Oregon ITE ITS Subcommittee
February 13, 2013

Reflections on 20 Years of the U.S. National ITS Program

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Secretary LaHood’s Priorities

**Safety:** Improve public health and safety by reducing transportation-related fatalities and injuries.

**State of Good Repair:** Ensure the U.S. proactively maintains its critical transportation infrastructure in a state of good repair.

**Economic Competitiveness:** Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens.

**Livable Communities:** Foster livable communities through place-based policies and investments that increase transportation choices and access to transportation services.

**Environmental Sustainability:** Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.
Safety
- 32,788 fatalities in 2010 (-3% from 2009)
- 1.09 fatalities per 100 million vehicle miles traveled (0.7% increase in VMT in 2010)
- 2.2 million injuries in 2009
- 5.5 million crashes in 2009
- $230 billion total cost
  - $32 billion medical cost
  - $51 billion for impaired driving
- Leading cause of death for ages 4 to 34

Accessibility, Reliability and Mobility
- 4.8 billion hours of travel delay (34 hours per auto commuter)
- $115 billion cost of urban congestion

Household Market Basket
- Second biggest monthly expense, after housing
- 28% of U.S. GHG emissions
  - 78% of CO
  - 58% of NO\textsubscript{x}
  - 36% of VOCs
- Contributions to particulate matter
- 29% of U.S. energy
- consumption, almost all petroleum
- 70% of U.S. petroleum consumption
  - 60% of oil imported → 68% in 2020
  - >40% of imported oil from OPEC nations
- 3.9 billion gallons of wasted fuel annually
- About half of all Americans live in areas that exceed air quality standards for at least one pollutant
  - No national GHG standards but many state and local
U.S. DOT is the Sum of its Modes—Including RITA

SECRETARY
DEPUTY SECRETARY

Chief of Staff

Executive Secretariat
Board of Contract Appeals
Office of Civil Rights
Office of Small and Disadvantaged Business Utilization
Office of Intelligeance and Security
Office of the Chief Information Officer
Office of Public Affairs

General Counsel
Assistant Secretary for Transportation Policy
Assistant Secretary for Aviation and International Affairs
Assistant Secretary for Budget and Programs/Chief Financial Officer
Assistant Secretary for Governmental Affairs
Assistant Secretary for Administration
Office of Inspector General

FAA Federal Aviation Administration
FHWA Federal Highway Administration
FRA Federal Railroad Administration
FTA Federal Transit Administration
NHTSA National Highway Traffic Safety Administration
SLSDC St. Lawrence Seaway Development Corporation
MARAD Maritime Administration
RITA Research and Innovative Technology Administration
PHMSA Pipeline and Hazardous Materials Safety Administration
FMCSA Federal Motor Carrier Safety Administration

Under Secretary for Policy
Office of Drug and Alcohol Policy and Compliance

Office of the Assistant Secretary for Budget and Programs/Chief Financial Officer
Assistant Secretary for Governmental Affairs
Assistant Secretary for Administration
Office of Inspector General
Estimated FY 10 DOT Research Budget

Total $1.3 billion
USDOT Budget and Personnel

Total: 57,000 employees

$73 Billion
More cross modal
Now including rail and maritime
Cars, trucks, buses, fleets, and vehicles of all kinds
Commitment to dedicated short range communications
- Safety
- Mobility
- Environment
Increased outreach and involvement of stakeholders
Broadening of participation of public and private sectors and universities
ITS By the Numbers

- Years: 20+
- Funding: $3B federal + $18B by 75 top metro areas
- Market: $48B ITS end-use products and services
- Federal Programs: 3 (ISTEA, TEA21, SAFETEA-LU)
- Electronic Toll Collection: 99% of plazas/94% of lanes
- Transit Automatic Vehicle Location: 77% of 117 fixed route bus agencies
- Transit Smart Cards: 16,000+ buses/451 rail stations
- Commercial Vehicle Electronic Screening: 40 states/360 weigh stations/70,000 companies/500,000 trucks
- Professional Capacity Building: 2,500 participants in 2010
- Standards Participation: 106 published since 1995
- Traffic Management Centers: 266
- Freeway Miles Under Surveillance: 7,700 roadside/4,500 probe vehicles/54% of freeways in 75 metropolitan areas
- Arterial Miles Under Surveillance: 2,500 roadside/1,700 probe vehicles/50% of intersections in 75 metropolitan areas
- 511 Coverage: All or part of 38 states (70% of population)
- Dynamic Message Signs: 4,200/109 freeway management agencies post information/36 of 40 metro areas post travel times
Deployed Technologies

- CCTV Cameras
- Traveler Information
  - DMS ~90% of freeways
  - Social Networking 40%
  - HAR 60%
  - Subscription 35%
  - Web 90%
  - Email 50%
  - Phone 20%
  - 511 70%
- Electronic Toll Collection
- Ramp Control
- Sensors/Loops
- Automated Enforcement
- Lane Management
- Archived Data
- Probe Vehicles
* Other (only) indicates the presence of freeway lanes equipped with: (a) lane management measures such as reversible flow lanes and lane control management to support emergency evacuations or (b) lane control signs, supported by surveillance and detection technologies, to allow the temporary closure of lanes.

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007
Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area

Freeway Centerline Miles with Real-time Traffic Data (2007)

- 0
- 1 - 50
- 51 - 100
- 101 - 986
- No Data

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

* Does not include CCTV
One or More Agencies Operating a Transportation Management Center or Transportation Operations Center (2007)

- **No**
- **Yes**

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007
ITS Benefits and Costs

• ITS Benefits Database
  • 566 benefit element
  • 362 source documents
• ITS Costs Database
  • 291 cost elements
  • 194 system cost summaries
  • 171 source documents
• Deployment statistics continually tracked in 108 metro areas

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Sent</th>
<th>Returned</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial Management</td>
<td>542</td>
<td>433</td>
<td>80%</td>
</tr>
<tr>
<td>Electronic Toll Collection</td>
<td>74</td>
<td>71</td>
<td>96%</td>
</tr>
<tr>
<td>Freeway Management</td>
<td>148</td>
<td>124</td>
<td>84%</td>
</tr>
<tr>
<td>Public Safety - Fire Rescue</td>
<td>386</td>
<td>313</td>
<td>81%</td>
</tr>
<tr>
<td>Public Safety - Law Enforcement</td>
<td>530</td>
<td>450</td>
<td>85%</td>
</tr>
<tr>
<td>Transit Management</td>
<td>235</td>
<td>206</td>
<td>88%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1915</strong></td>
<td><strong>1597</strong></td>
<td><strong>83%</strong></td>
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</table>
## Top 10 Benefits

<table>
<thead>
<tr>
<th>Title</th>
<th>Goals</th>
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<tbody>
<tr>
<td>Virginia 511 services indicated 90 percent of callers found the service useful, and nearly half adjusted their travel plans based on the information provided.</td>
<td>Customer Satisfaction</td>
</tr>
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<td>Freeway lane reversal improved traffic volumes by 44 percent following South Carolina hurricane</td>
<td>Efficiency</td>
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<td>By implementing coordinated signal timing on the arterial network in Syracuse, New York total fuel consumption was reduced by 9 to 13 percent, average fuel consumption declined by 7 to 14 percent, average vehicle emissions decreased by 9 to 13 percent.</td>
<td>Energy &amp; Environment</td>
</tr>
<tr>
<td>The E-ZPass electronic toll collection system on New Jersey Turnpike reduced delay for all vehicles by 85% saving approximately 2.1 million hrs per year, an estimated 1.2 million gallons of fuel each year and eliminating approximately 0.35 tons of VOC and 0.056 tons NOx per weekday.</td>
<td>Energy &amp; Environment Mobility</td>
</tr>
<tr>
<td>Bus rapid transit (BRT) can reduce transit running times by 38 to 69 percent, increase ridership by 35 to 77 percent, and improve service reliability.</td>
<td>Mobility</td>
</tr>
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<td>In Washington DC an ITS work zone program implemented on I-295 decreased delay up to 90 percent with an average decrease in delay of 52 percent when drivers were advised to take alternate routes.</td>
<td>Mobility</td>
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<tr>
<td>In Oakland County, Michigan a two-phase project to retime 640 traffic signals resulted in a benefit-cost ratio of 175:1 for the first phase and 55:1 for the second.</td>
<td>Productivity</td>
</tr>
<tr>
<td>The Traffic Light Synchronization program in Texas demonstrated a benefit-to-cost ratio of 62:1</td>
<td>Productivity</td>
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<tr>
<td>Integrated Corridor Management (ICM) strategies that promote integration among freeways, arterials, and transit systems can help balance traffic flow and enhance corridor performance; simulation models indicate benefit-to-cost ratios for combined strategies range from 7:1 to 25:1.</td>
<td>Productivity</td>
</tr>
<tr>
<td>An anti-icing program implemented by the Idaho Transportation Department resulted in a 83 percent decline in winter crash frequency.</td>
<td>Safety</td>
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<td>Title</td>
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<td>Advanced curve warning system on interstate in northern California caused over 68% of drivers to reduce their speed.</td>
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<td>An evaluation of infrared brake screening systems at weigh stations indicated the technology increased the percentage of vehicles placed out of service because of brake problems by 250 percent.</td>
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<td>In Vantage, Washington, the deployment of an automated anti-icing system on I-90 was projected to eliminate up to 80 percent of snow and ice related crashes.</td>
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<td>Anti-icing program implemented by Idaho Transportation Department resulted in a 83% decline in winter crash frequency.</td>
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<td>Automatic anti-icing systems on bridges reduced crashes by 25-100% and benefit-to-cost ratios ranged from 1.8:1-3.4:1.</td>
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<td>Based on all police-reported crashes in 7 states over 2 years, electronic stability control (ESC) reduced single-vehicle crash involvement risk by approximately 41 percent and single-vehicle injury crash involvement risk by 41 percent.</td>
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<td>In Switzerland, an animal warning system installed at 7 sites decreased collisions with large animals by more than 80 percent.</td>
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<td>In Georgia, the Navigator incident management program reduced secondary crashes from an expected 676 to 210 in the twelve months ending April 2004.</td>
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<td>In Myrtle Creek, Oregon, advanced curve speed warning system installed on I-5 reduced speed of 76% of drivers surveyed.</td>
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<td>Through use of the Roll Stability Control (RSC) systems, it was estimated that between 1,422 and 2,037 combination vehicle rollover crashes in curves could be prevented, resulting in effectiveness rates of 37 percent and 53 percent, respectively.</td>
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<tr>
<td>Congressional Legislation</td>
<td>Dates and Mission</td>
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<td>------------------------------------------------------------------------------------------</td>
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<tr>
<td></td>
<td>• Research and Development</td>
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<td></td>
<td>• Operational Tests</td>
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<td></td>
<td>• Technical assistance including architecture and standards</td>
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<td></td>
<td>• Policy and Institutional Challenges to Deployment</td>
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<td></td>
<td>• ITS Deployment Program (Congressionally designated)</td>
</tr>
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<td></td>
<td>• Model Deployment Initiatives</td>
</tr>
<tr>
<td></td>
<td>• Research</td>
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<td></td>
<td>• Mainstreaming ITS</td>
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<tr>
<td>Moving Ahead for Progress in the 21st Century (MAP-21)</td>
<td>2012-2014</td>
</tr>
</tbody>
</table>
Crash Avoidance Has Arrived

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
Today’s Intelligent Vehicles

Available in a $20,000 car

(Ford Focus):

Adaptive cruise control
Forward Collision Mitigation
Blind spot information system
Traffic sign recognition
Lane keeping aid
Driver alert
Vision for Connected Future

- Multi-modal surface transportation system—with connectivity as its central core.
- Vehicles (cars, trucks, buses, fleets of all kinds) ↔ Drivers and operators ↔ Infrastructure ↔ Mobile Devices
- Leveraging technology to maximize safety, mobility and the environment—enabled through wireless communications—in all modes.
- First priority is safety: crash and injury prevention (address 80% of crash scenarios).
Strategic Research Plan

The Evolution of ITS

Traditional ITS Technologies
- Ramp Metering
- Transit Information
- CV Electronic Credentialing
- Transportation Management Centers

Major ITS Initiatives
- ICM
- IVBSS
- VII - POC
- MSAA
- NG911

Research

Deployment

Demonstration/Deployment

Wireless Connectivity
Vision: National, multi-modal surface transportation system that features a connected transportation environment among vehicles (cars, trucks, buses, fleets of all kinds), the infrastructure, and mobile devices to serve the public good by leveraging technology to maximize safety, mobility and environmental performance. Connectivity is achieved through dedicated short range communications (DSRC).

**Goal: Safety**
Vehicle to Vehicle Communications for Safety
Vehicle to Infrastructure Communications for Safety

**Goal: Mobility/Accessibility/Reliability**
Real-Time Data Capture and Management
Dynamic Mobility Applications including Weather

**Goal: Environment**
Applications for the Environment: Real-Time Information Synthesis (AERIS)
Real-time, environmental data from all sources will be integrated and available for use in multimodal transportation management and performance improvement and will contribute to better environmental practices.
## ITS Strategic Research Program Components

<table>
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<tr>
<th>Applications</th>
<th>Safety</th>
<th>Mobility</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2V</td>
<td>V2I</td>
<td>Real Time Data Capture &amp; Management</td>
<td>AERIS</td>
</tr>
<tr>
<td></td>
<td>Safety Pilot</td>
<td>Dynamic Mobility Applications</td>
<td>Road Weather Applications</td>
</tr>
</tbody>
</table>

## Technology
- Harmonization of International Standards & Architecture
- Human Factors
- Systems Engineering
- Certification
- Test Environments

## Policy
- Deployment Scenarios
- Financing & Investment Models
- Operations & Governance
- Institutional Issues

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*Transforming Transportation Through Connectivity*
latitude, longitude, time, heading angle, speed, lateral acceleration, longitudinal acceleration, yaw rate, throttle position, brake status, steering angle, headlight status, wiper status, external temperature, turn signal status, vehicle length, vehicle width, vehicle mass, bumper height

“Here I Am” / Where’s My Bus/Carpool?

“Here I Am” / What is the Fastest Route to my Delivery Point

“Here I Am” / I am Full
Connectivity

Opportunity for Innovation

Vehicle Status Data

...65 mph...

...brakes on...

...two passengers...

Weather Data

Transaction Data

Infrastructure Status Data

E-Payment Service

Real-Time Travel Info

Signal Phase & Timing Adjusts Real-Time Conditions

Safety Alerts and Warnings

Data Environment

Location Data
Data is Power
Data Environment Evolution

Current State

TRAVELER
“nearly zero”

VEHICLE
“a few”

INFRASTRUCTURE
“some”

Potential Interim States

Potential End State

TRAVELER
“some”

VEHICLE
“nearly all”

INFRASTRUCTURE
“where needed”

some
a few
nearly zero

some
nearly all
where needed
Safety Pilot 2011-2013

- Major field test and real world implementation
  - Multiple vehicle types: cars, fleets, trucks, buses
  - Fully integrated systems & aftermarket devices
  - Prototype security mechanisms
  - Certification processes

- Goals
  - Support real world V2V & V2I applications with data rich environment
  - Establish benefits data in support of NHTSA 2013 Agency Decision
  - Public awareness & determine user acceptance

- Outcomes
  - Benefits and user acceptance data for supporting future federal actions
  - Archived road network data for supporting mobility, environmental, and other research
  - Multiple supplier sources for devices and infrastructure
  - Better understanding of the operational policy issues associated with the deployment of V2V and V2I
Dynamic Mobility Applications

- Enable Advanced Traveler Information System (EnableATIS)
- Freight Advanced Traveler Information Systems (FRATIS)
- Integrated Dynamic Transit Operations (IDTO)
- Intelligent Network Flow Optimization (INFLO)
- Multi-Modal Intelligent Traffic Signal Systems (MMITSS)
- Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)
# Dynamic Mobility Applications Program

<table>
<thead>
<tr>
<th>Program Activity Track</th>
<th>Foundational Analysis Phase 1</th>
<th>Research, Development &amp; Testing Phase 2</th>
<th>Demonstration Phase 3</th>
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<tr>
<td>Stakeholder Engagement</td>
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<td>Program Planning</td>
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<tr>
<td>Institutional and Policy</td>
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<tr>
<td>Standards</td>
<td>Standards Plan</td>
<td>Standards Development and Testing</td>
<td>Standards Demonstration</td>
</tr>
<tr>
<td>Research and Development</td>
<td>Open Source Portal Development</td>
<td>Deploy Open Source Portal</td>
<td>Maintain Open Source Portal</td>
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<tr>
<td>Testing</td>
<td>Application Identification</td>
<td>Data Capture</td>
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<tr>
<td>Demonstrations</td>
<td>Demo Coordination Planning</td>
<td>Phase 3 Apps Testing (OPT.)</td>
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<tr>
<td>Evaluation</td>
<td>Define Measures</td>
<td>Evaluation Planning</td>
<td>Phase 2 Apps Evaluation</td>
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<tr>
<td>Outreach</td>
<td></td>
<td>Phase 3 Demo Evaluation(s)</td>
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**Legend:**
- Diamond point: Decision point
- Gray Activity: Program activity
- Yellow Data: Data capture
- Green Activities: Data feed

**Questions:**
- Do the candidate applications show enough promise to be tested?
- Do these applications address key performance measures?
- Do we understand the communications requirements of these applications?
- Are there clear and compelling arguments for deployments showing significant benefits?
AERIS Program

Data Capture and Management

- Vehicle Status Data
- Infrastructure Status Data
- Weather Data
- Truck Data
- Transit Data
- Location Data

Environmental Applications

- Transit Signal Priority
- Low Emission ZONE
- Real-Time Travel Info
- "Green" Routes
- "Green" Fleet Management
- Eco-driving
- Phase & Adjusts Time Limitations
AERIS Program

- Low Emission Zone
- Eco-integrated Corridor Management
- Eco-Signal Operations
- Eco-Lanes
- Support Alternative Fuel Vehicle Operations
- Eco-Traveler Information
Imagine a sustainable future:
- Transition to ubiquitous mobile data streams @ 0.1 s resolution
- Wealth of stationary/mobile data for real time and off line
- Public/private roles and timeline
- Who archives?
- Role for researchers?
- Links to energy/grid?

Some Issues
- Financing
- Privacy
- Cyber/Security
- Implementation
- Governance
- Deployment approach
- Data ownership
- Certification
- Sustainability
- Risk
- Liability
Research Call to Action

- **Benefits**: understand definitive interactions among safety, mobility and the environment.

- **Data**: importance of keeping, sharing and leveraging data from demos, field operational tests and pilots.

- **Evaluation**: systematize and consolidate results from numerous evaluation efforts.

- **Demos**: need to move to cooperative deployment, public and private.

- **Collaboration**: in the U.S., the DOT should talk to the NSF, DOE and DOD

- **Fleets**: first.

- **Distraction**: see new NHTSA guidelines and confront the issue.
Research Call to Action

- **Tools**: we develop them for every project, can’t we leverage?
- **Implementers**: don’t forget about them.
- **Roadside**: rapidly accelerate definition of requirements and build in flexibility.
- **Field Operational Tests**: what do they add up to?
- **Implement**: what we know works.
- **Policy**: new people at the table, be creative with the authority we have.
- **It’s the People**: workforce of the future.
- **My Skeptical Neighbor**: win them over with the facts.
- **Funding**: confront it. New models for vehicle ownership and use.
Human Resources

Not just technology and policy—the people are important

Strategic plan: need to attract, recruit, orient, retain, develop, and mentor a diverse, engaged, collaborative, and high performance workforce:

Anticipate demographic shifts, impending retirements, and operations/ITS needs

Increase the education and training level of the workforce
Charismatic Leadership

- The people are important
- Workforce development initiative
- Living the collaborative spirit—sharing data and ideas
- Regional coordination/collaboration
- Recruiting and retaining management staff who are effective in keeping regional collaboration moving forward.
- Interpersonal skills may be as critical as technical skills.
- To be outstanding in your field, you need to be outstanding in the field!
- In memory of Bill Kloos, Signal Systems, Lighting and ITS Manager at Portland Office of Transportation
Thank You for Your Attention