NSF/Intel Partnership on Information-Centric Networking in Wireless Edge Networks (ICN-WEN) NSF 16-586

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505310

July 28, 2016

Agenda

- **Welcome and CISE Context** — *Ken Calvert*, *Division Director, CISE/CNS*
- **Intel Partnership** — *David Ott & Jeff Foerster*, *Intel*
- **ICN-WEN Challenge** — *Jeff Foerster/David Ott*, *Intel*
- **ICN-WEN scope, requirements, & review** — *Thyaga Nandagopal & Darleen Fisher*, *Program Managers, CISE/CNS*
- **Questions and Answers** — *NSF-Intel Team*

Intel Partnership

- NSF/Intel Partnerships:
  - Cyber-Physical Systems Security and Privacy
  - Visual and Experiential Computing
  - Information-Centric Networking in Wireless Edge Networks
- University research critical in tech evolution
- Augment other Intel university programs:
  - 5G
  - Software Defined Networks

ICN-WEN Vision: Background

- Next-gen wireless networks promise peak bit rates of tens of gigabits per second and latencies of less than a millisecond.
- Enable autonomous vehicles, industrial robotics, tactile Internet applications, virtual and augmented reality, and dense Internet of Things (IoT) deployments.
- Key requirement: ***fast information response time*** that is invariant as a function of the bandwidth demanded, users/ devices supported, and data generated, of which low-latency wireless access time is only one component.
- Also need intrinsic security, seamless mobility, scalable content caching, and discovery/distribution.

ICN and the Wireless Edge

- ICN promises scalability and security for content identification and distribution
- Advanced wireless networks will provide high bandwidths and support a large number of devices.

- Many emerging applications need both.

- Most of the content will be at the edge of the network.

- Can we make the ICN work in the wireless edge?

ICN-WEN Challenge

This solicitation challenges the research community to:

- Create a new, integrated ICN approach for wireless networks
- Address fundamental challenges of wireless ICN data delivery:
  - Discovery, movement, transport, reliability, & management of data
  - Naming, caching, and storage of content & distributed processing
  - Protection of information within a network
  - Device power consumption, device & network heterogeneity
  - Network latency and large scale scalability
- Demonstrate & quantify the benefits of a potential ICN-WEN
  - Via simulations, emulations, and testbeds
  - Focus on ultra-low latency applications & Massive IoT deployments
- Transition research findings into practice
  - Evaluate realistic deployments and implementation complexities

ICN-WEN Goals

- Target Beyond-5G applications
  - Ultra low-latency and Massive IoT
- Clean-slate design of ICN at the network edge
  - Not trying to change the whole Internet
  - Consider realistic wireless network models
- Three Dimensions
  - ICN-Enabled Wireless Device Endpoints
  - ICN-Wireless Network Infrastructure and Architecture
  - ICN-Wireless Information Security and Data Privacy
- Prototyping and demonstrations

ICN-WEN:

NSF 16-586

Letter of Intent Due: Sept 19, 2016

Proposals due: November 21, 2016

- 2 – 3 projects awarded
- Up to $3,000,000 per project
- Over 3 years
- $6M total investment (not including supplements)
- Funds from FY2017; start date as appropriate

ICN-WEN Solicitation and Review

Outline:

- Solicitation Requirements
  - Personnel/Teams
  - Proposal Sections
- Review Process
  - Solicitation-Specific Review Criteria
- Q&A

Who can submit

- Universities and two- and four-year Colleges (including community colleges)
  - Accredited in and having a campus located in the US acting on behalf of their faculty members
- Sub-awardees
  - Same as submitting institutions—see above

ICN-WEN Personnel Requirements

- An individual may participate as PI, co-PI, or senior personnel in **no more than one proposal** submitted in response to this solicitation.
  - If an individual exceeds limit, only the proposal with the earliest date will be accepted—all others will be returned without review
- Each project must include PIs or co-PIs with demonstrable expertise in network security, wireless networking, and ICN.
  - Composition and individual inclusion of each member needs to be justified with respect to the goals of the project

ICN-WEN Letter of Intent

- Only one per project
  - Lead Institution must submit one LOI on behalf of the entire project representing all collaborating institutions involved in that project.
- 2 pages
  - Project synopsis
  - Summary of how project addresses the three dimensions sought
  - Team Composition and expertise - can change in full proposal

ICN-WEN Full Proposal

- Title of the form "ICN-WEN: <title>"
  - For Collabs: "ICN-WEN: Collaborative Research: <title>"
- Project Description: up to 20 pages
- Supplementary Documents
  - A list of Project Personnel and Partner Institutions
  - Collaboration Plan
  - Data Management Plan
  - Post-Doctoral Mentoring Plan
- Single Copy Documents
  - list of collaborators

ICN-WEN Section Requirements: Project Description (up to 20 pages)

Clearly explain:

- How project goals and outcomes deliver a suitable co-design of ICN and future wireless networks to support Beyond-5G (B5G) applications at the edge?
- The research components and how together they address the three dimensions sought in the proposal
- The proposed validation plan that should include simulation, experimentation and prototyping
- The major tasks, milestones, and interdependencies through a Gantt chart

ICN-WEN Section Requirements: Project Description (continued)

Clearly explain:

- The plan to integrate research outcomes into education and advance education in the field;
  - Note: REU support for undergraduates may be submitted for the first year of the project by inclusion in proposal budget for each institution. These funds do not count against the $3,000,000 maximum budget limit.
- The plans for disseminating the research and education outcomes beyond academic publications;
- Rationale for including each member of team
- If involving multiple institutions, the rationale for the multi-institution structure of the project and how effective collaboration will be assured.

ICN-WEN Section Requirements: Collaboration Plan (up to 2 pages)

The Collaboration Plan should include:

- 1) The specific roles of the project participants in all organizations involved;
- 2) Information on how the project will be managed across all the investigators, institutions, and/or disciplines;
- 3) Identification of the specific coordination mechanisms that will enable cross-investigator, cross-institution, and/or cross-discipline scientific integration (e.g., yearly workshops, graduate student exchange, project meetings at conferences, use of video-conferences, software repositories, etc.); and
- 4) Specific references to the budget line items that support collaboration and coordination mechanisms.
- The Gantt chart cannot be included in this section.

ICN-WEN Section Requirements:
Postdoctoral Research Mentoring Plan (1 page)

When a Postdoc is on the project provide a description of :

- the mentoring activities that will be provided for such individuals
- Refer to CRA resource page on best practices for mentoring post-docs

ICN-WEN Section Requirements: Data Management Plan (up to 2 pages)

The Data Management Plan should conform the CISE guidance on such plans.

Describe, in addition, how the proposal will conform to NSF policy on the dissemination and sharing of research results and the intellectual property, publishing, and licensing requirements:

- Offer software with open source license under an BSD/ Apache 2.0 or equivalent license; (see solicitation)
- A website that is updated on a monthly basis with the specifics of progress on the projects

See solicitation (Sections V.A and VII.B) for more guidance.

ICN-WEN: Additional Supplementary Documents

- Letters to document collaborative commitments as needed, but **do not** submit general letters of support
- No appendices, preprints, etc…

https://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/gpg_index.jsp

Additional ICN-WEN Personnel Suggestions

- Projects should include personnel with needed expertise, but no more than appropriate to complete the project
- Support for software engineers or programmers is allowable
- Projects may support PostDocs as appropriate

ICN-WEN Review Process

- Intel: Internal Review
- NSF: Panel with ad hoc reviews as appropriate:
  - Intellectual Merit & Broader Impacts
  - See NSF 16-1; Proposal and Award Policies and Procedures Guide (PAPPG) for more information
  - Additional Review Criteria—see next slide
- Joint NSF-Intel reverse site visits as needed
- Joint NSF-Intel decisions on awards

ICN-WEN: Solicitation-specific Review Criteria

In addition to Intellectual Merit and Broader Impact, the proposal will be evaluated on the basis of:

- Technical innovation along each of the three dimensions
- Non-incremental potential, and relevance.
- Collaboration
- Cost effectiveness and cost realism

ICN-WEN: Funding model

Projects will be jointly funded by NSF and Intel through separate NSF and Intel funding instruments.

- NSF awards will be made as continuing or standard grants.
- Intel awards will be made as Intel agreements (Contracts or Grants).
- NSF and Intel will manage their respective awards/ agreements in accordance with their own guidelines and regulations.
- Either organization may supplement a project without requiring the other party to provide any additional funds.

ICN-WEN: Program management

- NSF and Intel will each designate a Program Director for each NSF/Intel Partnership award who will jointly oversee the execution of the project
- The Intel Program Director may become a member of the NSF/ Intel Partnership Project Management Team.
- Annual on-site reviews may be conducted jointly by NSF and Intel.
- Institutions may request site visits to Intel or invite site visits from Intel.

ICN-WEN and National Priorities

- Supporting fundamental, interdisciplinary, and high-risk research and education;
- Transforming how we understand and design complex engineered systems;
- Creating trustworthy Internets that will meet the information needs of the 21st century

Reminder: Deadlines

- Letter of Intent: September 19, 2016
- Full Proposal: November 21, 2016
  - The intent is to give about 4 months in which to prepare full proposals.

FAQs

- Formal FAQ will be posted on solicitation website in late August.
- Questions answered today are informal and serve to clarify. The solicitation is the official word. The Formal FAQ is an advisory document, and is not binding.

FAQs (continued)

Q: Will there be any feedback from NSF/Intel on LoI? Should we expect any?
A: LoI serves to inform NSF and Intel on what projects are being devised by the community in response, with the understanding that not all of them might materialize into full proposals. Intel and/or NSF can optionally choose to respond to any of the specific teams with queries on the contents on the LoI. PIs should not expect any response from NSF. An official acknowledgment of the receipt of the LoI will be sent out by October 3, 2016.

Q: For collaborative proposals, should all institutions submit supplementary documents and single copy documents?
A: No, only the lead institution should submit these documents.

FAQs (continued)

Q: What are the Intel criteria for their internal review?
A: For Intel, internal review will be conducted, and will consider the degree to which proposals have a substantial potential for influencing the direction of Intel's long-range technology plans, as well as industry ecosystem plans for ICN and wireless innovation. Also, Intel has a strong commitment to broadening participation and will provide the same considerations as NSF to the diversity of the proposer team in the evaluation of the proposals.

Q: Can there be collaborations with researchers from foreign countries?
A: NSF has agreements with certain countries to encourage such collaborations. No funds can be allocated for international participants. We can discuss specific country arrangements on a case-by-case basis.

Q: Can non-academic institutions participate?
A: Yes, if they are non-profits, and as sub-awardees only.

Questions?

FAQs (continued)

Q: What are the other NSF-Intel Collaborations?
A: Visual and Experiential Computing (NSF 15-518), Cyber-Physical Systems Security and Privacy (NSF 14-571), Information-Centric Networking in Wireless Edge Networks (NSF 16-586).

Q: Is each institution limited to one proposal?
A: There are no limits on the number of proposals per institution.

Q: What kind of changes are permissible between LoI and full proposal?
A: Lead Institution cannot change. Collaborating institution set can change. Lead PI cannot change. Co-PIs can change. Project synopsis and focus can change.

ICN-WEN: Proposal Specifics

- Proposal Page Limits:
  - Project descriptions: 20 pages
  - Collaboration and management plan: 2 pages
  - Data management plan: 2 pages
  - Postdoc mentoring plans (if applicable): 1 page
- Cumulative project budget:
  - Up to $3,000,000 for 3 years (support for REUs do not count against this limit)