A NPSTC Public Safety Communications Report

The National Public Safety Telecommunications Council is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.

Use Cases & Requirements for Public Safety Multimedia Emergency Services (MMES)

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MMES Use Cases & Requirements

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1 EXECUTIVE OVERVIEW

The public safety community has a desire to have Multi-Media Emergency Services (MMES) for communication between its incident command teams, field supervisors, PSAP supervisors, and telecommunicators and incident management personnel and those responders first arriving on the scene of an incident using mechanisms that are not primarily voice and that leverage the commercial approaches being developed for NG9-1-1 and other applications and services. Public safety MMES may support a variety of non-verbal communications modes, including:

- Text communication
- Multimedia (e.g., pictures, video clips) communications.
- Real-time video communications
- Text communication with supplementary media (such as background audio and/or video)
- Other data and telemetry such as sensors, probes, location information, etc.

Public safety MMES as defined in this document focuses on Next Generation Network (NGN) technology and does not include legacy messaging services, such as Short Messaging Service (SMS).[1]

There will be significant impacts to the entire public safety communication system resulting from the changes in networks and devices as described in this document. It is expected that end user devices and networks will ultimately evolve, and that the next generation emergency services solution will allow this evolution to take place over time.

This document specifically limits its applicability to meet the following public safety MMES definition:

Public safety MMES are next generation emergency services supporting non-voice initiated communications between responders and associated equipment and communications centers using real-time session- and non-session-based text and other multimedia. Public safety MMES support location determination of the end device, location updates, and location transport in a manner similar to NG9-1-1. Public safety MMES support additional media in a two-way voice

[1] While text messaging is expected to remain popular, the underlying technology must shift from legacy SMS to IP-enabled messaging (including various forms of instant messaging (IM)). Increasingly, both smart phones and feature phones support multiple technologies for text messaging. It is important not to confuse a specific underlying technology such as SMS with functionality such as text messaging.

emergency communications session. Public safety MMES may also support additional use cases for emergency services without requiring two-way emergency voice communications.

This document identifies requirements for public safety MMES. These public safety MMES requirements are subdivided into the following categories: end-to-end message requirements, device requirements, subscriber group requirements, Public Safety Communications Center requirements, and LTE network requirements.

In addition, Annex A contains 16 public safety MMES use cases to provide example scenarios of the usage of next generation messaging amongst emergency responders and Public Safety Communications Centers in support of multimedia emergency communications.

It is important to note that these use cases are intended to illustrate at a high level the actions that would occur during a particular scenario and are illustrative of ***what*** information would be needed and does not provide any recommendation on ***how*** it is provided (For example, whether a client software is needed or some sort of standards based – CAP, EDXL - feed is necessary, or how geo location is established – via network or GPS).

2 INTRODUCTION

The public safety MMES requirements in this document have been identified by individual use cases. The Use Cases generated associated requirements which have been categorized and listed in the "PS MMES Requirements" section which follows. Because many of the requirements apply to more than one of the Use Cases from this document, a reference "(n)" was included so that traceability back to the original Use Cases has been maintained.

3 DEFINITIONS

Public Safety Multimedia Emergency Services (MMES) – Public safety MMES are next generation emergency services utilizing real-time session- and non-session-based text and other multimedia, in addition to voice, that are based on trusted applications in support of non-voice communications amongst responders and public safety communications centers. Public safety MMES provides secure transport of messaging and media content, and location information of the reporting device.

Public Safety Communications Center – In this document, the phrase "public safety communications center" is used to include any incident command location, including an onsite incident command post, a public safety answering point (PSAP), a public safety communications center, or an emergency operations center.

Mobile Command Center – Mobile Command Centers are typically specialized vehicles which include a wide variety of communications and interoperability equipment and may be used to enhance emergency communications at the incident scene and provide back up to fixed Command Centers.

Subscriber Group – A set or collection of members (two or more) subscribed to a group communication service that allows the members to participate and exchange data among the set of members using one-to-many communication. The group is defined by a set of rules that identifies the privileges of the members.

Sub-Network –The subset of the Nationwide Public Safety Broadband Network (NPSBN) defined by a IMSI/MSIN [International Mobile Subscriber Identity/ Mobile Subscription Identification Number] range within the common PLMN ID [Public Land Mobile Radio Identifier]. A sub-network provides an HSS [Home Subscription Server] for its particular IMSI Range.

Nationwide Public Safety Broadband Network (NPSBN) – The NPSBN is the entire public safety LTE network with a common PLMN ID, which is comprised of many small sub-networks.

Public Safety Sub-Network Mobility – Movement of a user between sub-networks. Service availability across sub-networks is provided by IMSI-range and APN [Application Point Name] node-selection functionality.

3GPP Roaming – As defined in the 3GPP standard, referring to movement of a user between the systems of different PLMN IDs. Other forms of roaming exist.

Direct Mode – A mode of operating a user device whereby the user device is able to communicate with one or more direct mode-enabled user devices using a direct radio to radio path without the use of infrastructure in support of a variety of services. Communication can take place from an individual user device to another individual user device, to devices that are members of an associated group, or to all authorized user devices in transmission range. Direct Mode is also referred to as device-to-device or “D2D” communications.

Application Data – Data used by applications that may be shared between different users or different applications. Application data may consist of voice, video, images, human vital signs, proprietary data, forms, and other types of data.

Location Information – Location information typically describes the latitude, longitude, bearing, speed, time, height, and other location information related to an MMES device and/or end user.

Mobile Data Terminal (MDT)/Mobile Computer Terminal (MDC) – A device which is typically within a vehicle,(but which may be handheld and mobile) that provides a visual representation of information with a capability of entering information. The MDT has connectivity to the LTE

network through some mechanism (integrated LTE radio or interface to a local LTE device through wired or wireless means). An MDT may be a laptop, heads-up display, tablet, LTE dash-mount radio, portable radio, or similar device.

Subscriber Group Emergency – When a subscriber group is put into an emergency state, application data associated with the subscriber group is provided an elevated priority level on the network and within the associated applications.

Emergency Alert (general) – A unit emergency alert is a data payload sent from a MMES device to the network to indicate that the end user is in an emergency condition. The unit emergency alert includes the end user's MMES device identifier and may optionally include other information, such as the MMES device's location information.

Emergency State (general) – When a unit emergency alert or an emergency transmission is initiated by an MMES device, the user associated with the MMES device enters an emergency state. When the user is in an emergency state, network traffic associated with the user shall have an elevated priority on the network for some defined set of application data.

Responder Emergency Situation – Responder emergency is a situation in which a responder(s) is unable to continue providing their normal functions and is in a life-threatening situation. Responder Emergency should be rarely used. Examples: responder shot, injured, outgunned, trapped, lost, etc.

Immediate Peril Situation – Used to indicate an immediate threat to human life and a responders' need for immediate assistance. This function may also be used, for example, when the destruction of property or other events may imminently endanger human life. Immediate Peril should be rarely used. Examples: forest fire about to circle campers, tanker truck about to explode near school, EMT video consultation required with doctor regarding poisoned patient.

Officer Down Sensor – This service, in the context of the MMES Use Cases, refers to one or more intelligent accessories or devices which would allow an "officer down" indication to be transmitted should the LTE officer user be incapacitated. Indicators could include M2M [mobile to mobile] messages from combinations of bulletproof vests, vehicles, gunshot detectors, and horizontal orientation detection. Details of this functionality are beyond the scope of this document.

Mayday Alert – Typically defined as a distinct indication to notify personnel that a member involved in operations is in need of assistance.

Editor's Note: Regarding "Fixed" vs "Mobile" Networks - *In the context of this document, the term "Fixed Network" generally refers to a non-wireless end device which is not communicating over LTE, such as what a*

dispatcher might use, versus a "Mobile" network which are wireless devices communicating via the 3GPP over the air interface. Mobile Network is not used to refer to Direct Mode which is referred to as such throughout this document.

3.1 ACRONYMS AND ABBREVIATIONS

3GPP	3rd Generation Partner Project
ALPR	Automatic License Plate Reader
APN	Application Point Name
ATIS	Alliance for Telecommunications Industry Solutions
CAD	Computer-Aided Dispatch
CJIS	Criminal Justice Information Services
D2D	Device-to-device communications, also known as Direct Mode.
EKG	Electrocardiogram (medical)
ESIF	Emergency Services Interconnection Forum
FIPS	Federal Information Processing Standards
FLIR	Forward Looking Infra Red
FRS	Facial Recognition System
GPS	Global Positioning System
HIPAA	Health Insurance Portability and Accountability Act
HSS	Home Subscription Server
ICS	Incident Command System
IMSI	International Mobile Subscriber Identity
LTE	Long Term Evolution

MDT	Mobile Data Terminal AKA/Mobile Data Computer
MSIN	Mobile Subscription Identification Number
MMES	Multimedia Emergency Services
NENA	National Emergency Number Association
NIMS	National Incident Management System
NVI	Non-Voice Initiated
PLMN ID	Public Land Mobile Radio Identifier
PS	Public Safety
PSAP	Public Safety Answering Point
PTSC	Packet Technologies and Systems Committee
PTZ	Pan, Tilt, Zoom
UE	User Equipment
URL	Uniform Resource Locator
VAN	Vehicular Area Network
WTSC	Wireless Technologies and Systems Committee

4 PUBLIC SAFETY MULTI-MEDIA EMERGENCY SERVICES (MMES)

4.1 BENEFITS

The following benefits of MMES to public safety have been identified:

- Public safety could leverage similar architecture and procedures being developed for commercial networks
- Provide additional ways to contact a Public Safety Communications Center (and group call members) other than voice during emergency situations:

- Real-time Text
- Background audio
- Real-time video
- Pre-recorded video clips

- Enable contact from a Public Safety Communications Center using non-voice media types
- Enable communication with a Public Safety Communications Center after initiating emergency alarm

4.2 SECURITY IMPACTS

Public safety MMES are next generation emergency services that utilize applications in support of non-voice initiated communications between responders and communications centers using real-time session- and non-session-based text and other multimedia. Delivery of all information should be capable of being protected against unauthorized disclosure and alteration in a similar manner to NG9-1-1.

Responder and communications center communications directly affect the safety of responders and need to be secured against disclosure, replay, and other security attacks; existing voice systems optionally utilize end-to-end encryption for such security. Both NG9-1-1 and public safety MMES communications may also be subject to the additional security requirements of the Criminal Justice Information Services (CJIS) security policy or Health Insurance Portability and Accountability Act (HIPAA) privacy rules, and the design of the public safety MMES cannot preclude addition of end-to-end security measures to meet these various needs.

Public safety MMES support location determination of the end device, location updates, and the transportation of location information across the PS LTE network in a manner which is highly similar to NG9-1-1 today, in addition to supporting additional media in two-way voice emergency communications. Delivery of location information should be protected against unauthorized disclosure and alteration in a similar manner to NG9-1-1.

4.3 ANTICIPATED TIMELINE

As this is a major change for both the first responder community and the public safety communications centers, adoption of a public safety MMES standard will take several years and will require significant attention by FirstNet on behalf of the NPSBN.

4.4 COSTS FACTORS

Public safety MMES are an all-new component of the responder and communications center environment. At this time it is difficult to predict the costs and more work will be needed by vendors and service providers to determine the impact of the changes on their products and operations.

5 PUBLIC SAFETY MMES REQUIREMENTS

This section identifies public safety requirements for multimedia emergency services.

The public safety MMES requirements are subdivided into the following categories: End-to-end message requirements, device requirements, subscriber group requirements, Public Safety Communications Center requirements, and LTE network requirements.

The term "PS MMES Device" is generically defined as a device which provides multi-media emergency services (MMES) and operates in 700 MHz public safety spectrum.

Although a generic definition is useful, in reality, the PS MMES devices (UEs) encompass a wide variety of capabilities depending upon a variety of factors. Of course, a primary driver of the functionality is the *device form factor*; for example, whether the device is a handheld/portable, tablet, a ruggedized laptop, or dongle connected to a laptop. The capabilities will also be driven by the *applications* installed and activated and capabilities of the PS LTE *network* to which the PS MMES device is attached. Capabilities will also be defined by the user's *configuration* and authorization.

Because of these multi-faceted inter-dependencies, the MMES Task Group has assumed that if the Use Case generates a requirement, then the device, user configuration, application, and network will need to be enabled to support it. Additional discussions will be needed to determine if the requirements driven by the Use Cases, including those that drive PS MMES device functionality, are "optional" or "mandatory." The decisions that result from these discussions will have potentially large cost implications and will therefore need to be carefully managed. The working group, however, envisions a future where there will be various combinations of devices, form factors, applications, and network support that will meet the needs of the various broadband users at differing price points so as to provide choices and options for the user.

For additional reference, the National Emergency Number Association (NENA) requirements that were developed for the general public in addressing next generation multimedia emergency services are documented in a technical reference document, *NENA Use Cases & Suggested Requirements for Non-Voice-Centric (NVC) Emergency Services NENA 73-501, Version 1.0, January 11, 2011.*

The numbers in parentheses following the requirements refer to the operational scenarios in the Use Cases in Section 6.

5.1 General PS Multi-Media Emergency Services Requirements

MMES shall allow an authorized user on the fixed network or mobile network to filter a collection of users based on various criteria such as location, status, availability, etc. (14)

PS MMES services shall be capable of being initiated by authorized commanders, dispatch operators, or from end user devices. (All)

Certain PS MMES services and applications shall be capable of being torn down quickly and easily so that no unwanted residual behaviors remain once the service is no longer needed. (3)

PS MMES shall be capable of group communications. (3)

PS MMES shall be capable of providing visual or audible indicators which clearly indicate to all users that a MMES service is in progress. (3)

MMES shall allow an authorized user on the fixed network or mobile network to clear the emergency state of a subscriber group. (14)

MMES shall allow an authorized user on the fixed network or mobile network to clear the emergency state of another user. (14)

MMES shall allow an authorized user on the fixed network or mobile network to clear their own emergency state. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically add static application data to one or more subscriber groups. (14)

MMES shall support the notification of an individual's cleared emergency state to users on a subscriber group and to the Public Safety Communications Center. (14)

5.2 PS Multi-Media Messaging Requirements

For PS MMES Emergency Alarm messaging, all message content shall be carried with an indication of the source. (8) (7)

For PS MMES Emergency Group data, transmissions all message content shall be carried with an indication of the source. (2) (8) (7)

For PS MMES Non-Emergency Group text messaging, all message content shall be carried with an indication of the source. (8) (7)

For PS MMES Pre-defined Emergency Text messaging, all message content shall be carried with an indication of the source. (2) (7) (8)

For PS MMES Supplementary Audio and or Video messaging, content shall be carried with an indication of the source. (1)

PS MMES Emergency Alarm messaging shall be sent to all active members of one or more PS MMES Subscriber Groups. (8)

PS MMES Emergency Alarm messaging shall carry location information for the Public Safety Communications Center and other members of an MMES subscriber group. (8)(7)

PS MMES Emergency Alarm messaging shall have high priority access capability to ensure that life-threatening emergency messaging can be successfully sent and received by all group members and Public Safety Communications Center. (8) (7)

PS MMES Emergency Group data transmissions shall be sent to all active members of one or more PS MMES subscriber groups. (2) (8) (7)

PS MMES Emergency Group data transmissions shall provide location information for the Public Safety Communications Center and other members of an MMES subscriber group. (2) (8) (7)

PS MMES Emergency Group data transmissions shall have high-priority access capability to ensure that life-threatening emergency messaging can be successfully sent and received by all group members and Public Safety Communications Center. (2) (8) (7)

PS MMES Non-Emergency Group text messaging shall be sent to all active members of an MMES subscriber group. (8) (7)

PS MMES Non-Emergency Group text messaging shall provide location information for the Public Safety Communications Center and other members of an MMES subscriber group. (8) (7)

PS MMES Predefined Emergency Text messaging shall be sent to all active members of one or more PS MMES subscriber groups. (2) (7)

PS MMES Predefined Emergency Text messaging shall provide location information for the Public Safety Communications Center and other members of an MMES subscriber group. (2) (7)

PS MMES Predefined Emergency Text messaging shall have high-priority access capability to ensure that life-threatening emergency messaging can be successfully sent and received by all group members and Public Safety Communications Center. (2) (7)

PS MMES Supplementary Audio and or Video messaging shall be sent to the members of one or more PS MMES subscriber groups. (1)

PS MMES Supplementary Audio and or Video messaging shall provide UE location information for the Public Safety Communications Center and other members of an MMES subscriber group. (1)

PS MMES Supplementary Audio and or Video messaging shall have high-priority access capability to ensure that life-threatening emergency messaging can be successfully sent and received by all group members and the Public Safety Communications Center. (1)

PS MMES User Device may be capable of automatically transmitting Emergency Group Data to the Public Safety Communications Center and other members of one or more MMES subscriber groups directly (without generating a pre-defined emergency text message) for a first responder in a life-threatening situation. Emergency Group Data may include critical sensor data, GPS tracking data, device identification, and other vital information, such as that related to physical well-being. (4)

5.3 PS MMES NETWORK REQUIREMENTS

A PS MME Network shall be capable of transmitting streaming video to/from a PS MMES User Device at appropriate quality for the task. (10-13) (16)

A PS MME Network shall be capable of transmitting streaming video to/from the Dispatch Center at appropriate quality for the task. (10-13) (16)

A PS MMES Network shall be able to transport and distribute MMES supplementary audio and or video messaging from a PS MMES User Device to a Public Safety Communications Center and other subscriber group members, in the same session or different session. (1)

A PS MMES Network shall be able to transport and distribute MMES supplementary audio and or video messaging sent from a Public Safety Communications Center to the members of a dispatch response team. (1)

A PS MMES Network shall be capable of transporting and distributing group multi-media messaging among group members, using User Devices, Public Safety Communications Centers or other subscriber group members, in Emergency mode. (6) (7)

A PS MMES Network shall be capable of transporting and distributing group multi-media messaging among group members, using a User Devices, Public Safety Communications Centers, or other subscriber group members, in non-Emergency mode. (6) (7) (8)

A PS MMES Network shall be capable of interfacing to a NG9-9-1-1 network.

A PS MMES Network shall be capable of transporting and distributing incident scene information from a Public Safety Communications Center to a dispatch response team, on scene or in transit. (6)

A PS MMES Network shall transport and distribute an MMES Group Text message response back (from a Public Safety Communications Center or other active members of an MMES subscriber group) from a PS MMES User in a life-threatening situation and other active members of an MMES subscriber group. (8) (7)

A PS MMES Network shall transport and distribute MMES emergency alarm and emergency group text messaging from a PS MMES User device to a Public Safety Communications Center and all other active members of an MMES subscriber group. (8) (7)

A PS MMES Network shall transport and distribute MMES pre-defined emergency group text messaging or emergency sensor data and GPS tracking information sent automatically from a PS MMES User device to a Public Safety Communications Center and all other active members of an MMES subscriber group. (2)

A PS MMES Network shall transport and distribute non-emergency group text messaging from a PS MMES User device to all members of an MMES subscriber group. (8) (7)

For a mobile first responder in an emergency situation, a PS MMES Network and Devices shall be capable of providing periodic location updates, requested by a Public Safety Communications Center or Dispatch Response Team. (1)

MMES shall support data transfer to and from national and regional databases. (14)

MMES shall support high-priority transmission of an individual's location information on a subscriber group. (14)

MMES shall support high-priority transmission of an individual's location information to the Public Safety Communications Center. (14)

MMES shall support high-priority transmission of an individual's status, which may include states such as an emergency state, "In Pursuit," "Siren and lights active," "Idle," etc, on a subscriber group. (14)

MMES shall support high-priority transmission of application data to an individual user. (14)

MMES shall support high-priority transmission of application data to the Public Safety Communications Center. (14)

MMES shall support high-priority transmission of application data to users on a subscriber group. (14)

MMES shall support high-priority transport of unit emergency alerts to the Public Safety Communications Center. (14)

MMES shall support high-priority transport of unit-to-unit emergency text messaging between users on a fixed network. (14)

MMES shall support high-priority transport of unit-to-unit emergency text messaging between users on a mobile network. (14)

MMES shall support the transmission of data with a high priority to a preconfigured group of users authorized user may be on the fixed network or mobile network. (14)

5.4 PS MMES PRIORITY MANAGEMENT REQUIREMENTS

A PS MMES Network shall be capable of supporting prioritized operation, which once invoked would allow voice, text, and data to be sent to/from PS MMES User device to/from a Public Safety Communications Center and all other active members of an MMES subscriber group within 2[2] seconds, despite traffic congestion on PS LTE sectors(s) supporting target PS user operation. (3) (2) (4)

MMES shall allow an authorized user on the fixed network or mobile network to elevate the network priority of various voice and data applications related to another end user. (14)

MMES shall allow an authorized user on the fixed network or mobile network to elevate the priority of an application of another user. (14)

MMES shall allow an authorized user on the fixed network or mobile network to raise the priority of a subscriber group to provide higher network priority for application data on the group. (14)

MMES shall allow an authorized user on the fixed network or mobile network to reduce the network priority of various voice and data applications related to another end user to a normal, non-emergency priority level. (14)

[2] Two-second value preliminary and subject to change.

MMES shall allow an authorized user on the fixed network or mobile network to reduce the priority of an application of another user to a normal, non-emergency priority level. (14)

MMES shall allow an authorized user to select and downgrade the network priority of voice and data applications of the selected end user MMES device.(4)

MMES shall allow an authorized user to select and elevate the network priority of voice and data applications of the selected end user MMES device. (4)

MMES shall allow an end user to elevate the network priority of various voice and data applications related to the end user. (14)

MMES shall allow an end user to reduce the network priority of various voice and data applications related to the end user to a normal, non-emergency priority level. (14)

MMES shall allow users to be a participant in multiple subscriber groups at a time which may have varying priority. (14)

PS MMES shall be capable of operating in a prioritized fashion, allowing 1-2[3]second response times despite any level of congestion for any group members. (3)

The PS MMES Network shall be capable of supporting the Dispatcher or Incident Commander to have the capability to dynamically change the priority of the PS MMES unit(s) in the pursuing vehicle(s). Once invoked, the MMES service would allow voice, text, and data to be sent to/from PS MMES User device to/from a Public Safety Communications Center and all other active members of an MMES subscriber group within 2 seconds, despite traffic congestion on PS LTE sectors(s) supporting target PS User operation. (9)

5.5 PS MMES SUBSCRIBER GROUP REQUIREMENTS

A PS MMES subscriber group shall be capable of supporting supplementary audio and or video messaging from a PS MMES User Device in an emergency situation. (1)

A PS MMES subscriber group shall support Emergency and non-Emergency Group text messaging. (8)

A PS MMES subscriber group shall support Emergency and non-Emergency Group voice messaging for direct mode. (5)

A PS MMES subscriber group shall support Group data, Group voice, and Group multi-media messaging (e.g., such as voice and data). (7) (6)

[3] The 1-2 second value is preliminary and subject to change.

A PS MMES subscriber group shall support late entry of a Group member into an existing Group session. (7)

A PS MMES subscriber group shall support one or more Emergency Group data Transmissions (critical sensor data and GPS tracking information) sent automatically from an MMES User Device. (2) (3)

A PS MMES subscriber group shall support one or more pre-defined Emergency Group Text messages sent automatically from an MMES User Device. (2) (8)

A PS MMES subscriber group shall support pre-defined emergency alert messaging for direct mode. (5)

A PS MMES subscriber group shall support sending and receiving of Emergency Group Text messaging sent from an MMES User Device or a Public Safety Communications Center. (3) (8)

MMES shall allow an authorized user on the fixed network or mobile network to add static application data from a subscriber group to one or more subscriber groups. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically add real-time application data to one or more subscriber groups. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically add users to a subscriber group. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically create a subscriber group. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically control and remove real-time application data from being received by one or more active subscriber groups. (14)

MMES shall allow an authorized user on the fixed network or mobile network to dynamically remove users from a subscriber group. (14)

MMES shall allow an authorized user on the fixed network or mobile network to pre-configure a collection of users in an inactive group. (14)

MMES shall support the transmission of data between authorized applications without user intervention. (14)

5.6 PS MMES RESPONDER EMERGENCY REQUIREMENTS

PS MMES Responder Emergency service would be invoked in special circumstances as warranted. Activation of this service should be highly restricted and based upon circumstances which warrant the service. (4)

PS MMES Responder Emergency service shall be capable of initiating a PS BB Responder Emergency in an intuitive, secure, and easily accessible manner. The service shall be easy to access such as by depressing a button or hitting an application icon on the home screen. (4)

PS MMES Responder Emergency service should be set up so that it cannot be accidentally invoked. (4)

When PS MMES Responder Emergency service is invoked, all traffic to and from the device shall be given pre-emptive treatment on the network. (4)

When PS MMES Responder Emergency service is invoked additional services, apps, or information could be sent to and from the device. (4)

When PS MMES Responder Emergency service is invoked, it should activate GPS tracking in a high-priority mode, which could include more frequent polling interval than the standard polling interval. (4)

PS MMES Responder Emergency service shall be capable of providing visual and/or audible indicators which clearly indicate to all users that the User or device is in Responder Emergency mode using a screen or indicator light on the UE should differentiate to the user that the device is in Responder Emergency mode. (4)

PS MMES Responder Emergency service shall be capable of being torn down quickly and easily so that no unwanted residual behaviors[4] remain once the service is no longer needed. (4)

5.7 PS MMES USER DEVICE REQUIREMENTS

A PS MMES User Device shall be able to display the status (e.g. emergency) of other users and updates of the status from the PS MMES Public Safety Communications Center. (10-13)(16)

A PS MMES User Device shall be able to receive a CAD incident record and related attachments. (2) (3)

[4] Residual behaviors include MMES "artifacts" which are created if the service is not properly torn down on all components and devices, which would result in inadvertently and unintentionally re-initiating MMES, such as those which can be experienced in P25 Emergency services today.

A PS MMES User Device shall be able to update a CAD incident record and have the updates automatically shared with other users assigned to the call (on other PS MMES User Devices and at dispatch positions in the Public Safety Communications Center) viewing the incident record.(2) (3)

A PS MMES User Device shall be capable of accessing a website (including secure websites) for additional incident-related information (e.g., floor plans, maps, hazmat info, poison control info, etc.) (10-13)(16)

A PS MMES User Device shall be capable of allowing the user to take control (PTZ) of cameras. (10-13) (16)

A PS MMES User Device shall be capable of authenticating an end user using two factors to comply with security requirements (e.g., CJIS). (10-13) (16)

A PS MMES User Device shall be capable of automatically transmitting a pre-defined emergency text message indicating a life-threatening situation to a Public Safety Communications Center and other members of an MMES Subscriber Group. (2)

A PS MMES User Device shall be capable of automatically transmitting critical sensor data, GPS tracking data, device identification, and other vital information (related to physical well-being condition) directly (without generating a pre-defined emergency text message) for a first responder in a life-threatening situation to Public Safety Communications Center and other members of an MMES subscriber group. (2) (3)

A PS MMES User Device shall be capable of communication in both the network/infrastructure and direct modes of operation in near simultaneous fashion. (7)

A PS MMES User Device shall be capable of creating a real time video, or displaying pre-recorded video or pictures during a voice session, using the same PS MMES Device used to generate the voice session and shall be able to send the multi-media content created, as part of the original voice communication session. (6)

A PS MMES User Device shall be capable of detecting a request for an emergency group text session using any kind of emergency numbers such as Emergency SIP and TEL URIs. (8)

A PS MMES User Device shall be capable of enabling the addition of a supplementary audio and or video feed by a Dispatch Operator in an emergency situation, in the same session or different session. (1)

A PS MMES User Device shall be capable of encryption of all sent and received data (text messages, location information, status information, etc.) (10-13)(16)

A PS MMES User Device shall be capable of end-to-end data encryption. (10-13)(16)

A PS MMES User Device shall be capable of generating a pre-defined emergency text message indicating a life-threatening situation (2)

A PS MMES User Device shall be capable of issuing a query to appropriate agency, state, and national databases and receive the query responses. (10-13)(16)

A PS MMES User Device shall be capable of providing a Group Text message response to an Emergency Group Text message or non-Emergency Group Text message. (8)

A PS MMES User Device shall be capable of receiving a CAD incident record. (10-13)(16)

A PS MMES User Device shall be capable of receiving a Group Text message response back from a Public Safety Communications Center or other active Group members in response to Emergency or non-Emergency Group Text messaging. (8)

A PS MMES User Device shall be capable of receiving as input 1) critical sensor data (related to well-being-condition of a first responder) from multiple sensors directly attached to a first responder or via a vest, mask, or other equipment (e.g., bullet impact detection, Officer Down indicators, heart rate, blood pressure, body temperature) and 2) GPS location information (location including height, date, time, direction, speed, and heading) of first responder. (2)

A PS MMES User Device shall be capable of selecting from available fixed video sources to view a first responder initiating an emergency event or some other video source. (10-13)(16)

A PS MMES User Device shall be capable of sending and receiving discrete media (e.g. picture, non-real time video clip, etc.) (10-13)(16)

A PS MMES User Device shall be capable of sending and receiving Emergency Group Data transmissions. (4)

A PS MMES User Device shall be capable of supporting Emergency Group Text messaging. (8)

A PS MMES User Device shall be capable of supporting federal security requirements (e.g. FIPS compliance). (10-13)(16)

A PS MMES User Device shall be capable of supporting MMES pre-defined emergency text messaging. (2)

A PS MMES User Device shall be capable of transmitting and receiving group multi-media messaging (e.g., voice, real-time video, pre-recorded video, and pictures) in the same session (emergency and non-emergency). (6) (7)

A PS MMES User Device shall be capable of updating a CAD incident record. (10-13)(16)

A PS MMES User Device should clearly differentiate emergency group text sessions from non-emergency group text sessions on the user display. (8)

An operator-authorized PS MMES User device shall be able to be configured into one or more subscriber groups, pre-defined or as needed. (2) (3) (7) (8)

During an MMES Group multi-media session, a PS MMES User Device shall be capable of displaying all MMES group multi-media messaging (for which it is an active group member) taking place among group members. (6)

During an MMES group text session, a PS MMES User Device shall be capable of displaying all MMES group text messaging (for which it is an active group member) taking place among group members. (8)

If a PS MMES User Device is equipped with a still camera, images from the devices shall be capable of being sent over the network, quickly and easily in prioritized emergency mode. (3)

MMES shall allow an authorized user to remotely enable application data transmission from a capable end user device on a subscriber group to the Public Safety Communications Center or to an authorized user who may be on the fixed network or mobile network. (14)

MMES shall allow an authorized user to remotely enable location updates from a capable end user device on a subscriber group, to the Public Safety Communications Center or to an authorized user who may be on the fixed network or mobile network. (14)

MMES shall allow an authorized user to remotely enable video transmission from a capable end user device, on a subscriber group, to the Public Safety Communications Center or to an authorized user who may be on the fixed network or mobile network. (14)

MMES shall allow an authorized user to remotely enable voice transmission from a capable end user device on a subscriber group. (14)

MMES shall allow an authorized user to remotely enable voice transmission from a capable end user device to an authorized user who may be on the fixed network or mobile network. (14)

MMES shall allow an authorized user to remotely enable voice transmission from a capable end user device to the Public Safety Communications Center. (14)

Once a PS MMES User Device is aware that a PS Emergency Group text session has been initiated, the device (subject to user configuration) should avoid drawing unnecessary attention to the user

and should confirm this to the user in as private a manner as is reasonable. Behavior in an emergency situation may need to be different relative to a normal configuration. (8)

PS MMES end user shall be capable of utilizing a camera on a device and quickly and easily forward images to the MMES Public Safety Communications Center and/or to other responders in the group. (4)

PS MMES User Device shall be capable of supporting non-Emergency Group Text messaging.(8)

PS MMES User Devices shall be capable of sending and receiving text information in prioritized Emergency Text messages. (3)

The PS agency deploying the PS MMES service shall be able to create a single "button" which activates a PS MMES Emergency call, described as a "Pursuit" button in this scenario. This allows data to be sent and received automatically over the PS LTE network with no involvement or action needed by the officer behind the wheel. (9)

The PS MMES User Device shall be capable of initiating a PS MMES Emergency service in an intuitive, secure, and easily accessible manner, such that minimal training is needed. Screen should differentiate to the user that the device is on an Emergency call. An acceptable option would include a red box or blinking red icon which would, at a glance, let the device user know the device is in Emergency Mode. (3)

The PS MMES User Device shall be optionally capable of being integrated into a Vehicular Area Network (VAN) which could include active sensors and subsystems such as Doppler Speed Radar, Automatic License Plate Reader (ALPR), Facial Recognition System (FRS), and onboard video systems. (9)

An operator-authorized PS MMES User device shall be able to be configured into one or more subscriber groups (pre-defined or as needed) as authorized user for that User Device. (15)

An operator PS MMES Network shall be capable of allowing different users from one or more subscriber groups (pre-defined or as needed) to be authorized and authenticated from a single User Device. (15)

PS MMES networks and devices shall be capable of transitioning between multiple users who can be authorized and authenticated from one MMES device. (15)

A PS MMES User Device shall be capable of receiving as input: Critical Sensor Data (related to well-being of first responder) from multiple sensors directly attached to a first responder or via vest, mask, or other equipment. (2) (5)

A PS MMES User Device shall be capable of receiving GPS location information including height, date, time, direction (speed and heading) of first responder. (2) (5)

A PS MMES User Device shall be capable of automatically transmitting a pre-defined emergency text message indicating a life threatening situation to Public Safety Communications Center and other members of an MMES Subscriber Group. (2) (5)

5.8 PS MMES DIRECT MODE REQUIREMENTS

A Public Safety Communications Center shall be capable of being informed of an incident where direct mode communication is taking place. (5)

A PS MMES Direct Mode-Capable Device shall be able to exchange data in a group using one-to-many communications. (5) (7)

A PS MMES Direct Mode-Capable Device shall be able to minimize the use of battery power during direct mode communication. (5)

A PS MMES Direct Mode-Capable Device shall be capable of being configured into one or more subscriber groups for device-to-device (direct mode) communication. (5)

A PS MMES Direct Mode-Capable Device shall be capable of being configured to automatically transmit critical sensor data and other vital information received for a victim at an incident. (7)

A PS MMES Direct Mode-Capable Device shall be capable of being switched from direct mode to infrastructure mode when necessary (e.g., after a fireground incident). (5)

A PS MMES Direct Mode-Capable Device shall be capable of communicating with another user/device that transitions into transmission range at a later time. (5)

A PS MMES Direct Mode-Capable Device shall be capable of detecting vital changes in data received as input and automatically transmitting updates, such as loss of blood pressure, heart rate, body temperature indicators.(7)

A PS MMES Direct Mode-Capable Device shall be capable of determining and displaying its mode of operations: infrastructure mode only, direct mode only or hybrid (infrastructure and Direct) mode. (5)

A PS MMES Direct Mode-Capable Device shall be capable of participating in multiple, near simultaneous individual and/or group interactions. (7)

A PS MMES Direct Mode-Capable Device shall be capable of providing all MMES group voice communications taking place in direct mode among group members. (5)

A PS MMES Direct Mode-Capable Device shall be capable of supporting pre-defined emergency alert messaging (indicating a life-threatening emergency) for direct mode. Messaging can include biometric sensor data (e.g., blood pressure, heart rate), air tank capacity indicator, and three-dimensional tracking information (location, date, time, direction of first responder). (5) (7) (8)

A PS MMES Direct Mode-Capable Device shall be capable of transmitting and receiving Group Voice messaging while in direct mode: (Emergency and non-Emergency). (5)

A PS MMES Incident Command Center in direct mode shall be capable of communicating directly with a UE in direct mode. (5)

A PS MMES Incident Command Center shall be capable of receiving an Emergency Alert message in direct mode. (5)

A PS MMES Incident Command Center shall be capable of transmitting and receiving Group Voice messaging in direct mode (Emergency and Non-Emergency) (5)

A PS MMES Incident Command Center shall be capable of dispatching a response team to a first responders (users) location in direct mode. (5)

A PS MMES Incident Command Center shall be capable of informing a Public Safety Communications Center of an incident where direct mode communication is taking place. (5)

A PS MMES Incident Command Center shall be capable of monitoring a UE in an emergency in direct mode. (5)

A PS MMES Incident Command Center shall be capable of receiving an Emergency Alert message in direct mode. (5)

A PS MMES Incident Command Center shall be capable of transmitting and receiving Group Voice messaging in direct, emergency mode. (5)

A PS MMES User Device in direct mode shall be capable of automatically transmitting a pre-defined emergency text message indicating a life-threatening situation to a Public Safety Communications Center and other members of an MMES subscriber group. (5)

A PS MMES User Device in direct mode shall be capable of receiving GPS location information including height, date, time, direction (speed and heading) of first responder. (5)

A PS MMES User Device in direct mode shall be capable of receiving as input: Critical sensor data (related to well being of first responder) from multiple sensors directly attached to a first responder or via vest, mask, or other equipment. (5)

A PS MMES User Device operating in direct mode shall be capable of providing minimal interference to communications taking place over the network infrastructure. (5)

A subscriber group shall support emergency and non-emergency group voice messaging for direct mode. (5)

A subscriber group shall support pre-defined emergency alert messaging for direct mode. (5)

Direct mode of operation shall transport and distribute emergency group voice messaging from a User Device to an ICC and other group members. (5)

Direct mode of operation shall transport and distribute non-emergency group voice messaging from a User Device to an ICC and other group members. (5)

Direct mode shall be available regardless of the presence of a network/infrastructure. (5)

Direct mode shall function if the individual user/device, upon power up, has not attached to a network/infrastructure. (5)

Direct mode shall provide an emergency message a high priority. (5)

Direct mode shall provide mechanisms to ensure authenticity, integrity, and confidentiality of communications between PS MMES devices. (5)

Direct mode shall provide the capability for a message to be transmitted from an individual user/device to another individual user/device. (5)

Direct mode shall provide the capability for a message to be transmitted to all devices in transmission range. (5)

Direct mode shall provide the capability for a message to be transmitted to devices that are members of an associated group. (5)

End user shall have ability to activate or de-activate direct mode on a user device. (5)

For PS MMES Emergency Alert messaging in direct mode, all message content shall be carried with an indication of the source. (5)

For PS MMES Emergency voice messaging in direct mode, all message content shall be carried with an indication of the source. (5)

For PS MMES Non-Emergency voice messaging in direct mode, all message content shall be carried with an indication of the source. (5)

PS MMES Emergency Alert messaging in direct mode shall be capable of supporting critical sensor data received from multiple sensors (directly attached to a first responder or via a mask, vest, or other equipment) and three-dimensional tracking. (5) (7)

PS MMES Emergency Alert messaging in direct mode shall be sent to all members of one or more subscriber groups using one-to-many communications. (5)

PS MMES Emergency Alert messaging in direct mode shall carry UE location information for Incident Command Center and other subscriber group members. (5)

PS MMES Emergency Alert messaging in direct mode shall have high-priority access capability to ensure that the emergency messaging can be sent and received successfully by all group members and the Incident Command Center. (5)

PS MMES Emergency Voice messaging in direct mode shall be capable of supporting critical sensor data received from multiple sensors (directly attached to a first responder or via a mask, vest, or other equipment) and three-dimensional tracking. (5) (7)

PS MMES Emergency Voice messaging in direct mode shall be sent to all members of one or more subscriber groups using one-to-many communications. (5)

PS MMES Emergency Voice messaging in direct mode shall carry UE location information for Incident Command Center and other subscriber group members. (5)

PS MMES Emergency Voice messaging in direct mode shall have high-priority access capability to ensure that the emergency messaging can be sent and received successfully by all group members and the Incident Public Safety Communications Center. (5)

PS MMES Non-Emergency Voice messaging in direct mode shall be capable of supporting critical sensor data received from multiple sensors (directly attached to a first responder or via a mask, vest, or other equipment) and three-dimensional tracking. (5) (7)

PS MMES Non-Emergency Voice messaging in direct mode shall be sent to all members of one or more subscriber groups using one-to-many communications. (5)

PS MMES Non-Emergency Voice messaging in direct mode shall carry UE location information for Incident Command Center and other subscriber group members. (5)

PS Network Operator shall control the use of radio resources necessary for direct mode communication that takes place off of network infrastructure. (5)

6 PUBLIC SAFETY MMES USE CASES

These 16 public safety MMES use cases provide example scenarios of the usage of next generation messaging amongst emergency responders and Public Safety Communications Centers in support of non-voice initiated emergency communications. The following is a summary of the use cases detailed in Section 6:

Use Case #1 – Text Message from MMES Mobile Device to Public Safety Communications Center after Emergency Alarm

Use Case #2 – Man Down Data from GPS Bulletproof Vest to Public Safety Communications Center via LTE device with MMES Capability

Use Case #3 – Hostage Incident

Use Case #4 – Hostage Incident with Shots Fired

Use Case #5 – Mayday Alert from a Firefighter during a Fireground Incident Operation

Use Case #6 – Voice Message from an MMES Mobile Device to Public Safety Communications Center with Addition of Real-time Video

Use Case #7 – EMS Monitoring of Victims at Scene of Car Bombing Using LTE Devices with MMES Capability

Use Case #8 – Emergency Group Text Message from an MMES Mobile Device to Talk Group after Emergency Alarm

Use Case #9 – Pursuit Scenario- Situational Awareness and Location Information of Responders

Use Case #10 –Remote Monitoring of a Traffic Stop

Use Case #11 – Dispatcher Monitoring Fixed Cameras

Use Case #12 – Citizen 911 Video Feed to First Responder

Use Case #13 – FBI Surveillance

Use Case #14 – Armed Bank Robbery

Use Case #15 – Different Subscribers Using One User Device

Use Case #16 – DEA Surveillance

As mentioned earlier, it is important to note that these Use Cases are intended to illustrate at a high level the actions that would occur during a particular scenario and are illustrative of ***what*** information would be needed and do not provide any recommendation on ***how*** it is provided. (For example, whether client software is needed or some sort of standards based – CAP, EDXL - feed is necessary, or how geo location is established – via network or GPS).

The Use Cases assume a steady state environment, including that the devices are programmed, configured, and equipped as described, that the devices are in range to perform functions as described and that the system is in full operation with no failures impacting operation. The Use Cases also assume that the public safety users in the scenarios are properly authorized and adequately trained to use the services and perform the tasks described.

It is assumed for all Use Cases that all services which change states or functions in the system, such as those which use incident-related traffic and users, return to normal operation and priority upon conclusion of the Incident.

6.1 USE CASE #1 - TEXT MESSAGE FROM MMES MOBILE DEVICE TO PUBLIC SAFETY COMMUNICATIONS CENTER AFTER EMERGENCY ALARM

Short Description

Bob, a first responder has a mobile device with an MMES text messaging application. In an emergency situation, Bob decides to send a text message to his Public Safety Communications Center (after initiating an emergency alarm).

Actors

Bob is a UE device user and first responder (police officer). Carol is a Public Safety Communications Center operator.

Pre-Conditions

Bob's UE supports MMES text messaging. Bob's UE is currently turned on and is registered with the system. Bob has configured his UE device so that once the device is aware that a PS Emergency Group text session has been initiated, (and the device is in the emergency state) the device will avoid drawing unnecessary attention to the user.

The Public Safety Communications Center for which Carol works is configured to receive and send MMES text messaging.

Post-Conditions

Emergency alarm and text message originated by Bob was delivered to Carol at the Public Safety Communications Center.

Normal Flow (of events)

1. Bob encounters an emergency situation in which it would be dangerous to make a voice call.
2. For example an armed robbery in a convenience store where Bob is a customer and obscured from view in the back of the store. Bob initiates an emergency alarm on his MMES device to his Public Safety Communications Center to indicate a life-threatening situation.
3. Bob composes a text message describing the emergency.
4. Bob addresses the message to "SOS" or another string, which designates the destination as a Public Safety Communications Center Emergency.
5. The text message is sent to Bob's Public Safety Communications Center, along with Bob's location, with high priority.
6. A call back phone number (or URL) is also included.
7. Carol, who works at Dispatch, receives the text message.
8. Carol sends a text message back to Bob asking questions, and Bob responds.
9. Per MMES configuration, Bob's device is configured so that it does not beep or make noise when response from a Public Safety Communications Center is received when the device is in the emergency state.
10. Carol provides a Dispatch Response team with Bob's emergency information, and sends response team to Bob's location.
11. Carol sends a message to Bob advising him that help is on the way.

Alternative Flow #1 – Addition of audio or video by Public Safety Communications Center

Steps 1-6 as shown in Normal Flow (of events) from above occur first.

1. On reading Bob's initial text, Carol determines that having additional media such as an audio or video stream would be helpful.
2. Carol (Dispatch Operator) requests to add an audio feed or video feed.
3. The device asks Bob for permission to transmit audio and/or video.
4. Bob indicates approval.
5. Bob's device starts transmitting audio and/or video. Carol listens to the audio and/or watches the video to assist in assessing the emergency situation.
6. Bob and Carol continue to exchange text messages.
7. Per MMES configuration, Bob's device is configured so that it does not beep or make noise (does not draw unnecessary attention) when response from a Public Safety Communications Center is received when the device is in the emergency state.
8. Carol provides a Dispatch Response team with Bob's emergency information, and sends the response team to Bob's location.
9. Carol sends a message to Bob advising him that help is on the way.

Alternative Flow #2 – Location Change of Bob during exchange of messages with Public Safety Communications Center

Steps 1-6 as shown in Normal Flow (of events) from above occur first.

1. Carol receives information from Bob that he is in pursuit of robbers who are leaving the scene of the robbery.
2. Based on the information received from Bob (e.g., that he is mobile) Carol requests and receives (from the network) periodic updates of Bob's location.
3. Carol provides a Dispatch Response team with Bob's emergency information and sends a response team to Bob's updated (or projected) location.
4. Carol and the Response Team request and continue to receive (from the network) periodic updates of Bob's location.

Alternative Flow #3 – Addition of audio or video by Public Safety Communications Center - with direct communication between Bob and Response Team

Steps 1-6 as shown in Normal Flow (of events) from above occur first.

1. On reading Bob's initial text, Carol determines that having additional media such as an audio or video stream would be helpful.
2. Carol (Dispatch Operator) requests to add an audio feed or video feed.
3. The device asks Bob for permission to transmit audio and/or video.
4. Bob indicates approval.
5. Bob's device starts transmitting audio and-or video.
6. Carol listens to the audio and/or watches the video to assist in assessing the emergency situation and decides to multicast the audio or video stream directly to the Response Team to provide firsthand information to them.
7. Bob and the Response Team continue to exchange text messages with Carol monitoring the discussion.

8. Per MMES configuration, Bob's device is configured so that it does not beep or make noise (does not draw unnecessary attention) when response from a Public Safety Communications Center is received when the device is in the emergency state.

6.2 USE CASE #2 - MAN DOWN DATA FROM GPS BULLETPROOF VEST TO PUBLIC SAFETY COMMUNICATIONS CENTER VIA LTE DEVICE WITH MMES CAPABILITY

Short Description

Bob, a first responder police officer wears a GPS bullet proof vest. Bob's vest is equipped with:

- An LTE mobile device with MMES capability.
- A bullet impact detection system.
- GPS tracking to provide accurate position, time, date and direction (speed and heading) of officer.

During an emergency situation, Bob is shot and a pre-defined "Officer Down" text message is sent from the LTE device in Bob's vest to his Public Safety Communications Center.

Actors

Bob is a UE device user and first responder (police officer). Carol is a Public Safety Communications Center operator.

Pre-Conditions

The LTE Device in Bob's GPS bulletproof vest supports MMES pre-defined text messaging. The Public Safety Communications Center for which Carol works is configured to receive MMES pre-defined text messaging.

Post-Conditions

The pre-defined "Officer Down" text message originated by the LTE Device in Bob's GPS bulletproof vest was delivered to Carol at the Public Safety Communications Center.

Normal Flow (of events)

1. Bob already has the LTE mobile device in his (GPS bulletproof) vest turned on.

2. Bob encounters an armed robbery in a convenience store and while on foot pursues the suspects down the block. He has radioed in the situation and has been assigned to a pursuit incident by dispatch.
3. Bob is shot while in pursuit.
4. Bob's bullet impact detection system is activated and impact data is sent to a microprocessor in Bob's vest where GPS tracking data is also collected.
5. The impact data and GPS tracking data is input to the LTE device (with MMES capability) in Bob's vest.
6. The LTE device in Bob's vest initiates a pre-defined emergency "Officer Down" text message (which includes GPS tracking information) to indicate a life-threatening situation.
7. The pre-defined emergency text message (with Bob's GPS tracking information) is sent to Public Safety Communications Center.
8. Carol, who works at Dispatch, receives the pre-defined "Officer Down" text message.
9. Carol takes appropriate action within CAD to assure units are dispatched to Bob's location.

Alternative Flows

None

6.3 USE CASE #3 - HOSTAGE INCIDENT

Short Description

Mike, an on-duty and armed officer in street clothes, is on scene where a suspect has taken a woman hostage inside a shopping mall. The suspect appears to have a weapon.

Actors

Mike is an Officer with a PS LTE device user, operating within coverage. Division A Group is a Law Enforcement First Responders Group of which Mike is a member. Ashley the dispatcher – Is online at a Public Safety Communications Center monitoring Division A Group.

Pre-Conditions

Mike is carrying an operational PS LTE UE Device which is configured and capable of initiating a MMES services. Ashley the dispatcher is monitoring all members of Division A Group.

Event Description

Mike, an on-duty and armed officer in street clothes, is in a shopping mall. Suddenly, he hears screaming from the cosmetics section. He is able to see a suspect, who appears to be brandishing a weapon, has taken a woman hostage and is crouching behind a counter. He has not been seen by the suspect and he watches the events unfold from an unobstructed vantage point.

Due to chaos and panic in the mall which ensued, commercial cellular systems immediately become congested. Mike assesses the situation and considers it to be one of Immediate Peril.

Post-Conditions

Due to advanced and instant communications the situation is quickly resolved with no additional injuries. All incident-related traffic and users on the network return to normal priority.

Normal Flow (of events)

1. Within a fraction of a second, using an intuitive, secure, and easily accessible interface, Mike initiates PS MMES service operation on his PS MMES device consistent with an Immediate Peril:
    a. Mike's MMES device enters an Immediate Peril state which sends an Immediate Peril message to indicate an Immediate Peril situation.
    b. The service includes Mike's MMES device identifier and GPS location information.
    c. The PS LTE network raises Mike's application priorities to a higher level.
    d. Mike's device provides a visual indication that it is in an Immediate Peril state.
2. Mike sends a short description of the situation to Ashley at the Public Safety Communications Center
3. Ashley the dispatcher receives the message and initiates incident and crisis management procedures based on NIMS [National Incident Management System] ICS [Incident Command System] guidelines.
4. Mike gathers and sends additional information to those preparing to respond, as well as to responders already in the vicinity. This includes:
    a. Initial imagery of the interior area of the incident
    b. Exact location of suspect "Armed suspect with hostage behind the cosmetics counter"
5. Mike manages to capture a clear facial image of the suspect and sends it into the Dispatcher for facial recognition analysis.
6. Ashley coordinates the Response Team. She selects a geographical area and identifies available resources and brings them together into a Response Group that also includes Mike. She also

elevates the group's priority allowing voice and data on the Response Group to have a higher network and application priority. This is performed using NIMS ICS procedures.

    a. The resources include EMS, SWAT, and hostage negotiators, all of whom are dispatched to the scene and arrive within minutes.

7. Ashley runs Facial Recognition on the suspect and receives information that the suspect is known to have a mental illness but has no history of violent behavior.
8. Mike, on the scene, determines the alleged weapon is actually a toy pistol.
9. On direction from her Commander, Ashley sends real-time text, audio, and video of the incident, supporting current and other relevant responders.
10. With the new information, the Incident Commander is able to deploy hostage specialists who are able to diffuse the situation quickly and the suspect is taken into custody.

Alternative Flows

None

6.4 USE CASE #4 - HOSTAGE INCIDENT, SHOTS FIRED

Short Description

Mike, an on-duty and armed officer in street clothes, is on scene where a suspect has taken a woman hostage inside a shopping mall. The suspect has a weapon and shots have been fired. Due to chaos and panic in the mall which ensued, commercial cellular systems immediately become congested.

Actors

Mike is a first responder and a PS LTE Device user, operating within coverage. Division A Group is the Law Enforcement First Responders Group of which Mike is a member. Ashley is the dispatcher and is online at a Public Safety Communications Center monitoring Division A Group.

Pre-Conditions

Mike is carrying an operational PS LTE UE Device which is configured and capable of Responder Emergency MMES operation. Ashley the dispatcher is monitoring all members of Division A Group.

Post-Conditions

Due to advanced and instant communications the situation is quickly resolved with no additional injuries. All incident-related traffic and users on the network return to normal priority.

Normal Flow (of events)

1. Within a fraction of a second, using an intuitive, secure, and easily accessible interface, Mike initiates PS MMES service operation on his PS MMES device consistent with a Immediate Peril situation:
2. Mike's MMES device enters an Immediate Peril state which sends information which indicates a Immediate Peril situation. The service includes Mike's MMES device identifier and GPS location information.
3. The PS LTE network raises Mike's application priorities to a higher level.
4. Mike's device provides a visual indication that it is in a Responder Emergency state.
5. Mike sends a short description of the situation to Ashley at the Public Safety Communications Center.
6. Ashley the dispatcher receives the message and initiates incident and crisis management procedures based on NIMS ICS guidelines.
7. Mike manages to capture a clear facial image of the suspect and sends it into the Dispatcher for recognition analysis.
8. Ashley conveys critical information to all support personnel and her Commander, per NIMS ICS procedures.
9. The assigned Incident Commander immediately begins monitoring the activities and activates EMS, SWAT, and hostage negotiators, all of whom are dispatched to the scene and arrive within minutes.
10. Ashley responds with information on the suspect, that he has been identified, and that he has a history of unpredictable and extremely violent behavior. A background document on the suspect is forwarded to key personnel on the scene.
11. The suspect shoots and injures a civilian bystander; she is lying wounded behind a cosmetics counter.
12. Upon seeing the situation escalate, Mike initiates (or upgrades) the service from Immediate Peril to Responder Emergency. The assigned Incident Commander elevates the incident to Responder Emergency, identifies key information sources and uses, and prioritizes them for pre-emptive priority on the network.
13. On direction from her Commander, Ashley sends real time text, audio, and video of the incident, supporting current and other relevant responders. Ashley can also control priority, as authorized, as described in previous step.
14. The Incident Commander dispatches hostage negotiators, EMS, and SWAT to the scene.

15. Upon arrival at the incident, the support teams are able to disarm the suspect, the civilian is transported by EMS and the situation is diffused without further injury.

Alternative Flow #1 – Officer is incapacitated, and "Officer Down" function is initiated.

Steps 1-5 in the Normal Flow occur first

1. The suspect shoots and injures Mike the Officer. Mike is equipped with an automatic "Officer Down" detection system, which activates anytime the unit experiences rapid and specific gravitational and orientation changes. Notifications to Dispatch or others occur if the officer does not promptly reset the local alert.
    a. The "Officer Down" function is activated.
    b. The Dispatcher or Incident Commander is capable of taking over the MMES device such that cameras, microphones, or other functions can be activated and controlled remotely.
2. The Incident Commander is able to view the scene from the downed officer's camera as well as initiate voice communications with the officer.

USE CASE #5 - MAYDAY ALERT FROM A FIREFIGHTER DURING A FIREGROUND INCIDENT OPERATION

Short Description

Bob, a first responder firefighter is a member of a fire team. Each member of the team wears a firefighting vest equipped with:

- An LTE mobile device with MMES capability.
- Sensors to monitor heart rate, blood pressure and air tank capacity.
- GPS tracking to provide accurate position, time, date and direction (speed and heading) of firefighter.

During an incident operation, Bob is trapped and asserts a button on the LTE device in his vest to send a pre-defined "Mayday alert" text message to his Incident Commander, fire team, and standby Emergency Medical Services (EMS). Bob then initiates a group voice message to his incident subscriber group describing the situation.

Actors

A fire team comprised of Bob, Dave, Tim, Mark, and Ed (team leader)--UE Device users and first responders (firefighters). John is a UE device user and Incident Commander (positioned outside)

at sight of incident. Bill is an EMS first responder on standby (positioned outside) at sight of incident. Carol is a Public Safety Communications Center operator.

Pre-Conditions

MMES pre-defined text messaging and group voice messaging using device-to-device (Direct Mode) communication is supported by:

- The LTE Device in Bob's vest.
- The LTE Device for each member of Bob's fire team.
- The LTE Device for the Incident Commander and standby EMS first responder.

Post-Conditions

The pre-defined "Mayday alert" text message originated by Bob was delivered to the Incident Commander, Bob's fire team, and standby EMS (using direct mode communication). The group voice message originated by Bob was delivered to his incident talk group (using D2D communication).

Normal Flow (of events)

1. After arriving at the scene of a fireground incident, Bob's fire crew and Bill (standby EMS) are briefed by the Incident Commander and review a schematic detailing the interior structure of a building on fire.
2. The team leader Ed determines a preliminary positioning of his fire team within the building.
3. Before the fire team enters the building where the fire is, the fire team, Incident Commander and standby EMS first responder switch over their LTE devices for direct mode communication [5]using a pre-determined talk group.
4. Each talk group member checks ability to transmit and receive on the talk group.
5. Once inside the building, the fire team distributes themselves according to plan.
6. While maneuvering to stop the fire, Bob loses track of his surroundings in dense smoke and becomes trapped.

[5] For fireground incident operations, device-to-device (talk around) communications is a reliable form of communication. Radios can communicate directly with one another without having to overcome the resistance of a building and the distance to the nearest base station. Firefighters are not reliant on the system for assignment of resources and not affected by failure of system infrastructure or system induced delays. (See Phoenix Fire Department Radio System Safety Project, Final Report, Version 1.7, October 8, 2004 (Conclusions and Recommendations, p.14-17), http://phoenix.gov/FIRE/radioreport.pdf last viewed September 30, 2011).

7. Bob activates a button on the LTE device in his vest to send a pre-defined "Mayday alert" text message to his incident talk group.
8. The pre-defined "Mayday alert" text message includes biometric data, air tank capacity indicator, and GPS tracking information.
9. Bob then initiates a group voice message to his incident talk group describing the situation.
10. Bob's horizontal and vertical position within the building is determined by the incident commander (positioned outside).
11. The Incident Commander and the fire team leader guide Dave and Tim (Bob's teammates) to Bob's location.[6]
12. Bob is freed and extracted from the building by his teammates.
13. Once outside, Bob is escorted to the standby EMS ambulance where Bill (standby EMS first responder) monitors Bob's condition and sends Bob's biometrics to a hospital for evaluation using a fixed LTE device in the EMS ambulance.
14. John (Incident Commander) provides Carol in the Public Safety Communications Center with information regarding Bob's "Mayday alert" transmission and his current condition.
15. The fire team remains at the scene and continues to battle the fire until the fire is extinguished.

Alternative Flows

None[7]

6.5 USE CASE #6 - VOICE MESSAGE FROM AN MMES MOBILE DEVICE TO PUBLIC SAFETY COMMUNICATIONS CENTER WITH ADDITION OF REAL-TIME VIDEO

Short Description

Bob, a first responder has a mobile device with MMES voice and real-time video capability. In an emergency situation, Bob sends a voice message to his Public Safety Communications Center to describe the scene of an incident where many are hurt. The communication includes the

[6] Incident commander would notify Carol the dispatcher that a Mayday has occurred or the dispatcher might have already received it

[7] Further work product could include alternative flows to cover a situation where Bob sends the Mayday but is not able to further communicate with his team.

transmission of a real-time video of the emergency situation to his Public Safety Communications Center.

Actors

Bob and Ed are UE Device users and first responders (police officers). Carol is a Public Safety Communications Center operator.

Pre-Conditions

Bob and Ed's UEs support MMES voice and real-time video communication. The Public Safety Communications Center for which Carol works is configured to transmit and receive MMES voice and real-time video communication.

Post-Conditions

The MMES voice and real-time video communication originated by Bob was delivered to Carol at the Public Safety Communications Center. Carol and Bob exchange several voice messages successfully.

Normal Flow (of events)

1. Bob and his partner Ed are dispatched to the scene of an incident where 911 callers have reported an explosion.
2. After arriving at the scene of the incident Bob and Ed notice what appears to be a car bombing.
3. Many people are lying on the ground hurt, crying and moaning.
4. Some are motionless and may be dead.
5. Bob contacts the Public Safety Communications Center describing the scene and asks for emergency medical assistance as well as additional police and bomb squad.
6. As Bob is describing the emergency situation to Carol, she asks him if he can provide a real-time video of the site.
7. Bob starts streaming real-time video of the emergency situation to Carol as part of the original communication session using his MMES-capable device.
8. Bob streams real-time video while the voice communication with Carol continues.
9. Carol provides a Dispatch Response team with Bob's emergency information, real-time video, and sends the response team to Bob's location.
10. Carol sends a message to Bob advising him that help is on the way.

Alternative Flow #1 – Voice Message from an MMES Mobile Device to Public Safety Communications Center with addition of pre-recorded video

1. Steps 1-3 as shown in Normal Flow (of events) from above occur first.
2. As Bob is describing the emergency situation to Carol, she asks him if he can send a video recording of the site.
3. Bob makes a video recording with the same MMES-capable device that he used to initiate the voice communication.
4. Bob makes the video recording while the voice communication with Carol continues.
5. Bob then immediately uses the original communication session to forward the video recording as a multimedia message to Carol using his MMES-capable device.
6. Carol provides a Dispatch Response team with Bob's emergency information, a link to the video recording, and sends response team to Bob's location.
7. Carol sends a message to Bob advising him that help is on the way.

Alternative Flow #2 – *Voice Message from an MMES Mobile Device to Public Safety Communications Center with addition of pictures*

1. Steps 1-3 as shown in Normal Flow (of events) from above occur first.
2. As Bob is describing the emergency situation to Carol, she asks him if he can send a few pictures of the site.
3. Bob takes several pictures with the same MMES-capable device that he used to initiate the voice communication.
4. Bob takes the pictures while the voice communication with Carol continues.
5. Bob then immediately uses the original communication session to forward the pictures to Carol using his MMES-capable device.
6. Carol provides a Dispatch Response team with Bob's emergency information and any important pictures and sends response team to Bob's location.
7. Carol sends a message to Bob advising him that help is on the way.

6.6 USE CASE #7 - EMS MONITORING OF VICTIMS AT SCENE OF CAR BOMBING USING LTE DEVICES WITH MMES CAPABILITY

Short Description

Bob, Bill, and Mary are EMS first responders that comprise an EMS team. Their EMS team is assigned to an EMS vehicle. Each team member has an MMES device with voice and real-time data capability. The EMS team communicates with each other, their EMS Public Safety Communications Center, and a standby doctor in a Hospital Center Emergency Room (ER) via an incident talk group.

At the scene of a car bombing, Bill and Mary place LTE MMES-capable EKG monitors on victims in the field, while Bob remains in the EMS vehicle. The MMES-capable monitors are configured for

device-to-device (direct mode) communication. The monitors send data to a MMES device connected to a PC (MMES-capable PC) in the EMS vehicle.[8]

In the EMS vehicle:

- Bob communicates with his incident talk group using a fixed LTE device with MMES voice and real-time data capability.
- Bob receives biometric data from the victims in the field via an MMES-capable PC configured for direct mode communication.

Actors

Bob, Bill, and Mary are UE Device users and first responders (EMS personnel). Alice is an EMS Public Safety Communications Center operator. Ann is a Standby Physician in a Hospital Center ER.

Pre-Conditions

MMES voice and real-time data communication are supported by:

- Bill and Mary's mobile UEs.
- Bob's fixed UE.
- The EMS Public Safety Communications Center for which Alice works.
- The Hospital Center Emergency Room for which Ann works.
- The Talk Group comprised of the EMS Team, Alice (in the EMS Public Safety Communications Center) and Ann (in the Hospital Center ER).

The LTE EKG monitors placed on the car bombing victims in the field:

- Are configured to transmit MMES real-time data (biometric sensor[9] data such as heart rate, and blood pressure) using direct mode communication.

- Transmit GPS location information, date, time, and victim identification.

The LTE MMES-capable PC in the EMS ambulance:

- Is configured to receive periodic real-time data from the LTE EKG monitors setup for the victims in the field using direct mode communication.

Post-Conditions

[8] More detailed requirements would include functions to enable MMES-capable monitors to be associated with a patient ID to maintain the association between a specific victim and the associated biometric data stream sent pertaining to the patient.

[9] Ibid

The real-time data sent from the LTE MMES EKG monitors placed on the victims in the field (by Bill and Mary) was delivered to the MMES-capable PC in the EMS vehicle (at the scene of the incident). The MMES voice and real-time data communication:

- Originated by Bob in the EMS vehicle was delivered to Bob's incident talk group.
- Originated by Ann (standby physician) in the Hospital Center ER was delivered to Bob and the other members of the incident talk group.

The MMES voice communication:

- Originated by Bill and Mary in the field was delivered to all members of the incident talk group.
- Originated by Alice in the Public Safety Communications Center was delivered to all members of the incident talk group.

Normal Flow (of events)

1. Bob, Bill, and Mary are dispatched to the scene of a car bombing incident where police have reported victims on the ground at the scene.
2. After arriving at the scene of the incident Bill and Mary position themselves in the field, determine the extent of the incident and evaluate the victims.
3. Bill and Mary communicate their findings to the members of their talk group.
4. Bill and Mary examine each victim, collect identification, and then start programming and placing LTE EKG monitors on each of them.
5. Bob contacts his EMS Public Safety Communications Center describing the scene of the incident.
6. Bob asks for additional emergency medical assistance (e.g., EMS support).
7. Bob asks for medical information on the victims identified.
8. Alice, who works in the EMS Public Safety Communications Center, contacts a Hospital Center ER and connects Ann (a standby physician in the Hospital Center ER) into the talk group.
9. Alice provides a Dispatch Response team with Bob's emergency information, and sends a response team to Bob's location.
10. Alice sends a message to Bob advising him that help is on the way.
11. Bob starts receiving historical medical information of the victims identified in the field from Ann in the Hospital Center ER.
12. After the LTE EKG monitors are configured for the victims (e.g., using direct mode data communication) by Bill and Mary. Bob starts receiving their biometric information, along with GPS location, date, time, and identification.

13. Bob starts streaming real-time data for the victims to Ann in the Hospital Center ER for evaluation, so decisions can be made on the order of transport to the hospital as other EMS personnel and vehicles arrive on the scene.
14. Bob starts receiving additional medical information of the victims identified in the field from Ann in the Hospital Center ER.
15. Real-time data includes heart rate, blood pressure, injury details, current conditions, victim identification (including age, height, weight, blood type), GPS location information, date, and time.
16. Bob performs a central monitoring and evaluation of the car bombing victims in the field from the EMS vehicle taking into account:
    - Age, weight and current conditions of victims.
    - Information received from the LTE MMES capable EKG monitors in the field.
    - Information received from the hospital regarding medications and existing pre-conditions for the victims.
17. Bob continues to stream real-time data for the victims to Ann in the hospital center ER and continues to exchange voice messages with his talk group members until all of the victims have been transported to a hospital.

6.7 USE CASE #8 - EMERGENCY GROUP TEXT MESSAGE FROM AN MMES MOBILE DEVICE TO TALK GROUP AFTER EMERGENCY ALARM

Short Description

Bob, a first responder has a mobile device with a MMES text messaging application. Bob is a member of an MMES Talk Group (with emergency text messaging capability) that includes his partner Ed and Carol in the Public Safety Communications Center. In an emergency situation, Bob decides to send an emergency text message to his talk group (after initiating an emergency alarm).

Actors

Bob is a UE Device user and first responder (police officer). Ed is a UE Device user and first responder (police officer, Bob's partner). Carol is a Public Safety Communications Center operator.

Pre-Conditions

Bob's and Ed's UE supports Emergency Alarm and MMES text messaging. Bob and Ed have configured their UE devices so that once the device is aware that a PS Emergency Group text session has been initiated, (and the device is in the emergency state) the device will avoid drawing unnecessary attention to the user.

The Public Safety Communications Center for which Carol works supports MMES text messaging and is configured to receive Emergency Alarm. The MMES Talk Group comprised of Bob, Ed, and Carol supports Emergency Alarm, voice, and emergency text messaging.

Post-Conditions

Emergency alarm and initial emergency text messaging originated by Bob was delivered to Carol (Public Safety Communications Center operator) and Bob's partner Ed (in his patrol car). Subsequent text messaging originated by Carol, Bob, and Ed was received by all talk group members.

Normal Flow (of events)

1. Bob already has his mobile device turned on.
2. Bob encounters an emergency situation in which it would be dangerous to make a voice call.
3. For example an armed robbery in a convenience store where Bob is a customer and obscured from view in back of store.
4. Bob initiates an emergency alarm on his MMES device to his talk group to indicate a life-threatening situation.
5. Bob then composes an emergency text message describing the emergency.
6. Bob addresses the emergency text message to his MMES subscriber group using a string that indicates an emergency group text session.
7. The emergency group text message is sent to Bob's talk group along with Bob's location.
8. A call back phone number (or URL) is also included.
9. Carol, who works at Dispatch, receives the emergency group text message.
10. Ed, (Bob's partner in a patrol car) also receives the emergency group text message and is alerted to Bob's emergency situation.
11. Carol sends a text message back to Bob asking questions, and Bob responds.
12. Per MMES configuration, Bob's device is configured so that it does not beep or make noise (does not draw unnecessary attention) when response from the Public Safety Communications Center is received when the device is in the emergency state.

13. Ed (Bob's partner) also views the emergency group text message exchange with Bob and Carol.
14. Ed sends a text message back to Bob and Carol indicating that he is in position to help Bob with the suspects.
15. Carol provides additional police units with Bob's emergency information, and sends response team to Bob's location.
16. Carol sends a message to Bob and Ed advising them that help is on the way.

6.8 USE CASE #9 - PURSUIT SCENARIO - SITUATIONAL AWARENESS AND LOCATION INFORMATION OF RESPONDERS

Short Description

Mike, a first responder police officer, is monitoring traffic on a busy highway.

Actors

Mike, the first responder, has a PS LTE Device user, operating within coverage. Division A Group is a Law Enforcement First Responders Group of which Mike is a member. Ashley, the dispatcher, is online at a Public Safety Communications Center monitoring Division A Group.

Pre-Conditions

Mike's vehicle has an integrated, operational PS LTE UE Device which is an integral part of his vehicle's VAN (Vehicle Area Network) and associated sensors and computing systems. Integrated and currently active sensors include Doppler (Speed) Radar, Automatic License Plate Reader (ALPR, and a Facial Recognition System (FRS). Ashley, the dispatcher, is monitoring all members of Division A Group.

Post-Conditions

Throughout the event, all relevant personnel are able to monitor the event in real time.

Normal Flow (of events)

1. Mike's vehicle is stationed on a major highway monitoring traffic with his radar.
2. A black SUV speeds past Mike's vehicle. The speed radar determines the vehicle is traveling 22 mph over the speed limit and passes this to the in-car system server.
3. The in-car system server notifies the officer and queries the automatic license plate reader and video surveillance system through the on-board network.

4. The ALPR extracts the plate number and automatically sends it to the onboard stolen database and to other databases over the LTE network for query.
5. The system server activates the video surveillance system, quickly extracts facial features of the driver, and processes this image for transmission over the LTE network to a facial recognition database at headquarters.
6. Less than 1 second later, Mike, Ashley the dispatcher, and a stolen vehicle unit are notified of the vehicle's stolen status.
7. Mike decides to pursue the vehicle, following standard stolen vehicle procedures by initiating "Pursuit" functionality using an easy-to-use, tactile interface method.
8. The system knows the details of the vehicle in question, understands a pursuit has been initiated, and automatically knows who to contact in various support entities.
9. No other actions by Mike are required, as the officer maintains full visuals on the vehicle and keeps both hands on the steering wheel.
10. As other units are notified and join in the pursuit, a map and other relevant data are displayed on their windshield through their existing line of sight (called a "Heads Up Display"). This ability, fed by the LTE network, provides the ability for the officer to absorb a significant amount of data through graphics, maps, or imagery without changing his view. Additional units are able to get imagery of others in the vehicle. This is processed through the LTE network, where one additional suspect is identified as a known associate of the driver.
11. Division A Group Command was notified automatically and they watch the video of the suspect vehicle in real-time, monitor location and velocity of the chase, and are alerted to any changes in status.
12. About a minute later, over the LTE network, the facial recognition system notifies Mike, other responders in the area, and supervisory personnel in the field and Public Safety Communications Center that the driver has multiple violent felony warrants outstanding.
13. Without having to take his eyes off the road or suspect or hands off the wheel, Mike and other officers are given spoken and map-based details on assisting units and their ETAs through the LTE network.
14. Division A Group supervisory personnel aid the pursuing and assisting officers by coordinating a stop location with other units blocking streets and traffic, and providing other details relevant to the situation through the LTE network.
15. Noting congestion ahead and potential complications, supervisory personnel were able to take control of traffic control signals from the Department of Transportation through the LTE network, moving other motorists out of the intended 'take down area' as quickly as possible,

and coordinating with other units and control signals to create traffic blockages that would discourage the suspect from taking exits that may provide a more ready escape.

16. Responding units and supervisory personnel monitor the chase via real-time map displays and video of the suspect as it unfolds, through the real-time capabilities of the LTE network.
17. The pursuing vehicles are pulled back slightly once positive visualization of the suspect vehicle is made using cameras along the highway and other routes. In addition, an air asset with LTE connectivity provides updated imagery and location information of the suspect vehicle as it moves.
18. All of these cameras can be controlled by Dispatch Commanders or police supervisory personnel through the LTE system for this specific incident, and their imagery is provided to various responders in real-time.
19. At an appropriate time and location, spike strips are placed in front of the suspect vehicle, and noted on the map. Video from a vehicle near the spike strips provides real time imagery of the vehicle stop and felony takedown.

Due to advanced and instant communications and real-time situational awareness, the situation is quickly resolved with a safe felony arrest.

6.9 USE CASE #10 - REMOTE MONITORING OF A TRAFFIC STOP

Short Description

Mike, a first responder police officer, makes a traffic stop. Ashley, the dispatcher, monitors the traffic stop.

Actors

Mike, the first responder, has a PS LTE Device, user operating within coverage. Division A Group is a Law Enforcement First Responders Group of which Mike is a member. Ashley, the dispatcher, is online at a Public Safety Communications Center covering Division A Group.

Pre-Conditions

Mike's vehicle has an MDT running a mobile dispatch client. Integrated and currently active sensors include Doppler (Speed) Radar and GPS location. The vehicle also has a multi-camera video recording system.

Ashley the dispatcher is monitoring all members of Division A Group via her wired dispatcher's console which includes several screens displaying dispatch information and a location plotting map. Ashley is located in the Public Safety Communications Center.

Post-Conditions

Throughout the event, all relevant personnel are able to monitor the event in real time.

Normal Flow (of events)

1. Mike has logged in to his MDT mobile dispatch client using advanced (2 factor, consistent with CJIS (Criminal Justice Information Services) requirements) authentication.
2. Mike's vehicle is stationed in a school zone monitoring traffic with his radar.
3. A black SUV speeds past Mike's vehicle. The speed radar determines the vehicle is traveling 10 mph over the speed limit.
4. Mike decides to pursue the vehicle, for a normal speeding traffic stop and radios in to Ashley that he is making a traffic stop due to speeding.
5. Ashley decides to monitor the traffic stop because Mike is alone, without backup. She is able to visually monitor via the video feed from the vehicle and also see the location of Mike and other nearby units on the map display.
6. The SUV has pulled over to the side of the road and Mike pulls over behind it.
7. Mike decides to perform a license plate query on the SUV. He enters the license plate number into the query function on the MDT.
8. The query function relays the query to the backend system over the encrypted over-the-air channel.
9. The backend system queries the appropriate state and national databases and receives the query responses.
10. The backend system returns the query responses to Mike's MDT over the encrypted over-the-air channel. Mike sees that the results show there are no warrants or hot hits on the vehicle or its owner.
11. As Mike approaches the vehicle, he is attacked by the driver but is unable to signal to Ashley that an emergency situation has developed.
12. Ashley sees the attack, signals an emergency, and immediately dispatches the closest nearby unit. Ashley pushes a URL linking to the video of the previously recorded SUV and driver to the

dispatched unit. Ashley can then initiate emergencies as needed, creating dynamic priority on the network for the selected traffic.[10]

13. As the backup arrives, the suspect flees on foot.

14. The backup officers pursue on foot and quickly apprehend the suspect.

Due to advanced and instant communications and real-time situational awareness, the situation is quickly resolved with a safe felony arrest.

6.10 USE CASE #11 - DISPATCHER MONITORING FIXED CAMERAS

Short Description

At a fire, fixed outdoor cameras are directed to monitor the outside of the burning building. Jim is a firefighter who is inside the building. An explosion takes place and Jim signals an emergency by pressing the emergency key on his handheld device. Ashley, who is in the Public Safety Communications Center, receives the emergency notification. Ashley also monitors Jim's location via the map display. Sharon, who is also in the Command Center, is monitoring the cameras and sees a civilian stumble out of the rear of the building. Sharon alerts Ashley about the civilian via a high priority message. Ashley sends a message to the fire commander on site who then sends aid to the civilian.

Actors

Jim, the firefighter, has a handheld device. Ashley is Public Safety Communications Center personnel. Sharon is Public Safety Communications Center personnel, responsible for monitoring fixed cameras. Tom is Fire Commander on site. A Civilian is located in a burning building.

Pre-Conditions

Ashley is monitoring the incident information, the map, and cameras at the Public Safety Communications Center. Sharon is monitoring the cameras at the Public Safety Communications Center. Tom is on site, coordinating the response.

Post-Conditions

Throughout the event, all relevant personnel are able to monitor the fire and aid is quickly sent to the civilian while Jim's location is also monitored.

[10] Future work should include Alternate Flow in which dispatcher controls MMES activations and associated dynamic prioritization.

Normal Flow (of events)

1. Tom sends Jim into the building along with other firefighters to fight the blaze.
2. Jim heads towards the back of the building, separate from his colleagues.
3. An explosion takes place towards the rear of the building.
4. Jim feels the effects of the explosion and presses the emergency key on his handheld device.
5. Jim is able to exit the building.
6. Sharon notices Jim has exited the building at the rear by monitoring the cameras and notifies Ashley via a text message.
7. Ashley monitors Jim's location on the map display and receives Sharon's text message about Jim existing the building. Ashley is able to notify Tom about Jim's location outside of the building.
8. Sharon, while monitoring the fixed cameras, sees a civilian stumble out of the building. She notifies Ashley with another text message.
9. Upon receiving Sharon's text message, Ashley radios Tom the location of the civilian and that he might require aid.
10. Tom sends the onsite medic to the civilian's location to provide aid.

Due to advanced and instant communications and real-time situational awareness, the situation is quickly resolved with aid rendered to the civilian and the firefighters location outside of a burning building verified.

6.11 USE CASE #12 - CITIZEN 911 VIDEO FEED TO FIRST RESPONDER

Short Description

Carol observes a robbery taking place at a convenience store. She calls 911 from her LTE device, equipped with a video camera, and forwards the live video to the PSAP. Mike is dispatched to the scene. Dispatcher Ashley forwards a URL linking to the video from Carol to Mike while he is in route to the incident. When Mike arrives, the video from his vehicle is available to Ashley.

Actors

Mike, the first responder, has a PS LTE Device user, operating within coverage. Ashley, the dispatcher, is online at a Public Safety Communications Center covering Division A Group via her wired dispatcher console which also has several screens displaying dispatch information and a location plotting map. Carol is a citizen with an LTE device equipped with a video camera.

Pre-Conditions

Mike's vehicle has an integrated, operational PS LTE UE Device. Integrated and currently active sensors include GPS location and a multi-camera video recording system. Ashley, the dispatcher, is covering all members of Division A Group. Carol is shopping at the convenience store.

Post-Conditions

Throughout the event, all relevant personnel are able to monitor the event in real time. Perpetrator is arrested and no one is injured.

Normal Flow (of events)

1. Carol is shopping at a convenience store. While she is near the back of the store she observes a robbery at the cashier at the front of the store.
2. Carol calls 911 and pushes the video from her LTE device along with the 911 call.
3. Ashley views the video from Carol and dispatches Mike to the scene.
4. Ashley pushes a URL which links to Carol's video and to Mike's LTE device. Mike can choose to click on the link to view the video in order to assess the situation in real time before he arrives.
5. Mike arrives at the scene and his vehicle's video system is automatically activated. Ashley sees a URL indicating availability of video from Mike's vehicle. She clicks on the link to view the video in order to remotely monitor the situation outside the store.
6. Mike enters the store from the rear and is able to surprise the perpetrator and arrest him.
7. Ashley has seen that Mike has made an arrest and observed no other suspect has run out of the store.

Due to advanced and instant communications and real-time situational awareness, the situation is quickly resolved with a safe felony arrest.

Alternative Flows

None[11]

6.12 USE CASE #13 - FBI SURVEILLANCE

Short Description

The FBI Joint Terrorism Task Force (JTTF) is conducting surveillance of a terrorist suspect and his vehicle.

Actors

Steve and Jim, along with six other FBI agents are conducting surveillance of a terrorist suspect and his vehicle. Tom and Bill are two local Task Force Officers (TFOs) and are also conducting surveillance of the terrorist suspect and his vehicle. Mike, the FBI Group Supervisor (GS), is at the office monitoring the suspect vehicle location as well as the location of the surveillance team.

Pre-Conditions

Steve, Jim, the six other FBI agents, Tom, and Bill are all equipped with portable PS LTE UE devices operating within coverage. The devices all have a built in GPS device and support location reporting.

The suspect vehicle is equipped with a GPS tracking device.

Mike is able to communicate (voice and text) with the agents in the field and able to monitor their location and the suspect vehicle via an integrated map display.

There is a covert camera installed near the suspect vehicle monitoring the vehicle and the suspect location.

Mike establishes a geo-fence around a one block area of the suspect vehicle. If the vehicle trips the "fence," the surveillance team and Mike are immediately notified via their LTE Devices. Mike knows where surveillance is located ensuring all exits are covered should the suspect vehicle move.

[11] Future work on this scenario would benefit from additional Alternative Flows. For instance the case where Carol will reach an NG9-1-1 system and her information will be handled by a calltaker within the NG9-1-1. An ESInet-the calltaker may remain in contact with Ashley for the duration of the call until units arrive.

The surveillance agents and TFOs can view the surveillance from the mapping software on their portable devices and know each other's location as well as the location of the suspect vehicle. Each agent on surveillance can access and view the covert camera.

Steve is conducting surveillance of the subject on foot, near the subject's residence.

Jim is conducting surveillance of the subject in an unmarked vehicle across the street from the subject's residence.

The surveillance team and the GS are grouped together into a messaging group**.**

Post-Conditions

Throughout the scenario, all communications and data are securely transmitted to the agents and TFOs via their LTE devices and to the GS in the office.

Normal Flow (of events)

1. The subject leaves his residence on foot. Steve decides to follow on foot.
2. Steve communicates with the team and the GS by quickly selecting a predefined text message addressed to the messaging group. The message is encrypted end-to-end using cryptography module compliant to the appropriate federal standards, e.g. FIPS 140-2 (Federal Information Processing Standards), in order to comply with federal requirements.
3. As Steve follows the subject, his updated location information is relayed automatically to the team and the GS. The GPS information is also encrypted. Team members and the GS are able to observe Steve's location on the displayed map.
4. Mike is temporarily called away from his desk.
5. An individual leaves the subject's residence, gets into the subject's vehicle and drives away.
6. Jim communicates via voice that he will follow the vehicle.
7. The subject vehicle trips the geo-fence which alerts all team members and the GS.
8. Mike returns to his desk and can see on his map display that the geo-fence has been tripped. The updated location displayed shows that Jim is following the vehicle.

Due to advanced and secure communications, the locations of the surveillance team and subject's vehicle are available to all team members and the GS.

6.13 USE CASE #14 - ARMED BANK ROBBERY

Short Description

Bob, an off-duty police officer is in a bank during an armed robbery. Bob notifies Carol, a dispatcher, of the robbery. Carol assigns locally available units to a response team and sends them to the bank. The suspects flee the bank and the response team gives chase to the suspects. Carol brings in an air unit to provide overhead video of the chase. The suspects cause a multicar accident, which results in a number of injuries. Carol brings in an EMS team to aid the wounded. A civilian in critical condition is brought to the hospital, while her EKG information is sent to the ER while en route.

Actors

Bob is an off-duty police officer in a bank. Carol is a Public Safety Communications Center operator. Peter and a number of other individuals are police officers in vehicles in the vicinity of the bank.

Deborah is a civilian involved in an accident. Sarah is an EMS responder. Tony is an EMS supervisor. Response Group is a subscriber group that contains users responding to the bank robbery. EMS Group is a subscriber group that contains EMS users responding to the accident.

Pre-Conditions

MMES pre-defined All Points Bulletin group. The pursuing officer's (Peter) vehicle is equipped with a dash-mount video camera. The officers' vehicles that are involved in the chase are equipped with MDTs that have mobile network communications.

Post-Conditions

All incident-related traffic and users on the network return to normal priority.

Normal Flow (of events)

1. While Bob, an off-duty officer, is in a bank, an armed individual enters the bank and begins an armed robbery.
2. Bob silences his MMES device, which may be done by lowering the volume, pressing a mute button, or some other function.
3. Bob initiates a unit emergency alert on his MMES device.
4. Bob's MMES device enters an emergency state.
5. Bob's MMES device sends a unit emergency alert which is forwarded to his Public Safety Communications Center to indicate a life-threatening situation.

6. The unit emergency alert includes Bob's MMES device identifier and may include Bob's GPS location information (if available).
7. The LTE network raises Bob's application priorities to a higher level.
8. Bob's device provides a visual indication that it is in the emergency state.
9. Because the MMES device was silenced, it does not generate any audio.
10. The armed robber tells everyone to get on the ground with hands behind the head, and Bob complies.
11. Carol, who works at Dispatch, sees Bob's unit emergency alert and attempts to contact him, but he does not respond.
12. Carol enables remote audio and video monitoring on Bob's MMES device and also pulls the device's real-time location information to track his movement. Carol hears a commotion at the scene and sees a view from the floor of people lying down on the floor scared. The location information reveals that Bob is in the bank.
13. Carol sends an emergency unit-to-unit text to Bob to let him know help is on the way, in the event that he can consume the message. In Bob's current state, he cannot.
14. Carol coordinates a response team. She selects units in the vicinity that are available along with their relevant supervisors and brings them together into a Response Group that also includes Bob. Carol elevates the group's priority, allowing voice and data related to the Response Group higher network and application priority. The priorities for user traffic associated with other groups that users in the Response Group are a part of are not elevated.
15. Carol informs the response team of a suspected bank robbery via voice commands.
16. The location of the units in the response team is sent via the network, and is displayed on Carol's console and on the other responding officers' MDTs via mapping software. Bob's location with his emergency status is included in the group and is also displayed on Carol's console and the mobile officers' MDTs.
17. Before the responding units arrive at the bank, the armed robber flees the bank and enters a getaway vehicle.
18. When the armed robber leaves the bank, Bob uses his MMES device to transmit a visual description of the suspect and the make and model of the getaway vehicle via voice to all participants on the Response Group. The suspect is identified as armed and dangerous.
19. Because Bob is no longer in harm's way, he removes the emergency status of his unit.
20. Bob's emergency state on the network is cleared and his unit priorities return to normal.
21. Carol's dispatch console shows that Bob's emergency state is cleared.

22. The mobile officers on the Response Group also see that Bob's emergency state is cleared.
23. Because Bob is no longer involved in the scenario, Carol removes him from the Response Group. The group remains in an elevated state.
24. Carol sends the description of the suspect and make/model of the getaway vehicle as an all-points bulletin (APB) to all units. The APB is transmitted with a high priority to users previously configured within an APB group. The information is presented on the MDTs of all recipients.
25. Peter, an officer in the Response Group that is responding to the scene, sees a vehicle matching the description fleeing the scene and begins pursuit.
26. Peter presses a pursuit button on his MDT, which informs Carol and other members on the Response Group that he is pursuing the suspect. The console and MDTs are updated with this status.
27. Peter turns on his siren and lights. The siren and lights status is sent to Carol and other members on the group. The console and MDT display updates to show the active siren and lights status.
28. Through default behavior, Peter's active siren and lights status and his location information is used by the network to coordinate traffic light changes. Peter is able to turn traffic lights along his projected course green, while all cross traffic is stopped with a red light. Strobe lights on the traffic lights indicate an emergency condition.
29. Carol elevates the priority of Peter's dash cam and monitors the situation.
30. Peter's dash cam optically recognizes the license plate of the suspect's car. The plate is checked against a national database and is identified as being registered to a convicted felon. This information is forwarded to Carol.
31. Carol forwards the suspect and vehicle information, as well as a mug shot to all of the officers involved in the scenario via the Response Group. This information is updated on their MDTs.
32. Carol is able to control traffic light cycles of traffic lights in the path of the chase to that they slow down the suspect and to prevent an accident in an intersection.
33. Carol coordinates an air unit to monitor the chase. Carol adds the air unit to the Response Group, which provides the pursuing officer's location information to the air unit, as well as the location of all other participating units. The air unit's addition to the Response Group, as well as its location information, is provided to dispatch and the other members of the response team. The console and MDTs are updated with this information on their maps.
34. The air unit gets a visual contact of the chase and informs Carol.
35. Carol elevates the priority of the helicopter's video feed and adds it to the Response Group to provide an overhead view of the chase to units involved in the chase.

36. Sometime later, Carol observes an accident in the dash cam of the Peter's vehicle and the air unit video feed. The suspect's car has caused a multi-car accident.
37. Carol calls for EMS units in the vicinity to respond to the scene. Based on the observed severity of the accident, Carol creates an EMS Group which includes crews in three ambulances, the hospital, and appropriate supervisors.
    a. Carol adds hospital into the EMS Group as part of the notifications
38. Carol raises the priority of the EMS Group to ensure critical information (voice and data) on the group is delivered.
39. The suspects are injured and are detained until EMS arrives to provide treatment.
40. Carol forwards the recorded dash cam video of the accident and the live air unit video to EMS units via the EMS Group to prepare them for the scene.
41. Officers aid the wounded and report critical injuries to Carol. Officers scan the licenses of injured victims, whose information is detected optically and forwarded to Carol at dispatch. Officers take images of some of the wounded and send the images to Carol. Carol forwards the identity and photo information to the EMS teams on the EMS Group.
42. The medical history of the injured civilians may be available, in which case it is sent to the EMS units to help prepare for unique medical needs of the injured (pregnancy, allergies, etc).
43. EMS uses all of the available information to prepare adequate responses for the injured civilians while en route.
44. EMS arrives and begins to aid the wounded.
45. Deborah, a pregnant civilian in critical condition, is immediately moved into an ambulance for transport to the hospital.
46. Sarah, an EMS responder, attaches EKG monitors to Deborah in the ambulance. Due to the critical nature of the victim, Sarah assigns the EKG information to have high priority on the network. The data is forwarded to the hospital.
47. Sarah also forwards Deborah's identity information, received medical information, and images of her injuries to the hospital.
48. Because the pursuit has ended and EMS teams have the situation under control, Carol downgrades the priority of the Response Group, officer dash cam, and air unit video feed to normal priority.
49. All of the participants involved in the Response Group see that the group priority has returned to normal.
50. When the group is no longer needed, Carol tears down the Response Group.

51. All of the participants involved in the group see that the group has been torn down.
52. Once EMS communications are no longer needed at a high priority, Tony, an EMS supervisor, downgrades the priority of the EMS Group to normal priority.

Alternative Flow #1 – Image transfer

Steps 1- 3 as shown in Normal Flow (of events) from above occur first.

1. Bob is able to quickly take an image of the armed robber and transmits it on his current group.
2. Carol is monitoring his current group and receives the image.
3. Steps 4-8 occur.
4. Carol informs the response team of a suspected bank robbery via voice commands. Carol pushes Bob's image of the robber to all of the members in the Response Group.
5. The use case continues at Step 10.

Alternative Flow #2 – Text communications

Steps 1-2 as shown in Normal Flow (of events) from above occur first.

1. Bob is able to move to a concealed area of the bank, out of view of the armed robber.
2. Bob composes a text message describing the emergency.
3. Bob designates the text message as an emergency text message.
4. Bob sends the text message directly to his Public Safety Communications Center.
5. Bob's MMES device enters an emergency state.
6. Bob's MMES device sends a unit emergency alert which is forwarded to his Public Safety Communications Center to indicate a life-threatening situation.
7. The unit emergency alert includes Bob's MMES device identifier and may include Bob's GPS location information (if available).
8. The LTE network raises Bob's application priorities to a higher level.
9. Bob's device provides a visual indication that it is in the emergency state.
10. Because the MMES device was silenced, it does not generate any audio.
11. Bob's emergency text message is sent to the Public Safety Communications Center.
12. The emergency text message includes Bob's MMES device identifier and may include Bob's GPS location information (if available).
13. Carol, who works at Dispatch, receives the text message.
14. Carol sends a text message to Bob to request more information, and Bob responds.
15. The use case continues with Step 8. Carol relays the information Bob has provided to the response team.

Alternative Flow #3 – Officer responds to the APB

Steps 1- 15 as shown in Normal Flow (of events) from above occur first.

1. An officer that is not included in the Response Team receives the APB and sees a vehicle matching the description near the bank.

2. The officer presses a pursuit button on his MDT that is associated with the APB. The MDT informs Carol that he is pursuing the suspect. The console is updated with this status.
3. The officer turns on his siren and lights. The siren and lights status is sent to Carol. The console display updates to show the active siren and lights status.
4. Carol brings the pursing officer into the Response Group.
5. The pursuing officer's siren and lights status, pursuit indication, and location information are shown on the MDTs of all participants on the Response Group.
6. The location information of other users on the Response Group is displayed on the pursuing officer's MDT.
7. The use case continues normally.

Alternative Flow #4 – Hospital team included in a group

Steps 1- 38 as shown in Normal Flow (of events) from above occur first.

1. A supervisor in the ER establishes an ER Group that includes the ER and Sarah.
2. The ER supervisor increases the priority of the ER Group.
3. Alternatively, an EMS supervisor in the field may increase the priority of the ER Group.
4. A doctor in the ER adds Deborah's EKG information to the ER Group.
5. Sarah enables a video feed in the ambulance and adds it to the ER Group to allow doctors in the ER a real-time visual of Deborah, who is having complications.
6. ER doctors assist Sarah in ensuring Deborah is properly prepared for emergency surgery upon arrival at the ER.

6.14 USE CASE #15 - DIFFERENT SUBSCRIBERS SHARING ONE END USER DEVICE

Short Description

Bob is a policeman and a member of a highway patrol team. Bob shares with another colleague the same vehicle installed with user devices for MMES communication.

Actors

A police team comprised of Bob and John. They share a vehicle with advanced communication equipment in the vehicle. John is Bob's teammate.

Pre-Conditions

John has completed his day shift. Bob comes to work to take over John's shift.

Post-Conditions

Bob uses the user device in the vehicle with his own subscription. Communication with the device displays Bob's identification.

Normal Flow (of events)

1. John completes his working shift and logs off of the user devices in the vehicle. John let Bob take over his vehicle for the evening shift.
2. Communication to the user devices in this vehicle displays no current active user.
3. Bob enters the vehicle and successfully logs in to the user device with his account to start his shift.
4. Any communication with Bob displays Bob's identification.

Alternative Flow #1 – Multiple users share a pool of user devices

1. Multiple users share the available user pool of user devices. Each user is able to log on to any of the devices.

Alternative Flow #2 – User logs in with supervisor user identification

1. After step 4, Bob logs off from the user device and then logs in with another supervisor (or privileged) user identification to allow him to access different authorized data.

6.15 USE CASE #16 - DEA SURVEILLANCE

Short Description

The DEA is conducting controlled delivery from South Texas to North Carolina. It will involve 8 Agents and three Task Force Officers conducting surveillance across multiple states.

Actors

Eight DEA agents and three Local Task Force Officers assigned to the Corpus Christi, TX, DEA Office. The Corpus Christi and Charlotte, NC, DEA Group Supervisors (GS) will monitor the surveillance from their respective offices and homes.

Pre-Conditions

DHS Customs Border Patrol (CBP) discovers 30K pounds of marijuana secreted in a tractor trailer at the Falfurrias, TX, CBP check point. They immediately contact the DEA Resident Office in Corpus Christi, TX.

The driver of the tractor trailer cooperates and reports that he was to drive the load to Charlotte, NC, and upon his arrival he would receive a text message with further instructions.

DEA decides to follow the load to Charlotte where the marijuana will be delivered and the suspects arrested. The tractor trailer is equipped with a GPS tracker, and video and audio surveillance devices. The DEA agents and the TFOs are equipped with portable PS LTE UE Devices.

The surveillance agents and TFOs monitor audio and video on mobile clients/LTE UE devices and are aware each other's location as well as the location of the tractor trailer. All communications and data are securely transmitted to the agents and TFOs via their LTE devices.

Post-Conditions

Throughout the scenario, all communications and data is securely transmitted to the agents and TFOs via their LTE devices. The agents are able to track the tractor-trailer location as well as locations of the other agents in real time. They are able to access the video and audio surveillance from the tractor trailer throughout the operation.

Both DEA Supervisors are able to monitor the surveillance remotely and communicate with the surveillance agents.

The surveillance will cross multiple states and jurisdictions and will require uninterrupted service for the duration of the operation. The agents' ability to communicate and access data will need to be continuous and to a consistent quality of service when passing from one NPSBN service area to another (i.e., from state to state).

Normal Flow (of events)

1. CBP seizes marijuana at their check point and detains the driver and the tractor- trailer and contacts DEA.
2. DEA responds and interviews the driver who agrees to cooperate with DEA. The tractor trailer is equipped with a GPS tracker, video and audio surveillance devices.
3. A controlled delivery of the marijuana is initiated and the agents/TFOs depart Texas en route to Charlotte.
4. The surveillance/controlled delivery of the marijuana will cross multiple states and jurisdictions and will require uninterrupted service for the duration of the operation.
5. The surveillance agents and TFOs monitor audio and video on mobile clients and are aware of each other's location, as well as the exact location of the tractor trailer at all times. All communications and data are securely transmitted to the agents and TFOs via their mobile devices.

6. Once in Charlotte the agents and TFOS will need to communicate with the Charlotte-based agents and coordinate the eventual arrest of suspects. Charlotte-based agents will need to monitor audio and video from the surveillance as well.

ANNEX A - RECOMMENDED READING AND REFERENCES

NENA Master Glossary of 9-1-1 Terminology, National Emergency Number Association, NENA 00-00

i3 Technical Requirements Document, National Emergency Number Association, NENA 08-751

NENA Functional and Interface Standards for Next Generation 9-1-1 Version 1.0 (i3), National Emergency Number Association, NENA 08-002

NENA Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3, National Emergency Number Association, NENA 08-003 (yet to be published

NENA Use Cases & Suggested Requirements for Non-Voice-Centric Emergency Services, NENA 73-501, Version 1.0, January 11, 2011

3GPP TS22.101 V11.4.0 (2011-12), 3rd Generation Partnership; Technical Specifications Services Group and Systems Aspects; Service aspects; Service principles (Release 11)

Public Safety Communications Research Program (PSCR) of the National Institute of Science and Technology (NIST), Video Quality in Public Safety Program (VQiPS), see: http://www.pscr.gov/outreach/vqips/vqips_guide/define_vid_qual_reqs.php

Video Technology Advisory Group (VTAG) of the National Public Safety Telecommunications Council (NPSTC), see: http://www.npstc.org/vtag.jsp

ANNEX B - PUBLIC SAFETY MMES WORKING GROUP PARTICIPANTS

Members	Company
George Stanek (Lead)	AT&T
Bill Moore	CITIG
Frank Korinek	Motorola Solutions
Val Oprescu	Motorola Solutions
Brian Daly	AT&T
DeWayne Sennett	AT&T
Christian Militeau	Intrado
Wim Brouwer	Alcatel-Lucent
Gordon Hsu	Alcatel-Lucent
Brian Kassa	Nokia-Siemens Networks
Rich Orsulak	NTIA
Ralph Parker	NCS Support
Chris McIntosh	State of VA
Brandon Abley	Minnesota DPS
Robert Wilson	WYODOT
Joe Kuran	Washington County, OR
Edgardo Barreto	Puerto Rico Fire Dept
Baruch Altman	LiveU
Lincoln Unruh	RavnTech Corp
Doug Onhaizer	Search

Patrick Kenealy	MPSCS
Michael Britt	AZ
Andy Thiessen	PSCR
Darcy Anton	PSCR
Jeff Bratcher	PSCR
Cynthia Wenzel Cole	Texas Department of Public Safety
Mike Barney	Texas Department of Public Safety
Shawn Lefebre	Harris
Alvin Sunhara	Honolulu Hawaii
Bruce Ward	PSCR
George Horwath	Motorola Solutions
Regina Harrison	NTIA
Trent Miller	Motorola Solutions
John Contestabile	John Hopkins University
Gabriela Abramovici	Alcatel-Lucent

ANNEX C - PS MMES APPLICATION AND NON-LTE REQUIREMENTS

The following requirements are added for completion only and are generally beyond the scope of this document as they do not directly impact PS LTE network elements.

Vehicular Area Network does not utilize LTE but does provide Doppler Radar which detects vehicle speeding over user-defined threshold and automatically engages Automatic License Plate Recognition (ALPR) and facial recognition software systems so that those images can be instantly captured for processing. (9)

Vehicular Area Network does not utilize LTE but does provide Facial Recognition Software (FRS) capable of verifying identity and generating background information, including history of violent crimes and felony warrants outstanding. (9)

Any additional database queries are initiated by the applications and sent over the PS LTE network when/as needed, noting that some may be available in the vehicle. (9)

The agency's CAD system detects a Stolen Vehicle and automatically sends a notification to the responding officer, the affiliated Dispatcher and any other support entities (such as the Stolen Vehicle Unit) as determined by the agency's SOP. (9)

The vehicle is equipped with a "Pursuit" button which automatically contacts, via CAD apps over the PS LTE network, all support entities in surrounding areas, and also activates appropriate vehicular subsystems such as the light bar, on-board video, and GPS tracking. (9)

Vehicles are equipped with "Heads Up Displays" which allow officers to receive additional information without having to take their eyes off the road. Relevant data, such as location information, other entities assisting, mapping information, roadblocks, felony warrant information, would be sent to the pursuing officer's vehicle and would show up on the Heads Up Display on the windshield. (9)

For this scenario, NIMS ICS procedures could be activated which would activate an Incident Commander, who could then order and enable the takeover of traffic controls. (9)

For this scenario, NIMS ICS procedures could be activated which would activate an Incident Commander, who could then order and enable additional support resources such as air support, medical response, other jurisdictions and support entities such as a Stolen Vehicle Unit team. (9)

For this scenario, NIMS ICS procedures could be activated which would activate an Incident Commander, who could then order and enable activation of other video and camera resources for more comprehensive monitoring of the vehicle in pursuit, especially if the pursuing vehicle loses the suspect for some reason. (9)

For this scenario, NIMS ICS procedures could be activated which would activate notification to supporting units that the suspect may be armed and dangerous, so that the apprehension of the suspect happens as safely as possible. (9)

Real time GPS-based location information for the pursuing vehicle would be sent back to Dispatch which could then be viewed on a mapping application to assist responding units and the Dispatcher coordinating them. This application should be viewable in real time by any supporting entities as determined by the Incident Commander. (9)

All video of the incident shall be capable of being recorded. (9)

The PS MMES shall be capable of providing all of the services and capabilities to ground and air assets traveling at pursuit speeds. (9)

The PS BB LTE UE shall have an automatic “Officer Down” detection system, which activates any time the unit experiences rapid and specific gravitational and orientation changes OR if the vehicle itself becomes incapacitated. Notifications to Dispatch or others occur if the officer does not promptly reset the local alert. This would be needed if the pursuing officer were to get into an accident and become injured or incapacitated. (9)

All services should function even if/when the pursuing vehicle moves between PS Sub-Networks. (9)

The PS BB LTE UE may be equipped with an automatic “Officer Down” detection system, which activates any time the unit experiences rapid and specific gravitational and orientation changes. Notifications to Dispatch or others occur if the officer does not promptly reset the local alert. (9)

The PS BB LTE UE may be capable of having an acoustic “Gunshot Detection” application built in. (9)

PS MMES services may be capable of activating “Swarm of Sensors”/“Soldier-as-a-Sensor”-like features that flood an area with significant data collection capabilities by activating all PS BB LTE UE Device sensors in a defined area. (9)

A PS MMES Hospital Center Emergency Room shall be capable of transmitting and receiving group multi-media messaging (e.g., voice and/or data) in the same or different session. (7)