Midtown in Motion
New York City Active Traffic Management
Results to date and Wrap up

Algorithms, Data, Metrics

System Demonstration

System Design

Choice of ITS Technologies Deployed

Background of MIM Project

FHWA, NYCDOT, and ITS

Overview
FHWA/NYCDOT TEAM PARTNERSHIP APPROACH IN ALL ITS OPERATIONS INITIATIVES
13 tri-state TCs
16 major bridges/tunnels
5 million commuters/day
1 million vehicles/day

Regional
Freight Corridor
Inter-modal
Multi-centers
Multi-modal
Multi-jurisdictions
Multi-agencies

New York City's Diverse Network
<table>
<thead>
<tr>
<th>Project/Activity</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYS DOT/NYCDOT</td>
<td>1994-1996</td>
</tr>
<tr>
<td>NY/NJ/CT Model Deployment Initiative (MDI)</td>
<td>1997</td>
</tr>
<tr>
<td>Nyc Early Development Plan (EDP)</td>
<td>Early 1990s-1996</td>
</tr>
<tr>
<td>NYCTE/Early Development Plan (EDP)</td>
<td>- This Federal ITS Program Funded Field Operational Test and Early Deployment Plans in the New York City Sub-Region. The NYCTE/EDP...</td>
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<table>
<thead>
<tr>
<th>Stakeholders in the In-State Region</th>
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<tbody>
<tr>
<td>- NYS DOT/NYCDOT develop a concept and provide funding opportunity for joint traffic management and travel information sharing.</td>
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<tr>
<td>- MDI involved a large number of multi-modal transportation stakeholders in the MDI and focused on traveler information and travel planning.</td>
</tr>
<tr>
<td>- NY/NJ/CT Model Deployment Initiative (MDI) was the successor to the JTOC which was operational from 1999 to early 2008. Prior to the JTOC was the Traffic Management Center (TMC). With the addition of the New York Police Department, the JTOC was a center for monitoring and management of ITS and incidents on the surface streets and limited access freeways in the 5 boroughs. The TMC was the successor of the JTOC.</td>
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Team Partnership Approach
<table>
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<th>Project/Activity</th>
<th>Time Frame</th>
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<tr>
<td>Tier II Workshops</td>
<td>2000</td>
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<tr>
<td>Tier II Workshops - The Tier II Workshops, facilitated by the National ITS Architecture Sub-Regional Development Team, provided the sub-region with an initial inventory of existing and planned ITS elements. The workshops served as the foundation for the later development of a comprehensive New York City Sub-Regional ITS Architecture. The workshops led stakeholders to develop a preliminary Sub-Regional ITS Architecture and Turbo Architecture database of ITS elements.</td>
<td></td>
</tr>
<tr>
<td>NVC Sub-Regional ITS Architecture Development White Paper - The Four Lead Agencies submitted a white paper to outline alternatives for development of an ITS Architecture.</td>
<td>2001</td>
</tr>
<tr>
<td>NVMTC Integration Strategy - An ITS Integration Visionary Strategy with a Time Horizon</td>
<td>2002-2004</td>
</tr>
<tr>
<td>USDOT Rule 490: NVC Sub-Regional ITS Architecture: The Planning &amp; Development of the ITS Architecture with emphasis on the Functional/Meeting Approach.</td>
<td>2001-2005</td>
</tr>
<tr>
<td>Achieve Transportation &amp; Demand Management</td>
<td>Present</td>
</tr>
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<td></td>
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Long-held favored Manhattan-bound in the AM/PM outbound

Wireless

2007/2009: Topics IV Computerization Expansion (~2’200) &
leased telephone lines: ~$77M annually (~4000 intersections

Manhattan: ~2’700, 700 Outer Boroughs: ~3400

Circa 1970 - 2006: VTCS central real-time active control ~6100

NY City has ~12’400 signalized intersections

Intersection Management & NYPD Administration

- TMC in Queens (Long Island City – East of the 59th St. Bridge)
NYC WIRELESS NETWORK (NYCWIN)
Deputy Commissioner, NYCDOT

Bruce Schaller

MOBILITY STRATEGY
THE NYCDOT ENHANCED IS AN INTEGRAL PART OF (MIM) MIDTOWN IN MOTION
Sustainable Streets: NYCDOT's Strategic Plan

- Modernize ITS
- Improve Mobility
- Vision for NYC
Regional Coordination
Management of ITS Infrastructure
Centralized Monitoring and
Reduced Emissions
Real-Time Travel Information
Mobility
Safety

Program Goals
State-of-the-Art ITS Infrastructure Deployment
NYCDOT - Modernize ITS
network communication

NYC's

Use of NYCWIN -

scale deployment

World's largest (ASTC) and the remaining are in progress

9,000 have been upgraded to smart controllers

NYC has ~12,400 signalized intersections

NYCDOT - Modernize ITS
NYC WiN - New York City Wireless Network

NYC DOT - Modernize ITS
NYC Trafic Control System (TCS) to replace VTCSS

NYC DOT - Modernize ITS

- Control
- Adaptive Traffic Adjustment
- Dynamic Split
- Collection
- Real-time data
- TSP oriented
- Traffic Responsive Communications
- NTCP Field
- ASTC
- NYC Trafic Control System (TCS) to replace VTCSS
Initial Zone: 2 Ave to 6 Ave, 42St to 57St

Study Area -- Midtown Manhattan -- Powerhouse of NYC

MIM -- An off shoot of the ITS Modernization Project

(MIM) Midtown in Motion (MIM)
Deputy Director, NYCDOT ITS
Mohammad Talas, Ph.D, P.E., PTOE

MANAGEMENT INITIATIVE
THE MIN ACTIVE TRAFFIC
THE LOCAL FOUNDATION FOR
Need a centralized system to monitor and control performance and assess Need reliable data to

Low vehicle speeds (> 10 mph)

Overcated, congested Dense CBD

Project Challenges and Approach
- Minimum phase requirements addressed
- No pedestrian push button/actuations
- Synchronization across dense grid

Fixed cycle lengths (90s)

- Pedestrians
- Bikes
- Buses
- Autos, Taxis

Multi-modal mobility

Project Challenges and Approach
Define level of congestion using both measures
- Concept of regimes
- Given flow - different occupancies, different flow conditions
- Use both flow & occupancy
- Microwave Sensors

ITS Design
Lexington Ave between 58th and 59th Street

10% Occupancy
Lexington Ave between 58th and 59th Street

30% Occupancy
3rd Ave between 44th and 45th Street

≈ 50% Occupancy
- Mid block location ideal
- Microwave Sensors

ITS Design
and slow vehicle speeds
works under congested conditions
- Reliable source of travel time
- 2 readers per location
- Maximize coverage
- Strategic placement
- Penetration of ETC tags
- Unique environment with high
- ETC Tag Readers

ITS Design
- Observe, Verify, and Monitor

Video Cameras

ITS Design
Video cameras for verification & monitoring

Typically, 8-block segments on north-south arterials

Zone and on the approaches to the zone

ETC readers, for travel times in segments... within the

Occupancy when combined with flow indicators level of congestion

Flow in thru lanes, as an indicator of need for action

Throughout the area and at key locations

Microwave sensors, for flow and occupancy

Sensor Network
- Balance queueing and minimize gridlock condition
- Complimentary to level 1
- Implemented at intersection level
- Level 2 - Tactical control
- Use library of carefully developed plans
- Rebalance traffic being delivered to the zone
- Implemented by Avenue
- Level 1 - Strategic area wide control
- Hierarchical Control

For an extremely complex grid network, developed following approach

Control Policy
Define trigger condition based on real-time data.

Develop library of plans and field test.

Level 1 Control - Plan Library Design
Illustrative Section: 3rd Ave - 49St to 57St - 8 Blocks, 2000 feet - 8 traffic lights in the trip

Travel Time - Underlying Patterns
Travel Time > 10 minutes

300s = 5 minutes

Ideal travel time for 2000 feet at 25mph is 55 seconds

One day sample

Travel Time
Clusters/groups - separated by stops
Close up view of travel time less than 10 minutes
Travel Time - Underlying Patterns
Travel Time - Underlying Patterns
Box and Whisker Plot and Raw Data

Findings
Travel Time - Selecting a Metric

Congestion
turn relation to level of
dominant clusters, which in
The median relates well to
approaches
elimination & other
the metric, over outlier
percentile) for stability in
Use the median (50th)

T3 Webinar
Federal Highway Administration
U.S. Department of Transportation
US DOT
NYC DOT
Solid line = Median

Display of Control Regimes of ETC Tag Reader-Based Travel Times

Relation of Travel Time to # of Stops
ACZ – Simultaneous offset, higher green tapering
ACT – Simultaneous offset, increased green tapering
NBP – Simultaneous offset, minimal green tapering

<table>
<thead>
<tr>
<th>Advanced Control Plan (ACZ)</th>
<th>3+ Stops</th>
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<tbody>
<tr>
<td>Advanced Control Plan (ACT)</td>
<td>3 Stops</td>
</tr>
<tr>
<td>Network Balancing Plan (NBP)</td>
<td>2 Stops</td>
</tr>
<tr>
<td>Area Wide Control Plan</td>
<td>Travel Time</td>
</tr>
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</table>

Define trigger conditions based on real-time data

Level 1 Control