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TOGAF® 9 Certified Study Guide

Preparation for the TOGAF 9 Part 2 Examination

3rd Edition

Rachel Harrison

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Study Guide 3rd Edition

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TOGAF® 9 Certified

Study Guide

3rd Edition

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Preface

This Document

This document is a Study Guide for TOGAF® 9 Certified. It is based on Version 2 of the TOGAF Certification for People Conformance Requirements and is aligned to TOGAF Version 9.1. This third edition contains minor updates to remove references to the TOGAF 8-9 Advanced Bridge Examination[1] and also adds four bonus practice examination questions to Appendix B.

It gives an overview of every learning objective for the TOGAF 9 Certified Syllabus beyond the Foundation level, and is specifically designed to help individuals prepare for certification.

The audience for this Study Guide is:

- Individuals who require a deeper understanding of TOGAF 9
- Professionals who are working in an organization where TOGAF 9 has been adopted and who need to participate in architecture projects and initiatives
- Architects who will be responsible for developing architecture artifacts
- Architects who wish to introduce TOGAF 9 into an architecture practice
- Architects who want to achieve a recognized qualification to demonstrate their detailed knowledge of TOGAF 9

This Study Guide assumes a prior knowledge equivalent to TOGAF 9 Foundation.

While reading this Study Guide, the reader should also refer to the TOGAF documentation[2] available online at www.opengroup.org/architecture/togaf9-doc/arch and also available as a hardcopy book.

The Study Guide is structured as follows:

- Chapter 1 (Introduction) provides a brief introduction to TOGAF certification and the TOGAF 9 examinations that lead to TOGAF 9 Certified, as well as how to use this Study Guide.

1 The TOGAF 8-9 Advanced Bridge Examination was withdrawn on November 1, 2013.
2 TOGAF Version 9.1 (ISBN:978 90 8753 679 4, G116), available at www.opengroup.org/bookstore/catalog/g116.htm.

- Part 1: TOGAF 9 Architecture Development Method (ADM) comprises Chapters 2 through 13 and consists of a tour of the ADM phases:

  - Chapter 2 describes the Preliminary Phase within the ADM. This chapter covers the preparation and initiation activities required to create an Architecture Capability.
  - Chapter 3 describes Phase A: Architecture Vision. This chapter covers the initial phase of an Architecture Development Cycle. It includes information about defining the scope, identifying the stakeholders, creating the Architecture Vision, and obtaining approvals.
  - Chapter 4 describes Phase B: Business Architecture. This chapter covers the development of a Business Architecture to support an agreed Architecture Vision.
  - Chapter 5 provides an introduction to Phase C: Information Systems Architectures. The next two chapters describe the details of the two parts of Phase C.
  - Chapter 6 describes the development of the Data Architecture within Phase C.
  - Chapter 7 describes the development of the Application Architecture within Phase C.
  - Chapter 8 describes Phase D: Technology Architecture. The Technology Architecture is used as the basis of the following implementation work.
  - Chapter 9 describes Phase E: Opportunities and Solutions. This phase identifies major implementation projects and groups them into work packages that deliver the Target Architecture defined in the previous phases.
  - Chapter 10 describes Phase F: Migration Planning. This phase develops a detailed Implementation and Migration Plan addressing how to move from the Baseline to the Target Architecture.
  - Chapter 11 describes Phase G: Implementation Governance. This phase ensures that the implementation projects conform to the architecture.
  - Chapter 12 describes Phase H: Architecture Change Management. This phase ensures that the architecture capability can respond to the needs of the enterprise as changes arise.
  - Chapter 13 describes ADM Architecture Requirements Management, a process that applies throughout the ADM.

- Part 2: Guidelines for Adapting the ADM consists of three chapters:
  - Chapter 14 describes how to apply iteration to the ADM, and how to apply the ADM at different enterprise levels.
  - Chapter 15 describes security considerations during the application of the ADM.
  - Chapter 16 describes SOA as an architectural style.
- Part 3: The Architecture Content Framework consists of a single chapter:
  - Chapter 17 describes the Architecture Content Framework and the TOGAF Content Metamodel.
- Part 4: The Enterprise Continuum consists of two chapters:
  - Chapter 18 describes Architecture Partitioning.
  - Chapter 19 describes the Architecture Repository, which is a model for a physical instance of the Enterprise Continuum.
- Part 5: TOGAF Reference Models consists of two chapters:
  - Chapter 20 describes the Technical Reference Model (TRM).
  - Chapter 21 describes the Integrated Information Infrastructure Reference Model (III-RM).
- Part 6: Architecture Capability consists of three chapters:
  - Chapter 22 describes the relationship between Architecture Governance and the ADM. It also describes how to establish and operate an Architecture Board.
  - Chapter 23 describes Architecture Maturity Models.
  - Chapter 24 describes the Architecture Skills Framework.
- Appendix A provides a Practice Test for the TOGAF 9 Part 2 Examination.
- Appendix B provides four bonus practice questions for the TOGAF 9 Part 2 Examination.
- Appendix C provides the answers to the examination in Appendix A.
- Appendix D provides the answers to the bonus practice questions in Appendix B.
- Appendix E provides the TOGAF 9 Certified Syllabus.

How to Use this Study Guide

The chapters in this Study Guide should be read in order. However, you may wish to use this Study Guide to study topics with which you are already familiar, and it is certainly possible to select topics for review in any order. Where a topic requires further information from a later part in the syllabus, a cross-reference is provided.

Within each chapter are "Key Learning Points" and "Summary" sections that help you to easily identify what you need to know for each topic. Where applicable, a chapter has an "Exercises" section that will help you reinforce key learning points in the chapter.

Each chapter also has a "Recommended Reading" section that indicates relevant, additional sections of the TOGAF document and other sources that should be read to obtain a full understanding of the subject material.

Finally, at the end of this Study Guide is a "Test Yourself" examination paper that can be used to test your readiness to take the official TOGAF 9 Part 2 examination. This paper is designed to include the same question formats and a similar difficulty level to the official TOGAF 9 Part 2 examination. In addition to the examination paper, four bonus practice questions are also provided.

Conventions Used in this Study Guide

The following conventions are used throughout this Study Guide in order to help identify important information and avoid confusion over the intended meaning.

- Ellipsis (…)
  Indicates a continuation; such as an incomplete list of example items, or a continuation from preceding text.
- **Bold**
  Used to highlight specific terms.
- *Italics*
  Used for emphasis. May also refer to other external documents.
- *(Syllabus Reference Unit X, Learning Outcome Y: Statement)*
  Used at the start of a text block to identify the associated TOGAF 9 Certified Syllabus learning outcome.

In addition to typographical conventions, the following conventions are used to highlight segments of text:

A Note box is used to highlight useful or interesting information.

A Tip box is used to provide key information that can save you time or that may not be entirely obvious.

About the TOGAF Standard

TOGAF®, an Open Group Standard, is a proven enterprise architecture methodology and framework used by the world's leading organizations to improve business efficiency. It is the most prominent and reliable enterprise architecture standard, ensuring consistent standards, methods, and communication among enterprise architecture professionals. Enterprise architecture professionals fluent in TOGAF standards enjoy greater industry credibility, job effectiveness, and career opportunities. The TOGAF standard helps practitioners avoid being locked into proprietary methods, utilize resources more efficiently and effectively, and realize a greater return on investment.

About The Open Group

The Open Group is a global consortium that enables the achievement of business objectives through IT standards. With more than 375 member organizations, The Open Group has a diverse membership that spans all sectors of the IT community – customers, systems and solutions suppliers, tool vendors, integrators, and consultants, as well as academics and researchers – to:

- Capture, understand, and address current and emerging requirements, and establish policies and share best practices
- Facilitate interoperability, develop consensus, and evolve and integrate specifications and open source technologies

- Offer a comprehensive set of services to enhance the operational efficiency of consortia
- Operate the industry's premier certification service

Further information on The Open Group is available at www.opengroup.org.

The Open Group has over 15 years' experience in developing and operating certification programs and has extensive experience developing and facilitating industry adoption of test suites used to validate conformance to an open standard or specification.

The Open Group publishes a wide range of technical documentation, most of which is focused on development of Open Group Standards and Guides, but which also includes white papers, technical studies, certification and testing documentation, and business titles.

A catalog is available at www.opengroup.org/bookstore.

Readers should note that updates – in the form of Corrigenda – may apply to any publication.
This information is published at www.opengroup.org/corrigenda.

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Rachel Harrison is a Professor of Computer Science in the Department of Computing and Communication Technologies at Oxford Brookes University. Previously she was Professor of Computer Science, Head of the Department of Computer Science, and Director of Research for the School of Systems Engineering at the University of Reading. Her research interests include systems evolution, software metrics, requirements engineering, software architecture, usability, and software testing. She has published over 100 refereed papers and consulted widely with industry, working with organizations such as IBM, the DERA, Philips Research Labs, Praxis Critical Systems, and The Open Group. She is Editor-in-Chief of the Software Quality Journal, published by Springer.

Prof. Harrison holds an MA in Mathematics from Oxford University, an MSc in Computer Science from University College London, and a PhD in Computer Science from the University of Southampton. She is a Member of the British Computer Society, an Affiliate Member of the IEEE-CS, a Member of the Association of Computing Machinery, and is a Chartered Engineer.

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References

The following documents are referenced in this Study Guide:

- TOGAF Version 9.1, available online at www.opengroup.org/architecture/togaf9-doc/arch, and also available as a book at (ISBN: 978 90 8753 679 4, G116) at www.opengroup.org/bookstore/catalog/g116.htm.
- TOGAF 9 Foundation Study Guide, 2nd Edition (ISBN: 978 90 8753 6817, B111) available at www.opengroup.org/bookstore/catalog/b111.htm.
- The Open Group Architecture Principles, Case Study by Darren Hawley on behalf of The Open Group Internal Architecture Board, October 2008 (Y082), published by The Open Group (www.opengroup.org/bookstore/catalog/y082.htm).
- SOA Source Book, April 2009 (G093), published by The Open Group (www.opengroup.org/bookstore/catalog/g093.htm).
- ISO/IEC 42010:2007, Systems and Software Engineering – Recommended Practice for Architectural Description of Software-Intensive Systems, Edition 1 (technically identical to ANSI/IEEE Std 1471-2000).
- TOGAF Certification for People: Program Summary Datasheet, 2013, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_cert_summary.pdf).
- TOGAF 9 Certified Datasheet, 2013, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_foundation.pdf).
- TOGAF 9 Certified Datasheet, 2013, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_cert.pdf)
- TOGAF Certification for People: Certification Policy, February 2009 (X091), published by The Open Group (www.opengroup.org/bookstore/catalog/x091.htm).
- TOGAF Certification for People: Conformance Requirements (Multi-Level), Version 2, December 2011 (X111), published by The Open Group (www.opengroup.org/bookstore/catalog/x111.htm).
- Zachman Framework, Zachman Institute for Framework Advancement (ZIFA) (www.zifa.com).
- Bill Estrem, "TOGAF to the Rescue" (www.opengroup.org/downloads)

- Enterprise Architecture Planning (EAP): Developing a Blueprint for Data, Applications, and Technology, Steven H. Spewak & Steven C. Hill, ISBN: 0-47-159985-9, John Wiley & Sons, 1993.
- US Department of Commerce Enterprise Architecture Capability Maturity Model (ACMM), Version 1.2 (http://ocio.os.doc.gov/ITPolicyandPrograms/Enterprise_Architecture/PROD01_004935).
- Guide to Security Architecture in TOGAF ADM, White Paper developed by The Open Group Security Forum and Members of The Open Group Architecture Forum, December 2005 (W055), published by The Open Group (www.opengroup.org/bookstore/catalog/w055.htm)

The following web links are referenced in this Study Guide:

- The Open Group TOGAF 9 Certification website: www.opengroup.org/togaf9/cert
- The TOGAF information website: www.togaf.info
- TOGAF 9 People Certification Overview presentation: www.togaf.info/sg01
- Introduction to the ADM presentation: www.togaf.info/sg02
- Sample Catalogs, Matrices, and Diagrams presentation: www.togaf.info/sg03
- TOGAF 9 Architecture Content Metamodel Overview presentation: www.togaf.info/sg04

Chapter 1

Introduction

1.1 Key Learning Points

This document is a Study Guide for TOGAF Version 9 for students planning to qualify as TOGAF 9 Certified. This document is a companion document to the TOGAF 9 Foundation Study Guide, and focuses on the learning outcomes beyond the Foundation level.

It gives an overview of every learning objective for the TOGAF 9 Certified Syllabus and in-depth coverage on preparing and taking the TOGAF 9 Part 2 Examination. It is specifically designed to help individuals prepare for certification.

Prerequisite Knowledge

This Study Guide assumes a prior knowledge equivalent to TOGAF 9 Foundation. This can be obtained by reading the TOGAF 9 Foundation Study Guide (see References).

This first chapter will familiarize you with the TOGAF 9 certification program, as well as give you important information about the structure of the TOGAF 9 examinations.

The objectives of this chapter are as follows:

- To provide an understanding of TOGAF certification
- To learn key facts about the TOGAF 9 Part 2 examination

1.2 The TOGAF Certification for People Program

Certification is available to individuals who wish to demonstrate they have attained the required knowledge and understanding of TOGAF Version 9.

There are two levels defined for TOGAF 9 "people certification", denoted *TOGAF 9 Foundation* and *TOGAF 9 Certified*, respectively. This Study Guide

covers the second of these – TOGAF 9 Certified. Studying for TOGAF 9 Certified includes all the learning outcomes for TOGAF 9 Foundation, which are covered in a separate companion document (see References).

1.2.1 Certification Document Structure

The documents available to support the program are as shown in Figure 1:

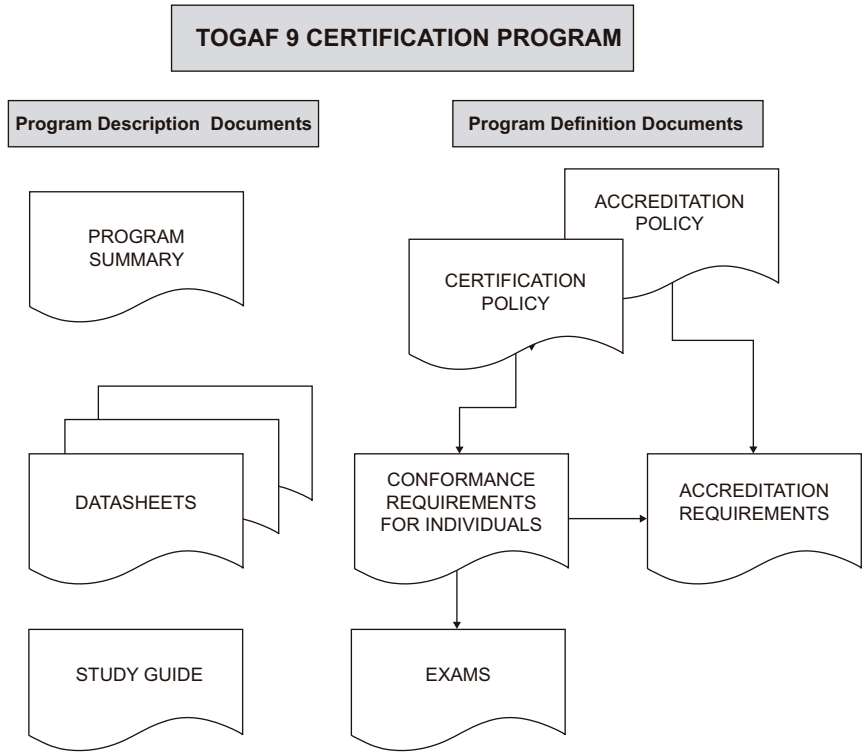

Figure 1: Certification Document Structure

Program description documents, such as this Study Guide, are intended for an end-user audience including those interested in becoming certified. The Program definition documents are intended for trainers, examination developers, and the Certification Authority. All these documents are available from The Open Group website.[3]

3 Available at the TOGAF 9 certification website (www.opengroup.org/togaf9/cert), or The Open Group bookstore (www.opengroup.org/bookstore).

1.2.2 TOGAF 9 Foundation

The purpose of certification to TOGAF 9 Foundation is to provide validation that the candidate has gained knowledge of the terminology, structure, and basic concepts of TOGAF 9, and understands the core principles of enterprise architecture and the TOGAF standard. The learning objectives at this level focus on knowledge and comprehension. More information is provided in the TOGAF 9 Foundation Study Guide (see References).

1.2.3 TOGAF 9 Certified

The purpose of certification to TOGAF 9 Certified is to provide validation that, in addition to the knowledge and comprehension of TOGAF 9 Foundation, the Candidate is able to analyze and apply this knowledge. The learning objectives at this level therefore focus on application and analysis in addition to knowledge and comprehension.

Individuals certified at this level, in addition to the knowledge required for TOGAF 9 Foundation, will have demonstrated their understanding of:

- How to apply the ADM phases in development of an enterprise architecture
- How to apply Architecture Governance in development of an enterprise architecture
- How to apply the TOGAF Architecture Content Framework
- How to apply the concept of building blocks
- How to apply the Stakeholder Management Technique
- How to apply the TOGAF Content Metamodel
- How to apply TOGAF recommended techniques when developing an enterprise architecture
- The TOGAF Technical Reference Model (TRM) and how to customize it to meet an organization's needs
- The Integrated Information Infrastructure Reference Model (III-RM)
- The content of the key deliverables of the ADM cycle
- How an enterprise architecture can be partitioned to meet the specific needs of an organization
- The purpose of the Architecture Repository
- How to apply iteration and different levels of architecture with the ADM
- How to adapt the ADM for security
- SOA as a style of architecture

- The role of architecture maturity models in developing an enterprise architecture
- The purpose of the Architecture Skills Framework and how to apply it within an organization

Self-Study Paths

The self-study paths[4] to achieve certification for TOGAF 9 Certified are summarized in Figure 2. The chosen path depends whether you want to first become certified to TOGAF 9 Foundation or proceed direct to TOGAF 9 Certified.

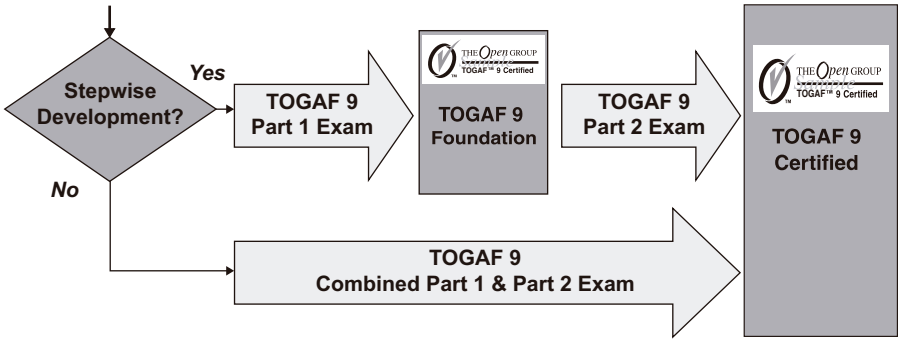

Figure 2: Paths to Achieving TOGAF 9 Certified

What is the Relationship between TOGAF 9 Foundation and TOGAF 9 Certified?
Candidates are able to choose whether they wish to become certified in a stepwise manner by starting with TOGAF 9 Foundation and then at a later date TOGAF 9 Certified, or bypass TOGAF 9 Foundation and go directly to TOGAF 9 Certified.
For those going directly to TOGAF 9 Certified there is a choice of taking the two examinations separately or a Combined examination. The advantage of taking the two examinations over the single Combined examination is that if you pass Part 1 but fail Part 2 you can still qualify for TOGAF 9 Foundation.

4 The latest information on the TOGAF 9 certification program can be obtained from the TOGAF 9 Certification website at www/opengroup.org/togaf9/cert.

1.2.4 The Certification Process

The TOGAF 9 Certified Syllabus is contained in Appendix E.

Readers are assumed to be already familiar with the syllabus for TOGAF 9 Foundation and its accompanying TOGAF 9 Part 1 Examination. Detailed information is provided in the TOGAF 9 Foundation Study Guide (see References).

The TOGAF 9 Part 2 Examination

The syllabus for the TOGAF 9 Part 2 Examination consists of all the learning outcomes defined in both Level 1 and Level 2 of the Conformance Requirements document. At the time of writing this document, the examination topics are drawn from the learning outcomes with eight scenario-based questions.

The eight scenarios are drawn from the following major topic areas:

- ADM Phases: Project Establishment (Phases Preliminary, A, Requirements Management)
- ADM Phases: Architecture Definition (Phases B, C, D)
- ADM Phases: Transition Planning (Phases E and F)
- ADM Phases: Governance (Phases G and H)
- Adapting the ADM
- Architecture Content Framework
- TOGAF Reference Models
- Architecture Capability Framework

1.2.4.1 Format of the Examination Questions

The questions for the TOGAF 9 Part 2 Examination consist of eight complex scenario questions. Candidates must read a scenario describing a situation where the TOGAF standard is being applied. The question will then ask how the TOGAF standard would be used to address a particular point, and provide four possible answers. The answers are graded. One answer is more correct than two of the others, and one is incorrect for the situation. The aim is to select the best answer according to TOGAF 9. The correct answer scores five points, the second best answer three points, and the third best answer one point. The incorrect answer (or distracter) scores zero points. You may need to refer to the TOGAF document during the examination and a copy is provided with the examination (see below for more details).

The exact display format is test center-specific and will be made clear on the screens when taking the examination. Examples of these questions are provided in Appendix A.

1.2.4.2 *What do I need to bring with me to take the examination?*

You should consult with the test center regarding the forms of picture ID needed to verify your identification.

1.2.4.3 *If I fail, how soon can I retake the examination?*

You are expected to be familiar with the current policy on The Open Group website. At the time of writing, the policy states that individuals who have failed the examination are not allowed to retake the examination within one month of the first sitting.

1.2.5 Preparing for the Examination

You can prepare for the examination by working through this Study Guide section-by-section. After completing each section you should complete the exercises and read the referenced sections from the TOGAF documentation. Once you have completed all the sections in this Study Guide, you can then attempt the Test Yourself examination paper in the appendices. This is designed as a thorough test of your knowledge. If you have completed all the prescribed preparation and can attain a pass mark for the Test Yourself examination paper, then you may be ready to sit the examination.

Open-Book Examinations

The TOGAF 9 Part 2 Examination is open-book. The test center will provide access to the TOGAF document. At Prometric test centers, the TOGAF document is provided as part of the examination itself.

1.3 Summary

The TOGAF 9 People certification program is a knowledge-based certification program. It has two levels, leading to certification for TOGAF 9 Foundation and TOGAF 9 Certified, respectively.

The topic for this Study Guide is preparation for the TOGAF 9 Part 2 Examination, leading to TOGAF 9 Certified. The TOGAF 9 Part 2 Examination comprises eight scenario-based questions to be completed in 90 minutes. [5]

Preparing for the examination includes the following steps:

- You should work through this Study Guide step-by-step.
- At the end of each chapter, you should complete the exercises (where provided) and read the sections of the TOGAF documentation listed under Recommended Reading.
- Once you have completed all the chapters in this Study Guide, you should attempt the Test Yourself examination paper in Appendix A and the bonus questions in Appendix B.
- If you can attain the target score for the paper in Appendix A and satisfactorily complete the bonus questions in Appendix B, then you have completed your preparation.

1.4 Recommended Reading

The following are recommended sources of further information for this chapter:

- TOGAF Certification for People: Program Summary Datasheet
- TOGAF 9 Certified Datasheet
- TOGAF Certification for People: Certification Policy)
- TOGAF Certification for People: Conformance Requirements (Multi-level)
- The Open Group TOGAF 9 Certification website: www.opengroup.org/togaf9/cert
- The TOGAF information website: www.togaf.info
- TOGAF 9 People Certification Overview presentation: www.togaf.info/sg01

5 Additional time is allowed for candidates for whom English is a second language where the examination is not available in the local language. For further information see the advice to candidates sheet on The Open Group TOGAF 9 certification website.