

Excerpt of pages on dynamic
ridesharing from a longer
document

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ADVANCED PUBLIC TRANSPORTATION SYSTEMS: THE STATE OF THE ART UPDATE 2006

Operations System Block Diagram

Metrolink street map

ToMer's Interactive System Map also provides detailed information on bus stops and links directly to Transit Tracked, which provides next arrival times.

Chubbuck Class Network



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ADVANCED PUBLIC TRANSPORTATION SYSTEMS: THE STATE OF THE ART UPDATE 2006

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FOREWORD

This report contains the final results of a high-level scan of the transit industry, including interviews and analysis, concerning the status of state-of-the-art Intelligent Transportation System (ITS) applications to public transit service in North America. The objective of this effort was to increase the transit community's knowledge of new opportunities, challenges, and lessons learned by agencies and suppliers in applying advanced technologies to improve the efficiency, effectiveness, reliability, safety, and security of public transit services.

Key observations from the research include:

- The complexities associated with state-of-the-art ITS technologies exceed the transit community's current ability to deploy them and stay abreast of ongoing developments.
- Key obstacles include:
 - The stand-alone nature of most individual technology deployments limits the benefits that could be provided by business-oriented, enterprise-wide technology strategies;
 - Most technology-based applications require continuous cooperation and coordination between and among many different departments, agencies, and jurisdictions that are often difficult to achieve;
 - Limited resources and gaps in education and training in the integration, use, and maintenance of technologies and the standards necessary for interoperability and data sharing make it difficult for transit professionals to keep up with technological developments and opportunities;
 - Fast-paced changes in technologies put deployment efforts at risk.
- Looking ahead:
 - The greatest improvements to ITS will come from efforts to integrate existing technologies into cohesive state-of-the-art *systems*, where collectively they provide far more benefits than any one technology functioning independently;
 - Federal efforts to provide opportunities for peer group knowledge-sharing, education, and training would help foster a better understanding of opportunities and challenges of state-of-the-art technologies.

Challenges and Lessons Learned	<ul style="list-style-type: none"> • The collection, management and maintenance of data and information from multiple departments and agencies require keen leadership and team-building skills, as well as significant staff resources to ensure that data and information are kept up-to-date • Interoperability with other emergency command centers falls short due to the proprietary nature of procured systems
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CHAPTER 7: TRANSPORTATION DEMAND MANAGEMENT

Introduction	<ul style="list-style-type: none"> • Reduces the impact of traffic by influencing travel behavior • “Big picture” strategic solution for mobility problems that ITS was originally created to address
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Dynamic Ridesharing

Technology Overview	<ul style="list-style-type: none"> • Paratransit-like service allows travelers to be joined in real time to provide taxi-like responsiveness • Makes use of many technologies: call centers, Internet-based ridematch, automobiles, and automated personal rapid transit
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State of the Art	<ul style="list-style-type: none"> • “Next day” responsiveness has been achieved • However, “dynamic” ridematching (i.e., pairing riders with hosts in real time) has not yet been successfully implemented • Trends include: <ul style="list-style-type: none"> ▪ Technology improvements that reduce lead time requirements for trip requests ▪ Use of Internet to facilitate statewide ridematching
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Challenges and Lessons Learned	<ul style="list-style-type: none"> • Integrating paratransit with supplemental subscription services improves net operating results • Paratransit vehicles with enhanced systems require robust onboard electrical systems • Geographic-based software systems require an accurate base map; also need to be maintained on a continual basis
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Automated Service Coordination

Technology Overview	<ul style="list-style-type: none"> • Technology enables passengers to transfer between modes of transit during a fully linked trip • Makes use of automatic vehicle location, electronic fare collection, decision support systems, and mobile data terminals
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The distinction between transit-related TDM and everyday transit operations is a fine one. For example, offering attractive and reliable transit headways and travel times is a basic tenet of everyday transit operations; it is also an enabling strategy for TDM. Effective marketing of transit services is an everyday business reality; it also is an element of TDM when influencing mode shifts from personal vehicles to transit. Fleet management and operations supervision is another everyday transit occurrence; it too becomes TDM when coordinated to enhance service and/or provide seamless connections across modes. With respect to transit, therefore, TDM is perhaps best characterized simply as “advanced transit operations and marketing.”

For purposes of this report, advanced transit operations and marketing technologies applicable to ITS Transportation Demand Management have been divided into three major categories:¹²⁰

Dynamic Ridesharing;
Automated Service Coordination; and
Multimodal Transportation Management Centers.

Concerning state of the art, little has changed with respect to ITS transportation demand management since the last State of the Art Report (Update 2000) was published. The sites listed at that time essentially retain that distinction today.

7.2 Dynamic Ridesharing

7.2.1 Technology Description

Dynamic ridesharing¹²¹ services can run the gamut of technical complexity from manually operated call centers to fully automated, Internet-based ridematch¹²² applications, and from personal automobiles to fully automated personal rapid transit (PRT).¹²³

¹²⁰ It should be noted that elements of various other ITS application areas, most notably traveler information, traffic control, electronic payment, fleet management, in-vehicle guidance, and the ITS data warehouse, when used effectively, may also support transportation demand management. These applications are typically not intended primarily for TDM, however, and so are addressed elsewhere in this report.

¹²¹ Ride sharing is the act of sharing a vehicle with one or more other people.

¹²² Ride matching is the process of pairing prospective passengers with available drivers with common origins or destinations.

¹²³ Personal Rapid Transit (PRT) is theoretically a highly efficient [transport](http://en.wikipedia.org/wiki/Personal_rapid_transit) method that offers unscheduled on-demand nonstop transportation between any two points on an interlaced network of specially built guideways, using small (1-6 person) cars that follow mathematically optimized trajectories from point to point. (Wikipedia, http://en.wikipedia.org/wiki/Personal_rapid_transit).

In its ultimate form Dynamic Rideshare is essentially a low-cost paratransit service that provides a means by which two or more travelers can be joined in real time with others headed to, or past, the same locale with taxi like responsiveness.¹²⁴ The rideshare trip may start or end at an initial origin, a final destination, a transit stop, or an intermediate rideshare transfer point. It could also involve private automobiles, vanpools, paratransit vehicles, boats, and even light aircraft. Most common at present, however, are subscription ridematch¹²⁵ and shared paratransit services that use private carpools, private or corporate vanpools, and government-funded paratransit vehicles.

Subscription ridematch services are administered by hundreds of public and private Transportation Management Associations (TMAs) throughout the U.S., as well as by many state DOTs. Subscription ridematch services allow travelers (usually commuters) to register themselves as passengers, drivers, or both, and then match prospective drivers and passengers having common travel times, preferences, origins, and destinations. They are often supported by corporate sponsors who benefit from a reduction in required parking at their facilities. Most sponsored ridematch services also offer a guaranteed ride home in case of emergencies.

Shared paratransit services are typically operated by government entities (either in-house or through a contracted provider) that provide curbside pickup for multiple riders on preplanned routes that are “dynamically” programmed the day before. This type of next-day rideshare has found widespread use in satisfying the transportation needs of state and federal welfare, Head Start, disabled, and special needs programs throughout the U.S. They may also serve as feeder services for local transit facilities.

Obviously, the greater the number of travelers that can be carried in a given vehicle on a given trip without compromising quality of service, the more efficient and effective the rideshare operation becomes. One relatively recent innovation that has been successful in increasing capacity utilization for next-day rideshare is the merging of conventional subsidized paratransit services with full-fare subscription services to provide a guaranteed ride for nonsubsidized travelers. The idea is that if a vacancy exists on a subsidized paratransit vehicle, then it makes perfect sense to pick up a full-fare passenger or two (or six) along the way. Since the trip will run regardless, it may as well run with more passengers. Subscription riders in Massachusetts enjoy a high degree of satisfaction with the reliability, comfort, and convenience of the merged

¹²⁴ Many airport shuttle services operate in this fashion.

¹²⁵ In a subscription service, the ride matching process is accomplished well in advance of the trip; typically the subscription is for multiple repeated trips to/from the same location.

service; so much so that the subscription service must be managed to avoid oversubscribing spare paratransit capacity.

Proposed advanced versions of dynamic ridesharing also include Personal Rapid Transit (PRT)¹²⁶ and Autonomous Dial a Ride Transit (ADART). PRT is a theoretically highly efficient transport method that offers unscheduled on-demand, nonstop transportation between any two points on an interlaced network of specially built guideways separate from existing roadways. It uses small (1-6 people) cars on mathematically optimized point-to-point trajectories. ADART is a proposed method of dispatching and routing transit vehicles over the existing roadway network in real time that is theoretically more efficient than operating a conventional fixed-route transit line with extremely low ridership (as is often the case on mandated routes). Development projects are currently underway in both areas, including a partial ADART implementation in Corpus Christi, TX. However, fully functional and fully operational examples in revenue service do not yet exist in the U.S.

7.2.2 State of the Art

“Static” ridesharing and ride matching services have been in operation since before the 1970s. The current state of the art has achieved “next day” responsiveness (i.e., pairing riders with transportation providers on a flexible day-by-day basis), but true “dynamic” ride matching, (i.e., pairing riders with hosts in real time) has not yet been successfully implemented in the U.S.

State-of-the-art paratransit ridesharing services are currently distinguished by such features as:

- Automatic Web-based user registration;
- Automatic verification of trip eligibility (through integration with the agency’s automated itinerary planning tool and eligibility databases);
- Next-day service;
- Automatic verification of service delivery (typically using coded subscriber ID cards and onboard card readers);
- Innovative use of supplemental subscription services to reduce subsidies;
- Dynamic allocation of individual trips to lowest cost operators on a day-to-day basis;
- Partnering (providing startup vehicles, umbrella insurance, communications, and administrative services) to encourage small operator participation; and
- Rigorous quality inspection and quality control to proactively ensure reliable service from contracted providers.

¹²⁶ (Wikipedia, http://en.wikipedia.org/wiki/Personal_rapid_transit).

State-of-the-art sponsored carpool and vanpool ridematching services are currently distinguished by such features as:

- Automatic Web-based user registration;
- Guaranteed ride home;
- Automated quality control surveys; and
- Automatic verification and purging of inactive participants.

Examples and characteristics of state-of-the-art dynamic ridesharing and ridematching deployments found in transit include:

Montachusets Area Regional Transit, Fitchburg, MA

System allows management of transportation brokerage for 75% of the state (most of Massachusetts except for Cape Cod and the Boston Metropolitan Area).

Provides 11,500 trips per day with over 150 vendors and 600 vehicles.¹²⁷

Coordinates with commuter rail and intercity buses, and provides feeder services and parking.

Working toward utilization of commuter rail for long-haul trips, using paratransit for relatively short distance carriage at origin and destination only.

Conventional paratransit was merged with full-fare subscription service, which delivered an operating cost reduction of 60% with no impact on quality of service.

Subscription service is especially popular for transporting young children to schools where conventional fixed-route transit typically involves multiple transfers or extended walking distances.

MTA, Los Angeles, CA.

Automatic paratransit eligibility verification.

Automatic paratransit service delivery verification.

New Jersey Department of Transportation, Trenton, NJ

DOT-sponsored portal to Transportation Management Associations statewide (www.njcommuter.com).

Statewide ridematching service.

7.2.3 Emerging Trends

As vendors have developed more capable flex routing systems, and more and more operators have equipped their vehicles with various forms of communications and

¹²⁷ "APTS State of the Art Update 2005" Web survey, Palisades Consulting Group, 2005.

location tracking technologies, the lead time required for trip requests continues to drop. Additionally, a growing number of states are taking advantage of Internet technology to facilitate statewide ridematching. In Corpus Christi, TX, where a simplified partially autonomous dial-a-ride transit (ADART) implementation is currently operational, progress continues toward development of a fully functional ADART service designed to replace underutilized fixed-route transit services with paratransit vehicles dynamically scheduled in real time.¹²⁸ Perhaps the most dramatic development, however, is the certification in the United Kingdom of what may become the world's first economically viable personal rapid transit (PRT) application, due to begin pilot implementation at London's Heathrow Airport later this year.

7.3 Automated Service Coordination

7.3.1 Technology Description

Automated Service Coordination refers to advanced transit operations technologies, policies, and procedures designed to guarantee or "protect" passenger transfers between the various vehicles and services that may comprise a fully linked trip. In this usage, it is also sometimes referred to as "automatic connection protection." A second usage of the term applies to automatic headway coordination among two or more different service providers along a common operating corridor.

Service coordination could occur between different vehicles of the same mode, different modes, different agencies, and even different sectors of the transportation industry. Supported transfers could include connections between bus, rail, paratransit, ferry, rapid transit, vanpool, taxi, commercial airline, and others. Even the connections from pedestrian segments of the journey might be conditionally protected as well (i.e., when PDAs and cell phones become more universally GPS enabled), especially in areas where headways are significantly long.

Scheduled connections are planned at a policy level (where schedulers design planned connections into the service) and executed at the operational level (where dispatchers ensure that vehicles do not depart from a planned connection point until their connecting trips have arrived). Scheduled connections may be protected unconditionally as a matter of agency policy, or conditionally as part of managed strategy to optimize service quality and effectiveness on a trip by trip basis.

Automatic Service Coordination systems use ITS technologies such as AVL, electronic fare collection, decision support systems, and mobile data terminals to:

Identify and/or confirm the existence of a desired transfer;

¹²⁸ <http://www.its.dot.gov/resources/IntegrationProject/projects/PTO-72.htm>