SPARKING INNOVATIVE TRANSPORTATION SOLUTIONS

Issue 17
Spring/Summer
2011

HIGHWAY SYSTEMS
RELIABILITY
TRANSIT
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Ignition

News from **TRB's IDEA** Programs

INSIDE:

TRB
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

THE IDEA PROGRAMS

Innovations Deserving Exploratory Analysis

IDEA programs provide start-up funding for promising but unproven innovations in surface transportation systems. The programs' goal is to foster ingenious solutions that are unlikely to be funded through traditional programs.

Managed by the Transportation Research Board, IDEA programs are supported by the member state departments of transportation of the American Association of State Highway and Transportation Officials (AASHTO), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and the Federal Motor Carrier Safety Administration (FMCSA).

The Transit IDEA program, which receives funding from FTA as part of the Transit Cooperative Research Program, is guided by a panel chaired by Fred Gilliam, President, Gilliam and Associates, Austin, Texas. Harvey Berlin is the TRB program officer.

The NCHRP Highway IDEA program is supported by the member state departments of transportation of AASHTO through the National Cooperative Highway Research Program (NCHRP). It is guided by a panel chaired by Sandra Q. Larson, Director of Research and Technology, Iowa State DOT. Inam Jawed is the TRB program officer.

Safety IDEA is jointly funded by FMCSA and FRA. The committee is chaired by Bob Gallamore, a consultant. The program focuses on innovations to improve railroad inter-city bus, and truck safety. Harvey Berlin is the TRB program officer.

Reliability IDEA is funded throught the second Strategic Highway Research Program to encourage innovation in techniques and tools to reduce congestion and delay caused by unexpected events. The program's goal is to improve travel time reliability. The committee is chaired by Leslie Spenser Fowler, ITS Program Manager for Kansas Department of Transportation. Inam Jawed is the TRB program officer.

Visit the IDEA Web site:
www.TRB.org/IDEA

On the Cover: A moment of calm in the lobby of Orlando, Florida's LYNX Central Station. The Central Florida Regional Transportation Authority participated in a pilot of Transit IDEA project 60 to test the feasibility of providing near real-time data on bus location, departure times, and other information to transit dispatchers and passengers. Story on page 3.

Photo courtesy of LYNX

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Contents

Better Together

Isn't it amazing when a cloud of starlings so suddenly changes direction that the thousands of individual birds seem to move as one? Schools of fish, swarms of bees, colonies of ants (and occasionally troops of teenagers) are known to do the same thing. Scientists studying this phenomenon have identified some shared characteristics: information is gathered by many and shared with everyone; there is no leader, the groups self-organize; decisions are based on repeated experience and they support survival. Author Peter Miller titled his book on this subject, *The Smart Swarm*. Are there lessons here for how we design and use transportation systems?

In this issue, several of the IDEA projects highlighted actually model characteristics of smart swarms. In Where's My Bus, investigators pilot gathering data from three different sources about every bus in service and converting it to near real-time information that transit system operators and passengers can use to make decisions. Using a national standard format, the information can be shared even more broadly across business areas within a transit agency and can simplify efforts to interconnect data systems between agencies.

Pooling the Benefits describes a project that builds on proven smart swarm behavior—the self-organized casual carpool. Transit IDEA project 61 tests a scheme for membership-based casual carpooling to park-and-ride lots that provides the benefits of ridesharing and promotes transit use at the same time.

And in the Business Section, we celebrate what groups of volunteers can accomplish when they replicate the successful experience of others. The Independent Transportation Network, ITNAmerica, a volunteer-based community transportation service for seniors that started in Portland, Maine, with help from the Transit IDEA program 16 years ago, now has 18 affiliates in 14 states and recently provided its 25,000th ride.

Linda Mason
Communications Officer
Transportation Research
Board of the
National Academies

IDEA Investigators' Final Reports are posted on the TRB website:
http://trb.org/Publications/PubsIDEAPublications.aspx

Your comments are welcome and
may be sent to the editor at **lmason@nas.edu**

Where's *My Bus?*

If you're a transit passenger on the LYNX system in Orlando, soon you'll no longer have to wonder if you've just missed your bus. Just check the large screen that's been installed at the Central Station to find out where your bus is and when it is expected to leave the station. You may also find out the time and temperature and maybe learn about a new restaurant somewhere along the route. While this information simplifies using public transit, it is surprisingly complicated to supply.

To provide transit riders with accurate, real-time information about bus locations, a project team led by Robert Ayers of Ayers Electronic Systems (aE) developed a Transit Communications Interface Profile (TCIP) system to combine data from three sources and convert it to a standard data-sharing format. The system can also provide real-time location of the bus fleet to transit dispatchers. This pilot project (Transit IDEA project 60) was conducted in cooperation with the Central Florida Regional Transportation Authority, known as LYNX, to demonstrate the viability of using TCIP interfaces in a transit agency environment.

What Are Transit Communication Interface Profiles?

Transit Communications Interface Profiles (TCIP) are an American Public Transportation Association (APTA) standard that provides a library of information-exchange building blocks that make it possible to use data across functions or even agencies. Transit agencies and their suppliers can use TCIP as the foundation for tailoring data interfaces to suit their specific data transfer needs. TCIP is based on earlier work performed by the Institute of Transportation Engineers, the American Association of State Highway and Transportation Officials, and the National Electrical Manufacturers Association and was published as the National Transit Communications Interface Profiles 1400-Series Standards. TCIP information exchanges are grouped into 'business areas' that are common to public transport, control center, fare collection, onboard systems, passenger information, scheduling, spatial data, and transit signal priority.

The first applied test of TCIP was the product of an earlier Transit IDEA project, Dynamic Timetable Generator from Schedule Data. The principal investigator for Transit IDEA Project 39, Paula Okunieff, developed a tool to automate the process of generating timetables from raw schedule data so that current information could be available for customers on a website. Her team and a small group of participating transit agencies coordinated closely with the APTA working group that was developing TCIP. TriMet of Portland, Oregon, which participated in that project, improved on the outcome and branded the product now known as Timetable Publisher. It is available as open source software at www.timetablepublisher.org.

The aE/LYNX project is the first to implement time-critical TCIP interfaces and the first use of TCIP to connect operational business systems. TCIP has the potential to reduce life-cycle costs of intelligent transportation systems (ITS) projects within the transit industry and simplify the effort to interconnect ITS systems between agencies.

TCIP Traveler Information Pilot Basics

Ayers and the investigative team refer to the current Transit IDEA project as TTIP: the TCIP Traveler Information Pilot. To provide transit customers at LYNX Central Station with near real-time information on the current location of buses, TTIP fuses automatic vehicle location (AVL) information with schedule and bus assignment information. This TCIP-based AVL system gives agencies the ability to monitor the locations and status of all vehicles on one display even if they buy onboard equipment from various suppliers. To dispatchers, TTIP displays the near real-time vehicle locations with near real-time traffic information on a map. To transit passengers, TTIP displays the schedule, the bus assignments, and the current location of the buses, which can be expressed as the number of stops away from the passenger's location. The screen for transit passengers can also display advertisements, which could be a revenue generator for the agency.

Prototype sign at LYNX Central Station

Gathering Data

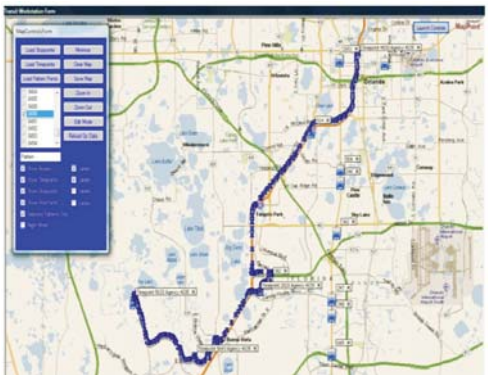
TTIP gathers three types of information: bus schedules, vehicle assignments, and vehicle location.

Bus schedules are obtained from LYNX as a series of files that include temporal and geographical elements of the schedule. These files are imported to a database, validated, adjusted, and converted to TCIP message files. This process has to be repeated when bus schedules are updated.

Vehicle assignments specify which buses will run which routes at which times. Sometimes buses are reassigned

due to mechanical failures or other operational needs and will not always run a complete route. TTIP gathers vehicle assignment information from an in-house LYNX application that manages vehicle assignment changes.

TTIP obtains the vehicle location from two sources: an AVL system and TCIP-enabled vehicle logic units (VLUs). LYNX buses were equipped with an automatic vehicle location system prior to this Transit IDEA project. TTIP receives the AVL data through an internet connection. The VLUs transmit encrypted data to the TTIP central equipment using a commercial cellular network.

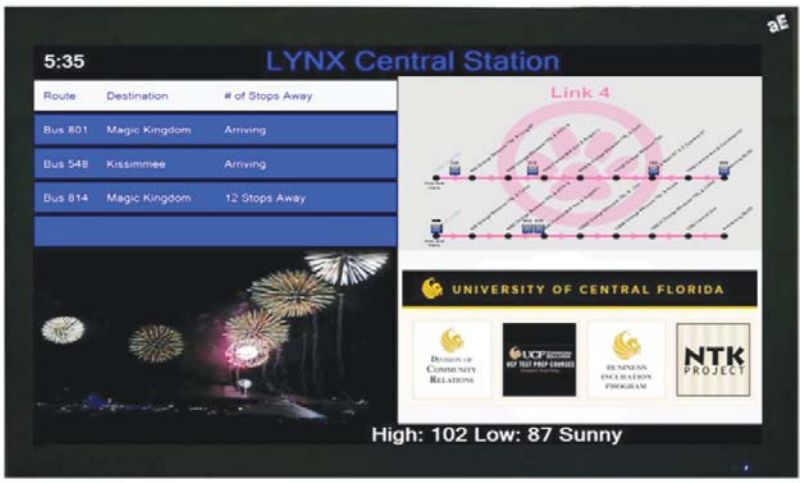


Screenshot of map application for dispatchers

"Customer *feedback* leads to results that please"

Displaying Information

Once TTIP obtains all of the data, a server integrates the information to display it to passengers and dispatchers. TTIP generates a TCIP-formatted fleet location feed to dispatchers on a map display. TTIP delivers the passenger information to LYNX customers on a 46-inch LCD screen at LYNX Central Station. The LCD screen displays information to customers in five modes: (1) current location mode, which specifies the location names of the approaching buses; (2) estimated departure mode, which specifies the expected departure times of buses; (3) stops-away mode, which specifies the number of stops from the approaching bus's location to the stop containing the sign; (4) distance-away mode, which specifies the distance along the route from the approaching bus to the stop containing the sign; and (5) estimated arrival mode, which specifies when the bus is expected to arrive. This screen can also concurrently display advertising (still and video) to customers along with the passenger information.



Display showing stops-away and schematic modes indicates how advertising and community service announcements could be incorporated.

Advertising

Advertising provides an opportunity to offset some or all of the costs of installing this system. The LCD screen for displaying passenger information to transit customers was specifically designed to concurrently display advertisements. This includes still graphics, text, and video. Advertisements are managed through the same network that sends the TCIP-formatted passenger information.

The research team found that interacting directly with transit passengers provided valuable information on how to make the TTIP useful to customers. In response to comments, the team added a graphic display mode that shows bus location on a route map, showing at a glance where the bus is along the route. Customers also said that the information they wanted varied by the type of stop they were at. This knowledge led investigators to implement the multiple display modes, including current location, estimated departure, stops-away, distance-away, and estimated arrival time.

Two LYNX routes were the focus of these Stage 1 tests: Link 4 (LYNX Central Station to Kissimmee) and Link 50 (LYNX Central Station to Magic Kingdom). In addition to displaying the current location of inbound buses, pilot tests also demonstrated stops-away, distance-away, and estimated-departure modes. Expected arrival time was not tested in the pilot because it is not as useful to passengers as expected departure time, but it is under test in the aE laboratory. The tests produced favorable results both in the lab and at the LYNX Central Station. The data generated was predominantly accurate. There were a few instances of incorrect data, but the causes of those problems were resolved. The project team began to receive positive feedback from the public as soon as the sign was installed; transit customers were happy to see that LYNX was working to give them real-time locations of the buses. The product continues to be refined, and aE is still developing new features and capabilities for TTIP. For example, the project team is conducting further tests on the onboard service information and advertising subsystem, and they are also creating a cell phone application to disseminate the bus information to transit riders.

TTIP is being commercialized. The passenger information system is designed to operate with a variety of different sign types, and aE is pursuing opportunities using their own signs as well as those from other manufacturers. They are also developing the hardware and software to provide service information and advertising onboard transit vehicles. Commercial versions of these products are scheduled for availability later in 2011. aE is also in conversations with several other agencies that have indicated their interested in the commercial version of this system. Future plans include exhibiting the system at trade shows and marketing the system to more transit agencies.

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Pooling the Benefits: Flexible Carpooling to Transit Stations

Since the advent of highway lane restrictions for high-occupancy vehicles (HOV) in the 1970s, thousands of people around Washington, DC, San Francisco, Houston, and other cities have commuted for free, using a casual carpooling arrangement known in Washington as "slugging." (The term comes from the name for fake coins or tokens used to ride transit without paying.) There are no formal arrangements and no one is in charge. Basically, people who need a ride line up at a spot where drivers, who need extra riders to meet HOV requirements, can easily pull over. The first two riders in line (two for safety) get into the first car headed where they want to go and everybody benefits.

Slugging is not for everyone, however. Getting into a car with a complete stranger seems too risky to some people. And what if you don't get a ride? Because ridesharing has obvious personal, societal, and environmental benefits, public agencies and other entities have used various methods to formalize carpooling to overcome these issues.

In Transit IDEA project 61, researcher Paul Minett combines the most workable elements of both systems to create a membership-based flexible carpool strategy that provides the benefits of ridesharing and promotes transit use at the same time. The idea is to encourage people to flex-pool to park-and-ride lots, where they access public transit. Flex-pooling is casual, in that people participate when it is convenient and no prearrangements are required, but there is a measure of formality in that members have passed screening for driving and criminal violations and there is an organizing entity that administers the program. The administrative function allows for possible incentive and ride-credit accounts as well as data collection to capture trip records and provide system metrics.

Park-and-ride lots are expensive to transit agencies and, because the lots often lack sufficient capacity, they may actually limit growth in ridership. Flex-pooling could effectively increase capacity at park-and-ride lots; 50 parking spaces could accommodate 100 or more transit riders. The park-and-ride lot would have dedicated flex-pool parking spaces and an evening pick-up point for forming flexible carpools back to the residential area where the flex-pool commute began.

Washington State Department of Transportation, King County Metro, and Sound Transit serving the Seattle area are participating in this Transit IDEA project, which will identify potential routes for formal flexible carpooling to transit stations. These Stage 1 efforts will carry out the investigation and document the process so that it can be followed by others. Innovations of this formal flexible carpooling method include an application and screening process, a biometric infrared membership card, a combination infrared/radio-frequency-identification transceiver for drivers' cars, and a ride-credit system to reward system use. If a field operational test becomes feasible, a park-and-ride facility near Seattle would serve as an origin-end point for 100 member participants to leave their cars and flex-pool in 50 other members' cars to a transit station without prearranging specific driver-rider combinations.

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Computer Vision May See the Future of Traffic Data Collection

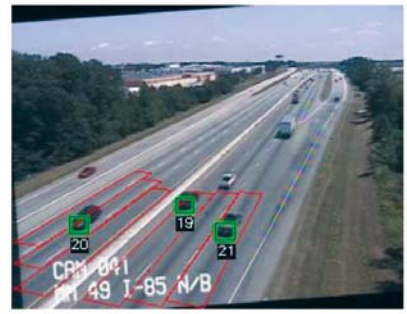
Traffic updates and other news about road conditions broadcast through our local media outlets often originate from traffic management centers (TMCs) operated by state and local transportation agencies. TMCs have banks of monitors that receive data from sensors and video cameras strategically placed along major streets and roads. That's often how emergency responders are dispatched to incident scenes and it is how roadway operations are managed to keep traffic moving. With so many uses for traffic data, it's easy to see why we need the most reliable and timely information possible.

Research conducted in NCHRP IDEA project 140 has developed a next-generation traffic sensor that uses computer vision technology to collect traffic parameters from a single camera sensor. The ability to actually track vehicles through the camera's field of view overcomes many limitations of current systems. For example, the system can produce accurate vehicle count, speed, and classification data in various weather, lighting, and congestion conditions and operates with both fixed and pan-tilt-zoom cameras. In addition, because the system detects and tracks individual vehicles over time, it can also be used for more advanced scene analysis, such as detecting lane changes and dangerous driving behavior.

Hundreds of hours of video data have been collected for analysis and testing from installations arranged with cooperation from the Maryland State Highway Administration, the New York State Department of Transportation, and the South Carolina Department of Transportation. Results show that using computer vision technology, cameras can become sensors with accuracy rates equivalent to existing inductive loop detectors and piezoelectric sensors, which must be embedded in pavement.

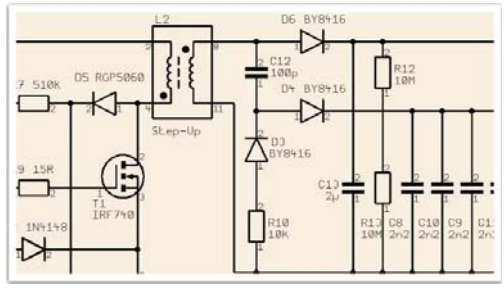
Researchers Stan Birchfield and Wayne Sarasua, both with Clemson University in South Carolina, have partnered with a local software company to bring the research idea to market. The product, named TrafficVision, was launched in an exhibit at the TRB Annual Meeting in January.

More information is available in New IDEAs for Highway Systems, the NCHRP IDEA program annual progress report available on the IDEA website: www.TRB.org/IDEA. The researchers can be reached by email: Stan Birchfield: stb@clemson.edu or Wayne Sarasua: sarasua@clemson.edu.



Training Day

The mass transit bus industry is undergoing rapid technological changes. Alternative fuel technologies and complex electrical systems are becoming more commonplace. But because little bus-specific training occurs in US trade schools, many new technicians must learn the new systems on the job. To address this problem, a project team led by Robert H. Mann of CDX Global has developed an online training course on modern electrical systems for buses in Transit IDEA project 62.



The online training course, which is now available to all transit agencies, was designed with the principle that technicians learn better and faster when using highly visual training materials in a reinforced teaching model. The course includes short videos, interactive reinforcing activities, and online testing. Two key innovations were used in creating the training course: first, digital production technology was used to create the content; and second, the course was built on a dynamic online platform that is easy to change. The result is a training course that can be quickly updated when new technology becomes available.

Training, specifically electrical systems training, is a high priority for the bus transit industry. This training module fills a gap in modern electrical systems knowledge, and it can be particularly useful to smaller transit agencies that do not have access to a training department. The training course also has the potential to help technicians prepare for the Automotive Service Excellence (ASE) electrical exam. The final version of the product has been released to the industry on a subscription basis. CDX is assessing the possibilities of partnering with other organizations within the industry to offer the training course.

Contact: Robert H. Mann, robertm@cdxglobal.com and visit: http://www.cdxglobal.com/products/bus/

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A Small Investment Then—Nationwide Benefits Now

It's been 16 years since the Transit IDEA program first provided funding to help Katherine Freund pilot test a program to help seniors maintain their independence after they stop driving. Following that 3-month, 2-car study, Freund vigorously persisted in developing her innovative concept for the Independent Transportation Network and now ITN*America* has 18 affiliates (and another in the works) in 14 states that together provide about 50,000 rides a year with a network of volunteer drivers and paid staff.

ITN*America* is the only national nonprofit transportation system for America's aging population. It follows a model that supports grassroots community efforts with a national network of experience and technical assistance. For example, affiliate communities are linked through a proprietary software system that manages the logistics of ride scheduling, membership administration, and other critical activities.

An array of inventive programs developed by ITN*America* helps solve the complex problems related to maintaining seniors' mobility, independence, and dignity. For example, people who have decided not to drive any longer can donate their cars to the program to pay for rides. Volunteer drivers can store credits for their own future rides or endow a fund for others. There is a gift certificate program that helps adult children support their parents' transportation needs no matter where the children live. There is also a way for merchants and service providers in the communities to help their customers and clients continue to shop and keep their appointments.

ITN*America* affiliates provide rides in 14 states:
California • Connecticut • Florida • Illinois • Iowa
Kentucky • Maine • Massachusetts • Missouri
Nevada • Ohio • South Carolina • Tennessee • Wisconsin

Freund believes safety is another benefit of the door-to-door, arm-through-arm service ITN provides. She notes that the same impairments that make it difficult for people to drive can make it difficult for them to use public transit, negotiating the distance from home to the bus stop and contending with weather-related complications en route, for example. Overall, her practical and compassionate approach to meeting a human need reminds us that transportation is a social issue and sometimes the payoffs are personal.

Learn more about ITN*America* at www.itnamerica.org.