

ITR-IDM: Collaborative Information Sharing

Project Summary

Collaborative information sharing is a critical element in the activities of a large number of social, governmental and law-enforcement agencies. It involves the discovery, propagation, and aggregation of information shared by multiple participants in these activities. Unfortunately, traditional information sharing systems may suffer from problems such as central point of failures/attacks and poor scalability. We propose a framework for de-centralized and collaborative information sharing to overcome such problems, while considering multiple aspects of the framework including economics, integrity and trust. Our research requires bringing together expertise in databases, quality of service (QoS), peer-to-peer, economics, and telecommunications.

Intellectual Merits Our intellectual contributions are as follows:

- *Proactive dispersion of information* Algorithms for the search and dispersion of information will be developed, so that collaborating parties can disperse information and build up information availability in a community-aware fashion. Techniques to automatically adapt information availability to popularity will be pursued.
- *Collective and opportunistic information aggregation* Due to the dynamic and diverse nature of collaborators, protocols for collective and opportunistic information aggregation will be developed. By aggregating the contributions from multiple providers, an information requester will be able to obtain the requested information, even if none of the providers supply the complete information. Furthermore, critical but hidden facts will also be discovered by information aggregation.
- *Economics-inspired information sharing incentive* To encourage collaborators to share information, an economics-inspired model will be proposed to create incentive. The entire community forms a dynamic and mutually beneficial economic environment: for each member, the contribution to other members will lead to the contribution from other members.
- *Integrity and trust maintenance* To maintain the integrity of information being shared, an integrity check and violator identification method will be developed, based on the digest of information and the construction of a web of trust among collaborators.

Broader Impacts Our proposed research will contribute to the success of a variety of collaborative missions and tasks. Examples include: (1) e-Commerce, e-Government, and remote education. The sharing of information will lead to higher robustness and cost-effectiveness. (2) Social, governmental, and law-enforcement missions. Information sharing will result in better mission-planning and prevention of disasters. Critical facts and hidden problems are often revealed and confirmed by the sharing and aggregation of information which are seemingly irrelevant to each other.

We will disseminate our research results by distributing our software and data to scientists and engineers, providing tools to agencies and institutions to build information sharing infrastructures. We plan to apply our results to the creation of a multi-hospital medical research infrastructure at Indiana University Medical School. Undergraduate and graduate courses will be enhanced to reflect the latest advances in collaborative information sharing and knowledge about peer-to-peer, trust models, and economics.

We will contribute to the outreach programs, including the one at the Center for Education and Research in Information Assurance and Security (CERIAS) at Purdue University. Five women (two of them minority) graduate students will participate in this research effort. The PIs will involve undergraduate minority and women students in the project through the EPICS Program (Engineering Projects in Community Service). We will develop new experimentation and simulation infrastructure, to be used not only for research, but also for teaching and public access. The platform for experiments and simulations will be made available to other universities.