Invited Talk

TRUST: in Cyberspace and Beyond

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ABSTRACT

There is an alarming increase in the number of virus and worm attacks, phishing emails, identity theft both on the internet and physical infrastructures. Indeed, cyberspace has several features of lawlessness which make it difficult for us to mirror societal trust relationships into cyberspace. A cursory examination of the issues involved in an issue like phishing or electronic voting reveals that the problems that we are confronting have both a technology and a policy component. Further, with our increase dependency on computing and communication to instrument physical infrastructures, such as electric power, water, gas, etc. we find that they are vulnerable to information attack as well. To address these grand challenge societal problem, in June 2005, the NSF has established a Science and Technology Center entitled "TRUST: Team for Research in Ubiquitous Secure Technologies" between Berkeley (lead), CMU, Cornell, Stanford and Vanderbilt with outreach partners at San Jose State, Mills and Smith College. In this talk, I will give you a snap shot of the kinds of research, education, technology transfer, privacy and policy work that we have underway. Rather than present a smorgasbord of work at the Center I will give a selected few examples of the work, technology transfer and impact that the Center has already had in the area of network embedded systems:

There has been a great deal of excitement in recent years concerning the evolution of sensor webs of smart dust. There has been a very substantive active world wide in this area and in particular at Berkeley there have now been over six generation of "motes" for these sensor webs, and at least three new start ups have arisen to commercialize these developments. I will survey these developments and where they have brought us in what is undoubtedly a very important new class of computing involving an integration of communication and computing. I will describe how the technology push is matched by the applications pull of numerous different applications.

Throughout the talk, I will highlight the efforts of my group and that of my colleagues especially Culler, Pister, Wagner and Brewer in "closing the loop" around these networked embedded systems. We believe that this closing the loop brings into sharp focus the real time constraints and issues inherent in the use of networked embedded systems. Further, the most important new directions in sensor webs involve this new direction beyond simply sensing and monitoring the physical environment and infrastructure. In particular, I will describe the range of methods and algorithms needed to track multiple targets in a sensor web and to be able to pursue them. I will also discuss security aspects of using sensor networks in physical infrastructures.