

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)
)
Amendments to Part 11 of the Commission's Rules) PS Docket No. 15-94
Regarding the Emergency Alert System)

**Comments in Response to the Notice of Proposed Rule Making on
Implementation of Multilingual Wireless Emergency Alerts**

Thank you for the opportunity to comment on this proposal. My name is Art Botterell. I was the originator and lead designer of the Common Alerting Protocol (CAP)¹, the digital message format adopted in 2007 by the Commission's Commercial Mobile Service Alert Advisory Committee (CMSAAC) as a foundation technology for the Integrated Public Alert and Warning System (IPAWS).

At the time of CMSAAC I managed an all-hazard public alert and warning system on behalf of the Sheriff of Contra Costa County, California, where I had the opportunity to refine and validate CAP in real-world public warning practice. Previously I had served as Assistant Chief of Telecommunications for the California Governor's Office of Emergency Services (CalOES), as a field Public Information Officer for FEMA, and as a consultant on warning and emergency public information systems to Industry Canada and the Republic of Singapore.

¹ OASIS Emergency Management Technical Committee, *Common Alerting Protocol (CAP) Version 1.2* (2009), retrieved from <https://docs.oasis-open.org/emergency/cap/v1.2/CAP-v1.2-os.pdf>.

More recently I have served as a consultant and contractor to the FEMA IPAWS Program Office, CalOES, Emergency Management Australia, the European Research Executive Agency, the United Nations Development Program, the U.S. Public Broadcasting Service, and Carnegie Mellon University-Silicon Valley.

Introduction

In this NPRM the Bureau proposes a sweeping modification of IPAWS-based public warning systems with the laudable aim of expanding multilingual alerting service. While that goal is both worthy and urgent, the method proposed is in my view deeply and unnecessarily problematic.

The proposed scheme, introducing pre-written and -translated warning messages stored “downstream” on individual wireless devices, would reduce the flexibility and expressiveness, and thus the effectiveness, that alert originators currently can rely on. It seriously underestimates the inherent complexity of effective warning messages.

The proposal has other problems from the perspective of the alert originator. I will point out some of them in the following. I will also recommend an alternative that avoids the pitfalls of the present proposal.

Particular Comments in Response to the NPRM

The following comments correspond to selected sections of the Synopsis and Discussion portions of this NPRM as published in the Federal Register on May 5, 2024:

1. ***“This document proposes requiring Participating CMS Providers to support the display of pre-translated templates of WEA emergency alerts that would display the alert in the thirteen most commonly spoken languages in the United States...”***

The scope of this proposed disruption of existing workflows for IPAWS and WEA would extend far beyond the CMS Providers, to impact on FEMA, on the State, Local, and Tribal alerting authorities who rely on WEA and IPAWS, and ultimately on the public. It also will disrupt the commercial marketplace for software alert origination tools, with effects rebounding onto local alert originators in costs, training, and warning effectiveness.

2. ***“We propose that Participating CMS Providers must support the use of the Alert Messages templates listed in Appendix C. As discussed in the 2023 WEA Report and Order, these templates would be pre-installed and stored on mobile devices...”***

As the Bureau acknowledges in the NPRM, the proposed imposition of pre-deployed static templates raises grave operational concerns about a loss of warning message expressiveness, flexibility, and effectiveness. It also wafts an uncomfortable impression of restricting local alert authorities’ operational flexibility, and an intimation of local costs and other burdens to come.

3. ***“These templates represent, in the Bureau’s analysis, the most commonly issued alerts...”***

A story I heard in my first statistics class in college: During World War II the U.S. Air Force tasked base personnel to plot the locations of all anti-aircraft damage sustained by returning bombers, in hope of extracting insights as to where additional armor should be placed... until a researcher pointed out that they were only looking at the planes that came back. The story may be apocryphal, but it’s nonetheless a vivid illustration of the problem of selection bias.

Are we counting alert originators' actual needs and intents here? Do we count alerting attempts that were abandoned in frustration or confusion? Or alerts that never happened, but that might have been lifesaving? We don't know how to do that, and so I urge caution in assuming that the future will stay within the bounds of our current understanding of the past. (For that matter, IPAWS has only been operational for about a dozen years... that isn't terribly long in historic terms.)

The effectiveness of IPAWS and WEA under unexpected and even "black swan"² conditions should not be taken for granted. Emergency managers don't lose sleep over their regularly exercised plans; they lie awake wondering "what have we overlooked?"

4. "We seek comment on the specific text used in the templates, as well as their translations..."

There are several scientific and industrial metrics for translation quality, such as SAE J2450 for the automotive and manufacturing industries, and the ASTM F2575-14 Standard Practice for Language Translation. There are also specialized metrics used for machine translation quality, such as "BiLingual Evaluation Understudy" (BLEU) score.

Any translation project should, I recommend, be calibrated against such objective tools, and should also be critiqued by representative speakers of each language.

5. "We seek comment on how the translations for the 13 languages should be conducted..."

I join with other commenters in questioning the efficacy and feasibility of redesigning WEA, EAS and IPAWS to rely on pre-translated and pre-disseminated warning messages. I will expand on those concerns below.

² Taleb, N. N. (2007). *The Black Swan: The Impact of the Highly Improbable*. Random House.

Fortunately, we have an alternative. This proceeding comes at a moment when machine language translation (MLT) capability is achieving previously unimagined levels of performance. I note that in the past the Commission has expressed reasoned caution about MLT but considering extraordinary recent achievements using Large Language Models (LLMs)³ and vector accelerator technology, any evaluation of MLT capabilities that is more than a few months old is, unavoidably, already out of date.

MLT is essentially a mathematical operation whereby the semantics, the meanings of words and phrases are represented as numeric vectors. The magic of this technique, to the extent there is any, lies in algorithms that can perform “semantic encoding” and “semantic search” across text in multiple human languages⁴. This allows high-quality, near-instant translation between languages, which can be verified and monitored using automated evaluation metrics such as those mentioned in section 4, above.

In addition, the “training” (the programming) of an LLM can be refined by fine-tuning of values within the model. This is done to achieve specialization, as when training an MLT translator, which typically would lack interactive or instruction-following capabilities. It can also be done to enhance accuracy of translations by overlaying specialized training on a core input vocabulary or lexicon.⁵

³ LLMs are large binary data files that represent a cumulative overlapping of words, phrases, and other language structures in one or more human languages, and that can be read to yield correspondences between words and languages. The biggest LLMs can be “trained” (programmed) to generate simulated conversations, while smaller instances can be configured to do specialized language tasks such as translation. The largest LLMs are hosted in huge cloud facilities, but functional translation LLMs can be deployed on local servers, desktop computers, and even portable wireless devices.

⁴ Wikipedia contributors. (n.d.). Neural machine translation. In *Wikipedia, The Free Encyclopedia*. Retrieved May 17, 2024, from https://en.wikipedia.org/wiki/Neural_machine_translation

⁵ E.g., Sutton, J., Olson, M. K., & Waugh, N. A. (2023). The warning lexicon: A Multiphased Study to Identify, Design, and Develop Content for Warning Messages. *Natural Hazards Review*, 25(1). <https://doi.org/10.1061/nhrefo.nheng1900>.

6. “We observe that certain templates in Appendix C direct recipients to evacuate, but evacuation may not be appropriate for all incidents. Alerting authorities may want to send alerts that direct different behavior from recipients, such as sheltering in place...”

This brings us back to the fundamental problem with static templates. Evacuations aren't the only example, but they're a good one. Let us look a little more closely: Imagine you receive a warning to evacuate. All right, fine... but in which direction? By what means... on foot, by car, by bus? Which routes should we take, or avoid? How far and to which locations should we travel? What about my children at school? And can I take my pets to some or all shelter destinations? The answers to those questions, particularly that last one about pets⁶, vary from incident to incident, and have proven dispositive as to whether some people take recommended actions in critical warning events.⁷

Certainly, a hazardous condition may call for different protective actions in different places. At present this is most simply dealt with by sending multiple alerts, each to a different target area.

Some warning scenarios are simple and boilerplate, but many are more complex and individual in the real world than they seem on abstract inspection. Alert originators need the flexibility to address complexity when it arises, foreseen or not.

⁶ Chadwin R. Evacuation of Pets During Disasters: A Public Health Intervention to Increase Resilience. *Am J Public Health*. 2017 Sep;107(9):1413-1417. doi: 10.2105/AJPH.2017.303877. Epub 2017 Jul 20. PMID: 28727532; PMCID: PMC5551593.

⁷ Mileti, D. S., & Sorensen, J. H. (1990). *Communication of emergency public warnings: A social science perspective and state-of-the-art assessment* (ORNL-6609). Oak Ridge National Laboratory. Prepared for the Federal Emergency Management Agency, Washington, D.C.

7. “We seek comment on whether alerting authorities would benefit from one or more generic alerts on this list, such as ‘shelter in place’ or ‘evacuate now...’”

Having devised several message template-sets over the years, my preference is generally for starting from the protective action (or actions) we’re requesting from the public. I believe that’s what’s meant as “generic” here.

Still, once we have such action-oriented templates, the problem remains of filling in the essential details. Issuing a generic evacuation order without relevant specifics could be compared to shouting “Fire!” in a crowded theater.

8. “We seek comment on whether alerting authorities would benefit from an alert ‘all-clear’ template that would inform the public the danger has passed or the alert is no longer in effect...”

Both alerting authorities and the public would, I believe, benefit from such a capability. But experience leads me to offer a caveat.

Contra Costa County, California hosts several large oil refineries, which by their nature are prone to occasional blow-outs, fires, and other misadventures that lead to airborne releases of toxic chemicals. With a fresh Bay breeze the plume of such a release can travel downwind for miles before it dissipates to acceptable safety levels.

The words “all clear” are used at the refineries to indicate that the release has been halted, and that the immediate workspace is safe. However, that does not necessarily mean that people downwind are no longer at risk. When local citizens and news media near the refinery hear the words “all clear” they sometimes hasten to spread the news to people downwind for whom it is premature.

Terms of jargon like “all clear” can be a trap for alert originators. Among other things, they can challenge translation, as directly equivalent idioms don’t always exist in other languages. Currently alert originators can mitigate such problems by addressing them in the message body text, but a static template system would make that sort of adaptation infeasible.

Some sort of negation or termination message is very much needed, as we were reminded in Hawaii in 2018.⁸ But again, it may not be simple enough or predictable enough to be pre-templated.

13. “In the 2023 WEA Report and Order, the Commission directed the Bureau to seek comment on whether templates can be customizable to include event-specific information. We seek comment on whether this is feasible. In doing so, we recognize and seek to address concerns about static templates that were raised in the record of the underlying proceeding...”

The crucial importance of event-specific details in alert messages is well-documented⁹ and widely appreciated by experienced warning practitioners. In general, event-specific details contribute to personalization and, thereby, to the effectiveness of warnings. In cases where specific instructions to the public are required (e.g., a specification of a highway to avoid) such “customization” becomes a bare necessity.

⁸ Oliveira, B. E. (2018, January 29). *False ballistic missile alert investigation for January 13, 2018* [Memorandum]. To Major General Arthur J. Logan, Director of Emergency Management (HI-EMA).

⁹ Working Group on Natural Disaster Information Systems, Subcommittee on Natural Disaster Reduction, National Science and Technology Council, Committee on Environment and Natural Resources. (2000, November). *Effective Disaster Warnings Report*. Retrieved from https://www.sdr.gov/docs/NDIS_rev_Oct27.pdf

14. “We seek comment on the incorporation of four fillable elements: Sending Agency, Area Affected, Expiration Time, and (if desired) a URL...”

This perfunctory provision glosses over the many event-specific details that warning originators routinely include today, often in the CAP <description> and <instruction> fields. E.g., in a tornado warning, NOAA routinely includes storm-speed-and-direction-of-movement data that are entirely incident-specific and unique. A local flood warning often will include forecast depths at various locations. Tsunami warnings include tables of arrival-time data. And local alerts often need to relate hazards and activities to local landmarks or features such as rivers or major highways.

Not all those specifications are needed in every warning, or even in most warnings. Public warning is an activity in which variation is the rule. In my view, templates should be used as they are at NOAA, to aid the alert originator, but never to replace her.

33. “To the extent not already addressed, the Commission, as part of its continuing effort to advance digital equity for all, including people of color, persons with disabilities, persons who live in rural or Tribal areas, and others...”

Potential equity concerns arise as soon as we select some alerts for one level of translation and handling, while relegating others to a different tier of service. For economic, social, and historic reasons, not all people face the same profile of hazard exposures. As a result, any inconsistency in warning practice has a significant chance of translating into an equity problem somewhere on the ground.

Conclusion

My support for the goal of this NPRM, the expansion and improvement of our public warning infrastructure by achieving consistent multilingual capability, is unequivocal.

However, I cannot recommend this proposed approach, which I view as disruptive, damaging, and unnecessary.

Instead, I join the National Association of Broadcasters, REC Networks, and other commenters in respectfully asking the Commission to recycle and reframe this proceeding as a Notice of Inquiry, which among other things would allow an objective up-to-date review of the state of the art of Machine Language Translation, before committing the nation to a disruptive and retrograde scheme affecting our critical national public warning infrastructure.

Particularly if swift action is desired, as I believe it should be, I believe an MLT-based initiative could be implemented for WEA and EAS more quickly and with much less detriment to our existing capabilities than the proposed static-template approach.

Respectfully submitted,

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