



# Effective Public Warnings and the Common Alerting Protocol (CAP)

```
<alert>  
<msg_id>43b08071-3727-41b4-  
<sender_id>U.S. Federal Gover  
<sent>2003-04-02T14:39:01-05:0  
<msg_status>Actual</msg_status  
<msg_scope>Public</msg_scope>  
<msg_type>Alert</msg_type>  
<info>  
<language>en-US</language>  
<event_cat>Security</event_ca  
<event_type>Homeland Securiti  
<urgency>Forecast</urgency>  
<severity>Severe</severity>  
<certainty>High</certainty>  
<info_url>http://www.dhs.gov  
<info_url>http://www
```

# ○ ● ● Outline

---

- The Challenges of Effective Public Warning
- The Common Alerting Protocol
- Discussion
- The Road Ahead

# ○ ● ● Goals of Public Warning

- Save lives
- Avoid losses
- Reduce fear

The measure of warnings are the *actions and attitudes* that result.

# ○ ● ● Effective Warning Systems

- Reach everyone who is at risk, wherever, whenever
- Don't alarm people unnecessarily
- Easy to use
- Reliable and secure
- Deliver *effective warning messages*

# ○ ● ● Effective Warning Messages

- Accurate and specific
- Understandable in terms of:
  - Languages and special needs
  - Prior knowledge and experience
  - Timeframe and instructions
- Action-oriented

# ○ ● ● There is no “magic bullet”

- No single system or technology can solve the public warning problem alone:
  - Need for reliability
  - Need for reach
  - Need for *corroboration*

# ○ ● ● Corroboration

- People don't act on the first warning signal
- Instead, they become vigilant and look for confirmation
- When convinced it isn't a false alarm, then they transform *information* into *action*

# ○ ● ● Challenges

---

- Many different warning systems
- Different capabilities, different procedures
- Social diversity - languages, needs
- Detecting patterns in activity
- Applying best practices



# ○ ● ● New Opportunities

- Computerized warning systems  
(*most modern ones!*)
- Internet and other data networks
- Encryption and digital signatures
- Extensible Markup Language  
(XML) and Web services

# An XML Message

```
<alert>
  <identifier>43b08071-3727</identifier>
  <sender>hsas@dhs.gov</sender>
  <sent>2003-04-02T14:39:01-05:00</sent>
  <status>Actual</status>
  <scope>Public</scope>
  <type>Alert</type>
  <info>
    <language>en-US</language>
    <category>Security</category>
    <event>Homeland Security Advisory System</event>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <from>U.S. Federal Government, Department of Homeland Security</from>
    <web>http://www.dhs.gov/dhspublic/display?theme=29</web>
    <image>http://www.dhs.gov/dhspublic/getAdvisoryImage</image>
    <parameter>HSAS=orange</parameter>
    <area>
      <areaDesc>U.S. nationwide</areaDesc>
    </area>
  </info>
</alert>
```

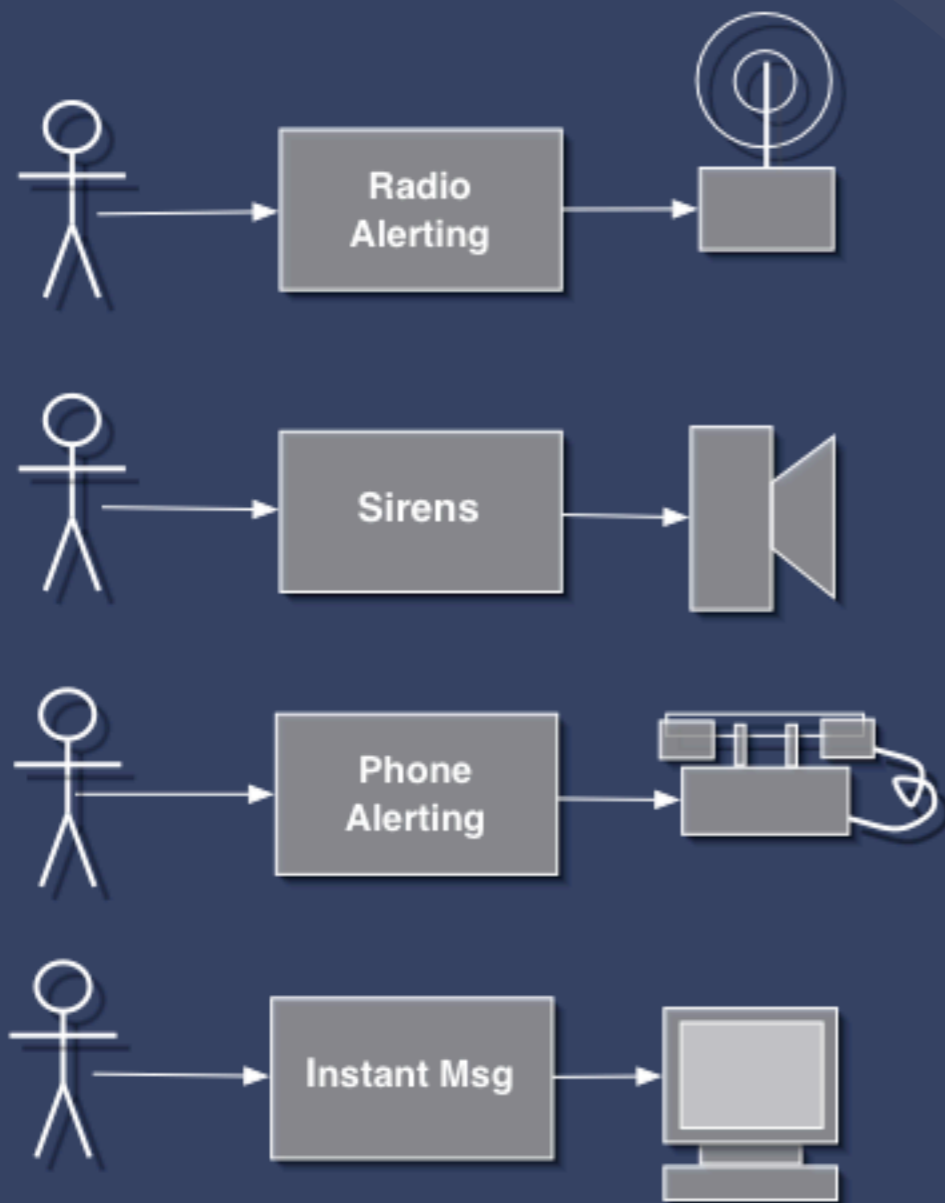
# An XML Message

```
<alert>
  <identifier>43b08071-3727</identifier>
  <sender>hsas@dhs.gov</sender>
  <sent>2003-04-02T14:39:01-05:00</sent>
  <status>Actual</status>
  <scope>Public</scope>
  <type>Alert</type>
  <info>
    <language>en-US</language>
    <category>Security</category>
    <event>Homeland Security Advisory System</event>
    <urgency>Immediate</urgency>
    <severity>Severe</severity>
    <certainty>Likely</certainty>
    <from>U.S. Federal Government, Department of Homeland Security</from>
    <web>http://www.dhs.gov/dhspublic/display?theme=29</web>
    <image>http://www.dhs.gov/dhspublic/getAdvisoryImage</image>
    <parameter>HSAS=orange</parameter>
    <area>
      <areaDesc>U.S. nationwide</areaDesc>
    </area>
  </info>
</alert>
```

# ○ ● ● The Common Alerting Protocol

- An open, non-proprietary standard
- All-hazard warning exchange and coordination
- Developed by emergency managers and technologists worldwide

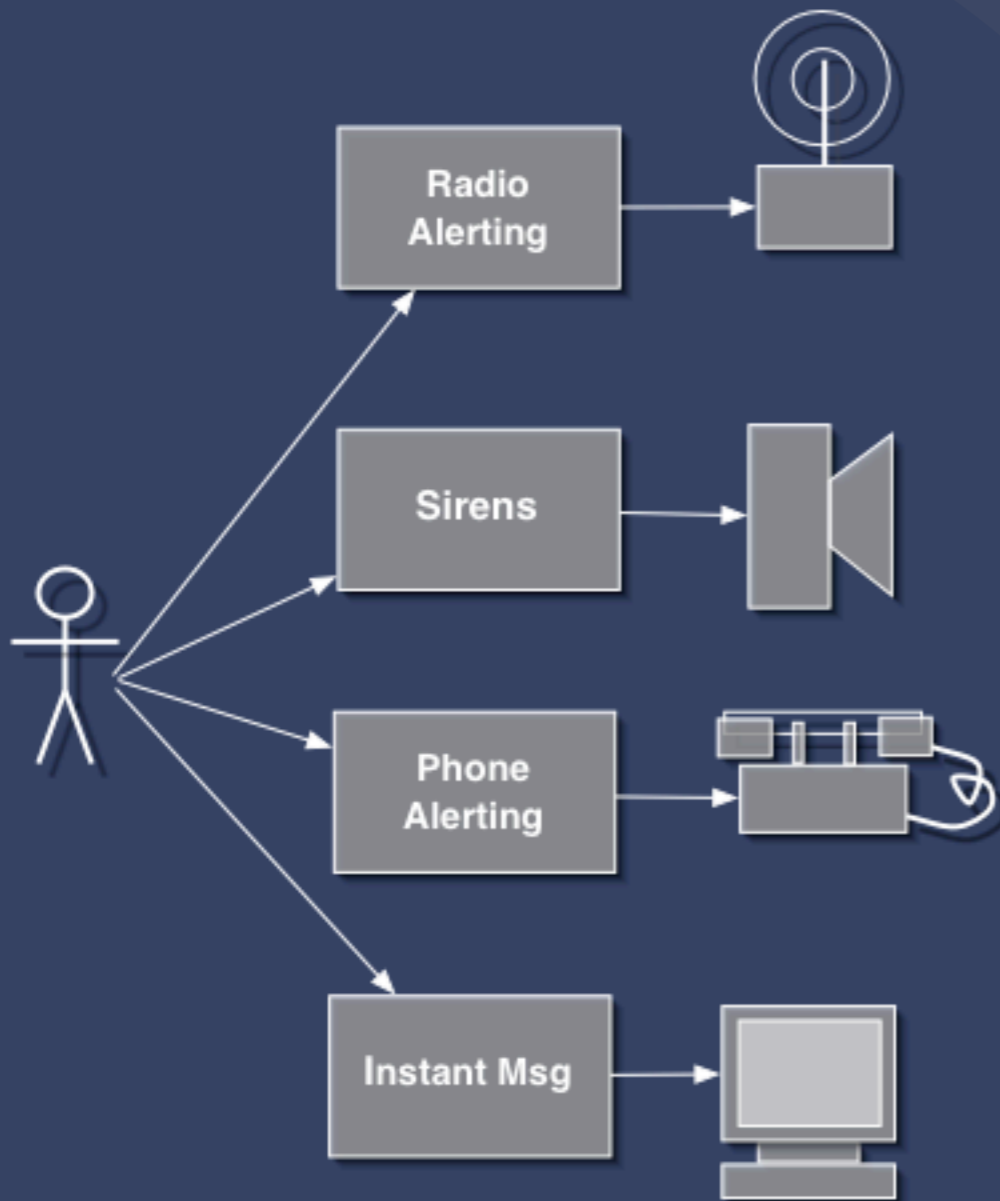
# ○ ● ● Historically...



- **Multiple systems**
- **Multiple purposes**
- **Multiple operators**

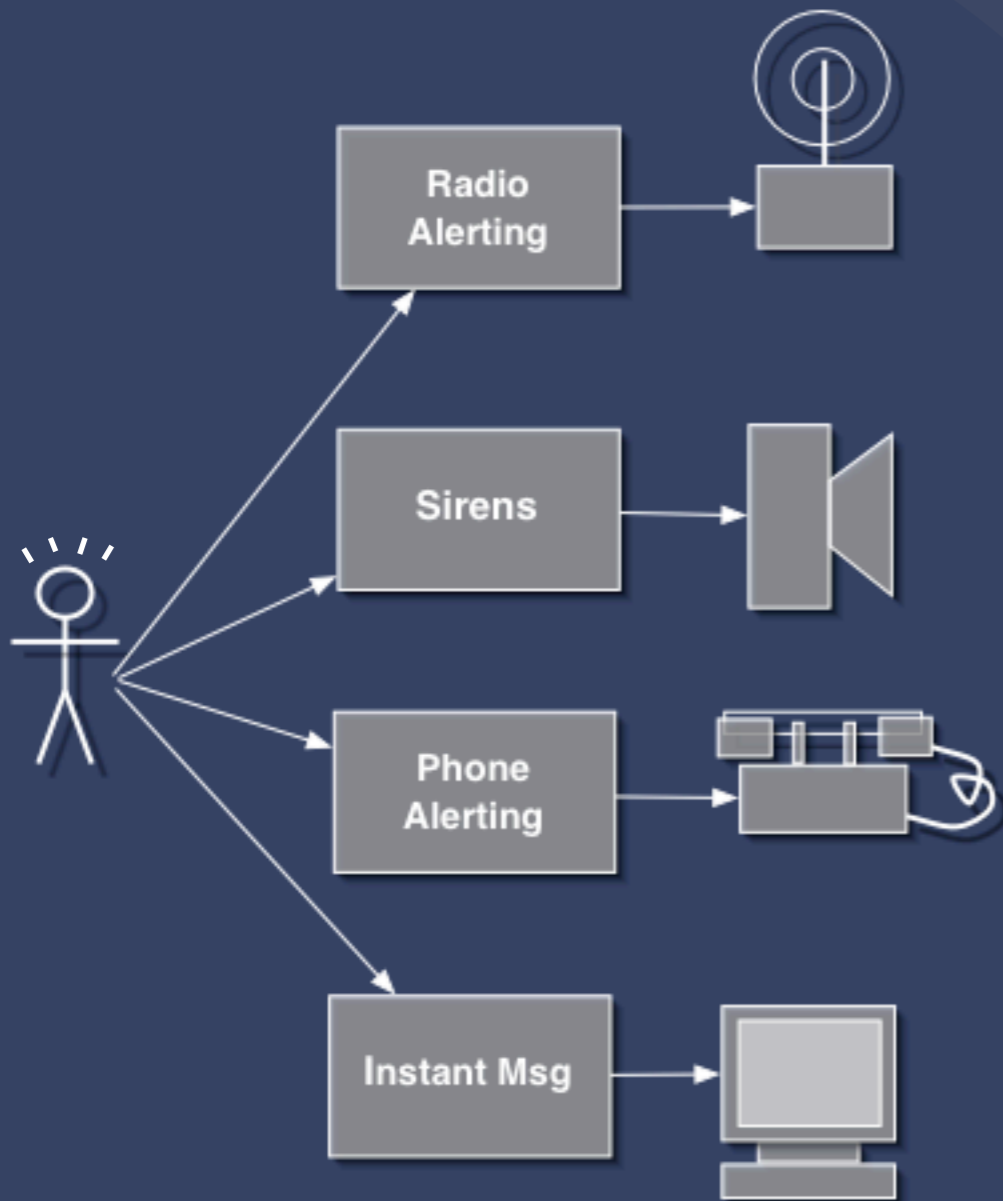
# ○ ● ● Today's reality...

- One operator has to activate multiple systems at once to warn effectively

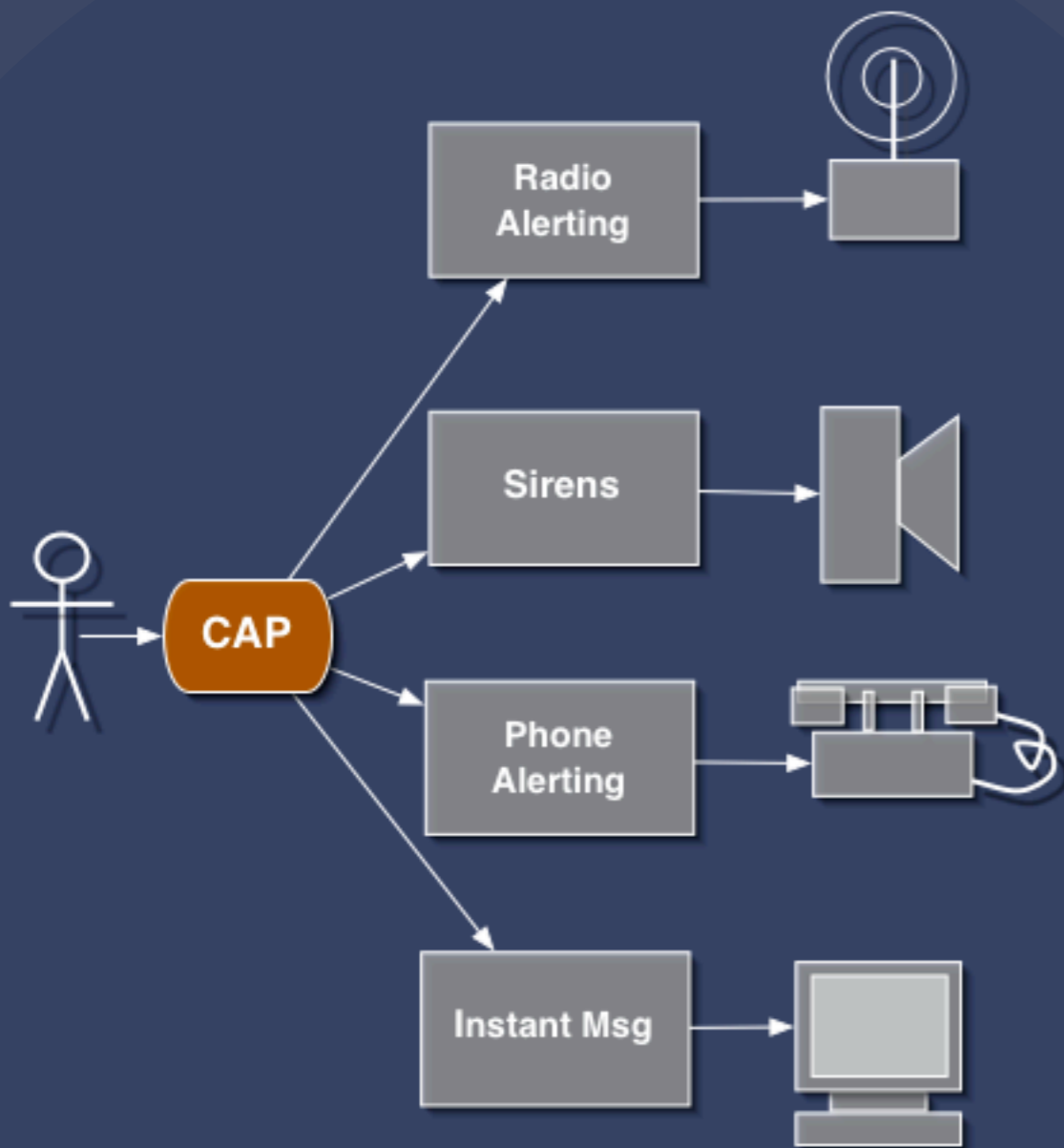


# ○ ● ● Today's reality...

- One operator has to activate multiple systems at once to warn effectively



# Using CAP...



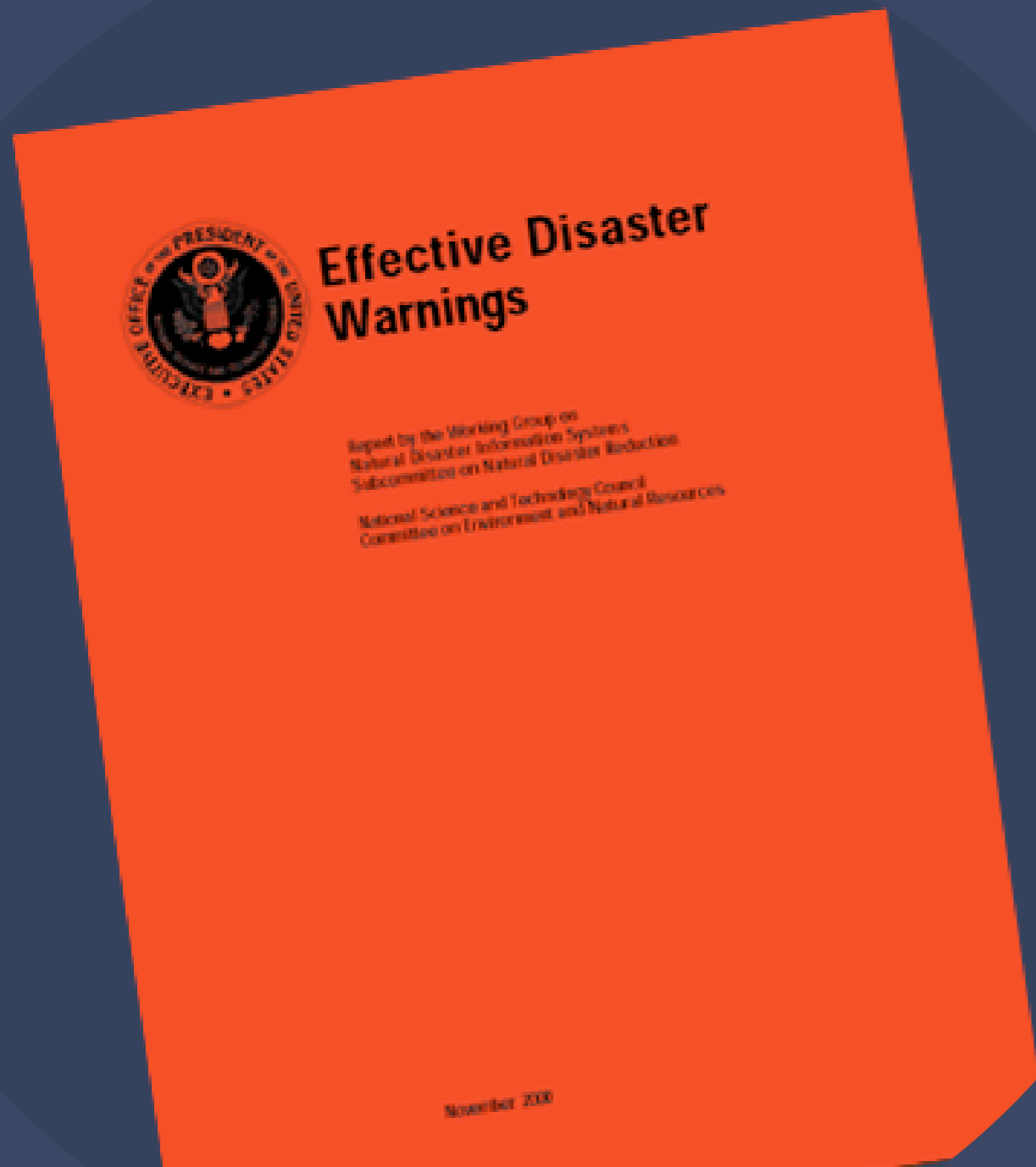
- One activation triggers multiple systems
- Consistent, complete messages



# ○ ● ● Open Standards

- Available to all users and systems
- No royalties or restrictions
- Adaptation and enhancements allowed so long as result also remains open
- Copyright used to ensure openness

# ● ● ● CAP History - 2000



National Science  
and Technology  
Council releases its  
"Red Book" report  
on "Effective  
Disaster Warnings"

# ○ ● ● CAP History - 2000

"A standard method should be developed to collect and relay instantaneously and automatically all types of hazard warnings and reports locally, regionally and nationally for input into a wide variety of dissemination systems."

"Effective Disaster Warnings"  
Working Group on Natural Disaster Information Systems  
Subcommittee on Natural Disaster Reduction  
Committee on Environment and Natural Resources  
National Science and Technology Council  
November 2000

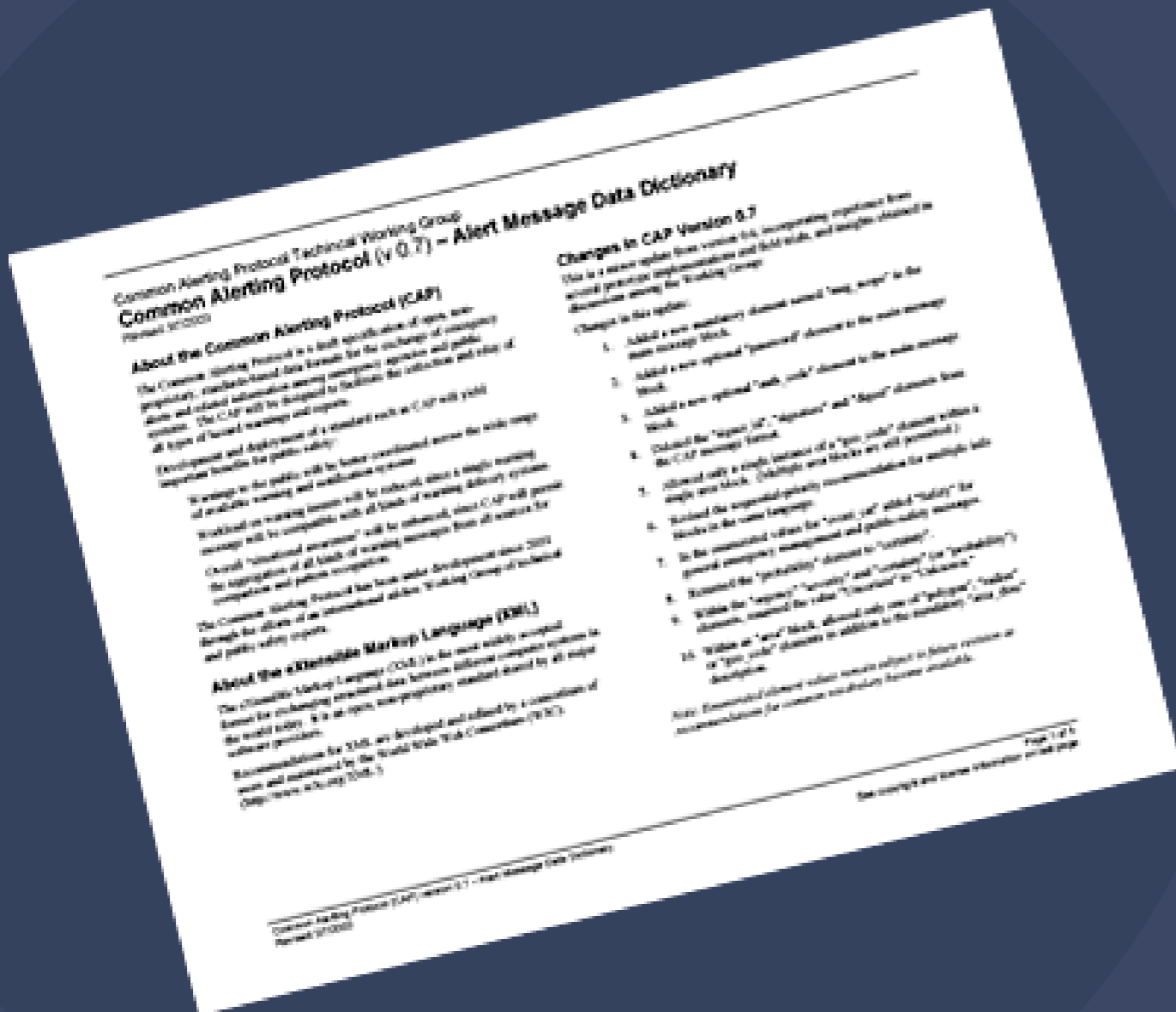
# ○ ● ● CAP History - 2001

Formation of:

- Partnership for Public Warning
- International CAP Ad-Hoc Working Group

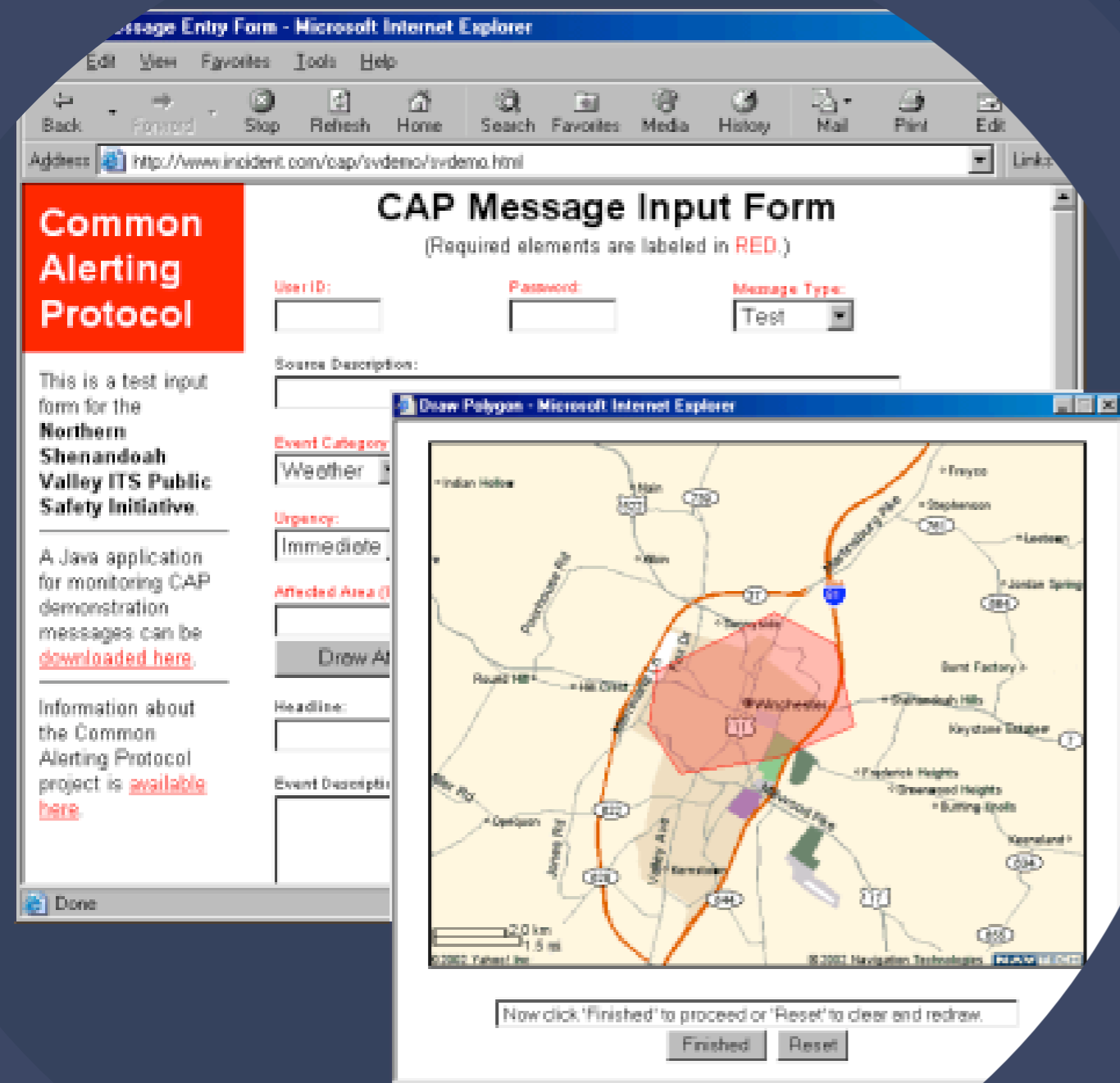
# CAP History - 2002

## Draft CAP Format



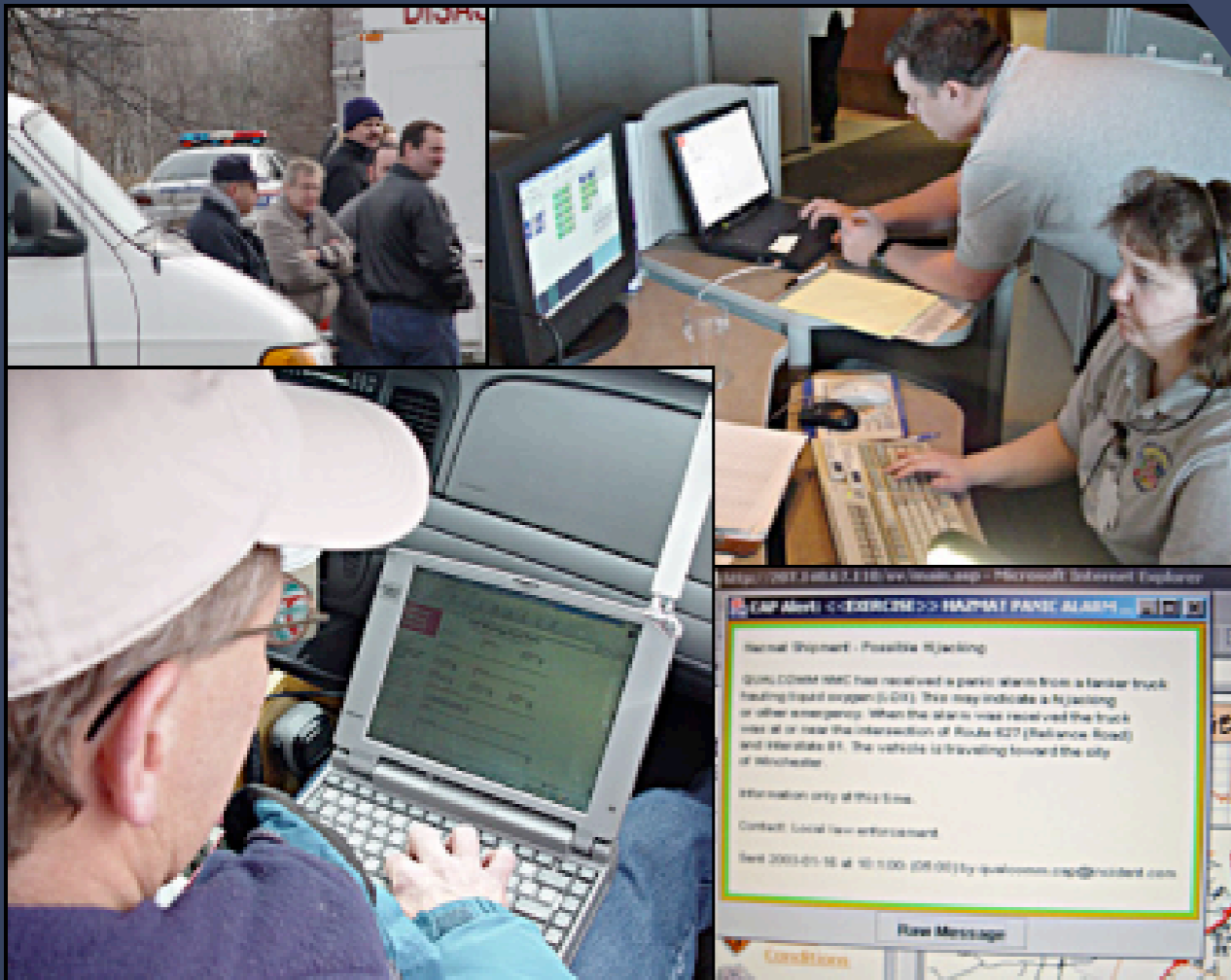
# CAP History - 2002

- Draft CAP Format
- Prototype Applications



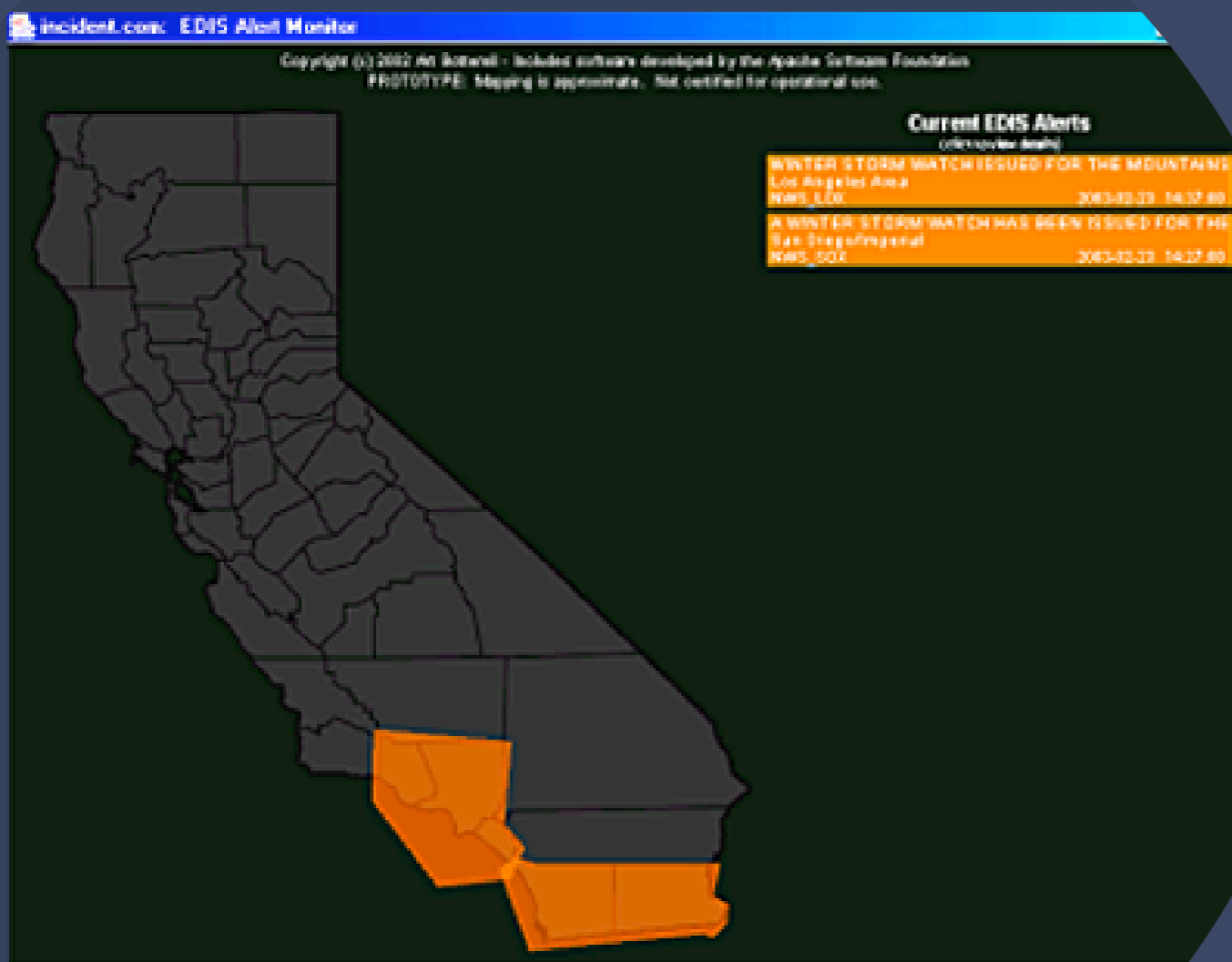
# ● ● ● CAP History - 2002

- Draft CAP Format
- Prototype Applications
- Virginia Field Trials (ComCARE Alliance)



# ● ● ● CAP History - 2002

- Draft CAP Format
- Prototype Applications
- Virginia Field Trials (ComCARE Alliance)
- California Field Trial (California EDIS)





# ● ● ● CAP History - 2003

- OASIS standards organization forms "Emergency Management XML Technical Committee"
- EM TC selects CAP as its first standards-track project
- *(Today!)* CAP draft released for public review and comment



# The CAP Message

(As of draft version 0.8)

- Alert Block - information about this message *which may contain...*
- Info Block(s) - information about the threat *which may contain...*
- Area Block(s) - information about the affected area(s)



# The CAP Message

(As of draft version 0.8)

## alert

**Message ID**

**Sender ID**

**Date/Time Sent**

**Alert Status**

**Alert Type**

*Password*

*Operator ID*

*Alert Scope*

*Restriction*

*Address*

*Handling Code*

*Note*

*Reference ID*

*Incident ID*

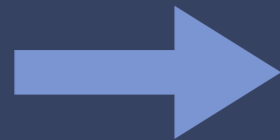


# The CAP Message

(As of draft version 0.8)

## alert

**Message ID**  
**Sender ID**  
**Date/Time Sent**  
**Alert Status**  
**Alert Type**  
*Password*  
*Operator ID*  
*Alert Scope*  
*Restriction*  
*Address*  
*Handling Code*  
*Note*  
*Reference ID*  
*Incident ID*



## info

**Event Category**  
**Event Type**  
**Urgency**  
**Severity**  
**Certainty**  
*Language*  
*Audience*  
*Target Code*  
*Date/Time Effective*  
*Date/Time Onset*  
*Date/Time Expires*  
*Sender Name*  
*Headline*  
*Event Description*  
*Instructions*  
*Information URL*  
*Image URL*  
*Audio URL*  
*Contact Info*  
*Parameters*



# The CAP Message

(As of draft version 0.8)

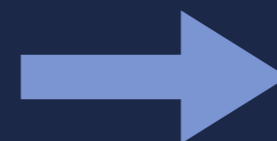
## alert

**Message ID**  
**Sender ID**  
**Date/Time Sent**  
**Alert Status**  
**Alert Type**  
*Password*  
*Operator ID*  
*Alert Scope*  
*Restriction*  
*Address*  
*Handling Code*  
*Note*  
*Reference ID*  
*Incident ID*



## info

**Event Category**  
**Event Type**  
**Urgency**  
**Severity**  
**Certainty**  
*Language*  
*Audience*  
*Target Code*  
*Date/Time Effective*  
*Date/Time Onset*  
*Date/Time Expires*  
*Sender Name*  
*Headline*  
*Event Description*  
*Instructions*  
*Information URL*  
*Image URL*  
*Audio URL*  
*Contact Info*  
*Parameters*



## area

**Area Description**  
*Polygon*  
*Circle*  
*Geocode*  
*Altitude*  
*Ceiling*

# ○ ● ● The Alert Block

Basic information about this message:

- Date/Time
- Sender
- Message Type & Status
- Distribution Scope

# ● ● ● Message Type

Describes the general purpose of this message:

|               |   |
|---------------|---|
| <b>Alert</b>  | Initial information about an event or hazard        |
| <b>Update</b> | New information updating an earlier message         |
| <b>Cancel</b> | Cancels an earlier message                          |
| <b>Ack</b>    | Acknowledges receipt and acceptance of a message    |
| <b>Error</b>  | Indicates rejection of a message (with explanation) |

# ● ● ● Message Status

Describes the appropriate use of this message:

|                 |  |
|-----------------|--|
| <b>Actual</b>   | Refers to actual hazards or events                               |
| <b>Exercise</b> | Refers to simulated hazards of events, for exercise participants |
| <b>Test</b>     | Technical testing, not actionable                                |
| <b>System</b>   | Network internal messages, updates, etc.                         |



# ● ● ● Message Scope

Describes the appropriate dissemination of this message:

|                   |  |
|-------------------|--|
| <b>Public</b>     | For general delivery to unrestricted audience and the public |
| <b>Restricted</b> | For delivery only according to a specified rule.             |
| <b>Private</b>    | For delivery only to specified addresses.                    |

# ○ ● ● The Info Block

Specifics of an event or a threat:

- Category and description
- Urgency / Severity / Certainty
- Timeframes
- Recommended action
- Links to additional information

# ○ ● ● Multiple Info Blocks

- Multiple languages
- Different instructions or timeframes for different areas
  - Phased evacuation
  - Evacuate vs shelter-in-place
  - Watch vs. warning

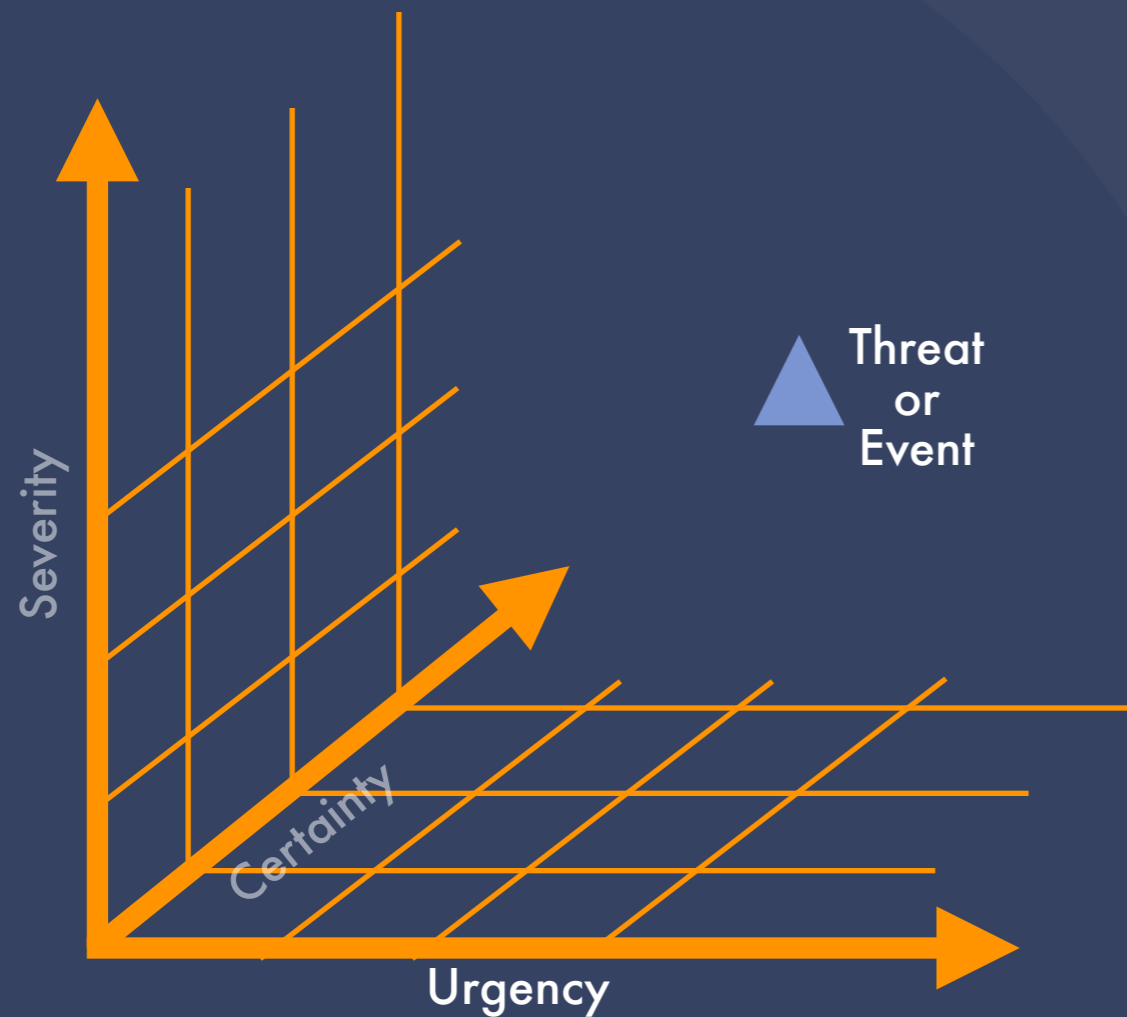


# Event Category

*(A perfect list is hard to find!)*

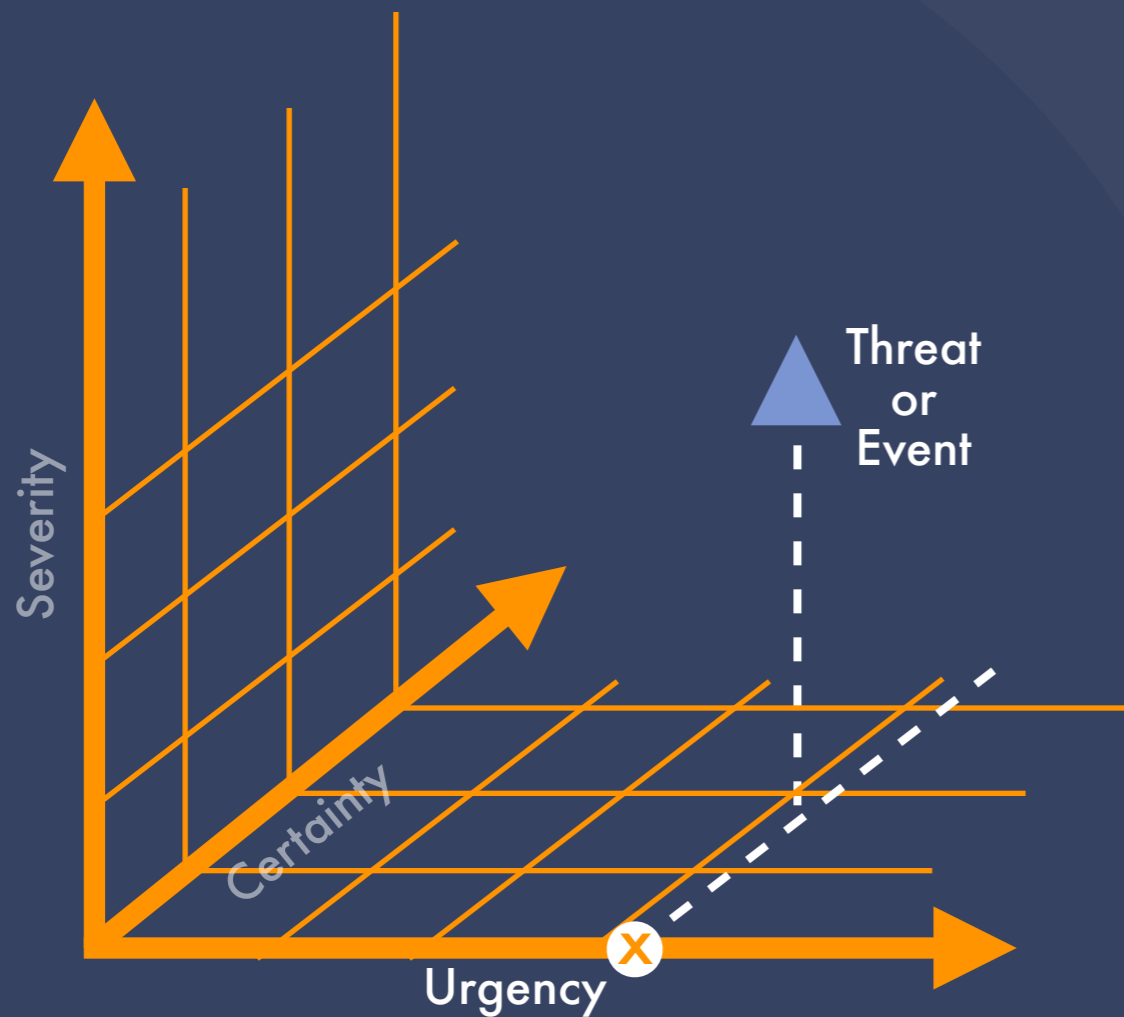
|                  |  |
|------------------|--|
| <b>Geo</b>       | Geophysical  |
| <b>Met</b>       | Meteorological   |
| <b>Safety</b>    | General emergency and public safety                      |
| <b>Security</b>  | Law enforcement, military, homeland and private security |
| <b>Rescue</b>    | Rescue and recovery                                      |
| <b>Fire</b>      | Fire suppression   |
| <b>Health</b>    | Public health and medical                                |
| <b>Env</b>       | Hazmat, pollution and other environmental                |
| <b>Transport</b> | Public and private transportation                        |
| <b>Infra</b>     | Utility, telecommunications, other infrastructure        |
| <b>Other</b>     | Not otherwise categorized                                |

# ○ ● ● The U/S/C Model



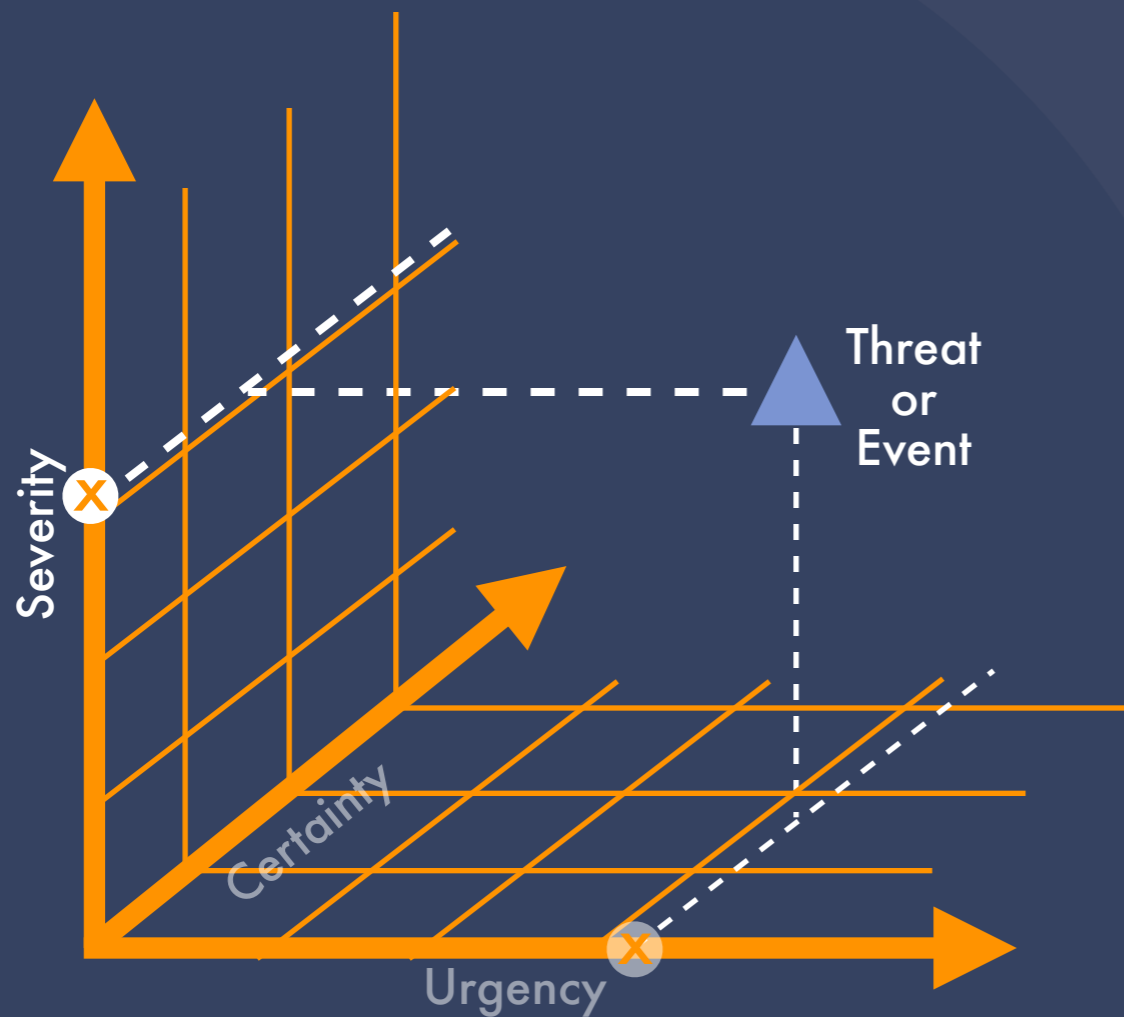
- Traditional one-dimensional model of "priority" is expanded into a "3D" model that expresses:

# ○ ● ● The U/S/C Model



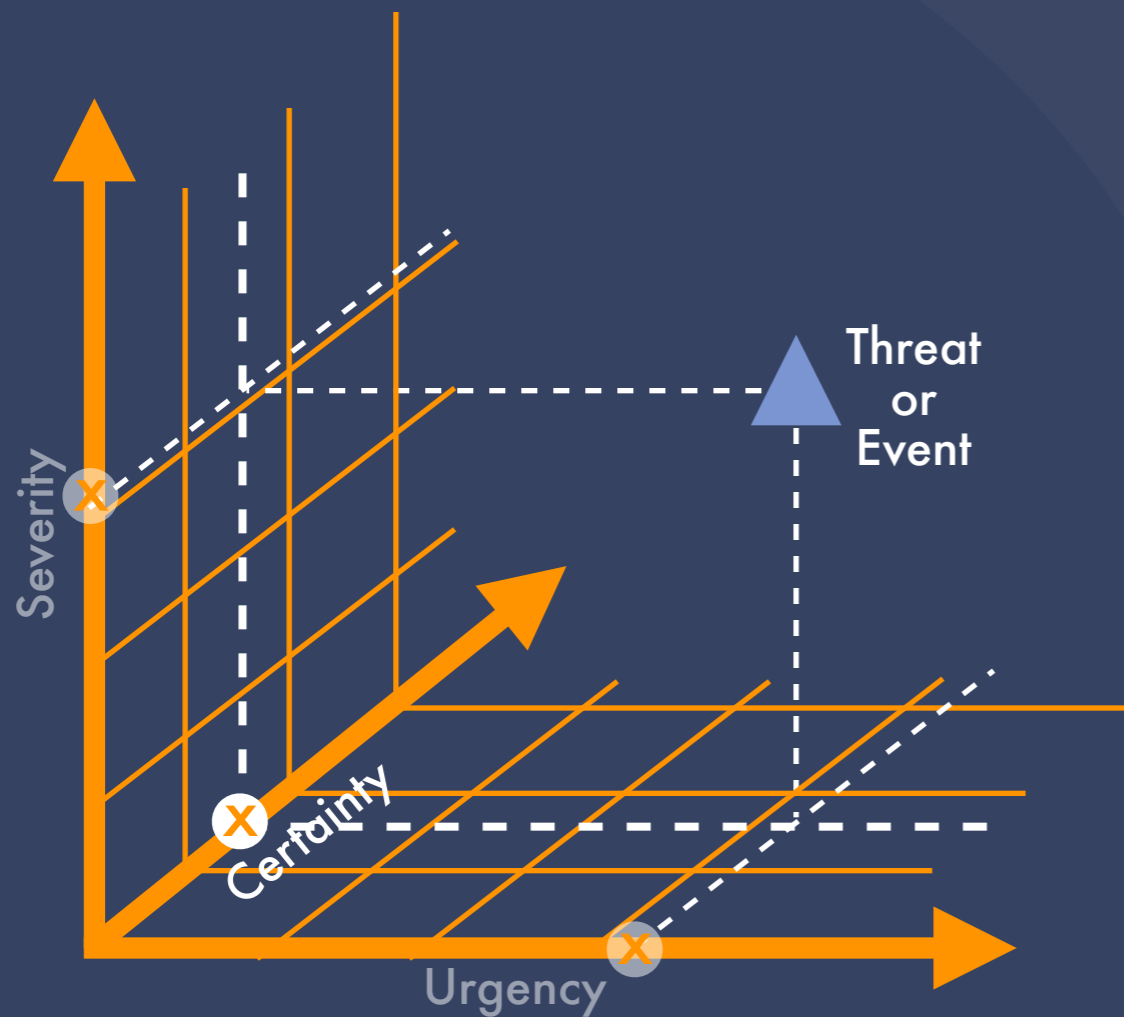
- Traditional one-dimensional model of "priority" is expanded into a "3D" model that expresses:
  - Urgency (time)

# ○ ● ● The U/S/C Model



- Traditional one-dimensional model of "priority" is expanded into a "3D" model that expresses:
  - Urgency (time)
  - Severity (impact)

# ○ ● ● The U/S/C Model



● Traditional one-dimensional model of “priority” is expanded into a “3D” model that expresses:

- Urgency (time)
- Severity (impact)
- Certainty (probability)





# Urgency

In the U/S/C model

Describes the time available to prepare:

|                  |   |
|------------------|---|
| <b>Immediate</b> | Responsive action should be taken immediately |
| <b>Expected</b>  | Action within next hour                       |
| <b>Future</b>    | Action in near future (typically 6-24 hours)  |
| <b>Past</b>      | Past, no preparatory action required          |
| <b>Unknown</b>   | Not known                                     |



# Severity

In the U/S/C model

Describes the intensity of impact (if it occurs):

|                 |  |
|-----------------|--|
| <b>Extreme</b>  | Extraordinary or large-scale threat to life and property |
| <b>Severe</b>   | Significant threat to life and property                  |
| <b>Moderate</b> | Potential threat to life and property                    |
| <b>Minor</b>    | Limited threat to live and property                      |
| <b>Unknown</b>  | Not known  |



# Certainty

In the U/S/C model

Describes the issuer's confidence that the event will occur or has occurred:

|                    |   |
|--------------------|---|
| <b>Very Likely</b> | Highly likely or certain ( $p > 85\%$ )           |
| <b>Likely</b>      | Likely, although not highly likely ( $p > 50\%$ ) |
| <b>Possible</b>    | Possible but not likely ( $p < 50\%$ )            |
| <b>Unlikely</b>    | Not expected to occur                             |
| <b>Unknown</b>     | Not known   |

# ○ ● ● The Area Block

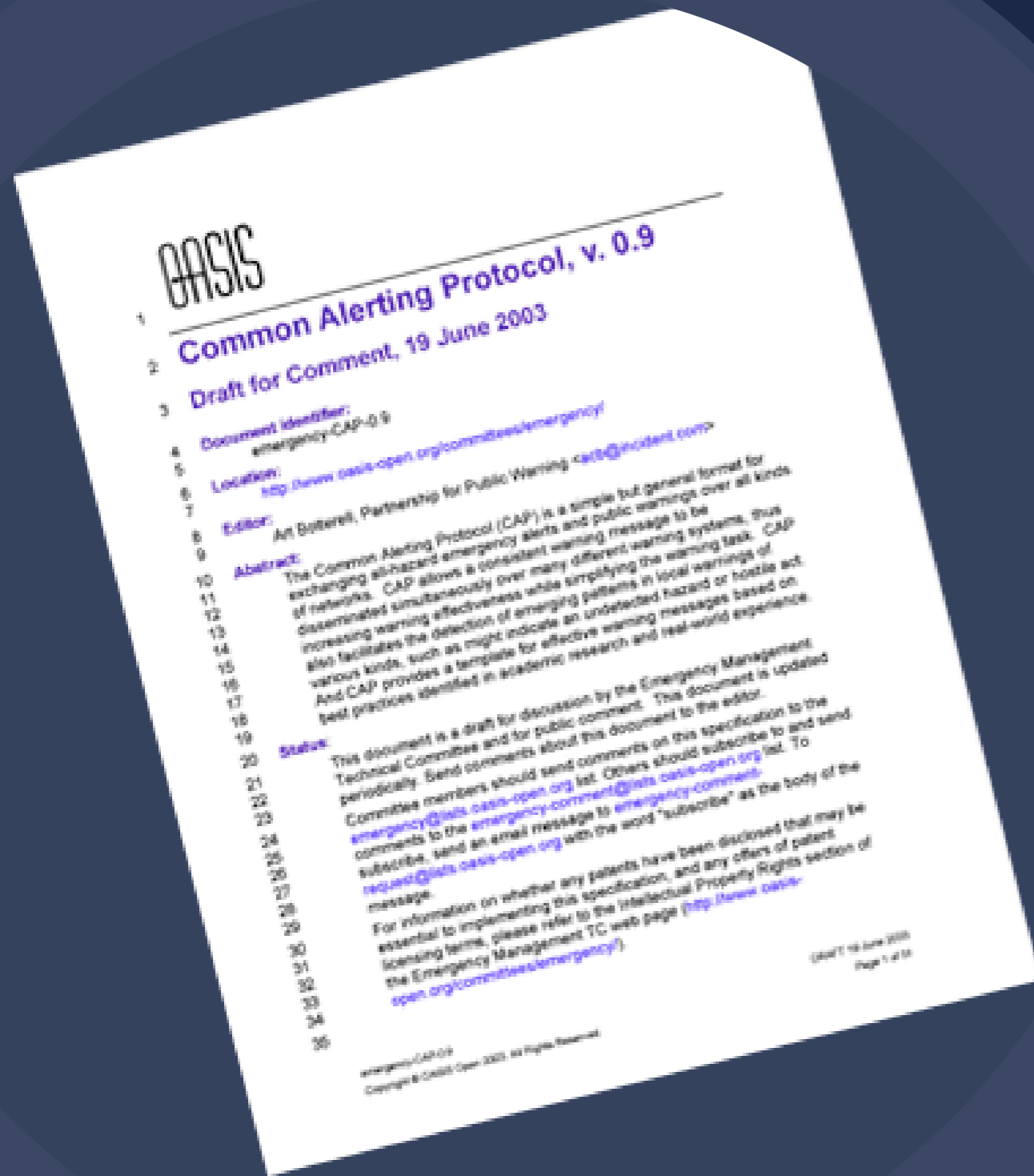
Geographic target area:

- Text description and combo of:
  - GIS Polygon (area)
  - Point and Radius
  - Geographic Code
- Optional altitude and ceiling

# ○ ● ● Multiple Area Blocks

- Multiple areas affected in same way and simultaneously:
  - Multiple floodplain areas along a river
  - Multiple utility service zones
  - Areas with different descriptions

# ● ● ● The OASIS draft



For your review  
and comment:

[http://  
www.oasis-  
open.org/  
committees/  
emergency/](http://www.oasis-open.org/committees/emergency/)

# ○ ● ● The Road Ahead

- User review and comment
- Finalize the standard
- Demonstrations and reference implementations
- Education
- Widespread implementation

# Contacts

for the Common Alerting Protocol project

## OASIS EM TC

<http://www.oasis-open.org/committees/emergency/>

## Partnership for Public Warning

<http://www.ppw.us/>

## CAP Working Group

<http://www.incident.com/cap/>

Workshop presented by

**Art Botterell**

[acb@incident.com](mailto:acb@incident.com)

copyright (c) 2003 Art Botterell

```
<alert>
<msg_id>43b08071-3727-41b4-
<sender_id>U.S. Federal Gover
<sent>2003-04-02T14:39:01-05:
<msg_status>Actual</msg_status
<msg_scope>Public</msg_scope>
<msg_type>Alert</msg_type>
<info>
<language>en-US</language>
<event_cat>Security</event_ca
<event_type>Homeland Securiti
<urgency>Forecast</urgency>
<severity>Severe</severity>
<certainty>High</certainty>
<info_url>http://www.dh
<info_url>http://www
```



