SUMMIT: Enhancing Use of Science-based Tools for Emergency Preparedness and Management

Preparing responders to work within a rapidly evolving, diverse, and multi-jurisdictional environment—often with limited or quickly changing situational understanding—is a major challenge. Since actual emergencies are rare, maximizing preparedness requires a continuous cycle of activities, from pre-event planning and equipping, to training and exercises, to evaluation and improvement.

The Integrated Modeling, Mapping, and Simulation (IMMS) program is seeking to improve this cycle by enhancing the ability of the emergency preparedness and management (EPM) community to apply science-based tools to their activities. By creating a collaboration environment that allows linking of "best-in-class" modeling and simulation (M&S) tools and underlying data, IMMS aims to decrease the time and cost needed to train for, analyze, and respond to real or potential incidents—while increasing preparedness effectiveness.

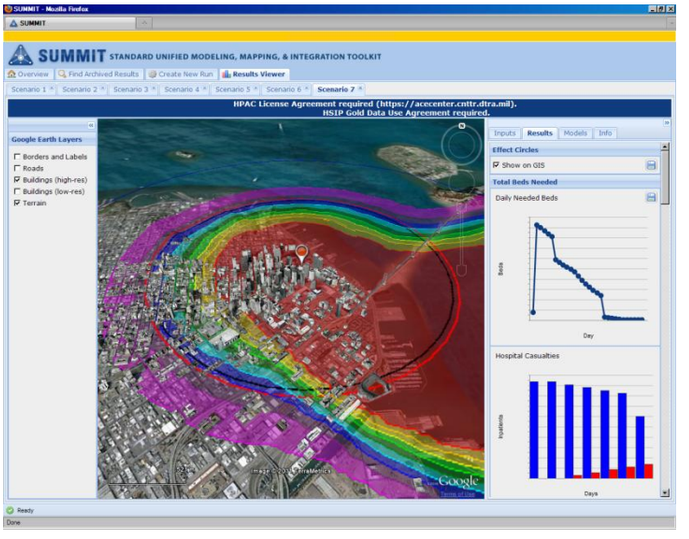
The principal component of IMMS is the Standard Unified Modeling, Mapping and Integration Toolkit (SUMMIT), which allows EPM personnel to easily and rapidly discover, integrate, configure, execute, and view the results of the nation's M&S resources and related data. These resources help ensure a scientific grounding for exercises and other EPM activities, while enabling a dynamic view of fast-moving events that allows for analysis of the "what if" trade-offs that are so crucial to effective response during an actual event. Further, SUMMIT offers M&S tool and data providers a standard mechanism for making their resources widely available, providing the nation greater access to a broad range of exercise planning resources.

The IMMS program is funded by the Infrastructure Protection and Disaster Management Division (IDD) of the Department of Homeland Security (DHS) Science and Technology (S&T) directorate. DHS S&T has partnered with the FEMA National Exercise & Simulation Center (NESC), to pilot SUMMIT for use in FEMA exercises. Sandia National Laboratories is the primary IMMS performer and principal SUMMIT architect.

Providing Value for Federal, State, and Local EPM Personnel

The primary customer for the IMMS project is the Federal Emergency Management Agency (FEMA), and the initial SUMMIT versions will be deployed at FEMA's National Exercise and Simulation Center (NESC). However, when delivered, the system will support a multitude of state and local EPM personnel.

The NESC deployment is an essential part of the process, as the SUMMIT capability resulting from NESC will contain the methodologies and results of previous efforts in similar EPM areas. This will allow the community at large to find and reuse applicable information and data (such as threat calculation, critical infrastructure impact, etc.), enhancing the efficacy of EPM activities.



SUMMIT results viewer enhances a common operating picture

Further, the SUMMIT capabilities being demonstrated at NESC highlight the range of potential benefits of this system. For example, SUMMIT has been used to link data from different

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models to create color coded maps showing damage to individual buildings for NLE11, which is exploring a catastrophic earthquake scenario. Exercise planners have a tool to tailor building damage to better align with exercise goals—thus creating scenarios that are science-based, yet objective-driven.

SUMMIT also facilitates development of end-to-end scenarios through its linking capabilities. For one portion of the NLE11 scenario, for example, SUMMIT linked HAZUS casualty outputs to a casualty distribution model and the AHRQ Hospital Surge Model. This linking led to distribution of casualties over time to the nearest undamaged hospitals; calculation of medical staffing and supply needs; and development of the hospital census for all hospitals and medical centers receiving casualties in the eight states participating in NLE11.

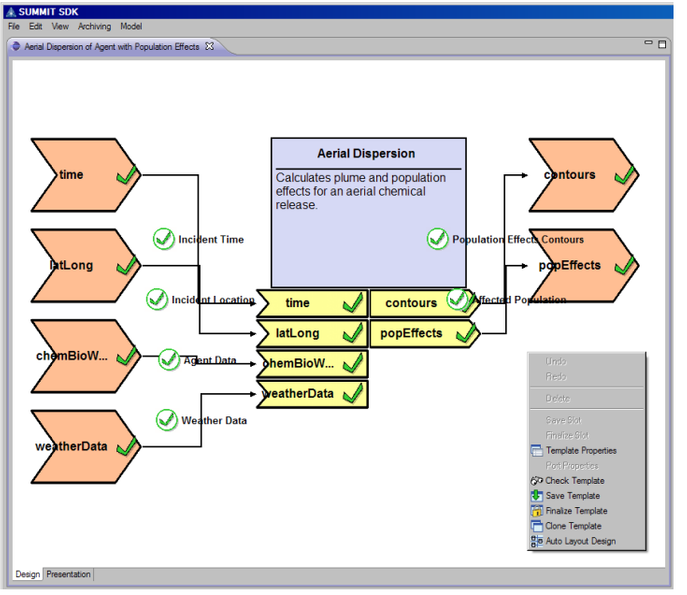
In addition, SUMMIT demonstrates the potential of enhanced visualization of scenarios and data. SUMMIT contains a results viewer that allows exercise controllers to visualize SUMMIT-linked data in enhanced formats, such as in a combination of 2D (GIS), 3D, and charts/graphs. This common and enhanced view facilitates communication and consistency in the control area.

Providing Value for Model and Tool Developers and Owners

Model Owners

Through use of the SUMMIT Software Development Kit (SDK), model and simulation developers can "wrap" their model with an interface that allows the SUMMIT server to communicate with the model. This standardization of models and data has many advantages for the M&S development community. First, making a model SUMMIT-compliant enforces conformance with a community-driven data standardization, which allows for easy data exchange with other SUMMIT-compliant models and software toolkits.

Further, models that are SUMMIT-compliant will have greater exposure and usage within the EPM community, through SUMMIT's M&S discovery process. This process leverages a tagging system that is populated as part of the SUMMIT-compliance process, allowing users to discover all models and data sets applicable to their scenario.



SUMMIT SDK facilitates model "wrapping"

Tool Providers

SUMMIT acts as an aggregation point for M&S information and data applicable to EPM community activities. This information and data is distributed over web services to allow other tools to access and leverage this data for EPM activities. Making an EPM tool SUMMIT-compliant allows the tool to gain access to the M&S dataset that is available in SUMMIT (including historical data).

If an EPM tool is SUMMIT-compliant, the EPM community will know that the data being used to drive their activity will be readily available, a factor that may prove to be a differentiating capability when an EPM tool is being chosen for a particular activity. In addition, in the future, SUMMIT will likely display consortium members—giving the EPM community a single location to seek tools that are SUMMIT-compliant.

Currently, IMMS is focused on support of the National Level Exercise (NLE) program, while several FEMA exercise series are under consideration for pilot usages of SUMMIT. These pilots will allow the EPM community to work with SUMMIT and begin to more intensely leverage M&S in EPM activities. By making an EPM-applicable model or EPM tool SUMMIT-compliant, it will be useable not only to support these immediate pilots but also for the longer term installation with FEMA.

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