

Future Integrated Threat and Hazard Analysis Capability using SUMMIT

(Standard Unified Modeling Mapping and Integration Toolkit)

SUMMIT Program Manager

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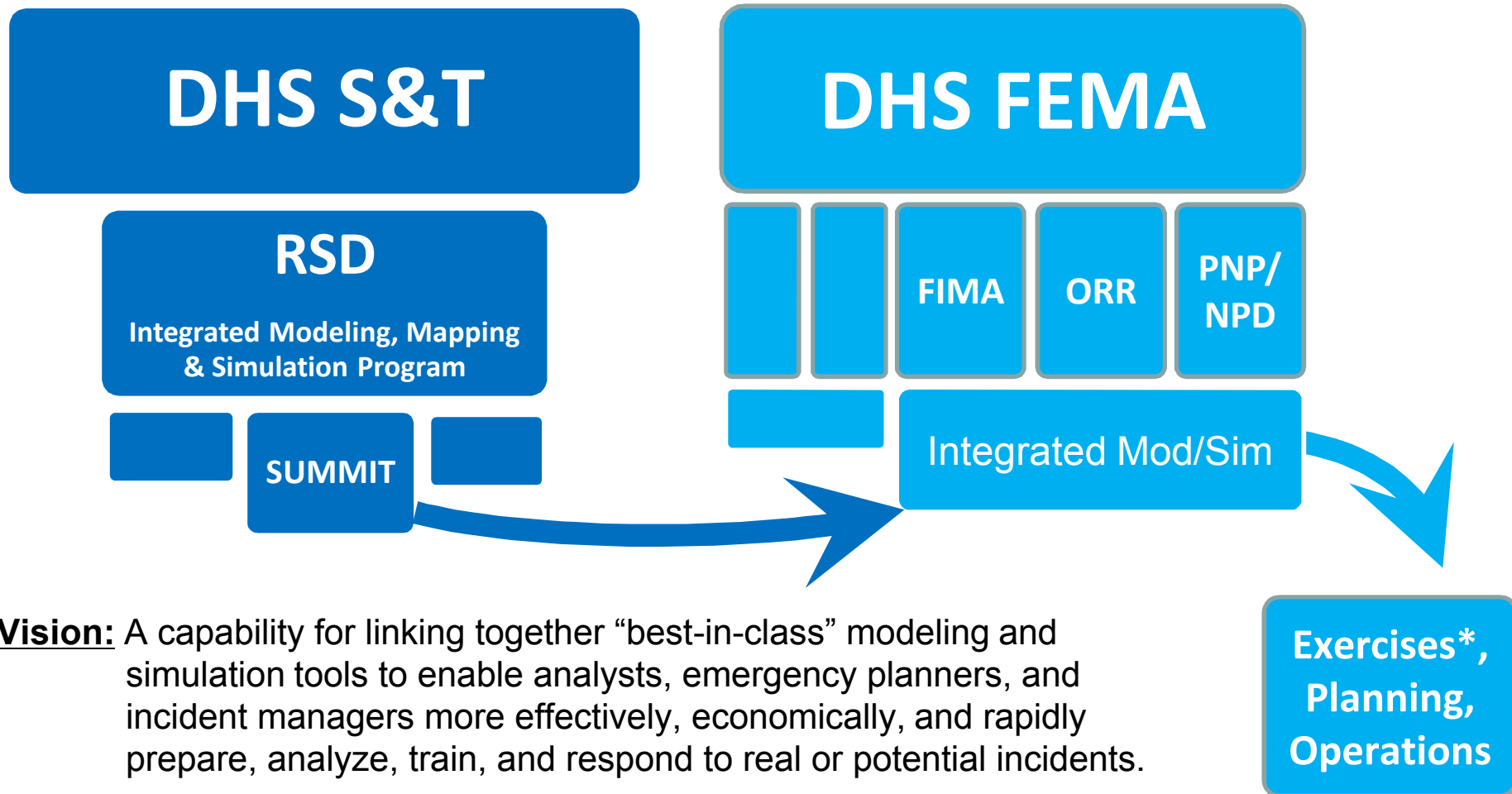
**Homeland
Security**

Science and Technology



FEMA

Program Vision for SUMMIT

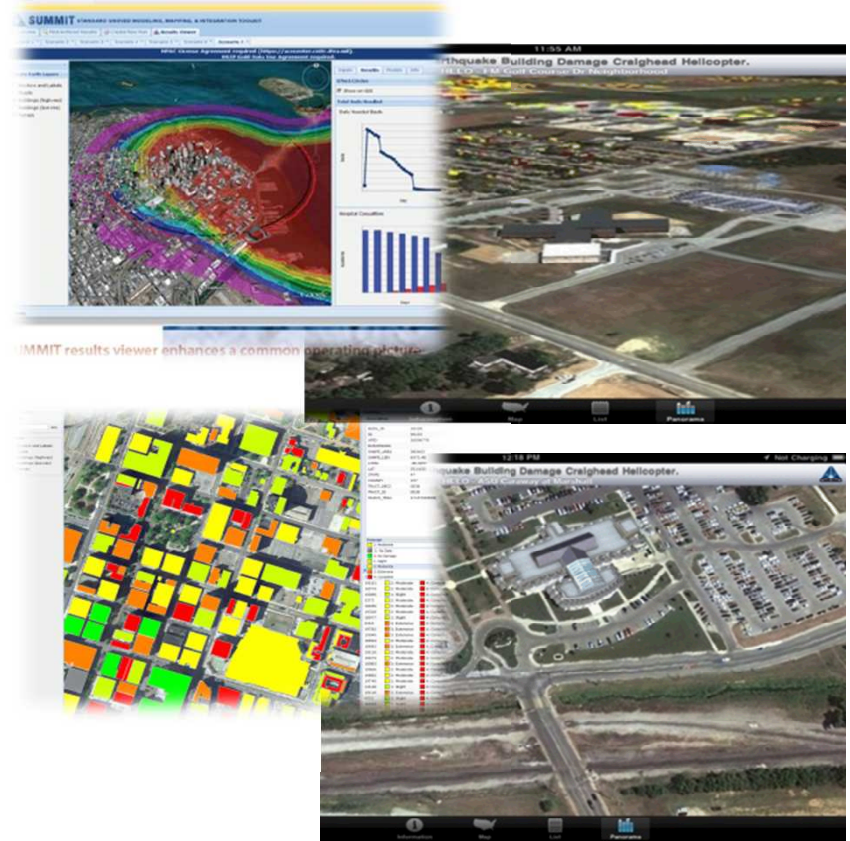


Vision: A capability for linking together “best-in-class” modeling and simulation tools to enable analysts, emergency planners, and incident managers more effectively, economically, and rapidly prepare, analyze, train, and respond to real or potential incidents.

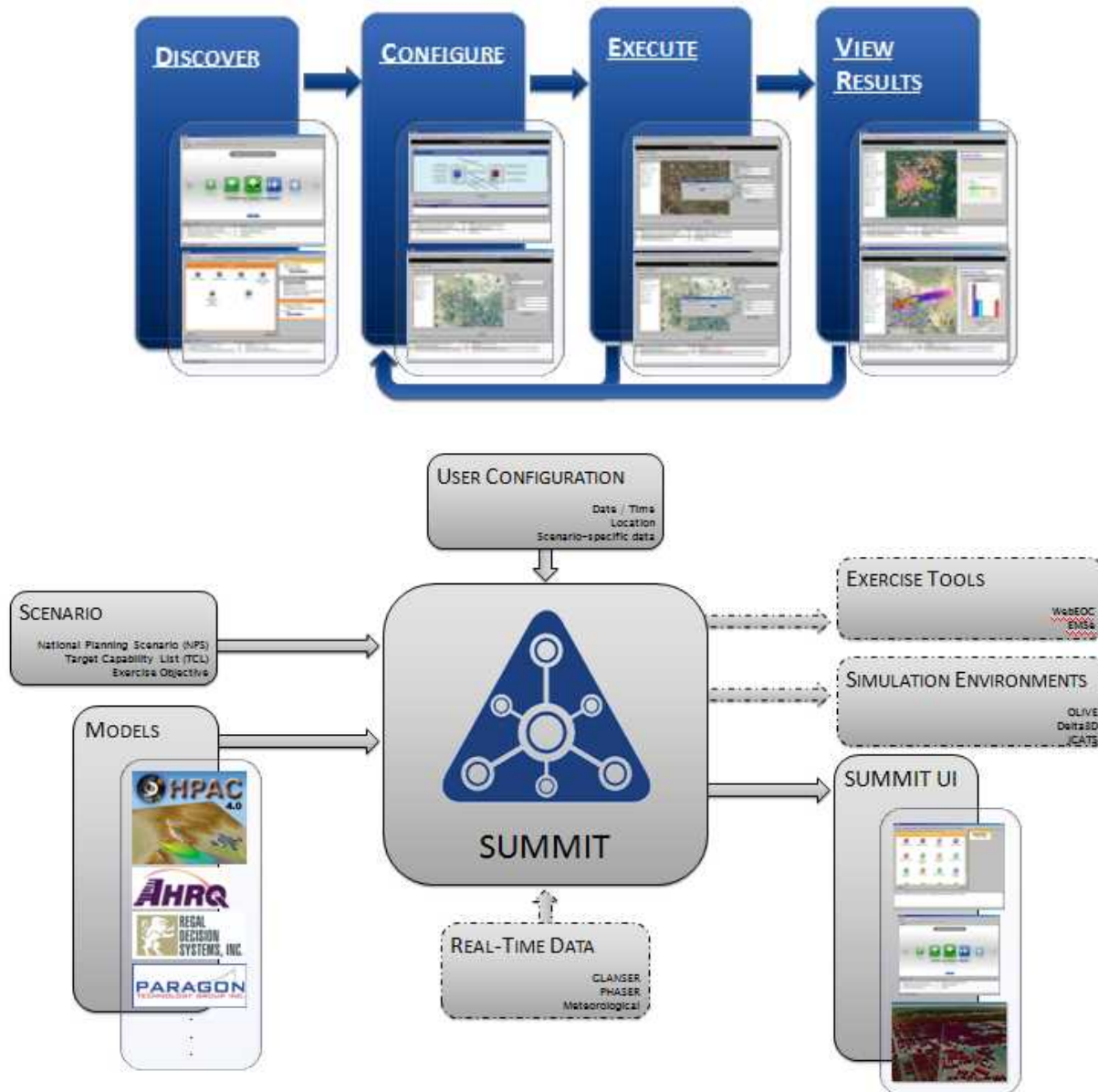
Integrated Modeling and Simulation for Analysts

CURRENT capabilities to support the following scenarios

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



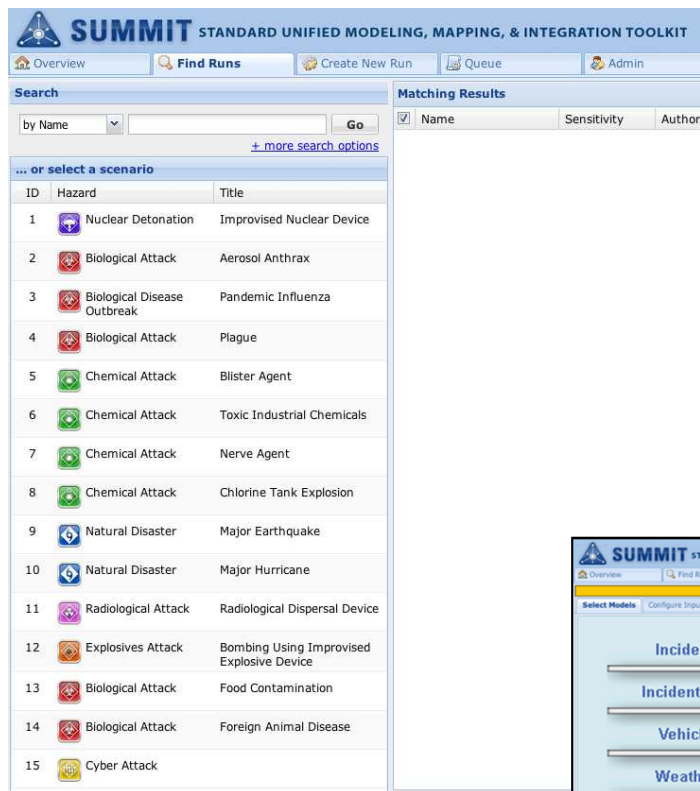
SUMMIT Architecture



SUMMIT Technology

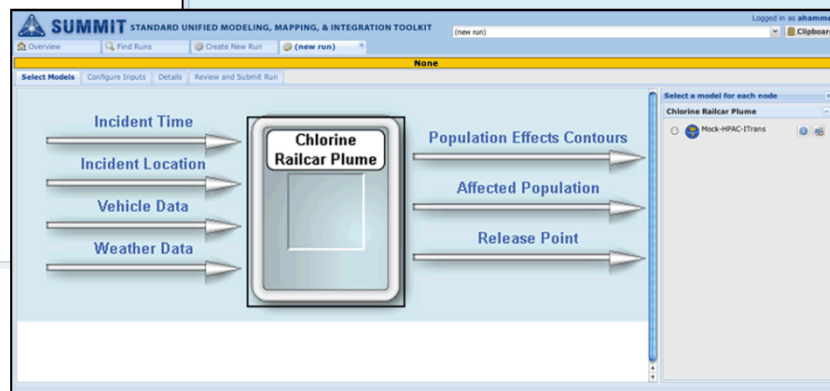
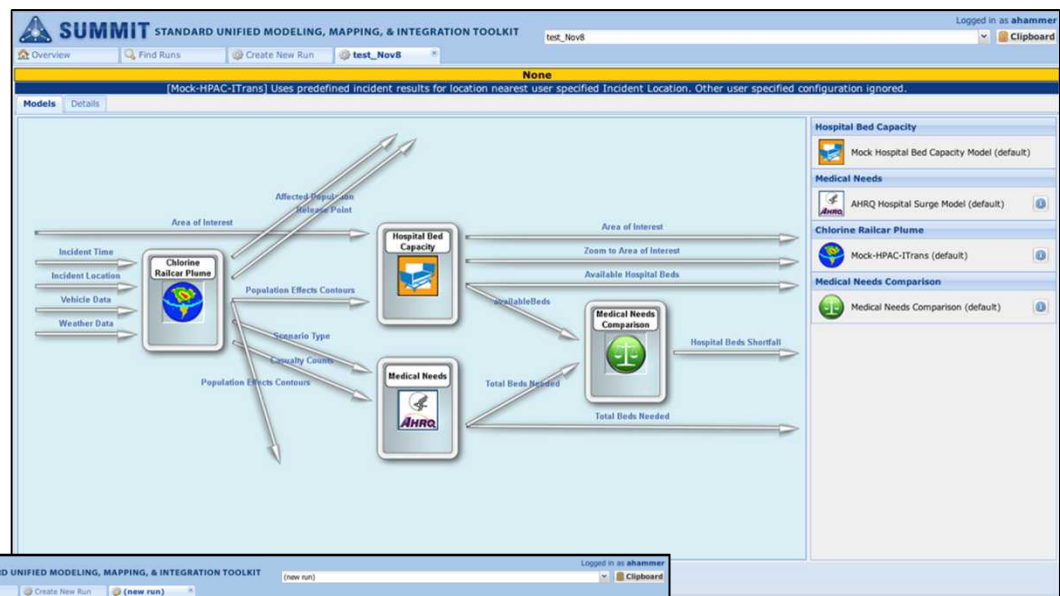
SUMMIT innovation is new method for model integration

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



The SUMMIT Search Interface displays a list of scenarios categorized by hazard type. The interface includes a search bar, a 'Find Runs' button, and a 'Create New Run' button. The search results are displayed in a table with columns for ID, Hazard, and Title.

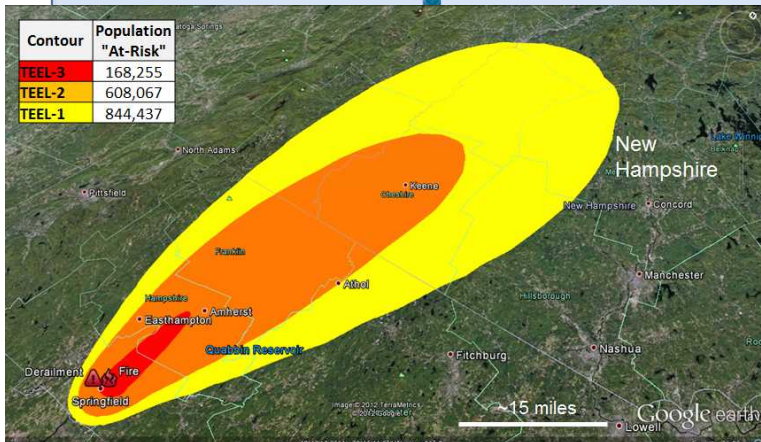
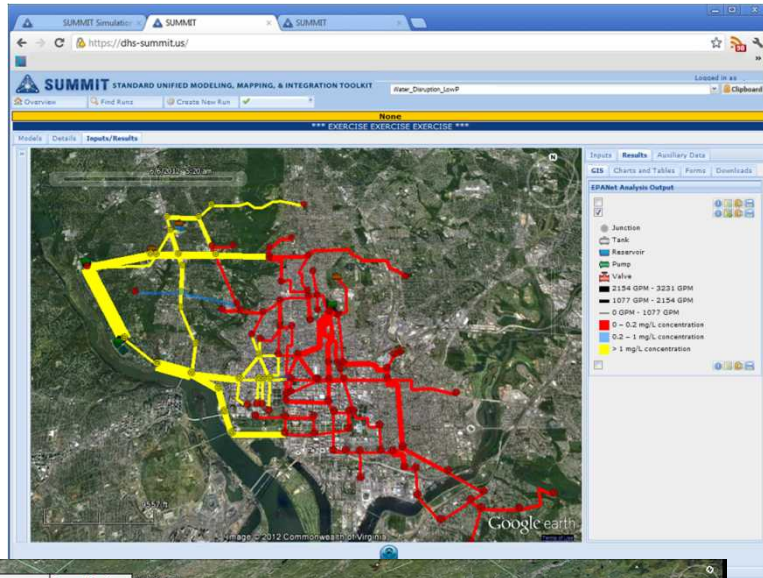
ID	Hazard	Title
1	Nuclear Detonation	Improvised Nuclear Device
2	Biological Attack	Aerosol Anthrax
3	Biological Disease Outbreak	Pandemic Influenza
4	Biological Attack	Plague
5	Chemical Attack	Blister Agent
6	Chemical Attack	Toxic Industrial Chemicals
7	Chemical Attack	Nerve Agent
8	Chemical Attack	Chlorine 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	



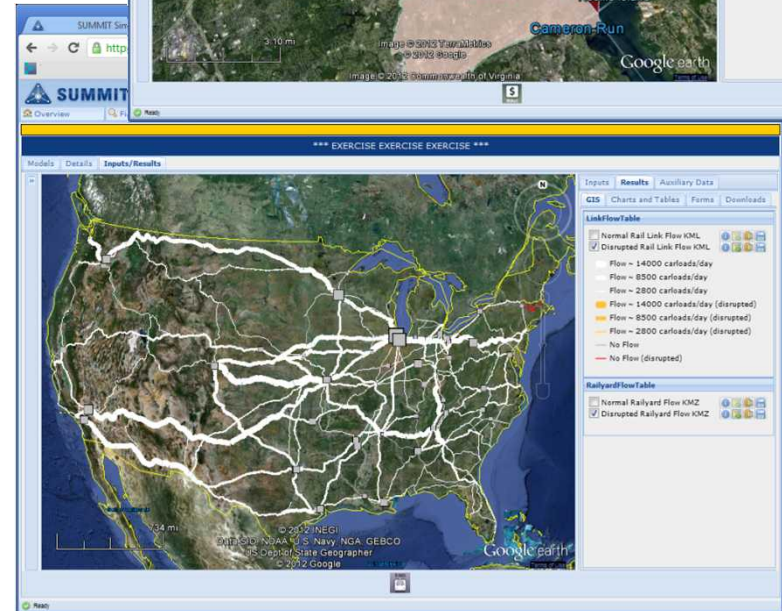
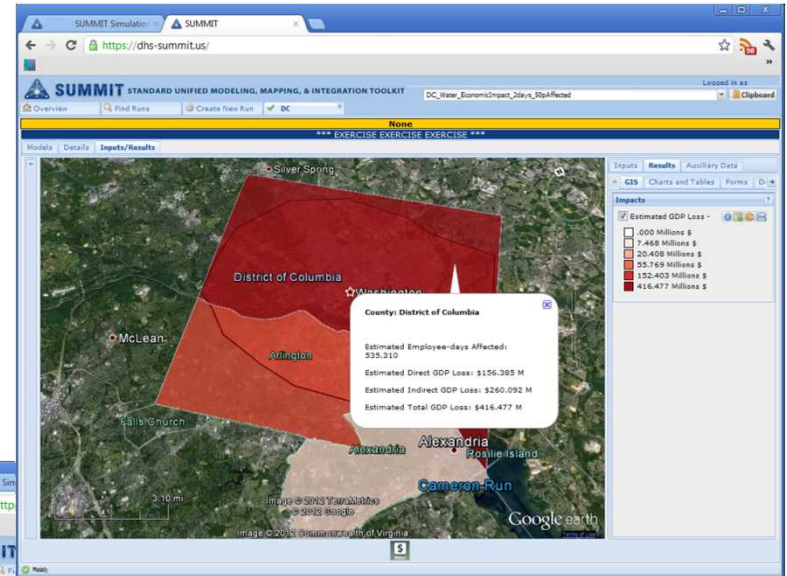
Example SUMMIT Results

Economic Disruption

Lifeline Disruption



Populations at-risk



Logistics Disruption


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.
THREAT MODELS																
Air Dispersion (Plume)																
HPAC								M								
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																

SUMMIT  SUPPORTED

EXERCISES



SUMMIT Exercise Support Examples

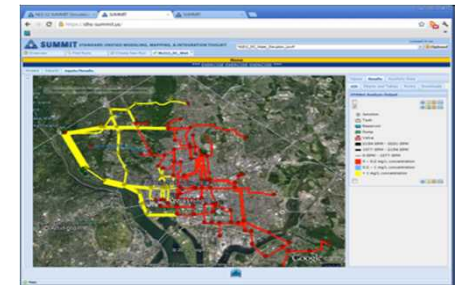
FEMA Region II Blue Surge (May 2013)

- 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 displays the LLIS.gov website, specifically the MODSIM section. The browser address bar shows <https://www.llis.dhs.gov/MODSIM>. The website header includes navigation links: Lessons Learned, NEP, HSEEP, Exercise Mod Sim, Contact Us, Register, and Login. The main content area is titled "Modeling and Simulation" and features a search bar. Below the header, there is a section for "SUMMIT Reports" and a "Resources" section. The "SUMMIT Reports" section explains that SUMMIT reports are generated based on modeling results and data, and provides a link to the "Search Reports" menu. The "Resources" section lists various SUMMIT materials, including DHS S&T and FEMA SUMMIT Overview, SUMMIT Fact Sheet, and SUMMIT in Action: Supporting Emergency Exercises. A graphic on the right side of the page shows a 3D model of a damaged area, with a caption stating: "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."

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

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

Search

[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 -
▼

Tags

○

Author

Creation Date Range: Start Date
E.g., 2013-08-13

Creation Date Range: End Date
E.g., 2013-08-13

Apply

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 the SUMMIT M&S Report Page for a Chlorine Release (Moderate) Railcar Population Effects and Medical Needs: LA. The page is structured as follows:

- Report Run Metadata:**
 - Report Run:** ID: 23d1ac6e-2354-44ce-9214-9c165cb942e7, Author: CJJohn, Creation Date: Monday, April 1, 2013 - 12:14, Sensitivity: Open Source.
 - Report:** Name: Chlorine Release (Moderate) Railcar Population Effects and Medical Needs: LA, 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_Mod_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 (AEGL)(LA_CTRail_Mod_Mod_GIS1.jpg):** Analysis of mock data Acute Exposure Guideline Levels (AEGL) 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 AEGL 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 AEGL 2):** is airborne concentration of chlorine above which it is
- Report Run Files:**
 - PDF Report:** Chlorine Tanker Railcar Mock Moderate: LA
 - Images and Screen Shots:** Hospital Capacity, Acute Exposure Guideline Levels (AEGL) 1, Acute Exposure Guideline Levels (AEGL) 2, Population Effects, Medical Resources.
 - Google Earth:** Chlorine Tanker Railcar Mock Moderate: LA - KML
 - CSV / Excel:** Daily Needed Beds, Hospital Casualties, Hospital Capacity, Hospital Equipment, Hospital Pharmacy, Hospital Staff.
 - Report Inputs:**



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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.		



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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

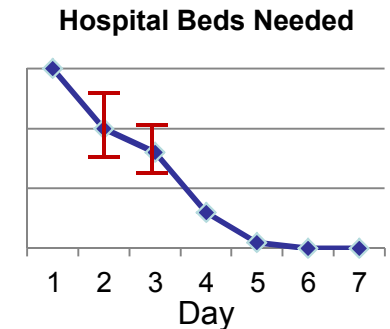
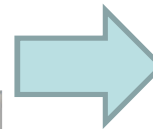
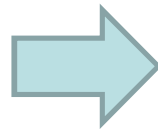
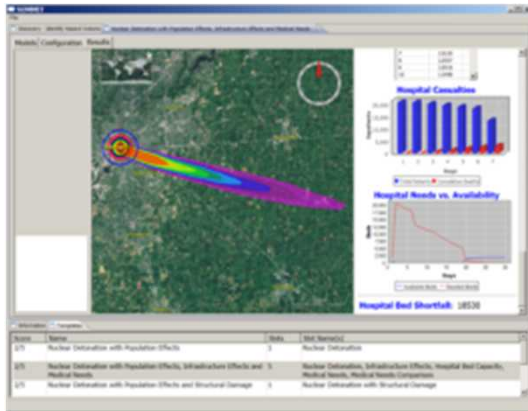
1 SUMMIT run for 1 set of inputs:

- 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 website in a browser window. The address bar displays <https://dhs-summit.us>. The page features the SUMMIT logo and the tagline "Standard Unified Modeling, Mapping & Integration Toolkit". A navigation bar includes links for Home, SUMMIT in Action, Learn More, News, and Contact Us. The main banner area contains a video player with the title "Making SUMMIT a pervasive part of emergency preparedness" and a description: "SUMMIT's architecture will help a range of emergency preparedness professionals from the federal, regional, and local levels. Contact us »". Below the banner, there are three columns of content:

- What is SUMMIT?**

SUMMIT is a modeling & simulation software environment that enables analysts, emergency planners, responders, and decision makers to seamlessly access integrated suites of modeling tools & data sources for planning, exercise, or operational response. SUMMIT is being used in small and large-scale exercises to accelerate scenario planning, provide scientifically-grounded scenario data, and enhance the realism and common operating picture. [Learn more »](#)

Download our SUMMIT fact sheet (1.4MB PDF) for an overview of SUMMIT.
- See SUMMIT in Action**

A video player showing a map with a play button. Below the video, it says: "SUMMIT Results Archive: This video demonstrates SUMMIT's capability to find, view, and use results to create new runs. [More videos of SUMMIT in action »](#)
- SUMMIT User Login**

Username:
Password:
 [Forgot your password?](#)

Don't have an account? [Contact us.](#)

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.