

# SUMMIT Support for Earthquake Exercises

SAND2011-6907P

## About SUMMIT

The Infrastructure Protection and Disaster Management Division (IDD) 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 analysts, emergency planners, responders, and decision makers to seamlessly access integrated suites of modeling tools and data sources for planning, exercises, or operational response. Currently in its pilot phase, the initial SUMMIT versions will be deployed at the Federal Emergency Management Agency's National Exercise and Simulation Center (NESC). 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. Sandia National Laboratories is the principal SUMMIT architect.

SUMMIT allows emergency management 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 emergency 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 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.

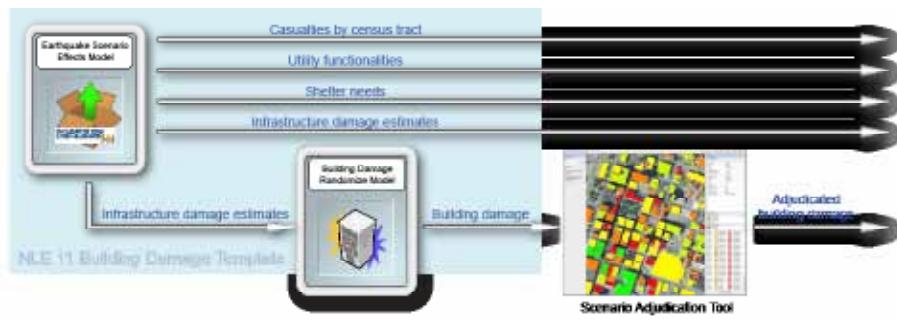
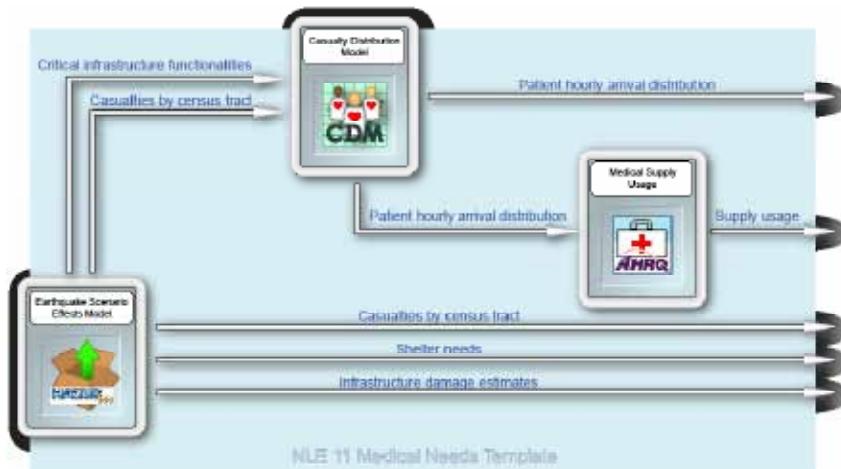
Currently, the NESC intends to use SUMMIT to support the National Level Exercise (NLE) program, while several FEMA exercise series are under consideration for pilot usages of SUMMIT. These pilots will allow the emergency management community to work with SUMMIT and begin to more intensely leverage M&S in emergency management activities.

## SUMMIT links models to create scenario data for earthquake exercises

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 an earthquake scenario, SUMMIT links models and data through two templates. In the earthquake building damage template, SUMMIT links FEMA HAZUS model outputs to a casualty distribution model and the AHRQ Hospital Surge Model. Casualties from HAZUS are distributed over time to the nearest undamaged hospitals, and then the AHRQ Hospital Surge Model calculates medical needs (staffing, supplies, hospital census) for all hospitals and medical centers in the region of interest.

If building footprint data is available, SUMMIT can model building damage data at the building level in the earthquake building damage template. This template links the HAZUS building damage probabilities and building inventory to a building damage random assignment model. These data can then be adjudicated with exercise planners using the SUMMIT scenario adjudication tool.

In addition, SUMMIT extends the HAZUS building damage data capability by computing collapsed building probabilities, by census tract, for all regions of interest.



## SUMMIT Capabilities and Products: Earthquake Exercises

## Medical surge data for all hospitals and medical centers in region of interest

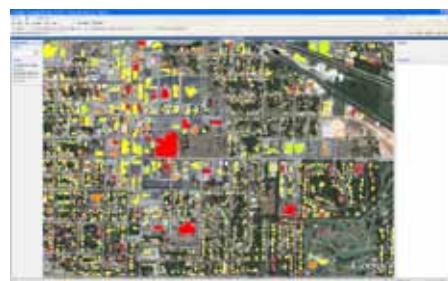
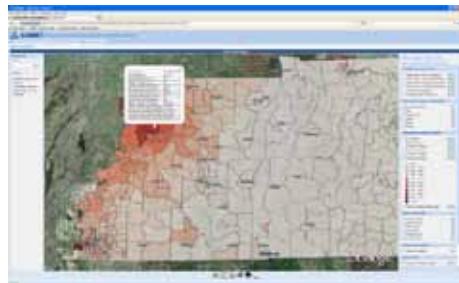
Category	Item	Chosen	Immediate	Expected	Actualized	Residual
1.	Administrator	N	N	1	1	0
2.	Normal	N	N	0	0	0
3.	Guest	N	N	0	0	0
4.	Power User	N	N	0	0	0
5.	Local User	N	N	0	0	0
6.	Local Group	N	N	0	0	0
7.	Local Machine	N	N	0	0	0
8.	Local User (2)	N	N	0	0	0
9.	Local Group (2)	N	N	0	0	0
10.	Local Machine (2)	N	N	0	0	0
11.	Guest (2)	N	N	0	0	0
12.	Power User (2)	N	N	0	0	0
13.	Normal (2)	N	N	0	0	0
14.	Administrator (2)	N	N	0	0	0
15.	Local User (3)	N	N	0	0	0
16.	Local Group (3)	N	N	0	0	0
17.	Local Machine (3)	N	N	0	0	0
18.	Guest (3)	N	N	0	0	0
19.	Power User (3)	N	N	0	0	0
20.	Normal (3)	N	N	0	0	0
21.	Administrator (3)	N	N	0	0	0
22.	Local User (4)	N	N	0	0	0
23.	Local Group (4)	N	N	0	0	0
24.	Local Machine (4)	N	N	0	0	0
25.	Guest (4)	N	N	0	0	0
26.	Power User (4)	N	N	0	0	0
27.	Normal (4)	N	N	0	0	0
28.	Administrator (4)	N	N	0	0	0
29.	Local User (5)	N	N	0	0	0
30.	Local Group (5)	N	N	0	0	0
31.	Local Machine (5)	N	N	0	0	0
32.	Guest (5)	N	N	0	0	0
33.	Power User (5)	N	N	0	0	0
34.	Normal (5)	N	N	0	0	0
35.	Administrator (5)	N	N	0	0	0
36.	Local User (6)	N	N	0	0	0
37.	Local Group (6)	N	N	0	0	0
38.	Local Machine (6)	N	N	0	0	0
39.	Guest (6)	N	N	0	0	0
40.	Power User (6)	N	N	0	0	0
41.	Normal (6)	N	N	0	0	0
42.	Administrator (6)	N	N	0	0	0
43.	Local User (7)	N	N	0	0	0
44.	Local Group (7)	N	N	0	0	0
45.	Local Machine (7)	N	N	0	0	0
46.	Guest (7)	N	N	0	0	0
47.	Power User (7)	N	N	0	0	0
48.	Normal (7)	N	N	0	0	0
49.	Administrator (7)	N	N	0	0	0
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51.	Local Group (8)	N	N	0	0	0
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53.	Guest (8)	N	N	0	0	0
54.	Power User (8)	N	N	0	0	0
55.	Normal (8)	N	N	0	0	0
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59.	Local Machine (9)	N	N	0	0	0
60.	Guest (9)	N	N	0	0	0
61.	Power User (9)	N	N	0	0	0
62.	Normal (9)	N	N	0	0	0
63.	Administrator (9)	N	N	0	0	0
64.	Local User (10)	N	N	0	0	0
65.	Local Group (10)	N	N	0	0	0
66.	Local Machine (10)	N	N	0	0	0
67.	Guest (10)	N	N	0	0	0
68.	Power User (10)	N	N	0	0	0
69.	Normal (10)	N	N	0	0	0
70.	Administrator (10)	N	N	0	0	0
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72.	Local Group (11)	N	N	0	0	0
73.	Local Machine (11)	N	N	0	0	0
74.	Guest (11)	N	N	0	0	0
75.	Power User (11)	N	N	0	0	0
76.	Normal (11)	N	N	0	0	0
77.	Administrator (11)	N	N	0	0	0
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79.	Local Group (12)	N	N	0	0	0
80.	Local Machine (12)	N	N	0	0	0
81.	Guest (12)	N	N	0	0	0
82.	Power User (12)	N	N	0	0	0
83.	Normal (12)	N	N	0	0	0
84.	Administrator (12)	N	N	0	0	0
85.	Local User (13)	N	N	0	0	0
86.	Local Group (13)	N	N	0	0	0
87.	Local Machine (13)	N	N	0	0	0
88.	Guest (13)	N	N	0	0	0
89.	Power User (13)	N	N	0	0	0
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91.	Administrator (13)	N	N	0	0	0
92.	Local User (14)	N	N	0	0	0
93.	Local Group (14)	N	N	0	0	0
94.	Local Machine (14)	N	N	0	0	0
95.	Guest (14)	N	N	0	0	0
96.	Power User (14)	N	N	0	0	0
97.	Normal (14)	N	N	0	0	0
98.	Administrator (14)	N	N	0	0	0
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100.	Local Group (15)	N	N	0	0	0
101.	Local Machine (15)	N	N	0	0	0
102.	Guest (15)	N	N	0	0	0
103.	Power User (15)	N	N	0	0	0
104.	Normal (15)	N	N	0	0	0
105.	Administrator (15)	N	N	0	0	0
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107.	Local Group (16)	N	N	0	0	0
108.	Local Machine (16)	N	N	0	0	0
109.	Guest (16)	N	N	0	0	0
110.	Power User (16)	N	N	0	0	0
111.	Normal (16)	N	N	0	0	0
112.	Administrator (16)	N	N	0	0	0
113.	Local User (17)	N	N	0	0	0
114.	Local Group (17)	N	N	0	0	0
115.	Local Machine (17)	N	N	0	0	0
116.	Guest (17)	N	N	0	0	0
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121.	Local Group (18)	N	N	0	0	0
122.	Local Machine (18)	N	N	0	0	0
123.	Guest (18)	N	N	0	0	0
124.	Power User (18)	N	N	0	0	0
125.	Normal (18)	N	N	0	0	0
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128.	Local Group (19)	N	N	0	0	0
129.	Local Machine (19)	N	N	0	0	0
130.	Guest (19)	N	N	0	0	0
131.	Power User (19)	N	N	0	0	0
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135.	Local Group (20)	N	N	0	0	0
136.	Local Machine (20)	N	N	0	0	0
137.	Guest (20)	N	N	0	0	0
138.	Power User (20)	N	N	0	0	0
139.	Normal (20)	N	N	0	0	0
140.	Administrator (20)	N	N	0	0	0
141.	Local User (21)	N	N	0	0	0
142.	Local Group (21)	N	N	0	0	0
143.	Local Machine (21)	N	N	0	0	0
144.	Guest (21)	N	N	0	0	0
145.	Power User (21)	N	N	0	0	0
146.	Normal (21)	N	N	0	0	0
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149.	Local Group (22)	N	N	0	0	0
150.	Local Machine (22)	N	N	0	0	0
151.	Guest (22)	N	N	0	0	0
152.	Power User (22)	N	N	0	0	0
153.	Normal (22)	N	N	0	0	0
154.	Administrator (22)	N	N	0	0	0
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156.	Local Group (23)	N	N	0	0	0
157.	Local Machine (23)	N	N	0	0	0
158.	Guest (23)	N	N	0	0	0
159.	Power User (23)	N	N	0	0	0
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163.	Local Group (24)	N	N	0	0	0
164.	Local Machine (24)	N	N	0	0	0
165.	Guest (24)	N	N	0	0	0
166.	Power User (24)	N	N	0	0	0
167.	Normal (24)	N	N	0	0	0
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173.	Power User (25)	N	N	0	0	0
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180.	Power User (26)	N	N	0	0	0
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184.	Local Group (27)	N	N	0	0	0
185.	Local Machine (27)	N	N	0	0	0
186.	Guest (27)	N	N	0	0	0
187.	Power User (27)	N	N	0	0	0
188.	Normal (27)	N	N	0	0	0
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193.	Guest (28)	N	N	0	0	0
194.	Power User (28)	N	N	0	0	0
195.	Normal (28)	N	N	0	0	0
196.	Administrator (28)	N	N	0	0	0
197.	Local User (29)	N	N	0	0	0
198.	Local Group (29)	N	N	0	0	0
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200.	Guest (29)	N	N	0	0	0
201.	Power User (29)	N	N	0	0	0
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204.	Local User (30)	N	N	0	0	0
205.	Local Group (30)	N	N	0	0	0
206.	Local Machine (30)	N	N	0	0	0
207.	Guest (30)	N	N	0	0	0
208.	Power User (30)	N	N	0	0	0
209.	Normal (30)	N	N	0	0	0
210.	Administrator (30)	N	N	0	0	0
211.	Local User (31)	N	N	0	0	0
212.	Local Group (31)	N	N	0	0	0
213.	Local Machine (31)	N	N	0	0	0
214.	Guest (31)	N	N	0	0	0
215.	Power User (31)	N	N	0	0	0
216.	Normal (31)	N	N	0	0	0
217.	Administrator (31)	N	N	0	0	0
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219.	Local Group (32)	N	N	0	0	0
220.	Local Machine (32)	N	N	0	0	0
221.	Guest (32)	N	N	0	0	0
222.	Power User (32)	N	N	0	0	0
223.	Normal (32)	N	N	0	0	0
224.	Administrator (32)	N	N	0	0	0
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228.	Guest (33)	N	N	0	0	0
229.	Power User (33)	N	N	0	0	0
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231.	Administrator (33)	N	N	0	0	0
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233.	Local Group (34)	N	N	0	0	0
234.	Local Machine (34)	N	N	0	0	0
235.	Guest (34)	N	N	0	0	0
236.	Power User (34)	N	N	0	0	0
237.	Normal (34)	N	N	0	0	0
238.	Administrator (34)	N	N	0	0	0
239.	Local User (35)	N	N	0	0	0
240.	Local Group (35)	N	N	0	0	0
241.	Local Machine (35)	N	N	0	0	0
242.	Guest (35)	N	N	0	0	0
243.	Power User (35)	N	N	0	0	0
244.	Normal (35)	N	N	0	0	0
245.	Administrator (35)	N	N	0	0	0
246.	Local User (36)	N	N	0	0	0
247.	Local Group (36)	N	N	0	0	0
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## Casualty counts by county within region of interest

## Building damage probabilities by census tract

## Individual building damage\*

\*if building footprint data is available



Sandia National Laboratories



FEMA

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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.

## Contact information



# Homeland Security

Jalal Mapar

## Program Manager

## Infrastructure Protection and Disaster Management (IDD)

## Science and Technology Directorate

## Department of Homeland Security

Jalal.Mapar@DHS.gov

website: [dhs-summit.us](http://dhs-summit.us)

National Exercise and Simulation Center  
NESC@DHS.gov