WORLD TELECOMMUNICATION
DEVELOPMENT CONFERENCE

ITU WTDC
BAKU2025
17–28 November 2025
Baku, Azerbaijan

20th Asia Media Summit (AMS) 2025 - Pre-event
21 July 2025
Leveraging ITU-Standardized CAP (ITU-T X.1303) Alerting for Effective Early Warning Dissemination

21 July 2025

Agenda

- Introduction to Common Alerting Protocol (CAP)
- CAP structure and example
- CAP Infrastructure and Integration
  - CAP origination
  - CAP aggregator
  - CAP dissemination
- CAP Alerting Authority

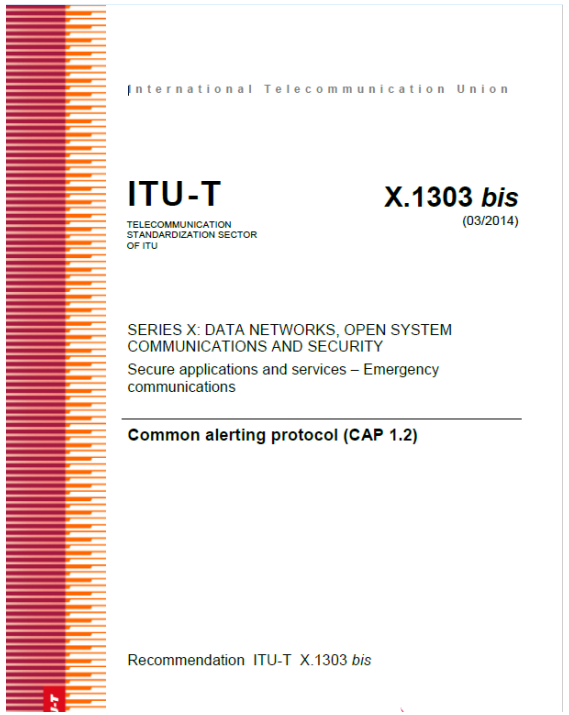
Agenda

- Introduction to Common Alerting Protocol (CAP)
- CAP structure and example
- CAP Infrastructure and Integration
  - CAP origination
  - CAP aggregator
  - CAP dissemination
- CAP Alerting Authority

Introduction to Common Alerting Protocol CAP

Some history …

- 2000: The U.S. National Science and Technology Council's (NSTC) report "Effective Disaster Warnings" recommended the development of a standard method to collect and relay instantaneously and automatically all types of hazard warnings across various dissemination channels.
- 2001: an international independent working group began specifying and prototyping the CAP data structure based on the recommendations of the NSTC report.
- 2004: CAP v1.0 was developed and ratified as an OASIS (Organization for the Advancement of Structured Information Standards) Standard.
- Updates:
  - 2005: OASIS Standard CAP v1.1
  - 2010: OASIS Standard CAP v1.2
- Adopted by the International Telecommunication Union – Standardization Sector (ITU-T) in 2006 and updated in 2014 as Recommendation ITU-T X.1303bis Common Alerting Protocol (CAP 1.2) (03/2014).
- Today, CAP has been extensively adopted worldwide.



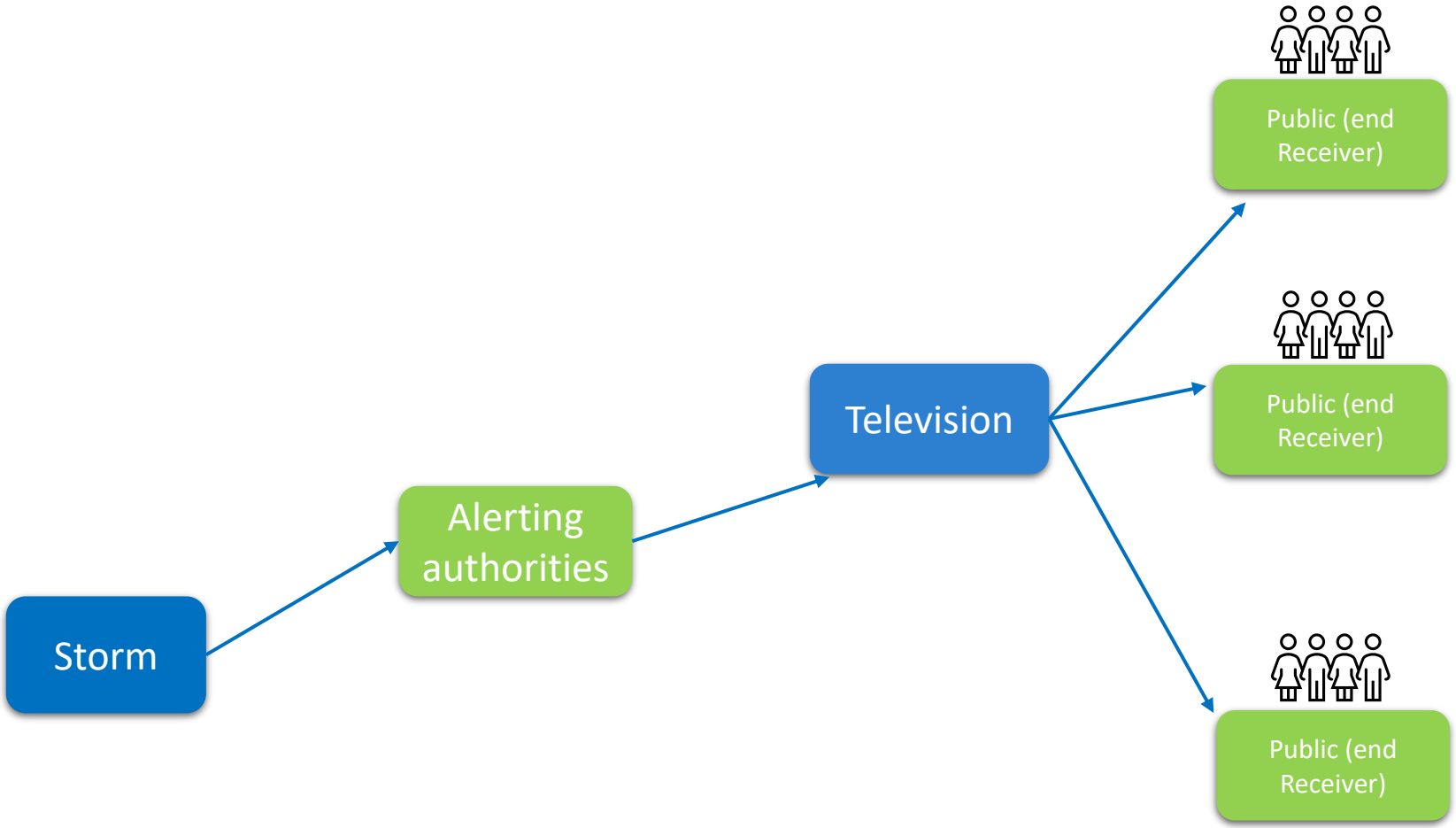
CAP – Common Alerting Protocol

The Challenge of Alerting without CAP

All governments have various public alerting systems. It creates a “public alerting patchwork”:

- multiple alerting authorities send multiples alerts through multiple channels (first receivers or disseminators) to multiple audiences (end receivers).

This can lead to missed or misdirected alerts and confusion.

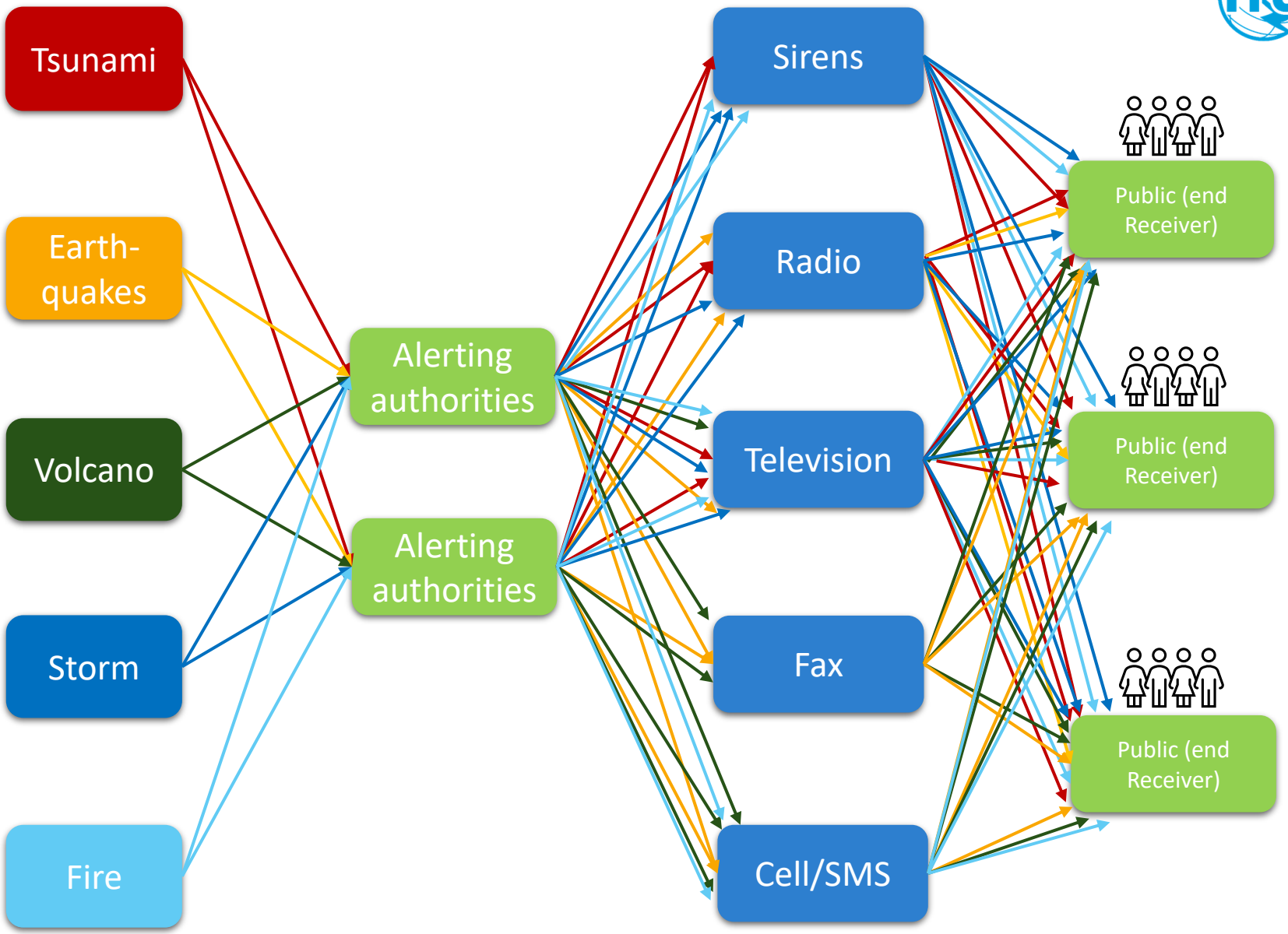


The Challenge of Alerting without CAP

All governments have various public alerting systems. It creates a “public alerting patchwork”:

- multiple alerting authorities send multiples alerts through multiple channels (first receivers or disseminators) to multiple audiences (end receivers).

This can lead to missed or misdirected alerts and confusion.



Introduction to Common Alerting Protocol CAP

What is CAP?

- International standard format for emergency alert messages.
- CAP is designed to **simplify and streamline** the way alerts are **created, shared and distributed** across different systems and devices.
- CAP is an **open, non-proprietary** digital message format.
- CAP is **machine** (xml – eXtensible Markup Language) and **human** (text) readable.
- CAP provides the key facts related to an emergency:
  - **What** is the emergency?
  - **Where** is the affected area?
  - **How soon** do we need to act?
  - **How bad** will it be?
  - **How certain** are the experts?
  - **What** should we do?

Definitions

- Alert Origination: Usually, software that provides alerting authorities the ability to compose, send and receive CAP-based messages.
- Receiver: Disseminator
- Sender: Alerting authority
- Alerting Authority: are those government agencies that have been given the authority to initiate (issue) alerts to be disseminated to the public at risk of an imminent disaster, or to initiate (issue) alerts to disseminate detailed public safety messages.
- Transport: Ways of transmitting the information.
- CAP Feed: Continuously available or regularly updated data source that distributes CAP messages. It provides a structured stream or repository of CAP-formatted alerts, allowing automated systems, applications, or users to access, retrieve, and process emergency notifications in real time.
- CAP Hub: Centralized platform that aggregates Common Alerting Protocol (CAP) alerts from various official alerting authorities and republish them to its subscribers.

Agenda

- Introduction to Common Alerting Protocol (CAP)
- CAP structure and example
- CAP Infrastructure and Integration
  - CAP origination
  - CAP aggregator
  - CAP dissemination
- CAP Alerting Authority

XML: a Digital Document Format

CAP alert messages are created and disseminated using XML (eXtensible Markup Language).

XML is designed to store and transport information via the internet. It contains information readable both by humans and software.

```
<?xml version="1.0" encoding="UTF-8"?>
<note>
   <to>John</to>
   <from>Jane</from>
   <heading>Weather Report</heading>
   <body>This weekend's forecast is for clear and sunny skies.</body>
   <importance>Not important</importance>
</note>
```

Structure of a CAP Message

CAP Messages contain:

- Text values for human readers ("headline", "description", "instruction", "area description", etc.)
- Coded values useful for filtering, routing, and automated translation to human languages

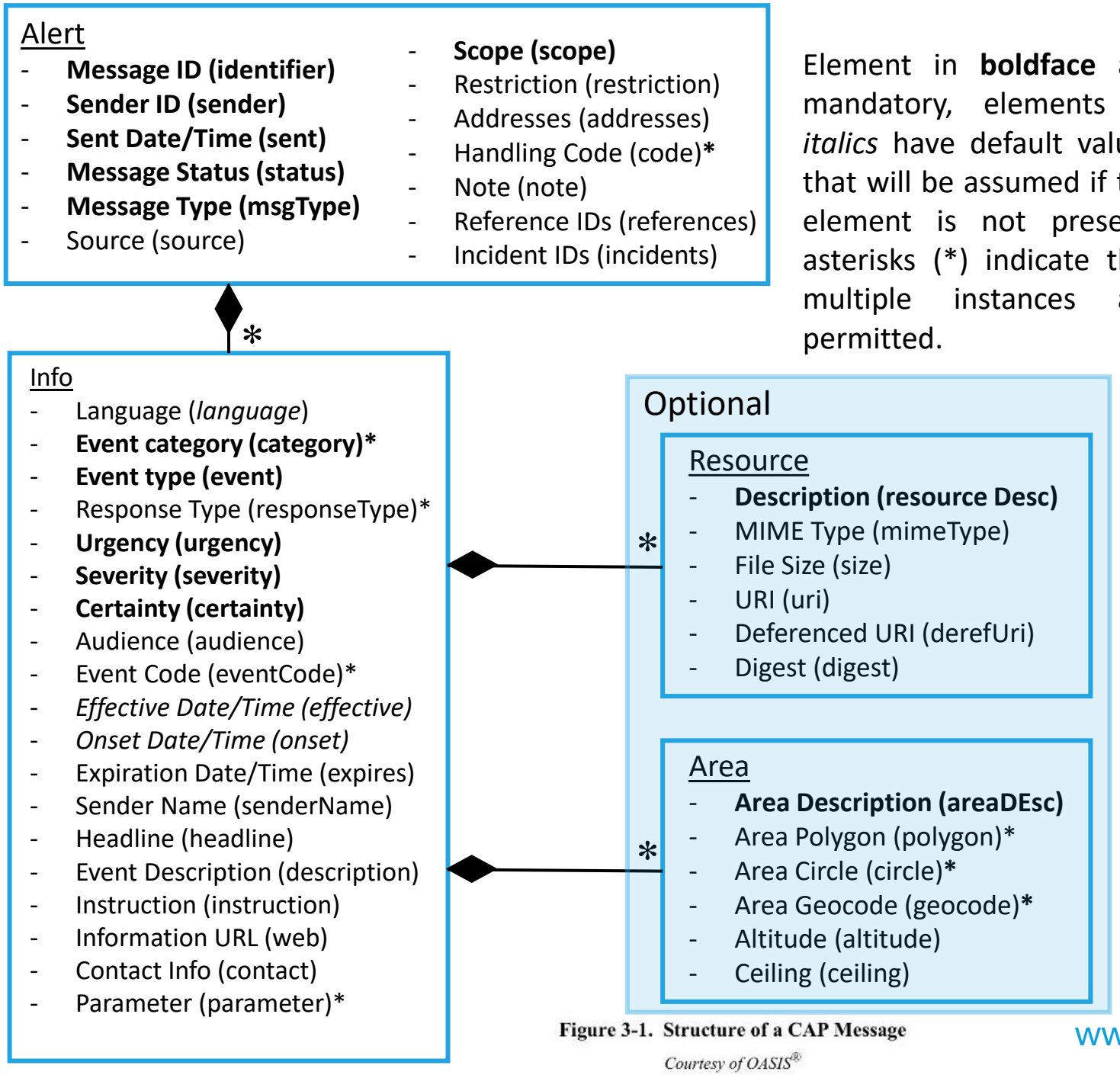


Figure 3-1. Structure of a CAP Message

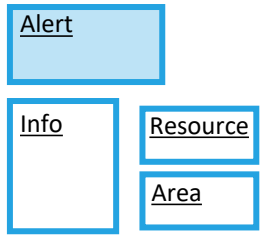
Courtesy of OASIS®

Element in **boldface** are mandatory, elements in *italics* have default values that will be assumed if the element is not present; asterisks (*) indicate that multiple instances are permitted.

Sample CAP Message


```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Structure of a CAP Message - Alert



Alert

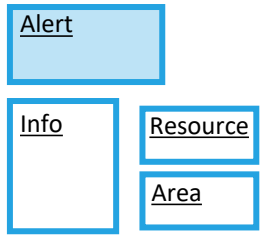
- **Message ID (identifier)**
- **Sender ID (sender)**
- **Sent Date/Time (sent)**
- **Message Status (status)**
- **Message Type (msgType)**
- Source (source)
- **Scope (scope)**
- Restriction (restriction)
- Addresses (addresses)
- Handling Code (code)*
- Note (note)
- Reference IDs (references)
- Incident IDs (incidents)

The <alert> segment provides basic information about the current message:

- its purpose
- its source
- its status
- a unique identifier for the current message and links to any other related messages

An <alert> segment may be used alone for message acknowledgements, cancellations or other system functions, but most <alert> segments will include at least one <info> segment.

Structure of a CAP Message - Alert



Alert

- **Message ID (identifier)**
- **Sender ID (sender)**
- **Sent Date/Time (sent)**
- **Message Status (status)**
- **Message Type (msgType)**
- Source (source)
- **Scope (scope)**
- Restriction (restriction)
- Addresses (addresses)
- Handling Code (code)*
- Note (note)
- Reference IDs (references)
- Incident IDs (incidents)

Some elements have values already defined by CAP:

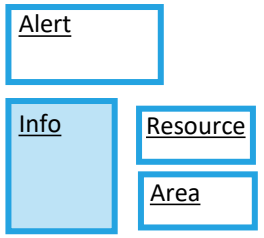
Message Status	Message Type	Scope
Actual	Alert	Public
Exercise	Update	Restricted
System	Cancel	Private
Test	Ack	
Draft	Error	

Some elements are free text which means the information is not a coded value or a text item that must be picked from a list.

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Structure of a CAP Message - Info



The <info> segment describes an anticipated or actual event in terms of:

- its urgency (time available to prepare),
- its severity (intensity of impact)
- its certainty (confidence in the observation or prediction)

This segment provide both categorical and textual descriptions of the subject event.

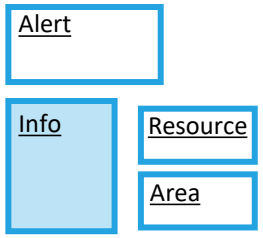
It may also provide instructions for appropriate response by message recipients and various other details (hazard duration, technical parameters, contact information, links to additional information sources, etc.)

Multiple <info> segments may be used to describe differing parameters (e.g., for different probability or intensity “bands”) or to provide the information in multiple languages.

Info

- Language (*language*)
- **Event category (category)***
- **Event type (event)**
- Response Type (responseType)*
- **Urgency (urgency)**
- **Severity (severity)**
- **Certainty (certainty)**
- Audience (audience)
- Event Code (eventCode)*
- *Effective Date/Time (effective)*
- *Onset Date/Time (onset)*
- Expiration Date/Time (expires)
- Sender Name (senderName)
- Headline (headline)
- Event Description (description)
- Instruction (instruction)
- Information URL (web)
- Contact Info (contact)
- Parameter (parameter)*

Structure of a CAP Message - Info



Some elements have values already defined by CAP:

Event Categories

Geological (Geo)
Meteorological (Met)
Safety
Security
Rescue,
Fire
Health
Environment (Env)
Transport
Infrastructure (Infra)
Other

Urgency

Immediate
Expected
Future
Past

Severity

Extreme
Severe
Moderate
Minor

Certainty

Very Likely
Likely
Possible
Unlikely

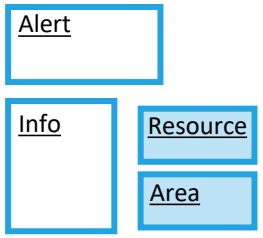
Info

- Language (*language*)
- **Event category (category)***
- **Event type (event)**
- Response Type (responseType)*
- **Urgency (urgency)**
- **Severity (severity)**
- **Certainty (certainty)**
- Audience (audience)
- Event Code (eventCode)*
- *Effective Date/Time (effective)*
- *Onset Date/Time (onset)*
- Expiration Date/Time (expires)
- Sender Name (senderName)
- Headline (headline)
- Event Description (description)
- Instruction (instruction)
- Information URL (web)
- Contact Info (contact)
- Parameter (parameter)*

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Structure of a CAP Message – Resource and Area



Resource

The <resource> segment provides an optional reference to additional information related to the <info> segment within which it appears in the form of a digital asset such as an image or audio file.

Area

The <area> segment describes a geographic area to which the <info> segment in which it appears applies.

Textual and coded descriptions (such as postal codes) are supported, but the preferred representations use geospatial shapes (polygons and circles) and an altitude or altitude range, expressed in standard latitude/longitude/altitude terms in accordance with a specified geospatial datum.

Optional

Resource
- **Description (resource Desc)**
- MIME Type (mimeType)
- File Size (size)
- URI (uri)
- Deferenced URI (derefUri)
- Digest (digest)

Area
- **Area Description (areaDEsc)**
- Area Polygon (polygon)*
- Area Circle (circle)*
- Area Geocode (geocode)*
- Altitude (altitude)
- Ceiling (ceiling)

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
 <info>
   <language>en-US</language>
   <category>Met</category>
   <event>Flash Flood Warning</event>
   <responseType>Avoid</responseType>
   <urgency>Immediate</urgency>
   <severity>Severe</severity>
   <certainty>Likely</certainty>
  <eventCode>
   ...
   </eventCode>
  <eventCode>
   ...
   </eventCode>
   <effective>2025-01-31T07:59:00-10:00</effective>
   <onset>2025-01-31T07:59:00-10:00</onset>
   <expires>2025-01-31T11:00:00-10:00</expires>
   <senderName>NWS Honolulu HI</senderName>
   <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
   <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
   AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
   remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
   SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
   areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
   Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
   Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
   <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
   <web>http://www.weather.gov</web>
  <area>
    <areaDesc>Hawaii in Hawaii, HI</areaDesc>
    <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
    19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
   </area>
 </info>
</alert>
```

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
 <info>
   <language>en-US</language>
   <category>Met</category>
   <event>Flash Flood Warning</event>
   <responseType>Avoid</responseType>
   <urgency>Immediate</urgency>
   <severity>Severe</severity>
   <certainty>Likely</certainty>
  <eventCode>
   ...
   </eventCode>
  <eventCode>
   ...
   </eventCode>
   <effective>2025-01-31T07:59:00-10:00</effective>
   <onset>2025-01-31T07:59:00-10:00</onset>
   <expires>2025-01-31T11:00:00-10:00</expires>
   <senderName>NWS Honolulu HI</senderName>
   <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
   <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
   AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
   remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
   SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
   areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
   Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
   Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
   <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
   <web>http://www.weather.gov</web>
  <area>
    <areaDesc>Hawaii in Hawaii, HI</areaDesc>
    <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
    19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
   </area>
 </info>
</alert>
```

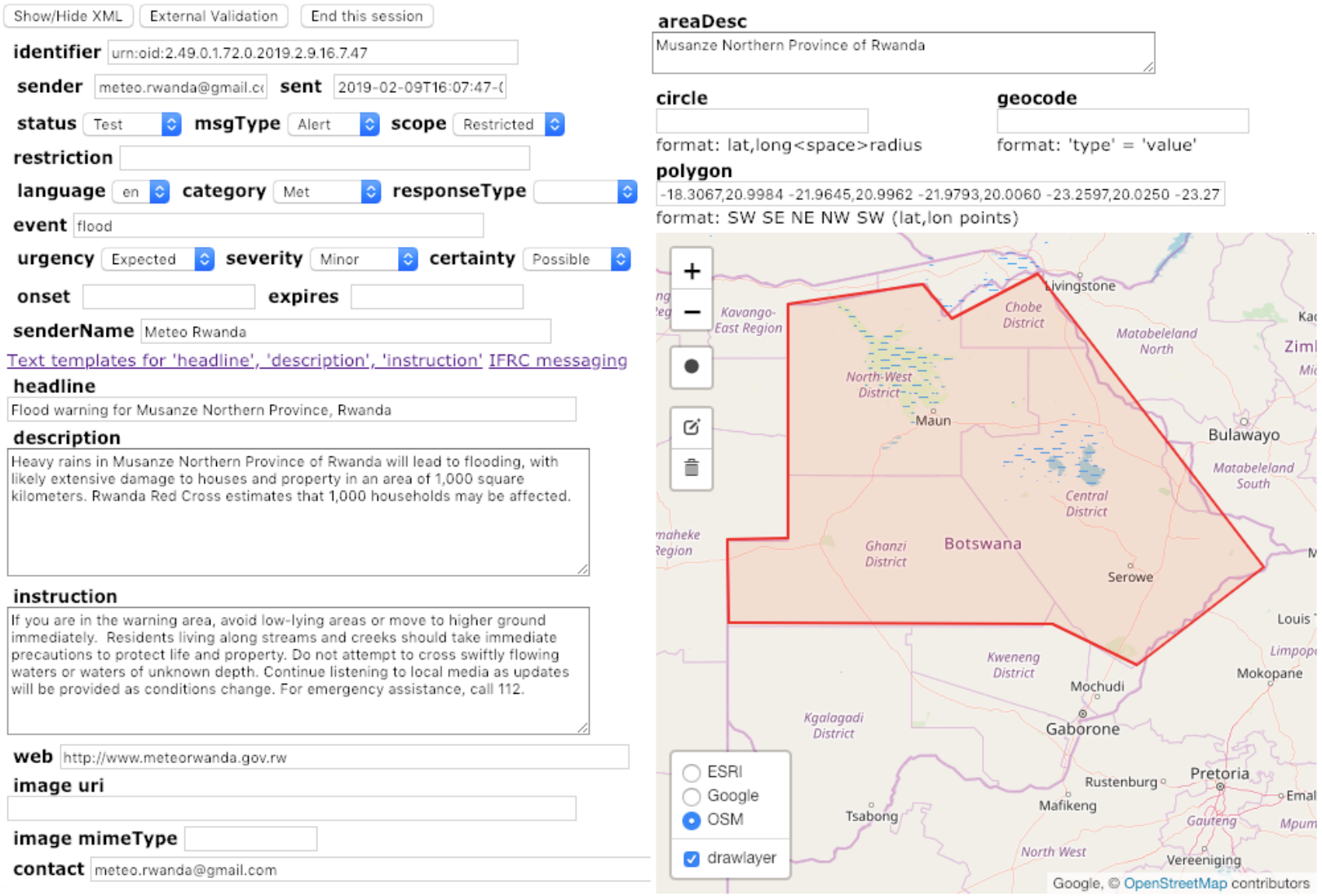
Sample CAP Message

```
<alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
  <identifier>urn:oid:2.49.0.1.840.0.4a7952ab2edbf8d01b2536baeb6010cd08e36524.001.1</identifier>
  <sender>w-nws.webmaster@noaa.gov</sender>
  <sent>2025-01-31T07:59:00-10:00</sent>
  <status>Actual</status>
  <msgType>Alert</msgType>
  <scope>Public</scope>
  <code>IPAWSv1.0</code>
  <info>
    <language>en-US</language>
    <category>Met</category>
    <event>Flash Flood Warning</event>
    <responseType>Avoid</responseType>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <eventCode>
    ...
    </eventCode>
    <eventCode>
    ...
    </eventCode>
    <effective>2025-01-31T07:59:00-10:00</effective>
    <onset>2025-01-31T07:59:00-10:00</onset>
    <expires>2025-01-31T11:00:00-10:00</expires>
    <senderName>NWS Honolulu HI</senderName>
    <headline>Flash Flood Warning issued January 31 at 7:59AM HST until January 31 at 11:00AM HST by NWS Honolulu HI</headline>
    <description>FFWHFO The National Weather Service in Honolulu has issued a * Flash Flood Warning for... The island of Hawaii in Hawaii County * Until 1100 AM HST. * At 759
    AM HST, radar and rain gages indicated heavy rainfall over the west and south sides of the Big Island. Peak rain rates of up to 2 inches were moving onshore. Area streams
    remain elevated, and additional rainfall is likely to continue to move over the Big Island from the southwest this morning. HAZARD...Flash flooding caused by heavy rain.
    SOURCE...Radar and automated gauges. IMPACT...Flooding in drainages, streams, rivers, roads, properties, and other low-lying areas. Public road closures possible in some
    areas. Landslides are possible in steep terrain. * Some locations that will experience flash flooding include... Kailua-Kona, Captain Cook, Waikoloa Village, Kapaau,
    Pohakuloa Training Area, Honaunau, Kealakekua, Kainaliu, Honalo, Holualoa, Kahaluu-Keauhou, Wood Valley, Puuanahulu, Kalaoa, Pahala, Punaluu Beach, Hawaiian Ocean View,
    Kawa Flats, Naalehu and Hawaii Volcanoes National Park. </description>
    <instruction>Stay away from streams, rivers, drainage ditches, and culverts, even if they are currently dry.</instruction>
    <web>http://www.weather.gov</web>
    <area>
      <areaDesc>Hawaii in Hawaii, HI</areaDesc>
      <polygon>19.98,-155.85 20.2,-155.92 20.27,-155.89 20.28,-155.88 20.26,-155.76 20.12,-155.59 19.44,-155.68 19.37,-155.47 19.43,-155.06 19.34,-154.98 19.25,-155.16
      19.25,-155.29 19.13,-155.5 18.96,-155.59 18.9,-155.67 19.03,-155.89 19.14,-155.93 19.46,-155.93 19.73,-156.08 19.98,-155.85</polygon>
    </area>
  </info>
</alert>
```

Practice – CAP Alert Creation

Free Tool for CAP Alert Creation, a first step into “Origination”

https://cap.alert-hub.org



Practice – CAP Alert Creation

1. Open a CAP Editor: https://cap.alert-hub.org

2. Create a CAP file for your country

3. Fill the CAP file

4. Verify the content with a validator: https://cap-validator.appspot.com/

google.org Common Alerting Protocol Validator

The Common Alerting Protocol validator is a free service that checks the syntax of CAP XML messages and Atom, RSS and EDXL-DE feeds of CAP messages. It supports CAP v1.0, v1.1 and v1.2.

Input feed

```
   <eventCode>
     <valueName>SAME</valueName>
     <value>SVR</value>
   </eventCode>
   <expires>2003-06-17T16:00:00-07:00</expires>
   <senderName>NATIONAL WEATHER SERVICE SACRAMENTO CA</senderName>
   <headline>SEVERE THUNDERSTORM WARNING</headline>
   <description> AT 254 PM PDT...NATIONAL WEATHER SERVICE DOPPLER RADAR
INDICATED A SEVERE
THUNDERSTORM OVER SOUTH CENTRAL ALPINE COUNTY...OR ABOUT 18 MILES SOUTHEAST OF
KIRKWOOD...MOVING
SOUTHWEST AT 5 MPH. HAIL...INTENSE RAIN AND STRONG DAMAGING WINDS ARE LIKELY
WITH THIS
STORM.</description>
   <instruction>TAKE COVER IN A SUBSTANTIAL SHELTER UNTIL THE STORM PASSES.
</instruction>
   <contact>BARUFFALDI/JUSKIE</contact>
   <area>
     <areaDesc>EXTREME NORTH CENTRAL TUOLUMNE COUNTY IN CALIFORNIA, EX
NORTHEASTERN
CALAVERAS COUNTY IN CALIFORNIA, SOUTHWESTERN ALPINE COUNTY IN
CALIFORNIA</areaDesc>
     <polygon>38.47,-120.14 38.34,-119.95 38.52,-119.74 38.62,-119.89
38.47,-120.14</polygon>
     <geocode>
       <valueName>SAME</valueName>
       <value>006109</value>
     </geocode>
     <geocode>
```

Type an alert or upload a file.

Try these examples:

CAP 1.2 Severe Thunderstorm Warning
CAP 1.2 Homeland Security Advisory
CAP 1.1 Earthquake Atom feed
CAP 1.1 Amber Alert RSS feed
CAP 1.2 Rural Fire EDXL-DE feed

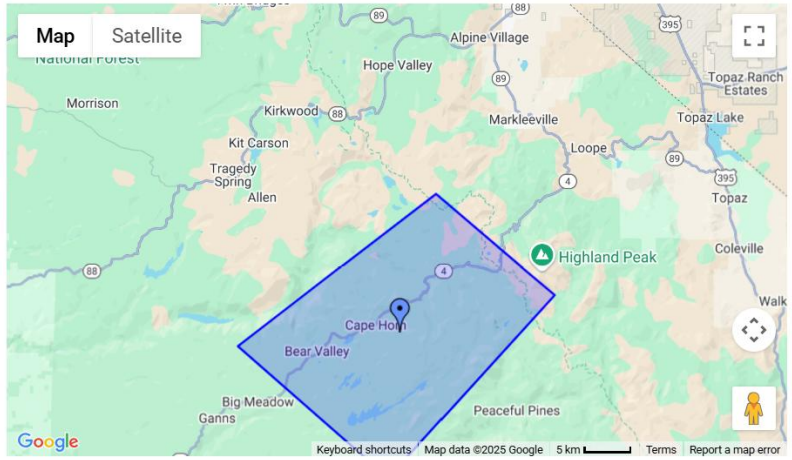
Subscribe to feed validation results

- ☐ US IPAWS Profile v1.0
- ☐ CAP Canadian Profile v1.0
- ☐ CAP Australian Profile v3.0, Committee Specification 02
- ☐ Google Public Alerts CAP v1.0

Validate

Result

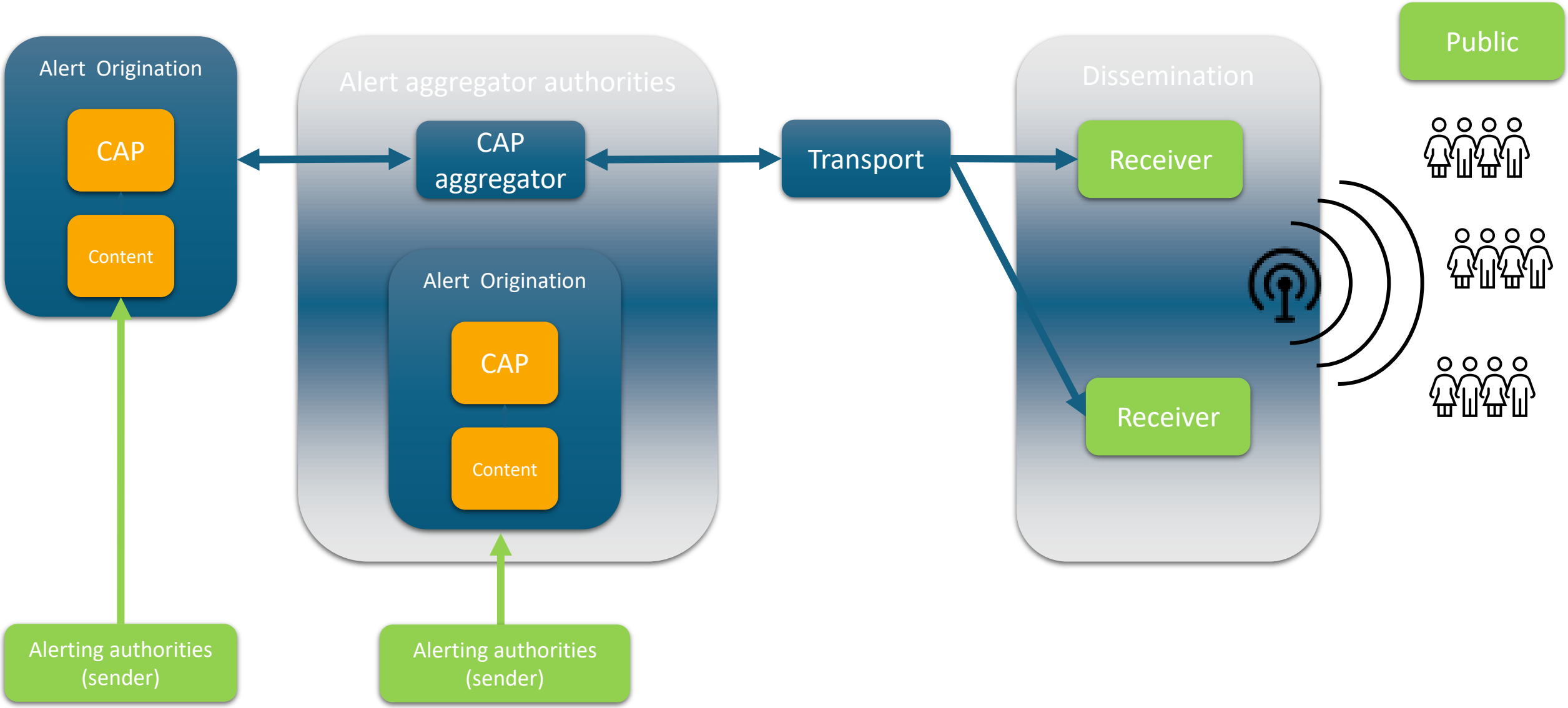
Valid!



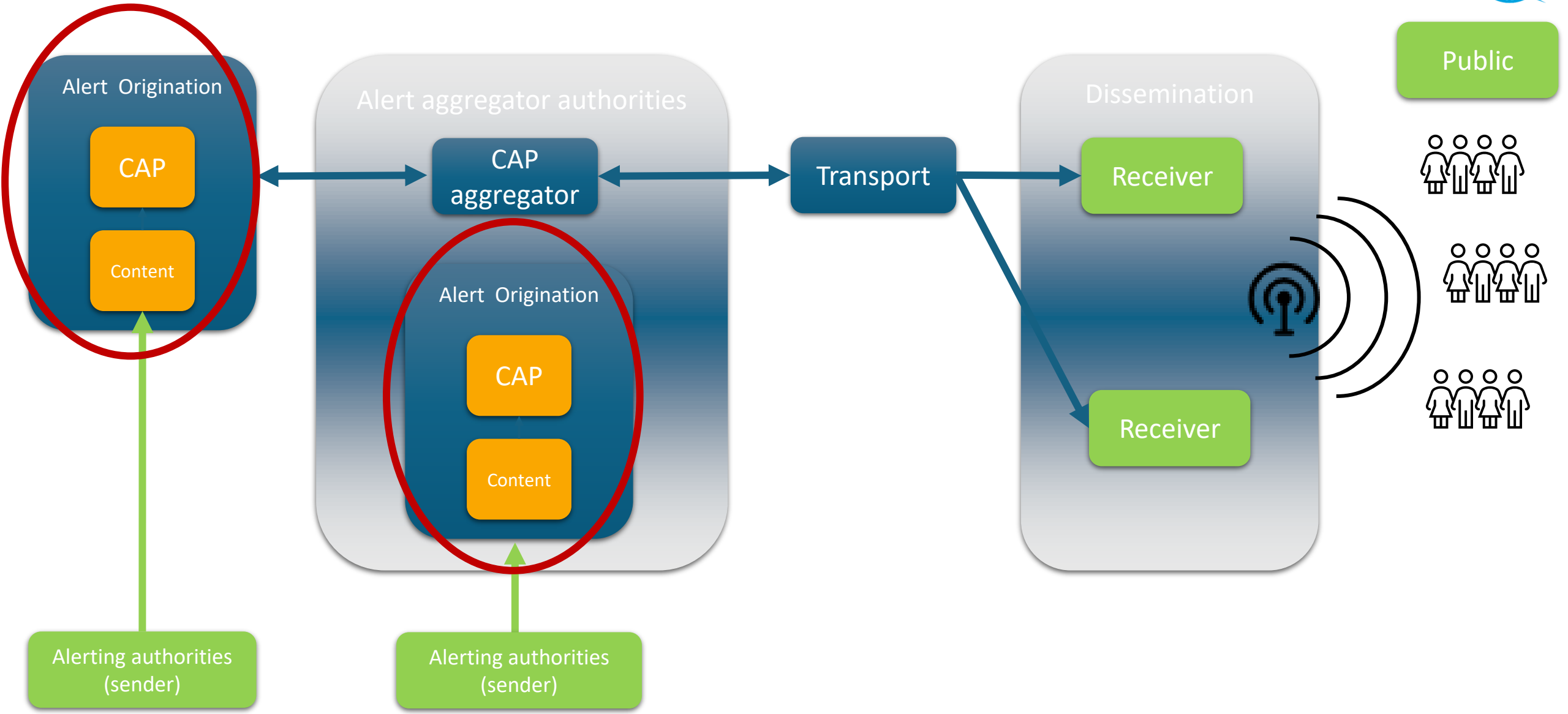
Agenda

- Introduction to Common Alerting Protocol (CAP)
- CAP structure and example
- CAP Infrastructure and Integration
  - CAP origination
  - CAP aggregator
  - CAP dissemination
- CAP Alerting Authority

All-Hazards, All-Media Message Format



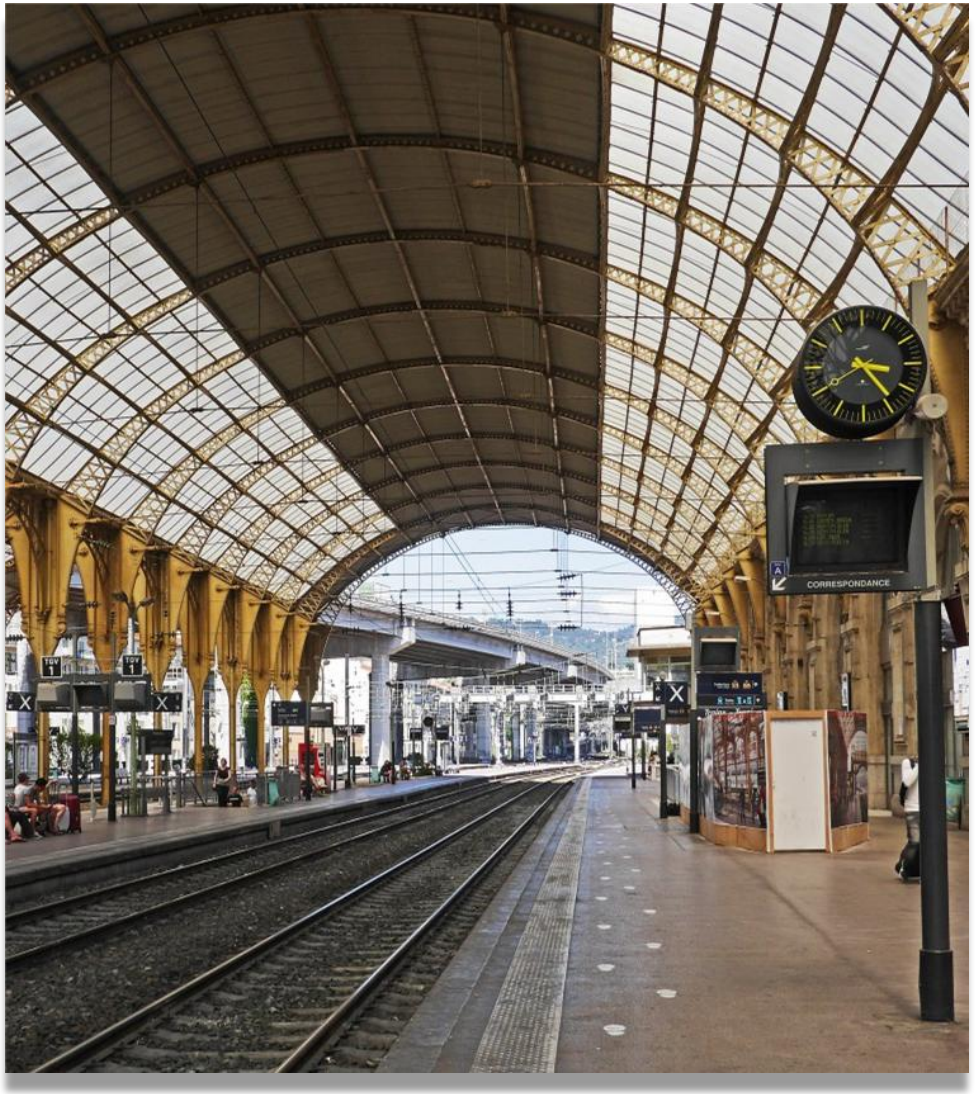
Alert Origination



Alert Origination

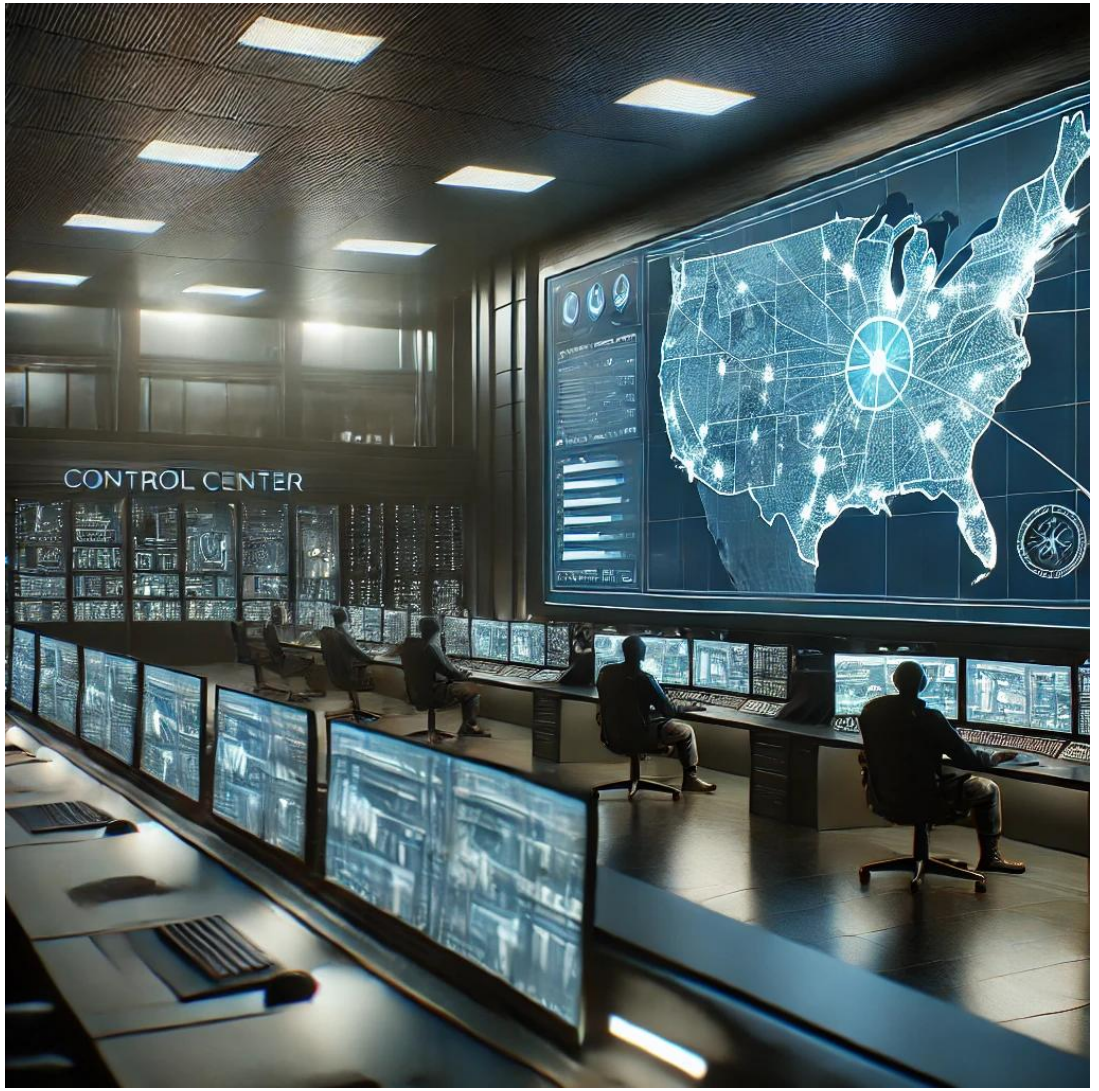
- **What is CAP Origination?**

CAP Origination is the process where an **authorized entity** (e.g., government, emergency management center, NDMA) creates and sends an emergency alert in **CAP format**. This is the **first critical step** in the emergency communication chain before dissemination through various public and private alerting channels.



Alert Origination Software

- A smart interface (software) that interprets business workflows, manages roles, and seamlessly generates dissemination orders and collects feedback, ensuring coherence and transparency, including CAP messages and beyond.



Alert Origination Software

Step 1: Alert decision

Alert sending is decided ***can be automatized**

Step 2: Authentication & logging (Role and responsibilities)

Determinate the responsibility for the software and area of use.

Step 3: Message Composition

CAP message is **structured (all parameters including geo-targeting), validated, and assigned a priority level**

Step 4: Approval & Authorization

Ensures compliance with alerting policies and national regulations

Step 5: Transmission to Aggregator (campaign notion)

CAP message is sent to **CAP Aggregators, MNOs, or Government Alerting Systems**

Step 6: Multi-Channel Dissemination

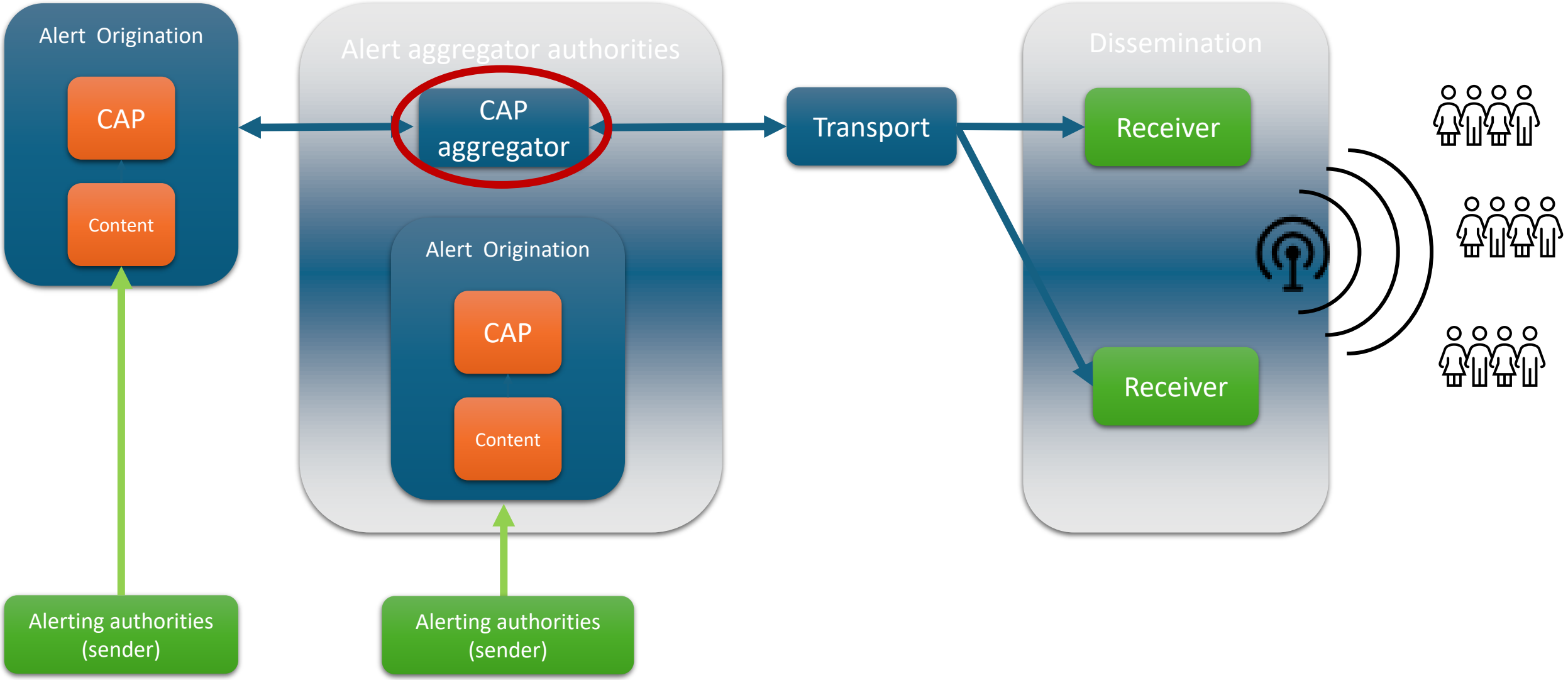
CAP message reaches **MNOs (CB…), TV, Radio, Mobile Networks, Sirens, IoT, Social Media**

Step 7: Feedback and statistics

The decision maker has an immediate view of the ongoing campaign.

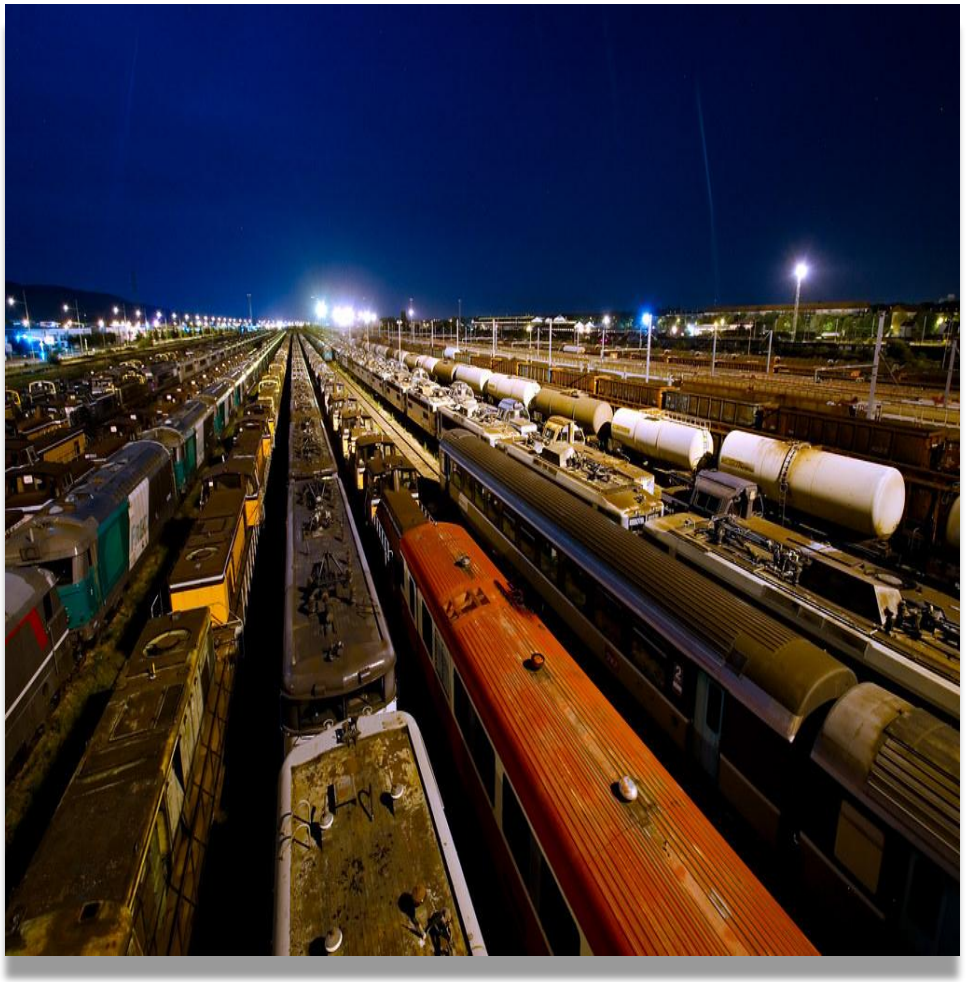
It also provides a way of managing technical errors on disseminators and acting accordingly.

Functional Level (components)



CAP Aggregator

CAP aggregator



Centralizing & Streamlining Alert Dissemination

A **CAP Aggregator** is a central component in an early warning system that **collects, standardizes, and redistributes** alerts from multiple sources to ensure uniform, multi-channel dissemination.

Why is a CAP Aggregator Important?

CAP aggregator

Interoperability – Ensures seamless communication between different alerting authorities and technologies.

Efficiency : Automates alert distribution, reducing delays in critical situations.

Scalability : Supports national and regional alerting needs across various hazard types and disseminators.

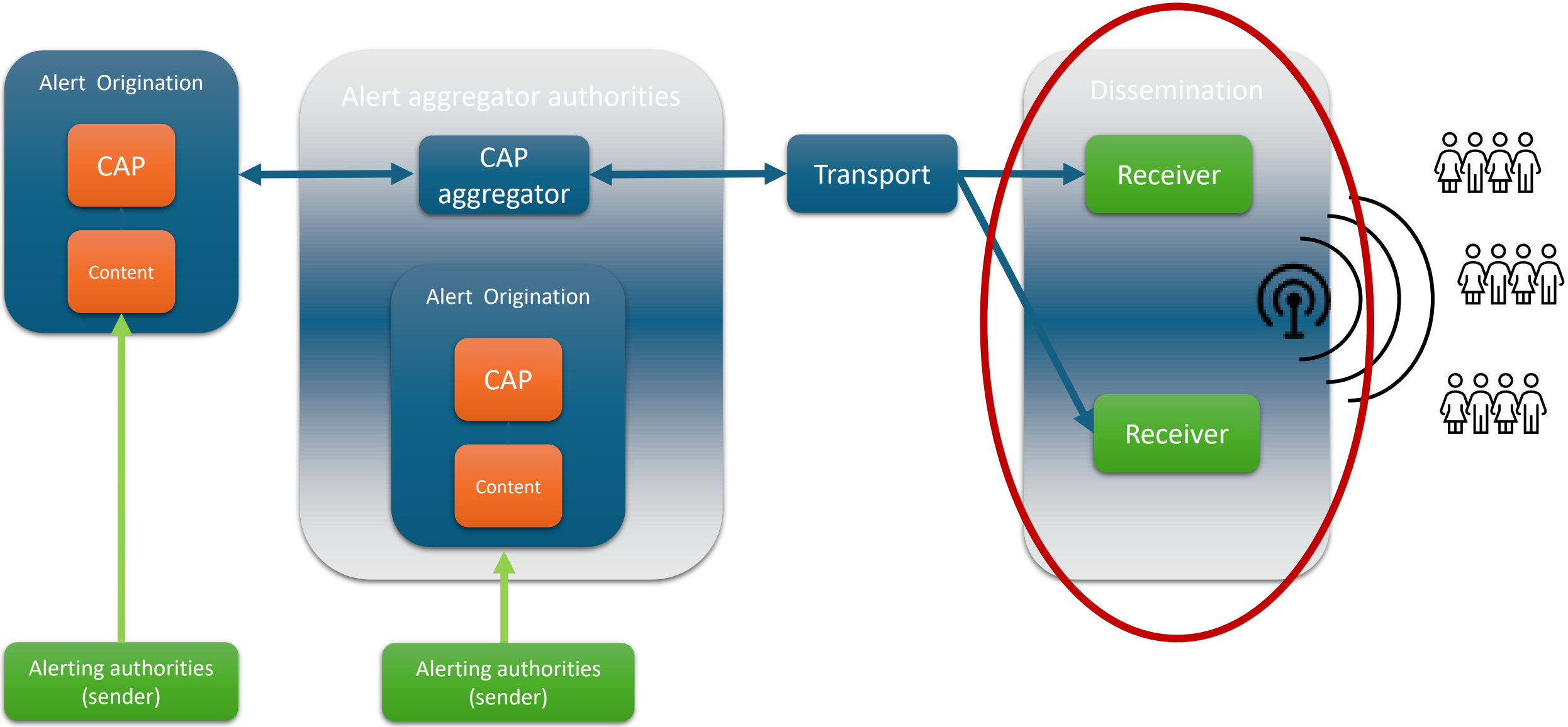
Reliability : Provides redundancy and fallback mechanisms in case of infrastructure failures.

CAP Aggregator Key functions

CAP aggregator

- **Receives CAP messages** from multiple authorized alert originators (e.g., government agencies, meteorological services, emergency response units).
- **Validates and standardizes alerts** to ensure compliance with the CAP format (ITU-T X.1303) and the policy.
- **Filters and categorizes alerts** based on priority, geography, and recipient type.
- **Routes alerts** to multiple dissemination channels.
- **Ensures message consistency** across all platforms, avoiding misinformation or duplicated alerts.

Dissemination



Disseminators

- Phone Network
  - MNOs CellBroadcast
  - MNOs SMS (LB-SMS, National SMS…)
  - Voice messages
  - Fax
- Satellite
- Radio
  - Analog/Digital Radio
  - Radio display
  - Beepers/Pagers
- Television
- Infrastructure networks
  - Digital road signs / Billboards
  - Sirens

- Internet
  - Public feeds
  - Government Websites
  - Syndicated websites
  - App & Instant messaging App
  - Social media
  - Online gaming
  - IoT
  - E-mails

Match the Right Disseminator to the Right Purpose

1. **Speed of Dissemination**: How quickly the message reaches the audience.
2. **Mass Notification Ability**: Ability to notify large audiences simultaneously.
3. **Content Capacity (Poor to Rich)**: Maximum message richness (e.g., text size, multimedia).
4. **Feedback Capacity**: Whether recipients can respond or acknowledge the alert.
5. **Automation Effectiveness**: refers to the ability of a system to efficiently execute tasks with minimal human intervention, ensuring speed, accuracy, adaptability, and reliability in dynamic or emergency environments.
6. **Geo-Targeting Effectiveness**: Precision in reaching specific groups or areas.
7. **Alignment with Alert Constraints**: Compliance with CAP format and dissemination requirements.

Agenda

- Introduction to Common Alerting Protocol (CAP)
- CAP structure and example
- CAP Infrastructure and Integration
  - CAP origination
  - CAP aggregator
  - CAP dissemination
- CAP Alerting Authority

Reminder: What is an Alerting Authority?

Alerting authorities

Government agencies that have been given the authority to initiate (issue) alerts to be disseminated to the public at risk of an imminent disaster, or to initiate (issue) alerts to disseminate detailed public safety messages.

Examples

Meteorological Service of New Zealand Limited

India Meteorological Department

Ministry of Water Resources and Meteorology, Cambodia

The Role of WMO Registry in CAP and Other CAP Implementations

Purpose

Verifies and lists authorised alerting authorities worldwide.

Usage

- Used by **CAP Alert Hubs** (e.g., WMO Alert Hub, Google Public Alerts)
- Supports **CAP Feeds** for CAP Aggregators and online alerting platforms
- Ensures that only **verified sources** issue alerts

Limitations

- Designed for aggregation & public awareness, not real-time dissemination.
- Latency Issues: CAP feeds rely on periodic polling or updates, causing delays.

Example

A national meteorological agency registers with WMO. When they publish a CAP alert, CAP Hub and CAP Aggregator (Google, MeteoAlarm, WMO Alert Hub) **validate its authenticity** before distributing it to various online platforms.

Increasing Interoperability and Reducing Cost

- International standard format for emergency alerting to ensure the interoperability and consistency of alerts via different communication networks.
- A CAP message sender can activate multiple alerting systems with a single input
- Standardized alerts from many sources can be compiled for "situational awareness“
- Managers can monitor the whole picture across all types of local, regional, and national alerts (public alerts as well as messages among emergency personnel)
- Integrating CAP into Multi-Hazard Early Warning Systems
- Local agreement of the CAP specificities and the feedback between Authorities and Mobile Network Operators before implementation (negotiation)

Typical CAP-based Alerting System

Phone operator Networks

MNOs Cell Broadcast
MNOs SMS
Voice Messages
Fax

Infrastructure

Digital Roads Signs
Digital Billboards
Sirens

Internet

Public Feeds
Government Websites
Apps/Instant Messaging Apps
Social Media
Online Gaming
IoT
E-mails

Radio

Analog Radio
Radio Display RDS
DAB+
Bipers

Television

Analog TV
Digital TV (ATSC 3.0)

Satellite

Multiple technologies

Thank you