Case study n°3

The Global-Scale Alert Hub for Official Emergency Alerts

Country: United States of America

Level: National

SDG Addressed: SDG 11 – Sustainable Cities and Communities

Summary

The objective of this case study is to show how the Common Alerting Protocol (CAP) standard (ITU X.1303) and other standards have been used by the United States National Oceanic and Atmospheric Administration (N.O.A.A.) and other national administrations for public alerting in emergencies. The CAP is a remarkable success story with 75% of the world's population living in a nation with at least one CAP alert feed operational or under development. Additionally the CAP has led to myriad technical advances, cited in over 300 patents in the U.S. lone and is supported by many commercial enterprises.

The CAP directly contributes to the achievement of SDG Goal 11.b , to "develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels".

The Global-Scale Alert Hub aggregates emergency alerts across official news feeds using the Common Alerting Protocol (CAP) standard, greatly simplifying access and source management. It is implemented on an Internet cloud, using open source freeware developed in the Filtered Alert Hub initiative (see http://alert-hub.org), part of the National Oceanic and Atmospheric Administration (NOAA) Big Data Project.

The Filtered Alert Hub freeware provides customized alert feeds for any of 2000+ defined places (countries and cities), with further selection by any CAP content criteria. The freeware is designed for an Internet cloud, so that an implementation would be highly reliable, highly available, and fast enough that a published alert can reach online users within two seconds. Such speed is crucial for sudden-onset threats (e.g., earthquakes, flash floods, tsunami, tornadoes) where each second delay could result in lives lost.

The Global-scale Alert Hub is an implementation of the Filtered Alert Hub technology. It is set to restrict the alert sources to authorities in the international Register of Alerting Authorities. It is also set to select only high-priority alerts: where people in the alerting area need to act within one hour in response to an extreme or severe emergency having at least 50% certainty.

Background

Historically, emergency messages have been mostly unstructured text, composed like a press release. Unstructured text is a barrier to automated communications processing, especially because emergency messages varied widely across hazard threats, and across countries and languages as well.
The Common Alerting Protocol (CAP) standard addressed this problem with a "standard form" an XML message constructed through fill-in boxes and check boxes to convey just the essential alerting data and information about any kind of emergency.

Every officially recognized source of CAP alerts is in the international Register of Alerting Authorities, maintained by WMO, a treaty-level organization within the UN family.

Strategy

Essential to realize an effective Alert Hub is the accelerating uptake by alerting authorities of the Common Alerting Protocol (CAP) standard, ITU X.1303. Today, 75% of the world's population lives in a nation with at least one CAP alert feed operational or under development. Some countries have very many. For example, the United Sates operates a kind of national scale Alert Hub known as IPAWS, which aggregates over 1000 CAP alert feeds within the U.S. Italy has a CAP alert source for every fire station nationwide.

In addition to CAP, the Alert Hub technology and the international Register of Alerting Authorities are built on many other international standards, including: ISO/IEC 10646, ISO 3166, ITU X.660, ISO 19125, ISO/IEC 11179, and ISO 639, as well as Internet and W3C standards such as XML, RSS, ATOM, HTTP/HTTPS, and TCP/IP.

Results and Impact

The CAP standard, ITU X.1303, has been widely adopted in the 13 years since its first release. CAP is now the pre-eminent standard for public alerting of emergencies in most countries. CAP has led to myriad technical advances, cited in over 300 patents in the U.S. alone

CAP is supported by many commercial enterprises. For example, Pinkertons uses CAP in support of its business intelligence services to 80 of the 100 world largest companies. Microsoft and IBM each offer comprehensive management packages for cities and both are CAP-enabled. Google supports CAP in its products as a public service to alert users in harm's way.

CAP and the Filtered Alert Hub initiative specifically are fundamental to the global-scale WMO Alert Hub prototype. This already including a clone prototype operated by the Hong Kong Observatory and another Alert Hub being developed to serve all of South America. Both AccuWeather and The Weather Company have stated intent to use the WMO Alert Hub once it is operational.

Challenges and Lessons Learned

Given that public safety systems, including CAP-enabled systems, are targets for deliberate mischief, strong security and authentication is essential. ICT security techniques such as encryption and digital signage are used in many CAP systems, but some implementers have difficulty implementing such techniques fully and correctly. A challenge to the ICT community is to make good security easy.

CAP-enabled systems are often life-critical, so it is essential that each message is schema-valid. XML fully serves this requirement, but many programmers find XML challenging, especially with regard to XML namespaces. XML's complexity has led to "dumbed down XML" facilities in some programming languages, and to the use of JSON in Javascript. In a CAP context, these XML substitutes must be used with great care. For example, it is common to find latitude and longitude coordinates reversed in a CAP system where JSON was used somewhat carelessly.

Many real-world implementations of the CAP standard mis-handled use of the "Unknown" value in three enumerated lists: "urgency", "severity" and "certainty". Apparently it is not common for system designers to correctly handle a missing value; instead the value is handled as though assigned a minimal value.

Potential for Replication

The initiative has produced freeware already used in multiple global-scale Alert Hub prototypes. Operational costs are minimal: annual cloud service charges for one prototype is about 2000 USD. Systems at other scales or a subset of all hazards would cost substantially less.

The Alert Hub technology could be applied at any level: global, national, provincial, city, and down to communities, campuses, parks, etc. It could also provide specialized alerting services to globally-dispersed populations such as persons with disabilities, or to anyone in a place where he/she does not understand the native language, such as visitors and refugees.

The technology could be used by any service that has a situational awareness component, whether for purposes of emergency management or for risk management, logistics, investment planning, selective dissemination of news, and business or defence intelligence, among many others. It could be used as the core aggregation and dissemination facility that underlies virtually any monitoring/alerting system. In that sense, it could be directly employed in myriad existing systems specialized by type of man-made or natural hazard, such as typhoons, floods, tsunami, volcanoes, landslides, earthquakes, transportation disruption, firefighting, missile defence, anti-terrorism, child abduction, etc. For instance, it could be a useful adjunct to the global-scale Humanitarian OpenStreetMap Team efforts.

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