



**Homeland
Security**
Science and Technology

DHS S&T supports National Level Exercise 2011 using SUMMIT



SUMMIT provides next-generation exercise capabilities to NLE 11

The Department of Homeland Security (DHS) Science and Technology's (S&T) Standard Unified Modeling, Mapping & Integration Toolkit (SUMMIT) team provided next-generation exercise capabilities to the planning and conduct of National Level Exercise 2011 (NLE 11). DHS S&T partnered with the Federal Emergency Management Agency's (FEMA) National Exercise and Simulation Center (NESC) to pilot the SUMMIT software tool in NLE 11. The SUMMIT capabilities included a scenario adjudication tool that allowed planners to bridge the gap between a model-driven exercise with an objective-driven exercise, an iPad app that introduced next-generation immersive visualization tools for exercises, an innovative platform for generating integrated scenario data from linked models, and integrated visualization of scenario data to support the common operating picture.



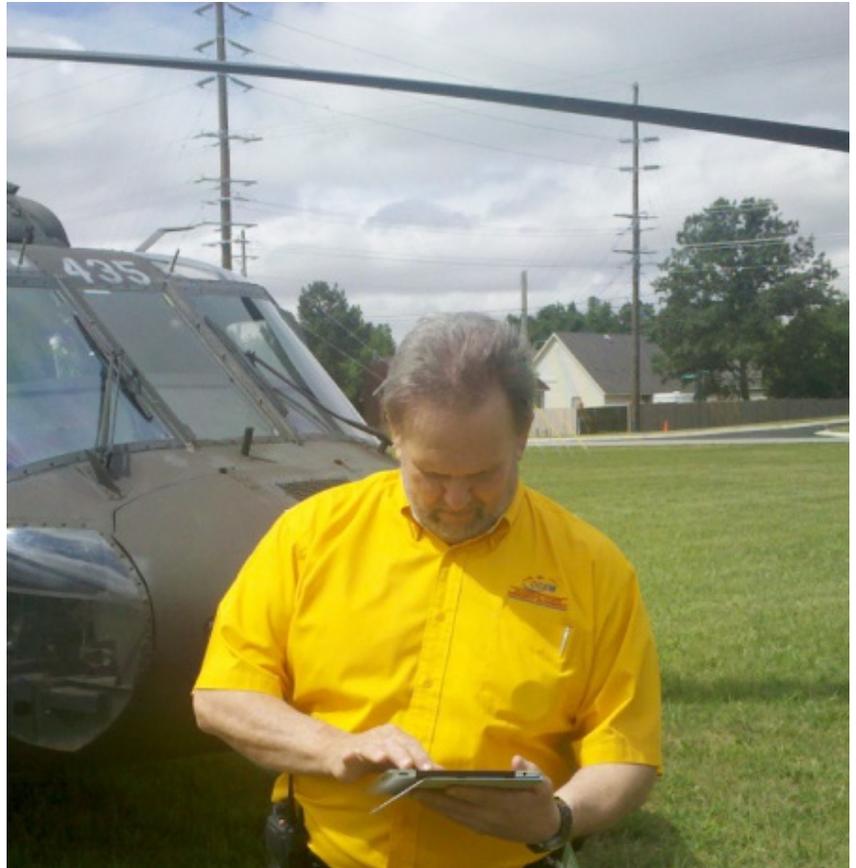
The NLE 11 exercise scenario was a catastrophic earthquake in the New Madrid Seismic Zone. The SUMMIT team worked with exercise planners, from early 2010 to May 2011 to generate and refine scenario data. From May 16-19, 2011, SUMMIT team members were deployed during the exercise to support controllers and evaluators in the Master Control Cell in the National Capital Region and to pilot the iPad app with players in Jonesboro, Arkansas.

SUMMIT pilots iPad™ app in Jonesboro, Arkansas

Using iPad™ mobile devices, emergency preparedness officials and first responders participating in NLE 11 were able, for the first time, to make use of a new, science-based software tool, as part of the SUMMIT program, that allows them to view accurate models of building damage and other post-event disasters.

First responders role-playing in the exercise in Jonesboro, Arkansas, had iPads™ available to them with the SUMMIT software, while others in the Master Control Cell were able to see the visualization software on large screens. This enhanced, 3D virtual view of building damage available to players in the field is expected to create a new level of realism and a common operating picture for players in future exercises at national, regional, and local levels. The visualization was based on model-derived building damage scenario data.

SUMMIT partnered with the FEMA NESC, FEMA Region VI, and the state of Arkansas to pilot SUMMIT in Jonesboro, Arkansas.



SUMMIT adjudication tool enables planners to tailor scenario data to meet objectives



SUMMIT linked together models to create scenario data for NLE 11, one of which was building damage states for individual buildings. Exercise planners for NLE 11 were able to tailor the model-generated scenario data to meet exercise objectives using the SUMMIT adjudication tool. This allows the exercise to have a scientifically-grounded scenario but with the flexibility needed to effectively meet all exercise objectives.

By creating an online collaboration tool for display and modification of the model-derived building damage, SUMMIT gave planners the ability to override model building damage results to meet their own exercise objectives. For NLE 11, planners in select pilot regions were able to view buildings, color-coded by damage level, and rapidly modify damage levels as necessary in a secure online tool. The adjudicated data was then submitted to a central repository and integrated into the official exercise scenario data. This adjudicated data was then used in the 3D virtual visualizations in Jonesboro and in the Master Control Cell.

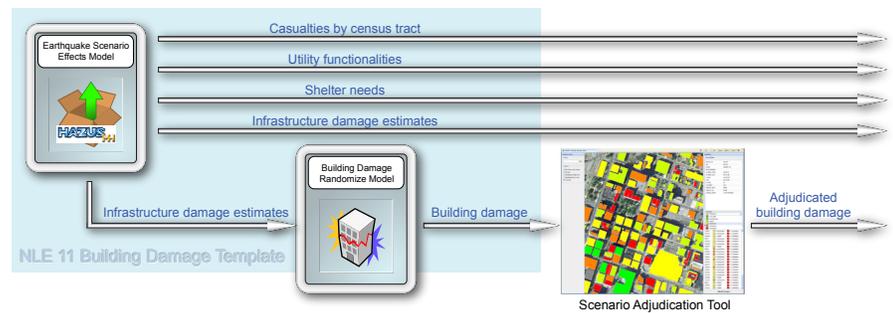
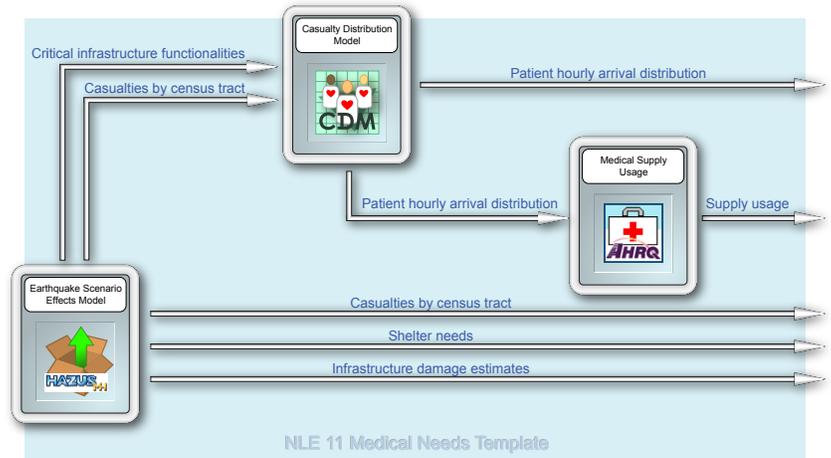
SUMMIT links models to create scenario data

SUMMIT facilitates development of integrated scenario data through its model linking capabilities. SUMMIT templates represent the workflow for linking models and data to address a specific incident. For the NLE 11 scenario, SUMMIT linked models and data through two templates.

In the NLE 11 building damage template, SUMMIT linked the FEMA HAZUS model outputs to a casualty distribution model and the AHRQ Hospital Surge Model. Casualties from HAZUS were distributed over time to the nearest undamaged hospitals, and then the AHRQ Hospital Surge Model calculated medical needs (staffing, supplies, hospital census) for all hospitals and medical centers in the NLE 11 scenario, for every hour of the exercise.

For select pilot regions, SUMMIT modeled building damage data at the building level in the NLE 11 building damage template. This template linked the HAZUS building damage probabilities and building inventory to a building damage random assignment model. These data were then adjudicated with exercise planners using the SUMMIT scenario adjudication tool, and then the finalized data was displayed in SUMMIT and linked to virtual environment visualizations for Jonesboro, Arkansas, and Memphis, Tennessee.

In addition, SUMMIT extended the HAZUS building damage data capability by computing collapsed building probabilities, by census tract, for all 8 states in the NLE 11 scenario.



Models and databases used in SUMMIT for NLE 11

By linking together existing models, SUMMIT enhances utility of our nation's modeling and simulation resources. For NLE 11, SUMMIT acknowledges use of the following models and databases.

Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA)

HAZUS-MH MR5: FEMA's methodology for estimating potential losses from disasters

Department of Health & Human Services (HHS) Agency for Healthcare Research and Quality (AHRQ)

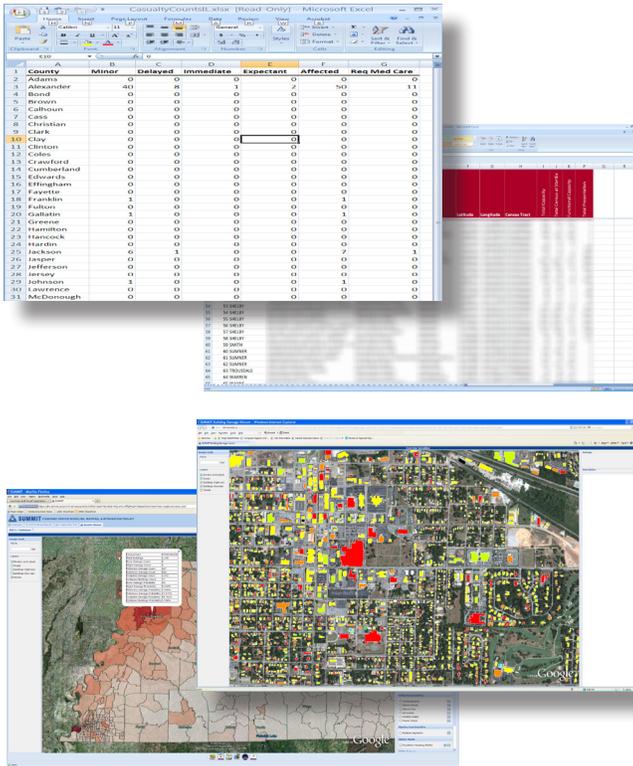
Hospital Surge Model v. 1.3: hospital resource estimation model

National Geospatial-Intelligence Agency (NGA) in partnership with the Department of Homeland Security (DHS)

Homeland Security Infrastructure Program (HSIP) Gold 2010: national infrastructure and critical asset information database

SUMMIT Products

SUMMIT was used to create a number of scenario products to support NLE 11 exercise planners and controllers



Medical surge data for all 334 hospitals and medical centers in all 8 states in NLE 11 scenario

The medical surge data was part of the scenario data distributed to planners prior to the exercise and was used by controllers in the Master Control Cell during exercise conduct.

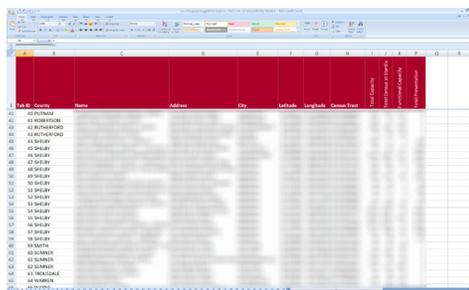
Casualty counts by county for each state

The casualty data was part of the scenario data for the exercise, and it was visualized in a GIS display for controllers in the Master Control Cell during exercise conduct. Spreadsheet outputs of casualty data were provided to ESF 5 (emergency management) controllers/simulators for input into an urban search and rescue model to determine number and type of rescues by building structure and USAR team composition.

Building damage data

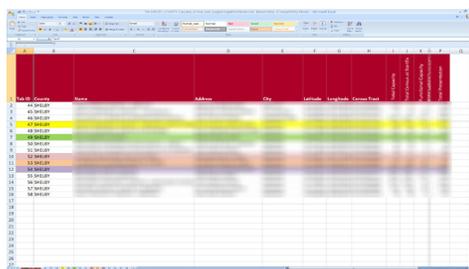
Building damage data (probabilities by census tract and individual building damage for select regions) were included in the Master Control Cell master Google Earth display for controllers. These data were used to support simulated asset requests, damage assessments, and ESF 9 (Urban Search & Rescue) controllers.

SUMMIT was used during NLE 11 exercise conduct to respond to specific data requests in the Master Control Cell.



Casualty count by county for Illinois

In response to a request from the State of Illinois during exercise conduct, SUMMIT provided a spreadsheet of casualty counts by county to Illinois. These data were for inclusion in the Governor's report to the President of the United States during exercise conduct.



Casualties for Shelby county

In response to a request from the lead exercise controller during exercise conduct, SUMMIT provided the casualties for Shelby county. These data were used by controllers to respond to a local request to halt arrivals of casualties to hospitals in the exercise.

Hour	Minor (Green)	Delayed (Yellow)	Immediate (Red)	Expectant (Black)
1	0	0	16	0
2	0	11	71	8
3	2	48	149	35
4	36	126	237	75
5	94	258	320	133
6	194	444	400	207
7	361	679	467	293
8	597	966	524	379
9	921	1288	569	474

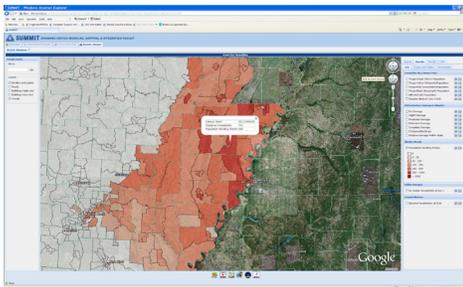
Casualty distribution data by state

In response to a request from the Exercise Situation Unit in the Master Control Cell during exercise conduct, SUMMIT provided a spreadsheet of detailed casualty distribution, by state, cumulative for each hour of exercise, and by operation period of the exercise. These data were used for overall exercise control and operational period briefings. These were also used for exercise evaluation, allowing comparison of the exercise scenario to that which was reported by exercise players.

Resource	07:00:00	08:00:00	09:00:00	10:00:00	11:00:00	12:00:00	13:00:00	14:00:00	15:00:00	16:00:00	17:00:00	18:00:00	19:00:00	20:00:00	21:00:00	22:00:00	23:00:00	24:00:00
Final Count	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Delayed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Immediate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expectant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Patient arrival and medical resources for 4 major hospitals in Memphis

In response to a request from ESF 7 (logistics management and resource support) controllers during exercise conduct, SUMMIT provided patient arrivals over time and medical resources needed for the four major hospitals in Memphis. These data were used to determine the total resource requirements.



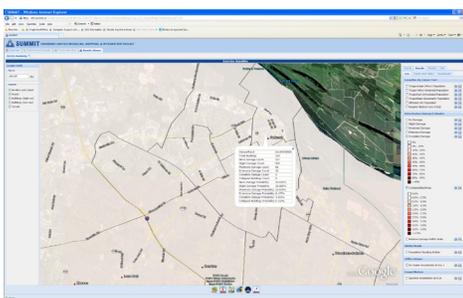
Shelter needs, casualty estimates, and building damage for Missouri, Arkansas, and Indiana

In response to a request from ESF 15 (Faith-based organizations/My Social Media) during exercise conduct, SUMMIT provided casualty data and building damage probabilities for Missouri, Arkansas, and Indiana. These data were used to determine needs for faith-based organizations and to create content for My Social Media during the exercise.



Collapsed building data for Memphis

In response to a request from ESF 9 (Urban Search & Rescue) controllers during exercise conduct, SUMMIT provided image files, KMZ files, and coordinates of collapsed buildings for Memphis, Tennessee. These were used to determine the parts of the city that would need urban search and rescue teams and to define the grids that the ESF 9 controllers used to create injects for the exercise.



Building damage near Paducah, KY

In response to a request from ESF 9 (Urban Search & Rescue) controllers during exercise conduct, SUMMIT provided KML files of building damage (damage state probabilities by census tract) for the area near Paducah, Kentucky. These were used to determine assignments for urban search and rescue teams in that region for the exercise.

About SUMMIT

The Standard Unified Modeling, Mapping, & Integration Toolkit is funded by 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 Federal Emergency Management Agency's National Exercise and Simulation Center (NESC) to pilot SUMMIT. The NESC is a congressionally-mandated exercise and simulation facility within FEMA headquarters. The NESC's primary objectives include providing state-of-the-art modeling and simulation capabilities to support national, federal, state, local, and tribal exercises.

SUMMIT is enhancing the use of science-based tools for the emergency preparedness and management community. By creating an environment that allows linking of "best-in-class" modeling and simulation tools and underlying data, SUMMIT aims to decrease the time and cost needed to train for, analyze, and respond to real or potential incidents--while increasing preparedness effectiveness.

SUMMIT allows emergency preparedness and management personnel to easily and rapidly discover, integrate, configure, execute, and view the results of the nation's modeling and simulation resources and related data. These resources help ensure a scientific grounding for exercises and other emergency preparedness and management 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 modeling and simulation 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.

Sandia National Laboratories is the principal SUMMIT architect.



Sandia National Laboratories

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FEMA

FEMA's Mission is to reduce the loss of life and property and protect communities nationwide from all hazards, including natural disasters, acts of terrorism, and other man-made disasters. FEMA leads and supports the nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery and mitigation.

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