FY 2000 ITS Integration Earmarks:

National Evaluation Program
CapWIN: The Capital Wireless Integrated Net

Phase III Final Report

Submitted to:
Federal Highway Administration
ITS Joint Program Office
Washington, DC 20590

April 2008

US Department of Transportation
Research and Innovative Technologies Administration

Quality Assurance Statement

The U.S. Department of Transportation provides high-quality information to serve Government, industry and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. USDOT periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Disclaimer

The United States Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear herein only because they are considered essential to the objective of this document.

Technical Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle **FY 2000 ITS Integration Earmarks: National Evaluation Program CapWIN: The Capital Wireless Integrated Network Phase III Final Report**		**5. Report Date** April 2008
		6. Performing Organization Code
7. Authors Nick Owens (SAIC), Aaron Zappone (SAIC), Carol Mitchell (SAIC)		**8. Performing Organization Report No.**
9. Performing Organization Name and Address Science Applications International Corporation (SAIC) 1710 SAIC Drive, M/S T1-12-3 McLean, VA 22102		**10. Work Unit No. (TRAIS)** **11. Contract or Grant No.** DTFH61-96-C-00098; Task 9823
12. Sponsoring Agency Name and Address United States Department of Transportation ITS Joint Program Office 1200 New Jersey Ave., NE Washington, DC 20590		**13. Type of Report and Period Covered** Final Report **14. Sponsoring Agency Code**
15. Supplementary Notes Ms. Linda Dodge (Task Manager) Mr. John Augustine (COTR)		

16. Abstract

The Capital Area Wireless Integrated Net (CapWIN) is comprised of first responder agencies in the Washington, DC metropolitan area. Through the use of the CapWIN application, responders are able to:

1. Exchange messages with other users at roadside locations or at fixed facilities such as dispatch centers directly without having to transmit messages through a third party,(i.e., roadside to dispatch to other agency/other roadside unit).
2. Directly access and exchange information with databases such as Maryland Interagency Law Enforcement System (MILES), Washington Area Law Enforcement System (WALES), and Virginia Criminal Information Network (VCIN), instead of relying on a third party to conduct the exchange.
3. Access the CapWIN V2 online directory. The directory allows users to search the profiles of other users and locate their contact information. In addition, the directory can also be used to search the capabilities or skill-sets (i.e., Spanish speaking, crash investigator) of other users.
4. Establish real-time incident message reports/dialogues that can be accessed by all end users. The incident message reports enable users to post incident description/location, request on-scene help, upload incident photos, etc.

The system is also designed to handle multiple users on a concurrent basis and to accommodate multiple platforms or operating systems. Additional system features include: seamless integration between multiple databases; chat and instant messaging capabilities; secured access and password-protected sign on; flexible input devices including keyboard, touch screen, WIN/PEN, and PDA, etc.; dynamic screens; built-in data integrity checks; and wireless electronic data transfer.

Key Words	18. Distribution Statement
Public Safety, Incident Response, Evaluation, Interoperable Communications, Intelligent Transportation Systems, ITS, Transportation, CapWIN, Wireless Integrated Net.	No restrictions. This document is available to the public from: The National Technical Information Service, Springfield, VA 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21.No of Pages	22. Price
Unclassified	Unclassified	92	N/A

Form DOT F 1700.7 Reproduction of completed page authorized.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

Executive Summary viii
1. Introduction 1
1.1 Problem Statement 1
1.2 Evaluation History 2
1.3 Report Organization 4
2. CapWIN Program Summary 6
2.1 CapWIN Program Management and Structure 6
2.2 CapWIN V2 Application Overview 8
2.2.1 CapWIN Architecture 8
2.2.2 Operating Hardware / Software 10
2.2.3 Using the CapWIN System 11
2.2.4 Access Transportation and Criminal Databases 13
2.2.5 CapWIN Incident Management Capabilities 15
2.2.6 Messaging Capabilities 18
2.2.7 Online Directory 20
2.3 CapWIN Common Field Reporting System (CFRS) ITS Project 21
3. Evaluation Overview 24
3.1 Original Evaluation Goals 24
3.1.1 Evaluation Goal #1 – Assess Customer Satisfaction with the CapWIN System 24
3.1.2 Evaluation Goal #2 - Determine the Impact of CapWIN on Efficiency of Incident Response Communications, Management, and Costs 24
3.1.3 Goal #3: Determine Potential Indirect Impacts of CAPWIN 25
3.2 Modified Evaluation Goal 25
3.2.1 Modified Evaluation Goal #2 – Determine the Impact of CapWIN on Incident Response Communications, Efficiencies, and Management 25
3.2.2 Modified Test Hypotheses 26
4. Data Collection and Analysis 27
4.1 Customer Satisfaction Surveys – “After Project” 27
4.2 Comparative “Before” and “After” Customer Satisfaction Surveys 31
4.3 CapWIN Use Statistics 32
4.4 Case Studies 35
4.5 Indirect Impacts 36
5. Evaluation Findings 41
5.1 Achievement of Evaluation Goals and Hypotheses 41
5.2 General Evaluation Findings 43
6. Conclusions and Recommendations 45
6.1 Conclusions 45
6.2 Recommendations 46
6.2.1 Recommendation #1: Long-Term Capital Financing for New Developments and Expansions 46
6.2.2 Recommendation #2: Outreach and Program Expansion 48
Appendix I : CapWIN Board of Directors Agencies 50
Appendix II: CapWIN By-Laws 51
Appendix III: Current CapWIN Users 58
Appendix IV: USDOT CapWIN User Survey Post-System Deployment 61

LIST OF FIGURES

Figure 1. CapWIN V2 System Architecture. xi
Figure 2. CapWIN V2 System Architecture. 9
Figure 3. CapWIN V2 Log-In Screen. 11
Figure 4. Selecting a CapWIN Association. 12
Figure 5. CapWIN V2 Home Screen. 13
Figure 6. Database Login-Screen. 14
Figure 7. Incident Search Screen. 16
Figure 8. Incident Information Screen. 17
Figure 9. CapWIN V2 Resource Feature. 18
Figure 10. CapWIN V2 Messaging Screen. 19
Figure 11. CapWIN V2 Instant Message Screens. 20
Figure 12. CapWIN V2 Online Directory. 21
Figure 13. “As Is” Information Flow. 22
Figure 14. Proposed Project Information Flow. 23
Figure 15. Survey Responses by Agency. 27
Figure 16. Survey Responses by Organization. 28
Figure 17. How CapWIN is Used. 29
Figure 18. Should CapWIN be used by Transportation and Law Enforcement Agencies? 31
Figure 19. User Growth. 33
Figure 20. Database Queries Statistics. 34
Figure 21. CapWIN V2 Daily Snapshot. 35
Figure 22. Distribution of Reported Secondary Incidents. 39

LIST OF TABLES

Table 1. Summary of Responder Demographics – “Before” and “After” 28
Table 2. Respondents’ “Before” and “After” Expectations Regarding CapWIN 31
Table 3. Comparison of Incident Durations for Various Types of Lane Blockages With and Without CHART/SHA (minutes) 38
Table 4. Delay and Emissions Reductions due to CHART/MSHA Operations for Washington and Baltimore Regions 40
Table 5. Findings for CapWIN Evaluation Goal #1 41
Table 6. Findings for CapWIN Evaluation Goal #2 42
Table 7. Findings for CapWIN Evaluation Goal #3 43
Table 8. CapWIN Strategic Action Plan for FY 08-FY 10 47

ABBREVIATIONS

CATT	Center for Advanced Transportation technology
CapWIN	Capital Wireless Information Net (formerly Capital Wireless Integrated Network)
CFRS	Common Field Reporting System
CHART	Coordinated Highway Action Response Team
CIA	Central Intelligence Agency
COTR	Contracting Officers Technical Representative
DDOT	District of Columbia Department of Transportation
DHS	Department of Homeland Security
EMS	Emergency Management Systems
FHWA	Federal Highway Administration
GMU	George Mason University
Hazmat	Hazardous Materials
ID	Identification
IIMS	Integrated Incident management System
IPAS	ITS Program Assessment Support
ITS	Intelligent Transportation Systems
MCAC	Maryland Coordination and Analysis Center
MDC	Mobile Data Computer
MDOT	Maryland Department of Transportation
MD SHA	Maryland State Highway Administration
MdTA Police	Maryland Transportation Authority Police
MILES	Maryland Interagency Law Enforcement System
MOEs	Measures of Effectiveness
MSP	Maryland State Police
NCIC	National Crime Information Center
NLETS	National Law Enforcement Teletype System
NTIMC	National Traffic Incident Management Coalition
NUG	National Unified Goal
PD	Police Department
PDA	Portable Data Assistant
RITIS	Regional Integrated Transportation Information System
SAIC	Science Applications International Corporation
SOW	Statement of Work
TIM	Traffic Incident Management
TOC	Transportation Operations Center
UMD-CATT	University of Maryland's Center for Advanced Transportation Technology
USDOT	United States Department of Transportation

USP	Virginia State Police
VCIN	Virginia Criminal Information Network
VDOT	Virginia Department of Transportation
VPN	Virtual Private Network
WALES	Washington Area Law Enforcement System

EXECUTIVE SUMMARY

Introduction

Improving the regional coordination of incident response and emergency management is increasingly recognized as an important tool to alleviate incident-related congestion on the Interstate highway system (in particular, on I-495, the Capital Beltway) and the surrounding road network. This is particularly true where incidents often involve multiple responders, not only from a particular jurisdiction, but also across jurisdictional boundaries. These jurisdictional boundaries may include some or all of the following: law enforcement; fire and rescue; emergency medical services; transportation agencies; motorist assistance services; information service providers; and the media. The current scenario of fragmented and indirect communication introduces confusion and adds unnecessary delay in situations where every second counts.

To address this lack of an integrated communications infrastructure for the region, Maryland, Virginia, and the District of Columbia have established a partnership to implement the Capital Wireless Integrated Net (CapWIN) Program committed to interoperable first responder data communications and information sharing.

Through the CapWIN Program, an integrated transportation and public safety integrated safety wireless information network has been developed and implemented for the Washington Metropolitan Region. This unique program integrates transportation and public safety data in the two states and the District of Columbia. CapWIN has created a data communications center and developed the Nation's first platform specifically designed to connect first responders in the field across jurisdictions, disciplines, and at all levels of government.

Science Applications International Corporation (SAIC) was selected as the independent Evaluator (Evaluation Team) for this project. Based on the results of a study conducted under Contract # DTFH61-96-C-00098 (SAIC – Intelligent Transportation System [ITS] Program Assessment Support [IPAS]), Task #9809 titled "Phase I – National Evaluation of Selected FY 2000 Earmarked ITS Integration Program Projects," a decision was made to select the CapWIN Program to be evaluated under the National Evaluation Program. This report presents the final results of the CapWIN evaluation.

CapWIN Overview

The CapWIN is a coalition of first responder agencies operating in the State of Maryland, the Commonwealth of Virginia, and the District of Columbia that was established to develop an interoperable first responder data communication and information sharing network in the Washington, DC metropolitan area.[1]

The CapWIN Program is directed by a Board of Directors (Board) made up of representatives of local, State, and Federal first responder agencies from Maryland, Virginia, and the District of Columbia. By-Laws adopted by the Board in June 2007

[1] For a detailed description and link to the CapWIN Website, see: <http://www.capwin.org/> last accessed January 30, 2008.

establish Board representation, appointment of members, voting rights, and the Board's powers and duties. CapWIN is managed by an operational staff based out of the University of Maryland's Center for Advanced Transportation Technology (CATT).

The Phase II baseline evaluation of the CapWIN system was done based on the initial version of CapWIN, known as CapWIN V1. Phase III presents an overview of the system (CapWIN V2), which was introduced in January 2006. CapWIN V2 incorporated a substantial number of improvements, in particular, in the user interface, based on experience gained during the CapWIN "beta test" and the follow-on deployment of the Web-based CapWIN V1.

The CapWIN V2 application was developed with an open, standards-based architecture. The system provides for interoperability between multiple systems through a highly secured wireless connection. In January 2006, CapWIN was updated to help improve the overall performance and future expansion capabilities of the system. The new version was called CapWIN Web Services Client (CapWIN V2).

In contrast to the previous Web browser-based version, CapWIN V2 is installed directly onto each computer terminal or mobile data device (i.e., laptop, Personal Data Assistant [PDA], etc.). To access the CapWIN V2 network, a virtual private network (VPN) connection must be made through a commercial/public wireless networks or direct/state wireline networks. Examples may include Virginia's COVANET or Network Maryland, or the public Internet. The updated version has enabled the CapWIN Team to improve system performance and offer additional features or capabilities to users. The CapWIN V2 system architecture is presented in **Figure 1.**

The CapWIN V2 system enables users to access the system through a central message gateway, which enables CapWIN users to:

- Exchange messages with other users at roadside locations or at fixed facilities such as dispatch centers directly without having to transmit messages through a third party (i.e., roadside to dispatch to other agency/other roadside unit).

- Directly access and exchange information with databases such as Maryland Interagency Law Enforcement System (MILES), Washington Area Law Enforcement System (WALES), and Virginia Criminal Information Network (VCIN), instead of relying on a third party to conduct the exchange.

- Access the CapWIN V2 online directory. The directory allows users to search the profiles of other users and locate their contact information. In addition, the directory can also be used to search the capabilities or skill-sets (i.e., Spanish speaking, crash investigator) of other users.

- Establish real-time incident message reports/dialogues that can be accessed by all end-users. The incident message reports enable users to post incident description/location, request on-scene help, upload incident photos, etc.

The system is also designed to handle multiple users on a concurrent basis and to accommodate multiple platforms or operating systems:[2]

- Seamless integration between multiple databases.
- Chat and instant messaging capabilities.
- Secured access and password-protected sign on.
- Flexible input devices include keyboard, touch screen, WIN/PEN, and PDA, etc.
- Dynamic screens.
- Built-in data integrity checks.
- Wireless electronic data transfer.

CapWIN V2's graphical interface can also be customized (screen size and location) by the user, allowing the screens or messaging windows to reside on a portion of the computer's desktop. This enables users to access or view other computer functions while using CapWIN V2. The system was also designed for scalability and was developed in a phased methodology, enabling the incorporation of added functionality as development and testing activities were completed.

[2] The system is designed to handle 10,000 concurrent users, and during tests, was able to handle 21,000 concurrent emails and 128,000 concurrent instant messages while using about 30 percent CPU capacity.

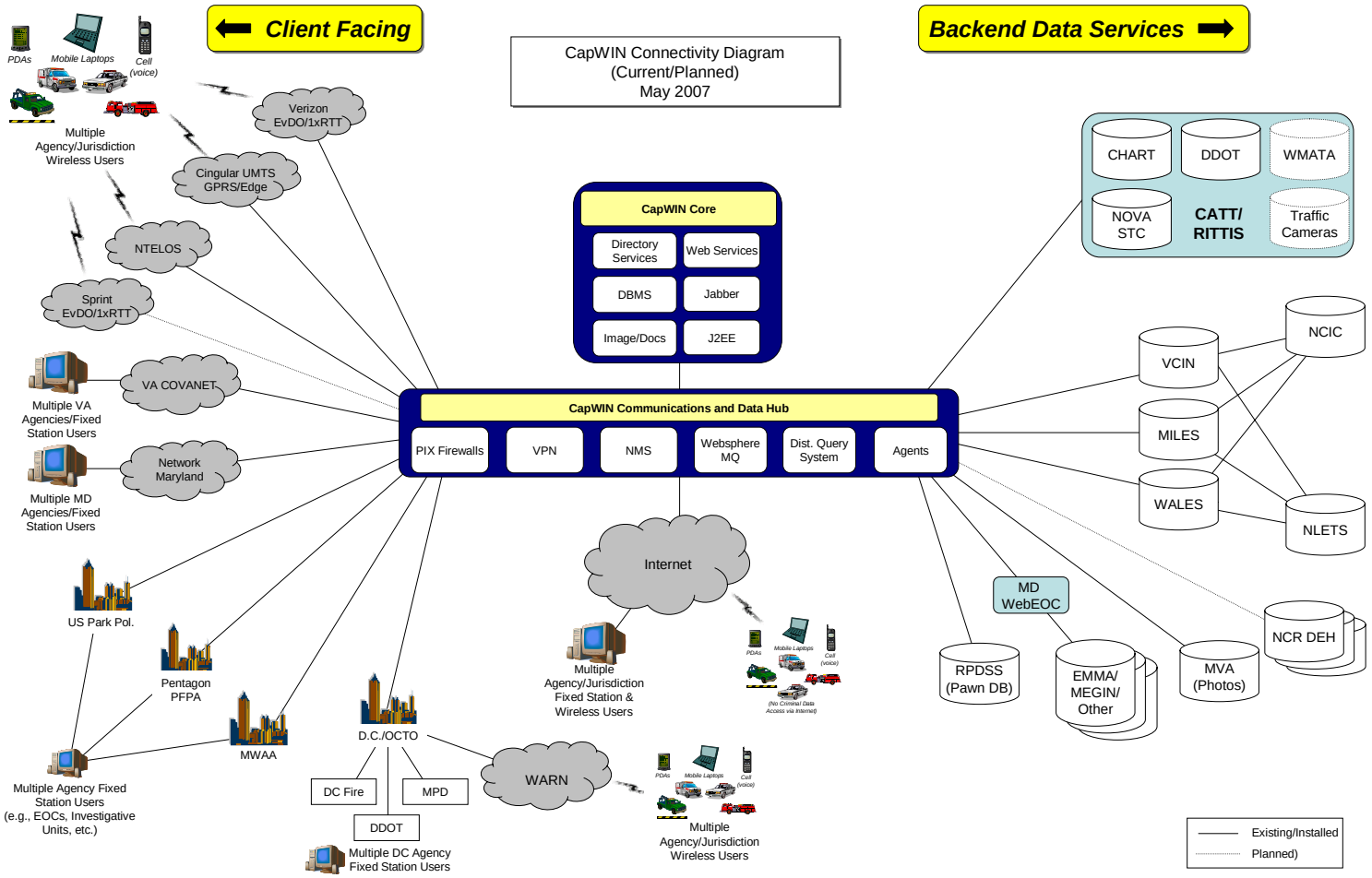


Figure 1. CapWIN V2 System Architecture.

Evaluation Findings

Following are the general evaluation findings:

- **Finding #1:** The CapWIN system has been successfully deployed as an operational system providing interoperable communications to the responder community in the Washington, DC metropolitan area. The CapWIN Web page[3] indicates that CapWIN currently has 65 user agencies and approximately 4,000 users. This is supported by the CapWIN use statistics, which show a high level of system use.

- **Finding #2:** The CapWIN deployment strategy has been successful in promoting the value of CapWIN. The approach taken by the University of Maryland's Center for Advanced Transportation Technology (UMD-CATT) CapWIN Team during the Beta Test of CapWIN was to provide interested agencies with "seed" computers – that is, several computers with CapWIN installed that the agency can use to test the system. The intent of this was to promote CapWIN to the recipient agency but to allow the agency to determine if CapWIN use should be expanded and in turn make the necessary investments needed to deploy the CapWIN operating system. The success of this approach is reflected in the total number of users as well as in the fact that CapWIN is now being used on a state-wide basis by the Maryland State Police.

- **Finding #3: The Systems Engineering Approach used by CapWIN is successfully meeting end-user needs.** CapWIN has placed a significant emphasis on user participant in all aspects of systems engineering – requirements analysis, identifying user needs, obtaining user feedback from tests. CapWIN V1 was extensively tested and emphasis was placed by the CapWIN team on obtaining user feedback. As a result, CapWIN V2 substantially changed the graphical user interfaces from CapWIN V1 and also incorporated additional features identified as useful by users. This high degree of involvement has ensured that the system is one that users will actually use and view as beneficial, which is reflected in the use statistics and Customer Satisfaction Survey results.

- **Finding #4: The CapWIN Organizational Structure represents a model for regional coordination and cooperation.** The CapWIN Board of Directors includes a wide range of stakeholder groups – elected officials, senior managers, practitioners, Federal, State, and local/municipal government. This has ensured that all sides of issues – operational, technical and programmatic – are captured. Further, bringing these stakeholder groups together to provide guidance to CapWIN has promoted regional cooperation and coordination of incident response activities, as evidenced by the anecdotal information provided on the CapWIN Webpage case studies.[4] In addition, the By-Laws adopted by the Board of Directors represent a model agreement for other jurisdictions to consider.

[3] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=28>, last accessed January 30, 2008.
[4] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=28>, last accessed January 30, 2008.

Conclusions

The CapWIN system provides a technological solution for interoperable communications that strongly supports a number of major initiatives to reduce congestion and improve traffic incident management (TIM).

In May 2006, then DOT Secretary Norman Mineta introduced the *National Strategy to Reduce Congestion on America's Transportation Network* as a blueprint for federal, state and local officials to tackle congestion. Secretary Mineta stated that "… congestion kills time, wastes fuel, and costs money."[5]

Mr. Mineta noted that America loses an estimated $200 billion a year due to freight bottlenecks and delayed deliveries. The Secretary added that consumers lose 3.7 billion hours and 2.3 billion gallons of fuel sitting in traffic jams and that airline delays waste $9.4 billion a year.[6]

The National Strategy identified six areas of emphasis for both reducing congestion in the short-term and building the foundation for long-term congestion relief strategies, including the deployment of operational and technological improvements to improve the management of the transportation system. The US Department of Transportation (USDOT) notes that

> …recurring congestion (non-optimized supply not meeting user demand) experienced by drivers on the road today is caused by physical bottlenecks and poor traffic signal timing. Other congestion events are caused by non-recurring factors, such as crashes and other incidents, highway construction, and bad weather. The goal of this point of the Congestion Initiative is to have transportation system managers manage these recurring and nonrecurring conditions successfully (in conjunction with a congestion pricing approach to balancing supply and demand) so that the system is optimized and more efficient…the operational and technological solutions presented in this point of the Congestion Initiative include providing traveler information, improving traffic incident management, enhancing mobility in the vicinity of work zones, improving traffic signal timing, and reliving traffic congestion at bottlenecks.[7]

The CapWIN system, as deployed in the Washington, DC, metropolitan area, strongly supports a number of the focus areas identified in the National Strategy, in particular the deployment of operational and technological solutions involving TIM. A key component of the actions identified to improve TIM is to provide integrated communications for transportation and public safety agencies. CapWIN represents such an integrated communications systems that, most importantly, is deployed and fully operational.

CapWIN's demonstrated interoperability and use by Federal, State, and local/municipal government agencies also supports the National Unified Goal (NUG) recently ratified by the National Traffic Incident Management Coalition (NTIMC). The NTMIC includes

[5] Source: < http://www.dot.gov/affairs/dot5706.htm>, last accessed January 30, 2008.
[6] Ibid.
[7] Source: <http://www.oti.dot.gov/>, last accessed January 30, 2008.

20 national transportation, public safety, and private sector associations working together to improve traffic incident management in the United States and developed the NUG to align with the USDOT congestion initiative. The NUG encompasses five themes: safe responders; prompt, reliable incident communications; safe, quick clearance; public education for incident prevention; and accountable progress. As with the TIM component of the congestion initiative, CapWIN provides prompt, reliable communications for incident responders in support of this particular NUG theme.[8]

Recommendations

Identifying a dedicated source of funding is critical for ensuring CapWIN's continued success and long-term viability. CapWIN is providing a fully operational interoperable communications system that is meeting a critical need in the Washington metropolitan area. That CapWIN is meeting this need is well documented through the customer satisfaction assessment as well as in the CapWIN use statistics.

The Evaluation Team, therefore, recommends that the ITS Joint Program Office conduct a study to develop a viable, long-term business model to support CapWIN's continued expansion and development. The Evaluation Team further recommends that the development of a business model should include:

1. The identification of sources of additional funding such as expanded user fees, grant programs, and/or seeking appropriations from participating Federal, State and local/municipal government agencies that would provide funding for capital investments for new development and expanded service offerings.

2. The development of strategies for securing additional capital funding such as obtaining support from senior managers and elected officials, obtaining support for grant applications, and/or establishing user fees that are not cost-prohibitive but support operations.

The Evaluation Team further recommends that consideration be given to supporting an outreach program to assist CapWIN with implementing this strategy. The Evaluation Team further recommends that if such an outreach effort is undertaken, consideration also should be given to the New York DOT's IIMS program. Both of these systems offer the responder community working models of interoperable systems based on open standards and real-time exchange of data. Both systems are being used across multiple agencies at State and local/municipal levels of government, as well as Federal government with CapWIN, and can help other jurisdictions meet the critical need for interoperable communications to support incident management and emergency response activities. If such an outreach effort is conducted, the Evaluation Team recommends that the following issues be addressed:

- **Identify potential target user groups**: Including transportation and other potential end-user groups – Fire/Emergency Management Systems (EMS), Homeland Security, private sector, and law enforcement.

- **Identify target audiences within each user group:** Practitioners, senior managers, and elected officials.

[8] Source: <http://www.ntoctalks.com/articles/NUG.php>, last accessed January 30, 2008.

- **Determine the appropriate message:** Target the particular needs of each audience.
- **Coordinate outreach efforts with other USDOT-supported programs:** Congestion Initiative, NTIMC, and the NUG.
- **Identify forums to target outreach activities:** ITE, AASHTO, IACP meetings and conferences.
- **Develop a variety of outreach materials:** Electronic presentations, videos, brochures, references with experience in using each system, technical points of contact.

1. INTRODUCTION

This section provides an overview for the Capital Wireless Integrated Net (CapWIN) Phase III Final Report.

1.1 Problem Statement

The Washington Metropolitan Region is home to one of the most congested highway systems in the country. In addition, portions of the highway system pass through the States of Virginia and Maryland, and the District of Columbia. The responsibility for managing the region's transportation system is divided among these three jurisdictions. Within the two states, transportation system management is further subdivided among counties and municipalities. Incident management and response, particularly on the region's Interstate highway system, may involve response personnel from each of the jurisdictions, as well as from neighboring counties and municipalities.

A major concern at present is the lack of an integrated, interoperable communications system that enables these jurisdictions to communicate directly with one another, thus coordinating incident response and emergency management activities. Attempts are being made to improve communications as exemplified by the Virginia Department of Transportation's (VDOT) Safety Service Program and the Maryland State Highway Administration's (MD SHA) exchange of communications equipment. While the intent of this equipment exchange is to enable the real-time exchange of information on incidents and incident response activities, the region lacks an integrated communication system. The main problem is that no single system exists that can be accessed by multiple jurisdictions for the real-time exchange of information on incidents and incident response.

Currently, there are several processes used by incident response personnel to communicate and exchange information about an incident or emergency response situation. One common approach is based on roadside to dispatcher communications, with the dispatcher then contacting other groups within an agency or other agencies. Incident response agencies are also using wireless communications systems such as NEXTEL phones, and agencies are exchanging radios to enable inter-agency communications.

Improving the regional coordination of incident response and emergency management is increasingly recognized as an important tool to alleviate incident-related congestion on the Interstate highway system (in particular, on I-495, the Capital Beltway) and the surrounding road network. This is particularly true where incidents often involve multiple responders, not only from a particular jurisdiction, but also across jurisdictional boundaries. These jurisdictional boundaries may include some or all of the following: law enforcement; fire and rescue; emergency medical services; transportation agencies; motorist assistance services; information service providers; and the media. The current scenario of fragmented and indirect communication introduces confusion and adds unnecessary delay in situations where every second counts.

To address this lack of an integrated communications infrastructure for the region, Maryland, Virginia, and the District of Columbia have established a partnership to

implement the CapWIN Program committed to interoperable first responder data communications and information sharing.

Through the CapWIN Program, an integrated transportation and public safety integrated safety wireless information network has been developed and implemented for the Washington Metropolitan Region. This unique program integrates transportation and public safety data in the two states and the District of Columbia. CapWIN has created a data communications center and developed the Nation's first platform specifically designed to connect first responders in the field across jurisdictions, disciplines, and at all levels of government.

Science Applications International Corporation (SAIC) was selected as the Independent Evaluator (Evaluation Team) for this project. Based on the results of a study conducted under Contract # DTFH61-96-C-00098 (SAIC – ITS Program Assessment Support [IPAS]), Task #9809 titled "Phase I – National Evaluation of Selected FY 2000 Earmarked ITS Integration Program Projects", a decision was made to select the CapWIN Program to be evaluated under the National Evaluation Program. This report presents the final results of the CapWIN evaluation.

1.2 Evaluation History

For Phase III of the CapWIN evaluation, the original Statement of Work (SOW)[9] required that the Evaluation Team complete the collection of the "after project" data to measure project impacts. The following specific activities were to be undertaken in support of the evaluation:

- **Task 1: Task Management:**
  - Prepare periodic progress reports.
  - Coordinate evaluation activities with the University of Maryland's Center for Advanced Transportation Technology (UMD CATT) CapWIN Project Management Team, the George Mason University (GMU) Evaluation Team, and stakeholder groups.
- **Task 2a: After Project Data Collection:**
  - Seek to obtain records that can be broken out by Incident and Disabled Vehicle using the current Maryland Department of Transportation (MDOT) definitions for each of these two events.
  - Seek to ensure that the data for all locations include information cells that will allow analysis of both Total Duration and Response Time.
  - Seek to collect data at the same locations for the time periods as the baseline data. If that is not possible, the data should be collected in January or June.

[9]Contract No. DTFH61-96-C-00098 (SAIC - IPAS, Task 9823): "Phase III National Evaluation of Selected FY 2000 Earmarked ITS Integration Program Projects: CAPWIN - Greater Capital Metro Region: Scope of Work."

  - Seek to collect data for the MDOT region, the Beltway, and the Interior Bridges in separate data sets.
  - Update the Evaluation Goal #3 literature review to identify any additional studies or research on projects similar to CapWIN.

- **Task 2b: Data Analysis:**
  - Complete analysis of data collected in Phase III.
  - Compare results of Phase III data analysis with Phase II baseline to determine extent of project impact.

- **Task 3: Update the Communications Process Flows Developed During Phase II.**

- **Task 4a: After Project Customer Satisfaction Survey:**
  - Conduct interviews with the same stakeholders interviewed for the Phase II baseline data collection.
  - Develop and test the "after" project survey instrument.
  - Identify stakeholders who participated in the Beta Test training and completed the baseline Customer Satisfaction Survey and conduct the after project Customer Satisfaction Survey with these same stakeholders.
  - Identify other stakeholders who have experience with CapWIN and include these stakeholders in the Customer Satisfaction Survey target audience.

- **Task 4b: Analysis of Survey Data:**
  - Analyze survey data and compare findings with Phase II to determine project impact.

- **Task 5: Update Indirect Benefits Study:**
  - Update Phase II indirect benefits study.
  - Conduct stakeholder interviews to identify qualitative project impact on indirect benefits
  - As feasible, review stakeholder group records to determine if data exists to prepare quantitative analysis of indirect project impacts. If data exists, conduct analysis. If data is inadequate, explore the possibility of using existing methodologies to model indirect project impacts.

- **Task 6: Preparation of draft final and final Evaluation Report.**

As Phase III of the evaluation progressed, the Evaluation Team became concerned that conducting a comprehensive data analysis of "before" and "after" project data

would not properly identify and quantify CapWIN-specific impacts. It would be problematic to determine at a macro level what impact factors such as weather, time of day, congestion, etc would have on incident response times. This is similar to what the Evaluation Team has encountered with other evaluations involving the measurement of impacts on incident response times. In addition, a decision had been made by the Virginia State Police (VSP) to temporarily withdraw from CapWIN participation while a major new VSP CAD system was being deployed. The baseline analysis conducted in Phase II had included VSP data on incident response activities and not having VSP participation had the potential to create a significant gap in the "after project" data.

The Evaluation Team had recommended that the types of case studies that were (and are) being done for the IPAS II Task 61016 Integrated Incident Management System (IIMS) project in New York be replicated for CapWIN. The IIMS case studies map out each step in the incident response process and identify how the use of IIMS improved response procedures and/or saved time. These case studies have been effective in identifying and documenting where in the incident response process the use of IIMS has provided benefit. The Evaluation Team believes that developing similar case studies for CapWIN would show similar benefits, specifically how the use of CapWIN has improved communications, reduced redundancy, and enabled responders to contact multiple parties concurrently

This recommendation was accepted by the Joint Program Office and a modification to the original SOW was issued in September 2007[10] that changed Tasks 2 and 3 to the following:

- **Task 2: Develop case studies for three incident types that demonstrate how the use of CapWIN improved incident response communications and efficiencies.**

- **Task 3: Document CapWIN use statistics by agency and incident type.**

1.3 Report Organization

This document presents the Evaluation Team's findings in response to both the original SOW and the September 2003 modification. The remainder of this document is organized as follows:

- **Section 2 – CapWIN Program Summary:** This section presents an overview of the CapWIN Program.

- **Section 3 – Evaluation Overview:** This section presents a summary of the evaluation hypotheses, test plans, and methodology.

- **Section 4 – Data Analysis and Analysis:** This section summarizes the data collection and analysis completed in support of the evaluation.

[10]Contract No. DTFH61-96-C-00098 (SAIC - ITS Program Assessment Support), Task 9823: "Phase III National Evaluation of Selected FY 2000 Earmarked ITS Integration Program Projects: CAPWIN - Greater Capital Metro Region: Scope of Work – Modification I."

- **Section 5 – Evaluation Findings:** This section presents a discussion of the results of the data analysis and evaluation findings.
- **Section 6 – Conclusions and Recommendations:** This section discusses evaluation conclusions and recommended "next steps".
- **Appendix I – CapWIN Board of Directors' Agencies.**
- **Appendix II – CapWIN By-Laws.**
- **Appendix III – CapWIN Users.**
- **Appendix IV – Customer Satisfaction Survey:** This appendix presents the instrument used to conduct the "after project" Customer Satisfaction Survey.

2. CAPWIN PROGRAM SUMMARY

2.1 CapWIN Program Management and Structure

The CapWIN is a coalition of first responder agencies operating in the State of Maryland, the Commonwealth of Virginia, and the District of Columbia that was established to develop an interoperable first responder data communication and information sharing network in the Washington, DC metropolitan area.[11]

The CapWIN Program is directed by a Board of Directors (Board) made up of representatives of local, State, and Federal first responder agencies from Maryland, Virginia, and the District of Columbia. By-Laws adopted by the Board in June 2007 establish Board representation, appointment of members, voting rights, and the Board's powers and duties. CapWIN is managed by an operational staff based out of the University of Maryland's Center for Advanced Transportation Technology (CATT).

The BOD agency representation is included in Appendix I of this report and the governing By-Laws are included in Appendix II.

The CapWIN program has evolved substantially since the start of the evaluation. At the time when CapWIN was selected for inclusion in the FY 2000 ITS Earmarks Evaluation program, the intent was to build a CapWIN application that would be used by first responder agencies in the Washington Metropolitan Area. The tragic events of September 11, 2001 led to Congress authorizing substantial additional funding for CapWIN with the result that CapWIN had the resources to develop a full production system.

CapWIN's growth has continued and the program is expanding beyond the deployment of an application that could be used by participating agencies toward a comprehensive system providing value-added services by providing agencies with access to new sources of data using the agencies own and/or existing applications. The CapWIN system as currently deployed consists of two components: a Data Communications Center, and the Mobile Field Application known as the V2. The Data Communications Center is the engine that draws data from several information sources and delivers them over a wireless media to the end user in the field or in operations centers. The V2 is an application located on a laptop or desktop that supports several functionalities important to transportation, law enforcement, and emergency services such as incident reporting, queries, and instant messaging.

With the development of the Data Communications Center, CapWIN is now able to offer expanded services to first responder agencies beyond the CapWIN V2 application. One example of this is a recent functionality that enables the CapWIN application that enhances Maryland Interagency Law Enforcement System (MILES) queries. If a MILES query is routed through the CapWIN application by a Maryland law enforcement official and an operator's license number is provided, this information is routed to the MVA on a real-time basis and the operator's license photograph is then

[11]For a detailed description and link to the CapWIN Website, see: <http://www.capwin.org/>, last accessed January 30, 2008.

pulled and routed through the CapWIN application to the user initiating the MILES query. Baltimore City also has established a working relationship with CapWIN that enables the City's police to obtain the same information. The City has built an interface between the City's legacy system and the CapWIN system to provide the same functionality and obtain driver's license photographs. The City system can access the CapWIN system so that a City user, when making a query and providing an operator's license number through the City's system, is provided with the license photograph through the City's interface with the CapWIN system.

CapWIN's Board of Directors approved a CapWIN Strategic Plan[12] in September 2007. As noted in the Strategic Plan, the intent of the Plan is to present:

> …overall direction for CapWIN, defines the primary constituencies for its mission, identifies the products and services the program has to offer to each of these constituencies, and recommends strategies for addressing each of their needs. The Plan concludes with a recommended set of action steps to guide the program's development over the next three years.[13]

In the Plan, the Board has established three objectives for CapWIN to be achieved over the next 3 fiscal years (FY08-FY10), such that by the end of FY 10, CapWIN will:

1. Have a broad geographic & functional footprint.

2. Be financially sound.

3. Be considered a Trusted Partner for technical development implementation of new technologies.[14]

To achieve these objectives, the program should build upon the assets that have already been created. These assets can be summarized as follows:

1. **The Data Communications Center.** The Hub includes the hardware, software, and data sources that make up the infrastructure of the CapWIN system. They are unique in using Web services to support moving data across agency, discipline, and jurisdictional boundaries from field to field, field to center, and center to center.

2. **The Field Access Products.** The program has created a software application that allows agencies to access the data, supports instant messaging among field user, and provides a communications tool for incident based information sharing. It also has created a software application for the portable data assistant (PDA) that can be used to access data.

3. **The Knowledge Management Services.** In developing these products the program has created a skill set among its staff, and a knowledge base of

[12]Excerpted from the CapWIN Board of Directors Strategic Plan, September 2007.
[13] Ibid., p. v.
[14] Ibid., pp. v-vi.

experience among its clientele that can make a major contribution to addressing the issues of interoperability.[15]

The intent is to continue to expand CapWIN service offerings, in particular access to and exchange of information, to the Washington Metropolitan Area's first responder agencies and other public and private agencies involved in traffic operations and management.

2.2 CapWIN V2 Application Overview

2.2.1 CapWIN Architecture

The Phase II baseline evaluation of the CapWIN system was done based on the initial version of CapWIN, known as CapWIN V1. Phase III presents an overview of the system (CapWIN V2), which was introduced in January of 2006. CapWIN V2 incorporated a substantial number of improvements, in particular, in the user interface, based on experience gained during the CapWIN "beta test" and the follow-on deployment of the Web-based CapWIN V1.

The CapWIN V2 application was developed with an open, standards-based architecture. The system provides for interoperability between multiple systems through a highly secured wireless connection. In January of 2006, CapWIN was updated to help improve the overall performance and future expansion capabilities of the system. The new version was called CapWIN Web Services Client (CapWIN V2).

In contrast to the previous Web-browser based version, CapWIN V2 is installed directly onto each computer terminal or mobile data device (i.e., laptop, PDA, etc.). In order to access the CapWIN V2 network, a virtual private network (VPN) connection must be made through a commercial/public wireless networks or direct/state wireline networks. Examples may include Virginia's COVANET or Network Maryland, or the Public Internet. The updated version has enabled the CapWIN Team to improve system performance and offer additional features or capabilities to users. The CapWIN V2 system architecture is presented in **Figure 2.**

The CapWIN V2 system enables users to access the system through a central message gateway, which enables CapWIN users to:

- Exchange messages with other users at roadside locations or at fixed facilities such as dispatch centers directly without having to transmit messages through a third party (i.e., roadside to dispatch to other agency/other roadside unit).

- Directly access and exchange information with databases such as Maryland Interagency Law Enforcement System (MILES), Washington Area Law Enforcement System (WALES), and Virginia Criminal Information Network (VCIN), instead of relying on a third party to conduct the exchange.

[15] Excerpted from the CapWIN Board of Directors Strategic Plan, September 2007, pp. v-vi.

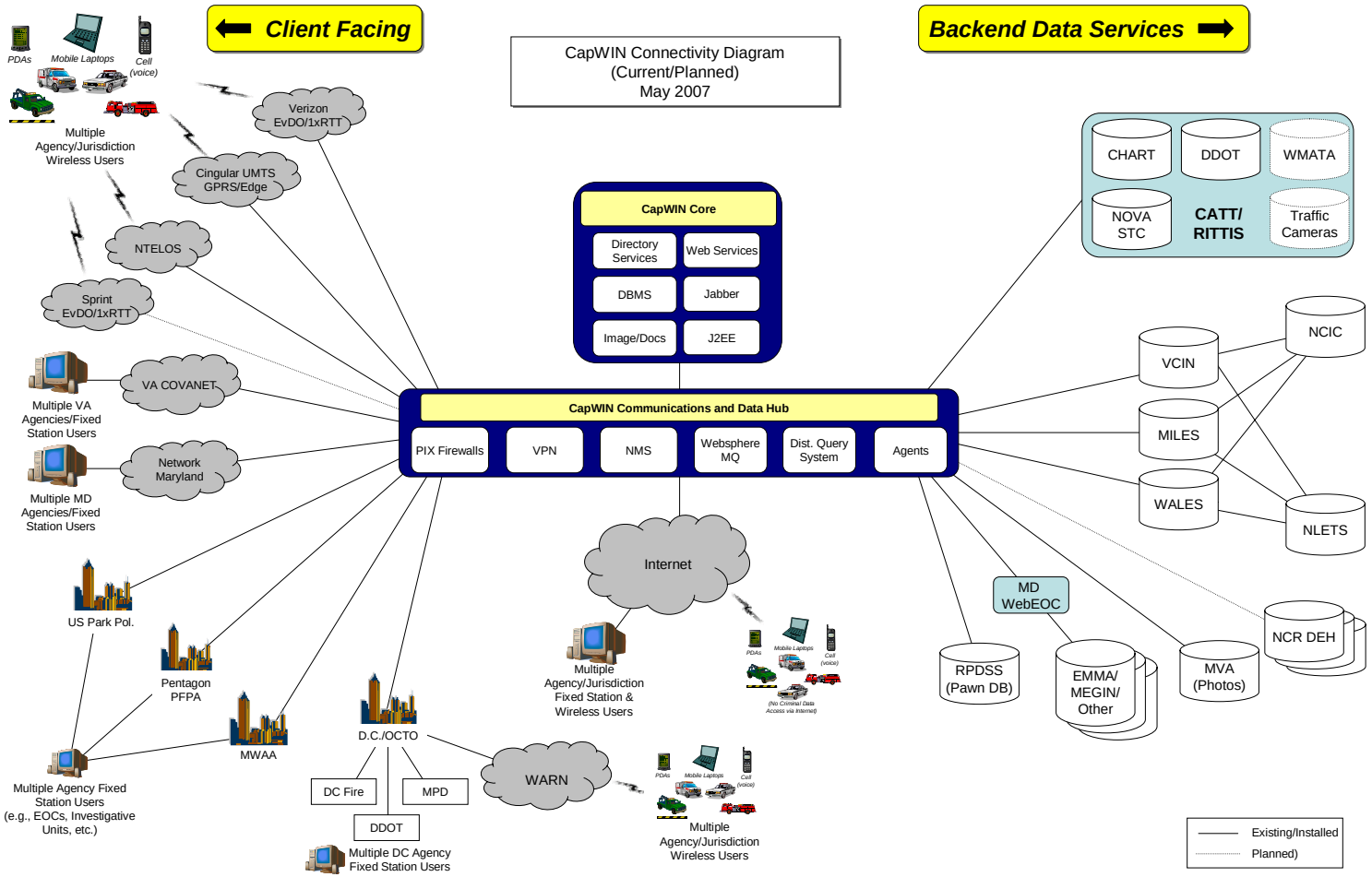


Figure 2. CapWIN V2 System Architecture.

- Access the CapWIN V2 online directory. The directory allows users to search the profiles of other users and locate their contact information. In addition, the directory can also be used to search the capabilities or skill-sets (i.e., Spanish speaking, crash investigator) of other users

- Establish real-time incident message reports/dialogues that can be accessed by all end-users. The incident message reports enable users to post incident description/location, request on-scene help, upload incident photos, etc.

The system is also designed to handle multiple users on a concurrent basis and to accommodate multiple platforms or operating systems.[16] Additional system features include:

- Seamless integration between multiple databases.

- Chat and instant messaging capabilities.

- Secured access and password-protected sign on.

- Flexible input devices include keyboard, touch screen, WIN/PEN, and PDA, etc.

- Dynamic screens.

- Built-in data integrity checks.

- Wireless electronic data transfer.

CapWIN V2's graphical interface can also be customized (screen size and location) by the user, allowing the screens or messaging windows to reside on a portion of the computer's desktop. This enables users to access or view other computer functions while using CapWIN V2. The system was also designed for scalability and was developed in a phased methodology, enabling the incorporation of added functionality as development and testing activities were completed.

2.2.2 Operating Hardware / Software

The CapWIN V2 system can be run on any laptop or desktop computer equipped with Windows 2000 or Windows XP (or compatible software). Because CapWIN V2 utilizes a local application on each computer, the system requirements are higher than previous versions of CapWIN. For the CapWIN V2 to operate efficiently, it is recommended that all computers be equipped with 256 MB RAM (or higher), 500 MB of available hard disk space, and a Pentium III (or equivalent) microprocessor. The recommended Web-browser is Internet Explorer 5.1 (or higher) and an updated version of Adobe Acrobat Reader should be installed on each machine. To help increase accessibility and portability for users, CapWIN V2 can also be accessed with a PDA (not all functionalities are available on the PDA). For optimal system results, it is

[16]The system is designed to handle 10,000 concurrent users and during tests, was able to handle 21,000 concurrent emails and 128,000 concurrent instant messages while using about 30 percent of CPU capacity.

recommended that all PDAs contain a minimum of 64 MB RAM, 48 MB ROM, Pocket PC 2002 operating system and a video resolution display consisting 240x320 pixels.[17]

2.2.3 Using the CapWIN System

All authorized CapWIN V2 users are assigned a unique user identification (ID) and password to provide access and log on capability to the system. Once a user has logged on, the system allows the user to establish an agency affiliation, select a location of operation, and select the particular unit that is being used.

The system contains a drop-down menu for each field which enables a user to select the appropriate response. The CapWIN V2 system also retains this information so a user is not required to complete these fields each time the user logs on. **Figures 3 and 4** show representative samples for the login and association selection screens for CapWIN V2.

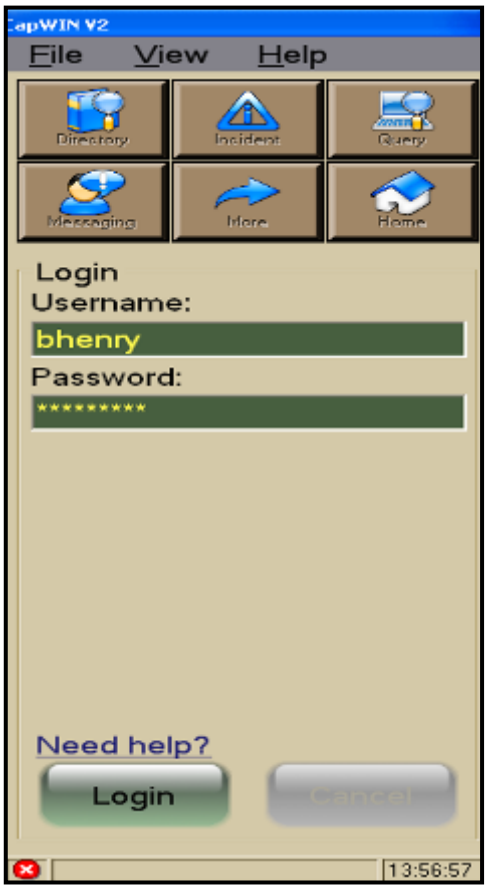


Figure 3. CapWIN V2 Log-In Screen.

[17] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=72>, last accessed January 30, 2008.

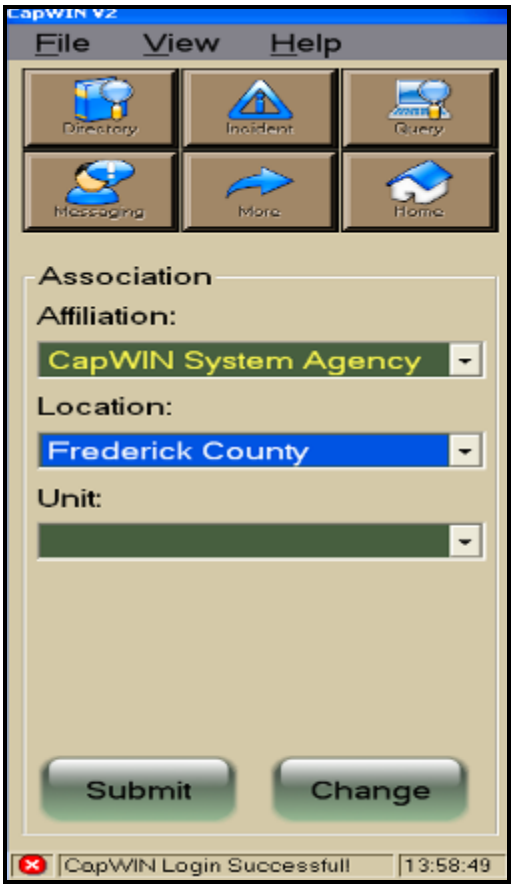


Figure 4. Selecting a CapWIN Association.

After successfully logging on and selecting the appropriate association, the CapWIN user is then directed to the home screen. The home screen enables the user to access all capabilities of the system, including the user directory, incident management functions, messaging features, and data exchange features with criminal and transportation databases. The CapWIN management staff often utilizes the home screen to display CapWIN disclaimers or system updates. A representative sample of CapWIN V2's home screen is shown in **Figure 5.**

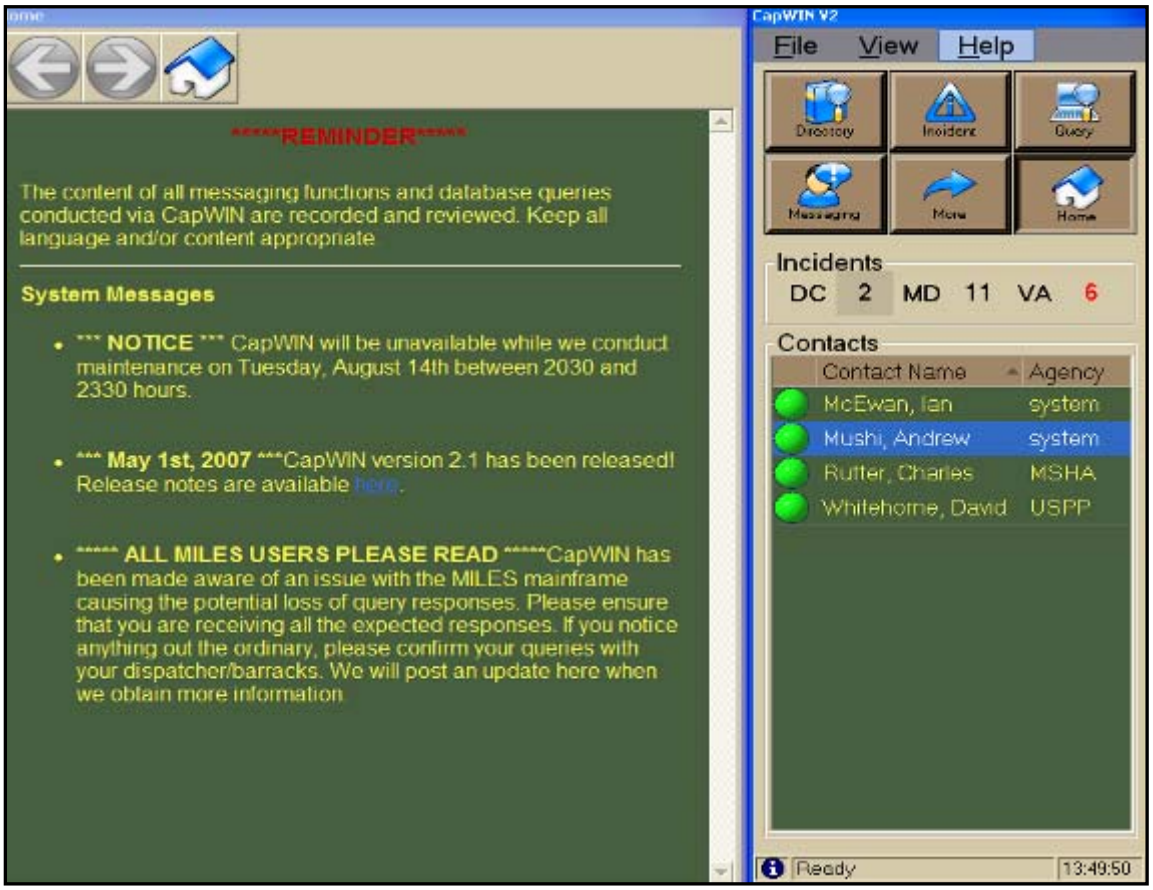


Figure 5. CapWIN V2 Home Screen.

2.2.4 Access Transportation and Criminal Databases

Incident management and response is a multi-jurisdictional function where responders must have the ability to access accurate, up-to-date traffic and law enforcement related data. This information serves as a critical tool for making accurate decisions, improving responder safety, and streamlining incident management activities. To help satisfy this need and improve the capabilities of incident responders, the CapWIN V2 system provides users with access to several transportation- and law enforcement-related databases. These repositories allow users to gain valuable information, including access to criminal records, vehicle information, traffic conditions, accident details, and medical information.

To enable users to access the various databases, the CapWIN staff and database owners assign access privileges to each user. Depending on their access privileges, users will then be able to perform database queries to gain additional information or updates. **Figure 6** illustrates the database login-screen for CapWIN V2.

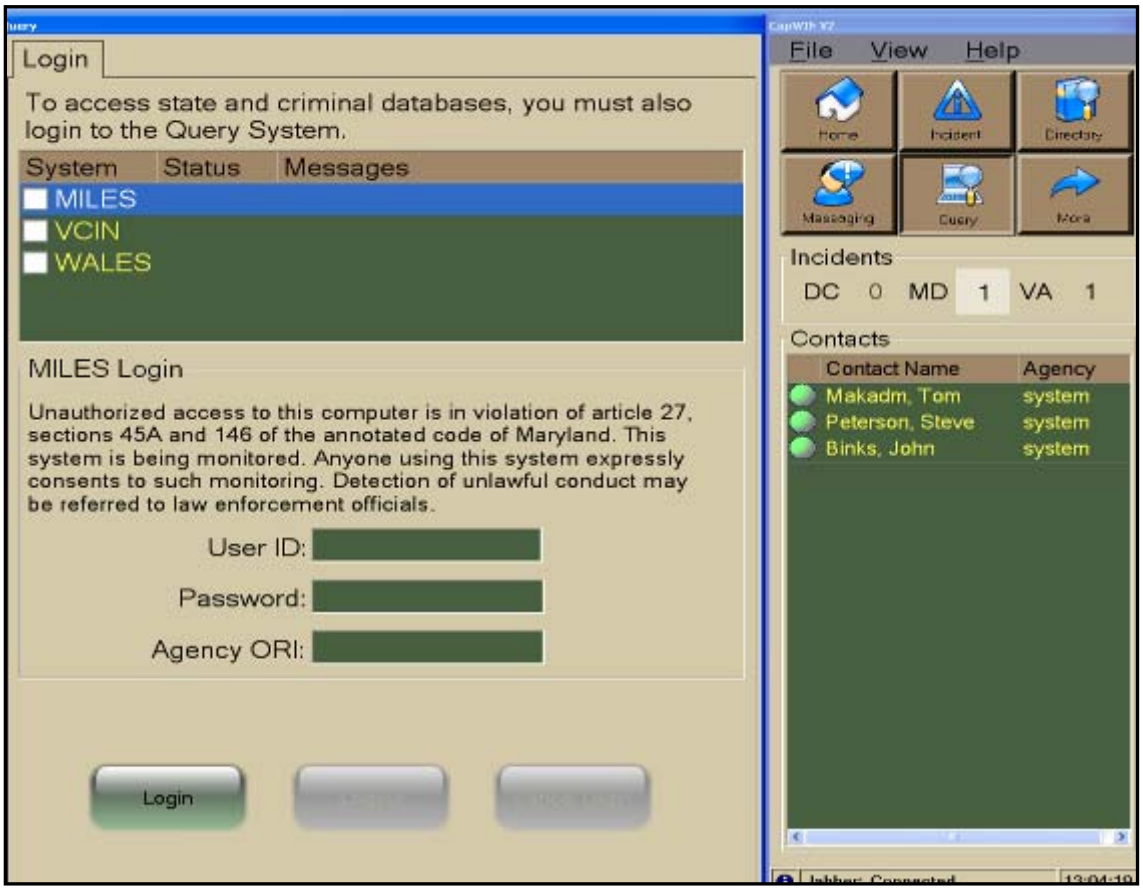


Figure 6. Database Login-Screen.

After successfully logging in, the user is then able to perform queries on the selected databases. At present, there are several databases that users may access and perform queries on, including:

- Virginia Criminal Identification Network (VCIN).
- Maryland Interagency Law Enforcement System (MILES).
- Washington Area Law Enforcement System (WALES).
- National Crime Information Center (NCIC).
- National Law Enforcement Teletype System (NLETS).
- Maryland's Motor Vehicle Administration (MVA).
- Regional Integrated Transportation Information System (RITIS).

In addition to these core databases, there is an ongoing effort to provide access to additional databases or Web-links (some are currently under development) that may be accessed by CapWIN users. These sources may include information relevant to medical and hazardous materials (Hazmat) disciplines.

2.2.5 CapWIN Incident Management Capabilities

One of the key components of the CapWIN V2 system is the incident management capabilities. There are several incident management features that are often used by CapWIN users following an incident. Specifically, the CapWIN system offers users the following incident management capabilities:

- Search for an Incident.
- View Incident Details.
- Create/Join an Incident.
- Create an Incident Chat Room.
- Open an Incident Chat Room.
- Modify an Incident.
- Leave an Incident.
- Delete an Incident.
- Upload Incident Files/Photos.

From within the main incident management screen, the user is able to create a new incident by selecting the “create new” button or search for an existing incident by selecting the incident tab. If a log has not been created, or if the user decides that a new log is needed for the user’s agency, the user may create a new incident log. To create a new incident, the user can select the “Create” button from the bottom of the screen. The user is then able to enter a description of the incident and location, and the system generates a time stamp documenting when the incident log was opened. After the new incident log has been created, other users may begin joining the incident as necessary, allowing them to provide or request additional details of the incident. If the user selects the “Users” tab, they are able to view all of the participants who are involved with the incident. After a new user has joined the incident, they may begin using messaging capabilities to communicate with other users.

If a user wants to join or view an existing incident, this can be done by accessing the incident tab from the main screen. While viewing the incident tab, users are able to observe all of the incident logs that have been opened. All incidents are listed in a “tree” structure which can be expanded or collapsed by clicking the “+” or “- " buttons. Currently, all incidents are placed into one of three state or jurisdiction categories, including Virginia, Maryland, and the District of Columbia. If a user continues to expand the tree directory, all incidents can be viewed at the county level. The total numbers of incidents (in parentheses) for each location are also displayed as incidents are opened and closed. In addition, users can also specify the duration of time that an incident log may be open for. A representative sample of the incident search screen is shown in **Figure 7**.

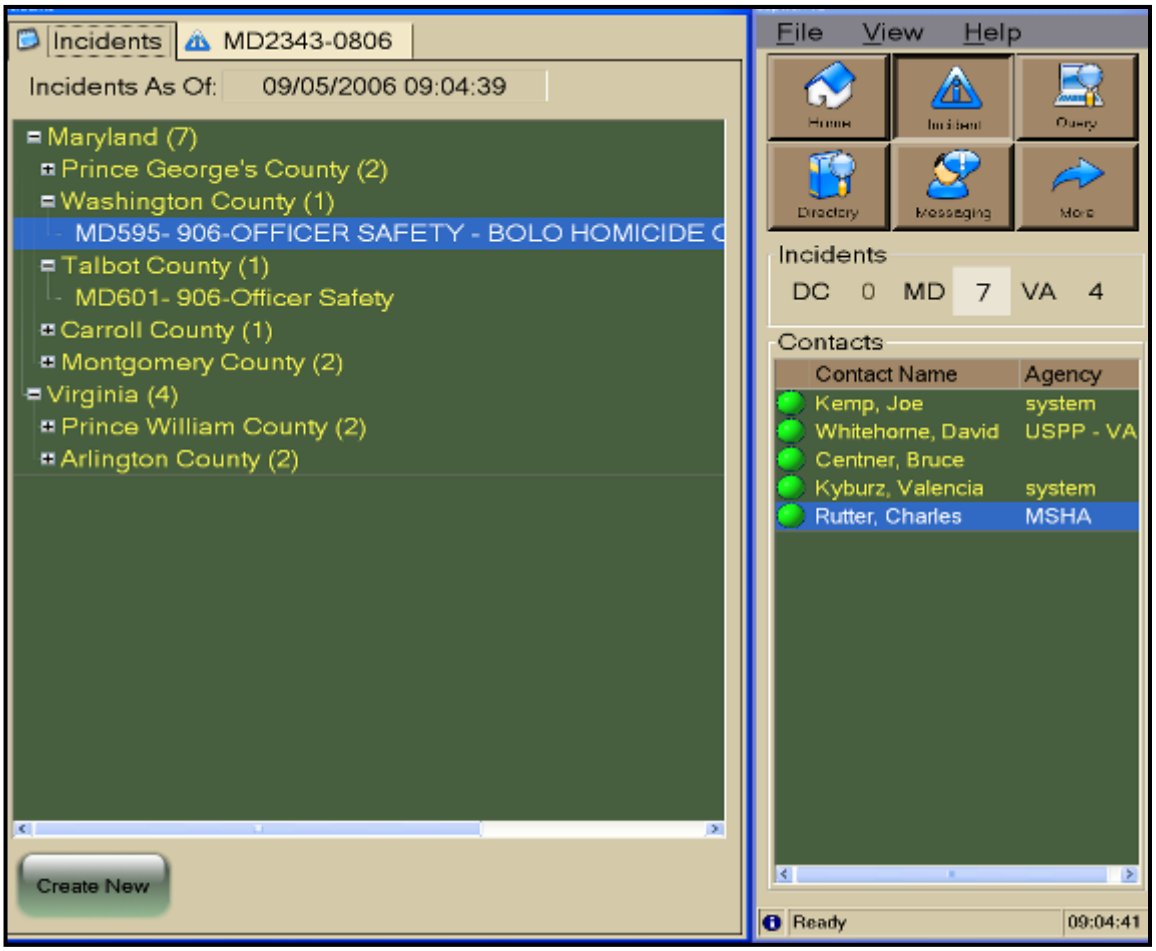


Figure 7. Incident Search Screen.

Once the user has joined the incident, he/she can view and exchange messages with other users that are involved in the incident. This can be done by selecting the "messaging" button from the main screen. This capability enables users to share real-time messages and obtain incident specific information from other users or agencies. Specifically, once a user joins an incident, he/she is then able to view the details, description, and location of the incident.

In an effort to eliminate multiple duplicate logs pertaining to a single incident, the CapWIN staff encourages users to check open incidents to determine if a log has already been created by another user. The incident information screen, including the "Join" incident button, is shown in **Figure 8.**

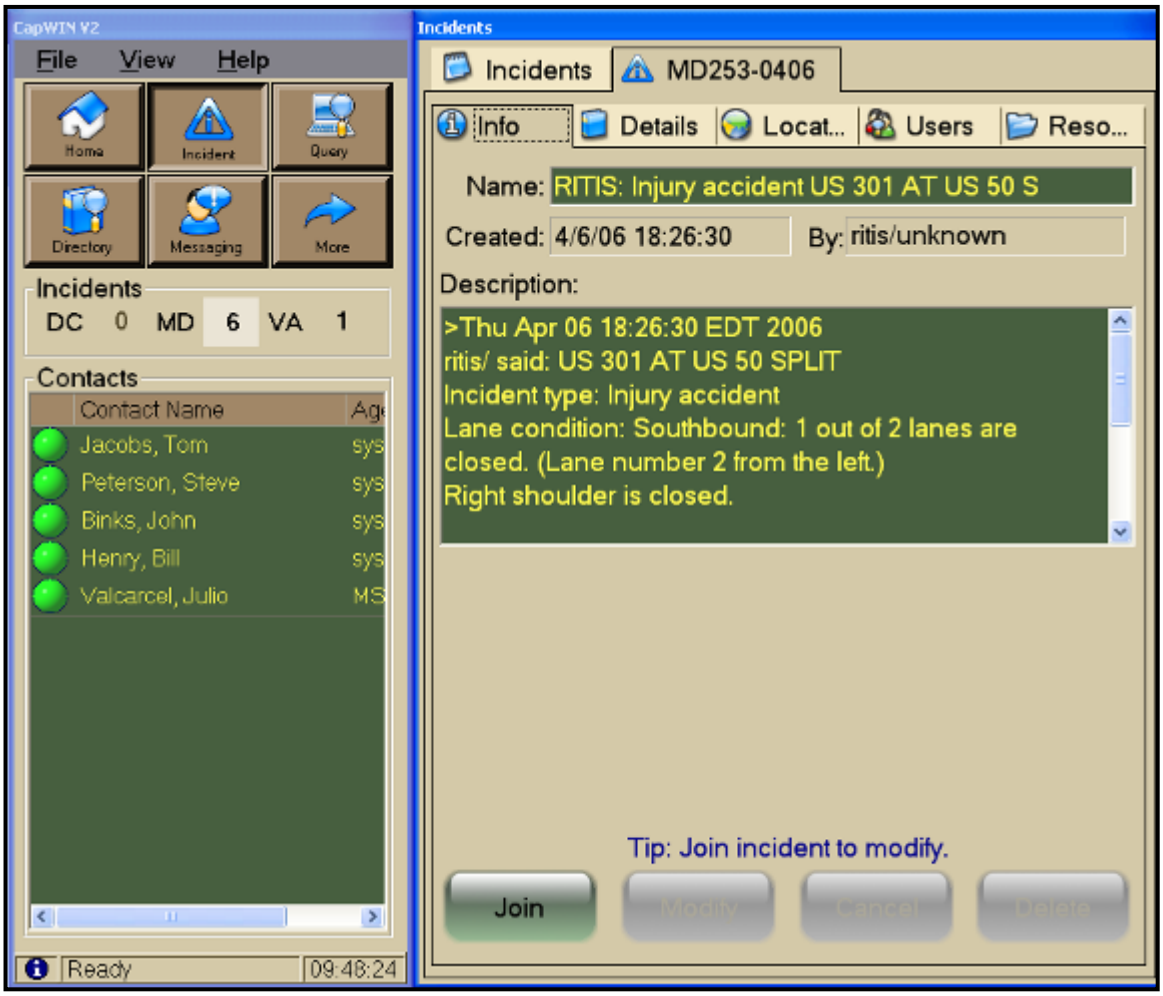


Figure 8. Incident Information Screen.

One of the updated features of the CapWIN V2 incident management component is the addition of the resources tab. This feature enables users to append files to an incident log and share them with other participants who are involved with the incident. These files, for instance, may include photographs, maps, documents, video/sound bites, a missing person broadcast alert, and other useful information. This feature serves as an important tool for sharing critical information throughout the duration of the incident. For example, a police officer may upload a photograph of a suspect who may be wanted or pursued by other law enforcement agencies or a document with look-out information. This photo or document can then be viewed by all CapWIN users who are participating in the incident. A sample image of the resource tab highlighting a missing person broadcast is shown in **Figure 9**.

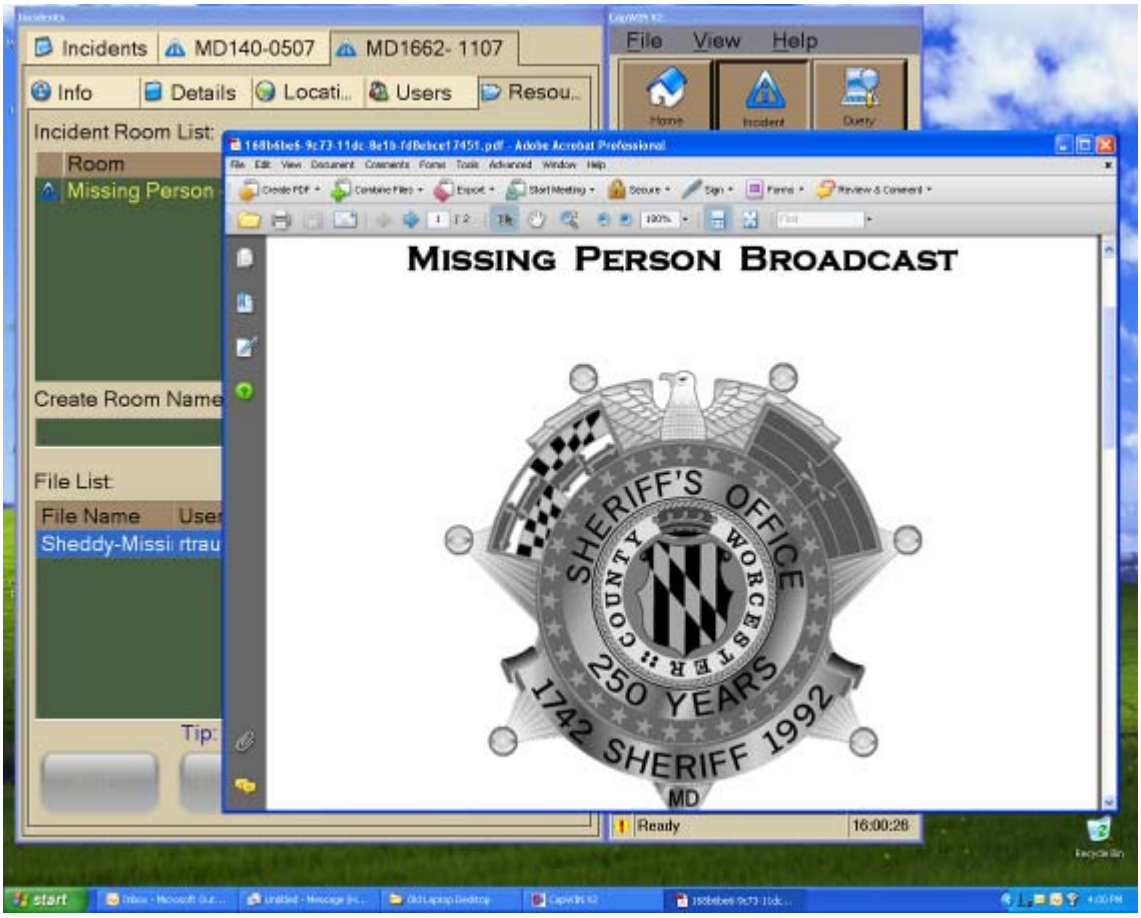


Figure 9. CapWIN V2 Resource Feature.

Based on feedback from CapWIN management and end-users, it is evident that the CapWIN V2 resources component is a critical tool for aiding in incident management and response activities. This feature enables responders, both law enforcement and transportation, to append and view supplementary incident information in a real-time environment. Ultimately, this level of functionality greatly improves the decision making capabilities and quality of information available to responders.

2.2.6 Messaging Capabilities

Adequate communication is a vital function during any incident management or response activity. As such, the CapWIN development team has provided users with several mechanisms for sharing data and messages with one another. As mentioned throughout the proceeding paragraphs, CapWIN V2 users have a variety of methods for transmitting messages with one another.

One of the key methodologies for communication between users is the ability to open or create chat rooms. Typically, the chat rooms are opened before or during an incident. The intent of the chat rooms is to enable users to exchange real-time messages or information with one another. This capability improves information flow between the participating agencies and aids with the overall incident management or response activities. Chat rooms are often used when a large group of users, possibly

an entire agency, wish to communicate with one another. The chat rooms provide an opportunity to collectively share ideas, information, and messages as they relate to a particular incident or event.

Two types of chat rooms can be created, a public chat room (open to all users) and a private chat room (open only to users who are requested or invited). Private chat rooms are often used if sensitive or proprietary information is being communicated between the users. To view the existing chat rooms, users must select the “rooms” tab from within the main messaging screen. In addition, the “rooms” tab is also where a user can create a new chat room and determine if it will be public or private. A representative sample of the messaging screen is shown in **Figure 10**. After a user has joined a chat room, they are then able to send messages or communicate with other users.

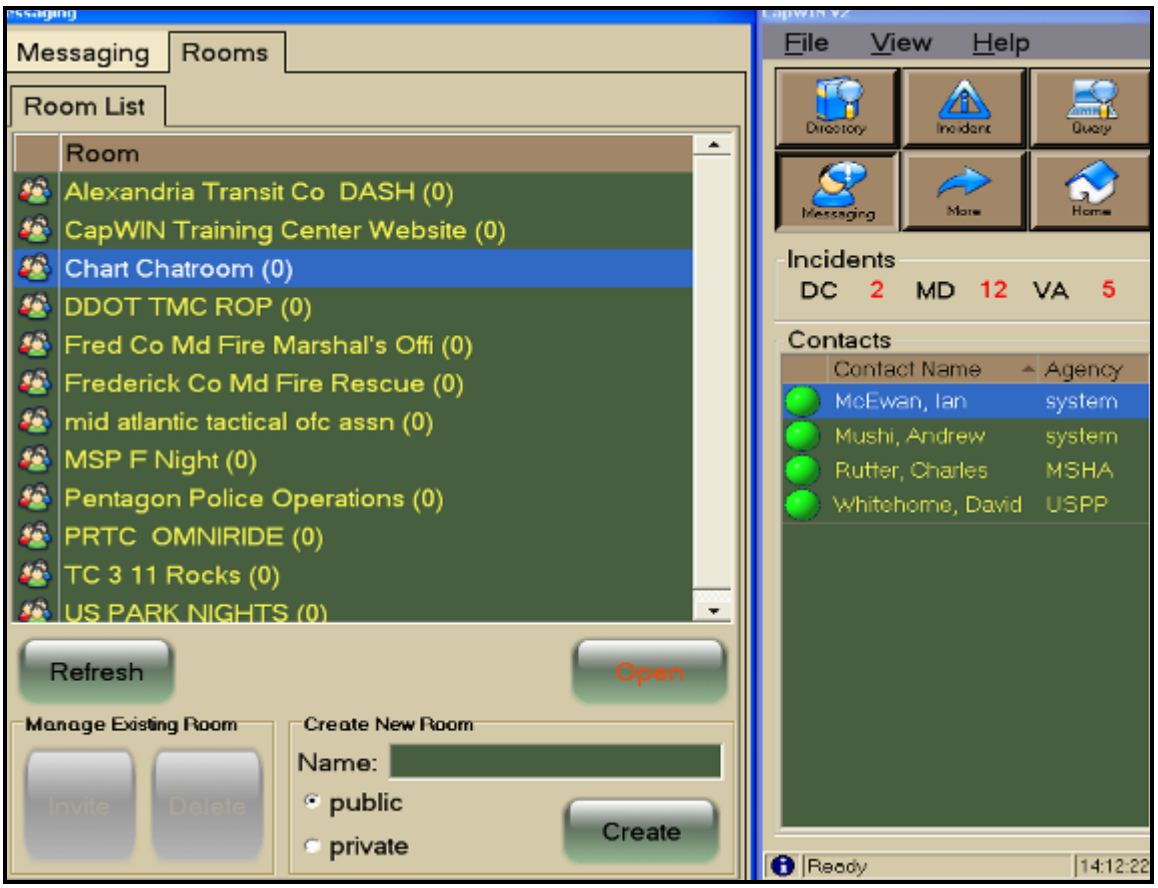


Figure 10. CapWIN V2 Messaging Screen.

If a user does not want to join a chat room, they still have the capability to transmit messages to other users. In addition to chat rooms, CapWIN V2 provides instant messaging capabilities to all users. This feature enables direct, one-on-one communication between users without having to enter a chat room. After a user selects the name or icon (highlighted green if they are currently online) of another individual they wish to communicate with, a messaging window will be displayed. Once the messaging window is displayed, users are able to send and receive messages from

one another. Representative samples of the instant messaging screens are shown in **Figure 11**.

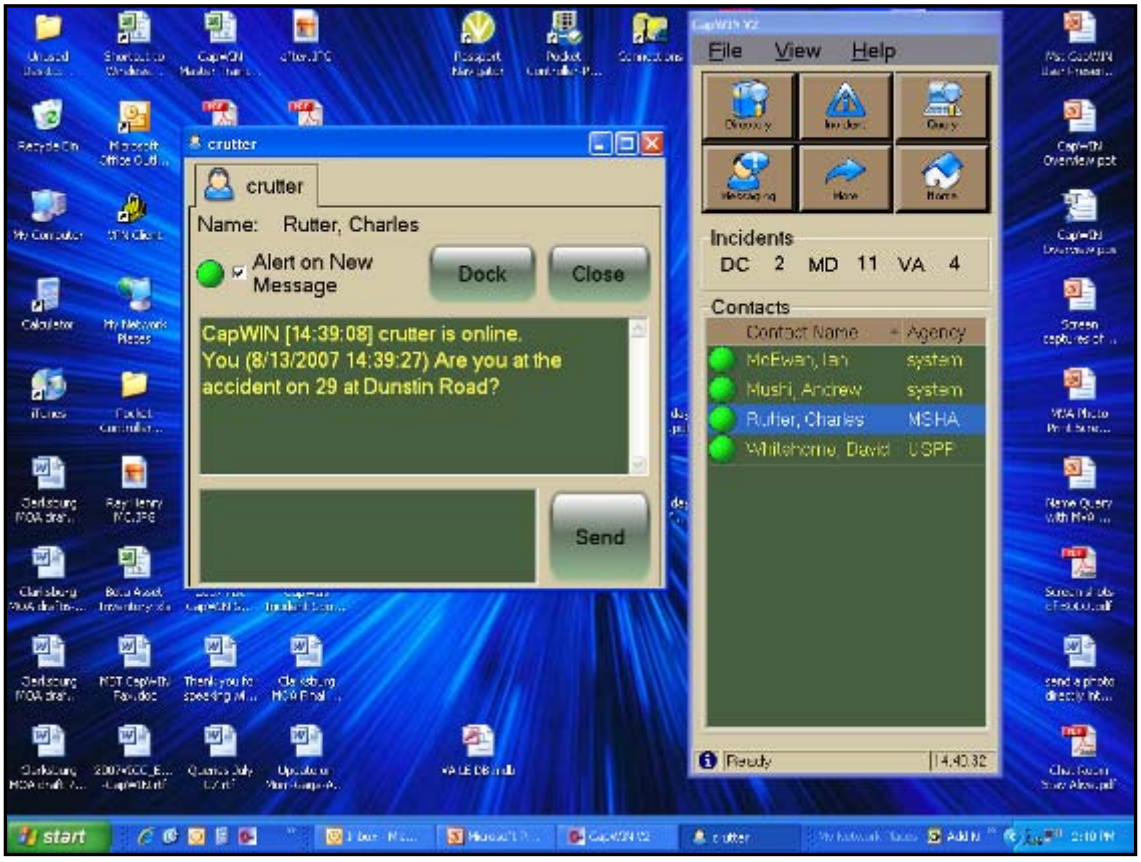


Figure 11. CapWIN V2 Instant Message Screens.

Similar to all of CapWIN V2's interface screens, the instant messaging windows are located on the user's desktop and can be customized with respect to size and location. The instant messaging features provide a more personalized form of communication between end-users.

2.2.7 Online Directory

The CapWIN V2 system has a built-in directory that can be accessed online by users. The online directory contains important information about each user and their specialized skills. In addition, the directory contains contact information for all CapWIN users, including phone, email, and pager access numbers. One of the unique aspects of the online directory is the ability to search the specialized skills of each CapWIN user.

The directory contains an extensive list of searchable skills, including languages spoken, medical training or certification, Hazmat training or certification, and many other types of capabilities. During a traffic accident, for example, a responding law enforcement officer may encounter an accident victim who only speaks Spanish. If the responding officer does not speak Spanish, he/she may use the online directory to help identify and contact an individual who does. As shown in **Figure 12**, a user can search

the online directory by first and last name, user ID, agency, unit, state, skill, and discipline.

Figure 12. CapWIN V2 Online Directory.

The expanded search capabilities of the CapWIN V2 online directory enable users to quickly and accurately identify other users who may aid in the incident management or response activities. The online directory also displays users that are currently online and contains a section with the user's personal contacts. If a user is currently online, a green ball icon will illuminate beside their name and agency name. Conversely, if a user is not online, the icon beside the individual's name will remain white.

2.3 CapWIN Common Field Reporting System (CFRS) ITS Project

As noted on the CapWIN Website,

> …the Capital Wireless Information Net (CapWIN) has been awarded a total of $3.2M in grant funding to implement an Intelligent Transportation Systems (ITS) solution for first responders in Virginia, Maryland, and the District of Columbia. This grant includes funding from the Federal highway Administration (FHWA) as well as matching contributions from

the Virginia Department of Transportation and the Maryland State Highway Administration.[18]

These grant funds are being to support the CFRS ITS Project. The goals of the project are to "improve incident coordination tools and processes; increase data sources to support/create incidents; automate exchange of data between centers and the field; and to demonstrate new technologies."[19]

The intent of the project is to enhance existing applications (primarily CapWIN's mobile computing software) and system interfaces (primarily between CapWIN and the Regional Integrated Transportation Information System [RITIS]) to achieve the project's goals.

The following figures demonstrate the existing gap that the CFRS ITS Project is intended to address. **Figure 13** shows the current information flows between RITIS and CapWIN.[20] As can be seen, while CapWIN is able to extract information from RITIS, this is a one-way information flow.

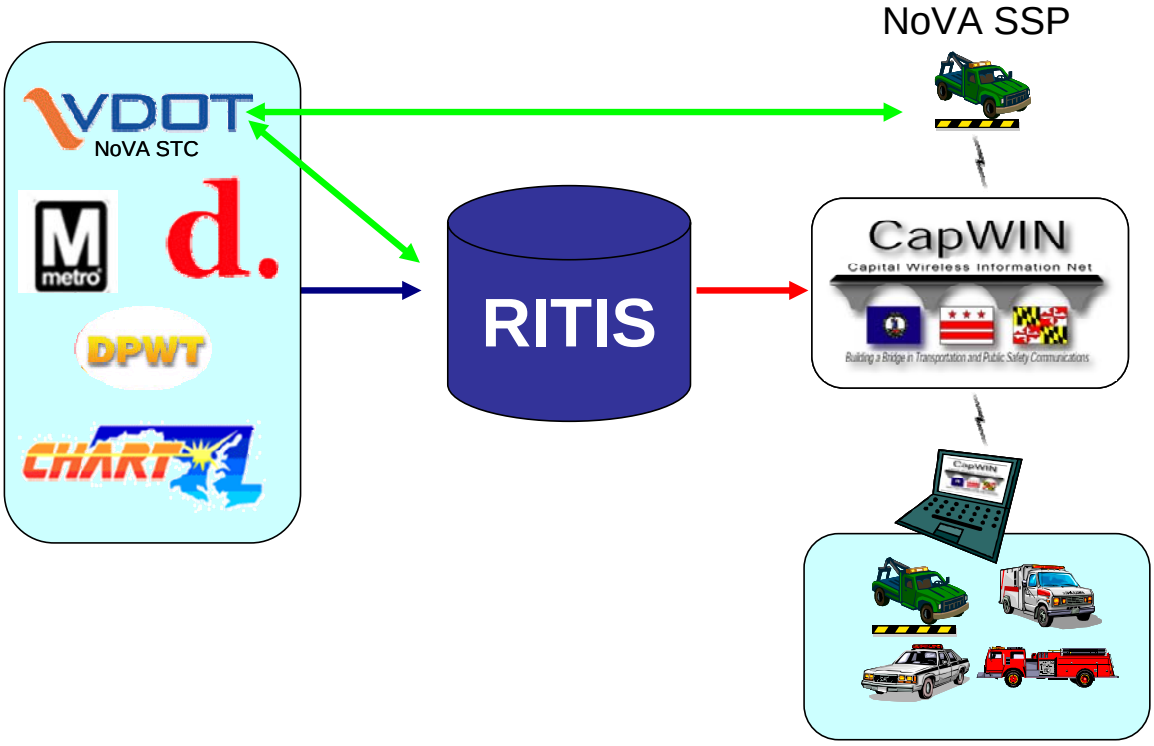


Figure 13. "As Is" Information Flow.

Figure 14 shows the proposed information flow to be developed through the CFRS ITS Project.[21] As can be seen, the intent of the project is to enable automated data exchange and communication between traffic management centers and first

[18] Source: <http://www.capwin.org/>, last accessed January 30, 2008.
[19] CapWIN CFRS ITS Project - Project Work Group Meeting Minutes, November 11, 2007.
[20] UMD CATT and CapWIN, CFRS Concept of Operations Document, p. 5.
[21] OP. CIT., p. 7.

responders in the field. CapWIN and RITIS have already initiated preliminary data exchange and integration services and CFRS represents the following:

> …an extension of CapWIN's/RITIS' current field client and data integration services by enhancing and expanding the type of information available to be accessed and documented by field users and by enhancing the exchange of data between field and center-based users by enabling automated data exchange between CapWIN and RITIS services. CFRS, therefore, represents an operational and technical enhancement of both the CapWIN and RITIS programs.[22]

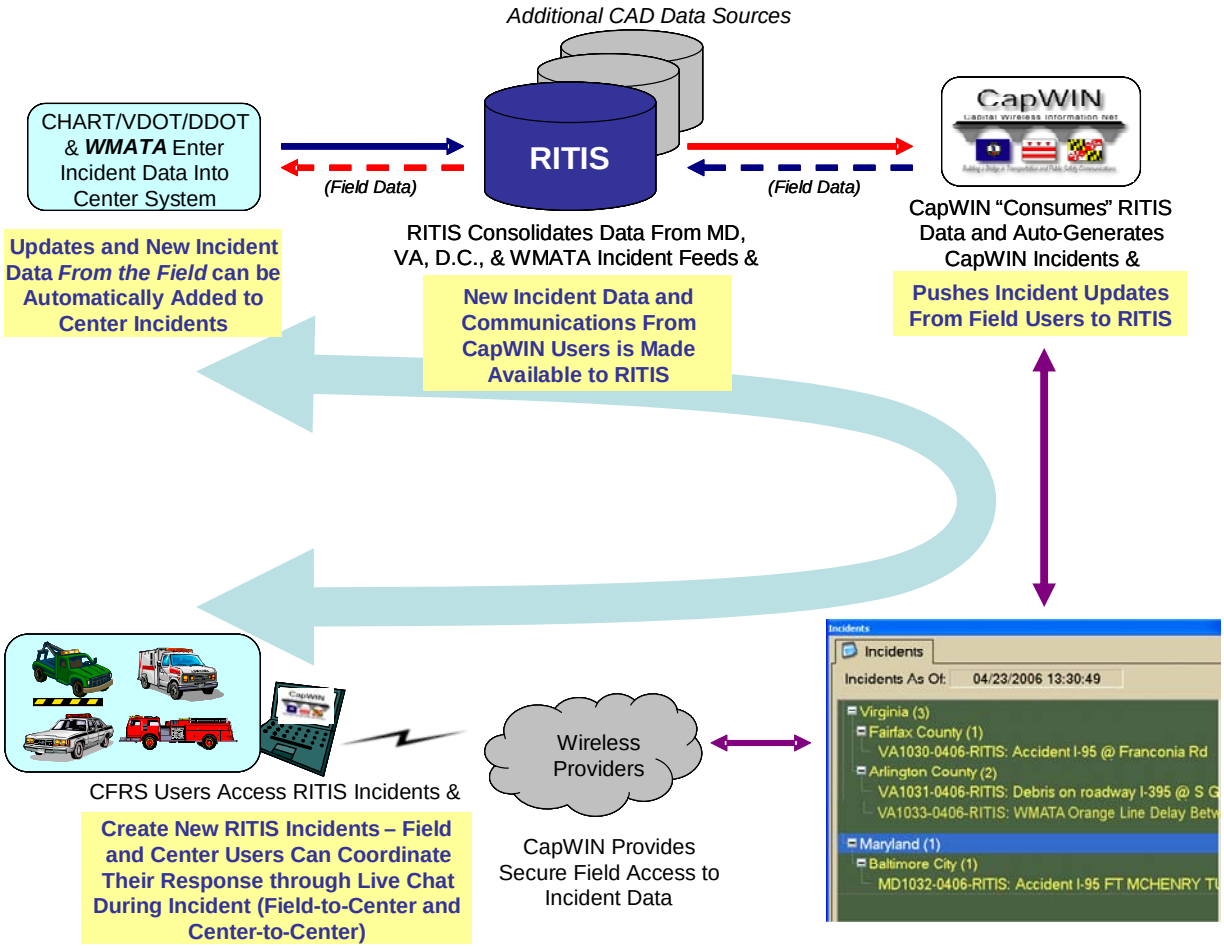


Figure 14. Proposed Project Information Flow.

[22] UMD CATT and CapWIN, CFRS Concept of Operations Document, p. 6.

3. EVALUATION OVERVIEW

3.1 Original Evaluation Goals

Evaluation goals were developed during Phase II to support the evaluation, and data collection was designed to collect the information needed to establish a project baseline that would enable the assessment of after project impacts. The three goals developed and the supporting Phase II activities undertaken in support of these goals are summarized in the following subsections 3.1.1 through 3.1.3.

3.1.1 Evaluation Goal #1 – Assess Customer Satisfaction with the CapWIN System

The Evaluation Team conducted interviews with key stakeholders from the UMD-CATT CapWIN project management team and participating agencies. The results of these interviews were used to develop a customer satisfaction baseline survey. The survey was tested at a CapWIN Beta Test training program and has since been distributed to all the CapWIN V1 application training participants.

A total of 122 completed surveys have been received. Preliminary findings indicate that existing communications systems, as expected, rely heavily on radio systems and that dispatchers play a substantial role in exchanging information within and between agencies.

The second most common communications system in use is cellular telephones. Expectations for the CapWIN project are high: a significant percentage of respondents expect CapWIN to substantially improve communications and enhance incident response capabilities.

3.1.2 Evaluation Goal #2 - Determine the Impact of CapWIN on Efficiency of Incident Response Communications, Management, and Costs

Detailed process flows of all communication channels and agencies involved in incident management and response were developed for both Maryland and Virginia. These included communications between state and local government agencies (county and municipalities). After project process flows will be developed to identify changes in type and number of communications as a result of CapWIN.

Quantitative baseline data from the Maryland Department of Transportation (MDOT), Virginia Department of Transportation (VDOT), Maryland State Police, and District of Columbia Department of Transportation (DC DOT) was collected and analyzed to support evaluation of the impact of CapWIN on the Incident Management Process. Data was collected to support three areas of interest: the seasonal impact on the occurrence of incidents in the region; the baseline incident duration and incident response times for key locations; and the difference between the incident durations between the test locations. The goal of the seasonal analysis is to determine if there is a significant difference between the occurrence of traffic influencing events in the CapWIN area due to seasonal travel and weather pattern differences.

3.1.3 Goal #3: Determine Potential Indirect Impacts of CAPWIN

Evaluation Goal #3 is intended to assess the indirect benefits of CapWIN. The strategy proposed for this goal was to identify similar deployments that have produced measurable safety, mobility, and emissions benefits, and to summarize these findings. Based on the CapWIN implementation results and the "after" data collected, these findings would be used to infer the extent to which CapWIN produced similar benefits. To identify measures of effectiveness (MOEs) for these indirect benefits of CapWIN implementation, the Evaluation Team conducted a literature review to identify past studies and research that show a relationship between incident response time and safety, mobility, and emissions. These benefits include tangible and intangible improvements in safety, mobility, and emissions reductions and an additional indirect benefit identified by the Evaluation Team during the literature review, as follows:

- **Safety.** The primary safety benefit is reduction in secondary crashes (those crashes that take place within a defined timeframe and distance with respect to the initial crash or incident). The degree of benefit is directly related to the degree of incident duration reduction associated with the response synergies created with the CapWIN system.

- **Mobility.** The mobility benefits include the reduction in duration of the congested period and the reduction in the associated travel delay components for those travelers that must deal with the congested state. A significant intangible mobility benefit affecting both incident response time and delay to the traveling public is the reduction in the effects of speed changes in and around an incident.

- **Emission Reductions.** The traveler delay and emissions benefits include the potential to reduce the delay and emissions associated with congested states that accompany freeway incidents. Reduction in incident duration reduces idle time, and efficiency in traffic management reduces the number of speed changes made by travelers on the primary route (and on diversion routes if arterial traffic management plans are implemented).

A component of the modification to the Statement of Work approved in September 2007, specifically the restructuring of Tasks 2 and 3, was a modification to Evaluation Goal #2. The proposed modification reflected the decision to conduct three case studies instead of a quantitative impact assessment of the use of CapWIN at four beta test locations. Evaluation Goal #2 and the supporting evaluation strategy were revised as described in section 3.2.

3.2 Modified Evaluation Goal

3.2.1 Modified Evaluation Goal #2 – Determine the Impact of CapWIN on Incident Response Communications, Efficiencies, and Management

Per the modification, three incident types will be selected and a case study will be developed for each incident. The case study shall create a process flow documenting each component of the incident response process. These process flows will then be analyzed to identify how the use of CapWIN improved response communications and procedures, and/or saved time. The case study shall then document how CapWIN was

used for the particular incident selected and estimate potential benefits that could be realized for all similar incidents created in CapWIN.

3.2.2 Modified Test Hypotheses

The revision to Evaluation Goal #2 further required a modification to the test hypotheses developed as part of Phase II of the evaluation. The key hypotheses developed as part of the Phase II Evaluation Strategy included:

- **1. CapWIN will result in improved Customer Satisfaction due to the reliability, functionality, and enhanced communications capabilities of the system:**
  - CAPWIN will be viewed as beneficial by end-users.
  - CapWIN will improve intra- and inter-agency and inter-jurisdiction communications.
  - The performance of the CapWIN system will be reliable.
  - End-users will be able to access CapWIN without problem.
- **2. CapWIN will improve the efficiency of incident response and management and result in cost savings:**
  - CapWIN will enable more timely notification of emergency response personnel and deployment of assets to incident scene.
  - Agencies will revise response procedures to incorporate the use of CapWIN.
  - Improvements in incident response and management will result in decreased costs for incident response agencies.
- **3. CapWIN will result in indirect benefits, such as, a reduction in secondary crashes and increased mobility during incidents.**

The amendment to the SOW and the amendment to Evaluation Goal #2 led to the following change in Hypothesis 2:

- **2. The use of CapWIN will improve incident response communications and enhance operational efficiencies:**
  - CapWIN will enable more timely notification of emergency response personnel and deployment of assets to incident scene.
  - Improvements in incident response and management may result in decreased costs for incident response agencies.

4. DATA COLLECTION AND ANALYSIS

4.1 Customer Satisfaction Surveys – "After Project"

This section of the report presents the findings of the "after project" Customer Satisfaction Surveys. This section also includes a comparison of the "before" and "after" project surveys.

In conducting the "after project" surveys, the Evaluation Team obtained contact information for CapWIN users who had completed the CapWIN training as of October 2006. The survey was posted electronically on a Web page, and each user was sent an email explaining the purpose of the survey with the Web page link. A total of 643 users were contacted, and 133 accessed the Web page and completed the survey. The "after project" survey, with all responses included, is included in Appendix IV to this report.

Of the respondents, 96 percent were from law enforcement agencies and 2.3 percent were from transportation agencies. The Maryland State Police (MSP) and Maryland Transportation Authority Police (MdTA Police) have deployed CapWIN and are using the system throughout their respective jurisdictions, hence the large percentage of state law enforcement responders. Together, the MSP (43.6 percent) and the MdTA Police (19.5 percent) accounted for 63 percent of total responses. The distribution of responders by agency is shown in **Figure 15**.

Survey Question	Answer Option	%
What type of agency or workforce are you employed with?	Law Enforcement Agency	96.2%
	Transportation Agency	2.3%
	Fire Department	0%
	Emergency Medical Center	0%
	Other	1.5%

Figure 15. Survey Responses by Agency.

Of the responders, 65 percent were from State government agencies and 20 percent from municipal agencies. Federal responders represented 10 percent of the total. The distribution of responders by agency is shown in **Figure 16**.

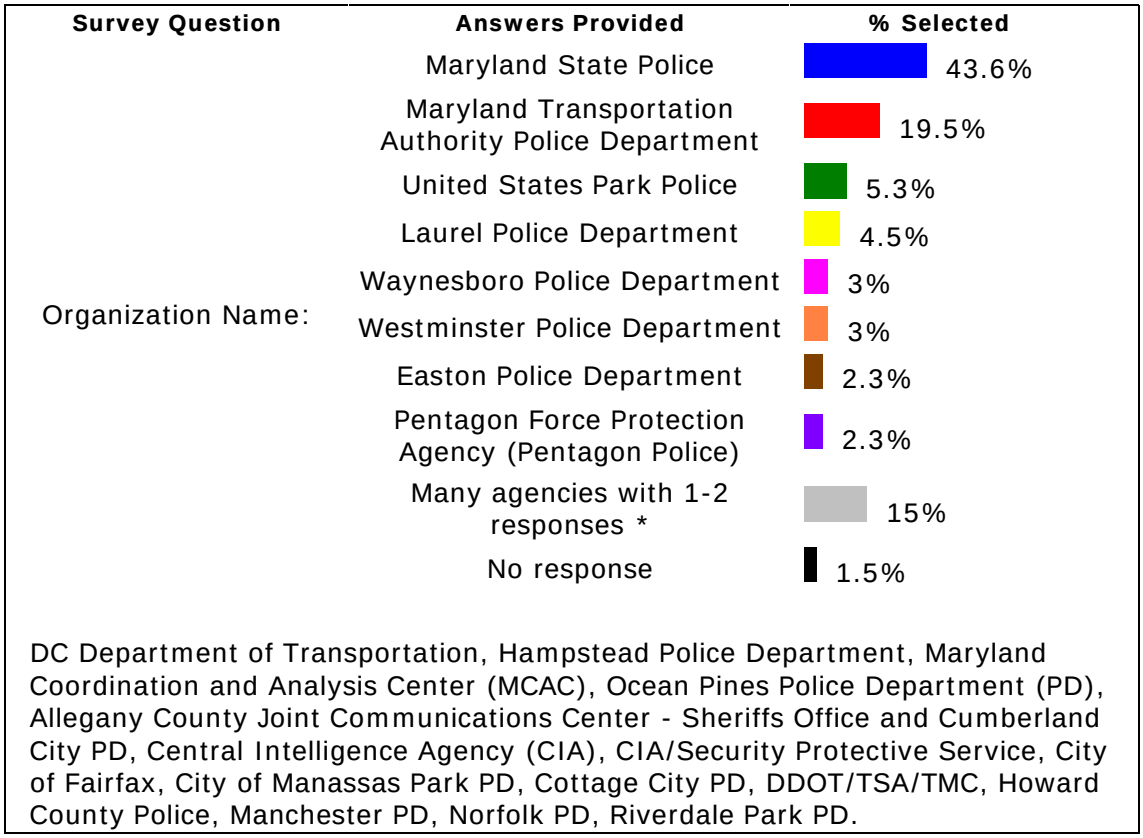


Figure 16. Survey Responses by Organization.

About 80 of all responders had 6 or more years of experience and 81 reported that they had 5 years' experience or less in their current positions. About 63 respondents indicated they had the same amount of time working with incident management.

Table 1 presents a summary of before and after responder demographics from the CapWIN Customer Satisfaction Survey.

Table 1. Summary of Responder Demographics – "Before" and "After"

Years	By Number of Respondents					
	Years on Current Job		Years – Career		Years – Incident Management	
	Before	After	Before	After	Before	After
0 to 5	28	81	6	29	24	63
6 to 10	22	31	20	30	20	10
10 to 15	20	12	21	20	6	5
16 to 20	19	7	18	6	1	5
More than 20	8		20	24		6

Respondents overwhelmingly replied that they still rely primarily on their radio systems for communications with their dispatch centers and with other units within their own agency. The respondents indicated that CapWIN is used primarily to contact other agencies when responding to an incident or emergency situation – 29 percent indicated that CapWIN was their means of communication, while 56 and 24 percent indicated that their means of communication were radio and cellular phone, respectively.

Forty percent of the respondents indicated that they had used CapWIN at least sometimes during a multi-jurisdictional incident or emergency situation, and about 41 percent indicted that they use CapWIN on a daily basis. About 62 percent indicated that they had experience some problems with using CapWIN V1, but this dropped to about 37 percent when using CapWIN V2. This reflects the effort made by the CapWIN UMD CATT Project team to address the problems identified with CapWIN V1. The majority of respondents (65 percent) have been using CapWIN since 2006, which is the year when Version 2 was first released.

Figure 17 presents the variety of purposes for which CapWIN is used.

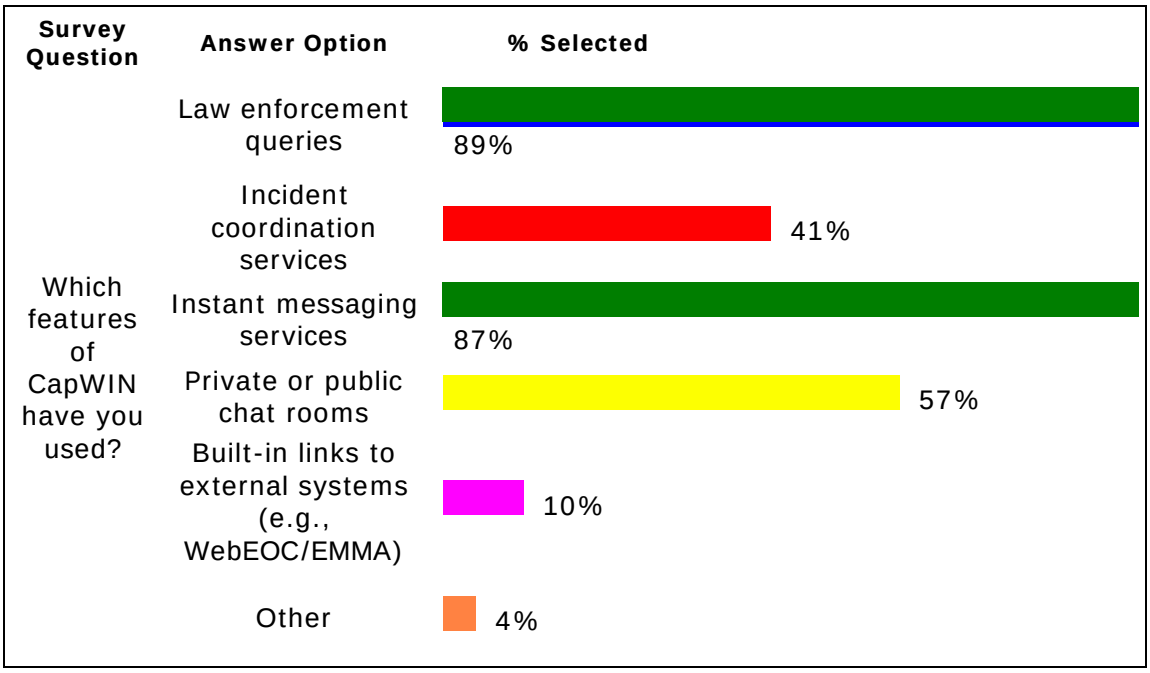


Figure 17. How CapWIN is Used.

As identified by users below, the primary benefits from using CapWIN were focused on improved intra-agency and inter-agency communications and coordination related to incidents and emergency situations.[23]

[23] This discussion does not include responses rated as neutral or not applicable/no response. Responses consolidate "Somewhat Agree" and "Strongly Agree" and also consolidate "Somewhat Disagree" and "Strongly Disagree."

- **Response:** 64 percent of respondents indicated that the use of CapWIN has improved intra-agency communications, while 9 percent indicated no improvement.

- **Response:** 54 percent of respondents indicated that the use of CapWIN had improved the overall quality of communications between agencies, while 8 percent stated that CapWIN had not resulted in improvements.

- **Response:** 56 percent of respondents indicated that CapWIN has resulted in improved intra-agency coordination, while only 8 percent indicated no improvement.

- **Response:** 49 percent indicated that inter-agency coordination had improved through using CapWIN, while 8 percent indicated no improvement.

- **Response:** 66 percent of respondents indicated that the CapWIN runs reliably over wireless communications, with 16 percent indicating that they did not believe CapWIN was reliable.

- **Response:** 36 percent indicated that CapWIN made it easier for them to get the right equipment to an incident or emergency situation, while 9 percent indicated no improvement. For this particular question, 31 percent were neutral and 24 percent had no opinion.

- **Response:** 78 percent indicated that the CapWIN system is easy to use, while 9 percent indicated that they did not find CapWIN easy to use.

- **Response:** 70 percent indicated that CapWIN helped them do their job more effectively by providing sufficient information, with 13 percent indicating that they did not feel they were being provided with sufficient information.

- **Response:** 70 percent indicated that CapWIN has reduced the time needed to respond to and clear an incident or emergency situation, while 13 percent responded that no improvement had been noted.

- **Response:** 52 percent responded that the use of CapWIN had improved incident response management, while only 7 percent responded that no improvement had been identified.

- **Response:** 69 percent responded that it is easy to create an incident chat room to facilitate information sharing, while 8 percent responded that it was not easy.

Respondents also indicated that CapWIN is easy to use at night (71 percent) and that the CapWIN interface is easy to use on laptops and mobile data computers (MDCs) that have been equipped with touch screen technologies (68 percent).

Perhaps the most impressive result form the “after project” Customer Satisfaction Survey is that some 64 percent of respondents strongly agreed that the use of CapWIN would be beneficial, and an additional 12 percent responded that they somewhat agreed. Only 8 percent of respondents somewhat disagreed or strongly disagreed. The results for this question are shown in **Figure 18**.

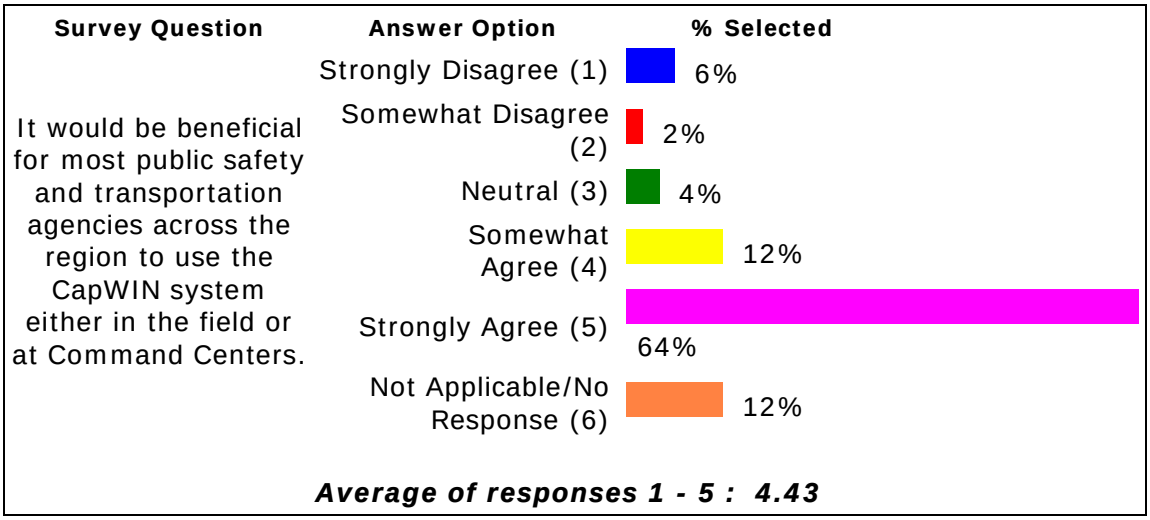


Figure 18. Should CapWIN be used by Transportation and Law Enforcement Agencies?

4.2 Comparative "Before" and "After" Customer Satisfaction Surveys

During the "before project" baseline assessment, participants in the Customer Satisfaction Survey were asked to state their expectation for CapWIN. Table 2 shows how this data on expectations compares to the "after project" responses based on actual experience with CapWIN.

Table 2. Respondents' "Before" and "After" Expectations Regarding CapWIN

Response	Answers in Percent that CapWIN will:							
	Make Me More Effective		Reduce Incident Response Time		Reduce Time Needed to Get Right Equipment		Reduce Incident Clearance Time	
	Before	After	Before	After	Before	After	Before	After
Strongly Disagree	2	5	4	5	3	3	3	5
Moderately Disagree	1		2		1		3	
Slightly Disagree	1	8	4	8	1	6	3	8
Neutral	5	4	22	5	10	31	16	5
Slightly Agree	11		18		16		17	
Moderately Agree	33	16	24	16	28	14	31	16
Strongly Agree	48	54	26	54	42	22	31	54

As shown in Table 2, respondents' actual experience with CapWIN compares well with expectations. Of particular interest is the finding that 54% of respondents strongly agreed that the use of CapWIN reduced incident and clearance time, as compared to expectations of 26 and 31 percent in the "before" baseline, respectively. Fifty-four percent of the respondents strongly agreed that CapWIN made them more effective, as compared to an expectation of 48 percent in the baseline. When all "agree" categories are compared, CapWIN still appears to have met expectations – Incident Response Time 68 percent before to 70 percent after and Incident Clearance Time 69 percent before to 70 percent after.

Where some drop off is seen in the impressions of CapWIN's overall effectives is in the question relating to the use of CapWIN making respondents more effective. While the "strongly agree" category favors the "after" over the "before", the overall comparison if 70 percent after and 92 percent before. The same is true for the use of CapWIN in reducing the time needed to get the right equipment, with a very high before expectation of 86 percent to an after finding of 36 percent. The Evaluation Team expects that this finding reflects the fact that the majority of responders to the survey were law enforcement as compared to transportation personnel, with the latter group likely to be more involved in incident clearance and getting the right equipment on scene.

4.3 CapWIN Use Statistics

Since being deployed in 2002, the number of CapWIN users has continued to grow steadily. During November of 2005, there were approximately 720 first responders from 32 agencies that were able to access CapWIN.[24] As the system continued to expand and the levels of functionality increased, the number of CapWIN user agencies has now grown to over 65. In January of 2006, CapWIN was updated to help improve the overall performance and future expansion capabilities of the system. [25]

This updated version was known as CapWIN V2. As a result of this new version, many agencies throughout the Washington Metropolitan region have chosen to use CapWIN V2 as a primary method of communication and data retrieval for their daily operations. From February 2006 to December 2007, the number of CapWIN V2 users who logged in on a regular basis has grown from 534 to 1448, and the total number of registered CapWIN users is now at 4,000. A graphical illustration of this growth can be seen below in **Figure 19**.

[24]Source: <http://www.capwin.org/index.cfm>, dated November 2005.

[25] At present, the CapWIN system does not have the capability to breakdown users by agency or queries by type of query. These functionalities will be incorporated into future system improvements and enhancements.

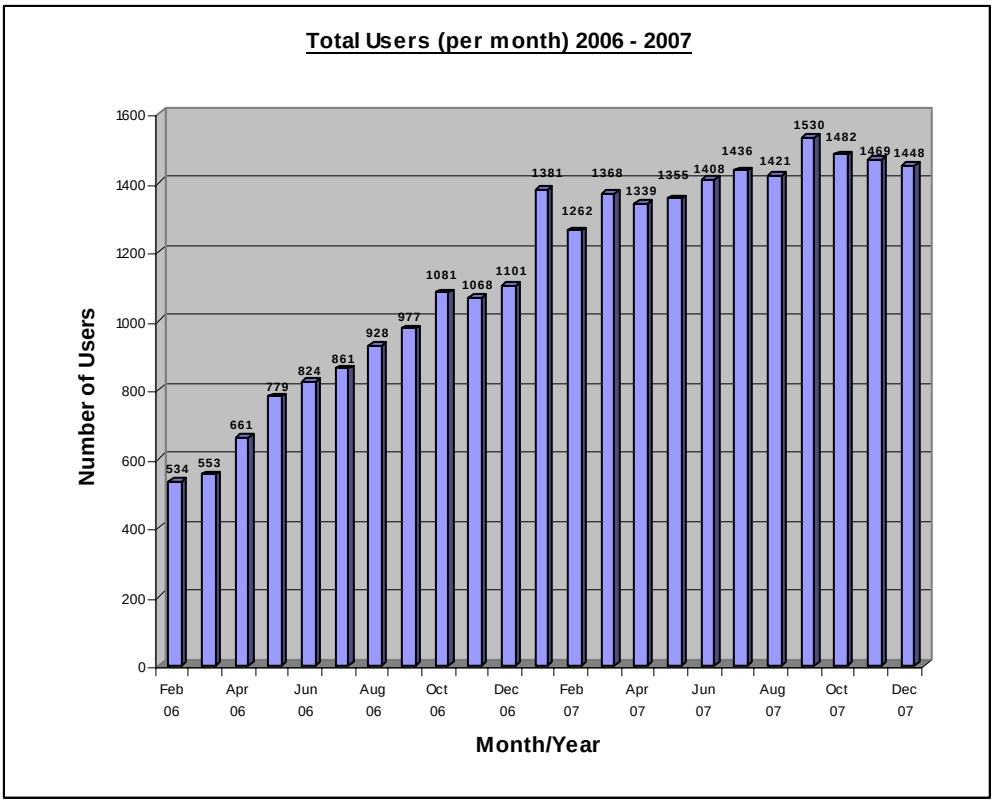


Figure 19. User Growth.

Currently, the number of users encompasses over 65 agencies from throughout the Washington Metropolitan region and surrounding areas. In addition, several agencies in Virginia and Maryland are in the process of deploying CapWIN V2 or plan to use the system in the near future.[26] The growth of the system has continued to expand from the immediate metropolitan areas to more rural areas, including agencies located in Southwestern Virginia and Maryland's Eastern Shore.

The ability of the system to meet the operational needs of the end user is a primary driver for the growth and usage of the system. In addition, the capability to use mobile computers to conduct queries on both transportation and law enforcement databases is likely a primary explanation for CapWIN's tremendous growth. As shown in **Figure 20,** the number of monthly database queries conducted by CapWIN V2 users has grown from over 42,000 in February 2006 to approximately 106,000 in December 2007. A listing of current CapWIN user agencies is included in Appendix III of this report.

[26] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=24>, last accessed January 30, 2008.

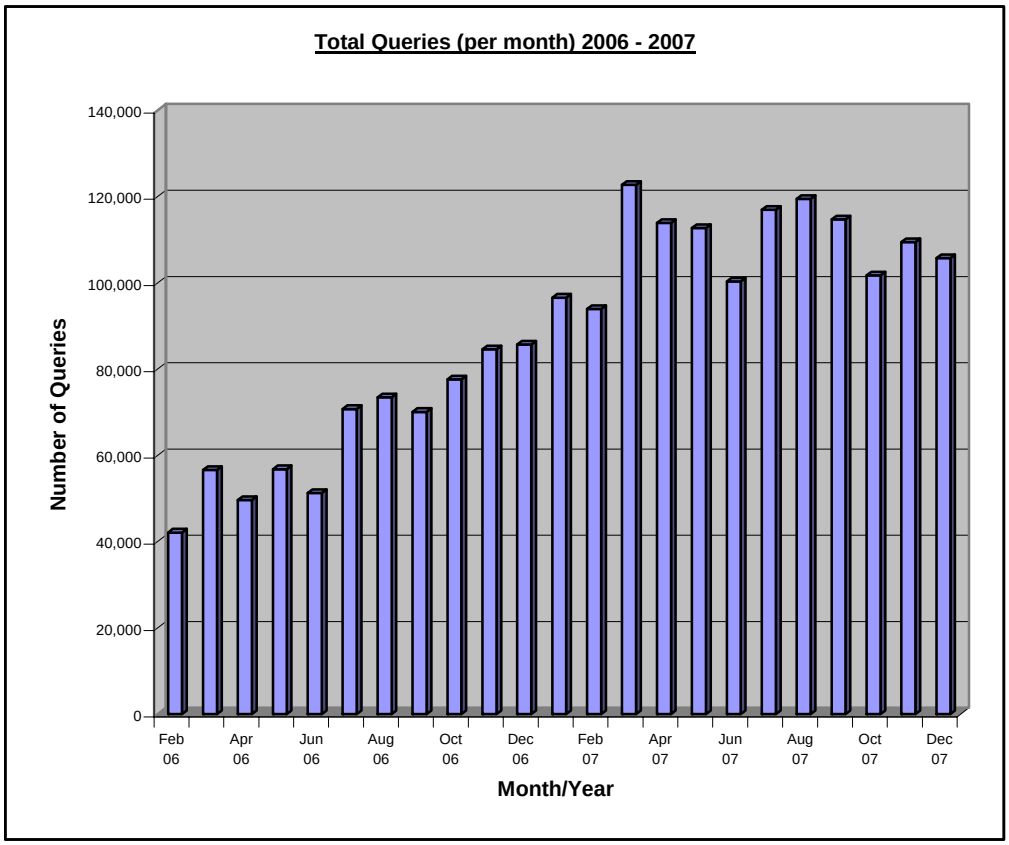


Figure 20. Database Queries Statistics.

This substantial growth illustrates the need of law enforcement officers and incident responders to gain access to remote data sources.

In an effort to depict the overall usage of the CapWIN V2 system, the Evaluation Team worked with CapWIN management to capture a "daily snapshot" of the system. This snapshot illustrates the day-to-day activity or transactions that may be seen during a typical day. It serves as a representative sample of the number of messages sent/received, law enforcement database queries, the number of incidents created, and the quantity (and type) of devices that access CapWIN V2. The CapWIN V2 "daily snapshot" is shown below in **Figure 21**.

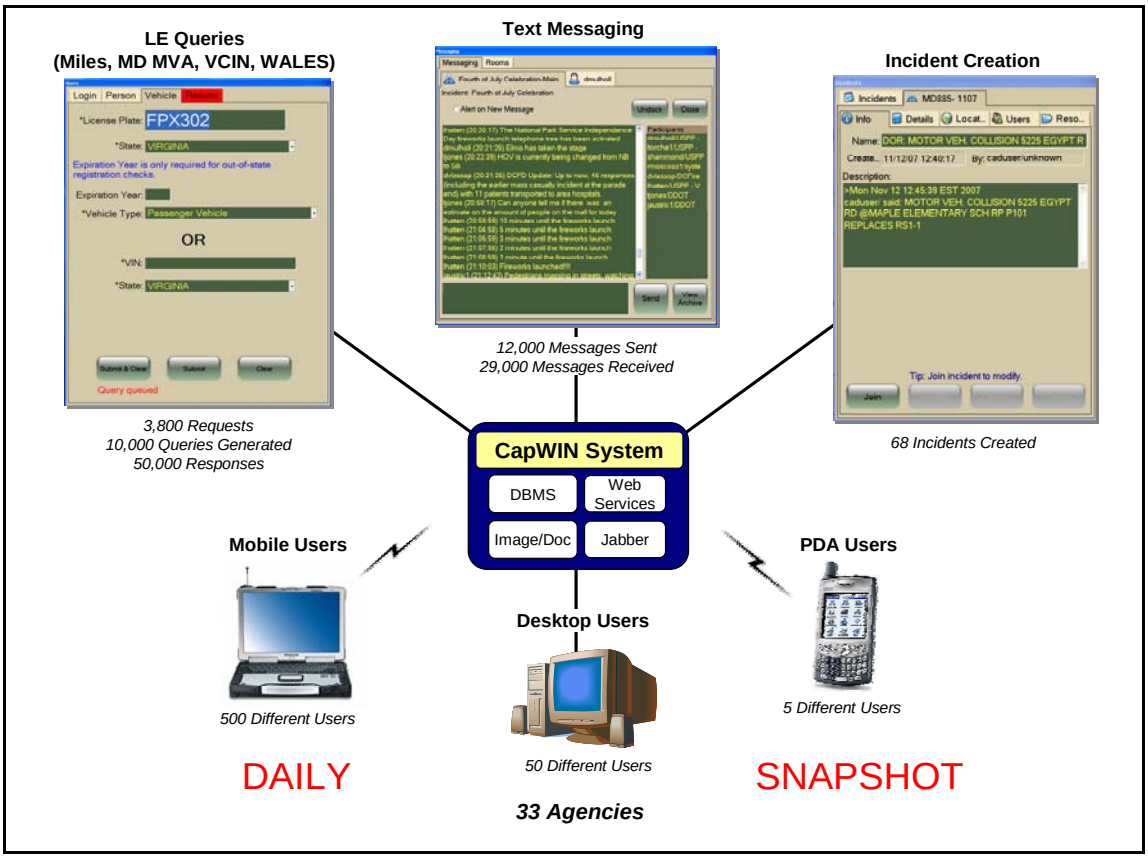


Figure 21. CapWIN V2 Daily Snapshot.

The analysis reveals that users are employing mobile, desktop, and PDA devices to access the CapWIN V2 system. As illustrated above in Figure 20, CapWIN V2 users may generate over 10,000 queries to law enforcement databases and can receive upwards of 50,000 responses. It is evident, based on the statistics above, that mobile access to remote databases is a critically important feature to CapWIN V2 users. Based on the volume of messages that are sent/received, it is apparent that users also rely on CapWIN V2's messaging component to aid with incident management or response activities. The messaging component often improves the levels of communication and coordination between disparate agencies.

As summarized by the statistics above, CapWIN V2 is a viable system that continues to grow and is extensively used by law enforcement and transportation entities to aid with incident management and response activities. As noted in proceeding paragraphs, the number of CapWIN users is expected to grow as CapWIN Management continues to develop partnerships with other transportation and public safety agencies located throughout Maryland, Virginia, and the District of Columbia.

4.4 Case Studies

CapWIN has been used for a number of planned events in the Washington, DC metropolitan area. The intent of the Evaluation Team, under the revised SOW, was to conduct focus groups with CapWIN users who had participated in these planned events to develop Case Studies in support of Evaluation Goal #2. This particular

component was not completed, however, due to a number of issues beyond the control of the Evaluation Team, in particular, scheduling a focus group at a time when participants would be able to attend.

CapWIN has posted Case Study summaries of these planned events on its Webpage which can be viewed at: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=28>.

While these summaries do not contain the level of detail that the Evaluation Team had hoped to develop, the summaries do provide a representation of how CapWIN was used and the benefits realized from using CapWIN.

4.5 Indirect Impacts

Evaluation Goal #3 is intended to assess the indirect benefits of CapWIN. These benefits include tangible and intangible improvements in safety, mobility, and emissions reductions, an additional indirect benefit that the Evaluation Team identified during the literature review.

Research by the Evaluation Team identified the key characteristics of each benefit area and summarized them as follows:

- **Safety.** The primary safety benefit is reduction in secondary crashes (those crashes that take place within a defined timeframe and distance with respect to the initial crash or incident). The degree of benefit is directly related to the degree of incident duration reduction associated with the response synergies created with the CapWIN system. A significant intangible safety benefit is reduction in roadside exposure time for incident response personnel. This time may involve waiting for additional assets to arrive (a tow truck) or for traffic management personnel to respond (law enforcement personnel arriving on site to direct traffic). Incident duration reduction and more efficient incident specific traffic control enabled through wireless communication among on-scene personnel, traffic management personnel, and approaching travelers may significantly reduce risk to response personnel.

- **Mobility.** The mobility benefits include the reduction in duration of the congested period and the reduction in the associated travel delay components for those travelers that must deal with the congested state. A significant intangible mobility benefit affecting both incident response time and delay to the traveling public is the reduction in the effects of speed changes in and around an incident. Reducing the secondary accident potential will benefit from reducing the number of and severity of speed changes involved in traveler progression past the original crash scene and may provide a more efficient response by incident management personnel attempting to get to the scene.

- **Emission Reductions.** The traveler delay and emissions benefits include the potential to reduce the delay and emissions associated with congested states that accompany freeway incidents. Reduction in incident duration reduces idle time, and efficiency in traffic management reduces the number of speed changes made by travelers on the primary route (and on diversion routes if arterial traffic management plans are implemented).

To identify MOEs for these indirect benefits of CapWIN implementation, the Evaluation Team conducted a review of the literature to identify past studies and research that have shown a relationship between incident response time and safety, mobility, and emissions. This section of the evaluation report presents the Evaluation Team's findings.

The program with the most relevance to CapWIN is the Maryland Coordinated Highway Action Response Team (CHART) program. CHART is a joint effort of the Maryland Department of Transportation, Maryland Transportation Authority and the Maryland State Police, in cooperation with other Federal, State, and local agencies. CHART's mission is to improve "real-time" operations of Maryland's highway system through teamwork and technology. This program started in the mid-1980s as the "Reach the Beach" initiative, which was focused on improving travel to and from Maryland's eastern shore. It has become so successful that it is now a multi-jurisdictional and multi-disciplinary program. Its activities have extended not just to the busy Baltimore-Washington Corridor, but into a statewide program.[27]

It is important to bear in mind that the CHART assessment used in this report is an independent evaluation of the CHART service patrols, not of the CapWIN application, and the data shown are unique to CHART. The intent is to demonstrate that improvements in incident response capabilities such as the deployment of service patrols or the use of improved communications applications such as CapWIN can reduce incident response and clearance times and provide secondary benefits.

This analysis is not intended to imply that the use of CapWIN will provide similar benefits, or that the combination of CapWIN and the CHART service patrols will provide expanded benefits. Further, the analysis is not intended to imply that CapWIN will realize the same or better benefits. Rather, the intent of the analysis is to indicate the potential that CapWIN offers for realizing indirect benefits. The CHART evaluation demonstrates that improving incident response capabilities does have a secondary benefit impact.

To accurately determine if CapWIN does in fact generate similar indirect impacts would require a study unique to CapWIN that collects and analyzes data on these indirect impacts. As noted, the intent of this discussion is to indicate that it is reasonable to hypothesize CapWIN offers this potential for indirect impacts, but the Evaluation Team is not stating that the CHART results are connected with or dependent on CapWIN.

The 2002 CHART Evaluation Report[28] reported that CHART recorded 19,062 emergency response reports for incidents and 13,752 emergency response reports for disabled vehicles. Using this date, the report estimated that incidents where CHART responded had a weighted average duration of 27.7 minutes as compared to incidents where CHART did not respond – weighted average duration of 38.8 minutes. **Table 3** below, adapted from the report, shows the average incident duration by number of lanes blocked with and without CHART response (MD SHA Service Patrol).[29]

[27] Source: <http://www.chart.state.md.us/default.asp>, last accessed January 30, 2008.
[28] Source: <http://www.chart.state.md.us/ReadingRoom/readingroom.asp>, last accessed January 30, 2008.
[29] OP. CIT., p. 40.

Table 3. Comparison of Incident Durations for Various Types of Lane Blockages With and Without CHART/SHA (minutes)

Blockage	Duration With SHA Patrol		Duration Without SHA Patrol	
	2002	2001	2002	2001
1 lane	18.5	17.0	21.1	23.9
2 lanes	37.6	32.2	36.9	69.3
3 lanes	44.1	51.7	47.3	74.1
>=4 lanes	79.7	79.7	38.5	56.4
Weighted Average	**27.7**	**28.8**	**38.8**	**50.7**

In addition, the report contained an assessment of the impact of CHART in reducing secondary incidents. Secondary crashes are generally the result of sudden speed changes within the traffic stream. Often, these changes are related to slowdowns caused by the occurrence or persistence of a primary crash. The evaluation of CHART attempted to determine the reduction in secondary crashes as a result of reduction in incident duration. Since there is no universal definition of "secondary crash", the authors of the study established temporal and spatial criteria to define a secondary crash.

> Incidents incurred within two hours from the onset of a primary incident and also within two miles downstream of the primary incident location; or
>
> Incidents incurred in the opposite direction that are within a half-hour from the onset of a primary incident and lie within a half-mile either downstream or upstream of the primary incident location.[30]

Using this definition and data provided by the MSP, the study developed the following distribution of reported secondary incidents as shown in **Figure 22**. [31]

[30] OP. CIT., p. 45.
[31] OP. CIT., p. 46.

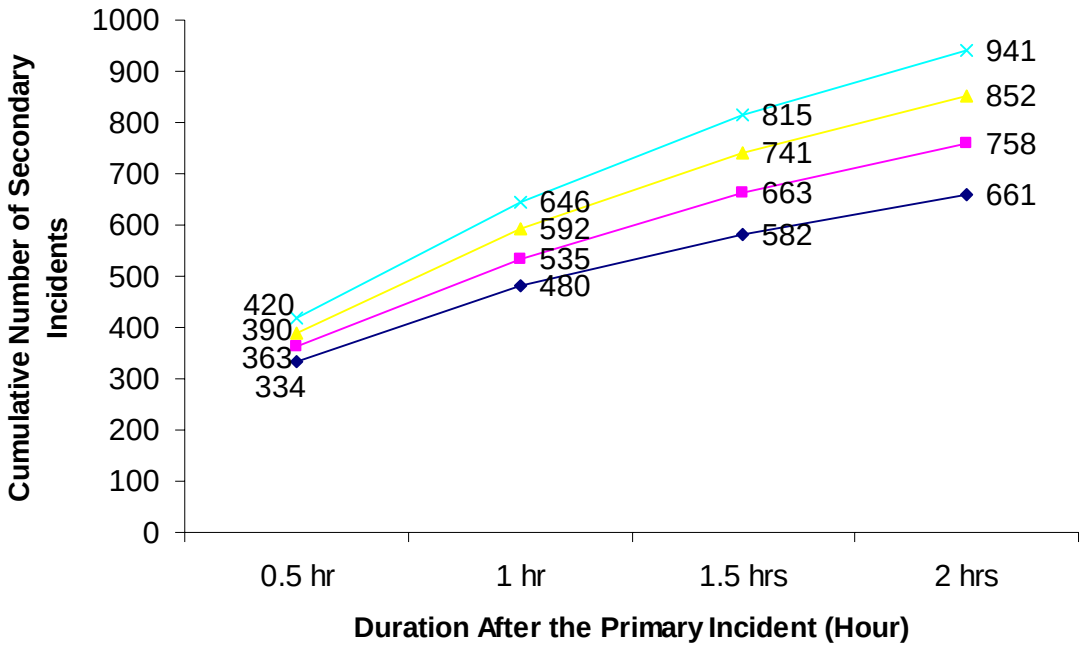


Figure 22. Distribution of Reported Secondary Incidents.

Under CHART incident management, there were 941 crashes that met the definition criteria. Each of the 625 crashes was plotted with respect to distance and time relative to the primary incident. The plot revealed that the correlation between incident duration and crashes was nearly linear providing a basis for estimating the reduction in secondary crashes that was the result of reduction in incident duration. The estimated number of secondary crashes that would have taken place without CHART (based on a 28.6% incident duration reduction) is 941/(1-..286)=1,318. The conclusion from this analysis is that CHART reduced the number of secondary crashes by 28.6% percent from 1,318 to 941, a total of 377 secondary incidents potentially reduced through the CHART program.[32]

The 2002 report also included a computation of the reduction in delay emissions in the Baltimore and Washington regions due to CHART/MSHA operations.[33] The result of the analysis, shown in **Table 4**, estimate the delay reduction for the Washington region in Year 2002 was 71,700 hours/day compared with 65,640 in Year 2001.

The delay reduction for the Baltimore region also has increased when comparing with previous year (43,597 versus 33,590). The reduction in emissions for the Washington region was estimated at 78,589 dollars/day compared with $72,180 in the previous year. For the Baltimore region, the emissions reduction was estimated to be 48,474 dollars/day in Year 2002 compared to $37,180 in Year 2001.[34]

[32] OP. CIT., p. 45 – numbers are adapted from the formula shown in the report.
[33] OP. CIT., p. 51.
[34] OP. CIT., p. 50.

Table 4. Delay and Emissions Reductions due to CHART/MSHA Operations for Washington and Baltimore Regions

Reduction Elements		Total by Chart		Washington Region		Baltimore Region	
		Year 2002	Year 2001	Year 2002	Year 2001	Year 2002	Year 2001
Annual Delay Reduction	Hours	29,977,331	25,799,000	18,642,088	17,065,000	11,335,323	8,734,000
Daily Delay Reduction	Hours	115,297	99,230	71,700	65,640	43,597	33,590
Emissions Reduction							
HC Reduction	Ton/Day	1.507	1.297	0.932	0.856	0.575	0.441
	$/Day	10,099	8,690	6,246	5,740	3,853	2,960
CO Reduction	Ton/Day	16.929	14.570	10.471	9.616	6.458	4.954
	$/Day	107,670	92,670	66,594	61,160	41,075	31,510
NO Reduction	Ton/Day	0.722	0.62	0.446	0.41	0.275	0.21
	$/Day	9,294	8,000	5,748	5,280	3,546	2,720
Total	$/Day	**127,063**	**109,360**	**78,589**	**72,180**	**48,474**	**37,190**

HC = Hydrocarbons.
CO = Carbon monoxide.
NO = Nitric oxide.

5. EVALUATION FINDINGS

This section of the report presents the evaluation findings. Section 5.1 assesses the extent to which evaluation goals and hypotheses were met through the CapWIN deployment. Section 5.2 presents general evaluation findings.

5.1 Achievement of Evaluation Goals and Hypotheses

For Evaluation Goal #1, the assessment focused on customer satisfaction, as shown in **Table 5**. Based on the results of the Customer Satisfaction Survey and the CapWIN use statistics, it is reasonable to state that this evaluation goal was achieved. CapWIN users stated that the system is providing benefits and that its deployment should be expanded.

Table 5. Findings for CapWIN Evaluation Goal #1

Evaluation Goal	Hypotheses	MOEs	Findings
#1 – Assess Customer Satisfaction with the CapWIN System.	CapWIN will result in improved Customer Satisfaction due to the reliability, functionality, and enhanced communications capabilities of the system: • CAPWIN will be viewed as beneficial by end-users. • CapWIN will improve intra- and inter-agency and inter-jurisdiction communications. • The performance of the CapWIN system will be reliable. • End-users will be able to access CapWIN without problem.	• Customer Satisfaction Surveys • CapWIN Use Statistics	The results of the analysis support this hypothesis.

Assessing Evaluation Goal #2 is problematic. As noted in **Table 6**, the Evaluation Team had intended to complete this assessment through the development of Case Studies. Absent these, only anecdotal information from the Customer Satisfaction Surveys is available.

It is reasonable to state that the anecdotal information indicates that this CapWIN has had a positive impact on incident response communications, efficiencies, and management. However, in the absence of the more detailed Case Studies, the Evaluation Team concludes that this evaluation goal has not been fully achieved.

Table 6. Findings for CapWIN Evaluation Goal #2

Evaluation Goal	Hypotheses	MOEs	Findings
#2 – Determine the Impact of CapWIN on Incident Response Communications, Efficiencies, and Management.	• The use of CapWIN will improve incident response communications and enhance operational efficiencies • CapWIN will enable more timely notification of emergency response personnel and deployment of assets to incident scene. • Improvements in incident response and management may result in decreased costs for incident response agencies.	• Customer Satisfaction Surveys • CapWIN Use Statistics • Case Studies	As noted, much of the information required to complete this assessment was expected to be obtained through the Case Studies. Anecdotal information obtained through the Customer Satisfaction Surveys indicates that responders do view CapWIN as improving the efficiency of incident response. However, the surveys lack the information necessary to fully assess changes in procedures and potential cost savings. The Case Study summaries available on the CapWIN Website indicate that CapWIN has the potential to improve incident management and response and potentially reduce costs. However, the Evaluation Team was not able to independently verify these findings.

The anecdotal information obtained through the Customer Satisfaction Surveys indicates that CapWIN use has reduced incident response and incident duration times. Using the 2002 CHART Evaluation Report and the three proxy measures identified as measures of indirect benefits – reduced incident duration, reduction in secondary incidents, and emissions reductions – it is reasonable to state that this Evaluation Gal #3 goal has been achieved, although as with Goal #2, the Evaluation Team had intended to use the Case Studies to obtain a more detailed assessment of indirect impacts. However, in the absence of the more detailed Case Studies, the Evaluation Team concludes that this evaluation goal has not been fully achieved, as summarized in **Table 7**.

Table 7. Findings for CapWIN Evaluation Goal #3

Evaluation Goal	Hypotheses	MOEs	Findings
#3: Determine Potential Indirect Impacts of CAPWIN.	• CapWIN will result in indirect benefits, such as, a reduction in secondary crashes and increased mobility during incidents.	• Customer Satisfaction Surveys • Case Studies	As noted, much of the information required to complete this assessment was expected to be obtained through the Case Studies. Anecdotal information obtained through the Customer Satisfaction Surveys indicates that responders do view CapWIN as improving the efficiency of incident response and reducing the time needed to respond to and clear incidents. This anecdotal information does support the findings of the 2002 CHART Evaluation Report on indirect benefits – safety, mobility and emissions reductions.

5.2 General Evaluation Findings

Following are the general evaluation findings:

- **Finding #1:** The CapWIN system has been successfully deployed as an operational system providing interoperable communications to the responder community in the Washington, DC metropolitan area. The CapWIN Web page[35] indicates that CapWIN currently has 65 user agencies and approximately 4,000 users. This is supported by the CapWIN use statistics, which show a high level of system use.

- **Finding #2:** The CapWIN deployment strategy has been successful in promoting the value of CapWIN. The approach taken by the UMD-CATT CapWIN Team during the Beta Test of CapWIN was to provide interested agencies with "seed" computers – that is, several computers with CapWIN installed that the agency can use to test the system. The intent of this was to promote CapWIN to the recipient agency but to allow the agency to determine if CapWIN use should be expanded and in turn make the necessary investments needed to deploy the CapWIN operating system. The success of this approach is reflected in the total number of users as well as in the fact that CapWIN is now being used on a state-wide basis by the Maryland State Police.

[35] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=28>, last accessed January 30, 2008.

- **Finding #3: The Systems Engineering Approach used by CapWIN is successfully meeting end-user needs.** CapWIN has placed a significant emphasis on user participant in all aspects of systems engineering – requirements analysis, identifying user needs, obtaining user feedback from tests. CapWIN V1 was extensively tested and emphasis was placed by the CapWIN team on obtaining user feedback. As a result, CapWIN V2 substantially changed the graphical user interfaces from CapWIN V1 and also incorporated additional features identified as useful by users. This high degree of involvement has ensured that the system is one that users will actually use and view as beneficial, which is reflected in the use statistics and Customer Satisfaction Survey results.

- **Finding #4: The CapWIN Organizational Structure represents a model for regional coordination and cooperation.** The CapWIN Board of Directors includes a wide range of stakeholder groups – elected officials, senior managers, practitioners, Federal, State, and local/municipal government. This has ensured that all sides of issues – operational, technical and programmatic – are captured. Further, bringing these stakeholder groups together to provide guidance to CapWIN has promoted regional cooperation and coordination of incident response activities, as evidenced by the anecdotal information provided on the CapWIN Webpage case studies.[36] In addition, the By-Laws adopted by the Board of Directors represent a model agreement for other jurisdictions to consider.

[36] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=28>, last accessed January 30, 2008.

6. CONCLUSIONS AND RECOMMENDATIONS

This section of the report presents the Evaluation Team's Conclusions and Recommendations for the consideration of the Joint Program Office.

6.1 Conclusions

The CapWIN system provides a technological solution for interoperable communications that strongly supports a number of major initiatives to reduce congestion and improve traffic incident management (TIM).

In May 2006, then DOT Secretary Norman Mineta introduced the *National Strategy to Reduce Congestion on America's Transportation Network* as a blueprint for federal, state and local officials to tackle congestion. Secretary Mineta stated that "… congestion kills time, wastes fuel and costs money."[37]

Mr. Mineta noted that America loses an estimated $200 billion a year due to freight bottlenecks and delayed deliveries. The Secretary added that consumers lose 3.7 billion hours and 2.3 billion gallons of fuel sitting in traffic jams and that airline delays waste $9.4 billion a year.[38]

The National Strategy identified six areas of emphasis for both reducing congestion in the short-term and building the foundation for long-term congestion relief strategies, including the deployment of operational and technological improvements to improve the management of the transportation system. The US Department of Transportation (USDOT) notes that

> …recurring congestion (non-optimized supply not meeting user demand) experienced by drivers on the road today is caused by physical bottlenecks and poor traffic signal timing. Other congestion events are caused by non-recurring factors, such as crashes and other incidents, highway construction, and bad weather. The goal of this point of the Congestion Initiative is to have transportation system managers manage these recurring and nonrecurring conditions successfully (in conjunction with a congestion pricing approach to balancing supply and demand) so that the system is optimized and more efficient…the operational and technological solutions presented in this point of the Congestion Initiative include providing traveler information, improving traffic incident management, enhancing mobility in the vicinity of work zones, improving traffic signal timing, and reliving traffic congestion at bottlenecks.[39]

The CapWIN system, as deployed in the Washington, DC, metropolitan area, strongly supports a number of the focus areas identified in the National Strategy, in particular the deployment of operational and technological solutions involving TIM. A key component of the actions identified to improve TIM is to provide integrated communications for transportation and public safety agencies. CapWIN represents

[37] Source: < http://www.dot.gov/affairs/dot5706.htm>, last accessed January 30, 2008.
[38] Ibid.
[39] Source: <http://www.oti.dot.gov/>, last accessed January 30, 2008.

such an integrated communications systems that, most importantly, is deployed and fully operational.

CapWIN's demonstrated interoperability and use by Federal, State, and local/municipal government agencies also supports the National Unified Goal (NUG) recently ratified by the National Traffic Incident Management Coalition (NTIMC). The NTMIC includes 20 national transportation, public safety, and private sector associations working together to improve traffic incident management in the United States and developed the NUG to align with the USDOT congestion initiative. The NUG encompasses five themes: safe responders; prompt, reliable incident communications; safe, quick clearance; public education for incident prevention; and accountable progress. As with the TIM component of the congestion initiative, CapWIN provides prompt, reliable communications for incident responders in support of this particular NUG theme.[40]

6.2 Recommendations

The intent of the recommendations developed by the Evaluation Team is to suggest several options for consideration on how the ITS Joint Program Office may be able to assist CapWIN with achieving the objectives identified by the CapWIN Board of Directors in CapWIN's Strategic Plan.

6.2.1 Recommendation #1: Long-Term Capital Financing for New Developments and Expansions

CapWIN is in the somewhat unique situation of receiving strong programmatic support from State and local/municipal government agencies in Maryland and Virginia as well as the District of Columbia and a number of Federal government agencies. At the same time, CapWIN is not receiving operational (i.e., funding) support. Historically, a significant percentage of CapWIN's funding was been obtained through Congressional earmarking of funds.

The recent user subscription service fees approved by CapWIN's Board of Directors are intended to fund system operations. The concern, however, is that any expansion of CapWIN applications services – development and investment costs – would need to be funded by grants and contracts as the approved fees are not adequate to cover these costs. All new agencies that join CapWIN are required to pay a subscription fee to use CapWIN services but this covers operations, not investment and development. This is reflected in **Table 8**, adapted from the Strategic Plan, that shows a substantial portion of CapWIN's revenue goals relies on obtaining additional grants/contracts. [41]

If these are not obtained, CapWIN operations are expected to continue but implementing the action items shown that will help CapWIN expand service offerings will be problematic absent funding.

[40] Source: <http://www.ntoctalks.com/articles/NUG.php>, last accessed January 30, 2008.
[41] OP. CIT., p. vi.

Table 8. CapWIN Strategic Action Plan for FY 08-FY 10

ACTION	METRICS	REVENUE GOAL
1. Expand use of PC & PDA Application • VA: Reach out to state & local agencies outside of NCR. • DC: Identify and work with lead agency(s). • MD: Maintain presence among state & local agencies. • Federal: reach out to potential users in law enforcement & emergency services fields. • Create service to support internal coordination of federal agencies across broad geographic region. • Reach out to transportation, transit, & rail agencies.	**Short Term:** • 20% increase in number of agencies using Application in VA, DC & Fed; • Expanded use among transportation, transit, & emergency services; • Steady increase in support in MD. • Grant to revise PDA Application. **Long Term:** • Contract with a federal agency to revise PC/PDA Applications to support national coordination efforts.	Fees: FY08: $350,000 FY09: $800,000 FY10:$1,200,000 Grants/Contracts: FY08 $300,000 FY09: $300,000 FY10: $500,000
2. Develop Data Access as Major Service • Synthesize incident reporting systems among law enforcement & transportation. • Create technology to support CAD-CAD data exchanges. • Increase number and variety of sources. • Establish membership fee around data services. • Enroll new members in law enforcement based on data service using their native wireless solution. • Expand the functionality of data services to serve emergency management, fire, transportation, transit, & rail agencies.	**Short Term:** • Common incident reporting system consistent with MATOC. • Web service is consumed by law enforcement agencies to access data. • Center based emergency management agencies consuming Web service. **Long Term:** • Access to discipline based interoperability efforts (e.g., LInX. WebEOC) provided by CapWIN.	Fees: FY08: $0 FY09: $75,000 FY10: $500,000 Grants/Contracts: FY08: $0 FY09: $500,000 FY10:$1,000,000
3. Establish CapWIN as a Resource Center for Innovation in Interoperability Technology • Establish program of seminars and workshops using constituent agencies' experience as resource. • Develop initiatives for federal funding that use CapWIN technical resources and skill sets as a test site for national models for information sharing. • Provide consultant services to constituent agencies on IT development projects and issues.	**Short Term:** • A series of workshops is established to support constituent agencies' IT development. • Grant proposals are submitted to DOJ & DHS. **Long Term:** • CapWIN has several contracts to assist agencies with IT development. • CapWIN is recognized and funded as a Center Innovation.	Fees: FY08: $5,000 FY09: $25,000 FY10: $35,000 Grants/Contracts: FY08: $250,000 FY09: $400,000 FY10: $500,000

Identifying a dedicated source of funding is critical for ensuring CapWIN's continued success and long-term viability. CapWIN is providing a fully operational interoperable communications system that is meeting a critical need in the Washington metropolitan area. That CapWIN is meeting this need is well documented through the customer satisfaction assessment as well as in the CapWIN use statistics.

The Evaluation Team, therefore, recommends that the ITS Joint Program Office conduct a study to develop a viable, long-term business model to support CapWIN's continued expansion and development. The Evaluation Team further recommends that the development of a business model should include:

1. The identification of sources of additional funding such as expanded user fees, grant programs, and/or seeking appropriations from participating Federal, State and local/municipal government agencies that would provide funding for capital investments for new development and expanded service offerings.

2. The development of strategies for securing additional capital funding such as obtaining support from senior managers and elected officials, obtaining support for grant applications, and/or establishing user fees that are not cost-prohibitive but support operations.

The Evaluation Team's determination is that CapWIN has successfully created one of the first multi-state, inter-jurisdictional transportation and public safety integrated wireless networks in the United States. CapWIN also provides a "communication bridge" allowing mobile access to multiple criminal justice, transportation, and Hazmat data sources. To this end, the Evaluation Team believes that identifying a dedicated source of funding to support long-term CapWIN capital investments for new developments and expansion would be of significant benefit to the national emergency responder and incident management community. CapWIN's operational status based on interoperability and open standards offers a model communications system that has the potential to meet a critical national need, the general lack of a widely-deployed, interoperable emergency responder communications system.

6.2.2 Recommendation #2: Outreach and Program Expansion

As is evidenced in the information obtained by the Evaluation Team, CapWIN's initial in-roads into the potential user community have been primarily with the law enforcement community. The CapWIN Strategic Plan notes that the transportation sector, in particular the incident management responders, represent a substantial potential user group. The Strategic Plan includes a detailed strategy on how transportation sector use can be expanded:

> CapWIN's role in transportation is well established. The challenge in the next three years will be to enhance the services it has to offer and to develop a revenue stream to support operations. The funding and program plan for FY08 are already well established. First, CapWIN will be responsible for the production component of the Regional Information Transportation Intelligence System (RITIS), working in concert with the CATT Lab, which will continue to do the development work.

> Second, the earmark from Virginia and Maryland titled the Common Field Reporting System (CFRS) will be used to integrate the transportation reporting systems in the three jurisdictions with the incident reporting system of CapWIN. This combination of efforts will materially enhance the regional and situational awareness functions of CapWIN. If CapWIN is successful in expanding its presence among Law Enforcement Have-Not agencies it can become a valuable resource of ITS centers as a source of information on law enforcement incidents on secondary roads that impact primary road management. It is recommended that CapWIN actively pursue this potential service.
>
> CapWIN should also pursue providing services to the transit agencies in the area. These services may take several forms such as supporting messaging among agencies, providing regional awareness of transportation problems, and developing coordination mechanisms. It will be necessary for CapWIN to develop a fee structure that takes account of the circumstances of transportation.[42]

The Evaluation Team further recommends that consideration be given to supporting an outreach program to assist CapWIN with implementing this strategy. The Evaluation Team further recommends that if such an outreach effort is undertaken, consideration also should be given to the New York DOT's IIMS program. Both of these systems offer the responder community working models of interoperable systems based on open standards and real-time exchange of data. Both systems are being used across multiple agencies at State and local/municipal levels of government, as well as Federal government with CapWIN, and can help other jurisdictions meet the critical need for interoperable communications to support incident management and emergency response activities. If such an outreach effort is conducted, the Evaluation Team recommends that the following issues be addressed:

- **Identify potential target user groups:** Including transportation and other potential end-user groups – Fire/Emergency Management Systems (EMS), Homeland Security, private sector, and law enforcement.

- **Identify target audiences within each user group:** Practitioners, senior managers, and elected officials.

- **Determine the appropriate message:** Target the particular needs of each audience.

- **Coordinate outreach efforts with other USDOT-supported programs:** Congestion Initiative, NTIMC, and the NUG.

- **Identify forums to target outreach activities:** ITE, AASHTO, IACP meetings and conferences.

- **Develop a variety of outreach materials:** Electronic presentations, videos, brochures, references with experience in using each system, technical points of contact.

[42] OP. CIT., 10-11.

APPENDIX I : CAPWIN BOARD OF DIRECTORS AGENCIES

The following agencies participate in the CapWIN Board of Directors: [43]

State of Maryland

- Maryland State Police
- Maryland Department of Transportation
- Montgomery County Council
- Frederick County Fire and Rescue Service
- Montgomery County Public Works & Transportation

Commonwealth of Virginia

- Virginia Department of Transportation
- Governor's Office of Commonwealth Preparedness
- Fairfax City Police Department
- Fairfax County Board of Supervisors
- Vacant

District of Columbia

- Office of Unified Communications
- Metropolitan Police Department
- Homeland Security and Emergency Management Agency
- DC Department of Transportation
- Vacant

Other/At-Large

- Metropolitan Washington Airports Authority
- United States Park Police
- Pentagon Force Protection Agency
- Maryland Transportation Authority
- Potomac and Rappahannock Transit Commission

[43] Source: <http://www.capwin.org/index.cfm?fuseaction=t3&ID=19>, last accessed January 30, 2008.

APPENDIX II: CAPWIN BY-LAWS

Capital Wireless Information Net RES/01-061307

June 13, 2007

CapWIN Board Resolution

Resolution 01-061307

Short Title: By-Laws

Adopted by the CapWIN Board of Directors at its meeting on June 13, 2007

At the meeting of the Board of Directors of the Capital Wireless Information Net (CapWIN) on June 13, 2007, the following resolution was proposed and approved by the Board:

Resolved:

WHEREAS the Board serves as the governing body of the CapWIN program with responsibility for its design, development, and direction; and

WHEREAS to further the institutional development of the program the Board requires an established set of rules for its organization and operation;

Now, therefore, let it be resolved that the Board adopts the following By-Laws as governing its mission, composition and operations; and

These By-Laws supersede all other agreements, resolutions, and statements previously adopted; and

These By-Laws are to be effective as of July 1, 2007.

Capital Wireless Information Net (CapWIN)

Bylaws
March 7, 2007

Article I
Mission, Objectives, and Strategies

Section 1: Capital Wireless Information Net (CapWIN)

CapWIN is a coalition representing the state governments of Virginia and Maryland, the government of the District of Columbia, the local governments of Virginia and Maryland, and public safety, transportation, and homeland security agencies at the local, state, and federal levels.

Section 2: Mission

The CapWIN Coalition promotes and enables interoperable data communications, access to operational data, and incident coordination among public safety, transportation, and homeland security agencies across Maryland, the District of Columbia, Virginia, and the federal government in order to strengthen their collective ability to secure the welfare of the public.

Section 3: Objectives

(a) Sponsor the development of operational policies, procedures and protocols for information sharing across disciplines, jurisdictions, and agencies in partnership with other initiatives, as a facilitator of cooperative efforts, and as a leader when no other efforts are underway.

(b) Promote the development and use of tools that will provide agency staff and field personnel with (1) authorized access to relevant information and data sources regardless of jurisdiction, discipline, or geographic boundaries; (2) the means for communications among agency centers and field operatives that are reliable, secure, and mission critical; and (3) incident information that is shared in real time among all participants across agency, discipline, and geographic boundaries.

(c) Support solutions that begin with the interoperability issues of local, state, and federal agencies operating within Virginia, Maryland, and the District of Columbia, but that are consistent with national standards, and capable of national application.

Section 4: Bylaws

These Bylaws and any regulations and procedures adopted by the Board of Directors (Board) shall govern the management and operations of CapWIN.

Article II
Powers and Duties of the CapWIN Board

Section 1: Powers and Duties

The Board and its Members shall act to further the CapWIN mission, shall ensure CapWIN's operations and programs are consistent with that mission, and shall adopt policies and procedures that promote the continued institutional integrity of CapWIN. To fulfill this role the Board has the following general powers and duties:

1. to participate with other governmental and non-governmental entities in carrying out the purpose, goals and objectives as stated in these Bylaws;
2. to create committees and delegate responsibilities;
3. to plan, coordinate, monitor, and make recommendations as may be necessary to accomplish the purpose, goals and objectives as stated in these Bylaws;
4. to oversee on behalf of CapWIN memoranda of agreement, memoranda of understanding or contracts as may be necessary to accomplish the purpose, goals and objectives as stated in these Bylaws;
5. to conduct studies as may be necessary to accomplish the purpose, goals and objectives as stated in these Bylaws and to share this information among the CapWIN participants and with others;
6. to adopt Bylaws and procedures governing its conduct;
7. to oversee a process that provides for obtaining the professional, technical, clerical and other staff support and consultants as may be necessary to accomplish the purpose, goals and objectives as stated in these Bylaws;
8. to oversee the receipt and expenditure of any funds administered in the name of CapWIN;
9. to cooperate with appropriate interstate, regional, federal, state and local governmental entities or any other person as may be necessary to accomplish the purpose, goals and objectives as stated in these Bylaws.

Article III
Organization of the CapWIN Board

Section 1: Membership

(a) Members. The Board shall consist of twenty-one Members representing governmental entities from Virginia, Maryland, the District of Columbia, the federal government, and regional authorities.

(1) Five Members shall represent the Commonwealth of Virginia. These Members shall include two representing the State Government and three representing local Virginia governmental entities.

(2) Five Members shall represent the State of Maryland. These Members shall include two representing State Government and three representing local Maryland governmental entities.

(3) Five Members shall represent the District of Columbia.

(4) Six Members shall be drawn at large. At least one of these Members shall represent a Federal government agency, and at least one shall represent a multi-jurisdictional governmental or quasi-governmental entity in Virginia, Maryland, and the District of Columbia, such as the Washington Metropolitan Area Transit Authority and the Metropolitan Washington Airports Authority.

(b) Alternates. In the event a Member is unable to attend a meeting of the Board, he/she may designate an Alternate who shall attend and carry out all of the functions of the Member, including voting on CapWIN matters. The Alternate must meet the same criteria as the original member.

Section 2: Selection of Members

(a) The Members of the Board shall be appointed by a simple majority vote of the sitting members of the Board of Directors.

(b) Representatives of the Commonwealth of Virginia. The representatives from Virginia shall be nominated by the sitting Members of the Board representing Virginia state and local government entities acting as a caucus. The caucus will take due diligence to ensure the Members represent a broad spectrum of governments and disciplines.

(c) Representatives of the State of Maryland. The representatives from Maryland shall be nominated by the sitting Members of the Board representing Maryland state and local government entities acting as a caucus. The caucus will take due diligence to ensure the Members represent a broad spectrum of governments and disciplines.

(d) Representatives of the District of Columbia. The representatives from the District of Columbia shall be nominated by the sitting Members of the Board representing the District of Columbia government entities acting as a caucus. The caucus will take due diligence to ensure the Members represent a broad spectrum of agencies and disciplines.

(e) At-Large Members. The five At Large Members shall be nominated by a committee of the Board established for that purpose. The committee will take due diligence to ensure the Members represent a broad spectrum of agencies and disciplines.

Section 3: Terms

(a) Terms of Office. All Member positions are for three year terms. Terms of office will begin with formal confirmation of nominations by the Board at its Annual Meeting. Members may be reappointed upon completion of their term of office. To ensure

continuity, the terms of office shall be staggered to ensure approximately one-third of the Members are selected in any given year.

(b) Vacancies. In the event of a vacancy in the office of a Member it shall be filled in the same manner as an original appointment and the new appointee shall serve the balance of the term of office.

(c) Removal from Office. The Board of Directors may remove a Member for Cause as specified in its operations manual.

(d) Implementation of Terms. The schedule of the terms of office following the adoption of these By Laws is specified in Addendum I.

Section 4: CapWIN Officers

(a) Officers will be selected from among the Board membership and serve for two year terms. Election shall be by vote of the Board according to the requirements of any Board action.

(b) Chair: The Chair shall act as Chief Executive of the Board with power to enter into agreements on its behalf, make appointments to the committees, and create standing and ad hoc committees as needed. All powers of the Chair shall be exercised in consultation with and approval of the Board.

(c) Vice-Chair. The Vice-Chair shall serve as acting leader of the Board in the absence of the Chair, including officiating at all Board functions, assuming signatory powers on behalf of the Board, and supervising the activities of the Executive Director. The Vice-Chair shall ensure a record of all Board proceedings is maintained.

(d) Treasurer. The Treasurer shall review the financial records of CapWIN to ensure their consistency with sound financial practices, including a regular audit of accounts.

Section 5: Voting

Each Board Member shall have one vote. Actions shall be taken by the Board upon a simple majority of the vote when a quorum is present. Changes in the Bylaws shall require an affirmative two-thirds (or super majority) vote of the Board. Participation, including voting, in a meeting of the Board may be in person, by telephone, or by video conference. If it is determined by the Officers that a face-to-face meeting is impractical or not necessary then a vote may be taken by telecommunication or by mail.

All votes of the Board shall be recorded, shall become part of the official record of the Board, and shall be made available to the public upon request.

Section 6: CapWIN Operational Staff

The CapWIN Board shall appoint and employ by contract or agreement with another entity an Executive Director. The Executive Director is responsible for planning, organizing, directing, and coordinating all technical and administrative activities of CapWIN. The Executive Director shall select and appoint all employees. The Executive Director may contract for goods and services and shall establish and maintain such banking arrangements and financial accounts as necessary in the name of CapWIN, certify vouchers and disburse funds within the limits of the annual budget. The Executive Director shall have the authority to adjust appropriation accounts or sub-accounts within the limits imposed by the Board of Directors.

Section 6: Budget and Fiscal Policy

(a) The fiscal year for CapWIN will be July 1-June 30.

(b) The Executive Director shall prepare a proposed Annual Budget, which shall be submitted to the Board for its approval in the final quarter of the fiscal year.

(c) The Executive Director shall present a financial summary for the previous year of the CapWIN program within the first quarter of the Fiscal Year.

Article IV
Meetings & Hearings

Section 1: Meetings

Meetings of the CapWIN Board shall be announced in advance in a manner approved by the Board.

Meetings shall be held at any time or place within Virginia, Maryland, or the District of Columbia.

(a) Annual Meeting. An Annual Meeting shall be held in the fourth quarter of the fiscal year for the express purpose of formal nomination and selection of Officers.

(b) Budget Meeting. A meeting shall be held in fourth quarter of the fiscal year for the express purpose of taking action on the annual budget to begin July 1.

(b) Other Business Meetings. Other meetings shall be held at any time upon the request of the Chair of the Board.

(c) Notice of Business Meetings. Board Members shall be given notice of time and location by the Executive Director at least one week in advance of the meeting, together with a copy of the agenda and all available pertinent information.

(d) Minutes. The Executive Director shall make and distribute copies of the minutes to each Member within a reasonable period of time following each meeting.

Section 2: Quorum

A quorum of the Board shall be defined as a simple majority of the elected Board Members or their designated Alternates.

Article V
Amendments & Waivers

Amendments to these Bylaws shall require an affirmative vote of two-thirds of the Members or their designated Alternates at a meeting for which written notice was given of the meeting and the proposed changes to the Bylaws. The rules contained in "Robert's Rules of Order," Revised Latest Edition, shall govern the Board in all cases to which they are applicable, and in which they are not inconsistent with these Bylaws and Rules of Procedures adopted there under.

APPENDIX III: CURRENT CAPWIN USERS

The following agencies are currently enrolled in CapWIN, using the system for daily operations or piloting/evaluating CapWIN:[44]

District of Columbia

- District Department of Transportation
- District Emergency Management Agency
- District Fire/EMS

Maryland

- Allegany County Joint Communications Center
- Allegany County Sheriff s Office
- Carroll County Sheriff's Office
- Cecil County Detention Center
- Cecil County Sheriff's Office
- Cottage City Police Department
- Cumberland City Police Department
- Dorchester County Public Safety
- Dorchester County Sheriff s Office
- Easton Police Department
- Forest Heights Police Department
- Frederick County DFRS
- Hampstead Police Department
- Howard County Police Department
- Hyattsville City Police Department
- Laurel Police Department
- Laurel Emergency Services Management
- Manchester Police Department
- Maryland Coordination and Analysis Center
- Maryland Emergency Management Agency
- Maryland State Fire Marshals Office
- Maryland State Police
- Maryland State Highway Administration
- Maryland Transportation Authority Police
- Montgomery County Police Department
- Mount Rainier Police Department
- Ocean Pines Police Department
- Princess Anne Police Department
- Prince George's County Public Safety Communications
- Riverdale Park Police Department
- Westminster Police Department

[44] Source: <http://www.capwin.org/index.cfm?fuseaction=t2&ID=24>, last accessed January 30, 3008.

Virginia

- Arlington Police Department
- Charlottesville Fire Department
- Fairfax County Police Department
- Fairfax City Police Department
- Franklin Police Department
- Galax Police Department
- Manassas Park Police Department
- Norfolk Police Department
- Northern VA Community College Police
- Virginia Department of Transportation
- Virginia State Police
- Waynesboro Police Department
- Waynesboro Fire Department
- Waynesboro Emergency Management

Federal

- Central Intelligence Agency Police
- Pentagon Force Protection Agency
- United States Capitol Police
- United States Marine Corps
- United States Park Police
- Texas State Guard

Regional Authority/Other

- Metropolitan Washington Airports Authority Police Department
- Alexandria Transit DASH
- City of Fairfax CUE
- Fairfax County Connector
- Montgomery County RIDE ON
- Potomac and Rappahannock Transportation Com.
- Washington Metropolitan Area Transit Authority
- W/B HIDTA
- International Association of Chiefs of Police

These agencies have indicated their intent to use CapWIN or are in the process of deploying CapWIN:

Maryland:
Bladensburg Police, Greenbelt City Police, Kent County Sheriffs, MD Dept. of General Services Police, MD Transit Administration Police, Regulatory and Enforcement Div. of MD Comptroller s Office, Sykesville Police, Taneytown Police.

Virginia:
Radford Police, Manassas City Police.

These **MARYLAND** agencies are using a Web Services interface from their existing CAD to obtain MVA photos from CapWIN: Baltimore City Police.

The following agencies have indicated their intent to use CapWIN or are in the process of deploying CapWIN: **MARYLAND**: Caroline County Sheriff's Office, Garrett County Sheriff's Office, Wicomico County Sheriff's Office, Federalsburg Police, Oxford Police Department, Taneytown Police, Elkton Police, Hancock Police, Westernport Police, Maryland Natural Resources Police and the Annapolis City Fire Marshal's Office.

VIRGINIA: Radford Police and the Prince William Park Rangers, National Park Service.

APPENDIX IV: USDOT CAPWIN USER SURVEY POST-SYSTEM DEPLOYMENT

Results as of 1/4/07 - 133 completed surveys

Survey Question	Answer Option	% Selected
1. What type of agency or workforce are you employed with?	Law Enforcement Agency	96.2%
	Transportation Agency	2.3%
	Fire Department	0%
	Emergency Medical Center	0%
	Other	1.5%

Survey Question	Answer Option	% Selected
2. What level of government is your agency affiliated with?	Federal	10%
	State	65%
	County	2%
	Municipal	20%
	Other	3%

Survey Question	Answers Provided	% Selected
3. Organization name:	Maryland State Police	43.6%
	Maryland Transportation Authority Police Department	19.5%
	United States Park Police	5.3%
	Laurel Police Department	4.5%
	Waynesboro Police Department	3%
	Westminster Police Department	3%
	Easton Police Department	2.3%
	Pentagon Force Protection Agency (Pentagon Police)	2.3%
	Many agencies with 1-2 responses *	15%
	No response	1.5%

* DC Department of Transportation, Hampstead Police Department, Maryland Coordination and Analysis Center (MCAC), Ocean Pines Police Department, Allegany County Joint Communications Center - Sheriffs Office and Cumberland City PD, Central Intelligence Agency, CIA/Security Protective Service, City of Fairfax, City of Manassas Park Police, Cottage City Police Department, DDOT/TSA/TMC, Howard County Police, Manchester Police Department, Norfolk Police Department, Police Department, Riverdale Park Police Department

Survey Question	Answer Option	% Selected
4a. How many years of experience do you have in your entire work career?	1 - 5	21.8%
	6 - 10	22.6%
	11 - 15	15%
	16 - 20	19.5%
	21 - 25	9.8%
	26 - 30	4.5%
	31 - 35	3.8%
	36 - 40	1.5%
	Greater than 40	0%
	No response	1.5%

Average of responses > 0 : 13.4 years

Survey Question	Answer Option	% Selected
4b. How many years of experience do you have in your current position?	1 - 5	60.9%
	6 - 10	23.3%
	11 - 15	9%
	16 - 20	4.5%
	21 - 25	0%
	26 - 30	0%
	31 - 35	0%
	36 - 40	0%
	Greater than 40	0%
	No response	2.3%

Average of responses > 0 : 5.6 years

Survey Question	Answer Option	% Selected
4c. How many years of experience do you have in Incident Management?	1 - 5	48.1%
	6 - 10	8.3%
	11 - 15	3.8%
	16 - 20	3.8%
	21 - 25	1.5%
	26 - 30	2.3%
	31 - 35	0%
	36 - 40	0%
	Greater than 40	0.8%
	No response	31.6%

Average of responses > 0 : 6.6 years

Survey Question	Answer Option	% Selected
5. What is your primary means of communication with your dispatch center?	CapWIN	0.8%
	Radio	95.5%
	Cellular Telephone	1.5%
	Mobile Data Terminal	0.8%
	Other	1.5%

Survey Question	Answer Option	% Selected
6. What is your primary means of communication with other units in your own agency while responding to an incident or emergency situation?	CapWIN	4.5%
	Radio	85.7%
	Cellular Telephone	6.0%
	Mobile Data Terminal	0.8%
	Other	1.5%
	No Response	1.5%

Survey Question	Answer Option	% Selected
7. What is your means of communication with other agencies while responding to an incident or emergency situation? **(Check all that apply)**	CapWIN	29%
	Radio	56%
	Cellular Telephone	24%
	Mobile Data Terminal	2%
	Via your dispatcher center	48%
	Other	5%

Survey Question	Answer Option	% Selected
8. Have you ever used the CapWIN System?	Yes	100%
	No	0%

Survey Question	Answer Option	% Selected
9.When did you start using the CapWIN System?	1998	0.8%
	1999	0%
	2000	0%
	2001	1.5%
	2002	0.8%
	2003	2.3%
	2004	9.8%
	2005	18.8%
	2006	65.4%
	No response	0.8%

Survey Question	Answer Option	% Selected
10. Please check which version of CapWIN you are using, or check both if you have used both.	Version 1	45.9%
	Version 2	93.2%
	Both Versions	39.8%
	No response	0.8%

Survey Question	Answer Option	% Selected
11. Have you had the opportunity to use the CapWIN system during a major planned event (e.g., Presidential Inauguration, Marine Corps Marathon, July 4th)?	Yes	19.5%
	No	80.5%

Survey Question	Answer Option	% Selected
12. Please select how often you used the CapWIN system during a multi-jurisdictional incident or emergency situation.	Always (1)	11%
	Frequently (2)	11%
	Sometimes (3)	18%
	Rarely (4)	21%
	Never (5)	39%

Average of responses 1 - 5 : 3.62

Survey Question	Answer Option	% Selected
13. On a daily basis, how often have you used the CapWIN system?	Always (1)	41.4%
	Frequently (2)	23.3%
	Sometimes (3)	19.5%
	Rarely (4)	13.5%
	Never (5)	0.8%
	No response	1.5%

Average of responses 1 - 5 : 2.07

Survey Question	Answer Option	% Selected
14. What time of day do you most frequently use the CapWIN system?	AM rush hour	16%
	noon	5%
	PM rush hour	11%
	night	21%
	other / no response	47%

Other responses include:

Survey Question	Answer Option	% Selected
15a. Have you experienced any problems (system availability, functionality, delays, etc.) with the CapWIN system (Version 1)?	Yes	21.1%
	No	61.7%
	No response	17.3%

Version 1 problems include:

Survey Question	Answer Option	% Selected
15b. Have you experienced any problems (system availability, functionality, delays, etc.) with the CapWIN system (Version 2)?	Yes	36.8%
	No	54.9%
	No response	8.3%

Version 2 problems include:

Survey Question	Answer Option	% Selected
16. Which features of CapWIN have you used? **(Check all that apply)**	Law enforcement queries	89%
	Incident coordination services	41%
	Instant messaging services	87%
	Private or public chat rooms	57%
	Built-in links to external systems (e.g., WebEOC/EMMA)	10%
	Other	4%

Survey Question	Answer Option	% Selected
17. Would you recommend any improvements or added functionality (i.e., additional databases, system features) incorporated into the CapWIN system?	Yes	96%
	No	4%

Recommendations include:

Survey Question	Answer Option	% Selected
18. The CapWIN system has improved the overall quality of communication between units within the same agency (intra-agency) during an incident or emergency situation.	Strongly Disagree (1)	5%
	Somewhat Disagree (2)	4%
	Neutral (3)	13%
	Somewhat Agree (4)	22%
	Strongly Agree (5)	42%
	Not Applicable/No Response (6)	14%

Average of responses 1 - 5 : 4.02

Survey Question	Answer Option	% Selected
19. The CapWIN system has improved the overall quality of communication between different agencies (inter-agency) during an incident or emergency situation.	Strongly Disagree (1)	4.5%
	Somewhat Disagree (2)	3.8%
	Neutral (3)	16.5%
	Somewhat Agree (4)	21.1%
	Strongly Agree (5)	33.1%
	Not Applicable/No Response (6)	21.1%

Average of responses 1 - 5 : 3.94

Survey Question	Answer Option	% Selected
20. The CapWIN system has improved the overall quality of coordination between units within the same agency (intra-agency) during an incident or emergency situation.	Strongly Disagree (1)	4.5%
	Somewhat Disagree (2)	3.8%
	Neutral (3)	18.8%
	Somewhat Agree (4)	19.6%
	Strongly Agree (5)	36.8%
	Not Applicable/No Response (6)	16.5%

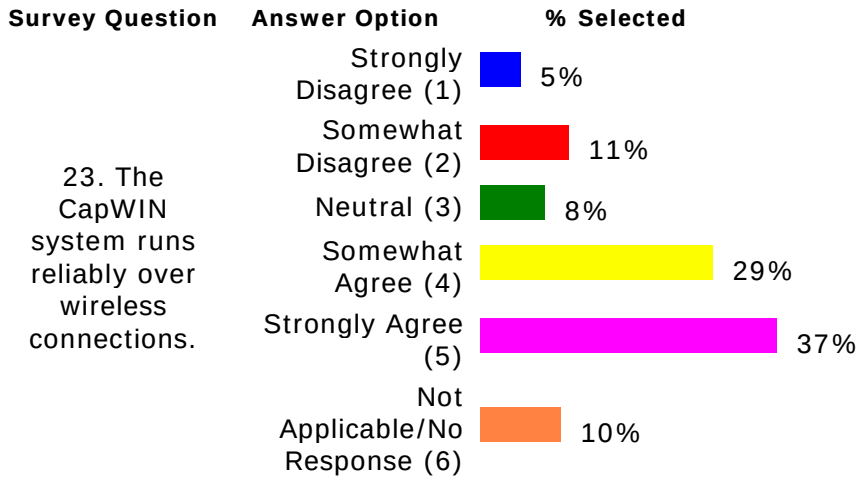
Average of responses 1 - 5 : 3.96

Survey Question	Answer Option	% Selected
21. The CapWIN system has improved the overall quality of coordination between different agencies (inter-agency) during an incident or emergency situation.	Strongly Disagree (1)	3.8%
	Somewhat Disagree (2)	4.5%
	Neutral (3)	19.5%
	Somewhat Agree (4)	22.6%
	Strongly Agree (5)	27%
	Not Applicable/No Response (6)	22.6%

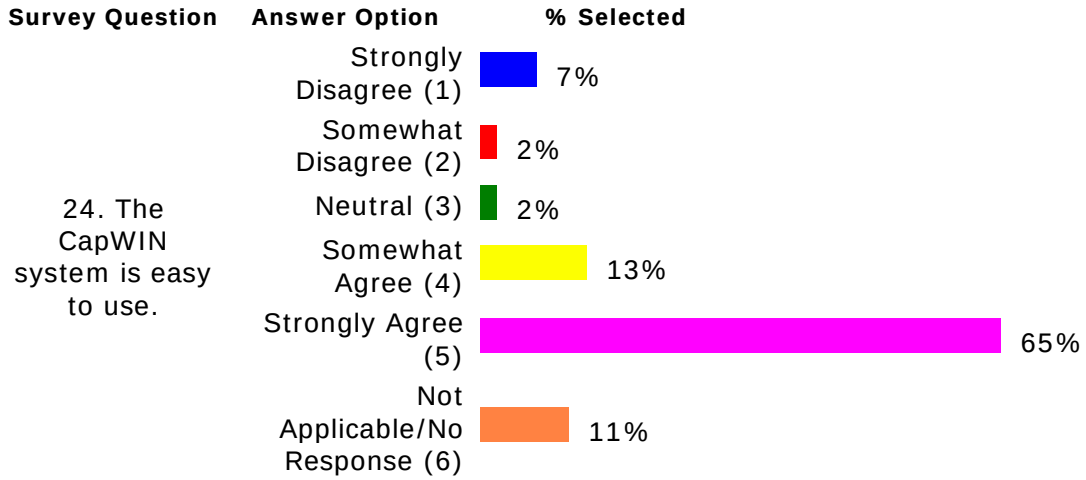
Average of responses 1 - 5 : 3.83

Survey Question	Answer Option	% Selected
22. The CapWIN system has made it easier to get the right equipment to an incident or emergency situation more quickly.	Strongly Disagree (1)	3%
	Somewhat Disagree (2)	6%
	Neutral (3)	31%
	Somewhat Agree (4)	14%
	Strongly Agree (5)	22%
	Not Applicable/No Response (6)	24%

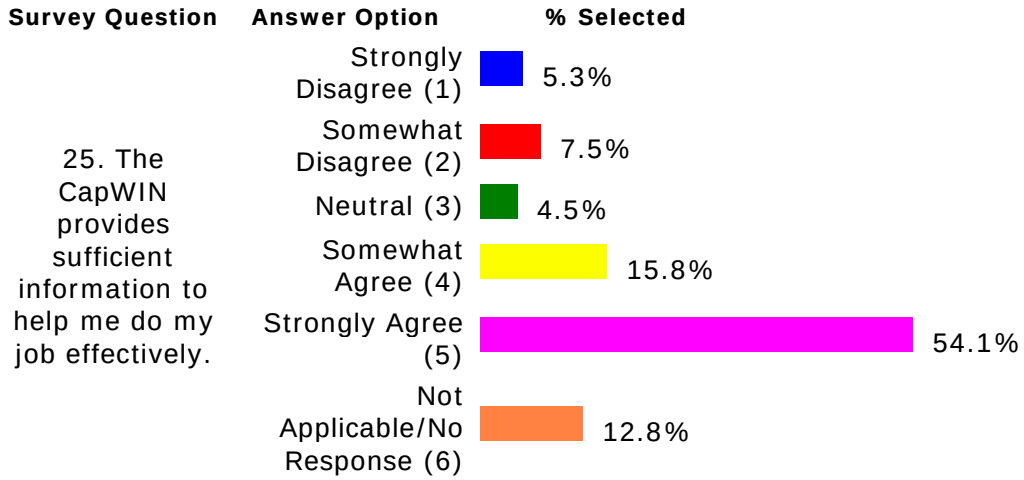
Average of responses 1 - 5 : 3.60



Average of responses 1 - 5 : 3.89



Average of responses 1 - 5 : 4.43



Average of responses 1 - 5 : 4.21

Survey Question	Answer Option	% Selected
26. The CapWIN system has helped reduce the amount of time needed to respond and clear an incident or emergency situation.	Strongly Disagree (1)	5.3%
	Somewhat Disagree (2)	7.5%
	Neutral (3)	4.5%
	Somewhat Agree (4)	15.8%
	Strongly Agree (5)	54.1%
	Not Applicable/No Response (6)	12.8%

Average of responses 1 - 5 : 4.22

Survey Question	Answer Option	% Selected
27. The CapWIN system has improved the incident management process.	Strongly Disagree (1)	3%
	Somewhat Disagree (2)	4%
	Neutral (3)	24%
	Somewhat Agree (4)	24%
	Strongly Agree (5)	28%
	Not Applicable/No Response (6)	17%

Average of responses 1 - 5 : 3.85

Survey Question	Answer Option	% Selected
28. It is easy to create an incident chat room to facilitate information sharing.	Strongly Disagree (1)	4.5%
	Somewhat Disagree (2)	3.8%
	Neutral (3)	10.5%
	Somewhat Agree (4)	16.5%
	Strongly Agree (5)	52.6%
	Not Applicable/No Response (6)	12%

Average of responses 1 - 5 : 4.24

Survey Question	Answer Option	% Selected
29. The CapWIN system can retrieve timely and relevant information from criminal related - databases or systems (e.g. National Crime Information Center (NCIC), Virginia Criminal Identification Network (VCIN), Maryland Interagency Law Enforcement System (MILES), and Washington Area Law Enforcement System (WALES).	Strongly Disagree (1)	7%
	Somewhat Disagree (2)	5%
	Neutral (3)	7%
	Somewhat Agree (4)	14%
	Strongly Agree (5)	52%
	Not Applicable/No Response (6)	15%

Average of responses 1 - 5 : 4.17

Survey Question	Answer Option	% Selected
30. The CapWIN system can retrieve timely and relevant information from transportation related-databases or systems (e.g. RITIS*).	Strongly Disagree (1)	5%
	Somewhat Disagree (2)	4%
	Neutral (3)	15%
	Somewhat Agree (4)	23%
	Strongly Agree (5)	38%
	Not Applicable/No Response (6)	15%

Average of responses 1 - 5 : 3.99

** The Regional Integrated Transportation Information System (RITIS) collects, consolidates, and disseminates traffic management center date to public agencies and to the traveling public. CapWIN has an interface to this system which provides incident information involving lane closures on interstates and primary arterials in the region.*

Survey Question	Answer Option	% Selected
31. The RITIS* provided through CapWIN is useful for doing my job.	Strongly Disagree (1)	4.5%
	Somewhat Disagree (2)	5.3%
	Neutral (3)	20.3%
	Somewhat Agree (4)	18.8%
	Strongly Agree (5)	33.1%
	Not Applicable/No Response (6)	18%

Average of responses 1 - 5 : 3.86

** The Regional Integrated Transportation Information System (RITIS) collects, consolidates, and disseminates traffic management center date to public agencies and to the traveling public. CapWIN has an interface to this system which provides incident information involving lane closures on interstates and primary arterials in the region.*

Survey Question	Answer Option	% Selected
32. It is easy to use the CapWIN system in the dark.	Strongly Disagree (1)	5.3%
	Somewhat Disagree (2)	4.5%
	Neutral (3)	4.5%
	Somewhat Agree (4)	15%
	Strongly Agree (5)	56.4%
	Not Applicable/No Response (6)	14.3%

Average of responses 1 - 5 : 4.31

Survey Question	Answer Option	% Selected
33. The CapWIN Interface is easy to use on laptops/MDCs that have been equipped with touch screen technologies.	Strongly Disagree (1)	6%
	Somewhat Disagree (2)	0.8%
	Neutral (3)	7.5%
	Somewhat Agree (4)	7.5%
	Strongly Agree (5)	60.9%
	Not Applicable/No Response (6)	17.3%

Average of responses 1 - 5 : 4.41

Survey Question	Answer Option	% Selected
34. It would be beneficial for most public safety and transportation agencies across the region to use the CapWIN system either in the field or at Command Centers.	Strongly Disagree (1)	6%
	Somewhat Disagree (2)	2%
	Neutral (3)	4%
	Somewhat Agree (4)	12%
	Strongly Agree (5)	64%
	Not Applicable/No Response (6)	12%

Average of responses 1 - 5 : 4.43