ABSTRACT

Brief summary of need and objectives of a multi-temporal transportation analytic platform. Introduce the three temporal modes: real time operations, near time scheduling, and long term forecasting.

- ➢ **Operations** – real time data, control, and execution; immediate feedback; limited human interaction.
- ➢ **Scheduling and planning** – variable time frames; validated simulations; system optimization; special events; economic impact.
- ➢ **Forecasting and Prediction** – long time scales; multi-system simulation; economic, demographic, and environmental projections; sophisticated behavioral model.

1 Introduction

- Overview of current state of operations, scheduling, and long term forecast
    - o Limited vision
    - o Lack of data
    - o Lack of sophisticated analytics
- High level description of the platform, data requirements, capabilities (Figure 1)
- Description of economic benefits, cost savings, and quality of life impacts
- Touch points with other chapter topics
- Stakeholders
    - o DOE Office of Science – data analytics
    - o DOE EERE – programmatic direction, road mapping and investment
    - o DHS – Cyber Security, threat analysis, emergency response
    - o DOD – scenario analysis and planning
    - o DOT and States – long term planning, operations and control
    - o Municipalities (via MPOs and RTPOs) – long term planning, operations and control
    - o University partnerships – strong connections to DOTs and municipalities
- Outline the rest of the chapter

2 Scope and Definitions

- Real-time operations
    - o Weather
    - o Special Events
- Scheduling and planning
    - o Weather
    - o Special Events
    - o Economic and social impact
- Long term forecasting
    - o Activity models
    - o Agent-based models
- Data – acquisition, curation, storage, …

3 Challenges and Opportunities

- Operations (see Figure 2 for an example workflow)
    - o Traffic flow

- o Parking controls
- o Emergency response
- o Freight and commercial deliveries
- o Weather and special event response
- o Meeting power demands of transportation system and EV
- o Real-time pricing – tolls, public transportation, parking, electrical charging
- o Meeting real-time data acquisition and decision requirements and deadlines
- Scheduling and planning
  - o Job scheduling
  - o Traffic congestion models
  - o Detour and traffic flow optimization
  - o Weather and special event planning
  - o Economic and social impact models
- Long Term forecasting
  - o Human behavior models
  - o Economic goals and trends
  - o Demographic goals and trends
  - o Replace synthetic data with real-world data
  - o Climate change and environmental impact studies
  - o Uncertainty quantification analysis
  - o High-performance, scalable activity and agent-based models

4 Transportation Analytic Platform Strawman (Figure 1)

4.1 Data

- Types
- Collection – sensors, surveys, crowd sourcing, speeds and feeds
- Processing, curation, and storage

4.2 Analytics

- Workflow
- Analytic components
- Development of high-performance, scalable simulations

4.3 Event perturbation and event library

- Weather
- Special Events

4.4 Operator Interface

- Dashboards
- Presentations
- Query interfaces
- Alerts and signals
- Control and communications

4.5 Description of Real-time Operation Example (Figure 2)

5 Transportation Analytic Platform Impacts and Touchpoints

- How the Transportation Analytic Platform will impact/touch other GCTC Transportation SuperClusters
  - o SDK
  - o Sensors
  - o Freight
  - o First/Last Mile
- How the Transportation Analytic Platform will impact/touch other GCTC SuperClusters
- How the Transportation Analytic Platform will impact/touch communities and the marketplace

6 Next Steps and Conclusions

- Use cases
- Requirements
- Platform features and capabilities
- Proposed development schedule
- Milestones and demonstrations

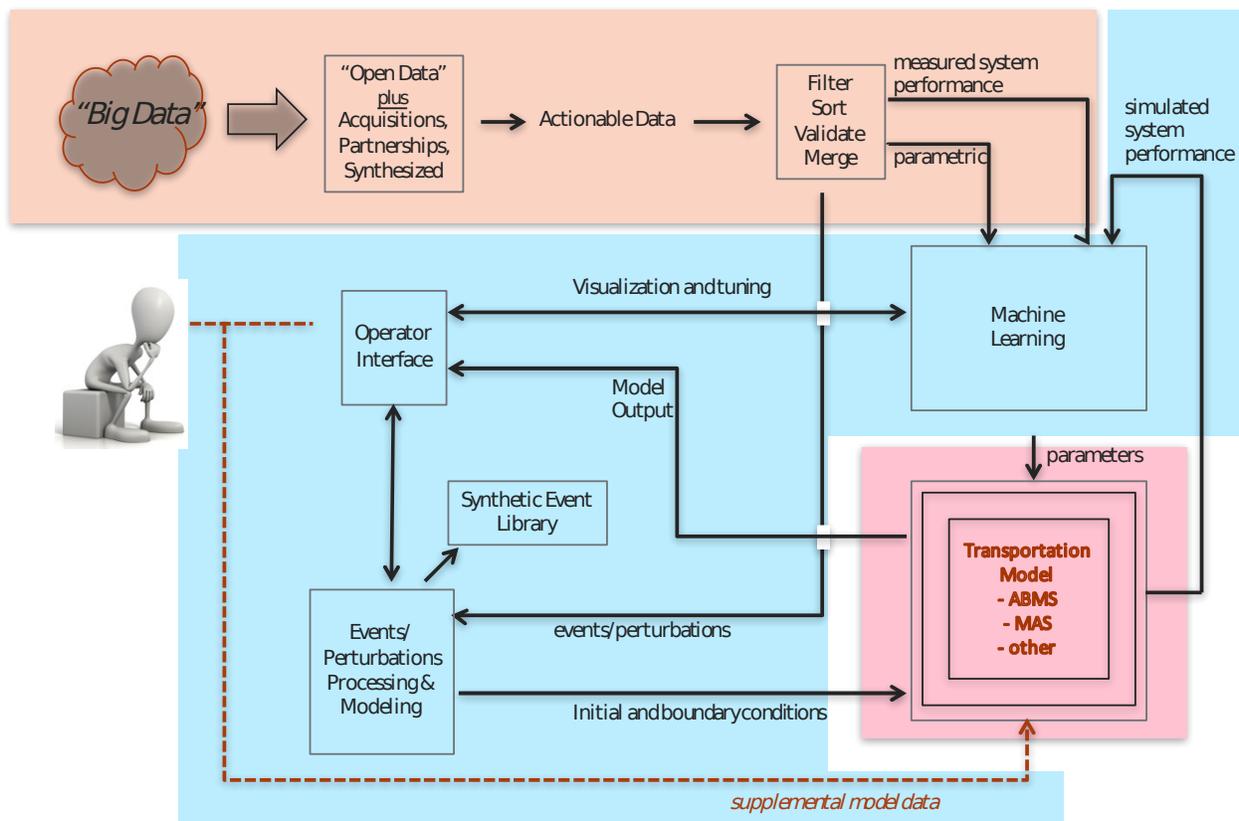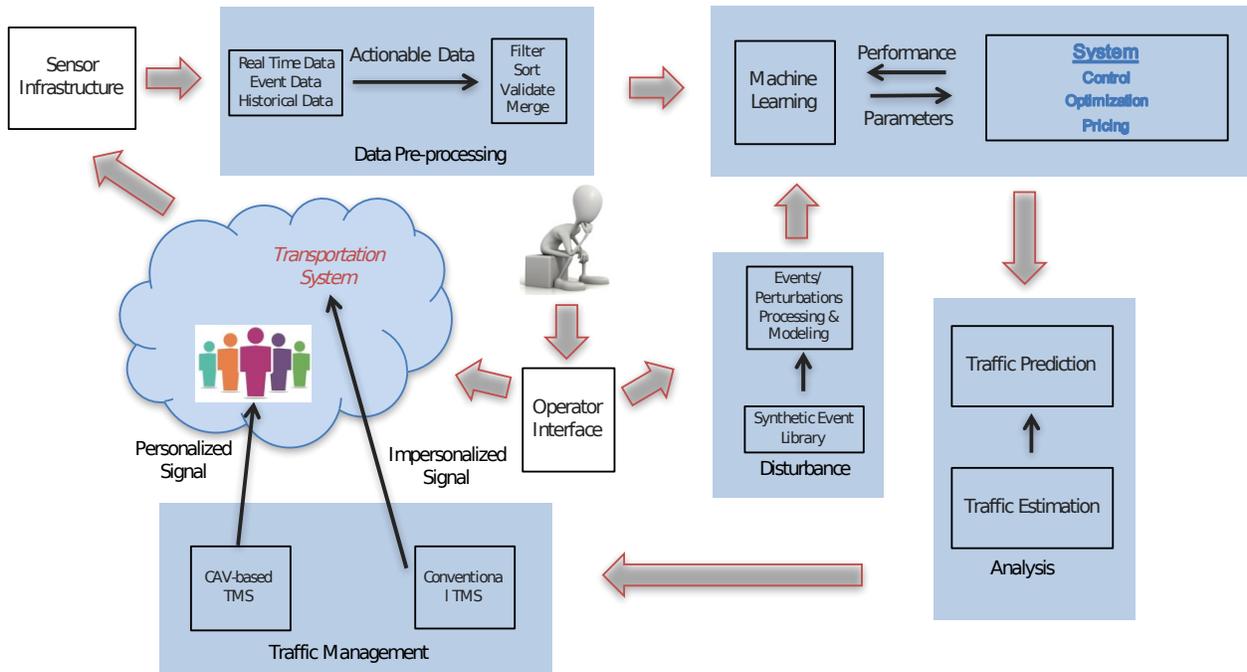## Figure 1 – Transportation Analytic Platform Architecture

Figure 2 – Real-Time Operation Example

Real-time Operation Example

Desired features:
- Support modular plug and play
- Support user defined libraries
- Support different applications

Different application scenarios:
- Real-time management and control
- Near-term planning and analysis
- Long-term planning and forecast