

Curriculum for

Certified Professional for
Software Architecture (CPSA)[®]
Advanced Level

**Module
EAM**

**Enterprise Architecture Management (EAM) for
Software Architects**

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List of Learning Goals

- LG 1-1: EAM definition and the relation to other management areas.
- LG 1-2: EAM basic terms.
- LG 1-3: Overview of EAM frameworks and tools.
- LG 2-1: General approaches for developing and enhancing an enterprise architecture.
- LG 2-2: Business capabilities as a link between business and software architecture.
- LG 2-4: Methods for developing and changing the target architecture.
- LG 2-5: Methods for developing and changing the architecture roadmap.
- LG 2-6: Architecture Principles
- LG 2-7: Reference models or architectures.
- LG 2-8: EAM Repository
- LG 3-1: Governance Terms and Concepts
- LG 3-2: Governance roles and responsibilities.
- LG 4-1: Influences from the enterprise architecture on the software architecture.
- LG 4-2: Influences of the Software Architecture on the Enterprise Architecture
- LG 4-3: Architectural aspects that impact multiple applications (crosscutting concerns or concepts).

Introduction: General information about the iSAQB Advanced Level

What is taught in an Advanced Level module?

- The iSAQB Advanced Level offers modular training in three areas of competency with flexibly configurable training paths. It takes individual affinity and priorities into account.
- The certification requires the creation of a written solution for a predefined case study. The assessment and oral exam is conducted by experts appointed by the iSAQB.

What can Advanced Level (CPSA-A) graduates do?

CPSA-A graduates can:

- Independently and methodically design medium to large IT systems
- In IT systems of medium to high criticality, assume technical and content-related responsibility
- Conceptualize, design, and document actions to achieve quality requirements and support development teams in the implementation of these actions
- Control and execute architecture-relevant communication in medium to large development teams

Prerequisites for the CPSA-A certification

- Successful training and certification as a Certified Professional for Software Architecture, Foundation Level® (CPSA-F)
- At least three years of full-time professional experience in the IT sector; participation on the design and development of at least two different IT systems
 - Exceptions are allowed on application (e.g., collaboration on open source projects)
- Training and further education within the scope of iSAQB Advanced Level training courses with a minimum of 70 credit points from at least three different areas of competence
- Successful completion of the CPSA-A certification exam



Essentials

Curriculum Structure and Recommended Durations

Content	Recommended minimum duration (minutes)
1. Basic terms used in Enterprise Architecture Management	220
2. EAM Approaches	540
3. Architecture Governance	120
4. Interaction Between Software Architecture and Enterprise Architecture	200
Total	1080 (18h)

(All times include exercises.)

Duration, Teaching Method and Further Details

The times stated are recommendations. The duration of a training course on the EAM module should be at least 3 days, but may be longer. Training providers may differentiate themselves by changing the duration, teaching method, type and structure of the exercises, course structure, etc. In particular, the curriculum provides no specifications on the nature of the examples and exercises.

Licensed training courses for the EAM module contribute the following credit points towards admission to the final Advanced Level certification exam:

Methodical Competence:	30 Points
Technical Competence:	0 Points
Communicative Competence:	0 Points

Prerequisites

Participants **should** have the following prerequisite knowledge:

- Fundamentals of architecture development: Importance and delimitation of architecture, procedures, influences and requirements, architecture decisions, models and documentation with views, as taught at the CPSA-F Foundation Level.

Knowledge in the following areas may be **helpful** for understanding some concepts:

- Practical experience in the architecture field and an insight into at least one modern technology or platform for development of distributed applications.
- Knowledge of typical challenges in the field of enterprise architectures:
 - Definition of (IT) enterprise objectives
 - Strategic (IT) planning
 - (IT) portfolio management.
 - Application Lifecycle Management

- IT-Infrastructure-Library (ITIL)

Structure of the Curriculum

The individual sections of the curriculum are described according to the following structure:

- **Terms/principles:** Essential core terms of this topic.
- **Teaching/practice time:** Defines the minimum amount of teaching and practice time that must be spent on this topic or its practice in an accredited training course.
- **Learning goals:** Describes the content to be conveyed including its core terms and principles.

This section therefore also outlines the skills to be acquired in corresponding training courses.

Supplementary Information, Terms, Translations

To the extent necessary for understanding the curriculum, we have added definitions of technical terms to the [iSAQB glossary](#) and complemented them by references to (translated) literature.

1. Basic terms used in Enterprise Architecture Management

Total duration: 220 min	Practice time: 100 min
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1.1. Terms and Principles

Enterprise Architecture Management (EAM), Solution Architecture, Software Architecture, Corporate Strategy, IT Strategy, Architecture Governance, Architecture Domains (Business Architecture, Application Architecture, Data Architecture, Infrastructure Architecture), Architecture Roadmap, Migration Planning, Capabilities, Architecture Frameworks (e.g. TOGAF, etc.), Repository

1.2. Learning Goals

LG 1-1: EAM definition and the relation to other management areas.

- Be able to name and explain the goals and benefits of EAM.
- Understand EAM as a bridge between strategic business planning and application projects.
- Understand the interaction of EAM and other strategic management tasks (e.g. corporate and strategic planning, IT strategy, IT management, process management, project management, innovation management, change management, etc.).
- Explain the distinction between corporate, IT, and architecture governance.
- Explain the distinction between EAM and other architecture areas, e.g. IT architecture, solution architecture and software architecture.
- Know and distinguish roles and tasks of architecture management, e.g. enterprise architect, domain architect, solution architect, software architect.

LG 1-2: EAM basic terms.

- Understand stakeholder-oriented documentation of the enterprise architecture using Views, Architecture Models, etc., e.g., as described in the ISO-42010 standard.
- Understand architecture domains, including essential elements of the domains, e.g:
 - Business architecture
 - Application architecture (a.k.a. Information system architecture)
 - Information system architecture (a.k.a. application architecture)
 - Data architecture (a.k.a. information architecture)
 - Technology architecture (a.k.a. infrastructure architecture)
- Understand the distinction and interrelationships between architectural domains.
- Understand the relationship between the architecture domains and software architecture.
- Know architecture principles and their benefits and consequences.
- Know the definition of capabilities (a.k.a. business domains).
- Know what an enterprise architecture roadmap is.
 - Know baseline, target, and transition IT enterprise architectures.
 - Differentiate between an enterprise and software system implementation roadmap.

LG 1-3: Overview of EAM frameworks and tools.

- Know different enterprise architecture frameworks and their benefits, e.g. TOGAF.
- Know architecture repositories and their use, benefits, and challenges in enterprise architecture.
- Know different architecture frameworks and their classification, e.g.:
 - Architecture frameworks, e.g. TOGAF, NAF, MoDAF, DoDAF, ITIL.
 - Taxonomies, e.g. Zachmann
 - Industry frameworks, e.g. BIAN, TM Forum Framework
 - Process management frameworks, e.g. PCF
- Know how software architecture and software development are represented in enterprise architecture frameworks.

1.3. References

[AMBoK2013], [Bente2012b], [Burlton2022], [COBIT], [Gharbi2012], [Greefhorst2011], [Grigoriu2011], [Hanschke2012], [Hanschke2022], [ITIL], [Keller2012], [Morris2013], [Op'tLand 2009], [Reussner2008], [Ross2006], [Schekkerman2004], [Schwarzer2009], [Tiemeyer2011], [Tiway2019], [TOGAF], [Ulrich2011], [Vogel2005], [Ziemann2022]

2. EAM Approaches

Total duration: 540 min	Practice time: 240 min
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2.1. Terms and Principles

Architecture principles, current, target, and transition architectures, application portfolio management, TOGAF Architecture Development Method (ADM), maturity analysis, gap analysis, impact analysis, architecture roadmap, risk analysis, business capability, capability analysis, business scenario, EAM visualisation types, agile frameworks, domain-driven design, reference model.

2.2. Learning Goals

LG 2-1: General approaches for developing and enhancing an enterprise architecture.

- Know how the software architects are involved in deriving the IT enterprise architecture from the enterprise strategy.
- Know typical EAM visualisations, such as blueprints, portfolio graphic, information flow graphic, cluster graphic, or roadmap graphic.
- Understand that different architectural decisions could be made when viewed from the enterprise architect's perspective or from the software architect's perspective.
- Know the different approaches to develop or enhance enterprise architectures, e.g.:
 - Top-down, bottom-up
 - Process-oriented approach, e.g. TOGAF ADM
 - Capability-based planning
 - Application portfolio management
 - Pattern-oriented approach, e.g. SEBIS Technical University of Munich
 - Risk-driven further development
- Know the impact of the corporate culture on the approach.
- Know how software architecture is addressed in the different approaches.

LG 2-2: Business capabilities as a link between business and software architecture.

- Explain the definition, benefits, and uses of business capabilities.
- Know the relationship between business capabilities and architecture domains.
- Know the relation of business capabilities to software architecture methodologies, e.g., domain-driven design.

LG-2-3: Methods for specifying and analyzing the baseline architecture.

- Know the challenges in describing and modeling the baseline architecture.
- Know the various tools and techniques for analyzing and evaluating the baseline architectures, e.g., maturity analysis, gap analysis, impact analysis, risk analysis, scenario-based assessment, cost-benefit analysis, etc.

LG 2-4: Methods for developing and changing the target architecture.

- Understand that the analysis of the business drivers, strategy, and requirements are a basis for the target architecture.
- Present and explain the evolution of a target architecture that impacts multiple applications.
- Understand the need to continuously update the target architecture.

LG 2-5: Methods for developing and changing the architecture roadmap.

- Understand how to derive transition architectures from the baseline and target architectures.
- Know impact and gap analysis.
- Be able to explain the approach for architecture planning (roadmap).
- Understand the need to continuously update roadmap.

LG 2-6: Architecture Principles

- Understand architecture principles as a part of enterprise architecture.
- Know how to categorize architecture principles.
- Know the TOGAF architecture principles catalog.

LG 2-7: Reference models or architectures.

- Understand standards, reference models, best practices, architecture guidelines, and principles as drivers of quality.
- Know the definition and use of reference architectures.
- Know examples of reference architecture models, e.g.:
 - TOGAF reference models
 - Industry-specific reference models, e.g., TM Forum, BIAN, Frameworx, etc.
 - Architecture patterns that impact multiple systems, e.g. microservices, event- or message-driven, composable architecture, etc.
 - Integration patterns
- Know reference models as a means of knowledge management / transfer.
- Know the challenges (e.g., level of abstraction, constraints) in evolving reference models.
- Know the differences and relationships between reference models at the enterprise and software architecture levels.

LG 2-8: EAM Repository

- Understand the function and benefits of EAM repositories, e.g., maintaining a history of changes, determining the delta, and versioning.
- Know the challenges in maintaining and updating data in the repository.
- Understand the challenges in describing different architectural domains (e.g., business, information, application, and technology domains) and architectural layers (e.g., transitions between enterprise architecture, solution architecture, and software architecture).
- Be able to name the types of information in an EAM repository, e.g.:
 - Architecture metamodel, e.g. from the TOGAF Architecture Content Framework

- Documentation of baseline, transition, and target architectures
- Standards (industry standards, etc.)
- Reference library (reference architectures, templates, patterns, etc.), e.g., TOGAF reference models

2.3. References

[AMBoK2013], [Bente2012b], [Burlton2022], [Gharbi2012], [Greefhorst2011], [Grigoriu2011], [Hanschke2012], [Lankhorst2013], [Morris2013], [Op'tLand 2009], [Reussner2008], [Ross2006], [Tiemeyer2011], [Tiwarey2019], [TOGAF], [Ulrich2011], [Weill2004], [Ziemann2022]

3. Architecture Governance

Total duration: 120 min	Practice time: 60 min
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3.1. Terms and Principles

Governance, levels of governance (corporate, IT, architecture), architecture boards, architecture guidelines, metrics, compliance, COBIT.

3.2. Learning Goals

LG 3-1: Governance Terms and Concepts

- Know the definition, objectives, and benefits of architecture governance
- Understand the tasks of architecture governance, e.g. risk management, compliance.
- Understand the correlation between enterprise architecture and software architecture in terms of governance.
- Explain the function, role, and composition of architecture boards.
- Understand that requirements and acceptance criteria are a basis for compliance.
- Understand methods for monitoring and assessing architecture compliance, e.g. according to TOGAF.

LG 3-2: Governance roles and responsibilities.

- Understand the different architect roles (e.g. enterprise architect, solution architect and software architect) and responsibilities, as well as their delineation and interrelationships.
- Understand collaboration as a success factor across architecture and business domains, e.g. through architecture communities.
- Understand the Interaction between the enterprise architect and the software architect, e.g.:
 - Support in architecture decisions.
 - Experiences from projects
 - Discussions about new technologies

3.3. References

[COBIT], [Hanschke2010], [Johannsen2010], [Op'tLand 2009], [TOGAF], [Weill2004], [Ziemann2022]

4. Interaction Between Software Architecture and Enterprise Architecture Management

Total duration: 200 min	Practice time: 90 min
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4.1. Terms and Principles

Corporate strategy, architecture principle, architecture decision, architectural aspects that impact multiple applications (cross-cutting concerns / concepts).

4.2. Learning Goals

LG 4-1: Influences from the enterprise architecture on the software architecture.

- Identify and account for influences from enterprise strategy and requirements on the IT landscape and the corresponding software architectures, e.g.:
 - New strategies, business models, etc.
 - Legal changes, e.g. data protection
 - Economic situation of the company
 - Organizational restructuring
- Recognize and account for influences of trends on the IT landscape and corresponding software architectures, e.g.:
 - Market trends (competition, prices, customer preferences, etc.)
 - Methodology trends (e.g., the impact of agile approaches on the decision-making processes and authority)
 - Architecture and technology trends (e.g., blockchain, microservices, cloud, etc.)
 - Internationalization (including the subtle issues, such as cultural differences)
 - Demographic change
- Recognize and account for influences from the enterprise architecture specifications on the IT landscape and corresponding software architectures, e.g.:
 - Flexibility and adaptability at the IT-landscape level.
 - EA principles, e.g. Bezos API mandates
 - Changes in domains or capabilities

LG 4-2: Influences of the Software Architecture on the Enterprise Architecture

- Know that software architecture decisions influence the enterprise architecture, especially regarding the different aspects in the architecture domains, including business domains, organizational structures, processes, data, infrastructure, etc.
 - e.g. the microservices approach can influence decision making, processes, standardization, organizational structure, integration, composition, bounded contexts, privacy and accountability, security, etc.
- Identify influences of software architecture principles on the IT landscape.
- Know that software architecture decisions influence the business and IT strategy.

- Know that application changes (not just new development) influence enterprise architecture.

LG 4-3: Architectural aspects that impact multiple applications (crosscutting concerns or concepts).

- Know architectural aspects that affect multiple applications, e.g., interfaces, integration, internationalization, security, administration, monitoring, transaction management, user interaction, flow control, reliability, etc.
- Be able to decide on the division of responsibilities for aspects that impact multiple applications.
- Understand the interrelationship between enterprise architecture and software architecture regarding these aspects.

4.3. References

[\[AMBoK2013\]](#), [\[Greefhorst2011\]](#), [\[Grigoriu2011\]](#), [\[Hohmann2003\]](#)

5. Examples

Duration: - min	Practice time: - min
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This section is not examinable.

5.1. Terms and Principles

In every licensed training session, at least one example for EAM must be presented.

Type and structure of the examples presented may depend on the training and participants' interests. They are not prescribed by iSAQB.

5.2. Learning Goals

Discussion of the development of a real enterprise architecture, and its advantages and disadvantages.

References

This section contains references that are cited in the curriculum.

A

- [AMBoK2013] Architecture Management Body Of Knowledge. IT Architecture Management Institute Inc. 21013. ISBN: 978-0-9868626-1-8.

B

- [Bente2012b] Bente, Stefan. Collaborative Enterprise Architecture – Enriching EA with Lean, Agile, and Enterprise 2.0 Practices. Morgan Kaufmann Verlag. 2012. ISBN 978-0-12-415934-1.
- [Burlton2022] Burlton, Roger: Business Architecture – Collecting, Connecting, and Correcting the Dots. Technics Publications. 2022.

C

- [Cox2014] Cox, Iain R. Enterprise Architecture: How to get EA-Optimised. 2014.
- [Cretu2012] Cretu, Liviu Gabriel. Designing Enterprise Architecture Framework – Integrating Business Processes with IT Infrastructure. Apple Academic Press. 2014. ISBN: 978-1-4822-4057-3.
- [COBIT] Information Systems Audit and Control Association (ISACA), Online: <http://www.isaca.org/COBIT/Pages/default.aspx>

D

- [DoDAF] Department of Defence (DoD), Online: <http://dodcio.defense.gov/dodaf20.aspx>

G

- [Gharbi2012] Gharbi, M., Koschel, A., Rausch, A., Starke, G.: Basiswissen für Software-Architekten: Aus- und Weiterbildung zum Certified Professional for Software Architecture Foundation Level nach iSAQB-Standard, dpunkt Verlag, 2012.
- [Greefhorst2011] Greefhorst, Danny. Architecture Principles – The Cornerstones of Enterprise Architecture. Springer Verlag. 2011. ISBN 978-3-642-20278-0.
- [Grigoriu2011] Grigoriu, Adrian. An Enterprise Architecture Development Framework – The Enterprise Reference Maps, Single Page Business Architecture, Metamodel SOA Design, Business Case and Strategic Planning for your Enterprise. 2011.

H

- [Hanschke2010] Hanschke, I.: Strategisches Management der IT-Landschaft. Hanser Verlag, 2010.
- [Hanschke2012] Hanschke, I.: Enterprise Architecture Management – Einfach und Effektiv. Hanser Verlag, 2012.
- [Hanschke2022] Hanschke, I.: Enterprise Architecture Management – Einfach und Effektiv. 3., überarbeitete und erweiterte Auflage. Hanser Verlag, 2022.
- [Hanschke2013] Hanschke, I.: Strategisches Management der IT-Landschaft. 3., aktualisierte und erweiterte Auflage. Hanser Verlag, 2013.

- [Hohmann2003] Hohmann, L.: Beyond Software Architecture – Creating and sustaining Winning Solutions. Addison-Wesley Professional, 2003.
- [Hohpe2020] Hohpe, G.: The Software Architect Elevator. O'Reilly Media, Inc., 2020.

I

- [ITIL] Cabinet Office at His Majesty's Government (HMG), Online: <http://www.itil-officialsite.com/>

J

- [Johannsen2010] Johannsen, W., Goeken, M.: Referenzmodelle für IT-Governance. dpunkt Verlag, 2010.

K

- [Keller2012] Keller, W.: IT-Unternehmensarchitektur. dpunkt Verlag 2012.

L

- [Lankhorst2013] Lankhorst, Marc. Enterprise Architecture at Work – Modelling, Communication and Analysis. Springer Verlag. 2013. ISBN: 978-3-642-29650-5.

M

- [Matthes2011] Matthes, Dirk. Enterprise Architecture Frameworks Kompendium – Über 50 Rahmenwerke für das IT-Management. Springer Verlag. 2011. ISBN: 978-3-642-12954-4.
- [MODAF] Ministry of Defence (MOD)at Her Majesty's Government(HMG), Online: <https://www.gov.uk/government/publications/modaf-website-download>
- [Morris2013] Morris, Bernard. Business Architecture Made Easy: A Journey from Complexity to Simplicity. Book Baby. 2013.

O

- [Op'tLand 2009], Op't Land, Martin et. al. Enterprise Architecture – Creating Value by Informed Governance. Springer Verlag. 2009. ISBN: 978-3-540-85231-5.]]

R

- [Reynolds10] Reynolds, C., Introduction to Business Architecture, Course Technology 2010.
- [Reussner2008] Reussner, R., Hasselbring, W.: Handbuch der Software-Architektur. dpunkt Verlag, 2008.
- [RISK IT] Information Systems Audit and Control Association(ISACA),Online: <http://www.isaca.org/Knowledge-Center/Risk-IT-IT-Risk-Management/Pages/Risk-IT1.aspx>
- [Ross2006] Ross, Jeann W. et. al. Enterprise Architecture as Strategy – Creating a Foundation for Business Execution. Harvard Business School Press. 2006. ISBN: 978-1-4221-4817-4.

S

- [Schekkerman2004] Schekkerman, Jaap. How to Survive in the Jungle of Enterprise Architecture Frameworks. Trafford Verlag. 2004.

- [Schmelzer2010] Schmelzer, H., Sesselmann, W.: Geschäftsprozessmanagement in der Praxis. Hanser Wirtschaft Verlag, 2010.
- [Schwarzer2009] Schwarzer, Bettina. Einführung in das Enterprise Architecture Management - Verstehen, Planen, Umsetzen. ISBN: 978-3837021226.

T

- [Tiemeyer2011] Tiemeyer, E.: Handbuch IT-Management – Konzepte, Methoden, Lösungen und Arbeitshilfen für die Praxis. Hanser Verlag, 2011.
- [Tiway2019] Amit Tiway et. al.: Outcome-Driven Business Architecture – Synergizing Strategies and Intelligence with Architecture. CRC Press 2019.
- [TOGAF] The Open Group, Online: <http://www.opengroup.org/togaf/>

U

- [Ulrich2011] Ulrich, William et.al.: Business Architecture: The Art and Practice of Business Transformation. MK Press. 2011.

V

- [Vogel2005] Vogel, O., Arnold, I.: Software-Architekturen Grundlagen – Konzepte. Spektrum Akademischer Verlag, 2005.
- [VAL IT] Information Systems Audit and Control Association(ISACA),Online: <http://www.isaca.org/Knowledge-Center/Val-IT-IT-Value-Delivery-/Pages/Val-IT1.aspx>

W

- [Weill2004] Weill, P., Ross, J.: IT Governance. Mcgraw-Hill Professional, 2004.

Z

- [Ziemann2022] Ziemann, Jörg. Fundamentals of Enterprise Architecture Management - Foundations for Steering the Enterprise-Wide Digital System. Springer Verlag. 2022. ISBN: 978-3-030-96733-8.