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

In the Matter of	)	
	)	
The Commercial Mobile Alert System	)	PS Docket No. 07-287
	)	
	)	

Re: NOTICE OF PROPOSED RULEMAKING

This NPRM is welcome. It is a significant step forward since I proposed that this be started as part of my EAS NPRM submission in 2005.

1) SCOPE

There are a number of items which are absent in the NPRM. They include, but are not limited to; Mexico, Canada (except in context of French), ITU (International Telecommunications Union), United Nations, and ATSC.

State and Local Governments are mentioned in the context of their EMOs providing emergency message sources. However there does not appear to be a mention of them in terms of the requirements of the architecture of the system

The value of the system, and architectural considerations that may derive from that, are not mentioned. . For example, Reverse911 can provide Water Supply Warnings. However this is not listed here, and is not even an EAS event code. However this has real value for local governments.

Therefore a scope statement should be included at the beginning. A possible example of a scope statement would be:-

"This NPRM is intended to be the U.S. Federal Government minimum requirements for a Commercial Mobile Alert System (for Commercial Mobile Service, usually called cellphones, and not mobile radio) Proprietary systems such as Blackberry may require some adaption to implement this NPRM. These requirements may be supplemented by State and Local Governments, and the United Nations or its' agencies such as ITU and UNISDR may contribute by making more uniform requirements for world wide applicability. Also Engineering Standards may assist by developing technically appropriate specifications, and

Recommended Practices may also be developed by Engineering Standards Organizations in order to address quality of implementation issues. Also research shall be supported as to what is the architecture that provides the greatest value to society."

2) AREA SELECTION

The NWS SAME polygon area selection method is specified. This needs to be continued for compatibility. However it has three major limitations.

a) This format is only applicable for north of the equator and the western hemisphere. It does not provide for the end of the Aleutian chain with the 180 degree limit, nor does it provide for American Samoa.
b) The resolution is limited to 0.01 degrees of latitude or longitude. This is satisfactory for weather or most other Federal purposes. However many emergencies are more local and a resolution appropriate to cell sectors would be much more appropriate. Also there is not even any mention of cell sectors. A serious but localized disaster was the steam pipe explosion at Grand Central Station in New York City, but EAS was too inadequate to be used.
c) There is no provision for Forward Error Correction (FEC). This is important for better reliability or accuracy of transmission. Also the security of the system can be improved by extensions of this.
d) There is no means of assessing the BER (Bit Error Rate) along with the header in EAS or some other transmission methods.
e) In EAS, there is no clear relationship defining when polygon area selection is applied and when State-County-Sector area selection is applied.

Therefore the method of area selection, with an algorithm in a different file, Appendix A) will not only process the SAME format, but also the improved proposed format that was submitted in 2005 as part of my EAS submission EB Docket 04-296.

3) EAS IMPROVEMENTS

The ability to select different languages is noted as being desirable. This is but one of many desirable improvements for EAS. While CAP is a preferred format for messages to cell towers, a disaster may eliminate this means of transmission. Therefore an improved EAS is also desirable as a means of transmission. This would provide redundancy. See the following paper “EAS+ as a complement of CAP”. Appendix B)

4) AMBER ALERT

There is no mention of transmission of pictures relevant to AMBER ALERT messages. However an increasing percentage of cellphones support such a capability. Also the Chief Prosecutor for New Jersey said that such a capability was desirable when I asked him that question. This would best not be a rulemaking item, rather that the desirability of this be indicated, and the details developed by an appropriate standards organization.

5) VALUE OF THE SYSTEM

As the following paper "Towards a Value Based Paradigm for EAS+ and Other Alerting." Appendix C) indicates, there is important work to be done to truly develop this into a valuable system. However there does not appear to be any mention of this aspect. Indeed, the event codes selected in Table X-1 are limited to major events and already local governments are using other event categories than are not even in the larger EAS set of event codes. A fundamental question is whether a path is being pursued toward a limited value and problematic system that only fulfills some Federal mandate under penalty of fines as an incentive, or a versatile system that is reliable and fulfills the great range of public needs, and is perceived by the great majority as being valuable. If furthermore, those who would incur significant expenses in installing, maintaining and operating the system are provided benefits, not necessarily financial, for doing so. Then in a competitive business environment there would not be the reluctance that hinders the deployment and maintenance quality.

6) QUALITY OF THE SYSTEM

There is no mention of quality. See www.asq.org for the standards organization. My 2005 EAS submission addressed quality planning, quality assurance and quality control. These are important matters to assure that the system has high quality. Also I see that the present architecture is a "fire and forget" one. Rulemaking is not a substitute for good design. Engineering Standards Organizations could also develop Recommended Practices (RPs) to address quality of implementation issues that are outside of a standard.

7) 911 SYSTEM OUTAGE PROBLEMS

While EAS at present is selective by transmitter coverage area, situations such as this are a problem to address. However this illustrates the desirability of alerting considerably more selectively. As cellphones are intended to be added, and the 911 outage might have been limited to particular telco Central Offices, this is a situation where cell sectors could match the problem reasonably. Also polygon selection with a much finer resolution than the SAME format, which has 0.01 degree resolution, in theory might be applicable. So cellphones and landline phones sometimes could serve as alternatives for 911 access. Refer to the following link for an example.

http://www.examiner.com/a-1160843~Confusion_led_to_delay_in_notifying_public_of_911_outage_in_Montgomery.html

A further selection could be by category selection. See Appendix G).

8) SEVERITY, URGENCY, CERTAINTY

These are not provided for in EAS, and this needs to be addressed.
SEVERITY: Allowed values; Unknown, Extreme, Severe, Moderate, Mild
Deriving this value requires processing, probably by people. This adds to the response time which can be unacceptable by the highest priority events. An Unknown, Extreme or Severe severity will result in 1 being added to the priority, except for 1 which remains the same, and 0 which would become 9. This shall be encoded in the units of minutes in the header as follows, where C is the value indicating certainty;
Last 4 bits, units of minutes,
Previous Bits 0xC011 Unknown
Previous Bits 0xC100 Extreme or Severe
Previous Bits 0xC110 Moderate or Mild
URGENCY: Allowed values; Unknown, Immediate, Expected, Not urgent.
In EAS+, this is the assignment of the priority of the event codes. Priority 1, 2 or 3 is for Unknown or Immediate. Priority 4,5,6 or 7 is Expected. Priority 8,9 or 0 are Not Urgent. This is prior to the severity addition noted above.
CERTAINTY: Allowed Values; Observed, Likely, Unlikely.
C bit is 0 Observed or Likely,
C bit is 1 Unlikely
If this proposal is inadequate as a backup requirement for transmission to towers, this can be addressed following discussion.

9) RESPONSE TIME

There is no mention of the system response time. For the highest priority messages, this is of critical importance. A system response time of six seconds from detection of a problem to the public receiving the alert appears achievable. This would then be a useful system in case of an earthquake. The Internet is normally faster. This would require automatic CAP application processing for such messages. The human supervisor can transmit a FAW event code for false alarm warning if it is determined that it is a false alarm.

10) COUNTY SECTORS

There is no mention of County Sectors. This is not a Federal responsibility, but Counties may wish to subdivide their jurisdiction areas into sectors in some manner. So the option to be able to do so is important, and so it the capability to decide the means of deciding the area selection between jurisdiction based and by latitude-longitude polygons. Some counties may decide to allocate sectors to cities, townships or boroughs in the county. A mechanism for defining this is in the appendix on the EAS protocol. As cell sectors are normally rather smaller than county sectors,

this is a reasonable means of translating from the source definition to the message coverage area without an excessive overlap of adjacent areas.

11)**THE ROLE OF ENGINEERING STANDARDS ORGANIZATIONS**
ESOs are mentioned in various contexts. This is not a problem. However a considerable part of the NPRM is devoted to technical material which is normally found in Engineering Standards. This is P31 and all following. This appears to be intended for engineering standard(s), but by which ESO is unclear. This is a problem because of a basic reality. Software is likely to have bugs or need improvements. Protocols have limitations, e.g. EAS. The Internet would not be as successful if the protocol were made by the time consuming process of government legislation. The hardware environment changes. ESOs are organizations that live with this and can respond in an appropriate manner. Improvements are expected. However when all of this is cast in stone as part of legislation or rulemaking, the improvement process becomes more time consuming and difficult. This is to the detriment of the system. The situation with EAS is an example of this. We are now in an age of MPEG splicers, HD radio, PSIP and Dolby Digital, but are expected by law to implement an analog architecture. Delegation of the responsibility for this type of component to Engineering Standards Organizations is the more mature methodology, and will also result in more cost-effective systems.

12)**THE ARCHITECTURE OF THE OVERALL ALERTING SYSTEM**
While there are some diagrams illustrating the SMS architecture, this does not depict how the overall architecture would appear. For example, much of the CAP network is single threaded, i.e. it lacks redundancy. The attached diagrams Appendix D) illustrate how different paths using different technologies can provide a very robust architecture.

13)**PROJECT MANAGEMENT**
Project Management is not mentioned. I hope that this does not lead to a poorly managed project by those without suitable qualifications or experience. To reiterate, the optimum approach to take is to implement project managed standards development. An activity diagram to accomplish this was submitted in 2005 and is also attached. Appendix E).

APPENDICES
A) An improved method for area selection. An algorithm is a Visio file following. This is not intended to be publicly accessible.
B) EAS+ as a Complement of CAP
C) Toward a Value Based Paradigm for EAS+ and Other Alerting Technologies.
D) National, State and County Architecture for Emergency Alerting.
E) An Activity Diagram for Emergency Alerting Improvements.
F) The EAS+ Protocol.

G) Receiver Category Selection Method.

Appendix A); Latitude and Longitude formats and Forward Error Correction (FEC) Algorithm.

The U.S. NWS latitude and longitude format is illustrated by;

LAT…LON 3165 8940 3179 8939 3180 8904
3176 8904 3175 8902 3173 8904 3173
8907 3170 8912 3163 8938

$$

The numbers are two decimal places of degrees at the end with the degrees before them. This example has no hundreds of degrees. Minutes are not used, as the example has more than 59. They are in pairs, with the latitude preceding the longitude. This example is a 9 point polygon. It is always North latitude and West longitude. Latitude precedes longitude because in navigation, latitude was a known factor before the longitude was. The blank line before the $$ is optional. The tab on the second and third lines is optional. The $$ denotes the end of the message and the latitude and longitude is always the last item.

The proposed EAS format is illustrated by;

LAT.LON N52. (AB) E172.2 (ABC) N52.0 (ABC) W177.45 (ABCD) N51.02536 (ABCDEF) W177.451 (ABCD) N50.0096 (ABCDE) E172.176 (ABCD)

$$

The decimal points can be followed up to 5 places resolution. The N, W, E, or S will be in the first character position because they are equivalent to a sign in arithmetic. They are in pairs, but the order within the pair should not be of concern to any software developed. Rather, all the pairs should have the same order for human convenience. The following blank line is [CR][LF] and is not necessary if $$ is there. For processing efficiency, the LAT.LON string should be the first thing in the body after the header so the microprocessor can be processing that while receiving the rest of the message. Then determination as to whether the receiver is in the area specified can proceed. The (AB…) sections are the forward error detection and correction characters used as part of the algorithm described elsewhere. The example crosses 180 degrees. This algorithm is rather contorted. That is deliberate so as to greatly increase the difficulty of reverse-engineering it. So this algorithm also aids the security by making it difficult to generate unauthorized messages. End of line is [CR][LF].

The algorithm is not made public, but would be on the next pages if included. The brackets and their contents must not be displayed to the public. As this algorithm needs to be executed in devices like car radios, it cannot be too complex, also there is no possibility of the algorithm being upgraded as it has to be in firmware. The polygons are defined as enclosing areas for alert messages. There are no interior polygons included unless the shape is like a "C". Rumb lines are the connections between the vertices, these are simpler for small microprocessors to process. The north and south poles can be included if a polygon surround them, the polygon can only be in one hemisphere if that is so for simpler software. So the security is provided by inaccessibility from the public, which is one level. System security needs provision by other means, some of which are outlined elsewhere. Currently some exercising of the algorithm needs to be done to debug it but that should be completed soon. It provides for near or crossing of the equator or the 0^{o} or 180^{o} longitudes. If the bit error(s) in a character cannot be determined and corrected, but are too numerous, the character shall be followed by a "?". Then the polygon drawing algorithm can construct the largest polygon with the value that is unknown, this errs on the side of safety. Also the display of the ? alerts the public to a signal quality issue.

Also it provides for a secure mode which is accessed by using position N99. E199. To set and S99. W199. to clear this mode. In this mode, positions which can be from 90. to 99.99999 latitude and 180. to 199.99999 longitude can be used for county and sector positions and the FEC security mechanism will still work. However such positions shall not be displayed to the public, and the value of the sector shall be 0 to 9 only. This is an unusual FEC method in that it is human-readable. This is to be compatible with existing EAS equipment and for viewing by operators. It is advantageous that the security switches are passed through forward error correction. However they should be repeated also for reliability. This FEC algorithm is good against random noise, however it can be susceptible to burst noise. For improved reliability, the LAT.LON string can be repeated on a new line and the characters followed by a ? can be replaced with acceptable data from the second copy. If there are discrepancies between accepted characters, the output of them shall be followed by a ?, but that should be infrequent.

If a second instance of the message is received and no ? characters are in the message latitude and longitude section where there are any in the first message, the non-? character shall be substituted and the message transmitted. Consumer devices shall not reject a second instance of the message but shall amend their response so as to be applicable to the resulting corrected message.

The NMEA-0183 format may be used for data from a GPS or other navigation device. Its' format is illustrated by;

$$GPGGA,hhmmss.sss,ddmm.mmmm,N,dddmm.mmmm,E,F,SU,HD.P,AL.T,M,G,M,DGPSA,DGPS,CHK[CR]LF]

Where GP means that a GPS is the talker identifier. GGA means that it is a global positioning system fix data sentence.
hhmmss.ss is the fix time (UTC).
ddd or dd are the degrees. mm.mmmm are the minutes
N may be S, E may be W,
F is position fix (0 = Invalid, 1 = Valid SPS, 2 = Valid DGPS, 3 = Valid PPS)
SU Satellites Used (2 digits, presently 12 max.)
HD.P Horizontal Dilution of Position (same units as altitude)
AL.T Altitude (based on WGS-84 ellipsoid)
M meters, units of HD.P and AL.T
G Geoid separation
M meters, units of geoid separation
DGPSA Age of DGPS data in seconds
DGPS DGPS Station ID, 4 characters
CHK Checksum, 3 characters. This is inadequate for Forward Error Correction
[CR][LF] carriage return, line feed

The NMEA (www.nmea.org) first published this in January 1983. The use of minutes is because navigators used paper charts that had degrees and minutes on. A format to transmit polygons from a receiver to a videoplotter is being researched. There are some proprietary formats existing. The U.S. Census Department and U.S. Geological Survey use and prefer an ArcView Shapefile format. NMEA could be engaged to formulate a polygon standard sentence. However this format does not provide for error correction and the associated bit error and quality assurance, so a translation application would have to be developed between this format and EAS.

Appendix B: EAS+ as a Complement of CAP

Frank W. Bell

Abstract: CAP, the Common Alert Protocol standard, was developed in an EAS environment. It is rather complementary to EAS, but both its capabilities and other developments have led to the desirability of improvements in EAS (Emergency Alert System) itself. These are first considered, then the other improvements to EAS that together could be called EAS+ are considered.

COMPARING CAP AND EAS OR EAS+

CAP	EAS and EAS+ (+) means both
Emergency management application	Public alerting application
Private or secure network	Public distribution (cable & broadcast presently)
Complex and versatile	Simple and difficult to modify
Needs a PC level device	Needs a microcontroller device.
Moderate or high expense device	Low cost device (radio, TV, perhaps + cellphone)
Significant power consumption	Low power consumption
Device must always be on	Device can be in standby if suitably designed
Device is not readily mobile except PDA-cellphone with internet	Personal and Vehicular mobility.
CAP can generate EAS messages	EAS(+) messages, in their limited content, can generate CAP messages with assistance. + is better.
Private networks can be infiltrated	EAS daisy chain can be infiltrated.
VLANs can be infiltrated (difficult)	EAS+ is more difficult to infiltrate
Successful infiltration can be very serious	Successful infiltration can be apparent to public
Separate from ISP, corporate LAN alerts	EAS+ for ISP or corporate alerts, not remotely hackable for large population
Unsuitable for automatic messages to adjacent adjacent countries, (national security).	Suitable for automatic messages to countries and counties across border where selected
Device location awareness an add-on	Device location awareness can be in-built or E911-2
More training of staff	Can operate automatically e.g. night radio station

TCP/IP error correction	EAS triple redundant header and testing only EAS+ adds BER, monitoring, FEC for Lat-Long.

Needs power and network at all points except DEAS	Broadcast stations with generators have large coverage, daisy chain a backup for "CAP" network failure.
Largely fiber or microwave transmission	Broadcast transmission
Satellite transmission must be bidirectional	Satellite transmission is one direction
Unsuitable for SDARS &DBS	Suitable for SDARS and DBS
Unsuitable for cable/telco STBs	Suitable for cable/telco STBs
Fiber can fail with ground shear earthquake	Broadcast towers can fail in or building failure e.g. 9-11
Possibly better to cellphone towers	EAS+ suitable for cellphone towers (cost only?)
Difficult to use for Fire-Alarm/PA systems	EAS+ suitable for Fire-Alarm/PA systems
Audio not inherent, text to speech may be needed	Audio inherent, text-to-speech is an add-on
CAP cannot be securely internet broadcast securely	EAS+ can broadcast CAP

CONCLUSION;
Both CAP and EAS+ systems are complementary and having both provides a measure of redundancy in an Integrated Public Access Warning System. Other technologies such as CATS, an email system for emergency messages also known by other acronyms, and reverse-911 for limited personnel e.g. first responders, are also applicable and probably have an appropriate place if only for redundancy.

A COMPARISON OF EAS AND EAS+;
The Society of Cable Television Engineers (SCTE) have published a standard (J-STD-042-2002) for the transmission of EAS on digital cable systems, to be decoded by cablecards. Unlike the original EAS, the EAS data and audio are separated from the program audio and video. This is done by using different PIDs (Program IDs) in a multiplexed digital stream. The decoding device determines if the EAS message is intended for the recipient and if so, then it overrides the audio and superimposes a crawl that is similar to how TV broadcasters currently transmit EAS video. This was included in my 2005 submission to the FCC, minus the acronym. This is the most suitable standard for how to implement EAS in DBS and SDARS (Satellite Digital Audio Radio Service) systems. Some adaption to do this may be required. XM radio already has a dedicated channel for emergency information, but there is

no widespread usage of the approach of superimposing EAS video and substituting EAS audio for the program.

This recipient override selection capability is an important component of solving the over-alerting problem. While first responders and legislators may not consider this an important problem, the general public certainly does. Otherwise alerts are liable to have as much attention given as advertisements. Also there should be legislation inhibiting advertisers from mimicking EAS alerts just as private cars are prohibited from operating sirens. The numbers in brackets refer to the appendix where this is explained in more detail.

EAS	EAS+
Message overrides audio program	Only in EAS compatible mode or when recipient selected by location and category (1)
Message superimposes or replaces video	Superimposes only in EAS compatible mode or when recipient selected by location and category (1)
HD radio, ATSC, DVB-T same as analog	EAS+ data and audio in a different PID, the analog transmission would be in the EAS compatible mode (1,4)
Location selection by coverage or headend	Location selection by jurisdiction to county sector or latitude and longitude.(1,2)
Lat-Long specification by NWS format	Lat-Long by NWS or EAS+ format, worldwide (2)
Relationship of Lat-Long to jurisdiction not specified	Relationship of Lat-Long to jurisdiction clearly specified (2)
Lat-Long resolution to 0.01 degree	Lat-Long resolved to 0.00001 deg EAS+ format (2)
Resolution suitable for weather break (2)	Resolution suitable for gas pipeline
School Weather Closing or Water Supply Warning not permitted	School Weather Closing & Water Supply possible in EAS+ mode
Response time in minutes	Response time in seconds for special messages
Unites States of America only	Canada and any other country (1)
English only, no language code	All languages possible (1)
County and sector area selection added (2)	Latitude and Longitude polygons
Area selection not feasible by car radio	Selection feasible by car radio for HD and SDARS (2,4)
Location by street address automatically with product registration also, or NMEA-0183 (2)	Location can be by sector
AMBER Alert no pictures	Pictures possible for graphics devices (JPEG?)
No DND (Do-Not-Disturb)	EAS-DND possible with priority messages passing
RMT interrupts program or spot PSA	RMT scheduled by traffic, counted as

RWT not to the consumer	RWT to the consumer in all-EAS message mode
No RYT (Required Yearly Test) a National Test	RYT interrupts program or spot at announced time of the year, a PSA time.
Error correction in triple header only	Adds FEC (Forward Error Correction) for lat-long (2)
Human monitoring only plus logs also (7)	Automated monitor including BER
Active code testing requested	No active code testing needed (6)
Selected codes transmitted	All codes transmitted (not 0 priority to DBS or SDARS) (6)
Not to fire alarms/PA systems	To fire alarms/PA systems
Incompatible with E911-2 resolution	Compatible with E911-2 cellphone sector resolution
Protocol defined in ASCII	Same protocol for US English, defined in binary, with latitude-longitude extension permitted (1,2)
Emergency location in remote area difficult for 911 calls if E911-2 unavailable	Location by latitude-longitude simpler when 911calls include this from the car radio or cellphone GPS (4)
No secure message transmission	Checks against tampering/infiltration and secure message transmission for limited use (1,2)
Data is FSK audio, not easily compressed	Data is data in separate PID, audio remains for unique FSK alerting sound
Basically audio with modem for data	Basically digital audio and data
Audio levels a problem	Audio levels need to be correct for the microphone, not a problem thereafter once analog outputs set, details in (7).
"West, Texas" City or region?	Only the specified area gets the alert to the people (1)
FCC evaluation or equivalent certified	Adds self evaluation and staff test (3)
Broadcast & cable only (5)	Adds ISPs, LANs, cell and IP phones
EAS+ English compatible in US.	EAS compatible with less functions supported.
Override mode only	Priority 1 override, others work with automation, may use PSIP. (6)

Daisy chain of broadcasters (some more)	WARSEPS primary distribution with digital secondary channel daisy chain backup
Suitable as analog periphery	Recommended for daisy-chain core
Only National override	Priority scheme especially for DBS & SDARS
Specification and various plans	Engineering Standard and Recommended Practice for improved quality both ways
No critical, severity or urgency codes	These codes possible with restrictions
Legal mandated architecture	adds architecture for value to society
No categories	receiver categories for more selectivity.
911 outage warning usually impractical	911 outage warning practical

The following references refer to the book "The Emergency Alert System"; [In this document if included]

1) EAS Protocol in sec 3.10 and OP 10.D [Appendix F]
2) Latitude and Longitude in Appendix A [Appendix A]
3) Self Evaluation & Staff test OP Appendix J and sec 8
4) HD Radio considerations in Appendix D
5) ISPs, larger LANs and buildings/venues/campus/fire/PA I OP 15. 7-11
6) EAS codes and routing prioritization in OP 10 C
7) Reliability & Audio in Appendix E.
8) A Category Selection Method.[Appendix G]

SUMMARY;

A full description of a project plan to implement this is in the 2005 FCC submission, but in brief there is the scope definition, standards development and implementation. The implementation here is primarily developing improved firmware and installing it. Implementation can begin before standards development is complete, which is usual. Because EAS+ will handle EAS messages, and EAS should handle EAS+ messages, there is no switchover required. The "should" in reality requires testing in case there are some unexpected behavior(s) which would limit what can be done until the upgrade is complete. With these improvements, and perhaps others not listed here could be included, the EAS+ should provide satisfactory service for a long time into the future. While digital technologies are developing, there is no prospect of digital being replaced by something else, unlike analog being replaced.

Appendix C; Towards A Value Based Paradigm For EAS+ and Other Emergency Alerting Technologies

Frank W. Bell

The current societal paradigm under which EAS is currently operating can be described as that of a directed or command economy. This has a benefit that things can get implemented which is better than no paradigm and no progress. However, this is a paradigm that was widely employed in communism, and is not necessarily the best possible. When the fear of fines is the primary motivating factor, this can inhibit progress towards a more mature approach. This paper is not intended to be the definitive statement, but is rather to initiate a discussion on this subject.

The severity of disaster or emergency incidents varies with their average frequency. Less severe incidents may be no less traumatic to the individuals involved, but are more localized, affecting a smaller area or fewer people. The range can be from extinction or civilization changing events such as a major meteorite impact or Yellowstone caldera eruption to incidents affecting perhaps 5 people such as a traffic accident. While the latter are part of the scale, the management of them usually does not become an emergency management activity. The relationship between the two can be approximated to an equation of the form;

Eq#1 $$S = \frac{k}{f}$$

where S is severity, k is a severity constant, and f is the average frequency.

An example of a curve of this type is the relationship between electrical power disturbances and their average frequency of occurrence. This is the CBEMA curve which distinguishes high and low deviations. A curve similar to the equation above is noted in FEMA literature.

The value of an emergency message can be considered to be in proportion to the number of people that it is relevant to but less the annoyance or time wasted of people who receive the message but to whom it is not relevant. An equation approximating this is in the form;

Eq#2 $$v = Ir - A(p - r)$$

where v is value, I is the importance value of that message event code, r is the number of relevant recipients, A is the annoyance value or that message event code, and p is the population of recipients.

This gives, for example in one year, a total value of;

Eq#3

$$V = \sum_{n=1}^{n=N} \{I(E)r(n) - A(E,C)\{p(n,C) - r(n)\}\}$$

where V is the Value per year, n is the particular incident, N is the total number of incidents, r(n) and p(n) are the values of r and p for each incident. E is the event code. C is the consumer choice as to whether they select a basic receiver that receives all EAS+ messages, or they have the added feature of selectivity by location and priority. I is a function of the event code. A is also a function of the event code and the consumer choice. p is a function of the recipients of the message coverage area and C the consumer selectivity.

The values of I (1 column) and A (more than one column) would be a table with units of hours preferably, or of $ U.S. (year) for each event code. In order to ascertain values of this, then an evaluation would be needed. Sources for this information would include but not be restricted to the Department of Homeland Security, the International Association of Emergency Managers, the Insurance Information Institute, the Society of Broadcast Engineers, the State Emergency Communications Committees, a well-researched public opinion poll, relevant engineering standards committee(s), the United Nations International Strategy for Disaster Reduction (and related organizations) and the opinion of experts such as Art Botterel. The values for I should be reasonably straightforward to determine, but the values for A may be more difficult to ascertain. This table should be applicable to messages delivered by other means such as reverse 911, texting, PA systems, email, etc. Such research should also assess what should be an appropriate public education campaign. Also the RMT text can be changed to note that EAS+ compatible or compliant receivers would not have messages interrupting program audio unless all messages are selected.

So, to increase the value of EAS, there are some approaches to take, which are complementary.

A) reduce (p-r) by making the message delivery as selective as possible to those relevant to the message, preferably without excluding any r (recipients). The technology to accomplish this is discussed in related material. There would be two values of p, the total area recipients and the selected area recipients.
B) Increase N, the number of incidents for which EAS is used. However because of Eq#1, this means that there are only really severe incidents

available for which this can be applied to. While AMBER Alert is a message type that only directly affects a few people, it is one where the A (annoyance constant) is very low. As TV stations cover a large area, perhaps several states, then EAS messages from all these states can be included. The value of A is in part determined by the recipient, as the proposals have outlined that all basic radios and TVs will receive EAS messages, but EAS+ compatible or compliant receivers will have the selectivity feature at some added price. Also, the capability of the user to exclude lower priority messages in EAS+ compatible receivers will reduce A.

C) Add relevant types of incidents. These can be water supply emergencies and school weather closings for example. As there are already means to address these issues, this can be a decision of the local jurisdiction as to which message types become added to the responsibilities of the Emergency Management Office. Radio stations may prefer to retain the school weather closing messages as a means of retaining audience. However as most household radios are basic analog, this can receive the EAS messages, but increasingly car radios are HD radios, and this opens the possibility for selectivity to be applied so the drive time music is not interrupted unless the audience selects the EAS priority low enough.

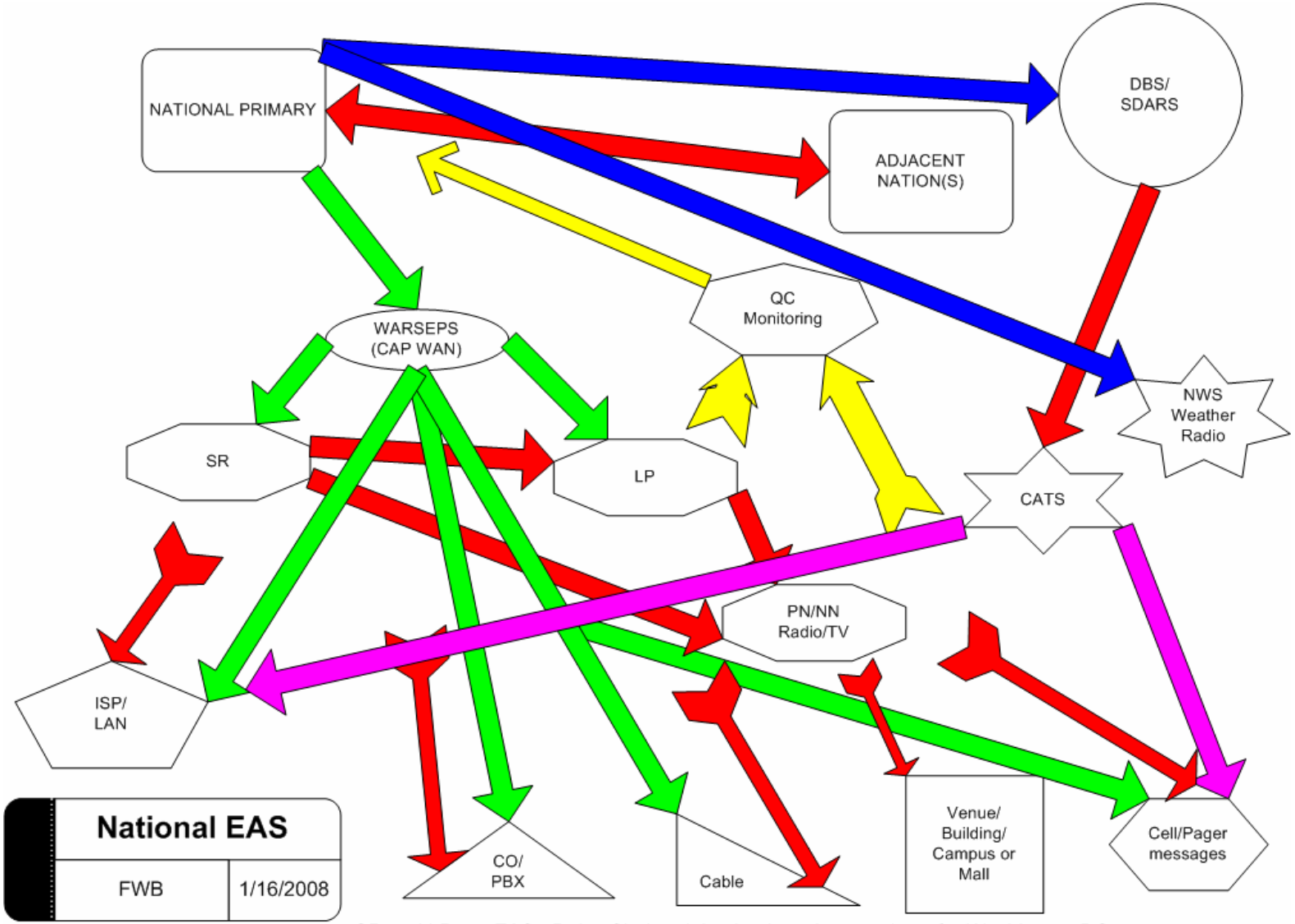
The UNISDR approach to emergency alerting is primarily in response to the Asian tsunami. While this has led to some policy development progress, the result may be to develop a system that lacks a value paradigm. This can result in a significant expenditure for a system that may not be used with sufficient frequency as to justify the expense of continued development, staff training and maintenance in an annual budget. The result in twenty years will be that the money is not forthcoming for the replacement to the original equipment. So a value based paradigm is relevant to that effort also, and by using hours as units, the paradigm should be the same. This can be translated to money by multiplying by the average cost of wages and economic disruption.

Another important part of the value is the cost side of the cost/value ratio. Relating to this, most people are not aware that the price of multistandard TVs (which are analog TVs that can be used in any part of the world and hence are more complex) has become lower than SECAM (French and Soviet) only TVs. This is illustrating the benefit of designing a system and relevant products once and selling them worldwide. Even the U.S. is a limited size market, and already all automobile manufacturers have abandoned the use of U.S. standard threads. For this reason, it is more cost effective to not have a U.S. Government specification, but instead to have a standard developed by a relevant engineering standards committee, which can be referenced by other

governments. Also such standards committees have the best technical expertise as members, and so are more thorough in the development of a standard. Employees have an inclination to choose the continuation of their career instead of what might be the best solution because of their employers' popular flavor of the month. IT employees made this observation.

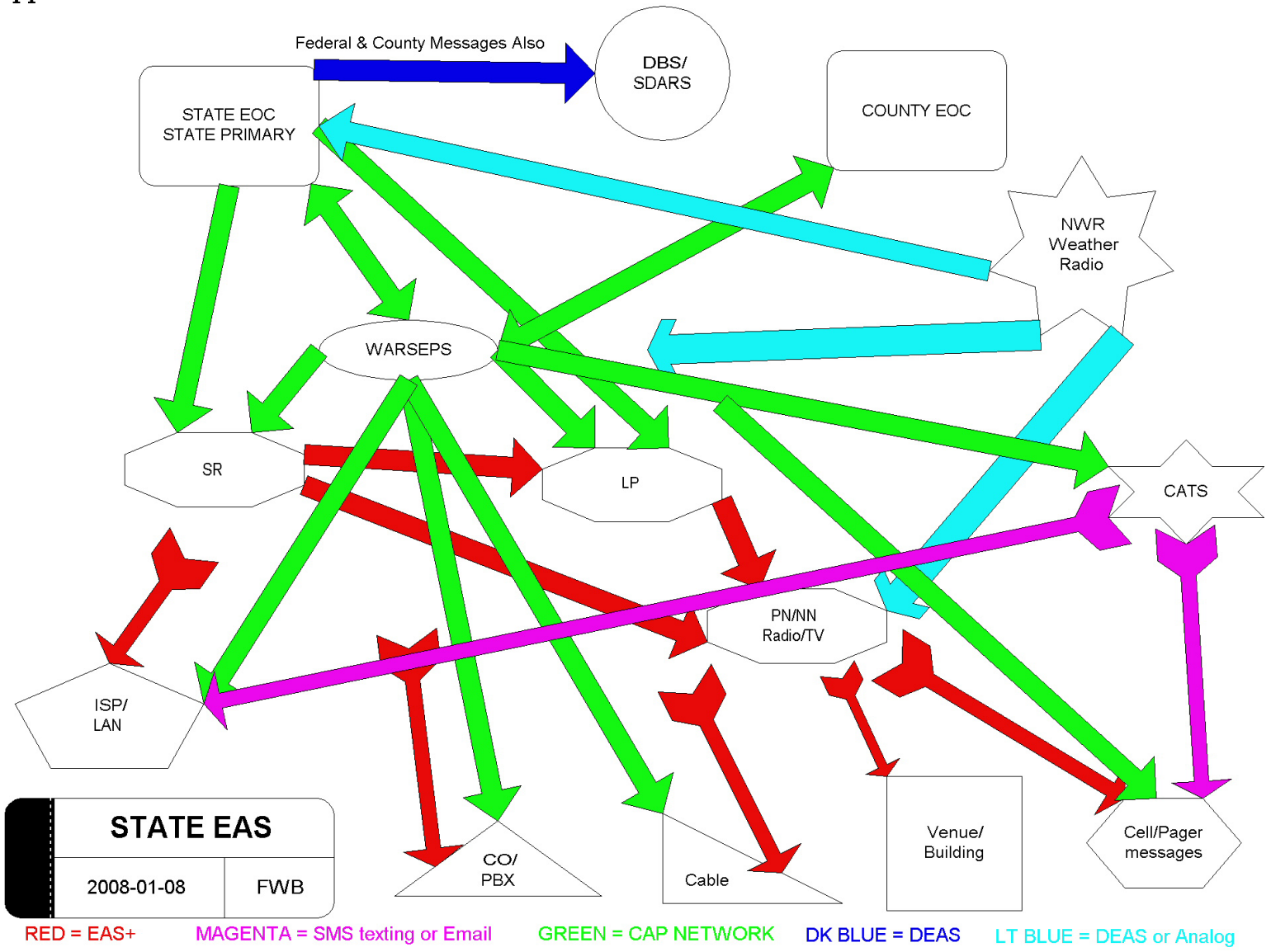
An important aspect of an appropriate paradigm is that it should enable all the participants to buy in to the system. How this translates in financial terms is relevant, but this pertains to discussion between the various parties, and is rather beyond this paper in which I am focusing on the relevant paradigm and economic theory.

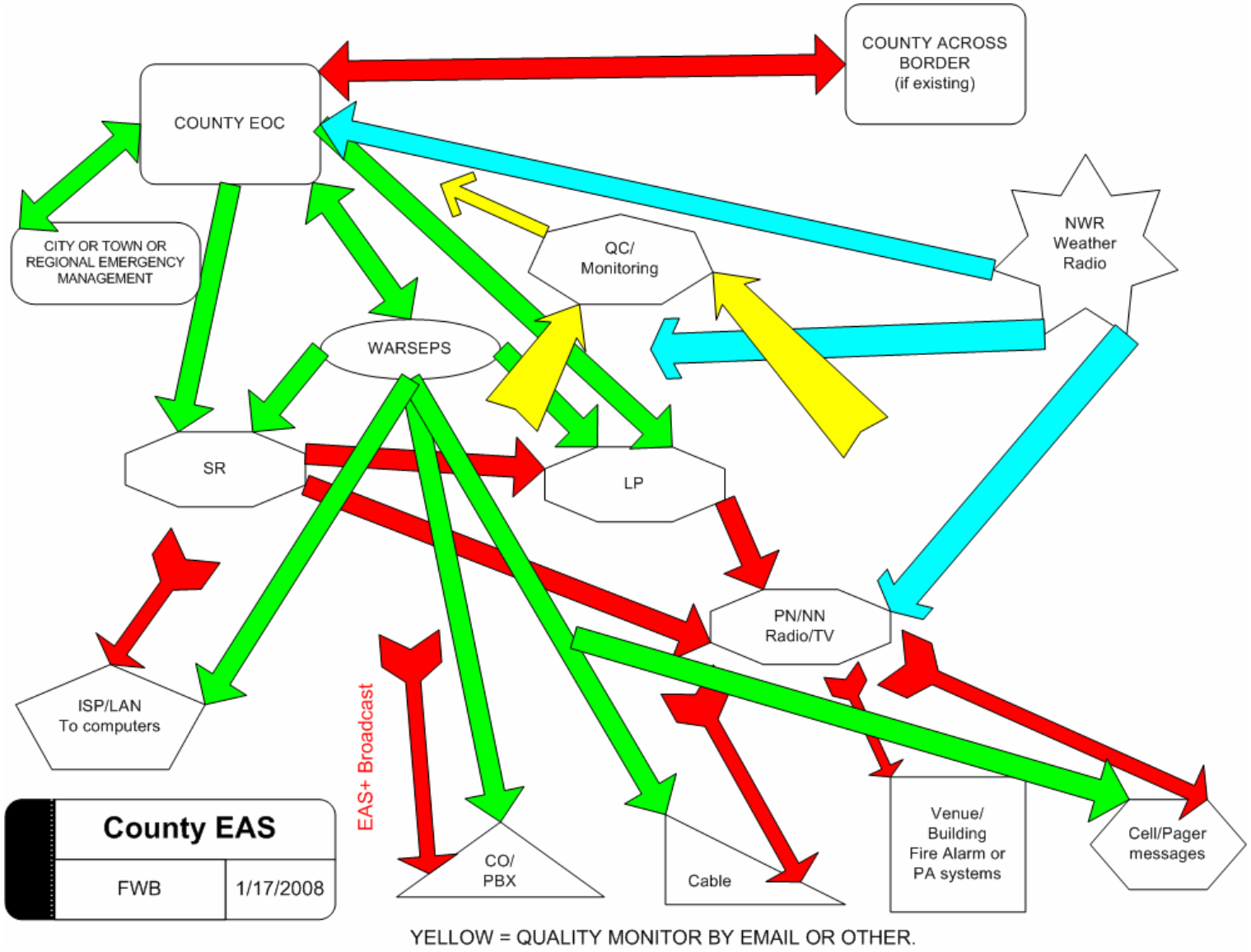
Appendix D: National, State and County general interconnection


NATIONAL PRIMARY
DBS/
SDARS
ADJACENT
NATION(S)
QC
Monitoring
WARSEPS
(CAP WAN)
NWS
Weather
Radio
SR
LP
CATS
PN/NN
Radio/TV
ISP/
LAN
National EAS
FWB
1/16/2008
CO/
PBX
Cable
Venue/
Building/
Campus or
Mall
Cell/Pager
messages
SR and LP are EAS+ Daisy Chain originating broadcasers, here for Washington DC

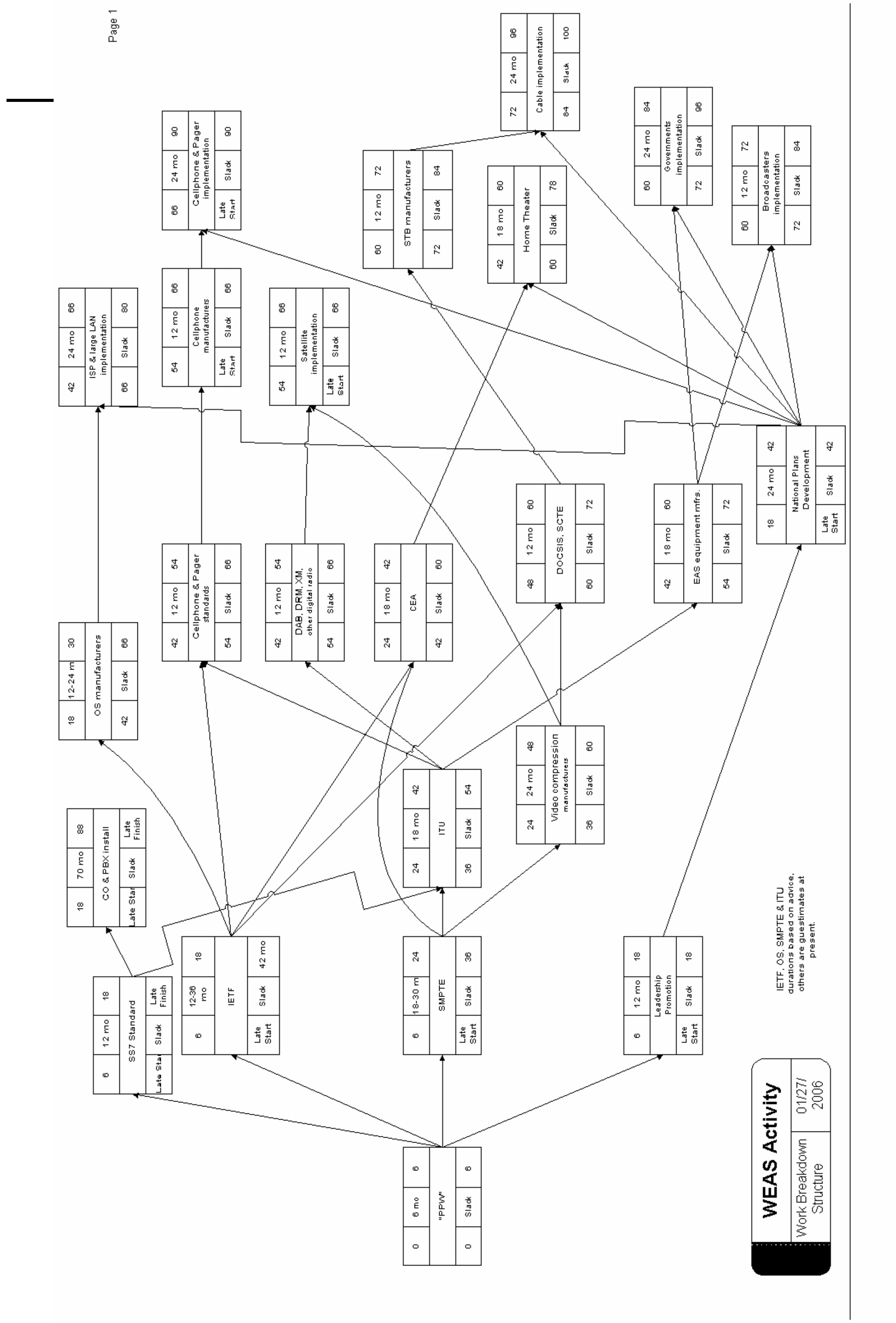
diagrams.

Appendix D: EAS State




COUNTY ACROSS BORDER (if existing)
COUNTY EOC
CITY OR TOWN OR REGIONAL EMERGENCY MANAGEMENT
QC/ Monitoring
NWR Weather Radio
WARSEPS
SR
LP
PN/NN Radio/TV
ISP/LAN To computers
EAS+ Broadcast
CO/ PBX
Cable
Venue/ Building Fire Alarm or PA systems
Cell/Pager messages
County EAS
FWB
1/17/2008
YELLOW = QUALITY MONITOR BY EMAIL OR OTHER.

Appendix E) An EAS Activity Network Diagram


Page 1
WEAS Activity
Work Breakdown Structure
01/27/2006
"PPW"
SS7 Standard
IETF
SMPTE
Leadership Promotion
CO & PBX install
OS manufacturers
ITU
Video compression manufacturers
ISP & large LAN implementation
Cellphone & Pager standards
Cellphone manufacturers
Cellphone & Pager implementation
DAB, DRM, XM, other digital radio
Satellite implementation
CEA
Home Theater
DOCSIS, SCTE
STB manufacturers
Cable implementation
EAS equipment mfrs.
Governments implementation
National Plans Development
Broadcasters implementation
IETF, OS, SMPTE & ITU durations based on advice, others are guestimates at present.

Appendix F: The EAS+ Protocol.

This is:
(Repeated 3 times) PREAMBLE-ZCZC-ORG-EEE-PSSCCC+TTTT-JJJHHMM-LLLLLLLL
1-second pause
8-25 Second Attention Signal
Then spoken content, or video or text.
1-second pause
(Repeated 3 times) PREAMBLE-NNNN

ORG identifies the originating organization. These can be EAS, WXR, CIV, EAN or PEP.

EEE identifies the type of Event and information contained in the verbal message, if a verbal message is sent. The Event Codes are listed in the Outline State plan. The event code may be sent with or without a WAT or verbal message as an alerting function only. It may also be sent as a control code for some National Weather Radio (NWR) system control functions.

PSSCCC. EAS uses a two digit regional code SS, which is adequate for North America and counties/provinces CCC are another three. The P was originally intended to be the first character of a country code and smaller countries would split to share the next character similar as is done for airplanes. In the implementation, P was defined as 0x00 (hexadecimal 00) (binary 00000000). More recently however the P has been assigned to be used for county sector coding. ASCII is the definition format with 0 (0x30) being the whole county, 1 being the northwest sector, 2 the north, 3 the northeast, 4 the west, 5 the central, 6 the east, 7 the southwest, 8 the south and 9 (0x39) the southeast. I suggest that 0x3A be reserved for the East 3 sectors unless the latitude and longitude area defines a smaller area. Similarly that 0x3B be the North 3 sectors, 0x3C be the East 3 sectors, 0x3D be the South 3 sectors, and 0x3E be the whole county. Also that 0x3F be reserved to mean that only the latitude and longitude area definition will apply, however that should only be used when county officials are satisfied that enough EAS decoders have the correct latitude and longitude of their position entered. This range 0x0-0xF is the last 4 bits of that byte. The FCC also wished to reserve 10 to 16 but these are not ASCII characters and so this is not currently implemented. The SCTE reserved 0x30 to 0x3F. To assign subdivision codes to large countries seems desirable so in order to avoid conflict with software installed in the U.S. I propose;

0x00 - 0x0F Reserved (possible Antarctic, oceanic or space use)
0x10 – 0x1F China
0x20 – 0x2F Australia
0x30 – 0x3F USA as at present
0x40 – 0x4F Canada

0x50 – 0x5F Russia
0x60 – 0x6F Brazil
0x70 – 0x7F Argentina
This would be followed by the present SSCCC 5 digit code.

In order to provide for a country code, I propose that country codes start with bit 7 set to 1. This gives provision for country codes to be assigned as proposed below;
0x80 – 0x8F non-American and Caribbean countries.
0x90 – 0x9F non-American and Caribbean countries.
0xA0 – 0xAF non-American and Caribbean countries.
0xB0 – 0xBF Reserved so as to avoid compatibility problems with EASv0 software.
0xC0 – 0xCF country codes including Caribbean and American not included above
0xD0 – 0xDF country codes
0xE0 – 0xEF country codes
0xF0 – 0xFF country codes with next character being another country character, for small countries.
Some governments may derive their regional coding system from the zip or postcode system. This has the advantage that regular users usually know their zip/postcode, and when configuring their equipment can enter this. As some postcode systems are alphanumeric, this should be provided for in the user interface and format definitions. The final digits zero meaning a region broadcast may require some tweaking of the coding system e.g. using last digits ZZ if 00 is a zip/postcode number assigned. If ZZ is assigned, then perhaps 99 is not. That aspect of implementation needs further research, and the original design may be adequate worldwide. The countries are responsible for devising their identification scheme and if their assignment is unworkable, e.g. not enough characters in a country split character assignment, this is a matter to resolve as the standard is being finalized. The last byte shall have the last 4 bits assigned as above. The purpose of this is to make a definition such that one version of software shall apply to all EAS decoders in the world of that make and model, except if the country code is in the software rather than locally configured.

The seas and oceans, for administrative purposes, are currently divided into 19 areas. These are called METAREAS and, except for the ones called ARCTIC OCEAN and ANTARCTICA, the area is listed by Roman numeral, plus perhaps an N or S. This does not include freshwater areas such as the Great Lakes that are in the U.S. FIPS code. Also countries can include their economic zone of the sea in their country divisions. The U.S. has FIPS codes for these areas.

LOCATION DETERMINATION; For their jurisdictional purposes, emergency managers issue alerts based on their state or county EMO (Emergency Management Office). Counties may be divided into 9 sectors of north, middle, south and also east, central, west. While this is understandable for their management, this has a limitation. While the public almost always know what state they are in, and usually know what county they are in, I would expect that a survey asking which sector of the county they are in would not result in a score much greater than the random probability of 12%. So this would show that the public would need to have an education program and sources of information as to what their home and work state, county and sector codes are.

A goal of the EMO and of EAS design is to be able to implement SAME (Specific Area Message Encoding) successfully so that as much as practicable, only the selected people receive the message and others are not disturbed. When most messages are irrelevant, the public is inclined to ignore the relevant ones. An alternative approach is to focus on the use of latitude and longitude to define the selected area. This may be as rectangles where two co-ordinates define the rectangle, and where more define a polygon. I suggest an upper limit of eight points to the polygon to ensure that processing capabilities are within limits for small and reasonably priced units. Precision of the determined latitude and longitude should be such that the number of digits entered after the decimal point (preferred) or of the minutes and seconds (not preferred as it is more difficult to process) shall be compared to the message specification with the last digit being rounded up and truncated down. This gives two answers, and if either is yes or the state, county and sector codes are an affirmative, then the message shall be played to the recipients for the range 0x0-0x9 as above, and if latitude and longitude data is valid, the range 0xA-0xF shall be based on latitude and longitude only. Because of liability concerns and communication of intent, it would be best if the latitude and longitude specifications be made by the relevant Emergency Management Office rather than a communications vendor such as DBS or SDARS companies. Cellphone tower sectors can be decision-making points for the SMS EAS messages to be broadcast. This saves adding software to cellphones.

Latitude and longitude are becoming of increasing interest with the decreasing cost of GPS receivers. Many of these have serial interfaces and the standard format for position data is NMEA 0183 www.nmea.org. Latitude and longitude data can be derived from street addresses using Internet map services. Some of these used to display the latitude and longitude in a decimal format, but none do so now. Reintroduction of this is a matter to consider. The zip +4 postal areas are fairly small in urban areas and the Post Office could be asked to provide translation to latitude and longitude for example on their web site. This would not be appropriate for rural and security addresses.

Another source of latitude and longitude values are topographical maps, which a few people have, and cadastral maps (property surveyors maps), which local governments have. Then local governments can add this data to the property tax bill given a reasonable implementation time.

The E911 Phase 2 extensions for cellphones are adding fairly precise positioning capabilities. While this might not be latitude and longitude, it should be practicable to add a translation capability in the network and cellphone menus so as to provide this to the cellphone users without adding a GPS in the cellphone. A few cellphones have GPS, but it adds to the price. This might not be available as a standard serial data format from the cellphone to another device that can receive EAS, necessitating manual transfer. To provide this translation for a small number of single requests for emergency services or individual users should not be much added processing for the cellphone companies. However to apply this continuously to a city of with moving cars would be a considerable amount of processing. So for vehicles I recommend that GPS be the preferred means of determining latitude and longitude. With the increasing installations of navigation on vehicles, it is becoming more desirable to specify locations in terms of latitude and longitude. This will develop whether or not EAS makes use of and encourages this trend. It has the advantage that it is a common data format that can be transferred between otherwise independent equipment and in the process make things simpler for users. Also most people can relate to it having had military or other navigational experience. While street maps do not have the latitude and longitude printed, it is in the source data and with the increasing use of GPS in cars, this should be added to street maps except where there is a security concern.

Tornadoes are an example of where latitude and longitude should be included because the path of the tornado can be transmitted at regular intervals. This can be additional information that people can follow in their storm cellars (with a receiver). Some may even find it worthwhile to have an NMEA0183 output on the receiver fed into a computer with map software and use that progress plot to pass the time while in their shelters.

+TTTT-. This header code block identifies the PURGE time of the message expressed in a delta time from the issue time in 15-minute segments up to one hour. Then in 30 minutes segments beyond one hour up to six hours; i.e. **+0015-, +0030-, +0045-, +0100- +0430-, 0600-.** This delta time, when added to the issue time, specifies then the MESSAGE is no longer valid and should be purged from the system, not to be used again. It is important to note that the valid or purge time of the MESSAGE will NOT always equal the event expiration time. For most short-term events such as tornadoes and severe thunderstorms, the two times will most often be identical. For longer duration events such as a hurricane or winter storm that may not end for

many hours or days, the valid time of the code only applies to that message, and is not an indicator of when the threat is over.

-JJJHHMM-. This header code block identifies the Julian Calendar date and the time the message was originally disseminated in hours and minutes using the 24-hour Universal Time Coordinated (UTC) clock.

An implication of the New Orleans experience of EAS performance is the desirability to be able to carry different languages. Also an implication of specific message coding is to be able to select appropriate language messages by different users. This means that language identification should be in the EAS header. While the header has everything assigned, a redefinition is proposed for the first J of JJJ, the Julian calendar day of the year. This J at present can only have the ASCII values of 0, 1, 2 or 3. So the proposal is to keep this the same for English. The date only requires the last two bits. So use the first six bits as follows

Binary 000000 Octal 00 Use for National or local language, ASCII 7 bit.
Binary 000001 Octal 01 Use for National or local language, Unicode extended data after Lat-Long.

Binary 000010 Octal 02
To To be assigned to multi-country or major languages, 10 codes
Binary 001011 Octal 13

Binary 001100 Octal 14 English
Binary 001101 Octal 15 Spanish
Binary 001110 Octal 16 French

Binary 001111 Octal 17
To To be assigned to multi-country or major languages, 17 codes
Binary 011111 Octal 37

Hexadecimal 0x80
To Reserved to keep 7 bit ASCII format
Hexadecimal 0xFF

These characters will read as ASCII "0", "1", "2", "3" for English, "4", "5", "6", "7" for Spanish (i.e. subtract 4 for the date value). "8", "9", ":", ";" for French as the date hundreds change. The rest are more difficult and not a current

concern for the U.S. EAS system. However a few examples of multi-country languages are:
German is the language of Germany, Austria and Switzerland, so it needs a code.
Korean is the language of the Republic of Korea and the Democratic Peoples' Republic of Korea, so it needs a code as it is multi-country.
Chinese has many languages/dialects with one writing system. It is used widely in Singapore for example. So to provide the local language option for another spoken language, Chinese needs a code.
Russian and Arabic are multi-country languages. Japanese is an important language, and they have an extensive alert system also.
Latin is the international language of botany and zoology, so it needs a code.
Esperanto is neither a national or local language, but it is an official language of the U.N. so it needs a code.

As Unicode has been proposed, perhaps the languages can be grouped into those that would use extended ASCII and those that would use Unicode for the extended data. However U.S. ASCII shall be the basis for the header code e.g. event codes, originators, etc. unless otherwise specified.
The first H shall have the first bits 001100 defined and reserved with the last two bits used for tens hour value. The second H shall have the first bits 0011 defined and reserved with the last four bits used for units hour value. The first M shall have the first bits 00110 defined and reserved with the last three bits used for the tens minutes value. The second M shall have the first bits 0011 defined and reserved with the last four bits used for the units minutes value. If Unicode is mixed with ASCII in the text, the start delimiter shall be (space)$XZ. The exit of the Unicode mode appears to be defined by ISO 2022 and 6049. This shall be done before the pause and end of the message.

-LLLLLLLL-. This header code block identifies the originator of the message, or in the case of EAS, that of the station rebroadcasting the message. NWS offices use the World Meteorological Organization office identification, e.g., KDTX/NWS for Detroit, MI and KTOP/NWS for Topeka, KS, USA. Radio and television stations use the station call sign such as KFAB/AM or WDAF/FM. Further details are in the Outline State Plan.

The one second pause may by substituted with NUL characters in a synchronous system, but such characters shall not be repeated beyond the EAS device terminating the synchronous system.

NNNN. This code block is the End Of Message (EOM) code.

The applicable details of most of this should be defined in the state plan, an outline version of which follows.

The Society of Cable Television Engineers (SCTE) have published a standard (J-STD-042-2002) for the transmission of EAS on digital cable systems, to be decoded by cablecards. I had some questions as to the interpretation of the standard, which are answered below.

1) How does the EAS audio override the program audio to be transmitted, e.g. what PID and format?

Normally, the audio portion of an EAS event comes by "tuning" to the Details channel. An "audio_oob_source_id" may be optionally specified in that case, when an out-of-band channel is available (CableCARD is in place), the receiver may access audio by resolving the audio_oob_source_id reference through the out-of band virtual channel table (see SCTE 65), which provides the TSID and program number of the MPEG-2 program carrying the audio. Alternatively, private means may be used (these are outside the scope of the standard).

There are situations where EAS messages are not relevant to the location served, and so should not override the program audio.

The cable operator must arrange to distribute messages as applicable to the subscriber. For the out-of band- case, the CableCARD may filter out irrelevant EAS messages. Various proprietary methods are possible.

2) What is the specification of how the message is to be displayed in relation to the program in an MPEG-2 system?

The method is specific to MPEG-2 transport signaling (the MPEG-2 Transport Stream defined in ISO/IEC 13818-1), but not specific to MPEG-2 video. A Character Generator in the STB is used to generate a crawl in the manner akin to TV broadcast EAS messages.

3) What is the current (MPEG-2) implementation of the joint standard?

The standard is implemented in all "Digital Cable-Ready" retail devices, as specified by FCC regulations.

4) Are there any considerations for how this may be implemented in MPEG-4/H.264 and VC1 systems?

The method is independent of the video codec used.

5) What about international application with country codes and Unicode alphabet application?

Test strings are coded per ATSC A/65 sec. 6.10. The encoding options include Unicode and other international alphabets.

Time and Date.

The EAS protocol is based on UTC and the Julian day number is as of that time. Radio and TV facilities use LTC (Linear Time Code) and VITC (Vertical Interval Time Code). Neither of these have a date specification. However they both provide for 8 digits of user bits, and this could be used for a date. The ISO preferred order of YYYYMMDD would therefore be recommended. The time in both of these is usually available as an accurate local time of day, sometimes GPS referenced. With daylight saving, the LTC/VITC time is often switched at the time that it is officially changed. However sometimes it is at a time that is more convenient for station purposes, and occasionally it is not changed at all for daylight saving. So bearing this in mind, this may be a time reference for EAS equipment by appropriately setting the offset. Another time source is NTP (Network Time Protocol). This is available on LANs often, but may not be as accurate as the LTC/VITC time. NTP should have a UTC reference. As different jurisdictions can specify different daylight saving switch dates (and even change the specifications), there is no universal solution to that. Digital cellphones have time transmitted from the cell tower. HD radios and digital (DVB or ATSC or DBS) TVs can have time transmitted to them, but this has not been a focus of consumer electronics or broadcast, satellite or cable implementation. Car radios integrated with navigation systems have time available from GPS, but the offset needs entering, and this changes with daylight saving and time zone, but the UTC time is in there even if it is not easily available. The date may be user settable and therefore possibly incorrect.

WARning Systems Entry Points (WARSEPS)

There may be installed an internal network for the nation and each state called a WARSEPS network. This is a generic name and actual systems have various names. This is a reliable, secure network connecting relevant departments' intranets. Terminals may be portable or located in special non-governmental facilities such as nuclear power plants. For EAS purposes the CAP, EPAD and other emergency management protocols are used and these translate to EAS format messages for broadcast and other public distribution. Some states already have such networks executed in varying manners and with different names. This is a subject that can be expanded on as appropriate to the situation of each nation and state or province. Originally EAS messages were distributed by a broadcasters' daisy chain, but that

should be secondary and backup to the WARSEPS network. The WARSEPS network can carry photographs and video clips that are a problem for EAS. In the U.S., this is not called WARSEPS, but the function is part of the Integrated Public Alert and Warning System (IPAWS). The U.N. is developing policy for International Strategy for Disaster Reduction (ISDR) of which Early Warning Conference (EWC3) is part.

EAS MODES of OPERATION

EAS can operate in various modes. The first of these are operation modes;

a) Basic mode. This is the original mode where all EAS messages override program audio, and either replace or add a crawl over video. The video replacement is being phased out by cable companies as it is more intrusive, but the technology for crawls was too expensive. Latitude and longitude are only user text in the NWR format which is only valid for the north-west quadrant of the globe. Override mode always occurs in basic mode. This mode is for English language only, Unicode is not supported, and the country code is USA.
b) DEAS mode. This is specified by SCTE J-STD-042-2002. This enables the receiver to insert EAS crawls and override audio when appropriate.
c) EAS+ mode. This extends DEAS mode by providing priorities, with optional user priority selection, and improves Specific Area Message Encoding (SAME) with optional latitude and longitude polygon selection with an improved latitude and longitude format. Override mode is for specific message types in this mode.
d) CAP broadcast mode. This is only on DEAS or EAS+ transmission.
e) There are also transmission modes where pauses are replaced by null bytes. Such null bytes shall be removed at the reception before forwarding to subsequent equipment.
f) EAS compatible mode on analog AM, FM or composite TV. The data is by modem tones in the audio. The reference level for voice is 0 VU (+4 dBm or +8 dBm according to facility). The level for modem tones is -4 VU. The video crawl or video replacement is done at the studio or headend. Override of program for all messages is expected. However unlike basic mode, latitude & longitude polygons, language selection, country code and such header extensions are permissible. However receiver processing of this data is not required other than displaying it. As a consequence, EAS endecs may have multiple output ports which transmit the message in different modes.
g) Digital transmission. This may be HD radio, DVB or ATSC. However the program audio is replaced by the EAS audio and the video may be replaced or have a crawl superimposed at the studio or headend. The reference level is -20 dB FS for voice and -24 dB FS for modem tones.

This value may be adjusted if measurements of dialnorm justify that. Otherwise refer to f) above.

h) DEAS transmission. The audio is separate and the data also separate from the program. While the audio contains the modem data, this is not intended to be the data transmission path. The reference levels are the same as for digital.
i) EAS+ transmission. This adds to DEAS with prioritization for nationwide EAS channels via DBS (e.g. DirecTV, Echostar, Sky) or SDARS (e.g. Sirius or XM). Reference levels are the same as for digital.
j) Cellphone messages may be transmitted in broadcast mode locally or by text transmission for subscription services. The source may be EAS or CAP messages.
k) Transmission to computers is by TCP/IP or IPv6 broadcast for local messages or email for subscription services. The broadcast messages would emulate TV transmitted EAS. The source may be EAS or CAP messages, but the security of the system against unauthorized alerts is a very important factor in the system design.
l) 7&1 bit mode. This uses 7 bit ASCII followed by the MSB (most significant bit) instead of normal 8 bit ASCII or other data. This applies to basic, analog and EAS compatible digital mode. The SCTE standard makes no reference to 7 bit ASCII so it is normal 8 bit ASCII.
m) Unicode mode. This uses byte pairs or others defined by ISO 2022 and 6049 and the Unicode consortium.

CAP BROADCAST

As it is desirable to transmit CAP messages to public computers in a secure manner, this can be accomplished using EAS+. The protocol differs in that the header has CZCZ replacing ZCZC. This will cause all inappropriate devices to ignore the message. The event code will be CAP and the priority will be 2. The latitude and longitude string can be included. The CAP message with forward error correction (FEC) will then follow, and the preamble NNNN will end as usual. The action expected at the computer is to popup a window saying that a CAP emergency alert message is stored with a filename ORGPSSCCCJJJHHMMLLLLLLLL.xml, and if the file is to be saved, opened or put in the recycle bin. As these messages would arrive from broadcast to the LAN direct or via ISP, it should be impossible to falsely generate a widespread alert. CAP broadcast messages can be large, numerous and hence would not be suitable for DBS or SDARS distribution. Additional file types that can be transmitted with FEC are .pdf, .txt, .dxf, .wav, .jpg, .mpg, .xml and others to be decided. EDXL (emergency data exchange language) and EPAD (Emergency Provider Access Directory) are a couple of examples. Only data and no executables or macros are permitted. Files will be named as above and stored in a <drive>:\EAS folder, selectable

by the user. Although the extensions are normally lower case, the upper case version shall be used in the header code. While it is possible to reinforce this by legislation, a point to remember is that the computer user has no control, and therefore the originator is therefore responsible for any damages. Not all users have adequate storage space and additional files can lead to crashing and other problems including loss of data. The file is already on the computer when the user decides to save it. The possibility of lawsuits for damages should be considered when originating file downloads.

MONITOR MESSAGES

The EAS monitor receivers shall send acknowledgement messages of all EAS and CAP Broadcast messages as emails in the following format; ORG-EEE-PSSCCC-JJJHHMM-LLLLLLLL-WWW-BER=M.Ne-P-LEVEL=<+/-VV>dBr100-MMSS.S on separate lines if multiple messages are acknowledged.
Where WWW is the county or state ID of the monitor receiver, 000 being reserved for the county monitor email address. M.N are the units and tenths of the Bit Error Rate. P is the exponent, with a maximum of 9. If the BER is better than 0.1e-9 it shall be indicated as 0.0e-9 unless there are no errors in which case it shall be indicated as 0.0e-9. The LEVEL is the level of the peak audio that lasts for 100ms, as the simplest level measurement of voice audio. It is relative to the reference analog or digital level as appropriate. The time of receipt of the ZCZC or CZCZ start of the message is the MMSS.S. This is to measure distribution time. The subject line shall be PSSCCC-JJJHHMM-WWW.

The email address is recommended to be in the form PSSCCC-WWW@<mailserver>. If a message to this address with a subject line RUOK, the reply shall be with a subject line of PSSCCC-JJJHHMM-WWW-OK. The content shall be LLLLLLLL-RX=M.Ne-P, (repeated for multiple receivers), TEMP=+VVVC, <AC=VVV or DC=VV.V>, PSU1=<OK/Fail>, PSU2=<OK/Fail>, UPTIME=VVVVVHRS, FAN=<OK or BAD or NNNNRPM>. Where RX=M.Ne-P is the receive signal strength in dBm with an accuracy of +/- 20%, and the – could be a + if appropriate. The TEMP is Celsius, and the + could be a -. The AC or DC are the input supply voltages. The UPTIME is the time since last boot. Together these email messages can not only monitor the EAS messages but also the EAS monitoring system automatically with software, for cost-effectiveness

Appendix G: Receiver Category for Additional Selectivity

In addition to location, the category of the receiver can provide additional selectivity for EAS+ messages. The categories are assigned as follows;
0x000000 to
0x001011 reserved
0x001100 Everyone
0x001101 Vehicle receivers (including first responders)
0x001110 Domestic or household receivers (business if purchased as a domestic model)
0x001111 First Responders special receivers.
0x010000 Telephone company #1
0x010001 Telephone company #2
0x010010 Telephone company #3
0x010011 Telephone company #4
0x010100 to
0x010110 reserved for other telephone or cable TV company.
0x010111 Cable TV company
0x011000 Cellphone company #1
0x011001 Cellphone company #2
0x011010 Cellphone company #3
0x011011 Cellphone company #4
0x011100 to
0x011110 reserved for other radio transmission company.
0x011111 Messaging Company (e.g. RIM)
0x100000 to
0x111111 Reserved for compatibility with 7 bit ASCII

These six bits would be applied to the bits before the last two in the tens of hours of HH in the header. The Everyone category would display the tens as 0, 1 or 2 in ASCII. The Vehicle category would display the tens as 4, 5 or 6 in ASCII. The Domestic category would display as the tens as 8, 9 or : in ASCII. The First Responders would display the tens as <, = or > in ASCII. The first 3 bits are defines as 001 in 8 bit ASCII.

The allocation of company name to the assignments above would be on a statewide basis, with unused assignments in border counties where there are companies not present in both states.

By making this additional selectivity, then except for basic receivers which are not EAS+ compatible or compliant, the messages for other than everyone can be deselected. Vehicle receivers could be selected for AMBER ALERT messages. School weather closings could be selected for domestic receivers.

Messages for First Responders could be selected by their specially coded or configured receivers. User menus could add configuration with a minimum of one choice. If more categories are needed, there are four more available.

Currently available "emergency style" receivers are basically cheap or low quality receivers with a manual generator added. They are not digital, usually not even stereo. There is a market gap for something bigger than the current mini FM receivers that can deliver louder headphone levels like a mini-boombox can and is also stereo or HD radio compatible, yet is portable and be EAS+ compatible. Disasters happen where people are, which may be distant from the "emergency style" receiver that is collecting dust in a closet. As power consumption reduces, digital EAS+ TVs that have emergency power source or option may become available before long.

These selection mechanisms might also be applicable for more targeted advertising, but the design of EAS+ is not optimized for that application. An event code of ADV with a priority of 0 would be reserved for this application. There are other mechanism(s) implemented in relevant standards that are optimized for this application. Any such advertising shall be restricted to the single broadcast coverage area and any cable/telco carriage. This would also apply to any broadcasters that are part of the daisy chain. This application might also be restricted to digital broadcasting.

The reason for the carrier section of the categories is primarily in case of failure of the 911 system. This way only subscribers of the carrier with the problem will be selected to receive the message, unless there is no selectivity for that receiver.