New Directions of Transportation Policies and Big Data

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IMAGINE THE FUTURE.

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- What is Big Data?

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Self introduction

- 1951 Born in Osaka
- 1974 Graduated from CE Dept. of Tokyo Univ.
- 1996 Prof., Tsukuba Univ.

- Research Field;
  Transportation Planning, Transportation Policy Development, Transportation and Environment, ITS, Travel and Transportation Surveys,…

- Chairs of Committees on
  - Strategic Reconstruction of Road Traffic Census with Big Data
  - Strategic reconstruction of Person Trip Surveys with Big Data
 - Big Data and New Public Transportation Policies

What is Big Data?

- Bigness of Big Data
- Existing Big Data
- Private Definition

Bigness of Big Data

K(kilo 千)	1,000
M(mega 100万)	1,000,000
G(giga 10億）	1,000,000,000
T(tera 兆)	1,000,000,000,000
P(peta 0.1京)	1,000,000,000,000,000
E(exa 100京)	1,000,000,000,000,000,000
Z(zetta 10垓)	1,000,000,000,000,000,000,000
Y(yotta じょ)	1,000,000,000,000,000,000,000,000

- ## Explosive Growth of Big Data
  - Amount of Digital Data produced/ duplicated in a year   is almost doubled every Two Years

From Exa to Zetta

Doubled Every 2 Years

40(ZB)

130(EB)   1.2(ZB)

50
40
30
20
10
0

2005   2010   2020
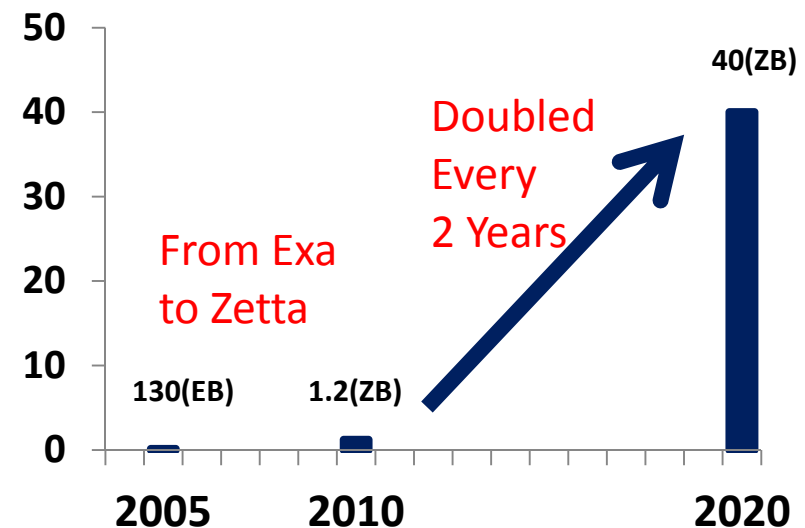
Innovations of Support Technologies

- Sensor Technologies
  - Cheap and High performance Sensors
  - GPS systems
  - Image Processing,…..
- Computation Powers
  - Super computers from Peta FLOPS to Exa FLOPS
  - Very Fast PCs
- Storage Technologies
  - Big and Cheap Storage Systems and Retrieval Systems
- Internet
- And, Day to Day Innovations

My mini disk

Capacity   1TB
Usage   80GB
All of my data in these 15 Years
PPT, Papers, Photos, Literatures

HITACHI's View

Big Data =Data on Products +People +Management
Concerns about our Society

Originally made by Mr. Iwata, Vice President of HITACHI

Existing Big Data in Transportation Sector

- ## Railways in Tokyo
  - Demand -- IC card System (Suica and Pasmo)
  - Service Provision -- Train Operation Data
  - Not fully utilized due to privacy issues and lack of good management/operation systems
- ## Road Traffic

Traffic counters only for traffic signal control
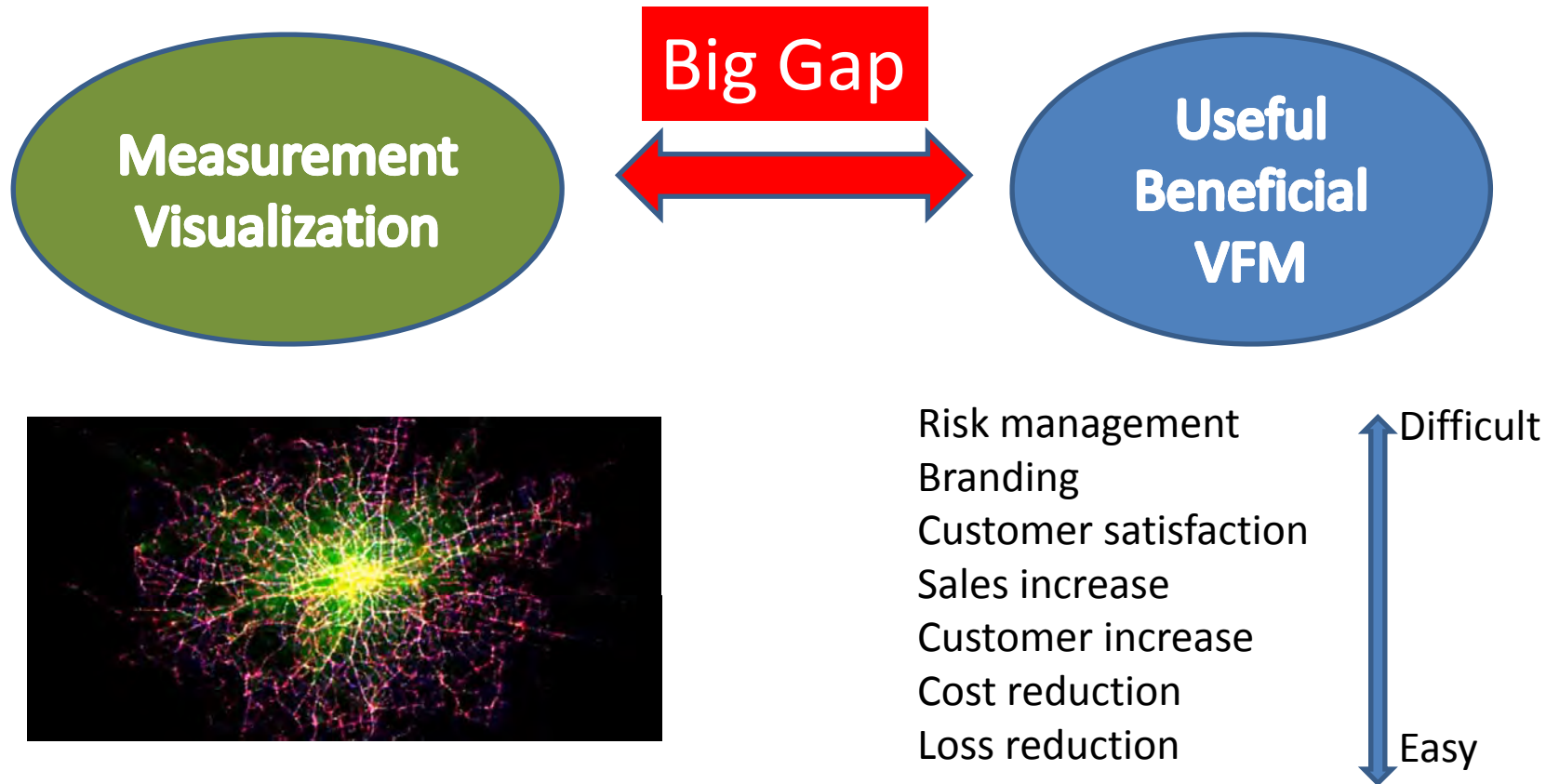
Visualization of traffic jams by probe cars
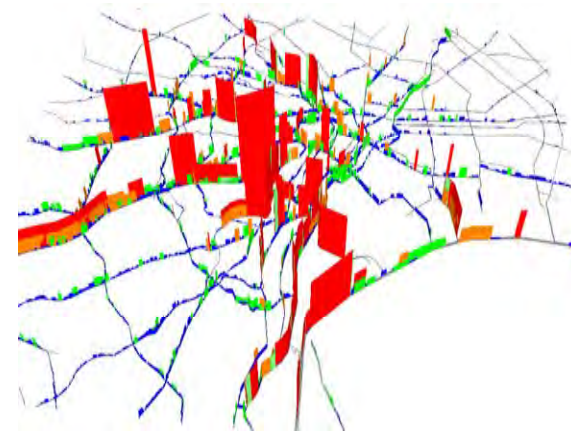
- ## We have Big Data, but not yet utilize fully.

My Understanding on Big Data

- **Big Data System could**

- **Measure, Collect, Store, Retrieve and Analyze in Affordable way**
  - Innovative improvement in continuous collection /storage and analysis of huge data
  - High Time/Space Resolution

- **Data on People , Products and Occurrences(Our Society it self)**

- **And Big Data Systems are Driving Engines for Growth**
  - Changes in Quantity would bring about changes in styles, systems and qualities
  - Important Issues
    - Privacy
    - VFM and Usecase

Present and Expected Situations of Big Data

Big Gap

Measurement Visualization

Useful Beneficial VFM

Risk management
Branding
Customer satisfaction
Sales increase
Customer increase
Cost reduction
Loss reduction

Difficult

Easy

London in Motion
Movement of people and busses

Efforts to Reduce Big Gap

Emerging Transportation Policies

- New and Remarkable Challenges in Transportation
- Urban Public Transportation as a Part of City Management　Case from Toyama City
- New Concept of Transportation Systems and Transportation Policies

New and Remarkable Challenges 1

- ## Public Transportation
  - M.Yajima (CEO,Eagle bus co.) Data utilization to sustain local public transportation
  - M.George (Founder & CEO, Bridj) Using big data to create the world's first smart mass transit system
  - J.Condo (Head of pubic policy, Asia-Pacific,Uber) Data's role in innovating business

- ## Common Features
  - Integration of Facility, management and Operation
  - Full Utilizations of Available Data
    - Digital –Analogue
    - High Tech and Low tech
  - Wide Range of Concerns and Measurements

New and Remarkable Challenges 2
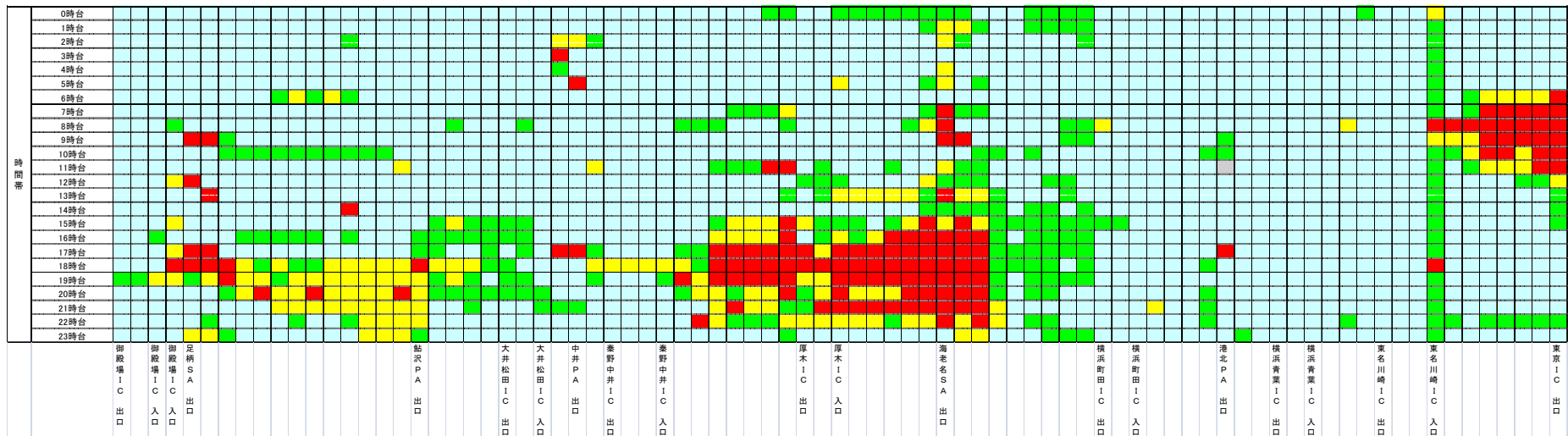
Road Probe on Tomei Exp. Way

Time and Space Identification of Traffic Jams
Information Provision to Road Users to Encourage the Shift in Time and Routes

Congestion during Obon week (Aug.9 to 16 ,2014)
measurement by ETC 2.0 Probe cars

Yamato Sag

Yamato Sag

Source National Institute of Land and Infrastructure Management

Challenges and Outcomes Toyama LRT

- Changes in Travel Behaviors in elder groups
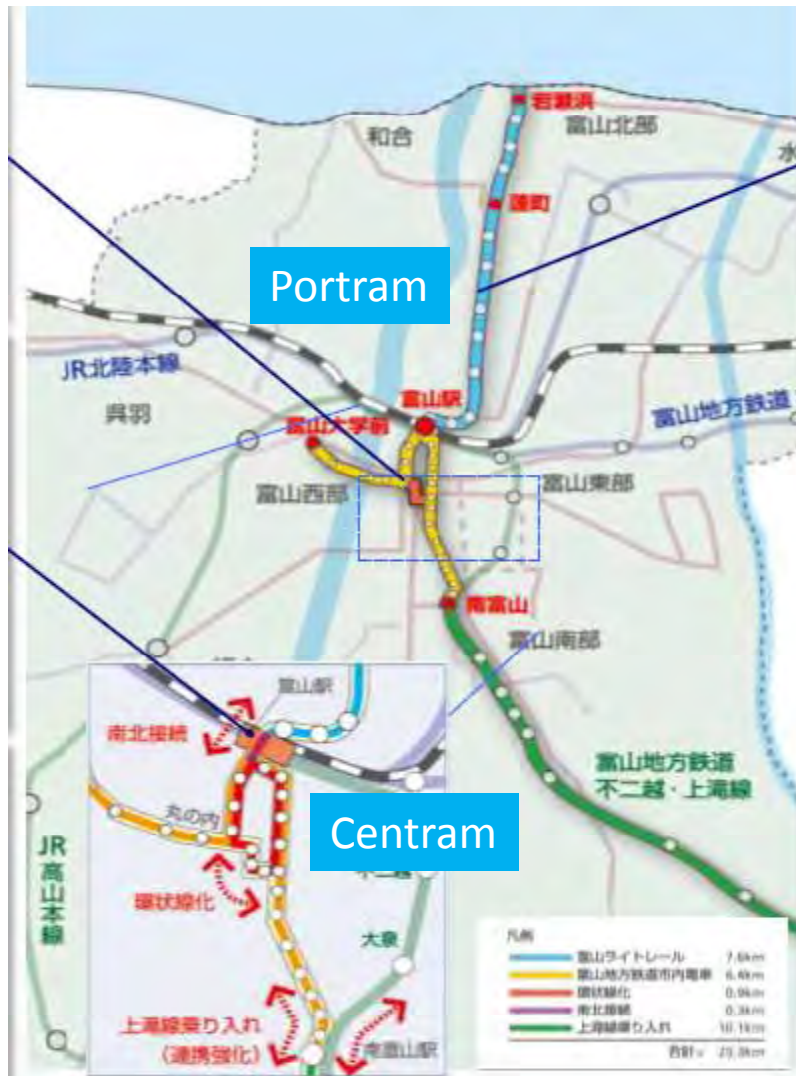- Effects on Shopping Behaviors

公共交通を軸としたコンパクトなまちづくり

富山市長　森　雅志

Centram
LRT circle line in
Downtown Toyama

Made by Mayor Mori
For JCOMM Toyama(2012.7)

LRT in Toyama   Portram and Centram

Portram
 New LRT from
 conventional railway
Open 200.6.4.29
Length 7.6km
Stations 13

Centram
 Short extension to
 circle line
 Open 2009.12.23
 Length 0.9km
 Stations 4

Changes in Passenger Demand
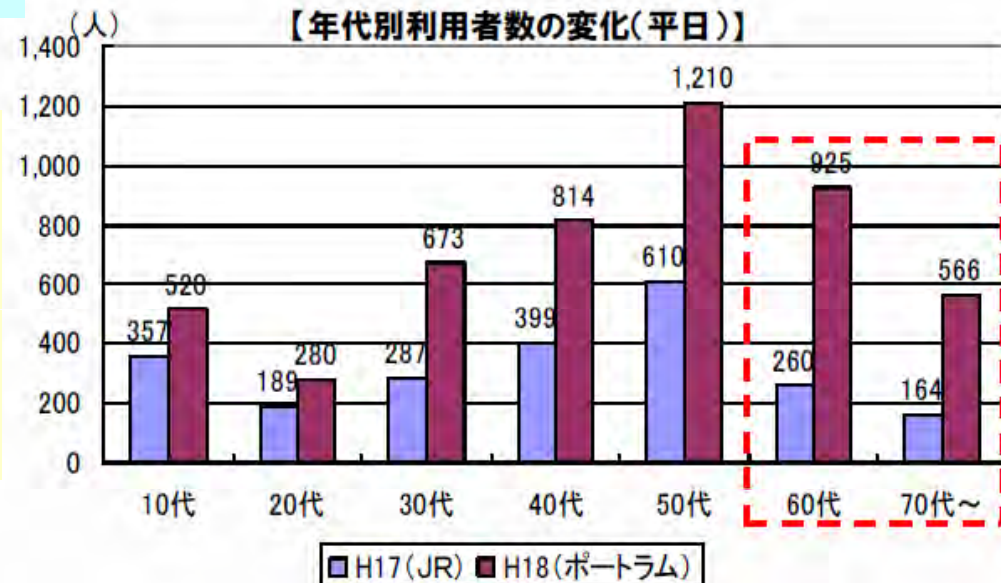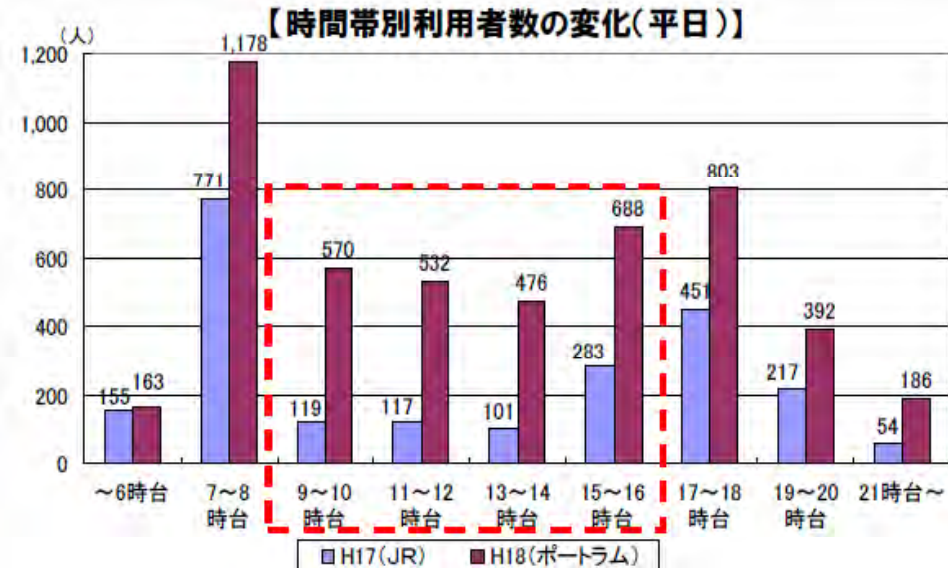

Big Increase of Passengers

esp. in

For Private and Shopping
Day Time
Elder Grope

Effects on More participation
and activities of Elders

Expectations to reduce costs of
medical care and social security

Effects of Centram on Shopping in Downtown

Centram passengers
 stay longer,
 visit more frequently,
 spend more money
than car users.

 Revitalization of downtown
and increase in tax revenue

LRT and other public
transportation system
must be considered as a
part of city
management

【買物・飲食の際の平均滞在時間（分／日）】

	平　　日			休　　日		
（参考）自動車	環状線			（参考）自動車	環状線	
H22	H22	H23		H22	H22	H23
96分	80分	101分		113分	97分	145分

【中心部への来街頻度と消費金額】

買物目的の平均来街頻度（回／月）

	平　　日			休　　日		
（参考）自動車	環状線			（参考）自動車	環状線	
H22	H22	H23		H22	H22	H23
2.5回	5.6回	6.1回		1.8回	4.7回	6.4回

平均消費金額（円／日・人）

	平　　日			休　　日		
（参考）自動車	環状線			（参考）自動車	環状線	
H22	H22	H23		H22	H22	H23
¥11,489	¥5,491	¥12,533		¥9,207	¥11,811	¥14,994

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Expansion of Transportation Systems

Conventional View of Components

- Decision makers   Passenger and Owner of Goods (Freight)
- Carriers   Cars, Trucks, Trains, Airplanes, Ships…
- Transportation Facilities
  - Links: Road, Railway, Pedestrian
  - Nodes: Stations, Car Parks, Airport, Port….

Proposal of New Components

- Demand side   Decision makers
- Supply side
  - Carriers
  - Transportation facilities
  - Operation/Management systems: ITS, Information center, Traffic signals, Finance system,…
- Market
  - Operators, Regulations
- Environment
  - Stake holders (Users, Operators, Neighbors, Future generations…)
  - Natural/Built-up Environment
- Government policies
  - Infrastructure development, Fares, Regulations…
  - Involvement/Collaboration of Public/Communities

In Shorter Words,

Transportation Planning

to

Transportation Policy Development

Transportation System Management

Infrastructure Investment

Management

Day to Day Operation

Collaboration with Public/Communities

with

Wider Areas of Concerns

Only data can connect/integrate them.

digital/analogue, quantitative/qualitative, subjective/objective, verbal/numerical,…
on Products, People and Money

Big Data is expected to be the one.

Actions to be Taken (to be discussed later)

- Acquisition of VFM

- Privacy Issues

- Basic R&D
  - Area Specific-- Traffic flow, Travel behavior, …
  - Common– Data mining, Storage/retrieve, …
  - Discussion on Transport Big Data Platform/Architecture by Transportation professionals and System engineers

- Step by Step Approach
  - From Small/Partial systems to Holistic through utilization of Existing / Available data
  - Visualizations of Gains
  - Demonstration Project

Acquisition of VFM

- Visualization of True VFM of Big Data in Business Scenes
  - Collaboration between Indigenous Ideas and Supporting Data Technologies
  - Environment Development for Flexible Usage of Open Big Data
    - Open Government and Discussion on Data Openness
    - Rules on Private Sector Participation
  - Sharing Experiences thru Public Reports of Use case Trials

Privacy Issues

- Principle is to acquire clear agreement from informant
- For this, we must prepare
  - Assurance /credibility of Privacy Protection
  - Access to and Correction of provided data
  - Returns
    - Direct personal returns— Money and other benefits/Satisfactions
    - Contributions to Society – Participation / Contribution/ Co-Feeling
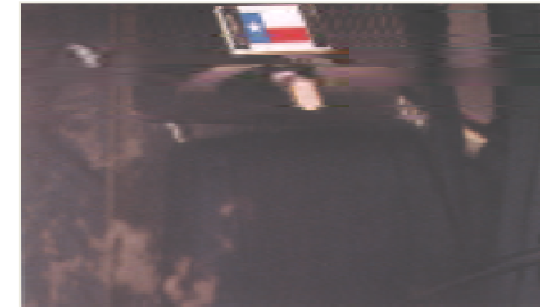- Old but Good Practice

TransGuide in San Antonio ,Texas   1998
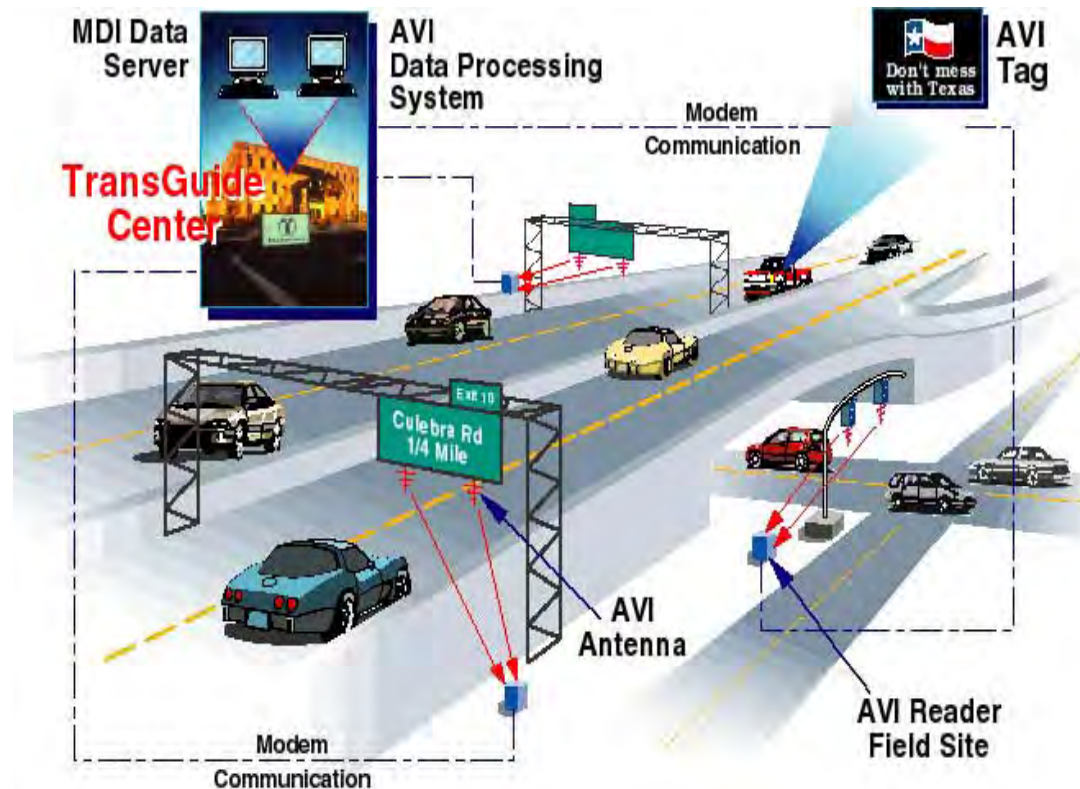
Travel speed monitoring by AVI

78,000 **voluntary monitors**

Information provision based on clear agreement

Secure protection of privacy

AVI tag

Real time provision of Congestion Map
Good for himself/herself and entire
community

Concluding Remarks

- We have already Transportation Big Data.
- Big Gap exists between Present and Ideal Situations of Big Data.
- We need to reduce this Gap.
  - Three presentation will give us ideas and courage
  - I want to discuss Challenges and Directions to reduce this Gap in Panel Discussion

Thank You for Your Attention!!
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