2016 National IPAWS EAS Test Report

On September 28, 2016, the FEMA Integrated Public Alert and Warning System (IPAWS) Program Management Office (PMO) conducted the second nationwide EAS Test. This test exercised IPAWS message distribution via the Emergency Alert System (EAS).

The IPAWS Lab convened the Test Management conference call and began sharing the Monroe DASEOC Common Alerting Protocol (CAP) message authoring tool shortly after 2 PM eastern time. We confirmed that the IPAWS Testing Common Operating Group (COG) was properly configured to send NPT and RWT event code messages to the entire country both through the IPAWS management tool (AMS) and the COG profile view function on the DASEOC.

A representative of National Weather Service confirmed that there was no anticipated severe storm activity with the exception of a small risk of thunderstorms.

The test message origination was observed by a representative from the White House Military Office, and Wade Witmer, Deputy Director of the IPAWS PMO. Federal Communication Commission (FCC) staff were on the Test Management call as well.

At precisely 2:20 PM EDT IPAWS Lab personnel sent the test message to IPAWS. Within less than a minute EAS devices both in the IPAWS Lab and the field began relaying the message. At approximately 2:21:30 IPAWS PMO contractor Ben Sheppard began capturing a series of media monitoring suite snapshots. Various people on the Test Management call reported their observations.

Metrics

AWS traffic reported the following activity associated with serving the audio messages:

Time	Spanish	English	
2:19		2262	
2:20	155	4406	
2:21	410	980	
2:22	113	151	
2:23	14	17	
2:24	5		
	8.19%	91.81%	
Totals	697	7816	8513

Total Requests	Hits	Misses*	Errors
8697	8584	83	30

* “Miss” indicates the file was not present on the Amazon Cloud edge and was retrieved from the original document store, it does not indicate lack of delivery.

Location (by IP)	Request Count	Request %	Bytes (Adjusted)
United States	8,738	98.88%	1.89 GB
Puerto Rico	51	0.58%	11.40 MB
Canada	24	0.27%	4.17 MB
Virgin Islands, U.S.	7	0.08%	1.56 MB
Guam	6	0.07%	1.35 MB
American Samoa	5	0.06%	1.12 MB
Northern Mariana Islands	2	0.02%	456.76 KB

During regional IPAWS testing we observed and reported both Akamai demand reflecting the amount of data pulled from the IPAWS OPEN servers and the management system polling counts. These counts were inconsistent in the past. For the September 28th test Akamai indicated a demand volume of 206 MB which would be the equivalent of a maximum of over 22,000 CAP downloads. Considering that every CAP enabled EAS device should have downloaded the NPT message that may not be too far off. Meanwhile AMS indicated that DC1 served 570 message retrievals and DC2 served 3,303 retrievals for a total of only 3,873 message retrievals, which is clearly not correct. The message retrieval count process in OPEN needs to be reviewed.

Sage Alerting Systems monitored the performance of five Sage 3644 Endecs in their lab.

Sage Audio File Download

UTC	Mbit/sec	Language
18:20:21	3.44	English
18:20:24	3.14	English
18:20:32	3.57	English
18:20:45	6.07	English
18:20:51	2.33	Spanish

Harold Price commented "All of these were on a shared 100mb switch, but none of the fetches overlapped. It does show that, at no time did I get unacceptable performance fetching the audio files."

EAS TEST REPORTING SYSTEM DATA ANALYSIS

Final information submission via the EAS Test Reporting System (ETRS) was due November 14, 2016. The FCC shared an initial extract of their database with FEMA on December 15, 2016.[1] The raw ETRS data as received consisted of a 27,800 line, 81 column spreadsheet, with some filers submitting multiple and/or incomplete filings. Elimination of entries not containing minimal day of test performance data reduced the number of ETRS responses (spreadsheet lines) as show here:

[1] ETRS information was shared consistent with FCC rules, which permit the FCC to share individual ETRS data on a confidential basis with other Federal agencies. It is noted that the FCC continued to accept late-filed test results in ETRS until December 31, 2016. Figures drawn from the final ETRS data may differ than those presented in this report, though any differences are expected to be minor.

	Total Entries, Raw Data	Entries w Test Data	Post Duplicate Elimination
Broadcast	19,477	18,203	16,903
Cable	7,843	6,571	3,295

We note that editing ETRS data with the intent of eliminating multiple entries is a manual and imperfect effort which relies on the judgement of the editor in many cases. When FEMA and the FCC independently exercise this process we expect that our results will be similar but not identical. Differences in the ETRS data editing process and the following ETRS data analysis processes will result in minor statistical differences in figures reported by the two agencies.

Further analysis of the ETRS data following elimination of duplicates and entries from stations not in operation (silent) at the time of the test revealed the following:

Form 2 Responses	Received Message	Relayed Message
All Broadcast	95.50%	87.46%
Full Power	95.96%	88.27%
RADIO	95.78%	88.90%
TV	96.88%	85.07%
LP FM	87.80%	73.94%
Cable	93.81%	77.59%

These results compare favorably with observations from monitored regional testing conducted in preparation for the September 28th test. The regional tests resulted in an eighty eight to ninety percent rate of successful relay of the NPT message among voluntary participants. Low Power FM broadcast is presented separately as providing informative outreach to the Low Power FM broadcast community has been problematic as these licensees are very independent and are generally not represented by associations.

ETRS data showed that 49.23% of full power broadcast licensees received the test message from IPAWS first. Cable reported 40.66% received first from IPAWS. For Low Power FM stations this figure was 40.04%. These figures also match expectations for EAS devices that poll IPAWS at 30 second intervals. We anticipated that roughly half the devices would receive the test message via over the air relay prior to polling IPAWS.

ETRS REPORTED FAILURE MODE ANALYSIS

When analyzing failure modes FEMA performed an engineering review of each licensee's stated observations and assigned each reporting licensee one core issue from the general categories as shown below. The FCC's test report may choose to tally all licensee comments which could result in a single licensee contributing to multiple categories and significantly different tallies.

Failure Modes Among Radio & TV Broadcasters (excluding LP FM)			
		% of Fails	% of Overall
No Reason Given	578	26.86%	3.59%
Configuration	443	20.59%	2.75%
Silent	321	14.92%	1.99%
Update Required	220	10.22%	1.37%
Equipment Failure	217	10.08%	1.35%
Rules Variance	106	4.93%	0.66%
Source Issues	90	4.18%	0.56%
Obsolete Equipment	65	3.02%	0.40%
Wiring Errors	44	2.04%	0.27%
Automation	42	1.95%	0.26%
Connectivity	18	0.84%	0.11%
Antenna (reception)	2	0.09%	0.01%
EAS Device not installed	1	0.05%	0.01%
Class D	1	0.05%	0.01%
Class LD TV	1	0.05%	0.01%
EAS Plan	1	0.05%	0.01%
Manual Operation	1	0.05%	0.01%
EAS Box Stolen	1	0.05%	0.01%

A number of licensed stations were not broadcasting at the time of the test, shown above as "Silent". That number includes mostly new licensees which have not yet commenced operation. Other listed failure modes including "EAS Device Configuration", "EAS Device Update Required", and "Equipment Failure" were anticipated and track well with observations from regional testing. The "Rules Variance" category was populated by operators that indicated their stations do not relay EAS messages by licensee policy.

The most interesting Message Receipt Explanation was offered by an FM station: "An owl's nest obstructed the transmission." The exact relationship between the owl's nest and the EAS message remains unknown.

The Automation category reflects principally television operations where automated systems downstream of the EAS device did not perform as expected. Using a commercial monitoring suite we

collected 125 video clips demonstrating various levels of performance during the test. Cross referencing observations from the video clips with television licensee comments in ETRS showed indicated that most television licensees not only were aware of presentation issues but also accurately reported them in ETRS.

The Source Issue category contains stations whose EAS monitoring assignments would benefit from review by the appropriate State Emergency Communications Committee. Source failures include inability to receive assigned monitor stations and cases where the monitored stations did not successfully relay the test message.

Failure Modes Among Cable Systems			
		% of Fails	% of Group
Configuration	337	43.94%	10.23%
No Reason Given	136	17.73%	4.13%
Middleware	126	16.43%	3.82%
Equipment Failures	54	7.04%	1.64%
Source Issues	33	4.30%	1.00%
Update	28	3.65%	0.85%
System	23	3.00%	0.70%
Antenna	16	2.09%	0.49%
Connectivity	8	1.04%	0.24%
Obsolete EAS Device	3	0.39%	0.09%
No EAS Box	2	0.26%	0.06%
Power Issue	1	0.13%	0.03%
(By PSID with unique monitoring assignments)			

For cable operators there were many reports of middleware related failures. For purposes of this analysis Middleware includes control systems, switching systems, RF systems and distribution elements. There were a surprising number of cable systems that reported EAS monitor antenna problems. This may be indicative of a general lack of focus on EAS device performance with regard to weekly test message reception.

SPECIFIC CASE STUDIES

Information supporting development of the following case studies was drawn from post-test conference calls with SECC Chairs, email exchanges, telephone conversations, various engineering list servers and other publically available sources and was compiled for inclusion in this report with the permission of the various contributors. Each of the following case studies was developed prior to receipt of ETRS data.

PHILADELPHIA area stations reported receiving the NPT followed by some station's normal talk programming with no End Of Message (EOM). This was another case where a centrally programmed K-Love station initially carried the NPT as part of satellite delivered program material only to have the test message interrupted by the station's local EAS device. In Philadelphia the K-Love station, WKVP-FM serves as a monitor source for the Local Primary station WHYY. When WHYY's EAS device received the double header NPT message from WKVP-FM the WHYY EAS device failed and returned to normal programming without originating an EOM. As a result a number of Philadelphia area stations carried up to two minutes of WHYY's programming in lieu of the NPT audio message. One Philadelphia engineer, Larry Paulausky, recommended: "It would probably be better in a perfect world if KLOV's EAS interrupt was placed at a point in KLOV's air chain which was AFTER the feed to its network of simulcast stations." This affected at least 20 Philadelphia area broadcast stations.

SAINT LOUIS - The Illinois Emergency Management Agency (IEMA) employs a VHF radio link to distribute EAS. The signal quality of the portion of this link extending to East Saint Louis, Illinois was marginal at the time of the test. The Saint Louis area experienced a problem where KTRS received the test message from IEMA before almost any other station received the NPT from CAP. Joe Gearling at the St. Louis PEP station reported: "…somehow the IEMA feed was enough to get the code but the message was a mess – noise and no voice. About half the stations that were in our SBE mail chain reported the problem. Many Saint Louis stations received the cap message last, 1-2 minutes after KTRS sent the bad test."

HAWAII – The State of Hawaii Emergency Operations Center maintains a microwave link for the purpose of distributing EAS messages and alerts throughout the island chain. This microwave link normally carries NOAA Weather Radio audio which is fed through a state EAS device for state EAS originations and a PEP specific EAS device for federal EAS. The state EAS device monitors local Honolulu stations KSSK and KRTR as well as the IPAWS CAP feed. Hawaii EMA first received the test message over the air from KRTR and relayed that message via the inter-island microwave. In this case there were quality and distortion issues with the audio received from KRTR which were propagated throughout the island chain.

The Philadelphia, Saint Louis, and Hawaii cases each illustrate what can occur when a secondary, unanticipated, or corrupted EAS distribution system is in service. Additional work must be done to coordinate currently unanticipated EAS message delivery paths and to work with EAS device manufacturers to gain a better understanding of how specific devices process malformed and/or truncated EAS messages which appear to contain double data header packages. State and regional EAS distribution networks must be exercised and examined regularly to ensure network integrity and to

avoid delivery of garbled or distorted messages. At the moment a number of states have locally developed EAS distribution networks comprised of anything from leased lines to microwave and radio links to IP networks. In each case these are best effort systems and not subject to federal oversite. It would be helpful if these systems were cataloged so that FEMA and the FCC are aware of their existence. This would also allow FEMA to observe and make best practice recommendations in regard to these independent EAS distribution systems.

SUMMARY

Test observations and reports fell within expected norms based upon observations during previous regional testing efforts. There are a number areas for improved performance, most of which require more attention to EAS device maintenance and configuration by individual EAS Participants. Both the Cable and Television industry are now more aware of how their middleware and station automation products handle (or mishandle) EAS messages and need continuing encouragement to ensure that these internal systems will properly process and pass EAS messages to their customers/viewers.

RECOMMENDATIONS

We must continue to promote EAS awareness to industry through outreach to individual state and regional broadcast and cable organizations in coordination with state emergency managers.

Some licensees will only review their EAS preparedness when pressed to do so by testing with incumbent reporting. Taking these two factors into consideration I propose that we consider conducting additional rounds of tests:

- The first round should be a repeat of the September 28th test exercising the IPAWS CAP message distribution structure; this will allow licensees to determine if individual mitigation efforts following the September 28th were effective.
- The following round should exclusively exercise the PEP distribution structure to evaluate our capability to deliver a message in the absence of terrestrial telephone and internet connectivity. In both cases we encourage the FCC to shorten the ETRS response time window so that more timely analysis may be performed.

FEMA is considering the addition of a broadcast PEP station in Hawaii to supplement the existing PEP feed to the HEOC inter-island microwave relay system.

Use of ETRS data by FEMA and others could constitute a significant educational and promotional opportunity with regard to EAS and public alerting. For example: presentation of data from the National Test to state emergency management and State Emergency Communications Committees could serve as a catalyst for the improvement of alerting. Unfortunately due the confidentiality of ETRS data that is not be possible. FEMA encourages the FCC to re-assess the ETRS data confidentiality prior to any subsequent data collection. ETRS data in the right hands such as State Emergency Communications Committees can

provide significant insight into how EAS is really structured and where improvements in message flow may be implemented.

With selected, non-confidential ETRS information in hand FEMA and the FCC could assist states with their alerting plans and refresh the integration of broadcast and cable operators and state alerting authorities as they update and improve their alerting plans.