REVISION ASSESSMENT FOR THE INCORPORATION OF FIRE AND EMS FUNCTIONS INTO THE LAW ENFORCEMENT CAD FUNCTIONAL SPECIFICATIONS

Public Safety Data Interoperability Program (PSDI)

Final Report	January 28, 2010
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1 Purpose

1.1 Forward

In 2003, The Law Enforcement Information Technology Standards Council (LEITSC) identified the need for a national standard for computer aided dispatch (CAD) functional specifications to:

- Provide a starting point for law enforcement agencies to use when developing CAD requests for proposal (RFP);

- Level the playing field when working with vendors; and

- Promote system interoperability.

This recognition ultimately led to the creation of the *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems* through the cooperation of a number of partner organizations and with funding from the Bureau of Justice Assistance.

In 2009, the IJIS Institute's Public Safety Data Interoperability Project, with funding from the Bureau of Justice Assistance, identified the need to expand the original document to include fire service and emergency medical service (EMS) CAD functional specifications. Through a series of meetings and collaborative efforts, a *Revision Assessment for the Incorporation of Fire and EMS Functions into the Law Enforcement CAD Functional Specifications* was created and is included herein. This *Revision Assessment* not only identified functional specifications that should be added to the existing document, but also a number of areas where the existing law enforcement-focused document should be altered to be timely and accurate.

This Revision Assessment serves two purposes.

- First, it provides the basis for determining the level of effort required to incorporate fire and EMS functional requirements into the existing *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* document. This document specifically describes fire and EMS CAD functionality that would need to be added, as well as numerous modifications to current language and restructuring suggestions. Understanding the level of effort and need will help create and guide a future effort to achieve the desired goal – a revision of the CAD Functional Specifications.[1]

- Secondly, until the next revision is published, this document can serve as a supplement of sorts to the existing *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* to those needing a more complete list of base CAD functionality. It may be of particular use to those drafting Requests for Proposals (RFPs) for CAD systems that need to support dispatching fire or EMS – either alone or in addition to law enforcement.

It is worthy of note that the team identified numerous additional functions that apply to law enforcement as well as fire and EMS. Some of these functions stem from recent technologies and initiatives, such as Next Generation 9-1-1 and Suspicious Activity Reporting, which have been developed since the original document was drafted.

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[1] With a few exceptions, CAD functionality related to non-emergency scheduled EMS dispatch was not completely examined as a result of this effort.

1.2 Introduction

Historically, technology and operations in public safety organizations evolved independently from one another, in stove pipe fashion, with each discipline addressing their own individual needs. In the last thirty years, particularly after September 11, 2001, the need for coordination, collaboration, and collective planning became more of the rule. It is now common for emergency communications centers to take an "all hazards approach" to defining systems and operations.

There are compelling reasons why it is imperative that fire and EMS functionality be added to the current *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems*:

1. The majority of local emergency communication centers dispatch for multiple first responder services – a combination of law enforcement, fire, and EMS. Practitioners writing RFPs for CAD systems to support these centers need the multiple service CAD functionality of the proposed revision. As municipalities and jurisdictions seek to consolidate their communications centers, facilities, and technologies, more and more centers are using unified CAD systems that serve law enforcement, fire, and EMS for single and multiple jurisdictions. The transition of this document from an exclusively law enforcement CAD standard is reflective of this change in the public safety operational environment. The inclusion of fire and EMS CAD standards, as well as the update of generic standards, is in keeping with current best practices in the broader public safety discipline.

2. The impact on CAD system software should not be underestimated. In order to be as competitive as possible, software providers work hard to provide cutting edge technology and functionality. A law enforcement, fire, and EMS CAD Functional Specification would serve as a guideline to industry for the development and implementation of integrated CAD Systems that are responsive to fire and EMS needs in addition to those of law enforcement.

With these reasons in mind, there is an obvious need to define CAD requirements for fire and EMS agencies. This document describes the changes and additions required to transform the legacy *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* to include these additional requirements as well as the updates, modifications, and edits to the original content.

1.3 Target Audience

This document is targeted to organizations having a stake in CAD functional specifications. It is hoped that this *Revision Assessment* will provide the impetus for one or more stakeholder organizations to fund a project to update the existing *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* to a new version incorporating fire/EMS functions. These stakeholders include organizations, potential funding sources, practitioners, sponsors, and other supporters. Suggested organizations include:

- The original participants of the *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems*:
  - International Association of Chiefs of Police (IACP)
  - National Organization of Black Law Enforcement Executives (NOBLE)
  - National Sheriff's Association (NSA)
  - Police Executive Research Forum (PERF)

- The following are suggested organizations to be added to the stakeholder/sponsor group:
    - American Ambulance Association (AAA)
    - National Fire Protection Association (NFPA)
    - Association of Public-Safety Communications Officials-International (APCO)
    - National Emergency Number Association (NENA)
    - IJIS Institute's IJIS Public Safety Technology Standards Committee (IPSTSC)
    - International Association of Emergency Medical Service Chiefs (IAEMSC)
    - International Association of Fire Chiefs (IAFC)
    - International Association of Fire Fighters (IAFF)
    - International City/County Management Association (ICMA)
    - National Association of Counties (NACo)
    - National Association of State EMS Officials (NASEMSO)
    - U.S. Conference of Mayors (USCM)

In addition to funding needs, the governance of a revised document will need to be examined. Since the resulting CAD Functional Specification would address all three primary first responder domains, it also crosses traditional governance and project sponsorship models. No single agency or organization has clear jurisdiction over such a document and project. It would seem appropriate, therefore, that the project sponsorship/oversight and governance of the future document would likely require a partnership between multiple agencies or organizations.

1.4 *The Current Standard Functional Specifications for Law Enforcement CAD Systems Document*

The Law Enforcement Information Technology Standards Council (LEITSC) was created in 2002 with funding from the U.S. Department of Justice, Bureau of Justice Assistance and continued in 2003 with funding through a collaborative effort between the Bureau of Justice Assistance and the National Institute of Justice. The mission of LEITSC is to foster the growth of strategic planning and implementation of integrated justice systems through the development and implementation of information technology standards. In June of 2006, this group produced the *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch Systems*.

The LEITSC Functional Standards Committee, composed of law enforcement practitioners and industry experts from around the country, was appointed to develop the *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems*. The baseline document was developed from common elements found in requests for proposals, technical documentation, and other CAD-related research. The document was then validated by the group using a modeling tool. Once developed and validated, the specifications were vetted through the law enforcement community via each of the participating associations: International Associations of Chief of Police (IACP), National Sheriff's Association (NSA), National Organization of Black Law Enforcement Executives (NOBLE), and the Police Executive Research Forum (PERF), as well as through other stakeholder communities in an effort to gain input from a number of different perspectives.[2]

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[2] Excerpted from the Purpose Statement of the *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* (2003).

1.5 Revision Assessment Effort

On October 14-15, 2009, the Public Safety Data Interoperability (PSDI) Project hosted industry leaders, subject matter experts, consultants, and IJIS Institute staff for the purposes of exploring the delta between the existing *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems* and a revised CAD Functional Specification that would incorporate fire service and EMS standards into the document. The group met over a two-day period at the IJIS Institute offices in Ashburn, Virginia, and identified functional requirements that are unique to the fire service, to EMS, to combined fire/EMS agencies, and additional requirements that are applicable to all public safety disciplines.

It was recognized that adding fire and EMS functional requirements to the document would require some global changes to the language contained in the existing document. Terms such as law enforcement, officer, and patrol would need to be changed to more generic terms encompassing all of public safety. It was also recognized that the use case and process diagrams would need to be changed in order to be applicable to the wider scope of the document.

Participants were encouraged to adhere to certain "ground rules." The guidelines included:

- Avoid a focus on vendor- or product-specific functionality;

- Maintain an "all hazards approach" to requirements that would be appropriate in a wide variety of emergency situations; and

- Maintain a forward-looking view as this document would need to evolve as technology and capabilities evolve.

Initially, the group tried to identify needed fire/EMS functionality by following the organization of the existing law enforcement document. By noon of the first day, the group decided to depart from the document's organization and "brain storm" the additional requirements. It was felt that the level of expertise in the room was sufficient to list added functionality and differentiate that list from the law enforcement-centric document.

By the close of the meeting on the second day, the group was able to identify a large number of fire/EMS-specific functions. They were also able to identify additional functionality that should be included addressing all public safety disciplines. Finally, the group concluded its discussions with an examination of future trends, technologies, and practices that were captured with the intent of having a closing discussion in the final document.

On November 3-4, 2009, the second meeting was conducted also at the IJIS Institute offices. This meeting focused on practitioner viewpoints and included practitioner leaders and subject matter experts as well as consultants and IJIS Institute staff.

This group used the *Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems* document as a reference (particularly regarding missing fire/EMS functionality), but focused on editing and updating the draft Revision Assessment document generated from the October meeting.

The group reviewed, and edited where needed, each function in the draft Revision Assessment. Additionally, several modifications were made to the organization of the document, i.e. order of the functions. Finally, several new functions were identified and incorporated into the draft.

Both face-to-face meetings were very successful and instrumental to the effort.

Subsequent to the two meetings, conference calls were held on November 12, 2009, and December 11, 2009, by the Revision Assessment Work Group to review and finalize the draft.

The draft Revision Assessment was then provided to the organizations listed in Section 1.3 for comment on December 15, 2009.

Feedback was incorporated as appropriate then a final review was provided by BJA. The document was published on January 28, 2010.

2 Identified Modifications Needed for the Existing Document

This section identifies numerous modifications that are needed to be made to the existing Law Enforcement CAD Functional Specifications. These are divided into three sections:

- Examples of Changes Required to Current Language
- Functions to be Added
- Restructuring Suggestions

2.1 Examples of Changes Required to Current Language

2.1.1 Reframe Language from "Law Enforcement" to "Public Safety"

Numerous language references in the current document are specific to law enforcement (LE). Many of these would be inappropriate if fire and EMS were included. Although a few are within LE specific examples, most could simply be modified such as changing "officers" to "public safety providers" or "emergency responders." The intention is to provide a global reference to all public safety providers.

2.1.2 Glossary Additions

With the incorporation of fire/EMS functionality, numerous terms will need to be added to the glossary. Examples include: Request for Assistance (RFA), Run Cards, Response Plans, Health Insurance Portability and Accountability Act (HIPAA), Advance Life Support (ALS), Basic Life Support (BLS), Move Ups, and Emergency Medical Dispatch (EMD).

2.1.3 Review Diagrams

Use Case Diagrams and Activity Diagrams need to be reviewed. Examples: the Call Taking Use Case diagram does not include a branch for Emergency Medical Dispatch pre arrival instructions; the Call Taking Activity Diagram does not show the retrieval of property information; and, on the Call Taking Activity Diagram there is a box for "Retrieve Premise Hazard and History" which should read, "Retrieve Premises Hazard and History."

2.1.4 GIS Use Cases

Add use cases to the existing discussion of GIS [Section 5.5 and others][3] to cover additional operational uses for fire and EMS. There are no GIS use cases in the existing document. One GIS Use case would be the ability of the CAD user to change street and location attributes on the fly such as street and bridge closures, road impedance routing, and detours.

2.1.5 Expand Sources of CAD Inputs

Expand sections to include better coverage of other inputs (such as NG9-1-1, Alarm Exchange Interface, mobile computing, and their entry points) aside from what is listed in the document. [Applies to Sections 1.3.9 and 1.3.9.1]

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[3] Document references included in brackets from this point forward in the document will refer to the *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems*.

2.1.6 Single User/Multiple Calls

This refers to a single console/single call taker handling multiple incoming calls at the same time. [This does not refer to duplicates as covered in Sections 1.3.1 and 1.3.5.] An example would be a Call Taker entering information into CAD for a non-emergency call, and then being able to put that call (and incident entry) on "hold", without losing any information, to handle and enter an emergency call. [Applies to Section 1.3]

2.1.7 Capture Duplicate Call Info

Information related to an incident will be updated as new information becomes available. Multiple callers provide potential witnesses to the incident and may provide additional or supportive information. The user will need the ability to enter narrative data at any time. This may also result in reclassification and prioritization of the incident. [Applies to sections 1.3.1 and/or 1.3.5]

2.1.8 Remove "If Duplicate" Language

Remove the "If duplicate" from the beginning of the paragraph [Section 1.3.1]. It should also not limit to only open calls. Change reference from dispatcher to user.

2.1.9 Restructure Call Processing

Suggestion to restructure the call processing section as: (1) inputs, (2) call receipt/processing, (3) decision to create (actionable) incident. [Section 1.3]

2.1.10 Emergency Button Activation

Language in [Section 5.6 Push to Talk] needs to include reference to activation of the emergency button on portable radios, mobile data terminals (MDT), and mobile data computers (MDC).

2.1.11 ANI/ALI Automatic Transfer

The requirement for ANI/ALI should also include the automatic transfer of ANI/ALI data from the phone system to the CAD system.

2.1.12 Location Validation

[Section 1.3.8] needs to discuss validation locations based on latitude and longitude. Additionally, this section should discuss Phase II E9-1-1[4] compliance with whether provided by the phone system or the CAD system.

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[4] The FCC has divided its wireless E9-1-1 program into two parts - Phase I and Phase II. Under Phase I, the FCC requires carriers, within six months of a valid request by a local Public Safety Answering Point (PSAP), to provide the PSAP with the telephone number of the originator of a wireless 9-1-1 call and the location of the cell site or base station transmitting the call. Under Phase II, the FCC requires wireless carriers, within six months of a valid request by a PSAP, to begin providing information that is more precise to PSAPs, specifically, the latitude and longitude of the caller.

2.2   Functions to be Added

2.2.1   Add Destination Locations

During the call taking process, or at some time during the incident, EMS-specific functionality should include the ability to capture the hospital or facility destination. In a multiple patient/multiple facility EMS call, the system should support the capture of multiple destinations if the unit transports patients to different facilities. [Section 1.3] This function is not limited to EMS – a law enforcement agency may desire to record the destination for a prisoner transport.

2.2.2   Alerting

Add additional alerting functionality/references. These can include station alerting and personnel alerting (such as toning, paging, SMS texting, email, activating doors, rip/run printing, and station and personnel voice alerts). This also includes messaging to PDAs (Blackberries, Palm devices) that require SMTP protocol.

2.2.3   Move Up ("Fill-In" and "Station Fill")

Move up refers to the temporary reallocation or reassignment of one or more units in order to appropriately cover predetermined geographical response areas. This could be either automatically recommended by CAD or manually recommended. It could be an interface from a third-party software program that decides coverage levels and recommends changes. Also, the function must be able to cancel a move up.

2.2.4   Staffed versus Unstaffed Units

Volunteer fire and EMS agencies may require a CAD functionality that supports the ability to handle unstaffed units as available. This also applies to combination and paid on-call departments. In the case of paid-on call, this functionality can assist in tracking hours on call. It is also helpful for tracking specialized groups such as Hazardous Materials, Special Weapons and Tactics (SWAT), and Urban Search and Rescue (USAR) teams.

2.2.5   Cross-Staffing/Crew Counting/Shared Staffing

Cross-staffing can be either station-based or unit-based:

- In station-based cross-staffing, crews can jointly staff more than one available unit. When the crew level (generally the number of personnel available in quarters) is reduced to less than needed for the remaining unit or units, the units in quarters are placed out of service.

- Unlike station-based cross-staffing, unit-based is a one-to-one relationship. When one unit responds the cross-staffed unit is placed out of service. Multiple units may be shared.

Crew counting is based on minimum unit staffing (an example would be two medics required for a unit to respond with ALS capabilities.) Additional units may need to be dispatched to meet a minimum certification level, skill set, and/or equipment set.

2.2.6 System Status Management (Dynamic Resource Deployment)

System Status Management (SSM) is the practice of pre-positioning resources strategically to minimize response times. Resources may be positioned at permanent or temporary post locations (e.g., street corners). The CAD system should have the ability to build system status plans by hour of day/day of week that define levels of resource availability and which posts/stations should be prioritized for coverage. For example, at 2:00 PM on weekdays, if there is only one ambulance left in the system (available), that unit might be positioned in the middle of downtown. In this example, that post would be the priority 1 post. The plan should be able to accommodate an unlimited number of priority posts in each plan and posts may be designated as equal to or an alternate of other posts in the plan.

The CAD should continually monitor each plan in effect for the current time period and alert the dispatcher if the plan goes "out of compliance" (units not in their proper position). The system should allow users to view the out of compliance condition and, ideally, the CAD should provide a recommendation to the dispatcher for how to position units to meet the requirements of the plan. The user should be able to accept, override, or ignore the CAD recommendation. For AVL enabled systems, vehicle location should be used in SSM.

The system must provide for multiple plans by unit resource type. For example, there may be separate ALS and Engine SSM plans. As resource levels change (units are assigned to incidents, clear off incidents, come on shift or go off shift), the plan will automatically update.

The SSM function could be provided via a third party interface.

2.2.7 Station Dispatch (versus Unit Dispatch)

In station dispatch, a station is alerted without prior knowledge of what individual units will respond. Station dispatch could be used to request in-station coverage for a high volume of calls within a geographic area, independent of an actual Request for Assistance (RFA) for the station.

2.2.8 Run Cards/Response Plans

A Run Card is a plan that identifies the number, type, or specific units that respond to an incident of a specific type, and the order in which they respond. It includes static response cards, response algorithms, response matrices, and response plans. Other concepts to be included are: fixed run cards versus dynamic run cards; specification of alarm levels; the minimum alarm levels to be defined in the CAD; and dynamic run cards aligned with Automatic Vehicle Location (AVL) data and current unit status.

Run cards may be based on special criteria such as staffing capabilities, unit capabilities, routing-based recommendations, target hazards, premises based response plans, etc. (Note: run cards may include unit types, location of incident, location of unit, alarm level, special criteria, call type, and target hazard.)

Particularly in combined fire/EMS systems that use AVL, there is a need to define business rules for each incident type that control the order in which units are considered for dispatch based on their location relative to each other. For example,

there may be a business rule that says only dispatch an ALS unit to a BLS incident if the ALS unit is at least 0.25 miles closer to the incident than the nearest available BLS unit. There might also be a business rule that says if a BLS incident does not require the dispatch of a transport unit, dispatch a BLS transport unit to provide BLS treatment only if it is more than .5 miles closer to the incident than the nearest BLS non-transport unit.

2.2.9 Adjustable Dispatch Levels

This refers to changing dispatch levels to alternative run card sets in special circumstances like inclement weather, major incidents, disasters, MCI, terrorism, and low resource levels. Dispatchers must be able to raise and lower the level on demand. The consequence of changing the dispatch level is that the resource requirements change according to pre-defined response plans. There is a difference between changing the nature of the call and changing the dispatch level since dispatch levels affect the entire agency response recommendations. (A different set of events occurs when an EMS incident changes to structure fire in the same location versus a structure fire in a location that is upgraded to a higher alarm assignment.)

This item does not refer to changing the incident type, which could apply to LE, fire, and EMS.

Note that there is a difference between filling-in the balance of an assignment (balance of alarm) that was only partially filled or adding units to the initial alarm, versus upgrading the alarm assignment. Example: Filling out the balance of an incomplete first alarm assignment when transmitting a second alarm.

2.2.10 Adjustable Response Plans

There are conditions in which fire and EMS agencies need to alter their response levels (either globally or in a particular geographic area) to meet demand and/or special circumstances. When activity reaches a predetermined plateau (either globally or in a particular geographic area), and a supervisor, chief, or other high-ranking operational officer authorizes it, the CAD system would reduce the recommended response levels for calls for service. They may be multi-tiered to handle varying levels of service consumption. For example, a department has determined that it needs to reduce response levels when activities consume 40% of all available resources within a jurisdiction. The first level of response reduction is to remove one engine company from a standard response complement. A higher level may remove two engines or an engine and a ladder company.

The reverse is also true. Under special circumstances, an alarm level may be increased due to conditions, such as a severe snow storm. Using a CAD command, a global change to standard response complements is made and remains in effect until circumstances normalize.

2.2.11 Hospital Status/Availability and Hospital Recommendation

This refers to the tracking of hospital availability/status (e.g., available, busy, closed) within the CAD system. Additionally, the system can recommend the appropriate hospital based on geography and/or capabilities, such as the closest hospital, a hospital with the appropriate specialized facility (burn unit, trauma center), or the hospital that

is next on the rotation. The system provides a warning to units if transporting to a closed or non-recommended facility. This could be an interface with external systems.

The hospital status may also be a warning. For example, an emergency room may be under construction and the ambulance may need to use an alternative entry point.

2.2.12 Additional Attributes

Additional attributes of units (e.g. personnel skills, location, distance, routing, and equipment) are needed to complement fire/EMS functionality. This information drives unit availability and recommendations. The system must have the ability to allow dispatchers to modify the attributes on the fly and be dynamic. Each apparatus must be able to have multiple capabilities and multiple attributes. Examples of fire/EMS attributes include:

- Equipment examples: extrication equipment, hazardous materials equipment, and types of ladder trucks (tiller, tower, rear mount).
- Personnel certifications and special skills as dictates for unit recommendations. Examples include attributes of people versus attributes of units, such as an ALS versus BLS certification, staffing level, special certifications (medical, dive, high angle, technical rescue), vaccinations, and special skills, such as public information officers (PIO) or Critical Incident Stress Management (CISM) providers.

A revision effort may want to take a fresh look at law enforcement attributes as well. Some of this information for these attributes could come from an external system.

2.2.13 CAD Incident Type

Additional CAD incident types are needed that describe the type of incident. Associated with the incident type is the response plan and attributes such as the service type(s) required for the incident type and its default priority.

Most fire/EMS CAD Incident Types are given high priority since most fire/EMS calls for service are considered urgent until proven otherwise. There are lower priority incident types in the fire/EMS discipline, such as routine ambulance transports, flooded basements, public service stand-bys, and residential wellness visits. Examples of fire/EMS specific call codes are Structure Fire, Auto Accident, and Cardiac Arrest. The CAD Incident Type may also be known as the Nature Code.

This should be a user-definable field to add more specialized Incident Types such as hazardous materials, Weapons of Mass Destruction (WMD), decontamination, bomb threat, and civil disturbance.

2.2.14 Unit Recommendation Based on Input from Other Jurisdictions

Fire and EMS dispatching frequently refers to memoranda of understanding (MOU) agreements with other agencies such that the system makes recommendations based on another agency's availability or location. This can occur with neighboring jurisdictions (e.g., a fire response from another town/county in the event of a major incident or a location physically closer to the other's border/station) or between different agencies (e.g., sending a paramedic engine company to an EMS call when an EMS unit is not

available to respond or too far away - also called cross-agency dispatch. This may require a real-time CAD-to-CAD interface.)

Agreements between allied agencies (mutual aid, automatic aid, etc.) vary between jurisdictions and are subject to periodic change. A CAD system should include the ability to accommodate the variety of agreement terms and changes to terms that occur in existing agreements. Examples of configuration parameters include the ability to indicate within which jurisdictions a unit can be suggested for dispatch as a mutual aid unit, whether or not the mutual aid unit is permitted to fulfill response requirements when suggested for dispatch into a particular jurisdiction (or needs to be backed up by another unit), and when a mutual aid unit should be considered for suggestion (e.g. must be at least 0.5 miles closer than alternative units, etc.) This includes defining sharing rules between units. For example, an engine might be able to respond only within its agency or the adjoining jurisdiction but not three towns over.

2.2.15 Predetermined and User Defined Timers

Additional timers are needed to accommodate fire/EMS functionality. These include: incident duration checks, crews operating in Immediately Dangerous to Life or Health (IDLH) environments[5]; Personnel Accountability Report (PAR) checks, time in environments, time in rehabilitation, burn time, patient contact time, and other user-definable timers. Systems offer predefined timers as well as the availability of reserved fields for user definable timers. This function may also be applied to law enforcement for officer safety checks during self-initiated incidents.

2.2.16 Unit Status Timers

Fire/EMS functionality will require additional timer functions such as failure to respond (for example, if a first unit is dispatched and does not respond, a timer alerts the dispatcher to move to next due unit). Additional timers might include too long at scene and too long at hospital.

2.2.17 Patient Tracking

This is the ability to track patients removed from the scene to their ultimate destinations. It should include the ability to maintain data on multiple patients and multiple destinations. This could be an interface with a third-party software package.

2.2.18 Additional Unit Status

Fire/EMS functionality requires additional unit statuses, e.g. Assigned to Post/Move Up, En Route to Post, At Post, Area Post, Patient Contact, Staged, En Route to Hospital, At Hospital, At Hospital/Available for Emergency Calls, and Available. A Patient Contact status should allow the dispatcher to record the time when the crew made contact with the patient following their on-scene status change. This should include the ability for the user to create/modify unit statuses.

Some unit statuses may also need to support modifiers as indicated below:

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[5] Reference http://www.cdc.gov/niosh/idlh/idlhintr.html.

Status	Modifier 1	Modifier 2
En Route	without lights and siren or with lights and siren	Available for dispatch or unavailable for dispatch
En Route to Hospital	without lights and siren or with lights and siren	ALS patient or BLS patient

2.2.19 Strike Team/Task Force Designations

Fire and EMS organizations require the ability in CAD to create strike teams and task forces designated as a "virtual unit." Task forces and strike teams are temporary complements of resources designed to be deployed in special circumstances. For example, in wildland firefighting, a Task Force of three engine companies and an ambulance may be assigned to fight a fire on a ridge as a single unit. Rather than CAD accounting for, dispatching, and tracking the individual units, they are grouped on the fly by the CAD system and managed collectively. Once grouped into a Strike Team or Task Force, individual units are not normally considered for independent dispatch.

2.2.20 Unit Rotation (aka Unit Load Balancing)

Some departments require the ability to balance response loads among their resources. For example, in periods of high activity, run assignments may be adjusted by CAD to give rest to particularly busy units and assign calls to less active units. This is, in essence, "load balancing" response resources. The same is true for crews. An engine company, for example, may be placed out of service or only be considered available for dispatch based on predefined criteria, (e.g. type of incident, priority of incident, proximity to incident relative to other units, etc.) for a time to give the crew rest and rehabilitation following a period of heavy workload. Unit rotation /load balancing may also occur when more than one unit of the same type housed in a single station. For example, two engines may be posted at the same station. To prevent one engine from being over used, the CAD should alternate recommendations between the two engines.

Unit rotation /load balancing may also occur in stations where there is more than one like piece of apparatus in which a policy decision is made to distribute calls among them as a routine function in order to balance the mileage, operating hours and activity among the duplicate units. Methods used for load balancing can vary from agency-to-agency and even station-to-station within the same agency and may even differ based on type of call. Preference may be given to the unit with the older time of last dispatch (e.g., don't wake up the same crew two consecutive times). Preference may be given to the unit with the fewest number of dispatches since the start of the shift. Preference may be given to a particular unit based on the location of the incident (e.g., separate first due areas for fire calls but rotation for EMS calls).

2.2.21 Conditional Availability of Apparatus

This function allows units with specific statuses to be recommended and dispatched to certain types of calls for service. Some examples are: a unit in training is recommended to respond to a nearby traffic crash with injury; a unit that is at the training center with hoses pulled, may continue to be available for high priority incidents, but would not be

recommended for routine calls; and a unit that is responding to a low priority incident (e. g., open fire hydrant, unsafe swimming pool, etc.) would be recommended for dispatch to a higher priority incident if closer than other units. The lower priority incident would be automatically re-queued for dispatch.

2.2.22 Ability to Route to a "Decision Dispatcher"

This function covers the business process where a Call Taker routes an incident to a decision dispatcher. The decision dispatcher alerts the units, then routes the incident to a radio dispatcher to handle the remainder of the call. Typically, this function is only desired by very large communication centers. It is important to note that more than one "decision dispatcher" position may exist, and the routing of the waiting incident to the appropriate decision dispatcher may be based on call type.

2.2.23 Linking an Audio File to the CAD Dispatch Record

Audio logging is a significant component of the PSAP technology infrastructure. Audio logging and recording is the active recording of all or selected forms of audio. The 9-1-1 telephone call, the administrative radio system, voice radio, console-to-console intercom, and direct connect ring down telephone lines are examples of the audio that is recorded in a PSAP. The ability of the CAD system to associate an incident record with the captured audio for that incident is required.

Additionally, with the emergence of NG9-1-1, other media types coming in to CAD may also need to be linked/attached to the audio file.

2.2.24 Rostering

Rostering is the process of scheduling personnel for a shift and having that schedule affect their duty status. Rostering allows users to schedule personnel in advance of their shift and allow dispatchers to place units on duty with the scheduled personnel when they report for duty. Units may be automatically brought on and off duty at differing times or locations. Roster records should include the portable radio ID, pagers and other equipment specific to that unit or the personnel staffing the unit. Units should also be able to be placed on duty on-the-fly if they are coming in for an emergency shift that was not previously scheduled. The system should allow the unit to be placed off duty at the end of the shift and record the duration of the shift for reporting. The CAD should allow personnel modifications during the shift in the event a crew member goes home sick and is replaced.

This may either be an internal function in CAD or the CAD system is integrated with an external product.

2.2.25 Mileage Tracking

For billing and other purposes, agencies require the ability to track mileage on each call. This may also be utilized in law enforcement for tracking juvenile transport mileage.

2.2.26 Hydrant Location and Status (Water Sources)

This capability allows CAD to track the location, service status, and/or flow rate/main size of fire hydrants and alternative water sources (such as drafting sites, dry hydrants, pools, and ponds). Hydrant recommendation should be displayed to dispatchers and responders based on location of the incident. Hydrant information may be obtained from an external GIS source. This may be displayed on the approach route CAD map and should allow the user to drill down into this information from the mapping window. Hydrant data may also be displayed to the field providers automatically in the incident on their MDT or on a station printout when the unit is alerted.

2.2.27 Additional Unit Dispositions

A Unit Disposition records an action made by a single unit to a specific incident. When a unit transitions from active status (e.g., assigned to a specific incident) to available status at the end of the incident, a dispatcher may assign a disposition from a pre-defined list to that unit, along with a comment or note. This results in the unit's action regarding the incident to be recorded at the time that the unit completes its work at an incident. The dispatcher may also choose to not select a unit disposition.

- Example 1: One of two engines is en route to scene and is canceled before arriving on scene – so as to be able to respond to another nearby but separate incident.

- Example 2: Two ambulances arrive on scene and one transports while the other does not transport. Individual unit dispositions may be independent of the call disposition.

A revision effort may want to take a fresh look at law enforcement dispositions as well, including user-definable dispositions.

2.2.28 Exception Reason Tracking

The CAD system should allow dispatchers to record reasons when a unit has an extended response time that exceeds the standard. The system should track response time standards for each priority and each jurisdiction and prompt the user to enter a late reason when the incident is completed or at the end of their shift. Exception reasons should be pre-defined and the user should be able to enter a comment in addition to the reason.

2.2.29 Add Next Generation Functions

Next Generation 9-1-1 (NG9-1-1) refers to an initiative aimed at updating the 9-1-1 service infrastructure in the United States to improve public emergency communications services in a wireless, mobile society. In addition to calling 9-1-1 from a phone, the public will be able to transmit text, images, video, and data to the 9-1-1 center. The initiative also envisions additional types of emergency communications and data transfer. This NG9-1-1 infrastructure, over time, will replace the current services.

CAD inputs such as text messaging, images, video, and sensors are possible additions to the list [Section 1.3]. A review of the layout of the sub-sections may be necessary to align them with the activity diagrams presented in the current edition.

2.2.30 Multiple Simultaneous Calls to Single Unit

This refers to the ability to assign multiple calls to a single unit. This includes "stacking," multiple simultaneous calls, pre-emption, diversion and Linking Events. An example of this would be EMS Wellness Visits or multiple incidents of similar vandalism in a given area. [The discussion of stacking in the original document also needs revision.]

2.2.31 Notifications

LE/fire/EMS functionality requires additional enhanced paging/text-based alerting. CAD should have the ability to associate notifications with specific call types and locations, by time of day and day of week to individuals or groups. For example, a fire in a federal building may require notification to a staff chief, or a shooting generates an automatic notification to the investigations supervisor. Note that since some fire/EMS organizations' staff operational platoons on rotating schedules, the person who receives the notification may be dependent upon the shift on duty at the time of the incident. [Related to Section 5.4] Definitions for notification triggers must support a wide variety of parameters (e.g., incident location attributes such as fire jurisdiction/fire zone/fire district/fire battalion/fire first due area/police precinct/police beat, assigned unit, assigned unit jurisdiction, call type, response type, call category, incident status, alarm level, incident status, incident milestone, incident jurisdiction shift on duty, assigned unit jurisdiction shift on duty).

2.2.32 Contact List

Dispatchers may be required to place outbound phone calls or pages to individuals or groups of individuals that are not assigned to a unit. The contact list function allows the creation, search, and maintenance of such contacts and their contact information. In some cases, the contact list will be interfaced to the phone system to create a point and click capability for outbound calling. This would include call-back and overtime lists to cover vacancies and extreme emergencies.

2.2.33 Scheduled Events

Scheduled events are events scheduled in CAD for some time in the future, such as a controlled burn, non-emergency hospital transports, a fireworks display, or funeral escorts. Processing of the scheduled events/incidents should be included. Scheduled incidents will be placed in the pending queue automatically a certain number of minutes prior the start time to allow the dispatcher to assign resources in advance. There may be other details necessary in the call taking function for scheduled incidents such as the multiple patients/multiple facilities scenario. [Section 1.3]

2.2.34 Special Dispatch Areas

This is the ability to temporarily or permanently segregate a geographic area and change the dispatch rules/algorithms for that area. Examples of special dispatch areas are flooded areas, restricted access areas, civil disturbances and special events. Other CAD system functions may also be tied to these geographic areas (e.g., warnings displayed to dispatch personnel, warnings sent to responding units, automatically generated notifications, etc.)

2.2.35 EMD/Call Triage

Emergency Medical Dispatch (EMD) or Call Triage (for fire/LE) provides a set methodology for analyzing an event and determining an appropriate response based upon the information gained from the calling party. This capability guides the call taker through the process of collecting vital information from the caller, obtaining status, choosing an appropriate dispatch level, and delivery approved/standardized instructions to the caller until the dispatched units arrive at the scene. It may also provide pre-arrival instructions to responding units and the caller as well as special dispatch instructions to help the dispatcher choose the correct resources. The EMD/call triage process can result in a change to the incident type and/or priority resulting in a change in the response. CAD may provide or interface with an EMD/call triage product.

2.2.36 Premises Information/Hazards

This capability allows for CAD to appropriately provide information specific to a particular location or premises. The alert information can be either manually entered, based on previous calls for service, and/or provided by an interface to another records system (law enforcement RMS for example). Examples of premises hazards information can include hazardous or flammable chemicals on site (which ones and what quantity), resident has outstanding warrant, resident has history of violence, aggressive dogs, and locations of special or critical equipment such as fire alarm panels, automatic external defibrillators, and sprinkler shut off valves. This capability should also include temporary hazards such as holes in floors, buildings under renovation, and restricted access situations. EMS premises information may also include patient history such as contagious disease information, combative patients, and patients requiring additional staffing resources because of size. An alternative solution is to provide the ability to attach other data sources (electronic documents, PDF, WAV, JPEG, and other files) to the CAD map. Premises information should not be limited to specific addresses; it may also be applicable to a geographic area.

2.2.37 Public Safety Flight Tracking

This is the ability to track aircraft flights. There are FAA and Commission for the Accreditation of Air Medical Transport Systems (CAAMTS) requirement to follow aircraft in flight for specific time periods. This may be provided by integration with an external flight following system. This function typically does not use the drive-time algorithms used in ground-based operations, but rather "as the crow flies." Integrated access to, and recording of, flight weather would also be beneficial.

2.2.38 Channel Designations

This refers to CAD tracking and/or displaying the radio channel assignment(s) or tactical (TAC) channel assignment(s) for each incident. Channels may be automatically assigned by incident type or area, or manually selected. CAD should be able to recommend a tactical radio channel(s), talk groups, and how information is routed to/from active incident, as well as track more than one radio channel/talk group per incident. Recommendation of tactical radio channels may be based on the location of the incident, the type of incident, the type of radio equipment on the units suggested for

dispatch to the incident, the number of incidents currently assigned to the various tactical channels, etc.

Functions are needed to control which dispatch positions are currently managing which tactical radio channels, to reassign incidents from one tactical channel to another, and to indicate that no additional incidents should be assigned to a particular tactical channel.

2.2.39 Suspicious Activity Reporting Functionality

The National Suspicious Activity Reporting (SAR) Program is designed to support the sharing of information about suspicious activity, incidents, or behavior (hereafter collectively referred to as suspicious activity or activities) that have a potential terrorism nexus. The program includes State and major urban area fusion centers and their law enforcement, homeland security, or other information sharing partners at the Federal, State, local, and tribal levels to the full extent permitted by law. In addition to providing specific indications about possible terrorism-related crimes, SAR reports can be used to look for patterns and trends by analyzing information at a broader level than would typically be recognized within a single jurisdiction, state, or territory. Standardized and consistent sharing of suspicious activity information regarding criminal activity among state and major urban area fusion centers and federal agencies is vital to assessing, deterring, preventing, or prosecuting those involved in criminal activities associated with terrorism.[6]

Local information, determined and vetted to be SAR related by the local agency, is provided to the state-designated Fusion Center via a NIEM-conformant XML data exchange[7]. Both law enforcement Records Management Systems (RMS) and CAD may have occasion to generate a SAR Report. An example of a SAR Report from CAD would be a call for service of a suspicious person taking detailed photos (e.g., exits, security cameras, etc.) of a location deemed to be a critical infrastructure target. If the suspicious person is gone on arrival and there are no other witnesses to speak to or leads to follow, a formal report is unlikely to result. However, this SAR, together with other SAR reports submitted to the Fusion Center, may assist investigators working on preventing terrorist activity. Alternatively, CAD functionality for SAR may be a flag to require an RMS report based on the type and location of the report, e.g., requiring a report for the scenario presented above.

2.2.40 Geo-fencing

In an AVL-enabled system, geo-fencing is a user definable virtual boundary that facilitates automatic status changes. It refers to the automatic change in the status of a unit based on its entering or exiting a boundary around a location. This function provides more accurate time reporting by eliminating missed status changes by the crew. Using this function, a unit's status may be changed to en route when the unit leaves the location from which it was dispatched, to arrived when the unit arrives near the incident, to departed scene when the unit leaves the area of the incident to a

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[6] Information Sharing Environment (2009). Functional Standard (FS) Suspicious Activity Reporting (SAR) Ver. 1.5.
[7] To access the SAR Information Exchange Package Documentation (IEPD) search for "SAR" in the IEPD Clearinghouse at http://it.ojp.gov/default.aspx?area=implementationAssistance&page=1108.

secondary location, to available in quarters when it arrives at the station. Geo-fencing may also be used to notify units, e.g., when a unit enters an area where a hazmat plume is projected or a restricted response area has been established (e.g., barricade hostage situation, civil unrest, etc.)

2.2.41 Communications Center Standard Operating Procedures

Many responses to incidents require actions that are not unit-based responses and, thus, may not be part of a designated response plans. Nonetheless they are very important items that need to be executed. Depending on the agency, geographic area, incident type, and alarm level, the dispatcher may be required to complete specific tasks; a user may be asked to perform one task (e.g., place one phone call to a specific agency) or there may be multiple tasks (e.g., place two notification phone calls, or one to a utility company and one to an agency). An SOP tool should prompt the user to ask for additional information, perform certain tasks, or relay critical information to responding units or other responders. This feature is similar to common help functionality.

2.2.42 Incident/Premises/Unit Standard Operating Procedures

A CAD system should be able to store SOPs that are associated with incident types, properties, and/or units. These SOP would be available for viewing and/or transmitting when an associated incident type is encountered, the response is to a specific location with unique response/operational requirements, and/or specialized units are assigned to the call. More sophisticated functionality may include alert and check off of tasks, notifications made, or other issues capable of being tracked.

2.2.43 Snapshot/Incident Replay

Training, quality review, and investigations may be made easier for supervisors if the CAD system can capture and display an application "snapshot" of the entire dispatch center's system at the time a dispatcher assigned units to each incident. The snapshot may record the CAD recommended dispatch in addition to the complement that was assigned by the dispatcher.

2.2.44 Pre-Release or Pre-Alerting

Pre-alerting refers to the function of providing advance notice to stations and/or units that an imminent dispatch is likely to occur. This is used in situations where there has been enough information gathered to know that some type of dispatch will be required (generally the address or location) but not enough to determine the actual response (incident type). The pre-alert allows the dispatcher to notify units to prepare for a response and reduce turnout time.

2.2.45 Remote Access

A CAD system should support remote access by users outside of the communications center. This access includes permission-based views of CAD data by certain workstations and/or individuals. Remote access includes security-controlled, web-based access. Another example of remote access would be the capability to operate the CAD system from a remote location, such as a mobile command post or a secondary location.

2.2.46 Integration/Interfaces with Other Systems

Fire/EMS functionality may require additional integration with other systems. Data transfer categories include inbound, outbound, peer-to-peer, and/or query-response. Interfaces should conform to the National Information Exchange Model (NIEM) wherever possible. Examples include: E911 (ANI/ALI), paging, cross-agency automatic dispatching, billing systems, web-based resources/two-way integration for ICS, weather, EOC, fire and security alarms, hazardous materials databases, hospital availability, fire station alerting, push-to-talk radio, AVL, and pre-populating electronic patient care reports (ePCR) forms. Other interfaces may include functions such as attaching multimedia links to CAD locations that go to web-based resources, closed-circuit television (CCTV) feeds, traffic camera feeds, building information, and hazardous materials information. This may also include two and three dimensional bar coding, UPC numbers and inventory identification.

It is particularly important that records interfaces be compliant with their respective local, state, and federal reporting standards reporting standards. Examples of federal reporting standards may include:

- The National Incident-Based Reporting System (NIBRS) and the Law Enforcement National Data Exchange (N-DEx) for law enforcement records management.

- The National Fire Incident Reporting System (NFIRS) for fire service records management.

- The National EMS Information System (NEMSIS) for EMS records management.

A final public safety CAD functional specifications document should also reference the Public Safety Data Interoperability (PSDI) Priority Data Exchange for Local Communications Centers and list the highest priority exchanges:

- E9-1-1 Information to CAD

- Calls For Service (initial) (to Mobiles)

- New Call for Service from Another CAD System (CAD-to-CAD)

- External Alarm Information

- NG9-1-1 Information to CAD

- Transfer of Call for Service

- Incident Notifications via Telematics (crash, disabled vehicle, etc.)

- Updates to Call for Service (from Mobiles)

- New Call for Service from a Field Unit

- Call for Service Updates via MDC

- GIS System / AVL Providing Closest Unit Recommendation

- Broadcast Media Warnings and Alerts

Another emerging allied technology system is automated patient tracking systems (PTS). The deployment of such systems will require tight integration with the host CAD system or systems in the case where a single PTS is used in a multi-CAD environment.

2.2.47 CAD Workstation-to-CAD Workstation Messaging

CAD functionality should include short messaging from one CAD Workstation to another. The agency should be able to disable this function if desired. This may include the ability to create message groups, whether they are dispatch workstations, mobile computers, or other communications devices. This may also include the ability to create user definable "canned" messages for selection and distribution to other system users.

2.2.48 Secondary Incident Location

This refers to the ability of the CAD system to capture, validate, and track units that are operating on the same incident but at different locations from the primary or initial location. This is frequently used in law enforcement when a crime occurs at the incident location but a suspect is at another location. Units should be able to be placed dispatched to, enroute to, or at scene of the secondary location.

2.2.49 Vehicle/Unit Change

This requirement is the ability of the CAD system to change, on the fly in any status mode, the identity of a unit based upon a change in the unit's staffing, capability, status, or resources. Included in this requirement is the ability to transfer a unit's capabilities from one unit to another. This includes transferring all radios, pagers, and MDT ID's.

2.2.50 Automatic Routing

Automatic Routing is the service provided by a CAD system to advise units the best route to respond to an incident based upon the responding unit's current location. Routing should take into consideration any road closures or other relevant information stored in the CAD system.

2.2.51 Scheduling

A CAD system should be able to manage workforce scheduling as either an internal or integrated function. Scheduling should include routine platoon rotation as well as overtime, exchange of shift, and special call outs.

2.2.52 Incident Command Support

To the extent possible, a CAD system should be able to support the functions of the Incident Command System and to provide data to support NIMS-required reporting from a Fire Records Management System. This includes the ability to track roles, tasks, and situation reports. This can either be provided directly in a CAD system or integrated with an external system.

2.2.53 Single Discipline Call to a Combined Discipline Call

The ability for the dispatcher to add agencies to an existing call by creating unique incident/event numbers for the added agency and transferring existing call data to the newly-created call. Inter-agency calls should be linked and should share pertinent information automatically such as narratives and address changes.

2.2.54 Narrative Field "Shorthand" (Auto Text)

The ability of the CAD system to recognize character patterns and automatically fill in expanded text. An example, a dispatcher enters /PPE in a comments field and the text expands to indicate that personal protective equipment is required on an event. The CAD will automatically expand the shorthand into a full description and save into the narrative.

2.2.55 Command Line/GUI

CAD systems should include the ability to operate the system via a command line entry, mouse and keyboard, or both.

2.2.56 Time Stamps

CAD activities such as status changes, task accomplishments (e.g., Time Work on Fire Started, Time Fire Under Control, Time at Patient), and notifications, as well as many other CAD transactions, must be "time stamped" with the time they occur and are logged by the CAD system. This is important for QA, training, documentation, and evidentiary purposes. Original time stamps must be saved at all times – even if they are overridden. Time stamp overrides should be security protected and any changes must be documented on the incident including the ID of the person performing the modification and the reason for the modification.

2.2.57 Bypassed Units

For CAD systems that use AVL, dispatch personnel should be notified when a closer appropriate unit becomes available for dispatch to an incident to which another unit has already been dispatched. For example, if Engine 4 was out of service when an incident was dispatched in their area and the unit that was dispatched to the incident is still further from the incident than Engine 4 when Engine 4 goes back into service, appropriate dispatch personnel should be notified.

2.2.58 Post Dispatch Response Re-evaluation

For CAD systems that use AVL, dispatch personnel should have the ability to reevaluate the appropriateness of the units assigned to an incident. The reevaluation should indicate to the dispatcher, based on current unit locations and status, [a] any units that should be added to the incident, [b] any units that should be cancelled, and [c] any units that could be cancelled if the units indicated in [a] are added to the incident. For

example, when dispatch personnel are notified that a unit that had been bypassed on an incident is now available, this feature would be used to indicate to the dispatcher that Engine 4 should be added to the call and that the other unit could be cancelled after Engine 4 is added.

2.2.59 Unit Status Transition Matrix

Unit status transitions that do not conform to the business rules of the agency should not be permitted. If a unit is in En Route status and is the only unit assigned to the incident, it is not permissible to change the status of the unit to Available in Quarters, Available on Radio, Training, etc., unless the incident has first been cancelled.

2.3 Restructuring Suggestions

2.3.1 Move Section 4

Suggestion: Revision efforts should consider the movement of Section 4 to Section 3 (following "Dispatch.") [Sections 4 and 3]

2.3.2 Consolidate Glossaries

Suggestion: Consolidate numerous appendices into one terminology glossary. Consider highlighting first use of key terms included in glossary and use hyperlinks to connect highlighted term to glossary entry. Glossary will need to be reviewed for applicability to revised document.

2.3.3 Separate Out Call Taking

Suggestion: Call Taking should become its own section in the revised document. [Section 1.3]

Also, consider renaming it to "call taking and incident creation." Subsequent sections can be "dispatching and supervisory positions." In existing document format, following Executive Summary, "Call Taking and Incident Creation" will precede "Dispatch" in first Business Function and then be followed by "Supervisory Positions."

2.3.4 Explain Terminology

Suggestion: Add narrative section early in document to explain terminology that will be used throughout - used in addition to the glossary.

2.3.5 Change Language in 1.3.2

Suggestion: Change to "Decision to Create an Actionable Incident." [Section 1.3.2]

2.3.6 Standards Requirements

Suggestion: Throughout the document, there should be an effort to include appropriate references to standards and requirements (such as HIPAA, NIMS, OSHA, NIEM, EXDL, CAP, and CAP-DE). [Section 2.3.19]

2.3.7 Functionality/Service Matrix

Suggestion: Add a matrix to the appendix that would indicate which services (law enforcement, fire, and/or EMS) to which each function is related. This matrix would enable users to quickly identify those functions which are associated to a specific service. The layout of such a matrix would be similar to the one provided in Appendix A.

2.4 Suggestions Not Related to Editing

While not related to CAD functionality, the following considerations were identified by the SME Work Group.

2.4.1 Alternative Publishing Methods

Consider alternative publishing strategies (Wiki, web-based, ePublication, etc.) for the new document.

2.4.2 Functional Specifications for Public Safety Mobiles (MDTs and MDCs)

The creation of a separate effort to define mobile environment requirements, resulting in a *Functional Specification for Public Safety Mobile Software* should be given serious consideration.

2.4.3 Early CAD Providers Involvement

It is suggested that the CAD provider representatives be involved at the earliest point possible in the process of the creation and vetting of the next version.

2.4.4 Standards Process

It is suggested that the next version of the CAD Functional Specifications be submitted to a standards validation process.

3   Future Directions in CAD Functionality

Enhancing the *Standard Functional Specification for Law Enforcement Computer Aided Dispatch (CAD) Systems* by including functional requirements for fire and EMS providers would not be complete unless future trends, developments, and evolutions in the state of the technology and the disciplines are included in the discussion. This is not an attempt to apply a crystal ball to technical and procedural developments that have not yet been considered. There is research and development already in the works for many of the advancements mentioned here. There are also items of discussion included that predict significant structural and procedural changes to the state of traditional call taking, dispatching and incident management as it is at the time of this writing. A ten-year projection is assumed.

- On the immediate horizon is accommodation of Next Generation 9-1-1 (NG9-1-1). NG9-1-1 seeks to accommodate the expansion of pure voice telephony with that of text messaging, images, and streaming video. Current 9-1-1 technology makes use of voice calls and teletype (by deaf or hearing impaired persons). Minimal data is delivered with these calls, such as Automatic Number Identification (ANI), subscriber name, and Automatic Location Identification (ALI), where available. In the NG9-1-1 environment, the public will be able to make voice, text, or video emergency "calls" from any communications device via Internet Protocol-based networks. The PSAP of the future will also be able to receive data from personal safety devices such as Advanced Automatic Collision Notification systems, medical alert systems, and sensors of various types. For the fire service, personal accountability systems should be included. The new infrastructure envisioned by the NG9-1-1 project will support "long distance" 9-1-1 services, as well as transfer of emergency calls to other PSAPs – including any accompanying data. In addition, the PSAP will be able to issue emergency alerts to wireless devices in an area via voice or text message, Reverse 911, and to highway alert systems (Wikipedia).

- As mentioned in the previous item, Telematics is an automatic reporting system provided by General Motor's OnStar©, Ford's SYNC 911 Assist™, and ATX. It provides for automatic notification to the nearest PSAP of a collision involving a monitored vehicle. CAD systems need to be capable of receiving these automatic notifications.

- As public safety takes a more regional approach, regional situational awareness becomes more important. Enhancing CAD-to-CAD interfaces links the police, fire, and EMS CAD systems so that one PSAP/dispatch center will know what neighboring PSAPs/dispatch centers are doing. Additionally, CAD systems will need the ability to handle different codes and call types of neighboring CAD systems (translation tables).

- For many public safety agencies, CAD is the command and control system. It is the automated incident command aid, providing instruction and assistance to the incident commander either through dispatcher voice relay or through mobile computing capability. As to whether CAD will continue to directly support incident command, the answer is likely affirmative. CAD will, however, morph into a more tightly integrated combination of systems and databases that offer current incident information, situational awareness and predictive analysis, providing decision support to the incident commander.

- The fundamental CAD platform may also move away from the traditional host server/LAN-based model to a web-based environment (e.g., "cloud computing"), resulting in reduced reliance on dedicated hardware and software; challenges to throughput, latency, and security will emerge. Such a move would also shift support responsibility away from the PSAP and more to a consolidated IP software/platform provider. This also affords greater integration of PSAP-to-PSAP, or dispatch center-to-dispatch center.

- Increased use of Personal Data Assistants (PDAs) is anticipated. Blackberries, iPhones, and Palm devices will replace tone and voice pagers, alphanumeric pagers, and, in some cases, mobile computers.

- On-scene video is becoming more common in both law enforcement and fire/EMS agencies. With the ability to include video in NG9-1-1 systems, the capability to receive on-scene video from emergency response vehicles is enabled based on the availability of the appropriate wireless transport.

- Further developing on the NG9-1-1 theme, intelligent video or video analytics is evolving in the safety and security market place. The ability of software to "detect" suspicious movements and behaviors allows for automated monitoring. In the future, cameras protecting sensitive areas and their software servers may be connected directly to a video monitoring section of a local PSAP or central station monitoring facility.

- CAD systems should be able to accommodate emerging technology in which personnel will be tracked. GPS, dead reckoning, and mesh WiFi technologies are examples of tracking technologies that may be deployed.

- Advanced biomedical monitoring of persons working in an IDLH environment may be accomplished by special sensors and monitors that transmit signals from the device to a command and control monitoring station. In the event that a monitoring point crosses a pre-established threshold, the system could produce an alert.

- The same is true for environmental sensors. The fire alarm industry is moving to add a number of chemical, biological, and radiological sensors to their systems to protect sensitive areas, transportation hubs, and places of public gathering. These sensors, when activated, will produce alerts similar to those produced by smoke or heat detectors.

- Gunshot recognition and tracking systems similarly may be connected to a PSAP.

- Improvement in platform reliability is an ongoing effort. The public safety community should expect to see more in the way of system health monitoring for critical systems. CAD/RMS and their supporting systems (Heating, Ventilating, and Air Conditioning [HVAC], power, etc.) should be part of a total infrastructure monitoring system to maximize up time.

- Multilingual support will become an increasingly important function; this is beyond telephonic translation services.

At the highest level, traditional public safety call taking and dispatching will evolve over the next decade to take advantage of emerging technologies, prompting a migration of public safety best practices and a philosophical change in the emergency dispatch paradigm. As more and more information and information sources become available to the dispatcher, a point may be reached in which information overload occurs. The current approach to the human/machine interface needs to be revisited so that the flow and delivery of information to dispatch personnel can be effectively managed. Instead of the 9-1-1 and CAD infrastructure being an information delivery and management system, more intelligence needs to be built into the systems for enhanced decision support.

4 Discussion of Resources Needed to Perform a Revision

In order to produce a CAD functional specification that includes law enforcement, fire, and EMS functions, it will be more cost effective to treat this effort as the creation of a new document, not just a modification and revision of the previous document.

To undertake such an effort, there will need to be a minimum of one face-to-face meeting of the CAD software providers and one web conference, and one face-to-face meeting of the practitioners and a web conference. Once this has been accomplished and work has been done towards a draft document, at least one final face-to-face meeting will need to be held that would include both CAD software providers and practitioners.

A project manager will be required to oversee this effort. Either a modeling tool will be needed or a technical writer or subcontractor needs to track and maintain the different versions of the document.

This effort will require a minimum of eight months to complete.

5 Summary

It became clear through the course of the Revision Assessment effort that enthusiasm and energy exists in the CAD software provider and practitioner communities concerning the possibility of revising the *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems* to include law enforcement, fire services, and EMS functions.

The group established to conduct the Revision Assessment came up with an extensive list of changes, additions, and modifications necessary to not only add public safety functional specifications to the existing document, but found numerous instances where the existing language for law enforcement needed alteration. The group took the extra step of identifying some future considerations of CAD in public safety to make sure that any revision effort maintained a focus on these future functionalities and interfaces.

6 Appendix A: Requirements Specific to Discipline Matrix

These requirements were extracted from the two documents: _Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems_ and this _Revision Assessment for the Incorporation of Fire and EMS Functions into the Law Enforcement CAD Functional Specifications_. The first document was the original CAD specification addressing only law enforcement requirements. This, the second document, is a revision assessment for adding Fire and EMS specifications to the original document.

The specific requirements in this matrix were extracted in the order in which they are listed in the two documents. This matrix is intended to be a quick reference for the development of customized RFP requirements for user agencies. It is not an all-encompassing list, nor does is dictate the inclusion or removal of any unique performance and/or functional requirement a user agency may desire.

Requirements from the Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems	Law Enforcement	Fire	EMS
Business Function: Law Enforcement Dispatch			
Call Taking	X	X	X
Dispatch Decision Support	X	X	X
BOLO	X		
Dispatch Units	X	X	X
Unit Status Management	X	X	X
Call Management	X	X	X
Supplemental Resources Tracking	X	X	X
Call Disposition	X	X	X
Business Function: CAD System Administration			
Geofile Maintenance	X	X	X
Security	X	X	X
Logging	X	X	X
Configuration	X	X	X
Table Maintenance	X	X	X
Communication Center Relocation	X	X	X
CAD Catch-Up	X	X	X
Business Function: Support Services			
BOLO	X		
Emergency Operations Center	X	X	X
Business Function: Call Management and Management Reporting			
Dispatch Supervisor Support	X	X	X
CAD Management Reporting	X	X	X
Training and Testing	X	X	X
Business Function: Interfaces			
Primary	X	X	X
Additional Interfaces	X	X	X
Locational Systems Interfaces	X	X	X
Administration Interfaces	X	X	X
Communications Interfaces	X	X	X
Public Awareness Messaging	X	X	X
Emergency Operations Interface	X	X	X
Additional Business Functions	X	X	X

REQUIREMENTS FROM THE REVISION ASSESSMENT FOR THE INCORPORATION OF FIRE AND EMS FUNCTIONS INTO THE LAW ENFORCEMENT CAD FUNCTIONAL SPECIFICATIONS	Law Enforcement	Fire	EMS
Add Destination Locations	X	X	X
Alerting		X	X
Move Up ("Fill-In" and "Station Fill")		X	X
Staffed versus Unstaffed Units		X	X
Cross-Staffing/Crew Counting/Shared Staffing		X	X
System Status Management (Dynamic Resource Deployment)			X
Station Dispatch (versus Unit Dispatch)		X	X
Run Cards/Response Plans		X	X
Adjustable Dispatch Levels		X	X
Adjustable Response Plans		X	X
Hospital Status/Availability and Hospital Recommendation		X	X
Additional Attributes	X	X	X
CAD Incident Type	X	X	X
Unit Recommendation Based on Input from Other Jurisdictions		X	X
Predetermined and User Defined Timers			
Unit Status Timers	X	X	X
Patient Tracking		X	X
Additional Unit Status	X	X	X
Strike Team/Task Force Designations	X	X	X
Unit Rotation (aka Unit Load Balancing)	X	X	X
Conditional Availability of Apparatus	X	X	X
Ability to Route to a "Decision Dispatcher"		X	
Linking an Audio File to the CAD Dispatch Record	X	X	X
Rostering	X	X	X
Mileage Tracking	X	X	X
Hydrant Location and Status		X	
Additional Unit Dispositions	X	X	X
Exception Reason Tracking	X	X	X
Add Next Generation Functions	X	X	X
Multiple Simultaneous Calls to Single Unit			X
Notifications	X	X	X
Contact List	X	X	X
Scheduled Events	X	X	X
Special Dispatch Areas	X	X	X
EMD/Call Triage	X	X	X
Premises Information/Hazards	X	X	X
Public Safety Flight Tracking	X	X	X
Channel Designations	X	X	X
Suspicious Activity Reporting Functionality	X		
Geo-fencing	X	X	X

Communications Center Standard Operating Procedures	X	X	X
Incident/Premises/Unit Standard Operating Procedures	X	X	X
Snapshot/Incident Replay	X	X	X
Pre-Release or Pre-Alerting	X	X	X
Remote Access	X	X	X
Integration/Interfaces with Other Systems	X	X	X
CAD Workstation-to-CAD Workstation Messaging	X	X	X
Secondary Incident Location	X	X	X
Vehicle/Unit Change	X	X	X
Automatic Routing	X	X	X
Scheduling	X	X	X
Incident Command Support	X	X	X
Single Discipline Call to a Combined Discipline Call	X	X	X
Narrative Field "Shorthand" (Auto Text)	X	X	X
Command Line/GUI	X	X	X
Time Stamps	X	X	X
Bypassed Units	X	X	X
Post Dispatch Response Re-evaluation	X	X	X
Unit Status Transition Matrix	X	X	X

7   Appendix B: Revision Assessment Work Group

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8 Appendix C: PSDI Committee Members

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9 Appendix D: The APCO/IJIS Institute Partnership

IJIS Institute and APCO established an Alliance Partnership for the purpose of jointly addressing the public safety data interoperability issue, and to seek resources and funding to advance this mission.

The IJIS Institute is a nonprofit corporation funded mostly through grants from DOJ's Office of Justice Programs, Bureau of Justice Assistance (BJA). The Institute uses these funds to assist "national scope" efforts related to information sharing in justice and public safety. The Institute comprises a membership of approximately 280 companies active in supplying information technology products and services to justice and public safety agencies. IJIS Institute achieves its mission of advancing information sharing through the development and endorsement of standards, and by providing assistance to local, tribal, and state agencies. The IJIS Institute was founded on the premise that information sharing is a significant national imperative and that a public/private partnership is the most effective way to achieve this goal. The Institute has developed and implemented a service delivery model that combines the best of government and industry. The model engages stakeholder organizations and practitioners, via committees, to ensure that business requirements are represented. The IJIS model also provides the best expertise to ensure solutions are viable. The IJIS Institute staff is comprised of professionals with over 100 years of collective experience in training, consultancy management, project management, and technical support. The IJIS Institute team is augmented by the expert resources of industry. (www.ijis.org)

The Association of Public Safety Officials (APCO) International has a strong cadre of senior management executives, technical staff, and enthusiastic committee structure that is perfectly positioned to support the IJIS Institute and affiliated organizations to undertake and successfully complete the objectives of this project. APCO has a long history of providing leadership in a myriad of public safety projects and initiatives. Through the 70-plus-year history of APCO, it has been at the forefront of projects dedicated to the safeguarding of our citizens and improving public safety communications. APCO's qualified staff champions projects with goals to standardize processes, procedures, and services. After receiving its first federal grant award for the research and development of a public safety communications standard operating procedure manual, APCO has undertaken a variety of projects to enhance communications standards, notable examples of which are "Project 36" and "Project 38." Project 36 was initiated to research and develop universal standards for Computer Aided Dispatch (CAD) and CAD-to-CAD exchanges. The goal was to design effective processes for the exchange of data between third party call centers, such as alarm companies, and Public Safety Answering Points (PSAPs). The Project 36 activity was turned over to the APCO Data Transfer Committee and the work is on-going today. APCO and the Central Station Alarm Association (CSAA), in conjunction with outside vendors and two working PSAPs, have successfully demonstrated the initial objectives of the ALERTS Alarm Project. IJIS Institute, working with the aforementioned organizations, is assisting in the exploration of the additional beta sites. The work done in this arena illustrates the need to expand upon this initial demonstration activity. APCO, through its staff and committee partnerships, has within the last four years undertaken high profile nationwide projects, most notably, APCO "Project 38" (also known as Project LOCATE). APCO is an ANSI Standards Development Organization and in this capacity will be actively working with its Standards Development Organization (SDO) committee to move forward in the critical area of standards. (www.apcointl.org)

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10 Appendix E: Bibliography

Law Enforcement Information Technology Council (2003). **Standard Functional Specifications for Law Enforcement Computer-Aided Dispatch (CAD) Systems**, http://www.leitsc.org/Publications.htm.

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