IMPACTS OF TRANSPORTATION TECHNOLOGY ON TRAFFIC DATA PROGRAMS

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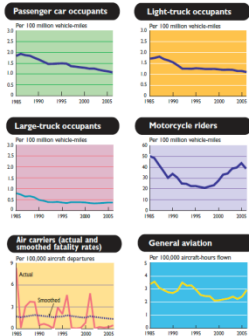
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DOT Focused on Critical Transportation Issues

- Safety
- Distracted driving
- High-speed rail
- Alternative fuels
- Livability
- Sustainability
- Nanotechnology
- Land use planning
- Connected vehicles
- Next generation 9-1-1
- Traffic congestion
- Innovative financing
- Marine highways
- Climate change
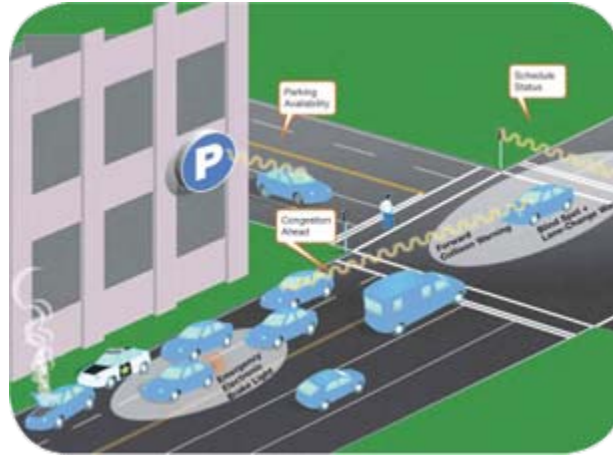
RITA

- RITA Mission
  - Coordinate multimodal research and education programs
  - Advance deployment of cross-modal technologies
  - Comprehensive statistics research and analysis
  - Support transportation education and training
  - National transportation library and knowledge networks
- Promoting collaboration with external stakeholders
- Policy and investment decisions based on sound science and rigorous analysis
- Solid transportation research would be a hallmark of Secretary LaHood's DOT
- Create synergies—make the whole of our research efforts greater than the sum of its parts
- Cross-modal perspectives
- Research coordination as linchpin to progress: Safety Council and Distracted Driving Summit

# U.S. DOT Priorities Feed Into Research Clusters

Key Priorities

- Safety
- Livable Communities
- State of Good Repair
- Economic Competitiveness
- Environmental Sustainability

Scientific Clusters

- Infrastructure & Materials
- Human Factors
- Energy Sustainability
- Risk-Based Analysis to Address Safety Issues
- Data Driven Decision Making
- Multimodal Intelligent Transportation Systems
- Livability
- Modeling and Simulation
- Positioning, Navigation & Timing
- Transportation Implications for an Aging Population and Those with Special Needs
- System Resilience & Global Logistics
- Policy Analysis
- Travel Behavior
- Economics
- International
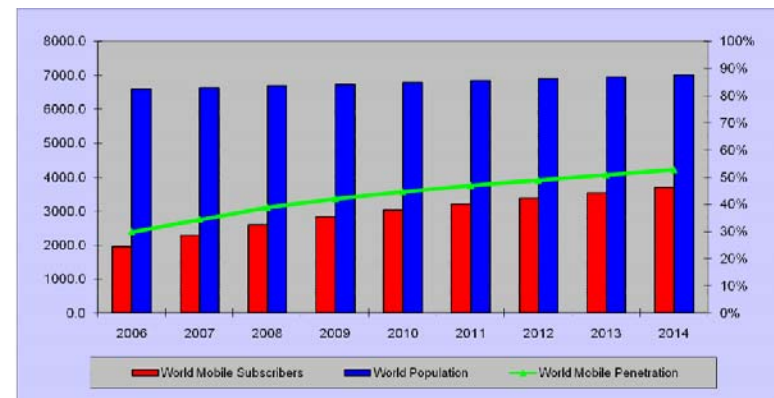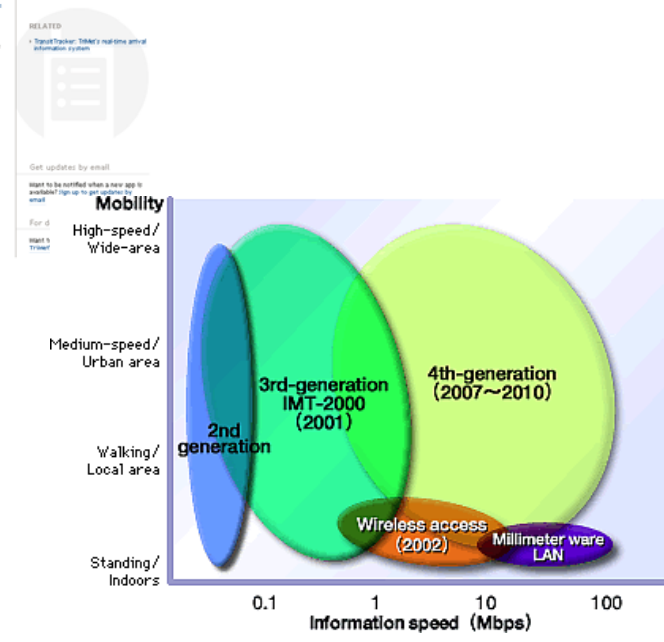
Transportation Trends

- Safety statistics

- Growing passenger and freight congestion

- Growing interest in transit

- Growing environmental awareness

- Emphasis on performance measurement and management

- Troubled transportation financing

- Road pricing and financing alternatives

- Transportation impacts lives

- Growing need for accountability and transparency (open.gov initiative)
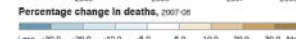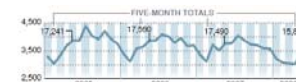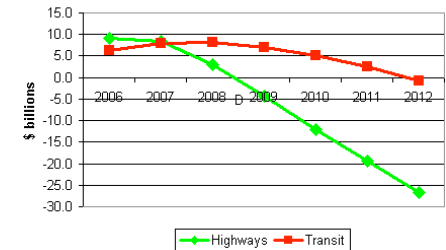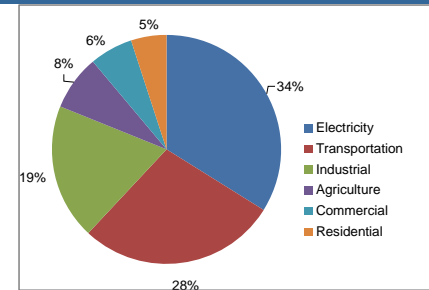
Technology Trends

- Wireless technology boom
- Proliferation of personal devices
- Expanded wireless networks
- Location based applications
- Crowd-sourcing
- Existing ITS deployments generating data
- Open data frameworks encouraging innovation and "apps"
- Strong consumer market
- Fast pace of innovation
- Expectation for information
- Ubiquitous connectivity
- Person-to-person networking

Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area
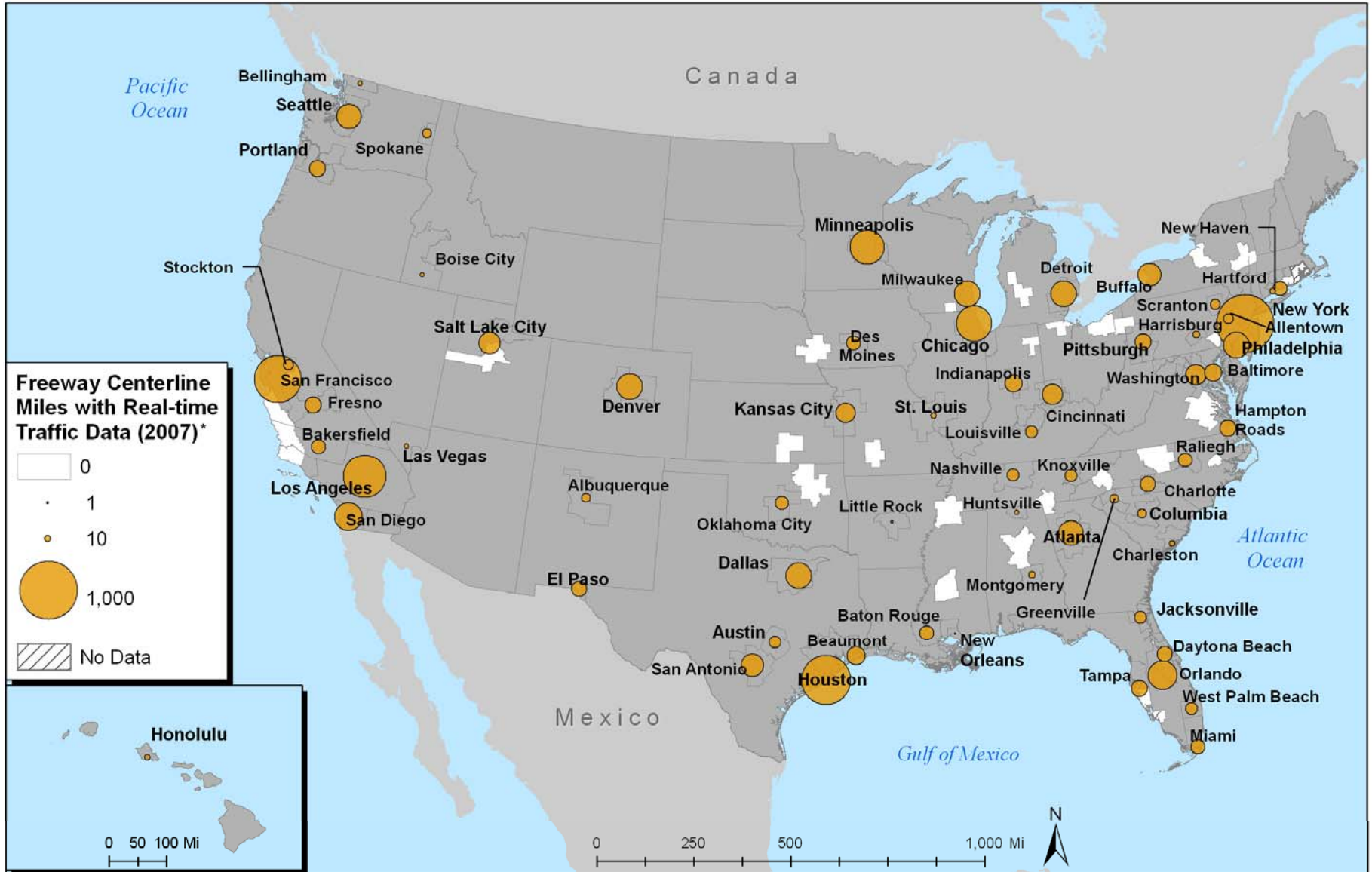
Freeway Centerline Miles with Real-time Traffic Data (2007)*

- 0
- 1
- 10
- 1,000

No Data

* Does not include CCTV

Freeway Ramps with Ramp Meters Operated by Agencies in Metropolitan Areas
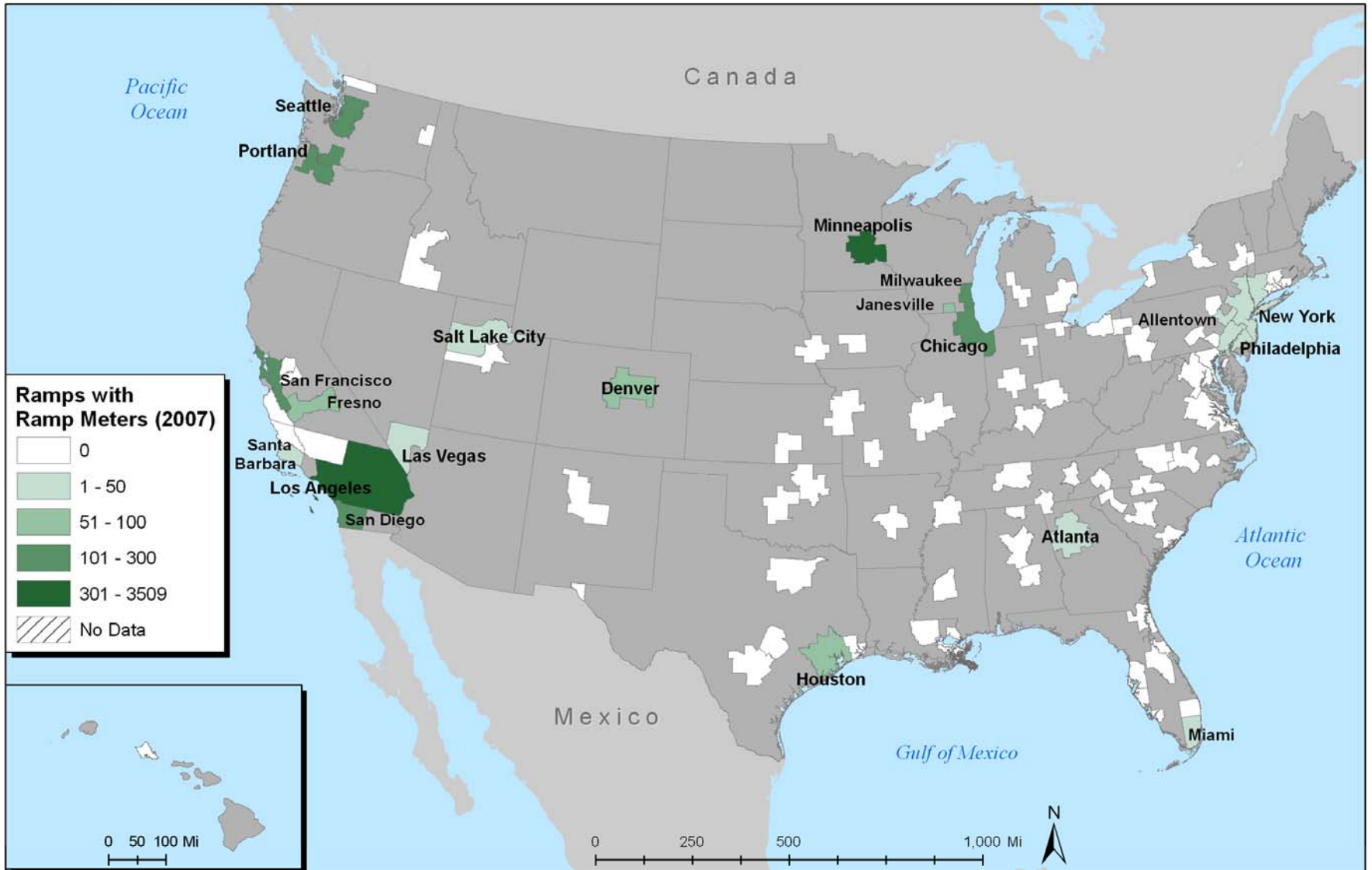
Ramps with Ramp Meters (2007)

- 0
- 1 - 50
- 51 - 100
- 101 - 300
- 301 - 3509
- No Data

Pacific Ocean

Atlantic Ocean

Gulf of Mexico

Canada

Mexico

Seattle
Portland
Minneapolis
Milwaukee
Janesville
Allentown
New York
Philadelphia
Chicago
Salt Lake City
San Francisco
Fresno
Denver
Santa Barbara
Las Vegas
Los Angeles
San Diego
Atlanta
Houston
Miami

0 50 100 Mi

0 250 500 1,000 Mi

N

Service Patrols per 100 Freeway Centerline Miles by Metropolitan Area
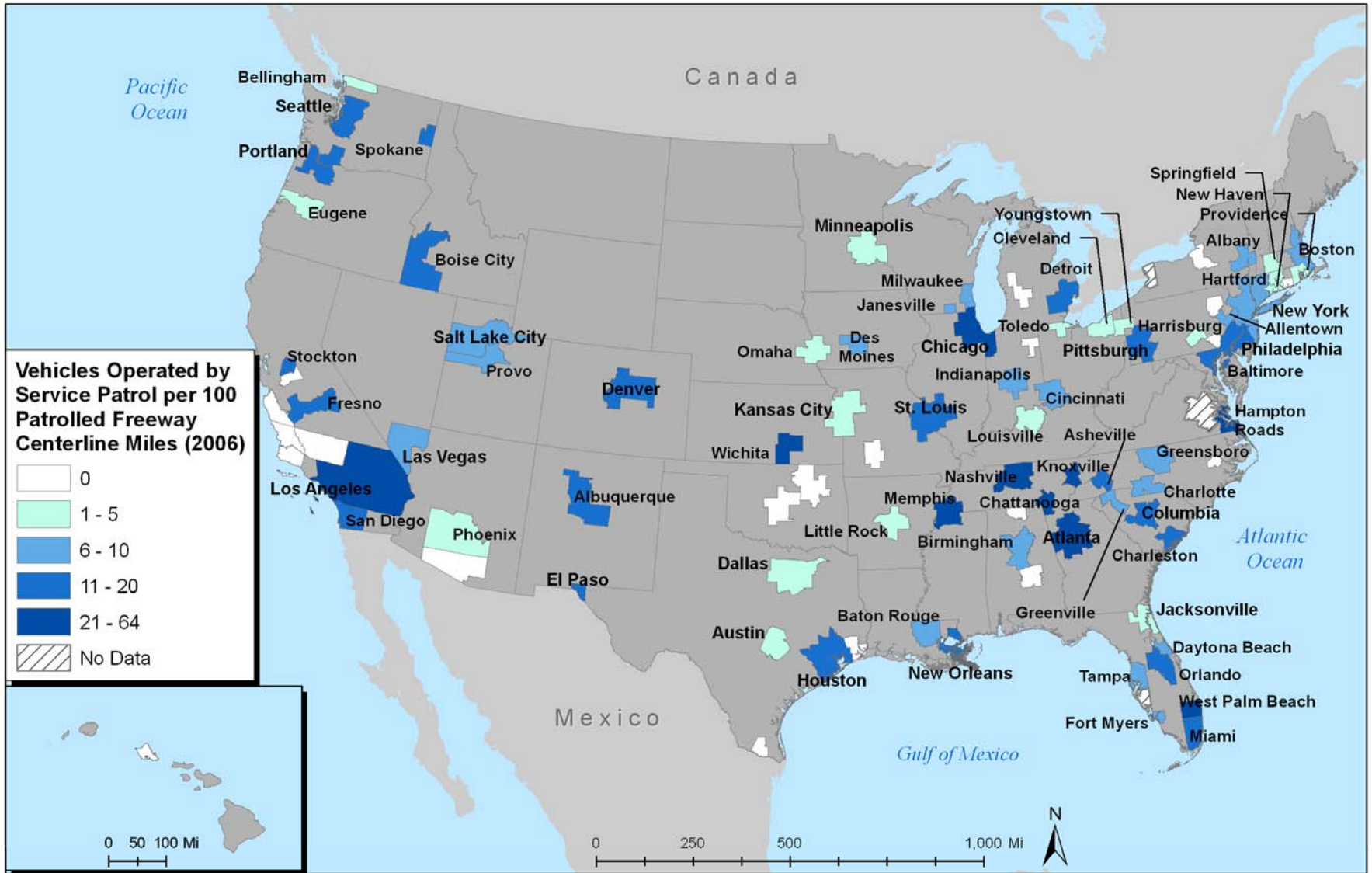
Vehicles Operated by Service Patrol per 100 Patrolled Freeway Centerline Miles (2006)

- 0
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 64
- No Data

Converging Forces for Leveraging Data

Collaboration and Sharing

Charisma and Leadership

Location (GPS)

Wireless Communications

Computing Power

Data Culture
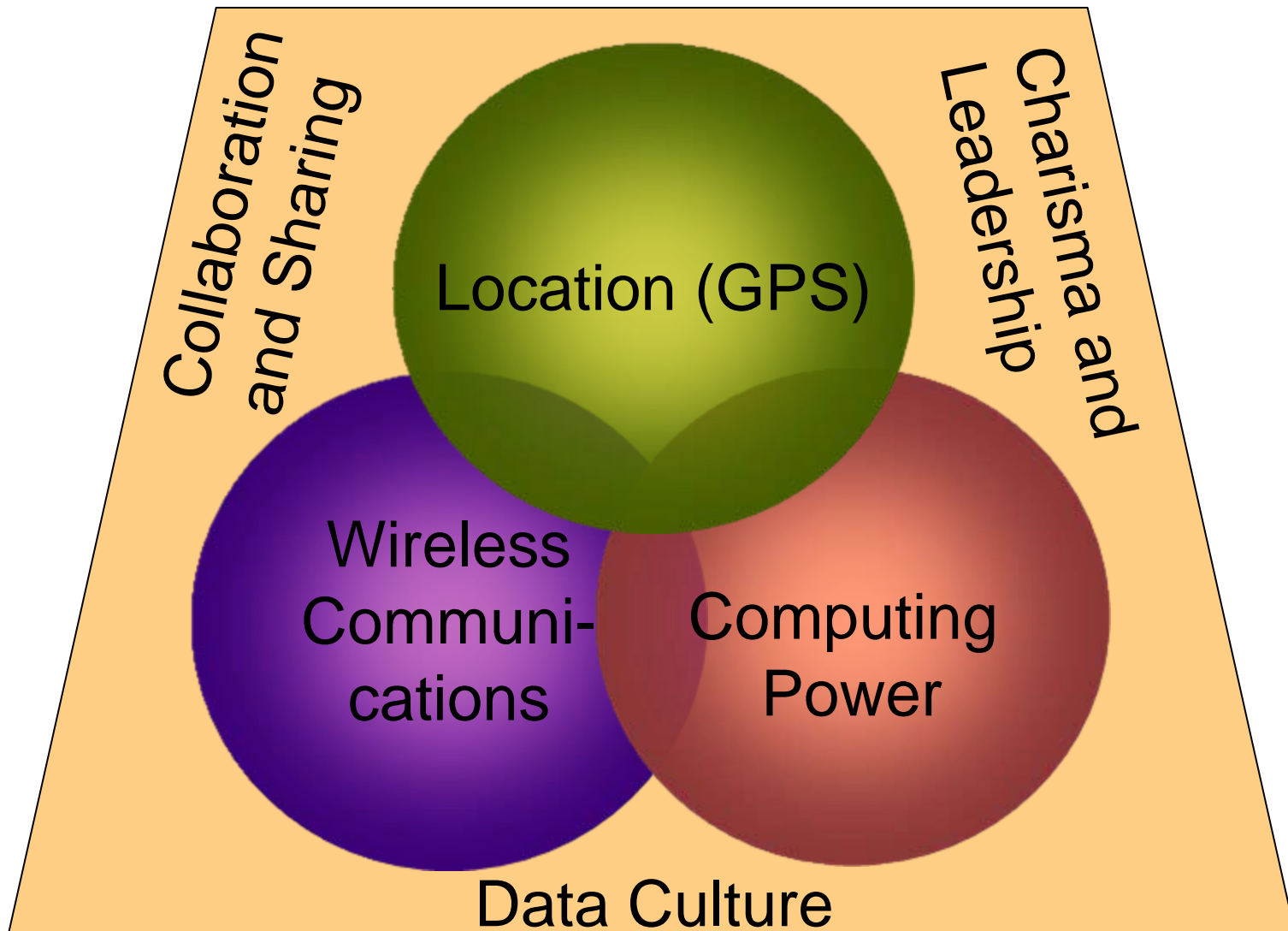
What is Intellidrive?

- Suite of technologies and applications that use wireless communications to provide connectivity:

  - Among vehicles of all types

  - Between vehicles and roadway infrastructure

  - Among vehicles, infrastructure and wireless consumer devices

- Multimodal focus on cars, trucks, buses, vehicles and fleets of all kinds

Drivers/ Operators

Vehicles and Fleets
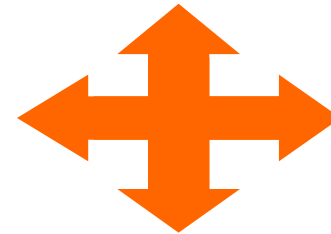
Infrastructure

Wireless Devices

Intellidrive Networked Environment
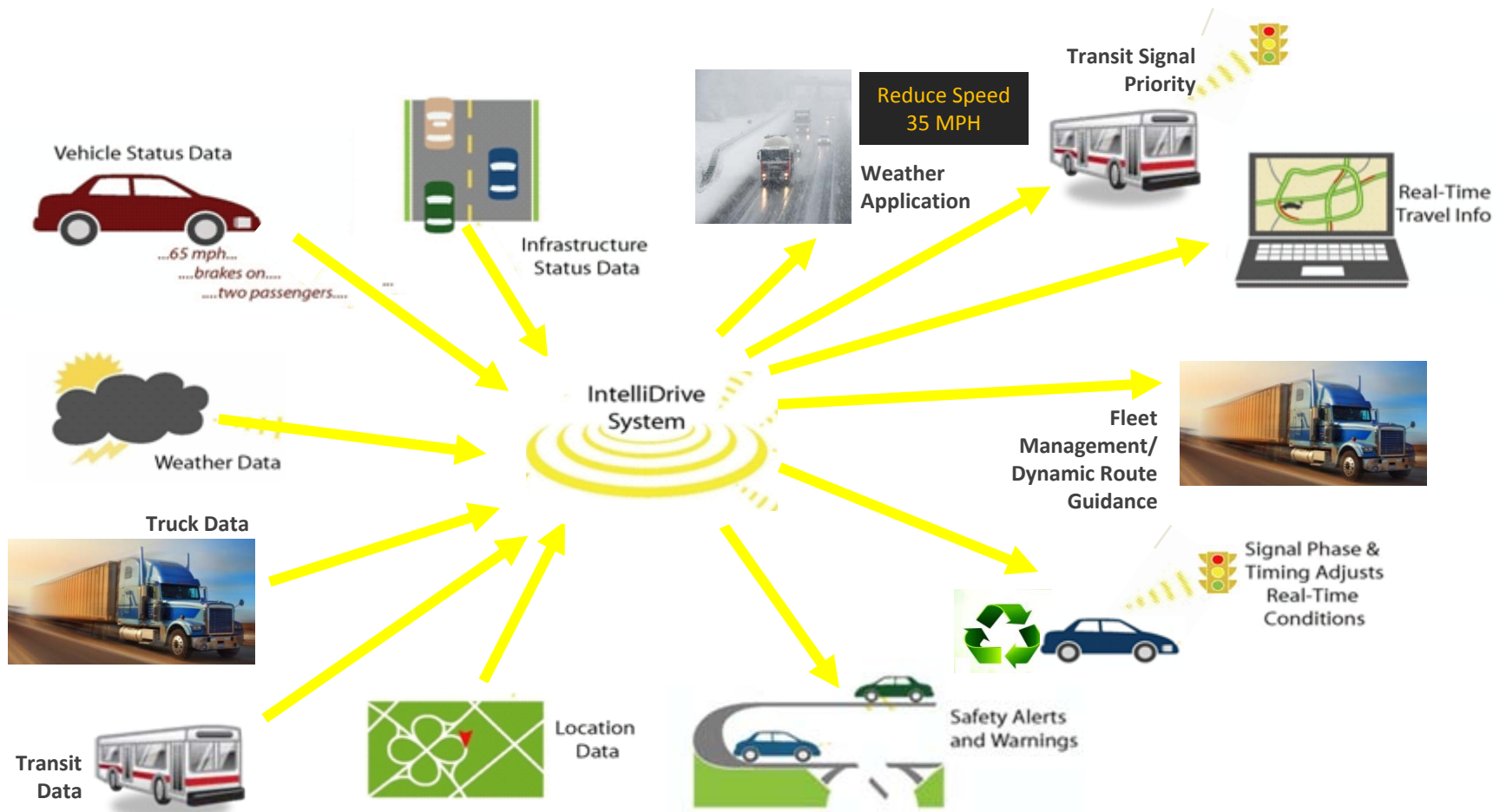
Data In, Actionable Information Out

Intellidrive Mobility

Real-time Data Capture and Management

- Vehicle Status Data
  - ...65 mph...
  - ....brakes on....
  - ....two passengers....
- Infrastructure Status Data
- Weather Data
- Truck Data
- Transit Data
- Location Data

Data Environment

Mobility and Environmental Applications

- Reduce Speed 35 MPH — Weather Application
- Transit Signal Priority
- Real-Time Travel Info
- Fleet Management/ Dynamic Route Guidance
- Signal Phase & Timing Adjusts Real-Time Conditions
- Safety Alerts and Warnings

Real-Time Data Capture and Management

Vision

- Active acquisition and systematic provision of integrated, multi-source data to enhance current operational practices and transform future surface transportation systems management
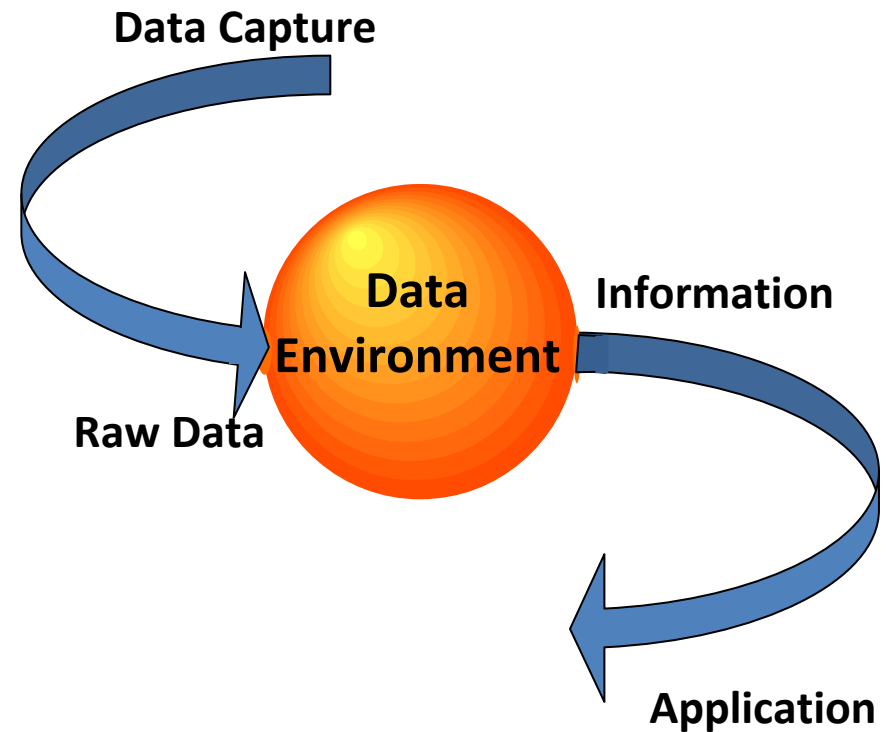
Objectives

- Enable systematic data capture from connected vehicles (automobiles, transit, trucks), mobile devices, and infrastructure

- Develop data environments that enable integration of data from multiple sources for use in transportation management and performance measurement

- Reduce costs of data management and eliminate technical and institutional barriers to the capture, management, and sharing of data
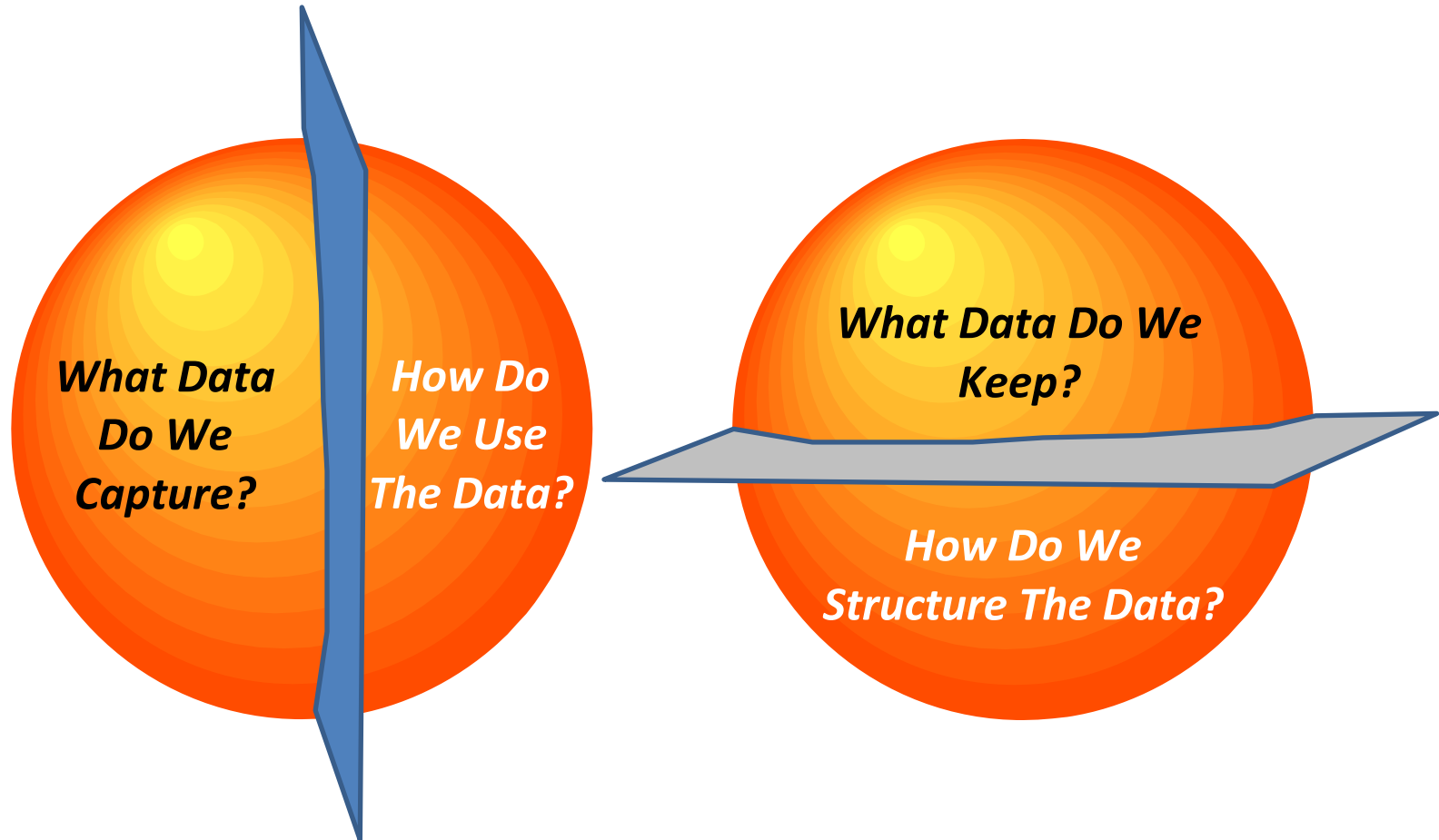
Creating a Data Environment

Data environment:

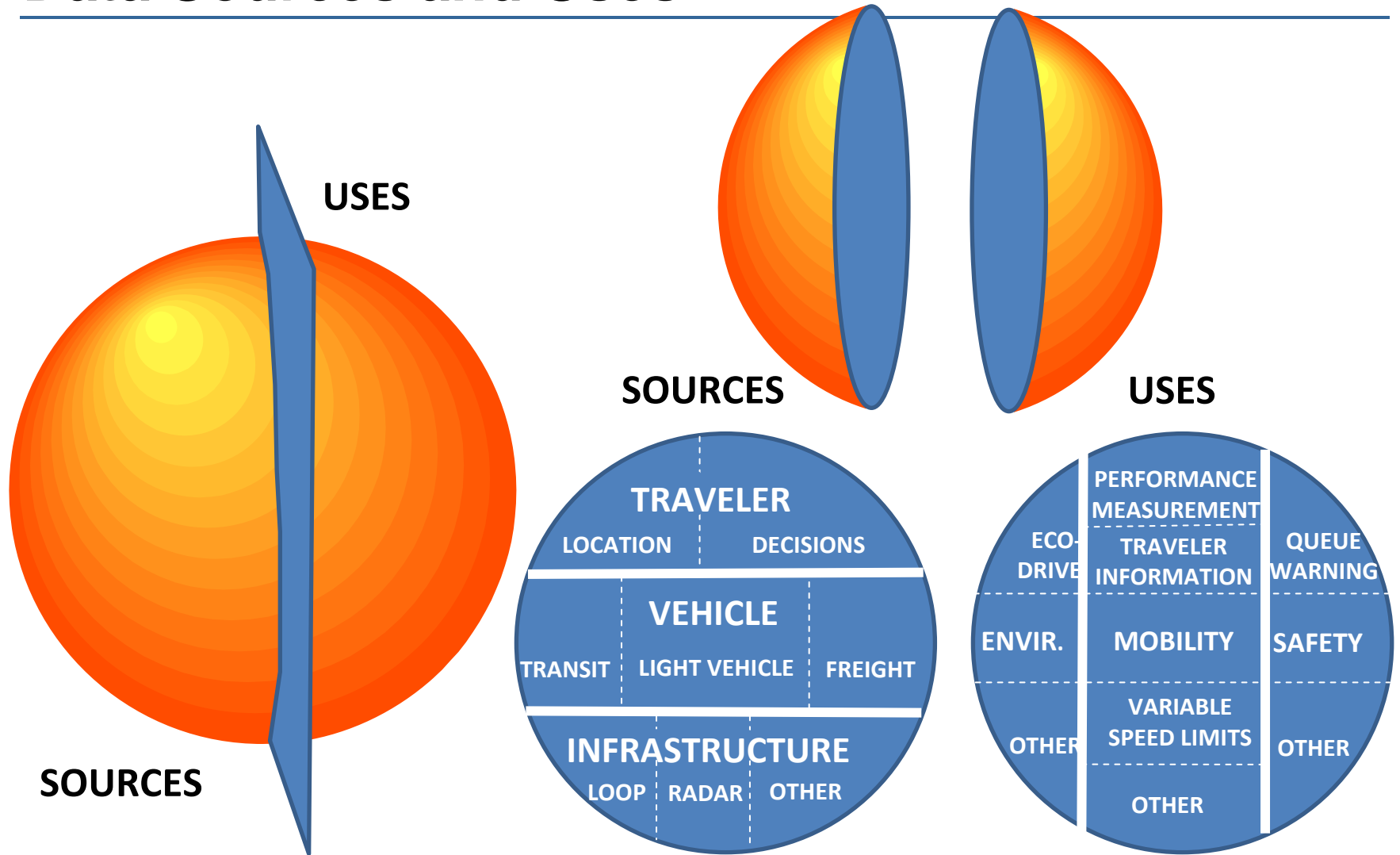- Well-organized collection of data of specific type and quality

- Captured and stored at regular intervals from one or more sources

- Systematically shared in support of one or more applications

Data Capture

Data Environment

Information

Raw Data

Application

Key Issues in Defining A Data Environment

What Data Do We Capture?

How Do We Use The Data?

What Data Do We Keep?

How Do We Structure The Data?

Data Sources and Uses

USES

SOURCES

SOURCES

TRAVELER
LOCATION · DECISIONS

VEHICLE
TRANSIT · LIGHT VEHICLE · FREIGHT

INFRASTRUCTURE
LOOP · RADAR · OTHER

USES

ECO-DRIVE

ENVIR.

OTHER

PERFORMANCE MEASUREMENT

TRAVELER INFORMATION

MOBILITY

VARIABLE SPEED LIMITS

OTHER

QUEUE WARNING

SAFETY

OTHER
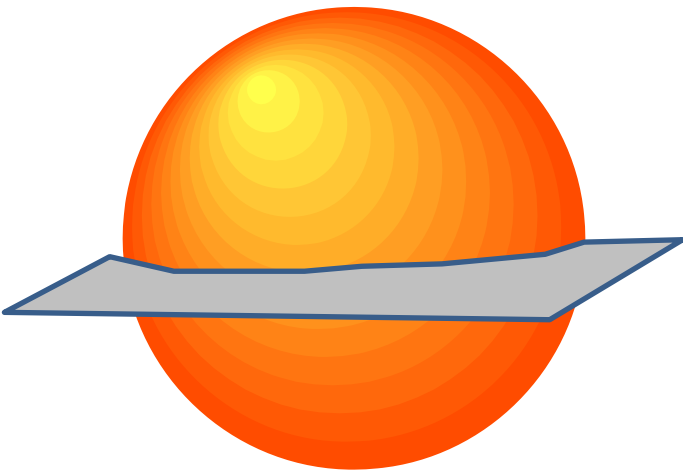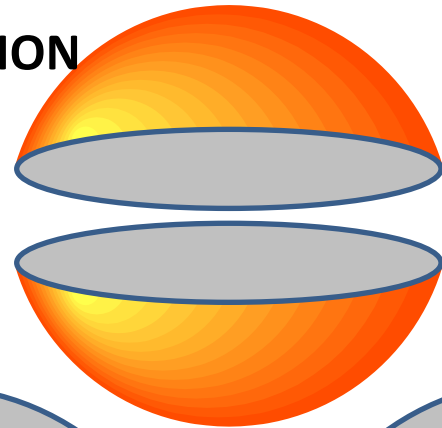
Data Aggregation and Structure

AGGREGATION

STRUCTURE

AGGREGATION

STRUCTURE

AREA-WIDE
AGGREGATION

RAW
DATA

AGGREGATION

STANDARDS

QUALITY

ACCESS

IP

PRIVACY

STORAGE
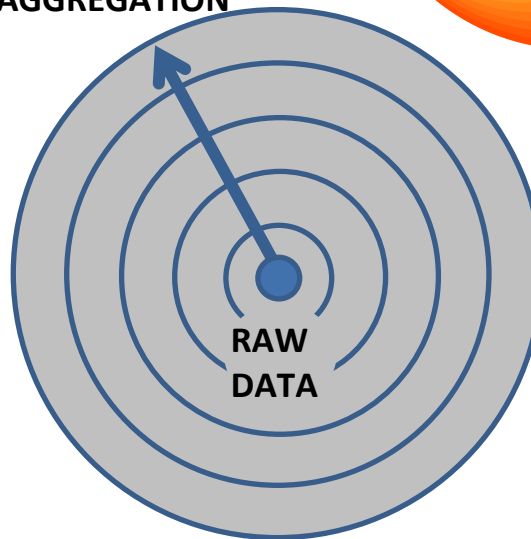
REGULATION

STRUCTURE

Data Environment Evolution

Current State

TRAVELER *"nearly zero"*

VEHICLE *"a few"*

INFRASTRUCTURE *"some"*

Potential Interim States

T
V
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Potential End State

TRAVELER *"some"*

VEHICLE *"nearly all"*

INFRASTRUCTURE *"where needed"*
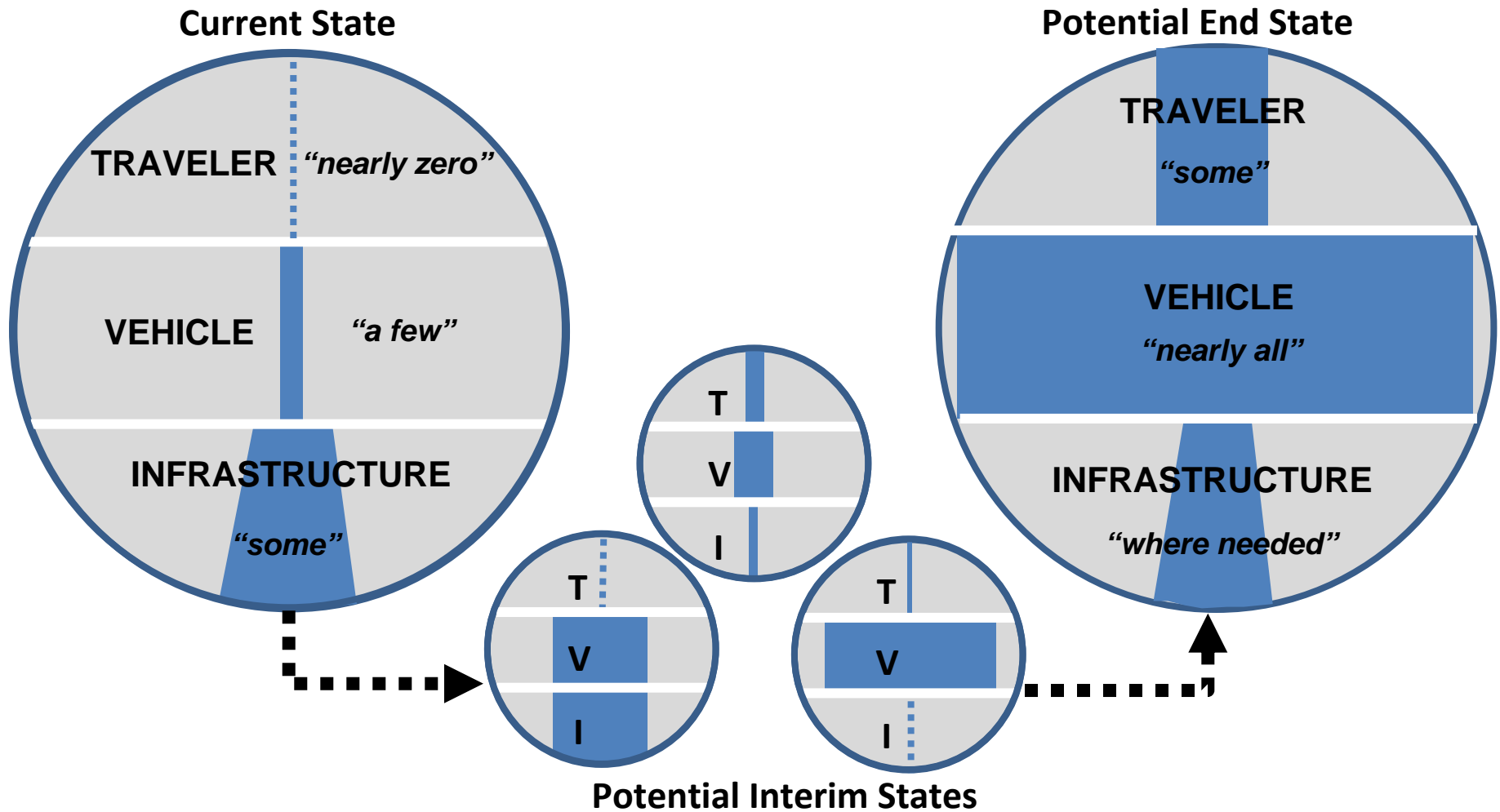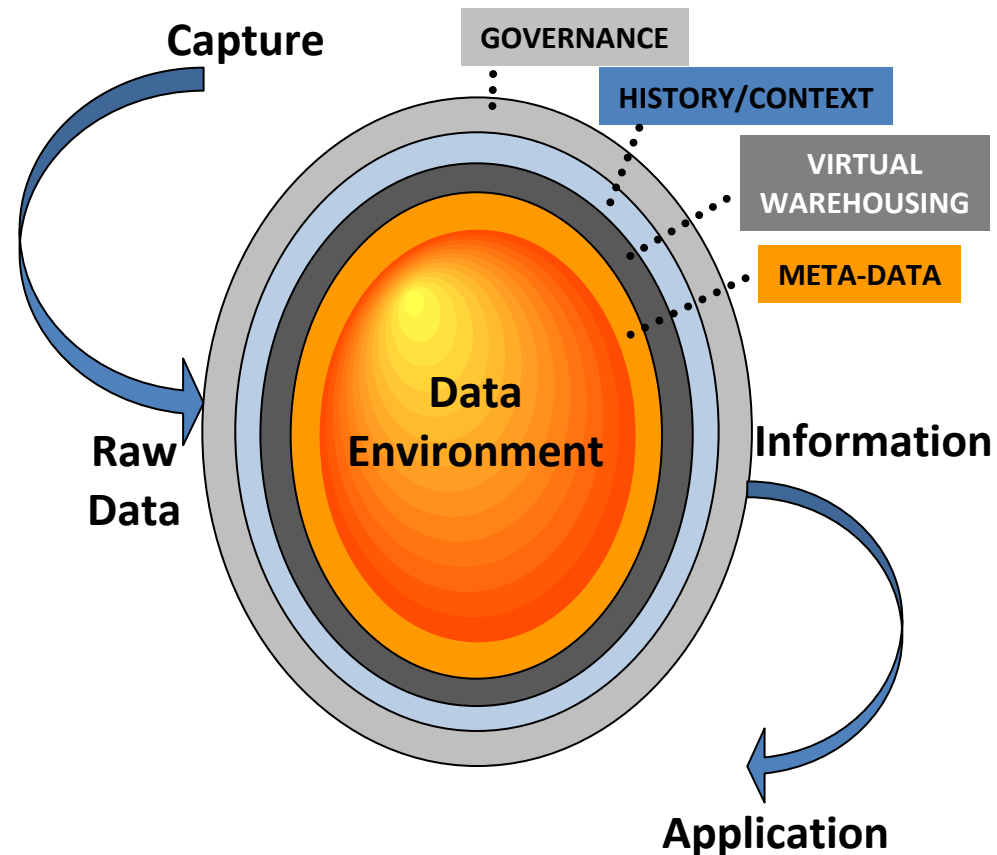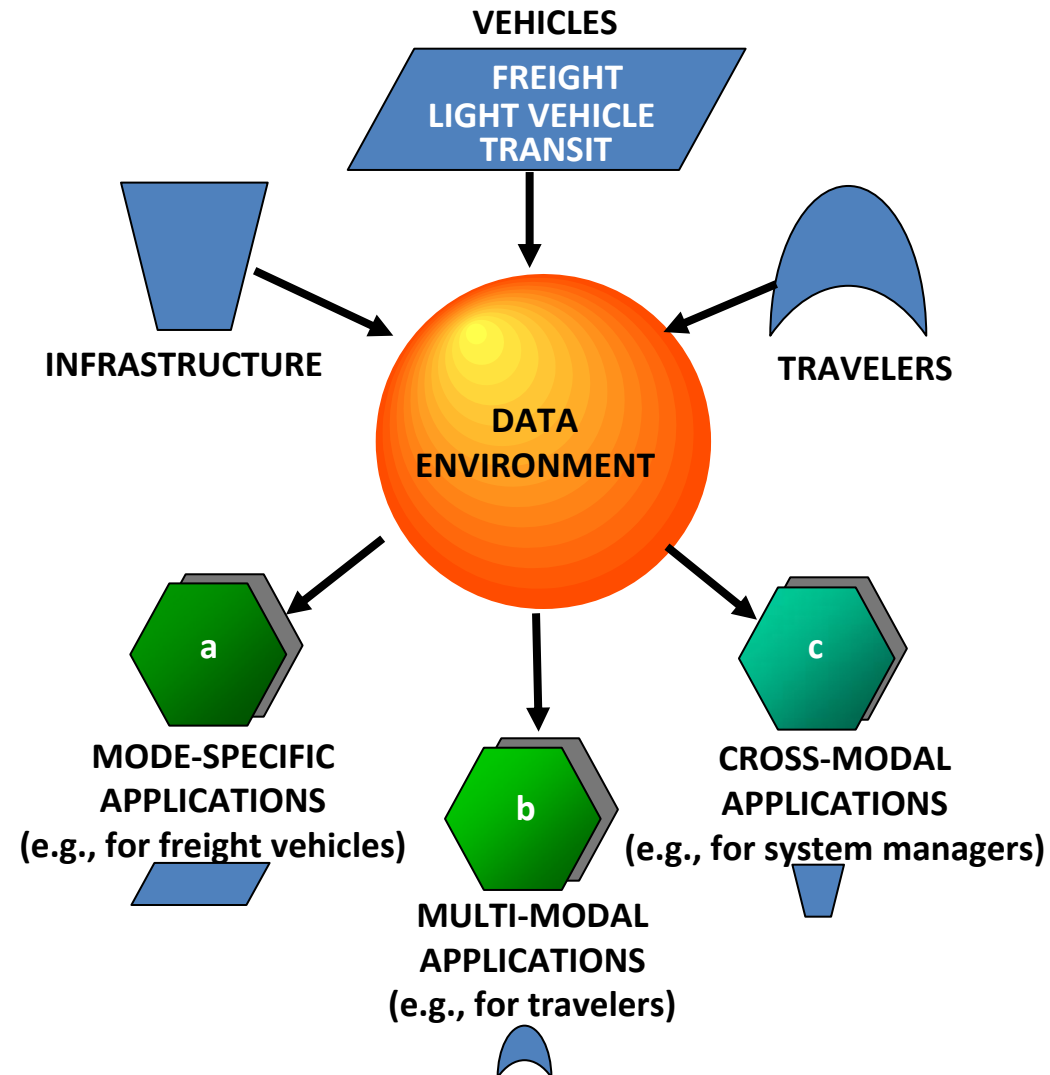
Elements of Data Capture and Management

- **Meta data**:
  - Provision of well-documented data environment
- **Virtual warehousing**:
  - Supports access to data environment and forum for collaboration
- **History/context**:
  - Objectives of data assembly
- **Governance**:
  - Rules under which data environment can be accessed and procedures for resolving disputes

Capture

GOVERNANCE

HISTORY/CONTEXT

VIRTUAL WAREHOUSING

META-DATA

Data Environment
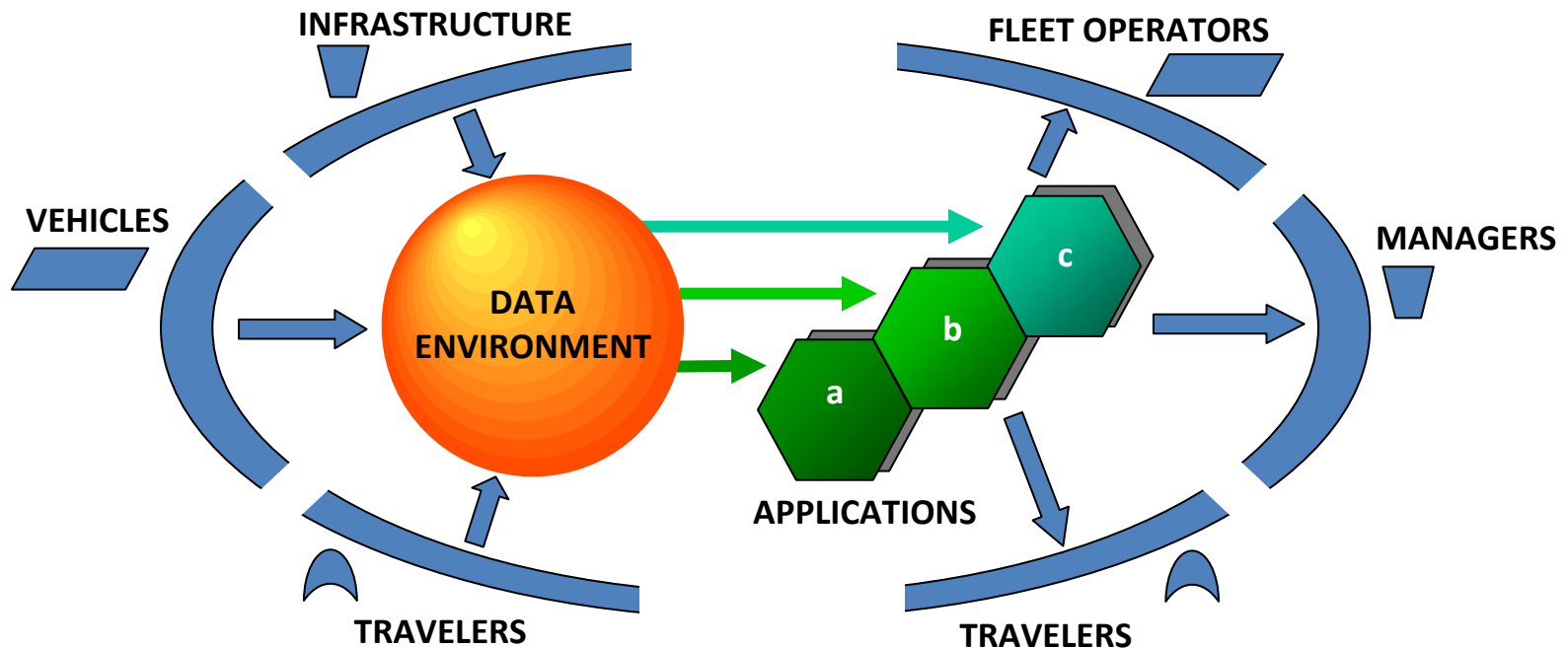
Raw Data

Information

Application

Leverage Multi-Source Data

- Leverage high-quality data integrated from mobile and fixed sources to develop multiple applications (mode-specific and multi-modal)

- Requires coordination with Real-Time Data Capture and Management program

VEHICLES

FREIGHT
LIGHT VEHICLE
TRANSIT

INFRASTRUCTURE

TRAVELERS

DATA
ENVIRONMENT

a

MODE-SPECIFIC
APPLICATIONS
(e.g., for freight vehicles)

b

MULTI-MODAL
APPLICATIONS
(e.g., for travelers)

c

CROSS-MODAL
APPLICATIONS
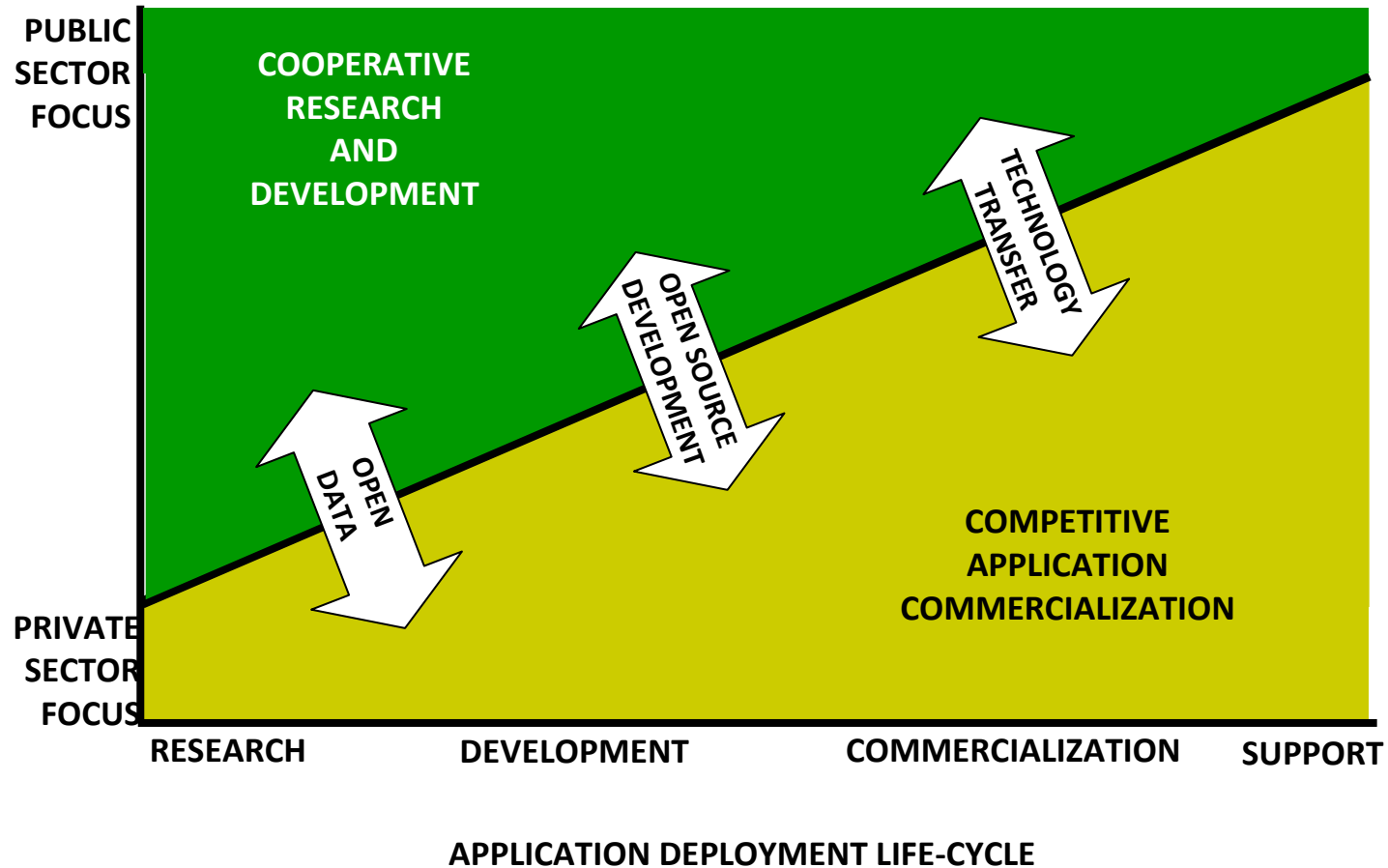(e.g., for system managers)

Multi-Modal Applications Development and Test

- Coordinated development of mode-specific and multi-modal applications:
  - Avoid duplication
  - Cost-effective

Encourage Competitive Application Commercialization

PUBLIC SECTOR FOCUS

COOPERATIVE RESEARCH AND DEVELOPMENT

TECHNOLOGY TRANSFER

OPEN SOURCE DEVELOPMENT

OPEN DATA

COMPETITIVE APPLICATION COMMERCIALIZATION

PRIVATE SECTOR FOCUS

RESEARCH   DEVELOPMENT   COMMERCIALIZATION   SUPPORT

APPLICATION DEPLOYMENT LIFE-CYCLE

Projected Outcomes

- Establish one or more data environments

- Broad collaboration supporting data environment utilization

- Implementation of data management processes representing best practices

- Provide data resources through data.gov initiative

- Multiple applications developed leveraging multi-source data

- Research spurs commercialization

- Applications enable transformational change

Getting Involved

- Provide feedback on program direction, goals, data environment, mobility applications (see *IntelliDrive Data Capture and Management Program: Transforming the Federal Role* on RITA website)

- Respond to upcoming funded requests for research and development of mobility applications

- Seek to leverage IntelliDrive data and applications resources in other non-federal or non-IntelliDrive federally funded research projects

- Offer new data sets and applications

- Actively commercialize mobility applications developed within the IntelliDrive program

- Sign up for email updates: www.intellidriveusa.org/whoweare/updates.php

Archiving ITS Data

- Data are too valuable to be used only once
- Archived ITS data useful for many stakeholders
- Keep raw data, include quality control
- Data poor→data rich
- Truth in data
- Share data freely
- Metadata for interoperability
- Performance evaluation and measurement
- Experiment with different measures
- Freeways as a starting point
- Arterials and transit
- Integrate Into decision support
- Involve university researchers
- Management of the transportation system cannot be done without knowledge of its performance
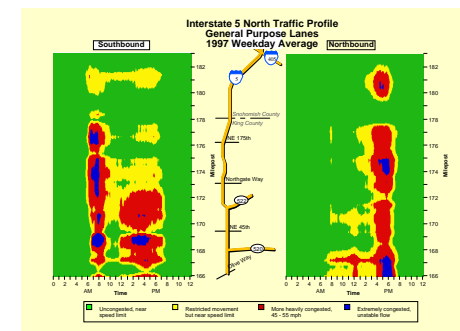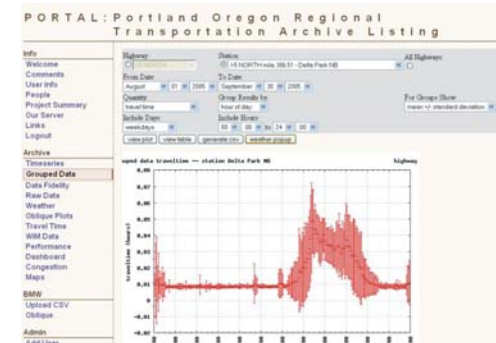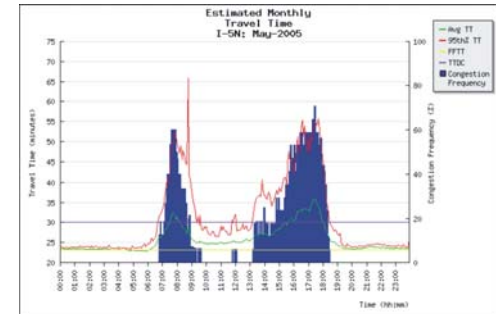
Charismatic Leadership

- 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.
- In memory of Bill Kloos, Signal Systems, Lighting and ITS Manager at Portland Office of Transportation

Thank You for Your Attention

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