

Fundamentals of Molecular Nano-Communication Networks

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Abstract:

Nanotechnology is providing a new set of tools to the engineering community to design and manufacture devices in a scale ranging from one to a few hundred nanometers. At this scale, nanomachines, which are the most basic autonomous nano-devices able to compute, store data, sense and actuate, will cooperate and share information through their interconnection into nano-communication networks. In this talk, the MoNaCo project is presented which is recently funded by the US NSF. The project is focused on investigating the use of molecules to encode and transmit information among nanomachines as a viable solution to the communication needs at the nanoscale, by taking into account the limitations of the nano-devices in terms of energy consumption, computation and application environments (e.g. intra-body nano-medicine). Unlike traditional communication technologies, molecular communication represents a radically new communication paradigm, which demands novel solutions, including the identification of existing molecular communication mechanisms, the establishment of the foundations of molecular information theory, or the development of architectures and networking protocols for nanomachines. The MoNaCo project will make contributions along four broad directions: the theoretical characterization of the molecular communication channel for a network of nanomachines, the definition of suitable molecular communication protocols for the transmission of information, the engineering of a standard tool for the simulation of molecular nano-communication networks and the realization of a testbed for their experimental validation. Since to date the realization of artificial nanomachines is still under development, the MoNaCo testbed will be based on genetically engineered bacteria and their molecular communication capabilities.

Speaker Bio:

Ian F. Akyildiz received his B.S., M.S. and Ph.D. degrees in Computer Engineering from the University of Erlangen-Nuernberg, Germany, in 1978, 1981 and 1984, respectively. Currently, he is the Ken Byers Chair Professor with the School of Electrical and Computer Engineering, Georgia Institute of Technology, Director of Broadband Wireless Networking Laboratory, Chair of the Telecommunication Group at Georgia Tech. Dr. Akyildiz is an Honorary Professor with School of Electrical Engineering at the Universitat Politecnica de Catalunya, and Founding Director of N3Cat (NaNoNetworking Center in Catalunya) in Barcelona, Spain since June 2008. He is also an Honorary Professor with University of Pretoria, South Africa since March 2009. Dr. Akyildiz is an IEEE FELLOW (1996) and an ACM FELLOW (1997) and received numerous awards from several organizations including IEEE and ACM. His current research interests are in Nanonetworks, Cognitive Radio Networks, Wireless Sensor Networks.

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