Blueprint for Current and Future Smart Cities

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Computing Research: Addressing National Priorities and Societal Needs Washington, D.C. 23-24 October 2017



The future ain't what it used to be.

- Yogi Berra



Computing Research: Addressing National Priorities and Societal Needs

- Security & Privacy
- Security & Safety
- Artificial Intelligence
- Algorithms & Efficiency

- vs. Accessibility & Convenience
- vs. Open Democratic Society
- vs. Human Abilities & Character
- vs. Fairness & Equitability



Security & Safety

Artificial Intelligence

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- Security & Privacy vs. Accessibility & Convenience
 - vs. Open Democratic Society
 - vs. Human Abilities & Character
- Algorithms & Efficiency vs. Fairness & Equitability
- Progress/Growthvs.SustainabilityTechnology R/evolutionvs.Quality of Life (Individual / Societal)



Security & Safety

Artificial Intelligence

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Natural Environment





Built Environment

Cities / Infrastructure Engineered Systems Transportation

Natural Environment



Social Environment

Communities / Organizations Social & Economic Activities Communication





Built Environment

Cities / Infrastructure Engineered Systems Transportation

Natural Environment



Cognitive / Information Ecosystem

Model / Understand Environments Interact with Features Manage Relationships



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"Research for a Reason"







The NIMSAT Institute seeks to enhance the resiliency of the United States by conducting research, building publicprivate partnerships, and developing advanced technologies to support the first responder and homeland security communities, and contribute to the mission of saving lives and mitigating the consequences of natural and human-caused disasters.

UL Lafayette



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| Donation Information | improving the ability of Louisana businesses and non-portills to prepare for, respond to, and recover term natural and human-caused distances, and to marrian the stability, resilence and economic |
| Volunteer Information | recovery of their communities. |
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Louisiana Business Emergency Operations Center

A Public / Private Sector Partnership and Information-Sharing Portal to:

- Establish Situational Awareness across public and private sectors
- Support State disaster recovery when public resources are exhausted.

And a resource to enable businesses to

- PROVIDE information
- OBTAIN information
- Identify REQUIREMENTS
- Provide RESOURCES



www.labeoc.org



EXECUTIVE DEPARTMENT

PROCLAMATION NUMBER 111 JBE 2016

STATE OF EMERGENCY - HEAVY RAIN AND FLOODING

- WHEREAS, the Louisiana Homeland Security and Emergency Assistance and Disaster Act, La. R.S. 29:721, et seq., confers upon the Governor of the State of Louisiana emergency powers to deal with emergencies and disasters, including those caused by fire, flood, earthquake or other natural or manmade causes, in order to ensure that preparations of this State will be adequate to deal with such emergencies or disasters and to preserve the lives and property of the people of the State of Louisiana;
- WHEREAS, when the Governor determines that a disaster or emergency has occurred, or the threat thereof is imminent, La. R.S. 29:724(B)(1) empowers the Governor to declare a state of emergency by executive order or proclamation, or both;
- WHEREAS, a flash flood watch is in effect for all of southeastern Louisiana until at least Saturday morning, with rainful accumulations of seven to ten inches likely, with some areas expected to receive more;





East Baton Rouge: Between I-12 and Florida Blvd. West of Amite River

Civil Air Patrol











Weather Forecast for Sun, Aug 14, 2016, issued 4:08 PM EDT DOC/NOAANWS/NCEP/Weather Prediction Center Prepared by Krekkeler based on WPC, SPC and NHC forecasts







2017 Hurricane Season



Hurricane Irma (+ Jose and Katia) 5-10 September

Hurricane Maria 18-24 September

Surface Wind Field of Hurricane Maria Winds as of 200 PM AST Tus Sep 19, 2017 Advisory Number 14A





Hurricane Harvey 24-28 August







Hurricane Nate 4-8 October

Hurricane Harvey 24-28 August Corpus Christi / Port Aransas / Houston

















http://www.cnn.com/2017/09/04/us/hurricane-harvey-from-corpus-christi-to-houston/index.html https://www.dallasnews.com/news/photos/2017/08/29/aerial-photos-show-storm-damage-harvey-corpus-christi https://www.cbsnews.com/pictures/hurricane-harvey/71/





Key West

Hurricane Irma 5-10 September













Havana, Cuba



Charlotte Amalie, St. Thomas



Task Force 1 Search and Rescue Teams staging in Warner Robbins AFB, GA

https://www.fema.gov/media-library/assets/images/138308# http://www.nydailynews.com/news/hurricane-gallery-1.3474735



AREALER!



Saint Maarten

Hurricane Maria

18-24 September



Hurricane Watch Tropical Storm Watch

Humicane Force Tropical Storm Force

https://www.theguardian.com/artanddesign/gallery/2017/sep/26/puerto-rico-after-hurricane-maria-in-pictures















A flooded street is seen in Mobile, Ala., on Oct. 8, in this still image taken from a video obtained from social media.



Workers gather near a highway collapsed by Hurricane Nate in Casa Mata, Costa Rica, on Oct.



People walk next to an area destroyed by a landslide caused by heavy rains during Tropical Storm Nate in the Los Anonos neighbourhood of San José, Costa Rica, on Oct. 6. EZEQUIELBECERRA/AFP/Getty Images



http://www.mercurynews.com/2017/10/09/maps-napa-wildfire-santa-rosa-evacuation-area/

https://www.washingtonpost.com/news/post-nation/wp/2017/10/09/these-images-show-the-devastation-caused-by-californias-deadly-wine-country-fires/



Las Vegas mass casualty shooting 1 Oct 2017

http://www.cnn.com/2017/10/05/us/las-vegas-shooting-investigation/index.html



Barcelona terrorist attack 17 Aug 2017

https://www.cnbc.com/2017/08/18/in-pictures-deadly-terrorist-attacks -in-barcelona-and-cambrils-spain.html



This graphic shows where the explosion took place, in the foyer area, leading towards Victoria railway station

Manchester terror attack 22 May 2017

http://www.dailymail.co.uk/news/article-4532890/Was-Manchester-suicide-bomber-terror-network.htmJ **PUBLISHED:** 02:39 EDT, 23 May 2017 | **UPDATED:** 09:54 EDT, 23 May 2017 http://www.telegraph.co.uk/news/0/manchester-terror-attack-everything-know-far/





http://www.nlc.org/resource/state-of-the-cities-2016

Top 10 Issues





https://pages.nist.gov/GCTC/

A SuperCluster

is a multi-dity, multi-stakeholder collaboration organized around a common smart dity project, goal, objective or shared solution. SuperClusters work together to produce, a blueprint that cities and communities around the world can leverage as the foundation to build their own smart city strategies.

Currently there are seven major SuperClusters:



• GLOBAL CITY • TEAMS CHALLENGE

SuperClusters and ActionClusters are making a lasting impact in these benefit areas:

SAFETY

Enhancing safety and security of citizen's lives and property

MOBILITY

Creating greater reliability and efficiency for travelers and freight in all modes of transportation

EQUITY

Driving attordable and reliable solutions that address critical issues including poverty, unemployment and access to health care and education.

SUSTAINABILITY

Developing environmentally friendly and energy efficient urban solutions using renewable resources.

JOB CREATION

Growing the economy, entrepreneurship and job creation in existing and new business sectors.



national and local experience and identifying gaps that need to be fulfilled.

 National Institute of Standards and Technology Technology Administration, U.S. Department of Commerce



GCTC Smart City SuperClusters

Blueprint for Public WiFi SuperCluster Lead City: San Leandro, California

Blueprint for Improving First and Last Mile Connections for Transit and Freight Lead City: Portland, Oregon

Designing a Smart City Data Platform: Civic Internet of Things Technologies Lead City: Kansas City, Missouri

Framework for Sustainable Public Utilities: Energy, Water and Waste Solutions Lead City: Atlanta, Georgia

Blueprint for Smart Public Safety in Connected Communities

Lead City: Washington, D.C.

SuperClusters in Development:

Healthcare Agriculture and Rural Areas Data Governance and Exchange

https://pages.nist.gov/GCTC/super-clusters/



Public Safety SuperCluster



Blueprint for Smart Public Safety in Connected Communities

GCTC Exposition Washington, D.C. 28-29 August 2017







• GLOBAL CITY • TEAMS CHALLENGE

Blueprint for Smart Public Safety in Connected Communities

An Initiative of the Global City Teams Challenge

August 28, 2017

https://pages.nist.gov/GCTC/super-clusters/







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The Public Safety SuperCluster (PSSC) is a public-private partnership dedicated to identifying technologies, processes and strategies to enhance public safety and resilience within smart and connected communities, and improve the preparedness, response and recovery of modern society from the complex challenges, hazards and risks that threaten local and regional stability.

The broad goal of the PSSC is to develop, integrate and pilot technology applications and test new operating procedures and employment methods in collaboration with first responders, public safety officials, and government agencies, to improve situational awareness before, during, and after a civil emergency in order to protect human life, maintain community functions and infrastructure, and ensure public safety.

The PSSC aims to improve policies and procedures for integration of advanced communications methods and decision systems to enhance interagency planning and coordination of resources within smart and connected communities. The PSSC focuses specific attention on the integration of current and future Internet of Things (IoT) technologies to build resilience and sustainability into the technology ecosystem that comprises smart, connected communities.





Smart Public Safety Action Clusters

Alameda / San Francisco, CA Conover, NC Denton, TX / UNT / PSU Fairfax County, VA / GMU Genoa / Milan / Torino, Italy Lafayette, LA / UL Lafayette Las Vegas, NV Montgomery County, MD Nashville, TN Newport News / VA Beach, VA North Central Texas COG **Orlando**, FL Ronart / Santa Rosa, CA San Francisco, CA Taichung City, Taiwan Wakayama / Nagano / Miyagi Prefectures, Japan Washington, DC

AI-based Emergency Preparedness GEO Fencing Predictive Policing Solutions Deployable Communications & Incident Command Multi-Team Coordination & Analysis Open Platform for Smart City Disaster Prevention Louisiana Business Emergency Operations Center **IoT for Preparing Underserved Communities** Safe Community Awareness and Alerting Network **Integrated Analytics & Scheduling of First Responders** Storm Sense Inundation and Flood Prediction Modeling **Smart Emergency Response System** Video Analytics for Public Safety during Special Events **Advanced Flood Warning & Environmental Awareness** Mobile Micro-Grids for Disaster Resilience **Community Traffic Control for Disaster Response** NerveNet Regional Resilience IoT Platform

Cyber City Education Platform





TEAMS CHALLENGE



GCTC Smart City SuperClusters Common Themes

- 1. Develop the strategic plan and a common sense architecture for implementation before embarking on a Smart City technology development program.
- 2. Leverage existing and proven technologies and problem solutions before engaging in an expensive R&D effort, only to learn that your solution repeats earlier successes.
- 3. Understand that organizational and, often, cultural change will accompany any new or innovative technology adoption, and that change management starts at the top.
 - Ask the right questions
 - Identify the real problems
 - Define resources required and available

https://pages.nist.gov/GCTC/

https://pages.nist.gov/GCTC/super-clusters/







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- Security & Safety <u>and</u> Democratic Society
- Artificial Intelligence and Human Abilities & Character
- Algorithms & Efficiency and Fairness & Equitability
- Progress/Growth <u>and</u> Sustainability
- Technology R/evolution and
- **Quality of Life (Individual / Societal)**

Blue-Sky Days and Dark-Sky Days



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Cognitive / Information Ecosystem

Model / Understand Environments Interact with Features Manage Relationships



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Simulation of the August 2016 Historic Flood Event: Sample Results

1-D Model along the Amite River & 2-D Model for the lower region of the system

Emad Habib, PhD, PE Professor and Endowed Chair, Department of Civil Engineering Associate Director, Institute for Coastal and Water Research University of Louisiana at Lafayette



"Research for a Reason"





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Water Surface Elevation along the Main Channel



Preliminary validation for the 2-D model





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Built Environment Cities / Infrastructure Engineered Systems Transportation

Natural Environment Geography / Terrain Climate / Weather

Biosphere

Cybersecurity Risks of EV Charging

Raju Gottumukkala, Ph.D

Director of Research, Informatics Research Institute Site Director, NSF Center for Visual and Decision Informatics Assistant Professor, College of Engineering

2017 Internet2 Global Summit (04/25/2017)







Charging a Plug-in Electric Car



resources.

EVSE to EV Communications



Communications

Fingerprinting Algorithms to uniquely identify devices and vehicles



- The DSM system senses the closest EVSE using Bluetooth Energy
- DSM senses closest EVSE using Bluetooth Low Energy
- DSM associates with EVSE using WPA-2 Protected WIFI
- 4) DSM sends security snapshot to EVSE
- 5) EVSE forwards security snapshot to BEMS
- 6) BEMS (or operator) makes decision to allow/deny charging
- 7) EVSE allows or denies charging



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How does a community transcend a crisis?



Who are the key actors in the recovery from a crisis?





Who were the key actors in creating a crisis?



Figure 3 - All Nodes within 2 steps / degrees of original suspects

What does the leadership map of a community look like?





Assessing Community Resilience through Integrating and Modeling Human Geography

Objectives:

- 1. Conduct an analysis of the impact of a crisis on a community's social, economic, communications, and influence networks
- 2. Develop a GIS-based analysis tool for mapping social networks, communications channels, socio-economic relationships, and community leadership networks.







Assessing Community Resilience through Integrating and Modeling Human Geography

RESEARCH TEAM:

- NIMSAT Institute: Public safety, law enforcement, emergency management, and first responders
- Moody College of Business: Economic impact of the incident and the ensuing investigation
- The Picard Center: Social and psychological consequences for children and families
- Office for Campus Diversity: Impact on social networks within the University community
- Department of History & Geography: Historical perspective on firearms-related violence in the U.S.
- Acadian Ambulance Service: Operational perspective on response and incident command
- United Way of Acadiana: Response of the non-profit and faith-based communities
- Water Institute of the Gulf: Geospatial display of social vulnerability and risk







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