

Enabling Collaborative and Resilient Emergency Management Efforts: DFES and Western Australia's Adoption of a Common Operating Picture.

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ABSTRACT

The purpose of this paper is to highlight the immense value that a web-based incident management system can offer emergency services agencies, using the Department of Fire and Emergency Services of Western Australia (DFES) as a case study.

Following a number of recommendations and reviews that found their current incident management system and processes insufficient during an emergency situation, DFES implemented WebEOC, a web-based Crisis Information Management System (CIMS), that affords them a resilient, common operating picture and supports complete situational awareness, cross-collaboration and communication in real-time.

This paper also briefly presents the state of Western Australia (WA) as leaders in the field of collaborative, intuitive emergency response systems, following their recent adoption and implementation of WebEOC Fusion – a single information hub that provides seamless inter-agency and intrastate collaboration. Through Fusion, connected agencies can disseminate crucial information rapidly and transparently, and intelligently prepare for and respond to events.

WA is the first Australian state to have implemented such a system. Though Fusion is still in its infancy within the state's agencies, WA has proven that they are leading the nation in ensuring increased efficiency, collaboration and resiliency in their emergency management efforts.

Keywords

Collaboration, resilience, common operating picture, emergency management, preparedness.

INTRODUCTION

The Department of Fire and Emergency Services (DFES) of Western Australia plays a crucial role in the coordination of emergency services for any incidents or disasters that pose a threat to life, property or infrastructure.

Western Australia (WA) is a vast and multifaceted state. Comprising 2.5 million square kilometres of sparse cities, remote towns, rolling deserts, dense forests and dry wheatlands, the role of DFES's approximately 29,000 operational personnel, including volunteers and corporate staff members, is a vital and extremely complex one.

The State's bushfire season is high-pressure and high-risk. Exacerbated by WA's differing weather patterns and sometimes difficult terrains, it is a time that requires avid attention to detail and tremendous response and recovery efforts. Climate change has affected a one-degree Celsius rise in average temperature over the last 50 years and seen a decrease in rainfall along the west and lower south-west coasts of the state (www.agric.wa.gov.au, 2017), creating increasingly unpredictable and unruly weather patterns.

Following two very severe fires, both of which were subject to Major Incident Reviews, and a request from the State's governing emergency management body, DFES followed in the footsteps of Western Australia Police

(WA Police) and replaced their end-of-life and increasingly archaic incident management system with WebEOC, a web-enabled crisis management solution that would allow them to confidently and collaboratively manage incidents end-to-end within a common operating picture. This platform affords DFES levels of transparency, usability and accessibility unlike any they had experienced before, increasing not only their capacity for resilience in times of strife but also their ability to predict and pre-empt a multitude of incidents and events, boosting their capability to ready themselves and the community, and respond in a timely and fitting manner.

After the implementation of WebEOC, DFES continued to enhance their incident management efforts by launching the EmergencyWA website which is supported by Whispir, a web-based notifications platform that enables the real-time dissemination of critical messaging across multiple channels. The site offers the communities of WA easy access to accurate and timely warnings and alerts, making it simple for them to stay abreast of incidents within their areas and prepare for action when needed.

Most recently, six of WA's key government agencies (including DFES and WA Police) have connected each of their WebEOC instances together through an information hub called WebEOC Fusion (WebFusion), becoming the first Australian state to have a single crisis information management system that offers a common operating picture for all entities. WebFusion enables these agencies to share and disseminate critical information within a single, accessible source, affording them situational awareness and the ability to prepare for and respond to incidents in a manner that was not previously possible.

Though they've faced their challenges over the years, these days DFES, WA Police and WA's core emergency management agencies are ensuring increased efficiency in preparation, response and recovery throughout serious incidents, as well as heightening resiliency within the communities of WA through consistent, trustworthy and accurate communication.

REASONING FOR IMPLEMENTING A WEB-BASED EMERGENCY MANAGEMENT SOLUTION.

The decision to implement the web-based crisis information management system, WebEOC, within DFES was one that arose from a variety of needs and recommendations.

In 2008, the State Emergency Management Committee (SEMC), which is the peak emergency management body in WA, acknowledged that there was an increasing need for an emergency management platform that allowed government departments to quickly and easily share and disseminate crucial information during major incidents.

Three key factors arose for DFES over the following years to support this observation.

The current State Emergency Services (SES) incident management system was becoming obsolete. The use of Lotus Notes EM2000, paper-based manual spreadsheets and templates, shared drives, and email and phone communications to distribute and receive critical information during an incident was beginning to prove insufficient. Having multiple processes and platforms that could not connect with each other had an increasingly negative impact on communications between operations staff and responders, local government agencies and state agencies, and emergency agencies and the community. And of course, with any organisation, legacy plans and platforms find themselves at the mercy of technological advances as the years progress, and the need for agile yet trustworthy data capture and distribution becomes even more important to stakeholders and communities.

Alongside this, it became widely recognised that there was a distinct need for a system that would seamlessly accommodate and facilitate information sharing within DFES's internal groups, such as the Incident Management Team (IMT), the Regional Operations Centre (ROC), the Metropolitan Operations Centre (MOC) and the State Operations Centre (SOC), as well as external entities like Western Australia Police.

Finally, a number of reviews into severe fires that resulted in the loss of homes, livelihoods and vital infrastructure had identified the need for a web-based common operating system. The Toodyay Bushfire that occurred on 29 December 2009 was noted as "one of the most damaging bushfires in Western Australia's history" (Murphy et al., 2010), and resulted in the destruction of 38 homes and 3000 hectares of land as well as minor injuries reported. On 6 February 2011, the Perth Hills Bushfire destroyed 71 homes and damaged a further 39 homes, leading to the evacuation of 517 families in the Roleystone-Kelmscott area of the Perth Hills.

Both incident reviews acknowledged the fundamental need for WA emergency agencies and responders to have access to a system that enabled ease of communication and collaboration, recommending that "[DFES must] identify and document its information requirements for end-to-end information exchange and then assess the adequacy of current systems to meet these information needs." (Murphy et al., 2010)

KEY OBJECTIVES AND REQUIREMENTS OF THE SOLUTION.

Driven to take action by these key factors, DFES underwent a detailed process of identifying their needs and required outcomes. WA Police had acquired WebEOC in 2005 (the first of the state's government agencies to do so) and, with a desire to standardise emergency management state-wide, DFES followed suit in 2011, implementing WebEOC version 7 as their de facto incident management system.

WebEOC is a web-enabled crisis management solution that can be fully configured and scaled to suit the unique needs of its users. The platform offers up a collaborative, secure common operating picture and provides end-to-end management for the preparation, response and recovery of an incident whilst adhering to international best practices as well as an organisation's specific business rules.

There were three crucial aspects defined by DFES that the platform needed to deliver on in order to adhere to the SEMC's plan for a common Crisis Information Management System (CIMS).

1. The system would need to support a streamlined process in which to capture, store and distribute incident information and, in turn, enable DFES to significantly improve their effectiveness and efficiency in managing incidents.
2. Having assessed and refined the different requirements for data capture, storage and distribution, DFES needed the system to be able to handle a varied range of input and output mediums, as well as integrate seamlessly with other operating systems, allowing information to be shared with frontline staff via mobile devices if needed.
3. To ensure the timely and uncorrupted delivery of information from first responders to the command centre and vice versa, the platform would need to offer uninterrupted flow and distribution pathways allowing data to get through in a timely manner during an incident.

WebEOC was able to provide DFES with what they needed: a web-based system that could be configured to the agency's unique requirements and would allow them to communicate, collaborate and cooperate with other systems and agencies.

OVERCOMING CONFLICT AND INTRODUCING THE SOLUTION AS BUSINESS-AS-USUAL.

As is well known, with change often comes conflict. Organisations who have relied on and trusted in one system or process for a number of years may be reluctant to "fix it if it's not broke", particularly if it requires a major overhaul of the ways in which they work, communicate and learn.

This was no different for DFES. Implementing a brand new, agency-wide incident management system would involve large scale changes to operational procedures and business workflows, and the maintenance and overall management of the platform would increase overheads.

Many staff members were initially apprehensive of the system and user acceptance was somewhat low. Before the platform really begun to take shape, they perceived it as something akin to a blog – essentially, an electronic running sheet that simply provided a chronological account of resource requests, actions and reports.

The project owners of DFES's WebEOC implementation were attentive to these concerns and were candid in the way they introduced the system throughout the various areas of the agency. Initially it was used in a limited capacity for major incidents, allowing users to move comfortably and confidently from the old system to the new. DFES also introduced a number of change management programs, including various training groups and exercises for all Operational and State Operations Centre personnel, and added the common use of WebEOC to its doctrine and standard operating procedures.

With this, user acceptance grew. The benefits of WebEOC became increasingly clear: this was a system that offered a single common operating picture; could be expanded or exclusively configured when needed to meet DFES's unique requirements and business rules; and would integrate with DFES's other incident management systems.

AN INTUITIVE SYSTEM CONFIGURED TO DFES' REQUIREMENTS.

Today, WebEOC is used extensively throughout DFES and is considered business-as-usual for all hazards, incidents and events managed by the department.

The platform is exclusively configured to cater to DFES's requisites and integrates easily with their Computer Aided Dispatch (CAD), Resource Management System (RMS), Geographical Information System (GIS), and Critical Messaging systems. It also provides a seamless two-way flow of information between the IMT, ROC,

MOC and SOC.

It is easy enough to argue that perhaps the utilisation of a single crisis management platform between such a variety of teams and platforms could be a hindrance. It may enforce a blanket set of rules across a diverse range of users and, in turn, convey a multitude of information that may or may not be relevant to these users. However, for DFES WebEOC boasts the opposite of standardisation and generic information sharing processes.

From the outset, DFES established a distinct set of business rules and tools, including group permissions that dictate what information individual users can or can't access depending on their positions; an Incident Management Toolbox that sits within the platform and has been crafted specifically to support DFES's incident management efforts; and a risk management tool that ensures correct information is captured and disseminated. These regulations allow DFES to be confident that their reputation and professionalism will be consistently upheld.

BUILDING RESILIENCY AND MINIMISING RISK.

DFES, along with their WA agency counterparts, continue to substantiate the evidence that Australian government departments are using the WebEOC crisis management system in a way that is wholly unique to them. It is not simply an out-of-the-box Software as a Service (SaaS) offering, it is a highly configured and critical part of their end-to-end incident management program.

As a business-as-usual platform, DFES utilise WebEOC for all of their readiness, reduction, response and recovery efforts. They have built key features into their emergency management system that are aligned with the SEMC's CIMS requirements, including the ability to send SMS alerts from within WebEOC to response personnel during an emergency; ensure DFES personnel (and the system itself) are adhering to standards and regulations by utilising reporting, log and audit boards; and the ability to house all response plans, including business, community and industry plans, within the system.

On a weekly basis, WebEOC is used as the central medium for DFES's Operational Preparedness Briefing – an exercise in readiness for the entire state. Documents reviewing current and forecast risks and readiness are uploaded to the platform from all regions. So too are any required actions related to heightened risks and readiness measures such as fire danger, severe weather, or upcoming community events. This information is encapsulated in DFES's State Preparedness Board on WebEOC which provides them with a transparent overview of their forecast risk and readiness, as well as staff resourcing levels at a state and regional level. Further to this, DFES can populate pre-emptive intelligence and predictive modelling within WebEOC to provide additional support to their readiness and reduction efforts for known events, such as incoming severe weather, bushfire incidents, or for sizeable community or government-based events.

During an incident, WebEOC proves itself as a robust engine that ensures DFES have the capability to manage a multitude of tasks. It administers a consistent and accurate flow of information between the IMT, ROC, MOC and SOC, providing situational awareness to all relevant parties, as well as ensuring the timely distribution of warnings. WebEOC also enables DFES to plot out predicted changes or additions to personnel and equipment needs, and allows them to suitably manage and support worker fatigue and hours.

Every bit of information that is entered into WebEOC during an incident is recorded, meaning After Action Reviews are simple and transparent. And because DFES's WebEOC instance was developed in line with their business rules and regulations, there is no risk of the system or its users not complying with the agency's legislature and policies.

ENHANCING COMMUNICATIONS WITH WA COMMUNITIES.

Having successfully progressed the SEMC's plan for a common CIMS through their use of WebEOC, it was time for DFES to tackle another critical task. Both the *Report of the Perth Hills Bushfire February 2011 Review* (Keelty, 2011) and the *Report of the Special Inquiry into the January 2016 Waroona Fire* (Ferguson, 2016) recommended that DFES develop a centralised emergency communications system that would act as a single source of truth for communities during an incident. This would further enhance DFES's ability to not only be resilient and prepared for an event, but it would also give communities throughout the state the information and encouragement they needed to be resilient and prepared for themselves.

In October 2016, the EmergencyWA website was launched. The site works as a Critical Messaging System, providing emergency information to the people of WA via a range of digital and social media platforms. It is backed by Whispir, a web-based notifications system that provides multichannel communication options and allows users to send tailored messages in real-time to predefined distribution lists. DFES uniquely configured the platform to suit their needs to ensure that EmergencyWA provided information that was accurate and

relevant, plus easily accessible and instantaneously available to communities.

EmergencyWA encompasses a streamlined process in which to disseminate warnings and alerts whilst simultaneously publishing content across multiple channels including email, social media, RSS feeds and WebEOC. The site also incorporates a GIS component featuring a map that broadcasts live feeds from DFES's Fire Dispatch System, Geoscience Australia and the Bureau of Meteorology, as well as fire bans and information on fire danger ratings, enabling communities to see hazards within their area as they become available.

DFES had again implemented a solution that would ensure resilience for their department and WA communities in times of strife. Increased efficiency in the distribution of incident and warning notifications to the public and media, as well as a user-friendly and easily accessible interface, has given Western Australians a true, real-time view of warnings and incidents, allowing them to be informed and prepared.

Since its launch in late 2016, EmergencyWA has more than proven its robustness: it can serve up to 16 million site visits per day (as shown under extreme load testing) and has generated more than 7.6 million page views (Adonis, 2016).

With the addition of the Whispir-based EmergencyWA communications platform and WebEOC running smoothly as their de facto CIMS, DFES had executed a sound, transparent and accurate way of communicating with the public, media and their own personnel.

CONNECTING WA WITH A SINGLE, COMMON OPERATING PICTURE.

Alongside WA Police and DFES's successful implementation of WebEOC as their CIMS at the request of SEMC, a number of key agencies throughout the state followed suit. The Department of Health (including St. John Ambulance) and Main Roads WA had already implemented WebEOC in 2009, and in the years following, Public Transport Authority (PTA) and the Department of Primary Industries and Regional Development (DPIRD) introduced WebEOC to meet their own emergency management requirements.

However, despite the application of a common operating system within all these agencies, the *SEMC Emergency Preparedness Report 2015* (Edwards, 2015) raised concern around "effective and interoperable communication systems" throughout the wider state. A key finding in the report cited that the ability to maintain "effective and interoperable communication systems remains a challenge". Although a number of agencies had committed to using a CIMS, each instance of the platform was operating independently without the ability or much needed mechanisms to share information automatically with each other, proving there was a serious capability gap within the current CIMS arrangements. This issue had been highlighted in two different reports over previous years. In the Auditor General's 2009 report, it was deduced that "[Hazard Management Agencies] do not share a common crisis information management system or approach to managing incidents. This reduces their capability to respond to major emergencies." (Murphy, 2009) Likewise, the 2012 Community Development and Justice Standing Committee's report cites that "the Minister for Emergency Services request the State Emergency Management Committee to review by June 2013 the sharing of data between the State's emergency response agencies using the WebEOC software and any further enhancements that can be made to this process." (Quirk, 2012)

Given that a number of WA's key government agencies were using WebEOC as their de facto CIMS, it was suggested that the agencies utilise WebFusion, an information hub that allows users to connect multiple WebEOC systems into a secured network, facilitating the seamless sharing of critical information such as tasking, maps and resource availability. It would also enable the agencies to collaborate on incidents within the system, a feature that offers a fast and reliable way to communicate incident information to all involved parties when more than one Emergency Operations Centre (EOC) is responding to a single event.

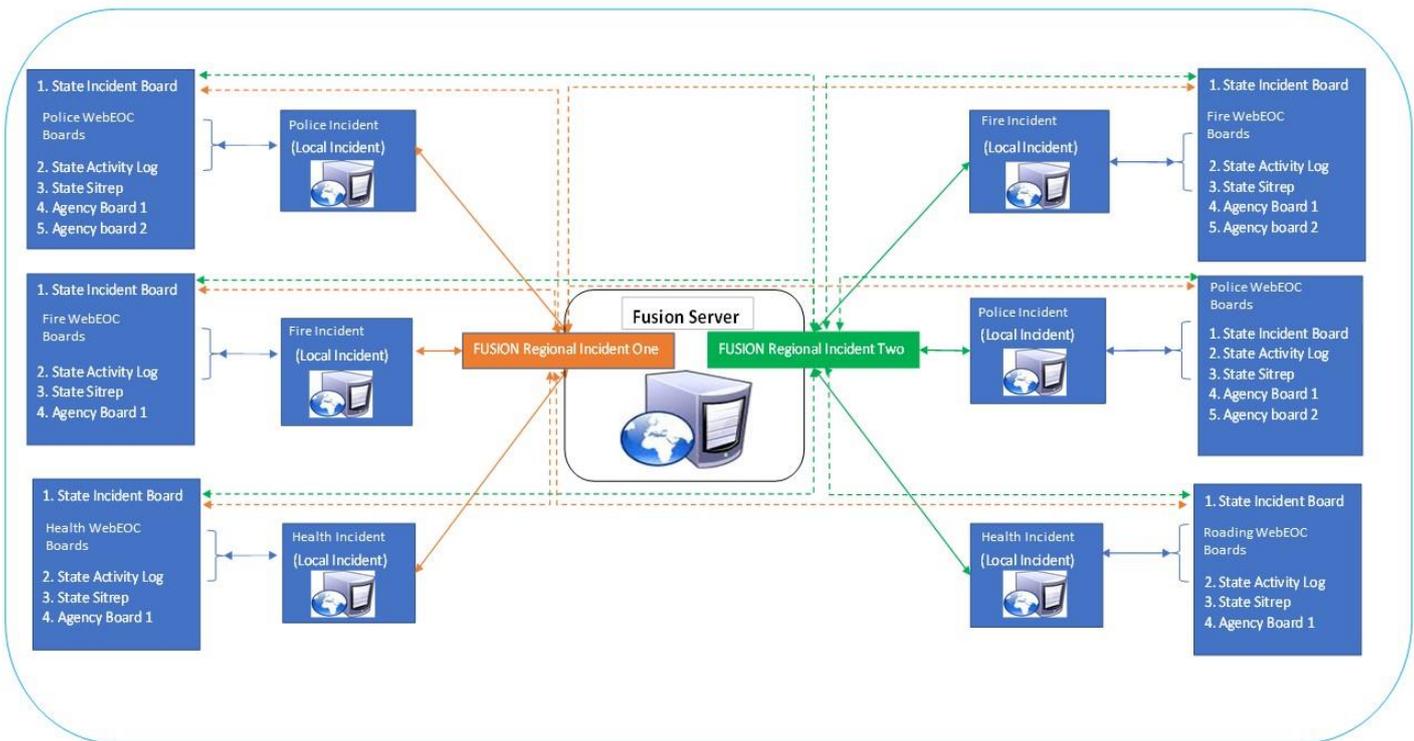


Figure 1. Example of Fusion System Setup and related State Incident Boards (these are incident dependent)

The ability to link incidents together and allow for the accurate dissemination of information among jurisdictions in real-time was hugely appealing for both the government agencies involved and the SEMC. State-wide, participating entities would now have access to a single source of truth, boosting their ability to effectively coordinate and respond to major events.

In March 2013, the SEMC endorsed the WA Police as the host agency for the State Crisis Information Management System (SCIMS). Having agreed to this, WebFusion was implemented within WA Police's computer network to provide 24/7 support for the application and database.

Whilst the procurement of funding for WebFusion was protracted over a number of years, as of May 2018, all six agencies – WA Police, DFES, Main Roads, PTA, DPIRD and the Department of Health – have been successfully connected to the platform, making WA the first of Australia's states to have a wholly joined, collaborative incident management system.

The implementation of WebFusion was supported by comprehensive training for Operations personnel conducted by external WebEOC Fusion experts during the user acceptance testing phase, as well as the development of comprehensive documentation that outlined WebFusion's groups, positions and deployment activities, and ongoing 24/7/365 support from WebEOC developers.

WebFusion provides a starting point for information sharing between these agencies. In its initial release, WebFusion includes three key components:

1. State Incidents: A simplified, over-arching view consistently accessible to all agencies that provides real-time information on major incidents they each may be dealing with.
2. State Activities: An inter-agency activity log that provides a consolidated view of each agency's involvement in response to any incidents.
3. Situation Reports (SitReps): To ensure situational awareness for all users, agencies can file a SitRep in order to provide a summary of current situations, current risks and issues, and any planned activities over the coming period.

Responsible Agency	Created Date/Time	Incident Level	Map / Location	Status	Incident Type	Description	Agencies Involved	Emergency Declaration	Regional Incident	Detail
WA Police	22/08/2018 15:20:52	Level 1		Response	Road Crash	Police are attending a 10 vehicle crash on Kwinana Freeway, Perth. Information at this time from on scene vehicle reports; 2x deceased, 4x critical and an unconfirmed number of injured. Police and Fire on scene with SJA eta of 5 minutes. All Southbound lanes are closed. Roads advised for diversion of traffic and media release to be conducted via radio to advise public to find alternative routes.	<ul style="list-style-type: none"> DFES WA Health 		Kwinana Freeway Road Crash	View
DFES	21/08/2018 15:18:49	Level 3		Response	Fire	Fire are attending an uncontrolled bushfire currently 5 kilometres North East of Yarloop, currently 3 farm houses have been destroyed and another 2 are under threat. A Watch and Act alert is in place for the Shire of Yarloop with Police assisting traffic control and evacuation routes. Stuart Highway is closed and Roads have detours in place with Police conducting road blocks to stop all traffic heading into the fire zone.	<ul style="list-style-type: none"> WA Police DFES 	REVOKED - The countdown has expired. Please update the Emergency Declaration on this State Incident	Yarloop Bushfire	View
WA Health	20/08/2018 15:16:52	Level 2		Response	Storm	A severe storm has created an Asthma event. Health are reporting 54 critical calls for assistance and approximately 100 people have self-presented at hospitals. All hospitals have been notified and alert level escalated in response to more casualties expected.	<ul style="list-style-type: none"> DFES WA Health 		Health Risk 1	View
Public Transport Authority	18/08/2018 15:12:53	Level 2		Response	Flood	Reports of a major water main has burst under Freeway causing extensive flooding. All traffic flow has stopped with all lanes flooded. Media being notified to alert public that freeway will be closed for next two hours until main is shut down and water subsides. Unconfirmed report that this may be related to fatal traffic crash incident.	<ul style="list-style-type: none"> WA Police 		Extensive Flooding	View
GOVERNMENT OF	17/08/2018 15:11:12	Level 2		Response	Electricity supply disruption	As a result of a severe thunderstorm there are numerous power outages within the Metropolitan region, South West District and Lower South District. Initial reports indicate 2 hospitals are on backup generators, and 30 vulnerable people have been affected and are being transferred to Hospital. Power restoration not expected for at least 6 hours, further information to be provided as received.	<ul style="list-style-type: none"> WA Police WA Health 		Power Disruption Metro 1	View

Figure 2. Example of the State Incident Board

Although WebFusion for WA is still in its infancy, the solution has had complete buy-in from the agencies involved as well as the SEMC. The fact that it will now provide the state’s emergency management departments with an opportunity to accurately share and build on intelligence within a common operating picture inspires confidence in its users and stakeholders.

From here, the next step for the agencies is to develop a mechanism for connecting their existing customised WebEOC boards to the WebFusion hub, enabling them to automatically send information from their own platforms through to the State Incidents and State Activities logs. Due to the highly configurable nature of WebEOC and WebFusion, and the unique and complex needs of WA’s incident management agencies, this is just the beginning of what may possibly become one of the most exceptional and impressively adapted crisis information management systems the world has seen so far.

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