toll Modeling Methodology

- Toll costs are inputs to several model components
  - » Destination choice
  - » Mode choice
  - » Highway assignment
- Modeling methodology should be able to account for
  - » Different tolling operations
  - » Different tolling policies
  - » Different values of time associated with varying income levels

Toll Modeling Methodology

- Potential Areas for Investigation
  - » Obtain data for the region regarding willingness to pay tolls for better calibration
  - » Calculation of congestion pricing linked to capacity and volume instead of time or speed (current TPB application)
  - » Maintain tolling as part of the route choice element in the highway assignment model
  - » Incorporate multiple income groups through all model steps
  - » Toll choice model
    - After mode choice and preassignment
    - Impact access and egress on toll facilities

Miscellaneous Model Validation Assistance

- Senior level resource assistance
  - » Trip generation – trips per household reasonableness checks
  - » VMT validation
  - » Distributed processing issues