Global City Teams Challenge

National Institute of Standards and Technology, Administration Building 101, 100 Bureau Drive, Gaithersburg, MD Campus

TECH JAM
February 12-13, 2015

Welcome to the Workshop

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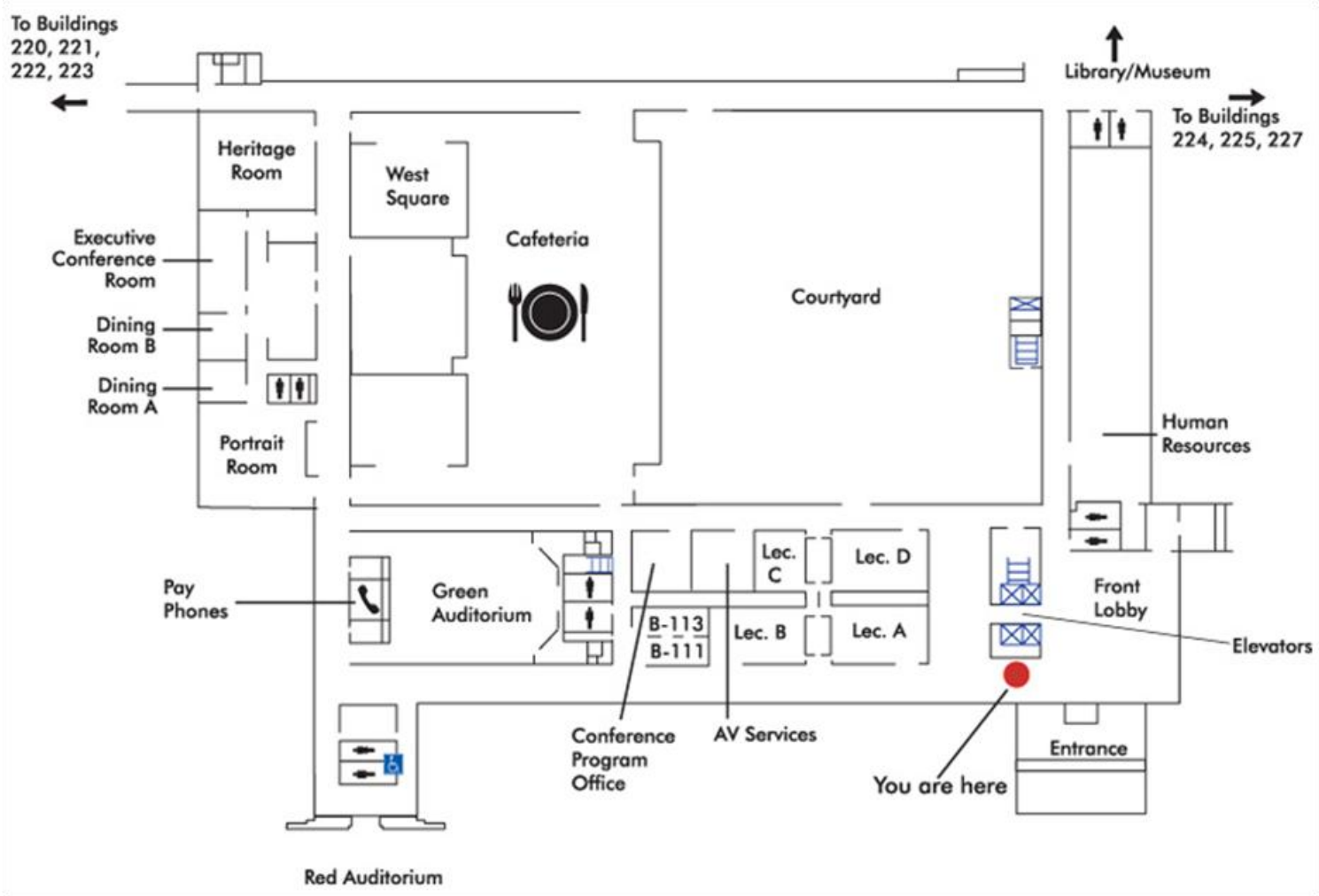
Meeting Room Locations

Activity	Room	2.12.15 Concurrent: Breakout Sessions	Working Sessions
All Plenary Sessions	Green Auditorium	**1:30 pm**	**2:30 pm**
Energy, Transportation	Portrait Room		
Health & Public Safety, Disaster Resilience	Heritage Room		
Education, General *	Lecture Room A		
New Action Cluster / Team Formation Room	Lecture Room B		
Overflow / Networking / New Action Clusters	Lecture Room C		
Overflow / Networking / Existing Action Clusters	Lecture Room D		
Individual Group Sessions (first come-first serve)	B—111		
Bringing IoT Know-how to High School Students	B—113		

* General includes Recreation, Mobile Communication, Smart Neighborhoods, etc.



Agenda

February 12, 2015	
7:30 am	**Registration**
8:30 am	**Opening Remarks – Green Auditorium** **Welcome** *Richard Cavanagh, Acting Associate Director for Laboratory Programs and the Director of the Special Programs Office, National Institute of Standards and Technology (NIST)* **Global City Teams Challenge Overview:** *Sokwoo Rhee (NIST) and Glenn Ricart (US Ignite)*
9:05 am	**Keynotes** *Dan Correa, Senior Advisor for Innovation Policy, White House Office of Science and Technology Policy (OSTP)* *Jon Bruner, O'Reilly Media, Co-Chair of Solid Conference*
9:35 am	**Special Remarks** *Ike Leggett, County Executive of Montgomery County, MD*
9:40 am	**Federal Program Opportunities for Smart Communities and the Internet of Things (IoT)** *Perspectives offered by government officials on current and future program opportunities* • *David Corman,* **National Science Foundation** • *Walton Fehr,* **US Department of Transportation**
10:10 am	**Break**
10:30 am	**Action Cluster Panels – Scenarios for Global Cities - Green Auditorium** *Perspectives from Global City Action Cluster Teams – current/future work, partners needed, expected outcomes and challenges:* **Disaster Resiliency, Transportation, General, Education**
12:25 pm	**Breakout Session Process Overview –** *Joan Pellegrino, Energetics*
12:30 pm	**Lunch and Networking** – *NIST Cafeteria (on your own)*
1:30 pm	**Concurrent Breakout Sessions – New Partner and Project Explorations** (Room assignments: page 2) *Newcomers give 2 minute overviews on needs (cities, municipalities, states) or potential contributions (industry, associations, non-profits, universities, government programs) to the Global City Teams Challenge* **See page 2 for room assignments**
2:30 pm	**Concurrent Working Sessions – Project Discussion and Formation** (Room locations: page 2) • **Existing Project Teams Discussion:** *Refine action plans, metrics, and demonstration plans; and recruit new team members* • **New Project Teams Formation:** *Discuss possible new teams/projects and scenarios, recruit team members, create potential path forward, discuss public-private partnerships*
4:30 pm	**Adjourn**
5:30-7 pm	**Reception –** *hosted by Montgomery County at Thingstitute, 29 Courthouse Square, 2nd floor, Rockville, MD*
February 13, 2015	
8:30 am	**Opening Perspectives – Green Auditorium** *Chris Greer, Director of Cyber-Physical Systems and Smart Grid Program Office (NIST)*
8:45 am	**Keynote** *Richard Voyles, Assistant Director of Robotics and Cyber-Physical Systems (OSTP)*
9:00 am	**International Efforts in Global Cities** *Thibaut Kleiner, European Commission (video presentation)* *Bram Reinders, Amsterdam Smart City* *Noa Pereg, Head of Media, Tel Aviv*
9:45 am	**Action Cluster Panels – Scenarios for Global Cities** *Perspectives from Global City Action Cluster Teams – existing and newly formed:* **Health & Public Safety, Energy & Utilities, Education**
10:45 am	**Break**
11:00 am	**Action Cluster Panels – Continue**
12:45 pm	**Next Steps and Adjourn**

Action Cluster Presentations

Thursday, February 12, 2015: 10:30am-12:30pm

Primary Sector: Disaster Resilience	Presenters
Human Population Mapping for Enhanced Community Resilience (Annapolis Team)	**Tina Williams**, TCecure, LLC
Smart Emergency Response System (SERS)	**Shengli Fu**, University of North Texas
Cyber Attack-Defense Exercise for System Planners and First Responders (Iowa)	**Manimaran Govindarasu**, Iowa State
Real-Time Geospatial Collaboration Platform for First Responders	**Chris Philips**, TouchShare
Using Dynamic Virtualization and Intelligent Edge Devices in Disaster Response	**Jeff Christensen**, Entry Point
Integrating an Aerial Base Station with a City's Emergency Communication Grid	**Kamesh Namuduri**, University of North Texas
Primary Sector: Transportation	**Presenters**
Smart Mobile Operation: the OSU Transportation Hub (SMOOTH): Columbus, OH	**Paul Carlson**, City of Columbus, OH
Connected, Intelligent Transit (Portland)	**Adrian Pearmine**, IBI Group
ARIBO: Applied Robotics for Installations and Base Operations	**Corey Clothier**, Comet Consulting
Greenville A-Taxi Shuttle Project	**Fred Payne**, County of Greenville, SC
Primary Sector: General	**Presenters**
Lower Manhattan's Smart Neighborhood Pilot	**Sander Dolder**, NYCEDC
PlanIT Impact (Kansas City)	**Kari Keefe**, Mozilla Foundation
Kumbh Mela: Solving the Problems of Millions (Camera Culture Group At MIT and Nashik)	**John Werner**, MIT Media Lab
Mobile-first Communication and Service On Demand Infrastructure for Hospitality - ALICE (NY)	**Sam Evers**, ALICE
ParaDrop	**Suman Banerjee**, University of Wisconsin-Madison
NYCLink	**Steve Crout**, Qualcomm Government Affairs
Primary Sector: Education	**Presenters**
Bringing Internet of Things Know-How to High School Students	**Greg Toth**, Internet of Things Dev Labs
SENAS: Smart City Educational Network for Autistic Students	**J. Cecil**, Oklahoma State University

Action Cluster Presentations (continued)

Friday, February 13, 2015: 9:45-10:45am

Primary Sector: Health & Public Safety	Presenters
Remotely Caring for Our Most Vulnerable Citizens In-Place During A Pandemic	**Julian Goldman**, Mass General Hospital and Harvard Medical School
PA 2040 (DC)	**Mamta Sodikumar**, OCTO **Ted Jutras,** Golden Triangle BID **Ken Walton**, NCPC
SCALE: Safe Community Alert Network	**Dan Hoffman**, Montgomery County, MD
Smarter Sockets: Indoor Emergency Response Locators	**Emmanuel Azih**, Smarter Sockets
Ecosystem for Smart Medical Simulation Team Training	**Brenda Bannan**, George Mason University **P. Shane Gallagher**, Learning Analytics Research Corp **Shelly Blake-Plock**, Yet Analytics, Inc.
Energy Efficient Data Collection Street Light Post Assembly	**Bridget LaFemina**, Pennsylvania Globe Gaslight Co
Managing Urban Air Quality (Chicago)	**Katie Olson, UI Labs**
Chattanooga GASP: Geolocated Allergen Sensing Platform	**David Lary, University of Texas, Dallas**

Friday, February 13, 2015: 11:00am-12:30pm

Primary Sector: Energy & Utilities	Presenters
Project X: GigaBit SMART City Project (Highland, IL)	**William Hadala**, iWire365
SmartCities Utility Infrastructure	**Ed Davalos**, AT&T
Intelligent Connectivity & Water Resource Management	**Steve Crout**, Qualcomm Government Affairs
Project Healthy Smart City	**Subrahmanian Eswaran**, Carnegie Mellon University
5D Smart San Francisco 2030 District	**Michael Jansen**, Cityzenith
Energy Storage based Adaptive Demand Response in Smart Commercial Buildings (NYSERDA)	**Christoph Meinrenken**, Columbia University
Distributed Mobile Storage for Resilience – Plugin Electric Vehicles (PEVs)	**Patrick Murphy**, Reluminati
Primary Sector: Education	**Presenter**
Resource Network for Early Childhood Care and Education	**Michael Dunaway**, The Aethena Group

Guidance for New Participants

Breakout Session Objectives and Description – New Scenarios for Global Cities

At the Tech Jam, we anticipate there will be many newcomers to the Global Cities Team Challenge – from cities, states, and countries as well as companies, universities, and other organizations. The breakout sessions are designed to give newcomers an opportunity to describe 1) their city/country challenge or 2) the systems and capabilities they bring to the table as partners. Many action clusters are still forming – and many others still need partners in key capability areas.

During the breakout sessions, newcomers will be asked to provide a 5-minute description of their organization. This will give existing action cluster participants a chance to hear about new partner capabilities and contributions, as well as some of the problems and challenges facing other communities. Following the breakout session, newcomers will have time to network with existing partners and/or form entirely new action clusters with incoming community partners.

Specific information we would like to hear from those new to the Global Cities Challenge are noted below. A facilitator will guide you through these questions and capture the information on a board at the front of the room – where all participants can then view it. **Newcomers: If you want to create or join new action clusters - please take advantage of this opportunity and come prepared with short answers to the bullets below.**

- **Community representatives: – Identify your needs for smart global city systems that will improve quality of life, transport, energy, health, safety, resilience to disasters, etc.**
  - Community and Organization **(Affiliation)**
  - Objective you want to achieve, e.g., problem you are solving or situation you are improving; e.g., what's your ideal city system **(Objective/Problem)**
  - Anticipated benefit to the community (societal, economic, environmental, energy, health and safety, other) **(Impacts/Benefits)**
  - Partners you would like to connect with **(Partners/Gaps)**
- **System/Company representatives: – Identify the smart systems and capabilities that you bring to the table to support Global Cities.**
  - Organization **(Affiliation)**
  - Functionality of your systems; what you bring to the table for a global smart city **(Functionality)**
  - Brief description of your proposed systems/scenario for smart city interconnections **(Domain(s)/Scenario)**
  - Anticipated benefit to the community (societal, economic, environmental, energy, health and safety, other) **(Impacts)**
  - Partners/communities you would like connect with **(Partners/Gaps)**
- **Focus question for Association/Non-Profit/Government representatives: – Identify the programs or activities that your organization brings to the table to contribute to (or that may be relevant to) Global Cities.**
  - Organization **(Affiliation)**
  - Title of activity/program **(Title)**
  - Areas/sectors that your activity impacts the most **(Domain(s))**
  - 2-3 key functional or programmatic elements that could contribute to global cities
  - Anticipated benefits of participation **(Impacts)**
  - Partners/communities you would like to connect with **(Partners/Communities)**

Speaker Bios

Glenn Ricart

Founder and CTO
US Ignite

Glenn Ricart brings forty years of innovation in computer networking and related fields to US Ignite. Glenn is an Internet pioneer who implemented the first Inter-net interconnection point (the FIX in College Park, Maryland) and was recognized for this achievement by being inducted into the Internet Hall of Fame in August 2013. In one of his previous roles where he was academic CIO at the University of Maryland, his campus implemented the first institution-wide TCP/IP (Internet) network in 1983 using low-cost PDP-11 routers ("Fuzballs") with software devised at the University of Maryland. Glenn was principal investigator of SURAnet, the first regional TCP/IP (Internet) network of academic and commercial institutions.

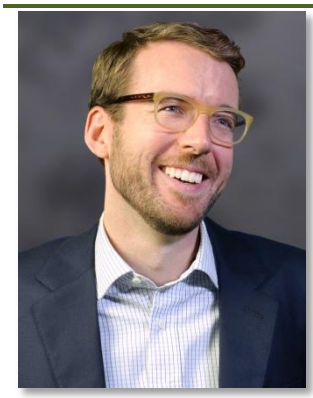
Dr. Ricart has also held other senior management positions including Executive Vice President and CTO for Novell in the 1990s, Managing Director of PricewaterhouseCoopers, and CEO and President of National LambdaRail. Dr. Ricart is also the founder or co-founder of five startups; the one previous to US Ignite, CenterBeam, was sold to Earthlink in 2013 after 14 years of independent operation.

Glenn's formal education includes degrees from Case Institute of Technology and Case Western Reserve University, and his Ph.D. in Computer Science is from the University of Maryland, College Park. His inventions have resulted in more than a dozen patents. Dr. Ricart has served on the boards of three public companies, CACI, the SCO Organization, and First USA Financial Services, in addition to numerous non-profits.

Dan Correa

Senior Advisor for Innovation Policy
White House Office of Science and Technology Policy

Dan Correa is Senior Advisor for Innovation Policy at the White House Office of Science and Technology Policy. Previously, he was an analyst at the Information Technology and Innovation Foundation, a Washington, D.C. think tank, where he authored reports on innovation, entrepreneurship, and broadband policy, which have been cited in publications including The Atlantic, The New York Times, and The Washington Post. Correa has also consulted for the Connecticut Technology Council on state entrepreneurship policies and technology-based economic development. He is a veteran of several political campaigns, most recently President Barack Obama's 2008 campaign, where he was Florida Deputy Get Out the Vote Director. He is a graduate of Yale Law School, holds an M.A. in Economics from Yale University, and a B.A. from Dartmouth College. At Yale Law School he has served as a Kauffman Fellow in Law, Economics and Entrepreneurship.



Jon Bruner

Co-Chair of O'Reilly Solid and Editor-at-Large at O'Reilly Media

Jon Bruner is a data journalist who approaches questions that interest him by writing and coding. He is co-chair of the O'Reilly Solid conference, focused on the intersection between software and the physical world, and he oversees O'Reilly's publications on hardware, the Internet of Things, manufacturing, and electronics. Before coming to O'Reilly, he was data editor at Forbes Magazine. He lives in San Francisco, where he can occasionally be found at the console of a pipe organ.

Isiah Leggett

County Executive, Montgomery County, MD

In November 2006, Isiah Leggett was elected to a four-year term as Montgomery County Executive. He is the first African American to be elected to this public office. In November 2010 he was reelected by County voters with over 65% of the ballots cast. He was elected to a third term in 2014. Isiah Leggett was the first African American to be elected to the County Council. Ike Leggett served four terms as an At-Large Member (1986 – 2002). He also served as the Council's President three times (1991, 1998, 1999) and as its Vice-President three times (1990, 1997 and 2002). As a Council Member he also chaired the Council's Transportation and Environment Committee and served on the Education Committee. He holds four higher education degrees: Bachelor of Arts from Southern University, a Master of Arts degree and a Juris Doctorate degree from Howard University, and a Master of Laws from George Washington University. In earlier leadership experience he served as an infantry Captain in the United States Army. His tour of duty in the Vietnam War earned him the Bronze Star Medal, the Vietnam Service, and Vietnam Campaign Medals.

David Corman

Cyber Physical Systems Program Director
National Science Foundation

David Corman is lead Program Director for the Cyber Physical Systems program at the National Science Foundation. Dr. Corman has a broad range of research interests spanning many technologies fundamental to CPS application areas including transportation, energy, medical devices, and manufacturing. Dr. Corman has extensive industrial experience in the development, design, and manufacture of CPS systems including manned and unmanned systems. Dr. Corman received PhD degree in electrical engineering from the University of Maryland.

Walton Fehr

Manager, Systems Engineering
Intelligent Transportation Systems Joint Program Office
US Department of Transportation

Walton Fehr has been the Manager of Systems Engineering for the US Department of Transportation's Intelligent Transportation System Joint Program Office (ITS JPO) since May 2009. The ITS JPO oversees a large part of the Department's connected intelligent transportation systems activities. At the ITS JPO, Mr. Fehr leads the research into a complete connected intelligent transportation system architecture which will support applications for safety, mobility, and sustainability for all modes including passenger vehicles, transit, and heavy trucks.

Mr. Fehr is a graduate of the University of Illinois, where he earned master's degrees in electrical engineering and in business administration, as well as a bachelor's degree in electrical engineering. He is a licensed Professional Engineer, a certified Project Management Professional, named inventor on 22 US patents, and author of many papers.

Richard Voyles

University Scholar Professor and Associate Dean for Research, College of Technology, Purdue University, and founding director, Purdue Robotics Accelerator
Assistant Director of Robotics and Cyber-Physical Systems Office, White House Office of Science and Technology Policy

Dr. Voyles has been a researcher, deployer, and advocate for robotics and cyber-physical systems most of his academic and professional life. His service in OSTP is concurrent with his Purdue University position. In this role, he has been instrumental in the expansion of the DARPA Robotics Challenge as an international cooperation, advocated for increased funding for robotics and CPS research, and pushed for "filling the gaps" in the educational continuum "*from HS to MS*," including Engineering Technology. Prior to this appointment, he was lead Program Director at the National Science Foundation running the National Robotics Initiative and was one of the founding PDs of the Innovation Corps program.

Dr. Voyles' formal training includes the pillars of robotics – electrical, mechanical and computer engineering -- having received the B.S. in Electrical Engineering from Purdue University in 1983, the M.S. in Manufacturing Systems Engineering from the Department of Mechanical Engineering at Stanford University in 1989, and the Ph.D. in Robotics from the School of Computer Science at Carnegie Mellon University in 1997. He has held tenured professor positions in Computer Science at the University of Minnesota and Electrical and Computer Engineering at the University of Denver as well as Site Director of the NSF Safety, Security, and Rescue Research Center, an NSF Industry/University Cooperative Research Center. Dr. Voyles' research interests are in the areas of robotics and artificial intelligence with particular focus on the development of small, resource-constrained robots and robot teams for urban search and rescue and surveillance as well as new generations of materials and co-robots for intelligent, human-assistive tasks. Dr. Voyles has additional expertise in sensors and sensor calibration, particularly haptic and force sensors, and real-time control. Dr. Voyles' industrial experience includes Dart Controls, IBM Corp., Integrated Systems, Inc., Avanti Optics and Mark V Automation Corp. He has also served on the boards of various start-ups and non-profit groups.

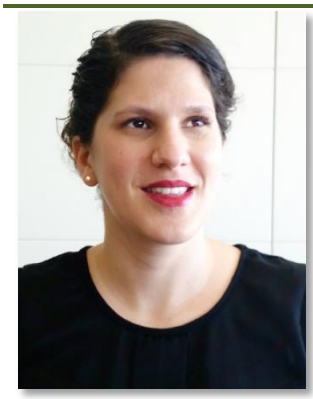
Bram Reinders

Director Alliance Management at Alliander NV
Founder of the European Network for Cyber Security
Chairman/Member of several European Commission Smart Grid Expert Groups

Bram Reinders studied Computer Science and holds an Executive MBA from Purdue University (US). His professional career focuses on developing and implementing emerging technologies in the US and Europe.

Bram's current role for Alliander is to establish relevant Smart Grid and Smart City partnerships for the Netherlands by aligning with European technology providers, government, regulators, universities, consumer organizations and the European Commission.

Bram is also founder of the European Network of Cyber Security ENCS, was Chairman of several Expert Groups of the European Commission and Co-author of several European Commission reports.



Noa Pereg

Head of Media
City of Tel Aviv

Noa Pereg is the City of Tel Aviv's Head of Media, where she manages the city's advertising, press, marketing and new media departments. Ms. Pereg is deeply involved in Tel Aviv's smart city efforts and in cultivating the city's innovation ecosystem.

Noa previously served as Media Advisor to the Prime Minister of Israel, Mr. Benjamin Netanyahu, where she implemented the National Information Directorate's media policy.

Noa lives in Tel Aviv with her husband and their daughter. She holds an MA in Political Communication and a BA in Communications & Journalism and in Political Science from the Hebrew University of Jerusalem.

Global City Team Action Cluster Project Abstracts

One-page slides of the action clusters are available at http://bit.ly/ActionCluster

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Disaster Resilience

Human Geography Mapping for Enhanced Community Resilience (Annapolis, MD)

This project will develop and pilot a GIS-based "Human Geography Mapping System" functioning within a Virtual Business Emergency Operations Center (VBEOC) to coordinate private sector communications, manage resources, and enhance collaboration across the community.

In a disaster or civil emergency, planning, response, and recovery requires sharing of information among emergency managers, first responders, government agencies, private sector businesses, and the civil population. However, emergency management local leaders lack situational awareness of the lines of communication and network of relationships that characterize the "human geography" within their jurisdictions.

The Human Geography Mapping project will demonstrate a social networking and analysis tool to map and visually display the "human geography" of the community—its population, vulnerabilities, assets, and resources—and provide that information to the visual display of terrain, built environment, and critical infrastructure systems commonly available through GIS mapping tools in Emergency Operations Centers. The Architecture Document will be based on open standards, and the results of a high level security and privacy assessment of human data sources will be incorporated. The platform can be extended to share data from IoT systems that provide baseline and dynamic information essential to planning, preparedness and recovery.

The ability to map the human geography of the community will enhance coordination between private and public sectors for disaster planning, and permit the integration of human capital into the resources and infrastructures that comprise a resilient community. In addition, the VBEOC will provide enhanced situational awareness for First Responders, emergency managers, and local government officials to improve regional disaster planning.

Smart Emergency Response System (SERS)

The Smart Emergency Response System (SERS) uses cyber-physical technologies to improve the efficiency of emergency response when disaster strikes. Continuing from the success of the SERS project developed through SmartAmerica Challenge, SERS for GCTC aims to mature the on-demand drone-carried broadband long-distance communication infrastructure, integrate it with existing emergency management systems to support the missions of first responders, rescue robots, mission command and control centers, and test the system's performance for the immediate smart city application on emergency response. The flexible, cost-effective, and drone-carried on-demand communication infrastructure extends wireless coverage, is critical for emergency scenarios where cell-towers are down, and is also needed at public events to temporally meet the surge of communication demands. It permits first responders to collect emergency information and communicate with mission centers in real-time to guide their actions. Rescue robotics and drones enhance the reachability and functionality of first responders. The optimal resource planning system improves human decision-making at mission centers. SERS is deployed and evaluated at multiple emergency exercises to prove its functionality through close collaboration with the Emergency Preparedness Department of the North Central Texas Council of Government (responsible of emergency preparedness of 16 counties in the Dallas-Fort Worth area). SERS transforms the provision of emergency communication, reduces emergency response time and cost, and save lives. It creates new job opportunities, inspires new businesses, improves economy growth, and has impacts in multiple domains, including public safety, air transportations, and education. SERS is a collaborative project among academic institutions (University of North Texas, Worcester Polytechnic Institute, and Wright State University), industry partners (Mathworks, HumanoidWay, and Myth Innovations), and government agencies (Emergency Preparedness Department of the North Central Texas Council of Governments).

CyDECS: Cyber Defense Exercise for Critical Infrastructure Security (Iowa)

Critical infrastructures, such as, power grid, water distribution and transportation networks, are complex cyber-enabled physical systems. Protecting such interconnected infrastructure against cyber attacks is of paramount importance to

national security and economic well-being. The goal of this project to leverage three existing testbed facilities to develop and deploy a suite of tools to provide an integrated environment to conduct security planning, risk assessment, attack-defense training and education for the community, government and industry stakeholders. We believe our integrated platform with associated tools will enable cyber security assessments and training well beyond the current state of art table-top exercise conducted by NERC (GridEx) and DHS for power grid and critical infrastructures, respectively.

The project partners include Iowa State University and the Information Science Institute, University of Southern California, and will will synergistically leverage three facilities: ISU PowerCyber (http://powercyber.ece.iastate.edu), ISU ISEAGE-based Cyber Defense Competition (https://cdc.iseage.org/), and USC/ISI DETER Testbed (www.isi.deterlab.net)

Use-case Scenarios:

1. "Cyber Security Planning and Risk Assessment Exercise" for CPS-based Critical Infrastructure Systems – e.g., power grid, Internet, water distribution and/or transportation network – engaging a couple of state government and industry stakeholders and deploying them at their sites.

2. "Cyber Security Attack-Defense Training Exercise" for a couple of state government and industry stakeholders and deploying them at their sites. Realistic attack-defense experiments with "dynamic" and "realistic" attacks and defenses on infrastructure elements in the testbed as opposed to performing them in a passive table-top fashion, which is very restrictive in its functionalities/capabilities.

Real-Time Geospatial Collaboration Platform for First Responders

This project sets out to demonstrate how real-time collaboration using a cloud-hosted analytical GIS tool has been used to improve situational awareness for US Special Operations Command (USSOCOM) and public safety teams in Los Angeles, CA and Ammon, ID. The sensor/source data are web services and network links, requiring minimal local storage, broadening the types of devices (Win, iOS, Android, desktops, tablets) that can be used for data collection and dissemination. The project explores how to better leverage first responders that serve as invaluable in-field sensors. The ability to collaboratively filter and explore data with disparate subject matter experts greatly improves analysis and discovery of patterns and anomalies. This project will demonstrate how on-the-fly analysis of Automated Vehicle Location systems and IP cameras from CalTrans can be filtered to focus the attention of co-located response teams to a specific area of interest. Combined with current traffic conditions from the World Traffic Service, this conflated view offers a more comprehensive understanding of a situation. Specific filters (e.g. lenses) may be stacked and assigned different metadata tags to employ colorization schemes to cue the attention of responders and enable change detection among dispersed stakeholders. This project will also further examine client-to-client latency experiments conducted by USSOCOM as a quantifiable metric for effective collaboration.

Using Dynamic Virtualization and Intelligent Edge Devices in Disaster Response

The objectives of the project are to demonstrate how virtualization technologies and intelligent edge devices (sensors, cameras, 2-way communication) can work together to help emergency responders and City managers more reliably anticipate and respond to human needs in a simulated regional disaster. This will be done by demonstrating how the combination of these technologies enable situational awareness in real time, provide 2-way communications to a premise to distribute operational plans (evacuation orders or shelter locations) in real time, accelerate damage assessment of city infrastructure and buildings within municipal borders, and reduce loss of life by improving medical response times to the most critical needs.

The simulation seeks to demonstrate how dynamic network virtualization combined with the use of sensors, cameras, and other edge devices can provide a number of community benefits in a disaster event. This simulation will include: 1) a real time damage assessment of city utilities and infrastructure that are operational following a disaster event via sensors and cameras; 2) A demonstration of the ways an in-premise device can facilitate 2-way communications for assessment of health needs at a residence, a school, and a healthcare facility; 3) a demonstration of the ways an in-

premise device can facilitate 2-way communications to enable situational awareness and communicate evacuation orders, available resources, and accelerate damage assessment of private residences and businesses.

Integrating an Aerial Base Station with a City's Emergency Communication Grid (Denton, TX)

The project proposes to design an Aerial Base Station that can be integrated with existing warnings and communications network used by the City of Denton's emergency response agencies. It will enable citizen to citizen communication and citizen to first responder communication when there are power failures and cell towers are dysfunctional during disaster response. Phase-I will implement a WiFi-based communication service that can be used by citizens (disaster victims) to communicate outside of the cellphone network. Laboratory design and testing of the aerial communication platform is set to begin, with on-campus testing of the aerial base station and face-to-face interviews with first responder agencies and data analysis continuing into April 2015. In June, the platform will be tested during a disaster drill scenario.

Transportation

SMOOTH: Smart Mobile Operation: OSU Transportation Hub (Columbus, OH)

In a Smart City, all individuals should have access to multiple choices of transportation. In the U.S., the first mile (access to transportation choice) and the last mile (from transportation station to final destination) can be the weakest links in smart mobility. Many people in the US do not live or work close to a transportation stop, and transportation stops are not always close to the final point of interest. While walking may be a solution for some, it does not apply to everybody (elderly, limited mobility, etc.). Note for instance that the elderly are expected to become 20% of the entire US population within the next 25 years. The proposed solution is a network of "on demand automated vehicles," demonstrated using a closed circuit of automated shuttle driving within the Ohio State University main campus and two selected stops within the outer campus. The automated shuttles will have Vehicle to Vehicle (V2V) communication modems and will be equipped with vulnerable road user detection technology, enabling them to function in pedestrian zones of campus. The Ohio State University is a very large campus with multiple local bus lines, bus stops, roads and pedestrian walkways. Although the first phase of the project will be on Campus, the City of Columbus will benefit as the proposed GCTC project moves to pilot studies in Columbus in later phases. MORPC develops the Columbus area metropolitan transportation plan, and will consider integration of SMOOTH project use cases into the transportation plans of Columbus and Mid-Ohio. The Center for Automotive Research at The Ohio State University; CISCO; City of Columbus; General Electric (GE); Mid-Ohio Regional Planning Commission (MORPC); Battelle, and Team ARIBO are participating.

Intelligent Transit Corridor Test Bed: Reduce Congestion (Portland, OR)

This project focuses on developing a sensor-connected "smart" corridor in Portland where real-time transit data is used to improve traffic signalization and reduce congestion. Bus/rapid transit vehicle data will be available to policymakers and the public via a data portal with visualization and analytics to improve transportation decision-making. *The research will focus on the impact of traffic signal systems and bus/rapid transit data on congestion. We are interested in how we can create better transportation policy using modeling and analytics to achieve faster and more efficient transportation outcomes. We will also look at what can be done with lower cost sensors to measure vehicle location data.* The test-bed will focus on congestion points caused by multiple, converging forms of transit in a discrete, wired corridor of Portland "known as the Powell Boulevard corridor." The Powell Boulevard corridor includes a major intra-city highway, the Clinton St. bikeway and the Division St. development. More generally, the connected test-bed research and analysis will demonstrate the application of big data to complex urban problems and the benefits of applying big data to urban planning and sustainability. Partners in the project include Intel, Portland State University, the City of Portland, the Technology Association of Oregon, the IBI Group, NetCity and others.

Intelligent Transit Corridor Test Bed: Improve Air Quality (Portland, OR)

This project focuses on developing a sensor-connected "smart" corridor in Portland where transit data, traffic signalization, and air quality sensing are made available in a data portal with visualization and analytics to reduce air pollution. *The research will focus on identifying the effects of traffic signal systems and bus/rapid transit on neighborhood air quality. How does the traffic signal system impact air quality? How do particulates disperse into neighborhoods? We will also look at what can be done with lower cost sensors to measure air quality, and ways we can use modeling and analytics to help local government make good transportation policy choices.* The test-bed will focus on air quality impacts of transit and transportation decision-making in a discrete, wired corridor of Portland "known as the Powell Boulevard corridor." The Powell Boulevard corridor includes a major intra-city highway, the Clinton St. bikeway and the Division St. development. More generally, the connected test-bed research and analysis will demonstrate the application of big data to complex urban problems and the benefits of applying big data to urban planning and sustainability. Partners in the project include Intel, Portland State University, the City of Portland, the Technology Association of Oregon, the IBI Group, NetCity and others.

Intelligent Transit Corridor Test Bed: Improve Health (Portland, OR)

This project focuses on developing a sensor-connected "smart" corridor in Portland where transit data, traffic signalization, and air quality sensing are made available in a data portal with data visualization and analytics to improve respiratory health. *The research will focus on exposure to air pollution, including particulates. What effects do traffic signal systems and bus/rapid transit have on neighborhood respiratory health? We are interested in how we can create better transportation policy to achieve better health outcomes through better air quality.* We will also look at what can be done with lower cost sensors, modelling and analytics to measure health impacts of pollution generated by vehicles in the transit corridor. The test-bed will focus on impacts to respiratory health of transit and transportation decision-making in a discrete, wired corridor of Portland "known as the Powell Blvd. corridor." The Powell Blvd corridor includes a major intra-city highway, the Clinton St. bikeway and the Division St. development. More generally, the connected test-bed research and analysis will demonstrate the application of big data to complex urban problems and the benefits of applying big data to urban planning and sustainability. Partners in the project include Intel, Portland State University, the City of Portland, the Technology Association of Oregon, the IBI Group, NetCity and others.

ARIBO: Applied Robotics for Installations and Base Operations

ARIBO, initiated by the US Army, is a series of automated vehicle pilots (or CPS pilots) using federal installations and universities as test-beds. Each ARIBO automated vehicle systems pilot is built around a business case for the user and the developer(s). Our transportation and logistics systems will be very different in twenty years and ARIBO will enable that transition by defining guidelines for deployment and building trust and confidence in the systems. Performance will be measured in each pilot. ARIBO has grown due to the Smart America Challenge from 3 sites to 9. The ARIBO pilots in 2015 will be:

1. Stanford SLAC campus
2. West Point Military Academy
3. Fort Bragg Warrior Transition Battalion
4. Tampa Museum of Science and Industry, University of South Florida and City of Temple Terrace
5. Seattle, WA
6. Greenville, SC
7. The Ohio State University and City of Columbus, OH
8. Greenwich England
9. Lausanne Switzerland at EPFL University
    - And we're working on more sites in WA, FL, MO, GA and MI!!

ARIBO leverages a whole-of-government approach engaging multiple federal agencies as well as small tech-companies and universities...to leverage their expertise and resources for mutual goals. Our small commercial pilots are providing the critical data needed to accelerate commercialization and policy. Our technical, safety and reliability data is extremely valuable, but our end-user data is the key. These are the future customers and their feedback will drive adoption and market development.

Greenville aTaxi: Driverless Vehicles Connecting People and Places (Greenville, SC)

There is potential for a ride on The Heritage Green in Greenville, SC can bring more 'green' to our local economy. Greenville's autonomous taxi, or aTaxi, shuttle enhances the mobility and connectivity for children, disabled, and seniors, citizens and visitors in a functional, fun and educational way. The Heritage Green is a wonderful place to demonstrate the potential for autonomous vehicles to ridership.

How it works: A family parks in an adjacent parking lot and boards the nearby aTaxi. After selecting their destination, the low-speed EV (Electric Vehicle) takes them to the location. The experience displays 21st century mobility potential.The aTaxi shuttle has the potential to improve the overall experience at the Heritage Green campus in a green, zero-emission way. As the Heritage Green aTaxi becomes more popular, it establishes Greenville County as a center for automated transport network systems bringing in related industries and further economic development. The Strategic Software Engineering research Group will investigate systems engineering research techniques for integrating aTaxi vehicles into a Greenville community and optimization. Lessons learned in executing and analyzing aTaxi service will be applied in transportation-challenged communities like the underserved community of Nicholtown. With the aTaxi homes will be connected with stores, schools, and medical care. Census data shows that 1/3 of the 2010 area workforce have no car and need transportation to work, shopping, and entertainment/recreation. This transportation innovation will improve the quality of life and enhance the effectiveness of existing public transportation networks.

General

Lower Manhattan's Smart Neighborhood Pilot (New York City)

The NYC Smart Neighborhood pilot would provide real-time data, through a sensor network, for city planners, businesses, academia, and entrepreneurs to better understand how the city, its infrastructure, and its population, are changing over time from a resources, population, and infrastructure perspective. This project aims to impact and strengthen those who live and/or work in lower Manhattan by providing real-time insight into urban challenges such as air quality and/or noise pollution, making sensor data publicly available, supporting entrepreneurs and innovation, and helping address some of the City's administration goals. This pilot neighborhood is representative of a business district neighborhood, and can be combined along with other NYC smart neighborhood projects (such as Hudson Yards and Red Hook) to give a more holistic systems view of how NYC functions with the long-term plan to map out the entire city of New York. Lastly, these pilot projects will play a critical role in helping shape the forthcoming New York City Smart Cities strategic plan that will set the vision for NYC's transformation and role in the Smart Cities revolution.

PlanIT Impact (Kansas City)

What: PlanIT Impact is a resource impact tool for the planning, design and construction industries that link locally available geospatial data with a specific development project's location to provide visually immersive feedback.

By calculating critical impact factors such as quality of life, energy usage, building mix, greenhouse gas and much more, PlanIT Impact allows you to make critical decisions sooner in the planning and design process. Information is brought to life using cross-referenced 3D modeling technology, GIS mapping and resource databases.

Why: As a first of its kind platform, the PlanIT Impact web app will potentially change the way building industry professionals make decisions and municipal leaders about where and how to invest in our communities. PlanIT Impact is also a powerful educational tool for students learning about the environment or as a research tool on how cities

metabolize resources. The design and development process allows for the input of more intensive information earlier on so smarter decisions can be made before significant investment has occurred.

Mobile-first Communication and Service On Demand Infrastructure for Hospitality - ALICE (NY)

ALICE is partnering with the Gansevoort Hotel Group in New York City to systemize, automate, and unify their staff and guest operations across 2 properties located in different neighborhoods of New York City over a mile apart. The objective is to understand, manage and improve the day to day operations of both hotels, across all departments, through the creation of real time mobile communication technology. The platform will provide a cloud-based task management system available for staff to manage their workflow. Tasks can be requested by guests from their own devices or by staff internally and will then be routed to the appropriate department automatically. The platform will then track and assist the workflow of that task through completion. This system will provide transparency, automation, and rules based alerting to ensure timely task completion. ALICE will also provide a front-end interface and 2-way communication capability for the hotel guests to engage with relevant staff in the hotel to resolve issues. Staff will also be able to interact with each other through a Staff application. The objective is to make task coordination centralized and streamlined. Automating what have traditionally been manual processes involving pen, paper, and 2-way radios will increase efficiency, reduce the number of unhandled incidents to 0, allow for the measurement and optimization of all hotel processes, and create a truly unique and personalized experience for all parties.

ParaDrop: City-scale Analytics (Madison, WI)

Specialized ParaDrop Access Points (APs) will be deployed to local businesses around State Street, a popular pedestrian zone in Madison, WI. These APs will provide insightful analytics about the population, and also serve as a computational hub for deployed IoT outdoor sensors. The analytics will provide customer-driven actionable items to individual businesses and city-scale data to the city of Madison for future city planning. The sensors will collect audio data, allowing ParaDrop to provide noise pollution metrics and public safety services.

NYCLink

LinkNYC is a first-of-its-kind communications network that will bring the fastest available municipal Wi-Fi to millions of New Yorkers, small businesses, and visitors. The five-borough LinkNYC network, which will be funded through advertising revenues, will be built at no cost to taxpayers and will generate more than $500 million in revenue for the City over the first 12 years.

The approach used for this program was to bring some of the best companies together to deliver a product that would generate a revenue stream for the City of New and free service for users. Partners include New York City, Qualcomm Incorporated, Titan360, Control Group, COMARK Corporation, and Antenna Design (Product Industrial Design).

The aging network of public pay telephones for years have been a less than utilized form of communication as well as an eye sore on the community. The challenge of this project was to design, manufacture, install, and operate a state of the art networked communication system that will bring the latest technology to bear to facilitate the lives of New Yorkers and visitor from around the world and provide the fastest free WiFi connectivity for free.

Benefits include:

- Improve street side appearance with a state of the design and technology.
- Provide new method to utilize 911 and 311 for public information and safety.
- Creating socio-economic parity for all residents and businesses starts with LinkNYC
- Improve quality of life for NYC residents and visitors providing free internet access via state of the art WiFi service.
- A facility for location manufacturing and production will be established in NYC for the LinkNYC structures.

- The LinkNYC program is expected to create 100 to 150 new full-time jobs in manufacturing, technology and advertising.
- LinkNYC will provide an estimated 650 support jobs in NYC.
- Will create a new revenue stream for NYC.

Education

Bringing Internet of Things Know-How to High School Students

Today's students will be the ones who are designing the smart cities and communities of tomorrow. There are many things to learn about the underlying technologies, applications,

data characteristics, and security/privacy issues and the time to start learning is now. This project defines Internet of Things experiments involving sensors, hardware, software and data, and brings them to high school students through workshops and hackathons that students participate in. The underlying enablers are template definitions of open hardware, software and sensors that students can use to build sensor pods of their own designs. They program their pods and deploy them in their own school environments, and exchange real-time data with student teams in other locations. After larger amounts of data have been collected over time, the students are shown how to manipulate the data and examine the data sets to find similarities and differences. The broader learning lessons include learning about open hardware and software, how sensing systems work, what kinds of data are generated by sensors, how data accumulates over time, how to examine data and make comparisons, practical issues such as noisy data and time zone differences, working with programming languages such as Python and others, and ways to potentially utilize high-speed network bandwidth in locations where that's also available. High school students and STEM educators participate from the participating locations, supplemented with local college students and volunteers who help with mentoring. Participants include Internet of Things DC, IoT Dev Labs, Arlington County Virginia, Virginia Tech, Montgomery County Maryland, and high school students, STEM educators and volunteers from locations across the US.

SENAS: A Smart City Educational Network for Autistic Students

Our GCTC project focuses on the creation of a Smart City Educational Network for Autistic Students. This network application enables students and teachers to interact and learn from various locations including schools and homes. It brings together experts from diverse fields including computer networking, cyber learning, virtual reality technologies and autism. In this project, Dr. J. Cecil (Oklahoma State University), Dr. P. Ramanathan (University of Wisconsin Madison) and Dr. Mary Sweet-Darter (ABA-OK Consulting) are working with the City of Stillwater and Stillwater Public Schools. The Smart Cities of the future need to have schools which adopt effective and innovative cyber learning frameworks and approaches which take advantage of Next Generation Internet and other 'smart' technologies. The Centers for Disease Control (CDC) estimates that around 1 in 61 American children are on the autism spectrum today. Our project will help autistic children learn science and math concepts using ultra-fast networks and cyber learning approaches. Availability of educational resources and their accessibility to autistic students is important especially in terms of reducing the increasing costs associated with such services. Our project will facilitate providing educational services with 'on demand' access so that autistic students, educators and parents can access them anytime from various locations. We plan to eventually expand this network to support STEM learning for other students in Stillwater and other schools in Minnesota and Oklahoma.

Resource Network for Early Childhood Care and Education (Baltimore, MD)

This GC Team will develop a Resource Network for Early Childhood Care and Education to connect parents and childcare providers with local resources to assist them in fostering their children's development and successful entry into kindergarten. The Resource Network will be tested in a pilot neighborhood of Baltimore, Maryland as the first phase of an effort to develop a Virtual Mentor for Early Childhood Care and Education. The overall project aims to establish an

interactive learning environment—delivered via smartphone, tablet or laptop computer—to provide parents and caregivers with a virtual mentor in early childhood development, parenting best practices, and access to childcare resources, that is accessible to caregivers at any time or place.

The Initial (pilot) demonstration of the Resource Network App is proposed for the Baltimore Promise Heights neighborhood, a U.S Department of Education Promise Neighborhood. The pilot aims to enable a group of parents to complete an online survey of services provided during a regular pediatric Well-Child Visit via the childcare Resource Network App, and provide the results to the Department of Pediatrics at the University of Maryland School of Medicine. For this test of technical feasibility and acceptability, synthetic data will be used as input to the survey, and no personally identifiable information will be used. The pilot will be guided by the University of Maryland Institutional Review Board process.

Health & Public Safety

PA 2040 (Washington, DC)

PA 2040 is a project that looks to implement IoT capabilities in ways that are simultaneously practical and exciting on "America's Main Street," Pennsylvania Avenue. The ultimate goal of the project is to provide a better, more rewarding experience to everyone who uses the corridor – visitors, workers, and businesses, as well as the local and federal governments.

The foundation for the system is Cisco's Smart + Connected Communities platform which is built around a pervasive mesh Wi-Fi network. The Wi-Fi will serve to provide free internet access to the public, as well as to connect a network of sensors that will measure a variety of environmental conditions, traffic,

The series of sensors – provided by a numerous partners – built into this network will provide data analytics capabilities allowing for real time maintenance alerts, improvements to transportation management, and ultimately a better experience to visitors to the corridor. A sampling of the capabilities includes:

- Wayfinding including location-aware, self-guided tours and other augmented reality on mobile devices as well as multi-lingual interactive kiosks.
- Parking demand management allowing visitors to see where parking is plentiful or scarce.
- Improved maintenance response times.
- Emergency response management.
- Long-term public space planning.

Analytics from the public Wi-Fi will also allow for greater information about where visitors to corridor are coming from and will allow for better planning and programming of public space.

SCALE - Healthy Air, Healthy Water, Healthy People (Montgomery County, MD)

A safe and healthy environment supported by connected devices/sensors, or the Internet of Things (IoT) is now well within the reach of many people. However, too often new technologies do not benefit those who need them most: elderly, infirmed and vulnerable residents who are unable to afford this level of protection. The public sector already plays a critical role in protecting the most vulnerable around us, and can now do it more effectively and efficiently with IoT. In this second phase of SCALE we will focus on three primary areas: healthy air, water and people. In our testbed, a large senior living facility in Montgomery County, this project will establish a diverse ecosystem of devices and demonstrate the viability of extracting data from these devices, bringing it to an open, interoperable platform and leveraging it for public safety and public health. To do this Montgomery County has established the Thingstitute, a living laboratory for the internet of things and a hub for the various testbeds we will establish.

Currently the Thingstitute features partnerships with the following companies and organizations via the SCALE project: University of California-Irvine, Massachusetts Institutes of Technology, IBM, Intel, AT&T, SigFox, Brivo Labs, Senseware,

N5 Sensors, the Telemedicine and Advanced Technology Research Center (TATRC), Responder, Del Ray Analytics, biobright, IoT Dev Labs, IoT DC, Captiva, Earth Networks, Victory Housing and more to come. Montgomery County has also established a partnership with Kansas City, MO to share information on project activities and how IoT is impacting public operations.

Smarter Sockets: Indoor Emergency Response Locators

It is often a matter of life and death whether a first responder can quickly locate a wireless caller in distress within a multistory building. But current location technologies do not work well in indoor spaces or in multistory buildings, since receivers require a clear view to communicate with satellites. In fact, the Federal Communications Commission estimates that roughly 10,000 lives, per year, could be saved in the United States if indoor location accuracy were improved.

This project will demonstrate the feasibility of using novel smart electricalsockets—embedded with a microprocessor, Bluetooth Low Energy (beacon), and WiFi—to provide an accurate dispatchable address to the indoor location of wireless 9-1-1 callers. The dispatchable address will include precise location tags and floor level. Providing a dispatchable address to a 9-1-1 caller is particularly important in instances where a caller cannot provide information directly—either because they do not know or cannot communicate their location due to extreme threat of danger.

Success of this project will represent a significant advancement in technology that can be deployed in virtually any building to provide reliable micro-location data. The technology will provide additional benefits: (i) building managers will be able to reduce energy consumption by conditioning each room based on the room's real-time occupancy, (ii) universities would be able to automatically monitor the indoor location of their students; and (iii) municipalities could use the technology to design smarter, safer cities based on aggregate, indoor location data. Using networked beacon devices, indoor positioning will be as accessible as Google Maps is today.

Ecosystem for Smart Medical Simulation Team Training (Fairfax, VA)

In emergency medical situations where seconds count and decisions can impact a life for years to come, a team's situational awareness, logistical decision-making and actions matter greatly. The critical importance of efficient and effective medical and logistical decision-making as well as ensuring continuity of care among the medical, trauma and surgical response teams in crisis situations cannot be underestimated to keep citizens and patients safe in city emergencies. These men and women dedicate themselves to keeping all of us safe and healthy by participating in rigorous high-fidelity simulation training, however, challenges to continually and efficiently improve their performance and response in these demanding situations remain. High fidelity simulation training in emergency response, hospital and surgical contexts has been shown to be effective in improving patient outcomes and research indicates the after action debriefing session is where the majority of learning occurs. However, what can be learned from high-stakes and complex team simulations is often limited by the attention, memory, and knowledge of the observers and facilitators during the simulation and in the debriefing session. The focus of this challenge is to provide immediate and enhanced information and feedback to emergency and medical response teams in the debriefing session concluding a complex, live-action, multi-team (e.g. emergency response, pre-hospital, surgical and post-op) simulation. Leveraging an extensible, interoperable system based on open specifications that dynamically collects and analyzes performance (big) data from multiple, networked devices in real-time, this system will track the activity of these professionals while engaged the live action simulation for immediate or latent analysis and display. The goal is improved learning, reflection and performance support in the debriefing session or in situ to ultimately improve patient care. Providing dynamic data collection and display by linking devices to people to actions for improved learning at the point of need from simulations by medical and emergency response teams in crisis situations can potentially improve their ability to learn, to perform and to respond efficiently and effectively to keep our citizens and their families safe and healthy.

Energy Efficient Data Collection Street Light Post Assembly (North Branford, CT)

City Planners, Town Managers and Law Enforcement personnel are with incorporating available resources into their long term strategies. Developing energy efficient lighting standards which integrate smart technologies allows for an intelligent return on investment. The premise of our concept is that important events and information need to be reported and transmitted from the critical area "under the trees" on our city streets. Government agencies are committed to reducing energy footprints across the country. In the aftermath of the Sandy Hook tragedy, we further see that every street light assembly, whether it be new construction or an energy saving retrofit, holds the potential to collect and deliver information. Lighting standards offer previously unused real estate, all of which is capable of delivering essential information to our communities. Our entry will focus on providing discreet surveillance and quality facial recognition when an incident occurs at the pedestrian level. The video information will simultaneously be collected and transmitted to law enforcement in real time, enabling them to provide a more effect response to an emergency situation. Our team consists of primarily Connecticut based members, all of which are committed to providing a solid solution to prevent other unfortunate events. Our team consists of State agencies, large and small local companies as well as WIBs and Community Colleges, each ready to address a viable solution. Penn Globe, Connecticut Innovations, Connecticut DECD, Town of North Branford, Queralt Inc., Remote Reality, Arrow Electronics, Connected Development, Workforce Alliance and Gateway Community College are participants.

Array of Things: Managing Urban Air Quality (Chicago, IL)

Many cities aspire to track and manage air quality in order to manage emissions through dynamic or policy-based traffic management. Understanding the spatial and temporal dynamics of air quality is critical to designing effective sensor networks and closing the loop between sensing and traffic controls and policy.

In June 2015 we will demonstrate a network of air quality sensor units deployed on BigBelly waste units in Chicago's central business district, with open data published to a cloud based system that allows the air quality data to be analyzed in conjunction with other data including weather and traffic flow. If possible in June 2015 or shortly thereafter, we will demonstrate similar capabilities in Portland, Seattle, New York City, and Boston.

Chattanooga GASP: Geolocated Allergen Sensing Platform

This platform is a way to combine Cyber Physical Systems and Chattanooga's gigabit network to provide real time information relevant to a major health concern of the city – allergies. This pilot project will deploy two types of sensors to detect pollen: 1) streaming sensors to provide size-based, real-time pollen and particulate data, and 2) off-line collectors to provide accurate, microscopic analysis of environmental pollen. The comparison of these two data sets will result in determining whether algorithms could be created to make the real-time data more valuable based on relationships discovered between the real-time and microscopic analysis. Integrating this local data with higher-level context from multiple NASA remote sensing data using machine learning will enable the creation of more accurate information. Chattanoogans suffer terrible allergies as a result of geographic conditions that concentrate pollen particulates into high pollen counts and equals general misery and malaise. This pilot platform's advanced data collection will be channeled into visualization tools that can then be used to support a real-time Pollution View for maps. This can be used by residents of the City or visitors to the City as an additional tool for planning outdoor activities. The test-bed is Chattanooga, TN. The partners located in Chattanooga are The Enterprise Center, the Chattanooga Public Library, and the Electric Power Board. We are also leveraging experts in the fields of environmental assessment and pollen distribution from the University of Texas – Dallas and the University of Tulsa.

Energy & Utilities

Project X: GigaBit SMART City Project (Highland, IL)

Smart utility meters solving demands for data, voice, and video

Can you imagine the impact on the world whereby everyone had premium access to the superhighway of information? The US Federal government and several private groups have partnered together to bring this innovation to reality for the City of Highland, Illinois and Tri-County Electric Cooperative in Hooker, Oklahoma.

The City of Highland is currently the only gigabit city in the state of Illinois with Internet access up to a gigabit of information. Developing an entirely new infrastructure is both costly and time consuming; therefore the solution is in leveraging the existing capabilities of the electric utility.

Project X is designed to seamlessly transform communities by allowing every citizen the advantage of exceptional connectivity like never before. Utility meters can be upgraded as "Smart Meters or Meter-less Meters" by linking into a wireless network to provide data, voice, and video into homes and businesses.

Imagine first responders having access to significantly more information before, during, and after an emergency, or millions of school children accessing pictures and videos from around the world in fractions of a second. Even the elimination of most electrical outages because of the ability to actively monitor, identify, and resolve issues before an outage could occur.

Additionally, Cyber Security will be an intrinsic component of Project X to protect data privacy and prevent unwanted intrusion, which will also expand to securing other utilities including water and gas.

SmartCity Utilities Infrastructure

Our initiative addresses smart solutions across water and lighting infrastructures. AT&T and IBM are coming together with Mueller, GE and Captiva to provide sustainable solutions.

Every year millions of gallons of water are lost through leaks in aged water pipes that date back to the turn of the century in cities around the world. Unaccounted for water is as high as 40% in cities around the world. The problem is that pipes were typically installed in the ground and information is unknown until leaks are reported, typically above the ground. Our demonstration scenario will use AT&T wireless network (LTE) infrastructure and inputs from sensory input sent to a smart dashboard. Sensors would be placed in the water distribution and fire protection infrastructure that will utilize wireless networks to send information such as pressure, temperature, and leak detection. Cities benefit by using sensors on fire hydrants and distribution infrastructure where leaks can be proactively located – instead of waiting for leaks to be reported.

With smart energy there is an opportunity to use smart lighting solutions to save energy and address smart cities applications such as video surveillance and parking and traffic management. The demonstration scenario will use AT&T wireless networks (LTE) infrastructure and inputs form smart lighting sensors for multipurpose applications. We will introduce a solution that not only is used for lighting control but also for other near applications such as traffic management, parking and video imaging and asset management.

Intelligent Connectivity & Smart Water Assets Management (Cincinnati, OH)

The Smart Water Assets Project brings together subject matter expertise from a utility (Greater Cincinnati Water Works), a system integrator (CH2M HILL), and a rapid prototype development and technology company (Qualcomm Technologies, Inc.). The program objective is to demonstrate how Smart Water Assets can fill a major gap currently existing in the water, wastewater & environmental industry effecting how utilities routinely collect, transmit, process, and use system and asset data, and how that data can be more effectively converted to "actionable" information for decision-making.

Smart Assets will mitigate longstanding challenges that are becoming more urgent, such as drought management. There are several different ways this will be done:

- ✓ Smart water assets will improve the ability of the utility to achieve a reduction of risk for unusual operational situations, such as the Elk River Chemical Spill.
- ✓ Use of the technology will enable water utilities to improve the management of water demand and supply and this will be particularly beneficial during times of drought.
- ✓ Smart water assets will enable utilities to better protect against environmental impacts. A primary example of this is use of the technology to provide advanced warning of sewage overflows thus enabling mitigative actions.
- ✓ Water and Wastewater utilities will have increased access to large data sets and information, and improved responses, which will result in better operational optimization, reduced operations and maintenance costs, and improved regulatory compliance.
- ✓ Use of the technology in modeling situations will result in lower lifecycle costs in achieving environmental outcomes, in capital cost reductions.

5D Smart San Francisco 2030 District (San Francisco, CA)

Buildings are responsible for 52% of the city's carbon emissions and 75% of the city's largest 2,000 commercial buildings fall within the boundaries of the 2.2 sq mi Area of Interest. While the local market benefits from the $1B that California utility ratepayers invest annually in energy efficiency incentives, ambitious building energy and green codes, and a large concentration of architectural and engineering talent, data about energy performance in buildings is a key missing ingredient. While Class A properties are well managed, governments, capital markets, real estate investors, property managers, commercial tenants, and even utilities lack comprehensive, granular, actionable data about the specific energy efficiency opportunities and solutions waiting to be tapped at the level of individual buildings and tenant spaces. And no single hub holds all of the information necessary to harness data in service of sustainability.

The principal goal of the 5D Smart San Francisco 2030 District project is to create that hub. This will make the necessary data and information easily available to building owners in the city in order to accelerate and expand investment in energy efficiency retrofits cost effectively and within a reasonable timeframe. The platform will serve as a collaboration tool for the city's major government agencies, private commercial buildings owners, academic institutions, energy management solutions providers, standards organizations, network and telecommunications companies, and energy retrofit finance firms to work together in ways they never have before. Use of the platform will accelerate awareness and adoption of best practices and best-in-class energy management solutions in the industry.

Energy Storage based Adaptive Demand Response in Smart Commercial Buildings (NYSERDA)

The objective of the project is to develop and demonstrate how battery electrical storage can be used synergistically in conjunction with a commercial building's other demand response (DR) capabilities, namely curtailment (e.g., modified temperature set points, light dimming) and load shifting (e.g., pre-cooling). The overarching aim is to simultaneously reduce grid stress, the need for environmentally and economically disadvantageous peak generation capacity, and building' ownership cost. This will be achieved by optimizing arbitrage savings in DR tariffs versus storage equipment cost, while monitoring building comfort as a constraint. It is hypothesized that strategic battery dispatch in coordination with other DR capabilities can increase the magnitude and duration of load reductions, thus significantly lowering electric bills, while improving the building's capability to maintain occupant comfort and services during such reductions. The project outcome will be a complete pre-commercial energy storage and building management device that integrates mechanical and electrical systems to provide load-shedding and energy storage assets. The device will leverage existing control features of advanced commercial building automation. It will be optimized and tested on actual tariffs. The project team will also evaluate the costs and benefits of conducting a full demonstration in a commercial building in New York City. The project team consists of Urban Electric Power (Lead), Siemens Corporation Corporate Technology, Columbia University, and City University of New York, NY-BEST.

Distributed Mobile Storage for Resilience – Plugin Electric Vehicles (PEVs)

The project will demonstrate an integration of multi-directional charging and load prioritization between stationary and mobile storage devices, power grids and microgrids. The overarching goal of the project is to demonstrate a system designed to be both economically sustainable during normal operations and provide for electricity resilience during electrical outages.

Demonstrating grid scale power levels and PEV integration in Washington DC; in Gulu, we use other mobile storage devices, like computers and phones, as proxies (and to demonstrate flexibility of the algorithms) to stress the algorithms in an environment that experiences numerous and extended grid failures.

We will demonstrate the impact of charging optimization algorithms using up-to 4 charging ports at the DC EcoDistrict site. Two of these ports will be reserved for fleet vehicles; the remaining 2 ports will be available for commercial customers. The typical mechanism for charging is first come first serve. We will implement algorithms that better meet customer needs and more efficiently use available power and energy.

Initial deployment will likely consist of one or more charging stations located within the EcoDistrict and in Gulu, where we will implement charging algorithms related to the use of laptops, cellphones and a water pump. The fragile grid in Gulu offers the opportunity to demonstrate the algorithms in an environment with 100s of hours of electrical outage per month.