New York City
Traffic Management for a New Era
A proud international hub of culture and commerce, New York City is home to more than 8 million people and hosts some 55 million visitors each year. And while it’s great to be the subject of countless songs, books and movies—the city’s popularity creates a formidable challenge: How to get more than 63 million busy people where they want to go.

As well known as its tourist destinations, New York’s traffic is an integral part of the city’s identity. What few may realize is that over the past 40 years New York City has relentlessly chipped away at the congestion, making significant strides that have steadily increased traffic flows and allowed its streets to handle increasing numbers of vehicles—safely and efficiently.

Yet, like its residents and guests, New York City never stands still. And when it was ready to move forward once again—to implement a third-generation traffic control system that could take advantage of technologies and innovations never before available—New York City once again selected its trusted traffic management partner, TransCore, to help get the job done.

**Situation**

Over the decades, New York City managed the majority of its more than 12,000 signalized intersections using 1950s-era electromechanical signal controllers. These were relatively simple timers capable of changing the lights at fixed intervals. However, these devices could only support a single cycle length (amount of time for each complete green-yellow-red, walk/don’t-walk cycle) and a single split (allocation of time for the various portions of the cycle). Because the majority of the city’s intersections were simple (a main street and a cross street, with no turn lanes), the devices performed adequately for decades.

Adding a new IBM mainframe and a room full of other computers in the late 1960s allowed the city to change the timing patterns on the 1,500 intersections that were connected directly to the traffic management center. During the 1980s, TransCore...
worked with the city to increase the number of signalized intersections from approximately 1,500 to over 3,200. The street equipment remained the same.

In the early 1990s, the city contracted with TransCore to replace the failing IBM systems with state-of-the-art equipment that monitored traffic conditions and controlled the traffic signals remotely.

This generation-two system was then expanded to incorporate 2,400 intersections in Manhattan. TransCore supervised the coaxial cable network installation, developed timing plans, and performed the field integration of traffic controllers. Video surveillance was added, but the electromechanical traffic controllers remained. And although the Manhattan controllers were now connected via a coaxial cable network, the 3,500 intersections in the outer boroughs continued to use twisted-pair copper circuits rented from the phone company.

Yet, even with remote communications, the basic electromechanical devices were still capable only of simple “direct advance” manipulation from the central system. Although the controllers could be remotely resynchronized after a power outage, and the split patterns and cycles could be modified through the central system, any communication failures or other service disruptions that occurred created challenges for operators. These units could only follow the fixed patterns that were set inside the controller’s dial keys, i.e., single cycle length and split pattern. The electromechanical controllers were unable to respond to real-time changes in traffic that might result from unusual conditions. And they could not support capabilities such as transit priority, emergency vehicle preemption, phase skipping, or time-of-day pattern changes. It would take another decade for those advancements to be achieved.

**Options**

When the time came to take the next step, the city considered many options. A surface traffic congestion pricing program was proposed, which would charge motorists variable fees based on the point of entry into Manhattan and the time of entry. That solution would have required the use of tolling technology (readers, tags, video cameras and software), applying fees to discourage drivers from traveling in congested areas at peak traffic times. Political conflicts intervened and the project was shelved.

At the same time, the city launched a program to manage ongoing traffic challenges by using wireless technology, sophisticated controllers, and adaptive control algorithms for traffic signal control. It was an ambitious plan, but one that promised countless benefits.

**North America’s Largest Integrated Traffic Control System:**

- More than 12,400 advanced solid-state traffic controllers (ASTCs)
- Over 60 TransCore Encompass® reader sites
- 210 remote traffic microwave sensor (RTMS) vehicle detectors
- 400 traffic video cameras
- TransSuite® software capable of managing 16,000 intersections
- Adaptive Control Decision Support System (ACDSS) for key zones
Solution

For its third-generation intelligent transportation systems (ITS) modernization project, the city once again partnered with TransCore to plan, design, implement, integrate, and maintain the new system.

Project Strategy

Wireless Integration

A critical breakthrough came when the city decided to install its own wireless communications network covering all five boroughs. The network—NYCWiN—provides a 3G communications backbone for police, fire, sanitation, transportation and other essential services. This backbone made any number of new traffic management opportunities not only possible but practicable and affordable.

Standards-based Approach

In a critical first step, the team committed to using a simplified, standards-based approach that leveraged the best of available and emerging technologies, including those implementing the National Transportation Communications for ITS Protocol (NTCIP). This approach ensured the city would reap the benefits of proven technology, economies of scale, and competitive pricing, with opportunities to exploit existing and future applications built upon these standards.

Intensive Testing and Refinement

The team allocated a significant portion of its budget for rigorous testing under simulated, real-world conditions to ensure the proposed hardware and software would perform as required. With over 12,000 integrated intersections involved, the impact of even relatively low failure rates and minor flaws in any design would be magnified dramatically. During testing, the selected vendor made many refinements to maximize product performance, so the city was assured the products selected would perform reliably as specified.

Aggressive Procurement

The combined result of intensive testing and competitive bidding was the city’s acquisition of the most powerful, advanced solid-state traffic controllers (ASTCs) in the industry at less than half the typical price.
Accelerated Installation
As part of this $50 million project spanning 2004-2013, TransCore has integrated as many as 200 new controllers per month—ensuring an installation rate 10 times faster than that of the hard-wired, generation-two project—with all 12,000+ intersections on schedule for replacement by the end of 2013.

System Design
Non-intrusive Traffic Detection and Monitoring
New York City installed a network of remote traffic microwave sensors at strategic locations to detect vehicle presence and monitor traffic volume and speed for use with adaptive signal control algorithms. Instead of conventional, in-pavement inductive loops that degrade with wear and age, this system uses roadside or overhead microwave sensors, E-ZPass RFID readers, and video cameras. This system helps diagnose traffic conditions and reports information on bottlenecks to the city's traffic management center. Engineers there use the system's near-real-time data to make adjustments, changing signal patterns to improve flow and/or transmitting traffic advisories to motorists.

Advanced Control Capabilities
Estimated to be 100 times faster than typical controllers, these sophisticated yet streamlined new ASTCs offer multi-modal capabilities that support actuated and coordinated operation, interval-based and pre-timed operation, and NEMA phase-based operation. They provide data for real-time pattern changes and enable advanced functions such as adaptive control, transit signal priority and emergency vehicle preemption.

Enhanced TransSuite® Traffic Management Software
Prior to commencing this project, TransCore completely redesigned its TransSuite traffic control software, ensuring it would be robust enough to handle the most extreme demands anticipated for New York City, while also providing exceptional value and responsive performance for much smaller cities.

“They're taking information not only from the immediate traffic signals but also from farther up the queue, and...that allows you to not only manage the traffic that you’re seeing, but more importantly to manage the traffic that’s coming.”

~Scott Belcher, President and CEO, ITS America
TransSuite integrates key functions including: incident management, ITS device management, transit signal priority, adaptive signal control, and maintenance support tools. The new software can manage up to 16,000 controllers as easily and efficiently as it can manage 100.

Modernized Central Control
As part of this project, the computer systems at the Joint Traffic Management Center (JTMC) in Long Island City were completely revamped. The new system provides LAN management, with 10 Gbps capacity to handle connectivity with all the ITS devices in the field. It also supports multiple operator workstations, graphic and video display walls, video-feed distribution, and Internet services that provide traffic information to users. Data from the field sensors and controllers is fed to the TransSuite software, and, where implemented, to the Adaptive Control Decision Support System (ACDSS, from KLD Engineering, P.C.), which models the current situation in each location and develops both short-term plan changes (splits) and longer-term changes (cycles and offset). Engineers then use these tools to update timing patterns for each intersection to optimally serve pedestrians as well as motorists.

Project Management

Innovative Operational Methods
Because the traditional landline-based, once-per-second polling of traffic controllers required enormous amounts of bandwidth, the team developed an alternative, exception-based reporting scheme for the city’s new wireless communication system. This approach preserves the data fidelity of polling while reducing bandwidth consumption by 90 percent. Exception-based reporting is being incorporated into new NTCIP standards to benefit other cities that implement wireless ITS.

Proven Engineering Guidelines
Because of this project’s complexity, the city elected to closely follow the Federal Highway Administration’s (FHWA) system engineering guidelines. Using critical path techniques, with testing and verification at various points in the process, the team was able to ensure cost effectiveness, minimize the waste of materials and effort throughout the process, and guarantee the desired performance of every part of the system.

Recognition:
Even prior to full implementation, this project has already been recognized for its achievements by ITS professional organizations in the U.S. and internationally.

- 2012 International Road Federation, Global Road Achievement Award for ITS
- 2011 ITS America, Smart Solutions Spotlight Award
- 2008 ITS America's Best of ITS Awards: Best Innovative Practice

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Results

The new system is already yielding benefits, as measured in a 10.2 percent reduction in average travel times and improved air quality, which, in turn, help increase overall productivity and enhance the quality of life for all New Yorkers. The system is expected to continue to pay off over time with reduced maintenance costs, easier upgrades and new installations, and additional applications yet to be developed leveraging the data now becoming available.

As TransCore's Vice President, Robert Rausch, observes, "This is certainly the world's largest and most aggressive deployment of integrated traffic controllers all being managed from a single point." And it has the capacity to grow as new technologies emerge.

For over 30 years, New York City has returned to the TransCore team again and again for our robust traffic control software as well as our expertise in developing and executing overall solutions. And through this latest project, the city has also come to rely on our expertise for wireless communications as well.

The same expertise, support, and versatile tools that serve New York City are today delivering cost savings and traffic management benefits to numerous cities of various sizes across the country. We are proud to serve cities like yours and are eager to show you how we can help solve even your biggest...or smallest...traffic challenges.

The Future

New York City is already looking ahead to implementing many of the advanced applications made possible through its wireless ITS infrastructure.

- Expand real-time adaptive controls beyond Manhattan into zones with low predictability of traffic demands.
- Transmit traffic information to the public in real time and on demand via Internet and smartphones to identify best travel routes and times.
- Install transit signal priority for the city's fleet of 6,000 buses to encourage increased bus ridership via more reliable service.
- Use Homeland Security grant to apply ITS technology and insights to coastal storm evacuation planning.
- Prepare to support "connected vehicle" applications that provide both vehicle-to-infrastructure (V2I) and infrastructure-to-vehicle (I2V) communications.

"It's not a very expensive system. It's something that any city can deploy, and you can go as sophisticated as you want."

~Scott Belcher, President and CEO, ITS America
Midtown in Motion

The first real test of New York City’s wireless intelligent transportation management system has been a project called Midtown In Motion (MIM), which began with efforts to optimize traffic flow within a critical 110-square-block area notorious for its gridlock.

NYCDOT Commissioner Janette Sadik-Kahn summed up the wisdom of beginning here to fully exploit the system’s inherent potential:

“When Midtown moves, New York City moves.”

The project implemented sophisticated adaptive control technology made possible by the new ITS infrastructure. It also added 53 new turn lanes and 23 new turn signals to help prevent vehicles from blocking intersections.

Following on the success of phase one, the city is now more than doubling the area to include 270 blocks in Manhattan.

“We are now using the most sophisticated system of its kind in the nation to...immediately identify congestion choke points as they occur and remotely alter traffic signal patterns to begin to clear up Midtown jams at the touch of a button.”

~ New York City Mayor Michael Bloomberg

To learn more about New York City’s intelligent transportation systems infrastructure modernization project, see the TransCore video at:

www.transcore.com/NYC

For more information:

Call 214.461.6435 or email ContactUs@TransCore.com

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