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TECHNICAL ADVISORY NOTE

Technical recommendations in support of the "Common Look and Feel" of Canadian public alerting messages distributed through the National Public Alerting System (NPAS)

Introduction

This Technical Advisory Note (TAN) presents the recommendations of a group of Canadian public alerting subject matter experts that were assembled in November 2012 to address the challenge of "common look and feel" (CLF) of public alerts distributed through the National Public Alerting System (NPAS).

This TAN assumes a technical understanding of the Common Alerting Protocol (CAP)[1], the Canadian Profile of CAP (CAP-CP)[2] and the Canadian practice of CAP "layers"[3].

An executive level business advisory note (BAN) and slide deck based on this TAN were prepared for a more business-focused audience. The BAN follows as an addendum.

Background

The Canadian public alerting *Common Look and Feel Sub-Working Grou*p (CLF SWG) aims "to ensure that public alert messages across Canada have a common structure and are easily recognizable to Canadians. Having a common structure that is simple and easy to follow for the public will help reduce errors and misinterpretations when receiving messages."[4].

The CLF SWG is a public-private working group of federal, provincial, territorial alert issuers, alert aggregators, last mile distributors, and other interested parties. The mandate for the CLF SWG comes from the *Federal-Provincial-Territorial Public Alerting Working Group* (FPT PAWG) which was established by the *Senior Officials Responsible for Emergency Management* (SOREM); SOREM's current activities related to public alerting are outlined in the *Action Plan* of the*Communications Interoperability Strategy for Canada (CISC)*[5].

In September 2012 the *Common Look and Feel Sub-Working Group* (CLF SWG) proposed that a "tiger team" hence after referred to as the team of subject matter experts be formed to make technical process, resource and specification recommendations in support of CLF objectives and related technical issues the SWG was dealing with.

The team objectives were defined as follows:

> *In consideration of CLF efforts to date, as well as recognized constraints, challenges, and established practices, make process, resource and specification recommendations that support the timely distribution of*

[1] http://docs.oasis-open.org/emergency/cap/
[2] www.CAP-CP.ca
[3] http://capan.ca/index.php/en/technical/#T-Layer
[4] Common Look and Feel Sub-Working Group
[5] http://www.publicsafety.gc.ca/prg/em/cisapc-scicpa-eng.aspx

public alert messages consistently across mediums and through numerous distribution channels, with a priority focus on television and radio.

The request to the Centre for Security Science – Canadian Safety and Security Program for funding and project management support came from the FPT PAWG through the Public Safety Canada – Interoperability Development Office (PS-IDO). The PS-IDO fulfills a coordinating role defined in the CISC for a number of initiatives, including the National Public Alert System (NPAS) and CAP-CP.

CSS contracted a tiger team leader familiar with the issues and stakeholders. The tiger team assembled included public, private and academic subject matter experts who had or were currently addressing public alerting CLF issues as originators, aggregators, last mile distributors (LMDs), system engineers, standards developers, product managers and or academics. They met in person and by webinar between October and December 2012.

The team workshop began with a core group that was challenged with identifying a common approach to achieving CLF objectives through all communications mediums. An extended team applied the approach to radio and television more specifically, and addressed other radio and television issues.

With a goal of transparency for all stakeholders, members of the alerting community were offered a briefing on the project by webinar before the tiger team met, and on the preliminary conclusions a few weeks later. Inputs by the greater community were encouraged, received and considered.

This technical advisory note (TAN) was published early in January 2013 and is to be supported with presentations to public alerting stakeholders, including the Governance Council of the National Alert Aggregation Dissemination (NAAD)[6] System.

Common Look and Feel Technical Challenges

Common Look and Feel technical challenges begin with an objective of a single alert message being distributed through a variety of communications mediums and receivers.

The alert may come from hundreds to thousands of alert originators, and be distributed by a few to hundreds of volunteer last mile distributors.

Each public alert may be distributed in text and audio, and perhaps braille, symbols and sign language, in English and/or French, additional languages, and then translated intoother languages.

The public will receive the alert using televisions with and without set-top boxes connected over the air, by satellite, cable, fibre and internet, radios using similar networks, telephones connected by wire, internet and cellular networks, computers in homes, offices, vehicles and palms, signs along roads, in stadiums and other public gathering places, email, faxes, sirens, etc.

The alerts will be presented visually in numerous formats, including high definition large screen displays and 15 character pager screens. Audio may be received through headphones or over the ambient noise of a stadium filled with thousands of screaming fans.

Distribution of the alert to the aggregator may be made over bandwidth constrained cellular and satellite communications networks, and from the aggregator to last mile distributor using low bandwidth one way networks.

The alert may include hyperlinks to additional resources that are available using other channels of communications.

Each alert may be updated and cancelled, and compete for distribution priority with alerts issued by other authorities.

Fortunately, an extensible common alert message format and central aggregation system has been adopted, as they are the two key elements in achieving the common look and feel objectives.

[6] http://alerts.pelmorex.com/en/

Recommendations

The recommendations of the tiger team are presented under the following headings:

1. Recommendations specific to CLF
2. Recommendations associated with other issues tasked to the tiger team
3. General recommendations resulting from this study

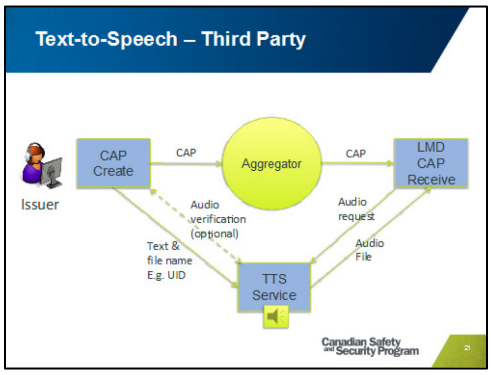
The recommendations below were discussed extensively by the team and several approaches and options were discussed and analyzed. The recommendations below are a summary of these discussions. In addition, further validations of the recommendations were performed by through a wider consultation with the Public Alerting community. The recommendations are meant to provide a basis for further discussion and it is anticipated that further technical analysis, design and engineering work is required to implement these recommendations. In addition, to technical work these recommendations require further policy investigation and business decisions by NPAS/NAADS stakeholders.

RECOMMENDATIONSSPECIFIC TO CLF

1. LMDs should be presented with audience alert message text tailored to specific distribution mediums (E.g. television, radio, SMS, Twitter, etc.), in all languages to be supported, using CAP <parameter> elements, to eliminate assembly and truncation decisions and potential errors by each LMD.
    a. <parameter><valueName>s and <value> constraints will need to be established for specific distribution mediums and or by text length for use in a number of distribution mediums. A combination approach is recommended, with <valueName>s based on text length (E.g. 120 characters) being used where practical, and the specific distribution medium approach being used where there is a unique requirement to do so (E.g. Twitter hash tag formatting) and or where there is direct sector involvement on length, formatting, content, etc. (e.g. Radio, television, cell broadcast).
    b. The <parameter><valueName>s and accepted <value>s should be documented, owned, managed and versioned as a CAP “layer” consistent with established Canadian “layer” and change management practices.
    c. Until this recommendation is implemented, and for a period of transition, the unconstrained CAP <description> element should continue to be used for radio and television text, and <headline> for short messages.
    d. Notes:
        i. Other languages could be supported in the same way, through a re-origination process, or using a <resource> URI associated with a centralized web service that might be established for such purposes.
        ii. There is no registry of <parameter><valueName>s; however, the international CAP community has discussed the need for one and is discussing the establishment of one. A Canadian registry would be beneficial in the near term to bring awareness to layer content and to avoid duplication.

2. Audience alert message audio should be generated by a centralized text-to-speech (TTS) process to reduce speaking errors, support translation, present a common voice, etc.
    a. The alert issuer should, at their discretion, have the opportunity to review the audio before the alert is issued.
    b. TTS by LMDs should be used as a back-up means of producing audio messages in cases where retrieving centralized audio is not possible (i.e. a communications interruption); with the understanding that there are increased risks of message errors when this method is employed.
    c. The use of prerecorded generic “fallback” messages, stored for immediate use in LMD broadcast intrusion devices, should be explored as an alternative to LMD TTS processing when retrieving centralized audio is not possible.

d. Making the centralized process and or national lexicon available for use elsewhere in NPAS where it might also be required should be considered. E.g. A Broadcasting Distribution Undertaking (BDU) central processing center might wish to carry out TTS in their facility to avoid the delay and possible interruption of audio message retrieval from a remote resource.
e. Notes:
    i. Centralized processing (and prerecorded fallback messages) supports a common public alerting voice throughout Canada, more consistent audio values for engineers to work with, and superior message intelligibility.
    ii. Regional dialects and support of other languages can also be accommodated.
    iii. Centralizing audio does not imply ownership. The following illustrationpresents an architecture option that includes a third party processor. A third party audio service could generate the audio for the alert issuer and make the audio available to LMDs.



3. Audience alert message text should be created using a semi-automated message composition approach, identified as “partially pre-scripted messages”, to reduce message errors, to reduce alert originator apprehension of using the system, to overcome translation challenges, and toimprove the consistency of message content.
    a. Alert issuers should be presented with community defined pre-scripted text message segments (E.g. Warning and watch statements) specific to the alert event references (E.g. Flash flood, wildfire), along with related response type message segments (E.g. Shelter, evacuate), for automated composition using community defined message algorithms that include content associated with the senders name, website address, etc., in all languages to be supported.
    b. The alert issuer should have an opportunity to review and revise the messages.
    c. AMBER Alerts should be supported with a user interface and algorithms specific to AMBER Alerts.
    d. Notes:
        i. This practice is being used in the Alberta Emergency Alert[7] system for television/radio, Twitter and other channels, where experience has demonstrated alert issuers prefer it over the use of free-form text. It can reduce errors and is proving to reduce alert issuer apprehension to issue alerts. CAP <urgency>, <severity>, <certainty> and other values are defaulted based on inputs by the alert issuer (E.g. Is there a severe risk to life? Yes or No).
        ii. Each of the message scripts, algorithm variables, sender names to be used, event and location references, etc. can be tested for audio pronunciation with text-to-speech processes in support of lexicon adjustments.
        iii. Additional languages might be supported in the original alerts consistent with the primary languages supported, centrally by a third party, or perhaps through the process of alert re-origination for specific LMDs.
        iv. An alternative message composition approach, which was used in the former New Brunswick Multi-Agency Situational Awareness System, used a generic algorithm based on statements associated with CAP urgency, severity and certainty values. This common approach to all event types might be considered as an acceptable alternative for languages other than English and French to reduce translation errors, and for the “fallback” message solution identified in 2.c.

[7] http://www.emergencyalert.alberta.ca

v. Alberta developed a unique user interface specific to AMBER Alerts with the AMBER community when the approach common to all other alerts was found inadequate for AMBER Alerts.

4. The addition of regional location names (e.g. Coastal areas, Red River flood plain) in the CAP-CP Location References should be considered to help ensure location names are presented completely, and more consistently.
    a. Notes:
        i. It is common practice to truncate a list of location names to meet the constraints of shorter message formats.
        ii. The CAP-CP Working Group[8] has discussed the addition of such location references with some of the provinces/territories.
        iii. Geocodes and polygons for these new areas would also have to be defined.

5. If an event location is included in the CAP message (optional), it should follow the layer practice[9] established in the Multi-Agency Situational Awareness System – National Information Exchanges (MASAS-X)[10] to ensure interoperability between systems.
    a. Notes:
        i. The inclusion of an event location supports a more precise presentation of an event location on a map than does presenting the alert area, or artificially picking a location within an alert area such as the centroid. E.g. Industrial fire location presented as a point within the polygon for the alert area polygon.

6. If public alerts are to be presented using symbols, the symbols should be engineered to work with the specific mediums they will be presented in. E.g. Television.
    a. Notes:
        i. A broadcaster participant noted that the emergency management symbols used in MASAS applications were not suitably engineered for television.

7. The engineering specifications for the Canadian alert tone adopted by the CLF SWG should be documented for the technical community to engineer to.
    a. Notes:
        i. The document requires an owner and change management process.
        ii. Some, but not all alert devices can be engineered to use a tone other than the one used in the U.S. E.g. Some set-top cable boxes cannot be upgraded, but are expected to be replaced in the future.

8. Alert repetition guidance to the LMD should be presented as a <parameter> value in the associated <info> block, so that it may be engineered to.
    a. The <value> should include the number of repetitions and the interval between them.
    b. The <parameter> should be documented and managed consistent with Canadian “layer” practices.
    c. Policy should be developed that identifies how the guidance is implemented in the presence of an update or cancel message.
    d. A common approach per event type should be identified and documented. E.g. A small number of repeats with short intervals for a tornado alert; more repeats and longer intervals for a boil water alert.
    e. Notes:
        i. Broadcasting a single broadcast intrusive alert message is common practice.
        ii. While some broadcast intrusion devices can be programmed to repeat a message, doing so is not common practice, and none of the equipment is known to be engineered to this recommendation at this time.

[8] www.CAP-CP.ca
[9] CAPAN CAP Event Location Layer, http://capan.ca/uploads/CAP-CP/CAPAN_CAP_Event_Location_Public_Draft_Rev._A.pdf
[10] Multi-Agency Situational Awareness Systems – National Information Exchanges (MASAS-X); www.masas-x.ca or for technical information www.masas.ca

iii. No near term approach was identified that would result in a consistent repeat practice, and also preclude the repetition of alerts in mediums where repeats are not warranted. Most, if not all broadcast intrusion devices are programmed to ignore duplicate alerts of the same message, so an updated alert is therefore required to trigger an additional interruption over radio and television; however the updated alert would also trigger a repeat in other distribution mediums such as email and SMS.

9. The appropriate use of the NPAS broadcast intrusion flag should be clarified to ensure consistent practices when a broadcast intrusive alert is updated with a CAP-CP minor update <parameter> value of “Yes”.
    a. Notes:
        i. This lack of clarity has resulted in multiple interpretations and may result in some LMDs distributing an update and others not.

10. Multiple <info> blocks of the same language should be presented in the order in which the alert issuer wishes to have them processed by others.
    a. Notes:
        i. If this recommendation becomes policy, this practice should be defined, owned and maintained using a “profile” document.

11. The issue of multiple broadcast intrusive <info> blocks per language should receive additional and ongoing attention by public alerting stakeholders until fully resolved.
    a. Alert issuers (E.g. Environment Canada) should not be constrained to issuing CAP alerts with but one broadcast intrusive <info> block.
    b. LMDs should be encouraged to implement solutions that can process more than one broadcast intrusive <info> block.
    c. In the short term, while solutions to process alerts with multiple <info> blocks are developed and implemented, LMDs should not be expected to process more than the first <info> block in any language.
    d. The re-origination of alerts with multiple <info> blocks per language should be undertaken on behalf of LMDs who can only process single broadcast intrusive <info> blocks in the near term.
    e. Notes:
        i. Constraining alerts to a single broadcast intrusive <info> block can be expected to increase the number of alerts published, create alert management challenges, and result in more than one alert for the same event being broadcast by some LMDs.
        ii. Re-originating alerts with a single broadcast intrusive <info> block per language from alerts with more than one such <info> block is a process that can be undertaken to address near term processing challenges, however doing so may create new CLF challenges. E.g. More than one alert being broadcast for the same event by some LMDs and not others.

12. The “processing” and possible “re-origination” of CAP messages for the purpose of such things as generating audio, limiting file size to bandwidth constraints, creating two or more alerts from one to overcome specific channel constraints, or other reasons that support the timely distribution of alerts to the CLF objectives is recommended.
    a. Notes:
        i. As was noted in the CSS CAP file size study[11] from early 2012, there is no one CAP file size that works under all circumstances, and processing may be required to overcome constraints for both alert issuers and last mile distributors.
        ii. Alberta, as an example, re-originates Environment Canada alerts with text for specific LMD mediums.

13. The 1800 character limitation engineered to by broadcast intrusion device vendors[12] should be recognized as an absolute maximum.

[11] *Preliminary Analysis of file size constraints for Common Alerting Protocol (CAP) public alert messages in Canada*, Centre for Security Science - Technical Advisory Note
[12] EAS-CAP Industry Group Recommendations for a CAP EAS Implementation Guide, Version 1.0, 17 May 2010.

a. Any formal reduction to the number of characters should follow the development and evaluation of pre-scripted message segments by the alert issuing community, and their consideration of the impact on audio messages.
b. Notes:
    i. Alberta's experience with partially pre-scripted messages suggests that the Broadcasters Technical Coordinating Committee (BTCC) draft recommendation of 2 pages of 720 characters[13] is sufficient for most messages. The draft recommendation is the result of efforts to link a typical audio run time limit of 60 seconds with a visual presentation of the same content, and the goal of having audio and text match with one another on television to avoid dead air.
    ii. While efforts to date have addressed radio and television collectively, they could be addressed separately so that the constraints of one do not reduce the potential of the other to deliver a longer message.

14. Audio should be produced uncompressed (e.g. Wav) and then compressed (e.g. MP3) where required to the agreed upon distribution specification.
    a. Notes:
        i. The BTCC proposal of MP3 64 kbs[14] mono as the default for most mediums is supported. However, one size may not fit all, as experience may prove; further compression, conversion, etc. may be necessary to overcome some network and device constraints.
        ii. Due to the complex nature of audio sampling, the Advanced Audio Systems Group of the Communications Research Centre Canada[15] might be consulted for more specific recommendations on audio file characteristics.

15. CAP <expires> should be optional in public alerting systems, consistent with CAP and CAP-CP.
    a. Alert issuers should be held responsible for expiring or cancelling their alert.
    b. Automated reminder notifications to alert issuers of alerts issued without an <expires> should be considered.
    c. Educating stakeholders that <expires> relates to the message and not necessarily the subject event should be undertaken to reduce error of interpretation by all NPAS stakeholders, and especially news agencies.
    d. Notes:
        i. A difference in <expires> policy is precluding message exchange between NAAD and the Alberta Emergency Alerting System.
        ii. The inclusion of an artificial <expires> time when an events duration is unknown presents a significant communications risk if the <expires> time is associated with the duration of the event referenced in the alert. E.g. A boil water alert issued with an artificial expires date of 5 days may be interpreted and presented as a "5 day boil water alert" or "boil water for 5 days only". The inclusion of a statement that the duration of the event is unknown could help reduce misinterpretation of the message.
        iii. While some broadcasters have stated they prefer to see <expires> to know the duration of an alert, many have also stated they cannot or will not repeat messages, which makes <expires> somewhat redundant to many. Message repetition is therefore closely tied with this item.

16. A single NPAS Layer (or Profile) document should be developed and managed that captures in one place all of the <parameter> elements defined herein.
    a. Notes:
        i. In the Canadian context, CAP layer documents are limited to optional <parameter> elements and the accepted values, while profile documents include CAP implementation rules.

[13] Broadcaster Guidelines: Uniform Standards for the Airing of Emergency Alerting Messages by Television Stations, Preliminary Document for Discussion Purposes, Prepared by Broadcasters Technical Coordinating Committee, September 4, 2012
[14] Broadcaster Guidelines: Uniform Standards for the Airing of Emergency Alerting Messages by Radio Stations, Preliminary Document for Discussion Purposes, Prepared by Broadcasters Technical Coordinating Committee, September 4, 2012
[15] http://www.crc.gc.ca/en/html/aas/home/home

ii. Whereas the Canadian Profile of CAP (CAP-CP) defines rules and references for all uses of CAP in Canada, additional CAP implementation rules specific to public alerting in Canada would ideally be captured in their entirety in a single NPAS profile (E.g. A public alert must include a broadcast intrusive flag, and it …). Additionally, and even more specifically, profiles specific to individual systems (E.g. NAAD, AEA) could speak to CAP implementation rules specific to their system. This tiered approach can provide increased clarity to the technical community.
iii. The layer document proposed requires an owner and change management process.

RECOMMENDATIONS ASSOCIATED WITH OTHER ISSUES TASKED TO THE TIGER TEAM

17. The practices of ending the effective time of an alert using cancel, or by updating the alert with a new <expires> value, should be recognized as equally acceptable practices.
    a. Notes:
        i. While both are recognized practices, formally recognizing both will avoid confusion and further debate.

18. Alert issuer and aggregator Atom (and or RSS) feeds associated with CAP alerts should be recognized as having a primary role of simply indicating that CAP alerts associated with a feed are available for processing; and that they are not to serve as an alternative to processing the entire CAP message.
    a. Notes:
        i. Neither the Atom or RSS feed formats were engineered to the considerations of CAP, and cannot therefore replace CAP's role.
        ii. Support for multiple feeds by an alert issuer or aggregator can reduce the processing of CAP alerts required by others. E.g. A feed could be limited to broadcast intrusive alerts, alerts for a specific province, etc.
        iii. The Organization for the Advancement of Structured Information Standards (OASIS) Emergency Management Adoption Technical Committee (EMA-TC) is supporting a discussion related to CAP feeds at the time of this study; documented recommendations are expected.

GENERAL RECOMMENDATIONS RESULTING FROM THIS STUDY

19. To support improved decision making, the public alerting community should define prescriptive objectives, common terminology and comprehensive use cases that support a common understanding of the many technical, social, business and other challenges associated with creating, aggregating, processing and distributing public alerts through the variety of communications mediums, in different languages, text and audio, etc.
    a. Notes:
        i. Public alert issues are often far too complex to comprehend without a reference. Events are often evolving (e.g. hurricane moves rapidly across provinces while changing shape and intensity), the community is diverse (e.g. pubic safety and communications officials, engineers, the full array of LMDs, etc.), the business issues quite complex (e.g. financial, legal, political, etc.), and for the most part, we Canadians have limited public alert processing experience.

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References

Other material referenced by the Tiger Team not previously noted:

1. *A study by the Broadcasters Technical Coordinating Committee (BTCC) for the BTCC shared with the FPT CLF SWG*.
2. *Phrase Algorithm Schematic*, Alberta Emergency Alert System
3. Wireless Emergency Alerts (WEA) Messages Originated by National Weather Service
4. Pelmorex email and SMS specifications
5. *Environment Canada Layer*; Environment Canada
6. CAP - Integrated Public Alert and Warning System Profile, OASIS, http://docs.oasis-open.org/emergency/cap/v1.2/ipaws-profile/v1.0/cap-v1.2-ipaws-profile-v1.0.pdf
7. CAP-CP Informative Reference; http://capan.ca/cap-cp/reference/

Addendum

Business Advisory Note

This business advisory note (BAN) provides an executive summation of the key conclusions and recommendations found in the Technical Advisory Note (TAN) titled *Technical recommendations in support of the "Common Look and Feel" of Canadian public alerting messages.* Additionally, it identifies resources, specifications and processes associated with the key recommendations, as well as key considerations for decision makers.

Key Conclusions and Recommendations

1. Achieving common look and feel (CLF) objectives through the growing variety of communications mediums requires content specific to the communications mediums and languages supported being available to the LMDs. The LMDs should receive computer identifiable text, and web links to centrally available audio files, that are tailored to the distribution mediums and languages supported by the National Public Alert System (NPAS). The Common Alerting Protocol (CAP) is well suited to transporting the related content and links.

2. Creating content specific to the communications mediums and languages supported, especially under the duress of a life threatening event, is beyond that which is reasonable for a person; a degree of automation is necessary. Public alert message creation should start with the selection of pre-scripted message segments ("partially pre-scripted messages") by alert issuers, with the selections driving the automated assembly of alert messages and text-to-speech audio files, to the distribution mediums and languages supported by the National Public Alert System (NPAS).

Efforts Associated with Key Recommendations

1. The partially pre-scripted message approach must be supported with the following:
    a. Message script segments and message assembly algorithms for each medium and language supported.
    b. Message creation application(s) that support alert issuer selection and automated message assembly for each medium and language supported.
    c. A technical document, the Common Alerting Protocol (CAP) "layer" specification is required.

2. A centralized text-to-speech approach must be supported with the following:
    a. System architecture that identifies how the text-to-speech application interfaces with other NPAS components and stakeholders.
    b. Text-to-speech and associated web service applications.
    c. Audio specification(s).
    d. Lexicon review, and text-to-speech application adjustments, for the message segments, location references, and organization names to be used in the messages, in each of the languages supported.

Executive Considerations

1. The recommendations are designed to be forward leaning and can be applied to future communications media as appropriate.

2. Many Canadian public alerting stakeholders, both public and private, are currently involved in the engineering of LMD public alerting applications and devices that will serve the Canadian public for many years to follow. The near term selection and promotion of the Canadian approach to CLF can influence this engineering, and in turn

result in the CLF approach being implemented by LMDs soon after they are supported upstream of them by alert issuers, aggregators and processors.

3. The Alberta Emergency Alert system was engineered to partially pre-scripted messages and centralized text-to-speech audio. They have resources (e.g. message scripts, translations, documentation) and knowledge (e.g. user experience) that can be leveraged.

4. Many of the activities required to support the key recommendations, including the development of the CAP layer specification and message scripts, can begin immediately, These changes can then be implemented within NPAS using a phased approach.

5. For the time being, and through a period of transition, CAP alerts can be formatted and processed using the current practices.

6. There are other recommendations that require executive attention. E.g. #9 “The appropriate use of the NPAS broadcast intrusion flag should be clarified…”, #15 “CAP <expires> should be optional…”