NOTICE OF FUNDING OPPORTUNITY (NOFO)
NIST Public Safety Innovation Accelerator Program 2022 (PSIAP-2022)

EXECUTIVE SUMMARY

- **Federal Agency Name:** National Institute of Standards and Technology (NIST), United States Department of Commerce (DoC)

- **Funding Opportunity Title:** NIST Public Safety Innovation Accelerator Program – 2022 (PSIAP-2022)

- **Announcement Type:** Initial

- **Funding Opportunity Number**: 2022-NIST-PSIAP-2022-01

- **Assistance Listing (CFDA Number):** 11.609, Measurement and Engineering Research and Standards

- **Dates:** Full Applications must be received at Grants.gov no later than 11:59 p.m. Eastern Time, January 18, 2022. Applications received after this deadline will not be reviewed or considered.

  Applicants should be aware, and factor in their application submission planning, that the Grants.gov system closes periodically for routine maintenance. Applicants should visit Grants.gov for information on any scheduled closures.

  NIST expects to complete its review, selection of initial successful applicants, and award processing by April 2022. NIST expects the earliest start date for awards under this NOFO to be May 2022. Depending on the availability of funds, NIST may issue additional awards in multiple batches through the end of September 2022. All awards in this program will be issued prior to September 30, 2022.

- **Application Submission Address:** Applications must be submitted using Grants.gov. Paper applications will not be accepted.

- **Funding Opportunity Description:** The NIST Public Safety Innovation Accelerator Program (PSIAP) is seeking applications from eligible applicants for activities to accelerate research, development, production, and testing of key public safety capabilities related to mission critical voice, location-based services, and user interface/user experience as described in Section I. of this NOFO.

- **Anticipated Amounts:** In Fiscal Year 2022, NIST anticipates funding up to $7,000,000 in new awards. Funding is expected to range from $300,000 to $600,000 per year, per award. Project performance periods may be up to two (2) years, with the exception of proposals submitted by institutions of higher education for the purposes of supporting research by graduate students as part of a doctoral program, for which the period of performance may be up to three (3) years.

- **Funding Instrument:** Grant or cooperative agreement.

- **Eligibility:** Eligibility for the program listed in this NOFO is open to all non-Federal entities. Eligible applicants include accredited institutions of higher education; non-profit organizations; for-profit organizations incorporated in the United States; state, local, territorial, and Indian tribal governments; foreign public entities; and foreign organizations. Please note that individuals and unincorporated sole proprietors are not considered "non-Federal entities" and are not eligible to apply under this NOFO. Although Federal entities are not eligible to receive funding under this NOFO, they may participate as unfunded collaborators.

  NIST will consider multiple applications per applicant. However, an individual researcher may only be listed as the principal investigator on one application. In addition, applicants should refrain from submitting multiple applications with related subject matter.

- **Cost Sharing Requirements:** Non-federal cost share is not required for awards issued pursuant to this NOFO.

- **Public Website and Frequently Asked Questions (FAQs):** NIST has a public website that provides information pertaining to this Funding Opportunity. NIST anticipates that a "Frequently Asked Questions" section or other resource materials will be maintained and updated on the website as needed to provide additional guidance and clarifying information that may arise related to this Funding Opportunity. Any amendments to this NOFO will be announced through Grants.gov.

  Applicants must submit all questions pertaining to this funding opportunity via e-mail to pscr@nist.gov with 'PSIAP-2022' in the subject line. Questions submitted to NIST may be posted on the public website. Alternatively, applicants may ask questions during the informational public webinar.

- **Webinar Information Session:** NIST will host a webinar to provide general information regarding this NOFO, offer general guidance on preparing applications, and answer questions. Scheduling details about the webinar will be available on the public website. Proprietary technical discussions about specific project ideas will not be permitted during the webinar and NIST staff will not critique or provide feedback on specific project ideas while they are being developed by an applicant, brought forth during the webinar, or at any time before the deadline for all applications. However, questions about the funding opportunity, eligibility requirements, evaluation and award criteria, selection process, and the general characteristics of a competitive application will be addressed at the webinar. There is no cost to attend the webinar, but participants must register in advance. Participation in the webinar is not required and will not be considered in the application review and selection process.

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FULL ANNOUNCEMENT TEXT

I. Program Description

The statutory authority for the NIST PSIAP is 15 U.S.C. § 3706 and 47 U.S.C. § 1443.

Program Description
The mission of the NIST Public Safety Communications Research (PSCR) Division is to research, develop, and test technologies to improve first responder communications and operations. PSCR created this funding opportunity to stimulate external research and development (R&D) activities addressing critical technology gaps identified by stakeholders and to build a public-safety-focused R&D ecosystem with long-lasting impact.

The NIST Public Safety Innovation Accelerator Program 2022 (PSIAP-2022) is seeking applications to accelerate research and development (R&D) around the use of mission critical voice (MCV), location-based services (LBS), and user interface/user experience (UIUX) for improving public safety communication technologies.

1. Background Information

The PSIAP-2022 funding opportunity supports the emerging Nationwide Public Safety Broadband Network and recognizes the urgent need for first responders to have access to the same broadband communications and innovative technologies that consumers on commercial networks now expect. Each of the three technical program goals, described in more detail in Sections I.4.a through I.4.c. of this NOFO, include specific objectives prioritized by public safety stakeholders that could transform the future of public safety operations.

2. Program Overview

Recipients will rapidly accelerate the objectives of the funding opportunity through innovative research and development (R&D) projects. Applicants may propose projects specific to one or more PSIAP-2022 technical program goals and may propose cross-cutting projects that address one or more objectives within each or multiple goals. Applicants may also propose new ideas and objectives within any of the goals but may not propose new goals.

Applicants are required to develop partnerships with Public Safety Organizations (PSOs) to ensure that the R&D outputs of each PSIAP-2022 project are highly relevant and will have a meaningful impact on the public safety community. Potential applicants are responsible for contacting the organizations and arranging partnerships. NIST will not assist potential applicants with finding partners.

For purposes of this NOFO, PSOs include U.S. federal, state, and local emergency medical services (EMS), fire services, law enforcement, and public safety communications/911 centers. At least one PSO involved in the project must be an active or volunteer department or agency. For the sake of the PSO participation requirement, consulting agencies and associations are not considered PSOs.

The program office recognizes that operational demands and limited budgets typically preclude public safety entities from dedicating resources to

participate in R&D activities. Therefore, applicants are encouraged to identify appropriate partners and include funding in their proposed budget for non-federal first responders and public safety personnel to actively participate within their projects, and to budget significant time and sufficient travel for this interaction. Please note that Federal entities are not eligible to receive funding under this NOFO, though they may participate as unfunded collaborators.

Applicants should also plan R&D projects tailored to disseminate their ideas and technology to the public safety stakeholder community. Such activities may be achieved through publications, technology transfer, commercialization, training, and/or the release of tools, designs, and/or data sets. Applicants may include funding in their proposed budget that would support the dissemination of the results and lessons of their PSIAP-2022 R&D efforts to the public safety stakeholder community.

The PSIAP-2022 funding opportunity is intended to accelerate R&D that directly impacts first responder communications and operations. This should be distinguished from activities addressing citizen emergency communications, e.g. 911. All applications must clearly demonstrate direct impact to first responder communications and operations.

The protection of human-subject-derived data is a priority for NIST research. The use of any data potentially involving human subjects will require an appropriate Institutional Review Board (IRB) waiver or approval that addresses the research to be performed. Data and IRB considerations and risks must be addressed in the Project Narrative. NIST cannot serve as an applicant's IRB. For more details about research involving human-subject-derived data, see Section VI.2.g. of this NOFO.

3. Program Requirements

Applicants may address one or more of the goals described below in Section I.4. of this NOFO within one application.

The recipient's Principal Investigator (PI) will be required to participate in the PSCR Public Safety Broadband Stakeholder Meetings (approximately five days) each calendar year during the term of the award to present research and meet with stakeholders from public safety, government, industry, and academia. Other essential project staff are encouraged to attend. Attendance at this event should be reflected in the project schedule and budget.

4. Technical Program Goals

a. Goal 1 – Mission Critical Voice

Ever increasing operational demands on first responders, along with new technological opportunities and capabilities, are driving public safety organizations (PSOs) to adopt broadband technologies such as Long Term Evolution (LTE) and 5G for mission critical data. While access to broadband data is improving public safety operations and providing new applications, voice remains the most critical communications capability. PSCR is seeking proposals for innovative R&D projects to accelerate the development, production, and testing of mission critical voice over broadband networks.

An operational MCV capability includes a number of key functions, and successful implementation using LTE will require incorporation of a broad set of technologies, some of which are new or developing. However, PSCR's stakeholder engagement and evaluation activities, coupled with the technology landscape assessments and industry roadmaps, clearly support the need for R&D in four particular areas: 1) direct mode operations, 2) mission critical push-to-talk, 3) LMR to Broadband, and 4) MCV Measurements/Quality of Experience.

i. Direct Mode Operations

Direct mode operations (DMO) allow first responders to communicate independent of existing network infrastructure. DMO is currently used for several reasons, e.g., when operating outside of coverage areas or in covert mode, in areas with limited or degraded network capacity, etc. But, above all, it is a lifeline for first responders that allows them to communicate in emergencies and remote areas where other means are not available.

To address the critical public safety requirement for a direct mode broadband technology, as well as new modes of communication and discovery, the 3rd Generation Partnership Project (3GPP) began to release LTE specifications in 2013 under the label Proximity Services (ProSe). Unlike conventional LTE in which transmissions are between base stations and devices via downlink or uplink, ProSe enables device-to-device (D2D) direct communication via a new channel called the 'sidelink'. ProSe further defines a method to extend network communications to out-of-coverage user equipment (UE) via the UE-to-network relay. ProSe also includes a 'direct discovery' feature that can be used to discover other users or devices in proximity. More recent specifications have been released to enhance the sidelink to

enable vehicle-to-vehicle/vehicle-to-everything (V2V/V2X) communications. Like ProSe, V2V/V2X are technologies that could potentially be used for public safety D2D communications.

Despite this initial momentum, there are few LTE direct mode enabled products in the broadband marketplace that meet the requirements of public safety users. With the emergence of 5G New Radio (NR) and the popularity of V2X communications, 3GPP introduced NR sidelink in Release 16 to enable direct communication between devices. Public safety organizations are looking to leverage this new capability being introduced in NR ProSe in Release 17 and beyond. Thus, ProSe still needs to be studied carefully in conceptual and practical applications for DMO, both on-network and off-network. Furthermore, it is expected that ProSe/V2V/V2X, along with emerging 3GPP specifications to support Internet-of-things (IoT) communication, will enable a first responder to contact any and all resources, including people, devices, and machines, within their proximity via the broadband network to ensure robust communications and augment current-day operations.

PSCR seeks applications for R&D projects to stimulate commercial and technical organizations to create and support a market that will accelerate the development and adoption of DMO capabilities in public safety broadband devices, networks, applications, and operations. Examples (in no particular order) of possible R&D projects in this area include, but are not limited to:

1. Studying service continuity, i.e., how to enable seamless communications and network access as users and groups transition through in-coverage, partial coverage, and out-of-coverage scenarios using technologies like ProSe direct communications and UE-to-network relay. Questions that might be considered include:
    a. Are there any architecture and design considerations to enable service continuity between operational environments beyond the reference architecture model as identified in 3GPP TS 23.303 and TS 23.304?
    b. In providing service continuity, what factors must be considered when using scheduled resource allocation versus autonomous resource selection?
    c. If automating the transition between network and direct mode operation, what factors and key performance indicators (KPIs) should be considered by an algorithm

that would trigger the changeover? What would be the impact on the user experience (e.g., handover delay, packet loss)?

2. Implementing a full NR UE stack that includes ProSe on a programmable system-on-a-chip that could be integrated in public safety devices.
3. Developing accurate uplink/sidelink coexistence traffic models for predicting and verifying network performance, building on some of the work documented in 3GPP TR 36.877.
4. Developing test cases for ProSe that can be used by the research community to test performance and conformance and be submitted for consideration by 3GPP for inclusion in conformance specifications like TS 38.521 and TS 38.523.
5. Developing methods to measure user quality of service and experience in an operational environment while operating in direct mode.
6. Conducting market research on how D2D technologies like ProSe might be adopted by consumers for applications like wearables, two-way radio, IoT, etc., and leveraged by commercial networks for carrier offloading, reduced backhaul, etc. Then further evaluating how this new mode of operation could be monetized and managed by commercial cellular operators, with the end-benefit for public safety being an economy of scale that could lower the cost of DMO-enabled public safety devices.
7. Studying how ProSe direct communication, and a related capability ProSe discovery, can be utilized to augment LBS technologies and public safety analytics.
8. Assessing the benefits, risks, and vulnerabilities of DMO technologies from a security perspective.
9. Developing enhancements to test equipment (e.g., base station emulators, load-testers) and software tools (e.g., Wireshark dissector, modeling and simulation, software defined radio frameworks) to facilitate test and measurement of sidelink and DMO technologies in LTE and 5G networks.
10. Evaluating coexistence scenarios where LTE, NR, and sidelink operate on the same frequency bands.
11. Develop best practices to improve user coverage (e.g., higher capacity, increased communication range) based on existing specifications or new capabilities.

ii. Mission Critical Push-to-Talk

First responders use push-to-talk (PTT) technology as their standard communications for everyday operations. PTT allows users to push a button to (nearly instantaneously) initiate a transmission that can be broadcast to other users in a ‘talkgroup’, then release the button when done to hear transmissions from other users in the group. Beyond the PTT functionality, there are a range of other important capabilities and features that a public safety communications system must provide. To accommodate mutual aid scenarios these services must also have standard interfaces to be interoperable across public safety networks, and all these capabilities, features, and interfaces must perform at a high level of reliability to support ‘mission critical’ first responder operations.

To address the critical public safety requirement of a mission critical broadband PTT capability, the 3GPP began to release LTE specifications for public safety PTT in 2016 under the label Mission Critical Push-to-Talk (MCPTT). In addition to providing the essential services and features, one of the primary goals of the MCPTT standard is to enable nationwide interoperability, a more competitive marketplace, and rapid technology migration at a scale not previously realized by current public safety networks and organizations. While most network operators are now offering 3GPP compliant MCPTT services over broadband, there is still a rich industry base supporting PTT communications in narrowband land mobile radio (LMR) networks. Emerging solutions, including the deployments of 5G NR, will require significant testing and evaluation to ensure they meet the rigorous demands of a mission critical network.

PSCR seeks applications for R&D projects to accelerate the creation and adoption of MCPTT in public safety broadband devices, networks, applications, and operations. Examples (in no particular order) of possible R&D projects in this area include, but are not limited to:

1. Creation of data sets/models that represent how public safety agencies currently use their LMR and broadband systems for MCV and how it will perform in broadband networks under similar usage.
2. Developing standards-based MCPTT application servers and clients that can be used as reference implementations across the public safety industry for prototypes to begin testing and evaluation.

3. Researching and developing standards-based interfaces between independent MCPTT application servers that will allow first responders in different networks, using different PTT applications and devices, to communicate without having to download new applications or deploy additional network resources.
4. Developing or enhancing devices and equipment with appropriate hardware and software features to enable end-to-end MCPTT applications and services.
5. Participating in the MCPTT plug-tests organized by the European Telecommunications Standards Institute.
6. Developing APIs and middleware for MCPTT to enable rapid deployment of applications that rely on mission critical services.
7. Developing KPIs and supporting test methodologies for evaluating LTE MCPTT capabilities and technologies against similar benchmarks in LMR systems.
8. Developing a framework and data specification for integrating sensors, analytics, and decision thresholds into MCPTT applications.
9. Studying and demonstrating the potential benefits and risks to public safety operations if adaptive/dynamic call and floor controls integrating real-time feedback from devices, sensors, and personnel are utilized.
10. Developing a test plan for expected battery life tailored to the operational requirements of first responder devices that includes consideration for ProSe, evolved multimedia broadcast/multicast services (eMBMS), location-based services, and personal area networks.
11. Developing enhancements to test equipment and software tools to facilitate test and measurement of MCPTT technologies in LTE and NR networks.
12. Studying security aspects of MCPTT to include protecting the signaling, media, and identity of users.
13. Investigating conditions leading to undesirable behaviors (e.g., multiple arbitrators on the same call) and developing solutions to resolve them.
14. Evaluating MCPTT performance over NR and identifying enhancements to MCPTT to exploit new capabilities offered by NR.

iii. LMR to Broadband

PSCR is committed to developing and implementing 3GPP-compliant technologies that bridge existing LMR systems to public safety broadband networks. These systems are required for public safety networks until broadband MCV capabilities are adopted widely by public safety agencies and their users. PSCR's main efforts in this area through FY22 are focused on:

1. Software Defined Radio (SDR) Interfaces.
2. 3GPP Interworking Function (IWF) Development.
    a. Radio Over IP (ROIP)/Bridging System Development/Implementation.

In SDR interfacing, PSCR has been developing technology and/or infrastructure that allows for the connection of existing legacy public safety radios, including analog and non-ISSI P25 radios, directly to 3GPP compliant interfaces without the use of donor radios or proprietary hardware/software.

PSCR has funded development in FY21 of an IWF that will be commercial grade and available for sale to encourage interoperability using TIA02 and 3GPP standards.

To continue to expand LMR to broadband capabilities, PSCR is interested in projects in the following areas:

1. Implementation of open source capabilities to bridge LMR radios/repeaters/base stations directly to 3GPP-compliant IWFs and MCPTT Application Servers (AS).
2. Affordable products for public safety to use to implement SDRs in their LMR radio coverage that directly bridges to 3GPP compliant systems.
3. Whole-system console integration of LMR to broadband capabilities that allow for dispatch/console solutions across domains for public safety agencies.

iv. MCV Measurements/Quality of Experience

PSCR has developed measurement methods and capabilities to benchmark the performance of MCV systems for MCPTT relative to the users' Quality of Experience (QoE). These methods and capabilities have been developed in a manner that treats the system under test as a black box so that all MCV systems, regardless of

underlying technology, can be measured against each other. The measurements heavily based around intelligibility of speech (whether the intended message is understood by the listener), as opposed to voice quality (how pleasant the sounds that make up speech are). The four key performance indicators (KPIs) are Speech Intelligibility/Voice Quality, Mouth-to-Ear Latency, End-to-End Access Time, and Probability of Successful Delivery.

In addition to developing measurement methods and capabilities, PSCR has also funded financial assistance awards to research how different values of these four KPIs affect public safety user job performance, and to study the specifics of public safety QoE.

To expand on PSCR's ongoing research activities, research topics are sought under, but not limited to, the following topics:

1. Improvement of MCV QoE measurement systems.
2. Additional measurements and analysis of public safety users' job performance related to QoE, expanding upon research performed under prior financial assistance awards.
3. Correlation of MCV QoE measurements to radio/system performance parameters in non-ideal, operational environments.
4. Extensive performance testing of various MCV technologies, deployments, and systems.
5. Comparison of LMR and LTE system performance.
6. Highly intelligible and reliable speech-to-text capabilities for public safety users, both generating text from speech and generating speech from text.
7. Development and implementation of measurement systems related to user QoE.
8. UE time to registration and service measurement.

b. Goal 2 – Location-Based Services

Emergency responders have a compelling need to understand the physical environment in which they are working. Where are public safety personnel and equipment? What hazards and resources are present in the area? What entry and exit routes are available? PSCR refers to the collection of technologies and systems that gather, store, disseminate, and act on location and located information as Location-Based Services (LBS).

i. Positioning

The most fundamental component of LBS for public safety is positioning: The ability to determine where something or someone is, especially the ability to locate public safety personnel and assets that are working in highly dynamic, potentially dangerous environments. A successful positioning system will be one that can determine personnel positions in three dimensions with sufficient precision, accuracy, timeliness, and reliability across the widest possible range of environments. The definition of “sufficient” will vary between use cases and situations, but a minimum level of performance is a sub 3 meter error radius with 95% probability and sub 1 second refresh rate (that is, at any given time, the most recent estimated position corresponds to the true position at a time less than 1 second ago) indoors, including in the basement of a large building. Note that this level of performance is what is required for first responder operations and should be distinguished from the positioning requirements in the Next Generation 9-1-1 initiative, which are for locating members of the public when responding to emergencies.

PSCR seeks applications for:

1. Developing positioning systems that can determine responder locations to sufficient accuracy and timeliness in diverse indoor environments regardless of whether the responder is walking, running, crawling, etc. These systems may rely on any mix of sensors and technologies but must not depend on the location where an incident occurs having been prepared in advance, for example by installing transmitters or receivers within the structure.
2. Developing positioning systems that can determine the location of other assets (e.g., equipment brought by emergency personnel or pre-installed in the environment), and people (e.g., patients or trapped persons) with similar accuracy and under similar constraints.

ii. Dissemination

A closely related component of LBS is position dissemination: the ability to get position information from the device(s) where it is calculated to the people who need to know it. It is frequently necessary to know where someone else is, for example to warn a person who is in danger, or to rescue a person who is incapacitated. Emergency responders frequently work in environments in which communication is

impaired; for example, it should not be assumed that infrastructure-based wireless communication is always available, or that there is a low-interference, low-attenuation radio path between all pairs of responders. A successful position dissemination system will be one that delivers sufficiently accurate and timely position information, reliably, across the widest possible range of communication environments.

PSCR seeks applications for:

1. System-level research and development on position dissemination systems appropriate to public safety use. Software defined application architecture optimized based on network, device, power and server performance. A strong system-level proposal will address objectives of timeliness, reliability, accuracy, and security while considering communication, networking, and computation challenges.

iii. Data Security, Integration, and Interoperation

The next layer of LBS is data security, integration, and interoperation: It is not enough to know locations of individual objects and people in some arbitrary coordinate system; it must be possible to integrate and derive meaningful information from a variety of data sources. PSCR seeks applications to assess, develop, and enhance the following capabilities:

1. Combining existing indoor and outdoor maps, drawings, imagery, and data in a way that is seamless to the user and presentable on a range of devices with a variety of form factors and display sizes, e.g., smartphones, tablets, and mobile data terminals.
2. Integrating data of variable provenance and confidence, for example publicly-sourced observations, responder-generated real-time updates, maps of varying age and quality, etc. This includes tracking the origin of information and enabling users to make real-time selections of which sources to trust (and to what extent).
3. A framework for protecting the privacy, identity, and integrity of metadata related to location of first responders utilizing LBS systems, as well as authentication of, and access to, different

LBS sources based on identity of users and operational scenarios.

iv. Mapping and Visualization

PSCR is interested in data collection (mapping) and data output (visualization and other UI modalities). PSCR seeks applications for:

1. Assessing and developing tools and techniques for indoor mapping, including automatic visual (or other) SLAM (Simultaneous Location and Mapping). Of particular interest are approaches for first responder pre-planning (in which response plans are developed in advance for known high-risk events / locations) as well as “on-demand” mapping in unplanned events. Relevant issues include interoperability for large-scale indoor/outdoor building mapping, accuracy, error correction, user learning curve, and system cost.
2. Developing techniques for mapping and localizing personnel within outdoor covered areas in which traditional GPS and visual aerial imagery are insufficient. Examples include under water or snow, heavily forested areas, and caves. Of particular interest are techniques based on (satellite or UAV) aerial measurement, including ground-penetrating RF and multi/hyperspectral imaging.
3. Addressing visualization of building and integration of vital information (e.g., sensors, HVAC and equipment, IoT devices, emergency equipment etc.). One example would be to create a Building Management Platform app that encourages building owners to make their own maps that can be utilized on a daily basis for building owners as well as for emergencies and requires zero technical expertise to set up or operate.

v. Affordable Localization Reference Environments

PSCR conducts internal research and development, with a heavy emphasis on testing and verification. We seek to test new localization technologies in realistic indoor scenarios with known “ground truth” location, and to accurately attribute location information to (other) measurements recorded while responders move around indoor environments. Thus, we are interested in ways that a controlled environment can be affordably instrumented to create a precise localization reference that can then be used to test a variety of LBS

technologies and solutions. The reference environment should enable precision localization of persons or objects moving freely within the space, without requiring them to alter their behavior in order to be accurately tracked.

There are two application scenarios of interest, with somewhat different requirements. The first is in an “LBS testbed” which will be a benign indoor environment. The second is in collecting measurements during response training and simulations. In the second case, the more robust the system is to adverse environments, the more broadly useful it will be.

PSCR seeks applications for:

1. Developing cost-effective reference measurement systems that can be installed in controlled indoor environments (i.e. testbeds, public safety training facilities, etc.) and used to assess the accuracy of LBS solutions in determining the location and movement of personnel and their equipment progressing within the test environment. While such tools need not be robust enough for field use, there is added value in being suitable for use in challenging environments such as a fire simulator or controlled burn.

c. Goal 3 – First Responder-Machine Interactions

In 2017, stakeholders across industry, academia, and public safety identified and prioritized seven key areas for impactful research around future user interfaces for public safety. The results were published in the 2018 Public Safety User Interface R&D Summit Report. These areas remain critical R&D areas for PSCR and public safety. To accelerate the development and adoption of these research areas for first responders, applicants can propose projects that conduct R&D in support of the following areas:

i. Augmented Reality

Augmented reality (AR) interfaces - AR technology enables users to interact with their physical environment through the overlay of digital information. The ability to overlay contextual information and background knowledge on an AR headset would increase the operator’s awareness in the field. This may provide a series of visual cues that alert a

responder to hazardous materials or resources within a scene as he or she moves between environments.

ii. Voice Command/Audio Intake

Vocal command - Natural voice interaction could streamline access to data and information and make data retrieval more intuitive to responders in action. Vocal commands could greatly reduce physical cognitive requirements for operating communications devices and allow responders to focus on the task at hand. Audio intake – auditory cues could supplement visual or haptic interfaces to provide alerts or directional aids.

iii. Unmanned Vehicles/Human-Machine Interaction

Remote operation of unmanned ground and aerial vehicles - Higher prevalence of drones will enable virtualized public safety operations to be conducted from remote locations. Remote operations can be thought of as a separation between the human operator and the physical execution of public safety tasks where control is maintained via a virtualized interface.

Human-machine interaction (HMI) and co-participation - Public safety may eventually gain the ability to interact with robots as co-participants during response. These machines may be able to process commands within the context of a scenario's mood, uncertainty, risk factors, etc. in real time and notice deviations from standard operating procedure. Responders may interact with robots to retrieve or transmit data on-scene.

iv. Biometrics/Wearables/Smart Suit

Biometric Input mediums (heart rate, tongue gesture) - These include biometric sensors, heart rate monitors, and subvocal input commands, among others. Given the extreme environmental conditions inherent to many emergency scenarios, these non-vocal input commands will help responders communicate with others on scene or trigger specific support services when experiencing high noise, low visibility, limited dexterity, or physical impairment.

Wearables and devices/sensors in clothing - Future public safety users may be equipped with wearable interfaces that measure physiological factors such as heart rate, electrical activity from muscles, and body

temperature. This performance data may lead to more informed resource allocation and operational decision making. Other wearables such as personal accountability tags may enhance responder situational awareness and user experience while yielding more precise location tracking and route optimization.

Smart suit interfaces and cooperative devices/sensors - “Smart Suits” present the opportunity for public safety to integrate multiple user interface capabilities into an integrated product design. The smart suit technology for public safety looks to incorporate data, communications, sensors, displays, and cameras supporting improved situational awareness with the protective layer of the operational uniform.

v. Haptics

Haptic feedback and responsive physical displays - Touchscreens represent one of the most common user interface technologies used today and will become more responsive to touch, resistance, and motion with and without gloves going forward. Other types of haptic displays such as haptic belts and harnesses will provide tactile feedback to help responders “feel their way” or navigate through extreme conditions during response.

vi. Virtual Reality

Virtual reality (VR) systems - VR systems will be used to train public safety and conduct controlled equipment and interface testing. The ability to completely virtualize the operational environment from the safety of a controlled, indoor location will reduce risk to the lives of first responders, costs of training staff, and difficulty in testing equipment for operational suitability.

vii. Gesture Recognition/Eye-Gaze

Gesture Recognition - Gesture recognition represents an attractive alternative to traditional user controls because it would reduce the cognition and dexterity required to operate devices such as computer interfaces and in-vehicle dashboard controls. Eye-gaze input command and Eye Tracking - Many tasks within emergency response scenarios require full use of device operators’ hands and cognitive capacity. Eye-gaze input commands that automatically track responders’ field of vision present a hands-free, potentially subconscious method to operate user

interface devices supporting the completion of these physically and mentally-demanding tasks.

These research areas account for areas that are deemed to have high impact and value for public safety based on feasibility, leverage, impacts on processes, results, and uniqueness to the public safety use case. The objective of Goal 3 is not to focus solely on the development of the underlying technology (e.g., create a drone) but rather to focus on the user interaction elements and potential applications for first responder training or operations.

Applicants will be able to research, design, and develop technologies that will improve first responder-machine interactions (FRMI). The R&D should apply a user-centered design approach and must include collaborating with a PSO to conduct user studies, assess human factors, and ensure potential implementations in the field align with PSO context of use. Further activities could include specific research including but not limited to: cognitive load and physical strain on performance, developing XR usability measurement capabilities, and testing methodologies.

II. Federal Award Information

1. Funding Instrument

The funding instruments that will be used are grants or cooperative agreements, as appropriate. Where cooperative agreements are used, the nature of NIST's "substantial involvement" will generally include collaboration with the recipient organization in developing and implementing the approved scope of work, in accordance with 2 CFR § 200.01.

2. Funding Availability

In FY 2022, NIST anticipates funding up to $7,000,000 in new awards. Funding is expected to range from $300,000 to $600,000 per year, per award. Project performance periods may be up to two (2) years, with the exception of proposals submitted by institutions of higher education for the purposes of supporting research by graduate students as part of a doctoral program, for which the period of performance may be up to three (3) years.

III. Eligibility Information

1. **Eligible Applicants**
   Eligibility for the program listed in this NOFO is open to all non-Federal entities. Eligible applicants include accredited institutions of higher education; non-profit organizations; for-profit organizations incorporated in the United States; state, local, territorial, and Indian tribal governments; foreign public entities; and foreign organizations. Please note that individuals and unincorporated sole proprietors are not considered "non-Federal entities" and are not eligible to apply under this NOFO. Although Federal entities are not eligible to receive funding under this NOFO, they may participate as unfunded collaborators.

   NIST will consider multiple applications per applicant; however, an individual researcher may only be listed as the principal investigator on one application. In addition, applicants should refrain from submitting multiple applications with related subject matter.

2. **Cost Sharing or Matching**
   Non-federal cost share is not required for awards issued pursuant to this NOFO.

IV. Application and Submission Information

1. **Address to Request Application Package**

   The application package is available at Grants.gov under Funding Opportunity Number 2022-NIST-PSIAP-2022.

2. **Content and Form of Application Submission.** Set forth below are the required content and form of applications submitted pursuant to this NOFO.

   a. **Required Forms and Documents.** The Application must contain the following:

      (1) **SF-424 (R&R), Application for Federal Assistance.** The SF-424 (R&R) must be signed by an authorized representative of the applicant organization.

      For SF-424 (R&R), Items 5, 14, and 19, use the Zip Code + 4 format (##### - ####) when addresses are called for.

      For SF-424 (R&R), Item 17, the list of certifications and assurances is contained in the SF-424B (item (3) below).

SF-424 (R&R), Item 18. If the SF-LLL, Disclosure of Lobbying Activities form (item (4) below) is applicable, attach it to field 18.

(2) Research & Related Budget (Total Fed + Non-Fed). The budget should reflect anticipated expenses for the full term of the project, considering all potential cost increases, including cost of living adjustments.

The budget should be detailed in these categories:

A. Senior/Key Person;
B. Other Personnel;
C. Equipment Description;
D. Travel;
E. Participant/Trainee Support Costs;
F. Other Direct Costs;
G. Direct Costs (automatically generated);
H. Indirect Costs;
I. Total Direct and Indirect Costs (automatically generated);
J. Fee (not relevant to this competition);
K. Total Costs and Fee (automatically generated);
L. Budget Narrative and Justification document (item (8) below) should be attached to field L.

A separate detailed R&R Budget must be completed for each budget period during the proposed award (e.g., annual basis). To add additional budget periods (e.g., year 2), click “Add Period” embedded at the end of the form. Information regarding the Research & Related Budget (Total Fed + Non-Fed) is available in the R&R Family Section of Grants.gov.

(3) CD-511, Certification Regarding Lobbying. Enter “2022-NIST-PSIAP-2022-01” in the Award Number field. Enter the title of the application, or an abbreviation of that title, in the Project Name field.

(4) SF-LLL, Disclosure of Lobbying Activities (if applicable).

(5) Executive Summary and Quad Chart. (This does not count toward the page limit.) The executive summary must explicitly state the objectives and approaches to meet those objectives, anticipated challenges, and benefits and impacts of the proposed project. The quad chart must contain a problem statement, the concept of the

proposed project, the potential impact of the project, and key milestones and/or deliverables. The executive summary and the quad chart must not exceed one (1) page each. Any materials provided beyond the one (1) page limit for the executive summary and the one (1) page limit for the quad chart will be redacted and not provided to the reviewers. The executive summary and quad chart are often used to inform PSCR webpages and should not contain proprietary or confidential information.

(6) Project Narrative. The Project Narrative is a word-processed document of no more than twenty (20) pages (double-spaced between lines), which is responsive to the program description and the evaluation criteria.

The projective narrative should contain the following information:

a. Cover Page. The cover page should include:

i. The name, address and contact information of the applicant institution, partner organizations, and the principal investigator;
ii. The project title;
iii. Any statements regarding confidentiality; and
iv. A summary of the project in approximately three to five sentences using plain language that can be understood by a general, lay audience.

b. Table of Contents.

c. Project Description. This is a detailed description of the proposed project and should include:

i. A clear problem statement and well-defined objectives.
ii. A description of how the proposed R&D aligns with and meets the relevant goal(s) described in Section I. of this NOFO.
iii. A technology assessment that reflects the current state of the technology and the projected state of the technology as a direct result of successful project completion. This includes a description of existing frameworks, data, resources, and tools to be leveraged in the research.
iv. Technology-specific key performance indicators and goals, as well as measurement techniques.

v. Drawings, renderings, or diagrams and an explicit description of standards-based vs. non-standards-based interfaces, if applicable.
vi. Identification of anticipated outputs with a discussion of how the research and technology developed will be disseminated or made available.
vii. Discussion of potential impacts to first responder communications and operations.

d. Project Execution. This is a detailed description of the plan to execute the project and should be contained within the Project Narrative. Applicants should note that all information regarding costs are to be addressed in the Budget Narrative and Justification (see Section IV.2.a.(8) of this NOFO). This section should include:

i. A summary of the overall approach to executing the award and how the schedule, deliverables, milestones, risk management, collaboration, and funding spent will maximize the applicant's chances of achieving the goals of this NOFO.
ii. A detailed project schedule (Gantt chart or similar) for the entire award period.
iii. A deliverable summary table identifying all deliverables, a description of each, and due dates.
iv. A milestone summary table identifying all milestones, a description of each, due dates, and clear, measurable criteria to verify milestone completion.
v. A description of experiments to be conducted and tools and prototypes to be developed and tested, if applicable.
vi. A description of the human data that will be used or generated in this study, identifying which data will be from or about individual humans. All proposals including such data will be reviewed as described in Section VI.2.g of this NOFO.
vii. A risk management plan identifying major risks during each phase of the award and mitigation strategies. This section should address program risk, specifically looking at budget and schedule risk, and describe the contingency plans in place to maximize the outcomes of the NOFO.
viii. An intellectual property plan that includes a discussion of proprietary intellectual property (whether existing or to be created) integrated in the R&D and why it would be necessary to the project. Applicants should identify any potential IP risks and encumbrances and address how IP challenges would be overcome in their technical approach.

e. **Qualifications.** This is a detailed description of the applicant's relevant qualifications, experience, and resources for successfully completing the requirements of this NOFO. This section should include:
   i. Qualifications of the individuals, teams, and organizations that will be executing or supporting the proposed project relative to the program goals.
   ii. Access to the necessary staff, equipment, facilities, support, and resources to accomplish the proposed objectives.

(7) Resumes of Key Personnel. Resumes for all key personnel assigned to the project must be provided. Resumes must be a maximum of two pages each. Additional pages beyond the two pages per resume will not be considered during the evaluation of the application. Resumes are not included in the page count of the Project Narrative.

(8) Budget Narrative and Justification. There is no set format for the Budget Narrative and Justification. The Budget Narrative and Justification must be attached to the Research & Related Budget (Total Fed + Non-Fed). The written justification should include the necessity and the basis for the cost. Proposed funding levels must be consistent with the project scope, and only allowable costs should be included in the budget. Information on cost allowability is available in the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200 (http://go.usa.gov/SBYh), which apply to awards in this program.

The Budget Narrative does not count against the twenty (20) page limit of the Project Narrative.

This section will be evaluated in accordance with the Budget Narrative evaluation criteria. It will also be reviewed to determine if all costs are reasonable, allocable, and allowable under 2 C.F.R. Part 200 Subpart E, Cost Principles.

Information needed for each budget category is as follows:

a) **Personnel**- At a minimum, the budget justification for all personnel should include the following: job title, commitment of effort on the proposed project in terms of average number of hours per week or percentage of time, salary rate, total personnel charges for each identified position on the proposed project, description of the role

of the individual on the proposed project and the work to be performed.

b) **Fringe Benefits**– Fringe benefits for each position should be identified separately from salaries and wages and based on rates determined by organizational policy. The items included in the fringe benefit rate (e.g., health insurance, parking, etc.) should not be charged under another cost category.

c) **Travel**- For all travel costs, the budget justification for travel should include the following: destination; names or number of people traveling; dates and/or duration; mode of transportation, lodging and subsistence rates; and description of how the travel is directly related to the proposed project. For travel that is yet to be determined, please provide best estimates based on prior experience. If a destination is not known, an approximate amount may be used with the assumptions given for the location of the meeting.

d) **Equipment**- Equipment is defined as an item of property that has an acquisition cost of $5,000 or more (unless the organization has established lower levels) and an expected service life of more than one year. The budget justification should list each piece of equipment, the cost, and a description of how it will be used and why it is necessary to the successful completion of the proposed project. Please note that any general use equipment (computers, etc.) charged directly to the award should be allocated to the award according to expected usage on the project.

e) **Supplies**– Supplies are defined as all tangible personal property other than that described as equipment. Provide a list of each supply, and the breakdown of the total costs by quantity or unit of cost. Include the necessity of the cost for the completion of the proposed project.

f) **Contractual (i.e. Contracts or Subawards)**– Each contract or subaward should be treated as a separate item. Identify the cost and describe the services to be provided and the necessity of the subaward or contract to the successful performance of the proposed project. Contracts are for obtaining goods and services for the Non-Federal Entity's own use and creates a procurement relationship with the contractor. A subaward is for the purpose of

carrying out a portion of a Federal award and creates a Federal assistance relationship with the subrecipient.

g) **Construction**– Not an allowable cost under this NOFO.

h) **Other Direct Costs**– For costs that do not easily fit into the other cost categories, please list the cost, and the breakdown of the total costs by quantity or unit of cost. Include the necessity of the cost for the completion of the proposed project. Only allowable costs can be charged to the award.

i) **Indirect Costs**- Commonly referred to as Facilities & Administrative Costs, Indirect Costs are defined as costs incurred by the applicant organization that cannot otherwise be directly assigned or attributed to a specific project. The justification should include a cost calculation that reflects the applicable indirect cost rate. For more details, *see* Section IV.2.a.(8) of this NOFO.

(9) Indirect Cost Rate Agreement. If indirect costs are included in the proposed budget, provide a copy of the approved negotiated agreement if this rate was negotiated with a cognizant Federal audit agency. If the rate was not established by a cognizant Federal audit agency, provide a statement to this effect. If the successful applicant includes indirect costs in the budget and has not established an indirect cost rate with a cognizant Federal audit agency, the applicant will be required to obtain such a rate in accordance with Section B.06 of the Department of Commerce Financial Assistance Standard Terms and Conditions, dated November 12, 2020.

Alternatively, in accordance with 2 C.F.R. § 200.414(f), applicants that do not have a current negotiated (including provisional) indirect cost rate - except for those non-Federal entities described in appendix VII, paragraph D.1.b. of 2 CFR 200 - may elect to charge a de minimis rate of 10 percent of modified total direct costs (MTDC). Applicants proposing a 10 percent de minimis rate pursuant to 2 C.F.R. § 200.414(f) should note this election as part of the budget portion of the application. Please be aware that Foreign applicants will be limited to use of the de minimis rate and will not have the opportunity to negotiate an indirect cost rate with NIST.

(10) Subaward Budget Form. The Research & Related Subaward Budget Attachment Form is required if sub-recipients and contractors are included in the application budget.

Instructions for completing subaward budget forms are available by visiting the R & R Family section of the Grants.gov Forms Repository and scrolling down to the R & R Subaward Budget Attachment(s) Form and selecting "Instructions."

(11) Letters of Commitment. Letters of commitment must be submitted by all funded and unfunded entities that will have an active role in executing the activities outlined in the Project Narrative. Letters of commitment should address the level of participation, qualifications of the personnel who will be actively involved, and the potential impact on the field. Letters of commitment must be signed by an individual with sufficient authority to legally bind the organization to its commitment. Letters of commitment will be evaluated in accordance with the *Performance* evaluation criteria (see Section V.1.b. of this NOFO). Letters of commitment do not count against the specified page limit of the Project Narrative.

1. **Public Safety Organizations**: All applications must include at least one letter of commitment from a PSO unless the applicant organization is a PSO. Applications from non-PSO entities that lack a Letter of commitment from a PSO will be deemed ineligible and not receive further consideration.

   Letters of commitment from PSO partners must address the importance of the proposed work as well as potential impact for first responders and public safety in general. Applicants must include a detailed description identifying how first responders will be actively engaged throughout the proposed project. For purposes of this NOFO, PSOs include U.S. federal, state, and local EMS, fire services, law enforcement, and public safety communications/911 centers. Please note that Federal entities are not eligible to receive funding under this NOFO, though they may participate as unfunded collaborators.

(12) Data Management Plan. Consistent with NIST Policy 5700.00[1], *Managing Public Access to Results of Federally Funded Research,* and NIST Order 5701.00[2], *Managing Public Access to Results of Federally Funded Research*," applicants proposing projects that include the conduct of research must include a Data Management Plan (DMP).

All applications for activities that will generate scientific data using NIST funding are required to adhere to a DMP or explain why data sharing and/or preservation are not within the scope of the project. For the purposes of the DMP, NIST adopted the definition of "research data" at 2 C.F.R. § 200.315(e)(3).

The DMP must include, at a minimum, a summary of proposed activities that are expected to generate data; a summary of the types of data expected to be generated by the identified activities; a plan for storage and maintenance of the data expected to be generated by the identified activities, including after the end of the award's period of performance; and a plan describing whether and how data generated by the identified activities will be reviewed and made available to the public.

A template for the DMP, an example DMP, and the rubric against which the DMP will be evaluated for sufficiency is available at https://www.nist.gov/open. An applicant is not required to use the template as long as the DMP contains the required information.

If an application stands a reasonable chance of being funded and the DMP is determined during the review process to be insufficient, the program office may reach out to the applicant to resolve deficiencies in the DMP. If an award is issued prior to the deficiencies being fully rectified, the award will include a Specific Award Condition (SAC) stating that no research activities shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer amends the award to indicate the SAC has been satisfied.

Reasonable costs for data preservation and access may be included in the application.

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1 https://www.nist.gov/system/files/documents/2018/06/19/final_p_5700.pdf

2 https://www.nist.gov/system/files/documents/2019/11/08/final_o_5701_ver_2.pdf

(13) Current and Pending Support Form. Any application that includes investigators, researchers, and key personnel must identify all sources of current and potential funding, including this proposal. Any current project support (e.g., Federal, state, local, public or private foundations, etc.) must be listed on this form. The proposed project and all other projects or activities requiring a portion of time of the Principal Investigator (PI), co-PI, and key personnel must be included, even if no salary support is received. The total award amount for the entire award period covered, including indirect costs, must be shown as well as the number of person-months per year to be devoted to the project, regardless of the source of support. Similar information must be provided for all proposals already submitted or that are being submitted concurrently to other potential funders.

Applicants must complete the Current and Pending Support Form, using multiple forms as necessary to account for all activity for each individual identified in the PI, co-PI and key personnel roles. A separate form should be used for each identified individual.

Applicants must download the Current and Pending Support Form from the NIST website at https://www.nist.gov/oaam/grants-management-division/current-and-pending-support and reference the guidance provided as it contains information to assist with accurately completing the form.

(14) Research and Related Other Project Information. Answer the highlighted questions and use this form to attach the Project Narrative (item (6) above), the Indirect Cost Rate Agreement (item (9) above), the Data Management Plan (item (12) above), and the Current and Pending Support Form (item (13) above). Instructions for completing the Research and Related Other Project Information can be found at Instructions R&R Other Project Information.

Please note that the Project Summary/Abstract is not relevant to this competition. However, Grants.gov requires an attachment to field 7 of the Research and Related Other Project Information form to successfully pass through Grants.gov. Please attach a document to field 7 stating, "A Project Summary/Abstract is not relevant to this competition".

There are no separate documents required for field 9, "Bibliography

& References Cited'; or for field 10, "Facilities & Other Resources;" or for field 11, "Equipment". Any details relating to these topics should be included in other documents and forms, if and as specified in this NOFO.

b. Attachment of Required Documents

Items IV.2.a.(1) through IV.2.a.(3) above are part of the standard application package in Grants.gov and can be completed through the download application process.

Item IV.2.a.(4), the SF-LLL, Disclosure of Lobbying Activities form, is an optional application form which is part of the standard application package in Grants.gov. If item IV.2.a.(4), the SF-LLL, Disclosure of Lobbying Activities form is applicable to this proposal, attach it to field 18 of the SF-424 (R&R), Application for Federal Assistance.

Item IV.2.a.(6), the Project Narrative, should be attached to field 8 (Project Narrative) of the Research and Related Other Project Information form by clicking on "Add Attachment".

Item IV.2.a.(8), the Budget Narrative and Justification, should be attached to field L (Budget Justification) of the Research and Related Budget (Total Fed + Total Non-Fed) form by clicking on "Add Attachment".

Items IV.2.a.(9), the Indirect Cost Rate Agreement, IV.2.a.(12), the Data Management Plan, and IV.2.a.(13), the Current and Pending Support Form, must be completed and attached by clicking on "Add Attachments" found in item 12 (Other Attachments) of the Research and Related Other Project Information form.

Item IV.2.a.(11), Letters of Commitment, should be attached by clicking on "Add Attachments" found in item 12 (Other Attachments) of the Research and Related Other Project Information form.

Item IV.2.a.(10), the Subaward Budget Form(s), if applicable to the submission, should be attached to the Research & Related Subaward Budget (Total Fed + Non-Fed) Attachment(s) Form in the application package.

Following these directions will create zip files which permit transmittal

of the documents electronically via Grants.gov.

Applicants should carefully follow specific Grants.gov instructions to ensure the attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicates only that an application was transferred to a system. It does not provide details concerning whether all attachments (or how many attachments) transferred successfully. Applicants will receive a series of e-mail messages over a period of up to two business days before learning whether a Federal agency's electronic system has received its application.

Applicants are strongly advised to use Grants.gov's "Download Submitted Forms and Applications" option to check that their application's required attachments were contained in their submission.

After submitting the application, check the status of your application here: CHECK APPLICATION STATUS. If any, or all, of the required attachments are absent from the submission, follow the attachment directions found above, resubmit the application, and check again for the presence of the required attachments.

If the directions found at https://www.grants.gov/help/html/help/index.htm#t=GetStarted%2FGetStarted.htm are not effective, please contact the Grants.gov Help Desk immediately. If calling from within the United States or from a U.S. territory, please call 800-518-4726. If calling from a place outside the United States or a U.S. territory, please call 606-545-5035. E-mails should be addressed to support@grants.gov. Assistance from the Grants.gov Help Desk will be available around the clock every day, with the exception of Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays.

Applicants can track their submission in the Grants.gov system by following the procedures at the Grants.gov site (http://go.usa.gov/cjamz). It can take up to two business days for an application to fully move through the Grants.gov system to NIST.

NIST uses the Tracking Numbers assigned by Grants.gov, and does not issue Agency Tracking Numbers.

c. Application Format

(1) Paper, Email, and Facsimile (fax) Submissions. Will not be accepted.

(2) Figures, Graphs, Images, and Pictures. Should be of a size that is easily readable or viewable and may be displayed in landscape orientation. Any figures, graphs, images, or pictures will count toward the page limits for the Project Narrative.

(3) Font. Easy to read font (10-point minimum). Smaller type may be used in figures and tables but must be clearly legible.

(4) Page Limit. See the table below:

Section	Page Limit	Required or Optional
Cover Page	1	Required
Table of Contents	1	Optional
Project Narrative	20	Required
Letter of Commitment	1 page per PSO	Required
Executive Summary	1	Required
Quad Chart	1	Required

(5) Page Limit Exclusions:

SF-424 (R&R), Application for Federal Assistance;
CD-511, Certification Regarding Lobbying;
SF-LLL, Disclosure of Lobbying Activities;
Executive Summary and Quad Chart;
Budget Narrative and Justification;
Research & Related Budget (Total Fed + Non-Fed);
Research and Related Other Project Information;
Indirect Cost Rate Agreement;
Letters of Commitment;
Data Management Plan;
Subaward Budget Form;
Current and Pending Support Form

(6) Page Layout. The Project Narrative must be in portrait orientation.

(7) Page size. 21.6 centimeters by 27.9 centimeters (8 ½ inches by 11 inches).

(8) Page numbering. Number pages sequentially.

(9) Application language. English. All documents must be in English, including but not limited to the initial application, any additional documents submitted in response to a NIST request, all reports, and any correspondence with NIST.

(10) Typed document. All applications, including forms, must be typed; handwritten forms will not be accepted.

d. **Application Replacement Pages.** Applicants may not submit replacement pages and/or missing documents once an application has been submitted. Any revisions must be made by submission of a new application that must be received by NIST by the submission deadline.

e. **Pre-Applications.** Pre-applications will not be accepted under this NOFO.

f. **Statement of Intent.** To assist NIST in gauging interest and planning for the evaluation process, all potential applicants are strongly encouraged to send an e-mail to pscr@nist.gov with "PSIAP-2022" in the subject line indicating intent to apply. The statement of intent will only be used for competition planning purposes; it will not be used as part of the evaluation process or to eliminate any applicants from consideration under this NOFO. An applicant will receive full consideration under this NOFO if they do not submit a statement of intent.

3. **Unique Entity Identifier and System for Award Management (SAM).** Pursuant to 2 C.F.R. part 25, applicants and recipients are required to: (i) be registered in SAM before submitting its application; (ii) provide a valid unique entity identifier in its application; and (iii) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency, unless otherwise excepted from these requirements pursuant to 2 C.F.R. § 25.110. NIST will not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements and, if an applicant has not fully complied with the requirements by the time that NIST is ready to make a Federal award pursuant to this NOFO, NIST may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

4. **Submission Dates and Times**
   Applications must be received at Grants.gov no later than 11:59 p.m. Eastern Time, January 18, 2022. NIST will consider the date and time recorded by Grants.gov as the official submission time. Applications received after this deadline will not be reviewed or considered. Paper applications will not be accepted.

   Applicants should be aware, and factor in their application submission planning, that the Grants.gov system closes periodically for routine maintenance. Applicants should visit Grants.gov for information on any scheduled closures.

   When developing the submission timeline, please keep in mind that: (1) all applicants are required to have current registrations in the electronic System for Award Management (SAM.gov) and Grants.gov; (2) the free annual registration process in the SAM.gov generally takes between three and five business days but can take more than three weeks; and applicants will receive e-mail notifications over a period of up to two business days as the application moves through intermediate systems before the applicant learns via a validation or rejection notification whether NIST has received the application. (See Grants.gov for full information on application and notification through Grants.gov.) Please note that a Federal assistance award cannot be issued if the designated recipient's registration in the System for Award Management (SAM.gov) is not current at the time of the award.

5. **Intergovernmental Review**
   Applications under this Program are not subject to Executive Order 12372.

6. **Funding Restrictions**
   Construction activities are not an allowable cost under this program. In addition, a recipient or a subrecipient may not charge profits, fees or other increments above cost to an award issued pursuant to this NOFO.

7. **Other Submission Requirements**

   a) **Applications must be submitted at Grants.gov. Paper applications will not be accepted.**

      i) Applicants should carefully follow specific Grants.gov instructions to ensure that all attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicating an application is received does not provide information about whether attachments have been received. For further information or questions regarding

applying electronically for the 2022-NIST-PSIAP-2022-01 announcement, contact the Grants.gov Help Desk at 800-518-4726.

ii) Applicants are strongly encouraged to start early and not wait until the approaching due date before logging on and reviewing the instructions for submitting an application through Grants.gov. The Grants.gov registration process must be completed before a new registrant can apply electronically. The typical registration process takes three to five business days. If problems are encountered, the registration process can take two weeks or more. Applicants must have a valid unique entity identifier number and must maintain a current registration in the Federal government's primary registrant database, the System for Award Management (https://www.sam.gov/), as explained on the Grants.gov Web site. After registering, it may take several days or longer from the initial log-on before a new Grants.gov system user can submit an application. Only individuals authorized as organization representatives will be able to submit the application, and the system may need time to process a submitted application. Applicants should save and print the proof of submission they receive from Grants.gov. If problems occur while using Grants.gov, the applicant is advised to (a) print any error message received and (b) call Grants.gov directly for immediate assistance. If calling from within the United States or from a U.S. territory, please call 800-518-4726. If calling from a place other than the United States or a U.S. territory, please call 606-545-5035. Assistance from the Grants.gov Help Desk will be available around the clock every day, except for Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays. For assistance using Grants.gov, the applicant may also contact support@grants.gov.

iii) To find instructions for submitting an application on Grants.gov, applicants should refer to the "Applicants" tab in the banner just below the top of the Grants.gov home page. Clicking on the "Applicants" tab produces two exceptionally useful sources of information, Applicant Actions and Applicant Resources, which applicants are advised to review.
Applicants will receive a series of e-mail messages over a period of up to two business days before learning whether a Federal agency's electronic system has received its application.

Applicants should pay close attention to the guidance under Grants.gov "Applicant FAQs," as it contains information important to successful submission, including essential details on the naming conventions for attachments to applications.

All applicants should be aware that adequate time must be factored into applicants' schedules for delivery of their application. Applicants are advised that volume on Grants.gov may be extremely heavy leading up to the deadline.

The application must be both received and validated by Grants.gov. The application is "received" when Grants.gov provides the applicant a confirmation of receipt and an application tracking number. If an applicant does not see this confirmation and tracking number, the application has not been received. After the application has been received, it must still be validated. During this process, it may be "validated" or "rejected with errors". To ascertain whether the application was rejected with errors and the reasons for the rejection, the applicant must log in to Grants.gov, select "Applicants" from the top navigation, and select "Track my application" from the drop-down list. If the status is "rejected with errors," the applicant may still seek to correct the errors and resubmit the application before the deadline. If the applicant does not correct the errors, the application will not be forwarded to NIST by Grants.gov.

Refer to important information in Section IV.4. Submission Dates and Times, to help ensure the application is received on time.

(b) Amendments. Any amendments to this NOFO will be announced through Grants.gov. Applicants may sign up on Grants.gov to receive amendments by e-mail or may request copies by e-mail from pscr@nist.gov.

V. Application Review Information

1. Evaluation Criteria

The evaluation criteria that will be used in evaluating applications and their assigned weights are as follows (sub criteria will be weighted approximately evenly in all categories):

a. Technical Merit (40 points)

Reviewers will evaluate the:

(1) Strategic alignment:

a) The extent to which the proposed technical approach meets one or more of the goals the objectives listed in the Program Description (see Section I. of this NOFO).
b) The breadth of the responsiveness to the topic area goals.
c) The likelihood that successful implementation of the proposed solution will have a significant real-world impact.
d) The extent to which the outputs will be available, traceable, and extendable for the public safety and R&D communities.

(2) Market:

a) The extent to which the proposed solution would easily integrate with existing hardware and software platforms.
b) The likelihood that the technology or research outcomes could have potential market impact.

b. Performance (40 points)

Reviewers will evaluate the:

(1) Qualifications and Resources Availability:

a) The appropriateness of the qualifications and experience of the key staff, leadership, and technical experts.
b) The extent of the applicant's prior experience and results achieved in leading programs similar in nature to the purpose, scope, and/or work activities as those described in Section I. of this NOFO.
c) The sufficiency, availability, and appropriateness of proposed facilities and resources.
d) Letters of commitment for the appropriateness of the partnership to PSIAP-2022, the relevance of the organization's expertise, and their ability to contribute to the project.

(2) Project Execution:

a) Extent to which the project management approach is clearly described and supports the objectives of this NOFO.
b) Feasibility, sufficiency, clarity, quality, and appropriateness of the schedule, deliverables, milestones, and data for achieving the goals of the program.

c) Sufficiency of the identified schedule and budget risk and mitigation strategies as defined in the risk management plan section of the Project Narrative.
d) Appropriateness of potential use and consideration of challenges of intellectual property as defined in the intellectual property plan section of the Project Narrative.

(3) Public Safety Mission:
a) Applicant's demonstrated knowledge of public safety requirements, missions, operations, and tasks.
b) The extent of PSO engagement as expressed through letters of commitment from PSOs.

c. Budget (20 points)

Reviewers will evaluate the:

(1) The appropriateness and cost-effectiveness of the budget regarding the proposed work to be performed, per year for the entire project.
(2) The degree to which the budget and budget narrative reflect a clear understanding of the objectives and requirements of the NOFO.

2. Selection Factors

a. The Selection Factors for this competition are**:**
(1) The results of the merit reviewers' evaluations.
(2) The availability of funding.
(3) Whether the project duplicates other projects funded or considered for funding by NIST or other federal agencies.
(4) Alignment with NOFO objectives and PSCR priorities.
(5) Diversity within the PSCR R&D portfolio.
(6) Regional diversity.

3. Review and Selection Process

Proposals, reports, documents and other information related to applications submitted to NIST and/or relating to financial assistance awards issued by NIST will be reviewed and considered by Federal employees, or non-Federal personnel who have entered into conflict of interest and confidentiality agreements covering such information, when applicable.

a. Initial Administrative Review of Applications.
Applications received by the deadline will be reviewed to determine eligibility, completeness, and responsiveness to this NOFO and to the scope of the stated program objectives. Applications determined to be ineligible, incomplete, and/or nonresponsive may be eliminated from further review. However, NIST, in its sole discretion, may continue the review process for an application that is missing non-substantive information, the absence of which may easily be rectified during the review process.

b. Full Review of Eligible, Complete, and Responsive Applications.
Applications that are determined to be eligible, complete, and responsive will proceed for full reviews in accordance with the review and selection process below:

1) **Merit Review.** At least three (3) objective reviewers, who may be Federal employees or non-Federal personnel, with appropriate professional and technical expertise relating to the topics covered in this NOFO, will evaluate and score each eligible, complete, and responsive application based on the evaluation criteria. While every application will have at least three (3) reviewers, applications may have more than three (3) reviewers if specialized expertise is needed to evaluate an application. During the review process, the reviewers may discuss the applications with each other, but scores will be determined on an individual basis. Applications will be ranked by averaging the scores of all reviewers for each application.

2) **Evaluation Panel.** Following the merit review, an evaluation panel consisting of at least three (3) NIST staff and/or other Federal employees with the appropriate technical expertise will conduct a panel review of the ranked applications. The evaluation panel may contact applicants via e-mail to clarify contents of an application. The evaluation panel will provide a final adjectival rating and written evaluation of the applications to the Selecting Official for further consideration, considering:

    i. All application materials
    ii. Results of the merit reviewers' evaluations, including scores and written assessments
    iii. Any relevant publicly available information
    iv. Any clarifying information obtained from the applicants

The adjectival ratings are:

i. Outstanding
ii. Very Good
iii. Average
iv. Deficient

For decision-making purposes, applications receiving the same adjectival rating will be considered to have an equivalent ranking, although their review scores may not necessarily be the same.

3) **Selection.** The Selecting Official, the PSCR Division Chief or designee, will make final award recommendations to the NIST Grants Officer. The Selecting Official shall generally select and recommend the most meritorious applications for an award based upon the adjectival rating of the applications and one or more of the Selection Factors. The Selecting Official retains the discretion to select and recommend an application out of order, i.e., from a lower adjectival category, based on one or more of the Selection Factors.

NIST reserves the right to negotiate the budget costs with any applicant selected to receive an award, which may include requesting that the applicant removes certain costs. Additionally, NIST may request that successful applicants modify objectives or work plans and provide supplemental information required by the agency prior to award. NIST also reserves the right to reject an application where information is uncovered that raises a reasonable doubt as to the responsibility of the applicant. NIST may select some, all, or none of the applications, or part(s) of any application. The final approval of selected applications and issuance of awards will be by the NIST Grants Officer. The award decisions of the NIST Grants Officer are final.

c. **Federal Awarding Agency Review of Risk Posed by Applicants.** After applications are proposed for funding by the Selecting Official, the NIST Grants Management Division (GMD) performs pre-award risk assessments in accordance with 2 C.F.R. § 200.206, which may include a review of the financial stability of an applicant, the quality of the applicant's management systems, the history of performance, and/or the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

In addition, prior to making an award where the total Federal share is expected to exceed the simplified acquisition threshold (currently $250,000), NIST GMD will review and consider the publicly available information about that applicant in the Federal Awardee Performance and Integrity Information System (FAPIIS). An applicant may, at its discretion, review and comment on information about itself previously entered into FAPIIS by a Federal awarding agency. As part of its review of risk posed by applicants, NIST GMD will consider any comments made by the applicant in FAPIIS in making its determination about the applicant's integrity, business ethics, and record of performance under Federal awards. Upon completion of the pre-award risk assessment, the Grants Officer will make a responsibility determination concerning whether the applicant is qualified to receive the subject award and, if so, whether appropriate specific award conditions that correspond to the degree of risk posed by the applicant should be applied to an award.

4. **Anticipated Announcement and Award Date**

   NIST expects to complete its review, selection of initial successful applicants, and award processing by April 2022. NIST expects the earliest start date for awards under this NOFO to be May 2022. Depending on the availability of funds, NIST may issue additional awards in multiple batches through the end of September 2022. All awards in this program will be issued prior to September 30, 2022.

5. **Additional Information**

   a. **Safety**. Safety is a top priority at NIST. Employees and affiliates of award recipients who conduct project work at NIST will be expected to be safety-conscious, to attend NIST safety training, and to comply with all NIST safety policies and procedures, and with all applicable terms of their guest research agreement.

   b. **Notification to Unsuccessful Applicants.** Unsuccessful applicants will be notified by e-mail and will have the opportunity to receive a debriefing after the opportunity is officially closed. Applicants must request within 10 business days of the email notification to receive a debrief from the program office. The program office will then work with the unsuccessful applicant in arranging a date and time of the debrief.

   c. **Retention of Unsuccessful Applications.** Unsuccessful applications will be retained in accordance with the General Record Schedule 1.2/021.

VI. Federal Award Administration Information

1. **Federal Award Notices.** Successful applicants will receive an award package from the NIST Grants Officer.

2. **Administrative and National Policy Requirements**

   a. **Uniform Administrative Requirements, Cost Principles and Audit Requirements.** Through 2 C.F.R. § 1327.101, the Department of Commerce adopted Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200, which apply to awards in this program. Refer to http://go.usa.gov/SBYh and http://go.usa.gov/SBg4.

   b. **Department of Commerce Financial Assistance Standard Terms and Conditions.** The Department of Commerce will apply to each award in this program, the Financial Assistance Standard Terms and Conditions in effect on the date of award. The current version, dated November 12, 2020, is accessible at Department of Commerce Financial Assistance Standard Terms and Conditions. Refer to Section VII. of this NOFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, if you need more information.

   c. **Pre-Award Notification Requirements.** The Department of Commerce will apply the Pre-Award Notification Requirements for Grants and Cooperative Agreements dated December 30, 2014 (79 FR 78390), accessible at http://go.usa.gov/hKkR. Refer to Section VII. of this NOFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, for more information.

   d. **Funding Availability and Limitation of Liability.** Funding for the program listed in this NOFO is contingent upon the availability of appropriations. NIST or the Department of Commerce will not be responsible for application preparation costs, including but not limited to if this program fails to receive funding or is cancelled because of agency priorities. Publication of this NOFO does not oblige NIST or the Department of Commerce to award any specific project or to obligate any available funds.

      NIST issues this Notice subject to the appropriations made available under the current continuing resolution funding the Department of Commerce: Section 101 of Division A of the Extending Government

Funding and Delivering Emergency Assistance Act, Public Law 117-43 (Sept. 30, 2021). NIST anticipates making awards for the program listed in this notice provided that funding for Fiscal Year 2022 is continued beyond December 3, 2021, the expiration of the current continuing resolution.

e. **Collaborations with NIST Employees.** If an applicant proposes collaboration with NIST, the statement of work should include a statement of this intention, a description of the collaboration, and prominently identify the NIST employee(s) involved, if known. Any collaboration by a NIST employee must be approved by appropriate NIST management and is at the sole discretion of NIST. Prior to beginning the merit review process, NIST will verify the approval of the proposed collaboration. Any unapproved collaboration will be stricken from the application prior to the merit review. Any collaboration with an identified NIST employee that is approved by appropriate NIST management will not make an application more or less favorable in the competitive process.

f. **Use of Federal Government-Owned Intellectual Property.** If the applicant anticipates using any Federal Government-owned intellectual property, in the custody of NIST or another Federal agency, to carry out the work proposed, the applicant should clearly identify such intellectual property in the proposal. This information will be used to ensure that no Federal employee involved in the development of the intellectual property will participate in the review process for that competition. In addition, if the applicant intends to use the Federal Government-owned intellectual property, the applicant must comply with all statutes and regulations governing the licensing of Federal government patents and inventions, described in 35 U.S.C. §§ 200-212, 37 C.F.R. Part 401, 2 C.F.R. §200.315, and in Section C.03 of the Department of Commerce Financial Assistance Standard Terms and Conditions, dated November 12, 2020. Questions about these requirements may be directed to the Chief Counsel for NIST, (301) 975-2803, nistcounsel@nist.gov.

   Any use of Federal Government-owned intellectual property by a recipient of an award under this announcement is at the sole discretion of the Federal Government and will need to be negotiated on a case-by-case basis by the recipient and the Federal agency having custody of the intellectual property if a project is deemed meritorious. The applicant should indicate within the statement of work whether it already has a license to use such intellectual property or whether it intends to seek a license from the applicable Federal agency.

If any inventions made in whole or in part by a NIST employee arise in the course of an award made pursuant to this NOFO, the United States Government may retain its ownership rights in any such invention. Licensing or other disposition of the Federal Government's rights in such inventions will be determined solely by the Federal Government, through NIST as custodian of such inventions, and include the possibility of the Federal Government putting the intellectual property into the public domain.

g. Research Activities Involving Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects Including Software Testing. Any application that includes research activities involving human subjects, human tissue/cells, or data or recordings from or about human subjects, must satisfy the requirements of the Common Rule for the Protection of Human Subjects ("Common Rule"), codified for the Department of Commerce at 15 C.F.R. Part 27. Research activities involving human subjects that fall within one or more of the classes of vulnerable subjects found in 45 C.F.R. Part 46, Subparts B, C and D must satisfy the requirements of the applicable subpart(s). In addition, any such application that includes research activities on these subjects must be in compliance with all applicable statutory requirements imposed upon the Department of Health and Human Services (DHHS) and other Federal agencies, all regulations, policies and guidance adopted by DHHS, the Food and Drug Administration (FDA), and other Federal agencies on these topics, and all Executive Orders and Presidential statements of policy on applicable topics. (Regulatory Resources: http://www.hhs.gov/ohrp/humansubjects/index.html which includes links to FDA regulations, but may not include all applicable regulations and policies).

NIST uses the following Common Rule definitions for research and human subjects research:

Research: A systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activities.

Human Subject: A living individual about whom an investigator (whether professional or student) conducting research: (i) Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or (ii) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens.

(1) *Intervention* includes both physical procedures by which information or biospecimens are gathered and manipulations of the subject or the subject's environment that are performed for research purposes.

(2) *Interaction* includes communication or interpersonal contact between investigator and subject.

(3) *Private information* includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and that the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator associated with the information) in order for obtaining the information to constitute research involving human subjects.

(4) *Identifiable biospecimen* includes a biospecimen for which the identity of the subject is or may readily be ascertained by the investigator or associated with the biospecimen.

See 15 C.F.R. § 27.102 (Definitions).

1) **Requirement for Federalwide Assurance.** If the application is accepted for [or awarded] funding, organizations that have an IRB are required to follow the procedures of their organization for approval of exempt and non-exempt research activities that involve human subjects. Both domestic and foreign organizations performing exempt research requiring limited IRB review or non-exempt research activities involving human subjects will be required to have protocols approved by a cognizant, active IRB currently registered with the Office for Human Research Protections (OHRP) within the DHHS that is linked to the engaged organizations. All engaged organizations must possess a

currently valid Federalwide Assurance (FWA) on file from OHRP. Information regarding how to apply for an FWA and register an IRB with OHRP can be found at http://www.hhs.gov/ohrp/assurances/index.html. *See* 15 C.F.R. § 27.103. NIST relies only on OHRP-issued FWAs and IRB Registrations for both domestic and foreign organizations for NIST supported research involving human subjects. NIST will not issue its own FWAs or IRB Registrations for domestic or foreign organizations.

2) **Administrative Review.** The NIST Research Protections Office (RPO) reserves the right to conduct an administrative review[3] of all applications that potentially include research involving human subjects and were approved by an authorized non-NIST institutional entity (an IRB or entity analogous to the NIST RPO) under 15 C.F.R. § 27.112 (Review by Institution). If the NIST RPO determines that an application includes research activities that potentially involve human subjects, the applicant will be required to provide additional information to NIST for review and approval. The documents required for funded proposals are listed in each section below. Most documents will need to be produced during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. Research involving human subjects may not start until the NIST Grants Officer issues an award explicitly authorizing such research. In addition, all amendments, modifications, or changes to approved research and requests for continuing review and closure will be reviewed by the NIST RPO. Please note that the NIST IRB is unable to serve as the IRB for financial assistance recipients. Proposers must describe their plan for when and how they will obtain IRB review.

3) **Required documents for proposal review. All applications involving human subjects research must clearly indicate, by**

[3] Conducting an "administrative review" means that the NIST RPO will review and verify the performing institution's determination for research not involving human subjects or exempt human subjects research. In addition, for exempt research requiring limited IRB review and non-exempt human subjects research, the NIST RPO will review and confirm that the research and performing institution(s) are in compliance with 15 C.F.R. Part 27, which means RPO will 1) confirm the engaged institution(s) possess, or are covered under a Federalwide Assurance, 2) review the research study documentation submitted to the IRB and verify the IRB's determination of level of risk and approval of the study for compliance with 15 C.F.R. Part 27, 3) review and verify IRB-approved substantive changes to an approved research study before the changes are implemented, and 4) review and verify that the IRB conducts a continuing review at least annually, as appropriate.

separable task, all research activities believed to be exempt or non-exempt research involving human subjects, the expected institution(s) where the research activities involving human subjects may be conducted, and the institution(s) expected to be engaged in the research activities.

a. **Not research determination.** If an activity/task involves human subjects as defined in the Common Rule, but the applicant participant(s) indicates to NIST that the activity/task is not research as defined in the Common Rule, the following information may be requested for that activity/task:

   (1) Justification, including the rationale for the determination and such additional documentation as may be deemed necessary by NIST to review and/or support a determination that the activity/task in the application is not research as defined in the Common Rule.
   (2) If the applicant participant(s) used a cognizant IRB that provided a determination that the activity/task is not research, a copy of that determination documentation must be provided to NIST. The applicant participant(s) is not required to establish a relationship with a cognizant IRB if they do not have one.

NIST will review the information submitted and may coordinate further with the applicant before determining whether the activity/task will be defined as research under the Common Rule in the applicable NIST financial assistance program or project.

b. **Research not involving human subjects**. If an activity/task is determined to be research and involves human subjects, but is determined to be *not human subjects research* (or *research not involving human subjects*) under the Common Rule, the following information may be requested for that activity/task:

   (1) Justification, including the rationale for the determination and such additional documentation as may be deemed necessary by NIST to review and/or support a determination that the activity/task in the application is not research as defined in the Common Rule.
   (2) If the applicant participant(s) used a cognizant IRB that provided a determination that the activity/task is research not involving human subjects, a copy of that determination documentation

must be provided to NIST. The applicant participant(s) is not required to establish a relationship with a cognizant IRB if they do not have one.

c. Exempt research determination with no IRB. If the application appears to NIST to include exempt research activities that do not meet the criteria for requiring a limited IRB review, and the performer of the activity or the supplier and/or the receiver of the information or biospecimens from human subjects **does not** have a cognizant IRB to provide an exemption determination, the following information may be requested during the review process so that NIST can evaluate whether an exemption under the Common Rule applies (*see* 15 C.F.R. § 27.104(b) and (d)):

(1) The name(s) of the institution(s) where the exempt research will be conducted.
(2) The name(s) of the institution(s) providing the biospecimens or information from human subjects.
(3) A copy of the protocol for the research to be conducted; and/or the biospecimens or information from human subjects to be collected/provided, not pre-existing samples (*i.e.,* will proposed research collect only information without personal identifiable information, will biospecimens or information be de-identified and when and by whom was the de-identification performed, how were the materials or data originally collected).
(4) For pre-existing biospecimens or information from human subjects, provide copies of the consent forms used for collection and a description of how the biospecimens or information were originally collected and stripped of personal identifiers. If copies of consent forms are not available, explain.
(5) Any additional clarifying documentation that NIST may deem necessary in order to make a determination whether the activity/task or use of biospecimens or information from human subjects is exempt under the Common Rule.

d. Research review with an IRB. If the application appears to NIST to include research activities (exempt or non-exempt) involving human subjects, proposed performer of the activity must have a relationship with a cognizant IRB registered with OHRP, and linked to their Federalwide Assurance. The following information may be requested during the review process:

(1) The name(s) of the institution(s) where the research will be conducted.
(2) The name(s) and institution(s) of the cognizant IRB(s), and the IRB registration number(s).
(3) The FWA number of the applicant linked to the cognizant IRB(s).
(4) The FWAs associated with all organizations engaged in the planned research activity/task, linked to the cognizant IRB.
(5) If the IRB review(s) is pending, the estimated start date for research involving human subjects.
(6) The IRB approval date (if currently approved for exempt or non-exempt research).
(7) If any of the engaged organizations has applied for or will apply for an FWA or IRB registration, those details should be clearly provided for each engaged organization.

If the application includes research activities involving human subjects to be performed in the first year of an award, additional documentation may be requested by NIST during pre-award review for those performers, and may include the following for those research activities:

(1) A copy of each applicable final IRB-approved protocol.
(2) A signed and dated approval letter from the cognizant IRB(s) that includes the name of the institution housing each applicable IRB, provides the start and end dates for the approval of the research activities, and any IRB-required interim reporting or continuing review requirements.
(3) A copy of any IRB-required application information, such as documentation of approval of special clearances (*i.e.,* biohazard, HIPAA, etc.) conflict-of-interest letters, or special training requirements.
(4) A brief description of which portions of the IRB submitted protocol are specifically included in the application submitted to NIST, if the protocol includes tasks not included in the application, or if the protocol is supported by multiple funding sources. For protocols with multiple funding sources, NIST will not approve the study without a non-duplication-of-funding letter indicating that no other federal funds will be used to support the tasks proposed under the proposed research or ongoing project.
(5) If a new protocol will only be submitted to an IRB if an award from NIST is issued, a draft of the proposed protocol.

(6) Any additional clarifying documentation that NIST may request during the review process to perform the NIST administrative review of research involving human subjects. (*See* 15 C.F.R. § 27.112 (Review by Institution)).

This clause reflects the existing NIST policy and requirements for Research Involving Human Subjects. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award.

If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving human subjects, contact Anne Andrews, Director, NIST Research Protections Office (e-mail: anne.andrews@nist.gov; phone: (301) 975-5445).

h. Research Activities Involving Live Vertebrate Animals or Pre-Existing Cell Lines/Tissues From Vertebrate Animals. Any application that proposes research activities involving live vertebrate animals that are to be cared for, euthanized, or used by award recipients to accomplish research goals, teaching, or testing must meet the requirements of the Animal Welfare Act (AWA) (7 U.S.C. § 2131 et seq.), and the AWA final rules (9 C.F.R. Parts 1, 2, and 3), and if appropriate, the Good Laboratory Practice for Nonclinical Laboratory Studies (21 C.F.R. Part 58). In addition, such research activities should be in compliance with the *"U.S. Government Principles for Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training"* (Principles). The Principles and guidance on these Principles are available in the National Research Council's "Guide for the Care and Use of Laboratory Animals," which can be obtained from National Academy Press, 500 5th Street, N.W., Department 285, Washington, DC 20055, or as a free PDF online at http://www.nap.edu/catalog/12910/guide-for-the-care-and-use-of-laboratory-animals-eighth.

1) Administrative Review. NIST reserves the right to conduct an administrative review[4] of all applications that potentially include

[4] Conducting an "administrative review" means that the NIST RPO will review and verify the performing institution's IACUC's approval of research with live vertebrate animals, and confirm that the research and performing institution(s) have an appropriate assurance and are in compliance with applicable regulations. RPO will 1) confirm the engaged institution(s) possess, or are covered under an applicable

research activities that involve live vertebrate animals, or custom samples from, or field studies with live vertebrate animals. If the application includes research activities, field studies, or custom samples involving live vertebrate animals, the applicant will be required to provide additional information for review and approval. In addition, NIST will verify the applicant's determination(s) of excluded samples from vertebrate animals. The documents required for funded proposals are listed in each section below. Some may be requested for a pre-review during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. If an award is issued, no research activities involving live vertebrate animals shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer issues written approval. In addition, all re-approvals, amendments, modifications, changes, annual reports and closure will be reviewed by NIST.

2) **Required documents for NIST proposal review.** ***The applicant should clearly indicate in the application, by separable task, all research activities believed to include research involving live vertebrate animals and the institution(s) where the research activities involving live vertebrate animals may be conducted. In addition, the applicant should indicate any activity/task that involves an excluded or custom collection from vertebrate animals, or a field study with animals.***

   a) **Excluded Collections from Vertebrate Animals:** The requirements for review and approval by an Institutional Animal Care and Use Committee (IACUC) do not apply to proposed research using preexisting images of animals or to research plans that do not include live animals. These regulations also do not apply to obtaining stock or pre-existing items from animal material suppliers (*e.g.,* tissue banks), such as pre-existing cell lines and tissue samples, or from commercial food processors, where the vertebrate animal was euthanized for food purposes and not for the purpose of sample collection.

assurance, 2) review the research study documentation submitted to the IACUC and verify the IACUC's determination of level of risk and approval of the study for compliance with applicable regulations, 3) review and verify IACUC-approved substantive changes to an approved research study before the changes are implemented, and 4) review and verify that the IACUC receives an annual report for the study and conducts an appropriate continuing review at least every three years.

For pre-existing cell lines and tissue samples originating from vertebrate animals, NIST requires that the proposer provide documentation or the rationale for the determination that the cell line or tissue is pre-existing and not a custom collection from live vertebrate animals for an activity/task within the proposal. NIST may require additional documentation to review and/or support the determination that the cells and/or tissues from vertebrate animals are excluded from IACUC review.

b) **Custom Collections Harvested from Live Vertebrate Animals:** NIST requires documentation for obtaining custom samples from live vertebrate animals from animal material suppliers and other organizations (*i.e.,* universities, companies, and government laboratories, etc.). Custom samples includes samples from animal material suppliers, such as when a catalog item indicates that the researcher is to specify the characteristics of the live vertebrate animal to be used, or how a sample is to be collected from the live vertebrate animal.

c) **Field Studies of Animals:** Some field studies of animals may be exempt under the Animal Welfare Act from full review and approval by an animal care and use committee, as determined by each institution. Field study is defined as "*… a study conducted on free-living wild animals in their natural habitat...".* 9 C.F.R. § 1.1. However, this term excludes any study that involves an invasive procedure or that harms or materially alters the behavior of an animal under study. Field studies, with or without invasive procedures, may also require obtaining appropriate federal or local government permits (marine mammals, endangered species, etc.). If the applicant's institution requires review and approval by an animal care and use committee, NIST will require that documentation to be provided as described below.

d) **For custom collections or studies with live vertebrate animals that require review and approval by an animal care and use committee the following documentation is required:**

(1) **Requirement for Assurance.** An applicable assurance for the care and use of the live vertebrate animal(s) to be used in the proposed research is required. NIST may request documentation to confirm an assurance, if adequate confirmation is not available

through an assuring organization's website. The cognizant IACUC where the research activity is located may hold one or more assurances applicable to the research activity that are acceptable to NIST. These four assurances are:

i. Animal Welfare Assurance from the Office of Laboratory Animal Welfare (OLAW) indicated by the OLAW assurance number, *i.e.,* A-1234;
ii. USDA Animal Welfare Act certification indicated by the certification number, *i.e.,* 12-R-3456;
iii. Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) indicated by providing the organization name accredited by AAALAC as listed in the AAALAC Directory of Accredited Organizations; and
iv. Letter of Assurance of compliance with the Animal Welfare Act, the U.S. Government Principles, and National Marine Fisheries Service (NFMS) IACUC policy that is valid for five years and provided by a NMFS Regional IACUC for activities with marine mammals or sea turtles (NMFS Policy Directive 04-112).

(2) **Documentation of Research Review by an IACUC:** If the applicant's application appears to include research activities, field studies, or custom sample collections involving live vertebrate animals the following information regarding review by an applicable IACUC may be requested during the application review process:

1. The name(s) of the institution(s) where the research involving live vertebrate animals will be conducted and/or custom samples collected.
2. The assurance type and number, as applicable, for the cognizant Institutional Animal Care and Use Committee (IACUC) where the research activity is located. [For example: Animal Welfare Assurance from the Office of Laboratory Animal Welfare (OLAW) should be indicated by the OLAW assurance number, i.e. A-1234; an USDA Animal Welfare Act certification should be indicated by the certification number i.e. 12-R-3456; and an Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) should be indicated by AAALAC.]

3. The IACUC approval date for the Animal Study Protocol (ASP) (if currently approved).
4. If the review by the cognizant IACUC is pending, the estimated start date for research involving vertebrate animals.
5. If any assurances or IACUCs need to be obtained or established, that should be clearly stated.
6. If any special permits are required for field studies, those details should be clearly provided for each instance, or indicated as pending.

If the application includes research activities involving vertebrate animals to be performed in the first year of an award, additional documentation may be requested by NIST during pre-award review for those performers, and may include the following for those research activities, which may also include field studies, custom sample collections involving live vertebrate animals:

1. A copy of the IACUC approved ASP.
2. Documentation of the IACUC approval indicating the approval and expiration dates of the ASP.
3. If applicable, a non-duplication-of-funding letter if the ASP is funded from several sources.
4. If a new ASP will only be submitted to an IACUC if an award from NIST is issued, a draft of the proposed ASP may be requested.
5. Any additional clarifying documentation that NIST may request during review of applications to perform the NIST administrative review of research involving live vertebrate animals.

This clause reflects the existing NIST policy for Research Involving Live Vertebrate Animals. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award.

If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving live vertebrate animals, contact Anne Andrews, Director, NIST Research Protections Office (e-mail: anne.andrews@nist.gov; phone: 301-975-5445).

3. **Reporting**

   a. **Reporting Requirements.** The following reporting requirements described in Sections A.01, Reporting Requirements, of the Department of Commerce Financial Assistance Standard Terms and Conditions, dated November 12, 2020, apply to awards in this program:

      (1) Financial Reports. Each award recipient will be required to submit an SF-425, Federal Financial Report on a quarterly basis for the periods ending March 31, June 30, September 30, and December 31 of each year. Reports will be due within 30 days after the end of the reporting period to the NIST Federal Program Officer, Grants Officer and Grants Specialist named in the award documents. A final financial report is due within 120 days after the end of the project period.

      (2) Research Performance Progress Report (RPPR). Each award recipient will be required to submit a RPPR to the Federal Program Officer, NIST Grants Officer and Grants Specialist named in the award documents on a quarterly basis for the periods ending March 31, June 30, September 30, and December 31 of each year. Reports will be due within 30 days after the end of the reporting period. The RPPR shall conform to the requirements in 2 C.F.R. § 200.328 (http://go.usa.gov/xkVgP) and Department of Commerce Financial Assistance Standard Terms and Conditions, Section A.01.

      A final technical progress report is due within 120 days after the end of the project period.

      (3) Patent and Property Reports. From time to time, and in accordance with the Uniform Administrative Requirements and other terms and conditions governing the award, the recipient may need to submit property and patent reports.

      (4) Recipient Integrity and Performance Matters. In accordance with section 872 of Public Law 110-417 (as amended; see 41 U.S.C. 2313), if the total value of a recipient's currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds $10,000,000 for any period of time during the period

of performance of an award made under this NOFO, then the recipient shall be subject to the requirements specified in Appendix XII to 2 C.F.R. Part 200, http://go.usa.gov/cTBwC, for maintaining the currency of information reported to SAM that is made available in FAPIIS about certain civil, criminal, or administrative proceedings involving the recipient.

b. **Audit Requirements.** The Department of Commerce Financial Assistance Standard Terms and Conditions, Section D.01, and 2 C.F.R. Part 200 Subpart F, adopted by the Department of Commerce through 2 C.F.R. § 1327.101, require any non-Federal entity (i.e., including non-profit institutions of higher education and non-profit organizations) that expends Federal awards of $750,000 or more in the recipient's fiscal year to conduct a single or program specific audit in accordance with the requirements set out in the Subpart. Additionally, unless otherwise specified in the terms and conditions of the award, entities that are not subject to Subpart F of 2 C.F.R. Part 200 (e.g., for-profit commercial entities) that expend $750,000 or more in DOC funds during their fiscal year must submit to the Grants Officer either: (i) a financial related audit of each DOC award or subaward in accordance with Generally Accepted Government Auditing Standards; or (ii) a project specific audit for each award or subaward in accordance with the requirements contained in 2 C.F.R. § 200.507. Applicants are reminded that NIST, the Department of Commerce Office of Inspector General, or another authorized Federal agency may conduct an audit of an award at any time.

c. **Federal Funding Accountability and Transparency Act of 2006.** In accordance with 2 C.F.R. Part 170, all recipients of a Federal award made on or after October 1, 2010, are required to comply with reporting requirements under the Federal Funding Accountability and Transparency Act of 2006 (Public Law No. 109-282). In general, all recipients are responsible for reporting sub-awards of $25,000 or more. In addition, recipients that meet certain criteria are responsible for reporting executive compensation. Applicants must ensure they have the necessary processes and systems in place to comply with the reporting requirements should they receive funding. Also see the Federal Register notice published September 14, 2010, at 75 FR 55663 available here http://go.usa.gov/hKnQ.

VII. Federal Awarding Agency Contacts

Questions should be directed to the following:

Subject Area	Point of Contact
Programmatic and Technical Questions	E-mail: pscr@nist.gov with 'PSIAP-2022 in subject line
Technical Assistance with Grants.gov Submissions	grants.gov Phone: 800-518-4726 E-mail: support@grants.gov
Grant Rules and Regulations	Grants Officer: Scott McNichol Phone: 303-497-3444 E-mail: scott.mcnichol@nist.gov

VIII. Other Information

1. Personal and Business Information

The applicant acknowledges and understands that information and data contained in applications for financial assistance, as well as information and data contained in financial, performance and other reports submitted by applicants, may be used by the Department of Commerce in conducting reviews and evaluations of its financial assistance programs. For this purpose, applicant information and data may be accessed, reviewed and evaluated by Department of Commerce employees, other Federal employees, and also by Federal agents and contractors, and/or by non-Federal personnel, all of whom enter into appropriate conflict of interest and confidentiality agreements covering the use of such information. As may be provided in the terms and conditions of a specific financial assistance award, applicants are expected to support program reviews and evaluations by submitting required financial and performance information and data in an accurate and timely manner, and by cooperating with Department of Commerce and external program evaluators. In accordance with 2 C.F.R. § 200.303(e), applicants are reminded that they must take reasonable measures to safeguard protected personally identifiable information and other confidential or sensitive personal or business information created or obtained in connection with a Department of Commerce financial assistance award.

In addition, Department of Commerce regulations implementing the Freedom of Information Act (FOIA), 5 U.S.C. Sec. 552, are found at 15 C.F.R. Part 4, Public Information. These regulations set forth rules for the Department regarding making requested materials, information, and records publicly available under the FOIA. Applications submitted in response to this Federal Funding Opportunity may be subject to requests for release under the Act. If an application contains

information or data that the applicant deems to be confidential commercial information that should be exempt from disclosure under FOIA, that information should be identified, bracketed, and marked as Privileged, Confidential, Commercial or Financial Information. In accordance with 15 CFR § 4.9, the Department of Commerce will protect from disclosure confidential business information contained in financial assistance applications and other documentation provided by applicants to the extent permitted by law.

2. Public Website and Frequently Asked Questions (FAQs)

NIST PSCR has a public website that provides information pertaining to this Funding Opportunity[5]. NIST anticipates that a "Frequently Asked Questions" section or other resource materials will be maintained and updated on the website as needed to provide additional guidance and clarifying information that may arise related to this Funding Opportunity. Any amendments to this NOFO will be announced through Grants.gov.

Applicants must submit all questions pertaining to this funding opportunity in writing to pscr@nist.gov with 'PSIAP-2022 in the subject line. Questions submitted to NIST may be posted on the public website. Alternatively, applicants may ask questions during the informational public.

3. Webinar Information Session:

NIST will host a webinar to provide general information regarding this NOFO, offer general guidance on preparing applications, and answer questions. Scheduling details about the webinar will be available at pscr.gov. Proprietary technical discussions about specific project ideas will not be permitted during the webinar and NIST staff will not critique or provide feedback on specific project ideas while they are being developed by an applicant, brought forth during the webinar, or at any time before the deadline for all applications. However, questions about the funding opportunity, eligibility requirements, evaluation and award criteria, selection process, and the general characteristics of a competitive application will be addressed at the webinar. There is no cost to attend the webinar, but participants must register in advance. Participation in the webinar is not required and will not be considered in the application review and selection process.

[5] Refer to Section VII. of this NOFO, Federal Awarding Agency Contacts, Programmatic and Technical Questions, if more information is needed.