

Using Information Technology to Achieve a Breakthrough in Transportation in New York City

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Introduction

Advances in information and communications technology offer the possibility of optimizing the performance of our existing road network in ways that were not possible even 10 years ago.

The ubiquity of web enabled cell phones has put a mobile data input device into the hands of the vast majority of citizens. By applying cell phone, internet, and computer technologies, New York now has the opportunity to create a system which can vastly speed travel times, increase the throughput of our road network, carry more people, while at the same time, radically reducing the number of vehicles on the road, gasoline usage, CO2 emissions, congestion, traffic, and the harm that traffic inflicts on our neighborhoods.

A new form of mass transit can be created that offers trip times highly competitive with the private automobile to nearly all points in the region. This new form of mass transit takes advantage of the existing road network and requires very little in the way of capital investment. This new form of transit is Smart Para-Transit.

Background

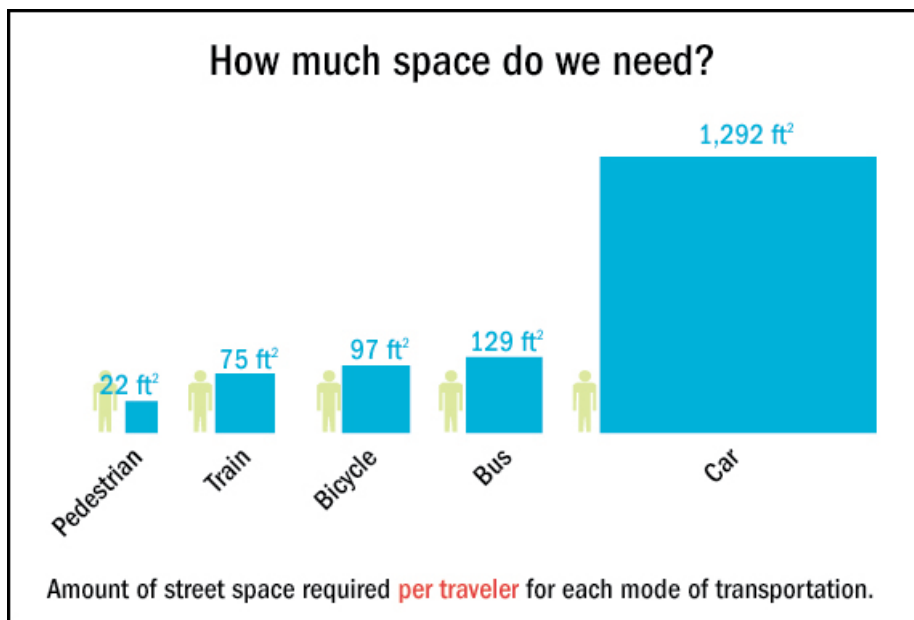
The past 100 years have seen New York City and the rest of the country spend huge amounts of money on road infrastructure improvements to serve automobiles. With the advantage of hindsight, neglecting investment in mass transit while promoting automobile usage may have been a poor policy decision; however, highways, bridges, tunnels, and roads have been built, and New York must now maximize the value it receives from the hundreds of billions of dollars spent on its surface transportation infrastructure.

Although cars have been a significant presence in our world for as long as anyone can remember, from a historical perspective, the automobile is still a relatively new invention. The first 100 years of

our society's infatuation with the automobile was spent without bothering to answer the key question: "Can we fit all the cars we need to move around?" Congestion and traffic jams are a way of life in New York. The previous answer to congestion was to build more roads, bridges, and tunnels; however, the added road capacity only encouraged more driving and led to even more congestion. Our society now knows that it is impossible to build its way out of its congestion problems.

In a city where space is very dear, the private car is the least spatially efficient form of transportation in use. However, for all of its drawbacks, the car is still an amazing technology. When the roads are not congested, it offers faster trip times than any other means of travel.

New York City is blessed with a fine mass transit system that provides good transit options to most of the people in the region. However, for outlying parts of the New York City region, the transit options are a poor substitute for the mobility provided by the private car.



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Banister, David. and Kenneth. Button. Transportation, the Environment and Sustainable Development. University Press, Cambridge: 1993.



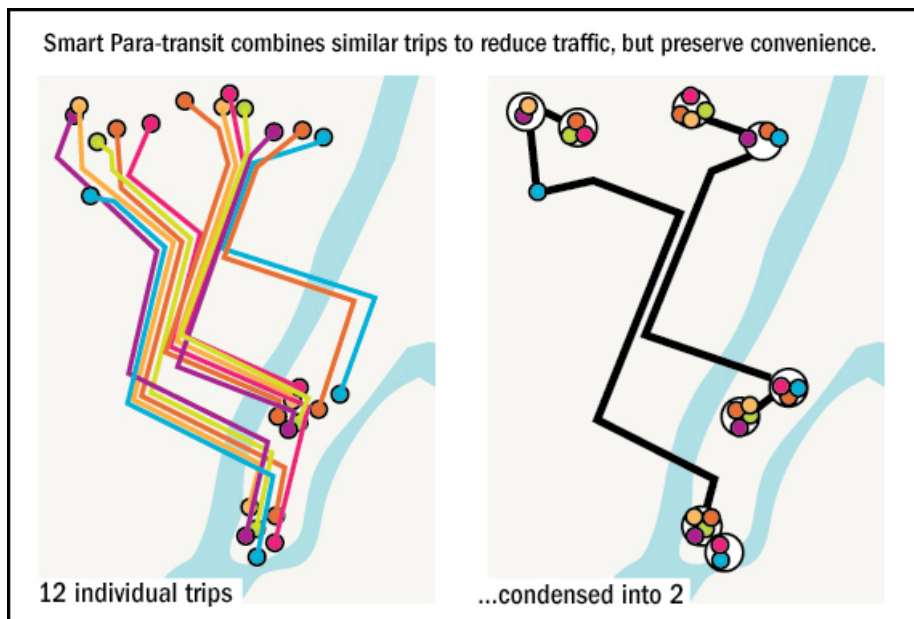
Image courtesy of Transportation Alternatives

How Smart Para-Transit Works

Smart Para-Transit uses information technology to group and optimize the existing trips that take place on the road network. Smart Para-Transit has a number of components. The physical transport component is a large fleet of dynamically routed vehicles: small vans, large vans, small buses, and large buses. As opposed to typical mass transit today, these vehicles do not run on predetermined routes. Instead, a central computer collects information about requested trips, figures out how best to group passengers, and dynamically dispatches vehicles to service the required trips.

In a city as dense as New York, lots of people make highly similar trips at the same time using private cars. Smart Para-Transit allows for grouping of these similar trips to reduce the wasteful overlap that occurs with many individual cars traveling the same routes. Take for example the group of people who want to travel from Tribeca to Montclair, NJ around 5:30 PM on a Tuesday. There might be a dozen people who plan to make this trip by car in a 15 minute period. These dozen people might require 8 separate cars for their trips. Instead of 8 separate cars, one large van could fit 12 people and consolidate these 8 vehicles into just one vehicle. The van could make 3 quick stops in Tribeca, pick up all 12 people and head directly to Montclair. Once in Montclair, the van could stop at a couple of central transit points, and then continue directly to some passengers houses.

The vans need not be beat up vehicles that we typically associate with van services today. They could be environmentally friendly hybrids with plush interiors with cup holders and ports to plug in computers.

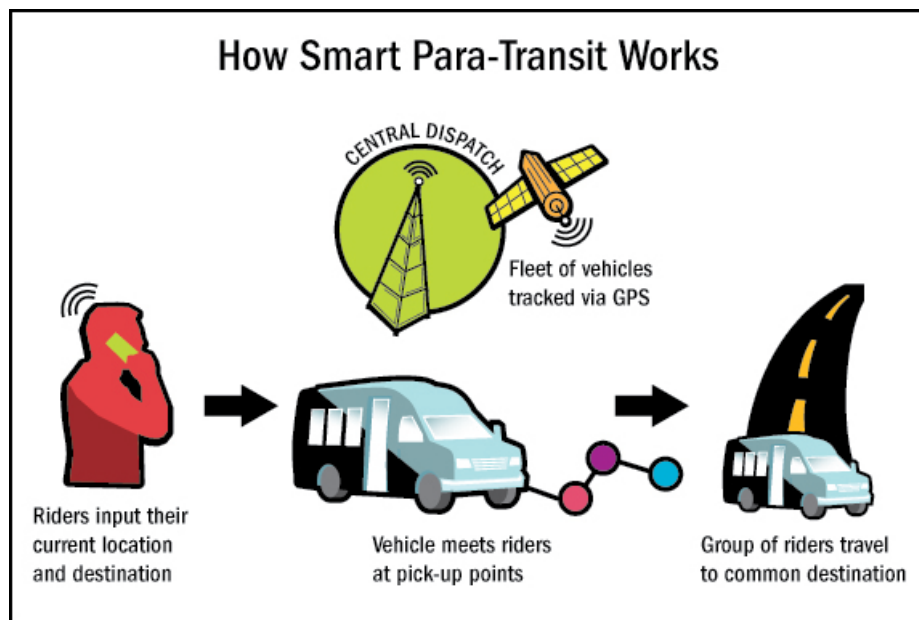


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A brief example of how the system would work from a user point of view can help illustrate how a Smart Para-Transit system could work. Before a user began a trip, they would enter their current location, their destination, and their desired departure time into the system. The Smart Para-Transit system could be accessed via website, mobile phone, or traditional phone. The centralized computer would take this trip information and direct the user to a pick a point within a few blocks of their current locations. The user would then walk to this pick up point. Within a few minutes a bus or van would stop at the pickup point and load the riders. The bus or van would then head directly to the destination area and disburse the passengers at a handful of points. The trip would be nearly as direct as a car trip and would involve no transfers and minimum waiting.

Examples of para-transit are in operation today. Super Shuttle runs a fleet of blue vans to airports. The Hampton Jitney bunches trips for people heading out the beach, and MTA

operates Access-A-Ride for people whose disabilities prevent them from being about to use traditional buses and subways. All of these services are much more limited, and less technologically sophisticated than the Smart Para-Transit system that could be built, but they each show elements of the larger potential system.



Combining Smart Para-Transit with HOV Lanes to Maximize System Throughput

The biggest constraints on the transportation capacity of New York City's road networks are the bridges and tunnels. The river crossings are jammed with traffic for a good fraction of each day. The only way to get more throughput capacity out of New York's existing bridges and tunnels is to use them more efficiently. A vehicle carrying multiple people is more spatially efficient than a single passenger car, so by having HOV lanes, our existing bridges and tunnels can move more people at no extra cost. The Lincoln Tunnel already employs dedicated bus lanes, and this concept can be expanded.

Smart Para-Transit all by itself could provide good transit options but would not have trip times superior to a private car. However, if the Para-Transit buses and vans had access to HOV lanes at the

river crossings and other constraints in the road network, the Para-Transit system could provide trip times superior to the private car. The Para-Transit buses and vans could zip through the bridges and tunnels while the private cars sat stuck in traffic. With quality vehicles, faster trip times, and cost savings, many people in the New York region would happily switch from private automobiles to Smart Para-Transit.

Adoption of Smart Para-Transit could then have a positive feedback effect. As more people used paratransit, trip times would go down as greater concentrations of riders would result in more optimal routes. The greater number of Para-Transit vehicles would then require more HOV and transit only lanes which would further squeeze the road capacity available to private automobiles at peak periods. Private automobiles would then be even slower in comparison to the Para-Transit vehicles further encouraging more drivers to adopt Para-Transit.

The end state could result with New York having a nearly congestion free road network. The current traffic system in New York is badly engineered. It prioritizes the least spatially efficient forms of transportation, the private automobile. As a result, the system is frequently congested leading to enormous wastes of both time and money. In addition, the constant crush of traffic oppresses New York City making its neighborhoods hostile places for the people who live in them.

Operational Issues

A regional Smart Para-Transit system would have many operational elements. Dealing with all such details is far beyond the scope of this article. However, it is worth touching upon some of the key operational issues. One of the biggest issues for such a system would be parking for the vehicles. However, space for these vehicles is available. Since one Para-Transit van can replace 5 private cars, only a moderate fraction of the existing space dedicated to private cars would be necessary for the Para-Transit fleet. The region is filled with parking lots and garages that are empty at night. Repurposing only a moderate fraction of these spaces would solve the parking issues of storing the fleet.

Since one Para-Transit van can replace 5 private cars, only a fraction of existing parking already dedicated to private cars would be necessary to house the Para-Transit fleet.

A large number of drivers would be required to pilot the fleet of vehicles and demand for drivers and vehicles would be uneven over the course of the day. The demand for drivers would be a benefit to the region bringing a large number of jobs to people with only a moderate education. Flexible scheduling policies could allow for some drivers to work only at peak hours and therefore be able to maintain multiple jobs.

Given that much of the travel demand is at peak hours, it would make sense to have a significant fraction of the vehicles in the system run only during rush hours. These vehicles would make one trip into and out of the city each day just like a regular commuter. It would be possible to create a system where people who are regular commuters now could join a program where they would switch

their private automobile for a smart para-transit van. These drivers would be paid for taking a bit of extra time each day to pick up and drop off some other people on their way to and from work. By leveraging the time that drivers already spend on their trips, the necessity for a large number of professional drivers would be minimized, and a great natural efficiency would be gained.

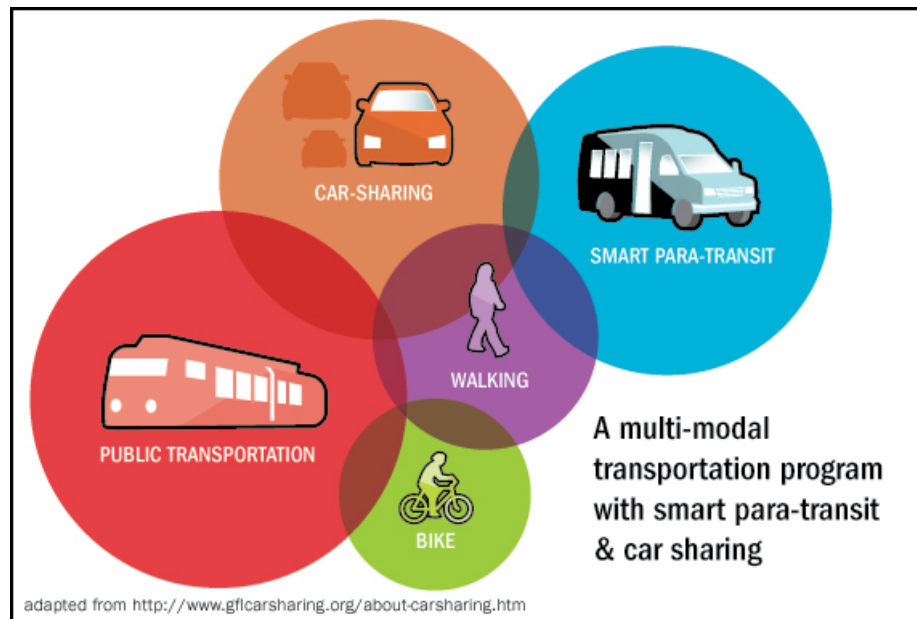
Issues would also need to be decided as to who would own the vehicles; manage, maintain and repair the vehicles; hire and train the drivers; and all the other issues of running a fleet of vehicles. A centralized authority is not required to manage the fleet. The only part of the Smart Para-Transit system that needs to be managed centrally is the computer information system. It might make sense to have a hybrid government/private system for managing the fleet of vehicles. The dispatch of the private and government managed vehicles would all be done by the central computer system, but the actual management of any individual vehicle could be done by any of a number of companies or agencies. The vehicles could all be branded uniformly, so that the end customer would have no idea who managed a particular vehicle. Maintenance, vehicle specifications, training, and cleanliness standards could be centrally maintained and determined. In many ways, the NYC taxi system works in this fashion.

Investments would need to be made in computer systems, support centers, maintenance depots, and the fleet of vehicles.

Combining Smart Para-Transit with Car Sharing

The Smart Para-Transit system I have described would be capable of replacing most of the automobile trips in the New York area. However, by itself, it would be insufficient to completely replace the need to own a car for many New Yorkers. But if Smart Para-Transit were paired with a car sharing program most all driving scenarios would be covered, and this system would eliminate the need for

car ownership for all but the most driving intense New Yorkers. Zipcar is an example of a private car sharing service.



The interface between the car sharing system and the customer would be the same as with the Smart Para-Transit system. The user would simply go to a website or a cell phone and enter what sort of vehicle they would like and the length of time they need the vehicle. The user would then be told the

location of a nearby vehicle that meets their needs. A premium service that drops the car at the customer's door could even be provided at an extra cost.

For example if a family wanted to travel up to the Finger Lakes region for a week, Smart Para-Transit would be a very costly way to meet their travel needs. But by taking an available car from the car sharing pool, the family would have a vehicle that met their needs for as long as they need it. Freight hauling vehicles could also be made available for sharing for times when people need to move large objects.

Many New Yorkers own cars but only use them infrequently. Yet these cars need to be stored all the remaining time. As a result, New York has an enormous parking shortage. Parked cars are not in use, yet they take up precious public space. Chronic parking shortages leads to cruising for parking which results in extra congestion, pollution, noise, and increased danger for children and senior citizens. In addition, parked cars take up valuable space that can be used for non-transportation purposes such as kids playing, benches, flea markets, outdoor cafés, etc. Car sharing allows each car to be kept in service a much higher percentage of the time, and as a result, fewer cars are necessary to serve the same number of trips. Fewer cars mean less demand for parking, and a smarter use of scarce public space. By creating a system that makes more optimal use of the vehicles in the system, New York would receive an enormous spatial dividend that would allow a whole host of public activities to flourish.

Many-fold Benefits of a Smart Para-Transit System

The potential of Smart Para-Transit combined with car sharing to remake New York City's surface transportation system is breathtaking. New York could be changed from a traffic choked city to one where the majority of the streets are nearly traffic free the majority of the time. Roads that are permanently congested can be congestion free. The noise, stress, and danger that come with traffic can be radically reduced. New York can reclaim with human life space where only traffic stood before.

Smart Para-Transit and car sharing need not be some far off dream. Pilot programs can be put in place in as little as a year or two, and a full scale system can be running in less than a decade. Our current system is inadvertently designed to maximize air pollution, maximize the waste of gasoline, maximize the production of CO2, maximize the constant threat to children, and it penalizes more spatially efficient forms of transportation such as buses and bikes. Adoption of a Smart Para-Transit system combined with car sharing would result in huge quality of life improvements for all New Yorkers. The radical reduction in traffic around the city would give New York the opportunity to reclaim excess road space for wider sidewalks, bike lanes, side walk cafes, pedestrian streets, open air markets, benches, and many other street amenities. All New Yorkers would benefit from a greener, cleaner, quieter, more peaceful, friendlier city. New Yorkers could again experience the vibrant street life and rich sense of community that existed in New York before the advent of the automobile.