

# Smart and Connected Communities Framework

## Vision and Actions to be taken

This framework outlines a vision and an approach agencies can use to move forward together in pursuing a vision of smart and connected communities. Activities within the framework include the entire pipeline from research and development to deployment of new tech-driven services and infrastructure in cities. The success of the framework requires federal interagency coordination, cooperation with external stakeholders, and next steps planning for Federal action.

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### VISION:

As the result of coordinated Federal action and partnerships with industry, academia, and other government entities, communities in all settings and at all scales have access to advanced cyber-physical systems/Internet of Things technologies and services to enhance the sustainability and quality of life, improved health and safety, and economic prosperity for their residents.

### SCOPE:

The Cyber-Physical Systems Senior Steering Group (CPS-SSG) will work to coordinate efforts among Federal agency and with public-private partnerships for smart and connected communities. The relevant agency activities include:

- Performing foundational research and accelerating innovation and transition in scalable and replicable smart city solutions
- Applying advanced cyber-physical systems concepts, coupled with sociotechnical system understanding, to integrate city-scale IT and physical infrastructures
- Enabling replicable smart city solutions that provide powerful new safe, reliable, sustainable, resilient, secure, privacy-enhancing, and cost-saving platforms and services
- Promoting discovery, innovation, and entrepreneurship in smart city technologies
- Facilitating the ability of communities to apply cyber-physical systems concepts to solutions that make them more livable, workable, safe, and sustainable and that support an informed and engaged populace

**GOALS:****The goals of the participating agencies under this framework include:**

- Creating next-generation capabilities by furthering and leveraging (via fundamental R&D) cyber physical systems, smart systems, sociotechnical systems understanding, and other emerging technologies, processes, and policies
- Supporting the R&D necessary to create smart cities using data analytics to enhance individuals' Quality of Life, to improve their health and safety, and economic prosperity, to make better decisions and breakthrough discoveries, and to take confident action based on the analytics
- Building and expanding access to the smart and connected communities resources – both domain specific and shared – that are needed for agencies to best achieve their mission goals and for the country to innovate and benefit
- Promoting interoperable, standards-based smart city solutions that reduce deployment costs and enable modular architectures that are flexible and adaptable in meeting a community's needs
- Improving the national landscape for education and training to fulfill increasing demand for both analytical talent and capacity for the broader workforce to support smart and connected communities

**The agencies will consider how to create new and enhance existing connections, for example:**

- Fostering the creation of new partnerships that cross sectors and domains
- Creating new partnerships that enable the interconnection and interplay of smart cities and technology innovators across agency missions
- Facilitating access to high value innovation, including small cities and rural communities with limited resources
- Ensuring the long-term sustainability and continued development of high-value innovation

**The outcomes of activities inspired by the framework include:**

- Applications - innovative technology that will enhance sustainable livelihoods, and the quality of life
- Analytics - acquiring information from the social, biological, and physical elements that constitute the environment
- People (smart citizens) - the education and tools necessary to create a smart city workforce and a citizenry able to benefit from smart city solutions
- Partnerships - across federal agencies and with stakeholders in industry, academia, and other government entities to achieve positive outcomes
- Deployments – Pilot and at-scale smart city deployments that demonstrate value, feasibility, sustainability, and resiliency

**The benefits to communities from activities enabled by the framework include:**

- Economic growth and new jobs in businesses that are globally competitive in smart city technologies
- Increase the safety and mobility of roadway travelers and reduce traffic-related pollution
- Reduced energy consumption in human mobility, in commercial and residential buildings, and in commercial operations
- Faster and more resilient wired and wireless communications
- Improved response and recovery to natural and man-made disasters
- Improved monitoring of air and water quality
- Reduced crime
- Increased private sector investment in new and growing businesses as a result of new services
- Expanded public participation in important decisions, such as planning and zoning
- Increased safety of infrastructure from condition-based monitoring
- Improved healthcare through the connection of emergency services to hospitals and diagnostic equipment

**AGENCY SMART AND CONNECTED COMMUNITIES GOALS****Department of Energy (DOE)/Office of Electricity Delivery & Energy Reliability (OE)**

- The DOE/OE Cybersecurity for Energy Delivery Systems (CEDDS) program is working toward resilient energy delivery systems that are able to survive a cyber incident. This further strengthens smart grid cyber-resiliency, and hence the cyber-resilience of smart cities that rely on critical energy delivery infrastructure.
- Smart Grid Integration Challenge for Cities: The Department of Energy Office of Electricity Delivery and Energy Reliability will launch a new challenge competition for at least \$1 million in 2016 to recognize U.S. cities as smart city leaders in implementing sensing, data sharing, and data analytics toward achieving energy consumption reduction targets set by individual cities. The competition will be open to city governments, who have already developed a roadmap or an action plan with clearly defined targets for energy consumption reduction for the entire city. Implementation activities under this competition must involve leveraging such technologies as smart grid, energy management systems for homes/buildings/districts, demand response, renewable energy sources and energy storage on a sufficiently large scale that their performance results can be quantified with respect to attaining the near-term and long-term goal targets for energy consumption reduction for the entire city. Each winning city through this competition will serve as a model for replication in other like cities nationwide.

**Department of Transportation (DOT)**

Through research and deployment of innovative transportation technologies, drive advances in how we move better:

- Reduce or eliminate deaths and serious injuries among all users of the transportation system – drivers, passengers, cyclists, and pedestrians;
- Increase the reliability and efficiency of the transportation system – for the movement of both people and goods;
- Drive innovation in the development of safe, affordable mobility options for all Americans;
- Increase the service life and optimize the maintenance of transportation structures in a state of good repair;
- Reduce the environmental and energy impacts in the development, operation, and maintenance and use of the transportation system; and
- Increase the resilience of the transportation system to withstand severe weather and climate change impacts.

**National Institute of Food and agriculture (NIFA)**

- Increased food and nutritional security through the development of high-output and efficient urban agriculture technologies and systems
- More resilient, robust, and reliable agricultural systems while faced with a changing climate and an increasing global population

**National Institutes of Health (NIH)**

- Enhance collaboration between researchers, smart citizens, local cities and municipalities and other stakeholders to evaluate the health-related benefits of networked sensors, infrastructure, and computing systems.
- Support research that develops, implements and evaluates health-related cyber physical systems in smart cities with consideration of security, privacy, health disparities and human factors
- Foster the development of interoperability, consensus standards, and evidence-base that will ensure appropriate technologies are safe, effective, and sustainable
- Promote a citizen-centric, data-driven system that embraces personalized health information and care options and is capable of learning

**National Institute of Standards and Technology (NIST)**

- Through the Global City Teams Challenge, bring together teams of cities and innovators working in partnership to use Internet of Things technologies in improving the safety, sustainability, livability, and workability of communities worldwide.
- Using open, consensus-based public working groups, develop a comprehensive framework for the design, evaluation, and operation of complex cyber-physical systems, including smart city technologies at scale.
- Through the Smart Grid program and public-private Smart Grid Interoperability Panel, work with the private sector on smart grid interoperability and security standards that enable the intelligent use of energy resources as a key component of smart city solutions.
- Through the National Cybersecurity Center of Excellence (NCCOE), provide businesses with real-world cybersecurity solutions based on commercially available technologies for smart city applications in areas including energy, transportation, and finance.
- Through the Big Data program collaborating with public working group and international standards effort, bring together a reference architecture that is vendor-neutral, technology- and infrastructure-agnostic to enable data scientists to perform analytics processing for their given data sources without worrying about the underlying computing environment.

- Through the NIST Cloud Computing Program (NCCP), provide a foundational cloud architecture and metrics to enable secure storage, transmission and processing of data and services through collaborations with public working groups, industry and international standards efforts.
- Promote the emergence of voluntary, consensus international standards that enable interoperable smart city solutions to speed deployment efforts, increase flexibility and capability, reduce costs, and catalyze the emergence of a vibrant and global smart city technologies market.

**National Science Foundation (NSF)**

- Bring together academic researchers, industrial and non-profit partners, and local cities, municipalities and regions to integrate data sources and networked computing systems with people, physical devices and infrastructure, and anchor institutions to have an impact on quality of life within communities across health and wellness, energy efficiency, building automation, transportation, etc.
- Support the fundamental research that gives rise to novel sociotechnical approaches enabling increased understanding of how to intelligently and effectively design, adapt, and manage Smart and Connected Communities.

**National Aeronautics and Space Administration (NASA)**

- Apply collaborative, planning, and scheduling applications to enhance multi-modal Smart Cities traffic flow management systems.
- Help accelerate safe and efficient future UAV operations for Smart Cities services, operations, and new businesses.
- Share and promote next generation verification and validation tools to enable smart city developers with the means to assure high integrity, robust, & interoperable complex systems.