

# Environment Canada and the Common Alerting Protocol (CAP) (Information Sheet)

## 1 - General Overview

Title:	Environment Canada and the Common Alerting Protocol (CAP) <i>1 - General Overview</i>
Description:	An overview of the Environment Canada implementation of the Common Alerting Protocol (CAP) using the Canadian Profile
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References:	<a href="http://alerts.pelmorex.com/">http://alerts.pelmorex.com/</a> <a href="http://www.canops.org/">http://www.canops.org/</a> <a href="http://emergencyalert.alberta.ca/">http://emergencyalert.alberta.ca/</a> <a href="http://dd.meteo.gc.ca/alerts/doc/README_CAP.txt">http://dd.meteo.gc.ca/alerts/doc/README_CAP.txt</a> <a href="http://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/mrgnc-prprdncs/ntnl-pblc-lrtng-sstm-eng.aspx">http://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/mrgnc-prprdncs/ntnl-pblc-lrtng-sstm-eng.aspx</a>  Refer additionally to the following information sheets:  <i>2 - Update, Cancel and Expires – Environment Canada use of CAP Message Types</i> <i>3 - Status of CAP Alerts by event as issued by Environment Canada</i> <i>5 - Environment Canada Layer</i>

### Purpose of this Document

This document provides a general overview of the Environment Canada implementation of the Common Alerting Protocol (CAP).

The overview will provide an introductory explanation as to...

- why Environment Canada has chosen to deliver our *warnings* using the

#### Common Alerting Protocol

- what alert information clients can expect from this product
- how the Environment Canada business rules regarding *warnings* are reflected in Common Alerting Protocol messages

### **The Environment Canada *Warning* Business Model**

Environment Canada has been issuing weather *warnings* for many years. The basic goal of these *warnings* is to create “awareness” in the minds of our clients, that some weather or environmental hazard, related to some weather or environmental event, is occurring or will likely occur in a location of interest to them.

Environment Canada endeavors to create this “state of awareness” by issuing *warning* messages on these hazards. We do so formally by creating the bulletin form of the message and sending it out on our transmission circuits. Our media partners are then alerted to the bulletins through a variety of systems that monitor for new bulletins.

Each of our *warnings* includes a series of messages. These messages are sent out by our forecasters at various intervals throughout the life of the event that is causing the hazard. Each message reports new updated details on

- the subject event of the *warning*
- the associated hazard(s)
- the geo-targeting information on where the hazard threat is applicable
- and in some cases, Environment Canada’s recommendations on how to respond to the hazard(s)

The first message in the series not only provides the initial details, but as it is first in the series, it is also assumed to trigger the “awareness” aspect of the *warning* to the general public. The formal start time then of the *warning* is when the first message is transmitted out to our clients. The last message in the series ends the *warning*. An Environment Canada *warning* can therefore be considered “in effect”, or “active”, for some measurable period of time.

Since the *warning* exists in time, with often changing details throughout its life, a *warning* can be considered a “living object”. Whenever the term “in effect” is used with a warning, this living nature can be assumed. It is a common approach that many issuing authorities use, both within and external to Canada.

### **Classes of Environment Canada *Warnings***

Environment Canada, by our own definition, actually differentiates between several classes of these “state of awareness” *warning* objects. Each class has a different level of awareness that we want conveyed. The four classes we currently use for our CAP products are named “warning”, “watch”, “advisory”, and “statement”.

It is not lost on us that one of the classes of *warnings* is also known as “warning” but this is a legacy issue that won’t go away any time soon. (It is so common a dual usage that it has become natural to see it used both ways within numerous documents and correspondence from Environment Canada.) When the term “warning” is used, one has to decipher from the context if it was meant to describe the object, or one of the classes of the object. Therefore, the use of “*warning*” (*italics*) in these sheets will mean any awareness object, while the use of “warning” (no italics) will be the individual class of the object distinguishable from “watch”, “advisory” and “statement”.

As *warning* classes go, there is only a loose relative ranking of importance of the levels of awareness between them<sup>1</sup>. Generally speaking, an Environment Canada “warning” is more urgent than an “advisory” which in turn is more urgent than a “statement”. A “watch”, on the other hand is unique in that it generally describes conditions that are favorable for the development of a hazardous event rather than an event itself. Its urgency is then dependent on what that event would be in order to compare it against the other classes.

## **What is CAP?**

CAP, the Common Alerting Protocol, is an XML-based information exchange standard used for conveying alerting information between alerting technologies.

By using the same standard as other national and international public alerting authorities, a single agency can be assured the messages they are using can be consistently disseminated over many networks and systems. In Canada, CAP is quickly becoming adopted for use in National and Regional Public Alerting Systems.

In 2010, an informal group of Canadian stakeholders convened a working group with the goal of identifying specific requirements that were of interest to the Canadian alerting community. The result of that work was what the community has called the Canadian Profile of CAP (CAP-CP).

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<sup>1</sup> In practice, ranking these classes is not really done as it is not always obvious what the ranking should be; furthermore these information sheets are not intended to address this issue. Fortunately, as far as CAP is concerned, this does not impact the design of a CAP system in any way and any ranking of “active” *warnings* can be done on the fly based on CAP elements built for this purpose and are present in each CAP message.

This Profile addresses recognized Canadian concerns such as delivering CAP messages in both official languages; managing a list of Canadian reference locations; and standardizing on a list of growing alert worthy events. The ideas and objectives of this Profile were then expressed in CAP format and made available for use in the Alerting community.

Most *warning* messages that Environment Canada creates - that also results in official bulletins in both official languages - is immediately used to generate a single new CAP-CP message for distribution on electronic networks. (see Information Sheet 3 - *Status of CAP Alerts by event as issued by Environment Canada* for a list of which *warnings* are included in the CAP process.)

## **History of CAP within Environment Canada**

In 2008, Environment Canada initiated a pilot CAP project to investigate CAP. We converted many of our active *warning* messages into the CAP format to see how effective the protocol could be in disseminating our *warning* information.

In 2010, we began applying the Canadian Profile.

In 2012, Environment Canada went live with our CAP messages, distributing them to several partners, with the intent of having them be used in live operational environments.

In 2016, the “Alert Ready” system resulted in one of the largest changes in our CAP offerings. Even though the changes may appear small in the CAP messages, there was considerable effort given to make the changes.

Throughout this time, both CAP and the Canadian Profile have gone through minor version upgrades and Environment Canada has remained current with these new versions.

## **Why Environment Canada chose CAP?**

CAP was chosen as it is a flexible and extensible data format standard that allows Environment Canada to easily exchange structured *warning* information with third parties. These parties benefit by having access to all our *warning* information in a way that allows them to identify the information elements of interest to them in order for them to extract and construct viable presentations.

Significant effort has been made to ensure that the CAP messages generated by Environment Canada contain all the *warning* information we have on hand to support a wide variety of last mile distributors looking to create such presentations. Not all last mile distributors will need every piece of information, but as CAP is an XML Standard, it's easy for last mile distributors to ignore what is not needed and just make use of what is.

Additionally, there is enough basic information in our CAP messages for them to be processed by third parties that have no knowledge of the Canadian Profile. This in turn allows us to share our public *warnings* across international borders.

### **The CAP model**

The CAP model is all about messages. It is simply a transaction based approach to conveying *warning* information from one party to another. With CAP, it is assumed that the recipient is normally a last mile distributor disseminating messages to a further audience in a display format that is not CAP. This is the primary function of a CAP message - to convey current *warning* information between parties in the alerting community.

The CAP model defines that a CAP message can supersede a previous message in full, by simply referencing the previous message. When a previous message is referenced then the previous message information is no longer valid. Information present in the newest message is a complete accounting of the relevant *warning* information the issuer has on that *warning*. This is a key point for last mile distributors in that they do not have to go back and find relevant information from old messages – they simply always work off the latest message.

For every *warning* Environment Canada creates, we always put all the relevant *warning* information into every CAP message. We make heavy use of the “latest message supersedes the previous message” aspect of CAP.

Other public alert issuers will publish CAP messages, let them expire on their own, and never reference previous messages later messages. This single message model works well for some authorities working in hazardous situations where the event is nearly instantaneous - for example, with an earthquake where the hazards to warn for are reported on after the event is over and updates may not be needed.

CAP doesn't judge whether the nature of an issuer's *warning* is “living” (with message updates); or is “one time” (without message updates) - CAP simply allows for several practices and strategies to be employed as each issuer sees fit.

CAP also doesn't address Environment Canada's classes of a *warning*. There is

no pre-defined CAP element specifically designed for a statement, advisory, watch or warning. CAP accomplishes the same objective of the Environment Canada class structure in a different way – through the use of the required Urgency, Severity and Certainty elements in each CAP message<sup>2</sup>.

Last mile distributors use Urgency, Severity and Certainty elements consistently across CAP messages from all issuers, allowing for all hazard alerting systems to be created<sup>3</sup>.

In the next section, Environment Canada’s definitions are explained in order to help our CAP users understand how we organize our *warning* information in-house before sending the information out to clients. We do this so that they may understand why our CAP messages are structured the way they are.

## **Alerts and *Warnings***

In the Environment Canada *warning* model, the terms “alert” and “*warning*” have a defined meaning and in CAP, those meanings are not entirely equivalent. So like with the terms “warning” and “*warning*” (see section above on the Environment Canada *Warning* Business model), distinctions must be defined to help make the Environment Canada position clear as we explain our use of CAP.

Within Environment Canada, the terms “alert” and “*warning*” are essentially equivalent. Both are “living” objects updateable by new messages. The terms are essentially interchangeable.

However, in the broader information exchange community, an alert is defined as being a “signal” from one party to another. Whether both parties work together to agree on the manner of the signal, or whether one party acts on behalf of the other party to define the manner of the signal, the net result is that there is a signal. It is these signals that activate the “state of awareness” that is desired by

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<sup>2</sup> EC’s class of *warning* is something EC still conveys in our EC CAP messages, however it has mostly been relegated to supplemental information in the non-standard section of a message (for only those parties particularly interested in that class distinction). Additionally, we do however; include the class term in the content section of the CAP message - the part that is used in constructing the tailored audience message. The term warning, watch, advisory and statement are part of the <headline> element Environment Canada populates in a CAP message, which is an element specifically designed for display purposes only to the final audience.

<sup>3</sup> It is noteworthy here to mention that Urgency, Severity and Certainty are pre-set lists of allowable values that all distributors can rely on being present and consistent. Additionally, they have a definition based not on the type of subject hazard(s) present but simply on the way delivery agents can distinguish actions based on the values present. Alerting business, individually or in a community, are the ones to define what those actions would be by policy.

the issuer of the information<sup>4</sup>.

Environment Canada also defines, on behalf of the public, what criteria for a hazard constitutes a warn-able situation. We then notify the public to that situation by employing a variety of signals. These signals can come in many forms. For example: bulletins on a newswire, alarms on a weather radio, banners on a web page, color coded maps on a web page, etc. When we include our partners in the notification aspect of a *warning*, the list of signals grows.

As mentioned, CAP enables delivery of *warning* information. So by our definition of Alert, CAP also enables delivery of Alert information – but how does it actually do that? What alert information is being conveyed? The answer is that CAP carries two types of Alert information:

1. The information for the intended final audience on the hazardous event and recommendations on how to handle it (i.e. the *warning* message)
2. The information needed by delivery agents along the path for the purposes of “getting the message out” to the right place, at the right time, and using the proper signaling

This latter information is not directly the hazard information, but is essentially the generic addressing information much like a label on a package in the mail. It tells the last mile distributor enough information to allow them to know when and where to create a signal. The *warning* information for the final audience is really just the payload (that which goes inside the package) and is delivered along with the signal (depending of course on what type of signal it is).

What it comes down to for Environment Canada as an issuer of *warnings* is whether the last mile distributors assume they are being alerted to an Alert (as we’ve defined Alert) or are they being alerted to a new message. CAP itself doesn’t actually define Alert, just alerting, and therefore has avoided the issue altogether.

Since CAP itself doesn’t define alert, nor does the actual signaling - only enables it, alerting agents need only to rationalize what an alert is in their business model (keeping in mind the above disparities when dealing with different issuers)<sup>5</sup>.

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<sup>4</sup> Technically, the activation only happens once – when the end recipient becomes aware, but since EC is warning the general public we assume that awareness occurs immediately upon distribution of the first message in the series of messages.

<sup>5</sup> The concept of equating an Alert to a *warning* is not uncommon. The alternative of calling an individual warning message an Alert is also not uncommon.

## Types of Alerting

Signals can also be classified in a variety of ways. One classification of significance to Environment Canada is whether the signal is:

- a) Continuous; such as a “siren” (and the “state of awareness” activates when one comes in range of the signal and hears it)
- b) Instantaneous; such as a “text message” (and the “state of awareness” activates when one eventually discovers the message where it was deposited to be found)

Environment Canada signals our clients in both ways.

In both cases the management of the *warning* information that the client is alerted to (last mile distributor or audience), can be handled in a variety of ways. Depending on the last mile distributor medium for dissemination, information that is no longer valid can be discarded, held for a period of time, or maintained indefinitely. When the trigger moment occurs, the audience may be directed to any of these styles of information management based solely on the business models of the alerting agent involved. And depending on which style, the client can act accordingly and gather the relevant information they need.

Whether the *warning* information the client is directed to is held on an issuer platform (i.e. web page), a distributor platform (i.e. repository of messages), or on an audience platform (i.e. a mobile phone), the nature of a signal and the associated alerting model is different. CAP enables all possible alerting models employing either signaling type.

Effectively, CAP does not judge. It enables many types of signaling solutions by employing a simple messaging model. This was done on purpose, primarily to be of service to all alerting parties involved. More importantly, it was done to promote interoperability of Alert messages across different systems and borders.

## Warning Messages and <info> Blocks

In the Environment Canada *warning* model, the term message has a defined meaning and in CAP, that meaning is not entirely equivalent. So like with the terms “warning” and “*warning*” (see section above on Environment Canada *Warning* Business model), distinctions must be defined to help make the Environment Canada position clear as we explain our use of CAP.

On average, several times during the course of a *warning*, a new message is



sent out - once to start it; once to end it; and usually several times in between to update it. This messaging is essentially the operator (forecaster) inputting new information into the system.

In the Environment Canada *warning* model, during an update, the alert/*warning* is redefined to the information found in the new update message. Like with CAP, an update Environment Canada *warning* message replaces in full the information found in the previous Environment Canada *warning* message, but unlike with CAP, the forecaster is doing so only for the locations referenced.

In CAP, the fact that a location is not referenced in an update means that there is no longer any valid message information applicable to that location. However within Environment Canada, occasionally there is. Our data management system consolidates the old still valid information to a current state with the new information and sends it all out in a new CAP message.

Secondly, and a more common practice in Environment Canada, is to create a list of locations for where the hazard is over. This list normally follows the list of locations where the hazard is still ongoing. Often, a single *warning* message contains a list of both<sup>6</sup>.

Therefore, since the information is not necessarily consistent across all referenced locations, we employ a CAP feature known as the multiple <info> blocks. An <info> block within a CAP message is essentially a message for a particular segment of the identified audience of the CAP message. If more than one <info> block is present in a CAP message then more than one audience message is present in a CAP message.

Each audience message is targeted to a different audience group. The differences can be due to *warning* hazard information being different from one location to another, or from one time to another; or the signaling information being different due to a level of Urgency or Severity; or whatever other information is significantly different to require a separate audience message.

Since CAP messages can be made to supersede previous messages by making a reference to the previous CAP message, and because several audience messages can appear in a CAP message, all relevant audience messages need to be superseded when using a CAP message “update” (see Information sheet 2 - *Update, Cancel and Expires- Environment Canada use of CAP Message Types* for more information on CAP message updates). For Environment Canada, since we use “update” frequently, a CAP message must contain everything about the

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<sup>6</sup> Environment Canada considers it good practice to have an end client message telling people the threat is over rather than just having a message for an active threat just disappear off the display when the threat is over.

*warning* that is to be “aired”, or to still be “aired”.

For those occasional in-house messages, where reference locations are attached to older, still valid information; and were not commented on in the latest Environment Canada in-house message, the older, still valid information is placed into the CAP message using its own <info> block.

Furthermore, it is also possible that two or more active areas with different characteristics, all from a single Environment Canada *warning*, will eventually be dealt with using multiple <info> blocks. For example, one case could be in a hurricane warning where areas of differing Urgency and Severity exist, as measured by how far away one is from the forecasted storm track. Environment Canada does not treat these areas as separate *warnings*, just one *warning* with different degrees of urgency by location. As long as this practice continues, our CAP will represent this using multiple <info> blocks.

In another example, based solely on the difference between the initial alert message and a follow up message, new locations (alerted for the first time) could require different signaling information. If an Environment Canada *warning* is updated by adding new locations, it may very well be that the locations that were already present from before may not want the same awareness triggers to be re-sent. This would be a community decision, and one we could accommodate, but it would have to be done using multiple <info> blocks.

Note that while CAP messages have ID's and are able to be backwards referenced, the individual <info> blocks and associated audience message are not. The audience message is a stand-alone message that is carried along and has no relationship to any previous audience message. More information on audience messages can be found in Information sheet 2 - *Update, Cancel and Expires- Environment Canada use of CAP Message Types*.

## **What goes into Environment Canada CAP?**

All Environment Canada *warning* messages are candidates for transformation into Environment Canada CAP alert message form; however to date that is not yet the case. (See Information sheet 3 - *Status of CAP Alerts by event as issued by Environment Canada* for more details on which *warnings* are included in our CAP products).

In that process, the *warning* information is augmented with additional alerting information and then a CAP alert message is generated and distributed. To see what supplemental non-standard information goes into an Environment Canada CAP message and for a list of Environment Canada's own non-standard information see Information sheet 5 – *Environment Canada Layer*.

## How is Environment Canada CAP delivered?

- 1) Environment Canada CAP alert messages are disseminated unaltered through the National Alert Aggregation & Dissemination (NAAD) system. The NAAD system is provided by Pelmorex Communications in support of CRTC Decision 2009-340. For more information, see <http://alerts.pelmorex.com/>

Alerts through this system are available free of charge to radio and television stations, cable and satellite TV companies, wired and wireless telecommunications providers, ISPs and internet websites, and *any* other last mile distributors wishing to connect to the NAAD system.

- 2) CAP alert messages are also shared through the Multi-Agency Situational Awareness System - Information Exchange (MASAS-X) – allowing for situational awareness messages to be shared between first responders and emergency management agencies in Canada. MASAS-X is a national priority as noted in the Communications Interoperability Strategy for Canada and Action Plan. For more information, see <http://www.canops.org/>

The MASAS-X share is comparable to IPAWS Open Platform (Integrated Public Alert and Warning System) in the United States.

- 3) Through an arrangement with the Province of Alberta, Environment Canada CAP alert messages are shared through the Alberta Emergency Management Agency (AEMA) alert system: Alberta Emergency Alert. Alberta Emergency Alert is a province wide program which provides alerts in a broadcast-ready format directly to the public and to distribution partners (broadcast media, social media and other web tools). For more information, see <http://emergencyalert.alberta.ca/>
- 4) Environment Canada also provides our CAP alert message on our Open Data server called the Datamart. The documentation for this service can be found online here: [http://dd.meteo.gc.ca/alerts/doc/README\\_CAP.txt](http://dd.meteo.gc.ca/alerts/doc/README_CAP.txt)

## Modification and Re-origination

Environment Canada also realizes that some partners may wish to modify and

re-originate our CAP messages before sending them downstream to their own clients. Modifying a CAP message involves changing the XML elements present in the file; while re-originating a CAP message essentially means modifying the message and taking ownership of the new resulting CAP message.

Environment Canada expects our partners to not alter the source *warning* information contained within our CAP Alert messages. Partners may add their own layer of additional parameters, reformat to fit a specific client group, filter to specific information, add a digital signature to the file, etc. During such activity, it is expected that none of the source *warning* information within the CAP message attributed to Environment Canada will be altered in any way.

Each partner may choose to exercise this activity based on their own business model and Environment Canada does not vouch for the validity and accuracy of any modified and re-originated CAP messages. However, our CAP feeds to these partners is contingent upon their good will to not alter the source *warning* information. That is, no changes to the basic *warning* message elements like <eventType>, <urgency>, <severity> and <certainty>, etc. should occur in the modification and re-origination process.

Environment Canada CAP Alert feeds are only provided to partners who have signed an agreement with Environment Canada for the right to receive a direct feed from us with the intent to re-distribute our CAP Alert messages.

### **Additional Information**

To better understand the Environment Canada business model for issuing *warnings* and alerts please consult the information sheet 2 - *Update, Cancel and Expires - Environment Canada use of CAP Message Types*. Basic information about how and when *warnings* and alerts are issued and updated is described there.

If certain alerting information expected in a CAP message is not present in a CAP message, this has nothing to do with the CAP Standard itself - it will have to do with the chosen business model of the issuer. Environment Canada is no exception, and these information sheets attempt to explain Environment Canada CAP and our chosen business model.

### **Future Direction**

Environment Canada will continue to evaluate our CAP products to ensure it meets the needs of our clients and that sound practices are being implemented.

With this in mind, efforts are underway to augment even more information into our *warning* program and thus CAP products. One example is the effort underway to add additional instruction when threatening weather approaches.

The information sheets surrounding Environment Canada Common Alerting Protocol messages will be revised as changes, corrections, and new releases are made available.