Improving Wireless Emergency Alert Rules and Standards

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1. Improving the WEA Imminent Threat Class and Categories

The WEA opt-out capability is only useful when alert originators can appropriately code high-importance and low-importance alert categories. And the public can make informed opt-out choices based on recognizable different types of alerts. Enabling mobile device end-user control of unwanted WEA alerts is an important factor for end-user acceptance. Lack of control is extremely frustrating for end-users, especially when irrelevant alerts interrupt what the person is doing.

Mobile device connected with GSM, UMTS, LTE and future access technologies use the 3GPP TS 23.041 Message ID Code to identify alert categories and classes received by a mobile device. A few 3GPP Message IDs are used for specific message types. That is the exception, not the rule. There are a limited number of 3GPP Message IDs shared worldwide, grouped into a few broad categories. For example, Imminent Threat messages use a criteria matrix mapped to eight 3GPP message ID codes for different CAP Urgency / Severity / Certainty values in a primary and an additional language. The current 3GPP Message IDs for Wireless Emergency Alerts are listed in the following table, with Extreme Alert and Severe Alert for the two categories of Imminent Threat alerts.

Table 1 WEA 3GPP message Identifiers

Main MsgID	Add'l MsgID	Current 3GPP Message ID Description
4370	4383	Presidential Alert
4371	4384	Extreme Alert (Extreme, Immediate, Observed)
4372	4385	Extreme Alert (Extreme, Immediate, Likely)
4373	4386	Severe Alert (Extreme, Expected, Observed)
4374	4387	Severe Alert (Extreme, Expected, Likely)
4375	4388	Severe Alert (Severe, Immediate, Observed)
4376	4389	Severe Alert (Severe, Immediate, Likely)
4377	4390	Severe Alert (Severe, Expected, Observed)
4378	4391	Severe Alert (Severe, Expected, Likely)
4379	4392	Child Abduction Emergency / AMBER Alert
4380	4393	Required Monthly Test
4381	4394	Exercise
4382	4395	CMSP-defined
4396	4397	Public Safety
4398	4399	State/Local WEA Test

The Main MsgID is used for alerts in a country's primary language. All WEA-enabled mobile devices monitor and display alerts using the Main Message ID regardless of the device's

language setting or the language of the alert message. In some countries, the Main Message ID is used for multiple languages. Canada uses the Main Message ID for both English and French language messages, meaning alerts in either language will be displayed on all WEA-enabled devices. The Additional MsgID is used for alerts in additional languages. Only mobile devices monitoring for selected languages will display alerts matching the Additional Message ID. The Additional Message ID can be used with multiple languages, but in the U.S. only Spanish is supported.

The 3GPP Message ID descriptions are for programmers and developers. Public names for WEA alert classes and message categories should be based on end-user experience research, country-specific and language-specific requirements. The 3GPP Message IDs don't name a threat or hazard, rather the IDs identify the search list of message types received by a mobile device. The contents of the WEA message, i.e., CMAMtext, should describe the specific threat or hazard.

1.1. Splitting Imminent Threats into Natural Hazard and Emergency Alerts

The Commercial Mobile System Alert Advisory Committee architecture included several innovative ideas for processing alerts using the Common Alerting Protocol (CAP). Many of those ideas have worked well. A few of them haven't worked as well. After 10 years, it's time to revisit some of those ideas.

The CMSAAC classified WEA alerts into three broad types: Presidential, Imminent Threat and Child Abduction Emergency/AMBER Alert. The CMSAAC criteria for Imminent Threat Alerts was incorporated into the Federal Communication Commission regulations: United States Code of Federal Regulations (CFR), 47 CFR 10.400 – Classification.

> (b) **Imminent Threat Alert.** An Imminent Threat Alert is an alert that meets a minimum value for each of three CAP elements: Urgency, Severity and Certainty.
>
> (1) **Urgency.** The CAP Urgency element must be either Immediate (i.e., responsive action should be taken immediately) or Expected (i.e., responsive action should be taken soon, within the next hour).
>
> (2) **Severity.** The CAP Severity element must be either Extreme (i.e., an extraordinary threat to life or property) or Severe (i.e., a significant threat to life or property).
>
> (3) **Certainty.** The CAP Certainty element must be either Observed (i.e., determined to have occurred or to be ongoing) or Likely (i.e., has a probability of greater than 50 percent).

The WEA standards subdivide the Imminent Threat class into Extreme Alert and Severe Alert message categories, which do not appear in the FCC Rules. Those WEA message categories were intended to enable end-users opting out of all or only some Imminent Threat alerts. The

FCC rules require the ability to opt-out of imminent threat alerts, but do not mention opting-out of different categories of imminent threats.

Table 2 Current WEA Imminent Threat Message Categorization

Message Category	CAP Severity	CAP Urgency	CAP Certainty	Main MsgID	Add'l MsgID
Extreme Alert Message	Extreme	Immediate	Observed	4371	4384
	Extreme	Immediate	Likely	4372	4385
Severe Alert Message	Extreme	Expected	Observed	4373	4386
	Extreme	Expected	Likely	4374	4387
	Severe	Immediate	Observed	4375	4388
	Severe	Immediate	Likely	4376	4389
	Severe	Expected	Observed	4377	4390
	Severe	Expected	Likely	4378	4391

The original CMAS Imminent Threat matrix was very elegant. In practice alert creators have difficulty choosing appropriate Severity, Urgency and Certainty values for each alert. Further, combining high-volume alert sources and low-volume alert sources made it difficult for the public to know which types of threats and hazards for opting out. Alerts about natural hazards and from the meteorological bureaus tend to be the largest source of public alerts. As a result, mobile end-users get frustrated and opt-out of all possible alerts. In countries which do not allow opting out of types of WEA message classes or categories, the public stops paying attention to frequent alerts. For example, during the 2018 Seoul Olympics, public alert fatigue was evident although South Korea uses a different mobile alerting protocol.

1.2. Proposed changes to split Imminent Threats

I propose keeping the FCC definition for Imminent Threat Alerts with an addition, keeping the WEA/CMAS Imminent Threat Extreme/Severe categories and keeping the same 3GPP Message ID code numbers with revised definitions for backward compatibility with existing mobile devices. Imminent Threat messages would still require the CAP Urgency, Severity and Certainty elements meet minimum values.

My proposed change uses the CAP Category element instead of the CAP Certainty element in the Imminent Threat categorization matrix for 3GPP Message ID codes. The CAP Certainty element value must still be Observed or Likely but would be implied in the WEA imminent threat categorization matrix. The EAS-ORG parameter code and EAS event codes are not used in order to maintain compatibility with worldwide CAP implementations.

The CAP Category element values are grouped into two Imminent Threat message categories, emergencies and natural hazards, according to the following table:

Table 3 Imminent Threat category by CAP Category

Imminent Threat category	CAP Category values
Natural Hazard	Env, Fire, Geo, Health, Met
Emergency	CBRNE, Infra, Rescue, Safety, Security, Transport, Other

If a CAP message contains multiple Category elements with values from both Imminent Threat categories or an unknown value, use the Emergency category. For example, fire weather forecasts typically use the CAP Category "Fire" alone because wildfires usually start from natural causes. When a wildfire threatens a city or town requiring a wildfire warning, add both CAP Category elements "Fire" and "Safety" in the CAP message to use the Emergency category instead of the Natural Hazard category. Likewise, when a public water supply system is damaged requiring a boil water order, use both "Health" and "Infra" Category elements.

There are a few corner cases, nevertheless the division between Natural Hazard and Emergency alerts separates the supermajority of high-volume and low-volume Imminent Threat alerts enabling clearer opt-out choices. The "Other" CAP Category covers other threats or hazards. The contents of the WEA message, i.e., CMAMtext, should describe the specific threat or hazard.

The revised WEA Imminent Threat message categorization matrix would be as follows:

Table 4 Revised WEA Imminent Threat Message Categorization

Message Category	CAP Severity	CAP Urgency	CAP / Threat Category	Main MsgID	Add'l MsgID
Extreme Alert	Extreme	Immediate	Emergency	4371	4384
	Extreme	Immediate	Natural Hazard	4372	4385
Severe Alert	Extreme	Expected	Emergency	4373	4386
	Extreme	Expected	Natural Hazard	4374	4387
	Severe	Immediate	Emergency	4375	4388
	Severe	Immediate	Natural Hazard	4376	4389
	Severe	Expected	Emergency	4377	4390
	Severe	Expected	Natural Hazard	4378	4391

The 3GPP Message ID definitions would be revised to reflect the new usage. The new 3GPP Message ID definitions are intended to be interoperable with the current definition while supporting additional opt-out and alert capabilities. The CAP Certainty element value must still be Observed or Likely but would be implied in the WEA imminent threat categorization matrix.

Re-writing and simplifying the Imminent Threat class message ID description:

Table 5 New Imminent Threat Class Message ID Descriptions

WEA Message Category	3GPP Message ID Description	Main MsgID	Add'l MsgID
Extreme Alert Messages	Extreme Alert (extreme, immediate, emergency)	4371	4384
	Extreme Alert (extreme, immediate, natural hazard)	4372	4385
Severe Alert Messages	Severe Alert (extreme, expected, emergency)	4373	4386
	Severe Alert (extreme, expected, natural hazard)	4374	4387
	Severe Alert (severe, immediate, emergency)	4375	4388
	Severe Alert (severe, immediate, natural hazard)	4376	4389
	Severe Alert (severe, expected, emergency)	4377	4390
	Severe Alert (severe, expected, natural hazard)	4378	4391

The pairing of Emergency and Natural Hazard values in the revised Imminent Threat matrix is intended to maintain backward interoperability with 3GPP Message IDs. Emergency management agency alert creators mostly use the maximum Urgency / Severity / Certainty values, i.e., the "Observed" Certainty value. Those will appear as Emergency alert messages.

New WEA mobile devices would use the revised 3GPP Message ID definitions to divide Imminent Threats into two subcategories of Natural Hazard and Emergency messages under Extreme Alerts and Severe Alerts; instead of Certainty values. Older WEA mobile device behavior essentially never used (and did not depend on) the CAP Certainty values. Instead, older WEA mobile devices would continue to display and opt-in/opt-out of Extreme Alerts and Severe Alerts in a backward compatible way.

1.3. Examples of Natural and Emergency threats and hazards

The Natural Hazard category includes alerts about non-meteorological threats and hazards. However, in the U.S. over 90 percent of natural hazard alerts are issued by the National Weather Service for meteorological events, hence the suggested Natural Hazard message category public name: "Weather/Natural Hazard Alert."

Some examples of natural, technological and human-caused threats and hazards include the following:

Table 6 Example Threats and Hazards by Category

Natural Hazard Alerts	Emergency Alerts	
Natural	**Technological**	**Human-caused**
Avalanche	Dam failure	Active shooter incident
Drought	Hazardous materials release	Armed assault
Earthquake	Industrial accident	Biological attack
Epidemic	Levee failure	Chemical attack
Fire weather	Mine accident	Cyber-infrastructure attack
Flood	Pipeline explosion	Explosives attack
Hurricane/Typhoon	Radiological release	Improvised nuclear attack
Space weather	Train derailment	Nuclear terrorism attack
Tornado	Transportation accident	Radiological attack
Tsunami	Urban/rural conflagration	
Volcanic eruption	Utility disruption	
Winter storm		

The revised Imminent Threat matrix gives emergency management agency CAP alert creators four alert levels for Emergency alert messages. And the National Weather Service or meteorological bureaus get four alert levels for Natural Hazard, i.e., weather alert, messages. Unlike the EAS-ORG code WXR, the Natural Hazard imminent threat category is not restricted to the National Weather Service or meteorological bureau. The natural hazard category can be used by other alert originators. Likewise, the National Weather Service could use the emergency alert category.

Refactoring the imminent threat message categorization matrix directs alert creators to two simpler natural hazard or emergency message types with 2x2 matrix categories. The CAP Certainty element is implied in the WEA imminent threat matrix and must be Observed or Likely. This make CAP Alert coding easier for alert creators and alert template creators.

Table 7 Natural Hazard and Emergency Messages Matrices for WEA

Imminent Threat Emergency Messages		
	Immediate	Expected
Extreme	4371 / 4384	4373 / 4386

Imminent Threat Natural Hazard Messages		
	Immediate	Expected
Extreme	4372 / 4385	4374 / 4387

Severe	4375 / 4388	4377 / 4390		Severe	4376 / 4389	4378 / 4391

This change primarily improves WEA message handling and opt-out options on mobile devices. Other CAP Alert dissemination channels are not directly affected by revising how WEA maps and interprets CAP element values into 3GPP Message ID values. However, more consistent CAP Alert coding would benefit all CAP Alert dissemination channels.

1.4. Proposed FCC rule changes to split Imminent Threat categories

The FCC rule 10.400 would be modified as follows (changes underlined):

§10.400 **Classification**.
* * *
(b) **Imminent Threat Alert.** An Imminent Threat Alert is an alert that meets a minimum value for each of three CAP elements: Urgency, Severity and Certainty; and distinguishes between two message categories, natural hazard and emergency, based on the values of the CAP Category element.

* * *

(4) **Category**. An Imminent Threat Alert must distinguish between two message categories:

(i) **Emergency**. Emergency alert messages must have at least one CAP Category element with a value not listed in (ii) below; and
(ii) **Natural Hazard.** Natural hazard alert messages must have only the following values in each CAP Category element: Env, Fire, Geo, Health or Met.

* * *

The Extreme Alert and Severe Alert imminent threat message categories do not appear in the FCC Rules. Nevertheless, the Extreme Alert and Severe Alert categories would continue to be used in the WEA standards.

Because the FCC Rules are silent about sub-categories of Imminent Threats, the commercial mobile service provider industry could proactively make this change without waiting for FCC rulemaking.

1.5. Affected WEA Standards

3GPP TS 23.041, *Technical Specification Group Core Network and Terminals; Technical realization of Cell Broadcast Service (CBS)*, would need to update the descriptions for CMAS CBS Message Identifier codepoints 4371 to 4378 and 4384 to 4391 used for imminent threat messages. The Category groups Emergency and Natural Hazard would replace the Certainty values Observed and Likely in the codepoint descriptions.

ATIS-0700006, *Enhanced Wireless Emergency Alert (eWEA) via GSM/UMTS Cell Broadcast Service Specification*, CMSP Gateway requirements would need to refactor the imminent threat

categorization by adding the CAP Category element. The CMAC_category is included with the CMAC_alert_info element. However, the CMAC XML Schema Definition specifies the CMAC_category element occurs only once instead of multiple times.

ATIS-0700010, *Enhanced Wireless Emergency Alert (eWEA) via EPS Public Warning System Specification*, CMSP Gateway requirements would need to refactor the imminent threat categorization by adding the CAP Category element. The CMAC_category is included with the CMAC_alert_info element. However, the CMAC XML Schema Definition specifies the CMAC_category element occurs only once instead of multiple times.

ATIS-0700036, *Enhanced Wireless Emergency Alert (eWEA) Mobile Device Behavior (MDB) Specification*, would need to refactor the imminent threat message categorization and add opt-out options for emergency versus natural hazard alert messages.

ATIS-0700037, *Enhanced Wireless Emergency Alert (eWEA) Federal Alert Gateway to CMSP Gateway Interface Specification*, CMAC XML Schema Definition would need to be updated to specify CMAC_category may occur multiple times.

ATIS-0700038, *Enhanced Wireless Emergency Alert (eWEA) Federal Alert Gateway to CMSP Gateway Interface Test Specification*, test cases for imminent threat messages would need to be updated.

2. Redefining the Child Abduction Emergency/AMBER class

When the CMSAAC was developing the original Commercial Mobile Alerting System architecture, the Child Abduction Emergency alert was the only missing person alert of its kind in the Emergency Alert System. The criteria for Child Abduction Emergency/AMBER Alerts was incorporated into the Federal Communication Commission regulations: United States Code of Federal Regulations (CFR), 47 CFR 10.400 – Classification.

(c) **Child Abduction Emergency/AMBER Alert**.

(1) An AMBER Alert is an alert initiated by a local government official based on the U.S. Department of Justice's five criteria that should be met before an alert is activated:

(i) Law enforcement confirms a child has been abducted;

(ii) The child is 17 years or younger;

(iii) Law enforcement believes the child is in imminent danger of serious bodily harm or death;

(iv) There is enough descriptive information about the victim and the abduction to believe an immediate broadcast alert will help; and

(v) The child's name and other data have been entered into the National Crime Information Center.

(2) There are four types of AMBER Alerts: Family Abduction; Non-family Abduction; Lost, Injured or Otherwise Missing; and Endangered Runaway.

(i) **Family Abduction**. A Family Abduction (FA) alert involves an abductor who is a family member of the abducted child such as a parent, aunt, grandfather or stepfather.

(ii) **Nonfamily Abduction**. A Nonfamily Abduction (NFA) alert involves an abductor unrelated to the abducted child, either someone unknown to the child and/or the child's family or an acquaintance/friend of the child and/or the child's family.

(iii) **Lost, Injured or Otherwise Missing**. A Lost, Injured or Otherwise Missing (LIM) alert involves a case where the circumstances of the child's disappearance are unknown.

(iv) **Endangered Runaway**. An Endangered Runaway (ERU) alert involves a missing child who is believed to have run away and in imminent danger.

Due to the success of the AMBER Alert program, a wide-variety of missing person and wanted person “color code” alerts have been created by states. Legislatures and officials use a similar phrase to describe how the new color-coded alerts should notify the public: “in the same way that AMBER Alerts are commonly issued.” These include color codes such as Silver Alerts for missing elderly persons, Gold Alerts for missing persons with a cognitive impairment, Green Alert for missing veterans, Yellow Alert for wanted persons for hit-and-run vehicle crashes, and others.

The FCC recently adopted the Blue Alert code as part of the Emergency Alert System to notify the public of wanted persons who have killed or seriously injured a law enforcement officer.

I expect state and local alert originators will increasingly want to use WEA for missing and wanted person color code alerts in the future.

2.1. Proposed change to the Child Abduction Emergency / AMBER Alert class

Because the desired WEA alert behavior notifies the public in the same way that AMBER Alerts are commonly issued, I propose grouping the various types of missing or wanted person alerts into same WEA alert class. The existing "Child Abduction Emergency/AMBER Alert" class would be renamed to the "Missing/Wanted Person Alert" class.

Changing the Child Abduction Emergency/AMBER Alert class name on mobile devices would require changing the public text associated with the existing Message ID, which is typically a CMSP localization option. AMBER Alerts would continue to be part of the renamed Missing/Wanted Person Alert class. The Missing/Wanted Person Alert class would be interoperable with existing mobile devices using the same 3GPP TS 23.041 Message IDs 4379 and 4392. Countries with only AMBER alerts would not issue other types of alerts with that codepoint.

The Federal Alert Gateway and CMSP Gateway Interface specification need to be updated to map the EAS event codes BLU, CAE and other Missing/Wanted Person alerts with the CMAC_special_handling element to the newly renamed "Missing/Wanted Person Alert" class.

The contents of each alert message itself would identify the specific type, e.g., AMBER Alert:

```
WEA Text: Phoenix, AZ AMBER Alert: LIC/000-ABC (AZ) 2018
Black Nissan Altima
```

or a Blue Alert, e.g.,

```
WEA Text: Miami, FL BLUE Alert: LIC/000-ABC (FL) 2014 Black
Honda Accord
```

2.2. Proposed FCC rule changes for Missing/Wanted Person Alert class

The FCC rule 10.280 would be modified as follows (changes underlined):

§10.280 Subscribers' right to opt out of WEA notifications.

(a) CMS providers may provide their subscribers with the option to opt out of the "Missing/Wanted Person Alert," "Imminent Threat Alert" and "Public Safety Message" classes of Alert Messages.

* * *

The FCC rule 10.400 would be modified as follows (changes underlined):

§10.400 Classification.

A Participating CMS Provider is required to receive and transmit four classes of Alert Messages: Presidential Alert; Imminent Threat Alert; Missing/Wanted Person Alert; and Public Safety Message.

* * *

(c) **Missing/Wanted Person Alert**. A Missing/Wanted Person Alert is an alert initiated by a local government official for a missing or wanted person based on criteria that should be met before an alert is activated. The activation criteria should be explicit and should be codified in statute, policy or both. There are two nationally recognized types of Missing/Wanted Person Alerts: Child Abduction Emergency/AMBER Alert; and Threat to Police Emergency/BLUE Alert.

(1) **Child Abduction Emergency/AMBER Alert**. An AMBER Alert is an alert to notify the public of the most serious child-abduction cases. It is initiated by a local government official based on the U.S. Department of Justice's recommended AMBER Alert criteria that should be met before an alert is activated.

(2) **Threat to Police Emergency/BLUE Alert**. A BLUE Alert is an alert to notify the public of violent criminals who have killed, or seriously injured an officer in the line of duty; when a suspect poses an imminent and credible threat to law enforcement; or when an officer is missing in the line of duty. It is initiated by a local government official based on the U.S. Department of Justice's recommended BLUE Alert criteria that should be met before an alert is activated.

The FCC rule 10.400 would be modified as follows (changes underlined):

§10.410 Prioritization.

A Participating CMS Provider is required to transmit Presidential Alerts upon receipt. Presidential Alerts pre-empt all other Alert Messages. A Participating CMS Provider is required to transmit Imminent Threat Alerts, Missing/Wanted Person Alerts and Public Safety Messages on a first in-first out (FIFO) basis.

2.3. Affected WEA Standards

3GPP TS 23.041, *Technical Specification Group Core Network and Terminals; Technical realization of Cell Broadcast Service (CBS)*, would need to update the descriptions for CMAS CBS Message Identifier codepoints 4379 and 4392 used for Missing/Wanted Person Alerts.

ATIS-0700010, *Enhanced Wireless Emergency Alert (eWEA) via EPS Public Warning System Specification*, CMSP Gateway requirements would need to change the alert class name from Child Abduction Emergency/AMBER Alert to Missing/Wanted Person Alert. No functional changes.

ATIS-0700036, *Enhanced Wireless Emergency Alert (eWEA) Mobile Device Behavior (MDB) Specification*, would need to change the alert class name from Child Abduction Emergency/AMBER Alert to Missing/Wanted Person Alert. No functional changes.

ATIS-0700037, *Enhanced Wireless Emergency Alert (eWEA) Federal Alert Gateway to CMSP Gateway Interface Specification*, CMAC XML Schema Definition would need to be updated to with "Missing/Wanted Person" for the CMAC_special_handling element. The Federal Alert Gateway would need to map EAS event codes "BLU" and "CAE" and other wanted/missing person messages for "Missing/Wanted Person" CMAC_special_handling.

ATIS-0700038, *Enhanced Wireless Emergency Alert (eWEA) Federal Alert Gateway to CMSP Gateway Interface Test Specification*, test cases for Missing/Wanted Person alert messages would need to be updated.

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3. Do Not Disturb WEA Behavior for Less Severe Alerts

The original WEA/CMAS specification used the same common audio attention signal and common vibration cadence for all alert classes. End-users could opt-out of Imminent Threat alerts completely, but could not control when those alerts were presented, e.g., respecting the mobile device's do-not-disturb hours. When the FCC added the Public Safety Message alert class as part of FCC-16-127, FEMA's comments (https://www.fcc.gov/ecfs/filing/60001375606) also recommended:

> In addition, the IPAWS PMO recommends that the subscriber have the flexibility to change the volume and ring tone for this, and possibly other WEA message classes. This would give the subscriber the option to silence alerts that do not present an immediate threat and potentially reduce the chances of opting out altogether.

The final FCC Wireless Emergency Alert Part 10 rules did not explicitly allow this. Instead, the FCC stated in FCC-16-127:

> 24. Further, we allow, but do not require Participating CMS Providers to associate a unique attention signal or vibration cadence with Public Safety Messages. […] Similarly, we will allow, but do not require Participating CMS Providers to provide their customers with the ability to turn off Public Safety Messages during certain hours. For example, if customers want to receive Public Safety Messages, but only during the daytime, they may be given the option to suppress the presentation of Public Safety Messages during nighttime hours.

Reviewing over 7,000 WEA messages from 2017, there were several groups of messages. Many of the less severe alerts were directed at travelers or people awake and active at the time. While the less severe alerts important for travelers, realistically the nighttime alerts were not severe enough wake people sleeping at home. Examples of less severe nighttime alerts included winter weather road conditions – avoid travel, minor storm related flooding – turn around, don't drown and child abduction emergencies – be on the lookout. The National Weather Service uses the concept of blackout hours to avoid activating weather radios for less severe alerts during overnight hours. There is a blackout period from midnight until 7 a.m. when these weather products will NOT be tone-alerted. If these weather products are issued between midnight and 7 a.m. weather radios will receive a tone-alert at 7 a.m.

Some potential examples include the following:

Table 8 Examples of Less Severe Alerts

Urgency	Severity	Category	EAS Code	Dynamic warning examples[1]
Expected	Severe	Natural Hazard	DSW	Dust Storm Warning (travel warning)
Expected	Severe	Natural Hazard	FFW	Minor Flash Flood Warning (typical storm flooding expected, turn around-don't drown travel warnings)
Expected	Severe	Emergency	LAE	I-90 closed due to strong winds and blowing snow from Kadoka to Chamberlain at 6 p.m. (CT)
Expected	Severe	Emergency	LEW	A curfew order will be in effect for Seminole County starting at 7 p.m.
Expected	Severe	Natural Hazard	TOR	Minor Tornado Warning (i.e., tornado flurries in hurricanes, excessive tornado warnings during hurricane Harvey)
Expected	Severe	Natural Hazard	SQW	Snow Squall Warning (travel warning)

Emergency officials do not want to unnecessarily delay less severe alerts because of the need to reach travelers and people active during those hours. Changing the default WEA alarm behavior for less severe alert message categories would enable alert originators to immediately notify active end-users during off-hours, while not disturbing sleeping end-users with less severe alerts. This would reduce the public complaints and annoyance with emergency officials issuing less severe alerts during overnight hours. Also, because some people work rotating shifts, different people are asleep or awake at different times of day making simple alert blackout hours ineffective.

3.1. Proposed Do Not Disturb option for less severe alert messages

To do this, I propose a new opt-out option for the Severe Alert message IDs: (expected, severe, emergency) and (expected, severe, natural hazard). These alert message IDs are typically used

[1] The National Weather Service currently does not dynamically adjust CAP parameters urgency / severity / certainty / category. NWS uses static U-S-C values based on the EAS event code, i.e. current WEA messages does not distinguish between an extreme tornado emergency and minor tornados inside a hurricane. These are examples how dynamic alerts could be used, not how they are currently used.

for less severe forecast hazards which usually impact travelers and people awake, not people sleeping. The Alert Do-Not-Disturb option would appear as an opt-out menu option between "On" and "Off."

Alert Do-Not-Disturb option: Active mobile device would immediately present the alert to the end-user. Mobile devices idle for long periods of time, e.g., during configured do-not-disturb hours or idle for over one-hour, would unobtrusively indicate reception and store less severe alert messages. Unobtrusive indicators could include message waiting LEDs, temporary illumination of the visual display with the alert message, quiet beeps or short vibration, etc. according to the device's do-not-disturb notification options. The next time the end-user interacts with the device, e.g., when they check messages, pick up the device or the Do-Not-Disturb hours end; stored alerts which are still active would be presented with the initial time received to the end-user. Stale, expired, superseded or canceled alerts should not be presented, although they may still appear in the alert history with the time initially received.

> Note: WEA does not currently transmit an explicit indication to mobile devices when an alert is expired, superseded or canceled. The cell broadcast just stops rebroadcasting the original alert message. If cell-broadcast stops refreshing an alert message for over one-hour, mobile devices could treat it as potentially stale, expired, superseded or canceled.
>
> Cell broadcast could transmit an explicit indication when an alert message is superseded or canceled but would require over-the-air protocol changes or interpretation of parts of the 3GPP message serial number.

I also propose using the alert do-not-disturb option as the default for the renamed Missing / Wanted Person Alert and Public Safety Message for the same reasons. AMBER Alert and BLUE Alert authorities want to reach active people at any time of the day and night. However, sleeping people are very unlikely to see a missing vehicle or person. Late-night alerts annoy people, who tend to turn-off all alerts. With the new alert behavior, sleeping end-users would get the AMBER Alert or BLUE Alert as soon as they wake up and check their mobile device.

Finally, I propose using the Public Safety Message notification audio attention signal and vibration cadence when presenting less severe alerts instead of using the WEA common audio attention signal and common vibration cadence. If the mobile device supports the optional capability to allow the user to select the audio attention signal or vibration cadence activation during an active voice and data call that notification method would be used when presenting these alerts to the end-user. The current ATIS options are a) No audio and/or vibration attention signal; b) Generic notification audio and/or vibration attention signal (e.g., a short beep and/or vibration) according to general device setting; c) eWEA audio attention and/or vibration cadence signal.

Table 9 Changed Default Mobile Device Alert Behavior

3GPP Message ID Description	Active Default	Audio / Vibration	Main MsgID	Add'l MsgID
Severe Alert (severe, expected, emergency)	D-N-D	Notify	4377	4390
Severe Alert (severe, expected, natural hazard)	D-N-D	Notify	4378	4391
Missing / Wanted Person	D-N-D	Notify	4379	4392
Public Safety	D-N-D	Notify	4396	4397

3.2. Proposed FCC rule changes for Do Not Disturb options

The FCC rule 10.280 would be modified as follows (changes underlined):

§10.280 Subscribers' right to opt out of WEA notifications.

(a) CMS providers may provide their subscribers with the option to opt out or suppress the presentation during certain hours of the "Missing/Wanted Person Alert," "Imminent Threat Alert" and "Public Safety Message" classes of Alert Messages.

* * *

The FCC rule 10.500 would be modified as follows (changes underlined):

§10.500 General requirements.

* * *

(c) Maintaining subscriber alert opt-out and suppression of alert content presentation during certain hours selections, if any.
* * *

(f) Presentation of alert content to the device, consistent with subscriber alert opt-out and suppression of alert content presentation during certain hours selections. Presidential Alerts must always be presented.
* * *

(i) Presentation of alert content to the device with the time initially received, when the presentation was suppressed during certain hours and the alert is still active, at the end of the suppression hours; or, if earlier, when the subscriber interacts with the device.

The FCC rule 10.520 would be modified as follows (changes underlined):

§10.520 Common audio attention signal.

* * *

(f) A device may include the capability to give the user the option to control how the Alert Message is presented on the mobile device with respect to the use of the common

audio attention signal for the "Imminent Threat Alert" with a CAP Urgency element value of "Expected" and a CAP Severity element value of "Severe;" the "Missing/Wanted Person Alert;" and the "Public Safety Message" classes of Alert Messages. Presidential Alerts must always use the common audio attention signal.

The FCC rule 10.530 would be modified as follows (changes underlined):

§10.530 Common vibration cadence.

* * *

(d) A device may include the capability to give the user the option to control how the Alert Message is presented on the mobile device with respect to the use of the common vibration cadence for the "Imminent Threat Alert" with a CAP Urgency element value of "Expected" and a CAP Severity element value of "Severe;" the "Missing/Wanted Person Alert;" and the "Public Safety Message" classes of Alert Messages. Presidential Alerts must always use the common vibration cadence.

Because the FCC Rules say CMS providers may provide subscribers the option to opt-out and do-not-disturb is a timed version opting out, the commercial mobile service provider industry could proactively add a do-not-disturb option without waiting for FCC rulemaking. Changing options for the common audio attention signal and common vibration cadence may require FCC rulemaking, although the rules don't explicitly allow different audio/vibration for public safety messages either.

3.3. Affected WEA Standards

ATIS-0700036, *Enhanced Wireless Emergency Alert (eWEA) Mobile Device Behavior (MDB) Specification*, would need to add the Alert Do-Not-Disturb opt-out option, use the Public Safety Message notification audio attention signal / vibration cadence for these alerts, and change default settings for less Severe Alerts, Missing / Wanted Person Alert and Public Safety Message.

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4. Revising Sample WEA Options Menu

Mobile device equipment manufacturers and mobile operating system user interface designers decide how much choice is given to the mobile device end-user. Apple iOS gives end-users only two choices: 1) AMBER alerts and 2) Emergency Alerts. Alphabet Android usually gives end-users three choices: 1) Extreme alerts, 2) Severe alerts and 3) AMBER alerts. I expect user interface designers will continue to use very minimal WEA options menus.

The public names of Alert Message classes and categories would vary based on end-user experience research, country-specific and language-specific requirements.

4.1. Proposed Sample WEA Options Menu

The following an illustrative WEA options menu uses nesting to indicate sub-option dependencies, and a red font indicates the default settings. This is not a prescriptive user interface design.

Table 10 Revised Sample WEA Options Menu

Emergency Alerts	
National Emergency Alerts	**ON**
Both Extreme and Severe Alerts	**ON** / DND / OFF
Emergency Alerts (Severe)	**ON** / DND / OFF
Weather/Natural Hazards (Severe)	**ON** / DND / OFF
Expected Emergencies & Weather/Natural Hazards (Severe)	ON / **DND** / OFF
Missing or Wanted Person Messages	ON / **DND** / OFF
Public Safety Information	ON / **DND** / OFF
Test Alerts	
Test Alerts	ON / **OFF**
(hidden) Exercise Messages	ON / **OFF**
(hidden) Monthly Test Alerts	ON / **OFF**
(hidden) Reserved Messages	ON / **OFF**

Option nesting means turning off “Both Extreme and Severe Alerts” disables (turn off) the categories Emergency Alerts (Extreme) and Weather/Natural Hazards (Extreme) as well as the

three nested options: Emergency Alerts (Severe), Weather/Natural Hazards (Severe) and Expected Emergencies & Weather/Natural Hazards (Severe).

To simplify the sample WEA option menu, the Extreme Expected Emergency & Weather/Natural Hazards categories are implicitly part of the Severe Threat alert options, like the existing WEA option handling.

Turning off "Weather/Natural Hazards (Severe)" should turn off Weather/Natural Hazards (Severe) and implicitly turn off the both Expected Weather/Natural Hazards (Severe & Extreme) categories. But it would not affect the categories: Weather/Natural Hazards (Extreme), Emergency Alerts (Severe or Extreme) or Expected Emergency (Severe or Extreme).

Finally, the Expected Emergency & Weather/Natural Hazards option should turn off only the least severe imminent threat categories: Expected Emergency (Severe) and Expected Weather/Natural Hazards (Severe). These are typically used for traveler warnings and less severe hazards.

While it's somewhat long to describe, this should be the least surprising behavior for most end-users. But it is not intended to be prescriptive or preclude innovative user interface improvements by designers.

A minimal WEA options menu could include the following:

Table 11 Sample Minimal WEA Options Menu

Emergency Alerts	
Emergency Alerts	**ON** / DND / OFF
Emergency Alerts (Severe)	**ON** / DND / OFF
Weather/Natural Hazards (Severe)	**ON** / DND / OFF
Expected Emergencies & Weather/Natural Hazards (Severe)	ON / **DND** / OFF
Missing or Wanted Person Messages	ON / **DND** / OFF
Public Safety Information	ON / **DND** / OFF
Test Alerts	
Test Alerts	ON / **OFF**

4.2. Proposed FCC rule changes for Sample Opt-Out Options Menu

The FCC rules do not specify sample user interface designs, such as the WEA Options Menu.

4.3. Affected WEA Standards

ATIS-0700036, *Enhanced Wireless Emergency Alert (eWEA) Mobile Device Behavior (MDB) Specification*, Annex A is an informative annex. However, the standards text would need to reflect the opt-out, do-not-disturb, and nesting of imminent threat options.

5. Default WEA class names for mobile device user interfaces

The U.S. enhanced Wireless Emergency Alerts (WEA) / Commercial Mobile Alerting System (CMAS) standards had worldwide impact due to the U.S.'s large consolidated mobile market and mobile device operating system developers such as Alphabet Android and Apple iOS. Canada (Alert Ready), Chile (LAT-Alert), Europe (EU-Alert) and New Zealand (Emergency Mobile Alert) are interoperable with WEA/CMAS. South Korea (Korean Public Alert System), Taiwan (Taiwan Emergency Alerts) and the generic 3GPP Public Warning System specifications use compatible 3GPP Message IDs; but have some specification differences.

As more nations around the world adopt Wireless Emergency Alerts standards for alerts in their countries, the names used in the ATIS and 3GPP standards have become an issue. Mobile device manufacturers often use the alert class names from the WEA and 3GPP standards documents as defaults. Mobile service providers may configure localized products for sale in different countries to customize the user interface display names.

Table 12 Comparison of Alert Class Names in Different Standards

<table>
<tr><th>FCC Part 10</th><th colspan="2">ATIS eWEA / CMAS</th><th colspan="2">3GPP PWS</th><th>EU-Alert</th></tr>
<tr><td>Presidential Alert</td><td colspan="2">Presidential Alert</td><td colspan="2">Presidential Level Alert</td><td>EU-Alert Level 1</td></tr>
<tr><td rowspan="2">Imminent Threat Alert</td><td rowspan="2">Imminent Threat Alert (U-S-C)</td><td>Extreme Alert</td><td rowspan="2">Imminent Threat Alert (U-S-C)</td><td>Extreme Alert</td><td>EU-Alert Level 2</td></tr>
<tr><td>Severe Alert</td><td>Severe Alert</td><td>EU-Alert Level 3</td></tr>
<tr><td>Child Abduction Emergency/AMBER Alert</td><td colspan="2">Child Abduction Emergency</td><td colspan="2">Child Abduction Emergency (or Amber Alert)</td><td>EU-Amber</td></tr>
<tr><td>Required Monthly Test</td><td colspan="2">RMT</td><td colspan="2">Required Monthly Test</td><td>EU-Monthly Test</td></tr>
<tr><td></td><td colspan="2">Exercise</td><td colspan="2">Exercise</td><td>EU-Exercise</td></tr>
<tr><td></td><td colspan="2">CMSP-defined</td><td colspan="2">Operator defined use</td><td>EU-Reserved</td></tr>
<tr><td>Public Safety Message</td><td colspan="2">Public Safety Message</td><td colspan="2">Public Safety Alerts</td><td>EU-Alert Level 4</td></tr>
<tr><td>State/Local WEA Test</td><td colspan="2">State/Local WEA Test</td><td colspan="2">State/Local WEA Test</td><td>EU-Test</td></tr>
</table>

In addition to mobile devices sold locally in a country, mobile devices are sold outside their original market and carried worldwide by international travelers. Those mobile devices typically display alert names from the "home" country of the device or display a manufacturer default

name with alert messages. Even when an international roaming user isn't fluent in the local language, the WEA display name can give a hint about the severity level of an alert. But other times it can be confusing, such as the use of "Presidential Alert" name in a country with a different form of government.

The most common country-specific change made by regulators when adopting WEA standards is renaming the "Presidential Alert" class. Some countries do not have a President as the Head of Government, and an alert called "Presidential" is confusing to the local populace. In the U.S., there was some public debate about the WEA "Presidential Alert" name before the 2018 FEMA nationwide test. According to the FCC Part 10 rules, the Presidential Alert is intended to be used by the President of the United States or the President's authorized designee. Which means even in the U.S., that alert could be from an authorized designee, not always the President.

The class names used in ATIS and 3GPP WEA/CMAS standards and specifications may have no functional affect, but the effort regulators worldwide put into choosing names for their national emergency alerts indicates the importance of names.

5.1. Proposed changes to WEA class names and suggested Display class names

The class names in 3GPP specifications and ATIS standards should not use country-specific terminology, i.e., don't use "Presidential" alert; but ATIS standards could include a mapping to names in U.S. FCC Part 10 regulations. While configuring display names in products can be relatively simple, commercial service providers and national regulators should maintain global compatibility how Message ID codes are used. Based on the experiences of regulators in other countries choosing names, I expect extensive debate from stakeholders. People have strong views about naming things.

I propose the following alert class names in 3GPP and ATIS WEA standards. The proposed WEA standard alert class names are appropriate as non-localized mobile device manufacturer defaults. As default names, they should be globally generic and compatible with the intended usage of the alert message code. Manufacturers may translate the WEA standard alert class names as part of their default configurations in other languages.

I also propose U.S. versions of public display names as a localization option for mobile devices sold in the U.S. Separate from the alert class names in WEA standards intended for developers and programmers; the FCC, FEMA and NWS should work with mobile device manufacturers, mobile service providers, user interface researchers and other stakeholders on guidance for display alert names intended for public use in the United States. User interfaces do not need to be identical. But similar public display alert names across manufacturers would assist developing public service announcements, training material and customer service scripts. Device manufacturers would still need to adjust a display name to fit specific display constraints, such as small displays or limited character set support.

The visible WEA class names appear in mobile device user interfaces.

Table 13 Proposed Names for Visible WEA Alert Classes

WEA Standards Name	Display U.S. English Name	Display U.S. Spanish Name
Critical Alert	National Emergency Alert	Advertencia nacional de emergencia
Imminent Threat Alert • Extreme Alert • Severe Alert (severity, urgency, certainty/category)	Emergency Alert (severity, urgency) Weather or Natural Hazard Alert (severity, urgency)	Advertencia de emergencia (gravedad, urgencia) Advertencia de clima o peligro natural (gravedad, urgencia)
Missing/Wanted Person Message	Missing or Wanted Person Information	Información sobre personas desaparecidas o buscadas
Public Safety Message	Public Safety Information	Información de seguridad pública
Test Alert	Test Alert	Alerta de prueba

Note: The severity, urgency and certainty / category are in parenthesis to indicate the supplemental names: Extreme / Severe, Immediate / Expected, Observed / Likely and Emergency / Natural Hazard. WEA standards use them to identify different message categories of Imminent Threats. The supplemental details are used for device processing of alert opt-out options; but are less relevant, and sometimes confusing, for the public display. User interfaces typically minimize the display of the parenthetical supplemental details or display the supplemental details on a secondary page.

The hidden WEA class names are usually hidden from public view in mobile device user interfaces, but nevertheless are given display names.

Table 14 Proposed Names for Hidden WEA Alert Classes

WEA Standards Name	Display U.S. English	Display U.S. Spanish
Monthly Test	Monthly Test Alert	Alerta de prueba mensual
Operator defined	Reserved Message	Mensaje reservado
Exercise Message	Exercise Message	Mensaje de ejercicio

Guidance for WEA alert class names in public displays could include additional languages, beyond English and Spanish.

In the U.S., IPAWS and WEA supports English and Spanish alert messages. 3GPP PWS standards support additional languages used in other countries. IPAWS could support WEA messages in multiple languages in future implementations.

5.2. Proposed FCC rule changes for WEA alert class names

The FCC Part 10 rules describe special audio and vibration specifications for WEA, but do not require use of specific alert class names in standards. FCC, FEMA and NWS may publish separate guidance or best practices for alert names in public displays.

5.3. Affected WEA Standards

Each 3GPP and ATIS WEA standard would need to be edited with the revised WEA alert class names. It would not be a functional change to the standards.

ATIS-0700036, *Enhanced Wireless Emergency Alert (eWEA) Mobile Device Behavior (MDB) Specification*, would need to add the guidance, or a reference to the guidance, for alert classes public display names.

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Main MsgID	Add'l MsgID	CAP Severity	CAP Urgency	CAP/Threat Category[2]	3GPP Message ID Revised Description[3]	Active Default	Audio / Vibration	Theme color
4370	4383	N/A	N/A	N/A	Critical Alert	Mandatory	WEA	Black
4371	4384	Extreme	Immediate	Emergency	Extreme Alert (extreme, immediate, emergency)	On	WEA	Purple
4372	4385	Extreme	Immediate	Natural	Extreme Alert (extreme, immediate, natural hazard)	On	WEA	Purple
4373	4386	Extreme	Expected	Emergency	Severe Alert (extreme, expected, emergency)	On	WEA	Orange
4374	4387	Extreme	Expected	Natural	Severe Alert (extreme, expected, natural hazard)	On	WEA	Orange
4375	4388	Severe	Immediate	Emergency	Severe Alert (severe, immediate, emergency)	On	WEA	Red
4376	4389	Severe	Immediate	Natural	Severe Alert (severe, immediate, natural hazard)	On	WEA	Red
4377	4390	Severe	Expected	Emergency	Severe Alert (severe, expected, emergency)	D-N-D	Notify	Yellow
4378	4391	Severe	Expected	Natural	Severe Alert (severe, expected, natural hazard)	D-N-D	Notify	Yellow
4379	4392	N/A	N/A	N/A	Missing / Wanted Person Message	D-N-D	Notify	Blue
4380	4393	N/A	N/A	N/A	Monthly Test Alert	Off/Hidden	WEA	Green
4381	4394	N/A	N/A	N/A	Exercise Message	Off/Hidden	WEA	Grey
4382	4395	N/A	N/A	N/A	Operator defined	Off/Hidden	WEA	Grey
4396	4397	N/A	N/A	N/A	Public Safety Message	D-N-D	Notify	Blue
4398	4399	N/A	N/A	N/A	Test alert	Off	WEA	Green

Appendix A – Consolidated WEA Category / Behavior Table

[2] The CAP Certainty element is implied for WEA Imminent Threat messages and must be Observed or Likely.

[3] The revised 3GPP Message ID descriptions avoid country-specific terminology, such as presidential alert. The descriptions are intended for developer, programmer and operator use. The public names for WEA alert classes should be chosen based on end-user experience research following country-specific and language-specific requirements.

Table 15 Consolidated WEA category behavior

Appendix B – Sample Alert Themes

These alert samples are illustrative, not prescriptive. They are poor design examples. User interface designers are encouraged to improve alert presentation based on user testing experience and mobile device capabilities. For example, some mobile devices may not support colors or have limited fonts. In any case, the alert presentation should not distract or obfuscate the content of the alert message.

These sample alert themes demonstrate a simple combination of colors, symbols and words to consistently distinguish between different types of alerts based on 3GPP Message IDs. End-users may have limited hearing or vision, fluent in different languages, color-blindness, or physical disability. The alert display should be consistent with the WEA Options menu, so end-users understand which unwanted message types would opt-out.

WEA-enabled mobile devices should prevent alert spoofing by controlling presentation elements used for WEA messages only.

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