

6/15/2005

Improving Information Exchange and Coordination amongst Homeland Security Organizations

ICCRTS 2005

June 15, 2005

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Smarter Software Solutions

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

The screenshot displays a dispatch software interface with several key components:

- Call Information Panel (1):** Shows details for a call received at 3:17:46 PM. The call type is 'Emergency' and the status is 'In Progress'. The address is '167TH ST / OCEANO'. A circled '1' highlights the 'Emergency' call type dropdown.
- Map:** A map view showing the location of the call. A circled '3' highlights a specific area on the map.
- Unit Recommendations:** A list of units available for dispatch, including 'Dispatch', 'Unit 10', 'Dispatch', 'Unit 11', 'Unit 12', 'Unit 13', 'Unit 14', 'Unit 15', 'Unit 16', 'Unit 17', 'Unit 18', 'Unit 19', 'Unit 20', 'Unit 21', 'Unit 22', 'Unit 23', 'Unit 24', 'Unit 25', 'Unit 26', 'Unit 27', 'Unit 28', 'Unit 29', 'Unit 30', 'Unit 31', 'Unit 32', 'Unit 33', 'Unit 34', 'Unit 35', 'Unit 36', 'Unit 37', 'Unit 38', 'Unit 39', 'Unit 40', 'Unit 41', 'Unit 42', 'Unit 43', 'Unit 44', 'Unit 45', 'Unit 46', 'Unit 47', 'Unit 48', 'Unit 49', 'Unit 50', 'Unit 51', 'Unit 52', 'Unit 53', 'Unit 54', 'Unit 55', 'Unit 56', 'Unit 57', 'Unit 58', 'Unit 59', 'Unit 60', 'Unit 61', 'Unit 62', 'Unit 63', 'Unit 64', 'Unit 65', 'Unit 66', 'Unit 67', 'Unit 68', 'Unit 69', 'Unit 70', 'Unit 71', 'Unit 72', 'Unit 73', 'Unit 74', 'Unit 75', 'Unit 76', 'Unit 77', 'Unit 78', 'Unit 79', 'Unit 80', 'Unit 81', 'Unit 82', 'Unit 83', 'Unit 84', 'Unit 85', 'Unit 86', 'Unit 87', 'Unit 88', 'Unit 89', 'Unit 90', 'Unit 91', 'Unit 92', 'Unit 93', 'Unit 94', 'Unit 95', 'Unit 96', 'Unit 97', 'Unit 98', 'Unit 99', 'Unit 100'. A circled '1' highlights the 'Dispatch' unit recommendation.
- Call Control Panel - Pending Calls:** A table showing pending calls. A circled '2' highlights the 'Call Number' column.
- Call Control Panel - Dispatched Calls:** A table showing dispatched calls. A circled '2' highlights the 'Call Number' column.
- Unit Status Control Panel - Police:** A table showing the status of police units. A circled '2' highlights the 'Unit Number' column.
- Unit Status Control Panel - Fire/IT:** A table showing the status of fire and IT units. A circled '2' highlights the 'Unit Number' column.

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
 1. 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