

Emergency Response Template Generation Utilizing SUMMIT

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Abstract

The Standard Unified Modeling, Mapping, and Integration Toolkit (SUMMIT) is a platform to integrate the nation's modeling and simulation resources (M&S) that enables the emergency management community to quickly and economically apply the resources to a wide range of disaster scenarios to improve the effectiveness of emergency response. In order to link these models together, a template, which is a basic abstract representation of the scenario under observation, must be created in order to analyze all necessary inputs and outputs of the system. Key capabilities of each model in use can then be pulled through the SUMMIT SDK "wrapping" process, after which testing can be performed and compared to expected results to determine the success of the template. The scenarios used in this research are taken from the Department of Homeland Security's (DHS') National Planning Scenarios, which were developed in response to the National Preparedness Goal.

Introduction

President Obama's Presidential Policy Directive 8 (PPD-8) calls for an approach to assess national preparedness through the National Preparedness System. In order to address this need the DHS Science and Technology Directorate (DHS S&T) partnered with the Federal Emergency Management Agency (FEMA), and collaborated with Sandia National Laboratories to create the Standard Unified Modeling, Mapping, and Integration Toolkit (SUMMIT). The primary objective of the SUMMIT program is to enhance the emergency response process through the use of a software environment linking modeling and simulation (M&S) tools to operate within the same framework. The SUMMIT Software Development Kit (SDK) is used to essentially "wrap" any model with an interface allowing SUMMIT to communicate with the model. With its capabilities to link modeling and simulation tools SUMMIT can be effortlessly used to rapidly discover, integrate, configure, execute, and review the results of the nation's M&S resources.

Methodology

The incidents under evaluation are a part of the National Preparedness Goal – a compiled list of National Planning Scenarios created by the Federal interagency, coordinated by the Homeland Security Council (HSC) in partnership with the Department of Homeland Security (DHS). M&S tools provide the ability to observe an incident under real-life conditions, while allowing parameters to be changed to adapt to any situation. This ability allows for ample training and preparedness prior to the incident, as well as providing efficient and timely simulation during an actual event. In order for models to be integrated in the SUMMIT platform, a template is created and acts as an abstract representation of the incident to be simulated. For each planning scenario, there are several desired modeling results such as medical needs, infrastructure damage, and shelter analysis. My responsibility in this project is to create templates for the incidents described in the National Planning Scenarios.

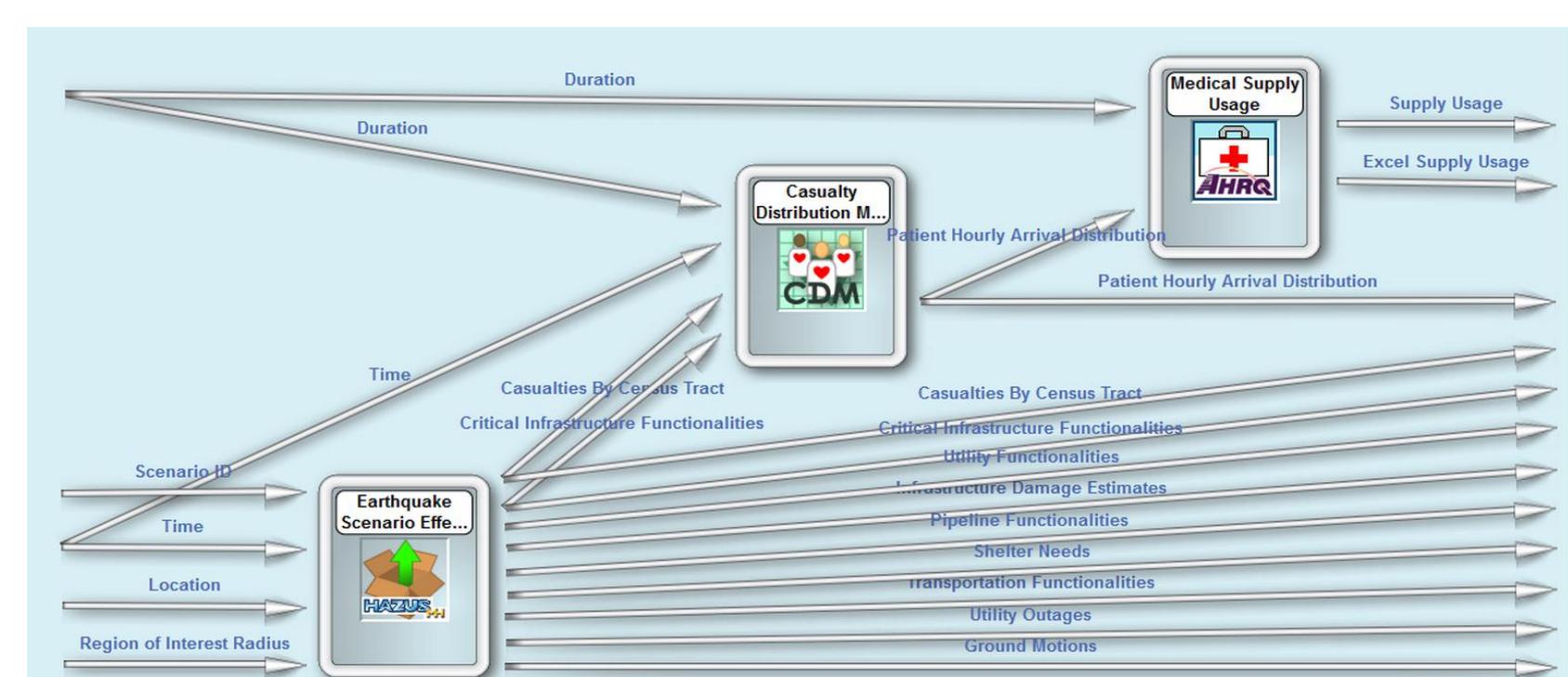


Figure 1: Utah Shakeout Medical Needs Template

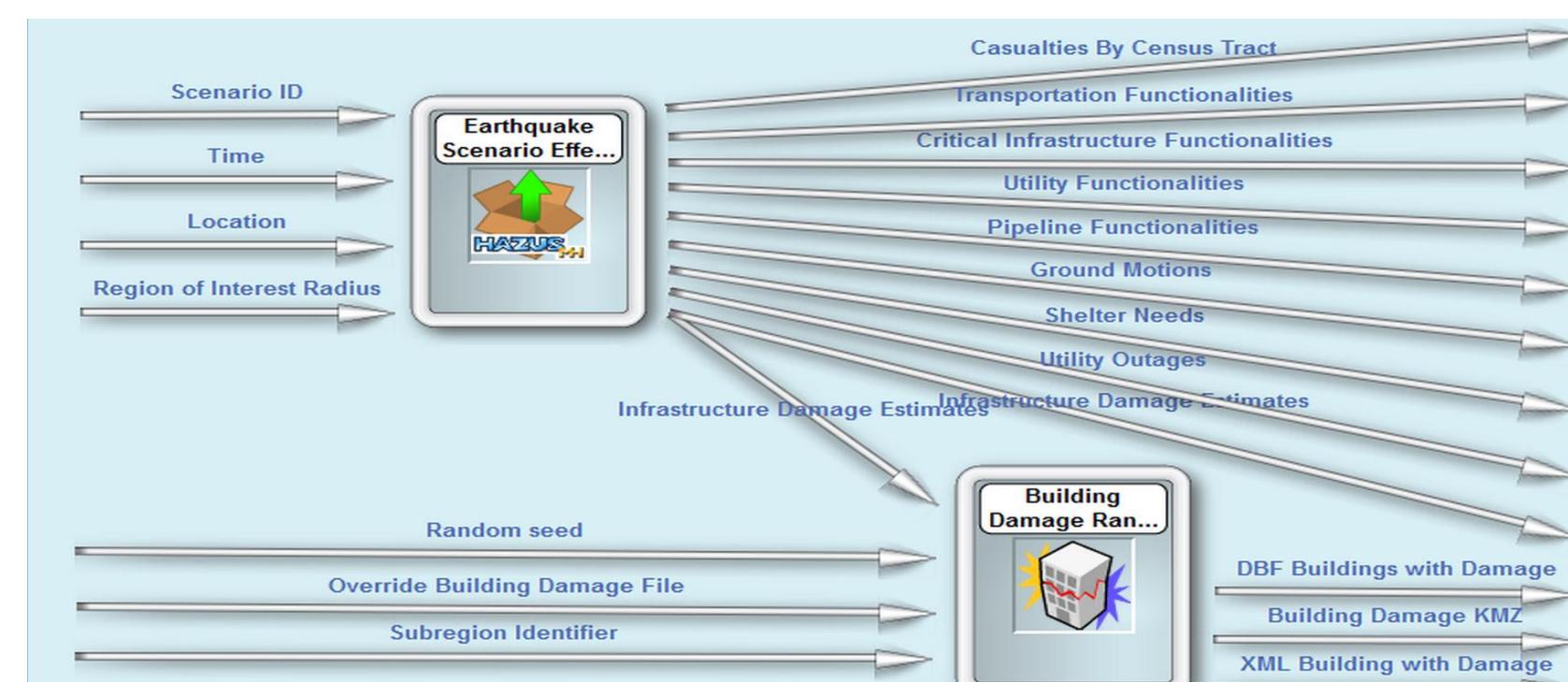


Figure 2: Utah Shakeout Building Damages Template

Models to simulate each topic of interest can be found using a catalogued list of models previously used in SUMMIT, or through the use of a web browser. There are times when there is no existing model to fill a particular slot in which case FEMA is notified that a model will need to be created to fulfill the identified specifications. The template is then created in SDK, each model wrapped appropriately, and testing performed to determine the success of the template.



Figure 3: Example SUMMIT Results, Casualty Distribution by Hospital

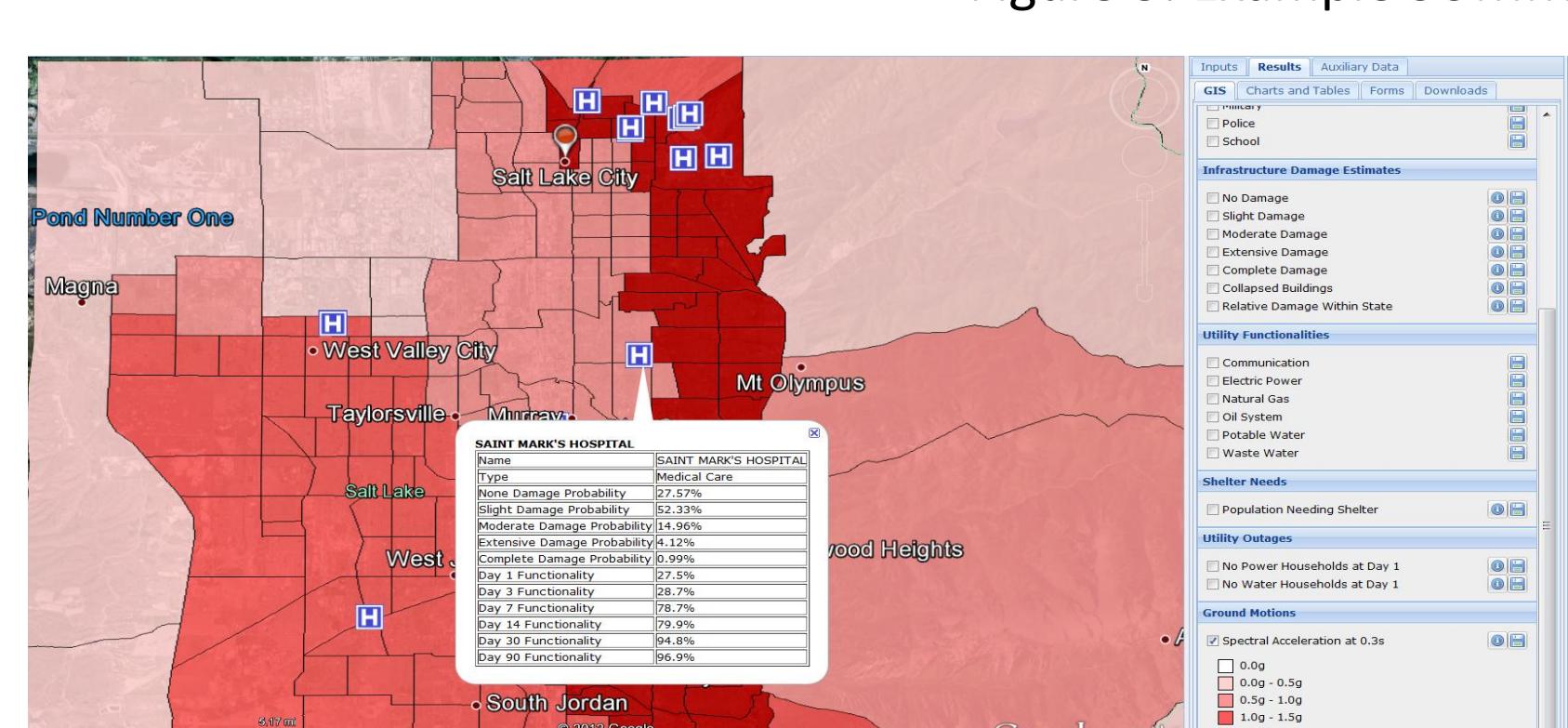


Figure 4: Example SUMMIT Results, Ground Motions and Infrastructure Effects

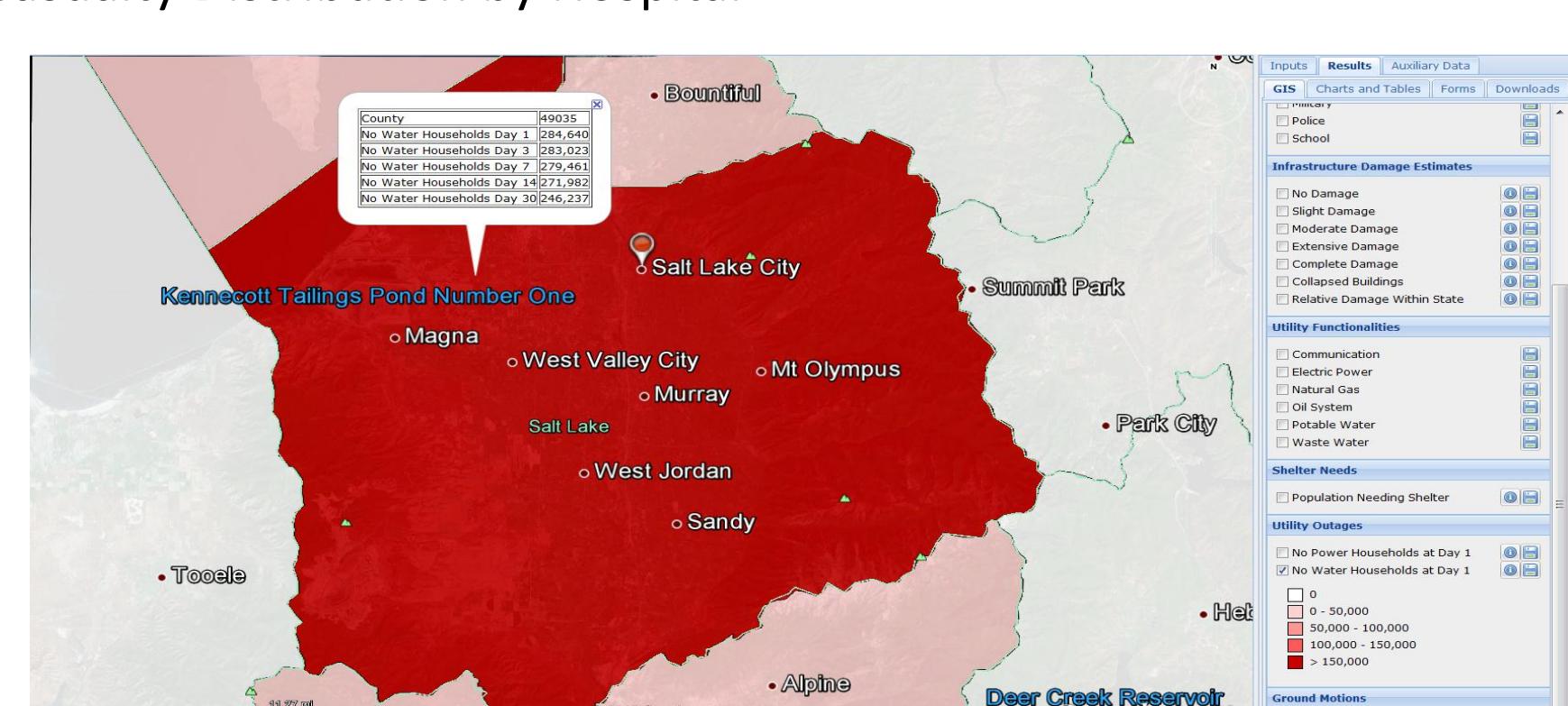


Figure 5: Example SUMMIT Results, Utility Outages (Water)

Results and Discussion

Preliminary templates have been completed for a few of the National Planning Scenarios in both a sketch and SDK format for use by FEMA to satisfy the National Preparedness Goal. The next steps will be to wrap the ideal models for each slot followed by testing of the template to determine compatibility of the models, as well as comparison of resulting data to expectations. I will be continuing the development of templates for other National Planning Scenarios along with creating templates simulating the effects of tsunamis and hurricanes. This research will enable a more capable response if and when natural or manmade disasters should occur.