State of Freight Data & Models:
*Rail, Truck-Load (TL) & PickUp & Delivery (PUD)*

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Princeton University

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### Discussion Framework

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**Princeton University**

**TRB**

**Transportation Research Board**
## Discussion Framework

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Supply Side

• Digital Map Databases:
  – Roadway (Positives):
    • Well developed with substantial detail
      – Developed, maintained and distributed by the private-sector
      – Essentially all roads, “all” the attributes
        » distance, lanes, speed limits, historic volumes, address ranges, tolls...
      – Current travel times essentially everywhere
        » historic statistical distributions for many
      – Can reliably compute paths and tours
        » Including time windows and other constraints
  – Roadway (Challenges):
    • MUST use Digital Map Database with **truck-specific attributes**
      – **PC*Miler** network is the standard
    • Travel time forecasts remain a challenge
      – Incidents are tough to predict
      – Stochastic route choice remains a challenge
        » Trading off risk and reward.
Supply Side

• Digital Map Databases:
  – Railway (Positives):
    • A somewhat detailed network exists
      – Developed, maintained and distributed by the private-sector
        » ALK’s PC*Rail is the standard
      – All major and most minor RRs in NA, “Some” the attributes
        » distance, ownership, trackage rights, interchange pts, freight stations, grade, track quality…
      – Can reliably compute paths (“flow” traffic), competitive and cooperative routes, URCS-type costs
  – Railway (Challenges):
    • Detailed Operations-oriented network databases exist @ each Railroad
      – Proprietary!
    • Travel time forecasts remain a challenge
      – Each railroad has the data but hey are held very closely.
Supply Side

• Vehicle Performance/Cost Models:
  – Pretty good for both trains and trucks.
    • Fuel consumption, pollution, environmental, speed, accident propensity, etc.
  – Example: Uniform Rail Costing System (URCS)
    • Est. variable and total unit costs for Class 1 RRs

• Pavement and Track (infrastructure) Performance/Maintenance
  – Pretty good for both Pavement and track
Demand Side

- Historic Traffic A->B:
  - Railway (Positives):
    - Carload Waybill Sample (aka 1% waybill sample)
      - Excellent annual data since 1979, spotty pre 1979
      - Stratified sample (closer to 2+% sample, includes unit trains)
        » Full route (O, O_RR, A, A_RR, B, B_RR, ..., D, D_RR), car_type, commodity, weight, revenue, ... (full waybill)
      - Sample accessible with appropriate permission for appropriate “legal” purposes
      - Public Use Waybill File available on-line
  - Roadway (Challenges):
    - Each Railroad has 100% waybill files that are excellent
      - Proprietary
        » but could be readily sampled
        » Not all that big given today’s “Big Data” + there are “few” RRs


http://www.stb.dot.gov/stb/industry/econ_waybill.html
## Demand Side

- **Historic Traffic A->B:**
  - **Roadway (Positives):**
    - I can’t think of any
  - **Roadway (Challenges):**
    - Commodity surveys have been very challenging
    - Essentially every trucking company has detailed movement data similar to *Carload Waybill Sample*
      - Always had it bit now not paper, but data files.
    - Many now have “GPS” tracking data and activity at each stop
      - Some every 45 minutes,
      - others every 5 minutes, 2 min even 3 sec.
    - All proprietary and many trucking companies.
    - One “aggregator”: Freight payment companies
      - They get electronic bill of lading
What to do?

• Supply Side:
  – Pretty good shape

• Demand Side:
  – Obtain legislative mandate comparable to what the ICC got for the Carload Waybill Sample
  – “Crowd source” the demand Data?????
  – “Learning Algorithms” ?????
    • Nothing to “calibrate” against.

• Intermodal:
  – Everything is Intermodal:
    • It is a logistics cycle:
      – from raw materials -> products -> consumers -> refuse -> recycleables
Thank You