NSF 25-539: Verticals-enabling Intelligent Network Systems (VINES)

Introduction to NSF VINES & Track 2

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VINES Informational Webinar for India - U.S. Collaborations

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NSF VINES Goal

- To enhance U.S. competitiveness in advanced telecommunications technologies,
- To establish U.S. as a global leader in both NextG wireless telecommunications and emerging potential NextG vertical industries, and
- To address the need for skilled workforce and expertise in these technology areas.

NSF VINES Objectives

- Support use-inspired fundamental research and vertical-driven technology development, demonstration and translation that will drastically improve and shape the future generations of advanced wireless and intelligent networked systems that span the user-edge-core-cloud-application continuum.
- Focus on innovations across various disciplines that lead to leaps in performance and capabilities of future networks and networked systems.
- Accelerate the lab-to-market translation of innovative research outcomes leading to global technology leadership and successful products and services for the benefit of society
- Enable formation of U.S. and international collaborations with like-minded countries to speed up the rate of innovations towards open, global, interoperable, reliable, resilient, and secure networks.
- Focus on emerging topics potentially critical to future generations of wireless networks and networked systems, such as cloud, AI & machine learning native designs, dynamic spectrum sharing and integrated sensing and communications.

NSF VINES Program Structure

- Track 1 (Use-inspired Fundamental Research) will support activities focused on use-inspired fundamental research to develop novel networking techniques and solutions.

- Track 2 (Verticals-Driven Technology Development, Demonstration, and Translation) will support activities focused on technology development, maturation, demonstration, integration, and translation of solutions with higher technology readiness levels (TRLs), with the goal of producing adoption-ready technologies.

NSF VINES Track 2 Partners: The Magnificent Seven

- U.S National Science Foundation (NSF)
- Department of Homeland Security (DHS) - Science & Technology Directorate
- U.S. Department of Defense (DOD) – Office of the Under Secretary of Defense for Research and Engineering (OUSD) (R&E)
- National Institute for Standards and Technology (NIST)
- Business Finland (BF)
- National Institute of Information and Communications Technology (NICT), Japan
- Ministry of Electronics & Information Technology, India (MeitY)

NSF VINES Track 2 Project Requirements

1. An emerging translation/adoption-ready NextG networking technology applicable to any part/parts of the end-to-end system. Examples include, but are not limited to, RAN, Core, Transport, Cloud or Edge technologies.
   - Has potential for translation and adoption in NextG mobile telecommunications networks (including 6G cellular and WiFi)
2. A wireless vertical for which the performance or capability offered through identified networking technology advancement will be critical for its success.
   - Whose connectivity requirements cannot reasonably (i.e. cost-effectively, reliably, efficiently, securely etc.) be met by today's networks (5G, WiFi, etc.).
3. Maturation, implementation, and integration of the proposed networking technology within the context of the identified vertical application.
4. At-scale demonstration of the integrated system enabling the selected vertical in an end-to-end network (testbeds/platforms or in partnership with MNOs/CSPs etc).
   - Demonstrate that the performance/capability achieved by the developed networking technology indeed will enable the selected vertical application

NSF VINES Track 2 Team Requirements

A. Identified primary networking technology expertise (competency A)
B. Selected vertical application expertise (competency B)
C. Integrated end-to-end system/network expertise

Teams must submit a concept outline (CO) before submitting the full proposal

- To determine the appropriateness of the work & the team (see NSF PAPPG Chapter 1.D.1)
- Proposers must include the email from the NSF VINES Program Director Team encouraging submission in the Program Officer Concurrence Email(s) section of the Full Proposal.

NSF VINES Track 2 Technical Scope: Potential Emerging Technologies of Interest

1. Integrated Sensing and Communications (ISAC)
2. Mobile/Multi-access Edge Computing (MEC)
3. Open & integrated networks (open standards and interfaces-based space-air-ground integration)
4. Semantic communications and networking (SC)
5. Advanced spectrum technologies such as Dynamic Spectrum Sharing (DSS), operation at higher frequencies, Multi-band, Multi-mode Radios (MBMMR) and low-power & spectrum-agile radios
6. High-performance data transport (e.g., fiber, WDM), transport layer, and automation technologies for various network environments, including software-defined wide area networks (SD-WAN) and data center and cloud networks
7. Reconfigurable Intelligent Surfaces (RIS)

NSF VINES Track 2 Technical Scope: Potential Emerging Vertical Applications

- Smart manufacturing, Industrial IoT (IIoT)
- Immersive applications, AR/VR/MR/XR
- Smart/precision agriculture
- Connected autonomous vehicles (CAVs), intelligent transportation
- Tele-medicine, remote healthcare, remote surgery
- Advanced Air Mobility (AAM), UAV networks
- Smart-grid
- Entertainment industry, gaming
- Disaster response
- Education, training

This is not an exhaustive list.

Emerging Networking Technologies: Requirements

- These are the candidates for primary networking technology competency (competency A).
  - While each Track 2 project must identify one of the above listed networking technologies as the primary networking technology focus of the project and the primary enabling technology for the selected vertical, a team's overall solution may incorporate aspects of other networking technologies (either from the above list or something not in it) as appropriate.
- The starting maturity level of the proposed primary technology solution is expected to be at least at Technology Readiness Level (TRL) 3 or higher while being novel and innovative in terms of translation and adoption.
- The scope of each of the above emerging technologies is intended to be broadly defined to allow for new ideas that are important for novel NextG vertical industries with potential for success and impact.

NSF VINES Track 2: PI Eligibility & Limitations

- Individuals with primary appointments at overseas branch campuses of U.S. IHEs are not eligible.
- An individual may serve as PI or co-PI on only one Track 2 proposal in this competition but may serve as Senior/Key Personnel or Other Personnel on any number of Track 2 proposals.
  - This is independent from Track 1 proposals
- For international collaborative proposals, foreign collaborators should not be listed on the NSF proposal coversheet (they are not considered NSF Senior/Key Personnel).

A U.S. investigator can be the PI or co-PI in only one Track 2 proposal regardless of whether the proposal include foreign collaborations or not.

NSF VINES Track 2 International Collaborative Teams

- A Track 2 team may include a bi-lateral collaboration between the U.S. and one of the participating countries.
- In an international collaborative team, entities from the same country cannot be primarily responsible for both networking technology (competency A) and the vertical (competency B):
  - Must demonstrate that entities from one country are primarily responsible for the competency A while those from the other country are primarily responsible for the competency B.
  - Both in concept outline and the full proposal.
- Participants from each partner country should possess unique capabilities that increase the chance of project success and potential translational impact that justifies the collaboration between the two countries.

NSF VINES Track 2: Awards

- $6M per award. Each award is for 3 years
- 8 ~ 10 awards
- Potential co-funding from international and other federal agency partners
- Cooperative Agreements: Cost reimbursement awards

- International partnerships:
  - The budget for the U.S. team can range between $2 million to $4 million.
  - The total combined budget must not exceed $6 million.

NS VINES Track 2: Concept Outlines

- Must submit a Concept Outline to aid in determining the appropriateness of the scope and work for consideration under this opportunity.
  - *Concept outline length limit is 2 pages*
- NSF PD Email with CO Concurrence must be included in Full Proposal Package submitted to NSF.
- Deadline to submit your CO to vines-track2@nsf.gov is August 25, 2025.
- NSF VINES Team will provide feedback/approval as they are received.

Do not wait till August 25! Submit your Concept Outline ASAP!

NSF VINES Track 2 Full Proposals: Supplementary Documents – Program Office Concurrence Email

Track 2 full proposals must include a copy of the NSF "Program Officer Concurrence Email" allowing the submission of the Track 2 proposal based on the proposed Concept Outline

- Include it under the “Single Copy Documents”

NSF VINES: Eligibility Letter (Only Required for International Collaborative Proposals)

- International collaborative proposals: involve at least one US-based organization and at least one organization based in, and seeking funding from, one of the international partner agencies
- International Collaborative Proposals must include a "PI(s) Eligibility Letter", issued by the applicable international partner agency to the foreign collaborators, in the full proposal submission to NSF.
  - Finland: BF
  - India: MeitY
  - Japan: NICT
  - Sweden: SRC
- To obtain the Eligibility Letter, foreign collaborators must follow the country-specific instructions provided by the relevant international partner agency
  - Each VINES international partner agency may require country-specific documentation to assess to what extent the proposed activities align with their priority topics and missions
  - Refer to their website for how, what, when and where to apply
- Track 2: The eligibility letter is not needed to be submitted with the Concept Outline, but must be included in Full Proposals

- Make sure international collaborators submit their request for Eligibility Letter to the relevant International Partner Agency ASAP!
- Do not wait till the last minute!

VINES Full Proposals: Additional instructions for International Collaborative proposals:

- Foreign collaborators must follow the guidelines provided in the respective international partner agency's instructions available at the links provided in the solicitation
  - Links also include instructions about how to obtain the required eligibility letter from the respective international partner agency
- For any questions, foreign collaborators are encouraged to contact the respective international partner agency listed in the international partner agency Contacts section of this solicitation.
- Foreign collaborators must submit documentation that may be required by the respective international partner agency directly to the relevant agency in accordance with their procedures, in addition to documentation submitted to NSF.

- It is the foreign collaborators responsibility to seek a "PI(s) Eligibility Letter" from the respective international partner agency, which must be included in the full proposal submission to NSF.

NSF VINES Deadlines

- Track 1
  - Full Proposals due August 25, 2025
- Track 2
  - Concept Outlines due August 25, 2025
  - Full Proposals due September 25, 2025

- Do not wait till August 25 to submit your Concept Outline for a potential Track 2 project! Submit it now!

NSF VINES Upcoming Events

- **Virtual networking event for potential international-U.S. NSF VINES principal investigators**
  - Thursday, July 10, 2025, 10:00 a.m. – 1:00 p.m. ET
    - Targeted to U.S., India, Finland, Japan and Sweden
  - ~~Thursday, July 10, 2025, 7:00 p.m. – 10:00 p.m. ET~~
    - ~~Targeted to U.S., Japan, and potentially India~~

NSF VINES Track 2

Questions?

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