

NATIONAL SCIENCE FOUNDATION
Proposal Abstract

Proposal:1937165

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Proposal Title: Convergence Accelerator Phase I (RAISE): Knowledge of Internet Structure: Measurement, Epistemology, and Technology (KISMET)
Institution: University of California-San Diego
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The NSF Convergence Accelerator supports team-based, multidisciplinary efforts that address challenges of national importance and show potential for deliverables in the near future.

The broader impact and potential societal benefit of this Convergence Accelerator Phase I project is to improve the security of the Internet infrastructure by creating a kind of map of the Internet that includes information on structural dependencies, ownership, and economic interrelationships. The first project goal is to build a system of public data on Internet structure, as manifested in the naming, addressing, and routing systems, which will address an increasing gap in science, security, and public communications policy. The project's approach involves cutting edge Internet measurement and analytic tools, crucial operational network engineering expertise required for sound interpretations of the measurements, new methodologies to synthesize different sources of data, and technology to responsibly manage data integrity, availability, and privacy. The second project goal is to establish and sustain an open knowledge network that will use this system of internet structure data to analyze and report on the extent of persistent Internet insecurities and progress in mitigating them, in a form that is understandable by non-technical users, including policy-makers and a wide range of public and private stakeholders. The knowledge network effort will include producing tutorial material that provide insights into the current state of the Internet, the underlying causes of persistent insecurity, and possible paths to a more secure future. The initial list of collaborators spans a range of disciplines that rely on Internet measurement -- from network science to security to economics to law and public policy, and the team will develop more partners during this phase I effort.

The intellectual merit of this project lies in the development and use of new tools and methods for the collection, curation, and analysis of massive datasets that capture the current structure of the Internet. These datasets, which include data about interconnection topology, ownership, and economic relationships between networks, and the structure and dependencies of the Internet's Domain Name System, are each complex and unwieldy datasets. The primary intellectual contribution of this project is to encode and process these data such that non-technical people can make useful queries about the datasets, and more technical users can correlate and analyze the information across the datasets. This project will require advances in data tagging, coding, and implementation of cross-dataset queries with sufficient performance to enable interactive investigation. In the past, many such datasets have been maintained on purpose-built platforms, but a significant advance of this project will be an exploration of the feasibility of moving various data items into cloud storage, which will reduce development costs and reduce the complexity of sustaining the effort over time. Therefore an additional outcome of this project will be guidelines and operating practices for the use of cloud services for this type of research.

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This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.