

# The Extreme Events Systems Laboratory at Penn State: A National Asset for Security and Response Research, Development, Education and Training between Agencies

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## **Background**

Extreme events constitute the direst category of “all hazards” that can befall a community, region, or nation. All hazards include natural or humanly instigated disruptions of normalcy or combinations of the two that unfold either spontaneously or along a planned trajectory. They impact significant populations of people, directly or indirectly, they result in large numbers of casualties, and in some instances can devastate sectors of an economy, or lead to a breakdown in governmental authority, and disrupt civil accord. Examples include: the World Trade Center attacks, hurricane Katrina, the tsunami in the south pacific, the earthquake in Pakistan, and the even the horrifying acts of violence which took place last spring at VaTech.

During such events data fusion, information processing, knowledge management and communication are key elements to success. But innovative information systems and technologies are not enough – cooperation and rapid decision making are also essential. What was at the outset one agency’s purview and responsibility, begins to flow quickly into that of others and across federal and state levels (i.e., from agencies within DHS including FEMA, USCG, etc.) to defense and the armed services, (National Guard, USN, USAF...) to state agencies, and law enforcement. Important non-governmental organizations (Red Cross, CARE, relief organizations) also become involved and to be effective they too must integrate into the operation and managed as part of the whole.

Success or failure also depends on the ability of emergency and security managers to cope with enormous stress while continuing to make good decisions. Truly extreme events are infrequent, so experience with real situations is rare. However, education and training can be done to fill the gap by providing realistic simulations to give managers experience with large scale, multilayered operations. These simulations can also afford researchers the opportunity to observe such situations, how responses unfold, where bottlenecks develop, and to develop and test new methods and protocols for higher efficacy.

With these factors in mind, we propose to create the Extreme Events Systems Laboratory (E<sup>2</sup>SL) at Penn State as a national resource to promote education and training, research, and interagency cooperation and trust.

The goals of developing the E<sup>2</sup>SL are practical on the one hand and academic on the other. *Practical* – to use the Penn State venue (its campus and stadium) as a living laboratory in which to design and develop the new protocols, data fusion systems, and knowledge management technologies for the ensuring security, response, and recovery at large scale events (e.g., home football games). Knowledge gained here through simulations would be shared to be used at other venues including other universities, professional sports venues (i.e., NFL, MLB...), and at public gatherings with large concentrations of people (conventions, concerts, etc.). *Academic* – to educate

students and professionals in a state-of-the-art laboratory that will provide real-life simulation experiences to prepare them for managing the unexpected. Simulations will proceed in real time; they will be dynamic and will require innovations in security enterprise integration. The E<sup>2</sup>SL simulations will be of sufficient complexity and depth as to require integrating human, cyber, communication, and physical assets for mitigation, protection, and response to and recovery from extreme events. Creating and studying new avenues for interagency cooperation will be a key feature of these simulations.

Through this systems laboratory security professionals from government, NGOs, and the corporate sector will come together with faculty and students to do innovative research and development. These research and development efforts will provide new tools needed to create a critical common operating picture and methods for sharing it between organizations. The lab will provide a forum for bringing forth new ideas and to foster cooperation and trust.

### **Elements of E<sup>2</sup>SL:**

There will be three main elements to E<sup>2</sup>SL: a) sensors and information gatherers, b) physical and cyber security assets for remote command and control, c) stationary systems for data fusion, storage, security enterprise integration, and asset allocation. A state-of-the-art command and control and data fusion center will be established in the College of Information Sciences and Technology. This facility will serve as an educational and research resource available for use nationally. The IST facility will be built around the CAVE facilities in IST and the Penn State Applied Research Laboratory (ARL) (both are already in place) since these provide new means to multi-dimensional data visualization. At the other end of the system we will deploy handheld devices for direct communications and live video transfers from the incident scene to the data fusion center. Between the two levels we will deploy a mobile command and control unit that will be deployable anywhere and which will serve to provide integration between the systems levels.

### **Plan for Financing**

We estimate that approximately \$3.5M is needed to establish this state-of-the-art laboratory for education, training, and research. To do this we seek to leverage Penn State internal investments with federal, state, corporate, and private support. DoD (RTTO) support amounting to \$450,000 has been committed to this project. A DURIP proposal for an additional \$250,000 in DoD support has been submitted and has a very high probability for success. In kind support in the form of equipment from commercial OEMs for the mobile command and control unit is being aligned and will amount to approximately \$500,000. Gift support from private donors is being sought. The lab will be available to law enforcement, security and defense, and intelligence agencies (FBI, DHS, DoD, CIA, NSA, etc.) and we will actively seek to bring their professionals to the lab for teaching and research. We will also seek to promote interagency cooperation. By dividing costs for this lab between the agencies, cost to each one can be kept to \$500K or less. Thus, we will seek approximately \$500K in capital from each agency to assist us in creating this national asset.