

Future Directions for Nanonetworking

Industry Connections (Individual Process)

Activity Initiation Document

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1. Background and Purpose

Nanonetworking is the study of communication among devices and/or entities – manmade, biological, and hybrid – with very small dimensions; challenging physical features of this communication environment make analysis and system design very different from conventional communication systems. Nanonetworking is a rapidly emerging discipline, but as yet (1) emerging technology trends and important open problems in this area are unclear; and (2) new industrial applications and potential industrial partners need to be identified. This research project will address both of these goals.

This project is related to the IEEE P1906.1 standards working group, and its potential membership will be drawn from that effort. The results of this research project may guide future standardization efforts in nanonetworking.

2. Charter and Scope

Within the IEEE Standards Association (IEEE-SA), the “Future Directions for Nanonetworking” (FDfN) activity will be overseen by the IEEE-SA Board of Governors (BOG) and the IEEE Communications Society Standardization Programs Development Board (CSPDB). The charter of FDfN focuses its activities as follows:

- This project will consider two important aspects of future directions in nanonetworking: first, emerging trends and important open problems; and second, industrial applications and potential industrial partners.
- The first part of the project:
 - Will evaluate, in as much detail as possible, the current state of the art in nanonetworking research, and will identify themes that currently occupy the attention of researchers;
 - Will consider gaps in current research, both theoretical and practical:
 - Concerning gaps in theoretical knowledge, the project will consider research areas such as (but not be limited to) mathematically realistic communication channel models, relationships to concepts from conventional communication systems, and interfacing across multiple layers and scales
 - Concerning gaps in practical knowledge, the focus will be on requirements for implementation of nanonetworking systems in laboratory environments (as opposed to simulation).
 - Will develop a plan for approaching potential funding partners (e.g., NSF, DARPA, NIH, NSERC, CIHR) to address these gaps in research; and
 - Will consider expertise to address the gaps that lie outside the traditional domain of the IEEE (e.g., biology, chemistry, materials science), and will

develop a plan to enhance collaborations with researchers from those disciplines.

- The second part of the project:
 - Will explore industrial applications of nanonetworking, especially those applications that are feasible and achievable at present (or in the near term), but also visionary/transformational future applications;
 - Will consider possible commercial products that use nanonetworking, and make the business case for those products;
 - Will identify companies that could produce nanonetworking-related products or exploit nanonetworking in an industrial context; and
 - Will propose next steps towards involving those companies in collaborative research and development, including involvement in university research.
- Together, both parts of the project will explore the potential for research partnerships, e.g., industrial/academic partnerships.
- Although this project is intended to support future standardization activities, work that is already part of the 1906.1 PAR is outside the scope of this project.

3. Potential Markets Served

This project will benefit the rapidly growing research community in nanonetworking, by providing a guide to important gaps in current research, and by considering sources of research funding to address those problems. This project will also benefit the technology industry, by providing a roadmap towards industrial applications of nanonetworking.

4. Proposed Deliverables

There are two deliverables of this project:

- A “vision document” which addresses the gaps and future directions for research; and
- An “industrial usage document” that presents industrial applications and commercial products of nanonetworking, outlines the business case for these applications, and identifies potential industrial partners.

It is expected that the deliverables will be produced within 18 months of the official start of the project.

5. Funding Requirements

No expenses are currently anticipated.

6. Initial Members

This project is mainly a collaboration among academic researchers and industrial representatives. We are actively seeking additional industrial representation, as well as

additional input from disciplines that are not traditionally covered by the IEEE, especially biology and chemistry.

The initial members in FDfN are the following:

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