Operational Information Flow

and the

Public Safety
Coordinated Operations Management Platform

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Introduction

Public safety agencies worldwide have a problem – operational information flow. Read almost any after action report of the last 10 years and you will find a pattern:

- Achieving and sharing situational awareness was difficult
- Communication with all relevant stakeholders was problematic
- Coordinated information flow was inadequate.

The critical missing link is operational information flow. Without solid operational information flow, you cannot get the right resources to the right place at the right time doing the right things. For operations commanders and front-line units, information is the foundation of decision-making and action. The best operational decisions are not possible without it. The more complex the event or incident, the more this holds true. Fire and police departments around the world need new ways to manage the information flow created by constant change and increasing complexity.

Constant change and increasing complexity assault your operational effectiveness and make your job harder every day. The arrow of time moves us forward into an inexplicable future. Disasters (natural or man-made), terrorism, fires, floods, and all sorts of events and incidents will continue to happen locally, regionally and nationally. All of these events have been occurring since the beginning of human existence and as time moves on, they will get more complicated and involve more stakeholders than you ever thought possible. More and more public safety agencies will find themselves faced with these "wicked problems".

A "wicked problem" is a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize.

It is becoming more and more difficult to address today's challenges because the world is experiencing an exponential increase in the rate of change, complexity, and the corresponding information flow. The world is changing ever faster and becoming more complex every day. How can you keep up? How can you ever hope to achieve the highest level of operational excellence, to save lives and property, to provide for the safety and security of the public, in the midst of all this chaos and confusion?

Data and information drive emergency response. That's a fact. Without data and information, you cannot know what has happened - what is happening - what is likely to happen - or have any idea what to do about it. Timely, quality information drives good decisions and effective response. In today's unpredictable, constantly changing, and ever more complex world, you need to manage information better than ever before.

Constant change and increasing complexity create a wicked problem of information flow. The challenge is to manage data and information better across five critical operational functions (let's call them C5):

1. Command
2. Control
3. Communications
4. Collaboration
5. Cooperation

"Safety hinges on a capability of transferring adequate information to appropriate persons in an appropriate time". *National Strategy for Information Sharing, 2012*

The right set of software applications can help you manage information across all of the C5 components.

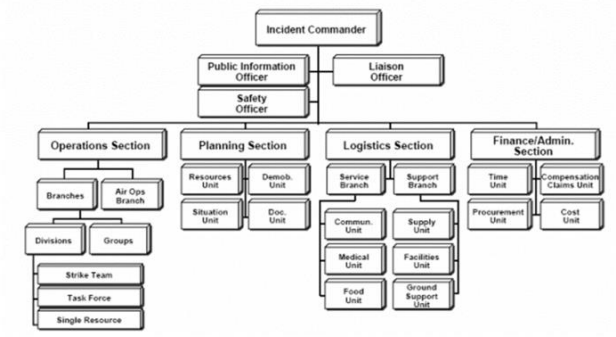
Software facilitates the management of data and information to increase efficiency and effectiveness. If you are not using the latest software to help manage events and incidents, to achieve situational awareness (for day-to-day and emergency events), to create a user-centric operational picture, to manage resources and tasks, and to communicate and collaborate with any and every stakeholder, then you are at risk of not being able to provide an adequate response. When the right data and information are not available and accessible, your decisions will not be the best ones, and lives will be at risk.

Google CEO Eric Schmidt says, "between the birth of the world and 2003, there were 5 Exabytes of information created. We [now] create 5 Exabytes every two days."

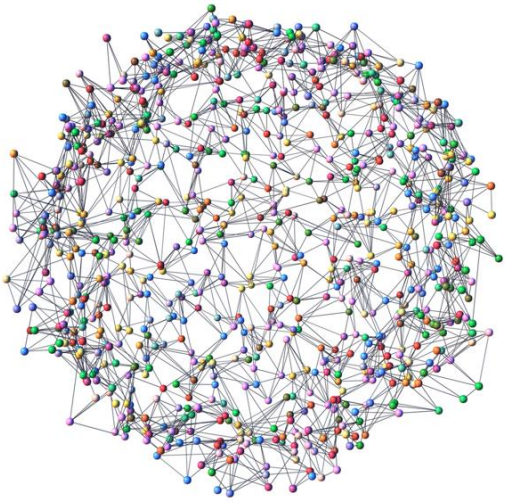
*** It has been said that five Exabytes would be equal to all of the words ever spoken by mankind.**

Public safety agencies and all relevant stakeholders must have the ability to act and interact flexibly and adaptively as changing circumstances dictate. The traditional approach of public safety agencies has been linear and hierarchical, essentially bi-directional. This approach will not keep pace. To be effective today, agencies must achieve coordinated multi-dimensional information flow. The military and the private sector have realized this need for many years. They have all implemented operations management systems. It is critical that all public safety agencies get on board as soon as possible.

Wicked problems are different because traditional processes cannot resolve them.



Linear
Bidirectional
Hierarchical



Asymmetric
Multi-dimensional
Decentralized

Fig. 1

The new way to achieve higher levels of operational excellence is with multi-dimensional information flow through a **Public Safety Coordinated Operations Management Platform (PS-COMP)**.

This white paper provides an overview of Coordinated Operations Management Platforms and how they can help you deliver operational excellence and achieve your mission more effectively in a world of constant change and increasing complexity.

The Problem

The problem is managing operational information flow. If you can't get all the information you need, can't filter it, and can't share it, you can't operate effectively.

The increasing rate of change, complexity, and corresponding information flow have reached critical mass. Public safety agencies must find new ways to manage multi-dimensional information flow to operate most effectively.

The New Math for Public Safety Operations

Albert Einstein was pretty good at math. His theory of general relativity is one of the two pillars of modern physics (along with quantum mechanics). He is best known for the formula **$E = m \times c^2$** (Energy equals mass times the speed of light squared, which has been dubbed "the world's most famous equation"). It is a simple formula with far reaching implications.

Simple formulas are wonderful things. They make complex operations and interactions easier to understand and easier to work with. If physicists can boil the universe down to a simple and elegant equation, can't we do the same for public safety operations?

Public safety operations (fire, police, emergency management, etc.) can get very complex, but seem to pale compared to the workings of the universe. So maybe we can come up with a comparable equation. Something that can give us a foundation to work from.

Let's start with the basics. The universe is made of three fundamental things: mass, energy, and information.

Resources

For purpose of relating these things to public safety operations, let's say mass is equivalent to resources (r). Resources are the sum of all the apparatus, people, equipment, knowledge, expertise, training, information, and everything else available to use in a response.

Effectiveness

We can think of energy (E) as the energy of the response to an event or incident. In other words, the effectiveness of the response or effectiveness of operations.

This relates to another physics term – entropy. Entropy is a measure of disorder or chaos, uncertainty or randomness. Ordered energy is applied to a disordered system to bring order back. Fire and police departments respond when entropy has exceeded a certain limit. Their

response applies ordered energy to get things back to normal. The goal of any public safety operation is to be as effective as possible, to avoid wasting time, effort, work, or resources.

Information Flow

For operations commanders and front-line units, information (i) is the foundation of decision-making and action. To be effective, information has to move. It has to be sliced, diced, parsed, packaged and put in motion. You have to get it into the operational information flow. And it just so happens that information travels close to the speed of light (c = about 670 million mph).

If we put these pieces back together with a public safety perspective, we have the makings of a familiar formula:

$$E=r \times if^2$$

Effectiveness of response/operations (E) = resources (r) x information flow squared (if^2).

Let's do a little math.

If r = 7 (good resources) and i = 2 (poor information flow)
Then E = 7 x 4 = **28** (effectiveness of response).

If r = 7 (good resources) and i = 5 (better information flow)
Then E = 7 x 25 = **175** (much higher effectiveness of response).

Public safety agencies have traditionally focused on resources. More personnel, more apparatus, more vehicles, more training, more of the most expensive part of this equation. Resources are critical, but if you cannot get the right resources to the right place at the right time doing the right things, your effectiveness takes a huge hit. The point of greatest leverage is information flow ("*Give me a place to stand, and a lever long enough, and I will move the world.*" — Archimedes).

Public safety agencies also tend to think of information in more linear, bi-directional, and hierarchical ways. The idea of asymmetric, decentralized, and multi-dimensional operation information flow might be a new concept. In any public safety operations, the best information is information that can move. Information that cannot be shared, that cannot move, is ineffective and hampers your response and your daily operations. Information sitting on an ICS command board or on a piece of paper cannot move well. You can only share it with people close enough to read it.

Situational Awareness, Shared Situational Awareness, Command & Control, Communications, Collaboration, and Cooperation (the pillars of public safety operations) all require information flow.

A Quick Survey

Most public safety agencies do not manage data and information flow as effectively as possible. To see if your agency has a solid handle on operational information flow, answer the following self-assessment questions:

1. Situational Awareness (SA) is achieved when **everyone who needs to know** has an understanding of what has happened, what is happening, what is likely to happen, and what tasks and actions are underway, or will be taken, to manage the event or incident at hand.

   Do you have the ability to achieve Situational Awareness with all necessary personnel from your agency?

   ___ Yes ___ Somewhat ___ No

2. A User Centric Operational Picture (UCOP) is shared Situational Awareness that can be tailored to meet the data and information needs of the end user. With a UCOP you can share different parts or pieces of the larger data and information pool with **any other agency** or entity you need to **at any time** and do it easily and quickly.

   Do you have the ability to create a User Centric Operating Picture? (To include all other departments in your jurisdiction; fire, police, transportation, utilities, power, etc., other public safety agencies in your region, hospitals in your region, emergency management centers in your region, state agencies, federal agencies, NGOs, and any private-sector organization necessary.)

   ___ Yes ___ Somewhat ___ No

3. **Can you assign tasks to private sector organizations, track those tasks and resources, and provide a UCOP for those private sector organizations along with task and resource tracking for their use?**

   ___ Yes ___ Somewhat ___ No

4. Interoperable Communications is the ability to **communicate as needed**, on demand, and as authorized at all levels of government and across all Public Safety disciplines and **across all communications devices** (radios of any type and on any frequency, smartphones, laptops, desktops, tablets).

Can field personnel on a radio easily start communications with any other public safety agency radio (regardless of type/frequency) anywhere in the region; with any VHF, UHF, or HAM radio; any landline phone; any smartphone; any device; and are all devices (except the radios) able to share videos, files, and messages?

___ Yes ___ Somewhat ___ No

If you responded "Somewhat" or "No" to any of the questions, then you are probably not using the latest software solutions for public safety, and you are not managing data and information as well as you could be. When you can respond "Yes" to all of these questions, you will be achieving the highest possible level of operational excellence.

Public safety agencies operate as Complex Adaptive Systems (CAS) where multi-directional information flow is imperative. Without multi-dimensional information flow, you are looking at information through a straw. If you cannot get the right information to the right people at the right time, decisions all down the line will be affected. Resources cannot be deployed effectively when information flow is impaired. Coordination becomes difficult to impossible.

A Complex Adaptive System (CAS) is a system such as a business, public safety agency, or other organization that consists of many connected parts that change as conditions change in order to succeed. They are open and dynamic; they continually adapt to new developments.

The image below is a graphic representation of what most information flow looks like today:

What Is:

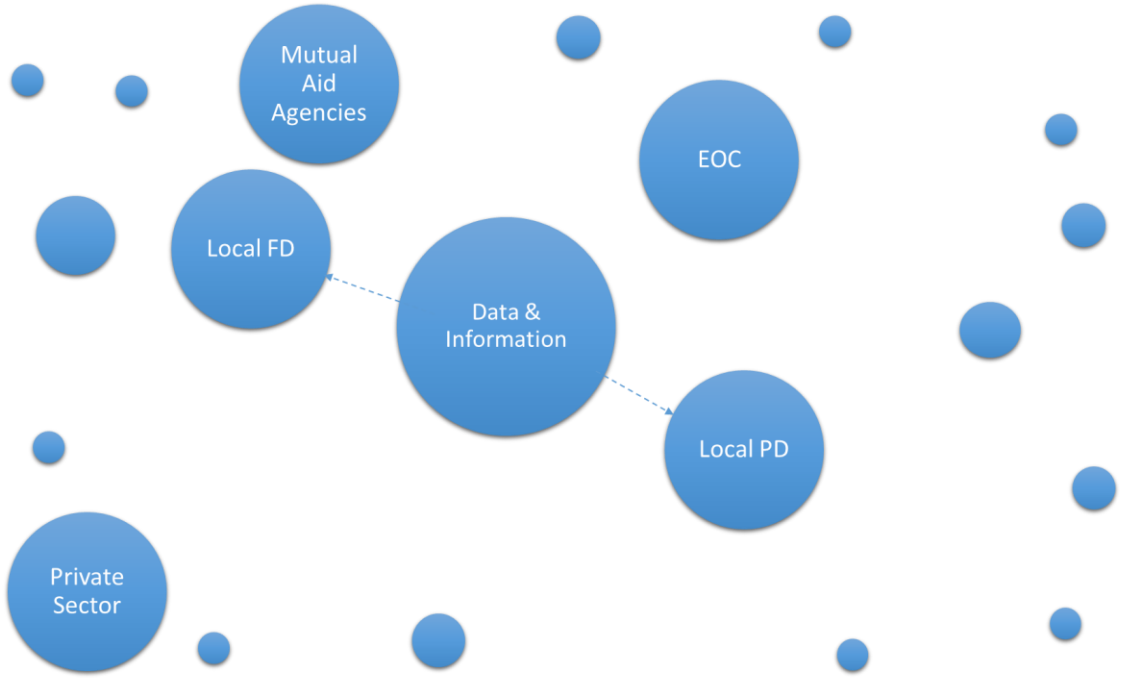


Fig. 2

Previous research proves that "teams fail to share information when they most need to do so." ***Mesmer-Magnus & DeChurch, 2009.***

Each dot is a stakeholder who needs information to carry out their assigned tasks. In this diagram, too many stakeholders are too far away from the information. Multi-directional information flow across all stakeholders is not possible.

This is the information you get when you look at a map through a straw. Can you tell where this is?

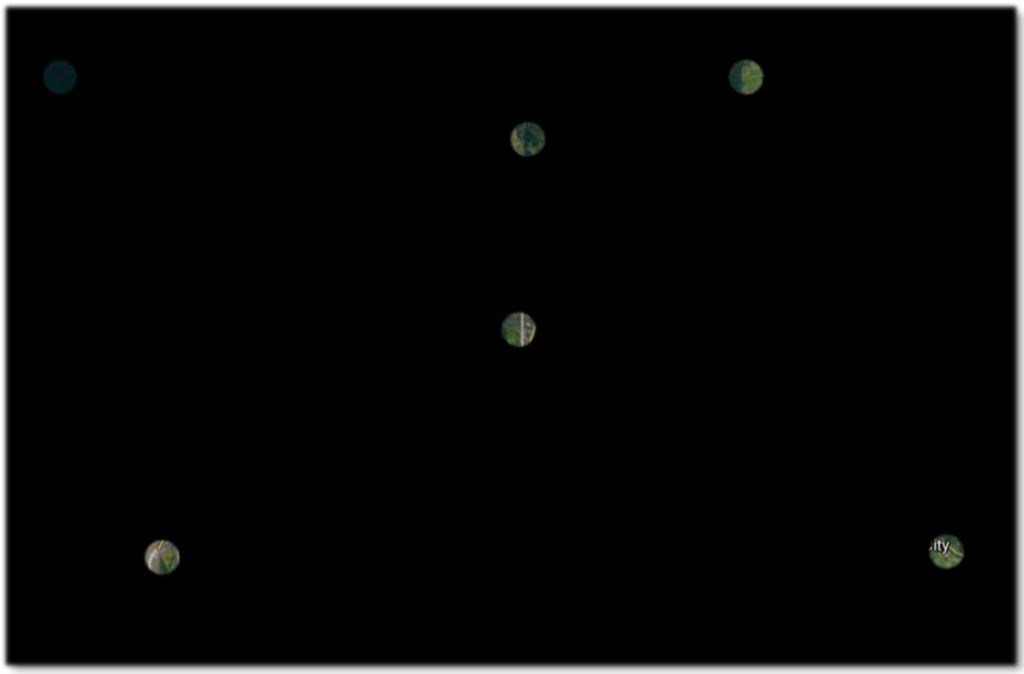


Fig. 3

The Solution

What public safety agencies need today is a Coordinated Operations Management Platform - a family of software applications that fills the gaps between existing applications and the ability to achieve multi-dimensional information flow to all stakeholders for any type or size of event or incident.

Multi-dimensional information sharing is the foundation for inter-organizational collaboration, and is critical for increasing efficiency and performance of public safety organizations.

Coordinated operations management requires multi-dimensional information flow that is:

1. Agile
2. Flexible
3. Adaptable

A CAS demands effective and continual information sharing.

A PS-COMP provides a much better and broader view of your world, much better than looking through straw. This is the full view that was under Fig. 3.

Fig. 4

The image below is a representation of effective multi-dimensional information flow delivered by a PS-COMP:

What Can Be:

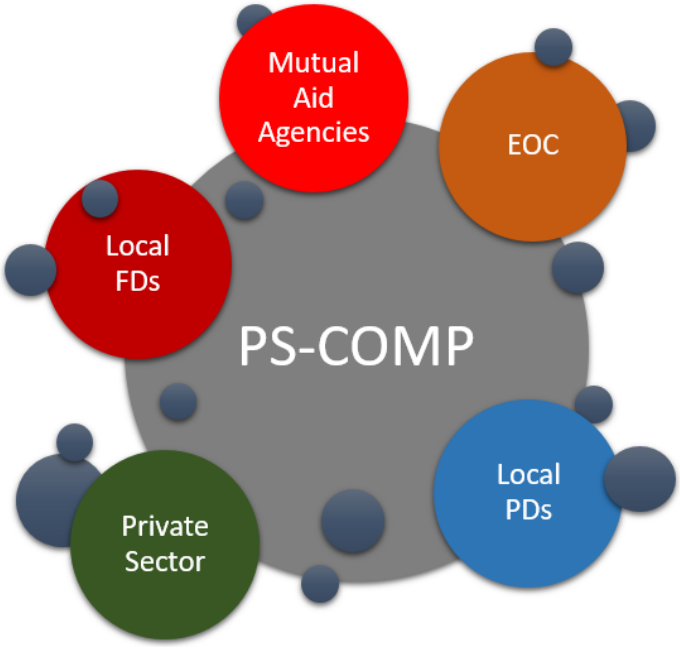


Fig. 5

Every stakeholder who needs information can get it quickly. In this new model, you have multi-directional information flow through all operational functions.

A PS-COMP provides similar capabilities to the U.S. military's Net-Enabled Command Capability (NECC): An integrated environment that is available to and easily accessible by each user and is structured to provide immediate, individualized access to the full range of information, software, guidance, advice and assistance, data, images, tools, and assessment and monitoring systems.

With a PS-COMP in place, you will have a regional system available to:

1. Manage data and information better.
2. Make better decisions.
3. Achieve greater situational awareness and share a User Centric Operating Picture.
4. Easily share critical information among public safety agencies and any other stakeholders.
5. Collaboratively share current situation status, deployment strategies, resource status, and response progression.
6. Gather information and intelligence from numerous stakeholder organizations.
7. Communicate effectively between all stakeholders.
8. Improve coordination and cooperation between agencies and stakeholders.

Coordination is the ability to "manage dependencies between activities performed to achieve a goal." For public safety agencies to achieve their goals, they have to be exceptionally agile, flexible, adaptable, and coordinated to handle the complex, dynamic, and interdependent activities of day-today operations and emergency response. To do this well you have to manage data and information better than you ever thought possible.

Information sharing in a CAS provides the foundation for making decisions, performing actions, locating resources, allocating funds, collaboration, and coordination of operations. The process of information sharing is multi-dimensional, asymmetrical, and dynamic.

A Public Safety Coordinated Operations Management Platform (PS-COMP) is an integrated toolset, a group of off-the-shelf software applications, carefully selected to meet the information flow gaps between public safety agencies and all stakeholders. A PS-COMP is designed to be a regional resource, used by all agencies and stakeholders who need information for day-to-day or emergency operations. It provides an architecture of participation and through its use, a community of action.

With a PS-COMP in place, police departments, fire departments, public agencies, private sector companies and all other stakeholders can share information and communicate, collaborate, and coordinate more effectively.

A PS-COMP provides core Situational Awareness (SA) and User Centric Operating Picture (UCOP) capabilities for effective communication and decision making, rapid staff actions, and appropriate mission execution. It integrates the SA and UCOP applications with other communications, collaboration, and cooperation applications that work together to support coordinated multi-directional information flow. This allows all stakeholders to collect, share, and display information that facilitates operational excellence in day-to-day and emergency response situations.

The following is an example of the capabilities of a PS-COMP and their general alignment in the emergency response process.

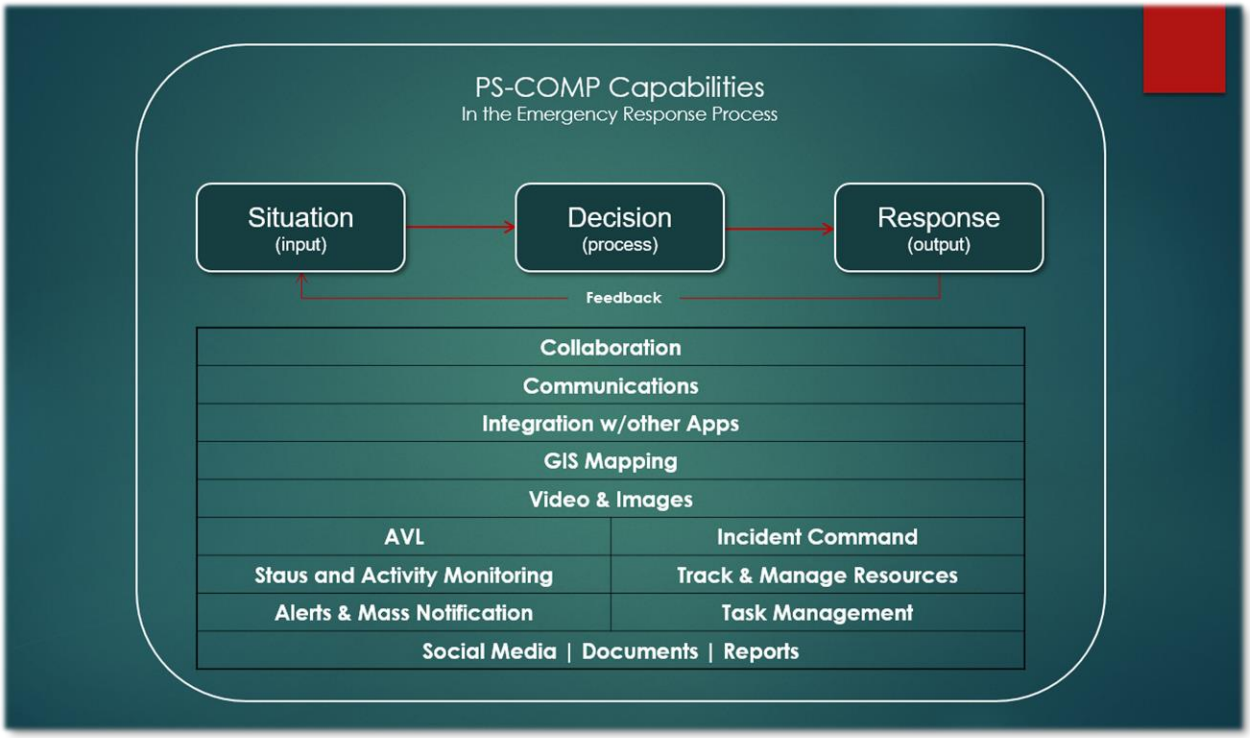
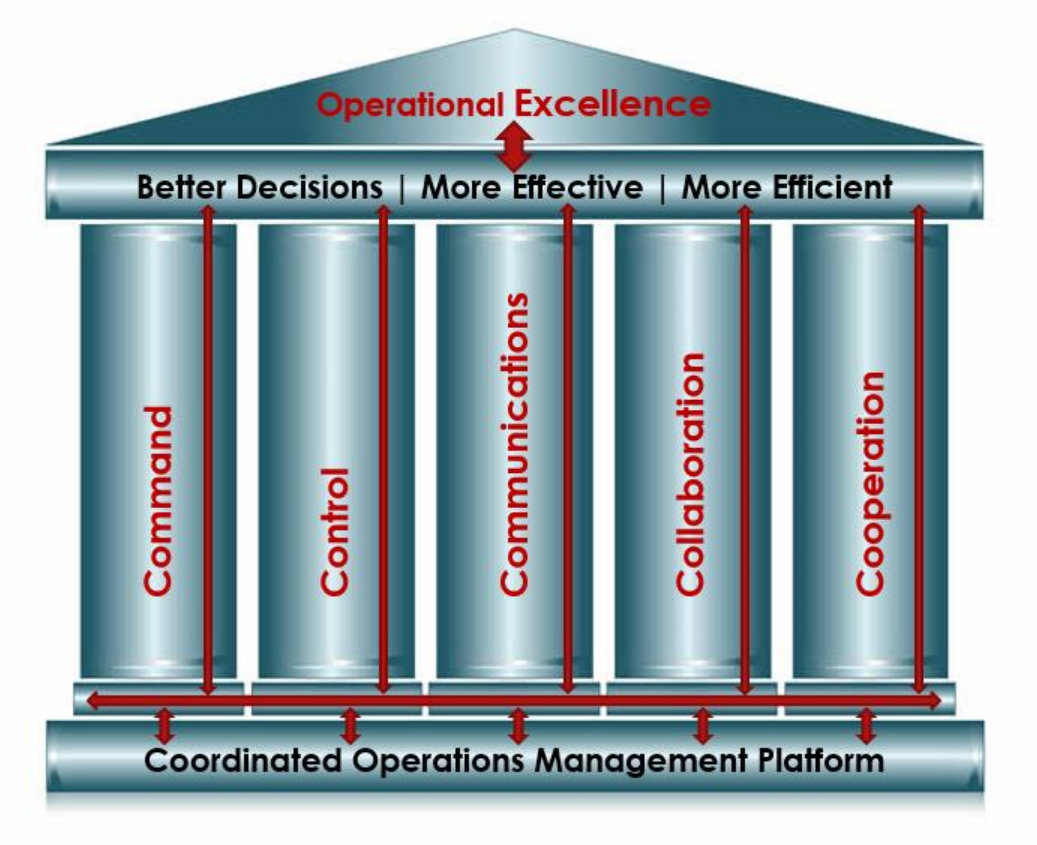


Fig. 6

This next figure represents information flow across the C5 operational components:



PS-COMP Core Capabilities

The core capabilities fall into three main categories: Command & Control, Communications, and Collaboration & Cooperation. Examples of each type of software application are given but keep in mind that these are not the only solutions available. Each application must fit your particular needs for each category. Remember also that this is an integrated set of software applications that can share information between any other application in the platform.

1. Command & Control

Core Functionality:

This category includes software that will provide Situational Awareness, a User Centric Operational Picture, and event/incident management through the Incident Command System. Police and Fire department CAD and RMS systems provide the core data and information and other non-emergency departments connect similar data sources.

Users:

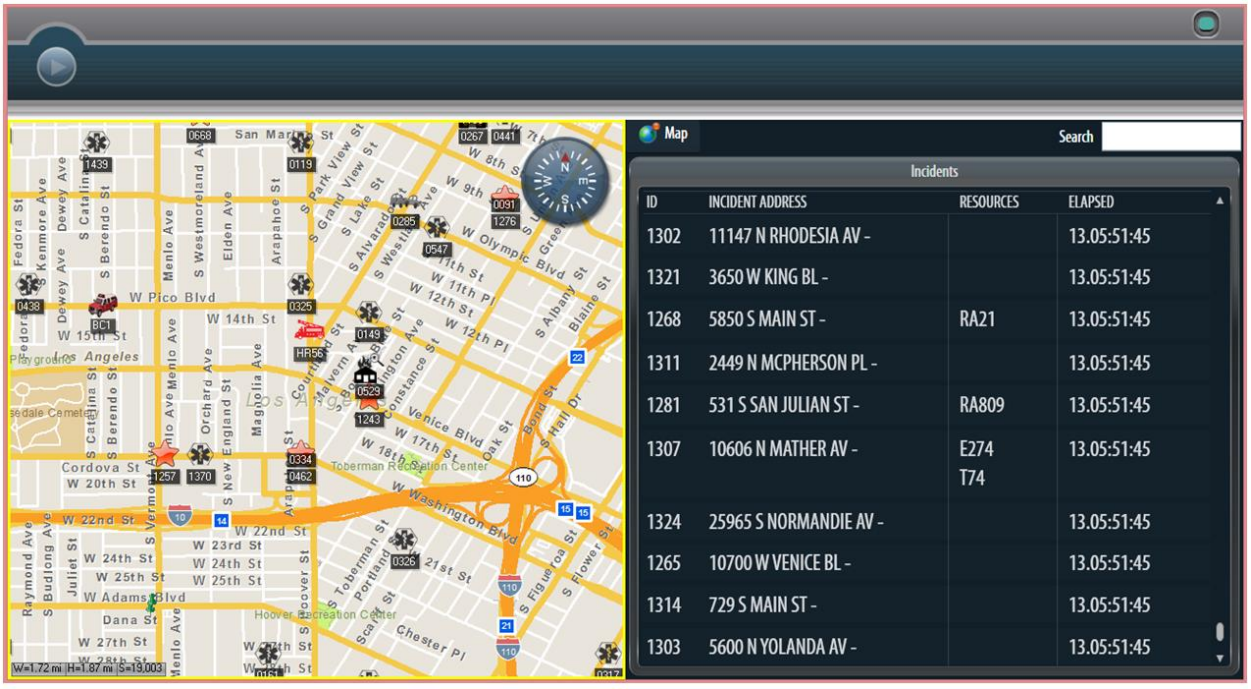
Users are usually limited to members of a public sector organization (city, county, state) and include police, fire, emergency management, utilities, transportation, and power departments. Port cities can use a command and control application to manage their maritime areas.

Example Software Application:

Adashi – Public Safety Command & Control

Adashi provides situational awareness, a common operating picture, event and incident management, and command and control functionality for police and fire departments. This application has a web viewer and a client server format. Adashi requires a data feed from computer-aided dispatch system. A server application is required. Adashi functional capabilities include: Collaboration, Incident Command, Communication and Messaging, Status and Activity Monitoring, Track and Manage Resources, Alerts, Integration with other apps/systems, Browser Based Access, GIS Integration and Mapping, Access to Video and Images, Document Management, Task and Project Management, Reports.

Adashi Screen Shots:

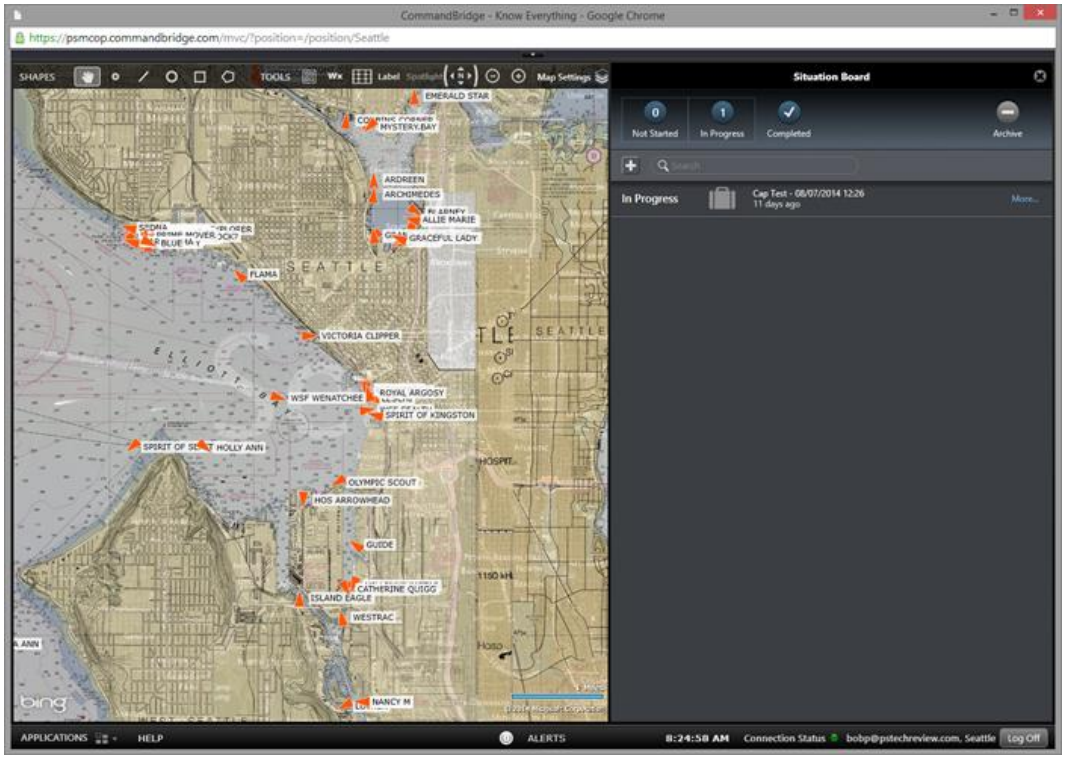


More information at www.adashisystems.com.

CommandBridge – Maritime Command & Control

CommandBridge provides situational awareness, a common operating picture, event and incident management, and command and control functionality for maritime stakeholders. The CommandBridge platform uses advanced software technology to assimilate sensor feeds, cut through security-information clutter, and provide relevant and actionable information to customers around the world. As a high performance system utilizing secure role-based access, CommandBridge provides you with a highly

configurable, secure, and scalable solution to situational awareness and incident response.



More information at http://aressecuritycorp.com/commandbridge/

2. Communications

Core Functionality:

This category provides interoperable communications across all communication devices and between all stakeholders (local, regional, private sector, hospitals, transportation, maritime, schools, and many more). Devices may include radios, smartphones, tablets, laptops, desktops, and landlines. Public safety agencies tend to focus on their radio systems to communicate while the rest of the world uses other means. This solution must bridge all communications devices, means, and methods and should include data, files, text, video, and images.

Users:

All public safety agencies and all other stakeholders.

Example Software Application:

Mutualink

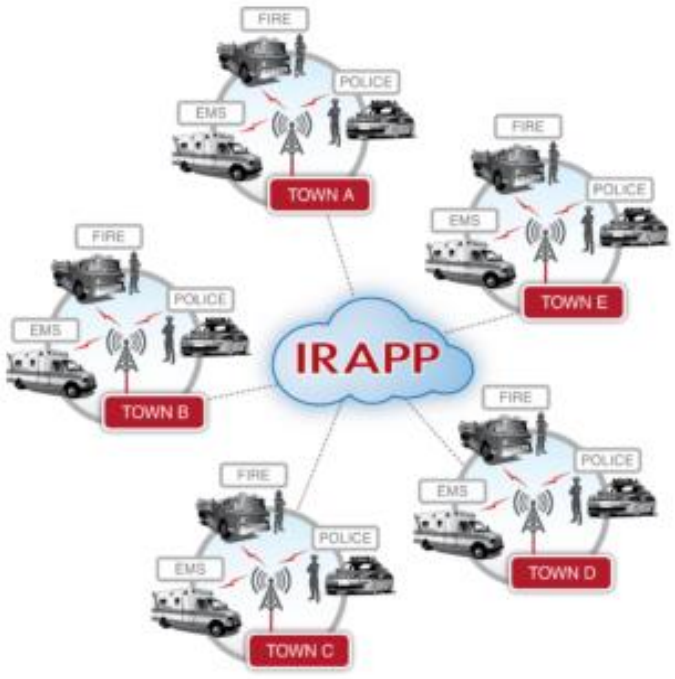
Mutualink is a Software-as-a-Service (SaaS) interoperable communications solution that provides communication connections between radios, smartphones, laptops, and any other communications devices. Voice, video, and text functionality is included. This application is intended for general use by all stakeholders. Radio integration requires a dedicated radio and router. Mutualink functional capabilities include: Collaboration, Communication and Messaging, Status and Activity Monitoring, Mapping, and Access to Video and Images.

Mutualink takes a distributed approach to bridging silos. Communication silos serve a purpose in public safety and private security for reasons of privacy. One drawback, however, is that they prevent seamless communication at times when agencies must collaborate to resolve an incident.

The Interoperable Response and Preparedness Platform (IRAPP) network is comprised of participants from public safety, private enterprise and critical infrastructure entities who have a need to collaborate, while desiring to maintain sovereign control over their communication assets.

In these cases, individuals silos can be overcome on an ad hoc basis with a distributed peer-to-peer IP-based network. Gateways bridge radio, video and data assets so that information and communications can be shared with select agencies as needed in an invitation-based environment.

Mutualink Screen Shot:



IRAPP: Interoperable Response and Preparedness Platform

More information at www.mutualink.net.

3. Collaboration and Cooperation

Core Functionality:

From a public safety perspective, collaboration during events or incidents is working together to maintain safety and order or repair a destructive state. People work together in support of shared goals and a shared vision. Cooperation is achieved when individuals and agencies exchange relevant information and resources in support of each other's goals, rather than a shared goal or vision. Selected data and information from the Command and Control category are shared with these applications to support collaboration and cooperation.

Users:

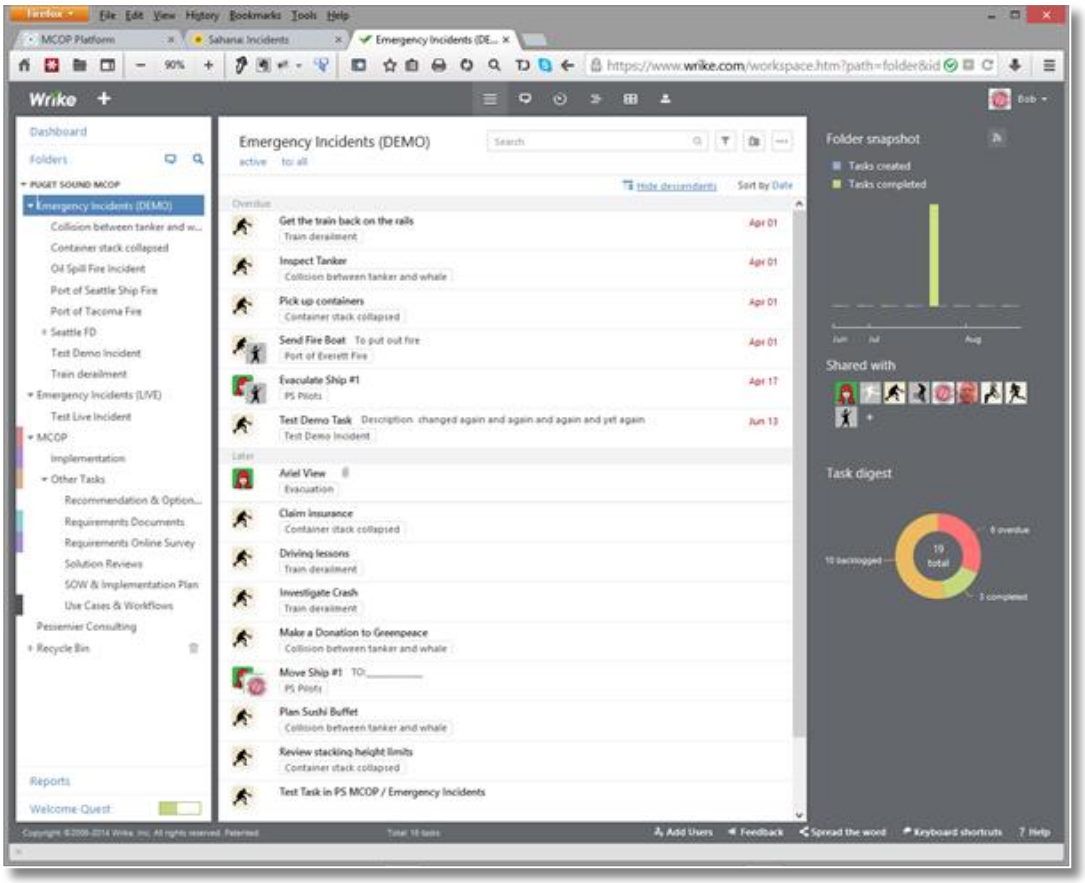
Stakeholders outside the public safety firewall. This may include private sector organizations, other public sector agencies, NGOs, volunteers, hospitals, and more.

Example Software Application:

Wrike

This is a SaaS application that provides task and project management, collaboration, and information sharing functionality. It can be used for daily and emergency operations. Wrike includes permalinks which are used by other WA-COP mapping applications. Intended for use by non-public safety organizations as a way to collaborate with public safety agencies, Wrike functional capabilities include: Collaboration, Communication and Messaging, Status and Activity Monitoring, Track and Manage Resources, Alerts, Integration with other apps/systems, GIS Integration and Mapping, Access to Video and Images, Document Management, Task and Project Management, Reports.

Wrike Screen Shot:

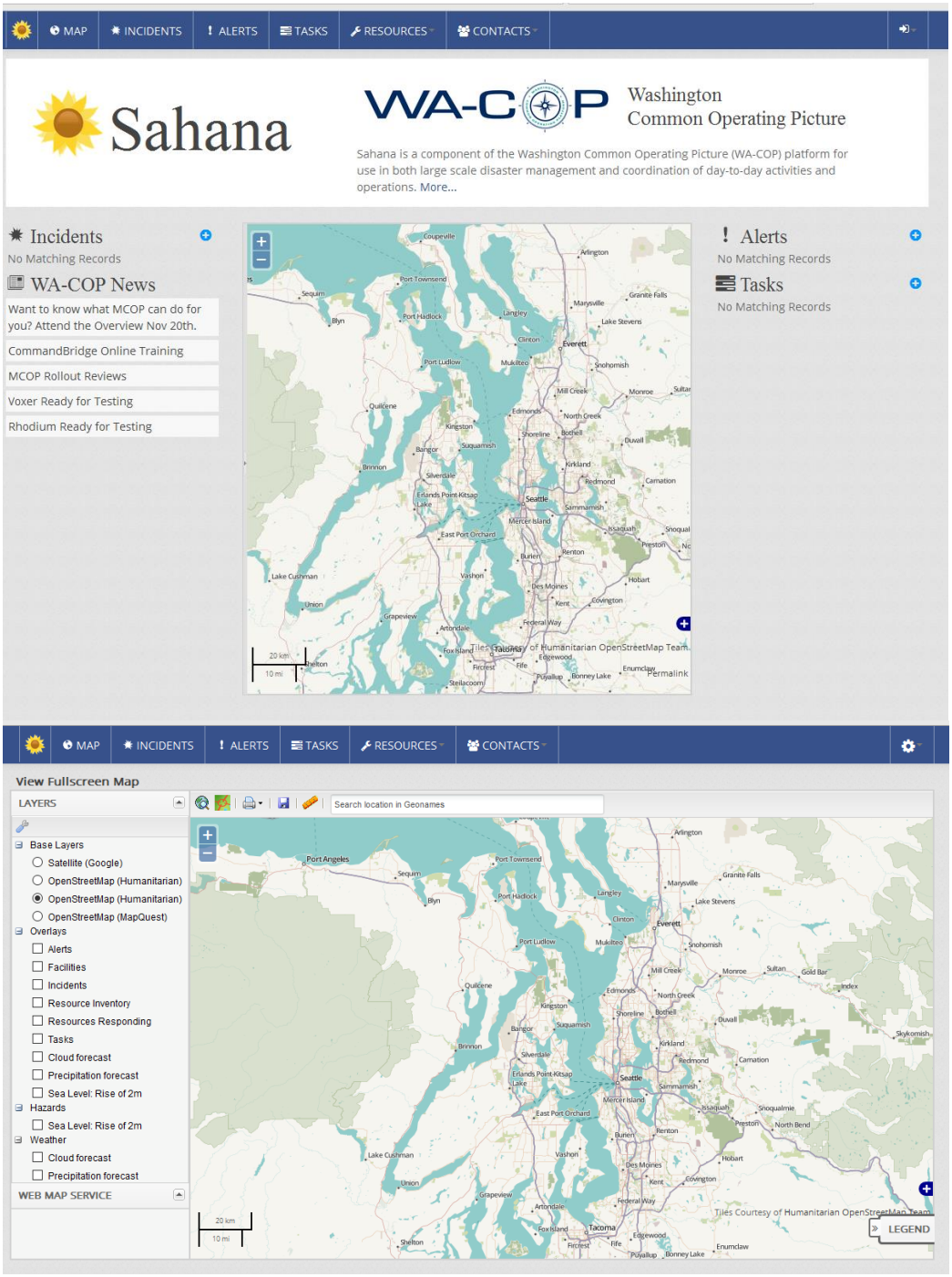


More information at www.wrike.com.

Sahana

This is a browser-based application that provides situational awareness, a common operating picture, task and resource management, information sharing, mapping, and disaster management functionality. It is intended for use by all stakeholders. Sahana functional capabilities include: Collaboration, Status and Activity Monitoring, Track and Manage Resources, Alerts, Integration with other apps/systems, GIS Integration and Mapping, Access to Video and Images, Document Management, Task and Project Management, Reports.

Sahana Screen Shots:



More information at www.sahanafoundation.org.

Note: The applications listed above are examples of what a large metropolitan area on the west coast implemented for their PS-COMP. These may or may not fit for your area and your needs.

Conclusion

To improve operational effectiveness, fire and police departments need to extend the range and reach of information. We are past the era of information sharing being on a "need to know" basis and are in the era of a "duty to share."

If you do not have good software at your disposal, if all you use at your command posts are pencils, markers, and magnets, you are in trouble. These traditional tools lock information into the command board. It may as well be in a black hole. You cannot effectively share any of it with anyone more than four feet away.

CAD and RMS systems limit information to your agency. Your fire department may use brand X CAD software and your police department uses brand Y. Most can never share information. Information sharing on a regional basis with multiple and varied stakeholders is usually out of the question.

Lousy operational information flow results in:

- Bad decisions
- Inability to achieve situational awareness
- Increased uncertainty
- Wasted time, energy, and money
- Slow response
- Incorrect or incomplete operational picture
- Ineffective command and control
- Communication difficulties
- Coordination problems
- Lack of cooperation
- Inefficient use of resources
- Increased risk to personnel and the public
- Inefficient response
- Increased costs

Public safety traditions are a wonderful thing. However, outdated practices can get in the way of progress. The difficulty today is merging the tried and true methods of public safety operations with the need for new thinking, new technologies, and new operational methods. Keep what is necessary and good and modify the rest to fit the challenges of today.

Old Habits

New Technologies

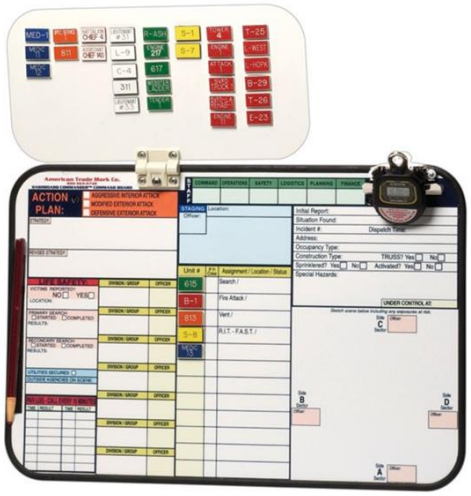


Fig. 7

Public safety agencies must keep up with the pace of change, complexity, and information flow. If they don't, they are going backwards and going backwards is failure. It may seem like trying to fit a square peg in a round hole, but it can be done.

A PS-COMP is designed to respond to the constant change and increasing complexity of the day-to-day and emergency environment in which first responders work. It delivers better decision making, cross agency communication, collaboration and more effective responses to events and incidents.

A PS-COMP is unique to each region. Using the concept of building blocks, it provides a better solution for less cost than a custom application development project. Similar projects when provided by large integrated software vendors or consultants are often configured from large bricks (custom-made applications), which form a system that is not functional in its individual parts, only as a whole. This approach involves developing complicated set of requirements and issuing a RFP for a single vendor that will meet as many of the requirements as possible. The complex process for these projects tend to take years to complete and by the end of the project, the initial requirements may be no longer valid.

A PS-COMP is built as an adaptable platform to meet end-user requirements by implementing individual blocks (each block is a software application), giving the user a cafeteria-style list of applications and solutions to choose from. Each participating agency gets an integrated platform that is agile, flexible, adaptable, cost effective and tailored to meet their needs. Parts and pieces of a PS-COMP can be removed and new

pieces (functionalities and capabilities) plugged in. This ensures a viable and fully capable solution for the long-term.

A PS-COMP provides coordinated and multi-dimensional information flow that supports command and control, communication, collaboration, and cooperation between public safety agencies and all relevant stakeholders.

"Failure isn't fatal, but failure to change might be." John Wooden

In our world of constant change and increasing complexity, operational information flow provides a new approach to achieving higher levels of operational excellence for all public safety agencies, all stakeholders, and the public they serve.

About the Author

Bob Pessemier is a technology solutions consultant for public safety agencies. A former Kent Fire Department Lieutenant and Washington State Fire Academy instructor, he has spent over 20 years working in IT with various software companies and technology consulting for public safety agencies. Bob holds a Master of Arts in Emergency and Disaster Management and an ITIL v3 Certification in IT Service Management. Bob was recently the Senior Consultant for the Washington Common Operating Platform project managed by Seattle PD and funded by DHS grants. More at www.wa-cop.org.

Contact Information

If you would like to explore how Operational Information Flow and a Public Safety Coordinated Operations Management Platform can help you improve your daily and emergency operations, please contact:

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