The Open Group Publications available from Van Haren Publishing

The TOGAF Series:
TOGAF® Version 9.1
TOGAF® Version 9.1 – A Pocket Guide
TOGAF® 9 Certified Study Guide, 2nd Edition

The Open Group Series:
Cloud Computing for Business – The Open Group Guide
Archimate® 2.0 Specification (Publishes 2012)

The Open Group Security Series:
Open Information Security Management Maturity Model (O-ISM3)
Open Enterprise Security Architecture (O-ESA)
Risk Management – The Open Group Guide

All titles are available to purchase from:
www.opengroup.org
www.vanharen.net
and also many international and online distributors.
Contents

Preface 9
Trademarks 14
About the Authors 15
Acknowledgements 18

1 Introduction 19
1.1 Introduction to TOGAF 19
1.2 Structure of the TOGAF Document 20
1.3 What is Architecture in the Context of TOGAF? 21
1.4 What kinds of Architecture does TOGAF deal with? 21
1.5 What does TOGAF Contain? 22
1.5.1 The Architecture Development Method (ADM) 23
1.5.2 ADM Guidelines and Techniques 23
1.5.3 Architecture Content Framework 24
1.5.4 The Enterprise Continuum 24
1.5.5 TOGAF Reference Models 24
1.5.6 The Architecture Capability Framework 25

2 The Architecture Development Method 27
2.1 What is the ADM? 27
2.2 What are the Phases of the ADM? 28
2.3 The ADM in Detail 31
2.3.1 Preliminary Phase 31
2.3.2 Phase A: Architecture Vision 32
2.3.3 Phase B: Business Architecture 34
2.3.4 Phase C: Information Systems Architectures 35
2.3.5 Phase D: Technology Architecture 38
2.3.6 Phase E: Opportunities and Solutions 39
2.3.7 Phase F: Migration Planning 40
2.3.8 Phase G: Implementation Governance
2.3.9 Phase H: Architecture Change Management
2.3.10 Requirements Management
2.4 Scoping the Architecture Activity

3 Key Techniques and Deliverables of the ADM Cycle

3.1 Tailored Architecture Framework
3.2 Organizational Model for Enterprise Architecture
3.3 Architecture Principles
   3.3.1 Developing Architecture Principles
   3.3.2 Defining Architecture Principles
   3.3.3 Qualities of Principles
   3.3.4 Applying Architecture Principles
3.4 Business Principles, Business Goals, and Business Drivers
3.5 Architecture Repository
3.6 Architecture Tools
3.7 Request for Architecture Work
3.8 Statement of Architecture Work
3.9 Architecture Vision
3.10 Stakeholder Management
   3.10.1 Steps in the Stakeholder Management Process
3.11 Communications Plan
3.12 Business Transformation Readiness Assessment
3.13 Capability Assessment
3.14 Risk Management
3.15 Architecture Definition Document
   3.15.1 Business Architecture
   3.15.2 Information Systems Architectures
   3.15.3 Technology Architecture
3.16 Architecture Requirements Specification
   3.16.1 Business Architecture Requirements
   3.16.2 Information Systems Architectures Requirements
   3.16.3 Technology Architecture Requirements
3.16.4 Interoperability Requirements 71
3.17 Architecture Roadmap 71
3.18 Business Scenarios 73
3.19 Gap Analysis 74
3.20 Architecture Viewpoints 76
3.21 Architecture Views 78
  3.21.1 Developing Views in the ADM 79
3.22 Architecture Building Blocks 79
3.23 Solution Building Blocks 80
3.24 Capability-Based Planning 81
3.25 Migration Planning Techniques 82
  3.25.1 Implementation Factor Assessment and Deduction Matrix 82
  3.25.2 Consolidated Gaps, Solutions, and Dependencies Matrix 83
  3.25.3 Architecture Definition Increments Table 83
  3.25.4 Transition Architecture State Evolution Table 84
  3.25.5 Business Value Assessment Technique 85
3.26 Implementation and Migration Plan 86
3.27 Transition Architecture 87
3.28 Implementation Governance Model 88
3.29 Architecture Contracts 88
3.30 Change Request 90
3.31 Compliance Assessment 91
3.32 Requirements Impact Assessment 92

4 Guidelines for Adapting the ADM 93
  4.1 Introduction 93
  4.2 Applying Iteration to the ADM 95
  4.3 Applying the ADM across the Architecture Landscape 101
  4.4 Security Architecture and the ADM 102
  4.5 Using TOGAF to Define and Govern SOAs 104
  4.5.1 Using TOGAF for SOA 105

Copyright protected. Use is for Single Users only via a VHP Approved License. For information and printed versions please see www.vanharen.net
5 Architecture Content Framework
5.1 Architecture Content Framework Overview 107
5.2 Content Metamodel 108
5.2.1 Core and Extensions 110
5.2.2 Catalogs, Matrices, and Diagrams 110
5.3 Architectural Artifacts 112
5.4 Architecture Deliverables 116
5.5 Building Blocks 116

6 The Enterprise Continuum
6.1 Overview of the Enterprise Continuum 119
6.1.1 The Enterprise Continuum and Architecture Re-Use 121
6.1.2 Using the Enterprise Continuum within the ADM 121
6.2 Architecture Partitioning 122
6.3 Architecture Repository 123
6.3.1 The Enterprise Repository 125

7 TOGAF Reference Models
7.1 TOGAF Foundation Architecture 127
7.1.1 Technical Reference Model (TRM) 127
7.2 Integrated Information Infrastructure Reference Model (III-RM) 127

8 Architecture Capability Framework
8.1 Establishing an Architecture Capability 131
8.2 Architecture Governance 131
8.3 Architecture Board 132
8.4 Architecture Compliance 133
8.5 Architecture Skills Framework 133

Appendix A Migration Summary 137
Glossary 151
Index 157

Copyright protected. Use is for Single Users only via a VHP Approved License. For information and printed versions please see www.vanharen.net
Preface

This Document
This is the Pocket Guide to TOGAF®, an Open Group Standard, Version 9.1. It is intended to help architects focus on the efficient and effective operations of their organization and senior managers understand the basics of TOGAF. It is organized as follows:

- Chapter 1 provides a high-level view of TOGAF, enterprise architecture, and the contents and key concepts of TOGAF.
- Chapter 2 provides an introduction to the Architecture Development Method (ADM), the method that TOGAF provides to develop enterprise architectures.
- Chapter 3 provides an overview of key techniques and deliverables of the ADM cycle.
- Chapter 4 provides an overview of the guidelines for adapting the ADM.
- Chapter 5 provides an introduction to the Architecture Content Framework, a structured metamodel for architectural artifacts.
- Chapter 6 provides an introduction to the Enterprise Continuum, a high-level concept that can be used with the ADM to develop an enterprise architecture.
- Chapter 7 provides an introduction to the TOGAF Reference Models, including the TOGAF Foundation Architecture and the Integrated Information Infrastructure Reference Model (III-RM).
- Chapter 8 provides an introduction to the Architecture Capability Framework, a set of resources provided for establishment and operation of an architecture function within an enterprise.
- Appendix A provides an overview of the differences between TOGAF 9.1 and TOGAF 8.1.1, and also a summary of the changes between TOGAF 9 and 9.1.
The audience for this document is:

- Enterprise architects, business architects, IT architects, data architects, systems architects, solutions architects, and senior managers seeking a first introduction to TOGAF

A prior knowledge of enterprise architecture is not required. After reading this document, the reader seeking further information should refer to the TOGAF documentation available online at www.opengroup.org/architecture/togaf9-doc/arch and also available as a hardcopy book.

About TOGAF Version 9.1

TOGAF 9.1 is a maintenance update to TOGAF 9, addressing comments raised since the introduction of TOGAF 9 in 2009. It retains the major features and structure of TOGAF 9 including:

**Modular Structure:** TOGAF 9 has a modular structure. The modular structure supports:

- Greater usability – defined purpose for each part; can be used in isolation as a standalone set of guidelines
- Incremental adoption of the TOGAF specification

**Content Framework:** TOGAF 9 includes a content framework to drive greater consistency in the outputs that are created when following the Architecture Development Method (ADM). The TOGAF content framework provides a detailed model of architectural work products.
Extended Guidance: TOGAF 9 features an extended set of concepts and guidelines to support the establishment of an integrated hierarchy of architectures being developed by teams within larger organizations that operate within an overarching architectural governance model. In particular, the following concepts are introduced:

- **Partitioning**: A number of techniques and considerations on how to partition the various architectures within an enterprise.
- **Architecture Repository**: A logical information model for an Architecture Repository which can be used as an integrated store for all outputs created by executing the ADM.
- **Capability Framework**: A structured definition of the organization, skills, roles, and responsibilities required to operate an effective enterprise architecture capability. TOGAF also provides guidance on a process that can be followed to identify and establish an appropriate architecture capability.

Architectural Styles: TOGAF 9, in Part III: ADM Guidelines & Techniques, brings together a set of supporting materials that show in detail how the ADM can be applied to specific situations:

- The varying uses of iteration that are possible within the ADM and when each technique should be applied
- The linkages between the TOGAF ADM and Service Oriented Architecture (SOA)
- The specific considerations required to address security architecture within the ADM
- The various types of architecture development required within an enterprise and how these relate to one another
Additional ADM Detail: TOGAF 9 includes additional detailed information over earlier versions of TOGAF for supporting the execution of the ADM. Particular areas of enhancement are:

- The Preliminary phase features extended guidance on establishing an enterprise architecture capability and planning for architecture development.
- The Opportunities & Solutions and Migration Planning phases feature a detailed and robust method for defining and planning enterprise transformation.

Conventions Used in this Document
The following conventions are used throughout this document 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.

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 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. Full details and a catalog are 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.
Trademarks

Boundaryless Information Flow™ is a trademark and ArchiMate®, Jericho Forum®, Making Standards Work®, Motif®, OSF/1®, The Open Group®, TOGAF®, UNIX®, and the “X” device are registered trademarks of The Open Group in the United States and other countries.

All other brand, company, and product names are used for identification purposes only and may be trademarks that are the sole property of their respective owners.
About the Authors

Andrew Josey, The Open Group
Andrew Josey is Director of Standards within The Open Group. He is currently managing the standards process for The Open Group, and has recently led the standards development projects for TOGAF 9 and 9.1, IEEE Std 1003.1-2008 (POSIX), and the core specifications of the Single UNIX Specification, Version 4. Previously, he has led the development and operation of many of The Open Group’s certification development projects, including industry-wide certification programs for the UNIX system, the Linux Standard Base, TOGAF, and IEEE POSIX. He is a member of the IEEE, USENIX, UKUUG, and the Association of Enterprise Architects.

Professor Rachel Harrison, Oxford Brookes University
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. She is the author of the study guides for the TOGAF 9 certification program.

Paul Homan, IBM
Paul Homan is a Technology Strategy Consultant within IBM’s Global Business Services. He is a Certified Master IT Architect, specializing in enterprise architecture with over 20 years’ experience in IT. Highly
passionate and practically experienced in architecture, strategy, design authority, and governance areas, Paul is particularly interested in enterprise architecture leadership, requirements management, and business architecture. He joined IBM from end-user environments, having worked as Chief Architect in both the UK Post Office and Royal Mail. He has not only established enterprise architecture practices, but has also lived with the results! Since joining IBM, Paul has dedicated his time to both advising clients on architecture capability as well as actively leading Architecture efforts on large client programmes. Paul has also been a leader in building IBM’s capability around Enterprise Architecture and TOGAF.

Matthew F. Rouse, Hewlett-Packard
Matthew Rouse is an Enterprise Architect at HP Enterprise Services. Matthew has over 20 years’ IS/IT experience in applications development, system architecture, IS/IT strategy, and enterprise architecture. He brings expertise in strategic IS/IT planning and architecture to ensure that enterprises align their IS/IT investments with their business objectives. Matthew is a Chartered IT Professional member of the British Computer Society, a Master Certified IT Architect, and a member of the IEEE Computer Society.

Tom van Sante, KPN/Getronics
Tom van Sante is Principal Consultant and program director for KPN/Getronics. He started his career in IT over 30 years ago after studying architecture at the Technical University in Delft. Working in a variety of functions, from operations to management, he has always operated on the borders between business and IT. He was involved in the introduction and development of ITIL/ASL/BiSL in the Netherlands. Tom van Sante has worked in numerous appointments for Government and Industry advising on the use of IT in modern society. He was responsible for the introduction and development of TOGAF within KPN/Getronics.
Mike Turner, Nokia
Mike Turner led Capgemini’s development effort on TOGAF Version 9 and also worked in the core team that developed the SAP Enterprise Architecture Framework (a joint initiative between Capgemini and SAP). He is currently working as an Enterprise Architect at Nokia.

Paul van der Merwe, Business Connexion
Paul van der Merwe, Business Unit Manager at Business Connexion, is one of South Africa’s most dynamic and insightful enterprise architecture practitioners. A conceptual thinker, he has driven a number of advances in the fields in which he has specialized, among them software development, business intelligence, ICT management, and enterprise architecture. The fundamental approach to enterprise architecture advocated by him is repository-based enterprise architecture that should be established within organizations as an ongoing practice that enables business and technology capabilities. He consults and trains on the implementation of TOGAF and frequently presents on enterprise architecture at industry events.
Acknowledgements

The Open Group gratefully acknowledges the following:

• Past and present members of The Open Group Architecture Forum for developing TOGAF

• Capgemini and SAP for contributed materials

• The following reviewers of this document:
  – Dave Hornford
  – Bill Estrem
  – Henry Franken
  – Judith Jones
  – Henk Jonkers
  – Mike Lambert
  – Kiichiro Onishi
  – Roger Reading
  – Saverio Rinaldi
  – John Rogers
  – Robert Weisman
  – Nicholas Yakoubovsky
Chapter 1
Introduction

This chapter provides an introduction to TOGAF, an Open Group Standard.

Topics addressed in this chapter include:

- An Introduction to TOGAF
- TOGAF, its structure and content
- The kinds of architecture that TOGAF addresses

1.1 Introduction to TOGAF

TOGAF is an architecture framework. Put simply, TOGAF is a tool for assisting in the acceptance, production, use, and maintenance of architectures. It is based on an iterative process model supported by best practices and a re-usable set of existing architectural assets.

TOGAF is developed and maintained by The Open Group Architecture Forum. The first version of TOGAF, developed in 1995, was based on the US Department of Defense Technical Architecture Framework for Information Management (TAFIM). Starting from this sound foundation, The Open Group Architecture Forum has developed successive versions of TOGAF at regular intervals and published each one on The Open Group public web site.

This document covers TOGAF Version 9.1, referred to as “TOGAF” within the text of this document. TOGAF 9.1 was first published in December 2011, and is a maintenance update to TOGAF 9 that was published in January 2009. This latest version is an evolution from TOGAF 8.1.1 and a description of the changes is provided in Appendix A.
TOGAF can be used for developing a broad range of different enterprise architectures. TOGAF complements, and can be used in conjunction with, other frameworks that are more focused on specific deliverables for particular vertical sectors such as Government, Telecommunications, Manufacturing, Defense, and Finance. The key to TOGAF is the method – the TOGAF Architecture Development Method (ADM) – for developing an enterprise architecture that addresses business needs.

1.2 Structure of the TOGAF Document

The TOGAF document is divided into seven parts, as summarized in Table 1.

Table 1: Structure of the TOGAF Document

| Part I: Introduction | This part provides a high-level introduction to the key concepts of enterprise architecture and, in particular, to the TOGAF approach. It contains the definitions of terms used throughout TOGAF and release notes detailing the changes between this version and the previous version of TOGAF. |
| Part II: Architecture Development Method | This part is the core of TOGAF. It describes the TOGAF Architecture Development Method (ADM) – a step-by-step approach to developing an enterprise architecture. |
| Part III: ADM Guidelines and Techniques | This part contains a collection of guidelines and techniques available for use in applying the ADM. |
| Part IV: Architecture Content Framework | This part describes the TOGAF content framework, including a structured metamodel for architectural artifacts, the use of re-usable Architecture Building Blocks (ABBs), and an overview of typical architecture deliverables. |
| Part V: Enterprise Continuum and Tools | This part discusses appropriate taxonomies and tools to categorize and store the outputs of architecture activity within an enterprise. |
| Part VI: TOGAF Reference Models | This part provides two architectural reference models, namely the TOGAF Technical Reference Model (TRM), and the Integrated Information Infrastructure Reference Model (III-RM). |
| Part VII: Architecture Capability Framework | This part discusses the organization, processes, skills, roles, and responsibilities required to establish and operate an architecture practice within an enterprise. |
1.3 What is Architecture in the Context of TOGAF?
ISO/IEC 42010:2007 defines “architecture” as:
“The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution.”

TOGAF embraces and extends this definition. In TOGAF, “architecture” has two meanings depending upon the context:
1. A formal description of a system, or a detailed plan of the system at a component level to guide its implementation
2. The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time

1.4 What kinds of Architecture does TOGAF deal with?
TOGAF covers the development of four related types of architecture. These four types of architecture are commonly accepted as subsets of an overall enterprise architecture, all of which TOGAF is designed to support. They are shown in Table 2.

Table 2: Architecture Types Supported by TOGAF

<table>
<thead>
<tr>
<th>Architecture Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Architecture</td>
<td>The business strategy, governance, organization, and key business processes.</td>
</tr>
<tr>
<td>Data Architecture</td>
<td>The structure of an organization’s logical and physical data assets and data management resources.</td>
</tr>
<tr>
<td>Application Architecture</td>
<td>A blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.</td>
</tr>
</tbody>
</table>

3 Data Architecture is called Information Architecture in some organizations.
1.5 What does TOGAF Contain?

TOGAF reflects the structure and content of an architecture capability within an enterprise, as shown in Figure 1.

<table>
<thead>
<tr>
<th>Architecture Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Architecture</td>
<td>The logical software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT infrastructure, middleware, networks, communications, processing, and standards.</td>
</tr>
</tbody>
</table>

Figure 1: TOGAF Content Overview
Central to TOGAF is the Architecture Development Method (documented in TOGAF, Part II). The architecture capability (documented in TOGAF, Part VII) operates the method. The method is supported by a number of guidelines and techniques (documented in TOGAF, Part III). This produces content to be stored in the repository (documented in TOGAF, Part IV), which is classified according to the Enterprise Continuum (documented in TOGAF, Part V). The repository is initially populated with the TOGAF Reference Models (documented in TOGAF, Part VI).

1.5.1 The Architecture Development Method (ADM)

The ADM describes how to derive an organization-specific enterprise architecture that addresses business requirements. The ADM is the major component of TOGAF and provides guidance for architects on a number of levels:

- It provides a number of architecture development phases (Business Architecture, Information Systems Architectures, Technology Architecture) in a cycle, as an overall process template for architecture development activity.
- It provides a narrative of each architecture phase, describing the phase in terms of objectives, approach, inputs, steps, and outputs. The inputs and outputs sections provide a definition of the architecture content structure and deliverables (a detailed description of the phase inputs and phase outputs is given in the Architecture Content Framework).
- It provides cross-phase summaries that cover requirements management.

The ADM is described further in Chapter 2.

1.5.2 ADM Guidelines and Techniques

ADM Guidelines and Techniques provides a number of guidelines and techniques to support the application of the ADM. The guidelines address adapting the ADM to deal with a number of usage scenarios, including different process styles (e.g., the use of iteration) and also specific specialty...
architectures (such as security). The techniques support specific tasks within the ADM (such as defining principles, business scenarios, business goals, gap analysis, migration planning, risk management, etc).

ADM Guidelines are described further in Chapter 4. ADM Techniques are described in detail in Chapter 3, together with key deliverables.

### 1.5.3 Architecture Content Framework

The Architecture Content Framework provides a detailed model of architectural work products, including deliverables, artifacts within deliverables, and the Architecture Building Blocks (ABBs) that deliverables represent.

The Architecture Content Framework is described further in Chapter 5.

### 1.5.4 The Enterprise Continuum

The Enterprise Continuum provides a model for structuring a virtual repository and provides methods for classifying architecture and solution artifacts, showing how the different types of artifacts evolve, and how they can be leveraged and re-used. This is based on architectures and solutions (models, patterns, architecture descriptions, etc.) that exist within the enterprise and in the industry at large, and which the enterprise has collected for use in the development of its architectures.

The Enterprise Continuum is described further in Chapter 6.

### 1.5.5 TOGAF Reference Models

TOGAF provides two reference models for possible inclusion in an enterprise’s own Enterprise Continuum, namely the TOGAF Technical Reference Model (TRM) and the Integrated Information Infrastructure Model (III-RM).
The TOGAF Reference Models are described further in Chapter 7.

1.5.6 The Architecture Capability Framework

The Architecture Capability Framework is a set of resources, guidelines, templates, background information, etc. provided to help the architect establish an architecture practice within an organization.

The Architecture Capability Framework is described further in Chapter 8.