



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**PROMOTING INTEROPERABILITY: THE CASE FOR
DISCIPLINE-SPECIFIC PSAPS**

by

Thomas Michael Walsh

December 2014

Thesis Advisor:
Second Reader:

Fathali Moghaddam
Anders Strindberg

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 2014	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE PROMOTING INTEROPERABILITY: THE CASE FOR DISCIPLINE-SPECIFIC PSAPS			5. FUNDING NUMBERS	
6. AUTHOR(S) Thomas Michael Walsh				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB protocol number ____N/A____.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) Given that public safety answering points (PSAPs or 9-1-1 dispatch centers) are undergoing a process of consolidation, should that consolidation occur as a function of simple geographic proximity or discipline? This thesis investigated the differences among different dispatch disciplines, the effect of dispatching on interoperability, case studies investigating the operations of several different models of PSAP consolidation, and a theoretical case study involving inter-discipline and intra-discipline consolidation of PSAPs in King County, Washington. A survey of nine PSAPs of various sizes, types, and regions was conducted to determine their capabilities in voice and operational interoperability, how often opportunities to take advantage of that interoperability were encountered, and finally, to what extent interoperability was exercised when those opportunities did present themselves. The findings indicated intra-discipline interoperability (fire-to-fire or law enforcement-to-law enforcement) is not only intuitively of more value than inter-discipline interoperability (law enforcement-to-fire) but is actually prioritized by PSAPs in their day-to-day operations. Given that PSAP consolidation is occurring, the conclusion of this thesis is that interoperability within disciplines can be best improved by consolidating PSAPs by discipline while still realizing the benefits of geographic consolidation.				
14. SUBJECT TERMS interoperability, PSAP, public safety answering points, dispatch center, 9-1-1, Police, fire, consolidation, communications, command, dispatcher			15. NUMBER OF PAGES 165	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

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**PROMOTING INTEROPERABILITY: THE CASE FOR DISCIPLINE-SPECIFIC
PSAPS**

Thomas Michael Walsh
Battalion Chief, Seattle Fire Department
B.A., University of Washington, 1989

Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
December 2014**

Author: Thomas Michael Walsh

Approved by: Fathali Moghaddam
Thesis Advisor

Anders Strindberg
Second Reader

Mohammed Hafez
Chair, Department of National Security Affairs

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ABSTRACT

Given that public safety answering points (PSAPs or 9-1-1 dispatch centers) are undergoing a process of consolidation, should that consolidation occur as a function of simple geographic proximity or discipline? This thesis investigated the differences among different dispatch disciplines, the effect of dispatching on interoperability, case studies investigating the operations of several different models of PSAP consolidation, and a theoretical case study involving inter-discipline and intra-discipline consolidation of PSAPs in King County, Washington.

A survey of nine PSAPs of various sizes, types, and regions was conducted to determine their capabilities in voice and operational interoperability, how often opportunities to take advantage of that interoperability were encountered, and finally, to what extent interoperability was exercised when those opportunities did present themselves.

The findings indicated intra-discipline interoperability (fire-to-fire or law enforcement-to-law enforcement) is not only intuitively of more value than inter-discipline interoperability (law enforcement-to-fire) but is actually prioritized by PSAPs in their day-to-day operations. Given that PSAP consolidation is occurring, the conclusion of this thesis is that interoperability within disciplines can be best improved by consolidating PSAPs by discipline while still realizing the benefits of geographic consolidation.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACPD	Arlington County Police Department
APCO	Association of Public-Safety Communications Officials
ALS	advanced life support
BLS	basic life support
BOEC	Bureau of Emergency Communications
CAD	computer aided dispatch
CCC911	Charleston County Consolidated 9-1-1 Center
CPL	concealed pistol licenses
CPR	cardio-pulmonary resuscitation
DCFD	District of Columbia Fire Department
DHS	Department of Homeland Security
DPS	Defense Protective Services
E9-1-1	enhanced 9-1-1
ECC	Emergency Communications Center
EMD	emergency medical dispatcher
EMS	emergency medical services
EMT	emergency medical technician
FAC	Fire Alarm Center
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDNY	Fire Department of New York
FEMA	Federal Emergency Management Agency
GAO	Government Accounting Office
IC	incident commander
ICS	incident command system
IDLH	immediately dangerous to life and health
IT	information technology
K-9	canine unit
LACoFD	Los Angeles County Fire Department
MCI	mass casualty incident

NENA	National Emergency Number Association
NFPA	National Fire Protection Administration
NG9-1-1	next generation 9-1-1
NIMS	national incident management system
NYPD	New York Police Department
OEM	Office of Emergency Management
PAPD	Port Authority Police Department
PSAP	public safety answering point
PBX	public branch exchange
SCBA	self-contained breathing apparatus
SCIP	statewide communication interoperability plan
SCR911	Santa Cruz Regional 9-1-1
SOP	standard operating procedures
SoR	statement of requirements
SWAT	special weapons and tactics
VHF	very high frequency
VoIP	voice over Internet protocol
WSP	Washington State Patrol

EXECUTIVE SUMMARY

Public safety answering points (PSAPs or 9-1-1 dispatch centers) are an essential component of emergency response. Since they act as the hub for communications for the agencies they serve, PSAPs play a direct role in interoperability. Efforts to consolidate PSAPs to reduce costs and avoid duplication of resources are increasing. The typical model for PSAP consolidation is to combine smaller PSAPs primarily due to geographic proximity, which places law enforcement, fire and emergency medical service (EMS) agencies under one roof. Given that consolidation is occurring, this thesis sought to answer whether interoperability would be better served by consolidating PSAPs by discipline rather than geography.

Since 9/11, the prevailing wisdom has been that emergency responders require voice interoperability unit-to-unit and member-to-member across disciplines. However, research indicates that this may, in fact, be counter-productive. First, all disciplines communicating on the same channel can overload both responders and the radio system; second, different disciplines, while coordinating for the same overall incident outcome, concentrate on discrete incident objectives; and third, different disciplines do not possess the organizational knowledge to communicate effectively with other disciplines.

This is not true of intra-discipline communications (e.g., police-to-police, fire-to-fire), which are crucial. Police or fire agencies, when working with another jurisdiction within the same discipline at an incident, will likely end up working on the same task need to coordinate unit-to-unit. Since inter-discipline coordination (e.g., police-to-fire) is not taking place at the task level, neither should the communications; they should occur at the strategic level, at a unified command post.

Nine PSAPs nationwide were surveyed with regard to their interoperable communications capacity. Results indicated that in practice, PSAPs exercise their intra-discipline interoperability at nearly every opportunity; between disciplines, rarely so, even though they possess equal capacity to do so. Reasons given were predominately because law enforcement and fire have no real need to communicate tactically. Given that

intra-discipline interoperability seems to have greater practical value than inter-discipline interoperability and that PSAPs function as the communications, command, and control centers for the agencies they serve, regional interoperability would be best served by consolidation of PSAPs by discipline.

ACKNOWLEDGMENTS

It goes without saying that, regardless of the name that appears on the cover of a document such as this, the assistance of a number of people was involved in its completion.

I would like to thank the following people for helping to bring this thesis to fruition:

My wife and family for putting up with the stress and inconvenience a project such as this entails.

Fire Chief Gregory Dean of the Seattle Fire Department, whose level of commitment to, and support of this program, was of the highest level.

My advisors Fathali Moghaddam and Anders Strindberg.

The PSAP directors whose responses to my survey were crucial to the conclusions of this document:

Lisa Turley, Bureau of Emergency Communications (Portland, OR)

Carl Simpson, Denver 9-1-1

Lori Markham, Spokane Fire Combined Communications Center

Dori Beck, Phoenix Fire Department Regional Dispatch Center

Kerry Crabtree and Steve Weston, Los Angeles County Fire Department

Karen Shilling, Seattle Police Communications

Marsha MillerAyers, Santa Cruz Regional 9-1-1

Also helpful were:

Steve Souder, Fairfax County (VA) 9-1-1

Jim Lake, Charleston County (SC) Consolidated 9-1-1 Center

Sue Pivetta, 911Trainer.com

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I. INTRODUCTION

A. PROBLEM STATEMENT—BACKGROUND

The 9-11 dispatch center, or public safety answering point (PSAP) has become an increasingly important facet of emergency response. Not only is it the prime connection between the public and the response agency for initial reporting of emergencies, but is also the point at which a response to those emergencies is generated. No matter how many resources, apparatus, members or training an agency possesses, without the ability to receive reports of emergencies and generate a response such capabilities are wasted.

Responsibilities extend beyond simply answering calls and sending responses; however. PSAPs also typically monitor the status and location of agency resources, maintain adequate coverage of the jurisdiction by agency assets, and act as the primary hub of radio communications between units in the field and the agency. In effect, they are the command and control centers for the jurisdictions they serve.

There are over 8,000 PSAPs in the United States,¹ with a majority small in size and associated with a single municipal or county public safety agency.² In 2012, for example, L. R. Kimball reported that Connecticut was home to 106 PSAPs: 17 consolidated centers, eight state police PSAPs, and 82 stand-alone centers.³ In addition, 56 percent of California's PSAPs have only three workstations or less,⁴ and nationally 85 percent of PSAPs have from one to seven workstations.⁵ Each PSAP, regardless of size,

¹ Federal Communications Commission, "PSAP Registry" 2012, <http://transition.fcc.gov/pshs/services/911-services/enhanced911/psapregistry.html>

² Trevor Womack, "Economies of Scale: Increasing Emergency 9-1-1 Communications Center Efficiency as a Means to Better Protect the Homeland," (master's thesis, Naval Postgraduate School, 2013).

³ Shawn Walker et al., "Connecticut PSAP Consolidation Study: Presentation of Findings" [powerpoint] January 18, 2012, http://www.ct.gov/despp/lib/despp/oset/state_of_ct_report_presentation_final_01182012.pdf

⁴ Governor's Office of Emergency Services, *California 9-1-1 Strategic Plan 2010*, July 2010, <http://www.caloes.ca.gov/PSC/Documents/911/pdf/911%20Strategic%20Plan.pdf>, 5.

⁵ National Emergency Number Association, *A Public Safety Answering Point Managers' Guide to Geographic Information Technology*, October 2002, <http://c.ymcdn.com/sites/www.nena.org/resource/collection/9958052B-4063-4AE1-A1D6-E00D3F4F15E9/nenagiswhitepaper-final.pdf>, 15.

requires physical space; administrative, technological, and personnel resources; and a large infrastructure that is expensive to purchase, upgrade, and maintain. This, coupled with financial constraints, caused by almost universal reductions in revenue to state and local governments across the United States, has fueled interest in consolidation of these smaller PSAPs to avoid duplication of equipment and staff.⁶ While not a new concept, the interest in consolidation appears to have increased over the past five years.⁷ Best practice would dictate that in a given geographic area, there should always be two PSAPs for continuity of operations, according to the Federal Communications Commission (FCC): “The PSAP should also consider arranging with another PSAP for backup and support in the event of total failure or abandonment of the PSAP.”⁸

In the context of homeland security events, which tend to be multidisciplinary and multijurisdictional, interoperability is a key factor for success. Responses to 9/11,⁹ the Oso mudslides in Washington, the Boston Marathon bombing, and other large incidents bear this out. Voice interoperability (the ability for responders to communicate with each other) and operational interoperability (the ability to operate with responders from different disciplines or agencies) are of paramount importance. The PSAP, which is hub of communications and command and control, are in a unique position to facilitate this interoperability, and consolidation efforts should be leveraged to achieve interoperability to the greatest extent.

B. RESEARCH QUESTION

To further interoperability, should PSAPs discipline be a primary factor in PSAP consolidation?

⁶ Keri Lovaso, “PSAP Consolidation: Effective Practices & Recommendations,” Public Safety Communications, November 1, 2010, <http://psc.apcointl.org/2010/11/01/psap-consolidation/>

⁷ Chuck Raasch, “Recession-battered Cities Combine Services,” *USA Today*, October 19, 2012, <http://www.usatoday.com/story/news/nation/2012/10/18/recession-hit-cities-combines-services/1634301/>

⁸ Federal Communications Commission, Public Safety and Homeland Security Bureau, “Emergency Planning: Public Safety Answering Points,” accessed January 24, 2014, <http://transition.fcc.gov/pshs/emergency-information/guidelines/psaps.html>

⁹ National Commission on Terrorist Attacks upon the United States [9/11 Commission], *The Final Report of the National Commission on Terrorist Attacks upon the United States* (New York, W.W. Norton & Company, 2004), 314.

C. LITERATURE REVIEW

Many of the issues considered by this research were brought to light in the wake of the terrorist attacks of September 2001, and thus the literature is limited. That which does exist can be organized into the following categories:

- Consolidation feasibility studies
- Trade magazine articles and literature by professional organizations
- PSAP publications and reports
- Interoperability initiatives
- Government reports
- Academic works

1. Consolidation Feasibility Studies

With the recent economic downturn resulting in reduced revenue for state and local entities, interest in consolidation has increased over the past five years,¹⁰ and a number of PSAP studies have been enjoined to determine the feasibility of PSAP consolidation. The consolidation studies examined for this review shared similar findings regarding the benefits and challenges of consolidation.

The financial benefits generally center on economy of scale. Consolidating multiple PSAPs under one roof reduces only the cost and maintenance cost of the physical plant, but also 9-1-1 infrastructures contained within. Expensive equipment necessary at each PSAP, such as trunked lines, public branch exchange (PBX), recorders, and all of their attendant back-up systems and redundancies required at each PSAP would no longer be duplicated among many. The reduction in 9-1-1 infrastructures would result in less to maintain and upgrade as well, which would lead to a decrease in information technology (IT) professionals required to manage the system. Administrative overhead is also reduced with consolidation, as is the need for upper level staff and directors.

While floor personnel and supervisors will likely not decrease, the programs that support them—hiring, training and continuing education—will benefit from the pooling of resources. Such programs may in fact be enhanced, as a larger PSAP generates greater

¹⁰ Raasch, “Recession-battered Cities Combine Services.”

purchasing power. A larger PSAP and its greater pool of employees can more easily absorb personnel attrition, which is 20 percent nationally.¹¹

Interoperability benefits could also be realized by consolidation. Resource management of overlapping jurisdictions could be managed by a single point of contact that would enhance mutual aid and regional response. In addition, a common PSAP would require common communications equipment and terminology, which means different jurisdictions would be using the same equipment and less parochial verbiage. Common voice communications would be complimented by a common computer aided dispatch (CAD) system, which would improve inter-agency data transfer.

Feasibility studies, such as those by GeoComm,¹² L. Robert Kimball,¹³ and Cleveland State University¹⁴ (2005), and the firm of L. Robert Kimball (2007) also identified challenges inherent in consolidation. Any consolidation of agencies under a common operating format necessitates a certain level of subordination of individual agency goals to the good of the whole. Long held procedures and traditions may need to change, which will incur resistance among members and agencies who do not wish to lose local control. The same is true for the dispatchers assigned to the PSAPs that are assimilated. The personnel issue goes beyond a loss of autonomy, however, different dispatchers from the amalgamated agencies may have disparate pay, benefit packages, and personnel regulations. In fact, the reduction in IT and administrative staff that garners economic benefits for the PSAP will cause a loss of hours or positions for these workers. Moreover, service concerns can result from a loss of municipal or agency legacy knowledge when geographic areas served become larger. Additionally, political and governance issues can also derail consolidation.

¹¹ Valley Communications Center, “2012 Annual Report,” 15

¹² GeoComm, *King County, Washington PSAP Consolidation Assessment of the King County E9-1-1 System: Existing Conditions Report*, October 2012, kingcounty.gov/~media/safety/E911/documents/GeoComm_PSAP_Consolidation_Assesment.ashx

¹³ Walker et al., “Connecticut PSAP Consolidation Study: Presentation of Findings.”

¹⁴ Daila Shimek, Kimberly R. Vining, and Scott Winograd, *Case Studies for Consolidated Public Safety Dispatch Center Feasibility Study: The Next Steps* (Cleveland, OH: Cleveland State University and Maxine Goodman Levin College of Urban Affairs, 2011), http://engagedscholarship.csuohio.edu/cgi/viewcontent.cgi?article=1422&context=urban_facpub

The potential of bias must be taken into account when considering consolidation studies. The possible bias stems from the fact that they are often undertaken by consulting firms retained by government agencies seeking to find cost savings through consolidation. Since the consulting firms are private entities whose income is tied to getting new business, a possible conflict of interest lies in the fact that they may be prone to tell governments what they want to hear in terms of consolidation.

2. Trade Magazine Articles and Literature by Professional Organizations

Trade magazine articles and releases by professional organizations, such as the National Emergency Number Association (NENA) and the Association of Public-Safety Communications Officials (APCO), generally present a generic or neutral position regarding consolidation of dispatch centers. None were found to be devoted to the concept of regional fire dispatching, and most were often simply a reporting of a recently released feasibility study or governmental decision to move forward with consolidation. Many deal with political obstacles, or technological problems involved in consolidating PSAPs with different alerting/, radio or CAD systems. This includes articles on specific PSAP or general IT consolidation efforts with a focus upon the actual brand of technology being implemented or referencing problems involving the integration of the police mobile data computer system.¹⁵ In a report issued in 2010, the Communications Security, Reliability and Interoperability Council concluded that there are clear benefits to consolidation in the vast majority of cases.¹⁶

Sue Pivetta of Professional Pride presents a thorough description of the different functions of telecommunicators in her *911 Emergency Communications Manual*.¹⁷ This

¹⁵ “Ann Arbor and Washtenaw County, Mich., Co-Locate 911 Staffs in One Dispatch Center,” Digital Communities, June 21, 2010, <http://www.digitalcommunities.com/articles/Ann-Arbor-and-Washtenaw-County-Mich.html>

¹⁶ Communications Security, Reliability and Interoperability Council (Working Group #1A), *Key Findings and Effective Practices for Public Safety Consolidation: Final Report*, Federal Communications Commission, October 2010, <http://transition.fcc.gov/pshs/docs/csrc/CSRIC-1A-Report.pdf>, 4.

¹⁷ Sue Pivetta, *911 Emergency Communications Manual*, 4th ed. (Sumner, WA: Professional Pride, 2003).

reference also details the similarities and difference between the three major disciplines (law enforcement, fire, and EMS) of emergency telecommunications.

3. PSAP Publications and Reports

Most PSAPs issue an annual report detailing their call processing times, performance, staffing, call volume, budgets, agencies served and service areas. Because these reports are largely an amalgamation of statistics that are easily verified, they can be relied upon as accurate.

4. Interoperability Initiatives and Reports

Post 9/11, voice interoperability became a focus for the emergency response and homeland security enterprise. The prevailing wisdom on the matter is crystalized in the Department of Homeland Security (DHS) *National Security Communications Plan*, issued in July 2008, which describes its vision as

to ensure emergency response personnel at all levels of government and across all disciplines can communicate as needed, on demand, and as authorized, through improvements in communications operability, interoperability, and continuity nationwide.¹⁸

This sentiment is repeated by the Government Accounting Office (GAO) in its 2007 report (GAO-07-301)¹⁹ and by the National Task Force on Interoperability in its publications *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives* and *When They Can't Talk Lives are Lost* from 2003.²⁰ DHS, through its SAFECOM initiative, has echoed this reasoning in documents such as the *Interoperability Continuum* from 2007, the *Statement of Requirements (SoR)* from 2004,

¹⁸ Department of Homeland Security, *National Emergency Communications Plan*, July 2008, http://www.safecomprogram.gov/necp/nationalemergencycommplan_aug08_v2.pdf, 2.

¹⁹ Government Accounting Office, *First Responders: Much Work Remains to Improve Communications Interoperability* (GAO-07-301) April 2007.

²⁰ National Task Force on Interoperability, *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives*, 2003, <https://www.ncjrs.gov/pdffiles1/nij/204348.pdf>; National Criminal Justice Reference System, *When They Can't Talk Lives are Lost*, 2003, www.ncjrs.gov/pdffiles1/nij/211512.pdf

and the *Statewide Communication Interoperability Plan (SCIP) Methodology* published in 2007.

Not surprisingly, there are many state interoperability plans that reflect this position due to the fact that the government publications listed above were used, by design, as tools and templates for the formulation of those documents. A possible criticism of the promulgation of the concept that all disciplines require voice interoperability with each other is that the conclusion is not data-driven but appears to derive from anecdotal evidence.

The FEMA National Incident Management System (NIMS) offers a different bite at the interoperability apple by focusing on functional operability as opposed to voice interoperability.²¹ It proscribes a national standard for using an incident command structure with a unified command capability so that all stakeholders in an incident have a representative with decision-making ability co-located at a command post and able to communicate directives to units within the discipline he or she represents.

5. Government Reports

The *9/11 Commission Report*, regarding the September 11, 2001 terrorist attacks, provides a thorough review of the events of that day. It highlights that the communication and coordination difficulties at both the World Trade Center and the Pentagon hampered operations.²² The *McKinsey Report* issued by New York Police Department (NYPD) in the wake of 9/11 identified several communications command and control, and technological issues that plagued the response.²³

The *After Action Report on the Response to the September 11 Terrorist Attack on the Pentagon* delineated communications problems at that incident as well. It noted that due to communications overload early on in the incident, “in the first few hours, foot

²¹ Federal Emergency Management Agency [FEMA], *Unit 6: NIMS Command and Management* [powerpoint], http://training.fema.gov/EMIWeb/IS/IS700a/IG%20files/IS700A_InstructorGuide_L6.pdf, 6.17–6.19

²² 9/11 Commission, *The Final Report of the National Commission*, 278–323.

²³ McKinsey & Company, *Improving NYPD Emergency Preparedness and Response*, August 2002, <file:///Users/chdsstudent/Downloads/nypdemergency.pdf>, 33–34.

messengers at times proved to be the most reliable means of communicating.”²⁴ Furthermore, the report notes that not only was voice interoperability between disciplines not established, but that fire operations were separated into divisions each with their own radio channel to cut down on transmission saturation. Also according to the report, EMS was directed to its own channel, as were law enforcement units—each function (i.e., evidence recovery, perimeter security, motors, and special weapons and tactics) had a dedicated channel. This separation of communication both geographically and by discipline contributed to the success of the operation to the extent that the after action report suggests expanding pre-planning radio separation by function: “Radio channel and talk group allocation for fire and rescue command, operations, and logistics functions should be preplanned, established early, and clearly communicated.”²⁵ Inter-discipline interoperability was achieved through adherence to a unified command structure per the National Incident Management System.

6. Academic Works

Currently, there are no theses located by this researcher on the subject of discipline-based PSAP consolidation. While not addressing PSAP consolidation directly, Trevor Womack, in a 2014 thesis for the Naval Postgraduate School, entitled “Economies of Scale: 9-1-1 Center Consolidation as a Means to Strengthen the Homeland Security Enterprise,” concluded that PSAP consolidation can result in increased cost efficiency through economies of scale and standardize and raise the quality of service across disciplines and jurisdictions on a regional level. In a 2006 thesis entitled “Radio Interoperability: Addressing the Real Reasons We Don’t Communicate Well at Emergencies,” Ronald P. Timmons argues that the homeland security enterprise, in its zeal for interoperability, is addressing the problem as a technological issue that may

²⁴ Titan Systems Corporation, *After Action Report on the Response to the September 11 Terrorist Attack on the Pentagon* (New York: W.W. Norton & Company, 2002), A-10.

²⁵ *Ibid.*, A-38.

exacerbate, rather than alleviate, communications at emergencies. He suggests instead that the solution lies in better procedures exercised regularly at daily, routine incidents.²⁶

While few sources directly deal with dispatcher specialization in fire or police dispatching, in a paper for the National Fire Academy, Robert Junell noted that specialization enhances productivity and that exposure to variety has a nonlinear influence on productivity (i.e., “too much variety” can impede learning). This was tempered by his finding that a proper balance between specialization and exposure to a variety leads to the highest productivity.²⁷

There have been studies in other fields related to job and skill specialization. In 1983, Rosen noted a maximized rate of return through the utilization of specialized skills as intensively as possible, generally in labor²⁸ In study of the Japanese banking industry in 2012, Staats and Gino recorded that productivity improves with job specialization over the course of a single day; however, examined across a number of days, variety improved productivity.²⁹

D. METHOD OF INQUIRY

This thesis begins with an examination of the function of PSAPs, the positions and duties of telecommunicators who work within them, and the differences between the different dispatch disciplines. In addition, this thesis analyzed the concept of interoperability, beginning with an exploration of the prevailing wisdom on the subject. It also examined the differences between functional interoperability (different jurisdictions/disciplines operating with one another at an emergency scene) and voice interoperability (the ability for units to communicate via radio at an emergency scene, across jurisdictions/disciplines). The notion of inter-discipline interoperability (i.e., law

²⁶ Ronald P. Timmons, “Radio Interoperability: Addressing the Real Reasons We Don’t Communicate Well During Emergencies” (master’s thesis, Naval Postgraduate School, 2006), 83

²⁷ Robert Junell, “Consolidation Versus Separate Fire and Police Communications Centers,” Emmitsburg, MD: National Fire Academy, 1991.

²⁸ Sherwin Rosen, “Specialization and Human Capital,” *Journal of Labor Economics* 1, no. 1 (1983): 43–49.

²⁹ Bradley R. Staats and Francesca Gino, “Specialization and Variety in Repetitive Tasks: Evidence from a Japanese Bank,” *Management Science* 58, no. 6 (2012): 1141–1159.

enforcement-to-fire) and intra-discipline interoperability (fire-to-fire and law-enforcement-to-law enforcement) is also analyzed, with the intent of determining which is more valuable in the mitigation of routine and homeland security level incidents. Examples of incidents featuring communication failures are studied to illustrate the interoperability problem relative to the prevailing wisdom on the subject.

The research also includes a mini-case study of nine PSAPs, which concentrates on their capabilities in terms of functional and voice interoperability, both inter- and intra-discipline. The PSAPs selected represent a cross-section of PSAPs in terms of size and location, as well as type of discipline served (single discipline [law enforcement or fire only] and multi-discipline [police and fire]). Case study data was obtained through a survey (see Appendix A) of PSAP directors. The survey attempted to divine not only the capacity of interoperability of the selected PSAPs, but also the degree to which that capacity was realized and why it was or was not utilized to its full potential.

In addition, the researcher also completed a hypothetical case study for King County, Washington, whose PSAP network is undergoing a consolidation assessment. Using information obtained from King County's consolidation assessment report, two scenarios were considered: consolidation under a multi-discipline model and a model where consolidation was separated by discipline. Using the analysis of data compiled earlier in the thesis, each model's respective potential positive and negative outcomes were compared and contrasted.

II. BACKGROUND

A. PSAP INFORMATION

A PSAP is “an entity operating under common management which receives 9-1-1 calls from a defined geographic area and processes those calls according to a specific operational policy.”³⁰ Commonly known as a 9-1-1 or dispatch center, the PSAP is a central location for the receipt of 9-1-1 emergency calls for law enforcement, fire, and/or emergency medical services (EMS). There are two different types of PSAPs in the United States, dependent upon how the 9-1-1 call is processed:

- **Primary PSAP:** A primary PSAP receives 9-1-1 calls directly from the public. It may process those calls itself or transfer the call to another agency. An example of a primary PSAP is the Seattle Police Communications Center. All 9-1-1 calls within the city of Seattle are received by this center. If the call regards a law enforcement problem, it is processed by Seattle Police Communications. If the call is for a fire or medical emergency, it is transferred to the Fire Alarm Center to be processed.
- **Secondary PSAP:** A secondary PSAP does not receive 9-1-1 calls directly from the public; rather, the calls are received by a primary PSAP and transferred to the secondary PSAP for processing. In the example above, the Fire Alarm Center is a secondary PSAP—all calls received by the Fire Alarm Center are transfers from Seattle Police Communications.

Regardless if they are primary or secondary, PSAPs may be organized into one or more of the following categories:

- **Single agency PSAP:** A PSAP that processes calls for a single agency. The agency may be of any public safety discipline (law enforcement, fire, or EMS).
- **Consolidated PSAP:** A PSAP that processes calls for multiple agencies. Typically, the agencies contract with the PSAP for such services under a governance structure that gives all agencies a voice in the operation of the PSAP.
- **Single-discipline PSAP:** Regardless of the number of agencies served, all of the agencies are of a single discipline (law enforcement, fire, or EMS).

³⁰ National Emergency Number Association Development Steering Committee, *NENA Master Glossary of 9-1-1 Terminology*, 2013, http://c.ymcdn.com/sites/www.nena.org/resource/collection/625EAB1D-49B3-4694-B037-8E854B43CA16/NENA-ADM-000.17_Master_Glossary_20130909.pdf

Note that many fire departments in the United States are primary providers for EMS to their jurisdictions; in such cases, they would be considered one discipline. In those jurisdictions where EMS is a third service, fire and EMS would be considered separate disciplines.

- Multi-discipline PSAP: A PSAP that processes calls for agencies of different disciplines, such as police and fire. All multi-discipline PSAPs are by definition consolidated centers.

PSAPs have become an essential facet of emergency response. Not only are PSAPs the prime connection between the public and the response agency for initial reporting of emergencies, but are also the point at which a response to those emergencies is generated. No matter how many resources, apparatus, members, or trainings an agency possesses, without the ability to efficiently receive reports of emergencies and generate a response, such capabilities are wasted.

Responsibilities extend beyond simply answering calls and sending responses; however, PSAPs also typically monitor the status and location of agency resources, maintain adequate coverage of the jurisdiction by agency assets, and act as the primary hub of radio communications between units in the field and the agency.

Because of the critical role PSAPs play in emergency response, it is paramount that their key operational systems have a capacity for continuity of operations in exigent circumstances.³¹ There are redundancies to phone systems, power systems, computer systems and computer aided dispatch (CAD) systems, among others. In fact, PSAPs are considered so mission critical that, despite all of the redundancies *within* the PSAP, the FCC recommends as a best practice that, in a given geographic area, there should always be two PSAPs for continuity of operations: “The PSAP should also consider arranging with another PSAP for backup and support in the event of total failure or abandonment of the PSAP.”³² The reason for this is simple: if an event occurs that renders the PSAP untenable or unusable—an earthquake, bomb threat, or gas leak, for example—that PSAP can continue operations in a back-up facility. Due to the highly technical and specialized

³¹ Federal Communications Commission, “Public Safety Tech Topic #14: Diversity, Redundancy, and Resiliency—In That Order,” accessed April 20, 2014, <http://www.fcc.gov/help/public-safety-tech-topic-14-diversity-redundancy-and-resiliency-order>

³² Federal Communications Commission, “Emergency Planning: Public Safety Answering Points.”

nature of the PSAP and its equipment, only another PSAP can serve as a back-up facility if the level of service is not to be completely compromised.

B. TELECOMMUNICATOR FUNCTIONS

With more than 8,000 PSAPs in the United States,³³ there are operational differences that make defining the operations of a “typical dispatch center” difficult.³⁴ However, there are basic functions performed by personnel in most PSAPs. Although referred to as dispatchers or telecommunicators in general, PSAP personnel perform these basic functions, typically in discrete positions, aided by a CAD system. Depending upon the size of the PSAP, the staffing model utilized and the operating framework of the PSAP in question, some of these functions may be combined into one position:

- Call taker: Answers incoming 9-1-1 calls and gathers information necessary to send a response.
- Dispatcher: Dispatches responding units, tracks unit status and location, and monitors status of incidents.
- Radio: Maintains communications between the PSAP and field units
- Supervisor: In charge of dispatch operations on PSAP floor
- PSAP director: Supervises administration of the PSAP (budget, policy, hiring, training, etc.)

C. DISPATCH DISCIPLINES

While these positions and functions are utilized to some degree in all dispatch centers and by all disciplines, police, fire, and EMS dispatching are very different in practice.

1. Law Enforcement Dispatching

Although about 85 percent of all 9-1-1 calls are made for law enforcement services,³⁵ the majority of these are not for “in-progress” emergencies but reports of

³³ Federal Communications Commission, “PSAP Registry.”

³⁴ Pivetta, *911 Emergency Communications Manual*. 7.

³⁵ *Ibid.*, 8.

incidents that have already occurred.³⁶ Since the event has already transpired, there no danger of loss of life or property. Most incidents of this nature simply require investigation, a case report, and follow up from an officer. Thus, such calls may be “held” or “stacked” until the police unit assigned to that geographic sector is available to respond. In this way, patrol units can be kept in their assigned areas instead of assigning an officer from an adjacent area.³⁷ In some cases (typically in municipalities over 25,000 residents), there may be no response at all by a sworn law enforcement officer; the incident will be handled by a community service officer, administrative units or other alternative responders.³⁸ The call may not be an emergency, but still requires data to be taken from the caller and recorded by the call taker (either manually or in CAD) so the police unit has the information when it eventually responds.

Police officers are constantly out on patrol, resulting in traffic stops, investigation of suspicious activity, and responses to citizen input.³⁹ In the course of patrolling, officers place demands on dispatchers and radio operators by generating requests for information. Officers in the field may request information on warrants, license plates, or report traffic stops. Since officers are potentially at risk with each such contact, they report their location to the PSAP so assistance can be sent should the situation become dangerous. Radio must take the report, and the dispatcher tracks the units as they respond, arrive, and monitors any activity or request until units clear the scene. Such requests often result in searches of various local and national databases. According to Pivetta, “Many times the emergency communications personnel working with these systems are the field units only link to that information. It is vital that Telecommunicators’ training be extensive in these areas of information gathering and dissemination.”⁴⁰ This information, once discovered, must be reported back to the officer who requested it; thus, police radio is a busy and vital function of law enforcement

³⁶ Ibid., 12.

³⁷ Tom McEwen et al., *Call Management and Community Policing: A Guidebook for Law Enforcement Report*, U.S. Department of Justice Office of Community Oriented Policing Services, 2003, http://www.cops.usdoj.gov/Publications/e05031968_web.txt

³⁸ Pivetta, *911 Emergency Communications Manual*, 12.

³⁹ Ibid., 111.

⁴⁰ Ibid., 123.

dispatching.

Not all calls are simple reports or requests that can be held. In-progress calls, where life or property is at risk, make up a smaller portion of police 9-1-1 calls. In these cases, if the officer who is serving the geographic area of the emergency is busy, the call must be re-assigned to another officer. This is generally simple, as with few exceptions, police units generally have the same resources and capabilities. While motorcycle units cannot, for example, transport prisoners, and the obvious exceptions of specialty units (SWAT, K-9, etc.), police patrol units generally share the same capabilities. Frequently, such calls for service require two or more units; however, police incidents typically involve few units and require no command or control structure.

2. Fire Dispatching

9-1-1 calls for the fire department are nearly all are for ongoing emergencies.⁴¹ This in turn means that “holding” of “stacking” calls is rarely if ever utilized in fire dispatching, and calls that require searching a database or making a simple report are scarce.⁴² Due to the emergent nature of these calls, the National Fire Protection Administration (NFPA) has set a national standard for 9-1-1 call processing:

- 90 percent of all emergency calls must be processed within 60 seconds or less
- 99 percent of all emergency calls must be processed within 90 seconds or less.⁴³

If a unit serving a certain geographic district is unavailable, there is no hesitation in assigning the emergency to another available unit with the same capabilities.

Unlike police departments, where patrol units have the same basic capabilities and thus can be assigned to incidents interchangeably, fire departments have different

⁴¹ Ibid., 15.

⁴² Ibid.

⁴³ Robert Upson and Kathy Notarianni, “Quantitative Evaluation of Fire and EMS Mobilization,” Fire Protection Research Foundation, May 2010, <http://www.nfpa.org/~media/Files/Research/Research%20Foundation/Research%20Foundation%20reports/For%20emergency%20responders/mobilizationpart2.ashx>

apparatus with different capabilities.⁴⁴ While the terms “fire engine” and “fire truck” are ubiquitous and interchangeable in popular culture, engine companies and truck companies have very different capabilities. The former is the only apparatus that carries water and a pump, and the latter has a wide assortment of tools and skills absent in the former. Many departments have other specialized apparatus—tankers, rescue units, aid cars, paramedic engines and paramedic units, each with its own unique set of capabilities. Thus, assigning and re-assigning units is not as simple a proposition as it is with law enforcement units. Additionally, if a fire unit (or units) is out of service for an extended period of time, another fire unit may be “moved-up” to that station to maintain jurisdiction-wide coverage.

In contrast to law enforcement incidents, which characteristically involve few units and are short in duration, fires and other emergencies can generate a large number of units of different types and can last for hours. Deciding which combination of units is needed for a response is a key component of fire dispatch.⁴⁵ Fire departments also make use of the NIMS Incident Command System (ICS) on significant alarms—each incident has a command structure and functional responsibilities that must be taken into account during communications. Pivetta explains, “Often during a large fire, dispatch will split the frequencies and handle multiple requests from the fire scene to send additional units, support units or handle a variety of other tasks.”⁴⁶ This makes for a much more structured communications process that creates a radio dynamic unlike law enforcement.⁴⁷

Another factor affecting fire communications is that firefighters are often working in environments with immediately dangerous to life and health (IDLH) atmospheres, such as fires and hazardous materials incidents. This requires personal protective equipment be worn, including self-contained breathing apparatus (SCBA). The protective equipment, in

⁴⁴ Pivetta, *911 Emergency Communications Manual*, 167.

⁴⁵ *Ibid.*, 162.

⁴⁶ *Ibid.*, 15.

⁴⁷ *Ibid.*, 178.

conjunction with the noisy environment of the fireground due to apparatus, use of hand tools, and physical exertion, make radio transmissions difficult to understand.

Since firefighters typically do not place units on patrol as do law enforcement agencies, the day-to-day operations of fire radio are not as busy as police radio—there are few requests from fire units that require effort or information from the dispatcher. However, when operating at a fire, the radio position must carefully listen to all transmissions, which are numerous: firefighter to firefighter, division to command, command to dispatch. Any one of these could be a firefighter in trouble, which must be acknowledged. Pivetta notes, “A fire call demands full, all-out attention by every person involved until the call is ended—and past—when the danger is abated. A fire incident takes much focused dispatch power.”⁴⁸

Mutual aid, or units from one jurisdiction responding to another due to resource needs, either for the incident size or unit unavailability,⁴⁹ is a regular facet of many fire departments’ operations. Interoperability of equipment, tactics, communications and command structure is key in these interactions. In 2012 alone, there were 1,326,500 fire incidents requiring the dispatch of units from other jurisdictions.⁵⁰

3. EMS Dispatching

Like emergency calls for fire, the almost all 9-1-1 calls for EMS are for an ongoing emergency.⁵¹ Usually, EMS responses consist of one or two units and require either a basic life support (BLS) response or an advanced life support (ALS) response. ALS events are generally considered those situations in which a patient could die without pre-hospital care.⁵² These include: cardiac events and shock, for example, as opposed to a broken arm, which would be a BLS response. Typically, BLS responders have

⁴⁸ Ibid., 161.

⁴⁹ Ibid., 185.

⁵⁰ Michael Karter, “Fire Loss in the United States During 2012,” National Fire Protection Agency Association, September 2013, <http://www.nfpa.org/~media/FD0144A044C84FC5BAF90C05C04890B7.ashx>, 24.

⁵¹ Ibid., 240.

⁵² Ibid., 201.

emergency medical technician (EMT) or first responder certification, while ALS responders are certified paramedics.⁵³ Those certified members may respond on dedicated EMS units, a fire apparatus or, in some cases, a police unit.⁵⁴ However, the most common delivery method for EMS delivery nationwide is fire departments. According to Franklin et al.,

Of the 200 largest cities in the United States, 97% have fire service-based pre-hospital 9-1-1 emergency medical response and the fire service provides advanced life support (ALS) response and care in 90% of the 30 most populated U.S. jurisdictions (cities and counties).⁵⁵

Emergency medical dispatching is typically provided by an emergency medical dispatcher (EMD), who is trained to take 9-1-1 calls and triage the problem through a set of pre-determined questions (often called protocols) to determine the level of response necessary. A key component of these calls is pre-arrival instructions, which are self-care instructions for the caller to initiate prior to the arrival of responders.⁵⁶ Such instructions ensure that aid, such as cardio-pulmonary resuscitation (CPR) or childbirth instructions, begins as soon as possible to increase positive patient outcomes.

Unlike police units, EMS units do not patrol the city actively seeking out incidents, and unlike fire incidents, EMS events are generally short in duration. EMS workers do not work in an environment as dangerous as either law enforcement or the fire service, and thus the radio demands of EMS dispatching are generally not as active as law enforcement or fire radio.⁵⁷ Table 1 illustrates the general differences between dispatching disciplines, relative to each other.

⁵³ Ibid., 189.

⁵⁴ Ibid.

⁵⁵ Franklin Pratt et al., *Prehospital 9-1-1 Emergency Medical Response: The Role of the United States Fire Service in Delivery and Coordination*, International Association of Fire Fighters, 2007, [https://www.iaff.org/tech/PDF/FB EMS Whitepaper FINAL July 5 2007.pdf](https://www.iaff.org/tech/PDF/FB%20EMS%20Whitepaper%20FINAL%20July%205%202007.pdf), 26.

⁵⁶ Pivetta, *911 Emergency Communications Manual*, 190.

⁵⁷ Ibid., 201.

Table 1. General differences, relative to each other, in dispatching disciplines

TELECOMMUNICATOR FUNCTION	LAW ENFORCEMENT	FIRE	EMS
CALL TAKING			
Call volume	High	Low	Low
Nature of calls	Mostly non-emergent	Emergent	Emergent
Call-answering standard	No	Yes	Yes
DISPATCHING			
Incidents held or stacked	Yes	No	No
Reports taken	Yes	No	No
Database Search	Yes	No	No
Unit generation of incidents from the field	Yes	Rare	Rare
Unit specialization	No	Yes	Some
Responses involving a large number of units	Rare	Yes	No
RADIO			
Volume of traffic	High	Low generally, high at ongoing incidents	Low
Routine/informational transmissions	Frequent	Low	Low
Generation of incidents from field units	Yes	Rare	Rare
Use of ICS	Rare	Yes	Rare
Multiple frequencies at incidents	Rare	Yes	Rare
PPE affects transmissions	No	Yes	No
Incident length	Short	Long	Short
Attention intensive incidents	Rare	Yes	No

D. BASIC TERMS

Several basic terms will be employed repeatedly throughout this thesis. For convenience, they are defined in Table 2.

Table 2. Basic terms used in thesis

TERM	DEFINITION
PSAP	dispatch center, 9-1-1 call center
discipline	an area of functional expertise, such as law enforcement, firefighting, or transportation
agency	an individual department or organization that practices a discipline (e.g., Seattle Fire Department, Snohomish County Sheriff or Department of Transportation)
interoperability	the ability for different disciplines to coordinate communications (voice interoperability) or actions (functional interoperability)
inter-discipline interoperability	interoperability between disciplines (e.g., fire and police)
intra-discipline interoperability	Interoperability between different agencies within a discipline (e.g., two different fire agencies)

E. PSAP CONSOLIDATION

The over 8,000 PSAPs in the United States⁵⁸ are generally small, composed of a few workstations, and are associated with a single public safety agency.⁵⁹ Each of these requires physical space, administrative, technological, and personnel resources and a large infrastructure that is expensive to purchase, upgrade, and maintain. This, coupled with financial constraints caused by almost universal reductions in revenue to state and local governments across the United States, has fueled interest in consolidation of these smaller PSAPs to avoid duplication of equipment and staff.⁶⁰ While not a new concept, the interest in consolidation appears to have increased over the past five years.⁶¹

In a report issued in 2010, the Communications Security, Reliability and Interoperability Council found that

⁵⁸ Federal Communications Commission, “PSAP Registry.”

⁵⁹ Womack, “Economies of Scale.”

⁶⁰ Lovaso, “PSAP Consolidation.”

⁶¹ Raasch, “Recession-battered Cities Combine Services.”

in the vast majority of cases, there are clear benefits to consolidation. The sharing of resources allows for the elimination of duplicate costs, supports coordinated responses, provides greater interoperability, and ultimately leads to more effective and efficient service.⁶²

The typical model for PSAP consolidation is to combine smaller PSAPs primarily due to geographic proximity. Most often, this includes multiple law enforcement, fire, and EMS PSAPs under one roof in a consolidated, multi-discipline PSAP. However, many of these potential savings are not model-dependent. Financial savings resulting from reduced office space, reduced/shared personnel resources, economies of scale (increased production with fewer inputs), improved and more efficient use of technology through shared IT infrastructure, increased purchasing power, and standardization across jurisdictions will be achieved regardless if consolidation takes the form of a multi-discipline PSAP or a single-discipline PSAP.

However, increasing interoperability and enhancing service levels may well depend upon the model of consolidation used. If interoperability *between* law enforcement and fire agencies (*inter-discipline* interoperability) is less important than interoperability *among* law enforcement and fire agencies (*intra-discipline* interoperability), then interoperability may be better enhanced through consolidation in a single-discipline consolidated PSAP than a multi-discipline consolidated PSAP.

Chapter III explores the prevailing wisdom regarding interoperability and its impact on the landscape of communications doctrine. It also provides analysis of the benefits and needs for of inter- and intra-discipline interoperability in emergency response and how a misrepresentation of those needs may in fact be exacerbating communications issues.

⁶² Communications Security, Reliability and Interoperability Council, *Key Findings*, 4.

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III. COMMUNICATIONS INTEROPERABILITY

A. PREVAILING WISDOM

In a capstone paper, Merchant et al. explain:

During the September 11, 2001 (9/11) attack on the World Trade Center, police helicopters circling the scene issued warnings about the possible collapse of the tower. However, due to lack of interoperability among the radios used by the police and fire departments, hundreds of firefighters never received this warning and 343 firefighters lost their lives. In contrast, most of the police officers were able to hear the warnings on the police frequencies and to escape in time. Thus, their death toll was significantly lower.⁶³

Judging by how often it is cited in the literature, this event has been a driving force in developing American strategy in communications interoperability. The National Emergency Communications Plan produced by DHS in 2008 describes its vision “to ensure emergency response personnel at all levels of government and across all disciplines can communicate as needed, on demand, and as authorized, through improvements in communications operability, interoperability, and continuity nationwide.”⁶⁴ The Government Accounting Office noted in 2007 that “As the first to respond to natural disasters, domestic terrorism, and other emergencies, public safety agencies rely on timely communications across multiple disciplines.”⁶⁵ In a report issued in 2003, the National Task Force on Interoperability defines interoperability as:

the ability of public safety service and support providers—law enforcement, firefighters, EMS, emergency management, the public utilities, transportation, and others—to communicate with staff from other responding agencies, to exchange voice and/or data communication on demand and in real time.⁶⁶

⁶³ Ronak Merchant et al., “The Lack of Interoperability in the 911 Emergency Communications System in Colorado: What Solutions Exist?” Capstone, University of Colorado, 2011, 2.

⁶⁴ Department of Homeland Security, *National Emergency Communications Plan*, 2.

⁶⁵ Government Accounting Office, *Much Work Remains to Improve Communications Interoperability* (GAO-07-301) (Washington, DC: Government Accounting Office, 2007).

⁶⁶ National Task Force on Interoperability, *Why Can't We Talk? Working Together To Bridge the Communications Gap To Save Lives* (Washington, DC: National Task Force on Interoperability, 2003).

These sentiments are echoed in many other state and organizational interoperability plans: the necessity of police, fire, EMS and other governmental response agencies' ability to communicate directly with each other via radio.

Since 9/11, homeland security efforts have focused upon interoperable radio communications for local emergency responders of different disciplines; it the primary focus for those seeking grant funding.⁶⁷ The framework for this solution to communications interoperability is technical: "Once disparate radios are connected, communications will be facilitated."⁶⁸ Figure 1 depicts this prevailing wisdom on interoperable communications.

⁶⁷ Timmons, "Radio Interoperability," 77.

⁶⁸ Ibid.

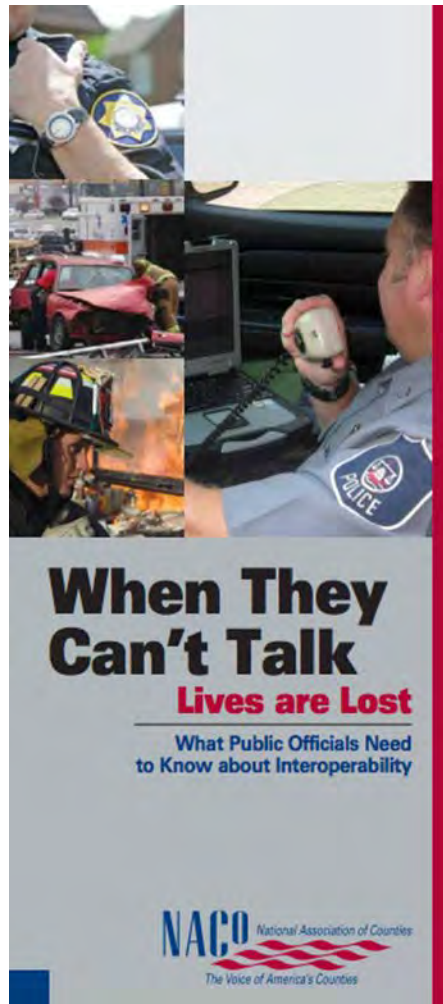


Figure 1. This pamphlet on interoperability, designed to inform public officials, typifies the prevailing wisdom on the subject⁶⁹

B. PROBLEMS WITH THE PREVAILING WISDOM

The National Task Force on Interoperability discusses the importance of communications in a report from 2003:

The terrorist attack on the Pentagon demonstrates in a very public way how critically important communications capabilities are for public safety agencies. Imagine the challenge of 50 different local, State and Federal public safety agencies responding at the Pentagon—900 different radio

⁶⁹ National Association of Counties, *When They Can't Talk Lives are Lost* [pamphlet], 2003, http://www.region49.org/txrc/files/When_They_Can't_Talk_Brochure_10-09-08.pdf

users, operating on multiple radio systems, and attempting to communicate with each other.⁷⁰

The above quote, by a member of the National Task Force on Interoperability, perhaps best sums up the prevailing wisdom on communications interoperability. However, treating communications interoperability as a mere technological problem may actually make matters worse, not better.⁷¹ The assumption that interoperability will be enhanced by direct communications between responders of different disciplines ignores four aspects of large emergency incidents:

- Communications system overload
- Cognitive overload among responders
- Uniqueness of disciplines
- Organizational knowledge

1. General Communications Overload

The corollary response to the quote in the previous section by the National Task Force on Interoperability is to imagine the challenge of 50 different local, state and federal public safety agencies responding at the Pentagon—900 different radio users, operating **on the same radio system**, and attempting to communicate with each other. A characteristic of large-scale multi-jurisdictional or multi-disciplinary incidents is an overload of the communications system. The nature of such events and the sheer number of responders attempting to transmit messages cause the system to become ineffective. As Timmons succinctly states, “Radio spectrum is a limited commodity—once it’s full, it’s full.”⁷² Adding more users to a saturated system in an effort to improve communications only compounds the problem.

2. Cognitive Overload

Communications overload isn’t limited to the system’s capacity or bandwidth; it also overloads the users of that system. Radio transmissions are designed to increase

⁷⁰ National Task Force on Interoperability, *Why Can’t We Talk?*, 10.

⁷¹ Timmons, “Radio Interoperability,” 77.

⁷² Ibid.

situational awareness, providing critical clues and cues that expand understanding of an incident. However, too many transmissions, or transmissions that do not serve the interests of responders can create a kind of cognitive noise that has the opposite effect. Essentially, human cognition is limited with respect to the amount of information it can hold, and the number of operations it can perform based on that information—at a certain point, the cognitive load of performing a certain task (such as listening to the radio while operating at an incident) becomes a hindrance to performance.⁷³

This is also noted by the International Association of Fire Chiefs,

A frequent contributing factor in firefighter casualties is too much radio traffic. This can have a significant impact on situational awareness because it becomes nearly impossible to take in, comprehend, process and remember the volume of information being transmitted over the radio when communications aren't disciplined.⁷⁴

3. Uniqueness of Disciplines

The government has several obligations to the public it serves: provide protection from crime, assist in fire and rescue events, treat the sick and injured, provide utility service—the list is extensive. Because these services are unique (as is the knowledge, skills and equipment required to provide them), government provides discrete departments to provide these services.

This distinctiveness of the disciplines does not change when operating at an incident together. While all agencies at an incident are working together for a common goal, they are generally working on different aspects of that incident related to their unique mission. For example, a car crash into a utility pole may generate a response by police, fire, ambulance and utility agencies. While all four agencies have a role in the incident, those roles are largely unrelated: police will control traffic and investigate the cause of the accident, fire will extricate the victim and extinguish any fire present, the ambulance unit will treat and transport the victim, and utilities personnel will secure and

⁷³ Fred Pass et al., “Cognitive Load Measurement as a Means to Advance Cognitive Load Theory,” *Educational Psychologist* 38, no. 2, 2003, 64.

⁷⁴ International Association of Fire Chiefs, “Firefighter/EMT Safety, Health and Survival: Radio Discipline,” accessed August 12, 2014, <http://www.iafc.org/onScene/article.cfm?ItemNumber=7079>

restore electricity. While all responders are working together to achieve the goals of the incident, they are not working together on any one task—their cooperation is more akin to a mosaic than a melting pot. Each has its function to perform, which must be coordinated. However, in the actual performance of their tasks, each discipline largely operates separately. Other than being told when to begin and end traffic control, for example, the police will be operating independently from the other disciplines—their performance of that duty requires little communication with the other entities on scene. The overall incident is essentially four incidents in one: a police incident, a fire incident, a utilities incident, and an EMS incident. While the various functions must be coordinated at a strategic level, at the task level the function of each discipline is largely distinct.

One of the recommendations of the National Incident Management System is that “during incident response activities, radio traffic should be restricted to those messages necessary for the effective execution of emergency management/response personnel tasks.”⁷⁵ Communication unrelated to a responder tasks is superfluous and provides no benefit or situational awareness to a responder receiving such a message and serves only to reduce air time on the radio. Given that the tasks for each discipline are disparate, it would follow that communications regarding those tasks also be separate. There is no benefit at the task level to hearing transmissions unrelated to the task at hand. There is value to such information of the strategic level of communication to enable coordination of the different tasks to the overall incident objectives, but that advantage is realized at the command level, not the task level.

4. Organizational Knowledge

Unit-to-unit communications between disciplines at a large incident are fraught with difficulties. Reasons cited for the necessity of such communications include requesting action or to warn of impending danger. Organizational differences make such communications largely impractical. This is in part because requesting action requires

⁷⁵ Federal Emergency Management Agency [FEMA], *National Incident Management System* (Washington, DC: Federal Emergency Management Agency, 2008), 28.

organizational knowledge that one discipline may not possess about another. Consider a police unit working at a large incident with a fire department. The police unit notices a previously unnoticed fire in a building and wants to request that a fire unit, which he sees 300 feet away, to extinguish it. While the request is appropriate and makes sense in the abstract, in practice there are barriers to this to this course of action:

- Notification—Although he can see the fire unit he wants to contact, the police officer has no idea what the unit's radio signature is. Simply put, a radio signature is the name of the unit; without knowing this information, it is impossible to address this unit in particular via radio. Simply seeing an apparatus does not provide a unit signature.
- Capability—Members of one discipline do not have the expertise to know the quantity and type of units required to handle emergencies from another discipline. The police officer may have no idea of the capability of the fire unit he sees—it may be a ladder company, which carries no water and has no ability to actually extinguish fires.
- Command and control—The unit the police officer is trying to assign may already be performing a critical assignment for the incident commander, or the crew may already be committed to a task in which disengagement will take some time, essentially rendering the unit unavailable.

C. EXAMPLES OF DIFFICULTIES RELATING TO COMMUNICATIONS INTEROPERABILITY AT LARGE SCALE INCIDENTS

An examination of several large-scale incidents since 9/11 illustrates some of the communications interoperability concepts outlined above.

1. 9/11 Pentagon Response

Robert E. Lee, Public Safety Wireless Network Program Manager, is quoted in *Why Can't We Talk? Working Together To Bridge the Communications Gap To Save Lives* as stating:

The Pentagon report found that the majority of local public safety responders at the scene experienced little difficulty establishing interoperable communications during the initial response. Due to existing mutual aid agreements, most of the first responders had [common] radio frequencies pre-programmed into their portable radio equipment and had frequently used the capability for other mutual aid responses.⁷⁶

⁷⁶ National Task Force on Interoperability, *Why Can't We Talk?*, 10.

While grounded in truth, the quote does not paint the full picture of radio communications as described in the *After Action Report on the Response to the September 11 Terrorist Attack on the Pentagon*, issued in 2002. Communications at the Pentagon on 9/11 were not initially a success. Because initial radio communications were overloaded and ineffective, two firefighters were sent on foot to record the location and name of every piece of equipment on the Pentagon grounds. According to the after action report, “in the first few hours, foot messengers at times proved to be the most reliable means of communicating.”⁷⁷

By September 12, the Incident Command Operations Section organized the fire suppression units into four divisions, each led by a chief officer from a lead jurisdiction (Division A—Arlington, Division B—the District of Columbia, Division C—Alexandria, and Division D—Fairfax). Each division used the assigned lead jurisdiction’s radio channel for communicating, which facilitated communications by separating the radio traffic into four different channels, each tied to a geographic location.⁷⁸ EMS responders were also located on a different functional channel.

Law enforcement used a similar strategy to facilitate communications. A network, separate from the fire operations network, was established. Using 5 of the 14 available radio channels, the police network was divided into channels not by geography, but by function. Each law enforcement function (i.e., evidence recovery, perimeter security, motors, and special weapons and tactics) had a dedicated channel. The function sectors shared a common command channel, which was reserved for the command staff of each function. “Once radio discipline was restored and the initial volume of traffic subsided, the ACPD radio system worked well.”⁷⁹

There were many successes on 9/11 at the Pentagon; however, communications interoperability dependent on agencies of different disciplines being able to contact each other via radio was not one of them. Communications were aided by the separation of

⁷⁷ Titan Systems Corporation, *After Action Report*, A-10.

⁷⁸ *Ibid.*, A-37.

⁷⁹ *Ibid.*, C-17.

police and fire communications; in fact, only the fire groups that were actively working together were kept on the same channel. Even within the same discipline, unit-to-unit communications were not seen as necessary if they were not operating on the same task. This separation of communication geographically, functionally, and by discipline contributed to the success of the operation to the extent that the after action report suggests expanding pre-planning radio separation by function: “Radio channel and talk group allocation for fire and rescue command, operations, and logistics functions should be preplanned, established early, and clearly communicated.”⁸⁰

2. 1997 New Hampshire Manhunt

In 1997, an armed fugitive in New Hampshire responsible for the deaths of two law enforcement officers, a judge, and a newspaper editor stole a police car, retrieved additional ammunition and altered his appearance. Local, county, state, and federal law officials were mobilized in the effort to apprehend this fugitive. A series of radio communications failures were attributed to technology—incompatible radio systems and poor reception. However, one trooper commented, “There was so much (radio) traffic because of the police responding (to the scene) that I couldn’t get air time to talk to our dispatcher. So I gave up trying to communicate with anybody at [that] point.”⁸¹ Even though all responders were from the same discipline (law enforcement), the sheer number of transmissions rendered communications ineffective. Had perfect interoperability in terms of unit-to-unit capability been present, the problem could only have been worse, as the number of transmissions already paralyzing the system would only have increased.

3. 9/11 World Trade Center Response

In the anecdote that opens this chapter, the failure of Fire Department of New York (FDNY) to receive transmissions from New York Police Department (NYPD) helicopter pilots who were warning of possible collapse contributed to disaster:

⁸⁰ Ibid., A-38.

⁸¹ Donald A. Lund, *The Lessons of Non-Interoperability in Public Safety Communication Systems* (Durham, NH: University of New Hampshire, 2002).

hundreds of firefighters never received this warning and 343 firefighters lost their lives. In contrast, most of the police officers were able to hear the warnings on the police frequencies and to escape in time. Thus, their death toll was significantly lower.⁸²

This statement is disingenuous; it completely ignores the facts that the FDNY manpower commitment to interior operations dwarfed NYPD's, as well as the fact the South Tower had already collapsed, killing 222 FDNY members.⁸³ Far from demonstrating that all responders being on a single channel would have prevented the deaths, it also fails to take into account other communications facts regarding the incident.

The FDNY's radios performed poorly during at World Trade Center at both 1993 and 2001 incidents for two reasons: first, numerous steel and concrete floors that affected signal penetration; and second, so many different companies were attempting to use the same point-to-point channel that communications became unintelligible.⁸⁴ Adding all police communications onto the same channel as the FDNY would only have saturated the system more. The differences in police and fire communications were outlined in the 9/11 Commission Report, published in 2004:

The success of NYPD ESU instruction is attributable to a combination of (1) the strength of the radios, (2) the relatively small numbers of individuals using them, and (3) use of the correct channel by all. The same three factors worked against successful communication among FDNY personnel. First, the radios' effectiveness was drastically reduced in the high-rise environment. Second, tactical channel 1 was simply overwhelmed by the number of units attempting to communicate on it at 10:00. Third, some firefighters were on the wrong channel or simply lacked radios altogether.⁸⁵

Again, these problems would not have been solved or have been exacerbated if all responders had been on a single radio system.

⁸² Merchant, "The Lack of Interoperability," 2.

⁸³ "9/11 Exposed Deadly Flaws in Rescue Plan," *New York Times*, July 7, 2002, <http://www.nytimes.com/2002/07/07/nyregion/07EMER.html>

⁸⁴ 9/11 Commission, *The Final Report of the National Commission*, 283.

⁸⁵ *Ibid.*, 322.

D. COMMUNICATIONS INTEROPERABILITY SOLUTIONS

Based on the examples above, the prevailing wisdom of curing interoperability by enabling all radios to have direct communication across all disciplines is not the answer. In each example, the quantity of transmissions saturated the communications systems—adding more transmissions to the system would only serve to intensify the problem. If technology in and of itself is not the solution, what is?

1. Who Needs to Talk?

Communications issues outlined in the preceding examples demonstrate that not every responder needs to be able to talk every other responder at an incident involving multiple agencies. While command and control needs to be exercised over all units, only those units actively working together on the same task need to be in direct communication. Typically, this involves units from the same discipline—units fighting a fire together, for example, regardless of jurisdiction or agency, need to be in contact, as may law enforcement agents attempting to secure a perimeter.

Even this may not apply in larger incidents—at the Pentagon on 9/11, fire units involved in suppression activities that were remote from each other were on separate channels to facilitate communications. However, law enforcement at the Pentagon, even though embroiled in the same incident as the various fire departments, had completely different objectives, and did not need to monitor or communicate on fire channels in order to function effectively. The units involved in the manhunt in New Hampshire, even though they were all law enforcement agencies, may have benefitted from geographic parsing of channels; interoperability clearly was not aided by the radio saturation they experienced.

2. Organizational Aids to Interoperability

Regardless of discipline, few would argue that a large incident with multiple jurisdictions and agencies operating together requires communications capability in place to ensure that all participants may be informed enough to coordinate and accomplish the

overall strategy. The state of Connecticut recognizes this in its plan for communications interoperability, in which three strategies are identified:

- Interoperability at the functional level
- Infrastructure improvements
- Interoperability at the incident/unified command level⁸⁶

a. *Interoperability at the Functional Level*

Agencies in the same discipline must be able to operate functionally in conjunction with one another. Complex incidents such as 9/11, hurricanes, and other large events have demonstrated that such events are likely to cross jurisdictional boundaries.

The jurisdictions around Arlington prior to the 9/11 Pentagon incident have fully acknowledged this interdependence with their mutual aid agreements. The regional fire departments had automatic mutual aid agreements, to the point of “sharing battalion chiefs across the lines on first-alarm assignments,” according to one local chief.⁸⁷ This familiarity of operations and systems meant that the various fire jurisdictions operated as well at the Pentagon as they did at more routine incidents, with the exception of the District of Columbia Fire Department (DCFD), which lacked previous experience or mutual aid agreements with the other responders. Consequently, DCFD’s efforts were not as well coordinated as the other responding agencies, who exercised interoperability regularly prior to 9/11.⁸⁸ Mutual aid agreements also facilitated law enforcement collaboration among 300 officers from 17 jurisdictions.⁸⁹ The interagency bond was evident even where no formal understanding existed. Defense Protective Services (DPS) and Arlington County Police had no mutual aid agreement. However, the shared experience of interacting during large-scale events, such as the Marine Corps Marathon,

⁸⁶ State of Connecticut, “Plan for Enhanced Public Safety Communications Interoperability,” February 2004, http://www.ct.gov/oem/lib/oem/docsuploaded/interop_minutes/comm_interop_plan_-_final.pdf

⁸⁷ Pam Weiger, “Pentagon Report: Arlington County Starts Implementing Changes Urged in 9/11 Report,” *NFPA Journal*, November/December 2002, <http://www.nfpa.org/assets/files/MbrSecurePDF/Journal1102Pentagon.pdf>, 38.

⁸⁸ *Ibid.*, 39.

⁸⁹ Titan Systems Corporation, *After Action Report*, C-21.

helped facilitate coordination and communications between the two organizations and enabled the evacuation of the Pentagon to go smoothly.⁹⁰ Previous work together provided “instant trust among emergency response agencies” according to Chief Jester of the DPS.⁹¹ Building functional interoperability between agencies during routine events enhances operational interoperability at larger, more complex events.

b. Infrastructure Improvements

As discussed above, different agencies within a given discipline in a geographical proximity must have the ability to communicate unit-to-unit, as they will often be coordinating on the same task. This includes not only voice, but also increasingly data, especially in the case of law enforcement agencies. This is not to say that the ability to communicate unit-to-unit across disciplines (i.e., police to fire) is a useless capability. Even though it does not appear to be as important in large events, there may be rare occasions when it is necessary or desirable—when different disciplines are operating on the same task, for instance. However, circumstances in which multiple disciplines are operating jointly on the same task are considerably rarer than such cooperation among the same discipline.

c. Interoperability at the Incident/Unified Command Level

Interoperability at the command and control level was recognized to be the first priority in the state of Connecticut’s plan.⁹² Perhaps the greatest tool for interdisciplinary interoperability is the Incident Command System (ICS). The National Incident Management System (NIMS), adopted by all federal agencies and those agencies wishing to receive DHS funding, provides such a tool through the concept of unified command (UC). NIMS defines unified command as:

An Incident Command System application used when more than one agency has incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of

⁹⁰ Ibid., C-9.

⁹¹ Ibid., C-32.

⁹² State of Connecticut, “Plan for Enhanced Public Safety Communications Interoperability.”

the UC, often the senior persons from agencies and/or disciplines participating in the UC, to establish a common set of objectives and strategies and a single Incident Action Plan.⁹³

By having representatives from all disciplines and jurisdictions at a single location (the command post), requests for inter-disciplinary actions can be arranged in conjunction with the incident strategy. For example, if a fire unit requires police for crowd control, rather than contact a police unit directly, it can contact the incident commander (IC), who can pass the request to the law enforcement representative at the command post. This law enforcement representative will be better able to locate and communicate with the appropriate law enforcement unit(s) whom can best provide this.

At the Pentagon on 9/11, incident command was established onsite within minutes of the attack and its authority was never challenged.⁹⁴ As a unified command, all major stakeholders were present at the command post to ensure that the needs of each jurisdiction and discipline were taken into account in the decision-making process, and their efforts could be coordinated.⁹⁵ Though communications were on separate channels according to geography and function, the unified command enabled all stakeholders to be informed and updated on all facets of the incident and acted as a communications clearinghouse. This enabled the Arlington County Fire Department to retain primacy during the rescue/suppression phase of the incident, the Federal Bureau of Investigation (FBI) to assume command for the investigation phase on September 21, and the Department of Defense to take over on September 28.

This contrasts sharply with the World Trade Center in which the FDNY and NYPD had separate command structures, separate command posts, and little information sharing or interaction between the two.⁹⁶ As stated in a public hearing following 9/11,

The NYPD and the FDNY were two of the preeminent emergency response organizations in the United States. But each considered itself

⁹³ FEMA, *National Incident Management System*, 149.

⁹⁴ Titan Systems Corporation, *After Action Report*, A-13.

⁹⁵ Federal Emergency Management Agency, “NIMS and the Incident Command System,” accessed June 21, 2013, http://www.fema.gov/txt/nims/nims_ics_position_paper.txt

⁹⁶ Titan Systems Corporation, *After Action Report*, 319–323.

operationally autonomous. Each was accustomed to responding independently to emergencies. By September 11th neither had demonstrated the readiness to respond to an ‘Incident Commander’ if that commander was an official outside of their Department.⁹⁷

That said, unified command would not have aided the situation delineated in the helicopter anecdote that opens this chapter, as the FDNY command post was obliterated in the collapse of the South Tower; however, this was a singular event. It is difficult to argue that collaboration would not have been helped by co-location of FDNY, NYPD and the Port Authority Police Department (PAPD) in a unified command post. For example, the FDNY, PAPD, and NYPD did not coordinate searches of the World Trade Center, resulting redundant searches of certain floors and areas.⁹⁸

Isolating the disciplines, their tasks, and their communications at a large or complex incident is not a failure of interoperability, but rather an enhancement of it. The after action report for the 9/11 Pentagon response stated that the “ACPD should recommend, in incidents not commanded by law enforcement organizations, a Law Enforcement Branch be established within the ICS Operations Section.”⁹⁹ By separating the activities and communications of each discipline, organization and communications at an incident are enriched.

E. COMMUNICATIONS INTEROPERABILITY AND PSAPS

The cases and interoperability analysis discussed above suggests the following characteristics of interoperability:

- Intra-discipline unit-to-unit communication capabilities are important at all incidents, regardless of scope. Because these units may be performing operational tasks together, the ability to coordinate and communicate at the tactical and task levels is crucial. Because they are within the same discipline, the units share organizational understanding and possess similar knowledge, skills, abilities that will be applied to the same objectives. Communications will all be germane to the objectives at hand

⁹⁷ National Commission on Terrorist Attacks upon the United States, “National Commission on Terrorist Attacks upon the United States, Eleventh Public Hearing,” May 18, 2004, http://www.9-11commission.gov/archive/hearing11/9-11Commission_Hearing_2004-05-18.htm

⁹⁸ 9/11 Commission, *The Final Report of the National Commission*, 321.

⁹⁹ Titan Systems Corporation, *After Action Report*, C-19.

and would not cause cognitive overload if proper discipline is maintained. The possibility can be mitigated by radio separation by geography or function, as demonstrated by the response to the Pentagon on 9/11.

- Inter-discipline unit-to-unit communications are less important. Because the uniqueness of disciplines, even though they are operating at the same incident, each discipline would likely be concentrating on tasks and tactics that are unrelated to each other. Organizational knowledge likely precludes meaningful dialogue, and the different objectives will result in transmissions that will be of no use to many responders, increasing the possibility for cognitive overload. Consequently, inter-discipline communications are rarely needed and may in fact be counterproductive.
- Intra-discipline functional interoperability is crucial at all incidents. Again, working on the same tasks and objectives requires cooperation and coordination. Building functional interoperability between agencies during routine events enhances operational interoperability at larger, more complex events.
- Inter-disciplinary interoperability is best helped at large or complex incidents via unified command, where information regarding each discipline's role can be addressed by the stakeholder of that discipline. Even though the ultimate goal of all responders at a large scale incident is the same, different disciplines will pursue different objectives through separate tactics and tasks. Since tactics and tasks are completed at the unit level, interoperability between disciplines will not be facilitated by unit-to-unit voice communications—the strategic level is where different disciplines will have their activities coordinated with the overall incident action plan.

The PSAP's role in interoperability can be viewed through this framework. As noted in Chapter II, the function of the PSAP is not only to receive 9-1-1 calls for assistance; PSAPs also:

- Serve as the hub for all communications activities of each of the agencies they serve
- Track unit status and location
- Ensure that jurisdictions maintain adequate protection through distribution of units
- Monitor radio communications of ongoing incidents

Given these missions that all revolve around command, control, and coordination, which category of PSAP provides the opportunity for the greatest interoperability benefits: a single agency PSAP, a consolidated multi-discipline PSAP, or a consolidated

single-discipline PSAP? An examination of a hypothetical PSAP structure in a fictional county may prove useful in examining this question.

1. Parameters

This exercise will begin with the following assumptions:

- An imaginary county with multiple jurisdictions
- The county, in line with FCC best practices, will have at least two PSAPs, each of which will act as a back-up facility for the other
- The county is home to 20 fire departments and 20 law enforcement agencies
- Technology such as CAD and radio systems in each PSAP has been leveraged for peak interoperability

a. *Single Agency PSAP*

A single agency PSAP dispatches for a single fire or law enforcement agency. Single agency PSAPs are typically small in size and make up the majority of PSAPs in the United States.¹⁰⁰ By definition a single-discipline PSAP, as a single agency PSAP will have knowledge of all unit locations and status for its agency, direct control of all communications for the agency, and monitor all incidents for this agency. It will also maintain jurisdictional coverage of units for this agency.

If mutual aid is needed by the agency represented by the PSAP, whether for a routine incident or a complex one, it will need to be requested and coordinated with another PSAP. Doing so may necessitate “patching” of radio channels to facilitate communications. The single agency PSAP will not know the availability, location or capabilities of the mutual aid units until given that information by the PSAP it is coordinating with, nor will it likely be able to track those units in its own CAD system.

These issues will be reversed if mutual aid is requested from the single agency PSAP for an incident outside of its jurisdiction. The single agency PSAP will need to coordinate with the requesting PSAP to enable a response, and the radios may or may not

¹⁰⁰ Womack, “Economies of Scale,” 1.

be interoperable. These issues will confront the single agency PSAP regardless of whether it interacts with an agency that represents the same discipline or not.

Since single agency PSAPs are typically small in size, it will be a strain on staffing to monitor the additional responsibilities in tracking and communicating with units that larger incidents will require. Essentially, single agency PSAPs offer no enhancement to either intra- or inter-discipline interoperability. This is exchanged for another positive effect highly valued by agencies: control: the main advantage to a single agency PSAP is that it is under complete local control—that is, the PSAP’s policies and procedures reflect exactly what the agency want the PSAP to reflect. When consolidation occurs, there is a governance structure that attempts to unify the policies and practices of the PSAP, which may not dovetail well with all agencies’ practices.

b. Consolidated Multi-discipline PSAP

Given the parameters of the exercise, we can presume there are two PSAPs in the county, both of which are multi-discipline, each serving 10 law enforcement and 10 fire agencies. Each PSAP would serve as the back-up facility for the other. Each PSAP would increase communications interoperability for each of the 10 agencies in each discipline—all of the fire agencies would use the same radios, alerting system and standard operating procedures (SOPs) for dispatch. Likewise, each of the 10 law enforcement agencies would receive the same benefits, including data interoperability.

Both disciplines would also gain the benefit of all of their units being tracked for status, location, and capability in CAD. Any specialty unit needed by one agency that was operated by the other (a SWAT or hazmat team, for example) would have one point of contact for utilization. Other mutual aid responses between the agencies at that PSAP would similarly be facilitated. Only when the mutual aid was needed from an agency at the other PSAP would the problems facing the single agency PSAP arise.

Each PSAP would also gain some measure of interoperability between its police and fire agencies; however, as noted above, on routine calls such interoperability is typically handled face-to-face, and at larger incidents through ICS. Rare though the cases may be, this interoperability must still be considered a benefit.

c. Consolidated Single-discipline PSAP

Given the parameters of the exercise, we can again presume there are two PSAPs in the county, both of which are single-discipline. The first is a law enforcement PSAP, which serves all 20 of the law enforcement agencies in the county. The other is a fire/EMS PSAP, which serves the 20 fire departments in the county. The fire PSAP would be a secondary PSAP. All 9-1-1 calls for the county would first go to the law enforcement PSAP, and be transferred to the fire PSAP if related to a fire or medical emergency.¹⁰¹

The intra-disciplinary interoperability benefits would be the same as for the multi-discipline PSAP, except that the benefits would be countywide, for both routine and large scale, complex events. Every fire department in the county could share the same resources, including regional assets. Every fire communication and unit would be monitored and tracked by the same entity. A large or complex incident happening in the county, with the right governance, could operate as one large regional fire department. The same benefits would be present at the law enforcement PSAP.

Though there are intra-disciplinary benefits, no significant strides would be made in inter-discipline interoperability (see Table 3). The primary/secondary PSAP concept would necessitate a call transfer, which adds a step to 9-1-1 call processing.

¹⁰¹ Law enforcement PSAPs, due to staffing requirements, are more qualified to serve as primary PSAPs than fire PSAPs

Table 3. Interoperability gains by PSAP type

INTEROPERABILITY GAIN	SINGLE AGENCY PSAP	MULTI-DISCIPLINE PSAP (Police and Fire)	SINGLE-DISCIPLINE PSAP (Police only or Fire only)
Intra-discipline Communications SOPs (Fire to Police/Police to Fire)	LOW	IMPROVED	REGIONAL
Inter-discipline Unit-to-Unit Communications (Fire to Police/Police to Fire)	LOW	IMPROVED	LOW
Intra-discipline Unit-to-Unit Communications (Fire to Fire/Police to Police)	LOW	IMPROVED	REGIONAL
Inter-discipline Unit Status, Tracking and Locating in CAD	LOW	IMPROVED	LOW
Intra-discipline Unit Status, Tracking and Locating in CAD	LOW	IMPROVED	REGIONAL

Table 3 shows that while all aspects of interoperability are strengthened in the multi-discipline PSAP, they are not augmented to a regional level. The single-discipline PSAP, by contrast, does not offer enhancements to inter-discipline interoperability. However, the effects of intra-disciplinary interoperability (highlighted in yellow on Table 3) are amplified to the regional cooperation level. As noted, intra-discipline interoperability is key. While firefighters and law enforcement agencies have a common desirable outcome in mitigating large or complex incidents, they have different objectives, tasks, and tactics in which they rarely operate together. Inter-discipline interoperability and communication is best when it occurs within ICS via unified command. At the unit level, attempts at inter-discipline interoperability can actually make communications *more* difficult, as noted by Ronald Timmons:

Assumptions made by the misinformed general public, as well as by public-sector policy makers, have led to a misguided solution strategy. Solution strategies currently being pursued may actually make matters worse, instead of better (via overloading systems by patching too many users together), despite hundreds of millions of public dollars awarded through grant funding to *improve* communications.¹⁰²

¹⁰² Timmons, "Radio Interoperability," 77.

This suggests that the PSAPs, which control communications and resource management, are better suited to do so as single-discipline entities with the ability to effect interoperability on a regional level.

F. CONCLUSION

A hypothetical approach is useful in making generalizations about the potential of interoperability, and it suggests that true regional response capacity is furthered through the separation of PSAPs by discipline. In Chapter IV, case studies of a number of actual PSAPs will be undertaken to examine their interoperable capability, to what extent they realize that capability relative to inter- and intra-discipline interoperability, and how their practices regarding interoperability frame the importance of that concept.

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IV. INTEROPERABILITY SURVEY OF PSAPS

A. INTRODUCTION

Chapter III suggested that the current prevailing wisdom regarding communications interoperability—that it is desirable for all disciplines at an incident to communicate unit-to-unit and member-to-member—is incorrect and may in fact actually inhibit incident communications. However, the importance of intra-discipline (law enforcement-to-law enforcement and fire-to-fire) communications interoperability, across jurisdictional and agency boundaries, is paramount. If true, this would indicate that PSAPs, which function as the hub of emergency response communications, should combine by discipline when consolidation occurs.

Chapter IV will examine a national cross-section of actual PSAPs, both single-discipline (fire or law enforcement only) and multi-discipline (fire and law enforcement), to determine the capacity for communications interoperability, how communications interoperability is handled operationally, and to what extent that capacity is realized relative to discipline. This information was obtained through a survey (see Appendix A) sent to nine PSAPs of varying sizes across the United States:

- Portland (OR) Bureau of Emergency Communications
- Charleston County (SC) Consolidated 9-1-1 Center
- Fairfax County (VA) 9-1-1
- Denver (CO) 911 Emergency Communications
- Santa Cruz (CA) Regional 9-1-1
- Seattle (WA) Police Communications
- Spokane (WA) Combined Communications Center
- Los Angeles County Fire Department Command and Control
- Phoenix Fire Department (AZ) Regional Dispatch Center

B. BACKGROUND INFORMATION ON SURVEYED PSAPS

PSAPs surveyed varied in size, type, and geographic location, in an effort to represent as wide a range of PSAP diversity as possible.

1. Bureau of Emergency Communications

Portland's Bureau of Emergency Communications (BOEC) has existed in some consolidated model for nearly 40 years.¹⁰³ Portland's BOEC provides 9-1-1 dispatch services for all public safety agencies within Multnomah County with the exception of the Port of Portland; see Table 4.¹⁰⁴ The BOEC is a primary PSAP that employs civilian call takers, dispatchers, radio operators and administrators, and it serves five police agencies, four fire agencies, and one EMS provider.

Table 4. Basic PSAP information: Bureau of Emergency Communications

	PSAP PROFILE		
	PSAP NAME:		Bureau of Emergency Communications
	LOCATION:		Portland, OR
	TYPE:		Multi-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	5	POLICE	284,225
	4	FIRE	80,301
	1	EMS	73,245

All agencies served by BOEC use the same Portland-owned public safety voice radio system. Funded in part by a grant through the Department of Homeland Security, this system is a key component of a larger, regional effort toward interoperability and includes seven countywide 9-1-1 centers.¹⁰⁵ Currently, the BOEC shares radio interoperability with three adjacent counties.¹⁰⁶

¹⁰³ Womack, "Economies of Scale," xix.

¹⁰⁴ Ibid., 74.

¹⁰⁵ Ibid., 90.

¹⁰⁶ Ibid.

In addition, the BOEC enjoys a high level of data interoperability among its law enforcement agencies. All law enforcement agencies within Multnomah County share the same Records Management System (RMS)¹⁰⁷ that is completely compatible with their CAD system.¹⁰⁸ In many ways, the BOEC is an exemplar of the prevailing wisdom of interoperability as discussed in Chapter III.

2. Charleston County Consolidated 9-1-1 Center

Charleston County Consolidated 911 Center (CCC911) is owned and operated by the county of Charleston, South Carolina. It provides 9-1-1 emergency communications services for the county and multiple local jurisdictions in the region. CCC911 was established in January 2009 and, to date, has consolidated 10 separate dispatch centers: five primary PSAPs, one secondary PSAP, and four dispatch-only centers; see Table 5.¹⁰⁹ CCC911 provides all law, fire, and EMS 9-1-1 dispatch services within Charleston County with the exception of Folly Beach Public Safety, which operates as a secondary PSAP.¹¹⁰ It is staffed and administered by civilians.

Table 5. Basic PSAP information: Department of Public Safety Communications

	PSAP PROFILE		
	PSAP NAME:		Department of Public Safety Communications
	LOCATION:		Fairfax County, VA
	TYPE:		Multi-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	7	POLICE	897,452
	13	FIRE	56,438
	1	EMS	53,390

¹⁰⁷ Ibid.

¹⁰⁸ Ibid.

¹⁰⁹ Womack, "Economies of Scale," 49.

¹¹⁰ "Charleston County Consolidated 9-1-1 Center," Charleston County South Carolina Online, June 12, 2014, <http://www.charlestoncounty.org/Departments/dispatch/index.htm>

3. Fairfax County 9-1-1

Fairfax County 9-1-1 is the largest PSAP in the Commonwealth of Virginia and one of the 10 largest in the United States.¹¹¹ It is a primary PSAP that employs civilians in all floor and administrative positions. It dispatches units of the Fairfax County Police Department, Fire and Rescue Department, and Sheriff's Office; see Table 6. In addition to Fairfax County, it is the designated 9-1-1 PSAP for the towns of Herndon, Vienna, and Fairfax.

Table 6. Basic PSAP information: Fairfax County 9-1-1

	PSAP PROFILE		
	PSAP NAME:		Department of Public Safety Communications
	LOCATION:		Fairfax County, VA
	TYPE:		Multi-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	2	POLICE	598,673
	2	FIRE	90,185
		EMS	Provided by fire service

4. Denver 911 Emergency Communications

Denver 9-1-1's service area encompasses all of Denver city and county (the geographic footprint is one and the same); see Table 7. Emergency calls placed within these boundaries are received and then screened to determine if the caller has a police, fire, or medical emergency. Police and medical calls for service are processed immediately by the 9-1-1 call-taker. All fire related calls are transferred to Denver Fire Dispatch,¹¹² making it essentially a secondary PSAP within a PSAP. Denver fire dispatchers are sworn firefighters, and Denver Public Health dispatchers are certified paramedics. Floor supervisors are a mix of civilian and uniformed personnel.

¹¹¹ "About Us," Fairfax County Virginia, accessed June 12, 2014, <http://www.fairfaxcounty.gov/911/aboutus.htm>

¹¹² "Department of Public Safety: About Denver 911," Denver.gov, accessed July 12, 2014, <http://www.denvergov.org/mos/ManagerofSafety/EmergencyResponse/911EmergencyResponse/OurOperations/tabid/443461/Default.aspx>

Table 7. Basic PSAP information: Denver 911 Emergency Communications

	PSAP PROFILE		
	PSAP NAME:		Denver 911 Emergency Communications
	LOCATION:		Denver, CO
	TYPE:		Multi-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	1	POLICE	860,000
	1	FIRE	94,000
	1	EMS	86,000

5. Santa Cruz Regional 9-1-1

Santa Cruz Regional 9-1-1 (SCR 9-1-1) is located on the north side of Monterey Bay. It is a multi-discipline consolidated PSAP that serves 10 fire departments, six law enforcement agencies, and two stand-alone EMS agencies; see Table 8. It is the primary PSAP for all of Santa Cruz County with the exception of Scotts Valley Police and the University of California at Santa Cruz, for whom SCR 9-1-1 acts as a secondary PSAP.¹¹³ SCR 9-1-1 is an entirely civilian operation. Its 10 fire departments operate as a single entity—the closest units are sent to an emergency regardless of jurisdiction. Its law enforcement agencies operate together via mutual aid upon request.

Table 8. Basic PSAP information: Santa Cruz Regional 9-1-1

	PSAP PROFILE		
	PSAP NAME:		Santa Cruz Regional 9-1-1
	LOCATION:		Santa Cruz, CA
	TYPE:		Multi-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	6	POLICE	326,058
	10	FIRE	29,302
	2	EMS	22,957

¹¹³ “About Us,” Santa Cruz Regional 9–1–1, accessed July 24, 2014, <http://www.scr911.org/>

6. Seattle Police Communications

The Seattle Police 9-1-1 Center is the primary answering point for all police, fire, and medical emergency calls within the city limits of Seattle. The center dispatches only for the Seattle Police Department; two smaller law enforcement agencies within the city limits (Port of Seattle Police and University of Washington Police) have their own PSAPs; see Table 9. Any calls for fire or medical emergencies are then transferred to the secondary PSAP at the Seattle Fire Department's Fire Alarm Center.¹¹⁴ Seattle Police Communications is a civilian operation, with a mix of sworn and civilian administrative staff.

Table 9. Basic PSAP information: Seattle Police Communications

	PSAP PROFILE		
	PSAP NAME:		Seattle Police Communications
	LOCATION:		Seattle, WA
	TYPE:		Single-discipline, Primary PSAP
	AGENCIES SERVED:		CALL VOLUME:
	1	POLICE	870,000 ¹¹⁵
		FIRE	
		EMS	

7. Spokane Fire Combined Communications Center

The Spokane Fire Combined Communications Center was formed in 1998 as a consolidation of four fire dispatch centers.¹¹⁶ While this joint facility allowed for significant cost avoidance for each agency through the elimination of duplication of buildings and associated equipment,¹¹⁷ its roots lie in interoperability. In 1991, Spokane

¹¹⁴ Ibid.

¹¹⁵ "Seattle Police Department: 9-1-1 Communications Center," seattle.gov, accessed August 10, 2014, <http://www.seattle.gov/police/work/911center.htm>

¹¹⁶ "Spokane County Combined Communications Center," home.comcast.net, accessed May 2, 2014, <http://home.comcast.net/~ka7fvv/scslhtml/cc.html>

¹¹⁷ "Doing a Lot with a Little," Association of Washington Cities, accessed May 5, 2014, www.awcnet.org/Apps/ma/projects/2004SpokaneCombo.doc

County suffered from a series of firestorms that taxed fire suppression forces countywide. According to an article in the *The Spokesman Review*:

During firestorm, dispatchers for four agencies in Spokane County received thousands of calls for service, leading to confusion and difficulties coordinating firefighting efforts. In 1998, officials created the Combined Communication Center, and all Spokane County fire emergency calls are now dispatched from one location.¹¹⁸

The Spokane Fire Combined Communications Center serves 15 fire agencies, which encompasses all of Spokane County; see Table 10. It operates as a secondary PSAP to a 9-1-1 answering center that receives all 9-1-1 calls countywide, but it does no actual dispatching. It simply serves as a plenum to the other Spokane County PSAPs.

Table 10. Basic PSAP information: Spokane Fire Combined Communications Center

	PSAP PROFILE	
	PSAP NAME:	Spokane Fire Combined Communications Center
	LOCATION:	Spokane, WA
	TYPE:	Single-discipline, Secondary PSAP
	AGENCIES SERVED:	CALL VOLUME:
	POLICE	
15	FIRE	59,337
	EMS	Provided by fire service

The Spokane Fire Combined Communications Center is a rarity in that it has a mix of uniformed and civilian staff, all of which work 24-hour shifts and are both emergency medical dispatch (EMD) trained and emergency medical technicians (EMT).¹¹⁹ Operationally, some agencies have agreements in place to assist if they are the closest unit, regardless of the size of call; however, the majority of agencies served follow have automatic mutual aid.¹²⁰ Like Portland's BOEC, all first responders in the

¹¹⁸ Chelsea Bannach, "91 Firestorm Seared into Memory," *The Spokesman Review*, October 16, 2011, <http://www.spokesman.com/stories/2011/oct/16/91-firestorm-seared-into-areas-memory/>

¹¹⁹ Lori Markham (Operations Manager, Spokane Fire Combined Communications Center) survey response, June 2014.

¹²⁰ Ibid.

county, law enforcement, and fire, share a common radio system and are a model for the current prevailing wisdom on interdiscipline voice interoperability.

8. Los Angeles County Fire Department Command and Control

The Los Angeles County Fire Department Command and Control Center is a secondary, fire-only PSAP that dispatches only a single agency: The Los Angeles County Fire Department (LACoFD), which provides fire and EMS services for the majority of Los Angeles County; see Table 11. The administration of the center is a mix of civilians and sworn personnel. The LACoFD operates a distinctive model of consolidation—dispatch operations expand in conjunction with their fire protection services. As the fire department footprint of coverage expands, so does its dispatch coverage—when municipalities contract for fire protection with LACoFD, they also get the services of Command and Control. Currently, LACoFD and Command and Control serve 57 of 88 municipalities in Los Angeles County, as well as all unincorporated areas. LACoFD Command and Control serves only the County Fire Department; however, responses often involve units from every other agency on its borders.¹²¹

Table 11. Basic PSAP information: LACoFD Command and Control Center

	PSAP PROFILE	
	PSAP NAME:	LACoFD Command and Control Center
	LOCATION:	Los Angeles County, VA
	TYPE:	Single-discipline, Secondary PSAP
	AGENCIES SERVED:	CALL VOLUME:
	POLICE	
1	FIRE	513,880
	EMS	Provided by fire service

9. Phoenix Fire Department Regional Dispatch Center

The Phoenix Fire Regional Dispatch Center is a fire-only, secondary PSAP that dispatches for the vast majority of Maricopa County, Arizona. Its service area includes

¹²¹ Survey result.

the city of Phoenix and covers over 2,000 square miles; see Table 12.¹²² The Phoenix Fire Regional Dispatch Center is in many ways the interoperability gold standard—all 29 agencies it serves are part of a common radio system, all are dispatched from the same CAD system, and all agencies represented are treated as one large fire department for the purposes of dispatching. The closest units, regardless of jurisdiction, are dispatched to any emergency. According to the Regional Dispatch Center,

Each participating agency must adhere to standard operating policies and procedures which allows multiple agencies to work side-by-side on incidents under one Incident Command. This seamless cooperative effort ensures that the closest most appropriate resources are dispatched without a time or distance delay.¹²³

The Phoenix Fire Regional Dispatch Center employs civilians as floor personnel (call takers, dispatchers, and radio operators) but its administration is made up of sworn personnel.

Table 12. Basic PSAP information: Phoenix Fire Department Regional Dispatch Center

	PSAP PROFILE	
	PSAP NAME:	Phoenix Fire Department Regional Dispatch Center
	LOCATION:	Phoenix, AZ
	TYPE:	Single-discipline, Secondary PSAP
	AGENCIES SERVED:	CALL VOLUME:
		POLICE
	29	FIRE
		EMS

C. PSAP SURVEY

The survey was designed to determine the interoperability capacities of the surveyed PSAPs. The survey included an examination of voice interoperability within

¹²² “Regional Dispatch Center,” City of Phoenix, accessed April 27, 2014, <http://phoenix.gov/fire/directory/regional911/dispatch/index.html>

¹²³ Ibid.

disciplines and between disciplines, both for agencies served by the PSAP surveyed as well as those served by neighboring PSAPs.

The survey also explored the frequency of functional interoperability—how often agencies within PSAPs operate at incidents with other agencies across jurisdictional boundaries, within and between disciplines, and from outside of the PSAP’s own service area. Finally, the survey examined the level to which this interoperability capacity is exploited, and why.

1. Voice Interoperability Capability

Capacity for voice interoperability was established through an examination of voice communication capabilities of agencies served by the PSAP. Abilities to communicate between disciplines, among disciplines, and between agencies were determined both for agencies within the PSAP and agencies from other PSAPs. Results are shown in Figures 2 and 3.

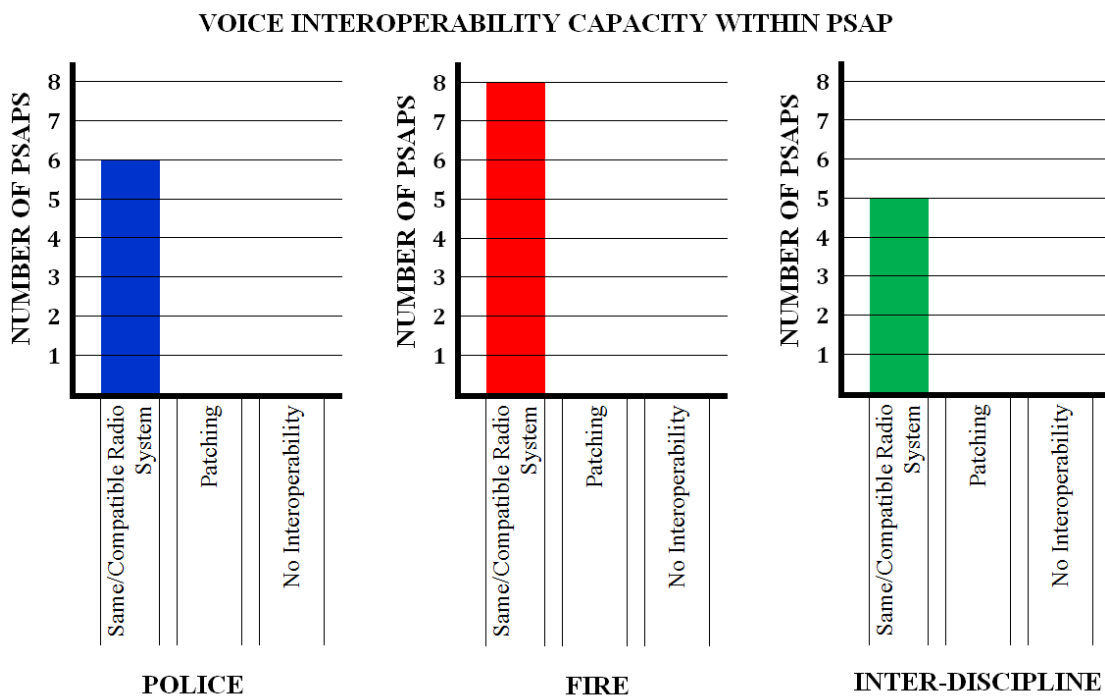


Figure 2. Survey results indicating voice interoperability capacity between different police agencies, different fire agencies and between police and fire agencies served by the PSAP

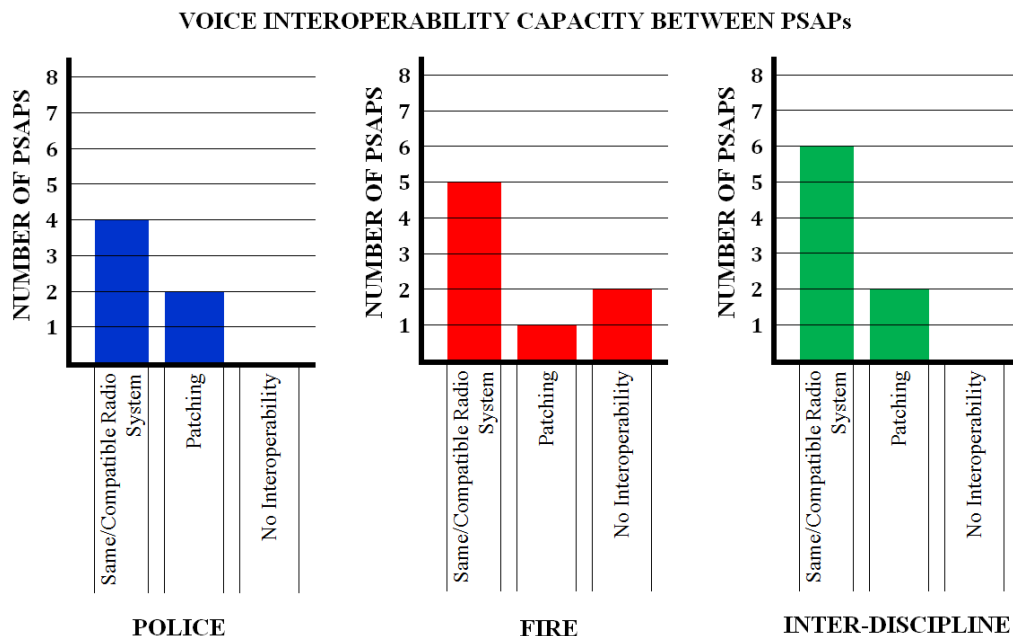


Figure 3. Survey results indicating voice interoperability capacity between different police agencies, different fire agencies and between police and fire agencies served by different PSAPs

Results show that each of the PSAPs surveyed enjoys a high level of voice interoperability, consistent with the prevailing wisdom: each PSAP boasts a common radio system that allows full voice interoperability between all disciplines and agencies served by the PSAP. In fact, in most cases radio interoperability within and between disciplines extends to neighboring PSAPs as well, whether due to sharing the same radio system or the ability to patch systems, with the exception of LACoFD, which must have a “loaner radios” for working with certain jurisdictions. However, overall, the PSAPs surveyed have the equipment and technology necessary to achieve unit-to-unit and person-to-person voice communications regardless of jurisdictional boundary or discipline. In most cases, the radios are intrinsically able to accomplish this without additional efforts such as patching.

2. Frequency of Functional Interoperability

The survey sought to determine how often voice interoperability was capable of being exercised by assessing how often different agencies at the PSAP had the

opportunity to operate at incidents together across discipline and jurisdictional lines. These opportunities included both routine incidents (defined as those incidents that occur regularly or require less than three units and less than one hour to mitigate) and less-routine incidents (defined as incidents that require more than three units and one hour to mitigate) to assess the frequency of functional interoperability.

As seen in Figures 4 and 5, survey responses indicate that interaction between agencies across disciplines, jurisdictional boundaries, and between PSAP service areas occur regularly. This is true of both routine incidents and less-routine incidents.

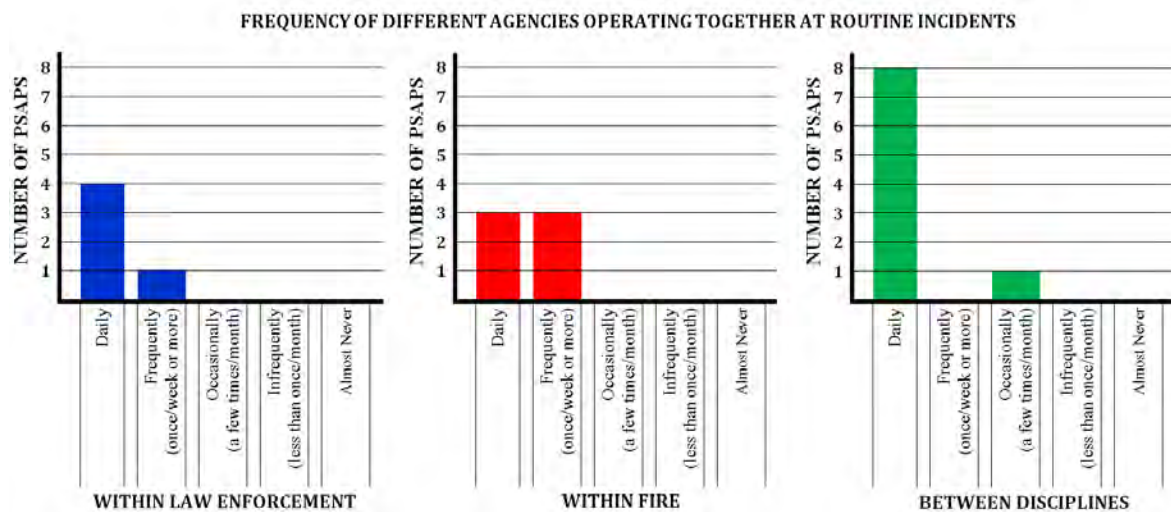


Figure 4. Survey results indicating the frequency with which different agencies operate together at routine incidents

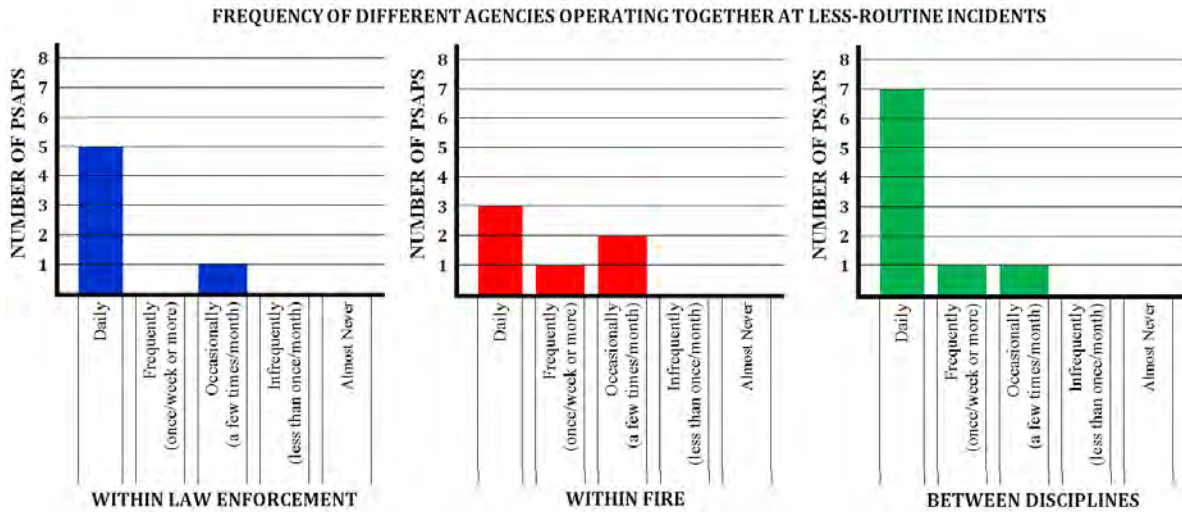


Figure 5. Survey results indicating the frequency with which different agencies operate together at less-routine incidents

3. Realization of Interoperability Capacity

Respondents were asked how often the interoperability capacity identified was exercised. In addition, the survey focused on the frequency with which interoperable communication was exercised on incidents routine and less-routine in nature, both between and within disciplines (see Figures 6 and 7).

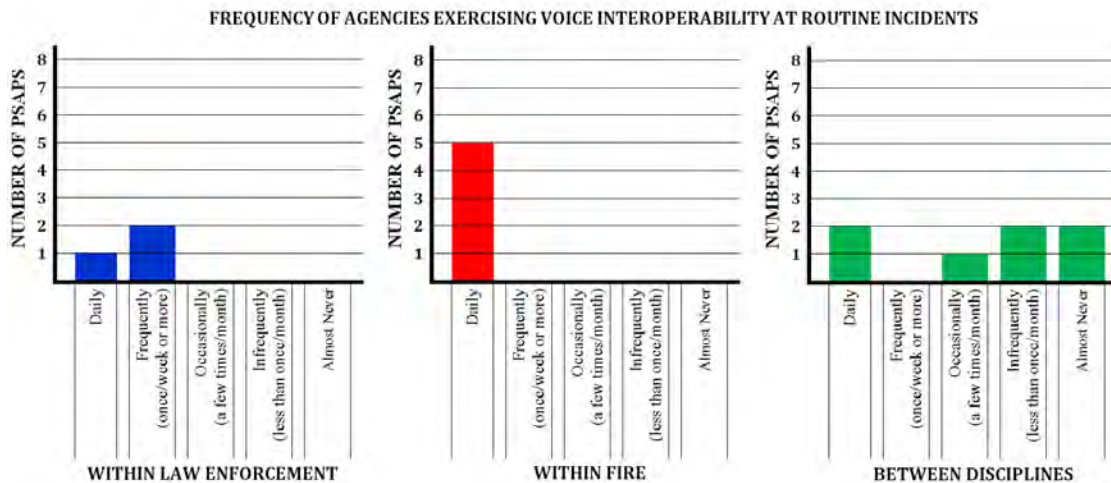


Figure 6. Survey results indicating the frequency with which agencies exercise their interoperability capacity at routine incidents

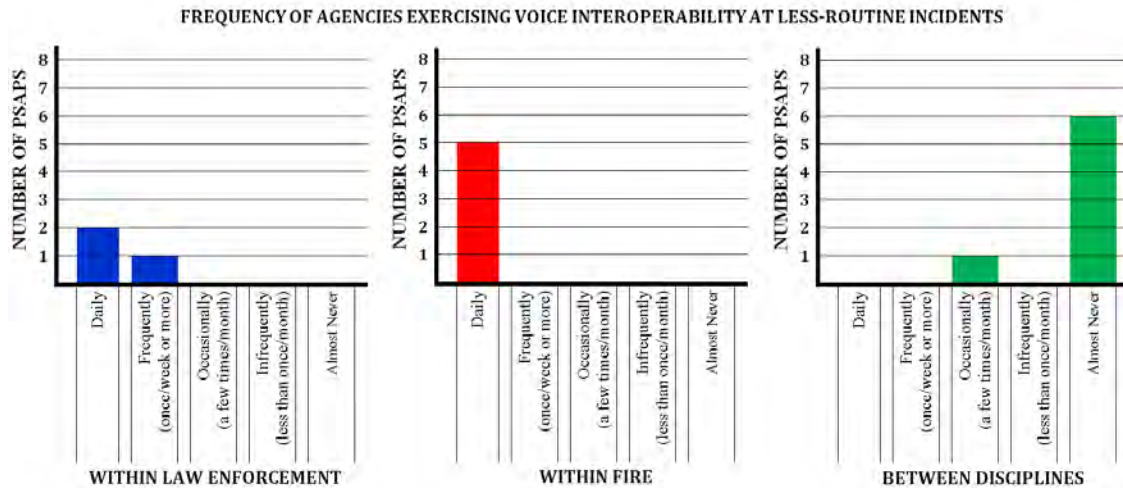


Figure 7. Survey results indicating the frequency with which agencies exercise their interoperability capacity at less-routine incidents

The survey results indicated divergence in how often and under what circumstances interoperability capacity was exploited. The responses show that while voice interoperability capacity was exercised on a regular basis within disciplines, it was rarely exploited between disciplines. Respondents were also asked to identify reasons that an identified interoperability capacity was not utilized; the results are demonstrated graphically in Figures 8 and 9.

Each PSAP director surveyed was told to select as many reasons as he or she felt applied to explain why interoperability was not exercised and was given the option to comment on other reasons not listed. A small number of directors indicated that training issues and organizational culture were impediments to interoperable communications; however, the majority of the responses indicated that it was the lack of utility that drove the lack of implementation. Responses most often selected indicated that the PSAPs chose to avoid inter-discipline interoperability because it was not necessary. This is in sharp contrast to intra-discipline interoperability, in which interoperability was the de facto mode.

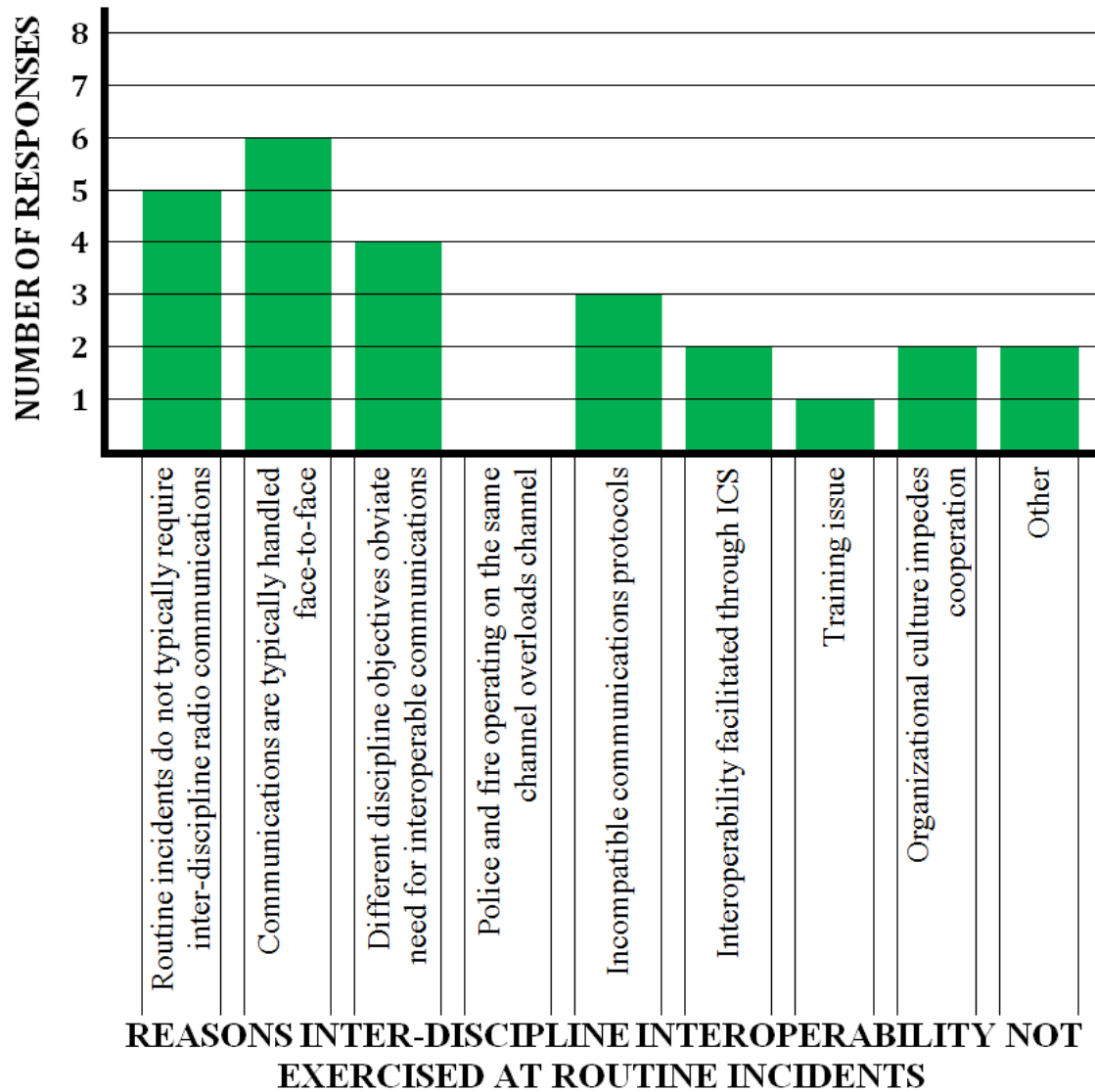


Figure 8. Survey results indicating the reasons inter-discipline interoperability capacity was not exercised at routine incidents

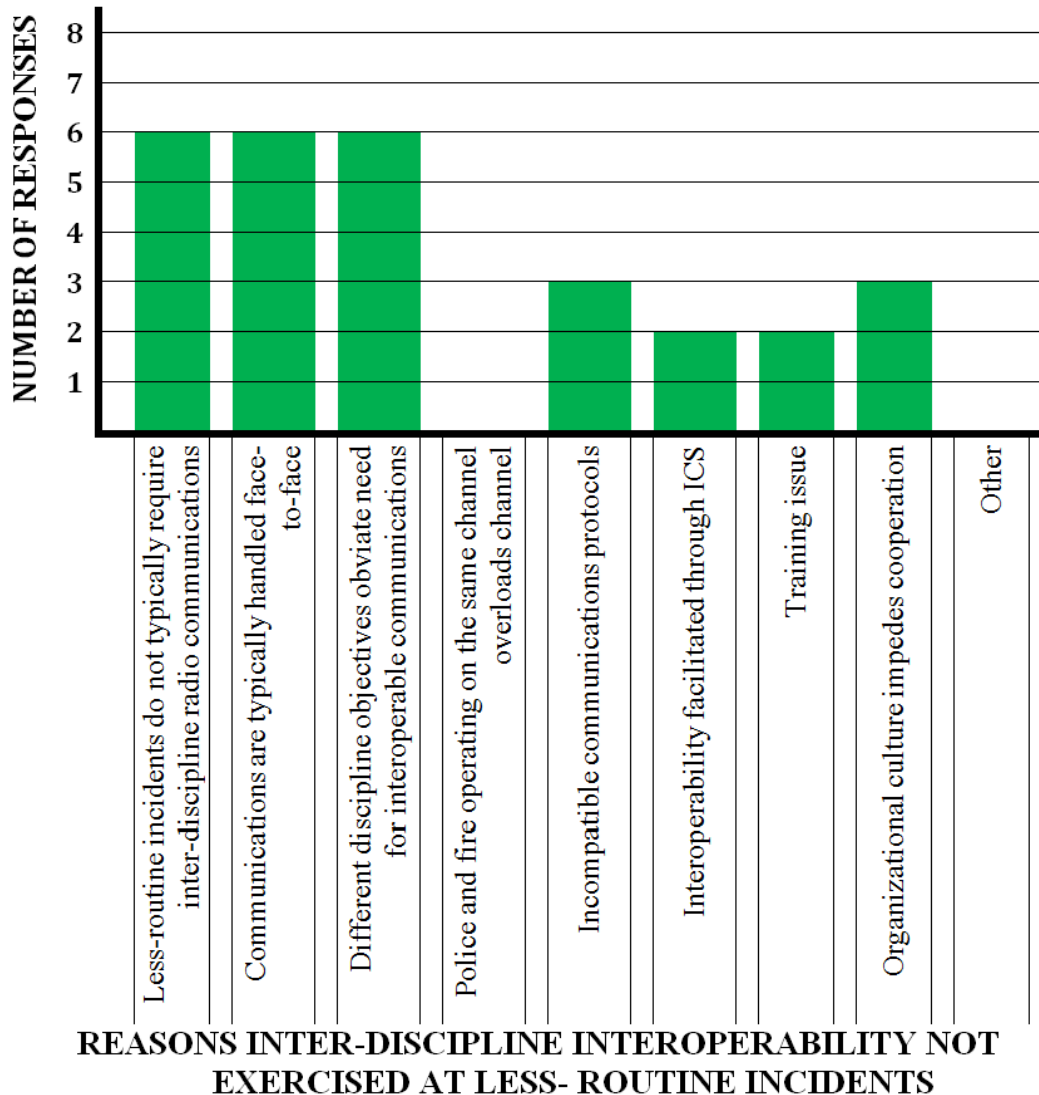


Figure 9. Survey results indicating the reasons inter-discipline interoperability capacity was not exercised at less-routine incidents

D. ANALYSIS OF SURVEY FINDINGS

In brief, the PSAP survey findings indicate the following:

- PSAPs surveyed have a high capacity for voice interoperability, including inter- and intra-discipline, inter-agency, and inter-PSAP
- At routine and non-routine incidents, surveyed PSAPs have ample opportunity to exercise their interoperability capacity including inter- and intra-discipline, inter-agency, and inter-PSAP

- Surveyed PSAPs exercise their capacity for voice-interoperability regularly within a given discipline; however, the capability is rarely exercised between disciplines.
- Surveyed PSAPs predominately cited reasons indicating the lack of usefulness to explain their choice to not exercise inter-discipline interoperability

1. Voice Interoperability Capability

The capacity for interoperability exhibited by all surveyed PSAPs correlates with the prevailing wisdom on the subject, which is crystalized in the DHS *National Security Communications Plan* of 2008. The plan describes its vision “is to ensure emergency response personnel at all levels of government and across all disciplines can communicate as needed, on demand, and as authorized, through improvements in communications operability, interoperability, and continuity nationwide.”¹²⁴

The DHS SAFECOM program Interoperability Continuum (see Figure 10) was developed to enable emergency response agencies and policy makers to plan and implement voice and data interoperability systems. It shows that several of the surveyed PSAPs, thanks to a common radio system with daily usage, operate at the highest levels on the “technology” and “usage” fields. Interoperability capacity does not appear to be an issue among the surveyed PSAPs.

¹²⁴ Department of Homeland Security, *National Emergency Communications Plan*, 2.



Interoperability Continuum

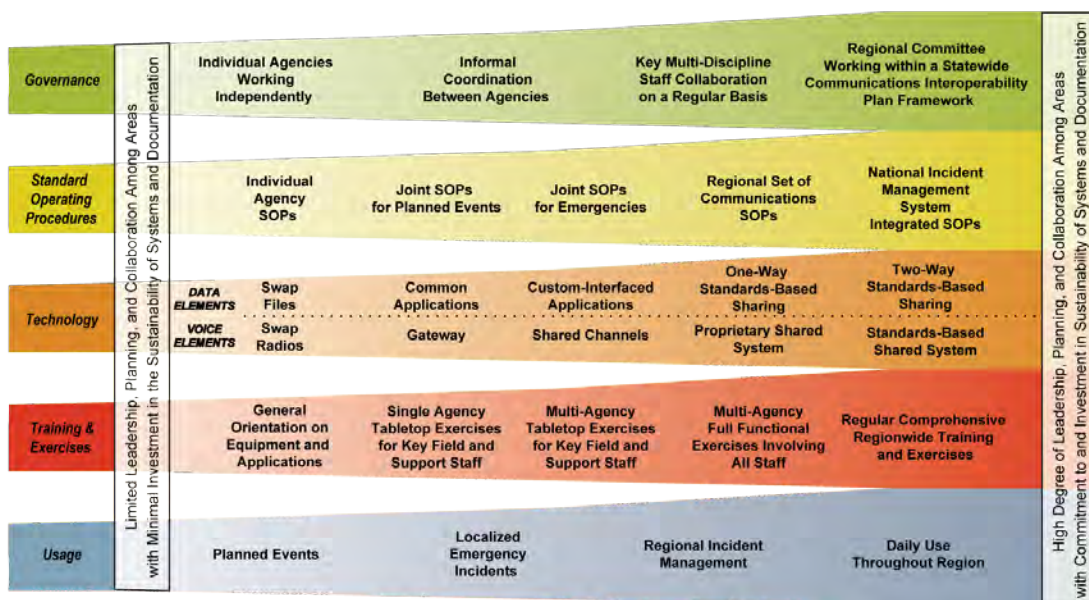


Figure 10. SAFECOM Interoperability Continuum¹²⁵

2. Functional Interoperability

As demonstrated by the 9/11 attacks, the Oso mudslide in Washington, the Boston Marathon bombing, and other large incidents, homeland security events are likely to be multi-jurisdictional and multi-discipline in nature, and interoperability will be a key success indicator in responding to them. However, interoperability and the ability to collaborate does not magically appear when such incidents occur; agencies and disciplines working together in more routine incidents provide the groundwork for collaboration in regional events. This concept is well illustrated by the response to the Pentagon on 9/11.

The PSAPs surveyed are well situated to take advantage of this concept. The survey results show that the PSAPs involved are provided and take advantage of ample opportunities to exercise functional interoperability on a variety of incident types across

¹²⁵ "SAFECOM Interoperability Continuum," Statewide Interoperability Executive Committee, accessed May 3, 2014, <http://siec.utah.gov/safecom/index.html>

municipal borders and between and among disciplines. Most survey respondents indicated such opportunities are presented on a daily basis.

3. Realization of Interoperability Capacity

As noted above, interoperable capability and the opportunity to put it to use does not appear to be an issue for the PSAPs that participated in this survey. Yet, that capability is maximized when intra-discipline (e.g., fire-to-fire, law enforcement-to-law enforcement) opportunities present themselves and rarely utilized when inter-discipline prospects transpire, even though both opportunities occur on a daily basis.

An examination of the reasons why this capacity is not applied indicates that it is not perceived as necessary. The capability could be realized, but is not deemed beneficial—in effect, it is underutilized by choice. As one PSAP official surveyed noted,

Interoperability between police and fire has been portrayed as a technology solution. But the reality is it is a solution for a problem that doesn't really exist. The fact is, cops and firemen don't have a lot to say to each other tactically.¹²⁶

Two PSAPs (Denver and LACoFD) do, in fact, host law enforcement and fire disciplines on the same radio channel (see Figure 6). Denver 911 situates all responders on a common operating channel. However, this seems more for the purpose of facilitating situational awareness rather than communicating tactically. As Denver 911 Executive Director Carl Simpson explains, “when both police and fire are operating tactically, they are placed on different channels.”¹²⁷

LACoFD also communicates via radio with its law enforcement partners on a daily basis, according to Firefighter Stephen Weston.¹²⁸ LACoFD has a specific interoperable channel for coordination of fire and law enforcement activity. When LACoFD units are waiting for a potentially violent scene to be secured or wish to request law enforcement at a scene, they can switch to this joint channel and speak directly to the

¹²⁶ Anonymous, personal communication with the author, July 14, 2014.

¹²⁷ Carl Simpson, personal communication with the author, July 14, 2014.

¹²⁸ Stephen Weston, personal communication with the author, July 14, 2014

law enforcement PSAP to do so. At extremely large incidents, this channel is sometimes used as an adjunct to the Incident Command System to coordinate activities between disciplines. However, this is a specific, additional channel—tactical police and fire communications at incidents are kept on their respective, discipline-specific channels.¹²⁹

Thus, even the graph describing frequency of inter-discipline interoperable voice communications (Figure 6) is misleading—even though two respondents indicated they employed inter-discipline communications daily, the fact is that when each discipline has ongoing tactical communications, they stay on their respective channels. As a Santa Cruz Regional 9-1-1 Administrative Supervisor noted on a survey response,

Firefighters and police officers speak a different language (even though all agencies are plain text in our jurisdiction) and often feel that they don't have the knowledge of each other's radio channels to "break in" on a radio channel that is not specifically their own. They also struggle with the cultural knowledge of when it's appropriate to speak and when it's best to not be on the radio. Given that we are a consolidated communications center, it is just as fast and easy for them to use dispatchers to facilitate their communication.¹³⁰

A Seattle Police communications supervisor notes that the only time Seattle Police speak to Seattle Fire on the same tactical channel is at ship fires or water rescues in which a police boat is being used as a firefighting or rescue platform.¹³¹ This may be the exception that proves the rule, as this is a rare case of police and firefighters operating together on the same task with the same function. Because police officers are actually performing the work of firefighters in these instances (fire suppression and rescue), they are actually operating within the same discipline when sharing a tactical radio channel.

E. CONCLUSION

Chapter III suggested that in theory, intra-discipline interoperability had more value than inter-discipline interoperability. This chapter's survey of PSAPs indicates that, despite adhering to the prevailing wisdom regarding interoperability in terms of

¹²⁹ Stephen Weston, private conversation with the author, July 14, 2014.

¹³⁰ Marsha MillerAyers, survey response, August 11, 2014.

¹³¹ Karen Shilling, personal communication with the author, August 11, 2014.

developing capability across disciplines, in practice, intra-discipline interoperability was indeed given much more weight. This is not due to the fact that such communications were not possible, but because it is not useful. The PSAPs surveyed enjoy the capability and daily opportunity to engage in inter-discipline interoperable communications but choose not to—contrasting sharply with the fact that they take almost every opportunity to take advantage of interoperability within disciplines.

In light of these findings, Chapter V will explore a hypothetical amalgamation of PSAPs in King County, Washington, which is currently undergoing a consolidation assessment. A single-discipline consolidation model will be contrasted with a multi-discipline model to examine the potential benefits of each.

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V. KING COUNTY, WASHINGTON: POTENTIAL MODELS FOR INTER- AND INTRA-DISCIPLINE CONSOLIDATION

A. INTRODUCTION

Chapters IV focused on how a national cross-section of PSAPs of various models managed interoperability. This chapter will use those lessons as a framework for a potential consolidation of PSAPs in King County, Washington, to see how interoperability might be facilitated in single-discipline and multi-discipline models.

B. KING COUNTY 9-1-1 SYSTEM: BACKGROUND

King County encompasses 2115 square miles on the eastern shore of Puget Sound in the state of Washington.¹³² It is the state's most populous county with just over two million people.¹³³ The county is home to 39 incorporated cities, the largest of which include Seattle (population: 634,535),¹³⁴ Bellevue (126,439),¹³⁵ and Kent (122,999).¹³⁶

King County currently has 12 PSAPs, which serve 59 agencies (see Table 13), with oversight by the King County 9-1-1 Program Office. This complement of PSAPs consists of two large multi-discipline PSAPs, one small multi-discipline PSAP, three small single-discipline consolidated PSAPs, and six single agency PSAPs. These PSAPs are widely divergent in size and volume of calls received (see Table 14)—the busiest six PSAPs handle approximately 97 percent of King County's 9-1-1 calls.

Each PSAP has redundant systems for continuity of operations, as well as a defined alternate location from which to operate should their primary facility become compromised. In each case, this back up facility is one of the other King County PSAPs.¹³⁷

¹³² "State and County QuickFacts: King County, Washington," United States Census Bureau, last modified July 8, 2014, <http://quickfacts.census.gov/qfd/states/53/53033.html>

¹³³ Ibid.

¹³⁴ Ibid.

¹³⁵ Ibid.

¹³⁶ Ibid.

¹³⁷ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 5–4.

Table 13. King County PSAP names, type and number/discipline of agencies served¹³⁸

KING COUNTY PSAP	TYPE	AGENCIES	
		POLICE	FIRE
Bothell Police Department	Single discipline	2	
Enumclaw Police Department	Multi discipline	1	1
Issaquah Police Department	Single discipline	2	
King County Sheriff	Single Agency	11	
North East King County Regional Public Safety Communication Agency (NORCOM)	Multi discipline	5	15
Port of Seattle Police Department	Multi discipline	1	1
Redmond Police Department	Single discipline	3	
Seattle Police Department	Single Agency	1	
University of Washington Police Department	Single Agency	1	
Valley Communications Center (Valley Com)	Multi discipline	9	13
Washington State Patrol	Single Agency	1	
Seattle Fire Alarm Center	Single Agency		1

Table 14. King County PSAP Call Volume (2011)¹³⁹

KING COUNTY PSAP BY CALL VOLUME	9-1-1 CALL VOLUME		
	TOTAL	POLICE	FIRE
Seattle Police Department	523,021	523,021	
Valley Communications Center	439,320	305,206	85,450
King County Sheriff	331,966	331,966	
Washington State Patrol	246,910	246,910	
North East King County Regional Public Safety Communication Agency (NORCOM)	151,391	97,579 ¹⁴⁰	53,812 ¹⁴¹
Seattle Fire Alarm Center	82,495		82,495
Redmond Police Department	20,568	20,568	
Bothell Police Department	14,829	14,829	
Issaquah Police Department	10,818	10,818	
Port of Seattle Police Department	13,508	8658	4850
Enumclaw Police Department	4184	2307	1877
University of Washington Police Department	3763	3763	

¹³⁸ All numbers from GeoComm, *King County, Washington PSAP Consolidation Assessment*.

¹³⁹ Ibid.

¹⁴⁰ North East King County Regional Public Safety Communication Agency, *2011 Annual Report* (Bellevue, WA: North East King County Regional Public Safety Communication Agency, 2012), <http://www.norcom.org/docs/misc/2012%20Final%20Annual%20Report.pdf>, 8.

¹⁴¹ Ibid.

1. King County 9-1-1 Program Office

The King County 9-1-1 Program Office is a unit of the King County Office of Emergency Management (OEM) responsible for the provision of E9-1-1 service within its jurisdiction, and is financially supported through an E9-1-1 tax levied upon subscribers of wireline, wireless, and voice over Internet protocol (VoIP) communication services.¹⁴² In turn, the King County 9-1-1 Program Office financially supports the county's 12 PSAPs through providing and maintaining the E9-1-1 system, funding for system staff support, and a partial distribution to the local PSAPs of the E9-1-1 excise tax levied by the county. Governance is through the *King County Enhanced 9-1-1 Participation Agreement* between the 12 PSAPs and the King County 9-1-1 Program Office. This agreement prioritizes how excise tax revenue is to be disbursed. Those priorities are:¹⁴³

- Purchase and maintain PSAP equipment including upgrades required for NG9-1-1
- Defray the costs of operations payable to the telephone companies as defined in 9-1-1 tariffs and service agreements
- Pay for the costs for 9-1-1 program administration, risk management and PSAP insurance
- Defray costs associated with PSAP consolidation
- Contribute to costs associated with county approved PSAP support staff
- Defray operational and equipment costs for PSAP operations

While the King County 9-1-1 Program Office expends funds on system administration and overhead, public education, and a reserve fund, the vast majority of the funds are devoted to the 9-1-1 system infrastructure or disbursed to the PSAPs. In addition, 42 percent of expenditures go to 9-1-1 infrastructure, such as network databases and equipment, and nearly 44 percent is distributed among the PSAPs for training, equipment, and technical support.¹⁴⁴

¹⁴² GeoComm, *King County, Washington PSAP Consolidation Assessment*, 3–5.

¹⁴³ Ibid.

¹⁴⁴ Ibid., 3–6.

2. King County 9-1-1 Voice and Data Interoperability

According to a study performed in 2012 by GeoComm, a firm with extensive public safety and PSAP consulting experience, “interoperability functionality is at a high level in and among the King County PSAPs.”¹⁴⁵ The King County 9-1-1 system functions at a high level of interoperability both PSAP-to-PSAP and agency-to-agency via radio and CAD technology.

a. Radio Interoperability

With the exception of two PSAPs that use unique radio systems in daily operations, King County PSAPs and the agencies they represent enjoy a high level of voice interoperability. This is provided by the King County Regional Radio System, an 800 MHz trunked radio system employed by 10 of 12 King County PSAPs, consisting of 27 transmitter sites and multiple interconnecting microwave and fiber systems. The system encompasses approximately 14,000 radio users countywide, including police, fire, EMS, school districts, utility operators and other government functions.¹⁴⁶ This includes a dedicated PSAP to PSAP radio channel to facilitate communications among dispatch centers in the King County 9-1-1 system.

In line with the prevailing wisdom regarding intra- and inter-disciplinary interoperability, the system provides voice communication between all agencies that utilize it and provides a “robust complement of shared talk-groups for use during incidents when interoperability is necessary for long periods of time.”¹⁴⁷ On SAFECOM’s Interoperability Continuum (see Figure 10, Chapter IV), developed to enable emergency response agencies and policy makers to plan and implement voice and data interoperability systems, GeoComm ranked King County at Level 4 (of 5 levels) on the voice elements lane of the *Technology* scale. A proposed radio replacement project that incorporates a P25 phase two-trunked would move that ranking to Level 5.¹⁴⁸ Due to

¹⁴⁵ Ibid., 5–8.

¹⁴⁶ “Radio Communication Services,” last updated April 9, 2012, King County, <http://www.kingcounty.gov/operations/it/it-services/radio.aspx>

¹⁴⁷ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 5–1.

¹⁴⁸ Ibid.

the fact that the King County Regional Radio System is used daily throughout the county, it is rated at the highest level on the *Usage* scale as well.¹⁴⁹

The two dispatch centers that are not a part of the King County Regional Radio System are the Port of Seattle Police PSAP and the Washington State Patrol PSAP. The Port of Seattle PSAP dispatches for the Port of Seattle Fire Department at King County Airport and the Port of Seattle Police, which provides law enforcement services to the airport and seaport properties.¹⁵⁰ The port public safety agencies use an 800 MHz trunked system, which can be patched for direct communication with radios on the King County Regional System.¹⁵¹ Although it requires an extra step, interoperability with the rest of King County PSAPs is possible.

The Washington State Patrol is a statewide law enforcement agency and presently operates in King County using the same non-trunked VHF radio system that it uses statewide. The Washington State Patrol is in the process of transitioning to a P25 radio system that would be capable of operating on the King County regional system; however, implementation problems have delayed the project, and the Puget Sound region has not yet incorporated the new system.¹⁵² According to the GeoComm report:

Today, interoperability between the State Patrol and other regional agencies is primarily achieved through messages relayed by dispatchers and face-to-face contact at the scene of the incident. In a few cases regional PSAPs have VHF conventional channels the patrol units can use to contact them.¹⁵³

b. Data Interoperability

A regional CAD Interoperability Project is underway in King County in order to allow data sharing among the region's various CAD systems, which will require the

¹⁴⁹ Ibid.

¹⁵⁰ "About the Port," Port of Seattle, accessed May 3, 2014, <http://www.portseattle.org/About/Public-Safety/Police-Department/Pages/default.aspx>

¹⁵¹ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 5–2.

¹⁵² Greg Gordon and Lydia Mulvany, "Motorola Systematically Builds Emergency Radio Stranglehold," *The News Tribune*, April 8, 2014, <http://www.thenewstribune.com/2014/04/08/3138351/motorola-systematically-builds.html>

¹⁵³ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 5–2.

upgrade of a regional CAD data switch. The King County 9-1-1 office will contract for the upgrade of this regional switch, but because there are multiple CAD systems in use, individual PSAPs will be responsible to coordinate with their CAD vendor to develop and implement an interface between their CAD system and that switch. If completed, the CAD Interoperability Project will provide data interoperability reaching the Level 3 on the *Data Elements* lane of SAFECOM Interoperability Continuum's *Technology* scale (see Figure 10).¹⁵⁴

3. King County 9-1-1 Consolidation Assessment

In 2011, the King County 9-1-1 Program Office began seeking “an experienced, qualified firm to provide a high quality professional PSAP consolidation assessment of the King County E-911 system.”¹⁵⁵ The stated goal of the assessment was “to evaluate whether the current PSAP configuration is providing the most efficient and effective emergency communications services possible to the public.”¹⁵⁶ The means to that goal were presented as the reasons the assessment was conducted:

- Reducing the number of 9-1-1 call transfers¹⁵⁷
- Projected costs of NG911 (Next Generation 911) implementation¹⁵⁸
- Reduction of King County E911 funding demands¹⁵⁹

¹⁵⁴ Ibid., 5–4.

¹⁵⁵ “PSAP Consolidation Assessment of the King County E-911 System,” National Emergency Number Association, accessed May 1, 2014, http://www.nena.org/m/feed_detail.asp?id=16078&mid=694406

¹⁵⁶ Marlys Davis, *Memo to Readers of GeoComm's Existing Conditions and Final Recommendations Reports*, King County, July 26, 2013, [www.kingcounty.gov, http://www.kingcounty.gov/~media/safety/E911/documents/GeoComm_PSAP_consolidation_Assesment.ashx](http://www.kingcounty.gov/~media/safety/E911/documents/GeoComm_PSAP_consolidation_Assesment.ashx)

¹⁵⁷ Ibid.

¹⁵⁸ Davis, *Memo to Readers of GeoComm's Existing Conditions.*

¹⁵⁹ King County E911 Program Office, “King County PSAP Consolidation Assessment and PSAP Future Configuration Recommendation Process” [presentation], King County, September 2013, [kingcounty.gov/~media/safety/E911/documents/Final_Assesment_Presentation_9-23-13.ashx](http://www.kingcounty.gov/~media/safety/E911/documents/Final_Assesment_Presentation_9-23-13.ashx)

a. *Reducing the Number of 9-1-1 Call Transfers*

Transfer calls, by their very nature, increase the processing time of a 9-1-1 call, whether they are a result of a call to the wrong jurisdiction or to a secondary PSAP. Not only does the physical act of transferring the call take time, but information obtained by the original call taker must be obtained again by the call taker taking the transfer.¹⁶⁰ Consolidation, by reducing the number of PSAPs or eliminating secondary PSAPs, would reduce the number of transfers, thus rendering more efficient service.

b. *Projected Costs of NG911 Implementation*

The current 9-1-1 system was designed to provide one service: provide a single answering point for the human voice via telephony. According to NENA,

In the past 15 years, advancements in modern communications technology have created the need for a more advanced system to access emergency care. While the existing 9-1-1 system has been a success story for more than 30 years, it has been stretched to its limit as technology advances.¹⁶¹

The future of 9-1-1, known as Next Generation 9-1-1 (NG9-1-1), will enable PSAPs to receive emergency text messages, images and video (including those from American Sign Language users), as well as access telematics data, medical information and other data.¹⁶² It is difficult to determine the cost impact of NG9-1-1 on PSAP technology budgets since many of the details about how NG9-1-1 will be implemented at the national, state, and regional levels are still unresolved.¹⁶³ However, NG9-1-1 will require a system comprised of hardware, software, data, and new demands on call-takers to implement, which will require a corresponding increase in costs in installation and maintenance. The more PSAPs that require these products and services, the greater the cost will be.

¹⁶⁰ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 1–8.

¹⁶¹ “NG9-1-1 Project,” National Emergency Number Association, accessed May 8, 2014, http://www.nena.org/?NG911_Project

¹⁶² “What is NG9-1-1?” National Emergency Number Association, accessed May 8, 2014, http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/ng9-1-1_project/whatisng911.pdf

¹⁶³ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 2–6.

NG9-1-1's demand on call takers will disproportionately affect smaller PSAPs, as noted by GeoComm:

NG9-1-1 will, in fact, significantly influence and push the need for smaller agencies to consider consolidation, at least for some of the services they provide. Smaller agencies will likely not be in a position to replace equipment or hire and train additional staff, especially if the support funding from KCE9-1-1 is not available. This factor could impact the viability of the small PSAPs significantly.¹⁶⁴

c. King County 911 Funding Demands

With regard to King County funding for PSAPs, the GeoComm report states, "PSAPs in King County are well funded when compared to other agencies across the country."¹⁶⁵ As noted above, nearly 44 percent of the King County 9-1-1 Program Office's expenditures are disbursed for direct PSAP support. However, with the duplication of equipment, training and technology of each PSAP, there is some question whether the model is financially sustainable in the future, particularly with the advent of the NG9-1-1 upgrade. In the event the money disbursed directly to the PSAPs had to be reduced, it is questionable whether the smaller PSAPs could overcome the economic impact.

C. THE FUTURE OF KING COUNTY 9-1-1

King County 9-1-1 is seriously considering consolidation of its PSAPs as evidenced by its contract with GeoComm, which produced an *Existing Conditions Report* in 2012 and a *Final Recommendations Report* released in June of 2013. The reports determined not only that consolidation was feasible, but provided recommendations for how that consolidation should be carried out.

Given the serious consideration to consolidation in King County, a hypothetical case study of how consolidation may function under a multi-discipline PSAP model and a single-discipline model may be useful in determining which would most further interoperability. GeoComm's *Final Recommendations Report* contained several models

¹⁶⁴ Ibid., 15.

¹⁶⁵ Ibid., 3–16.

for consolidation, including one recommended as the “optimum model.”¹⁶⁶ Although the King County PSAP Consolidation Steering Committee indicates that the GeoComm report is “**not** a comprehensive implementation plan,”¹⁶⁷ it acknowledges that GeoComm’s report will be used “as the starting point for the next, [sic] decision-making phase that will develop a comprehensive plan.”¹⁶⁸ While the Steering Committee suggests that no consensus has been reached regarding the GeoComm report’s model, it will be used as a “framework for the implementation team.”¹⁶⁹ As of this writing, no other plan has been proffered.

Given that GeoComm’s “optimum model” is the only current consolidation plan under consideration (GeoComm’s alternate “Model B” shared nearly every key aspect of the “optimum plan”), the fact that it will be the springboard for any future plan and that it is a multi-disciplinary plan (as were all of the GeoComm models), make it worth exploring as the hypothetical multi-disciplinary model for this case study. It will be contrasted with a potential single-discipline model, using the following methodology:

- The GeoComm *Existing Conditions Report* and *Final Recommendations Report* represent a snapshot in time from 2011. Data from these reports was used in the formulation of the GeoComm “optimum plan” for consolidation. For consistency’s sake, the same data will be used for the single-discipline model.
- In some instances and due to a variety of reasons, call volume calculations and other numbers in the GeoComm reports differ from the official annual reports of the individual PSAPs. Again, in the interests of consistency, numbers from the GeoComm reports will be utilized in analyzing both models.
- The costs involved in the GeoComm report would also need to be updated in any comprehensive consolidation implementation effort. That said, the costs as written in the GeoComm report for 2011 will be applied to both models for purposes of comparison.

¹⁶⁶ GeoComm’s *Final Recommendations Report*, 6–1.

¹⁶⁷ Davis, *Memo to Readers of GeoComm’s Existing Conditions*.”

¹⁶⁸ Ibid.

¹⁶⁹ Ibid.

- According to the GeoComm reports, the University of Washington Police PSAP and the Port of Seattle Police PSAP, due to their populations served and unique requirements, “make them challenging partners for a consolidation with any existing traditional PSAP and would present new challenges if they combined.”¹⁷⁰ Similarly, the Washington State Patrol PSAP “as a component of a state agency has a very focused service area and function which is not enhanced by consolidation with local government agencies.”¹⁷¹ To maintain cost comparisons and because these PSAPs do not interfere with the single-discipline model theory, the same restrictions were placed on the single-agency model presented.

D. KING COUNTY PSAP CONSOLIDATION MODEL: A PLAN FOR MULTI-DISCIPLINE PSAPS

The optimum model for PSAP consolidation as recommended by GeoComm in its final recommendations report consisted of amalgamating King County’s 12 PSAPs into three multi-discipline centers and three smaller centers as follows (see Table 15):

- Seattle Police and the Fire Alarm Center combine as a civilian-staffed combined PSAP as an independent city department
- Enumclaw Police combining with Valley Com
- Consolidation of NORCOM, Bothell, Issaquah, and Redmond into the King County Sheriff’s Office
- Washington State Patrol transitions to a secondary PSAP
- University of Washington Police and the Port of Seattle remain unchanged

¹⁷⁰ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 1–8.

¹⁷¹ Ibid.

Table 15. GeoComm consolidation plan. Figures calculated from those in Table 2.

CURRENT PSAPs	GEOCOMM "OPTIMUM PLAN"	POLICE AGENCIES	FIRE AGENCIES	NEW CALL VOLUME
Seattle Fire Alarm Center	New city department	1	1	605,518
Seattle Police Department		523,021	82,495	
Valley COM		10	14	443,504
Enumclaw Police Department		307,513	87,327	
NORCOM	New entity at King County Sheriff's Office	23	15	529,572
King County Sheriff				
Redmond Police Department				
Bothell Police Department				
Issaquah Police Department		475,760	53,812 ¹⁷²	
Washington State Patrol	Becomes a secondary PSAP	1		246,910
University of Washington Police Department	No change	1		3763
Port of Seattle Police Department	No change	1	1	8658

1. Compliance with Stated Goals of County 9-1-1 Consolidation Assessment

The King County 9-11 Program Office had three goals in its consideration of consolidation, including reducing the number of 9-1-1 call transfers, mitigating projected costs of next generation 9-1-1 implementation, and creating a sustainable funding system for the King County 9-1-1 system. The GeoComm optimum model makes inroads on each of these goals.

a. Reduction of 9-1-1 Call Transfers

By reducing the number of PSAPs, the number of transfers from one PSAP to another will be reduced simply because more jurisdictions will be housed under the same roof. Wireless calls in particular can reach a PSAP outside the jurisdiction in which the call originated. By bringing the 26 of the county's 30 agencies into three large PSAPs instead of the nine in which they currently reside, transfers will be reduced and processing times for those calls will be lessened.

¹⁷² North East King County Regional Public Safety Communication Agency, 2011 Annual Report, 8.

Transfers by design will be reduced, particularly in the City of Seattle because the Fire Alarm Center is a secondary PSAP, and each one of its more than 80,000 calls by design necessitates a transfer from Seattle Police. Although the delay is only seconds, it does require a duplication of effort by call takers at each PSAP. By consolidating these operations, this issue would be eliminated.

The optimum model also has the Washington State Patrol (WSP) PSAP transitioning from a primary PSAP to a secondary PSAP. As a state agency, the jurisdiction of WSP is the entire state of Washington. Typically, state troopers patrol and respond to incidents on interstates and state highways, where they bear primary responsibility regardless of municipality.¹⁷³ Regardless, the geography of their jurisdiction overlaps all other jurisdictions. Due to the nature of wireless calls and the proximity of cellular towers to freeways, wireless calls intended for the State Patrol are routed to other PSAPs and vice versa and require a transfer. The King County 9-1-1 Program statistics show that such transfers are required on less than 2 percent of WSP calls.¹⁷⁴ By recommending that the WSP become a secondary PSAP, however, the “optimum plan” creates a situation in which each of the more than 250,000 calls received there will be transfers, which represents an overall increase in the number of transferred calls.

b. Projected Costs of NG911 Implementation

Since NG9-1-1 will require a system of hardware, software, and data, there will a corresponding increase in costs in installation and maintenance. By reducing the number of PSAPs from 12 to 6, the “optimum plan” will reduce those costs correspondingly. King County 9-1-1 will only have to support this technology in half the PSAPs it would under the current operational model. However, the hard costs of technology and maintenance are only part of the story.

¹⁷³ “Revised Code of Washington, 47.52.210: Law Enforcement Jurisdiction within City or Town,” Washington State Legislature, accessed September 10, 2014, <http://apps.leg.wa.gov/rcw/default.aspx?cite=47.52.200>

¹⁷⁴ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 5–1, 5–2.

The addition of NG-911 features, such as receiving text, images, and other data, will place additional burdens on dispatchers and will impact their workload. As the GeoComm report states:

There is some concern that PSAPs will not be able to maintain the current level of service when NG9-1-1 is fully implemented. NG9-1-1 will make it challenging for a single position PSAP to handle both voice and non-voice calls. A single call taker/dispatcher will not be able to effectively process these two types of calls at the same time. The additional data that will be both available and sent to the PSAP with NG9-1-1 calls will need to be managed and handled. This additional information that is part of the NG9-1-1 call will clearly impact current PSAP staffing levels.¹⁷⁵

The larger PSAPs created by the optimum model,” with their greater staffing levels, will be better able to absorb this additional workload while still maintaining levels of service. Smaller PSAPs, such as the Enumclaw Police dispatch center, will be unlikely to be able to maintain performance once NG9-1-1 is implemented.

c. King County 911 Funding Demands

King County PSAPs receive revenue from King County 9-1-1, not only in direct financial support, but also for technical support, training, and equipment. This support represented 26 percent of the PSAP budgets in 2011.¹⁷⁶ This direct financial support is currently based on the number of 9-1-1 calls received; therefore, if the current funding model is continued, the support level will remain unchanged, as the total call volume for King County will be present regardless of the number of PSAPs. However, certain equipment is necessary to operate a PSAP regardless of size or call volume. By reducing the number of PSAPs from 12 to six, the amount of equipment to purchase, as well as the corresponding technical support required to maintain and upgrade it, is also reduced.

Consolidation also reduces the number dispatchers necessary in the system as a whole. This is primarily due to economy of scale and the reduction in duplication of supervisory and management staff. The Fire Alarm Center, which utilizes sworn firefighters as dispatchers, has higher average salaries than their civilian counterparts.

¹⁷⁵ Ibid., 2–12.

¹⁷⁶ Ibid., 2–5.

Since the “optimum plan” combines the Fire Alarm Center with the Seattle Police in a civilian PSAP, the additional costs of firefighters would be saved. Much is made of these savings in the GeoComm report; it concludes the optimum model results in a minimum estimated cost savings of \$2,899,946 annually in dispatcher salary costs alone.¹⁷⁷ However, this does not result in any financial savings to King County 9-1-1, which does not pay for dispatcher salaries; that cost is paid by the PSAP or the jurisdiction (such as the Seattle Fire Department) that employs them. Dispatcher salaries play no part in the sustainability of King County 9-1-1, and thus civilianization of fire dispatch does not impact King County 9-1-1 financially.

2. Other Potential Advantages of GeoComm Optimum Model

Larger PSAPs require a larger back-up facility to accommodate their larger on-floor staffing requirements. The optimum model provides each PSAP with a potential back-up center of similar size. Larger PSAPs also enable resources be pooled and utilized, such as equipment, staff, and training opportunities that may not be funded in a single PSAP.¹⁷⁸ Reducing the number of PSAPs from 12 to six also reduces King County 9-1-1’s span of control, which could lead to easier and increased oversight.¹⁷⁹ Finally, a larger PSAP has more operating personnel on the dispatch floor, and thus has more “surge capacity” than a smaller PSAP, which creates capability to more readily handle an event that creates a massive influx of 9-1-1 calls, such as a terrorist attack, earthquake, or air disaster.¹⁸⁰

3. Potential Disadvantages of GeoComm Optimum Model

The GeoComm “Optimal Model” is not without its disadvantages. For all the benefits of larger PSAPs, smaller PSAPs (and especially single agency PSAPs) provide more local control and are better able to reflect the goals of the jurisdiction or organization. Amalgamated PSAPs carry with them the burden of an amalgamated

¹⁷⁷ Ibid., 1–9.

¹⁷⁸ Ibid., 1–8.

¹⁷⁹ Ibid., 1–9.

¹⁸⁰ Ibid., 1–12.

governance structure, which can result in slow changes to policy or practices due to increased bureaucracy. Smaller jurisdictions also fear that their desires may be overshadowed by the needs of larger municipalities. These concerns are reflected in the GeoComm report:

Bothell, Redmond, and Issaquah are reluctant to participate in membership of NORCOM due to perceived inequity in decision-making. They have expressed a fear that as a smaller community and a late “joiner” to the NORCOM jurisdiction, they will not have a sufficient voice in its governance and policy, whereas today they have complete control over their own PSAP operation.¹⁸¹

Because they are staffed 24/7/365, PSAPs often provide a variety of ancillary functions for the agencies and municipalities they serve. GeoComm identifies these duties among PSAPs in King County as including, but not limited to, handling walk-in traffic for records and fingerprinting requests, jail business, issuance of concealed pistol licenses (CPLs), monitoring jail security cameras, answering after-hours administrative lines for other city departments, and answering panic and fire alarms.¹⁸² Some of these ancillary tasks are so ingrained in the culture of each PSAP that it may not even be realized that the practice is agency specific. However, consolidation may render many of these duties impossible in the new model. If so, an alternate means of performing these secondary duties must be found.

Political obstacles will be present in nearly any consolidation scenario, and it is not within the scope of this thesis to address each such difficulty. However, the GeoComm optimum model presents two hurdles that will have a financial and operational impact. In adding 12 new police agencies and 15 fire agencies representing more than 200,000 additional calls per year, The King County Sheriff PSAP will need to be reconfigured or redesigned to accommodate this growth, which would interrupt operations and incur costs.¹⁸³

¹⁸¹ Ibid., 2–4.

¹⁸² Ibid., 2–11.

¹⁸³ Ibid., 1–9.

Greater still will be the impact on the City of Seattle. The optimum model states that “the City of Seattle should design and build a suitable facility to accommodate the consolidated operations of police and fire/EMS communications”¹⁸⁴ under a new city department.¹⁸⁵ Creation of a new city department is no small undertaking, and building a new PSAP to house it would incur millions in costs. In addition, the city would have to vacate the state of the art facility that currently houses its Fire Alarm Center, King County’s newest PSAP, completed in 2008 at a cost of \$36 million (including attached Emergency Operations Center and Fire Station 10).¹⁸⁶ Since the proposed Seattle Police/Fire PSAP would be a civilian operation, Seattle’s firefighter/dispatchers would need to be reassigned to engine or ladder companies, which would incur training costs. In some cases, firefighter/dispatcher injuries would make their return to fire duty impossible, and they would simply be retired. In essence, GeoComm’s “Optimal Model” passes a tremendous financial and organizational burden on to the city of Seattle to achieve some of its efficiencies. Politically, this may be insurmountable.

4. Potential Effects on Interoperability

As discussed previously, King County already operates at a high level of voice interoperability through its regional radio system. However, multiple CAD systems are in use by the various PSAPs, and in fact, NORCOM uses different CAD systems for police and fire operations. NORCOM call takers must determine whether a call is for law enforcement or for fire/EMS services before they know which CAD system(s) to utilize for call processing.¹⁸⁷ By consolidating 12 PSAPs into six, fewer CAD variations will be present, which would better lay the groundwork for King County’s regional CAD interoperability initiative.

¹⁸⁴ Ibid.

¹⁸⁵ Ibid., 1–7.

¹⁸⁶ Pacific Coast Architecture Database, “City of Seattle, Fire Department (SFD) Station #10, Second Station, Pioneer Square, Seattle, WA,” Universtiy Libraries, University of Washington, accessed May 19, 2014, <https://digital.lib.washington.edu/architect/structures/5318/> id 5318

¹⁸⁷ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 2–21.

Operationally, all of Seattle’s emergency responders would be dispatched by a single PSAP. Their communications, status, and location would originate from the same facility, thus offering maximum inter-discipline interoperability for joint operations. Intra-disciplinary interoperability in Seattle would not be affected. The remainder of King County’s emergency responders would be split between two facilities, Valley Com and the King County Sheriff’s Office PSAP. Valley Com would absorb only the Enumclaw police and fire departments and would make insignificant gains in interoperability in south King County.

The King County Sheriff’s office, by adding 12 law enforcement agencies, would significantly improve intra-disciplinary interoperability among police agencies. Fire agencies would see no improvement, as they are currently already consolidated in NORCOM. Inter-disciplinary interoperability between police and fire would be greatly enhanced as 15 fire agencies would share communications, status, and location information with 11 law enforcement agencies they previously did not. The GeoComm report notes, “For incidents that require both a law enforcement and fire response, one PSAP is in a better position to effectively manage the incidents, with both police and fire disciplines receiving the exact same information at the exact same time.”¹⁸⁸

Interoperability between the PSAPs will not change, and joint responses between agencies of different PSAPs will not be affected. A list of advantages and disadvantages of the GeoComm “Optimal Plan” are shown in Table 16.

¹⁸⁸ Ibid., 5–2.

Table 16. Advantages and disadvantages of GeoComm “Optimal Model” compared the status quo.

ADVANTAGES	DISADVANTAGES
Number of PSAPs reduced from 12 to 6	City of Seattle required to build new PSAP, train civilian dispatchers, and create new city department
Call transfers reduced between PSAPs, particularly Seattle Police and Fire	Call transfers increase tremendously as WSP becomes a secondary PSAP
Higher staffing levels for NG9-1-1 implementation	Smaller PSAPs feel disenfranchised
Lower overall staffing requirements	Less local/agency control
Reduced installation and upkeep costs for NG-911 technology	Ancillary duties must be reassigned
Increase in surge capacity	King County 9-1-1 finance model unaffected
City of Seattle inter-discipline interoperability at maximum	No change to intra-discipline interoperability
Inter-discipline interoperability increased	No countywide interoperability
Redundant facility plan intact	Countywide, intra-disciplinary interoperability only marginally increased
CAD interoperability upgraded	

E. KING COUNTY PSAP CONSOLIDATION MODEL: A PLAN FOR SINGLE-DISCIPLINE PSAPS

In its *Final Recommendations Report*, the optimum model was not the only potential model examined by GeoComm. In all, 6 new models were explored,¹⁸⁹ including “Model B,” which was a slight variation of the optimum model. Not a single model discussed the possibility of consolidation based on dispatch discipline; in fact, all but two models recommended that Seattle’s Fire Alarm Center, the only fire-only PSAP in the county, merge into a multi-discipline facility.

In examining the concept of a “single-discipline model,” an ideal plan would create one law enforcement PSAP, one fire PSAP, and one PSAP for the Washington State Patrol, that possesses unique needs making it unsuitable for consolidation. A model such as this would maximize interoperability within the disciplines (intra-disciplinary interoperability). However, the ideal is not always possible, and the GeoComm “optimum model,” despite its name, took those realities into account. Rather than attempt to create a perfect plan that is not feasible for political or financial reasons, the proposed single-

¹⁸⁹ Ibid., 3–2, 3–3.

discipline model was guided by and used many of the assumptions utilized in the creation of the GeoComm optimum model. This will simplify examination how the goals of King County 9-1-1 Program Office could be attained in the single-discipline format and easily compared with the benefits and disadvantages of the “Optimal Model” (see Table 16). The benefits of an ideal single-discipline model may be easily extrapolated in the context of the model examined below (see Table 17).

The single-discipline model incorporates the following elements:

- The Seattle Fire Alarm Center becomes the central PSAP for all fire and EMS services countywide, and remains a secondary PSAP
- The Seattle Police PSAP remains unchanged
- The Enumclaw Police PSAP would be absorbed by Valley Com
- Consolidation of NORCOM’s law enforcement agencies, Bothell, Issaquah, and Redmond into the King County Sheriff’s Office
- Washington State Patrol transition to a secondary PSAP
- University of Washington Police and the Port of Seattle remain unchanged

Table 17. Single-discipline consolidation plan. Figures calculated from those in Table 4.

CURRENT PSAPs	SINGLE DISCIPLINE MODEL	POLICE AGENCIES	FIRE AGENCIES	NEW CALL VOLUME
Seattle Fire Alarm Center	Regional Fire Dispatch Center		30 223,634	223,534
Seattle Police Department	No change	1 523,021		523,021
		10		
Enumclaw Police Department		307,513		307,513
NORCOM	New entity at King County Sheriff’s Office	23 475,760		475,760
King County Sheriff				
Redmond Police Department				
Bothell Police Department				
Issaquah Police Department				
Washington State Patrol	Becomes a secondary PSAP	1		246,910
University of Washington Police Department	No change	1		3763
Port of Seattle Police Department	No change	1	1	8658

1. Compliance with Stated Goals of County 9-1-1 Consolidation Assessment

A comparison to the GeoComm optimum model begins with an analysis of how well the single-discipline model meets the goals the King County 9-11 Program Office set in its consideration of consolidation: reduction of 9-1-1 call transfers, mitigation of projected costs of NG9-1-1 implementation, and creation of a sustainable funding system for the King County 9-1-1 system.

a. Reduction of 9-1-1 Call Transfers

As with the GeoComm offering, the single-discipline model reduces the number of PSAPs, which in turn will reduce the number of ad hoc transfers between PSAPs. The single-discipline model will be slightly less effective in this regard as it maintains seven PSAPs instead of six, but will still improve the situation. The experience of wireless calls reaching a PSAP outside the jurisdiction in which the call originated will be improved by the same margin, again slightly less effectively than the GeoComm model.

Because the Fire Alarm Center remains a secondary PSAP in the “Single-discipline Model,” the 80,000 9-1-1 call transfers eliminated by the optimum model will still be in place. Since both the GeoComm model and the single-discipline model change convert the Washington State Patrol PSAP into a secondary PSAP, both models ultimately increase the number of transfers. However, the single-discipline model will, by design, require about 25 percent more transfers than the “Optimal Model.”

b. Projected Costs of NG911 Implementation

By reducing the number of PSAPs from 12 to six, the optimum model will reduce costs of NG9-1-1’s system of hardware, software, and data by roughly 50 percent. By retaining an additional PSAP, the single-discipline model will reduce the costs about 42 percent. The additional call taker workload brought on by NG9-1-1 will be alleviated by both models, as both plans create larger PSAPs with greater staffing levels that will be better able to absorb this additional workload while still maintaining levels of service.

c. *King County 911 Funding Demands*

King County 9-1-1's direct financial support to PSAPs will not be reduced by either consolidation model discussed here as that support is based on number of 9-1-1 calls, not the number of PSAPs. However, by reducing the number of PSAPs from 12 to seven instead of six, the amount of equipment to purchase, as well as the corresponding technical support required to maintain and upgrade it, will be reduced. This will be slightly less than the multi-discipline model.

The single-discipline model reduces the number dispatchers necessary in the system as a whole for the same reasons as the optimum model: economy of scale and the reduction in duplication of supervisory and management staff. The Fire Alarm Center, which utilizes sworn firefighters as dispatchers, will require more firefighter/dispatchers (with higher average salaries than their civilian counterparts) to handle the increased call volume. As noted, however, this does not result in any financial savings to King County 9-1-1, which does not pay for dispatcher salaries. Even so, these costs would be offset to some degree by increased funding from King County due to the FAC's increase in call volume as well as contract for services costs for dispatching fire departments currently served by Valley Com and NORCOM.

2. *Other Potential Advantages of the Single-discipline Model*

The single-discipline model provides for an equivalent sized back-up facility for each PSAP, and, like the optimum model," it provides for larger PSAPs that enable resources such as equipment, staff, and training opportunities be pooled and utilized. However, since the single-discipline model separates fire dispatching from law enforcement dispatching, PSAPs can devote all of their training resources to one discipline or another. In the "Optimal Plan," all PSAPs have to train on radio and call-taking for both disciplines. By separating the disciplines, training time can be cut in half to save money or the training time effectively doubled since only one discipline can be the focus for all training.

The reduction of the number of PSAPs from 12 to seven will reduce King County 9-1-1's span of control, which may lead to easier and increased oversight.¹⁹⁰ The larger PSAPs created will, like the "Optimal Model," feature more operating personnel on the dispatch floor. In addition, it provides more "surge capacity" than a smaller PSAP and creates capability to more readily handle an event that creates a massive influx of 9-1-1 calls, such as a terrorist attack, earthquake, or air disaster.¹⁹¹ Due to specialized operational practices at the FAC, it will have greater surge capacity than the other PSAPs, which will be discussed in Section 5 below.

3. Potential Disadvantages of the Single-discipline Model

Like the GeoComm "Optimal Model," the single-discipline model is not without its disadvantages. Smaller PSAPs (and especially single agency PSAPs) provide more local control and are better able to reflect the goals of their jurisdiction or organization; however, each PSAP will be a specialist in its respective discipline, and so no one discipline will be marginalized by another. Like the "Optimal Model," the amalgamated PSAPs of the single-discipline model will carry with them the burden of an amalgamated governance structure, which may result in slow changes to policy or practices due to increased bureaucracy. Smaller jurisdictions may fear that their desires may be overshadowed by the needs of larger municipalities, no matter their discipline.

The ancillary functions for the various PSAPs are still going to require adjustment. However, because they are separated by discipline, the ancillary functions will likely be easier to assimilate. Citywide coverage for fire companies is likely to be comparable no matter the jurisdiction. Similarly, duties such as handling walk in traffic for records and fingerprinting requests, jail business, issuance of concealed pistol licenses (CPLs) are likely similar in law enforcement PSAPs. In addition, the monitoring of fire alarm systems is a function that the FAC already undertakes, and it would expect to continue for other fire agencies if consolidated. Still, consolidation may render many of

¹⁹⁰ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 1–9

¹⁹¹ *Ibid.*, 1–12.

these duties impossible in the new model. If so, an alternate means of performing these secondary duties must be found.

Political obstacles will manifest themselves in the single-discipline model just as they do in the “Optimal Model.” While fire disciplines may feel they take a backseat to law enforcement desires in the latter, it is likely that Valley Com will resist the decrease in call volume, which will come with an attendant decrease in funding from King County 9-1-1 due to its funding model. It will be difficult for Valley Com to view this as anything other than a transfer of revenue from Valley Com to the FAC.

The tremendous gain of this new model is that the city of Seattle would not face the burden of creating a new city department, nor would it be required to abandon its newest PSAP, construct an all new PSAP, and train the civilian dispatchers necessary to operate it. Similarly, any reorganization of the King County Sheriff’s Office PSAP would have much less of an impact. Instead of having to support 12 new law enforcement agencies and 15 new fire agencies, representing almost 200,000 new 9-1-1 calls, and the attendant staffing and training in a new discipline (the Sheriff’s Office currently does not serve any fire agencies) that would be required, it would simply take on 12 law enforcement agencies and 125,000 additional calls. Whatever reorganization is required by the “optimum model,” the impact would be greatly reduced by the “Single-discipline Model.”

Another political consideration is job loss. Under the GeoComm’s “Optimal Model,” disabled firefighters would be forced to retire and enter the state retirement system’s disability rolls (although this would not affect King County 9-1-1 funding). Under the single-discipline model,” firefighter/dispatcher numbers would likely increase, again at no cost to the King County 9-1-1 Program Office. While overall numbers of dispatchers would drop in King County, it would likely not affect employment for dispatchers. According to GeoComm’s numbers, “the region’s call taker staffing is currently understaffed by 83 positions.”¹⁹²

¹⁹² Ibid., 2–11.

4. Potential Effects on Interoperability

The single-discipline plan would have an effect on different aspects of interoperability throughout the region.

a. Voice and Data Interoperability

Thanks to its regional radio system, King County already operates at a high level of voice interoperability. This would be greatly enhanced for King County's 30 fire departments, which would share all communications with the FAC on a daily basis. These common communication protocols would pay dividends on mutual aid responses and large, multi-jurisdictional events. In terms of data interoperability, by consolidating 12 PSAPs into seven the single-discipline model would reduce the number of CAD systems, easing the transition into King County's planned regional CAD interoperability initiative.

b. Inter-discipline (Fire/Police) Interoperability

Unlike the GeoComm "optimum plan," Seattle's police and fire departments would maintain separate PSAPs. Thus, there would be no change in interoperability between the two agencies operationally from the status quo with implementation of the "Single-discipline Model," and in fact there would be a reduction in police/fire interoperability when compared to the "optimum plan." Outside the city of Seattle, there would be little intra-discipline interoperability. With the King County Sheriff's Office PSAP and Valley Com having no fire agencies, operational interoperability between police and fire would not be improved for joint operations.

c. Intra-discipline (Fire/Fire, Police/Police) Interoperability

Like the GeoComm "optimum model," Seattle and Valley Com would see little or no improvements to intra-disciplinary interoperability as a result of the "Single-discipline Model," as their changes from the status quo are minimal. The King County Sheriff's Office PSAP, by adding 12 law enforcement agencies, would significantly improve intra-disciplinary interoperability among police agencies. 23 police agencies. In addition, one

of them with a countywide jurisdiction, would share communications, status, and location information for all of their units.

Fire interoperability could be increased to its fullest potential by implementation of a single-discipline model (as would law enforcement in an ideal single-discipline model). Similar to the Spokane Fire Combined Communications Center and Phoenix Regional Communications models discussed in Chapter IV, all communications relating to fire would originate from a single source. The status and location of all fire resources countywide would be tracked at one entity. For routine incidents, the nearest unit or units could be dispatched regardless of jurisdictional boundaries. As an example, 145th Street is the north border of the city of Seattle. A fire occurring on the south side of the street generates an all-Seattle response, drawing from much of Seattle's north end. The same fire on the north side of the street receives a response the Shoreline Fire Department. Both agencies responding in the single-discipline model would generate the same number of responding units, but they would get there more quickly. This represents the ultimate in intra-discipline interoperability—treating the many jurisdictions as one, large regional fire department, as exemplified by the Phoenix Regional Communications model.

Medical emergencies would fare better as well. Currently, if all three of Seattle's northernmost medic units are out of service on emergencies. A patient in the north end of the city would need to wait for a downtown medic unit, even though Shoreline has a medic unit much closer. Interoperability of this nature is operational common sense and provides better service to the taxpaying public.

Large and complex incidents would also benefit from this concept. Requests for mutual aid would not need to be relayed to another PSAP. The Fire Alarm Center would have situational awareness for the entire county, and it could send needed resources from anywhere in the county as needed. This is particularly true of regional resources.

Due to its size, the Seattle Fire Department manages several regional assets, including multiple fireboats, mass decontamination units, technical rescue teams, tactical air support personnel with equipment for rescue and equipment delivery, urban search and rescue caches, a mass ventilation unit, along with other such resources that smaller

departments do not have. These regional assets could be activated almost immediately due to the increased situational awareness afforded by having all county fire services under one roof. A summary of the advantages and disadvantages of the single-discipline model appear in Table 18.

Table 18. Advantages and disadvantages of single-discipline model compared to the status quo.

ADVANTAGES	DISADVANTAGES
Number of PSAPs reduced from 12 to 7	Call transfers increase tremendously as WSP becomes a secondary PAP
Higher staffing levels for NG9-1-1 implementation	Call transfers for fire/EMS services increase as all such calls go to a secondary PSAP
Lower overall staffing requirements	Smaller PSAPs feel disenfranchised
Reduced installation and upkeep costs for NG-911 technology	Less local/agency control
Increase in surge capacity	Ancillary duties must be reassigned
Redundant facility plan intact	King County 9-1-1 finance model unaffected
CAD interoperability upgraded	Reduced inter-discipline interoperability
No major new construction/remodels of PSAPs required	
Intra-discipline law enforcement interoperability increased	
Intra-discipline fire/EMS interoperability increased to complete countywide coordination	

5. Feasibility of the Fire Alarm Center Becoming a Countywide PSAP

One of the major hurdles faced by GeoComm’s “Optimal Model” was that the city of Seattle would have the financial burden of building a new PSAP of sufficient size to facilitate police and fire dispatching under one roof. If the Fire Alarm Center is to be the focus of fire/ EMS 9-1-1 calls and dispatching for all of King County and not encounter the same costs as the “Optimal Model,” it would need to be operationally able to do so. An analysis of the Fire Alarm Center (FAC) operations could determine whether the FAC has such capability, as well as illuminate some features of the FAC that make it operationally unique among King County PSAPs.

a. Facility

Completed in 2008, the FAC is King County’s newest PSAP. Not only is the equipment new, but the building itself is constructed to be capable of withstanding an

earthquake load 50 percent higher than most buildings. These design specifications affect most components of the building, construction materials, and equipment specifications. To ensure the building remains operable after an earthquake, all critical building systems are designed to accommodate movement.¹⁹³

However, a state of the art facility is not enough if it does not possess enough capacity. To become a regional fire dispatch center, the FAC would have to be able to staff enough workstations to account for the increase from about 82,000 9-1-1 calls/year to more than 220,000—an increase of over 250 percent. Given that the FAC comfortably meets industry standards with the current staffing model of four dispatchers on the floor, it is reasonable to conclude that 10 workstations would need to be staffed to account for the extra call volume. The FAC was designed with such growth in mind. It currently has 14 dispatcher workstations in place, without reconfiguring the center in any way.

b. *Firefighter/Dispatchers*

The Seattle Fire Department's Fire Alarm Center has been providing dispatch services since 1890. It is one of the few fire-only PSAPs in Washington, and one of a small number of nationwide that still uses sworn firefighters as dispatchers. Seattle firefighters may apply for the position after completion of five years in the Operations (fire suppression) Division. Because of this, all FAC dispatchers are emergency medical technicians or certified paramedics. Proponents of firefighter dispatchers argue that the experience of firefighters in responding to fires, rescues, and medical emergencies add a dimension to 9-1-1 call receiving and radio communications that civilians could not.¹⁹⁴ While firefighters do not process calls any quicker than do civilian dispatchers, it can be argued that firefighter/dispatchers provide other, less tangible benefits.

¹⁹³ Fred Podesta, "Fire Facilities and Emergency Response Levy: Station 10—EOC/FAC," seattle.gov, accessed May 23, 2014, <http://www.seattle.gov/fleetsfacilities/firelevy/facilities/fs10/10.htm>

¹⁹⁴ Sjoberg-Evashenk Consulting, *Review of the Los Angeles Fire Department Dispatch Staffing and Special Duty Assignments*, April 24, 2006, http://controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_008200.pdf, 15.

(1) Retention

Civilian PSAPs nationwide are plagued by high vacancy rates, which nationally are at 20 percent.¹⁹⁵ Turnover is high because dispatchers leave for less stressful jobs that do not require working nights and weekends, which means mandatory overtime and increases dissatisfaction.¹⁹⁶ This crisis in retention of public safety dispatchers has ongoing since the early 1990s.¹⁹⁷ NORCOM, a civilian PSAP in Bellevue, Washington, had a vacancy rate of 27.5 percent in 2012.¹⁹⁸ ValleyCom, in Renton, Washington has fared better, with fluctuation between 9 percent and 7 percent over the past three years.¹⁹⁹ As a result, civilian centers are constantly in a hiring and training mode, and experience level suffers. The vacancy rate at the FAC is 0 percent, which keeps hiring and training costs lower.

(2) Stress

Dispatchers perform a complex and stressful function.²⁰⁰ Stressors cited include the responsibility to citizens and responders, job dissatisfaction, low pay, lack of promotional opportunities, and low status.²⁰¹ This plays a large part in the industry's 20 percent vacancy rate.²⁰² In addition, it also creates more mandatory overtime and hiring costs.²⁰³ While dispatchers at the FAC experience stress, it can be argued that the stress they feel is considerably less given the top civilian stressors listed earlier: their pay is

¹⁹⁵ Valley Communications Center, *2012 Annual Report*, 15
<http://www.valleycom.org/docs/2012annualreport.pdf>

¹⁹⁶ Judy Ronningen, "Help Wanted, and It's a Matter of Life and Death: High-tech Competition Creates 911 Dispatcher Shortage on the Eastside," *Eastside Journal Online*, September 14, 2000, http://www.eastsidejournal.com/sited/retr_story.pl/23212

¹⁹⁷ G. Miraglia, "Recruiting and Retaining Dispatchers beyond 10 Years," *APCO Bulletin* #62 (1996, August): 96.

¹⁹⁸ North East King County Regional Public Safety Communication Agency, *2012 Annual Report* (Bellevue, WA: North East King County Regional Public Safety Communication Agency), <http://www.norcom.org/docs/misc/2012%20Annual%20Report%20Final.pdf>, 35.

¹⁹⁹ Valley Communications Center, *2012 Annual Report*, 15

²⁰⁰ Tod Burke, "Dispatcher Stress," in *Protect Your Life!: A Health Handbook for Law Enforcement Professionals*, ed. Davidson C. Umeh (Flushing, NY: Looseleaf Law Publications, 2006), 79

²⁰¹ *Ibid.*, 81–82.

²⁰² Ronningen, "Help Wanted."

²⁰³ *Ibid.*

generally higher than civilian dispatchers,²⁰⁴ their promotional opportunities are the same as any other member of the fire department, and they are used to the responsibility for citizen and responder safety as experienced first responders. Firefighting is considered to be one of the nation's most stressful occupations. After a minimum of five years in that capacity, firefighters that become dispatchers are moving to a position of *less* stress at the FAC.²⁰⁵

(3) Street Experience

Firefighter dispatchers have spent time as response agents, so the argument, though difficult to quantify, is that they make better dispatchers since they know both sides of the dispatcher/responder relationship. Proponents of firefighter dispatchers assert that they make better EMS dispatchers because of their EMT training as well as the fact that they actively practiced emergency medical care as first responders.²⁰⁶ Additionally, they also indicate that firefighters make better fire dispatchers because of their experience responding to and communicating on the radio at fires.²⁰⁷

This experience is discounted by proponents of civilian dispatchers. They assert that modern emergency medical dispatching (EMD) protocols, which provide medically-approved pre-arrival instructions designed to be delivered by phone by civilian dispatchers, obviate the need for dispatchers with actual emergency medical experience.²⁰⁸

In disagreement with this is Dr. Leonard Cobb, co-founder of Seattle's Medic One program, which is widely regarded as the number one program nationally in pre-hospital emergency care²⁰⁹ Cobb states,

²⁰⁴ Sjoberg-Evashenk Consulting, *Review of the Los Angeles Fire Department Dispatch Staffing*, 11

²⁰⁵ Mary Rose Roberts, "Firefighting the Second-Most Stressful Job in the Nation, White Paper Reports," *Fire Chief* (2012, January), <http://Firechief.Com/Health-Safety/Ar/Firefighter-Stressful-Job-20120105>

²⁰⁶ Sjoberg-Evashenk Consulting, *Review of the Los Angeles Fire Department Dispatch Staffing*, 13–14.

²⁰⁷ *Ibid.*

²⁰⁸ *Ibid.*, 15.

²⁰⁹ Robert Davis, "Doctors in Charge Rarely Call the Shots," *USA Today*, July 29, 2003.

Our utilization of experienced EMS responders is more to the point than EMT [training] per se. Little doubt in my mind that our dispatchers are better equipped to do an excellent job, compared to inexperienced individuals not previously involved in EMS.²¹⁰

This is corroborated by a 2002 study done in Europe, which concluded:

What information is attended to and how the information is considered, is dependent upon the schemata that dispatchers have. These schemata are made up of their ambulance training, medical and road experience. The schemata enable dispatchers to recognize patterns in the presented cues that help them diagnose the situation.²¹¹

Wong and Blandford also offer an opinion:

Situational cues that violate these expectations set off alarm bells that relate to what dispatchers refer to as 6th sense. This is often verbalized by the dispatchers as ‘it just doesn’t look right’ and highlight the value of experience in this job.²¹²

In that vein, as described in *After Action Report on the Response to the September 11*, during the response to the Pentagon on 9/11, a firefighter named Terry Theodore was on light duty on September 11. He was assigned to a temporary communications technician position at the Emergency Communications Center (ECC) in Arlington, Virginia. Many responders commented on the value of having someone with his operational background and knowledge of fireground and ICS activities at the ECC.²¹³

c. Dispatch Operations

The dispatch floor operates on a four-platoon system, with each platoon rotating through a 24-hour shift. The shift parallels the Operations (fire suppression) Division’s 24-hour shifts, so each platoon of dispatchers works with the same fire companies each shift. Each platoon at the FAC is supervised by a lieutenant/dispatcher, who reports to the

²¹⁰ Leonard Cobb, interview with author, July 9, 2013.

²¹¹ Raanan Lipshitz and Ben Shaul, “Schemata and Mental Models in Recognition-primed Decision Making,” in *Naturalistic Decision Making*, ed. Caroline E. Zsombok and Gary Klein (Mahwah, NJ: Lawrence Erlbaum Associates, 1997), 293–303.

²¹² William Wong and Ann Blandford, *Analysing Ambulance Dispatcher Decision Making: Trialing Emergent Themes*, UCL Interaction Centre, 2002, <http://www.ucl.ac.uk/annb/docs/wwabfh2002.pdf>, 6.

²¹³ Titan Systems Corporation, *After Action Report*, A-35.

administrative captain. In addition to the lieutenants, each platoon is staffed with six firefighter/dispatchers.

In terms of operational model, most PSAPs divide dispatch duties by function: supervisors, radio, call taker, and dispatcher. This method utilizes call takers to receive and process incoming 9-1-1 calls, interrogate the caller, and choose the appropriate resource types to respond to the incident. Call takers forward the incident into a queue for a dispatcher, who selects the unit(s) to respond to the incident and dispatches them. The radio position is the point of contact for all units on duty and maintains radio communication with them. The supervisor manages all aspects of activity on the dispatch floor.

At the FAC, the call taker and dispatcher positions are combined. The call taker processes the 9-1-1 call, chooses the response type, and selects and sends the units on the alarm. The radio function and supervisor functions remain the same, although the lieutenant will take overflow 9-1-1 calls if all call takers are engaged.

Standard staffing is four dispatchers on the floor and three off the floor, according to an established schedule. Because they work 24-hour shifts, those dispatchers that are off the floor are able to be summoned back to the floor for large incidents or a sudden increase in call volume. Since all FAC dispatchers are trained in radio, dispatching, and call taking functions, when recalled to the floor for help they can assume whatever position is necessary. Such surge capacity is unusual in PSAPs that do not work 24-hour shifts. PSAPs that operate a 24-hour shift feature the least amount of employee turnover.²¹⁴

Critics concede the greater flexibility of the 24-hour shift but note that if such flexibility was absolutely necessary that most dispatch centers would employ it; most do not, including the eight large cities that the Los Angeles Fire Department uses as comparison cities.²¹⁵ A consulting firm hired by Los Angeles maintains that peak-time scheduling utilizing an 8, 10 or 12-hour shift assigns more dispatchers on duty at the

²¹⁴ Ibid.

²¹⁵ Ibid., 14.

busiest times. The firm does not cite studies, indicating that most emergencies requiring upstaffing occur at peak times, but refers to the infrequency of such events as a mitigating factor.²¹⁶

Shift work can also cause sleep issues, safety concerns, and can impact family activities, such as getting children to school, especially if the spouse has a job with a typical schedule.²¹⁷ Some civilian centers do operate 24-hour shifts, and in some cases receive a pay differential of up to 14 percent for the inconvenience.²¹⁸ Regardless of shift model, since PSAPs operate 24-hours a day, 7 days per week, 365 days per year, shift work of some kind is required.

At the FAC, firefighter/dispatchers must have a minimum of five years of experience as a firefighter in the field before applying to be a dispatcher. For those five years, they work a 24-hour shift schedule. In fact, they essentially volunteered for shift work when they accepted employment at the fire department. Thus, Seattle firefighters transitioning to the FAC have no schedule adjustment to make, nor do their families; any adjustment to shift work was made at least five years prior. For them, the 24-hour shift is normal. Furthermore, the 24-hour shifts at the FAC also match the department's Operations Division shifts, which builds teamwork and a sense of camaraderie.²¹⁹

d. Dispatch Pool

An aspect of operations that appears to be unique to the FAC is the dispatcher pool. The pool consists of 20 firefighters, trained as dispatchers, who are not assigned to the FAC. Upon completion of dispatcher training, they are returned to their operational assignment on an engine, ladder, or medic unit. To maintain their dispatching skills, they work one 24-hour shift at the FAC every six weeks. This gives the Seattle Fire Department great flexibility. In a disaster, pandemic, or other homeland security crisis, up

²¹⁶ Ibid.

²¹⁷ Peter Finn, "The Effects of Shift Work on the Lives of Employees," *Monthly Labor Review* (1981, October), 32–33, www.bls.gov/opub/mir/1981/10/art5full.pdf

²¹⁸ Mike Scott, "Dispatch Center Scheduling Options: From 8's to 24's and Everything in Between," *9-1-1 Magazine*, June 2003, 20–27.

²¹⁹ Ibid.

to 71 percent of FAC dispatchers could become incapacitated and continuity of operations would be preserved. If such a situation called for additional personnel, the staff of the FAC can be nearly doubled in a short time. When a dispatcher retires or is on extended disability, a fully trained replacement is available immediately.

e. Command and Control

Inadequate fireground communication is repeatedly cited as a contributing factor in the safety of emergency personnel and may contribute to injuries or deaths of firefighters, rescue workers, and civilians.²²⁰ To bridge that gap, significant incidents such as fires, mass casualty incidents (MCI), and hazardous materials incidents are assigned a radio position specific to that incident. Firefighter/dispatchers use their experience at such incidents to prompt incident commanders for incident needs and assemble resources they anticipate will be required. They also insert themselves into incidents, ensuring that critical communications that go unacknowledged are repeated to the incident commander. As an arm of the Seattle Fire Department, the FAC makes decisions regarding citywide coverage, what units may travel where, and what units should relocate to ensure engine, ladder, and EMS coverage is maintained.

f. Expense

Firefighter/dispatchers are more expensive than civilian dispatchers.²²¹ While the lower salaries of civilian dispatchers make them less expensive, it is not without unintended consequences. According to Francis Holt, less attractive salaries mean less quality candidates in the profession:²²²

I loved my job as a fire alarm dispatcher, but I don't do it anymore. I got married, had kids, and had a choice: work several jobs as far into the

²²⁰ Adam Thiel and Hollis Standbaugh, *Special Report: Improving Firefighter Communications* (Washington, DC: United States Fire Administration, 1999), <http://www.usfa.fema.gov/downloads/pdf/publications/tr-099.pdf>

²²¹ *Ibid.*, 11.

²²² Francis Holt, "How to Ruin a Dispatcher," *Fire Engineering* 145, no. 9 (1992, September): 112.

future as I could see, or go to school and learn to do something else. Like many talented people with whom I worked, I opted for the latter.²²³

The 20 percent industry vacancy rate corroborates Holt's statement, as does a 2005 Association of Public Safety Communications Officials (APCO) study which states that 58 percent of the turnover is due to low pay.²²⁴ As noted previously, dispatcher salaries are not a factor in King County 9-1-1's finances.

²²³ Ibid.

²²⁴ Mary Jean Taylor, Veronica Gardner, and Barbara McCombs, *Staffing and Retention in Public Safety Communications Centers* (Denver, CO: Association of Public-Safety Communications Officials and Denver Research Institute, 2005), 7.

VI. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

A. PROBLEM SPACE

The research question that informed this thesis was: “To further interoperability, should PSAPs discipline be a primary factor in PSAP consolidation?” PSAP consolidation has been increasing in the last five years, primarily as a cost saving measure, and simple geographic proximity, rather than discipline, has been the driving factor. This thesis is not intended to promote nor dissuade consolidation or to serve as a clearinghouse for all issues that surround consolidation such as governance, oversight, or politics. Consolidation is largely a function of the will of county government, and it will continue to be a fact of life for PSAPs to consider.

This thesis is intended to address how consolidation should occur, given that is underway. In public safety, it is important to never lose sight of the overall goal—maintaining the safety of the public at the highest level. As stated by GeoComm in its consolidation assessment report for King County, Washington: “The primary goal of any consolidation effort should be to enhance public safety in the region. Service enhancements should be clear and immediate.”²²⁵ It is to that end that these findings, conclusions, and recommendations are presented.

B. FINDINGS

1. Police, Fire and Law Enforcement Dispatching are Discrete and Separate Functions

The telecommunicators positions of call taker, dispatcher, and radio operator as they relate to fire, law enforcement, and EMS are similar to the casual observer, but they share almost as many differences as the disciplines they serve. Law enforcement dispatching generates most of its responses to incidents that are over. In addition, many of those responses are not initiated by 9-1-1 callers but by patrolling police officers that generate the response themselves; this creates a flurry of activity on the radio.

²²⁵ GeoComm, *King County, Washington PSAP Consolidation Assessment*, 6–18.

Law enforcement call volume is higher than that of fire or EMS, and it typically requires the stacking of calls (queuing calls for units to respond to later). Generally, the incidents are short lived, often simply generating a report. Dispatchers must supply information to field officers by searching databases and records.

Fire dispatchers experience lower call volumes, but nearly every call is for an ongoing emergency. Consequently, no calls are stacked. Unlike police dispatching, fire dispatching involves different types of units with unique capabilities. There are fewer responses, but they typically involve multiple units. Some alarms may last for hours, and radio operators must monitor transmissions and adhere to a rigid command structure and communication style. In addition, excessive background noise and the effects of personal protective gear often hamper radio transmissions. Very few fire responses are generated from the field.

The third type, EMS dispatching, like fire, is typically for emergent situations. Responses of more than two units are rare, but dispatchers must adhere to strict dispatching protocols to identify life-threatening events in order to send the proper response.

While dispatchers across the country can and do perform all three types of dispatching, there is a case to be made for skill specialization. While few sources directly deal with dispatcher specialization in fire or police dispatching, in a paper for the National Fire Academy Robert Junell noted that specialization enhances productivity and that exposure to variety has a nonlinear influence on productivity (i.e., “too much variety” can impede learning). This was tempered by his finding that a proper balance between specialization and exposure to a variety leads to the highest productivity.²²⁶

Studies in other fields related to job and skill specialization have noted a maximized rate of return by utilizing specialized skills as intensively as possible generally in labor.²²⁷ In contrast, a 1983 study of the Japanese banking industry recorded productivity improves with job specialization over the course of a single day; however,

²²⁶ Junell, “Consolidation Versus Separate Fire.”

²²⁷ Rosen, “Specialization and Human Capital,” 49.

examined across a number of days variety improved productivity.²²⁸ However, productivity in dispatching is of questionable value, as nothing is produced per se by PSAPs. Calls are received and dispatched as rapidly as possible as they come in, and intuitively it would seem that more experience in a particular dispatch discipline would increase proficiency. Even some multi-discipline PSAPs, such as Denver 911 and the Chicago Emergency Communication Center, have separate career paths for dispatchers in each discipline. Given that within each discipline, there are several discrete dispatching functions (call taker, dispatcher, radio operator), rotation among these tasks could potentially alleviate the problems inherent in discipline specialization.

2. The Prevailing Wisdom Regarding Interoperability Does Not Reflect the Needs of Responders

Simply put, the prevailing wisdom on interoperability is that all disciplines need the ability to communicate with each other by radio. It is echoed in the literature from the federal to the local level. The story of the NYPD helicopter warning of the tower's imminent collapse at 9/11 is oft cited as proof of this. However, this anecdote does not provide the necessary context for the debate.

First, at 9/11 and elsewhere in the literature, examples can be found of communications saturation at incidents. The transmissions become so numerous, even within one discipline, that adding the rest would exacerbate communications problems, not enhance them. In fact, at the Pentagon on 9/11, not only were police and fire communications separate, but even *within* those disciplines communications were detached—on the law enforcement side, by function, and on the fire side by geography. Communications were broken down by what was necessary for certain responders for situational awareness; the last thing needed was for all disciplines of responders to be on one channel.

Second, the disciplines are separated for a reason: even when working toward the same ultimate goal on a given incident, they are rarely assigned to the same objectives or tasks. At an incident, firefighters may engage in fire suppression, police in investigation,

²²⁸ Staats, and Gino. "Specialization and Variety in Repetitive Tasks," 1141–1159.

and EMS in patient treatment. All of these move the incident forward to mitigation, but none particularly relates to the others, nor is communications regarding the tasks necessary for the situational awareness of the others.

Third, the organizational and institutional knowledge is unique to each discipline. Law enforcement and fire do not speak or understand the same language, and the nomenclature and unit signatures of the disciplines are as different as the disciplines themselves.

3. Inter-discipline Interoperability at Incidents is Best Achieved through Unified Command

While each discipline at a major incident is working toward the same ultimate goal of incident mitigation, the tasks and tactics employed by each discipline are most often discipline specific. Since tasks and tactics are discrete, the need for tactical communication between disciplines is obviated. Communication at the strategic level is needed to ensure that these discrete tasks are coordinated as part of an overall strategy to complete incident objectives. Organizational structures exist to solve the problem that voice interoperability cannot—namely, the incident command system. It is through unified command under the NIMS system that situational awareness and coordination of objectives between disciplines are established. Discipline commanders with decision-making authority communicate with each other face-to-face at the command post. Those commanders then ensure that all within their discipline are operating in a coordinated effort according to the overall incident action plan.

4. Intra-discipline Interoperability is of Greater Value than Inter-discipline Interoperability

While police and fire may not speak the same language or have the same objectives at an incident, firefighters and police absolutely need to work as seamlessly as possible with firefighters and police from their respective disciplines from different jurisdictions. At a regional or homeland security scale event, units of the same discipline from different jurisdictions may well be working together on the same task or objective, and interoperability will be crucial to their success. This is not only true of voice

interoperability but functional interoperability. Building functional intra-discipline interoperability between agencies during routine events enhances operational interoperability at larger, more complex events.

5. PSAP Practices Reflect the Importance of Intra-discipline Interoperability

All PSAPs surveyed for this thesis have dutifully complied with the prevailing wisdom on interoperability and possess the capability to have all disciplines utilize voice interoperability with each other. However, in practice, they seldom make use of that capability. While all PSAPs report that intra-discipline interoperability is exercised frequently, the inter-discipline capacity for interoperability is rarely exploited. This reflects their relative importance—the means exist to make it happen, but the need is not enough to drive use. Even PSAPs that do make use of the capability for police and fire to communicate directly keep tactical communications by different disciplines on different channels.

6. Single-discipline PSAPs Increase Intra-discipline Interoperability, Multi-discipline PSAPs Increase Inter-discipline Interoperability

Amalgamating PSAPs via a single-discipline model increases intra-discipline interoperability by consolidating the unit status and location, voice communications, data, and regional assets of an entire discipline under the command and control of a single entity. Amalgamating PSAPs via a multi-discipline model increases inter-discipline interoperability by consolidating the unit status and location, voice communications, data, and regional assets of all disciplines under the command and control of a single entity.

The converse is also true; single-discipline PSAPs reduce inter-discipline interoperability by separating the command and control functions of the disciplines. Multi-discipline PSAPs decrease intra-discipline interoperability by reducing the geographic footprint of its effects. Essentially, the gain in interoperability comes at the cost of true regionalization for either discipline. This is only true if the FCC best practice is followed regarding two-PSAPs per geographic region; however, to ignore that

recommendation would mean trading away a proximal back-up for a mission critical component of command and control (the PSAP) for interoperability.

C. CONCLUSIONS

The PSAP's role in interoperability should be viewed through the framework of the findings above. As noted in Chapter II, the function of the PSAP is not only to receive 9-1-1 calls for assistance. PSAPs also:

- Serve as the hub for all communications activities of each of the agencies they serve
- Track unit status and location
- Ensure that jurisdictions maintain adequate protection through distribution of units
- Monitor radio communications of ongoing incidents

Given these missions, which all revolve around command, control, and coordination, the interoperability benefits of each model of PSAP consolidation can be determined by analyzing the effects on interoperability of a consolidated multi-discipline PSAP and a consolidated single-discipline PSAP.

1. Analysis of Each Model's Impact on Interoperability

The analysis is based on eight aspects of interoperability affected by the model of consolidation, and it presumes compliance with the FCC's proximal back-up facility recommendation (a minimum of two PSAPs in any region). The effect of each model of consolidation on each aspect of interoperability is rated on two criteria: net effect (positive, negative or none) and degree of effect (high, moderate, low or none).

a. Inter-discipline Voice Communication Ability

Since all agencies served by a PSAP enjoy a common hub of communications, voice interoperability is improved. Respective to model, the effects were analyzed as follows:

- Multi-discipline—By combining disciplines within a PSAP, communications are facilitated between disciplines. Net effect is positive.

Because the agencies are distributed between two PSAPs, the degree of effect is moderate.

- Single-discipline—By separating disciplines by PSAP, communications are not facilitated between disciplines. Net effect is negative. Because no other discipline is present at the communications hub, despite the fact that patching could be effected, the degree of effect is high.

b. Intra-discipline Voice Communication Ability

Since all agencies served by a PSAP enjoy a common hub of communications, voice interoperability is improved. By model, the effects were judged as follows:

- Multi-discipline—By having multiple agencies within each discipline, communications are facilitated. Net effect is positive. Because the agencies are distributed between two PSAPs, the degree of effect is moderate.
- Single-discipline—By having all agencies of a single-discipline under one roof, the Net effect is positive. Because this allows complete intra-discipline voice interoperability, the Degree of Effect is high.

c. Inter-discipline Voice Communication SOP's

Communications protocols are standardized by the PSAP for all agencies within disciplines, which means all agencies within that discipline are using the same terminology and conventions. This enhances the capabilities of voice interoperability and functional interoperability.

- Multi-discipline—Because different disciplines have radically different communications protocols, the net effect is none; the degree of effect is none.
- Single-discipline—Because different disciplines have radically different communications protocols, the net effect is none. The degree of effect is also none.

d. Intra-discipline Voice Communication SOP's

Communications protocols are standardized by the PSAP for all agencies within disciplines, which means all agencies within that discipline are using the same terminology and conventions. This enhances the capabilities of voice interoperability and functional interoperability.

- Multi-discipline—By bringing multiple agencies of the same discipline under one PSAP, the net effect is positive. Because a portion of those agencies is served by a different PSAP, the degree of effect is moderate.
- Single-discipline—By having all agencies of a single-discipline under a common set of communications SOPs, functional interoperability is enhanced, and the net effect is positive. Because this allows complete intra-discipline voice interoperability, the degree of effect is high.

e. Inter-discipline Unit Location/Status

The location and status of units is tracked at the PSAP and provides a snapshot of resources and capabilities available to respond, as well as an indication of responder coverage of the area served by the PSAP.

- Multi-discipline—Because the response capabilities of all disciplines are monitored, the net effect is positive. The disciplines have different missions and thus the coverage is discipline specific—the number of fire units available is unrelated to police presence and vice-versa. Additionally, the area overseen by the other PSAP reduces the area monitored. The degree of effect is low.
- Single-discipline—Since only one discipline is present at the PSAP, no information on the other is monitored. Net effect is negative. Because the disciplines have different missions and thus the coverage is discipline specific, the number of fire units available is unrelated to police presence and vice-versa. Hence, the degree of effect is low.

f. Intra-discipline Unit Location/Status

The location and status of units is tracked at the PSAP, providing a snapshot of resources and capabilities available to respond, as well as an indication of responder coverage of the area served by the PSAP.

- Multi-discipline—Multiple agencies that represent each discipline are monitored, increasing situational awareness within that discipline. The net effect is positive. Because the agencies available are split with another PSAP, the degree of effect is moderate.
- Single-discipline—All agencies within the discipline are monitored. Net effect is positive. A regional picture of response capability is presented. The degree of effect is high.

g. Dispatcher Skill Specialization

Fire, EMS, and law enforcement dispatching are discrete functions that require the development of different skill sets and abilities.

- Multi-discipline—Although some multi-discipline PSAPs separate dispatcher career paths by discipline, it is not the most common model. Skill specialization would not be enhanced. The net effect is negative. Because dispatchers nation-wide have demonstrated the ability to successfully manage all disciplines of dispatching, the degree of effect is low.
- Single-discipline—By dispatching only a single discipline, skill specialization would be enhanced. Net effect is positive. Because dispatchers nationwide have demonstrated the ability successfully manage all disciplines of dispatching, the degree of effect is low.

h. Effect on Regionalization

Interoperability has more impact when achieved over a wider geographic footprint.

- Multi-discipline—Since consolidation increases the geographic area of service of a PSAP, the net effect is positive. The nature of the model is such that agencies and disciplines divide a given geographic area. The degree of effect is moderate.
- Single-discipline—Since consolidation increases the geographic area of service of a PSAP, the net effect is positive. By separating the PSAPs by discipline, interoperability within disciplines covers the entire geographic footprint of both PSAPs. The degree of effect is high.

2. Interoperability Impact Matrix

Both models have a positive impact on interoperability, which is not surprising given that consolidation in and of itself will increase interoperability.²²⁹ However, the level of impact is different. In the matrix in Table 19, the interoperability benefits of each aspect are identified graphically by consolidation model. Positive impacts are green, and negative impacts are red. The level of impact is indicated by a plus sign for high impact, a minus sign for low impact, and no symbol for moderate impact.

²²⁹ Womack, “Economies of Scale,” 8.

Table 19. Interoperability impact matrix

IMPACT LEVEL				PSAP CONSOLIDATION MODEL	
POSITIVE	LOW		HIGH	CONSOLIDATED MULTI DISCIPLINE PSAP	CONSOLIDATED SINGLE DISCIPLINE PSAP
Degree of Impact	Low	Moderate	High		
NEGATIVE	LOW		HIGH		
ASPECTS OF INTEROPERABILITY IMPACT					
Inter-discipline voice communication ability					HIGH
Intra-discipline voice communications ability					HIGH
Intra-discipline voice communications SOP's					HIGH
Inter-discipline unit location/status				LOW	LOW
Intra-discipline unit location/status					HIGH
Dispatcher skill specialization				LOW	LOW
Effect on regionalization					HIGH

The findings of this thesis indicate that some aspects of interoperability have greater value than others. Specifically, intra-discipline interoperability is of greater import than inter-discipline interoperability. The PSAPs surveyed that possess enormous capacity for inter-discipline interoperability do not exercise it for a variety of reasons that ultimately boil down to a lack of advantage in doing so.

Re-examining the interoperability impact matrix through this framework yields the following diagram (Table 20), in which the impacts of each model on intra-discipline interoperability are highlighted.

Table 20. Interoperability impact matrix, with intra-discipline interoperability impacts highlighted

IMPACT LEVEL				PSAP CONSOLIDATION MODEL	
POSITIVE	LOW		HIGH		
Degree of Impact	Low	Moderate	High	CONSOLIDATED MULTI DISCIPLINE PSAP	CONSOLIDATED SINGLE DISCIPLINE PSAP
NEGATIVE	LOW		HIGH		
ASPECTS OF INTEROPERABILITY IMPACT					
Inter-discipline voice communication ability					HIGH
Intra-discipline voice communications ability					HIGH
Intra-discipline voice communications SOP's					HIGH
Inter-discipline unit location/status				LOW	LOW
Intra-discipline unit location/status					HIGH
Dispatcher skill specialization				LOW	LOW
Effect on regionalization					HIGH

Highlighting the matrix in this manner demonstrates that, while both models enhance interoperability, the single-discipline model supplies the greatest positive impact to interoperability in the areas of most value. The multi-discipline model shows more areas of improvement, but the gains are modest. The aspects in which the single-discipline model has a negative impact are in the areas of inter-discipline interoperability; the very areas that surveyed PSAPs do not exercise in spite of great capacity to do so.

3. Conclusion

The analysis above indicates that PSAPs, which control communications and resource management, are better suited to do so as single-discipline entities with the ability to effect interoperability on a regional level, than as multi-discipline entities,

which cannot. The opportunity to create regional response capability and resource management among police and fire departments should not be understated.

This conclusion comes with qualifiers. All things being equal, the research suggests that separating PSAPs by discipline promotes the most important aspects of interoperability; however, all things are rarely equal. There are political, governmental, and monetary restraints that affect consolidation in ways that may make the best choice unavailable.

In fact, the best choice to increase interoperability across the entire spectrum would be a single, large PSAP that did fire, law enforcement, and EMS dispatching for the entire region. As noted, the FCC recommendation for a proximal back-up facility could be satisfied by having the PSAP for the adjacent region situated nearby. The amount of planning, money, and political capital involved in such a scenario makes it highly unlikely to come to fruition, and again, would the gains in inter-discipline interoperability be worth the effort required to attain them? Given the coordination and political maneuvering required, it would be much easier to attain two regional PSAPs separated by discipline within a single governmental jurisdiction..

D. RECOMMENDATIONS

Based on the findings and conclusions above, the following recommendations are proffered:

A Two-PSAP, Single-discipline Model Should be Part of Any PSAP Consolidation Assessment. Typically, consolidation efforts begin with a feasibility assessment and planning document. If a single-discipline model is not considered at this stage, it will not be a part of the final planning document.

If Conditions are Favorable, a Two-PSAP, Single-discipline Model Should be implemented. If the political, governmental, and financial environment will support it, consolidation should occur with a two-PSAP, single-discipline model. This will maximize the most important aspects of interoperability, satisfy the FCC best practice

regarding proximal back-up and provide consolidation benefits consistent with consolidation irrespective of discipline.

Regional Intra-disciplinary Interoperability Should Be a Goal of Consolidation. If the political, governmental, and financial environment will not support a two-PSAP, single-discipline model, then attempts should be made to facilitate regionalization of a discipline to the extent possible. If three or four PSAPs are the extent of consolidation (see Chapter V), one of those PSAPs should be police or fire specific. Additionally, it should serve all agencies from that discipline in the geographic area of consolidation to achieve interoperability within at least one of the disciplines.

1. Recommendations for Further Research

The subject areas of interoperability and PSAP consolidation provide opportunities for further research. Further study in both areas have potential to provide significant operational enhancements and financial savings.

a. Increase Survey Sample Size

Due to constraints placed upon research involving human research subjects by the Office of Management and Budget, only nine PSAPs were surveyed. Broadening the research by obtaining a bigger sample size would present an opportunity to validate or refute the findings in this thesis.

b. Continue Studying Perceived Wisdom on Interoperability

The concept that every responder must be able to communicate with every other responder, regardless of discipline, has driven policy decisions in the United States since shortly after the 9/11 Commission released its report.²³⁰ This concept may not be as worthwhile as it intuitively appears based on actual practice, and it is worthy of further examination in light of the conclusions in this thesis.

²³⁰ Timmons, "Radio Interoperability," 77.

c. *How Big is too Big?*

There is limited literature on PSAP consolidation in general. While some research suggests that consolidation can provide benefits, at what point does consolidation result in an entity that is too large? In Israel, the Magen David Adom provides emergency medical services. It is dispatched from a centralized system consisting of one national dispatch center, which shares full interoperability with 11 smaller regional dispatch centers.²³¹ This provides great interoperability benefits, particularly during mass casualty incident (MCI) events. The regional centers handle routine calls, while all calls related to the MCI are routed to the national dispatch center.²³² In this way, all information pertaining to an ongoing event is collected by the same entity that tracks resources assigned to that event, which enhances situational awareness. Responses to routine incidents can carry on uninterrupted.

Of course, this practice is predicated upon Israel's size and its nationalized public safety agencies. In contrast to Israel, a nation about the size and population of New Jersey,²³³ the United States is vast in area and has a population of 317 million.²³⁴ While Israel has one national police department, the United States has more than 18,000; each is independent from the others and subject to laws and practices governing its jurisdiction.²³⁵ The scope and government model of the United States makes nationalized dispatch centers unlikely to work. Whatever benefits consolidation may provide, the size of a PSAP may reach the point of diminishing returns with respect to those benefits. Research into where that point lies would be of benefit.

²³¹ Michael Peddle, "Mass Casualty Incident Preparedness: Lessons learned from Israeli preparedness and surge response for MCI," CAEP, June 2012, http://caep.ca/sites/default/files/caep/files/caep_2012_1.pdf

²³² Ibid.

²³³ "State Population by Rank, 2013," infoplease.com, accessed March 9, 2014, <http://www.infoplease.com/us/states/population-by-rank.html>

²³⁴ "U.S. and World Population Clock," www.census.gov, accessed March 9, 2014, <https://www.census.gov/popclock/>

²³⁵ Nadav Morag, "Self-Study Course: Homeland Security in Israel," Naval Postgraduate School, August 2009, <https://www.chds.us/courses/course/view.php?id=342>.

APPENDIX. PSAP SURVEY

This survey was sent electronically in two parts to nine PSAP directors or Operations Managers. Participant comments at the end of the survey were encouraged.

PART I: PERSONAL INFORMATION

NAME:	
TITLE:	

NOTE: You will be identified by name, title and PSAP affiliation in thesis citations.

PART II: PSAP INFORMATION

NAME OF PSAP:	
----------------------	--

1) TYPE OF PSAP (Place X in the appropriate box):

	Primary PSAP
	Secondary PSAP

2) NUMBER OF AGENCIES SERVED:

Note: For law enforcement agencies, please count only truly independent agencies. For example, if your county sheriff contracts services for a jurisdiction, and sheriff's deputies serve as the police officers in that town (regardless of uniform or car marking), do not count this as a separate agency.

	Law Enforcement
	Fire
	EMS (If third service only—do not count if FIRE is primary EMS provider)
	Other

3) EMERGENCY CALL VOLUME FOR 2013:

	Law Enforcement
	Fire
	EMS

Comments (if needed):

PART III: PSAP OPERATIONS

SECTION 1: Please answer the following questions about employees at your PSAP

4) Call takers/dispatchers are:

	Sworn (firefighters or police officers)
	Civilian
	Mixed

5) Radio operators are:

	Sworn
	Civilian
	Mixed

6) Dispatch floor supervisors are:

	Sworn
	Civilian
	Mixed

7) Administrators are:

	Sworn
	Civilian
	Mixed

Comments (if needed):

SECTION 2: Skip to Section 3 if your PSAP is single-discipline (Law Enforcement only OR Fire only)

8) Which best describes your call taking operations:

	Call takers will process any call they answer regardless if it is for a Fire, EMS or Law Enforcement problem
	Calls are answered by Law Enforcement dispatchers, and transferred to a Fire or EMS call taker if it is a Fire or EMS problem
	Other (explain in comments)

SECTION 3: Skip to Part III if your PSAP is multi-discipline (Law Enforcement AND Fire)

9) Which best describes your call taking operations:

	Primary PSAP: 9-1-1 calls of all types are answered, and transferred to another PSAP if they require the services of another discipline
	Secondary PSAP: Calls are transferred from another PSAP if they require the services of our discipline
	Other (explain in comments)

Comments (if needed):

PART III: CAD INTEROPERABILITY

10) Which best describes your CAD model:

	All agencies served at my PSAP are dispatched from the same CAD system
	Different disciplines (police, fire) served at this PSAP are dispatched from different CAD systems
	Different agencies served at this PSAP are dispatched from different CAD systems
	Other (explain in comments)

Comments (if needed):

11) Which best describes your CAD model (Check all that apply):

	Units from all agencies served have their location and status presented at all CAD workstations
	Units from different disciplines have their location and status presented at different CAD workstations
	Units from different agencies have their location and status presented at different CAD workstations
	Other (explain in comments)

Comments (if needed):

PART IV: RADIO INTEROPERABILITY

SECTION 1: SKIP TO SECTION 2 IF YOUR PSAP DOES NOT SERVE ANY FIRE AGENCIES

12) Do all Fire agencies served by your PSAP share radio interoperability?

	Yes, radios are compatible/same system
	Yes, through patching
	No

Comments (if needed):

13) Do all Fire agencies served by your PSAP share radio interoperability with Fire agencies served by other PSAPs?

	Yes, radios are compatible/same system
	Yes, through patching
	Not sure
	No

14) Do the Fire and Law Enforcement agencies served by your PSAP share radio interoperability with each other?

	Yes, radios are compatible/same system
	Yes, through patching
	No
	N/A—PSAP does not serve any Law Enforcement agencies

Comments (if needed):

15) Do the Fire agencies served by your PSAP share radio interoperability with Law Enforcement agencies served by other PSAPs?

	Yes, radios are compatible/same system
	Yes, through patching
	Not sure
	No

SECTION 2: SKIP TO SECTION 3 IF YOUR PSAP DOES NOT SERVE ANY LAW ENFORCEMENT AGENCIES

16) Do all Law Enforcement agencies served by your PSAP share radio interoperability?

	Yes, radios are compatible/same system
	Yes, through patching
	No

Comments (if needed):

17) Do the Law Enforcement agencies served by your PSAP share radio interoperability with Law Enforcement agencies served by other PSAPs?

	Yes, radios are compatible/same system
	Yes, through patching
	Not sure
	No

Comments (if needed):

18) Do the Fire and Law Enforcement agencies served by your PSAP share radio interoperability with each other?

	Yes, radios are compatible/same system
	Yes, through patching
	No
	N/A—PSAP does not serve any Fire agencies

Comments (if needed):

19) Do the Law Enforcement agencies served by your PSAP share radio interoperability with Fire agencies served by other PSAPs?

	Yes, radios are compatible/same system
	Yes, through patching
	No

SECTION 3: SKIP THIS SECTION IF YOUR PSAP DOES NOT SERVE ANY THIRD SERVICE EMS AGENCIES (i.e. EMS ONLY AGENCIES—SKIP IF FIRE PROVIDES EMS SERVICES)

20) Do all EMS agencies served by your PSAP share radio interoperability?

	Yes, radios are compatible/same system
	Yes, through patching
	No

Comments (if needed):

21) Do the EMS and Fire agencies served by your PSAP share radio interoperability with each other?

	Yes, radios are compatible/same system
	Yes, through patching
	No
	N/A – PSAP does not serve any Fire agencies

Comments (if needed):

22) Do the EMS and Law Enforcement agencies served by your PSAP share radio interoperability with each other?

	Yes, radios are compatible/same system
	Yes, through patching
	No
	N/A – PSAP does not serve any Law Enforcement agencies

Comments (if needed):

PART V: OPERATIONAL INTRA-DISCIPLINE INTEROPERABILITY

SECTION 2: SKIP TO SECTION 3 IF YOUR PSAP DOES NOT SERVE ANY FIRE AGENCIES OR IF YOUR PSAP SERVES A SINGLE FIRE AGENCY

23) Which best describes your model for coordination among Fire agencies served by your PSAP?

	Complete coordination: Essentially, the Fire agencies act as one large fire department. SOPs and communications are integrated, and the closest units are dispatched regardless of jurisdictional boundaries or incident size.
	Automatic Mutual Aid: Mutual aid is automatic for large incidents, but routine incidents are dispatched according to jurisdictional boundaries if units from the primary jurisdiction are available.
	Mutual Aid on Request: Incidents are dispatched with respect to jurisdictional boundaries; mutual aid agreements are in place but must be activated.
	Jurisdictional: Incidents are dispatched purely based on jurisdictional boundaries
	Other (please explain in comments section)

Comments (if needed):

24) How often do different Fire agencies served by your PSAP operate together at routine FIRE (not to include EMS) incidents? (For the purpose of this question, routine incidents are those that occur regularly or require less than three units or one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

Comments (if needed):

25) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and firefighter-to-fighter regardless of agency?

	Every time by design – radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

26) How often do different Fire agencies served by your PSAP operate together at routine EMS incidents? (For the purpose of this question, routine incidents are those that occur regularly or require less than three units or one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)

	Almost never
	EMS is not provided by Fire

Comments (if needed):

27) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and firefighter-to-firefighter regardless of agency?

	Every time by design – radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

28) How often do different Fire agencies served by your PSAP operate together at less-routine incidents? (For the purpose of this question, less-routine incidents are those that require more than three units and more than one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

Comments (if needed):

29) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and firefighter-to-fighter regardless of agency?

	Every time by design – radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

SECTION 3: SKIP THIS SECTION IF YOUR PSAP DOES NOT SERVE ANY LAW ENFORCEMENT AGENCIES OR IF YOUR PSAP SERVES A SINGLE LAW ENFORCEMENT AGENCY

30) Which best describes your model for Intra-Discipline coordination among Law Enforcement agencies served by your PSAP?

	Complete coordination: Essentially, the Law Enforcement agencies act as one large police department. SOPs and communications are integrated, and the closest units are dispatched regardless of jurisdictional boundaries or incident size.
	Automatic Mutual Aid: Mutual aid is automatic for large incidents, but routine incidents are dispatched according to jurisdictional boundaries if units from the primary jurisdiction are available.
	Mutual Aid on Request: Incidents are dispatched with respect to jurisdictional boundaries; mutual aid agreements are in place but must be activated.
	Jurisdictional: Incidents are dispatched purely based on jurisdictional boundaries
	Other (please explain in comments section)

Comments (if needed):

31) How often do different Law Enforcement agencies served by your PSAP operate together at routine incidents? (For the purpose of this question, routine incidents are those that occur regularly or require less than three units or one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

32) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and officer-to-officer, regardless of agency?

	Every time by design—radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

33) How often do different Law Enforcement agencies served by your PSAP operate together at less-routine incidents? (For the purpose of this question, less-routine incidents are those that require more than three units and more than one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

Comments (if needed):

34) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and officer-to-officer, regardless of agency?

	Every time by design—radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

PART VI: OPERATIONAL INTER-DISCIPLINE INTEROPERABILITY

35) Regardless of what type of PSAP you operate, how often do Fire and Police agencies operate together at routine incidents in the area you service? (For the purpose of this question, routine incidents are those that occur regularly or require less than three units or one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

Comments (if needed):

36) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and officer-to-fighter?

	Every time by design—radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

37) Regardless of what type of PSAP you operate, how often do Fire and Police agencies operate together at routine EMS incidents in the area you service? (For the purpose of this question, routine incidents are those that occur regularly or require less than three units or one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

38) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and EMT-to-officer regardless of agency?

	Every time by design—radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

39) Regardless of what type of PSAP you operate, how often do Fire and Police agencies operate together at less routine incidents in the area you service (For the purpose of this question, less-routine incidents are those that require more than three units and more than one hour to mitigate)

	Daily
	Frequently (once/week or more)
	Occasionally (a few times a month)
	Infrequently (less than once/month)
	Almost never

Comments (if needed):

40) In situations described by the previous question, how often are communications facilitated by the PSAP to ensure that radio communications are possible unit-to-unit and officer-to-fighter regardless of agency?

	Every time by design—radios are compatible
	Every time
	Most of the time
	Infrequently
	Almost never

Comments (if needed):

PART VII: YOUR PSAP

41) Is there anything in particular I should know about the operations of your PSAP that may make it unique?

Comments:

PART VIII: Follow Up

1) In the following situations, how often do firefighters actually communicate directly with police officers unit-to-unit or firefighter-to-police officer on the same radio channel? (Do not include situations where messages are relayed through the PSAP or through a unified command structure. Please consider only **DIRECT** communication via radio).

	Daily	Frequently (once/week or more)	Occasionally (a few times a month)	Infrequently (less than once/month)	Almost never
Routine incidents (Incidents that occur regularly or require less than three units and more than one hour to mitigate)					
Less-routine incidents (Incidents that require more than three units and more than one hour to mitigate)					

2) If police and fire agencies operating together at **ROUTINE INCIDENTS** only communicate unit-to-unit and firefighter-to-officer a few times a month or less despite the capability to do so every time, why is that? **CHECK ALL THAT APPLY**

☐	Routine incidents do not typically require inter-discipline radio communications
☐	Communications at routine incidents are typically handled face-to-face
☐	Police and fire are working on discipline specific objectives at incidents, and thus do not require radio communications
☐	Police and fire communicating on the same channel make the channel too cluttered with transmissions for effective communications
☐	Police and fire utilize different communications protocols which are not compatible
☐	Police and fire operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications

	Training issue – police and fire are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

3) If police and fire agencies operating at LESS ROUTINE INCIDENTS only communicate unit-to-unit and firefighter-to-officer a few times a month or less despite the capability to do so every time, why is that? CHECK ALL THAT APPLY

	Less-routine incidents do not typically require inter-discipline radio communications
	Communications at routine incidents are typically handled face-to-face
	Police and fire are working on discipline specific objectives at incidents, and thus do not require radio communications
	Police and fire communicating on the same channel make the channel too cluttered with transmissions for effective communications
	Police and fire utilize different communications protocols which are not compatible
	Police and fire operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications
	Training issue – police and fire are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

4) IF YOUR PSAP DOES NOT DISPATCH FOR ANY LAW ENFORCEMENT AGENCIES, SKIP TO QUESTION 7.

In the original survey, you indicated that your system has the capability for police from different agencies to communicate unit-to-unit and officer-to-officer via radio.

In the following situations, how often do police officers from different agencies actually communicate directly on the same radio channel? (Do not include situations where messages are relayed through the PSAP or through a unified command structure. Please consider only DIRECT communication via radio).

	Daily	Frequently (once/week or more)	Occasionally (a few times a month)	Infrequently (less than once/month)	Almost never
Routine incidents (Incidents that occur regularly or require less than three units and more than one hour to mitigate)					
Less-routine incidents (Incidents that require more than three units and more than one hour to mitigate)					

IF YOU ANSWERED ONLY “DAILY” OR “FREQUENTLY” TO THE ABOVE, YOU ARE FINISHED. THANK YOU FOR YOUR PARTICIPATION. IF ANY OTHER ANSWERS, PLEASE CONTINUE.

5) If different police agencies operating at ROUTINE INCIDENTS only communicate on the same channel a few times a month or less despite the capability to do so every time, why is that? CHECK ALL THAT APPLY

	Routine incidents do not typically require intra-discipline radio communications
	Communications at routine incidents are typically handled face-to-face
	Different agencies communicating on the same channel make the channel too cluttered with transmissions for effective communications
	Different agencies utilize different communications protocols which are not compatible
	Police operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications
	Training issue – police are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

6) If different police agencies operating at LESS ROUTINE INCIDENTS only communicate on the same channel a few times a month or less despite the capability to do so every time, why is that? CHECK ALL THAT APPLY

	Routine incidents do not typically require intra-discipline radio communications
	Communications at routine incidents are typically handled face-to-face
	Different agencies communicating on the same channel make the channel too cluttered with transmissions for effective communications
	Different agencies utilize different communications protocols which are not compatible
	Police operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications
	Training issue – police are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

7) IF YOUR PSAP DOES NOT DISPATCH FOR ANY FIRE AGENCIES, YOU ARE DONE.

In the original survey, you indicated that your system has the capability for firefighters from different agencies to communicate unit-to-unit and officer-to-officer via radio.

In the following situations, how often do firefighters from different agencies actually communicate directly on the same radio channel? (Do not include situations where messages are relayed through the PSAP or through a unified command structure. Please consider only DIRECT communication via radio).

	Daily	Frequently (once/week or more)	Occasionally (a few times a month)	Infrequently (less than once/month)	Almost never
Routine incidents (Incidents that occur regularly or require less than three units and more than one hour to	x				

mitigate)					
Less-routine incidents (Incidents that require more than three units and more than one hour to mitigate)	x				

IF YOU ANSWERED ONLY “DAILY” OR “FREQUENTLY” TO THE ABOVE, YOU ARE FINISHED. THANK YOU FOR YOUR PARTICIPATION. IF ANY OTHER ANSWERS, PLEASE CONTINUE.

8) If different fire agencies operating at ROUTINE INCIDENTS only communicate on the same channel a few times a month or less despite the capability to do so every time, why is that? CHECK ALL THAT APPLY

	Routine incidents do not typically require intra-discipline radio communications
	Communications at routine incidents are typically handled face-to-face
	Different agencies communicating on the same channel make the channel too cluttered with transmissions for effective communications
	Different agencies utilize different communications protocols which are not compatible
	Police operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications
	Training issue – police are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

Comments (please comment utilizing complete sentences that may be quoted in thesis text):

9) If different fire agencies operating at LESS ROUTINE INCIDENTS only communicate on the same channel a few times a month or less despite the capability to do so every time, why is that? CHECK ALL THAT APPLY

	Routine incidents do not typically require intra-discipline radio communications
	Communications at routine incidents are typically handled face-to-face
	Different agencies communicating on the same channel make the channel too cluttered with transmissions for effective communications
	Different agencies utilize different communications protocols which are not compatible

	Police operate through a unified command structure, which obviates the need for firefighter-to-police officer voice communications
	Training issue – police are unable to take full advantage of this capability
	Organizational culture is an impediment
	OTHER: Please specify in comment section below.

Comments (please comment utilizing complete sentences that may be quoted in thesis text):

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