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ITS as a Data Resource

Workshop Proceedings

ITS America - BEC and Institutional Issues Committees
U.S. Department of Transportation – ITS Joint Program Office
Federal Highway Administration
Federal Transit Administration
Bureau of Transportation Statistics
Association of Metropolitan Planning Organizations

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ITS as a Data Resource

- Workshop -

Overview

In January 1998, ITS America, in association with the Federal Highway Administration, Federal Transit Administration, the Bureau of Transportation Statistics, and the Association of Metropolitan Planning Organizations, sponsored a Workshop entitled: *ITS As a Data Resource*.

At the onset, the purpose of the Workshop was to identify opportunities for tapping data produced by Intelligent Transportation Systems for use in:

- Transportation Planning Applications (covering both highway and transit).
- Transportation Operations (including state and local traffic engineering).
- Commercial Vehicle and Intermodal Freight Planning.

Background

ITS operations are based on the collection and use of data on transportation system performance and user characteristics. These data are used to implement control strategies and to advise travelers on system conditions. Typically, massive amounts of data are received from ITS surveillance equipment and are used in real-time or very close to real-time by ITS components. For example, Freeway Management Systems routinely gather traffic data (volumes, speeds, and densities) from equipment installed at short intervals along a freeway. The traffic data can then be used to revise ramp meter timing or can be passed along to travelers through variable message signs, highway advisory radio, or other forms of communication.

Clearly, much of the data available from ITS can be of great value beyond their immediate use in ITS control strategies. However, unless ITS operators have made special provisions, data from the system surveillance equipment are not stored for future use. Because the amount of data is so enormous, it is doubtful that simply saving the raw data would be of use to other stakeholders -- some level of aggregation or sampling is required to make the data more meaningful to planners and operators. For example, freeway traffic data can be reported from field sensors every 20 seconds for each lane of traffic. These data could be used by transportation planners for a variety of purposes including congestion monitoring and calibration of travel demand forecasting models. These activities require that the data be aggregated to higher levels: hourly or daily statistics for each direction of traffic usually suffice.

Further, the ITS National Architecture currently has no specification for a data archival process. This Workshop was designed to help identify how ITS can be used as a data resource for Transportation planning and operations applications, resulting in an update to the National Architecture to accommodate this concept.

Objectives

The objectives of the Workshop were to:

- Bring transportation planners and operators together with representatives of the ITS community to discuss common data needs and concerns.
- Identify currently available ITS data that can meet the data needs of transportation planners and operators.
- Identify opportunities for expanding ITS data collection to meet additional data needs of planners and operators.

Workshop participants also dealt with a variety of issues including:

- The nature of ITS data that are now available, with particular emphasis on the data structures in the ITS National Architecture.
- A discussion of the general data needs of transportation planners and operators.
- Matching available ITS data with data needs.
- Discussing how additional data needs can be met by expanding ITS data services.
- Levels of summarization that would have to be made to raw ITS data to meet data needs.
- Computer resource requirements.

Background of Participants

More than 96 individuals participated in the Workshop *(An attendance list is available with each breakout group).* A steering committee invited the participants based on their area of representation. This invitation was partially funded by FHWA in terms of travel costs. A variety of cities/metropolitan areas - large, mid-size, small - were initially chosen. These cities offered a mix of ITS deployment. These cities include: Atlanta, Baltimore/Washington, Chicago, Des Moines, Detroit, Houston, Los Angeles, Minneapolis, New York/New Jersey, Orlando (Florida in general), Philadelphia, Phoenix, Portland (Oregon), San Antonio, San Diego, San Francisco, and Seattle.

In order to achieve the objectives of the Workshop, representatives of each of the identified stakeholder groups (i.e. Traffic Operations, Transit, and CVO) were selected from each of the cities. These representatives were augmented by individuals representing their particular Metropolitan Planning Organization (MPO). Other participants represented a "fourth" stakeholder group, such as traffic modelers and simulators.

Additional participants were invited as "Floaters" and requested to attend the several breakout groups in order to observe common threads among the groups. These individuals are shown below.

NAME	ORGANIZATION
Ralph Gillmann	FHWA
Frank Jarema	FHWA
Stephen Lockwood	PB Farradyne
Richard Margiotta	SAIC/TransCore
Gary Maring	FHWA
Richard Mudge	Apogee Research
Joe Peters	ITS JPO
Alan Pisarski	Consultant
Henry Peyrebrune	Consultant
Christopher Wolz	Forum One Inc

Opening Remarks

Dr. Richard Mudge (Apogee Research, and ITS America Benefits, Evaluations and Costs Committee Chair) and Gary Maring (FHWA - Director, Office of Highway Information Management) provided the opening remarks.

Dr. Mudge emphasized that, while there are clear objectives to this workshop, the participants should approach this workshop as a "Retreat." This retreat would facilitate the dialogue between ITS operators and planners.

Gary Maring reiterated the background, scope and objectives of this workshop. He requested active participation in the breakout sessions in order to assess the outcome of this workshop, and determine whether or not an *ITS data user service* is needed, if any.

White Paper Presentations

Putting emphasis on the three identified stakeholder groups, three consultants were requested by the steering committee to develop and present a white paper. These white papers were distributed to the participants as background material prior to the workshop, and were used to facilitate discussions during the breakout sessions. These white papers were:

- *Using ITS Derived Data for Transportation Planning, Programming, and Operations: An exploratory analysis*, by Robert M. Winick (Transportation Planning Consultant)
- *Use of ITS data for transit planning*, by Eva Lerner-Lam (Palisades Consulting Group)
- *ITS data for freight planning*, by John Kaliski (Cambridge Systematics)

The final versions of these papers are available in Appendices 2, 3 and 4.

ITS Data Relevant to Transportation Planning and Operations

Richard Margiotta (SAIC/TransCore) presented a briefing (Appendix 5) on the requirements for archived ITS data. This briefing includes the data flows for the "Planning" subsystem as currently implemented in the physical architecture of the ITS National Architecture.

More importantly, Mr. Margiotta presented an *ITS data relevant to transportation planning and operations* filled matrix (Appendix 6), as an example and background information. This matrix is also based on the data flows of the "Planning" subsystem.

A blank version of this matrix was distributed to the participants as an exercise tool. The purposes of this exercise were:

- to facilitate the discussion
- to engage the planners and operators in a dialogue
- to highlight the eventual task required, should the outcome of this workshop focus on the need to establish an *ITS data user service*.

Eventually, the *ITS data user service* user requirements document, as well as a complete and finalized *ITS data relevant to transportation planning and operations* data flow matrix, are necessary and required input documents for the ITS National Architecture Team. These documents will then be used to implement the user service into the ITS Architecture.

Breakout Sessions

The participants were equally divided into 5 breakout groups. Each group had a previously assigned facilitator, recorder, note taker and a member of the ITS National Architecture Team. Joe Peters (ITS JPO) delivered the charge to the breakout groups. A list of discussion topics was provided to each breakout group in terms of four breakout sessions, under the following general headings:

I - OPENING/INTRODUCTIONS
II - UNDERSTANDING THE ISSUES AND CONSTRAINTS
III - APPROACHES TO USING ITS AS A DATA RESOURCE:
IV - RE-BUILDING THE DATA FLOW MATRIX

The charge to the breakout groups and focus questions for each of the above sessions are presented in Appendix 7.

Group A
Deliberations

Group A included 17 individuals as shown below:

Facilitator	Elaine Murakami (FHWA)				
Recorder	Gene Bandy (Baltimore Metropolitan Council)				
Note Taker	Doug Laird (FHWA)				
ITS Architect	Cliff Heise (Odetics)				
NAME	**ORGANIZATION**	**Traf. Ops**	**Transit**	**CVO**	**Plan**
Baltimore/Washington:					
Gene Bandy	Baltimore Metropolitan Council				1
Bruce Mangum	Montgomery County ATMS				
Mr. James Robinson	Virginia DOT	1			1
J. B. Robinson	Virginia DOT	1			
Irene Shuman	Virginia DOT	1			
Andy Meese	Metropolitan Washington COG				1
Jeff Smith	MD SHA				1
Pam Marston	FHWA Region 3	1			
Eric Graye	Mo. Co. National Park & Planning Com.				1
C. Patrick Zilliacus	Metropolitan Washington COG				1
William Walsek	MD SHA				1
Martha Schwalenstocker	Metropolitan Washington COG				1
OTHER NAMES					
George V. Wickstrom	Urban Transportation Planning Consultant				1

I - OPENING/INTRODUCTIONS:

While not homogeneous, this group was unique because it represented a single large metropolitan area, the Baltimore-Washington region. The group included representatives from traffic operations, traffic data archivists, local and regional transportation planners, primary data collectors (surveys), travel demand modelers, and policy analysts. Many people already knew each other and some already had started ITS data sharing activities.

There was general agreement that even with the limited ITS systems currently in place, information was being lost due to lack of procedures to archive it. Also, in many cases, particularly in existing traffic counting programs which are NOT ITS, there was a lot of data that existed and WAS being saved (archived), but the problem was how to access the data and use it. There was general agreement that standards were needed because the vendors would build routines into their systems without having to customize for each user, and that FHWA traffic monitoring guide and HPMS guidelines could be used as a starting point for ITS data archiving systems.

II - UNDERSTANDING THE ISSUES AND CONSTRAINTS:

1. Functions for which ITS data could be used:
   - Simulation -- project evaluation, design and performance measurement
   - Travel forecasting
   - Traffic operations
   - Control strategies
   - Incident management
   - Informing decision makers
   - System performance monitoring
   - Facility design
   - ITS project evaluation

2. Players involved in ITS as a data resource
   - Collect primary data -- Can ITS be a substitute? Will it provide broader coverage? Will it be cheaper or more expensive? Will it be accurate and reliable? Will it reduce my field data collection costs?
   - Archiving/warehousing -- How much data will there be? What kind of geographic referencing? What is the cost? And who pays for it?
   - Managing Data -- Who keeps track of changes? Who administers the data?
   - Retrieving Data -- Who is the “expert” and who pays for the “expert”? Who is going to develop and provide software to access the data?
   - Forecasting
   - Long range planning
   - Short term programming

3. Data Elements
   - Volume
   - Speed -- Link speeds
   - Travel Time
   - Origin/Destination -- Smart cards and electronic payment systems for tolls, parking, transit fares could be used for large scale O/D data
   - Vehicle occupancy -- Can ITS provide an answer?
   - Density

The items listed above were considered the priority data items for the working group. The ability to get reliable volume and speed data over a broad geographic area on an on-going basis was perhaps the most basic piece of information for which ITS was considered a valuable resource. Second, in any data source that could provide origin-destination data for private vehicle, trucks, and transit passengers was strongly desired. Having the information on an on-going basis would provide analysts with the ability to do trend analysis and could assist with short-term planning and impact analysis. Travel time was also a key item, but the workshop participants felt that current ITS systems could not provide this except for a small number of probe vehicles, which would limit its usefulness.

4. Issues:
   - Geographic coverage
   - Geographic detail
   - Cost
   - Timeliness
   - Reliability
   - Accessibility
   - Archiving
   - Quantity of data
   - Level of aggregation/disaggregation
   - Time increments
   - Data management

5. Barriers:
   - Legacy systems
   - Turf and trustworthiness
   - Personnel
   - Common language, e.g. occupancy

III - APPROACHES TO USING ITS AS A DATA RESOURCE:

1. Montgomery County Advanced Traffic Management System (ATMS) data for Maryland National Capital Park and Planning Commission (MNCPPC) travel demand model

The primary purpose of the Montgomery County ATMS is a real-time traffic operations system to reduce congestion. Since their primary goal is to keep traffic moving, they do not have a system for archiving any data. Discussions with MNCPPC have begun to develop specifications for storing and transferring data. MNCPPC would like to have volume counts, specifically peak hour volume counts, for as many locations in the county as possible, for use in their long range travel demand forecasting model. An on-going program of data transfer would provide trend data (e.g. quarterly, yearly), information on the variability of traffic counts by day of week, month, etc.

As the Montgomery County traffic volume counting program was suspended, local and regional planners would like to see if the ATMS can be a substitute data source. Traffic volume counts are used to calibrate travel demand forecasts. At the regional level, collecting traffic volume data is a time-consuming and labor intensive task because there are many jurisdictions, and legacy systems may only provide paper documents such that transfer to a GIS is difficult.

The Montgomery County ATMS sees that information transfer can go both directions. Travel models may assist in improved traffic management when specific routes are closed because of major incidents or planned maintenance.

2. CHART equipment for incident management

The CHART program was designed for incident management. The equipment collects date, time, volume and speed; however, the equipment, does not capture this data to the accuracy needed for planning purposes. The equipment is accurate enough for incident detection, since that is its primary purpose. WHAT ACCURACY IS NEEDED FOR PLANNING PURPOSES? IS THE PROBLEM WITH VOLUMES OR SPEEDS?

WHAT ACCURACY IS NEEDED FOR INCIDENT DETECTION? ARE THEY LOOKING FOR SLOW DOWNS OF 20+ mph? Are they only looking for volumes exceeding a specific number?

For these reasons, Maryland State Highway Administration's Office of Planning has requested CHART that future improvements to CHART equipment take other uses of volume and speed into account.

3. Virginia DOT (VDOT) traffic counting and vehicle classification data

Based on VDOT's data warehousing efforts, even if there was no ITS, there is already a LOT of data. ITS did not create a NEW problem—these issues have been around a long time. Storing data may be cheaper than it used to be, but there is a very large cost to maintaining the data, and especially to being able to access the data and make it useful. There needs to be commitments to support STAFF, and there needs to be data management software systems that can make data quality checks (geographic consistency, reliability, outliers…) and access large datasets in a timely manner.

IV - RE-BUILDING THE DATA FLOW MATRIX:

(The numbers associated below refer to the ITS Data Relevant to Transportation Planning and Operations Worksheet, available in this package)

First Tier

1. Freeway Traffic Flow	- Volumes and speed by lane, by time of day, day of week - 5 min increments and accumulations in 15/30/60min - Vehicle classification for same as above
7. Arterial Traffic Flow	- Volumes and speed by lane, by time of day, day of week - 5 min increments and accumulations in

	15/30/60min - Vehicle classification for same as above
10. Transit Usage	- Origin-destination using SmartCards - Passenger Counting for performance measures - On-time performance analysis using fleet management systems.
13. Incident Logs	- System impacts of incidents, need to combine with data from 1 and 7. - Need very precise geographic location
24/27. Probe Data/ vehicle trajectories	- Travel time and travel speed for specific network links. - Privacy issues.

Second Tier

4. Visual and video surveillance	- Concern that don't have software to interpret images to translate into data. - Privacy issues.
5. Electronic tolls	- Origin-destination by vehicle classification if coverage is broad enough. - Volume counts.
8. Traffic signal phasing	- Use in traffic simulation models. WHAT DATA???
25. Geographic referencing	This is key to ability to share data. Need direction/heading, lane number, street address, intersection, lat/long, lane use (HOV, one-way, reversible, turn prohibition), Problems with legacy systems, and GIS.

Others:
17. Construction work zones
18. Hazmat
19. Emissions
20. Parking management (congestion)

Group B
Deliberations

Group B included 15 individuals as shown below:

Facilitator	Robert Winick (Consultant)				
Recorder	Amy Polk-Gribbon (JPL)				
Note Taker	Hariett Dietz (FTA)				
ITS Architect	Bob Glass (JPL)				
NAME	**ORGANIZATION**	**Traf. Ops**	**Transit**	**CVO**	**Plan**
Chicago:					
Ed Christopher	Chicago Area Transportation Study				1
Mr. David Zavattero	Chicago Area Transportation Study	1			
Mr. Joseph Ligas	Illinois DOT	1			
Phoenix:					
Dan Powell	AZ DOT	1			
Mark Schlappi	Maricopa Association of Governments				1
Pierre Pretorius	AZTech ITS MDI	1			
OTHER NAMES					
David R. McElhaney	Consultant				1
Dave Barry	National Private Truck Council			1	
John Harding	FHWA	1			
Lee Simmons	JPO				
Dan Stock	ATA			1	

I - OPENING/INTRODUCTIONS:

What is the one thing you would like to see accomplished by considering user services in the ITS architecture?

Breakout session participants discussed their desired accomplishments for the workshop. Participants stated that would like the following to happen:

- The role of CVO data users and data generators should be identified.
- Recognize the need for and use of ITS-generated data. The wide range of planning applications, users and responsibilities should be recognized.

- Understand the needs of planners, plus other users of ITS-generated data.
- Planners should be an integral part of the ITS architecture.
- ITS data streams should be mapped to planning needs. Data from non- traditional ITS sources should also be mapped to planning needs.
- ITS data should eventually become an aid to investment decisions, to answer such questions as "How congested is our district?", "Where are transportation improvements most needed?", "Which improvements will be most effective in meeting our needs?"
- The workshop should result in better communication between planners and ITS people.
- The workshop should result in specific next steps.
- Data formats: How data will be processed, and who will do processing should eventually be determined.
- How can ITS data be integrated with other data sources.
- The workshop should result in new customers for ITS-generated data: planners, operators, decision-makers.

What is an important issue you think must be resolved before ITS becomes a data resource for transportation planners and operators?

Breakout session participants listed the following barriers to successful sharing of ITS-generated data among planners and other users. The following constraints/barriers were later defined as critical (see *III - Approaches to using ITS as a data resource* section):

- Resources, namely funding and staffing, are constantly in short supply. Archiving of historical data may not be a priority, and may be subject to budget cuts.
- Many view data ownership as power and don't want to give it up + turf battles.
- There are different objectives among planners and operators, and among regional, state and national levels. There is a lack of communication of these different objectives.
- Privacy concerns are a huge potential barrier. What happens to data after initial use?
- There is a need for tools to extract useful data. Plus, there is a need for standard definitions for common terms for aggregated data. For example: "level-of-service", "congestion" and "occupancy."
- There is a great difficulty in integrating legacy systems with newer systems, and integrating multiple legacy systems with each other.

The following constraints/barriers were later defined as not as critical (see *III - Approaches to using ITS as a data resource* section):

- There is a need to clearly define the problem, i.e. what exactly do planners want?
- Training is needed to develop professional capacity for sharing of ITS-generated data among planners and among computer "techies" who work for planning organizations.
- There is a need to account for planners' needs early at the design and maintenance stage of ITS systems.

- There is no clear mandate for any stakeholder organization to lead the effort of sharing ITS-generated data. "Who's in charge?"
- ITS-planning interface covers only one aspect of planning, i.e. transportation planning. There are other aspects of planning such as land use planning and waste disposal.
- High priority data needs, the "short list", is different for each organization.

II - UNDERSTANDING THE ISSUES AND CONSTRAINTS:

The purpose of this session is to identify and elaborate on key issues and constraints, both technical and institutional, that currently prevent ITS from realizing its potential as a data resource for planners. Each group should consider both current and future transportation planning practices in this discussion.

What impact could ITS data have on current transportation planning practices?

Participants discussed how planners and operators would use ITS-generated data if they had access to it. Some MPO representatives noted that it is difficult to know what data they need without having access to the full spectrum of ITS-generated data, in order to determine what is useful. Despite this "Catch-22," planning representatives were able to list some planning needs for ITS-generated data:

The continuous nature of volume count data collected by ITS surveillance systems would enable planners to adjust transportation demand forecasting models according to important factors, such as time-of-day, day-of-week and seasonal variations throughout the year. Calibration of models - checking simulation results with empirical measurements - was also mentioned as an important use for ITS-generated data. Electronic toll collection tags and probe vehicles equipped with GPS-based automatic vehicle location (AVL) systems would be extremely helpful in continuously collecting origin/destination (O/D) and travel time surveys. Currently, MPO's collect travel time and O/D data on an annual, 4-year or sometimes 10-year basis. With ITS as a data resource, planners could have access to this data on a continuous basis. Speed profiles, what type of vehicles (passenger cars v. commercial trucks) are going what speed, would be useful for air quality modeling. Locations, causes and duration of incidents noted on incident logs kept by many traffic operations centers would be helpful in assignment of law enforcement and incident response resources to maximize their effectiveness.

MPO representatives emphasized that the ITS organization generating the data should also "clean" it because ITS traditionally has more funding to perform this task than planning organizations. Data privacy was mentioned as an important issue, especially for commercial vehicles because travel times and origin/destination data are trade secrets for them. Aggregated data would be acceptable for commercial vehicle operators to share with planning organizations, more so than merely individual vehicle records stripped of identifying information.

A Chicago MPO representative brought along his organization's regional congestion management plan, which lists performance measures and data needs of that area's federally-mandated

Congestion Management System (CMS). The performance measures and data needs listed in the plan are similar to the data needs mentioned previously in the session: volume counts, speed profiles, O/D surveys and average travel times, plus traffic signal delays at intersections on arterial streets.

How could ITS data potentially change the future of transportation planning practice?

After listening to the discussion of the manual, cumbersome and expensive nature of many traditional data collection efforts, an ITS architecture representative predicted that ITS systems will enable planners to collect and analyze data on a continual, instead of multi-year basis. This architecture representative predicted that sharing of ITS-generated data will result in cost savings in data collection, and new, more insightful analyses.

An MPO representative predicted that, with or without ITS-generated data, the trend in transportation planning will be towards more of a short-term or even real-time emphasis. This MPO representative predicted that there would be less of an emphasis on planning for the design and construction of new roads, and more of an emphasis on efficient operations and maintenance of existing facilities. This MPO representative predicted that the dominant planning time frame would shift from long-range (20 years) to mid-range (3-5 years).

CVO representatives noted that dispatchers typically plan commercial vehicle routes 1 hour to 12 hours in the future. Incident locations and projected duration are the data elements most needed by this stakeholder group. Once again, privacy was mentioned as an important issue in the CVO industry. Furthermore, there are two significant components of the CVO private sector that have different needs for proprietary information: shippers, the manufactures whose products are being transported , and carriers - the trucking companies doing the transporting.

What data issues must be resolved/addressed before ITS becomes a viable source of data? Identify critical issues that should be the focus of future efforts to make ITS a resource for transportation planners.

The concept of a "Data Mine" - a single data repository that would handle logistical details such as access, storage and standard formats - was introduced. It was then discussed in this group that the organization running such a Data Mine would be different in different regions. MPO's, state governments, non-profit or for-profit consortia, and universities were all mentioned as possible organizations to operate the Data Mine. A traffic operations representative raised the issue of funding. Who would pay for such a Data Mine? As the example given by the lunchtime keynote speaker - Christine Johnson, Director of the USDOT ITS Joint Program Office, illustrated, data collection and archiving might be the first item to be cut in a lean budget year. A Chicago MPO representative noted that Chicago has a small data repository used by the MPO and university researchers. This representative emphasized that it is the tools that allow easy extraction of meaningful information that make the data repository a worthwhile effort. "It's a mine, not a dump." The ITS architecture representative noted that a Data Mine need not reside in one place or one organization. Given certain regional standards, the data repository could be a "virtual mine." Most participants felt that there is a need for federal guidance on key issues, such as standard data formats and access tools.

A debate ensued amongst planning representatives about whether or not this Data Mine should collect all available data, or should prioritize and only collect the most needed data. One planning representative said that, in light of limited resources, data needs should be prioritized and the Data Mine should archive only the high-priority data. Another planning representative said that he did not want to run the risk of not collecting and storing data that might be needed in the future. This debate highlighted the Catch-22 discussed earlier - that it is difficult for planners to know what data they need without having access to the full spectrum of ITS-generated data, in order to determine what is useful. The debate also emphasized the need for efficient organization of the data, which should be accomplished with both software tools and human resources. The concept of a "data librarian" was mentioned. The Florida DOT Statistics Office has plans to hire such a person in the next few months.

One advantage of the Data Mine concept is that it could shift the burden of giving access to data to members of the public who request it to a neutral third-party. Currently, traffic operators who store certain traffic data must expend limited manpower fulfilling requests from the general public, such as requests from local television stations for certain surveillance video. In addition, there may be some kinds of data users who may not be desirable, such as personal injury lawyers requesting surveillance video of accidents.

Privacy was mentioned again as an important issue to consider. What if law enforcement requested travel speeds and used surveillance video to identify individual drivers who exceeded speed limits? Procedures need to be developed for data security and to protect individual privacy. George Mason University researcher Priscilla Regan's 1996 study of privacy and ITS may be helpful in addressing this issue.

The issue of limited resources was raised again. Even assuming that data storage is inexpensive, the interface - data access software tools and people to run this Data Mine - cost money. A traffic operations representative noted that people often assume that traffic operations has excess funding. Data archiving and access is exactly the kind of extra duty that traffic operators might be asked to perform with no additional funding. Several planning representatives noted that, like traffic operators, MPO's and other planning organizations also do not have excess funding to operate the Data Mine.

The possibility was raised of a for-profit business to operate the Data Mine. A CVO load-matching service was mentioned as a possible for-profit organization to operate a CVO data repository. (The concept of a for-profit business running the Data Mine was discussed again in *III - Approaches to using ITS as a data resource* section.

III - APPROACHES TO USING ITS AS A DATA RESOURCE:

This session will provide participants an opportunity to share current strategies for using ITS as a data resource as well as brainstorm on how ITS data are (and can be) stored, processed, managed, and shared throughout the U.S. For those who have experience with the use of ITS data for planning, they can share the lessons learned from their experience and some ideas about what they would do differently if they had to start from scratch.

What do you do with ITS data now?

Phoenix traffic operations collects volume counts via in-ground sensors (loop detectors) in each lane, spaced every 1/3 miles apart on all instrumented freeways. There are 42 miles of freeway currently instrumented. Future implementation plans call for the remaining 34 miles of metro area freeways to be instrumented. Volume counts in 20-second intervals are collected and archived. These volume counts are stored for 12 months in a rolling archive. Phoenix traffic operations also keeps a log of incidents which occur anywhere on the freeway network, on instrumented and non-instrumented sections. This log records the location, time, date and duration of each incident. Phoenix traffic operations generally does not archive surveillance video.

The Phoenix MPO, in turn, uses ITS-generated volume count data for calibration of transportation planning models. The Phoenix MPO representative noted that manual transfer of data may be easier and less expensive than hiring a programmer to automate the process.

Chicago traffic operations, run by the Illinois DOT (IDOT), collects volume count and incident data in a similar manner as Phoenix. Volume count data is stored on magnetic tape “forever”. The data is used by IDOT themselves, as well as shared with the Chicago MPO. IDOT uses the real-time data collected to develop motorist information messages disseminated via various media, such as highway advisory radio and variable message signs. Another example of IDOT’s use of its own data was an analysis they performed on volume count data collected between 1982-1990. IDOT compared volume counts at freeway entrance ramps to volume counts on the mainline freeway, in order to evaluate the effectiveness of the region’s ramp metering program. Real-time average travel speeds on instrumented freeways and other data is shared with commercial traffic information services, such as Metro Networks and Shadow Traffic. Chicago traffic operations re-emphasized one benefit of a central data repository, that it would save on traffic operations staff time that is currently spent fulfilling data requests.

Electronic toll collection (ETC) customers serve as probe vehicles on toll roads operated by the Illinois State Toll Highway Authority (ISTHA), which is a separate organization from the Illinois DOT. Traffic operations staff from IDOT were involved in the design of the ETC system and paid for modifications to make the system better provide data from probe vehicles. (Batteries must be paid for by the ETC tag customers themselves, and the batteries are used every time the tag is read. Therefore, it is bad business practice for roadside readers to put too much drain on the ETC tag batteries.) Readers are placed a 3-mile intervals and give average travel time measurements for these segments. Currently, ISTHA has more than 2000 ETC customers. On ISTHA roads, incidents are detected by people calling in via cellular phones.

Chicago traffic operations noted that they keep hoping that a private company would create a for-profit business archiving, repackaging and selling this archived data. An estimated seven to ten companies have attempted to do so in the past few years, but all have gone out of business.

The Chicago MPO uses volume count data, collected from ITS and non-ITS sources, for calibration of their planning models. Volume counts were noted to be more important for this purpose than average travel speed. Intersection level-of-service is another important metric for analysis of traffic conditions on arterial streets. The physical characteristics of the transportation network are always important in creating accurate planning models. Origin/destination information collected via conventional means is also used. Finally, for air quality analysis, ITS-generated data is used to account for variations in congestion levels due to time-of-day, day-of-week and season-of-year.

A transit representative noted that continuous bus location, real-time passenger counts and fare collection information are all useful information in transit planning. Transit planners would also be interested in receiving and sharing incident information with other agencies in the region.

A CVO representative said that real-time congestion information is useful for truck re-routing. Sometimes, due to HAZMAT or weight restrictions, there is no alternative route. However, the congestion information would still be useful, enabling drivers and dispatchers to make accurate estimates of the duration of shipping assignments.

How did you solve/address some of the key issues identified above?

The group revisited the constraints/barriers to using ITS as a data resource identified in *I - Opening/Introductions*. Participants selected the most critical constraints/barriers, and then discussed ways to address each one.

- Resources, namely funding and staffing, are constantly in short supply. Archiving of historical data may not be a priority, and may be subject to budget cuts.
- There are different objectives among planners and operators, and among regional, state and national levels. There may be lack of communication of these differing objectives.
- Many view data ownership as power and don't want to give it up, turf battles.
- Privacy concerns are a huge potential barrier. What happens to data after initial use?
- There is a need for tools to extract useful data. Plus, there is a need for standard definitions for common terms for aggregated data. For example: "Level-of-service", "congestion" and "occupancy."
- There is a great difficulty in integrating legacy systems with newer systems, and integrating multiple legacy systems with each other.

There was a debate regarding the need for tools to extract useful data. Some participants thought that off-the-shelf spreadsheet software would be sufficient for data analysis. Other participants disagreed, saying that special software is needed.

Chicago area participants recalled that the ITS planning process, used for the ITS Strategic Early Deployment Plan (SEDP) and other regional ITS projects, was helpful in overcoming institutional barriers. This process got the planners and ITS advocates "at the same table."

It was noted that newcomer cities with few legacy systems, such as Phoenix, Atlanta and Salt Lake City, have the advantage of a clean slate.

What are the critical gaps in the data and pitfalls to using it?

One gap identified by many participants was the lack of comprehensive geographic coverage of data collection. A certain percentage of freeways instrumented is not enough. In addition, geographic formats are sometimes incompatible between different organizations. Chicago area participants described how a common geographical base map made sharing data among organizations much easier.

The issue of modal coverage was also identified. There is plenty of data collection on some modes, such as freeways and commuter rail lines. There is less or no coverage on other modes, such as traffic at intermodal freight yards. Parking space availability would be very helpful to planners in heavily congested urban areas. (Regulation of parking space availability is used by these urban areas as a land-use development control tool.) However, parking information is private and not shared with local governments. In Chicago, where parking payment is automated to some degree, each owner of each parking structure chain has its own automated payment card.

Another issue identified was the granularity of the data. Door-to-door O/D data would be more useful than average travel speeds on link segments. If O/D data is accomplished via an automatic vehicle location system (AVL), possibly with GPS, the privacy of individual travelers becomes a key issue. One possible solution proposed was to pay probe vehicle owners, in a manner similar to Neilsen ratings.

The quality and reliability of the data was also raised as a critical, and frequently overlooked, issue. If a loop detector reports zero volume counts during the rush hour period, is the road empty or is the detector malfunctioning? Who is responsible for ensuring the accuracy of data: the organization collecting it or the administrators of the Data Mine? Or is the end-user or customer responsible, setting a "Buyer Beware" atmosphere?

Another issue raised was that public records laws may result in burdensome storage and access requirements for local agencies. For example, a Minnesota public records law requires that any public data, including all traffic surveillance data stored by the traffic management system, must be archived for seven years and shared with anyone who asks for it. This legal requirement is one of the key reasons that the traffic management system does not store video surveillance data.

What do you think will improve the use of ITS as a data resource?

To aid in this group's understanding of the process of adding an ITS User Service to the ITS National Architecture, a representative of the ITS National Architecture Team gave a brief history of 30th ITS User Service - Highway-Rail Intersection (HRI). This is the only ITS User Service to be added to ITS National Architecture after the initial architecture design was completed.

Step 1: Identify the users and stakeholders. Have them describe their needs and thus the user service. The HRI User Service description was a 20-page document in the format found in the National ITS Program Plan.

Step 2: A leader of the user community should formally request that this new ITS User Service be added. In April 1996, The Federal Railroad Administration made a formal request to the ITS Strategic Planning Group that the Highway-Rail Intersection ITS User Service be added to the existing list of 29. (The ITS Strategic Planning Group acts as a steering committee for the national ITS program, run by the ITS Joint Program Office at USDOT.) The ITS Strategic Planning Group quickly approved FRA's request.

Step 3: Develop the user service requirements from the user service description. The HRI User Service Requirements was a 3-page document consisting of 42 "Shall" statements.

Step 4: The national architecture team - a consortium consisting of Odetics (formally "Rockwell International") and Lockheed Martin - revises the National ITS Architecture to accommodate this new ITS User Service and requirements, incorporating regular feedback from stakeholder groups. In the case of HRI, three formal reviews and several other less formal feedback sessions were conducted with stakeholders - mostly railroads and state government rail safety offices - as this work progressed. Integration of HRI into the National ITS Architecture was completed in January 1997, approximately 6 months after the architecture team began its effort.

Step 5: Forward list of required standards to appropriate Standards Development Organizations (SDO's). Five SDOs - consisting of trade groups and professional organizations - are under contract to the USDOT ITS Joint Program Office to develop ITS standards, using on a consensus decision-making process among their members.

Some participants expressed concern that the process to create a new ITS User Service is too cumbersome and would take too long. The Architecture Team representative responded that Steps 1 through 4 were completed, and the ITS National Architecture was modified to include railroad crossing safety considerations in less than a year.

Chicago MPO representatives provided a list of planning functions, in order to aid in identification of user needs in Step 1. Each planning function was described as either Long-range (more than 5 years), Short-range/Mid-range (1-5 years), or Operations Analysis (less than 1 year).

Planning Functions

Policy planning	Long-range
Long-range regional (20 year) plan	Long-range
Project planning/programming/prioritization	Short-range/Mid-range
Operations planning	Operations analysis
Safety planning	Operations analysis
Enforcement planning	Operations analysis
Modal planning - transit, port, airport, intermodal, etc.	Can be all three
Air quality planning	Short-range/Mid-range
Land-use regulation	Short-range/Mid-range
Financial forecasting	Short-range/Mid-range
Engineering & feasibility studies	Short-range/Mid-range
Simulation & modeling	Short-range/Mid-range
Maintenance planning	Short-range/Mid-range
Congestion Management Systems (CMS) planning	Short-range/Mid-range
Freight planning/Goods movement	Short-range/Mid-range

A survey was taken among the group of desired next steps, regarding the ITS National Architecture:

- Option A was defined as the creation of a separate ITS User Service (or multiple User Services) for Data Archiving.
- Option B was defined as the inclusion of data archiving requirements for each of the 30 existing ITS User Services.

There was a great diversity of opinion. Some participants voting for Option B voiced a concern that creation of a new ITS User Service would take too long and action is needed immediately. Some participants with traffic operations experience reiterated their concern for limited resources, expressing their desire to avoid an unfunded mandate, to avoid being required to run the Data Mine without additional funding. Participants voting for Option A predicted that creation of a new User Service seemed to be the best way to focus the resources and attention of the National ITS Architecture teams. Advocates of both approaches were trying to discern which option is more likely to result in funding and standards for this activity at a rapid pace.

IV - RE-BUILDING THE DATA FLOW MATRIX:

(The numbers associated below refer to the ITS Data Relevant to Transportation Planning and Operations Worksheet, available in this package)

The ITS System Architecture describes some flows for data that may be collected from various ITS sources. These flows have been represented in a matrix to suggest the source of the data and its potential use by planners. Ideally, the matrix is three-dimensional to reflect the *continuum of planning applications and their impact on data resolution. The purpose of this breakout session is to focus on the disconnect between data being generated by ITS and the planner's uses/needs of this data.*

Participants reviewed the ITS data source matrix, ranked data sources by priority, and noted issues associated with the collection, archiving and potential uses of this data. It was the consensus of the group that the data elements in Ref. #1 through Ref. #7 should be collected in as many lane miles of roadway of the metropolitan region and as frequently spaced as possible. Data reliability should be as accurate as possible. Data should be collected on a continuous basis.

Freeway and Toll Collection

Ref. #1: Freeway traffic flow surveillance data. Volume, speed and lane occupancy, vehicle classification and vehicle weight were all identified as high priority. Planners use these data elements for long-range planning, short-term facilities planning and air quality analysis. Vehicle classifications do not need to be as detailed as the 13 vehicle classifications required by the Highway Performance Monitoring System (HPMS). However, vehicle classifications should at a minimum meet the 8 types used in air quality analysis.

Ref. #2: Ramp meter and traffic signal preemptions. Time of preemption and location of preemption were identified as a low priority.

Ref. #3: Ramp meter and traffic signal cycle lengths. Begin time, end time, location and especially cycle length were identified as high priority, if the ramp meter or traffic signal is controlled by a demand-actuated dynamic algorithm, not just a set time-of-day pattern.

Ref. #4: Visual and video surveillance data. Time, location and length of vehicle queues collected by video surveillance were identified as low priority. However, there was discussion about the importance of video surveillance data in measuring vehicle occupancy, i.e. the number of people in a vehicle. Although current ITS technologies cannot automatically count the number of occupants in a car, certain video surveillance systems may facilitate manual counts. In addition, video surveillance data could aid in conducting license plate surveys, which are currently conducted manually.

Ref. #5: Vehicle counts from electronic toll collection. Time, location and vehicle counts from ETC systems were identified as high priority, in order to calculate volume counts on toll facilities - see Ref. #1.

Ref. #6: TMC generated traffic flow metrics. Linked congestion indices and stops/delay estimates were identified as medium priorities. Smoothed detector data was identified as really belonging in Ref. #1. Participants emphasized the need for national examples on congestion management system performance measures, such as level-of-service.

Arterial and Parking Management

Ref. #7: Arterial traffic flow surveillance data. Volume, speed and lane occupancy of arterials were identified as a high priority. In addition, data that could aid in the calculation of intersection level-of-service, such as average vehicle delay at intersection, would be high priority. The fact that in-ground sensors (loop detectors) are placed at different locations within an intersection to measure different parameters presents a problem for multiple uses of this data element.

Ref. #8: Traffic signal phasing and offsets. See note on traffic signal cycle lengths in Ref #3.

Ref. #9: Parking management. Time and lot location of available parking spaces were identified as a medium priority. MPO's currently collect this information by surveying lot owners over the phone. Regulation of construction of parking spaces is used by MPO's as a land-use development control tool. Parking space availability would also be helpful to many regional government organizations that run their own commuter park-and-ride lots. Parking space availability information would also allow MPO's to better estimate the transportation impacts of traffic generators, such as airports, malls and universities. License plate surveys conducted, through conventional not ITS means, at Milwaukee and Atlanta airports were mentioned as possible model projects.

Transit and Rideshare

Ref. #10: Transit usage. Vehicle boardings (by time and location), station origin/destination and paratransit origin/destination were identified as high priority. Another high priority data element not currently listed in the matrix is passenger boardings by bus stop location. Although APTS technologies currently exist to automatically count passenger boardings and disembarkations, coupling these technologies with an AVL system to get real-time locations has not worked well to date.

Ref. #11: Transit route deviations and advisories. Time, location and cause of route deviation, plus the alternative route taken by transit vehicles, were identified as low priority.

Ref. #12: Rideshare requests. Time and origin/destination of rideshare requests were identified as high priority, if ITS technologies could automate data collection and sharing. Participants mentioned the need for national examples on rideshare matching data.

Incident Management, Safety and Maintenance

Ref. #13: Incident logs. Despite the fact that incident logs are currently being collected by traffic operators and in some cases shared with regional planning organizations, data elements of incident logs were identified as low priority.

Ref. #14: Estimated train arrivals at Highway-Rail Intersections. Time, location and duration of train arrivals at railroad crossings were identified as low priority.

Ref. #15: Emergency vehicle dispatch records. Time, origin/destination and notification times of emergency response vehicles were identified as low priority.

Ref. #16: Emergency vehicle locations. Time and location of emergency vehicle assists, plus the type of vehicle assisted and type of vehicle performing assistance, were identified as low priority.

Ref. #17: Construction and work zone identification. Time, date, location of work zones, plus the number of lanes and shoulders blocked, were identified as low priority.

Commercial Vehicle Operations (CVO)

Ref. #18: Hazardous Material cargo identifiers. Time, route, HAZMAT cargo type and type of container or package of hazardous materials cargo were identified as low priority.

Ref. #19: Fleet Activity Reports. Inspection results, citation records and accident records of carriers were identified as low priority.

Ref. #20: Cargo identification. Cargo type and origin/destination were identified as high priority among private vehicle operators, whereas public organizations generally have little interest in this data. Another high priority data element of interest to commercial vehicle operators but not listed in the matrix was cargo weight.

Ref. #21: Border crossings. Origin/destination, counts by vehicle type and counts by cargo type of international border crossings were identified as low priority.

Environmental and Weather

Ref. #22: Emissions Management System. Time and location of pollution measurements were identified as high priority. Wind direction, wind speed and humidity were also identified as high priority weather data elements. The Clean Air Act Amendments of 1990 require regional transportation planning organizations to measure and report current levels of certain pollutants output by cars and trucks. Metropolitan areas that exceed minimum standards of pollution levels (called “non-attainment areas”) are required to implement, and are allocated limited funding for, transportation improvements to alleviate the pollution. These transportation improvements (called “Transportation Control Measures” or TCM’s) vary widely. Example programs include encouraging large employers to stagger work hours, or coordinating traffic signal timings to reduce stop-and-go traffic on arterial streets. The process of non-attainment metropolitan areas attempting to meet minimum pollution levels is called “conformity”.

Ref. #23: Weather data. See note about weather data elements in Ref. #22.

Vehicle and Passenger Information

Ref. #24: Location referencing data. The importance of a common geographical base map was mentioned in Session III.

Ref. #25: Probe data. Anonymous vehicle ID’s, segment location and travel time were identified as high priority. Even more useful would be full origin/destination data on selected vehicles. Considerations of using truck fleets, private vehicles and transit buses as vehicle probes were discussed. The issue of privacy was again raised as a major barrier to collection of this important data element. The E-ZPass electronic toll collection system in the New York City metro area gave an example of a possible solution to the privacy issue. The New York State DOT, through the Transcom consortium, uses ETC customers as probes. Customers are told this when signing up for the program, so that they have the option of not enrolling if privacy is a concern for them.

Ref. #26: VMS messages. Time, location and content of VMS messages were identified as low priority.

Ref. #27: Vehicle trajectories. Time, location (route), speed, acceleration and headway of vehicles were identified as low priority. However, there are new emissions modeling procedures currently under development that could potentially benefit from these data elements.

Ref. #28: TMC/Information Service Provider-generated route guidance. Time, location and estimated travel time of alternate routes provided by public traffic management centers and private information service providers were identified as low priority.

Group C
Deliberations

Group C included 17 individuals as shown below:

Facilitator	Jim Bunch (Mitretek)				
Recorder	Wendy Klancher (BTS)				
Note Taker	Robert Puentes (ITS America)				
ITS Architect	Ray Starsman (ITS America)				
		Traf.			
NAME	**ORGANIZATION**	**Ops**	**Transit**	**CVO**	**Plan**
San Antonio:					
Ms. Ling Yu	City of San Antonio				1
Russell Henk	TTI	1			
Shawn Turner	Texas Transportation Institute	1			
Houston:					
Rick Grochoske	Houston TranStar		1		
Portland:					
Terry Whister	Portland Metro (MPO)				1
OTHER NAMES:					
Hesham Rakha	VPI	1			
Pat Hu	ORNL				1
Brian Gardner	FHWA				1
Mark Kehrli	FHWA	1			
Mary Pigott	FHWA				
Steve Natzke	FHWA			1	
Allan DeBlasio	Volpe				1
Kim Richeson	JHU APL			1	

I - OPENING/INTRODUCTIONS:

The group discussed the possibility of creating a “Planning” bubble chart since the discipline itself is so amorphous. In other words, the group attempted to define “planning”. Planning activities involve using the past to project the future as a guide for decision making; however, different actors (MPOs, DOTs, city, county, transit properties, motor carriers, emergency medical services) have different needs depending on their function and time factor (short, intermediate, or long range)

The group also examined a number of functions performed by actors:

- MPO Function: Long Range System Planning, Air Quality Conformity, (5 - 20 year planning), Congestion Management Systems, Project Selection, Demographics (projections), MPOs are moving toward Average Travel Time rather than using Level of Service;
- DOT Function: Safety, Pavement and Bridge Maintenance Planning, Congestion and Construction Management Systems, (Short Range Planning). Need for Feedback and evaluation of Freeway Management Systems, Operations Planning
- Local Function: Event Planning, Operations, Land-Use Planning (Impact Analysis)

The group was asked generally what they would like to see accomplished at this workshop (i.e. what are the expectations). Several participants felt that:

There is a serious lack of awareness and communications between ITS practitioners and planners.

For example, since the two groups do not have open lines of communication, planners in Texas generally do not know what type of information they can get from the TransGuide system. Conversely, TransGuide does not know what planners need and what they want to do with the multitude of information they collect. Again, it would be useful to describe exactly "*what is planning?*".

II - UNDERSTANDING THE ISSUES AND CONSTRAINTS:

The group discussed the elements that encumber the ITS/Planning relationship:

The group expressed its frustration that:

It is difficult to evaluate the benefits of ITS projects since they change so often.

The group also felt that benefits are difficult to measure because many deployments have been recently deployed and have not been around long enough to evaluate.

However,

Using ITS for planning purposes could be an excellent demonstration of benefit.

This is where modeling could prove quite useful. It could enable others outside of ITS to see what kinds of data they can use. For example, data can be used to make an argument for investment. The ability to simulate benefits has been missing from ITS.

In addition, many agencies may not have the training to:

Leverage the data to achieve the goals of the organization.

Integrating data is key in normal day-to-day operations but the collection of that data must be automated. Unfortunately, there is a shortage of skilled personnel so people still have to be trained to be able to identify the potential errors. In this regard, it is quite difficult to go from the conceptual to a practical application.

The group discussed Houston TranStar and their "flagship" project which is the 100 miles of freeway speeds that is collected and archived through AVI.

They key element was convincing the decision makers that they needed to save the data.

This, however, brings up key issues such as data storage and access. Although freeway speeds are available for 100 miles of roads in Houston, there are no comparable indication of incidents. The incidents are indicated through logs, but the linear (or location) referencing system (LRS) used is different; therefore, the data points are not comparable/compatible. (i.e., the speed data is on one LRS and the incident data is on another). *Data integration* is the key.

Data dictionaries are needed

Data dictionaries are needed to justify and retain the same data and it needs to be described in ways everyone (including key decision-makers) can understand. However, when data is standardized, it looses the ability to be flexible for particular needs.

The addition of standards should not slow down deployment

The addition of standards should not slow down deployment and/or the purchase of certain units. ITS deployment in some cities is done by folks with trim budgets and putting up obstacles can seriously hinder its development. Also, they want something that is reliable because their budgets are so small.

Also, since some agencies (MPO's, traffic centers, etc.) have quite a bit of data while others have little or none, an important issue is:

How does one share or borrow data?

It was mentioned that the Volpe Center is trying to document, as case studies, what areas and agencies are using ITS data - early deployments for ITS data use such as transit agencies - that could assist in this effort.

Summary of Critical Issues:

- Lack of awareness of technology. Need to train personnel/Professional Capacity Building (PCB)
- Leveraging data to achieve organizational goals
- Institutional barriers and communication infrastructure

- Data quality
- Overlapping efforts in traffic monitoring (HPMS, local counts, ITS sensors)
- Access, mining and aggregation of large amounts of data
- Disconnect between location reference of incidence data and loop data (*data integration*)
- Real-time data is not needed for long-range planning
- Data Dictionary: documenting format
- Cooperation and data "ownership"
- Costs and risk in investment of new technologies
- Data sharing and fusion
- Case studies of ITS data use would be very helpful (i.e. Transit Route Planning Case Study)

III - APPROACHES TO USING ITS AS A DATA RESOURCE:

The group discussed their strategies and needs for ITS data, lessons learned and critical gaps and pitfalls to using this data. The group also brainstormed to fill-in what could not be covered by first-hand experiences.

For example, Texas Transportation Institute (TTI) produced a CD-ROM containing ITS data. What is done with the data depends on the computer system and its output. They are computing link travel time. But it can also be used for O/D data. Data storage costs, including hardware and database administration, must be taken into consideration. Steps to accomplish this:

1. ask who would use the data (e.g., projects within TTI);
2. initiate dialogue with data providers;
3. developing algorithms for cleaning the data;
4. putting the information on-line is the way around the access issue.

In San Antonio, data is collected on the system performance, signalization, etc. - 700 signals are tied into a central location. The data is used just to monitor the system. It is not saved because they don't have the room. Storage is time consuming because it's a lot of database maintenance. However, a new planning model may change their data requirements. It is important to look into the future - not just the current needs.

Houston TranStar has 2000 signals; however, they are not tied into a central system. Nearly half of the signals are still non-ITS. But, the AVI and real time data that is collected is all saved - but used only for training personnel. (e.g., How long did it take to clear that accident? That's the information they can get.).

For the most part, information collected from video surveillance cameras are not saved because the issue of ***liability*** is a great concern.

Selling the data? The question was raised as to whether governments should simply sell the data to the private sector in order to recuperate their costs. If a business model exists whereby the private sector can make money by adding enough value to the data, then the public sector should consider selling the data; however, data privacy should not be compromised at any time.

The critical gaps identified by the group included:

1. loop detection cannot obtain speeds below 30 mph. Interesting modeling starts at 30 mph and less
2. need vehicle classification tags
3. O-D data
4. Special studies such as cellular phones and grids (possibly release forms could be signed by users to overcome the liability issue)
5. Characteristics of freight
6. Documentation
7. Integration (minimum standard keys like time stamps)
8. Geo-coding issues
9. Linear or location referencing issues—the need to have a common base so geo–referenced data is compatible

Summary of How to Produce and Use the Data; How to Improve?

- First ask who would use the data, engage a dialogue with the user, and clean the data accordingly
- Data quality is dependent on two elements : technology and processing
- Internet access
- Storage cost: about $100 per gigabyte. The greater cost is in time and effort in database administration
- Integration (incident response with weather data, monitoring data, etc..)
- Speed (Infrared)
- AVI for O-D data (done manually in San Antonio)
- With aggregation variability is lost
- Human Interface is the weak link
- CCTV storage and liability issues
- Time stamps would be helpful
- TMC "crises" take precedence over data collection
- Opportunity for value added data (selling data to ISP to cover costs of public investment)
- ISP model a good idea - should be explored
- The DEVELOPER of a model first *Verifies* the model (debugging) and then *Validates* the model to ensure it is consistent with theory . The USER of the model *calibrates* by fine-tuning parameters.

IV - REBUILDING THE DATA FLOW MATRIX:

The group discussed the following question:

Is there a need for a separate user service?

Two plausible options were presented:

1. Take all the planning requirements and create a new planning user service; or
2. Take existing user services and establish planning requirements around them (traffic, transit, etc.).

It was generally felt that a new user service is required: however, semantic issues of whether it should be referred to as a *planning* user service or a descriptive term, such as *data archival*.

The group then examined each of the ITS data elements relevant to transportation planning and operations identified on the matrix. The group decided the following items were not particularly useful:

(The numbers associated below refer to the ITS Data Relevant to Transportation Planning and Operations Worksheet, available in this package)

4. Visual and Video Surveillance Data - low usefulness in saving the data The liability is like the 3rd rail! Its a nice item to have but expensive to convert to planning or modeling uses.
11. Transit Route Deviations and Advisories - limited use except for special studies and/or evaluating new ITS user services.
14. Estimated Train Arrivals at HRI - limited for special planning use.
15. Emergency Vehicle Dispatch Records - limited for special planning use.
16. Emergency Vehicle Locations - limited for special planning use.
17. Construction and Work Zone Identification - good to track exception data as it exists from time to time. Nice to have - but not critical.
19. Fleet Activity Reports - little perceived usefulness.
22. Emissions Management System - actually useful data, but undesired due to political sensitivities.

The remaining data items were generally felt to be useful in providing data to planners. However, two new items need to be added:

1. *Transit AVL* should be added because it is a different than private probes. This is the only data stream you can use for short-term and add to long-term.
2. *CVO Business Systems* data is quite useful for O/D data.

Group D
Deliberations

Group D included 18 individuals as shown below:

Facilitator	Wende O'Neill (BTS)				
Recorder	Mark Carter (SAIC)				
Note Taker	Russ Capelle (BTS)				
ITS Architect	Rob Jaffe (Jaffe Engineering)				
NAME	**ORGANIZATION**	**Traf. Ops**	**Transit**	**CVO**	**Plan**
Minneapolis:					
Eil Kwon	University of Minnesota	1			
Mr. Pierre Carpenter	Minnesota Department of Transportation			1	
NY/NJ/CT					
Edward Mark	NY DOT	1			
Jim Davis			1		
Ronald W. Tweedie	NY DOT				1
Al Karoly	NY DOT	1			
Orlando/Florida					
Bob Krzeminiski	Florida Department of Transportation				1
Harshad Desai	FDOT				1
San Francisco					
Charles L. Purvis	MTC				1
Martha Tate Glass	Califonia DOT				1
OTHER NAMES					
Debbie Buchacz	AASHTO				1
Eva Lerner-Lam	ITSA/Palisades		1		
Harry Caldwell	FHWA			1	
Henry Lieu	FHWA	1			

I - OPENING/INTRODUCTIONS:

What is the one thing you would like to see accomplished by considering user services in the ITS architecture? What is an important issue you think must be resolved before ITS becomes a data resource for transportation planners and operators?

The most important goal of group was to bring the ITS and planning worlds together. There is great potential for ITS to supplement data currently used in planning practice and provide data for entirely new ways of planning.

Institutional barriers are a key issue, but critical technical issues inhibit data sharing as well, such as data quality, and temporal and geographic coverage. Institutional barriers can lean to technical ones. Lack of inter-organizational cooperation can lead to incompatibility data formats.

There was a discussion about whether or not aggregation of the data before storage would make the data more useful. Some thought that user requirements should be defined beforehand, data aggregated to meet those requirements. Others predict that their current needs (or future needs that they don't know about yet) would not be met if data was aggregated. Aggregation always means that some detail is lost.

II - UNDERSTANDING THE ISSUES AND CONSTRAINTS:

The purpose of this session is to identify and elaborate on key issues and constraints, both technical and institutional, that currently prevent ITS from realizing its potential as a data resource for planners. Each group should consider both current and future transportation planning practices in this discussion.

What impact could ITS data have on current transportation planning practices? How could ITS data potentially change the future of transportation planning practice? What data issues must be resolved/addressed before ITS becomes a viable source of data? Identify critical issues that should be the focus of future efforts to make ITS a resource for transportation planners.

The concept of privatized ITS-planning data center was discussed. Such a center would fulfill requests by people and perform needed processing. The Center would also publicize what data is available. Again, data quality, accuracy, and aggregation are important issues.

Several ITS standards-setting activities were discussed, such as the Traffic Management Data Dictionary and Location Referencing Management System. Should the planning community hope that their needs are accommodated by current standards or should they define their own needs first and then set standards based on their own needs? The latter line of thinking would endorse the concept of an ITS User Service for archived data.

One participant described the experience developing location referencing system, where requirements came from operations personnel, who do not necessarily see themselves as ITS personnel. Those setting the standards need to educate operations personnel and draw the requirements out of them.

III - APPROACHES TO USING ITS AS A DATA RESOURCE:

This session will provide participants an opportunity to share current strategies for using ITS as a data resource as well as brainstorm on how ITS data are (and can be) stored, processed, managed, and shared throughout the U.S. For those who have experience with the use of ITS data for planning, they can share the lessons learned from their experience and some ideas about what they would do differently if they had to start from scratch.

What do you do with ITS data now? How did you solve/address some of the key issues identified above? What are the critical gaps in the data and pitfalls to using it? What do you think will improve the use of ITS as a data resource?

In the New York metropolitan area, planners receive incident information from traffic operators. They analyze the data by incident location, duration, severity, weather condition and type of vehicle. They prefer that the information be provided to them in an electronic database format such as dBase. A regional clearinghouse provides the information.

The New York DOT also uses data from the EZPass toll collection system. The system provides the home zip code of users of the HOV lanes and those going through general use lanes. That allows the state DOT to analyze demand on the two different types of lanes. However, the toll agencies do not want publicized the fact that EZPass users' zip code information is given out.

In Florida, the state DOT is trying to bring together for analysis incident data from all the different Districts in the state. They are interested in analyzing incident data by location, time, direction of travel and other factors. However, the different Districts collect and store state in different formats.

The University of Minnesota gets 30-second volume count data from 3,000 loop detectors installed throughout the metro area and operated by the state Traffic Management Center (TMC). The University and the state use this data to test traffic models. Several important issues have arose:

- Data quality – Some detectors are not functioning correctly. Location of the loops is pre-fixed, not always providing data needed for models.
- Coverage – Currently, only 70% of the metro area freeway network is instrumented with detectors. The goal is to have total coverage by 2002.
- Format – The Traffic Management Center outputs the data in a one-column ASCII file. The University then must write software to reformat the data, which is a time-consuming process.

The San Francisco metropolitan area also has a data collection system using loop detectors, which feeds information to both transportation planners and the TravInfo traveler information system. The MPO is also interested in using data form probe vehicles, equipped with ETC transponders.

There was a discussion about the use of innovative, experimental forms of traffic detection, such as using cellular phone users as vehicle probes. Location of cellular phones is now accurate enough that using these point locations is feasible for vehicle location and calculation of vehicle speed and travel time. An operational test of such a system took place in the Washington, D.C. area in 1995-1996. Mercedes and the Seattle Metropolitan Mode Deployment Initiative project will also be testing the concept in the next few years.

Participants believed that it is necessary to have secondary uses of data in mind when the data collection systems are designed. Currently, there are unfortunate mismatches. Data are being collected and not used, and needed data are not being collected. One way to make sure that secondary uses are considered at the design state of ITS systems is revision of the National Architecture, plus some sort of requirement that the Architecture is followed in the design of systems. However, there was great uncertainty among the group as to U.S. DOT policy on this issue.

IV - REBUILDING THE DATA FLOW MATRIX:

The ITS System Architecture describes some flows for data that may be collected from various ITS sources. These flows have been represented in a matrix to suggest the source of the data and its potential use by planners. Ideally, the matrix is three-dimensional to reflect the continuum of planning applications and their impact on data resolution. The purpose of this breakout session is to focus on the disconnect between data being generated by ITS and the planner's uses/needs of this data.

One of the participants provided a list of these secondary uses of ITS-collected data:

- Operations
- Planning
- Design
- Construction
- Administration
- Maintenance

The participants discussed what data were needed for each of these functions.

Types of data needed for Operations include: travel time/speed, lane occupancy, vehicle occupancy, transit boardings, incidents, special events data, volume and throughput, construction/workzone locations and schedules, queue wait time at ramp maters, road (pavement) and weather conditions, and system inventory. Vehicle classification and weight are needed to a lesser extent, such as for pavement management. Some demographic information would be useful, such as customer databases, such as those of an electronic toll collection system. Parking information would also be useful. Inventory of traffic control devices, including traveler information media such as variable message signs would be especially helpful in determining the effectiveness of those devices.

The Planning function seemed to need much the same data as Operations. However, planners made use of derived performance measures rather than raw data. Some of the performance measures used by planners are: duration and extent of congestion, spatial distribution of accidents, and HOV effectiveness (persons carried in HOV lanes v. unrestricted lanes). Freight origin/destination data are used to calculate commodity flow. Planners could also benefit from environmental data, such as Code Red days when special demand reduction strategies are employed.

The Design, Construction, Administration and Maintenance have similar data needs as the Planning function, i.e. raw data used to derive performance measures.

The group brainstormed ways in which data from widely different sources could be used for innovative purposes, such as optimizing snow plow routing. This discussion highlighted the necessity of a good geographic referencing system to tie spatial data from different sources together for analysis. The facilitator noted that the Bureau of Transportation Statistics is producing a CD-ROM with case studies of successful implementations of linear referencing systems in GIS.

Group E
Deliberations

Group E included 19 individuals as shown below:

Facilitator	Erin Bard (Apogee Research)				
Recorder	Jon Obenberger (FHWA)				
Note Taker	Joe Mergel (Volpe)				
ITS Architect	Bruce Eisenhart (Lockheed-Martin)				
		Traf.			
NAME	**ORGANIZATION**	**Ops**	**Transit**	**CVO**	**Plan**
Detroit/Oakland County					
Ray Klucens	Michigan DOT	1			
Steve Underwood	Univ. of Michigan				1
Los Angeles					
David Stein	SCAG				1
Philadelphia:					
John Coscia	Delaware Valley Regional Planning Commission				1
Seattle:					
Dave Reinerson	King County Metro Transit/DOT		1		
Bob Sicko	Puget Sound Regional Council				1
Mark Hallenbeck	TRAC				1
Dan Dailey	Univ. of Washington				1
OTHER NAMES					
Janet Oakley	AMPO				
Phil Masters	Ministry of Transport, Ontario	1			
Carl Sobremisana	MARAD			1	
George Mundell	IANA			1	
Don Roberts	Mitretek	1			
John Kaliski	Cambridge Systematics			1	
Jeff Secrist	FHWA			1	

I - OPENING/INTRODUCTIONS:

The participants were asked two focus questions:
1. What is one thing you would like to see accomplished by considering user services in the ITS architecture?
2. What is an important issue you think must be resolved before ITS becomes a data resource for transportation planners and operators?

While half of the participants had no thoughts on the matter, ten of the participants offered the following observations and comments:

- The workshop should identify uses for ITS data
- The workshop should provide a better understanding of the need for and usefulness of data
- The focus of the workshop should be on data rather than planning
- The public sector could benefit by gaining an understanding of issues faced by private transportation companies (who have already done it) in archiving, accessing and managing data
- What data is available from ITS and how one could get at it?
- What data was needed for freight planning by MPOs and others, in order to better match data collection with what was needed. Privacy issues related to CVO data are a potential obstacle in the overall process
- The workshop should open to a dialogue between users and suppliers of data
- The workshop should open a discussion of needs vs. availability of data
- The workshop should provide a better understanding of the data’s problems: an understanding of what is there or what we really do have; and an understanding of what is involved in transforming a tremendous volume of data into summary information.

II - UNDERSTANDING THE ISSUES AND CONSTRAINTS:

The purpose of this session was to identify and elaborate on key issues and constraints, both technical and institutional, that currently prevent ITS from realizing its potential as a data resource for planners. The group decided to ignore the focus questions on the agenda, and instead chose to engage in an open ended, top down approach to identifying issues and constraints.

The major points raised during the discussion are indicated below in roughly chronological order, followed by a short summary of the group's major conclusions.

One of the major points of departure for the group was to change the focus of discussions from the use of ITS data by planners to the more general data potential of ITS.

The concept of a "data mine" (or a data explosion) was introduced. Planning was defined as the application of local expert knowledge to information. The group stressed the need to discuss planning and data separately. Then any kind of planning can be done (long range planning, operations planning, etc.), once the mine exists.

The group was requested to focus on either data for planners (a very narrow focus) or the data resource potential of ITS.

The group then determined a list of activities that might use data coming from ITS:

- Operations planning
  - Roadway maintenance
  - Traffic
- Decision support
- Performance monitoring
- Pavement performance/capacity
- Simulation modeling - model calibration - tools
- Research
- Resource allocation/prioritization
- Private sector consumption
- Equity/fair share (Compare who pays for what, who benefits.)
- Historical review
- Devolution
- General public consumption

It was also noted that different levels of planning, as indicated below, imply different levels of data needs/requirements:

- strategic planning
- programming - resource allocation
- project specific planning

Major issues identified in the discussion of the use of ITS data were as follows:

- Accessibility
- Shared use of common data collected
- Policy - strategic
  - Provide more data to decision-making process - political level
  - Provide information at appropriate level for effective understanding
  - Match architecture and requirements

    - Can information available be used now?
- Conversion of data into information for different uses
    - Information vs. data (communication)
    - Data “mine” - what to store, what to throw out
    - Planning (apply information to an application)
- Real-time dependent needs for data
- Time horizons with use of data
    - Operations
    - Land use
    - Infrastructure development
- Types of decisions and data
    - Planning
    - Design (historical)
    - Operations (historical or real time)
- Miscellaneous data issues

The group attempted to flesh out the concept of the data “mine”, and developed a list of factors that would have to be addressed in developing a data “mine”:

- Data mine structure - what to store, throw away
- Electronic vs. protocol (person to person) communications
- Establish data standards/firewall/protocol/formats
- Iterative process needed to develop the mine?
    - How to store it - mine(operator)
    - What it is - quality dimensions
    - It exists - can you use it?
    - Here is how you get at it - access
    - Is it worth using? - reconcile, quality
- Technical and institutional cost issues
    - Cost to collect
    - Cost to use
    - Cost of no data
- Uses of data
    - Primary – real-time use in operations
    - Secondary - save data if small incremental cost

Development of integrated systems would require a consideration of the following factors:

- Cost differential with central processing
- Communication costs
- Legacy systems issues
- Backbone system
- Data - protocol
- Institutional barriers - understand needs of each other
- Access

- Types of data to collect and address in order to support the process of planning and project decisions
  - Check list to reference
  - Include all stakeholders
  - Identify all data sources/ needs
  - Identify the system builder and roles and responsibilities for agencies in the region (entire transportation system)
  - Open system design - justify incremental costs based on benefits

The group then tried to summarize the key institutional/technical issues related to the mine, as indicated below. The group concluded that it was not possible to easily separate the technical from the institutional.

- Data mine structure
  - How to store it
  - What to store
- What it is - definition (protocol)
- What are you going to do to it
  - Human validation (yes - no)
  - Pre-filter
- Tell people it is available
- How you get the data (pay?, privacy)

It was stressed that the development of the mine would have to be an iterative process.

Over arching issues related to the data mine structure were identified as:

- Data reconciliation
- Deciding who does what in the overall process
- Quality control
- Cost
- Configuration management
- Need for a vision - champion - facilitation
- Effect of outside influences
- Ability to communicate

In summary, the group agreed upon the following:

- There is a data mine (ITS systems only - marginal cost)

- Technical/Institutional sides to the mine
  - What is in it?
  - Quality Control

- Communication Process
    - Tell the world it exists
    - Tell them how to get access to it (protocol) - planners mine data
    - What it is
- Who does what
- Cost
- Iterative development
    - Give and take between supplier /user
    - User inputs change the above
    - (Also iterative in the design process)

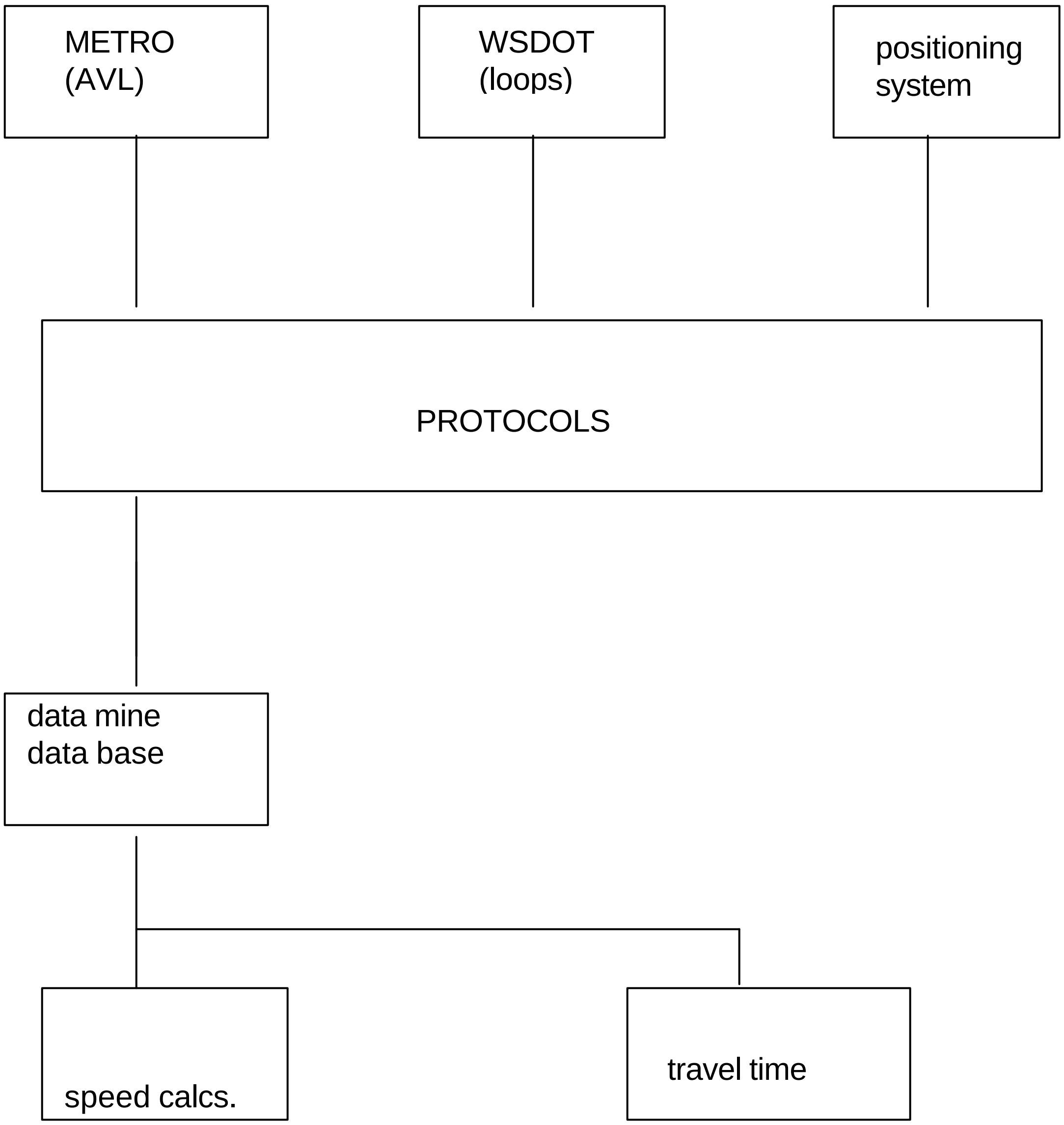
III - APPROACHES TO USING ITS AS A DATA RESOURCE:

The purpose of this session was to provide participants an opportunity to share their experience for using ITS as a data resource. As in the previous session the participants chose to ignore the focus questions presented in the agenda.

Individuals from Seattle, Toronto, Detroit, Philadelphia and Los Angeles presented their experience with the use of ITS data for planning. The group then put together a set of summary points which represented a common thread among the experiences shared by the participants.

<u>Seattle</u>

Seattle used a number of legacy systems for research purposes. This was illustrated in the diagram below. Data flows through the components. The key features are a set of ID interfaces and protocols which allow the integration of data from several sources to be “processed” and sent to the database/data “mine”. This data can then be fed to various modules for further processing.



The use of ITS data by Seattle Transit was described. Automatic Passenger Counting (APC) data is processed with schedule data and GIS data. Route attribute and stop data are added later. They use the data to do trend analysis. Separate groups in METRO, the Service Development, and Manage Information Technology groups and the outside world (e.g., consultants) use the data.

Multiple uses of the same data implied multiple checks on data, and that this provided an added dimension to Quality Control.

A users' manual, on-line help, and new user training aids in educating people on the use of the data are available.

The danger in giving data to users who are not aware of what the data really means was stressed. If data is given out - data is out of your control.

Ontario

The Toronto freeway ATMS was described. They save raw data for 3 separate sections of freeway from the freeway management system. It was noted that they only get data for a small portion of the region's road network. They have always saved data (just in case), and have data going back to 1975, in some form.

Their data base structure is indicated below. This is their "Powerhouse" real time data base system. It contains historical data, and can be accessed on demand.

20 sec. volume, speed, occupancy, length	incidents	configuration of network includes loop location
A	B	C

They provide data to other planning and construction groups in the Ministry of Transport. Maintenance staff also uses the data to determine closure times. In addition, the City of Toronto has access to Highway 401 data.

They backed into the current system. It was not designed in advance. It was noted that permanent (analog & proprietary PC) loop stations may not integrate. When the system was extended they had to redo detector location codes, etc. They developed a "reader' for the electronic data (on disk). This solved system ID and location problems so data can be compared historically.

Initially, data users <u>were</u> primarily universities. (They knew it was there.) The system operators educated others, internal users within the Ministry of transport. Now, more people know about data (public, TV stations, consultants), and more and more people are seeking data (TV stations have access to their cameras). They are going to start charging for data because private sector resuppliers are taking free data and selling it.

Detroit

Volume data only is now collected from the 32 mile freeway ATMS. They have distributed tapes with the data. Their customers have been designers at MDOT, people responsible for maintaining traffic on construction projects, and MDOT planners (transportation planning group). These planners now have a modem connection to the database.

In the future they hope to expand the system to 140 miles to include the Oakland County FASTRAC system data (20 sec. data) with a capability to plug into other uses (open architecture). They plan to establish a total link between the street system ATMS and freeway management system.

It was noted that a private vendor is being selected to package and sell the traffic volume data produced by the system.

Philadelphia

While they have no current experience with ITS data, they see ITS as way to simplify data collection and reduces manual counts. They currently have 4 people involved in data collection, and noted that it was almost impossible to get data on high volume roads without improved technology. The data they need includes volume, occupancy, travel time, and speed.

Los Angeles

In Los Angeles the planners have no real experience with ITS data. Institutional problems are greater than anything else. It was noted that having data to coordinate signals is not same as having the political will to coordinate signal systems.

Although there are a number of TMCs in the region, SCAG gets no data from them, even though the TMCs do save data. However, SCAG doesn't really know which centers have data. Inter-agency coordination is poor among operating agencies. Caltrans data has quality issues.

The planners from both Philadelphia and Los Angeles indicated that they would want data in electronic form.

The group then summarized their collective experience with the use of ITS data as follows:

- Some data is available and is stored in some regions (generally the data is available for a region's most heavily traveled links).

- If planning requirements are part of system design, planning data is readily accessible.

- We aren't communicating well, regarding data availability, but improving.
- There isn't any regional data coordination agency.
- Recent changes to electronic connectivity will improve rapidly and will continue to cause changes.
- We really have done a lot. It's just the beginning.
- A major gap appears to be the lack of a common GIS/location referencing system.

IV - RE-BUILDING THE DATA FLOW MATRIX:

The ITS System Architecture describes some flows for data that may be collected from various ITS sources. These flows were represented in a matrix to suggest the source of data and its potential use by planners. The purpose of this session was to have participants fill out the elements of the matrix giving examples of uses and applications for each data item, if any; specific data item requirements, e.g., temporal coverage, units of measure, etc.; and identifying issues for ITS system design related to that data item as well as identifying data items that might be required but which were not being collected by ITS.

The group was divided into a number of subgroups in order to work on filling out the matrix. The actual output of this process was submitted to the conference coordinators and are not a part of these deliberations.

The subgroups then reconvened as a larger group and discussed what was learned in attempting to fill out the matrix. General comments presented are indicated below, followed by the groups' attempt to reach a consensus on major conclusions and recommendations, and to summarize the lessons learned as a result of this exercise.

The group recognized the political issues/turf issues associated with data. Everyone agreed on the need for data, but the question was how to get it. **It was pointed out that a single user service might be politically better, even though technically it doesn't matter if we have a new user service or add requirements to existing services**.

Various "Discoveries" were made in the process of filling out the matrix:

- Different technologies produce different types of data creating difficulty with data standards. Implies need for self-describing data.
- "Not everyone can produce the same kind of data". Not everyone can meet a "standard" with their system, therefore we can't set the standard too high.

- Moreover, there is variation in the type and quality of data within a region/system. There is variation between regions/systems also.

- Could we have a minimum standard for new systems? Operations needs dictate data gathered so maybe not. But we need standards for communicating data (protocols). At least mandate a protocol so any data can be transmitted. The architecture needs to define protocols robust enough to transmit any type of data.

- Let's see who wants the data at all. More broadly, what are the tasks and functions the data supports?

- Implementation of data service could be done many ways to meet needs.

- There are issues beyond the architecture - architecture would just say "store the data" and probably would not address Quality Control or privacy issues which are implementation issues. Data definition must include quality.

- If data changes over time, requirements will change over time also. Need periodic review of architecture.

- Not possible to define national standards. Give and take needed to define specifics. Needs to be a local level decision.

- Could use architecture to standardize some data. Could tell "where we go" without specifying what/how it is done?

- Many audiences, implies many data needs.

- Shouldn't look at data types in detail. Need "rule of thumb" , e.g., store data, transmit data rather than detailed specs. of units of measure, geographic level, etc.

- Shouldn't look at data types and what is stored, etc., look at each system, adopt rules of thumb for storage, communication, and protocols:
  - Need to store data at lowest level of aggregation that you can afford.
  - Need Quality Control function
  - Need Aggregation function

The real challenge in terms of planning is not to think about what we did in the past, or what we do now but rather what we could be doing in future. Everything planners do is based on what is available.

So this might mean we must have a user service.

Can we ID high level data needs as the basis for specific data needs?

The group recognized that we don't:

- have enough data
- capture it systematically
- share it well.

This discussion led to the group to the conclusion:

IMPLEMENT LOCALLY - FACILITATE NATIONALLY.

Comparison across local systems (from federal perspective) requires standard data input to meet standard reporting requirements.

In addition it was recognized that there was a need to foster integration across local jurisdictions, within a region, and local level understanding of each agency's data. So there will be some pre-defined data needs

Finally it was suggested that Levels of Standardization (either equipment e.g., NTCIP, or evaluation standards, e.g., "NEXTEA) will drive data standards.

The following Next Steps were identified:

- Define requirements in more detail for user service.
- Develop outreach plan for locals.
- Coordinate with architecture constituency.
- Develop the "shopping list" of stakeholder data needs.
- Create a sales document ("for little money you get big benefits"). (Need a different sales document for different groups - ITS audience, planning audience, those who pay for it/politicians)

Closing Remarks, Observations, and Next Steps

Much of the data generated by Intelligent Transportation Systems (ITS) can be of great value beyond their immediate use in real-time control strategies. However, unless ITS operators have made special provisions, data from system surveillance equipment and other sensors are typically not stored for future use. Because the amount of data is so enormous, it is doubtful that simply saving the raw data would be of use to other stakeholders; some level of aggregation or sampling is required to make the data more meaningful to stakeholders.

Furthermore, the ITS National Architecture currently has no specification for a data archival process. In fact, the "PLANNING" sub-system implemented by the National ITS Architecture Team, as a center sub-system in the ITS Physical Architecture, does not address data storage and archival. During the development of the National ITS Architecture, the Architecture Team foresaw the need for a "PLANNING" function; however, no stakeholders were identified or stepped forward at that time. The Architecture Team openly admits that the "PLANNING" sub-system was developed without a stakeholder input, and thus without a previously identified user service. Therefore, it was recommended that continued attention to the "PLANNING" sub-system would probably not be particularly beneficial to the ultimate goals and objectives of this Workshop.

Instead, attention should be directed toward the development of an *ITS data user service*. Because of the wide range of support among stakeholders represented, the Workshop concluded that there is clearly a need for a new user service to be included in the National ITS Architecture. A tasking was given to Rich Margiotta (SAIC/TransCore) by Gary Maring (FHWA - Director, Office of Highway Information Management) to begin the development of this user service for eventual inclusion into the National ITS Architecture. The actual name of this service was not defined in the workshop; however, several suggestions were floated including *Archived Data User Service*.

The next steps were identified as follows:
1. defining the user service
2. developing the user requirements for eventual revision of the National ITS Architecture
3. implementing the user service and associated requirements in the National ITS Architecture
4. identifying additional steps for implementation beyond inclusion in the Architecture
5. fostering communication between stakeholder groups, and outreach to the Association of Metropolitan Planning Organizations (AMPO), Transportation Research Board (TRB), and other agencies.

Clearly, the potential of ITS data is so great that the definition of its own user service is warranted. The creation of a new user service requires that the Architecture be amended to include it. The first step in this process is the definition of the user service, including its stakeholders, main functions, costs and benefits, and technical and institutional issues.

The development of an ITS user service was previously described in a breakout group as follows:

Step 1: Identify the users and stakeholders. Have them describe their needs and thus the user service.

Step 2: A leader of the user community formally requests the ITS Strategic Planning Group that this new ITS User Service be added. (The ITS Strategic Planning Group acts as a steering committee for the national ITS program, run by the ITS Joint Program Office at USDOT.)

Step 3: Once approved by the ITS Strategic Planning Group, develop the user service requirements from the user service description. These are known as the “Shall” statements.

Step 4: The National Architecture Team - a consortium consisting of Odetics (formally “Rockwell International”) and Lockheed Martin - revises the National ITS Architecture to accommodate this new ITS User Service and requirements, incorporating regular feedback from stakeholder groups. Formal reviews and several other less formal feedback sessions are conducted with stakeholders.

Step 5: Forward list of required standards to appropriate Standards Development Organizations (SDO’s). Five SDOs - consisting of trade groups and professional organizations - are under contract to the USDOT ITS Joint Program Office to develop ITS standards, using on a consensus decision-making process among their members.

Once a user service is defined, a detailed set of ITS requirements is generated. These requirements are then used to formally amend the National Architecture. This workshop has already developed a preliminary list of requirements for this user service. The *ITS Data Relevant to Transportation Planning and Operations* exercise and worksheet were beneficial in identifying this preliminary list of user requirements. The workshop also identified a number of stakeholders. More importantly, a user service “champion” has also emerged - FHWA’s Office of Highway Information Management

In addition to identifying specific requirements, several observations on the uses and benefits of ITS-generated data were made :

- The continuous nature of most data generated by ITS removes sampling bias from estimates and allows the study of variability

- The detailed data needed to meet emerging requirements and for input to new modeling procedures can be provided by ITS (i.e., models can be validated and calibrated)

- Use of data generated by ITS for multiple purposes is a way to stimulate the support of other stakeholders for ITS initiatives

- Promoting the use of archived data for multiple purposes complements the initiative for integrating ITS in general

- Because the data are already being collected for ITS control, other uses provide a value-added component to ITS

- ITS is a rich data source for multiple uses, but not a panacea; traditional sources of data will continue to be important

- As the focus of transportation policy shifts away from large-scale, long-range capital improvements and toward better management of existing facilities, ITS-generated data can support the creation and use of the system performance measures that are required to meet this new paradigm.

Simply archiving ITS data is not sufficient, the workshop identified several institutional and technical issues that must be addressed, specifically issues indirectly related to the revision of the architecture. In fact, specifying the functions of the *ITS data user service* appears to be the easy part; achieving implementation will be much harder. Participants raised several issues that can impede implementation:

- Cost of data storage and database administration
- Access to the data
- Ownership of the data
- Quality, reliability and timeliness of the data
- Management of the data
- Standards - (potentially a major barrier as ITS data is already being standardized)
- Data Privacy and confidentiality of privately collected data (from private fleet management systems in particular)
- Liability
- Coordination with non-traditional ITS data sources

There is a general level of skepticism among planners that an *ITS data user service* would ever function in a way that would be useful given the above concerns. This highlights the need that much more is needed in terms of outreach to the MPOs and other agencies. The success of this user service depends on whether or not the planners (and associated planning functions) are an integral part of the ITS deployment process. In other words, planning must be ultimately integrated in the ITS Architecture. This step, however, is further down the road.