

Conceptual Model of Emergency Management in the 21st Century

Homeland Security

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Abstract

In post 9/11 society, the need for efficient and effective emergency management is imperative at all levels of government. In the past ten years, the United States has witnessed many Incidents of National Significance, from terrorism to natural disasters. Local level resources can quickly deplete, forcing the need for cooperation and assistance from external sources. While there are numerous emergency response plans in existence, there is no universally accepted model for integrated incident response involving all levels and players.

Evidence Based Research, Inc. (EBR) has been tasked with developing a conceptual model at the state and local levels, including attributes and behaviors of first responders and other local and state emergency response agencies. This model will be used to facilitate the development of a simulation that is capable of driving exercises and training in a Homeland Security environment. Additionally, the model will utilize the various existing plans to document the roles of emergency response personnel at various levels.

Physical, information, cognitive, and social domains of Command and Control (C2) are represented throughout the model. Data from Determined Promise 04 (DP04) and several emergency response plans are being used to provide the initial foundation for the development of the model. Additionally, data will be collected during Ardent Sentry 05 to further refine the model. The conceptual model will serve as the foundation for a multidimensional, interactive simulation, which will be utilized to assist in the training and development of emergency responders/agencies.

Introduction

Natural and manmade disasters have long plagued society, forcing humans to cope with the aftermath, and prevent future destruction when possible. Out of these efforts, the process of emergency management evolved to create the underpinnings of the system currently in place. With time and experience, emergency management has improved and become adept at addressing many previous concerns; however, one of the current challenges facing emergency responders is determining how to provide an integrated response across jurisdictions and departments. In the sections that follow, the history of emergency management and lessons learned from previous incidents will be discussed. In addition, the newly developed conceptual model to aid emergency workers in a comprehensive response will be described.

History of Emergency Management

Pre 9/11

The idea of a civil defense in the United States has been around for decades, dating as far back as the early 1900's with references to protecting the country against foreign attackers, natural disasters, and the coordination of resources.

The Army Appropriations Act, the first piece of legislation for civil defense, was enacted by Congress in 1916 and also created the Council of National Defense (CND). The council was created to coordinate industries, resources, and state and local defense councils for national defense purposes. It also analyzed problems of readjustment and reconstruction after a war. (U.S. National Archives & Records Administration, 2005) The War Industries Board was formed by the CND and state defense councils were organized by the states through this board. Meanwhile, the states were pushing for localities to create their own defense councils. (U.S. National Archives & Records Administration, 2005)

The first systematic efforts by the federal government to give some type of assistance after a disaster were during the Dust Bowl Years in the late 1920s and early 1930s after farmlands were devastated. The onslaught of WWII and the development of missiles capable of traveling several hundred miles by Germany was the catalyst causing the federal government to develop a federal civil defense system. (Huntingdon Country, Pennsylvania, 2005)

A priority was placed on civilian defense of coastlines to protect citizens from enemy countries. The first federal administration, the Federal Civil Defense Administration (FCDA), was created by President Harry Truman in 1949 after the Soviet Union detonated its first atomic weapon. Congress remedied the fact that there was no instrument in place to offer direct federal aid to state and local governments during an emergency by passing the Federal Civil Defense Act of 1950. (New Jersey Office of Emergency Management, 2005)

The 1950s and 1960s saw an emergence of policies and plans dealing with the threat of a nuclear attack resulting from the Cold War between the United States and the Soviet Union. The FCDA was turned into an independent agency. (United States Code, 2005) It then took over the responsibilities of what was once the National Security Resources Board (NSRB) which was formed out of the National Security Act of 1947. This board was created to "advise the President on mobilization coordination of the United States" during times of war.

There was tension within all levels of government during this time about the difference between civil defense activities during times of war and natural disaster relief efforts and what types of aid and activities were to be used for each. Also during this time, civil defense planners

were creating mass evacuation policies for assumed targets of the USSR, on the belief that major cities and installations would become prime targets for nuclear missiles. (Huntingdon Country, Pennsylvania, 2005)

The Federal Civil Defense Act was modified in 1958 to allow the government to allocate money for civil emergency preparedness (New Jersey Office of Emergency Management, 2005) During the 1960s, the Office of Emergency Planning (OEP), which was renamed to the Office of Emergency Preparedness, became the lead organization for the coordination all of civilian emergency preparedness events (U.S. National Archives & Records Administration, 2005) These activities included disaster relief, post-attack analysis, financial stabilization, resource deployment, and continuity of government functions. There were also several serious Hazardous Materials (HAZMAT) incidents during this time that motivated the government to reevaluate the way it transported and stored hazardous materials. There was also more damage being done to buildings and more lives being lost due to natural disasters. Thus, in 1979, the Federal Emergency Management Agency (FEMA) was created by President Jimmy Carter to house civil defense emergency preparedness functions together in one organization. (FEMA, 2005) For the next two decades, FEMA would be the center for state and local emergency preparedness.

Another important piece of legislation passed was the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which was amended in 2000. When the local and state governments become overwhelmed with emergency response efforts, the federal government may be called upon to provide additional relief to help the citizens of the effected areas. (Robert T. Stafford Disaster Relief and Emergency Assistance Act, amended 2000) It also defines the appropriate channels to request federal aid and the various conditions that must be met in order to receive assistance.

In the 1980's, an idea known as "Comprehensive Emergency Management" (CEM) developed within FEMA's civilian programs. "CEM refers to the responsibility for managing responses to all types of disasters and emergencies through the coordination of multiple agencies or entities. One of the concepts of CEM was the division of emergency activity into four 'phases', specifically mitigation, preparedness, response, and recovery." (FEMA, 2004).

Another concept beginning to take root during this time was Integrated Emergency Management System (IEMS), which highlighted the "all-hazards" function for emergency response. Nuclear attacks were no longer given priority by the federal government for state and local entities over natural disasters. In other words, states and localities were allowed to focus their planning on incidents that were most likely to directly affect their citizens.

In the Federal Response Plan was developed by FEMA, which was a more comprehensive version of the plan developed for response to California's earthquakes. Emergency Support Functions or ESFs were established, along with a guideline determining the lead and support Federal agencies for each of the ESFs. Along with this plan came the notion that FEMA needed to "reinvent" itself.

President Clinton nominated James Lee Witt as FEMA director in 1993. James Lee Witt revamped the agency into the more in-tune one as it is known today, making it more responsive to state and local government needs during an emergency [citation needed]. He streamlined the processes for disaster assistance and shortened the response time for federal relief. State and local governments were for the first time not required to trade the execution of certain tasks for funding; instead they were allowed to determine what affected them the most and receive funding and assistance that focused on those concerns. (FEMA, 2004)

However, the events on September 11, 2001 would drastically alter the way the nation would respond to emergency incidents.

Post 9/11

On September 11, 2001, two planes were flown into the twin towers of the World Trade Center and one plane was flown into the Pentagon. With this terrorist attack upon American soil, the nation was forever changed. Emergency preparedness became the center of focus for many in the government as well as the public as we struggled to determine how to deal with this new threat.

The Office of Homeland Security was created and the Patriot Act was signed shortly after September 11, 2001. FEMA became an agency housed under the umbrella of the new Department of Homeland Security. The Patriot Act gave sweeping new powers to domestic law enforcement and intelligence agencies, especially in the areas of surveillance.

From the Office of Homeland Security came the Department of Homeland Security (DHS). "Homeland Security leverages resources within federal, state, and local governments, coordinating the transition of multiple agencies and programs into a single, integrated agency focused on protecting the American people and their homeland." (United States Department of Homeland Security, 2005) Examples of the agencies under DHS purview are FEMA, Customs and Border Protection, Office of National Laboratories, U.S. Coast Guard, and the U.S. Secret Service (USSS).

Before 9/11, there was no comprehensive federal emergency response plan available that integrated all the federal agencies and their respective roles. To remedy this, the Department of Homeland Security drafted the National Incident Management System (NIMS), which works as a guide for the federal government, as well as the state and local governments. (NIMS, 2004).

NIMS is an emergency response system aimed at providing flexibility and standardization throughout the life cycle of an incident. The main goal of NIMS is to provide effective and efficient coordination between the various levels of government during an emergency. NIMS is designed to function regardless of the size or difficulty of the incident; and it uses a standard language to unify the response effort. NIMS is divided into three sections, the Incident Command System (ICS), the Multi-agency Coordination System, and the Public Information System. For the purposes of the development of the conceptual model, the ICS will serve as a basis for the development.

The ICS is hierarchal in nature with a command center at the top and several sections and branches making up the body. The command center holds key personnel including the Incident Commander (IC), the Public Information Officer (PIO), the Safety Officer (SO), and the Liaison Officer (LO) (NIMS, 2004). This section is responsible for the command and control of the entire incident and the relay of information to the state or federal government, as necessary. Within the ICS are four sections; Operations (strategic functions), Planning (gathering and assessing data), Logistics (managing and monitoring equipment), and Finance and Administration (financial and administrative support) (NIMS, 2004). The scope of an individual incident will determine what sections are necessary to staff. For example, in a small incident, it is possible that only the operations section will be staffed. On the other hand, in a larger incident all four sections may be employed. The ICS is intended to be used at all levels of government and can be applied to civilian operations, such as the Red Cross, private hospitals, and nuclear power plants.

In 2004, the Department of Homeland Security drafted the National Response Plan (NRP) as a guideline for federal agencies and departments, as well as state and local governments and agencies, to use for natural disasters, chemical spills, terrorist attacks, etc. Therefore, the NRP was created as an “all hazards” guideline for law enforcement, medical services, and other emergency management personnel. (United States Department of Homeland Security, 2004)

The events of 9/11 forced government leaders and emergency responders to reevaluate their procedures and policies for disasters. While emergency response plans are far from being completely coordinated, a significant step towards synchronization has been taken and lessons learned are being evaluated to gather more helpful data to solve this problem.

Lessons Learned and Emergency Training

According to the Federal Emergency Management Agency’s (FEMA) archive of disasters, there have been 1,572 major declared disasters since 1953. These disasters include flooding, hurricanes, tornadoes, and excessive snow. It has been only recently that some of these disasters have been terrorist attacks. Since 1993, there have been multiple attacks and events on the United States. There have been many lessons learned from each of these attacks as well as new developments in training and emergency policies and procedures. For example, emergency management has seen the need for a more comprehensive, joint emergency response plan over the last 5 years. In response to this need was the development of the National Response Plan (NRP). Additionally, the National Incident Management System (NIMS) is strongly recommended at all levels of government. The NIMS outlines the command and coordination of emergency response. Finally, with new national plans, individual states are taking it upon themselves to update their state emergency response plans to parallel the national plans.

Due to reoccurring natural disasters and an increase in terrorist attacks coupled with new emergency response plans, training is essential for emergency responders in today’s world. Additionally, it is necessary to review past events and learn from both the failures and victories. The following section will discuss and highlight the main themes of the lessons learned from both terrorist attacks and natural disasters. Afterwards, there will be a discussion on the steps taken to better prepare our emergency personnel in handling Incidents of National Significance with regard to both terrorists attacks and natural disasters.

Common Themes in Lessons Learned Reports

In August 1992, Hurricane Andrew hit the east coast of Florida. This hurricane caused more than \$20 billion in damage, destroyed 28,066 homes, and left 1.4 million people homeless (Disaster Planning and Response Review Committee (DPRRC)). This was the most destructive hurricane Florida had ever witnessed. On February 26, 1993, a bomb exploded in the parking garage of the World Trade Center. This incident killed six people and injured approximately 1,000 others. On April 19, 1995, the Alfred P. Murrah Federal Building in Oklahoma City was bombed, killing 168 people. On the morning of September 11, 2001, commercial airliners crashed into both towers of the World Trade Center Towers, the Pentagon, and an open field near a small town outside of Pittsburgh, PA. These major disasters came to the American people unexpectedly, in the case of a terrorist attack or expectedly, in the case of forecasted natural disasters. In either case, the need for immediate and efficient emergency response was imperative to the lives of those involved. However, after action reports and lessons learned in

these incidents cite a number of problems in the emergency response process. The following section will highlight the common lessons learned from these incidents.

A review of the literature regarding lessons learned during terrorist events and natural disasters revealed three categories of lessons learned: emergency responder communication, interagency coordination, and release of public information (Fire Engineering, 1993; ODCM, 2003; Jenkins & Edwards-Winslow, 2003, DPRRC, 1993). In many situations, the initial chaos has the potential to cause major breakdowns in communication between essential emergency personnel. For example, in a report of the 1993 World Trade Center Bombing, fire fighters' encountered major problems with their communication systems. This was due to the high volume of civilian calls immediately after the incident. This limitation of emergency responders' communication systems affects their ability to perform life saving operations after a disaster.

Another common limitation noted was the need for interagency coordination. In large-scale events, it is important for emergency responders to work with other agencies in their response efforts. The Oklahoma Department of Emergency Management (ODCEM) 2003 report stated that after the 1995 Oklahoma City Bombing there was confusion among emergency personnel due to a lack of coordination among the emergency responders. In addition, there was confusion on the role of many Multi-Agency Coordination Centers (MACC) involved in the incident. In particular, it was unclear whether the MACC's were a main coordinating site for personnel from all levels of government or strictly for state personnel. This type of confusion can have severe costs during an incident when lives are on the line. Finally, there was a need for a Public Information Office and a Joint Information Center as being essential elements in order to coordinate incident information and necessary public actions (i.e. evacuation, finding family members, etc.). A report by Jenkins and Edwards-Winslow (2003) states that an administration staff within the PIO would be able to assist in the incoming public calls.

While it is important to recognize the limitations inherent during an emergency response, correcting these limitations should be mandatory in anticipation of future events. Employing an integrated training program several times throughout the year will greatly assist emergency personnel when a major disaster does occur. The following section will explore the training techniques of today's emergency personnel.

Preparing Emergency Personnel

Training of emergency personnel typically takes the form of tabletop exercises and simulated emergency scenarios. An example of a large-scale exercise is Top Officials (TOPOFF). This exercise includes senior officials, emergency management personnel, and first responders at all levels of government participating in a real time Weapons of Mass Destruction (WMD) exercise (USDS, 2002). The goals for TOPOFF are to strengthen the existing roles of all organizations involved, "create a broader operating framework" of experts at all levels of government, validate existing policies and procedures for emergency response, and build a national exercise program for emergency response (USDS, 2002). Previous TOPOFF exercises have included a simulated chemical bomb explosion in 2000 and a bioterrorism attack in 2002.

In a report on TOPOFF 2, the state of Illinois emergency response personnel documented a number of lessons learned. The first lesson learned was the need for training on response structures and plans such as the Incident Command, NIMS, NRP, and the Statewide Response Plan. Many of the emergency personnel did not have a clear understanding of these plans. Next, the first responders were slow to respond due to being unprepared. The report stated that these first responders needed additional equipment that was not readily available. Another lesson learned

was the need for strong mutual aid agreements which would be reinforced on a daily bases. Illinois had these agreements but did not use them in the exercise and found that without the mutual aid agreements personnel quickly become overworked. Finally, there was an observed need for special operation units to coordinate within their own units and with other units. It is clear from the exercise that training of emergency personnel is critical. During a real disaster, a lack of understanding, coordination, and slow response times can result in lost lives and property. Lessons learned produced after an exercise are important to enable the jurisdiction to take steps to correct all observed problems as well as conduct other training exercise to acclimate personnel to current plans and procedures.

In order to facilitate local training efforts on current plans and procedures, FEMA offers a variety of courses focusing on the NIMS, the Incident Command System (ICS), the Emergency Operations Center (EOC), and other issues related to emergency management (FEMA). FEMA recommends online courses available for all emergency personnel and civilians. In terms of the emergency personnel, these “pen and paper” courses paired with tabletop and simulated exercises will increase the understanding of emergency managers and first responders in dealing with a major disaster.

Lessons learned, online courses, and training sessions give valuable knowledge and experience for emergency responders and personnel. In an effort to further supplement their training, a conceptual model is being created to be used as a basis for the development of a simulation engine that will allow for the integrated training of emergency responders in an Live Virtual Constructive (LVC) environment.

The Conceptual Model

The conceptual model’s purpose is to visually represent the underlying knowledge and interactions that must occur when responding to an incident. Our models are focused specifically on the mass casualty management and population control aspects of a particular incident and are intended to be scalable to cover other use cases as funding becomes available . The conceptual models are designed to serve as the basis for a simulation to be developed by another party in the future.

The conceptual model was constructed using Microsoft Visio Professional 2003®. Visio® was selected because it allowed easy manipulation of complex interactions among a variety of entities. It also enabled layering of entities to represent different levels of responsibility. While functionality was of vital importance in selecting a software platform, visual appearance was also very important to the team. Visio® allowed the creation of a functional, visually appealing, and user-friendly application.

Use Cases Modeled

In an effort to demonstrate the applicability of the model, two distinct use cases were developed. The first use case involves the release of sarin gas at the Verizon Wireless Virginia Beach Amphitheater during a concert with 20,000 people in attendance. The incident was set to occur on a 96°F summer night with overcast conditions. This is important because the weather affects the behavior of the sarin gas plume (CDC, 2004a; CDC, 2004b). Heat makes sarin more volatile, while overcast conditions allow the gas to linger longer in the immediate area before dissipating into the atmosphere. The sarin was also set to be released in a low lying area, causing immediate harm to all or most of the individuals in that area. The second use case represents an event in which pneumonic plague is spread from a ship docked at a port in New Jersey.

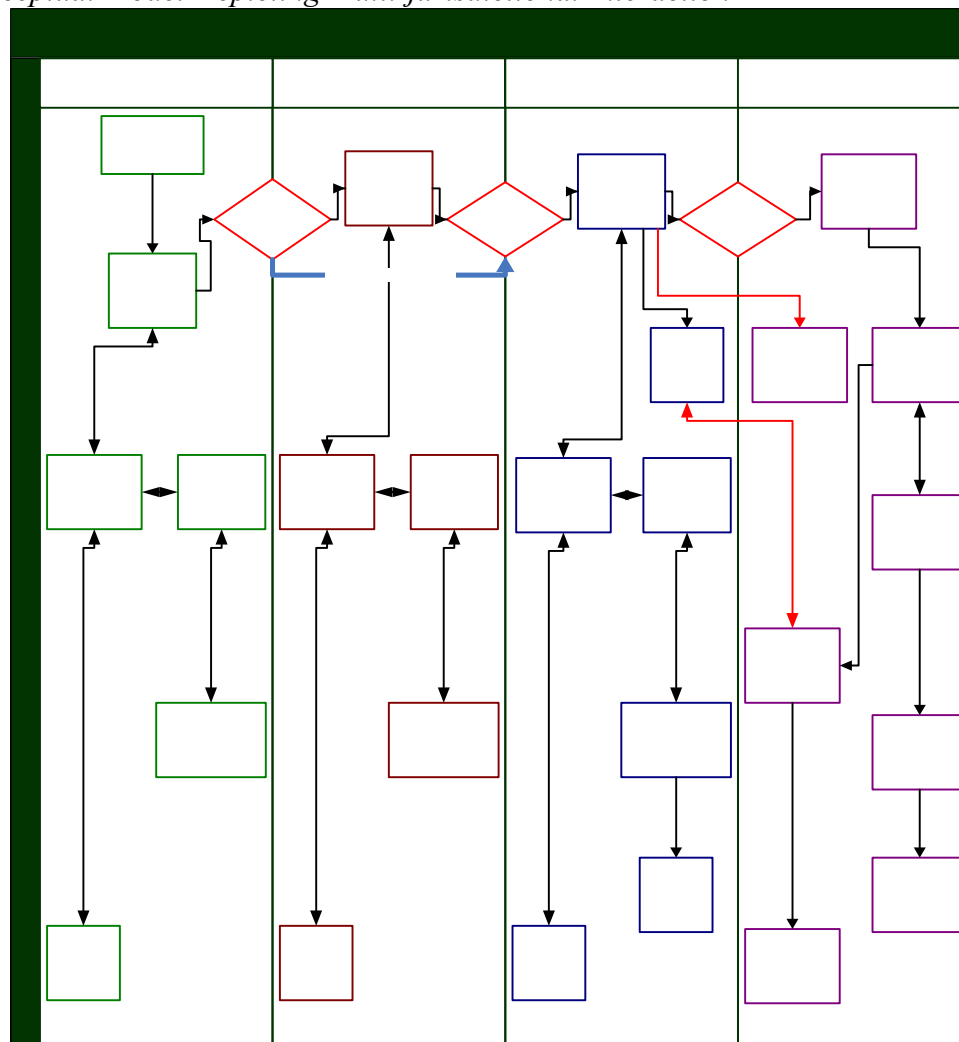
In each use case, two different scenarios are examined in different conceptual models. One scenario examines mass casualty management, while the other looks at population control. Both use cases provide a rich basis for interactions in each scenario.

Evolution of the Model

Prior to beginning construction on the model, the team researched extensively to understand the interactions and entities that would need to be represented. With research, time, and discussion, the list of entities to be denoted in the final model grew to sixty. However, the way the entities and their interactions were represented changed quite a bit from the initial version of the model to its present state.

Initially, the model began as an exceedingly complex series of interactions that took on the form of a highly expansive cause and effect diagram (see figure 1). This served as an important first step because it represented the necessary comprehension of the event processes, which were not clearly stated in any single document. As was the case with the model, the process of connecting previously distinct entities in a single document was a complex undertaking.

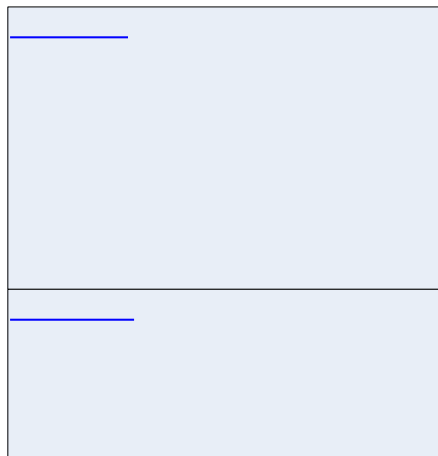
Figure 1. Conceptual Model Depicting Multi-jurisdictional Interaction



With the progression of work on the model also came the progression of work on documents explaining how interactions were to occur in the event of an incident. *The National Response Plan (NRP)*, formally introduced by the Department of Homeland Security in November 2004, serves as the primary underlying document for our logic concerning the development of the conceptual model. In addition, the *National Response Plan's Catastrophic Incident Supplement (NRP-CIS)*, the *National Incident Management System (NIMS)*, and individual state emergency response plans were also helpful in developing a more complete picture of events.

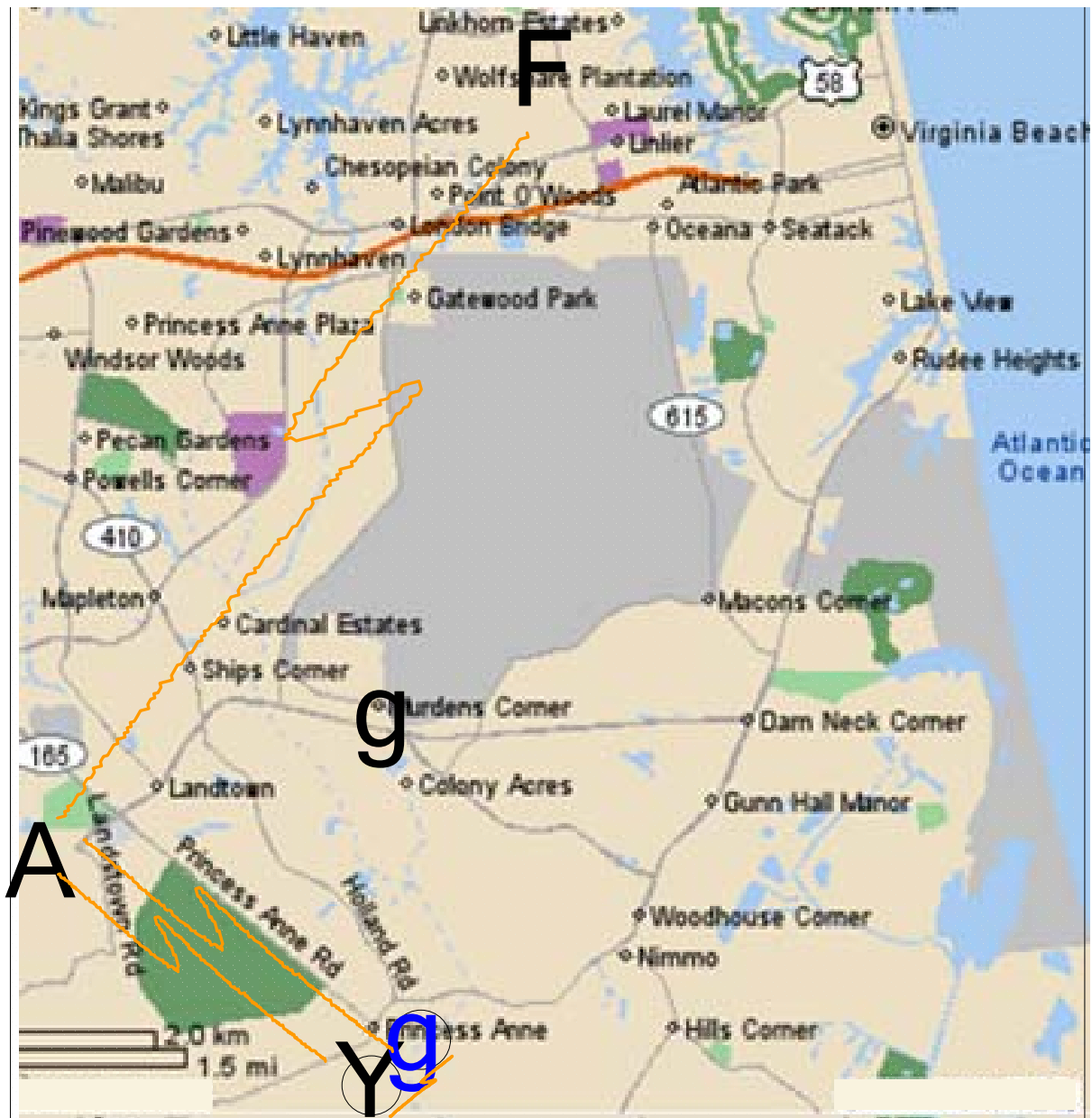
The second major version of the model incorporated attributes and behaviors of each entity (see figure 2). Entities were individual sub-units within the Emergency Operations Center (EOC) that were dictated by the Incident Command System (ICS). Attributes are properties of the entity, while behaviors are documented by denoting which Emergency Support Function (ESF) a particular entity could perform.

Figure 2. Attributes and Behaviors of an Entity



A physical map serves as the background for the conceptual model, so that the users can form a basis for spatial relationships. A temporal reference was incorporated by dividing the model into three distinct time segments: thirty minutes, three hours, and five hours after the incident occurred. Each time segment was selected to capture the involvement of interaction at a new level. At thirty minutes, local resources should be involved. At three hours, state resources should also be on the scene for an incident of the proposed magnitude. Likewise, at five hours, federal resources would be in place for such an incident. Each component of the conceptual model displays only entities and interactions that are present at that given moment in time. The map also expands to take in account a growing jurisdictional influence. The symbols used to represent each entity are the official standard developed by the Homeland Security Working Group (Homeland Security Working Group 2004). A symbol glossary can be viewed in *Appendix 1*. Figure 3 shows a view of the conceptual model of what the emergency response would look like thirty minutes after the incident occurred.

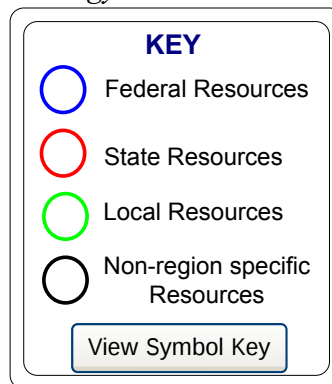
Figure 3. Conceptual Model depicting thirty minutes after the incident



The current version of the conceptual model was revised to incorporate specific use case parameters, while keeping the model general enough to be applicable across situations. This was accomplished by eliminating the map background to prevent the user from focusing only on those particular interactions occurring in a specific geographical area. The decontamination zones were also incorporated into the model to visually display theoretical placement of entities. The decontamination zones are directly related to the behavior of the incident. For example, in the sarin use case, the zone is determined by the plume behavior. The zones are represented on the model with growing concentric ovals around the site of the incident. The most dangerous zone is that where the incident occurred, and is pictured as bright orange. The zones become less dangerous as you near the outer perimeter of the model.

The Homeland Security Working Group’s symbology continued to be used in this rendition with the exception that it was slightly modified to reflect jurisdictional authority. To view a key of the Homeland Security Working Group’s symbology, click on “View Symbol Key” button within the key on the conceptual model. This was accomplished by placing a colored circle around the outer border of each symbol. A blue circle was used to represent federal resources, a red for state resources, and a green for local resources. The symbol remained encircled with black, if it was not directly controlled by any particular jurisdiction. Entities such as the media and hospitals are examples of symbols that remained unchanged. This information is reflected in a key on the conceptual model (see figure 4).

Figure 4. Key for Jurisdictional Symbology used in the Conceptual Model



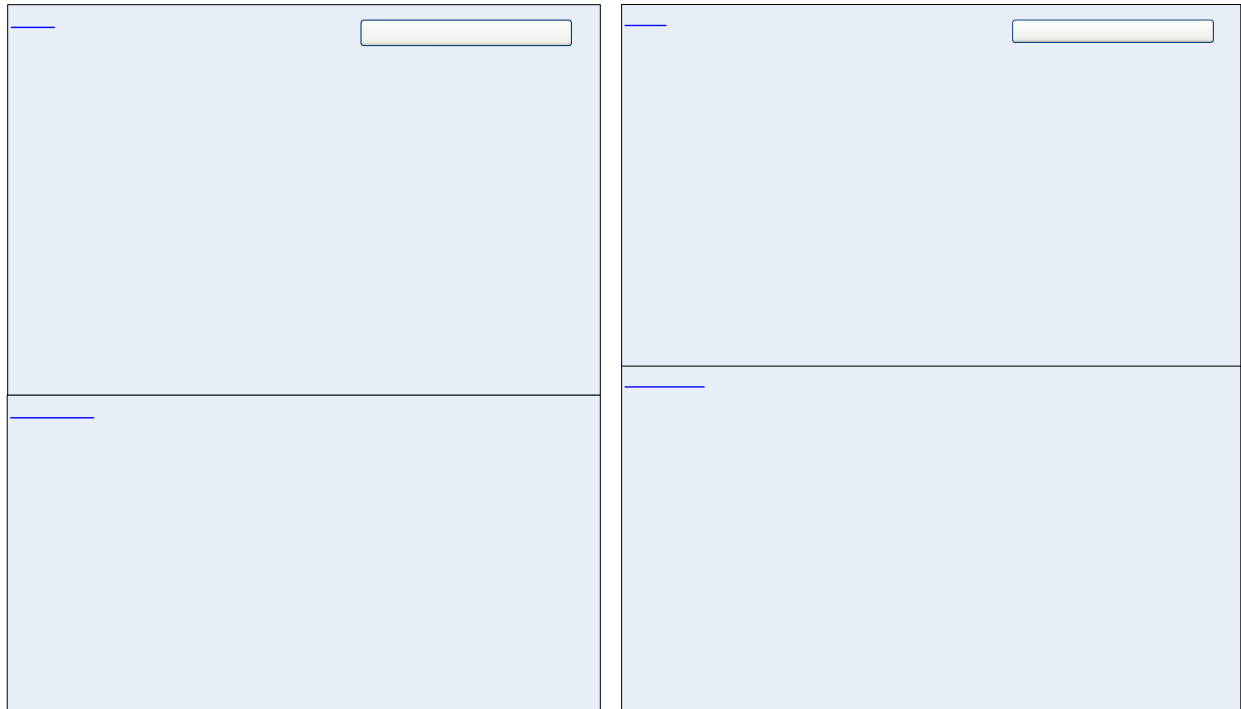
The previously used “attributes” and “behaviors” was changed to “states” and “behaviors”. The content in both sections changed slightly to reflect an effort to streamline the content, while making it convey as much information as possible. The states section was altered to incorporate the framework of Network Centric Operations (NCO). All of the items formerly present as attributes were further divided into the domains of NCO: physical, information/cognitive and social aspects. NCO flattens the traditional stovepipe hierarchal structure of command and control by promoting coordination between agencies and levels of each agency, as well as coordination between different levels of government (Alberts, Garstka, & Stein 2003). In terms of an emergency situation, the physical domain will include all equipment, personnel, forms, etc. The information domain will include all information relating to the response and management of the incident (Alberts, Garstka, & Stein 2003). For example, while a form needed to request supplies falls into the physical domain, the information contained on that form falls into the information domain. The social domain of NCO involves the social interactions and networks between all persons involved in the incident. These interactions and networks can be formal and informal. Finally, the cognitive domain focuses on the individual in an emergency situation (Alberts, Garstka, & Stein 2003). This domain asks the question of what information the individual knows and what information does that individual think he or she knows. The cognitive domain, while the most difficult to pin down, provides the most information regarding the reason certain events happened as they did.

The behaviors were structured such that they all incorporated a core set of six directives, which consisted of “observe,” “request,” “receive,” “process,” “direct,” and “inform”. Each directive was augmented to reflect the particular behavior for that entity. The behaviors reflected by each entity are only those that are used for that particular action. For example, the fire department is responsible for ten main behaviors for emergency response; however, in the use

case involving population control, the fire department is only responsible for six main behaviors, so only six are reflected (see figure 5).

Another major change to the model was the incorporation of macros underlying each entity and the overall level of resources. Upon clicking on an entity, you are directed to a screen that reveals the states and behaviors of each entity, as seen in figure 5. Properties of the incident and decontamination zones are also viewable by clicking on their particular icon.

Figure 5. States and Behaviors of the Fire Department reflected in the general model (left) and specific to population control (right)



In addition, macros are also built into the model to reflect jurisdictional authority. Four buttons were built into the model: “Show Local Resources,” “Show State Resources,” “Show National Resources,” and “Show All Resources”. Once the button is clicked, the conceptual model will display only the entities involved from that level of government. There are also lines depicting interactions between entities. If a line is pictured with no entity on one end, that is indicative of an interaction between another level of government. Figure 6 delineates the current version of the conceptual model in the “Show All Resources” mode.

Fire

State

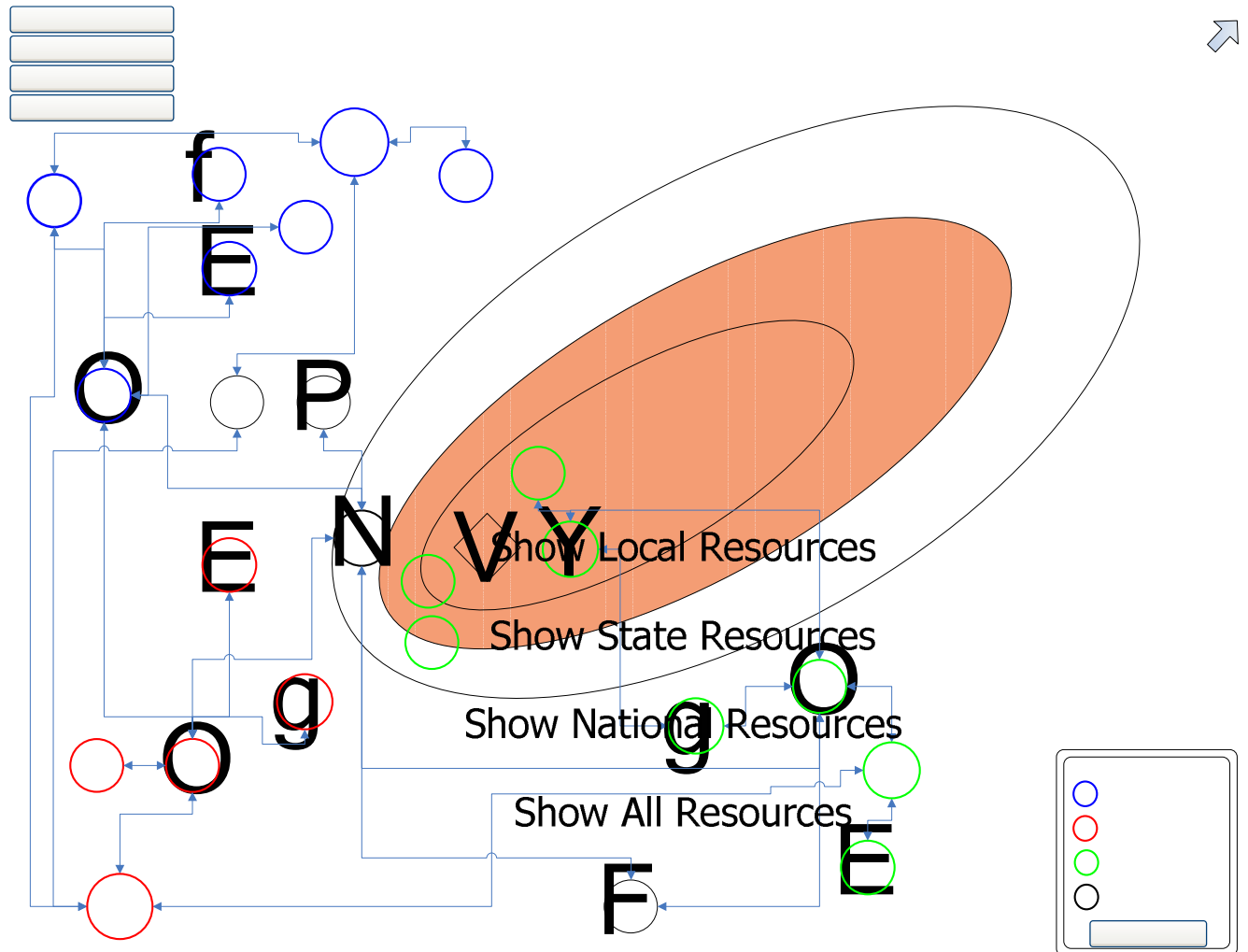
Physical

Resources

Location

Time to respond

Figure 6. Conceptual Model of Mass Casualty Management in the “Show All Resources” Mode



Conclusion

Emergency Management has made great strides in improving interoperability between departments and jurisdictions; however, there is still quite a bit of work to be done in fine tuning those efforts. In order for the necessary resolution to occur, emergency responders will have to undergo extensive training in new procedures and innovative ways to interact. The development of this model reflects but one effort to facilitate such training.

DHS

DC

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Appendix 1: Homeland Security Working Group Symbols

Emergency Medical Operation		Emergency Incident Command Center	
EMT Station Locations		Emergency Operations Center	
Ambulance		Emergency Public Information Center	
Medical Evacuation Helicopter Station		Emergency Shelters	
Health Department Facility		Emergency Staging Areas	
Hospital		Emergency Teams	
Hospital Ship		Emergency Water Distribution Center	
Medical Facilities Out Patient		Emergency Food Distribution Centers	
Morgue		Fire Suppression Operation	
Pharmacies		Fire Hydrant	
Triage		Other Water Supply Location	
Emergency Operation		Fire Station	
Emergency Collection Evacuation Point		Law Enforcement Operation	

ATF

Border Patrol

Customs Service

DEA

DOJ

FBI

Police

Prison

Secret Service

TSA

US Coast Guard

US Marshals Service

Sensor Operation

Biological Sensor

Chemical Sensor


Intrusion Sensor

Nuclear Sensor

Radiological Sensor

Incident

Natural Event

Operation


Representing Homeland Security Command and Control: Conceptual Modeling in Support of the National Response Plan

Amber L. Fagan

Heather L. Warren

Evidence Based Research, Inc.

June 2005



Overview

- Project Overview
- The Conceptual Model
- Data Collection Efforts
- Observations & Conclusions



Project Background

- JFCOM J-7, in support of a Congressional mandate, is sponsoring a multi-agency, multi-contract team intent on better understanding and improving the state-of-the-art in modeling and simulation support for homeland security training, research and experimentation.
- Effort spans a broad area of interest:
 - Conceptual modeling
 - Simulation Investments
 - Exercise data collection and analysis to inform modeling and simulation effort

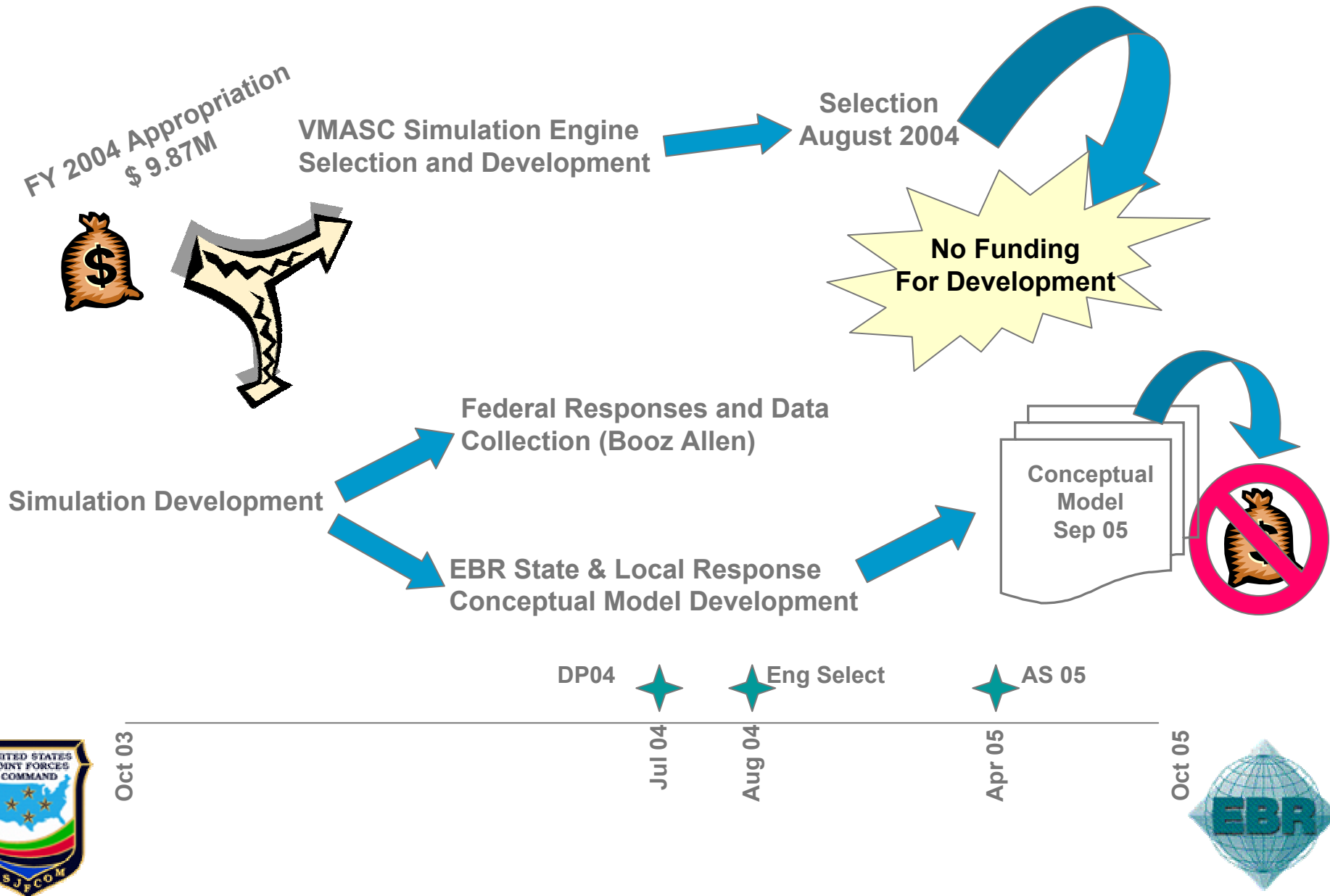


Project Context

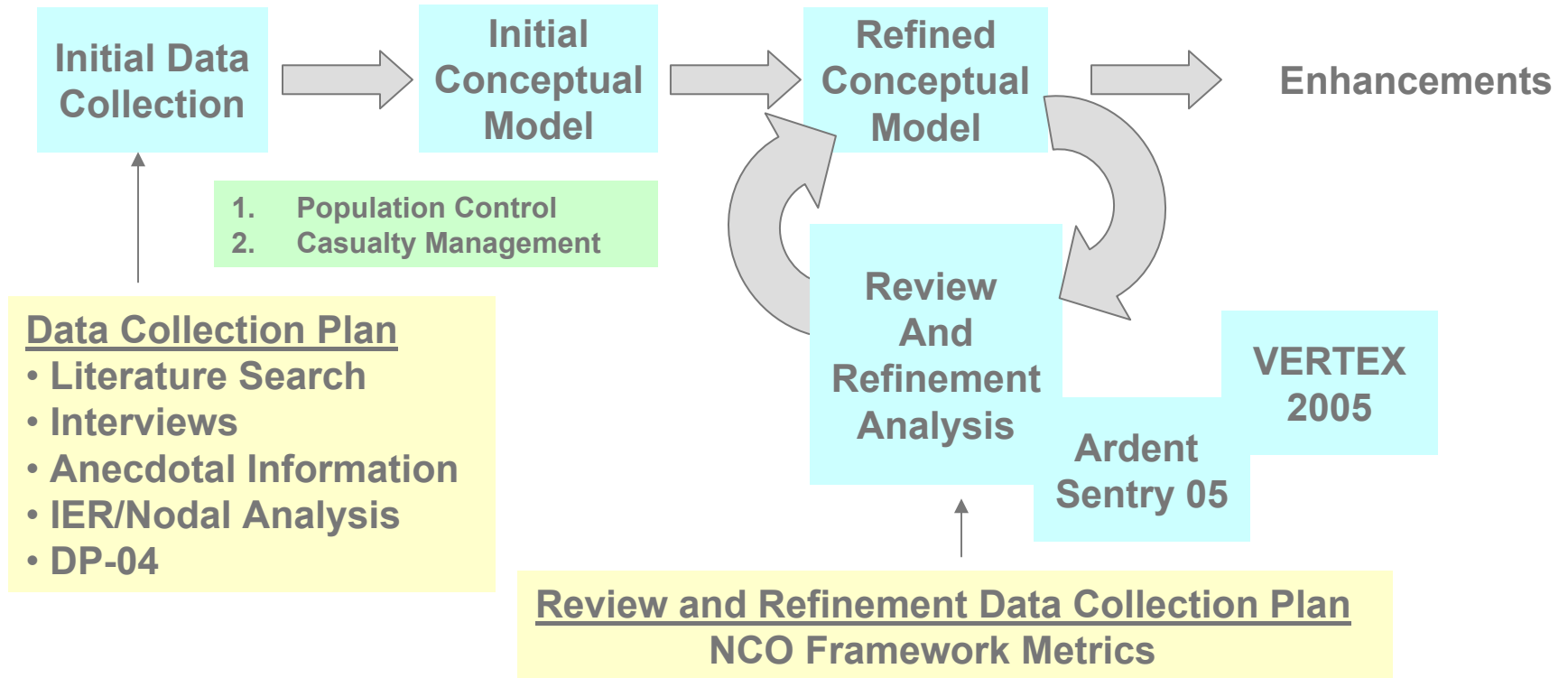
- Conceptual Model is attempting to be true to National Response Plan (NRP)
- NRP was approved November 2004
- Modeling efforts pre date approval of the NRP
- NRP is a living document



HLS Training Simulation Initiative Overview



Technical Process



The Conceptual Model

- Implemented in Visio® as a description of the NRP for:
 - Mass Casualty Management
 - Population Control
- Continues to evolve as collaboration and data collection occur



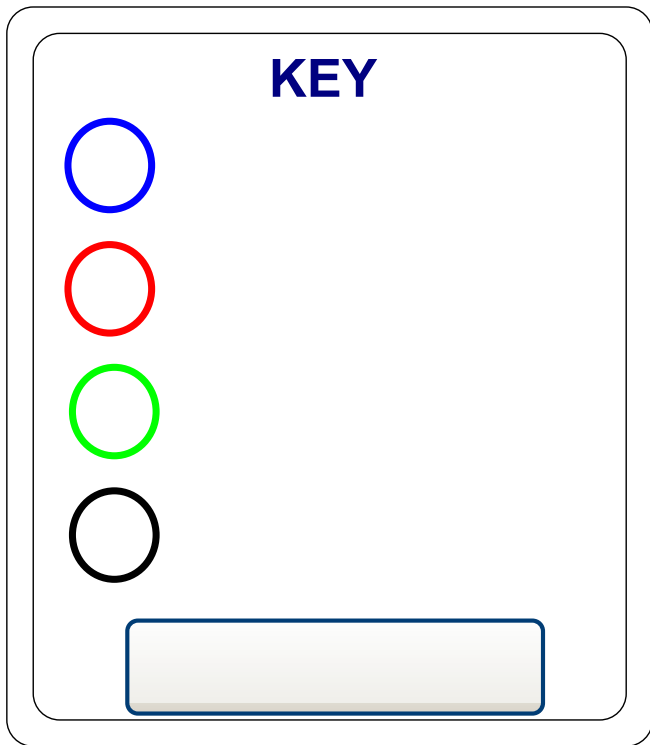
Data Collection

- Researched a variety of documents
 - NRP, NIMS, state response plans, local response plans, etc.
- Initial data collection at Determined Promise-04
- Conducted interviews with emergency responders
- Observed the Ardent Sentry-05/TOPOFF-3 exercises
- Observed the Virginia Emergency Response Team Exercise

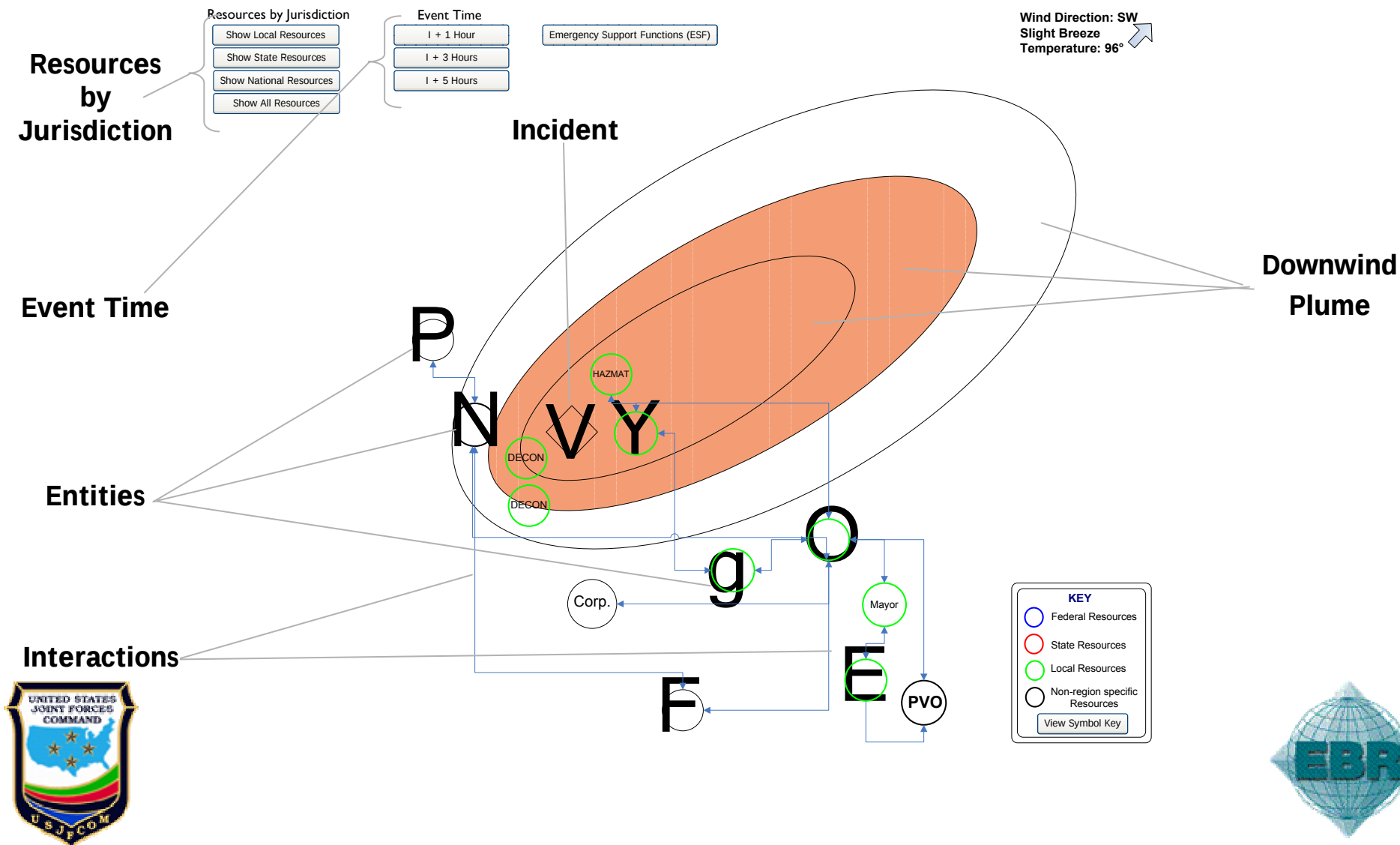


Symbology

- Homeland Security Working Group Symbology
- Adapted with color ring to denote jurisdictional authority



Conceptual Model Showing Local Interactions



Conceptual Model Showing Local and State Interactions

Resources by Jurisdiction

Show Local Resources

Show State Resources

Show National Resources

Show All Resources

Event Time

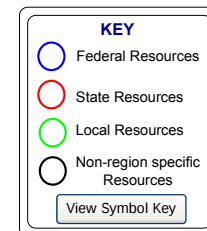
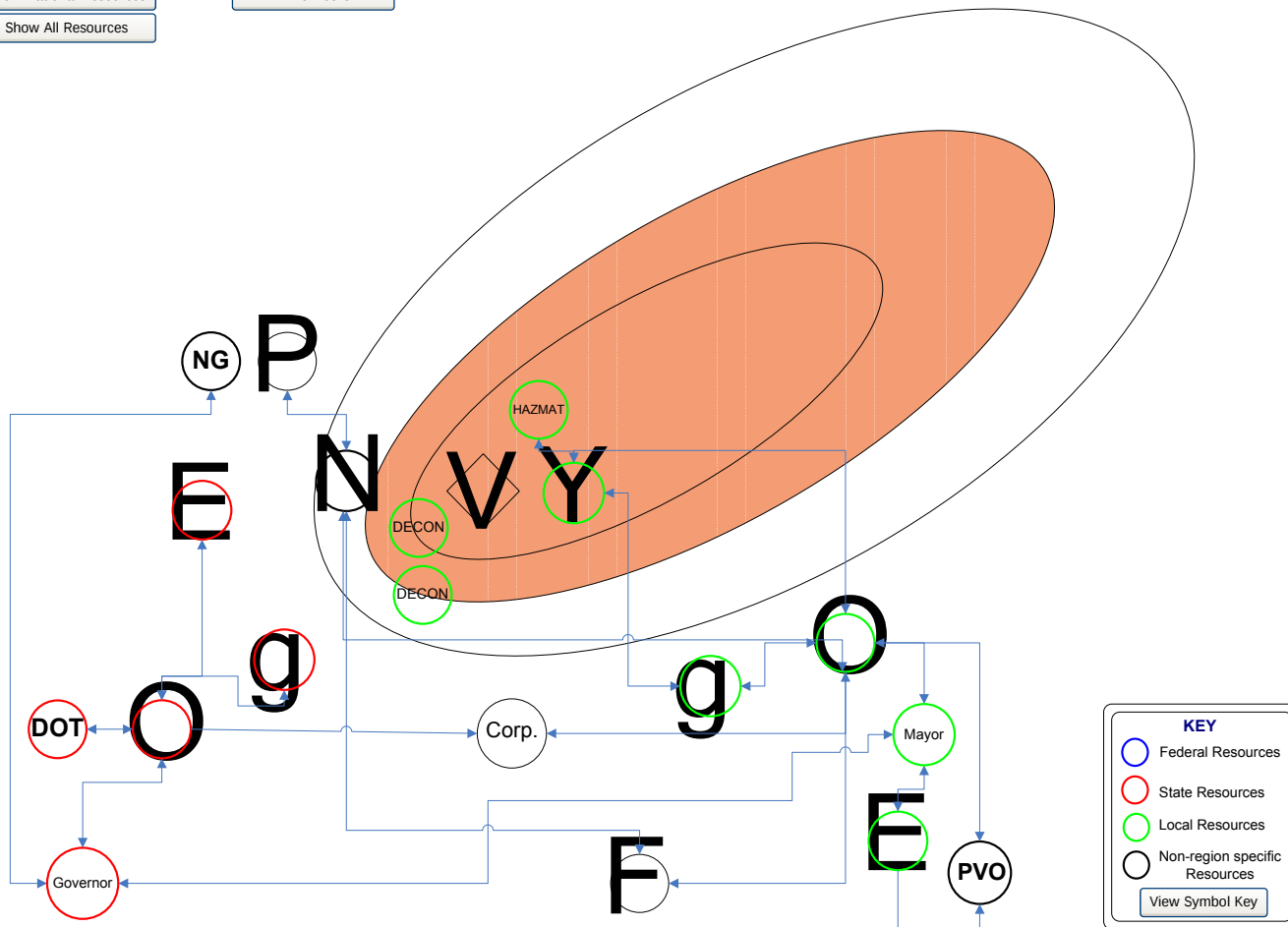
I + 1 Hour

I + 3 Hours

I + 5 Hours

Emergency Support Functions (ESF)

Wind Direction: SW
Slight Breeze
Temperature: 96°



Conceptual Model Showing Local, State, and Federal Interactions

Resources by Jurisdiction

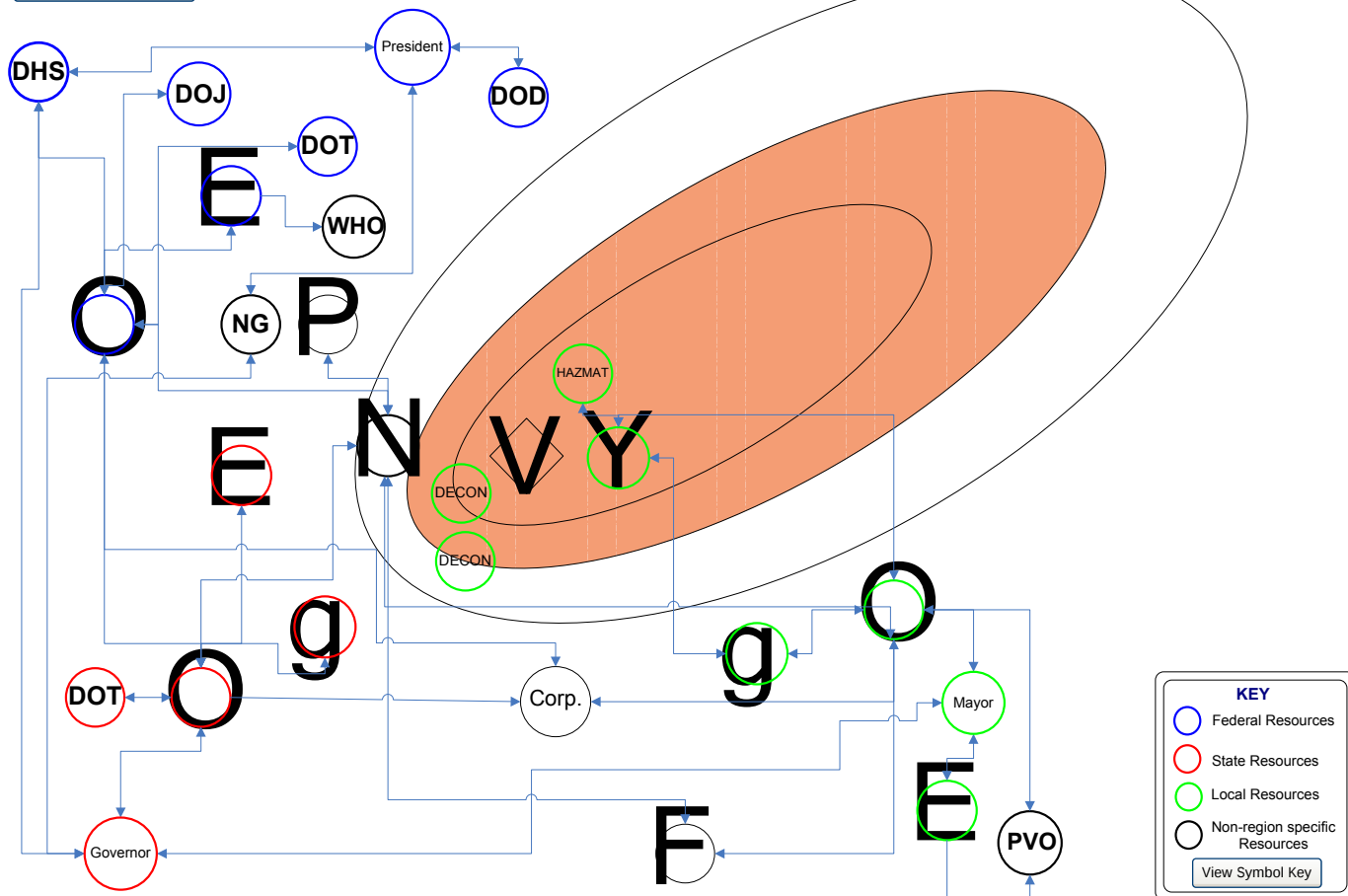
- Show Local Resources
- Show State Resources
- Show National Resources
- Show All Resources

Event Time

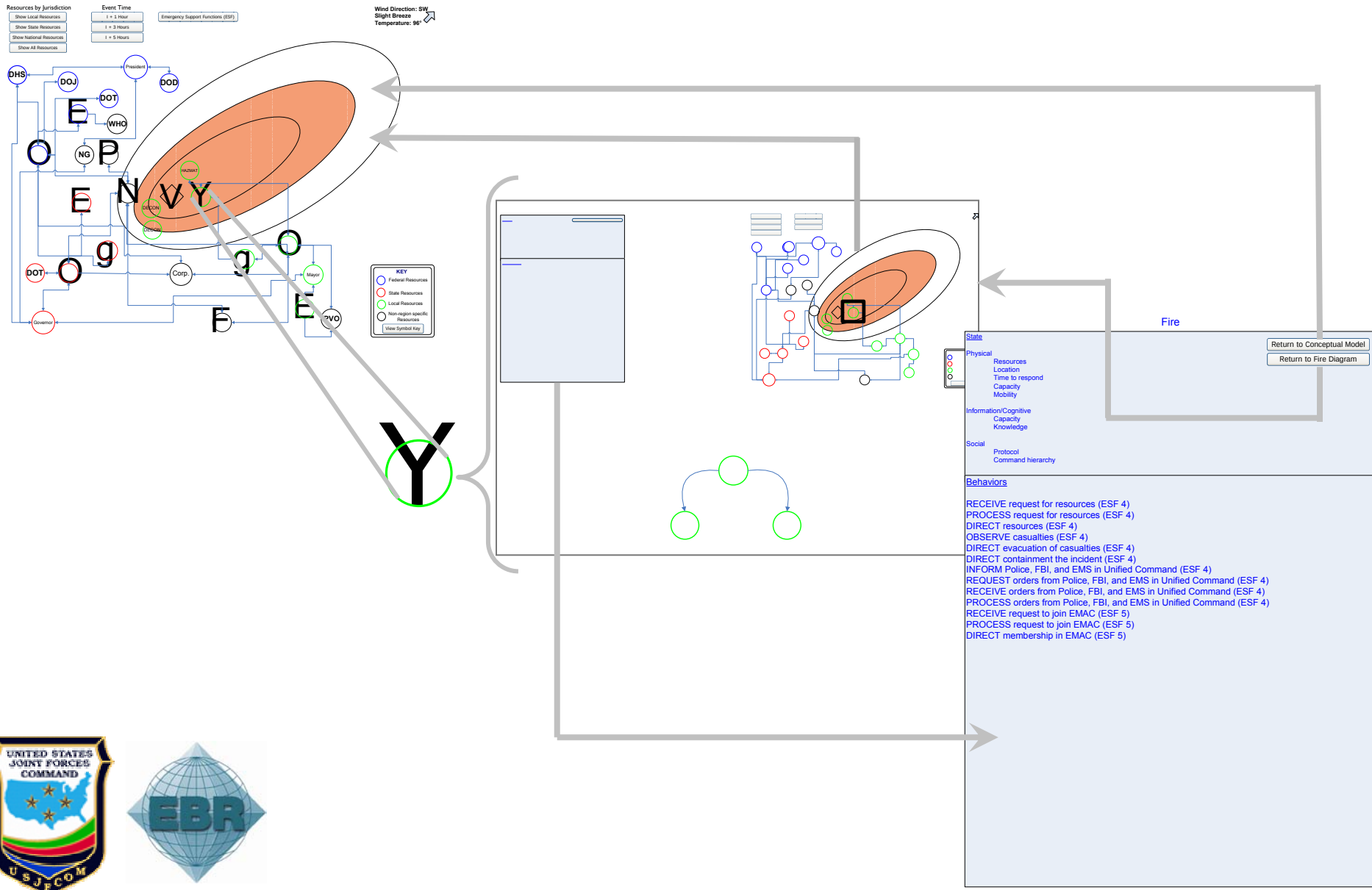
- I + 1 Hour
- I + 3 Hours
- I + 5 Hours

Emergency Support Functions (ESF)

Wind Direction: SW
Slight Breeze
Temperature: 96°



Model Interaction



Observations and Conclusions

- Evolving model represents:
 - Highly complex and dynamic process
 - Emergency response as dictated through the NRP
- Current limitations:
 - Informal interactions are not represented
 - Regional specialization may not be represented



Research Issues

- Modeling Issues
 - Logical representation of multilayered and multidirectional data
 - Regional specificity vs. generalized usability
- Application Issues
 - Capturing tacit knowledge & informal information exchanges
 - Assembling elements from a variety of resources, which do not necessarily agree
 - Modeling is a discovery process



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Back Up



Project Partner Roles

- **JWFC:** Project Sponsor, providing overall direction
- **VMASC:** Project leadership, Integration and Development
- **Northrop Grumman:** Model Development
- **Booz Allen Hamilton:** DoD, Federal, and State Interagency process data collection and analysis
- **Evidence Based Research:** Data collection and analysis, Interagency decision making process conceptual model development
- **Loyola Enterprises:** Database and GIS Data Environment Support
- **Additional partners include:** Hampton University, Norfolk State University, Eastern Virginia Medical School, VisiTech, WernerAnderson



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