EDAPTS:
Smart Solutions for Small Urban & Rural Transit Operators

Session T1: Turning Data into a Better Transit System

Josh Cohn
September 3, 2008
Presentation Outline

- The EDAPTS Concept
  - Cal Poly Research & Field Test
  - Lessons Learned

- CCIT’s involvement
  - Commercialization
  - Understanding transit agencies’ needs
  - Steps to a solution

- Results from CCIT’s efforts:
  - Procurement options
  - Agency database
  - Funding mechanisms
  - User Guide
The EDAPTS Concept

- **EDAPTS: Efficient Deployment of Advanced Public Transportation Systems**
  - Effort in applied research & development to demonstrate feasibility of low cost, open standards transit management system for smaller or rural agencies

- **Sponsored by California Department of Transportation (Caltrans)**
- **Developed by Cal Poly San Luis Obispo & currently in operation at San Luis Obispo Transit**
- **Current demonstration underway at Cal Poly Pomona**
Previous Stages of EDPTS: Cal Poly

- Cal Poly San Luis Obispo research project: 1997 – 2000
  - Birth of Efficient Deployment of Advanced Public Transportation Systems (EDAPTS)
  - Team consisting of FTA, Caltrans, Cal Poly SLO, and SLO Transit
  - Investigate ways to make APTS affordable for small transit operator, provide lower cost system growth & enhancements over time

- Cal Poly San Luis Obispo Field Test (2000-2002)
  - Test systems installed on the SLO Transit bus fleet
    - Automatic Vehicle Location (AVL) using GPS
    - Solar powered Dynamic Messaging Sign for bus arrival time at bus stops
    - Central dispatch software & internet web page
    - Silent emergency alarm for situations requiring law enforcement
    - RF modem for transmission of digital data over voice radio link
    - Mobile Data Terminal (MDT) for driver / dispatch interfaces
    - Card reader input for magnetic or electronic fare media
  - Critical performance parameters were measured / surveyed:
    - Safety & operational efficiency
    - Employee satisfaction & customer service level
Lessons Learned: SLO Transit

- Performance vs. cost trade-off can significantly lower the life-cycle cost of ITS ownership

- Cost saving ideas:
  - Transmission of digital data by time sharing the current analog voice radio link
  - Single text paging service to simultaneously update bus arrival data at all bus stop Dynamic Messaging Signs
  - Solar powered signs allow installation anywhere

- Caltrans ready to pursue next phase
  - Commercialization with help of CCIT
  - Compile a comprehensive body of knowledge that could be used by any small urban or rural transit agency to deploy APTS more efficiently & at a lower life-cycle cost
The California Center for Innovative Transportation (CCIT) **accelerates the implementation of research results and the deployment of technical solutions by practitioners** to enable a safer, cleaner and more efficient surface transportation system.
CCIT’s Project Goals

- Identify industry partners and procurement options
  - Build qualified list of technology suppliers
  - Categorize & qualify needs of potential adapters
  - Explore funding mechanisms

- Propose a design for a statewide EDAPTS marketing approach

- Pilot EDAPTS through a first commercial deployment

- Create sustainable deployments over the long term
Rural & Small Urban Transit Problems

- **Transit Users**
  - Problems when trying to use transit in small urban and rural communities
  - The "Have I missed the bus?" question

- **Transit Operators**
  - Problems maintaining schedules
  - Problems with real-time fleet management & traveler information
  - Faced with elevated safety concerns
    - Long, remote headway sections of a route → higher response time

The 64,000 dollar question to transit agencies: "Why don't you make more use of ITS technology to resolve operational and customer service problems?"
Transit Agency Survey

- Survey characteristics
  - Conducted July & August 2007
  - Distributed to rural & small urban transit agencies
  - Understanding needs & expectations
  - 3 question “Zoomerang” survey
Transit Agency Characteristics

- Completed online by 48 agencies
  - 32 complete responses
  - 27 agencies indicated interest in further participation
- 25 transit agencies provided fleet size
  - 85% operate fewer than 50 buses
  - Following results based on these 25 agencies

<table>
<thead>
<tr>
<th>Categories of Fleet Size</th>
<th>&lt;10</th>
<th>11-20</th>
<th>21-50</th>
<th>51-100</th>
<th>&gt;100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count of Survey Respondents</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
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</table>
Survey Results: Question 1

Q1: What types of technologies has your agency already implemented?
Survey Results: Question 2

Q2: What types of technologies would your agency be interested in implementing?

![Bar Chart Illustrating Survey Results]

- Wireless Communications
- Web-based systems
- Variable Message Signs
- Transit User Information
- Reservations and Scheduling
- Passenger Counters
- Mobile Data Terminals (MDT)
- Geographic Information Systems (GIS)
- Fleet Management
- Electronic Fare Payment
- Computer Aided Dispatch (CAD)
- Automatic Vehicle Location (AVL)
- Interactive Voice Response (IVR)

Legend:
- 0-10
- 11-20
- 21-50
- 51-100
- >100
Q3: What are the barriers that generally prevent your agency from implementing ITS technologies?

- Technology sourcing and procurement
- Lack of staffing and/or technical skills
- Funding

Count

- 0-10
- 11-20
- 21-50
- 51-100
- >100
Introducing ITS as a Solution

- Simple Ground Rules
  - ITS solutions must be:
    - low cost
    - non-proprietary
    - easily configurable to local needs
  - System performance trade-offs that significantly reduce costs can be made if they do not adversely impact the usefulness of the deployed system
Steps to Successful Deployment

- The three-legged stool approach to ITS Deployment
Technology Suppliers / Vendors

- In conversation with vendors
  - Relatively excited
  - Small urban & rural next big market segment
  - Range from AVL/CAD to GPS and central software

- Pomona Deployment (Bronco Express)
  - First attempt at reaching out to vendors
  - Difficulty in matching RFP specifications
Potential Adapters Database

- Constructed database of small urban & rural transit agencies
  - Contact information
  - Operating expenses / fare revenues
  - Service area
  - Population
  - Vehicle inventory

- Database Profile
  - Primary list of 170 agencies
  - 128 agencies profiled, 79 complete entries
Database Results

<table>
<thead>
<tr>
<th>Fleet Size</th>
<th>Service Area (mi²)</th>
<th>Population Density (persons/mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Route</strong></td>
<td>Number: 92</td>
<td>Number: 115</td>
</tr>
<tr>
<td></td>
<td>Min.: 1</td>
<td>Min.: 1.2</td>
</tr>
<tr>
<td></td>
<td>Max.: 338</td>
<td>Max.: 8,141</td>
</tr>
<tr>
<td></td>
<td>Average: 34.47</td>
<td>Average: 466</td>
</tr>
<tr>
<td><strong>Demand Responsive</strong></td>
<td>Number: 102</td>
<td>Number: 113</td>
</tr>
<tr>
<td></td>
<td>Min.: 1</td>
<td>Min.: 2.4</td>
</tr>
<tr>
<td></td>
<td>Max.: 76</td>
<td>Max.: 29,167</td>
</tr>
<tr>
<td></td>
<td>Average: 12.60</td>
<td>Average: 2,802</td>
</tr>
<tr>
<td><strong>Total Transit Vehicles</strong></td>
<td>Number: 128</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min.: 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max.: 414</td>
<td></td>
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<tr>
<td></td>
<td>Average: 35.77</td>
<td></td>
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</tbody>
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Population Density (persons/mi²):
- Number: 113
- Min.: 2.4
- Max.: 29,167
- Average: 2,802

Urban: 64%
Rural: 36%

Service Area (mi²):
- Number: 115
- Min.: 1.2
- Max.: 8,141
- Average: 466
Potential Adapters Future

- Conclusions
  - Agencies operate both fixed routes & demand responsive service → EDAPTS approach to consider both types
  - more small urban transit providers than rural ones → prioritization of procurement / commercialization strategies

- Next steps
  - Continue personal contacts
  - Narrow list of potential adapters
  - Choose agency to participate in commercial deployment
Funding Contributions

- The contributions of local, state, and Federal funding sources have been approximately the following:

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Percentage</th>
<th>用途</th>
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<tbody>
<tr>
<td>Federal funding</td>
<td>47%</td>
<td>Capital &amp; operational improvements (new routes, vehicles, technologies)</td>
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<tr>
<td>State funding</td>
<td>11%</td>
<td>Operational &amp; administrative costs of transit services</td>
</tr>
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<td>Local special funds</td>
<td>27%</td>
<td></td>
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<tr>
<td>Local funding</td>
<td>15%</td>
<td></td>
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(Vuchic, 2005)
Funding Mechanisms

- **Federal Sources (SAFETEA-LU)**
  - Federal Transit Administration (FTA) grants
    - Rural & Small Urban Areas, #5311
    - National Research Program, #5314

- **CA State Sources**
  - California Transportation Commission (CTC) & Caltrans Division of Mass Transportation (DMT)
    - Prop 1B – Transportation Funds
    - Traffic Congestion Relief Program (TCRP)
    - State Transportation Improvement Program (STIP)

- **Local Sources**
  - Local Transportation Fund (LTF), sales tax, parking tax, tolls, etc
GoSmart: EDAPTS User Guide

- Document to help transit agencies identify:
  - Needs of those most affected by changes in service (passengers, dispatchers, drivers)
  - Technology to meet those needs
  - System performance trade-offs (wants vs. needs of an agency)
  - Funding sources
  - Procurement options
    - including open source, open interface protocols
The Future of EDAPTS

- **Phase II**
  - Identification of
    - industry partners
    - potential candidate agencies
    - Funding plan
  - Case studies with benefit/cost analysis

- **Phase III**
  - Final Operational Test
    - Pilot project with one agency
Acknowledgements

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  - Xiaohong Pan
  - Tia McDonald
  - Nina Harvey
  - Manju Kumar
  - J.D. Margulici
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