

**ARCHITECTURE:
CATALYST FOR COLLABORATION**



Welcome to the Eighth SEI Architecture
Technology User Network Conference
in collaboration with **IEEE Software**



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SATURN

→ NETWORK

SATURN's purpose is to connect architecture practitioners from around the world to

- share best architecture practices to build and evolve predictable, high-quality systems
- network with colleagues and SEI experts who will help you advance your software and systems architecture knowledge
- find potential solutions, service providers, training, partners, and more to help you and your organization use effective software and systems architecture practices across the life cycle
- stay current with the latest SEI architecture technologies
- meet and learn from other software, systems, and enterprise architecture professionals at the annual SATURN Conference





SATURN HISTORY

Started in 2005 as an SEI gathering in Pittsburgh, focusing only on users of SEI software architecture tools and methods

- “Ring” event was also held in Washington, DC, organized by Booz Allen

SATURN 2006 (still in Pittsburgh) gained broader participation

- Content spread beyond SEI technology.

SATURN 2007-2009 events continued to be held in Pittsburgh

- expanded from a workshop to a conference
- Focus grew from strictly software architecture to architecture for all software-reliant systems covering software, system, and enterprise architectures.

SATURN 2010 first time outside of Pittsburgh, in Minneapolis, MN

- began collaboration with *IEEE Software*

SATURN 2011 expanded, theme-based program offerings

- collaboration between SEI staff and external theme leaders on program design
- increased focus on agile and architecture, SOA, and cloud computing
- session on “Research in Architecture Practices.”

SATURN 2012 increased community involvement

- technical program chair (George Fairbanks, Rhino Research) and tutorials chair (Olaf Zimmerman, ABB) from outside the SEI
- sessions on evolution & extensibility, large scale, and enterprise architecture
- panels on “20 Years of Architecture” and “Architecture and Collaboration”



SATURN 2012

More than 150 attendees representing

- 17 countries
- 74 organizations

The program

- three keynotes
- three invited talks
- two panels
- 35 presentations selected from a record number of submissions
- eight tutorials
- Software Architecture Principles and Practices and new Advanced Software Architecture Workshop courses from the SEI



SATURN 2012

Third year for the SATURN speaker awards, attendee voted, sponsored by *IEEE Software*

Architecture in Practice Presentation Award

Awarded to the presentation that best describes lessons learned in applying architecture-centric practices. The lessons and ideas described can be applied by others and help them to improve their use of architecture-centric practices.

New Directions Presentation Award

Awarded to the presentation that best describes ideas on the horizon where architecture-centric practices can assist innovation and change in today's practices to deliver better systems faster.



Software Engineering Institute (SEI)

Department of Defense R&D Laboratory (FFRDC)

Created in 1984

Under contract to Carnegie Mellon University

Offices in Pittsburgh, PA; Washington, DC; and Frankfurt, Germany

SEI Mission: advance software and related disciplines to ensure the development and operation of systems with predictable and improved cost, schedule, and quality.



SEI Technical Programs

Networked Systems Survivability (CERT)

- Secure Software and Systems
- Cyberthreat and Vulnerability Analysis
- Enterprise Workforce Development
- Forensics

Software Engineering Process Management (SEPM)

- Capability Maturity Model Integration (CMMI)
- Team Software Process (TSP)
- Software Engineering Measurement and Analysis (SEMA)

Acquisition Support (ASP)

Research, Technology, and System Solutions (RTSS)

- Architecture Practices
- Product Line Practice
- Cyber-Physical and Ultra-Large-Scale (ULS) Systems
- Advanced Mobile Systems
- Concept Lab

Exploratory New Starts (IR&D)



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Research, Technology, and System Solutions (RTSS) Program

Mission

Innovate software development for competitive advantage: With a focus on **system structure and behavior**, create and harness innovations for assured development, adaptation, and rapid deployment of software-reliant systems at all scales.

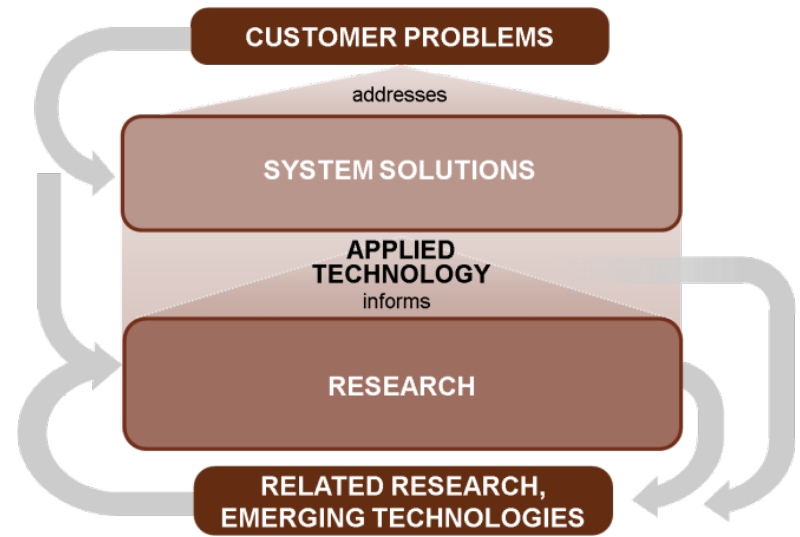
Vision

Assured and flexible system capabilities at all scales



RTSS Program Approach

- Conduct and apply research in the areas of architecture, construction, recomposition, evolution, and assurance of software-reliant systems with a focus on quality attributes
- Develop and mature theories, analyses, technologies, techniques, and methods for acquiring evidence to predict and bound system behavior
- Provide the technical foundations to accommodate change and facilitate rapid and in-situ deployment
- Create and transition system solutions to assure acceptable system behavior and meet business and mission goals for systems in all domains and at all scales

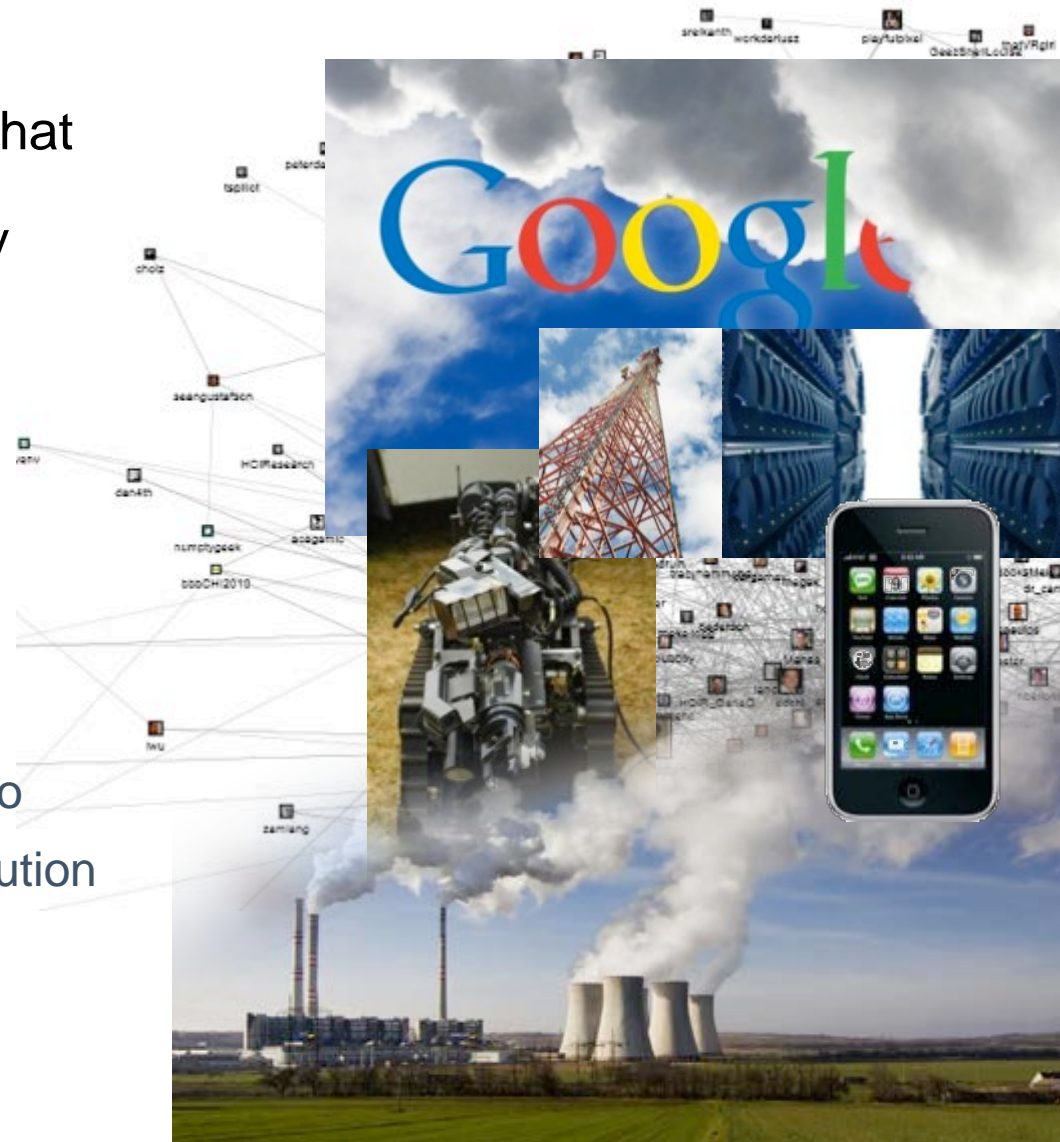


Software-Reliant Systems: What Has Changed?

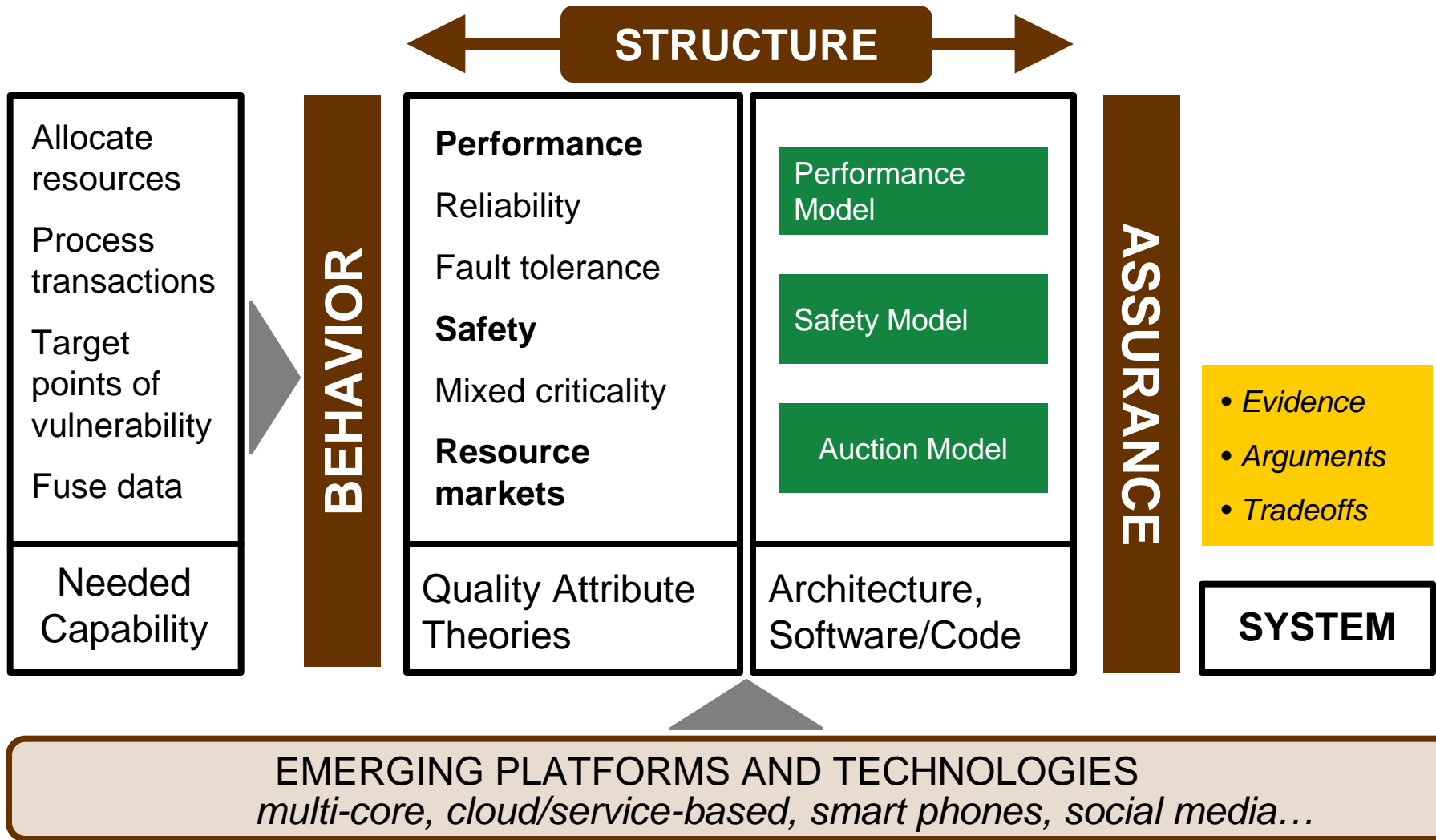
Organizations need to assure that their software-reliant systems behave and adapt appropriately and to quickly deploy them in a diverse and changing network environment.

Trends that lead to technical problems and stand in the way

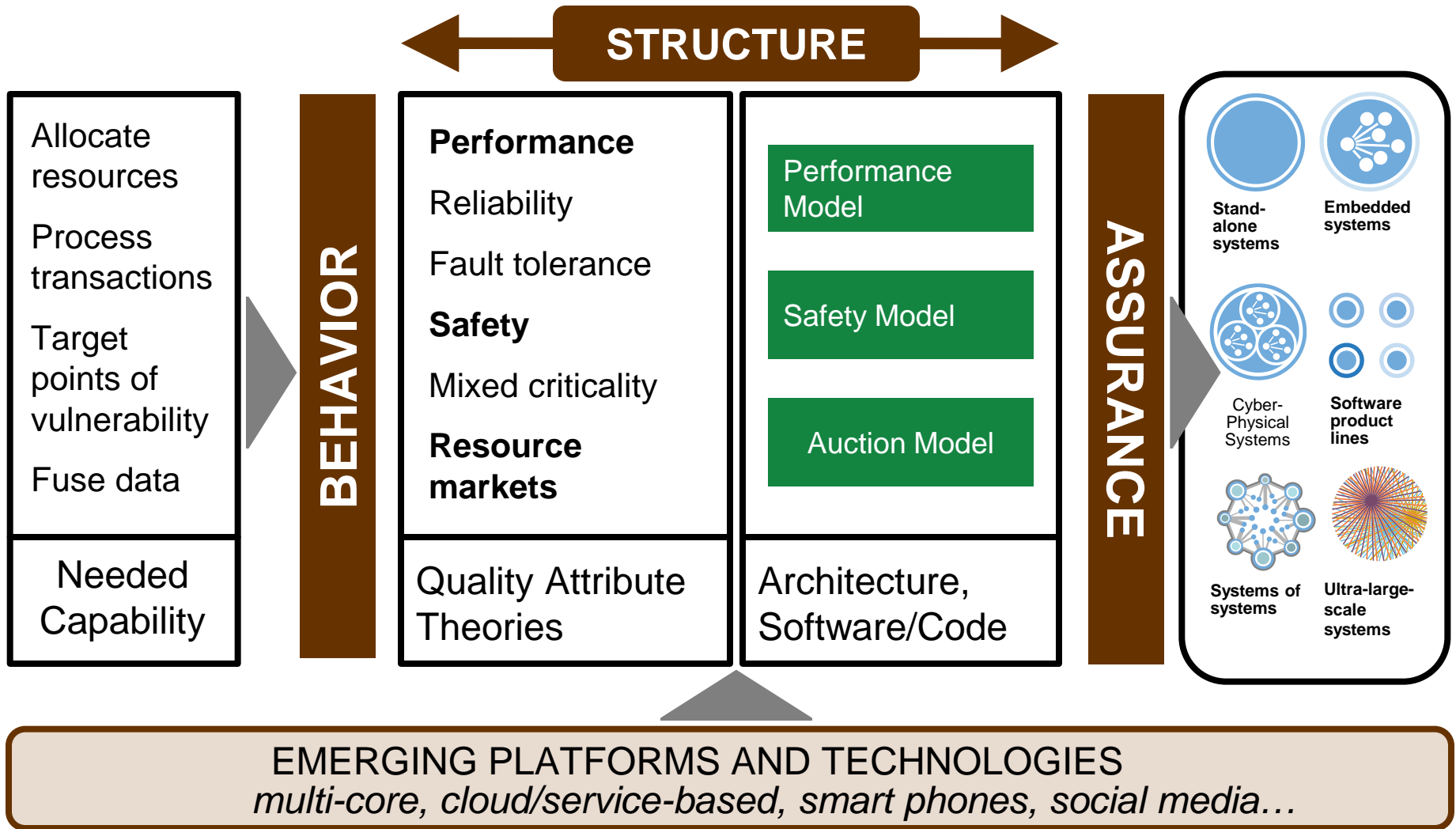
- Scale and complexity
- Increased operational tempo
- Decentralization and distribution
- Disruptive technologies



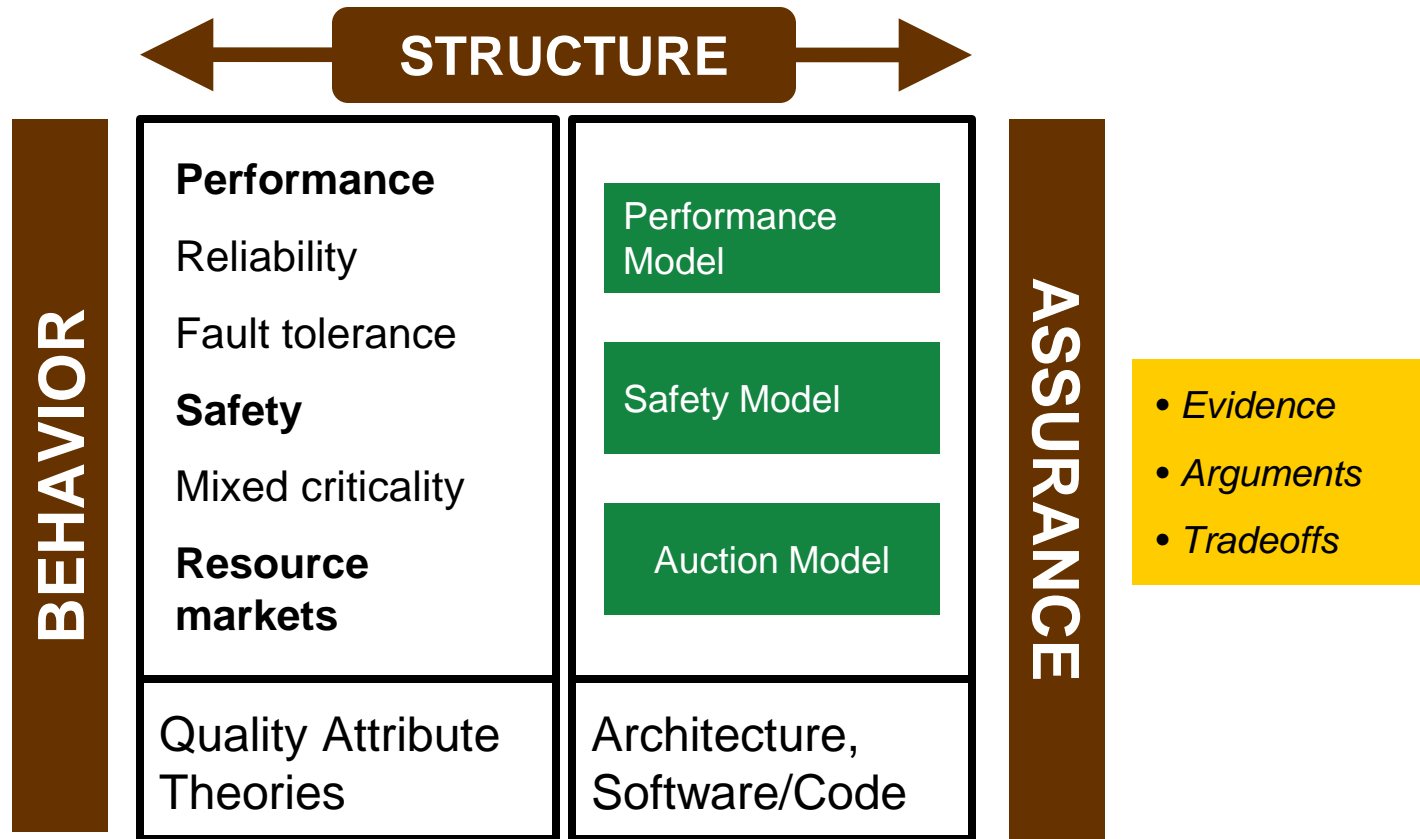
Structure, Behavior, and Assurance - 1



Structure, Behavior, and Assurance - 2



Needed Foundations



Combination of formal notations, design paradigms, quantitative analyses, and qualitative methods.



RTSS Portfolio of Work

Initiatives

Architecture Practices

Develops architecture technology and practices for incremental, cost-effective development and evolution of assured and flexible system capabilities at all scales.

Product Line Practice

Makes software product line development and acquisition a low-risk, high-return proposition for all organizations.

Cyber-Physical and ULS Systems

Develops principles and technology to understand, control, and bound the behavior of cyber-physical-social systems

Advanced Mobile Systems

Explores mobile systems and strategies that increase the flexibility of edge users to respond to diverse missions and tactical network infrastructure.

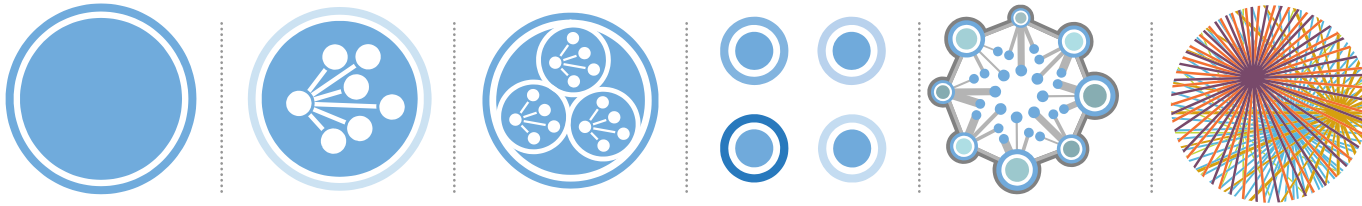
Cross-Cutting Efforts

Concept Lab

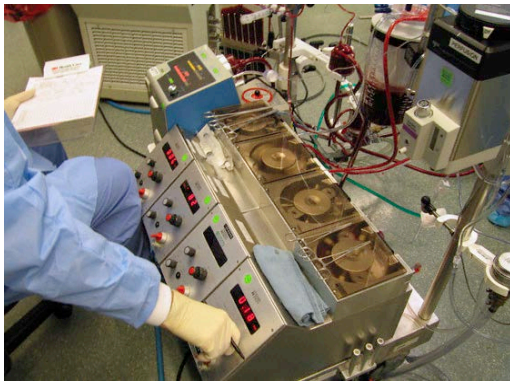
Integrating System Solutions



Architecture-Centric Engineering



Architecture-Centric Engineering (ACE) is the discipline of using architecture as the focal point for performing ongoing analyses to gain increasing levels of confidence that systems will support their missions.



The **Architecture Practices Initiative** develops principles, methods, foundations, techniques, tools, and materials in support of creating, fostering, and stimulating widespread transition of the ACE discipline.



SEI ACE Techniques and Methods

- understanding current **practices** and how to proceed/improve: *Architecture Fact Finding Workshop*
- creating the **business case** for the system: *Pedigreed Attribute eLicitation Method (PALM)*
- understanding the **requirements**: *Quality Attribute Workshop (QAW), Business/Mission Thread Workshop*
- **creating and/or selecting** the architecture: *Attribute-Driven Design (ADD) and ArchE*
- **documenting and communicating** the architecture: *Views and Beyond Approach, AADL*
- **developing the architecture incrementally**: agile architecting
- **analyzing or evaluating** the architecture: *Architecture Tradeoff Analysis Method (ATAM), System ATAM, SOS Arch Evaluation, Active Reviews for Intermediate Designs (ARID), and Cost Benefit Analysis Method (CBAM)*
- evolving the architecture so that it **continues to meet business and product goals**: *Architecture Improvement Workshop (AIW), ArchE, Architecture Evolution Workshop (AEW)*

All Are

- *explicitly focused on quality attributes*
- *directly link to business and mission goals*
- *explicitly involve system stakeholders*
- *grounded in state-of-the-art quality attribute models and reasoning frameworks*
- *documented for practitioner consumption*



SEI Architecture Products and Services

Assist others

- Operationalizing ACE principles in customer-specific settings
- Applying/adapting ACE methods and techniques
- Assisting with concept development
- Performing analyses
- Improving architecture competence
- Coaching and teaching

Foster widespread awareness

- Books
- Reports
- Presentations
- Practitioner Curriculum
- Community development
- Workshops and conferences
- Standards development
- Web site



Ensure practicability

- Methods
- Case studies
- Acquisition guidelines
- Technology investigation
- Collaborative research

Enable others

- Course licensing
- Certificate and certification programs
- Prototype tools



What's New in Architecture at the SEI?

Research

- Value-Driven Incremental Development
- System Reliability Framework
- Architecture-focused testing
- Composition of Assured SoS
- High-Confidence Cyber-Physical Systems
- Socio-Adaptive Systems
- Edge-Enabled Tactical Systems

Connections

- Architecture and agile development
- CMMI V1.3 update added material on architecture-related product development
- ACE together with the Team Software Process (TSP)

Transition

- SOA Architect Certificate
- Advanced Software Architecture Workshop Workshop
- On-line version of Software Product Lines course
- On-line version of Documenting Software Architecture course
- *Documenting Software Architectures, 2nd Edition*
- Licensing option for architecture courses with streamlined observation process
- Streamlined observation process for SEI ATAM Leader Certification



<http://www.sei.cmu.edu/go/architecture-credentials/>



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<http://www.sei.cmu.edu/architecture/saturn/> to

- SATURN** → **TECHNOLOGY** ■ Find out about the SEI software architecture work, current research, tools and practices, news, and how the SEI can help you.
- SATURN** → **NETWORK** ■ Stay connected to architecture experts through the SATURN Network on LinkedIn.
- SATURN** → **BLOG** ■ Stay up to date



*Many thanks to the SATURN 2012
Conference Committee!*

Enjoy!!



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