2003

Computer aided dispatch technology: A study of the evolution and expectations of CAD and a comparative survey of CAD in the U. S. Fire Service and the Clark County Fire Department.

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Computer Aided Dispatch Technology: A study of the evolution and expectations of CAD and a comparative survey of CAD in the U. S. Fire Service and the Clark County Fire Department.

By

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A Professional Paper for
Partial Fulfillment of the requirements of a

Master of Public Administration

Department Of Public Administration
University of Nevada, Las Vegas
2003

Abstract

Dispatchers are the first link to assistance in the event of an emergency. Dispatchers must remain calm and gather information from terrified individuals, sort and extract the pertinent information, then relay that information to the responders. Effective dispatching is one of the most important functions of any public service agency (Christen 1991).

This paper takes a look at the history and development of Computer Aided Dispatching (CAD). It will explain the various components of a fully functional state of the art CAD system and how each component affects the efficiency of emergency operations.

Has computer aided dispatching made an impact on emergency response? The Clark County Fire Department utilizes a CAD system operated by the City of Las Vegas Fire Department. This study will determine how the Clark County Fire Department measures against the other departments in the United States.

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Chapter 1

Introduction

In 1999 a woman awoke to her dogs barking. Disoriented from being in a deep sleep, she did not comprehend that her dogs were barking at a fire, which had started downstairs in her living room. After gaining her composure, she discovered that she was unable to go down stairs because of smoke moving up the stairs. Retreating back to her room, she dialed “911” and was connected the dispatch center, but before she was able to relay any information other than the fact she had a fire; she was forced onto a balcony adjoining her bedroom. Despite the lack of relayed information, the dispatch center was able to identify her phone number, match that to an address, determine which fire units were available and were closest to the address, and alert those units of the emergency. Fire department technology had accomplished this task in seconds, a process that would have taken several minutes 20 year ago. This technology has reduced the response time of the fire department, time that meant survival for that woman.

Technologically, the fire service has never seen so many changes in such a short time (Werner 2001). Besides water, alarm boxes are probably the only 19^{th} century technologies that are still in every day use. One of the most significant technology innovations has been the development and implementation of Computer Aided Dispatching (CAD). CAD, simply put, is the cataloging of street addresses, hundred blocks, and buildings etc., which are loaded into a computer database. Completing the system is the listing of fire, rescue, or EMS station/unit you wish to respond for an alarm at each location" (Grenados 1993)

This paper examines development of fire reporting and how Computer Aided Dispatching (CAD) has become an essential tool to the fire service by reducing the time required to make critical decisions.

History of Fire Reporting

In the earliest days of fire protection, alarms were passed by running through the town and yelling, "FIRE!" In 1844 Samuel Morse took his telegraph concept and placed it on the streets of Boston. His system consisted of a telegraph receiver in the local station and several telegraph boxes, placed in strategic locations in Boston. The introduction of this system revolutionized communications by permitting messages to be transmitted instantly over long distances (Maurath 1997). As a result, the first municipal fire alarm system installation began in Boston in 1851 (Boston Fire Department 2002). This modernized the Boston Fire Department, by speeding the transmission of alarms to the firehouses. Each alarm "Box" had a unique identifier, usually a series of numbers that identified its location. While this speed up the transmission of the alarm, it was not perfect. Unfortunately this early alarm system sent the signal to all firehouses. This system required that the firefighter on "house watch" look up the box number on a set of pre-planned cards to determine if his unit was assigned. Eventually the system was upgraded, and the receivers were moved to a central location. Operators received the signals, determined the stations that needed to respond and then retransmitted the alarm to the selected stations (Boston Fire Department 2002). Fire dispatching was born.

Alarm boxes are rapidly fading away. They are activated anonymously and as such are prone to false and prank activation. As a department's false alarm rates increase at these boxes, so does the department's operational cost along with an increase in the risk to personnel. Unit availability decreases and delays in service occur. Units are often not available to respond to real emergencies, as they are assigned to a false alarm. Technology has dramatically reduced this problem with the installation of Emergency Response Service (ERS) boxes. These are closed circuit telephone systems that require callers to actually talk to the alarm operator. If there is no answer at the box end then no units are sent to the alarm. Modern innovations have assisted in the removal of alarm boxes from the streets. As they have become easily obtainable, telephones have had the biggest impact on reducing the need for the neighborhood alarm boxes. Most cities have discontinued the use of the alarm boxes because of these factors. New York, Boston and San Francisco still utilize the signal box, ERS box or combination of the two.

Introduction of Computers and CAD in the Fire Service

Since the advent of the microcomputer in the 1970s, the use of computers in public safety has increased at an explosive rate (Christen, 1989). In 1976 computer technology was not widely available in the fire service. Initially computer use in the fire service was limited to personnel duties, inventories and other administrative tasks. Computer use in emergency operations was limited at best and was adapted from the command and control systems that are used by the military. Computer technology specific to the fire service was limited to accessing databases such as those provided by Chemtrec with its Hazardous Information Technology (HIT) database and the Environmental Protection Agency (EPA) with its Oil and Hazardous Materials technical Assistance Data System (OHNTADS), Anderson (1978) reported that by using the sophisticated calculating ability of the computer one could determine the quickest route for vehicles to follow to an emergency, and determine prior to dispatching which equipment is closest to the emergency with respect to time. He recognized that computers could make rapid decisions with multiple pieces of information such as road closures, special events or traffic patterns. In the 1970s computers were quite sophisticated, but they were large and very expensive. Affordable microcomputer technology was in its infancy and had limited ability. Programs to manage this type of data were very limited and costly. They required large amounts of memory, which was very expensive. Several factors pushed the fire service to integrate a computer aided dispatch (CAD) into the response system. Benson (1991) reports community growth specifically, that is more people, streets, and traffic as the main factor. Second was data gathering and reporting which is vital to validate the need for services, and defend funding demands. Also, there was a desire to access regional, state, or national databases, which became valuable in providing information to responding personnel. “The software programs make dispatchers’ work easier and faster – and there is a whopping greater amount of calls to take so speed is important” (Chase 1997). The law enforcement community entered the age of CAD earlier, and pioneered many of the systems in use today. Their call volume was much higher, and they had more units to manage, thus, the demand for a management system was more prevalent, and more importantly, there was money available from LEAA funds. As early as 1972, the Los Angles Police Department began looking at a method to assist them with increased call volume. They partnered with the Jet Propulsion Laboratory to develop a CAD system with Mobile Data Terminals (MDT) in the vehicles. Their system was dubbed the Emergency Command and Control Communications System (ECCCS) (Los Angles Police Department 2003).

Knowledge is the key to a successful operation on the fireground. The more information that a command officer has regarding an operation (such as: units assigned, specific dangers, or water supply availability, the easier it will be to make decisions that will affect the operational outcome. Anderson (2002) further indicates that communicated knowledge has a positive impact on fireground decisionmaking and that this knowledge can be critical to firefighter survival. CAD entered the fire service in the larger departments in the early 1980s and relieved the fire alarm operators of an enormous task. The ability to take in call information, make decisions about alarms, track availability of responding units and process their requests is monumental. Add multiple calls and confusion begins. This confusion leads to poorer service, inefficient operations and a potential for an increase in the loss of life and property. Efficiency is directly related the technology used in the system. This can be a double-edged sword. As the technology increases, the knowledge required to operate and maintain the system increases, as does its associated costs.

In the most modern of CAD systems, alarm operators receive calls via Enhanced 911 (E911), which is interfaced with the computer and automatic number identification-automatic location identification (ANI-ALI). This system automatically inputs the telephone number and address of the caller into the CAD, decreasing the time required to process the request for service. As the operator gains information on the type of call, it is entered into the CAD system. When the CAD system is satisfied it has enough information to recommend a response pattern; it will do so issuing the recommendation for the approval of the operator. There is no need for the operator to consult maps, look at unit availability, determine the appropriate response, radio the unit, and announce the call. If the operator agrees with the recommendation, a key is pushed and the alarm is transmitted to the appropriate location. The modern state of the art CAD system will do this automatically, and with incredible speed. In most systems this can be accomplished in 30 to 45 seconds (See dispatch and field processes, attachments 8 & 9). In the past this process could take as long as 120 to 150 seconds. When you consider that brain death begins in as little as 6 minutes after a cardiac arrest, and fire flash over (total room involvement) can occur in as little as 5 minutes, time becomes a crucial factor.

Foremost among the criteria for a new CAD system is to reduce response time, which most agencies use to measures their effectiveness. The time starts when the call is received and ends when the first unit arrives. The CCFD uses this measure of efficiency. Benchmarks are as follows: one minute for initiation to dispatch (call taking and processing), two minutes for turnout time (receive, determine location and don required equipment prior to departure), and four minutes for response; giving a total time from initiation to arrival of seven minutes (Clark County Fire Department Standards of Coverage).

Modern CAD is incredibly complex. It is not limited to alarm processing, as it performs a variety of functions. It will track availability, predict service needs, recommend a changes of unit location to insure reduced response times, transfer data for reporting and a variety of other functions. These statistical functions traditionally required several people many hours to accomplish. This paper examines the evolution of CAD systems. Chapter Two will discuss the history, development, and expectations of CAD, the CAD system components, their effect on efficiency, and parameters used to measure the efficiency of the CAD system. It will review the system utilized by the Clark County Fire Department (CCFD), which is operated by the City of Las Vegas Fire & Rescue (LVF&R) in conjunction with the North Las Vegas Fire Department (NLVFD) as a combined service, and it will be referred to as the Clark County CAD. Chapter Three will introduce the methodology of the study. Chapter Four will present the findings of the study with a comparison of the Clark County CAD to the findings of the Survey. Chapter Five will offer conclusion about the study with its respect to the literature review and present new questions, which arose during the preparation of this paper.

Chapter 2

Literature Review

This chapter discusses the history of computer aided dispatching, the effect the personal computer revolution has had on CAD and the expectations of computer aided dispatching. Discussion will include the components of the Clark County CAD and how they interact, and will include: mobile data computers/terminals, geographical positioning systems/geographical information systems, automatic vehicle location, enhanced 911 systems and wireless local area networking. Finally, system failure will be addressed

The History of CAD

Much of the technology the fire service has today was adapted from the military. Infrared technology was adapted to allow firefighters to see in smoke filled environments. Radio technology, department hierarchy, and microwave communications are all adopted from the military. Global Positioning Systems (GPS)[1] is used to track and locate fire apparatus and is the same system that is being used by our military in the battlefield in Iraq to locate friendly forces and target the enemy. On-board computers are also adapted from military and have become a vital part of the fire service. The military is a constant source of applications for the fire service.

Other cutting edge technology also has fire service applications. Imagine lost firefighters quickly found using the same GPS technology that pinpoints a downed pilot within 10 feet of his location anywhere in the world (Rielage, R & Rielage D 2000).

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[1] United States Department of Defense is charged by law with developing and maintaining The Navigation System with Time and Ranging [NAVSTAR] Kennedy 1996

Communication is simply the skill and ability to use words (or signals) to effectively impart information and ideas (Anderson 2002). From the nineteenth century until the 1960s, dispatch was done manually (Christen 1991). Keeping track of units was accomplished on paper or by logging the information on a book and it required a good memory. Later, electric boards with colored lights replaced manual tracking. This still required the dispatcher to manually operate a switch that indicated the status of each unit. The fire service dispatchers of 1970s continued to communicate alarms, and track units using manual methods. Alarms were received and dispatchers wrote information on an incident form, and then located the call on a map. This was followed by locating the closest fire station on that same map. They then had to determine if the unit was in quarters, available to respond, or out of the area. In more sophisticated systems, run or running cards established who would respond. This still required the dispatcher to determine unit availability. Each fire alarm box and key street intersection had an assignment card indicating what units responded on the first through the fifth alarms (Christen 1991). Alarms were then transmitted to the unit or the station over the radio, requiring the responding personnel to write the information down, then look at a map and plan the fastest route. Many career and volunteer departments continue to use this system today.

In departments that have a low call volume, this operation may still work. As call volume increases this method of dispatching became difficult, requiring more personnel. Dispatchers had reached their limit on being able to manually gather information, track multiple units and monitor calls. The human computing efficiency is limited and is subject to overload and subsequent erroneous decision-making. Christen (1991) identified numerous shortcomings of a manual dispatch system. They include a lack of flexibility, poor tracking systems, inability to respond to specialized incidents, lack of incident specific information, and the time involved in the dispatch process. Customer service became an issue as the time from Public Safety Answering Point (PSAP) access to the initial response of the assigned unit, began to climb. Demand had finally exceeded what the human interaction could process. Inefficiency was not limited to the dispatchers overwhelming demands. Responding apparatus found it difficult to navigate streets in new neighborhoods; radio traffic had exceeded the designed capability resulting in missed calls; and that poor communication of essential information was occurring more often, with the potential for catastrophic results. How important is communication? It was a communication failure, in this case radio communications, which resulted many of the firefighter's deaths in the World Trade Disaster. Further inadequate unit tracking resulted in delays determining who was on scene and where they were assigned within the collapse zone.

Computer aided dispatching entered the fire service and had immediate encouraging results. Computer technology solved many of the shortcomings of manual dispatcher systems (Christen 1991). The ability to transfer large amounts of information to responding apparatus improved efficiency dramatically. Early CAD systems were limited to larger cities and entities because of cost. They were custom engineered systems and expensive. In 1980 the Fire Department of New York (FDNY) entered the computer age with Starfire. At a cost of fifteen million dollars (1980 funds), it connected fourteen computers, twelve microcomputers, and five hundred terminals, and covered just one of five boroughs (Mohan 1980). This was a major undertaking, for New York, and had some risk, mostly fiscal.

The Personal Computer Revolution

The personal computer revolution of the late 1970s marked the beginning of the CAD revolution (Christen 1991). As computers developed they became faster and smaller. Microchip technology reduced the size and cost of the systems. The systems became more affordable to smaller budget-limited departments. Software engineers began to capitalize on this affordable technology, writing programs intended to be used on smaller computers and tailored to smaller fire departments. Modern CAD systems provide linkage to other operating systems such as 911, geobased mapping, fire prevention data, pre-plan drawings/data, and resource contact databases (Christen 1991). Modern systems can also compile and report statistics. CAD is a data based system and has the ability to adjust responses based upon past statistics and current unit availability. CAD can analyze current workloads; project future needs based upon the data and recommend changes to the response plan. It makes time its tool; it accomplishes in minutes what would take a team of statisticians weeks to accomplish.

Portable and mobile radios are very effective for brief fireground communications (e.g. on-scene reports or progress reports) but are rapidly overwhelmed (Anderson 2002). CAD has reduced the information disseminated over the radio by allowing text messaging to be sent to the responding units. Routine status changes are accomplished with a keystroke, requiring no use of the radio. This clears up the radio for other essential and emergency information, increasing the safety and efficiency of field units. It has allowed information to be stored in the system and to be recalled as needed during the incident.

The ability to transfer alarm data, associated hazards, maps related to the call, and even plot and floor plans at an instant reduces response time, reduces potential for error, and increases the margin of safety many fold. Anderson (2002) further states that better quality, timely, and accurate information leads to informed decision making on all levels-strategic, tactical, and task. In the initial response, the “first-due” (as the response plan dictates) company officer has many duties. He must gather information regarding the emergency such as time of day (people may be sleeping or not home), location, building type and construction, closest water supply, and any special hazards involved. This is in addition to monitoring the radio, getting outfitted for the alarm, and directing the driver on the route. This information must be extracted from a variety of locations; map books, information copied from the radio, and the officer’s memory. Having this information compiled in a system for easy retrieval makes the action planning of the officer easier and more efficient. Poor information on the other hand leads to uninformed/frazzled decision making and dangerous fireground situations.

Expectations of CAD

The key expectation of modern CAD systems was to reduce the workload of dispatchers and to reduce response time. System (CAD) integration is the key to today’s powerful Public Safety Answering Point (PSAP) (Kozoman 1997). This was accomplished by taking most of the processing tasks out of the hands of dispatchers. Decision-making is faster because of the ability of the computer. Error reduction resulted as a unit’s status is constantly updated in the CAD in real time. Automation in processing also resulted in alerting stations faster, which reduced response times.

Knowing the streets in one’s response area is a basic requirement for dispatchers, drivers, and officers (Rosenhan, 1989). Modern CAD systems have interface capability with Geographic Information Systems (GIS) databases. These databases create mapping options that allow the responders to locate the emergency faster. The display shows the map, the unit’s location, and the location of the fire. Some systems even recommend a route to take to get to the emergency, and can account for road closures, and other obstructions. Interfacing GIS data with the CAD computer provides this. These systems make use of client/server configurations either as part of a Local Area Network (LAN) or Wide Area Network (WAN). This improves information handling and makes upgrading the system much more efficient (Kozoman 1997). Units are provided with text messaging and hard copy printouts that decrease the errors that occurred using radio messaging.

A reduction of radio traffic made operations safer. Also sensitive information can be relayed to the responding personnel with more security and privacy. Many CAD systems fall short of total automation (and, thus ultimate benefit) of direct interface of an automatic fire alarm system (commercial) to the CAD system (Powell 1989). The time required to receive the automatic alarm by a private monitoring company, process and transmit the information to the dispatch center can be excessive. Most central station alarm companies now use automated alarm receivers. The retransmission can take place via a leased circuit or via a packet radio network now being designed for such purpose (Powell 1989).

Clark County's CAD Components and How They Interact.

The CCFD entered the CAD age in December of 1978 (Wiseman 2002). Prior to that time, the CCFD used a Microfiche "Rapid Access and Retrieval System" for dispatch. When CAD was introduced, the microfiche became the backup for the CAD system. The Clark County CAD system completed an upgrade in 1998. This year we are in the process of updating Mobile Data Terminals (MDT) to Mobile Data Computers (MDC). Utilizing Panasonic "tough book" lap top computers, we will have the ability to initiate reporting, inspections, and obtain mapping and pre-fire plans while in the field. The future holds some interesting possibilities.

The Multiple PCs system

The CAD system used by the CCFD is a redundant mini-computer system consisting of seven computers that are interlinked together, and serve PCs at each of the 11 workstations. Each computer has a specific function and they use a LAN network to complete tasks specific to the process. They include:

- The unit status system, which monitors the location of each unit using GPS tracking, and the status of each unit. The system updates the status computer each 15 seconds for units that are active in the field, and every half hour for units in quarters or out of service;
- The Geofile system, which coordinates our mapping, breaks down each map into one square mile grids and processes the locations of calls and units. It is updated regularly from our GIS department.

- Automatic Number Information-Automatic Location Information (ANI-ALI) functions which are described below
- Emergency medical services (EMS) interface system sends EMS calls to the ambulance providers, based upon the area they serve. Each ambulance can also generate EMS calls and this computer interfaces those calls to our system.
- "SunPro-RMS" interface system sends call information to our reporting system.
- Station alerting system automatically alerts our stations and prints the data on our station printer. It also initiates the "Voice Lady" a female computer voice that announces the call.
- The final computer controls the radios and alphanumeric pagers.

Each is independent and is used for just the assigned function. A controlling computer coordinates all functions. A multiple PC base system has many advantages. First it almost never completely fails. One function may fail, but a redundant or "mirror" computer can fill in for the failing system. Second, the system is almost never over tasked. Since each computer does only a part of the process, CPU usage is kept to a minimum.

These computers are linked to 11 workstations, which control various functions in the dispatch center. Five positions are for call taking, four are for dispatching, one each for the Las Vegas Fire & Rescue, North Las Vegas Fire Department and the remaining two are for the Clark County Fire Department. The last two control the Emergency Medical Radio System, and the master computer, which can modify the system as needed.

Mobile Data Terminals/Computers

Data must have a destination to be useful. While half of the CAD system is used at the dispatch location, this is only half of the complete system. The other major part of the system was pioneered by the Phoenix (Arizona) Fire Department. Receiving the data at the units allows for faster response, and more informed decision-making during the response. The responding crews obtain their data from one of two devices, the mobile data terminals (MDTs) or mobile data computers (MDCs). MDTs are dumb terminals only. They have no processing power; they just receive information that is sent to them. The trend today is away from mobile data terminals in vehicles in favor of personal computers (PCs) and Laptops (Grenada 1993). These components referred to as MDCs, are computers that interface with the dispatch system, and have the ability to function independently for other tasks. Mobile crews can write reports, pull up maps and building plans, process e-mail and a host of other tasks. System capability includes the ability to transfer any data loaded into the MDC in the field to the main reporting and data computers for storage and later retrieval.

Geographical Positioning Systems/Geographical Information Systems

Two of the most exciting and effective technological developments to emerge in the last decade are the introduction of Global Position Systems (GPS) (the GPS of the United States is called NAVSTAR), and the phenomenon of Geographical Information System (GIS) (Kennedy 1996) The basic concept of GIS is about 30 years old. It was designed for use in production of geographic maps. It required large mainframe type computers to store and manipulate the massive amounts of data. This would have made its use in the fire service impractical. Digital technology has improved GPS data collection. Today technology has advanced so much that desktop PCs are more powerful and quicker than those large mainframe types of the late 1970s, and can easily run GIS programs. GIS is considered largely a public-sector technology (Ventura 1995). Integrating GIS into the fire service has given it a major tool for use in planning and emergency response. Station Location, response route planning, water source location and trend tracking all utilize GIS. Today local governments generate approximately 90 percent of GIS data (Hissong and Couret 1999). This data is not usually collected by the fire department; the department is simply a user agency for another department that maintains the database. All computer-mapping applications may be separated into one of three categories: street level, tactical, or GIS. Street level mapping is available at almost any software store, and can be utilized by any low end PC. These applications make good back-up programs for the control room and make good quality public information maps (Bradford 2000). Tactical mapping is more advanced than street level mapping. Layering technology is available on tactical mapping program, and requires moderate programming skills. GIS data is also layered, and as such, data can be added or stripped away to improve intended information needed. GIS data pulls information from in house data such as assessor maps, tax records, and public works information. As nice as they are, they will only address the issues that engineers/programmers designed them to fulfill (Bradford 2000)

The CCFD uses this layering technique to overlay responses to alarms. It provides an indication of areas that may need additional resources in the present and in the future. Water systems, arson related fires and traffic accidents involving apparatus are examples of potential uses of GIS.

GIS has been integrated with Global Position Systems, to provide an extremely significant asset to CAD operations. The ability to transmit locations of fire apparatus, and track the response to an emergency insures that the closest available unit is assigned the call. This technology affords yet another tool to reducing the critical time from system access to arrival. GIS Mapping data can be sent to the responding units providing them with a plotted location of the emergency and their unit’s location. GIS will also allow closures in roads or other response disruptions to be located. More importantly, GIS has allowed multiple jurisdictions to work together on a common front (Haque 2001).

NAVSTAR uses a constellation of 24 satellites orbiting and broadcasting data that allows users on or near the earth to determine their spatial positions (Kennedy 1996) GPS receivers collect data for these satellites to triangulate a position. The CAD system then matches the information to a GIS map database to pinpoint the units’ location. Public accuracy standards call for about a 100-yard acceptable rate of error with military specifications being more than four times more stringent (Furey 2001).

Automatic Vehicle Location

Automatic Vehicle Location (AVL) technology has enhanced the CAD environment dramatically. The locator uses computers and satellite technology to tell dispatchers where the nearest appropriate emergency vehicle is to the location needed. Barnes (2001) said “the technology speeds up the time it takes to process a call and get an emergency vehicle on its way" (Griffin 2001). The AVL computer "polls" the units in the field and updates the computer with their locations. This can occur as rapid as every five seconds, allowing for tracking down to a tenth of a mile.

Enhanced 911

Nine-One-One calls comprise up to 70% of emergency call volume (Sutherland 2001) Modern CAD systems utilize a newer technology referred to as Enhanced 911. Enhanced 911 uses Automatic Number Information-Automatic Location Information (ANI-ALI) that links two databases; one from the telephone company which provides the "ANI" (the callers telephone number), and the second, located at the PSAP which links the phone number to an address. This is linked into the CAD operation. ANI-ALI is even more critical, because nothing is more important than getting a good address (Furey 2000). ANI-ALI is critical should a patient become incapacitated, and is unable to assist the dispatcher. ANI-ALI information includes the phone number of origin, and the associated address of the call. All that is required is the nature of the call and, if the call is a medical request a preliminary run through the ProQA queue prior to dispatch. ProQA is a computerized (although it can be flip card based) program that establishes the seriousness of a medical call based upon several standardized questions. Calls are categorized by level A through D, with D being the most serious. The Clark County CAD responds the closest appropriate unit; Intermediate life support on A & B level calls and a Paramedic response on C & D level calls. This system attempts to send paramedics level units to calls that warrant that level. This insures that paramedics are utilized efficiently, are available for these calls and are not sent on calls that do not require their level of expertise. ProQA has a drawback. Since it is base upon answers to specific medical questions, it is only as effective as the answers to those questions from the caller are. Address verification prior to sending the call to the responders insures efficiency in the transmission of the alarm.

The technology of 911 is not picture perfect. “Whereas a conventional phone call to 911 generates an address record clear down to the floor or apartment number if necessary, a wireless call does not” (Furey 2000).

Cellular phones were not originally a part of the enhanced 911 technology. Since many emergency calls come in from cellular callers and since 911 has proven so successful, the Federal Communications Commission requires Cellular Phones, PCS, and certain specialized mobile radio (SMR) operators must relay the telephone number of the originator of a 911 call. E911 enables a caller’s position to be located within 100 meters instead of miles (Sutherland 2001). “This ALI is accomplished by using GPS coordinates, latitude(x) and longitude(y). What ALI can’t take into account is elevation, or the “z” coordinate. An x/y coordinate that translates into an address for a multi-story high rise for example is still going to take an awful lot of looking to find” (Furey 2000). The E911 with cellular location has proven successful in accessing the public safety system.

Wireless Local Area Networking

CAD has ability to forward information to responding crews. This facet of CAD allows for more informed decisionmaking of the fire ground. Information such as pre-fire plans or Hazardous Materials Data (Hazmat) can be stored as data in unit computers. This will allow responding crews to retrieve up to date data on building floor plans, hydrant location including inoperative hydrants, sprinkler hook-up locations and elevator locations. Since this data changes it needs to be updated on a regular basis. It would be very time consuming and inefficient to manually up-load this information to each MDC. The use of Wireless Local Area Network (WLAN) allows information data to be transmitted to and from units seamlessly to insure data is the most current available. Successful outcome of an emergency is dependant upon accurate and rapid information gathering. Further, this WLAN will allow an officer to assemble information on a call and input it at the scene or while returning. The WLAN will transfer the information to the system, and file the report. WLAN could also open the MDC to department E-mail, internet reference, and a host of other possibilities.

System Failure

Computers can fail for any number of reasons. There is a tendency to rely on computers and forget back up systems (Christen 1989). Computers are machines and therefore are subject to human limitations. They are only as good as the scholars that program them. Chisten (1989), reported that there is an over reliance on computer processing. When the USS Vincennes accidentally shot down a civilian airliner, the computer tapes were analyzed carefully. The computer performed correctly, as it was programmed. The people that were under severe strain and emotional stress misinterpreted the data.

Chapter 3

Methodology

This chapter discusses the methodology used to develop this paper, including the method of data collection, how the departments were selected and how local information was gathered. The information for the paper was collected from three separate sources. First, a literature review of the development of CAD systems, the problems CAD was developed to correct, and the technology that is available for use. Journals specific to the fire service provided most of the information. Several books were consulted for information specific to the technical aspects such as GIS/GPS and LAN. Second, an exploratory survey of fire agencies in the United States was conducted to collect data on how the technology is currently used. Finally, information specific to the Clark County Fire Department was gathered by personal interviews with staff members. Clark County Fire Departments, CAD system controller, for information specific to the technology used in the local system; four fire dispatchers, who use the CAD system; and six fire officers from the Clark County Fire Department who are the end users.

Data Collection

This research paper compared the CAD utilized by fire departments in the United States, with the Clark County CAD. It used a review of the literature and an electronic survey.

Departments for the surveys were selected by reviewing the Firehouse.com website. A list was established by selecting two departments from each state, which had listed their e-mail addresses on the web site. They were of various sizes, and serve various population bases. Initially one hundred departments (two from each state) were identified, and through non-functioning e-mail addresses and elimination to maintain a good representation of population served, these were reduced to sixty fire departments. The population spread was established to explore if population may be a factor in the usage of CAD. In the category of 300,000 and above, an assumption was made that these departments will have a CAD system, simply based upon assumed call volume. The category of 100,000 and below was established to determine if smaller communities with more limited funds used CAD. Project time constraints further limited more in-depth data collection

First Survey: The questionnaire surveyed the dispatch component in the selected departments. It was intended to explore how the systems are being used and how they affect decision-making and task management. This perspective established the basis of which our CAD system would compare. This information was compiled and categorized into a spreadsheet for analysis on the extent that CAD is being utilized.

Second Survey: The second survey accompanied the first and explored the perspective of the field user, including the usage of MDT and the usage of available technology to increase efficiency in the fire service. To gain an objective view of the CCFD's assessment, six field officers were sent the survey. Their assessment represents the field user view. The survey results will explore the extent that CAD is used in the United States and will provide a comparative base for the study.

These surveys have a bias. Since e-mail was used to collect data, assumption that the departments use some sort of computer technology must be made. This data explored the use of CAD, and CAD components specifically; however a technology bias may exist.

Interviews: The Clark County CAD perspective was assessed by an interview of the CAD system management technician, and questionnaire submission by the LVF&R alarm office operators.

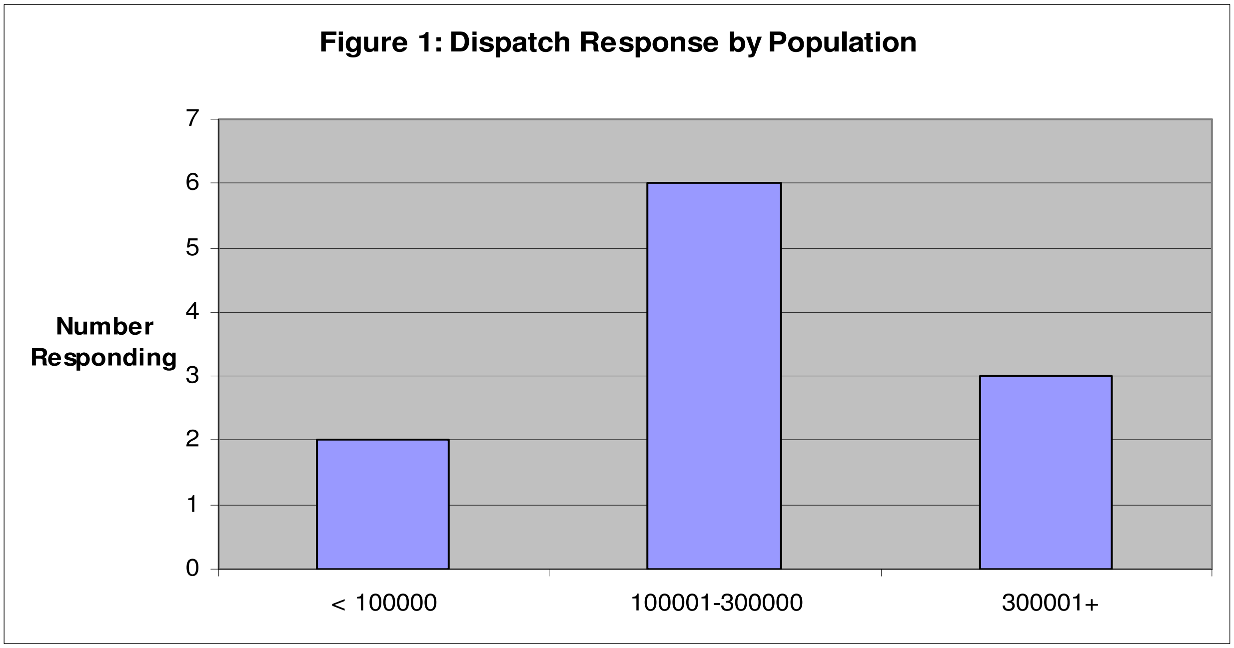
Chapter 4

Study of Computer Aided Dispatching in the Fire Service

Included in this chapter are the results of the survey sent to other agencies and a comparison to Clark County using interviews. The chapter is divided into the following sections: Dispatch Perspective & Comparison, Computer Aided Dispatching Reduced Access to Dispatch Time, Computer Aided Dispatching Makes Operations Easier, Systems Comparison, Field Perspective & Comparison, and Field Efficiency

Dispatch Perspective & Comparison

Of the 60 dispatch surveys sent to departments across the United States, only 11 surveys were returned, for a disappointing 18 percent. Despite the low response, the results for the respondents were fairly consistent. All of the departments that responded use computer aided dispatch. This is an indication of the value of CAD and its importance in the management of emergency services. This resulted in a question not included in the survey. Is cost a factor? Can smaller departments afford the expensive CAD systems? Responding departments served communities as small as 60,000 with call volumes as low as 6173 runs per year. The majority was in the 100,001 to 300,000-population range. While this certainly does not indicate that all small departments use CAD, it does appear to indicate that department call volume and community size are not limiting factors in CAD usage. Figure 1, indicates the spread of population



The average time departments reported using CAD was 15.0 years with the average age of the current system being 6.5 years. The Clark County CAD system has been operational for nearly 25 years making it a senior member of the CAD community. Our current system is three years old and is updated by contract regularly. Call volume may have been a driving factor in the early development of CAD in the Las Vegas Valley. Annual call volume in the dispatch center has reached 170,882 calls per year of which, CCFD accounted for 91,171, City of LVF&R, 63557 and North Las Vegas 16,154.

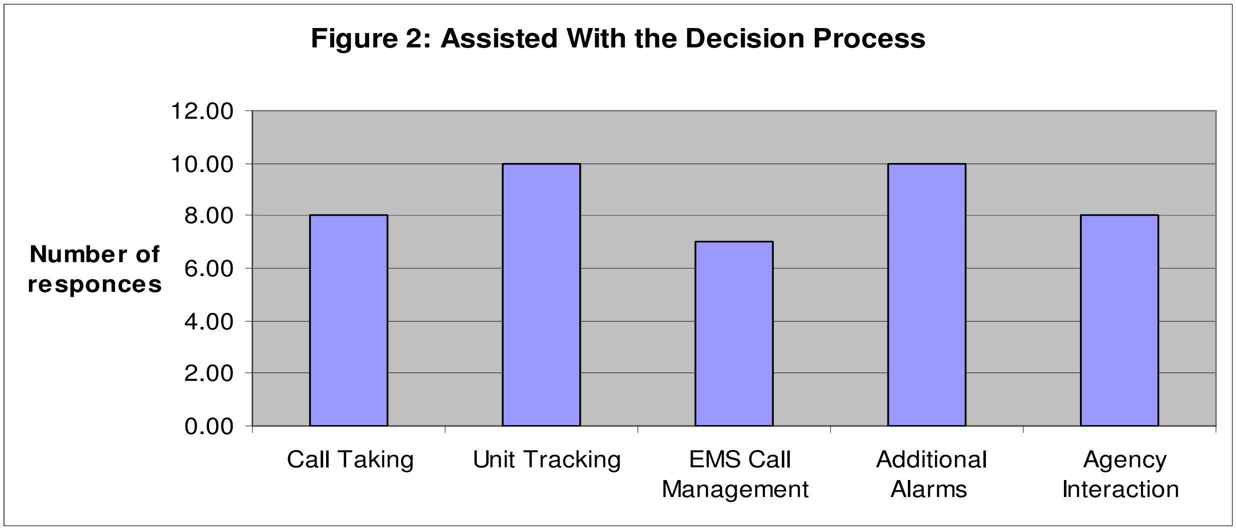
CAD Reduced Access to Dispatch Time

Respondents reported an average time from access of the system to dispatch of the call of 37.49 seconds. This was an overall reduction of an average of 16.36 seconds over pre-CAD access time. The Clark County CAD does not have time statistics on the old method of call management, but reports that the average call to dispatch time is 46 seconds, somewhat longer than the average. This comparison was not as dramatic as anticipated, however many departments did not have data relating to the access time prior to implementation of CAD.

Further enhancing the times reported was the automatic transfer of “911” information into the CAD system. The Clark County CAD system transfers such information automatically. Of the respondents, 91 percent reported that 911 information was transferred automatically, which makes the call process faster, deleting time required to introduce this information into the system. What was not addressed in the survey was the increase in accuracy of information transmitted or sent to responding units. Additionally the survey did not inquire if the departments use the ProQa system for the prioritization and classification of EMS calls.

CAD Makes Operations Easier

Each department was asked to indicate which of five tasks areas CAD assisted in making their responsibility easier. The next chart indicates the responses to the categories. While all respondents indicated some tasks were easier, 36 percent reported all tasks were easier. Each of the efficiency categories surveyed indicated that CAD has made the dispatchers’ job responsibilities easier. Response to the categories ranged from a low of 73 percent to a high of 91 percent. This may be due to the calculation ability of the computer and its ability to perform multiple data queues in a short amount of time. Four LVF&R dispatchers were given the same questionnaire. They reported overwhelmingly that the CAD system has assisted their decision-making processes. They further reported that job tasks were easier as the computer makes most of the decisions for them. Figure 2, shows how the outside department dispatchers indicated CAD assisted with the decision process.

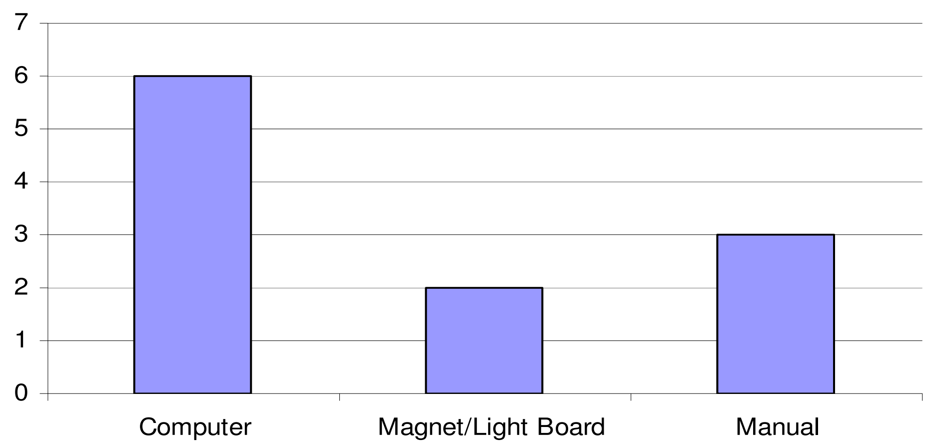


Systems Comparison

The survey reported that the average CAD system comprised 9.4 computers. Of the responses returned, only one used a mainframe type system, with a mirror backup. All of the other systems were multiple PCs arranged in a LAN configuration. This is similar to the Clark County CAD system discussed earlier. While this question provided the basic information I had requested, it also may be flawed. Some departments indicated that each workstation had several PCs in addition to the main data computers. The specifics of the function of each computer were vague, and as such conclusions were difficult to ascertain other than the overwhelming usage of the multiple PC type system.

The survey did yield a surprise. While most departments have used CAD for several years, it was interesting to discover that 45.45 percent of the respondents still use a manual method as opposed to automated method for backup. Figure 3, indicates the types of back-up systems used.

Figure 3: Back-Up System Used

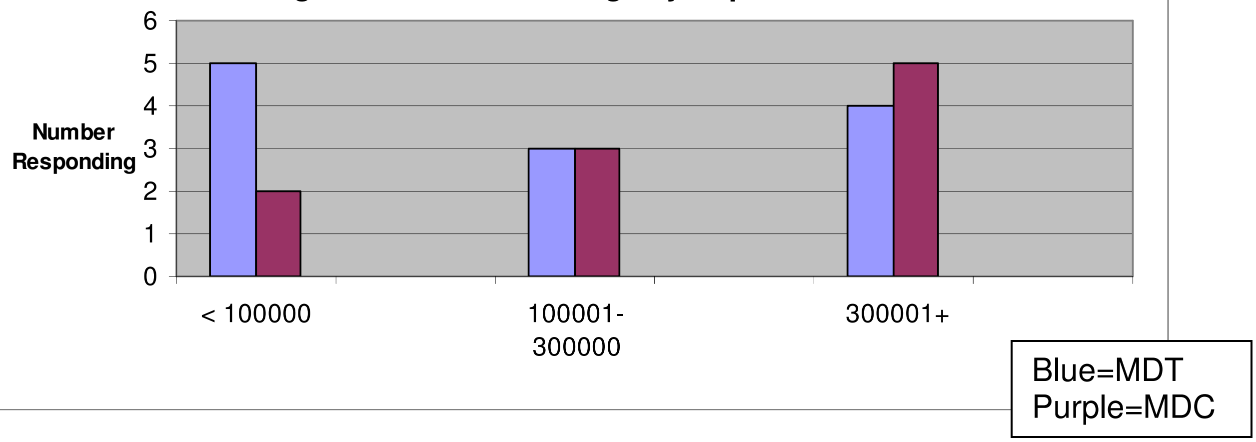


Geographical Information Systems and Wireless Local Area Networks were included in the survey to determine how advanced the systems were regarding GIS and WLAN. While all of the respondents used CAD, only 64 percent used GIS and fewer (14 percent) used WLAN. The power that GIS provides was not utilized. This result was surprising. GIS is a powerful tool and can provide essential information for the fire service. Further, it is utilized at almost every level of government. However, GIS requires a separate database, which is extremely expensive and can be manpower intensive to develop. The WLAN is an expensive option that requires additional hardware and training, and its benefits are limited to advance system configurations.

Field perspective & comparison

While the first part of the survey focused on the dispatcher's use of CAD, it was felt the system must be evaluated from the end user to get the full representation. The field perspective returned 17 of 60 responses or 28 percent. This was also a lower return than anticipated. Again, population served was not a factor. This reinforced the assumption that CAD systems are not “big city tools”. Figure 4, indicates the spread of population served by the field survey.

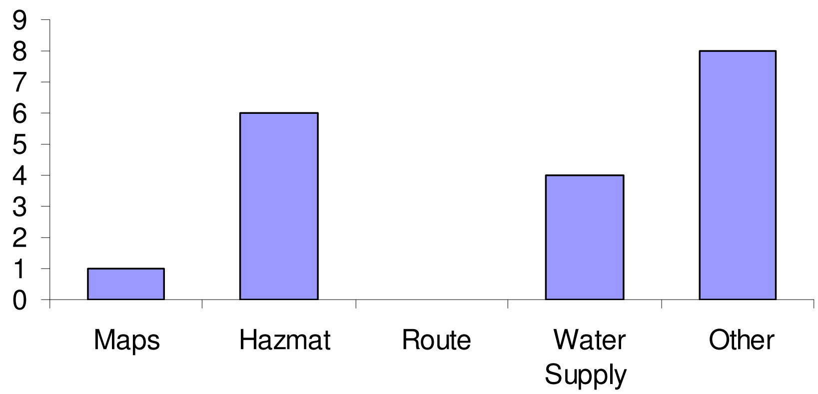
Figure 4: MDT/MDC Usage by Population



MDT/MCT usage was evenly split. 58 percent use terminals with the remainder using computers despite their greater flexibility. The systems appear to be quite reliable. The survey reported down time in the range of 1percent to 15 percent, with an average of 6 percent

Communications with field units is essential for smooth operation on the fire ground. Of the respondents, three departments indicated that they did not have MDT/MDCs. Of those that have CAD, 93 percent have the ability to communicate from dispatch to unit or unit to unit. This is an essential function of the CAD system. This communications was not limited to messaging. Data transfer was assessed and while all reported getting call information, 86 percent indicated getting some type of supplemental information. Figure 5, shows a breakdown of the information sent to the field units.

Figure 5: Suplemental Information

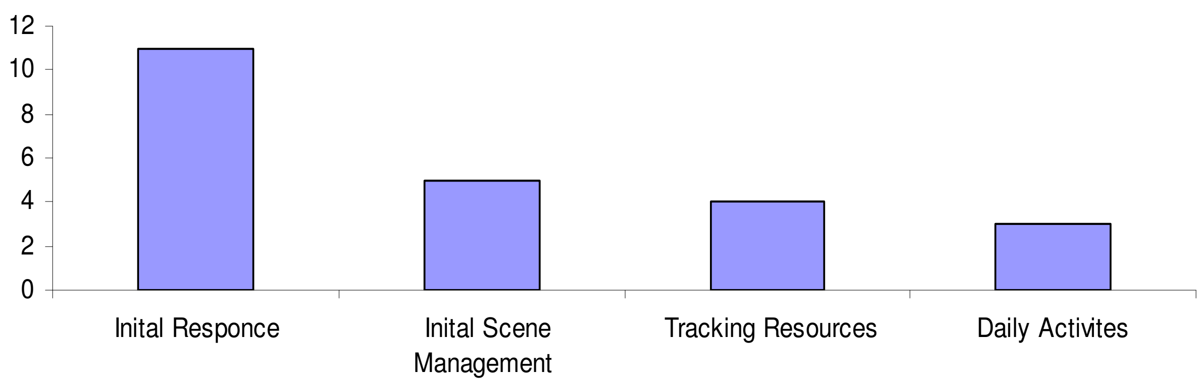


Other information was wide spread including address specific alerts, key box locations, and ambulance agency status. None of the respondents indicated getting route information. Currently the Clark County CAD transmits basic dispatch information and essential hazardous materials information, specific to occupancy. This will change in the near future. For those agencies having Mobile Data Computers, pre-plans were the most provided information.

Field Efficiency

CAD has proven itself in the dispatch center, but is it an asset in the field? The survey indicated that it improved decisionmaking in the field in all categories. Initial response and initial scene management are the critical phase of operations in the field. Forty-Eight percent of respondents indicate that CAD data has improved their decisionmaking during response. This initial response management is critical. Initial priorities must be established and personnel assigned to them. The ability to have this information such as special hazards (chemicals, explosives, animals, etc.) easily available directly affects the outcome of the emergency. 26 percent indicated improvement in initial scene management. Fulfillment of mission objectives, while maintaining compliance with established standards such as the “two-in two-out rule which requires a rescue team for firefighters engaged in suppression activities, can be challenging. Add to this, the confusion of the emergency situation, whether fire or medical, and a disaster can result. Proper coordination is essential to firefighter and civilian safety and property conservation. Figure 6, shows the breakdown of the respondents regarding efficiency in the field.

Figure 6: MDT/MDC Help with Decision Making



Clark County officers indicated that our current MDTs assist in the decision process during the initial response and during initial management. Our system does not allow queues for tracking by field units and it has no computing ability to assist in daily activities.

As Clark County CAD transitions to MDCs, it is presumed that this change will significantly increase efficiency in the field. This when compounded with the increased capacity of the CAD system, will place CCFD, LVF&R, and NLVFD near the top in available CAD technology. Casa Grande Fire Department installed MDCs recently.

Division Chief Dave Strayer indicates: “There is no question that these computers (MDCs) have enhanced our ability to access important information quickly and accurately, where and when it is needed-in route to and on the scene, while at the same time increased the accuracy of our response times” (Strayer 2002).

Chapter 5

Conclusions

Included in this area are the conclusions to be drawn from the study, a preview of the future of the CCCAD, and unresolved research questions.

Conclusions of the Survey

The results indicate that CAD is used extensively in the fire service, and that it has improved the management of emergency response. It further indicates that it is a valuable tool in making emergency response and emergency scene management more efficient by making required tasks easier to accomplish.

The survey yielded good results despite the disappointing response. Times have changed and information gathering regarding public services is becoming difficult. Security is on everybody's mind after the events of September 11, 2001. On two occasions, departments requested verification of the status of the author, to insure adequate security. This may have been a factor in the low response.

The current Clark County CAD is only half finished. As the system is now, it is comparable to most of the systems in the survey. With the enhancement of MDCs, the system will be more advanced than most systems in the survey. The fire departments in the Las Vegas Valley are unique in one aspect. They deal with a large volume of transients (short term residents) in the community. This is a very popular tourist destination, and as such it brings different problems. These visitors are concentrated in small areas, and come from all aspects of society. The call volume generated by these individuals presents a distinct workload. While these visitors do not provide to the tax base, they represent a significant economic source for the area and as such it is our responsibility to insure the safety of these individuals to preserve that economic source. Any tool or system that provides better service is essential. The system is expensive, and as mentioned in this paper, one difficulty is assessing the cost/benefit return of the system. To ease the cost of the system to the taxpayers, the system was phased in, thus allowing the ability to spread the cost over several years.

As the community grows, it places more demands on the departments for service. Requests for service continue to grow at a rate near 5.8 percent annually. This has placed increased demands on LVF&R dispatchers and on the responding units.

“Computer-aided dispatch systems have provided public safety departments with a valuable tool. The ability of computers to store and retrieve information as well as complete the millions of computations needed to perform logic functions in seconds 24 hours a day, seven days a week, makes it an indispensable technology to public safety” (Cady 2001). There is no question that these computers have enhanced our ability to access important information quickly and accurately, where and when it is needed in route to and at the scene, while at the same time increased the accuracy of or our response times (Strayer 2000). CAD technology with E911, GPS, AVL, and mobile data computers are catapulting the fire service into the future, and the Clark County CAD is moving with them.

The CCFD, in partnership with LVF&R and the NLVFD (the three departments served by our system) will have a state of the art CAD and MDC system which will provide efficient and reliable service to the citizens of our communities. We are on the leading edge for CAD in the fire service. The new mobile data Computer system will bring the departments into modern age in available technology, as we currently know it. It will provide responding crews with features including mapping, with multiple layer capability text driving instructions specific to each responding unit, unit and station status viewers which will include the status of each unit responding to an assignment, messaging including "auto reply" response to messaging such as "out of vehicle". The units will have the ability to add comments to the CAD event. Phase II will add graphic driving instructions and pre-plans that can be updated automatically using an 802.11 WLAN network. While initially some difficulties are expected to occur, when the system is fully operational, the Clark County Fire Department will have a tool to increase the efficiency beyond our current level.

CAD is a valuable tool, but it is an expensive commitment. Initial commitments can be hefty. Add in the training, maintenance, and updating and these systems can price themselves right out of some fire department budgets. Many departments join together and form consortiums to purchase and utilize the technology. One of the surveyed dispatch centers services ten departments. Many of these departments joined together for economic reasons. The reduction of duplicate services saves money further; consolidating a dispatch center improves communication between area fire departments.

Future Research

Assessing the cost/benefit of CAD may be difficult. The value of CAD comes in the increased efficiency of the operations. The possible reduction in personnel required to perform the same amount of tasks may be one approach. Actually looking at costs directly related to the efficiency of CAD would require departments to assess selected data prior to and after the implementation or improvement of a CAD system. Many departments do not have data on their system prior to implementation of their respective CAD systems. Is it worth the cost? The most valuable benefit of CAD is the reduction of response time for emergency apparatus. This time is an essential function of CAD and directly related to citizen survival. This area research could be analyzed, and would provide a direct assessment of the benefit of the systems. Research on the accuracy of the ProQa function of CAD would also provide a direct effect on the efficiency of the fire service providers. There is a great concern, as mis-catagorization of responses by ProQa, has the result of an inappropriate and inefficient response to the medical call.

Computers are essential to the effectiveness and functionality of the fire service. From CAD to pre-planning occupancies to word processing, the capabilities of the computer have only begun to be realized. How have departments adapted computers to their daily functions? Emergency medical reporting (in field) is a growing interest to the fire and private agencies. This application can reduce turn around time at the hospital, provide for faster billing and revenue recovery. Field data is collected and placed on a written record, which is time redundant. Handheld computers and personal data devices have the ability to reduce this redundancy. If a crew can enter information gathered in the field into a computer device, in addition to the information supplied from the CAD, redundancy will be reduced. Data can then be transmitted to the emergency room, allowing the ER staff to make appropriate preparations for the patient or advise the crew to divert to another facility (this is currently accomplished by radio or upon arrival at the ER). This should reduce the “turn-around” time for EMS crews at the hospital.

Upon the arrival at the emergency room, the record can be completed and transmitted to the billing department. This will insure rapid billing and return of revenue. What type of hardware is available to assist in this aspect? How much is it utilized and has it increased the efficiently of transporting crews at the hospital. Does it insure a rapid billing process and revenue recovery to insure future operations?

Firefighter safety is always an issue that is important to the fire community. How can technology improve their safety? Progress into firefighter vital sign telemetry (monitoring body temperature, heart rate and blood pressure) continues to develop. Imagine the ability to monitor these functions at the command post, and being able to intervene prior to a firefighters collapse. New design in building collapse alerting will provide early warning of collapse, to allow firefighters to withdraw from the building thus avoiding being trapped in a collapse.

Computers solve problems. They are limited only by the designers mind, and the ability to construct programs to solve those problems. But change does not come easy in the fire service. Older members are uneasy with change despite the benefits. This can present a barrier to the implementation of new technology in the fire service.

This paper has addressed the benefits of CAD. It shows that CAD offers a number of benefits to the taxpayer, both from the dispatch and field perspectives. As technology improves, there will be additional benefits from CAD. Most communities place public safety high in the funding priorities, and as such any time they can get measurable benefit from it makes assurances that the expense was well made.

Attachments

1. Cover letter sent in accompaniment to the questionnaires.
2. Computer aided dispatch survey, Field Perspective.
3. Computer aided dispatch survey, Dispatch Perspective.
4. Cover letter sent to the LVF&R dispatch center.
5. Computer aided dispatch survey, LVF&R dispatch perspective.
6. Dispatch survey results.
7. Field survey results.
8. Dispatch process comparison.
9. Field process comparison.

Kenneth E. Morgan

1401 European Drive
Henderson, Nevada 89052-4022
(702) 547-1201 Fax: (702) 898-3083

March 6, 2003

Fellow Fire Service Professionals:

I am a Captain with the Clark County Fire Department in Las Vegas Nevada and a fifteen-year career employee. I have been actively pursuing a Masters Degree in Public Administration, and I'm nearing the completion of the program. This has been a three-year process, and as final part of the completion of the program, I must prepare a professional paper.

This is where I am soliciting your departments' assistance. I am preparing a paper on the history and usage of Computer Aided Dispatch (CAD), and would like to include your department in the paper. Your input should not take more than a few minutes.

I need two pieces of information:

1. I would like to have your communications (dispatch) division complete the enclosed ***CAD Dispatch Perspective survey***. This will give me information about the system and its capabilities.

2. I would like a member of the suppression force, preferably a company officer complete a ***CAD Field Perspective survey***. This will give me information from a user perspective.

I have requested that the surveys be either faxed or e-mailed back to me as soon as possible. The number and e-mail address is on the bottom of the survey. This will allow me to compile the information faster.

I would like to take this opportunity to thank you and your department in advance of the completion of the surveys. It will provide information for my paper, further my knowledge of a functioning part of the fire service.

If you would like a copy of the completed paper, I will gladly send you an electronic (word format) or hard copy version. Please indicate your request by fax or email at the provided number/address. I will forward a copy after acceptance by the committee

Sincerely,

Kenneth E. Morgan
Kenneth E. Morgan, MPA Candidate
University of Nevada – Las Vegas

Encl: Dispatch Perspective Survey
Field Perspective Survey

I. Computer Aided Dispatch Survey

Field Perspective

1. Does your department use Mobile Data Terminals or Mobile Data Computers?
   ☐ Mobile Data (dumb) Terminal ☐ Mobile Computer (laptop computer or equivalent)
   How old is you current MDT/MC? ______ Years
2. Can you communicate (unit messaging) with responding units via the CAD/MDT? Yes☐ No ☐
3. Do you get supplemental information on the MDT/MCT? Yes☐ No ☐
   If yes, what info: ☐ Directional Maps ☐ Hazmat info ☐ Route Recommendations
   ☐ Water Supply ☐ Other ________________________________
4. Does the information you Send/store/receive on the MDT/MCT improve your decision making on:
   The initial response? ☐ Yes ☐ No Initial Scene Management? Yes ☐ No ☐
   Tracking Resources? ☐ Yes ☐ No Daily Activities? Yes ☐ No ☐
5. Approximately what is the percentage of down time of your system? _________

FOR MOBILE COMPUTER USERS ONLY:

6. Can you use your MDC for tasks other than CAD? Yes ☐ No ☐
   If Yes, What other tasks do you use your MCT for? Reports ☐ Pre-Plans ☐
   ☐ E-Mail (intra department) ☐ E-Mail (outside department) ☐ Internet
   ☐ Scheduling ☐ Other: ____
7. Does the information you Send/Store/Receive on the MDT/MCT improve your decision making on: Report writing and filing? Yes☐ No ☐
   Fire Prevention tasks? Yes☐ No ☐
8. Does your MDC utilize a wireless LAN or WAN to transmit data to station computers?
   Yes☐ No ☐
9. What is your units approximate annual call volume ? _____________

Department Name: ___________________________ Population Served ___________

Thank you for taking the time to do this survey. I sincerely appreciate your time

Please FAX to (702) 898-3083 or Email to firetaz@lvcm.com

Computer Aided Dispatch Survey

Dispatch Perspective

1. Does your department use Computer Aided Dispatching? Yes☐ No☐
   If Yes, How long has your departments been using CAD? ______ Years
   How old is you current system? ______ Years
2. What was your department's average "contact to dispatch" time before CAD was implemented?
   ___ Minutes; after CAD was implemented? ___ Minutes
3. Does your CAD system utilize Automatic Vehicle Location technology? Yes ☐ No ☐
4. Does Your CAD system utilize Geographical Information System Mapping Data? Yes☐ No☐
5. Does you CAD system "ship" information to a MDT/MDC? Yes☐ No☐
   If yes, what information: ☐ Maps ☐ Hazmat Info ☐ Route recommendations
   ☐ Water Supply ☐ Other ________________________________
6. Does your system provide for auto transfer of 911 (ANI-ALI) for call information? Yes☐ No☐
7. your system utilize a single computer, or multiple linked PCs? ☐ Single ☐ Multiple
8. If it uses multiple computers linked together, how many _______
9. What does each computer do? (Ex: maps, hazard data, unit status)
   ____
10. Does your system automatically alert assigned units? Yes☐ No ☐
11. Can you communicate with responding units via the CAD/MDT? Yes☐ No ☐
12. What back-up system do you use? ☐ Computer ☐ Magnetic/Light Board
    ☐ Manual ☐ Microfiche ☐ Other
13. Does the CAD system make the decision-making process easier:
    ☐ During call taking? ☐ Tracking Units? ☐ Establishing levels of service for EMS requests?
    ☐ Responding additional resources or alarms ☐ Interacting with other agencies?
14. What is the annual call volume of your dispatch center? __________
15. How many departments does you dispatch center service? __________
16. How many stations does your center control? __________ Units? ______________

Department Name: ____________________________ Population Served ____________

Thank you for taking the time to do this survey. I sincerely appreciate your time

Please FAX to (702) 898-3083 or Email to firetaz@lvcm.com

Kenneth E. Morgan

1401 European Drive
Henderson, Nevada 89052-4022
(702) 547-1201 Fax: (702) 898-3083

March 19, 2003

Las Vegas Dispatch Personnel,

I am a Captain with the Clark County Fire Department in Las Vegas Nevada and a fifteen-year career employee. I have been actively pursuing a Masters Degree in Public Administration, and I'm nearing the completion of the program. This has been a three-year process, and as final part of the completion of the program, I must prepare a professional paper.

This is where I am soliciting your departments' assistance. I am preparing a paper on the history and usage of Computer Aided Dispatch (CAD), with a comparison of our system to the responding fire services. I would like to include our dispatcher's opinion in the paper. Your input should not take more than a few minutes.

Please have 3 o r 4 of the dispatchers complete the attached **Las Vegas Fire Dispatch Survey**

I have requested that the surveys be either faxed back to me at station 17, as soon as possible. The number and e-mail address is on the bottom of the survey. This will allow me to compile the information faster.

I would like to take this opportunity to thank you and your department in advance of the completion of the surveys. It will provide information for my paper, further my knowledge of a functioning part of the fire service.

Sincerely,

Kenneth E. Morgan
Kenneth E. Morgan, MPA Candidate
University of Nevada – Las Vegas

Encl: Las Vegas Dispatch Perspective Survey

Computer Aided Dispatch Survey

Las Vegas Dispatch Perspective

1. In your opinion, does our CAD system make the decision-making process easier?
   a. During the call taking process? Yes No
   b. Assigning units to calls? Yes No
   c. Establishing levels of service for EMS requests? Yes No
   d. Responding additional resources or alarms? Yes No
   e. Interacting with other agencies? Yes No
   f. Selecting and monitoring radio channels? Yes No
2. In your opinion, does our CAD system make your job task easier?
   a. Taking Calls Yes No
   b. Keeping track of unit status and location? Yes No
   c. Interacting with other agencies? Yes No
   d. Selecting and monitoring radio channels? Yes No
3. Overall is our CAD system efficient at its designed function Yes No
4. What is the annual call volume of your dispatch center? _________

Thank you for taking the time to do this survey. I sincerely appreciate your time

Please FAX to (702) 450-4807 (Station 17)

Dispatch Perspective

	Yes	No	Average	100,000 & Under	100001 to 300000	300001 and over
Responses			Years			
Use CAD	11	0		2	6	3
Average length of use			15.00	2	6	3
Average Age of current system			6.50			
Average CTD before			53.75			
Average CTD after (Seconds)			37.39			
Use AVL	3	8				
Use GIS	7	7				
Ship Info	7	4				
Maps			2			
Hazmat			3			
Route			1			
Water Supply			0			
Other			4			
Single Computer	0					
Multi Computer	11					
Average Number of Computers			9.40			
Communicate with MDT/MCT	4	6	36.36%			
Back up						
Computer			6			
Magnet/Light Board			2			
Manual			3	**CHART**		
Microfiche			0			
Other			0			
Highest Annual Call Volume			800000			
Lowest Annual Call Volume			6173			
Highest Population			2000000			
Lowest Population			60000			
Average Number of Departments Serviced			4			
Highest Number of Departments Serviced			10			
Highest Number of Computers Used			27			
Lowest number of Computers Used			3			
Number sent			60			
Number returned			11			
Average returned			18.33%			
Percent using CAD			100.00%			
Percent using AVL			27.27%			
Percent using ANI/ALI			90.91%			
Percent using GIS			63.64%			
Percent Shipping Information			63.64%			
Dispatch Process						
Call taking			8.00			
Call tracking			10.00			
EMS			7.00	**CHART**		
Additional Alarms			10.00			
Agency Interaction			8.00			

Field Perspective

	Yes	No	Average	Under 100,000	100001 to 300000	300001 and over
Responses						
MDT			9	5	3	4
MDC			5	2	3	5
Communicate with MDT/MCT			13		CHART	
Supplemental Info	9	3				
Maps			1			
Hazmat			6			
Route			0	CHART		
Water Supply			4			
Other			8			
Decision Making						
Initial Response			11			
Initial Scene Management			5	CHART		
Tracking Resources			4			
Daily Activities			3			
Down Time			6%			
MDC Tasks	3	3				
Reports			0			
Pre-Plans			2			
E-Mail (Intra Department)			0			
E-Mail (Outside Department)			0			
Internet			0			
Scheduling			0			
Other			1			
Decision Making						
Report Completion			0			
Fire Prevention Inspections			0			
Lan/Wan Use	1	4				
Average Run volume			7504			
Lowest Run Volume			0			
Highest Run Volume			39000			
Average Population			745235			
Highest Population			2000000			
Lowest Population			55000			
Responses sent			60			
Responses returned			17			
Average Responses			28.3%			
Average MDT/MDC use			82.35%			
Number of Departments with no MDT/MDC			3			
Percent using MDT			64.29%			
Percent using MDC			35.71%			
Percent using LAN/WAN			7.14%			

Dispatch Process Comparison: Dispatch Comparison

Manual Method	***CAD***
1. Answer Call	***1. Answer 911 Line***
2. Write Call Nature	***2. Input Call Type (nature)***
3. Write Call Address	***3. Automatically accomplished***
4. Write Callers Name	***4. Automatically accomplished (verification required)***
5. Write Callers Phone Number	***5. Automatically accomplished***
6. Locate call on map	***6. Automatically accomplished***
7. Locate closest fire station	***7. Automatically accomplished***
8. Alert fire stations	***8. Automatically accomplished***
9. Relay information	***9. Automatically accomplished***
Duration 90 to 150 Seconds Time is estimated, as no records are available	***Duration 30-45 Seconds***

Dispatch Process Comparison: Field Perspective

Manual Method	***MDT/MDC***
1. ***Receive Alert***	1. ***Receive Alert***
2. ***Write Call Nature***	2. ***Automatically accomplished***
3. ***Write Call Address***	3. ***Automatically accomplished***
4. ***Write Map Info***	4. ***Automatically accomplished***
5. ***Write Units Responding***	5. ***Automatically accomplished***
6. ***Locate call on map***	6. ***Automatically accomplished***
7. ***Determine Route***	7. ***Automatically accomplished***
8. ***Prepare (Turnout) for call***	8. ***Prepare (Turnout) for call***
9. ***Respond***	9. ***Respond***
Duration 60-90 Seconds	***Duration 30-60 Seconds***

Time is estimated, as no records are available

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Local Dispatch Perspective:

Four LVF&R Dispatch Operators (local operators)

Local Field Perspective: Six Captains (Company Officers), Clark County Fire Department.