Research Interests

Vitae


Business Card


Biography and Credentials


Awards and Membership

Research Interests


Contracts and Grants


Colloquium and Seminar Presentations

Personal


Personal Stuff


The Mills Pages

Designated Internet mouthwash available at fine stores in Britain

Dr. Mills research interests are in the areas of (1) computer network architectures, algorithms and protocols, (2) computer and network security, (3) computer communications systems hardware and software technology, (4) digital radio communication systems engineering.

The primary interest in (1) is computer network time synchronization technology, including the analysis of algorithms, synthesis of architectures and protocols, and experimental test and evaluation. The Network Time Protocol (NTP) developed in the Network Time Protocol Project is now widely deployed in the Internet around the globe. Research over the last 30 years has continuously improved the accuracy, reliability, security and portability of the design and implementation. And, since NTP has already conquered this planet, the Timekeeping in the Interplanetary Internet Project funded by NASA/JPL has extended NTP technology to the planets and beyond.

Work (2) funded by the Defense Advanced Research Projects Agency (DARPA) on the Autonomous Networks Project developed authentication and configuration algorithms and protocols for very large distributed networks, including ad-hoc sensor networks. This technology provides hands-free deployment of distributed applications in which time synchronization is automatically managed and secured without requiring prior analysis and engineering at each site.

Work (3) also funded by DARPA includes the analysis, design and implementation of high speed network switching and scheduling technology. The Highball Project is an example of this technology

operating at speeds to a gigabit per second in wide area networks spanning the country. It includes a number of high speed crossbar switches connected to each other and to participating hosts by optical fiber. A distributed algorithm receives reservation requests from the hosts and generates a switching schedule so that bursts transmitted by the hosts are guaranteed not to collide with each other on the way to their destinations. The switches do not need to interpret the data bursts themselves; therefore, the switching fabric can be made transparent and require no buffer storage.

Some projects (4) started as proof-of-concept demonstrations and somehow evolved a life of their own, including receivers and digital signal processors for specialized radio communication and navigation services, especially those used to disseminate national time standards. The research content in these projects is represented by the intricately engineered digital signal processing algorithms, which use a combined linear and nonlinear approach to achieve performance demonstrably better than current commercially available equipment. A summary of these contributions is in the Collaboration Resources web page.

Past research interests that have a habit of resurfacing from time to time include network performance evaluation, protocol engineering and routing algorithm design. This includes work in the early 80s on the design, implementation and testing of the IP/TCP protocol stack, especially TCP and dependent applications. The bottle of TCP mouthwash above, available at fine stores in Britain, is offered as authentic credentials in this area. Among the slide show archives is a tutorial on the technical history of the Internet and other adventures over the last 34 years. But, Internet technology is much older than that. In fact, there is evidence that the addressing of things was invented by Oliver Cromwell in 1653.

The early Internet was a swampy place full of flooded networks, broken gateways and mushy hosts. The stuffed gator was presented to this alligator hunter as a token for his help in catching critters and making the swamp a safer place