SRI International Releases New Game for DARPA Crowd-Sourced Software Verification Program

Citizen scientists interested in cybersecurity can now play Binary Fission at www.verigames.com

Paris, France – September, 11, 2015 — SRI International, in partnership with CEA, the University of California, Santa Cruz (UCSC), the Air Force Research Laboratory, and the U.S. Defense Advanced Research Projects Agency (DARPA) Crowd-Sourced Formal Verification (CSFV) program, has created a game where sophisticated gamers can help improve security of the country's critical software. *Binary Fission* was designed as a fun and accessible way for "citizen scientists" to help increase the reliability and security of mission critical software by verifying that it is free of cyber vulnerabilities.

From a gaming perspective, the goal of *Binary Fission* is simple — sort colored atomic particles or "quarks" in as few steps as possible. "We're very excited about the play experience in Binary Fission," said lead game designer Heather Logas of UC Santa Cruz. "Informed by new research about formal software verification and inspired by the citizen science phenomenon, the game is both very playable and also should contribute well to the underlying science problem."

Examples of critical software behavior, along with some pre-made invariants, are used to generate each level in Binary Fission. The quarks in the game actually represent values of variables inside the critical software, and the sorting process reviews the potential invariants to be explored and applied. Through efficient sorting, players can help to verify that the software is free of security vulnerabilities. *Binary Fission* also emphasizes community, an important aspect of successful citizen science projects, through integrated chat, active community management and regular community events.

"The auxiliary *Binary Fission* feature set is very light, since our goal is to keep players focused on solving problems," said John Murray, Ph.D., program director in the Computer Science Laboratory at SRI International and principal investigator for the overall project. "However, as a citizen science project, our recruitment policy draws in players who are interested in solving cybersecurity issues."

Currently, formal verification requires software experts to have the necessary training in verification techniques. In particular, finding loop invariants in source code has historically been a challenging task requiring extensive training and insight.

"CEA has been successfully developing and applying formal software verification for 25 years, starting in domains such as avionics and energy. As the amount of critical software has grown through the digital revolution, CEA formal tools and expertise have been confronted with new challenges in transportation, health, and manufacturing. We

are pleased to work with our partners in DARPA's highly innovative program," said Karine Gosse, Ph.D., director of CEA List institute on smart digital systems. "Having our Frama-C code analysis platform used as a cornerstone of the project's first game, *Xylem*, has helped us address some of the toughest challenges in code analysis, while gaining numerous insights on new approaches. To make code analysis even more efficient we have accelerated our research, and introduced more automation, interaction and sophistication. By leveraging these improvements to the Frama-C platform, we've made *Binary Fission* the best game yet," added Florent Kirchner, Ph.D., head of CEA List's Software Security Laboratory. "There is tremendous value in international collaboration around formal software verification, and this project illustrates how ambitious objectives can be met with concrete results when world-level expertise on code analysis, system-level verification, and interface design come together."

Binary Fission is one of five games that DARPA is releasing under its Crowd-Sourced Formal Verification (CSFV) program. All games, including the first SRI-CEA-UCSC-created game, *Xylem,* are freely accessible through the Verigames website.

About SRI International
SRI International creates world-changing solutions to make people safer, healthier, and more productive. SRI, a research center headquartered in Menlo Park, California, works primarily in advanced technology and systems, biosciences, computing, and education. SRI brings its innovations to the marketplace through technology licensing, spin-off ventures and new product solutions.

About CEA
The French Atomic Energy and Alternative Energies Commission (CEA) is a public sector research body active in four main fields: carbon-based energy, information and healthcare technologies, very large-scale research infrastructures (TGIR), and defence and global security. Within its technological research division, CEA Tech, the CEA List Institute focuses its research on smart digital systems. Major economic and social drivers, its R&D programmes are focused on advanced manufacturing, embedded systems, ambient intelligence and radiations control for health. By developing cutting-edge technological research, CEA List helps its industrial partners enhancing their competitiveness through innovation and technology transfer (www-list.cea.fr).

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