

California Legislature

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Emergency Alerts and Evacuations – Lives Saved or Lives Lost?

BACKGROUND

In the past two years California communities have experienced severe problems in notifying or warning citizens in times of disaster or emergency. These difficulties and failures have resulted in the loss of lives and can be generally attributed to: faulty preparation, issues in planning and decision making; limitations in existing warning and notification systems; the inability of communications providers to have needed equipment or services in rural communities; and the failure of citizens to sign up for warnings or to heed the warnings that they do receive.

When an emergency takes place or a disaster strikes, the toolbox for public warnings includes:

- Automated phone calls or texts through a city's or a county's opt-in warning program.
- Reverse 9-1-1 calling systems.
- Pushed notifications from local authorities onto cellphones through the federal Wireless Emergency Alert system (WEA).
- Warnings broadcast on TV and radio stations.
- Social media alerts, including through Nixle.com and CodeRed.
- Specialized sirens on law enforcement patrol cars.
- Door to door alerts from first responders.
- Community systems of sirens.
- Neighbors warning neighbors.

EMERGENCY ALERT AND NOTIFICATIONS SYSTEMS

A public warning is a communication intended to persuade members of the public to take protective actions in order to reduce losses or harm. The measure of an effective public warning message is the extent to which the intended audience receives the message and takes the protective action and/or heeds the guidance.

All of California's current notification tools have inherent limitations and weaknesses, especially in more rural areas. None of the existing notification systems alone is going to do everything the government needs it to do. Even the Federal Communications Commission (FCC) recommended using multiple platforms or systems to be effective. No one system is the silver bullet or the "be all, do all" answer to alerting the public in times of emergency. When systems are layered or combined together government will get closer to notifying more people in a timely manner. Even with these solutions many cities and counties are looking to sirens and door to door alerts.

Because of the deficiencies, the public is encouraged to register or verify that they are registered for Reverse 9-1-1, opt-in for all local, state and federal alerts, have a National Oceanic and Atmospheric Administration (NOAA) weather radio, and ensure they have a battery powered radio to ensure that emergency officials have multiple ways to provide emergency information. As technologies continue to develop and expand, and our systems grow more sophisticated and complete, the ability to get real time notifications out in times of disaster will improve. We are not there yet and as a result lives are endangered.

EXAMPLES OF RECENT CALIFORNIA ALERT NOTIFICATION PROBLEMS

In 2017, Mendocino County emergency staffers waited for a supervisor to arrive before they issued a warning to residents of a disastrous fire. In Santa Barbara County, officials hesitated to issue a blanket evacuation order before mudslides ripped through Montecito in 2018 because they were worried that such an alert might cause a panic.

In Sonoma County wildfires that broke out late the night of October 8, 2017, burned nearly 5,300 homes and killed 24 people. Many survivors received no warning about the fire, and a review by the Governor's State Office of Emergency Services (OES) found that the county's warning system was inadequate to effectively notify residents about an impending natural disaster. The County did not use WEA to notify citizens believing that it was inadequate for ordering evacuations because it couldn't target specific neighborhoods and expressed concern that the alert would reach too many people outside the evacuation area, causing widespread panic and traffic jams. A total of 341 cell sites went down during the 2017 Wine Country fires, making it impossible for many public safety personnel to send alerts, communicate with each other or reach 911.

During a 2014 Mendocino County wildfire, officials reported that the destruction of 400 feet of fiber optic line resulted in the loss of almost every type of communication for nearly two days. During California's severe rainstorms in January and February of 2017, nearly 1 million customers lost access to 911 due to service outages.

In October 2017, the Redwood Complex Fire took out the main cell tower and the laughlin repeater, leaving residents of Willits without the ability to call 911. In November of 2018, whole neighborhoods in Butte County were never told to evacuate as the Camp fire burned 90 percent of the structures in the city. An analysis by the Bay Area News Group showed that about 56 percent of the 4,272 emergency alert calls in the first hours of the Paradise blaze failed. As the fire progressed, the call-failure rate climbed as seventeen cell towers were lost in the fire's first day due to damage or the loss of power.

EMERGENCY AND ALERT WARNING SYSTEMS

Private-Sector Alert Solutions

Reverse 9-1-1 is a public safety communications technology used by public safety organizations to communicate with groups of people in a defined geographic area. The system is offered by a private sector company and uses a database of telephone numbers and addresses, which, when tied into geographic information systems, can deliver recorded emergency notifications to a selected set of telephone service subscribers.

Reverse 9-1-1 alerts individuals and businesses by sending a recorded voice message to landline telephones and registered cellphones within a defined geographical area. The system identifies which phones should receive the emergency alert by matching databases of telephone service subscribers and databases of available registered cellphone users to their physical addresses, and then transmits the recorded message.

Reverse 9-1-1 has access to telephone subscriber and address location from communications providers. For landlines, the address for the phone is extremely accurate since the area of service is the actual location of the phone. Due to the high costs of establishing and maintaining hardwired landlines, most telephone providers are now abandoning copper lines and switching to Voice over Internet Protocol (VoIP) services instead. Having a VoIP phone presents different challenges. VoIP is a methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks. The terms internet telephony, broadband telephony, and broadband phone service specifically refer to communication services provided over the internet, rather than the public switched telephone network.

Reverse 9-1-1 and local 911 service includes the transmission of your telephone number, and information you provide to your communications provider about the physical location of the equipment and facilities that are used to provide your VoIP service; this is the "Registered Location." When an individual dials 911, their call is routed to the applicable Public Safety Answering Point (PSAP). If the PSAP is capable of receiving your telephone number and registered location, the information will be conveyed to the PSAP. Communication providers caution customers that the use of VoIP service from a location other than the registered location may cause 911 calls to be routed to the wrong PSAP and may cause emergency response personnel to be dispatched to the wrong address. Customers are cautioned to update their registered location before using VoIP service at a different address. Failure to do so will also affect the accuracy of Reverse 9-1-1 being sent to targeted locations.

Since services are provided generally over an internet connection, a telephone company will not necessarily know the exact location of the caller unless they have the accurate address registered. This may mean that a local government using a Reverse 9-1-1 system could make calls to individuals out of a notification area or exclude individuals in an area who should be notified. There are additional problems associated with VoIP that are discussed later.

Most local governments and emergency management agencies will augment their emergency alert systems with other private-sector alert solutions such as CodeRED or Nixle. These services provide an open communication forum that connects public safety, municipalities, schools, businesses and the communities they serve by enabling real-time, two-way communications through text, email, voice messages, social media, and mobile apps. These platforms can be effective in sending automated alerts, but they frequently reach only a limited number of citizens because they generally require individuals to proactively opt in. In some instances private alert systems or local governments are able to reach an agreement with cellphone companies to provide government agencies with the cellphone numbers of account holders with addresses in cities so that they can be entered into the system database.

Similar to Reverse 9-1-1, these alert systems cause a notification to be sent out to the phone numbers that are registered with the service. A major limitation to the effectiveness of this form of notification is the inherent weakness of using cell towers to disseminate alerts. Cell coverage or broadband availability in rural areas is spotty or non-existent, meaning that individuals in these areas will often not receive these types of alerts. Many fires and other disasters will destroy cell towers or cause loss of power to operate them, causing cell phones in the area to not receive emergency alerts. When towers go out the accuracy of directed location alerts also suffers, these systems do not work off of global positioning system (GPS) and so residents must update their addresses every time they move. Providers also suggest that residents choose a specific ring tone for such alerts so they know when an emergency alert has been sent.

Users who change their telephone service provider any time after signing up for an alert will need to log in and update their information. In many cases residents can also install a free mobile alert app on their mobile device. The California Department of Forestry and Fire Protection has created an app that is designed to educate residents about fires that will also notify them of wildfires in their area. Emergency notifications received through a mobile app can show a map of the affected area and can use an emergency alert tone.

Integrated Public Alert and Warnings System (IPAWS)

The IPAWS was created by the Federal Emergency Management Agency (FEMA) to provide public safety officials with an effective way to quickly alert and warn the public about serious emergencies and provide them with life-saving information.

IPAWS is a modernization and integration of the nation's alert and warning infrastructure. It unifies the EAS, National Warning System, WEA, and NOAA Weather Radio, under a single platform. IPAWS was designed to modernize these systems by enabling alerts to be aggregated over a network and distributed to the appropriate system for public dissemination. IPAWS consists of several different systems that are used to alert the public:

- Emergency Alert System (EAS): The message dissemination pathway that sends warnings via broadcast, cable, satellite, and wireline services.
- Wireless Emergency Alert (WEA): The message dissemination pathway that broadcasts alerts and warnings to cell phones and other mobile devices.
- NOAA Weather Radio: A nationwide network of radio stations including 1,000 transmitters covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories.
- Internet Systems: The IPAWS All Hazards Feed, also known as the Public Feed, allows for services, applications, and devices to monitor and retrieve alerts and warnings over an internet connection.

Authorized and registered organizations such as states and local government agencies are able to disseminate and coordinate emergency alerts and warning messages through EAS, WEA and other public systems by means of IPAWS. EAS messages are transmitted primarily via terrestrial and satellite radio and television (including broadcast and multichannel television). WEA is a secondary system using cell broadcast to relay public alerts to cellphones.

The IPAWS does have distinct limitations and FEMA, is currently seeking to modernize and improve it as available technology and equipment changes. FEMA's National Advisory Council recently released a report that includes 14 recommendations, on how to improve the reach and reliability of IPAWS. The report states, "It must expand IPAWS reach into the special needs and multilingual communities, and support multimedia presentation, while maintaining the capability to deliver simple text and audio when and where needed."

The report contains a total of 14 proposals broken into five themes that targeted specific areas of concern and opportunities for improvement. Those key areas include:

- 1) Improving alerting authorities' ability to transmit effective alerts;
- 2) Improving public and congressional understanding of emergency alerting;
- 3) Optimizing technology;
- 4) Identifying and adopting current and future technologies; and,
- 5) Initiating cross-functional management and administration of IPAWS.

The report also proposes that FEMA educate lawmakers about needed improvements to the nation's emergency alerting systems by clarifying the need for multiple and redundant alerting technologies and encouraging the use of public media broadcast capabilities to fill gaps in rural and underserved areas.

It also proposes that FEMA develop a policy for redundant alert origination stating “Considering that a jurisdiction’s primary alerting capability can be compromised and/or fail during a catastrophic event, alternate alert origination is a critical life-saving capability.” The report cites the malfunctioning of an alert system in Texas during Hurricane Harvey and damage caused to the communications infrastructure in the Caribbean islands during Hurricane Maria, as examples in the latter case, emergency management officials were unable to issue a WEA alert to notify residents of where to find shelter, food and water.

The Emergency Alert System (EAS)

The EAS is a national warning system designed to enable the President of the United States to speak to the United States within 10 minutes and to alert the public of local weather emergencies. The EAS is jointly coordinated by FEMA, the FCC, and NOAA and its regulations and standards are governed by the Public Safety and Homeland Security Bureau of the FCC. EAS alerts interrupt radio and television broadcasts in designated areas to inform the public of the potential problem or emergency.

Wireless Emergency Alerts (WEA)

WEA is a public safety system that allows citizens to receive geographically-targeted, text messages alerting them of safety threats in their area. According to the FCC, the system been used more than 40,000 times to warn the public about impending weather, missing children and other emergencies, all through cell phone alerts. WEA alerts are sent through IPAWS to participating wireless carriers, who then push the alerts to mobile devices in the affected areas. Federal, state and local authorities have the ability to leverage IPAWS alerts to send messages within their own jurisdictions as well. The WEA notification is designed to get your attention and alerts you with a unique sound and vibration and resembles a text message on your wireless device. WEA alerts will not interrupt calls in progress and they are one-way alerts that authorities cannot use to collect any data from an individual and are not affected by network congestion.

WEA can be activated by; local emergency officials, the National Weather Service for severe weather events, the California Highway Patrol for AMBER alerts, and the President of the United States for times of national crisis. Individuals do not have to register your cell phone to receive WEA. Most major wireless carriers and cell phones are currently able to receive WEA messages but individuals must have their notifications turned on.

While WEA is very effective at reaching large areas of the public in a rapid manner, there are some downsides. WEA provides alert messages to every cellphone within a designated area by sending the alert to every phone within the range of specified cell towers. Although messages can be directed to a certain geographic area the margin of error with these designations is quite large and the system is reliant on the cooperation and technology of cell providers and cell towers. Although there are differences between providers, all cellphones within the coverage area of a designated cell tower will receive the alert. Based on which cell towers are in the affected area identified, cell phones may receive alerts far outside the designated emergency

area. Coupled with the 90 character limit, this system does have challenges in the effectiveness of its messaging.

Alerts are broadcast to coverage areas that best approximate the zone of an emergency. In November 2017, the FCC added new changes to WEA including a requirement for participating wireless carriers to transmit alerts to the best approximation of the geographic area impacted by an emergency, no matter what the size of that area. Beginning November 30, 2019, participating wireless providers must improve geo-targeting of alerts even further making such that geo-targeting does not overshoot 1/10th of a mile past the target area.

All mobile devices that are in the alert zone will receive the alert. This means that if an alert is sent to a zone in Los Angeles, all WEA-capable mobile devices in that zone will receive the alert, even if they are roaming or visiting from another state. In other words, a customer visiting Los Angeles from elsewhere would receive alerts in Los Angeles so long as they have a WEA-enabled mobile device in the alert zone while they are in Los Angeles.

Although emergency officials urge you not to, consumers may opt out of receiving Imminent Threat and Amber Alert messages by making changes in the settings option on their phone. Because of the very unique sound and vibration that the alert uses, some individuals choose to opt out of receiving alerts because they find the distinct notification sound of the message annoying or inconvenient. Opting out means that consumers will not receive alerts.

Sirens and Speakers

Sirens have long been used to provide notice of disaster and warnings. A civil defense siren (also known as an air-raid siren or tornado siren) is a siren used to provide an emergency population warning to the general population of approaching danger. It is frequently sounded again to indicate the danger has passed. Initially designed to warn city dwellers of air raids in World War II, sirens were later used to warn of nuclear attack and natural destructive weather patterns such as tornadoes.

Except in certain instances (such as tsunami warnings), over time siren systems have gradually fallen out of favor. However, as communities begin to realize that their current warning systems have deficiencies, many local governments are now looking to either install new sirens or refurbish older ones. Older sirens typically just make noise to get residents attention, and their effectiveness is limited because there is no specificity on the emergency. Newer technology and equipment is being developed that used a speaker system capable of projected noise and voices clearly and over distance. These systems can provide a warning sound and provide information, instructions, or orders.

SYSTEM LIMITATIONS ON RECEIVING ALERTS

All of our current systems that are used to notify or alert citizens to disasters or emergencies have inherent strengths and limitations on their effectiveness to reach and motivate individuals. The use of multiple systems can reach more people but can often create confusion and different messages.

Landlines and Cell Phone Limitations

In the past it was easy and efficient to call landlines to warn residents that a disaster or emergency was imminent because the local government agency had the numbers and addresses of all landlines in their jurisdiction. With the development of cell phones or wireless communications, more and more people are getting rid of their landlines and are relying solely on cellular phones. More than half of U.S. households — 53.9 percent — rely entirely on cellphones, according to a survey from the National Center for Health Statistics, an arm of the Centers for Disease Control and Prevention. For adults renting homes, that number is even higher at 70 percent. In 2006, only 15.8 percent of survey respondents said they didn't have a landline telephone. Another statewide survey modeling state-level estimates of California adults living in households with a telephone from 2013 to 2017 estimated in 2019 that almost 56 percent of households would be cell phone only.

Cell only	55.9%
Landline only	4.5
Landline and cell	39.5

Due to the costs of establishing and maintaining landlines, many telephone providers are switching to VoIP services provided over an internet connection instead. This means that a telephone company will not know the location of your VoIP phone call unless it is register with the correct address. A local government using a Reverse 9-1-1 system could make calls to individuals using VoIP that are out of a notification area or miss persons who should be notified.

In addition, landlines are powered through the physical wire itself so even if the power to your home goes out, your telephone will continue to work. In the case of a power outage VoIP phones only work if it has a battery backup and continued internet service. A disaster such as an earthquake or a fire could disrupt electric power and internet service meaning that individuals with a VoIP phone will not receive reverse 9-1-1 calls or even have the ability to call 911 for assistance.

PG&E and other utilities are now de-energizing power lines in high wind and other dangerous situations in order to reduce the possibility of wildfire. When this occurs, VoIP telephone lines will be at risk of not receiving reverse 9-1-1 calls or other forms of notifications. In addition, the loss of power means televisions and radios will also not be on to receive alerts and warnings from the IPAWS system unless they are battery powered.

Furthermore, WEA alerts and services such as Nixle rely on cellular networks for many of their notifications. Power outages or damage to cell towers will render these notification systems useless unless there is a form of battery backup or the signal is capable of being routed through another working cell tower.

Areas without Telephone Coverage

In areas where telephone coverage is unavailable, experts have recommended buying a battery powered or battery backed-up NOAA weather radio. These weather radios can have features that beep before an urgent message is broadcast about an imminent fire warning issued by local law enforcement, which the National Weather Service can transmit over its frequency. NOAA weather radios use a special receiver to tune into National Weather Service broadcasts 24/7. This alert system is an almost immediate source for comprehensive weather and emergency information available as they broadcast warning and post-event information for a wide variety of hazards and emergencies.

Issues with Television and Radio Alerts

For decades, people around the country would find their favorite TV shows or radio stations interrupted by emergency warning alerts. These alerts come with a grating, discordant noise that makes listeners take notice. However, the ability of these alerts is diminishing in effectiveness as more people cut the cord and turn to entertainment that cannot carry such broadcasts.

A 2018 survey conducted by a private firm found that 27 percent of the 2,500 adults they polled said they watched Netflix most often, while 20 percent turn on cable TV and 18 percent watch broadcast TV. The major TV providers are losing hundreds of thousands of viewers, while Netflix and Hulu subscriber bases continue to grow. While a large share of Americans still tune in to traditional radio, there are now many options to supplant local stations, such as Pandora, iHeart Radio, Spotify, and Apple music.

The FCC requires TV and radio stations to broadcast alerts, as well as cable and satellite channels, but so far, there's no protocol in place to send out an alert to users of streaming services and other online platforms.

Adding alerts to streaming services will require companies to agree to participate, or Congress to mandate their participation. There are technological challenges to how this could even be made possible such as, how streaming services would be able to identify users in a specific geographical range or location. TV and radio stations have a regional broadcast range, and cable companies have physical wires into people's homes, so they can identify an individual's location, but this is much more difficult for a service that provides content over an internet connection. A streaming service could, in theory, send alerts to devices based on the IP address it's using, but this could be misleading since some people use virtual private networks that mask their location; or, to appear to be in another location.

Weaknesses Associated with Alerts Broadcast Through Cell Towers

A major concern expressed by some alerting authorities with WEA is that it requires alerts being sent out to cell phones through the use of cell towers. Because cell towers does not yet provide accurate location designations in specific areas, the alert notification area can be overly broad. Some local governments have in the past hesitated to use a system that sends broad brush warnings that reaches too many people in an emergency fearing that sending an overly broad

alert to too many people could cause a panic and potentially overwhelm available evacuation routes.

Cell phones work well in urban areas because of the coverage provided by a comprehensive network of cell towers. Rural areas have fewer or no cell towers, so coverage is often spotty or not available at all. The same is true for the provision of broadband or internet services in rural areas. Unfortunately, both of these services are necessary for many Californians to receive emergency alerts or information.

Cell towers can also be vulnerable to wildfires and other natural disasters. According to the OES Californians experience, on average, about 15 outages and 255 hours of downtime a month due to failures on the grid. During the recent Camp Fire the cell phones of many of the residents of the City of Paradise did not work, preventing them from giving or getting alert information. Due to a number of factors the residents of Paradise weren't getting messages to evacuate. An analysis by the Bay Area News Group showed that about 56 percent of the 4,272 emergency alert calls in the first hours of the Paradise blaze failed. They suspected that a lack of power at cell towers was a contributing factor in that failure. As the fire progressed, the call-failure rate climbed. Seventeen towers were lost in the fire's first day, either because they were damaged or because they lost power. A total of 66 cellphone sites were either damaged or out of service in Butte County as a result of the fire. Concerns have been expressed that the state's cellphone system lacks the resiliency needed to prevent a repeat of the Camp Fire's communications failure.

As a result, a legal motion has been filed by the Public Advocates Office urging the California Public Utilities Commission to immediately require carriers to provide backup battery or generator power and network redundancy in designated high fire risk zones to ensure that emergency alerts are received and that 911 calls are answered. Over a decade ago, the FCC ordered carriers to install eight hours of backup power at all cell sites and 24 hours of backup power at all central switching facilities. The wireless industry challenged the order in court and these requirements were never adopted. California at one time considered stronger reliability standards but did not proceed. As a result, cell towers in many areas, especially rural parts of the state are in jeopardy of losing vital communications resources during a fire or emergency.

CALIFORNIA'S STATEWIDE ALERT AND WARNING GUIDELINES

After the 2017 and 2018 disastrous fire seasons, state and local officials realized that not all jurisdictions were prepared to issue emergency alerts or did not understand how they should be issued. These issues caused many individuals to not receive the necessary alerts or information for them to take action to protect their property and lives. As a result, the Legislature passed SB 833 (Chapter 617, Statutes of 2018) requiring OES to prepare and release voluntary statewide alert and warning guidelines. These guidelines provide local government with best practice procedures on how emergency alerts and warnings should be sent to the public. The guidelines are voluntary and the procedures and practices that are ultimately employed and undertaken is still the responsibility of local government.

A comprehensive alert and warning program is a critical component to a community's ability to effectively respond to emergencies. With recent disasters highlighting the differences and inconsistencies among various alert and warning programs, emergency management leadership identified the need to establish statewide guidelines for the purpose of enabling and encouraging consistent application of alert and warning best practices, procedures, and protocols.

The Guidelines address the critical components of an effective and comprehensive alert and warning program including: Roles and Responsibilities; When and How to Issue a Public Alert or Warning; Methods and Technologies; Messaging; Alerting Coordination; Training Requirements; and System Testing and Exercise Requirements.

Furthermore, local government officials typically have the most accurate and timely understanding of the situation, necessary protective actions, and potential adverse impacts of the incident. It is incumbent upon local officials to rapidly and adequately communicate to the public what is occurring and any steps or actions the public needs to take. These actions could include: Evacuation orders (Including evacuation routes, shelter info, key information, etc.); Locations of points of distribution (for food, water, medicine, etc.); Direction to move to higher ground; HazMat incidents; Red Flag warnings; Weather alerts; Lockdown; and Shelter-in-place guidance.

DOES THE PUBLIC TAKE WARNINGS SERIOUSLY?

During recent fires and disasters many people were reluctant to leave their homes and belongings until, it was too late. In one instance, once the fires were over, at-risk residents in Montecito were ordered to evacuate when torrential rains fell across an area ravaged by the Thomas Fire. Some residents chose not to evacuate and that decision cost lives. Others have complained that they received no warning. Studies have been conducted to determine why people fail to follow mandatory evacuation orders. The reasons are both simple and complex in nature.

Failure to evacuate may depend upon the demographics of the individuals at risk, such as financial resources, available alternative shelter for family members, pets and livestock, and structural mitigation measures already taken by residents. An individual's age, income, their level of preparation for a wildfire, or having a risk-taking personality has also been shown to be factors. In addition, complacency, apathy and a sense of "it won't happen to me" can play a part in whether people heed an evacuation warning or not. Any past success of riding out a storm or fire also plays a major factor in their evacuation decision.

These studies also indicate that some people are simply unable to evacuate due to disabilities, the lack of transportation or the lack of assistance. Other reasons people fail to evacuate include a fear of their home being looted or damaged along with not wishing to leave behind a familiar place they know as home with all its contents and memories. Some residents are afraid to leave pets or animals like horses, goats or cattle behind.

More complex reasons that people fail to heed evacuation warnings include a lack of knowledge or understanding of the risks they are facing and a lack of training about what they need to do. Some residents simply do not understand the threat and its potential dangers. In the case of WEA

alerts it is often difficult to get a message across in 90 characters. There is a strong need for emergency personnel to have education and training regarding the risks of an event and the ability to communicate those risks to citizens to ensure that at-risk residents heed evacuation warnings.

While emergency and disaster management professionals have a clear and healthy understanding of just how quickly a tornado, earthquake, tsunami, wildfire or debris flow can destroy everything in its path, people in our communities often have little understanding of just how deadly forces of nature can be. Our disaster and emergency management professionals need to know how to communicate these risks effectively. Public education needs to take place prior to the occurrence of an event.

IPAWS Architecture: “a National System for Local Alerting”

