

Future Integrated Threat and Hazard Analysis Capability using SUMMIT

(Standard Unified Modeling Mapping and Integration Toolkit)

SUMMIT Program Manager

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**Homeland
Security**

Science and Technology

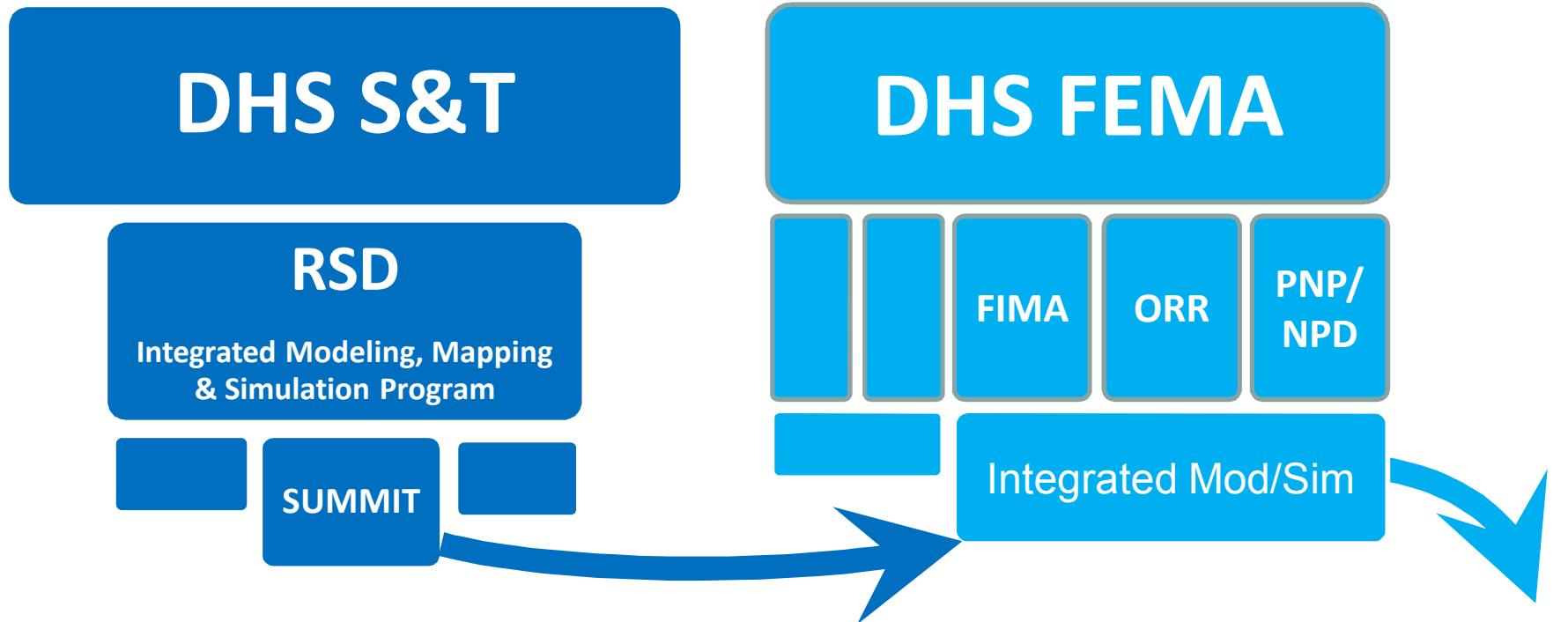


SUMMIT



FEMA

Program Vision for SUMMIT

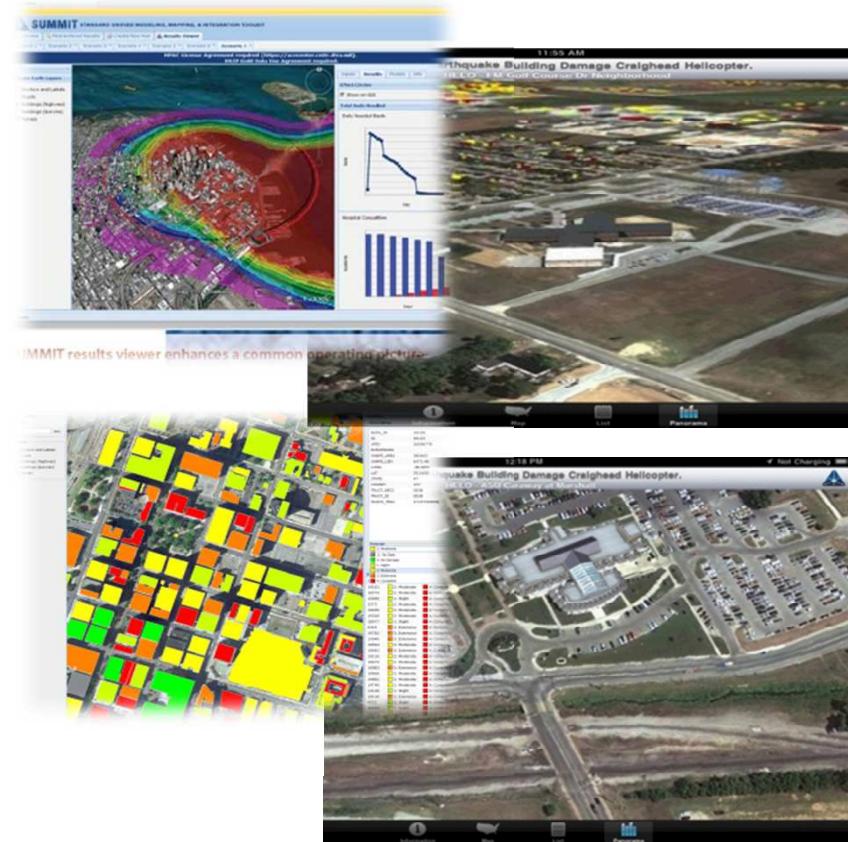


Vision: A capability for linking together “best-in-class” modeling and simulation tools to enable analysts, emergency planners, and incident managers more effectively, economically, and rapidly prepare, analyze, train, and respond to real or potential incidents.

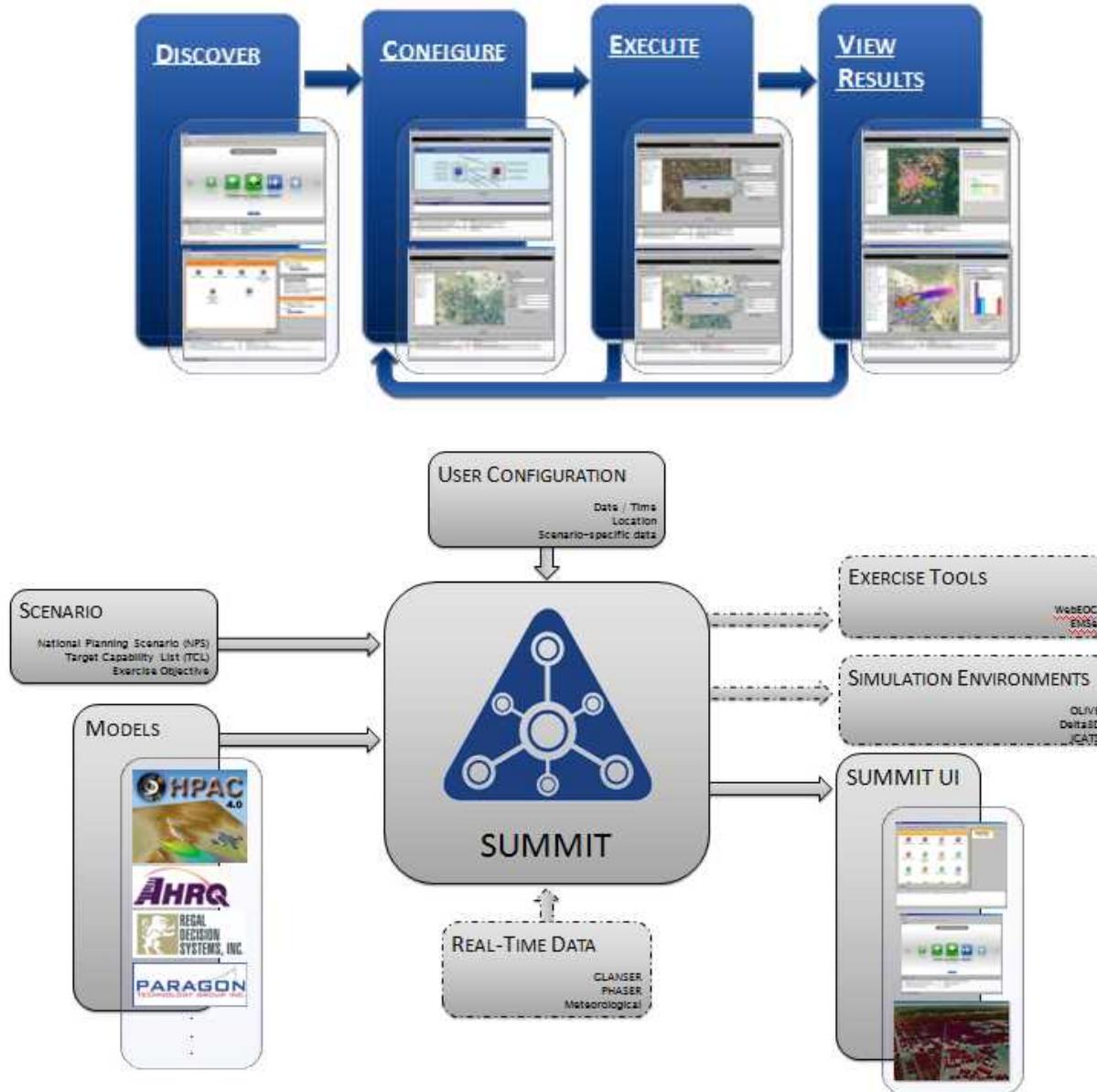
Integrated Modeling and Simulation for Analysts

CURRENT capabilities to support the following scenarios

- Improvised Nuclear Device
- Hurricane
- Tsunami
- Earthquake
- Chemical Release
- Biological Release
- Cyber Attack



SUMMIT Architecture



SUMMIT Technology

SUMMIT innovation is new method for model integration

- Extendable repository of Templates, Slots, NIEM datatypes, and Model Wrappers
- User-supplied description and usage meta data
- Slots categorized by Taxonomy (syntax and semantics)

SUMMIT STANDARD UNIFIED MODELING, MAPPING, & INTEGRATION TOOLKIT

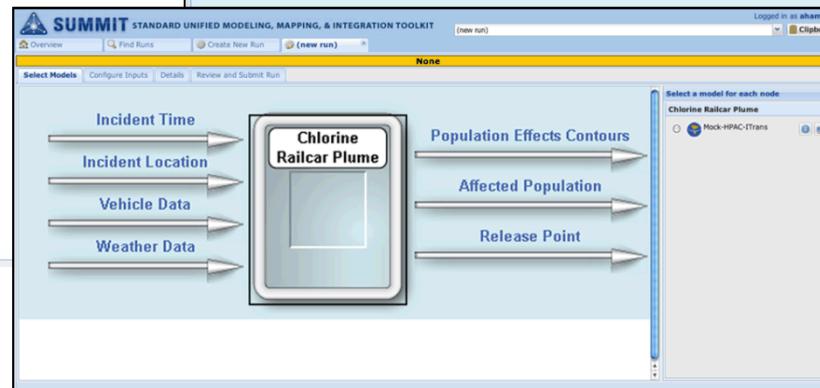
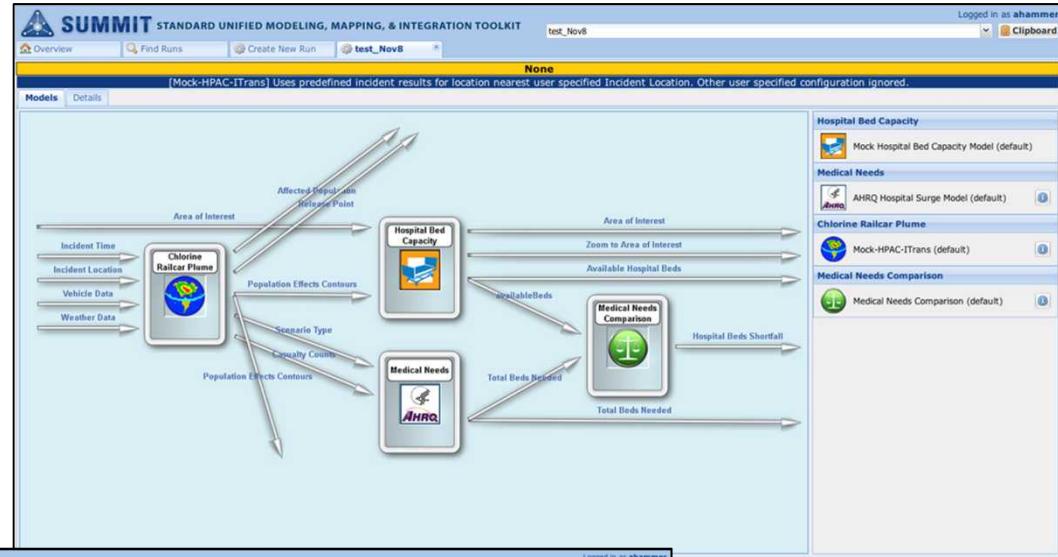
Overview Find Runs Create New Run Queue Admin

Search

Matching Results

... or select a scenario

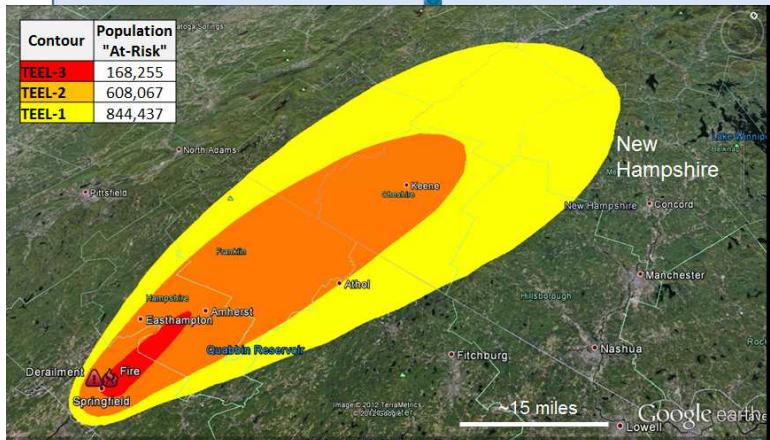
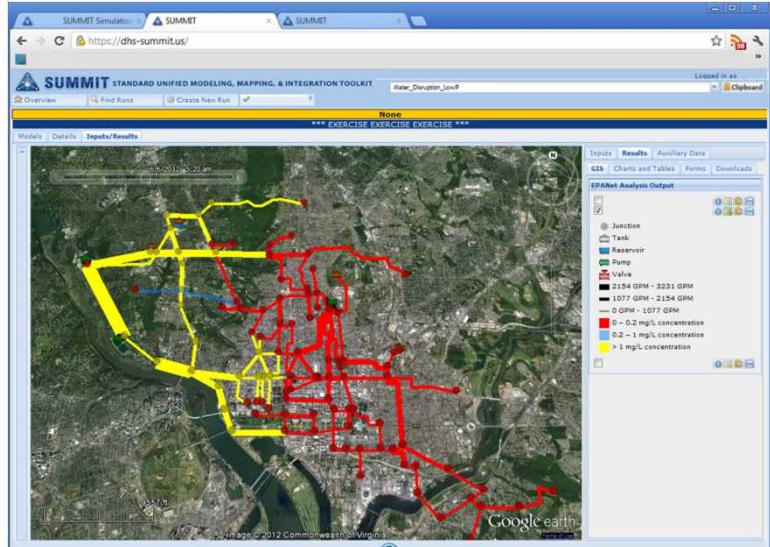
ID	Hazard	Title
1	Nuclear Detonation	Improvised Nuclear Device
2	Biological Attack	Aerosol Anthrax
3	Biological Disease Outbreak	Pandemic Influenza
4	Biological Attack	Plague
5	Chemical Attack	Blister Agent
6	Chemical Attack	Toxic Industrial Chemicals
7	Chemical Attack	Nerve Agent
8	Chemical Attack	Chlorine Tank Explosion
9	Natural Disaster	Major Earthquake
10	Natural Disaster	Major Hurricane
11	Radiological Attack	Radiological Dispersal Device
12	Explosives Attack	Bombing Using Improvised Explosive Device
13	Biological Attack	Food Contamination
14	Biological Attack	Foreign Animal Disease
15	Cyber Attack	



Example SUMMIT Results

Economic Disruption

Lifeline Disruption

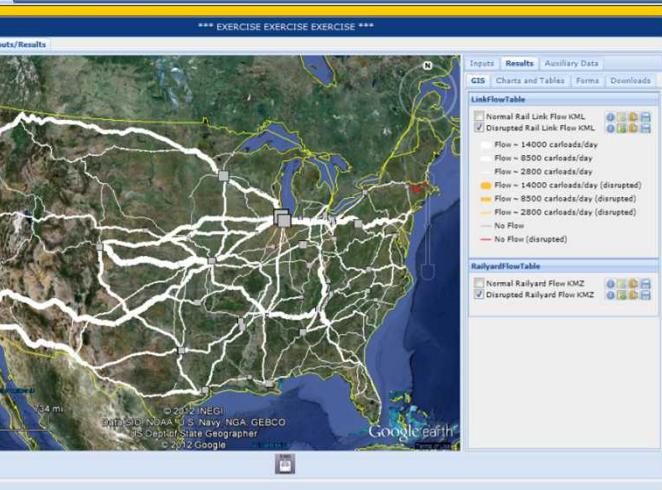
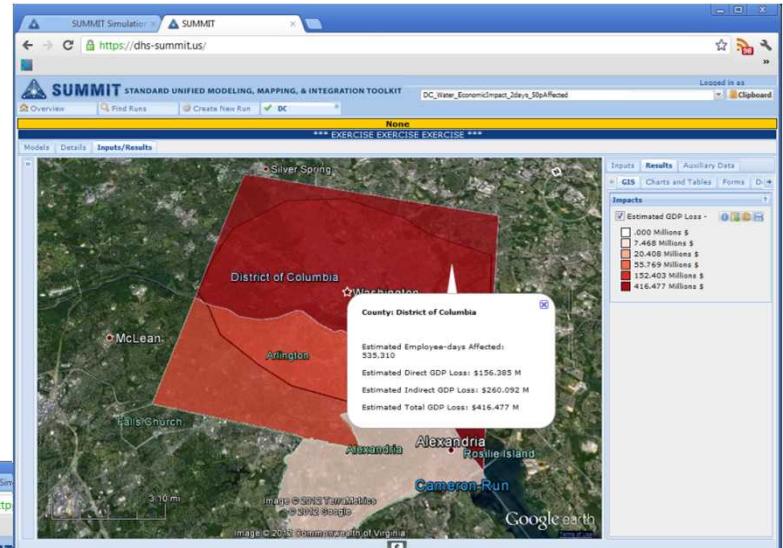


Populations at-risk



Homeland
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Logistics Disruption



FEMA

Models Currently Available

(additional models constantly being added to SUMMIT ecosystem)

Legend

NPS: National Planning Scenario

I.D.: Infrastructure Damage

 Model available in template to support scenario

 Model could be added to template to support scenario

 Mature model and template used in support of multiple exercises

	Scenario																
	NPS 1	NPS 2	NPS 3	NPS 4	NPS 5	NPS 6	NPS 7	NPS 8	NPS 9	NPS 10	NPS 11	NPS 12	NPS 13	NPS 14	NPS 15	I.D.	Flood
THREAT MODELS																	
Air Dispersion (Plume)																	
HPAC																	
Sweden Plume Model																	
Disease																	
SIR Disease Model																	
CONSEQUENCE MODELS																	
Medical Needs																	
AHRQ Hospital Surge Model																	
Hospital Bed Capacity Model																	
BERM Clinic Staffing Model																	
Transportation																	
(RAIL) - RNAS																	
Population Movement																	
Air Travel Population Movement Model																	
Regional Travel Model																	
Infrastructure Effects																	
Building Damage Randomization Model																	
HAZUS Data Extractor (**Extraction ONLY)																	
Sweden Infrastructure Effects Model																	
Flood critical infrastructure effects model																	
HSIP Infrastructure effects model																	
GIS Utility Slot Model																	
Casualties																	
HPAC																	
HAZUS Data Extractor (**Extraction ONLY)																	
AEGL Health Effects Models																	
GIS Utility Slot Model																	
Water Networks																	
EPAnet																	
Flood																	
Flood Inundation Model																	
Flood Population Effects Model																	
Economic Effects																	
ReAcct																	
Mass Care and Sheltering																	
The Army Corps of Engineers Commodities Model																	



EXERCISES



SUMMIT Exercise Support Examples

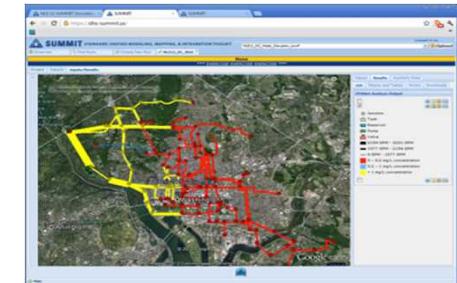
FEMA Region II Blue Surge (May 2013)

- 3 day functional exercise focusing on the first 72 hours a tsunami in the Caribbean. SUMMIT provided:
 - HAZUS earthquake and flood
 - USACE/DoD commodities
 - Trucks, Ice, PODs, Staff
 - Casualty distribution
 - Infrastructure effects
 - Displaced households

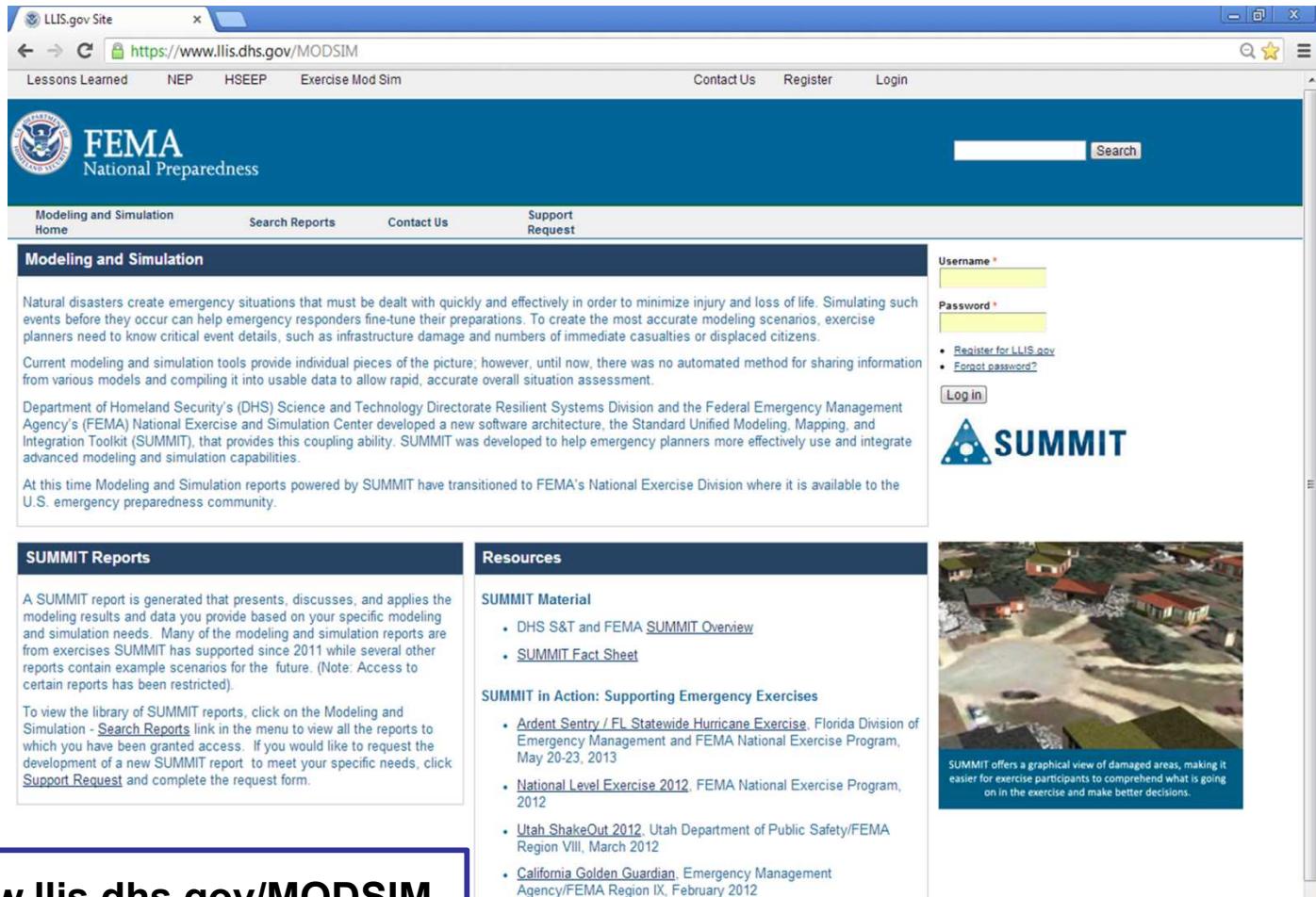


National Level Exercise 2012 (June 2012)

- Cyber-security exercise. SUMMIT provided:
 - Model-based scenario data
 - Capability to view integrated M&S results to enhance situational awareness and common operating picture during exercise conduct.
- Models/data integrated in SUMMIT:
 - Regional Economic Accounting (REAcct)-GDP
 - Railroad Network Analysis System
 - EPAnet – effects of chemical levels in water
 - HPAC – air dispersion model
 - FASTMap - infrastructure effects map



SUMMIT Reporting Capability has Successfully Transitioned from DHS S&T to FEMA's LLIS and HSEEP



The screenshot shows a web browser window for the LLIS.gov Site at <https://www.llis.dhs.gov/MODSIM>. The page features the FEMA National Preparedness logo and navigation links for Lessons Learned, NEP, HSEEP, and Exercise Mod Sim. The main content area is titled "Modeling and Simulation" and discusses the transition of SUMMIT reporting to FEMA's LLIS and HSEEP. It includes sections for "SUMMIT Reports" and "Resources". The "Resources" section lists "SUMMIT Material" and "SUMMIT in Action: Supporting Emergency Exercises" with links to various exercises. To the right, there is a login form and a graphic showing a 3D rendering of a damaged area.

LLIS.gov Site <https://www.llis.dhs.gov/MODSIM>

Lessons Learned NEP HSEEP Exercise Mod Sim Contact Us Register Login

FEMA
National Preparedness

Modeling and Simulation Home Search Reports Contact Us Support Request

Modeling and Simulation

Natural disasters create emergency situations that must be dealt with quickly and effectively in order to minimize injury and loss of life. Simulating such events before they occur can help emergency responders fine-tune their preparations. To create the most accurate modeling scenarios, exercise planners need to know critical event details, such as infrastructure damage and numbers of immediate casualties or displaced citizens.

Current modeling and simulation tools provide individual pieces of the picture; however, until now, there was no automated method for sharing information from various models and compiling it into usable data to allow rapid, accurate overall situation assessment.

Department of Homeland Security's (DHS) Science and Technology Directorate Resilient Systems Division and the Federal Emergency Management Agency's (FEMA) National Exercise and Simulation Center developed a new software architecture, the Standard Unified Modeling, Mapping, and Integration Toolkit (SUMMIT), that provides this coupling ability. SUMMIT was developed to help emergency planners more effectively use and integrate advanced modeling and simulation capabilities.

At this time Modeling and Simulation reports powered by SUMMIT have transitioned to FEMA's National Exercise Division where it is available to the U.S. emergency preparedness community.

SUMMIT Reports

A SUMMIT report is generated that presents, discusses, and applies the modeling results and data you provide based on your specific modeling and simulation needs. Many of the modeling and simulation reports are from exercises SUMMIT has supported since 2011 while several other reports contain example scenarios for the future. (Note: Access to certain reports has been restricted).

To view the library of SUMMIT reports, click on the Modeling and Simulation - [Search Reports](#) link in the menu to view all the reports to which you have been granted access. If you would like to request the development of a new SUMMIT report to meet your specific needs, click [Support Request](#) and complete the request form.

Resources

SUMMIT Material

- DHS S&T and FEMA [SUMMIT Overview](#)
- [SUMMIT Fact Sheet](#)

SUMMIT in Action: Supporting Emergency Exercises

- [Ardent Sentry / FL Statewide Hurricane Exercise](#), Florida Division of Emergency Management and FEMA National Exercise Program, May 20-23, 2013
- [National Level Exercise 2012](#), FEMA National Exercise Program, 2012
- [Utah ShakeOut 2012](#), Utah Department of Public Safety/FEMA Region VIII, March 2012
- [California Golden Guardian](#), Emergency Management Agency/FEMA Region IX, February 2012

Username Password
[Register for LLIS.gov](#) [Forgot password?](#)

SUMMIT



SUMMIT offers a graphical view of damaged areas, making it easier for exercise participants to comprehend what is going on in the exercise and make better decisions.

<https://www.llis.dhs.gov/MODSIM>

SUMMIT Reports are Searchable by Type and Category

 **FEMA**
National Preparedness

[Modeling and Simulation Home](#) [Search Reports](#) [Contact Us](#) [Support Request](#)

Modeling and Simulation – Search Reports

The table below lists all reports to which you have been granted access. Use the filter selections to narrow your area of interest and click "Apply" to update the list of reports.

Report Run Name	Report Run ID	Report Run Description	National Planning Scenario Hazard and Title	
			- Any -	<input type="button" value="Apply"/>
Tags	Author		Creation Date Range: Start Date	Creation Date Range: End Date
			E.g. 2013-08-13	E.g. 2013-08-13
Report Run Name	National Planning Scenario	Sensitivity	Author	Creation Date
Chlorine Release (Severe) Railcar with Population Effects Medical Needs: Chicago	 6: Chemical Attack: Toxic Industrial Chemicals	Open Source	CJJohn	04/02/2013 1:55 am
Chlorine Release (Moderate) Railcar Population Effects and Medical Needs: LA	 6: Chemical Attack: Toxic Industrial Chemicals	Open Source	CJJohn	04/01/2013 12:14 pm
Chlorine Release from Railcar with Population Effects, Infrastructure Effects and Medical Needs: Washington, DC	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	04/01/2013 3:17 am
Nuclear Detonation with Population Effects, Infrastructure Effects and Medical Needs - IND Region 5 Seminar: Chicago	 1: Nuclear Detonation: Nuclear Device	For Official Use Only (FOUO)	CJJohn	03/28/2013 11:12 am
Chlorine Release from Railcar Tanker with Population Effects, Infrastructure Effects and Medical Needs:Chicago	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/28/2013 7:53 am
Chloride Explosion from Railcar Tanker with Population Effects: Houston 2	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/28/2013 5:52 am
Chlorine Release from Railcar Tanker with Population Effects: Houston	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/28/2013 5:16 am
Chlorine Explosion from Railcar Tanker with Population Effects: Chicago	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/28/2013 2:55 am
Chlorine Release (Severe) Railcar Tanker with Population Effects: Chicago	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/27/2013 1:43 pm
Chlorine Release (Moderate) Railcar Tanker with Population Effects: Chicago	 6: Chemical Attack: Toxic Industrial Chemicals	For Official Use Only (FOUO)	CJJohn	03/26/2013 2:34 am

SUMMIT M&S Report Page

SUMMIT's M&S report feature downloadable data including:

- Analysis notes
- Model(s) parameters
- Excel/CSV results data
- GIS layers (Google Earth and ESRI Shapefiles)
- Result Images
- PDF summary
- Raw data formats

The screenshot shows a web browser window for the FEMA National Preparedness website. The URL is <https://www.llis.dhs.gov/MODSIM/Reports/chlorine-release-moderate-railcar-pop>. The page title is "Modeling and Simulation - Report Details for Chlorine Release" and the subtitle is "Moderate Railcar Population Effects and Medical Needs: LA".

Report Run Metadata

Report Run	Tags
ID: 23d1ac6e-2354-44ce-9214-9c165cb942e7	Los Angeles, Chlorine Railcar Transition, DDS_SUMMIT
Author	
CJJohn	
Creation Date	
Monday, April 1, 2013 - 12:14	
Sensitivity	
Open Source	

Report

Name	Additional Restrictions
Chlorine Release (Moderate) Railcar Population Effects and Medical Needs: LA	Mock-HPAC-ITrans: Uses predefined incident results for location nearest user specified Incident Location. Other user specified configuration ignored.
ID	
SUMMIT:Template:5767919159269528928	
National Planning Scenario(s)	
6: Chemical Attack: Toxic Industrial Chemicals	

Report Run Description

Chlorine Release (Moderate) Railcar Population Effects and Medical Needs - Los Angeles (LA_CTRail_Mod Mock)

Analyst Notes

Analysis: Hospital Capacity (LA_CTRail_Mock_Mod_AvailBeds.png)
Hospital Capacity Available reports the total number of available beds for the hospitals listed. There are approximately 2,818 available beds at this time for an approximate demand in excess of 40,000 inpatient beds needed.

Analysis: Acute Exposure Guideline Levels (A EGL)(LA_CTRail_Mock_Mod_GIS1.jpg)
Analysis of mock data Acute Exposure Guideline Levels (A EGL) represent a threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours.

Death Possible (Red A EGL 3) is the airborne concentration of chlorine, which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Injury Possible (Orange A EGL 2) is airborne concentration of chlorine above which it is

Report Run Files

- Report Run Details
- PDF Report: Chlorine Tanker Railcar Mock Moderate: LA
- Images and Screen Shots
- Google Earth: Chlorine Tanker Railcar Mock Moderate: LA - KML
- CSV / Excel
- Report Inputs



R&D and Value Roadmap for SUMMIT

Q4/FY2014

Q4/FY2015

Timeline

“base capability”

SUMMIT R&D Capability	Planning Focus			Response Focus			
	SUMMIT Capability						
	Batch	Model Run Library	Basic Informatics	Live Data Fusion	Data Analytics	Visualization and Uncertainty	
	Capability to run hundreds of SUMMIT scenarios automatically by specifying a range of input parameters	Archive library of batch runs that can be queried using the basic informatics described below	Ability to search library of batched SUMMIT results for parameter values (e.g., max/min)	Capability to incorporate real-time data feeds from other tools or sources that are important for response operations. For example, the use of live data for the configuration of models (e.g. inverse plume modeling based on environmental sensor data feeds).	Capability to perform analyses/data manipulation of real-time operational data to support decision-making. Analytics performed on SUMMIT results to provide an initial testable hypothesis of incident scope, scale, impact and resource needs or other decision support via what-if analysis.	Human factor-informed data representation for intuitive interpretation of data and data uncertainty for use by a variety of client types including mobile computing platforms.	
Value Add	Planning: Enables user to analyze the variability and sensitivity of scenario parameters and response decisions on scenario outcomes in order to develop robust operational plans .			Response: Data analytics will build on Basic Informatics, providing users with response guidance and ability to develop robust operational plans. Live data fusion will enable the user to replace modeling data with real data over the course of operations, and use best available estimates for decision-making. Visualization will enable the user to intuitively interpret complex data and data uncertainty , to obtain situational awareness and respond more effectively and efficiently.			

Future SUMMIT Application to Emergency Planning

In the future, SUMMIT could be used to develop libraries of modeling runs that provide data to answer key planning questions, incorporating scenario variations and uncertainty.

Additional requirements from end-users are needed

Example

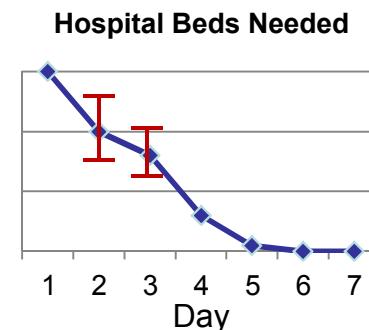
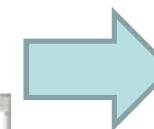
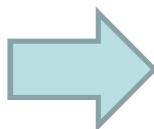
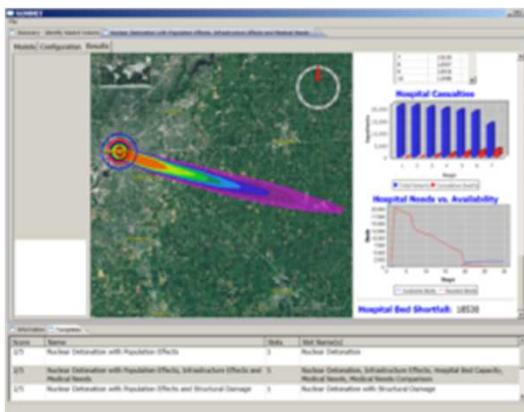
1 SUMMIT run for 1 set of inputs:

- 1 IND detonation location
- Winds W 15mph
- Static population (home locations)...

Thousands of SUMMIT run for varying inputs:

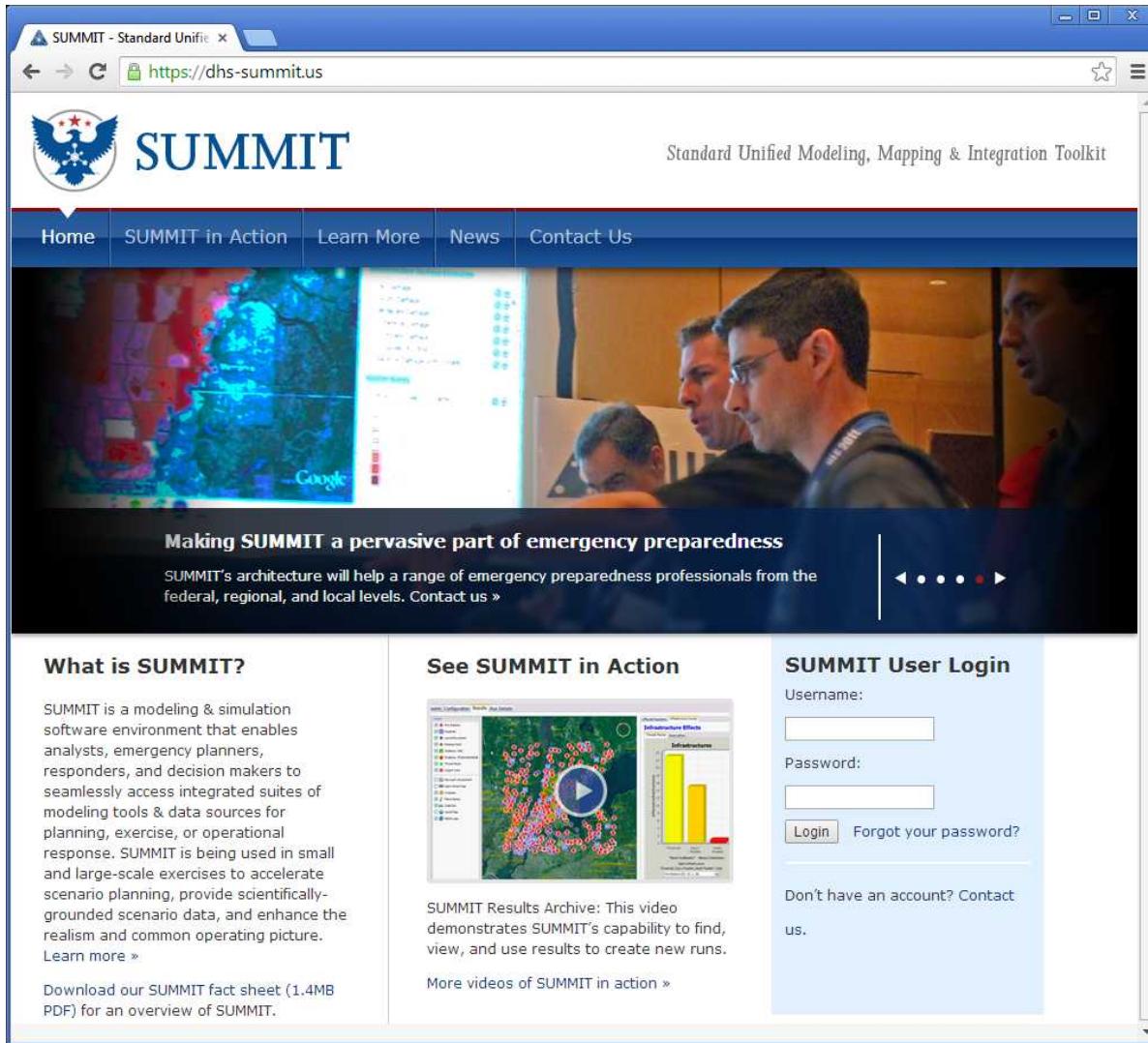
- Multiple detonation locations
- Varying weather conditions by time of year
- Population distributions for home, work...

Planning Guidance (e.g., Medical surge requirement for IND detonation threat)



SUMMIT is being advanced to automate this capability

Beta version of SUMMIT available online



The screenshot shows the SUMMIT beta website homepage. The header features the SUMMIT logo (an eagle with a shield) and the text "SUMMIT" in large blue letters, with "Standard Unified Modeling, Mapping & Integration Toolkit" in smaller text to the right. The navigation menu includes "Home", "SUMMIT in Action", "Learn More", "News", and "Contact Us". Below the menu is a banner image showing a map and several people in a meeting room. The banner text reads "Making SUMMIT a pervasive part of emergency preparedness" and "SUMMIT's architecture will help a range of emergency preparedness professionals from the federal, regional, and local levels. Contact us »". The main content area is divided into three sections: "What is SUMMIT?", "See SUMMIT in Action", and "SUMMIT User Login". The "What is SUMMIT?" section contains a detailed description of the software and a "Learn more »" link. The "See SUMMIT in Action" section includes a video thumbnail and a "More videos of SUMMIT in action »" link. The "SUMMIT User Login" section has fields for "Username" and "Password", a "Login" button, a "Forgot your password?" link, and a "Don't have an account? Contact us." link.

Contact Information

www.dhs-summit.us

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Sandia National Laboratories is the principal SUMMIT architect

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.