THE Open GROUP

An Introduction to the ArchiMate® 3.0 Specification

A White Paper by:

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Boundaryless Information Flow™
achieved through global interoperability
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Executive Summary

This White Paper provides an overview of the ArchiMate® 3.0 Specification, an Open Group Standard, including the role of the language in Enterprise Architecture, a description of its structure and content, and a summary of the new features of this major update.

The ArchiMate 3.0 Specification is a major update to the ArchiMate 2.1 Specification, and was published as an Open Group Standard in June 2016. New features included in Version 3.0 include elements for modeling the enterprise at a strategic level, such as capability, resource, and outcome. It also includes support to model the physical world of materials and equipment. Furthermore, the consistency and structure of the language have been improved, definitions have been aligned with other standards, and its usability has been enhanced in various other ways.

This White Paper supports The Open Group vision of Boundaryless Information Flow™ by introducing a new version of a visual modeling language standard for developing, analyzing, and communicating architectures with diverse stakeholders. These architectures typically support organizational objectives such as improved strategic alignment, interoperability, and performance.

Introduction to the ArchiMate Specification

The ArchiMate Specification, an Open Group Standard, is an open and independent modeling language for Enterprise Architecture that is supported by different tool vendors and consulting firms. The ArchiMate language enables Enterprise Architects to describe, analyze, and visualize the relationships among architecture domains in an unambiguous way.

Just as an architectural drawing in classical building architecture describes the various aspects of the construction and use of a building, the ArchiMate Specification offers a common language for describing the construction and operation of business processes, organizational structures, information flows, IT systems, and technical and physical infrastructure. ArchiMate models enable stakeholders to design, assess, and communicate the consequences of decisions and changes within and between these architecture domains.

This White Paper provides an overview of the ArchiMate 3.0 Specification. The ArchiMate 3.0 Specification is a major update to the ArchiMate 2.1 Specification, and was published as an Open Group Standard in June 2016. New features included in Version 3.0 include elements for modeling the enterprise at a strategic level, such as capability, resource, and outcome. It also includes support to model the physical world of materials and equipment. Furthermore, the consistency and structure of the language have been improved, definitions have been aligned with other standards, and its usability has been enhanced in various other ways.

The Development of the ArchiMate Language

The ArchiMate language was created in the period 2002-2004 in the Netherlands by a project team from the Telematica Instituut in co-operation with several partners from government, industry, and academia, including Ordina, Radboud Universiteit Nijmegen, the Leiden Institute for Advanced Computer Science (LIACS), and the Centrum Wiskunde & Informatica (CWI). The development included tests in organizations such as ABN AMRO, the Dutch Tax and Customs Administration, and the Stichting Pensioenfonds ABP.

In 2008, the ownership and stewardship of the ArchiMate language was transferred from the ArchiMate Foundation to The Open Group. Since 2009, The Open Group ArchiMate Forum has developed successive versions and published them on The Open Group public website.

The ArchiMate Language and Enterprise Architecture

The role of the ArchiMate Specification is to provide a graphical language for the representation of Enterprise Architectures over time (i.e., including strategic, transformation, and migration planning), as well as the motivation and rationale for the architecture. The ArchiMate modeling language provides a uniform representation for diagrams that describe Enterprise Architectures, and offers an integrated approach to describe and visualize the different architecture domains together with their underlying relations and dependencies.

The design of the ArchiMate language started from a set of relatively generic concepts (objects and relations), which have been specialized for application at the different architectural layers of an Enterprise Architecture. The most important design restriction on the ArchiMate language is that it has been explicitly designed to be as compact as possible, yet still usable for most Enterprise Architecture modeling tasks. In the interest of simplicity of learning and use, the language has been limited to the concepts that suffice for modeling the proverbial 80% of practical cases.

ArchiMate 3.0 Specification Overview

The contents of the specification are summarized in Table 1.

Table 1: Structure of the ArchiMate Standard

Chapter	Description
Chapter 1: Introduction	This chapter includes the objectives, overview, conformance requirements, normative references, and terminology.
Chapter 2: Definitions	This chapter includes definitions of the general terms used in the document.
Chapter 3: Language Structure	This chapter describes the structure of the ArchiMate modeling language, including the top-level structure, layering, the ArchiMate Core Framework, and the Full Framework.
Chapter 4: Generic Metamodel	This chapter describes the structure and elements of the ArchiMate generic metamodel.
Chapter 5: Relationships	This chapter describes the relationships in the language.
Chapter 6: Motivation Elements	This chapter describes the concepts for expressing the motivation for an architecture, together with examples.
Chapter 7: Strategy Elements	This chapter provides elements for modeling the enterprise at a strategic level, together with examples.
Chapter 8: Business Layer	This chapter covers the definition and usage of the Business Layer elements, together with examples.
Chapter 9: Application Layer	This chapter covers the definition and usage of the Application Layer, together with examples.
Chapter 10: Technology Layer	This chapter covers the definition and usage of the Technology Layer, together with examples.
Chapter 11: Physical Elements	This chapter describes the language elements for modeling the physical world, together with examples.
Chapter 12: Cross-Layer Dependencies	This chapter covers the relationships between different layers of the language.
Chapter 13: Implementation and Migration Elements	This chapter describes the language elements for expressing the implementation and migration aspects of an architecture; e.g., projects, programs, work packages, plateaus, and gaps.
Chapter 14: Stakeholders, Viewpoints, and Views	This chapter describes the ArchiMate viewpoint mechanism.
Chapter 15: Language Customization Mechanisms	This chapter describes how to customize the ArchiMate language for specialized or domain-specific purposes.
Appendix A: Summary of the Language Notation	This is an informative appendix summarizing the language notation.

Chapter	Description
Appendix B: Relationship Tables	This is a normative appendix detailing required relationships between elements of the language.
Appendix C: Example Viewpoints	This is an informative appendix presenting a set of Architecture Viewpoints.
Appendix D: Relationships to Other Standards	This is an informative appendix describing the relationship of the language to the TOGAF® Framework, BPMN™, UML®, and BMM.
Appendix E: Changes from ArchiMate 2.1 to ArchiMate 3.0	This is an informative appendix outlining the changes between Version 2.1 and Version 3.0.

What's New in the ArchiMate 3.0 Specification?

Why a New Version of the Language?

The new version of the language has been created to respond to a number of requirements:

- Increasing demand for relating business strategy with business and IT operations
- Technology innovations that mix IT and the physical world
- Usage in new domains; e.g., manufacturing, logistics
- Improved consistency and comprehensibility
- Improved alignment between Open Group standards, notably with the TOGAF Framework

The key changes in the new specification are provided below.

Additions to Support Business Strategy Modeling and the Physical World

The ArchiMate framework has been extended to include strategy and physical elements, as shown in Figure 1.

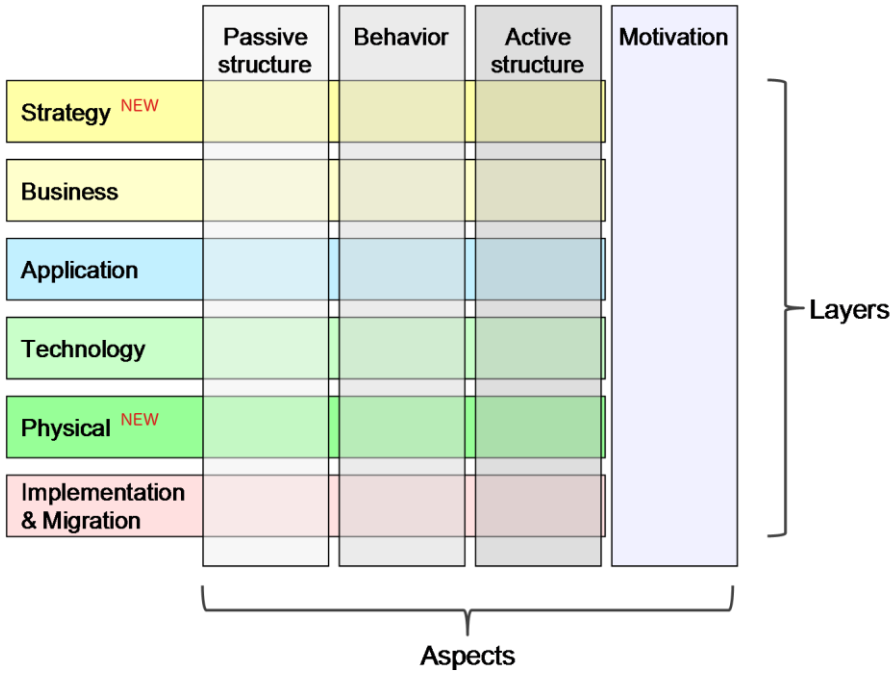

Figure 1: The ArchiMate Framework

The strategy elements include elements for capability, resource, and course of action. The physical elements build upon the Technology Layer and add elements for modeling physical facilities and equipment, distribution networks, and materials.

Strategy Elements

Elements have been added to support modeling strategy, capability-based planning, and related domains. This supports the increased usage of Enterprise Architecture in supporting strategy execution, and is in line with approaches used in related standards, such as the TOGAF Framework [1] and the Business Motivation Model [2].

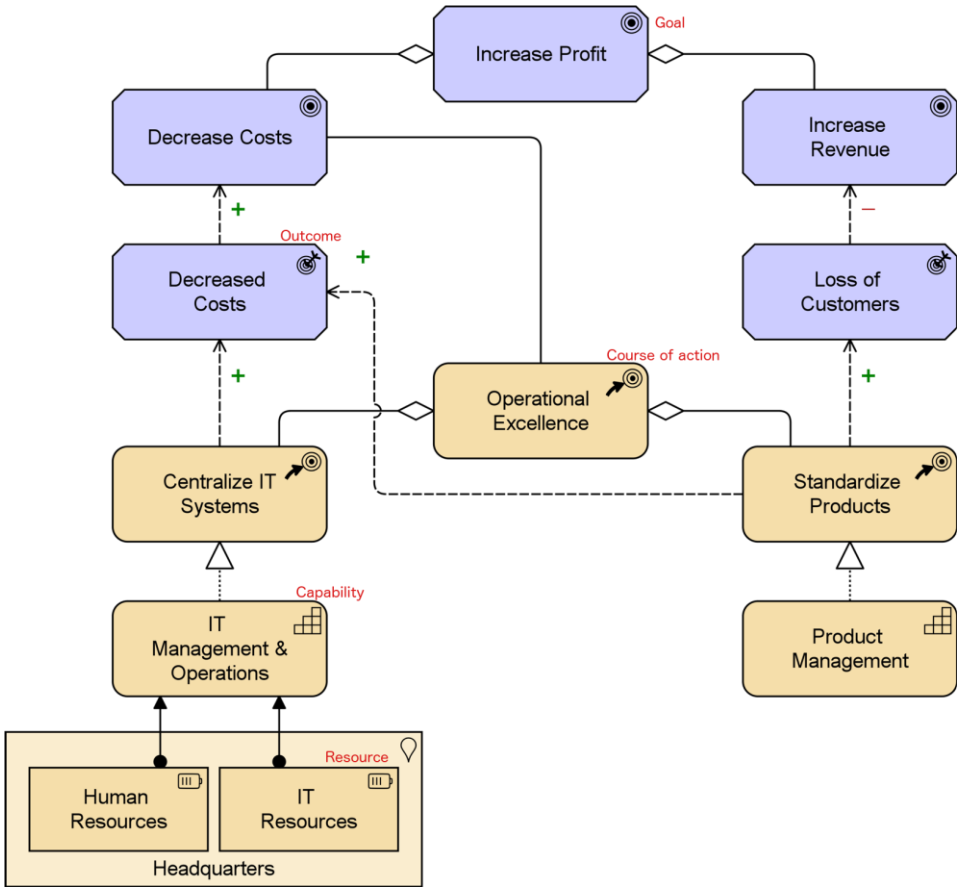

Figure 2: Motivation and Strategy Elements Example

Figure 2 shows an example using both motivation and strategy elements. Note that *outcome*, *course of action*, *capability*, and *resource* are new elements introduced in the ArchiMate 3.0 Specification.

Increase Profit is a goal that can be decomposed into a number of other goals: Decrease Costs and Increase Revenue. The former is related to the Operational Excellence strategy of the company, modeled as a course of action. This is decomposed into two other courses of action: Centralize IT Systems and Standardize Products. These result in two outcomes: Decreased Costs and Loss of Customers, which influence the goals

in positive and negative ways. This shows an important difference between goals and outcomes: not all outcomes lead to the intended results.

The courses of action are realized by a number of capabilities: IT Management & Operations and Product Management, and appropriate resources Human Resources and IT Resources are assigned to the former. The model fragment also shows that these resources are located in the Headquarters of the organization, in line with the Centralize IT Systems course of action.

Physical Elements

The Technology Layer has been extended with elements for modeling the physical world; for example, manufacturing, logistics, and other physical environments.

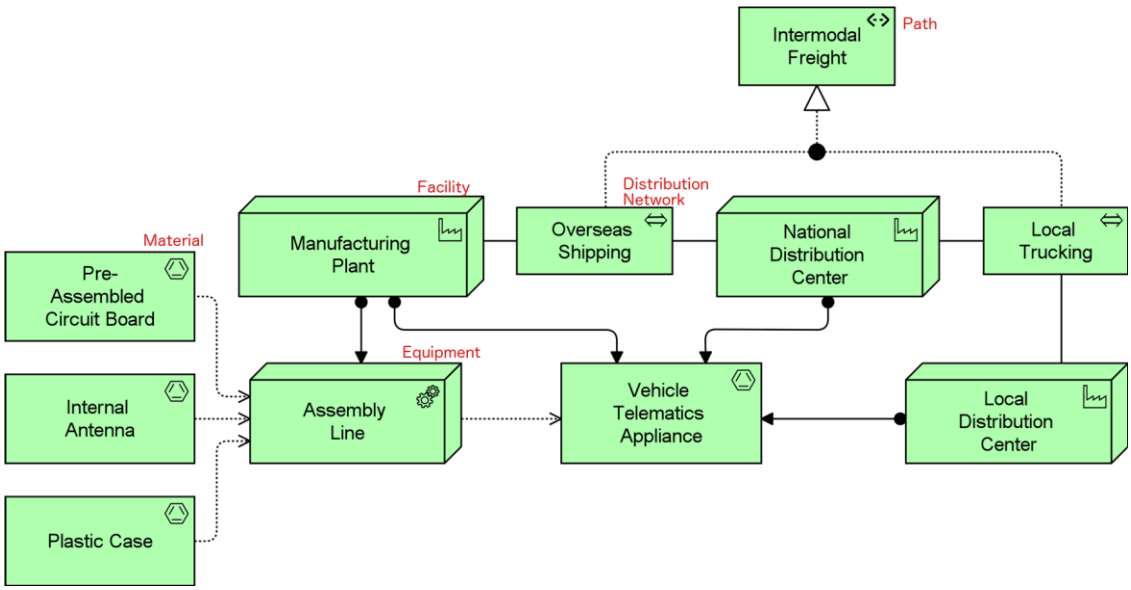

Figure 3: Physical Elements Example

Figure 3 shows an example of physical elements. Note that all the elements shown in the example except for Path, are new in the ArchiMate 3.0 Specification, and Path has been renamed from Communication Path and its meaning extended to allow it to integrate with physical elements.

An Assembly Line, modeled as equipment, and installed at a facility Manufacturing Plant, makes use of materials Pre-Assembled Circuit Board, Internal Antenna, and Plastic Case to produce material Vehicle Telematics Appliance. The appliance, initially located at the Manufacturing Plant facility, is subsequently transported to the facilities National Distribution Center and Local Distribution Center, making use of the distribution networks Overseas Shipping and Local Trucking. These distribution networks together realize the path Intermodal Freight.

No separate physical behavior elements have been introduced in the ArchiMate 3.0 Specification. Rather, the behavior elements from the Technology Layer (technology function, process, interaction, service, and event) are used to model the behavior of all nodes, including physical equipment. Since equipment is often computer-controlled, or used in other ways having a close relationship to IT, the behavior can be described in

an integral way using the existing technology behavior concepts. These concepts can also be used to describe the behavior of sensors and the connected devices that make up the Internet of Things (IoT).

Improved Usability and Consistency

A number of changes have been made to the language to improve its usability and consistency. These are summarized below.

Generic Metamodel

An upper-level generic metamodel has been introduced to document the full structure of the language.

Composite Elements

Grouping is no longer classified as a relationship, it is now a composite element. A grouping now has an aggregation or composition relationship with its contents, making it much more useful. It is also permissible to draw relationships from or to a grouping. One useful way of employing grouping is for modeling Architecture and Solution Building Blocks; another is for modeling domains in an architecture.

The location element has been moved from the Business Layer to the generic metamodel and defined as a composite element.

Improvements in the use of nesting as a notation allow a better representation of related items in modeling.

Changed the Notation for the Representation and Contract Elements

The notation of representation and contract has been changed to differentiate these from deliverable and business object, respectively.

Optional Notation to Denote the Layer of an Element

An optional notation has been introduced to explicitly denote the layer of an element. A letter ‘M’, ‘S’, ‘B’, ‘A’, ‘T’, ‘P’, or ‘I’ in the top-left corner of an element can be used to denote a Motivation, Strategy, Business, Application, Technology, Physical, or Implementation & Migration element, respectively. Figure 4 is an example model showing Application and Technology elements.

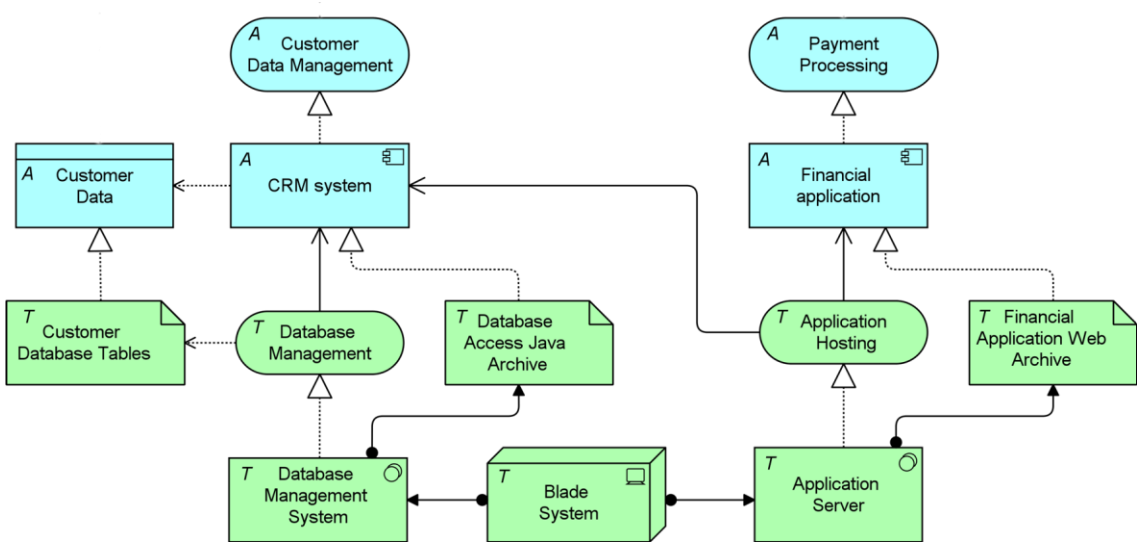

Figure 4: Element Notation Example

Relationships

Relationships to other relationships are now allowed in some cases; e.g., to associate objects with flows or aggregate relationships within groupings or plateaus.

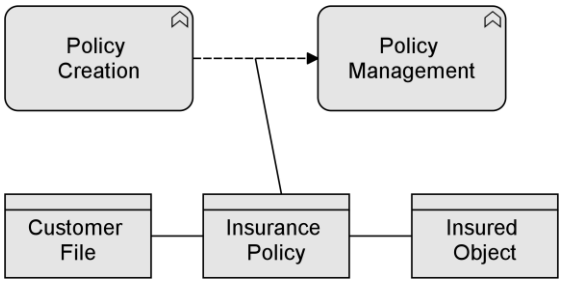

Figure 5: Example of a Relationship to a Relationship

The 'used by' relationship has had its name changed to 'serving', to better reflect its direction with an active verb: a service serves a user. The meaning of the relationship has not been altered. The 'used by' designation is still allowed but deprecated, and will be removed in a future version of the standard.

The notation of the influence relationship has been changed for consistency with the other dependency relationships (access and serving).

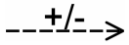

Figure 6: Influence Relationship Notation

A directional notation has been introduced for the assignment relationship by replacing the black circle at the target end by an arrow.

Figure 7: Assignment Relationship Notation

A junction is no longer classified as a relationship, but as a relationship connector, A junction is now explicitly either an 'or' junction, or a general 'and' junction.

Figure 8: Junction Notation

Motivation Elements

The outcome element has been added. The meaning and value elements have been transferred from the Business Layer.

Events Added

Event elements with a time attribute have been added at all layers in the ArchiMate core language as well as to the implementation and migration elements. The new elements are application event, technology event, and implementation event, which correspond to the pre-existing business event.

Improved Consistency in the Layers

Added application process, technology process, technology interaction, and technology collaboration, to increase the consistency of elements present in the layers.

Business Layer

The location, value, and meaning elements are no longer specified in the Business Layer.

The notation of the representation and contract elements has been changed, to distinguish these from deliverable and business object, respectively.

Technology Layer

The elements in the Technology Layer have been renamed from 'infrastructure [element name]' to 'technology [element name]'. The 'communication path' element has been renamed to 'path' and its meaning has been extended, to support the physical elements. The 'network' element has been renamed to 'communication network', to distinguish it from the physical element 'distribution network'.

Cross-Layer Relationships

Cross-layer relationships are now defined connecting the motivation and strategy with the core concepts (business, application, technology, physical), which connects strategy with its implementation.

There are also changes in cross-layer relationships to support better alignment between elements of the different layers (alignment of the Business Layer with lower layers).

Viewpoint Mechanism

Previous versions of the standard included an extensive list of viewpoints within the normative body of the standard, and the ability to define viewpoints to fit a particular situation. In Version 3.0, the description of the

viewpoint mechanism has been improved, and the list of viewpoints has been placed in an informative appendix to make it clear that these are example viewpoints.

The ArchiMate Language and the TOGAF ADM

The ArchiMate language consists of the ArchiMate core language, which includes the Business, Application, and Technology Layers, along with elements to model the strategy and motivation underlying an architecture, as well as its implementation and migration. Figure 9 shows a simplified mapping of how the ArchiMate language can be used in relation to the phases of the TOGAF Architecture Development Method (ADM).

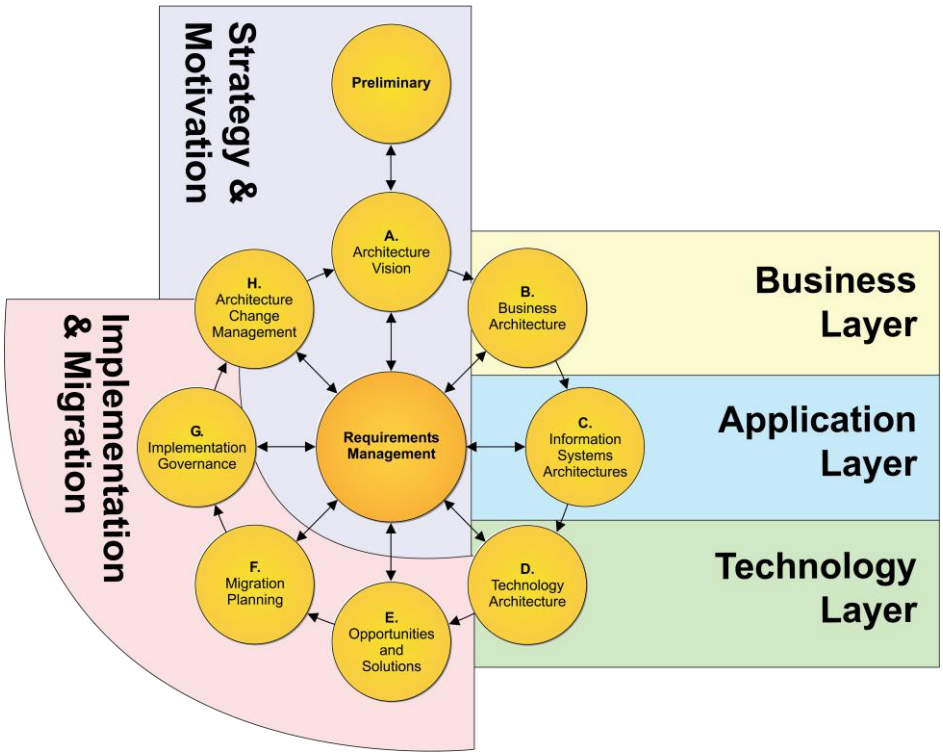

Figure 9: Simplified Mapping between the ArchiMate Language and the TOGAF ADM

The Business, Application, and Technology Layers support the description of the Business, Information Systems, and Technology Architecture domains defined by the TOGAF framework, as well as their inter-relationships.

The strategy and motivation elements in the ArchiMate language can be used to support the Requirements Management, Preliminary, and Architecture Vision phases of the TOGAF ADM, which establish the high-level business goals, architecture principles, and initial business requirements. They are also relevant to the Architecture Change Management phase of the TOGAF ADM, since the phase deals with changing requirements. Although not shown in Figure 9, it should be noted that these elements could also be used in other ADM phases, such as Phases B, C, and D.

The implementation and migration elements of the ArchiMate language support the implementation and migration of architectures through the Opportunities and Solutions, Migration Planning, and Implementation Governance phases of the TOGAF ADM.

Further Reading

The ArchiMate 3.0 Specification is available for online reading and download from The Open Group Bookstore at www.opengroup.org/bookstore/catalog/c162.htm.

Consult the ArchiMate website at www.opengroup.org/archimate for the latest information on publications and white papers.

References

(Please note that the links below are good at the time of writing but cannot be guaranteed for the future.)

[1] TOGAF® Version 9.1, an Open Group Standard (G116), December 2011, published by The Open Group; refer to: www.opengroup.org/bookstore/catalog/g116.htm.

[2] Business Motivation Model (BMM), Version 1.1 (formal/2010-05-01), Object Management Group, 2010.

About the Authors

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Andrew Josey is VP Standards and Certification, overseeing all certification and testing programs of The Open Group. He also manages the standards process for The Open Group. Since joining the company in 1996, Andrew has been closely involved with the standards development, certification, and testing activities of The Open Group. He has led many standards development projects including specification and certification development for the ArchiMate®, TOGAF®, IT4IT™, POSIX®, and UNIX® programs.

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Marc Lankhorst is Managing Consultant and Chief Technology Evangelist at BiZZdesign. He is responsible for market development, consulting, and coaching on digital business design and Enterprise Architecture, and spreading the word on the ArchiMate modeling language for Enterprise Architecture. His expertise and interests range from Enterprise Architecture and business process management to agile methods, portfolio management, and digital business design. Previously, Marc was a Senior Member of Scientific Staff at Novay (formerly Telematica Instituut), where he managed the collaborative R&D project that developed the initial version of the ArchiMate language. He leads the core team of The Open Group ArchiMate Forum that has defined the new version of the standard.

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Iver Band is a practicing Enterprise Architect and a developer and communicator of Enterprise Architecture standards and methods. At Cambia Health Solutions, he has guided initiatives focusing on provider systems, web and mobile experiences, and architecture methods and tools. He is currently focused on solutions that provide information about healthcare consumers and groups. Iver is also the elected Vice-Chair of the ArchiMate Forum. He has led development of several Open Group White Papers and contributed to the second and third major versions of the ArchiMate language. He is TOGAF 9 and ArchiMate 2 Certified, a Certified Information Systems Security Professional (CISSP), a Certified Information Professional, an AHIP Information Technology Professional, and a Prosci Certified Change Consultant.

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Henk Jonkers is a Senior Research Consultant, involved in BiZZdesign's innovations in the areas of Enterprise Architecture and engineering. He participates in multi-party research projects, contributes to training courses, and performs consultancy assignments. Previously, as a member of scientific staff at the Telematica Instituut, he was involved in research projects on business process modeling and analysis, Enterprise Architecture, Service-Oriented Architecture (SOA), and model-driven development. He was one of the main developers of the ArchiMate language and an author of the ArchiMate 1.0, 2.1, and 3.0 Specifications, and is actively involved in the activities of The Open Group ArchiMate Forum.

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Dick Quartel is a Senior Research Consultant at BiZZdesign. In this role he contributes to the development and improvement of BiZZdesign's products and services, is involved in research projects, supervises MSc students and interns, and performs consultancy assignments. In addition, he is an author of many scientific and professional publications, and an author of the ArchiMate 2.1 and 3.0 Specifications. Previously, he worked as a Senior Researcher at Novay (formerly Telematica Instituut), where he acted as researcher and project manager and contributed to the definition and acquisition of research projects. As an Assistant Professor at the University of Twente, he worked in the areas of distributed systems design, protocol design and implementation, and middleware systems.

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The Open Group is a global consortium that enables the achievement of business objectives through IT standards. With more than 500 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:

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