

NYC ITS

Case Study

Developing The World's Largest Traffic Signal Control System

On any given weekday, more than eight million people traverse the busy streets of New York City. This includes residents, commuters, visitors and students – all looking for the fastest way to get where they're going. Over several decades, managing traffic has remained both a top priority and moving target for the New York City Department of Transportation (NYC DOT).

1950s and 1960s

Long before the dawn of Wi-Fi, the World Wide Web and Smart Phones, Manhattan was managing most of its 12,000 intersections with what was then state-of-the-art electro-mechanical signal controllers. These timers could change traffic lights at fixed intervals, but could only support single-cycle length changes. In the late 1960s, a new IBM mainframe and room full of computers were added to the Traffic Management Center (TMC), enabling City engineers to change traffic signal timing patterns, but only on 1,500 intersections that were connected directly to the TMC.

1980s

Recognizing these limitations, in the 1980s the NYC DOT asked TransCore to increase the number of centrally-managed signalized intersections from 1,500 to over 3,200, while maintaining the current equipment.



1990s

In the early 1990s, NYC DOT contracted with TransCore to replace the aging IBM systems with new equipment that could monitor traffic conditions and control traffic signals remotely. TransCore supervised the coaxial cable network installation, developed timing plans, installed new traffic controllers, and added video surveillance functionality. As a result, more than 2,400 signalized intersections were added to the system, bringing the number of intersections managed by the system to 5,600. For the first time, City engineers could resynchronize traffic signals after a power outage, and signal patterns could be changed from the TMC.

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Benefits:

- ▶ Travel times reduced 10.2%
- ▶ \$5 million/per year in landline savings
- ▶ Constant network availability
- ▶ Increased travel safety
- ▶ Improved air quality

These included the National Transportation Communications for ITS Protocol (NTCIP), the NEMA TS2 standard, Advanced Traffic Controller (ATC) standard, and New York State cabinet standards. This approach ensured the City would reap the benefits of proven technology, economies of scale, and competitive pricing, and provided opportunities to exploit existing and future applications built upon these standards.

Designing for Real-Time Solutions

Smarter traffic signals need real-time data to be able to respond to changing traffic conditions. *TransCore advised against conventional, in-pavement inductive loops that degrade over time.* Instead, TransCore installed a network of traffic microwave sensors, E-ZPass RFID readers, and video cameras to monitor traffic volume and speed, as well as any changes in traffic flow, such as bottlenecks. By using the data obtained from these monitors, City engineers could make signal adjustments, change signal patterns, and transmit traffic advisories directly to motorists.

To maximize the City's new wireless communication system, TransCore developed an exception-based reporting scheme for the City's traffic signal system to preserve data fidelity of polling while *reducing bandwidth consumption by 90 percent.*

Competitive bidding enabled the City to purchase the most powerful, advanced solid-state traffic controllers for New York's 12,000+ intersections at less than half the typical price. *These controllers are estimated to be 100 times faster than typical controllers,* and support advanced functions, such as "green lighting" city buses and emergency vehicles, a program known as Transit Signal

However, with the basic electromechanical devices still in use, the City could not respond to real-time traffic changes, and could not support transit priority, emergency vehicle preemption, signal phase skipping when needed, or time-of-day pattern changes.

Finally, in the early 2000s, technology caught up with these growing needs.

NYCWiN Opens Door to New Intelligent Transportation System

In 2004, NYC DOT partnered once again with TransCore to plan, design, implement, integrate, and maintain an entirely new system – built on wireless technology and contemporary traffic signal control technology. The new 3G communications network covered all five boroughs and, for the first time, connected police, fire, sanitation, transportation, and other essential services.

Starting with a Standards-Based Approach

To prevent limitations caused by obsolete technology, TransCore and the NYC DOT team committed to a critical first step in the design of the City's new ITS solution: *adopt proven standards.*

Priority. By setting up a strict installation schedule, TransCore was able to install up to 200 new controllers per month, ensuring an installation rate 10 times faster than that of the 1990s upgrade.

To ensure the new ITS solution would be robust enough to handle the most extreme challenges of NYC traffic, TransCore redesigned its **TransSuite® traffic control software**. TransSuite integrates key traffic management functions, including adaptive signal control, incident management, and reporting, and maintenance support. The new software can manage up to 16,000 controllers as easily and efficiently as it can manage 100.

World's Largest Traffic Signal Control System

As part of the integrated ITS project, TransCore completely revamped the computer systems of the Joint Traffic Management Center in Long Island City. The new system provides LAN management with 10-gigabyte capacity to handle connectivity with all ITS devices in the field. It also supports multiple operator workstations, graphic and video display walls, video-feed distribution, and Internet services that connect real-time traffic data to NYC traffic engineers.

Data from the field is fed directly into the TransSuite software, which models the current traffic situation in each location and develops both short- and long-term plan changes (splits) and longer-term changes (cycles and offsets). NYC Engineers

“To effectively manage the transportation demands of the largest city in the U.S., we started with a vision that literally began in the 1980s. Today, that vision is coming to fruition. TransCore designed and installed an innovative system to fulfill our objectives.”

- Mohamad Talas
Deputy Director of System Engineering
NYC DOT

then use these tools to update timing patterns for each intersection, better serving both motorists and pedestrians in the area.

In 2014, the Center became the *first in the world* to actively manage and control over 10,000 signalized intersections from a single traffic management center and one integrated system.

Guaranteeing Success

To ensure all equipment operated as promised, the NYC DOT allocated a significant portion of its budget for testing. Every device was rigorously tested under simulated, real-world conditions at various points throughout the integration and before being installed in the field.

Given the complexity of the 10-year project, the city also closely followed the Federal Highway Administration's system engineering guidelines. This reduced costs, minimized waste, and guaranteed the desired performance of each part of the system.

Groundbreaking Results

The first real test of New York City's wireless intelligent transportation system was a project called Midtown-in-Motion. Starting with an objective to improve traffic flow within a critical 110-square block area, the *project reduced average travel times by 10 percent* on key corridors, and improved air quality, safety, and mobility in the area. The project's enormous success has led to its continued expansion.



Today, New York City's custom intelligent traffic system manages recurring traffic congestion, incidents, special events, emergency responses, and areas particularly susceptible to gridlock. The TransSuite traffic control system enables City traffic and maintenance engineers to share traffic data across multiple agencies in real time. Law enforcement, fire, and sanitation agencies are now using this data to improve their efficiency and effectiveness in delivering critical services.

More in the Making

- ▶ New York City continues to expand its successful software-based **Transit Signal Priority pilot program** – an initiative made possible from the sophisticated functionality of the City's upgraded advanced traffic controllers. In 2015, the program that helps keep city buses on schedule while keeping city traffic moving won the ITS-NY Outstanding *ITS Project of the Year award*. TSP is being deployed in downtown Flushing and will become an integral component of the City's Select Bus Service program that will be deployed along 20 City arterials by 2017.
- ▶ TransCore is working with NYC DOT to plan the design, operations, and maintenance for a pioneering **Connected Vehicle Pilot Program**. Using the TransSuite Traffic Management System, New York will be able to improve traffic flow, reduce accidents, and improve pedestrian safety. The success of this project will enable New York City to lead the nation with this critical innovation.

World's Largest Traffic Signal Control System:

- ▶ More than 12,000 advanced solid-state traffic controllers
- ▶ More than 60 TransCore Encompass® reader sites
- ▶ 210 remote traffic microwave sensor vehicle detectors
- ▶ 400 traffic video cameras
- ▶ Can manage 16,000 intersections



Award-Winning Programs:

- ▶ 2016 ACEC New York Platinum Award
 - *NYC Traffic Control System Modernization*
- ▶ ITS Society of New York, Outstanding ITS Project of the Year
 - *2015 Transit Signal Priority*
 - *2011 Traffic Control Systems*
 - *2009 Traffic Management*
 - *2009 Transportation Management*
- ▶ 2011 ITS America, Smart Solutions Spotlight Award
- ▶ 2008 ITS America's Best of ITS Awards
 - *Best Innovative Practice*

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