



System of Systems Practice (SoSP) Initiative

Success in today's interconnected world requires that distributed systems work together in network-centric operations and systems of systems environments. However, systems of systems are difficult to acquire, develop, test, operate, and evolve.

In the System of Systems Practice (SoSP), Initiative, we focus on practices to successfully engineer systems of systems, rather than stand-alone systems.

Our Work

Our SoSP work provides

- validated methods for the cost-effective migration to new environments from multiple legacy systems
- proven, risk-reducing practices in architecture and design, testing and certification, and identity management and security for service-oriented architecture (SOA) environments
- realistic, experience-based SoS governance and acquisition strategies that help organizations avoid common failures and follow a path for success in an SoS environment throughout the life cycle
- context-based analysis of the viability of technologies in an organization's SoS setting

How We Can Help

We can help organizations to investigate SoS problems, whether in support of a government acquisition or of software development.

In particular, we can help to

- overcome cross-organizational SoS engineering and organizational challenges
- migrate legacy systems to a SOA environment
- evaluate technologies appropriate for SoS implementation
- use SOA in technically constrained or highly distributed situations

Our Methods

- SOA Migration, Adoption, and Reuse Technique (SMART)—for determining what is needed and the costs involved in migrating to a SOA environment
- Seven methods for SoS governance and acquisition—for addressing the broad range of challenges that stem from managing and governing an SoS effort
- T-Check technology investigations
- practices to address SOA testing, web service verification, and identity management

Some Facts about SoSP . . .

- U.S. Department of Defense organizations have adopted SMART for their efforts to migrate systems to SOA environments. In particular,
 - the Army Communications-Electronic Research Development and Engineering Center (CERDEC) used SMART in a migration effort
 - the Air Force Electronic Systems Center (ESC) has licensed the technology
 - more than 100 people in Military Health Systems (MHS) have received training
- Barry Boehm, renowned software engineer and developer of the spiral development model, calls SMART a “good approach to the underemphasized area of Brownfield software engineering.”
- The SoSP team has played a leadership role in the development of a SOA research agenda. The agenda includes more than 50 topic areas in business, engineering, and operations categories. Since its formation in 2007, the agenda has led to nine international workshops, more than 35 papers, and several Ph.D. dissertations.
- The SoSP-developed web service compliance method for Army CIO/G6 provides the means to reduce compliance from 6 months to 2 weeks.

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Our Courses

- Five-course SOA curriculum that includes training in best practices for SOA adoption, legacy system migration, and advanced topics in SOA
- SOA strategy and governance workshops
- SOA-SMART certification program

Research Collaboration Opportunities

SoSP researchers are interested in teaming with others to advance the SoS engineering practice in areas such as

- security and federated identity management in constrained environments
- data interoperability in an SoS
- principles for SoS implementation in the cloud
- integrated SoS practices
- requirements in an SoS environment
- guidelines for SoS testing
- an updated framework for SOA research challenges

Related SEI Work

SoSP 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 Website

www.sei.cmu.edu/sos/

For More Information

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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.