Preliminary Investigation for Multimodal Common Operating Picture (COP) for Emergency Services

Requested by
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Developed by the
Advanced Highway Maintenance and Construction Technology (AHMCT)
Research Center

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Executive Summary

Background and Need

During emergencies, State Departments of Transportation (DOTs) are expected to have situational awareness of how the various modes of transportation are being impacted. Moreover, the Governor's Office of Emergency Services (OES) routinely asks the California Department of Transportation (Caltrans) and the California State Transportation Agency (CalSTA) for transportation awareness and impact information throughout the duration of the incident. Off-the-shelf Common Operating Picture (COP) software systems have been developed specifically to help agencies communicate with various partners during an emergency, and to share and push vital information in near real time. Caltrans Emergency Services is prepared to procure an appropriate software system. However, since Caltrans has not owned such software in the past, the preferred method is to conduct a Preliminary Investigation (PI) ask other State DOTs what COP software they are using, if any, and any information they feel would help Caltrans make an informed procurement.

During emergencies, Caltrans is responsible for near real-time tracking of impacts on the major modes of transportation including, rail, transit, aviation, maritime, freight mobility, plus roads and bridges. Caltrans does not have a COP solution that can collect, analyze, and communicate such information across its districts or with its external partners. Current technology is available to help Caltrans make such informed decisions during an emergency. There is a need to research the solution that may best fit Caltrans' response and recovery mandates, as expected by the State at various executive levels.

Messaging during an emergency is a critical function. Caltrans currently uses Everbridge. Within large state agencies including Caltrans, some staff have agency-purchased mobile phones and plans, while some use their personal phones and service. Because of this, phone numbers cannot be entered into a messaging system like Everbridge for all staff. Having a centralized messaging system within a COP may facilitate this issue.

Some smaller states rely on the National Guard to manage emergencies in their states. For such states, COP compatibility with the National Guard would be critical. In California, some agencies are known to use WebEOC, including the most essential, the California Office of Emergency Services (Cal OES). Ability to coordinate with Cal OES would be an important consideration when selecting a COP for any California agency.

The massive impact of and response to the recent Tropical Storm Hilary in southern California clearly illustrate the need for a COP. Caltrans' response was excellent for this extremely challenging situation. However, availability of a COP for Caltrans, and ability to interact with other local and state agencies would clearly have enhanced Caltrans' capabilities, and improved resource usage.

Objective of the Preliminary Investigation

The PI objective was to support Caltrans in making an informed procurement decision or develop a well thought out request for qualifications solicitation, based in part on best practices from other State DOTs. The primary PI deliverable was a survey of other state DOTs to determine what (if any) COP software they are using, their best practices, and any information DOTs feel would help Caltrans make an informed procurement.

Significant Findings

- WebEOC was the most common response for current use (Q1).
- Responses to the important features (Q2) are quite varied. These responses should be considered carefully in the context of a specific DOT's needs.
- Geographic Information System (GIS) importance (Q4) ranged from very or extremely to essential.
- Training (Q5) was highly valued by all respondents. The responses ranged from important to very or extremely. One respondent called it the lifeblood of COP.
- Most respondents indicated sharing with external partners (Q6) was important or at least helpful.
- For choosing a COP now, all but one of those with WebEOC indicated they'd still choose WebEOC. One of these indicated they would improve it.

Detailed Findings

Background

During emergencies, State DOTs are expected to have situational awareness of how the various modes of transportation are being impacted. Moreover, the Governor's Office of Emergency Services (OES) routinely asks Caltrans and CalSTA for transportation awareness and impact information throughout the duration of the incident. Off-the-shelf COP software systems have been developed specifically to help agencies communicate with various partners during an emergency, and to share and push vital information in near real time. Caltrans Emergency Services is prepared to procure an appropriate software system. However, since Caltrans has not owned such software in the past, the preferred method is to conduct a PI ask other State DOTs what COP software they are using, if any, and any information they feel would help Caltrans make an informed procurement.

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The PI objective was to support Caltrans in making an informed procurement decision or develop a well thought out request for qualifications solicitation, based in part on best practices from other State DOTs. The Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center surveyed other state DOTs to determine what (if any) COP software they are using, their best practices, and any

information DOTs feel would help Caltrans make an informed procurement. The PI presents the survey (Appendix A) which was distributed to state DOT personnel, summarizes the response, and provides their complete responses in Appendix B.

Summary of Findings

Related Research and Resources

An initial list of commercial off-the-shelf COP software is provided in Table 1. Caltrans was aware of this software at the time of the PI request. The key features, strictly as noted by the vendors on their web sites, are summarized here. All feature categories are courtesy of the vendors' web sites, and feature text is summarized from their text. For original details, refer to the web sites listed in Table 1. As part of the PI, AHMCT contacted each of the four vendors for more information. A summary of the contact and response is provided in Table 2.

Table 1: Known commercial-off-the-shelf COP software

Vendor	Software
Dynamis	COBRA (https:/cobrasoftware.com/)
Juvare	WebEOC (https:/www.juvare.com/webeoc/)
The Response Group, Inc.	Common Operating Picture (https:/www.responsegroupinc.com/common-operating-picture)
Futurity	Common Operating Picture (https://futurityit.com/)

Table 2: Contact and response summary

Vendor	Date of Contact	Vendor responded?
Dynamis	August 23, 2023	Yes
Juvare	August 23, 2023	Yes
The Response Group, Inc.	August 23, 2023	Yes
Futurity	September 21, 2023	No

Dynamis COBRA

Communication, Coordination, & Collaboration

Dynamis has 20 years of experience helping first responders and organizations see, understand, and act first by providing effective communication, coordination, and collaboration tools. The intent of their COBRA COP suite of tools is to allow an organization to focus on what is important, i.e., the incident and response, rather than the technology.

Decision Support

COBRA has several tools that build a COP, allowing decision makers and first responders the ability assess and respond to a chaotic incident. Real-time display of data in the map and dashboard allows for rapid dissemination of information, quick understanding of the situation as it unfolds, and ability to make appropriate decisions.

Common Operating Picture with Maps

COBRA GIS Mapping gives users an easy and powerful tool for creating custom COP maps viewable by all users. It allows display of information such as residential and commercial facilities, decontamination zones, shelters, building damage, severe weather, designated areas of activity, personnel status, and real-time resource locations. COBRA GIS Mapping allows users to see information in real time and make updates as needed. Users can add icons, sketches, points, lines, concentric circles, measurements, and polygons.

System Interoperability and Scalability

COBRA is designed to support day-to-day activities, special event monitoring, security operations and small to large emergencies. COBRA achieves this range by providing a distributed collaboration environment including activity logs, chat rooms, interactive maps, and multiple tools and resources that can be shared by users at the local, state, and federal level.

Knowledge Management

Corporate and cultural knowledge of previous crises are essential to successful response and recovery. COBRA provides tools that help organizations build on that corporate knowledge. Using the many Knowledge Management tools in COBRA, organizations can effectively manage everyday or black swan events.

Custom Application Development

Dynamis provides an expert development team with the knowledge and experience to work with a DOT to build custom solutions. The COBRA web site discusses their Software Development Kit (SDK), and provides details for a few customization examples:

- Authority to Survive and Operate (ATSO)
- Incident and Crisis Management System (Kingdom of Belgium)
- Brazil Army Command, Control and Reconnaissance System for High Visibility Events
- Crisis Negotiation

The COBRA SDK supports standard web application frameworks and languages including ASP.NET, C#, JAVA, and PHP. Testing of any customization is meant to occur separate from the COBRA server(s). When testing is complete and successful, the customization can then be incorporated into the server.

Juvare WebEOC (Web Based Emergency Operations Center)

Flexible Data and Process Workflows

WebEOC Boards provides a single shared platform which allows users to plan, coordinate, and review emergency management initiatives and day-to-day activities as well as collect, analyze, and report operational and critical incident data. Users can modify standard Boards or develop custom Boards for new use cases.

Low-Code/No-Code Workflow Builder

Each WebEOC subscription includes DesignStudio—an in-solution low-code/no-code Board builder—which supports development of custom data and process workflows.

Collaboration and Integration

Via interface with Juvare Exchange (JX), WebEOC helps agencies break down geographic, jurisdictional, and communication barriers to enable effective peer-to-peer collaboration. In addition, clients can leverage standard and custom JX Connectors to combine external data sources within their WebEOC instance.

Targeted Multi-Channel Communications

WebEOC Alerts lets users automate notifications associated with specific workflows and send ad-hoc messages to internal and external contacts using text/SMS [Short Message/Messaging Service], mobile push, voice, email, a built-in solution inbox, and Microsoft Teams, Slack, or any other webhook application.

Powerful Mapping Capabilities

WebEOC's mapping capabilities provide users and administrators customization options and advanced spatial visualization features, including toggled map layers, external data source integrations, custom icons, and live feeds to support real-time map generation. Users can create multiple maps, add annotations, print map displays showing geocoded points, view data from WebEOC Boards, and measure distance between any two points or the size of any area.

The Response Group, Inc. Common Operating Picture

The Response Group's (TRG's) Common Operating Picture is a direct visual linkage into Incident Command System (ICS) form data to enhance situational awareness. The COP accepts real-time data inputs from your response team. COP is web-based, aiding in remote collaboration and coordinated decision making. When your assets are overlaid in COP, the system centralizes data and overlays real-time information related to your areas of interest, allowing users to make informed real-time decisions.

The COP provides free access to TRG's GIS data dictionary and public basemap services including environmental and socio-economic datasets.

Futurity Disaster Management

Futurity offers its Common Operating Picture (COP) Dashboard and GIS-enabled Mapping product, which helps organizations streamline mitigation efforts via analytics, response, and recovery efforts, so that resources are allocated effectively, quickly, and appropriately.

COP Dashboard

Users can access live data and resources from any location in the field. With the COP Dashboard, teams can streamline resources allocation using a COP and data-driven decision making. In a transportation scenario, the COP Dashboard allowed all parties to see detailed reports from the field, toggle between individual incidents and the full scope of road damage, and view a clear visual summary with actionable data reflecting the full response.

GIS Mapping & Layering

Users can visualize and analyze critical data related to transportation, health, and emergency management, supporting improved decision-making and response.

The GIS platform provides a comprehensive, layered view of road damage, for example, on a GIS-enabled map, bringing together numerous parties who would have previously seen only a small part of the big picture. It allows reporting from the county to the state level for more effective post-disaster resource allocation.

Mitigation Planning

With Futurity's Mitigation planning tool, organizations can plan for and mitigate potential emergencies and disasters, reducing the impact of real-world adverse events on individuals and communities. Leveraging the insight from previous events, the tool provides direct trends and data to help identify potential hazards and vulnerabilities for future events.

Government Reporting Form Aggregator

Using the Government Reporting Form Aggregator, users can streamline government reporting processes, saving time and resources, and ensuring regulatory compliance.

This feature can streamline the process of submitting various forms, such as Individual Assistance (IA), Public Assistance (PA), Small Business Administration (SBA), ICS, Category F, and Federal Emergency Management Administration (FEMA) forms, by aggregating data from multiple sources to generate accurate and timely reports.

Multipanel Displays

Most COP vendors will advise that to gain the maximum visual benefit of their system, users will need to concurrently invest in a visual display system to show many features at one time. One such display vendor is Activu Corporation (https://www.activu.com/). Some display vendors have incorporated typical COP functions into their system software, along with the panel operating tools. While researching these features is beyond the scope of this survey, readers are encouraged to also explore the features of current multipanel display systems and peruse the COP solutions built into some of these products.

Summary of DOT Survey Results

A survey questionnaire was sent to state DOTs to determine what (if any) COP software they are using, their best practices, and any information DOTs feel would help Caltrans make an informed procurement. The survey was meant to determine:

1. What COP software is your DOT using, planning to use, or would like to use if it were possible?
2. What features in a COP would your DOT like to have?
3. How important is it to share and post information with modal partners via the COP?
4. How important is it that the COP have GIS integration capabilities?
5. How important is it that the software contain an integrated alert messaging and chat features?
6. How important is it that the software support dashboards and position information?
7. How important is it that the software support training and exercises?

The survey questionnaire was distributed using Microsoft (MS) Forms. The full survey questions are provided in Appendix A. The use of Forms allowed the respondents to answer the questionnaire online to minimize response burden and facilitate subsequent analysis. The redacted responses are provided in Appendix B.

Twelve responses were received. Eight responses were from state DOTs, two were from state emergency management agencies, and two were unknown. The complete responses for the main questions are provided in the following tables and figures.

Table 3: Responses to Question 1: What Common Operating Picture (COP) software system, if any, is your DOT using?

#	Response
1	WebEOC
2	None
3	WebEOC (provided by Oklahoma Emergency Management)
4	We created a dashboard/map using AGO [ArcGIS Online] - fed by our ATMS [Advanced Transportation Management System] data

#	Response
5	Have a system developed internally called Traffic Management System
6	ARDOT [Arkansas DOT] does not currently have a COP
7	WebEOC
8	WebEOC
9	WebEOC
10	MS Teams and Esri experience builder dashboards which get data from NWS, DTN, NHC, etc., plus our field users using QuickCapture and Survey123
11	WebEOC
12	Currently none I am aware of. Working on acquiring WEBIAP [Incident Action Plan] since our SEOC and other use.

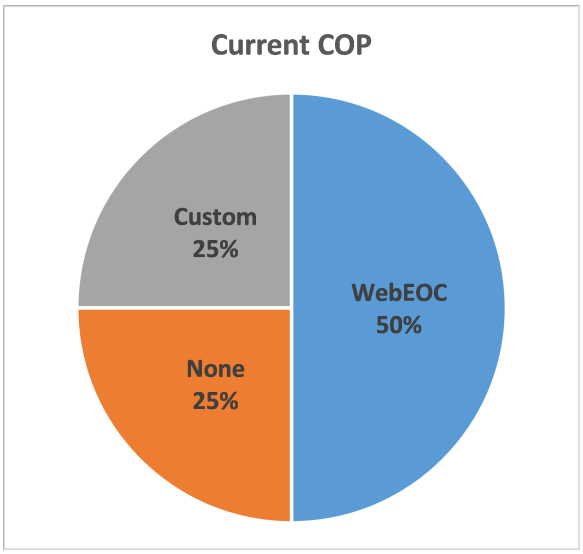

Figure 1: Visualization of responses to Question 1: What Common Operating Picture (COP) software system, if any, is your DOT using?

Table 4: Responses to Question 2: What features of a COP are most important to you?

#	Response
1	Ability to share road closures below state level, Ability to track taskings, information sharing
2	Road status overlaid with critical infrastructure
3	Resource request log and tracking
4	Having a list of full closures, partial closures, roads that were previously closed and now open. Counters for each state, and cumulative mileage for each state (closed, partial, open). Having a map/visual displaying the different states as well - including roads that were previously closed and are now open (show the progress). It is also very important to isolate the data displayed to the current incident/response/event - not cluttered with other ATMS data. It's also important to be able to queries data to fulfill specific requests by leadership - "how many roads have reopened in the past 12 hours, 24 hours, etc. and how many miles of roadway?"
5	Ability to visualize traffic impacts across the state. Ability for field staff to report incidents and automate the process to update our public facing traveler map.
6	1. Transportation network status 2. Personnel & Equipment status
7	Multiple users are able to be logged in at once, it is customizable, easy to use, intuitive, ability to add features later
8	Real-time information with all stakeholders
9	Documentation of resource requests
10	Real-time automatic data updates and the ability to share across the organization and with stakeholders based on user permissions
11	Connecting requests, responses, etc. with all participating agencies
12	Forms, org charts, communication, and assent identification

Table 5: Responses to Question 3: Is it important or desirable that the COP software include integrated alert messaging and chat features? If so, why?

#	Response
1	No opinion
2	That would imply that more than one agency were subscribing to the same SaaS [Software as a Service] like WebEOC - but instant communication is critical to emergency operations
3	Not so much. During an emergency, we are mostly on our cell phones. Even with mobile applications, we rely on verbal communication that supports digital comms.
4	No. Our COP is fed by our ATMS, which has alert messaging built in already.
5	Not a top priority for MoDOT [Missouri DOT]
6	No
7	It is easier if all the systems are integrated
8	No, we use other platforms for these. ReadyOp for alert messaging and MS Teams for Chat.
9	I have not seen chat done well in COP software. The people issuing alerts are not the same people working in an EOC [Emergency Operations Center] setting in our agency.
10	Probably not because MS Teams is so good and we already pay for that. We use Teams daily for routine business and double down during emergency events/traffic incidents by pulling in more people and holding more Teams video chats/meetings. Using the routine system for emergencies means no additional credentials/cost/familiarizing folks with another system.
11	It would be good so that users are alerted to the requests and/or needs
12	Would be very helpful

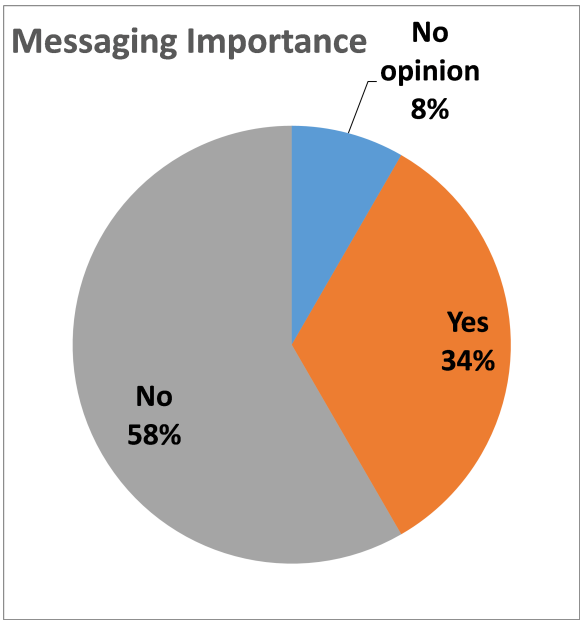

Figure 2: Visualization of responses to Question 3: Is it important or desirable that the COP software include integrated alert messaging and chat features? If so, why?

Table 6: Responses to Question 4: How important is it that the COP software have GIS integration capabilities, such as mapping and dashboards? Why is this important?

#	Response
1	Very important
2	The essential nature of a COP is information and GIS is a way to show that information
3	Extremely important. GIS helps tell a more detailed story by adding a geospatial references to location data. Maps speak louder than memos.
4	Very important. GIS is a universal language at this point that most parties are familiar with and have a skillset in. COPs are meant to be high level and in our case are relied on heavily by our emergency management folks, executive leadership including the governor's office, and the media.
5	Very important. Mapping and using dashboards with GIS systems, provides better situational awareness than scrolling through report after report to summarize data
6	GIS integration is needed to adapt to ever changing data

#	Response
7	It's not important as we have a dedicated GIS team that use other platforms and can use existing files and layers to create better information faster
8	Very important and we continue to struggle to integrate GIS into WebEOC
9	Very important for statewide incidents. Helps communicate impacts.
10	We have an enterprise license with Esri, and I'd want to avoid paying for another system. If the system could ingest our feeds/data from current Esri maps/features/services, then maybe. If a DOT didn't already use a common GIS platform agency-wide, then it would be invaluable. Make sure it's the same system, or compatible with, what the state emergency management agency uses.
11	This would be a good tool to be used if you are sending others different locations. This would provide directions easily.
12	Very important, GIS mapping and identification is excellent for sharing information

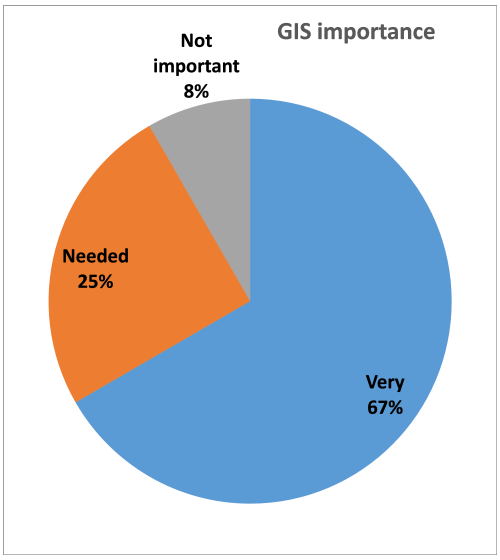

Figure 3: Visualization of responses to Question 4: How important is it that the COP software have GIS integration capabilities, such as mapping and dashboards? Why is this important?

Table 7: Responses to Question 5: How important is it that the COP software support training and exercises? Why?

#	Response
1	Important, train like you fight
2	There should always be an environment of testing and refining processes
3	Training is the lifeblood of an effective database management system. Without consistent training that is updated and repeated regularly, any and all COP software will eventually fail
4	Important. Have to flex this muscle periodically, as there can be years in between disasters.
5	Training and exercises should be used to support the capabilities of the COP
6	Training and exercise potential scenarios are helpful with preparedness
7	Training is extremely important to get users ready to use the software and relieve the burden of the staff managing the system to develop and provide their own training
8	Very. Training and exercise as we would real-world.
9	We do a lot of just in time software training. People don't use it everyday, and sometimes features or pathways change between activations.
10	It is important
11	Very. As users move on, this would allow new users to be knowledgeable of the software and keep consistency as times change.
12	Train the plan, work the plan

Figure 4: Visualization of responses to Question 5: How important is it that the COP software support training and exercises? Why?

Table 8: Responses to Question 6: How important is it to share and post information with external modal partners? Why?

#	Response
1	Important
2	Another essential feature of a COP is the C – common. Everyone should know what is going on all at the same time from the Governor down to a Sheriff's deputy of any given jurisdiction
3	Transparency builds trust and cooperation
4	Depends on who you ask. All of the information in our COP is readily available via 511. That said, many stakeholders do not understand this and rely on the COP during times of crisis. Our COP is publicly available.
5	If the capability exists, then sharing with external partners would help with situational awareness across all agencies
6	Many external partners rely on our information to make decisions
7	It is important to be able to produce reports that can be shared but I don't want external partners to see our internal communications. WebEOC has the ability to limit what positions can see what information but that is complicated to set up and requires a lot of maintenance of users.

#	Response
8	Very. Provide as much as possible to reduce the need to have additional conversations.
9	Our COP is a statewide EM [Emergency Management] purchase. External partners have very limited access.
10	It's important to have full situational awareness. If other modes have trouble and stop/curtail operations, then more people will drive on the roads. It's got to let you share data with the state EMA [Emergency Management Agency] too.
11	Everyone has someone they report to. This would be beneficial depending on the need.
12	It's ICS, everyone has a role

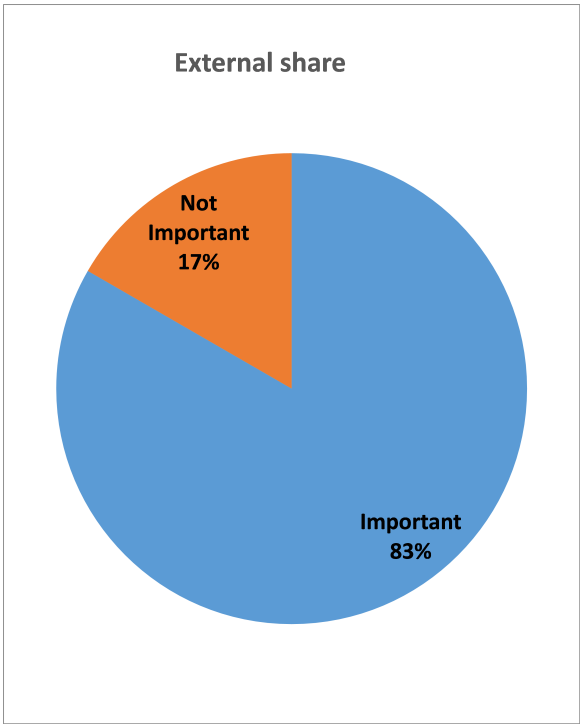

Figure 5: Visualization of responses to Question 6: How important is it to share and post information with external modal partners? Why?

Table 9: Responses to Question 7: What COP software would you use if you could choose one now?

#	Response
1	WebEOC
2	Anything that is sharable between states National Guard units and the civilian entities
3	WebEOC
4	Esri/AGO
5	We are working on a contract with Futurity software
6	We don't know what is available
7	WebEOC
8	Use what we have just continue to improve it
9	WebEOC
10	I'd fully build out what I want with Esri doing their fancy magic
11	Not sure
12	Without knowing all the options, WEBIAP as mentioned in Q1

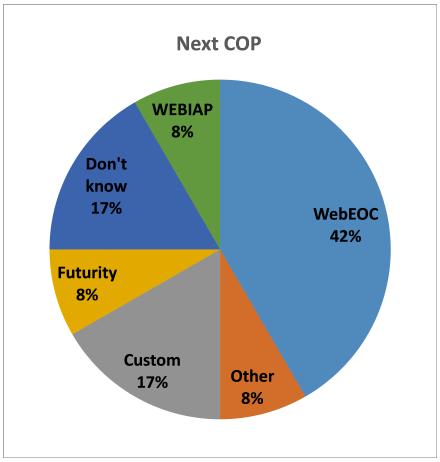

Figure 6: Visualization of responses to Question 7: What COP software would you use if you could choose one now?

Table 10: Responses to Question 8: Are you aware of any COP Subject Matter Experts (SMEs)?

#	Response
1	Yes - other
2	Yes - other
3	Yes - other
4	Yes - self
5	No
6	No
7	Yes - self
8	No
9	No
10	No
11	Yes - other
12	No

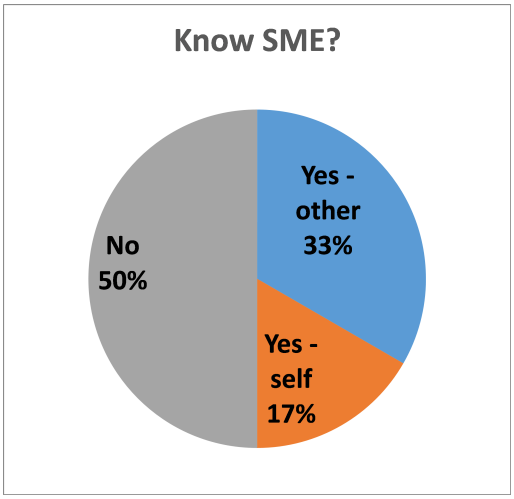

Figure 7: Visualization of responses to Question 8: Are you aware of any COP Subject Matter Experts (SMEs)?

Findings from Survey

The survey responses, taken as a group, support the following findings:

1. WebEOC appears most often for current use (Q1), and as the most frequent response for would choose in the future (Q7).
2. Three respondent DOTs have created their own COP capabilities (Q1).
3. Responses to the important features (Q2) are quite varied. These responses should be considered carefully in the context of a specific DOT's needs.
4. The responses for integrated communications (Q3) were less enthusiastic than expected. That said, the respondents often had another preferred method in place.
5. GIS importance (Q4) ranged from very or extremely to essential. The two respondents who indicated less or not important noted that they already have a GIS solution, prefer it, and can use existing files and layers to create better information faster.
6. Training (Q5) was highly valued by all respondents. The responses ranged from important to very or extremely. One respondent called it the lifeblood of COP.
7. Most respondents indicated sharing with external partners (Q6) was important or at least helpful. Two provided a mixed message which was difficult to characterize.
8. For choosing a COP now, all but one of those with WebEOC indicated they'd still choose WebEOC. One of these indicated they would improve it. The one current WebEOC respondent that did not indicate WebEOC said "not sure". One DOT is contracting with Futurity. Two would continue with their custom setup or a new one. One is open to anything that is sharable between state National Guard units and the civilian entities. One indicated they are working to acquire WEBIAP, which is not precisely a COP. Finally, one just doesn't know what is available, and could potentially benefit from the current PI.
9. Six of twelve respondents know an SME (Q8). Of these six, two self-identify as an SME.

Gaps in Findings

Per the request for preliminary investigation, this effort did not include background/literature search. The primary focus of the PI was the survey and its results.

In general, the information available from the vendors' web sites is high-level and oriented to marketing. This is as would be expected. It was difficult to discern specific features of each of the COP offerings, and the descriptions provided herein remain at approximately the same level as provided on the vendors' sites. COBRA's web site provided the most information, and Juvare was a close second. Juvare was quite supportive throughout the investigation, supporting a meeting with key personnel and providing more detailed capabilities documents which are not included within this PI.

The methods of grouping and packaging features varies among the vendors. It will be important to carefully choose the right collection of packages or services at the time of procurement. This is best supported by the vendor sales team.

The response to Question 2 is presented as is and is not analyzed or plotted. The responses were diverse, yet overlapping, defying a clear classification. They are provided as-is for the direct interpretation by the DOT reader.

Next Steps

- Question 8 of the survey asked "Are you aware of any COP Subject Matter Experts (SMEs)? If so, please provide their contact information." Approximately half the respondents provided information for an SME, with two identifying themselves as SME. AHMCT recommends that Caltrans Emergency Services reach out to each of these SMEs to obtain further information and initiate long-term collaboration.
- Caltrans Emergency Services should consider forming or joining a DOT peer-to-peer support group for COP and for emergency response coordination in general, to exchange best practices, information, and ideas.
- With this PI and the information already collected by Caltrans Emergency Services, AHMCT recommends Caltrans now consider procurement of a commercial COP package or service. This would greatly facilitate Caltrans' internal emergency response capabilities, along with its ability to effectively communicate with external agencies including Cal OES, counties, and cities.

Contacts

Caltrans contacted the individuals below to gather information for this investigation. We thank them for their time and input. Additional individuals responded to the associated survey and provided valuable feedback.

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Appendix A: State DOT Survey on Multimodal Common Operating Picture (COP) for Emergency Services

This brief survey (5 to 10 minutes to complete) is meant to gather information about Common Operating Picture (COP) Software for emergency services, particularly as used by transportation agencies to help communicate with various partners during an emergency, and to share and push vital information in near real time. Survey responses will be included in a report by the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center at the University of California-Davis. This report, entitled Preliminary Investigation for Multimodal Common Operating Picture (COP) for Emergency Services, was requested by Caltrans to support their continual improvement of near real-time tracking of impacts on the major modes of transportation including, rail, transit, aviation, maritime, freight mobility, and roads and bridges during emergencies.

1. *What Common Operating Picture (COP) software system, if any, is your DOT using?*

2. *What features of a COP are most important to you?*

3. *Is it important or desirable that the COP software include integrated alert messaging and chat features? If so, why?*

4. *How important is it that the COP software have GIS integration capabilities, such as mapping and dashboards? Why is this important?*

5. *How important is it that the COP software support training and exercises? Why?*

6. *How important is it to share and post information with external modal partners? Why?*

7. *What COP software would you use if you could choose one now?*

8. *Are you aware of any COP Subject Matter Experts (SMEs)? If so, please provide their contact information.*

9. *Please provide any other information, documents, or feedback that you believe may be valuable for this research and to Caltrans' COP software decisions. If you feel your agency has more information to offer on this subject, please provide contact information to allow a follow-up discussion.*

10. *Please provide your name, organization, and email. This information is strictly for survey administration by the researchers. It will not be shared in the PI report, or with other survey respondents.*

Appendix B: Redacted Responses to State DOT Survey on Multimodal Common Operating Picture (COP) for Emergency Services

The complete responses to the survey are provided below. Immediately identifying information has been redacted. All other data is as provided by the respondents.