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DHS HS-STEM Summer Internship

Written Presentation:

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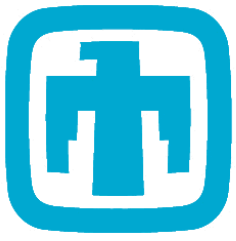

Sandia National Laboratories

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All opinions expressed in this presentation are the author's and do not necessarily reflect the policies and views of DHS, DOE, or ORAU/ORISE. This research was performed under an appointment to the U.S. Department of Homeland Security (DHS) HS-STEM Summer Internship Program, administered by the Oak Ridge Institute for Science and Education (ORISE) through an interagency agreement between the U.S. Department of Energy (DOE) and DHS. ORISE is managed by Oak Ridge Associated Universities (ORAU) under DOE contract number DE-AC05-06OR23100.

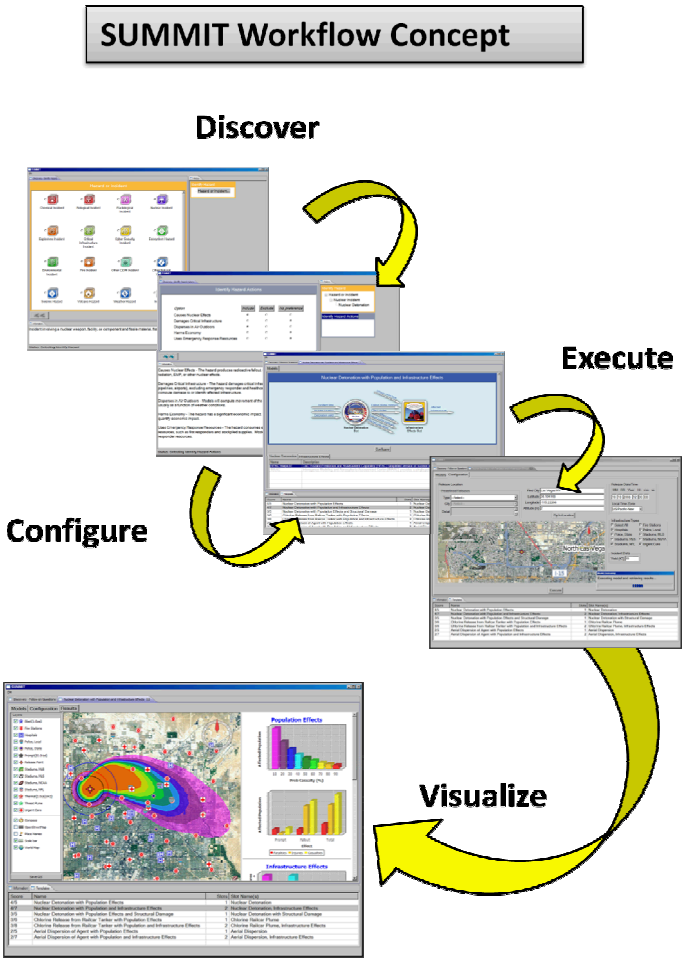
Introduction

My name is Mark Andrew Garner, a Sophomore/Second Year Student completing a Bachelor's of Science in Biology under the Pre-Med and Pre-Law curriculum at Texas A&M International University in Laredo, Texas. In March 2010, after a highly selective application process, I was chosen to attend a United States of America Department of Homeland Security HS-STEM Summer Internship at Sandia National Laboratories in Livermore, California. As a recipient of this opportunity, I spent 10 weeks under the mentorship of a laboratory employee conducting research and performing tasks that would support the endeavors of my assigned project. This internship provided a stipend of $500 a week and the cost of housing up to $1,700 per month, as well as travel expenses to California and back to Texas. This document describes the laboratory projects I was involved with, the role I played as an intern, the contributions I had within this project, the impact the internship experience has had on my academic/career goals, and the suggestions I have towards further development within the Department of Homeland Security.

Project Description and the Student Intern Role

When applying to the DHS HS-STEM Summer Internship program, students list their project preferences, but ultimately receive their assignments by a selection committee. I was soon informed that the project I initially listed as my first choice involved a strong background in computer science programming that I unfortunately did not possess. However, the mentor for the

aforementioned project, Karim Mahrous, was working in another group that could use my assistance. Entitled *Integrated Modeling, Mapping & Simulation* (IMMS), the concept plan states that IMMS "aims to provide analysts, emergency planners, responders and decision makers access to data sources, models, and subject matter experts in order to generate comprehensive knowledge of a hazard into a single tool for planning, training, or operational response. This single tool will provide multi-model, multi-data integration…dynamically composing the interface for the user to run for appropriate analysis."



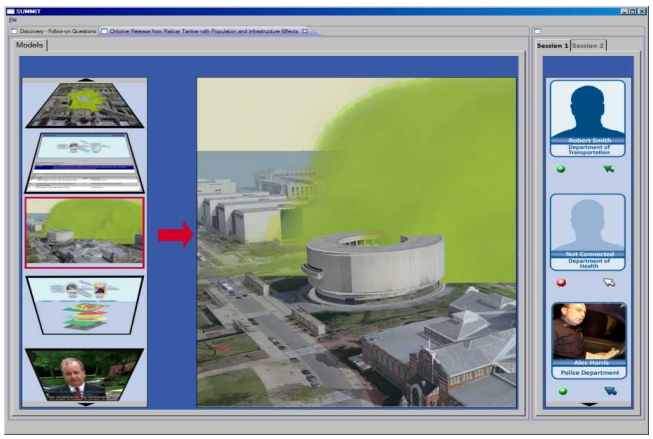
Within the IMMS project, the *Standard Unified Modeling, Mapping and Integration Toolkit* (SUMMIT) is the main component that will provide the interface for the integrated suites of modeling tools and data sources to be used. The SUMMIT *Software Development Kit* (SDK) is the specific tool which makes the models and datasets discoverable, integrated and executable through the SUMMIT architecture. Under the mentorship of the Project Leader Karim Mahrous, Ph.D., I supported the IMMS team in surveying potential programs and software for integration into the SUMMIT architecture. Additionally, I completed many assignments that would aid in the development and organization of the IMMS project as a whole. My role as a student intern revolved around tasks that did not

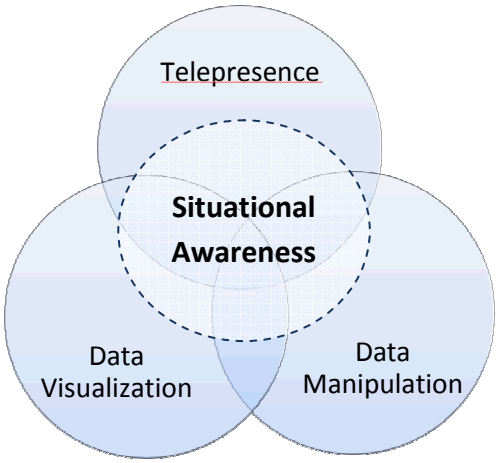
rely on being a subject matter expert which allowed me to adapt to an environment that I was completely unfamiliar with, to refine my team building skills and to learn new skill sets that ultimately contribute towards my pre-professional development.

Contribution to the Project

I surprised myself with how much of the project I was familiar with in such a short period of time because of my involvement in IMMS's many facets. On my first day, I was given a 30-page Virtual Environment Study that outlined the intentions of integrating a virtual environment into the SUMMIT interface. The very next day, I was tasked with compiling over 50 responses from a Department of Homeland Security (DHS) Request for Information. The companies that replied had sent information about their software and programs that fell under specific criteria in which DHS was interested in learning more about. My job was to determine which of their programs fell into the three categories that formed SUMMIT's Virtual Environment Situational Awareness. As a result, the compilation was presented to our DHS project managers in Washington, D.C. as a resource for their decision making.

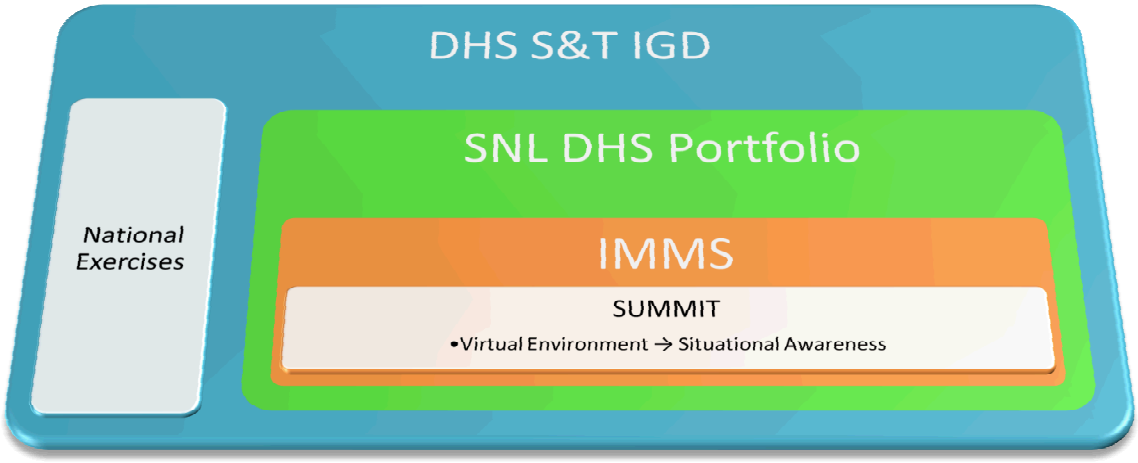
SUMMIT Situational Awareness Concepts





My next task was to search and evaluate commercial models (as opposed to academic or government based models) that the IMMS team could integrate into the SUMMIT's framework. These models would provide the mathematical data and computer code for a myriad of scenarios (e.g. air dispersal, traffic evacuations, population effects, etc.). I was well versed as to what models characteristics to look for because I had "user tested" the Beta version of SUMMIT's SDK. Due to our team's search, we narrowed the recommendations to five models to send to our DHS project managers.

My final weeks consisted of very crucial assignments. My mentor, as Project Lead, needed a way of prioritizing tasks for a SUMMIT virtual environment capability demonstration for DHS scheduled for October 2010. Also, IMMS/SUMMIT is projected to be a simulation tool in annual National Level Exercises held by the National Exercise Simulation Center and, therefore, our priorities had to match this need. I led members of the IMMS team to prioritize the "use-case" that would be demonstrated in October as well as organized an extended task list timeline to ensure the development of SUMMIT's final collaborative virtual environment interface in the next few years. All of which resulted in an action plan left to my mentor and Project Lead, Karim Mahrous, who would utilize this document as the project progresses to completion.



My Internship as a Career Foundation

It is my hope to attend a six year M.D./J.D. (Doctor of Medicine and Juris Doctor) graduate degree program after my undergraduate studies, working eventually as a physician/policy maker working for the United Nation's World Health Organization. Working with the Department of Homeland Security and Sandia National Laboratories is my first stepping stone towards achieving these goals. During the 2010-2011 school year, I will be applying to transfer into Yale University's History of Science, History of Medicine Undergraduate Program and will apply to their Bachelors of Arts/Masters of Public Health Combined Degree program soon thereafter. My summer in Livermore will result in the perspective of a student who has spent time in a national laboratory setting and can give insight into one of the many government processes safe-guarding scientific advancement for the United States of America. I have the privilege in serving my country through an experience which contributed to the protection of our homeland before my second year in college.

The subject area I immersed myself with is ostensibly far from the topics a pre-med/pre-law student would concern themselves with: this disparity was precisely why I chose this internship. What better way to learn about national government problems than to take part in solving them? There will always be a necessity for medical professionals who are familiar with the development of national security and how to contribute towards securing the health and well-being of our homeland. Medical expertise was crucial in the development of hospital facility influx models which the SUMMIT program is hoping to integrate. Knowing the proper procedures for prophylaxis distribution in the case of a biological weapon attack is also integral information that government programs such as IMMS value.

My project tasks cultivated the skill of relying on others' expertise in order to synthesize a well-organized product. My final assignment was particularly critical to the development of the

overall project because it addressed the entire scope of what a Virtual Environment had the potential to contribute to SUMMIT and the National Exercise community as a whole. The abilities gleaned from thriving in an environment that a person is not comfortable with are invaluable and must be cultivated for the type of work I hope to pursue. Good communication skills are needed to relay esoteric information in a comprehensible form to members of the team or a general audience. For instance, when making public health policies and conducting medical research in foreign countries in the near future, I will have to enter unfamiliar realms of culture and understand native idiosyncrasies to produce laws that can help more than one nation. Without a doubt, I had the opportunity to test my adaptability and resolve in a professional atmosphere during my summer at Sandia National Laboratories--an opportunity to get a head start on my career.

S.N.L. Activities for Personal and Professional Development

There were many occasions where Sandian student interns could supplement their time at the laboratory and I made sure to utilize them all! For instance, throughout the summer the Human Resources Student Intern Program organized seminars with interesting and relevant topics such as *How to Get into Grad School* and *How to Get a Job at Sandia*. There were also talks given by SNL employees on *The History of Nuclear Weapons* and *The Power of Persuasion*. Our DHS coordinator even coordinated access into Lawrence Livermore National Laboratory to attend a few seminars they offered as well. Weekly games of basketball, volleyball and ultimate Frisbee took place at the Robert Livermore Recreation Center down the street after work on certain days. And unfailingly, student interns would gather each Wednesday for a Lunch Social at the cafeteria. Because of my inclinations towards the medical field, I personally looked forward to

when the Life Design Center, Sandia's health and fitness gym, hosted several lectures by alternative medicinal doctors (i.e. naturopathy, acupuncture/oriental, and chiropractic).

If I could recount the single most beneficial experience at Sandia National Laboratories, it would be fulfilling the DHS HS-STEM Summer Scholarship requirement of attending the Student Intern Symposium. In the final weeks of our summer, student interns were asked to display their summer experience on poster and Powerpoint presentations and exhibit their work for the Sandia community. Upon finishing these tasks, I was able to create an artifact that was tangible: a piece to share with the community of Texas A&M International University.

Recommendations for Future DHS Research

Another of my aspirations is to work for *Medecins Sans Frontieres* (Doctors Without Borders) in the relief effort to position practicing physicians in areas of the world facing crisis. Naturally, my interest leans towards emergency medicine, natural disaster response, and international crisis. DHS should utilize its funding towards a full body immersive virtual simulation that caters towards first responders for in-the-field training. A virtual world has the capacity to emulate an emergency response scene after a bomb has exploded in a city. Medical students would be able to put on goggles, gloves and boots that allow them to enter into the simulation for triage practice. Ostensibly, training would be advantageous to not involve lives of real-life human patients. When arriving at Sandia National Laboratories, I had hoped (with my limited knowledge in the computer science/virtual environment field) to find that our technology was close to achieving something like this already. However, what I came to realize is that the technology community as a whole is far from being able to simulate such a process in the near future.

Another assumption I had before I arrived for my internship was that DHS had elicited the help, or at least the consultation, of main stream video gaming companies to help develop the software needed for its projects involving virtual environments. Since this is not the case, future plans must incorporate this particular expertise into the virtual representation of data and "game play" for training exercises. This conclusion came about after working with my mentor Karim Mahrous who has a background in working with Electronic Arts and has become a vital asset to the IMMS/SUMMIT project. My generation, who is unfailingly computer literate and grappled by the video game industry, will be able to transition our inherent aptitudes and abilities into the workforce if DHS can solidify the aforementioned connection.

Conclusion

If I could sum up my summer internship in one word, I would describe my time as "enlightening". I was exposed to a professional environment that utilizes computer science and biology to help our country prepare for and respond to national emergencies: experience that I can later apply to my future career. From technology surveying to organizing task timelines, I truly believe that my work contributed to Sandia National Laboratories' directive of "*exceptional service in the national interest*". Even though my internship involved computer science based project management, I gained an experience that challenged my boundaries as a pre-professional who is aspiring towards a future of multi-faceted management. My DHS HS-STEM Summer Internship with SNL has given me an opportunity to grow as an individual in many different capacities. In ten weeks, I was able to reaffirm my paradigm that the future calls for cosmopolitan individuals who are always seeking the challenge of constantly improving themselves and their surroundings. In ten weeks, I was able to broaden my horizons and embrace yet another eye-opening life experience.

References

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