

Chapter 3

ITS User Services and Market Packages

3.1 ITS USER SERVICES AND THEIR LOCAL APPLICABILITY

Thirty (30) ITS user services have been identified by the Federal Highway Administration (FHWA). These user services have been grouped into six (6) "bundles", each of which represents the application of advanced technology to a specific transportation function. The six (6) bundles of user services are:

- Travel and Transportation Management.
- Public Transportation Operations.
- Electronic Payment.
- Commercial Vehicle Operations.
- Emergency Management.
- Advanced Vehicle Safety Systems.

The following sections discuss the bundles of user services, and provide a brief description of each user service, as well as a discussion of its applicability to the Wichita area. Each user service is discussed in the context of how it would potentially enhance the efficiency or capability of the transportation system, and how it would help meet the needs identified by the various users of the transportation system. Information on the user services was obtained from ITS America and the *National ITS Program Plan, Intelligent Transportation System*, edited by Gary W. Euler and H. Douglas Robertson, March 1995.

Travel And Transportation Management

The Travel and Transportation Management bundle includes ten (10) user services that are designed to use advanced systems and technologies to improve the safety and efficiency of the transportation system, and to provide motorists with current information about traffic and roadway conditions, as well as traveler services. The user services in the Travel and Transportation Management bundle are shown in Table 3-1 and discussed in greater detail in the following sections.

Local Applications of Travel and Transportation Management User Services. In general, the user services in this bundle, with the exception of emissions testing and mitigation and demand management and operations, are identified as most appropriate for application in the Wichita area because they facilitate management of the transportation infrastructure. Traffic control, incident management, en-route driver information, and highway-rail intersection were often cited as high priorities as well as appropriate for short term implementation in the agency interviews. This reflects the importance that the local agencies put on resolving rail/highway conflicts as well as improving inter-agency communications and coordination in the Wichita metropolitan area.

Table 3-1 Travel and Transportation Management User Services

Bundle	User Services
Travel and Transportation Management	En-Route Driver Information Route Guidance Traveler Services Information Traffic Control Incident Management Emissions Testing and Mitigation Demand Management and Operations Pre-trip Travel Information Ride Matching and Reservation Highway-Rail Intersection

En-Route Driver Information

The en-route driver information service provides motorists with information about traffic and roadway conditions due to both scheduled activities (such as construction or special events) and unscheduled activities (such as accidents). Driver information may be provided via radio, variable message signs (VMS), or in-vehicle signing.

Local Applications for En-Route Driver Information. En-route driver information was identified as an appropriate user service for implementation in the short to medium term by many of the agencies interviewed. KDOT currently uses portable VMS's during construction projects and for accidents or other special events.

En-route driver information is currently provided on a limited basis through radio stations in the Wichita area. For example, if there is major construction or a major accident on any of the major routes that will cause major delays, the local radio stations will usually pass this information along to their listeners.

Route Guidance

The route guidance service provides motorists with a suggested route to reach their destination, along with instructions for upcoming turns or other maneuvers. Ultimately, a route guidance system would provide travelers utilizing all modes with directions to their destinations based on real-time information about the transportation system, including lane closures, traffic conditions, and transit information.

Local Applications for Route Guidance. Although some agencies felt that the volumes on most facilities do not warrant intervention, other agencies thought that route guidance information would be valuable.

Currently, route guidance information is sometimes provided by radio stations, particularly during major incidents. Also, some automobile manufacturers are now offering route guidance as an optional feature on new cars. In general, however, route guidance is recognized as a user service appropriate for implementation in the medium term.

Traveler Services Information

Traveler services provides the traveler with information regarding local services and facilities, and has been compared to a computerized version of the "yellow pages". This information would be available for pre-trip planning via a terminal in the home, office or hotel. This information would also be available en-route via either a terminal in the vehicle or at public facilities such as highway rest stops or transit terminals. Information regarding the location, services or amenities, and operating hours would be available for a variety of goods and services, including food, lodging, parking, auto repair, hospital and medical, and police stations. This service would also allow the traveler to communicate with service providers interactively, which would allow travelers to reserve or confirm vacancies or services.

The type of information provided would vary depending on whether the information is accessed at a fixed location (such as a hotel lobby or transit center), or en-route (such as in a transit vehicle, private auto, or commercial vehicle). The type of information and method of presentation would also vary: information presented to drivers while the vehicle is in motion would be restricted for safety reasons; when the vehicle is parked, the driver would be free to access and utilize all available information.

Local Applications for Traveler Services Information. Traveler services information was generally identified as appropriate for implementation in the medium term. Some agencies identified this as low priority with the assumption that adequate information about these services could be obtained before coming to the area either by calling ahead or via the internet.

Traffic Control

The traffic control user service focuses on increasing the safety and efficiency of traffic flow on streets and highways. It includes adaptive signal systems on surface streets and freeway control techniques such as ramp metering on freeways.

The traffic control service would gather data from the field, analyze it, and use it to assign right-of-way to users of the transportation system. The goal is to maximize the efficiency of the movement of people and goods through the roadway network, thus it may provide preferential treatment to transit and other high occupancy vehicles (HOVs), if preferential treatment is in accordance with local objectives and operating policies. The proper implementation of traffic control would help alleviate congestion problems, and improve air quality. The information generated by the traffic control user service can also be disseminated to the general public, and other service providers, laying the foundation for other user services.

Traffic control, which includes surveillance, control, and communications, provides the basis for many of the other user services. The data collected, processed and used by traffic control will be utilized by virtually all of the other services in the Travel and Transportation Management bundle, as well as some of the services in the Public Transportation Operations and Emergency Management bundles.

Local Applications for Traffic Control. Traffic control was considered a priority by all of the agencies interviewed. Most of the traffic signals in the area are maintained by the City of Wichita and are currently controlled by a closed loop signal system. This system consists of Type 170 controllers interconnected to zonal masters via city-owned twisted pair communications cable. The zonal masters are connected to a central microcomputer for monitoring and control purposes. The system has the capability to operate in both a time-of-day

and traffic responsive mode, although it operates on a time-of-day/day-of-week schedule for most sections. A limited number of locations operate in the traffic responsive mode.

The system has the capability to support multiple timing plans which can be easily changed from the central microcomputer. This feature provides the City of Wichita with the capability to develop and implement alternate route timing plans to facilitate incident management and diversion strategies. Approximately 70% of the City's traffic signals are currently on-line with the system and there are plans to expand the system to include all signals within the City of Wichita

Incident Management

The incident management user service focuses on enhancing incident detection and response. Incident detection would be enhanced by advanced sensors, data processing, and communications which would allow officials to quickly and accurately identify a variety of incidents, and would allow immediate implementation of actions to minimize the effects of incidents. This user service would also help officials identify and forecast hazardous weather, as well as traffic and roadway conditions so that preventative action can be taken to minimize the consequences of incidents. Incident management also involves activities that minimize the negative impacts of planned events, such as lane closures or special events. Incident management may include coordinating the schedules of construction or other planned roadway activities.

Local Applications for Incident Management. Incident management was identified as a high priority by many of the agencies interviewed. It was deemed beneficial both from the standpoint that it enhances safety and from the standpoint that it increases capacity. In fact, development of an incident management plan for the Wichita metropolitan area is a significant component of this study.

Incident management might be expected to have a significant impact on delay, due to the fact that much of the delay in the Wichita area is due to incident related congestion, rather than recurring congestion.

The foundation for successful incident management is apparently already in place. Emergency responders throughout Sedgwick County are centrally coordinated through the Sedgwick County Emergency Communications Center, located in the County Courthouse building in downtown Wichita. Motorist Assistance Patrols (MAP), operated by the Kansas Highway Patrol, currently cover I-135 and I-235 in the metropolitan area assisting motorists in need. Currently, two (2) MAPs operate during the peak hours and one (1) MAP operates during the non-peak hours.

The timely removal of incidents was identified as a major concern for the incidents that occur on the non-freeway portions of Kellogg Avenue and at any of the railroad crossings in the area. A railroad accident blocking a track crossing could result in the isolation of the some communities, which could have significant impacts because it may restrict emergency vehicles from easily accessing the area.

Emissions Testing and Mitigation

Emissions testing and mitigation can be used to provide area-wide pollution information for use in monitoring air quality and providing data to be used to develop strategies to improve air quality. Emission information may be used to re-route traffic around sensitive air quality areas, or even, under severe conditions, to control access to such areas. Other applications include

roadside monitoring of individual vehicles to identify vehicles that exceed emission standards; or diagnostic systems that provide in-vehicle monitoring of emissions levels, which would alert the driver of non-compliance so that corrective measures could be taken.

Local Applications for Emissions Testing and Mitigation. Emissions testing and mitigation is not of interest to many of the agencies interviewed. The Wichita metropolitan area is currently classified as an attainment area.

Demand Management and Operations

The demand management and operations user service attempts to accomplish three primary goals: reduce SOV travel, particularly SOV commuting; affect a mode change from SOVs to HOVs, specifically in certain targeted markets; and provide a variety of mobility options. In an effort to accomplish these goals, demand management and operations may facilitate convenient alternatives to the SOV in an effort to affect a change in mode, such as transit service enhancements, the development and/or improvement of HOV facilities, and the implementation of carpool and vanpool programs.

This user service may also affect mode choice through travel incentives and disincentives, through controls on the availability, location, and price of roadways and parking. These measures are expected to improve traffic and transit operations, and increase auto occupancies. Alternative work arrangements, such as variable work hours, compressed work weeks, and telecommuting may also be implemented in an effort to manage demand.

Local Applications for Demand Management and Operations. Many agencies thought that demand management and operations would be more appropriate sometime in the future when congestion is more significant in Wichita. There are, however, some examples of existing programs and facilities that might be considered a part of the demand management and operations user service. These include the ridesharing program administered by the MTA (discussed in further detail later), bike routes, pedestrian walkways, and parking restrictions downtown.

Another potential application of demand management and operations in the Wichita metropolitan area would be to work with the major employers in the area, such as Boeing, Cessna, McConnell Air Force Base, etc., to enhance and increase the ridesharing programs to these major employment centers. Reducing the total vehicle travel to and from these destinations could help reduce the localized congestion that occurs during shift changes.

Pre-Trip Travel Information

The pre-trip travel information user service provides travelers with information prior to departure, before a mode has been chosen. This information may encourage alternatives to SOV travel, including either an HOV mode or the elimination of a trip. Information about transportation demand management (TDM) pricing strategies may also be available to further encourage alternatives to the SOV. Coordination with electronic payment services (discussed later) would further enhance the capabilities and presumably the effectiveness of the pre-trip travel information.

Pre-trip information includes a range of multimodal transportation information that may be accessed at home, work, or other major sites where trips originate. Information to be provided may include transit routes, schedules, transfers, fares, intermodal connections, and ride matching

services; current traffic and highway conditions, regulations and tolls; information on incidents, accidents, and road construction; current and predicted congestion and traffic speeds on specific routes; parking conditions and fees; availability of park-and-ride facilities, special event information, and weather information.

Local Applications for Pre-Trip Travel Information. Pre-trip travel information is considered appropriate for implementation in the medium term by most of the agencies interviewed. This reflects the fact that there is little perceived congestion in the area, other than construction related congestion, and travelers do not feel compelled to use this service.

Ride Matching and Reservation

Ride matching and reservation provides a strategy for reducing demand by facilitating and encouraging ridesharing as an alternative to the SOV. This service expands the market for ridesharing by providing real-time ride matching information along with reservations and vehicle assignments.

Under this service, people who wish to rideshare would provide a travel itinerary (date, time, origin and destination) and any specific restrictions or preferences (the need for wheelchair access, mode preference, etc.) to a ride matching service. The traveler would then receive ridesharing options for that itinerary, considering the preferences noted.

Local Applications for Ride Matching and Reservations. Ride matching and reservations is considered appropriate for implementation in the medium term by many of the agencies interviewed. It is expected that this service would have a greater impact when congestion is more significant, which might be expected in the future since the Wichita area has experienced steady and continual growth.

There are, however, some applications of Ride Matching and Reservations currently underway in Wichita. There is a rideshare program administrated by the MTA which currently serves a 50 mile radius of Wichita. The annual goal is to provide 400 matches, and this goal is usually reached. Another rideshare program currently underway matches carpools for area schools, called SchoolPool.

Highway-Rail Intersection

The highway-rail intersection user service deals with the interface of railway and roadway vehicles. Collisions are reduced by monitoring rail and vehicular movements and providing advance warning to drivers and by implementing improved crossing control and warning devices for at-grade crossing sites. This user service intends to support the provision of real-time information on train position, estimated time of arrival and roadway traffic conditions at highway-rail intersections, proactive train control by train control centers, and interactive coordination between traffic management centers and train control centers. The objectives of this user service are to improve and automate crossing warnings, to provide travelers with advanced warning of crossing closures, and to coordinate rail movements with the traffic signal control system.

This component is expected to interface with planned and existing rail automation and safety systems such as Advanced Train Control Systems (ATCS), Vehicle Proximity Alerting Systems (VPAS), and remote monitoring systems which alert local rail dispatchers and/or TMCs of equipment failures at highway-rail intersections

Local Applications for Highway-Rail Intersection. Highway-rail intersection is considered appropriate for implementation in the short term and a high priority item by many of the agencies interviewed. There are many railroad crossings within the Wichita metropolitan area which can create numerous possibilities for train/automobile conflicts.

There have been negotiations with Union Pacific Railroad regarding the potential interface of a train location system to the existing 911 system. This package would use AVL to identify routes where a train blocks the path of an emergency vehicle, thus allowing the 911 dispatcher to reroute the vehicle around the train. However, the money from these negotiations has been diverted to grade separation projects since the 911 dispatchers believed that the train notification system would hinder their efforts by adding another screen for them to view during an emergency.

Public Transportation Operations

The Public Transportation Operations bundle includes four user services that are designed to utilize advanced vehicle electronic systems to provide data which is then used to improve transit service to the public. The user services in the Public Transportation Operations bundle are shown in Table 3-2 and discussed in greater detail in the following sections.

Local Applications of Public Transportation Operations User Services. All transit service in the Wichita area is provided by a single transit agency, Wichita Transit. Wichita Transit is currently trying to increase ridership and find ways to more efficiently dedicate their funding. Wichita Transit is updating its fleet, replacing 70% of its busses over the next few years, and has started construction on their new administration and maintenance center. While the interviewees connected with public transit indicated that these user services would be of high priority, the majority of the interviewees indicated that these user services would be better suited for implementation in the medium to long term.

Table 3-2 Public Transportation Operations User Services

Bundle	User Services
Public Transportation Operations	Public Transportation Management En-route Transit Information Personalized Public Transit Public Travel Security

Public Transportation Management

Public transportation management automates the operations, planning, and management functions of public transit systems. It provides real-time computer analysis of vehicles and facilities to improve transit operations and maintenance. The analysis identifies deviations from the schedule and offers potential solutions to dispatchers and drivers. This service will help maintain transportation schedules and assure transfer connections from vehicle to vehicle and between modes and can be coupled with traffic control services to facilitate quick response to

service delays. Information regarding passenger loading, vehicle running times, accumulated miles and hours, and vehicle maintenance will help improve service and provide managers with a wealth of information on which to base decisions. Service schedulers will have timely data to adjust trips. Personnel management will be enhanced with automatic recording and verification of driving and maintenance task performance. Reports, including management, operations, and Section 15 reports will be prepared with greater efficiency.

Local Applications for Public Transportation Management. Transportation service provided by Wichita Transit includes regular fixed-route bus service, paratransit service, and motorized trolley service for downtown and charter groups. Wichita Transit has secured funding for obtaining an AVL system and is investigating obtaining an electronic fare collection system for installation on their new busses. The addition of these technologies will provide valuable information to Wichita Transit in terms of accurate ridership and accounting figures. As indicated in Chapter 2, information obtained from these technologies can also be used by the city, county, MAPD, KDOT, and any other agency requesting such information. Such a system will also allow the MTA to more effectively manage their operations.

Wichita Transit currently uses Public Transit Management System (PTMS) software for scheduling paratransit services.

En-Route Transit Information

En-route transit information is provided to travelers using public transportation after they begin their trips. Real-time, accurate transit service information will be available on-board the vehicle, at transit stations and bus stops to assist travelers in making informed decisions and itinerary modifications once a trip is underway.

Local Applications for En-Route Transit Information. Many of the agencies interviewed identified this user service as appropriate for implementation in the medium term and ranked it as a medium to low priority. Currently, en-route transit information is provided by the driver's announcements to passengers after he/she receives information from the dispatcher. This user service could be enhanced with the addition of AVL. The bus location information gathered by the AVL system can be used to notify their passengers where the bus is and the expected arrival time or of any delays through kiosks, variable message signing at the bus stops, or other interactive method.

Personalized Public Transit

Personalized public transit provides flexibly routed transit vehicles which offer more convenient, and often more cost effective, service to customers where traditional, fixed route operations cannot be economically justified. Small, publicly or privately operated vehicles provide on-demand routing to pick up passengers who have requested service and deliver them to their destinations. Route deviation schemes, where vehicles leave a fixed route for a short distance to pick up or discharge passengers, is another possible approach. Vehicles providing this service include small buses, taxis, or other small, shared-ride vehicles. This type of service can expand transit service to lesser populated locations and neighborhoods and can potentially provide transportation at a lower cost and with greater convenience than conventional fixed route transit.

Local Applications for Personalized Public Transit. Only one of the agencies interviewed specifically indicated an interest in personalized public transit. This is presumably due to a

perception that those who “need” this user service at this time already get it through paratransit services.

Public Travel Security

The public travel security user service creates a more secure environment for transit patrons and operators by providing systems that monitor the environment in transit stations, parking lots, bus stops, and on transit vehicles. These systems generate alarms, either automatically or manually, when necessary. This improves security, and the perception and acceptance of transit. This service can be integrated with other anti-crime activities.

Local Applications for Public Travel Security. Public travel security was indicated to be a low priority item by many of those interviewed. This may be due to a perception that the transit system is a safe mode of travel. There is on-board video monitoring on eight (8) of Wichita Transit’s fixed-route buses and it is planned to be on all newly purchased vehicles. All of the buses in the fleet are in radio contact with central dispatch and can radio for assistance in case of an emergency.

Electronic Payment

The Electronic Payment bundle includes one user service, electronic payment services, shown in Table 3-3 and discussed below.

Table 3-3 Electronic Payment User Services

Bundle	User Services
Electronic Payment	Electronic Payment Services

Electronic payment services allow travelers to pay for transportation services with electronic cards or tags. The goal is to provide travelers with a common electronic payment medium for all transportation modes and functions, including tolls, transit fares, and parking. Electronic payment services encompass the integration of payment systems of various modes to create an intermodal user service, as well as the improvement of payment systems for separate transportation modes. Payment systems for various modes have to be perfected independently before they can be widely integrated.

Another goal is integration among systems in different states, especially with respect to toll payment. Electronic toll collection, transit fare payment, and parking payment would be linked through an intermodal multi-use electronic system. A common fee payment structure could be used with all modes, possibly tying into roadway pricing options. Coordinated pricing strategies and incentives for HOV travel would be facilitated by such a system. Components of electronic payment services include electronic toll collection, electronic fare collection for transit, and electronic parking payment.

Local Applications for Electronic Payment The Kansas Turnpike Authority (KTA) currently utilizes a “K-Tag” electronic toll payment system based on in-vehicle transponders, or “tags”. The transponders transmit the vehicle information, including the owners account number and

point of entry, to receivers at the toll plazas. This information is then used to debit the customer's preset account for the appropriate toll.

Wichita Transit is planning on implementing an electronic payment service in the future. Funding concerns are preventing immediate implementation.

With the exception of the Transit representatives, the interviewees placed low priority on this user service. This may be because the user service is already established for the KTA.

Commercial Vehicle Operations

The Commercial Vehicle Operations (CVO) bundle includes six user services that are concerned primarily with freight movement and focus in two specific areas, one to improve private sector fleet management, and one to streamline regulatory functions. The user services in the Commercial Vehicle Operations bundle are shown in Table 3-4 and discussed in greater detail in the next sections.

Local Applications for Commercial Vehicle Operations User Services All of the CVO user services, with the exception of hazardous material incident response and freight mobility, were considered low priority items.

The State of Kansas published the *Business Plan for Commercial Vehicle Operations Using Intelligent Transportation Systems* (Kansas CVISN) in December 1997 that is to "...promote the economic well-being of Kansas by facilitating the movement of goods for business and industry."

The business plan identifies several projects that would employ various commercial vehicle user services.

Table 3-4 Commercial Vehicle Operations User Services

Bundle	User Services
Commercial Vehicle Operations	Commercial Vehicle Electronic Clearance Automated Roadside Safety Inspection On-Board Safety Monitoring Commercial Vehicle Administrative Processes Hazardous Materials Incident Response Freight Mobility

Commercial Vehicle Electronic Clearance

Commercial vehicle electronic clearance would allow enforcement personnel to electronically check safety, credential, and size and weight data for transponder-equipped vehicles before they reach an inspection site, selecting only illegal or potentially unsafe vehicles for an inspection. Safe and legal carriers would be able to travel without stopping for compliance checks at weigh stations, ports-of-entry, and other inspection sites. This service will also support the North

American Free Trade Agreement (NAFTA) by expediting international carriers at the Mexican and Canadian borders.

Automated Roadside Safety Inspection

Automated roadside safety inspections would use safety data provided by the electronic clearance service combined with advanced technologies to allow for more selective and rapid inspections. Through the use of sensors and diagnostics, inspectors will eventually be able to check vehicle systems and driver requirements and ultimately driver alertness and fitness for duty.

Local Applications for Commercial Vehicle Electronic Clearance and Automated Roadside Safety Inspection These user services are addressed together because they are closely related. Commercial vehicle electronic clearance and automated roadside safety inspection are of interest to enforcement personnel. The State Highway Patrol ranked these as high priority.

The Kansas CVISN plan indicates the implementation of weigh-in-motion and video monitoring technologies to streamline the inspection processes and to establish automated vehicle clearance procedures. The electronic screening and the mobile enforcement systems are expected to be in full operation by fiscal year 2001 using state and federal funds. The sites selected for implementation are at the state borders along interstate highways which are outside of the scope of this study. Implementation of these user services in the Wichita area is therefore assumed to occur in the long term.

On-Board Safety Monitoring

On-board safety monitoring allows non-intrusive monitoring of the driver, vehicle, and cargo and notification of the driver, carrier, and possibly enforcement personnel if an unsafe situation arises. An unsafe situation might involve driver fatigue, vehicle systems, or cargo shifting. Eventually, this service will tie into the automated roadside safety inspection and electronic clearance services.

Local Applications for On-Board Safety Monitoring. On-board safety monitoring would require sophisticated technologies, technologies that have not been fully developed and tested. Because this user service relies on technologies that are not currently available, it is only appropriate for implementation in the long term.

Commercial Vehicle Administrative Processes

Commercial vehicle administrative processes will allow carriers to purchase credentials and collect and report fuel and mileage tax information electronically. Through automation, this service should provide to carriers and States a significant reduction in the paperwork burden and has the potential for simplifying compliance operations.

Local Applications for Commercial Vehicle Administrative Processes. While the commercial vehicle administrative processes user service is of interest to agencies that think it would facilitate operations for local companies, it is more appropriate for implementation by state regulatory agencies, rather than for implementation at a local level.

Hazardous Materials Incident Response

Hazardous materials incident response would provide emergency response personnel at the scene of a hazardous materials incident immediate information on the types and quantities of hazardous materials present in order to facilitate a quick and appropriate response.

The National Academy of Sciences determined that it is not cost effective to track all hazardous material shipments. For certain types and amounts of hazardous materials it may only be important to locate these trucks when they are involved in a serious accident/incident and then provide specific cargo information to the appropriate emergency responders.

Local Applications for Hazardous Materials Incident Response Hazardous materials incident response is of interest to many agencies. This is not unexpected, due to the fact that it complements the incident management user service. Presently, hazardous materials incident response is provided by the local fire departments. The amount of commercial vehicle traffic through the Wichita metropolitan area may warrant some consideration to enhance the hazardous materials incident response through closer coordination and communication between agencies.

Freight Mobility

Freight mobility provides links between drivers, dispatchers, and intermodal transportation providers, enabling carriers to take advantage of real-time traffic information, as well as vehicle and load location information, to increase productivity.

Local Applications for Freight Mobility While freight mobility was identified as appropriate for some of the entities in the area that have a significant number of trucks, this user service is more appropriate for implementation by private, rather than public entities, due to the fact that the benefits will accrue primarily to the private entity. Furthermore, most of the larger fleets in the area already have dispatcher to vehicle communications capabilities.

Emergency Management

The Emergency Management bundle includes two user services that relate directly to the detection, notification, and response to emergency and non-emergency incidents which take place on or adjacent to the roadway. The focus is the improvement of the ability of roadside service providers, as well as the ability of police, fire, and rescue operations to respond appropriately, thereby saving lives and reducing property damage. The user services in the Emergency Management bundle are shown in Table 3-5 and discussed in greater detail in the following sections.

Local Applications of Emergency Management User Services In general, emergency management user services are of interest because they would complement incident management activities.

Table 3-5 Emergency Management User Services

Bundle	User Services
Emergency Management	Emergency Notification and Personal Security Emergency Vehicle Management

Emergency Notification and Personal Security

Emergency notification and personal security focuses on decreasing the time it takes for responding agencies to be notified of emergency and non-emergency incidents, and providing an accurate estimate of the location of the vehicle in need of assistance. This service includes both driver and personal security, in instances where manual notification of incidents is possible, and automated collision notification, in cases where incident severity precludes manual notification of incidents.

Local Applications for Emergency Notification and Personal Security Emergency dispatch is currently provided via a 911 system. The 911 calls are directed to the central dispatch for Sedgwick County which is housed in the County Courthouse building in downtown Wichita. The central dispatch system allows the closest available responder to be dispatched. This central dispatch enhances the coordination and communication between the emergency response and traffic operations activities.

Since the project area includes all of Sedgwick County, both urban and rural conditions are present and need to be considered as part of the study. Emergency notification/mayday systems could be very beneficial for automatically reporting incidents in some of the more remote locations. Several automobile manufacturers are already offering mayday systems as an optional feature on new cars.

Emergency Vehicle Management

Emergency vehicle management focuses on decreasing the time it takes for agencies to respond once the incident is reported to the operator or dispatcher. This includes three subservices, emergency vehicle fleet management, route guidance, and signal priority. Emergency vehicle fleet management provides information regarding emergency vehicle location, and automated support to dispatchers to help determine which vehicle can most quickly reach the incident site. Route guidance will assist in the determination of the quickest route to the incident scene, and from the scene to the hospital, if needed. Signal priority would provide the capability to preempt traffic signals on emergency vehicle's route, and the capability to warn drivers that an emergency vehicle is approaching.

Local Applications for Emergency Vehicle Management This user service was considered a high priority and suitable for implementation in the short term by many of the interviewees.

The city DPW currently is running an Opticom signal preemption demonstration project on four (4) signals along Main Street. This system, which is utilized by both fire trucks and emergency medical responders, has proven very satisfactory and there are plans to expand the system to include other signals in proximity to fire/rescue stations.

Advanced Vehicle Safety Systems

The Advanced Vehicle Safety Systems bundle includes seven user services that are related primarily to the safety goals of ITS by diminishing the number and the severity of crashes. The user services in the Advanced Vehicle Safety Systems bundle are shown in Table 3-6.

Local Applications for Advanced Vehicle Safety Systems User Services. The technologies necessary for the user services in the Advanced Vehicle Safety Systems bundle are currently

being researched and developed at the national level by automobile manufacturers and other interested entities. Most of these user services are expected to be available in automobiles, and thus implementation will be a private sector, rather than public sector, activity. The exception to this may be the implementation of the automated highway systems user service, which public entities would be expected to play a role in. However, the technologies needed for this user services have not yet been developed, and implementation of this user service is not expected in the planning horizon considered in this study.

Table 3-6 Advanced Vehicle Safety Systems User Services

Bundle	User Services
Advanced Vehicle Safety Systems	Longitudinal Collision Avoidance Lateral Collision Avoidance Intersection Collision Avoidance Vision Enhancement for Crash Avoidance Safety Readiness Pre-Crash Restraint Deployment Automated Highway Systems

Longitudinal Collision Avoidance

Longitudinal collision avoidance systems address vehicle collisions in which one or two vehicles are moving in essentially the same path prior to the collision, or in which one of the vehicles is stationary (for example, a rear end collision).

Lateral Collision Avoidance

Lateral collision avoidance systems address one or two vehicle collisions that arise when a vehicle leaves its own lane of travel while moving forward, for example, for a merge or lane change maneuver.

Intersection Collision Avoidance

Intersection collision avoidance systems address collisions that arise when vehicles improperly violate the right of way of other vehicles, or when right of way at an intersection is not clear (for example, right angle accidents). This service will provide warnings of imminent collisions with crossing traffic, as well as warnings of control devices at upcoming intersections.

Vision Enhancement for Collision Avoidance

Vision enhancement for collision avoidance will address collisions in which limited visibility is a factor. The system will enhance visually acquired information when driving visibility is low, such as at night or in fog. It will not, however, compensate for blind spots or other visual obstructions.

Safety Readiness

Safety readiness addresses collisions caused by fatigued or impaired drivers, malfunctioning vehicle components, or degraded infrastructure conditions. Safety readiness includes three subsystems: driver condition warning and control override, vehicle condition warning, and in-vehicle infrastructure condition warning.

Pre-Collision Restraint Deployment

Pre-collision restraint deployment provides a means to anticipate an imminent collision and activate safety systems (such as side impact airbags) prior to impact. The equipment is contained entirely in the vehicle.

Automated Highway Systems

The automated highway systems user service focuses on improving the safety, efficiency, and comfort of the roadway system by providing fully automated control of instrumented vehicles on instrumented highways, as well as partial vehicle control (extension of the collision avoidance systems).

3.2 AGENCY RANKINGS OF ITS USER SERVICES

All of the representatives of the agencies interviewed (shown in Appendix B, Table B-1) were requested to rank the twenty-three ITS user services in terms of priority (all user services were ranked except those in the Advanced Vehicle Safety Systems bundle). User services were ranked from high to low. Eleven priority rankings were returned and the results are shown in Table 3-7. All of the agency rankings are shown in Appendix C, Table C-1. Based on the agency rankings, the user services were divided into three (3) groups indicating relative priority.

High Priority

The high priority group includes the ITS user services in the first five rows of Table 3-7. These user services address both recurring and incident related congestion. Note that these user services all contribute to the efficient identification and removal of incidents and to the reduction of the impact of incidents. These user services address both typical conditions such as recurring congestion (traffic control, highway-rail intersection), as well as conditions related to incidents (traffic control, emergency vehicle management, hazardous material incident response, incident management, and highway-rail intersection). The fact that all user services of the highest priority relate to incidents reflects the fact that much of the delay in the Wichita area is incident related.

Medium Priority

The medium priority group includes eleven ITS user services. These user services relate to communications with motorists (en-route driver information, pre-trip travel information, route guidance), as well as incident response (emergency notification and personal security, en-route driver information, pre-trip travel information, route guidance), safety (emergency notification and personal security, public travel security), and public transportation users (personalized public transit, public transportation management, en-route transit information, electronic payment services, traveler services information, and ride matching and reservation). The freight mobility user service is not targeted to benefit the primary roadway user as much as it is to the commercial

vehicle operators. Note that, in many cases, there is overlap between the user services and to the functions that they contribute. For example, the user services related to communications (en-route driver information, pre-trip travel information, route guidance) not only inform the public about roadway conditions and alternate routes, but also facilitate the incident management user service.

Low Priority

The low priority group includes seven ITS user services. These are user services that would primarily benefit a smaller audience, and address issues that are not currently of the highest priority in the Wichita area. Some of these user services are primarily targeted to commercial vehicle operators (on-board safety monitoring, automated roadside safety inspection, commercial vehicle electronic clearance, and commercial vehicle administrative processes). Others are primarily targeted to transit (public travel security), while others address issues that have not been identified as critical problems in the metropolitan area (emissions testing and mitigation). The demand management user service is not targeted to benefit the primary roadway user, the single occupant commuter, as much as it is to the high occupancy vehicle.

Table 3-7 Overall Priority Rankings of ITS User Services by Local Agencies

User Service	Rank	Priority
Traffic Control	1	High
Emergency Vehicle Management	2	
Hazardous Materials Incident Response	3	
Incident Management	4	
Highway-Rail Intersection	5	
Emergency Notification and Personal Security	6	Medium
En-Route Driver Information	7	
Personalized Public Transit	8	
Route Guidance	9	
Public Transportation Management	10	
Freight Mobility	11	
En-Route Transit Information	12	
Electronic Payment Services	13	
Traveler Services Information	14	
Pre-trip Travel Information	15	
Ride Matching and Reservation	16	
On-Board Safety Monitoring	17	Low
Demand Management and Operations	18	
Public Travel Security	19	
Automated Roadside Safety Inspection	20	
Commercial Vehicle Electronic Clearance	21	
Commercial Vehicle Administrative Processes	22	
Emissions Testing and Mitigation	23	

3.3 SHORT, MEDIUM, AND LONG TERM ITS USER SERVICES

A time frame for implementation has been identified for each of the ITS user services, and is shown in Table 3-8. The time frame associated with each user service was based on a number of things, including input from local agencies (discussed in *Section 3.1 Local Applicability of ITS User Services*), agency rankings of priority (discussed in *Section 3.2 Agency Rankings of ITS User Services*), the state of technology that is needed to implement various aspects of the user service, and whether or not the user service contributes to the core infrastructure. In general, the specified implementation time frame corresponds to the priority indicated by the local agencies unless there are other limiting factors, such as available technology. User services are identified for implementation in the short term (within five years), medium term (within ten years), or long term (over ten years).

It is important to note that a single user service could encompass any number of specific projects, some of which require minimal technology and thus could be implemented in the short term, and others which require very sophisticated technology that is currently in the research, or even theoretical, stage. This is shown by the number of market packages that are available for each user service. For example, consider the Emergency Notification and Personal Security user service. A low-tech project geared toward the objectives of this user service would be to install milepost markers on the freeway, as well as identify the roadway on bridge overpasses, so that people calling in to report an incident could more accurately communicate their exact location. On the other hand, a high-tech project geared toward the objectives of this user service would be automatic collision notification, which may be an in-vehicle device that would be activated upon impact (like an airbag) and would automatically send out a distress signal that would be received at the traffic control center or by emergency dispatch.

The issue of technologies brings up the point that any plan that incorporates “advanced technologies” as a component must necessarily be dynamic, changing to reflect and utilize new technologies and applications. Many technologies are rapidly evolving, and these evolutions cannot always be anticipated. This deployment plan must be modified to reflect not only changing circumstances, but also changing technologies.

It is also important to re-iterate that there is often overlap between the various user services. A single project might fulfill the objectives of two or more of the user services. For example, a changeable message sign could be used to provide En-Route Driver Information, moreover, the information provided could be regarding a detour or alternate route around an incident, thus providing Route Guidance, and enhancing Incident Management.

The many factors that have been discussed above that are related to the ITS user services priority and implementation time frame are not intended to negate the value of the identification of priority and implementation time frame for each user service, but are rather intended to emphasize the limitations of the identification of priority and implementation time frame. In summary, the priority and implementation time frame noted for each user service should perhaps be considered a general, rather than an absolute, guideline. Actual implementation time frames would also be affected not only by priority and the availability of proven technology, but also by opportunity and available funding. Road widening projects and other activities may present the opportunity to implement advanced technologies at a much lower cost, making implementation of certain user services appropriate.

Existing Or Planned ITS User Services

Nine (9) user services are identified as being either existing or planned, as shown in Table 3-8. Additional details about the projects that have been implemented for each of these user services were provided in Section 2.3, *Current and Planned ITS Activities and Projects*. A priority and implementation time frame has also been identified for each of these user services, this is intended to address other projects that would also address the objectives of the user service.

Table 3-8 Priority and Implementation Time Frames for ITS User Services

User Service	Implementation Time Frame			
	Existing or Planned	Short (0-5 years)	Medium (5-10 years)	Long (10+ years)
Traffic Control	X	High		
Emergency Vehicle Management		High		
Hazardous Materials Incident Response		High		
Incident Management	X	High		
Highway-Rail Intersection	X	High		
Emergency Notification and Personal Security		Medium		
En-Route Driver Information	X	Medium		
Personalized Public Transit	X		Medium	
Route Guidance			Medium	
Public Transportation Management			Medium	
Freight Mobility			Medium	
En-Route Transit Information			Medium	
Electronic Payment Services	X		Medium	
Traveler Services Information			Medium	
Pre-trip Travel Information			Medium	
Ride Matching and Reservation	X		Medium	
On-board Safety Monitoring				Low
Demand Management & Operations				Low
Public Travel Security				Low
Automated Roadside Safety Inspection	X			Low
Commercial Vehicle Electronic Clearance	X			Low
Commercial Vehicle Administrative Processes				Low
Emissions Testing and Mitigation				Low

User Services For Implementation In The Short Term

Seven user services are identified as appropriate for implementation in the short term. These user services include all of the user services that were identified as high priority in the agency rankings. These user services address both recurring congestion (traffic control, highway-rail intersection) and incidents (traffic control, incident management, hazardous material incident response, emergency vehicle management, emergency notification and personal security, en-route driver information, highway-rail intersection). These user services also enhance communications (en-route driver information and emergency notification and personal security). The emergency notification and personal security and en-route driver information user services are considered medium priority while traffic control, emergency vehicle management, hazardous material incident response, incident management, and highway-rail intersection are considered high priority, reflecting the input of all the agencies surveyed.

Traffic control and incident management user services provide significant contributions to the core infrastructure. Furthermore, both the emergency vehicle management and emergency notification and personal security user services would play an important role in an incident management program.

User Services For Implementation In The Medium Term

Nine (9) user services are identified as appropriate for implementation in the medium term. These user services mainly address agency interests in communicating with motorists (route guidance, pre-trip travel information). The user services also include transit service interests (personalized public transit, public transportation management, en-route transit information, electronic payment services), ridesharing (ride matching and reservation), tourist information (traveler services information), and commercial vehicle concerns (freight mobility).

User Services For Implementation In The Long Term

The remaining seven (7) user services are identified as appropriate for implementation in the long term. These user services address a variety of issues, including issues primarily targeted to commercial vehicle operators (Automated Roadside Safety Inspection, Commercial Vehicle Electronic Clearance, Commercial Vehicle Administrative Processes, On-Board Safety Monitoring), and public transit (Public Travel Security). The user services also address issues that have not been identified as critical problems in the metropolitan area (Emissions Testing and Mitigation and Demand Management and Operations).

Note that the priority and time frame of some of these user services would be expected to change with changing circumstances. For example, On-Board Safety Monitoring would be appropriate for implementation in the medium term if proven technologies to provide this user service were developed.

3.4 MARKET PACKAGES

The purpose of the market packages is to provide visibility into the user service options that are considered for ITS implementation. 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. They address the specific service

requirements of traffic managers, transit operators, travelers, and other ITS stakeholders. The market packages were defined with enough granularity to support specific benefits analysis with clear ties to transportation problems. Some of the user services are too broadly defined to allow this sort of evaluation.

The market packages are directly traceable to the user services. A market package often includes capabilities, which span more than one user service. A single user service sometimes includes a range of incremental capabilities that are segregated into separate market packages so that they can be considered separately from a deployment perspective. As a result, there many relationships between the market packages and the user services.

The following example illustrates these relationships. The Traffic Control user service requires distinct surveillance, freeway and surface street traffic control, integrated area-wide traffic control, and traffic information dissemination capabilities. Each of these capabilities may be deployed individually by a local jurisdiction and are allocated to distinct market packages. The market packages also distinguish between different traffic surveillance approaches: Roadside instrumentation (Network Surveillance Market Package) and vehicle probes (Probe Surveillance Market Package) are separated due to fundamentally different technical and institutional issues for the two approaches. Several market packages provide different mechanisms and levels of support for satisfying the Traffic Control user service requirements.

The association between user services and market packages is presented in Table 3-9. As shown in this table, the identified market packages support all of the priority user services.

Recommended Market Packages

Market packages appropriate for the Wichita area have been identified based on their relationships with the recommended user services. Table 3-10 shows various market packages for short-, medium-, and long-term implementation in the Wichita area. The market packages are grouped by Advanced Traffic Management Systems (ATMS), Advanced Public Transit Systems (APTS), Advanced Traveler Information Systems (ATIS), Advanced Vehicle Safety Systems (AVSS), Commercial Vehicle Operations (CVO), and Emergency Management (EM).

Table 3-10 Recommended Market Packages for the Wichita Metropolitan Area

USER SERVICE CATEGORY	SHORT-TERM	MEDIUM-TERM	LONG-TERM	NOT RECOMMENDED
TRAFFIC MANAGEMENT	<ul style="list-style-type: none"> Network Surveillance Surface Street Control Freeway Control Traffic Information Dissemination Incident Management System Standard Railroad Grade Crossing Advanced Railroad Grade Crossing Railroad Operations Coordination 	<ul style="list-style-type: none"> Probe Surveillance Regional Traffic Control Traffic Network Performance Evaluation Dynamic Toll/Parking Fee Management 	<ul style="list-style-type: none"> Emissions and Environmental Hazards Sensing 	<ul style="list-style-type: none"> HOV and Reversible Lane Management Virtual TMC and Smart Probe Data
PUBLIC TRANSPORTATION	<ul style="list-style-type: none"> Multi-modal Coordination Transit Vehicle Tracking 	<ul style="list-style-type: none"> Transit Fixed-Route Operations Demand Response Transit Operations Transit Passenger and Fare Management Transit Security Transit Maintenance 		
TRAVELER INFORMATION	<ul style="list-style-type: none"> Broadcast Traveler Information Interactive Traveler Information 	<ul style="list-style-type: none"> Autonomous Route Guidance Dynamic Route Guidance Yellow Pages and Reservation 	<ul style="list-style-type: none"> ISP-Based Route Guidance Integrated Transportation Management/Route Guidance In Vehicle Signing 	<ul style="list-style-type: none"> Dynamic Ridesharing
COMMERCIAL VEHICLE OPERATION	<ul style="list-style-type: none"> HAZMAT Management 	<ul style="list-style-type: none"> Fleet Administration 	<ul style="list-style-type: none"> Electronic Clearance CV Administrative Processes Weigh-In-Motion Roadside CVO Safety On-board CVO Safety CVO Fleet Maintenance 	<ul style="list-style-type: none"> Freight Administration International Border Electronic Clearance
EMERGENCY MANAGEMENT	<ul style="list-style-type: none"> Emergency Response Emergency Routing Mayday Support 			
PLANNING		ITS Planning		

The remainder of this section provides a brief description of the service offered by each recommended market package

Short Term Market Packages

Network Surveillance

This basic market package provides the fixed roadside surveillance elements utilizing hardwire communication to transmit the surveillance data. This includes items as simple as vehicle detectors connected to traffic signal controllers or as complex as CCTV cameras transmitting video data to traffic control centers. This enables traffic managers to monitor road conditions, identify and verify incidents, analyze and reduce the collected data, and make it available to users and private information providers.

Surface Street Control

This market package provides the communication links and the signal control equipment for completely local surface street control and/or arterial traffic management control. An example would be arterial signalization control. This market package is considered as an intra-jurisdictional package since coordination between adjacent cities is required to coordinate signal control along arterials. This package is consistent with typical urban traffic signal control systems.

Freeway Control

This market package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. Coordination and integration of ramp meters are included as part of this market package. This package is consistent with typical urban traffic freeway control systems. This package also incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option.

This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. The equipment associated with incident detection that is distributed along the roadway and included within the Traffic Management Center will be separately identified within the architecture so that incident detection may be considered and analyzed.

Traffic Information Dissemination

This market package allows traffic information to be disseminated using roadway equipment like changeable message signs or highway advisory radio. The emphasis is on provision of basic traffic information or other advisories by means which require minimal or no in-vehicle equipment to receive the information. This package provides a tool that can be used to notify drivers of incidents; careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package could also ensure that information is available in a format for media usage, such as a fax output or a direct tie-in to radio and television station computer systems.

Incident Management System

This 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 supported by this market package.

Information from these diverse sources is collected and correlated by this market package to detect and verify incidents. This market package provides traffic management center 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

Standard Railroad Grade Crossing

This market package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.

Advanced Railroad Grade Crossing

This market package manages highway traffic at HRI's where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems which preclude entrance into the intersection when the barriers are activated. Like the Standard Railroad Grade Crossing package, the HRI equipment is activated on notification by wayside interface equipment, which detects, or communicates with the approaching train. In this market package, additional information about the arriving train is also provided by the wayside interface equipment so that the train's direction of travel, its estimated time of arrival, and the estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This market package also includes additional detection capabilities, which enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

Railroad Operations Coordination

This market package provides an additional level of strategic coordination between rail operations and traffic management centers. Rail operations provide train schedules, maintenance schedules, and any other forecast events, which will result in HRI closures. This information is used to develop forecast HRI closure times and durations, which may be used in advanced traffic control strategies, or to enhance the quality of traveler information.

Multi-modal Coordination

This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Intermodal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

Transit Vehicle Tracking

This market package provides for an Automated Vehicle Location (AVL) system to track the transit vehicle's real time schedule adherence and updates the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the transit management center is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and to facilitate communications with each vehicle at fixed intervals.

Broadcast Traveler Information

This market package provides the user with a basic set of ATIS services. It involves the collection of traffic conditions, advisories, general public transportation and parking 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 subcarrier, cellular data broadcast). Different from the Traffic Information Dissemination market package --which provides the more basic HAR and VMS information capabilities, this market package provides the more sophisticated digital broadcast service. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles or other means.

Interactive Traveler Information

This market package provides tailored information in response to a traveler request. The user can request and obtain current information regarding traffic conditions, transit services, traveler services, ride share/ride match, parking management, and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en-route to include phone, kiosk, Personal Digital Assistant, home computer, and a variety of in-vehicle devices. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles or other means.

HAZMAT Management

This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

Emergency Response

This market package automates emergency vehicle notification upon verification of the location and nature of an incident by the Emergency Management subsystem. This package uses existing and emerging wireline interconnects to sensors and vehicle position locators for incident detection. Coordination between Emergency Management Subsystems supports emergency notification and coordinated response between agencies. Existing wide area wireless communications, between the Emergency Management subsystem and the emergency vehicle, enables coordination with the emergency fleet. The Emergency Management Center would include hardware and software for tracking the emergency vehicles. Law Enforcement would normally be an integral part of this package as well as processing violation notifications and supporting incident clearing efforts.

Emergency Routing

This market package supports dynamic routing of emergency vehicles and coordination with the Traffic Management subsystem for special priority on the selected route(s). The ISP provides the route planning function for the emergency fleet based on real-time traffic conditions and the emergency routes assigned to other responding vehicles. The emergency vehicle would also optionally be equipped with dedicated short-range communications for local signal coordination.

Mayday Support

This package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveler needing assistance may be manually initiated or automated and linked to vehicle sensors. The data is sent to the Emergency Management subsystem using wide area wireless communications with voice communications as an option. Providing user location implies either a location technology within the user device or location determination within the communications infrastructure.

Medium Term Market Packages

Probe Surveillance

This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless communications between the vehicle and ISP are used to communicate current vehicle location and status, and 2) dedicated short range communications between the vehicle and roadside are used to provide equivalent information back to the traffic management subsystem. The first

approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short-range communications applications identified within the architecture. The market package enables traffic managers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers.

Regional Traffic Control

This market package advances the Surface Street Control and Freeway Control market packages by allowing integrated interjurisdictional 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 wireline communications capabilities to implement traffic management strategies which are coordinated between neighboring Traffic Management Subsystems. Several levels of coordination are supported from sharing of information through sharing of control between traffic management subsystems.

Traffic Network Performance Evaluation

This market package includes advanced algorithms, processing, and mass storage capabilities that support historical evaluation, real-time assessment, and forecast of traffic network performance. This includes the prediction of travel demand patterns to support better link travel times for route planning customers. The source data would come from the traffic management center itself as well as emergency management plans and predicted traffic loads derived from route plans supplied by the ISP. In addition, interface with transportation planners is required. This market package provides data that supports the implementation of TDM programs, and policies managing both traffic and the environment. Information on vehicle pollution levels, parking availability, usage levels, and vehicle occupancy are collected by monitoring sensors to support these functions.

Dynamic Toll/Parking Fee Management

This market package provides toll operators with the ability to collect tolls electronically and detect and process violators. The network surveillance data, which is a natural by-product of the toll collection process, provides highway authorities with road use statistics. Variations in the fees that are collected enable implementation of demand management strategies. Dedicated short-range communication between the roadway equipment and the vehicle is required as well as wireline interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Vehicle tags of toll violators are read and electronically posted to vehicle owners.

This market package also allows a parking facility to manage its parking operations, coordinate with the transportation authorities and collect parking fares in a similar fashion. This is performed by sensing/collecting parking data, sharing it with information providers and traffic management subsystems over the wireline infrastructure, and automatic fee collection using short-range communications with the same in-vehicle equipment utilized for electronic toll collection.

Transit Fixed-Route Operations

This market package performs automatic driver assignment and monitoring, as well as, vehicle routing and scheduling for fixed-route services. This service uses the existing AVL database as a source for current schedule performance data, and is implemented through data processing and information display at the transit management subsystem. This data is exchanged using the existing wireline link to the information service provider where it is integrated with that from other transportation modes (e.g. rail, air) to provide the public with integrated and personalized dynamic schedules.

Demand Response Transit Operations

This market package performs automatic driver assignment and monitoring as well as vehicle routing and scheduling for demand response transit services. This package uses the existing AVL database to monitor the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. Traveler equipment is also included within this market package to enable traveler requests for flexible route transit and paratransit service

Transit Passenger and Fare Management

This market package allows for the management of passenger loading and fare payments on-board vehicles using electronic means. The payment instrument may be either a stored value or credit card. This package is implemented with sensors mounted on the vehicle to permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle to allow fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed in the Transit Management Center using existing wireless infrastructure.

Transit Security

This market package provides for the physical security of transit passengers. An on-board security system is deployed to perform surveillance and warn of potentially hazardous situations. Transit areas (e.g. stops, park and ride lots, stations) are also monitored. Information is communicated to the Transit Management Center using the existing or emerging wireless (vehicle to center) or wireline (area to center) infrastructure. Security related information is also transmitted to the Emergency Management Center when an emergency is identified that requires an external response.

Transit Maintenance

This market package supports automatic maintenance scheduling and monitoring. On-board condition sensors monitor critical system status and transmit critical status information to the transit management center. Hardware and software in the transit management center processes these data and schedules maintenance activities.

Autonomous Route Guidance

This market package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is

assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.

Dynamic Route Guidance

This market package offers the user advanced route planning and guidance, which is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information which is considered by the user equipment in provision of route guidance.

Yellow Pages and Reservation

This market package enhances the Interactive Traveler Information market package by adding infrastructure provided yellow pages and reservation capabilities. The same basic user equipment is included; service or advertising fees should allow recovery of the ISP investment. This market package provides different ways for accessing information, either while en-route in a vehicle, pre-trip via wireline connections, etc.

Fleet Administration

This market package keeps track of vehicle location, itineraries, and fuel usage at the Fleet and Freight Management Center using a cell based or satellite data link and the preexisting wireless infrastructure. The vehicle has a processor to interface to its sensor (e.g., fuel gauge) and to the cellular data link. The Fleet and Freight Management Center can provide the vehicle with dispatch instructions, and can process and respond to requests for assistance and general information from the vehicle via the cellular data link. The market package also provides the Fleet Manager with connectivity to intermodal transportation providers using the existing wireline infrastructure.

ITS Planning

This market package supports ITS planning functions. It accepts data from every center subsystem and uses this data to plan new deployments and new market packages. This data also supports policy decision making, allocation of funding, allocation of resources and other planning activities.

Long Term Market Packages

Emissions and Environmental Hazards Sensing

This market package provides monitoring of the emissions levels using roadway sensors to collect the data. The data are transmitted to a center for processing and used by traffic management. It may include machine vision-based equipment to identify violators' license plates for appropriate actions. This market package also includes sensors to detect environmental hazards such as icy road conditions and dense fog, and communications equipment to transmit data to a center. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.

ISP-Based Route Guidance

This market package moves the route planning function from the user device to the information service provider. This approach simplifies the user equipment requirements and can provide the infrastructure better information on which to predict future traffic and appropriate control

strategies. The package includes two way data communications and optionally also equips the vehicle with the data bases, location determination capability, and display technology to support turn-by-turn route guidance.

In Vehicle Signing

This market package supports distribution of advisory information to drivers through in-vehicle devices regarding road conditions and status. It includes short-range communications to the vehicle and wireline connections to the TMS for coordination and control. This market package includes information distribution to inform the driver of both highway-highway and highway-rail intersection status.

Integrated Transportation Management/Route Guidance

This market package allows a traffic management center to continuously optimize the traffic control strategy based on near-real time information on intended routes for a proportion of the vehicles within their network. It represents an extension to the ISP-Based Route Guidance market package, which improves the level of coordination between ISP and Traffic Management Subsystem so that the planned routes can be factored in to near-future traffic management strategies. It would utilize the individual and ISP route planning information to optimize signal timing while at the same time providing updated signal timing information to allow optimized route plans. The use of predictive link times for this market package is possible through utilizing the Traffic Network Performance Evaluation market package at the traffic management center.

Electronic Clearance

This market package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem over wireline to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This package allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and dedicated short-range communications to the roadside. The roadside check facility may be equipped with Automatic Vehicle Identification (AVI), weighing sensors, transponder read/write devices, computer workstation processing hardware, software, and databases.

Commercial Vehicle Administrative Processes

This Market Package provides for electronic application, processing, fee collection, issuance, and distribution of CVO credentials and tax filing. Through this process, carriers, drivers, and vehicles are enrolled in the electronic clearance program provided by a separate market package, which allows commercial vehicles to be screened at mainline speeds at commercial vehicle check points. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration Subsystem and snapshots of this database are made available to the commercial vehicle check facilities at the roadside to support the electronic clearance process.

Weigh-In-Motion

This market package provides for high speed weigh-in-motion with or without AVI attachment. Primarily this market package provides the roadside with additional equipment, either fixed or removable. Fixed implementations are typically thought to be an addition to the electronic clearance and would work in conjunction with the AVI equipment in place.

Roadside CVO Safety

This market package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the commercial vehicle check subsystem. The capabilities for performing the safety inspection are shared between this market package and the On-Board CVO Safety Market Package, which enables a variety of implementation options. The basic option, directly supported by this market package, facilitates safety inspection of vehicles that have been pulled in, perhaps as a result of the automated screening process provided by the Electronic Clearance Market Package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-Board CVO Safety market package, utilize additional vehicle safety monitoring and reporting capabilities in the commercial vehicle to augment the roadside safety check.

On-board CVO Safety

This market package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety market package and includes roadside support for reading on-board safety data via tags. This market package uses the same communication links as the Roadside CVO Safety market package, and provides the commercial vehicle with a cellular link (data and possibly voice) to the Fleet and Freight Management and the Emergency Management Centers. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Fleet and Freight Management and Commercial Vehicle Check roadside elements.

CVO Fleet Maintenance

This market package supports maintenance of CVO fleet vehicles through close interface with on-board monitoring equipment and AVL capabilities within the Fleet and Freight Management Center. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

3.5 OTHER MARKET PACKAGES

The National ITS System Architecture has defined several market packages under the category of Advanced Vehicle Safety Systems (AVSS). These market packages are autonomous vehicle systems that involve only vehicle equipment. In addition to the AVSS market packages, the following market packages which have also been defined by the National ITS System Architecture are not recommended for the Wichita area.

HOV and Reversible Lane Management

This market package provides management of HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatments are given to HOV lanes. Vehicle occupancy detectors may be installed to determine if vehicles are HOVs. This market package also provides the capability for the traffic managers to access and manage reversible lane facilities. Additional hardware and software is needed to process traffic information and control reversible lane activities. This also includes the hardware to electronically reconfigure intersections to manage dynamic demand changes and special events.

Virtual TMC and Smart Probe Data

This market package provides for the special requirements of a rural road system. Instead of a central TMC, the traffic management is distributed over a very wide area (e.g., a whole state or collection of states). Each locality has the capability of accessing available information for assessment of road conditions. The package uses vehicles as smart probes that are capable of measuring road conditions and providing this information to the roadway for relay to the Traffic Management Subsystem and potentially direct relay to following vehicles (i.e., the automated road signing equipment is capable of autonomous operation). In-vehicle signing is used to inform drivers of detected road conditions.

Dynamic Ridesharing

This market package enhances the Interactive ATIS with Infrastructure Driver and Traveler Information package by adding infrastructure-provided dynamic ridesharing capability. The investment to the driver or traveler should not increase. If this service is provided by a private ISP, service fees may be required to allow for recovery of the ISP investment.

Freight Administration

This market package tracks cargo location and condition. This information is communicated with the Fleet and Freight Management Center via the existing wireless infrastructure. Interconnections are provided to intermodal freight shippers for tracking cargo across modes as it travels from source to destination.

International Border Electronic Clearance

This market package provides for automated clearance specific to international border crossings. It augments the electronic clearance package by allowing interface with customs related functions and permitting NAFTA required entry and exit from the US to Canada and Mexico.