ITS for Transit

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Intelligent Transportation Systems

• Traveler Information
• Fare Payment
• Mobility Services for All Americans (MSAA)/Veterans Transportation Community Life Initiative (VTCLI)
• Integrated Corridor Management (ICM) Systems
• Vehicle Assist and Automation (VAA)
• Connected Vehicle Program
• ITS Standards
En-Route Traveler Information System
Dynamic Displays

- Real Time Bus Arrival Systems
- On-board Systems - In-vehicle next stop and location information is common now (bus and train)

BART, SF Bay Area, CA

LA Metro Rapid, Los Angeles, CA

TriMet, Portland, OR

Lynx, Orlando, FL

WMATA, Washington, DC
En-Route Traveler Information System
Mobile Device

Send a SMS message as usual.
Type a number of the bus stop.
Type a number of ACIS SMS Service
Send the message.
Waiting for a while.
Get a response.

➤ Get a list of buses.
Other Transit ITS Applications

- Universal Electronic Payment
- Park-and-Ride Improvements
Contactless Fare Collection

* regional or multi-agency schemes
Open Loop Payments
Smart Parking options
- Park and Ride

Technology
- Smart phone apps
- Web reservation
- Payment options
Intelligent Transportation Systems – Mobility Services For All Americans (MSAA)

- USDOT ITS initiative
- Collaboration with United We Ride
- Joint demonstration of scalable and replicable Travel Management Coordination Centers (TMCC)
  - Simplified point of access
  - Comprehensive set of services
  - Utilizing ITS
Challenges
Consumer with Mobility Needs

One Call

Transportation Service Providers

U.S. State & Local Government Funds, Policies, and Regulations

Funding Agencies
Common ITS Used by Project Sites

- Database interface/integration
- Reservation/eligibility systems
- Routing/scheduling/dispatching systems
- Automatic vehicle location/geographic information systems
- Mobile data computer
- Interactive pre-trip and en-route traveler information
- Interactive voice response (for customer service and reservation)
- Electronic fare payment media and collection
Intelligent Transportation Systems - Integrated Corridor Management (ICM)

- **Goals**
  - Demonstrate and evaluate strategies and ITS technologies that help transportation operators efficiently and proactively manage corridors
  - Provide the necessary tools, knowledge, and guidance, for ICM
- $28.5 million in USDOT funds
• Transit offers additional corridor capacity
• Transit can assist in managing corridor demand
• ITS increases transit flexibility, efficiency, and coordination
• Increase multi-agency collaboration and coordination for overall corridor management
  – Coordinate incident management
  – Coordinate operations for planned and special events
  – Optimize corridor mobility by promoting mode and route shifts
  – Manage demand
**Proposed Strategies**

- Decision support system
- Actionable traveler information
  - IVR (e.g., 511)
  - Website
  - E-mail alerts
  - Comparable travel times
- Rerouting of traffic
  - Coordinated timing and adaptive signal control
- Mode shift
  - Parking management
  - Real-time service adjustments

**Proposed Strategies**

- Decision support system
- Actionable traveler Information
  - 511 (phone and website) upgrade
  - Comparable travel times
- Managed lanes
- Rerouting of traffic
  - Coordinated timing and responsive signal operations
  - Coordinated ramp metering and traffic signals
- Mode Shift
  - Bus Rapid Transit
  - Transit signal priority
  - Real-time transit info

Dallas (US-75)

San Diego (I-15)
Intelligent Transportation Systems – Vehicle Assist and Automation (VAA)

Assists or automates movement of buses to allow precise operations in extremely narrow lanes, at stations, and potentially bus maintenance facilities

Major functions:
- Precision docking
- Vehicle guidance
- Vehicle platooning
- Automated operations
Goals

- Demonstrate the technical merits and feasibility of VAA technology applications
- Assess benefits and costs

Awarded to Caltrans Team

- Caltrans
- Alameda-Contra Costa Transit District
- Lane Transit District
- Partners for Advanced Transit and Highways

Anticipated Results

- Shorter travel times
- Greater reliability
- More precise docking
• **Revenue Service Applications**
  – Lateral guidance on an HOV lane and through a toll plaza
  – Bus Rapid Transit (BRT) lateral guidance and precision docking

• **Technologies Proposed**
  – Magnetic marker sensing
  – Differential Global Positioning System (DGPS) with inertial navigation sensors
  – Combination of the two

• **Operational Field Tests**

• **Independent Evaluation by CUTR**
ITS Research = Multimodal and Connected Drivers/Operators
Connected Vehicle Program
Transit Connected Vehicle Program

Safety Applications
• Pedestrian Indication
• Vehicle Collision Warnings
• Transit Vehicle at Stop Warnings
• Intersection Collision Warnings

Dynamic Mobility Applications
• Connection Protection (T-Connect)
• Dynamic Transit Operations (T-Disp)
• Dynamic Ridesharing (D-Ride)
• Transit Signal Priority (TSP)
• Smart Park and Ride System
• Universal Map Application
• Smart Emergency Communications and Evacuation
• Intermittent Bus Lane
• Route ID for the Visually Impaired
• Integrated Multi-modal Electronic Payment
• Transit Vehicle Real-Time Data Collection

AERIS
• Interactive TSP (Green Wave)
• Transit Urban Probes
• Dynamic Vehicle Assignment
• Greener Operators
• Greener Travelers

Data Capture & Management
Connected Vehicle Benefits Analysis

• V2V systems potentially address about 79% of all vehicle target crashes annually.

• V2I systems potentially address about 26% of all-vehicle target crashes annually.

• Combined V2V and V2I systems potentially address about 81% of all-vehicle target crashes annually.
Transit Safety (V2I)

Approximately 35% of all pedestrian crashes occur during turning maneuvers.

85% are left turns
15% are right turns
Transit Safety (V2V)

Cars passing a stopped bus do not realize the bus is pulling away from the stop.
• Data Capture is the active acquisition and systematic provision of integrated, multi-source data to enhance current operational practices and transform future surface transportation systems management.

• This data is used to assist operations, traveler information, and maintenance.
Mobility applications expedite development, testing, commercialization, and deployment of innovative mobility applications to maximize system productivity and enhance mobility of individuals within the system.
High Priority Dynamic Mobility Applications

• Advanced Transit Signal Priority
• Integrated Multimodal Electronic Payment
• Dynamic Transit Dispatching
• Smart Park and Ride System
• Dynamic Connection Protection
Environmental

• Applications for the Environment: Real-Time Information Synthesis (AERIS) program
• Focuses on the capture, synthesis, and delivery of real-time, vehicle- and infrastructure-based, environmentally relevant information to support system management that advances environmental improvements within the transportation system.
Transit ITS Benefits

- Fleet requirements \( \downarrow \) 2% to 5%
- Schedule adherence \( \uparrow \) 9% to 23%
- Boarding time with AFC \( \downarrow \) 38%
- Transit travel times after TSP \( \uparrow \) 1.5% to 15%
- Customer satisfaction with 511 \( \uparrow \) 68% to 92%
- Operating cost per transit VMT \( \downarrow \) 8.5%
- Large transit agencies:
  - 43% employ in-vehicle video surveillance
  - 64% employ magnetic stripe payment systems
  - 31% employ smart card technology
  - 60% employ AVL on fixed-route buses

Source: Intelligent Transportation Systems Benefits, Costs, Deployment, and Lessons Learned: 2008 Update
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