In this talk, I will describe recent work that uses Abstract MAC Layers to develop and analyze algorithms for wireless networks. These algorithms are intended to run in networks with local radiobroadcast communication, with a variety of possible signal characteristics. Current work on wireless network algorithms is complicated by a diversity of low-level communication assumptions, including assumptions about message collisions and other forms of interference, and about how the success of message delivery depends on geographical distance. It is hard to understand how the results depend on the particular communication assumptions. Moreover, many algorithms use similar techniques to deal with the same network difficulties. The result has been a rather complicated theory. To simplify matters, we propose using Abstract MAC Layers to mask some of the complexities of the underlying networks. For example, we have defined a layer that provides reliable local broadcast communication, with timing guarantees stated in terms of abstract delay functions of the local contention. We have developed and analyzed two algorithms over this layer for the important problem of Multi-Message Broadcast—a simple greedy algorithm and one that uses regional leaders. The second of these algorithms extends to mobile networks. In work in progress, we are demonstrating how our Abstract MAC Layer can be implemented using existing methods of probabilistic decay and network coding. We are showing how one can use such layers to split existing algorithms and their analysis into smaller pieces. And, we are showing how our layer can be used to solve other problems, such as implementing a popular dynamic graph model. The basic Abstract MAC Layer was developed jointly with Fabian Kuhn and Calvin Newport. Other collaborators on related projects include Alex Cornejo, Majid Khabbazian, Darek Kowalski, Saira Viqar, and Jennifer Welch.

**ABSTRACT:** Nancy Lynch is the NEC Professor of Software Science and Engineering in the Department of Electrical Engineering and Computer Science at MIT. She heads the Theory of Distributed Systems research group in MIT's Computer Science and Artificial Intelligence Laboratory. She received her B.S. degree in mathematics from Brooklyn College in 1968, and her PhD in mathematics from MIT in 1972. Lynch has written numerous research articles about distributed algorithms and impossibility results, and about formal modeling and verification of distributed systems. Her best-known research contribution is the "FLP" impossibility result for distributed consensus in the presence of process failures, developed with Fischer and Paterson; their paper, entitled "Impossibility of Distributed Consensus with One Faulty Process" won the 2001 Dijkstra Prize. A subsequent paper with Dwork and Stockmeyer, entitled "Consensus in the Presence of Partial Synchrony", presented an approach to circumventing the FLP impossibility result, and won the 2007 Dijkstra Prize. Lynch's other well-known research contributions include the I/O automata mathematical system modeling frameworks, with Tuttle, Vaandrager, Segala, and Kaynar. Her recent work is focused on algorithms for mobile ad hoc networks. Lynch has written three books: on "Atomic Transactions" (with Merritt, Weihl, and Fekete), on "Distributed Algorithms", and on "The Theory of Timed I/O Automata" (with Kaynar, Segala, and Vaandrager). She is an ACM Fellow, a member of the National Academy of Engineering, a co-winner of the first van Wijngaarden prize (2006), winner of the 2007 Knuth Prize, and winner of the 2010 IEEE Emanuel Piore Award. Lynch has supervised approximately 25 PhD students and over 50 Masters students, as well as numerous postdoctoral research associates. Many of her students and postdocs are now research leaders in their own right. 