

Secure and Economically Viable Internet Architecture

Dr. Arjan Duresi

School of Science

Indiana University – Purdue University Indianapolis

Abstract

The evolution of the Internet is one of the most intriguing and magnificent engineering feats in the history of technological innovations. The Internet mirrors and enhances all aspects of our lives, by creating unprecedented opportunities for advancing knowledge in all fields of human activities. However, the 21st century society's needs may not be met by the current trajectory of incremental changes to the current Internet. Furthermore, the continued success of the Internet is increasingly threatened by increased and sophisticated security attacks and by the lack of performance reliability of Internet services. Therefore, the research community worldwide is engaged in exploring new architectures and solutions for the future Internet.

We are working to design a new Internet architecture. Our larger team includes multidisciplinary expertise of researchers, from institutions such as Washington University in Saint Louis, Purdue University, and Seikei University in Tokyo Japan. Our research in this field focuses on various major requirements of the future Internet, including security, resilience, mobility, better manageability, economic viability and suitability for the needs of society.

The Internet suffers by a number of serious security vulnerabilities, including weak defenses against attacks on hosts, communications, on availability (Denial of Service attacks), and privacy. Furthermore, the existing Internet architecture not only does not provide sufficient security, but worst, it empowers the attacking activities. We are exploring ways make Internet trustworthy, which includes properties such as security, reliability, privacy, and usability. Our multidisciplinary approach is based on the interplay among technical, psychology and legal aspects of system trustworthiness. We propose drastic changes, starting with strong authentication, various layers of security, and evaluation of trust, that will make the Internet a much more trustworthy and resilient system.

The future Internet will be composed mostly of mobile nodes such as cell phones, PDAs, various types of sensors, and so on. Unfortunately, today's Internet is not support mobility. We are exploring solutions that provide mobility service based on the interplay among technical, security and economic factors. Our mobility architecture uses cloud computing and explores the tradeoffs among Quality of Service, security, privacy and economic viability of mobility service.

This project is currently partially funded by NSF. We are looking forward to expand our collaborations and partnership in this research field.