Train to Respond, Respond as Trained

SUMMIT Support to FEMA's Threat and Hazard Identification and Risk Assessment (THIRA) Process

FEMA National Exercise and Simulation Center's Modeling and Simulation Service Line provides modeling, analyses and data to support the planning process in Anaheim/Santa Ana Urban Area

Homeland Security
Science and Technology

FEMA

About SUMMIT

The Resilient Systems Division of the Department of Homeland Security (DHS) Science and Technology (S&T) directorate has funded the development of the Standard Unified Modeling, Mapping and Integration Toolkit (SUMMIT), a software toolkit that enables the emergency management community to access integrated suites of modeling tools and data sources for planning, exercises, or operational response. SUMMIT has been deployed at the Federal Emergency Management Agency (FEMA) National Exercise and Simulation Center (NESC), a congressionally-mandated exercise and simulation facility. Through its Modeling and Simulation (M&S) Service Line, the NESC provides state-of-the-art M&S capabilities and Subject Matter Experts (SMEs) to support nation-wide exercises, training, education, planning and response. Sandia National Laboratories is the principal SUMMIT architect.

SUMMIT allows the emergency management community to easily and rapidly discover, integrate, configure, execute, and view the results of the nation's M&S resources. Applying these resources helps ensure a scientific grounding for exercises, planning and other emergency management activities.

The NESC's M&S Service Line has deployed SUMMIT and SMEs in many exercises, including the National Level Exercise (NLE) program and regional exercises, developing integrated scenario data and scientifically grounded injects for earthquake, cyber, bio-attack, chemical attacks, tsunami and other threats. The NESC has also begun to apply these modeling and analyses capabilities to planning, supporting FEMA's Threat and Hazard Identification and Risk Assessment (THIRA) planning process.

Figure 1. NESC M&S Service Line provides access to a range of resources from automated tools to SMEs.

SUMMIT Supports THIRA Process

In October 2012, the M&S Service Line deployed SUMMIT and SMEs to support the THIRA planning process for the Anaheim/Santa Ana Urban Area (ASAUA). Using SUMMIT, models were integrated and run to calculate impacts for several threat and hazard scenarios across preparedness core capabilities including mass care services, economic recovery, and public health/medical services. The models utilized for this effort included dispersion models, an epidemic model, a health care surge model, and economic disruption models.

SUMMIT's output enabled ASAUA emergency planners to quantify and compare impacts across different scenarios; in turn, these impacts were used to set capability targets for ASAUA. The modeling and analyses did not substitute for, but rather supplemented emergency planners' expertise and experience-based knowledge of threat and hazard impacts. Especially for scenarios with little to no historical precedence, modeling results provided scientifically grounded data as a basis for planning where real-world data and experience is lacking.

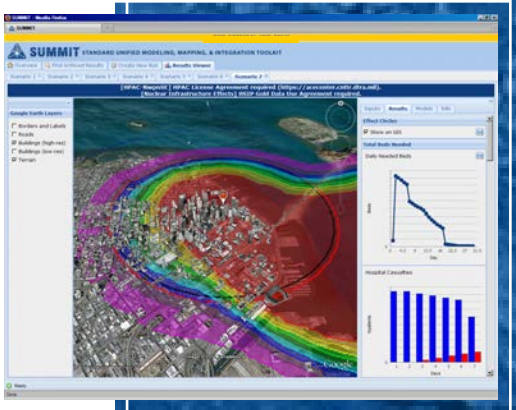


Figure 2. SUMMIT results viewer enhances a common operating picture.

Lessons Learned and Potential Future Applications

Because these planning scenarios are securely stored in SUMMIT, ASAUA can retrieve and reuse the same models for their THIRA process in future years, building off of this 2012 application. Furthermore, SUMMIT scenarios and models can be extended to other jurisdictions. Other jurisdictions may retrieve the SUMMIT scenarios that were developed by ASAUA if provided appropriate access permissions, configure the models for their own region and run the same analyses for their own THIRA planning process. By using the same set of models and scenarios, jurisdictions will be applying a standardized science-based method for THIRA planning, which will produce capability targets that FEMA can more easily assess and compare.

For future support activities, SUMMIT could be used to execute sets of model runs with varying ranges of input parameters to analyze a range of representative scenarios for each threat or hazard, from which robust response plans can be written by jurisdictions. SUMMIT data for ASAUA planning are summarized below, followed by example output from SUMMIT.

Table 1. SUMMIT outputs for ASAUA THIRA planning

Threat/Hazard for ASAUA THIRA Planning	Impacts Calculated Using SUMMIT
Epidemic	# infected, # fatalities, # seeking outpatient medical care
Hazardous Materials Incident	# exposed, # injured, # fatalities, medical surge requirements, lost Gross Domestic Product (GDP) and employee work days
Improvised Explosive Device	# injured, # fatalities, medical surge requirements
Bio-terrorism attack	# infected, # fatalities, medical surge requirements
Cyber attack	economic impacts due to water treatment facility disruption

Sample SUMMIT Capabilities and Products

Figure 3. Example SUMMIT industrial fire plume data

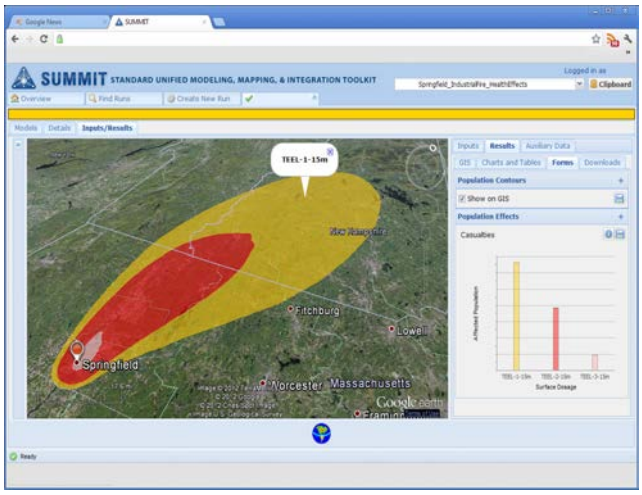


Figure 4. Example SUMMIT economic damage by county

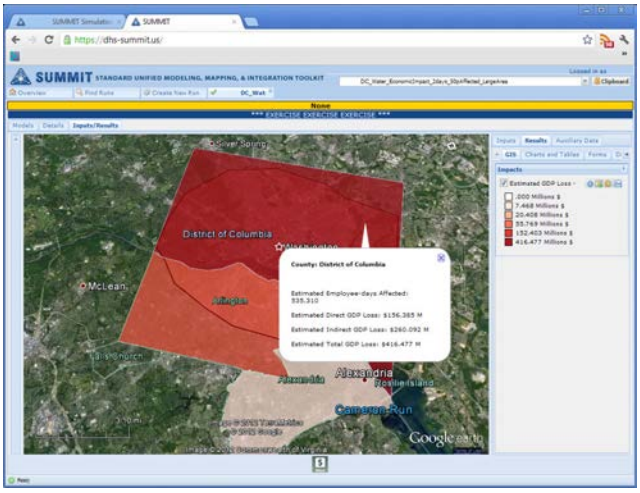
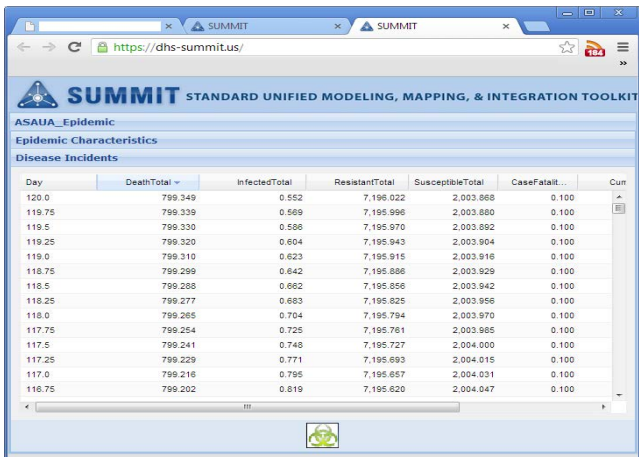
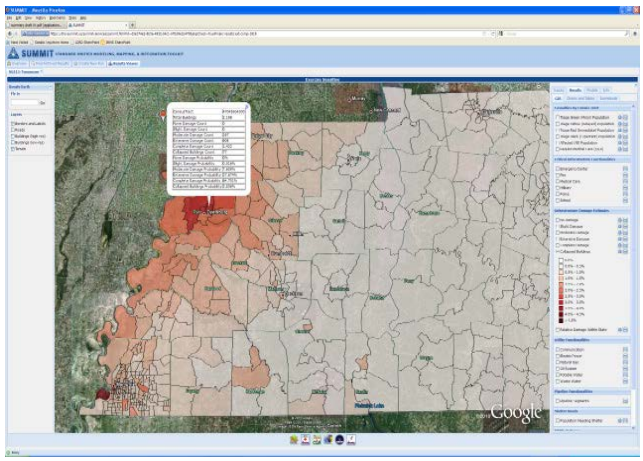


Figure 5. Example SUMMIT epidemic impacts



Day	DeathTotal	InfectedTotal	ResistantTotal	SusceptibleTotal	CaseFatalit...	Curr
120.0	799.349	0.552	7,196.022	2,003.868	0.100	
119.75	799.339	0.569	7,195.996	2,003.880	0.100	
119.5	799.330	0.586	7,195.970	2,003.892	0.100	
119.25	799.320	0.604	7,195.943	2,003.904	0.100	
119.0	799.310	0.623	7,195.915	2,003.916	0.100	
118.75	799.299	0.642	7,195.886	2,003.929	0.100	
118.5	799.288	0.662	7,195.856	2,003.942	0.100	
118.25	799.277	0.683	7,195.825	2,003.956	0.100	
118.0	799.265	0.704	7,195.794	2,003.970	0.100	
117.75	799.254	0.725	7,195.761	2,003.985	0.100	
117.5	799.241	0.748	7,195.727	2,004.000	0.100	
117.25	799.229	0.771	7,195.693	2,004.015	0.100	
117.0	799.216	0.795	7,195.657	2,004.031	0.100	
116.75	799.202	0.819	7,195.620	2,004.047	0.100	

Figure 6. Example SUMMIT earthquake damage



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National Exercise and Simulation Center
National Exercise Division
Federal Emergency Management Agency

Sandia National Laboratories

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