Urban Freight Transport:
The Final Frontier
(and our role as the pioneers...)

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Outline

❖ What could we do to improve urban freight?
  ❖ Public sector interventions
  ❖ Research needs

❖ An example: The Off-Hours Delivery Project in New York City
What is the freight system?
The freight system

- The conglomerate of all the economic entities involved in the generation, transportation, consumption, and transformation of cargo

- Key agents:
  - Producers, the ones that manufacture/produce the goods
  - Shippers, the ones that send the goods
  - Receivers, the ones that use the goods transported
  - Carriers, the ones that transport the goods
  - Ancillary functions: warehouses, distribution centers, etc.

These are key to behavior change
There are many players and ways to interact

- Interactions among players determine truck traffic patterns (Shippers, warehouses, distribution centers, carriers and receivers, 3PLs, 4PLs)
Relatively low efficiency, due to market forces

- Although current trucking practices are efficient from the private company perspective, they are very inefficient from the system point of view.

- Surveys show that about:
  - 25% of the truck trips are empty
  - Only 20% of the truck capacity is utilized

- Increasing this efficiency will translate into more livable cities and a more productive economy.
## NYMTC REGION

<table>
<thead>
<tr>
<th>County</th>
<th>Area</th>
<th>Population</th>
<th>Establishments</th>
<th>Estimated employment</th>
<th>Estimated daily deliveries received</th>
<th>Percentage of total deliveries received per day</th>
<th>Estimated daily truck trips produced</th>
<th>Percentage of total truck trips produced per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRONX</td>
<td>42.15</td>
<td>1,332,650</td>
<td>7,754</td>
<td>91,787</td>
<td>19,900</td>
<td>4%</td>
<td>14,048</td>
<td>4%</td>
</tr>
<tr>
<td>BROOKLYN</td>
<td>70.88</td>
<td>2,465,326</td>
<td>23,262</td>
<td>232,199</td>
<td>58,114</td>
<td>13%</td>
<td>40,883</td>
<td>12%</td>
</tr>
<tr>
<td>NASSAU</td>
<td>287.96</td>
<td>1,334,544</td>
<td>24,142</td>
<td>314,287</td>
<td>62,828</td>
<td>14%</td>
<td>46,956</td>
<td>14%</td>
</tr>
<tr>
<td>MANHATTAN</td>
<td>23.09</td>
<td>1,537,195</td>
<td>40,415</td>
<td>692,260</td>
<td>113,069</td>
<td>26%</td>
<td>76,874</td>
<td>23%</td>
</tr>
<tr>
<td>PUTNAM</td>
<td>245.91</td>
<td>95,745</td>
<td>1,731</td>
<td>14,937</td>
<td>4,040</td>
<td>1%</td>
<td>3,298</td>
<td>1%</td>
</tr>
<tr>
<td>QUEENS</td>
<td>109.71</td>
<td>2,229,379</td>
<td>23,276</td>
<td>290,156</td>
<td>55,737</td>
<td>13%</td>
<td>46,390</td>
<td>14%</td>
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<tr>
<td>RICHMOND</td>
<td>58.74</td>
<td>443,728</td>
<td>4,268</td>
<td>49,668</td>
<td>10,136</td>
<td>2%</td>
<td>8,182</td>
<td>2%</td>
</tr>
<tr>
<td>ROCKLAND</td>
<td>192.39</td>
<td>286,753</td>
<td>4,547</td>
<td>60,963</td>
<td>11,600</td>
<td>3%</td>
<td>8,895</td>
<td>3%</td>
</tr>
<tr>
<td>SUFFOLK</td>
<td>926.81</td>
<td>1,419,369</td>
<td>26,787</td>
<td>357,405</td>
<td>69,234</td>
<td>16%</td>
<td>52,788</td>
<td>16%</td>
</tr>
<tr>
<td>WESTCHESTER</td>
<td>465.79</td>
<td>923,459</td>
<td>15,127</td>
<td>204,525</td>
<td>38,498</td>
<td>9%</td>
<td>30,477</td>
<td>9%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>2,423.43</td>
<td>12,068,148.00</td>
<td>171,309.00</td>
<td>2,308,184.50</td>
<td>443,155.77</td>
<td>100%</td>
<td>328,790.82</td>
<td>100%</td>
</tr>
</tbody>
</table>
New York County
What Could the Public Sector and Academia Do?
The Short Answer is: A Lot...
Range of interventions (from NCFRP 38)

- Infrastructure Related Interventions
- Traffic Management
- Logistical Management
- Vehicle Related Interventions
- Pricing, Taxation
- Demand Management
- Land Use Management
- Governance
Traffic Management

- Access Time Restrictions
- Vehicle Size Restrictions
- Truck Traffic/Route Regulations:
  - Advisory, Statutory, Freight Routes
- Lane Management:
  - Multi-use lanes, exclusive truck lanes
- Traffic Signals and Signs
- General Infrastructure Investments

To be considered very carefully, they could make things worse
Freight loading zone (Waikiki, Hawaii)
Logistical Management

- Pick-up/Delivery to Alternate Destinations

- Joint Delivery Service / Urban Consolidation Centers

  a) Current condition

  b) With JDS doing the last leg of deliveries

Intelligent Transport Systems, Improve last leg
La Petite Reine

- Source of local employment, engages in labor re-training & socially responsible practices
- Ally of companies interested in sustainability
- Vehicles equipped with batteries to assist pedaling
- Could use bicycle lanes, able to enter narrow streets and pedestrian areas, and to park in front of receivers
Muni Meters in NYC
Pricing, Taxation

- Carefully use freight road pricing
  - Of limited effectiveness to reduce congestion
  - Could produce significant revenues to finance improvements
- Foster differentiated parking charges
- Make sure that vehicle license fees reflect externalities produced by vehicles, age, condition, etc.
Typical Freight Village

Freight Village Plan
Governance

- Create industry advisory groups
- Create freight quality partnership
- Share best practices
- Conduct regular meetings with industry
The Off-Hours Delivery Project
An example of demand management
Interlocking components

- Demand modeling/behavioral/economic components
  - Analyses of most promising industry segments
  - Freight trip generation analyses

- Technology component
  - GPS to assess performance (cell phones, own systems)

- Network modeling component
  - Mesoscale traffic model to assess local impacts
  - Regional model to assess networkwide impacts

- Industry/Agency outreach component
  - To get feedback from all involved

- Small scale pilot test component
  - To assess real life impacts...
Pilot Test

- Initial efforts delayed by Wall Street collapse, skepticism on the part of the industry...initially a huge challenge because of lack of precedents
- Original plan: Sysco and Whole Foods
- Foot Locker/New Deal Logistics asked to join test
- Three separate stages to accommodate them:
  - Foot Locker (10 stores)/NDL (Oct. 2 -Nov.14, 2009)
  - Whole Foods (four stores) (Dec. 28, 2009-Jan. 31, 2010)
  - Sysco (twenty one stores) (Dec. 21, 2009-Jan. 23, 2010)
- About 35 receivers, 20 trucks/vendors
  - Half doing staffed OHD
  - Half doing unassisted OHD
Regular vs. Off-Hour Deliveries
Typical results from satisfaction surveys

- **Whole Food Vendors:** 1.55

- **Participating drivers:**
  - Travel speeds = 1.33
  - Congestion = 1.11
  - Parking = 1.11
  - Stress levels = 1.11
  - Time to deliver goods = 1.38
  - Time to complete the route = 1.44
  - Driver’s feeling of safety = 1.86

- **Sysco’s customers:**
  - Impression of off-hour deliveries = 1.50
  - How likely are you to accept off-hour deliveries = 1.42

Scale:
1 = Very favorable,
5 = Very unfavorable
Average space mean speeds

More than twice as fast
Average service times

More than three times as fast
After the end of the pilot

- All of the receivers doing staffed OHD reverted back to the regular hours
- Almost all the receivers doing unassisted OHD remained in the off-hours
  - The reason: reliability of OHD
  - “Our locations will continue to receive ‘night drops’ even though this program has ended as our managers now favor the dependability of night drops vs. late day time deliveries. Thanks again for the program.” Nick Kenner, Managing Partner, Just Salad LLC
The Economic Bottom Line
Implementing various forms of off-hour delivery policies in Manhattan leads to:

- Travel time savings to all highway users of about 3-5 minutes per trip
- Travel time savings to carriers that switch to the off-hours of about 48 minutes per delivery tour
- Savings in service times (per tour) could be in the range of 1-3 hours

Depending on the extent of the policies, economic savings are between $100 and $200 million/year in travel time savings and pollution reduction
Environmental Pollution Reductions

<table>
<thead>
<tr>
<th>Scenario</th>
<th>CO Reduction (metric tons)</th>
<th>HC Reduction (metric tons)</th>
<th>NOx Reduction (metric tons)</th>
<th>PM$_{10}$ Reduction (kilograms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive</td>
<td>% OHD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$5,000</td>
<td>6.49%</td>
<td>101.196</td>
<td>24.047</td>
<td>3.004</td>
</tr>
<tr>
<td>$10,000</td>
<td>14.10%</td>
<td>169.582</td>
<td>28.535</td>
<td>8.223</td>
</tr>
<tr>
<td>$15,000</td>
<td>20.90%</td>
<td>202.749</td>
<td>39.972</td>
<td>11.824</td>
</tr>
<tr>
<td>$20,000</td>
<td>25.34%</td>
<td>253.141</td>
<td>56.559</td>
<td>15.044</td>
</tr>
<tr>
<td>$25,000</td>
<td>29.07%</td>
<td>383.813</td>
<td>55.764</td>
<td>26.333</td>
</tr>
</tbody>
</table>
How the Adventure Ended...
A Huge Success...Widely Reported in the Press

TIME magazine listed the OHD project as a “Top 10 Ideas” March 25th, 2013.
NYC adopted off-hour deliveries as part of its sustainability strategy!
The Impacts of the Project...

- In June 2012 the Federal Highway Administration (FHWA) and Environmental Protection Agency (EPA) issued $450,000 in grants for small to medium size cities to implement off-hours goods movement/delivery programs based on the NYC pilot.

- Numerous cities are considering off-hour delivery programs: Boston, Washington, Atlanta, etc.
Awards

- ITS-NY (Intelligent Transportation Society) 2011 Project of the Year in Freight Management

- Numerous research awards:
  - Robert E. Kerker Award
  - Milton Pikarsky MS Award to Ms. Brenda Cruz
  - Best Paper Award for UTC Region II
  - Student of the Year Award to Mike Silas
  - etc
Ongoing Work
Ongoing work

- USDOT/RITA provided funds for a larger implementation project focusing on:
  - Unassisted deliveries:
    - Technologies/systems that enable OHD without the need for staff of the receiving business would produce the same benefits as regular OHD, at minimal cost
  - To address the liability concerns of receivers
  - Large Traffic Generators:
    - Large buildings/establishments generate hundreds of truck trips per day
      - About 80 such buildings → 4% of the truck traffic
      - Adding large establishments → 8% of truck traffic
    - They could implement OHD very cost effectively and without inconveniencing the receivers
Chief conclusions

- Removing the constraints imposed by receivers (either by providing financial incentives, or using un-assisted OHDs) works as it is
  - More effective than freight road pricing
  - A truly win-win-win-win-win-win policy:
    - Benefits regular hours travelers
    - Benefits the environment, improves quality of life
    - Benefits the business community, enhances economy
    - Noise impacts could be easily mitigated → electric trucks, low-noise truck technologies/practices
    - Benefits participants in OHD
  - Political appeal, implementable as a voluntary program
Thanks!

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