# Smart Emergency Response System (SERS)

## – SERS team story –

*Justyna Zander (SERS Team Lead) …*
*October 2013 – August 2014*

## Contents



**October 2013**

I am receiving this email from the government. At first, I deleted the email. Hmm… "why would we want to be involved?" I am asking my colleague. "You wanted impact? This may create impact. Save lives, create jobs, improve economies." – he responds. It is the White House initiative.

I reflected upon his statement. Yes! Let us write a proposal for the White House. Actually let us write multiple proposals. They want a description of an existing cyber-physical systems test bed. My friend pulled in a few more coauthors. We created two write-ups, one on an autonomous emergency response and one on computarithms.

> Henry Ford:
>
> *"None of our men are 'experts.' We have most unfortunately found it necessary to get rid of a man as soon as he thinks himself an expert because no one ever considers himself expert if he really knows his job . . . Thinking always ahead, thinking always of trying to do more, brings a state of mind in which nothing is impossible." So if you're going after grand challenges, experts may not be your best coconspirators."*

**November 2013**

We all are in. We got the invites for the Workshop at the White House.

## How the team came together and how did we form a structured way of working

**December 12, 2013**

The SmartAmerica Challenge is bringing together organizations with cyber-physical systems (CPS) technology, programs, and test beds to demonstrate the potential to improve safety, sustainability, efficiency, mobility, and overall quality of life. It was organized by two Presidential Innovation Fellows, Sokwoo Rhee and Geoff Mulligan.

The Workshop was planned for a full day on December 12, 2013 in the US capital hosted by the White House and NIST. At this event, participants from diverse sectors were to come together, identify possible test bed collaborations, and work on practical approaches to making them a reality. For example, an interconnected test bed could demonstrate how a mobile communication system for first responders is connected directly to hospitals to alert them of potential incoming casualties.

**8:00 AM, December 12, 2013, the White House**

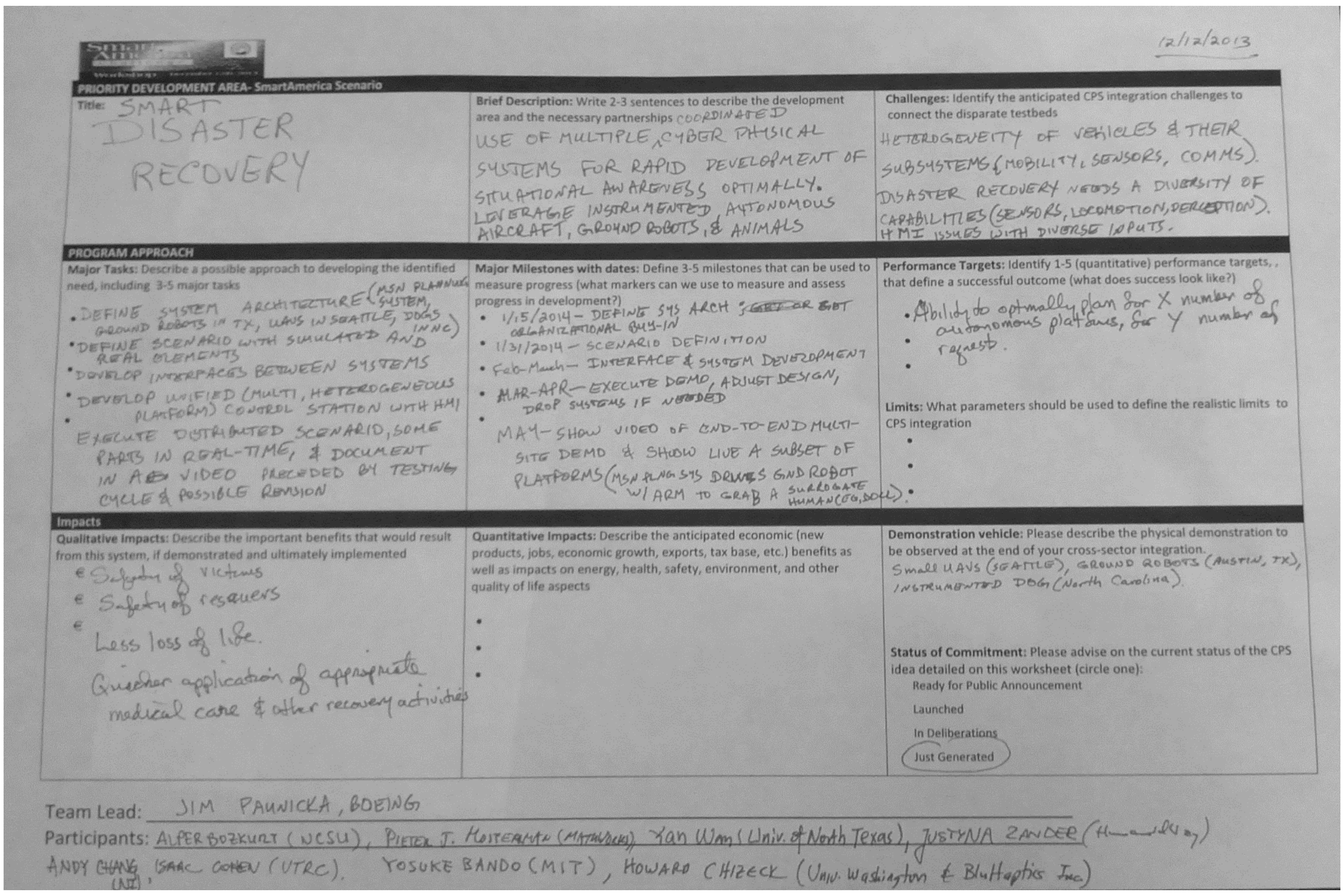
The Workshop started. First, all sixty five participants from diverse sectors were randomly shuffled into four groups to discuss our test beds and how to achieve a positive societal impact together. The criteria were clear: (1) save lives, (2) create jobs, (3) create new businesses, and (4) foster economic and GDP growth. After half a day of discussions with multiple organizations we were asked to self-organize and regroup based on interests.

### A team formed on the fly

The Smart Emergency Response System (SERS) idea was sparked by my colleague, Pieter Mosterman. He ran the Summer Research Internship program on that topic just a few months earlier. People quickly started gathering around his proposal. Boeing joined first. Jim Paunicka of St. Louis office elaborated on their Boeing Collaborative Systems Lab in Seattle facility. Some people were focused, some were randomly joining out of curiosity.

The workshop turned out to indeed be the first milestone in the SERS project. The SERS team—now composed of BluHaptics, North Carolina State University (NCSU), Boeing, the University of North Texas (UNT), MathWorks, the University of Washington (UW), National Instruments (NI), United Technologies Research Center (UTRC), and the Massachusetts Institute of Technology (MIT) self-organized into a coherent group. We discussed what each of us can contribute. We also filled out the first common deliverable, a project plan sheet provided by the organizers (see Figure 1).

Nobody committed yet, but we tentatively agreed on what we could work on together.



12/12/2013

PRIORITY DEVELOPMENT AREA- SmartAmerica Scenario

Title: SMART DISASTER RECOVERY

Brief Description: Write 2-3 sentences to describe the development area and the necessary partnerships
USE OF MULTIPLE COORDINATED CYBER PHYSICAL SYSTEMS FOR RAPID DEVELOPMENT OF SITUATIONAL AWARENESS OPTIMALLY. LEVERAGE INSTRUMENTED, AUTONOMOUS AIRCRAFT, GROUND ROBOTS, & ANIMALS

Challenges: Identify the anticipated CPS integration challenges to connect the disparate testbeds
HETEROGENEITY OF VEHICLES & THEIR SUBSYSTEMS (MOBILITY, SENSORS, COMMS). DISASTER RECOVERY NEEDS A DIVERSITY OF CAPABILITIES (SENSORS, LOCOMOTION, PERCEPTION). HMI ISSUES WITH DIVERSE INPUTS.

PROGRAM APPROACH

Major Tasks: Describe a possible approach to developing the identified need, including 3-5 major tasks
- DEFINE SYSTEM ARCHITECTURE (MSN PLANNING SYSTEM, GROUND ROBOTS IN TX, UAVS IN SEATTLE, DOGS IN NC)
- DEFINE SCENARIO WITH SIMULATED AND REAL ELEMENTS
- DEVELOP INTERFACES BETWEEN SYSTEMS
- DEVELOP UNIFIED (MULTI, HETEROGENEOUS PLATFORM) CONTROL STATION WITH HMI
- EXECUTE DISTRIBUTED SCENARIO, SOME PARTS IN REAL-TIME, & DOCUMENT IN A VIDEO PRECEDED BY TESTING CYCLE & POSSIBLE REVISION

Major Milestones with dates: Define 3-5 milestones that can be used to measure progress (what markers can we use to measure and assess progress in development?)
- 1/15/2014 – DEFINE SYS ARCH; GET OR BUY ORGANIZATIONAL BUY-IN
- 1/31/2014 – SCENARIO DEFINITION
- Feb-March – INTERFACE & SYSTEM DEVELOPMENT
- MAR-APR – EXECUTE DEMO, ADJUST DESIGN, DROP SYSTEMS IF NEEDED
- MAY – SHOW VIDEO OF END-TO-END MULTI-SITE DEMO & SHOW LIVE A SUBSET OF PLATFORMS (MSN PLNG SYS DRIVES GND ROBOT W/ ARM TO GRAB A SURROGATE HUMAN (EG, DOLL).

Performance Targets: Identify 1-5 (quantitative) performance targets, , that define a successful outcome (what does success look like?)
- Ability to optimally plan for X number of autonomous platforms, for Y number of request.

Limits: What parameters should be used to define the realistic limits to CPS integration

Impacts

Qualitative Impacts: Describe the important benefits that would result from this system, if demonstrated and ultimately implemented
- Safety of victims
- Safety of rescuers
- Less loss of life.
- Quicker application of appropriate medical care & other recovery activities

Quantitative Impacts: Describe the anticipated economic (new products, jobs, economic growth, exports, tax base, etc.) benefits as well as impacts on energy, health, safety, environment, and other quality of life aspects

Demonstration vehicle: Please describe the physical demonstration to be observed at the end of your cross-sector integration.
Small UAVS (SEATTLE), GROUND ROBOTS (AUSTIN, TX), INSTRUMENTED DOG (North Carolina).

Status of Commitment: Please advise on the current status of the CPS idea detailed on this worksheet (circle one):
Ready for Public Announcement
Launched
In Deliberations
Just Generated

Team Lead: JIM PAUNICKA, BOEING
Participants: ALPER BOZKURT (NCSU), PIETER J. MOSTERMAN (MATHWORKS), Yan Wan (Univ. of North Texas), JUSTYNA ZANDER (HumanityX), ANDY CHANG (NI), ISAAC COHEN (UTRC), YOSUKE BANDO (MIT), HOWARD CHIZECK (Univ. Washington & BluHaptics Inc.)

Figure 1. SERS project plan as of December 12, 2014.

## Getting to the commitment, i.e., logistics challenges to overcome

There certainly were organizational challenges for each of the participating organizations.

First, the announced timeline was very short, unexpected, and quite urgent. All of us are busy individuals. On top of this, the organizations that we represent have their agendas and schedules that are being approved in advance. Introducing a project that occurs suddenly and of which the requirements are continuously and gradually changing is certainly a challenging disruption to all parties involved.

> In 1997 Apple introduced its "Think Different" advertising campaign with the now famous declaration: "Here's to the crazy ones":
>
> *"Here's to the crazy ones, the misfits, the rebels, the troublemakers, the round pegs in the square holes . . . the ones who see things differently -- they're not fond of rules... You can quote them, disagree with them, glorify or vilify them, but the only thing you can't do is ignore them because they change things... they push the human race forward, and while some may see them as the crazy ones, we see genius, because the ones who are crazy enough to think that they can change the world are the ones who do."*

Second, there was no funding provided. For the academic partners it was an obstacle. Some have been able to use the National Science Foundation funding, others had found other means. In any case, it was not easy. For the industrial partners, similarly, the situation created logistics troubles. The expenses needed to be covered from the opportunistic budget that has not been accounted for.

Interestingly enough, sooner or later, we managed to get to approval and to the commitment of almost each organization. UTRC did not join, but we gained Worcester Polytechnic Institute (WPI) as a team member, with Taskin Padir who was providing two test beds: the humanoid ATLAS that they were working on in the DARPA Challenge and a computational integration with Google Glass .

The geographic distribution of the SERS team is illustrated in Figure 2.

**BluHaptics | Boeing | MathWorks | MIT Media Lab | National Instruments | North Carolina State University University of North Texas | University of Washington | Worcester Polytechnic Institute**

Figure 2. SERS team members – geographic distribution.

## The Smart Emergency Response System (SERS)

The Smart Emergency Response System (SERS) is a combination of multiple test beds from all nine organizations.

The Presidential Innovation Fellows told us to think out of the box and make things happen. Create a **glimpse of the future.** We took it seriously. Even though we knew that the deployment of SERS technology is still way beyond consideration. We had to make the prototype work. All in all, SERS was being built in the US government initiative. We had the sense of responsibility towards society to perform the best we could.

> *"We asked people to do some significant work, and if they did, we said we would shine a national spotlight on it," said Geoff Mulligan, one of two organizers of the challenge announced in October.*
>
> *"Our project was not about technology," Mulligan told us. "It was about beneficially impacting the economy and the lives of Americans."*
>
> *"We are trying to refocus attention on the benefits and impacts of IoT, instead of just tech for tech sake," said Sokwoo Rhee.*
>
> (*News & Analysis, US Event Flexes IoT Muscle, Rick Merritt, 5/9/2014 09:00 AM EDT)*

### What exactly is SERS?

The SERS system provides survivors of an emergency such as a natural disaster and the emergency personnel with information to locate and assist each other. SERS allows submitting help requests to a mission center implemented in MATLAB connecting first responders, apps, search-and-rescue dogs, a 6-feet-tall humanoid, robots, autonomous drones, and ground vehicles. The command and control center optimizes the available resources to serve every incoming requests and generates an action plan for the mission. The Wi-Fi network is created on the fly by the equipped with antennas. In addition, the autonomous drones, such as rotorcrafts, fixed-wing air planes, and ground vehicles are simulated with Simulink and visualized in a 3D environment (Google Earth) to unlock the ability to observe the operations from a personal computing machine.

## Technical challenges to overcome and how we solved them

**January 2014**

We defined a SERS vision. We started engaging the organizations involved and getting the commitment and approvals. We began to learn about each other's work details. The form of collaboration was first limited to weekly conference calls. Every Tuesday evening we gathered together to discuss the progress, planned next steps and milestones, all accounting for the short timeline.

Also, we needed a leader to organize the daily activities and comprehend the results.

**February 4, 2014**

One Winter day we were on the SERS phone call. All project participants happened to attend. Jim Paunicka of Boeing was originally acting as an initial team lead, however, he then nominated me to take over his role. The team supported his vote and the selection process was performed. I was representing MathWorks and SERS as a whole.

My organizational agenda was pretty straightforward and applicable every day:

1. Identify challenges of the day
2. Beware, be alerted, listen
3. Solve the challenges and/or find the right people to solve them
4. Document and communicate the solution:
    a. internally within my organization
    b. externally to the SERS team
    c. and to the PIFs at the White House.

I considered collaborative leadership advocated by Prof. Malone of MIT best ("coordinate-and-cultivate" in his book 'The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style and Your Life' (2004)), in particular, given the way the team is organized. Everyone was being listened to. From now on, I had knowledge about the technical progress and technical details required for the integration from each participating organization. I also got very busy. A 24/7 service. We were thirteen people on the core team, but each organization involved multiple researchers, engineers, technicians, creative services, and public relations experts. Altogether, we formed a group of about forty people involved in the process of making SERS a reality.

The entire SERS team decided to focus on success from day one. Ultimately and fortunately, the project was featured at the White House in June 2014. In press SERS was described by Todd Park (*U.S. Chief Technology Officer*) as an exemplary achievement.

### Design, engineering, and hard work

Technically, Model-Based Design (MBD) has proven to be a successful facilitator in the SERS integration process. In particular, the use of a common and reliable design environment enabled a smooth workflow while adding new components to a core optimization system. The SERS algorithms have been continuously refined through multi-domain simulation and the operations of the integrated devices were tested in a 3D virtual world. Combining the rescue mission optimization with inexpensive hardware test beds, sensory animals, humanoid components, cars, planes, and UAVs allowed for illustrating how systems-of-systems of the future can collaborate, especially if built on the foundations of the proper engineering paradigms. MBD works well in relation to CPS and Internet of Things (IoT) because it gradually builds up from the abstract models to concrete implementations on various platforms.

**The inventory of the resulting SERS system includes the following elements integrated with the mission center and in part with each other:**

- MATLAB: Optimization (e.g., mixed-integer linear programming optimization), mission user interface, and a display on a geo-map
- Simulink: Simulation of the fleet of vehicles (e.g., AR.Drones, ground vehicles, fixed wings)
- Simulink and MATLAB: Interface for visualization of the simulation part in Google Earth
- MATLAB: Integration of the system with other software/hardware providers
- MATLAB: Communication component (UDP, TCP)
- MATLAB and DLLs: Face detection of the videostream from the AR.Drone
- Android application: ShAir Emergency Response (MIT)
- MATLAB: GUI for ATLAS (WPI), embedded in SERS GUI

- MATLAB: GUI for WiFi drones (UNT), embedded in SERS GUI
- Hardware/software from:
    - UNT (drones with antennas),
    - NCSU (dog harness),
    - WPI (ATLAS humanoid, Google Glass),
    - UW (KUKA arm),
    - BluHaptics (haptic device),
    - Boeing (drones and virtual reality),
    - AR.Drone and phones.

**February 11, 2014**

**SmartAmerica Challenge – TechJam Event in Washington, DC**

To build on the success of the White House Workshop meeting of December 2013, the Presidential Innovation Fellows welcomed us to play a part in a follow-on meeting on February 11, 2014 at the NIST Gaithersburg, Maryland campus. Attendees heard about progress being made on the interconnected test beds that were identified at the previous Workshop, as well as about other projects that are newly proposed or independently pursued.

**March 15, 2014**

March 15 was the deadline for the deliverables for the White House. The documents that were required to be submitted to the PIFs included: SERS storyboard and/or storyline, SERS impact document, one concise slide (see Figure 3) about the SERS idea, and SERS message. We provided a SERS flyer and SERS architecture in addition.


Figure 3. Concise SERS vision slide.

**April 15, 2014**

April 15 was the next milestone deadline for deliverable. This time, documents, such as, a SERS abstract and a SERS short write-up were required. We provided SERS narrative description in addition.

We also started collecting information on our concrete gains resulting from creating SERS together as opposed to building it in separate isolated organizations. This collection was going to better prepare us for the events in June.

**May, 2014**

From the very beginning of the SmartAmerica Challenge, we were promised that select teams will be invited to the White House for a preview event on June 10th. Supposedly only three to five teams (out of twenty four) were to be invited and the selection process was taking place directly at the White House. An unknown to us.

One afternoon, I received an email from the PIFs requesting a quick call with the team. Our SERS team was very good at responding to unexpected changes at this point. We organized this call the same afternoon. According to my knowledge, we were the first group that was invited to the White House event. We made it! Sokwoo and Geoff shared the news with the team and it certainly was a day of celebration for everyone. Fortunately, we knew that most of us are meeting in person the following week for a dry run. So, in spite of the hard work and incredibly packed schedules behind and ahead of us, the moods were uplifted and very happy.

**May 10-13, 2014**

**Dry-run Event at the University of Washington in Seattle, WA**

The dry-run event in Seattle proved to be a great success. Not only did we manage to integrate software and hardware that we had onsite, but we also spent some quality hours working together as a team, face to face, and in person. This was a good and very productive week for each and every one of us.

Already in Seattle, SERS attracted a lot of press coverage. The event is summarized here.

Selected SERS press excerpts can be found in the following list:

- Design News
- LiveScience
- Communications of the ACM
- Yahoo! News
- Discovery
- Science Magazine
- Gizmag
- Fox News
- IEEE Spectrum
- Fast Company
- WPI News
- Eureka Alert
- PDDnet
- UW News
- Evaluation Engineering

## Architecture of SERS

The components of the SERS architecture are presented in Figure 4. The mission command and control center in the center of the figure is the computational brain of the system. Every time a help request from the ShAir app comes in, a fleet of robots, dogs, and autonomous vehicles is sent to the field for operation purposes.

The fleet consists of the following hardware elements that are illustrated on the left-hand side of Figure 4 and listed below.

1. Drones equipped with wireless routers and antennas to set up a WiFi network.
2. Biobots (i.e., dogs equipped with sensors such as, cameras or gas detectors) to sense and monitor the situation.
3. A KUKA mobile robotic arm for performing difficult field activities, such as closing a gas leak.
4. A haptic device for telerobotic remote operations.
5. An ATLAS humanoid (originally developed by Boston Dynamics) for performing heavy lifting operations and reaching the areas too dangerous for humans.
6. Fleet of UAVs (i.e., rotorcraft and fixed wings) and ground vehicles simulated and shown in a virtual 3D environment.

In addition, SERS consists of the human-machine interfaces depicted on the right-hand side of Figure 4. They include:

7. Simulink to Google Earth interface for visualization of the simulated field operations.
8. A component for the video stream analysis of the cameras placed on the drones (e.g., AR.Drone) to perform real-time face detection of the survivors in the field.
9. Wearable computing for observing and manipulating certain elements of SERS.

The communication between the components is realized using UDP and TCP connections, depending on the integrated component.

The complexity of the system integration is encompassed by the software logic that is implemented in MATLAB. The simulation of the dynamic systems (e.g., ground vehicle) included in SERS is implemented in Simulink and other blocksets.

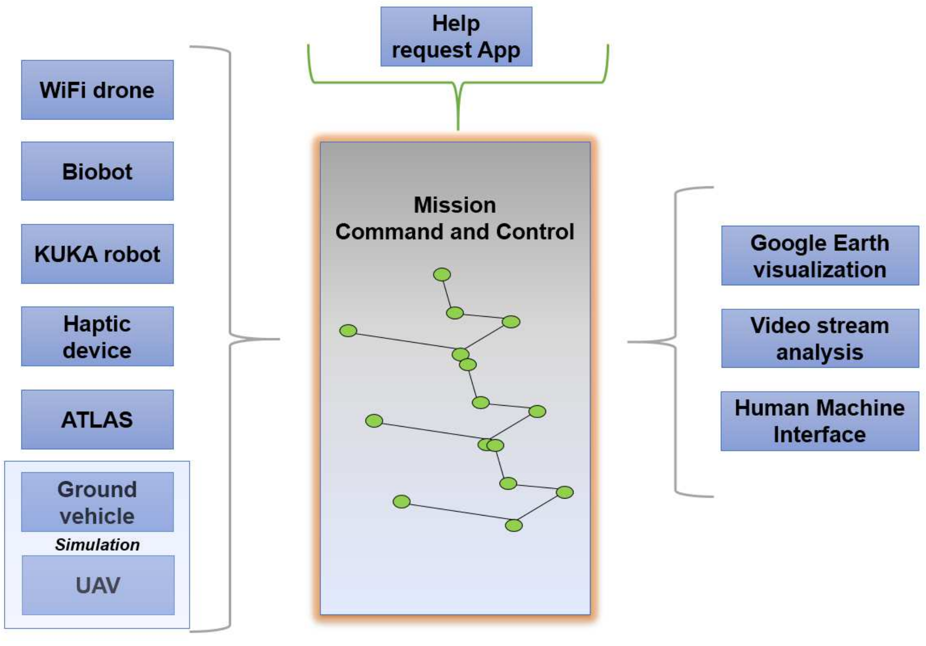



Figure 4. SERS architecture.

A more detailed architecture of SERS, including the underlying implementation and hardware details is presented in Figure 5.

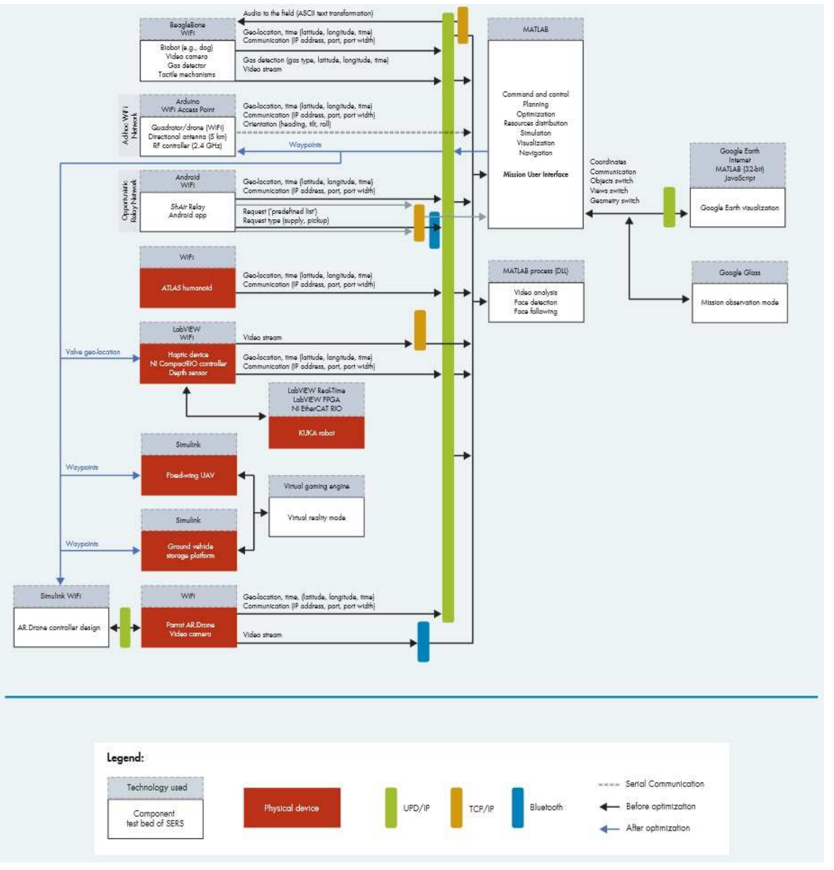


Figure 5. SERS system architecture – detailed view.


Figure 6. SERS software architecture.

The SERS software is divided into six logical components as shown in Figure 6. In particular, it consists of components such as:

- Simulation and visualization
- User interface
- Optimization of the resources
- Hardware integration
- Requests
- Helpers

SERS is built based on an object-oriented approach. That is, each logical component is represented by a number of classes and their methods. A detailed architecture of these components is provided in this diagram and described in these slides.

## Model-based Design and its role in SERS

The SERS concept illustrates how to arrange for more effective disaster response. The CPS paradigm unlocks the potential for looking at hardware and software as collaborating modalities. A seamless interoperability between hardware and software components is enabled with Model-Based Design that MathWorks supports. Also, the rapid prototyping of components is supported by simulation techniques. Most importantly, an open design makes the accessibility, processing of data, and computation meaningful for the rescue operations directly in the field which holds the promise of technology forces changing the game in emergency response efforts.

A prototypical implementation of SERS is available on GitHub: here, and the SERS video is on YouTube: here.

**June 10, 2014**

## Mystery around the White House Preview event.

Everything related to the White House was shrouded in mystery. I trust, it is so for a good reason. The event was an interesting experience. The executives of multiple companies presented the results and visions behind them. SERS was represented by Vice President of Marketing from MathWorks, Rich Rovner, and Vice President of Marketing from NI, Ray Almgren.

We took a team photo at the facility (see Figure 7).

Figure 7. SERS team at the White House.

**June 11, 2014**

## SmartAmerica Challenge Expo at the DC Convention Center

The full day event held at the Washington DC Convention Center on June 11 included keynote talks from the US CTO and Presidential advisor **Todd Park**, GSA Administrator **Dan Tangherlini** and former US CTO **Aneesh Chopra**. The day also included speakers from government agencies, including DOT, DHS, HHS, DOD, and NSF. Each team presented a short talk that focused on their collaborative effort and output of creating socio-economic goals of the SmartAmerica Challenge (copies of their presentations are linked below). In conjunction with the talks the teams demonstrated their projects. These demonstrations included robotics, autonomous vehicles, UAVs, search dogs, 3D printing, security technology, healthcare systems and advanced vehicle communications.

> *"Just like the Internet allows people all over the world to interact seamlessly with each other, the Internet of things will allow devices all over the world to communicate and collaborate seamlessly," Park said.*
>
> *On June 10, the White House hosted an event where SmartAmerica Challenge teams from across the country demonstrated their projects.*
>
> Emerging Technology, The Internet of government things,
> Colby Hochmuth, June 11, 2014
> http://fcw.com/articles/2014/06/11/internet-of-things-expo.aspx

After the June events, SERS got even more press coverage. Selected excerpts are to be found in the following list:

**June 2014**

- NextGov
- State Tech magazine
- Science Magazine
- FedScoop
- Commerce
- IT Business Net
- IEEE Spectrum
- Information Week
- PR Web
- Wall Street Journal
- FastCompany

**July 2014**

- Scientific Computing
- Phys.org
- PSFK
- Huffington Post and NSF
- SCS Newsletter
- SummerSim 2014 wrap-up of SCS
- SERS talk at the SmartAmerica Expo 2014
- Desktop Engineering article
- Design News blog

## Summary

The SmartAmerica Challenge changed many rules. The level of people one interacted with modified both sides of the equation. These were *executive* people, literally and figuratively. In the way they acted, pro-acted, and reacted. The project was a continuous drive for excellence. Every day with no exception. We made SERS happen because of the commitment of every single member.

We integrated the technological breakthroughs of each member organization and we experienced them in the making. We learned about each other and about ourselves. We also learned about the White House, the US government, and the difficulties assisting innovation.

## SERS core team members

**SERS core team members by name (alphabetical order):**

- Alper Bozkurt, North Carolina State University
- Andy Chang, National Instruments
- Daniel Dubois, Massachusetts Institute of Technology
- David Roberts, North Carolina State University
- Fredrik Ryden, BluHaptics
- Howard Chizeck, University of Washington
- Jim Paunicka, Boeing
- Justyna Zander, MathWorks – Team Lead
- Kevin Huang, University of Washington
- Konosuke Watanabe, Massachusetts Institute of Technology
- Pieter J. Mosterman, MathWorks
- Shengli Fu, University of North Texas
- Taskin Padir, Worcester Polytechnic Institute
- Yan Wan, University of North Texas
- Yosuke Bando, Massachusetts Institute of Technology

**SERS team member by organizations (alphabetical order):**

- BluHaptics
- Boeing (St. Louis and Seattle)
- MathWorks – Team Lead
- Massachusetts Institute of Technology Media Lab
- National Instruments
- North Carolina State University
- University of North Texas
- University of Washington
- Worcester Polytechnic Institute

**SERS MathWorks development foundations (timely order):**

- Kun Zhang (Google Earth, Kinect, gadgets, and apps)
- David Escobar Sanabria (dynamic simulation)
- Enes Bilgin (static optimization)
- Aubrey da Cunha (dynamic optimization)
- Poornima Kaniarasu (standalone Simulink to Google Earth interface)

## Genesis of the project: how it started at MathWorks and how it scaled up to a national endeavor

The 2013 MathWorks Summer Research Internship was the initial project during which an automated autonomous emergency response system evolved. The interns addressed the challenge of finding a topic for 10 weeks that can make a difference in the world. After extensive brainstorming and evaluation, earthquake disaster relief was ultimately chosen as the mission. A combination of real world physical hardware set in cyberspace ("when worlds collide, ideas spark!") allowed to address the range of problems from cloud-based high-level optimization in deploying the heterogeneous fleet of vehicles (automobiles, fixed wing aircraft, and rotorcraft) based on various requests from the field all the way down to low level feedback control of an autonomously flying drone.

The Summer project was the fundamental test bed for building the SERS endeavor. Although half of the implementation has been redesigned and recoded, it served as an indicator of what works well and what parts should be given special attention. Ultimately, it unlocked the potential for a large-scale integration and a professional development of the system.

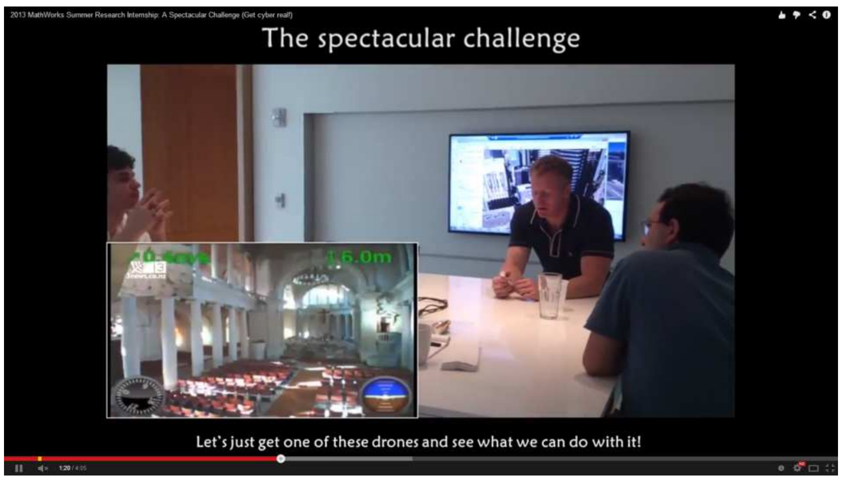



Figure 8. 2013 MathWorks Summer Research Internship: A Spectacular Challenge (Credit: Pieter Mosterman).

## Future of the project: GitHub availability and potential ways to go

There are at least three US national-level initiatives announced in June 2014 that are related to SERS results. We welcome everyone to build on top of what we have achieved in the SmartAmerica challenge. The SERS software is available for download on GitHub and can be used for any purpose including the purpose of building Centers of Excellence.

The national initiatives include:

**1. The National Institute of Standards and Technology (NIST)** has posted a Federal Funding Opportunity (FFO) for a new research **Center of Excellence** to work with academia and industry on issues in **community disaster resilience**. NIST will select an awardee based on a merit competition to establish the center, which will be funded at up to $4 million a year for five years (total up to $20M). NIST Centers of Excellence are meant to provide multidisciplinary research centers where experts from academia, industry and NIST can work together on specific high-priority research topics. The center will work on developing integrated, systems-based computational models to assess community infrastructure resilience and guide community-level resilience investment decisions. The proposed center also would develop a data management infrastructure, as well as tools and best practices to improve the collection of disaster and resilience data. The proposal announcement can be found at http://www.nist.gov/coe/resilience/.

**2. The Department of Homeland Security (DHS)** Office of University Programs (OUP), within the Science and Technology Directorate is releasing a Funding Opportunity Announcement (FOA) for a new **DHS Critical Infrastructure and Resilience Center of Excellence** (CIRC) Cooperative Agreement. The Center Lead institution will fund partnering organizations through sub-awards. For applicants interested in only submitting a partner proposal, OUP is also posting a separate FOA for eligible applicants to submit single project proposals for consideration as a partner to this Center of Excellence (COE). Funding for the center will be total $20M over five years and DHS will make one award. See solicitation.

**3. SmartAmerica/Global Cities Challenge of NIST 2014-2015**

Current deployments of CPS/IoT in Smart Cities/Communities are fragmented lacking interoperability and standards. As a result, many Smart Community deployments are isolated and do not enjoy the economy of scale. Many CPS/IoT innovators already have technologies (i.e., building blocks) and their impact can be maximized by fostering collaboration among the innovators to create interconnected solutions to provide tangible benefits to the end users. SmartAmerica/Global Cities Challenge is aiming to address the issue by establishing and demonstrating a measurable, scalable and repeatable model for incubation and deployment of CPS/IoT technologies in Smart Communities/Cities to accomplish improved efficiency and productivity, create new business opportunities, and create affordable and sustainable living environments to enhance the quality of life. All the teams in SmartAmerica Round One will be invited to participate in the SmartAmerica Round Two/Global Cities Challenge as well as **new participants from around the world.**

> *"As a next step, we hope these teams and others across the United States and around the world will join NIST and collaborating organizations for the SmartAmerica/Global Cities Challenge. We'll ask them to work together in creating the building blocks of smart cities. Our goal is to cut in half the time and money it will take for cities to deploy advanced engineering and information technologies to better manage their resources and improve everything from health and safety to education and transportation. Progress will require standard ways for all of these devices and systems to communicate, and that will take coordination among the people building the information technology, physical devices and communities."*
>
> (The Internet's Next Big Idea: Connecting People, Information, and Things,
> Chris Greer, Senior Executive for Cyber-Physical Systems
> at the National Institute of Standards and Technology, June 11, 2014)

In August 2014, US Ignite and the National Institute of Standards and Technology (NIST) have teamed-up with the Department of Transportation (DoT), National Science Foundation (NSF), Health and Human Services (HHS), and Intel to create the Global City Teams Challenge, an initiative designed to advance the deployment of Internet of Things (IoT) technologies within a SmartCity/Smart Community environment.

## SERS scenario

One part of SERS, interesting from the user perspective, is the projection of the simulation results in an easily accessible 3D environment. This possibility emerges when marrying Simulink models with Google Earth display. Such combination provides a realistic visualization of simulations that are at the heart of Model-Based Design. Any car, plane, drone, machine, or robot of which behavior is designed in Simulink can now be simulated and projected in Google Earth (see Figure 9 and Figure 10). They then can be observed in motion in the virtual 3D world.


Figure 9. SERS cars designed in Simulink and driving in Google Earth environment (Credit: Pieter Mosterman).

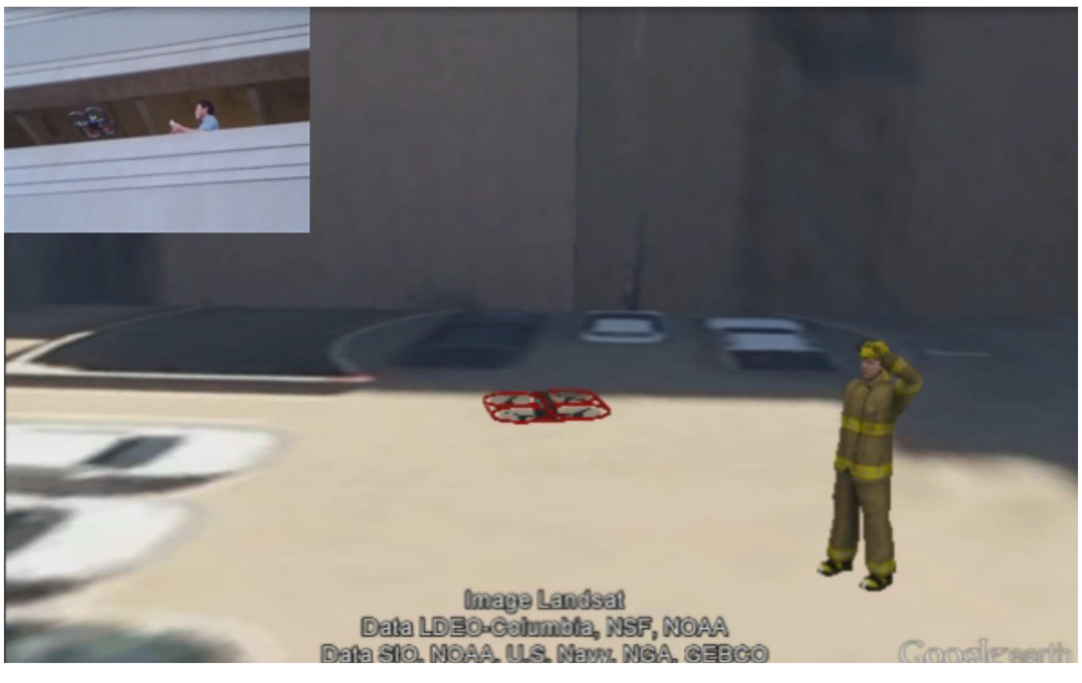



Figure 10. SERS rotorcraft designed in Simulink and flying in Google Earth environment (Credit: Pieter Mosterman).