Chapter 4
Emergency Communications Technology

5 hours

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Arkansas Basic Telecommunicator Course

References:

APCO Institute Public Safety Telecommunicator 1, Seventh Edition, 2016

National Emergency Number Association

IFSTA Telecommunicator, First Edition; 2001 Springhill

Niagara University and Disability Awareness Training, 2013

Training Aids:

Prezi Presentation
Computer

Coordination/Personnel:

Gary "Bud" Gray, North Little Rock Emergency Service
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Instructional Unit Summary:

Chapter 4 Emergency Communications Technology

Lesson Purpose:

To provide the Telecommunicator with an understanding of 9-1-1 systems, computer aided dispatch systems, mapping systems, and other Public Safety related technology and how to effectively utilize that technology within their own agency.

Instructional Objectives:

At the conclusion of this block, the student will be able to:

1. Display an understanding of the different Telephony Technologies
2. Display an understanding of types of Answering Points
3. Display an understanding of the differences of Basic 911 and Enhanced 911
4. Demonstrate the knowledge of Call Transfers, Alternate & Default Routing
5. Display an understanding of the differences between Wireless Phase I and Wireless Phase II
6. Demonstrate how Plotting works with 911 systems.
7. Demonstrate a working knowledge of how to perform Call Traces
8. Display an understanding of Voice Over Internet Protocol
9. Demonstrate the understanding of Next Generation 911 & Text to 911
10. Display an understanding of TDD/TTY/TRS
11. Display an understanding of the use of Telematics and Video/Security Cameras as it relates to public safety
12. Display a working knowledge of Computerized Mapping/GIS
13. Display an understanding of Logging Recorders
14. Display a working knowledge of CAD Systems
15. Display a working knowledge of Mobile Data Systems, AVL, Paging, Alarms, etc.
16. Display a working knowledge of Mass Notifications
17. Display an understanding of Security Breaches and Cyber Security Threats

18. Demonstrate an understanding of the Arkansas Fusion Center and Terrorist Tracking
19. Demonstrate the knowledge of Smart 911 & Panic Button

I. INTRODUCTION

Telecommunications is a general term for a vast array of technologies that send information over distances. Mobile phones, landlines, CAD systems, Automated Vehicle Locators and even the computers we sit at are all examples of current technology that we use daily in our jobs.

II. BODY

A. Telephony Technologies

1. Local Exchange – Is the local central office that connects local access and transport area (LATA) to interexchange carriers (IXC) such as long-distance carriers: AT&T, Sprint, Verizon, etc.

2. Private Branch Exchange (PBX) – A PBX is a private branch exchange (telephone switching system within a business or organization).

3. Multi-line Telephone Systems (MLTS) – Typically up to 10 lines are connected to each phone unit and can be answered individually. They host a variety of features to include caller ID, conference calling, transferring, call forwarding, etc.

4. Voice Over Internet Protocol (VoIP) – Is the transmission of voice and multimedia content over Internet Protocol.

5. Call Distributor Systems (CDS) – Some providers have automatic call distributor systems, which place incoming calls in a queue and distribute them to the next available call taker.

B. 911 System

1. 911 Emergency Telephone Service History

a. Basic 9-1-1 came about in the early fifties in Europe and provided a convenient, easy to remember number.

b. In 1957, in the United States, the National Association of Fire Chiefs recommended the use of a single number for reporting fires.

c. In 1967, the Presidents Commission on Law Enforcement and Administration of Justice recommended that a "single number should be established" nationwide for reporting emergencies. Different telephone numbers for each type of emergency was determined to be contrary to the purpose of a single, universal number. The Federal Communications Commission (FCC) was tasked with finding a solution.

d. In November 1967, the FCC met with the American Telephone and Telegraph Company (AT&T) and 9-1-1 was established as the emergency code throughout the United States.

    i. The code 9-1-1 was chosen because it was a unique code that had not been used as an area, service, office or other code.

    ii. It is brief, easy to remember, and can be dialed quickly.

e. Congress backed AT&T's proposal and passed legislation making 9-1-1 the standard emergency number nationwide.

f. On February 16, 1968, Senator Rankin Fite completed the first 9-1-1 call made in the United Sates in Haleyville, Alabama.

g. On February 22, 1968, Nome, Alaska implemented 9-1-1 services.

h. The percentage of the U.S. population with 9-1-1 service increased from approximately 17% in 1976 to approximately 98% at present (December 2017).

i. 98.9% of the United States population have some Phase I and 98.8% of the United States population have some Phase II.

j. "An estimated 240 million calls are made to 9-1-1 in the U.S. each year. In many areas, 80% or more are from wireless devices" (National Emergency Number Association, 2017).

2. 9-1-1 Service in Arkansas

a. 9-1-1 Service in Arkansas was enabled and established by Act 683 of 1985.

b. Pulaski County established the first 9-1-1 system in Arkansas followed by Washington County.

c. Act 683 was amended by Act 46 of 1999, which added fifty-cent surcharge on all cell phones with an Arkansas area code to defray the cost of complying with federal law that mandated new standards for 9-1-1 calls placed from cell phones.

d. Technology was available to display the calling number from cellular phone calls and direct calls to the proper PSAP, commonly known as Phase I.

e. After Phase I technology, new technology known as Phase II became available that enabled equipment to plot cellular 9-1-1 calls on maps.

3. Types of Answering Points

a. Public Safety Answering Point (PSAP) are call centers responsible for answering calls to an emergency telephone number (911).

i. Primary PSAP's are call centers who initially answer 911 calls.

ii. Secondary PSAP's are call centers in which 911 calls are transferred from a Primary PSAP.

4. Basic 911

a. For Basic 911, the phone company created a direct connection from the central telephone office to the PSAP. The PSAP would not receive any caller identification information such as name, phone number or address.

b. Sometimes calls were not directed to the correct PSAP because telephone service areas did not always line up with jurisdictional service areas.

c. Later, basic 911 improved (when caller ID was created) which provided PSAP's with automatic number identification (ANI). Later, automatic location identifier (ALI) would cross reference the 10-digit phone number with telephone company's database. This gave the 911 call taker subscriber information such as customer name and address that was associated with the 10-digit phone number.

i. ANI – The ability to display the telephone number of the telephone from which the 911 call was made.

ii. ALI – The ability to display the address of the telephone from which the 911 call was made.

5. Enhanced 911

a. Enhanced 911 was an improvement over Basic 911. The system uses a selective router, which would route the 10-digit number to the specific PSAP based on the subscribers address using an Emergency Service Number (ESN).

   i. The ESN is a 3-digit number, which represents a combination of emergency service agencies (Law Enforcement, Emergency Medical Service, and Fire) designated to serve a specific range of addresses within a particular geographical area or Emergency Service Zone (ESZ).

   ii. An ESN number is assigned to each line of a Master Street Address Guide (MSAG). The MSAG includes the exact spelling of street names, range of addresses for each street, both even and odd and other address information.

   iii. When a new telephone account is created, the address is located in the MSAG and the proper ESN is assigned to the 10-digit number, so if a 911 call is made, it selectively routes to the appropriate PSAP. Telecommunicator's should fill out a 9-1-1 problem call sheet on landline calls, which do not display an address or show incorrect information.

b. Enhanced 911 also included the abilities for Selective Transfer, Fixed Transfer, Manual Transfer, Alternate Routing, Default Routing and Overflow Routing.

   i. Selective Transfer is the capability to transfer a 911 call by selecting a console key associated to a response agency based on the type of emergency service needed (law, ems, or fire).

   ii. Fixed Transfer allows the PSAP to transfer a 911 call to a specific agency by selecting a pre-

programmed “speed dial” button that corresponds to that agency.

iii. Manual Transfer allows the PSAP operator to manually dial another agency by dialing their telephone number.

iv. Alternate Routing is used when a primary PSAP has a need to transfer all their 911 lines to another pre-determined PSAP. For example, if a PSAP evacuates due to an emergency or if they have 911 equipment failure, the Telecommunicator can flip the switch to transfer the 9-1-1 lines or call AT&T resolution center. Telecommunicators should know what agency has been designated as their pre-determined back up PSAP for their 9-1-1 lines.

v. Default Routing is used to deliver a 911 call to a pre-determined PSAP when selective routing is not available. For example, for calls where the record is not found or there is network trouble.

vi. Overflow Routing is used in cases where the primary PSAP is unable to receive calls due to all lines being busy. Pre-determined back up PSAPs are set up to automatically receive these calls during this situation.

6. Wireless Phase I

a. Requirements

i. Wireless service providers are required to provide the telephone number and the location of the cell site and/or sector of the originating 911 call to the PSAP.

ii. A pseudo ANI (pANI) is a number used by the wireless service provider to identify the cell tower site from which a wireless 911 call originates as well as route it to the PSAP.

7. Wireless Phase II

a. Requirements

i. Wireless service providers are required to provide the telephone number and the location of the cell site and/or sector of the originating 911 call to the PSAP as well as the X,Y coordinates.

ii. Wireless carriers could choose between handset-based location technology using global positioning systems (GPS) or network based location technology using cell tower triangulation.

8. Plotting

a. GPS location accuracy had to be within 50 meters for 67 percent of the calls and 150 meters for 90 percent of the calls. Network based accuracy had to be within 100 meters for 67 percent of the calls and 300 meters for 90 percent of the calls.

b. Outer Confidence Ring designates the area within which the event is most likely to be located. With each inner ring, the certainty of the location accuracy decreases.

c. Confidence Level (CNF) shows the percentage of confidence out of 100%. The uncertainty level (UNC) will show you approximately how many meters the call is from the location that plotted.

d. Rebid (Retransmitting) is used for wireless calls when the caller's longitude and latitude is unavailable at the time when the call was delivered to the PSAP. Retransmitting can be used to also update the caller's longitude and latitude every 30 seconds during the call if the caller's location is changing.

9. Call Traces (Pinging a cellular phone)

a. The Telecommunicator must follow agency policies regarding pinging a cellular phone.

b. To locate the wireless service provider (if unknown), google free cellular provider look up or use freecarrierlookup.com. Type in the phone number and it will provide the wireless service provider.

c. To ping a cell phone, the Telecommunicator must contact the wireless service provider and request a ping. The wireless service provider will ask a few questions regarding the circumstances and then will send a fax to be filled out by the requestor. After filling out the request, it should be faxed back to the wireless service provider.

i. The wireless service provider will verify your employment and they will either approve or disapprove the request If approved, the wireless service provider may email the requestor with ping updates or verbally provide updates using latitude/longitude or degrees/minutes/seconds. The Telecommunicator must enter these coordinates into the map to determine where the latest ping is plotting.

d. A manual search in the 9-1-1 system, allows the Telecommunicator to manually search a 10-digit landline number, which will give subscriber

information (name and address, response agency information, etc.) if it is available.

10. Voice over internet protocol (VoIP) allows subscribers to use the internet as the medium for placing phone calls.

    a. Since all routers are not static (permanent location) and most are nomadic (no permanent location), customers (citizens who have VoIP service) must update their addresses if their location changes.

11. Next-Generation 911 (NG911) is an internet protocol that allows digital information (voice, videos, photos, and text messages) to be sent through the 911 system.

C. FirstNet

1. This nationwide broadband network will be used only by first responders/agencies to enhance communications between agencies as well as enable information sharing over a secured network.

D. TDD/TTY/TRS (Telecommunications device for the deaf, Text Telephone, Telephone Relay Service)

1. Text Telephone (TTY) – This allows callers who are deaf, hard of hearing, or speech impaired to type messages back and forth to one another instead of talking and listening.

2. Upon receiving a call that is silent or if a series of beeps can be heard it might be an indication of a TTY call.

3. To communicate by TTY, a person types his/her conversation, which is read on a TTY display by the person who receives the call. Both parties must have TTYs to communicate.

4. A person can also use a computer with a TTY modem and related software to communicate with someone who also has the same technology.

5. When typing on a TTY, each letter is transmitted by an electronic code called Baudot, which is sent from the TTY on the sending end of the call through the telephone line in the form of tones to the TTY on the receiving end of the call, the same way voiced communications occur between two parties.

6. The receiving TTY transforms the tones back to letters on a small display screen.

7. Communications between two person using standard TTYs can only occur in one direction at a time. Thus, both persons who are conversing cannot type to each other at the same time; they must take turns sending and receiving. A person sending a communication by TTY indicates that he or she has finished transmitting by typing the letters "GA," which stands for "go ahead."

    a. List of TTY Abbreviations

8. Telephone relay services are provided by states, as required by Title IV of the ADA, and are regulated by the FCC. Relay services involve a relay assistant who will communicate on the behalf of the caller to the Telecommunicator.

    1. Arkansas Relay Service is a communications system that allows hearing persons and Deaf, hard of hearing, or speech-impaired persons to communicate by telephone.

    a. Some of the Telephone Relay Services are:

        i. Hearing Carry-Over (HCO)
        ii. TeleBraille
        iii. Voice Carry-Over (VCO)

iv. Speech-Relay Operator (SRO)

E. Telematics

1. Telematics is a method of monitoring a vehicle by using GPS and cellular technologies for anti-theft protection, navigation, remote vehicle unlock, emergency reporting, automatic crash collision notification and response, stolen vehicle assistance, etc. There are several companies that provide devices that track vehicles or property. There are also companies that provide tracking devices that assist banks in the recovery of stolen money.

2. Vehicle Telematics

   a. Service providers such as OnStar, Ford Sync, Toyota Safety Connect, etc., operate much like PSAP. They are staffed 24/7/365 by trained personnel and are a link for customers to a public safety call center.

   b. PSAPs may receive calls from a Telematics Call Center (TCC) connecting the subscriber to the appropriate PSAP during emergencies.

   c. During a motor vehicle crash if built-in sensors activate, telematics service providers will automatically contact the subscriber even if the subscriber did not request assistance.

   d. Some telematics service providers provide anti-theft services that can block someone trying to start the vehicle, can slow down vehicles, which are stolen, and can track stolen vehicles using GPS.

3. Personal Emergency Response Systems

   a. Personal Emergency Response Systems allows a subscriber to push a button during an emergency. When a button is activated, the system is set up to call

an emergency response center who will determine the nature of the emergency and will contact the appropriate response agency.

F. Video/Security Cameras

1. Cameras can be used to track the movement of suspect vehicles and assist in the proper identification of suspects.

2. Some 9-1-1 centers have the ability to access video cameras at schools, businesses and/or financial institutions, etc.

G. Computerized Mapping/GIS

1. Digital mapping system is the process by which a collection of data is compiled and formatted into a virtual image. The primary function of this technology is to produce maps that give accurate representations of a particular area, detailing major road arteries and other points of interest. This technology also allows the calculation of distances from once place to another, using applications such as Google earth and GPS. They can provide the Telecommunicator with names of school, churches, hospitals, intersections. All of this can be useful to help a responder identify a location.

2. Information for mapping systems is usually generated from the county 9-1-1 coordinator.

H. Logging Recorders

1. Most PSAPs are equipped with some type of recording device. These devices record radio traffic and telephone conversations. Each workstation may have a device that is capable of playing back radio or telephone communications. Telecommunicators should not become dependent on the playback function; its primary responsibility is for storing information.

I. CAD Systems

1. The CAD can be a useful resource for the Telecommunicator. It can offer historical information, alert of potential problems provide guidance on calls for service, special concerns, tracking of units, and preplans, etc. All of this information can be important to a responder.

2. Telecommunicators enter information such as the address, the nature of the incident, caller phone number, etc., into the system. If the CAD system is interfaced with the PSAPs 9-1-1 system, the address and the telephone number will populate by the way of ANI/ALI database.

3. Computer Aided Dispatch systems record information about each call for service that comes in, helping departments keep a record of what is happening in their jurisdiction and to use the information to adjust patrolling areas based on crime.

4. Today's CAD technology can be linked to criminal history databases from other police jurisdictions, fire and EMS dispatch centers, and jails. This link enables agencies to streamline and share information.

J. Mobile Data Systems

1. Responders who respond to emergencies, anticipate what they will encounter when they arrive on-scene, and to help predict incident trends and patterns.

2. Prior to computers, information was gathered by responders in the field. The responders where totally dependent on the information provided by the Telecommunicator or on what they might remember from past calls. Now that the computer has taken over routine data collection, via the Telecommunicator, information can be easily transmitted to the responder in their units by way of Mobile Data Systems.

3. Mobile Data Terminals (MDT) or MDIS connect to CAD systems by radio and allow data transfer between the responders and the PSAP in real time format.

4. MDT/MDC's can link to other systems and allow the responder information that could only be obtained by communicating with the PSAP.

5. Reduces the amount of traffic and the time it takes to receive information through an additional relay. Where a request to a Telecommunicator might take 60 seconds – through an MDT/MDC it may only take seconds. This can free up the radio for emergency traffic.

K. AVL

1. Automated Vehicle Locator - Some PSAP's have AVL systems linked into their CAD systems that can be used to provide a location for a responding unit. This system works using the Global Positioning System.

L. Paging

1. Some PSAPs use software to deliver emergency messages directly to cell phones just like it would going to a pager. This allows the PSAP to send emergency messages to response teams to alert them of emergency calls, and allows responders to view a map of the incident, details of the call, etc.

M. Alarms

1. Alarms may come into the PSAP in various ways. Some PSAPs monitor alarms directly, while others may receive calls directly from the alarm company.

2. Telecommunicators need to determine the type of the alarm, i.e. panic, burglary, trouble, fire or medical, and send the appropriate responder(s) to the alarm. Due to the high

number of false alarms, the Telecommunicator should use caution not to become complacent when dispatching alarm calls. All alarm calls should be processed in the same matter every time.

N. Mass Notifications

1. Mass notifications can be operated using different companies. The software can deliver messages by different methods, such as phone, SMS, email, etc. using different platforms (reverse 911, geo-fencing or subscription).

O. Security Breaches, Cyber Security Threats

1. With technology ever changing and progressing, it is necessary to ensure proper steps are taken to keep the 911 center secure. Following the National Institute of Standards and Technology (NIST) Cybersecurity Framework and other effective strategies can be employed to thwart the efforts of cybercriminals and their attacks on PSAP systems and data. Breaches can cripple PSAP operations and have a dramatic negative affect on emergency response.

2. The Multi-State Information Sharing & Analysis Center (MS-ISAC) has been designated by the U.S. Department of Homeland Security as the central resource for cyber threat, prevention, protection, response and recovery for the nation's state, local, territorial and tribal governments as well as fusion centers. You can contact the MS-ISAC at 866-787-4722 anytime as they operate 24/7. Their website is http://msisac.cisecurity.org.

P. Arkansas Fusion Center (Terrorist Tracking)

1. The State of Arkansas in conjunction with the Federal Government monitors the movement of national and international terrorists through the Department of Homeland Security's Terrorism Screening Center.

2. On May 19, 2008 Governor Mike Beebe signed an Executive Order establishing the Arkansas State Fusion Center (ASFC), highlighting the critical need to protect our Nation and specifically, the citizens of the State of Arkansas, against future terrorist attacks by joining efforts with the Department of Homeland Security, FBI, Department of Justice and many others.

3. The Governor's order stipulated that the ASFC be organizationally located within the Arkansas State Police.

4. The mission of the ASFC is to provide an integrated, multi-discipline, information sharing network to collect, analyze and disseminate information to stakeholders in a timely manner to protect the citizens and the critical infrastructure of Arkansas.

5. The purpose of the ASFC is to assist in enabling law enforcement, public safety, emergency management and other partners to mutually aggregate, analyze and disseminate criminal and terrorist-related information.

6. Any Law Enforcement encounter that results in an ACIC/NCIC check will touch the Terrorist Screening Data Base (TSDB). When reviewing the record of the subject/subjects the officer/dispatcher should follow the procedure below if the subject information returns a positive hit.

7. If dispatch is coordinating the NCIC/ACIC checks for Law Enforcement, the dispatcher should ensure the Officer can take the information without disclosure prior to providing the disposition of the subject on the TSDB. Notification that the subject/s is showing on the TSDB and the Handling code and action required should be provided to the LE partner. (be aware that the codes could be different from locally know system of identification) (See example of ACIC/NCIC return on a TSDB notification in student book)

8. Upon any officer or dispatcher running a name that results in a positive hit against the Terrorist Screening Data Base (TSDB) take note of the associated handling. Follow the guidance specific to the handling code and call the TSC at 1-866-872-9001 to validate the identity of the subject and update the record with any peripheral information.

9. If appropriate, provide as much detail as possible to the TSC Analyst including:

    a. The identity and physical descriptions of the occupants or individuals associated with the stop

    b. The description of the vehicle or activity that prompted the engagement with Law Enforcement

    c. Any other information that you believe would be beneficial to the investigating agency and in the interest of Homeland Security based on the officers observations (computers, chemicals, technology etc.)

DO NOT NOTIFY THE SUBJECT THEY HAVE BEEN IDENTIFIED AS BEING ON THE TERRORIST WATCHLIST

Forward information pertaining to positive engagements to the Arkansas State Fusion Center, including Field Interview Cards, when possible. ASFC will research the subject follow-up with TSC and provide any additional information to the local officer or reporting agency.

Q. Smart911 & Panic Button

1. Smart911 is a service used by PSAPs across the country to enhance communication and response for their community. It can be used by PSAPs to quickly send first responders to the location of an emergency with more information.

2. Smart Prepare can be utilized by emergency managers to better plan for and respond to disasters. Citizens with a Smart911 profile can opt in to have their information accessed by the emergency manager. The emergency manager can pull various reports to assist emergency responders during large-scale events. For example, the emergency manager can draw a polygon on a map and request a report of the citizens inside the area that are bedridden, mobility impaired and/or would need assistance evacuating.

3. The Panic Button is an app, which provides facility (schools, hospitals and corporations) information to the Telecommunicator when a panic button is activated. Individuals within the facility have an app that is pre-downloaded. Pressing the panic button on the app, places a 911 call. The 911 call routes to the appropriate PSAP while at the same time, the system notifies key on-site individuals that an emergency exists. The Telecommunicator also receives the facility profile, which includes demographic information, blue prints of the facility and emergency contact information.

    a. Anytime a 911 call is placed within the geofencing of the facility, the facility profile will be made available to the Telecommunicator. The Telecommunicator determines if the incident being reported needs to be sent as an emergency notification to authorized personnel at the facility.

III. CONCLUSION

Technology is a great asset in the field of telecommunications. To be efficient, Telecommunicators must be aware of the technology available and possess knowledge of its capabilities. As technology advances, additional resources will become available to better enhance emergency response today and into the future.