

PROJECT SUMMARY

Collaborative Research: NeTS-FIND: Market-Enabling Network Architecture

PI: Jean Walrand, University of California, Berkeley

Co-PI: Venkat Anantharam, University of California, Berkeley

PI: John Musacchio, University of California, Santa Cruz

PI: Shyam Parekh, Bell Laboratories, Lucent Technologies

There is a substantial mismatch between today's needs and the network architecture. The Internet was designed for best effort connectivity among friendly users with no commercial interests. Today, the network is used for important commercial and security activities, it is plagued by malicious intruders, and its evolution is driven by economic interests of providers. Economic aspects are essential in the design of the future architecture as they stimulate or inhibit development and implementation of technological solutions.

Today's network fails to develop markets for services and security. Because of these limitations, the interests of providers and users are misaligned. Suitable architecture components facilitate these markets through information they reveal and actions they enable. These markets create incentives to improve the services and the security of the network. Our goal is to expose the coupling between economic incentives and the network architecture. The economic issues and the network architecture are tightly interlocked and must be studied together. This work will identify suitable components that should be included in a future architecture.

We propose to study the interactions between users, hackers, providers, and regulators. We will build on our experience with network technology and its models and with economic aspects of contracts and transactions. Our methodology combines analysis and simulations to compare the efficiency and scalability of various approaches. We believe this proposal addresses issues that are essential for the future of the networking industry.

Intellectual Merit

This proposal addresses fundamental scientific and engineering questions. Some of the scientific questions concern the suitable formulation and analysis of the strategic choices that the users, content providers, service providers, and other parties in the network face when they interact. The properties of their equilibrium strategies and their distributed computation raise novel mathematical questions and require new results and algorithms. Other fundamental scientific issues addressed include how to do secure information aggregation and how to provide incentives for network evolution and for improved security and reliability. Engineering questions concern the scalability of proposed algorithms and protocols, their security and robustness, how they can be deployed incrementally, and their extensibility as new technologies, services, and applications get implemented.

Broader Impact

The publications and conference papers that will result from this research will contribute to making the community aware of the economics aspects of networks and will suggest new mechanisms and protocols for networks that lead to better services and security and a higher utility for users. We expect our courses to expose our undergraduate and graduate students to these issues.