OAHU REGIONAL ITS PLAN

INTELLIGENT TRANSPORTATION SYSTEMS ARCHITECTURE

Operational Concept & Physical Architecture

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Task 6

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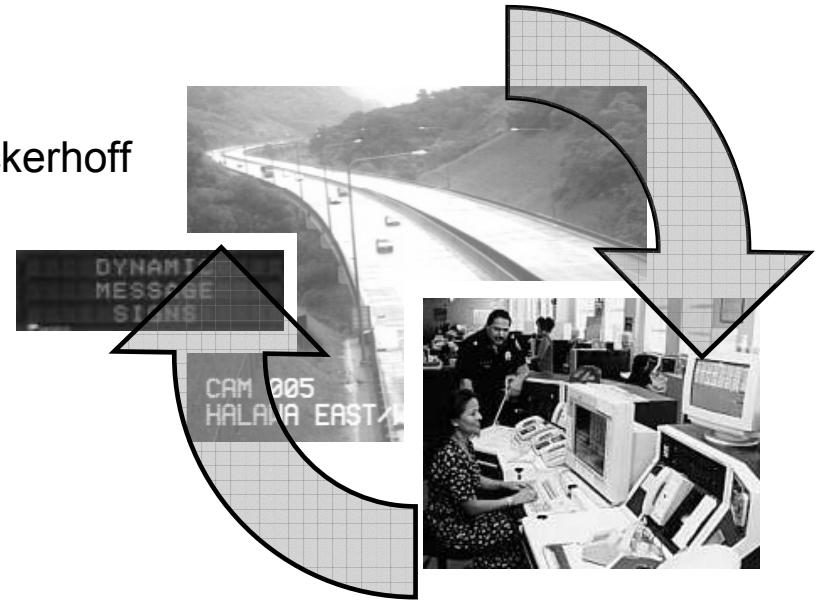

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LIST OF ACRONYMS

ADUS	Archive Data User System
ATIS	Advance Traveler Information System
ATMS	Advance Traffic Management System
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Location
DMS	Dynamic Message Sign
DTS	City and County of Honolulu Department of Transportation Services
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CDPD	Compressed Digital Processed Data
CVISN	Commercial Vehicle Information System Network
DDC	City and County of Honolulu Department of Design and Construction
DIT	City and County of Honolulu Department of Information Technology
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
GIS	Geographic Information System
GPS	Global Positioning System
HDOT	Hawaii Department of Transportation
HESD	Honolulu Emergency Services Department
HFD	Honolulu Fire Department
HPD	Honolulu Police Department
HTA	Hawaii Transportation Association
ISP	Information Service Provider
IT	Information Technology
ITS	Intelligent Transportation Systems
LTAP	Local Technical Assistance Program
MHz	Megahertz
MDT	Mobile Data Terminals
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
OCDA	Oahu Civil Defense Agency
OMPO	Oahu Metropolitan Planning Organization
OTS	Oahu Transit Services
PDA	Personal Digital Assistant
RTTSL	Real-Time Traffic Surveillance Laboratory
TOC	Traffic Operations Center
TSM	Transit Management System
UPS	United Parcel Service
VTU	Vehicle Tracking Unit

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1. INTRODUCTION

The preparation of the Oahu Regional Intelligent Transportation System (ITS) Architecture and Operational Concept, presented here forth, was completed under the guidance of the Oahu Metropolitan Planning Organization (OMPO) with the participation and support of Oahu's transportation stakeholder agencies. The Oahu Regional ITS Architecture and Operational Concept provides a framework to foster ITS integration and improve inter-agency communication and is the first of two guiding documents that comprise the Oahu Regional ITS Architecture Project. The second document, the Oahu ITS Integration Strategy Plan, builds on the information presented in this document to guide implementation of integrated ITS on Oahu.

1.1 WHAT IS AN INTELLIGENT TRANSPORTATION SYSTEM?

An ITS is a collection of technologies or systems (e.g., advanced sensors, computers, communication systems) that enable multiple agencies to work together to collectively manage the entire regional transportation network. The transportation network includes all transportation modes, and includes airports, harbors, in addition to traditional roadways. These technologies and systems enhance traditional transportation operations and processes through the electronic exchange of information and data. Among other things, an ITS increases roadway capacity without adding lanes and alerts drivers en-route and pre-trip to conditions (e.g., weather, construction, accidents) affecting travel. Before these processes can occur, however, the who, what, when, and how of integrated ITS operations need to be defined.

1.2 WHAT IS A REGIONAL ITS ARCHITECTURE?

A regional ITS Architecture is a framework that identifies how regional agencies and systems interconnect to improve regional transportation safety and operations. It identifies the regional inventory of ITS systems and the stakeholders that are responsible for their operation. In addition to the fore mentioned tasks, the Oahu Regional ITS Architecture also acts as a mechanism for identifying existing and planned ITS systems (referred hereafter as elements) and the information or data that are exchanged.

To obtain the maximum benefits of, and to fully understand a Regional ITS Architecture, a few commonly used and often misunderstood words should be defined before reading. A Glossary of ITS Terminology is provided at the end of this document in Appendix A.

1.3 WHAT IS AN OPERATIONAL CONCEPT?

An operational concept defines the who, what, when, and how of ITS operations. One of its main functions is to identify current and future stakeholder roles and responsibilities. This

includes discussion on how systems are to be operated and maintained. Through this process, stakeholders become involved with the regional ITS architecture development process, providing the catalyst and foundation needed to define high level inter-agency agreements. The Oahu ITS Operational Concept defines agency roles and responsibilities through desired transportation services or National ITS Architecture Market Packages.

1.4 NEED FOR A REGIONAL ITS ARCHITECTURE

The need for a regional ITS architecture is two fold. First, a regional ITS architecture is important from the aspect of improving transportation system efficiency. Second, a recent Federal Highway Administration (FHWA) Rule and Federal Transit Administration (FTA) policy now requires a region deploying ITS to develop a regional ITS architecture if it wants to continue to fund projects using the Federal Highway Trust Fund. Both of these concepts are explained in greater detail in the following paragraphs.

1.4.1 Transportation System Efficiency

An ITS consists of various systems that are integrated to increase safety, and enhance operational efficiency of the regional transportation network. Systems that are deployed in an isolated, or "stove pipe" fashion provide much less of a benefit than systems that are integrated. In addition, systems that make up an ITS are often very expensive, and if not integrated, may not produce enough benefit to justify the cost. A regional ITS architecture and operational concept fosters system integration through identification of a region's existing and planned systems, the stakeholders that operate these systems, and stakeholders' roles and responsibilities. The usefulness of an architecture however, is dependent on the level of input stakeholders provide, and their willingness to integrate.

1.4.2 FHWA Rule & FTA Policy

In early 2001, the United States Department of Transportation (USDOT) announced the release of FHWA's final rule and FTA's policy for applying the National ITS Architecture at the regional level. This Rule/Policy requires regions that are funding ITS projects through the National Highway Trust Fund, to develop a regional ITS architecture that conforms with the National ITS Architecture. Jurisdictions that had deployed an ITS project prior to April 8th, 2001, are required to develop a regional ITS architecture within four years, or by April 8th, 2005. Areas yet to deploy an ITS project are required to have a regional ITS architecture developed within four years of the first deployment. ITS projects that are not funded through the National Highway Trust Fund are exempt from the Rule/Policy.

If a region has not developed a regional ITS architecture before the April 8th, 2005 deadline, or four years after the first ITS deployment, no new ITS projects can advance if they are funded through the National Highway Trust Fund. Projects can only advance when the regional ITS architecture is finished, and if the project can show conformance with it.

Section 940.9D of the Rule/Policy states that a "regional ITS architecture shall include, at a minimum, the following:

1. A description of the region.
2. Identification of participating agencies and other stakeholders.
3. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture.
4. Any agreements (existing or new) required for operations including, at a minimum, those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture.
5. System functional requirements.
6. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture).
7. Identification of ITS standards supporting regional and national interoperability.
8. The sequence of projects required for implementation."

In addition to the above requirements, the rule/policy also requires regions to develop ITS projects using a systems engineering approach. This will ensure that various aspects of the project (e.g., system planning, design, procurement, deployment, operations, maintenance, expansion and retirement) are considered to ensure successful deployment.

The Oahu Regional ITS Architecture Project will address these requirements in two distinct deliverables; The Oahu Regional ITS Architecture and Operational Concept, and Oahu ITS Integration Strategy Plan. This document, the Oahu Regional ITS Architecture and Operational Concept, covers items 1 through 6 of the policy/rule requirements.

1.5 REGIONAL ARCHITECTURE ORGANIZATION

Section 1: Introduction - The introduction provides the basic information that is needed to understand the content of this document. The introduction explains at a high level what an ITS is, and why a regional ITS architecture is needed.

Section 2: Background - This section provides the information needed to begin the process of regional ITS architecture development. In this section the region, or area, that the regional ITS architecture includes is described, the transportation network is summarized, and a few underlying needs in terms of the transportation network are outlined. Following this discussion, the process used to obtain stakeholder input is provided.

Section 3: Operational Concept - This section illustrates and defines the Oahu Regional ITS Operational Concept in terms of regionally significant transportation services, or market packages (e.g., Incident Management, Emergency Response, etc.). System interconnections are shown at the Subsystem Class Level. The Operational Concept provides the framework for system definition as part of the Integration Strategy Plan.

Section 4: Conceptual Architecture - This section defines the interconnections of specific elements, going into greater detail by defining the architecture flows or information/data shared between systems.

Section 5: Next Steps - The section overviews the next steps for the regional ITS development – The Oahu ITS Integration Strategy Plan.

Appendix A: Glossary of ITS Terminology

Appendix B: Architecture Flow Definitions

2. BACKGROUND

2.1 DEFINITION OF REGION

Regional ITS architecture development begins by defining the physical area that will be part of or impacted by the regional ITS. After setting the physical boundaries, the transportation system within that area is closely examined to determine regional transportation needs. At this same time agencies that impact the transportation system are contacted to obtain their views of the transportation network and their individual transportation needs.

2.1.1 Geographic Characteristics and Coverage

The Oahu Regional ITS Architecture is focused on the entire island of Oahu. The island of Oahu is one of eight main islands that make up the State of Hawaii. Although not the largest Island at 600 square miles, Oahu is the home to 876,000 of Hawaii's 1,212,000 residents. The City of Honolulu, located in the south central portion of the Island, is where many people on Oahu live and work. In 2000, the population of Honolulu was estimated at 372,000. Honolulu, also serves as the temporary home to many of the Island's year round visitors who often visit the Island to enjoy the pleasant weather and beaches, shop in Honolulu, or explore the many other tourism activities the Island has to offer. Due to its regional significance, most of the Oahu's roadway network is either located in, or radiates from the Honolulu Metropolitan Area. Oahu's major transportation corridors are shown in Figure 2.1.1.

Figure 2.1.1: Oahu Region

2.1.2 Oahu Transportation Network

The Honolulu Metropolitan Area is connected to areas west, north, and east by the H-1, H-2, and H-3 Freeways, respectively. These freeways connect to expressways that parallel the Island's coast. This is primary a result of the Oahu's mountainous terrain, which consumes much of the interior land. The City and County of Honolulu has an extensive network of collector and arterial roadways that integrate with the regional freeway system as well as providing alternative routes in the more urbanized areas.

2.1.3 Need for ITS on the Island of Oahu

As with most urban areas in the United States, mobility on Oahu has been significantly hampered by a growing population and increase in vehicle use. Today, many of the highways and major arterials suffer from congestion making travel on the Island, and especially in Honolulu, rather difficult and inconvenient. According to the 2025 Transportation for Oahu Plan, the Island's population is expected to grow by 18 percent over the next 25 years, an increase of approximately 157,000 residents. The need for transportation improvements is easy to see when this population increase is combined with the expected 28 percent increase in total visitor trips, and 31 percent increase in employment.

ITS can significantly reduce the burden placed on the transportation network in the future, through efficient use of existing roadway capacity. ITS can also enhance safety. On Oahu, ITS has been deployed in varied forms for a number of years. Some key highlights of these efforts include:

- The City and County of Honolulu Department of Transportation Services (DTS) has implemented an interconnected signal system with Closed Circuit Television (CCTV) surveillance on the majority of the priority arterial corridors. The City has also implemented a signal pre-emption system along many of these corridors to expedite emergency vehicle response.
- The Hawaii Department of Transportation (HDOT) has implemented a freeway management system along the H-3 freeway that includes detection, surveillance, lane control and traveler information systems.
- The Honolulu Fire Department (HFD) and the Honolulu Emergency Services Department (HESD) have implemented vehicle tracking and computer-aided dispatch capabilities.
- The Honolulu Police Department (HPD) has recently upgraded their CAD system.
- The Oahu Civil Defense Agency (OCDA) has begun the process of improving the technology at the Emergency Operations Center (EOC).

Oahu's primary emergency and transportation management stakeholders recognize the value that ITS can provide in meeting some of their operations and maintenance needs and continue to advocate increased deployment of appropriate technology and systems. As these systems continue to be developed, the Oahu Regional ITS Architecture provides an opportunity to ensure that independent systems are developed to accommodate integration needs. The

regional architecture likewise provides an opportunity to identify specific integration opportunities to leverage existing and planned ITS investments.

2.1.4 Delivery of ITS Services

For the purpose of orienting the project oversight committees as well as Oahu stakeholder agencies, ITS was categorized into the following key categories:

- Incident Management Systems
- Traffic Signal Systems
- Arterial Management Systems
- Transit Management Systems
- Freeway Management System
- Traveler Information Systems
- Commercial Vehicle Operations
- Electronic Fare Collection Systems
- Emergency Response Management Systems

Figure 2.1 provides a summary graphic of these primary system areas and denotes the organizations primarily responsible for development and delivery of these systems. As detailed later in this document, these system areas are defined using the National ITS Architecture market package approach. Using this approach, the following high-level summary provides a quick reference for orienting the reader to the role each stakeholder organization plays with respect to specific system development and delivery. The key stakeholders included in outreach efforts and their general role in regional ITS architecture development is discussed in the following section.

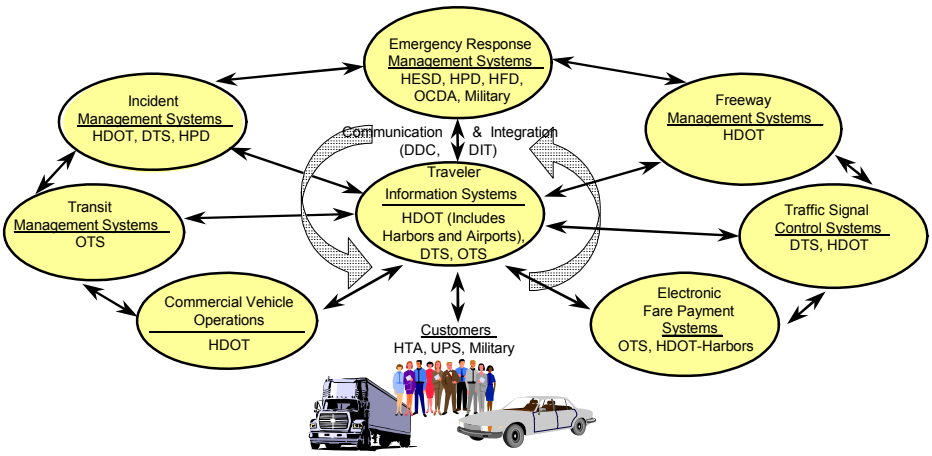

Figure 2.1.4: ITS Systems and Key Regional Stakeholders

2.2 STAKEHOLDER OUTREACH

Engaging regional stakeholders is a key step in regional ITS architecture development. Stakeholder outreach and education has been an active process on Oahu for several years with the initial step being the establishment of an ITS Task Force in July 1998. In cooperation with the FHWA, OMPO and the University of Hawaii's Local Technical Assistance Program (LTAP) initiated an education forum, using the National Highway Institutes' (NHI) ITS Awareness coursework, as a guide that focused on regional ITS architecture development. The FHWA sponsored the Tier I and Tier II workshops in February and August of 2001 respectively, and subsequent to those workshops, OMPO finalized a baseline ITS architecture that was carried forward into the final regional ITS architecture presented in this document.

To complete the information for this document, stakeholder outreach consisted of one-on-one interviews, workshops, and periodic reviews of draft documents and the Turbo Architecture database provided by OMPO. OMPO spearheaded the effort to develop a regional ITS architecture for Oahu, and as such, helped ensure that the following stakeholders were contacted so their input could be reflected in the Oahu Regional ITS Architecture and Operational Concept and later in the Oahu ITS Integration Strategy Plan. Table 2.2 provides a list of stakeholders who directly participated in the interview process.

Table 2.2: List of Stakeholders

<table>
<tr><td rowspan="4">City & County of Honolulu
• Department of Information Technology (DIT)
• Department of Design & Construction (DDC)
• Department of Transportation Services
• Honolulu Emergency Medical Services Department
• Honolulu Police Department
• Honolulu Fire Department</td><td>State of Hawaii
• Department of Transportation[1]</td></tr>
<tr><td rowspan="2">Real-Time Traffic Surveillance Laboratory (RTTSL)</td></tr>
<tr></tr>
<tr><td>Hawaii Transportation Association (HTA)</td></tr>
<tr><td>Oahu Transit Services (OTS)</td><td>Oahu Civil Defense Agency</td></tr>
<tr><td>United Parcel Service (UPS)</td><td>Navy Region Hawaii</td></tr>
</table>

A brief overview of the Oahu stakeholders directly involved in the architecture development process is provided below.

[1] Included planning, traffic, freeway operations, port and commercial vehicle representatives.

2.2.1 Hawaii Department of Transportation

The Hawaii Department of Transportation is responsible to plan, design, construct, cooperate, and maintain State facilities in all modes of transportation, including air, water, and land. Coordination with other State, County, and Federal programs is maintained in order to achieve the objective. The Department currently provides, operates, and maintains eleven (11) commercial service airports, four (4) general aviation airports; ten (10) commercial harbors; and two thousand four hundred fifty (2,450) lane miles of highway. Four of the five major airports now serve domestic overseas carriers. The HDOT mission is:

> "To provide a safe, efficient, accessible, and inter-modal transportation system that ensures the mobility of people and goods, and enhances and/or preserves economic prosperity and the quality of life."

In achieving the objective HDOT is structured into three modal divisions; Airports Division, Harbors Division, and Highways Division. HDOT Highways Division implemented its most extensive ITS system as part of the H-3 freeway and tunnel management system in the late 1990's and continues deployment in support of ITS planning and operations. Current ITS program efforts include the expansion of the freeway management systems, expansion of port surveillance systems, integration with DTS communications system and commercial monitoring and data collection systems.

2.2.2 City and County of Honolulu Department of Transportation Services

DTS manages the operation and maintenance of the arterial based traffic management system. The mission of DTS is:

> "To provide for a safe and efficient transportation system for the City & County of Honolulu through the effective management of departmental resources in the planning, design, implementation, operation, and maintenance of the City's transportation facilities."

DTS has successfully deployed technology based solutions for arterial management for many years and is currently in the process of refining its operations strategy to account for increased operational responsibilities and capabilities. Amongst other features, DTS's arterial management system includes an extensive communication network, video surveillance, central control, and signal pre-emption infrastructure. Ongoing work includes enhancement to its central operations facility.

In addition to its arterial management responsibilities, DTS also manages the transit system for Oahu through oversight of a private contract with the Oahu Transit Services (OTS).

2.2.3 City and County of Honolulu Police Department

The City and County of Honolulu Police Department provides enforcement services for the island of Oahu including HDOT's transportation facilities. The mission of HPD is:

> "We, the men and women of the Honolulu Police Department, are dedicated to providing excellent service through partnerships that build trust, reduce crime, create a safe environment, and enhance the quality of life in our community …"

HPD has been actively involved in ITS planning and implementation for many years. This involvement primarily has been focused on incident and emergency management systems. HPD has and continues to implement enhancements to its core technology infrastructure to support internal as well as interagency needs.

2.2.4 City and County of Honolulu Fire Department

The City and County of Honolulu Fire Department provides various emergency services for the island of Oahu. The mission of HFD is:

> "… to respond to fires, emergency medical incidents, hazardous materials incidents, and rescues on land and sea to save lives, property, and the environment. We accomplish this mission by:
>
> - Promoting safety and maintaining a well equipped, highly trained, and motivated force of professional fire fighters and rescue personnel.
> - Promoting fire prevention and other public safety education programs."

HFD has likewise been active in ITS planning and implementation for a number of years primarily initiated during the design, construction, and startup of the H-3 facility. HFD has implemented many technology improvements to its core infrastructure including signal preemption, computer aided dispatch (CAD) and on-vehicle global positioning system (GPS)/automatic vehicle location (AVL) equipment.

2.2.5 City and County of Honolulu Emergency Services Department

The City and County of Honolulu Emergency Services Department plays a primary role in delivery of emergency medical services on Oahu. The mission of HESD is:

> "… to provide 24 hour quality prehospital emergency medical care and services to residents and visitors on Oahu, to improve the quality of our care and services, to support individual and staff development programs for our personnel, and to offer information about the Emergency Medical Services Division to our community."

As with the other primary emergency service providers on Oahu, HESD has been an active participant in the planning of incident and emergency management systems for many years. HESD has implemented many technology improvements to its core infrastructure including signal preemption, CAD and on-vehicle GPS/AVL equipment.

2.2.6 City and County of Honolulu Department of Information Technology

The City and County of Honolulu Department of Information Technology plays a key ITS role by providing information technology (IT) support to most of the City and County of Honolulu's transportation and emergency service departments. In this role, DIT provides IT support to DTS, HESD, and HFD with limited support to HPD, who also has some in-house IT resources. Amongst other responsibilities, DIT provides web, archive data, and network services to the agencies it supports. As an example of current ITS support, DIT hosts DTS's traffic information web site.

DIT also plays a key ITS role by providing and maintaining network infrastructure connecting the majority of City and County facilities. This network includes connections to some external agencies. As additional inter-agency integration needs are identified as part of the regional ITS architecture development process, DIT will play a key role for the City and County of Honolulu in the design, implementation, operations and maintenance of the required IT components.

2.2.7 City and County of Honolulu Department of Design & Construction

The City and County of Honolulu Department of Design and Construction's mission includes responsibility for the City and County of Honolulu's radio systems. DDC is responsible for planning, designing, contracting, operating, and maintaining the City's 800 MHz system and has responsibility for some limited fiber optic and microwave systems. As with DIT, DDC has and will continue to play a key role in designing, implementing and maintaining the supporting communication infrastructure critical to successful deployment and operation of internal as well as integrated ITS for the City and County of Honolulu.

2.2.8 Oahu Transit Services

Oahu Transit Services is the primary provider of public transportation services on Oahu. OTS is privately contracted under the management of DTS. The mission of OTS is:

> "… (OTS) is responsible for providing safe, secure, economical, efficient, effective, and dependable public bus service to the community in an environmentally sensitive manner. …"

OTS has been, and continues to be, proactive in its use of technology solutions to enhance its operations and maintenance activities. OTS has a computer CAD system and is in the process of implementing a real-time AVL system for its fleet. More recently, OTS has run trial deployments of real-time transit information and bus signal priority. Though OTS is primarily involved in the delivery of transit services, its fleet plays a role in emergency management support.

2.2.9 Oahu Civil Defense Agency

The Oahu Civil Defense Agency plays a primary role in major emergency management activity. The mission of OCDA is:

> "To develop, prepare for, and under disaster or emergency situations, assist in the implementation of civil defense plans and programs to protect and promote the public health, safety and welfare of the people of the city."

OCDA's involvement in emergency and incident management is typically a function of the magnitude of the event. The majority of day-to-day incidents do not require OCDA involvement, but during major events (e.g., those requiring long-term roadway closures, OCDA will become active). OCDA is based in the City and County of Honolulu's EOC.

2.2.10 Real-Time Traffic Surveillance Laboratory

The Real-Time Traffic Surveillance Laboratory, managed by the University of Hawaii, provides a linkage to ITS academic research and education activity. The mission of RTTSL is to provide a forum for ITS education and training, and to provide a test bed for ITS research. RTTSL has supported several Oahu ITS test deployments including the City and County of Honolulu's initial traffic information web site. RTTSL also provided support to the City and County of Honolulu for the real-time transit arrival project. RTTSL is not an operations and maintenance organization typically divesting from deployments as they move from research and trial deployments to mainstream program implementation.

2.2.11 Navy Region Hawaii

The Oahu Regional ITS Architecture Project included outreach to several key stakeholders that do not directly manage the transportation system or respond to emergencies but are significant users of the system or provide special support during certain events. The military has a significant presence on Oahu and the Navy Region Hawaii was included as representative of the military interests on Oahu. With the enhanced focus on homeland security and the strategic nature of the military on Oahu, the Navy Region Hawaii provides a key perspective to Oahu's Regional ITS Architecture and Operational Concept. The military has a variety of security infrastructure, which often is centralized around surveillance systems and access control. During major events, the military can be called in to provide medical air support, open restricted roadways for alternative routing or provide supplemental emergency personnel support.

2.2.12 Commercial Vehicle Operations - Hawaii Transportation Association & United Parcel Service

As with the outreach to the military, the Oahu Regional ITS Architecture and Operational Concept included selective outreach to private users of the transportation system. Commercial vehicle operators are a key user of the system both in the support of freight movement but also in the support of the tourism industry, which is a key component of Oahu's economy.

The Hawaii Transportation Association (HTA) was included in the outreach as the first step in involving the private commercial vehicle community. The mission of HTA is to provide a forum for the local private and commercial vehicle providers to exchange information. HTA represents these providers at the State, County, and Federal government levels. HTA

specifically represents the heavy truckers and tour bus operators (including Roberts Hawaii) as well as van and limousine carriers. HTA members include Federal Express (FedEx), United Parcel Service (UPS), Matson, CSX (formerly Sealand), and Young Brothers. HTA does not represent the rental car companies or the taxi companies. As a follow up to the HTA outreach, UPS was contacted. As with many of the private providers, technology plays an important role in fleet management for UPS and UPS is interested in transportation information and management that enhances the operation of the regional transportation network.

As part of ongoing activities, Oahu is moving towards development of a regional Commercial Vehicle Information System Network (CVISN) architecture. If implemented, the CVISN architecture will expand the current regional ITS architecture with a specific focus on the commercial vehicle elements.

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3. OPERATIONAL CONCEPT

The Operational Concept provides, at a high level, an understanding of the various transportation services (e.g., incident management, regional traffic control) that are identified by stakeholders as being important to a region. The operational concept states and illustrates how these regional transportation services are satisfied through use of the National ITS Architecture. The National ITS Architecture provides flexibility in how each region depicts these transportation services. For the purpose of the Oahu Regional ITS Architecture Project, these services are defined using market packages, further defined in the following section. In addition, the regional ITS elements involved with the delivery of each transportation service, are also identified in this section.

3.1 MARKET PACKAGE DEFINITION

A region's transportation services are typically satisfied by one or more market packages from the National ITS Architecture. Version 3.0 of the National ITS Architecture sets forth 63 market packages that are categorized into the following seven functional areas referred here after as bundles.

- AD Archived Data Management
- APTS Advanced Public Transportation Systems
- ATIS Advanced Traveler Information Systems
- ATMS Advanced Traffic Management Systems
- AVSS Advanced Vehicle Safety Systems
- CVO Commercial Vehicle Operations
- EM Emergency Management

In the future, as more transportation services are identified, the number of market packages and bundles defined in the National ITS Architecture should increase. Therefore, it will be important for the region to update their architecture based on the updates made to the National ITS Architecture.

A market package is a group of entities (subsystems, equipment packages, and terminators) that work together to deliver a transportation service. In other words, a market package identifies the parts or equipment of the physical world that are required to successfully perform a certain function such as managing incidents on a highway. Market packages also provide all the data that may possibly be exchanged between entities. The data that are exchanged are more commonly referred to as architecture flows and are almost always customized to accurately address regional needs.

Based on previous inventories, a review of additional agency materials and completion of one-on-one interviews with the key stakeholders, a summary of market packages was developed

for the Oahu region, see Table 3.1. As summarized in Table 3.1, many market packages are applicable to Oahu and in many cases currently deployed in some form. The intent of the Oahu Regional ITS Architecture Project is to focus on those that require multi-agency regional integration both in terms of physical systems as well as interjurisdictional plans and agreements. The following six primary regional market packages are identified for Oahu in the five- to ten-year timeframe:

- ITS Data Warehouse
- Broadcast Traveler Information
- Regional Traffic Control
- Incident Management System
- Emergency Response
- Emergency Routing

3.1.1 ITS Virtual Data Warehouse – AD3

The ITS Virtual Data Warehouse transportation service provides broad access to multi-modal, multi-dimensional data from varied data sources but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse market package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.

3.1.2 Broadcast Traveler Information – ATIS1

The Broadcast Traveler Information transportation service provides a basic set of Advanced Traveler Information System (ATIS) services. It involves the collection of traffic conditions, advisories, general public transportation, parking information, incident information, weather information, and the near real-time dissemination of this information over a wide area through existing infrastructures and low-cost user equipment (e.g., FM sub-carrier, cellular data broadcast). Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

3.1.3 Regional Traffic Control – ATMS07

The Regional Traffic Control market package advances the Surface Street Control and Freeway Control market packages by adding the communications links and integrated control strategies that enable integrated inter-jurisdictional traffic control. This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control market packages and adds hardware, software, and wire-line communications capabilities to implement traffic management strategies that are coordinated

between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

Table 3.1: Oahu Market Package Summary

Oahu Market Package Summary

Market Package Bundle	Market Package	Market Package Name	Existing	Planned 1-5 Years	Planned 6 – 10 Years	Future 10+ Years	HDOT	C/C DTS	C/C HPD	C/C HFD	C/C HESD	OAHU CIVIL DEFENSE	OAHU TRANSIT	COMMERCIAL OPERATORS[1]	INFORMATION SERVICE PROVIDERS	OMPO	TRAVELERS
Archived Data Management	ad1	ITS Data Mart		✓			●	●	○				○				
	ad2	ITS Data Warehouse			➳		●	●	●	●	●		●			○	
	ad3	ITS Virtual Data Warehouse					●	●	●	●	●		●			○	
Advanced Public Transportation Systems	apts1	Transit Vehicle Tracking		➳				●					●				
	apts2	Transit Fixed-Route Operations	➳					●					●				
	apts3	Demand Response Transit Operations	➳					●					●				
	apts4	Transit Passenger and Fare Management			➳			●					●				
	apts5	Transit Security	➳	✚				●					●				
	apts6	Transit Maintenance	➳	✚				●					●				
	apts7	Multi-modal Coordination		➳				●					●				
	apts8	Transit Traveler Information		➳				●					●				○
Advanced Traveler Information Systems	atis1	Broadcast Traveler Information	➳	✚			●	●	○			○	○		○		○
	atis2	Interactive Traveler Information			➳		●	●					●		○		○
	atis3	Autonomous Route Guidance			➳									●			○
	atis4	Dynamic Route Guidance				➳	○	○	○					●			○
	atis5	ISP Based Route Guidance															
	atis6	Integrated Transportation Management/Route Guidance															
	atis7	Yellow Pages and Reservation															
	atis8	Dynamic Ridesharing															
	atis9	In Vehicle Signing															
Advanced Traffic Mangagement Systems	atms01	Network Surveillance	➳	✚			●	●									
	atms02	Probe Surveillance			➳		●	●					●	●			
	atms03	Surface Street Control	➳	✚				●									
	atms04	Freeway Control	➳	✚			●										
	atms05	HOV Lane Management			➳		●										
	atms06	Traffic Information Dissemination	➳	✚			●	●									○
	atms07	Regional Traffic Control		➳	✚		●	●					○				
	atms08	Incident Management System		➳			●	●	●	●	●	○	○		○		
	atms09	Traffic Forecast and Demand Management				➳	●	●									
	atms10	Electronic Toll Collection															
	atms11	Emissions Monitoring and Management															
	atms12	Virtual TMC and Smart Probe Data															
	atms13	Standard Railroad Grade Crossing															
	atms14	Advanced Railroad Grade Crossing															
	atms15	Railroad Operations Coordination						●									
	atms16	Parking Facility Management			➳			●						●			○
	atms17	Reversible Lane Management	➳				●	●									○
	atms18	Road Weather Information System	➳		✚		●	●				●					
	atms19	Regional Parking Management			➳			●						●			○
Advanced Vehicle Safety Systems	avss01	Vehicle Safety Monitoring															
	avss02	Driver Safety Monitoring															
	avss03	Longitudinal Safety Warning		➳													○
	avss04	Lateral Safety Warning		➳													○
	avss05	Intersection Safety Warning															
	avss06	Pre-Crash Restraint Deployment															
	avss07	Driver Visibility Improvement		➳													○
	avss08	Advanced Vehicle Longitudinal Control	➳														○
	avss09	Advanced Vehicle Lateral Control															
	avss10	Intersection Collision Avoidance															
	avss11	Automated Highway System															
Commercial Vehicle Operations	cvo01[2]	Fleet Administration	➳	✚			●	●	●	●	●		●	●			
	cvo02[2]	Freight Administration		➳										●			
	cvo03[2]	Electronic Clearance		➳			●							○			
	cvo04[2]	CV Administrative Processes		➳			●							○			
	cvo05[2]	International Border Electronic Clearance															
	cvo06[2]	Weigh-In-Motion	➳				○							○			
	cvo07[2]	Roadside CVO Safety	➳				●							○			
	cvo08[2]	On-board CVO Safety		➳			○							●			
	cvo09[2]	CVO Fleet Maintenance															
	cvo010[2]	HAZMAT Management			➳		●		○	●				●			
Emergency Management	em1	Emergency Response	➳	✚			○	○	●	●	●	●	○				
	em2	Emergency Routing			➳		●	●	●	●	●	○	○				
	em3	Mayday Support			➳										●		○

LEGEND:

- ➳ *Basic Level of Market Package Deployment*
- ✚ *Enhanced Level of Market Package Deployment*
- ○ *Secondary Stakeholder*
- ● *Primary Stakeholder*
- *Regionally Significant Market Package*

1 - Hawaii Transportation Association (HTA) and United Parcel Service (UPS) were representative stakeholders for commercial the operators category
2 - Oahu agencies are currently discussing development of a CVISN architecture. CV01 through CV10 would be covered in more detail under that activity.

3.1.4 Incident Management – ATMS08

The Incident Management market package manages both predicted and unexpected incidents so that the impact to the transportation network and traveler safety is minimized. Requisite incident detection capabilities are included in the freeway control market package and through the regional coordination with other traffic management and emergency management centers, weather service entities, and event promoters supported by this market package. Information from these sources are collected and correlated to detect and verify incidents and implement an appropriate response. This market package provides Traffic Management Subsystem equipment that supports traffic operations personnel in developing an appropriate response in coordination with emergency management and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications and presentation of information to affected travelers using the Traffic Information Dissemination market package. The same equipment assists the operator by monitoring incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other field service personnel.

3.1.5 Emergency Response – EM1

The Emergency Response transportation service provides the computer-aided dispatch systems, emergency vehicle equipment, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification and coordinated response between agencies. Existing wide area wireless communications may be utilized between the Emergency Management Subsystem and an Emergency Vehicle to enable an incident command system to be established and supported at the emergency location. The Emergency Management Subsystem may include hardware and software for tracking the emergency vehicles. Public safety, traffic management, and many other allied agencies may each participate in the coordinated response managed by this package.

3.1.6 Emergency Routing – EM2

Emergency Routing supports dynamic routing of emergency vehicles and coordination with Traffic Management Subsystems for special priority on the selected route(s). Information Service Provider Subsystems support routing for the emergency responders based on real-time traffic conditions and the emergency routes assigned to other responding vehicles. The Information Service Provider Subsystem is frequently integrated with the Emergency Management Subsystem in a public safety communications center. The Emergency Vehicle may be equipped with dedicated short-range communications for local signal preemption.

3.2 MARKET PACKAGE CUSTOMIZATION

The National ITS Architecture documents include a graphic depiction of the market packages overviewed in the previous section. These generic diagrams provide a starting point for each region to review and ultimately customize to their own local vision for delivery of each focused transportation or emergency related service.

For the purpose of the Oahu Regional ITS Architecture Project, the six market packages discussed in the previous section were customized to satisfy Oahu's unique transportation needs. This process involved the mapping of regional elements to systems and terminators and is presented as a baseline for near- and mid-term project development. Each of these key regional market packages is presented in the following section with a graphical depiction of the market package and a summary matrix of relevant roles and responsibilities. Roles and responsibilities are presented by agency and focus on four key areas of ITS deployment – design, implementation, operation, and maintenance. These are intended to provide a high-level assessment of each agency's role and responsibility in delivering the specific service as they are moved from the planning stage to full implementation.

3.2.1 ITS Virtual Data Warehouse – AD3

Of the market packages reviewed as part of the Oahu Regional ITS Architecture Project, the configuration of a regional archive data management remains the most difficult to assess. The Oahu Regional ITS Architecture Project entered the interviews using the AD2 (ITS Data Warehouse) market package as the basis for regional archive data applications. As interview discussions on existing, planned, and desired archive data systems progressed, three key points were observed:

- Implementation of archive data systems varies considerably amongst Oahu's various agencies. Though archive data exists in most agencies, electronic- or system-based solutions are limited. Electronic data formatting varies extensively with each agency.
- Given the infancy of systems within each of the member agencies, the system configuration for regional archive data sharing is unclear. An eventual system could take the form of a single regional ITS Data Warehouse, as represented under the AD2 market package, or more of the form of a virtual ITS Archive Data System better represented by the AD3 (ITS Virtual Data Warehouse) market package.
- There is a strong interest in improving inter-agency archive data sharing and, given the infancy of most agency systems, this interest may best be served by establishing agency and regional policies that promote the creation of the archive data systems in each agency that likewise account for regional needs.

As noted in the second bullet and discussed in the operational concept workshop, the exact nature of future archive data systems on Oahu remains speculative. As depicted in Figure 3.2.1, it is likely that a combination of two or more ITS Data Warehouses that are integrated as a Virtual Data Warehouse (AD3) will eventually develop. A key discussion point amongst the regional agencies is the need to continue to monitor individual agency archive data development and communicate amongst the agencies as deployments move forward and opportunities for broad integration present themselves. Some form of ongoing committee

monitoring, be it in the form of the ITS Task Force established for this project or a distinct group specific to archive data, is needed to enhance the region's ability to integrate various systems as development occurs. A near-term need is to initiate discussion on a common referencing system and to evaluate regional archive data sharing needs in greater detail than occurred under this current architecture evaluation. The need for a common referencing system is relevant to several market packages where data, both archive and real-time, will be shared by various agencies.

Table 3.2.1 provides a high-level assessment of roles and responsibilities for archive data development. Again, this remains highly speculative, as much work needs to be done by individual agencies to advance their internal archive data systems before regional integration will be practical or a priority. As currently presented, HDOT and DIT will have primary responsibility for implementation and maintenance of their respective agencies' archive systems. All users that will either contribute or use the data should be included in initial requirements definition. The requirements definition stage is a key step in the development of any systems implementation and, in this instance, provides an opportunity for all the primary users of the system to define the desired functionality and breadth of data for the initial archive data management systems.

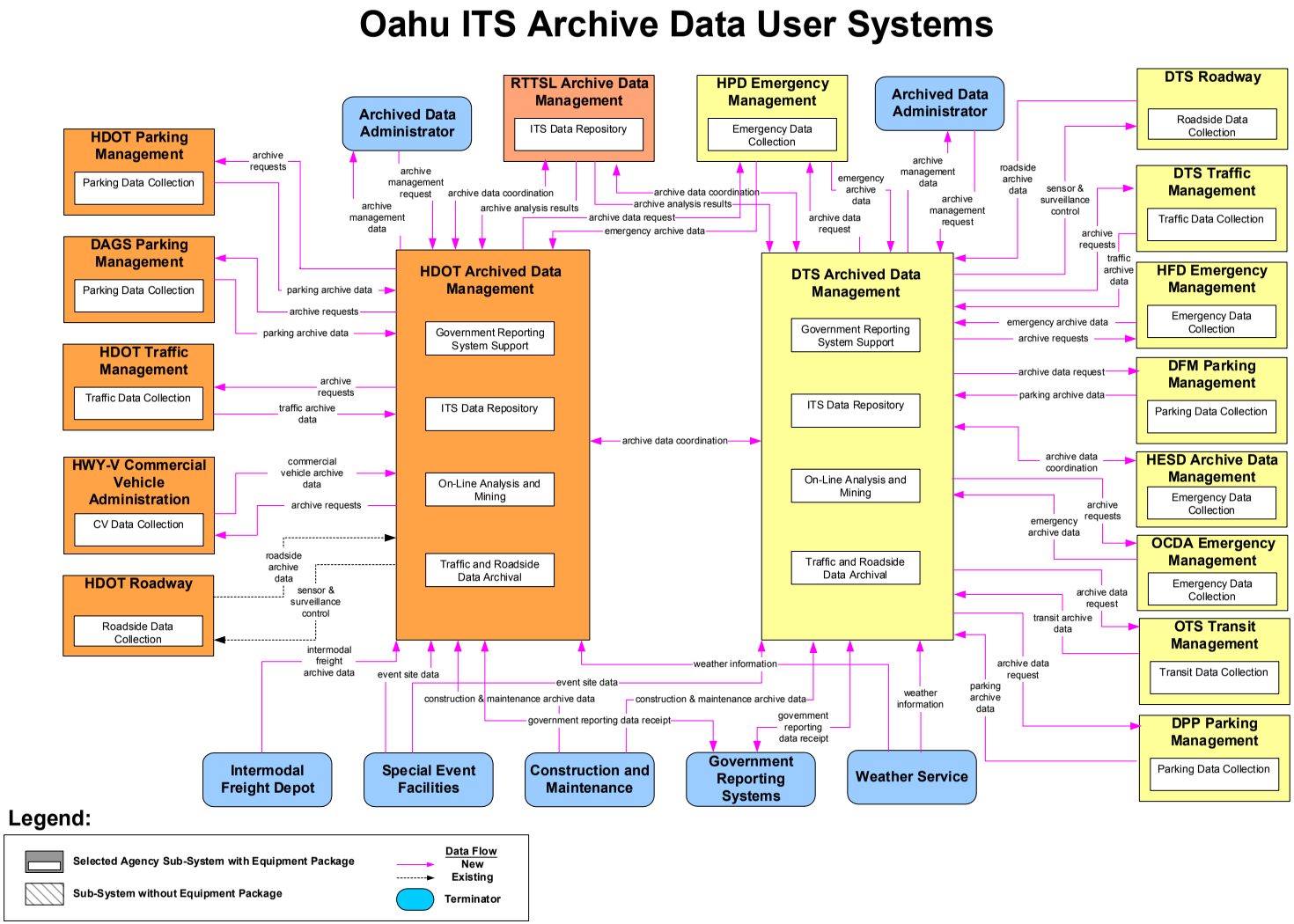


Figure 3.2.1: Archive Data User System

Table 3.2.1: Archive User Data Systems – Roles and Responsibilities

	HDOT	DTS	DIT	HPD	HFD	HESD	OCDA	OTS	OMPO	RTTSL
Design	Lead design of internal HDOT systems and combined archive data management system	Participate in system requirements definition	Lead design of internal City/County systems and combined archive data management system	Participate in system requirements definition	Participate in system requirements definition	Participate in system requirements definition	Participate in system requirements definition	Participate in system requirements definition	Participate in system requirements definition	Participate in system requirements definition
Implementation	Lead implementation of internal HDOT systems and combined HDOT archive data management system	NA	Lead implementation of internal City/County systems and combined City/County archive data management system	NA	NA	NA	NA	NA	NA	NA
Operation	Operate HDOT Archive Data Management System	Archive Data Management System User	NA	Archive Data Management System User	Archive Data Management System User	Archive Data Management System User, Operate Internal Archive Data Management System	Archive Data Management System User	Archive Data Management System User	Archive Data Management System User	Archive Data Management System User, Provide Archive Data Management Services
Maintenance	Maintain HDOT Archive Data Management System	NA	Maintain City/County Archive Data Management System	NA	NA	Maintain Internal Archive Data Management System	NA	NA	NA	NA

NA - Not Applicable

3.2.2 Broadcast Traveler Information – ATIS1

Broadcast traveler information is currently being provided at varying levels by Oahu's agencies. Electronic format, mostly in the form of web pages, and manual methods exist to disseminate real-time information but most of the agencies recognize opportunities for improvements. A key need in this area is enhanced infrastructure to collect relevant traffic and incident data. As currently planned, DTS and HDOT will likely continue to disseminate information independently in the near-term but an outgrowth of the Oahu Regional ITS Architecture Project may be the consolidation of this information to a jointly sponsored site as well as the development of a single 'point of presence' to provide data access to a private information service provider (ISP). In the near-term, OTS will continue to disseminate information as an independent ISP but consolidation with the City/County system is under consideration in the next few years.

Additional institutional agreements may be needed to move the region to a single consolidated broadcast system. As the region moves towards a 511 traveler information telephone based system, this consolidation will become a key consideration. Initial information considered for regional data dissemination includes:

- Transit Information – Static and Real-Time, Trip Planning
- Incident Data (including alternative route information)
- Construction and Maintenance Information
- Roadway Congestion Data
- Weather Information
- Video
- Special Event Information
- Parking Information
- Airport Information – Flight Information, Parking Availability, Congestion
- Tourist Information

Figure 3.2.2 presents the near- and mid-term vision for broadcast traveler information consistent with the overview provided above. Roles and responsibilities are presented in Table 3.2.2. In the near-term, HDOT, DIT, and OTS retain primary operation and maintenance responsibilities that may be contracted out or held internally. Future consolidation will require some level of agreement to define operation and maintenance responsibility. The key feature of near- and mid-term enhancements is the increase in data and video sharing amongst the key transportation and emergency services in a manner that can be selectively provided to Oahu's regional transportation users.

Oahu Broadcast Traveler Information

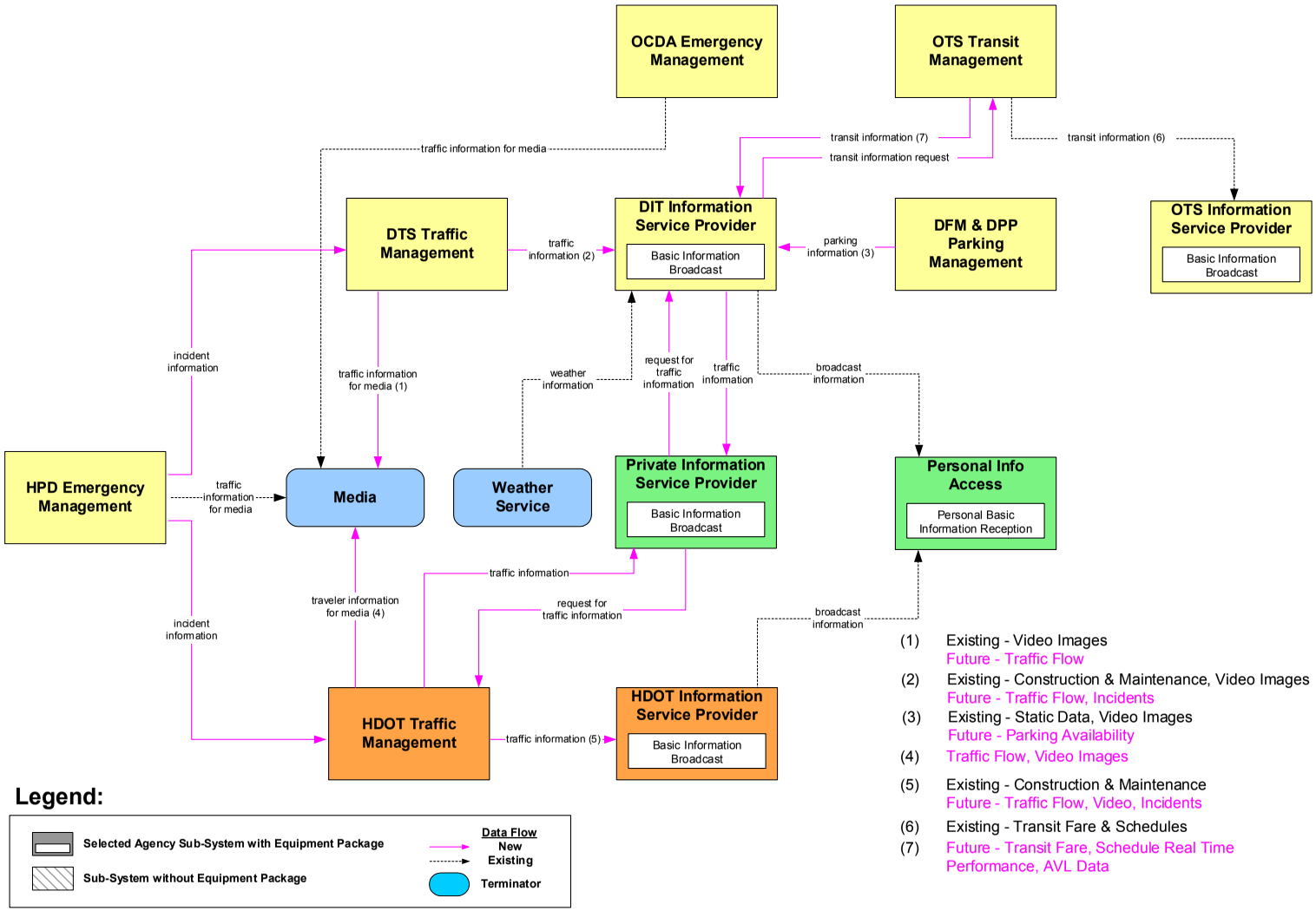


Figure 3.2.2: Broadcast Traveler Information System

Table 3.2.2: Broadcast Traveler Information Systems – Roles and Responsibilities

	HDOT	DTS	DIT	HPD	OCDA	OTS
Design	Lead design of internal HDOT systems.	Participate in system requirements definition with DIT	Lead design of internal City/County systems.	Participate in system requirements definition with DIT	NA	Participate in system requirements definition with DIT (future if consolidation is planned)
Implementation	Lead implementation of internal HDOT systems.	NA	Lead implementation of internal City/County systems.	NA	NA	Lead implementation of internal OTS systems (prior to consolidation with DIT)
Operation	Operate HDOT Traveler Information System	Operate DTS component of City/County Traveler Information System	NA	NA	Continue direct information role with media	Operate OTS Transit Information System (prior to DIT consolidation)
Maintenance	Maintain HDOT Traveler Information System	NA	Maintain City/County Traveler Information System	NA	NA	Maintain OTS Transit Information System (prior to DIT consolidation)

NA - Not Applicable

3.2.3 Regional Traffic Control – ATMS07

Oahu's Regional Traffic Control primarily involves DTS as the arterial manager and HDOT as the freeway manager. The primary needs for regional traffic control revolve around signal operations, CCTV, and general traffic data sharing.

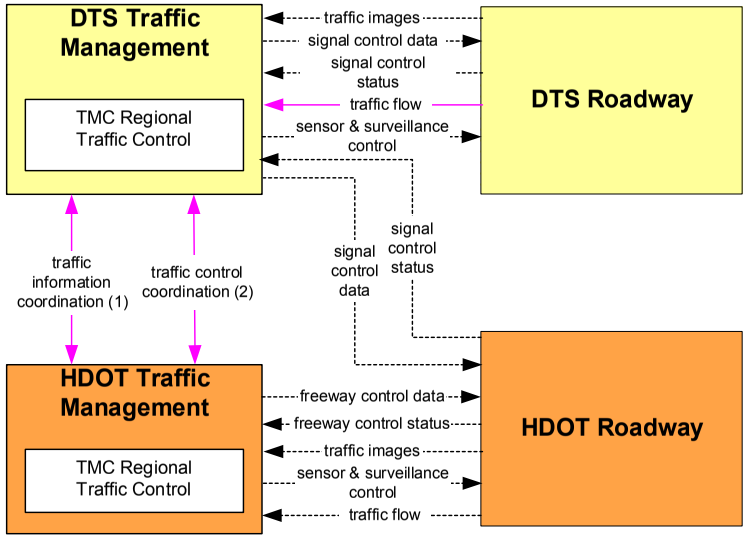
With respect to signal operations, DTS and HDOT have developed an amendment to an existing Memorandum of Agreement (MOA) as a step towards improved inter-agency cooperation. This MOA amendment addresses inter-agency interests and responsibility for joint signal operations. Historically, DTS has operated and maintained HDOT's Oahu based signals and the MOA amendment establishes some criteria and organizational structure to guide that inter-agency activity. According to the MOA amendment, DTS would continue to maintain all of Oahu's traffic signals, including HDOT's, but HDOT and DTS would work jointly to establish operational plans for HDOT signals.

Developing consensus for inter-agency control of ITS devices is a common challenge in regional ITS architecture projects. With respect to HDOT and DTS, the existing and near-term inter-agency control includes the signal systems, discussed above, and the CCTV systems. The Oahu Regional ITS Architecture Project presents the interests of these lead agencies for eventual shared control of these devices and leaves the opportunity to expand shared control to other devices as ITS deployment advances on Oahu. The Oahu ITS Integration Strategy Plan developed as the next stage of the Oahu Regional ITS Architecture Project will provide more detail on possible phasing for full activation of this inter-agency capability. As presented in the architecture, HDOT and DTS provide each other secondary control of their respective CCTV systems. An inter-agency agreement will be needed to define the conditions for this shared control prior to implementation of the capability.

The Oahu Regional ITS Architecture and Operational Concept includes enhanced data sharing between HDOT and DTS primarily focused on traffic flow data and device status information. Device status includes dynamic message signs (DMS) and, if deployed, ramp meters. As with many future elements of the regional ITS architecture, regional data sharing will require agency enhancements, as an example, enabling data collection within DTS's signal control system in order to share traffic flow data.

Figure 3.2.3 presents the near- and mid-term vision for regional traffic control consistent with the overview provided above. Roles and responsibilities are presented in Table 3.2.3.

Oahu Regional Traffic Control



(1) Video Images
Traffic Flow
Signal Control Status
Ramp Meter Status

(2) Surveillance Control
Signal Control Data

Legend:

Figure 3.2.3: Regional Traffic Control System

Table 3.2.3: Regional Traffic Control Systems – Roles and Responsibilities

	HDOT	DTS
Design	Responsible for design of HDOT freeway management systems and HDOT highway signal systems	Responsible for design of DTS arterial signal systems
Implementation	Responsible for implementation of HDOT freeway management and HDOT arterial signal systems	Responsible for implementation of DTS arterial management systems
Operation	Responsible for operation of HDOT freeway management systems. Coordination with DTS on HDOT signal systems.	Responsible for operation of DTS and HDOT arterial and highway signal systems
Maintenance	Responsible for maintenance of HDOT freeway management systems	Responsible for maintenance of DTS and HDOT arterial management systems

3.2.4 Incident Management System – ATMS08

Oahu has targeted inter-agency coordination on incident management for many years. Incident management targets early detection of traffic incidents on the transportation network and works to rapidly respond and clear those incidents to minimize overall system delay and reduce the risk of secondary accidents. Currently, limited detection capabilities exist with the exception of H-3, which has full instrumentation that could be used for some level of automatic detection. H-3, as well as the arterial system, is covered extensively by CCTV, but only the H-3 facility actively uses these systems for incident management purposes. Beyond H-3, the Oahu freeway system has an extensive network of call boxes that allow motorists to call HDOT directly for assistance. As with most regions in the United States, cellular phones contribute extensively to the reporting of incidents on Oahu's transportation network.

HPD, HFD and HESD have primary responsibility for response to traffic related incidents with their roles dependent on the nature of the incident, e.g., injury, hazardous materials, stalled vehicle. HPD typically is the first responder. HDOT has implemented a program of tow vehicles that are stationed at key locations on the freeway system and may be called to assist in vehicle removal. HDOT is planning to expand its incident management role through deployment and operation of a service patrol program.

There continues to be a general consensus and commitment amongst Oahu's emergency and traffic management agencies to continue to enhance incident management capabilities. This goal includes a combination of policy, project, and planning activities. From a systems perspective, the immediate needs include data and video sharing mostly in the form of traffic flow data, incident data and video imaging. There is an interest in having control of HDOT and DTS's CCTV cameras by some agencies and, likewise, some concern by those agencies in providing broad access to that control. MOA's have not been used extensively in DTS's current program for video sharing but, if some level of shared control were allowed, an MOA may be required.

Incident data sharing is the primary inter-agency need identified by most of the stakeholder agencies. There are several technical and policy challenges in providing the desired incident data but the next logical step is to better identify the specific data needs amongst agencies. All agencies expressed a willingness to share incident data but, in most cases, noted the need to filter the data and to implement MOA's to control use and further dissemination of the information. As identified earlier, under Archive Data Management, a common regional referencing system is needed to allow seamless sharing of incident data.

Center-to-center integration will be extensive if all desired regional data flows are implemented for incident management purposes. Limited center-to-field enhancements are expected with the caveat that continued improvements in the supporting communication infrastructure is needed. Beyond existing center-to-field connections, HPD demonstrated an interest in direct communication access to HDOT's new service patrol vehicles when they are deployed but HDOT's preferred architecture is for center-to-center coordination with HDOT dispatching the service patrol vehicles. In the near-term, the regional architecture assumes that HDOT and DTS retain operational roles in incident management. The architecture currently allows the services to be implemented from separate or combined centers.

Figure 3.2.4 presents the near- and mid-term vision for Oahu Incident Management consistent with the overview provided above. Roles and responsibilities are presented in Table 3.2.4.

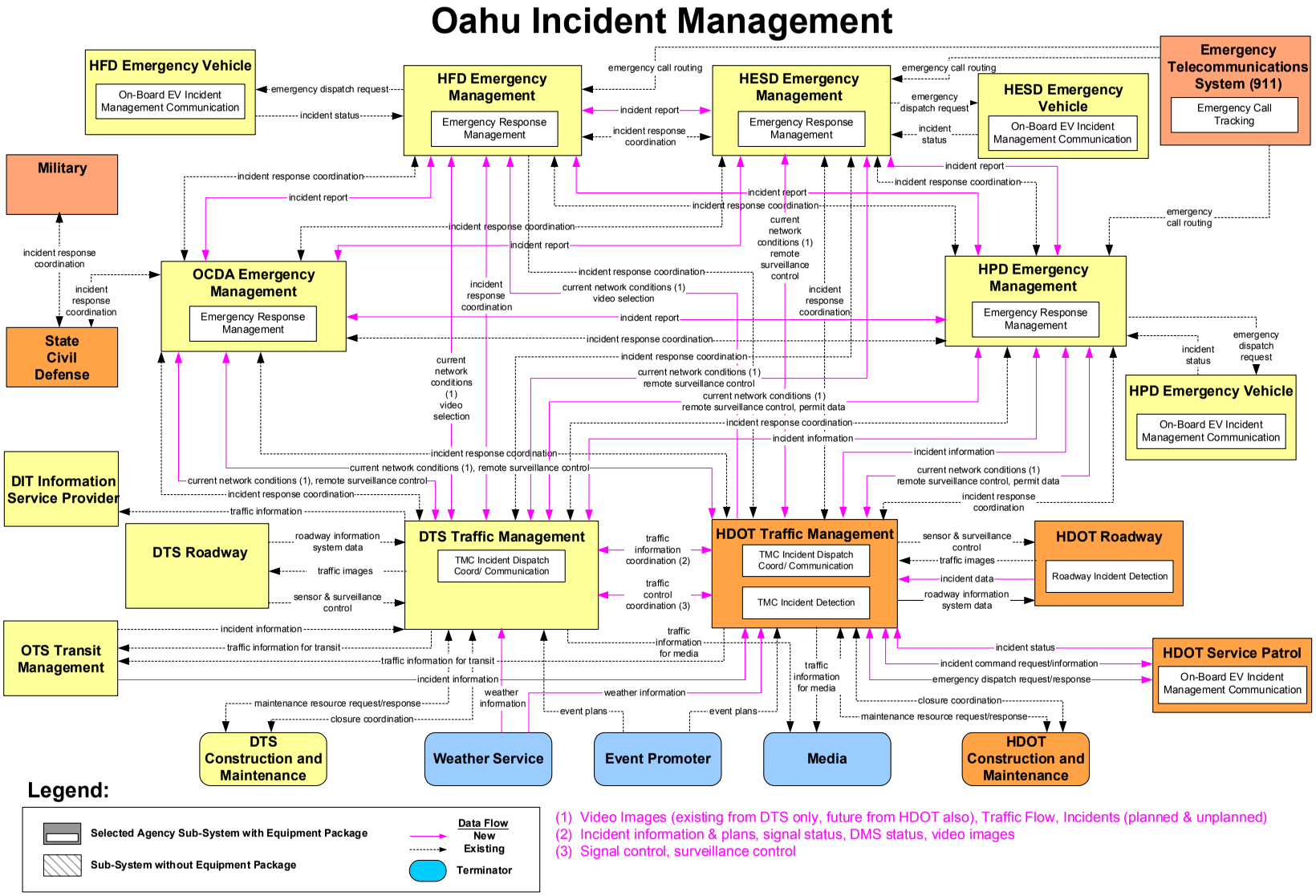


Figure 3.2.4: Incident Management System

Table 3.2.4: Incident Management Systems – Roles and Responsibilities

Design	Lead design of HDOT Incident Management Systems and Program.	Lead design of relevant components of City/County Incident Management Systems and Program.	Lead design of internal City/County wireless communication systems.	Coordinate design of internal City/County Incident Management Systems.	Participate in relevant Incident Management System requirements & program definition with HDOT, DIT & DTS	Participate in relevant Incident Management System requirements & program definition with HDOT, DIT & DTS	Participate in relevant Incident Management System requirements & program definition with HDOT, DIT & DTS	Participate in relevant Incident Management System requirements & program definition with HDOT, DIT & DTS	Participate in requirement definition with DIT (future if consolidation is planned)
Implementation	Lead implementation of HDOT Incident Management System & Program.	Lead implementation of DTS Incident Management System & Program.	Lead implementation of internal City/County wireless communication systems.	Support implementation of internal City/County systems.	Implement HPD components of Oahu Incident Management Systems.	Implement HESD components of Oahu Incident Management Systems.	Implement HFD components of Oahu Incident Management Systems.	NA	Lead implementation of internal OTS systems (prior to consolidation with DIT)
Operation	Operate HDOT Incident Management System & Service Patrol	Operate DTS Incident Management System & Program	NA	NA	Operate per HPD's role in Oahu Incident Management Program	Operate per HESD's role in Oahu Incident Management Program	Operate per HFD's role in Oahu Incident Management Program	Coordinate with HDOT and DTS Incident Management Program	Operation OTS Transit Information System (prior to DIT consolidation)
Maintenance	Maintain HDOT Incident Management System	NA	Maintain City/County wireless communication system	Maintain City/County components of Incident Management System	NA	NA	NA	NA	Maintain OTS Transit Information System (prior to DIT consolidation)

NA - Not Applicable

3.2.5 Emergency Response – EM1

Emergency response and incident management include many of the same stakeholders and, for that reason, much of the same supporting infrastructure. Whereas incident management focuses on transportation related incidents, emergency response has a broader emergency response focus with the transportation network playing a supporting role in response to the emergency. Under this context, emergency management agencies play the predominant role in detection and response with transportation system management agencies providing support. These emergency agencies primarily include OCDA, HPD, HFD, and HESD with the military called in during certain major events. HDOT and DTS provide transportation network support.

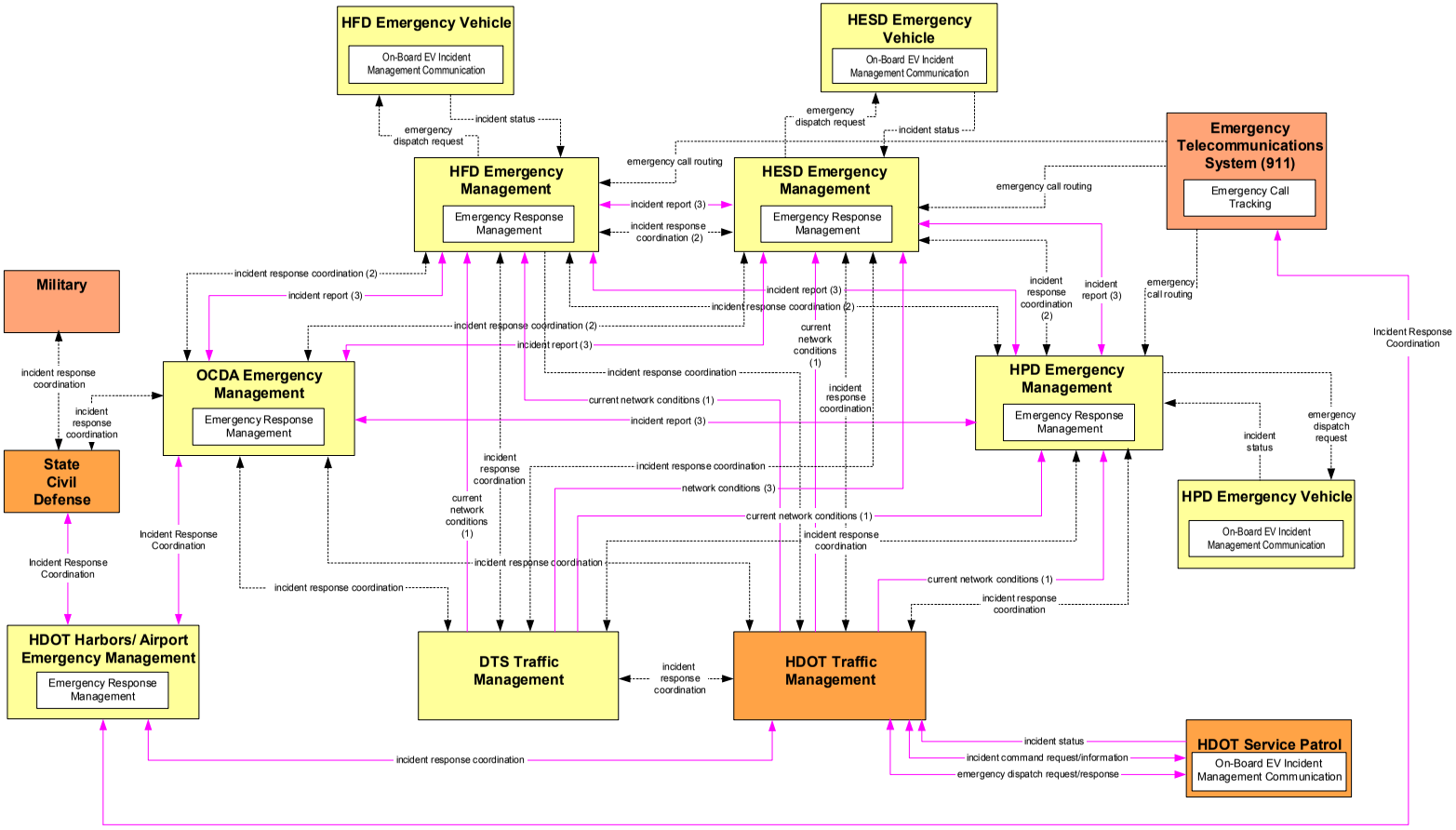
On Oahu, OCDA, HPD, HFD, and HESD are continuing to implement technical advances in this area including improved CAD, AVL, and Mobile Data Terminals (MDTs). As addressed under incident management, the agencies generally support better integration of their CAD system incident data to inform partner agencies of ongoing activity. This integration will, however, require MOAs amongst the involved agencies.

The need for real-time traffic data as a tool for enhanced emergency response was reviewed with each emergency system stakeholder. HFD and HESD are implementing improved vehicle technology to allow display of emergency data in the vehicle but are not convinced that the real-time data will be useful in the vehicles. HPD is not implementing in-vehicle displays that will accommodate this data in the near- or mid-term. As reflected in the Oahu Regional ITS Architecture, these agencies are interested in having real-time data for their central operations.

Both incident and emergency response require a reliable supporting wireless communication network. HPD and HFD have been migrating to an 800 MHz system with additional agencies in line to come onto the system in the near- and mid-term. There are evolving challenges in deploying the 800 MHz radio system that will potentially inhibit some capabilities for center-to-field data flow. As the needs for center-to-field and field-to-field communications are further defined, modifications to the in-progress deployment may be necessary, i.e., increases in center-to-vehicle data flow will push the limits of the current systems bandwidth.

Figure 3.2.5 presents the near- and mid-term vision for Oahu Emergency Response consistent with the overview provided above. Roles and responsibilities are presented in Table 3.2.5.

Oahu Emergency Response



Legend:

(1) Video Images (existing from DTS only, future from HDOT also), Traffic Flow, Incidents
(2) Future Enhancement - Emergency Response Plan Clearinghouse
(3) Existing is non-electronic, future enhancement to make this an electronic exchange

Figure 3.2.5: Emergency Response Systems

Table 3.2.5: Emergency Response Systems – Roles and Responsibilities

Design	Lead design of relevant components HDOT Emergency Management Systems	Participate in development of relevant Emergency Management System requirements	Lead design of internal City/County wireless communication systems.	Lead design of internal City/County Emergency Management Systems.	Participate in development of relevant Emergency Management System requirements.	Participate in development of relevant Emergency Management System requirements.	Participate in development of relevant Emergency Management System requirements.	Participate in development of relevant Emergency Management System requirements.
Implementation	Lead implementation of HDOT Emergency Management System	Lead Implementation HPD components of Oahu Emergency Management Systems.	Lead implementation of internal City/County wireless communication systems.	Support implementation of internal City/County systems.	Lead Implementation HPD components of Oahu Emergency Management Systems.	Lead Implementation HESD components of Oahu Emergency Management Systems..	Lead Implementation HFD components of Oahu Emergency Management Systems..	Lead Implementation OCDA components of Oahu Emergency Management Systems.
Operation	Operate HDOT Emergency Management System.	Operate DTS Emergency Management System	NA	NA	Operate HPD Emergency Management System.	Operate HESD Emergency Management System.	Operate HFD Emergency Management System.	Operate OCDA Emergency Management System.
Maintenance	Maintain HDOT Emergency Management System	NA	Maintain City/County wireless communication system	Maintain City/County components of Emergency Management System	Maintain HPD components of Emergency Management System	NA	NA	NA

NA - Not Applicable

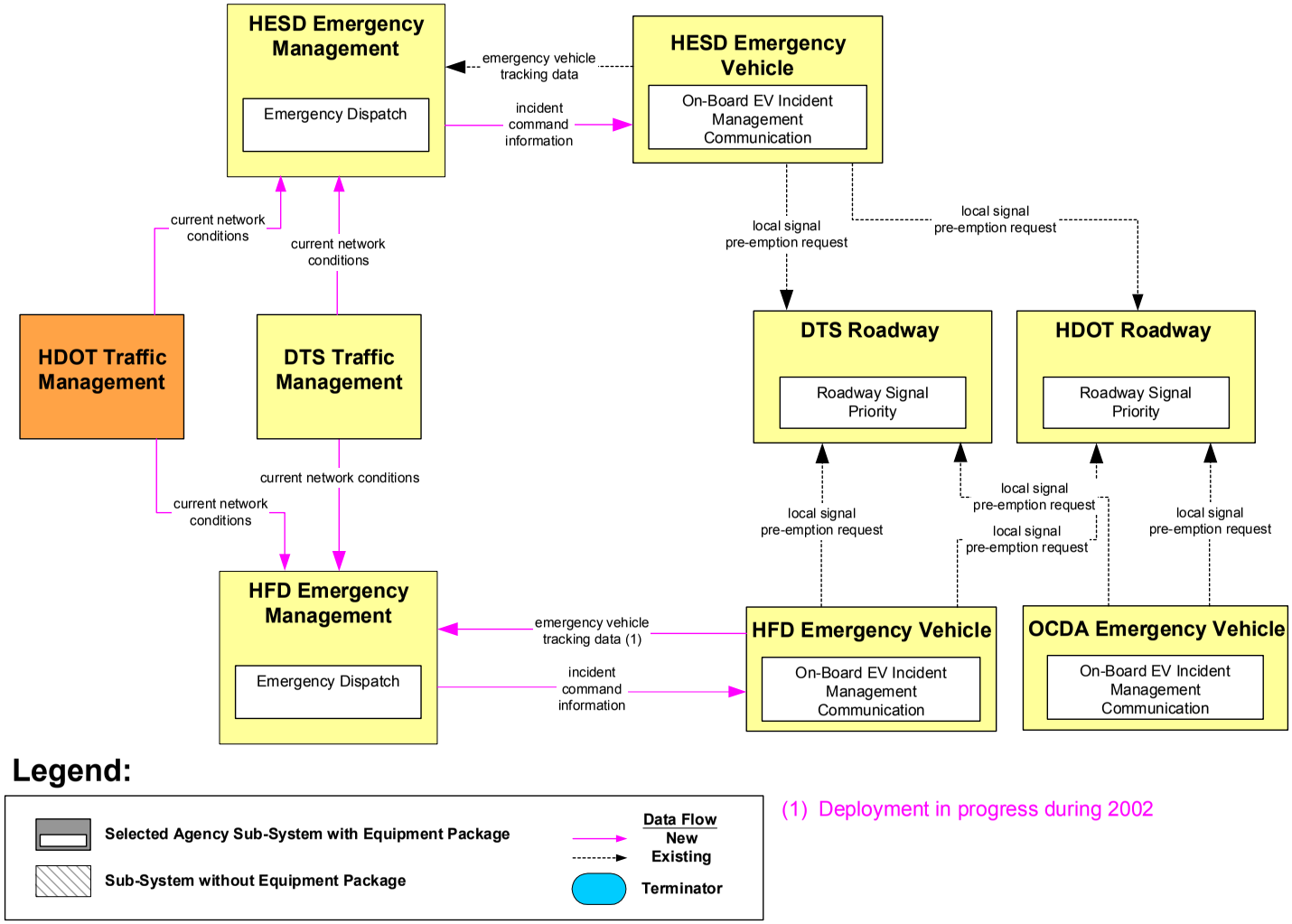
*Includes Harbors, Aiprorts, and Highways

3.2.6 Emergency Routing – EM2

Emergency routing is a relatively mature market package in Oahu. HPD, HFD, and HESD maintain CAD systems as well as supporting center-to-field communication systems. In general, the emergency signal pre-emption system is considered a key component for field response and continued expansion of this system is a priority for HFD and HESD. As discussed under the emergency response market package, the value of having real-time traffic information available in response vehicles had mixed responses from the agencies, but the emergency response agencies perceive some value if the information is provided to the dispatch centers. The architecture presented in Figure 3.2.6 shows the enhancement of network condition information from the traffic management centers to the emergency centers. Enhancements to in-vehicle information are also detailed as mid-term improvements.

Roles and responsibilities for Oahu Emergency Routing are presented in Table 3.2.6.

Oahu Emergency Routing



(1) Deployment in progress during 2002

Figure 3.2.6: Emergency Routing Systems

Table 3.2.6: Emergency Routing Systems – Roles and Responsibilities

	HDOT	DTS	DDC	DIT	HESD	HFD
Design	Lead design of relevant components HDOT Emergency Routing Systems (center-to-center & field pre-emption)	Support design of relevant center-to-center and lead design of field components DTS Emergency Routing Systems	Lead design of internal City/County wireless communication systems.	Lead design of internal City/County Emergency Routing Systems (primarily center-to-center data transfer)	Participate in development of relevant Emergency Routing System requirements.	Participate in development of relevant Emergency Routing System requirements.
Implementation	Lead implementation of HDOT Emergency Routing System	NA	Lead implementation of internal City/County wireless communication systems.	Lead implementation of internal City/County systems.	NA	NA
Operation	NA	NA	NA	NA	Operate HESD Emergency Routing System.	Operate HFD Emergency Routing System.
Maintenance	Maintain HDOT Emergency Routing System (primarily center-to-center data transfer)	Maintain City/County Emergency Routing System (primarily signal pre-emption)	Maintain City/County wireless communication system	Maintain City/County Emergency Routing System (primarily center-to-center data transfer)	NA	NA

NA - Not Applicable

4. CONCEPTUAL ARCHITECTURE

The Conceptual Architecture summarizes the agency-to-agency interconnections and information/data flows that occur between different elements on Oahu. Unlike the Operational Concept, the Conceptual Design is more specific and is defined from the viewpoint of each agency and their respective elements, not by transportation service. The Conceptual Design provides individual stakeholders a concise summary of their systems, the data that is exchanged by their systems, the status of each system (existing or planned), and a listing of systems owned and operated by other agencies through which communication is being shared. The Conceptual Architecture process was enhanced through the use of Turbo Architecture Software.

4.1 THE TURBO ARCHITECTURE SOFTWARE TOOL

The Turbo Architecture Software Application is a tool used to develop and maintain regional ITS architectures. The Turbo Architecture tool inventories regional ITS-related elements, storing information pertaining to each such as their respective stakeholders, deployment status, and relevant market packages. Besides storing information relevant to an ITS architecture, the Turbo Architecture Software package also ensures that a region's ITS architecture conforms to the National ITS Architecture.

The Oahu Regional ITS Architecture Turbo File was updated to reflect changes that occurred as a result of this work.

4.2 REGIONAL ITS ELEMENT INVENTORY

The Oahu Regional ITS Element Inventory identifies the regional agencies and their respective elements partaking in the Oahu Regional ITS Architecture. An inventory will help regional stakeholders identify the elements a given agency is responsible for and whether these systems are existing or planned. Newly identified and/or planned systems can be added to the inventory at anytime, and entered into the existing Turbo Architecture database. The Oahu Regional ITS Element Inventory is shown in Table 4.2. Each element listed in Table 4.2 was identified through stakeholder input, entered into the Turbo ITS Architecture tool, and then mapped to one or more applicable National Architecture subsystems.

Table 4.2: Oahu Regional ITS Inventory (Element to Stakeholder View)

Stakeholder	Element(s)	Deployment Status
Aloha Stadium Authority	Aloha Stadium Parking Authority	Existing
Archived Data Administrators (PLACEHOLDER)	Archived Data Administrator	Existing
City & County of Honolulu, Department of Information Technology (DIT)	DIT Archive	Planned
	DIT Website	Existing
City & County of Honolulu, Department of Facilities Maintenance (DFM)	DFM Archive	Existing
	DFM Parking Management	Existing
City & County of Honolulu, Department of Transportation Services (DTS)	DTS Archived Data Management	Existing
	DTS Archived Data Management	Existing
	DTS Construction and Maintenance	Planned
	DTS Public Transit Division	Existing
	DTS TCC CCTV	Existing
	DTS TCC Traffic Signals	Existing
	DTS Traffic Control Center	Existing
City & County of Honolulu, Honolulu Emergency Services Department (HESD)	HESD Archived Data Management	Planned
	HESD CAD	Existing
	HESD Vehicles	Existing
City & County of Honolulu, Honolulu Fire Department (HFD)	HFD Archived Data Management	Planned
	HFD Communications Center CAD	Existing
	HFD Vehicles	Existing
City & County of Honolulu, Honolulu Police Department (HPD)	911 Call Center	Existing
	HPD CAD	Existing
	HPD Safety Management System (Archive)	Existing
	HPD Vehicles	Planned
City & County of Honolulu, Emergency Operating Center (EOC)	City Emergency Operating Center (OCDA)	Existing
	OCDA Archived Data Management	Planned
Commercial Broadcast Stations	Media	Existing
Commercial Operators	Commercial Personal Computing Devices	Planned
Department of Accounting and General Services (DAGS)	DAGS Parking Management	Existing
City & County of Honolulu, Department of Planning and Permitting (DPP)	DPP Parking Management	Existing
Event Promoters	Event Promoters	Existing
Government Agencies (PLACEHOLDER)	Government Reporting Systems	Existing

Table 4.2: Regional ITS Inventory (Element to Stakeholder View), Cont.

Stakeholder	Element(s)	Deployment Status
State of Hawaii, Hawaii Department of Transportation (HDOT)	HDOT Archived Data Management	Existing
	HDOT Construction and Maintenance	Planned
	HDOT Parking Management	Existing
	HDOT Freeway Service Patrol Dispatch	Planned
	HDOT Freeway Service Patrol Vehicles	Planned
	State Freeway Management Center	Planned
	State Freeway Management Center - Emergency	Existing
	State Freeway Management Center - Kiosks	Planned
	State Freeway Management Center - Ramp Meters	Planned
	State Freeway Management Center - Roadside Equipment	Planned
	State Freeway Management Center - Website	Planned
	State Tunnels Management Center	Existing
	State Tunnels Management Center - Emissions	Existing
	State Tunnels Management Center - Roadside Equipment	Existing
	HDOT Highways - P Count Stations	Existing
	HDOT Highways - Planning Archive	Existing
	HDOT Highways - Safety Archive	Existing
	HDOT Highways - V MVSO Archive	Existing
	HWY-V Commercial Vehicle Administration	Existing
Intermodal Freight Depots (PLACEHOLDER)	Intermodal Freight Depot	Existing
Military (PLACEHOLDER)	Military	Existing
National Weather Service	Weather Service	Existing
Private Agency	Private Information Service Provider	Existing
Real-Time Traffic Surveillance Laboratory	Real-Time Traffic Surveillance Laboratory	Existing
State Civil Defense	State Civil Defense Center	Existing
Oahu Transit Services (OTS)	TheBus Central Control Center	Existing
	TheBus Kiosks	Planned
	TheBus Transit Vehicles	Existing
	TheBus Website	Existing
	TheHandi-Van Dispatch Center	Existing
	TheHandi-Van Vehicles	Existing
Traveling public	User Personal Computing Devices	Existing

4.3 NATIONAL ITS ARCHITECTURE MAPPING

Figure 4.3 is known as a "Sausage Diagram" and it identifies at a high level those subsystems from the National ITS Architecture that are represented by an element in the Oahu Regional ITS Architecture. There are four classes of subsystems; Travelers, Centers, Vehicles, and Roadside, containing nineteen subsystems all together. The inactive (gray) subsystems, represent subsystems that are not represented in the Oahu Regional ITS Architecture.

The active white subsystems are represented by one or more ITS elements. A summary of the elements that correspond to the subsystems in Figure 4.3 is provided in Table 4.3.

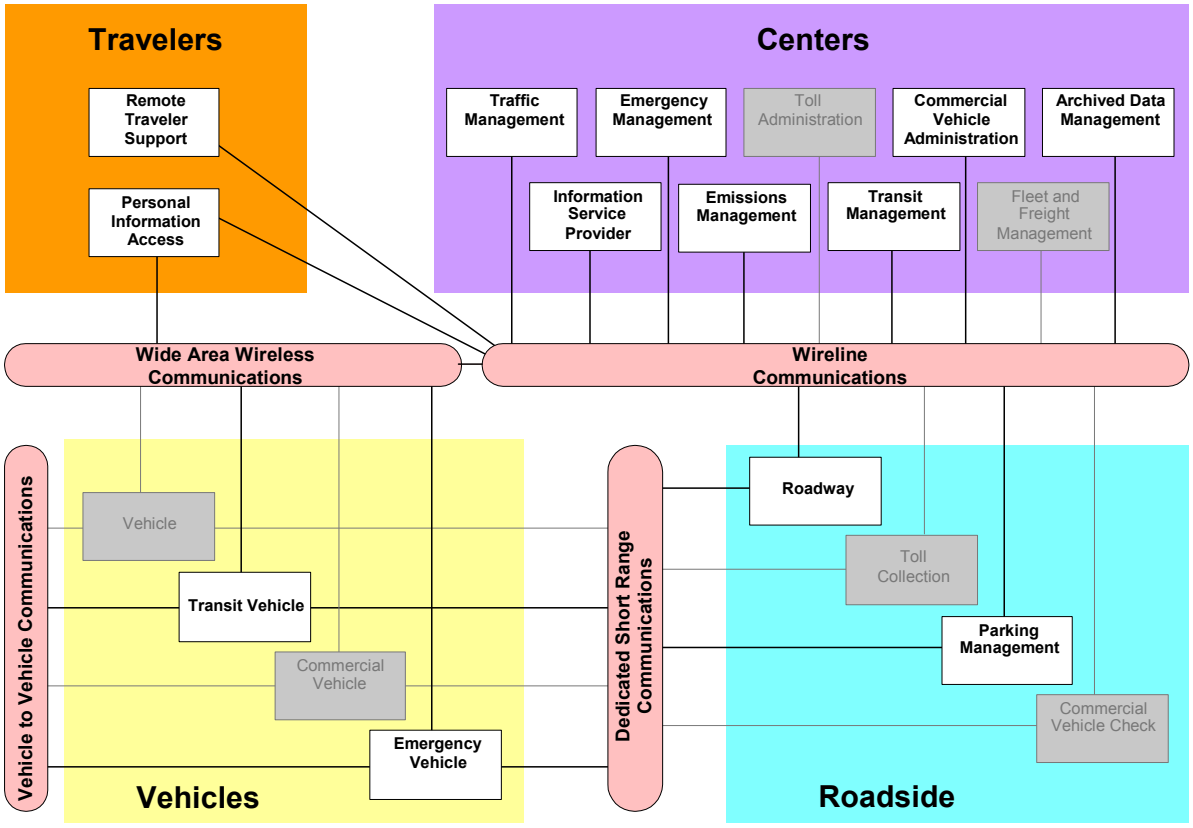


Figure 4.3: Oahu Regional ITS Architecture Sausage Diagram

Table 4.3 presents the National ITS Architecture Subsystem to Regional Element mapping. Mapping regional elements ensures that the Oahu Regional ITS Architecture conforms to the National ITS Architecture. Specifically, mapping ensures that the correct data flows are exchanged between systems.

Table 4.3 is divided into systems classified as subsystem or terminator. Subsystems in the table are shaded by their respective subsystem class as presented in Figure 4.3.

Table 4.3: National ITS Architecture Subsystem to Regional Element Mapping

Architecture Entity	Subsystem/Terminator Name	Element	Status
	Archived Data Management Subsystem	DFM Archive	Existing
		DIT Archive	Planned
		DTS Archived Data Management	Existing
		HDOT Archived Data Management	Existing
		HDOT Highways - Planning Archive	Existing
		HDOT Highways - Safety Archive	Existing
		HDOT Highways - V MVSO Archive	Existing
		HESD Archived Data Management	Planned
		HFD Archived Data Management	Planned
		HPD Safety Management System (Archive)	Existing
		OCDA Archived Data Management	Planned
		Real-Time Traffic Surveillance Laboratory	Existing
	Commercial Vehicle Administration	HWY-V Commercial Vehicle Administration	Existing
	Emergency Management	City Emergency Operating Center (OCDA)	Existing
		HDOT Freeway Service Patrol Dispatch	Planned
		HESD CAD	Existing
		HFD Communications Center CAD	Existing
		HPD CAD	Existing
		State Civil Defense Center	Existing
		State Freeway Management Center - Emergency	Existing
	Emissions Management	State Tunnels Management Center	Existing
		State Tunnels Management Center - Emissions	Existing
		State Tunnels Management Center - Roadside Equipment	Existing
	Information Service Provider	DIT Website	Existing
		Private Information Service Provider	Existing
		Real-Time Traffic Surveillance Laboratory	Existing
		State Freeway Management Center - Website	Planned
		TheBus Website	Existing
	Traffic Management	DTS Traffic Control Center	Existing
		State Freeway Management Center	Planned
		State Tunnels Management Center	Existing
		TheBus Central Control Center	Existing
		TheHandi-Van Dispatch Center	Existing

Table 4.3: National ITS Architecture Subsystem to Regional Element Mapping, Cont.

Architecture Entity	Subsystem/Terminator Name	Element	Status
Subsystem (Travelers)	Personal Information Access	Commercial Personal Computing Devices	Planned
		User Personal Computing Devices	Existing
	Remote Traveler Support	State Freeway Management Center - Kiosks	Planned
		TheBus Kiosks	Planned
Subsystem (Roadside)	Parking Management	Aloha Stadium Parking Authority	Existing
		DAGS Parking Management	Existing
		DFM Parking Management	Existing
		DPP Parking Management	Existing
		HDOT Parking Management	Existing
	Roadway Subsystem	DTS TCC CCTV	Existing
		DTS TCC Traffic Signals	Existing
		HDOT Highways - P Count Stations	Existing
		State Freeway Management Center - Ramp Meters	Planned
		State Freeway Management Center - Roadside Equipment	Planned
		State Tunnels Management Center - Roadside Equipment	Existing
Subsystem (Vehicles)	Emergency Vehicle Subsystem	HDOT Freeway Service Patrol Vehicles	Planned
		HESD Vehicles	Existing
		HFD Vehicles	Existing
		HPD Vehicles	Planned
	Transit Vehicle Subsystem	TheBus Transit Vehicles	Existing
		TheHandi-Van Vehicles	Existing
Terminators	Archived Data Administrator	Archived Data Administrator	Existing
	Archived Data User Systems	DTS Archived Data Management	Existing
		HDOT Archived Data Management	Existing
		HDOT Highways - Planning Archive	Existing
		HDOT Highways - Safety Archive	Existing
		HDOT Highways - V MVSO Archive	Existing
	Construction and Maintenance	DTS Construction and Maintenance	Planned
		HDOT Construction and Maintenance	Planned
	Emergency Telecommunications System	911 Call Center	Existing
	Event Promoters	Event Promoters	Existing
	Government Reporting Systems	Government Reporting Systems	Existing

Table 4.3: National ITS Architecture Subsystem to Regional Element Mapping, Cont.

Architecture Entity	Subsystem/Terminator Name	Element	Status
Terminators, Cont.	Intermodal Freight Depot	Intermodal Freight Depot	Existing
	Media	Media	Existing
	Other Archives	DFM Archive	Existing
		DIT Archive	Planned
		DTS Archived Data Management	Existing
		HDOT Archived Data Management	Existing
		HDOT Highways - Planning Archive	Existing
		HDOT Highways - Safety Archive	Existing
		HDOT Highways - V MVSO Archive	Existing
		HESD Archived Data Management	Planned
		HFD Archived Data Management	Planned
		OCDA Archived Data Management	Planned
		Real-Time Traffic Surveillance Laboratory	Existing
	Other CVAS	HWY-V Commercial Vehicle Administration	Existing
	Other EM	City Emergency Operating Center (OCDA)	Existing
		HDOT Freeway Service Patrol Dispatch	Planned
		HESD CAD	Existing
		HFD Communications Center CAD	Existing
		HPD CAD	Existing
		Military	Existing
		State Civil Defense Center	Existing
		State Freeway Management Center - Emergency	Existing
	Other ISP	DIT Website	Existing
		Private Information Service Provider	Existing
		Real-Time Traffic Surveillance Laboratory	Existing
		State Freeway Management Center - Website	Planned
		TheBus Website	Existing
	Other TM	DTS Traffic Control Center	Existing
		State Freeway Management Center	Planned
		State Tunnels Management Center	Existing
	Other TRM	DTS Public Transit Division	Existing
		TheBus Central Control Center	Existing
		TheHandi-Van Dispatch Center	Existing
	Weather Service	Weather Service	Existing

4.4 SYSTEM INTERCONNECTS

System Interconnect definition is the first step that needs to be taken to understand how regional agencies will integrate. Basically, system interconnects show all the agencies that a selected agency can expect to communicate with. Through this process, gaps in agency integration can be easily identified and addressed with updates to this Architecture. Basically, interconnects show the communication linkages between subsystems and terminators. Agencies can use the interconnect diagram to quickly observe how other systems will integrate with their own. At the interconnect stage, however, the type of information that will be exchanged has not been completely defined. Information exchanges, or data flows, will be summarized in the next section. Due to the large number of interconnects contained in the Oahu Regional ITS Architecture, only six systems, which significantly impact the region, are analyzed in this document. The six systems are:

- TheBus Control Center
- Honolulu Police Department Computer Aided Dispatch
- Honolulu Fire Department CAD
- State Freeway Management Center
- State Tunnels Management Center
- Honolulu Emergency Service Division CAD
- Department of Transportation Services Control Center

A summary of system interconnects for each of the fore mentioned systems is provided in Figures 4.4A through 4.4F respectively. A summary of architecture flow definitions is provided in Appendix B.

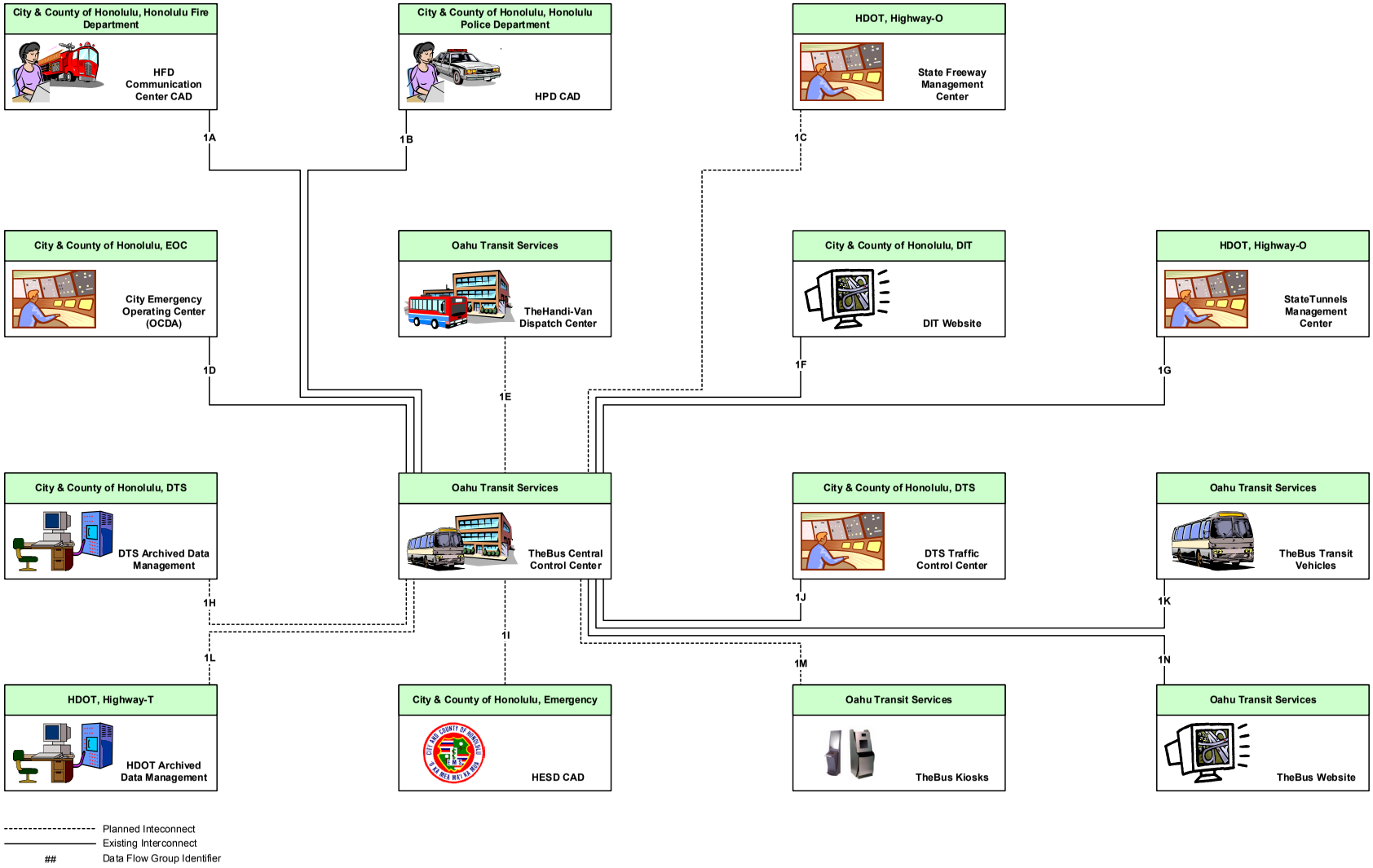


Figure 4.4A: Oahu Transit Services (OTS) Interconnect Diagram

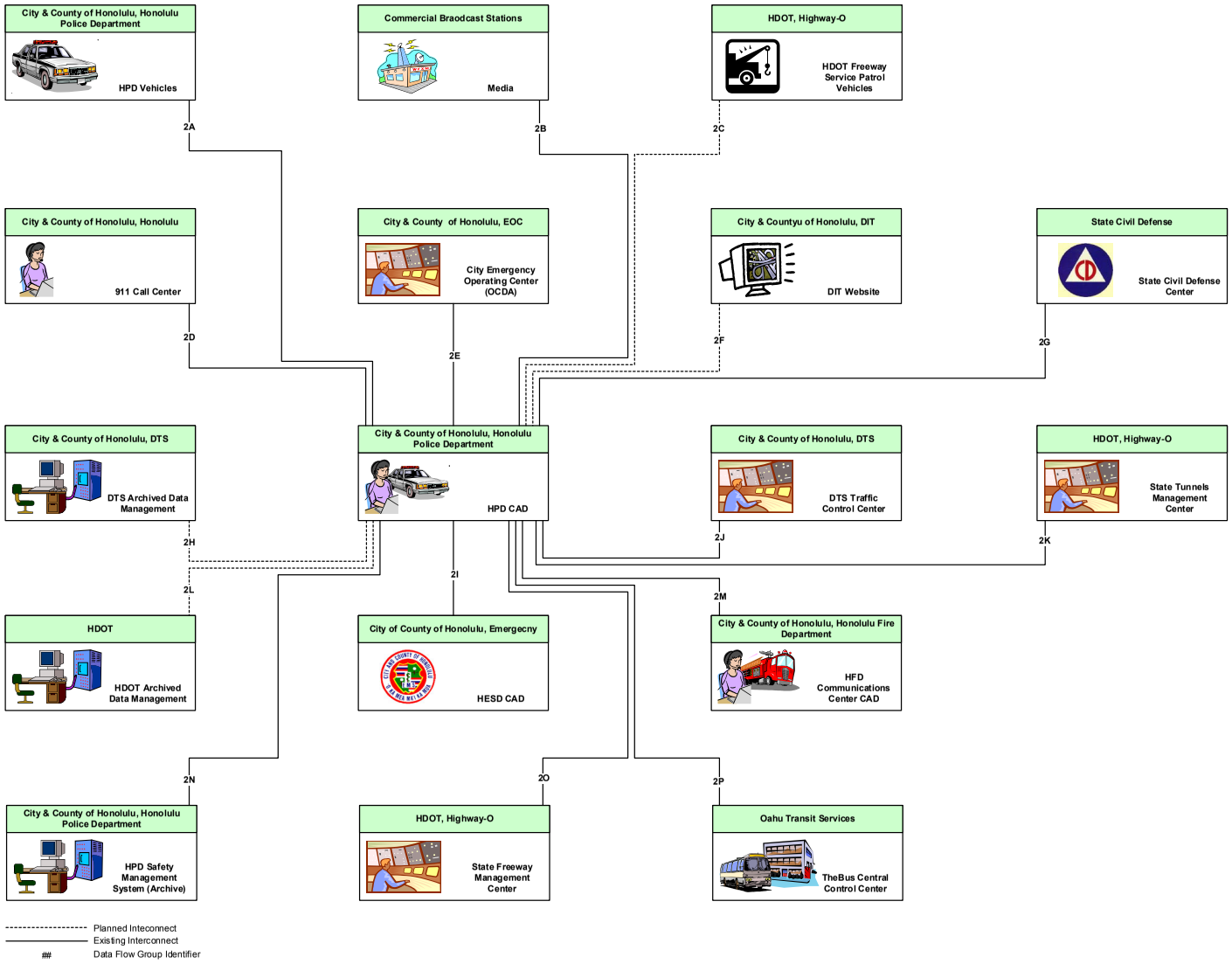


Figure 4.4B: Honolulu Police Department (HPD) Interconnect Diagram

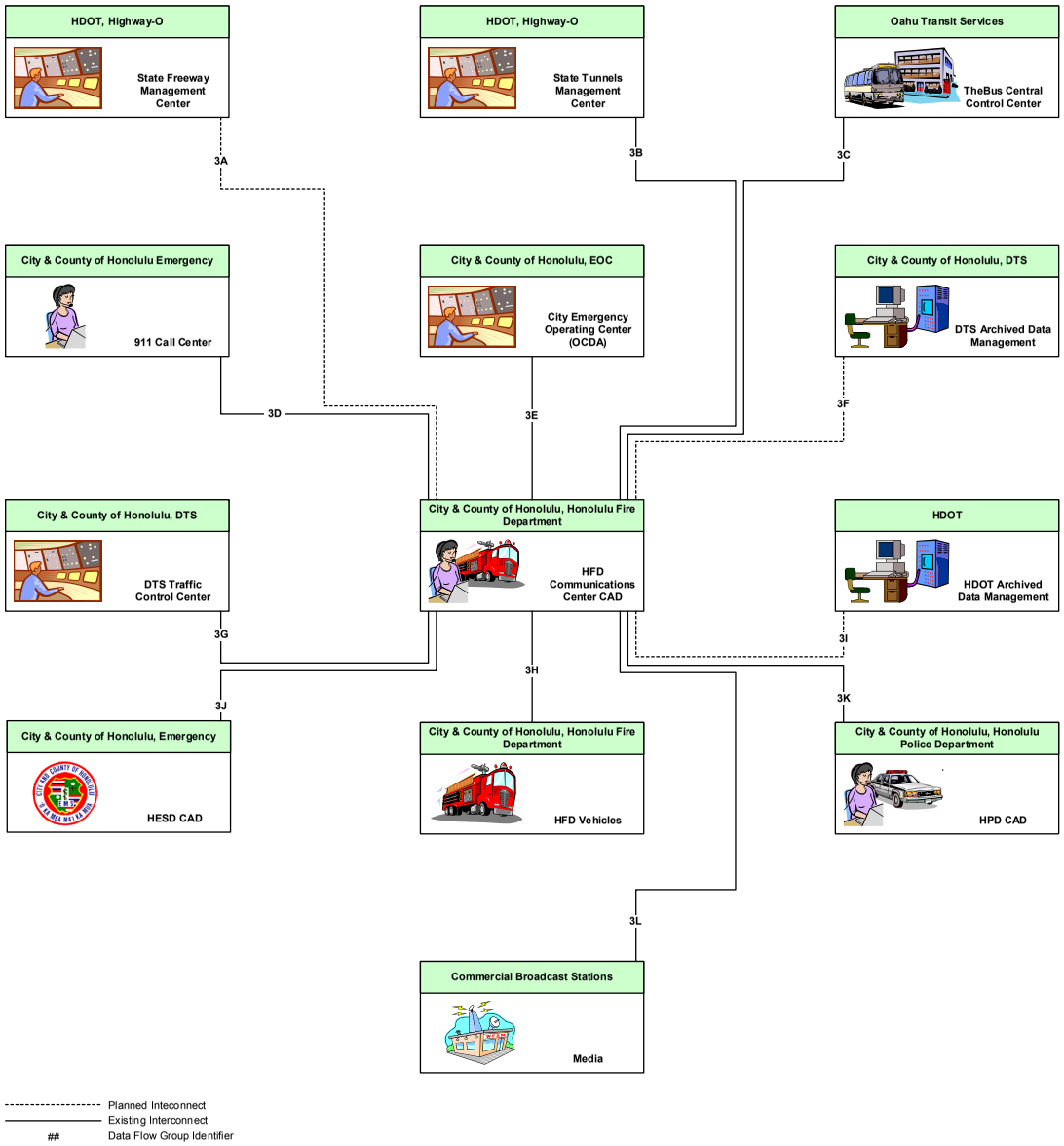


Figure 4.4C: Honolulu Fire Department (HFD) Interconnect Diagram

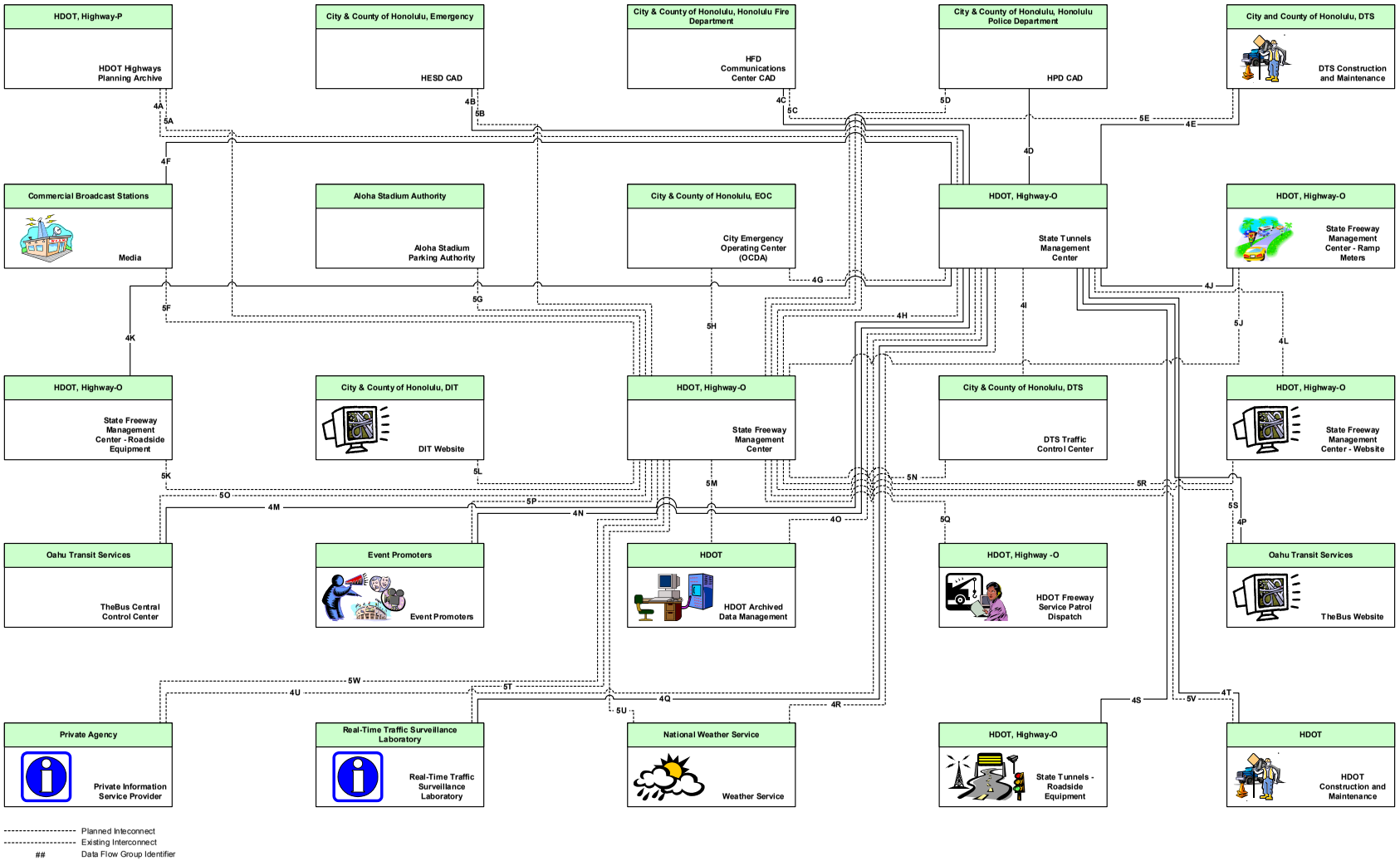


Figure 4.4D: State Freeway and State Tunnels Management Centers Interconnect Diagram

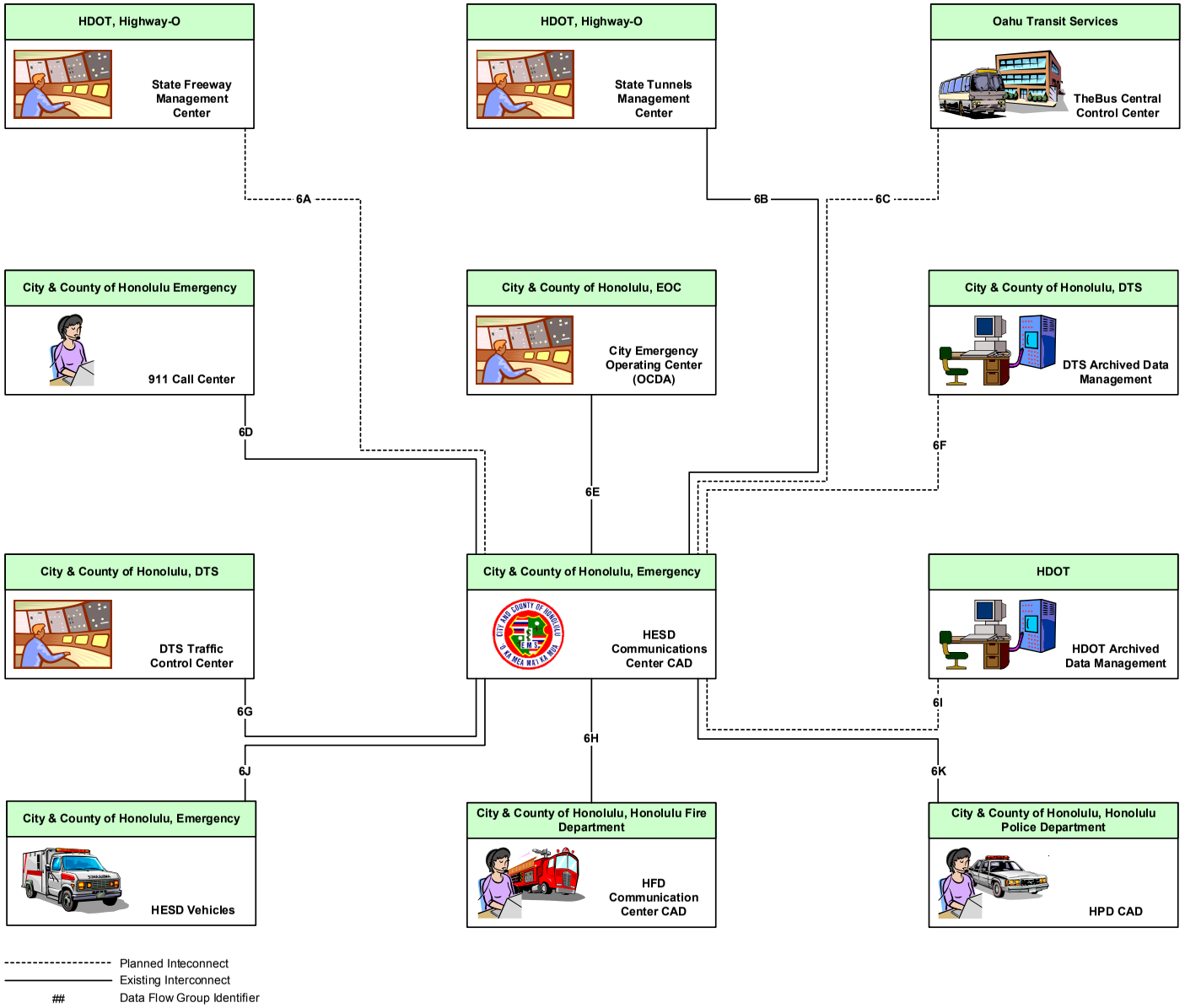


Figure 4.4E: Honolulu Emergency Services Division (HESD) Interconnect Diagram

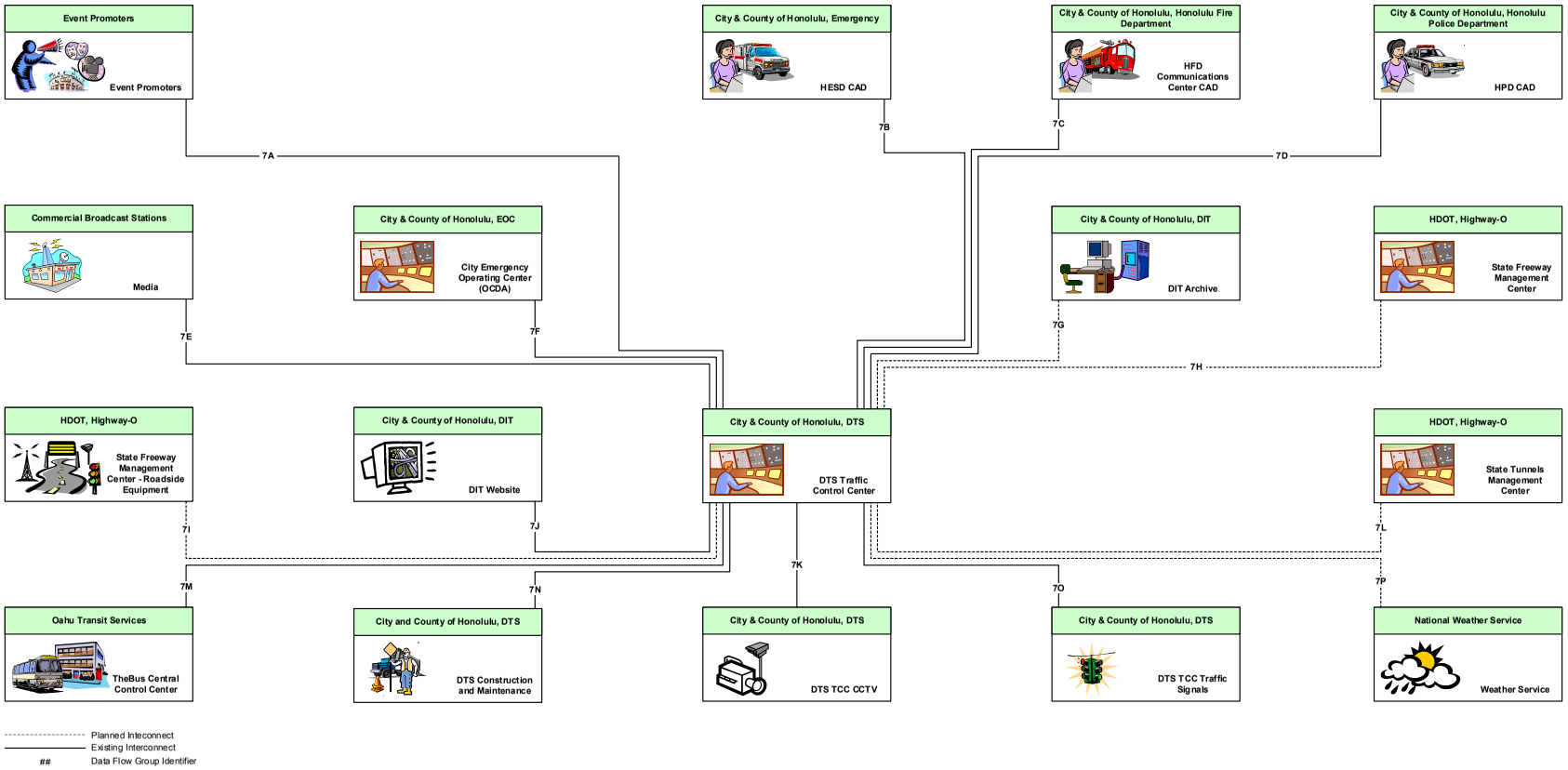


Figure 4.4F: Department of Transportation Services (DTS) Interconnect Diagram

4.5 SYSTEM DATA FLOWS

The type of information, or data flows, that are exchanged between subsystems and terminators are provided in this section. A data flow is one set of data that satisfies a particular transportation need. For instance, the data flow "incident data" provides data and imagery collected at the roadside to support incident detection and verification. Such a flow may originate at a roadway subsystem and be sent to a traffic management subsystem. A single interconnect may contain one or several of these data flows.

Several standard development organizations, have issued standards (documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics for the interchange of data) for several of the data flows planned between systems on Oahu. This ensures that interfaces between subsystems are common between unique regional ITS architectures. For example, if the flow "incident data" were in the Oahu Regional ITS Architecture, standards associated with this flow would then set forth the same interface requirements for this flow if implemented in a different regional ITS architecture and vice versa. The standards development process is still on-going, and not all flows in the National ITS Architecture have standards associated with them.

In Figures 4.4A – 4.4F, each of the interconnects shown are labeled with a number and letter. These labels are referenced in Table 4.4, providing the flow type, direction, and status. Regionally significant agencies, identified in Section 4.4 can use the interconnects and the specific data flows in the next section to quickly identify agencies they will communicate with, and the type of information that will be exchanged. This information will be expanded upon in the Oahu ITS Integration Strategy Plan.

Table 4.5: Regionally Significant Subsystem Data Flows

Flow	Source Element	Destination Element	Flow Name	Status
1A, 3C	HFD Communications Center CAD	TheBus Central Control Center	transit emergency coordination data	Existing
	TheBus Central Control Center	HFD Communications Center CAD	transit emergency data	Existing
1B, 2P	HPD CAD	TheBus Central Control Center	transit emergency coordination data	Existing
	TheBus Central Control Center	HPD CAD	transit emergency data	Existing
1C, 5O	State Freeway Management Center	TheBus Central Control Center	request transit information	Planned
	State Freeway Management Center	TheBus Central Control Center	traffic control priority status	Planned
	State Freeway Management Center	TheBus Central Control Center	traffic information for transit	Planned
	State Freeway Management Center	TheBus Central Control Center	transit demand management request	Planned
	TheBus Central Control Center	State Freeway Management Center	traffic control priority request	Planned
	TheBus Central Control Center	State Freeway Management Center	transit demand management response	Planned
	TheBus Central Control Center	State Freeway Management Center	transit system data	Planned
1D	City Emergency Operating Center (OCDA)	TheBus Central Control Center	transit emergency coordination data	Existing
	TheBus Central Control Center	City Emergency Operating Center (OCDA)	transit emergency data	Existing
1E	TheBus Central Control Center	TheHandi-Van Dispatch Center	TRMS coord	Planned
	TheHandi-Van Dispatch Center	TheBus Central Control Center	TRMS coord	Planned
1F	DIT Website	TheBus Central Control Center	transit information request	Existing
	TheBus Central Control Center	DIT Website	transit information	Existing
1G, 4M	State Tunnels Management Center	TheBus Central Control Center	request transit information	Planned
	State Tunnels Management Center	TheBus Central Control Center	traffic control priority status	Planned
	State Tunnels Management Center	TheBus Central Control Center	traffic information for transit	Existing
	State Tunnels Management Center	TheBus Central Control Center	transit demand management request	Planned
	TheBus Central Control Center	State Tunnels Management Center	traffic control priority request	Planned
	TheBus Central Control Center	State Tunnels Management Center	transit demand management response	Planned
	TheBus Central Control Center	State Tunnels Management Center	transit system data	Planned
1H	DTS Archived Data Management	TheBus Central Control Center	archive requests	Planned
	TheBus Central Control Center	DTS Archived Data Management	transit archive data	Planned
1I, 6C	HESD CAD	TheBus Central Control Center	transit emergency coordination data	Planned
	TheBus Central Control Center	HESD CAD	transit emergency data	Planned
1J, 7M	DTS Traffic Control Center	TheBus Central Control Center	request transit information	Existing
	DTS Traffic Control Center	TheBus Central Control Center	traffic control priority status	Planned
	DTS Traffic Control Center	TheBus Central Control Center	traffic flow data for transit	Existing
	DTS Traffic Control Center	TheBus Central Control Center	traffic images for transit	Existing
	DTS Traffic Control Center	TheBus Central Control Center	traffic information for transit	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
	TheBus Central Control Center	DTS Traffic Control Center	traffic control priority request	Planned
	TheBus Central Control Center	DTS Traffic Control Center	transit system data	Planned
1K	TheBus Central Control Center	TheBus Transit Vehicles	bad tag list	Planned
	TheBus Central Control Center	TheBus Transit Vehicles	driver instructions	Existing
	TheBus Central Control Center	TheBus Transit Vehicles	emergency acknowledge	Existing
	TheBus Central Control Center	TheBus Transit Vehicles	fare management information	Planned
	TheBus Central Control Center	TheBus Transit Vehicles	request for vehicle measures	Existing
	TheBus Central Control Center	TheBus Transit Vehicles	transit schedule information	Existing
	TheBus Central Control Center	TheBus Transit Vehicles	transit traveler information	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	emergency notification	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	fare and payment status	Planned
	TheBus Transit Vehicles	TheBus Central Control Center	request for bad tag list	Planned
	TheBus Transit Vehicles	TheBus Central Control Center	transit traveler request	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	transit vehicle conditions	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	transit vehicle location data	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	transit vehicle passenger and use data	Existing
	TheBus Transit Vehicles	TheBus Central Control Center	transit vehicle schedule performance	Existing
1L	HDOT Archived Data Management	TheBus Central Control Center	archive requests	Planned
	TheBus Central Control Center	HDOT Archived Data Management	transit archive data	Planned
1M	TheBus Central Control Center	TheBus Kiosks	emergency acknowledge	Planned
	TheBus Central Control Center	TheBus Kiosks	secure area monitoring support	Planned
	TheBus Central Control Center	TheBus Kiosks	transit fare payment responses	Planned
	TheBus Central Control Center	TheBus Kiosks	transit traveler information	Planned
	TheBus Kiosks	TheBus Central Control Center	emergency notification	Planned
	TheBus Kiosks	TheBus Central Control Center	secure area surveillance data	Planned
	TheBus Kiosks	TheBus Central Control Center	transit fare payment requests	Planned
	TheBus Kiosks	TheBus Central Control Center	transit information user request	Planned
1N	TheBus Central Control Center	TheBus Website	demand responsive transit plan	Planned
	TheBus Central Control Center	TheBus Website	transit and fare schedules	Existing
	TheBus Central Control Center	TheBus Website	transit incident information	Existing
	TheBus Central Control Center	TheBus Website	transit request confirmation	Planned
	TheBus Website	TheBus Central Control Center	demand responsive transit request	Planned
	TheBus Website	TheBus Central Control Center	selected routes	Existing
	TheBus Website	TheBus Central Control Center	transit information request	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
2A	HPD CAD	HPD Vehicles	emergency dispatch requests	Existing
	HPD CAD	HPD Vehicles	incident command information	Existing
	HPD Vehicles	HPD CAD	incident command request	Existing
	HPD Vehicles	HPD CAD	incident status	Existing
2B	HPD CAD	Media	incident information for media	Existing
	Media	HPD CAD	media information request	Existing
2C	HDOT Freeway Service Patrol Vehicles	HPD CAD	emergency dispatch response	Planned
	HDOT Freeway Service Patrol Vehicles	HPD CAD	incident command request	Planned
	HDOT Freeway Service Patrol Vehicles	HPD CAD	incident status	Planned
	HPD CAD	HDOT Freeway Service Patrol Vehicles	emergency dispatch requests	Planned
	HPD CAD	HDOT Freeway Service Patrol Vehicles	incident command information	Planned
2D	911 Call Center	HPD CAD	incident notification	Existing
	HPD CAD	911 Call Center	incident notification response	Existing
2E	City Emergency Operating Center (OCDA)	HPD CAD	incident report	Planned
	City Emergency Operating Center (OCDA)	HPD CAD	incident response coordination	Existing
	HPD CAD	City Emergency Operating Center (OCDA)	incident report	Planned
	HPD CAD	City Emergency Operating Center (OCDA)	incident response coordination	Existing
2F	HPD CAD	DIT Website	incident information	Planned
2G	HPD CAD	State Civil Defense Center	incident report	Existing
	HPD CAD	State Civil Defense Center	incident response coordination	Existing
	State Civil Defense Center	HPD CAD	incident report	Existing
	State Civil Defense Center	HPD CAD	incident response coordination	Existing
2H	DTS Archived Data Management	HPD CAD	archive requests	Planned
	HPD CAD	DTS Archived Data Management	emergency archive data	Planned
2I, 6K	HESD CAD	HPD CAD	incident report	Planned
	HESD CAD	HPD CAD	incident response coordination	Existing
	HPD CAD	HESD CAD	incident report	Planned
	HPD CAD	HESD CAD	incident response coordination	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
2J, 7D	DTS Traffic Control Center	HPD CAD	current network conditions	Existing
	DTS Traffic Control Center	HPD CAD	emergency traffic control response	Existing
	DTS Traffic Control Center	HPD CAD	incident information	Existing
	DTS Traffic Control Center	HPD CAD	incident information request	Existing
	DTS Traffic Control Center	HPD CAD	permit data	Planned
	DTS Traffic Control Center	HPD CAD	resource deployment status	Existing
	HPD CAD	DTS Traffic Control Center	emergency traffic control request	Existing
	HPD CAD	DTS Traffic Control Center	incident information	Existing
	HPD CAD	DTS Traffic Control Center	incident response status	Existing
	HPD CAD	DTS Traffic Control Center	resource request	Planned
	HPD CAD	DTS Traffic Control Center	video selection	Existing
2K, 4D	HPD CAD	State Tunnels Management Center	emergency traffic control request	Existing
	HPD CAD	State Tunnels Management Center	incident information	Planned
	HPD CAD	State Tunnels Management Center	incident response status	Planned
	HPD CAD	State Tunnels Management Center	resource request	Planned
	HPD CAD	State Tunnels Management Center	video selection	Planned
	State Tunnels Management Center	HPD CAD	current network conditions	Planned
	State Tunnels Management Center	HPD CAD	emergency traffic control response	Existing
	State Tunnels Management Center	HPD CAD	incident information	Existing
	State Tunnels Management Center	HPD CAD	incident information request	Planned
	State Tunnels Management Center	HPD CAD	permit data	Planned
	State Tunnels Management Center	HPD CAD	resource deployment status	Existing
2L	HDOT Archived Data Management	HPD CAD	archive requests	Planned
	HPD CAD	HDOT Archived Data Management	emergency archive data	Planned
2M, 3K	HFD Communications Center CAD	HPD CAD	incident report	Planned
	HFD Communications Center CAD	HPD CAD	incident response coordination	Existing
	HPD CAD	HFD Communications Center CAD	incident report	Planned
	HPD CAD	HFD Communications Center CAD	incident response coordination	Existing
2N	HPD CAD	HPD Safety Management System (Archive)	emergency archive data	Existing
	HPD Safety Management System (Archive)	HPD CAD	archive requests	Existing
	HPD Safety Management System (Archive)	HPD CAD	archive status	Existing
2O, 5D	HPD CAD	State Freeway Management Center	emergency traffic control request	Planned
	HPD CAD	State Freeway Management Center	incident information	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
	HPD CAD	State Freeway Management Center	incident response status	Planned
	HPD CAD	State Freeway Management Center	resource request	Planned
	HPD CAD	State Freeway Management Center	video selection	Planned
	State Freeway Management Center	HPD CAD	current network conditions	Planned
	State Freeway Management Center	HPD CAD	emergency traffic control response	Planned
	State Freeway Management Center	HPD CAD	incident information	Planned
	State Freeway Management Center	HPD CAD	incident information request	Planned
	State Freeway Management Center	HPD CAD	permit data	Planned
	State Freeway Management Center	HPD CAD	resource deployment status	Planned
	State Freeway Management Center	HPD CAD	resources request	Planned
3A, 5C	HFD Communications Center CAD	State Freeway Management Center	emergency traffic control request	Planned
	HFD Communications Center CAD	State Freeway Management Center	incident information	Planned
	HFD Communications Center CAD	State Freeway Management Center	incident response status	Planned
	HFD Communications Center CAD	State Freeway Management Center	resource request	Planned
	HFD Communications Center CAD	State Freeway Management Center	video selection	Planned
	State Freeway Management Center	HFD Communications Center CAD	current network conditions	Planned
	State Freeway Management Center	HFD Communications Center CAD	emergency traffic control response	Planned
	State Freeway Management Center	HFD Communications Center CAD	incident information	Planned
3B, 4C	HFD Communications Center CAD	State Tunnels Management Center	emergency traffic control request	Existing
	HFD Communications Center CAD	State Tunnels Management Center	incident information	Planned
	HFD Communications Center CAD	State Tunnels Management Center	incident response status	Planned
	HFD Communications Center CAD	State Tunnels Management Center	resource request	Planned
	HFD Communications Center CAD	State Tunnels Management Center	video selection	Planned
	State Tunnels Management Center	HFD Communications Center CAD	current network conditions	Planned
	State Tunnels Management Center	HFD Communications Center CAD	emergency traffic control response	Existing
	State Tunnels Management Center	HFD Communications Center CAD	incident information	Planned
	State Tunnels Management Center	HFD Communications Center CAD	incident information request	Planned
	State Tunnels Management Center	HFD Communications Center CAD	resource deployment status	Existing
3D	911 Call Center	HFD Communications Center CAD	incident notification	Existing
	HFD Communications Center CAD	911 Call Center	incident notification response	Planned
3E	City Emergency Operating Center (OCDA)	HFD Communications Center CAD	incident report	Planned
	City Emergency Operating Center (OCDA)	HFD Communications Center CAD	incident response coordination	Existing
	HFD Communications Center CAD	City Emergency Operating Center (OCDA)	incident report	Planned
	HFD Communications Center CAD	City Emergency Operating Center (OCDA)	incident response coordination	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
3F	DTS Archived Data Management	HFD Communications Center CAD	archive requests	Planned
	HFD Communications Center CAD	DTS Archived Data Management	emergency archive data	Planned
3G, 7D	DTS Traffic Control Center	HFD Communications Center CAD	current network conditions	Planned
	DTS Traffic Control Center	HFD Communications Center CAD	emergency traffic control response	Existing
	DTS Traffic Control Center	HFD Communications Center CAD	incident information	Planned
	DTS Traffic Control Center	HFD Communications Center CAD	incident information request	Planned
	DTS Traffic Control Center	HFD Communications Center CAD	resource deployment status	Existing
	HFD Communications Center CAD	DTS Traffic Control Center	emergency traffic control request	Existing
	HFD Communications Center CAD	DTS Traffic Control Center	incident information	Existing
	HFD Communications Center CAD	DTS Traffic Control Center	incident response status	Existing
	HFD Communications Center CAD	DTS Traffic Control Center	resource request	Existing
	HFD Communications Center CAD	DTS Traffic Control Center	video selection	Planned
3H	HFD Communications Center CAD	HFD Vehicles	emergency dispatch requests	Existing
	HFD Communications Center CAD	HFD Vehicles	incident command information	Planned
	HFD Communications Center CAD	HFD Vehicles	suggested route	Existing
	HFD Vehicles	HFD Communications Center CAD	emergency dispatch response	Existing
	HFD Vehicles	HFD Communications Center CAD	emergency vehicle tracking data	Planned
	HFD Vehicles	HFD Communications Center CAD	incident command request	Existing
	HFD Vehicles	HFD Communications Center CAD	incident status	Existing
3I	HDOT Archived Data Management	HFD Communications Center CAD	archive requests	Planned
	HFD Communications Center CAD	HDOT Archived Data Management	emergency archive data	Planned
3J, 6H	HESD CAD	HFD Communications Center CAD	incident report	Planned
	HESD CAD	HFD Communications Center CAD	incident response coordination	Existing
	HFD Communications Center CAD	HESD CAD	incident report	Planned
	HFD Communications Center CAD	HESD CAD	incident response coordination	Existing
3L	HFD Communications Center CAD	Media	incident information for media	Existing
	Media	HFD Communications Center CAD	media information request	Existing
4A	HDOT Highways - Planning Archive	State Tunnels Management Center	archive requests	Planned
	HDOT Highways - Planning Archive	State Tunnels Management Center	archive status	Planned
4B, 6B	HESD CAD	State Tunnels Management Center	emergency traffic control request	Existing
	HESD CAD	State Tunnels Management Center	incident information	Planned
	HESD CAD	State Tunnels Management Center	incident response status	Planned
	HESD CAD	State Tunnels Management Center	resource request	Planned
	HESD CAD	State Tunnels Management Center	video selection	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
	State Tunnels Management Center	HESD CAD	current network conditions	Planned
	State Tunnels Management Center	HESD CAD	emergency traffic control response	Existing
	State Tunnels Management Center	HESD CAD	incident information	Existing
	State Tunnels Management Center	HESD CAD	incident information request	Planned
	State Tunnels Management Center	HESD CAD	resource deployment status	Existing
4E	State Tunnels Management Center	DTS Construction and Maintenance	closure coordination	Existing
	State Tunnels Management Center	DTS Construction and Maintenance	maintenance resource request	Existing
	DTS Construction and Maintenance	State Tunnels Management Center	maintenance resource response	Existing
4F	Media	State Tunnels Management Center	external reports	Existing
	Media	State Tunnels Management Center	media information request	Existing
	State Tunnels Management Center	Media	traffic information for media	Existing
4G	City Emergency Operating Center (OCDA)	State Tunnels Management Center	emergency traffic control request	Planned
	City Emergency Operating Center (OCDA)	State Tunnels Management Center	incident information	Planned
	City Emergency Operating Center (OCDA)	State Tunnels Management Center	incident response status	Planned
	City Emergency Operating Center (OCDA)	State Tunnels Management Center	resource request	Planned
	City Emergency Operating Center (OCDA)	State Tunnels Management Center	video selection	Planned
	State Tunnels Management Center	City Emergency Operating Center (OCDA)	current network conditions	Planned
	State Tunnels Management Center	City Emergency Operating Center (OCDA)	emergency traffic control response	Planned
	State Tunnels Management Center	City Emergency Operating Center (OCDA)	incident information	Planned
	State Tunnels Management Center	City Emergency Operating Center (OCDA)	incident information request	Planned
	State Tunnels Management Center	City Emergency Operating Center (OCDA)	resource deployment status	Planned
4H	State Freeway Management Center	State Tunnels Management Center	traffic control coordination	Planned
	State Freeway Management Center	State Tunnels Management Center	traffic information coordination	Planned
	State Tunnels Management Center	State Freeway Management Center	traffic control coordination	Planned
	State Tunnels Management Center	State Freeway Management Center	traffic information coordination	Planned
4I, 7L	DTS Traffic Control Center	State Tunnels Management Center	traffic control coordination	Planned
	DTS Traffic Control Center	State Tunnels Management Center	traffic information coordination	Planned
	DTS Traffic Control Center	State Tunnels Management Center	video selection	Planned
	State Tunnels Management Center	DTS Traffic Control Center	traffic control coordination	Planned
	State Tunnels Management Center	DTS Traffic Control Center	traffic information coordination	Planned
	State Tunnels Management Center	DTS Traffic Control Center	video selection	Planned
4J	State Tunnels Management Center	State Freeway Management Center - Ramp Meters	freeway control data	Planned
	State Tunnels Management Center	State Freeway Management Center - Ramp Meters	roadway information system data	Planned
	State Tunnels Management Center	State Freeway Management Center - Ramp Meters	sensor and surveillance control	Planned
4K	State Tunnels Management Center	State Freeway Management Center - Roadside Equipment	roadway information system data	Existing
	State Tunnels Management Center	State Freeway Management Center - Roadside Equipment	sensor and surveillance control	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
4L	State Freeway Management Center - Website	State Tunnels Management Center	request for traffic information	Planned
	State Tunnels Management Center	State Freeway Management Center - Website	traffic information	Planned
4N	Event Promoters	State Tunnels Management Center	event plans	Existing
4O	HDOT Archived Data Management	State Tunnels Management Center	archive requests	Planned
	State Tunnels Management Center	HDOT Archived Data Management	traffic archive data	Planned
4P	TheBus Website	State Tunnels Management Center	request for traffic information	Existing
4Q	Real-Time Traffic Surveillance Laboratory	State Tunnels Management Center	request for traffic information	Existing
	Real-Time Traffic Surveillance Laboratory	State Tunnels Management Center	road network use	Planned
	State Tunnels Management Center	Real-Time Traffic Surveillance Laboratory	traffic information	Existing
4R	Weather Service	State Tunnels Management Center	weather information	Planned
4S	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	freeway control data	Existing
	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	pollution state data request	Existing
	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	roadway information system data	Existing
	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	sensor and surveillance control	Existing
	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	signal control data	Existing
	State Tunnels Management Center	State Tunnels Management Center - Roadside Equipment	vehicle pollution criteria	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	environmental conditions	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	fault reports	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	incident data	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	reversible lane status	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	signal control status	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	traffic flow	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	traffic images	Existing
	State Tunnels Management Center - Roadside Equipment	State Tunnels Management Center	widearea statistical pollution information	Existing
4T	HDOT Construction and Maintenance	State Tunnels Management Center	maintenance resource response	Existing
	State Tunnels Management Center	HDOT Construction and Maintenance	closure coordination	Existing
	State Tunnels Management Center	HDOT Construction and Maintenance	maintenance resource request	Existing
4U	Private Information Service Provider	State Tunnels Management Center	request for traffic information	Planned
	State Tunnels Management Center	Private Information Service Provider	traffic information	Planned
5A	HDOT Highways - Planning Archive	State Freeway Management Center	archive requests	Planned
	HDOT Highways - Planning Archive	State Freeway Management Center	archive status	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
5B, 6A	HESD CAD	State Freeway Management Center	emergency traffic control request	Planned
	HESD CAD	State Freeway Management Center	incident information	Planned
	HESD CAD	State Freeway Management Center	incident response status	Planned
	HESD CAD	State Freeway Management Center	resource request	Planned
	HESD CAD	State Freeway Management Center	video selection	Planned
	State Freeway Management Center	HESD CAD	current network conditions	Planned
	State Freeway Management Center	HESD CAD	emergency traffic control response	Planned
	State Freeway Management Center	HESD CAD	incident information	Planned
5E	State Freeway Management Center	DTS Construction and Maintenance	closure coordination	Planned
	State Freeway Management Center	DTS Construction and Maintenance	maintenance resource request	Planned
5F	Media	State Freeway Management Center	external reports	Planned
	Media	State Freeway Management Center	media information request	Planned
	State Freeway Management Center	Media	traffic information for media	Planned
5G	Aloha Stadium Parking Authority	State Freeway Management Center	parking availability	Planned
	Aloha Stadium Parking Authority	State Freeway Management Center	parking demand management response	Planned
	State Freeway Management Center	Aloha Stadium Parking Authority	parking demand management request	Planned
	State Freeway Management Center	Aloha Stadium Parking Authority	parking instructions	Planned
5H	City Emergency Operating Center (OCDA)	State Freeway Management Center	emergency traffic control request	Planned
	City Emergency Operating Center (OCDA)	State Freeway Management Center	incident information	Planned
	City Emergency Operating Center (OCDA)	State Freeway Management Center	incident response status	Planned
	City Emergency Operating Center (OCDA)	State Freeway Management Center	remote surveillance control	Planned
	City Emergency Operating Center (OCDA)	State Freeway Management Center	resource request	Planned
	State Freeway Management Center	City Emergency Operating Center (OCDA)	current network conditions	Planned
	State Freeway Management Center	City Emergency Operating Center (OCDA)	emergency traffic control response	Planned
	State Freeway Management Center	City Emergency Operating Center (OCDA)	incident information	Planned
	State Freeway Management Center	City Emergency Operating Center (OCDA)	incident information request	Planned
	State Freeway Management Center	City Emergency Operating Center (OCDA)	resource deployment status	Planned
5J	State Freeway Management Center	State Freeway Management Center - Ramp Meters	freeway control data	Planned
	State Freeway Management Center	State Freeway Management Center - Ramp Meters	roadway information system data	Planned
	State Freeway Management Center	State Freeway Management Center - Ramp Meters	sensor and surveillance control	Planned
	State Freeway Management Center - Ramp Meters	State Freeway Management Center	fault reports	Planned
	State Freeway Management Center - Ramp Meters	State Freeway Management Center	freeway control status	Planned
	State Freeway Management Center - Ramp Meters	State Freeway Management Center	request for right-of-way	Planned
	State Freeway Management Center - Ramp Meters	State Freeway Management Center	traffic flow	Planned
	State Freeway Management Center - Ramp Meters	State Freeway Management Center	traffic images	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
5K	State Freeway Management Center	State Freeway Management Center - Roadside Equipment	freeway control data	Planned
	State Freeway Management Center	State Freeway Management Center - Roadside Equipment	roadway information system data	Planned
	State Freeway Management Center	State Freeway Management Center - Roadside Equipment	sensor and surveillance control	Planned
	State Freeway Management Center	State Freeway Management Center - Roadside Equipment	signal control data	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	emissions data	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	environmental conditions	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	fault reports	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	freeway control status	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	hov data	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	incident data	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	roadway information system status	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	signal control status	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	traffic flow	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	traffic images	Planned
	State Freeway Management Center - Roadside Equipment	State Freeway Management Center	vehicle probe data	Planned
5L	State Freeway Management Center	DIT Website	traffic information	Planned
5M	HDOT Archived Data Management	State Freeway Management Center	archive requests	Planned
	State Freeway Management Center	HDOT Archived Data Management	traffic archive data	Planned
5N, 7H	DTS Traffic Control Center	State Freeway Management Center	traffic control coordination	Planned
	DTS Traffic Control Center	State Freeway Management Center	traffic information coordination	Planned
	DTS Traffic Control Center	State Freeway Management Center	video selection	Planned
	State Freeway Management Center	DTS Traffic Control Center	traffic control coordination	Planned
	State Freeway Management Center	DTS Traffic Control Center	traffic information coordination	Planned
	State Freeway Management Center	DTS Traffic Control Center	video selection	Planned
5P	Event Promoters	State Freeway Management Center	event plans	Planned
5Q	HDOT Freeway Service Patrol Dispatch	State Freeway Management Center	emergency traffic control request	Planned
	HDOT Freeway Service Patrol Dispatch	State Freeway Management Center	incident information	Planned
	HDOT Freeway Service Patrol Dispatch	State Freeway Management Center	incident response status	Planned
	HDOT Freeway Service Patrol Dispatch	State Freeway Management Center	remote surveillance control	Planned
	HDOT Freeway Service Patrol Dispatch	State Freeway Management Center	resource request	Planned
	State Freeway Management Center	HDOT Freeway Service Patrol Dispatch	current network conditions	Planned
	State Freeway Management Center	HDOT Freeway Service Patrol Dispatch	emergency traffic control response	Planned
	State Freeway Management Center	HDOT Freeway Service Patrol Dispatch	incident information	Planned
	State Freeway Management Center	HDOT Freeway Service Patrol Dispatch	incident information request	Planned
	State Freeway Management Center	HDOT Freeway Service Patrol Dispatch	resource deployment status	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
5R	State Freeway Management Center	State Freeway Management Center - Website	traffic information	Planned
	State Freeway Management Center - Website	State Freeway Management Center	logged special vehicle route	Planned
	State Freeway Management Center - Website	State Freeway Management Center	request for traffic information	Planned
	State Freeway Management Center - Website	State Freeway Management Center	road network use	Planned
5S	State Freeway Management Center	TheBus Website	traffic information	Planned
	TheBus Website	State Freeway Management Center	request for traffic information	Planned
5T	Real-Time Traffic Surveillance Laboratory	State Freeway Management Center	request for traffic information	Planned
	Real-Time Traffic Surveillance Laboratory	State Freeway Management Center	road network use	Planned
	State Freeway Management Center	Real-Time Traffic Surveillance Laboratory	traffic information	Planned
5U	Weather Service	State Freeway Management Center	weather information	Planned
5V	HDOT Construction and Maintenance	State Freeway Management Center	maintenance resource response	Planned
	State Freeway Management Center	HDOT Construction and Maintenance	closure coordination	Planned
	State Freeway Management Center	HDOT Construction and Maintenance	maintenance resource request	Planned
5W	Private Information Service Provider	State Freeway Management Center	request for traffic information	Planned
	State Freeway Management Center	Private Information Service Provider	traffic information	Planned
6D	911 Call Center	HESD CAD	incident notification	Existing
	HESD CAD	911 Call Center	incident notification response	Planned
6E	City Emergency Operating Center (OCDA)	HESD CAD	incident report	Planned
	City Emergency Operating Center (OCDA)	HESD CAD	incident response coordination	Existing
	HESD CAD	City Emergency Operating Center (OCDA)	incident report	Planned
	HESD CAD	City Emergency Operating Center (OCDA)	incident response coordination	Existing
6F	DTS Archived Data Management	HESD CAD	archive requests	Planned
	HESD CAD	DTS Archived Data Management	emergency archive data	Planned
6G, 7B	DTS Traffic Control Center	HESD CAD	current network conditions	Planned
	DTS Traffic Control Center	HESD CAD	emergency traffic control response	Planned
	DTS Traffic Control Center	HESD CAD	incident information	Planned
	DTS Traffic Control Center	HESD CAD	incident information request	Planned
	DTS Traffic Control Center	HESD CAD	resource deployment status	Planned
	HESD CAD	DTS Traffic Control Center	emergency traffic control request	Existing
	HESD CAD	DTS Traffic Control Center	incident information	Planned
	HESD CAD	DTS Traffic Control Center	incident response status	Planned
	HESD CAD	DTS Traffic Control Center	resource request	Planned
	HESD CAD	DTS Traffic Control Center	video selection	Planned

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
6I	HDOT Archived Data Management	HESD CAD	archive requests	Planned
	HESD CAD	HDOT Archived Data Management	emergency archive data	Planned
6J	HESD CAD	HESD Vehicles	emergency dispatch requests	Existing
	HESD CAD	HESD Vehicles	incident command information	Planned
	HESD CAD	HESD Vehicles	suggested route	Existing
	HESD Vehicles	HESD CAD	emergency dispatch response	Existing
	HESD Vehicles	HESD CAD	emergency vehicle tracking data	Existing
	HESD Vehicles	HESD CAD	incident command request	Existing
	HESD Vehicles	HESD CAD	incident status	Existing
7A	Event Promoters	DTS Traffic Control Center	event plans	Existing
7E	DTS Traffic Control Center	Media	traffic information for media	Existing
	Media	DTS Traffic Control Center	external reports	Planned
	Media	DTS Traffic Control Center	media information request	Existing
7F	City Emergency Operating Center (OCDA)	DTS Traffic Control Center	emergency traffic control request	Existing
	City Emergency Operating Center (OCDA)	DTS Traffic Control Center	incident information	Planned
	City Emergency Operating Center (OCDA)	DTS Traffic Control Center	incident response status	Existing
	City Emergency Operating Center (OCDA)	DTS Traffic Control Center	resource request	Existing
	City Emergency Operating Center (OCDA)	DTS Traffic Control Center	video selection	Existing
	DTS Traffic Control Center	City Emergency Operating Center (OCDA)	current network conditions	Planned
	DTS Traffic Control Center	City Emergency Operating Center (OCDA)	emergency traffic control response	Existing
	DTS Traffic Control Center	City Emergency Operating Center (OCDA)	incident information	Planned
	DTS Traffic Control Center	City Emergency Operating Center (OCDA)	incident information request	Planned
	DTS Traffic Control Center	City Emergency Operating Center (OCDA)	resource deployment status	Existing
7G	DIT Archive	DTS Traffic Control Center	archive requests	Planned
	DIT Archive	DTS Traffic Control Center	archive status	Planned
	DTS Traffic Control Center	DIT Archive	traffic archive data	Planned
7I	DTS Traffic Control Center	State Freeway Management Center - Roadside Equipment	signal control data	Planned
	State Freeway Management Center - Roadside Equipment	DTS Traffic Control Center	signal control status	Planned
7J	DIT Website	DTS Traffic Control Center	logged special vehicle route	Planned
	DIT Website	DTS Traffic Control Center	request for traffic information	Planned
	DIT Website	DTS Traffic Control Center	road network use	Planned
	DTS Traffic Control Center	DIT Website	traffic information	Existing

Table 4.5: Regionally Significant Subsystem Data Flows, Cont.

Flow	Source Element	Destination Element	Flow Name	Status
7K	DTS TCC CCTV	DTS Traffic Control Center	fault reports	Existing
	DTS TCC CCTV	DTS Traffic Control Center	traffic images	Existing
	DTS Traffic Control Center	DTS TCC CCTV	sensor and surveillance control	Existing
7N	DTS Construction and Maintenance	DTS Traffic Control Center	maintenance resource response	Existing
	DTS Traffic Control Center	DTS Construction and Maintenance	closure coordination	Existing
	DTS Traffic Control Center	DTS Construction and Maintenance	maintenance resource request	Existing
7O	DTS TCC Traffic Signals	DTS Traffic Control Center	fault reports	Existing
	DTS TCC Traffic Signals	DTS Traffic Control Center	freeway control status	Planned
	DTS TCC Traffic Signals	DTS Traffic Control Center	hov data	Planned
	DTS TCC Traffic Signals	DTS Traffic Control Center	incident data	Planned
	DTS TCC Traffic Signals	DTS Traffic Control Center	request for right-of-way	Existing
	DTS TCC Traffic Signals	DTS Traffic Control Center	signal control status	Existing
	DTS TCC Traffic Signals	DTS Traffic Control Center	traffic flow	Existing
	DTS TCC Traffic Signals	DTS Traffic Control Center	traffic images	Planned
	DTS Traffic Control Center	DTS TCC Traffic Signals	freeway control data	Planned
	DTS Traffic Control Center	DTS TCC Traffic Signals	roadway information system data	Planned
	DTS Traffic Control Center	DTS TCC Traffic Signals	sensor and surveillance control	Existing
	DTS Traffic Control Center	DTS TCC Traffic Signals	signal control data	Existing
7P	Weather Service	DTS Traffic Control Center	weather information	Planned

5. INTEGRATION STRATEGY

Completion of the Regional ITS Architecture and Operational Concept Document is the first stage in completing the Oahu Regional ITS Architecture. The next stage will be to develop the Oahu ITS Integration Strategy Plan, building on information presented in this document. The Oahu ITS Integration Strategy Plan lays the initial foundation on how the systems defined in this document will be implemented. The Oahu ITS Integration Strategy Plan includes:

- Textual depictions of opportunities for regional integration of ITS services and functions
- Potential policies that may be required to foster regional integration
- High-level descriptions of projects identified during the architecture process that will be implemented over the next 5 - 10 years
- Rough Order of Magnitude (ROM) costs for implementing the projects
- Procurement strategies considerations
- Potential funding sources for projects
- Recommendations for Integrating ITS into regional planning process

It is important to note that the Oahu Regional ITS Architecture and Operational Concept, and Oahu ITS Integration Strategy Plan are living documents. In such, they will need to be re-evaluated periodically and updated to reflect changes in agency priorities, advances in technology, and changes in funding availability. This document reflects the vision of the regional stakeholders at this point and time and will provide the framework to advance ITS deployment on Oahu in the near- and mid-term.

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APPENDIX A: GLOSSARY OF ITS TERMINOLOGY

Center Subsystem - Subsystems that provide management, administrative, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions. The nine center subsystems are Traffic Management, Transit Management, Commercial Vehicle Administration, Archived Data Management, Emissions Management, Toll Administration, Emergency Management, Information Service Provider, and Fleet and Freight Management. One of four general subsystem classes defined in the National ITS Architecture.

Data Flow - Information that is exchanged between subsystems and terminators in the Physical Architecture. Each architecture flow contains one or more data flows from the Logical Architecture. These architecture flows and their communication requirements define the interfaces which form the basis for much of the ongoing standards work in the ITS program.

Element - This is the basic building block of Regional ITS Architectures and Project ITS Architectures. It is the name used by stakeholders to describe a system or piece of a system.

Equipment Package - The building blocks of the Physical Architecture subsystems. Equipment Packages group like processes of a particular subsystem together into an "implementable" package. The grouping also takes into account the user services and the need to accommodate various levels of functionality. Since equipment packages are both the most detailed elements of the physical architecture and tied to specific market packages, they provide the common link between the interface-oriented architecture definition and the deployment-oriented market packages.

Intelligent Transportation System - The system defined as the electronics, communications or information processing used singly or integrated to improve the efficiency or safety of surface transportation.

Interconnect - Communications paths that carry information between subsystems and terminators in the Physical Architecture. Several different types of interconnects are defined in the architecture to reflect the range of interface requirements in ITS. The majority of the interconnects are various types of communications links that are defined in the Communications Layer. Four different types of communications links are defined: wireline, wide area wireless, dedicated short range communications, and vehicle to vehicle communications. In addition to these types, several specialized interconnects are also defined to reflect other interface requirements. Other types of interconnects include human interface (e.g., what the system user sees and hears) and physical/environmental (e.g., what the ITS sensors sense).

Market Package - The market packages provide an accessible, deployment oriented perspective to the national architecture. They are tailored to fit - separately or in combination - real world transportation problems and needs. Market packages collect together one or more Equipment Packages that must work together to deliver a given transportation service and the Architecture Flows that connect them and other important external systems. In other words, they identify the pieces of the Physical Architecture that are required to implement a particular transportation service. Because they were evaluated during the architecture development, supporting benefits and costs analyses are also available for the market packages.

National ITS Architecture - The framework for designing transportation systems that implement the full set of 31 ITS User Services. The architecture defines the functions that must be performed, the subsystems that provide these functions, and the information that must be exchanged to support these User Services.

Region - The geographical area that identifies the boundaries of the Regional ITS Architecture and is defined by and based on the needs of the participating agencies and other stakeholders.

Regional Architecture - A specific, tailored framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects in a particular region. It functionally defines what pieces of the system are linked to others and what information is exchanged between them.

Roadside Subsystem - Intelligent infrastructure distributed along the transportation network which perform surveillance, information provision, and plan execution control functions and whose operation is governed by center subsystems. Direct interface to vehicle subsystems exist. One of four general subsystem classes defined in the National ITS Architecture.

Standards - Documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics for the interchange of data. A broad array of ITS standards are currently under development that will specifically define the interfaces identified in the National ITS Architecture.

Subsystem - The principle structural element of the Physical Architecture. There are 19 subsystems in the National ITS Architecture which are grouped into four classes: Centers, Roadside, Vehicles, and Travelers. Example subsystems are the Traffic Management Subsystem, the Vehicle Subsystem, and the Roadway Subsystem. These correspond to existing things in the physical world: respectively traffic operations centers, automobiles, and roadside signal controllers. Due to this close correspondence between the physical world and the subsystems, the subsystem interfaces are prime candidates for standardization.

System Inventory - The collection of all ITS-related elements in a Regional ITS Architecture.

Terminator - Terminators define the boundary of the National ITS Architecture. The terminators represent the people, systems, and general environment that interface to ITS. The interfaces between terminators and the subsystems and processes within the National ITS Architecture are defined, but no functional requirements are allocated to terminators. The Logical and Physical Architectures both have exactly the same set of terminators. The only difference is that Logical Architecture processes communicate with terminators using data flows, while Physical Architecture subsystems use architecture flows.

Traveler Subsystem - Equipment used by travelers to access ITS services pre-trip and en-route. This includes elements that are owned and operated by the traveler as well as elements that are owned by transportation and information providers. One of four general subsystem classes defined in the National ITS Architecture.

Vehicle Subsystem - Covers ITS related elements on vehicle platforms. Vehicle subsystems include general driver information and safety systems applicable to all vehicle types. Three fleet vehicle subsystems (Transit, Emergency, and Commercial Vehicles) add ITS capabilities unique to these special vehicle types. One of four general subsystem classes defined in the National ITS Architecture.

APPENDIX B: ARCHITECTURE FLOW DEFINITIONS

Archive Analysis Requests – A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

Archive Analysis Results – Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.

Archive Coordination – Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.

Archive Management Data – Information used to support the management of an ITS archive including database reports on the condition and quality of the archived data, status of the import and collection process, reports that monitor archive usage, and any special requests that require direct action by the administrator (e.g., requests for access to new data sources).

Archive Management Requests – Commands, requests, and queries that support the administration and management of an ITS data archive.

Archive Request Confirmation - Confirmation that an archive request has been received and processed with information on the disposition of the request

Archive Requests – A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.

Archive Status – Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

Archived Data Products Requests – A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.

Archived Data Products – Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

Bad Tag Lists – List of invalid transit user tags which may have previously failed a fare payment transaction.

Broadcast Information – General broadcast information that contains link travel times, incidents, advisories, transit services and a myriad of other traveler information.

Client Files* – Electronic exchange of files between clients.

Closure Coordination – Coordination between subsystems regarding construction and maintenance closure times and durations.

Commercial Vehicle Archive Data – Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Construction and Maintenance Archive Data – Information describing road construction and maintenance activities identifying the type of activity, the location of the activity, and the activity status. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Current Network Conditions – Current traffic information, road conditions, and camera images that can be used to locate and verify reported incidents, and plan and implement an appropriate response.

Demand Responsive Transit Plan – Plan regarding overall demand responsive transit schedules and deployment.

Demand Responsive Transit Request – Request for paratransit support.

Driver Instructions – Transit service instructions for both transit and paratransit drivers.

Emergency Acknowledge – Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

Emergency Archive Data – Logged incident information that characterizes the identified incidents and provides a record of the corresponding incident response. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Emergency Dispatch Requests – Emergency vehicle dispatch instructions including incident location and available information concerning the incident.

Emergency Dispatch Response - Request for additional emergency dispatch information (e.g., a suggested route) and provision of en-route status.

Emergency Notification – An emergency request for assistance originated by a traveler using an in-vehicle, public access, or personal device. Sufficient information is provided so that the recipient can determine the location of the emergency as a minimum. Additional information identifying the requestor and requesting device and the nature and severity of the emergency may also be provided (and required) by some systems.

Emergency Traffic Control Request – Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, or request another special traffic control plan.

Emergency Traffic Control Response – Status of the special traffic signal control strategy implemented in response to the emergency traffic control request.

Emergency Vehicle Tracking Data – The current location and operating status of the emergency vehicle.

Emissions Data – Emissions data and associated imagery collected by roadside equipment.

Environmental Conditions – Current environment conditions (e.g., air temperature, wind speed, surface temperature) as measured by environmental sensors and communicated by supporting field equipment.

Event Plans – Plans for major events possibly impacting traffic.

External Reports – Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

Fare and Payment Status – Current fare collection information including the operational status of the fare collection equipment and financial payment transaction data.

Fare and Price Information – Current transit, parking, and toll fee schedule information.

Fare Management Information – Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.

Fault Reports – Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.

Freeway Control Data – Control commands and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other systems associated with freeway operations.

Freeway Control Status – Current operational status and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other control equipment associated with freeway operations.

Government Reporting Data Receipt – The acknowledgement of satisfactory receipt of information used as input to government data systems or a report identifying problems or issues with the data submittal.

HOV Data – Current HOV lane information including both standard traffic flow measures and information regarding vehicle occupancy in HOV lanes.

Incident Command Information – Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency personnel in the field to implement an effective, safe incident response.

Incident Command Request – Request for resources, commands for relay to other allied response agencies, and other requests that reflect local command of an evolving incident response.

Incident Data – Data and imagery from the roadside supporting incident detection and verification.

Incident Information – Notification of existence of incident and expected severity, location, time and nature of incident.

Incident Information for Media – Report of current desensitized incident information prepared for public dissemination through the media.

Incident Information Request – Request for incident information, clearing time, severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Incident Notification – The notification of an incident including its nature, severity, and location.

Incident Notification Response – Interactive acknowledgement and verification of the incident information received, requests for additional information, and general information on incident response status.

Incident Report – Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

Incident Response Coordination – Incident response procedures, resource coordination, and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.

Incident Response Status – Status of the current incident response including traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides).

Incident Status – Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

Intermodal Freight Archive Data – Information describing demand at intermodal freight terminals including loading/unloading activities of trailers and containers. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

ISP Coordination – Coordination and exchange of transportation information between centers. This flow allows a broad range of transportation information collected by one ISP to be redistributed to many other ISPs and their clients.

Local Signal Preemption Request – Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.

Local Signal Priority Request – Request from a vehicle to a signalized intersection for priority at that intersection.

Logged Special Vehicle Route – Anticipated route information for special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governer's motorcade) that may require changes in traffic control strategy.

Maintenance Resource Request – Request for road maintenance resources that can be used in the diversion of traffic (cones, portable signs), clearance of an incident, and repair of ancillary damage.

Maintenance Resource Response – Current status of maintenance resources included availability and deployment status.

Media Information Request – Request from the media for current transportation information.

Paratransit Operation* – Exchange of information between agencies for coordinating paratransit activities.

Parking Archive Data – Data used to analyze and monitor trends in parking demand, pricing, and operational actions. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Parking Availability – Current parking lot occupancy, parking availability, and cost information.

Parking Demand Management Request – Request to change the demand for parking facility use through pricing or other mechanisms.

Parking Demand Management Response – Response to parking demand management change requests indicating level of compliance with request.

Parking Information – General parking information and current parking availability.

Parking Instructions – Information that allows local parking facilities to be managed to support regional traffic management objectives.

Permit Data – Permit data

Personal Transit Information – General and personalized transit information for a particular fixed route, flexible route, or paratransit system.

Pollution Data – Measured emissions data comprised of various atmospheric pollutants.

Pollution State Data Request – Aggregated emissions data information request.

Remote Surveillance Control – The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.

Request for Bad Tag List – Request for list of bad vehicle tag IDs.

Request for Right-of-Way - Forwarded request from signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.

Request for Traffic Information – Request for traffic information that specifies the region/route of interest, the desired effective time period, and other parameters that allow preparation of a tailored response. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Request for Vehicle Measures – Request for vehicle performance and maintenance data collected by onboard sensors.

Request Transit Information – Request for transit service information and current transit status.

Resource Deployment Status – Status of traffic management center resource deployment identifying the resources available and their current deployment status.

Resource Request – A request for traffic management resources to implement special traffic control measures, assist in clean up, verify an incident, etc.

Reversible Lane Status – Current reversible lane status including traffic sensor and surveillance data and the operational status and mode of the reversible lane control equipment.

Road Network Use – Aggregated route usage and associated travel data from clients for planning and analysis.

Roadside Archive Data – A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.

Roadway Information System Data – Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.

Roadway Information System Status – Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

Secure Area Monitoring Support – Commands that control surveillance equipment and security sensors that monitor secure public transportation areas. Also includes information for general advisories and alerts intended for general dissemination in these same public areas.

Secure Area Surveillance Data – Data collected from surveillance systems used to monitor secure areas. Includes video, audio, and other security sensor outputs.

Selected Routes – Routes selected based on route request criteria.

Sensor and Surveillance Control – Information used to configure and control sensor and surveillance systems at the roadside.

Signal Control Data – Information used to configure and control traffic signal systems.

Signal Control Status – Status of surface street signal controls.

Suggested Route – Suggested route for a dispatched emergency vehicle that may reflect current network conditions and the additional routing options available to en-route emergency vehicles that are not available to the general public.

Traffic Archive Data – Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Traffic Control Coordination – Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.

Traffic Control Priority Request – Request for signal priority at one or more intersections along a particular route.

Traffic Control Priority Status – Status of signal priority request functions at the roadside (e.g. enabled or disabled).

Traffic Flow – Raw and/or processed traffic detector information which allows derivation of traffic flow variables (e.g., speed, volume and density measures).

Traffic Flow Data for Transit* – Raw and/or processed traffic detector information which allows derivation of traffic flow variables (e.g., speed, volume and density measures).

Traffic Images – High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.

Traffic Images for Transit* – High fidelity, near real-time traffic images. These images may be filtered by operators at a local traffic management center to limit the release of "sensitive" images.

Traffic Information – Current and forecasted traffic information, road and weather conditions, incident information, and pricing data. Either raw data, processed data, or some combination of both may be provided by this architecture flow.

Traffic Information Coordination – Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

Traffic Information for Media – Report of current traffic conditions, incidents, maintenance activities and other traffic-related information prepared for public dissemination through the media.

Traffic Information for Transit – Current and forecasted traffic information and incident information.

Transit and Fare Schedules – Specific transit and fare schedule information including schedule adherence.

Transit Archive Data – Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

Transit Demand Management Request – Request to change the demand for transit facility use through pricing or other mechanisms.

Transit Demand Management Response – Response to transit demand management change requests indicating level of compliance with request.

Transit Emergency Coordination Data – Data exchanged between centers dealing with a transit-related incident.

Transit Emergency Data – Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

Transit Fare Payment Requests – Information provided from the transit user location that supports fare payments and associated record keeping.

Transit Fare Payment Responses – Information provided by transit management that supports a fare payment transaction.

Transit Incident Information – Information on transit incidents that impact transit services for public dissemination.

Transit Information* – Information on transit schedules, fares, and other information to be posted to websites. This flow can be extended in the future to include performance and vehicle location information obtained from onboard AVL.

Transit Information Request – Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Transit Information User Request – Request for special transit routing, real-time schedule information, and availability information.

Transit Request Confirmation – Confirmation of a request for transit information or service.

Transit Schedule Information – Current and projected transit schedule adherence.

Transit System Data – Current transit system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.

Transit Traveler Information – Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, and general transit service information.

Transit Traveler Request – Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.

Transit Vehicle Conditions – Operating conditions of transit vehicle (e.g., mileage).

Transit Vehicle Information* – Location, speed, and direction for posting on University website

Transit Vehicle Location Data – Current transit vehicle location and related operational conditions data provided by a transit vehicle.

Transit Vehicle Passenger and Use Data – Data collected on board the transit vehicle pertaining to availability and/or passenger count.

Transit Vehicle Schedule Performance – Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.

Traveler Information – Traveler information comprised of traffic status, advisories, incidents, payment information and many other travel-related data updates and confirmations.

Traveler Profile – Information about a traveler including equipment capabilities, personal preferences and recurring trip characteristics.

Traveler Request – Request by a traveler to summon assistance, request information, make a reservation, or initiate any other traveler service.

Trip Confirmation – Acknowledgement by the driver/traveler of acceptance of a route.

Trip Plan – A sequence of links and special instructions comprising of a trip plan indicating efficient routes for navigating the links. Normally coordinated with traffic conditions, other incidents, preemption and prioritization plans.

Trip Request – Request by a driver/traveler for special routing.

TRMS Coordination – Coordination information between local/regional transit organizations including schedule, on-time information and ridership.

Vehicle Pollution Criteria – Vehicular pollution acceptance criteria.

Vehicle Probe Data – Vehicle probe data indicating identity, route segment identity, link time and location.

Video Selection* – Ability to select a specific video image from a network of cameras. This differs from remote surveillance control in the fact that there is no control of the pan/tilt/zoom features of the camera.

Weather Information – Collected weather condition data from sensors.

Widearea Statistical Pollution Information – Aggregated region-wide measured emissions data and possible pollution incident information.

Yellow Pages Information – Travel service information covering tourist attractions, lodging, restaurants, service stations, emergency services, and other services and businesses of interest to the traveler.

Yellow Pages Request - Request for information through a yellow pages type service.

* User Defined Flow