GCTC Objectives

- Establish and demonstrate replicable, scalable and sustainable smart city models

- Demonstrate measurable benefits to residents

- Enable measurement science for smart city technologies

Over 160 Participating Cities and Communities

- Genova, Milano, Torino, Perugia (Italy)
- Amsterdam (Netherlands)
- Coruna, Valencia (Spain)
- Saint-Quentin (France)
- Saitama (Japan)
- Shirahama (Japan)
- Abuja City, Obia-Akpor City (Nigeria)
- Busan, Seoul, Daegu (Korea)
- Portland, OR
- Newport News, VA
- Greenville, SC
- Raleigh, NC
- Montgomery County, MD
- Winooski, VT
- San Mateo County, CA
- New York, NY
- Washington, DC
- Columbus, OH
- Kansas City, MO
- Nashville, TN
- Austin, TX
- www.globalcitychallenge.org for the full list

And, over 400 companies, universities, non-profits, government agencies

GCTC Partners

GCTC Process

- Form teams of cities with shared goals

- Ask city teams to describe their common needs and success measures

- Pair city teams with teams of innovators from industry and academia to develop solutions (= Action Clusters)

- Combine Action Clusters in the same area to form Super Clusters – Transportation, Public Safety, WiFi Access, etc.

GCTC Structure
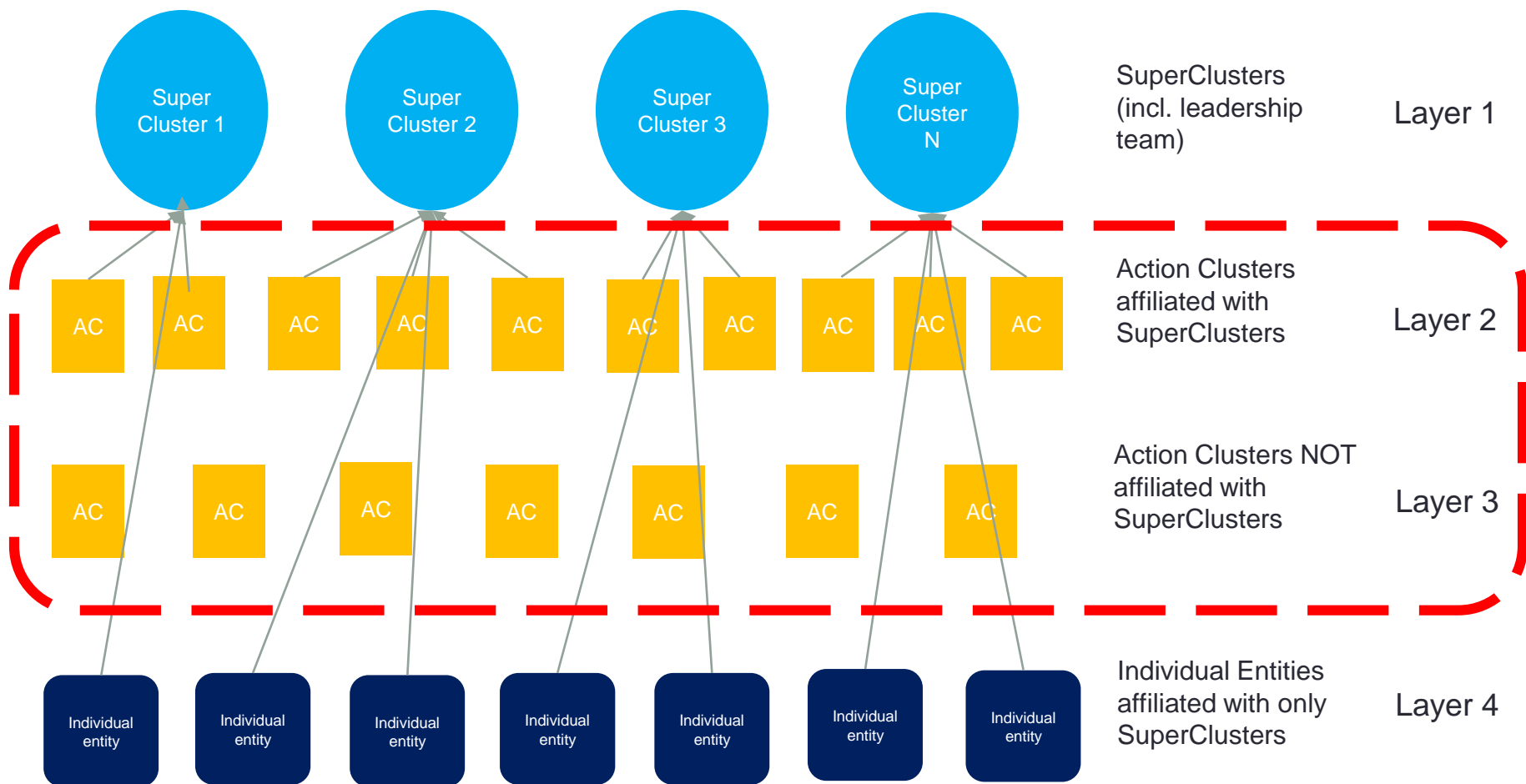
StormSense Project

Forecasting Flooding from Storm Surge, Rain, and Tide

Partners (as of April 2016):

Newport News — Where Great Things Are Happening

VIMS — William & Mary — Virginia Institute of Marine Science — 75 years

HAMPTON VA

THE CITY OF PORTSMOUTH

THE CITY OF NORFOLK

VB — Virginia Beach

City of CHESAPEAKE Virginia

York County VIRGINIA

CITY OF WILLIAMSBURG

CHRISTOPHER NEWPORT UNIVERSITY

WETLANDS WATCH — Protecting and Conserving Wetlands

VDH — Virginia Department of Health — Healthy People in Healthy Communities

(((SCALE: Safe Community Alert Network)))

Extending the Internet of Things to Everyone: Residents of an affordable housing complex who cannot otherwise afford broadband are given smart community sensors. A resident, possibly elderly, is in distress and the sensor sends a signal to the nearest base station.

County Facility Equipped with Antenna

Cloud-based public safety awareness and alert system

Dispatch Center

Emergency validated via mobile device; alert is sent to the dispatch center and a first response unit is sent to the resident in distress.

Within minutes first responders arrive without any need for manual action by the person in distress

ARIBO Robotic Vehicle CPS Test-Beds in 2014

Smart America Challenge Event

Demo

- Navia Ride – 12 mph of automated awesome will shuttle VIPs at the Smart America Event: Routes TBD
- Viewing station to remotely monitor vehicle location, speed, and diagnostics
- ARIBO Overview and Impact Discussion – Delivered by one of the ARIBO team members
- Team Member Testimonials – live or recorded (options):
  - DOT leadership and/or imitate – what will building robotic vehicles do for his/her future
  - SLAC operations team – Why did they choose an automated system
  - West Point Leaders and/or Cadets, in-kind Leadership
  - NASA
  - ROEC – How and why did they come up with ARIBO

What is the latest Navia?

navia
The 100% Driverless & 100% Electric Shuttle System

Mobile CPS Test-Bed

Who is Collaborating?

Team ARIBO
- US Army
- TARDEC
- Indust.
- NASA
- Stanford
- SLAC
- DOE
- DOT
- West Point
- Connet
- DARPA
- UTARI
- FHI

How is it Manufactured?

unicor

How is it being Tested?

Stanford SLAC Campus | West Point

Capabilities being Tested

ARIBO CPS Test-Beds Impact

High-Growth Industries	New Jobs	New Markets	Manufacturing
	Engineers, Roboticists, Programmers, Technicians, Operators, Cyber Security		Platform (vehicle), Accessories, Batteries

ARIBO CPS Test-Beds 2014 Timeline

APR 2014 → SON → JUL → AUG/SEP → OCT → 2015

Corey Clothier / coreyclothier@gmail.com

Vehicle-to-Pedestrian CPS Safety Concept

14% of U.S. traffic fatalities were incurred by pedestrians in 2011

Honda & Qualcomm collaborated to extend existing V2V development to the new area of vehicle-to-pedestrian (V2P) safety

HONDA   **Vehicle-To-Pedestrian** Cooperative Safety Application   **QUALCOMM**

Enhanced Water Distribution Infrastructure Enabled by Cellular-Based CPS

Conservation * Security * Environmental Benefits * Lower Cost

QUALCOMM
CH2MHILL

EVENTS

Water Contamination | Drought Management | Leak Detection | Water Quality

USING Cyber Physical Systems (CPS) / M2M to manage our water system means...

Aqueduct → Water Treatment Facility → Pump Station-Distribution → Water Distribution → Result

Real-time monitoring and control, addition of fewer chemicals, accident prevention, faster response to contamination or other events, better leak detection to minimize losses, safer and more secure water that costs less

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Lower Manhattan's Smart Neighborhood Pilot

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

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

EVERYTHING HAPPENING IN LOWER MANHATTAN   **NYCEDC**
New York City Economic Development Corporation

- 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
MUNICIPAL GOVERNMENT DEPARTMENT

C40 CITIES
GHG STANDARDS NETWORK

verizon
SMART CITY PLATFORM PROVIDER

HELiOS
BUILDING ENERGY RETROFIT FINANCE

STREETLIGHTDATA
TRANSPORTATION EMISSIONS ANALYSIS

BERKELEY LAB
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.

Greenville Smart City Vision

SERS 2 (Smart Emergency Response System)

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

NIST

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
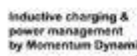
GEOLOCATED ALLERGEN SENSING PLATFORM

GASP

Four objectives:

1. Develop and deploy an array of Internet of Things remote airborne particle sensors within Chattanooga to be used to provide real-time streamed data on hourly particulate levels, both pollen- sized (10-40 micron) and smaller (<2.5 micron) particles.
2. Deploy an in-situ pollen air sampler in Chattanooga to identify specific pollen types.
3. Merge locally streamed data with already-collected, satellite-based NASA data to complement and enhance the newly-collected particulate data and generate Chattanooga-focused particulate maps.
4. Develop web-based visual tools to provide real-time pollen and smaller particle alerts to end users such as asthma patients, health institutions, and businesses and other institutions affected by elevated pollen levels.

Autonomous Notification and Data Collection System

Law Enforcement Safety Alert Network

PennGLOBE

Connecticut
still revolutionary
Department of Economic and Community Development

connecticut innovations

QUERALT

EYE LIGHTING INTERNATIONAL

CD CONNECTED DEVELOPMENT

REMOTEREALITY

Workforce Alliance   Gateway

POLICE

SMART MOBILE OPERATION: OSU TRANSPORTATION HUB (SMOOTH)

THE OHIO STATE UNIVERSITY
CENTER FOR AUTOMOTIVE RESEARCH

First Mile/Last Mile Solutions

* On demand automated vehicles will move passengers the first mile to the bus stop and the last mile from the bus stop (bottom picture).
* Scheduled or on demand vehicles will move passengers through a closed loop within OSU campus (through roads and pedestrian areas, top picture).
* The vehicles will:
    – use automated driving technology;
    – use V2V communication for convoy driving;
    – be equipped with vulnerable road user protection technology enabling them to function in pedestrian zones.
* SMOOTH will keep track of vehicles and guide them.
* Smartphone applications will be developed to schedule and track the on-demand automated vehicles.

PARTNERS

Ohio State University – Center for Automotive Research
City of Columbus
Mid-Ohio Regional Planning Commission (MORPC)
Team ARIBO

Location: Columbus, Ohio

Automating the First and Last Miles

LinkNYC by City Bridge

First-of-its-kind communications network that will bring the fastest available municipal Wi-Fi to millions of New Yorkers and visitors
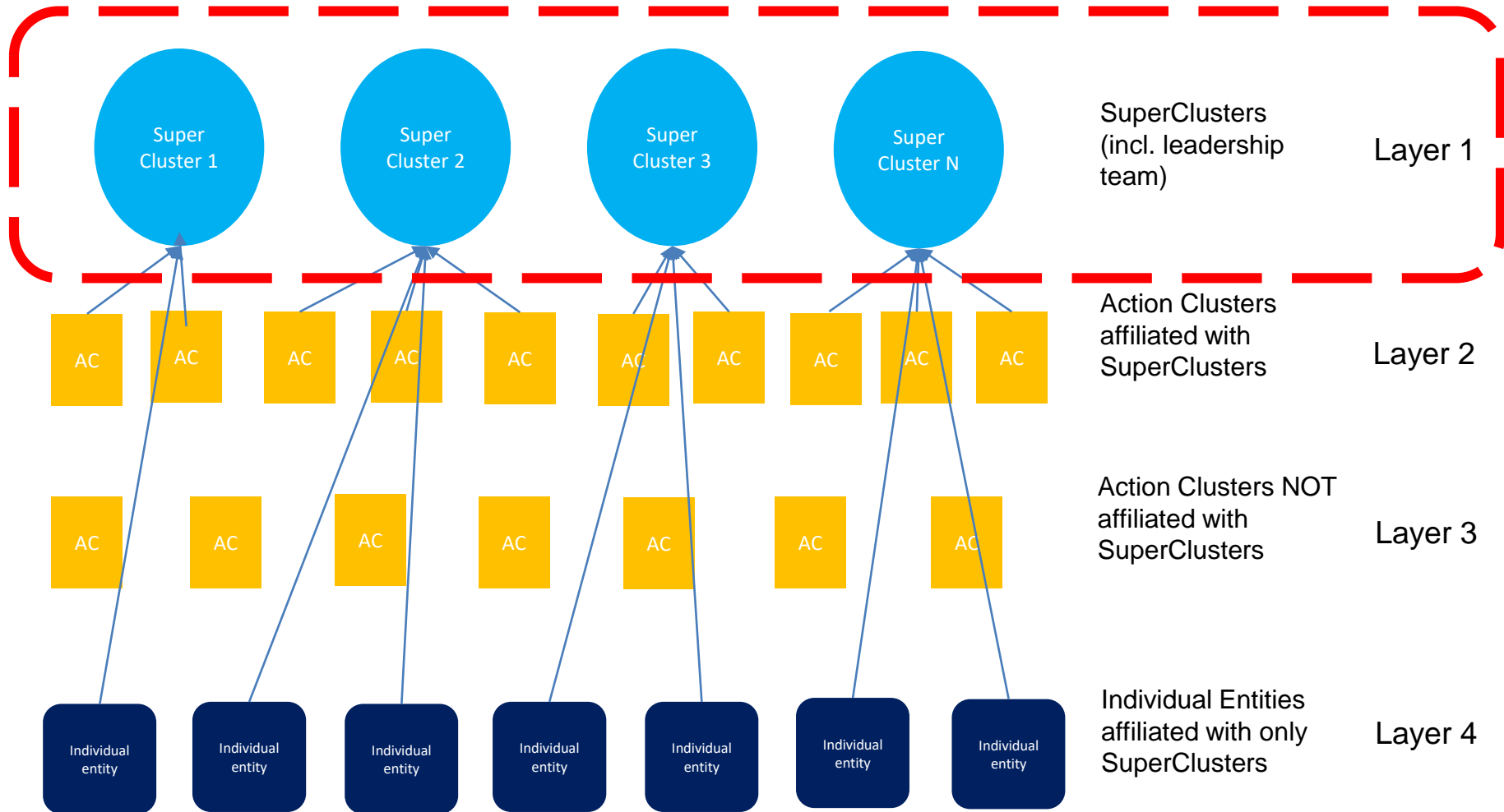
Source:

New York City, Qualcomm Incorporated, Titan360, Control Group, COMARK Corporation, Antenna Design

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Greenville Smart City Vision

at&t
Everything connected via AT&T and telematics

DUKE ENERGY

Duke Energy Smart Grid tech to energize the whole system

On-demand ClubCar aTaxis servicing downtown

enterprise

Automated BMW i3 connecting campuses

Managed fleets with Entreprise CarShare

Automated Proterra EV buses connecting campuses

Automated shuttles servicing campuses and airport

Proterra EV buses connecting communities

i3 car-sharing connecting communities

Inductive charging & power management by Momentum Dynamics

GCTC Structure

SuperClusters (incl. leadership team) — Layer 1

Action Clusters affiliated with SuperClusters — Layer 2

Action Clusters NOT affiliated with SuperClusters — Layer 3

Individual Entities affiliated with only SuperClusters — Layer 4

NIST

SuperClusters (Team of Teams)

- A Cluster of Action Clusters

  - Multiple cities, multiple companies, multiple universities working together

  - Organized around a theme such as transportation, energy, water, etc.

  - Developing a shared blueprint that can be followed by cities and communities around the world

  - Demonstrating results, including measurable benefits to community residents

Public Safety SuperCluster

PSSC Action Clusters

Alameda / San Francisco CA	Clarity Amid Chaos: How AI is Enhancing Emergency Preparedness
Austin / Denton / Tarrant County TX	Smart Emergency Response System (SERS)
Conover NC	GEO Fencing Predictive Policing Solutions to Reduce Response Times
Denton TX / UNT / PSU	Deployable Communications & Incident Command System
Fairfax County VA / GMU	SMART Emergency Medical and First Response Multi-Team System
Genova / Milano / Torino, Italy	**Resilience Data Treatment Tools for Real-Time Decision-Making**
Grand Rapids / Detroit MI	Responder to Vehicle Communication for Public Safety
Harris County TX / Arlington County VA	Indoor, GPS-Denied First Responder Location and Tracking
Lafayette LA	Louisiana Business Emergency Operations Center (LABEOC)
Las Vegas NV	Serving the Underserved with IoT Solutions
Midlothian / Fort Worth TX	NextGen Resilient Warning System for Tornados and Flash Floods
Montgomery County MD	Smartphone-based Snow Emergency Network
Montgomery County MD / Gainesville FL	Safe Community Awareness and Alerting Network (SCALE)
Nashville TN	Integrated Analytics & Scheduling of 1st Responders
Newport News / Norfolk / VA Beach VA	Storm Sense Inundation and Flood Prediction Modeling
Orlando FL	Video Analytics for Public Safety during Special Events
Reno NV / Wake County NC	Unravelling the Intersection of Incarceration, Homelessness, and Mental Health
Ronart / Santa Rosa CA	Advanced Flood Warning & Environmental Awareness
San Francisco CA	Mobi Micro-Grids: Sustainable, Resilient Mobile Power
Taichung City, Taiwan	Community Traffic Guidance and Control for Disaster Response
Taipei City, Taiwan	Tech-secure City
Taoyuan City, Taiwan	Taoyuan City Water Resources Information System
Wakayama / Nagano / Miyagi Prefectures, Japan	NerveNet Regional Resilient IoT Platform for Smart Cities and Towns
Washington DC / Loudon County VA	Cyber City Education Platform: Functional Training and Practice
Westminster, MD	MAGIC Smart Home/Smart Community Project

State of the Cities 2016

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

Top 10 Issues

Economic Development
Public Safety
Budgets
Infrastructure
Education
Housing
Environment/Energy
Demographics
Data/Technology
Health Care

100%

22%
20%
18%

28%

40%
42%

75%
70%

48%
52%
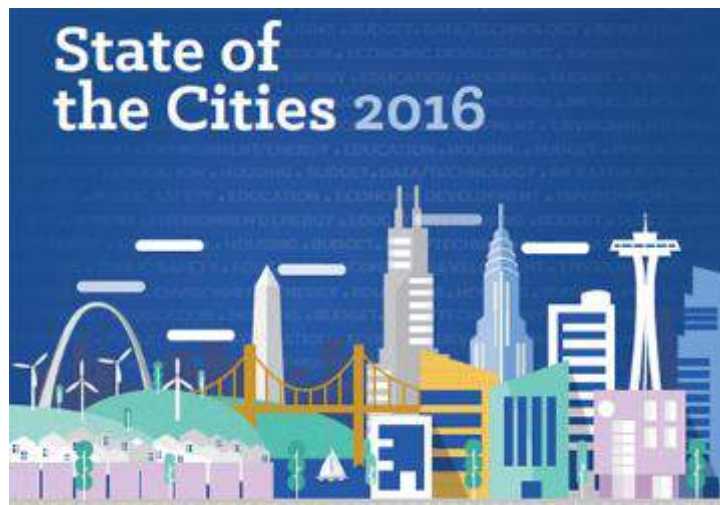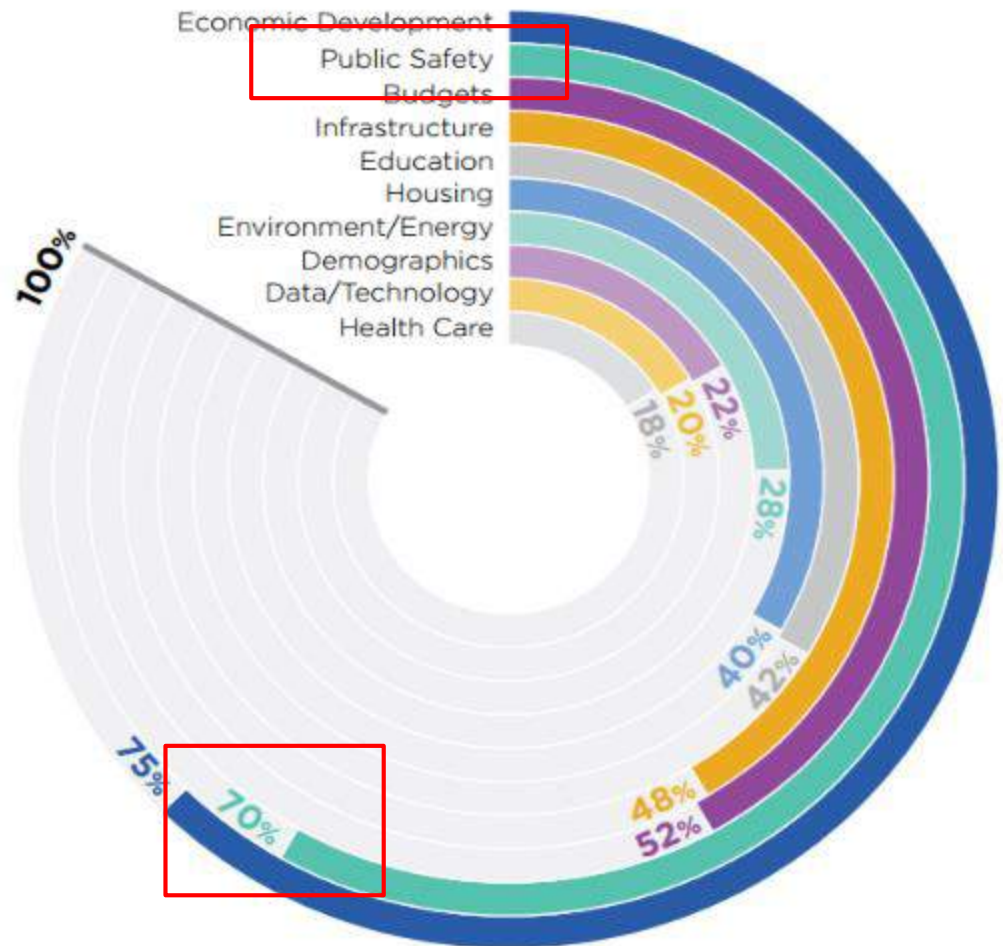
'Whole Community' Approach to Public Safety

Utility SuperCluster
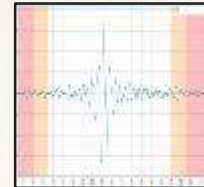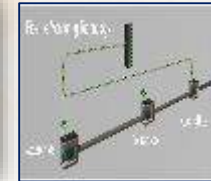**Sustainable Solutions for Energy, Water & Waste**

Working Group History and Progress

Utility Working Group History and Progress

2015

Participants = 4 / Utility Infrastructure / 1 Project

City/Counties : Las Vegas Water District

Solution Providers: Mueller / Echologics, IBM, AT&T, Intel

2016

Participants = 37 / Smart Cities Optimized / 19 Projects

City/Counties : University of Vermont, Loudoun Water, Goyang, Korea, Clean Tech San Diego, Montgomery County, MD, UT Chattanooga, Downtown DC BID

Solution Providers: Zip Power, AT&T, GE, CH2M, Black & Veatch, Qualcomm, IBM, Fiware, SAP, IoTDevLabs, Itron, Ingenu, Smart City Capital, McKinsey&Co, Intel, Siemens

2017

	100+ Members with 46 Total Government Agency Participants (U.S. and International)
USA = 25	City of San Leandro, CA, Gwinnett County Regional Water Authority, Winooski, VT, Burlington, VT, Cleveland, OH, City of Los Angeles CA; City of Chula Vista, CA; City of Hermosa Beach, CA, The District of Colombia, Coudersport Borough, PA; Eulalia Township, PA; Coudersport Area Municipal Authority (CAMA), City of Pittsburgh, Pittsburgh Water and Sewer Authority, ALCOSAN, Washington, DC, Allegheny County PA, City of Safety Harbor, Florida, Fontana, CA, City of El Paso, TX, Wayne County, MI, City of Detroit, MI, Port of San Diego, CA, Arlington County, VA; City of Alexandria, VA, Houston, TX, South Bend, IN
INT'L = 21	Suwon City, Korea, City of Manila (Philippines), City of Porto (Portugal), Greenwich Borough (UK), Municipality of Genova (Italy), Calabar Municipal Local Government, Nigeria; Calabar South Local Government, Nigeria; Ikom Local Government, Nigeria; Ogoja Local Government, Nigeria; Biase Local Government, Nigeria, Daxing District, Beijing, C...., Helsinki, Lahti, Oulu, Raahe, Salo, Tampere and Turku, Finland, Penghu County, Taiwan, Pune, Mahashatra Municipal Corporation, India, Goyang City, Korea

5

Municipality of Genova, Italy

NIST · GLOBAL CITY TEAMS CHALLENGE

Utility SuperCluster Approach

High Level Purpose
·   Address leading sustainability issues impact cities by including academia & tech partners   **Goals and Objectives**   ·   Saving energy and water to benefit cities and regions through innovative technologies   ·   Finance/business models that work for both production and consumption   ·   Account for water, increase conservation, and increase energy production

Energy
- Resiliency
- Renewable Energy
- Distributed Energy

Water
- Conservation
- Leaks/Revenue Mgt.
- Quality

Waste
- Waste Reuse
- Water Reuse
- Zero Waste

Co Chairs
- Derick Lee – PilotCity
- D Acosta –San Leando, CA

Co Chair
Ken Thompson - CH2M

Co Chair
Scott Pomeroy – Scalable Strategies

Communications

Funding

5

TRANSPORTATION SUPERCLUSTER
Urban Implications of Last Mile Transit

Agenda

Why Last Mile

Connected: Convenience

Electric Vehicles: Sustainable

Autonomous Vehicles: Safe

Community

Equity

Livability

Freight

Economic Opportunity

Autonomous Vehicles: Safety & Equity

Data Analysis:
The Heart of the Smart city

The City Platform Supercluster

Theory: Smart City Physiology

- Many ways to build a "skeleton"
  - Water, Electricity, Transportation
  - Public Safety
- Data exists in these and other systems
- Data is the lifeblood of the Smart City
- Data Analytics is the heart of the system that *drives change*
- Dashboards help tell the *post-analysis* story

GCTC PUBLIC WI-FI SUPERCLUSTER

- David Witkowski, Joint Venture Silicon Valley (Co-Chair)
- Tony Batalla, City of San Leandro, CA (Co-Chair)
- Jon Walton, County of San Mateo, CA (Co-Chair)
- Benny Lee, County of San Mateo, CA
- Steve Wimsatt, Ruckus Wireless
- Ulysses Vinson, County of San Mateo, CA
- John Coluccio, City of Schenectady, NY
- Eric Shannon, City of Schenectady, NY
- Bill Pugh, Smart Connections Consulting, LLC
- Geoff Arnold, Verizon Wireless
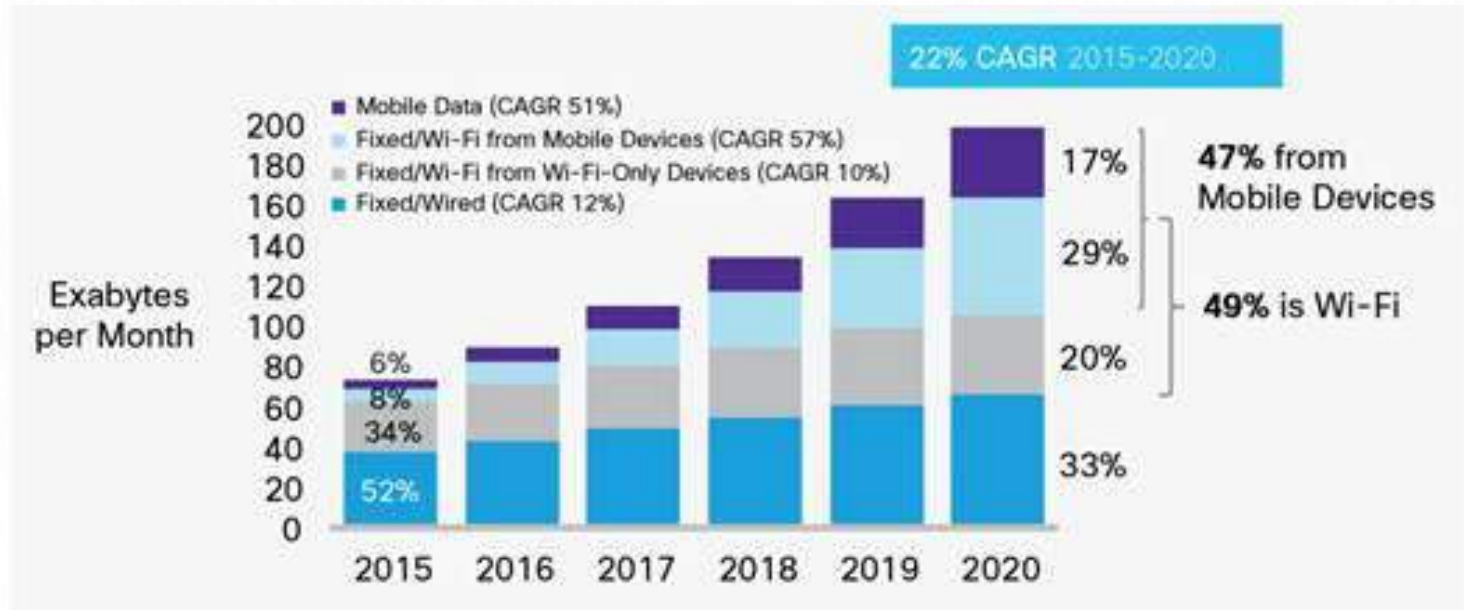
49% of Global Internet Traffic by 2020

Source: https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html

List of SuperClusters

- Transportation (TSC)
  - Leading city: Portland, OR, Columbus OH

- Public Safety, Emergency, Disaster Resilience (PSSC)
  - Leading City: Washington DC

- Energy, Water, Waste Management (EWSC)
  - Leading City: Atlanta, GA, San Leandro, CA

- Public WiFi (PWSC)
  - Leading City: San Mateo County, CA, San Leandro, CA, Schenectady, NY

- City Data Platform (CPSC)
  - Leading City: Kansas City, MO

- Data Governance and Exchange (DGE)
  - Leading City: Kansas City, MO

- Agriculture and Rural (A&R)

Smart Cities Partnership

NIST
Smart Cities Community

110 Project Teams
160 Cities
400 Companies, Universities

DHS S&T
Community

Companies
Universities
National Labs
Int'l Partners

Smart and Secure Cities
and Communities Challenge

- Building on NIST's Global City Teams Challenge (GCTC) program, NIST and DHS S&T will issue a challenge to teams of cities and innovators to demonstrate value and return on investment for designed-in trustworthiness for smart city deployments.

Smart & Secure
Cities and Communities Challenge (SC3)

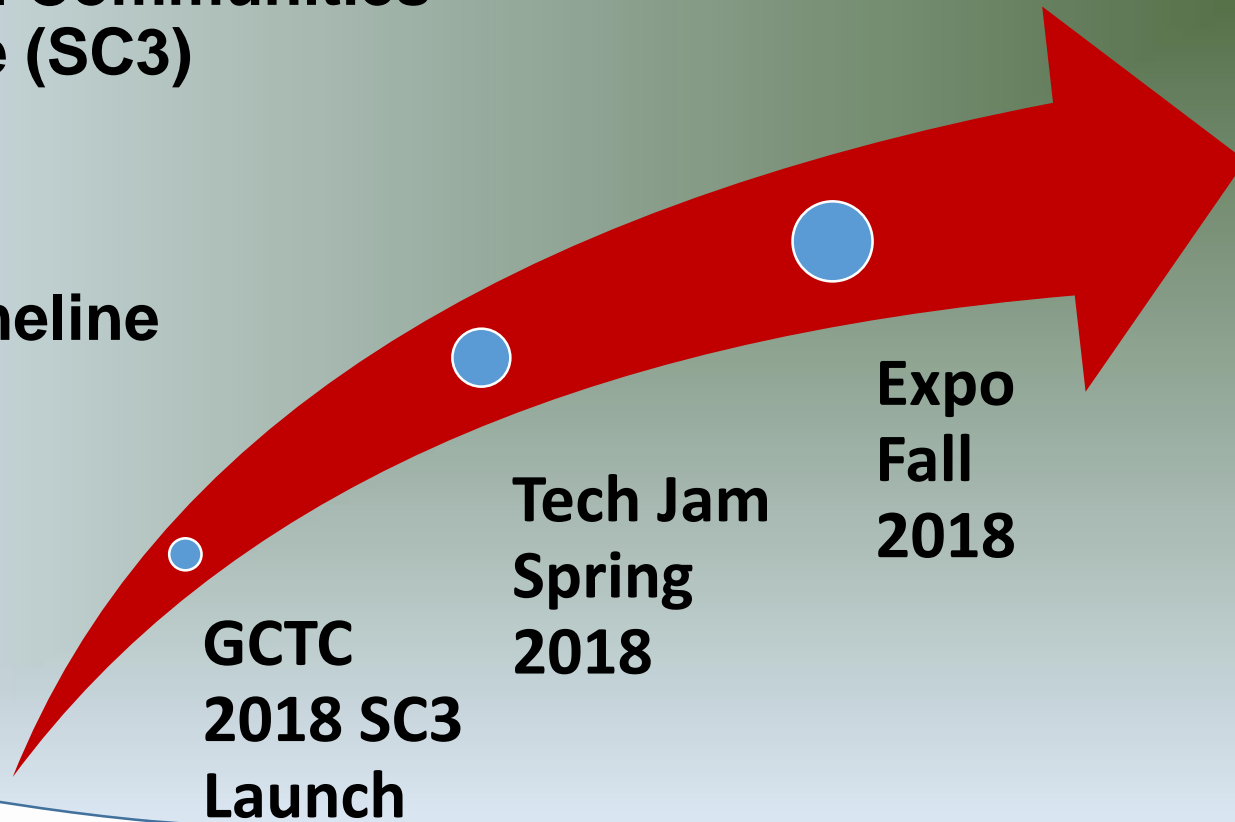# GCTC - Smart and Secure Cities and Communities Challenge (SC3)

Timeline

GCTC 2018 SC3 Launch

Feb. 6-7
Washington DC

Tech Jam Spring 2018

Expo Fall 2018

How to Participate:

- Contact
  - Sokwoo Rhee (sokwoo.rhee@nist.gov)
  - Gary Dennis (gary.dennis@associates.hq.dhs.gov)

- Background Info is at:
  - nist.gov/cps/sagc.cfm
  - dhs.gov/cyber-research

NIST

IES-City: Smart City Framework

- **IES-City ("Yes-City") Int'l Working Group**
  NIST and its partners have convened a public working group to distill a common set of smart city architectural features and to identify "Pivotal Points of Interoperability"

  - 3 working groups, collaboration site:
    https://pages.nist.gov/smartcitiesarchitecture/

  - Summit – Feb. 8, Washington, DC

Partners:

For More Information

- Contact
  - Chris Greer(chris.greer@nist.gov)

- GCTC web site:
  - www.globalcitychallenge.org

- GCTC Expo Registration:
  - www.globalcityexpo.org
- Join an Existing Team or Form a New Team
  - https://pages.nist.gov/GCTC/about/participation-guide/
- Join the GCTC Transportation Google Group
  - https://groups.google.com/a/urban.systems/forum/#!forum/global-city-teams-challenge-super-action-cluster/join
- Join the GCTC Public Safety Google Group
  - https://groups.google.com/forum/#!forum/gctc-public-safety-supercluster/join
- Join the GCTC Energy, Water, Waste Management Google Group
  - https://groups.google.com/forum/#!forum/gctc-energy-water-waste-management-supercluster/join
- Join the GCTC Public WiFi Google Group
  - https://groups.google.com/forum/#!forum/gctc-wifi-supercluster/join
- Join the GCTC Healthcare Group
  - https://groups.google.com/forum/#!forum/gctc-healthcare-supercluster/join