SmartAmerica & Global City Teams Challenge

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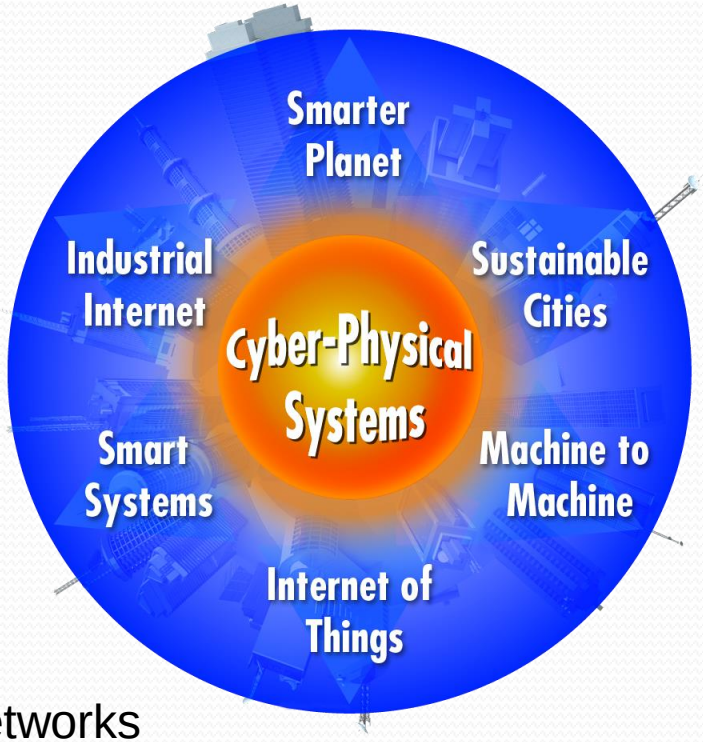
Cyber-Physical Systems (CPS)

- Integrated, hybrid networks of cyber and engineered physical elements
- Co-designed and co-engineered to create adaptive and predictive systems
- Respond in real time to enhance performance



Examples:

- Internet of Things (IoT)
- Emergency Response Networks
- Smart Robots/UAVs
- Autonomous Vehicles & Traffic Management Networks
- Smart Grid
- Network-enabled Healthcare Solutions
- Advanced Manufacturing Plants

Summary of the SmartAmerica Challenge - Smart America Expo, June 2014

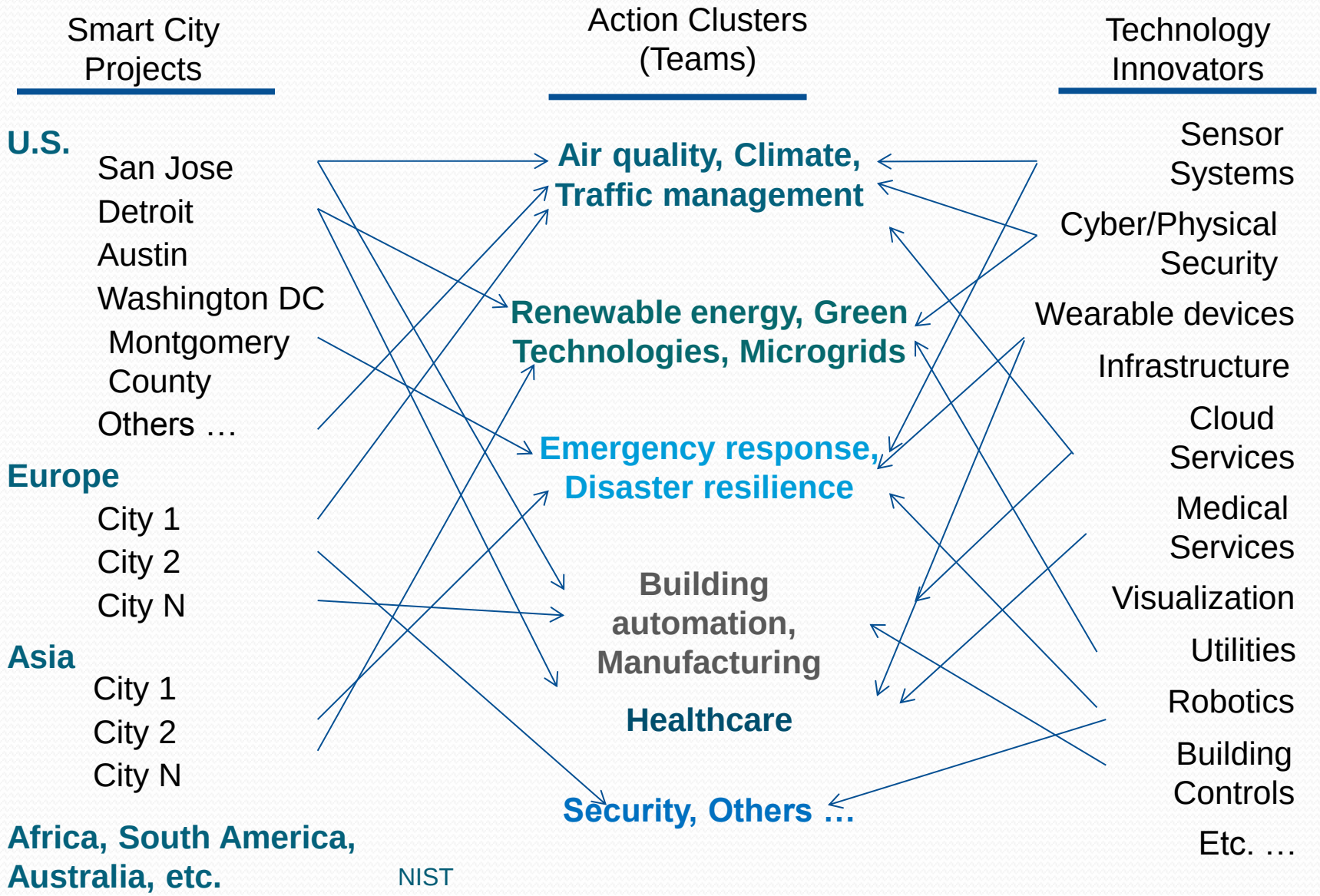
- SmartAmerica Preview event at the White House on June 10, 2014
  - 6 example team presentations plus 3 lightning talks.
  - Keynote by Dr. John Holdren, Assistant to the President and Director of Office of Science and Technology Policy, Executive Office of the President

- SmartAmerica Expo on June 11, 2013
  - All 24 teams presented and demonstrated
  - 8 invited speakers including:
    - Todd Park, US Chief Technology Officer
    - Dan Tangherlini, Administrator of GSA
    - Aneesh Chopra, Former US CTO
    - Conor Maddry, 11th Grade Student, Winner of SmartAmerica Award at Intel International Science and Engineering Fair
  - 800+ attendees
  - Many teams will continue development and deployment

Next Challenge: Opportunity for Smart Cities "Global City Teams Challenge"

- Smart Cities/Communities are increasingly turning to advanced technologies to improve services, promote economic growth, and enhance the quality of life.
- Many IoT/CPS 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 end users.
- Current deployments of IoT/CPS are fragmented lacking interoperability and standards.
- Many smart community efforts are one-off projects with heavy emphasis on customization and inadequate consideration for future upgradability and extensibility, which end up causing increased cost and inefficiency. As a result, many Smart Cities/Communities deployments are isolated and do not enjoy the economy of scale.

The Approach



Current Partners include:

- US-Ignite
- National Science Foundation
- International Trade Administration
- US Department of Transportation
- US Department of Health and Human Services
- US Department of Energy
- IBM, Intel, Qualcomm, Cisco, ARM Holdings, GE, Juniper Networks
- Many other corporations and academic institutions are participating

Current Participating Cities include:

- Portland, OR
- Annapolis, MD
- Greenville, SC
- Ammon, ID
- Chicago, IL
- Montgomery County, MD
- Columbus, OH
- Chattanooga, TN
- New York, NY
- Washington, DC
- San Francisco, CA
- Kansas City, MO
- Metropolitan Washington Council of Governments (Observer)
- In discussions with cities in UK, Holland, Spain, Poland, India, Korea, Japan, South Africa, and others
- Currently more than 30 teams

Lower Manhattan's Smart Neighborhood Pilot

Technical Specifications

- Sensors including air quality, noise, light, and/or motion sensors will be integrated into the current infrastructure of connected trash compactors and recycling bins ( )
- Information/data being outputted by these sensors would be collected wirelessly through a central system that would allow users to obtain and manipulate the data

Location

Lower Manhattan - Using the Downtown Alliance's free public Wi-Fi network and 174 connected trash compactors and recycling bins

What

Providing real-time data for city planners, businesses, academia, and entrepreneurs to better understand how the city, and its population, is changing over time

How

Develop a sensor data network that will monitor air quality, traffic patterns, noise levels, and/or sunlight

Why

Address Priorities of the DeBlasio Administration such as:

- Data that leads to the reduction of Pedestrian Deaths
- Data that helps understand and improve Air Quality
- Data that improves the City's resiliency planning

Optimize Urban Development and Livability such as:

- Traffic information of pedestrians, bikes, cars, or trucks to better understand urban mobility
- Increase livability by monitoring Air Quality, Sunlight, and/or Noise Pollution

Downtown Alliance

EVERYTHING HAPPENING IN LOWER MANHATTAN

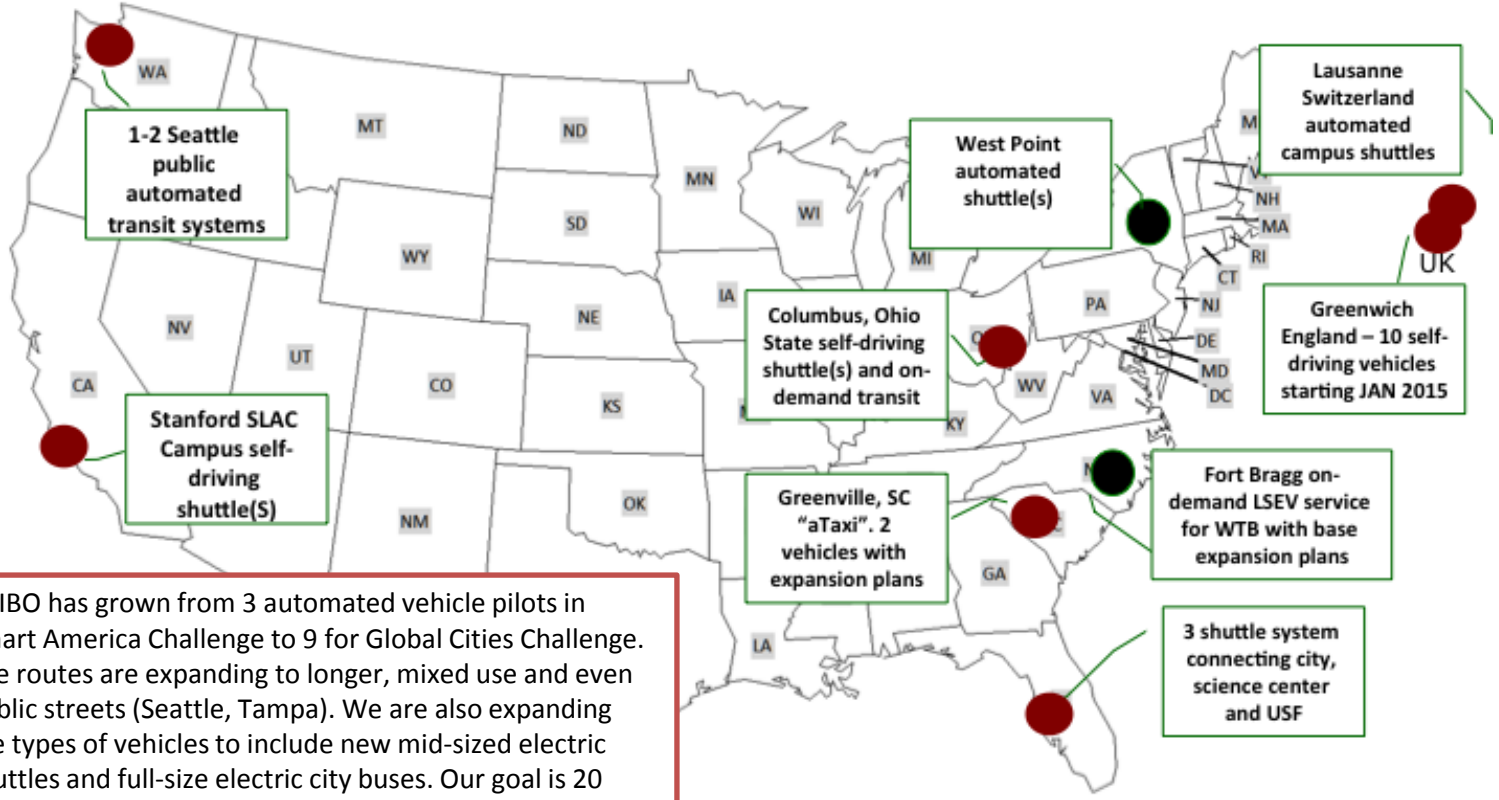
NYCEDC

New York City Economic Development Corporation

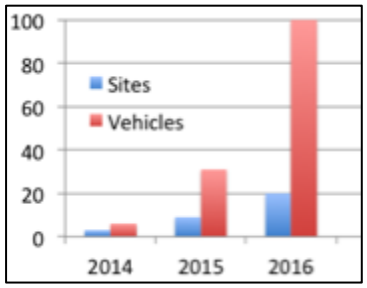
ARIBO

ARIBO marries technology and operational context to demonstrate and experiment with autonomous vehicle systems in real-world, semi-controlled environments. It is a *practical-to-tactical* approach that will guide the U.S. application of, and investment in, robotic technologies and automated vehicle policy. ARIBO is the U.S. self-driving living laboratory…

GLOBAL CITIES CHALLENGE 2015



ARIBO has grown from 3 automated vehicle pilots in Smart America Challenge to 9 for Global Cities Challenge. The routes are expanding to longer, mixed use and even public streets (Seattle, Tampa). We are also expanding the types of vehicles to include new mid-sized electric shuttles and full-size electric city buses. Our goal is 20 sites and at least 100 vehicles by 2017.



COMET
HEVO POWER
DEPARTMENT OF TRANSPORTATION
UNITED STATES GOVERNMENT
EPFL
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
FHWA
UNIVERSITY of SOUTH FLORIDA 1956
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
OHIO STATE
AUTONOMOUSTUFF
CVPC Connected Vehicle Proving Center
UNIVERSITY OF MICHIGAN-DEARBORN
veeo
NREL
NATIONAL RENEWABLE ENERGY LABORATORY
MOSI
CUICAR
unicor
oxis ENERGY
Next Generation Battery Technology





SCALE
Safe Community Alerting Network
Phase Two

Applications built on IoT | Applications built on IoT | SCALE Safe Community Alerting Network | Applications built on IoT | Applications built on IoT

Open and Interoperable Platform (The Internet of Things)

Proprietary platform conforming to industry standard | Proprietary platform conforming to industry standard | Proprietary platform conforming to industry standard | Open platform conforming to industry standard

Diverse forms of connectivity





Public Sector Apps built on the IoT.

Identify existing open standards and protocols that will allow varying devices to share their data securely.

A diverse ecosystem of IoT products make up a real world test bed. Many use cases will be demonstrated.

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, EIC Data, IoT DC, Captiva, Earth Networks, Victory Housing and more to come

- The City of San Francisco expects to incur an estimated $62 billion in climate-related infrastructure damage by the middle of the 21st century.
- Buildings are responsible for 52% of the city's carbon emissions, a major cause of climate change.
- 75% of the city's largest 2,000 commercial buildings fall within the boundaries of the San Francisco 2030 District.
- Despite progressive green building codes, capital markets, real estate investors, property managers, commercial tenants, and even utilities lack comprehensive, granular data about the specific energy efficiency opportunities and solutions.
- 5D Smart San Francisco 2030 District will serve as a hub making necessary data and solutions easily available to building owners in the city in order to accelerate and expand investment in energy efficiency retrofits.

5D SMART SAN FRANCISCO 2030 DISTRICT

CITYZENITH
DATA VISUALIZATION PLATFORM

SF Environment
Our home. Our city. Our planet.
MUNICIPAL GOVERNMENT DEPARTMENT

C40 CITIES
CLIMATE LEADERSHIP GROUP
GHG STANDARDS NETWORK

verizon
SMART CITY PLATFORM PROVIDER

HELIOS Building Efficiency
BUILDING ENERGY RETROFIT FINANCE

STREETLIGHTDATA
TRANSPORTATION EMISSIONS ANALYSIS

BERKELEY LAB
LAWRENCE BERKELEY NATIONAL LABORATORY
BUILDING ENERGY RETROFIT ANALYSIS

echoMESH
BUILDING ENERGY CHANGE MANAGEMENT

A 3D data visualization platform project mapping building energy usage and GHG emissions data to a 3D model of downtown San Francisco that will empower building owners with the information and tools they need to make their buildings more energy efficient.

Energy Storage based Adaptive Demand Response in Smart Commercial Buildings

Objective:

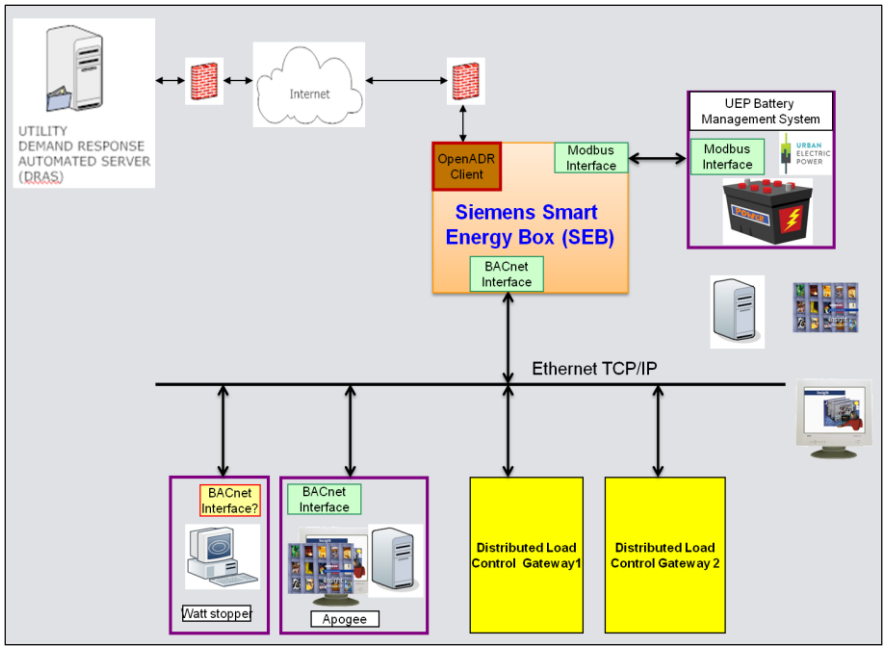
To develop and demonstrate how battery electrical storage can be used synergistically in conjunction with a commercial building's other DR capabilities.

Impacts:

- Reduce grid stress and rate payer cost
- Spur technology innovation
- Reduce environmental impacts
- Improve grid reliability

Domains/Sectors:

- Advanced battery technology
- Smart grid and smart building systems
- Building-based cyber physical systems and relevant control algorithms



URBAN ELECTRIC POWER RECHARGE. RENEW. RECYCLE.™ SIEMENS COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK NY BES+ NEW YORK BATTERY AND ENERGY STORAGE TECHNOLOGY CONSORTIUM CUNY The City University of New York

SERS 2 (Smart Emergency Response System)

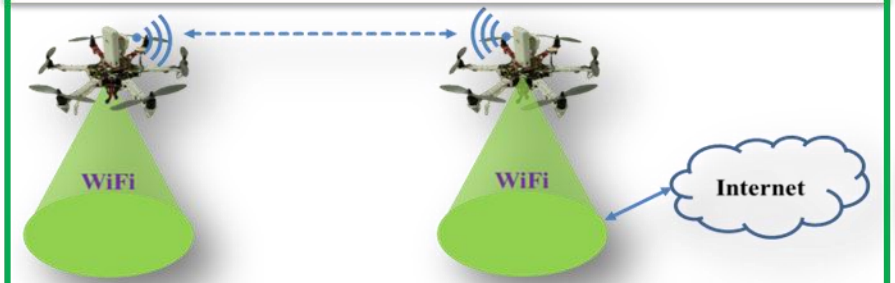
GLOBAL CITY TEAMS CHALLENGE

Drone Wi-Fi

Robust communication

Practical drone system design

On-Demand Communication Infrastructure



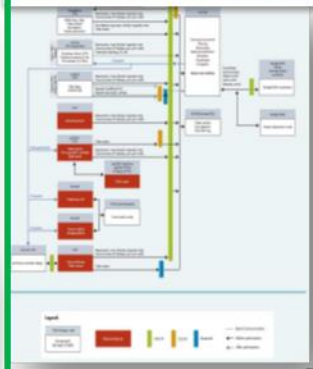
To connect cyber-physical technologies with humans in the loop to save lives, rescue people, and attend to their critical needs when disaster strikes.

- Seamless integration with existing emergency response system
- Mature on-demand drone-carried communication infrastructure
- Support of missions for first responders, rescue robots, and mission command and control centers
- Real-world deployment and testing

First Responders, Survivors, and Rescue Robots

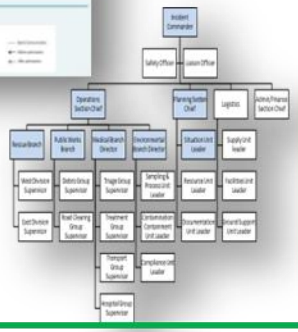
Autonomous rescue robots

Mission Command and Control



Optimized mission planning & resource deployment

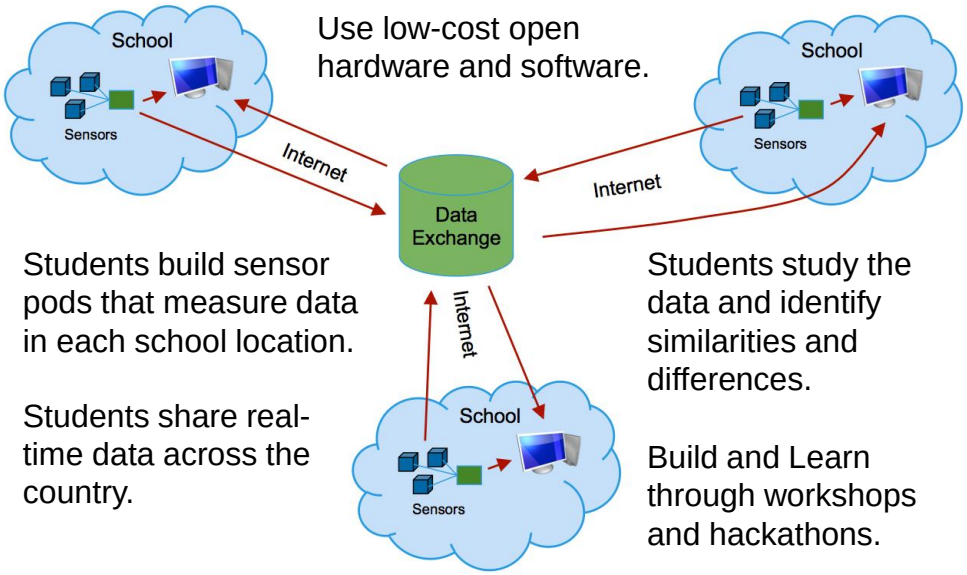
Agent-based Incident Command System



University of North Texas | Mathworks | HumanoidWay | Worcester Polytechnic Institute | Wright State University | Myth Innovations | Emergency Preparedness Department of the North Central Texas Council of Governments
Contacts: yan.wan@unt.edu; shengli.fu@unt.edu; dr.justyna.zander@ieee.org

Bringing Internet of Things Know-How to High School Students

Today's students will be building the smart cities and communities of tomorrow.
The time to start learning is now.



Use low-cost open hardware and software.

Students build sensor pods that measure data in each school location.

Students share real-time data across the country.

Students study the data and identify similarities and differences.

Build and Learn through workshops and hackathons.

Why?

- Strengthen STEM education and interest
- Learn about open hardware and software
- Learn to program hardware and sensors
- Learn how to share and analyze data
- Consider ways to leverage high-speed connectivity where available

IoT DC Internet of Things DC | IōT Dev Labs | Arlington Virginia USA | VirginiaTech National Capital Region | Innovation Program Montgomery County, Maryland | + Students, High Schools, Educators and Volunteers

Future Events

- Webinars for Q&A and additional team forming
- Potential regional meetings/events
- **February 12-13, 2015 at NIST: Tech-Jam**
  - Present the progress of the teams/clusters
  - Form additional teams/clusters
  - Collect the needs on standardization and metrics
  - Discuss Smart Cities Framework, IoT Global Connectivity Fabric Framework
- Summer 2015: Global City Teams Festival(s)

Anticipated Outcomes of the Challenge

- Increased publicity for the impact of replicable and scalable Smart City/IoT projects
  - Global City Teams Challenge Festivals
- Establishment of a Smart Cities Framework
  - Informed by the record established by the Challenge, address standards and measurement challenges in deploying IoT and CPS in Smart Cities/Communities to serve as the basis for framework
- Initiation of a IoT Global Connectivity Fabric Framework
  - Based on the inputs from the participants and the outcome of the Challenge, initiate architectures guidelines for interconnected "systems of systems" and a common data exchange/data analytics model for large scale IoT deployments.

For More Information

- Contact
  - Sokwoo Rhee (sokwoo.rhee@nist.gov)
- Challenge web site: Meet and join the action clusters
  - www.globalcityteams.org
- NIST information site
  - http://nist.gov/cps/sagc.cfm
- Social Media
  - Twitter #globalcityteams
- Webinar replay – Introduction to Global City Teams Challenge
  - http://www.nist.gov/cps/global-city-teams-challenge-webinar.cfm
- Webcast replay of the kick-off event
  - http://www.nist.gov/cps/global-city-teams-challenge-webcast.cfm
- SmartAmerica Round One web site
  - http://www.smartamerica.org/