



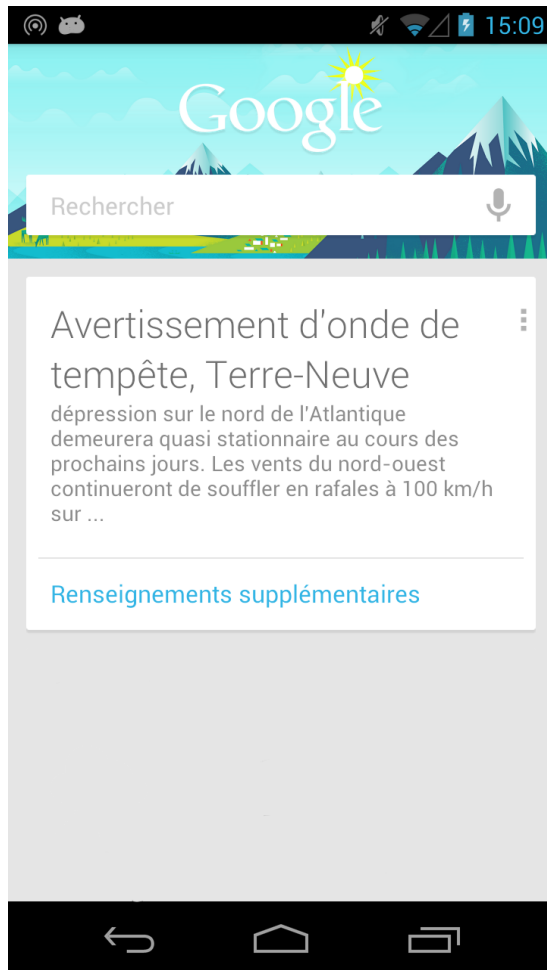
Hierarchical structured data in CAP

Steve Hakusa
Google.org Crisis Response
April 24, 2013

Agenda

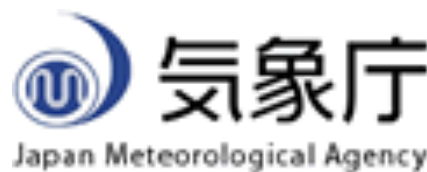
- Google Public Alerts
- Challenges with structured data
 - Amber alerts
 - Tsunami warnings
 - Earthquake notifications
- Next steps

Google Public Alerts



Google Public Alerts

- Launched in 2011
- 7 alert providers
- 3 countries
- 3 languages
- ~100 different alert types
- >100M views on Google
- Currently working with a number of other countries






How Google Public Alerts uses structured data

Tsunami Warning for US West Coast

1 day, 21 hours ago

Locations: Coastal areas between and including the California-Mexico border to Gualala Point, California (80 miles NW of San Franci... [Show more](#)

23 days ago – [West Coast and Alaska Tsunami Warning Center](#)

How likely:  How soon:  How severe: 

A tsunami Warning is now in effect which includes the coastal areas of California from the California-Mexico border to Gualala Point, California (80 miles NW of San Francisco). - Event details: Preliminary magnitude 8.4 (MI) earthquake / Lat: 33.800, Lon: -116.600 at 2012-09-17T23:53:57Z Tsunami warnings mean that a tsunami with significant widespread inundation is expected, or occurring. Warnings indicate that widespread dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after the initial wave arrival.

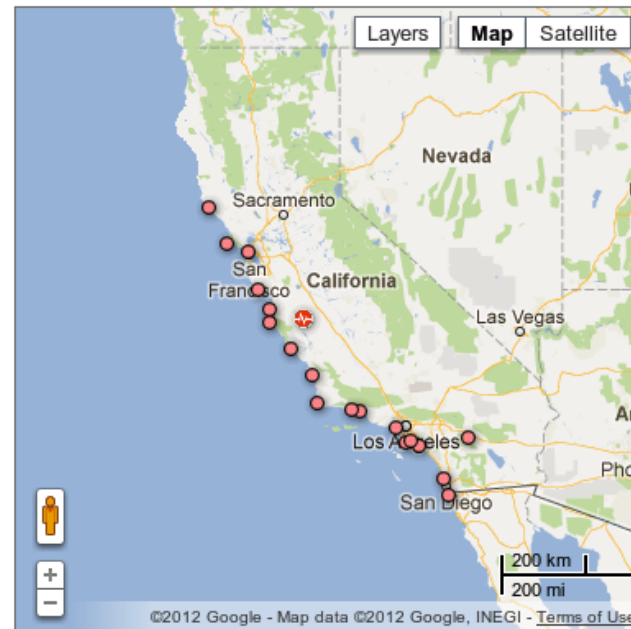
Estimated arrival times and wave heights

[Show all 17 locations](#)

Santa Monica, California	September 17, 2012 5:02 PM GMT-07 (23 days ago)	0.3m / 0.9ft
La Jolla, California	September 17, 2012 5:09 PM GMT-07 (23 days ago)	1.2m / 4.0ft
San Francisco, California	September 17, 2012 7:06 PM GMT-07 (23 days ago)	1.5m / 5.0ft

Recommended actions

Recommended Actions: People in low-lying coastal areas should be alert to instructions from their local emergency officials. Evacuations are only ordered by emergency response agencies. If in a tsunami warning coastal area, move inland to higher ground. If in a tsunami advisory coastal area,



 [Affected locations](#)

 [Open map in new window](#)

News

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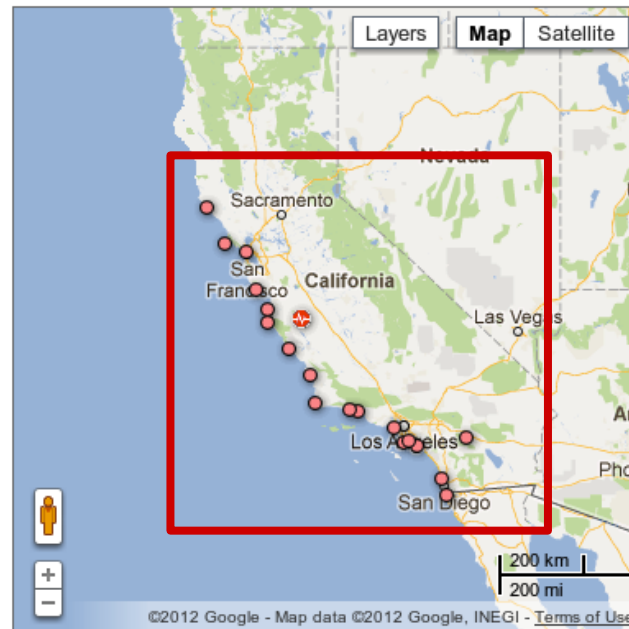
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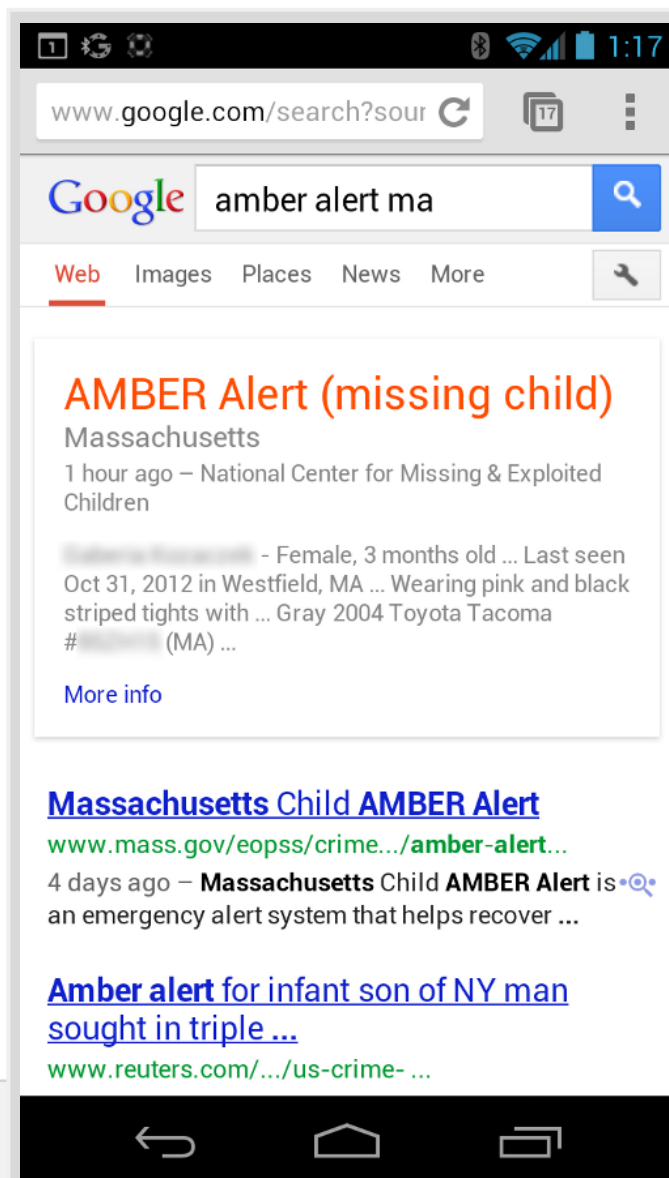


● Affected locations

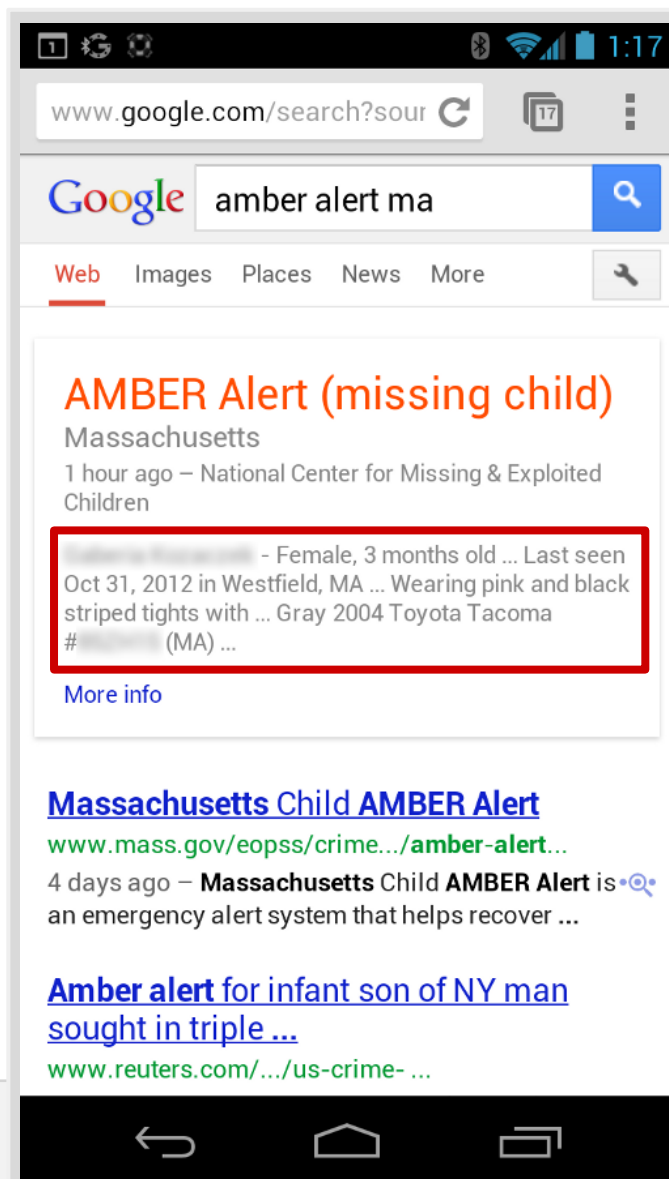
[Open map in new window](#)

News

How Google Public Alerts uses structured data



How Google Public Alerts uses structured data



How Google Public Alerts could use structured data

+You Web Images Videos Maps News Shopping Gmail more ▾
shakusa@google.com My Account Sign out

« [Google Public Alerts](#)

Flood Warning in West Central Illinois

Active for next 12 hours
Location: Jackson; Randolph

Posted 12 hours ago – [National Weather Service](#)

How likely: How soon: How severe:

The [original text](#) for this alert has been automatically reformatted to correct capitalization.

The Flood Warning continues for the Mississippi River. At Canton Ld20, Quincy, Quincy Ld21, Hannibal, Saverton Ld22, Louisiana, Clarksville Ld24. Winfield Ld25, Grafton, Alton Ld26, St. Louis and Chester.

This Flood Warning is a result of heavy rainfall over the past week across the Midwest.

The Flood Warning continues for the Mississippi River at Chester.

- Until Further Notice.
- At 10:00 pm Friday the stage was 31.1 feet.
- Flood stage is 27.0 feet.
- Forecast: The river will crest at 42.6 feet Thursday evening then begin falling.
- Impact: At 42.0 feet, four Cottage units at the Menard Correctional Center begin flooding near this height.
- Impact: At 40.8 feet, Main Street in Evansville inundated.
- Impact: At 40.0 feet, major flood level a hunting lodge near the mouth of the Kaskaskia River begins flooding.
- Impact: At 39.0 feet, Illinois State Highways 3 and 155 near Prairie du Rocher begin flooding near this height. Railroad tracks in St. Mary, Missouri begin flooding.
- Impact: At 38.5 feet, Illinois Route 3 at Rockwood and Missouri Highway J just west of Highway 61 between Ste. Genevieve and St. Marys begin flooding near this height.
- Impact: At 38.4 feet, at this level IL Route 3 at levee east of Cora inundated.
- Impact: At 37.5 feet, the southbound lane on Kaskaskia Street and the south parking lot at Menard Correctional Center Begins flooding.
- Impact: At 37.0 feet, Union Pacific property along Water Street begins to flood.

Layers
Light ▾

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Affected region
[Expand map](#)

Other alerts in this area

- [Flood Warning in Eastern Missouri](#)
National Weather Service - updated 11 hours ago
- [Flood Warning in Southeastern Missouri](#)
National Weather Service - updated 11 hours ago
- [AMBER Alert \(missing child\) for Illinois](#)
National Center for Missing & Exploited Children - updated 3 days ago

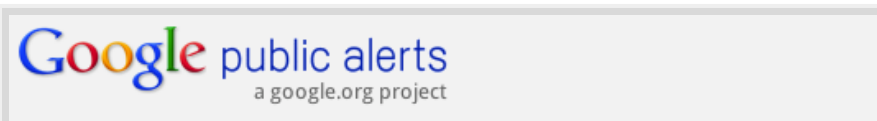
News

- [Flooding In Illinois Leaves Site Of Original McDonald's Underwater](#)
The Consumerist - 18 hours ago

Extending CAP

- CAP is great for standardizing common fields
 - `event`, `effective`, `expires`, `description`, `instructions`,
`area`
- CAP supports limited extensibility
 - `parameter`, a list of (key, value) string pairs
- Simple is good, but we're struggling with extensibility
- Let's look at some examples

Example 1: WCATWC Tsunami Alerts



Tsunami Warning for US West Coast

1 day, 21 hours ago

Locations: Coastal areas between and including the California-Mexico border to Gua

23 days ago – [West Coast and Alaska Tsunami Warning Center](#)

How likely: ■ ■ ■ ■ How soon: ■ ■ ■ ■ How severe: ■ ■ ■ ■

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Recommended actions

Recommended Actions: People in low-lying coastal areas should be alert to instructions from local emergency officials. Evacuations are only ordered by emergency response agencies in tsunami warning coastal area. move inland to higher ground. If in a tsunami advisory coastal area...

```
<!-- http://www.tsunami.gov/TEXSchema/TEX.html -->
```

```
<site id="1">
```

```
<location>
```

```
<name>Santa Monica, California</name>
```

```
<geo:lat>34.0</geo:lat>
```

```
<geo:lng>-118.5</geo:lng>
```

```
</location>
```

```
<observedArrivalTime>2012-09-17T17:02:00-07
```

```
00</observedArrivalTime>
```

```
<observedPosAmplitude unit="m">0.3</observedPosAmplitude>
```

```
<observedPosAmplitude unit="ft">0.9</observedPosAmplitude>
```

```
<predictedArrivalTime></predictedArrivalTime>
```

```
<predictedPosAmplitude unit=""></predictedPosAmplitude>
```

```
</site>
```

Example 1: WCATWC Tsunami Alerts

a google.org project

Tsunami Warning for US West Coast
 1 day, 21 hours ago
 Locations: Coastal areas between and including the California-Mexico border to Gua

23 days ago – [West Coast and Alaska Tsunami Warning Center](#)

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```

<!-- http://wcatwc.arh.noaa.gov/?page=cap -->
<parameter>
  <valueName>predictedArrivalTime</valueName>
  <value>"Santa Monica, California";2012-09-17T23:53:57Z;
17:02-07:00;34.0;-118.5;CAZ037;"CAP-TSU:1.0"
</value>
</parameter>
<parameter>
  <valueName>predictedWaveHeight</valueName>
  <value>"Santa Monica, California";"0.3m 0.9m 1.2m 1.5m";
34.0;-118.5;CAZ037;"CAP-TSU:1.0"</value>
</parameter>
<parameter>
  <valueName>observedArrivalTime</valueName>
  <value>"Craig, Alaska";2012-10-27T20:25:00-08:00;55.5;
-133.1;PKZ041;"CAP-TSU:1.0"</value>
</parameter>
<parameter>
  <valueName>observedWaveHeight</valueName>
  <value>"Craig, Alaska";"0.091m 0.300ft";55.5;
-133.1;PKZ041;"CAP-TSU:1.0"</value>
</parameter>
  
```

This parameter format is not optimal for CAP consumers

```
"Santa Monica, California";2012-09-17T22:17:02-07:00;34.0;-118.5;CAZ037;"CAP-TSU:1.0"  
"Santa Monica, California";"0.3m 0.9ft";34.0;-118.5;CAZ037;"CAP-TSU:1.0"
```

- Field definitions are not clear
 - Is 0.3m the "first wave height" or the "max wave height"?
 - Increases the chance that CAP consumers may misinterpret the data.
- Versioning is risky
 - Is the wave height in position 2 in version 1.0 but position 3 in version 1.1?
- Requires new parsing code
 - Why are semi-colon-separated values required inside an **eXtensible** Markup Language document?
 - CAP consumers have to write new (buggy?) parsing code
 - We can't take advantage of common XML parsing libraries

What should we recommend to other countries with tsunami data?

Example 2: Amber Alerts

AMBER Alert (missing child) for Missouri
 Currently active
 Posted 22 hours ago
 National Center for Missing & Exploited Children

(1 years old)

Last seen Mar 2, 2013 in Springfield, MO

Vehicle: 2002 Nissan Maxima, Gray
 Missouri license plate # [redacted]

[redacted], black female age 1, was from the Save-a-Lot Store at 1117 E Com Springfield, MO by white female with blur driving a stolen Gray 2002 Nissan Maxim registration [redacted] is female, 2 feet, 21 pounds, with black hair eyes and is wearing a blue one piece sleep

If you have information, contact:
 Springfield Police Department
 Call: 417-864-1810 or 911

Missing child

Suspect

Name Unknown
 Sex: Female
 Skin: White

What is an AMBER alert?

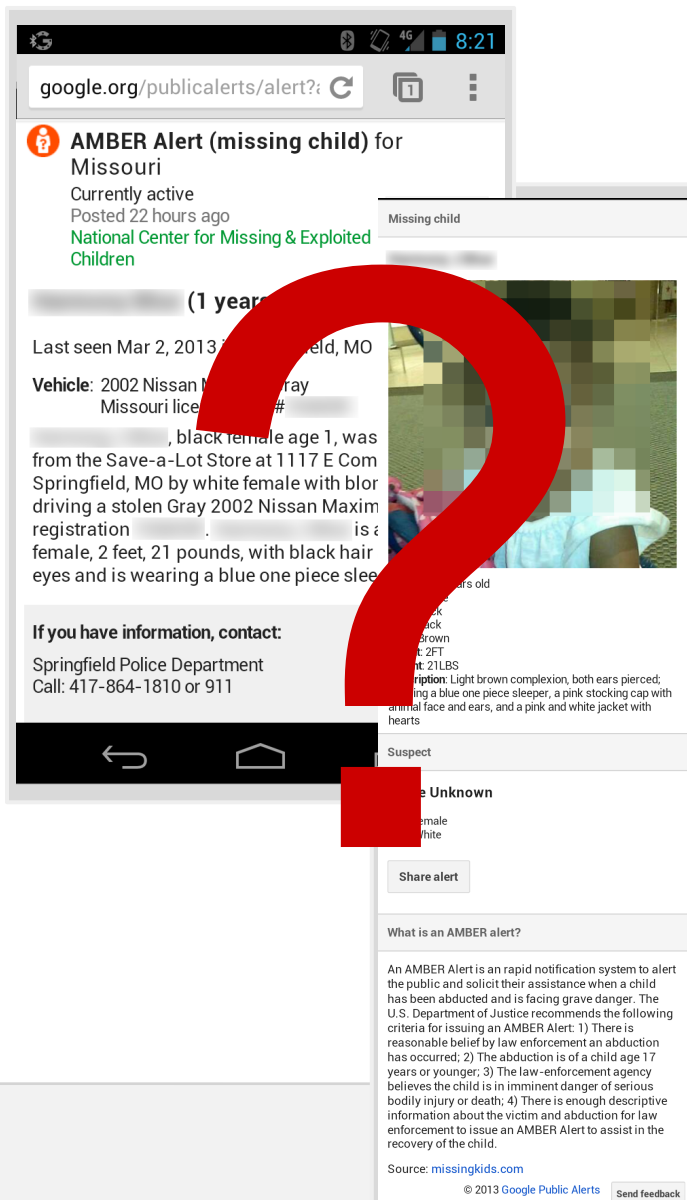
An AMBER Alert is a rapid notification system to alert the public and solicit their assistance when a child has been abducted and is facing grave danger. The U.S. Department of Justice recommends the following criteria for issuing an AMBER Alert: 1) There is reasonable belief by law enforcement an abduction has occurred; 2) The abduction is of a child age 17 years or younger; 3) The law-enforcement agency believes the child is in imminent danger of serious bodily injury or death; 4) There is enough descriptive information about the victim and abduction for law enforcement to issue an AMBER Alert to assist in the recovery of the child.

Source: missingkids.com

© 2013 Google Public Alerts

```
<!-- https://secure.missingkids.com/en\_US/amber/NCMECAmberAlert.xsd -->
<MissingChild>
  <PersonGivenName>Jane</PersonGivenName>
  <PersonSurName>Doe</PersonSurName>
  <Gender>Female</Gender>
  <Age>1</Age>
  <PhysicalDescription>
    <PersonEyeColorCode>Brown</PersonEyeColorCode>
    <PersonHairColorCode>Black</PersonHairColorCode>
    <PersonSkinToneCode>Black</PersonSkinToneCode>
    <Height>2'</Height>
    <Weight>23 lbs.</Weight>
  </PhysicalDescription>
</MissingChild>
<Suspect>
<SuspectVehicle>
  <VehicleMakeCode>Nissan</VehicleMakeCode>
  <VehicleModelCode>Maxima</VehicleModelCode>
  <VehicleColorPrimaryCode>Gray</VehicleColorPrimaryCode>
  <LicensePlate>
    <LicensePlateText>CJV 123</LicensePlateText>
    <LicensePlateState>MO</LicensePlateState>
  </LicensePlate>
</SuspectVehicle>
</Suspect>
```


IPAWS Amber Alert CAP



```

<info>
...
<event>Child Abduction Emergency</event>
<responseType>Monitor</responseType>
<effective>2013-04-13T19:17:06-04:00</effective>
<expires>2013-04-14T18:17:06-04:00</expires>
<senderName>Cedar Hill Police Department</senderName>
<headline>
  Cedar Hill, TX AMBER Alert: LIC/86p3357 (TX) 2006 Ford Expedition
</headline>
<description>NO FURTHER DESCRIPTIONS PROVIDED.</description>
<instruction>NO FURTHER INSTRUCTIONS PROVIDED.</instruction>
<web>www.missingkids.com</web>
<parameter>
  <valueName>BLOCKCHANNEL</valueName>
  <value>NWEM</value>
</parameter>
<parameter>
  <valueName>BLOCKCHANNEL</valueName>
  <value>EAS</value>
</parameter>
<parameter>
  <valueName>BLOCKCHANNEL</valueName>
  <value>PUBLIC</value>
</parameter>
<parameter>
  <valueName>CMAMtext</valueName>
  <value>
    Cedar Hill, TX AMBER Alert: LIC/86p3357 (TX) 2006 Ford Expedition
  </value>
</parameter>
</info>
  
```


How to recommend NCMEC extend their CAP?

1. Flatten the hierarchy to `parameters`?

```
<parameter>
  <valueName>
    Suspect0:Vehicle0:LicensePlateState
  </valueName>
  <value>MO</value>
</parameter>
```

- Parsing the `valueNames` gets complicated

2. Stuff NCMEC's XML into a single `parameter`?

- Duplicates all the common fields between NCMEC XML and CAP
- Requires two-steps of XML parsing

3. Create a formatted `description`?

- No one likes the idea of having HTML embedded in the `description` tag

What should we recommend to other missing children agencies?

Example 3: JMA's Earthquake JMX

M8を超える巨大地震、四国沖
 発令中
 6分前に発表 - 気象庁

凡例を隠す [地図を別のウィンドウで開く](#)

震度
 ● 7 ● 6強 ● 6弱 ● 5強 ● 5弱 ● 4 ● 3 ● 2 ● 1
 × 震源

地域: 徳島県南部; 徳島県北部; 高知県東部; ... [もっと見る](#)

これは訓練です
 21日10時33分ころ、地震がありました。
 津波警報等（大津波警報・津波警報あるいは津波注意報）を発表中です。

震度6強
徳島県 海陽町
高知県 室戸市 安芸市 田野町 安田町 北川村 芸西村 高知市 南国市 高知香南市

震度6弱
徳島県 阿南市 勝浦町 那賀町 牟岐町 徳島市 鳴門市 小松島市 吉野川市 徳島三好市 石井町 神山町 北島町 藍住町 板野町 東みよし町
高知県 東洋町 馬路村 十佐市 須崎市 香美市 本山

```

<!-- http://xml.kishou.go.jp/jmaxml1/body/seismology1/ -->
<Earthquake>
  <OriginTime>2013-02-07T10:03:00+09:00</OriginTime>
  <ArrivalTime>2013-02-07T10:03:00+09:00</ArrivalTime>
  <Hypocenter>
    <Area>
      <Name>和歌山県南方沖</Name>
      <Code type="震央地名">689</Code>
      <jmx_eb:Coordinate
        description="北緯33.0度 東経136.0度 深さ 10km"
        datum="日本測地系">+33.0+136.0-10000</jmx_eb:Coordinate>
      <NameFromMark>潮岬の南南東50km付近</NameFromMark>
      <MarkCode type="震央補助">502</MarkCode>
      <Direction>南南東</Direction>
      <Distance unit="km">50</Distance>
    </Area>
  </Hypocenter>
  <jmx_eb:Magnitude type="Mj" condition="不明"
    description="M8を超える巨大地震">NaN</jmx_eb:Magnitude>
</Earthquake>
<Intensity>
  <Observation>
    <MaxInt>6+</MaxInt>
    <Pref>
      <Name>三重県</Name>
      <Code>24</Code>
      <MaxInt>6+</MaxInt>
    </Pref>
  </Observation>
</Intensity>
  
```

Comparison: USGS CAP vs JMA JMX

```

<headline>EQ 6.0 Morioka, Honshu, Japan -
PRELIMINARY REPORT</headline>
<parameter>
  <valueName>EventIDKey</valueName>
  <value>usB000FXH7</value>
</parameter>
<parameter>
  <valueName>EventTime</valueName>
  <value>20130401T185317.370Z</value>
</parameter>
<parameter>
  <valueName>Magnitude</valueName>
  <value>6.0</value>
</parameter>
<parameter>
  <valueName>Depth</valueName>
  <value>12.5 km (7.8 miles)</value>
</parameter>
<area>
  <areaDesc>111 miles (178 km) E of Morioka,
Honshu, Japan; 112 miles (180 km) SE of
Hachinohe, Honshu, Japan; 153 miles (245 km)
NE of Sendai, Honshu, Japan; 327 miles (526
km) NE of TOKYO, Japan</areaDesc>
  <circle>39.528,143.196 21.6</circle>
</area>

```

```

<EventID>20130402035338</EventID>
<Earthquake>
  <OriginTime>2013-04-02T03:53:00+09:00</OriginTime>
  <ArrivalTime>2013-04-02T03:53:00+09:00</ArrivalTime>
  <Hypocenter>
    <Area>
      <Name>三陸沖</Name>
      <NameFromMark>盛岡の178km東</NameFromMark>
      <Code type="震央地名">288</Code>
      <jmx_eb:Coordinate
        description=
          "北緯39.5度 東経143.6度 深さ 10km"
          datum="日本測地系">+39.5+143.6-10000/
      </jmx_eb:Coordinate>
    </Area>
  </Hypocenter>
  <jmx_eb:Magnitude type="Mj"
    description="M6.1">6.1</jmx_eb:Magnitude>
</Earthquake>

```

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M8を超える巨大地震、四国沖
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 6分前に発表 - 気象庁

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高知県 東洋町 馬路村 十佐市 須崎市 香美市 本山

```

<!-- http://xml.kishou.go.jp/jmaxml1/body/seismology1/ -->
<Earthquake>
  <OriginTime>2013-02-07T10:03:00+09:00</OriginTime>
  <ArrivalTime>2013-02-07T10:03:00+09:00</ArrivalTime>
  <Hypocenter>
    <Area>
      <Name>和歌山県南方沖</Name>
      <Code type="震央地名">689</Code>
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<Intensity>
  <Observation>
    <MaxInt>6+</MaxInt>
    <Pref>
      <Name>三重県</Name>
      <Code>24</Code>
      <MaxInt>6+</MaxInt>
    </Pref>
  </Observation>
</Intensity>
  
```

JMX -> CAP?

- Could follow John Carrick

```
<parameter>
```

```
  <valueName>localMaxIntensity</valueName>
```

```
  <value>6+;"三重県";JP-PREFECTURE;24;34.7;136.5;CAP-EQ:1.0"</value>
```

```
</parameter>
```

- But has same problems as CAP-TSU
- Could embed the table as HTML in the CAP description
 - No one likes having HTML in the description
- We just process raw JMX for now
 - Sad: We want to write code once and have it work for all earthquake alerts
 - Don't know what to recommend to other countries with seismic intensity data

Challenge: Lack of hierarchy

- We believe that the continued growth of CAP as a standard would benefit from support for custom hierarchical structured data.
- It is already a stumbling block for this CAP implementor
 - Stops us from recommending CAP to groups that want to work with us
 - Writing custom parsers increases implementation costs and risks
- Slows down CAP adoption in the community

A 2-step proposal for discussion

1. **Allow XML extensions in the CAP schema**

This could be as simple as a small change to the .xsd:

```
<any minOccurs="0" maxOccurs="unbounded" namespace="##other"
      processContents="lax" />
```

- "Advanced" feature
 - `parameter` still the way to go for simple non-hierarchical content
- Allows earthquake and tsunami data to be represented cleanly
- Provides migration path to CAP for complex hierarchies like NCMEC
 - Migrate common fields to CAP, retain community-specific hierarchical data
- Provides clean separation of sets of fields for disparate purposes
- Does this cause fragmentation?
 - not much different than `parameter` (e.g. no standard formats/naming conventions)
 - Like `parameter`, CAP consumers who don't care about extensions can ignore them

A 2-step proposal for discussion

1. **Allow XML extensions in the CAP schema**
2. **Move towards standard extensions**

Develop recommendations and best-practices for commonly extensions

- Meteorological events, Earthquakes, Tsunamis, Floods, Missing Children, etc

Eventually, standardize well-adopted recommendations

- Similar to JMX in some respects
- Reduces concerns of fragmentation
- Lets the community migrate towards the best formats

Example: CAP + Tsunami Extension

```

<info>
  <category>Geo</category>
  <event>Tsunami Warning</event>
  <headline>The tsunami Warning continues in effect for the coastal areas of Alaska from Unimak Pass, Alaska
(80 miles NE of Dutch Harbor) to Amchitka Pass, Alaska (125 miles W of Adak)</headline>
  <description>...</description>
  <instruction>...</instruction>
  <web>http://newwcatwc.arh.noaa.gov/tsuPortal/events/PAAQ/2011/09/02/lqw6d6/2/WEPA41/WEPA41.t</web>
  <area>
    <areaDesc>Coastal areas between and including Unimak Pass, Alaska (80 miles NE of Dutch Harbor) to
Amchitka Pass, Alaska (125 miles W of Adak)</areaDesc>
    <geocode><valueName>UGC</valueName><value>AKZ185</value></geocode>
    <geocode><valueName>UGC</valueName><value>AKZ187</value></geocode>
  </area>
  <tsunami xmlns="http://tsunami.gov/cap/tsunami.xsd">
    <site>
      <location>
        <name>Santa Monica, California</name>
        <lat>34.0</lat>
        <lng>-118.5</lng>
      </location>
      <observed>
        <arrivalTime>2012-09-17T17:02:00-07:00</arrivalTime>
        <posAmplitude unit="m">0.3</posAmplitude>
        <posAmplitude unit="ft">0.9</posAmplitude>
      </observed>
    </site>
  </tsunami>
</info>

```

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```

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  <category>Geo</category>
  <event>Tsunami Warning</event>
  <headline>The tsunami Warning continues in effect for the coastal areas of Alaska from Unimak Pass, Alaska
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        <posAmplitude unit="m">0.3</posAmplitude>
        <posAmplitude unit="ft">0.9</posAmplitude>
      </observed>
    </site>
  </tsunami>
</info>

```

- Takes advantage of extensibility of XML
- Supports hierarchy
- Easily extended and versioned
- Feels cleaner than many parameters

Alternative from Eliot Christian

- Allow XML extensions directly at the `info` level
 - The proposal from this presentation
- Add XML extensions as **references using** `derefUri`
 - Problem: CAP 1.2 spec requires `derefUri` to be base-64 encoded
 - Requested change: allow non-encoded XML content in `derefUri`

Conclusion

- We're excited about the growth in the CAP community
- We want to see adoption accelerate
- We're looking forward to discussing the best ways to do that

Thanks.

Appendix

Google Public Alerts

◀ Google 災害情報

津波警報：宮城県

発令中
地域: 宮城県



7 分前に発表 - 気象庁

7日18時05分現在の、津波の観測値をお知らせします。場所によっては、観測した津波の高さよりさらに大きな津波が到達していることが考えられます。今後、津波の高さは更に高くなることも考えられます。

津波到達予想時刻と予想される津波の高さ

15 のすべての地域を表示

宮城金華山付近	0:36 GMT+09 (20 分前)	0.5m
岩手県	0:53 GMT+09 (3 分前)	0.5m
福島県	0:53 GMT+09 (3 分前)	0.5m
茨城県	0:53 GMT+09 (3 分前)	0.5m
青森県太平洋沿岸	0:53 GMT+09 (3 分前)	0.5m
宮城県	1:13 GMT+09 (17 分後)	1m

観測時刻と津波の高さ

宮城金華山沖 (GPS波浪計)	0:36 GMT+09 (20 分前)	0.2m
石巻市鮎川 (宮城県)	0:45 GMT+09 (11 分前)	1.0m

推奨される対応

ただちに海岸や川沿いから離れ、高台や避難ビルなど安全な場所へ避難してください。

ソース: seisvol.kishou.go.jp

津波警報について

大警報 **警報** 注意報 予報

津波警報の発表基準

予想される津波の高さが高いところで1mを超え、3m以下の場合。

想定される被害

標高の低いところでは津波が襲い、浸水被害が発生します。人は津波による流れに巻き込まれます。

ソース: seisvol.kishou.go.jp



影響を受ける地域

- 大津波警報
予想される津波の高さが高いところで3mを超える場合
- 津波情報
予想される津波の高さが高いところで1mを超え、3m以下の場合
- 津波注意報
予想される津波の高さが高いところで0.2m以上、1m以下の場合であって、津波による災害のおそれがある場合

🔍 地図を拡大

この地域の他の災害情報

震度速報、東北地方、関東地方
気象庁 - 6 分前に更新

- CAP-RSMCTK

- [Experimental tropical cyclone CAP profile by RSMC Tokyo-Typhoon Center](#)
- Describes the typhoon forecast cone; intended for distribution outside Japan
- Defines 21 (!) parameters, flattening JMX
 - TC_CycloneName, TC_CycloneID, TC_MovingDirection, TC_MovingSpeed, TC_PositionConfidence, TC_CenterPressure, TC_MaxSustainedWind, TC_PeakGust, EventEndTime, TC_AnalysisTime, TC_30knotMaxRadius, TC_30knotMinRadius, TC_50knotMaxRadius, TC_50knotMinRadius, TC_30knotMaxRadiusDirection, TC_30knotMinRadiusDirection, TC_50knotMaxRadiusDirection, TC_50knotMinRadiusDirection

Example: CAP + Earthquake Extension

```

<info>
  <category>Geo</category>
  <event>Earthquake</event>
  <senderName>U.S. Geological Survey</senderName>
  <headline>EQ 6.3 Neiafu, Tonga - PRELIMINARY REPORT</headline>
  <description>...</description>
  <web>http://earthquake.usgs.gov/eqcenter/recenteqsww/Quakes/us2010apcd.php</web>
  <area>
    <areaDesc>185 miles (298 km) NNE of Neiafu, Tonga;</areaDesc><circle>-16.053,-173.274 0.0</circle>
  </area>
  <earthquake xmlns="http://earthquake.usgs.gov/cap/earthquake.xsd">
    <eventTime>2010-08-30T23:25:40+00:00</eventTime>
    <eventId>us2010apcd</eventId>
    <version>6</version>
    <magnitude type="M">6.3</magnitude>
    <depth>
      <value units="km">38.7</value>
      <value units="miles">24.0</value>
      <verticalError units="km">6.7</verticalError>
    </depth>
    <hypocenter>
      <lat>-16.053</lat>
      <lng>-173.274</lng>
      <horizontalError units="km">6.7</horizontalError>
    </hypocenter>
    <numStations>268</numStations>
  </earthquake>
  <intensity xmlns="http://earthquake.usgs.gov/cap/intensity.xsd">
    <observation>
      <maxIntensity>VI</maxIntensity>
      <location>
        <name>Santa Monica, California</name>
        <lat>34.0</lat>
        <lng>-118.5</lng>
      </location>
    </observation>
  </intensity>

```