

Johns Hopkins Institute for Assured Autonomy and the Department of Computer Science

Present

The US National Agenda for Software Engineering Research & Development: Architecting the Systems of the Future



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ABSTRACT

In April 2021, the Software Engineering Institute concluded a study consisting of a panel of leaders in the Software community to develop a research roadmap for software engineering. The report expected out in the Summer of 2021 identifies future challenges in engineering software-reliant systems and identifies necessary advances in foundational software engineering principles across system types such as intelligent, autonomous, safety-critical, and data intensive systems. The goal of the report is to raise the visibility of software so the research portfolio can receive sustained recognition commensurate with its importance for national security and competitiveness and to provide a framework for strategic partnership and collaboration that drive innovation among industry, academia, and government.

The study found the current notion of software development will be replaced by one where the software pipeline consists of humans and AI as trustworthy collaborators that rapidly evolve systems based on user intent. This will be accomplished with advanced development and advanced architectural paradigms. Areas of focus for the research roadmap are AI-augmented software development, assuring continuously evolving systems, software construction through composition, engineering societal-scale software systems, engineering AI-enabled software systems, and engineering quantum computing software systems.

This overview will review the findings of the study and stimulate a discussion on how early results of the research might change the nature of software development and acquisition for government and industry.

BIO

Tom Longstaff is Chief Technology Officer of the SEI. As CTO, Longstaff is responsible for formulating a technical strategy and leading the funded research program of the institute based on current and predicted future trends in technology, government, and industry.

Before joining the SEI as CTO in 2018, Longstaff was a program manager and principal cybersecurity strategist for the Asymmetric Operations Sector of the Johns Hopkins University Applied Physics Laboratory (APL), where he led projects on behalf of the U.S. government, including nuclear command and control, automated incident response, technology transition of cyber R&D, information assurance, intelligence, and global information networks.

He also was chair of the Computer Science, Cybersecurity, and Information Systems Engineering Programs and co-chair of Data Science in the Whiting School at Johns Hopkins. His academic publications span topics such as malware analysis, information survivability, insider threat, intruder modeling, and intrusion detection. He maintains an active role in the information assurance community and regularly advises organizations on the future of network threat and information assurance. He is an editor for Computers and Security, and has previously served as associate editor for IEEE Security and Privacy; general chair for the New Security Paradigms Workshop and Homeland Security Technology Conference; and numerous other program and advisory committees.

Prior to joining the staff at APL, Longstaff was the deputy director for technology for the CERT Division at the Software Engineering Institute. In his 15-year tenure at the SEI CERT Division, he helped create many of the projects and centers that made the program an internationally recognized network security organization. His work included assisting the Department of Homeland Security and other agencies to use response and vulnerability data to define and direct a research and operations program in analysis and prediction of network security and cyber terrorism events.

Longstaff received his bachelor's degree in physics and mathematics from Boston University and his master's degree in applied science and his Ph.D. in computer science from the University of California, Davis.

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