

AADL User Day 2019

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Welcome

Welcome to AADL User Day

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CMU SEI is a DoD R&D Federally Funded Research and Development Center

Our mission: Engineering and securing software

Established in 1984 at Carnegie Mellon University

~700 employees

Offices in Pittsburgh and DC, with locations near customer facilities in MA, MD, TX, and CA

~\$145M in annual funding (~\$20M USD(R&E) 6.2 and 6.3 Line funding)

Our Vision: Software as the Strategic Advantage

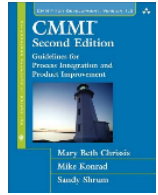


CMU SEI is critical to DoD's ability to acquire, develop, operate, and sustain software systems that are

- innovative,
- affordable,
- trustworthy, and
- enduring

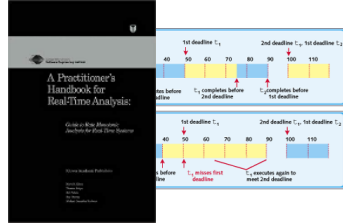
(CMU SEI Sponsoring Agreement)

CMU SEI: 30 Years in Software Engineering Leadership



Repeatable delivery of platforms

Mid-1980s



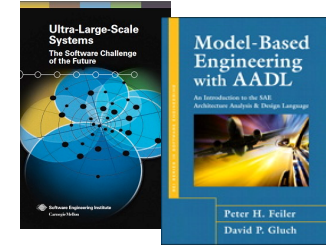
Verification and validation of real-time scheduling

Early 1990s



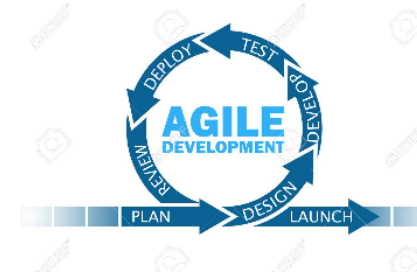
Strategic design; reuse and evolution; measurement and analysis

Late 1990s



Ultra large scale systems research; AADL

Mid 2000s



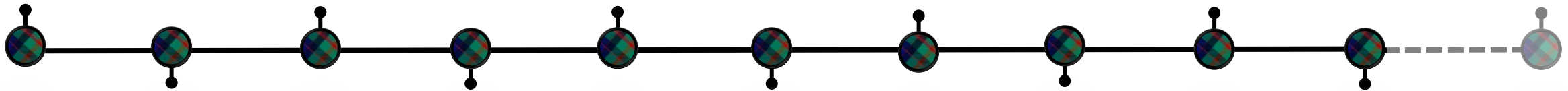
Adopting iterative development and acquisition practices

2010s



AI Engineering; Engineering for AI; AI for Mission

2020+



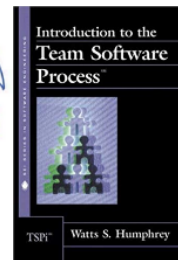
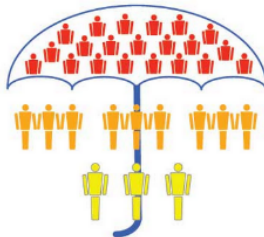
Late 1980s

Establishing a basis for software reuse



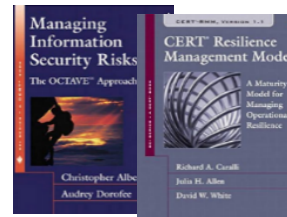
Mid 1990s

Evidence-based developer output



Early 2000s

Managing the operational risk of fielded systems



Late 2000s

SOA; secure design patterns; framework for architectural decisions



Today

Lifecycle automation, Agile/DevOps; assuring complex systems; continuous integration/ continuous deployment



Before You Even Write a Line of Code...

AADL allows you to design the entire system and see where the problems may occur. Then you can change the design of the system to eliminate those errors.

Being able to perform a virtual integration of the software, hardware, and system is the key to identifying problems early – and changing the design to ensure those problems will not occur.



About AADL

- SAE Avionics AADL standard adopted in 2004
- Focused on embedded software system modeling, analysis, and generation
- Strongly typed language with well-defined semantics
- Used for critical systems in domains such as avionics, aerospace, medical, nuclear, automotive, and robotics

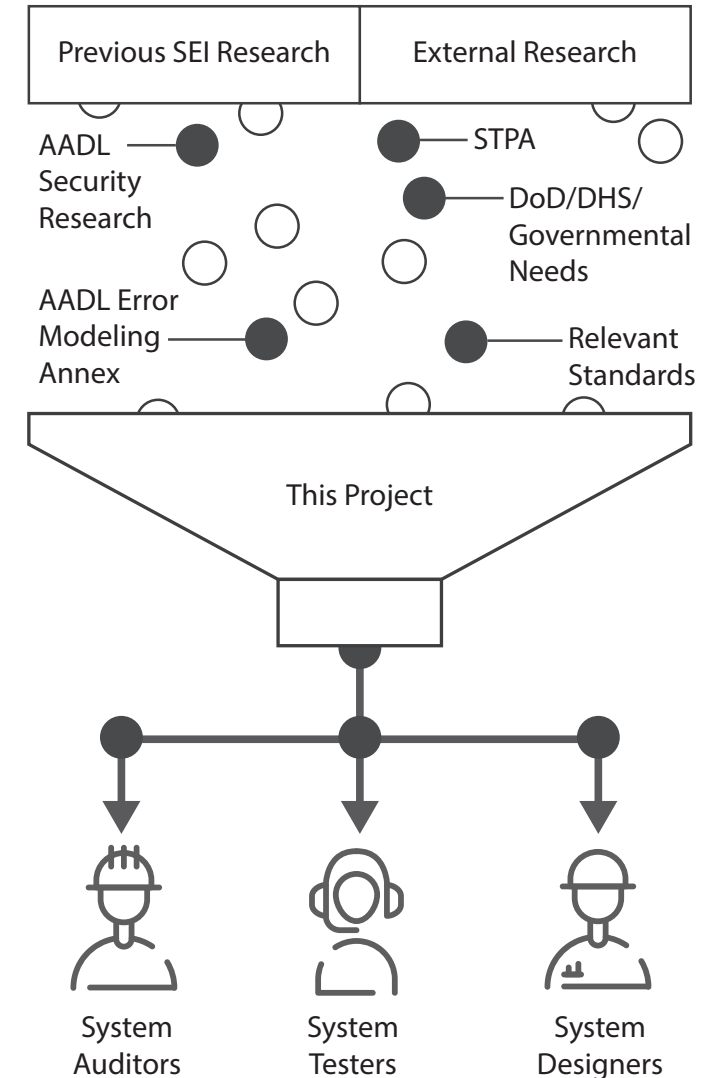
Making Critical Systems Safer and More Secure

Modern embedded systems need to be both safe and secure. As we have seen, the pace and scale of the development of these systems means traditional methods cannot keep up.



Research to Practice

The SEI works to rapidly move ideas from research in embedded systems – conducted either here at the SEI, in academia, or in industry – to practice.



Model, Integrate, Analyze...Then Build

Virtual integration makes issues visible throughout development, decreasing risk and reducing development and sustainment costs by more than 25%.

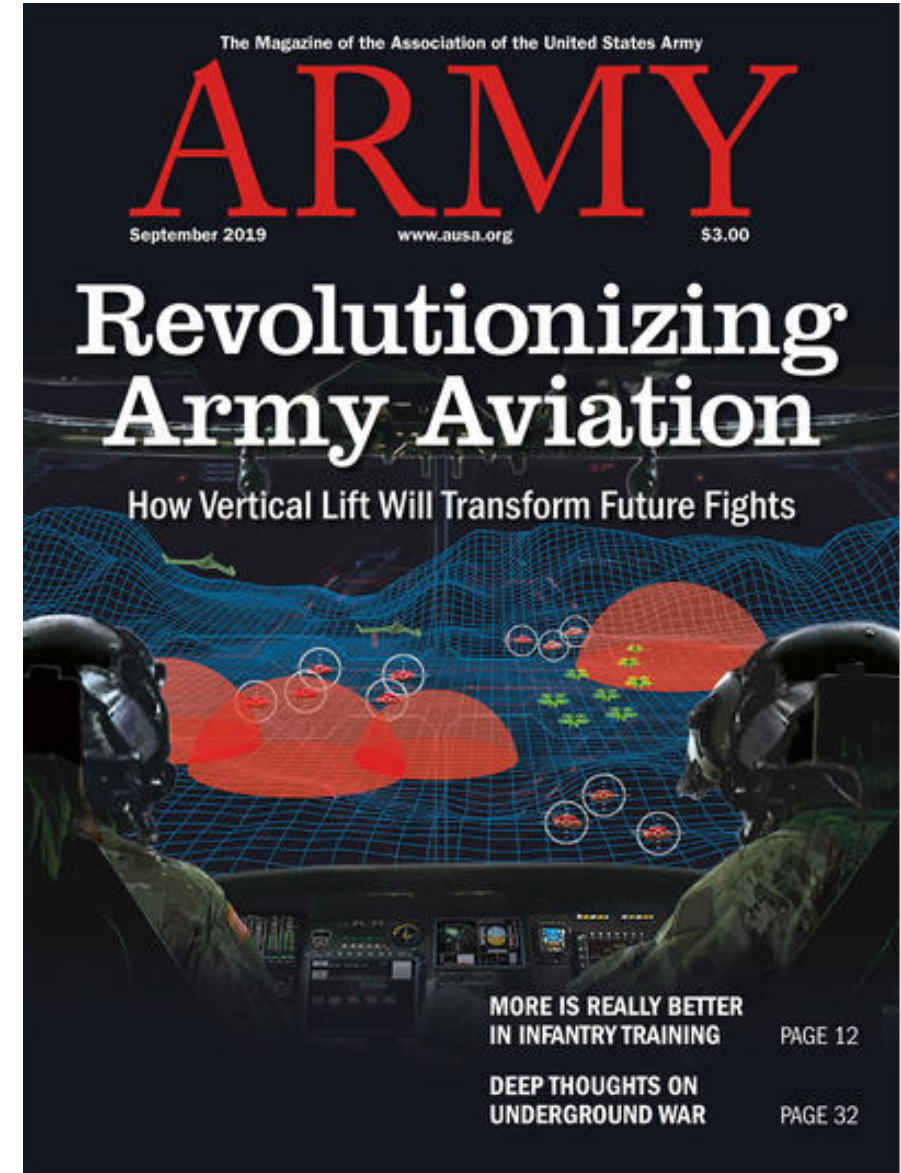
Benefits of AADL & ACVIP (via Alex Boydston)

- Decreased fielding time by finding problems early
- Early risk reduction by discovering performance issues early
- Increased cybersecurity by using AADL/ACVIP to improve system security
- Decreased development costs and support for MOSA and certification by transforming procurement supporting MBE and ACVIP

Virtual integration of software, hardware, and system supports verification, airworthiness, safety, and cybersecurity certification

Revolutionizing Army Aviation

Over many years, the SEI has had an outstanding partnership with the US Army, who is at the vanguard of applying AADL and ACVIP to the Army's future vertical lift challenge.



Looking Ahead



The need for model-based engineering for embedded systems is increasing as systems become larger and more complex. The SEI is looking forward to working on the future of AADL:

- Engaging more collaborators to use AADL tools and to provide real world input
- Leveraging model-based techniques (including AADL/ACVIP) to improve DoD procurement practice, revisit acquisition policies, and contribute to the Digital Engineering strategy
- Conducting research to explore the use of architecture modeling with emerging technologies (e.g., ML / AI, DevOps, formal verification of behavior)

About Today

Carnegie Mellon University
Software Engineering Institute

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Agenda