

# Sharing Expertise and Artifacts for Reuse through Cybersecurity Community Hub (SEARCCH)

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<https://search.cyberexperimentation.org/>

The NSF-funded Sharing Expertise and Artifacts for Reuse through Cybersecurity Community Hub (SEARCCH) project<sup>1</sup> aims to help improve the overall scientific quality of cybersecurity research by developing, deploying, and supporting new, innovative community infrastructure that enables the transfer and reuse of cybersecurity experimentation expertise and artifacts, including testbeds, methodologies, tools, data, and best practices. This infrastructure will provide an open, online “knowledge hub” to support experimentation, testing, and education. The team is working to pre-populate the hub with artifacts and engage the community to develop a diverse set of content.

SEARCCH aligns with and supports FABRICs goals of enabling new internet and science applications and of advancing cybersecurity research. SEARCCH will enable and support the transfer and sharing of cybersecurity experimentation expertise and artifacts for large-scale experiments running on FABRIC infrastructure.

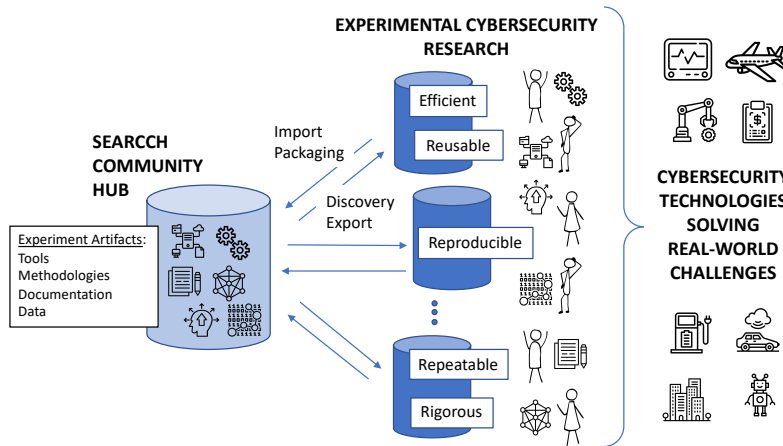


Figure 1: SEARCCH Community Hub Concept of Operations

SEARCCH is motivated by the need to not only share cybersecurity experimentation artifacts, but to also provide a platform that lowers the barrier to sharing. The evaluation of cybersecurity properties of computer, networking, and cyber-physical research is frequently performed in ad hoc ways, which severely retards scientific progress. Most researchers use a combination of methods and infrastructure to conduct experiments using one-off, painstaking, and error-prone processes that are rarely shared for reuse and validation. The lack of repeatable, reproducible, and reusable processes and other artifacts limits one’s ability to build upon the work of others or to compare solutions. Enabling sharing and reuse of experiment artifacts is crucial and will help transform scientific communities.

<sup>1</sup> This material is based upon work supported by the National Science Foundation under Grant Numbers 1925773, 1925616, 1925588, 1925564. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

SEARCCH is enabling sharing through its work in three main thrusts: technology, data collection, and community-building.

**Technology tasks** include the development and integration of:

- (1) the hub, a community collaboration portal which will (i) host an extensible catalog of experimental artifacts, including testbeds, methodologies, tools, data, and best practices and (ii) employ elements of social media and gamification to create an environment that encourages sharing, reuse, and community;
- (2) artifacts import tools that include a) an ontology of experimental artifacts that will provide structure on shared artifacts to help other researchers find and reuse them, and b) testbed-specific packaging tools that lower researcher cognitive load by helping identify useful pieces of experimental artifacts and package them for sharing via the hub; and
- (3) artifacts storage mechanisms for storing large artifacts;
- (4) artifacts discovery and export mechanisms that help researchers rapidly find and extract artifacts for use in their own environment; and
- (5) experiment design support tools that make use of the ontology and hub content to help researchers more rapidly design high-quality experiments.

**Data collection tasks** include mining, classifying, organizing and cataloging existing experimental artifacts and populating the SEARCCH hub. We will develop automated artifacts collection tools to support this activity.

**Community-building tasks** include outreach to and engagement with cybersecurity researchers and experimenters. SEARCCH will recruit from the broader research community, including from the FABRIC community, to create a body of active participants and to encourage and reward the sharing and reuse of experimental artifacts and infrastructure. Through community engagement, we will actively involve the community in the design, development, and eventual ongoing use of the hub.

The SEARCCH infrastructure will ultimately advance the knowledge, understanding, rigor, and practice of experimental cybersecurity research by making experimentation faster, simpler, and more robust. It will enable researchers to more easily build upon the work of others and to compare solutions by facilitating and encouraging sharing and reuse. The resulting infrastructure will directly support the broader research community, including those working on FABRIC's infrastructure in validating the security properties of diverse research solutions and in rapidly creating effective, validated cybersecurity solutions to meet the complex challenges of today's cyberspace. Ultimately, these advances will transform the way that experimental knowledge is accessed, shared, and validated and move the community from one of craftsmanship to a scientific discipline of rigorous experimentation.

Community impacts will be realized as the SEARCCH hub supports the broader community and enables new cybersecurity research through the ready and increased availability of expertise and artifacts on top of existing lab resources. By facilitating sharing and reuse of experiment artifacts, SEARCCH will enable vertical development, which will improve quality, maximize efficiency, and reduce the time and effort that researchers must invest in evaluation of their research prototypes. In turn, this will enable researchers to focus more on innovation and development tasks and produce higher quality solutions.

We anticipate that many members of the SEARCCH community will also be members of the FABRIC community and we look forward to coordination and collaboration between the two communities. We invite members of the FABRIC community to actively participate in planned SEARCCH community engagement activities and to contribute experiment expertise and artifacts to the SEARCCH hub.