



# System of Systems Software Assurance (SoSSA) Initiative

Organizations face significant challenges in achieving justified confidence that a system of systems (SoS) functions as intended in its actual environment of use, including

- how to reduce the cost of assurance
- how to reduce the time it takes to gain assurance or re-certification
- how to achieve security without impeding needed functionality

In the System of Systems Software Assurance (SoSSA) Initiative, we are developing an integrated set of theories, methods, and practices to lower the cost and reduce the time required to achieve justified confidence in SoS behavior.

## Our Work

Our SoSSA work focuses on

- assurance that undiscovered defects and vulnerabilities as well as unanticipated usage, environmental conditions, reconfiguration, and evolution will not impair functioning unacceptably
- reliability, security, and performance
- systems of systems in which rapid end-user adaptation is needed (such as large-scale, multi-user information management and command-and-control systems of systems)
- the use of structured argumentation (assurance cases) to achieve justified confidence in SoS behavior

## How We Can Help

Our approach in SoSSA can help

- DoD or civilian government programs concerned with gaining confidence in the security or reliability of a large, complex system

## Some Facts about SoSSA . . .

- a study of software supply-chain security risk evaluation provides an assurance case reference model for DoD and DHS
- an analysis of vulnerability management as an SoS ecosystem is being used by members of this community
- a white paper on software reliability assurance lays out a new approach for evaluating software reliability

- organizations that realize that software reliability is a problem that is not being well addressed today
- organizations concerned about SoS security

## Research Collaboration Opportunities

SoSSA researchers are interested in teaming with others to advance engineering practice in areas such as

- software reliability evaluation through assurance cases and a software FMECA (failure modes, effects, and criticality analysis)
- determining which assurance activities contribute the most to ensuring reliability, security, or performance properties
- identifying and studying SoS failure modes and techniques for assuring against them
- qualifying argumentation patterns for certain types of claims, to make system assurance go faster

- determining how much confidence to place in an argument
- analyzing behavioral interoperability in systems of systems
- understanding the implications of trust-management policy changes

## Relationship to Other SEI Work

SoSSA is an area of concentration in the Carnegie Mellon® Software Engineering Institute (SEI) Research, Technology, and System Solutions (RTSS) Program. The RTSS team focuses on the structure and behavior of software-reliant systems—and the intimate relationship between structure and manifested quality attributes—to enable assured and flexible system capabilities at all scales.

## Related Websites

- [www.sei.cmu.edu/dependability/research/assurance/](http://www.sei.cmu.edu/dependability/research/assurance/)
- [www.sei.cmu.edu/dependability/consulting/assurance/](http://www.sei.cmu.edu/dependability/consulting/assurance/)

## For More Information

SEI Customer Relations  
 Phone: 412-268-5800  
 FAX: 412-268-6257  
 Email: [info@sei.cmu.edu](mailto:info@sei.cmu.edu)  
 Software Engineering Institute  
 Carnegie Mellon University  
 4500 Fifth Avenue  
 Pittsburgh, PA 15313-2612

*About the SEI: The SEI is a federally funded research and development center that provides the technical leadership to advance the practice of software engineering, so that software-reliant systems can be acquired and sustained with predictable and improved cost, schedule, and quality.*