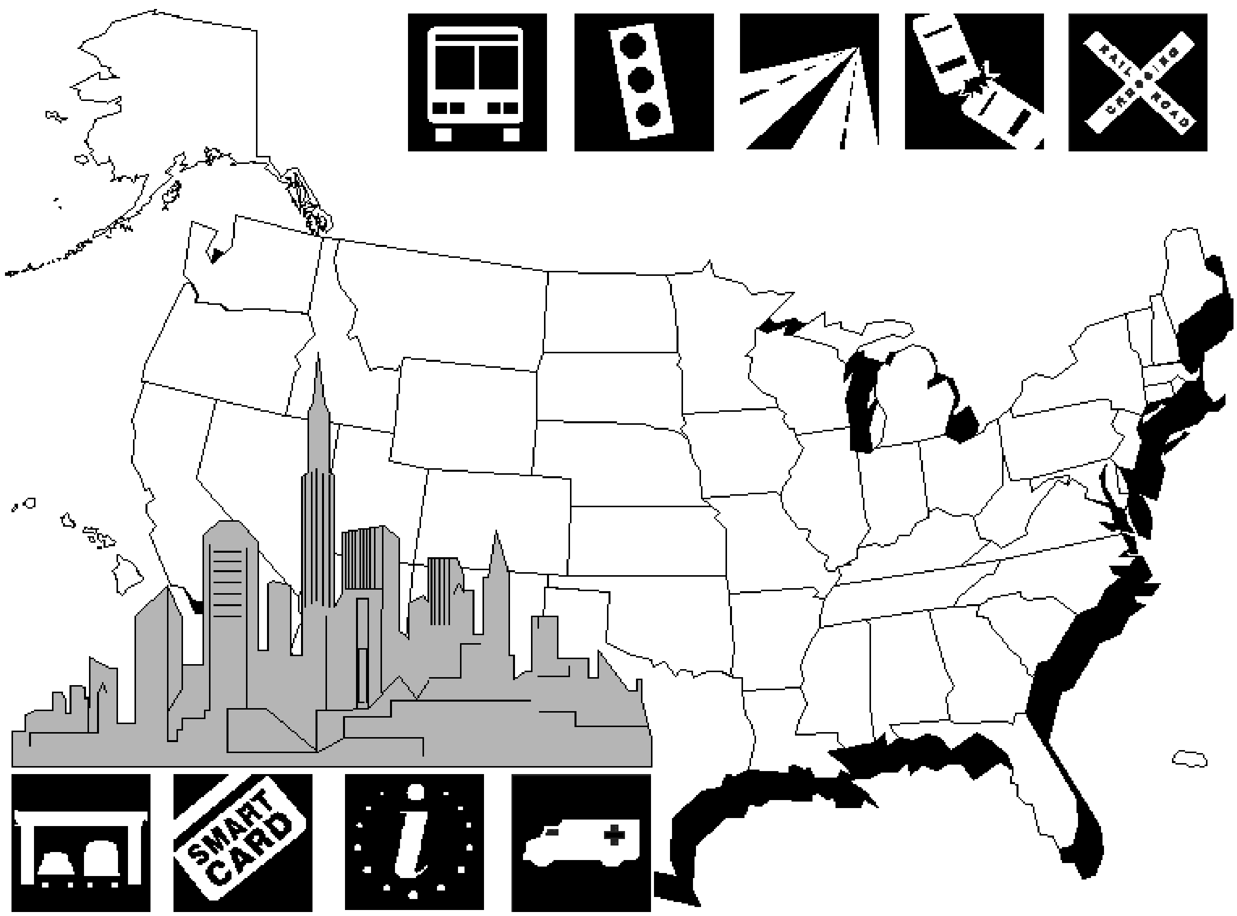
Tracking the Deployment of the Integrated Metropolitan Intelligent Transportation Systems Infrastructure in the USA: FY2000 Results

July 2001



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16. Abstract

This report describes the results of a major data gathering effort aimed at tracking deployment of nine infrastructure components of the metropolitan ITS infrastructure in 78 of the largest metropolitan areas in the nation. The nine components are: Freeway Management, Incident Management, Arterial Management, Electronic Toll Collection, Electronic Fare Payment, Transit Management, Highway-Rail Intersections, Emergency Management, and Regional Multimodal Traveler Information. Deployment is tracked through the use of indicators tied to the major functions of each component. In addition, integration of components is tracked through examining the transfer of information between components and the use of that information, once transferred. The report summarizes results at a national level and includes information on the number of metropolitan areas deploying selected technologies related to the indicators.

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Preface

This report presents the results of an update of a major nationwide data gathering effort to track the deployment of the metropolitan Intelligent Transportation Systems (ITS) Infrastructure in the largest metropolitan areas in the United States. In 1999, the U.S. Department of Transportation (USDOT) published a report updating the 1997 baseline survey. This current report documents results of a survey conducted in 2000 to update the 1999 results. Tracking deployment of ITS infrastructure is an important element of ITS program assessment since implementation of ITS is an indirect measure of effectiveness of the ITS program. Information regarding deployment activities provides feedback on progress of the program that can help stakeholders establish strategies for continued market growth. Understanding the rate of ITS deployment in various metropolitan areas can lead to insights regarding future program changes, redefinition of goals, or maintenance of current program direction.

The methodology followed to complete this effort is based on the development of deployment indicators designed to capture the most important functions provided by a particular ITS infrastructure component. The nine components tracked include: Freeway Management, Incident Management, Arterial Management, Transit Management, Electronic Fare Payment, Electronic Toll Collection, Highway-Rail Intersections, Emergency Management, and Regional Multimodal Traveler Information. In addition, indicators were developed to capture the level of integration of these components.

Questions or comments concerning the material presented in this report are encouraged and can be directed to:

Joseph I. Peters, Ph.D.
ITS Joint Program Office
Federal Highway Administration (HOIT-1)
400 Seventh Street, SW
Washington, DC 20590
(202) 366-2202
E-mail: joe.peters@fhwa.dot.gov

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Acronym List

ADOT	Arizona Department of Transportation
ATMS	Advanced Traffic Management System
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Location
CAD	Computer-Aided Dispatch
CBD	Central Business District
CCTV	Closed Circuit Television
EFP	Electronic Fare Payment
EM	Emergency Management
ETC	Electronic Toll Collection
FHWA	Federal Highway Administration
FM	Freeway Management
FTA	Federal Transit Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Material
HPMS	Highway Performance Monitoring System
HRI	Highway-Rail Intersections
IM	Incident Management
ISP	Information Service Provider
ITS	Intelligent Transportation Systems
IVS	In-Vehicle Signing
JPO	Joint Program Office
MMDI	Metropolitan Model Deployment Initiative
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
ORNL	Oak Ridge National Laboratory
PIAS	Personal Information Access System
RMTI	Regional Multimodal Traveler Information
RTS	Remote Transfer Support
TM	Transit Management
TSC	Traffic Signal Control
USDOT	United States Department of Transportation
VMS	Variable Message Sign

Executive Summary

In January 1996, former Secretary Peña set a goal of deploying the integrated metropolitan Intelligent Transportation System (ITS) infrastructure in 75[1] of the nation's largest metropolitan areas by 2006:

> *"I'm setting a national goal: to build an intelligent transportation infrastructure across the United States to save time and lives, and improve the quality of life for Americans. I believe that what we do, we must measure . . . Let us set a very tangible target that will focus our attention . . . I want 75 of our largest metropolitan areas outfitted with a complete intelligent transportation infrastructure in 10 years."*[2]
> *-- Former Secretary Peña, 1996*

In order to track progress toward fulfillment of the former Secretary's goal for deployment, the United States Department of Transportation (USDOT) Intelligent Transportation Systems (ITS) Joint Program Office (JPO) developed the metropolitan ITS deployment tracking methodology in 1997. This methodology tracks deployment of the nine components that make up the ITS infrastructure: Freeway Management; Incident Management; Arterial Management; Emergency Management; Transit Management; Electronic Toll Collection; Electronic Fare Payment; Highway-Rail Intersections; and Regional Multimodal Traveler Information. Information is gathered through a set of surveys distributed to the state and local agencies involved with these infrastructure components. The surveys gather information on the extent of deployment of the infrastructure and on the extent of integration between the agencies that operate the infrastructure. Deployment is measured using a set of indicators tied to the major functions of each component. Integration is measured by assessing the extent to which agencies share information and cooperate in operations based on a set of defined links between the infrastructure components. The details of the methodology are explained elsewhere. [3]

In FY97, the ITS JPO undertook a baseline survey of deployment in the nation's largest metropolitan areas following the metropolitan ITS deployment tracking methodology and published the results in a series of site reports and a nationwide summary report. During the summer and fall of 1999, the ITS JPO undertook a new data collection effort for the purpose of updating the 1997 survey results. This was repeated in 2000. Individual site reports have been developed for each metropolitan area surveyed. This report is a national summary of the FY2000 survey results.

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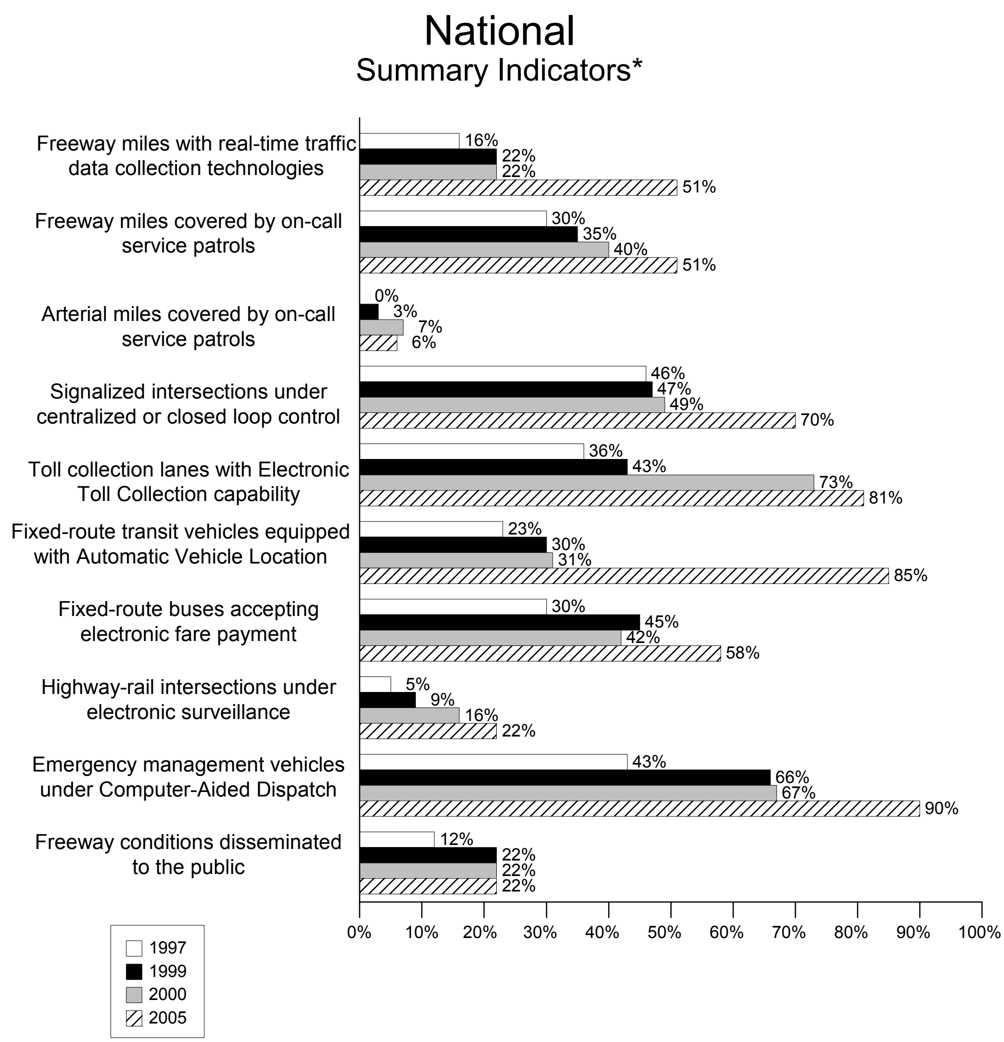
[1] Since former Secretary Peña's speech, the number of metropolitan areas that DOT will measure has been increased from 75 to 78. However, to maintain reporting consistency across the 10-year goal period, this report considers only the original 75 metropolitan areas.

[2] Excerpt of a speech delivered by former Secretary of Transportation Peña at the Transportation Research Board in Washington, DC on January 10, 1996.

[3] Additional Resources: "Measuring ITS Deployment and Integration" http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/3dg01!.pdf (also see: Electronic Document Number: 4372). U.S. Department of Transportation, Joint Program Office for Intelligent Transportation Systems, 400 Seventh St., SW (HVH-1), Washington, DC 20590, Phone: 202-366-9536, Fax: 202-366-3302, Web: http://www.its.dot.gov.

Deployment Summary Indicators

As will be seen in Section 2 of this report, the level of deployment of each of the ITS infrastructure components is described by a number of indicators. These indicators have been chosen to serve as estimators of the extent of technology deployment supporting critical functions. For each component, one of these indicators has been designated to serve as a summary for the whole component, allowing national results to be portrayed in a single graph. Figure 1 presents the national summary indicators. The FY2000 results are compared to results from 1999 and 1997. In addition, responders were asked to estimate deployment levels in the year 2005 as part of the 2000 survey and these projections are included in the figure. The indicators developed for deployment tracking are surrogates that do not necessarily reflect the full breadth of deployment. Because deployment goals have not been established, these indicators should not be read as a comparison of what is deployed versus eventual deployment goals. Instead, they only reflect what is deployed compared to full market saturation (i.e., the full deployment opportunity).



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Figure 1 National Summary Indicators

Integration Indicators

ITS integration is measured using 34 links that have been defined within the ITS infrastructure. These links are both inter-component (e.g., the sharing of arterial and freeway traffic condition information between freeway and arterial management agencies) and intra-component (e.g., the sharing of traffic signal timing information between arterial management agencies). The measure of integration is the simple calculation of the number of agencies that participate in integration compared to the total number of agencies that possibly could. As with deployment, this measure does not make a distinction between those agencies that should be linked and those that should not. Figure 2 presents the national summary of integration results for the FY2000 survey.

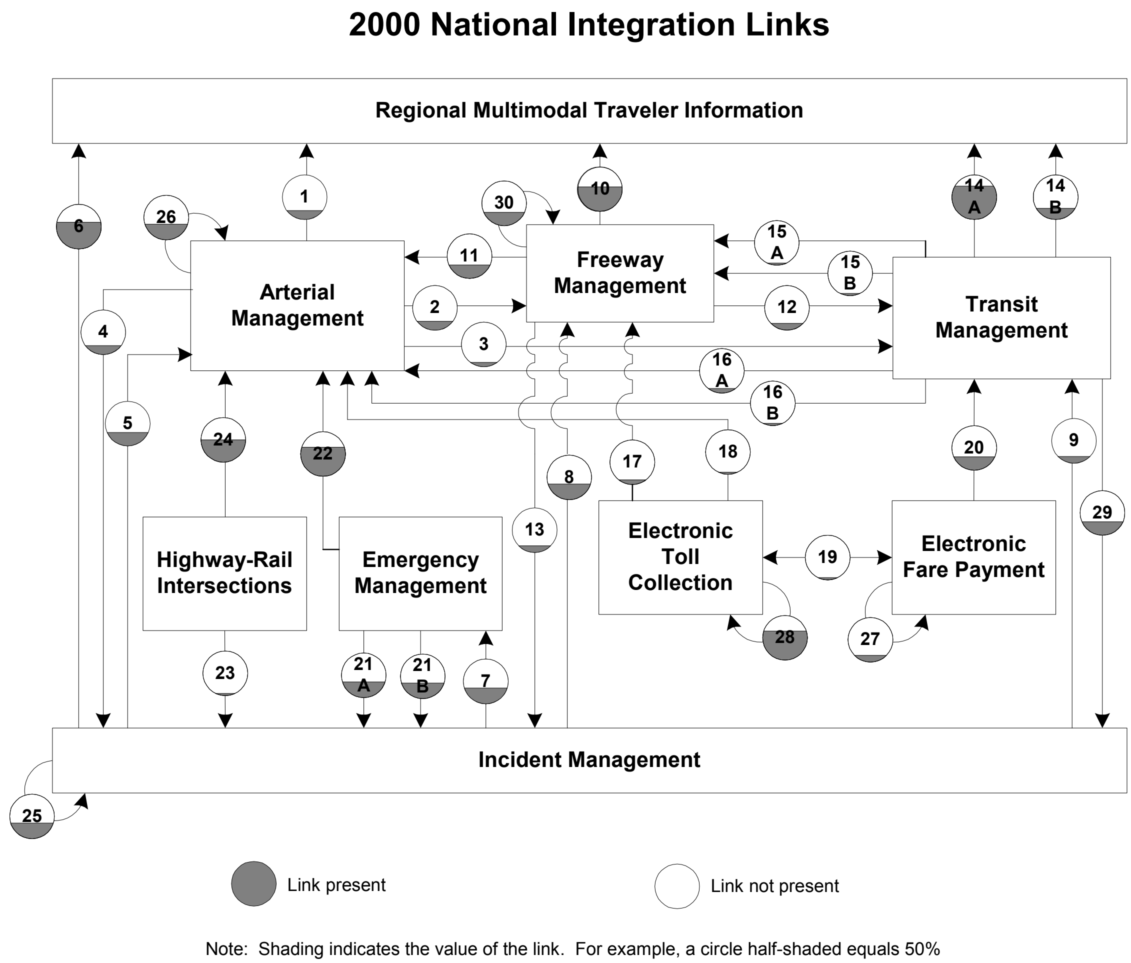


Figure 2 National Integration Links

Measuring Progress in Integrated Deployment

Deployment tracking data were used to develop a methodology for developing and tracking goals for integrated deployment to support monitoring of progress toward the former Secretary's 10-year goal. Deployment is measured using a set of threshold values for the major infrastructure components. A metropolitan area is assigned a rating of low, medium, or high based on the number of thresholds attained. Integration is measured by evaluating the existence of integration links between a subset of the infrastructure--freeway management, arterial management, and transit management. An integration rating of low, medium, and high is assigned and combined with the deployment rating to produce a single overall rating for integrated deployment. Crossing a threshold value for either deployment or integration means that a metropolitan area has made a significant commitment to deploy and integrate the metropolitan ITS infrastructure. *However, it does not mean that deployment or integration is complete*. The 10-year goal will be met if all of the 75 metropolitan areas are rated medium or above for integrated deployment. This methodology is explained in detail in section 4. Figure 3 summarizes the level of deployment in 75 of the nation's largest metropolitan areas for 1997, 1999, and 2000.

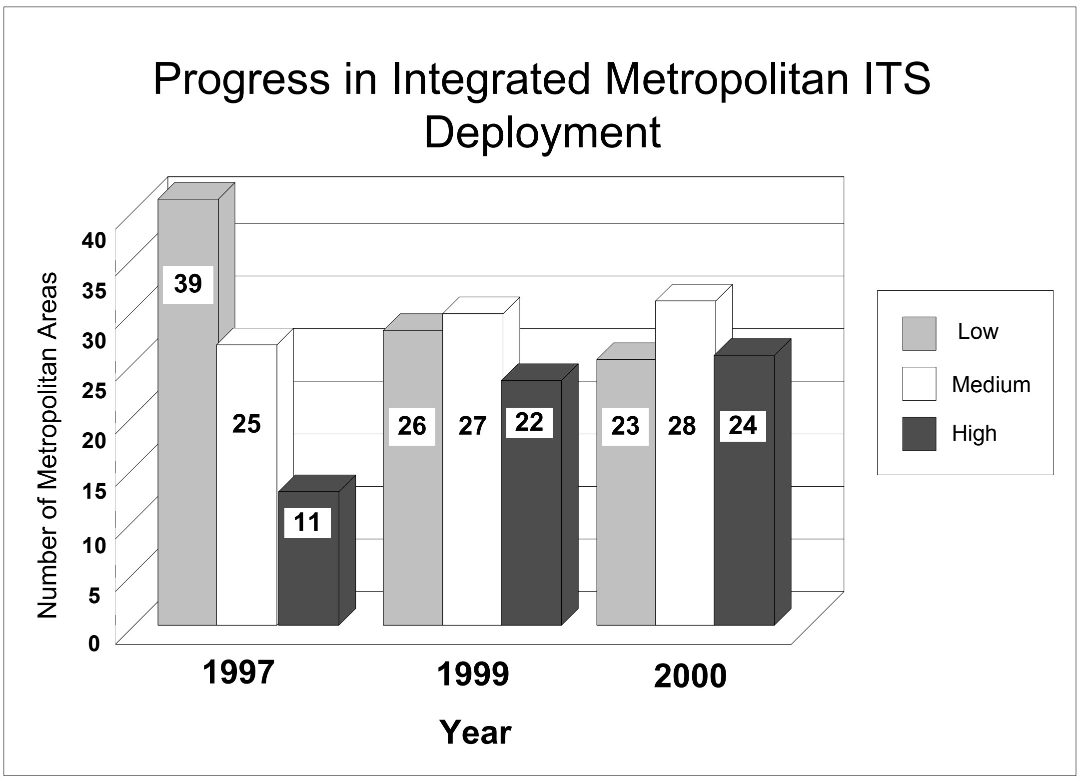


Figure 3 Progress in Integrated Metropolitan ITS Deployment

Introduction

Background

In January 1996, former Secretary Peña set a goal of deploying the integrated metropolitan Intelligent Transportation System (ITS) infrastructure in 75[4] of the nation's largest metropolitan areas by 2006:

> *"I'm setting a national goal: to build an intelligent transportation infrastructure across the United States to save time and lives, and improve the quality of life for Americans. I believe that what we do, we must measure . . . Let us set a very tangible target that will focus our attention . . . I want 75 of our largest metropolitan areas outfitted with a complete intelligent transportation infrastructure in 10 years."*[5]
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In order to track progress toward fulfillment of the former Secretary's goal for deployment, the United States Department of Transportation (USDOT) Intelligent Transportation Systems (ITS) Joint Program Office (JPO) developed the metropolitan ITS deployment tracking methodology in 1997. This methodology tracks deployment of the nine components that make up the ITS infrastructure: Freeway Management; Incident Management; Arterial Management; Emergency Management; Transit Management; Electronic Toll Collection; Electronic Fare Payment; Highway-Rail Intersections; and Regional Multimodal Traveler Information. Through a set of indicators tied to the major functions of each component, the level of deployment is tracked for the nation's largest metropolitan areas. In addition, the integration links between agencies operating the infrastructure are also tracked. The details of the methodology are explained elsewhere. [6]

In 1997, the ITS JPO published the results of the first nationwide survey of deployment in the nation's 78 largest metropolitan areas using the metropolitan ITS deployment tracking methodology. The results of this effort are documented elsewhere. In 1999, the ITS JPO implemented a national survey effort designed to update the information collected in the 1997 survey. This report summarizes the results of the 2000 data collection effort. Information provided in this report includes a comparison of 1997, 1999, and 2000 deployment for the metropolitan ITS infrastructure components mentioned earlier. In addition, this report compares levels of integration of these components in 1999 against those measured in 2000. In the 2000 survey, agencies were asked to estimate anticipated levels of deployment by 2005. Therefore, this report also includes a comparison of 1997, 1999, 2000, and 2005 levels of deployment from a national perspective.

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[4] Since former Secretary Peña's speech, the number of metropolitan areas that DOT will measure has been increased from 75 to 78. However, to maintain reporting consistency across the 10-year goal period, this report considers only the original 75 metropolitan areas.

[5] Excerpt of a speech delivered by former Secretary of Transportation Peña at the Transportation Research Board in Washington, DC on January 10, 1996.

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Approximately two thousand survey forms were distributed in these areas with an overall response rate of 81% in 1997, 84% in 1999, and 90% in 2000.

National Summary Indicators

Several deployment indicators have been developed for each component. However, a single indicator has been selected for the purpose of summarizing the level of deployment for a particular component. The summary indicators are expressed as a percentage; however, because deployment goals have yet to be established, these indicators should not be read as a comparison of what is deployed versus eventual deployment goals. Instead, they only reflect what is deployed compared to full market saturation (i.e., opportunity for deployment). The indicators are surrogates that do not necessarily reflect the full breadth of metropolitan ITS deployment. Figure 4 portrays the summary indicators developed from the 1997, 1999, and the 2000 survey. (The 2000 survey asked for estimated 2005 levels of deployment.)

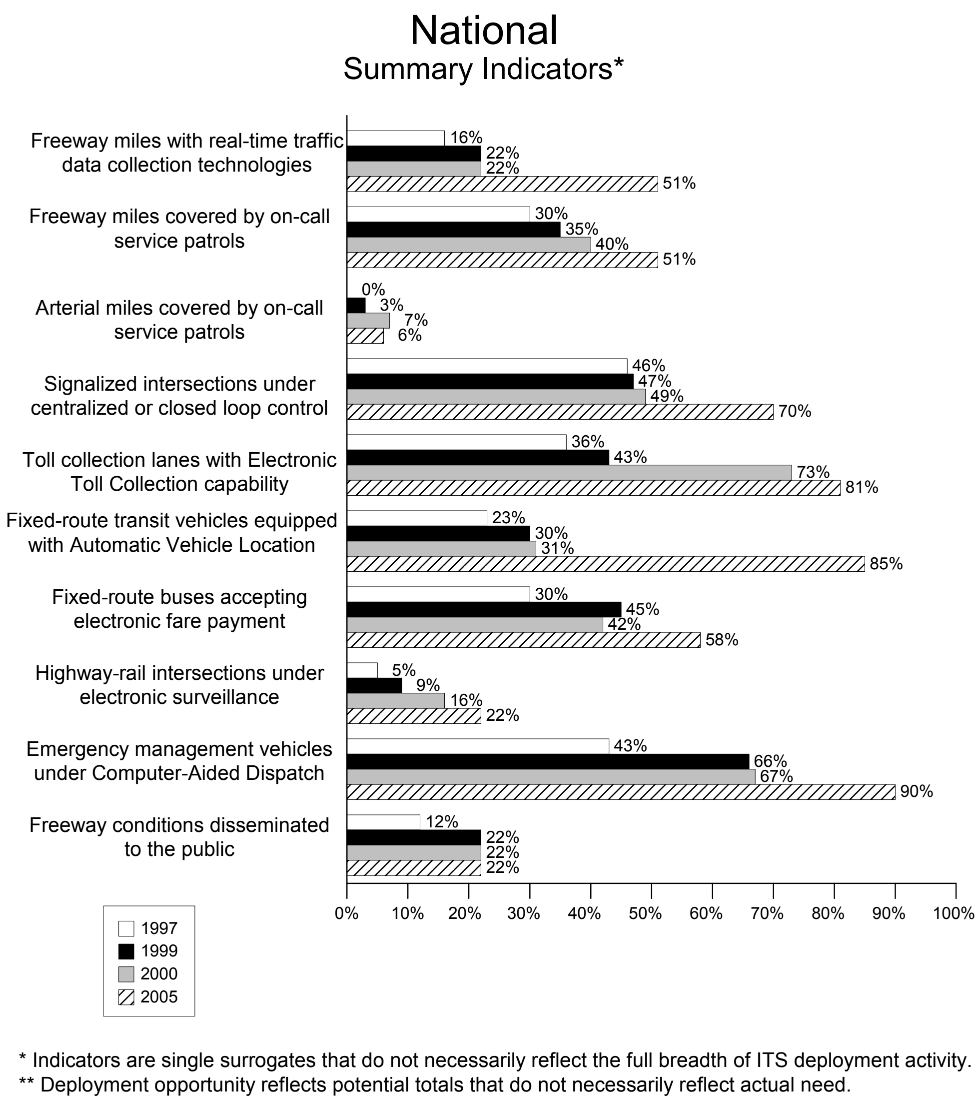
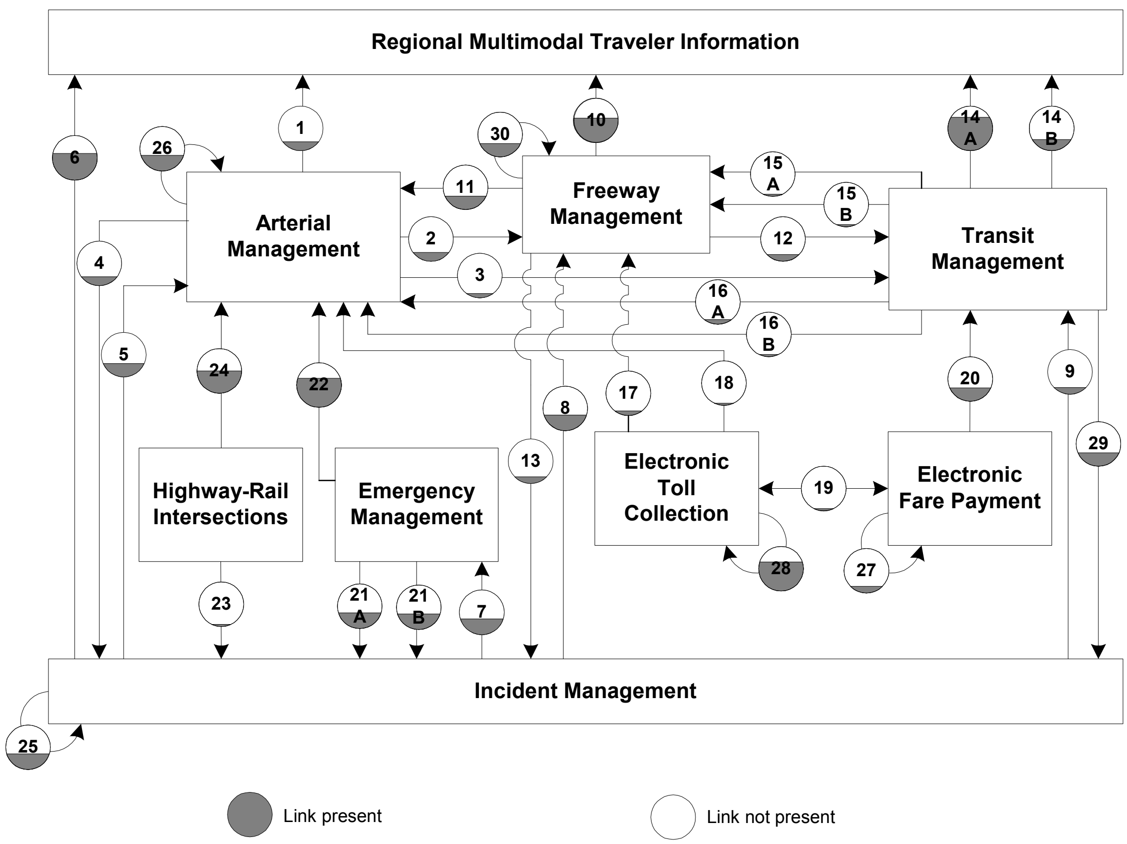


Figure 4 National Summary Indicators

Figure 5 portrays the national summary indicators for integration. As with the component indicators, definitions for inter- and intra-component integration were developed for each component. Indicators derived from these definitions were also produced for each component. A total of 34 individual integration indicators were specified and are portrayed in the third figure, which follows. Each integration indicator has been assigned a number and an origin/destination path from one ITS infrastructure component to another. For example, the number "10" identifies the integration of information from the Freeway Management component to the Regional Multimodal Traveler Information component.

2000 National Integration Links



Note: Shading indicates the value of the link. For example, a circle half-shaded equals 50%

Figure 5 National Integration Links

Organization of Report

This report is divided into five parts: Executive Summary; Introduction; ITS Infrastructure Component Description and FY2000 Survey Results; ITS Infrastructure Integration Indicator Description and FY2000 Survey Results; and Deployment Goal Setting.

ITS Infrastructure Component Description and FY2000 Survey Results

This section presents deployment-tracking indicators for each of the nine metropolitan ITS components. The following information is provided for each component:

1. A description of the basic functions performed by each component.

2. Data gathering results for each indicator displayed in a set of graphs. The horizontal bar graph that portrays results is expressed as a percent of deployment opportunity achieved for each indicator. The deployment opportunity reflects the total potential deployment and does not necessarily reflect actual need. For example, freeway management indicators are compared to a deployment opportunity consisting of the entire freeway system and are not corrected for any assessment of how local conditions might limit the scope of deployment to a portion of the freeway system. These indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity. Where possible, FY2000 results are compared to FY1997, FY1999, and estimates for FY2005. In some cases, a decrease in deployment or integration over time occurs. This may be due to difference in reporting from year to year, agencies responding one year and not the other, or an actual decrease in the level of deployment

3. Additional survey results are used to evaluate the extent that individual metropolitan areas have adopted technologies. This information is displayed in graphs that show the number of metropolitan areas reporting the presence of a particular technology that supports a component. In many cases, metropolitan areas have more than one of these technologies. As with the indicators, FY2000 results are compared to FY1997 results, FY1999 results, and 2005 estimates.

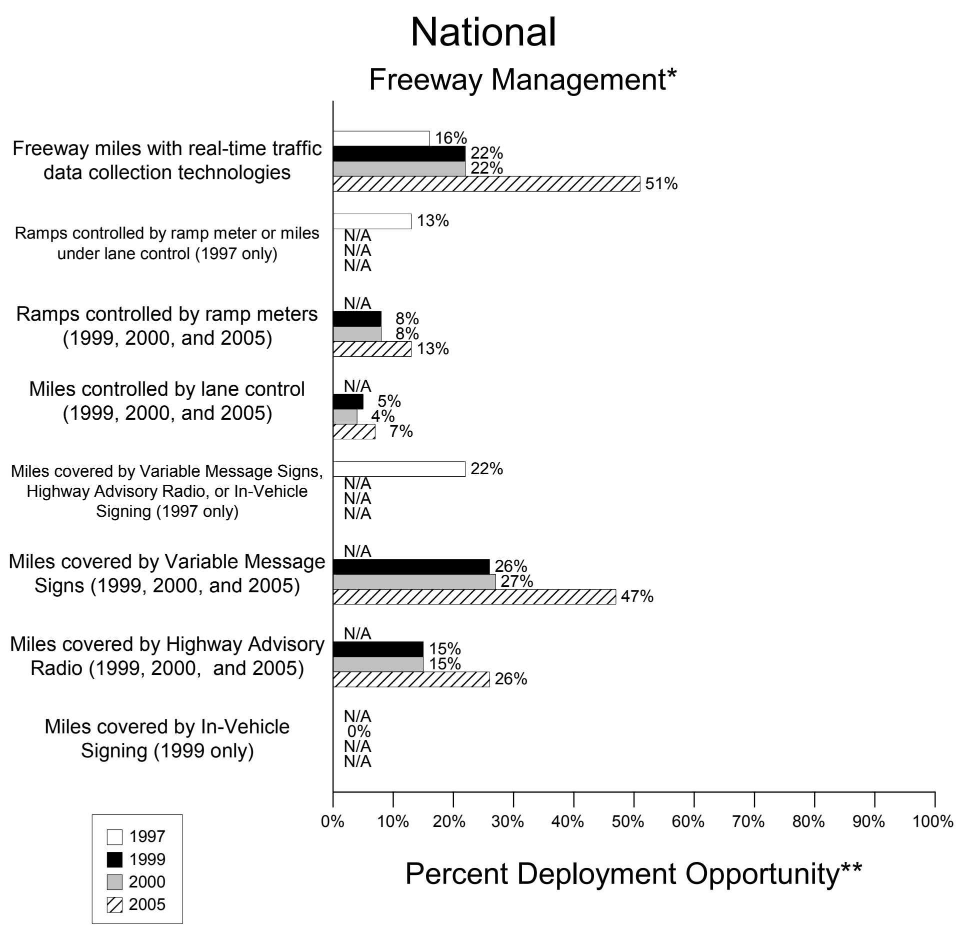
Freeway Management

Freeway Management Functions

Freeway Management provides the following traffic management functions:

1. Capability to monitor traffic conditions on the freeway system in real-time (i.e., traffic surveillance).
2. Capability to implement appropriate traffic control and management strategies (such as ramp metering and lane control) in response to recurring or non-recurring flow impediments (i.e., traffic control).
3. Capability to provide critical information to travelers through infrastructure-based dissemination methods such as Variable Message Signs (VMS), Highway Advisory Radio (HAR), or In-Vehicle Signing (IVS) (i.e., information display).

The Freeway Management component indicators are shown in Figure 6.



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Figure 6 Freeway Management Components

Traffic Surveillance

Figure 7 contains the number of metropolitan areas that use various surveillance technologies. Some metropolitan areas use more than one technology. The most frequently used electronic surveillance technology is loop detectors, although radar detectors and video image detectors show the greatest projected growth.

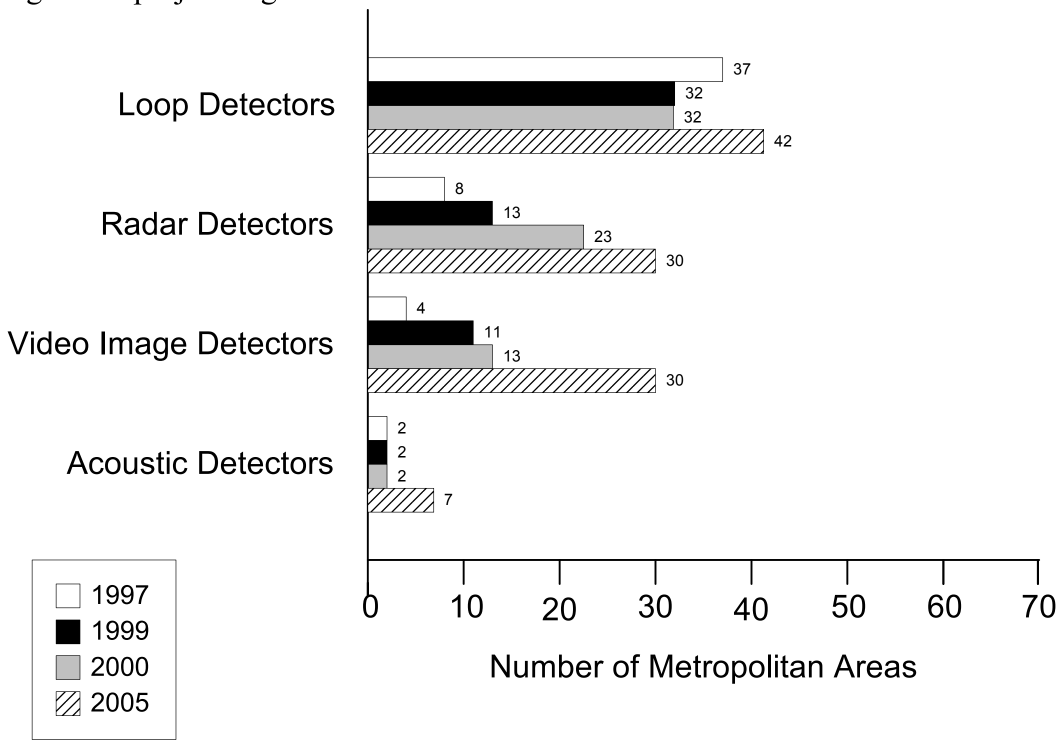


Figure 7 Surveillance Technologies

Traffic Control

Traffic condition data are analyzed to identify the cause of a flow impediment and to formulate an appropriate response in real-time. Traffic control devices, such as ramp meters or lane control devices, may be applied to provide a better balance between freeway travel demand and capacity during congested conditions.

Figure 8 contains the number of metropolitan areas that use lane control or ramp metering, the type of ramp meter control used, and the number of metropolitan areas that have ramp meter preemption for emergency vehicles and priority for transit vehicles.

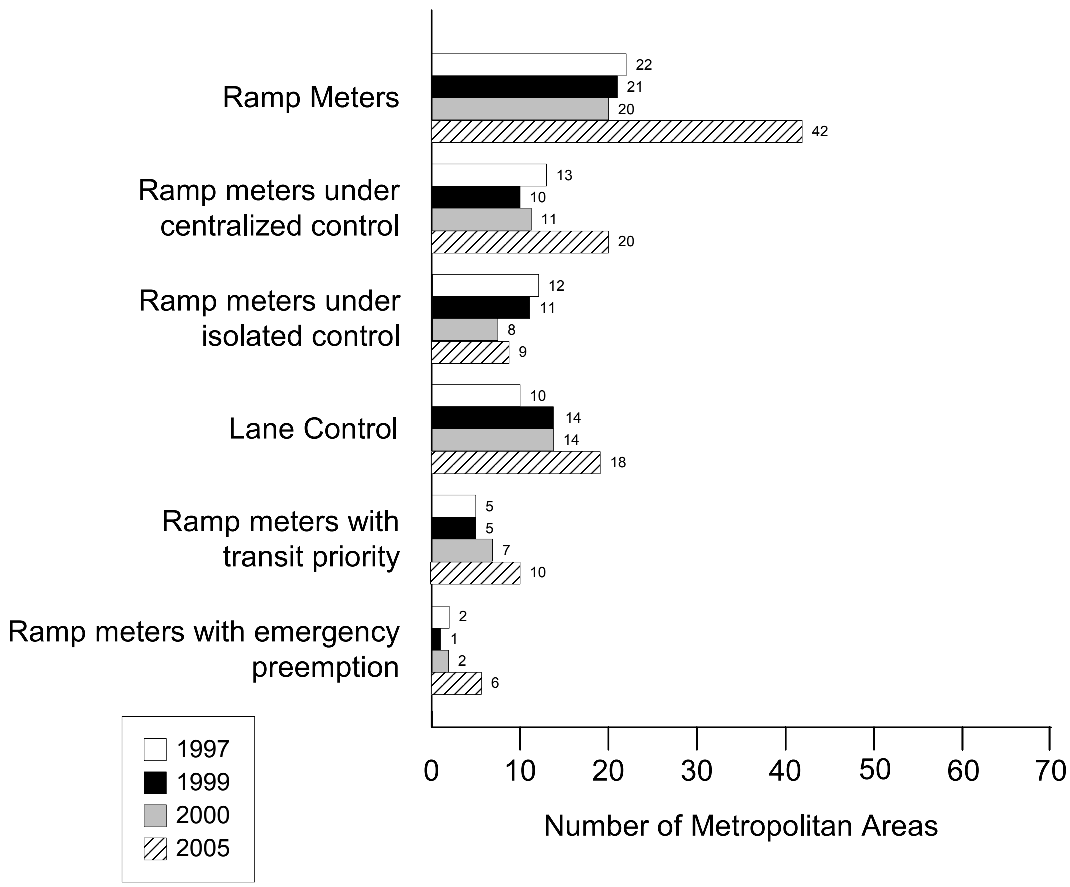


Figure 8 Traffic Control Devices

Information Display

Information may be provided to travelers through roadside traveler information devices such as VMS, HAR, and IVS.

Figure 9 contains a summary of the number of metropolitan areas reporting the use of information display technologies. The most frequently used technology is VMS, followed by HAR. No metropolitan area reports using IVS.

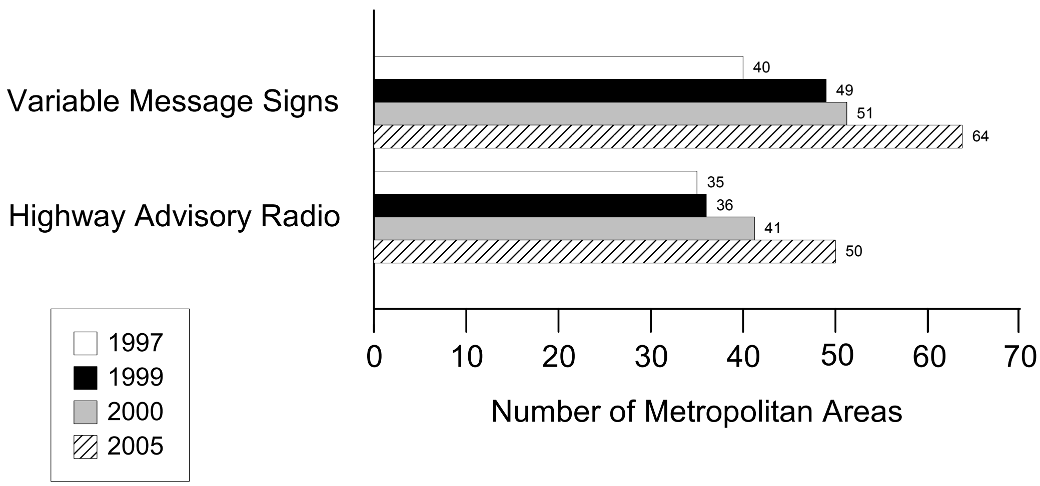


Figure 9 Information Dissemination

Incident Management

Incident Management Functions

Incident Management provides the following traffic management functions in real-time:

1. Capability to detect incidents on the freeway and arterial roadway system (i.e., incident detection).
2. Capability to verify incidents on the freeway and arterial roadway system (i.e., incident verification).
3. Capability to respond to incidents on the freeway and arterial roadway system (i.e., incident response).

The Freeway and Arterial Incident Management component indicators are shown in Figure 10.

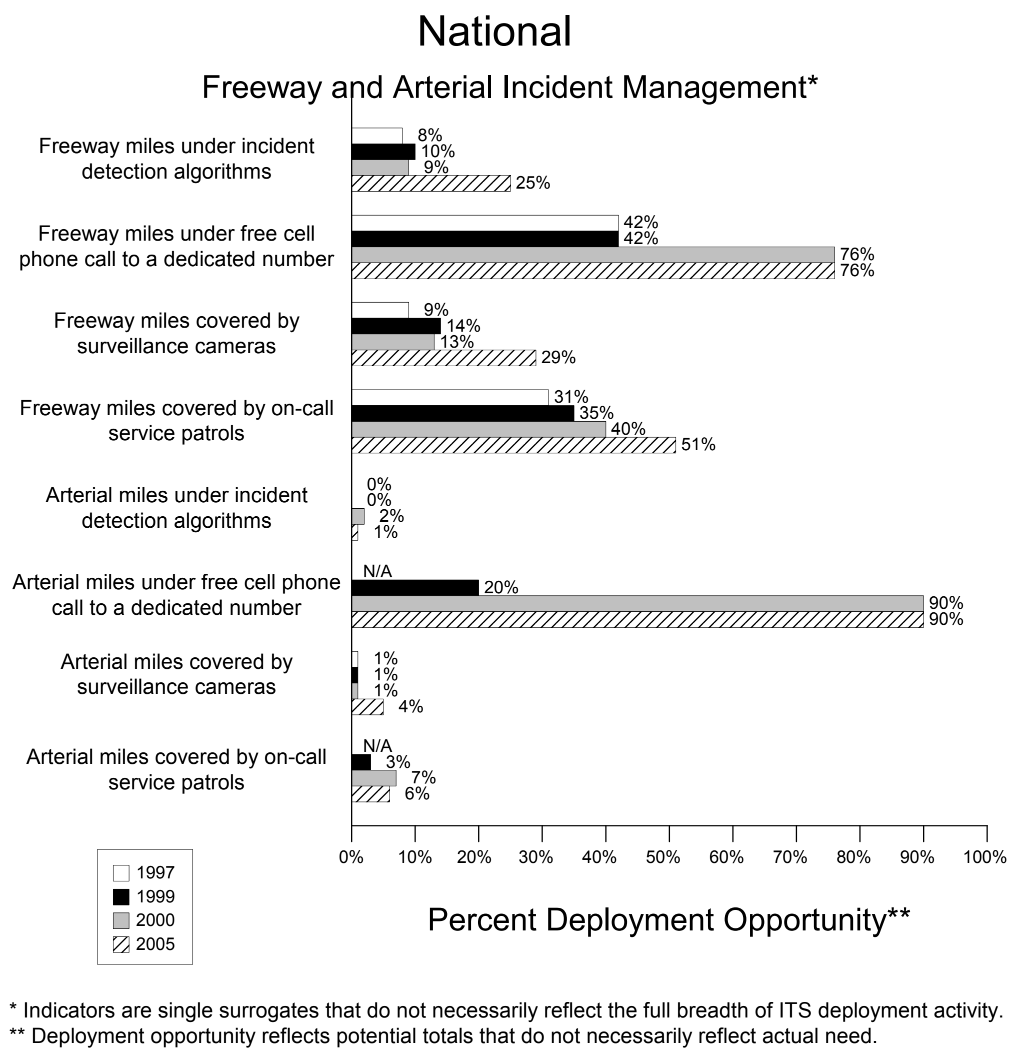


Figure 10 Freeway and Arterial Incident Management

Incident Detection

Monitoring of freeway conditions for the purpose of incident management is usually integrated with Freeway Management, with notification of the presence of an incident provided to the Incident Management component.

Figure 11 contains the number of metropolitan areas that use various incident detection methods. Use of free cellular phone calls to a dedicated number is the most commonly used method. Incident detection algorithms are also used in freeways and arterials.

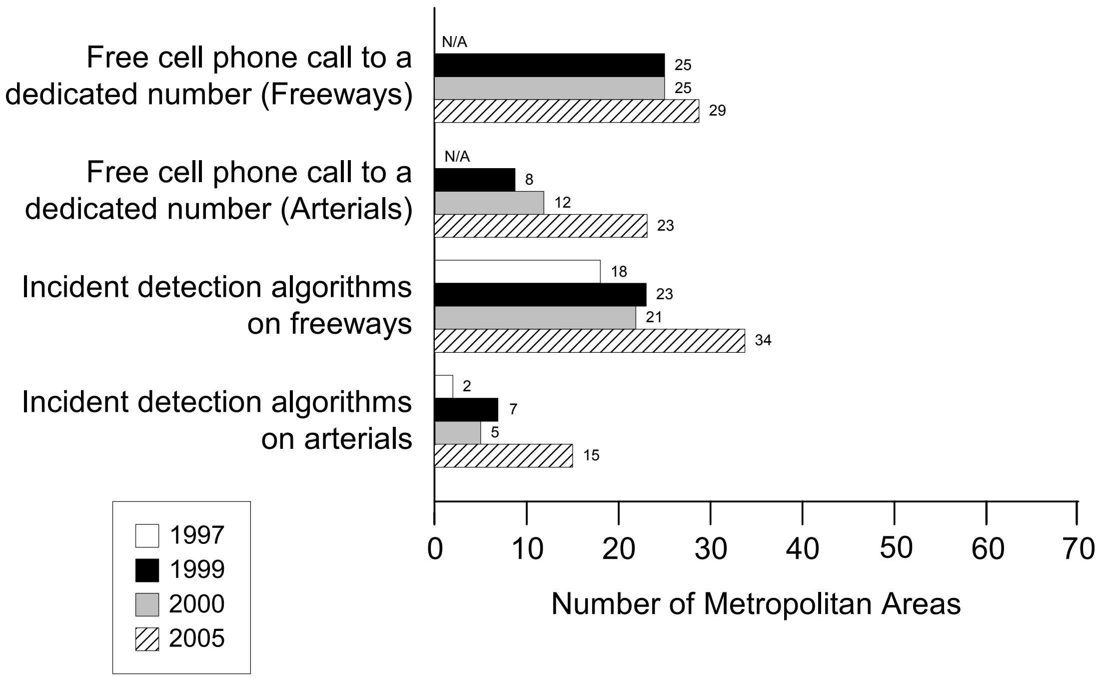


Figure 11 Incident Detection

Incident Verification

Incident verification is typically accomplished through observation by cameras.

Figure 12 contains the number of metropolitan areas that use surveillance cameras for incident verification on arterials and freeways.

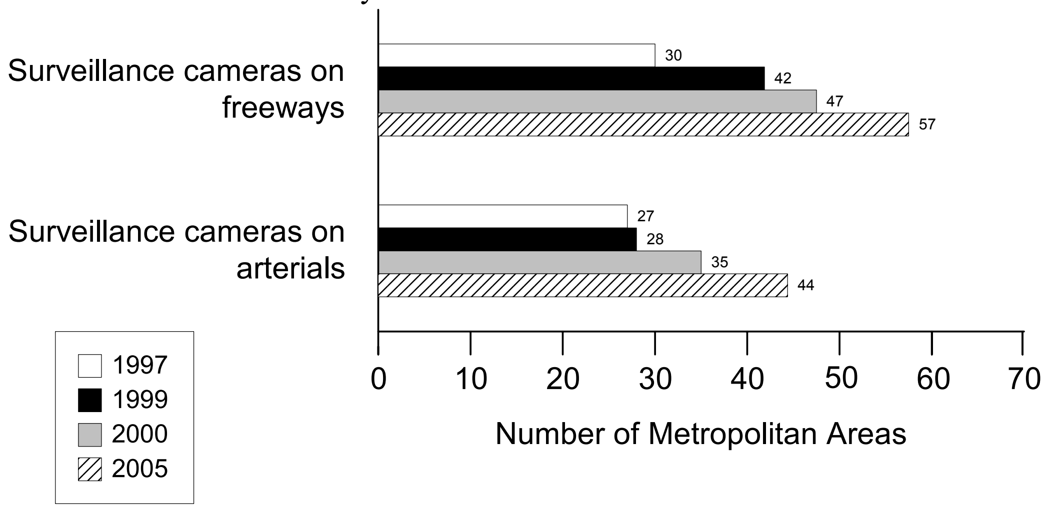


Figure 12 Incident Verification

Incident Response

Roadways are cleared and flow restored as rapidly as possible, minimizing frustration and delay to travelers while at the same time meeting the requirements and responsibilities of the agencies involved.

Figure 13 contains the number of metropolitan areas that use various incident response methods in freeways. More than half of the metropolitan areas reporting use publicly operated service patrols.

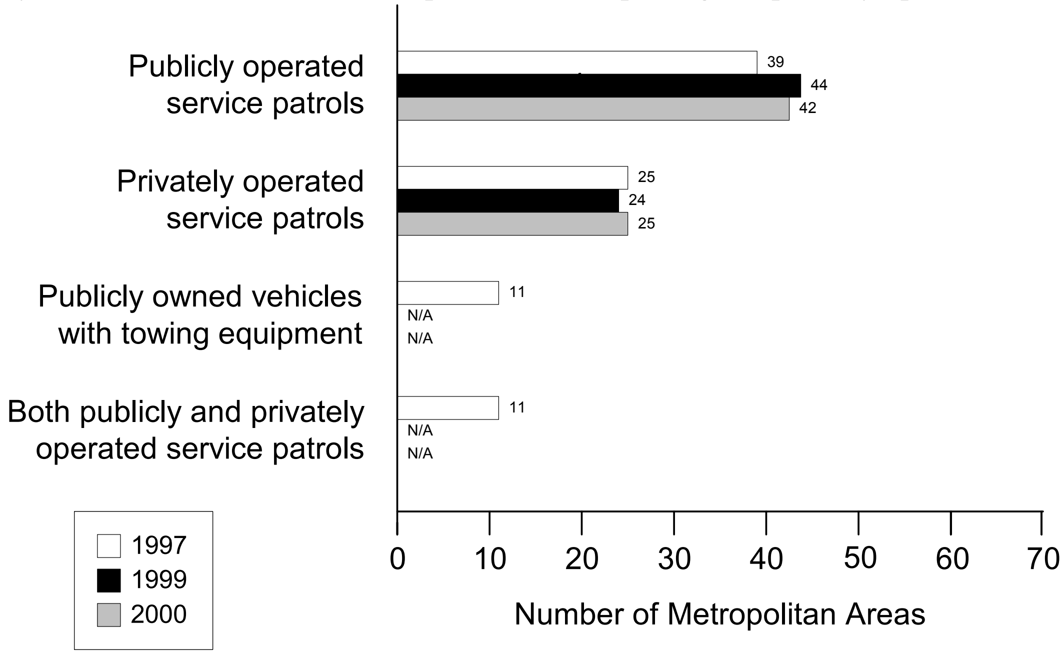


Figure 13 Incident Response on Freeways

Figure 14 contains the number of metropolitan areas that use various incident response methods in arterials. Although not widely deployed, the most commonly used method is the use of publicly operated service patrols.

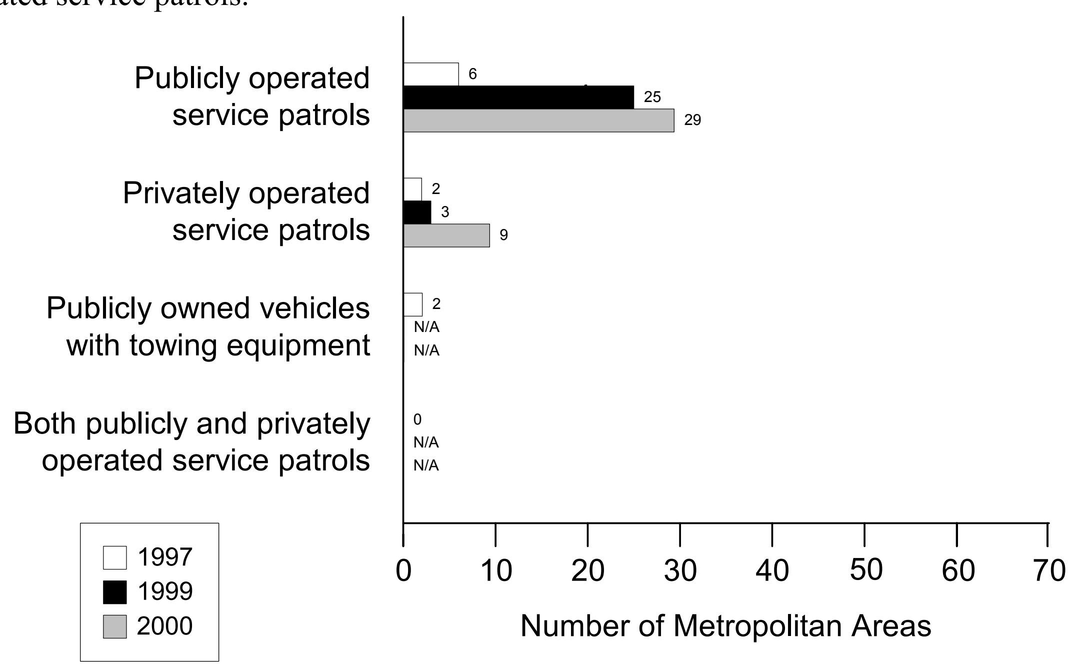


Figure 14 Incident Response on Arterials

Arterial Management

Arterial Management Functions

Arterial Management provides for the following traffic management functions:

1. Capability to monitor traffic flow conditions on arterials in real-time (i.e., traffic surveillance).
2. Capability to implement traffic signal timing patterns that are responsive to traffic flow conditions (i.e., traffic control).
3. Capability to provide critical information to travelers through infrastructure-based dissemination methods such as VMS, HAR, or IVS (i.e., information display).

The Arterial Management component indicators are shown in Figure 15.

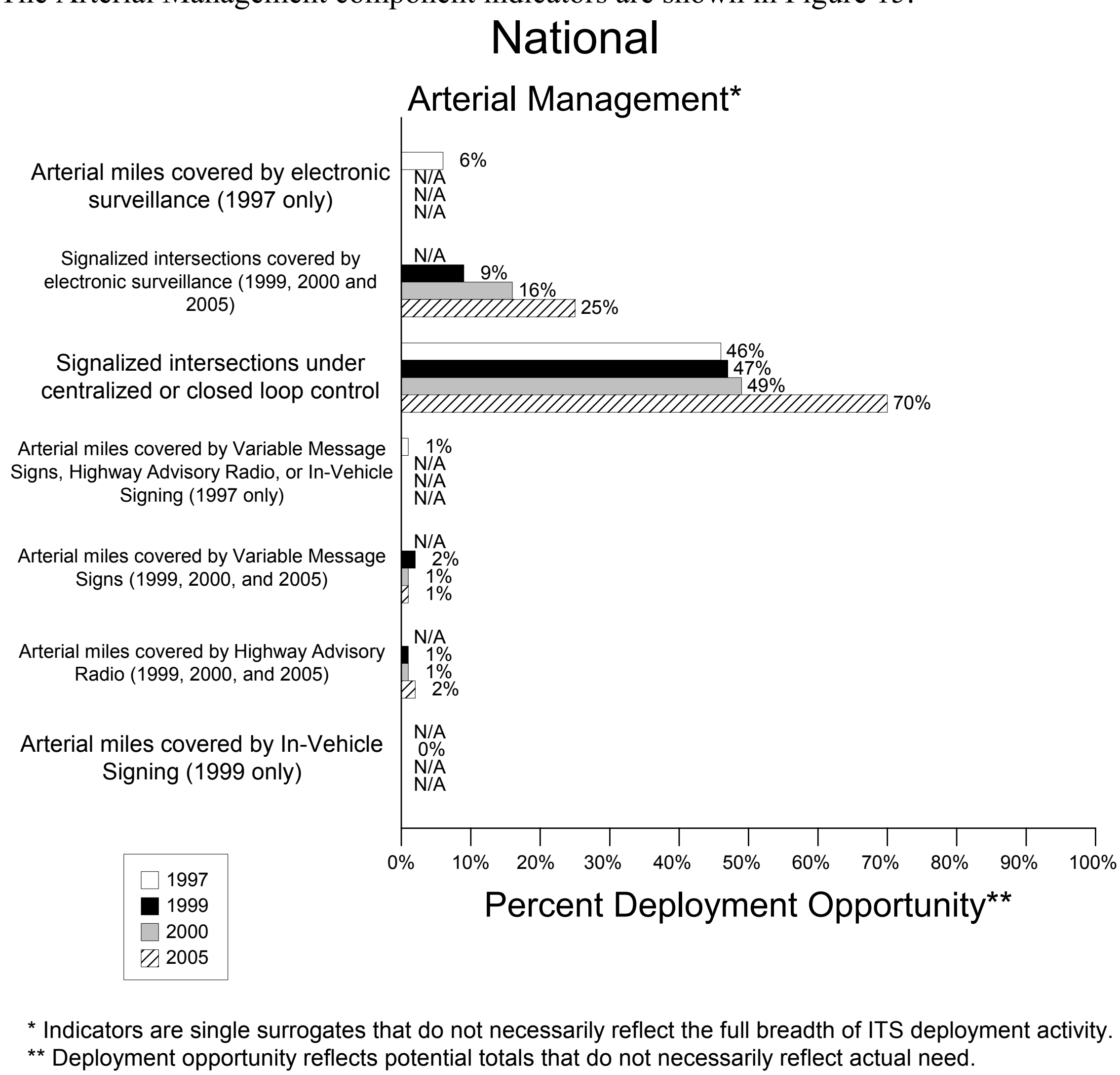


Figure 15 Arterial Management

Traffic Surveillance

Traffic signal control may incorporate peripheral elements that are not essential to the task of traffic control per se, but which may enhance overall traffic management capabilities in an area. These elements could include CCTV surveillance, motorist information and/or traveler information components, a database management system to support analysis and development of management strategies, and data exchange with other traffic management systems including freeway management and incident management.

Figure 16 contains the number of metropolitan areas that use electronic surveillance on arterials. More than half of the metropolitan areas reporting have signalized arterial miles with electronic surveillance for monitoring traffic flow.

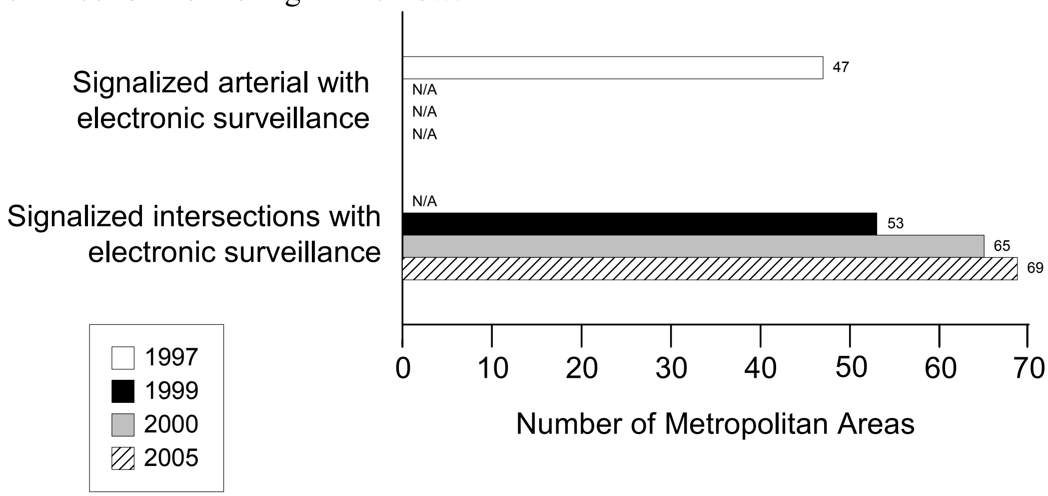


Figure 16 Traffic Surveillance

Traffic Control

Arterial Management is responsible for the coordinated control of traffic signals along urban arterials, networks, and the CBD. Arterial Management provides the capability to adjust the amount of green time for each street and coordinate operation between each signal in response to changes in demand patterns. Traffic signal timing patterns may be executed in response to pre-established "time of day" or "special event" plans, based on historical traffic conditions, or may be executed in response to real-time traffic conditions using "traffic-adaptive" algorithms. Coordination can be implemented through a number of techniques including time-based and hard-wired interconnection methods. Coordination of traffic signals across agencies requires development of data sharing and traffic signal control agreements. Therefore, a critical institutional component of Arterial Management is the establishment of formal or informal arrangements to share traffic control information as well as actual control of traffic signal operation across jurisdictions.

Figure 17 contains a summary of metropolitan areas that use various control technologies. All of the metropolitan areas that have responded report signalized arterial miles under centralized or closed loop control. The majority of the metropolitan areas reporting use closed loop control. More metropolitan areas have reported signals with preemption for emergency vehicles than priority for transit vehicles.

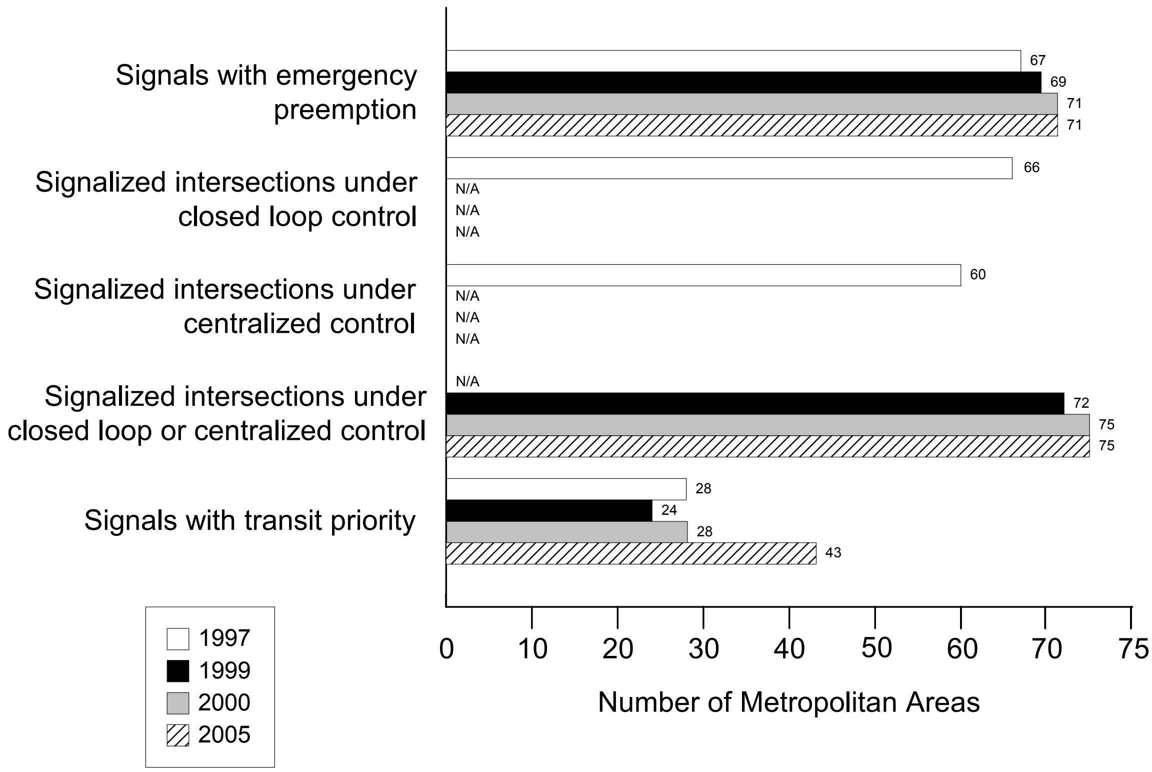


Figure 17 Traffic Control

Information Display

Information may be provided to travelers through roadside traveler information devices such as VMS and HAR.

Figure 18 contains a summary of metropolitan areas that use various display technologies. VMS is the method used most often.

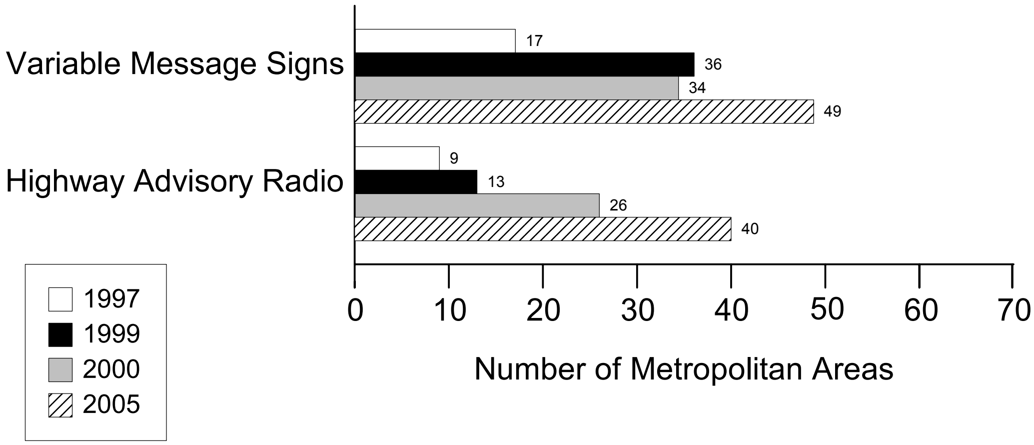


Figure 18 Information Dissemination

Electronic Toll Collection

Electronic Toll Collection Functions

Electronic Toll Collection (ETC) provides for the following traffic management function:

Automatically collect toll revenue through the application of in-vehicle, roadside, and communication technologies to process toll payment transactions (i.e., electronically collect tolls).

The Electronic Toll Collection component indicators are shown in Figure 19.

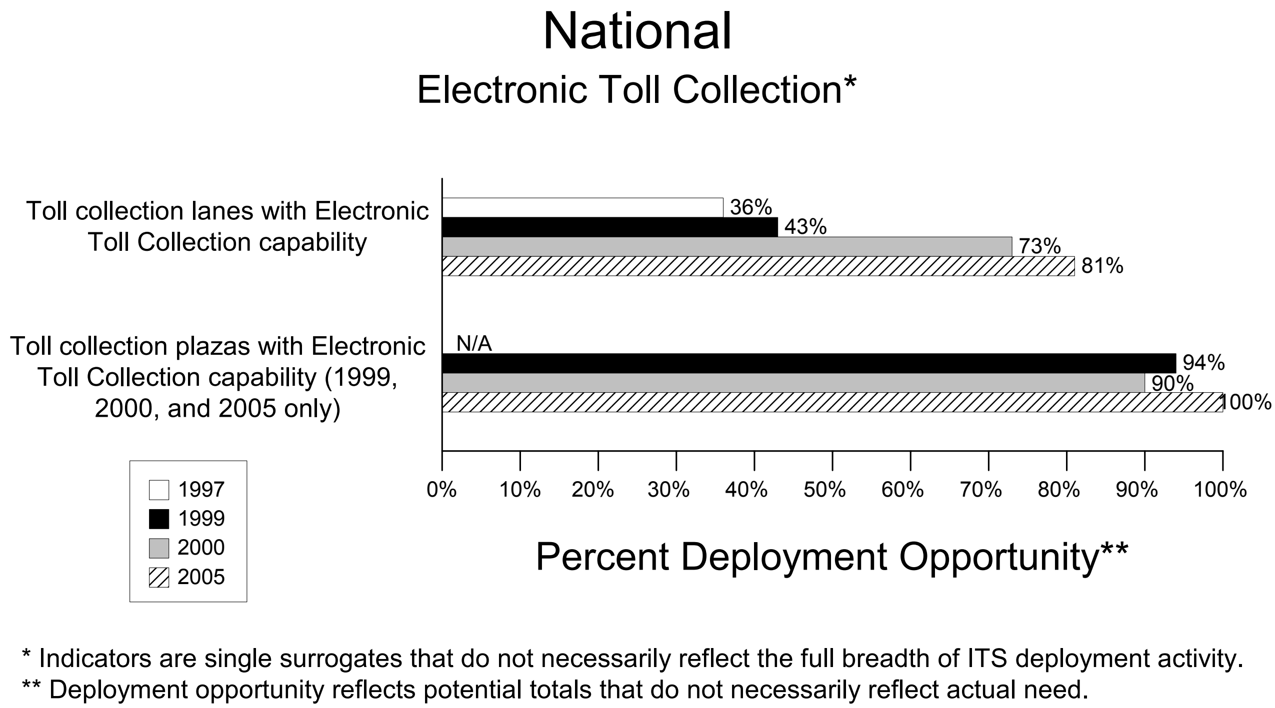


Figure 19 Electronic Toll Collection

Figure 20 contains the number of metropolitan areas that have toll collection lanes with ETC capability.

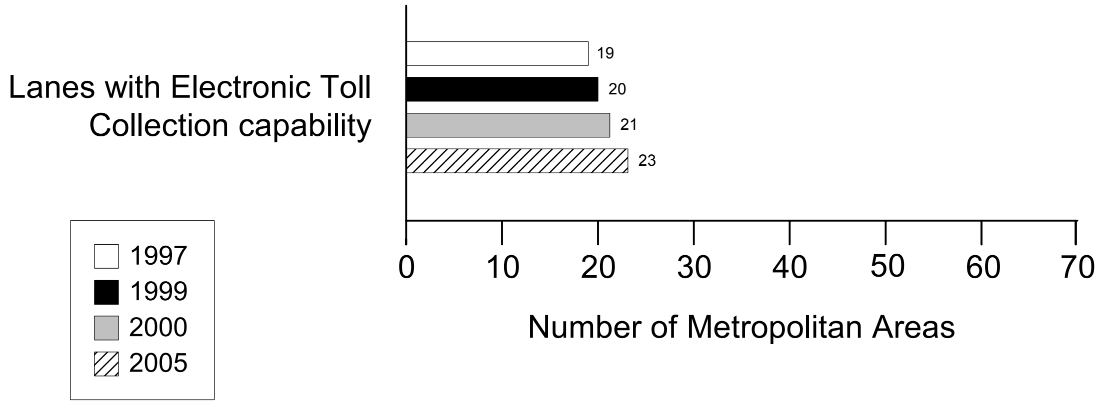


Figure 20 Lanes with ETC Capability

Electronic Fare Payment

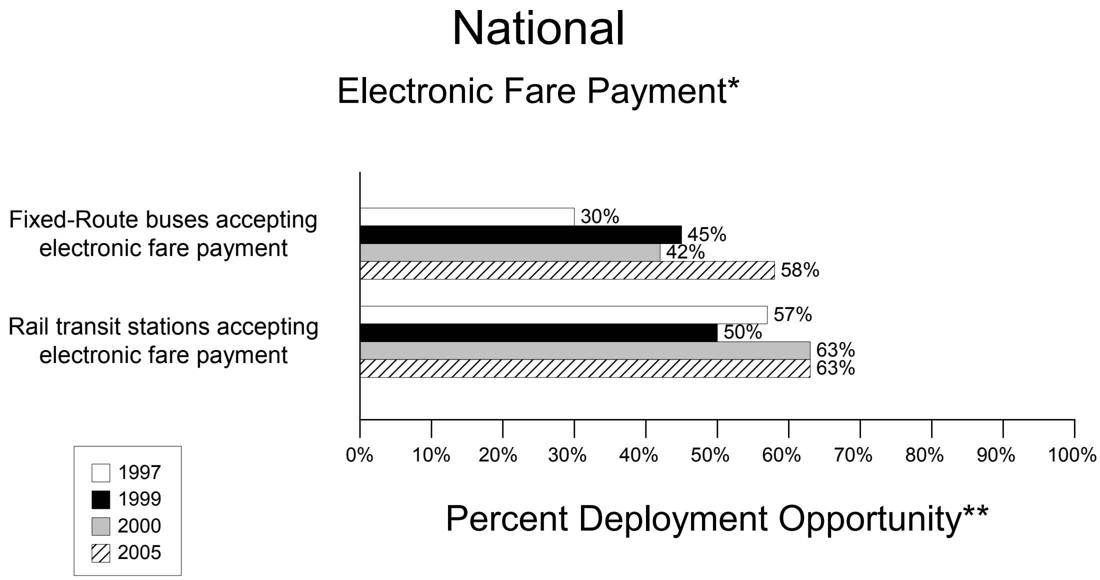
Electronic Fare Payment Functions

Electronic Fare Payment (EFP) provides for the following fare payment functions:

1. Capability to pay public transit fares on fixed-route bus and light-rail transit vehicles using EFP media.
2. Capability to pay public transit fares at heavy-rail transit stations using EFP media.

Electronic Fare Payment Component Indicators

The Electronic Fare Payment component indicators are shown in Figure 21.



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Figure 21 Electronic Fare Payment

Figure 22 contains the number of metropolitan areas that use EFP media for fixed-route bus services. Only five metropolitan areas use smart cards.

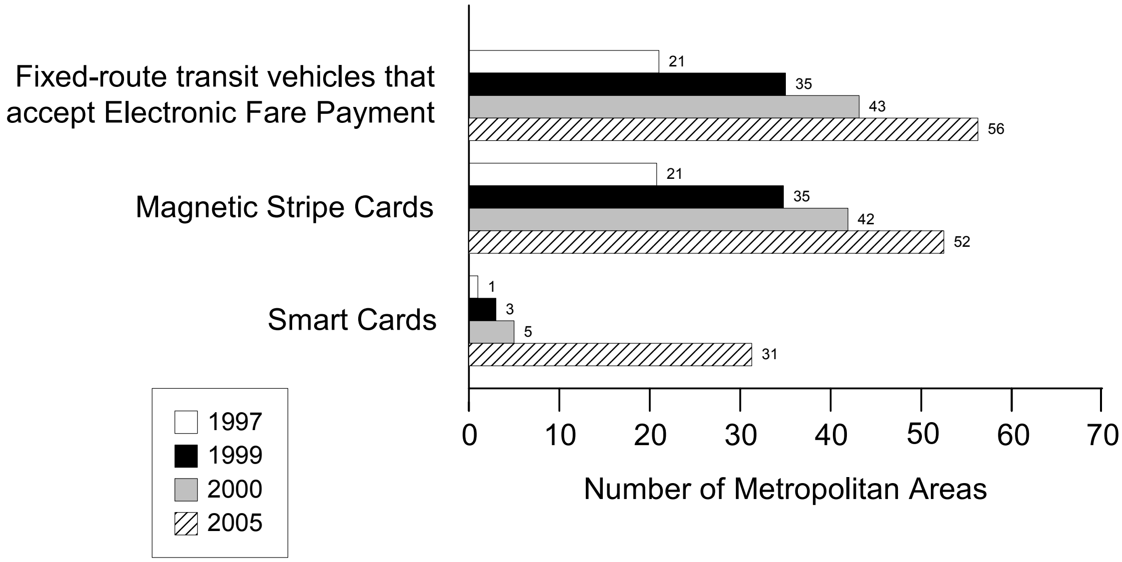


Figure 22 Vehicles with EFP

Figure 23 contains the number of metropolitan areas that use EFP for heavy-rail.

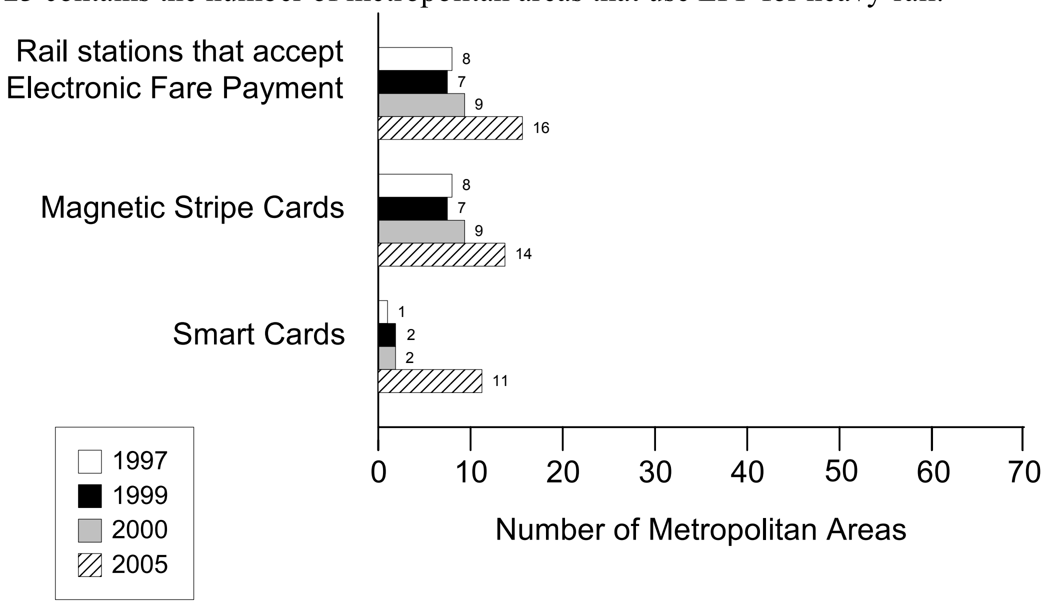


Figure 23 Rail Stations with EFP

Transit Management

Transit Management Functions

Transit Management provides for the following functions:

1. Capability to monitor the location of transit vehicles to support schedule management and emergency response (i.e., Automatic Vehicle Location [AVL]).
2. Capability to monitor maintenance status of the transit vehicle fleet (i.e., vehicle maintenance monitoring).
3. Capability to provide demand responsive flexible routing and scheduling of transit vehicles (i.e., paratransit management).
4. Capability to provide real-time, accurate transit information to travelers (i.e., information display).

The Transit Management component indicators are shown in Figure 24.

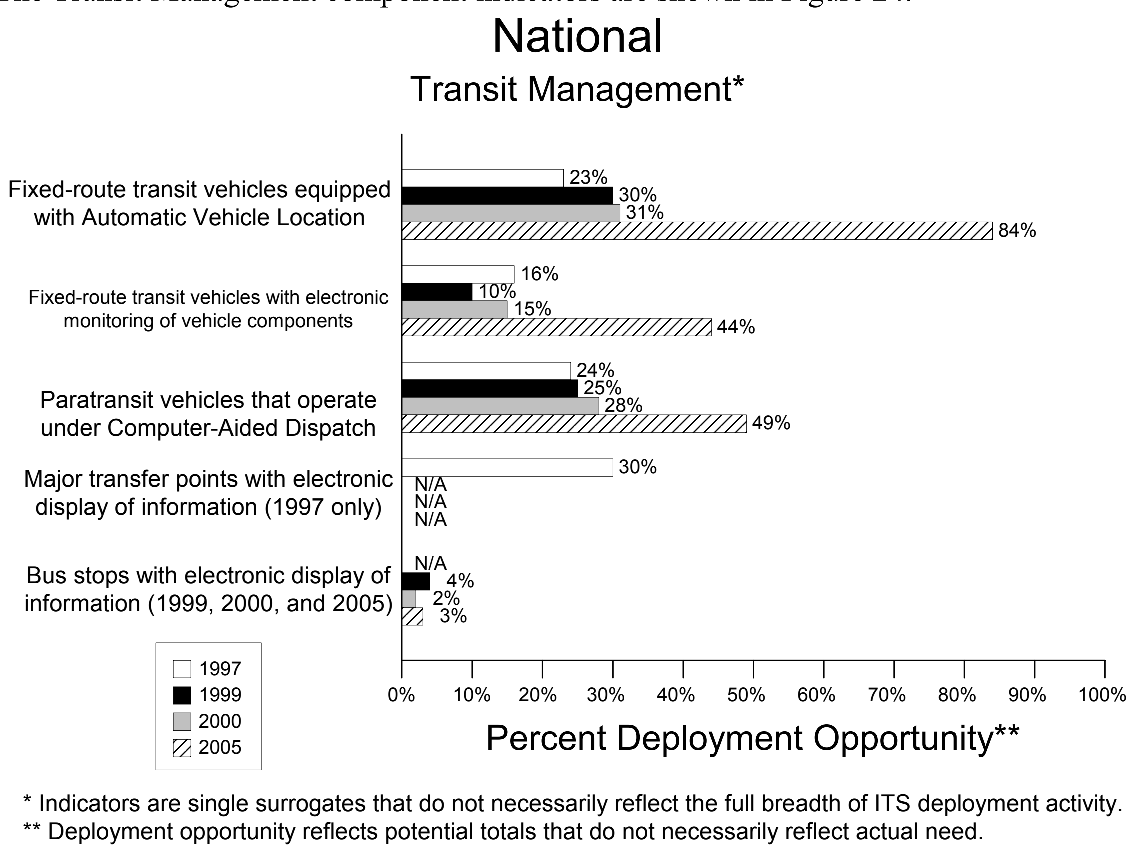


Figure 24 Transit Management

Automatic Vehicle Location

Transit Management supports management of the transit fleet by electronically monitoring vehicle locations in real-time. Transit vehicles equipped with AVL technology provide the basis for vehicle tracking. Information on the current location of a transit vehicle is transmitted to a centralized dispatcher who then compares the actual location with the scheduled location. Depending on the variance between the actual and scheduled locations, actions may be taken to improve schedule adherence and to transfer information to travelers. This also supports emergency response by providing real-time information on vehicle locations in emergency situations.

Vehicle Maintenance Monitoring

Transit Management includes electronic monitoring of vehicle performance parameters using in-vehicle sensors. This involves monitoring of usage statistics such as mileage and status of routine scheduled maintenance. In addition, this permits automatic monitoring of vehicle conditions including key parameters such as oil and fuels levels and tire pressure.

Paratransit Vehicle Dispatching

The use of AVL also supports advanced demand-responsive computer-aided routing and scheduling. Transit dispatchers can combine real-time information on vehicle location and status with advanced CAD systems to provide optimal vehicle assignment and routing to meet non-recurring public transportation demand.

Figure 25 contains the number of metropolitan areas reporting the use of AVL on fixed-route services, the use of electronic vehicle maintenance monitoring systems, and the use of a CAD system for demand-responsive vehicle dispatching.

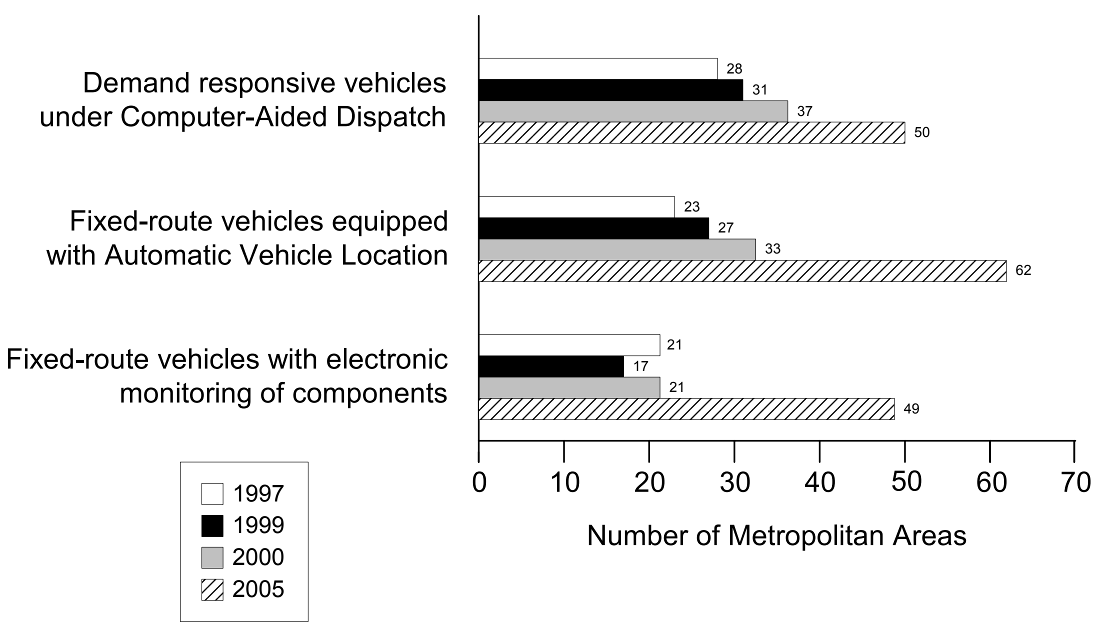


Figure 25 Transit Management Technologies

Highway-Rail Intersection

Highway-Rail Intersection (HRI) Functions

Highway-Rail Intersection provides for the following function:

Electronically monitor Highway-Rail Intersections to: (a) coordinate rail movements with the traffic control signal systems, (b) provide travelers with advanced warning of crossing closures, and (c) improve and automate warnings at highway-rail intersections.

The Highway-Rail Intersection component indicator is shown in Figure 26.

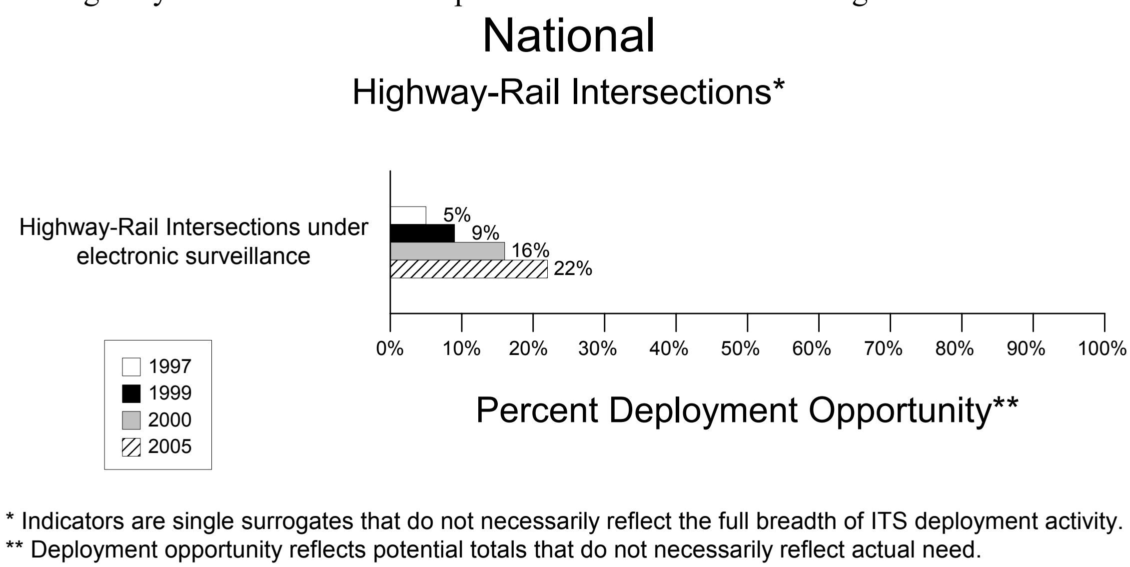


Figure 26 Highway-Rail Intersection

Electronic Surveillance

The at-grade highway-rail intersection is a special form of roadway intersection where a roadway and one or more railroad tracks intersect. At a Highway-Rail Intersection, the right-of-way is shared between railroad vehicles and roadway vehicles, with railroad vehicles typically being given reference. Railroad trains, which travel at high speeds and can take up to a mile or more to stop, pose special challenges. As a result, automated systems are now becoming available that allow the deployment of safety systems to adequately warn drivers of crossing hazards.

The Highway-Rail Intersection component involves electronic surveillance of grade crossings to detect vehicles within the crossing area, either through video or other means such as loop detectors. This may eventually support real-time information on train position and estimated time of arrival at a crossing and interactive coordination between roadway traffic control centers and train control centers.

Figure 27 contains the number of metropolitan areas reporting the use of video and other than video surveillance as well as electronic traffic violator devices. The purpose of the latter is to enforce crossing restrictions by identifying violators.

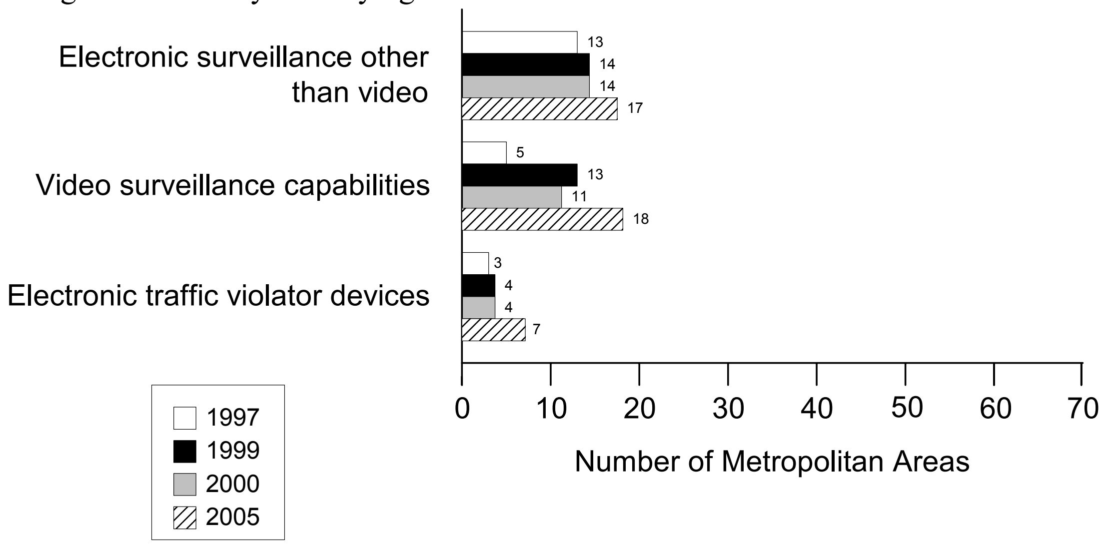


Figure 27 HRI Surveillance

Emergency Management

Emergency Management Functions

Emergency Management provides the following capabilities:

1. Capability to operate public sector emergency vehicles under CAD.
2. Capability to provide public sector emergency vehicles with in-vehicle route guidance capability.

The Emergency Management component indicators are shown in Figure 28.

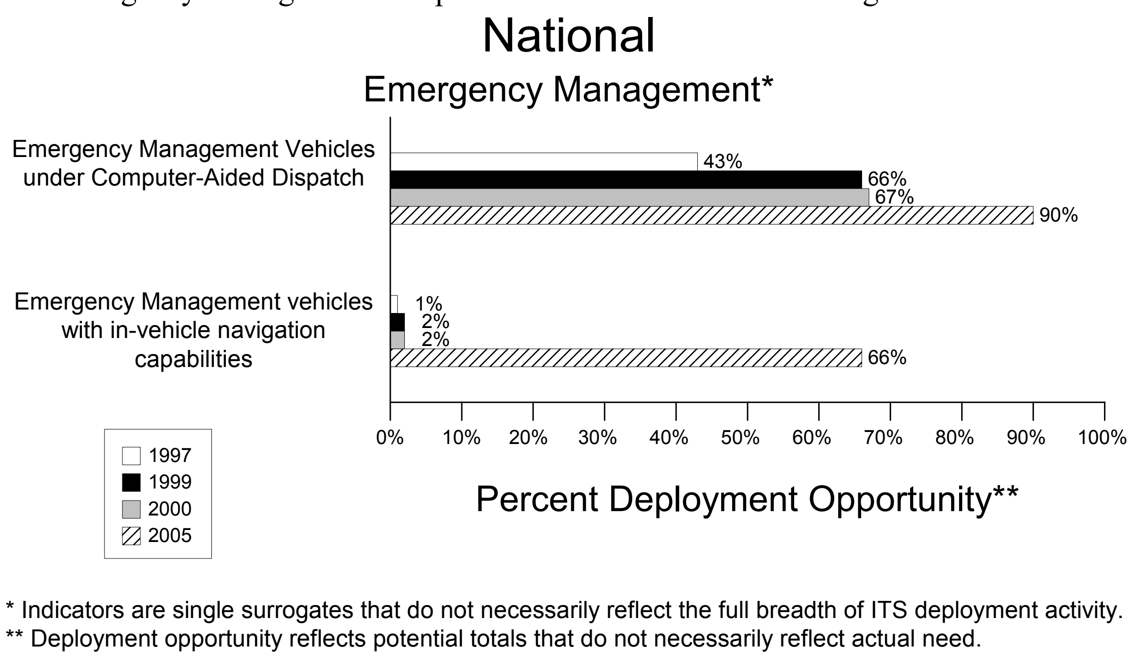


Figure 28 Emergency Management

Computer-Aided Dispatch

Emergency vehicle fleet management utilizes AVL equipment to provide CAD of vehicles. Through the use of real-time information on vehicle location and status, emergency service dispatchers can make optimal assignment of vehicles to incidents.

Route Guidance

The installation of route guidance equipment in emergency service vehicles provides improved directional information for drivers and improves responsiveness of emergency services.

Figure 29 contains the number of metropolitan areas with emergency management vehicles dispatch and guidance technologies.

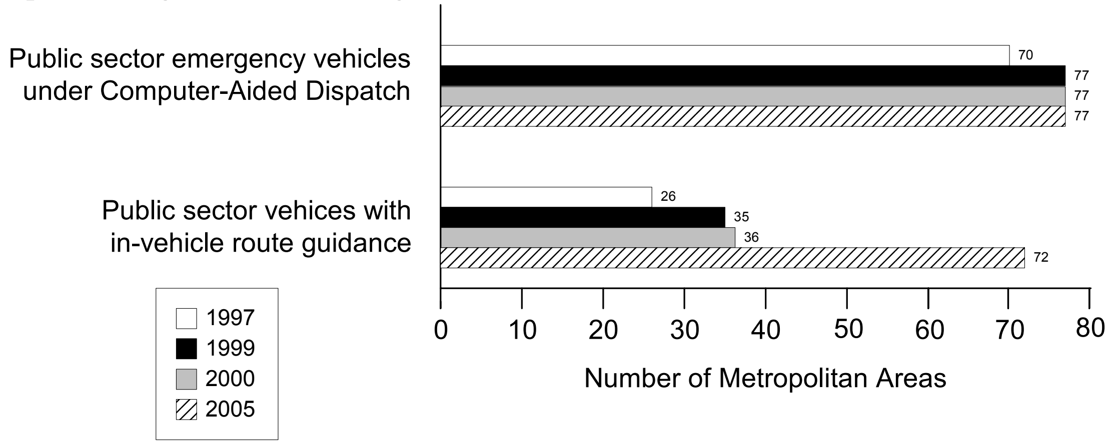


Figure 29 EMS Vehicles Technologies

Regional Multimodal Traveler Information

Regional Multimodal Traveler Information (RMTI) Functions

Regional Multimodal Traveler Information provides for the following capabilities:

1. Collect current, comprehensive, and accurate roadway and transit performance data for the metropolitan area.
2. Provide traveler information to the public via a range of communication techniques (broadcast radio, FM subcarrier, the Internet, cable TV) for presentation on a range of devices (home/office computers, television, pagers, personal digital assistants, kiosks, radio) (i.e., media).
3. Provide multimodal information to the traveler to support mode decision-making.

The Regional Multimodal Traveler Information component indicators are shown in Figure 30.

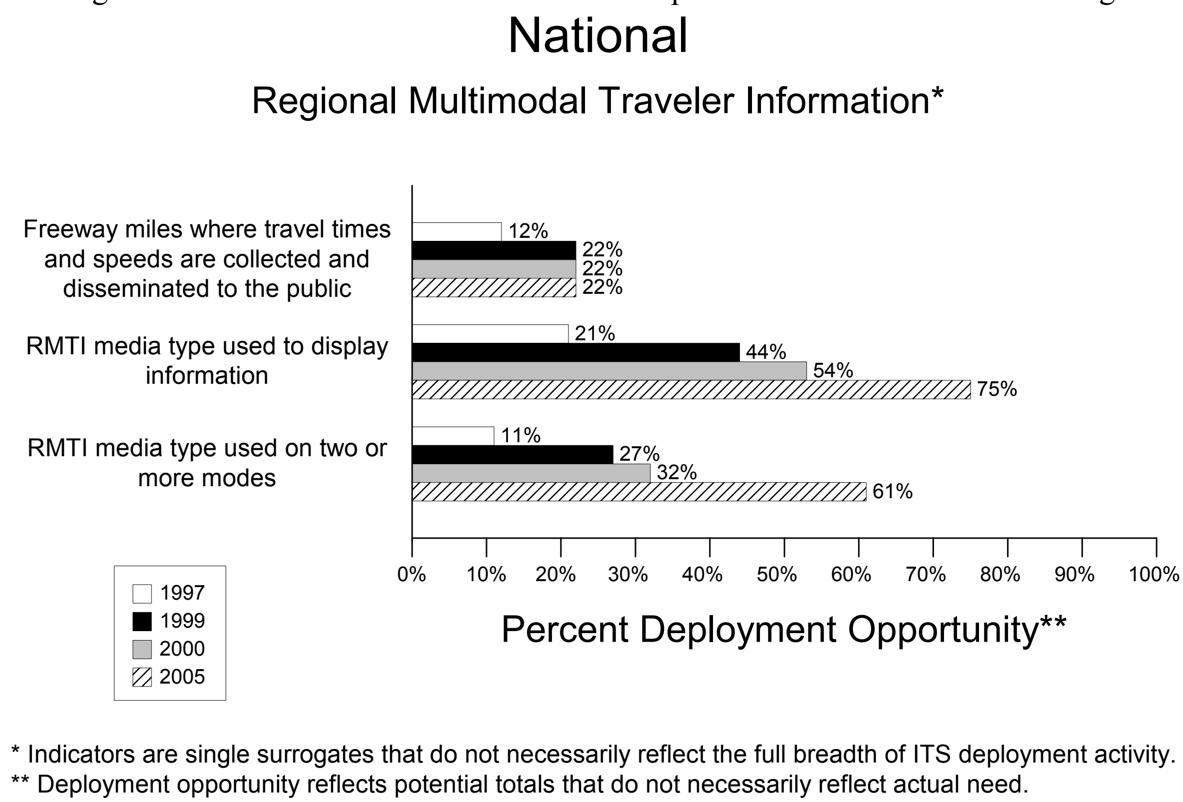


Figure 30 Regional Multimodal Traveler Information

Geographic Coverage of Traveler Information

The Regional Multimodal Traveler Information component of the metropolitan ITS infrastructure receives roadway and transit system surveillance and detection data from a variety of sources provided by both public and private sector entities. It has the capability to combine data from different sources, package the data into various formats, and provide the information to a variety of distribution channels.

Media Employed

Agencies or organizations use many methods to disseminate traveler information to the public. Indicator calculations are based on a deployment opportunity of eight media: dedicated cable TV, telephone systems, web sites, pagers, interactive TV, kiosks, e-mail, and in-vehicle navigation.

Media Displaying Information on More Than One Transportation Mode

Traveler information on more than one transportation mode may be displayed on a single medium. For example: Transit schedules and fares as well as freeway travel times, speeds, or conditions may be displayed on a Web site.

ITS Infrastructure Integration Indicator Description and FY2000 Survey Results

A critical aspect of ITS that provides much of its capability is the integration of individual components to form a unified regional traffic control system. Individual ITS components routinely collect information that is used for purposes internal to that component. For example, the Arterial Management component monitors arterial conditions to revise signal timing and to convey these conditions to travelers through such technologies as VMS and HAR. Agencies operating other ITS components can make use of this information in formulating control strategies. For example, Transit Management agencies may alter routes and schedules based on real-time information on arterial traffic conditions, and Freeway Management agencies may alter ramp metering or diversion recommendations based on the same information.

As with the component indicators, definitions for inter- and intra-component integration were developed for each component, and indicators, derived from these definitions, were produced for each. A total of 34 individual integration links were specified and are portrayed in Figure 31. Each integration link has been assigned a number and an origin/destination path from one ITS infrastructure component to another. Both inter- and intra-agency links are considered. For example, the number "10" identifies the integration of information from the Freeway Management component to the Regional Multimodal Traveler Information component. The transfer of information between traffic signal agencies is identified by link "26" that has Arterial Management as both the origin and the destination. This labeling convention is used throughout the main body of this report (Note: Four of the 32 numbered indicators have "a" and "b" indicators, making the total 34.)

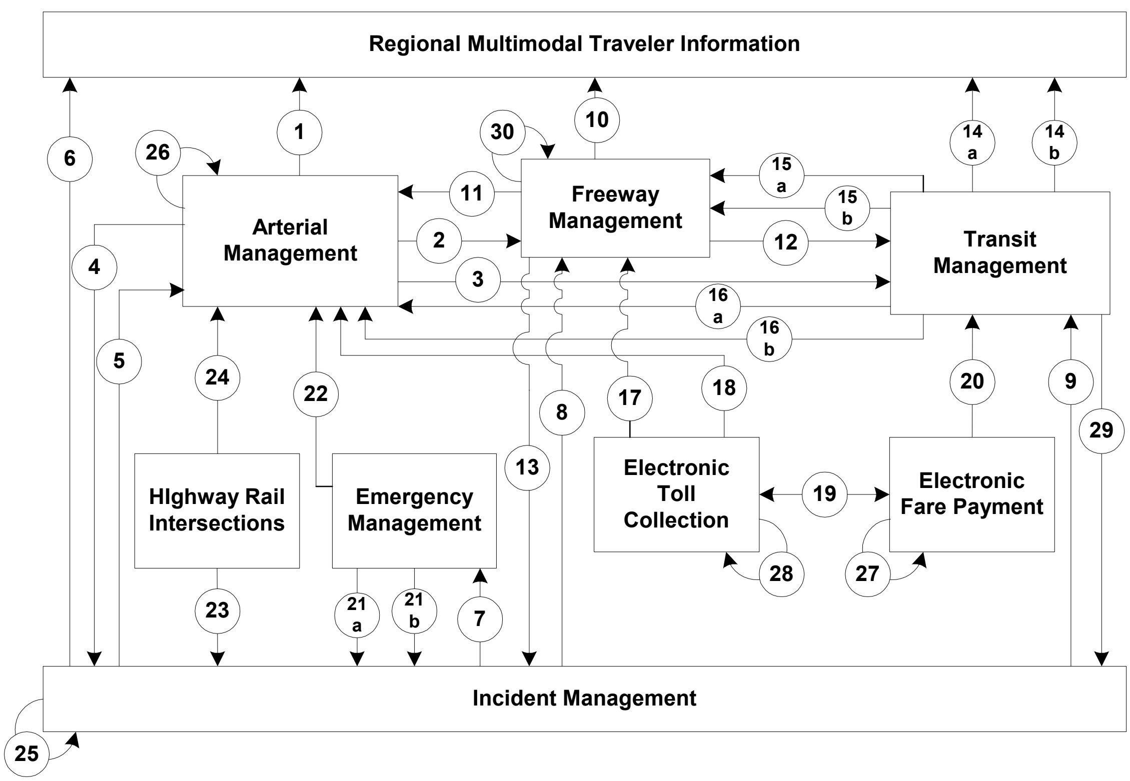


Figure 31 Integration Links

The measurement of integration associated with each of the links is agency-based. The calculation is simple and is an expression of the number of agencies that share data divided by the total number of agencies that possibly could. Therefore, for each of the integration links, a percentage integration score, ranging from zero to one hundred, is assigned. As with the deployment indicators, this rating system is based on the maximum possible integration without consideration of whether it is needed in every case.

In order to make the discussion of individual links clearer, links have been grouped into four broad categories: (1) Traffic Management Integration, (2) Traveler Information Integration, (3) Transit Management Integration, and (4) Emergency Management Integration. The integration rating is indicated by the shading in the circles associated with each link in Figures 32 to 35.

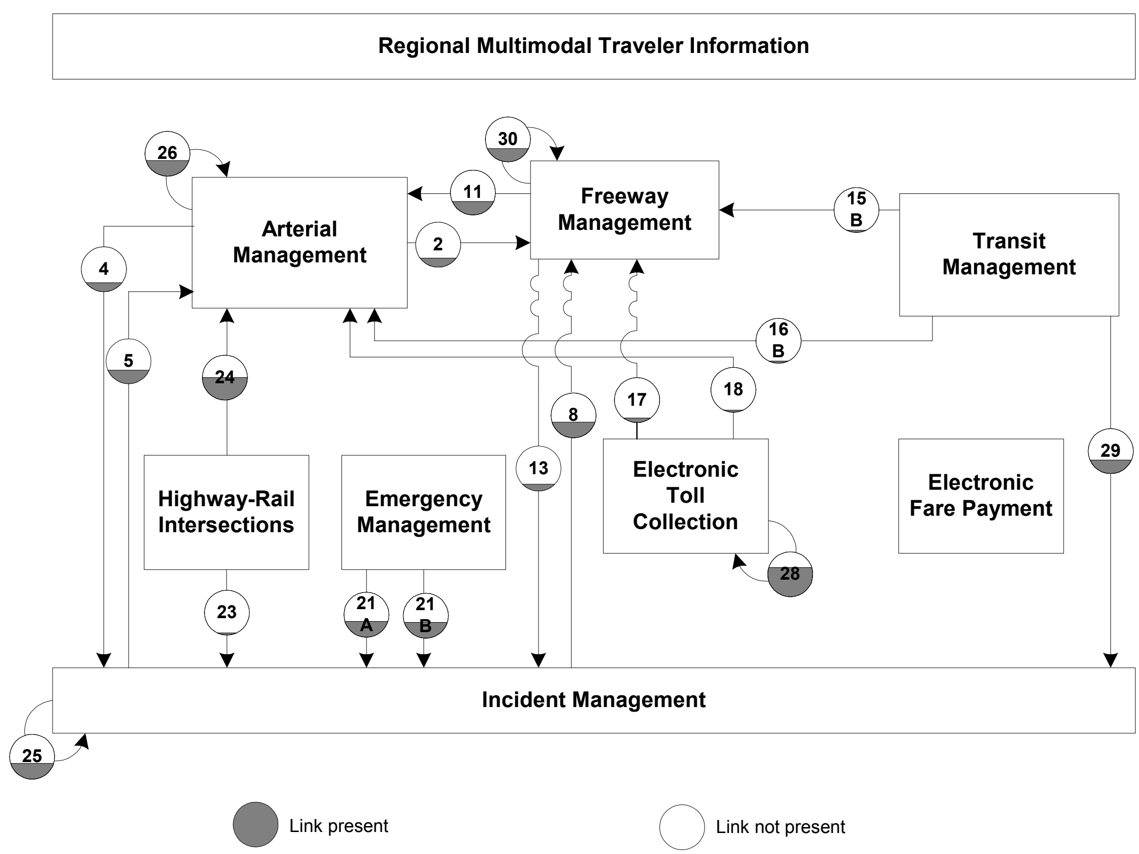
Traffic Management Integration

Traffic Management Integration enables the implementation of coordinated traffic management strategies among operating agencies responsible for Freeway Management, Incident Management, and Arterial Management within a metropolitan area. Key characteristics of Traffic Management Integration include the following:

1. Collection of real-time traffic and incident data on the freeway and arterial street network.
2. Coordination of management actions in response to changes in traffic flow.
3. Collaboration among operating agencies to optimize the strategies available to improve traffic flow.

Figure 32 presents an overview of the integration links that define Traffic Management Integration.

2000 Traffic Management National Integration Links



Note: Shading indicates the value of the link. For example, a circle half-shaded equals 50%

Figure 32 Traffic Management Integration Links

Table 1 presents a description of each of these links along with a summary of the survey results for each link.

Table 1 Traffic Management Integration Links

Link	From/To	Description	Survey Response
2	Arterial Management to Freeway Management	Freeway Management Center monitors arterial travel times, speeds, and conditions using data provided from Arterial Management to adjust ramp meter timing, lane control or HAR in response to changes in real-time conditions on a parallel arterial.	Traffic condition information is sent from 57 of the 396 (14%) Arterial Management agencies to a Freeway Management agency.
4	Arterial Management to Incident Management	Incident Management monitors real-time arterial travel times, speeds, and conditions using data provided from Arterial Management to detect arterial incidents and manage incident response activities.	Traffic condition information is sent from 61 of the 396 (15%) Arterial Management agencies to an Incident Management agency.
5	Incident Management to Arterial Management	Arterial Management monitors incident severity, location, and type information collected by Incident Management to adjust traffic signal timing or provide information to travelers in response to incident management activities.	Incident severity, location, and type data are sent from 34 of the 105 (32%) Incident Management agencies to an Arterial Management agency.

Link	From/To	Description	Survey Response
8	Incident Management to Freeway Management	Incident severity, location, and type data collected by Incident Management are monitored by Freeway Management for the purpose of adjusting ramp meter timing, lane control or HAR messages in response to freeway or arterial incidents.	Incident severity, location, and type data are sent from 39 of the 105 (37%) Incident Management agencies to a Freeway Management agency.
11	Freeway Management to Arterial Management	Freeway travel time, speeds, and conditions data collected by Freeway Management are used by Arterial Management to adjust arterial traffic signal timing or arterial VMS messages in response to changing freeway conditions.	Freeway travel time, speeds, and condition data are sent from 33 of the 105 (31%) Freeway Management agencies to a Arterial Management agency.
13	Freeway Management to Incident Management	Incident Management monitors freeway travel time, speed, and condition data collected by Freeway Management to detect incidents or manage incident response.	Freeway travel time, speeds, and condition data are sent from 21 of the 105 (20%) Freeway Management agencies to an Incident Management agency.
15b	Transit Management to Freeway Management (transit vehicles equipped as probes)	Transit vehicles equipped as probes are monitored by Freeway Management to determine freeway travel speeds or travel times.	Transit vehicle probe data is sent from 4 of the 220 (2%) Transit Management agencies to a Freeway Management agency.
16b	Transit Management to Arterial Management (transit vehicles equipped as probes)	Transit vehicles equipped as probes are monitored by Arterial Management to determine arterial speeds or travel times.	Transit vehicle probe data is sent from 5 of the 220 (2%) Transit Management agencies to an Arterial Management agency.

Link	From/To	Description	Survey Response
17	Electronic Toll Collection to Freeway Management (ETC-equipped vehicles as probes)	Vehicles equipped with ETC tags are monitored by Freeway Management to determine freeway travel speeds or travel times.	ETC-equipped vehicles are used as probes by 6 of the 105 (6%) Freeway Management agencies.
18	Electronic Toll Collection to Arterial Management (ETC equipped vehicles as probes)	Vehicles equipped with ETC tags are monitored by Arterial Management to determine arterial travel speeds or travel times.	ETC equipped vehicles are used as probes by 3 of the 396 (1%) Arterial Management agencies.
21a	Emergency Management to Incident Management (Incident location, severity, and type)	Incident Management is notified of incident location, severity, and type by Emergency Management to identify incidents on freeways or arterials.	Emergency Management agencies provide notification of incident location, severity, and type to 29 of the 105 (28%) Incident Management agencies.
21b	Emergency Management to Incident Management (Incident clearance activities)	Incident Management is notified of incident clearance activities by Emergency Management to manage incident response on freeways or arterials.	Emergency Management agencies provide notification of incident clearance to 37 of the 105 (35%) Incident Management agencies.
23	Highway-Rail Intersections to Incident Management	Incident Management is notified of crossing blockages by Highway-Rail Intersection to manage incident response.	Highway-Rail crossing blockage data are provided to 15 of the 396 (4%) Arterial Incident Management agencies (Arterial Management agencies).
24	Highway-Rail Intersections to Arterial Management	Highway-Rail Intersection and Arterial Management are interconnected for the purpose of adjusting traffic signal timing in response to train crossing.	203 of the 396 (51%) Arterial Management Agencies have signals that adjust timing in response to train crossing.

Link	From/To	Description	Survey Response
25	Incident Management intra-component	Agencies participating in formal working agreements or Incident Management plans coordinate incident detection, verification, and response.	336 of the 898 (37%) Emergency Management agencies participate in a formal Incident Management program.
26	Arterial Management intra-component	Agencies operating traffic signals along common corridors sharing information and possibly control of traffic signals to maintain progression on arterial routes.	123 of the 396 (31%) Arterial Management agencies share data with another Arterial Management agency.
28	Electronic Toll Collection intra-component	ETC agencies share a common toll tag for the purpose of facilitating “seamless” toll transactions.	42 of the 64 (66%) Toll Collection agencies use a common toll tag.
29	Transit Management to Incident Management	Transit agencies notify Incident Management agencies of incident locations, severity, and type.	Incident information is provided by 54 of the 220 (25%) Transit Management agencies to an Incident Management agency.
30	Freeway Management intra-component	Agencies operating freeways within the same region share freeway travel time, speeds, and condition data.	35 of the 105 (33%) Freeway Management agencies send data to another Freeway Management agency.

Traveler Information Integration

The collection, processing, and distribution of timely information related to the performance of the transportation system is a by-product of integrating selected metropolitan ITS components. Information gathered by Freeway Management, Incident Management, Arterial Management, and Transit Management components is fused to create a region-wide traveler information database. Information in the database is then transferred to various media for display to travelers. Travelers receiving this information can make better-informed decisions regarding if, when, where, and how to travel, which may lead to an increase in travel efficiency and a reduction in travel congestion and delay. Figure 33 presents an overview of the integration links that define Traveler Information Integration.

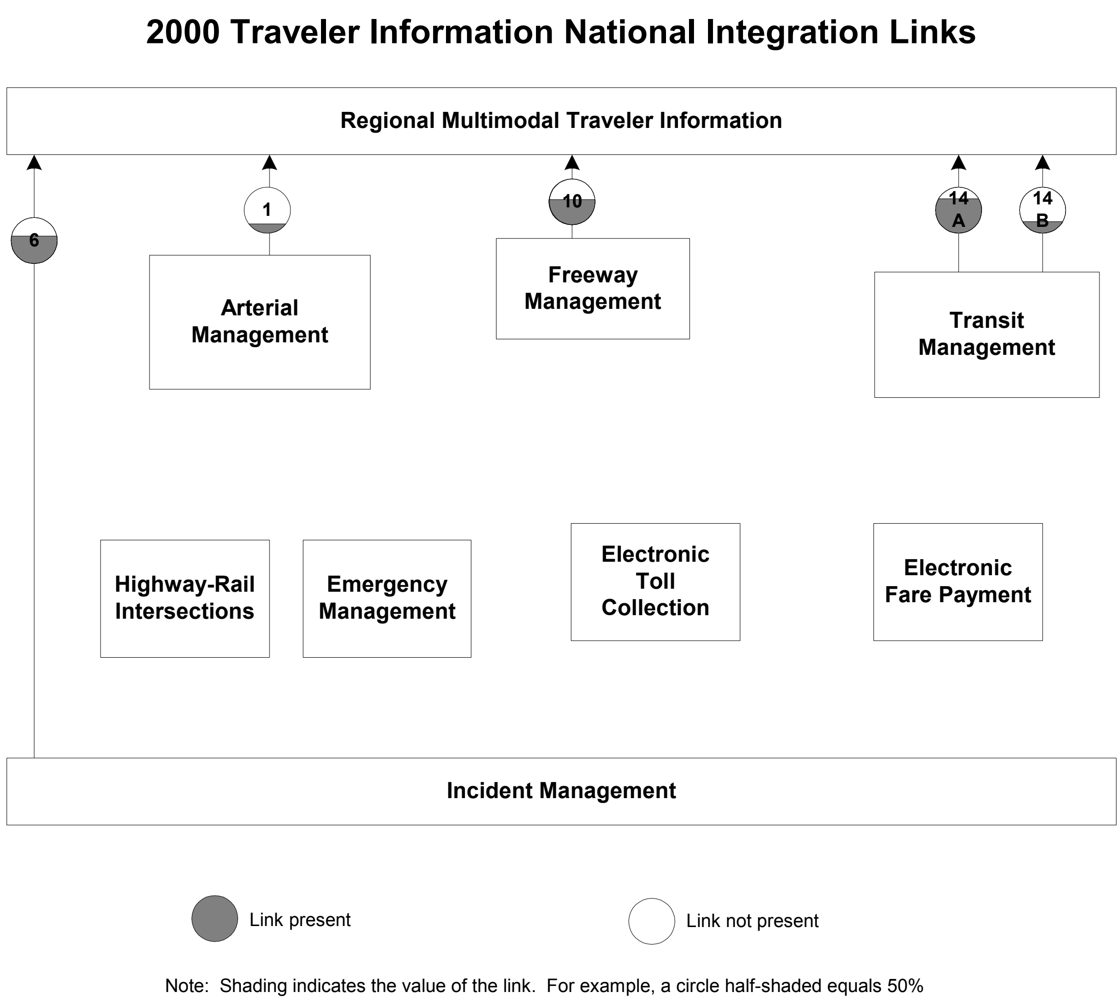


Figure 33 Traveler Information Integration Links

Table 2 presents a description of each of these links along with a summary of the survey results for each link.

Table 2 Traveler Information Integration Links

Link	From/To	Description	Survey Response
1	Arterial Management to Regional Multimodal Traveler Information	Arterial travel time, speed, and condition information are displayed by Regional Multimodal Traveler Information media.	Arterial travel time, speed, and condition information are displayed by Regional Multimodal Traveler Information media for 82 of the 396 (21%) of the Arterial Management agencies.
6	Incident Management to Regional Multimodal Traveler Information	Incident location, severity, and type information are displayed by Regional Multimodal Traveler Information media.	Incident location, severity, and type information are displayed by Regional Multimodal Traveler Information media for 61 of the 105 (58%) Incident Management agencies.
10	Freeway Management to Regional Multimodal Traveler Information	Freeway travel time, speed, and condition information are displayed by Regional Multimodal Traveler Information media.	Freeway travel time, speed, and condition information are displayed by Regional Multimodal Traveler Information media for 59 of the 105 (56%) Freeway Management agencies.
14a	Transit Management to Regional Multimodal Traveler Information (transit routes, schedules, and fares)	Transit routes, schedules, and fare information are displayed on Regional Multimodal Traveler Information media.	Transit routes, schedules, and fare information are displayed on Regional Multimodal Traveler Information media for 167 of the 220 (76%) Transit Management agencies.
14b	Transit Management to Regional Multimodal Traveler Information (schedule adherence)	Transit schedule adherence information is displayed on Regional Multimodal Traveler Information media.	Transit schedule adherence information is displayed on Regional Multimodal Traveler Information media for 50 of the 220 (22%) Transit Management agencies.

Transit Management Integration

Transit Management Integration provides public transit operators with information and control capabilities to better manage transit system on-time performance. Transit Management Integration also exploits the use of EFP media to improve the efficiency of route planning and financial management. Figure 34 presents an overview of the integration links that define Transit Management Integration.

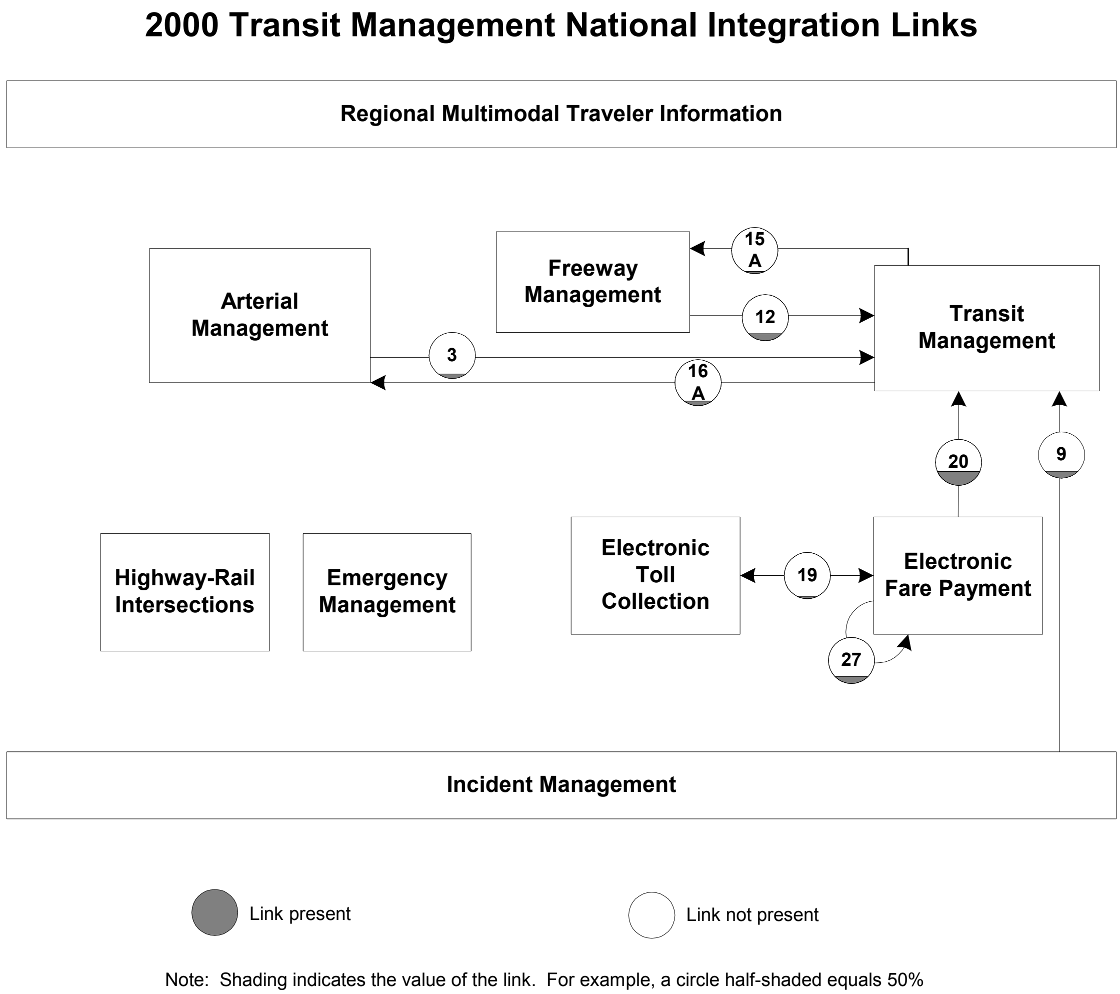


Figure 34 Transit Management Integration Links

Table 3 presents a description of each of these links along with a summary of the survey results for each link.

Table 3 Transit Management Integration Links

Link	From/To	Description	Survey Response
3	Arterial Management to Transit Management	Transit Management adjusts transit routes and schedules in response to arterial travel times, speeds, and conditions information collected as part of Arterial Management.	Traffic condition information is sent from 39 of the 396 (10%) Arterial Management agencies to a Transit Management agency.
9	Incident Management to Transit Management	Transit Management adjusts transit routes and schedules in response to incident severity, location, and type data collected as part of Incident Management.	Incident severity, location, and type data are sent from 15 of the 105 (14%) Incident Management agencies to a Transit Management agency.
12	Freeway Management to Transit Management	Transit Management adjusts transit routes and schedules in response to freeway travel times, speeds, and conditions information collected as part of Freeway Management.	Freeway travel time, speeds, and condition data are sent from 15 of the 105 (14%) Freeway Management agencies to a Transit Management agency.
15a	Transit Management to Freeway Management (ramp meter priority)	Freeway ramp meters are adjusted in response to receipt of transit vehicle priority signal.	Transit vehicle receives ramp meter priority for 5 of the 220 (2%) Transit Management agencies.
16a	Transit Management to Arterial Management (traffic signal priority)	Traffic signals are adjusted in response to receipt of transit vehicle priority signal.	Transit vehicle receives traffic signal priority for 18 of the 220 (8%) Transit Management agencies.
19	Electronic Toll Collection to Electronic Fare Payment	Transit operators accept ETC-issued tags to pay for transit fares.	2 of the 220 (1%) Transit Management agencies accept ETC tags for payment of transit fares.
20	Electronic Fare Payment to Transit Management	Rider ship details collected as part of EFP are used in transit service planning by Transit Management.	EFP data are used by 71 of the 220 (32%) Transit Management agencies.

Link	From/To	Description	Survey Response
27	Electronic Fare Payment intra-component	Operators of different public transit services share common EFP media.	35 of the 220 (16%) Transit Management agencies have a common fare media that can be used on more than one transit service (within that transit operator or with another transit operator).

Emergency Response Integration

Emergency Response Integration increases emergency response capabilities through improved incident notification from Incident Management and traffic signal preemption provided by Arterial Management. Figure 35 presents an overview of the integration links that define Emergency Response Integration.

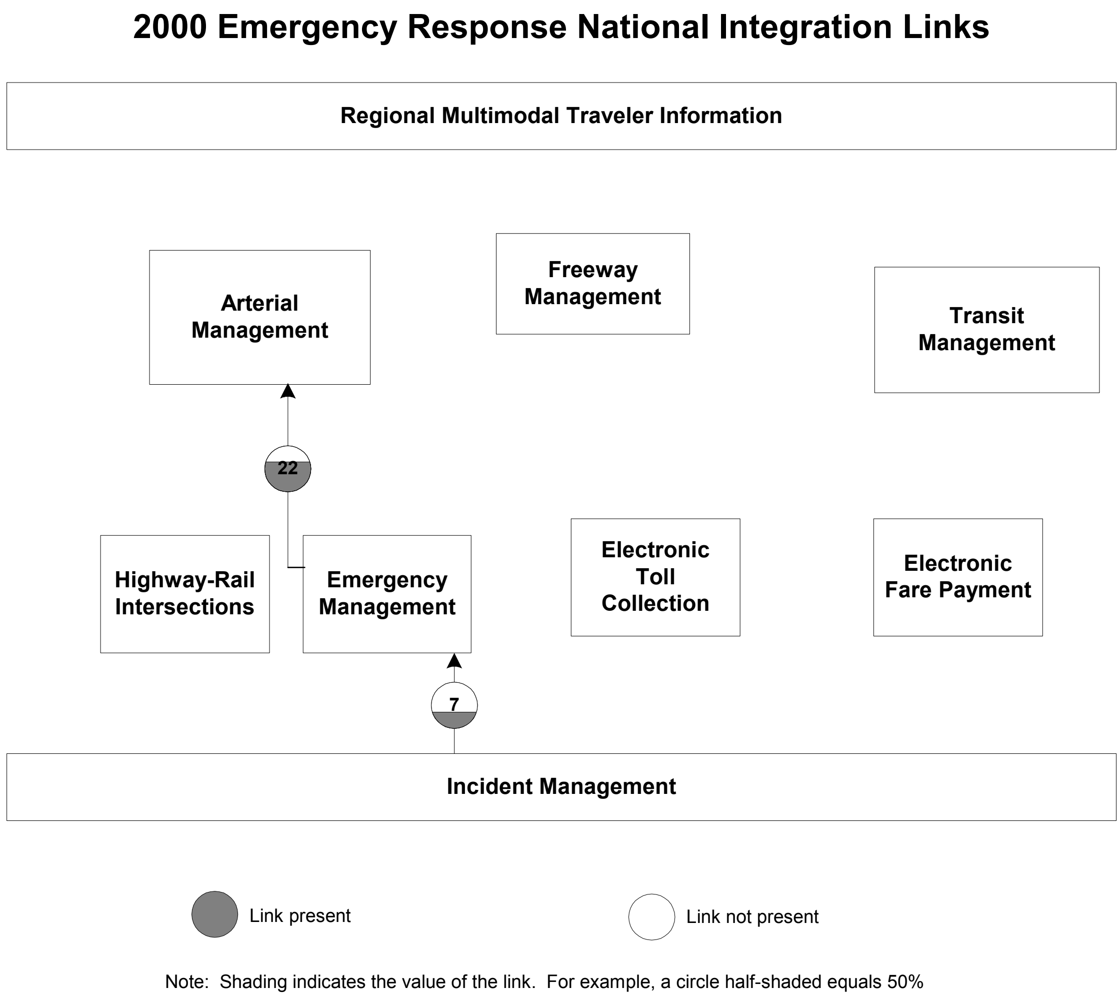


Figure 35 Emergency Response Integration Links

Table 4 presents a description of each of these links along with a summary of the survey results for each link.

Table 4 Emergency Response Integration Links

Link	From/To	Description	Survey Response
7	Incident Management to Emergency Management	Incident severity, location, and type data collected as part of Incident Management are used to notify Emergency Management for incident response.	Incident severity, location, and type data are sent from 35 of the 105 (33%) Incident Management agencies to an Emergency Management agency.
22	Emergency Management to Arterial Management	Emergency Management vehicles are equipped with traffic signal priority capability.	Emergency response vehicles receive traffic signal priority for 215 of the 898 (24%) Emergency Management agencies.

Deployment Goal Setting

Background

A set of deployment threshold values was identified and applied across all metropolitan areas in order to categorize each metropolitan area into one of three levels of deployment: High, Medium, or Low. These threshold values were established in a way that allowed demarcation of meaningful progress toward an achievable 10-year goal, while still maintaining some requirement for "stretching" to reach the goal.

The assignment of a single integrated deployment rating for each metropolitan area was accomplished using a three-step process. First, the current level of deployment of the ITS infrastructure components at each metropolitan area was determined. These data were compared to an established threshold level for each component to determine a deployment rating. Next, an integration rating was assigned to each area based on the degree to which infrastructure components are integrated. Finally, the resulting ratings for deployment and integration were combined into a single overall integrated deployment rating.

Crossing a threshold value for either deployment or integration means that a metropolitan area has made a significant commitment to deploy and integrate the metropolitan ITS infrastructure. However, it does not mean that deployment or integration is complete. Figure 36 shows that, even in the high level of deployment, a metropolitan area may still have "miles to go" in completing full deployment. A significant level of investment of time and money is needed to organize and perform initial planning for metropolitan areas categorized as low, in order to build deployment momentum. Metropolitan areas in the medium stage are moving rapidly toward full deployment through leveraging the important initial investments in ITS infrastructure. Metropolitan areas in the high category are beginning to experience still higher rates of return on investment in ITS; however, they still need continued investment to bring them up to complete deployment. New systems are being added to an already robust infrastructure, and integration is multiplying the impact of deployments, producing more "bang for the buck." All this adds up to a solid and expanding base for deploying the integrated infrastructure, but only with a sustained commitment of time and resources.

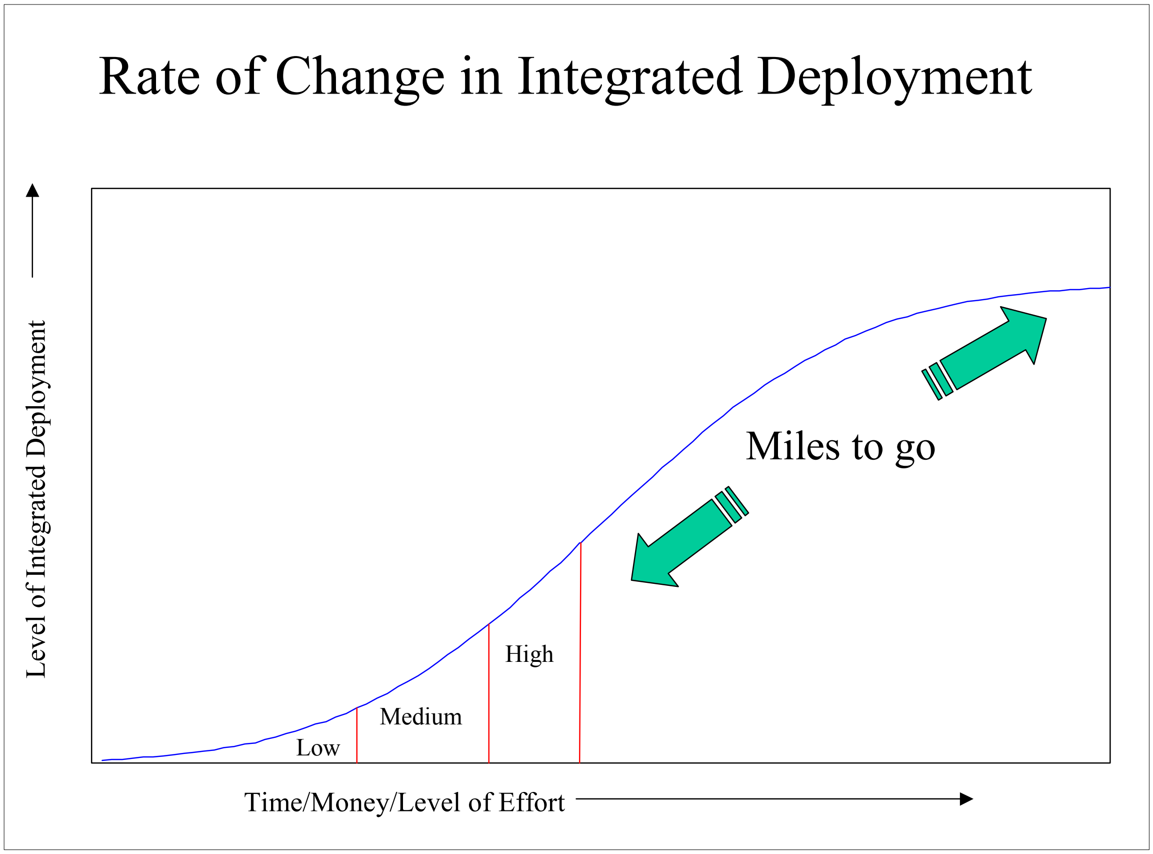


Figure 36 Rate of Change in Integrated Deployment

2000 Status of Integrated Deployment

As shown in Figure 37, a total of 23 metropolitan areas are categorized as low, 28 as medium, and 24 as high in 2000. This can be contrasted with 1999 where 26 areas were characterized as low, 27 as medium, and 22 as high. The information suggests that considerable progress has been made in the deployment of integrated ITS over the last year.

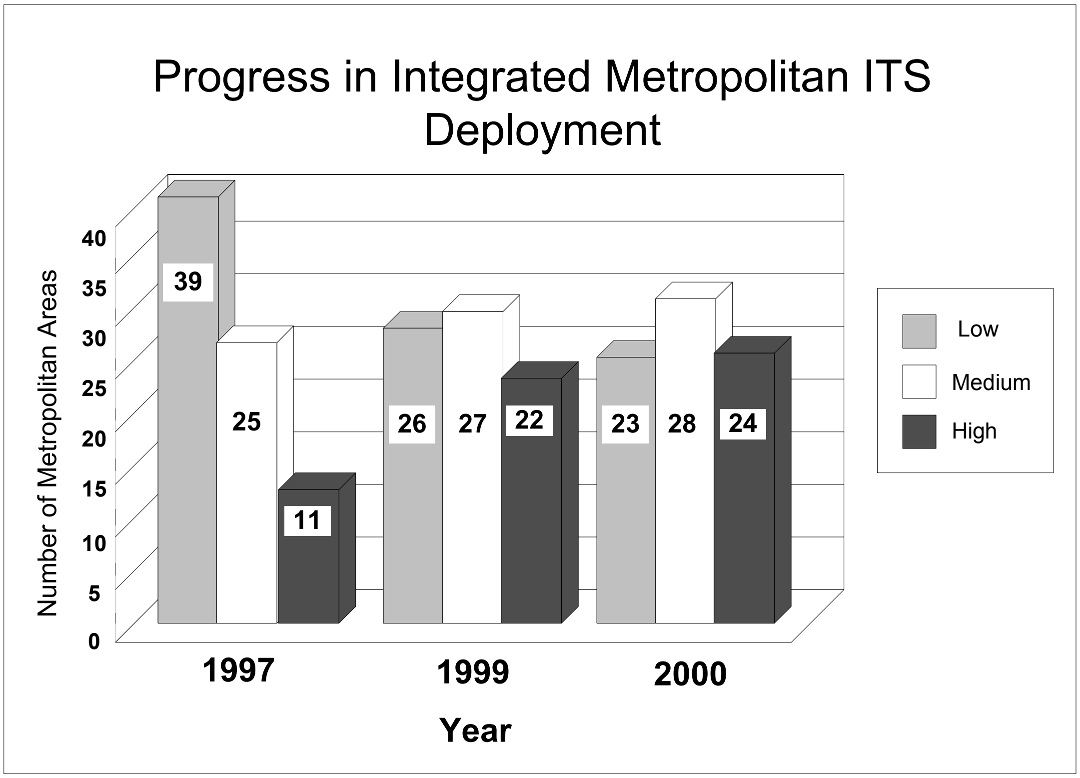


Figure 37 Progress in Integrated Metropolitan ITS Deployment

Table 5 lists the 75 metropolitan areas and their respective level of integrated deployment for 1997, 1999, and 2000. Areas with a high level of integrated deployment in 2000 are listed at the top of the table, followed by areas with a medium level of integrated deployment, and finally areas with a low level of integrated deployment. A total of 3 areas moved from a low to medium level of integrated deployment from 1999 to 2000. The methodology used to prepare these ratings combines information concerning deployment and integration into a single integrated deployment measure.

Table 5 Metropolitan Level of Integrated Deployment

Metropolitan Area	1997 Integrated-Deployment Level	1999 Integrated-Deployment Level	2000 Integrated-Deployment Level
Atlanta	High	High	High
Baltimore	Med	High	High
Charlotte, Gastonia, Rock Hill	Med	High	High
Chicago, Gary, Lake County	Med	High	High
Cincinnati, Hamilton	High	High	High
Dallas, Fort Worth	Med	High	High
Detroit, Ann Arbor	Med	High	High

Metropolitan Area	**1997 Integrated-Deployment Level**	**1999 Integrated-Deployment Level**	**2000 Integrated-Deployment Level**
Greensboro, Winston-Salem, High Point	Low	High	High
Houston, Galveston, Brazoria	High	High	High
Jacksonville	Med	Med	High
Los Angeles, Anaheim, Riverside	High	High	High
Miami, Fort Lauderdale	Med	Med	High
Milwaukee, Racine	Med	High	High
Minneapolis, St. Paul	High	High	High
New York, Northern New Jersey, Southwestern Connecticut	High	High	High
Orlando	Med	High	High
Philadelphia, Wilmington, Trenton	Med	High	High
Phoenix	High	High	High
Portland, Vancouver	High	High	High
San Antonio	Med	High	High
San Diego	High	High	High
San Francisco, Oakland, San Jose	Med	High	High
Seattle, Tacoma	High	High	High
Washington	High	High	High
Albany, Schenectady, Troy	Low	Med	Med
Allentown, Bethlehem, Easton	Med	Med	Med
Austin	Med	Med	Med
Baton Rouge	Low	Low	Med
Boston, Lawrence, Salem	Med	Med	Med
Birmingham	Low	Low	Med
Buffalo, Niagara Falls	Med	Med	Med
Cleveland, Akron, Lorain	Med	Med	Med
Denver, Boulder	Med	Med	Med
Hampton Roads	Med	Med	Med
Harrisburg, Lebanon, Carlisle	Low	Med	Med
Hartford, New Britain, Middletown	Low	Med	Med
Kansas City	Low	Low	Med
Memphis	Med	Med	Med
New Haven, Meriden	Med	Med	Med
New Orleans	Low	Med	Med
Pittsburgh, Beaver Valley	Med	Med	Med
Raleigh-Durham	Med	Med	Med
Richmond, Petersburg	Low	Med	Med
Rochester	Med	Med	Med
Sacramento	Med	Med	Med
Salt Lake City, Ogden	Low	Med	Med
Scranton, Wilkes-Barre	Low	Med	Med

Metropolitan Area	1997 Integrated-Deployment Level	1999 Integrated-Deployment Level	2000 Integrated-Deployment Level
St. Louis	Low	Med	Med
Tampa, St. Petersburg, Clearwater	Low	Med	Med
Tucson	Low	Med	Med
West Palm Beach, Boca Raton, Delray	Low	Med	Med
Providence, Pawtucket, Fall River	Low	Med	Med
Bakersfield	Low	Low	Low
Charleston	Low	Low	Low
Columbus	Low	Low	Low
Dayton, Springfield	Low	Low	Low
El Paso	Low	Low	Low
Fresno	Low	Low	Low
Grand Rapids	Low	Low	Low
Greenville, Spartanburg	Low	Low	Low
Honolulu	Low	Low	Low
Indianapolis	Low	Low	Low
Knoxville	Low	Low	Low
Las Vegas	Low	Low	Low
Little Rock, North Little Rock	Low	Low	Low
Louisville	Low	Low	Low
Nashville	Low	Low	Low
Oklahoma City	Low	Low	Low
Omaha	Low	Low	Low
Springfield	Low	Low	Low
Syracuse	Low	Low	Low
Toledo	Low	Low	Low
Tulsa	Low	Low	Low
Wichita	Low	Low	Low
Youngstown, Warren	Low	Low	Low

Tracking Integrated Deployment Progress

The measurement of progress for 2000 can be set in a context of yearly goals leading to successful achievement of the former Secretary's 2006 integrated deployment goal. Figure 38 portrays the level of integrated deployment measured in 1997, 1999, and 2000 along with goals for deployment for each year through 2005. No data were collected in 1998; therefore, only the goal levels of integrated deployment are shown for 1998. This figure shows that as of 2000, nationwide integrated deployment is advancing at a rate compatible with the achievement of the former Secretary's year 2005 goal. The data contained in this figure indicate that all 75 metropolitan areas should be moved out of the low category into either a high or medium level of deployment by 2006.

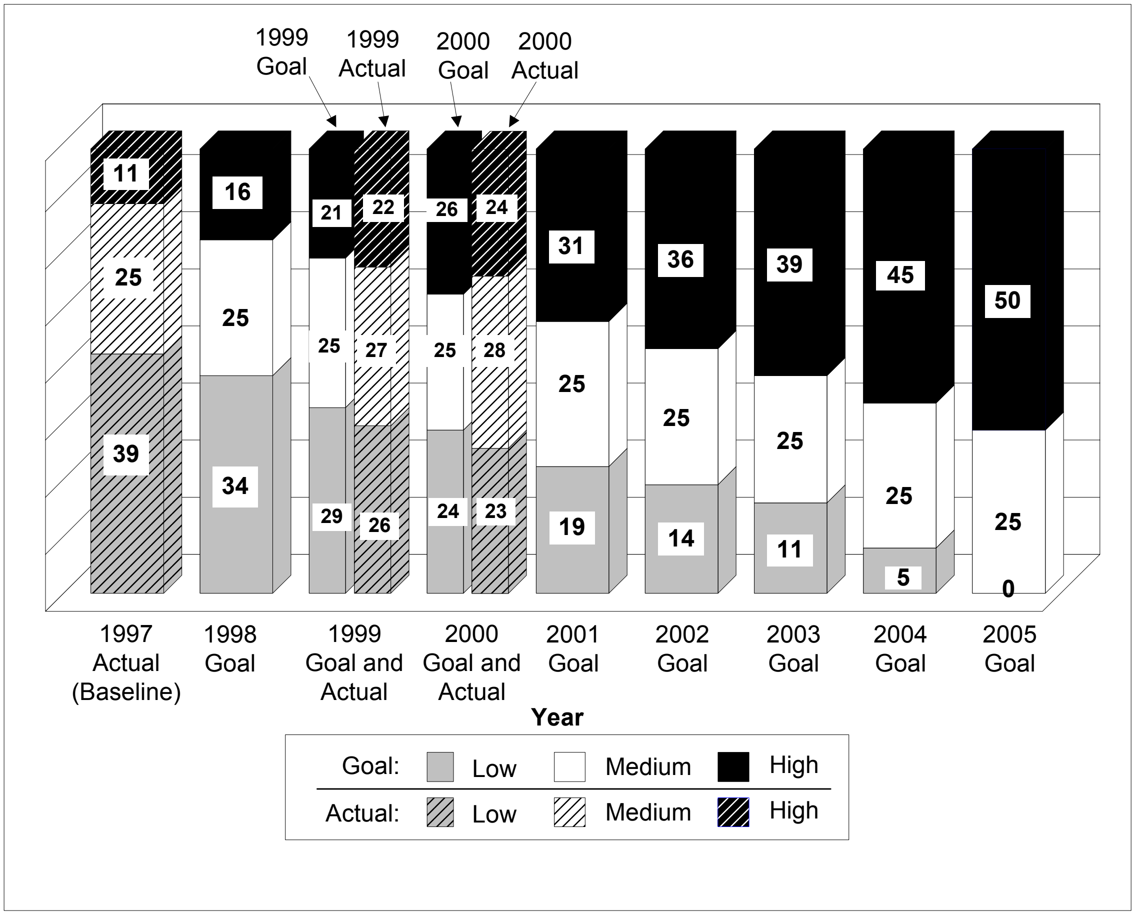


Figure 38 Level of Integrated Deployment (Actual and Goal)

Appendix A

Metropolitan Area	State	1997 Survey Return Rate	1999 Survey Return Rate	2000 Survey Return Rate
Albany-Schenectady-Troy	NY	94%	95%	95%
Albuquerque	NM	25%	70%	90%
Allentown-Bethlehem-Easton	PA	60%	100%	91%
Atlanta	GA	82%	96%	94%
Austin-San Marcos	TX	100%	92%	91%
Bakersfield	CA	36%	100%	75%
Baltimore	MD	68%	89%	100%
Baton Rouge	LA	100%	93%	100%
Birmingham	AL	58%	70%	100%
Boston-Worcester-Lawrence	MA	71%	76%	80%
Buffalo-Niagara Falls	NY	92%	100%	93%
Charleston- North Charleston	SC	68%	80%	80%
Charlotte-Gastonia-Rock Hill	NC	100%	100%	100%
Chicago-Gary-Kenosha	IL	95%	90%	95%
Cincinnati-Hamilton	OH	61%	91%	91%
Cleveland-Akron	OH	85%	84%	97%
Columbus	OH	100%	100%	100%
Dallas-Ft Worth	TX	91%	93%	94%
Dayton-Springfield	OH	66%	88%	93%
Denver-Boulder-Greeley	CO	63%	92%	88%
Detroit-Ann Arbor-Flint	MI	89%	86%	98%
El Paso	TX	86%	75%	87%
Fresno	CA	45%	89%	77%
Grand Rapids-Muskegon-Holland	MI	90%	81%	100%
Greensboro-Winston Salem-High Point	NC	92%	97%	100%
Greenville-Spartanburg-Anderson	SC	80%	100%	95%
Hampton Roads	VA	94%	91%	96%
Harrisburg-Lebanon-Carlisle	PA	60%	88%	100%
Hartford	CT	92%	86%	90%
Honolulu	HI	56%	83%	83%
Houston-Galveston-Brazoria	TX	87%	63%	56%
Indianapolis	IN	79%	100%	100%
Jacksonville	FL	95%	100%	100%
Kansas City	MO	82%	79%	100%
Knoxville	TN	78%	92%	91%
Las Vegas	NV	100%	100%	100%
Little Rock-North Little Rock	AR	100%	100%	100%
Los Angeles-Riverside-Orange County	CA	79%	84%	92%
Louisville	KY	91%	94%	100%

Metropolitan Area	State	1997 Survey Return Rate	1999 Survey Return Rate	2000 Survey Return Rate
Memphis	TN	100%	91%	80%
Miami-Ft Lauderdale	FL	100%	77%	92%
Milwaukee-Racine	WI	96%	89%	93%
Minneapolis-St. Paul	MN	73%	84%	93%
Nashville	TN	100%	75%	100%
New Haven	CT	90%	80%	86%
New Orleans	LA	83%	72%	84%
New York-Northern New Jersey-Southwestern Connecticut	NY	61%	77%	91%
Oklahoma City	OK	83%	88%	82%
Omaha	NE	95%	86%	92%
Orlando	FL	100%	94%	100%
Philadelphia-Wilmington-Atlantic City	NJ	62%	77%	87%
Phoenix-Mesa	AZ	96%	94%	88%
Pittsburgh	PA	73%	100%	93%
Portland-Salem	OR	78%	79%	95%
Providence-Fall River-Warwick	RI	66%	76%	83%
Raleigh-Durham-Chapel Hill	NC	80%	82%	100%
Richmond-Petersburg	VA	65%	75%	84%
Rochester	NY	100%	80%	84%
Sacramento	CA	71%	89%	100%
Salt Lake City-Ogden	UT	90%	86%	90%
San Antonio	TX	100%	63%	42%
San Diego	CA	65%	88%	86%
San Francisco-Oakland-San Jose	CA	83%	90%	89%
San Juan	PR	56%	33%	33%
Sarasota-Bradenton	FL	100%	100%	91%
Scranton-Wilkes Barre-Hazleton	PA	81%	73%	54%
Seattle-Tacoma-Bremerton	WA	90%	89%	85%
Springfield	MA	67%	54%	90%
St. Louis	MO	79%	83%	72%
Syracuse	NY	87%	90%	70%
Tampa-St. Petersburg-Clearwater	FL	94%	95%	100%
Toledo	OH	88%	84%	89%
Tucson	AZ	100%	100%	100%
Tulsa	OK	95%	81%	78%
Washington	DC	82%	89%	94%
West Palm Beach-Boca Raton	FL	94%	92%	100%
Wichita	KS	100%	100%	100%
Youngstown-Warren	OH	74%	81%	81%

Appendix B

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