Global City Teams Challenge: Strategic Planning Workshop Working Group Series

Proposed on behalf of George Mason University

EXECUTIVE SUMMARY

The primary goal of this proposal is to develop an integrated and supportive strategy to inform, strengthen and expand the NIST-sponsored Global City Teams Challenge (GCTC) program in an effort to facilitate and enhance technology research and development, based on a series of workshops. A two-part workshop series is proposed. The first workshop, to be hosted at George Mason University, is designed to establish a strategic research vision for GCTC superclusters, and to better understand how the GCTC organization interacts with external partners to achieve technology implementation. Building from the findings of the first workshop, the second workshop will emphasize organizational and strategic planning. Ultimately, the results of this workshop series will be used to: 1) construct a report to provide to the National Institute for Standards and Technology Federal Agency stakeholders to inform strategic directions with community input from the GCTC leadership and 2) yield insights into the complex and interdependent challenges of disseminating and implementing technology in the smart and connected communities vision.

Planning and execution of this series of workshops will be led by George Mason University through the Center for Advancing Human-Machine Partnership (CAHMP). The workshop organizing team offers decades of experience in research, development, and implementation of resilient community projects and cyber-physical infrastructure systems. They are also engaged with GCTC leadership who have cultivated deep understanding of the operations and needs of GCTC participants and the organization. The first workshop will be hosted by George Mason University, at the new Institute for Digital Innovation in Arlington, Virginia. The second workshop will be hosted by The Information Technology Department, The City of Coral Gables, Florida.

Introduction

Modern human communities can be understood as a nexus of five interdependent systems: (1) the natural environment, (2) the built environment of infrastructure, (3) the social environment of human (and non-human) populations, (4) the virtual environment underpinned by internet communications, and (5) the rapidly expanding information environment (Figure 1).
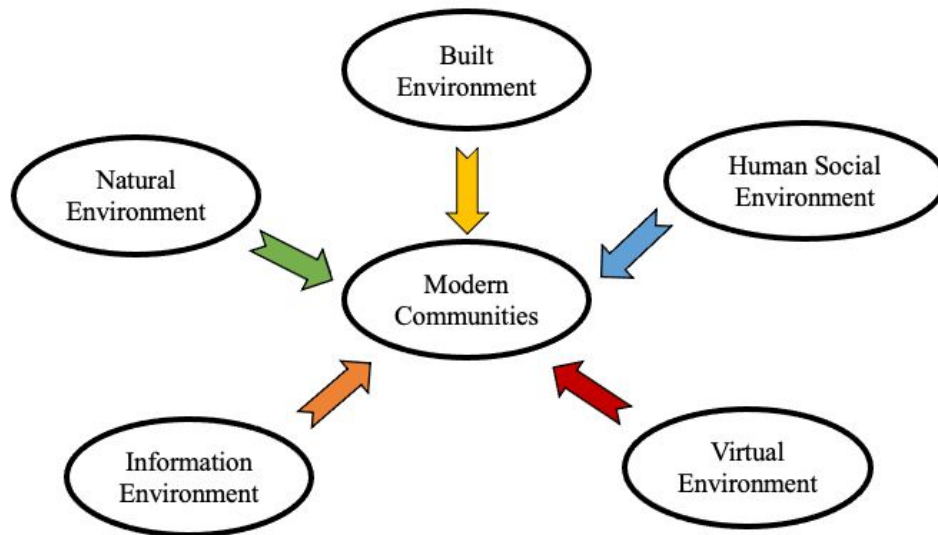

Figure 1. Modern human communities serve as the nexus for complex independent systems

As cities and communities become more connected, networked and technologically sophisticated, new challenges and opportunities arise that demand a rethinking of traditional approaches to sustainability, resilience, public safety and social services, information and communications, and the human relationship to technology. The design and integration of intelligent infrastructure—including embedded sensors, the Internet of Things (IoT), advanced wireless information technologies, real-time data capture and analysis, and machine-learning-based decision support—holds the potential to greatly enhance economies, social interaction, public safety and security, and overall community resilience, while addressing new and emerging challenges in society. At the same time, this trajectory toward universal connectedness and pervasive computing and surveillance challenges many of our traditional notions of what it means to live in an open society with high quality of life.

Over the last two decades, a number of municipal, regional, and federal programs have convened community-driven public private partnerships focused on solving specific community challenges through local collaboration and the application of advanced technologies. Many of these efforts have been largely coordinated at the municipal or regional level, with little opportunity for systematic integration beyond the comparison of lessons learned and best practices. Moreover, within the "smart city" community (loosely defined here to accommodate a wide range of societal structures), the challenges of integrating new technologies and analytic processes into legacy infrastructure has largely supplanted any dedicated consideration of such factors as environmental and economic sustainability (aside from economic development), social equity and diversity, or analysis of determinants that influence habitability, community health, stress mitigation, and quality of life in shared spaces.

The Global City Teams Challenge (GCTC), sponsored by the National Institute for Standards and Technology (NIST), was formed in response to these evolving and increasingly integrated environments, and to provide a more integrated pathway for the propagation of smart city technologies. The GCTC organization focuses on spurring the community adoption of smart city technologies to solve the complex challenges faced by modern, connected communities. The GCTC is a collaboration forum for developing and deploying replicable, interoperable, and scalable cyber-physical systems and Internet of Things (IoT) solutions in communities around the world. Aligned with NIST partnership program goals, the GCTC organization strives to encourage the transfer, implementation and commercialization of research and technology from the corporate sector, institutions of higher education, federally funded research and nonprofit institutes. With the goal of improving the quality of life of residents using emerging technologies, the GCTC program has identified and nurtured at least 200 smart city projects (called Action Clusters) over the course of five or more years and created eight working groups (SuperClusters) that cover several application domains to produce documents containing best practices and case studies (Bannan et al., 2019). The GCTC program has evolved into a successful collaboration space for communities, industry, and academic stakeholders to discuss, collaborate, develop, and document their accomplishments and share their experiences.

The GCTC is organized into SuperClusters of city/community technology teams, comprised of technology developers, researchers, state and local government representatives and community members from across the nation with a focus on developing effective solutions that solve identified smart city/community problems and strive to meet stakeholder needs. The GCTC leadership is comprised of the Chairs and Co-Chairs of the eleven SuperClusters.

Workshop Justification and Focus

Over its seven-year history, the GCTC has grown dramatically, and has evolved into a collaborative organization that connects community leaders with private sector and academic partners, all in pursuit of the advancement of smart city and community technologies. As the size and complexity of the GCTC has increased, so has the need for improved coordination and strategic planning. Given the rapidly evolving nature of human communities with respect to threats from climate change, disasters, and emergencies as well as rapid advancements in AI, now is the time for the GCTC to develop a research and development vision for this future. There is also a need to better understand the challenges and opportunities for engagement with private sector partners, state and local representatives and academic institutions, in order to deepen the impact of relevant technology development.

In order to support strategic planning for the GCTC and inform NIST stakeholders on future directions for the GCTC, a two-part workshop is proposed. The workshops will bring together the GCTC leadership, who represent a nation-wide public-private partnership of researchers, technologists, social scientists, private sector entities, and state and local representatives to identify priorities, goals and define a national strategy for fundamental research and development directed at advancing the mission of the NIST Global City Teams Challenge (GCTC). Conference participants will be selected from the leadership among local, regional and national smart cities programs who have current experience in the technical, social, economic, and

political dimensions of regional- and community-based technology implementation to improve public services, safety and security, and quality of life in communities of all types. The workshop organizing team offers decades of experience in research, development, and implementation of resilient community projects and cyber-physical infrastructure systems. They are engaged GCTC leaders and members with deep understanding of the operations and needs of GCTC participants. The result will be a conference of many of the nation's practicing authorities on design, development and implementation of smart and connected community solutions, who have collectively produced a significant number of strategies and blueprint guidelines for developing smart city programs. Together, they will uncover and establish a strategic research and organizational plan that builds on past experiences and successes of the GCTC, and engages current and next generation researchers and practitioners to advance the GCTC mission.

Proposed Workshop and Research Focus

The goal of this workshop series will be to serve as a catalyst for uncovering and defining the emerging technical, social and economic challenges in urban, rural and regional environments that will define future GCTC initiatives related to the transfer and commercialization of relevant research and technology. The aligned research goals will focus on the diverse interdisciplinary teams necessary for this complex work to uncover how to best support the development, conceptualization, implementation and translation of technology innovations by these teams as represented by the GCTC leadership, superclusters and action clusters. The findings will identify and inform the organizational and logistical support that the GCTC will need in the increasingly complex and interdependent smart city domain.

The GCTC leadership structure and interdisciplinary teams may be conceptualized as multilevel networks of individuals, organizations and knowledge (Lotrecchiano & Misra, 2019). The leadership, superclusters and actions clusters each represent highly interdisciplinary teams and public private partnerships that need to work together to synthesize knowledge and ideas from multiple areas of expertise to address complex community challenges with innovative technologies. The GCTC organization and leadership represents a multiteam system or MTS that involves two or more component teams "...whose members pursue both local "team-level" goals involving interdependencies among a subset of the system (i.e. their fellow teammates), as well as broader "system-level" superordinate goals requiring interdependent interactions among all of the component teams (Carter et al., 2019, p.392)".

In order to assess the needs of the GCTC multiteam system and to appropriately intervene, we must begin to understand:

- The goals of the leadership team, the superclusters and action cluster teams and how these different goals are related to one another
- The leadership team-level identities, goals and contributions to the system
- How to support individuals who serve as boundary spanners who work to develop relationships with other team's boundary spanners
- How to facilitate connections between teams and motivating members to pursue team and multiteam system goals

We plan to investigate in a needs analysis research approach through the following activities: 1) perform a gap analysis; 2) identify priorities; 3) identify problems and opportunities; and 4)

identify possible solutions and growth opportunities. Throughout this needs assessment approach, we plan to deploy evidence-based strategies and insights from multiteam system and science of team science recommendations in the planned GCTC leadership interactions. These interactions will articulate how the leadership participants frame complex community-based challenges with advanced wireless or IoT technologies to reconsider and inform strategic organizational planning to support innovation, research and commercialization. Insights gleaned from the science of team science and strategic planning facilitation will also inform our approach (Hall et al., 2019).

We will employ this approach to uncover important transactional relationships in these partnership and leadership systems through a multiteam systems and science of team science lens to: 1) understand the goals and collaborative needs of the stakeholder leadership, teams and communities; 2) translate those needs into organizational priorities and strategic planning; 3) evaluate and provide recommendations. Particular emphasis will be placed on gathering input for strategic planning related to equity and the diversity of constituents (e.g. researchers, community and government representatives, city planners, data scientists, citizens, etc.) in current and future GCTC teams to solicit multiple perspectives and diverse voices for strategic directions.

Strategic Planning

The shared goal of the GCTC leadership is to support innovation and integration of technology systems, standards and implementation efforts in an agile and effective manner to address complex community challenges with digital transformation and resiliency considering equity and inclusion. The strategic planning process will assist the leadership in clearly articulating a related mission, goals and values of the organization along with an action plan to work toward those goals. A strategic planning consultant will be identified who can assist in facilitating the articulation of and agreement on emergent directions or redirection of the organization.

Workshop Plan

Logistics and Goals

The planning committee for the workshops will be led by Drs. Brenda Bannan, David Lattanzi, (George Mason University), Wilfred Pinfold (CEO, Urban.Systems), Stan Curtis (SVP, Urban Systems), Raimundo Rodulfo (City of Coral Gables, Florida) and Eric Rensel (VP Gannett Fleming, Inc). Planning will incorporate perspectives from current GCTC leaders (Bannan, Pinfold, Curtis & Rodulfo) as well as include representation by new members (Lattanzi & Rensel) from various sectors and organizations. Workshop participants will include GCTC SuperCluster Directors or Co-Directors and the event will be by invitation only. The emphasis of the planned activities and outcomes will focus on drawing insights from the GCTC leadership and their expertise as much as possible to generate recommendations for the future of the organization to be submitted in a report to NIST stakeholders. The plan for this workshop series will align with the broad goals of NIST Smart Grid and Cyber-Physical Systems Program Office to promote innovation in areas of national priority by anticipating and meeting measurement science and standards needs for cyber-physical systems involving IoT to enhance economic prosperity and improve quality of life. Striving towards the integration of technology systems,

standards and implementation efforts in an agile manner to address complex community challenges with digital resiliency is a shared goal of the GCTC leadership. This work will begin to uncover insights and recommendations on how to establish new projects, partnerships and support new and existing transdisciplinary stakeholder teams to begin to address these challenging goals.

As available, additional workshop spots will be offered to relevant subject matter experts, facilitators, community and technology leaders, as well as organizational planning experts. The anticipated size of the workshop is 20-25 participants in total.

The first of the two planned workshops will be held at the Institute for Digital Innovation (IDIA) at George Mason University (GMU) in Arlington, Virginia. The Arlington location is easily accessible from two major airports, and is an ideal venue for a small and focused workshop. The anticipated date of the first workshop is November, 2021. The goals of the GMU workshop are to generally advance NIST partnerships through the GCTC related to technology innovation and service to the American industry through the following activities:

- Revisit purpose, goals and vision of the GCTC
- Team cohesion amongst leadership and interdisciplinary team building - clarifying shared goals, core outcomes, roles and interactions
- Define objectives and scope of collaborations
- Identification of priorities involving communities, emerging technologies and research trends - (e.g. building community and digital resiliency, agile problem solving, interoperability, siloed information, education and workforce development, etc.)
- Insights into the needs of the GCTC with respect to improving coordination and outreach

The second workshop will be held in Coral Gables, Florida in the city's new Public Safety headquarters smart building in the first quarter of 2022. The Coral Gables location is close to the Miami International Airport, and will provide firsthand access to observing the implementation of a cutting-edge, smart city strategic plan that resulted in the Coral Gables smart city hub and innovation districts. Workshop participants will have the opportunity to tour and walkthrough the innovation district as well as interact with the stakeholders who planned and implemented the strategic plan. The Coral Gables workshop will build off the findings of the GMU workshop,and will be focused on cohering those findings into organizational and strategic planning to meet the needs of the GCTC.

Tentative Workshop Itinerary

GMU workshop agenda

The first half-day of the first conference will be a plenary session focused on official welcome, keynote presentation, background and historical perspective on the GCTC, and on problem description and staging for the two-part workshop series. This introduction will be followed by networking and team-building opportunities to enhance participation in the workshops.

The second half of first day will be devote to a visioning exercise designed to identify research and development needs and opportunities for the GCTC. There will first be opportunities for each of the SuperCluster leaders to present about their teams and what they identify as the most pressing and emergent issues in their specific domain areas. Participants will then consider the

future of each of the SuperClusters foci/topics and their integration given current identified challenges:

- Transportation systems, vehicles, and autonomy
- Data governance and city data platforms and dashboards
- Public safety and security, and community resilience
- Public utilities for energy, waste, and water management
- Wireless communications and broadband applications
- Agriculture and rural productivity and quality of life
- Education and workforce development
- Cybersecurity and privacy for private and public sectors
- Smart building technologies and IoT applications
- Community Health and Well-Being, Equity, and Inclusion
- Smart Regions Strategies, multi-agency collaboration, and capacity-building

The second day of the workshop will begin with the group revisiting the visioning exercise. In small groups, and then as a whole, participants will work through activities designed to use the prior day's work to identify current research needs and the key obstacles that SuperClusters face in addressing emergent research challenges.

The second day of the workshop will also include a "simulation role-playing scenario" designed to explore how community actors work together to solve challenging problems. Topics such as a climate disaster or the implementation of a breakthrough AI technology will be given to each group, along with roles, responsibilities, and goals. The GMU workshop will close with a "homework assignment" based on these simulations. Each participant will be tasked with going back to their respective communities and work with their partners to determine how their community would approach a given challenge, and to identify the key pain points in solving those challenges. Participants will also be given opportunities to engage through additional asynchronous activities related to visioning and research needs.

Coral Gables workshop agenda

The second workshop in the series will commence with a recap and synthesis of the outcomes of the first workshop, most notably how the outcomes of that workshop were translated into a research and development vision for the GCTC. Participants will then work to iterate on the synthesis and build towards a consensus vision.

Each participant will then report on the results of their assignments, showing how different communities and stakeholders approach a particular challenge. The group will then look at the complete results in order to identify ways in which the GCTC could integrate expertise and adapt to provide logistical support and implementation guidance. Participants will identify the skills and organizational capabilities that are needed to improve the consistency and replicability of integrative smart technology implementations, and how the GCTC leadership could best provide consultancy across a range of community partners and scenarios.

The workshop group will also develop a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis for the GCTC on the first day. This SWOT analysis will underpin the final workshop report and will be used subsequently by a series of working groups tasked with looking at structure of the GCTC. Participants will be assigned to one of three working groups:

- Identifying the organizational needs of an evolving GCTC
- Outlining a strategic research vision for the GCTC
- Developing approaches to expanding and improving GCTC outreach

The second day of the workshop will commence with reporting from the working groups. The group will revisit the SWOT analysis of the prior day and discuss how the findings of the working groups reflects on the SWOT analysis. The group will work towards a consensus strategic plan and provide final recommendations to the planning committee and NIST.

The afternoon on the second day will be devoted to a presentation and tour of the Coral Gables smart city capabilities. Coral Gables has one of the most modern and successful smart city systems in the United States and will provide participants the opportunity to see technologies and concepts that they can consider for their respective communities. It will also allow Coral Gables experts to discuss the practicalities of their implementations and provide a real-world perspective for the workshop.

Day	Agenda / Event
GMU Day 1	-Informal reception -Initial welcome by the Executive Director, IDIA George Mason University -Team building and networking activities -Envisioning the smart community of the future
GMU Day 2	Morning Session -The future of smart communities, revisited -Identification of GCTC research needs Afternoon Session -Simulation activity -Homework assignment(s) Evening reception and dinner
Coral Gables, Day 1	Morning Session -Welcome back and re-introductions - Welcome remarks from Coral Gables City Manager -Visioning recap -Reporting from homework assignments -Discussion of workshop goals -Assignment of working groups -GCTC SWOT analysis Afternoon Working Groups

	- City of Coral Gables – Smart City Innovation and Technology Presentation -Identifying GCTC support needs -GCTC strategic plan -Improving outreach Tours and walkthroughs of Coral Gables Smart Districts and Innovation Corridors Evening reception and dinner
Coral Gables, Day 2	Morning Session -Reporting from working groups -Strategic plan development -Recommendations and wrap ups Afternoon Session -South Florida/Smart city infrastructure and economic development tech roundtable

Anticipated Outcomes

Direct products of this workshop will establish priorities and starting points for immediate and long-range strategic research and implementation goals for the GCTC. The workshop will also identify ways to broaden participation addressing diversity and equity in the GCTC, through the strategic consideration and incorporation of new public, private, and academic partners.

The workshop will also help to identify the needs of the GCTC with respect to new or revised organizational support structures that may improve research dissemination and impact. These support structures will be designed by the participants, considering the established research directions identified during the conference.

A complete reporting of the workshops, including all findings and recommendations will be made available for participant comment by the end of the second quarter of 2022. A final report submission to NIST will be made in the third quarter of 2022.

References

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