91st Transportation Research Board (TRB) Annual Meeting
January 23, 2012

The State of the Intelligent Transportation Systems Industry
Session # 316

Shelley Row
Director
Intelligent Transportation Systems Joint Program Office
Research and Innovative Technology Administration, USDOT
20-Year Look Back

Top level view of the 20-year vision established by planners:

- Implementation of a national ITS Program

- Scope comparable to Interstate Highway System, but major difference – NOT exclusively a Government program

- Public-private sector partnerships – with major private sector involvement

- National system of travel support operating mode-to-mode and state-to-state to promote safe, expeditious, environmentally safe, and economic movement of people and goods

- A vigorous US ITS industry
INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT (ISTEA) – 1991
20-Year Look Back: ISTEA

Highlights

- New innovative technology research for transportation
- Organize & categorize functional areas – establish a common language
- Find out what works and what does not work – identify barriers to deployment

- **Operational Tests**
- **Deployment**

ISTEA was the era of:

- **Field Operational Tests** – deployment in an operational setting, bridge between R&D and Deployment – and evaluate deployment impacts
- **Priority Corridor Program**
- **Early Deployment Planning Studies** – planning for deployment at the local level
- **Architecture Development Initiated** (1994) – private sector firms partnering to develop
- **CVISN Initiated**
- **Metropolitan Model Deployment Initiatives**
- **Standards Program** starts up (1996) with a list of critical interfaces
- **Sec. Peña Operation Timesaver** (1996) – 75 metro areas (expanded to 78)
- **Deployment Tracking** – Definition of metrics for evaluation
- **AHS Demonstration** – Possibilities of vehicle-infrastructure cooperation
Transportation Equity Act for the 21st Century (TEA-21)
1998
20-Year Look Back: TEA-21

TEA-21 (July 1998 – September 2005) funded two separate activities:

- **ITS Research and Development Program**
  - Reaffirms Department’s role in advancing research, development and integrated deployment of ITS
  - Creation and testing of vehicle infrastructure integration systems
  - Address policy and institutional issues uncovered during ISTEA

- **ITS Deployment Program**
  - ITS Integration Program
  - Commercial Vehicle ITS Infrastructure (CVISN) Deployment Program

- **Integrated Deployment**
- **Deployment Earmarks**
20-Year Look Back: TEA-21

- Other TEA-21 milestones

- 1998
- 1999

- 2000
- 2001
- 2002
- 2004

- 511 Approved by FCC
- Public Safety Program Initiated
- Operations Dialogue Begins
- Architecture Consistency Rule Issued
- iFlorida Program Initiated
- ITS 10-Year Research Agenda
- Nine Major Initiatives Established
Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) 2005
20-Year Look Back: SAFETEA-LU

- Concept of deploying/integrating ITS is portrayed as in the *mainstream of transportation*
- Congress enacts Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) – ITS Deployment Program **NOT** renewed
- JPO focuses on development of *fewer, high-impact, high-value* projects to showcase benefits of ITS. Connected vehicle emerges as the emphasis.
- ITS Research Program focuses on connected vehicles.
- Modal administrations lead in operations and deployment. ITS is growing part of “mainstream” programs.

**Connected Vehicle Research**

**Performance Management**
How have we done with ITS deployment?
### ITS Deployment Then and Now: *Transit Management, Electronic Fare Collection, Commercial Vehicles*

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<td>• Productivity management systems for commercial and transit fleets</td>
<td>• Electronic record-keeping for vehicle fleet operations</td>
<td>• Transparent borders for commercial vehicles</td>
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<td>• Electronic toll collection</td>
<td>• Integrated electronic transit fare, parking, and toll collection</td>
<td>• Fully integrated transportation user-fee collection systems</td>
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<td>• Electronic transit fee collection</td>
<td>• Automated HOV lane use verification</td>
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<td>• Electronic credential checking</td>
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- 77% of 117 fixed bus route agencies have AVL & real-time arrival data in fleets
- 16,000+ fixed route buses equipped with smart card readers
- 451 heavy/rapid rail station equipped with smart cards

**Electronic Toll Collection:**
- 99% of Toll plazas
- 94% Toll lanes
ITS Deployment Then and Now: *Transit Management, Electronic Fare Collection, Commercial Vehicles*

- 50 states & District of Columbia deployed:
  - Safety information exchange
  - Electronic credentialing & screening
- 33 states - Exchanging credential data via CVIEW/SAFER
- 28 States - Core CVISN Deployed
- 40 states have electronic screening systems at over 360 weigh stations with 70,000 participating trucking companies and about 500,000 transponder-equipped trucks
Training – Professional Capacity Building (PCB) will reach **50,000 total participants** this year
- National architecture
- Systems Engineering
- ITS Procurement
- ITS Standards

ITS JPO participated in the development of **106 published standards** (since 1995)
## ITS Deployment Then and Now: *Freeway and Arterial Management*

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<td>Transportation Management</td>
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<td>Local area traffic monitoring and control for 15 metro area corridors</td>
<td>Area-wide, real-time, adaptive traffic and transit fleet control for corridors in 50 metro areas and 25 inter-city corridors</td>
<td>Area-wide, full-featured systems to manage intermodal surface transportation nationwide in large urban areas and major rural corridors</td>
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- **266 Operational Traffic Management Centers (TMCs)**
- For collection of travel times:
  - 7700 freeway miles under surveillance from roadside infrastructure
  - 4500 miles under surveillance from vehicle probes
  - 54% of all freeways in 75 metro areas are under surveillance
### ITS Deployment Then and Now: *Freeway and Arterial Management*

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- For collection of travel times:
  - 2464 arterial miles under surveillance from roadside infrastructure
  - 1730 miles under surveillance from vehicle probes
  - 50% of intersections in 75 metro are under electronic surveillance
Benefit Ratings Assigned to Selected Technologies By Freeway Management Agencies

- %No Benefit (1)
- %2
- %Moderate Benefit (3)
- %4
- %Significant Benefit (5)

Vehicle Probes (3.64)
Growth in Vehicle Probe Data

- 15 minute snapshot of incoming GPS data (fleets, cars, phones, apps, etc.) – Source INRIX®

Courtesy: INRIX
Rise and Fall of Gadgets

NOTE: 2010 data are estimates and 2011 data are projections. GRAPHIC: Alicia Parlapiano / The Washington Post - January 10, 2011
Freeway Management Deployment Indicators

- % Freeway miles with real-time traffic data collection technologies
- % Freeway miles covered by surveillance cameras (CCTV)
- Number of Dynamic Message Signs (DMS)
## ITS Deployment Then and Now: *Traveler Information*

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<td><strong>Traveler Information Systems</strong></td>
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<td>• Transportation data available at home, work, public kiosks, stations, and through hand-held devices</td>
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<td>• Static route guidance with business/tourist data in new vehicles and as aftermarket product</td>
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<td>• Real-time transportation system condition information for regional and rural travel and multiple modes of transportation</td>
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<td>• Route guidance reflecting dynamic traffic conditions</td>
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<td>• In-vehicle display of road signs</td>
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<td>• Multi-modal demand-responsive information systems</td>
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<td>• Area-wide transportation control integrated with optimal routing</td>
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- 511 coverage for all or parts of 38 states covering 70% of US population
- 36 of 40 metro areas and 58 locations use travel time on DMS
- 109 freeway management agencies report posting traveler information on DMS
Methods Used to Distribute Traveler Information by Freeway Management and Arterial Management Agencies

- Dynamic Message Signs
- Twitter & other Social Networking Site
- Highway Advisory Radio
- Subscription Service
- Webpage
- Email or alert to mobile device such as cell phone or smart phone
- Email or alert to desktop
- Other (non-511) telephone system
- 511
- Other

- % Freeway Agencies (n=122)
- % Arterial Agencies (n=290)

40%
ITS Deployment Then and Now: *Traveler Information*

- Sample of companies providing traveler information:
  - INRIX
  - TrafficLand
  - Speed Info
  - Navteq

- **Smartphone navigation devices - New Traffic Service users**
- **Dedicated portable navigation devices - New Traffic Service users**
- **Factory Fitted System - New Traffic Service users**

Courtesy: Navteq
2012:
In fact, the connected car “is the third-fastest growing technological device, following smartphones and tablets,” said Intel in a statement Wednesday.

– CEO Outlook
### ITS Deployment Then and Now: *Vehicle Safety Systems*

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<td>Roadway and environment safety systems</td>
<td>Automated highway demonstration</td>
<td>Automated vehicle operation on specially equipped roadways</td>
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<td>Near-obstacle warning</td>
<td>Semi-automated Mayday capability</td>
<td>Fully automated Mayday systems with coordinated dispatching</td>
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<td>Simple vehicle performance monitoring</td>
<td>Passenger security systems</td>
<td>Intersection hazard warnings</td>
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<td>Adaptive cruise control</td>
<td>Vehicle monitoring systems</td>
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<td>Collision warning</td>
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<td>Automated collision avoidance</td>
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Crashes Avoidance Has Arrived

- Functions
  - Electronic Stability Control
  - Adaptive Cruise Control
  - Forward collision warning/avoidance
  - Lane departure warning / avoidance
  - Blind spot warning / avoidance
  - Pedestrian warning / avoidance
  - Driver Alert (fatigue)
  - Night Vision
  - Speed Sign Recognition

Courtesy: Bishop Consulting
Today’s Intelligent Vehicles - What’s Available in a $20,000 Car?

- Adaptive cruise control
- Forward Collision Mitigation
- Blind spot information system
- Traffic sign recognition
- Lane keeping aid
- Driver alert

2012 Ford Focus

Courtesy: Bishop Consulting
Connected Vehicle Program
NHTSA Agency Decision - 2013

- Evaluation includes several factors:
  - Technical functionality
    - Vehicle-based technology
    - Security network and back end functions
  - Effectiveness of applications – Safety Pilot
  - Cost Effective
  - Supportable operationally
    - Well managed
    - Sustainable financially
Safety Pilot Sites

- Driver clinics
  - Assess user acceptance
- Large-scale model deployment
  - Obtain empirical safety data for estimating safety benefits
Critical Questions

- Which communications media can support the needs for distributing security certificates? Choices include:
  - Existing Cellular Networks
  - Dedicated Short Range Communications (DSRC)
  - WiFi
  - No infrastructure option

- All security network options require financing for operational support
  - All public – politically feasible?
  - Public/private partnership – what type of framework?
  - All private – where’s the value?
Autonomous Vehicle Activities

- DARPA – Grand Challenge & Urban Challenge
- Google – 160,000 miles of autonomous operation
- SARTRE: Safe Road Trains for the Environment
  - European project
  - Autonomous driving, platooning
  - Lead vehicle in platoon human-driven
- Temporary Auto-Pilot
  - Volkswagen driving semi-automatically at 130 kmph
  - Within European HAVE-IT project
- VisLab Intercontinental Autonomous Challenge
- Truck Automation
Future Technology Evolution

Vehicle based
Connected
Autonomous
20-Year Self-Assessment

What happened in 20 years?

- Steady progress in advancing ITS technologies:
  - $18 billion in ITS deployment by top 75 metro areas
  - $3 billion in federal ITS funds
  - Deployment happened where local and regional governments had priorities
  - Investment happened where cost and perceived value made a case for deployment
  - Fostering a partnership with private sector
  - $48 billion U.S. ITS end-use products and services market – ITS America
% Agencies Planning to Invest in New ITS Technology or to Expand Current ITS Coverage in 2010 Through 2013

- %Freeway Management Agencies: 55% (Expand Current ITS Coverage), 79% (Invest in New ITS)
- %TMC Agencies: 56% (Expand Current ITS Coverage), 78% (Invest in New ITS)
- %Arterial Management Agencies: 36% (Expand Current ITS Coverage), 48% (Invest in New ITS)
- %Toll Collection Agencies: 42% (Expand Current ITS Coverage), 42% (Invest in New ITS)
- %Transit Management Agencies: 47% (Expand Current ITS Coverage), 31% (Invest in New ITS)
20-Year Self-Assessment

What happened in 20 years?

- **Steady progress in advancing ITS technologies:**
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20-Year Look Back: Closing Thoughts

- ITS is not the Interstate System model
- ITS is model of state and local government choice
- ITS is a public and private sector success story

The ITS deployment glass is more than half full