Improving Information Exchange and Coordination amongst Homeland Security Organizations

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Outline

- Motivation
- Practicalities of Emergency Management (EM)
- Technological support
- Opportunities for improvement
- The Vista concept
- Current status & future plans



Motivation

- The need for effective coordination
- Concerted effort to provide new resources
- Encouraging information exchange, but several complications remain:
 - Continued problems due to a lack of unified and hierarchical command
 - Lack of system and semantic interoperability amongst Homeland Security (HLS) organizations
 - Lack of practice



HLS Operations from the EM Perspective

- Gathered knowledge from decision makers with EM organizations in Washington State
 - City, County & State (National Guard)
- Breadth of coordination
 - Home Rule States
 - Non-government organizations
- HLS and All-Hazards EM
- Personnel characteristics
 - Infrequent exercises, changes in personnel, low levels of training

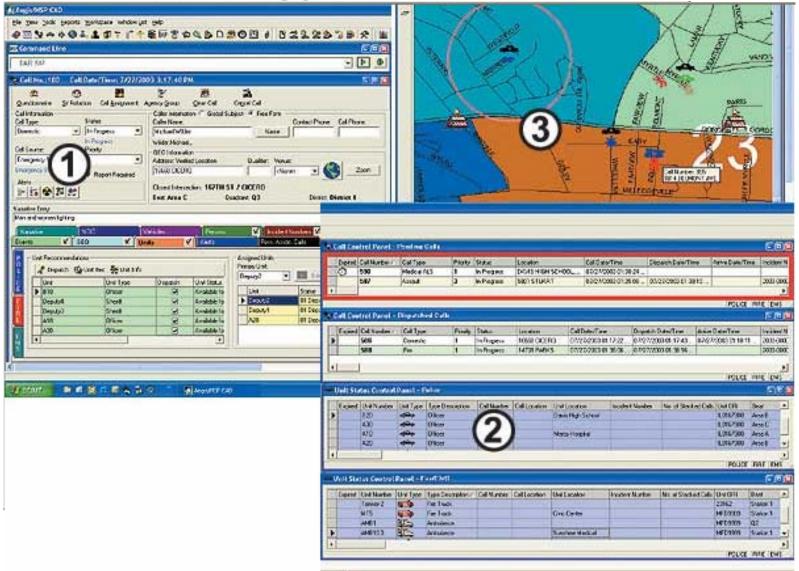


EM Concept of Operations

- Forewarning of an event (Phase I Alert)
 - EOC watch standers will monitor the situation
- The EOC is activated (Phase II Alert)
 - Department lacks sufficient resources
 - Involved departments meet at the EOC
- The EOC is fully activated (Phase III Alert)
 - Full resources are applied
 - Requests can be made to state



Technology Support



TOPOFF 2

- Communications challenges
 - heavy use of hand written information transcription and fax communication caused several errors
 - confusion over WMD device time and plume path
 - lack of shared terminology
- No shared knowledge of capabilities / resources
- Multitude of "control nodes"
 - Joint Operations Center failure



Opportunities to Improve / Our Goals

- Streamlining information monitoring/access across organizational boundaries
 - timely alerting in emergency response
 - support for everyday activities
- Supplying User Defined Operational Picture (UDOP)
 - · individualized display of common data
- Reducing the need for co-location
- Enhanced joint training



The Vista Concept

- Compliments current Crisis Information
 Management System (CIMS) technologies
 - Exploit unfolding mission context to understand information requirements
 - 2. Provide users with an ongoing awareness of the information being generated across partners
 - 3. Continually adapt in order to maintain semantic interoperability



Work-Centered Mission Context Modeling

Context understanding

- relevancy-rated documents
- situation data interpreted through a shallow model of EM processes
- task vocabularies

Federated information monitoring/access

- multi-search & context-based filtering/prioritization
- improves sharing efficacy in a broad set of tasks
- foundation for UDOP



Achieving Semantic Interoperability

Goals

- allow partner organizations to utilize their own systems
- support sharing and automated interpretation of "OPORD's" and intelligence
- Two reasonable approaches to semantic interoperability
 - Hybrid ontological approach
 - semantics of each source described by its own ontology
 - map to and from a central ontology (i.e., shared vocabulary)
 - Just-in-time and ad-hoc "concept switching"
 - exploit context awareness to automatically locate (and locally) align vocabulary to support task



Context-Aware Search and Monitoring

- Two primary modes of information access
 - "goal-driven" mode where the individual seeks to fill fairly well understood information needs
 - "knowledge surveillance" mode where the individual seeks to maintain an awareness of information being generated elsewhere
- Context-aware relevance judgments vs. keyword filters
- Multi-search



Experiments & Results

- Context-aware search with multi-search
 - control group: 4 queries
 - saw 56% increase in highly relevant results in 2nd half
 - experimental group: 2 queries + 2 automated queries
 - saw 127% increase in highly relevant results
- Concept switching in search
 - 2 communities with different terminology
 - tested the utility of selectively "sharing" vocabulary
 - averaged 27% gain in relevant results with sharing



Lessons Learned

- Supporting All-Hazards EM is necessary
 - the more tools see everyday use, the more effective they will be in a crisis
- Substantial effort spent in info. monitoring
 - critical information is not always pushed to where it is needed
- EM C2 is considerably different than military
 C2 in most situations
- Context-aware search/filtering & "concept switching" offer substantial benefits



Current Status & Future Plans

- Project has entered a second phase of R&D
 - focus is deploying and testing tools
- Consensus amongst user organizations was reached on the need for user-defined dashboard
 - automated monitoring of web data sources
 - task driven data aggregation and display
- Working toward automated processing of task, resource, and intelligence updates

