Definitions and General Treatment

Architecting Service-Oriented Systems
Philip Bianco, Grace Lewis, Paulo Merson, & Soumya Simanta
Technical Note (CMU/SEI-2011-TN-008), August 2011
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9829

This report presents guidelines for architecting service-oriented systems and the effect of architectural principles on system quality attributes.

A Research Agenda for Service-Oriented Architecture (SOA): Maintenance and Evolution of Service-Oriented Systems
Grace Lewis, Dennis B. Smith, & Kostas Kontogiannis
Technical Note (CMU/SEI-2010-TN-003), March 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9285

This 2010 report describes the agenda of an SEI-led group that was formed to explore the business, engineering, and operations aspects of service-oriented architecture.
Grace Lewis & Dennis B. Smith
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8477

This report presents the results of the Foundations of Software-Oriented Architecture (FSOA) workshop held at the Third International Conference on Interoperability for Enterprise Software and Applications (I-ESA 2007).

Evaluating a Service-Oriented Architecture
Philip Bianco, Rick Kotermanski, & Paulo Merson
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8443

This report contains technical information about SOA design considerations and tradeoffs that can help the architecture evaluator to identify and mitigate risks in a timely and effective manner.

A Comparison of Requirements Specification Methods from a Software Architecture Perspective
Len Bass, John K. Bergey, Paul C. Clements, Paulo Merson, Ipek Ozkaya, & Raghvinder Sangwan
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8121

In this report, five methods for the elicitation and expression of requirements are evaluated with respect to their ability to capture architecturally significant requirements.

Software Architecture: An Executive Overview
Paul C. Clements & Linda M. Northrop
Technical Report (CMU/SEI-96-TR-003), February 1996
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12509

This report summarizes software architecture for an intended audience of mid to senior level management.
The increasing importance of software in systems is also driving the software architecture renaissance. This article provides a brief overview of some important architecture related efforts.

Software Architecture in Practice (2nd Edition)
Len Bass, Paul C. Clements, & Rick Kazman
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30659

This book provides an easily accessible overview of software architecture. Anyone requiring a comprehensive overview of the software architecture field will benefit from this book.

The Golden Age of Software Architecture: A Comprehensive Survey
Mary Shaw & Paul Clements
http://reports-archive.adm.cs.cmu.edu/anon/isri2006/abstracts/06-101.html

This paper updates an invited keynote for ICSE-23, "The Coming-of-Age of Software Architecture Research" by Mary Shaw. It is also the basis for “The Golden Age of Software Architecture,” published in IEEE Software), March/April 2006.

Representation and Documentation

Documenting Software Architectures: Views and Beyond, Second Edition
Felix Bachmann, Len Bass, Paul C. Clements, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, & Judith A. Stafford
SEI Book (ISBN: 0321552687), October 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30386

This book provides the most complete and current guidance on how to capture a software architecture in a commonly understandable form.
Comparing the SEI’s Views and Beyond Approach for Documenting Software Architectures with ANSI-IEEE 1471-2000
Paul C. Clements
Technical Note (CMU/SEI-2005-TN-017), July 2005
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7427

This report summarizes the V&B and 1471 approaches to architecture description, and shows how a software architecture document prepared using V&B can be made compliant with 1471.

Creating and Using Software Architecture Documentation Using Web-Based Tool Support
Judith A. Stafford
Technical Note (CMU/SEI-2004-TN-037), September 2004
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6997

This report describes a design prototype that demonstrates a web-based approach to creating, communicating, and using software architecture throughout the life of the system.

Documenting Component and Connector Views with UML 2.0
James Ivers, Paul C. Clements, David Garlan, Robert Nord, Bradley Schmerl, & Oviedo Silva
(Carnegie Mellon School of Computer Science)
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7095

This 2004 report explores how changes in UML 2.0 affect UML’s suitability for documenting component and connector views.

Documenting Software Architecture: Documenting Interfaces
Felix Bachmann, Len Bass, Paul C. Clements, David Garlan, James Ivers, Reed Little, Robert Nord, & Judith A. Stafford
Technical Note (CMU/SEI-2002-TN-015), June 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5939

This report provides guidance for documenting the interfaces to software elements.
**Documenting Software Architecture: Documenting Behavior**
Felix Bachmann, Len Bass, Paul C. Clements, David Garlan, James Ivers, Reed Little, Robert Nord, & Judith A. Stafford
Technical Note (CMU/SEI-2002-TN-001), January 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5847

This report describes ways to document the behavior of systems, subsystems, and components of software architecture.

**Documenting Software Architectures: Organization of Documentation Package**
Felix Bachmann, Len Bass, Paul C. Clements, David Garlan, James Ivers, Reed Little, Robert Nord, & Judith A. Stafford
Technical Note (CMU/SEI-2001-TN-010), August 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5471

This comprehensive handbook outlines how to produce high-quality documentation for software architectures.

**SEI Workshop on Software Architecture Representation, 16-17 January 2001**
Felix Bachmann, Paul C. Clements, David Garlan, James Ivers, Reed Little, Robert Nord, & Judith A. Stafford
Special Report (CMU/SEI-2001-SR-010), May 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5355

This report summarizes the discussions from the 2001 Architecture Representation Workshop, where five leading software architects and practitioners were invited to discuss aspects of the architecture representation with senior members of the SEI technical staff.
Evaluation and Analysis

Adaptive Flow Control for Enabling Quality of Service in Tactical Ad Hoc Wireless Networks
Jeffrey Hansen, Scott Hissam, B. Craig Meyers, Edwin J. Morris, Daniel Plakosh, Soumya Simanta, & Lutz Wrage
Technical Report (CMU/SEI-2010-TR-030), December 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9633

The network infrastructure for users such as emergency responders or warfighters is wireless, ad hoc, mobile, and lacking in sufficient bandwidth. This report documents the results from 18 experiments to investigate Adaptive Quality of Service, an approach to enable applications to fulfill their missions despite tactical network infrastructure limitations.

A Workshop on Analysis and Evaluation of Enterprise Architectures
John Klein & Michael J. Gagliardi
Technical Note (CMU/SEI-2010-TN-023), November 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9363

This report summarizes a workshop on the analysis and evaluation of enterprise architectures that was held at the SEI in April of 2010.

COVERT: A Framework for Finding Buffer Overflows in C Programs via Software Verification
Sagar Chaki, Arie Gurfinkel
Technical Report (CMU/SEI-2010-TR-029), August 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9627

In this report, the authors present COVERT, an automated framework for finding buffer overflows in C programs using software verification tools and techniques.
Case Study: Model-Based Analysis of the Mission Data System Reference Architecture
Peter H. Feiler, David P. Gluch, Kurt Woodham (L-3 Communications-Titan Group)
Technical Report (CMU/SEI-2010-TR-003), May 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9407

This report describes how AADL support an instantiation of a reference architecture, address architectural themes, and provide a foundation for the analysis of performance elements and system assurance concerns.

System Architecture Virtual Integration: An Industrial Case Study
Peter H. Feiler, Jörgen Hansson (University of Skovde), Dionisio de Niz, Lutz Wrage
Technical Report (CMU/SEI-2009-TR-017), November 2009
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9145

This report introduces key concepts of the SAVI paradigm and discusses the series of development scenarios used in a POC demonstration to illustrate the feasibility of improving the quality of software-intensive aircraft systems.

Evaluating a Service-Oriented Architecture
Philip Bianco, Rick Kotermanski, & Paulo Merson
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8443

This report contains technical information about SOA design considerations and tradeoffs that can help the architecture evaluator to identify and mitigate risks in a timely and effective manner.

Quality-Attribute-Based Economic Valuation of Architectural Patterns
Ipek Ozkaya, Rick Kazman, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8307

This report shows how an analysis of the options embodied within architectural patterns allows a software and system architect or manager to make reasoned choices about the future value of design decisions.
**Risk Themes Discovered Through Architecture Evaluations**  
Len Bass, Robert Nord, William G. Wood, David Zubrow  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8111

This 2006 report analyzes the output of 18 evaluations conducted using the Architecture Tradeoff Analysis (ATAM). The goal of the analysis was to find patterns in the risk themes identified during those evaluations.

**Toward Measures for Software Architectures**  
Gary Chastek, Robert Ferguson  
Technical Note (CMU/SEI-2006-TN-013), March 2006  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7893

In this 2006 report, the authors describe the results of a preliminary investigation into measures for software architecture.

**Acquiring Evolving Technologies: Web Services Standards**  
Harry L. Levinson & Liam O'Brien  
Technical Note (CMU/SEI-2006-TN-001), February 2006  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7847

This technical note discusses some of the challenges of using Web services standards and presents the results generated by an assessment tool used to track the appropriateness of using this technology.

**Quality Attributes and Service-Oriented Architectures**  
Liam O'Brien, Len Bass, & Paulo Merson  
Technical Note (CMU/SEI-2005-TN-014), September 2005  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7405

This report examines the relationship between service-oriented architectures (SOAs) and quality attributes.
**Reasoning Frameworks**
Len Bass, James Ivers, Mark H. Klein, & Paulo Merson  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7637

This report describes a vehicle for encapsulating the quality attribute knowledge needed to understand a system’s quality behavior as a reasoning framework that can be used by nonexperts.

**Discovering Architectures from Running Systems: Lessons Learned**  
Hong Yan, Jonathan Aldrich, David Garlan, Rick Kazman, & Bradley Schmerl  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7165

This report describes a technique that uses automatically generated runtime observations of an executing system to construct an architectural view of the system.

**Integrating Software-Architecture-Centric Methods into Extreme Programming (XP)**  
Robert Nord, James E. Tomayko, & Rob Wojcik  
Technical Note (CMU/SEI-2004-TN-036), September 2004  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6989

The report presents a summary of XP (Extreme Programming) and examines the potential uses of the SEI’s architecture-centric methods.

**SACAM: The Software Architecture Comparison Analysis Method**  
Christoph Stoermer, Felix Bachmann, & Chris Verhoef  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6605

The report describes SACAM, a method that provides rationale for an architecture selection process by comparing the fitness of architecture candidates for required systems.
Integrating the Architecture Tradeoff Analysis Method (ATAM) with the Cost Benefit Analysis Method (CBAM)
Robert Nord, Mario R. Barbacci, Paul C. Clements, Rick Kazman, Mark H. Klein, Liam O’Brien, & James E. Tomayko
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6557

This technical note reports on a proposal to integrate the SEI ATAM (Architecture Tradeoff Analysis Method) and the CBAM (Cost Benefit Analysis Method).

Quality Attribute Workshops (QAWs), Third Edition
Mario R. Barbacci, Robert J. Ellison, Anthony J. Lattanze, Judith A. Stafford, Charles B. Weinstock, & William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6687

This report describes the newly revised QAW (Quality Attribute Workshop) and describes potential uses of the refined scenarios generated during it.

Interactions Among Techniques Addressing Quality Attributes
Hernan R. Eguiluz & Mario R. Barbacci
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6587

This report provides software architects a chart for determining the relationships among techniques that promote different architectural qualities.

SEI Architecture Analysis Techniques and When to Use Them
Mario R. Barbacci
Technical Note (CMU/SEI-2002-TN-005), October 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5883

When analyzing system and software architectures, the Quality Attribute Workshop (QAW) and the Architecture Tradeoff Analysis Method (ATAM) can be used in combination to obtain early and continuous benefits.
Illuminating the Fundamental Contributors to Software Architecture Quality
Felix Bachmann, Len Bass, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6193

This 2002 report presents the basic concepts of analysis models for two quality attributes-modifiability and performance, identifies a collection of tactics that can be used to control responses within those models, and discusses how to analyze the models in terms of these tactics.

Use of Quality Attribute Workshops (QAWs) in Source Selection for a DoD System Acquisition: A Case Study
John K. Bergey & William G. Wood
Technical Note (CMU/SEI-2002-TN-013), June 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5933

This case study outlines how a DoD organization used architecture analysis and evaluation in a major system acquisition to reduce program risk.

Using Economic Considerations to Choose Among Architecture Design Alternatives
Jai Asundi, Rick Kazman, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5785

The SEI developed the CBAM (Cost Benefit Analysis Method), which incorporates the costs and benefits of architectural design decisions and provides an effective means of making such decisions. This paper reports on the application of this method to a real world case study.

Active Reviews for Intermediate Designs
Paul C. Clements
Technical Note (CMU/SEI-2000-TN-009), August 2000
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5119

This 2000 technical note describes Active Review for Intermediate Designs (ARID), a piloted software design review technique.
Using Quality Attribute Workshops to Evaluate Architectural Design Approaches in a Major System Acquisition: A Case Study
John K. Bergey, Mario R. Barbacci, & William G. Wood
Technical Note (CMU/SEI-2000-TN-010), July 2000
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5123

This report describes a series of Quality Attribute Workshops (QAWs) that were conducted on behalf of a government agency during its competitive acquisition of a complex, tactical, integrated command and control system.

Architectural Evaluation of Collaborative Agent-Based Systems
Steve Woods & Mario R. Barbacci
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=13525

This report identifies features in agent-based systems that could be used to classify agent-system architectures and to guide the generation of scenarios applicable to these architectures.

Principles for Evaluating the Quality Attributes of a Software Architecture
Mario R. Barbacci, Mark H. Klein, & Charles B. Weinstock
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12681

This report describes a few principles for analyzing a software architecture to determine if it exhibits certain quality attributes.

Recommended Best Industrial Practice for Software Architecture Evaluation
Gregory Abowd, Len Bass, Paul C. Clements, Rick Kazman, Linda M. Northrop, & Amy Zaremski
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12653

This report details the results of two workshops on software architecture evaluation, held at the SEI in 1996.
**Quality Attributes**  
Mario R. Barbacci, Mark H. Klein, Thomas A. Longstaff, & Charles B. Weinstock  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12433

This report describes efforts to develop a unifying approach for reasoning about multiple software quality attributes.

**SAAM: A Method for Analyzing the Properties of Software Architectures**  
Gregory Abowd, Len Bass, Rick Kazman, & Mike Webb (Texas Instruments)  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=29288

This paper describes three perspectives by which we can understand the description of a software architecture and proposes a five-step method for analyzing software architectures called SAAM (Software Architecture Analysis Method).

**An Approach to Software Architecture Analysis for Evolution and Reusability**  
Sonia Bot (Nortel), Kalai Kalaichelvan (Nortel), Rick Kazman, & Chung-Horng Lung (Nortel)  
White Paper, November 1997  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=29765

This paper presents an approach to capturing and assessing software architectures for evolution and reuse.

**Scenario-Based Analysis of Software Architecture**  
Gregory Abowd, Len Bass, Paul C. Clements, & Rick Kazman  
White Paper, November 1996  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=29910

This paper presents an experiential case study illustrating the methodological use of scenarios to gain architecture-level understanding and predictive insight into large, real-world systems in various domains.
Assessing the Quality of Large, Software-Intensive Systems: A Case Study
White Paper, September 1995
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30012

This paper presents a case study in carrying out an audit of a large, software-intensive system.

An Architectural Analysis Case Study: Internet Information Systems
Gregory Abowd, Len Bass, Paul C. Clements, & Rick Kazman
White Paper, April 1995
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30057

This paper presents a method for analyzing systems for nonfunctional qualities from the perspective of their software architecture and applies this method to the field of Internet information systems (IISs).

Evaluating Software Architectures: Methods and Case Studies
Paul C. Clements, Rick Kazman, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30698

This book is a comprehensive guide to software architecture evaluation, describing specific methods that can quickly and inexpensively mitigate enormous risk in software projects.

A Case Study in Assessing the Maintainability of Large, Software-Intensive Systems
Alan W. Brown, David J. Carney, & Paul C. Clements
White Paper, March 1995
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=18976

This paper presents a case study in assessing the maintainability of a large, software intensive system. The techniques used are described, and their strengths and weaknesses discussed.
Making Architecture Reviews Work in the Real World
Rick Kazman & Len Bass
IEEE Software Article (ISSN: 0740-7459), January/February
https://www.computer.org/csdl/mags/so/2002/01/s1067-abs.html

This article explores the non-technical aspects of formal architecture reviews—social, psychological, and managerial.

Quality-Attribute-Based Economic Valuation of Architectural Patterns
Ipek Ozkaya, Rick Kazman, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8307

This report shows how an analysis of the options embodied within architectural patterns allows a software and system architect or manager to make reasoned choices about the future value of design decisions.

Using SAAM: An Experience Report

Architecture-Based Design and Development
Architecting Service-Oriented Systems
Philip Bianco, Grace Lewis, Paulo Merson, & Soumya Simanta
Technical Note (CMU/SEI-2011-TN-008), August 2011
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9829

This report presents guidelines for architecting service-oriented systems and the effect of architectural principles on system quality attributes.
Combining Architecture-Centric Engineering with the Team Software Process
Robert Nord, Jim McHale, & Felix Bachmann
Technical Report (CMU/SEI-2010-TR-031), December 2010
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9649

ACE methods and the TSP provides an iterative approach for delivering high quality systems on time and within budget. The combined approach helps organizations that must set an architecture/developer team in motion using mature, disciplined engineering practices that produce quality software quickly.

Realizing and Refining Architectural Tactics: Availability
James Scott & Rick Kazman
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9087

Tactics are fundamental elements of software architecture that an architect employs to meet a system’s quality requirements. This report describes an updated set of tactics that enable the architect to build availability into a system.

Using Aspect-Oriented Programming to Enforce Architecture
Paulo Merson
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8247

This report illustrates how to use AOP (aspect-oriented programming) to ensure conformance to architectural design, proper use of design patterns and programming best practices, conformance to coding policies and naming conventions.

Using ArchE in the Classroom: One Experience
John McGregor, Felix Bachmann, Len Bass, Philip Bianco, & Mark H. Klein
Technical Note (CMU/SEI-2007-TN-001), September 2007
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8191

The ArchE (Architecture Expert) tool serves as a software architecture design assistant. This report describes the use of a pre-alpha release of ArchE in a graduate-level software architecture class at Clemson University.
Modifiability Tactics
Felix Bachmann, Len Bass, & Robert Nord
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8299

This report describes how architectural tactics are based on the parameters of quality attribute models.

A Practical Example of Applying Attribute-Driven Design (ADD), Version 2.0
William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8319

This 2007 report describes an example application of the ADD method, an approach to defining a software architecture in which the design process is based on the quality attribute requirements the software must fulfill.

Attribute-Driven Design (ADD), Version 2.0
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8147

This report revises the steps of the Attribute-Driven Design (ADD) method and offers practical guidelines for carrying out each step.

Elements of a Usability Reasoning Framework
Jinhee Lee, Len Bass
Technical Note (CMU/SEI-2005-TN-030), September 2005
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7491

This note describes an ARL implementation of two usability scenarios: displaying progress feedback and allowing cancel.
Discovering Architectures from Running Systems: Lessons Learned
Hong Yan, Jonathan Aldrich, David Garlan, Rick Kazman, & Bradley Schmerl
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7165

This report describes a technique that uses automatically generated runtime observations of an executing system to construct an architectural view of the system.

Security and Survivability Reasoning Frameworks and Architectural Design Tactics
Robert J. Ellison, Andrew P. Moore, Len Bass, Mark H. Klein, & Felix Bachmann
Technical Note (CMU/SEI-2004-TN-022), September 2004
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6949

In this report, the authors describe an approach to disciplined software architecture design for the related quality attributes of security and survivability.

Integrating Software-Architecture-Centric Methods into the Rational Unified Process
Rick Kazman, Philippe Kruchten, Robert Nord, & James E. Tomayko
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7133

This report presents a summary of the RUP (Rational Unified Process) and examines the potential uses of the SEI's architecture-centric methods.

Preliminary Design of ArchE: A Software Architecture Design Assistant
Felix Bachmann, Len Bass, and Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6751

This 2003 report presents a procedure for moving from a set of quality attribute scenarios to an architecture design that satisfies those scenarios.
**Deriving Architectural Tactics: A Step Toward Methodical Architectural Design**
Felix Bachmann, Len Bass, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6593

This 2003 technical report provides the status on the work being done by the SEI to understand the relationship between quality requirements and architectural design.

**Analyzing Enterprise JavaBeans Systems Using Quality Attribute Design Primitives**
Anna Liu, Len Bass, & Mark H. Klein
Technical Note (CMU/SEI-2001-TN-025), October 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5555

This report introduces the notion of quality attribute design primitives, which are architectural building blocks that target the achievement of one or sometimes several quality attribute requirements.

**Achieving Usability Through Software Architecture**
Len Bass, Bonnie E. John, & Jesse Kates
Technical Report (CMU/SEI-2001-TR-005), March 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5605

This paper outlines an approach to improving the usability of software systems by means of software architectural decisions.

**Quality Attribute Design Primitives**
Len Bass, Mark H. Klein, & Felix Bachmann
Technical Note (CMU/SEI-2000-TN-017), December 2000
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5139

This report addresses mechanisms that significantly affect quality attribute behavior and have sufficient content for analysis.
An Application of the Architecture-Based Design Method to the Electronic House
Felix Bachmann, Len Bass, & Mark H. Klein
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5057

This report elaborates an example of the application of the ABD (Architecture-Based Design) method to designing software architecture.

The Architecture Based Design Method
Felix Bachmann, Len Bass, Gary Chastek, Patrick Donohoe, & Fabio Peruzzi
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5147

This paper presents the Architecture Based Design (ABD) method for designing the high-level software architecture for a product line or long-lived system.

Architecture-Based Development
Len Bass & Rick Kazman
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=13385

This report presents a description of architecture-centric system development.

Quality Attribute Design Primitives and the Attribute Driven Design Method
Felix Bachmann, Len Bass, & Mark H. Klein
White Paper, October 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=29604

This paper discusses the understanding of quality attributes and their application to the design of a software architecture.
Tool Support for Architecture Analysis and Design
Rick Kazman
White Paper, January 1996
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=29989

This position paper first presents a set of requirements that an ideal tool for architectural design and analysis, and then presents a tool—called SAAMtool—that meets most, but not all, of these requirements.

Understanding Architectural Influences and Decisions in Large-System Projects
Paul C. Clements
White Paper, April 1995
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30043

This paper discusses the approach taken in a pilot study to uncover the correlation, if any, between architectural influences and architectural decisions in large-scale, software-intensive development projects.

From Domain Models to Architectures
Paul C. Clements
White Paper, January 1994
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=30087

This white paper was presented at the Workshop on Software Architecture, USC Center for Software Engineering, Los Angeles, 1994, by Paul Clements.

Building Systems from Commercial Components
Scott Hissam, Robert C. Seacord, & Kurt C. Wallnau
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=31022

This book describes specific engineering practices needed to integrate preexisting components with preexisting specifications successfully, illustrating the techniques described with case studies and examples.
The Gadfly: An Approach to Architectural-Level System Comprehension
Paul C. Clements, Edwin J. Morris, & Kurt C. Wallnau
White Paper, March 1996
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=19882

This paper describes the Gadfly, an approach for developing narrowly-focused, reusable domain models that can be integrated and (re)used to aid in the process of top-down system comprehension.

Quality Attribute Workshops (QAWs)

Impact of Army Architecture Evaluations
Robert Nord, John K. Bergey, Stephen Blanchette, Jr., & Mark H. Klein
Special Report (CMU/SEI-2009-SR-007), April 2009
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8859

This 2009 report describes the results of a study of the impact that the ATAM evaluations and QAWs had on Army programs.

Integrating the Quality Attribute Workshop (QAW) and the Attribute-Driven Design (ADD) Method
Robert Nord, William G. Wood, & Paul C. Clements
Technical Note (CMU/SEI-2004-TN-017), July 2004
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6927

This technical note reports on a proposal to integrate the SEI Quality Attribute Workshop (QAW) and the SEI Attribute-Driven Design (ADD) method.

Quality Attribute Workshops (QAWs), Third Edition
Mario R. Barbacci, Robert J. Ellison, Anthony J. Lattanze, Judith A. Stafford, Charles B. Weinstock, & William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6687

This report describes the newly revised QAW (Quality Attribute Workshop) and describes potential uses of the refined scenarios generated during it.
**Use of Quality Attribute Workshops (QAWs) in Source Selection for a DoD System Acquisition: A Case Study**
John K. Bergey & William G. Wood
Technical Note (CMU/SEI-2002-TN-013), June 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5933

This case study outlines how a DoD organization used architecture analysis and evaluation in a major system acquisition to reduce program risk.

**Quality Attribute Workshops, 2nd Edition**
Mario R. Barbacci, Robert J. Ellison, Anthony J. Lattanze, Judith A. Stafford, Charles B. Weinstock, & William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6113

This report clarifies the context in which a QAW (Quality Attribute Workshop) is applicable, provides a rationale for developing the process and describes it in detail, and concludes with a list of lessons learned and a discussion of how these lessons have helped evolve the process to its current state.

**Quality Attribute Workshops**
Mario R. Barbacci, Robert J. Ellison, Judith A. Stafford, Charles B. Weinstock, & William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5613

This report describes the QAW (Quality Attribute Workshop) approach, which is a method for evaluating a software-intensive system architecture during the acquisition phase of major programs.

**Using Quality Attribute Workshops to Evaluate Architectural Design Approaches in a Major System Acquisition: A Case Study**
John K. Bergey, Mario R. Barbacci, & William G. Wood
Technical Note (CMU/SEI-2000-TN-010), July 2000
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5123

This report describes a series of Quality Attribute Workshops (QAWs) that were conducted on behalf of a government agency during its competitive acquisition of a complex, tactical, integrated command and control system.
Quality Attribute Workshop Participants Handbook
Mario R. Barbacci, Robert J. Ellison, Charles B. Weinstock, & William G. Wood
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=4995

This report describes the 1) process we use to conduct QAW (Quality Attribute Workshop), 2) information required, 3) suggested tools, and 4) expected outcomes of QAWs.

Coming Attractions in Software Architecture
Paul C. Clements
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12539

This 1996 report identifies a set of promising lines of research related to software architecture and architecture-based system development.

Architecture Tradeoff Analysis Method (ATAM)

Progress Toward an Organic Software Architecture Capability in the U.S. Army
Stephen Blanchette, Jr. & John K. Bergey
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8403

This 2007 report describes the Software Architecture Initiative of the Army Strategic Software Improvement Program.

Categorizing Business Goals for Software Architectures
Rick Kazman & Len Bass
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7751

This report provides a categorization of possible business goals for software-intensive systems, so that individuals have some guidance in the elicitation, expression, and documentation of business goals.
Using the SEI Architecture Tradeoff Analysis Method to Evaluate WIN-T: A Case Study
Paul C. Clements, John K. Bergey, & Dave Mason
Technical Note (CMU/SEI-2005-TN-027), September 2005
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7467

This report describes the application of the SEI ATAM (Architecture Tradeoff Analysis Method) to the U.S. Army's Warfighter Information Network-Tactical (WIN-T) system.

Integrating the Architecture Tradeoff Analysis Method (ATAM) with the Cost Benefit Analysis Method (CBAM)
Robert Nord, Mario R. Barbacci, Paul C. Clements, Rick Kazman, Mark H. Klein, Liam O'Brien, & James E. Tomayko
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6557

This technical note reports on a proposal to integrate the SEI ATAM (Architecture Tradeoff Analysis Method) and the CBAM (Cost Benefit Analysis Method).

Using the Architecture Tradeoff Analysis Method (ATAM) to Evaluate the Software Architecture for a Product Line of Avionics Systems: A Case Study
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6447

This 2003 technical note describes an ATAM evaluation of the software architecture for an avionics system developed for the Technology Applications Program Office (TAPO) of the U.S. Army Special Operations Command Office.

Use of the Architecture Tradeoff Analysis Method (ATAM) in Source Selection of Software-Intensive Systems
John K. Bergey, Matt Fisher, & Lawrence G. Jones
Technical Note (CMU/SEI-2002-TN-010), June 2002
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5907

This report explains the role of software architecture evaluation in a source selection and describes the contractual elements that are needed to support its use.
Using the Architecture Tradeoff Analysis Method to Evaluate a Wargame Simulation System: A Case Study
Lawrence G. Jones & Anthony J. Lattanze
Technical Note (CMU/SEI-2001-TN-022), December 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5535

This report describes the application of the ATAM (Architecture Tradeoff Analysis Method) to a major wargaming simulation system.

Applicability of General Scenarios to the Architecture Tradeoff Analysis Method
Len Bass, Mark H. Klein, & Gabriel Moreno
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5637

In this report, we compare the scenarios elicited from five ATAM (Architecture Tradeoff Analysis Method) evaluations with the scenarios used to characterize the quality attributes.

Use of the ATAM in the Acquisition of Software-Intensive Systems
John K. Bergey & Matt Fisher
Technical Note (CMU/SEI-2001-TN-009), September 2001
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5465

This report discusses the role of software architecture evaluations in a system acquisition and describes the contractual elements that are needed to accommodate architecture evaluations in an acquisition. The report also provides an example of contractual language that incorporates the ATAM as a software architecture evaluation method in a system acquisition.

An Evaluation Theory Perspective of the Architecture Tradeoff Analysis Method (ATAM)
Marta Lopez
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5237

This report analyzes and identifies the Architecture Tradeoff Analysis Method (ATAM)'s evaluation process and criteria, as well as its data-gathering and synthesis techniques, and more.
ATAM: Method for Architecture Evaluation
Rick Kazman, Mark H. Klein, & Paul C. Clements
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5177

This report presents technical and organizational foundations for performing architectural analysis, and presents the SEI's ATAM, a technique for analyzing software architectures.

Using the Architecture Tradeoff Analysis Method to Evaluate a Reference Architecture: A Case Study
Brian P. Gallagher
Technical Note (CMU/SEI-2000-TN-007), June 2000
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=5109k

This report describes the application of the ATAM (Architecture Tradeoff Analysis Method) to evaluate a reference architecture for ground-based command and control systems.

Software Architecture Evaluation with ATAM in the DoD System Acquisition Context
John K. Bergey, Matt Fisher, Lawrence G. Jones, & Rick Kazman
Technical Note (CMU/SEI-99-TN-012), September 1999
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=13301

This report explains the basics of software architecture and software architecture evaluation in a system acquisition context.

Steps in an Architecture Tradeoff Analysis Method: Quality Attribute Models and Analysis
Mario R. Barbacci, Peter H. Feiler, Mark H. Klein, Howard F. Lipson, Thomas A. Longstaff, Charles B. Weinstock, & Jeromy Carrière
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=12927

This paper presents some of the steps in an emerging architecture tradeoff analysis method (ATAM).
Architecture Tradeoff Analysis Method


Acquisition

A Proactive Means for Incorporating a Software Architecture Evaluation in a DoD System Acquisition

John K. Bergey

Technical Note (CMU/SEI-2009-TN-004), July 2009

https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8935

This technical note provides guidance on how to contractually incorporate architecture evaluations in an acquisition.

Impact of Army Architecture Evaluations

Robert Nord, John K. Bergey, Stephen Blanchette, Jr., & Mark H. Klein

Special Report (CMU/SEI-2009-SR-007), April 2009

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This 2009 report describes the results of a study of the impact that the ATAM evaluations and QAWs had on Army programs.


John K. Bergey, Stephen Blanchette, Jr., Paul C. Clements, Michael J. Gagliardi, Rob Wojcik, William G. Wood, & John Klein


https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=9099

This report confirms that various architectural genres enjoy more commonalities than differences. Each one has its own important knowledge base, and openness among the various architectural tasks within an organization is growing in importance.
**Progress Toward an Organic Software Architecture Capability in the U.S. Army**  
Stephen Blanchette, Jr. & John K. Bergey  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=8403

This 2007 report describes the Software Architecture Initiative of the Army Strategic Software Improvement Program.

**Software Architecture in DoD Acquisition: An Approach and Language for a Software Development Plan**  
John K. Bergey & Paul C. Clements  
Technical Note (CMU/SEI-2005-TN-019), February 2005  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7431

This report discusses the Software Development Plan (SDP), providing an example approach and corresponding SDP language that enable software architecture to play a central role in the technical and organizational management of a software development effort.

**Software Architecture in DoD Acquisition: A Reference Standard for a Software Architecture Document**  
John K. Bergey & Paul C. Clements  
Technical Note (CMU/SEI-2005-TN-020), February 2005  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=7437

This report provides a reference standard for a Software Architecture Document (SAD). Acquisition organizations can use this to acquire documentation needed for communicating the architecture design and conducting software architecture evaluations.

**DoD Experience with the C4ISR Architecture Framework**  
William G. Wood & Sholom G. Cohen  
Technical Note (CMU/SEI-2003-TN-027), September 2003  
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6527

This report discusses the context for using the C4ISR AF, the observations made during the interviews about its use, and the strengths and challenges of using it.
DoD Architecture Framework and Software Architecture Workshop Report
Technical Note (CMU/SEI-2003-TN-006), March 2003
https://resources.sei.cmu.edu/library/asset-view.cfm?assetID=6399

This report summarizes the activities of the Workshop on the Department of the 2003 Defense Architecture Framework and Software Architecture workshop.

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John K. Bergey & William G. Wood
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