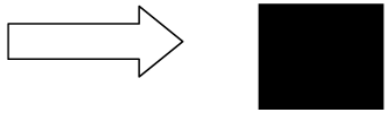
Would You Like an Earthquake Alert System +Others, e.g. floods?

When EAS+ messages are transmitted via digital broadcasting to EAS+ compatible receivers, the time budget depends on various delays, e.g. satellite hops. However a 2.5 second total time from one seismometer detecting an earthquake to the public hearing the alert in their ear appears practical. For the fine print of the details, see the attachment above the black dot

If the dot is not attached to, see http://kynx.us

EAS+ is an optional feature (not a mandate) for consumer receivers.



IPAWS, EEW, AEA & EAS+ Overview

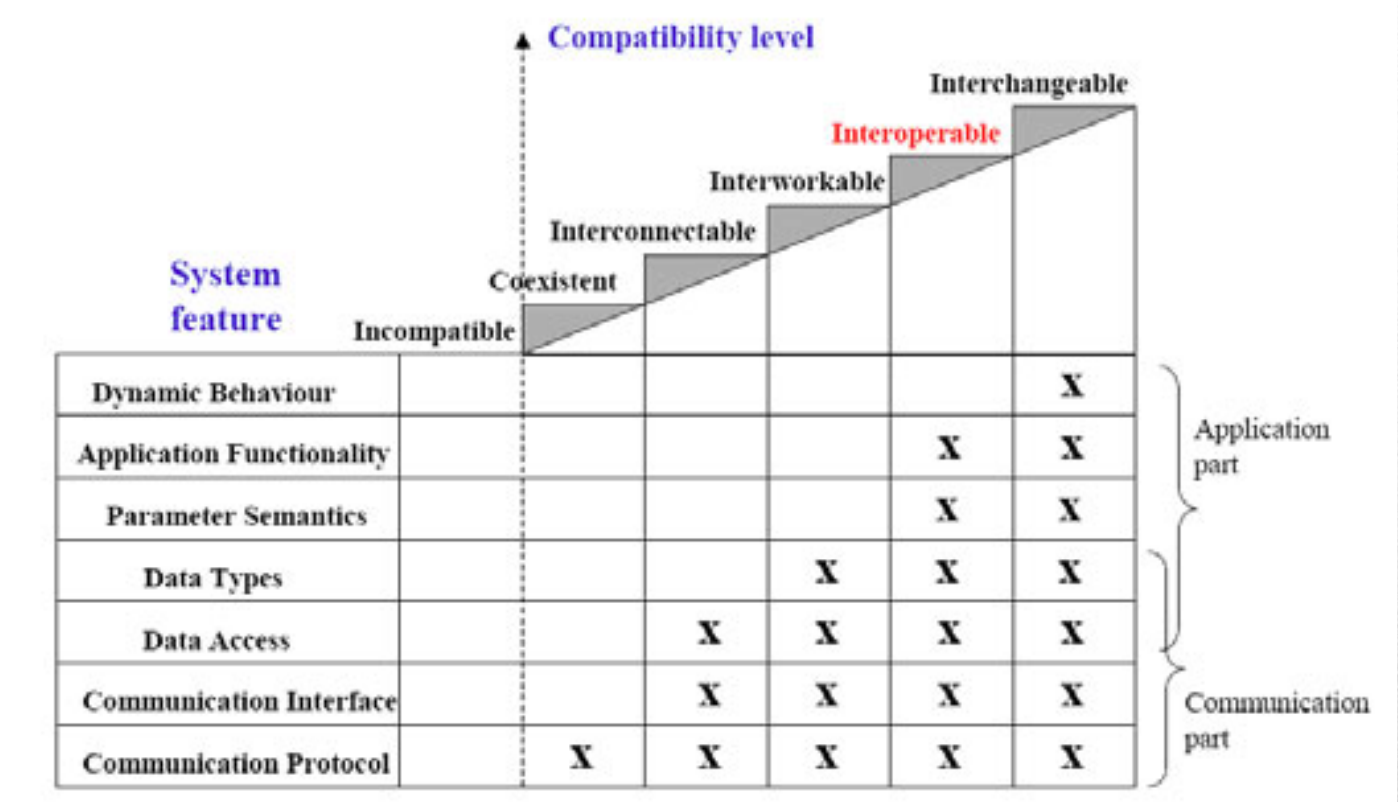
Frank W. Bell 2017-7-28

http://kynx.us for more. Consider EAS+ as a set of compatible tools for your situation. It is not a one size fits all approach. AWARN/AEA is for TV

Earthquake Early Warning System is based on EAS+ technology for most rapid, selective alerts.

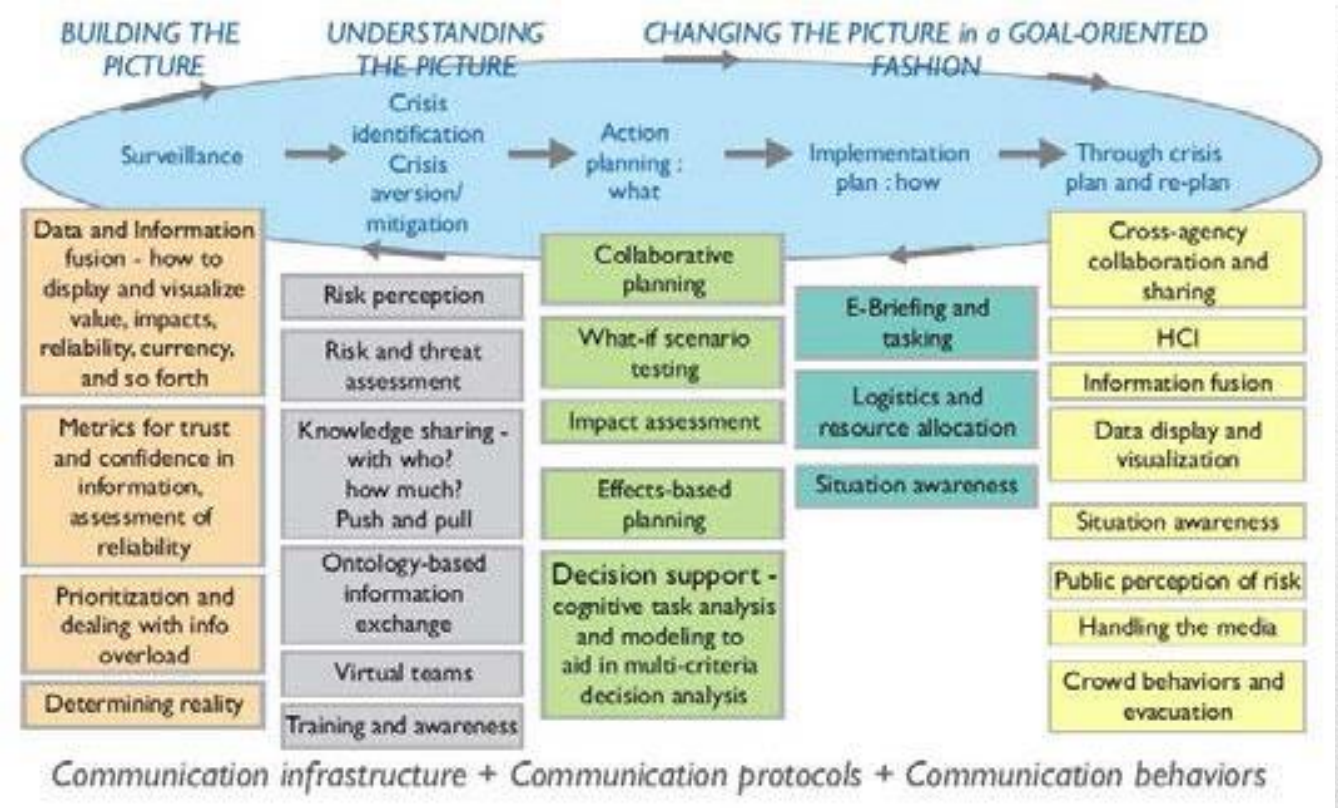
3 Learning Points

- EAS+/EEW is a broadcast alerting and file distribution system that saves lives, e.g. Samoa, though the features are limited when only analog broadcasting is available.
- IPAWS is a system of systems for emergency management using CAP and EDXL protocols. These protocols are developed by www.oasis-open.org.
- Severe non-human project risks are increasingly becoming manageable instead of invoking the “Acts of G_d” clause. Loss of life of project staff to disasters can be mitigated. Loss of time is also more manageable by allowing time for mitigation measures when appropriate. A response time of seconds is useful for tsunamis and for earthquake mitigation. Processing and transmission time is minimal.



Leppäniemi et al, 2009, *Toward a Flexible Service-Oriented Reference Architecture for Situational Awareness*.

What the Other Guy Said...



Adapted from "Interoperability and Situational Awareness and Disaster Management," Leppäniemi et al., 2009, *Toward a Flexible Service-Oriented Reference Architecture for Situational Awareness.*

What the Other Guy Said #2

What the Other Guy Said #3

A graphical depiction of the incident lifecycle. Presented in "Incident Lifecycle," Leppäniemi, 2009, *Toward a Flexible Service-Oriented Reference Architecture for Situational Awareness Systems in Distributed Disaster Knowledge Management.* Reported in Leppäniemi as originally from D. Alexander, Principles of Emergency Planning and Management, Tera Publishing, 2002, p. 6.

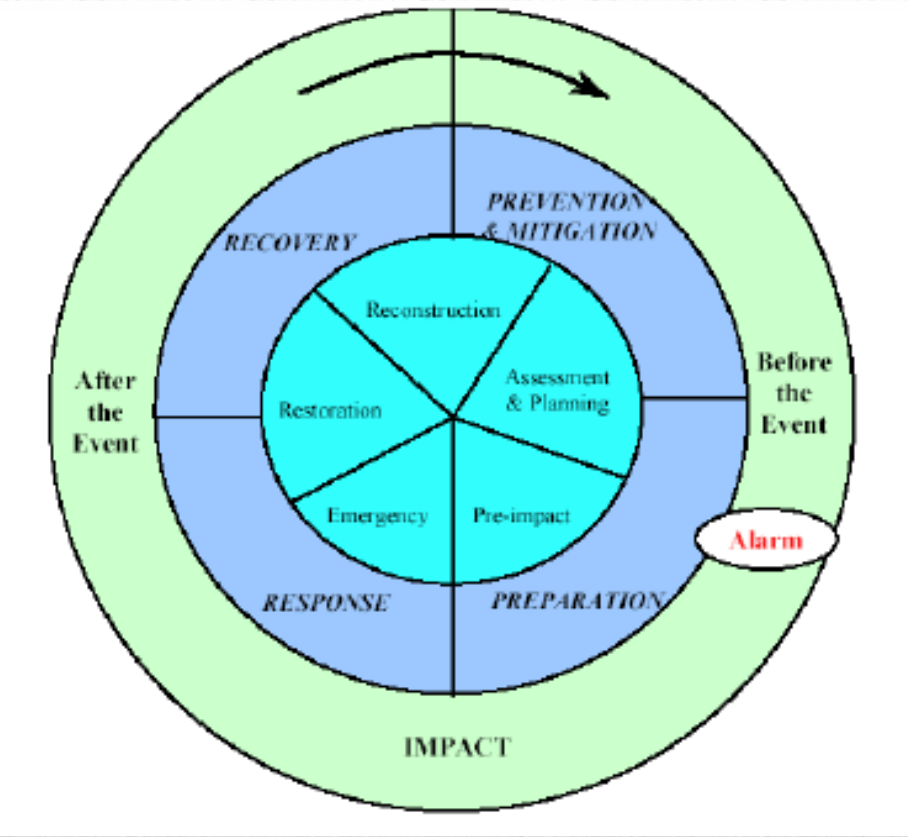
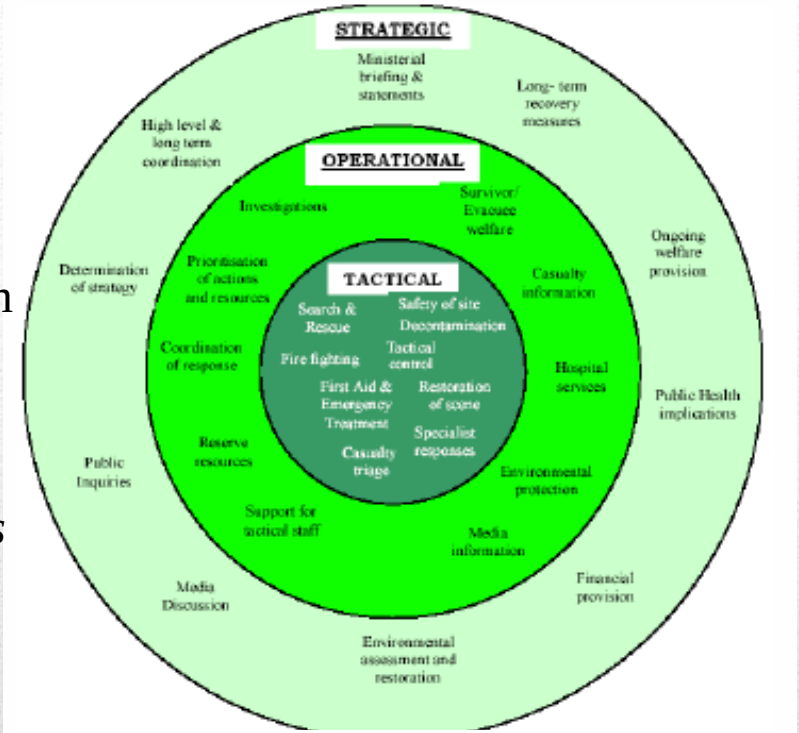
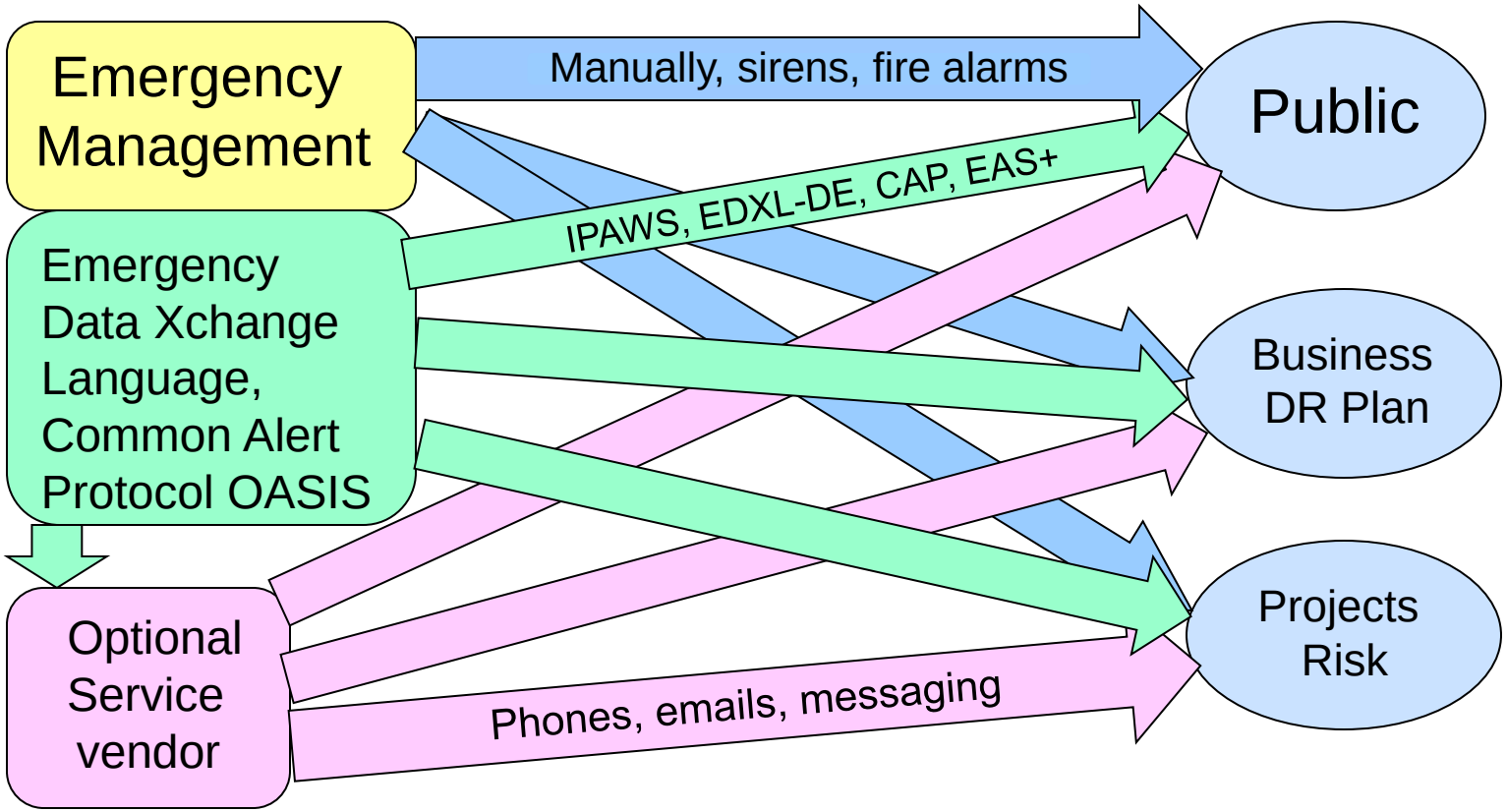


Figure 18. Levels of Situation Awareness. A graphical depiction of the need to support three levels of situation awareness: strategic, operational, and tactical. Adapted from "Levels of Situation Awareness," Leppaniemi, 2009, *Toward a Flexible Service-Oriented Reference Architecture for Situational Awareness Systems in Distributed Disaster Knowledge Management.* Reported in Leppäniemi as originally from A Guide to Emergency Planning in Northern Ireland, Emergency Planning Unit, 1998.



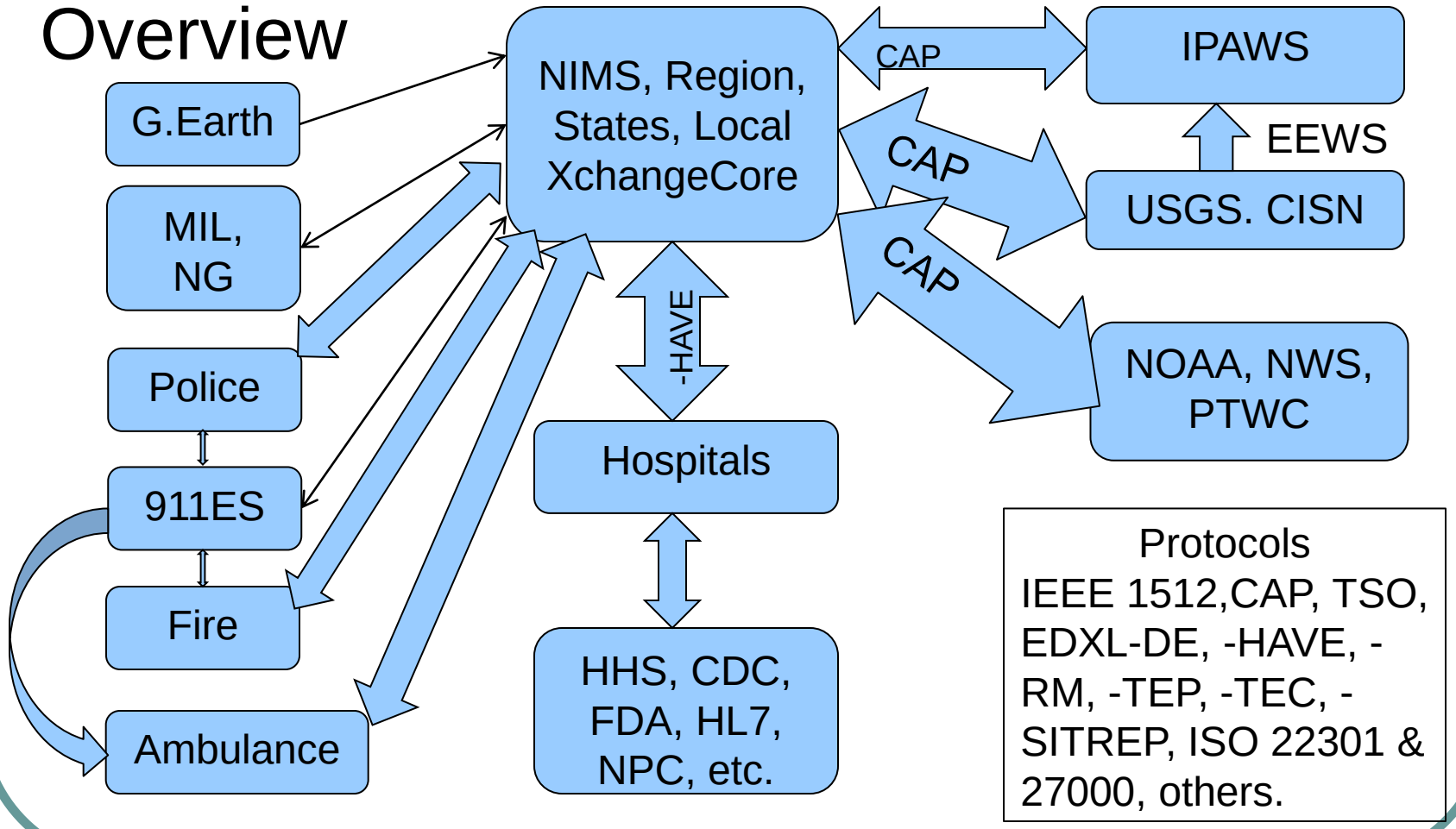
What the Other Guy Said #4

Integrated Public Alert & Warning System (IPAWS), computer based



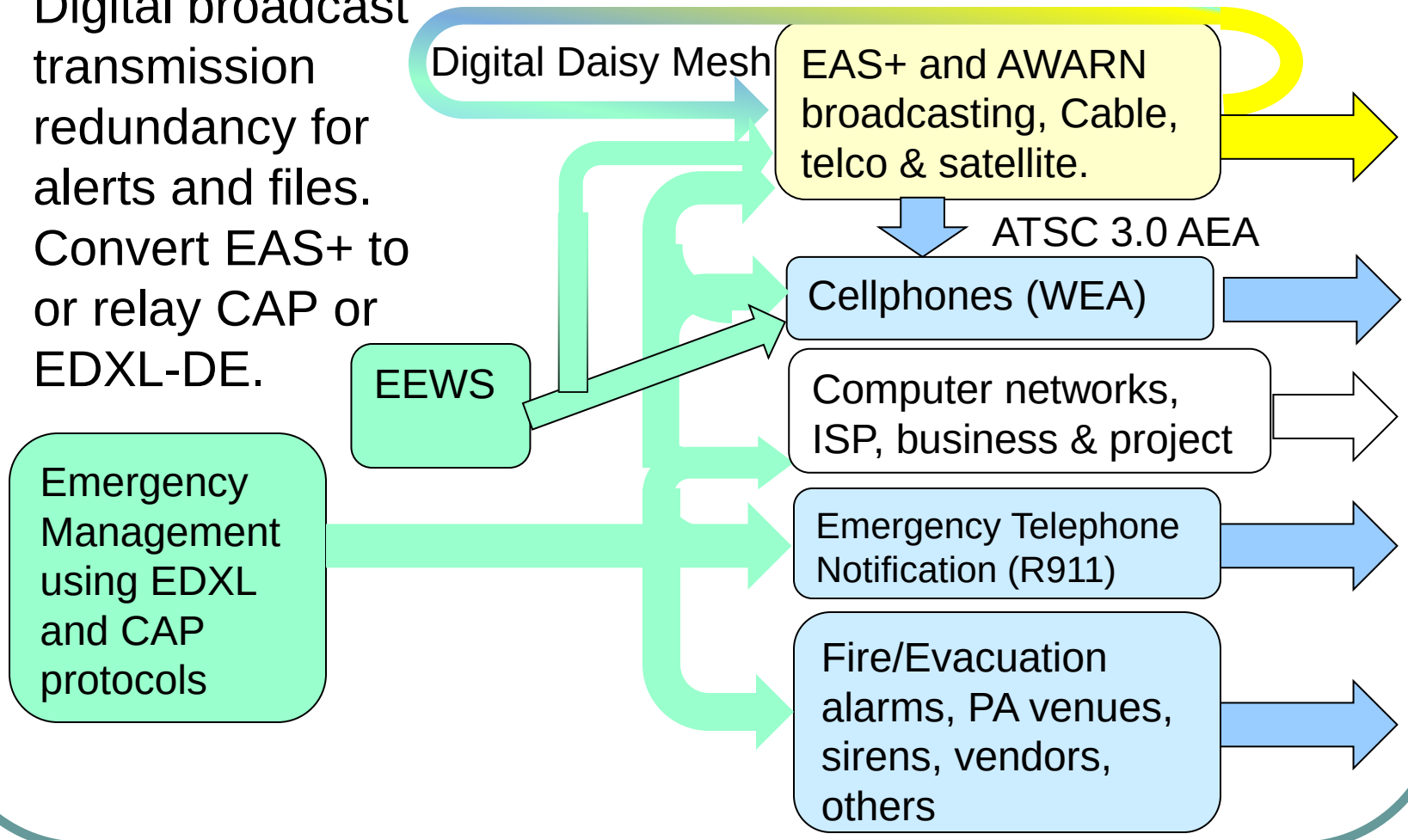
- With IT and other technologies

Why IPAWS? NIEM Compliance

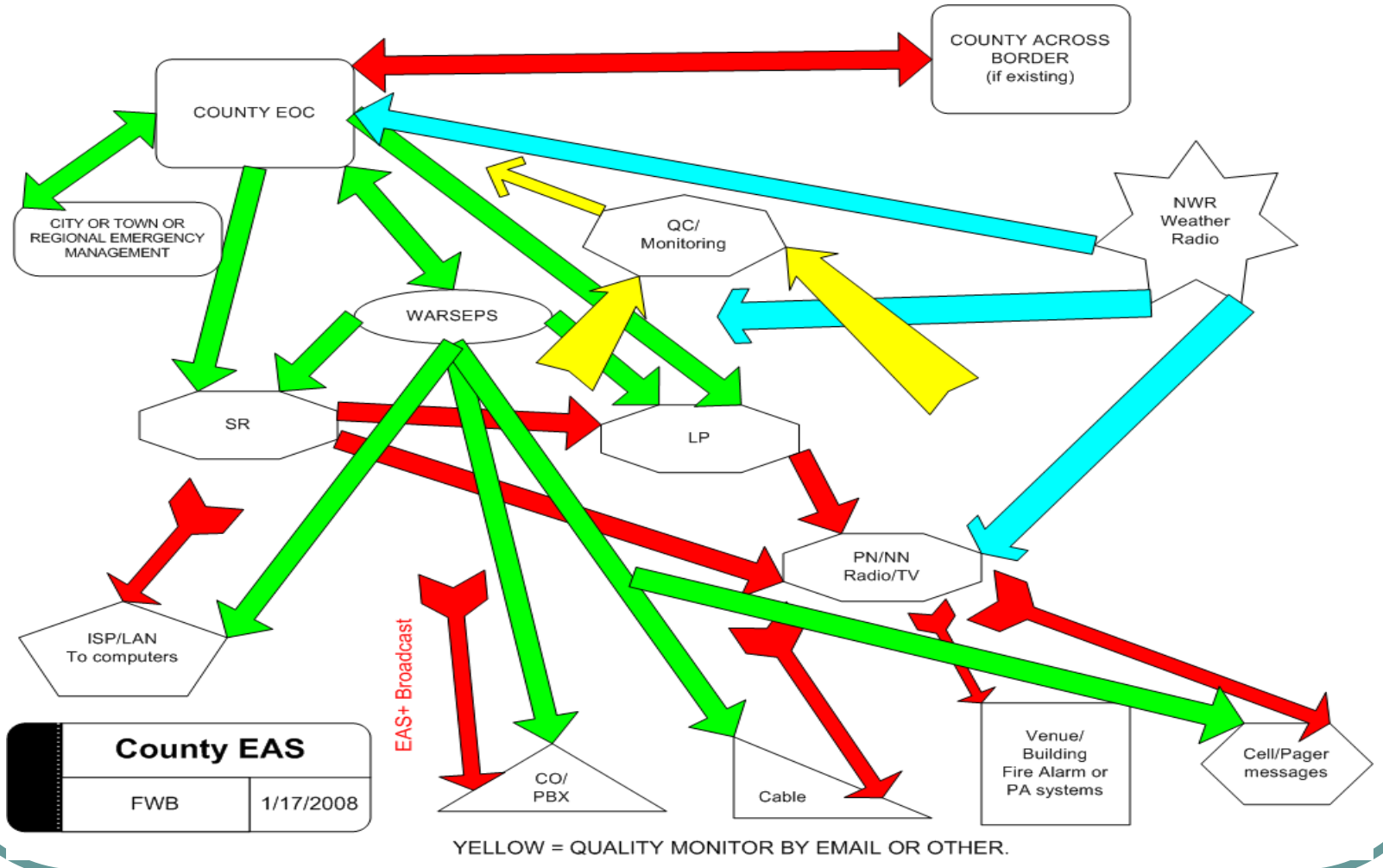


IPAWS Introduction - 3

- Digital broadcast transmission redundancy for alerts and files. Convert EAS+ to or relay CAP or EDXL-DE.



More Complex



Opinion -1

- Considerable dissatisfaction expressed at FEMA/FCC summit for EAS in 2008
- This Federal and large disaster system is little used by local EMOs because it is currently unsuitable and it effectively cannot be incorporated into exercises
- Original encoder/decoders are mostly replaced with PC platform now.
- HD radio & digital TV offer possibilities

Opinion -2

- Terrorists strike locally, but the current large area architecture is to the advantage of terrorists impact.
- E.g. Canada and other languages (e.g. Spanish, French) have no provision for local implementation
- Better selectivity to avoid irrelevant messages
- Less effort by broadcast staff, perhaps EMO also
- Better integration into program automation and hence flow.

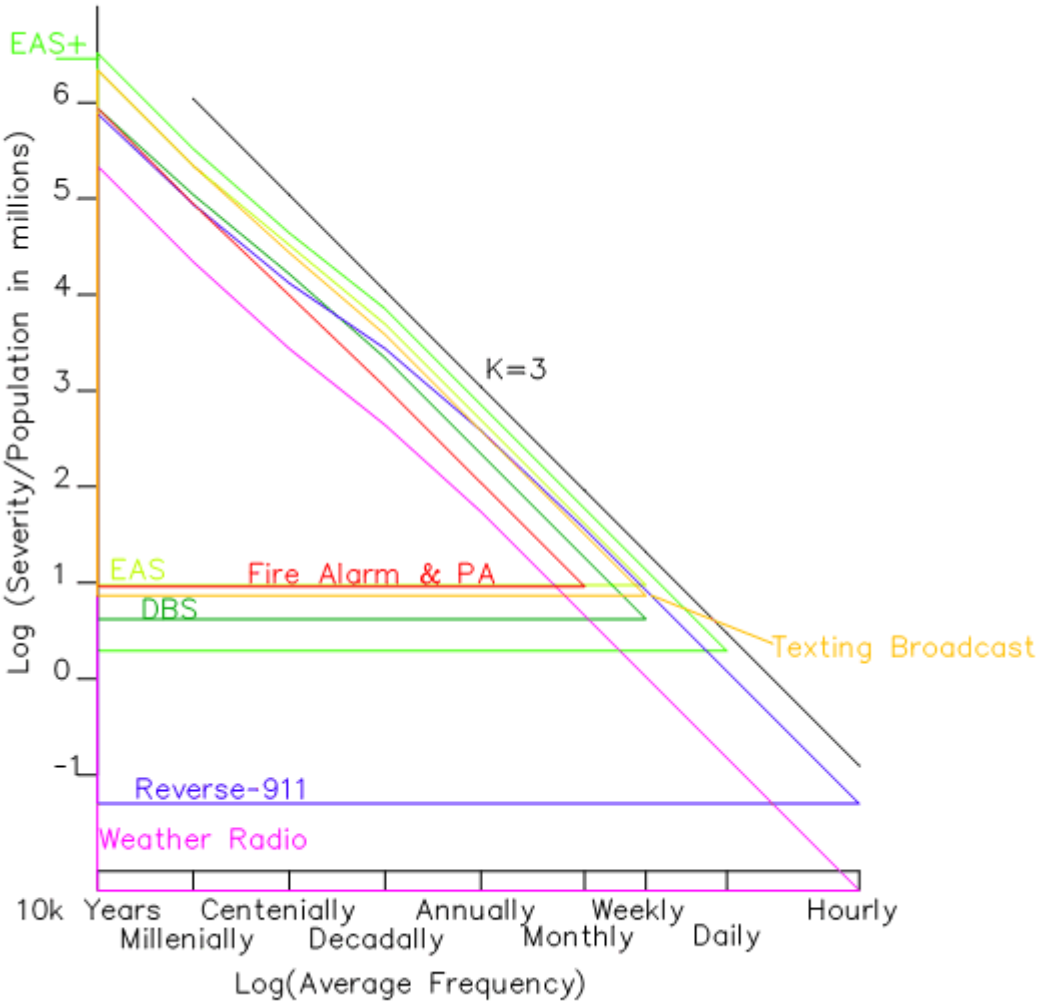
Value Based Paradigm

- The value of a message is the Importance of the message times the number of recipients it is important to, less the Annoyance of the population receiving the message who are not intended recipients.
- This depends on the Event code and the Customer selection ability to select important messages.
- Market research is needed

Value of different technologies

- The different technologies can vary by;
- P, the penetration into the coverage area as a fraction of the population reached at any time.
- R, the response time of the technology, earthquakes require rapid response
- F, the maximum frequency of usage

A Value Graph



This graph is a rough Approximation. A Survey to measure The source data would improve this. The K is assumed to be 3. This follows the y=K/f noise curve, which is comparable to the Zipf law, which gives rise to the Pareto Principle.

IPAWS

- Integrated Public Alert Warning System
- Common Alert Protocol & EDXL based
- Varying alerting technologies, e.g.;
- Improved EAS and AWARN/AEA
- Cellphone Text Broadcast
- Email/texting
- Emergency Telephone Notification (R911)
- Fire Alarms & PA Systems (& Sirens)
- Future delivery to computers of alerts and publication files (CAP Broadcast mode EAS+)

EAS+ improvements over EAS

- Capabilities beyond current CAP and EDXL standards
- Backward compatible with EAS for simple migration. Old encoder/decoders OK for analog with software upgrade.
- Priority scheme, 1 is immediate override, others can be scheduled by automation
- First responders exercise mode
- Future delivery to computers of alerts and publication files (EAS+AWARN)

EAS+ improvements - 2

- A tunneling mode possible to replace the daisy chain
- Response time in seconds for priority 1, can be an earthquake warning system.
- Selectivity by location by county sector or polygon defined
- Car radios can use polygons with navigation systems, good for jurisdictions
- More Event Codes for local emergencies

EAS+ improvements -3

- Selectivity by polygons to 1 yard/meter resolution (or better)
- Selectivity by receiver category (vehicles, Intelligent Highway Sign)
- Selectivity by user category (e.g. first responder)
- Customer adjustable selectivity, by feature or other (e.g. priority)

EAS+ improvements -4

- Country code
- Language code, and up to four languages of audio (text via CAP?)
- AMBER Alert pictures for kidnapped children
- To Fire Alarm/PA systems possible
- Multistate broadcast coverage possible for message routing (e.g. NYC to 3 states)
- Automated QC and value calculation with monitoring receivers and emails

EAS+ improvements -5

- Standards based architecture means that consumer electronics manufacturers can add this as a feature for the small additional cost. Also other countries adopting this would be aided by the volume economics of consumer electronics.
- CAP becoming world standard, EDXL is a standard, EAS+ also is possible
- CAP Broadcast mode for file broadcast.

EAS+ improvements -6

- An EAS+ message can be used to regenerate a CAP/EDXL message. This is useful in the event of CAP distribution network failure. EAS really can't do that
- EAS+ compatible encoder/decoders are already available, with an application upgrade that also supports the FEMA CAP to EAS specification available soon
- An EAS+ text protocol is appropriate, based on closed captioning EIA-708

EEW Processing Time Budget

- P wave processing & message 0.4s
- EMS processing 0.1s
- Transmission time 0.2s
- EAS+ encoder processing 0.1s
- Consumer receiver processing 0.3s
- Alert tone duration SEWS 0.7s
- “Earthquake” audio duration 0.3s
- TOTAL 2.1s

Conclusion

- Numerous problems, and numerous solutions to address them, including market research
- Standards for Computer Aided Dispatch can be compatible e.g. IEEE1512, TSO.
- Some complementary software appropriate
- Deployment will take time, but transistor prices are falling. Should become an insignificant extra cost for this consumer electronics feature. Frank.w.bell@usa.net
- http://kynx.us for downloads

Call To Action, Let's Mitigate Disasters!

- When timely, accurate and effectively delivered alerts are provided, this can be lifesaving and affordable. E.g. comparing American Samoa and Samoa tsunami in 2009, or Indian Ocean 2004 and Japanese 2011 earthquake/tsunamis, many lives are saved by alerting.
- Alerts can be delivered by radio, TV cellphone and internet. However as broadcasting is currently unable to be selective in the delivery, this is solved with a patent granted last year. This is not just a technology, but a set of solutions that are documented in over 500 pages. FEMA is responsible for the IPAWS Program (Integrated Public Alert and Warning System, includes WEA to cellphones and EAS on radio and TV).
- *Some further information is available at www.pattcom.com/eas. It is likely that FEMA will soon be able to move forward on this, as legislation is progressing through Congress. It also depends on various parties cooperating for this to be effective. This did not happen in Haiti, and has not begun for Nepal, a relief organization is needed. The most effective delivery device is the consumer electronics that people carry or have nearby. For suitable devices, the added cost is about 2c for added memory. Consumer electronics manufacturers respond to consumer needs, and government mandates are not desirable. FEMA however has been supporting the development of improved Emergency Management technologies that are suitable for worldwide use. Himalayan earthquakes can well exceed 8.0, perhaps reaching 9.0. Casualties may exceed 200,000 and be up to 1 million. Google "Himalayan earthquake casualty estimates"*